JES2 z/OS 1.5 Product Update

SHARE 102, Session 2655

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JES2 z/OS 1.5

- **JES2 z/OS 1.5**
  - Multi-level security
  - $DSERV service
  - ENF 58 enhancements
  - Monitor Enhancements
  - IPCS enhancements

JES2 z/OS 1.5 installation

- From **JES2 OS/390 R8** or earlier

  Note that **R8** and earlier releases are not supported on **z/OS 1.5** BCP (*enforced!!!*)

  - **$ACTIVATE** to R4 mode required to avoid **COLD** start

    - From **OS/390 R3** or earlier, requires intermediate migration or COLD start
  - No MAS coexistence (all-member-warm start)
- MAS coexistence from **OS/390 R10**-**z/OS 1.4**

  - APAR **OW55708** needed on downlevel member

Multilevel Security Overview

- **New function in RACF**
  - Define SECLABELs that are only active on a subset of SYSPLEX members
    - ▸ Inactive SECLABEL implies RACF calls will fail
  - Additional security rules require SDSF to have SECLABELs for rows
    - ▸ **Session 2672, Thusday 3:00**
- **Implications for JES2:**
  - SECLABELs are factored into job selection process
  - SECLABELs associated with devices, nodes, etc.
    - ▸ Overhead of SECLABEL extracts in JES2 (once) instead of SDSF
  - Seclabel for JES2 must be **SYSMULTI**

Multilevel security support in RACF enhances the security that is provided using security labels (SECLABELs). SECLABELs implement mandatory access control (MAC). Typically, installations that are interested in MAC, associate SECLABELs with projects or companies that the systems support. To increase security, installations will not combine work from multiple projects or companies on a single MVS (or SYSPLEX). The reasons is that even with MAC, there is still some information that is generally available that could compromise security. The multiple small systems creates a system management problem.

To address this, new features have been added to improve security when SECLABELs are used. Services added include the ability to
- Define seclabels that are only active on a subset of the systems in a SYSPLEX
- Hide the existence of objects (such as catalog entries or rows in an SDSF display)
- Restrict what ACEEs an authorized user can create in a server address space

These changes have driven changes to JES2 to better support the new services.

SECLABEL by System

- New RACF options
  - **SETR SECLBYSYSTEM**
  - **SETR CLASSACT(SECLMBR)**
  - Active based on SECLABEL member list
    - ▸ **RALTER SECLABEL** *seclabel* **ADDMEM(***smfid***)**
    - ▸ SMF ids of systems where SECLABEL is active
  - RACF checks fail if SECLABEL is not active
    - ▸ As if SECLABEL did not exist
  - New JES2 affinity mask in JQA (**JQASCLAF**)
    - ▸ Built based on member list (SMF ids)
    - ▸ Applies to conversion and execution phase
    - ▸ JES2 listens to RACF ENF 62 to keep mask up to date

The function that limits where a SECLABEL is active is call SECLABEL by system. This is activated by a new option on the RACF SETR command. Installations use the member list on the SECLABEL profiles to list what systems a SECLABEL is active on. If there are no entries in the member list for a SECLABEL profile, then the SECLABEL is active on all systems. The values specified in the member list are the SMF ids of the systems where the SECLABEL is active. RACF checks on a system where a SECLABEL is not active will fail in the same manner they would if the SECLABEL was not defined.

JES2 support for this involves maintaining an affinity mask for each job that has not executed, based on systems where the SECLABEL assigned to the job is active. JES2 uses the new mask to determine where a job can convert (due to RACF checks at conversion) and where it can run. To build the mask, JES2 has to track the SMF ids for all members of a MAS. JES2 also listens to a new RACF ENF that indicates when the SECLABEL class is activated (RACLISTed), de-activated (NORACLISTed) or updated (RACLIST REFRESH).

SECLABEL by System

- Affinity only used if SECLABEL by system active
  - Used by $QGET, $SJ, WLM sampling
  - **$DJ,SECLABEL_AFF** displays affinity for job
    - also on **$DJ,LONG**
  - **$DJ,DELAY** updated with **SECLABEL** delay
    - Factor in **MEMBER_STATUS** delay
- **$DMEMBER** updated with MVS SMF id if not equal to member name

```
$dmember(1)
$HASP673 MEMBER(1)
$HASP673 MEMBER(1)    NAME=PSU1,STATUS=ACTIVE,IND=NO,
$HASP673              LASTART=(HOT,(2004.034,19:19:21)),
$HASP673              SYSNAME=SY1,SMFID=SY1,TIME=(2004.037,
$HASP673              20:52:57.02),VERSION=z/OS 1.5,
$HASP673              SLEVEL=0,SSNAME=JES2,BOSS=YES
```

The new affinity is only used if the SECLABEL by system option is set on. It must be always maintained since there is no notification of the SETR option being activated. It only applies to batch jobs (not STCs and TSUs). To help installations understand where a job can run, the new mask is displayed on the $DJ commands. The actual list of members names (not the SMF ids) where the job can run are displayed. This is to be consistent with the other affinity lists that are displayed. A job can run on a member only if that member is in all 3 affinity masks for a job. The $DJ,DELAY command was updated to display delays because of the new affinity masks.

The mask also affects what is reported in WLM sampling data and system selection for $SJ commands. Installations with an exit 14 (replace JES2 job selection) have to examine the exit logic to determine if modifications are needed for the new affinity mask.
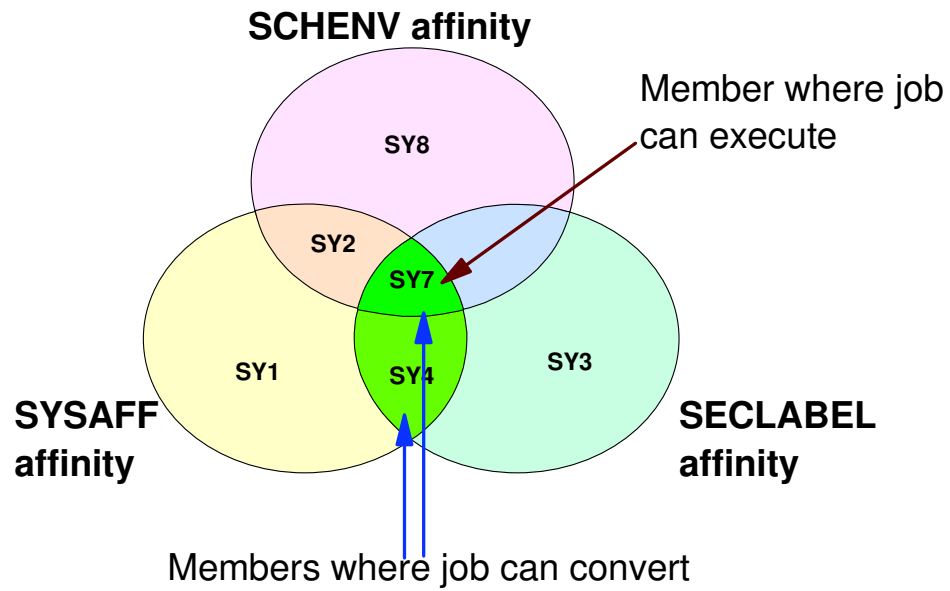
SECLABEL by System

- Consideration in **$EXIT 14** ($QGET exit)
  - New affinity must be factored into selection criteria
    - ▸ Affinity only applies if SETR option on (test **RCVTSBYS** bit in RCVT)
    - ▸ Applies only to selection for conversion and execution (WLM or JES)
    - ▸ Applies only to batch jobs (not STCs or TSUs)
  - Already factored in by **$EXIT 49** (QGOT exit)
- Extended status SSI (80) enhanced
  - Returns new list of systems where SECLABEL is available
  - New delay returned if SECLABEL not available anywhere

The new affinity is only used if the SECLABEL by system option is set on. It must be always maintained since there is no notification of the SETR option being activated. It only applies to batch jobs (not STCs and TSUs). To help installations understand where a job can run, the new mask is displayed on the $DJ commands. The actual list of members names (not the SMF ids) where the job can run are displayed. This is to be consistent with the other affinity lists that are displayed. A job can run on a member only if that member is in all 3 affinity masks for a job. The $DJ,DELAY command was updated to display delays because of the new affinity masks.

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Seclabel by System

SCHENV affinity

SY8

SY2

SY7

Member where job
can execute

SY1

SY4

SY3

**SYSAFF
affinity**

**SECLABEL
affinity**

Members where job can convert

This illustrates the relationship between the three affinities. Only members in the intersections of the affinities can run or convert jobs.
In this case, the job can convert on members SY4 and SY7. The job can only run on member SY7.

$DSERV service

- **Problem:** Easy way to access checkpoint data from non-main task exits
  - **DSERV=** parameter on various macros is required
    - ▸ **$DOGJQE, $DOGCAT, $DOGWSCQ**
    - ▸ **$QJQE, $#JOE**
  - Coding **SSI 71** to obtain checkpoint version is cumbersome
- **Solution:** New **$DSERV** service to obtain a checkpoint version

$DSERV macro

- **$DSERV**
  - **FUNC= GET/FREE**
    - ► To get or free DSERV
  - **DSERV=**
    - ► Pointer to DSERV (Output on GET, Input on FREE)
  - **OKRET=**, **ERRET=**
    - ► Retcode labels
- Cannot be used from JES2 main task
  - Use live copy of checkpoint instead of version
- Must be in USER, SUBTASK, or FSS environment
  - Not suitable for standalone applications

Before $DSERV

- Obtain checkpoint version
  - Build SSOB and SSJI, SSIB
    - ▸ Point SSJIUSER to DSERV storage
  - Issue IEFSSREQ
    - ▸ R1 points to pointer to SSOB
- Use version
  - **$DOGJQE ACTION=(FETCH,READ),DSERV=***???*
  - **$DOGJQE ACTION=RETURN,DSERV=***???*
- Release checkpoint version
  - Set SSJI to indicate free
  - Issue IEFSSREQ
  - Return SSOB, SSIB, etc.

With $DSERV

- Obtain checkpoint version
  - **$DSERV FUNC=GET,DSERV=(R5)**
- Use version
  - **$DOGJQE ACTION=(FETCH,READ),DSERV=(R5)**
  - **$DOGJQE ACTION=RETURN,DSERV=(R5)**
- Release checkpoint version
  - **$DSERV FUNC=FREE,DSERV=(R5)**

ENF 58

- Issued beginning in OS/390 R5
  - ENF58_Q_SELECT
    - ► Issued when JES selects a dataset for processing
  - ENF58_Q_PURGE
    - ► Issued when JES purges a dataset
  - ENF58_Q_EOD_OK
    - ► Issued when JES successfully finishes processing
  - ENF58_Q_EOD_ERR
    - ► Issued when processing unsuccessful
  - Other flavors when output deselected or modified
- Multi system ENF
- Only for SYSOUT with client tokens
- Issued for SAPI, PSO, FSS and PRPU

ENF 58

- New qualifier for ENF 58
  - ENF58_Q_CHECKPOINT
  - Issued when printer takes a checkpoint
- New/updated fields in IAZENF58
  - ENF58_VTWO – new version (2)
  - ENF58_COPY – copy count (starts at zero)
  - ENF58_RECORD – record count
  - ENF58_PAGE – page count
- Issued for SAPI, PSO, FSS and PRPU

SSI 54 Enhancements

- **Problem:** Customers/Vendors want to issue JES2 commands but do not know the JES2 command prefix
- **Solution:** Who-am-I SSI (54) updated with JES2 command character
  - Returned in variable section
    - "**COMMAND_PREFIX=**x"

Monitor enhancements

- **$JDDETAILS** and **$JDHISTORY** enhanced to report information about errors in JES2
  - $ERROR/ABEND
  - $DISTERR
  - CBIO errors (CBIMPLx $DISTERRs)
  - "OTHER" errors
- Further enhancements with APAR **OA06186**
  - **$JDDETAILS(ERROR)**
  - **$JDHISTORY(ERROR)**

Monitor Enhancements

- Examples

```
        $jddetails(error)
        $HASP9103 D DETAIL
$HASP9107 NO JES2 ERROR COUNTS SINCE 2004.037 13:00:00

        $jddetails(error)
        $HASP9103 D DETAIL
$HASP9107 JES2 ERROR COUNTS SINCE 2004.037 13:00:00
ERR-TYPE    COUNT
-------- --------
MAIN            1

        $jdhistory(error)
        $HASP9130 D HISTORY
$HASP9133 JES2 ERROR HISTORY
DATE       TIME          MAIN  DISTERR    CBIO  SUBTASK
OTHER
-------- -------- -------- -------- -------- --------
--------
2004.037 13:00:00         1        0        0        0
0
2004.037 12:00:00         0        0        0        0
0
2004.037 11:00:00         0        0        2        0
```

Monitor Enhancements

- Full IPCS support for monitor in z/OS 1.5
  - Formatting of sampling data, alerts, etc. for JES2 problem analysis
  - Formatting of monitor internal CBs for monitor error diagnosis
- Monitor address space is in JES2 dumps since z/OS 1.4

JES2 Monitor - Main IPCS panel   [_] [□] [X]

File   Edit   View   Communications   Help

```
   IPCS   JES2   Format   Trace   Debug
------------------------------------- JES2 Component Data Analysis
-------------------------------------
Option ===> 13                                        Scroll ===>
CSR
Enter JES2 name ===> JES2

Select desired option for JES2 dump:        These panels are for
   1 JES2 base display                      JES2 FMID:  HJE7708
   2 JES2 job control blocks                Service level:  0
   3 JES2 job output control blocks
   4 JES2 devices
   5 JES2 processors
   6 JES2 subtasks
   7 JES2 control blocks
   8 JES2 network control blocks
   9 JES2 MAS member data
  10 JES2 checkpoint control bl
  11 JES2 NJE/RJE control block        <══ New!
  12 JES2 BERT control blocks
  13 JES2 monitor data

Select desired option for non-JES2 dump:
 101 Select JES2 control blocks for non-JES2 address space

Debug JES2 IPCS support:
 999 Display module information for HASMFMTM and related modules
1000 Set JES2 IPCS runtime debug options; current status is NORMAL

Enter UP and DOWN commands to scroll the list of options.
Enter END command to terminate JES2 data analysis.
```

```
┌─────────────────────────────────────────────────────────────────────────────┐
│ ▣  JES2 Monitor - Main IPCS panel pulldown                          _ □ X    │
├─────────────────────────────────────────────────────────────────────────────┤
│  File   Edit   View   Communications   Help                                   │
│    IPCS   JES2   Format   Trace   Debug                                       │
│  ─────┌────────────────────────────────┐  omponent Data Analysis            │
│  ─────│────────────────────────────────│                                     │
│  Optio│  13  1.  Base Display           │               Scroll ===>          │
│  CSR  │                                 │                                     │
│  Enter│      2.  Job Control Blocks     │                                     │
│       │      3.  Output Control Blocks  │                                     │
│  Selec│      4.  Devices                │     These panels are for           │
│    1  │      5.  Processors             │     JES2 FMID:  HJE7708             │
│    2  │      6.  Subtasks               │     Service level:  0              │
│    3  │      7.  Control Blocks         │                                     │
│    4  │      8.  Network Control Blocks │  ◀━━  New!                         │
│    5  │      9.  MAS Member data        │                                     │
│    6  │     10.  Checkpoint Control Blocks                                    │
│    7  │     11.  NJE/RJE Control Blocks │                                     │
│    8  │     12.  BERT Control Blocks    │                                     │
│    9  │     13.  Monitor Data           │                                     │
│   10  │     14.  Non-JES2 Address Space │                                     │
│   11  └────────────────────────────────┘                                     │
│   12 JES2 BERT control blocks                                                 │
│   13 JES2 monitor data                                                        │
│                                                                               │
│  Select desired option for non-JES2 dump:                                     │
│   101 Select JES2 control blocks for non-JES2 address space                   │
│                                                                               │
│  Debug JES2 IPCS support:                                                     │
│   999 Display module information for HASMFMTM and related modules             │
│  1000 Set JES2 IPCS runtime debug options; current status is NORMAL           │
│                                                                               │
│  Enter UP and DOWN commands to scroll the list of options.                    │
│  Enter END command to terminate JES2 data analysis.                           │
│                                                                               │
└─────────────────────────────────────────────────────────────────────────────┘
```

JES2 Monitor - IPCS panel - Options for debugging JES2 problems   _ □ X

File   Edit   View   Communications   Help

  IPCS   JES2   Format   Trace   Debug
-- JES2 Monitor Data

 Option ===>   Scroll ===>
CSR
 Enter JES2 name ===> JES2

 Select one of the following:

   Options to debug JES2 problems using monitor data
     1 Alerts   Monitor alerts
     2 Tracks   Monitor event tracking

     3 $LMDSAMP   CPU Sampling data
     4 $LMDBERT   BERT usage history
     5 $LMDBSCB   BSC buffer usage history
     6 $LMDBUFX   Extended SPOOL buffer usage history
     7 $LMDCKVR   CKPT versions usage history
     8 $LMDCMBS   Message buffer (CMBS) usage history
     9 $LMDCMDS   Command buffer (CMDS) usage history
    10 $LMDES   Error counts table
    11 $LMDICES   ICE usage history
    12 $LMDJNUM   Job number usage history
    13 $LMDJOES   JOE usage history
    14 $LMDJQES   JQE usage history
    15 $LMDLBUF   SPOOL buffer usage history
    16 $LMDNHBS   NJE header buffer usage history
    17 $LMDSMFB   SMF buffer usage history
    18 $LMDTGS   Track group usage history
    19 $LMDTTAB   Trace table buffer usage history
    20 $LMDVTMB   VTAM buffer usage history

 Enter UP and DOWN commands to scroll the list of options.
 Enter END command to terminate JES2 data analysis.

```
 JES2 Monitor - IPCS panel - Options for debugging monitor problems      _ ☐ X
 File   Edit   View   Communications  Help
   IPCS   JES2   Format   Trace   Debug
------------------------------------------- JES2 Monitor Data
-------------------------------------------
 Option ===>                                                    Scroll ===>
CSR
 Enter JES2 name ===> JES2

 Select one of the following:

    12 $LMDJNUM        Job number usage history
    13 $LMDJOES        JOE usage history
    14 $LMDJQES        JQE usage history
    15 $LMDLBUF        SPOOL buffer usage history
    16 $LMDNHBS        NJE header buffer usage history
    17 $LMDSMFB        SMF buffer usage history
    18 $LMDTGS         Track group usage history
    19 $LMDTTAB        Trace table buffer usage history
    20 $LMDVTMB        VTAM buffer usage history

  Options to debug monitor problems
    21 $HJCT           Monitor communication table
    22 $LMD            Limit monitoring data
    23 $MONCB          Monitor address space control block
    24 $MSD            Monitor sampling data
    25 $CURCSD         Current CPU sampling data
    26 $ALTCSD         Saved CPU sampling data
    27 $MWT            MVS wait table
    28 $PRBMAIN        Main task PRBMs
    29 $PRBBRTL        BERT lock PRBMs
    30 $PRBJOBL        Job lock PRBMs
    31 $PRBCKPT        Checkpoint lock PRBMs


 Enter UP and DOWN commands to scroll the list of options.
 Enter END command to terminate JES2 data analysis.
```

Other IPCS enhancements

- Pulldowns added to all JES2 panels
  - **IPCS** - Common IPCS functions
  - **JES2** - JES2 Main Panel options
  - **Format** - formatting of commonly used data
    - ▸ $HCT, $HCCT, $MITs, $XIT/$XRT
    - ▸ Current PCE
    - ▸ JES2 Monitor Alerts, Events
    - ▸ Failure Data
  - **Trace** - trace formatting
    - ▸ CTRACEs
    - ▸ In-storage $TRACE data (NEW!)
    - ▸ Master Trace, System Trace
  - **Debug** - debugging options for JES2 IPCS code

Other serviceability enhancements

- Easier to figure out job that needs to be "zapped"
  - Job id always associated with $HASP096 for CBIMPLx disastrous errors ($CBIO)
  - Job id associated with $HASP088 when appropriate
- $ERROR can target specific MAS members to be dumped
  - Pre-z5, only option was to target all other members
  - Primary exploiter is CKPT

VER/REP enhancements

- VER/REP initialization statements
  - JES2 patch facility
  - Can alter any storage addressable via the JES2 address space
  - Cannot access CKPT data (too early)
  - Cannot access data spaces
    - ► More data in data spaces means less that can be patched
- So what's new?
  - Access to JES2 data space (by data space name)
  - Deferred patch to CKPT data until CKPT is read
  - Enhanced syntax more consistent with AMASPZAP

VER/REP enhancements

- VER/REP externals simple format:
  - **VER** *name offset data*
  - **REP** *name offset data*
  - **BASE** *name offset*
- VER/REP enhanced format (AMASPZAP):
  - **NAME** *xxxxx name*
  - **VER** *offset data*
  - **REP** *offset data*
  - **BASE** *offset*
  - **ENDZAP**

VER/REP enhancements

- For data space access
  - Name is the actual data space name (*jesxdspn*) or short name (*dspn*)
  - Short names (PSO, SAPI) sometimes conflict with module names
- Address and default base is always zero
  - Use actual address in space as "offset"
  - Zero and non-zero origin data spaces

VER/REP enhancements

- For checkpoint data set access:
  - Name starts with CKPT and is followed by the checkpoint section name
    - **CKPTJQE** is the JQE CTENT
  - Address starts at beginning of CTENT
    - Default base is x'18' (size of CKPT header)
    - Consistent with offsets like JQE/JOE offsets
  - **CKPTHCT** is for checkpointed HCT
    - Address is start of HCT
    - Default base is offset to $SAVEBEG
  - **CKPTMSTR** is for master record
    - Address is start of record, default base is zero
    - Do not use for checkpointed HCT

Coming Attractions

"Next" JES2 release

- "N-3" release will be z/OS 1.2
  - $ACTIVATE at z2 level will most likely be required
    - ‣ Offsets changed to indices in JQE/JOE
    - ‣ Job numbers from 2-byte to 4-byte fields
    - ‣ Job ids from JOBxxxxx to Jxxxxxxxx
      - ‣ JES control blocks
      - ‣ MVS control blocks
      - ‣ Messages
      - ‣ SMF records
    - ‣ JOBDEF RASSIGN=NO can be used to restrict valid job number range
      - ‣ 1-32767 (signed vs. unsigned computations)
      - ‣ 1-65535 (2-byte vs. 4-byte considerations)

"Next" JES2 release

- Input services for Internal reader and NJE done outside JES2 address space
  - Performance boost
    - ‣ Dependence on JES2 checkpoint cycle
    - ‣ Main task CPU
    - ‣ No restriction on # of internal readers
  - Impact on exits
    - ‣ 2, 3, 4, 20 (Input services)
    - ‣ 46, 47 (Header transmit/receive)
    - ‣ 13, 39 (SYSOUT transmitter/receiver)
  - New parallel exits in new environment
  - New exit when job added to next queue in JES2 main task

New exits

- "Expected" requirements in new exits
  - Ability to examine, modify, insert card images
  - Ability to modify JQA, JCT
  - Ability to carry user job-related information from job card exit through to end of processing
  - Ability to reference installation data structures
    - ▸ May require movement of data to persistent data space (or CSA)
    - ▸ JES2 address space may not be available
  - Ability to use certain JES2 services
    - ▸ $SCAN, $BLDMSG, $DSERV, etc.
- "Unexpected" requirements in new exits
  - ????????????????? (feedback welcome)