



z/VSE DMF

This presentation discusses DMF and how to set it up and use it.

Mike Poil

michaelalanpoil@gmail.com



Bedtime Reading

- CICS Performance SG33-1667.
- CICS Operations and Utilities SC33-1654.
- Beware, the above manuals were written for CICS TS for VSE/ESA 1.1.0.
- z/VSE Planning for sample configuration etc. shipped with z/VSE.



DMF

- DMF is the z/VSE equivalent of z/OS SMF, and is used by CICS to log SMF 110 records for CICS Statistics and Monitoring.
- The z/VSE Basic Security Manager (BSM) also uses it to write SMF 80 records for auditing, and other products may use DMF.
- ASG TMON/CICS and Velocity Software, Inc use the CICS Monitoring records and TMON/CICS stops them being sent to DMF by default, but that can be changed.
- It is described in the CICS TS 1.1 Operations and Utilities Guide chapter 8.
- DMF must run in a high PRTY partition with about 8MB of storage (ICCF library 59 SKDMFST has sample JCL) and must be active before CICS starts.
- The SMF records are initially cached in a Dataspace, but are "flushed" to an ESDS after a specified interval occurs or is changed, when the Dataspace usage exceeds a specified threshold, when a SETDMF FLUSH operator command (MSG xx,DATA=SETDMF FLUSH) is executed or when DMF is shut down normally.



DMF

- You must assemble and link it a DFHDMFDM macro-produced phase that specifies DMF options, including the names of a series of ESDS that are available to DMF - see IJSYSRS.SYSLIB DFHDMFSP.A for the z/VSE-supplied source for SUFFIX=SP, but I would suggest **not** to use suffix SP if you customise it.
- You run an IDCAMS DELETE/DEFINE for each ESDS - see IJSYSRS.SYSLIB VSAMDEFS.Z for the default DMF ESDS datasets allocated during installation in catalog VSESPUC; space allocations are likely to be much too small.
- Each ESDS must be cleared by the utility DFHDFOU before using it for the first time and **before** DMF reuses it, or DMF will add new data to the end.
- The SKDMFST skeleton DMF job clears the files whenever DMF is started, and IJSYSRS.SYSLIB VSAMINIT.Z clears them initially
- The first dataset is made "active", and DMF will use it until it is full or a SETDMF SWITCH command is issued, when the dataset is closed; DMF will use the next dataset in cyclic mode, and will re-use a non-empty dataset without warning.



DMF

- After a DMF ESDS is closed, the data must be copied to a sequential dataset by the DFHDFOU utility program for data formatting.
- ICCF library 59 SKDMFPR can be modified to run DFHSTUP to print CICS statistics records; DFH\$MOLS JCL is not supplied, but is very similar.
- The customer needs to think about the process for extracting and reporting on the data, especially if DMF is left to run continuously.
- For CICS statistics with SIT STATRCD=OFF, data is written at the CICS "midnight" (and CICS counters are reset) or at shutdown, whichever comes first.
- For STATRCD=ON, data is additionally written at regular intervals (and CICS counters are reset), by default every 3 hours.
- The use of CEMT commands can affect Statistics (and Monitoring) data collection in terms of content and/or when it is written to DMF.



DMF

- When Monitoring is first started in CICS, a dictionary record is created based on the MCT (I suggest that every CICS use the same MCT); without this the IBM-supplied formatters will not be able to use the data, although DFHMNDUP can be used to create a dictionary record from the MCT and VTAM applid.
- CICS monitor data is task-based; records are placed in a buffer and are written when the monitoring buffer is full or at CICS shutdown; the data types written are based on SIT MNxxx parameters.
- If CICS was shut down every day, I would start DMF before CICS starts and shut it down after CICS shutdown, allocating the first ESDS to contain the whole day's data with a smaller ESDS in case it was required.
- Otherwise, it gets a bit more complicated; you could schedule jobs that allow you to flip-flop between 2 datasets, i.e. one dataset one day, and the other dataset the following day; switch the active dataset just after CICS "midnight", extract the data then clear the ESDS ready for it to be used again the next day.



DMF

- Only DFH\$MOLS is available as standard to print CICS Monitoring records, and must be Assembled by the customer; expect a lot of printed output when using this and the default MCT, although you can reduce it by using a customised MCT.
- My DFH\$MCSV program is based on DFH\$MOLS, but creates a CSV data file directly from the Task Performance records (but prints everything else); it may need to have the source customised as the code does not format every possible data values; it handles CICS TS 1.1.1 and 2.1. I have yet to try 2.2, but I don't expect it to pose a problem.
- Include the DL/I EMPs if you have DL/I active under CICS - see the DL/I Database Administration manual chapter 10.
- Activating CICS Monitoring adds a cpu delta of about 10% within CICS based on my last test, but YMMV.
- To get help on DMF console commands, issue MSG xx to DMF in partition xx (e.g. MSG Z1), then reply with a "?".



DMF

- IJSYSRS.SYSLIB DFHDMFSP.A; add JCL to Assemble and LNKEDT.

```
*****
*                                                                 *
*   5686-066 (C) COPYRIGHT IBM CORP. 1996                       *
*                                                                 *
*****
      TITLE 'DFHDMFSP -- SUPPLIED BY VSE/ESA'
      PUNCH ' CATALOG DFHDMFSP.OBJ REP=YES '
      DFHDMFM TABLE,
          CATALOG=VSESP.USER.CATALOG, USE VSESPUC
          FILELIST=(CICS.DBDCCICS.DFHDMFA,CICS.DBDCCICS.DFHDMFB),
          INTERVAL=3000,      30 MINUTES 0 SECONDS
          LISTDSN=YES,      SHOW DATASETS WHEN DMF STARTS
          SID=VSE,          SYSTEM IDENTIFIER
          SIZE=4,           USE A 4M DATA SPACE
          STATUS=ACTIVE,   DMF IS ACTIVE AT START
          SUFFIX=SP,       THIS TABLE IS CALLED DFHDMFSP
          TRACE=NO,        NO TRACE ACTIVITY
          TRTABSZ=1024,    TRACE TABLE SIZE IS 1M
          TYPE=0:255,     RECORD ALL DMF DATA RECORD TYPES
          USAGE=50        REDUCE SPACE WHEN 50% FULL
      END
```




DMF

- Extract from IJSYSRS.SYSLIB VSAMDEFS.Z; add BUFSP(nnnnnn) to reduce EXCPs when writing data, using at least 7 * CISZ (use an odd number).
- For Monitor data a conservative estimate is 1 cylinder of 3390 for every 800 tasks with the default MCT, but a customised MCT will allow for more or less per cylinder, e.g. with the DL/I clocks it will be approximately 675.
- Maybe allocate 5 cylinders for each CICS EOD statistics data when using SIT STATRCD=OFF, but multiply that by n intervals for STATRCD=ON.

```
DEFINE CLUSTER (NAME (CICS.DBDCCICS.DFHDMFA) -  
  NONINDEXED -  
  RECORDS (20000,5000) - secondary should be zero  
  REUSE SPANNED -  
  RECORDSIZE (125 32767) - the average record size is much too small  
  VOLUMES (DOSRES,SYSWK1) -  
  NOCOMPRESSED -  
  SHAREOPTIONS (2) -  
  TO (99366 )) -  
  DATA (NAME (CICS.DBDCCICS.DFHDMFA.@D@) -  
  CONTROLINTERVALSIZE (4096)) - 8192 is better, but use 32768 if Monitor data is written  
  CATALOG (VSESP.USER.CATALOG)
```



DMF

- JCL to initially clear the DMF ESDS datasets in IJSYSRS.SYSLIB VSAMINIT.Z
- The z/VSE supplied DFHDMFA and DFHDMFB are in the Standard Label Area.

```
// EXEC DFHDFOU  
INDD ( DFHDMFA, OPTIONS (CLEAR) )  
/*  
// EXEC DFHDFOU  
INDD ( DFHDMFB, OPTIONS (CLEAR) )  
/*
```



DMF

- Modified SKDMFST from ICCF library 59; datasets are cleared on start-up:

```
* $$ JOB JNM=DMFSTART,CLASS=S,DISP=L
* $$ LST CLASS=Q,DISP=H
// JOB DMFSTART DMF STATISTIC SERVER (CLASS S IS 15MB)
* -----*
*   THIS JOB STARTS THE DMF SERVER PARTITION FOR CICS/TS           *
* -----*
* FOR COMMUNICATION USE 'MSG XX' (PARTITION ID) AND
* 'XX SETDMF .' COMMANDS.
* TERMINATING:
* 'XX SETDMF SHUTDOWN'
* -----*
// LIBDEF PHASE,SEARCH=COMSLIB.POILMIK
// EXEC DFHDFOU
INDD ( DFHDMFA, OPTIONS (CLEAR) )
/*
// EXEC DFHDFOU
INDD ( DFHDMFB, OPTIONS (CLEAR) )
/*
// EXEC DFHDFSIP,SIZE=DFHDFSIP,OS390
SUFFIX=SP
/*
/&
* $$ EOJ
```



DMF

- Modified SKDMFPR:

```
* $$ JOB JNM=DFHDMFPR,CLASS=0,LDEST=(UKCPSTG,POILMIK)
* $$ LST RBM=0,RBS=0
// JOB DFHDMFPR PRINT DMF STATISTICS
* -----*
*   THIS JOB PRINTS OFF STATISTIC DATA GATHERED BY DMF           *
* -----*
* FIRST CLOSE THE DMF DATASET AS FOLLOWS:
* MSG XX,DATA=SETDMF FLUSH
* MSG XX,DATA=SETDMF SWITCH
* WHERE XX IS THE DMF SERVER PARTITION ID.
* -----*
* *****
* STEP 1: UNLOAD DATA FROM THE DMF DATA SETS
* *****
// DLBL INDD1,'CICS.DBDCCICS.DFHDMFA',,VSAM,CAT=VSESPUC
// DLBL INDD2,'CICS.DBDCCICS.DFHDMFB',,VSAM,CAT=VSESPUC
// DLBL OUTDD1,'CICS410.DMF.DATA',0,SD
// EXTENT SYS044,VSEN31,1,0,15,135
// ASSGN SYS044,DISK,VOL=VSEN31,SHR
// EXEC DFHDFOU
INDD ( INDD1, OPTIONS (DUMP))
OUTDD ( OUTDD1, TYPE( 000:255))
/*
```



DMF

```
* *****
* STEP 2: SORT, FORMAT AND PRINT THE STATISTICS RECORDS
*
* THE GENERATED OUTPUT DEPENDS ON THE SELECTION CRITERIA ENTERED
* IN DFHSTUP. YOU MAY SELECT ALL ENTRIES FOR A CERTAIN APPLICATION
* AS SHOWN OR YOU ALSO MAY SELECT ALL ENTRIES BY DATE:
*     DATE START=MM/DD/YYYY,STOP=MM/DD/YYYY
* *****
// DLBL DFHSTAT, 'CICS410.DMF.DATA', 0,SD
// EXTENT SYS045,VSEN31
// ASSGN SYS045,DISK,VOL=VSEN31,SHR
// DLBL DFHSTWK, 'SORT.WORK.FILE.0', 0,SD
// EXTENT SYS011,VSEN31,1,0,300,150
// ASSGN SYS011,DISK,VOL=VSEN31,SHR
// EXEC DFHSTUP,SIZE=1M,OS390
SELECT APPLID=(IYBNZST3)
SORT WORK=1
COLLECTION TYPE=ALL
SUMMARY
/*
/&
* $$ EOJ
```



DMF

- Sample print CICS Monitoring data using DFH\$MOLS:

```
* $$ JOB JNM=DFHDMFPR,CLASS=0,LDEST=(UKCPSTG,POILMIK)
* $$ LST RBM=0,RBS=0
// JOB DFHDMFPR PRINT DMF STATISTICS
* -----*
*   THIS JOB PRINTS OFF STATISTIC DATA GATHERED BY DMF           *
* -----*
* FIRST CLOSE THE DMF DATASET AS FOLLOWS:
* MSG XX,DATA=SETDMF FLUSH
* MSG XX,DATA=SETDMF SWITCH
* WHERE XX IS THE DMF SERVER PARTITION ID.
* -----*
* *****
* STEP 1: UNLOAD DATA FROM THE DMF DATA SETS
* *****
// DLBL INDD1,'CICS.DBDCCICS.DFHDMFA',,VSAM,CAT=VSESPUC
// DLBL INDD2,'CICS.DBDCCICS.DFHDMFB',,VSAM,CAT=VSESPUC
// DLBL OUTDD1,'CICS410.DMF.DATA',0,SD
// EXTENT SYS044,VSEN31,1,0,15,135
// ASSGN SYS044,DISK,VOL=VSEN31,SHR
// EXEC DFHDFOU
INDD ( INDD1, OPTIONS (DUMP))
OUTDD ( OUTDD1, TYPE( 000:255))
/*
```



DMF

```
* *****  
* STEP 2: RUN DFH$MOLS TO PRINT THE CICS MONITORING DATA,  
*      USING THE CICS MONITORING RECORDS FROM STEP 1.  
* *****  
// LIBDEF PHASE,SEARCH=PRD2.CONFIG  
// DLBL INPUT01,'CICS410.DMF.DATA',0,SD  
// EXTENT SYS044,SYSWK2  
// ASSGN SYS044,DISK,VOL=SYSWK2,SHR  
// EXEC DFH$MOLS,SIZE=2M,OS390  
  CONCAT 01  
  SORT  
/*  
/&  
* $$ EOJ
```



DMF

- If DFH\$MCSV is used, change step 2:

```
* *****  
* STEP 2: RUN DFH$MCSV TO CREATE CICS MONITORING CSV DATA WITH  
*       THE CICS MONITORING RECORDS FROM STEP 1  
* *****  
// LIBDEF PHASE,SEARCH=PRD2.CONFIG  
// DLBL INPUT01,'CICS410.DMF.DATA',,VSAM,CAT=VSESPUC,DISP=(OLD,DELETE)  
/*  
/* OUTFILE IS RECFM=VB,BLKSIZE=27990 WITH EACH RECORD ABOUT 400 BYTES  
/*  
// DLBL OUTFILE,'CICS410.CSV.DATA',0,VSAM,CAT=VSESPUC,                *  
        RECORDS=50000,RECSIZE=400,DISP=(NEW,KEEP,DELETE)  
/*  
/* PARAMETER CARDS FOR DFH$MCSV ARE AS FOR DFH$MOLS AND ARE DESCRIBED  
/* IN THE CICS OPERATIONS MANUAL. DFH$MCSV ALSO HAS THE ABILITY TO  
/* USE A SELECT OR IGNORE PARAMETER CARD THAT CONTAINS A "?" CHARACTER  
/* AS A WILDCARD, E.G. IGNORE TRANID=C??? TO IGNORE CICS TRANSACTION  
/* IDS. IGNORE TRANID=C* IS NOT VALID.  
/*  
// EXEC DFH$MCSV,SIZE=2M,OS390  
/*  
/&  
* $$ EOJ
```




DMF

- Selected DMFSTART console messages:

DMF CONSOLE REPORT

DFHDF0025 Data management facility has created dataspace named
DFHDF000, which is 4M bytes in size.

. . .

DFHDF3001 Data set status report.

DFHDF3002 Data Set Name	Status	Avail (%)
-------------------------	--------	-----------

DFHDF3003 CICS.DBDCCICS.DFHDMFA	INIT	100
---------------------------------	------	-----

DFHDF3003 CICS.DBDCCICS.DFHDMFB	INIT	100
---------------------------------	------	-----

DFHDF3004 Data set status report is complete.

DMF CONSOLE REPORT

DFHDF3005 Data Management Facility dataset CICS.DBDCCICS.DFHDMFA
is open.

DMF CONSOLE REPORT

DFHDF0001 Data management facility is started



DMF

- DMF dataspace flush, the first message is produced only if a SETDMF FLUSH command was entered:

DMF CONSOLE REPORT

DFHDF1026 Data Management Facility has passed the FLUSH request to the File Manager.

DMF CONSOLE REPORT

DFHDF3023 Data Management Facility has processed the FLUSH request.

- DMF dataset has filled:

DMF CONSOLE REPORT

DFHDF3006 Data Management Facility dataset CICS.DBDCCICS.DFHDMFA
is closed.

DMF CONSOLE REPORT

DFHDF3005 Data Management Facility dataset CICS.DBDCCICS.DFHDMFB
is open.



DFHST0103 with Return Code X'28'

- DMF can't write the data fast enough to DFHDMF_x and the Dataspace fills up.
- Suggestions:
 - DFHDMFM INTERVAL=3000 to 6000, or low like 0500.
 - DFHDMFM SIZE=10 or higher (Dataspace size in MB).
 - DFHDMFM USAGE=10 or lower (Dataspace usage threshold to trigger a Flush).
 - DFHDMF_x IDCAMS CISZ(32768) BUFSP(294912) to reduce VSAM EXCPs.



AOB

- Install PTF UI71644 to avoid program checks.