17044 - MQ for z/OS

But Wait, There's More MQ SMF Data Now?!?! - Monitoring your Channels Using V8's New Chinit SMF Data

Wednesday March 4th 2015
4:30 – 5:30 PM
Seneca, Sheraton Seattle

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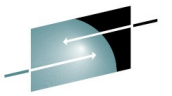

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Agenda

- CHINIT SMF
  - Channel Initiator Statistics
  - Channel Accounting Data

CHINIT SMF: The Problem

- Prior to MQ v8.0, there was limited SMF data for channels
- With CLASS(3) ACCOUNTING trace:

```
START TRACE(ACCTG) DEST(SMF) CLASS(3)
```

You get the Task/Thread Identification (WTID) SMF 116 Subtype 1 record which gives you data about the Sender or Receiver Message Channel Agent thread:

```
z/OS:LPA1  MQ QMGR:QML4  Time: 2010363 14:29:23.80  Jobname:QML4CHIN  Userid:MQUSER
           ====> New task record found     <==========
== Thread type..........> MOVER
== Connection name......> QML4CHIN
== Operator ID..........> MQUSER
== User ID..............> MQUSER
== Channel name.........> QSGM.OUT
== Chl connection.......> 1.2.3.43
== Correlator ID........>                 }
== Correlator ID.....(HEX)> 243DD000E7E75C5C243DD2C0
== Context token........>
== Context token.....(HEX)> 00000000000000000000000000000000
== NID..................> QML4CHING  W ÈÆ
== NID..............(HEX)> D4D8D7C5C3C8C9D5C71A1DE63B749E08
== Accounting token.....>
```

CHINIT TASK

Channel Name and Connection

CHINIT SMF: The Problem

- So, prior to MQ v8.0, there was no useful, detailed data for:
  - CHINIT address space
  - Channel activity
- Many customers have had to create their own ‘monitoring’ jobs
  - Issue periodic **DISPLAY CHSTATUS** commands
  - Use **MQCMD** program from Supportpac MP1B to do this
- Difficult to:
  - Monitor activity in the CHINIT address space
  - Investigate performance issues and tune for better performance
  - Perform capacity planning
  - Manage historical data

CHINIT SMF: The Problem

NOTES

- The category 2 SupportPac MP1B provides a program called **MQCMD** which can be used to automate issuing DISPLAY commands on a regular basis, which facilitates monitoring of channels. The output is formatted using Comma Separated Values (CSVs) for ease of importing into a spreadsheet for analysis.

CHINIT SMF: The Solution

- Additional SMF data for the CHINIT address space
  - **Channel Initiator Statistics**
    - High level view of activity in the CHINIT address space
      - Data about Dispatcher tasks
        - » Number of channels running, TCB usage
      - Data about Adapter, DNS and SSL tasks
    - Useful to determine:
      - Do tasks have any spare capacity ?
      - Do you need more or less dispatcher or adapter tasks ?
  - **Channel Accounting Data**
    - Detailed view of individual channels
      - What work are the channels doing ?
      - Which channels are heavily utilised ?

Channel Initiator Statistics

- Channel initiator
  - QSG name
  - Number of current channels
  - Maximum current channels
  - Number of active channels
  - Maximum active channels
  - Maximum TCP/IP channels
  - Maximum LU 6.2 channels
  - Storage usage in MB

- Dispatcher task
  - Task number (TCB address)
  - Number of requests for task
  - Busy CPU time of task
  - Sum of elapsed time of requests
  - Wait elapsed time of task

- Adapter task
  - Task number (TCB address)
  - Number of requests for task
  - Busy CPU time of task
  - Sum of elapsed time of requests
  - Wait elapsed time of task

- DNS task
  - Task number (TCB address)
  - Number of requests for task
  - Busy CPU time of task
  - Sum of elapsed time of requests
  - Wait elapsed time of task
  - Time of day of max DNS request
  - Duration time of max DNS request

- SSL task
  - Task number (TCB address)
  - Number of requests for task
  - Busy CPU time of task
  - Sum of elapsed time of requests
  - Wait elapsed time of task
  - Time of day of max SSL request
  - Duration of max SSL request

Channel Accounting Data

- For each channel instance

  - Channel name
  - Channel disposition
  - Channel type
  - Channel state
  - STATCHL setting
  - Connection name
  - Channel stopped date&time
  - Last msg date&time
  - Channel batch size
  - Num of messages
  - Num of persistent messages
  - Num of batches
  - Num of full batches
  - Num of transmission buffers sent
  - Num of transmission buffers received
  - Current shared conversations
  - Num of bytes
  - Num of persistent bytes

  - Num of bytes sent (both ctrl data & msg data)
  - Num of bytes received (both ctrl data & msg data)
  - Compression rate
  - Exit time average
  - Exit time min
  - Exit time max
  - Exit time max date&time
  - Net time average
  - Net time min
  - Net time max
  - Net time max date&time
  - Remote qmgr/app name
  - Put retry count
  - Transmission queue empty count

New SMF record subtypes and DSECTs

- New subtypes

  SMF 115 subtype 231 (0xE7='X') for Channel Initiator Statistics
  SMF 116 subtype 10 for Channel Accounting Data

- New DSECTs shipped

  CSQDQWHS (QWHS): Standard header
  CSQDQWSX (QWSX): Self defining section for **subtype 231**
  CSQDQCCT (QCCT): Definition for CHINIT statistics data
  - **CSQDQCT (QCT_DSP/QCT_ADP/QCT_SSL/QCT_DNS)**: Definition for CHINIT tasks

  CSQDQWHS (QWHS): Standard header
  CSQDQWS5 (QWS5): Self defining section for **subtype 10**
  CSQDQCST (QCST): Definition for channel accounting data

New SMF record subtypes and DSECTs

NOTES

Two new SMF records have been added:

SMF 115 sub type 231 has the CHINIT control information like adapter and dispatcher task CPU times, DNS resolution times. This helps with tuning the number of tasks configured.

SMF 116 sub type 10 has the per channel accounting data like bytes sent, achieved batch size, etc.

The DSECTs that are shipped for each type of record are listed.

Note: The standard layout for SMF records involves three parts:

SMF header - Provides format, identification, and time and date information about the record itself.
Self-defining section - Defines the location and size of the individual data records within the SMF record.
Data records - The actual data from MQ that you want to analyze.

QCCT = Chinit Control (now called Chinit Statistics)

QCST = Channel Statistics (now called Channel Accounting)

Starting CHINIT SMF via CSQZPARM

- Separate controls from Queue Manager SMF - **allows 'opt in'**
- Existing system (**CSQ6SYSP**) parameters have been reused
  - **SMFSTAT**
    - **Class 4** added for CHINIT Statistics
  - **SMFACCT**
    - **Class 4** added for Channel Accounting data
- If SMFSTAT/SMFACCT is set to 4 (or list of values including 4)
  - Corresponding trace is started when the queue manager is started
- CHINIT SMF collection starts when CHINIT is started
  - Reads trace settings and enables CHINIT STAT and/or Channel ACCTG
- Can be disabled/re-enabled by **STOP/START TRACE** while CHINIT started

CHINIT SMF: Controls

NOTES

- STAT trace allows a high level view of activity in the CHINIT address space.
- ACCTG trace allows a detailed view at the channel level.

Starting CHINIT SMF via MQSC commands

- You can also start Channel Initiator Statistics **(STAT)** trace by:

```
!MQ08 START TRACE(STAT) CLASS(4)
CSQW130I !MQ08 'STAT' TRACE STARTED, ASSIGNED TRACE NUMBER 05
CSQ9022I !MQ08 CSQWVCM1 ' START TRACE' NORMAL COMPLETION
```

- And you can start Channel Accounting data **(ACCTG)** trace by:

```
!MQ08 START TRACE(ACCTG) CLASS(4)
CSQW130I !MQ08 'ACCTG' TRACE STARTED, ASSIGNED TRACE NUMBER 06
CSQ9022I !MQ08 CSQWVCM1 ' START TRACE' NORMAL COMPLETION
```

- You can DISPLAY TRACE by:

```
!MQ08 DISPLAY TRACE(*)
CSQW127I !MQ08 CURRENT TRACE ACTIVITY IS -
TNO     TYPE   CLASS    DEST        USERID  RMID
02      STAT   01       SMF         *       *
05      STAT   04       SMF         *       *
06      ACCTG   04      SMF         *       *
END OF TRACE REPORT
```

- **ALTER** and **STOP TRACE** commands have also been updated

Starting CHINIT SMF via MQSC commands

NOTES

- START TRACE command extended to enable CHINIT SMF
  - START TRACE(STAT) **CLASS(4)**
    - New class 4 trace represents CHINIT SMF data
    - DEST(SMF) is default
    - Starts CHINIT SMF data collection
    - SMF records written at next SMF broadcast or interval
- STOP TRACE command extended to disable CHINIT SMF
  - STOP TRACE(STAT) CLASS(4), STOP TRACE(STAT), STOP TRACE(*)
    - Stops CHINIT SMF data collection
    - Writes outstanding data to SMF
- DISPLAY TRACE command modified to list CHINIT SMF trace info
  - DISPLAY TRACE(STAT) CLASS(4), DISPLAY TRACE(STAT), DISPLAY TRACE(*)
- ALTER TRACE command modified to alter CHINIT SMF trace
  - ALTER TRACE(STAT) TNO(tno_number) CLASS(4)

Starting CHINIT SMF via MQSC commands

NOTES

- Similarly, for Channel Accounting trace we have:
  - START TRACE(ACCTG) **CLASS(4)**
  - STOP TRACE(ACCTG) CLASS(4), STOP TRACE(ACCTG), STOP TRACE(*)
  - DISPLAY TRACE(ACCTG) CLASS(4), DISPLAY TRACE(ACCTG), DISPLAY TRACE(*)
  - ALTER TRACE(ACCTG) TNO(tno_number) CLASS(4)

New console messages for CHINIT SMF

- For **START/STOP TRACE(STAT)**

CSQX128I csect-name Channel initiator statistics collection started
CSQX129I csect-name Channel initiator statistics collection stopped

- For **START/STOP TRACE(ACCTG)**

CSQX126I csect-name Channel accounting collection started
CSQX127I csect-name Channel accounting collection stopped

Controlling the CHINIT SMF interval

- Use the **STATIME** parameter
  - Controls the SMF interval for both Queue Manager and CHINIT
  - Keeps both Queue Manager and CHINIT statistics synchronized in time
- Values for **STATIME**
  - **30 (minutes): Default value**
  - **Non-zero**: SMF data will be collected when the specified interval expires
  - **Zero**: SMF data is collected at SMF broadcast of z/OS (using global SMF interval)
- How to set
  - Modify STATIME parameter in **CSQ6SYSP** and rebuild the **CSQZPARM** module
    - Takes effect at next startup of Queue Manager
  - Use **SET SYSTEM** command
    - Takes effect immediately

    e.g. To set the SMF interval to 10 minutes, issue:

    /!MQ07 SET SYSTEM STATIME(10)

Controlling Channel Accounting

- Queue Manager attribute: **STATCHL**
  - **OFF (default value)**
    - Disables channel accounting for channels with STATCHL(QMGR)
  - **LOW/MEDIUM/HIGH**
    - Have the same effect
    - Enables channel accounting for channels with STATCHL(QMGR)
  - **NONE**
    - Disables channel accounting for all channels
- Channel attribute: **STATCHL**
  - **QMGR (default value)**
    - Channel accounting is controlled by the setting of the Queue Manager STATCHL attribute
  - **LOW/MEDIUM/HIGH**
    - Have the same effect
    - Enables channel accounting for this channel
  - **OFF**
    - Disables channel accounting for this channel

Controlling Channel Accounting

NOTES

- A new attribute called STATCHL which allows statistics collection granularity at the channel level has been added to the channel definition.

It can be specified on Sender, Receiver, Server, Requester, Cluster Sender and Cluster Receiver channels.

- STATCHL can also be specified at the Queue Manager level to allow channels to inherit a system wide setting.

- The amount of data collected is a superset of that collected on the distributed platforms with the STATCHL event message.

- The queue manager object also has a STATACLS which sets the STATCHL value for automatically defined cluster sender channels.

Channel Accounting for auto-defined cluster channels

- Queue Manager attribute: **STATACLS**
  - **QMGR (default)**
    - Channel accounting for auto-defined cluster sender channels is controlled by the setting of the Queue Manager **STATCHL** attribute
  - **LOW/MEDIUM/HIGH**
    - Have the same effect
    - Enables channel accounting for auto-defined cluster sender channels
  - **OFF**
    - Disables channel accounting for auto-defined cluster sender channels

Channel Accounting for auto-defined cluster channels

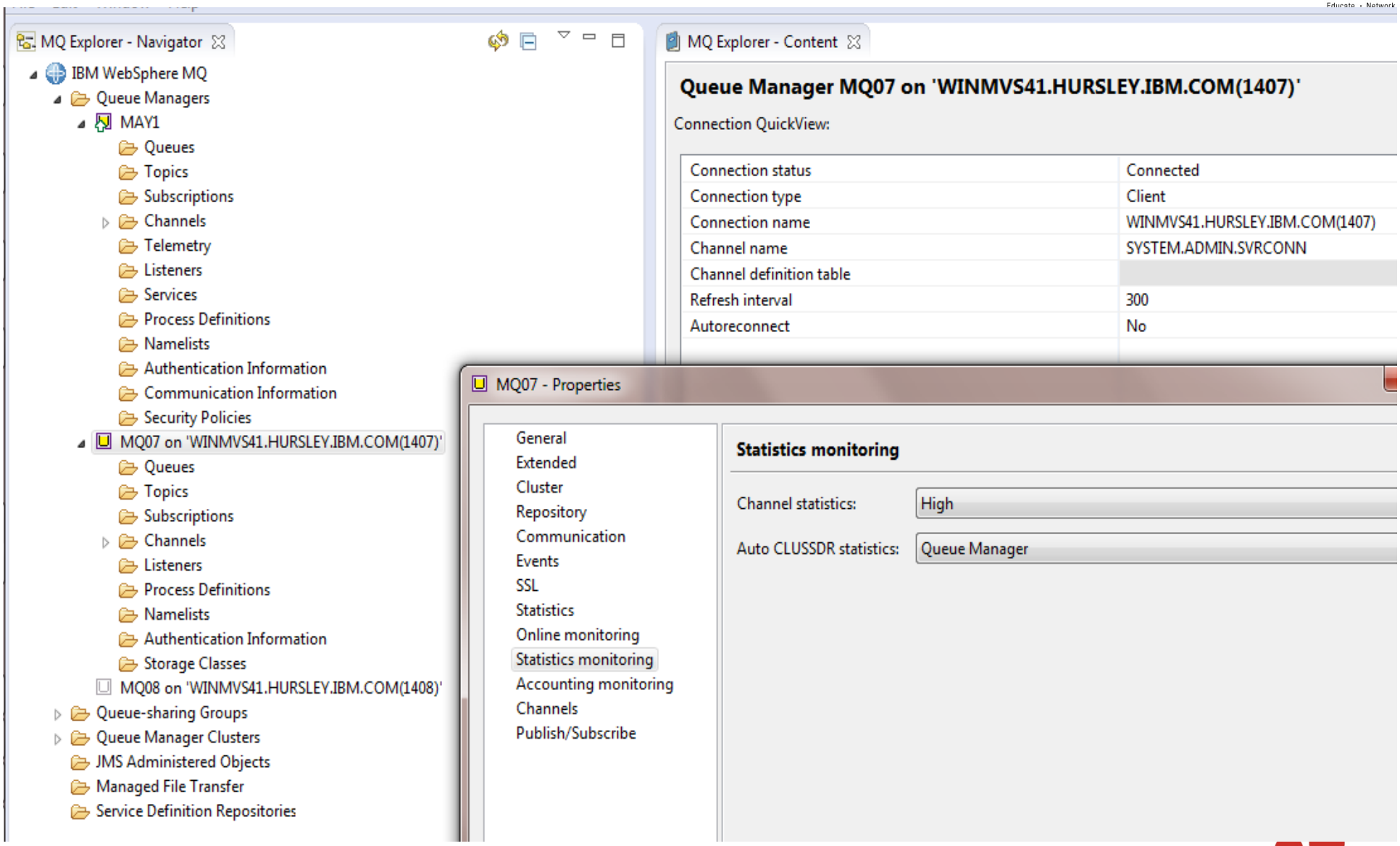
NOTES

- The queue manager object also has a STATACLS which sets the STATCHL value for automatically defined cluster sender channels.

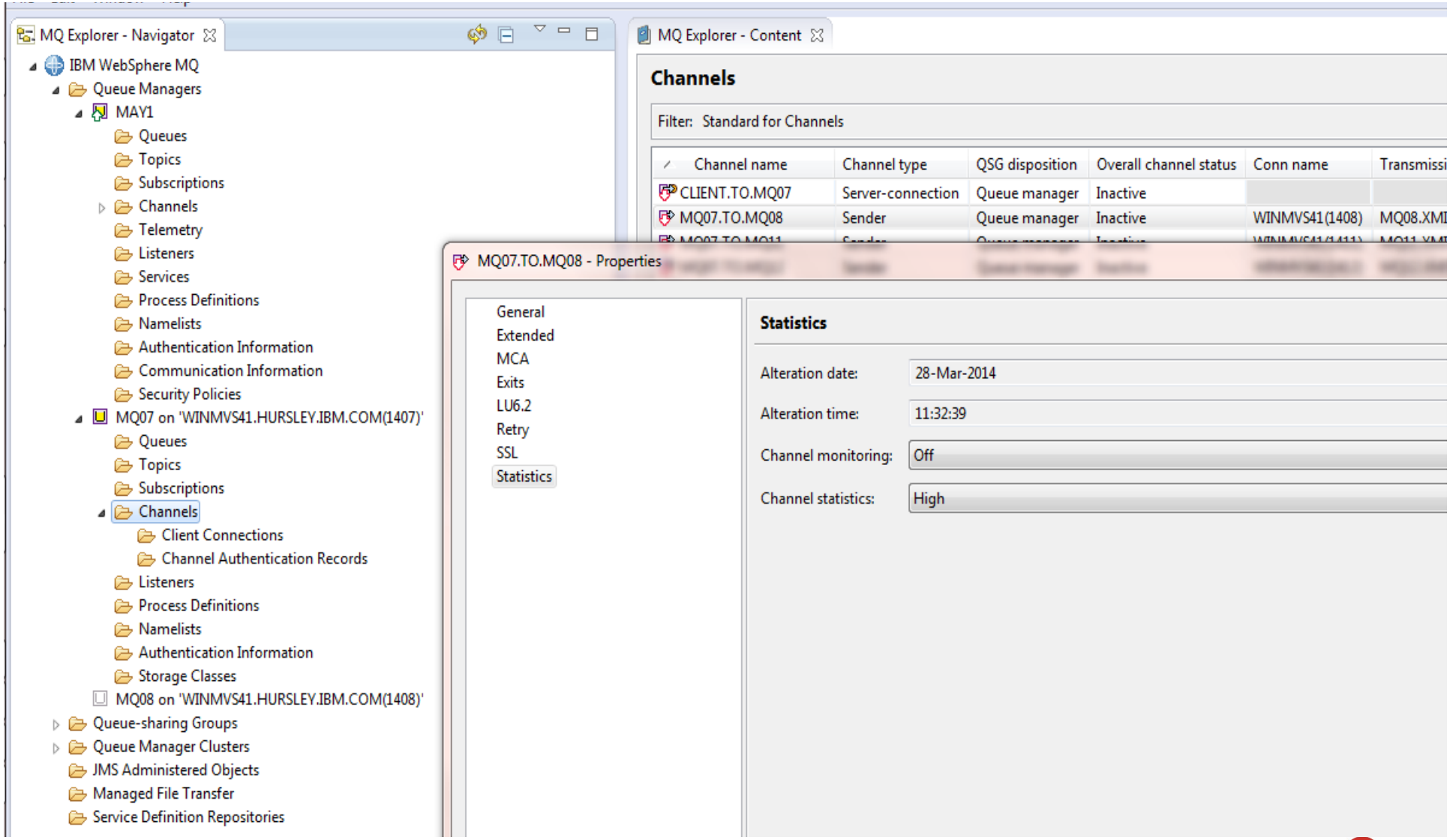
Channel Accounting for SVRCONN channels

- For SVRCONN channels
  - Set **STATCHL** at the QMGR level
- Enables it for all client connections
- But, be careful as channel accounting data is captured at:
  - Each SMF statistics interval (STATIME), and
  - When a channel ends data is captured and held until next interval
  - Hence, frequent client connects/disconnects can result in a lot of data !
- We may provide more control for SVRCONN channels in a future release

MQ Explorer - Enabling Channel Statistics on QMGR



MQ Explorer - Enabling Channel Statistics on channel



New console messages for CHINIT SMF

- **CSQX076I**
  - Issued during CHINIT startup
  - Reports values of Queue Manager attributes STATCHL and STATACLS

```
...
22.59.05 STC13103  +CSQX074I !MQ07 CSQXGIP MONCHL=OFF, MONACLS=QMGR
22.59.05 STC13103  +CSQX075I !MQ07 CSQXGIP ADOPTMCA=ALL, ADOPTCHK=ALL
22.59.05 STC13103  +CSQX076I !MQ07 CSQXGIP STATCHL=OFF, STATACLS=QMGR
22.59.05 STC13103  +CSQX078I !MQ07 CSQXGIP IGQ=DISABLED, CHADEXIT=
22.59.05 STC13103  +CSQX079I !MQ07 CSQXGIP TRAXSTR=YES, TRAXTBL=2
...
```

New console messages for CHINIT SMF

- A new task, CSQXSMFT, is attached for CHINIT SMF
- If this task encounters an error, the following message is issued:

CSQX124E csect-name SMF task ended abnormally, RC=retcode, reason=reason

  - An abend (with a dump) is issued

- If other errors are encountered while processing CHINIT SMF:

CSQX122E csect-name Failed to process channel accounting, RC=retcode
CSQX123E csect-name Failed to process channel initiator statistics, RC=retcode
CSQX125I csect-name SMF data incomplete

New console messages for CHINIT SMF

NOTES

If the MEMLIMIT parameter is not set in the channel initiator JCL, the amount of virtual storage above the bar may be set from by the MEMLIMIT parameter in the SMFPRMxx member of SYS1.PARMLIB or from the IEFUSI exit.

If the MEMLIMIT is set to restrict the above bar storage below the required level, the channel initiator will issue the **CSQX124E "SMF task ended abnormally"** message and class 4 accounting and statistics trace will not be available.

Interpreting SMF data

- Details of new SMF records are documented in the InfoCenter
  - Copybooks that map the records are shipped
- SupportPac **MP1B** has been updated to:
  - Format new SMF data
  - **MQSMF** displays formatted records
    - Outputs information to various files (DDs)
    - Highlights potential out-of-line conditions
    - Can output comma-separated values (CSV) to import in spreadsheets
- Sample program **CSQ4SMFD.C** (run by **CSQ4SMFJ.JCL**) has been updated
  - Formats CHINIT SMF data in a dump like fashion

Interpreting SMF data

NOTES

- WebSphere MQ provides detailed information describing the SMF records it produces. These can be used to understand the data that is generated and produce utilities to interpret this information.
- The category 2 SupportPac MP1B provides a program called **MQSMF** that can be used to format the SMF records instead. This program analyses SMF records and outputs information to various files (DDs) if they are specified. In addition to formatting the data in to human-readable output, it also has support for highlighting various conditions that might warrant further attention by administrators.
- **MQSMF** can also output data as comma separated values (CSV) that can be readily imported into spreadsheets for further analysis.

MQSMF - Example JCL

```
//S1 EXEC PGM=MQSMF,REGION=0M
//STEPLIB DD DISP=SHR,DSN=user.MP1B.LOAD
//SMFIN  DD DISP=SHR,DSN=user.SMF.OUT
//SYSIN DD *
*  comments
SMF_Interval_time 30 * new value
Detail 20
QM MQ07
//MESSAGE     DD SYSOUT=*
//BUFF        DD SYSOUT=*
//BUFFCSV     DD SYSOUT=*
//CF          DD SYSOUT=*
//CFCSV       DD SYSOUT=*
//DATA        DD SYSOUT=*
//DB2         DD SYSOUT=*
//EOJ         DD SYSOUT=*
//LOCK        DD SYSOUT=*
//LOG         DD SYSOUT=*
//LOGCSV      DD SYSOUT=*
//MSGM        DD SYSOUT=*
//MSGMCSV     DD SYSOUT=*
//QCPU        DD SYSOUT=*
//SMDS        DD SYSOUT=*
//TASKSUM     DD SYSOUT=*
//TASK        DD SYSOUT=*
//TASKCSV     DD SYSOUT=*
//TOPIC       DD SYSOUT=*
//STG         DD SYSOUT=*
//QSUML       DD SYSOUT=*,DCB=(LRECL=200)
//QSUMS       DD SYSOUT=*,DCB=(LRECL=200)
//STGSUM      DD SYSOUT=*,DCB=(LRECL=200)
//SYSPRINT    DD SYSOUT=*,DCB=(LRECL=200)
//SYSOUT      DD SYSOUT=*,DCB=(RECFM=VB,LRECL=200,BLKSIZE=27998)
//SYSERR      DD SYSOUT=*
```

NEW DD cards

```
//CHINIT      DD SYSOUT=*
//CHINCSV     DD SYSOUT=*
//CMESSAGE    DD SYSOUT=*
//ADAP        DD SYSOUT=*
//ADAPCSV     DD SYSOUT=*
//DISP        DD SYSOUT=*
//DISPCSV     DD SYSOUT=*
//DNS         DD SYSOUT=*
//DNSCSV      DD SYSOUT=*
//SSL         DD SYSOUT=*
//SSLCSV      DD SYSOUT=*
//DCHS        DD SYSOUT=*
//DCHSCSV     DD SYSOUT=*
//DCHSSUM     DD SYSOUT=*
```

CHINIT Statistics Summary (//CHINIT)

```
MVCA,MQPV,2014/03/18,13:00:00,VRM:800,
From 2014/03/18,12:45:00.015222 to 2014/03/18,13:00:00.083630 duration
900.068408 seconds
Peak number used of current channels..... 4
Peak number used of active channels ..... 0
MAXCHL. Max allowed current channels.....9999
ACTCHL. Max allowed active channels.....9999
TCPCHL. Max allowed TCP/IP channels.....9999
LU62CHL. Max allowed LU62 channels..... 200
Storage used by Chinit..................436MB
```

CHINIT Statistics Summary (//CHINIT)

NOTES

The next few slides show output of the CHINIT's SMF data, this has been formatted by supportpac MP1B - other formatters are available.

The output is taken from one of our test systems.

On this slide, the CHINIT summary data produced by the //CHINIT DD card is shown.

This CHINIT has peaked at 4 current and the address space is using 436MB of storage.

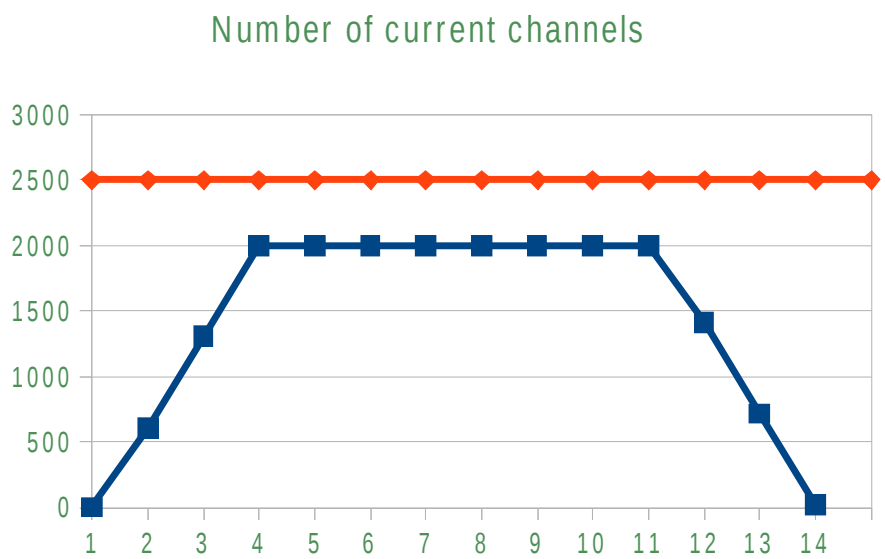
Notes:

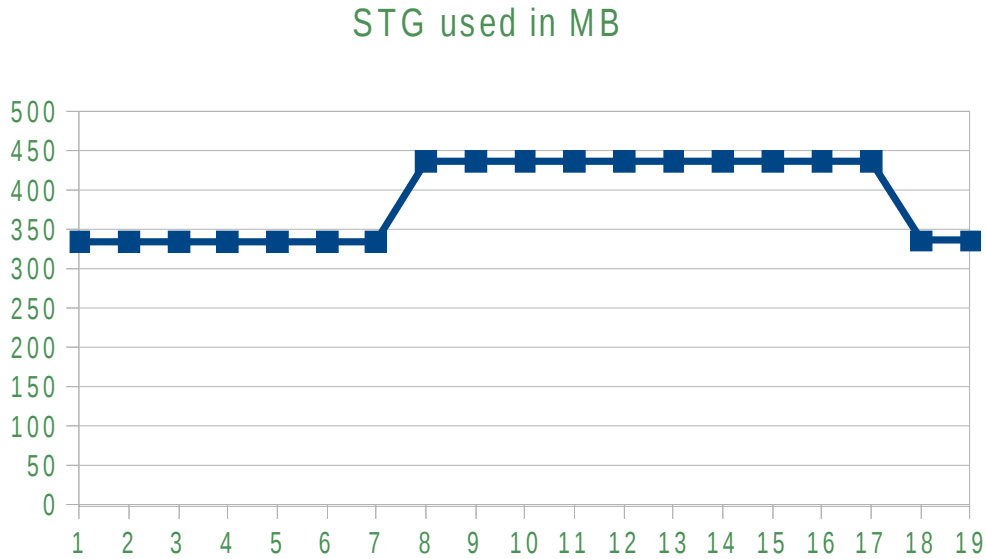
1) A current channel is "active" unless it is in RETRYING, STOPPED, or STARTING state.

2) A channel is "current" if it is in any state other than inactive.

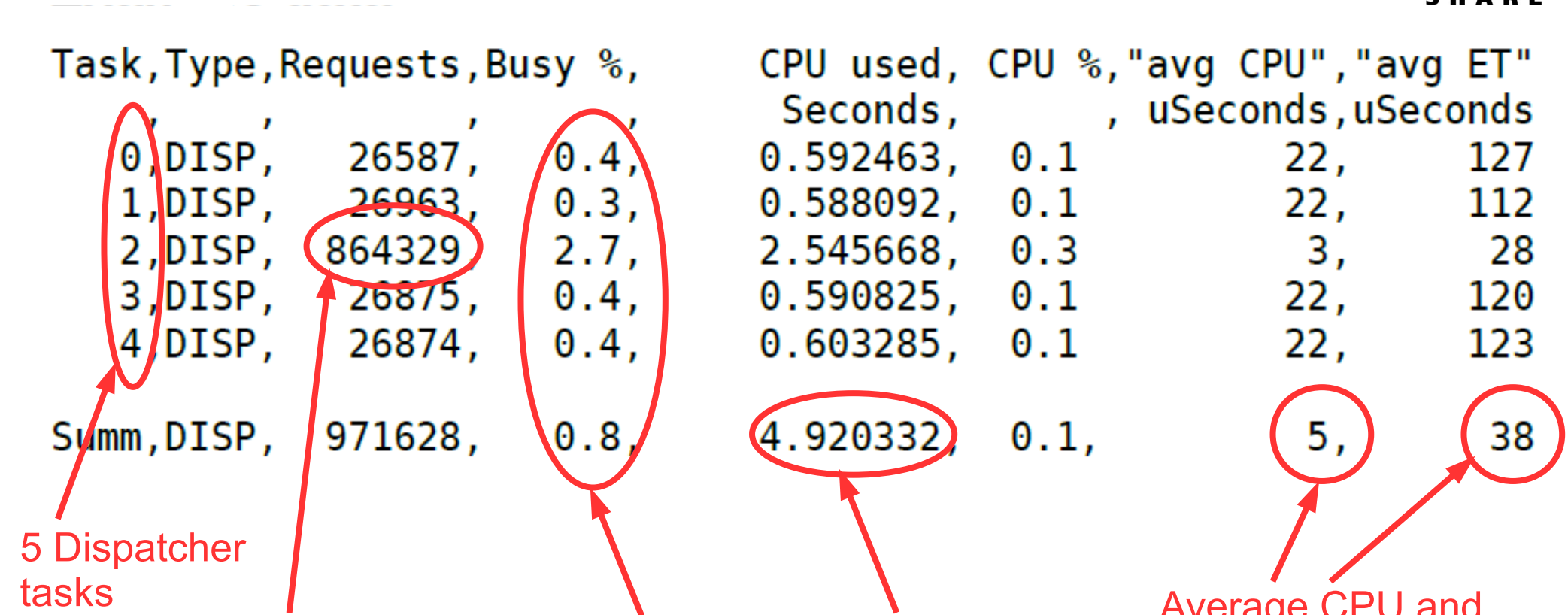
CHINIT Statistics Summary (//CHINITCSV)

- Number of current and active channels
  - How close are you getting to the maximums?
- Channel initiator storage usage
  - 31-bit usage – currently not much in 64-bit for the channel initiator
- Are these trending upwards?
  - Monitor over time





Dispatcher Task Statistics (//DISP + //DISPCSV)



```
Task,Type,Requests,Busy %,     CPU used, CPU %,"avg CPU","avg ET"
                                Seconds,       , uSeconds,uSeconds
   0,DISP,   26587,    0.4,  0.592463,  0.1          22,      127
   1,DISP,   26963,    0.3,  0.588092,  0.1          22,      112
   2,DISP,  864329,    2.7,  2.545668,  0.3           3,       28
   3,DISP,   26875,    0.4,  0.590825,  0.1          22,      120
   4,DISP,   26874,    0.4,  0.603285,  0.1          22,      123

Summ,DISP,  971628,    0.8,  4.920332,  0.1,          5,       38
```

5 Dispatcher tasks

Dispatcher 2 is busy, other tasks are less busy as some channels against them have stopped

Dispatchers have ample capacity

4.9 secs of CPU time used by Dispatcher tasks

Average CPU and Elapsed Times for Dispatcher requests

Dispatcher Task Statistics (//DISP + //DISPCSV)

NOTES

The example data shows that there are five dispatcher tasks (0 → 4) and that one dispatcher task is processing more requests than the others. This is normal, as some channels might stop so the dispatcher is processing fewer channels. Also, some channels can be busier than others.

• 4.9 seconds of CPU were used by the dispatchers.

• Dispatcher requests are generally TCP send and receive requests and channel exit requests. The average request used 5 microseconds of CPU and took 38 microseconds elapsed time.

• This report also shows the average time per request. The average CPU used per request depends on the message traffic, for example, bigger messages use more CPU than smaller messages.

• The %Busy indicates if a dispatcher has spare capacity so this report would help an MQ administrator work out if there are enough dispatchers.

Dispatcher Task Statistics (//DISP + //DISPCSV)

- **Dispatcher tasks:**
  - Dispatcher 7 has 1 channel using ZLIBFAST for compression
  - Dispatcher 8 has 1 channel using ZLIBFAST for decompression

```
Task,Type,Requests,Busy %,     CPU used, CPU %,"avg CPU","avg ET"
   ,    ,        ,      ,      Seconds,      , uSeconds,uSeconds
  7,DISP, 1443847,  71.6,    19.130398, 31.9,         13,       30
  8,DISP, 1431899,  20.4,    12.655084, 21.1,          9,        9
```

17 microsecs spent waiting for hardware compression (since compression was offloaded to a zEDC card)

Dispatcher Task Statistics (//DISP + //DISPCSV)

- **Dispatcher tasks:**
  - Dispatcher 7 has 1 channel using ZLIBHIGH for compression
  - Dispatcher 8 has 1 channel using ZLIBHIGH for decompression

```
Task,Type,Requests,Busy %,     CPU used, CPU %,"avg CPU","avg ET"
   ,   ,       ,     ,       Seconds,      , uSeconds,uSeconds
 7,DISP,  146303,  98.5,   58.729109, 97.9,        401,      404
 8,DISP,  147030,  25.7,   15.514522, 25.9,        106,      105
```

98.5% Busy !!

- **Dispatcher tasks:**
  - Dispatcher 7 has 1 channel using ZLIBFAST for compression
  - Dispatcher 8 has 1 channel using ZLIBFAST for decompression

```
Task,Type,Requests,Busy %,     CPU used, CPU %,"avg CPU","avg ET"
   ,   ,       ,     ,       Seconds,      , uSeconds,uSeconds
 7,DISP, 1443847,  71.6,   19.130398, 31.9,         13,       30
 8,DISP, 1431899,  20.4,   12.655084, 21.1,          9,        9
```

17 microsecs spent waiting for zEDC hardware compression
But, overall cost much cheaper than ZLIBHIGH !!

Dispatcher Task Statistics (//DISP + //DISPCSV)

- Shows distribution of channels across dispatchers

```
    0,DISP, number of channels on this TCB,    0
    1,DISP, number of channels on this TCB,   10
    2,DISP, number of channels on this TCB,   10
    3,DISP, number of channels on this TCB,    0
    4,DISP, number of channels on this TCB,    0
Summ,DISP, number of channels on all TCBs,   20
```

Adapter Task Statistics (//ADAP + //ADAPCSV)

```
MV45,MQ20,2014/04/08,20:43:57,VRM:800,
From 2014/04/08,20:41:54.984681 to 2014/04/08,20:43:57.237939
duration 122.253258 seconds
Task,Type,Requests,Busy %,     CPU used, CPU %,"avg CPU","avg ET"
    ,    ,        ,      ,      Seconds,      , uSeconds,uSeconds
   0,ADAP,  127599,   16.5,    0.953615,   0.8,         7,       158
   1,ADAP,   46790,    7.6,    0.309678,   0.3,         7,       199
   2,ADAP,   13702,    3.2,    0.065380,   0.1,         5,       284
   3,ADAP,    2909,    0.7,    0.029541,   0.0,        10,       279
   4,ADAP,     395,    0.1,    0.003179,   0.0,         8,       392
   5,ADAP,      37,    0.0,    0.000241,   0.0,         7,       149
   6,ADAP,      10,    0.0,    0.000175,   0.0,        17,       111
   7,ADAP,       0,    0.0,    0.000000,   0.0,         0,         0
Summ,ADAP, 191442,    3.5,    1.361809,   0.1,         7,       179
```

MQI requests are processed by first free adapter so adapters lower in the list process less requests

Difference could indicate wait for I/O due to commit or disk read

Adapter Task Statistics (//ADAP + //ADAPCSV)

NOTES

This shows an example of the adapter task statistics report.

The adapters process MQI requests. Each MQI request uses the first free adapter so expect to see decreasing busyness.

Some of these requests might wait, for example, for log I/O during a commit, so the difference between the average CPU time and average Elapsed Time per request can be quite large.

This is the report that an MQ administrator would use to ensure that there are enough adapter tasks defined. A channel should not generally need to wait for an adapter.

In this example, we never used all the adapters. So, there is no need to add more adapters. If the last adapter is very busy, consider increasing the number of adapter tasks.

DNS Task Statistics (//DNS +//DNSCSV)

```
MV45,MQ20,2014/04/08,20:41:54,VRM:800,
From 2014/04/08,20:40:07.101220 to 2014/04/08,20:41:54.984681 duration
107.883460 seconds
Task,Type,Requests,Busy %,     CPU used, CPU %,
    ,    ,        ,      ,      Seconds,      ,
   0,DNS ,      24,   0.0,    0.007980,  0.0,
Summ,DNS ,      24,   0.0,    0.007980,  0.0,



"avg CPU","avg ET",longest ,date       ,time
 uSeconds,uSeconds,uSeconds,           ,
      332,    1031,   24284,2014/04/08,20:41:49.573730
 Summ,332,    1031,   24284,2014/04/08,20:41:49.573730
```

Only 1 DNS task, not busy

Longest DNS resolution request

DNS Task Statistics (//DNS + //DNSCSV)

NOTES

- There is only one DNS task
  - If this task is very busy, let IBM know!
- Longest request was 24284 microseconds
- Date and time fields show when this happened
- Message **CSQX788I** issued if DNS lookup takes >3 secs

```
CSQX788I csect-name DNS lookup for address address
using function 'func' took n seconds
```

SSL Task Statistics (//SSL + //SSLCSV)

```
MV45,SS09,2014/04/10,23:22:24,VRM:800,
From 2014/04/10,22:53:26.883960 to 2014/04/10,23:22:24.204176 duration
1737.320215 seconds
Task,Type,Requests,Busy %,     CPU used, CPU %,"avg CPU","avg ET"
    ,    ,        ,      ,      Seconds,      , uSeconds,uSeconds
   0,SSL ,  109843,   0.3,     0.594580,  0.0,         5,      42,
   1,SSL ,  130180,   0.3,     0.713966,  0.0,         5,      41,
   2,SSL ,  117544,   0.3,     0.703146,  0.0,         6,      42,
   3,SSL ,  145944,   0.4,     0.830535,  0.0,         6,      43,
   4,SSL ,  123825,   0.3,     0.679656,  0.0,         5,      43,
```

```
longest ,date       ,time
uSeconds,           ,
  229638,2014/04/10,22:54:34.264949
  255082,2014/04/10,22:54:54.302855
  230501,2014/04/10,22:54:43.958105
  280241,2014/04/10,22:54:53.499979
  361212,2014/04/10,22:54:53.599940
```

Low average CPU time and high elapsed time due to cryptographic off-load to card

Longest busy times due to lots of channels starting together

SSL Task Statistics (//SSL + //SSLCSV)

NOTES

- CPU time expected to be less than elapsed time because cryptographic operations are offloaded
- The long busy times seen in the example were due to lots of channels starting up at the same time
- Adding more SSL tasks might not improve performance if waiting for external hardware, such as a single cryptographic card

Channel Accounting Data (//DCHS + //DCHSCSV)

127.0.0.1	MQ89_1	Connection name	127.0.0.1
127.0.0.1	MQ89_1	Remote qmgr/app	MQ89
127.0.0.1	MQ89_1	Channel disp	PRIVATE
127.0.0.1	MQ89_1	Channel type	SENDER
127.0.0.1	MQ89_1	Channel status	RUNNING
127.0.0.1	MQ89_1	Channel STATCHL	HIGH
127.0.0.1	MQ89_1	Channel started date & time	2014/04/08,19:41:48
127.0.0.1	MQ89_1	Channel stopped time	
127.0.0.1	MQ89_1	Channel status collect time	2014/04/08,19:43:57
127.0.0.1	MQ89_1	Last msg time	2014/04/08,19:43:52
127.0.0.1	MQ89_1	Active for	122 seconds
127.0.0.1	MQ89_1	Batch size	50
127.0.0.1	MQ89_1	Messages/batch	38.9
127.0.0.1	MQ89_1	Number of messages	2,998
127.0.0.1	MQ89_1	Number of persistent messages	1,506
127.0.0.1	MQ89_1	Number of batches	77
127.0.0.1	MQ89_1	Number of full batches	42
127.0.0.1	MQ89_1	Number of partial batches	35
127.0.0.1	MQ89_1	Buffers sent	3,319
127.0.0.1	MQ89_1	Buffers received	109
127.0.0.1	MQ89_1	Xmitq empty count	13

Channel Accounting Data (//DCHS + //DCHSCSV)

NOTES

- Uniquely identifies each channel with its connection name, channel name and remote queue manager name
- Some of the batches were not full. Target batch size was 50 but average achieved batch size was 38.9. The number of full and partial batches are shown.
  - `BATCHSZ`, `BATCHLIM` and message arrival impacts this
- About half the messages sent were persistent

Channel Accounting Data (//DCHS + //DCHSCSV)

127.0.0.1	MQ89_1	Message data	17,198,653	16 MB
127.0.0.1	MQ89_1	Persistent message data	4,251,780	4 MB
127.0.0.1	MQ89_1	Non persistent message data	12,946,873	12 MB
127.0.0.1	MQ89_1	Total bytes sent	17,200,221	16 MB
127.0.0.1	MQ89_1	Total bytes received	3,052	2 KB
127.0.0.1	MQ89_1	Bytes received/Batch	39	39 B
127.0.0.1	MQ89_1	Bytes sent/Batch	223,379	218 KB
127.0.0.1	MQ89_1	Batches/Second	0	
127.0.0.1	MQ89_1	Bytes received/message	1	1 B
127.0.0.1	MQ89_1	Bytes sent/message	5,737	5 KB
127.0.0.1	MQ89_1	Bytes received/second	25	25 B/sec
127.0.0.1	MQ89_1	Bytes sent/second	140,985	137 KB/sec
127.0.0.1	MQ89_1	Compression rate	0	
127.0.0.1	MQ89_1	Exit time average	0	uSec
127.0.0.1	MQ89_1	DNS resolution time	0	uSec
127.0.0.1	MQ89_1	Net time average	312	uSec
127.0.0.1	MQ89_1	Net time min	43	uSec
127.0.0.1	MQ89_1	Net time max	4,998	uSec
127.0.0.1	MQ89_1	Net time max date&time	2014/04/08,19:43:52	

Channel Accounting Data (//DCHS + //DCHSCSV)

NOTES

- Total message data of about 16MB sent during the interval
- The average number of bytes sent per message was about 5KB
- Bytes sent/received per second is:
  - Average/interval
- As this is a sender type channel, as expected, the bytes sent is greater than the bytes received
- Monitor channel usage over time to look for trends

Channel Accounting Summary (//DCHSSUM)

```
MVS,MQ,date,time,VRM,channelType,count,Persistent,NonPersistent,'P/Sec','NP/Sec'
MVCA,MQPV,2014/06/30,11:30:00,VRM:800,RECEIVER,2,75720,0,3786,0
MVCA,MQPV,2014/06/30,11:30:00,VRM:800,total,2,75720,0,3786,0
MVCA,MQPH,2014/06/30,11:30:00,VRM:800,SENDER,2,75720,0,2611,0
MVCA,MQPH,2014/06/30,11:30:00,VRM:800,total,2,75720,0,2611,0
MVCA,MQPH,2014/06/30,11:34:04,VRM:800,SENDER,23,86237508,0,559983,0
MVCA,MQPH,2014/06/30,11:34:04,VRM:800,total,23,86237508,0,559983,0
```

Sender channel activity
Shown over 2 intervals

Number of persistent
and non-persistent messages
processed during interval

CHINIT Messages (//CMESSAGE)

- Some Examples:

MQCHIN001W The high water mark of the number of active channels >50 % of max channels

MQCHIN007I Dispatcher task is nn% busy on average

MQCHIN008I Adapter task is nn% busy on average

MQCHIN009I SSL task is nn% busy on average

- There are more examples in the documentation for Supportpac MP1B

Performance overhead for statistics and accounting

- An MQ V8 Channel Initiator allocates approximately **190MB of above the bar** virtual storage for Channel Initiator Statistics and Channel Accounting Data, regardless of whether CLASS(4) trace is enabled.
- Recommend Channel Initiator is allowed access to a minimum of 256MB of virtual storage i.e. set **MEMLIMIT=256M** if CLASS(4) trace is enabled.
- Release specific Performance Support Pack MP1J
  - Indicates **1-2% CPU overhead** for collecting CHINIT statistics and Channel accounting data

Performance overhead for statistics and accounting

NOTES

If the MEMLIMIT parameter is not set in the channel initiator JCL, the amount of virtual storage above the bar may be set from by the MEMLIMIT parameter in the SMFPRMxx member of SYS1.PARMLIB or from the IEFUSI exit.

If the MEMLIMIT is set to restrict the above bar storage below the required level, the channel initiator will issue the CSQX124E “SMF task ended abnormally” message and class 4 accounting and statistics trace will not be available.

If your CHINIT is experiencing high CPU usage

- Check the CURDEPTH of your SYSTEM.CHANNEL.SYNCQ
  - If >1000, check that the Queue has INDEXTYPE(MSGID) set
- See presentation from L2 at:

  http://www-01.ibm.com/support/docview.wss?uid=swg27010914&aid=1

  It lists some things to try for high CPU usage in the CHINIT

- Check that you have enough Adapter tasks
  - See performance tuning recommendations for the CHINIT in Performance Supportpac MP16
- Check your MAXCHL parameter as this can influence the distribution of channels to dispatchers
  - See MP16
- Check the number of dispatchers you have defined
  - The first (MIN((MAXCHL / CHIDISPS) , 10) channels to start are associated with thefirst dispatcher TCB and so on until all dispatcher TCBs are in use. The effect of this forsmall numbers of channels and a large MAXCHL is that channels are NOT evenlydistributed across dispatchers.

    We suggest setting MAXCHL to the number of channels actually to be used where this is a small fixed number.
  - We suggest CHIDISPS(20) for systems with more than 100 channels. We have seen no significant disadvantage in having CHIDISPS(20) where this is more dispatcher TCBs than necessary.
  - See MP16

New Redbook covers MQ V8

New Redbook covers MQ V8

NOTES

This redbook covers the new features introduced in V8 that we have just discussed. The book is currently available in draft form. The final version is expected to be made available soon.

Additional Information

- See MQ Performance Supportpacs:
  - MP16: WebSphere MQ for z/OS - Capacity planning & tuning
  - MP1J: WebSphere MQ v8.0 for z/OS Performance Report
  - MP1B: WebSphere MQ Interpreting accounting and statistics data, and other utilities

Questions ?

This was session #17044. The rest of the week .....

	Monday	Tuesday	Wednesday	Thursday	Friday
08:30			17060: Understanding MQ Deployment Choices and Use Cases	17051: Application Programming with MQ Verbs [z/OS & Distributed]	16544: Why Shouldn't I Be Able To Open This Queue? MQ and CICS Security Topics Room: Willow B
10:00	17036: Introduction to MQ - Can MQ Really Make My Life Easier? [z/OS & Distributed]		17052: MQ Beyond the Basics - Advanced API and Internals Overview [z/OS & Distributed] 17035: MQ for z/OS, Using and Abusing New Hardware and the New V8 Features [z/OS] Room: Willow B	17054: Nobody Uses Files Any More do They? New Technologies for Old Technology, File Processing in MQ MFT and IIB [z/OS & Distributed]	17057: Not Just Migrating, but Picking up New Enhancements as You Go - We've Given You the Shotgun, You Know Where Your Feet Are [z/OS & Distributed]
11:15	17041: First Steps with IBM Integration Bus: Application Integration in the New World [z/OS & Distributed]		16732: MQ V8 Hands- on Labs! MQ V8 with CICS and COBOL! MQ SMF Labs! Room: Redwood	17046: Paging Dr. MQ - Health Check Your Queue Managers to Ensure They Won't Be Calling in Sick! [z/OS]	17053: MQ & DB2 – MQ Verbs in DB2 & InfoSphere Data Replication (Q Replication) Performance [z/OS]
01:45	17037: All About the New MQ V8 [z/OS & Distributed]	17034: MQ Security: New V8 Features Deep Dive [z/OS & Distributed]	17040: Using IBM WebSphere Application Server and IBM MQ Together [z/OS & Distributed]	17062: End to End Security of My Queue Manager on z/OS [z/OS]	All sessions in Seneca unless otherwise noted.
03:15	17042: What's New in IBM Integration Bus [z/OS & Distributed]	17065: Under the hood of IBM Integration Bus on z/OS - WLM, SMF, AT-TLS, and more [z/OS]	17043: The Do's and Don'ts of IBM Integration Bus Performance [z/OS & Distributed]	17039: Clustering Queue Managers - Making Life Easier by Automating Administration and Scaling for Performance [z/OS & Distributed]	
04:30	17059: IBM MQ: Are z/OS & Distributed Platforms like Oil & Water? [z/OS & Distributed]	17055: What's the Cloud Going to Do to My MQ Network?	17044: But Wait, There's More MQ SMF Data Now?!?! - Monitoring your Channels Using V8's New Chinit SMF Data [z/OS]	17068: Monitoring and Auditing MQ [z/OS & Distributed]	

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