Deploying IBM MQ IVT wmq.jmsra.ivt.ear in WebSphere Liberty Profile (WLP) in Linux RHEL

https://www.ibm.com/support/pages/node/7028184

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Rich Montjoy, Paul Titheridge, Angel Rivera
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+++ Objective +++

The purpose of this tutorial is to download, install, configure and run the WebSphere Liberty Profile (WLP) in a Linux (RHEL) server, with the intention to run the IBM MQ Installation-Verification-Test (IVT) ear file, wmq.jmsra.ivt.ear.

In particular for this tutorial, the version of MQ is 9.3.3 CD, but the steps are applicable to all supported versions of MQ.

Two main options for getting the IBM MQ IVT wmq.jmsra.ivt.ear are discussed:
- (Option 1) from the full MQ Server package downloaded from IBM Passport Advantage
- (Option 2) from the IBM-MQ-Java-InstallRA.jar downloaded from IBM Fix Central

The following full path names of MQ files will be used:

- The MQ Resource Adapter (RA) rar:	/opt/mqm/java/lib/jca/wmq.jmsra.rar
- The MQ IVT ear:	/opt/mqm/java/lib/jca/wmq.jmsra.ivt.ear

Then this tutorial describes how to download (in /downloads/wlp-liberty) and install WebSphere Liberty Profile (aka "Liberty") in:
  /opt/liberty

Finally, let's explore the steps for running Liberty and the IVT runtime application.

+ Local queue manager

We will use a queue manager located in the same host of the Liberty server.
Because our focus is just to have a basic queue manager with minimum security for testing the MQ IVT application, the CONNAUTH and CHLAUTH are disabled.

Queue manager name: QMWLP
Host: localhost
Port: 1414
Server-Connection channel: WLP.SVRCONN with MCAUSER('mqm') set.
Queue: RA_IVT_Q

One way to create such queue manager is by creating an mqsc file in /var/mqm such as:
/var/mqm/define-liberty.mqsc

The contents of this mqsc file is:

+ begin of file (do not include this line)

```
** Define queues
DEFINE QLOCAL('RA_IVT_Q')                       REPLACE

** Do not ask for password for remote access
ALTER AUTHINFO(SYSTEM.DEFAULT.AUTHINFO.IDPWOS) AUTHTYPE(IDPWOS) CHCKCLNT(OPTIONAL)
REFRESH SECURITY TYPE(CONNAUTH)

** Simplify the demo system by disabling channel and connection authentication
ALTER QMGR CHLAUTH(DISABLED) CONNAUTH(' ')
REFRESH SECURITY TYPE(CONNAUTH)

** Define channels to be used by a remote MQ client
DEFINE CHANNEL(WLP.SVRCONN) CHLTYPE(SVRCONN) MCAUSER('mqm')
```

+ end of file (do not include this line)

Then create the queue manager by issuing crtmqm with the flag -ic that points to the file that has the mqsc commands:

```
mqm@volterra1.fyre.ibm.com:
$ crtmqm -u SYSTEM.DEAD.LETTER.QUEUE -p 1414 -ic /var/mqm/define-liberty.mqsc   QMWLP
```

You need to ensure that the following command should work fine without errors, in that way, when you later on start and run the Liberty server, any new errors will be directly related to the use of Liberty and not from a basic initial configuration.

```
mqm@volterra1.fyre.ibm.com: /var/mqm
$ export MQSERVER='WLP.SVRCONN/TCP/localhost(1414)'
$ amqsputc RA_IVT_Q QMWLP
Sample AMQSPUT0 start
target queue is RA_IVT_Q
testing prior to start the WLP server
Sample AMQSPUT0 end
```

+++ Requirements

- About the MQ IVT application:

1. The IVT sample is located in the MQ installation under the following directory (if the java client is installed):

```
   <mq_install_dir>/java/lib/jca/wmq.jmsra.ivt.ear
```

2. It is a servlet that posts a message to an MQ queue and then uses an activation spec to consume the message.

3. This IVT sample is hard-coded to use a JMS Administrative object of type jmsQueue named IVTQueue which refers to the real (base) MQ queue named RA_IVT_Q

4. The sample can use whatever server-connection channel that you wish.

- Linux distribution and version.release supported by IBM MQ 9.3.

The most up to date information on the supported versions of the Operating Systems is found in the following web page:
.
https://www.ibm.com/support/pages/node/318077
System Requirements for IBM MQ
.
You need to select the desired version.release, then follow the prompts for the desired Operating System and then the fix pack level.
.
For example:
MQ 9.3:
RHEL 7.9 or later update
RHEL 8.4 or later update
RHEL 9 added for MQ 9.3.1 CD (20-Oct-2022), MQ 9.3.0.2 LTS

For this tutorial it is RHEL 8.6.

```
** ROOT ** volterra1.fyre.ibm.com: /downloads
# cat /etc/redhat-release
Red Hat Enterprise Linux release 8.6 (Ootpa)
```

- WebSphere Liberty Profile

https://www.ibm.com/support/pages/node/713049
Levels of JRE and GSkit bundled with IBM MQ
It is included also: GSKit, JRE, LDAP, WLP Liberty

Under the section for:
IBM MQ Continuous Delivery (CD)

Then from the table, see item for 9.3.3:

IBM MQ 9.3.x Continuous Delivery (CD)	GSKit Level	JRE Level	IBM Security Directory Server, Client Level	WebSphere Application Server Liberty profile
9.3.3.0 (Windows, Linux, AIX)	8.0.55.31	8.0.8.0	ISVD 10.0.0	23.0.0.3

The above means that MQ 9.3.3 Server package from IBM Passport Advantage ships the WAS Liberty Profile 23.0.0.3.

Thus, if you download Liberty, it is recommended that you use one based on 23.0.0.3.

++ References

https://www.ibm.com/docs/en/ibm-mq/9.3?topic=adapter-verifying-resource-installation
IBM MQ / 9.3
Verifying the resource adapter installation
The installation verification test (IVT) program for the IBM® MQ resource adapter is supplied as an EAR file. To use the program, you must deploy it and define some objects as JCA resources.

https://www.ibm.com/docs/en/was-liberty/base?topic=SSEQTP_liberty/com.ibm.websphere.wlp.nd.multiplatform.doc/ae/twlp_inst.htm
IBM WebSphere Application Server Liberty
Installing Liberty by using downloaded archives

The following tutorial deals with Open Liberty:

https://community.ibm.com/community/user/integration/blogs/anthony-beardsmore1/2020/09/08/openliberty-ibmmq
Deploying a Message Driven Bean in Open Liberty with IBM MQ
By Anthony Beardsmore posted Tue September 08, 2020

+ Begin excerpt

… you'll probably come across references to 'WebSphere Application Server', 'WebSphere Liberty Profile' and 'Open Liberty'. You can find much more information about these options elsewhere, but as a very brief summary:

- **WebSphere Application Server (WAS)**
IBM's traditional Java EE application server, extremely flexible, scalable and full featured. Sometimes referred to as 'traditional' WAS.

- **WebSphere Liberty Profile (WLP)**
A newer, related but separate runtime providing many of the same facilities, specifically designed to be lightweight and composable – so for example, if you do not require the full Java EE specification you do not need to deploy all of these features.

- **Open Liberty**
The free and open source 'upstream' source for WLP, contributed to the community by IBM.

+ End excerpt

+++ (Option 1) from the full MQ Server package downloaded from IBM Passport Advantage

To download the full MQ Server package, see:

https://www.ibm.com/support/pages/downloading-ibm-mq-933-continuous-delivery
Downloading IBM MQ 9.3.3 Continuous Delivery (CD)

Visit IBM Passport Advantage:
https://www.ibm.com/software/passportadvantage/pao_customer.html
... search for Part Number:

M0BD2ML	IBM MQ 9.3.3 Continuous Delivery release for Linux on x86 64-bit eImage
M0BCWML	IBM MQ 9.3.3 Continuous Delivery release for Windows 64-bit elmage

These are the locations for the MQ RA rar and IVT ear files.

Windows:

```
Directory of C:\Program Files\IBM\MQ\java\lib\jca
05/31/2023  01:00 AM            10,242 wmq.jakarta.jmsra.ivt.ear
05/31/2023  01:00 AM        20,417,740 wmq.jakarta.jmsra.rar
05/31/2023  01:00 AM            25,617 wmq.jmsra.ivt.ear
05/31/2023  01:00 AM        20,411,768 wmq.jmsra.rar
```

Linux:

```
**ROOT** volterra1.fyre.ibm.com: /opt/mqm
# ls -l /opt/mqm/java/lib/jca/*
-r--r--r-- 1 mqm mqm    10232 May 31 05:16 wmq.jakarta.jmsra.ivt.ear
-r--r--r-- 1 mqm mqm 20410248 May 31 05:16 wmq.jakarta.jmsra.rar
-r--r--r-- 1 mqm mqm    25579 May 31 05:16 wmq.jmsra.ivt.ear
-r--r--r-- 1 mqm mqm 20404161 May 31 05:16 wmq.jmsra.rar
```

These ear files are provided by fileset:

```
# rpm -qf /opt/mqm/java/lib/jca/wmq.jmsra.ivt.ear
MQSeriesJava-9.3.3-0.x86_64
```

+ Linux installation / uninstallation / maintenance ++

The following tutorial can be helpful for the installation and uninstallation tasks when you want to have only 1 installation in the host. Keep in mind that the Fix Packs mentioned in the tutorial were the ones that were the latest at the time the tutorial was written.
Even though the titles specify MQ 9.3, the same principles apply to all versions, release types (LTS/CD) and fix packs.
It applies also to the queue manager and/or client components.
All the tasks are done with the default Installation1 which is /opt/mqm

> https://www.ibm.com/support/pages/node/6988681
> Installing MQ 9.3, applying Fix Pack 9.3.0.5, uninstalling in Linux RHEL

+++ (Option 2) from the IBM-MQ-Java-InstallRA.jar downloaded from IBM Fix Central

If you do not have the IBM MQ server from IBM Passport Advantage, then you can download the MQ Resource Adapter (RA) from IBM Fix Central

The MQ RA code can be downloaded from IBM Fix Central:
- It does not require a license.
- It is a "manufacturing refresh". For example, MQ 9.3.0.6 includes base MQ 9.3.0.0 + 9.3.0.1 + ... + 9.3.0.6

https://www.ibm.com/docs/en/ibm-mq/9.3?topic=roadmap-mq-downloads
IBM MQ / 9.3 / IBM MQ downloads
Any MQ version, all downloads

Scroll to section:
  Resource adapter, clients and other resources

See the subsection:
  Clients:

Click on:
  IBM MQ Resource Adapter - - For use with any Java EE 7 or Jakarta EE compliant application server
  https://ibm.biz/mq93JRA

You will be taken to a selected list of items from IBM Fix Central.
Some example items are:

1 release level: 9.3.0.6-IBM-MQ-Java-InstallRA
Long Term Support release: 9.3.0.6 IBM MQ Resource Adapter for use with Application Servers

2 release level: 9.3.3.0-IBM-MQ-Java-InstallRA
Continuous Delivery release: 9.3.3.0 IBM MQ Resource Adapter for use with Application Servers

For this tutorial the following files were downloaded:
9.3.3.0-IBM-MQ-Java-InstallRA.jar (48.17 MB)
9.3.3.0-IBM-MQ-Java-InstallRA.jar.sha256sum (66 bytes)

… into the local directory in Linux (owned by root):
/downloads/mq933ra

The following tutorial has the installation instructions in Chapter 3.

https://www.ibm.com/support/pages/node/6202719
Download, install and test IBM-MQ-Install-Java-All (com.ibm.mq.allclient.jar) and IBM-MQ-Java-InstallRA (wmq.jmsra.rar)

Login as user: root

Go to the directory where the file 9.3.3.0-IBM-MQ-Java-InstallRA.jar was downloaded:
/downloads/mq933ra

Now proceed to unpack the jar file:

```
# java -jar 9.3.3.0-IBM-MQ-Java-InstallRA.jar
Before you can use, extract, or install IBM MQ V9.1 - 07/2019, you must
accept the terms of 1. IBM International License Agreement for
Evaluation of Programs 2. IBM International Program License Agreement
and additional license information. Please read the following license
agreements carefully.
The license agreement is separately viewable using the
--viewLicenseAgreement option.
Press Enter to display the license terms now, or "x" to skip.
  x
By choosing the "I Agree" option below, you agree to the terms of the
license agreement and non-IBM terms, if applicable. If you do not
agree, select "I do not Agree".
Select [1] I Agree, or [2] I do not Agree:
 1
Enter directory for product files or leave blank to accept the default value.
The default target directory is /downloads/mq933ra

Target directory for product files? /downloads/mq933ra
Extracting files to /downloads/mq933ra/wmq
Successfully extracted all product files.

The files will be located in the subdirectory "wmq"
+++ROOT+++ volterra1.fyre.ibm.com: /downloads/mq933ra
# ls -lR
-rw-r--r-- 1 root root 50506839 Aug 18 08:08 9.3.3.0-IBM-MQ-Java-InstallRA.jar
-rw-r--r-- 1 root root       66 Aug 18 08:07 9.3.3.0-IBM-MQ-Java-InstallRA.jar.sha256sum
drwxr-xr-x 2 root root      114 Aug 18 08:49 wmq
./wmq:
-rw-r--r-- 1 root root    10242 Aug 18 08:49 wmq.jakarta.jmsra.ivt.ear
-rw-r--r-- 1 root root 20417740 Aug 18 08:49 wmq.jakarta.jmsra.rar
-rw-r--r-- 1 root root    25617 Aug 18 08:49 wmq.jmsra.ivt.ear
-rw-r--r-- 1 root root 20411768 Aug 18 08:49 wmq.jmsra.rar
```

++ Download, install, configure WebSphere Liberty Profile (WLP)

+ Step 1: Download and install WLP

Note:
For this tutorial, the user "root" is used to download, install, configure and run WLP.

Visit:
https://www.ibm.com/support/pages/websphere-liberty-developers
WebSphere Liberty for developers

Scroll to the section:
Download Package

Download	Release Date	Size
WebSphere Liberty 23.0.0.7 + Java SE 8 for linux-x86	25 July 2023	247 MB

The file was downloaded into the local directory in Linux: /downloads/wlp-liberty

```
***ROOT*** volterra1.fyre.ibm.com: /downloads/wlp-liberty
# ls -l /downloads/wlp-liberty
-rw-r--r-- 1 root root 259527037 Aug 18 08:40 wlp-webProfile8-java8-linux-x86_64-23.0.0.7.zip
```

As user root, unzip the file into a new directory called: /opt/liberty

Let's create the directory and unzip the file:

```
***ROOT*** volterra1.fyre.ibm.com: /root
# mkdir /opt/liberty
# cd /opt/liberty
# unzip /downloads/wlp-liberty/wlp-webProfile8-java8-linux-x86_64-23.0.0.7.zip
```

The files are unzipped into a new directory called: wlp

```
# ls -l /opt/liberty
drwxr-xr-x 10 root root 167 Jul 10 16:32 wlp
```

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp
# ls -lF
drwxr-xr-x 4 root root  4096 Jul 10 16:32 bin/
drwxr-xr-x 3 root root    45 Jul 10 16:32 clients/
drwxr-xr-x 4 root root    28 Jul 10 16:32 dev/
drwxr-xr-x 3 root root    34 Jul 10 15:56 java/
drwxr-xr-x 2 root root  4096 Jul 10 16:32 lafiles/
drwxr-xr-x 7 root root 28672 Jul 10 16:32 lib/
drwxr-xr-x 4 root root    36 Jul 10 16:32 templates/
drwxr-xr-x 4 root root    35 Jul 10 16:32 usr/
```

+ Step 2: Use the WLP installUtility to install features for MQ JMS.

** SUMMARY **

You will need to install the following liberty features:

```
    <feature>webProfile-7.0</feature>
    <feature>servlet-3.1</feature>
    <feature>mdb-3.2</feature>
    <feature>wmqJmsClient-2.0</feature>
    <feature>jndi-1.0</feature>
```

NOTE: When you install the webProfile-7.0 it also installs the servlet-3.1 feature

As user root use the WLP utility: installUtility

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ./installUtility install webProfile-7.0
# ./installUtility install mdb-3.2
# ./installUtility install wmqJmsClient-2.0
# ./installUtility install jndi-1.0
```

** DETAILS **

There is an installUtility in the bin directory of the wlp install:

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ls installUtility
installUtility
```

For more information see:

https://www.ibm.com/docs/en/was-liberty/base?topic=command-installutility
All products /
WebSphere Application Server Liberty
installUtility command

For example, you can use the 'find' option to find a package that begins with "web"

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ./installUtility find web*
Establishing a connection to the configured repositories ...
This process might take several minutes to complete.

Successfully connected to all configured repositories.
```

```
Searching assets. This process might take several minutes to complete.

addon : webProfile10Bundle : Jakarta EE 10 Web Profile Bundle
addon : webProfile7Bundle : Java EE 7 Web Profile Bundle
addon : webProfile8Bundle : Java EE 8 Web Profile Bundle
addon : webProfile9Bundle : Jakarta EE 9 Web Profile Bundle
feature : adminCenter-1.0 : Admin Center
feature : appSecurity-1.0 : Application Security 1.0
feature : appSecurity-2.0 : Application Security 2.0
feature : faces-3.0 : Jakarta Server Faces 3.0
feature : faces-4.0 : Jakarta Faces 4.0
feature : facesContainer-3.0 : Jakarta Server Faces 3.0 Container
feature : facesContainer-4.0 : Jakarta Faces 4.0 Container
feature : grpc-1.0 : gRPC 1.0
feature : httpWhiteboard-1.0 : OSGi Http Whiteboard 1.0
feature : jaxrs-1.1 : Java RESTful Services 1.1
feature : jaxrs-2.0 : Java RESTful Services 2.0
feature : jaxrs-2.1 : Java RESTful Services 2.1
feature : jaxws-2.2 : Java Web Services 2.2
feature : jsf-2.0 : JavaServer Faces 2.0
feature : jsf-2.2 : JavaServer Faces 2.2
feature : jsf-2.3 : JavaServer Faces 2.3
feature : jsfContainer-2.2 : JavaServer Faces Container 2.2
feature : jsfContainer-2.3 : JavaServer Faces Container 2.3
feature : jwt-1.0 : JSON Web Token 1.0
feature : jwtSso-1.0 : JSON Web Token Single Sign-On 1.0
feature : mpJwt-1.0 : MicroProfile JSON Web Token 1.0
feature : mpJwt-1.1 : MicroProfile JSON Web Token 1.1
feature : mpJwt-1.2 : MicroProfile JSON Web Token 1.2
feature : mpJwt-2.0 : MicroProfile JSON Web Token 2.0
feature : mpJwt-2.1 : MicroProfile JSON Web Token 2.1
feature : oauth-2.0 : OAuth 2.0
feature : openapi-3.0 : OpenAPI 3.0
feature : openapi-3.1 : OpenAPI 3.1
feature : openid-2.0 : OpenID 2.0
feature : openidConnectClient-1.0 : OpenID Connect Client 1.0
feature : openidConnectServer-1.0 : OpenID Connect Provider 1.0
feature : osgiAppConsole-1.0 : OSGi Applications Console 1.0
feature : restfulWS-3.0 : Jakarta RESTful Web Services 3.0
feature : restfulWS-3.1 : Jakarta RESTful Web Services 3.1
feature : restfulWSClient-3.0 : Jakarta RESTful Web Services 3.0 Client
feature : restfulWSClient-3.1 : Jakarta RESTful Web Services 3.1 Client
feature : samlWeb-2.0 : SAML Web Single Sign-On 2.0
feature : spnego-1.0 : Simple and Protected GSSAPI Negotiation Mechanism 1.0
feature : wab-1.0 : OSGi Web Application Bundles 1.0
feature : webCache-1.0 : Web Response Cache 1.0
feature : webCacheMonitor-1.0 : Web Cache Monitor 1.0
feature : webProfile-10.0 : Jakarta EE Web Profile 10.0
feature : webProfile-6.0 : Java EE Web Profile 6.0
feature : webProfile-7.0 : Java EE Web Profile 7.0
feature : webProfile-8.0 : Java EE Web Profile 8.0
feature : webProfile-9.1 : Jakarta EE Web Profile 9.1
feature : wsAtomicTransaction-1.2 : WS-AT Service 1.2
feature : wsSecurity-1.1 : Web Service Security 1.1
feature : wsSecuritySaml-1.1 : WSSecurity SAML 1.1
feature : xmlWS-3.0 : Jakarta XML Web Services 3.0
feature : xmlWS-4.0 : Jakarta XML Web Services 4.0
```

Let's proceed to install: webProfile-7.0 : Java EE Web Profile 7.0
NOTE: When you install the webProfile-7.0 it also installs the servlet-3.1 feature

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ./installUtility install webProfile-7.0***ROOT*** volterra1.fyre.ibm.com:
/opt/liberty/wlp/bin

Establishing a connection to the configured repositories ...
This process might take several minutes to complete.

Successfully connected to all configured repositories.

Preparing assets for installation. This process might take several minutes to complete.
Step 1 of 32: Downloading servlet-3.1 ...
Step 2 of 32: Installing servlet-3.1 ...
Step 3 of 32: Downloading jdbc-4.1 ...
Step 4 of 32: Installing jdbc-4.1 ...
Step 5 of 32: Downloading jaxrsClient-2.0 ...
Step 6 of 32: Installing jaxrsClient-2.0 ...
Step 7 of 32: Downloading jpaContainer-2.1 ...
Step 8 of 32: Installing jpaContainer-2.1 ...
Step 9 of 32: Downloading jaxrs-2.0 ...
Step 10 of 32: Installing jaxrs-2.0 ...
Step 11 of 32: Downloading jpa-2.1 ...
Step 12 of 32: Installing jpa-2.1 ...
Step 13 of 32: Downloading jsf-2.2 ...
Step 14 of 32: Installing jsf-2.2 ...
Step 15 of 32: Downloading jsonp-1.0 ...
Step 16 of 32: Installing jsonp-1.0 ...
Step 17 of 32: Downloading beanValidation-1.1 ...
Step 18 of 32: Installing beanValidation-1.1 ...
Step 19 of 32: Downloading cdi-1.2 ...
Step 20 of 32: Installing cdi-1.2 ...
Step 21 of 32: Downloading webProfile-7.0 ...
Step 22 of 32: Installing webProfile-7.0 ...
Step 23 of 32: Downloading servlet-3.0 ...
Step 24 of 32: Installing servlet-3.0 ...
Step 25 of 32: Downloading jaxrs-1.1 ...
Step 26 of 32: Installing jaxrs-1.1 ...
Step 27 of 32: Downloading restConnector-1.0 ...
Step 28 of 32: Installing restConnector-1.0 ...
Step 29 of 32: Downloading jsp-2.2 ...
Step 30 of 32: Installing jsp-2.2 ...
Step 31 of 32: Validating installed fixes ...
Step 32 of 32: Cleaning up temporary files ...

All assets were successfully installed.

Start product validation...
Product validation completed successfully.
```

Let's find the features that begin with mdb

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ./installUtility find mdb*
Establishing a connection to the configured repositories ...
This process might take several minutes to complete.

Successfully connected to all configured repositories.

Searching assets. This process might take several minutes to complete.

feature : jmsMdb-3.2 : JMS Message-Driven Beans 3.2
feature : mdb-3.1 : Message-Driven Beans 3.1
feature : mdb-3.2 : Message-Driven Beans 3.2
feature : mdb-4.0 : Jakarta Enterprise Beans 4.0 Message-Driven Beans
```

Let's install: mdb-3.2

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ./installUtility install mdb-3.2
Establishing a connection to the configured repositories ...
This process might take several minutes to complete.

Successfully connected to all configured repositories.

Preparing assets for installation. This process might take several minutes to complete.
Step 1 of 6: Downloading jca-1.7 ...
Step 2 of 6: Installing jca-1.7 ...
Step 3 of 6: Downloading mdb-3.2 ...
Step 4 of 6: Installing mdb-3.2 ...
Step 5 of 6: Validating installed fixes ...
Step 6 of 6: Cleaning up temporary files ...

All assets were successfully installed.

Start product validation...
Product validation completed successfully.
```

Let's find the features that have: jms

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ./installUtility find jms*
Establishing a connection to the configured repositories ...
This process might take several minutes to complete.

Successfully connected to all configured repositories.

Searching assets. This process might take several minutes to complete.

feature : jms-1.1 : Java Message Service 1.1
feature : jms-2.0 : Java Message Service 2.0
feature : jmsMdb-3.1 : JMS Message-Driven Beans 3.1
feature : jmsMdb-3.2 : JMS Message-Driven Beans 3.2
feature : jndi-1.0 : Java Naming and Directory Interface 1.0
feature : wasJmsClient-1.1 : JMS 1.1 Client for Message Server
feature : wasJmsClient-2.0 : JMS 2.0 Client for Message Server
feature : wasJmsSecurity-1.0 : Message Server Security 1.0
feature : wasJmsServer-1.0 : Message Server 1.0
feature : wmqJmsClient-1.1 : JMS 1.1 Client for IBM MQ
feature : wmqJmsClient-2.0 : JMS 2.0 Client for IBM MQ
```

Let's install: wmqJmsClient-2.0

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ./installUtility install wmqJmsClient-2.0
Establishing a connection to the configured repositories ...
This process might take several minutes to complete.

Successfully connected to all configured repositories.

Preparing assets for installation. This process might take several minutes to complete.
Step 1 of 4: Downloading wmqJmsClient-2.0 ...
Step 2 of 4: Installing wmqJmsClient-2.0 ...
Step 3 of 4: Validating installed fixes ...
Step 4 of 4: Cleaning up temporary files ...

All assets were successfully installed.

Start product validation...
Product validation completed successfully.
```

Let's find the features that begin with: jndi

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ./installUtility find jndi*
Establishing a connection to the configured repositories ...
This process might take several minutes to complete.

Successfully connected to all configured repositories.

Searching assets. This process might take several minutes to complete.

feature : cloudant-1.0 : Cloudant Integration 1.0
feature : couchdb-1.0 : CouchDB Integration 1.0
feature : distributedMap-1.0 : Distributed Map interface for Dynamic Caching 1.0
feature : jndi-1.0 : Java Naming and Directory Interface 1.0
feature : mongodb-2.0 : MongoDB Integration 2.0
```

Let's install jndi-1.0
(It is ok if you get this warning)

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ./installUtility install jndi-1.0
CWWKF1250I: The following assets already exist: [jndi-1.0]. They will not be reinstalled. To modify
an existing feature, you must manually uninstall it first.
```

+ Step 3: Create WLP server

For the name of the WLP server, I would like to have a string that is easy to search in the logs and in the output of ps, such as my first name.

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ./server create wlp-angel
Server wlp-angel created.
```

When a new WLP server is created, a new directory for its configuration and other files will be created under "usr" in the WLP directory structure.

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/usr/servers
# ls
wlp-angel
```

+ Step 4: Backup the original server.xml for the new WLP server

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/usr/servers
# cd wlp-angel

***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/usr/servers/wlp-angel
# ls
apps  dropins  server.env  server.xml  workarea

***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/usr/servers/wlp-angel
# cp -p server.xml server-original.xml
```

+ Step 5: Create a new server.xml and edit it to suit your needs

The following server.xml is the one that was actually used for this tutorial.

The items in blue are the ones that you may need to customize.

+ being file (do not include this line)

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="new server">

    <!-- Enable features -->
    <featureManager>
        <feature>servlet-3.1</feature>
        <feature>webProfile-7.0</feature>
        <feature>jndi-1.0</feature>
        <feature>wmqJmsClient-2.0</feature>
        <feature>mdb-3.2</feature>
    </featureManager>

    <!-- Location of the MQ RA -->
    <variable name="wmqJmsClient.rar.location"
value="/opt/mqm/java/lib/jca/wmq.jmsra.rar"/>

    <!-- WLP wrapping trace enabled -->
    <logging traceSpecification="*=info:JMSApi=all:Transaction=all:WAS.j2c=all:EJBContainer=all:Injection=all"/>

   <jmsQueueConnectionFactory connectionManagerRef="ConMgrIVT" jndiName="IVTCF">
      <properties.wmqJms
        channel="WLP.SVRCONN"
        hostname="localhost"
        port="1414"
        transportType="CLIENT"
        queueManager="QMWLP" />
    </jmsQueueConnectionFactory>

    <jmsQueue id="IVTQueue" jndiName="IVTQueue">
      <properties.wmqJms
        baseQueueName="RA_IVT_Q"
        baseQueueManagerName="QMWLP"/>
    </jmsQueue>
    <jmsActivationSpec id="wmq.jmsra.ivt/WMQ_IVT_MDB/WMQ_IVT_MDB">
      <properties.wmqJms
        destinationRef="IVTQueue"
        transportType="CLIENT"
        channel="WLP.SVRCONN"
        hostname="localhost"
        port="1414"
        queueManager="QMWLP"/>
       <!-- The following commented line shows how to pass a user/password -->
       <!--<authData id="auth1" user="wlpuserid" password="passw0rd"/>  -->
    </jmsActivationSpec>

    <!-- Location of MQ IVT ear -->
    <enterpriseApplication id="wmq.jmsra.ivt" name="wmq.jmsra.ivt"
location="/opt/mqm/java/lib/jca/wmq.jmsra.ivt.ear"/>

    <!-- To access this server from a remote client add a host attribute to the following
element, e.g. host="*" -->
    <httpEndpoint host="*" httpPort="9080" httpsPort="9443" id="defaultHttpEndpoint">
      <accessLogging/>
    </httpEndpoint>

    <!-- Automatically expand WAR files and EAR files -->
    <applicationManager autoExpand="true"/>

</server>
```

+ end file (do not include this line)

Notes:

- The wrapping trace is enabled. It is suggested that you keep it during your initial experimentation with Liberty, in that way, if you get "weird" behavior, you could try at least to take a look at the traces (see last page in this tutorial for the location of the traces). After you become more familiar, then you could disable it.

- The section httpEndpoint uses the default ports. If you have another application that is currently using the default ports, you need to use "free" ports and specify it in the server.xml file.

- The last entry in the file indicates that the WAR or EAR should be expanded in the directory "./apps/expanded/" of the server:

```
# cd /opt/liberty/wlp/usr/servers/wlp-angel/apps/expanded/wmq.jmsra.ivt.ear
# ls
META-INF  WMQ_IVT_MDB.jar  WMQ_IVT.war
```

+ Step 6: Start the server

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ./server start wlp-angel
Starting server wlp-angel.
Server wlp-angel started with process ID 131971.
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
```

NOTE: Just for completeness, this is how to stop the service:

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# ./server stop wlp-angel
Stopping server wlp-angel.
Server wlp-angel stopped.
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
```

+ Step 7: Confirm that the server is running

a) Using ps -ef

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/usr/servers/wlp-angel
# ps -ef | grep angel
root      131971       1 36 08:15 pts/0    00:01:21 /opt/liberty/wlp/java/java/bin/java -
javaagent:/opt/liberty/wlp/bin/tools/ws-javaagent.jar -Djava.awt.headless=true -
Djdk.attach.allowAttachSelf=true -jar /opt/liberty/wlp/bin/tools/ws-server.jar wlp-angel
```

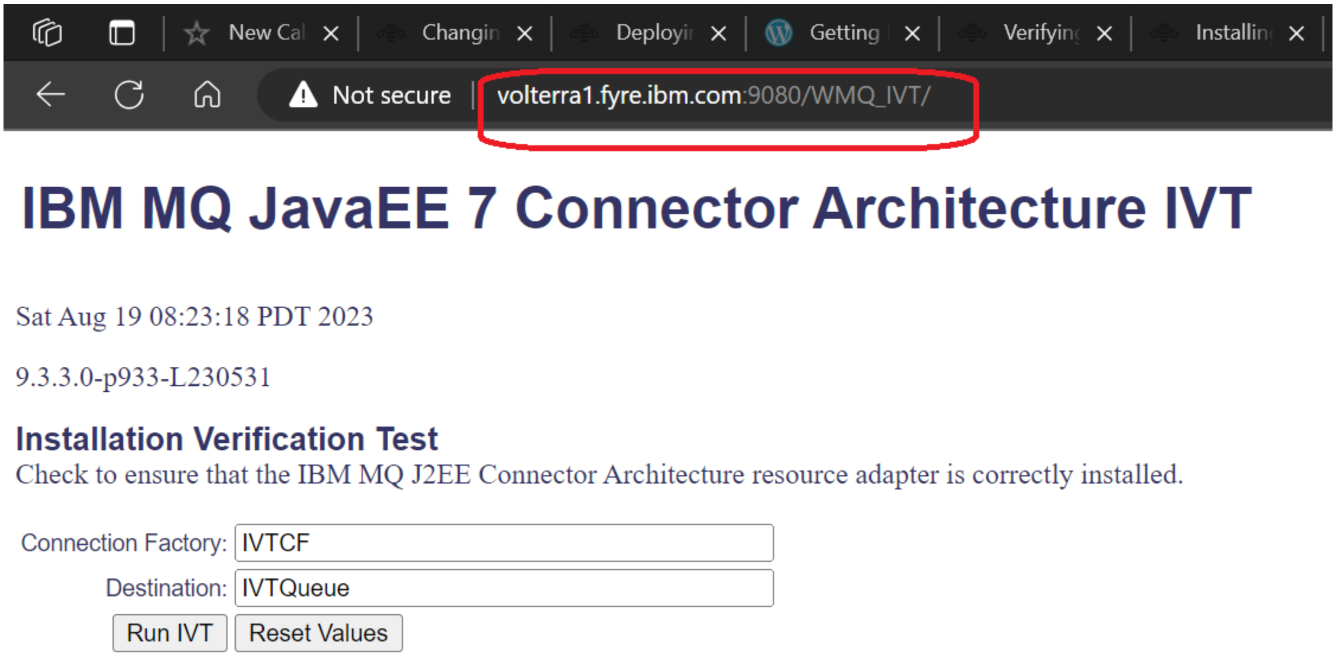
b) Ensure that the specified port (in this case the default 9080) is listening:

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/bin
# netstat -anp | grep 9080
tcp        0      0 0.0.0.0:9080            0.0.0.0:*               LISTEN      131971/java
```

+ Step 8: Open a Web Browser and specify the URL for the IVT

Using the Microsoft Edge browser from a Windows PC:

http://volterra1.fyre.ibm.com:9080/WMQ_IVT/



IBM MQ JavaEE 7 Connector Architecture IVT

Sat Aug 19 08:23:18 PDT 2023

9.3.3.0-p933-L230531

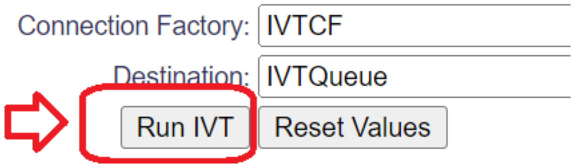
Installation Verification Test

Check to ensure that the IBM MQ J2EE Connector Architecture resource adapter is correctly installed.

Connection Factory: IVTCF

Destination: IVTQueue

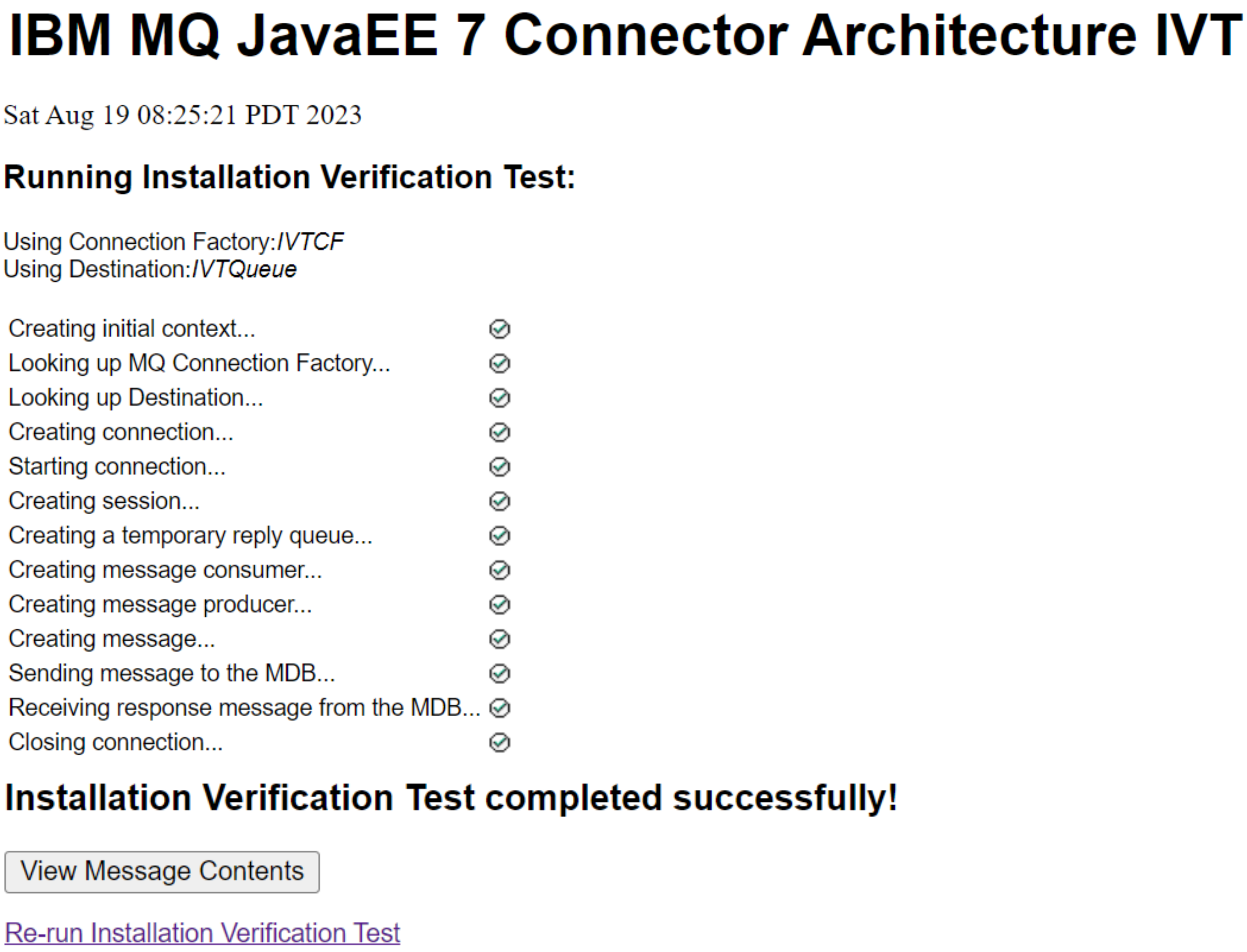
Now click on the button:



Connection Factory: IVTCF

Destination: IVTQueue

And you should see:



IBM MQ JavaEE 7 Connector Architecture IVT

Sat Aug 19 08:25:21 PDT 2023

Running Installation Verification Test:

Using Connection Factory:*IVTCF*
Using Destination:*IVTQueue*

Creating initial context... ✓
Looking up MQ Connection Factory... ✓
Looking up Destination... ✓
Creating connection... ✓
Starting connection... ✓
Creating session... ✓
Creating a temporary reply queue... ✓
Creating message consumer... ✓
Creating message producer... ✓
Creating message... ✓
Sending message to the MDB... ✓
Receiving response message from the MDB... ✓
Closing connection... ✓

Installation Verification Test completed successfully!

YEAH!!!

+ Step 9: (If necessary) Troubleshooting

If things are not working as expected, you can take a look at the different troubleshooting and trace files under the directory:

```
  <liberty-installation>/usr/servers/<server-name>/logs
```

```
***ROOT*** volterra1.fyre.ibm.com: /opt/liberty/wlp/usr/servers/wlp-angel/logs
# ls -1F
console.log
http_access.log
messages.log
state/
trace_23.08.19_08.25.23.0.log
trace.log
```

+++ end +++