XINFO

IWS Performance Analysis with IT-Charts

Reason for Performance Analysis

- IWS is a key sub-system in the z/OS environment
  - Job schedulers must work efficiently, in order to provide overall benefit
- Even small “wastes” in a job scheduler can have profound results
  - For example: On a system with 50,000 jobs per day, if 2,000 of these jobs lay on the critical path, if it takes 2 seconds instead of 1 second to submit a subsequent job, you would lose over 33 minutes per day from the batch window!
  - In fact, you can lose much more than this if IWS performance is poor.

Reason for Performance Analysis

- You must meet your SLA
- Your company recently merged different systems (or even IWS controllers), or you will merge systems in the future
- A high volume of ETT jobs have to start at the same time and must execute immediately, like transactions in real time
- By reviewing performance of IWS and “tuning” it to work more efficiently, you can delay new investments in hardware

Components that effect IWS Performance

- JES and the Workload Manager (WLM)
- IWS subtask interactions
- IWS I/O activity, location of the TWS files, the DASD subsystem, etc.
- IWS processor storage (50% of the CP is stored in LSR buffers)
- IWS dispatching priority and overall processor usage

IWS Subtask Interaction

Performance is OK if all system components work well together

IBM Tuning Recommendations

- An excellent publication:
  SC32-1265-03 IBM Tivoli Workload Scheduler for z/OS Customization and Tuning, Chapter 13, 14 and 15, Analyzing performance, tuning controller & tracker
- Explains indicators for performance-related problems, e.g.
  - Long queue of computer operations in ‘R’ status
  - Delay between job end time and the time IWS reports success or failure of the operation.
  - …

IBM Tuning Recommendations

- Many ready operations: set a higher QUEUELEN value
- Reduce the number of suspended events: Filter the test workload using EQQUX004
- Examine JES performance
- Use EQQUX002 exit to locate the JCL
- …

Tuning JES Parameter

- JES2 MASDEF CYCLEMGT=AUTO
  - Parameter available since z/OS version 2.2
  - Setting with $TMASDEF,CYCLEMGT=AUTO
  - Query with $DMASDEF
    - $DMASDEF

```
$HASP843 MASDEF
$HASP843 MASDEF  OWNMEMB=A921,AUTOEMEM=OFF,CKPTLOCK=ACTION,
$HASP843         COLDTIME=(2015.074,04:45:49),COLDVRSN=z/OS1.13,
$HASP843         ENFSCOPE=JESPLEX,DORMANCY=(47,300),HOLD=14,
$HASP843         LOCKOUT=1000,RESTART=NO,SHARED=CHECK,
$HASP843         SYNCTOL=120,WARMTIME=(2019.006,07:32:27),
$HASP843         XCFGRPNM=JESA921,QREBUILD=0,CYCLEMGT=AUTO
```

Tuning JES Parameter

- JES2PARM JOBDEF INTERPRET=JES
  - Parameter available since z/OS version 2.2
  - With default parameter ‘INIT’ convert run in JES subtask and Interpreter in Initiator task
  - Option ‘JES’ run Interpreter within JES subtask just after conversion processing
- JESPARM PCE Definitions
  - Specifies the number processors defined to JES2

```
PCEDEF CNVTNUM=25      /* Converter Count - Default 10 - Max 25      */
PCEDEF PURGENUM=20     /* Purge Count - Default 10 - Max 25          */
PCEDEF OUTNUM=20       /* Output Count - Default 10 - Max 25         */
PCEDEF SPINNUM=10      /* Spin Count - Default 3 - Max 10            */
PCEDEF PSONUM=10       /* Process Output cnt - Default 2 - Max 10    */
PCEDEF STACNUM=10      /* TSO/Status/Cancel cnt - Default 2 - Max 10*/
```

Performance Questions

- To identify IWS performance problems, you should be able to answer questions like this:
  - Are there many “ready” operations in queue?
  - Is the IWS queue length sufficient?
  - Does it take too long to submit subsequent jobs?
  - Are there many “uninteresting” (suspended) events?
  - Is response time becoming an issue?
  - …

Performance Data

- Performance data is available from a variety of sources, (e.g. RMF, SMF and IWS itself)
- Detailed IWS performance data can be obtained by using STATMSG keyword in JTOPTS initialization statement, e.g.
  - CPLOCK (Current Plan locking)
  - EVENTS (how many events were processed)
  - WSATASK (Workstation analyzer task)
  - GENSERV (The general service subtask)

Evaluation of Performance Data

- It’s quite difficult to get and evaluate performance data:
  - MLOG: Too many messages and figures
  - TRACKLOG: Too much data, more or less "unreadable"
  - Data has to be accumulated
  - It would take days to do that manually using standard methods such as Excel

Evaluation of Performance Data with XINFO

IWP - CP Enq Hold/Wait WSA

Client	Environment	DatAddInfo	Graphic-Type	Curve	X	Y	Year	Month	Day	Quarter	Week	Hour	Minute
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	10	3	2019	5	1	2	17	0	10
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	10	0	2019	5	1	2	17	0	10
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	110	1	2019	5	1	2	17	1	10
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	110	0	2019	5	1	2	17	1	10
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	211	7046	2019	5	1	2	17	2	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	211	3029	2019	5	1	2	17	2	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	311	1576	2019	5	1	2	17	3	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	311	1031	2019	5	1	2	17	[illegible]	[illegible]
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	411	0	2019	5	1	2	17	[illegible]	[illegible]
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	411	0	2019	5	1	2	17	[illegible]	[illegible]
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	511	143	2019	5	1	2	17	[illegible]	[illegible]
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	511	69	2019	5	1	2	17	[illegible]	[illegible]
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	611	123	2019	5	1	2	17	[illegible]	[illegible]
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	611	11	2019	5	1	2	17	[illegible]	[illegible]
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	711	3	2019	5	1	2	17	[illegible]	[illegible]
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	711	0	2019	5	1	2	17	7	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	811	2	2019	5	1	2	17	8	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	811	0	2019	5	1	2	17	8	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	911	17	2019	5	1	2	17	9	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	911	27	2019	5	1	2	17	9	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	1011	16	2019	5	1	2	17	10	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	1011	3	2019	5	1	2	17	10	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	1111	2	2019	5	1	2	17	11	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	1111	0	2019	5	1	2	17	11	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	1211	0	2019	5	1	2	17	12	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	1211	10	2019	5	1	2	17	12	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	001	1311	0	2019	5	1	2	17	13	11
HORIZONT	PROD	TXGC	ITCIWPE005WA	002	1311	0	2019	5	1	2	17	13	11

XINFO prepares data automatically
and presents the results graphically

How to get IWS Performance Data

Analyse Data

EQQMLOG

```
EQQE006I EVENT MANAGER EVENT TYPE STATISTICS FOLLOW:
EQQE006I TYPE    NTOT   NNEW    TTOT     TNEW      TAVG    NAVG    NSUS
EQQE007I ALL      213    213     1.0      1.0      0.00    0.00      14
EQQE007I 1          8      8     0.1      0.1      0.02    0.02       0
EQQE007I 2         15     15     0.0      0.0      0.00    0.00       0
EQQE007I 3S         8      8     0.0      0.0      0.00    0.00       0
EQQE007I 3J        45     45     0.2      0.2      0.00    0.00       4
EQQE007I 3P        48     48     0.3      0.3      0.00    0.00       4
EQQE007I 4          0      0     0.0      0.0      0.00    0.00       0
EQQE007I 5         39     39     0.0      0.0      0.00    0.00       6
EQQE007I USER       0      0     0.0      0.0      0.00    0.00       0
EQQE007I CATM       0      0     0.0      0.0      0.00    0.00       0
EQQE007I OTHR      43     43     0.1      0.1      0.00    0.00       0
EQQE004I CP ENQ LOCK STATISTICS SINCE PREVIOUS MESSAGE FOLLOW:
EQQE004I NAME                NEXCL  NSHRD  THELD  TWAIT    AHELD   AWAIT
EQQE005I NORMAL MODE MGR         1      0    0.0    0.1     0.00    0.11
EQQE005I WS ANALYZER             2      0    1.3    1.0     0.69    0.54
EQQE005I EVENT MANAGER           2      0    1.1    1.3     0.57    0.69
EQQN017I THE JCL REPOSITORY DATA SET WILL BE COPIED
EQQN016I DDNAME OF CURRENT JCL REPOSITORY DATA SET IS EQQJS1DS
EQQG013I QUEUE SIZE       687    687      0      0      0      0      0      0
EQQG013I QUEUE DELAY      687    687      0      0      0      0      0      0
EQQG010I GENERAL SERVICE REQUEST STATISTICS FOLLOW:
EQQG010I TYPE        TOTAL   NEWRQS   TOTTIME   NEWTIME    TOTAVG   NEWAVG
EQQG011I ALL           687      687     758.9     758.9      1.10     1.10
EQQG011I RL              4        4       0.0       0.0      0.02     0.02
EQQG011I OPER          214      214     235.4     235.4      1.10     1.10
EQQG011I OPRL            1        1       0.0       0.0      0.00     0.00
EQQG011I PREP            1        1       0.0       0.0      0.00     0.00
EQQG011I JCL            19       19      19.2      19.2      1.01     1.01
EQQG011I MCP            17       17      26.8      26.8      1.57     1.57
EQQG011I DEPC           38       38       6.6       6.6      0.17     0.17
EQQG011I R3P            11       11       0.0       0.0      0.00     0.00
EQQG011I C3C            86       86     188.1     188.1      2.18     2.18
EQQG011I AD             13       13       0.1       0.1      0.01     0.01
EQQG011I WS            126      126      76.1      76.1      0.60     0.60
EQQG011I WSRL            1        1       0.0       0.0      0.00     0.00
EQQG011I CP_G          106      106     203.3     203.3      1.91     1.91
```

XINFO Scanner

XINFO
IT-Chart Table

XINFO Scanner

XINFO
Database

IWS
Activity-Report

```
OP.CPDB_030 IN RZ01XX#TWS#CPBKUP IS SET TO S    JOBNAME: R01TWS01
PROCESSED IJ-SUBMIT JCL      AD/IA: RZ01XX#TWS#CPBKUP0511100600
PROCESSED A1-JOB CARD READ   R01TWS01(JOB52600)   AT: 02.17.43.87
PROCESSED A2-JOB START       R01TWX01(JOB52600)   AT: 02.17.46.35
```

Number of IWS Jobs per Hour

Number of Jobs

There is a high number of jobs during the day (normal online time)

Hours

Jobs per Hour of each Workstation

Submit-/Start Times / Workstation

Seconds

Time of Day

Time-Difference from Status S → IJ-Event

Time-Difference from IJ → A1-Event

Event Manager: Queue Length

Event Manager: Event Types

Event Manager: Suspended Events

Ready Queue: Queue Length

Ready Queue: Waiting Special Resource

Ready Queue: Select a Winner

General Service: Queue Size

CP Enqueue: Hold/Wait Times

Backup/Copy: Runtime

General Service: Queue Delay

Queue size and the delays can be an indicator of bad response times for IWS users

Summary Performance Analysis using IT-Charts

- XINFO automatically collects and accumulates IWS performance data based on EQQMLOG and Tracklog
- XINFO keeps historical performance data as long as needed, e.g. to compare any day in actual year with the same day in previous year
- XINFO visualizes data
- XINFO enables you to see bottlenecks and problem areas in your IWS environment

Thank you for your attention!