Custom MQ Images on RHOS

First section covers RHOS 3.11 with no TLS connectivity required

Second section covers RHOS 3.11 and RHOS 4.2

Where 4.2 requires TLS to connect clients from outside of the RHOS Cluster

Contents

Purpose of this document

ICP4i on RHOS 4.2 requires that “off cluster” clients connect via TLS to queue managers deployed in the cluster.

In scenarios there administrators wish to connect to MQ using existing tools or processes its is likely that they will do so against an MQ Image where a custom layer has been added over the top of the IBM MQ base image. Such a layer would simply enable client connectivity for “off cluster” tools.

When using RHOS 3.11 this is fairly straight forward. When using RHOS 4.2 we need TLS connection and therefore we need to consider that the administrators system (laptop etc) needs to be set up with keys and certs that will be interchanged with the queue managers on cluster.

This document assumes that “you” are that administrator and your system (laptop) has never used TLS for MQ connectivity before.

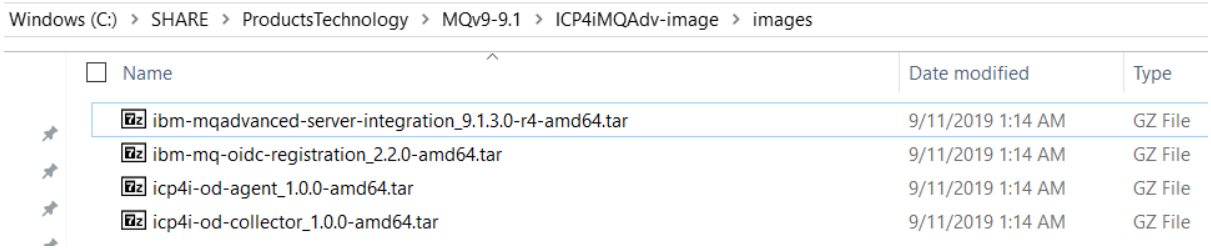
PART 1 of the document – this is simply showing how to create a custom layer on the MQ Image and make it available in an RHOS 3.11 cluster with ICP4i and connect administration tools over a specific SVRCONN channel

PART 2 of the document – this builds to connecting to queue managers on RHOS 4.2 over TLS from your laptop.

a) Setting up TLS between a client connected tools on the lap top to a queue manager running natively on your laptop
b) Reusing the collateral in a) above to build a custom docker image/container and have client connect tools on the lap top connect over TLS to a queue manager in the container running on the laptop.
c) Push the custom image to dockerhub, use an image stream on RHOS 3.11 to pull the image onto RHOS 3.11 cluster. ICP4i (Helm) deploy of the custom image. Connect tools on the lap top to the queue manager on ICP4i on RHOS 3.11 via TLS
d) To be Done Push the custom image to dockerhub, use an image stream on RHOS 4.2 to pull the image onto RHOS 4.2 cluster. ICP4i (Helm) deploy of the custom image. Connect tools on the lap top to the queue manager on ICP4i on RHOS 4.2 via TLS

Part 1 - Custom MQ Image on RHOS 3.1.1 with ICP4i (no TLS)

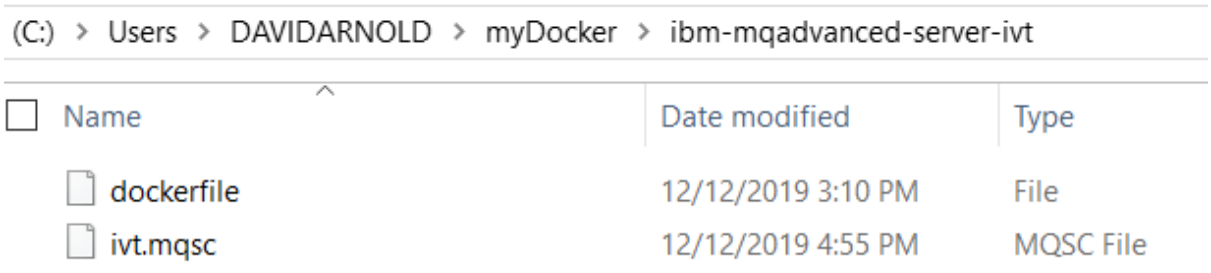
Load Official ICP4i MQAdvanced Server image to local docker repos



docker load < ibm-mqadvanced-server-integration_9.1.3.0-r4-amd64.tar.gz

```
 Directory of C:\SHARE\ProductsTechnology\MQv9-9.1\ICP4iMQAdv-image\images

13/12/2019  07:02 PM    <DIR>          .
13/12/2019  07:02 PM    <DIR>          ..
09/11/2019  01:14 AM       161,053,184 ibm-mq-oidc-registration_2.2.0-amd64.tar.gz
09/11/2019  01:14 AM       942,485,504 ibm-mqadvanced-server-integration_9.1.3.0-r4-amd64.tar.gz
09/11/2019  01:14 AM       310,161,408 icp4i-od-agent_1.0.0-amd64.tar.gz
09/11/2019  01:14 AM       321,895,424 icp4i-od-collector_1.0.0-amd64.tar.gz
               4 File(s)  1,735,595,520 bytes
               2 Dir(s)  217,878,286,336 bytes free

C:\SHARE\ProductsTechnology\MQv9-9.1\ICP4iMQAdv-image\images>docker load < ibm-mqadvanced-server-integration_9.1.3.0-r4-
amd64.tar.gz
cd28e8b3d42a: Loading layer [==================================================>]   7.68kB/7.68kB
84eaf14cef7b: Loading layer [==================================================>]  6.144kB/6.144kB
dc025946c48b: Loading layer [==================================================>]    806MB/806MB
084a5de0f8d3: Loading layer [==================================================>]   2.56kB/2.56kB
a0cf9052d6e2: Loading layer [==================================================>]  12.39MB/12.39MB
8c20517487b4: Loading layer [==================================================>]  5.876MB/5.876MB
0199fa08053a: Loading layer [==================================================>]  10.24kB/10.24kB
7f6264a97cf1: Loading layer [==================================================>]  11.78kB/11.78kB
1355ce09db14: Loading layer [==================================================>]  3.584kB/3.584kB
f9d44c67deb4: Loading layer [==================================================>]  18.28MB/18.28MB
c4b465bf4f6a: Loading layer [==================================================>]   7.68kB/7.68kB
79163b2a33c5: Loading layer [==================================================>]  2.146MB/2.146MB
2c903f0b7155: Loading layer [==================================================>]  3.072kB/3.072kB
87ba76dd2431: Loading layer [==================================================>]  3.584kB/3.584kB
1c321fdcb962: Loading layer [==================================================>]  7.168kB/7.168kB
f561b484f28b: Loading layer [==================================================>]  2.152MB/2.152MB
2b68e45b087e: Loading layer [==================================================>]  7.168kB/7.168kB
a10f6d83153f: Loading layer [==================================================>]   21.5kB/21.5kB
1cfd819e9f0e: Loading layer [==================================================>]  3.237MB/3.237MB
364112d1df0e: Loading layer [==================================================>]  261.6kB/261.6kB
9f4789d1e0ed: Loading layer [==================================================>]  3.072kB/3.072kB
07cdf8094239: Loading layer [==================================================>]  3.497MB/3.497MB
6eb6a773bf24: Loading layer [==================================================>]  3.738MB/3.738MB
ac7598f58291: Loading layer [==================================================>]  3.738MB/3.738MB
Loaded image: ibm-mqadvanced-server-integration:9.1.3.0-r4-amd64

C:\SHARE\ProductsTechnology\MQv9-9.1\ICP4iMQAdv-image\images>
```

Docker File and MQSC script for custom image



Docker file – run an mqsc script

FROM ibm-mqadvanced-server-integration:9.1.3.0-r4-amd64

USER mqm

COPY ivt.mqsc /etc/mqm/

IVT.mqsc – enable clients to connect

DEFINE CHANNEL(IVT.SVRCONN) CHLTYPE(SVRCONN)

SET CHLAUTH(IVT.SVRCONN) TYPE(BLOCKUSER) USERLIST(nobody)

ALTER AUTHINFO(SYSTEM.DEFAULT.AUTHINFO.IDPWOS) AUTHTYPE(IDPWOS) CHCKCLNT(NONE) ADOPTCTX(YES)

SET CHLAUTH(IVT.SVRCONN) TYPE (ADDRESSMAP) ADDRESS(*) MCAUSER('mqm')

REFRESH SECURITY TYPE(CONNAUTH)

OR – if this is based off a non ICP4i mq image that used admin/passw0rd

* Connection authentication

DEFINE AUTHINFO('ORG.AUTHINFO') AUTHTYPE(IDPWOS) CHCKCLNT(REQDADM) CHCKLOCL(OPTIONAL) ADOPTCTX(YES) REPLACE

ALTER QMGR CONNAUTH('ORG.AUTHINFO')

REFRESH SECURITY(*) TYPE(CONNAUTH)

* Channels (Application + Admin)

DEFINE CHANNEL('IVT.SVRCONN') CHLTYPE(SVRCONN) REPLACE

DEFINE CHANNEL('ORG.APP.SVRCONN') CHLTYPE(SVRCONN) MCAUSER('app') REPLACE

* Channel authentication rules

SET CHLAUTH('*') TYPE(ADDRESSMAP) ADDRESS('*') USERSRC(NOACCESS) DESCR('Back-stop rule - Blocks everyone') ACTION(REPLACE)

SET CHLAUTH('ORG.APP.SVRCONN') TYPE(ADDRESSMAP) ADDRESS('*') USERSRC(CHANNEL) CHCKCLNT(REQUIRED) DESCR('Allows connection via APP channel') ACTION(REPLACE)

SET CHLAUTH('IVT.SVRCONN') TYPE(BLOCKUSER) USERLIST('nobody') DESCR('Allows admins on ADMIN channel') ACTION(REPLACE)

SET CHLAUTH('IVT.SVRCONN') TYPE(USERMAP) CLNTUSER('admin') USERSRC(CHANNEL) DESCR('Allows admin user to connect via ADMIN channel') ACTION(REPLACE)

* Authority records

SET AUTHREC GROUP('mqclient') OBJTYPE(QMGR) AUTHADD(CONNECT,INQ)

SET AUTHREC PROFILE('ORG.**') GROUP('mqclient') OBJTYPE(QUEUE) AUTHADD(BROWSE,GET,INQ,PUT)

SET AUTHREC PROFILE('ORG.**') GROUP('mqclient') OBJTYPE(TOPIC) AUTHADD(PUB,SUB)

Docker build – Create image FROM ibm-mqadvanced-server

C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>docker images

REPOSITORY TAG IMAGE ID CREATED SIZE

ace11002mqc91intms1 1.0 ec39bb5df84f 2 days ago 1.59GB

ibmcom/mq latest 268baf40303f 7 days ago 927MB

ibmcom/ace-mq latest 0f5a883d8a95 4 weeks ago 2.51GB

ibmcom/ace-mqclient latest d71cee6dfd5f 4 weeks ago 1.94GB

ibmcom/ace latest d33c5a966d7b 4 weeks ago 1.63GB

ibm-mqadvanced-server-integration 9.1.3.0-r4-amd64 ee41039b9552 5 weeks ago 932MB

C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt> docker build -t davexacom/ibm-mqadvanced-server-ivt:9.1.3.0-r4-amd64 .

```
C:\Users\DAVIDARNOLD\myDocker\mqsrvmqsc>docker build -t davexacom/ibm-mqadvanced-server-ivt:9.1.3.0-r4-amd64 .
Sending build context to Docker daemon  4.096kB
Step 1/3 : FROM ibmcom/mq
 ---> 268baf40303f
Step 2/3 : USER mqm
 ---> Using cache
 ---> f976d4712a79
Step 3/3 : COPY ivt.mqsc /etc/mqm/
 ---> Using cache
 ---> 0c686c880b92
Successfully built 0c686c880b92
Successfully tagged davexacom/ibm-mqadvanced-server-ivt:9.1.3.0-r4-amd64
```

Perform Local testing on docker workstation

C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>docker images

REPOSITORY TAG IMAGE ID CREATED SIZE

```
davexacom/ibm-mqadvanced-server-ivt   9.1.3.0-r4-amd64   0c686c880b92   3 days ago   927MB
```

docker run -e LICENSE=accept -e MQ_QMGR_NAME=QM1 -P davexacom/ibm-mqadvanced-server-ivt:9.1.3.0-r4-amd64

Start the container – docker run

C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>docker run -e LICENSE=accept -e MQ_QMGR_NAME=QM1 -P davexacom/ibm-mqadvanced-server-ivt:9.1.3.0-r4-amd64

2019-12-13T08:29:20.120Z CPU architecture: amd64

2019-12-13T08:29:20.121Z Linux kernel version: 4.9.184-linuxkit

2019-12-13T08:29:20.121Z Container runtime: docker

2019-12-13T08:29:20.121Z Base image: Red Hat Enterprise Linux Server 7.7 (Maipo)

Break

Starting MQSC for queue manager QM1.

1 : DEFINE CHANNEL(IVT.SVRCONN) CHLTYPE(SVRCONN)

AMQ8014I: IBM MQ channel created.

2 : SET CHLAUTH(IVT.SVRCONN) TYPE(BLOCKUSER) USERLIST(nobody)

AMQ8877I: IBM MQ channel authentication record set.

3 : ALTER AUTHINFO(SYSTEM.DEFAULT.AUTHINFO.IDPWOS) AUTHTYPE(IDPWOS) CHCKCLNT(NONE) ADOPTCTX(YES)

AMQ8567I: IBM MQ authentication information changed.

4 : SET CHLAUTH(IVT.SVRCONN) TYPE (ADDRESSMAP) ADDRESS(*) MCAUSER('mqm')

AMQ8877I: IBM MQ channel authentication record set.

5 : REFRESH SECURITY TYPE(CONNAUTH)

AMQ8560I: IBM MQ security cache refreshed.

5 MQSC commands read.

No commands have a syntax error.

All valid MQSC commands were processed.2019-12-13T08:29:22.125Z

Metrics are disabled

2019-12-13T09:09:17.684Z AMQ8024I: IBM MQ channel initiator started.

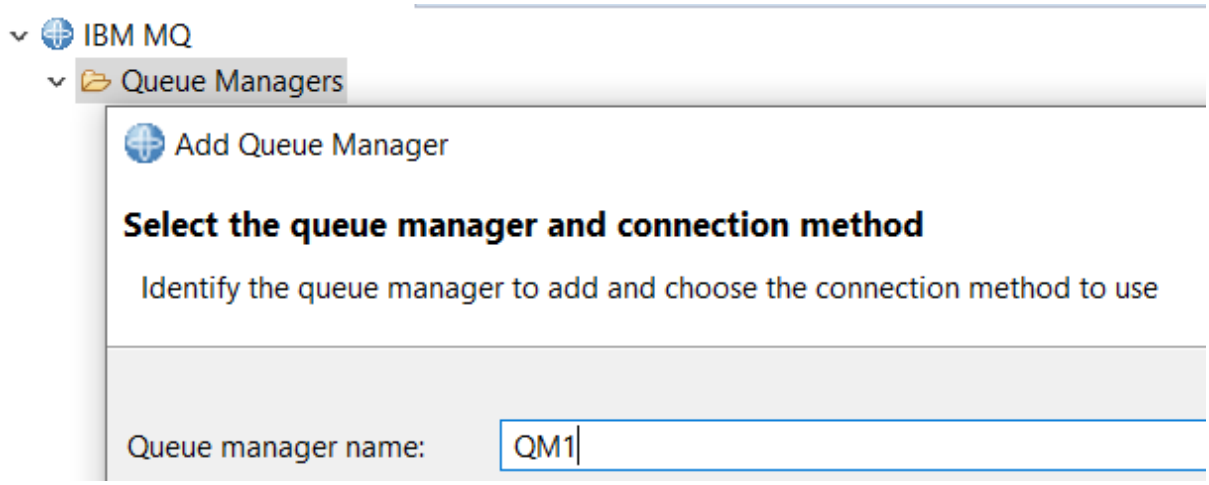
2019-12-13T09:09:17.706Z AMQ5806I: Queued Publish/Subscribe Daemon started for queue manager QM1.

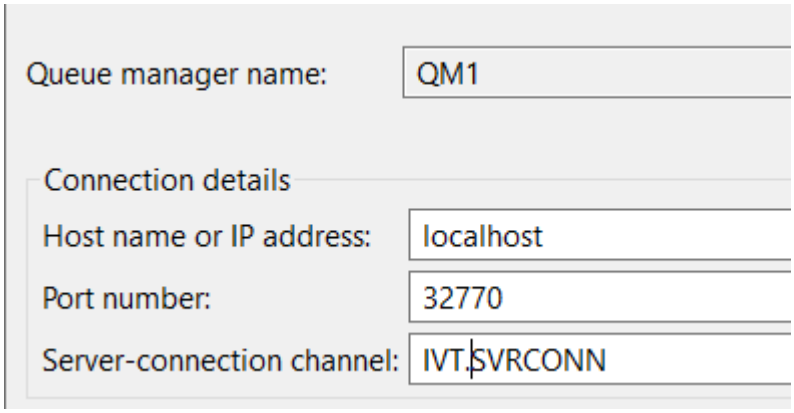
C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>
C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>docker ps

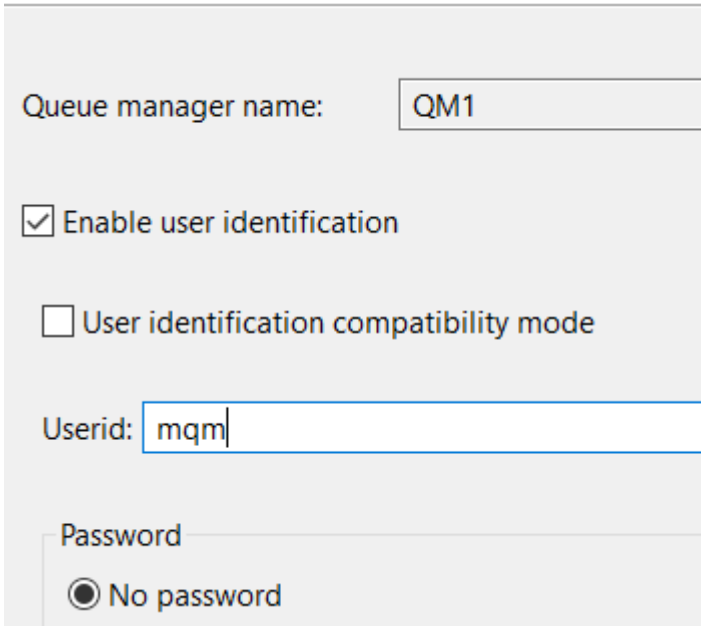
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES

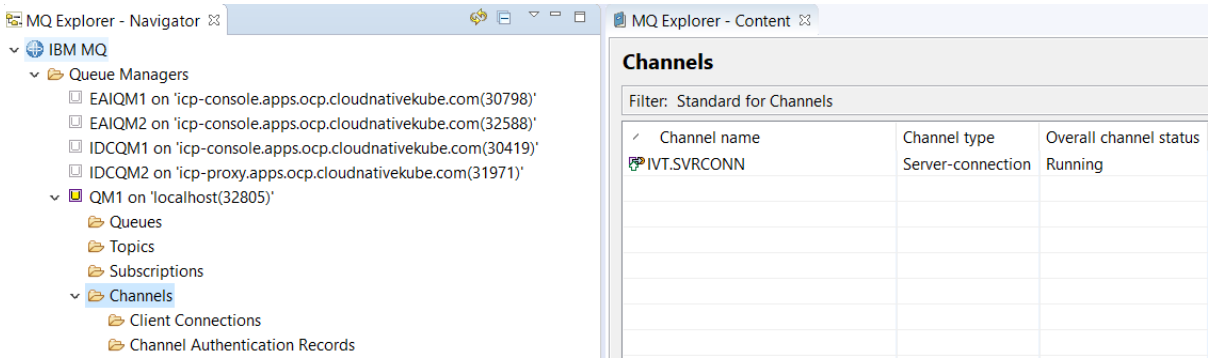
b5e2c8034d8c davexacom/ibm-mqadvanced-server-ivt:9.1.3.0-r4-amd64 "runmqintegrationser…" 26 seconds ago Up 25 seconds 0.0.0.0:32770->1414/tcp, 0.0.0.0:32769->9157/tcp, 0.0.0.0:32768->9443/tcp relaxed_lamport

Connect MQ Explorer









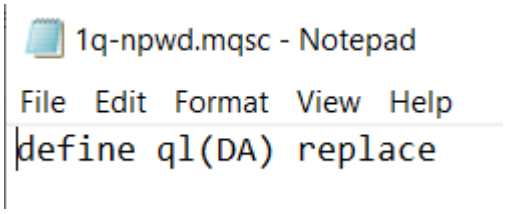
Access via RUNMQSC client

SET MQSERVER=IVT.SVRCONN/TCP/localhost(32770)

manual

```
C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>runmqsc -c QM1
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting MQSC for queue manager QM1.


def ql(DA.Q)
     1 : def ql(DA.Q)
AMQ8006I: IBM MQ queue created.
end
     2 : end
2 command responses received.
```

scripted



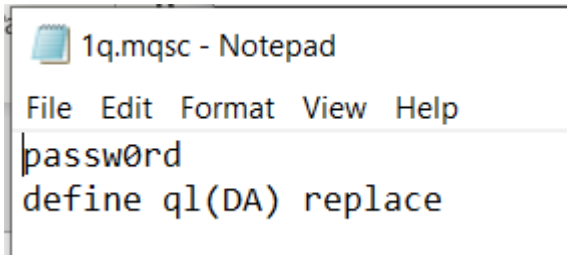
```
C:\temp>SET MQSERVER=IVT.SVRCONN/TCP/localhost(32805)

C:\temp>runmqsc -c QM1 < 1q-npwd.mqsc
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting MQSC for queue manager QM1.


     1 : define ql(DA) replace
AMQ8006I: IBM MQ queue created.
2 command responses received.
```

Note if you are using a queue manager where the username is password protected

Manual running of mqsc

```
C:\temp>runmqsc -c -u admin QM1
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Enter password:
********
Starting MQSC for queue manager QM1.


end
     1 : end
0 command responses received.
```

If -u is on the command and we are piping in, runmqsc assumes the first line is the password.




```
C:\temp>runmqsc -c -u admin QM1 < 1q.mqsc
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Enter password:
Starting MQSC for queue manager QM1.


     1 : define ql(DA) replace
AMQ8006I: IBM MQ queue created.
2 command responses received.
```

Push the new image to Dockerhub

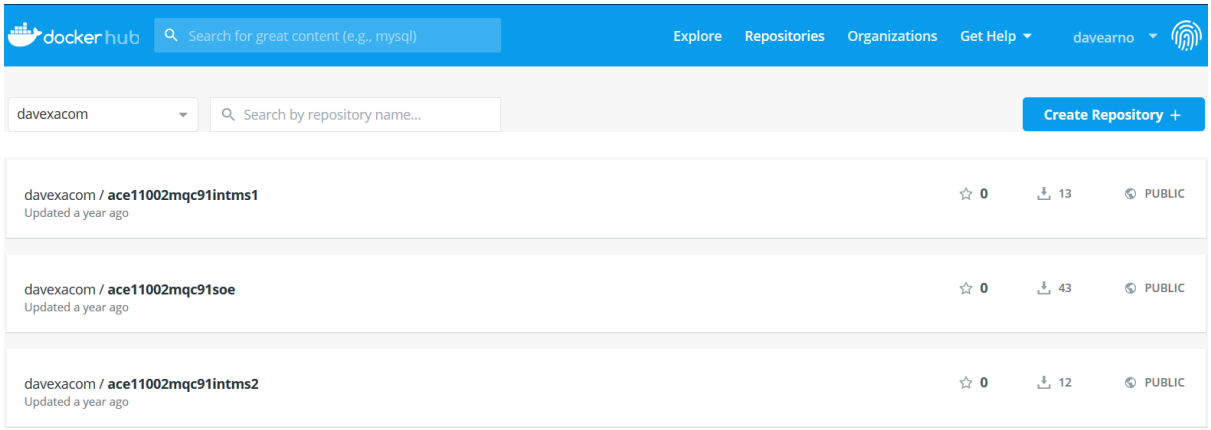
C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>docker images

REPOSITORY TAG IMAGE ID CREATED SIZE

davexacom/ibm-mqadvanced-server-ivt 9.1.3.0-r4-amd64 2237fea38967 17 minutes ago 932MB

```
C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>docker images
REPOSITORY                          TAG                 IMAGE ID            CREATED             SIZE
davexacom/ibm-mqadvanced-server-ivt 9.1.3.0-r4-amd64    e269ad126613        5 minutes ago       932MB
```

https://hub.docker.com/repositories



docker push davexacom/ibm-mqadvanced-server-ivt:9.1.3.0-r4-amd64

C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>docker push davexacom/ibm-mqadvanced-server-ivt:9.1.3.0-r4-amd64

The push refers to repository [docker.io/davexacom/ibm-mqadvanced-server-ivt]

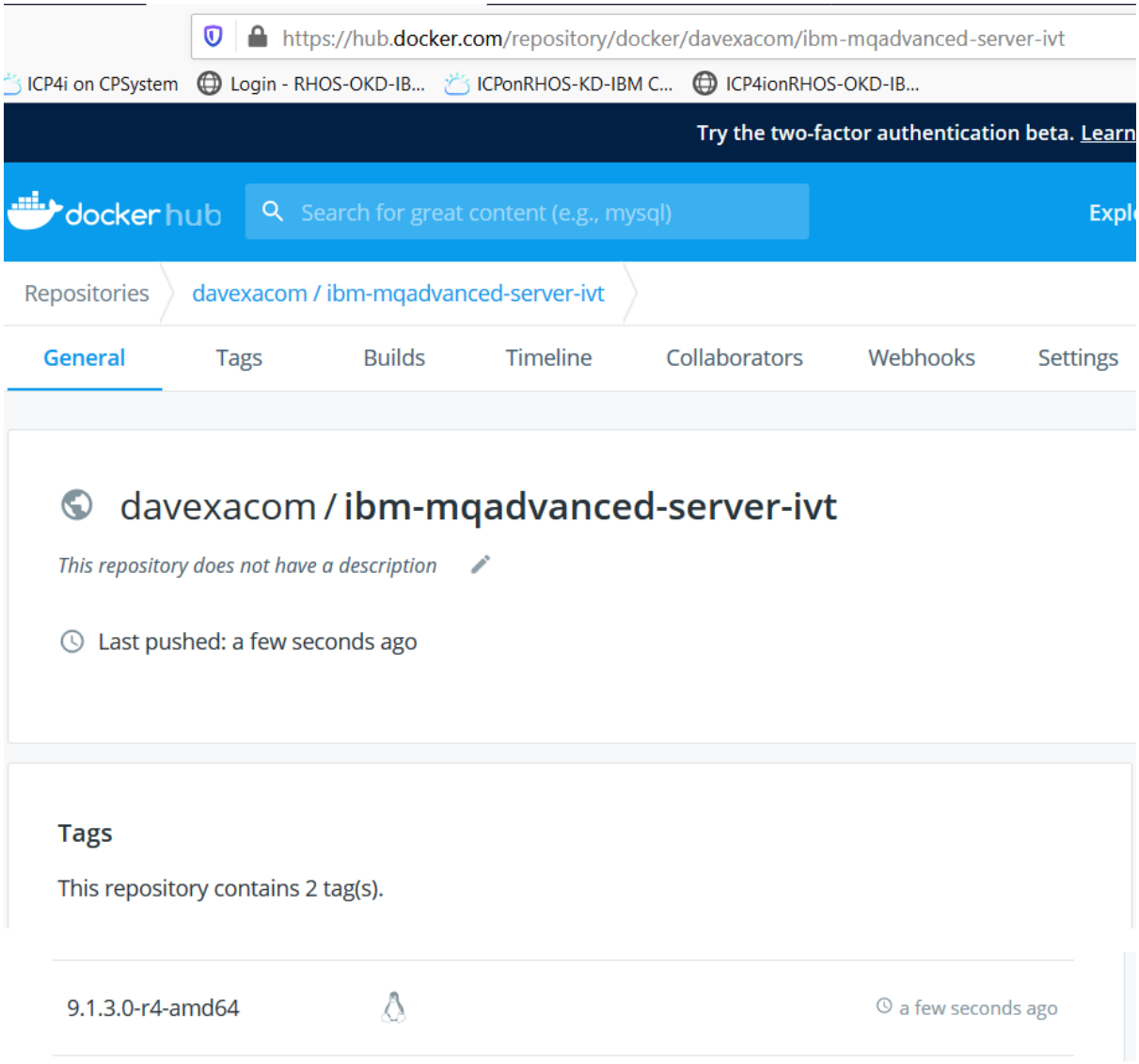
0d8459f27ecc: Pushing [==>] 3.072kB
ac7598f58291: Pushing [==================>] 1.378MB/3.735MB
6eb6a773bf24: Pushing [==================>] 1.378MB/3.735MB
07cdf8094239: Pushing [========>] 561.2kB/3.49MB
9f4789d1e0ed: Pushing [==>] 3.072kB
364112d1df0e: Waiting

cd28e8b3d42a: Pushed

2705f79af6db: Layer already exists

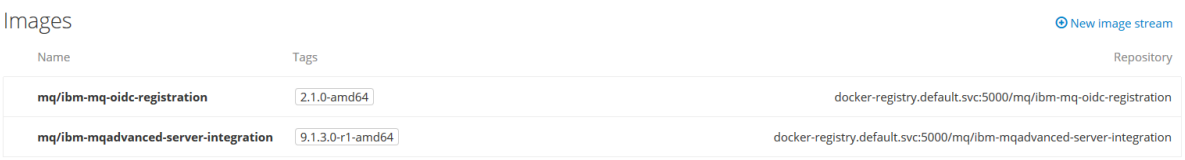
ce459cc53899: Layer already exists 9.1.3.0-r4-amd64: digest: sha256:040e8e0aca3307369b10cce8411f97e147a9a92bb7514619a16c2a78093c085f size: 5963

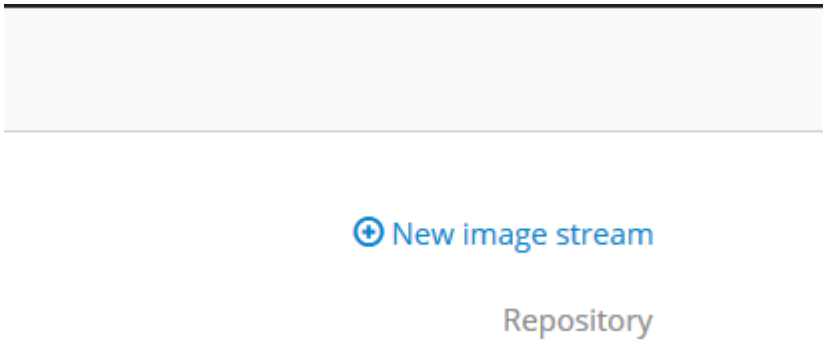
https://hub.docker.com/repository/docker/davexacom/ibm-mqadvanced-server-ivt



Create a new Image Stream on RHOS

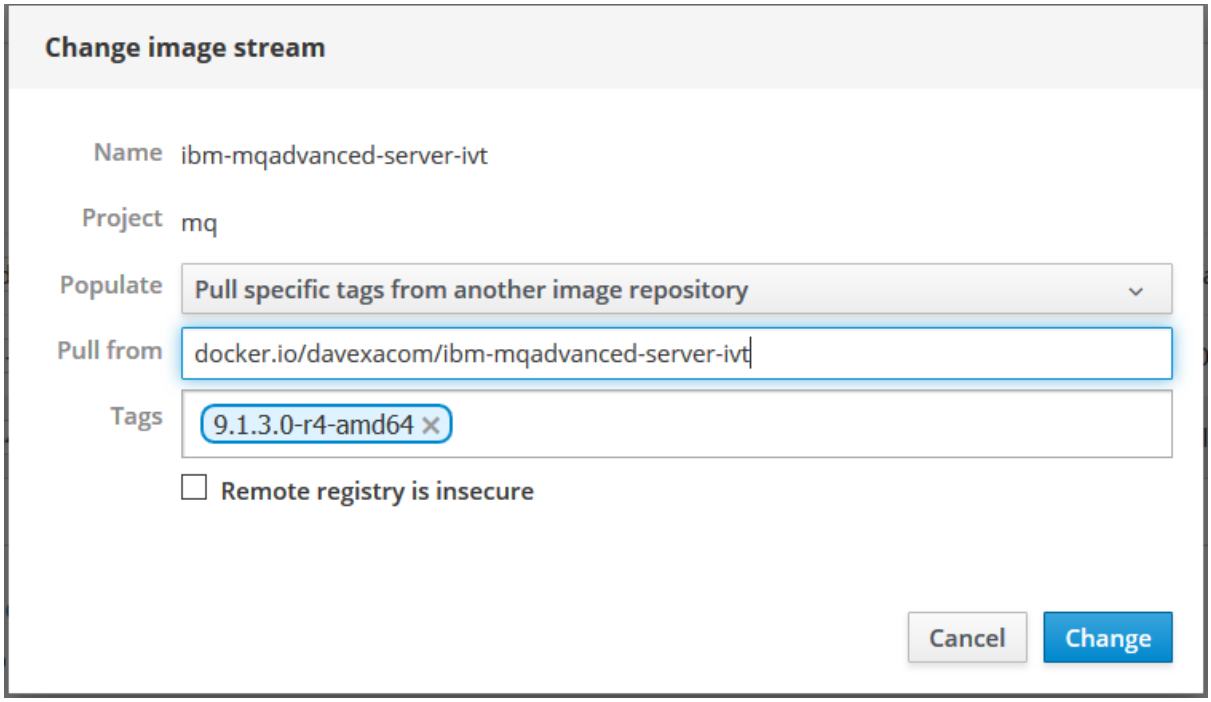
https://registry-console-default.apps.ocp.cloudnativekube.com/registry#/images/mq





Docker.io/davexacom/ibm-mqadvanced-server-ivt

Create new image stream / or change image stream



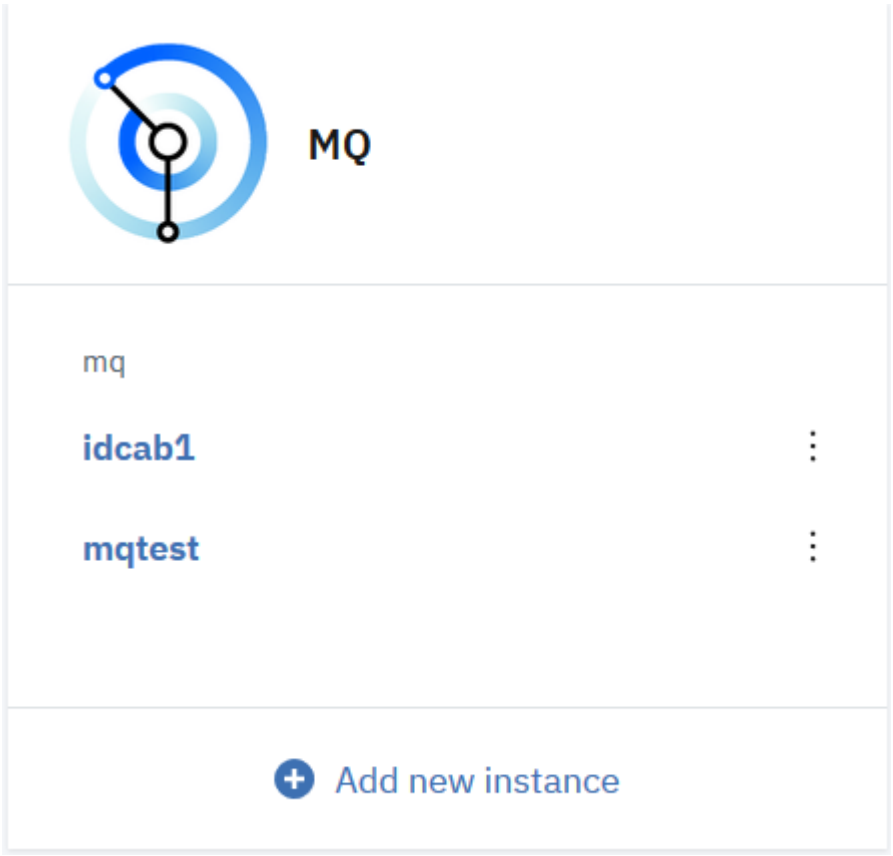
Pulling repository to use in helm charts

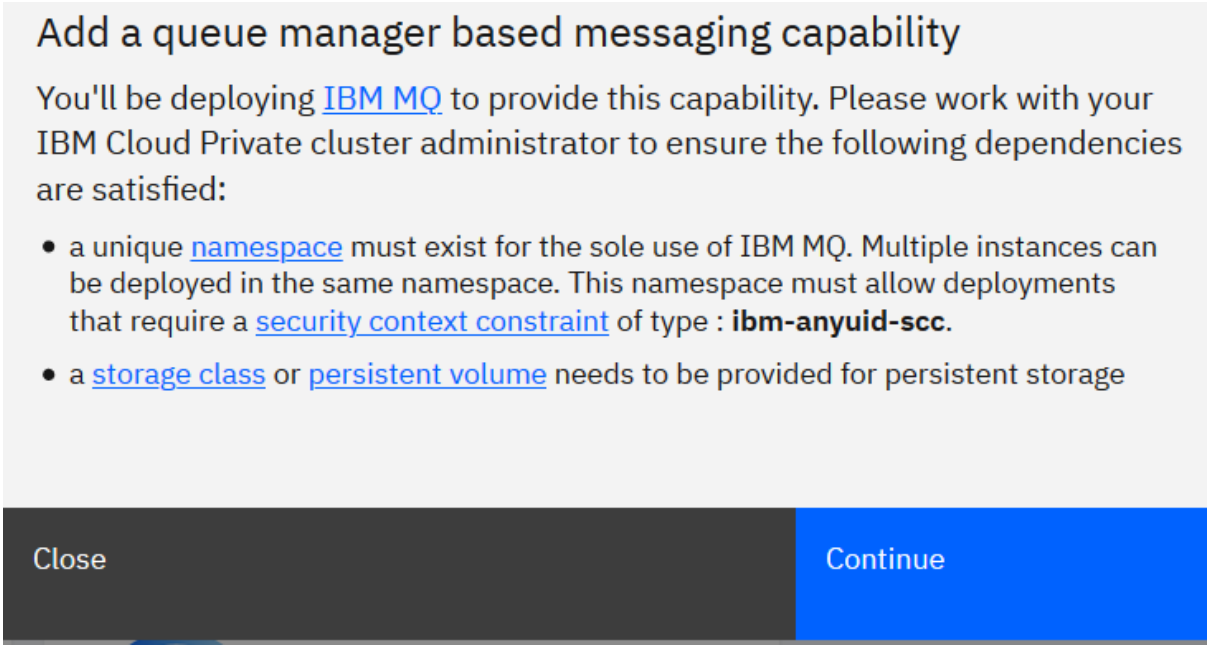
`docker-registry.default.svc:5000/mq/ibm-mqadvanced-server-ivt`

ICP4i MQ new instance using custom image

Add new ICP4i instance of MQ

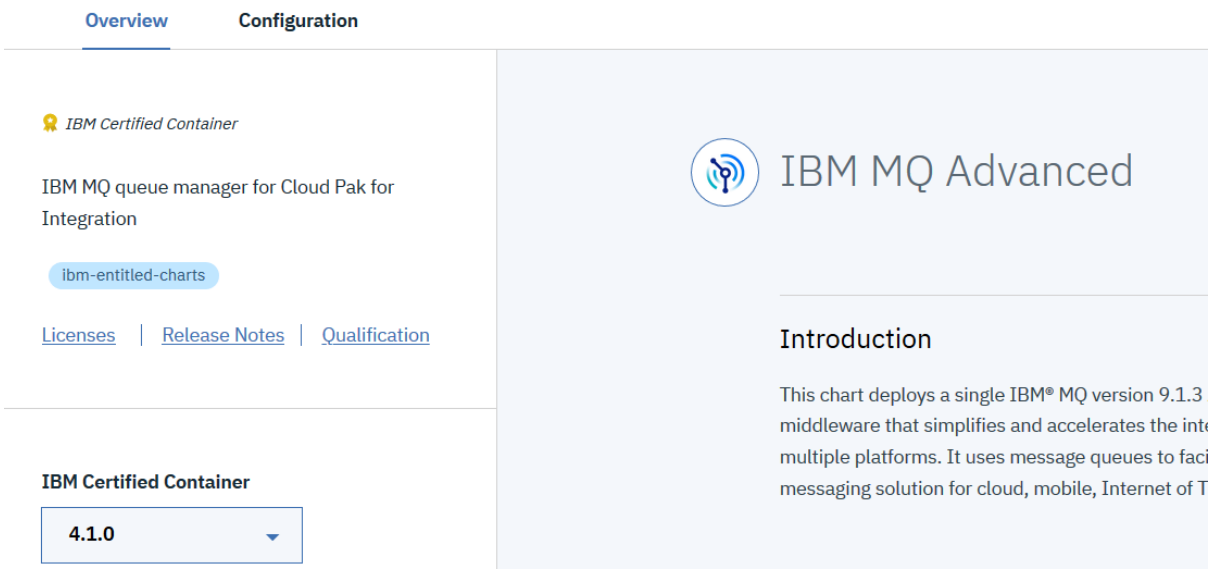
https://icp-proxy.apps.ocp.cloudnativekube.com/integration



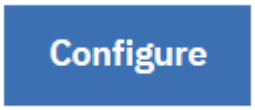


Configure Helm chart

ibm-mqadvanced-server-integration-prod V 4.1.0



Hit configure



Values for the charts

Cluster Hostname (for deployment)

icp-proxy.apps.ocp.cloudnativekube.com

MQ server image:

docker-registry.default.svc:5000/mq/ibm-mqadvanced-server-ivt

MQ Server image Tag:

9.1.3.0-r4

MQ Server OIDC registration image

docker-registry.default.svc:5000/mq/ibm-mq-oidc-registration

MQ Server OIDC registration image tag:

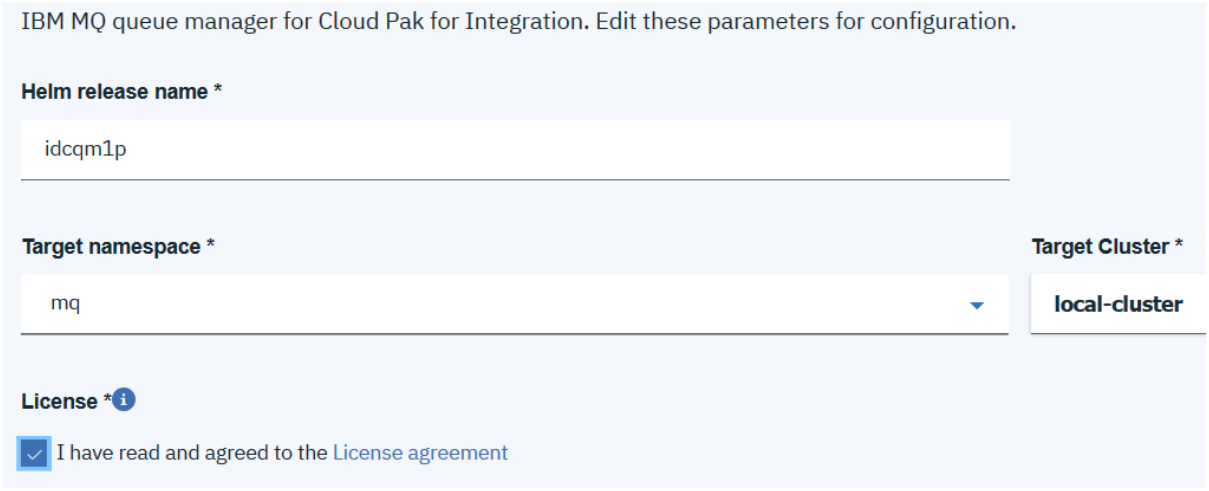
2.1.0

Managed NFS name (from oc command):

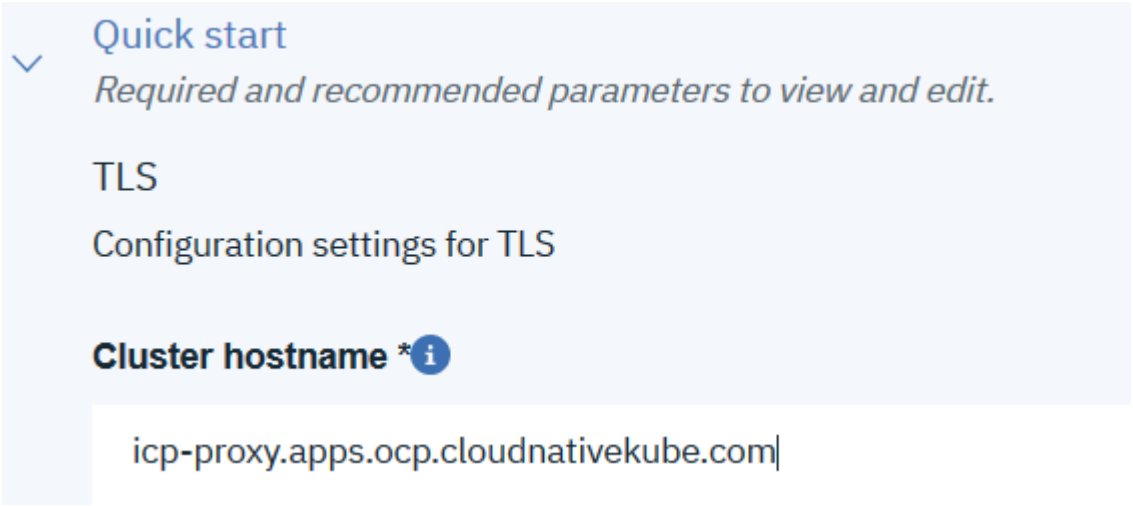
managed-nfs-storage

TLS Secret

Ibm-mq-tls-secret



icp-proxy.apps.ocp.cloudnativekube.com



MQ server image:

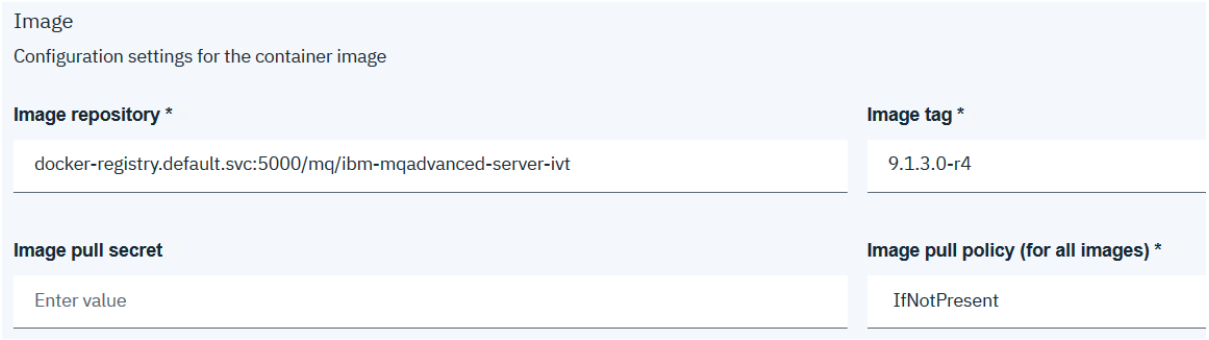
docker-registry.default.svc:5000/mq/ibm-mqadvanced-server-ivt

MQ Server image Tag:

9.1.3.0-r4

Results in the following image and tag being used

docker-registry.default.svc:5000/mq/ibm-mqadvanced-server-ict:9.1.3.0-r4-amd64

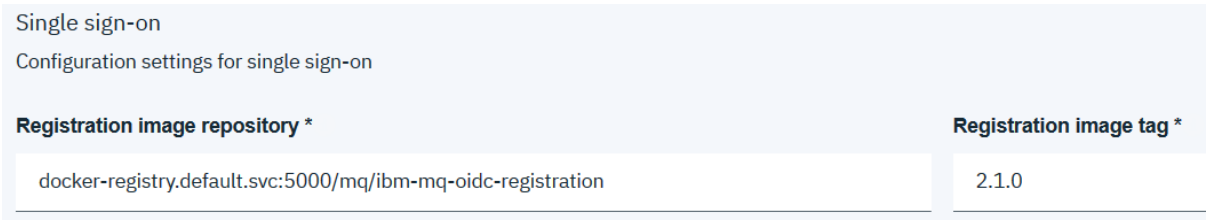


MQ Server OIDC registration image

docker-registry.default.svc:5000/mq/ibm-mq-oidc-registration

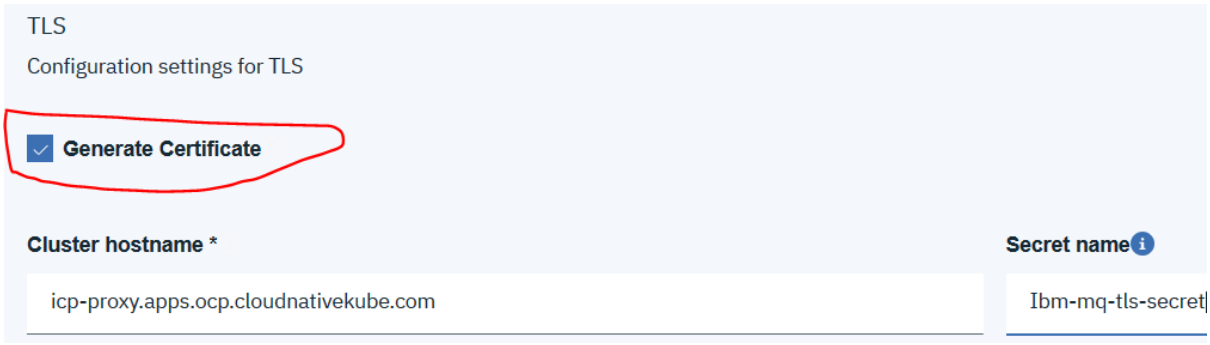
MQ Server OIDC registration image tag:

2.1.0



TLS Secret

Ibm-mq-tls-secret



Managed NFS name (from oc command):

managed-nfs-storage

Persistence

Configuration settings for Persistent Volumes

☑ **Enable persistence ***

☑ **Use dynamic provisioning ***

Data PVC

Configuration settings for the main Persistent Volume Claim

Name *

data

Storage Class name

managed-nfs-storage

Size *

2Gi

Queue manager

Configuration settings for the Queue Manager

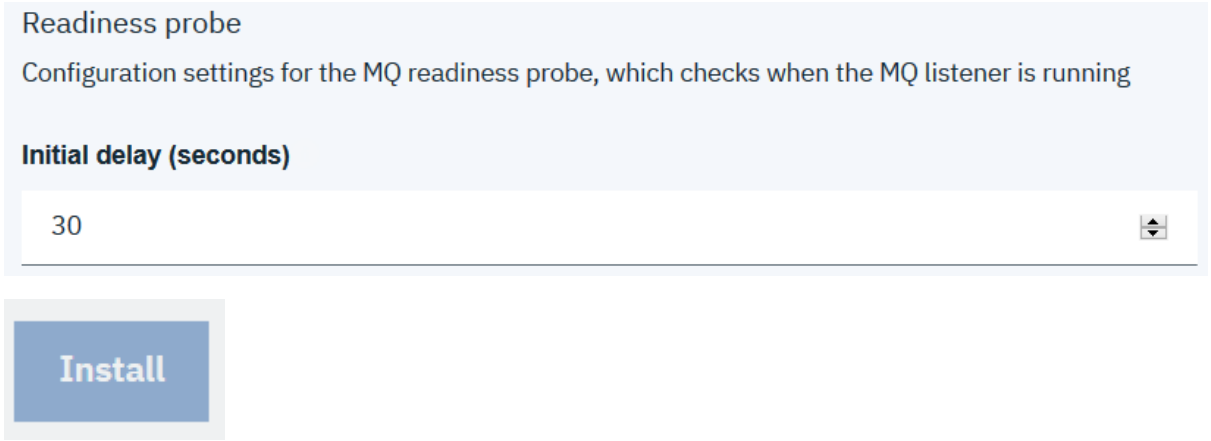
Queue manager name

IDCQM1

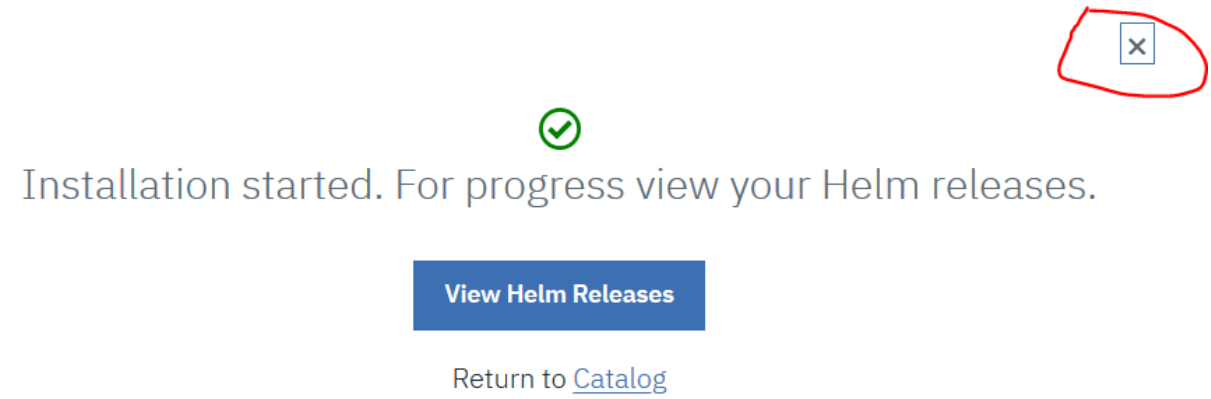
Metrics

Configuration settings for Prometheus metrics

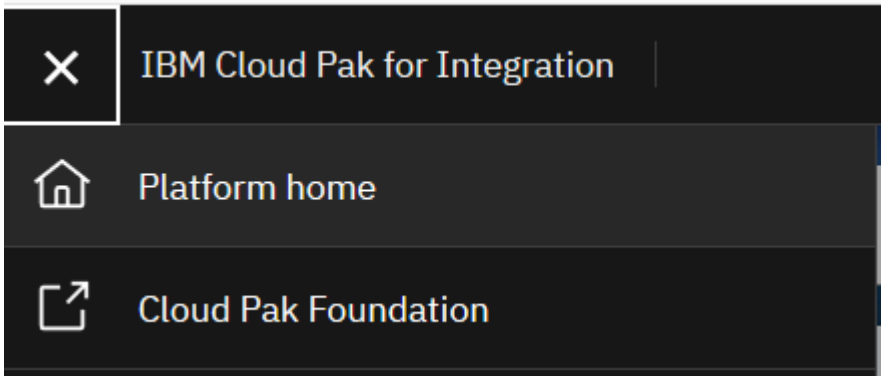
☐ **Enable metrics ***

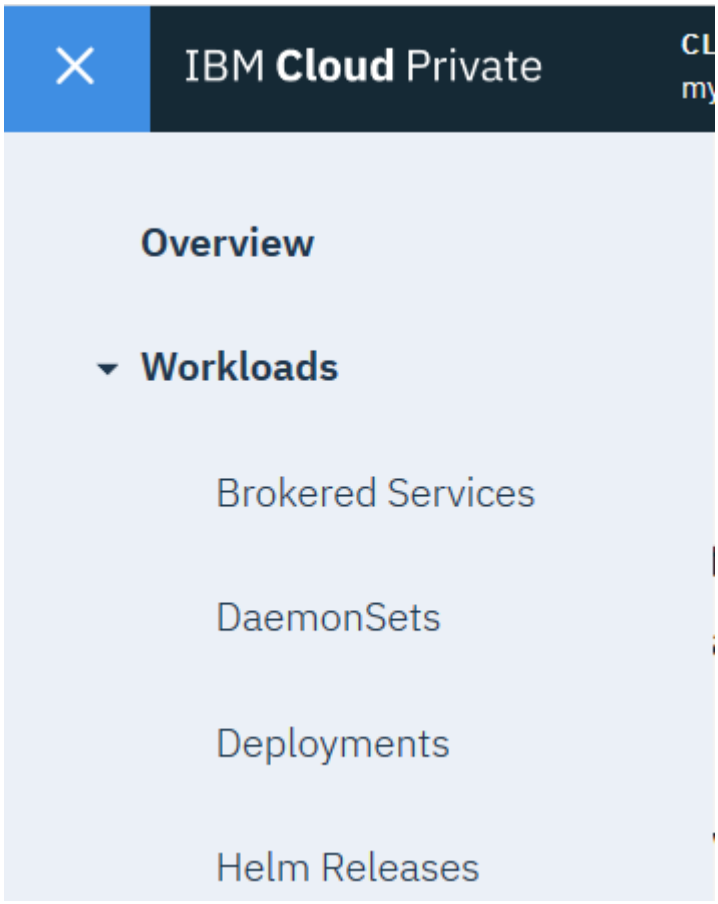


Use the little X to retain your populated chart for re-use if things go wrong.



Verifiying the Helm release via ICP foundation



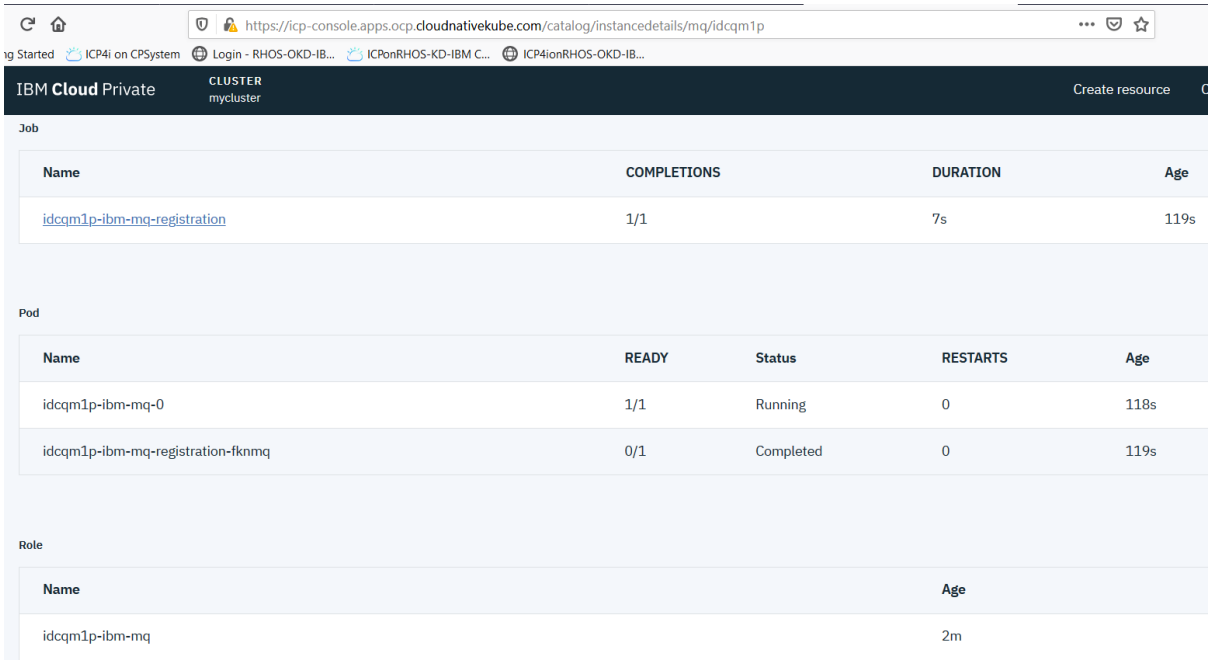


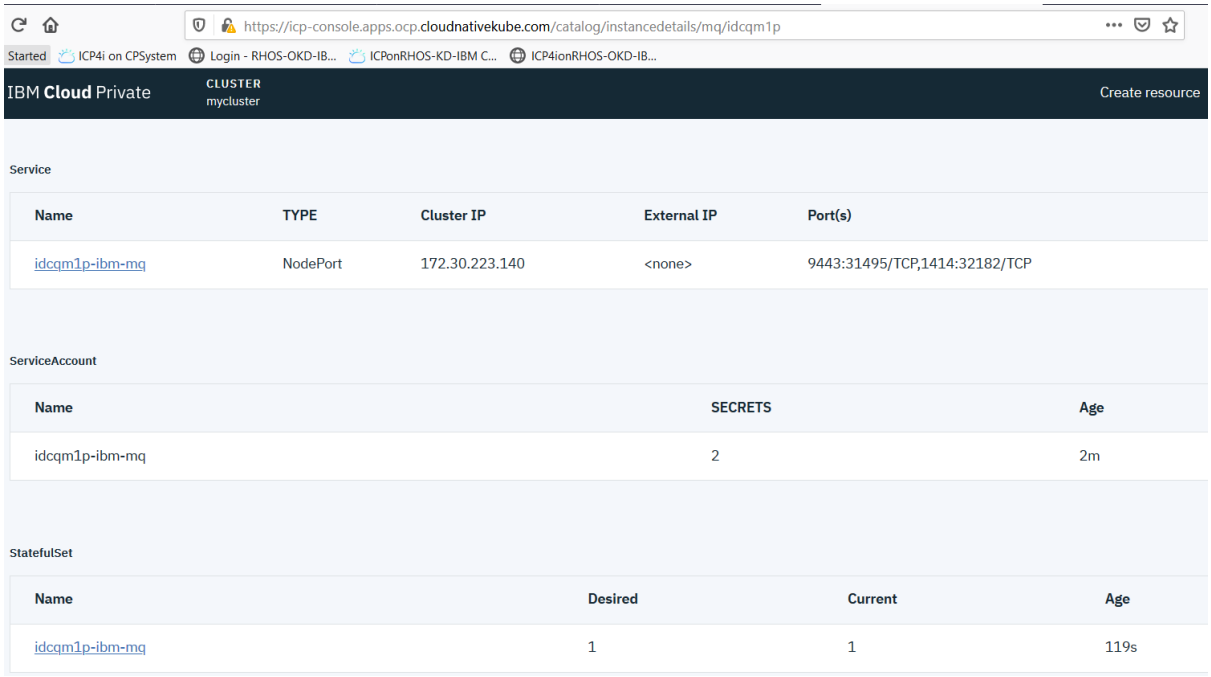
Helm Releases

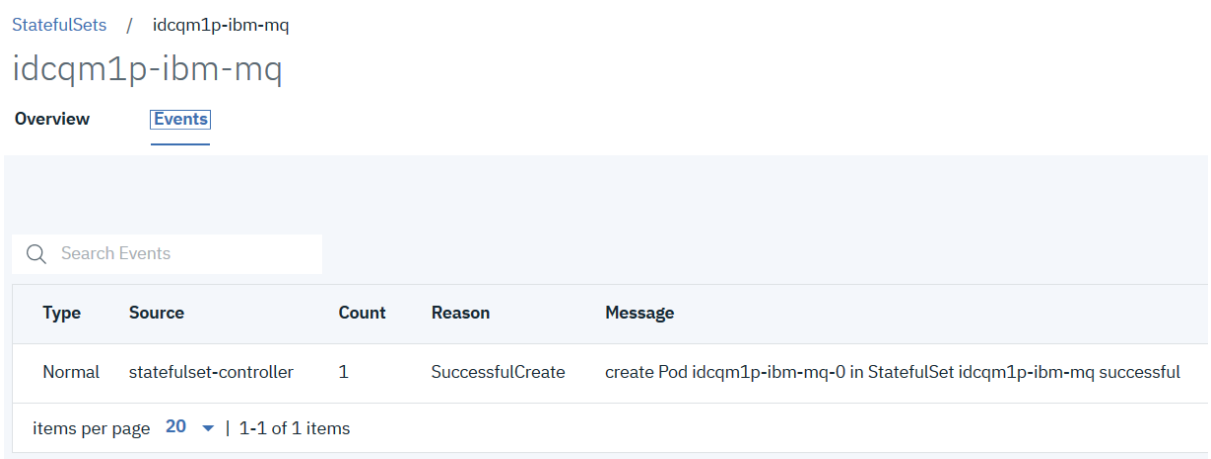
You are currently viewing only the helm releases of this cluster.

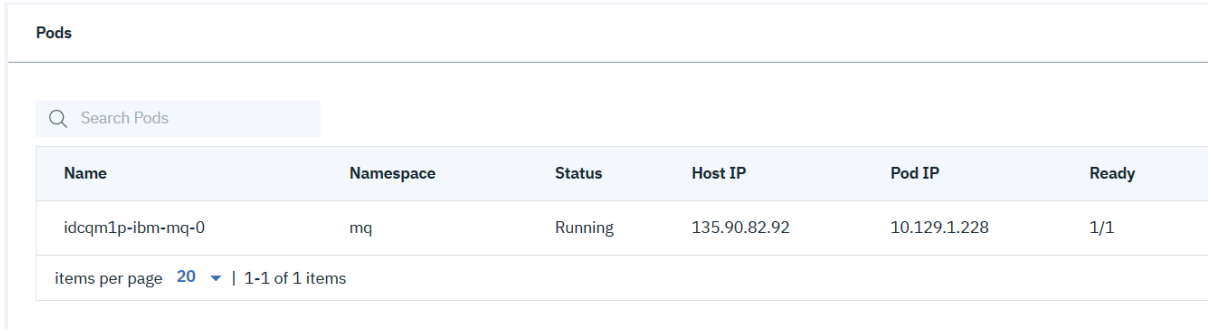
idcq

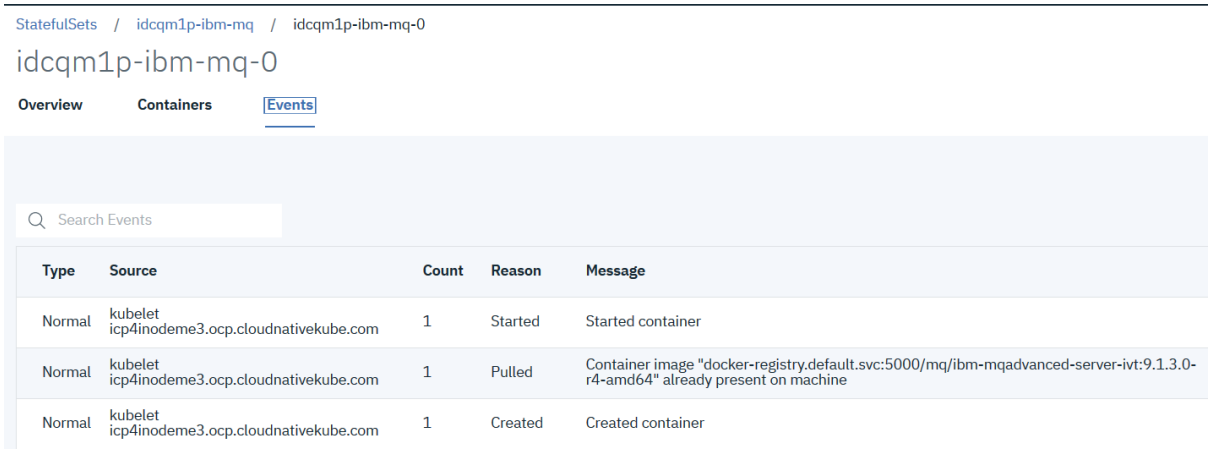
Name	Namespace	Status	Chart name
idcqm1p	mq	Deployed	ibm-mqadvanced-server-integration-prod


https://icp-console.apps.ocp.cloudnativekube.com/catalog/instancedetails/mq/idcqm1p
ICP4i on CPSystem
Login - RHOS-OKD-IB...
ICPonRHOS-KD-IBM C...
ICP4ionRHOS-OKD-IB...
IBM Cloud Private
CLUSTER
mycluster
Create resource
Job
Name
COMPLETIONS
DURATION
Age
idcqm1p-ibm-mq-registration
1/1
7s
119s
Pod
Name
READY
Status
RESTARTS
Age
idcqm1p-ibm-mq-0
1/1
Running
0
118s
idcqm1p-ibm-mq-registration-fknmq
0/1
Completed
0
119s
Role
Name
Age
idcqm1p-ibm-mq
2m

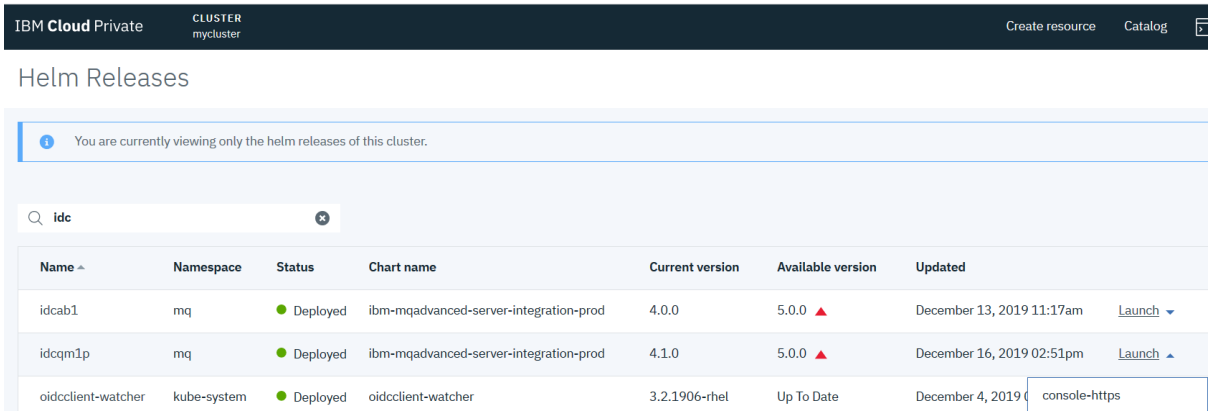

https://icp-console.apps.ocp.cloudnativekube.com/catalog/instancedetails/mq/idcqm1p
Started
ICP4i on CPSystem
Login - RHOS-OKD-IB...
ICPonRHOS-KD-IBM C...
ICP4ionRHOS-OKD-IB...
IBM Cloud Private
CLUSTER
mycluster
Create resource
Service
Name
TYPE
Cluster IP
External IP
Port(s)
idcqm1p-ibm-mq
NodePort
172.30.223.140
<none>
9443:31495/TCP,1414:32182/TCP
ServiceAccount
Name
SECRETS
Age
idcqm1p-ibm-mq
2
2m
StatefulSet
Name
Desired
Current
Age
idcqm1p-ibm-mq
1
1
119s

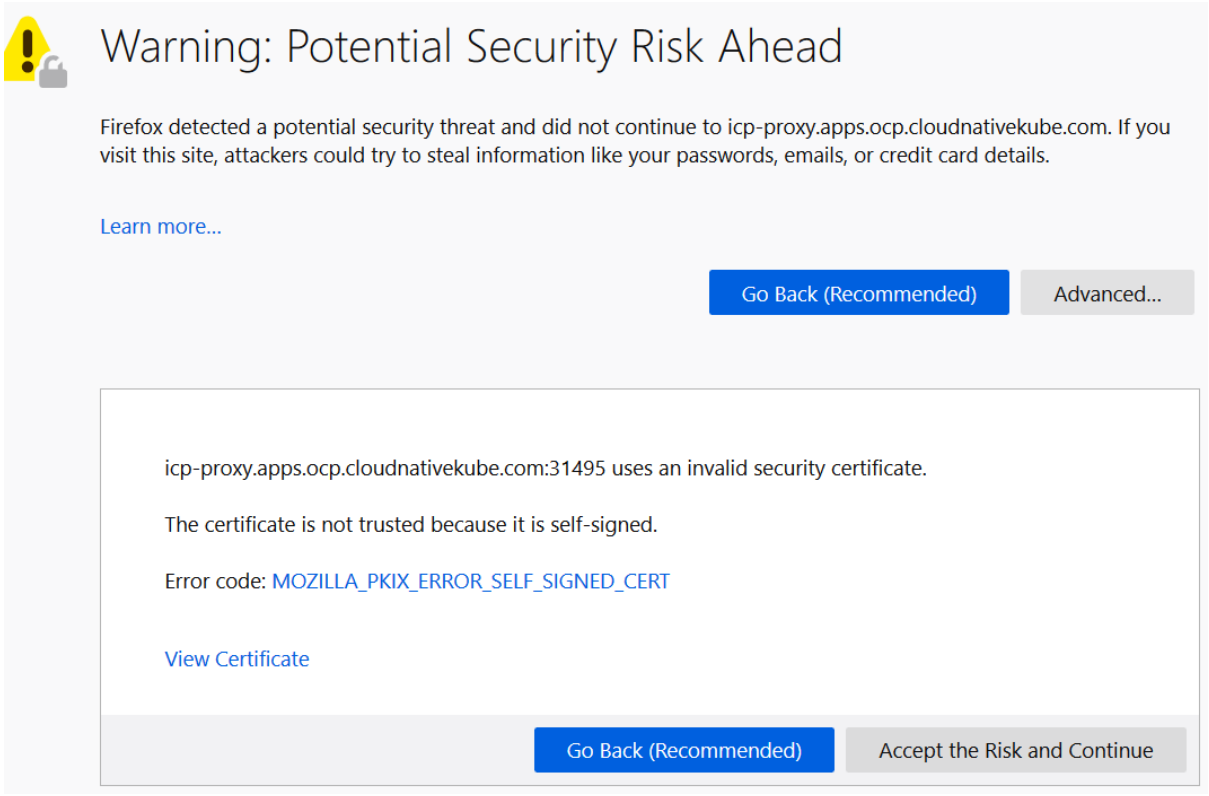

StatefulSets / idcqm1p-ibm-mq
idcqm1p-ibm-mq
Overview
Events
Search Events
Type
Source
Count
Reason
Message
Normal
statefulset-controller
1
SuccessfulCreate
create Pod idcqm1p-ibm-mq-0 in StatefulSet idcqm1p-ibm-mq successful
items per page 20 | 1-1 of 1 items



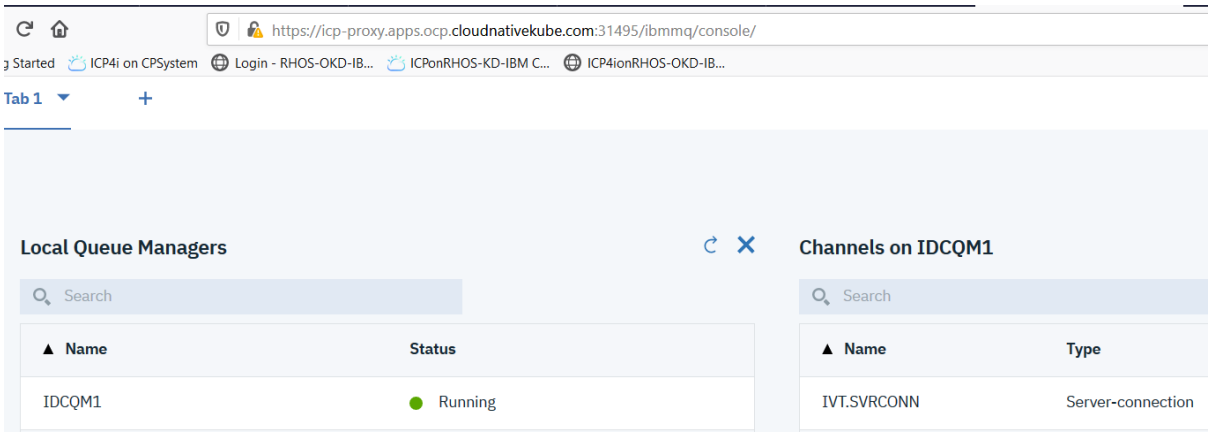


Starting the MQ Web Console



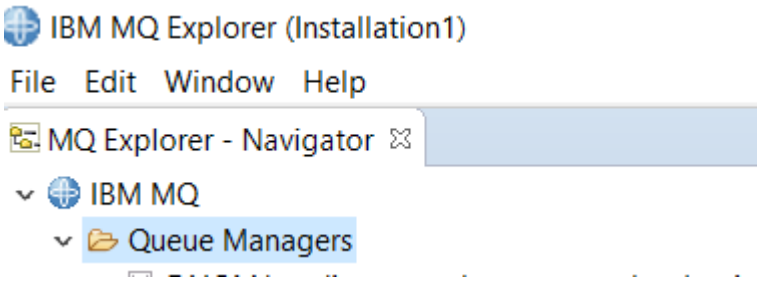


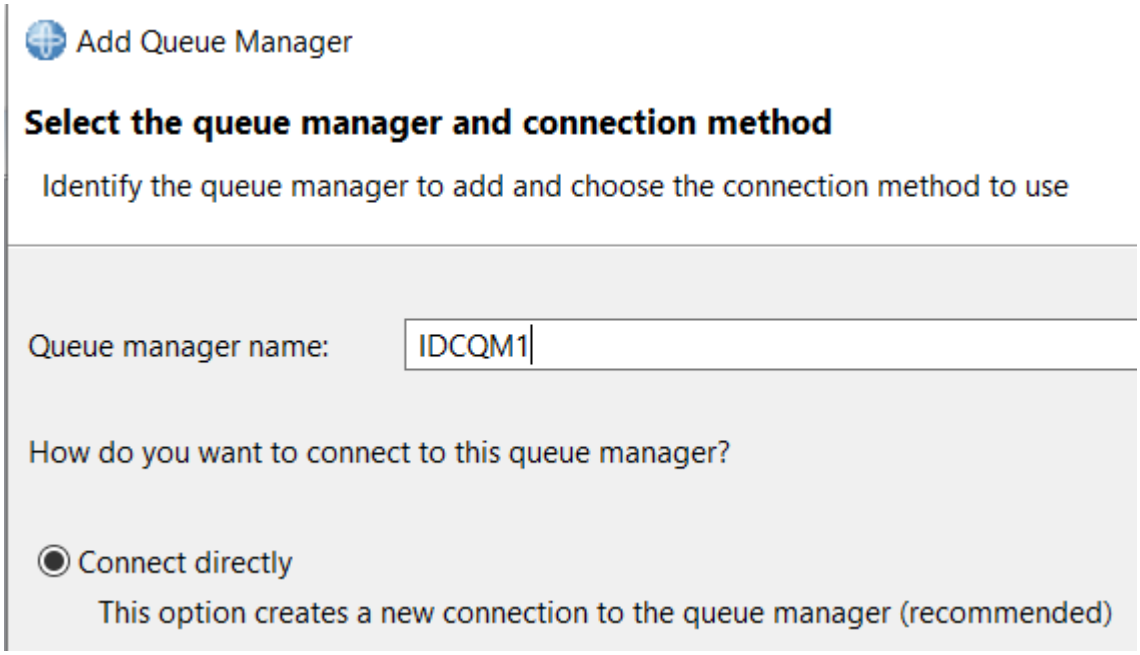
Add Widget - Channels

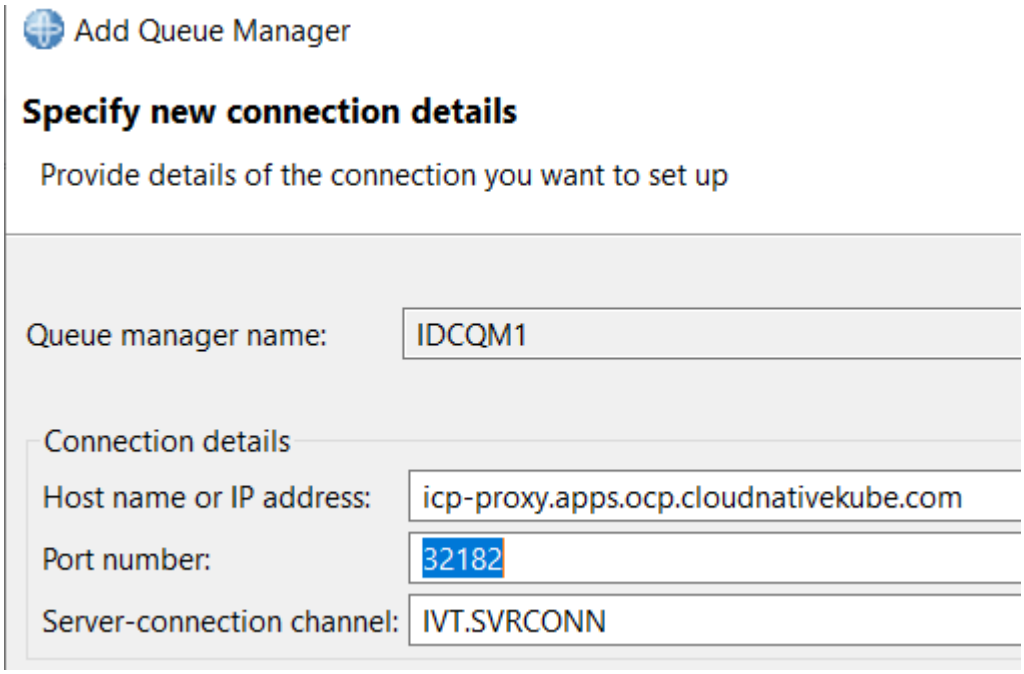


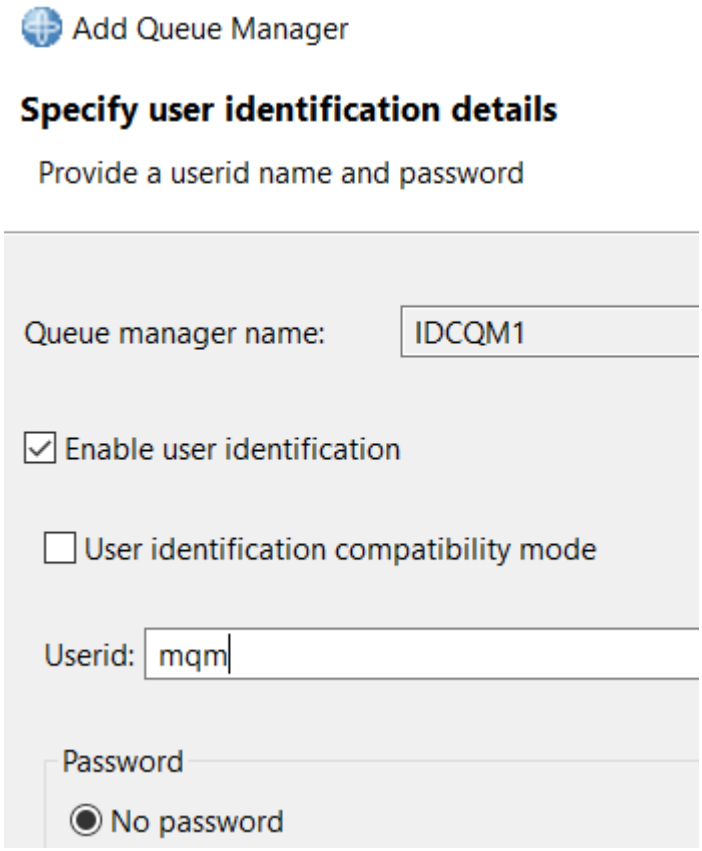
Connecting MQ Explorer

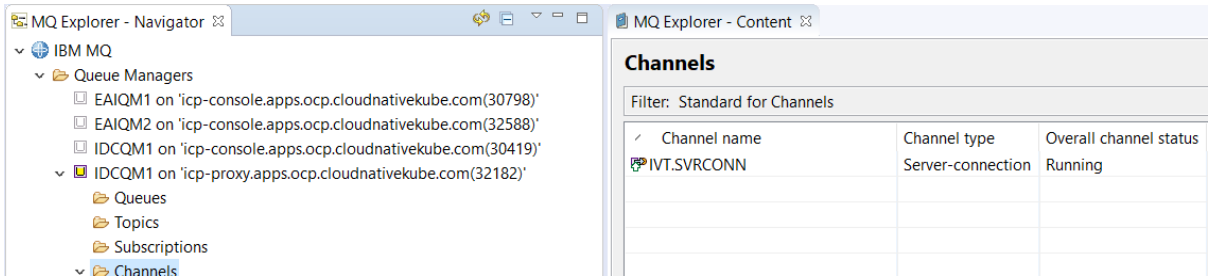
Add remote queue manager









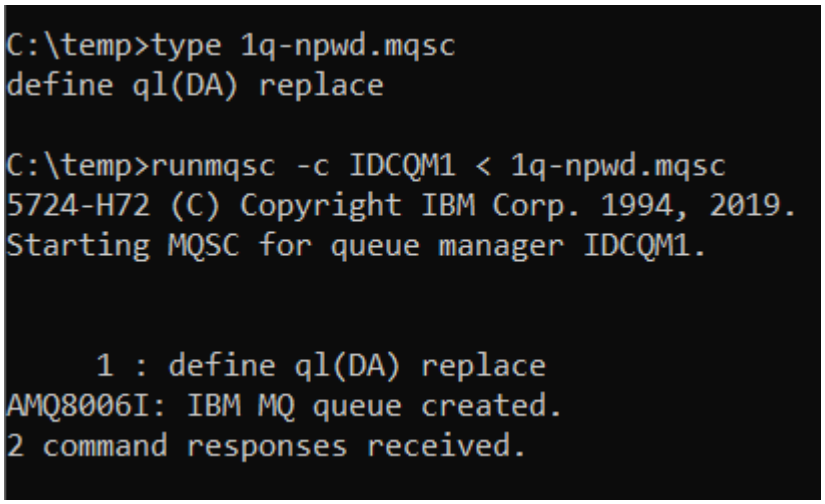


Using Runmqsc in client mode

SET MQSERVER=IVT.SVRCONN/TCP/icp-proxy.apps.ocp.cloudnativekube.com(32182)

Runmqsc -c IDCQM1

```
C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>SET MQSERVER=IVT.SVRCONN/TCP/icp-proxy.apps.ocp.cloudnativekube.
com(32182)

C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>runmqsc -c IDCQM1
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting MQSC for queue manager IDCQM1.


def ql(manual.q)
     1 : def ql(manual.q)
AMQ8006I: IBM MQ queue created.
end
     2 : end
2 command responses received.
```


C:\temp>type 1q-npwd.mqsc
define ql(DA) replace
C:\temp>runmqsc -c IDCQM1 < 1q-npwd.mqsc
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting MQSC for queue manager IDCQM1.
1 : define ql(DA) replace
AMQ8006I: IBM MQ queue created.
2 command responses received.

Part 2 - Custom MQ Image on RHOS 3.11 and 4.2 with ICP4i - TLS

With iCP4i on RHOS 4.2 for clients that are running outside the RHOS cluster to connect to queue managers TLS protocol must be used.

clients must use TLS to connect now.

https://www.ibm.com/support/knowledgecenter/en/SSFKSJ_9.1.0/com.ibm.mq.mcpak.doc/cc_conn_qm_openshift.htm

"You need an OpenShift Route to connect an application to an IBM® MQ queue manager from outside a Red Hat OpenShift cluster. You must enable TLS on your IBM MQ queue manager and client application, because Server Name Indication (SNI) is only available in the TLS protocol. The OpenShift Container Platform (OCP) Router uses SNI for routing requests to the IBM MQ queue manager. The required configuration of the OpenShift Route depends on the SNI behavior of your client application."

Documentation from the Helm chart with annotations

Configuring MQ objects

You have the following major options for configuring the MQ queue manager itself:

1. ~~Use the MQ web console interactively~~
2. Create a new image layer with your configuration for remote administration baked-in via the supply of an mqsc file with TLS enabled SVRCONN definitions for admin and app.baked-in.
3. ~~Configure remote administration over messaging, and use existing tools, such as `runmqsc`, MQ Explorer or the MQ Command Server.~~

The REST administrative API is not currently supported.

Configuring MQ using a new image layer

You can create a new container image layer, on top of the IBM MQ Advanced base image. You can add MQSC files to define MQ objects such as queues and topics, and place these files into `/etc/mqm` in your image. When the MQ pod starts, it will run any MQSC files found in this directory (in sorted order).

Example Dockerfile and MQSC script for creating a new image

In this example you will create a Dockerfile that creates two users:

- `admin` - Administrator user which is a member of the `mqm` group
- `app` - Client application user which is a member of the `mqclient` group. (You will also create this group)

You will also create a MQSC Script file called `config.mqsc` that will be run automatically when your container starts. This script will do the following:

- Create default local queues for my applications
- Create channels for use by the `admin` and `app` users
- Configure security to allow use of the channels by remote applications
- Create authority records to allow members of the `mqclient` group to access the Queue Manager and the default local queues.

First create a file called `config.mqsc`. This the MQSC file that will be run when an MQ container starts. It should contain the following:

```
* Create Local Queues that my application(s) can use.
DEFINE QLOCAL('EXAMPLE.QUEUE.1') REPLACE
DEFINE QLOCAL('EXAMPLE.QUEUE.2') REPLACE

* Create a Dead Letter Queue for undeliverable messages and set the Queue
Manager to use it.
DEFINE QLOCAL('EXAMPLE.DEAD.LETTER.QUEUE') REPLACE
ALTER QMGR DEADQ('EXAMPLE.DEAD.LETTER.QUEUE')

* Set ADOPTCTX to YES so we use the same userid passed for authentication
as the one for authorization and refresh the security configuration
ALTER AUTHINFO(SYSTEM.DEFAULT.AUTHINFO.IDPWOS) AUTHTYPE(IDPWOS)
ADOPTCTX(YES)
REFRESH SECURITY(*) TYPE(CONNAUTH)

* Create a entry channel for the Admin user and Application user
* add the TLS configuration values on channels here
DEFINE CHANNEL('EXAMP.ADMIN.SVRCONN') CHLTYPE(SVRCONN) REPLACE
DEFINE CHANNEL('EXAMP.APP.SVRCONN') CHLTYPE(SVRCONN) MCAUSER('app') REPLACE

REFRESH SECURITY TYPE(SSL)

* Set Channel authentication rules to only allow access through the two
channels we created and only allow admin users to connect through
EXAMPLE.ADMIN.SVRCONN
SET CHLAUTH('*') TYPE(ADDRESSMAP) ADDRESS('*') USERSRC(NOACCESS)
DESCR('Back-stop rule - Blocks everyone') ACTION(REPLACE)
SET CHLAUTH('EXAMP.APP.SVRCONN') TYPE(ADDRESSMAP) ADDRESS('*')
USERSRC(CHANNEL) DESCR('Allows connection via APP channel') ACTION(REPLACE)
SET CHLAUTH('EXAMP.ADMIN.SVRCONN') TYPE(ADDRESSMAP) ADDRESS('*')
USERSRC(CHANNEL) DESCR('Allows connection via ADMIN channel')
ACTION(REPLACE)
SET CHLAUTH('EXAMP.ADMIN.SVRCONN') TYPE(BLOCKUSER) USERLIST('nobody')
DESCR('Allows admins on ADMIN channel') ACTION(REPLACE)

* Set Authority records to allow the members of the mqclient group to
connect to the Queue Manager and access the Local Queues which start with
"EXAMPLE."
SET AUTHREC OBJTYPE(QMGR) GROUP('mqclient') AUTHADD(CONNECT,INQ)
SET AUTHREC PROFILE('EXAMPLE.**') OBJTYPE(QUEUE) GROUP('mqclient')
AUTHADD(INQ,PUT,GET,BROWSE)
```

Next create a `Dockerfile` that expands on the MQ Advanced Server image to create the users and groups. It should contain the following, replacing `<IMAGE NAME>` with the MQ image you want to use as a base:

```
FROM <IMAGE NAME>
# Add the admin user as a member of the mqm group and set their password
USER root
RUN useradd admin -G mqm \
    && echo admin:passw0rd | chpasswd \
# Create the mqclient group
    && groupadd mqclient \
```

```
# Create the app user as a member of the mqclient group and set their
password
    && useradd app -G mqclient \
    && echo app:passw0rd | chpasswd
# Copy the configuration script to /etc/mqm where it will be picked up
automatically
USER mqm
COPY config.mqsc /etc/mqm/
```

Finally, build and push the image to your registry.

You can then use the new image when you deploy MQ into your cluster. You will find that once you have run the image you will be able to see your new default objects and users.

JSON log output

By default, the MQ container output is in JSON format, to better integrate with log aggregation services. On the command line, you can use utilities like 'jq' to format this output, for example:

```
kubectl logs foo-ibm-mq-0 | jq -r '.ibm_datetime + " " + .message'
```

Supplying certificates to be used for TLS

Create a matched set of keys and certs "locally" and test that your MQ Explorer (client) can connect to a local queue manager over TLS.

Use the server side keys and certs as input to the following.

The `pki.trust` and `pki.keys` allow you to supply details of Kubernetes secrets that contain TLS certificates. By doing so the TLS certificates will be imported into the container at runtime and MQ will be configured to use them. You can supply both certificates which contain only a public key and certificates that contain both public and private keys.

If you supply invalid files or invalid YAML objects then the container will terminate with an appropriate termination message. The next 2 sections will detail the requirements for supplying each type of certificate.

Supplying certificates which contain the public and private keys

When supplying a Kubernetes secret that contains a certificate files for both the public and private key you must ensure that the secret contains a file that ends in `.crt` and a file that ends in `.key` named the same. For example: `tls.crt` and `tls.key`. The extension of the file denotes whether the file is the public key (`.crt`) or the private key (`.key`) and must be correct. If your certificate has been issued by a Certificate Authority, then the certificate from the CA must be included as a seperate file with the `.crt` extension. For example: `ca.crt`.

The format of the YAML objects for `pki.keys` value is as follows:

```
- name: mykey
  secret:
    secretName: mykeysecret
    items:
      - tls.key
      - tls.crt
```

```
      - ca.crt
```

or alternatively in a single line you can supply the following: `- name: mykey, secret: {secretName: mykeysecret, items: [tls.key, tls.crt, ca.crt]}`

`name` must be set to a lowercase alphanumeric value and will be used as the label for the certificate in the keystore and queue manager.

`secret.secretName` must match the name of a Kubernetes secret that contains the TLS certificates you wish to import

`secret.items` must list the TLS certificate files contained in `secret.secretName` you want to import.

To supply the YAML objects when deploying via Helm you should use the following: `--set pki.keys[0].name=mykey,pki.keys[0].secret.secretName=mykeysecret,pki.keys[0].secret.items[0]=tls.key,pki.keys[0].secret.items[1]=tls.crt,pki.keys[0].secret.items[2]=ca.crt`

If you supply multiple YAML objects then the queue manager will use the first object chosen by the label name alphabetically. For example if you supply the following labels: `alabel`, `blabel` and `clabel`. The queue manager will use the certificate with the label `alabel` for its identity. This can be changed at runtime by executing the MQSC command: `ALTER QMGR CERTLABL('<new label>')`.

Supplying certificates which contain only the public key

When supplying a Kubernetes secret that contains a certificate file with only the public key you must ensure that the secret contains files that have the extension `.crt`. For example: `tls.crt` and `ca.crt`.

The format of the YAML objects for `pki.trust` value is as follows:

```
- secret:
    secretName: mycertificate
    items:
      - tls.crt
```

or alternatively in a single line you can supply the following: `- secret: {secretName: mycertificate, items: [tls.crt]}`

`secret.secretName` must match the name of a Kubernetes secret that contains the TLS certificates you wish to add.

`secret.items` must list the TLS certificate files contained in `secret.secretName` you want to add.

To supply the YAML objects when deploying via Helm you should use the following: `--set pki.trust[0].secret.secretName=mycertificate,pki.trust[0].secret.items[0]=tls.crt`

If you supply multiple YAML objects then all of the certificates specified will be added into the queue manager and MQ Console Truststores.

Creating TLS key and certs set – In the local “Admin” environment

Points of note

Clarification of “extract”/“add” versus “export”/“import”

SSL uses public/private keys to provide a flexible encryption scheme that can be setup at the time of the secure transaction. When a certificate is created, it contains both the public and private keys.

The "extract" and "add" functions deal with ONLY the public keys. That is, the "extract" gets the public key of a certificate from a database and the "add" puts the public key into a database. No passwords are required because the private key is not obtained.

The "export" and "import" functions deal with BOTH the public and private keys for a certificate. Passwords are required due to the private key.

Summary of steps

Step 1: Client: Create TLS client key database

Step 2: Client: Create certificate

Step 3: Client: Extract the public TLS client certificate and copy it to the TLS server side

Step 4: Server: Create TLS server key database

Step 5: Server: Create certificate

Step 6: Server: Add the TLS client certificate to the Queue Manager's key database.

Step 7: Server: Extract the public TLS server certificate and copy it to the TLS client side

Step 8: Client: Add the TLS client certificate to the Client's key database.

Step 9: Server: Run MQSC commands for TLS server side queue manager SVRCONN

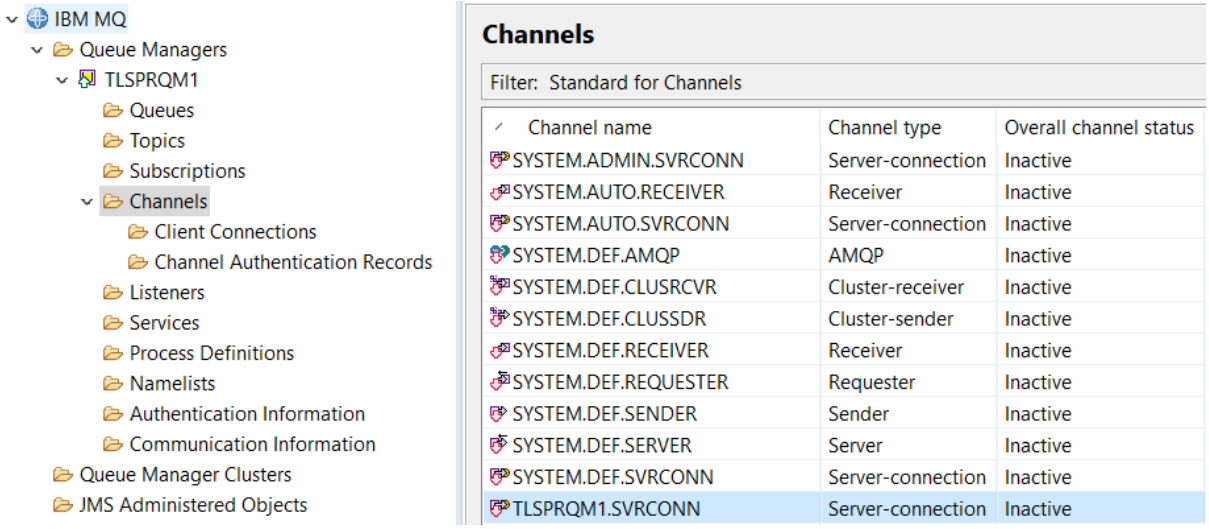
Step 10: Client: Verifying the TLS set up with MQCERTCK

Step 11:Client: Use runmqsc in client mode to connect to the QMGR and administer it

Local Environment

Queue Manager Name – TLSPRQM1 (TLS enabled Production Queue Manager 1)

Listening on port - 2414



Runmqsc TLSPRQM1 to create SVRCONN to use

Note: on windows This should have been MCAUSER(‘MUSR_MQADMIN’) rather than mqm

DEFINE CHANNEL(TLSPRQM1.SVRCONN) CHLTYPE(SVRCONN)

SET CHLAUTH(TLSPRQM1.SVRCONN) TYPE(BLOCKUSER) USERLIST(nobody)

ALTER AUTHINFO(SYSTEM.DEFAULT.AUTHINFO.IDPWOS) AUTHTYPE(IDPWOS) CHCKCLNT(NONE) ADOPTCTX(YES)

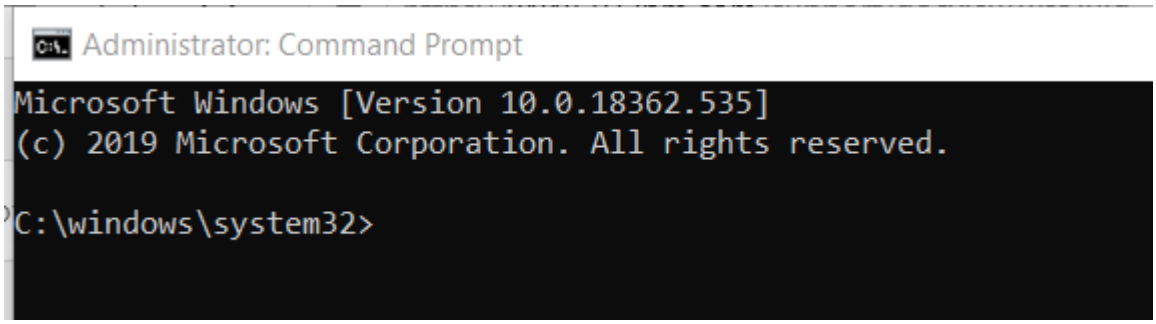
*SET CHLAUTH(TLSPRQM1.SVRCONN) TYPE (ADDRESSMAP) ADDRESS(*) MCAUSER('mqm')

SET CHLAUTH(TLSPRQM1.SVRCONN) TYPE (ADDRESSMAP) ADDRESS(*) MCAUSER(**'MUSR_MQADMIN'**)

REFRESH SECURITY TYPE(CONNAUTH)

Step 1: Client: Create SSL client key database

Windows command prompt running as administrator

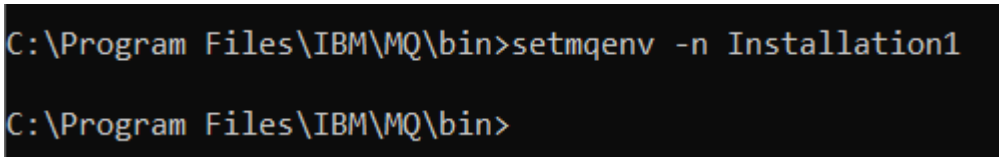


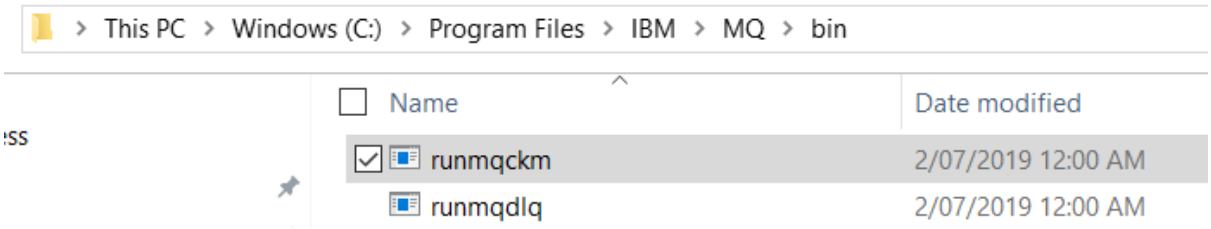
The default directory for MQ 9.1 in this machine is:

cd C:\Program Files\IBM\MQ\bin

If you have multiple installations of MQ versions set the correct installation

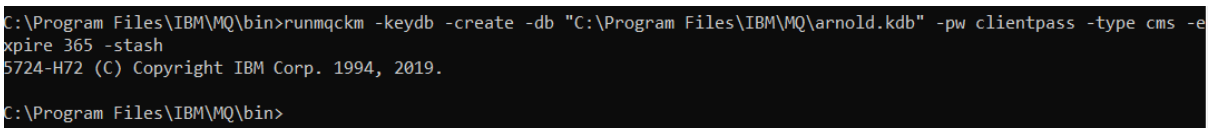
setmqenv -n Installation1



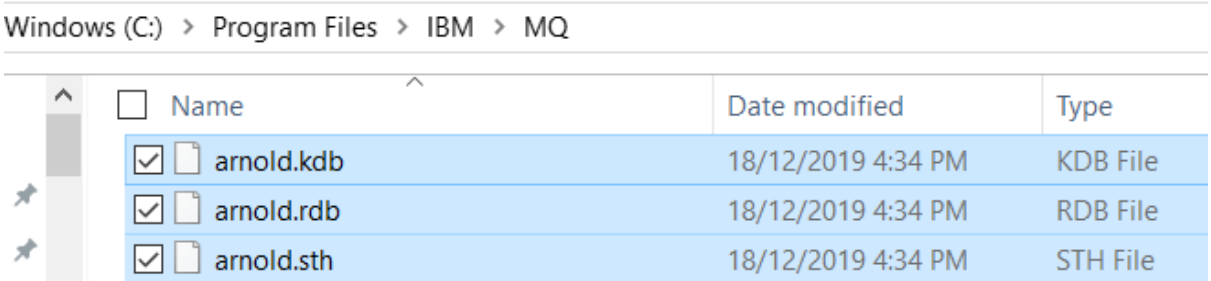


Create TLS client key database

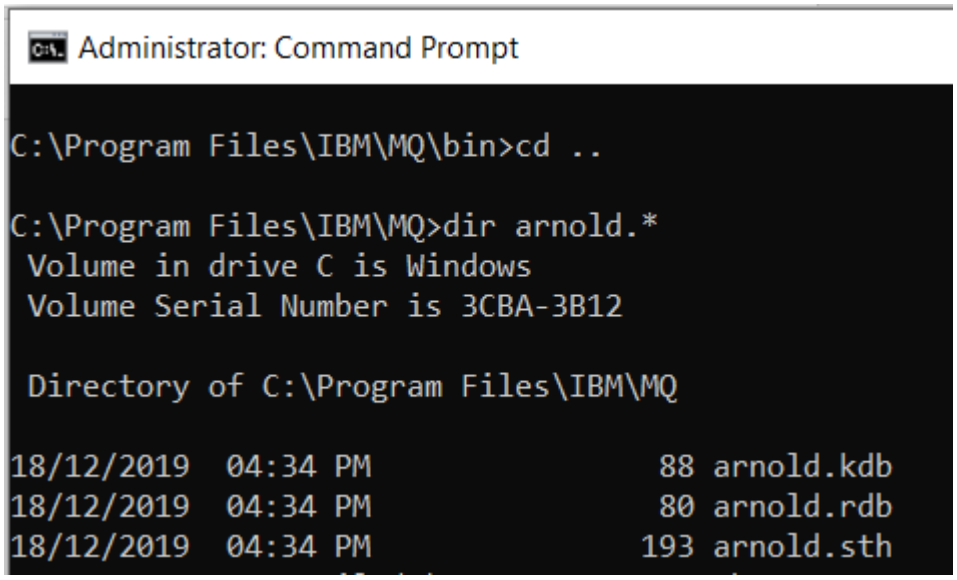
runmqckm -keydb -create -db "C:\Program Files\IBM\MQ\arnold.kdb" -pw clientpass -type cms -expire 365 -stash



Files are created by default in c:\program files\ibm\mq

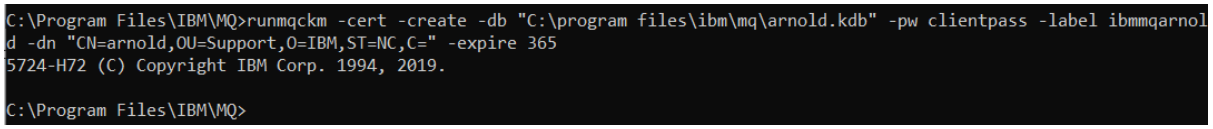


Step 2: Client: Create certificate



Create certificate

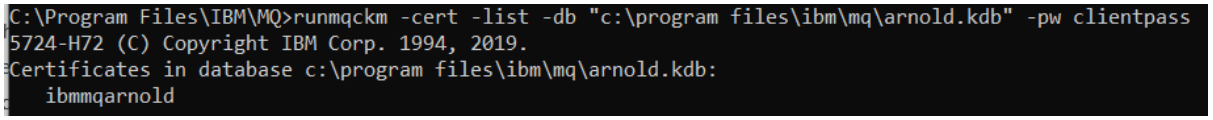
runmqckm -cert -create -db "C:\program files\ibm\mq\arnold.kdb" -pw clientpass -label ibmmqarnold -dn "CN=arnold,OU=Support,O=IBM,ST=NC,C=" -expire 365



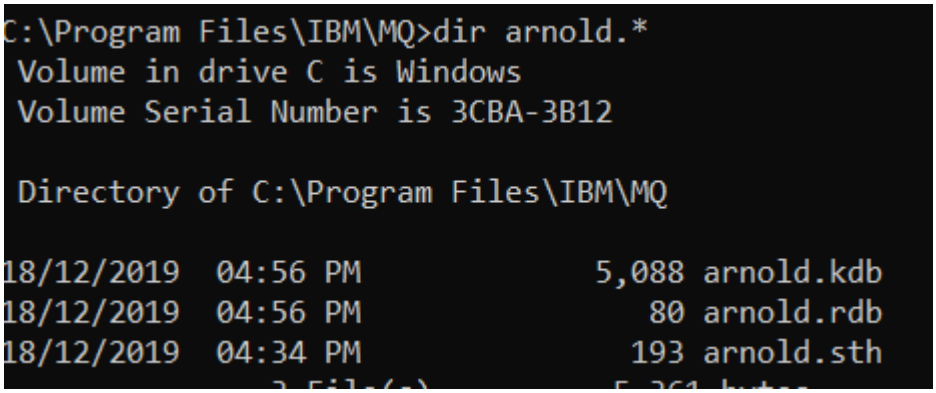
List the certificate

List the certificate:

runmqckm -cert -list -db "c:\program files\ibm\mq\arnold.kdb" -pw clientpass



Dir the files – note change in size of arnold.kbd



Step 3: Client: Extract the public SSL client certificate and copy it to the SSL server side

Extract the public TLS client certificate for copy to the TLS server side

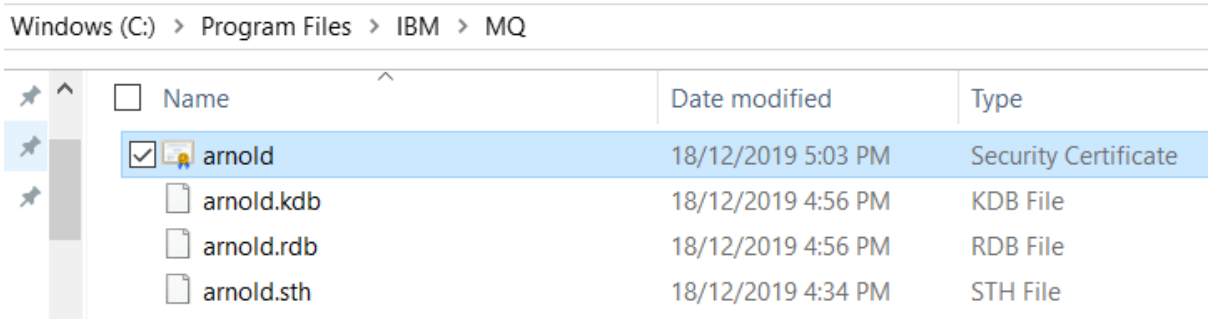
Extract the certificate:

runmqckm -cert -extract -db "c:\Program Files\IBM\MQ\arnold.kdb" -pw clientpass -label ibmmqarnold -target arnold.crt -format ascii

```
C:\Program Files\IBM\MQ>runmqckm -cert -extract -db "c:\Program Files\IBM\MQ\arnold.kdb" -pw clientpass -label ibmmqarno
ld -target arnold.crt -format ascii
5724-H72 (C) Copyright IBM Corp. 1994, 2019.

C:\Program Files\IBM\MQ>
```

Note: The file "arnold.crt" is created in the current directory

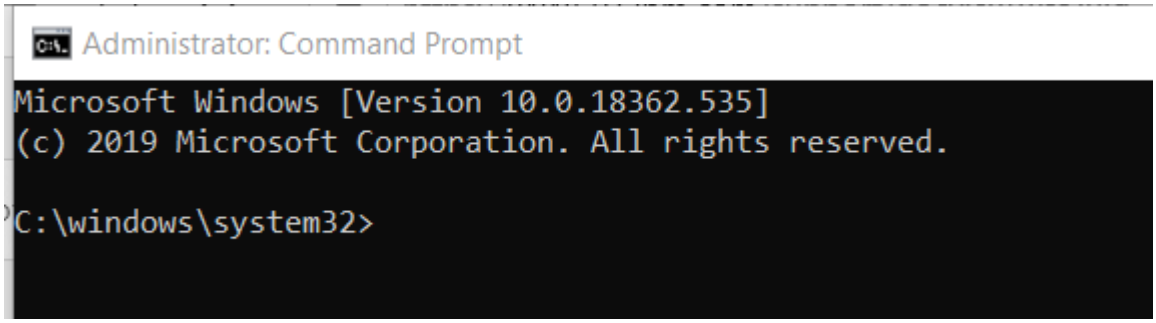
```
 Directory of C:\Program Files\IBM\MQ

18/12/2019  05:03 PM               836 arnold.crt
18/12/2019  04:56 PM             5,088 arnold.kdb
18/12/2019  04:56 PM                80 arnold.rdb
18/12/2019  04:34 PM               193 arnold.sth
```



Arnold.crt is our client side public TLS certificate extracted from the client database that can be used by the server side queue manager.

Step 4: Server: Create SSL server key database Step 5: Server: Create certificate

Windows command prompt running as administrator



The default directory for MQ 9.1 in this machine is:

cd C:\Program Files\IBM\MQ\bin

If you have multiple installations of MQ versions set the correct installation

setmqenv -n Installation1

```
C:\Program Files\IBM\MQ\bin>setmqenv -n Installation1

C:\Program Files\IBM\MQ\bin>
```

Change to the directory where the Queue Manager key database will be located:

Cd C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl

(linux cd /var/mqm/qmgrs/ TLSPRQM1/ssl/)

```
C:\Program Files\IBM\MQ>cd C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl

C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>dir
 Volume in drive C is Windows
 Volume Serial Number is 3CBA-3B12

 Directory of C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl

18/12/2019  04:12 PM    <DIR>          .
18/12/2019  04:12 PM    <DIR>          ..
               0 File(s)              0 bytes
```

Create SSL server key database

runmqckm -keydb -create -db “C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.kdb" -pw serverpass -type cms -expire 365 -stash

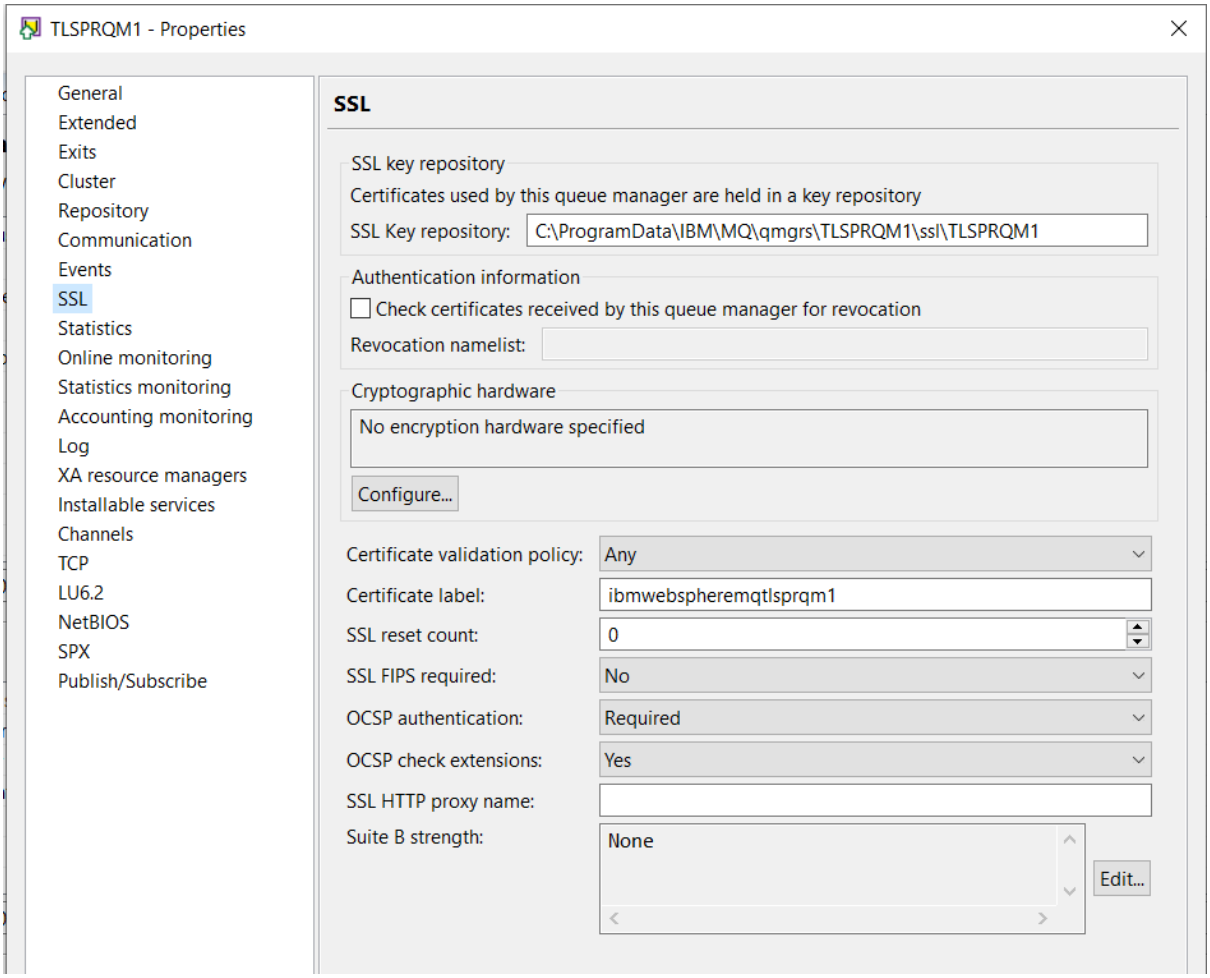
```
C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>runmqckm -keydb -create -db "C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.
kdb" -pw serverpass -type cms -expire 365 -stash
5724-H72 (C) Copyright IBM Corp. 1994, 2019.

C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>
```

These are the files that are created: dir C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl

```
C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>dir C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl
 Volume in drive C is Windows
 Volume Serial Number is 3CBA-3B12

 Directory of C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl

18/12/2019  06:41 PM    <DIR>          .
18/12/2019  06:41 PM    <DIR>          ..
18/12/2019  06:41 PM                88 TLSPRQM1.kdb
18/12/2019  06:41 PM                80 TLSPRQM1.rdb
18/12/2019  06:41 PM               193 TLSPRQM1.sth
```

Step 5: Server: Create certificate

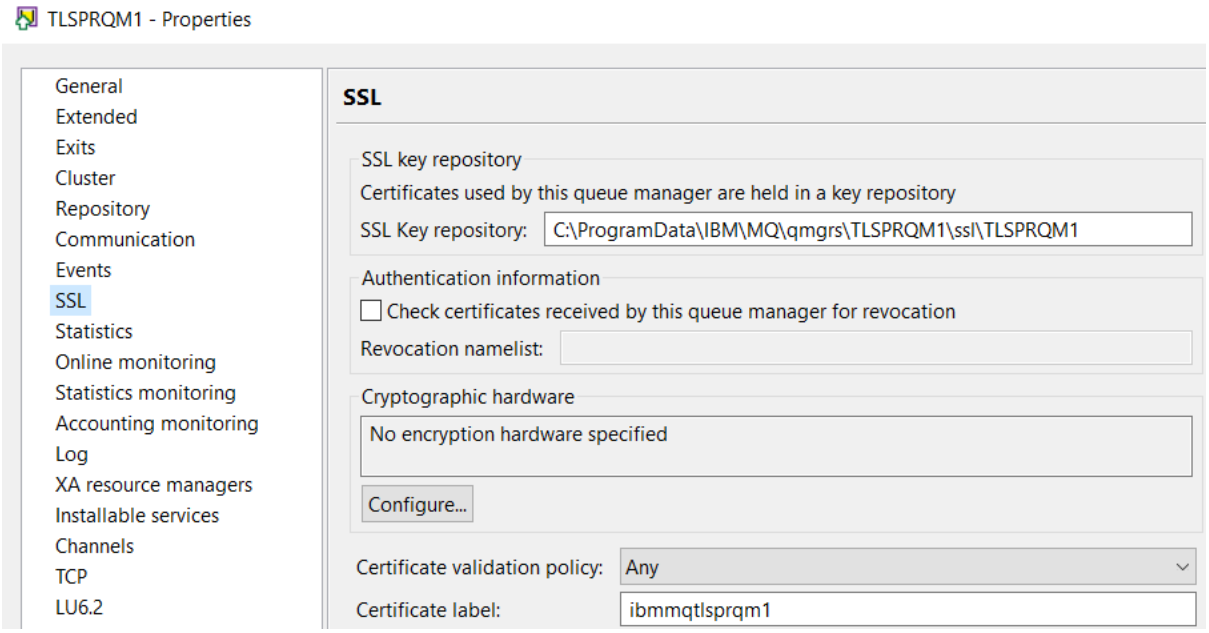
Important: There is a default certificate label on the Queue Manager side.



If you choose not to use the default ibmwebspheremq<lower case queue manager name> you will need to change this value in the queue manager.

In this example we will use a non default. “ibmmq<lower case queue manager name> i.e. **ibmmqtlsprqm1**

Therefore I will change the queue manager’s cert label



TLS server certificate setup

Create the certificate:

runmqckm -cert -create -db “C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.kdb" -pw serverpass -label ibmmqtlsprqm1 -dn "CN=TLSPRQM1,OU=Support,O=IBM,ST=NC,C=" -expire 365

```
C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>runmqckm -cert -create -db "C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.k
db" -pw serverpass -label ibmmqtlsprqm1 -dn "CN=TLSPRQM1,OU=Support,O=IBM,ST=NC,C=" -expire 365
5724-H72 (C) Copyright IBM Corp. 1994, 2019.

C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>
```

List the certificate:

runmqckm -cert -list -db “C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.kdb” -pw serverpass

```
C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>runmqckm -cert -list -db "C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.kdb
" -pw serverpass
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Certificates in database C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.kdb:
   ibmmqtlsprqm1
```

Notice that the file size for the kdb file was increased

dir C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl

```
C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>dir C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl
 Volume in drive C is Windows
 Volume Serial Number is 3CBA-3B12

 Directory of C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl

18/12/2019  06:41 PM    <DIR>          .
18/12/2019  06:41 PM    <DIR>          ..
18/12/2019  06:48 PM             5,088 TLSPRQM1.kdb
18/12/2019  06:48 PM                80 TLSPRQM1.rdb
18/12/2019  06:41 PM               193 TLSPRQM1.sth
```

Step 6: Server: Add the SSL client certificate to the Queue Manager's key database.

Add the SSL client certificate **arnold.crt** to the Queue Manager's key database.

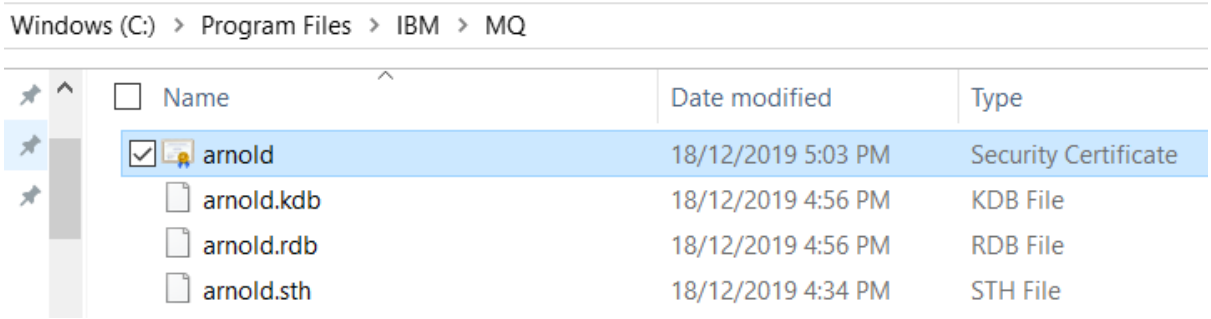
Change to the directory where the queue manager key database is located:

(linux cd /var/mqm/qmgrs/TLSPRQM1/ssl/)

Cd C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl

Notice that the file rivera.crt is in the directory: ls -l -rw------- 1 rivera mqm 5080 2014-03-04 11:43 QM_71SSL.kdb -rw------- 1 rivera mqm 80 2014-03-04 11:43 QM_71SSL.rdb -rw------- 1 rivera mqm 129 2014-03-04 11:37 QM_71SSL.sth -rw------- 1 rivera mqm 776 2014-03-04 11:50 rivera.crt (new file)

Add the client certificate arnold.crt:



runmqckm -cert -add -db "C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.kdb" -pw serverpass -label ibmmqarnold -file “c:\program files\ibm\mq\arnold.crt” -format ascii

```
C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>runmqckm -cert -add -db "C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.kdb"
 -pw serverpass -label ibmmqarnold -file "c:\program files\ibm\mq\arnold.crt" -format ascii
5724-H72 (C) Copyright IBM Corp. 1994, 2019.

C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>
```

List the certificates:

runmqckm -cert -list -db “C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.kdb" -pw serverpass

```
C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>runmqckm -cert -list -db "C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.kdb
" -pw serverpass
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Certificates in database C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.kdb:
   ibmmqtlsprqm1
   ibmmqarnold
```

Notice the increase in size for the kdb file:

```
C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>dir
 Volume in drive C is Windows
 Volume Serial Number is 3CBA-3B12

 Directory of C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl

18/12/2019  06:41 PM    <DIR>          .
18/12/2019  06:41 PM    <DIR>          ..
18/12/2019  07:02 PM            10,088 TLSPRQM1.kdb
18/12/2019  07:02 PM                80 TLSPRQM1.rdb
18/12/2019  06:41 PM               193 TLSPRQM1.sth
```

Step 7: Server: Extract the public TLS server certificate and copy it to the TLS client side

Extract the public TLS server certificate to make it available to the TLS client side

Change to the directory where the queue manager key database is located:

(linux cd /var/mqm/qmgrs/TLSPRQM1/ssl/)

Cd C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl

runmqckm -cert -extract -db “C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.kdb" -pw serverpass -label ibmmqtlsprqm1 -target TLSPRQM1.crt -format ascii

The file "TLSPRQM1.crt" is created in the current directory

```
C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>runmqckm -cert -extract -db "C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.
kdb" -pw serverpass -label ibmmqtlsprqm1 -target TLSPRQM1.crt -format ascii
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
```

Dir C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl

```
C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl>dir
 Volume in drive C is Windows
 Volume Serial Number is 3CBA-3B12

 Directory of C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl

18/12/2019  07:12 PM    <DIR>          .
18/12/2019  07:12 PM    <DIR>          ..
18/12/2019  07:12 PM               842 TLSPRQM1.crt
18/12/2019  07:02 PM            10,088 TLSPRQM1.kdb
18/12/2019  07:02 PM                80 TLSPRQM1.rdb
18/12/2019  06:41 PM               193 TLSPRQM1.sth
```

Step 8: Client: Add the SSL client certificate to the Client's key database.

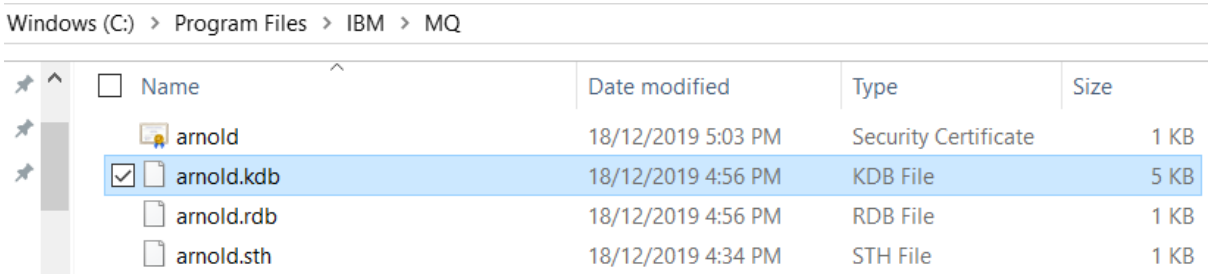
The MQ Queue Manager Signer Certificate, " TLSPRQM1.crt" needs to be made available to the host where the MQ Client is located.

Change directory to the local client side key database arnold.kdb

cd C:\Program Files\IBM\MQ

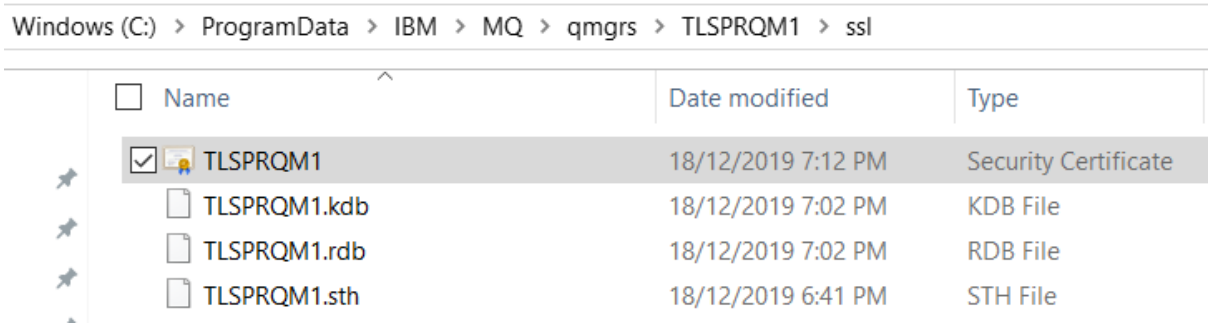
```
C:\Program Files\IBM\MQ>dir arnold.*
 Volume in drive C is Windows
 Volume Serial Number is 3CBA-3B12

 Directory of C:\Program Files\IBM\MQ

18/12/2019  05:03 PM               836 arnold.crt
18/12/2019  04:56 PM             5,088 arnold.kdb
18/12/2019  04:56 PM                80 arnold.rdb
18/12/2019  04:34 PM               193 arnold.sth
```

Client side key database



Add the queue manager certificate to client side key database

Queue manager certificate



runmqckm -cert -add -db "C:\Program Files\IBM\MQ\arnold.kdb" -pw clientpass -label ibmmqtlsprqm1 -file “c:\programData\ibm\mq\qmgrs\TLSPRQM1\ssl\TLSPRQM1.crt” -format ascii

```
C:\Program Files\IBM\MQ>runmqckm -cert -add -db "C:\Program Files\IBM\MQ\arnold.kdb"  -pw clientpass -label ibmmqtlsprqm
1 -file "c:\programData\ibm\mq\qmgrs\TLSPRQM1\ssl\TLSPRQM1.crt" -format ascii
5724-H72 (C) Copyright IBM Corp. 1994, 2019.

C:\Program Files\IBM\MQ>
```

List the certificate

runmqckm -cert -list -db "C:\Program Files\IBM\MQ\arnold.kdb" -pw clientpass

```
C:\Program Files\IBM\MQ>runmqckm -cert -list -db "C:\Program Files\IBM\MQ\arnold.kdb"  -pw clientpass
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Certificates in database C:\Program Files\IBM\MQ\arnold.kdb:
   ibmmqarnold
   ibmmqtlsprqm1
```

Note the change in size of the arnold.kbd file

```
C:\Program Files\IBM\MQ>dir arnold.*
 Volume in drive C is Windows
 Volume Serial Number is 3CBA-3B12

 Directory of C:\Program Files\IBM\MQ

18/12/2019  05:03 PM               836 arnold.crt
18/12/2019  07:28 PM            10,088 arnold.kdb
18/12/2019  07:28 PM                80 arnold.rdb
18/12/2019  04:34 PM               193 arnold.sth
```

Step 9: Server: Run MQSC commands for TLS server side queue manager

GSKit will add the “.kdb” suffix for the key database. So don’t add the kdb extension

You MUST provide the value for SSLKEYR as follows:

full path name of the key store MINUS the .kdb suffix (the .kdb is added at runtime):

Windows Full path name with suffix:
C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1.kdb

Windows Full path name minus suffix: C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1

(Linux full path name minus suffix /var/mqm/qmgrs/ TLSPRQM1/ssl/ TLSPRQM1)

Watch out for single quotes when cut and pasting – you might have to type over them in the command after the paste.

Runmqsc TLSPRQM1

ALTER QMGR SSLKEYR('C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1')

ALTER QMGR SSLFIPS(NO)

```
ALTER QMGR SSLKEYR('C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1')
     2 : ALTER QMGR SSLKEYR('C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\ssl\TLSPRQM1')
AMQ8005I: IBM MQ queue manager changed.
ALTER QMGR SSLFIPS(NO)
     3 : ALTER QMGR SSLFIPS(NO)
AMQ8005I: IBM MQ queue manager changed.
```

DEFINE CHANNEL('TLSPRQM1.SVRCONN') CHLTYPE(SVRCONN) TRPTYPE(TCP) SSLCIPH(ANY_TLS12) SSLCAUTH(REQUIRED) REPLACE

SET CHLAUTH(TLSPRQM1.SVRCONN) TYPE(BLOCKUSER) USERLIST('nobody')

REFRESH SECURITY TYPE(SSL)

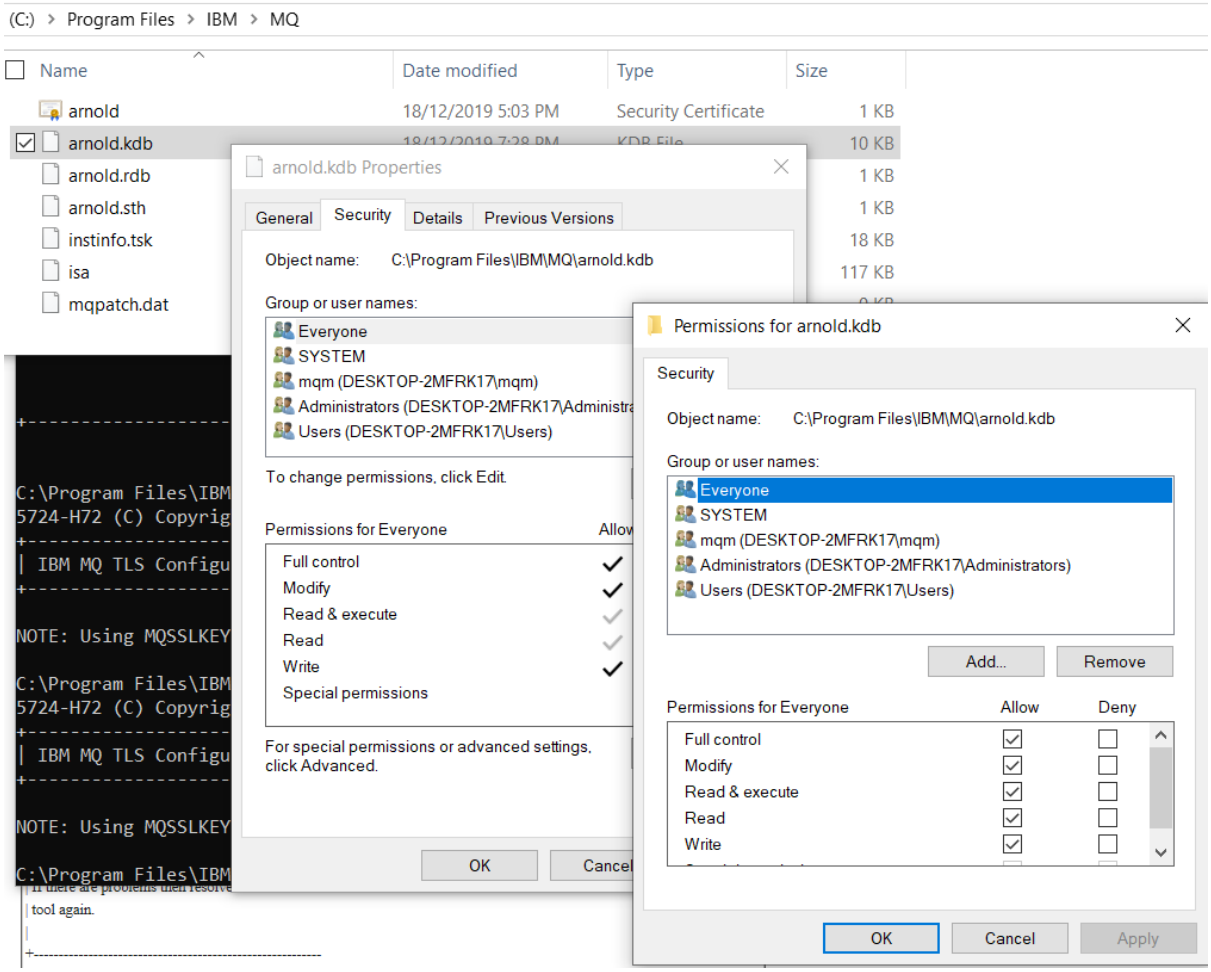
end

```
DEFINE CHANNEL('TLSPRQM1.SVRCONN') CHLTYPE(SVRCONN) TRPTYPE(TCP) SSLCIPH(ANY_TLS12) SSLCAUTH(REQUIRED) REPLACE
     7 : DEFINE CHANNEL('TLSPRQM1.SVRCONN') CHLTYPE(SVRCONN) TRPTYPE(TCP) SSLCIPH(ANY_TLS12) SSLCAUTH(REQUIRED) REPLACE
AMQ8014I: IBM MQ channel created.
REFRESH SECURITY TYPE(SSL)
     8 : REFRESH SECURITY TYPE(SSL)
AMQ8560I: IBM MQ security cache refreshed.
end
```

Step 10: Verifying the TLS set up with MQCERTCK

File read/write attributes on the .KDB

There might be a problem with read/write access to the files



Notes from an IBM tech note

Check the AMQERR01.LOG

AMQ9660: SSL key repository: password stash file absent or unusable. EXPLANATION: The SSL key repository cannot be used because MQ cannot obtain a password to access it. Reasons giving rise to this error include: (a) the key database file and password stash file are not present in the location configured for the key repository, (b) the key database file exists in the correct place but that no password stash file has been created for it, (c) the files are present in the correct place but the userid under which MQ is running does not have permission to read them, (d) one or both of the files are corrupt.

ACTION: Ensure that the key repository variable is set to where the key database file is. Ensure that a password stash file has been associated with the key database file in the same directory, and that the userid under which MQ is running has read access to both files. If both are already present and readable in the correct place, delete and recreate them. Restart the channel.

file permissions for the ssl files:

cd /var/mqm/qmgrs/TLSPRQM1/ssl ls -l -rw------- 1 davidarnold mqm 782 2014-03-04 12:12 TLSPRQM1.crt -rw------- 1 davidarnold mqm 10080 2014-03-04 11:51 TLSPRQM1.kdb -rw------- 1 arnold mqm 80 2014-03-04 11:51 TLSPRQM1.rdb -rw------- 1 davidarnold mqm 129 2014-03-04 11:37 TLSPRQM1.sth -rw------- 1 davidarnold mqm 776 2014-03-04 11:50 arnold.crt

Notice that the userid “davidarnold” is being used in this scenario. This user is a member of the “mqm” group, but the SSL files were created in such as way that other members of the group cannot read/write the files.

Change the permissions to allow the group “mqm” to read and write:

/var/mqm/qmgrs/TLSPRQM1/ssl chmod 660 *

rivera@veracruz: /var/mqm/qmgrs/TLSPRQM1/ssl ls -l -rw-rw---- 1 davidarnold mqm 782 2014-03-04 12:12 TLSPRQM1.crt -rw-rw---- 1 davidarnold mqm 10080 2014-03-04 11:51 TLSPRQM1.kdb -rw-rw---- 1 davidarnold mqm 80 2014-03-04 11:51 TLSPRQM1.rdb -rw-rw---- 1 davidarnold mqm 129 2014-03-04 11:37 TLSPRQM1.sth -rw-rw---- 1 davidarnold mqm 776 2014-03-04 11:50 arnold.crt

Using MQCERTCK

mqcertck <QMName> -clientkeyr <Client Key Repository> -clientchannel <Channel Name> -clientusername <Client Username> -clientlabel <Client Certificate label> -clientport <Free Port Number>

Set the environment variable for the client side key database arnold.kdb

set MQSSLKEYR=C:\Program Files\IBM\MQ\arnold

set the environment variable for MQSERVER to specific the client channel

Set MQSERVER=TLSPRQM1.SVRCONN/TCP/localhost(2414)

Try mqcertck with -clientuser mqm

C:\Program Files\IBM\MQ>mqcertck TLSPRQM1 -clientchannel TLSPRQM1.SVRCONN -clientuser mqm -clientport 5857

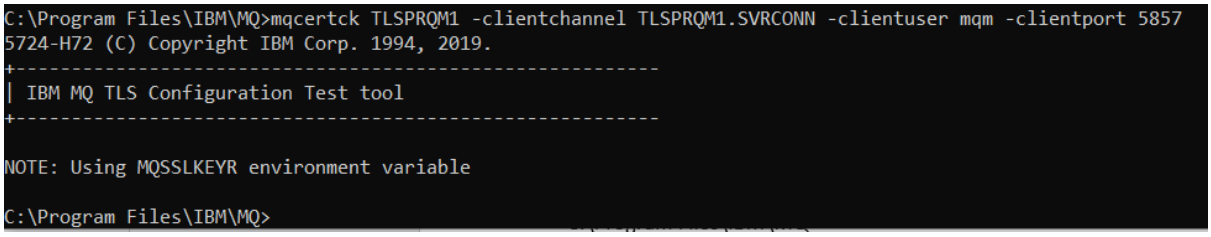
5724-H72 (C) Copyright IBM Corp. 1994, 2019.

+--

| IBM MQ TLS Configuration Test tool

+--

NOTE: Using MQSSLKEYR environment variable



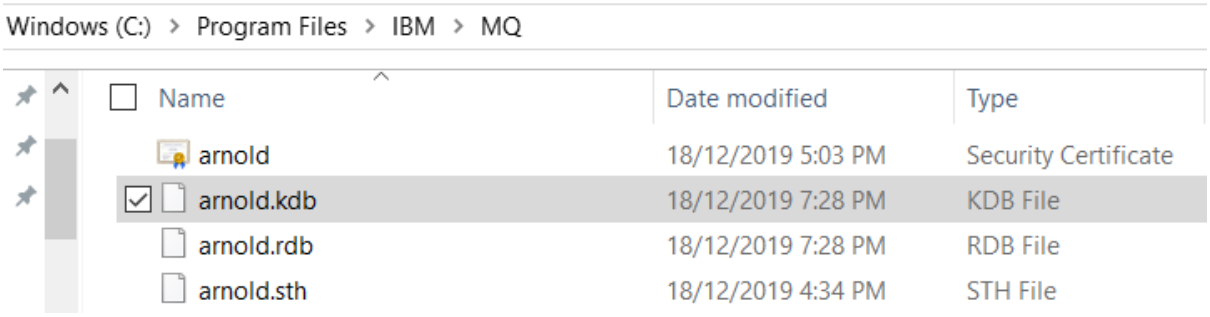
Try mqcertck with -clientlabel ibmmqtlsprqm1

C:\Program Files\IBM\MQ>mqcertck TLSPRQM1 -clientchannel TLSPRQM1.SVRCONN -clientlabel ibmmqtlsprqm1 -clientport 5857

```
C:\Program Files\IBM\MQ>mqcertck TLSPRQM1 -clientchannel TLSPRQM1.SVRCONN -clientlabel ibmmqtlsprqm1 -clientport 5857
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
+-----------------------------------------------------------
| IBM MQ TLS Configuration Test tool
+-----------------------------------------------------------

NOTE: Using MQSSLKEYR environment variable

C:\Program Files\IBM\MQ>
```

Step 11: Client: use runmqsc in client mode to connect to the TLSPRQM1 and administer it

Set the environment variable to point to the client's key database



Windows Full path name with suffix: C:\Program Files\IBM\MQ\arnold.kdb

Windows Full path name minus suffix: C:\Program Files\IBM\MQ\arnold

`set MQSSLKEYR=`C:\Program Files\IBM\MQ\arnold

```
C:\Program Files\IBM\MQ>set MQSSLKEYR=C:\Program Files\IBM\MQ\arnold

C:\Program Files\IBM\MQ>echo %MQSSLKEYR%
C:\Program Files\IBM\MQ\arnold
```

Using MQSERVER for the client channel won't work

Set the environment variable for the MQSERVER

Set MQSERVER=TLSPRQM1.SVRCONN/TCP/localhost(2414)

```
C:\Program Files\IBM\MQ>Set MQSERVER= TLSPRQM1.SVRCONN/TCP/localhost(2414)

C:\Program Files\IBM\MQ>echo %MQSERVER%
 TLSPRQM1.SVRCONN/TCP/localhost(2414)
```

Note that you cannot set the cipherspec for the client side channel to use.

If you runmqsc -c TLSPRQM1 it fails

```
C:\Program Files\IBM\MQ>runmqsc -c TLSPRQM1
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting MQSC for queue manager TLSPRQM1.


AMQ9709E: SSL/TLS initialization error.

0 command responses received.


C:\Program Files\IBM\MQ>
```

In the logs

MQ9639E: Remote channel 'TLSPRQM1.SVRCONN' did not specify a CipherSpec.

EXPLANATION:

Remote channel 'TLSPRQM1.SVRCONN' did not specify a CipherSpec when the local channel expected one to be specified.

Using MQCCDT for the client channel

Notes:

Do we have to use MQCCDT file in order for runmqsc to client connect because the MQSERVER limits the details we can specify for the connection to the SVRCONN

A CCDT enables the specification of cipher specs etc to be specified on the client end

See https://www-01.ibm.com/support/docview.wss?uid=swg27045974&aid=1

A CCDT file always have at least one channel: SYSTEM.DEF.CLNTCONN # It is the default, but causes confusion. Do not use it.

We need a CLNTCONN channel something like the following

display CHANNEL(TLSPRQM1.SVRCONN) all AMQ8414: Display Channel details.

CHANNEL(TLSPRQM1.SVRCONN)

CHLTYPE(CLNTCONN) AFFINITY(PREFERRED) CERTLABL( ) CLNTWGHT(0)
COMPHDR(NONE) COMPMSG(NONE)

CONNAME(localhost(2414)) DEFRECON(NO) DESCR( ) HBINT(300)
KAINT(AUTO) LOCLADDR( ) MAXMSGL(4194304) MODENAME( )
PASSWORD( ) QMNAME(TLSPRQM1) RCVDATA( ) RCVEXIT( )
SCYDATA( ) SCYEXIT( ) SENDDATA( ) SENDEXIT( ) SHARECNV(10)

SSLCIPH(ANY_TLS12) SSLPEER( ) TPNAME( ) TRPTYPE(TCP) USERID( )

Set up the CCDT

Create an client connection channel MQSC file

Make sure you add the **CERTLAB** to the CLNTCONN definition and retry

```
DEFINE CHANNEL(TLSPRQM1.SVRCONN) +
        CHLTYPE(CLNTCONN) +
        TRPTYPE(TCP) +
        CONNAME('localhost(2414)') +
        CERTLABL('ibmmqarnold') +
        QMNAME(TLSPRQM1) +
        SSLCIPH(ANY_TLS12) +
        REPLACE
```

```
C:\temp>dir TLSPRQM1CLTCONN.mqsc
 Volume in drive C is Windows
 Volume Serial Number is 3CBA-3B12

 Directory of C:\temp

19/12/2019  10:38 AM               197 TLSPRQM1CLTCONN.mqsc
               1 File(s)            197 bytes
               0 Dir(s)  211,153,235,968 bytes free

C:\temp>type TLSPRQM1CLTCONN.mqsc
DEFINE CHANNEL(TLSPRQM1.SVRCONN) +
        CHLTYPE(CLNTCONN) +
        TRPTYPE(TCP) +
        CONNAME('localhost(2414)') +
        CERTLABL('ibmmqarnold') +
        QMNAME(TLSPRQM1) +
    SSLCIPH(ANY_TLS12) +
        REPLACE
```

Runmqsc with the -n (no queue manager switch) to create a CCDT from the MQSC script

runmqsc -n < c:\temp\TLSPRQM1CLTCONN.MQSC

```
C:\temp>runmqsc -n < c:\temp\TLSPRQM1CLTCONN.MQSC
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting local MQSC for 'AMQCLCHL.TAB'.
     1 : DEFINE CHANNEL(TLSPRQM1.SVRCONN) +
       :        CHLTYPE(CLNTCONN) +
       :        TRPTYPE(TCP) +
       :        CONNAME('localhost(2414)') +
       :        QMNAME(TLSPRQM1) +
       :     SSLCIPH(ANY_TLS12) +
       :        REPLACE
AMQ8014I: IBM MQ channel created.
       :
       :
No commands have a syntax error.
```

If the default CCDT TAB name and default CCDT TAB directory are not used, we will need to set up the environment variable for path to AMQCLCHL.TAB

Because I have used all defaults the MQClient code will find and use the default AMQCLCHL.TAB

On Linux

export MQCHLTAB=/var/mqm/AMQCLCHL.TAB

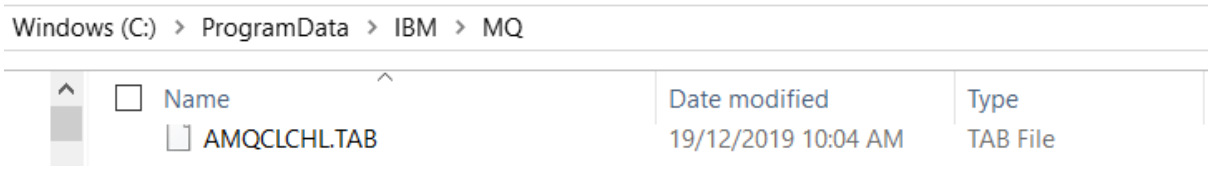
echo $MQCHLTAB

On windows

set MQCHLTAB= C:\ProgramData\IBM\MQ\AMQCLCHL.TAB

echo %MQCHLTAB%

C:\ProgramData\IBM\MQ



```
C:\temp>cd \programData\ibm\mq

C:\ProgramData\IBM\MQ>type AMQCLCHL.TAB
AMQR              TLSPRQM1.SVRCONN    ▯   ▯   ▯                                                                    TLSP
RQM1                                                                                    localhost(2414)
                                                                                  2   p▯
   <    ╔Ü;▒▯

 ╔Ü;  @ ▯
                                  ▯   localhost(2414)




   ▯▯  ,▯      ▯   ö  Ç
ANY_TLS12
                                                        ▯   ²   ²
       ╔Ü; ╔Ü;    ▯   ê▯  ▯       ibmmqarnold                                                                  ▯
                                          ᶜ┐·]                                                                      ▯▯▯▯▯▯
C:\ProgramData\IBM\MQ>
```

Check the MQSSLKEYR environment variable

```
C:\ProgramData\IBM\MQ>echo %MQSSLKEYR%
c:\program files\ibm\mq\arnold

C:\ProgramData\IBM\MQ>
```

Clear MQSERVER environment variable

```
C:\ProgramData\IBM\MQ>set MQSERVER=

C:\ProgramData\IBM\MQ>echo %MQSERVER%
%MQSERVER%

C:\ProgramData\IBM\MQ>
```

runmqsc -c TLSPRQM1

If you get any of the errors below check the logs C:\ProgramData\IBM\MQ\qmgrs\TLSPRQM1\errors

Goto the debug section in the document for help.

```
C:\ProgramData\IBM\MQ>runmqsc -c TLSPRQM1
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting MQSC for queue manager TLSPRQM1.


AMQ9709E: SSL/TLS initialization error.
```

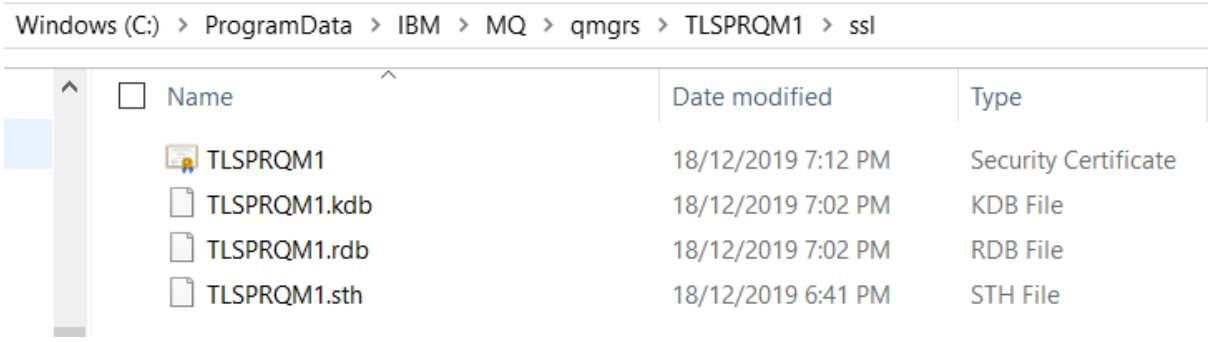
```
C:\temp>runmqsc -c TLSPRQM1
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting MQSC for queue manager TLSPRQM1.


AMQ8135E: Not authorized.
```

You should get

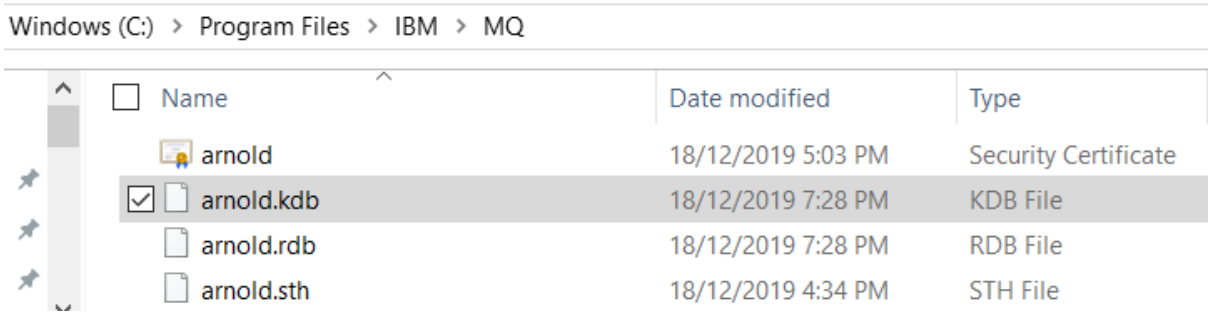
```
C:\temp>runmqsc -c TLSPRQM1
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting MQSC for queue manager TLSPRQM1.


dis QL(*)
     1 : dis QL(*)
AMQ8409I: Display Queue details.
   QUEUE(AMQ.5DF9F6E423C0A402)             TYPE(QLOCAL)
AMQ8409I: Display Queue details.
```

SUCCESS!!!!

SERVERside TLS files – end of exercise



CLIENTside TLS files – end of exercise

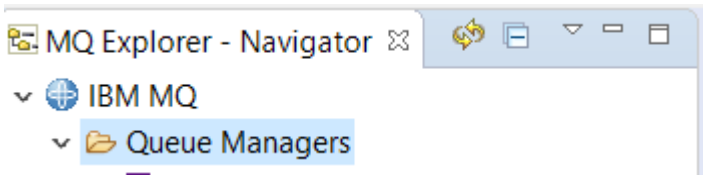


Step 12: Client: connect MQ Explore to queue manager via “Add remote Queue Manager”

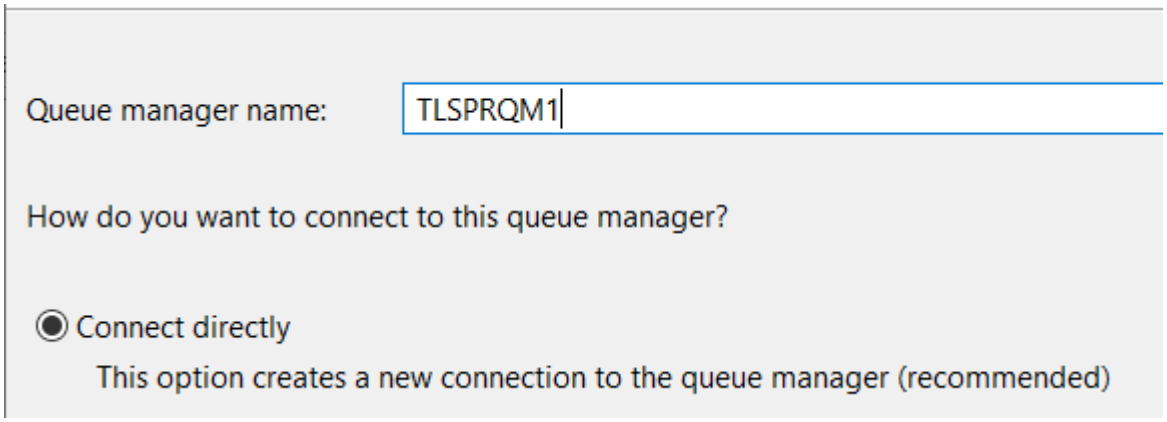
What the blazes! .JKS

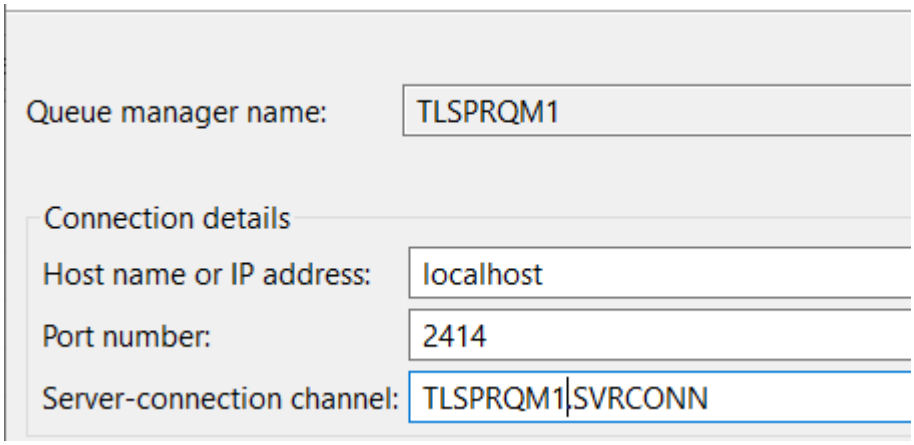
https://www.ibm.com/support/knowledgecenter/en/SSFKSJ_9.1.0/com.ibm.mq.adm.doc/q020430_.htm

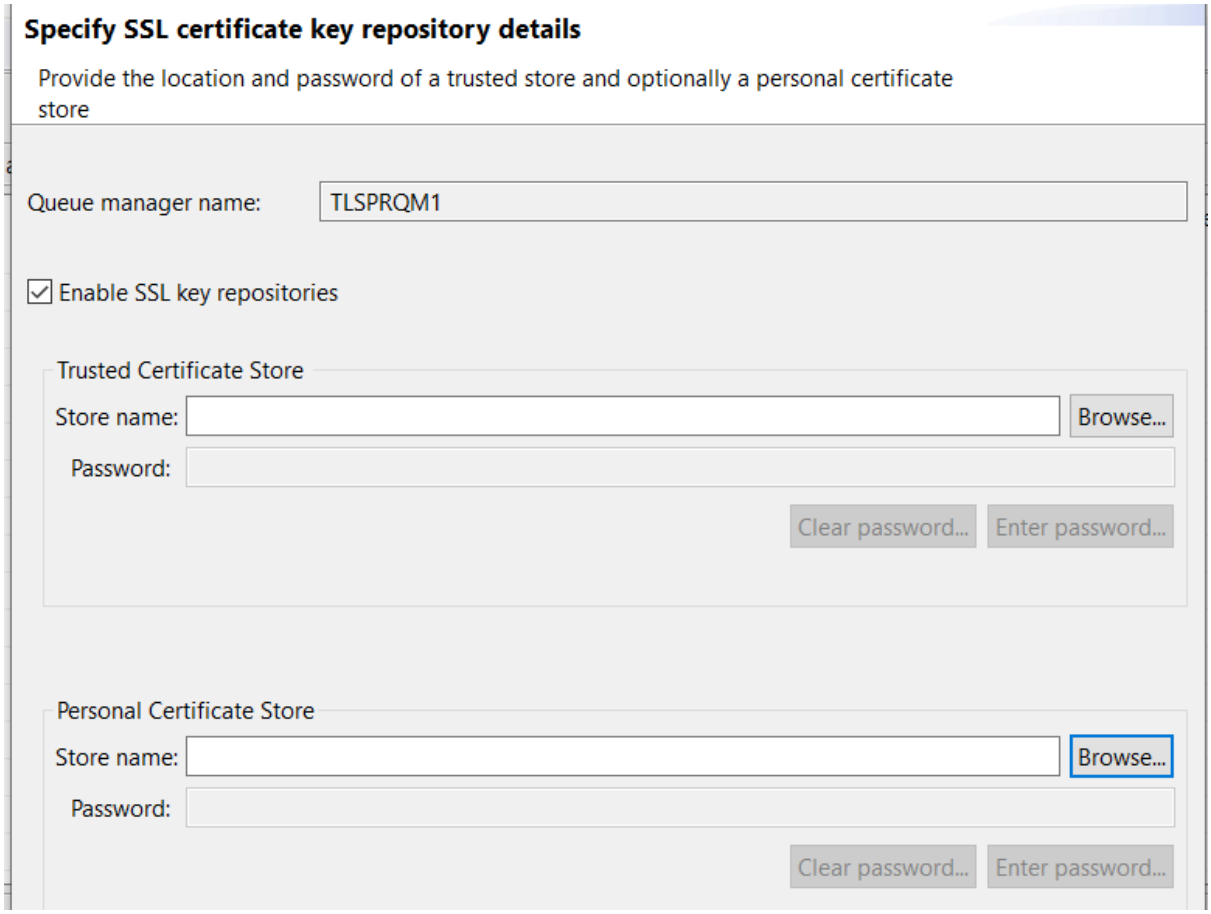
When you get to the SSL certificate repository details MQExplorer wants .JKS note .KDB



Add remote queue manager






Specify SSL certificate key repository details
Provide the location and password of a trusted store and optionally a personal certificate store
Queue manager name:
TLSPRQM1
Enable SSL key repositories
Trusted Certificate Store
Store name:
Browse...
Password:
Clear password...
Enter password...
Personal Certificate Store
Store name:
Browse...
Password:
Clear password...
Enter password...

Creating the custom MQ Image Layer for ICP4i on RHOS 4.2

Run docker images

```
C:\Users\DAVIDARNOLD\myDocker>docker images
REPOSITORY                                TAG                 IMAGE ID            CREATED             SIZE
davexacom/ibm-mqadvanced-server-ivt       9.1.3.0-r4-amd64    e269ad126613        3 days ago          932MB
ace11002mqc91intms1                       1.0                 ec39bb5df84f        8 days ago          1.59GB
ibmcom/mq                                 latest              268baf40303f        13 days ago         927MB
ibmcom/ace-mq                             latest              0f5a883d8a95        5 weeks ago         2.51GB
ibmcom/ace-mqclient                       latest              d71cee6dfd5f        5 weeks ago         1.94GB
ibmcom/ace                                latest              d33c5a966d7b        5 weeks ago         1.63GB
ibm-mqadvanced-server-integration         9.1.3.0-r4-amd64    ee41039b9552        6 weeks ago         932MB
```

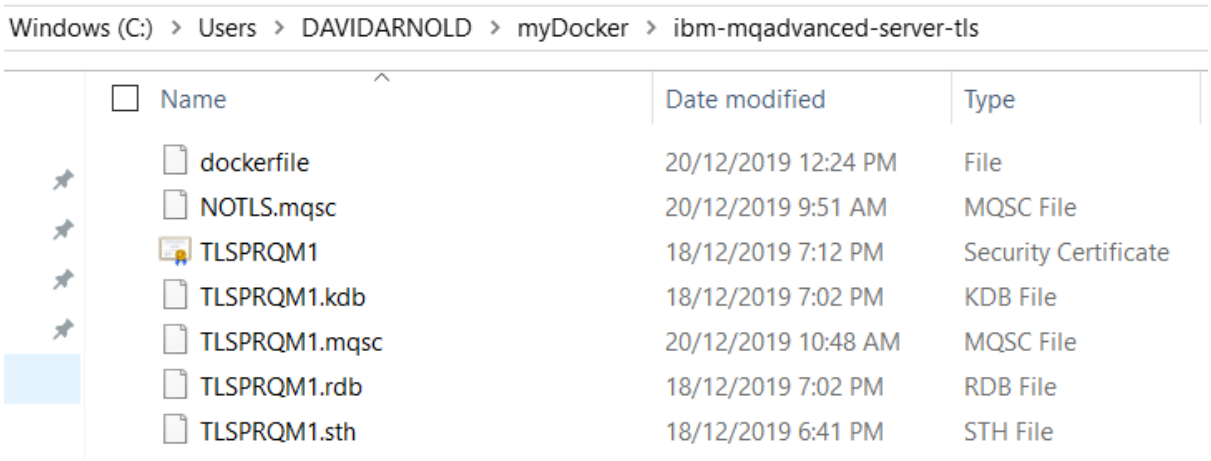
If you do not have an image for the IBM published ibm-mqadvanced-server-integration 9.1.3.0-r4-amd64 see the instructions in the RHOS 3.11 section for loading the image into the local repository

TLS enabled custom image layer – Build Files

md ibm-mqadvanced-server-tls

cd ibm-mqadvanced-server-tls

```
C:\Users\DAVIDARNOLD\myDocker>md ibm-mqadvanced-server-tls

C:\Users\DAVIDARNOLD\myDocker>cd ibm-mqadvanced-server-tls

C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-tls>
```



Docker file – run mqsc scripts and copy .KDB file to image

Notepad++ dockerfile

FROM ibm-mqadvanced-server-integration:9.1.3.0-r4-amd64

USER mqm

COPY TLSPRQM1.mqsc /etc/mqm/

COPY NOTLS.mqsc /etc/mqm/

COPY TLSPRQM1.kdb /run/runmqserver/tls/

COPY TLSPRQM1.crt /etc/mqm/

COPY TLSPRQM1.rdb /etc/mqm/

COPY TLSPRQM1.sth /etc/mqm/

dockerfile | TLSPRQM1.mqsc | NOTLS.mqsc | NOTLSPRQM1CLTCONN.mqsc

```
1  FROM ibm-mqadvanced-server-integration:9.1.3.0-r4-amd64
2
3  USER mqm
4
5  COPY TLSPRQM1.mqsc /etc/mqm/
6  COPY NOTLS.mqsc /etc/mqm/
7
8  COPY TLSPRQM1.kdb /etc/mqm/
9  COPY TLSPRQM1.crt /etc/mqm/
10 COPY TLSPRQM1.rdb /etc/mqm/
11 COPY TLSPRQM1.sth /etc/mqm/
```

TLSPRQM1.mqsc – enable TLS clients to connect

notes

MUSR_MQADMIN is windows version of mqm user in linux so should be changed for linux container deployment

The supplied base container sets this ***('/run/runmqserver/tls/key')*** *to target key.kdb*

We will ALTER QMGR SSLKEYR to targetTLSPRQM1.kdb

if you copy in the TLSPRQM1.kbd (and other key files) to the /run/runmqserver/tls directory this happens at start up so put it elsewhere /etc/mqm for example

2019-12-19T23:42:50.123Z Failed to create PKCS#12 TrustStore: error running "/opt/mqm/bin/runmqakm -keydb -create": /opt/mqm/bin/runmqakm: exit status 1 CTGSK3026W The key file "/run/runmqserver/tls/trust.p12" does not exist or cannot be read.

The supplied image does ALTER QMGR CERTLABL('')

We need to set CERTLABL('ibmmqtlsprqm1')

The MSQC file:

DEFINE CHANNEL(TLSPRQM1.SVRCONN) CHLTYPE(SVRCONN) SSLCIPH(ANY_TLS12) REPLACE

SET CHLAUTH(TLSPRQM1.SVRCONN) TYPE(BLOCKUSER) USERLIST(nobody)

ALTER AUTHINFO(SYSTEM.DEFAULT.AUTHINFO.IDPWOS) AUTHTYPE(IDPWOS) CHCKCLNT(NONE) ADOPTCTX(YES)

SET CHLAUTH(TLSPRQM1.SVRCONN) TYPE (ADDRESSMAP) ADDRESS(*) MCAUSER('mqm')

ALTER QMGR SSLKEYR('/etc/mqm/TLSPRQM1') CERTLABL('ibmmqtlsprqm1')

REFRESH SECURITY TYPE(CONNAUTH)

REFRESH SECURITY

Notepad++ TLSPRQM1.mqsc

dockerfile | TLSPRQM1.mqsc | NOTLS.mqsc | NOTLSPRQM1CLTCONN.mqsc | TLSPRQM1CLTCONN.mqsc

```
1  DEFINE CHANNEL(TLSPRQM1.SVRCONN) CHLTYPE(SVRCONN) SSLCIPH(ANY_TLS12) REPLACE
2  SET CHLAUTH(TLSPRQM1.SVRCONN) TYPE(BLOCKUSER) USERLIST(nobody)
3  ALTER AUTHINFO(SYSTEM.DEFAULT.AUTHINFO.IDPWOS) AUTHTYPE(IDPWOS) CHCKCLNT(NONE) ADOPTCTX(YES)
4  SET CHLAUTH(TLSPRQM1.SVRCONN) TYPE (ADDRESSMAP) ADDRESS(*) MCAUSER('mqm')
5  ALTER QMGR SSLKEYR('/etc/mqm/TLSPRQM1') CERTLABL('ibmmqtlsprqm1')
6  REFRESH SECURITY TYPE(CONNAUTH)
7  REFRESH SECURITY
```

NOTLS.mqsc – add channel for in cluster clients to connect

DEFINE CHANNEL(IVT.SVRCONN) CHLTYPE(SVRCONN)

SET CHLAUTH(IVT.SVRCONN) TYPE(BLOCKUSER) USERLIST(nobody)

ALTER AUTHINFO(SYSTEM.DEFAULT.AUTHINFO.IDPWOS) AUTHTYPE(IDPWOS) CHCKCLNT(NONE) ADOPTCTX(YES)

SET CHLAUTH(IVT.SVRCONN) TYPE (ADDRESSMAP) ADDRESS(*) MCAUSER('mqm')

REFRESH SECURITY TYPE(CONNAUTH)

Key database files and password stash files

The .KDB etc with server side and client side certs from the matched set of files created earlier

Docker build – Create image FROM ibm-mqadvanced-server

```
C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-tls>dir
 Volume in drive C is Windows
 Volume Serial Number is 3CBA-3B12

 Directory of C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-tls

20/12/2019  12:22 PM    <DIR>          .
20/12/2019  12:22 PM    <DIR>          ..
20/12/2019  10:47 AM               157 dockerfile
20/12/2019  09:51 AM               304 NOTLS.mqsc
18/12/2019  07:12 PM               842 TLSPRQM1.crt
18/12/2019  07:02 PM            10,088 TLSPRQM1.kdb
20/12/2019  10:48 AM               387 TLSPRQM1.mqsc
18/12/2019  07:02 PM                80 TLSPRQM1.rdb
18/12/2019  06:41 PM               193 TLSPRQM1.sth
```

C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-tls> docker build -t davexacom/ibm-mqadvanced-server-tls:9.1.3.0-r4-amd64 .

```
C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-tls>docker build -t davexacom/ibm-mqadvanced-server-tls:9.1.3.0-r4-amd64 .
Sending build context to Docker daemon  18.43kB
Step 1/8 : FROM ibm-mqadvanced-server-integration:9.1.3.0-r4-amd64
 ---> ee41039b9552
Step 2/8 : USER mqm
 ---> Using cache
 ---> 89c0bb4a3f90
Step 3/8 : COPY TLSPRQM1.mqsc /etc/mqm/
 ---> f4175b5e2b23
Step 4/8 : COPY NOTLS.mqsc /etc/mqm/
 ---> ada3d193149d
Step 5/8 : COPY TLSPRQM1.kdb /etc/mqm/
 ---> cfbf7115749c
Step 6/8 : COPY TLSPRQM1.crt /etc/mqm/
 ---> 8da14eae49e3
Step 7/8 : COPY TLSPRQM1.rdb /etc/mqm/
 ---> 75e9c882e224
Step 8/8 : COPY TLSPRQM1.sth /etc/mqm/
 ---> 0d0d475be96d
Successfully built 0d0d475be96d
Successfully tagged davexacom/ibm-mqadvanced-server-tls:9.1.3.0-r4-amd64
SECURITY WARNING: You are building a Docker image from Windows against a non-Windows Docker host. All files and directories added to
 build context will have '-rwxr-xr-x' permissions. It is recommended to double check and reset permissions for sensitive files and d
irectories.
```

Perform Local testing on docker workstation

C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-tls>docker images

```
C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-tls>docker images
REPOSITORY                              TAG                 IMAGE ID            CREATED             SIZE
davexacom/ibm-mqadvanced-server-tls     9.1.3.0-r4-amd64    f34a2f062408        2 minutes ago       932MB
```

Start the container – docker run

C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-tls>docker run -e LICENSE=accept -e MQ_QMGR_NAME=TLSPRQM1 -P davexacom/ibm-mqadvanced-server-tls:9.1.3.0-r4-amd64

```
C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-tls>docker run -e LICENSE=accept -e MQ_QMGR_NAME=TLSPRQM1 -P davexacom/ibm-mq
advanced-server-tls:9.1.3.0-r4-amd64
2019-12-19T06:30:19.945Z CPU architecture: amd64
2019-12-19T06:30:19.945Z Linux kernel version: 4.9.184-linuxkit
2019-12-19T06:30:19.945Z Container runtime: docker
2019-12-19T06:30:19.945Z Base image: Red Hat Enterprise Linux Server 7.7 (Maipo)
2019-12-19T06:30:19.947Z Running as user ID 888 () with primary group 888, and supplementary groups 0
2019-12-19T06:30:19.947Z Capabilities (bounding set): chown,dac_override,fowner,fsetid,kill,setgid,setuid,setpcap,net_bind_servic
e,net_raw,sys_chroot,mknod,audit_write,setfcap
2019-12-19T06:30:19.947Z seccomp enforcing mode: filtering
2019-12-19T06:30:19.947Z Process security attributes: none
2019-12-19T06:30:19.948Z No volume detected. Persistent messages may be lost
2019-12-19T06:30:19.971Z Open Tracing is disabled
2019-12-19T06:30:19.979Z Using queue manager name: TLSPRQM1
2019-12-19T06:30:19.984Z Created directory structure under /var/mqm
2019-12-19T06:30:19.984Z Image created: 2019-11-06T12:02:58+0000
2019-12-19T06:30:19.984Z Image tag: ibm-mqadvanced-server-integration:9.1.3.0-r4-amd64
2019-12-19T06:30:19.994Z MQ version: 9.1.3.0
2019-12-19T06:30:19.995Z MQ level: p913-L190628_IT30047_P
2019-12-19T06:30:19.995Z MQ license: Production
2019-12-19T06:30:20.398Z Creating queue manager TLSPRQM1
```

Break

note that the default container image sets an SSLKEYR ssl key repository of /run/runmqserver/tls/key which means it expects a key.kdb file in that location to house the key database.

```
     : * Set the keystore location for the queue manager
   1 : ALTER QMGR SSLKEYR('/run/runmqserver/tls/key')
AMQ8005I: IBM MQ queue manager changed.
   2 : ALTER QMGR CERTLABL('')
AMQ8005I: IBM MQ queue manager changed.
   3 : REFRESH SECURITY(*) TYPE(SSL)
AMQ8560I: IBM MQ security cache refreshed.
3 MQSC commands read.
```

Here are our TLS channel definitions being run

```
Starting MQSC for queue manager TLSPRQM1.


     1 : DEFINE CHANNEL(TLSPRQM1.SVRCONN) CHLTYPE(SVRCONN) SSLCIPH(ANY_TLS12) REPLACE
AMQ8014I: IBM MQ channel created.
     2 : SET CHLAUTH(TLSPRQM1.SVRCONN) TYPE(BLOCKUSER) USERLIST(nobody)
AMQ8877I: IBM MQ channel authentication record set.
     3 : ALTER AUTHINFO(SYSTEM.DEFAULT.AUTHINFO.IDPWOS) AUTHTYPE(IDPWOS) CHCKCLNT(NONE) ADOPTCTX(YES)
AMQ8567I: IBM MQ authentication information changed.
     4 : SET CHLAUTH(TLSPRQM1.SVRCONN) TYPE (ADDRESSMAP) ADDRESS(*) MCAUSER('mqm')
AMQ8877I: IBM MQ channel authentication record set.
     5 : ALTER QMGR SSLKEYR('/etc/mqm/TLSPRQM1') CERTLABL('ibmmqtlsprqm1')
AMQ8005I: IBM MQ queue manager changed.
     6 : REFRESH SECURITY TYPE(CONNAUTH)
AMQ8560I: IBM MQ security cache refreshed.
     7 : REFRESH SECURITY
AMQ8560I: IBM MQ security cache refreshed.
7 MQSC commands read.
```

```
2019-12-19T06:30:21.648Z Metrics are disabled
2019-12-19T06:30:21.471Z AMQ5051I: The queue manager task 'LOGGER-IO' has started.
2019-12-19T06:30:21.477Z AMQ7229I: 5 log records accessed on queue manager 'TLSPRQM1' during the log replay phase.
2019-12-19T06:30:21.477Z AMQ7230I: Log replay for queue manager 'TLSPRQM1' complete.
2019-12-19T06:30:21.478Z AMQ5051I: The queue manager task 'CHECKPOINT' has started.
2019-12-19T06:30:21.480Z AMQ7231I: 0 log records accessed on queue manager 'TLSPRQM1' during the recovery phase.
2019-12-19T06:30:21.480Z AMQ7232I: Transaction manager state recovered for queue manager 'TLSPRQM1'.
2019-12-19T06:30:21.488Z AMQ7233I: 0 out of 0 in-flight transactions resolved for queue manager 'TLSPRQM1'.
```

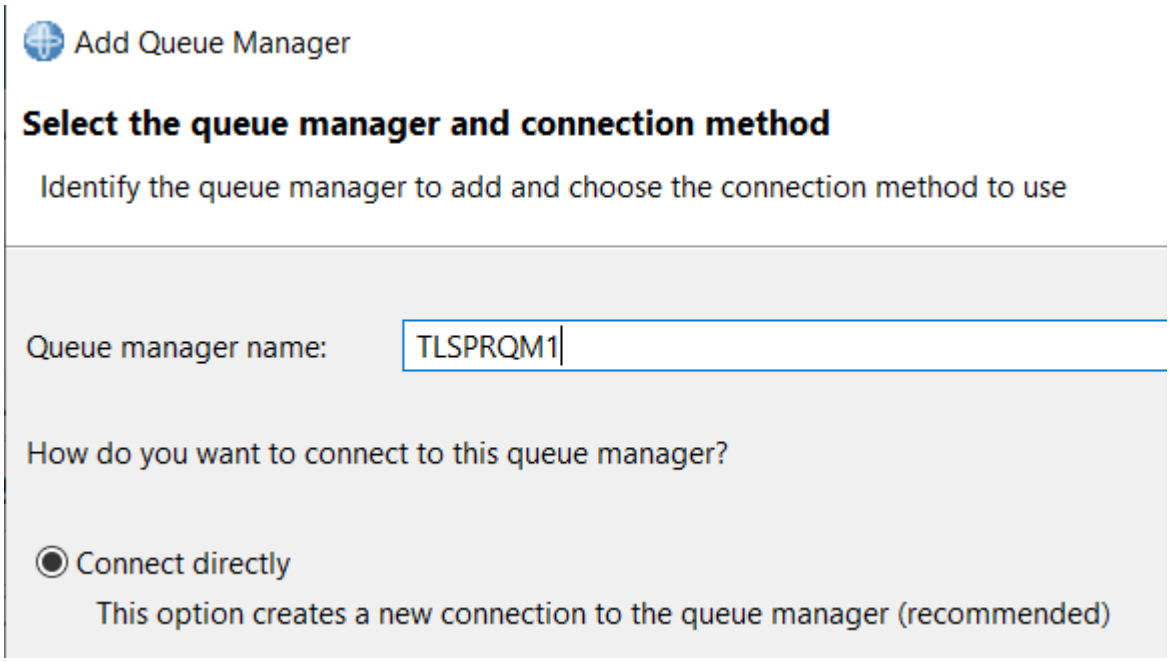
C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-tls>docker ps

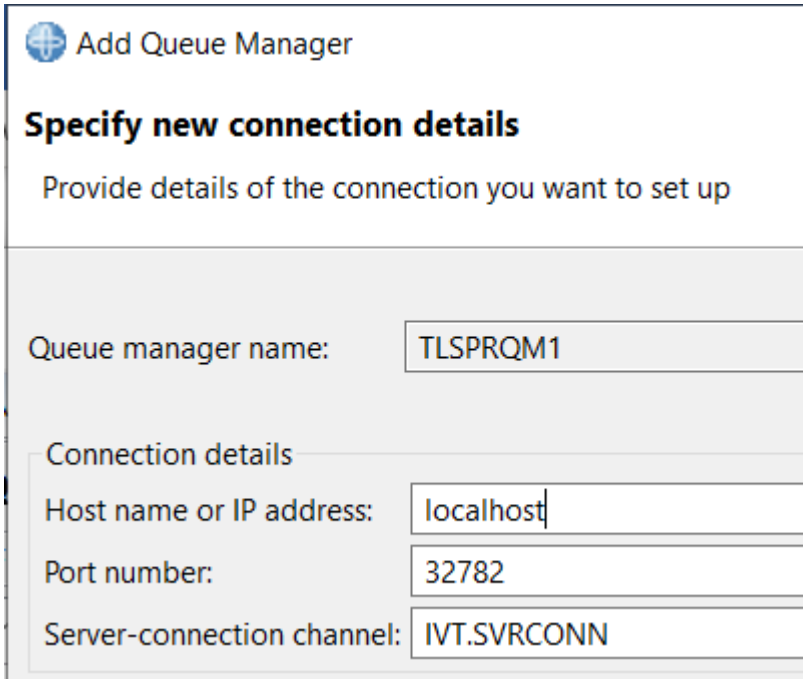
```
C:\temp>docker ps
CONTAINER ID        IMAGE                                          COMMAND                  CREATED
STATUS              PORTS                                                                   NAMES
8a10fb9133ac        davexacom/ibm-mqadvanced-server-tls:9.1.3.0-r4-amd64   "runmqintegrationser…"   41 seconds ago
Up 40 seconds       0.0.0.0:32782->1414/tcp, 0.0.0.0:32781->9157/tcp, 0.0.0.0:32780->9443/tcp   lucid_haibt
```

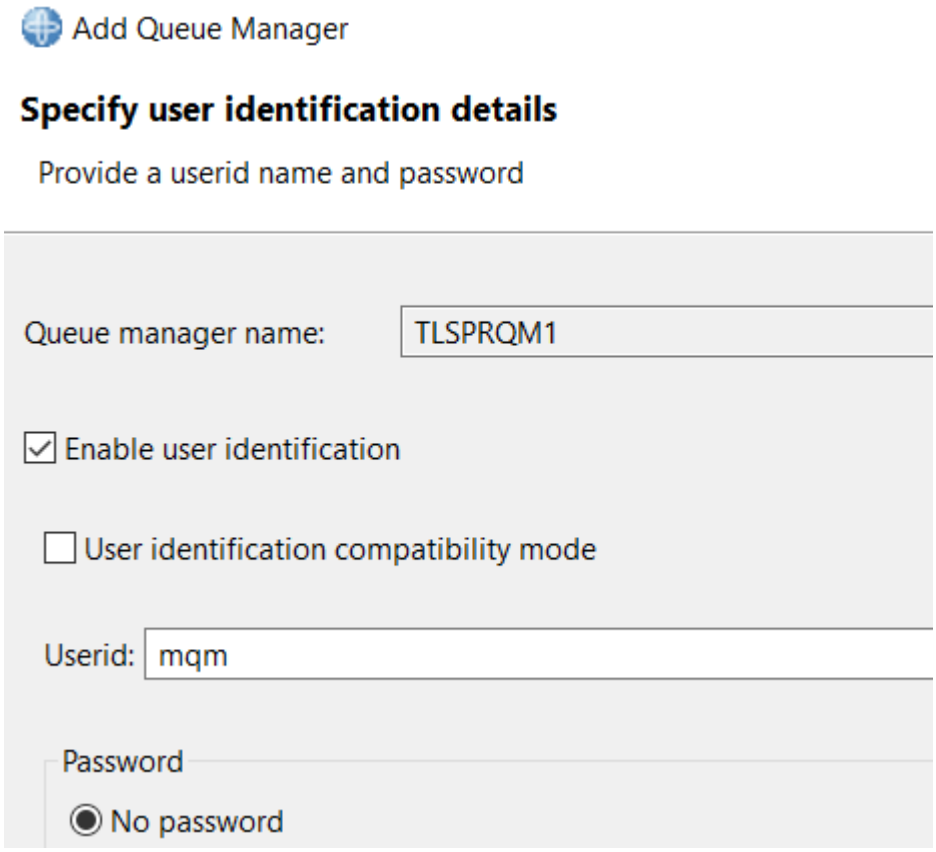
Ports exposed 0.0.0.0:32782->1414/tcp, 0.0.0.0:32781->9157/tcp, 0.0.0.0:32780->9443/tcp

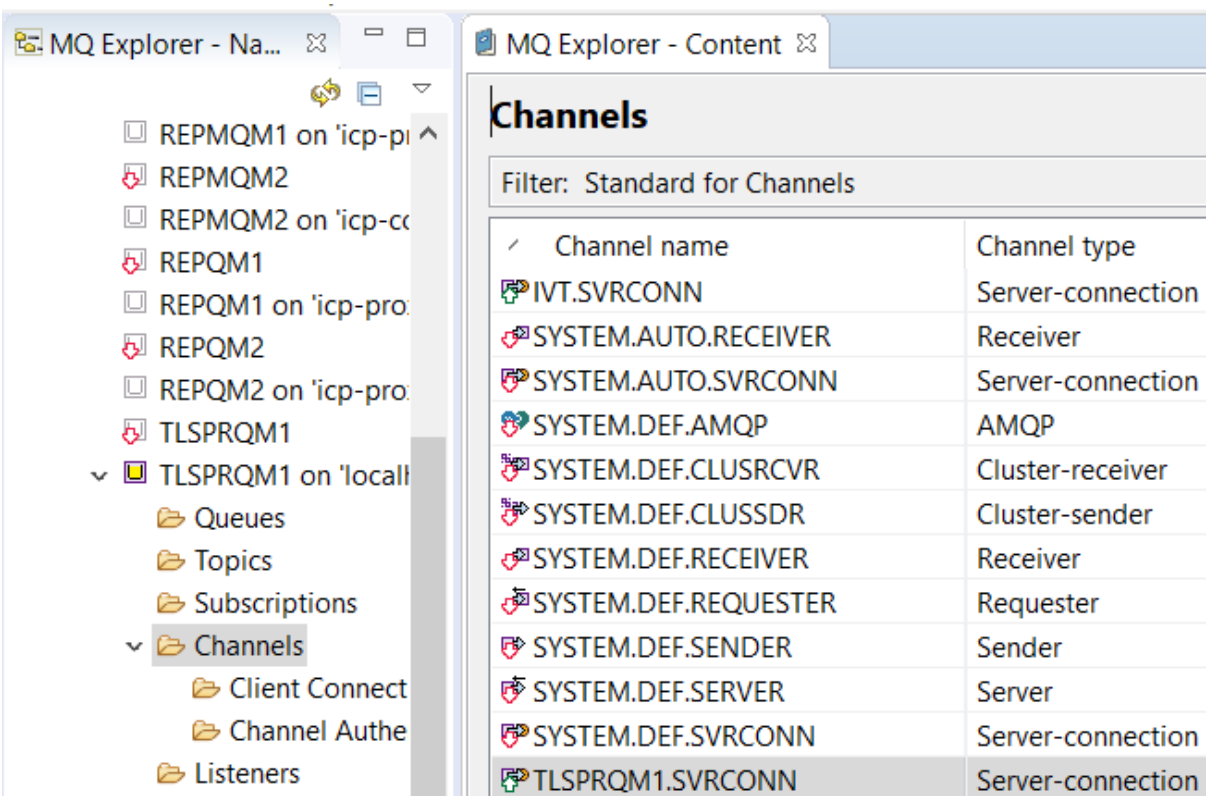
Connect MQ Explorer

Add remote queue manager




Add Queue Manager
Specify new connection details
Provide details of the connection you want to set up
Queue manager name:
TLSPRQM1
Connection details
Host name or IP address:
localhost
Port number:
32782
Server-connection channel:
IVT.SVRCONN


Add Queue Manager
Specify user identification details
Provide a userid name and password
Queue manager name:
TLSPRQM1
Enable user identification
User identification compatibility mode
Userid:
mqm
Password
No password



Connect RUNMQSC via Non TLS client

Set MQSERVER=IVT.SVRCONN/TCP/localhost(32782)

```
C:\temp>Set MQSERVER=IVT.SVRCONN/TCP/localhost(32782)

C:\temp>runmqsc -c TLSPRQM1
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting MQSC for queue manager TLSPRQM1.


dis ql(*)
     1 : dis ql(*)
AMQ8409I: Display Queue details.
   QUEUE(AMQ.5DFC2484257A2902)             TYPE(QLOCAL)
```

Connect RUNMQSC via TLS client

Set up the Client Channel Definition Table

Create an client connection channel MQSC file

Make sure you correctly set the port number

```
DEFINE CHANNEL(TLSPRQM1.SVRCONN) +
        CHLTYPE(CLNTCONN) +
```

TRPTYPE(TCP) +

CONNAME('localhost(32782)') +

CERTLABL('ibmmqarnold') +

QMNAME(TLSPRQM1) +

SSLCIPH(ANY_TLS12) +

REPLACE

NOTLS.mqsc | NOTLSPRQM1CLTCONN.mqsc | TLSPRQM1CLTCONN.mqsc

```
1  DEFINE CHANNEL(TLSPRQM1.SVRCONN) +
2      CHLTYPE(CLNTCONN) +
3      TRPTYPE(TCP) +
4      CONNAME('localhost(32782)') +
5      CERTLABL('ibmmqarnold') +
6      QMNAME(TLSPRQM1) +
7      SSLCIPH(ANY_TLS12) +
8      REPLACE
```

Runmqsc with the -n (no queue manager switch) to create a CCDT from the MQSC script

runmqsc -n < c:\temp\TLSPRQM1CLTCONN.MQSC

```
C:\temp>runmqsc -n < c:\temp\TLSPRQM1CLTCONN.MQSC
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting local MQSC for 'AMQCLCHL.TAB'.
     1 : DEFINE CHANNEL(TLSPRQM1.SVRCONN) +
       :        CHLTYPE(CLNTCONN) +
       :        TRPTYPE(TCP) +
       :        CONNAME('localhost(32782)') +
       :        CERTLABL('ibmmqarnold') +
       :        QMNAME(TLSPRQM1) +
       :     SSLCIPH(ANY_TLS12) +
       :        REPLACE
AMQ8014I: IBM MQ channel created.
       :
       :
No commands have a syntax error.
```

Optionally set the CCDT environment variables

If the default CCDT TAB name and default CCDT TAB directory are not used, we will need to set up the environment variable for path to AMQCLCHL.TAB

Because I have used all defaults the MQClient code will find and use the default AMQCLCHL.TAB

dir c:\programdata\ibm\mq*.TAB

```
C:\temp>dir C:\ProgramData\IBM\MQ\*.TAB
 Volume in drive C is Windows
 Volume Serial Number is 3CBA-3B12

 Directory of C:\ProgramData\IBM\MQ

20/12/2019  11:08 AM             2,106 AMQCLCHL.TAB
               1 File(s)          2,106 bytes
               0 Dir(s)  215,347,277,824 bytes free
```

This is the default but for reference purposes here's how to set the environment variable.

On Linux

export MQCHLLIB=/var/mqm/AMQCLCHL.TAB

echo $MQCHLLIB

On windows

set MQCHLLIB=C:\ProgramData\IBM\MQ\AMQCLCHL.TAB

echo %MQCHLLIB%

set MQCHLTAB= AMQCLCHL.TAB

echo %MQCHLTAB%

Eyeball the .TAB file – check for host and port number

type c:\programdata\ibm\mq\AMQCLCHL.TAB

```
C:\temp>type c:\programdata\ibm\mq\AMQCLCHL.TAB
AMQR                TLSPRQM1.SVRCONN                                                   TLSP
RQM1                                                                  localhost(32782)
                                                              2    p
   <     ╓Ü;
 ╓Ü;  @
                                      localhost(32782)



   Φ   ,         ö  Ç
ANY_TLS12
                                                    2    2
        ╓Ü; ╓Ü;     ê       ibmmqarnold
                                  ┘%ⁿ]
C:\temp>
```

Clear the MQSERVER environment variable so the CCDT is used

SET MQSERVER=

ECHO %MQSERVER%

Set the MQSSLKEYR environment variable for the client side

set MQSSLKEYR=C:\Program Files\IBM\MQ\arnold

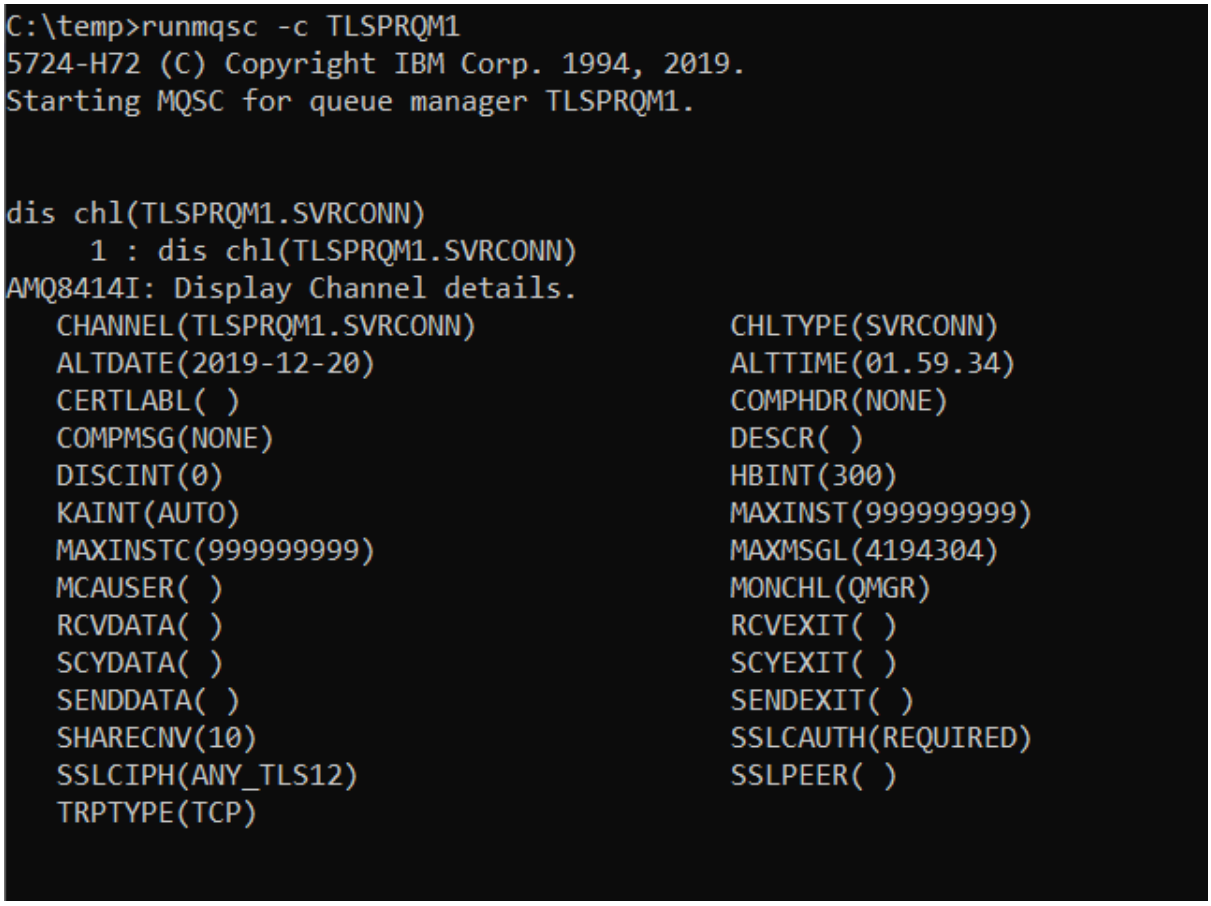
```
C:\temp>set MQSSLKEYR=C:\Program Files\IBM\MQ\arnold

C:\temp>echo %MQSSLKEYR%
C:\Program Files\IBM\MQ\arnold

C:\temp>dir C:\"Program Files"\IBM\MQ\arnold.kdb
 Volume in drive C is Windows
 Volume Serial Number is 3CBA-3B12

 Directory of C:\Program Files\IBM\MQ

18/12/2019  07:28 PM            10,088 arnold.kdb
               1 File(s)         10,088 bytes
               0 Dir(s)  215,355,838,464 bytes free
```

Double check MQSERVER is clear

Echo %MQSERVER%

```
C:\ProgramData\IBM\MQ>set MQSERVER=

C:\ProgramData\IBM\MQ>echo %MQSERVER%
%MQSERVER%

C:\ProgramData\IBM\MQ>
```

runmqsc -c TLSPRQM1



You are now connected to TLSPRQM1 in your container via TLS

Testing TLS custom MQ Image Layer on RHOS 3.11

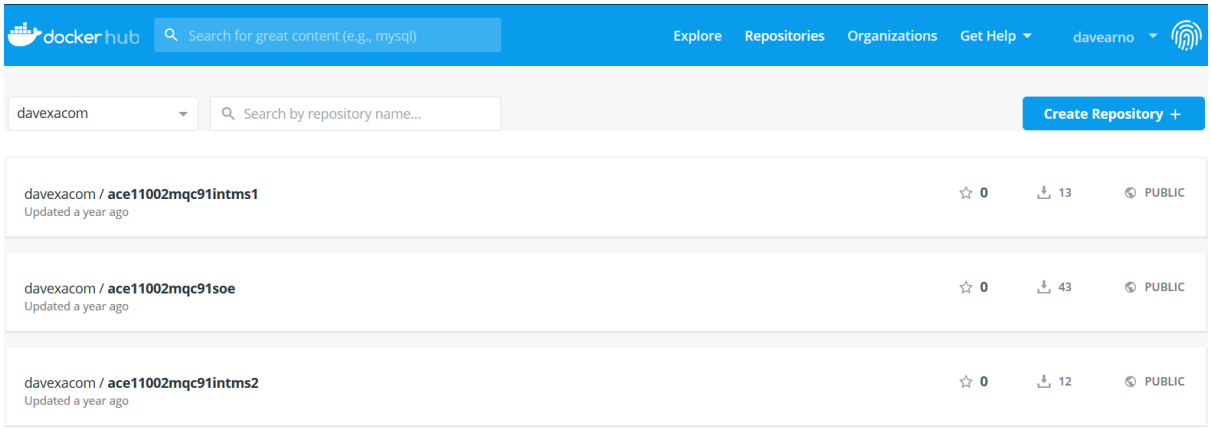
Pushing the custom image to docker hub

C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-tls>docker images

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
davexacom/ibm-mqadvanced-server-tls	9.1.3.0-r4-amd64	2237fea38967	17 minutes ago	932MB

```
C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>docker images
REPOSITORY                          TAG                 IMAGE ID            CREATED             SIZE
davexacom/ibm-mqadvanced-server-ivt   9.1.3.0-r4-amd64    e269ad126613        5 minutes ago       932MB
```

https://hub.docker.com/repositories



docker push davexacom/ibm-mqadvanced-server-tls:9.1.3.0-r4-amd64

C:\Users\DAVIDARNOLD\myDocker\ibm-mqadvanced-server-ivt>docker push davexacom/ibm-mqadvanced-server-tls:9.1.3.0-r4-amd64

The push refers to repository [docker.io/davexacom/ibm-mqadvanced-server-tls]

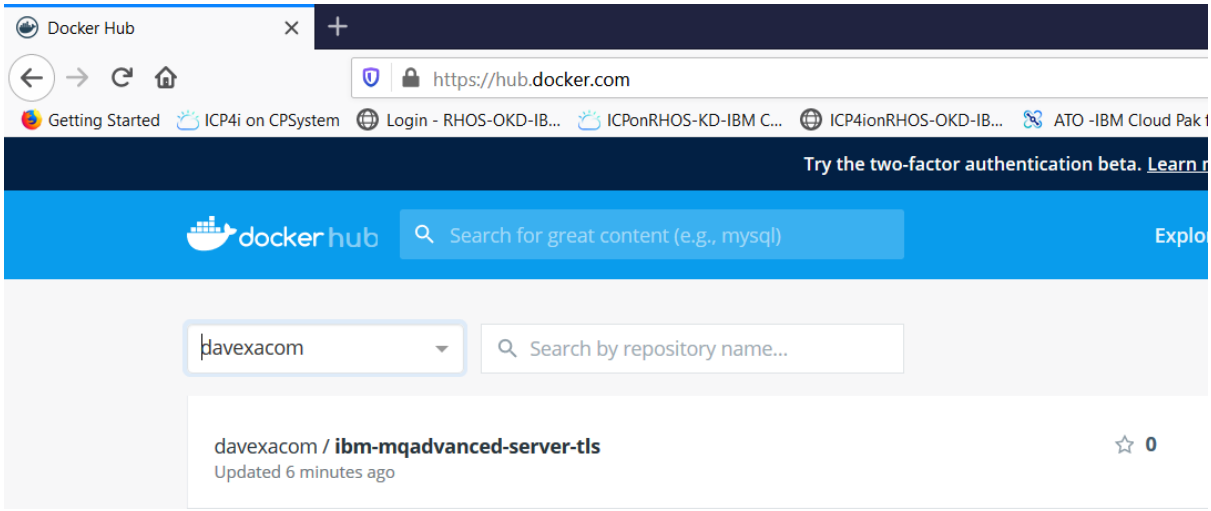
0d8459f27ecc: Pushing [==>] 3.072kB
ac7598f58291: Pushing [==================>] 1.378MB/3.735MB
6eb6a773bf24: Pushing [==================>] 1.378MB/3.735MB
07cdf8094239: Pushing [========>] 561.2kB/3.49MB
9f4789d1e0ed: Pushing [==>] 3.072kB
364112d1df0e: Waiting

cd28e8b3d42a: Pushed

2705f79af6db: Layer already exists

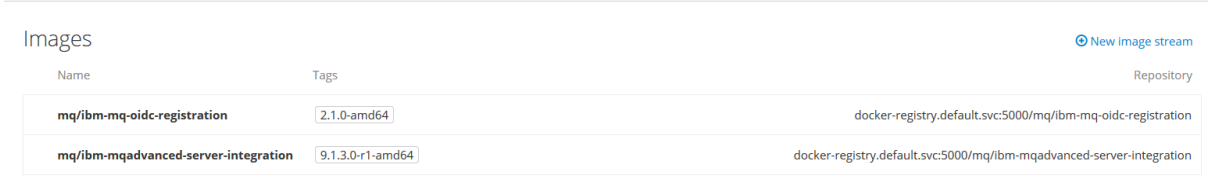
ce459cc53899: Layer already exists 9.1.3.0-r4-amd64: digest: sha256:040e8e0aca3307369b10cce8411f97e147a9a92bb7514619a16c2a78093c085f size: 5963

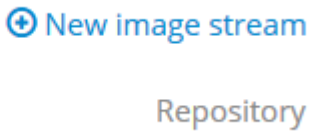
https://hub.docker.com/repository/docker/davexacom/ibm-mqadvanced-server-tls



Create a new Image Stream on RHOS 3.11

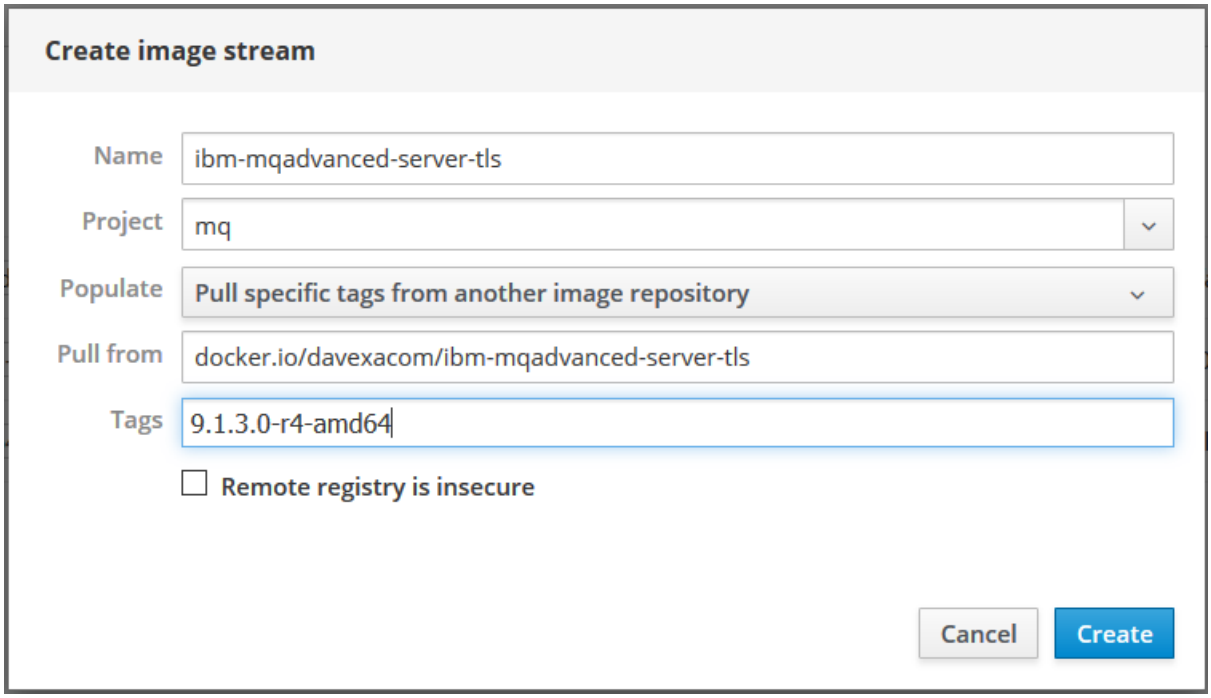
https://registry-console-default.apps.ocp.cloudnativekube.com/registry#/images/mq





Docker.io/davexacom/ibm-mqadvanced-server-tls

Create new image stream



Pulling repository to use in helm charts on 3.11

`docker-registry.default.svc:5000/mq/ibm-mqadvanced-server-tls`

Add new ICP4i instance of MQ custom TLS layer on RHOS 3.11

https://icp-proxy.apps.ocp.cloudnativekube.com/integration

MQ

mq

idcab1

mqtest

Add new instance

Add a queue manager based messaging capability

You'll be deploying IBM MQ to provide this capability. Please work with your IBM Cloud Private cluster administrator to ensure the following dependencies are satisfied:

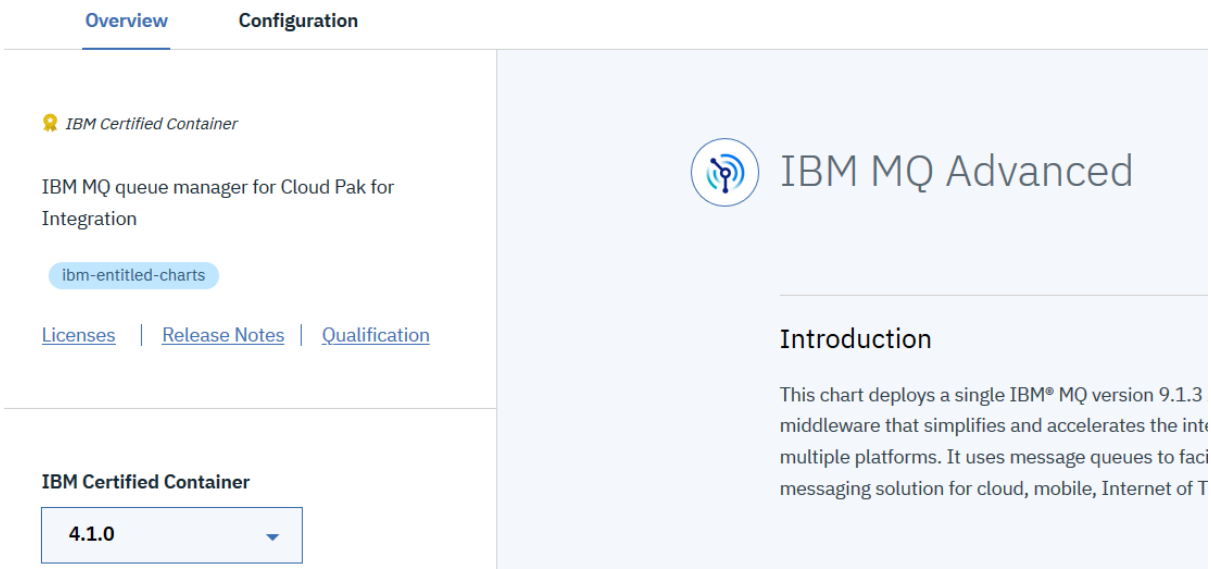
- a unique namespace must exist for the sole use of IBM MQ. Multiple instances can be deployed in the same namespace. This namespace must allow deployments that require a security context constraint of type : **ibm-anyuid-scc**.
- a storage class or persistent volume needs to be provided for persistent storage

Close

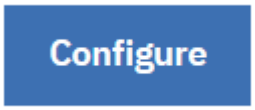
Continue

Configure Helm chart

ibm-mqadvanced-server-integration-prod V 4.1.0



Hit configure



Values for the charts

Cluster Hostname (for deployment)

icp-proxy.apps.ocp.cloudnativekube.com

MQ server image:

docker-registry.default.svc:5000/mq/ibm-mqadvanced-server-tls

MQ Server image Tag:

9.1.3.0-r4

MQ Server OIDC registration image

docker-registry.default.svc:5000/mq/ibm-mq-oidc-registration

MQ Server OIDC registration image tag:

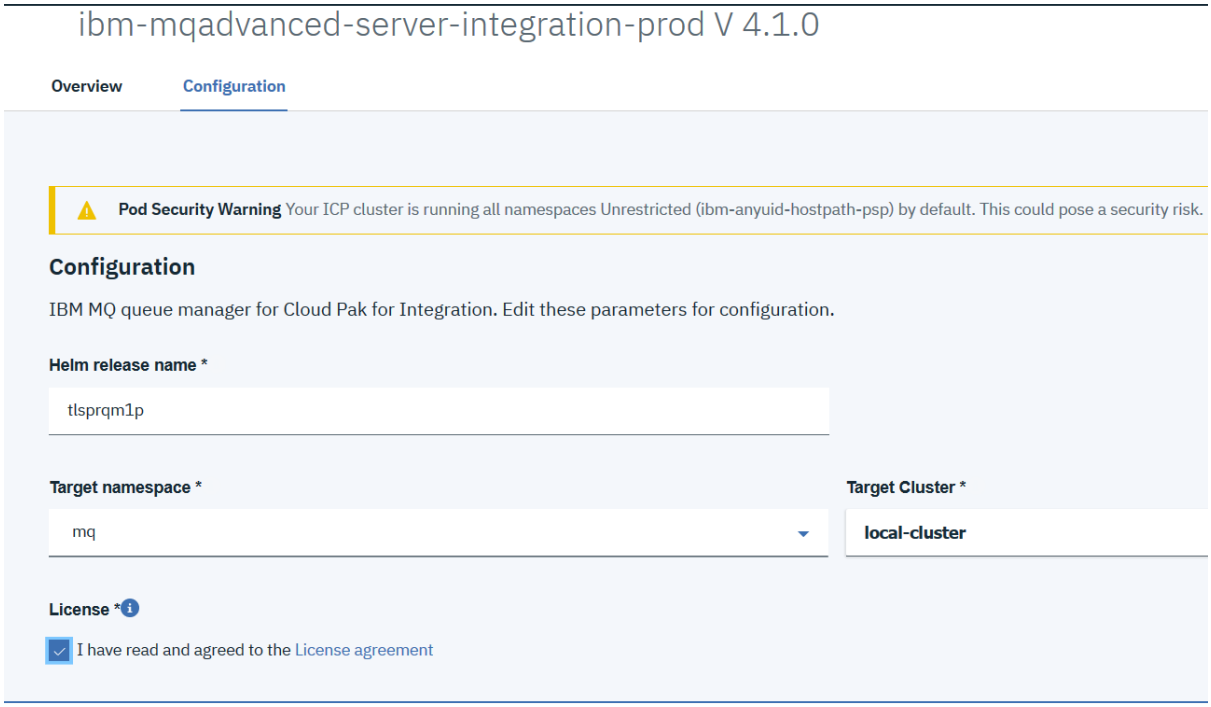
2.1.0

Managed NFS name (from oc command):

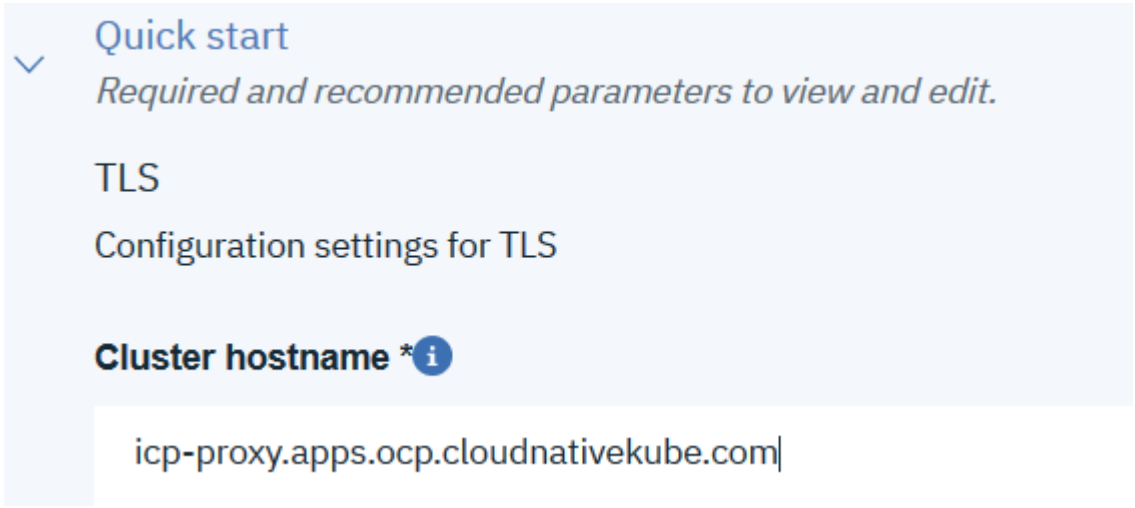
managed-nfs-storage

TLS Secret

ibm-mq-tls-secret



icp-proxy.apps.ocp.cloudnativekube.com



MQ server image:

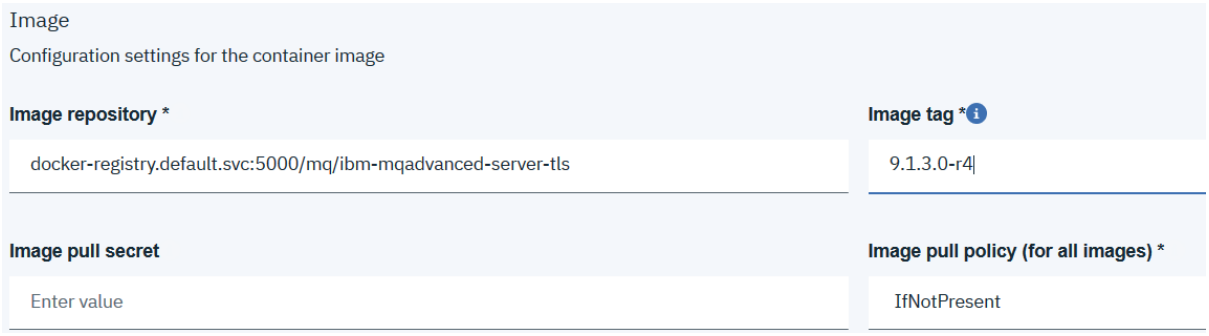
docker-registry.default.svc:5000/mq/ibm-mqadvanced-server-tls

MQ Server image Tag:

9.1.3.0-r4

Results in the following image and tag being used

docker-registry.default.svc:5000/mq/ibm-mqadvanced-server-tls:9.1.3.0-r4-amd64

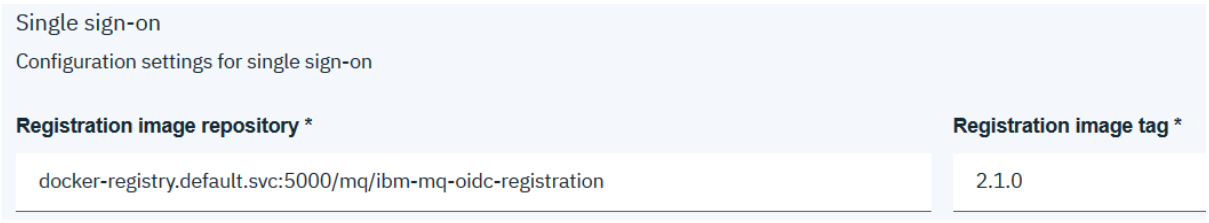


MQ Server OIDC registration image

docker-registry.default.svc:5000/mq/ibm-mq-oidc-registration

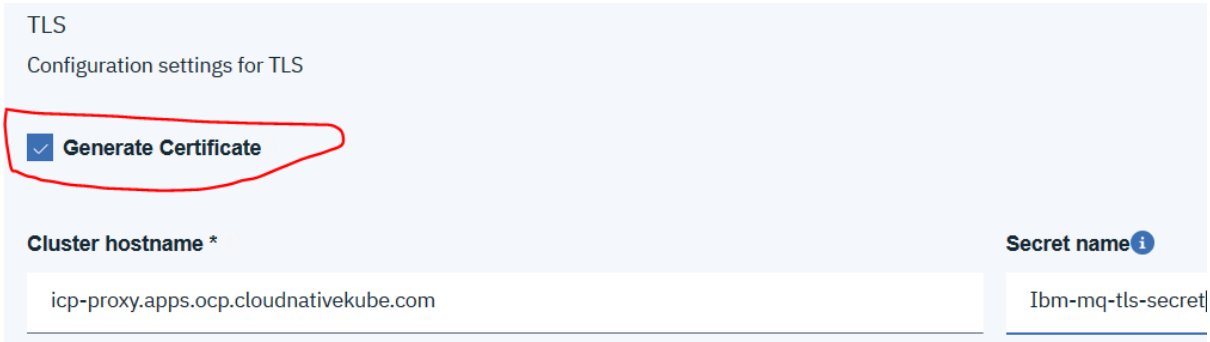
MQ Server OIDC registration image tag:

2.1.0



TLS Secret

Ibm-mq-tls-secret



Managed NFS name (from oc command):

managed-nfs-storage

Persistence

Configuration settings for Persistent Volumes

☑ **Enable persistence ***

☑ **Use dynamic provisioning ***

Data PVC

Configuration settings for the main Persistent Volume Claim

Name *

data

Storage Class name

managed-nfs-storage

Size *

2Gi

Queue manager

Configuration settings for the Queue Manager

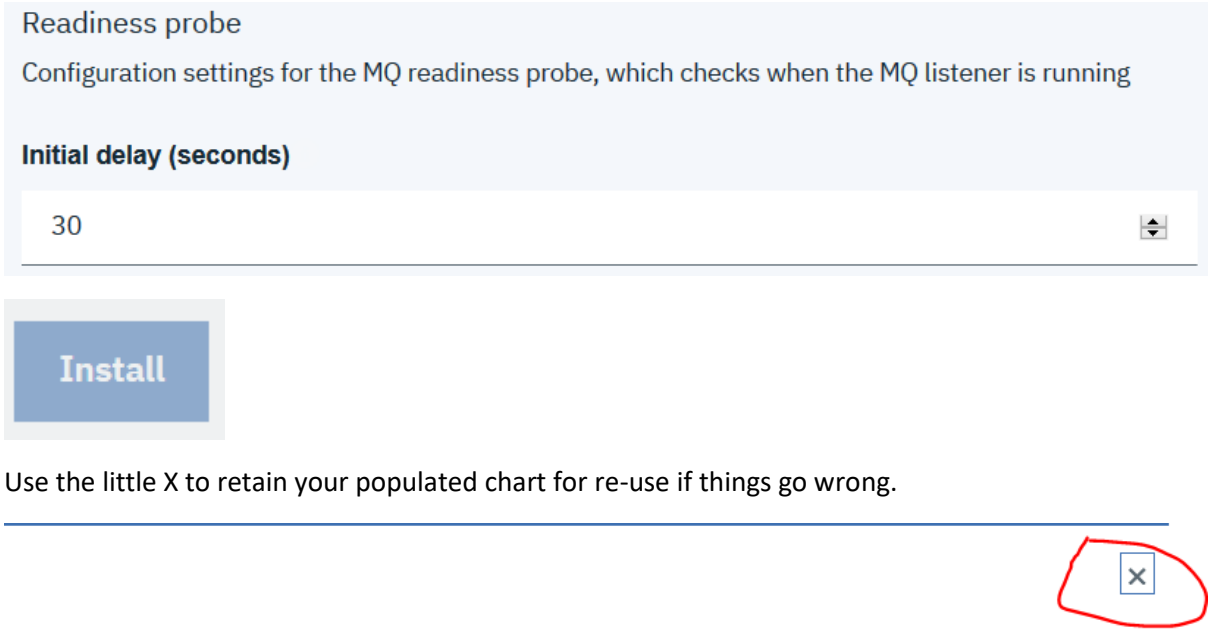
Queue manager name

TLSPRQM1

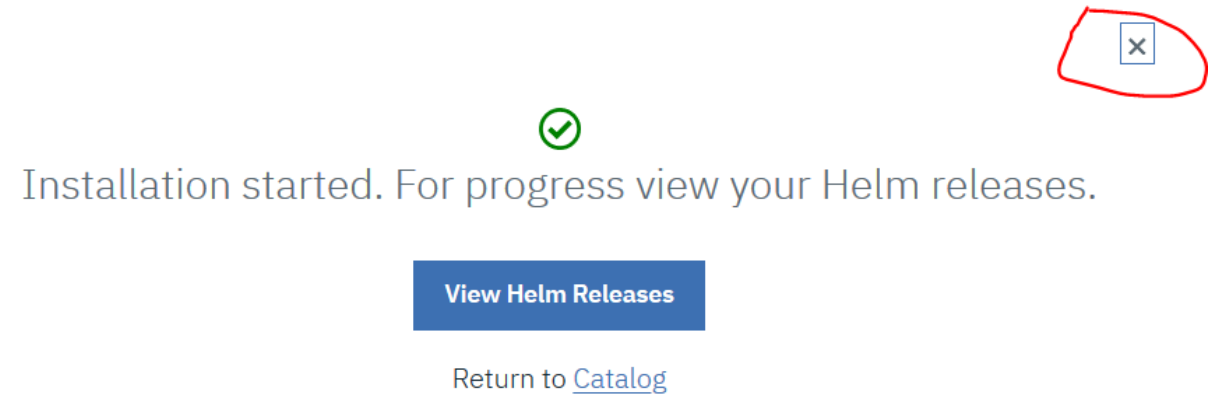
Metrics

Configuration settings for Prometheus metrics

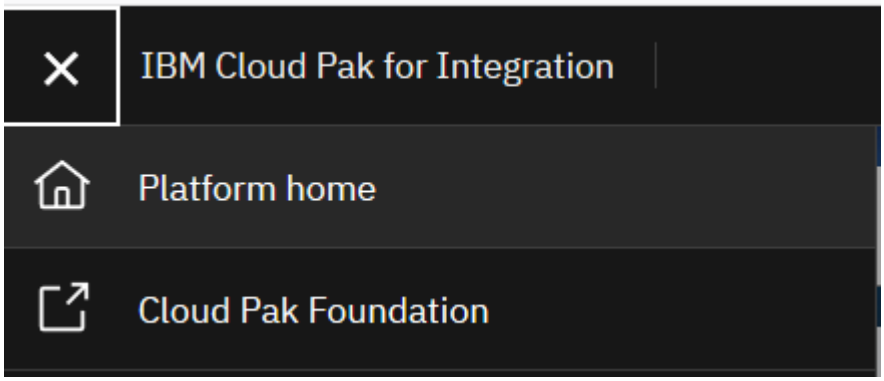
☐ **Enable metrics ***

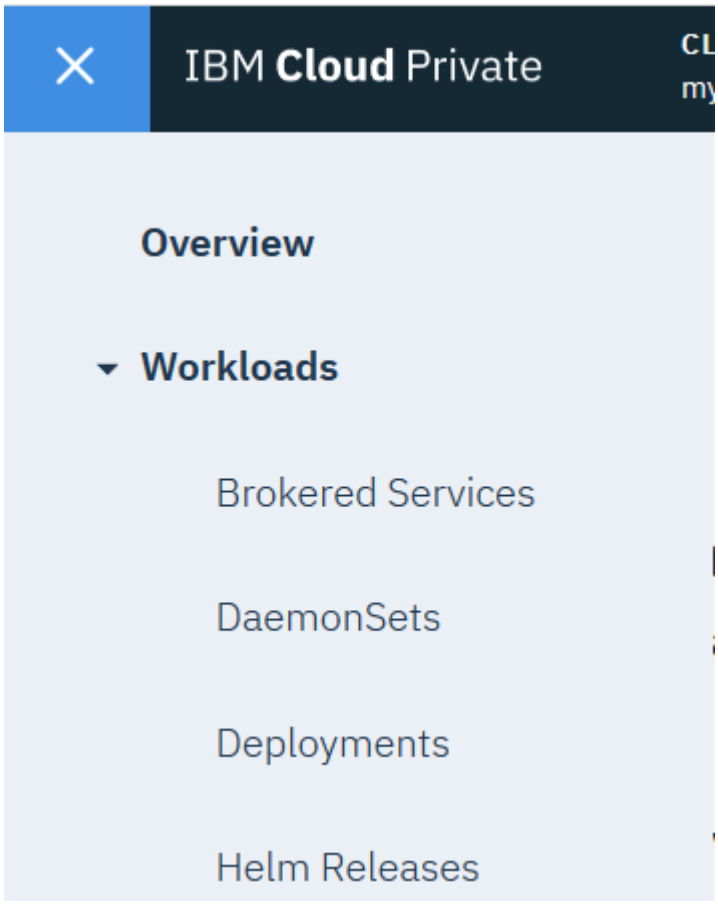


Use the little X to retain your populated chart for re-use if things go wrong.



Verifying the Helm release via ICP foundation





Helm Releases

You are currently viewing only the helm releases of this cluster.

tls

Name	Namespace	Status	Chart name	Current version
tlsprqm1p	mq	Deployed	ibm-mqadvanced-server-integration-prod	4.1.0

tlsprqm1p ● Deployed

UPDATED: December 20, 2019 at 1:40 PM

Details and Upgrades

CHART NAME

ibm-mqadvanced-server-integration-prod

NAMESPACE

mq

CURRENT VERSION

4.1.0

Installed: December 20, 2019

→ Release Notes

AVAILABLE VERSION

5.0.0 ▲

Released: November 29, 2019

→ Release Notes

Job

Name	COMPLETIONS
tlsprqm1p-ibm-mq-registration	1/1

Service

Name	TYPE	Cluster IP	External IP	Port(s)
tlsprqm1p-ibm-mq	NodePort	172.30.190.198	<none>	9443:30218/TCP,1414:30182/TCP

StatefulSets / tlsprqm1p-ibm-mq

tlsprqm1p-ibm-mq

Overview Events

Search Events

Type	Source	Count	Reason	Message
Normal	statefulset-controller	1	SuccessfulCreate	create Claim data-tlsprqm1p-ibm-mq-0 Pod tlsprqm1p-ibm-mq-0 in StatefulSet tlsprqm1p-ibm-mq success
Normal	statefulset-controller	1	SuccessfulCreate	create Pod tlsprqm1p-ibm-mq-0 in StatefulSet tlsprqm1p-ibm-mq successful

StatefulSets / tlsprqm1p-ibm-mq / tlsprqm1p-ibm-mq-0

tlsprqm1p-ibm-mq-0

Overview Containers Events

Name	Image	Port	State
qmgr	docker-registry.default.svc:5000/mq/ibm-mqadvanced-server-tls:9.1.3.0-r4-amd64	1414/TCP,9443/TCP,9157/TCP	Running

Configure client side CCDT for TLSPRQM1 on RHOS 3.11

Goto the Helm release's service definition

Service

Name	TYPE	Cluster IP	External IP	Port(s)
tlsprqm1p-ibm-mq	NodePort	172.30.237.192	<none>	9443:32527/TCP,1414:32602/TCP

Click on qmgr 32602/TCP

Node port console-https 32527/TCP
qmgr 32602/TCP

Copy the URL from the web browser link

icp-console.apps.ocp.cloudnativekube.com:32602

Update the MQSC file that builds the CCDT

dockerfile | TLSPRQM1.mqsc | NOTLS.mqsc | NOTLSPRQM1CLTCONN.mqsc | TLSPRQM1CLTCONN.mqsc

```
1  DEFINE CHANNEL(TLSPRQM1.SVRCONN) +
2      CHLTYPE(CLNTCONN) +
3      TRPTYPE(TCP) +
4      CONNAME('icp-console.apps.ocp.cloudnativekube.com(32602)') +
5      CERTLABL('ibmmqarnold') +
6      QMNAME(TLSPRQM1) +
7      SSLCIPH(ANY_TLS12) +
8      REPLACE
```

runmqsc -n < c:\temp\TLSPRQM1CLTCONN.MQSC

```
C:\temp>runmqsc -n < c:\temp\TLSPRQM1CLTCONN.MQSC
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting local MQSC for 'AMQCLCHL.TAB'.
     1 : DEFINE CHANNEL(TLSPRQM1.SVRCONN) +
       :        CHLTYPE(CLNTCONN) +
       :        TRPTYPE(TCP) +
       :        CONNAME('icp-console.apps.ocp.cloudnativekube.com(32602)') +
       :        CERTLABL('ibmmqarnold') +
       :        QMNAME(TLSPRQM1) +
       :     SSLCIPH(ANY_TLS12) +
       :        REPLACE
AMQ8014I: IBM MQ channel created.
       :
       :
No commands have a syntax error.
```

Check the MQSERVER, MQSSLKEYR and MQCHLLIB MQCHLTAB environment variables are correct

MQSERVER,MQCHLLIB and MQCHLTAB can all be unset if defaults are being used.

MQSSLKEYR should have been set from the local docker testing

C:\temp\SET

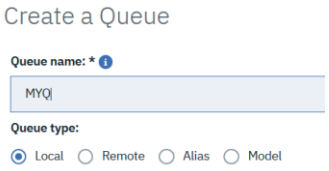
```
LOGONSERVER=\\DESKTOP-2MFRK17
MQSSLKEYR=C:\Program Files\IBM\MQ\arnold
MQ_FILE_PATH=C:\Program Files\IBM\MQ
```

Starting the MQ Web Console – from the service link

https://icp-console.apps.ocp.cloudnativekube.com:32527/

Add widgets->Queues

Create a new queue called MYQ



C:\temp\runmqsc -c TLSPRQM1

```
C:\temp>runmqsc -c TLSPRQM1
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting MQSC for queue manager TLSPRQM1.


dis chl(TLSPRQM1.SVRCONN)
     1 : dis chl(TLSPRQM1.SVRCONN)
AMQ8414I: Display Channel details.
   CHANNEL(TLSPRQM1.SVRCONN)               CHLTYPE(SVRCONN)
   ALTDATE(2019-12-20)                     ALTTIME(02.50.41)
   CERTLABL( )                             COMPHDR(NONE)
   COMPMSG(NONE)                           DESCR( )
   DISCINT(0)                              HBINT(300)
   KAINT(AUTO)                             MAXINST(999999999)
   MAXINSTC(999999999)                     MAXMSGL(4194304)
   MCAUSER( )                              MONCHL(QMGR)
   RCVDATA( )                              RCVEXIT( )
   SCYDATA( )                              SCYEXIT( )
   SENDDATA( )                             SENDEXIT( )
   SHARECNV(10)                            SSLCAUTH(REQUIRED)
   SSLCIPH(ANY_TLS12)                      SSLPEER( )
   TRPTYPE(TCP)
dis ql(MYQ)
     2 : dis ql(MYQ)
AMQ8409I: Display Queue details.
   QUEUE(MYQ)                              TYPE(QLOCAL)
```

Success ! you are no TLS connected to a QMgr on RHOS 3.11

Using pre-configured collateral to connect

Custom Layer MQ Image for TLS

https://hub.docker.com/repository/docker/davexacom/ibm-mqadvanced-server-tls

Deploy an ICP4i MQ instance

Follow instructions from earlier in this section = "Configure Helm Chart"

CCDT

AMQCLCHL.TAB from here and stick it in c:\programdata\ibm\mq (default location (windows example))

https://ibm.ent.box.com/folder/97121576520

client side TLS files

in C:\Program Files\IBM\MQ (default location (windows example))

https://ibm.ent.box.com/folder/96953449724

Set/Clear Environment Variables

Check the MQSERVER, MQSSLKEYR and MQCHLLIB MQCHLTAB environment variables are correct

MQSERVER,MQCHLLIB and MQCHLTAB can all be unset if defaults are being used.

MQSSLKEYR should have been set from the local docker testing

C:\temp\SET MQSSLKEYR=c:\Program Files\IBM\MQ\arnold

Connecting runmqsc in client mode

runmqsc -c TLSPRQM1

Testing TLS custom MQ Image Layer on RHOS 4.2

Pushing the custom image to docker hub

Appendix of useful-ish info and links

+++ Step 10: Client: Run sample client to test connection

WINDOWS: Run the C sample client "SSLSample.exe" (provided with the SupportPac MO04) on the Windows box

Download the following SupportPac. Notice that we are going to use the testing samples only, which work for 7.1 and 7.5. The GUI that is provided for the SSL Wizard function has not been updated to use the GSKit commands used by MQ 7.1 and 7.5.

http://www-1.ibm.com/support/docview.wss?uid=swg24010367 MO04: WebSphere MQ SSL Wizard

Change the directory to the location were the SupportPac was downloaded: cd "C:\MQ-SupportPac\MO04 SSL Wizard" cd client_samples\bin

SSLSample.exe veracruz.x.com(1430) SSL.SVRCONN QM_71SSL NULL_SHA "C:\Users\IBM_ADMIN\AppData\Local\VirtualStore\Program Files (x86)\IBM\WebSphere MQ_2\rivera" Connecting to: Conname = veracruz.x.com(1430). SvrconnChannelName = SSL.SVRCONN. QMgrName = QM_71SSL. SSLCiph = NULL_SHA. SSLKeyr = C:\Users\IBM_ADMIN\AppData\Local\VirtualStore\Program Files (x86)\IB M\WebSphere MQ_2\rivera. MQCONNX ended with reason code 2393 Use “mqrc” to find out the short name for the return code 2393.

C:\MQ-SupportPac\MO04 SSL Wizard\client_samples\bin> mqrc 2393

2393 0x00000959 MQRC_SSL_INITIALIZATION_ERROR

+++ Step 11: Troubleshooting

UNIX: Let's take a look at the error log for the queue manager

cd /var/mqm/qmgrs/QM_71SSL/errors

tail AMQERR01.LOG

AMQ9660: SSL key repository: password stash file absent or unusable. EXPLANATION: The SSL key repository cannot be used because MQ cannot obtain a password to access it. Reasons giving rise to this error include: (a) the key database file and password stash file are not present in the location configured for the key repository, (b) the key database file exists in the correct place but that no password stash file has been created for it, (c) the files are present in the correct place but the userid under which MQ is running does not have permission to read them, (d) one or both of the files are corrupt.

ACTION: Ensure that the key repository variable is set to where the key database file is. Ensure that a password stash file has been associated with the key database file in the same directory, and that the userid under which MQ is running has read access to both files. If both are already present and readable in the correct place, delete and recreate them. Restart the channel.

Let's take a look at the file permissions for the ssl files:

cd /var/mqm/qmgrs/QM_71SSL/ssl ls -l -rw------- 1 rivera mqm 782 2014-03-04 12:12 QM_71SSL.crt -rw------- 1 rivera mqm 10080 2014-03-04 11:51 QM_71SSL.kdb -rw------- 1 rivera mqm 80 2014-03-

04 11:51 QM_71SSL.rdb -rw------- 1 rivera mqm 129 2014-03-04 11:37 QM_71SSL.sth -rw------- 1 rivera mqm 776 2014-03-04 11:50 rivera.crt

Notice that the userid “rivera” is being used in this scenario. This user is a member of the “mqm” group, but the SSL files were created in such as way that other members of the group cannot read/write the files.

Let's change the permissions to allow the group “mqm” to read and write:

rivera@veracruz: /var/mqm/qmgrs/QM_71SSL/ssl chmod 660 *

rivera@veracruz: /var/mqm/qmgrs/QM_71SSL/ssl ls -l -rw-rw---- 1 rivera mqm 782 2014-03-04 12:12 QM_71SSL.crt -rw-rw---- 1 rivera mqm 10080 2014-03-04 11:51 QM_71SSL.kdb -rw-rw---- 1 rivera mqm 80 2014-03-04 11:51 QM_71SSL.rdb -rw-rw---- 1 rivera mqm 129 2014-03-04 11:37 QM_71SSL.sth -rw-rw---- 1 rivera mqm 776 2014-03-04 11:50 rivera.crt

Windows: Let's try again:

C:\MQ-SupportPac\MO04 SSL Wizard\client_samples\bin> SSLSample.exe veracruz.x.com(1430) SSL.SVRCONN QM_71SSL NULL_SHA "C:\Users\IBM_ADMIN\AppData\Local \VirtualStore\Program Files (x86)\IBM\WebSphere MQ_2\rivera" Connecting to: Conname = veracruz.x.com(1430). SvrconnChannelName = SSL.SVRCONN. QMgrName = QM_71SSL. SSLCiph = NULL_SHA. SSLKeyr = C:\Users\IBM_ADMIN\AppData\Local\VirtualStore\Program Files (x86)\IB M\WebSphere MQ_2\rivera. MQCONNX ended with reason code 2035 The rc 2035 means: 2035 0x000007f3 MQRC_NOT_AUTHORIZED

Unix: Let's take a look at the error log of the queue manager.

AMQ9776: Channel was blocked by userid EXPLANATION: The inbound channel 'SSL.SVRCONN' was blocked from address '9.80.3.88' because the active values of the channel were mapped to a userid which should be blocked. The active values of the channel were 'MCAUSER(rivera) CLNTUSER(rivera) SSLPEER(SERIALNUMBER=53:16:00:C7,CN=rivera,OU=Support,O=IBM,ST=NC,C=)'.

ACTION: Contact the systems administrator, who should examine the channel authentication records to ensure that the correct settings have been configured. The ALTER QMGR CHLAUTH switch is used to control whether channel authentication records are used. The command DISPLAY CHLAUTH can be used to query the channel authentication records.

Let's display the channel authentication records:

runmqsc QM_71SSL DISPLAY CHLAUTH (*) 2 : DISPLAY CHLAUTH (*) AMQ8878: Display channel authentication record details. CHLAUTH(SYSTEM.ADMIN.SVRCONN) TYPE(ADDRESSMAP) ADDRESS(*) USERSRC(CHANNEL) AMQ8878: Display channel authentication record details. CHLAUTH(SYSTEM.ADMIN.*) TYPE(BLOCKUSER) USERLIST(nobody) AMQ8878: Display channel authentication record details. CHLAUTH(SYSTEM.*) TYPE(ADDRESSMAP) ADDRESS(*) USERSRC(NOACCESS) AMQ8878: Display channel authentication record details. CHLAUTH(*) TYPE(BLOCKUSER) USERLIST(nobody ,*MQADMIN)

The last record is a rule that indicates that the “*MQADMIN” is going to be blocked for all channels, and this notation indicates an MQ Administrator. Because the userid used in this example is “rivera” and belongs to the group “mqm” is an MQ Administrator, and thus it is blocked.

We have now the choice to create a rule to add rivera as a valid user, or to reduce the blacklist for SSL.SVRCONN, allowing administrators to use this channel. Let's try this 2nd option:

SET CHLAUTH(SSL.SVRCONN) TYPE(BLOCKUSER) USERLIST('nobody') end

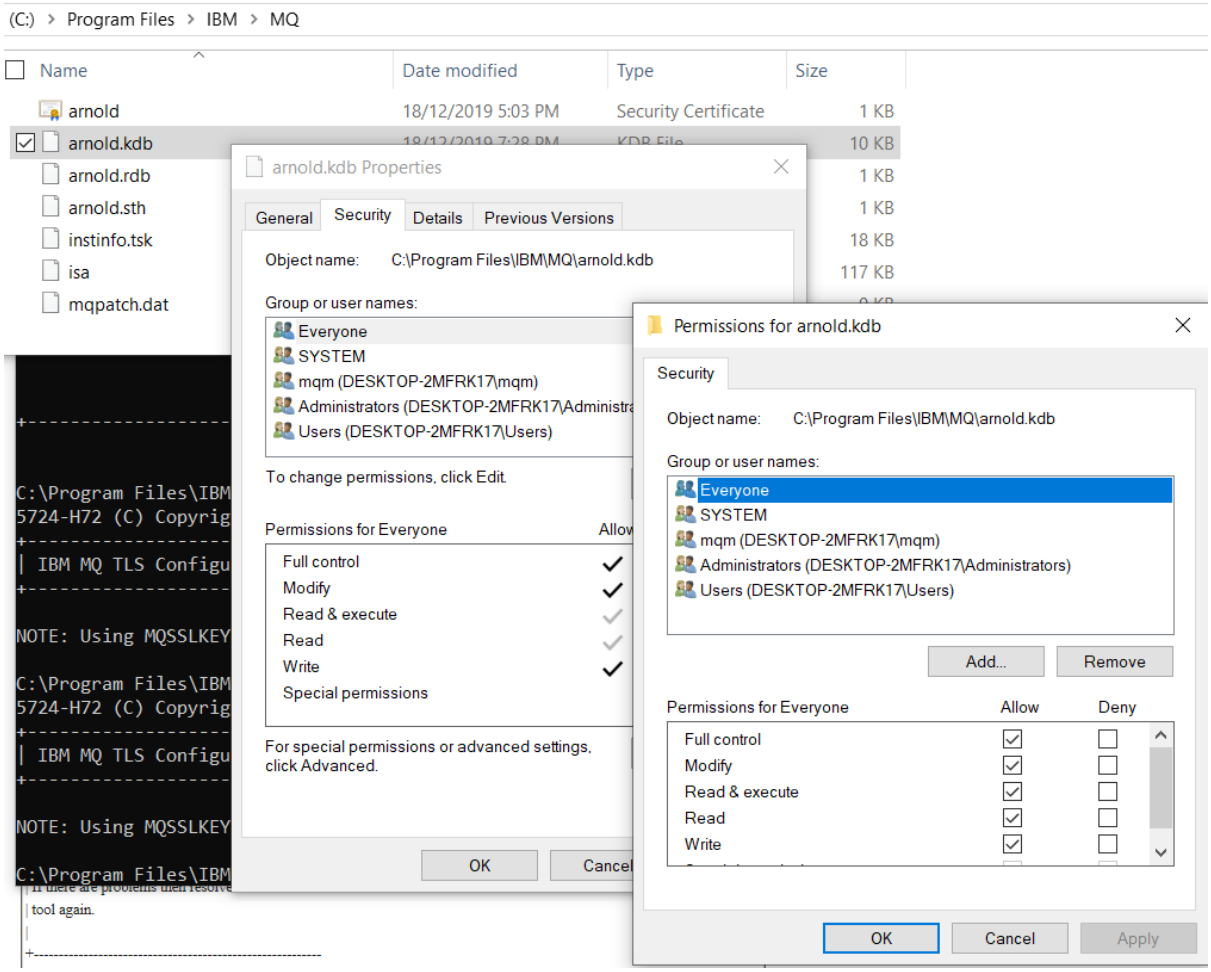
WINDOWS:

Let's try the sample again:

C:\MQ-SupportPac\MO04 SSL Wizard\client_samples\bin> SSLSample.exe veracruz.x.com(1430) SSL.SVRCONN QM_71SSL NULL_SHA "C:\Users\IBM_ADMIN\AppData\Local \VirtualStore\Program Files (x86)\IBM\WebSphere MQ_2\rivera" Connecting to: Conname = veracruz.x.com(1430). SvrconnChannelName = SSL.SVRCONN. QMgrName = QM_71SSL. SSLCiph = NULL_SHA. SSLKeyr = C:\Users\IBM_ADMIN\AppData\Local\VirtualStore\Program Files (x86)\IB M\WebSphere MQ_2\rivera. Connection Successful!. SSLSample end

This time, the connection was successful. Yeah!!!

+++ end ++



https://www.mqtechconference.com/sessions_v2018/Using_runmqsc_and_dmpmqcfg_over_TLS_client.pdf

http://runmqsc.blogspot.com/

https://www-01.ibm.com/support/docview.wss?uid=swg27045974&aid=1

CCDT setting up

```
DEFINE CHANNEL(TLSPRQM1.SVRCONN) +
        CHLTYPE(CLNTCONN) +
        TRPTYPE(TCP) +
        CONNAME('localhost(2414)') +
        QMNAME(TLSPRQM1) +
        SSLCIPH(ANY_TLS12)
        REPLACE

echo "run the runmqsc command to create the CCDT called AMQCLCHL.TAB in /var/mqm directory"
runmqsc -n < /tmp/mq/mqsc/TLSPRQM1CLT.MQSC"

# will need to set up the environment variable for path to
# AMQCLCHL.TAB if the default CCDT TAB name and default CCDT TAB directory are not used.
# because I have used all defaults the MQClient code will find and use the AMQCLCHL.TAB
# separate script package NPP-SET-MQENV can be used to export the MQCHLTAB env variable
#echo "setting MQCHLTAB to var/mqm for the CCDT .TAB file"
#
#export MQCHLTAB=/var/mqm/AMQCLCHL.TAB
#
#echo $MQCHLTAB
#
#you can test simple client connection with amqsputc
#putting msgs to APP qmgr RQ1s and they will be picked up by IIB
#and put back to EQ1s which exist in GW qmgrs across the cluster
#export MQSERVER=SYSTEM.DEF.SVRCONN/TCP/IPaddress
#echo $MQSERVER
#cd var/mqm/samp/bin
#./amqsputc RQ1 GWQM1
#export MQCHLTAB=/var/mqm/AMQCLCHL.TAB
```

#echo $MQCHLTAB

#cd var/mqm/samp/bin

#./amqsputc RQ1 GWQM1

Debugging

Lacking a certificate – didn't add the certlab to CLNTCONN in CCDT

from the logs

19/12/2019 10:15:11 - Process(29412.12) User(MUSR_MQADMIN) Program(amqrmppa.exe)

Host(DESKTOP-2MFRK17) Installation(Installation1)

VRMF(9.1.3.0) QMgr(TLSPRQM1)

Time(2019-12-18T23:15:11.742Z)

RemoteHost(127.0.0.1)

CommentInsert1(TLSPRQM1.SVRCONN)

CommentInsert2(gsk_attribute_get_cert_info)

CommentInsert3(kubernetes (127.0.0.1))

AMQ9637E: Channel is lacking a certificate.

EXPLANATION:

The channel is lacking a certificate to use for the SSL handshake. The channel

name is 'TLSPRQM1.SVRCONN' (if '????' it is unknown at this stage in the SSL

processing).

The remote host is 'kubernetes (127.0.0.1)'.

The channel did not start.

ACTION:

Make sure the appropriate certificates are correctly configured in the key

repositories for both ends of the channel.

----- amqccisa.c : 8245 ----------

19/12/2019 10:15:11 - Process(29412.12) User(MUSR_MQADMIN) Program(amqrmppa.exe)

Host(DESKTOP-2MFRK17) Installation(Installation1)

VRMF(9.1.3.0) QMgr(TLSPRQM1)

Time(2019-12-18T23:15:11.743Z)

CommentInsert1(TLSPRQM1.SVRCONN)

CommentInsert2(29412(39076))

CommentInsert3(kubernetes (127.0.0.1))

AMQ9999E: Channel 'TLSPRQM1.SVRCONN' to host 'kubernetes (127.0.0.1)' ended abnormally.

EXPLANATION:

The channel program running under process ID 29412(39076) for channel 'TLSPRQM1.SVRCONN' ended abnormally. The host name is 'kubernetes (127.0.0.1)'; in some cases the host name cannot be determined and so is shown as '????'.

ACTION:

Look at previous error messages for the channel program in the error logs to determine the cause of the failure. Note that this message can be excluded completely or suppressed by tuning the "ExcludeMessage" or "SuppressMessage" attributes under the "QMErrorLog" stanza in qm.ini. Further information can be found in the System Administration Guide.

CERTLABL

Certificate label for this channel to use.
The label identifies which personal certificate in the key repository is sent to the remote peer. If this attribute is blank, the certificate is determined by the queue manager **CERTLABL** parameter.

Add the CERTLAB to the CLNTCONN definition and retry

```
DEFINE CHANNEL(TLSPRQM1.SVRCONN) +
        CHLTYPE(CLNTCONN) +
        TRPTYPE(TCP) +
        CONNAME('localhost(2414)') +
        CERTLABL('ibmmqarnold') +
        QMNAME(TLSPRQM1) +
```

SSLCIPH(ANY_TLS12) +

REPLACE

runmqsc -n < c:\temp\TLSPRQM1CLTCONN.MQSC

Not authorized – used mqm instead of MUSR_MQADMIN in the chl auth rec

From the logs

----- amqrmrsa.c : 945 --

19/12/2019 10:38:58 - Process(29412.13) User(MUSR_MQADMIN) Program(amqrmppa.exe)

Host(DESKTOP-2MFRK17) Installation(Installation1)

VRMF(9.1.3.0) QMgr(TLSPRQM1)

Time(2019-12-18T23:38:58.367Z)

CommentInsert1(mqm)

CommentInsert2(TLSPRQM1.SVRCONN)

CommentInsert3(TLSPRQM1)

AMQ9245W: Unable to obtain account details for channel MCA user ID.

EXPLANATION:

IBM MQ was unable to obtain the account details for MCA user ID 'mqm'. This

user ID was the MCA user ID for channel 'TLSPRQM1.SVRCONN' on queue manager

'TLSPRQM1' and may have been defined in the channel definition, or supplied

either by a channel exit or by a client.

ACTION:

Ensure that the user ID is correct and that it is defined on the Windows local

system, the local domain or on a trusted domain. For a domain user ID, ensure

that all necessary domain controllers are available.

----- cmqxrsrv.c : 2220 --

19/12/2019 10:38:58 - Process(29412.13) User(MUSR_MQADMIN) Program(amqrmppa.exe)

Host(DESKTOP-2MFRK17) Installation(Installation1)

VRMF(9.1.3.0) QMgr(TLSPRQM1)

Time(2019-12-18T23:38:58.369Z)

ArithInsert1(2) ArithInsert2(2035)

CommentInsert1(mqm)

AMQ9557E: Queue Manager User ID initialization failed for 'mqm'.

EXPLANATION:

The call to initialize the User ID 'mqm' failed with CompCode 2 and Reason 2035. If an MQCSP block was used, the User ID in the MQCSP block was ''. If a userID flow was used, the User ID in the UID header was '' and any CHLAUTH rules applied prior to user adoption were evaluated case-sensitively against this value.

ACTION:

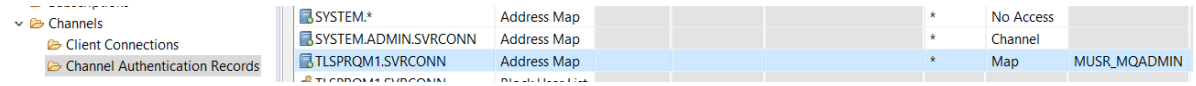
Correct the error and try again.

----- cmqxrsrv.c : 2524 --

When I created the SVRCONN in the first place I had a CHLAUTH for MCAUSER('mqm')

This should have been MCAUSER('MUSR_MQADMIN)

Change it in MQExplorer



No CipherSpec – used MQSERVER instead of CCDT.

MQ9639E: Remote channel 'TLSPRQM1.SVRCONN' did not specify a CipherSpec.

EXPLANATION:

Remote channel 'TLSPRQM1.SVRCONN' did not specify a CipherSpec when the local channel expected one to be specified.

Do we have to use MQCCDT file in order for runmqsc to client connect because the MQSERVER limits the details we can specify for the connection to the SVRCONN

A CCDT enables the specification of cipher specs etc

Debugging in local container

```
C:\temp>runmqsc -c TLSPRQM1
5724-H72 (C) Copyright IBM Corp. 1994, 2019.
Starting MQSC for queue manager TLSPRQM1.


AMQ9709E: SSL/TLS initialization error.

0 command responses received.
```

Docker ps

Docker exec -it <container id> /bin/bash

```
C:\temp>docker ps
CONTAINER ID        IMAGE                                                COMMAND                  CREATED
STATUS              PORTS                                                                    NAMES
5edaadeb1fe0        davexacom/ibm-mqadvanced-server-tls:9.1.3.0-r4-amd64   "runmqintegrationser…"   About an hour ago
Up About an hour    0.0.0.0:32779->1414/tcp, 0.0.0.0:32778->9157/tcp, 0.0.0.0:32777->9443/tcp   silly_noether

C:\temp>docker exec -it 5edaadeb1fe0 /bin/bash
bash-4.2$ ls
bin  boot  dev  etc  home  lib  lib64  licenses  media  mnt  opt  proc  root  run  sbin  srv  sys  tmp  usr  var
bash-4.2$
```

Find the error logs for MQ

/var/mqm/qmgr/TLSPRQM1/errors

```
bash-4.2$ ls /var/mqm/qmgrs/TLSPRQM1/errors
AMQERR01.json  AMQERR01.LOG  AMQERR02.json  AMQERR02.LOG  AMQERR03.json  AMQERR03.LOG
```

tail /var/mqm/qmgrs/TLSPRQM1/errors/AMQERR01.json

"AMQ9660E: SSL key repository: password stash file absent or unusable."}

{"ibm_messageId":"AMQ9999E","ibm_arithInsert1":0,"ibm_arithInsert2":0,"ibm_commentInsert1":"????","ibm_commentInsert2":"258","ibm_commentInsert3":"gateway (172.17.0.1)","ibm_datetime":"2019-12-20T01:05:05.311Z","ibm_serverName":"TLSPRQM1","type":"mq_log","host":"5edaadeb1fe0","loglevel":"ERROR","module":"amqrmrsa.c:945","ibm_sequence":"1576803905_312716800","ibm_qmgrId":"TLSPRQM1_2019-12-19_23.50.28","ibm_processId":"258","ibm_threadId":"9","ibm_version":"9.1.3.0","ibm_processName":"amqrmppa","ibm_userName":"mqm","ibm_installationName":"Installation1","ibm_installationDir":"/opt/mqm","message":"AMQ9999E: Channel '????' to host 'gateway (172.17.0.1)' ended abnormally."}

h