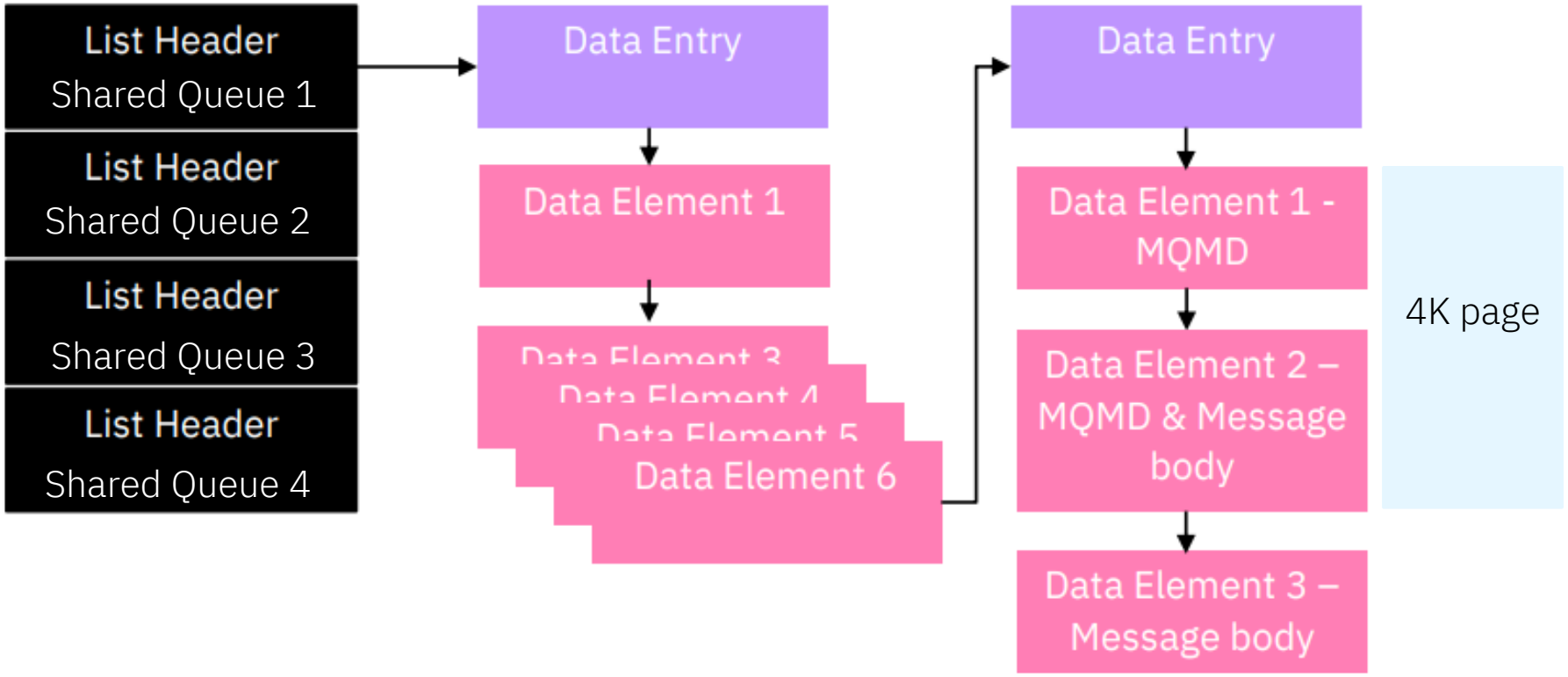
IBM Washington Systems Center

Building a queue-sharing group from scratch

IBM

Internal Representation of a Shared Queue



Planning Storage

Application structures – how to size them?

- How many queues?
- Characteristics of those queues:
  - How big are the messages?
  - How deep do they normally get?
  - How deep do they abnormally get?
    - Are there requirements to hold X messages for Y time?
  - Are there any messages greater than 63K?
    - External storage plans for Shared Message Data Sets
  - Characteristics of the CF List structure
    - How much storage will the z/OS admin let me have?
    - Do I need a failover structure (yes, yes you do)?
      - Where will that be?

Basic queue sharing group configuration

CSQ Admin

CSQSYSAPPL

App Structure

App Structure 2

- Holds information about the Queues and messages within a UoR
- Sizing is based on the number of queue managers in the QSG and the version of the CF you are using
- Use the CF Sizer tool to establish the size

- Hold Group UoR information – used by WAS and CICS
- Sizing has never really been an issue

- This holds the queues and messages (or pointers to the messages)

Background and parameters

Subsystem name: D3A1

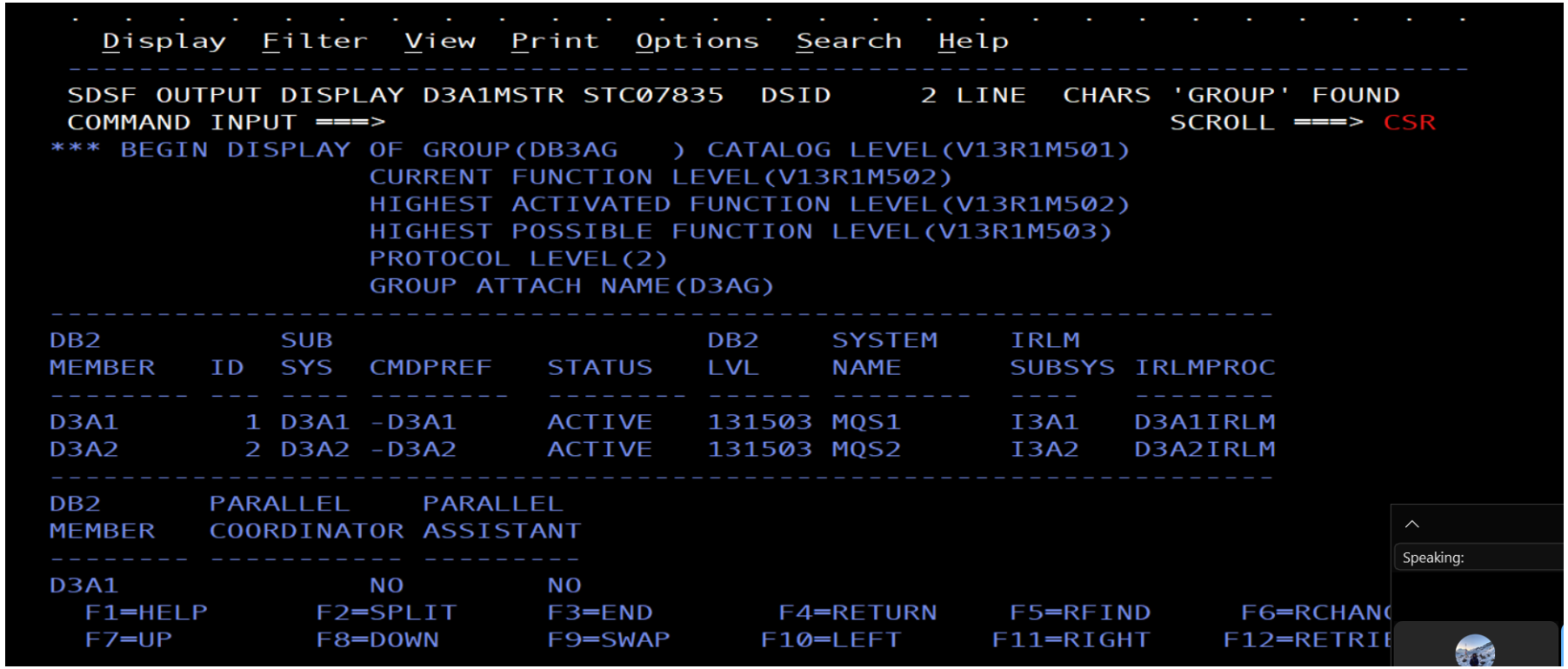
Structure tying them together: DB3AG_SCA

QSG name: QSGA

CF names: CF01, CF02

Structures we want to define: CSQ_ADMIN, CSQSYSAPPL, TEST

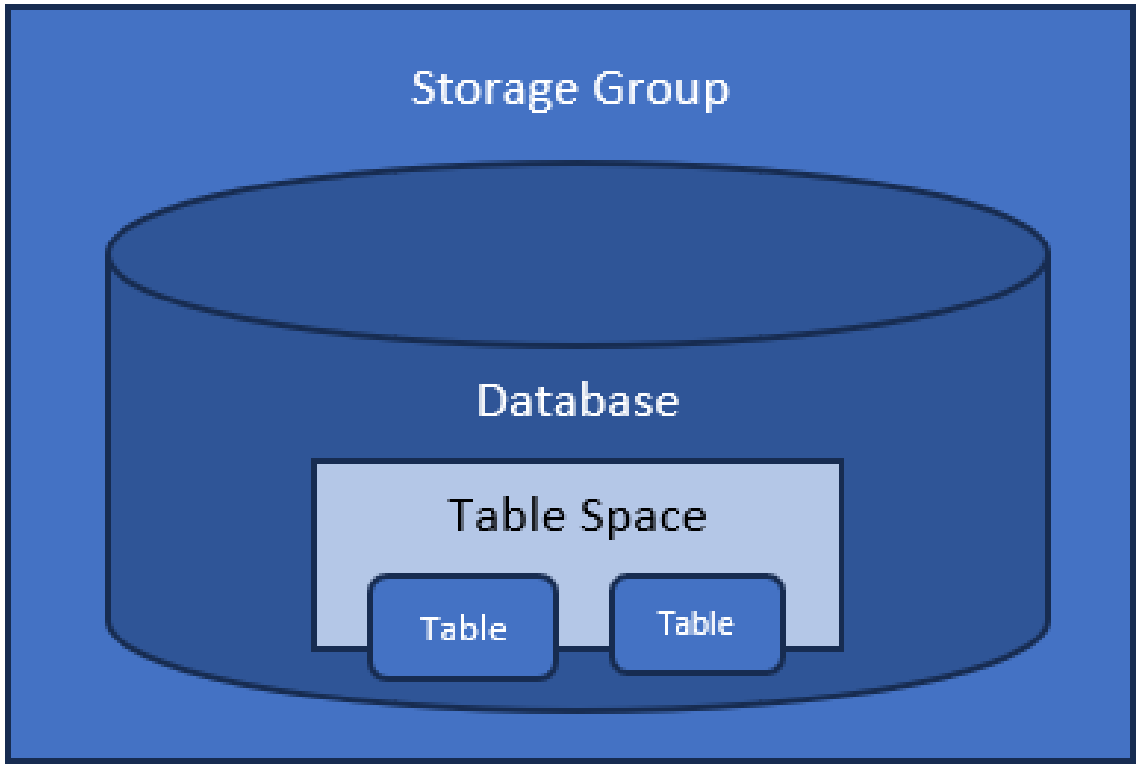
CFRM policy name: CFRM003



Members we will need

CSQ4CFRM	
CSQ4XCSG	Create the storage group
CSQ45CDB	Create the DB2 database used by IBM MQ
CSQ45CTS	Create the table spaces used by IBM MQ
CSQ4CTB	Create the tables and indices used by IBM MQ
CSQz45BPL	Bind the DB2 plans used by IBM MQ using DB2 TSO batch interface
CSQ45AQS	Add a QSG record into the DB2 admin table CSQ.ADMIN_B_QSG
CSQ45AQM	Add a queue manager record into the DB2 admin table CSQ.ADMIN_B_QSG

Some basic DB2 architecture



CSQ4CFRM

An administrative structure called qsg-name CSQ_ADMIN. This structure is used by MQ itself and does not contain any user data.

A system application structure called qsg-name CSQSYSAPPL. This structure is used by MQ system queues to store state information.

One or more structures used to hold messages for shared queues

```
STRUCTURE NAME(QSGACSQ_ADMIN)
      SIZE(60000)
      INITSIZE(30000)
      PREFLIST(CF01,CF02)
      FULLTHRESHOLD(85)
```

```
STRUCTURE NAME(QSGATEST2)
      SIZE(524288)
      INITSIZE(272144)
      PREFLIST(CF01,CF02)
      FULLTHRESHOLD(25)
      ALLOWAUTOALT(YES)
```

Activating the new CFRM policy with our changes

SETXCF START,POLICY,TYPE=CFRM,POLNAME=policy-name

```
BROWSE    SYS1.MQPLEX1.CFRM.POLICY.JCL(CFRM004)
      FULLTHRESHOLD(85)

  STRUCTURE NAME(QSGACSQSYSAPPL)
      SIZE(100000)
      INITSIZE(50000)
      PREFLIST(CF02,CF01)
      FULLTHRESHOLD(85)

  STRUCTURE NAME(QSGATEST1)
      SIZE(524288)
      INITSIZE(272144)
      PREFLIST(CF01,CF02)
      FULLTHRESHOLD(25)
      ALLOWAUTOALT(YES)
  STRUCTURE NAME(QSGATEST2)
      SIZE(524288)
      INITSIZE(272144)
      PREFLIST(CF01,CF02)
```

CSQ4XCSG

Sample job to create the DB2 storage group used by IBM MQ using the DB2 TSO batch interface.

```
CREATE STOGROUP
MQSTGG VOLUMES('*')
VCAT DB3AD;
```

```
//* YOU MUST DO GLOBAL CHANGES ON THESE PARAMETERS USING YOUR EDITOR
//*
//*    Replace   DB2V13
//*                      with the high level qualifier of the
//*                      DB2 target library data sets.
//*
//*    Replace   D3AG
//*                      with the DB2 subsystem ID or
//*                      batch group attach name through which access
//*                      is gained to the DB2 data-sharing group.
//*
//*    Replace   DB2V13
//*                      with the version number of DB2 you
//*                      are currently using, for example
//*                        71 = DB2 for OS/390 V7.1
//*
//*    Replace   USER1
//*                      with the name of the user id with sufficient
```

```
//*    Replace   MQSTGG
//*                      with the name of the DB2 storage group
//*                      associated with the IBM MQ database.
//*
//*    Replace   ++DB2VCAT++
//*                      with the short identifier of the ICF
//*                      catalog for the storage group.
//*
```

CSQ4XCDB

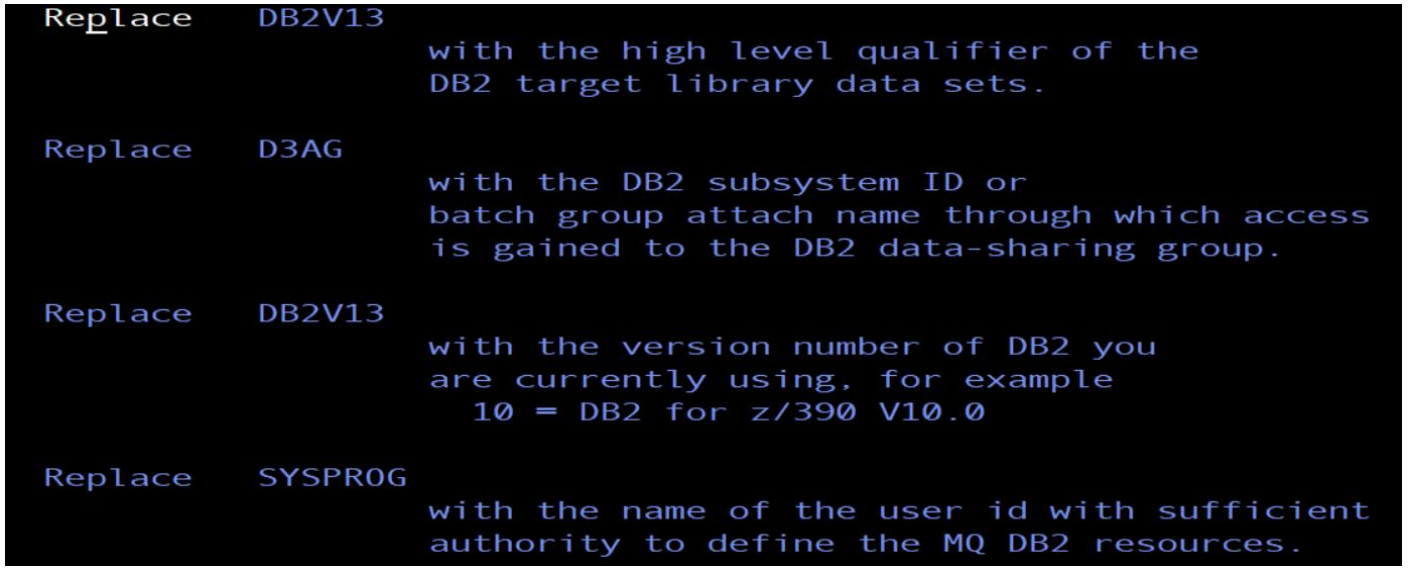
Sample job to create the DB2 database used by IBM MQ using the DB2 TSO batch interface.

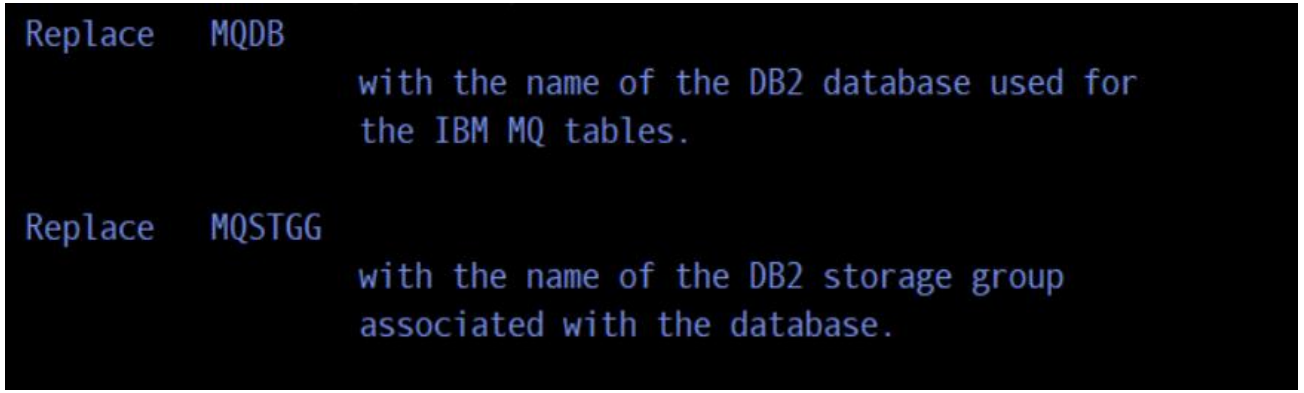
```
CREATE DATABASE "MQDB"
  STOGROUP MQSTGG
  BUFFERPOOL BP32K
  INDEXBP BP4
  CCSID EBCDIC;
```

```
Replace   DB2V13
                with the high level qualifier of the
                DB2 target library data sets.

Replace   D3AG
                with the DB2 subsystem ID or
                batch group attach name through which access
                is gained to the DB2 data-sharing group.

Replace   DB2V13
                with the version number of DB2 you
                are currently using, for example
                  51 = DB2 for OS/390 V5.1

Replace   SYSPROG
                with the name of the user id with sufficient
                authority to define the MQ DB2 resources.

Replace   MQSTGG
                with the name of the DB2 storage group
                associated with the database.

Replace   BP32K
                with the name of a DB2 32K buffer pool
                associated with the database.

Replace   BP4
                with the name of a DB2 4K buffer pool
                to be used for all indexes on IBM MQ tables
```

CSQ4XCTS

Sample job to create the DB2 tablespaces used by IBM MQ using the DB2 TSO batch interface.





CSQ4XCTB

Create the 15 Db2 tables and associated indexes.

```
CREATE TABLE CSQ.ADMIN_B_QSG
       (
       QSGNAME          CHAR(4)   NOT NULL,
       ARRAY_QMGR       CHAR(32),
       ARRAY_STRUC      CHAR(64),
       PRODLVL          CHAR(3)   NOT NULL,
       VERSIONCOUNT     INT,
       UPDT_QMGR        CHAR(48),
       UPDT_QMGRNUM     SMALLINT,
       UPDT_STAMP       CHAR(8),
       CREATE_QMGR      CHAR(48),
       CREATE_QMGRNUM   SMALLINT,
       CREATE_STAMP     CHAR(8),
       RECON_STAMP      CHAR(8)   WITH DEFAULT X'00',
       RECON_QMGRNUM    SMALLINT WITH DEFAULT 0,
       PRIMARY KEY (QSGNAME)
       )
       IN MQDB.ADMQSG;
```

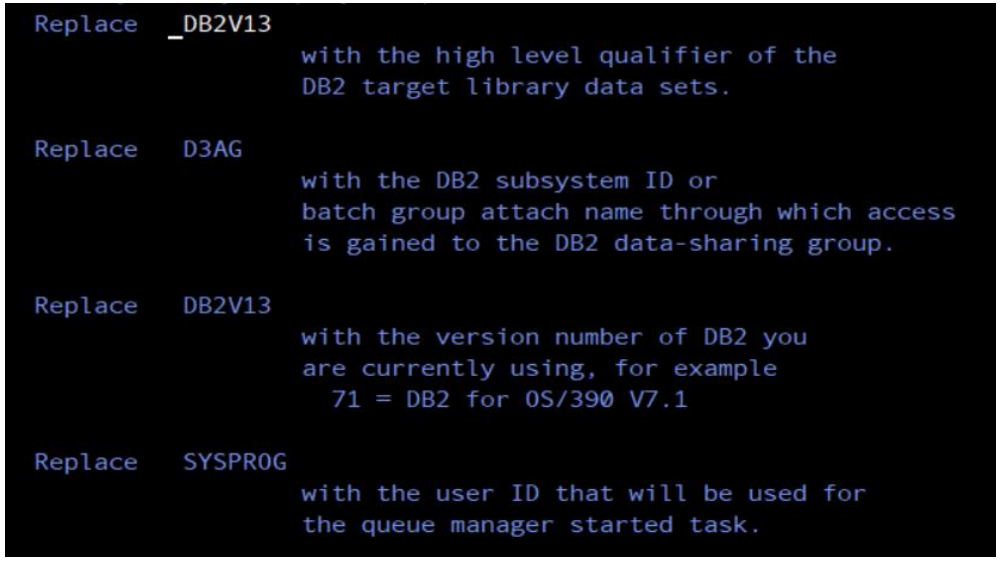
```
Replace    DB2V13
                  with the high level qualifier of the
                  DB2 target library data sets.

Replace    D3AG
                  with the DB2 subsystem ID or
                  batch group attach name through which access
                  is gained to the DB2 data-sharing group.

Replace    DB2V13
                  with the version number of DB2 you
                  are currently using, for example
                    71 = DB2 for OS/390 V7.1

Replace    MQDB
                  with the name of the DB2 database used for
                  the IBM MQ tables.
```

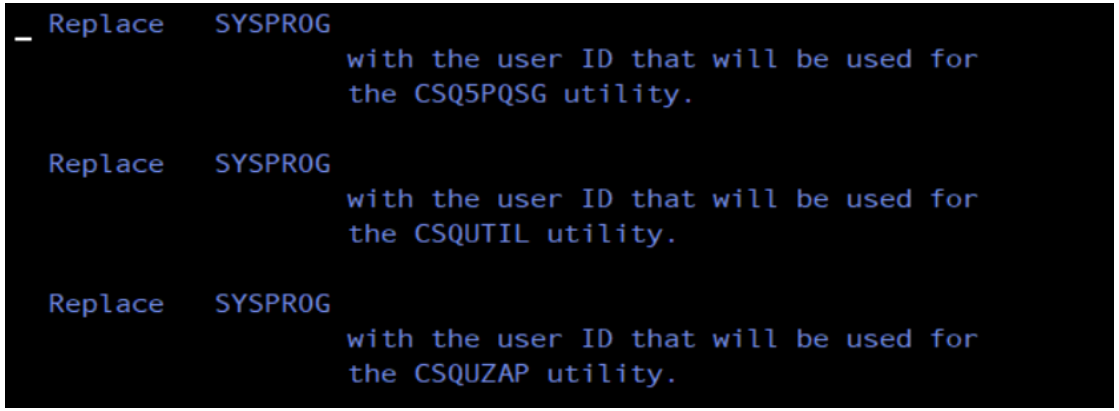
```
CREATE UNIQUE INDEX CSQ.ADMIN_QSG
       ON CSQ.ADMIN_B_QSG (QSGNAME ASC)
       CLUSTER
       USING STOGROUP MQSTGG
       PRIQTY -1
       SECQTY -1
       CLOSE NO;
```

```
PRIMARY KEY (NLNAME, QSGNAME),
FOREIGN KEY (QSGNAME) REFERENCES CSQ.ADMIN_B_QSG
ON DELETE CASCADE
)
IN MQDB.OBJNL;
```

CSQ45GEX

GRANT EXECUTE ON PLAN CSQ5A9X0 TO SYSPROG;
GRANT EXECUTE ON PLAN CSQ5C9X0 TO SYSPROG;
GRANT EXECUTE ON PLAN CSQ5D9X0 TO SYSPROG;
GRANT EXECUTE ON PLAN CSQ5L9X0 TO SYSPROG;
GRANT EXECUTE ON PLAN CSQ5M9X0 TO SYSPROG;
GRANT EXECUTE ON PLAN CSQ5P9X0 TO SYSPROG;

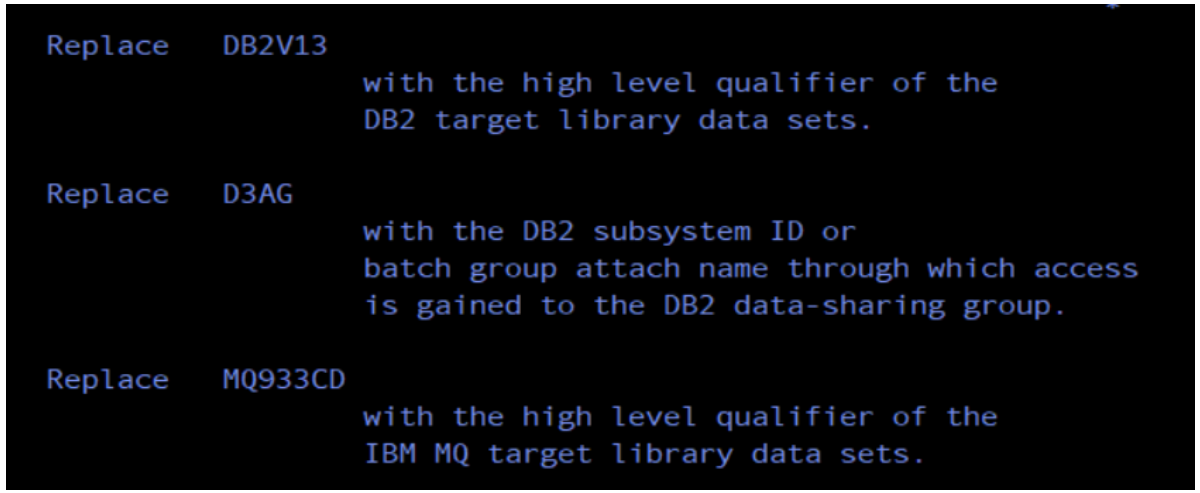




CSQ45BPL

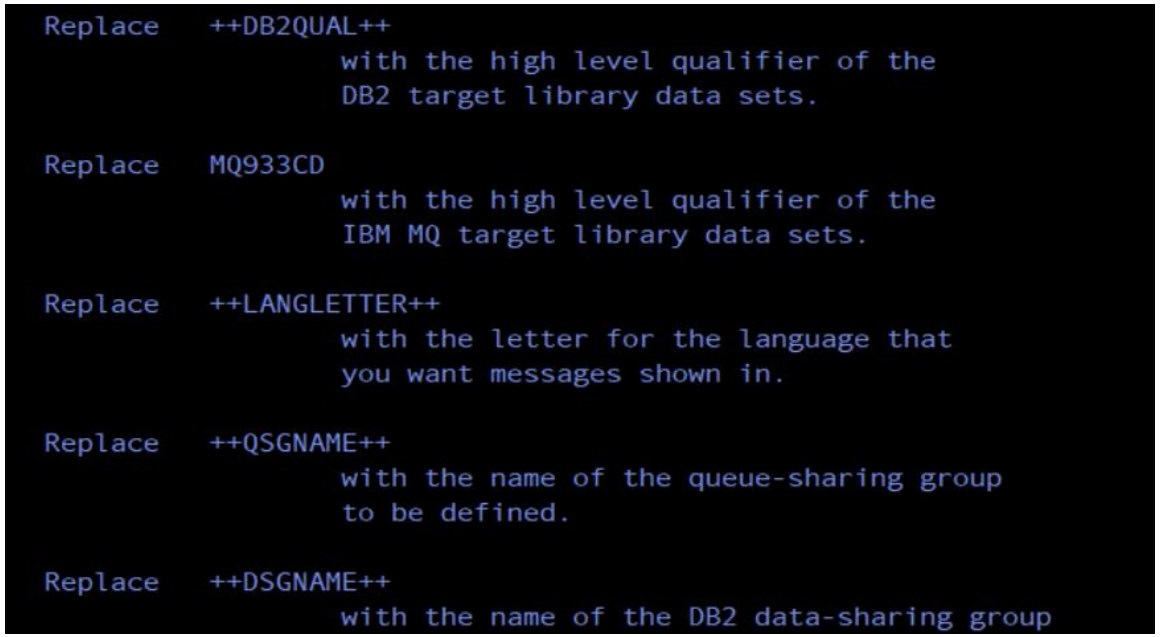
CSQ45BPL binds the Db2 plans for the queue manager, utilities, and channel initiator.

```
BIND PLAN(CSQ5A9X0) -
PKLIST(CSQ5A9X0.CSQ5A9X0) -
ACQUIRE(USE) RELEASE(COMMIT) -
CURRENTDATA(NO) -
ENCODING(EBCDIC) -
ACT(REP) RETAIN ISOLATION(CS)
```



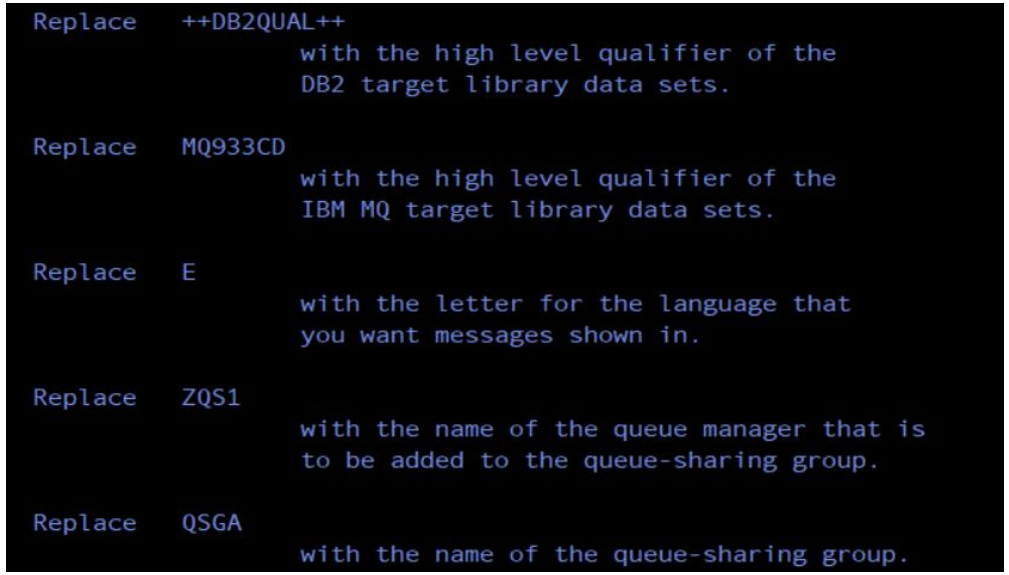
CSQ45AQS

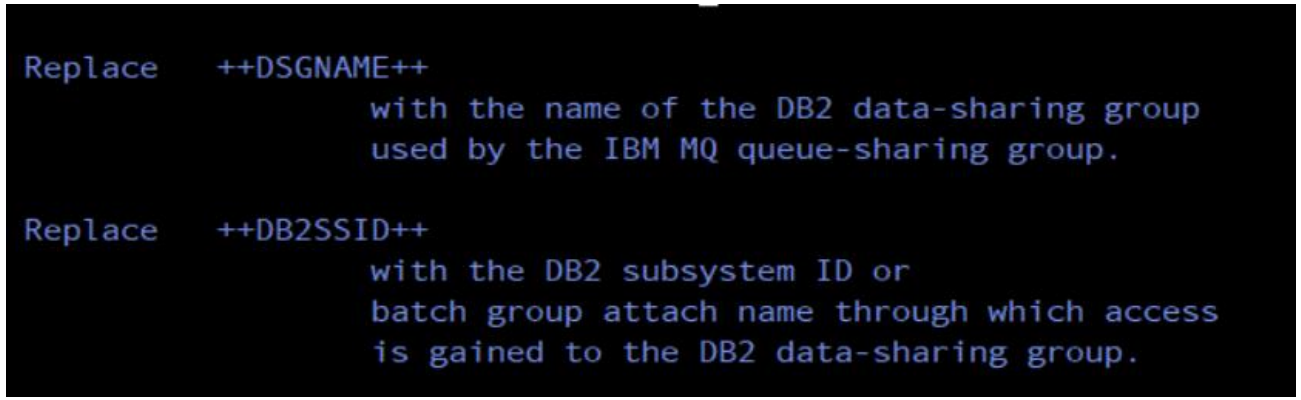
Sample job to add a queue-sharing group record into the DB2 administration table CSQ.ADMIN_B_QSG used by IBM MQ using the CSQ5PQSG utility.



CSQ45AQM

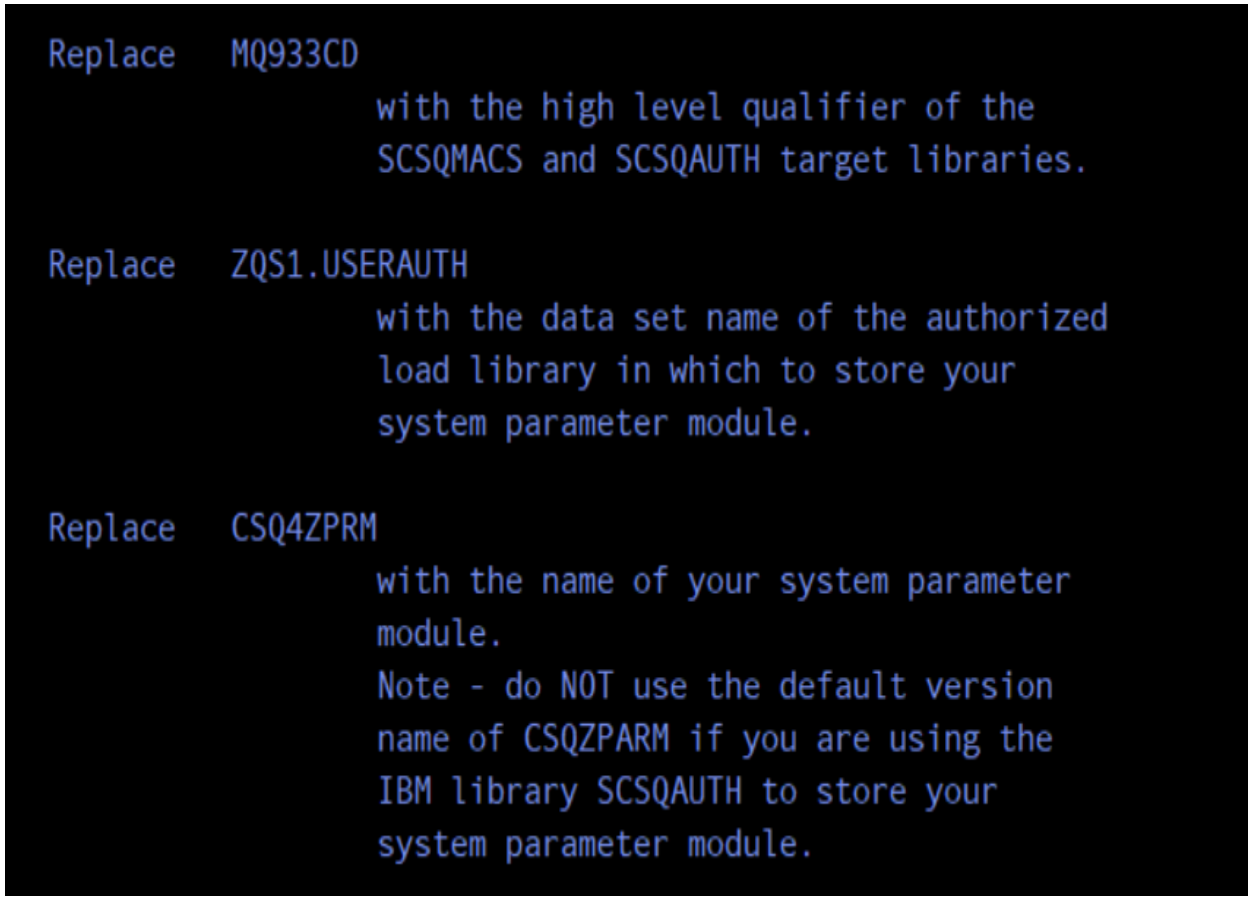
Defines the queue managers to the DB2 data sharing group tables for IBM MQ. This may be run multiple times as queue managers are added



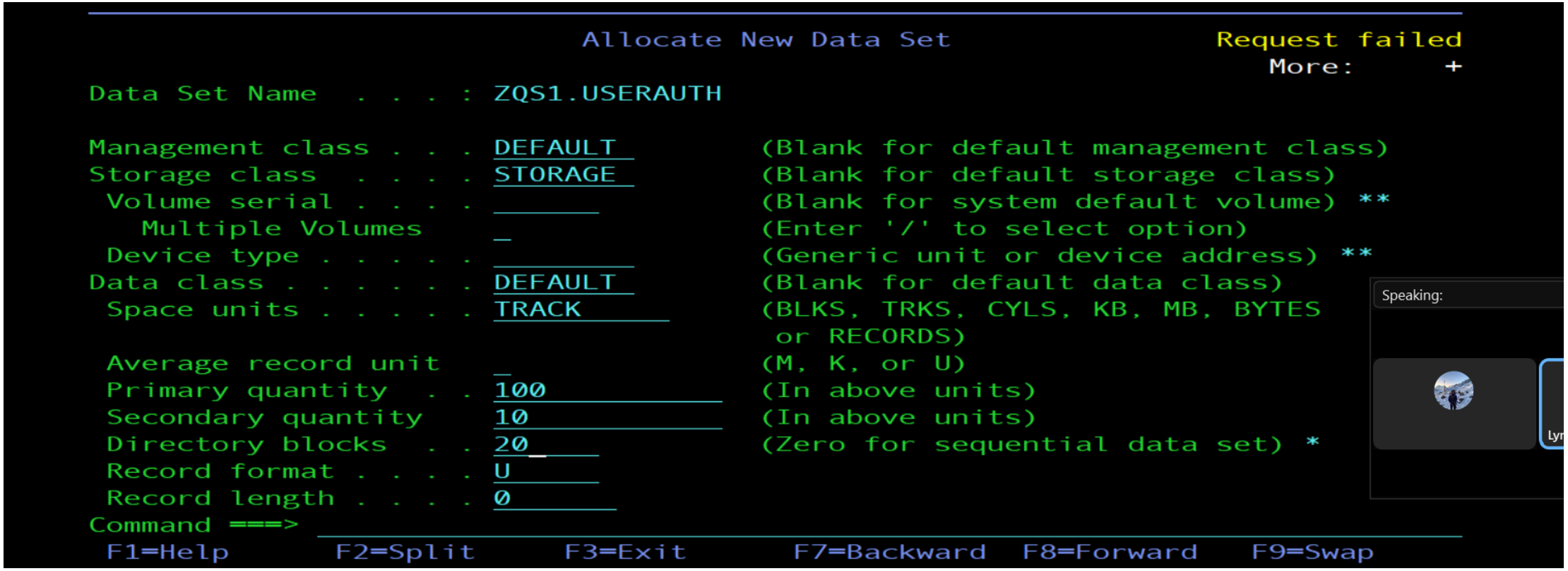


CSQZPRM

Must be customized for each queue manager
Update the QSGDATA parm
QSGDATA=(QSGA,DB3AG,D3AG,4,4)
QSGA is QSG name
DB3AG is the Db2 data sharing group
D3AG is the DB2 connection name
4 is the number of server tasks used for accessing DB2
4 is the number of tasks used for accessing the BLOBS



Allocating USERAUTH



APF authorizing USERAUTH

```
DISPLAY PROG,APF
```

```
SETPROG APF,ADD,DSNAME=ZQS1.USERAUTH, VOLUME=SMS
```

Display commands are your best friends

- display usage
- display qlocal
- -D3A1 DISPLAY BUFFERPOOL(BP4)
- DISPLAY PROG,APF
- display XCF,POLICY,TYPE=CFRM
- -D3A1 DISPLAY group(*)
- -DIS GROUP
- -D3A1 DISPLAY BPOOL(*)

Lessons lea

SQL ERROR DURING EXECUTE IMMEDIATE
DSNT408I SQLCODE = -647, ERROR: **BUFF**
MQDB.EXTQMGR HAS NOT
BEEN ACTIVATED
DSNT418I SQLSTATE = 57003 SQLSTATE F
DSNT415I SQLERRP = DSNXIC01 SQL PRC
DSNT416I SQLERRD = 40 0 0 -1 0 0 SQ
DSNT416I SQLERRD = X'00000028' X'00
activation of MQDB.OBJSTGC, MQDB.OBJ

```
//$$BP4      JOB (999,POK),'DB3A INSTALL',CLASS=A,
// MSGCLASS=T,NOTIFY=SYSADM,TIME=NOLIMIT,REGION=0M
/*JOBPARM SYSAFF=*,L=9999
// JCLLIB ORDER=(DB3AM.PROCLIB)
//JOBLIB  DD  DISP=SHR,
//            DSN=DB2V13.SDSNLOAD
//*
//DSNTIAB EXEC PGM=IKJEFT01,DYNAMNBR=20
//SYSTSPRT DD  SYSOUT=*
//SYSPRINT DD  SYSOUT=*
//SYSUDUMP DD  SYSOUT=*
//SYSTSIN  DD  *
  DSN SYSTEM(D3A1)
  -ALTER BUFFERPOOL (BP4) VPSIZE(20000)
//*
//DSNTICR EXEC PGM=IKJEFT01,DYNAMNBR=20,COND=(4,LT)
//SYSTSPRT DD  SYSOUT=*
//SYSPRINT DD  SYSOUT=*
//SYSUDUMP DD  SYSOUT=*
//SYSTSIN  DD  *
  DSN SYSTEM(D3A1)
  RUN PROGRAM(DSNTIAD)  PLAN(DSNTIA13) -
       LIB('DB3AM.RUNLIB.LOAD')
  END
//SYSIN    DD  *
   SET CURRENT SQLID = 'SYSADM';
   GRANT USE OF BUFFERPOOL BP4
         TO PUBLIC;
//*
```

Lessons learned

CREA

ID as

//SYS

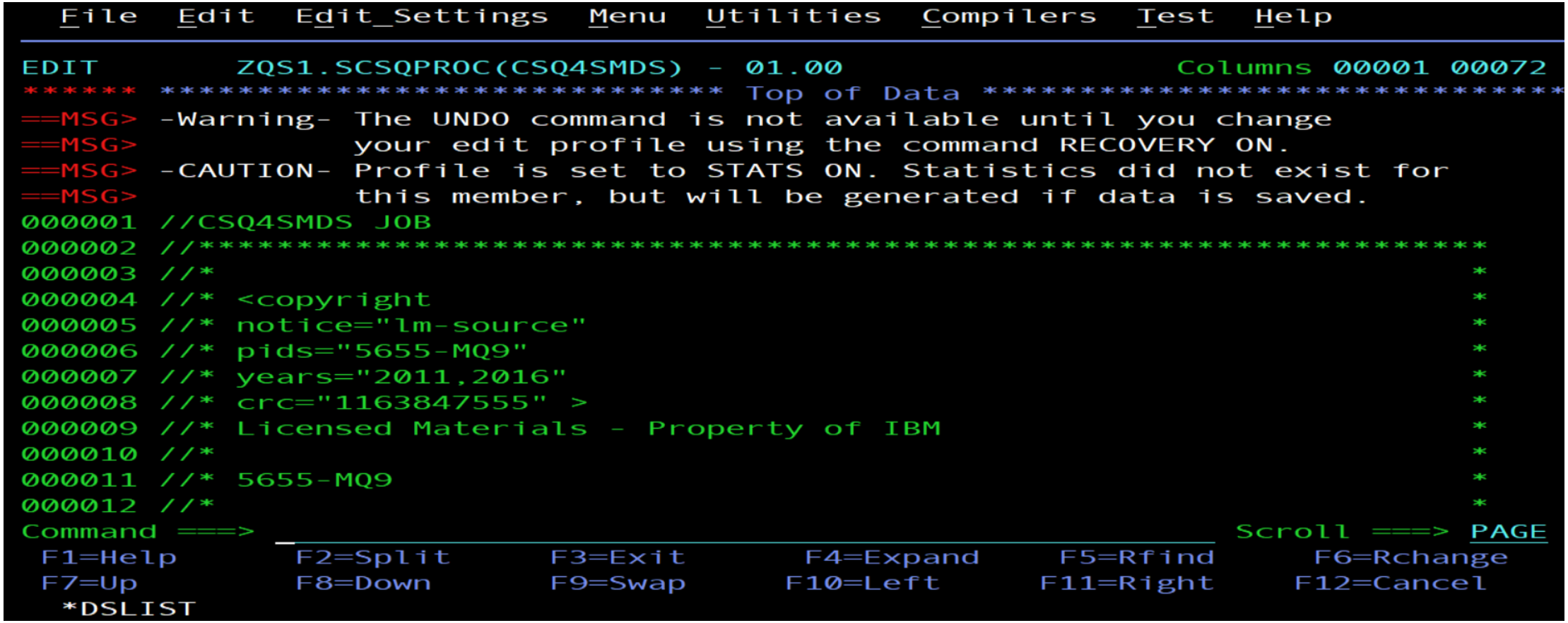
SET

```
000072 //SYSIN    DD *
000073    SET CURRENT SQLID = 'USER1';
000074    CREATE STOGROUP MQSTGG VOLUMES(*);
000075 /*
000076 //
```

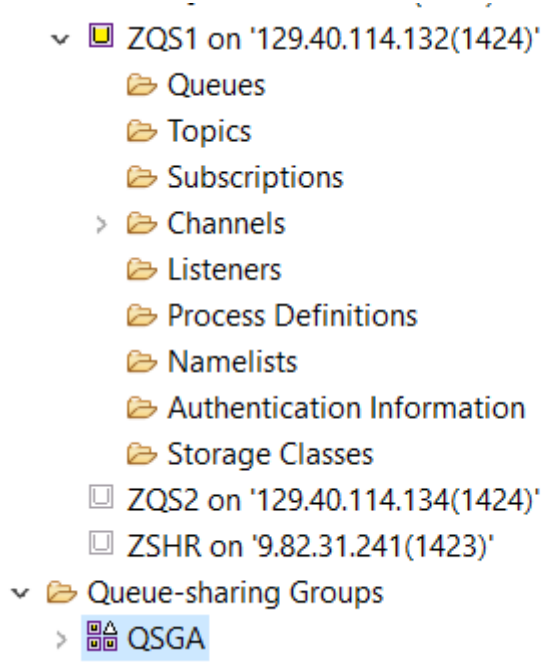
CREATE STOGROUP MQSTGG VOLUMES('*') VCAT DB3AD;

```
         CREATE STOGROUP MQSTGG VOLUMES(*)
 SQL ERROR DURING EXECUTE IMMEDIATE
DSNT408I SQLCODE = -104, ERROR:  ILLEGAL SYMBOL "*". SOME SYMBOLS THAT MIGHT BE
DSNT418I SQLSTATE   = 42601 SQLSTATE RETURN CODE
DSNT415I SQLERRP    = DSNHPARS SQL PROCEDURE DETECTING ERROR
DSNT416I SQLERRD    = 3  0  0  -1  32  502 SQL DIAGNOSTIC INFORMATION
DSNT416I SQLERRD    = X'00000003'  X'00000000'  X'00000000'  X'FFFFFFFF'  X'000
         INFORMATION
1READY
    DSN SYSTEM(D3AG)
```

What’s next? Shared message data sets



Success!



Queue-sharing Group QSGA

Queue-sharing group information source:

Queue manager name	ZQS1
Description	IBM MQ for z/OS - V9.3.3
Command level	933
QMID	ZQS1.DE7D142F0856B581
Coded character set ID	500

Last updated: 20:07:06

Members of queue-sharing group:

Queue manager name	Queue manager number	DB2 name	Queue manager status	DB2 connection status	Command level	Queue manager CPF
ZQS1	1	D3A1	Active	Active	933	ZQS1
ZQS2	2	D3A2	Active	Active	933	ZQS2

CFLEVEL = 3

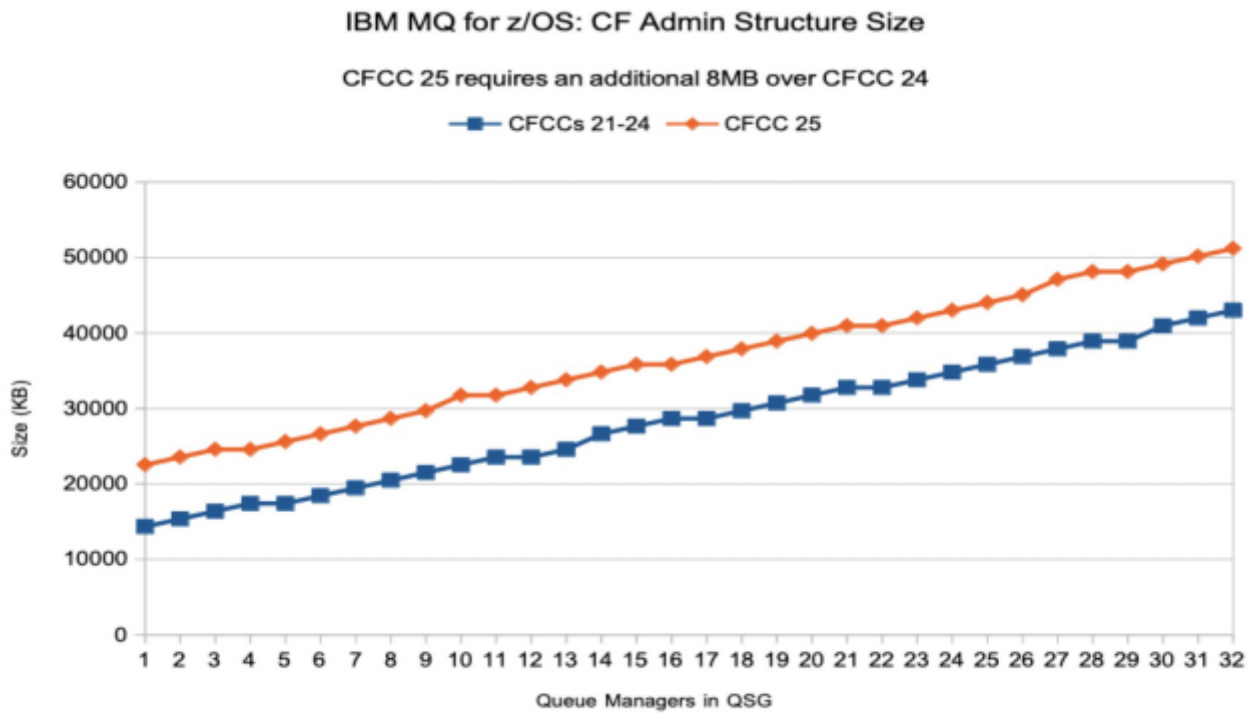
Persistent and non-persistent messages less than 63KB.

CFLEVEL = 4

Persistent and non-persistent messages up to 100MB

CFLEVEL = 5

As CFLEVEL(4) but allows tiered offloading when coupling facility fills and offload choice of DB2 or SMDS


IBM MQ for z/OS: CF Admin Structure Size
CFCC 25 requires an additional 8MB over CFCC 24
CFCCs 21-24
CFCC 25
Size (KB)
60000
50000
40000
30000
20000
10000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Queue Managers in QSG

CF Sizer tool
Link: [MQSeries (ibm.com)]

MQSeries Administration structure

MQSeries Administration structure help

Number of members in the queue sharing group: 8

Entry ratio	Element ratio
1	2

MQSeries Application structure

MQSeries Application structure help

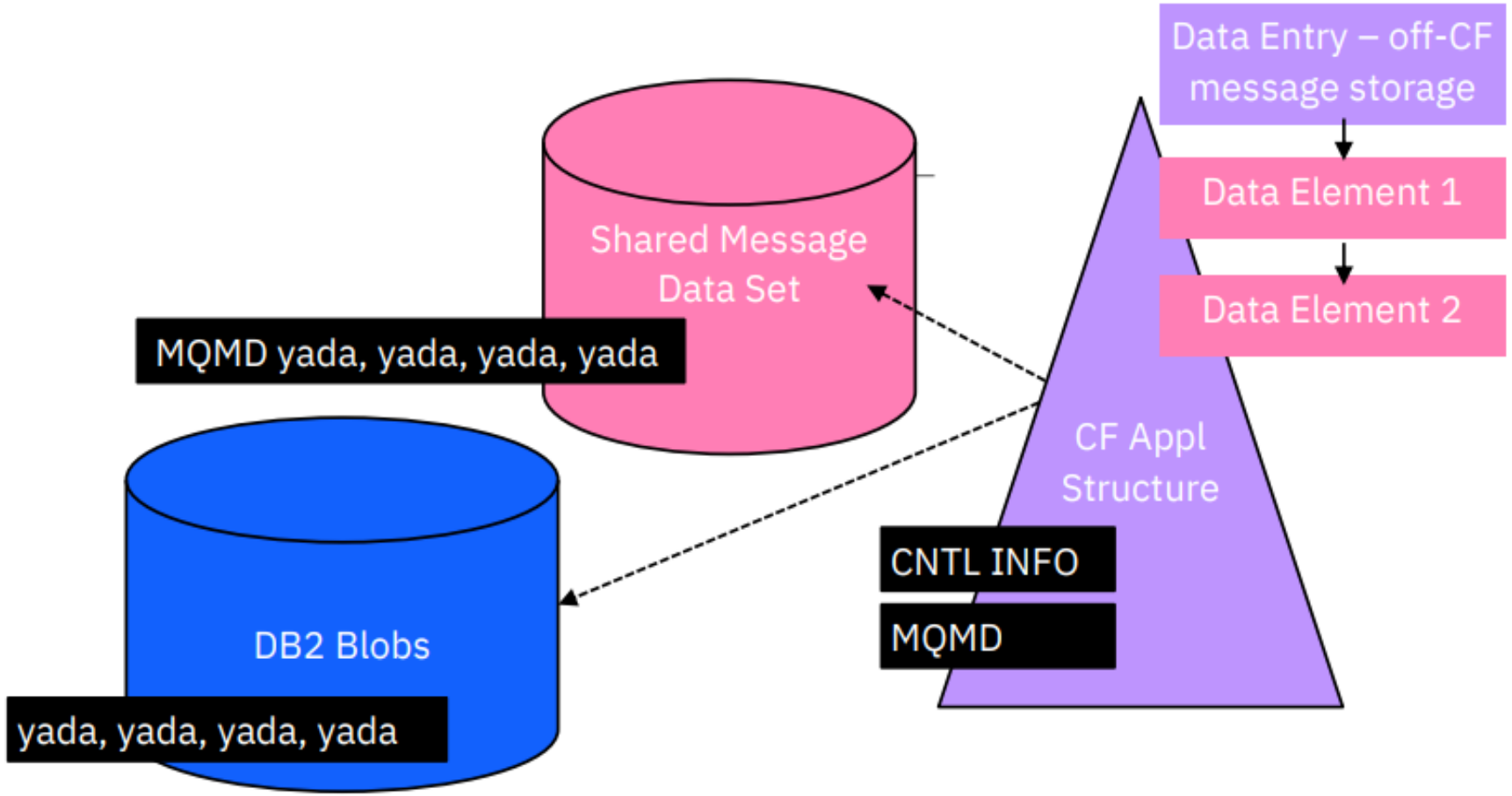
Average arrival rate of MQ messages with average size < 63KB (messages / minute)	Average size of those messages
100	956

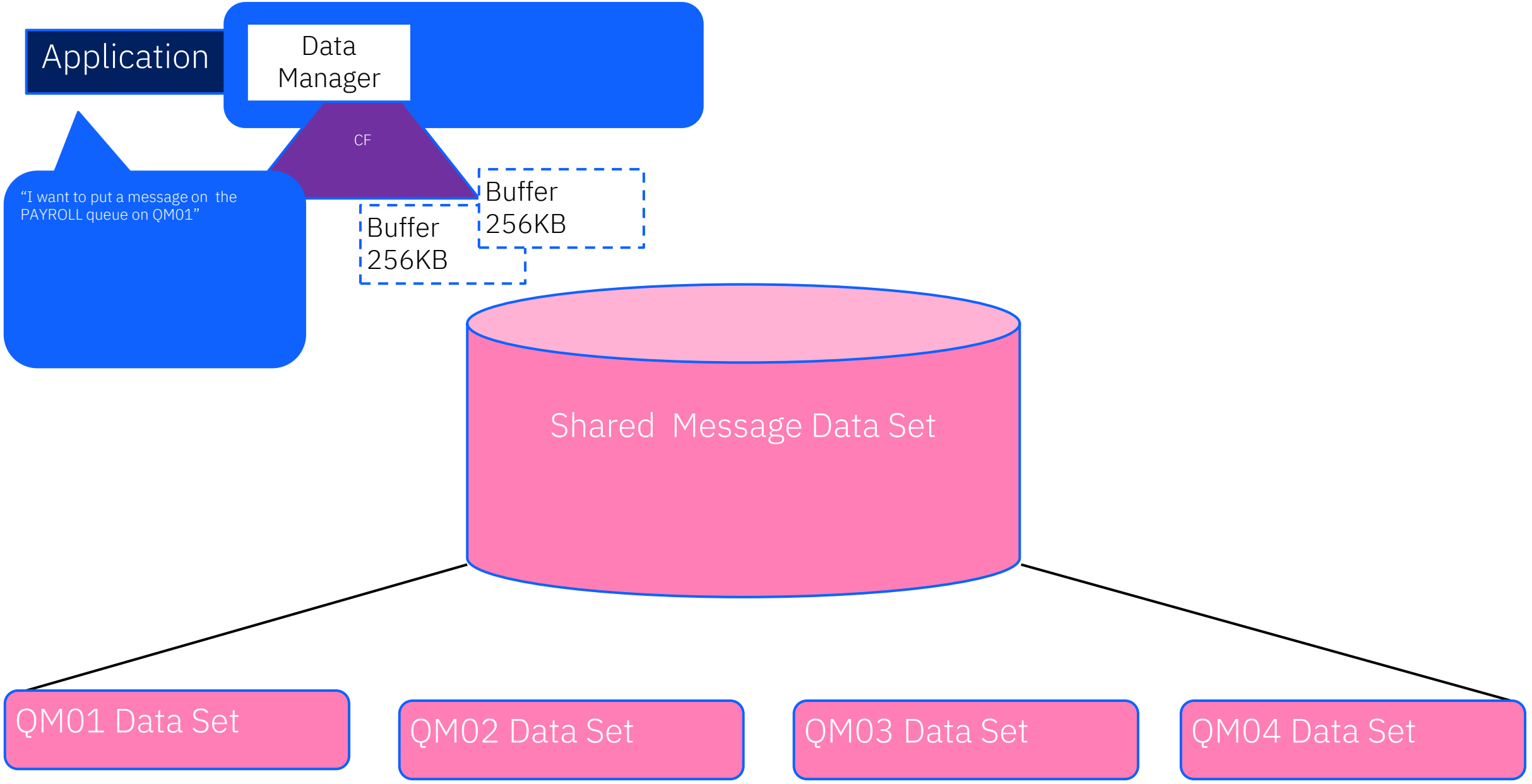
Average arrival rate of MQ messages with average size >= 63KB (messages / minute): 0

CF real storage message capacity (minutes)	Overflow (SCM) message capacity (minutes)
180	0

Entry ratio	Element ratio
1	6

Shared Queue Message Storage




Application
Data Manager
CF
"I want to put a message on the PAYROLL queue on QM01"
Buffer 256KB
Buffer 256KB
Shared Message Data Set
QM01 Data Set
QM02 Data Set
QM03 Data Set
QM04 Data Set

Resources:

Managing queue sharing groups - IBM Documentation

Set up the Db2 environment - IBM Documentation

MP16 performance manual