

# Title: Setting and using the IBM MQ Console on z/OS

Subtitle: Learn how to view and edit MQ objects using the IBM MQ Console on z/OS

Author: Dorothy Quincy (Dorothy.Quincy@ibm.com)

**Estimated time: This tutorial should take about 30 minutes**

In this tutorial, you'll learn how to set up the MQ web console on z/OS using basic authentication. You'll learn how to access the MQ console and view and edits MQ objects using it.

The security configuration defined in this tutorial is not sufficient for use in a production environment. For more information regarding MQ web console security, see the linked [documentation](#)

**The following restrictions apply when using the IBM MQ Console to manage queue managers on z/OS, but with each new version, there is more capability:**

- A web console must be created for each new version of MQ on z/OS
- Queue managers on z/OS cannot be created, deleted, started, or stopped.
- Channel initiators on z/OS cannot be started or stopped.

The JCL used in this exercise was originally developed by Mitch Johnson in the IBM Washington Systems Center.

## Prerequisites

-Java installed on z/OS, [linked here](#)

-IBM MQ installed on z/OS. We are using IBM MQ 9.4 here. [See link for more details](#)

-Unix Systems Services active on z/OS. Plan with a system administrator if USS configuration is needed.

-ZFS file system mounted (in our case, we mounted M940CD.SCSQZFS on /usr/lpp/mqm/V9R4MX)

## Steps

To configure the console, there are 4 main steps:

-Run the CRTMQWEB executable. This script creates the WebSphere® Liberty user directory that contains the mqm server configuration and log files.

- Modify the XML of the server created by running the CRTMQWEB executable
- Add the MQWEBS JCL to the started task library
- Explore the MQ web console functionality

## Step 1. Modify the JCL for the CRTMQWEB executable

For this tutorial, I created a data set to house all the relevant MQ Web Console JCL. It is called ZQS1.MQ.WEB.JCL. We will use the MQWEBS, MQANGEL, and CRTMQWEB JCL samples that are contained in ZQS1.MQ.WEB.JCL

1. The JCL executes the crtmqweb executable in the MQ installation. From the ISPF main menu, go to option 3.4 to search for the ZQS1.MQ.WEB.JCL JCL. In the **Dsname Level** field, specify ZQS1.MQ.WEB.JCL, and press **Enter**.

```

Menu  RefList  RefMode  Utilities  Help
-----
Data Set List Utility
More:  +
blank Display data set list      P Print data set list
V Display VTOC information      PV Print VTOC information

Enter one or both of the parameters below:
Dsname Level . . . ZQS1.MQ.WEB.JCL
Volume serial . . .

Data set list options
Initial View
1. Volume
2. Space
3. Attrib
4. Total

Enter "/" to select option
/ Confirm Data Set Delete
/ Confirm Member Delete
/ Include Additional Qualifiers
/ Display Catalog Name
- Display Total Tracks
- Prefix Dsname Level

When the data set list is displayed, enter either:
"/" on the data set list command field for the command prompt pop-up,
Option ==>

```

2. Specify an “e” to the left of the ZQS1.MQ.WEB.JCL data set name to browse its contents in edit-mode.

```

Menu  Options  View  Utilities  Compilers  Help
-----
DSLST - Data Sets Matching ZQS1.MQ.WEB.JCL                      Row 1 of 1
Command - Enter "/" to select action                            Message          Volume
-----
E_  ZQS1.MQ.WEB.JCL                                           MQ1PD1
***** End of Data Set list *****

```

- Place an “e” next to CRTMQWEB and press **Enter**. This will put you in edit-mode for the member.

Menu	Functions	Confirm	Utilities	Help				
EDIT	ZQS1.MQ.WEB.JCL				Row	0000001	of	0000007
	Name	Prompt	Size	Created	Changed	ID		
<u>e</u>	CRTMQWEB	*Edited	21	2024/01/08	2024/06/13 09:11:57	DQUINCY		
	MQANGEL		12	2024/01/08	2024/05/07 16:03:52	DQUINCY		
	MQWEBS		24	2024/01/08	2024/05/14 13:10:32	DQUINCY		
	NEW		22	2024/05/28	2024/05/28 15:33:57	DQUINCY		
	RACF		140	2024/01/08	2024/04/19 13:32:08	DQUINCY		
	XMQWEBS		4	2024/01/08	2024/04/19 12:56:08	DQUINCY		
	ZLSOF		21	2024/02/18	2024/04/19 12:56:37	DQUINCY		
	**End**							

- In the CRTMQWEB JCL, update the JAVAHOME, MQPATH, and WLPUSER environment variables for your own z/OS environment.

- JAVAHOME is where Java is installed in your z/OS environment
- MQPATH is where the MQ binaries are accessible from
- WLPUSER is where the server directory will be created

```
//CRTMQWEB JOB 'MQ WEB',CLASS=A,REGION=0M,MSGCLASS=H,
// NOTIFY=&SYSUID
//*****
//* SET SYMBOLS
//*****
//EXPORT EXPORT SYMLIST=(*)
// SET JAVAHOME='/usr/lpp/java/J8.0_64'
// SET MQPATH='/usr/lpp/mqm/V9R4MX/web'
// SET WLPUSER='/var/mqm'
//*****
//* Step crtmqweb - Use the crtmqweb command
//*****
//CRTMQWEB EXEC PGM=IKJEFT01,REGION=0M
//SYSTSPRT DD SYSOUT=*
```

```
//SYSERR DD SYSOUT=*

//STDOUT DD SYSOUT=*

//SYSTSIN DD *,SYMBOLS=EXEC SYS
BPXBATCH SH +

export JAVA_HOME=&JAVAHOME; +

export WLP_USER_DIR=&WLPUSER; +

&MQPATH/bin/crtmqweb &WLPUSER -p MQ
```

5. Submit the JCL by typing “submit” in the command line and pressing **Enter**.

```
EDIT          ZQS1.MQ.WEB.JCL (CRTMQWEB) - 01.10          Columns 00001 00072
***** Top of Data *****
==MSG> -Warning- The UNDO command is not available until you change
==MSG> your edit profile using the command RECOVERY ON.
000001 //CRTMQWEB JOB 'MQ WEB',CLASS=A,REGION=0M,MSGCLASS=H,
000002 // NOTIFY=&SYSUID
000003 //*****
000004 //* SET SYMBOLS
000005 //*****
000006 //EXPORT EXPORT SYMLIST=(*)
000007 // SET JAVAHOME='/usr/lpp/java/J8.0_64'
000008 // SET MQPATH='/usr/lpp/mqm/V9R4MX/web'
000009 // SET WLPUSER='/var/mqm'
000010 //*****
000011 //* Step crtmqweb - Use the crtmqweb command
000012 //*****
000013 //CRTMQWEB EXEC PGM=IKJEFT01,REGION=0M
000014 //SYSTSPRT DD SYSOUT=*
000015 //SYSERR DD SYSOUT=*
000016 //STDOUT DD SYSOUT=*
Command ==> SUBMIT Scroll ==> CSR
```

6. Next, let’s check out the angel process. What is that? The Liberty angel process is a started task that allows Liberty servers to use z/OS authorized services. It’s long-lived and can be shared among your multiple Liberty servers. Use the F3 key to back out of CRTMQWEB and place an ‘e’ to the left of the MQANGEL member, then hit enter.

Sample JCL for MQANGEL:

```
//MQANGEL PROC PARMS='',COLD=N,NAME='MQANGEL',SAFLOG=Y

/*-----

// SET ROOT='/usr/lpp/mqm/V9R4MX/web'

/*-----

/* Start the Liberty angel process for MQ
```

```

/*-----
//STEP1 EXEC PGM=BPXBATA2,REGION=0M,TIME=NOLIMIT,
// PARM='PGM &ROOT./lib/native/zos/s390x/bbgzangl COLD=&COLD NAME=X
//      &NAME &PARMS SAFLOG=&SAFLOG'

```

7. Lastly, let's check out the MQWEBS JCL. Using the 'e' edit function, make sure the JCL matches the below :

```

***** ***** Top of Data *****
==MSG> -Warning- The UNDO command is not available until you change
==MSG> your edit profile using the command RECOVERY ON.
000001 //MQWEBS PROC PARMS='mqweb --clean'
000002 /*
000003 // SET INSTDIR='/usr/lpp/mqm/V9R4MX/web'
000004 // SET USERDIR='/var/mqm'
000005 /*
000006 //MQCONSOL EXEC PGM=BPXBATSL,REGION=0M,TIME=NOLIMIT,
000007 // PARM='PGM &INSTDIR./lib/native/zos/s390x/bbgzsrv &PARMS.'
000008 //WLPUDIR DD PATH='&USERDIR.'
000009 //STEPLIB DD DSN=MQ940CD.SCSQANLE,DISP=SHR
000010 // DD DSN=MQ940CD.SCSQAUTH,DISP=SHR
000011 //STDOUT DD SYSOUT=*
000012 //STDERR DD SYSOUT=*
000013 //STDIN DD DUMMY
000014 //STDENV DD *
000015 JAVA_HOME=/usr/lpp/java/J8.0_64
000016 WLP_USER_DIR=/var/mqm/
000017 PATH=/usr/lpp/mqm/V9R4MX/web/bin:/bin:/usr/bin
000018 LIBPATH=/usr/lpp/mqm/V9R4MX/java/lib
000019 //ZTDENV DD *
000020 JAVA_HOME=/usr/lpp/java/J8.0_64
000021 WLP_USER_DIR=/var/mqm/
000022 PATH=/usr/lpp/mqm/V9R4MX/web/bin:/bin:/usr/bin
000023 LIBPATH=/usr/lpp/mqm/V9R4MX/java/lib
000024 IBM_JAVA_OPTIONS=-Dcom.ibm.ws.zos.core.angelName=MQANGEL
***** ***** Bottom of Data *****

```

8. We won't be submitting MQANGEL or MQWEBS, instead we will be adding it to the SYS1.PROCLIB. SYS1.PROCLIB is a system library in which the procedures that are included with the product are placed when you run the starter job.
9. Back out of MQANGEL and navigate to option 3.3 from the main menu. Enter the option 'C' for copy and then specify the member you'd like to copy next to 'Name'. NOTE! You must use single quotes around the data set names.

```

Move/Copy Utility

Option ==> c

C Copy data set or member(s)          CP Copy and print
M Move data set or member(s)         MP Move and print

Specify "From" Data Set below, then press Enter key

From ISPF Library:
Project . . . . . (--- Options C and CP only ---)
Group . . . . .
Type . . . . .
Member . . . . . (Blank or pattern for member list,
                  "*" for all members)

From Other Partitioned or Sequential Data Set:
Name . . . . . 'ZQS1.MQ.WEB.JCL(MQANGEL)'
Volume Serial . . . . . (If not cataloged)

Data Set Password . . . . . (If password protected)

F1=Help      F3=Exit      F4=Return      F10=Actions      F12=CRetrieval

```

10. You want the destination for the copy to be 'SYS1.PROCLIB(MQANGEL)'. Specify this here.

```

COPY      From ZQS1.MQ.WEB.JCL(MQANGEL)
More:      +

Specify "To" Data Set Below

To ISPF Library:      Options:
Project . . . . .      Enter "/" to select option
Group . . . . .      _ Replace like-named members
Type . . . . .      / Process member aliases
Member . . . . .      (Blank unless member is to be renamed)

To Other Partitioned or Sequential Data Set:
Name . . . . . 'SYS1.PROCLIB(MQANGEL)'
Volume Serial . . . . . (If not cataloged)

Data Set Password . . . . . (If password protected)

To Data Set Options:
Sequential Disposition      Pack Option      SCLM Setting
1 1. Mod                    3 1. Yes        3 1. SCLM
2 2. Old                    2 2. No         2 2. Non-SCLM

Command ==>

```

11. Repeat this copying process for 'ZQS1.MQ.WEB.JCL(MQWEBS)'

12. Excellent! Now both MQANGEL and MQWEBS will be included in the SYS1.PROCLIB as started tasks. You can navigate to SYS1.PROCLIB using 3.4 if you'd like to confirm!

## Step 2. Modify the XML files

In order to configure our web console, we will customize the Websphere Liberty server spun up by running CRTMQWEB. The XML that is used to construct the web console is located in the /var/mqm directory.

1. Navigate to the /var/mqm/ directory from option 3.4 in ISPF. In the servers directory, several XML files were created. You need to modify these files.
2. Put an 'l' to the left of the 'servers' option to browse its contents. Repeat for the 'mqweb' directory until you see several XML files.

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

```
<server>
```

```
<featureManager>
```

```
<feature>appSecurity-2.0</feature>
```

```
</featureManager>
```

```
<webAppSecurity allowFailOverToBasicAuth="true"/>
```

```
<variable name="httpsPort" value="9443"/>
```

```
<variable name="httpHost" value="-1"/>
```

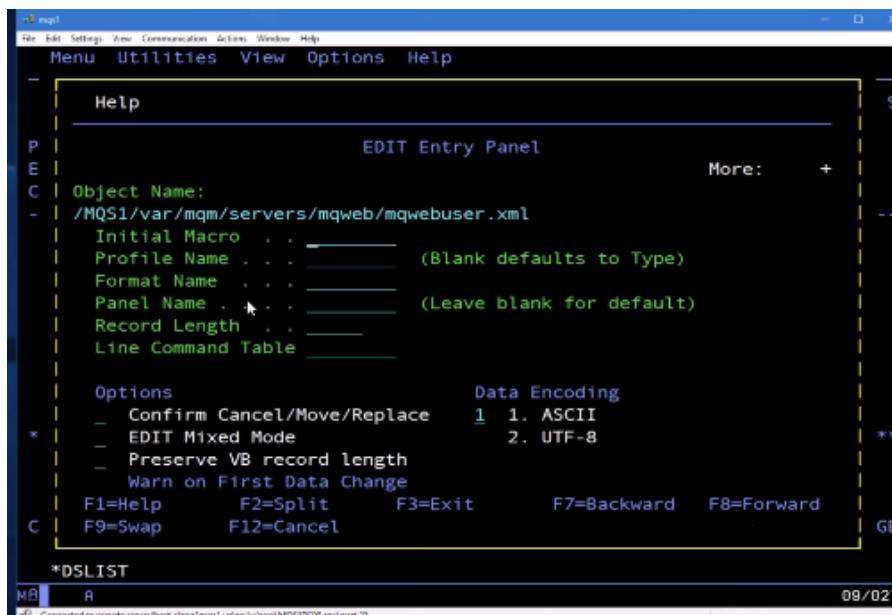
```
<variable name="mqRestMessagingEnabled" value="true"/>
```

```
<httpEndpoint host="*" httpPort="-1" httpsPort="9443"
```

```
id="defaultHttpEndpoint"/>
```

```
</server>
```

3. Type "ea" next to mqwebuser.xml to open the XML file in edit mode. An 'EDIT Entry Panel', like the one shown below will pop up, press **Enter** to move past it.



4. Once in edit mode, copy and paste the following lines into the file. Save the XML file and back out.

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

<server>

  <featureManager>

    <feature>appSecurity-2.0</feature>

  </featureManager>

  <webAppSecurity allowFailOverToBasicAuth="true"/>

  <variable name="httpsPort" value="9443"/>

  <variable name="httpHost" value="-1"/>

  <variable name="mqRestMessagingEnabled" value="true"/>

  <httpEndpoint host="*" httpPort="-1" httpsPort="9443"

    id="defaultHttpEndpoint"/>

</server>
```

5. Edit the sever.xml file. Add this line: `<include location="basic\_registry.xml"/>`. Save the XML file and back out.

6. To create this basic\_registry.xml file, pull the sample XML file from the MQ installation.
  - a. Navigate to /usr/lpp/mqm/V9R4MX/web/mq/samp/configuration using 3.4 from the ISPF menu.
  - b. Type 'tso omvs' in your command line.
  - c. In OMVS, type 'ls /usr/lpp/mqm/V9R4MX/web/mq/samp/configuration'. When you press **Enter**, you should see a list of the XML files in the directory, including basic\_registry.xml.

```
DQUINCY:/Z31RA1/usr/lpp/mqm/V9R4MX/web/mq/samp/configuration: >ls
basic_registry.xml      no_security.xml
ldap_registry.xml      zos_saf_registry.xml
```

Change directories to `/var/mqm/servers/mqweb` and then execute this command:



```
cp /usr/lpp/mqm/V9R4MX/web/mq/samp/configuration/basic_registry.xml.
```

7. Enter 'exit' to quit out of OMVS. Back out of the /MQS1/var/mqmqm/servers/mqweb directory, and then re-enter it. Browse the basic\_registry.xml file using 'va' to look at what credentials users will be able to use for the web console. Make note of the mqadmin username and password. You will need those later.

```

Menu Utilities View Options Help

z/OS UNIX Directory List Row 1 to 10 of 10

Pathname . : /MQS1/var/mqm/servers/mqweb
EUID . . : 91
Command Filename Message Type Permission Audit Ext Fmat
-----
. Dir rwxrwxrwx fff-- ----
.. Dir rwxrwxrwx fff-- ----
apps Dir rwxrwxrwx fff-- ----
va_ basic_registry. File rw-r--r-- fff-- --s- ----
dropins Dir rwxrwxrwx fff-- ----
jvm.options File rw-r--r-- fff-- --s- ----
lib Dir rwxrwxrwx fff-- ----
mqwebuser.xml File rw-r--r-- fff-- --s- ----
server.env File rw-r--r-- fff-- --s- ----
server.xml File rw-r--r-- fff-- --s- ----
***** Bottom of data *****

```

```

/MQS1/var/mqm/servers/mqweb/basic_registry.xml Columns 00001 00072
Sample Basic Registry
-->
<basicRegistry id="basic" realm="defaultRealm">
  <!--
    This sample defines two users with unencoded passwords
    and a group, these are used by the role mappings above.
  -->
  <user name="mqadmin" password="mqadmin"/>
  <user name="mqreader" password="mqreader"/>
  <user name="mftadmin" password="mftadmin"/>
  <user name="mftreader" password="mftreader"/>
  <group name="MQWebAdminGroup">
    <member name="mqadmin"/>
  </group>
</basicRegistry>

<!--
Enable HTTPS on a specific port by uncommenting the line below and p
-->

```

### Step 3. Access the MQ console

Now that you are all configured, start up the console!

1. From the ISPF main menu, type 'sdsf' and press **Enter**. On the new popup menu, type a '/' in the command line and press **Enter**.

Display Filter View Print Options Search Help				
-----				
SDSF MENU 3.1	MQPLEX1 MQS1		LINE 1-19 (94)	
NP	NAME	Description	Group	Status
	DA	Active users	Jobs	
	I	Input queue	Jobs	
	O	Output queue	Output	
	H	Held output queue	Output	
	ST	Status of jobs	Jobs	
	JG	Job groups	JES	
	SYM	System symbols	System	
	LOG	System log	Log	
	SR	System requests	Log	
	MAS	Members in the MAS	JES	
	JC	Job classes	JES	
	SE	Scheduling environments	WLM	
	RES	WLM resources	WLM	
	ENC	Enclaves	WLM	
	PS	Processes	OMVS	
	SYS	System information	System	
	ENQ	Enqueues	System	
	ENQC	Enqueue contention	System	
COMMAND INPUT ==> /				
				SCROLL ==> CSR

2. In the command window, type the command 's mqwebs' to start the MQ console.
  - a. You can take down the console by using the command 'p mqwebs' from the SDSF command shell

If you navigate to 'DA' from the SDSF main menu, you will see 'MQWEBS' is now running!

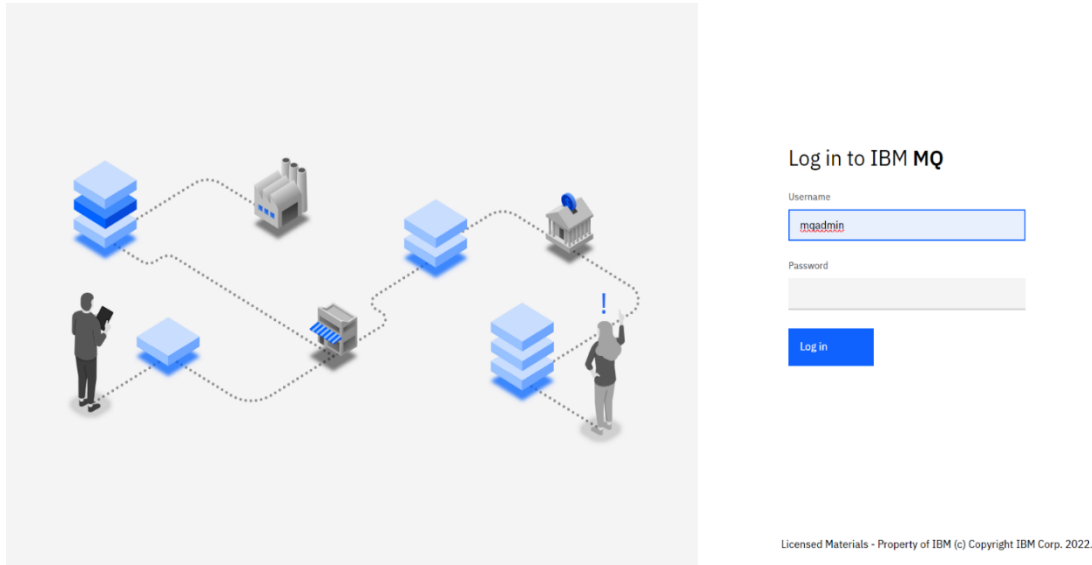
Display Filter View Print Options Search Help											
SDSF	DA	MQS1	MQS1	PAG	0	CPU	3	LINE 1-2 (2)			
NP	JOBNAME	StepName	ProcStep	JobID	Owner	C	Pos	DP	Real	Paging	SIO
	MQS1CICS	MQS1CICS	CICS	STC00107	CICSSTC	NS	FE	25T	0.00	0.00	
	MQWEBS	MQWEBS	MQCONSOL	STC00132	SYSPROG	IN	FE	79T	0.00	199.58	

COMMAND INPUT ==> prefix mq\* SCROLL ==> CSR

Open a browser (Chrome is recommended) in your virtual machine, and go to the following web address: [https://zos\\_ip\\_address:9443/ibmmq/console](https://zos_ip_address:9443/ibmmq/console) where X is your lab assigned z/OS environment.

- b. Tech tip: Troubleshoot any errors in the MQ web console itself by using the logs provided by the liberty server.
3. On the MQ Console login screen, use the credentials you saw in the basic\_registry.xml to login (The default credentials are mqadmin/mqadmin)

- a. Tech tip: Troubleshoot using the 'ST' function of SDSF, you may have a JCL error with MQWEBS if the console doesn't start up with the 's mqwebs' command



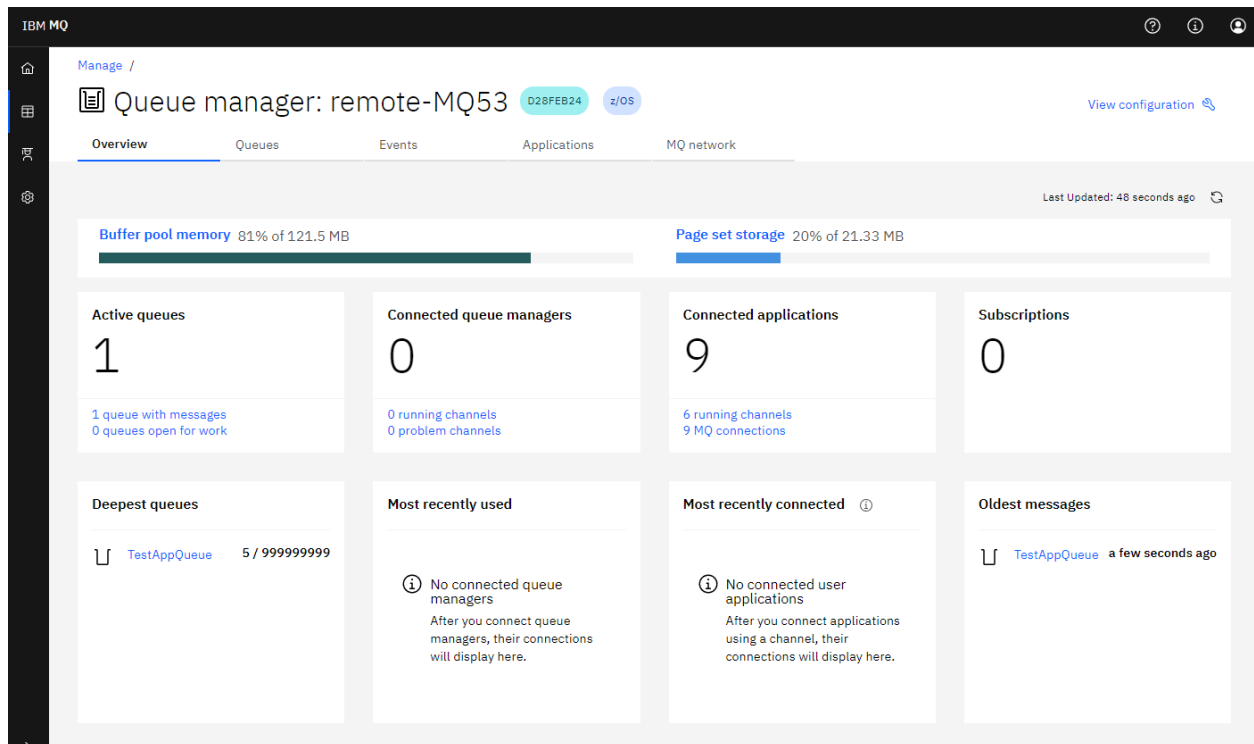
## Step 4. View and edit MQ objects by using the MQ Console

4. If no queue managers are running, go back to your z/OS environment and from the 'sdsf' command shell, enter the commands, where +cpf is your queue manager name

```
+cpf START QMGR
```

```
+cpf START CHINIT
```

5. From the Home page in the MQ console, select Manage to open a list of queue managers. You can create or manage them from here.
6. Selecting a queue manager will display the queues and other objects associated with this queue manager.
7. If you are using a queue manager with IBM MQ version 9.4 for z/OS, you will be able to have visibility into storage including 'Storage classes', 'Buffer pools' and 'Page sets'.
8. Navigate to investigate your buffer pools and page set utilization to determine which queues are consuming the most memory and storage



## Summary and next steps

Nice, you now have an MQ web console set up on your z/OS environment! If you are not able to access a test z/OS environment, please reach out to me at [dorothy.quincy@ibm.com](mailto:dorothy.quincy@ibm.com) to provision a sample lab environment in the Washington Systems Center.

The next step here is to tighten the security by upgrading from basic authentication to using the SAF registry. You can find more information about that [here](#).

I'd like to thank Mitch Johnson in the Washington Systems Center for developing the JCL used in this tutorial.