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JES3 SYSOUT: How It Works and How to Manage It

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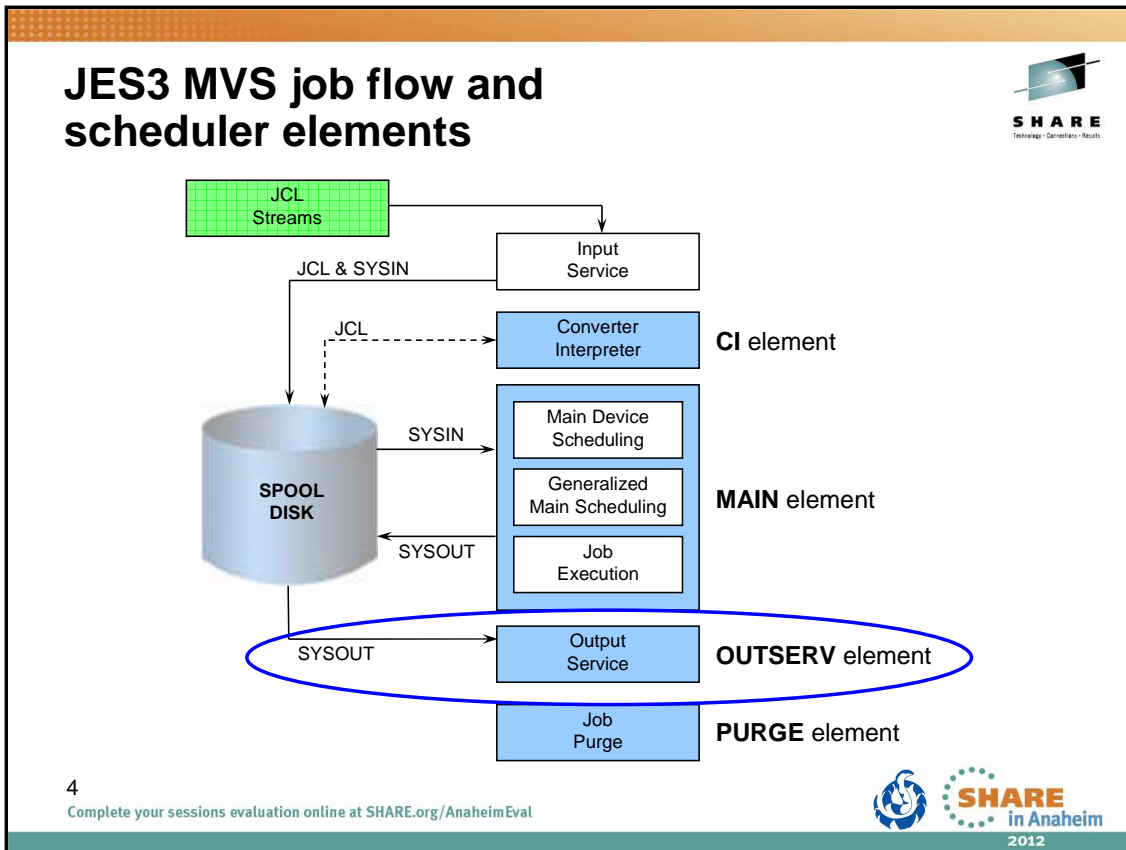
Objective

- **Session abstract:**
 - Presenter will cover JES3 SYSOUT from job JCL statements through what JES3 finally does with it. We will look at what controls how SYSOUT characteristics are specified and managed in JES3. Once we know what happened then we will look at how to find and manage it.

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ABCs of z/OS System Programming - Volume 13 – Chapter 3

JES3 MVS job flow

JES3 processing performed on behalf of jobs consists of distinct phases. A typical MVS job entering the JES3 complex is set by the input service to go through the following phases (scheduler elements (SE)):

Converter/Interpreter (CI) - Interpretation of the job's JCL to a form usable by MVS (SWA - Scheduler Work Area).

Main Device Scheduling (MDS) - Pre-execution resource allocation to insure I/O resources needed by the job are available, followed by passing (Generalized Main Scheduling - GMS) the job to MVS execution.

Output Service - Output processing that handles the job's SYSOUT data.

Purge - Removal the job from the system.

Scheduler elements


Each of the four phases of a job is represented by a scheduler element (SE) in the JCT entry. Every scheduler element denotes a unit of JES3 work (DSP) JES3 must perform when processing the job. The JES3 job segment scheduler (JSS) selects SEs (perhaps from several jobs) that are ready for processing, obtains an RQ for the job, and builds entries in the function control table (FCT) (if they do not already exist) so that DSP can be dispatched to do the work.

Output Service

This presentation will focus on output service processing.

After execution the job moves to the OUTSERV element where output from the job is handled.


A job in execution may also have an OUTSERV element if spin-off data sets are produced.



Output Service

- After execution, a standard job moves to the third scheduler element, **OUTSERV**, for output service processing.
 - Output service processing can also occur for spin-off data sets during job execution at the MAIN scheduler element.
- Output service executes on the JES3 global and processes the SYSOUT data sets destined for:
 - JES3 managed devices
 - Print Services Facility (PSF) managed devices
 - System Application Program Interface (SAPI) applications
 - Network Job Entry (NJE) – BSC, SNA, and TCP/IP
 - Process SYSOUT (PSO) applications

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z/OS V1R13.0 JES3 Initialization and Tuning Guide – Chapter 4.

Output service executes on the global and processes SYSOUT data sets destined for:

JES3 managed devices

PSF managed devices

System Application Program Interface (SAPI) applications

NJE (BSC and SNA)


Process SYSOUT (PSO)

The output service driver receives control after a job completes breakdown in main service, after a job spins off an output data set, or after JES3 spins off an output data set. JES3 output service performs three distinct functions:

Queueing output

Scheduling output


Writing output



Output Service Functions

- JES3 output service performs three distinct functions:
 - Queueing the output
 - Scheduling the output
 - Writing the output

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z/OS V1R13.0 JES3 Initialization and Tuning Guide – Chapter 4.

The output service driver receives control after a job completes breakdown in main service, after a job spins off an output data set, or after JES3 spins off an output data set.

JES3 output service performs three distinct functions:

- Queueing output
- Scheduling output
- Writing output




Queueing output

- SYSOUT data sets are placed on one of four queues:
 - Q=WTR – *Output service writer queue*
 - SYSOUT data sets to be processed by JES3 managed devices.
 - Q=HOLD – *Output service hold queue*
 - SYSOUT data sets to be processed by system routines other than JES3 managed devices.
 - Q=BDT – *MVS/BDT work queue*
 - Network job and SYSOUT streams to be transmitted in a JES3 SNA/NJE network.
 - Q=TCP – *TCP/IP/NJE work queue*
 - Network job and SYSOUT streams to be transmitted in a JES3 TCP/IP/NJE network.

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Scheduling output

- Output Scheduling Element (OSE)
 - A control block that describes the characteristics or processing options of one or more output data sets for the same job.
- Output service scheduling uses writer scheduling criteria to search the OSEs for the first perfect-fit OSE or for the OSE which best fits the requirements of the writer needing work.
 - Writer scheduling parameters are specified on the DEVICE or OUTSERV initialization statement by coding the WC and WS parameters.
 - Can be changed by the operator when calling, starting, or restarting a writer.


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ABCs of z/OS System Programming - Volume 13 – Chapter 11

Output scheduling element (OSE)


Output service uses a basic work unit, the OSE, to represent all the output service characteristics of the output data sets of a job. Output service characteristics include format, print size, paper requirements, number of copies, and other specifications that tailor the output to the user's needs. Every job is associated with at least one OSE; an OSE represents one or more data sets with similar output requirements. After OSE construction, the OSEs are queued



Writing output

- JES3 writer support is provided within the JES3 global address space.
 - Output data sets destined for JES3 managed devices such as print and punch.
- Output writer FSS
 - Device dependent routines that run in a separate address space and use the functional subsystem interface (FSI) to communicate with JES3 for output processing.
 - JES3 controls output scheduling for FSS-controlled devices.
- External Writer - PSO/SAPI applications
 - Routines executing in MVS jobs using the subsystem interface (SSI) to select/access/process output data sets.

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z/OS V1R12.0 JES3 Initialization and Tuning Guide – Chapter 4.

JES3 writer support consists of a writer driver, writer scheduling (selection) routines, device-dependent routines, command-processing routines (also called message-processing routines) and spool-access routines (for print and punch writers).

In most cases, the writer support is provided within the JES3 global address space. Certain devices, however, use device-dependent routines that operate in a separate address space called an output writer functional subsystem (FSS) address space. In this case, the writer driver and the command-processing routines operate in the JES3 global address space and communicate with the output writer FSS using the functional subsystem interface (FSI). The device-dependent routines, also called a functional subsystem application (FSA), and the spool-access routines operate in the output writer FSS.

External writer/SAPI application routines execute in an address space other than the JES3 address space. This type of writer is functionally independent of JES3 and operates as a completely separate MVS job. However, the external writer/SAPI application interacts with JES3, through the subsystem interface, to request data sets for processing. A subset of the output service scheduling function called PROCESS SYSOUT and system application printer interface are invoked as a result of this kind of request.

No attempt is made by output service to schedule external writers/SAPI applications as a result of constructing OSEs requiring their services; it is the responsibility of the operator to start external writers as required. JES3 posts started writers that are waiting for work when incoming jobs require processing.

Examples of how the facilities are used by different writers:

- FSSes are used by the Printer Service Facility (PSF).
- InfoPrint uses the SAPI SSI.
- TSO uses the PSO SSI.




Output characteristics

- OSEs are built for each group of data sets that have similar writer requirements.
 - An OSE is the composite set of the output characteristics specified for one or more data sets.
- JES3 output data set characteristics are based upon:
 - JES3 defaults and the OUTSERV initialization statement
 - SYSOUT initialization statements (define SYSOUT classes)
 - // DD JCL statement
 - // OUTPUT JCL statements
 - /*FORMAT JES3 control statement

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// OUTPUT and /*FORMAT

- Two types of // OUTPUT statements:
 - Default: *//name* OUTPUT with DEFAULT=YES
 - Can be defined for the job or for a step.
 - Direct: *//name* OUTPUT
 - An // OUTPUT statement can be both default and direct.
 - Can have multiple defaults.
- Two types of /*FORMAT statements:
 - Non-specific (default): /*FORMAT DDNAME=*null*,
 - Specific: /*FORMAT DDNAME=*ddname*
- Parameters from // OUTPUT and /*FORMAT statements are never mixed.

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Default // OUTPUT can be specified at the job level or at the step level (i.e. // OUTPUT with DEFAULT=YES within the step).



Default // OUTPUT statements

- Default // OUTPUT parameters apply to all DDs in a job or in a step:
 - When a direct // OUTPUT does not apply to the DD.
 - Default and direct // OUTPUT parameters are not merged.
 - When a specific `//*FORMAT` does not apply to the DD.
- Multiple SYSOUT copies are produced when multiple default // OUTPUT statements apply.
 - One for each default // OUTPUT at the job or step level (never both).
- The // OUTPUT parameters apply to system-managed data sets when JESDS= is specified.

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If one or more default // OUTPUT statements exist for the step, then they apply and any default // OUTPUT statements at the job level do not apply.

When both a non-specific `//*FORMAT` statement and a default // OUTPUT statement may apply to the DD, then only one copy of the data set is produced using the default // OUTPUT statement.



Direct // OUTPUT statements

- The DD statement directly identifies the // OUTPUT statement(s) to be applied with OUTPUT=.
 - Each DD needs to specify OUTPUT=.
 - Harder to specify for DDs in a procedure.
 - Can also specify the default // OUTPUT.
- // OUTPUT JESDS= used to apply parameters to system-managed data sets.
 - Can be used on default and direct // OUTPUT statements.
- Multiple SYSOUT copies are produced when multiple // OUTPUT statements are specified in a DD.
 - One for each // OUTPUT.

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How JES3 applies // OUTPUT parameters when building the OSEs



- Start with JES3 defaults.
 - JES3 defaults can be altered by OUTSERV initialization statement.
- Apply SYSOUT class parameters using the first of:
 - 1) SYSOUT class from // DD SYSOUT = parameter.
 - 2) SYSOUT class from // OUTPUT CLASS= parameter.
 - 3) SYSOUT class from // JOB MSGCLASS= parameter.
 - 4) Default SYSOUT class.
- Apply // OUTPUT statement parameters.
 - Either DEFAULT=YES statement or DD OUTPUT= statement.
- Apply DD statement specific parameters.
 - Note that this overrides // OUTPUT statement parameters.

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// OUTPUT example 1



- OUTSERV default is FORMS=1PRT (JES3 default)
 - FORMS= was not changed by SYSOUT,CLASS=I statement

```
//OUTPUT1 JOB   MSGCLASS=I,MSGLEVEL=(1,1)
//OUT2PRT OUTPUT FORMS=2PRT,DEFAULT=YES
//OUT3PRT OUTPUT FORMS=3PRT
//STEP0001 EXEC PGM=IEBGENER
//SYSPRINT DD   SYSOUT=(,)
//SYSIN DD     DUMMY
//SYSUT2 DD    SYSOUT=(,),OUTPUT=(*.OUT3PRT)
//SYSUT1 DD    *
STEP0001 TEXT LINE 1
STEP0001 TEXT LINE 2
STEP0001 TEXT LINE 3
/*
```

- 3 OSEs will be created with FORMS=
 - 1PRT for JESMSG LG, JESJCL and JESYSMSG (JES3 default)
 - 2PRT for STEP0001.SYSPRINT (Default // OUTPUT)
 - 3PRT for STEP0001.SYSUT2 (Direct // OUTPUT)

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Our first example is for // OUTPUT.

There is a default // OUTPUT statement specifying FORMS=2PRT and a direct // OUTPUT statement specifying FORMS=3PRT.

The OUTSERV initialization statement did not specify FORMS=, so the JES3 default is 1PRT.

Class I is defined with SYSOUT,CLASS=I,TYPE=PRINT – FORMS= is not specified.



Display job output for OUTPUT1


- *INQUIRY command showing job output and forms used:

```

*i,u,j=16,dd=?,f=?
IAT8131 JOB OUTPUT1 (JOB00016), T=PRT, F=1PRT, L=7, PG=0, SR=7,
IAT8131 JOB OUTPUT1 (JOB00016), BY=4084, COPIES=1,
IAT8131 JOB OUTPUT1 (JOB00016), DD=..JESMSGLG(1),
IAT8131 JOB OUTPUT1 (JOB00016), DSN=IBMUSER.OUTPUT1.JOB00016.D0000002.JESMSGLG.
IAT8131 JOB OUTPUT1 (JOB00016), T=PRT, F=1PRT, L=21, PG=0, SR=21,
IAT8131 JOB OUTPUT1 (JOB00016), BY=4084, COPIES=1, DD=..JESJCL(1),
IAT8131 JOB OUTPUT1 (JOB00016), DSN=IBMUSER.OUTPUT1.JOB00016.D0000003.JESJCL.
IAT8131 JOB OUTPUT1 (JOB00016), T=PRT, F=1PRT, L=17, PG=0, SR=17,
IAT8131 JOB OUTPUT1 (JOB00016), BY=4084, COPIES=1,
IAT8131 JOB OUTPUT1 (JOB00016), DD=..JESYSMSG(1),
IAT8131 JOB OUTPUT1 (JOB00016), DSN=IBMUSER.OUTPUT1.JOB00016.D0000004.JESYSMSG.
IAT8131 JOB OUTPUT1 (JOB00016), T=PRT, F=2PRT, L=4, PG=0, SR=4,
IAT8131 JOB OUTPUT1 (JOB00016), BY=4084, COPIES=1,
IAT8131 JOB OUTPUT1 (JOB00016), DD=.STEP0001.SYSPRINT(1),
IAT8131 JOB OUTPUT1 (JOB00016), DSN=IBMUSER.OUTPUT1.JOB00016.D000000A.?.
IAT8131 JOB OUTPUT1 (JOB00016), T=PRT, F=3PRT, L=3, PG=0, SR=3,
IAT8131 JOB OUTPUT1 (JOB00016), BY=4084, COPIES=1,
IAT8131 JOB OUTPUT1 (JOB00016), DD=.STEP0001.SYSUT2(1),
IAT8131 JOB OUTPUT1 (JOB00016), DSN=IBMUSER.OUTPUT1.JOB00016.D000000B.?.
IAT8119 NUMBER OF JOBS FOUND : 1
  
```

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You use the *INQUIRY,U command to display job output in a JES3 system. The job output can be at various places within the system and your selection of the proper "Q=" keyword value on the *INQUIRY,U command dictates what output you want. Later we will talk about where the output is queued. Suffice it to say in this case the output is on the WTR queue which is the default for the *INQUIRY,U command.

- dd=? is specified to display a summary output of all the data sets including the ddname and the data set identifier (dsn).
- f=? is specified so that the output displays the forms required for each data set.

OSEs for OUTPUT1



- Can use Dump Core to display OSE information:

```
*call,dc,key=system,out=con
IAT6306 JOB (JOB00018) IS DC          , CALLED BY C3E0SY1
IAT7921 ISSUE START/CANCEL/RESTART DC REQUEST
*s,dc,option=(snp=ose),j=16,DIAG
***** TIME=12185.11362208
***** JOB=JOB00016 OUTPUT1
OSE BUFFER NO. 1          INFORMATION.
-----
VAR SEC HAS 3  DATASETS; 0  MARKED DONE
  DEST=ANYLOCAL  FORM=1PRT  CARR=6          FRMT=N
  DD=..JESMSG LG
  DSN=IBMUSER.OUTPUT1.JOB00016.D0000002.JESMSG LG
  DD=..JESJCL
  DSN=IBMUSER.OUTPUT1.JOB00016.D0000003.JESJCL
  DD=..JESYSMSG
  DSN=IBMUSER.OUTPUT1.JOB00016.D0000004.JESYSMSG
VAR SEC HAS 1  DATASETS; 0  MARKED DONE
  DEST=ANYLOCAL  FORM=2PRT  CARR=6          FRMT=N
  DD=.STEP0001.SYSPRINT
  DSN=IBMUSER.OUTPUT1.JOB00016.D000000A.?
VAR SEC HAS 1  DATASETS; 0  MARKED DONE
  DEST=ANYLOCAL  FORM=3PRT  CARR=6          FRMT=N
  DD=.STEP0001.SYSUT2
  DSN=IBMUSER.OUTPUT1.JOB00016.D000000B.?
*****
```

- Subset of DC output shown
- Full output in speaker notes.

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The adventurous can use the Dump Code (DC) facility to display the actual OSEs. In this case DC is invoked such that the output is directed to the calling console (out=con). Using the DIAG parameter along with OPTION(SNP=OSE) displays the formatted OSEs for the job.

```
*call,dc,key=system,out=con
IAT6306 JOB (JOB00018) IS DC          , CALLED BY C3E0SY1
IAT7921 ISSUE START/CANCEL/RESTART DC REQUEST
*s,dc,option=(snp=ose),j=16,DIAG
***** TIME=12185.11362208
***** JOB=JOB00016 OUTPUT1
OSE BUFFER NO. 1          INFORMATION.
-----
VAR SEC HAS 3  DATASETS; 0  MARKED DONE
Q=WTR  CMLPT=N  SCHD=N  PRTY=2  CLASS=I  OUTST=N
DEST=ANYLOCAL  FORM=1PRT  CARR=6          FRMT=N
TPID=none      PRMD=LINE  USID=IBMUSER
OTBN=none      UCS=PN     FLASH=NONE  MODID=NONE
STCK=C  MODRC=0  IPAD=N  XTKW=N  FMDF=N  PGDF=N
L=45      PG=0      SR=45      BY=12252
WSI=1
  DD=..JESMSG LG
  DSN=IBMUSER.OUTPUT1.JOB00016.D0000002.JESMSG LG
  DD=..JESJCL
  DSN=IBMUSER.OUTPUT1.JOB00016.D0000003.JESJCL
  DD=..JESYSMSG
  DSN=IBMUSER.OUTPUT1.JOB00016.D0000004.JESYSMSG
VAR SEC HAS 1  DATASETS; 0  MARKED DONE
Q=WTR  CMLPT=N  SCHD=N  PRTY=2  CLASS=I  OUTST=Y
DEST=ANYLOCAL  FORM=2PRT  CARR=6          FRMT=N
TPID=none      PRMD=LINE  USID=IBMUSER
OTBN=none      UCS=PN     FLASH=NONE  MODID=NONE
STCK=C  MODRC=0  IPAD=N  XTKW=N  FMDF=N  PGDF=N
L=4      PG=0      SR=4      BY=4084
WSI=2
  DD=.STEP0001.SYSPRINT
  DSN=IBMUSER.OUTPUT1.JOB00016.D000000A.?
VAR SEC HAS 1  DATASETS; 0  MARKED DONE
Q=WTR  CMLPT=N  SCHD=N  PRTY=2  CLASS=I  OUTST=Y
DEST=ANYLOCAL  FORM=3PRT  CARR=6          FRMT=N
TPID=none      PRMD=LINE  USID=IBMUSER
OTBN=none      UCS=PN     FLASH=NONE  MODID=NONE
STCK=C  MODRC=0  IPAD=N  XTKW=N  FMDF=N  PGDF=N
L=3      PG=0      SR=3      BY=4084
WSI=3
  DD=.STEP0001.SYSUT2
  DSN=IBMUSER.OUTPUT1.JOB00016.D000000B.?
*****
```



// OUTPUT example 2

- Same as before with another direct OUTPUT specified.

```
//OUTPUT2 JOB   MSGCLASS=I,MSGLEVEL=(1,1)
//OUT2PRT OUTPUT FORMS=2PRT,DEFAULT=YES
//OUT3PRT OUTPUT FORMS=3PRT
//STEP0001 EXEC PGM=IEBGENER
//SYSPRINT DD   SYSOUT=(,)
//SYSIN DD DUMMY
//SYSUT2 DD   SYSOUT=(,),OUTPUT=(*.OUT3PRT,*.OUT2PRT)
//SYSUT1 DD   *
STEP0001 TEXT LINE 1
STEP0001 TEXT LINE 2
STEP0001 TEXT LINE 3
/*
```


- 3 OSEs will be created with FORMS=
 - 1PRT for JESMSG LG, JESJCL and JESYSMSG (JES3 default)
 - 2PRT for STEP0001.SYSPRINT and STEP0001.SYSUT2 (Default // OUTPUT)
 - 3PRT for STEP0001.SYSUT2 (Direct // OUTPUT)

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// OUTPUT example 2 is the nearly the same as // OUTPUT example 1, except OUTPRT2 is being used as both a default // OUTPUT statement and a direct // OUTPUT statement. With OUTPUT=(*.OUT3PRT,*.OUT2PRT) now specified, two copies of STEP0001.SYSUT2 will be written: one copy using FORMS=2PRT and one copy using FORMS=3PRT. Only three OSEs are still required to represent the output characteristics for the output data sets.



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Display job output for OUTPUT2


- *INQUIRY command showing job output and forms used:

```

*i,u,j=19,dd=?,f=?
IAT8131 JOB OUTPUT2 (JOB00019), T=PRT, F=1PRT, L=7, PG=0, SR=7,
IAT8131 JOB OUTPUT2 (JOB00019), BY=4084, COPIES=1,
IAT8131 JOB OUTPUT2 (JOB00019), DD=..JESMSGGLG(1),
IAT8131 JOB OUTPUT2 (JOB00019), DSN=IBMUSER.OUTPUT2.JOB00019.D0000002.JESMSGGLG.
IAT8131 JOB OUTPUT2 (JOB00019), T=PRT, F=1PRT, L=21, PG=0, SR=21,
IAT8131 JOB OUTPUT2 (JOB00019), BY=4084, COPIES=1, DD=..JESJCL(1),
IAT8131 JOB OUTPUT2 (JOB00019), DSN=IBMUSER.OUTPUT2.JOB00019.D0000003.JESJCL.
IAT8131 JOB OUTPUT2 (JOB00019), T=PRT, F=1PRT, L=17, PG=0, SR=17,
IAT8131 JOB OUTPUT2 (JOB00019), BY=4084, COPIES=1,
IAT8131 JOB OUTPUT2 (JOB00019), DD=..JESYSMSG(1),
IAT8131 JOB OUTPUT2 (JOB00019), DSN=IBMUSER.OUTPUT2.JOB00019.D0000004.JESYSMSG.
IAT8131 JOB OUTPUT2 (JOB00019), T=PRT, F=2PRT, L=4, PG=0, SR=4,
IAT8131 JOB OUTPUT2 (JOB00019), BY=4084, COPIES=1,
IAT8131 JOB OUTPUT2 (JOB00019), DD=.STEP0001.SYSPRINT(1),
IAT8131 JOB OUTPUT2 (JOB00019), DSN=IBMUSER.OUTPUT2.JOB00019.D000000A.?.
IAT8131 JOB OUTPUT2 (JOB00019), T=PRT, F=2PRT, L=3, PG=0, SR=3,
IAT8131 JOB OUTPUT2 (JOB00019), BY=4084, COPIES=1,
IAT8131 JOB OUTPUT2 (JOB00019), DD=.STEP0001.SYSUT2(1),
IAT8131 JOB OUTPUT2 (JOB00019), DSN=IBMUSER.OUTPUT2.JOB00019.D000000B.?.
IAT8131 JOB OUTPUT2 (JOB00019), T=PRT, F=3PRT, L=3, PG=0, SR=3,
IAT8131 JOB OUTPUT2 (JOB00019), BY=4084, COPIES=1,
IAT8131 JOB OUTPUT2 (JOB00019), DD=.STEP0001.SYSUT2(1),
IAT8131 JOB OUTPUT2 (JOB00019), DSN=IBMUSER.OUTPUT2.JOB00019.D000000B.?.
IAT8119 NUMBER OF JOBS FOUND : 1
  
```

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Data set STEP0001.SYSUT2 is listed twice – once for FORMS=2PRT and once for FORMS=3PRT.

Also note that the data set identifier is the same for both instances of STEP0001.SYSUT2:
DSN=IBMUSER.OUTPUT2.JOB00019.D000000B.?

That's because there is only one data set created with the actual output. In this case two copies are available to be written using different output characteristics (aka forms).



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OSEs for OUTPUT2

- Dump Core output to display OSE information:


```

*s,dc,option=(snp=ose),j=19,DIAG
***** TIME=12185.13360928
***** JOB=JOB00019 OUTPUT2
OSE BUFFER NO. 1 INFORMATION.
-----
VAR SEC HAS 3 DATASETS; 0 MARKED DONE
  DEST=ANYLOCAL FORM=1PRT CARR=6 FRMT=N
  DD=..JESMSG LG
  DSN=IBMUSER.OUTPUT2.JOB00019.D0000002.JESMSG LG
  DD=..JESJCL
  DSN=IBMUSER.OUTPUT2.JOB00019.D0000003.JESJCL
  DD=..JESYSMSG
  DSN=IBMUSER.OUTPUT2.JOB00019.D0000004.JESYSMSG
VAR SEC HAS 2 DATASETS; 0 MARKED DONE
  DEST=ANYLOCAL FORM=2PRT CARR=6 FRMT=N
  DD=.STEP0001.SYSPRINT
  DSN=IBMUSER.OUTPUT2.JOB00019.D000000A.?
  DD=.STEP0001.SYSUT2
  DSN=IBMUSER.OUTPUT2.JOB00019.D000000B.?
VAR SEC HAS 1 DATASETS; 0 MARKED DONE
  DEST=ANYLOCAL FORM=3PRT CARR=6 FRMT=N
  DD=.STEP0001.SYSUT2
  DSN=IBMUSER.OUTPUT2.JOB00019.D000000B.?
*****
                
```

- Subset of DC output shown
- Full output in speaker notes.

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Again data set STEP0001.SYSUT2 is listed twice – once in the OSE for FORMS=2PRT and once in the OSE for FORMS=3PRT.

```

*s,dc,option=(snp=ose),j=19,DIAG
***** TIME=12185.13360928
***** JOB=JOB00019 OUTPUT2
OSE BUFFER NO. 1 INFORMATION.
-----
VAR SEC HAS 3 DATASETS; 0 MARKED DONE
Q=WTR CMLPT=N SCHD=N PRY=2 CLASS=I OUTST=N
DEST=ANYLOCAL FORM=1PRT CARR=6 FRMT=N
TPID=none PRMD=LINE USID=IBMUSER
OTBN=none UCS=PN FLASH=NONE MODID=NONE
STCK=C MODRC=0 IPAD=N XTKW=N FMDF=N PGDF=N
L=45 PG=0 SR=45 BY=12252
WSI=1
  DD=..JESMSG LG
  DSN=IBMUSER.OUTPUT2.JOB00019.D0000002.JESMSG LG
  DD=..JESJCL
  DSN=IBMUSER.OUTPUT2.JOB00019.D0000003.JESJCL
  DD=..JESYSMSG
  DSN=IBMUSER.OUTPUT2.JOB00019.D0000004.JESYSMSG
VAR SEC HAS 2 DATASETS; 0 MARKED DONE
Q=WTR CMLPT=N SCHD=N PRY=2 CLASS=I OUTST=Y
DEST=ANYLOCAL FORM=2PRT CARR=6 FRMT=N
TPID=none PRMD=LINE USID=IBMUSER
OTBN=none UCS=PN FLASH=NONE MODID=NONE
STCK=C MODRC=0 IPAD=N XTKW=N FMDF=N PGDF=N
L=7 PG=0 SR=7 BY=8168
WSI=2
  DD=.STEP0001.SYSPRINT
  DSN=IBMUSER.OUTPUT2.JOB00019.D000000A.?
  DD=.STEP0001.SYSUT2
  DSN=IBMUSER.OUTPUT2.JOB00019.D000000B.?
VAR SEC HAS 1 DATASETS; 0 MARKED DONE
Q=WTR CMLPT=N SCHD=N PRY=2 CLASS=I OUTST=Y
DEST=ANYLOCAL FORM=3PRT CARR=6 FRMT=N
TPID=none PRMD=LINE USID=IBMUSER
OTBN=none UCS=PN FLASH=NONE MODID=NONE
STCK=C MODRC=0 IPAD=N XTKW=N FMDF=N PGDF=N
L=3 PG=0 SR=3 BY=4084
WSI=3
  DD=.STEP0001.SYSUT2
  DSN=IBMUSER.OUTPUT2.JOB00019.D000000B.?
*****
                
```

Non-specific **//*FORMAT** statements




- Non-specific **//*FORMAT** parameters apply to all DDs in a job:
 - When a default **// OUTPUT** does not exist in the job.
 - When a direct **// OUTPUT** does not apply to the DD.
 - Merged when a specific **//*FORMAT** applies to the DD.
- Non-specific **//*FORMAT** parameters apply to system-managed data sets.
 - Except when **// OUTPUT JESDS=** is specified for the data set.
- Multiple non-specific **//*FORMAT** statements are merged for a single default set of parameters.

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When both a non-specific **//*FORMAT** statement and a default **// OUTPUT** statement may apply to the DD, then only one copy of the data set is produced using the default **// OUTPUT** statement.



Specific **/*FORMAT** statements

- Specific **/*FORMAT** statement identifies the DD statement(s) to which it applies with **DDNAME=name**.
 - Easier to apply the parameters to DDs defined across the job, in a step, or in a procedure.
 - Can also specify system-managed data sets.
- Multiple SYSOUT copies may be produced when multiple specific **/*FORMAT** statements apply to a DD.
 - One for each **/*FORMAT** that applies.
 - **/*FORMAT** statements where **DDNAME=name** is more specific apply and less specific will not apply.
 - e.g. **DDNAME=SYSUT2** and **DDNAME=STEP0001.SYSUT2**
 - Only the more specific **STEP0001.SYSUT2** will apply.

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Given cases where multiple **/*FORMAT** statements may apply, **/*FORMAT** statements with a more specific **DDNAME=** specified will apply, and less specific (i.e. more generic) ones will not apply.

When both specific **/*FORMAT** statements and a direct **// OUTPUT** statements may apply to the DD, then multiple copies are produced for each **/*FORMAT** and **// OUTPUT** statement.

How JES3 applies **//*FORMAT** parameters when building the OSEs



- Start with JES3 defaults.
 - JES3 defaults can be altered by OUTSERV initialization statement.
- Apply **//*FORMAT DDNAME=null**, statement parameters.
- Apply SYSOUT class parameters using the first of:
 - 1) SYSOUT class from **// DD SYSOUT =** parameter.
 - 2) SYSOUT class from **// JOB MSGCLASS=** parameter.
 - 3) Default SYSOUT class.
- Apply DD statement specific parameters.
- Apply specific **//*FORMAT** statement parameters.
 - Specific **//*FORMAT** statement where DDNAME= identifies a DD.
 - Note that this overrides DD statement specific parameters whereas DD parameters override **// OUTPUT** parameters.

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//*FORMAT example 1



- OUTSERV default is FORMS=1PRT (JES3 default)
 - FORMS= was not changed by SYSOUT,CLASS=I statement

```

//FORMAT1 JOB   MSGCLASS=I,MSGLEVEL=(1,1)
//*FORMAT PR,DDNAME=,FORMS=2PRT
//*FORMAT PR,DDNAME=STEP0001.SYSUT2,FORMS=3PRT
//STEP0001 EXEC PGM=IEBGENER
//SYSPRINT DD  SYSOUT=(,)
//SYSIN DD    DUMMY
//SYSUT2 DD   SYSOUT=(,)
//SYSUT1 DD   *
STEP0001 TEXT LINE 1
STEP0001 TEXT LINE 2
STEP0001 TEXT LINE 3
/*

```

- 2 OSEs will be created with FORMS=
 - 2PRT for JESMSG LG, JESJCL, JESYSMSG and STEP0001.SYSPRINT (Non-specific //FORMAT)
 - 3PRT for STEP0001.SYSUT2 (Specific //FORMAT)

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//*FORMAT example 1 is similar to // OUTPUT example 1.

There is a non-specific (default) //FORMAT statement specifying FORMS=2PRT and a specific //FORMAT statement specifying FORMS=3PRT.

As before, the OUTSERV initialization statement did not specify FORMS=, so the JES3 default is 1PRT. Class I is still defined with SYSOUT,CLASS=I,TYPE=PRINT – FORMS= is not specified.

Note that the non-specific //FORMAT statement applies to the system-managed data sets.



Display job output for FORMAT1


- *INQUIRY command showing job output and forms used:

```

*i,u,j=22,dd=?,f=?
IAT8131 JOB FORMAT1 (JOB00022), T=PRT, F=2PRT, L=7, PG=0, SR=7,
IAT8131 JOB FORMAT1 (JOB00022), BY=4084, COPIES=1,
IAT8131 JOB FORMAT1 (JOB00022), DD=..JESMSGGLG(1),
IAT8131 JOB FORMAT1 (JOB00022), DSN=IBMUSER.FORMAT1.JOB00022.D0000002.JESMSGGLG.
IAT8131 JOB FORMAT1 (JOB00022), T=PRT, F=2PRT, L=21, PG=0, SR=21,
IAT8131 JOB FORMAT1 (JOB00022), BY=4084, COPIES=1, DD=..JESJCL(1),
IAT8131 JOB FORMAT1 (JOB00022), DSN=IBMUSER.FORMAT1.JOB00022.D0000003.JESJCL.
IAT8131 JOB FORMAT1 (JOB00022), T=PRT, F=2PRT, L=17, PG=0, SR=17,
IAT8131 JOB FORMAT1 (JOB00022), BY=4084, COPIES=1,
IAT8131 JOB FORMAT1 (JOB00022), DD=..JESYSMSG(1),
IAT8131 JOB FORMAT1 (JOB00022), DSN=IBMUSER.FORMAT1.JOB00022.D0000004.JESYSMSG.
IAT8131 JOB FORMAT1 (JOB00022), T=PRT, F=2PRT, L=4, PG=0, SR=4,
IAT8131 JOB FORMAT1 (JOB00022), BY=4084, COPIES=1,
IAT8131 JOB FORMAT1 (JOB00022), DD=.STEP0001.SYSPRINT(1),
IAT8131 JOB FORMAT1 (JOB00022), DSN=IBMUSER.FORMAT1.JOB00022.D000000A.?.
IAT8131 JOB FORMAT1 (JOB00022), T=PRT, F=3PRT, L=3, PG=0, SR=3,
IAT8131 JOB FORMAT1 (JOB00022), BY=4084, COPIES=1,
IAT8131 JOB FORMAT1 (JOB00022), DD=.STEP0001.SYSUT2(1),
IAT8131 JOB FORMAT1 (JOB00022), DSN=IBMUSER.FORMAT1.JOB00022.D000000B.?.
IAT8119 NUMBER OF JOBS FOUND : 1
  
```

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You use the *INQUIRY,U command to display job output in a JES3 system. The job output can be at various places within the system and your selection of the proper "Q=" keyword value on the *INQUIRY,U command dictates what output you want. Later we will talk about where the output is queued. Suffice it to say in this case the output is on the WTR queue which is the default for the *INQUIRY,U command.

- dd=? is specified to display a summary output of all the data sets including the ddname and the data set identifier (dsn).
- f=? is specified so that the output displays the forms required for each data set.

OSEs for FORMAT1



- Dump Core output to display OSE information:

```
*s,dc,option=(snp=ose),j=22,DIAG
***** TIME=12185.15313137
***** JOB=JOB00022 FORMAT1
OSE BUFFER NO. 1 INFORMATION.
-----
VAR SEC HAS 4 DATASETS; 0 MARKED DONE
DEST=ANYLOCAL FORM=2PRT CARR=6 FRMT=Y
DD=..JESMSGLG
DSN=IBMUSER.FORMAT1.JOB00022.D0000002.JESMSGLG
DD=..JESJCL
DSN=IBMUSER.FORMAT1.JOB00022.D0000003.JESJCL
DD=..JESYSMSG
DSN=IBMUSER.FORMAT1.JOB00022.D0000004.JESYSMSG
DD=.STEP0001.SYSPRINT
DSN=IBMUSER.FORMAT1.JOB00022.D000000A.?
VAR SEC HAS 1 DATASETS; 0 MARKED DONE
DEST=ANYLOCAL FORM=3PRT CARR=6 FRMT=Y
DD=.STEP0001.SYSUT2
DSN=IBMUSER.FORMAT1.JOB00022.D000000B.?
*****
```

- Subset of DC output shown
- Full output in speaker notes.

- Note FRMT=Y which indicates that /*FORMAT was used to set the output characteristics.

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The adventurous can use the Dump Code (DC) facility to display the actual OSEs. In this case DC is invoked such that the output is directed to the calling console (out=con). Using the DIAG parameter along with OPTION(SNP=OSE) displays the formatted OSEs for the job.

```
*s,dc,option=(snp=ose),j=22,DIAG
***** TIME=12185.15313137
***** JOB=JOB00022 FORMAT1
OSE BUFFER NO. 1 INFORMATION.
-----
VAR SEC HAS 4 DATASETS; 0 MARKED DONE
Q=WTR CMPLT=N SCHD=N PRTY=2 CLASS=I OUTST=N
DEST=ANYLOCAL FORM=2PRT CARR=6 FRMT=Y
TPID=none PRMD=LINE USID=IBMUSER
OTBN=none UCS=PN FLASH=NONE MODID=NONE
STCK=C MODRC=0 IPAD=N XTKW=N FMDF=N PGDF=N
L=49 PG=0 SR=49 BY=16336
WSI=1
DD=..JESMSGLG
DSN=IBMUSER.FORMAT1.JOB00022.D0000002.JESMSGLG
DD=..JESJCL
DSN=IBMUSER.FORMAT1.JOB00022.D0000003.JESJCL
DD=..JESYSMSG
DSN=IBMUSER.FORMAT1.JOB00022.D0000004.JESYSMSG
DD=.STEP0001.SYSPRINT
DSN=IBMUSER.FORMAT1.JOB00022.D000000A.?
VAR SEC HAS 1 DATASETS; 0 MARKED DONE
Q=WTR CMPLT=N SCHD=N PRTY=2 CLASS=I OUTST=N
DEST=ANYLOCAL FORM=3PRT CARR=6 FRMT=Y
TPID=none PRMD=LINE USID=IBMUSER
OTBN=none UCS=PN FLASH=NONE MODID=NONE
STCK=C MODRC=0 IPAD=N XTKW=N FMDF=N PGDF=N
L=3 PG=0 SR=3 BY=4084
WSI=2
DD=.STEP0001.SYSUT2
DSN=IBMUSER.FORMAT1.JOB00022.D000000B.?
*****
```

//*FORMAT example 2



- One way to get same results as // OUTPUT example 2:

```

//FORMAT2 JOB      MSGCLASS=I,MSGLEVEL=(1,1)
//*FORMAT PR,DDNAME=STEP0001.SYSPRINT,FORMS=2PRT
//*FORMAT PR,DDNAME=SYSUT2,FORMS=2PRT
//*FORMAT PR,DDNAME=SYSUT2,FORMS=3PRT
//STEP0001 EXEC PGM=IEBGENER
//SYSPRINT DD  SYSOUT=(,)
//SYSIN DD    DUMMY
//SYSUT2 DD   SYSOUT=(,)
//SYSUT1 DD   *
STEP0001 TEXT LINE 1
STEP0001 TEXT LINE 2
STEP0001 TEXT LINE 3
/*

```

- 3 OSEs will be created with FORMS=
 - 1PRT for JESMSG LG, JESJCL and JESYSMSG (JES3 default)
 - 2PRT for STEP0001.SYSPRINT and STEP0001.SYSUT2 (Specific // *FORMAT)
 - 3PRT for STEP0001.SYSUT2 (Specific // *FORMAT)

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Non-specific // *FORMAT statement not used, so system-managed data sets get the JES3 default FORMS=1PRT.

Specific // *FORMAT statements used to get desired FORMS= for each of the output data sets.

Note that DDNAME=SYSUT2 does not contain the step name. These apply to all SYSUT2 DD statements in the job when a more specific // *FORMAT statement does not apply.


For example, if the // *FORMAT statements were:

```

// *FORMAT PR,DDNAME=SYSUT2,FORMS=2PRT
// *FORMAT PR,DDNAME=STEP0001.SYSUT2,FORMS=3PRT

```

Only one OSE will be created for STEP0001.SYSUT2 with FORMS=3PRT.



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Display job output for FORMAT2


- *INQUIRY command showing job output and forms used:

```

*i,u,j=26,dd=?,f=?
IAT8131 JOB FORMAT2 (JOB00026), T=PRT, F=1PRT, L=7, PG=0, SR=7,
IAT8131 JOB FORMAT2 (JOB00026), BY=4084, COPIES=1,
IAT8131 JOB FORMAT2 (JOB00026), DD=..JESMSG LG(1),
IAT8131 JOB FORMAT2 (JOB00026), DSN=IBMUSER.FORMAT2.JOB00026.D0000002.JESMSG LG.
IAT8131 JOB FORMAT2 (JOB00026), T=PRT, F=1PRT, L=25, PG=0, SR=25,
IAT8131 JOB FORMAT2 (JOB00026), BY=4084, COPIES=1, DD=..JESJCL(1),
IAT8131 JOB FORMAT2 (JOB00026), DSN=IBMUSER.FORMAT2.JOB00026.D0000003.JESJCL.
IAT8131 JOB FORMAT2 (JOB00026), T=PRT, F=1PRT, L=17, PG=0, SR=17,
IAT8131 JOB FORMAT2 (JOB00026), BY=4084, COPIES=1,
IAT8131 JOB FORMAT2 (JOB00026), DD=..JESYSMSG(1),
IAT8131 JOB FORMAT2 (JOB00026), DSN=IBMUSER.FORMAT2.JOB00026.D0000004.JESYSMSG.
IAT8131 JOB FORMAT2 (JOB00026), T=PRT, F=2PRT, L=4, PG=0, SR=4,
IAT8131 JOB FORMAT2 (JOB00026), BY=4084, COPIES=1,
IAT8131 JOB FORMAT2 (JOB00026), DD=.STEP0001.SYSPRINT(1),
IAT8131 JOB FORMAT2 (JOB00026), DSN=IBMUSER.FORMAT2.JOB00026.D000000A.?.
IAT8131 JOB FORMAT2 (JOB00026), T=PRT, F=2PRT, L=3, PG=0, SR=3,
IAT8131 JOB FORMAT2 (JOB00026), BY=4084, COPIES=1,
IAT8131 JOB FORMAT2 (JOB00026), DD=.STEP0001.SYSUT2(1),
IAT8131 JOB FORMAT2 (JOB00026), DSN=IBMUSER.FORMAT2.JOB00026.D000000B.?.
IAT8131 JOB FORMAT2 (JOB00026), T=PRT, F=3PRT, L=3, PG=0, SR=3,
IAT8131 JOB FORMAT2 (JOB00026), BY=4084, COPIES=1,
IAT8131 JOB FORMAT2 (JOB00026), DD=.STEP0001.SYSUT2(1),
IAT8131 JOB FORMAT2 (JOB00026), DSN=IBMUSER.FORMAT2.JOB00026.D000000B.?.
IAT8119 NUMBER OF JOBS FOUND : 1
  
```

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Data set STEP0001.SYSUT2 is listed twice – once for FORMS=2PRT and once for FORMS=3PRT.

Also note that the data set identifier is the same for both instances of STEP0001.SYSUT2:
DSN=IBMUSER.OUTPUT2.JOB00019.D000000B.?

That's because there is only one data set created with the actual output. In this case two copies are available to be written using different output characteristics (aka forms).

OSEs for FORMAT2



- OSEs look similar to those for OUTPUT2:

```
*s,dc,option=(snp=ose),j=26,DIAG
***** TIME=12185.16054956
***** JOB=JOB00026 FORMAT2
OSE BUFFER NO. 1 INFORMATION.
-----
VAR SEC HAS 3 DATASETS; 0 MARKED DONE
  DEST=ANYLOCAL FORM=1PRT CARR=6 FRMT=Y
  DD=..JESMSGGLG
  DSN=IBMUSER.FORMAT2.JOB00026.D0000002.JESMSGGLG
  DD=..JESJCL
  DSN=IBMUSER.FORMAT2.JOB00026.D0000003.JESJCL
  DD=..JESYSMSG
  DSN=IBMUSER.FORMAT2.JOB00026.D0000004.JESYSMSG
VAR SEC HAS 2 DATASETS; 0 MARKED DONE
  DEST=ANYLOCAL FORM=2PRT CARR=6 FRMT=Y
  DD=.STEP0001.SYSPRINT
  DSN=IBMUSER.FORMAT2.JOB00026.D000000A.?
  DD=.STEP0001.SYSUT2
  DSN=IBMUSER.FORMAT2.JOB00026.D000000B.?
VAR SEC HAS 1 DATASETS; 0 MARKED DONE
  DEST=ANYLOCAL FORM=3PRT CARR=6 FRMT=Y
  DD=.STEP0001.SYSUT2
  DSN=IBMUSER.FORMAT2.JOB00026.D000000B.?
*****
```

- Subset of DC output shown
- Full output in speaker notes.

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Again data set STEP0001.SYSUT2 is listed twice – once in the OSE for FORMS=2PRT and once in the OSE for FORMS=3PRT.

```
*s,dc,option=(snp=ose),j=26,DIAG
***** TIME=12185.16054956
***** JOB=JOB00026 FORMAT2
OSE BUFFER NO. 1 INFORMATION.
-----
VAR SEC HAS 3 DATASETS; 0 MARKED DONE
Q=WTR CMLPT=N SCHD=N PRTY=2 CLASS=I OUTST=N
DEST=ANYLOCAL FORM=1PRT CARR=6 FRMT=Y
TPID=none PRMD=LINE USID=IBMUSER
OTBN=none UCS=PN FLASH=NONE MODID=NONE
STCK=C MODRC=0 IPAD=N XTKW=N FMDF=N PGDF=N
L=49 PG=0 SR=49 BY=12252
WSI=1
  DD=..JESMSGGLG
  DSN=IBMUSER.FORMAT2.JOB00026.D0000002.JESMSGGLG
  DD=..JESJCL
  DSN=IBMUSER.FORMAT2.JOB00026.D0000003.JESJCL
  DD=..JESYSMSG
  DSN=IBMUSER.FORMAT2.JOB00026.D0000004.JESYSMSG
VAR SEC HAS 2 DATASETS; 0 MARKED DONE
Q=WTR CMLPT=N SCHD=N PRTY=2 CLASS=I OUTST=N
DEST=ANYLOCAL FORM=2PRT CARR=6 FRMT=Y
TPID=none PRMD=LINE USID=IBMUSER
OTBN=none UCS=PN FLASH=NONE MODID=NONE
STCK=C MODRC=0 IPAD=N XTKW=N FMDF=N PGDF=N
L=7 PG=0 SR=7 BY=8168
WSI=2
  DD=.STEP0001.SYSPRINT
  DSN=IBMUSER.FORMAT2.JOB00026.D000000A.?
  DD=.STEP0001.SYSUT2
  DSN=IBMUSER.FORMAT2.JOB00026.D000000B.?
VAR SEC HAS 1 DATASETS; 0 MARKED DONE
Q=WTR CMLPT=N SCHD=N PRTY=2 CLASS=I OUTST=N
DEST=ANYLOCAL FORM=3PRT CARR=6 FRMT=Y
TPID=none PRMD=LINE USID=IBMUSER
OTBN=none UCS=PN FLASH=NONE MODID=NONE
STCK=C MODRC=0 IPAD=N XTKW=N FMDF=N PGDF=N
L=3 PG=0 SR=3 BY=4084
WSI=3
  DD=.STEP0001.SYSUT2
  DSN=IBMUSER.FORMAT2.JOB00026.D000000B.?
*****
```



Using both // OUTPUT and //*FORMAT

- Parameters from // OUTPUT and //*FORMAT statements are never mixed.
- When default // OUTPUT and non-specific //*FORMAT both apply to a data set, only one copy of the data set is created using the default // OUTPUT parameters.
- Multiple SYSOUT copies are produced when direct // OUTPUT and specific //*FORMAT statements apply to a DD.
 - One for each // OUTPUT and one for each //*FORMAT.

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// OUTPUT and //*FORMAT example



```
//OUTFMT1 JOB   MSGCLASS=I,MSGLEVEL=(1,1)
//*FORMAT PR,DDNAME=,FORMS=FMT1
//OUT2PRT OUTPUT FORMS=2PRT,DEFAULT=YES
//*FORMAT PR,DDNAME=STEP0001.SYSUT2,FORMS=FMT2
//OUT3PRT OUTPUT FORMS=3PRT
//STEP0001 EXEC PGM=IEBGENER
//SYSPRINT DD  SYSOUT=(,)
//SYSIN   DD  DUMMY
//SYSUT2  DD  SYSOUT=(,),OUTPUT=(*.OUT3PRT)
//SYSUT1  DD  *
STEP0001 TEXT LINE 1
STEP0001 TEXT LINE 2
STEP0001 TEXT LINE 3
/*
```

- 4 OSEs will be created with FORMS=
 - FMT1 for JESMSG LG, JESJCL and JESYSMSG (Non-specific //*FORMAT)
 - FMT2 for STEP0001.SYSUT2 (Specific //*FORMAT)
 - 3PRT for STEP0001.SYSUT2 (Direct // OUTPUT)
 - 2PRT for STEP0001.SYSPRINT (Default // OUTPUT)

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Non-specific //*FORMAT statement used for the system-managed data sets – gets FORMS=FMT1.

Specific //*FORMAT statement used to get one copy of STEP0001.SYSUT2 with FORMS=FMT2.

Direct // OUTPUT statement used to get one copy of STEP0001.SYSUT2 with FORMS=3PRT.

Default // OUTPUT statement applies only to STEP0001.SYSPRINT – gets FORMS=2PRT (non-specific //*FORMAT not applied).



Display job output for OUTFMT1


- *INQUIRY command showing job output and forms used:

```

*i,u,j=31,dd=?,f=?
IAT8131 JOB OUTFMT1 (JOB00031), T=PRT, F=FMT1, L=7, PG=0, SR=7,
IAT8131 JOB OUTFMT1 (JOB00031), BY=4084, COPIES=1,
IAT8131 JOB OUTFMT1 (JOB00031), DD=..JESMSG LG(1),
IAT8131 JOB OUTFMT1 (JOB00031), DSN=IBMUSER.OUTPUT1.JOB00031.D0000002.JESMSG LG.
IAT8131 JOB OUTFMT1 (JOB00031), T=PRT, F=FMT1, L=25, PG=0, SR=25,
IAT8131 JOB OUTFMT1 (JOB00031), BY=4084, COPIES=1, DD=..JESJCL(1),
IAT8131 JOB OUTFMT1 (JOB00031), DSN=IBMUSER.OUTPUT1.JOB00031.D0000003.JESJCL.
IAT8131 JOB OUTFMT1 (JOB00031), T=PRT, F=FMT1, L=17, PG=0, SR=17,
IAT8131 JOB OUTFMT1 (JOB00031), BY=4084, COPIES=1,
IAT8131 JOB OUTFMT1 (JOB00031), DD=..JESYSMSG(1),
IAT8131 JOB OUTFMT1 (JOB00031), DSN=IBMUSER.OUTPUT1.JOB00031.D0000004.JESYSMSG.
IAT8131 JOB OUTFMT1 (JOB00031), T=PRT, F=2PRT, L=4, PG=0, SR=4,
IAT8131 JOB OUTFMT1 (JOB00031), BY=4084, COPIES=1,
IAT8131 JOB OUTFMT1 (JOB00031), DD=.STEP0001.SYSRPT(1),
IAT8131 JOB OUTFMT1 (JOB00031), DSN=IBMUSER.OUTPUT1.JOB00031.D000000A.?.
IAT8131 JOB OUTFMT1 (JOB00031), T=PRT, F=3PRT, L=3, PG=0, SR=3,
IAT8131 JOB OUTFMT1 (JOB00031), BY=4084, COPIES=1,
IAT8131 JOB OUTFMT1 (JOB00031), DD=.STEP0001.SYSUT2(1),
IAT8131 JOB OUTFMT1 (JOB00031), DSN=IBMUSER.OUTPUT1.JOB00031.D000000B.?.
IAT8131 JOB OUTFMT1 (JOB00031), T=PRT, F=FMT2, L=3, PG=0, SR=3,
IAT8131 JOB OUTFMT1 (JOB00031), BY=4084, COPIES=1,
IAT8131 JOB OUTFMT1 (JOB00031), DD=.STEP0001.SYSUT2(1),
IAT8131 JOB OUTFMT1 (JOB00031), DSN=IBMUSER.OUTPUT1.JOB00031.D000000B.?.
IAT8119 NUMBER OF JOBS FOUND : 1
  
```

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Data set STEP0001.SYSUT2 is listed twice – once for FORMS=3PRT and once for FORMS=FMT2.

Also note that we still have only one data set identifier for both instances of STEP0001.SYSUT2:
DSN=IBMUSER.OUTPUT2.JOB00019.D000000B.?

Finally note that through all these examples we have generated the same number of outputs despite using different // OUTPUT and /*FORMAT combinations.

OSEs for OUTFMT1



- More OSEs for OUTFMT1:

```
*s,dc,option=(snp=ose),j=31,DIAG
***** TIME=12187.09264133
***** JOB=JOB00031 OUTFMT1
OSE BUFFER NO. 1 INFORMATION.
-----
VAR SEC HAS 3 DATASETS; 0 MARKED DONE
  DEST=ANYLOCAL FORM=FMT1 CARR=6 FRMT=Y
  DD=..JESMSG LG
  DSN=IBMUSER.OUTFMT1.JOB00031.D0000002.JESMSG LG
  DD=..JESJCL
  DSN=IBMUSER.OUTFMT1.JOB00031.D0000003.JESJCL
  DD=..JESYSMSG
  DSN=IBMUSER.OUTFMT1.JOB00031.D0000004.JESYSMSG
VAR SEC HAS 1 DATASETS; 0 MARKED DONE
  DEST=ANYLOCAL FORM=2PRT CARR=6 FRMT=N
  DD=..STEP0001.SYSPRINT
  DSN=IBMUSER.OUTFMT1.JOB00031.D000000A.?
VAR SEC HAS 1 DATASETS; 0 MARKED DONE
  DEST=ANYLOCAL FORM=3PRT CARR=6 FRMT=N
  DD=..STEP0001.SYSUT2
  DSN=IBMUSER.OUTFMT1.JOB00031.D000000B.?
VAR SEC HAS 1 DATASETS; 0 MARKED DONE
  DEST=ANYLOCAL FORM=FMT2 CARR=6 FRMT=Y
  DD=..STEP0001.SYSUT2
  DSN=IBMUSER.OUTFMT1.JOB00031.D000000B.?
*****
```

- Subset of DC output shown
- Full output in speaker notes.

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More OSEs were needed for OUTFMT1 since we had four different forms specified whereas previous examples had three.

```
*s,dc,option=(snp=ose),j=31,DIAG
***** TIME=12187.09264133
***** JOB=JOB00031 OUTFMT1
OSE BUFFER NO. 1 INFORMATION.
-----
VAR SEC HAS 3 DATASETS; 0 MARKED DONE
Q=WTR CMPLT=N SCHD=N PRTY=2 CLASS=I OUTST=N
DEST=ANYLOCAL FORM=FMT1 CARR=6 FRMT=Y
TPID=none PRMD=LINE USID=IBMUSER
OTBN=none UCS=PN FLASH=NONE MODID=NONE
STCK=C MODRC=0 IPAD=N XTKW=N FMDF=N PGDF=N
L=49 PG=0 SR=49 BY=12252
WSI=1
DD=..JESMSG LG
DSN=IBMUSER.OUTFMT1.JOB00031.D0000002.JESMSG LG
DD=..JESJCL
DSN=IBMUSER.OUTFMT1.JOB00031.D0000003.JESJCL
DD=..JESYSMSG
DSN=IBMUSER.OUTFMT1.JOB00031.D0000004.JESYSMSG
VAR SEC HAS 1 DATASETS; 0 MARKED DONE
Q=WTR CMPLT=N SCHD=N PRTY=2 CLASS=I OUTST=Y
DEST=ANYLOCAL FORM=2PRT CARR=6 FRMT=N
TPID=none PRMD=LINE USID=IBMUSER
OTBN=none UCS=PN FLASH=NONE MODID=NONE
STCK=C MODRC=0 IPAD=N XTKW=N FMDF=N PGDF=N
L=4 PG=0 SR=4 BY=4084
WSI=2
DD=..STEP0001.SYSPRINT
DSN=IBMUSER.OUTFMT1.JOB00031.D000000A.?
VAR SEC HAS 1 DATASETS; 0 MARKED DONE
Q=WTR CMPLT=N SCHD=N PRTY=2 CLASS=I OUTST=Y
DEST=ANYLOCAL FORM=3PRT CARR=6 FRMT=N
TPID=none PRMD=LINE USID=IBMUSER
OTBN=none UCS=PN FLASH=NONE MODID=NONE
STCK=C MODRC=0 IPAD=N XTKW=N FMDF=N PGDF=N
L=3 PG=0 SR=3 BY=4084
WSI=3
DD=..STEP0001.SYSUT2
DSN=IBMUSER.OUTFMT1.JOB00031.D000000B.?
VAR SEC HAS 1 DATASETS; 0 MARKED DONE
Q=WTR CMPLT=N SCHD=N PRTY=2 CLASS=I OUTST=N
DEST=ANYLOCAL FORM=FMT2 CARR=6 FRMT=Y
TPID=none PRMD=LINE USID=IBMUSER
OTBN=none UCS=PN FLASH=NONE MODID=NONE
STCK=C MODRC=0 IPAD=N XTKW=N FMDF=N PGDF=N
L=3 PG=0 SR=3 BY=4084
WSI=4
DD=..STEP0001.SYSUT2
DSN=IBMUSER.OUTFMT1.JOB00031.D000000B.?
*****
```

Additional OSE facts



- Not all output characteristics affect OSE grouping of data sets.
 - Examples are COPIES=, NAME=, PAGEDEF=.
- OSE grouping of data sets is affected by characteristics that can be specified for writer selection.
 - Writer Classes (WC) and Writer Selection (WS) parameters on OUTSERV and DEVICE initialization statements.
 - Examples are CLASS=, DEST=, FORMS=, UCS=, CHARS=.
- Modifying characteristics for an output data set may alter which OSE represents it.
 - Often the modified data set ends up with it's own OSE.

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Output characteristics that can be specified for writer selection and which affect OSE grouping of data sets are listed below.

The associated writer selection characters, for the WS= parameters on OUTSERV and DEVICE initialization statements, are included in parenthesis.

- (C) FCB= for forms control buffer (FCB) image or carriage control tape.
 - (CL) CLASS= for SYSOUT class
 - (CM) MODIFY= for a copy-modification module
 - (D) DEST= for SYSTOUT data set destination
 - (F) FORMS= for forms
 - (FL) FLASH= for the forms overlay to be used
 - (SS) BURST= and STACKER= for burst or continuous fanfold
 - (P) PRTY= for data set priority
 - (PM) PRMODE= for process mode
 - (T) Device type from the SYSOUT class definition
 - (U) UCS=, CHARS=, or TRAIN= for character sets (or print trains) to be used
- (L) Limit scheduling, via page, line, or record counts, affects writer selection, but not OSE grouping of data sets.



User exits to examine/modify an OSE

- IATUX72 and IATUX19 allow a user to examine and/or modify an OSE before it is written to spool.
 - When an OSE is initially constructed.
 - When an OSE is rebuilt (which may occur when moved from Q=HOLD to Q=WTR).
- IATUX72 also allows a user to examine and/or modify an OSE every time it is moved from Q=HOLD to Q=WTR.
 - IATUX19 called only if OSE is rebuilt due to the move.
 - IBM recommends using IATUX72 for this reason.

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Output Services processing

- Normally, when job execution ends or terminates, JES3 output services creates the OSEs.
- SYSOUT data sets are also placed on one of four output queues:
 - Q=WTR – *Output service writer queue*
 - Q=HOLD – *Output service hold queue*
 - Q=BDT – *MVS/BDT work queue*
 - Q=TCP – *TCP/IP/NJE work queue*

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OUTSERV element



- Job in the OUTSERV Scheduler Element until all output has been written (or purged).
- *CALL DISPLAY command used to display information about jobs in the JES3 job queue.

```
*x display,j=29
IAT6306 JOB (JOB00030) IS DISPLAY , CALLED BY C3E0SY1
IAT7762 - *2 JOB00029 IBMUSERA SE=(CI-COMPLETE,MAIN-COMPLETE,
IAT7762 - OUTSERV-ACTIVE,URGE-NOSTAT),JCTMAINS=(SY1,SY2,SY3,
IAT7762 - SY4,SY5,SY6,SY7,SYLOCAL8),
IAT7762 - SRVCLASS=DISCRETN,ORG=ANYLOCAL,CLASS=W,
IAT7762 - GROUP=JES3WLM,JTRACKS=00000006,IORATE=MED,
IAT7762 - PROCLIB=IATPLB11,MAINS=(
IAT7762 - SY1,SY2,SY3,SY4,SY5,SY6,SY7,SYLOCAL8),
IAT7762 - INDEX=WAITING FOR WRITER,INEST=999,PAGEST=099999999,
IAT7762 - BPPST=00001500,
IAT7762 - CRDEST=999,JESMSG LG=LOG,OUSID=IBMUSER,TUSID=IBMUSER
IAT7450 JOB DISPLAY (JOB00030) PURGED
```

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The *CALL DISPLAY command which can be used to obtain additional job details.

Using *CALL DISPLAY we see that JOB00029 is done executing, is in the OUTSERV SE, and is waiting for a writer.


Spin-off data sets

- Spin-off data sets are processed by output services while a job is still in execution.
- Examples:
 - SYSOUT with DD FREE=CLOSE parameter.
 - Except when SPIN=NO is also specified.
 - SYSOUT with DD SPIN=UNALLOC parameter.
 - Available as soon as the data set is unallocated.
 - Dynamic unallocate with CLOSE (DCB1,FREE).
 - All SYSOUT produced by APPC transaction programs.
- Often spin-off data sets are processed separately and have their own OSE.
 - When the data set is closed vs. at the end of the job.
 - May be processed and grouped together if output services falls behind.

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Another example is JESLOG=SPIN on the // JOB JCL statement.



Output queues

- **Q=WTR** – *Output service writer queue*
 - SYSOUT data sets to be processed by JES3 managed devices.
- **Q=HOLD** – *Output service hold queue*
 - SYSOUT data sets to be processed by system routines other than JES3 managed devices.
- **Q=BDT** – *MVS/BDT work queue*
 - Network job and SYSOUT streams to be transmitted in a JES3 SNA/NJE network.
- **Q=TCP** – *TCP/IP/NJE work queue*
 - Network job and SYSOUT streams to be transmitted in a JES3 TCP/IP/NJE network.
- Going to focus on Q=WTR and Q=HOLD.

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ABCs of z/OS System Programming - Volume 13 – Chapter 11


Q=WTR Output service writer queue: This queue contains data sets waiting for output processing by JES3 managed devices. Output service automatically selects data sets for processing based on their selection characteristics such as output class, output priority, and output device-related requirements. You can use JES3 commands to place these data sets in operator-hold status. You can also use JES3 commands to modify a data set's selection characteristics or move the data set to the HOLD queue.

Q=HOLD Output service hold queue: This queue contains data sets that are awaiting output processing by other than JES3-managed devices. These data sets must be processed by the function for which they are held (system application printer interface (SAPI) application, external writer or TSO). The function that processes the data set can then change data set characteristics, release it for JES3 processing, or cause JES3 to purge it. If necessary, the operator can force a JES3 writer to process the data set or issue a modify (*F) command to move the data set to the WTR for JES3 device processing.

Q=BDT MVS/BDT work queue: This queue contains SNA/NJE networking job or networking system output streams. MVS/BDT sends these job or system output streams to the proper node within a SNA/NJE network. You can use JES3 operator commands to hold, release, or cancel networking requests from the queue.

Q=TCP TCP/IP/NJE network jobs: This queue can be either network job streams or network SYSOUT streams. This command might have a length of 126 characters if the command is issued from an input device that permits that command length.


See also z/OS V1R12.0 JES3 Initialization and Tuning Guide – Chapter 4.



Output commands

- *I U...
 - Display job output in a JES3 system.
 - Dependent upon using the Q= parameter!
 - WTR, HOLD, BDT, and TCP queues (WTR is default).
 - Additional parameters dependent upon the Q= selected.
 - *I U by itself does not give you much of anything.
 - Default is 10 detail lines, use N= to get more or ALL.
- *MODIFY U...
 - Modify job output in a JES3 system.
 - Also dependent upon using the Q= parameter!
 - WTR, HOLD, BDT, and TCP queues (WTR is default).
 - Additional parameters dependent upon the Q= selected.

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*INQUIRY,U command to display job output in a JES3 system.

*MODIFY,U command to modify job output in a JES3 system.

Why not O for output instead of U, O is for console commands.


The job output can be at various places within the system and your selection of the proper "Q=" keyword value on the *INQUIRY,U and *MODIFY,U commands dictates what output you want.

Q=WTR is the default for *INQUIRY

Q=WTR is the default for *MODIFY

Parameters available depend upon the Q= used. Some are common to all queues, some are common for some queues, some are unique for the queue.

See z/OS V1R12.0 JES3 Commands for more details.



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Output command examples

- Queued output details.

```

*i u, j=29, dd=?, n=3
IAT8131 JOB IBMUSERA (JOB00029), T=PRT, L=4, PG=0, SR=4, BY=4084,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=.STEP0001.SYSPRINT(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D000000E.?.
IAT8131 JOB IBMUSERA (JOB00029), T=PRT, L=3, PG=0, SR=3, BY=4084,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=.STEP0001.SYSUT2(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D000000F.?.
IAT8131 JOB IBMUSERA (JOB00029), T=PRT, L=4, PG=0, SR=4, BY=4084,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=.STEP0002.SYSPRINT(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000011.?.
IAT8119 NUMBER OF JOBS FOUND : 1


*i u, j=29, dd=?, q=hold
IAT8131 JOB IBMUSERA (JOB00029), L=7, PG=0, SR=7, BY=16336,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=.JESMSG1G(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000002.JESMSG1G.
IAT8131 JOB IBMUSERA (JOB00029), L=74, PG=0, SR=74, BY=4084,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=.JESJCL(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000003.JESJCL.
IAT8131 JOB IBMUSERA (JOB00029), L=64, PG=0, SR=64, BY=12252,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=.JESYSMSG(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000004.JESYSMSG.
IAT8131 JOB IBMUSERA (JOB00029), L=3, PG=0, SR=3, BY=4084,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=.STEP0003.SYSUT2(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000015.?.
IAT8131 JOB IBMUSERA (JOB00029), L=3, PG=0, SR=3, BY=4084,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=.STEP0004.SYSUT2(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000018.?.
IAT8119 NUMBER OF JOBS FOUND : 1

*i u, j=29, dd=?, q=bdt
IAT8121 NO OUTPUT FOR SELECTED OPTIONS, OSE NOT FOUND

```

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Additional parameters on *I U,J=, like DD=?, will provide more details – essentially asking what are the DD names here.

Note that N=3 was used here to limit the amount of output. The default is 10.

Inquiry's done on WTR and HOLD queues find all the output for this job. Checking both the BDT and TCP queues would find no output – no output was expected on these queues for this job. But note that the reply message, IAT8121, indicates OSE NOT FOUND – this is why we mentioned what an OSE is. Sometimes the text is JOB NOT FOUND. Either way, no output matches the inquiry.


Now it was expected that output on Q=WTR should be printing. Why not?



Writer definition


- **DEVICE** initialization statement
 - Specifies device characteristics and tells JES3 how to use that device.
- **FSSDEF** initialization statement
 - Used to define a WTR FSS that runs in a separate address space and on any specified system.
 - One statement with TYPE=WTR for each output WTR FSS to be created.
 - More than one device can be controlled by the WTR FSS.
- **DEVICE FSSNAME=** parameter identifies the FSS which will control the AFP printer.

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Initialization statements in the JES3 INISH deck associated with Output Service definition.


See z/OS V1R12.0 JES3 Initialization and Tuning Reference for more details.



Hot v. Dynamic writers overview

- Hot writer:
 - Operator has total control of output handling on the device.
 - Started by the operator using a *CALL command.
 - Waits for work and remain active even when no output is available.
- Dynamic writer:
 - Allow JES3 to control changing the device characteristics.
 - Started when output is available and stopped when no output is available.
- Specified for a writer on the DEVICE initialization statement or modified using *MODIFY,W command.
 - Non-FSS devices default to DYNAMIC=YES.
 - FSS devices default to DYNAMIC=NO.

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Dynamic writers

JES3 output service starts the writer and its associated devices, based on the availability of output devices and the current output data set requirements. After JES3 initialization, you must use the *S command the first time you use a device associated with a dynamic writer. After that, printing or punching begins automatically for properly prepared devices that are in the ready state. You can use the *S, *R, and *C commands to control dynamic writers while they are active. The dynamic writer will stop immediately after no suitable output is available for processing by the writer.

A dynamic writer is scheduled when:

- There is work (one or more data sets) in the output queue
- There is an output device available

Dynamic writers reduce the amount of control operations personnel have over when and how writing is performed. They do allow operator interaction while the writer is active (that is, changing of setup characteristics). The dynamic writer terminates when no more work is available or a higher priority DSP is waiting for the device.

Hot writers

A hot writer is invoked using an *X command. The command can either be issued by you or by JES3, depending on how the DEVICE associated with the writer is defined to JES3. If the DEVICE specifies NO for the DYNAMIC keyword, the writer is controlled exclusively by you. If the DYNAMIC keyword specifies YES and a nonzero value for the timeout, the writer is eligible for an automatic *X by JES3. The writer notifies you when it is waiting for work and remains available for processing. The writer will wait for as long as the timeout period defined for the device. If no new work becomes available it will then terminate. You control the writer using the *X, *S, *R, and *C commands. You can use the *MODIFY,W command to restrict a device to be started as a hot writer or to change the associated timeout value. If the device is defined with the DYNAMIC keyword set to YES and a timeout value of zero, the device is eligible for a dynamic writer.

Caution: Running an output writer FSS as a dynamic writer could slow output processing, because an address space must be brought up or down each time the writer is started or stopped.

Writer selection criteria



- **DEVICE WS= parameter**
 - Specifies which output characteristics, and the order, used by Output Services to select data sets for a writer.
 - Same output characteristics maintained in the OSEs and used to group data sets.
 - WS= on OUTSERV initialization statement is the default criteria.
 - Can be modified with WS= on the *CALL, *START, and *RESTART device commands.
- **DEVICE WC= parameter**
 - Specifies SYSOUT classes in the order they are processed by the output service writers for this device.
 - Effective only when WS= includes CL for SYSOUT class selection.
 - WC= on OUTSERV initialization statement is the default criteria.

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WS=STANDARD or WC=STANDARD specify that the values from the OUTSERV initialization statement are used.

Device characteristics



- *INQUIRY D...
 - Display an output device and its current output characteristics.

```

*i d,d=prt002
IAT8562 PRTO02 0002 (AC ) WTR      F=1PRT U=PN DYN=Y
IAT8562 PRTO02 0002              TIMEOUT=0
IAT8562 PRTO02 0002              H=N B=N M=A
IAT8562 PRTO02 0002              L=0+ DGRPY=N
IAT8562 PRTO02 0002              C=6 PM=LINE
IAT8562 PRTO02 0002              WS=(P,CL,PM,L,D)
IAT8562 PRTO02 0002              DGRP=LOCAL
IAT8562 PRTO02 0002              JOB SYSLOG (JOB00002)
. . .

*i d,d=prtb03
IAT8562 PRTB03 0B03 (OFN)        F=1PRT CH=(GT15) DYN=N
IAT8562 PRTB03 0B03              TIMEOUT=NONE
IAT8562 PRTB03 0B03              FL=NONE H=N B=YM M=A
IAT8562 PRTB03 0B03              L=0+ PG=0+ CK=200P DGRPY=N MK=C
IAT8562 PRTB03 0B03              NPRO=1 MODE=FSS FSS=PRTB03
IAT8562 PRTB03 0B03              C=6 PM=LINE,PAGE
IAT8562 PRTB03 0B03              SS=C CGS=2 CM=(NONE,0)
IAT8562 PRTB03 0B03              SETUPMSG=Y
IAT8562 PRTB03 0B03              FD=PAGE (NONE)
IAT8562 PRTB03 0B03              WS=(CL)
IAT8562 PRTB03 0B03              WC=ABCDR DGRP=LOCAL
IAT8562 PRTB03 0B03              MATE=Y
. . .

```


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Use *INQUIRY D to see the output characteristics for the device.


WS= is the current writer selection criteria for the device.



Scheduling output


- OSEs are scheduled to writers when the selection criteria fits and:
 - When the OSE is created and there is a writer waiting for work.
 - When writers ask for work.
 - When a dynamic writer can be started.
- OSEs are scheduled using a “best fit” approach to match the output characteristics of a device (aka writer).
 - OSEs with a perfect fit get priority.
 - When OSEs fit equally well across jobs, output for a job with higher job priority goes first.

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Initialization statements in the JES3 INISH deck associated with Output Service definition.


See z/OS V1R12.0 JES3 Initialization and Tuning Reference for more details.



Matching output characteristics

- Using writer selection to determine a “best fit”:
 - A device characteristic that is not one of the writer selection criteria is ignored.
 - A device characteristic that is one of the writer selection criteria, and is not changeable on the device, must match to be selected.
 - A device characteristic that is one of the writer selection criteria, and is changeable on the device, will be changed to match the data set characteristic.
- For JES3 managed devices, all matching OSEs in a job will be selected for writing.
 - Can consider this to be “late binding” in that a set of output is selected for the device when a writer needs work.
 - Selected output cannot be selected by another writer.

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Initialization statements in the JES3 INISH deck associated with Output Service definition.

See z/OS V1R12.0 JES3 Initialization and Tuning Reference for more details.



Characteristic fitting examples

- In the initialization deck:

```
DEVICE ... WS=(D), CHARS=GS10, MODE=COMP
SYSOUT CLASS=A, TYPE=PRINT
```
- In the job's JCL:

```
//TEST JOB ...
//KME DDSYSOUT=A, CHARS=GT15
```
- The characteristic is ignored:

```
*CALL WTR OUT=00F
*START 00F
```

 - There is no writer selection criteria for CHARS on the DEVICE statement, so the system uses the character defined by the device statement when the writer is started.
 - The value specified by the user on the JCL is overridden to GS10.

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Characteristic fitting examples

- The characteristic matches:

```
*CALL WTR OUT=00F, WS=(U), CH=(GT15, H)  
*START 00F
```

- Writer is started using selection criteria for CHARS specified and the value is not changeable.
- Writer and output both match CHARS of GT15.

- The characteristic is changed:

```
*CALL WTR OUT=00F, WS=(U), CH=(GT10, R)  
*START 00F
```

- Writer is started using selection criteria for CHARS specified and the value is changeable.
- Writer characteristic changed to GT15 (per JCL).

Output status



- Details for a data set using REQ=ALL.
 - D= identifies the device this output is destined for.

```
*i u, j=29, dd= .STEP0001.SYSPRINT, req=all
IAT8131 JOB IBMUSERA (JOB00029), P=2, D=PRT002, SL=(NAVAIL), T=PRT,
IAT8131 JOB IBMUSERA (JOB00029), F=1PRT, C=6, U=PN, CH=GS10,
IAT8131 JOB IBMUSERA (JOB00029), FL=NONE, CM=(NONE,0), SC=C, CL=A,
IAT8131 JOB IBMUSERA (JOB00029), ID=IBMUSER, OB=NONE, H=N, PM=LINE,
IAT8131 JOB IBMUSERA (JOB00029), L=4, PG=0, SR=4, BY=4004,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, IP=N,
IAT8131 JOB IBMUSERA (JOB00029), DD=.STEP0001.SYSPRINT(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D000000E.?.
IAT8119 NUMBER OF JOBS FOUND : 1
```

- This data set is going to device PRT0002 and not held, but also not printing. Why?


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Here detailed the information for a specific DD name is obtained. Instead of using additional parameters like D=?, the REQ=ALL parameter was used to get more details for the data set. It can be used for just about any output inquiry, but you'll get many more lines of data!

For this output we see it is going to device PRT0002 and not held. So what's up?



Device status

- *INQUIRY D...
 - Display an output device and its current output characteristics like WS=.


```

*i d,d=prt002
IAT8562 PRT002 0002 (AC ) WTR          F=1PRT U=PN DYN=Y
IAT8562 PRT002 0002                    TIMEOUT=0
IAT8562 PRT002 0002                    H=N B=N M=A
IAT8562 PRT002 0002                    L=0+ DGRPY=N
IAT8562 PRT002 0002                    C=6 PM=LINE
IAT8562 PRT002 0002                    WS=(P,CL,EM,L,D)
IAT8562 PRT002 0002                    DGRP=LOCAL
IAT8562 PRT002 0002                    JOB SYSLOG (JOB00002)
IAT8572 0002 (AC ) SY1
IAT8572 0002 (AC ) SY2
IAT8572 0002 (AC ) SY3
IAT8572 0002 (AC ) SY4
IAT8572 0002 (AC ) SY5
IAT8572 0002 (AC ) SY6
IAT8572 0002 (AC ) SY7
IAT8572 0002 (AC ) SYLOCAL8
IAT8500 INQUIRY ON DEVICES COMPLETE
      
```

- Looks like SYSLOG (JOB00002) is active on the device.
 - If you look, likely the printer is not doing anything!

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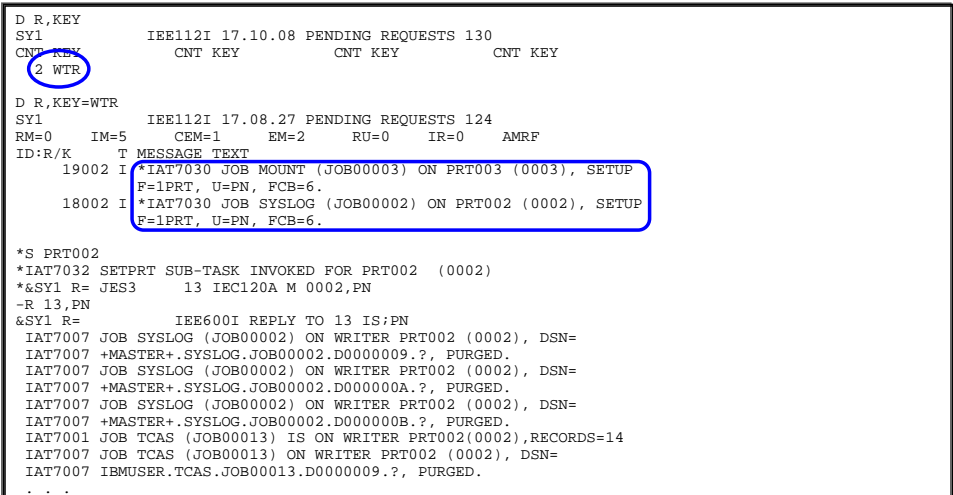
Use *INQUIRY D to see the output characteristics for the device.

WS= is the current writer selection criteria for the device.

(AC) indicates device is Active and job SYSLOG (JOB00002) is active on the device.

I'm confused. It looks like some job may be consuming the printer?

If you could physically see the printer, likely it is not doing anything.



A check for outstanding messages

- Displaying outstanding messages.


```

D R,KEY
SY1          IEE112I 17.10.08 PENDING REQUESTS 130
CNT KEY     CNT KEY           CNT KEY           CNT KEY
 2 WTR

D R,KEY=WTR
SY1          IEE112I 17.08.27 PENDING REQUESTS 124
RM=0       IM=5       CEM=1       EM=2       RU=0       IR=0       AMRF
ID:R/K     T MESSAGE TEXT
19002 I *IAT7030 JOB MOUNT (JOB00003) ON PRT003 (0003), SETUP
          F=1PRT, U=PN, FCB=6.
18002 I *IAT7030 JOB SYSLOG (JOB00002) ON PRT002 (0002), SETUP
          F=1PRT, U=PN, FCB=6.

*S PRT002
*IAT7032 SETPRT SUB-TASK INVOKED FOR PRT002 (0002)
*&SY1 R= JES3      13 IEC120A M 0002,PN
-R 13,PN
&SY1 R=          IEE600I REPLY TO 13 IS;PN
IAT7007 JOB SYSLOG (JOB00002) ON WRITER PRT002 (0002), DSN=
IAT7007 +MASTER+.SYSLOG.JOB00002.D0000009.?, PURGED.
IAT7007 JOB SYSLOG (JOB00002) ON WRITER PRT002 (0002), DSN=
IAT7007 +MASTER+.SYSLOG.JOB00002.D000000A.?, PURGED.
IAT7007 JOB SYSLOG (JOB00002) ON WRITER PRT002 (0002), DSN=
IAT7007 +MASTER+.SYSLOG.JOB00002.D000000B.?, PURGED.
IAT7001 JOB TCAS (JOB00013) IS ON WRITER PRT002(0002),RECORDS=14
IAT7007 JOB TCAS (JOB00013) ON WRITER PRT002 (0002), DSN=
IAT7007 IBMUSER.TCAS.JOB00013.D0000009.?, PURGED.
. . .
  
```

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So while trying to figure this out, someone mentioned an MVS command that might be useful. This provides a lists of outstanding messages.

```
D R,KEY=WTR
```

```
KEY=keyname
```

The system requests those messages that are identified by a one to eight-character keyname, such as those messages issued by the specified dynamic support program (DSP) of JES3.

Using just KEY summarizes outstanding requests for all JES3 DSPs.

Specifying a DSP like WTR gives a list of messages outstanding for that message.

IAT7030 indicates device needs to be started. These messages were also at the top of the operator screen – but I paid no attention to them as I rarely print output.

So the printer had to be started with *S PRT002 and output flies!

The point of this is not that messages on the operator console (a given) but that sometimes it takes using multiple JES3 and MVS commands to determine the overall picture of what is going on.



External writers

- External writers operate as a completely separate MVS job.
 - Execute in an address space other than the JES3 address space.
- Interact with JES3 via the subsystem interface (SSI) to request data sets for processing.
 - Process SYSOUT Data Sets call (PSO) — SSI function code 1
 - SYSOUT Application Program Interface (SAPI) — SSI function code 79
- Output service does not schedule external writers as a result of constructing OSEs requiring their services.
 - Operators must start external writers as required.
- Output service posts started writers that are waiting for work when output becomes available.
 - The writer routine must then try to obtain the data set.

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**// OUTPUT WRITER= v.
//*FORMAT EXTWTR=**

- // OUTPUT WRITER=*name* identifies an external writer to process the SYSOUT data set.
 - JES3 SYSOUT placed on Q=HOLD for WRITER=*name* if not destined for a known node (held for WRITER=*name*).
 - JES3 SYSOUT placed on appropriate Q for a destination node, then placed on Q=HOLD for WRITER=*name* at the destination node.
- //*FORMAT EXTWTR=*name* identifies an external writer at a destination node to process the SYSOUT data set.
 - JES3 SYSOUT placed on Q=WTR if not destined for a known node (not held for EXTWTR=*name*).
 - JES3 SYSOUT placed on appropriate Q for a known node, then placed on Q=HOLD for EXTWTR=*name* at the destination node.

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SAPI v. PSO to retrieve SYSOUT

- IBM recommends that applications use the SAPI SSI which provides richer function and better performance characteristics.
 - The ability to multitask data set selection and processing calls from within an application (i.e. concurrent requests from the address space).
 - A richer selection criteria, including the use of wildcard characters for attributes.
 - A greater number of SYSOUT data set characteristics returned to the application.
 - The application has the ability to retrieve information contained in the scheduler work blocks (SWBs).
 - A greater degree of modification ability of selected SYSOUT data sets.
 - A count facility that Process SYSOUT does not provide.

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SAPI v. PSO update access

- JES3 allows update of the data set attributes through PSO.
 - Requires update access even to read a data set.
 - Unknown by JES3 if update of the data set attributes may or may not be done.
- SAPI flag SSS2SRON indicates read only intent by the application.
 - Default SAF access for SAPI requests is UPDATE access to the JESSPOOL class.
 - READ access can be used when SSS2SRON is set.
 - Error occurs if the application attempts to modify the data sets with READ access.

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DSISO - Data Set ISolation

- Allows data sets to be purged from the spool immediately after printing.
 - Normally data sets are purged from spool after all data sets are printed and the job is purged.
 - DSISO does not affect output characteristics (OSEs) or scheduling.
- Specified for the SYSOUT class with TYPE=DSISO:
 - SYSOUT,CLASS=M,.....,TYPE=(PRINT,DSISO)
- Can also specify using the DALSPIN text unit to allocate a data set with dynamic allocation.
- Spin off data sets are DSISO.
 - Available for immediate processing/scheduling/writing so it makes sense that they are DSISO.

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Q=HOLD v. held output

- **Q=HOLD** is for SYSOUT data sets to be processed by system routines other than JES3 managed devices.
- Why does JES3 output end up on Q=HOLD?
 - For TSO user access with TSO/E OUTPUT command:
 - Output using a SYSOUT class with HOLD=TSO.
 - Output using a SYSOUT class with TYPE=RSVD and the MSGCLASS on the // JOB statement specifies a SYSOUT class with TYPE=RSVD.
 - Held for an external writer:
 - SYSOUT classes with HOLD=EXTWTR
 - // OUTPUT with WRITER=*name*
 - // DD with SYSOUT=(*class,name*)
 - Explicitly moved to Q=HOLD
 - *MODIFY with NQ=HOLD

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Output on Q=HOLD is output that is selectable and held for processing by a system function (TSO user, external writer). Not for processing by a JES3 managed device (WTR), BDT, or TCP.

z/OS V1R12.0 JES3 Initialization and Tuning Guide – Chapter 4.

Output service hold queue (Q=HOLD): This queue contains data sets that are awaiting output processing by other than JES3-managed devices. These data sets must be processed by the function for which they are held (system application printer interface (SAPI) application, external writer or TSO). The function that processes the data set can then change data set characteristics, release it for JES3 processing, or cause JES3 to purge it. If necessary, the operator can force a JES3 writer to process the data set or issue a modify (*F) command to move the data set to the WTR for JES3 device processing.

Q=HOLD example



- Display output on Q=HOLD for a job

```
*i u,j=29,dd=?q=hold
IAT8131 JOB IBMUSERA (JOB00029), L=7, PG=0, SR=7, BY=16336,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=..JESMSGGL(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000002.JESMSGGL.
IAT8131 JOB IBMUSERA (JOB00029), L=74, PG=0, SR=74, BY=4084,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=..JESJCL(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000003.JESJCL.
IAT8131 JOB IBMUSERA (JOB00029), L=64, PG=0, SR=64, BY=12252,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=..JESYSMSG(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000004.JESYSMSG.
IAT8131 JOB IBMUSERA (JOB00029), L=3, PG=0, SR=3, BY=4084,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=.STEP0003.SYSUT2(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000015.?.
IAT8131 JOB IBMUSERA (JOB00029), L=3, PG=0, SR=3, BY=4084,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, DD=.STEP0004.SYSUT2(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000018.?.
IAT8119 NUMBER OF JOBS FOUND : 1
```

- But why is it on Q=HOLD?

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An example if an *INQUIRY of SYSOUT data sets on Q=HOLD.

Q=HOLD example



- Detail for output on Q=HOLD using REQ=ALL.

```
*i u, j=29, dd=.STEP0003.SYSUT2,q=hold, req=all
IAT8131 JOB IBMUSERA (JOB00029), P=2, D=ANYLOCAL, DSID=*, SL=(NAVAI),
IAT8131 JOB IBMUSERA (JOB00029), W=*, F=1PRT, C=6, U=PN, CH=PS10,
IAT8131 JOB IBMUSERA (JOB00029), FL=NONE, CM=(NONE,0), SS=C, CL=T,
IAT8131 JOB IBMUSERA (JOB00029), ID=IBMUSER, OB=NONE, H=N, PM=LINE,
IAT8131 JOB IBMUSERA (JOB00029), L=3, PG=0, SR=3, BY=4084,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, IP=N,
IAT8131 JOB IBMUSERA (JOB00029), DD=.STEP0003.SYSUT2(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000015.?.
IAT8119 NUMBER OF JOBS FOUND : 1

*i u, j=29, dd=.STEP0004.SYSUT2,q=hold, req=all
IAT8131 JOB IBMUSERA (JOB00029), P=2, D=LOCAL, DSID=*, SL=(NAVAI),
IAT8131 JOB IBMUSERA (JOB00029), W=*, F=1PRT, C=6, U=PN, CH=PS10,
IAT8131 JOB IBMUSERA (JOB00029), FL=NONE, CM=(NONE,0), SS=C, CL=W,
IAT8131 JOB IBMUSERA (JOB00029), ID=IBMUSER, OB=NONE, H=N, PM=LINE,
IAT8131 JOB IBMUSERA (JOB00029), L=3, PG=0, SR=3, BY=4084,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, IP=N,
IAT8131 JOB IBMUSERA (JOB00029), DD=.STEP0004.SYSUT2(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000018.?.
IAT8119 NUMBER OF JOBS FOUND : 1
```

- Class T is defined by SYSOUT,CLASS=T,HOLD=TSO.
- Class W is defined by
SYSOUT,CLASS=W,HOLD=EXTWTR,DEST=LOCAL

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Using REQ=ALL to get more details there is no real indication of why the output is on Q=HOLD.

We only know from the initialization statements that:

Class T is defined by SYSOUT,CLASS=T,HOLD=TSO

Class W is defined by SYSOUT,CLASS=W,HOLD=EXTWTR,DEST=LOCAL


So again, sometimes it takes cross referencing information from multiple sources to come up with a complete picture.



Q=HOLD v. held output

- **Held output** is output in a hold state and is not selectable for processing.
 - Can be on any of the four output queues.
- When does JES3 output end up in a hold state?
 - JCL DD statement with HOLD=YES
 - H=(USER) state
 - Different from JES2 which treats like OUTDISP=HOLD and puts the output on the JES2 hold queue.
 - Explicitly held by operator
 - H=(OPER) state
 - *MODIFY with NH=HOLD
 - JES3 subsystem placed the data set in hold
 - H=(SYS) state

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Held output is output on any Q= that is in a hold state – when in a hold state, the output is not selectable for processing/writing.

Hold states are USER, OPER, SYS.

No specific references for this slide.

Held output example



- Output using JCL DD statement with HOLD=YES.
 - Output is on Q=WTR.

```

*i u, j=29, dd=?, req=all
IAT8131 JOB IBMUSERA (JOB00029), P=2, D=PRT002, SL=(NAVAIL), T=PRT,
IAT8131 JOB IBMUSERA (JOB00029), F=1PRT, C=6, U=PN, CH=GS10,
IAT8131 JOB IBMUSERA (JOB00029), FL=NONE, CM=(NONE,0), SS=C, CL=A,
IAT8131 JOB IBMUSERA (JOB00029), ID=IBMUSER, OB=NONE, H=(USER),
IAT8131 JOB IBMUSERA (JOB00029), PM=LINE, L=3, PG=0, SR=3, BY=1084,
IAT8131 JOB IBMUSERA (JOB00029), COPIES=1, IP=N,
IAT8131 JOB IBMUSERA (JOB00029), DD=.STEP0002.SYSUT2(1),
IAT8131 JOB IBMUSERA (JOB00029), DSN=IBMUSER.IBMUSERA.JOB00029.D0000012.?.
IAT8119 NUMBER OF JOBS FOUND : 1

*f, u, j=29, dd=.STEP0002.SYSUT2, NH=N
IAT8122 CHANGED JOB IBMUSERA (JOB00029) DATA SET=.STEP0002.SYSUT2
IAT8118 NUMBER OF DATA SETS MODIFIED : 1
IAT7001 JOB IBMUSERA (JOB00029) IS ON WRITER PRT002(0002), RECORDS=3

*i u, j=28, dd=.STEP0001.SYSUT2, req=all
IAT8131 JOB IBMUSERA (JOB00028), P=2, D=PRT002, SL=(NAVAIL), T=PRT,
IAT8131 JOB IBMUSERA (JOB00028), F=1PRT, C=6, U=PN, CH=GS10,
IAT8131 JOB IBMUSERA (JOB00028), FL=NONE, CM=(NONE,0), SS=C, CL=A,
IAT8131 JOB IBMUSERA (JOB00028), ID=IBMUSER, OB=NONE,
IAT8131 JOB IBMUSERA (JOB00028), H=(OPER,USER), PM=LINE, L=3, PG=0,
IAT8131 JOB IBMUSERA (JOB00028), SR=3, BY=1084, COPIES=1, IP=N,
IAT8131 JOB IBMUSERA (JOB00028), DD=.STEP0001.SYSUT2(1),
IAT8131 JOB IBMUSERA (JOB00028), DSN=IBMUSER.IBMUSERA.JOB00028.D000000F.?.
IAT8119 NUMBER OF JOBS FOUND : 1

```

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Still have one data set for job 29 on Q=WTR.

JCL had a DD statement with HOLD=YES which results in a USER HOLD of the output.

If the user wants the output printed, the modify command is used to release the hold.

When an operator uses the modify command to hold output, H=(OPER) would be seen.

You may actually see both: H=(OPER,USER) in which case doing a release with NH=N releases both!




JES3 SYSOUT HOLD differences

- JES3 Q=HOLD (hold queue) contains:
 - Data sets for external writers.
 - Data sets for a SYSOUT class with HOLD=TSO.
 - Available for TSO/E OUTPUT command.
- // DD HOLD=YES for JES3 is not the same as for JES2.
 - Sets JES3 hold status of USER with data set on Q=WTR.
 - JES2 data set on Q=HOLD and available for TSO/E OUTPUT.
- /*FORMAT parameters are not applied to JES3 data sets initially put on Q=HOLD.
 - One OSE will exist for a data set while on Q=HOLD.
 - /*FORMAT statement(s) are applied when released (data set moved to Q=WTR) and may create multiple OSEs.

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References

- z/OS V1R13.0 publications are available at <http://www-03.ibm.com/systems/z/os/zos/bkserv/r13pdf/>
- *z/OS V1R13.0 JES3 Initialization and Tuning Guide* (SA22-7549-10)
 - **Chapter 4 on “JES3 Job Management”**
 - **“Output Services” section.**
- *z/OS V1R13.0 JES3 Commands* (SA22-7540-11)
 - Chapters 4 through 7 on “Controlling...” along with command descriptions.
- *z/OS V1R13.0 JES3 Initialization and Tuning Reference* (SA22-7550-10)
 - JES3 initialization statements
- *ABCs of z/OS System Programming - Volume 13* (SG24-7717-01)
 - <http://www.redbooks.ibm.com/abstracts/sg247717.html>
 - Details on JES3 externals and internals (control blocks), initialization statements, and operator commands.

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Here are a number of references that were included in the presentation.

Chapter 4 of the *z/OS V1R13.0 JES3 Initialization and Tuning Guide* is a very good starting point (referred to often in the notes and while preparing the slides).

Chapter 4 through 7 of the *z/OS V1R13.0 JES3 Commands* all have descriptions and overviews that are very useful. And of course the publications documents all the JES3 commands!

z/OS V1R13.0 JES3 Initialization and Tuning Reference describes the various JES3 initialization statements.

The *ABCs of z/OS System Programming - Volume 13* is a Redbook that not only describes various portions of JES3 and JES3 services, but also goes into more details about the internals of JES3. Don't be overwhelmed by it as referring to it for specific topics provides additional insight and details not available in the standard publications.

Wrap up!



Questions?

If you liked this, any future topics?

Thank You!

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