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- I am writing tutorials on Rexx programming.
- Fixing the iframe bug, which doesn't allow embedded content to load in IE 9.0. You should turn on the Compatibility view in Internet Explorer, if you are unable to view embedded content on this website.
- If you are a college graduate, or a working-professional and would like to learn mainframe-programming, click here and pass on your contact-details.

Friday, February 12, 2010
Submitting Job

Q. How do you submit a Job on Mainframes for execution?

On Mainframes, when you want to perform any task, you write a Job, and give it to the Mainframe Computer for processing. This is called submitting a job.

However, contrary to what you might fancy, your job doesn't run immediately. Picture this - there are hundreds and thousands of Jobs, that are submitted on a Mainframe, minute-by-minute, every second, by different folks. How would the Mainframe computer decide which job goes first, and then which goes next and so on..

The MVS Operating System prepares a pretty time-table, a schedule, that goes something like this - JOB 1 runs at 12 o' clock, JOB 2 runs at 1 o' clock, JOB 3 runs at 2 o' clock and so on.. Thus every job is allotted a time-slot(period) in the Mainframe's Calendar/time-table.

Before you are just about to submit a job on Mainframes, give your JCL a cursory-glance, to ensure it is syntactically-correct. Forgetting to put a comma, or inserting unnecessary extra-whitespaces, can lead to JCL-Errors. Be cautious about the Datasets begin used by the Job. For example, make sure you've already created the Input-Dataset AGY0157.DEMO.INPUT. Click here to get the contents of the Input-Dataset AGY0157.DEMO.INPUT, if you would like to execute the below-job. To submit a JOB on Mainframes, you must type SUBMIT command or just SUB, on the command line of the editor. I have shown below, how you submit a job on Mainframes.

When you press <Enter>, the Job AGY015A gets submitted to the Mainframe computer for processing. This is indicated by a *** message displayed at the bottom of the screen. The *** indicates, that TSO is waiting for me to read the message. As soon as you press <Enter> key again, the message goes away.

A common practice adopted by most Mainframe Programmers, is to code the NOTIFY parameter on the JOB Statement. Coding this parameter is quite useful, as it gives you an alert, a notification message, saying **"The job AGY0157A has completed"**.

```
14.10.39 JOB53513 $HASP165 AGY0157A ENDED AT N1  MAXCC=0 CN(INTERNAL)
***
```

Q. How do you see the Job Print Output in TSO/ISPF?

I submitted the simple 3-Step JCL, by typing the SUBMIT command. Shortly after, MVS also alerted me, by sending a message, that my job AGY0157A completed.

But, I don't know for sure, whether my job completed successfully, or it failed(and the reason why it failed). MVS Operating System prints messages to a log, as the job is processed. These run-time messages which get recorded to the log, helps track, if the Job completed successfully or it failed. Further, they also contain error-messages that point out why the job fails.

To see the print output/log of any Batch Job, you use a software called SDSF. SDSF stands for Spooler Display and Search Facility - its a software for seeing the output in the Spool.

What is Spool? Well, generally, the log of a Job, when it runs on Mainframes, are to be sent to a printer. But prior to sending the log to the printer, the logs have to wait(buffered) in a staging area(in a queue), because hundreds of jobs complete every minute, and the logs gotta be printed. Not all logs can be printed at once. The logs have to wait in a Queue/staging area. This staging area is called Spool(Queue). The Mainframe printer will pick up the log from the spool one-by-one and print it.

Before TSO and SDSF was invented, you couldn't see the output till the time, it got printed. Waiting for it to get printed, could take hours on end. Now-a-days, TSO makes this easy, it's possible to view the logs in the Spool(Queue).

```
  Menu  Utilities  Compilers  Options  Status  Help
-------------------------------------------------------------------------------
                         ISPF Primary Option Menu
Option ===> START SDSF_

 0  Settings       Terminal and user parameters        User ID . : AGY0157
 1  View           Display source data or listings     Time. . . : 15:14
 2  Edit           Create or change source data        Terminal. : 3278
 3  Utilities      Perform utility functions           Screen. . : 2
 4  Foreground     Interactive language processing     Language. : ENGLISH
 5  Batch          Submit job for language processing  Appl ID . : ISR
 6  Command        Enter TSO or Workstation commands   TSO logon : SYSUSER
 7  Dialog Test    Perform dialog testing              TSO prefix: AGY0157
 9  IBM Products   IBM program development products    System ID : ADCD
10  SCLM           SW Configuration Library Manager    MVS acct. : 12345678
11  Workplace      ISPF Object/Action Workplace        Release . : ISPF 5.6
 S  SDSF           SDSF Panels
 D  DB2            DB2 Product, SPUFI and DB2 Commands
 A  DB2ADM         DB2 Administration Tools
 M  More           Additional IBM Products

       Enter X to Terminate using log/list defaults
```

To view the log of a Job in the Spool(Queue), type START SDSF and press <Enter>. This shows the shows the SDSF Screen. To see the log of Job, you must type ST on the SDSF menu and press <Enter>.

```
  Display  Filter  View  Print  Options  Help
-------------------------------------------------------------------------------
HQX7708 ----------------- SDSF PRIMARY OPTION MENU ------------------------
COMMAND INPUT ===> ST                                      SCROLL ===> PAGE

DA    Active users                      INIT   Initiators
I     Input queue                       PR     Printers
O     Output queue                      PUN    Punches
H     Held output queue                 RDR    Readers
ST    Status of jobs                    LINE   Lines
                                        NODE   Nodes
LOG   System log                        SO     Spool offload
SR    System requests                   SP     Spool volumes
MAS   Members in the MAS
JC    Job classes                       ULOG   User session log
SE    Scheduling environments
RES   WLM resources
ENC   Enclaves
PS    Processes

END   Exit SDSF

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```

A list of the logs for all jobs in Spool(Output Queue) is displayed. By default, this list will displayed only those jobs submitted via your TSO User-id. For example, if my TSO User-id is AGY0157, it will display all jobs starting with(prefix) AGY0157*.

```
  SDSF STATUS DISPLAY ALL CLASSES                      LINE 1-3 (3)
COMMAND INPUT ===>                                      SCROLL ===> PAGE
NP   JOBNAME  JobID    Owner    Prty Queue    C  Pos  SAff  ASys Status
     AGY0157  TSU59631 AGY0157    15 EXECUTION               SYS1 SYS1
     AGY0157  TSU57471 AGY0157     1 PRINT        561
?_   AGY0157A JOB59636 AGY0157     1 PRINT     A  568
```

The screen displays a list of logs of all jobs, you have submitted. For each job that you submit, there is an entry, and it shows various details like the job-name, owner, class and priority.

If your job is complete, and its log is ready to be dispatched to the printer, the

log is on the <u>PRINT</u> Queue. On the other hand, if the job is still running, then it is still in the <u>EXECUTION</u> Queue.

Mostly, all jobs that you submit, their logs would be dumped here in the Spool. To view the contents any particular job log, you can type **?** against the job=name and press <Enter>. This takes you inside the log.

```
SDSF JOB DATA SET DISPLAY - JOB AGY0157A (JOB59636)    LINE 1-8 (8)
COMMAND INPUT ===> _                                   SCROLL ===> PAGE
NP   DDNAME   StepName ProcStep DSID Owner    C Dest             Rec-Cnt Page
     JESMSGLG JES2                 2 AGY0157  Y LOCAL                 14
     JESJCL   JES2                 3 AGY0157  Y LOCAL                 23
     JESYSMSG JES2                 4 AGY0157  Y LOCAL                 40
     SYSUT2   STEP01             102 AGY0157  Y LOCAL                  3
     SYSPRINT STEP01             103 AGY0157  Y LOCAL                  4
     SYSOUT   STEP02             104 AGY0157  Y LOCAL                 32
     SYSUT2   STEP03             105 AGY0157  Y LOCAL                  3
     SYSPRINT STEP03             106 AGY0157  Y LOCAL                  4
```

The log(print output) of a job, contains several sections or Listings. You can type S(Show) against each Listing, and view the contents of it.

The <u>Input Queue</u> and <u>Output Queue</u> are analogous to the <u>run-ways</u> on an Airport. The <u>Input Queue</u> is runway from where the Jobs take-off. After their flight is complete, the jobs land on the runway called the <u>Output Queue</u>.But who's the Air Traffic Controller(ATC) on this Airport?

The <u>JES(Job Entry Sub-System)</u> is a software that manages the <u>Input Queue</u> and <u>Output Queue</u>. The JES acts like Traffic Controllers(Traffic cops). Without them, two airplanes or jobs could collide. The JES is a part of the MVS Operating System that decides, what time a job can takeoff safely from the <u>Input Queue</u>(Takeoff runway). Thus, it monitors the traffic in the Input Queue(Runway) and prepares the time-table, a chart or a schedule for Jobs entering the system.

On the <u>Input Queue</u> side, the JES(Job Entry Subsystem) welcomes all Jobs that enter into the <u>Input Queue</u>, reads the Jobs' JCL, converts it into an internal format known to MVS, and schedules the job for takeoff at 2 o'clock or 3 o'clock, till the Job takes off, and begins its flight(execution).

Sometimes, on the <u>Output Queue</u>(Staging area) side contains logs(outputs) of old jobs. Such old logs(print outputs) of a job, are deleted from time-to-time periodically by JES. So, JES ensures that the Output Queue clean and tidy.

The <u>JES Message Log</u> would contain messages, as shown in the below <u>Snap</u>. You can click here to see the JES Message Log in the ordinary <u>Text-Format</u>.

```
SDSF OUTPUT DISPLAY AGY0157A JOB76303 DSID    2 LINE 0      COLUMNS 02- 81
COMMAND INPUT ===>                                          SCROLL ===> PAGE
************************************ TOP OF DATA ************************************
                    J E S 2  J O B  L O G  --  S Y S T E M  S Y S 1  -- N

15.37.08 JOB76303 ---- FRIDAY,    19 FEB 2010 ----
15.37.08 JOB76303  IRR010I  USERID AGY0157  IS ASSIGNED TO THIS JOB.
15.37.10 JOB76303  ICH70001I AGY0157  LAST ACCESS AT 15:29:13 ON FRIDAY, FEBRUAR
15.37.10 JOB76303  $HASP373 AGY0157A STARTED - INIT 1   - CLASS A - SYS SYS1
15.37.10 JOB76303  IEF403I AGY0157A - STARTED - TIME=15.37.10
15.37.19 JOB76303  IEF404I AGY0157A - ENDED - TIME=15.37.19
15.37.19 JOB76303  $HASP395 AGY0157A ENDED
------ JES2 JOB STATISTICS ------
  19 FEB 2010 JOB EXECUTION DATE
         24 CARDS READ
        125 SYSOUT PRINT RECORDS
          0 SYSOUT PUNCH RECORDS
          7 SYSOUT SPOOL KBYTES
       0.17 MINUTES EXECUTION TIME
************************************ BOTTOM OF DATA ************************************
```

The <u>Job Entry Subsystem(JES)</u> reads the Job's JCL Statements. My Job had 24 lines of JCL Code, so JES reports this as 24 cards read.

Once the job takes off from the <u>Input Queue</u>, it executes, and lands at <u>Output Queue</u>. The log(print output) of Job, is referred as SYSOUT. This contains 125 lines of text. JES reports this as 125 SYSOUT Print records. This implies, the log(print output) of the job, contains 125 lines of text, in the <u>Output Queue</u>(Staging area), waiting to get printed.

Look at the snap below. In the <u>JCL-Listing</u>, MVS numbers the JCL Statements that you submitted as part of the job. You can click here to see the JCL-Listing in an ordinary <u>Textual-Format</u>.

```
SDSF OUTPUT DISPLAY AGY0157A JOB76303 DSID    3 LINE 0      COLUMNS 02- 81
COMMAND INPUT ===>                                          SCROLL ===> PAGE
************************************ TOP OF DATA ************************************
     1 //AGY0157A JOB A123,'QUASAR CHUNAWALA',CLASS=A,MSGCLASS=Y,
       // NOTIFY=&SYSUID
       IEFC653I SUBSTITUTION JCL - A123,'QUASAR CHUNAWALA',CLASS=A,MSGCLASS=Y
     2 //STEP01 EXEC  PGM=IEBGENER
     3 //SYSUT1 DD    DSN=AGY0157.INPUT.DATA,DISP=SHR
     4 //SYSUT2 DD    SYSOUT=*
     5 //SYSIN  DD    DUMMY
     6 //SYSPRINT DD  SYSOUT=*
     7 //STEP02 EXEC  PGM=SORT
     8 //SORTIN DD    DSN=AGY0157.INPUT.DATA,DISP=SHR
     9 //SORTOUT DD   DSN=&&OUTPUT,
       // DISP=(NEW,PASS,DELETE),
       // UNIT=SYSDA,
       // DCB=(RECFM=FB,LRECL=80,BLKSIZE=800),
       // SPACE=(TRK,1)
    10 //SYSIN  DD    *
    11 //SYSOUT DD    SYSOUT=*
    12 //STEP03 EXEC  PGM=IEBGENER
    13 //SYSUT1 DD    DSN=&&OUTPUT,
       // DISP=(OLD,DELETE)
    14 //SYSUT2 DD    SYSOUT=*
    15 //SYSIN  DD    DUMMY
    16 //SYSPRINT DD  SYSOUT=*
************************************ BOTTOM OF DATA ************************************
```

The JESYSMSG Listing contains Memory <u>Allocation</u> and <u>Cleanup</u> Messages. ALLOC tells you which devices and how much memory was allocated for the job-step. As you know, <u>one step</u> runs <u>one program</u>. It also informs you about the CPU time required to process a Job-step. Every Job-step leaves behind a trail, a <u>COND CODE</u> in the range of 0000 to 4095. The below <u>picture</u> shows how the <u>JESYSMSG-Listing</u> looks. You may also click here, to see the JESYSMSG-Listing in ordinary textual-format.

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```
 SDSF OUTPUT DISPLAY AGY0157A JOB76303 DSID    4 LINE 0        COLUMNS 02- 81
 COMMAND INPUT ===>                                           SCROLL ===> PAGE
 ******************************** TOP OF DATA ********************************
 ICH70001I AGY0157  LAST ACCESS AT 15:29:13 ON FRIDAY, FEBRUARY 19, 2010
 IEF236I ALLOC. FOR AGY0157A STEP01
 IGD103I SMS ALLOCATED TO DDNAME SYSUT1
 IEF237I JES2 ALLOCATED TO SYSUT2
 IEF237I DMY  ALLOCATED TO SYSIN
 IEF237I JES2 ALLOCATED TO SYSPRINT
 IEF142I AGY0157A STEP01 - STEP WAS EXECUTED - COND CODE 0000
 IGD104I AGY0157.INPUT.DATA                        RETAINED,  DDNAME=SYSUT1
 IEF285I   AGY0157.AGY0157A.JOB76303.D0000102.?      SYSOUT
 IEF285I   AGY0157.AGY0157A.JOB76303.D0000103.?      SYSOUT
 IEF373I STEP/STEP01 /START 2010050.1537
 IEF374I STEP/STEP01 /STOP  2010050.1537 CPU    0MIN 00.39SEC SRB    0MIN 00.04S
 IEF236I ALLOC. FOR AGY0157A STEP02
 IGD103I SMS ALLOCATED TO DDNAME SORTIN
 IGD101I SMS ALLOCATED TO DDNAME (SORTOUT )
         DSN (SYS10050.T153709.RA000.AGY0157A.OUTPUT.H01  )
         STORCLAS (USER) MGMTCLAS (        ) DATACLAS (       )
         VOL SER NOS= WRK000
 IEF237I JES2 ALLOCATED TO SYSIN
 IEF237I JES2 ALLOCATED TO SYSOUT
 IEF142I AGY0157A STEP02 - STEP WAS EXECUTED - COND CODE 0000
 IGD104I AGY0157.INPUT.DATA                        RETAINED,  DDNAME=SORTIN
 IGD106I SYS10050.T153709.RA000.AGY0157A.OUTPUT.H01  PASSED,  DDNAME=SORTOUT
 IEF285I   AGY0157.AGY0157A.JOB76303.D0000101.?      SYSIN
 IEF285I   AGY0157.AGY0157A.JOB76303.D0000104.?      SYSOUT
```

But apart from this , when you want to write your own extra notes to the logs(diary), you code a SYSOUT=* parameter on the DD Statement. For the 3-step job-stream that I have written, I have set the //SYSUT2 DD statement to point to the logs. This means that, the outputs of //STEP01 and //STEP03 shall be jotted down in the logs. The first step prints/copies the contents of the Unsorted Input file to the log. The second step

These are the contents of the Unsorted Input File, written to the log -

```
 SDSF OUTPUT DISPLAY AGY0157A JOB76303 DSID   102 LINE 0        COLUMNS 02- 81
 COMMAND INPUT ===>                                           SCROLL ===> PAGE
 ******************************** TOP OF DATA ********************************
 0002 QUASAR CHUNAWALA   5000 10
 0003 SHABBIR CHUNAWALA  7000 20
 0001 NAFISA CHUNAWALA   3000 30
 ****************************** BOTTOM OF DATA ******************************
```

These are the contents of the Sorted Output, written to the log. Click here to see the Sorted-Output in Text-Format.

```
 SDSF OUTPUT DISPLAY AGY0157A JOB76303 DSID   105 LINE 0        COLUMNS 02- 81
 COMMAND INPUT ===>                                           SCROLL ===> PAGE
 ******************************** TOP OF DATA ********************************
 0001 NAFISA CHUNAWALA   3000 30
 0002 QUASAR CHUNAWALA   5000 10
 0003 SHABBIR CHUNAWALA  7000 20
 ****************************** BOTTOM OF DATA ******************************
```

Note :

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