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JES2 z/OS 3.2 Product Update and Latest Status

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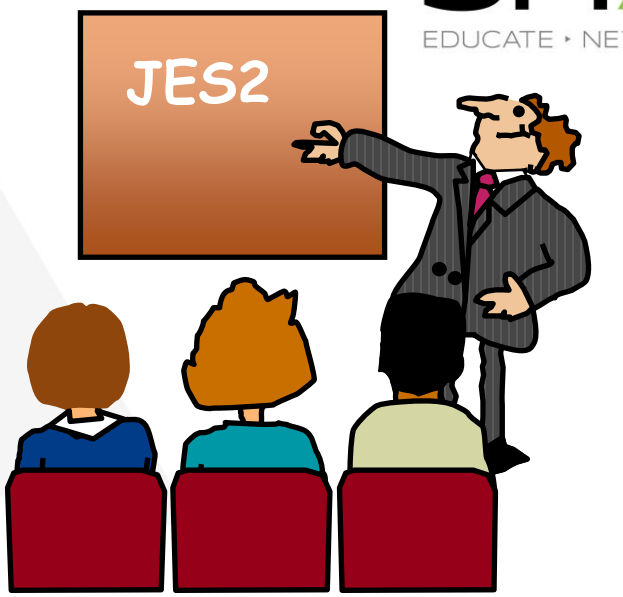
Agenda…



- JES2
  - Current JES2 Releases
  - JES2 z/OS 3.2 Service Updated

- Presentations this week
  - What's New in SDSF in z/OS 3.2
    - Tuesday 3:45PM – Room: Salon 23
  - JES2 z/OS 3.2 Product Update and Latest Status
    - Wednesday 8:00AM – Room: Salon 13

Current JES2 Releases

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FMIDs, Birthdays & Obituaries

JES2 Rel.#	FMID	First Available	No Longer Available	End of Service
z/OS 1.12	HJE7770	9/10	10/11	9/14
z/OS 1.13	HJE7780	9/11	01/14	9/16
z/OS 2.1	HJE7790	9/13	01/16	9/18
z/OS 2.2	HJE77A0	9/15	01/18	9/20
z/OS 2.3	HJE77B0	9/17	01/20	9/22
z/OS 2.4	HJE77C0	9/19	01/22	9/24
z/OS 2.5	HJE77D0	9/21	01/24	***9/26****
z/OS 3.1	HJE77E0	9/23	01/26	***9/28****
z/OS 3.2	HJE77F0	9/25		***9/30****

See https://www-01.ibm.com/software/support/lifecycle/index_z.html Search for 5650-zOS or 5655-ZOS

*** = projected...**

Z/OS 3.2 JES2 $ACTIVATE

New $ACTIVATE Level

- $ACTIVATE is a command to enable new functions in JES2
  - Creates new data areas (CTENTs) in the checkpoint structures
  - Performs various data transforms
- Full set of commands, options, and functions to manage the new $ACTIVATE level
  - Similar to what existed in last $ACTIVATE in z/OS 2.2
  - `$D ACTIVATE` displays current mode/what is needed for other mode
  - `$ACTIVATE` supports `LEVEL=z32` (activation) or `LEVEL=z22` (retro-activation)
  - `OPTSDEF COLD_START_MODE= Z22` or `Z32`
    - Note: **default currently** is **Z22** mode
  - `S JES2,PARM=(UNACT)` warm starts in z22 mode (all member warm or hot start)
  - SSI 54 (Who-Am-I) CKPT_LEVEL='Z32' returned
  - Updated health check `JES2_Upgrade_CKPT_Level`

New $ACTIVATE Level

- As with prior $ACTIVATE, all active members must be z/OS JES2 3.2 or higher
  - Further requirement that SPOOLDEF ADVANCED_FORMAT must be ENABLED
- This $ACTIVATE will require that all “optional” data areas are created
  - Some added data areas were “optional” if the checkpoint structures were too small
    - ESQ (Email), CDI/CDT (policies), RGD (Resource Groups)
- New functions with LEVEL=Z32
  - JES2 data repository (new DRX and DRTM CTENTs)
  - New CTENTs for job level data (JQY and JQS CTENTs)
  - Additional data available in the CKPT (for SSI calls)
    - Submitting userid, execution start and end time, Programmer name
  - Migrate fields from JQE and BERTs to JQY/JQS (reduce BERT usage)
    - JQETRAK MTTR migrated to JQETRAK_Z22 (MTTR) and JQYTRAK (MQTR)
- All new CTENTs are in 64 bit storage

New $ACTIVATE Level

- Checkpoint size increase (depends on parms)
  - Max 4k pages goes from 218,019 (3.1) to 275,846 (3.2)
    - JQY – 128 bytes per JQE (JOBNUM=)
    - JQS – 16 bytes per JQE (SPOOLNUM=32)
    - DRX – 64 bytes per index entry (DATADEF INDEX=LIMIT=)
    - DRTM – 20K based on 20,000 DRX limit
  - Typical sizes of new/added CTENTs
    - ESQ – 8K
    - CDI – 20K
    - CDT – 524K
    - RGD – 12K
    - JQY and JQS dependent on JOBNUM=
    - DRX – 1.2M (20K index entries)
    - DRTM – 20K

New $ACTIVATE Level

```
 $d activate
          $HASP895 $DACTIVATE
$HASP895 JES2 CHECKPOINT MODE IS CURRENTLY Z22
$HASP895 THE CURRENT CHECKPOINT:
$HASP895  -- CONTAINS 650 BERTS AND BERT UTILIZATION IS 24
$HASP895     PERCENT.
$HASP895  -- CONTAINS 236 4K RECORDS.
$HASP895 z32 CHECKPOINT MODE ACTIVATION WILL:
$HASP895  -- EXPAND CHECKPOINT SIZE TO 688 4K RECORDS.
$HASP895 z32 ACTIVATION WILL FAIL IF ISSUED FROM THIS MEMBER.
$HASP895     THE FOLLOWING ISSUES PREVENT ACTIVATION:
$HASP895  -- ADVANCED_FORMAT MUST BE ENABLED.
$HASP895  -- CKPT1 IS TOO SMALL BY 338 4K RECORDS.
$HASP895  -- CKPT2 IS TOO SMALL BY 338 4K RECORDS.
```

Z/OS 3.2 JES2
JES2 DATA REPOSITORY
JOB HISTORY
$QGET ENHANCEMENTS

JES2 Data Repository

- New general purpose data repository in JES2 to store information
- The DRX CTENT (in the CKPT) stores the repository index entries
  - Number of index entries set using DATADEF INDEX=LIMIT=nnnnnn (max 1,000,000)
- Index uses the existing AVL Tree support to manage the index
  - Support for multiple trees for potential future expansion
- Bulk data is stored in records on SPOOL
  - Spool space associated with new system job $DATAREP
  - DRTM CTENT manages TGs used by repository (bit map of available records)
    - CTENT size is managed internally
  - Each repository index entry can have up to 32K spool records of data
- Requires $ACTIVATE to LEVEL=Z32 and setting DATADEF REPOSITORY=ENABLED

```
$ddatadef
          $HASP888 DATADEF
$HASP888 DATADEF  REPOSITORY=ENABLED,INDEX=(LIMIT=20000,WARN=80,
$HASP888          FREE=20000)
```

- Job history will be first user of the repository
  - Job history tree uses SYS_JOBTOKEN or JCLID1/2 (from JES2 3.1) as index into tree

Job History Data

- Information about past runs of a job
  - Stored in the JES2 repository
  - Used to predict run time and CPU need for the job next time it is submitted
  - Retained for 30 days from last use (set via DATADEF RETENTION=MAX=)
    - Retention period lowered if there is a shortage of free index entries
- Index for these entries is either:
  - JCLID1/JCLID2 – Hash value of JCL (SMF30JCLID1/SMF30JCLID2)
  - SYS_JOBTOKEN – value passed at job submission (SMF30JOBTOKEN)
    - SYS_JOBTOKEN can also be set by pre-execution policies or exits
- Currently, job history and enhanced job selection is disabled
  - Testing continues for this function
  - Enablement will be via APAR OA68485 and switch once testing has completed

Enhancements to job selection ($QGET)

- As part of the Intelligent job selection process, $QGET is getting reworked
  - Changes in the WLM initiator selection pass (not other phases)
  - New local selectable work queue is being added for WLM service classes
    - Only contains jobs that can be selected locally (not active, held, limited, etc)
    - Maintained on each member
    - Can greatly reduce queue rattling when selecting work
    - New service (GTJBSEL) to check if a job can execute locally
- Changes will impact JES2 exits
  - Exit 14 ($QGET replacement exit)
    - New service GTJBSEL to determine if a job is eligible to run on the current member
    - Similar to GTSCREEN for SYSOUT
    - Current exit may continue to function
      - May want to update to take advantage of new service and side queue
  - Exit 49 ($QGET veto exit)
    - Installations need examine exit 49s to see if new structures/processing necessitates any changes
- Enhanced job selection requires APAR OA68485

Z/OS 3.2 JES2
JOB RESOURCE GROUPS

Job Resource Groups

- Resource groups were introduced in z/OS 3.1 for monitoring resource usage by a set of jobs
  - Job Queue elements (JQEs), spool space (TGs), Job Output Elements (JOEs) and BERTs
- Job must be assigned to resource group before any resources assigned to job
  - Group name can be assigned by JobCreate policy (ModifyJob ResGroup attribute)
  - Could also be assigned by exit 2/52
  - **Can not change resource group assignment once resources allocated**
- NOTE: Input phase processing in 3.1 was re-ordered to accommodate assignment
  - Assigning of spool space, the job id, and the JQE occurs after exit 2/52
    - Exits 2/52 can now set SPOOL allowed mask before any space assigned
  - This ensures no resources are assigned to the job until after a group name can be assigned

Job Resource Groups - Specifications

- Resource groups are defined in the JES2 checkpoint
  - Number of entries defined on the CKPTSPACE statement

    `CKPTSPACE RGD=(RGDNUM=xxxx, RGDFREE=xxxx)`
  - Default is 32, valid range is 16-2000
  - Can be adjusted using `$TCKPTSPACE` command
- Use `$ADD RESGROUP` command to create a resource groups

```
$ADD RESGROUP(nnnnnnnn),RESOURCE(TG   ) = (LIMIT = nn, ACTION = NONE )
                                 JQE                100           WAIT
                                 JOE                              FAIL
                                 BERT
```

Job Resource Groups - Specifications

`RESOURCE(`*`type`*`)`

- The following *types* are supported:
  - **TG** – Track Groups (SPOOL space)
  - **JQE** – Job Queue Elements
  - **JOE** – Job Output Elements
  - **BERT** – Block Extension Reuse Table

`LIMIT=` ***`nn`*** defines resource usage limit as percentage of ***total*** (is between 1% and 100%)

- In this context, ***total*** means total amount available in JES2 MAS minus amount reserved for privileged jobs
- When creating resource group, default for LIMIT= is 100%

Job Resource Groups - Specifications

ACTION= defines the action taken by JES2 when any job associated with the specified resource group makes a resource allocation request that may cause the configured limit of the respective resource type to be exceeded for this resource group:

- **NONE** – no action is taken, JES2 continues processing
- **WAIT** – JES2 issues message HASP1812 for the job and suspends allocation of resources of this type to the job until more resources of this type become available to the job
- **FAIL** – JES2 issues message HASP1812 for the job and fails resource allocation request

When creating resource group, default for ACTION= is **NONE**

Job Resource Groups - Specifications

- Limits and actions for resources associated with resource groups can be changed at any time by `$T RESGROUP` command

```
$T RESGROUP(nnnnnnnn),RESOURCE(TG  )=(LIMIT=nn, ACTION=NONE )
                               JQE                    WAIT
                               JOE                    FAIL
                               BERT
```

  - Note: `$T RESGROUP` command is rejected if it would place resource group in shortage. In other words, new usage limit cannot be smaller than current usage
- Resource groups are deleted with JES2 operator comman

```
$DEL RESGROUP(nnnnnnnn)
```

  - Resource group can only be deleted when there are no jobs assigned to it

  If this is the case, resource group will be deleted even if counters are wrong and not zeroes

Job Resource Groups

- Processing is similar to Job Resource Limits processing
- Displaying a resource group (includes current usage information)

```
$HASP1800 RESGROUP(TEST)
$HASP1800 RESGROUP(TEST)        RESOURCE(TG)=(CURRENT=0,
$HASP1800                       PERCENT=0.0000,LIMIT=20,
$HASP1800                       ACTION=FAIL),
$HASP1800                       RESOURCE(JQE)=(CURRENT=0,
$HASP1800                       PERCENT=0.0000,LIMIT=30,
$HASP1800                       ACTION=WAIT),
$HASP1800                       RESOURCE(JOE)=(CURRENT=0,
$HASP1800                       PERCENT=0.0000,LIMIT=30,
$HASP1800                       ACTION=WAIT),
$HASP1800                       RESOURCE(BERT)=(CURRENT=0,
$HASP1800                       PERCENT=0.0000,LIMIT=30,
$HASP1800                       ACTION=FAIL)
```

Job Resource Groups

- JRG display added in SDSF

```
SDSF JOB RESOURCE GROUP  SY1                                LINE 1-4 (4)
 COMMAND INPUT ===>                                          SCROLL ===> CSR
 NP   GROUP    Type     Status              Action         Use%    Usage    Limit Description
      TEST     BERT                         FAIL         0.0000        0      195 CB extensions
      TEST     JOE                          WAIT         0.0000        0       60 Job output elements
      TEST     JQE                          WAIT         0.0000        0      150 Job queue elements
      TEST     TG                           FAIL         0.0000        0     1575 Spool track groups
```

Job Resource Group States

JES2 monitors resource usage at the resource group level and issues messages in the following cases

- When resource usage is approaching configured limit (at or above 90% of the configured limit)

  `$HASP1811 Resource group group is close to its type resource usage limit.`

- When resource usage is at or above configured limit

  `$HASP1805 type resource shortage detected for resource group group.`

- When resource shortage was reported by HASP1805, and resource usage drops below the limit

  `$HASP1804 <resource type> resource shortage relieved for resource group <group>.`

Job Resource Group States

- These messages are issued by all members of MAS
  - The first member to issue HASP1805 highlights the message
  - Other members issue the same HASP1805 message without highlighting.
- When HASP1804 message is issued, the matching highlighted HASP1805 is removed

- JES2 monitor notice HASP9185 was added to indicate a resource shortage exists
  - JES2 monitor notices are displayed in response to commands $JD STATUS and $JD JES and SDSF RMA panel

```
$HASP9185 RESOURCE SHORTAGE HAS BEEN REPORTED FOR SOME RESOURCE
GROUPS
```

Z/OS 3.2 JES2
JES2 POLICY UPDATES

JES2 Policies

JES2 policy function was introduced in V2R4 to simplify customizing JES2

- At a very high level, JES2 policy defines in user-level terms what JES2 must do at certain strategic points in JES2 processing.
- Externally, a JES2 policy definition is a JSON object residing in a human-readable editable z/OS data set.
- Policies define true/false conditions and actions to take when they are true.
- After a system administrator creates a JES2 policy definition, it is imported into JES2 by a JES2 operator command, and the policy becomes available for JES2 processing on all members of the JESPlex (MAS).
- Note that JES2 policies do not completely replace JES2 exits – the exits are still supported.

Current Policy Types

Original Policies – z/OS 2.4

- JobConversion – Override job setting after converter processing (exit 44 time frame)
- SYSOUTGroup – Set attributes of SYSOUT data sets post execution (exit 40 time)

Policies addition z/OS 2.5

- PreConversion – Set job defaults (CI parms) before a job is converted

Policies additions z/OS 3.1

- JobInput – End of input processing (before exits 20/50) to finalize input settings
- JobCreate – Sets defaults for job base on JOB statement and submitter after exits 2/52, but before resources are allocated.

New Policy Type in 3.2

JCLEvaluation – applied as each JCL statement is processed during INPUT phase

- After exits 2/52 and 4/54 (before exits 3/53) whether there is an error or not
- After the JobCreate policy and before JobInput policy
- Primary purpose is to allow examination of select JCL statement
  - Only DD, EXEC, INCLUDE, JCLLIB, JOB, NOTIFY, and OUTPUT JCL statements
- Policies of this type can:
  - Extract the details specified on individual JCL statement that make up a job
  - Modify a limited selection of job attributes
  - Mark a job to fail after conversion
  - Write messages to a a jobs JESYSMSG (via the JCLIN data set)
    - Message is associated with the current JCL statement
    - Can be an ERROR, WARNING, or INFORMATIONAL message

Special Note

- JES2 policies **DO NOT** have access to the value specified for the PASSWORD= parameter of a JCL JOB Statement.
  - Policy job attributes *HasPassword* and *HasPassphrase* have been provided as an alternative

JCLEvaluation Policy Type

Actions supported

- Standard policy actions
  - (e.g. SendMessage, Assign, Leave, etc.)
- **ModifyJob** action - Modify the value for a job's attribute
  - Modifiable list of attributes is similar to *JobCreate* policy type
- **JCLINMessage** action (new)
  - Write a message to the job's JESYSMSG via the job's JCLIN data set

Functions supported

- All standard policy functions (e.g., AuthorityCheck(*class*, *resource*))
- JCL Statement related functions (new)

Attributes (readable) supported

- All standard policy attributes
- Job attributes supported by *JobCreate* policy type
- JCL Statement related attributes (new)

JCLEvaluation Policy Type

New functions/attributes to assess JCL keywords and values

- Valid for JCLEvaluation and JobCreate policies

- **Keywords** – Returns a list of names of all keyword parameters defined on the JCL statement. (Does NOT contain duplicates)
- **KeywordExists(*name*)** – Returns true/false if keyword is present
- **KeywordExists(*name-list*)** – Returns true/false if ANY of listed keywords present
- **KeywordHasDupl(*name*)** – Returns true/false if listed keyword is present multiple times
- **KeywordHasDupl(*alias-list*)** – Returns true/false if multiple of the listed keywords are present (e.g. a keyword and its alias)

JCLEvaluation Policy Type

- **PositionalRaw(*position*)** – returns value of positional parameter requested (1 based). Return null if positional does not exits or was specified as 0
- **KeywordRaw(*name*)** – Returns value associated with keyword. If multiple specified, it returns the value for the last instance. Null string returned if no present
- **KeywordRaw(*alias-list*)** – Like KeywordRaw, returns the last instance of a keyword from the list. It is assumed the list is a keyword and its aliases
- **StmtName** – the statement name (label) for the current statement
- **StmtOperation** – the statement operation (JOB, DD, etc)
- **NumStmtParms** – the number of statement parms (keyword and positional)
  - Duplicate keywords not counted
- **NumStmtPositionals** – the number of statement positional parms
- **NumKeywords** – the number of statement keyword parms (dups not counted)

Sample JCLEvaluation Policy

```
{
  "policyName":     "JCLEX002",
  "policyVersion":  1,
  "policyType":     "JCLEvaluation",
  "definitions":
  [
      {
         "condition" : " StmtOperation = 'DD' & StmtName = 'CEEOPTS'",
         "actions" :
         [
            {
               "action":   " ModifyJob ",
               "attribute":  " SchEnv ",
               "value":     " 'MYSCHED' "
            }
         ]
      }
   ]
}
```

If a CEEOPTS DD card is present, set the scheduling environment for the job to where the debugger is active.

Policy Updates – SendMessage Updates

Conditional SendMessage action

```
{
      "policyName"    :   " Example ",
      "policyType"    :   " JCLEvaluation ",
      "policyVersion" :   2,
      "variables"     : [ … ],
      "definitions"   : [
        {
            "condition" : " True  ",
            "actions"   : [
              {
                  "action"      : " SendMessage ",
                  "message"     : " 'message' ",
                  "condition"   : " True "
              },
              { … }
            ]
        },
        { … }
      ]
}
```

JSON Object Notation

- Policy Name
- Policy Type
- Policy Version
- Policy variable declarations
- Policy Definitions
  - Definition 1
    - Condition to apply actions
    - Actions
      - Action 1
        - Action Name
        - Action property 1
        - Action property 2
      - (End of Action 1)
      - Action 2 ...
    - (End of Actions)
  - (End of definition 1)
  - Definition 2 ...
- (End of Policy Definitions)

(End of JSON object)

Policy Updates - New JCLINMessage Functions

New action **JCLINMessage**

- Used to:
  - Write a message to the job's JCLIN dataset that is placed in JESYSMSG by the converter
  - Issue a WTO containing the message
  - Mark the job to fail during conversion
    - Similar to JES2 when reporting JCL errors
    - Does not prevent subsequent JCL statements being processed for the job
- HASP1668 - new message id
  - Used as the message prefix for any messages issued
- Supported by policy types: *JobCreate* and *JCLEvaluation*
- Policy action serves as an interface for invoking the JES2 macro *$RMSGQUE*

Policy Updates - New JCLINMessage Functions

JCLINMessage JSON properties supported

- "**message**" – A character evaluated expression that will generate the message text
- "**type**" – A character evaluated expression that will evaluate to one of the following types
  - '*ERROR*' – marks job to fail at conversion time, writes the message to the job's JCLIN and issue a WTO containing the message
  - '*DEFER*' – marks job to fail at conversion time, writes the message to the job's JCLIN and if the destination is the local node, it will issue a WTO containing the message
  - '*WARNING*' – writes the message to the job's JCLIN. Does not impact how the job will be processed
  - '*INFORMATIONAL*' – writes the message to the job's JCLIN and issues a WTO containing the message. Does not impact how the job will be processed
- **"condition"** – Takes a logical operand (TRUE/FALSE) to determine if message is processed or skipped (e.g."DEBUGMode")
  - **condition** can also be used on **SendMessage** and **LogMessage** action

Policy Updates - New JCLINMessage Functions

Example of a JCLINMessage function

- If an JCL EXEC Statement contains PGM= value PGM1 or PROGRAM2
  - The job is marked to fail during conversion
  - A WTO is issued with the message
  - The message is added to its JESYSMSG

```
"condition" : " StmtOperation = 'EXEC' &
                    KeywordRaw('PGM') in ('PGM1', 'PROGRAM2') ",
"actions" : [
    {
        "action"    :  " JCLInMessage ",
        "message" :  " 'PGM=' || KeywordRaw('PGM') || ' -- is not allowed' ",
        "type"      :  " 'ERROR' "
    },
    …
```

Note – Assumed policy type is *JCLEvaluation*

Policy Updates - New JCTUser*x* Functions

Supported by all policy types where the location (i.e., JCT) is accessible

JCTUser(*offset,len*) – allows reading of the user reserved section of the JCT (JCTUSER*x*)
- *offset* – offset into user section of the JCT (0-63)
- *len* – number of bytes to return (1-8)
- Returns a numeric value

JCTUserC(*offset,len*) – allows reading the user reserved section of the JCT (JCTUSER*x*)
- *offset* – offset into user section of the JCT (0-63)
- *len* – characters to return (1-64)
- Returns a character value

"SetArea" action
- **"Attribute" : "JCTUser"** – allows setting JCTUSERx
- Additional attributes "Offset", "Length", and "Value"

Policy Updates Miscellaneous Items

Available to policy types: ***JobCreate***, ***JCLEvaluation***, and ***JobInput***

- **HasPassword** – Indicates if a *password* or *passphrase* was specified for the job
- **HasPassphrase** – Indicates if a *passphrase* was specified for the job

Available to policy type: ***PreConversion***

- **DfltSteptime** – Specifies the default step time for a job to be passed to the converter as a numeric list (*mm*, *ss*)
  - Attribute is **modifiable v**ia *Preconversion* action **SetDefaults**

Available to all policy

- **ValidJobName(*string*)** – Verify if the given *string* is syntaxial correct as a valid JCL JOB Statement Name
- **Lowercase(*string*)** – Returns an equivalent string with all characters lowercased
- **Uppercase(*string*)** – Returns an equivalent string with all characters uppercased

Policy Subfunction of SSI 82

- SSI82 has been enhanced to include information about the policies existing in the MAS (JESPlex)
- SSI 82 (JES properties) - new JES2 Policy subfunction was added to return information on each policy imported:
  - Name
  - Type – can be filtered on (e.g., *JobCreate*, *JobConversion*, etc.)
  - Version
  - Current status (enabled/disabled)
  - Import timestamp
  - Path/data set name – 98 characters (*current maximum length*)
    - The dataset/directory and member/file name of the JSON document used to create the JES2 policy at the time it was imported
    - Field will **NOT** be populated for policies imported prior to z/OS 3.2 and policies of version 1
  - Optionally, policy source JSON (with APAR OA68485 and DATADEF REPOSITORY=ENABLED)
- IAZJPLCY is the interface macro
- SSJPPYOD/SSJPPYRS are the SSI sub functions

Z/OS 3.2 JES2
SYSDSN ENQ FOR SPOOL AND CKPT

SYSDSN ENQ protection

- CKPT and SPOOL data sets are now protected with SYSDSN ENQs
  - SHAREd ENQ is held by dynamic allocation added in the JES2AUX address space
  - Standard rules for allocation of protected data sets
    - Will require changes in how data sets allocated or deleted to avoid ENQ contention
    - Remember JES2 can allocate new data sets using SPACE= on JES2 commands
      - `$S SPOOL(SPOOL1),DSN=SYS1.HASPACE.SPOOL1,SPACE=(TRK,10)`
      - `$TCKPTDEF,CKPT2=(DSN=SYS2.JESCKPT2,VOL=CKPTPK,SPACE=(CYL,5))`
    - JES2 can expand existing SPOOL/CKPT data sets with $T command
- Normal JES2 processing is not impacted by these changes
  - If ENQ is not immediately available, periodically retry allocation
- Can be temporarily deactivated using `MASDEF SYSDSENQ=YES | NO`
  - Default is active

SYSDSN ENQ protection

- This feature blocks the allocation of SPOOL data sets via batch jobs
  - To replace jobs that allocate SPOOL data sets, you can use a **$S SPOOL** command instead, such as **$S SPOOL(SPOOL2),SPACE=MAX**. Note that the SPACE parameter is required to actually allocate a data set with this command.
- Functions such as DYNALLOC, IEHPROGM, TSO commands (alloc, delete, etc.), and JCL DD statements with the DSNAME parameter are impacted by SYSDSN ENQs.
  - ICKDSF, IDCAMS, IEBCOPY, IEBDG can bypass SYSDSN ENQ protection
- SYSDSN ENQs operate based on data set name, and nothing else.
  - If, for example, an installation has a SPOOL data set called SPOOL1 on volume VOL1, this function will block the creation of a data set called SPOOL1 on volume VOL2.
- Reminder: STGADMIN.DPDSRN.*olddsname* RACF profile can be used to allow rename “in use” data sets.

Z/OS 3.2 JES2
$VERIFY COMMAND

$VERIFY command

- Operator command to perform various verification processing
  - Similar to processing done during warm/hot start processing
  - Supports JOBQUEUE, OUTQUEUE, BERTS, and REPOSITORY

    ```
    $VERIFY JOBQUEUE
    ```
  - OPERCMDS class RACF check for *jesx*.VERIFY.*queue* CONTROL access
- Intended for use when problem is detected
  - Can be high CPU overhead
  - Reports errors to console (with enhanced messaging)
- Additional option REBUILD= YES|NO|COND to attempt a queue rebuild
  - COND does a rebuild if verify returned an error
  - Rebuild should only use if recommended by IBM support
  - High overhead. Also risk that repair could harm running jobs, alter queue order, etc

$VERIFY command

Sample usage:

```
1.$verify jobqueue
$HASP1250 $VERIFYJOBQUEUE
$HASP1250 Job queue verification completed - error detected
$HASP1250 RC=x'12' - JQE in use count bad


2.$verify jobqueue
$HASP1250 Job queue verification completed - no errors detected


3.$verify jobqueue,rebuild=cond
          $HASP1250 $VERIFYJOBQUEUE,REBUILD=
$HASP1250 Job queue verification completed - error detected
$HASP1250 RC=x'12' - JQE in use count bad
          $HASP517 JOB QUEUE REBUILD HAS COMPLETED.
```

Z/OS 3.2 JES2
SPOOL DATA SET BROWSE ENHANCEMENT

SPOOL Data Set Browse Enhancement

- SPOOL data set browse allows a DYNALLOC to access any JES managed DS
  - Currently requires writing a program to do a dynamic allocation with a special TU
- Support added to allow specification of SUBSYS= on JCL DD statement

  Simplifies accessing JES2 managed data sets from JCL (no program needed)
  - Specify JES2 subsystem where allocation is to be done
  - Option ACTIVE=YES|NO controls accessing unwritten buffers
- Standard JESSPOOL RACF class protection applies
- DSN= naming conventions the same as SPOOL Data set browse

  Specifying the Data Set Name

  Place data set name in apostrophes if using non-standard characters/formats

SPOOL Data Set Browse Enhancement

- A JESMSGLG (job log) data set (DSN copied from SDSF)

```
//SYSUT1   DD     DSN=IBMUSER.IBMUSERS.JOB00021.D0000002.JESMSGLG,
//       SUBSYS=JES2
```

- Same JESMSGLG (job log) data set with minimal DSN

```
//SYSUT1   DD     DSN='*.IBMUSERS.JOB00021.JESMSGLG',SUBSYS=JES2
```

- SMF data from EVENTLOG data set for an active job (SMF 30 records)

```
//SYSUT1   DD   DSN=IBMUSER.IBMUSER.TSU00020.EVENTLOG.SMF,
//         SUBSYS=(JES2,'ACTIVE=YES')
```

- SYSOUT data set allocated with SYSOUT=*,DSN=&TESTDSN

```
//SYSUT1   DD   DSN='*.HAMPERF.JOB00020.*.TESTDSN',SUBSYS=JES2
```

- JCL used to allocate JCL from a job and re-submit it

```
//IBMUSERB JOB   MSGLEVEL=(1,1),MSGCLASS=A,CLASS=A
//STEP1    EXEC   PGM=IEBGENER
//SYSPRINT DD     SYSOUT=A
//SYSUT2   DD     SYSOUT=(A,INTRDR)
//SYSIN    DD     DUMMY
//SYSUT1   DD     DSN='*.IBMUSERS.JOB00021.JCL',SUBSYS=JES2
```

- Current SYSLOG (on system SY1)

```
//SYSUT1   DD   DSN='SY1.SYSLOG.SYSTEM',SUBSYS=(JES2,'ACTIVE=YES')
```

SPOOL Data Set Browse Enhancement

Additional diagnostic information available

- Browse allocation now set SSALJSFR (normal) and SSAGRBIC (SUBSYS)
- This implies S99INFO now has additional information about allocation errors
  - Values documented in z/OS JES Application Programming manual

In addition, SUBSYS= supports (requires) a text message for failures

- Messages appear in JESYSMSG (with other allocation errors)

```
IEF752I HAMPERF READ SYSUT1 - REQUEST FAILED BY SUBSYSTEM
$HASP1445 Unable to locate data set number in data set name
```

- Each message has a unique message number documented in JES2 messages manual
- HASP1440 – HASP1465 messages describe errors

Z/OS 3.2 JES2
SUPPORT FOR ASCBV31

ASCB in 31 bit Storage

- DIAG option ASCBV31 allows ASCBs above the line
  - Combine with ATTR=ASCBV31 on the ASCRE macro or ASCBV31=YES on start command
- ATTR=ASCBV31 was added to ASCRE JES2 uses for
  - JES2MON – JES2 monitor
  - JES2EDS – Email Delivery
  - JES2Sxxx – NETSERV
  - JES2AUX – JES2 aux address space
- No impact unless the new DIAG option is specified
- Additional ASCBV31 support in 3.2 for JES2 initiators and FSS address spaces
  - `INIT(`*`xxxx`*`)` statement and $T command added ASCBV31=YES
  - `FSS(`*`nnnn`*`)` statement, $ADD, and $T command added ASCBV31=YES
    - AMODE 24 FSS cannot use ASCBV31=YES
- Tested running JES2 with ASCBV31=YES (specified on S JES2 command)

Z/OS 3.2 JES2 MIGRATION/COEXISTANCE

3.2 Upgrade & Coexistence Considerations

- All systems in the JESPlex (MAS) do not need to be at the z/OS 3.2 level
  - JES2 compatibility APAR OA65446 is required on 2.5 and 3.1 member to join a JESPlex with a 3.2 member active.
- Compatibility APAR OA65446 is also recommended for fallback to z/OS 3.1 or z/OS 2.5
  - Otherwise, policies created by z/OS 3.2 that exploit new features and remain in the JES2 checkpoint may fail
  - Additional 3.2 functions may encounter ABENDs after fallback to earlier releases if OA65446 is not active on those members
- Even in a single member MAS, you can encounter problems falling back to 2.5 or 3.1 without OA65446 on the downlevel member
  - DO NOT IPL 3.2 and warm start then try to IPL and warm start a 3.1 member without OA65446

OA66060 – FUNCTION REGISTRY EXPLOITATION

OA66060 – JES2 Function Registry Call

JES2 is now reporting operational data to IBM Functional Registry for z/OS

- Continuous delivery APAR to z/OS 3.1
- Reports telemetry data on
  - JES2 Automatic Checkpoint Cycle Management
  - JES2 Policy usage
  - JES2 Exits
  - JES2 Checkpoint on CF
  - JES2 Active Exits Bitmap
- Information is reported for the primary subsystem only

OA66060 – JES2 Function Registry Call

Example JES2 Product Name information from the FXEPRINT reporting tool

```
------------------------------------------------------------------
Product Name:          JES2
Product Release:       03.02.00
Product ID:            5655-ZOS
Instance ID:           01K-01S2
Product Description:   Job Entry Subsystem
Product Slot Path:     VS(1) PS(6,-)
Product Parent:        IBM
------------------------------------------------------------------
Function Name:         JES2 Automatic Checkpoint Cycle Management
Function Description: Automatic checkpoint tuning
Function Slot Path:    VS(1) PS(6,-) FS(1,AUTHONLY)
Function Parent:       JES2
Function Used:         NO
Function Enabled:      NO
```

OA66060 – JES2 Function Registry Call

```
-------------------------------------------------------------------
Function Name:          JES2 Policy
Function Description:   Policies in use
Function Slot Path:     VS(1) PS(6,-) FS(2,AUTHONLY)
Function Parent:        JES2
Function Used:          NO
Function Enabled:       NO
-------------------------------------------------------------------
Function Name:          JES2 Exits
Function Description:   Exits in use
Function Slot Path:     VS(1) PS(6,-) FS(3,AUTHONLY)
Function Parent:        JES2
Function Used:          YES
Function Enabled:       YES
-------------------------------------------------------------------
```

OA66060 – JES2 Function Registry Call

```
Function Name:         JES2 Checkpoint on CF
Function Description: Checkpoint on CF
Function Slot Path:    VS(1) PS(6,-) FS(4,AUTHONLY)
Function Parent:       JES2
Function Used:         NO
Function Enabled:      NO
-------------------------------------------------------------------
Function Name:         JES2 Active Exits Bitmap
Function Description: Exits defined and enabled at JES2 Initialization
Function Slot Path:    VS(1) PS(6,-) FS(5,AUTHONLY)
Function Parent:       JES2
Function Used:         YES
Function Enabled:      YES
Function Attributes:
 Attribute Name:       Exits 255-0 Bitmap
 Attribute Value:      0x00000000000000000000000000000000000000000001FFFFFFFFD7FDFFF
```

Z/OS 3.2 JES2
OA68485/OA68644
ENHANCED JOB SELECTION ENABLEMENT

Enhanced Selection of JOBs for WLM Initiators

Set of functions to enhance how batch jobs are selected by WLM mode initiators

- Current processing:
  - Job associated with MODE=WLM job classes are placed in queues by service class for WLM initiators
  - Jobs are ordered on the queue by “arrival time” adjusted by STARTBY processing
    - Basically a timed based order
  - Queue contains all jobs that that have completed CNVT processing and have not completed EXEC processing
  - Queue has active job, jobs with various affinities and holds, duplicate jobs, etc
  - Selection examines the queue looking for the first job that can be selected
    - Code repeatedly check if a job in the queue can be selected

Enhanced Selection of JOBs for WLM Initiators

Enhanced job selection functions:

- For all jobs in the system
  - Uses JCLID concept added in z/OS 3.1 (rolled down to 2.5) to collect jobs into sets
    - HASH method was enhanced in OA68485 based on customer data
  - Tracks average GP and zIIP service units and elapsed time for jobs in each set
  - Projects service units and elapsed time for new jobs in a set (based on history)
- For all systems in the JESPlex
  - Collect capacity information from WLM (JESPlex view of capacity)
- For each WLM work queue
  - Build a local “side queue” of 100 jobs that are ready to run
    - Does not include active, held, or any job that otherwise cannot run
- When a WLM initiator needs a job
  - Select best job from side queue based on projected resource usage and system capacity

Enhanced Selection of JOBs for WLM Initiators

- Determination of which job to select is done by logic within JES2
  - This logic can be updated dynamically using a JES2 Policy like function
  - Intent is to work with customers to identify what factors are important and what weight each factor should be given
- At some future point, an AI model could be developed using what is learned to further enhance job selection order and system placement
  - Other factors can be considered as we learn more about customer environments

Benefits:

- Cleaner, more efficient selecting of jobs especially when queues are full of jobs that cannot be selected
- Reduce likelihood of a large number of “big” jobs being selected on one system
- Better distribution of batch jobs across a JESPlex

Note: All restrictions on where a job can run (affinity, job class limits, etc) still apply

Enhanced Selection of JOBs for WLM Initiators

External switches to enable functions:

- $ACTIVATE LEVEL=Z32 to create the needed CKPTed data structures
- DATADEF REPOSITORY=ENABLE to enable the JES2 data repository
  - INDEX=(LIMIT=nnnnnnnn) to set the size of the repository
  - RETENTION=(MAX=nnnn) to set maximum retention for job history data
  - Setting REPOSITORY=DISABLED deletes all repository entries (job and policy)
- JOBDEF HISTORY=ENABLED starts collecting statistics as jobs complete
  - Setting HISTORY=DISABLED deletes all job history entries (Policy unaffected)
- JOBDEF SELECTION=ENHANCED will use new side queue and $QGET logic
  - Setting SELECTION=NORMAL reverts to the old $QGET logic
  - Can run with HISTORY=DISABLED and SELECTION=ENHANCED
    - Gets new side queue processing but jobs selected by age as in prior releases
  - Cannot set SELECTION=ENHANCED if exit 14 or 49 is enabled

SERVICE UPDATE

OA68682 – JES2 POLICY ACTION SETAREA DOES NOT PROPERLY TRUNCATE STRINGS

- For a SetArea policy action, improper truncation of the value field based the length field, may lead to an ABENDS0C7 or may cause jobs using the policy to fail.
- The storage after (or part of) JCTUSERx are being overlayed

- Fix is to properly truncate fields in SetArea action

OA67868 – JES2 POLICY AUTHORITYCHECK() FUNCTION FAILS WITH ABEND0C4 DUE TO MISSING WAVE IN PIWAREA

- ABEND 0C4 in NJE SYSOUT receiver processing a policy AUTHORITYCHECK()
- Check assumes presence of a WAVE which does not exist in this environment

- Code in the SYSOUT receiver was updated to properly manage the WAVE pointer in the PIWAREA

OA68226 – SLOW PERFORMANCE WHEN POINTING INTO A SPOOL DATA SET USING A RECORD NUMBER (NO MTTR) IN THE RBA

- Using POINT to move through a spool data set one record at a time a record number only as the RBA always starts at the top of the data set
- So POINT/GET through a data set using an RBA with no MTTR always starts at the top of the data set to seach for the desired record.
- This can be extremely slow

- Code was updated to try to locate the passed record number in existing in storage buffers before starting at the top of the data set
- Other optimizations were also added
- Note existing code uses the MTTR in the RBA to locate instorage buffers with the requested record. The problem is when no MTTR is passed.

OA67631 – JES2 POLICY JOBCONVERSION HAS INCORRECT COMPLETIONCODE AFTER CONVERSION FAILS

- Policy Type JobConversion does not set the CompletionCode value when conversion fails.
- This can cause JobConversion policies to not function properly

- Code is updated to properly maintain the CompletionCode value

OA67187 – Policy JobIsHeld attribute can be wrong when TYPRUN=HOLD

- Meaning of JobIsHeld was not consistent
  - TYPRUN=HOLD vs TYPRUN=JCLHOLD
- Intent was JobIsHeld means job is to be held for execution for execution
  - Not held for conversion

- Code was updated to correctly and consistently set JobIsHeld according to this definition (publications updated)

  Determines if the job is held or if the job is expected to be held prior to entering execution.

OA66725 – Data corruption when receiving NJE data with compression and blank truncation

- Data being received over NJE over TCP into a SYSOUT class that has BLNKTRNC=YES
- SYSOUT class also has COMPRESS=YES or SYSOUT is being encrypted
- Result is record length used when reading data may be incorrect

- APAR fixes the problem by re-ordering where blank truncation is done

OA66724 – After OA64073 a system can hang on "SVJ LOCK" ENQ

- OA66724 changed logic used to manage the "SVJ LOCK" ENQ (major name SYSZJES2) from the ENQ service to ISGENQ
- In the event of an ABEND (or a CANCEL), incorrect management of the ENQTOKEN= parameter on ISGENQ could result in the "SVJ LOCK" not being released
- The "SVJ LOCK" is needed to move jobs, started tasks, and TSO users into and out of execution processing
- Result of the error is that jobs cannot end or be started

- Logic that managed the ENQTOKEN value needed to be re-worked to deal with recovery scenarios.

OA67198 – An Idle WLM initiator may fail to select a job on a quiet system

- In a multi-member MAS (JESPlex), an idle WLM initiator may fail to select an eligible job
  - This occurs because of a missing POST to scan the execution work queue
  - Another job entering the execution queue will cause a POST resulting in the job being selected as normal
  - The problem was isolated to changes made to reduce excessive POSTing of the execution queue
    - Excessive POSTing masked the missing POST

- Code was updated to only POST to scan the execution queue when there are jobs waiting to be selected

OA67187 – Policy JobIsHeld attribute returns FALSE if TYPRUN=HOLD is specified

- Code that evaluates the JobIsHeld attribute does not detect TYPRUN=HOLD
  - This results in JobIsHeld being FALSE in this case

- Code that evaluates the JobIsHeld attribute has been corrected to detect a job with TYPRUN=HOLD

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DSFS SUPPORT FOR JES SPOOL (OA65560) JES2 AND JES3 - 2.5 AND 3.1

New DSFS JES SPOOL support

- You can now access SYSOUT data from the JES SPOOL using Data Set File System
  - Works with both JES2 and JES3
  - This support is available on z/OS V2.5 and z/OS 3.1 with PTFs for APAR OA65560
- From ISPF 3.4

```
                                                    z/OS UNIX Directory List
Command ===> _

Pathname . : /dsfs/sysout/wasik
EUID . . . : 2586
Command  Filename        Message          Type Permission Audit  Ext  Fmat Owner    Group    Links  Size        M
--------------------------------------------------------------------------------------------------------------
________ .                                Dir  rwxrwxrwx  ------      bin  BPXROOT  DEPTD60      3       8192 2
________ ..                               Dir  rwxrwxrwx  ------      bin  BPXROOT  DEPTD60      6       8192 2
________ wasik.tsu32406  Listed           Dir  rwxrwxrwx  ------      bin  BPXROOT  DEPTD60      2       8192 2
****************************************************************************** Bottom of data ********************
```

New DSFS JES SPOOL support *(cont.)*

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2nd Directory

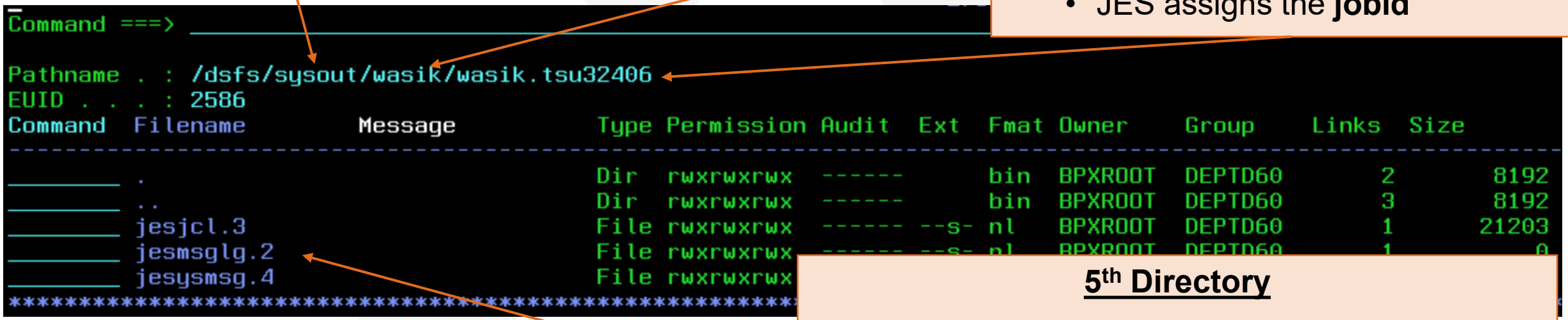
Need to specify **/sysout/** to access JES SPOOL

3rd Directory

The HLQ directory is the **job owner**

4th Directory

- The Job Directory.
- Naming convention is **jobname.jobid**
  - **jobname** comes from JCL
  - JES assigns the **jobid**



5th Directory

- The SYSOUT file names.
- Naming convention is **stepname.ddname.dskey**
  - **stepname** comes from JCL
  - **ddnames** comes from JCL (SYSOUT DDs)
  - **dskey** is assigned by JES

Extended Attributes for DSFS JES SPOOL support

- **system.jobstatus**
- **system.jobcompletion**

- Can be used with new ***--get*** and ***--list*** subcommands on **extattr** command (or programmatically)

- Only supported on job directories

  - Job must be completed to have a completion code

Examples:

```
WASIK:/u/wasik(136):>ls /dsfs/sysout/wasik/wasik.tsu32406
jesjcl.3    jesmsglg.2  jesysmsg.4
WASIK:/u/wasik(137):>extattr --list /dsfs/sysout/wasik/wasik.tsu32406
system.dsname='WASIK.WASIK.TSU32406'
system.dstype='JOB DIR'
system.jobstatus='Executing'
system.filefmt=X'01'
system.filetag=X'FFFF0000'
system.createtime=X'0000000066AD9AD2'
system.auditid=X'003BD93800000 9D8000000000000000'
WASIK:/u/wasik(138):>extattr --get system.jobstatus /dsfs/sysout/wasik/wasik.tsu32406
Executing
WASIK:/u/wasik(139):>extattr --list /dsfs/sysout/wasik/wasik.tsu32406/jesysmsg.4
system.dsname='WASIK.WASIK.TSU32406.D0000004.JESYSMSG'
system.dstype='SYSOUT FILE'
system.lrecl='137'
system.recfm='VA'
system.filefmt=X'02'
system.filetag=X'04178000'
system.createtime=X'0000000066AD9A86'
system.auditid=X'003BD93E00000 9D8000000000000000'
```

DSFS JES SPOOL support - Implementation Details

HLQ Directory

- Resync done each time directory is used in lookup operations
- DIRECTORY_REFRESH_THRESHOLD does not apply
- **Requesting user ID must match HLQ directory name**

Job Directory

- Resync done each time directory is used in lookup operations
- DIRECTORY_REFRESH_THRESHOLD does not apply
- Can be removed with **rmdir** if empty (i.e. all sysout files deleted)

DSFS JES SPOOL support - Implementation Details *(cont.)*

SYSOUT Files

- Appear as regular files.
- Can be removed with **rm** command
- Are treated as readonly, so can not be written to
  - sysout objects can not be renamed
  - sysout objects can not be created
  - sysout objects can not be truncated
  - sysout objects can not be the subject of setxattr
- Files only allocated when being read in
- PS_DYN_DURATION does not apply

Configuration options for JES SPOOL support

New IDFFSPRM configuration file (or IDFPRMxx PARMLIB) options / keywords for controlling the SYSOUT:

- **ENABLE_SYSOUT** - can be used to allow or disallow users to view JES SPOOL data via DSFS. Default value is ON and only needs to be specified in IDFFSPRM configuration file (or IDFPRMxx PARMLIB) if being set to OFF to not allow any users to view JES spool data via DSFS.
- **SYSOUT_DIRECTORY_POOL_SIZE** - can be used to control the number of threads issuing JES queries for directory refreshes. Default value is 10 and only needs to be specified in IDFFSPRM configuration file (or IDFPRMxx PARMLIB) if using a different value.
- **SYSOUT_IO_POOL_SIZE** - can be used to control the number of threads reading the contents of JES SYSOUT data sets. Default value is 10 and only needs to be specified in IDFFSPRM configuration file (or IDFPRMxx PARMLIB) if using a different value.

PAST SERVICE ITEMS

OA66725 – Various errors reading blank truncated records

- Problem occurs when compression or encryption is active for a data set
  - If the data set is received via NJE over TCP/IP
  - Compressed and encrypted data do not use blank truncation
  - Error in the code results in blank truncation being performed from these data sets
- Applications that try to read the data can get incorrect record lengths
  - In reporting customers case with was SMTP reading data with SAPI

- The code was corrected to not request blank truncation is encryption or compression is being done.

OA66757 – Disastrous error at symbol CBIMPL4 reading SPIN IOT

- Data being written from CSA SPIN IOT is corrupted
  - Second “half” of the IOT contains trash
- Type of I/O done to write IOT does not support buffers that span a page
  - Uses one IDAW to address data
- Unfortunately, code to get CSA buffer does not ensure storage does not span a page
  - CONTBDY=12 needs to be specified on the GETMAIN
- Problem has existed for a long time but recently started showing up in multiple shops running 3.1

OA64919 – RPLFDBK = 08022C reading a SPIN data set

- When a data set is spun due to SPIN criteria or command, the following message is added to the data set:
  - `$HASP138 JOBOUT   SPIN HAS OCCURRED BECAUSE OF …`
- If the LRECL of the spin data set is less than the length of the message, a read error may occur trying to process the data
- APAR splits the message into multiple lines as needed

- Also included was a change to how GET processes the RPLAREA passed in
- Customer reported:
  - An External Writer, when it processed 100 million lines sysout data on JES2 spool, it took 62.37 seconds in z/OS V2R5 while 40.21 seconds in z/OS 3.1
- Difference was this APAR was not applied to the 2.5 system
- Similar performance improvement may be observed for any application reading SYSOUT with a large RPLAREA (in this case it was 32K).

OA63579 – CKPT ABEND 0C9 When Member Leaves MAS with CYCLEMGT=AUTO

- CYCLEMGT=AUTO is active
- A busy member leaves the MAS
- Remaining members will balance the HOLD value
- Due to a rounding error, the calculation results in division by zero
  - This can bring JES2 down on multiple members

OA64542 – SYSLOG Hung after SPOOL Migration

- SYSLOG address space is writing to a SPOOL that is being migrated (source)
- Because of timing, the write needs to be re-driven to the new volume (target)
- A change made in z/OS 2.4 as part of SPOOL encryption prevents the re-drive of the I/O
- When a writelog is done, the close hangs due to the pending write
- The SYSLOG task is hung holding SYSZTIOT, impacting other activities in the master address space
- The system must be IPLed to recover
- Not limited to SYSLOG, any spool write can encounter problem

OA65911 – Writelog Hung After SPOOL Migration

- Similar to OA64542, SYSLOG write needs to be re-driven
- However, in this case, the address of the active buffer is not being cleared when the I/O completes
- This prevents the redrive from being started
  - It appears I/O is already active, though it is not
- Like OA64542, the writelog hangs
- Can also be caused by a path switch for a SPOOL volume or a physical I/O error
- Not limited to SYSLOG, any spool write can encounter problem

OA65460 – JES2 Fails to Register Requested Service Class

- WLM AI initiator support can request initiators to start before jobs are queued to the service class
- To accomplish this, WLM requests JES2 to register the service class via ENF 56
- JES2 successfully creates the service class queue head but does not call the IWMBREG service to register the service class with WLM
- WLM AI initiator support is unable to start the required initiator

OA65490 – JES2 Policy Does Not Properly Handle Null Entry in JOBACCT Attribute

- The JOBACCT policy attribute contains the job accounting string as a list
- When processing accounting string containing null (i.e. zero length) sub-parameters (e.g. (CC00,,A)), JOBACCT attribute produces incorrect result
- Code that processes list entries was not handling zero length entries correctly

- Logic which parses the accounting string was updated to handle null operands
- Note: with DEBUG POLICY=YES, a $HASP1653 Error 11 message is issued to indicate this problem was encountered

OA65707 – Incorrect PROCLIB Concatenation After a S213 ABEND

- A PROCLIB concatenation that specifies UNCOND (unconditional) should skip DDs that cannot be allocated or opened
  - The concatenation remembers the failed DDs but proceeds with the DDs that work
- Behavior is correct if the allocate fails, however, an OPEN failure can result in DDs missing from the actual allocated DD
  - The DD displays as expected but the underlying concatenation is incorrect
- This can be seen in the SDSF JDD panel for the JES2 address space
- Also applies to SUBMITLIB and POLICYLIB statements

OA65252 - $P SPL(*nnn*),C Does Not Remove Inactive Volume

- A SPOOL data set (or volume) becomes unavailable
- During warm start the volume becomes INACTIVE
  - One reason is a reply of 'GO' to HASP853
- Current command will not remove the SPOOL volume
  - Commands try to allocate the volume first, which will not work

- Logic accidentally deleted in z/OS 1.10 to remove volume was re-instated
  - A $P SPL(*xxx*),C will drain volume without attempting to allocate it

OA65112 – High CPU (loop) After Policy Import

- Incorrect code processing numbers in policy parser
  - Code does not properly handle leading ‘0’s in a number
  - Code loops processing leading ‘0’
- Error occurs in JES2 subtask during policy import processing

- Logic was corrected to properly parse numbers with leading ‘0’s

OA64234 – TLS 1.3 Support for JES2EDS Connection

- JES2 needs to be updated when new level of TLS is supported
- After z/OSMF APAR PH48850, if z/OSMF is configured to use TLSv1.3, JES2 EDS connections fail with:

```
$HASP1529 106 0420 Socket closed by remote partner
$HASP1523 Unable to connect to z/OSMF server.
```

- Install APAR to correct the problem

OA63968 – Reported CKPT Pain Incorrect

- The concept of ‘pain’ drives CYCLEMGT=AUTO tuning of CKPT hold
  - Pain is impact of not holding the checkpoint on various processes
- Due to an error, the pain for a member can be permanently increased
  - Occurs when operator command is canceled due to a CKPT reconfiguration
- This excessive pain can lead to one member holding the checkpoint for too long
  - Can starve other members of the checkpoint

- The fix properly adjusts the pain when a command is canceled
- A CKPT reconfiguration can occur at any time exposing this problem

OA63534 – SAPI Select by Token Delayed

- Delays when SAPI products select SPIN data sets by SYSOUT token
  - Problem when token is obtained by prior SAPI select
  - In particular if there are multiple SPIN data sets for the same job
- SYSOUT token returned by SAPI is a “data set token”
- Using this type of token on a select by token requires getting the JOB lock of the owning job
  - Also, the IOT for the data set must be read (potentially twice)
  - If multiple SAPI threads are selecting output, they can conflict on the JOB lock

- Code changed to make the SYSOUT token returned by SAPI for a SPIN data set a “JOE token”
  - This removes the need to get the JOB lock and read in the IOT

OA63479 – Instream Symbol Logging Missing

- An error in APAR OA62199 causes instream symbol substitution logging to be skipped
  - Could also result in an 0C4
  - Symbol substitution is still performed, but no logging is done

- Code corrected to restore logging function

OA63287 - $ECKPTLOCK Command Error

- $E CKPTLOCK should release the CKPT lock on CF in error situations
  - Should only be used if owning member is non-responsive
  - If owning system comes back, it will ABEND with a $K02 ABEND (IPL required)
- Problem results in code thinking the lock was stolen when it wasn't
  - This causes the member where the command was issued to ABEND with a $K02
- Also resulted in CKPT lockouts in $PJES2 while waiting for return jobid
  - Occurs when the HASP715 message is issued

- Logic for managing the CKPT lock was updated to address these problems

OA63207 – JES2 Private Storage Exhausted

- Customer lost contents of record 0 on all SPOOL volumes
  - Cause of this problem is unknown
- Record 0 is used by JES2 as a “signature record” to indicate ownership of track
- Code to process signature records detects the bad signature records
  - This results in appropriate error processing and recovery of record
- Problem is the error path fails to free a work area for the request
- With every signature record resulting in an error, storage can fill up fast
  - Nearly resulted in a Cold Start

- Fixing the storage leak allows proper error recovery from this situation

OA62156 – SYSZTIOT/SYSZJES2 deadlock

- DB2 and DFSORT recovery scenario results in a deadlock situation
  - Hangs writing to the SORTSNAP DD
- Problem is HAM recovery does not free the SDB lock ENQ in the ARR
  - This locks out other writes and hangs the address space

- Code was added to free the offending SDB ENQ in recovery