This task aims to establish security from a messaging application that transmits data to an IBM MQ application. How security will be implemented will be through encrypting whatever data is sent to the MQ using SSL/TLS.

First, when analysing our system network-wise, we see that data is sent bare (plain text). This makes our system susceptible to Man-in-the-middle-attacks or eavesdropping. For most legal jurisdictions data sent to be compliant to certain data protection policies such as PCI DSSI & GDPA.

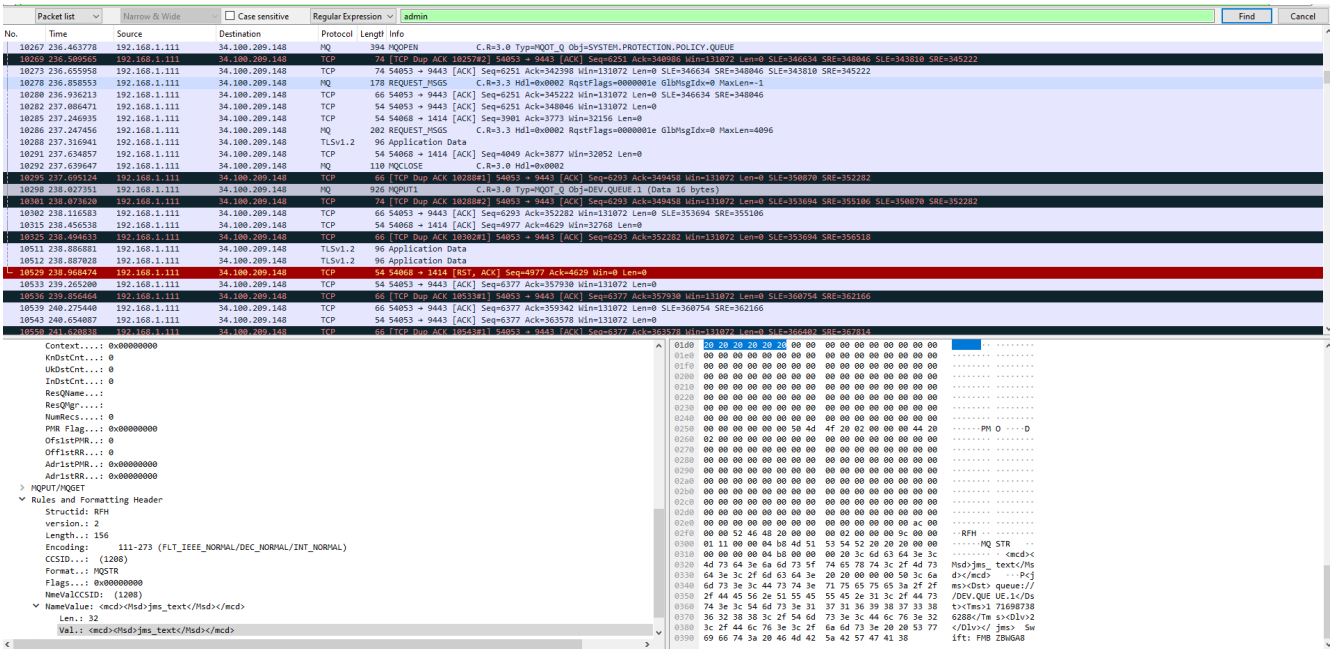
So in the previous section after we managed to get the application to send data to our MQ. So when we execute the application this is the data we get in plain text.

```
Sent message:

  JMSMessage class: jms_text
  JMSType:          null
  JMSDeliveryMode:  2
  JMSDeliveryDelay: 0
  JMSDeliveryTime:  1716988239704
  JMSExpiration:    0
  JMSPriority:      4
  JMSMessageID:     ID:414d5120514d3120202020202020202020d3f3566602960240
  JMSTimestamp:     1716988239704
  JMSCorrelationID: null
  JMSDestination:   queue:///DEV.QUEUE.1
  JMSReplyTo:       null
  JMSRedelivered:   false
    JMSXAppID: JmsPutGet (JMS)
    JMSXDeliveryCount: 0
    JMSXUserID: admin
    JMS_IBM_PutApplType: 28
    JMS_IBM_PutDate: 20240529
    JMS_IBM_PutTime: 13104097
Transaction:672

Received message:
Swift: FMBZBWGA2
SUCCESS
```

To test we opened WireShark and traced the traffic from our server.



As displayed in the zoomed picture below, our data passes in plain text. We can see the exact message that we got from the application being sniffed by the Wireshark. The contents of the message travelled in plain text and could have been viewed by a third party just as I have done here with Wireshark

```
4d 73 64 3e 6a 6d 73 5f  74 65 78 74 3c 2f 4d 73   Msd>jms_ text</Ms
64 3e 3c 2f 6d 63 64 3e  20 20 00 00 00 50 3c 6a   d></mcd>    ···P<j
6d 73 3e 3c 44 73 74 3e  71 75 65 75 65 3a 2f 2f   ms><Dst> queue://
2f 44 45 56 2e 51 55 45  55 45 2e 31 3c 2f 44 73   /DEV.QUE UE.1</Ds
74 3e 3c 54 6d 73 3e 31  37 31 36 39 38 37 33 38   t><Tms>1 71698738
36 32 38 38 3c 2f 54 6d  73 3e 3c 44 6c 76 3e 32   6288</Tm s><Dlv>2
3c 2f 44 6c 76 3e 3c 2f  6a 6d 73 3e 20 20 53 77   </Dlv></ jms>  Sw
69 66 74 3a 20 46 4d 42  5a 42 57 47 41 38         ift: FMB ZBWGA8
```

Open the Java code and uncomment line below.

```
//cf.setStringProperty(WMQConstants.WMQ_SSL_CIPHER_SUITE, "*TLS12ORHIGHER");

// Create JMS objects
```

Open the server that is hosting MQ, in this case, it's a Linux server. However, navigate to a directory and execute the command below to create a self-signed cert.

Run the code below to initiate the SSL cert creation process.

```
openssl req -newkey rsa:2048 -nodes -keyout key.key -x509 -days 365 -out key.crt
```

```
root@debian-bullseye-20240519-202906:/home/mmenaysto/store# openssl req -newkey rsa:2048 -nodes -keyout key.key
 -x509 -days 365 -out key.crt
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-----
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:
```

Fill in the details as prompted.

```
++++++++++++++++++++++++++++++
-----
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:BW
State or Province Name (full name) [Some-State]:CETRAL
Locality Name (eg, city) []:Gaborone
Organization Name (eg, company) [Internet Widgits Pty Ltd]:My Company Pty Ltd
Organizational Unit Name (eg, section) []:IT
Common Name (e.g. server FQDN or YOUR name) []:mqs.augcyba.com
Email Address []:lorem@augcyba.com
```

Below are the certs created.

```
root@debian-bullseye-20240519-202906:/home/mmenaysto/store# ls
clientkey.jks  key.crt  key.key
```

Now share these certificates from the server to the client via any desirable method. In this case, I was using *gsutil* as my server is hosted on Google Cloud.

com	2024/05/20 15:04	File folder	
java_certs	2024/05/30 13:06	File folder	
clientkey	2024/05/30 12:27	JKS File	2 KB
clientkey.kdb	2024/05/30 16:05	KDB File	2 KB
clientkey.sth	2024/05/30 16:05	STH File	1 KB
com.ibm.mq.allclient-9.3.0.0	2024/05/20 14:57	Executable Jar File	8 145 KB
javax.jms-api-2.0.1	2024/05/20 15:02	Executable Jar File	63 KB
json-20220320	2024/05/20 15:03	Executable Jar File	70 KB
key	2024/05/30 12:28	Security Certificate	2 KB
key	2024/05/30 12:28	Apple Keynote	2 KB
mqjms.log.0	2024/05/21 11:37	0 File	1 KB

Now that you have the MQ client libraries, you'll have the MQ security command line tool, *runmqakm*. Enter this command to create a keystore in `.kdb` format and store the password in a `.sth` file

```
C:\Users\lorem\MQ\MQClient>runmqakm -keydb -create -db clientkey.kdb -pw [!!pick_a_passw0rd_here!!] -type pkcs12 -expire
 1000 -stash
5724-H72 (C) Copyright IBM Corp. 1994, 2024.
```

After the command is executed we see the newly created password store file.

clientkey.sth	2024/05/30 16:05	STH File	1 KB

Import certificates into the keystore using the command below.

```
C:\Users\lorem\MQ\MQClient>runmqakm -cert -add -label QM1.cert -db clientkey.kdb -stashed -trust enable -file key.crt
5724-H72 (C) Copyright IBM Corp. 1994, 2024.
```

We should have this file in our directory.

clientkey.kdb	2024/05/30 16:11	KDB File	2 KB

When we initialize the container we should provide the directory of the key files.

So from the documentation, it seems we have to create a non running container just for the mere purpose of mounting the files to the storage volume.

```
root@debian-bullseye-20240519-202906:/# docker create --name mq-tls-config-container --mount="type=volume,src=tls-key-vol,dst=/home/rmmenaysto/store" --user 0:0 icr.io/ibm-messaging/mq:latest
a28cef78732771ee392a3ca667344c677065ac5bcb182444cefa55416c34e398
```

We can see the newly non-running container named *config container*

```
root@debian-bullseye-20240519-202906:/# docker ps -a
CONTAINER ID   IMAGE                              COMMAND                  CREATED          STATUS                     PORTS                                                                                    NAMES
a28cef787327   icr.io/ibm-messaging/mq:latest     "runmqdevserver"         2 minutes ago    Created                                                                                                             mq-tls-config-container
```

Copy the files over to the directory in the container.

```
root@debian-bullseye-20240519-202906:/# docker cp /home/mmenaysto/store/. config-container:/etc/mqm/pki/keys/mykey
Successfully copied 8.19kB to config-container:/etc/mqm/pki/keys/mykey
```

This completes the initial set-up. Now, we can enable TLS using the volume created previously and the MQ Docker image.

```
root@mqsinstance-20240531-092748:/home/account# docker run -it --name grand_queer --env LICENSE=accept --env MQ_QMGR_NAME=QM1 --mount="type=volum
e,src=tls-key-vol,dst=/etc/mqm/pki/keys/mykey" --publish 1414:1414 --publish 9443:9443 --detach --env MQ_APP_PASSWORD=B2%m2bp4A? icr.io/ibm-messa
ging/mq:latest "
```

```
chmod o+r /etc/mqm/pki/keys/mykey/key.key
chmod o+r /etc/ssl/server/key.*
```

```
DISPLAY CHANNEL(DEV.APP.SVRCONN)
     2 : DISPLAY CHANNEL(DEV.APP.SVRCONN)
AMQ8414I: Display Channel details.
   CHANNEL(DEV.APP.SVRCONN)                CHLTYPE(SVRCONN)
   ALTDATE(2024-06-03)                     ALTTIME(13.34.17)
   CERTLABL( )                             COMPHDR(NONE)
   COMPMSG(NONE)                           DESCR( )
   DISCINT(0)                              HBINT(300)
   KAINT(AUTO)                             MAXINST(999999999)
   MAXINSTC(999999999)                     MAXMSGL(4194304)
   MCAUSER(app)                            MONCHL(QMGR)
   RCVDATA( )                              RCVEXIT( )
   SCYDATA( )                              SCYEXIT( )
   SENDDATA( )                             SENDEXIT( )
   SHARECNV(10)                            SSLCAUTH(OPTIONAL)
   SSLCIPH(ANY_TLS12_OR_HIGHER)            SSLPEER( )
   TRPTYPE(TCP)
```

```
root@mqsinstance-20240531-092748:/home/account/mq-secure-ms# docker stop $(docker ps )
4c7b9f2f781d
```