Introduction for New JES2 System Programmers

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- Your experienced JES2 system programmer just left!
- Now YOU have to care for JES along with everything else! - You never paid much attention to JES, and wonder why you even needed one(?)
- Here's how to keep JES2 alive and healthy (and keep your job.)
- Don't touch it? NO! - Read on ...

What you NEED to know about JES2 ...

- **How does your company (ab)use JES2 ?**
  - ► Understand how JES2 works
  - ► Various Configuration options
- **How do you keep it alive and healthy?**
  - ► Customized for your environment
  - ► Available & Secure
  - ► Well Managed
  - ► Up-to-date, Maintained, & Well Tested
  - ► Performing like a top
- **References** .... (where to turn for help)

Why do you need JES, anyway?

- **Enter Jobs, TSO Users, Started Tasks**
  - From local & remote readers, other NJE nodes, offload, internal (programmable) readers
  - Provide temporary storage for I/O files (Spool)
- **Schedule Batch Job Execution**
  - Manage (queue) jobs before and after execution
- **Balance Work between multiple Systems & Nodes**
- **Distribute Output**
  - Printers, punches, remotes, NJE nodes, offload, and Programmable interfaces (PSO, SAPI)
- **History ...**
  - Efficiently manage system resources

Basic JES2 Functions

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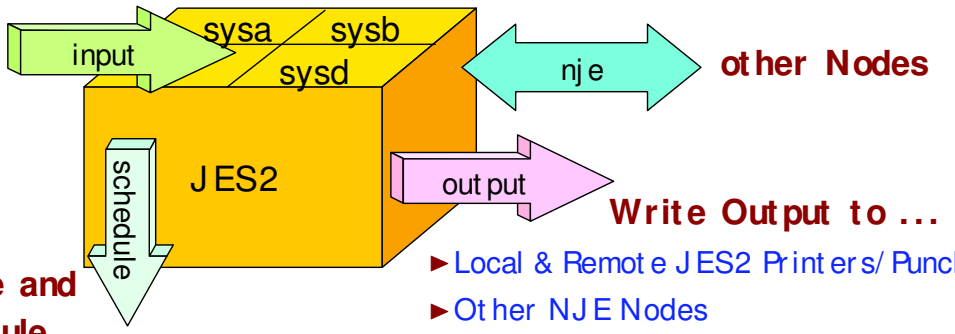
Read Jobs In from ...

- Local & Remote Readers
- Other NJE Nodes
- Spool Offload
- Internal Reader APIs: other jobs, CICS/IMS, online systems, FTP, ...)



other Nodes

Write Output to ...

- Local & Remote JES2 Printers/Punches
- Other NJE Nodes
- Spool Offload
- Functional Subsystems (PSF printers)
- Spool APIs - PSO & SAPI

Queue and Schedule...

- Jobs
- STCs
- TSUs

Phases of Job Processing

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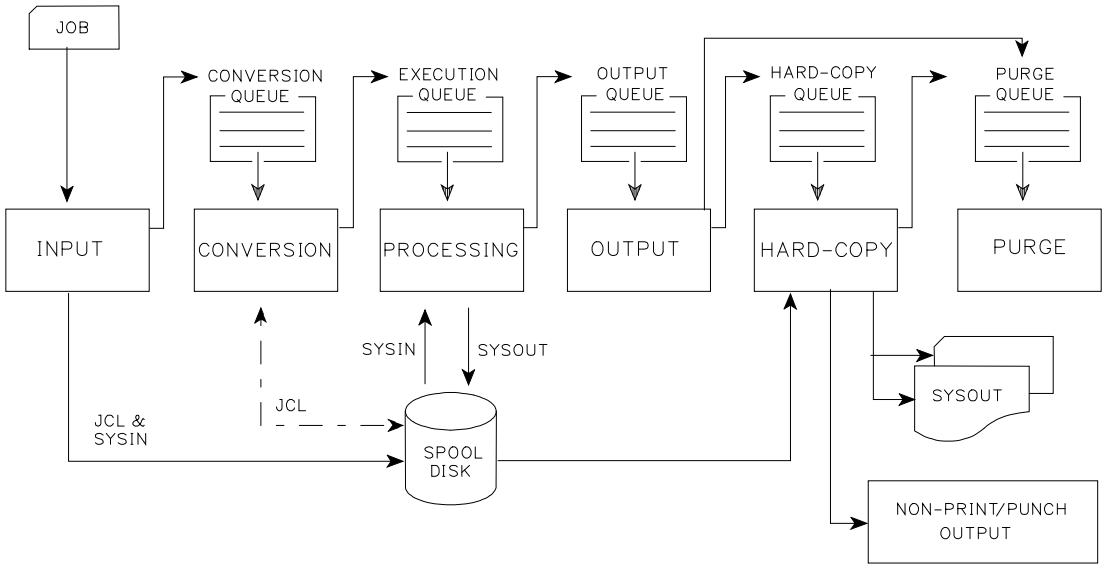

Each queue is input to specific JES2 processers (represented by PCEs - Process Control Elements)

JES2 Internals

- **Job Queuing & Selection**
  - 38 Execution Class Queues (A-Z, 0-9, STC, TSU)
    - Ordered FIFO within Priority (may be Priority Aged - optional)
  - Jobs (JQEs) Selected First-come-First-served by Job PCEs (CNVTs, XEQs, HOPEs, XMITs, PURGs) throughout the MAS
    - Using $QGET, Work-Select Tables, Exit 49/14, ...
- **Output Queuing & Selection**
  - 110 Output Qs (Hold, NJE, 36 local (A-Z, 0-9), 36 Rmt, 36 Usr)
    - Ordered FIFO within Prty within User/DestID (maybe Priority Aged)
  - Job Output Elements (JOEs) selected First-come-First-served by Output PCEs (PRTs, PUNs, XMITs, FSSs) throughout MAS
    - Using $# GET, PSO, SAPI, WS Tables (no Exits)

JES2 Multi-Access Spool (MAS)

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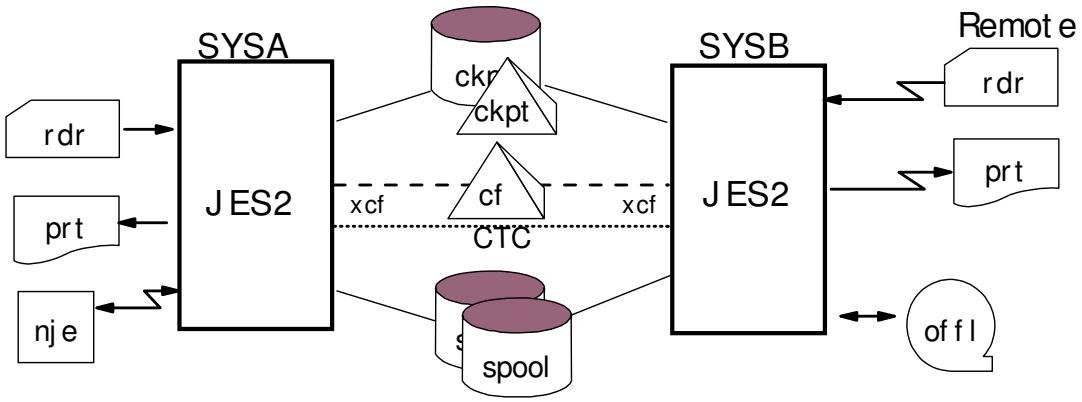
- **"MAS" Complex can have up to 32 Members:**
  - Must be in the same MVS Sysplex (Timer, XCF, CDS)
  - Must be "Compatible" (usually + or - 4 Releases)
  - Are Peer-Coupled; no master-slave; Devices anywhere
  - Share Queues by taking turns reading/writing Checkpoint



JES2 has many Parts ...

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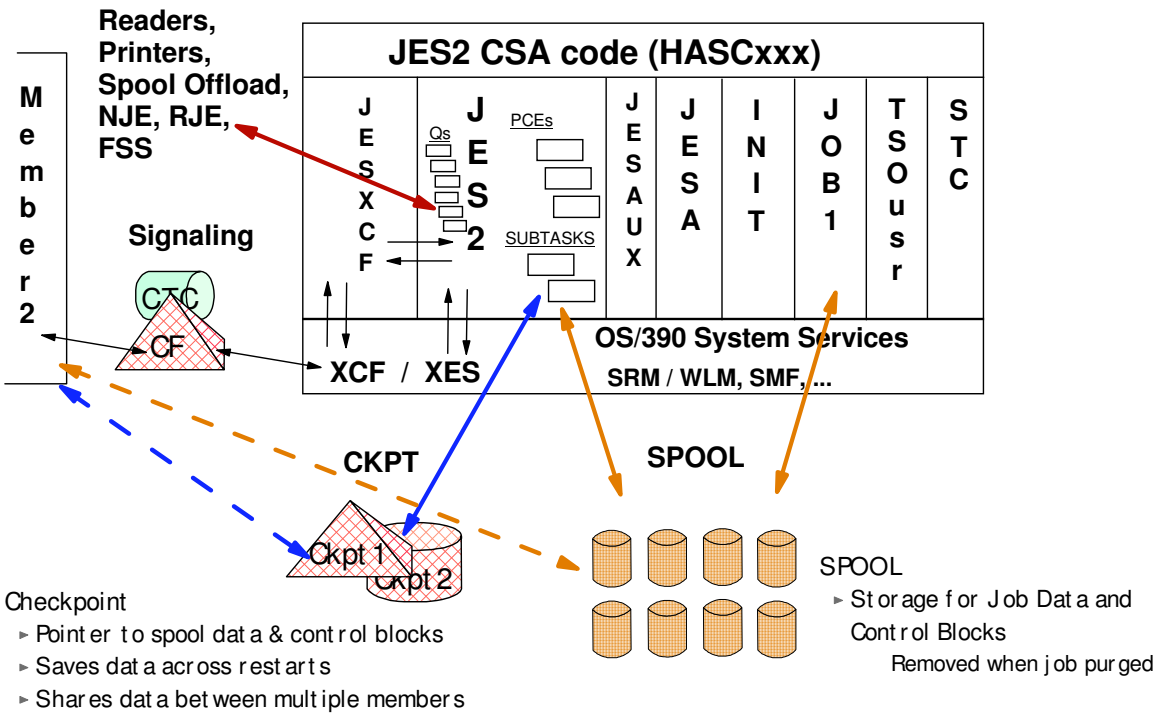

Checkpoint
- Pointer to spool data & control blocks
- Saves data across restarts
- Shares data between multiple members

SPOOL
- Storage for Job Data and Control Blocks
  Removed when job purged

JES2 Configurations

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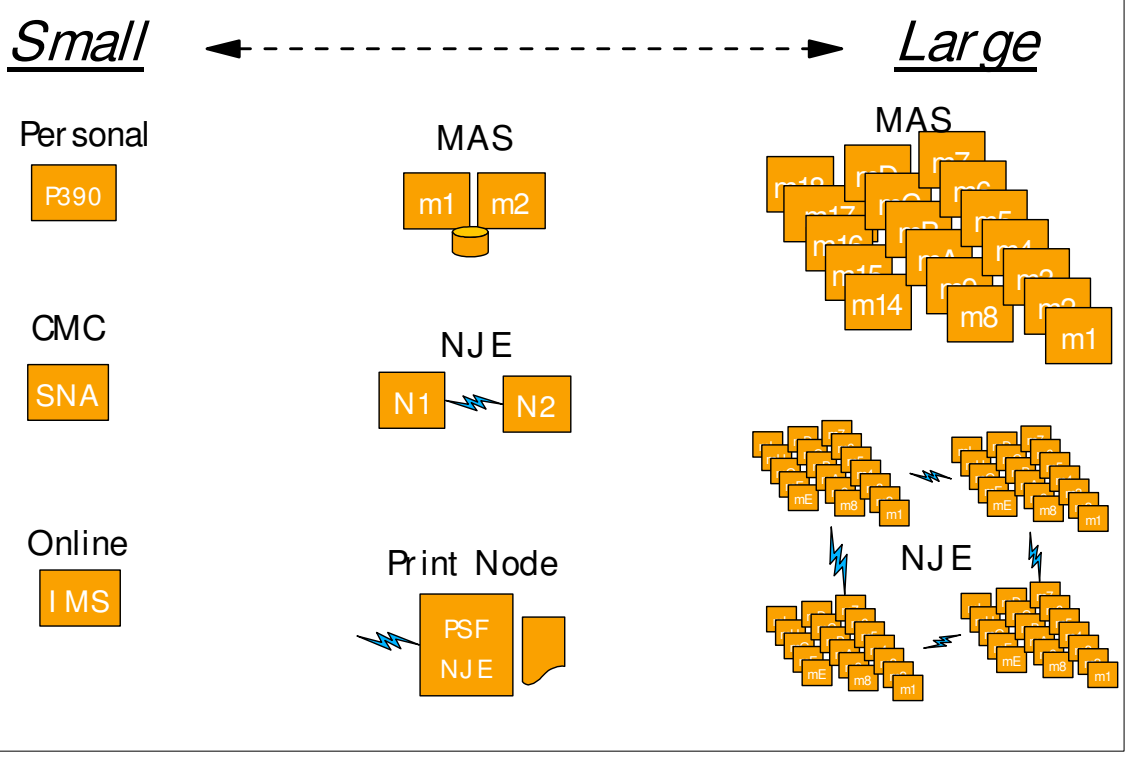

Tailoring JES2 for your Environment

1. **JES2 Init Parms**
   - ►Take the defaults unless you know differently
2. **JES2 Exits** (see session #s 2661, 2662, 2663)
   - ►Requires skills w/ ALC & JES2 Internals
   - ►MVS Exits (SMF, TSO, PSF) also available
   - ►Use only when necessary
3. **JES2 Table Pairs**
   - ►Used by many JES2 processes (WS, Init, PCE, ...)
   - ►IBM, Installation, Vendor tables
4. **JES2 Source Code ...**

JES2 Initialization

- **Automatically Started if Primary Subsystem**
  - Make your JES2 procedure "bullet-proof"
  - Specify options: 'warm,noreq'
    - Cold-start, Warm-start (single or all member), Hot-start
- **Initialization Parameters**
  - Define size, attributes & status of JES2 resources
  - Use the IBM defaults unless you know better
  - Customer specific processing options & Devices
- **Organize your init deck; share it between members**
  - Global parms: Spool, Checkpoint, JobClass, defs
  - Devices: Local, Remote
  - System-specific (use &symbolics in a MAS environment)

Sample JES2 procedure


```
//JES2    PROC DSN1='SYS1.PROCLIB',          * PRIMARY PROCLIB          *
//             DSN2='SYS2.USRPROC',          * USER PROCLIB             *
//             STEPLIB='SYS1.JES2.SHASLINK', * JES2 PGM LIBRARY         *
//             PGN=20,                       * PERFORM FOR JES2         *
//             TYPE=HAS,                     * DEFAULT NAME ALTERNATE   *
//             PARMSUF=,LOCLSUF=,NJESUF=,    * PARM MEMBER SUFFIXES     *
//             MBR=JES2PARM,                 * EMERGENCY PARMS          *
//             OPT='WARM,NOREQ'              * REPLY TO INIT OPTIONS    *
//IEFPROC EXEC PGM=HASJES20,DPRTY=(15,15),TIME=1440,
//             PARM=(&OPT.),                 * INIT. OPTIONS            *
//             PERFORM=&PGN                  * PERF. GROUP FOR RMF      *
//STEPLIB   DD DSN=&STEPLIB,DISP=SHR
//PROC00    DD DSN=&DSN1,DISP=SHR
//          DD DSN=&DSN2,DISP=SHR
//PROC01    DD DSN=&DSN2,DISP=SHR                 * ALTERNATE PROCLIB  *
//HASPPARM  DD DSN=SYS1.PROCLIB(&TYPE.PARM&PARMSUF),DISP=SHR
//          DD DSN=SYS1.PROCLIB(&TYPE.LOCL&LOCLSUF),DISP=SHR
//          DD DSN=SYS1.PROCLIB(&TYPE.NJE&NJESUF),DISP=SHR
//OTHER     DD DSN=SYS1.PROCLIB(&MBR),DISP=SHR    * ALTERNATE PARMS    *
//HASPLIST  DD DDNAME=IEFRDER                     * LISTING FILE       *
```

- **Testing the JES2 proc ...**
  - Use Poly-JES (more later)
  - "start JES2" on top of an already running JES2, then cancel it

JES2 Start-up Options

- **Cold-Start {Format}**
  - Was done the very first time your installation started JES2
  - All spooled jobs and data are lost {SPOOL space formatted}
- **All-Member Warm Start**
  - IPL & Restart of JES2 with no other members active
  - Rebuild damaged control blocks (seldom required)
- **Single System Warm Start (or Quick Start)**
  - Single system Restart of JES2 after IPL or JES2 quiesced
- **Hot Start**
  - Restart JES2 after ABEND without an IPL
  - Jobs running before ABEND continue running (may wait on JES2 for TGs, etc.)

JES2 Init Parms - key parmameters


```
CKPTDEF  CKPT1=(STR=xxxx,INUSE=YES),
         CKPT2=(DSN=SYS1.JES2.CKPT1,VOL=CKPTV1),
          NEWCKPT1=(DSN=SYS1.JES2.CKPTBK1),
          NEWCKPT2=(DSN=SYS1.JES2.CKPTBK2), ...
SPOOLDEF DSNAME=SYS1.HASPACE, VOLUME= SPOL,
         SPOOLNUM=32, BUFSIZE=3992, TGBPERVL=255,
         TGSIZE=30, TRKCELL=12, FENCE= ...
MASDEF   HOLD=50,DORM=(50,500)
JOBCLASS(*) JOURNAL=YES, SWA=ABOVE, ...
PCEDEF     xxxNUM=10
SUBTDEF    GSUBNUM=50
```

Plus Printers, Rmts, Nodes, and many more

JES2 Parameter Changes

- **Most Parms can be Changed or Added Dynamically**
  - $T and $ADD Commands
  - System Display & Search Facility (SDSF) program product
  - Keep your init deck up-to-date as you change them
- **Notable Exceptions (non-dynamic parms):**
  - **Hot-Start:** PCENUMs, some Device settings
  - **Single-member Warm start or Quick-start:** Exits
  - **All-Member Warm start:** CKPTDEF
  - **Cold-start Parms:** SPOOLDEF

Availability Issues

- **JES2 System Availability**
  - ►Throughly test all maintenance & exits in all your environments
  - ►Use JES2 automated restart functions - minimize JES2 down time
- **Spool - Job input & output, JCL, & Control Blocks**
  - ►Use reliable DASD (min. volume fencing can hurt perform.)
  - ►Use $SSPOOL; $PSPOOL to add and delete - Never use DFDSS, etc.!
  - ►Spool Offload can be used to archive important jobs/SYSOUT
- **Checkpoints - contain the pointers to all spool data**
  - ►Always use CKPT1 & CKPT2, NEWCKPT1 & NEWCKPT2
  - ►Use Reconfiguration Dialog to recover or move - Never use DFDSS!
  - ►Multiple MAS members need a Dedicated CKPT1 volume
- **Other operations - wide range of JES2 Commands**
  - ►Watch out for Unauthorized & Dangerous Commands: $PJQ
- **Secure all these with SAF/RACF**

JES2 Security

- **Protect System Data Sets (RACF DSNAME profiles)**
  - Spool, Checkpoint, Spool Offload
  - Program Libraries, Parmlibs (init deck), Proclibs
- **Use SAF/RACF classes instead of JES2 parms**
  - Input Sources - JESINPUT, NODES
  - Job Submission & Cancel - JESJOBS
  - Output Printers & Transmission - WRITER
  - Commands - OPERCMDS
  - Spool Data - JESSPOOL
  - Exits (36, 37) can be used to override, but not recommended
- **See "JES2 Init & Tuning Guide" (chapter 7)**
  - Also "RACF Security Administrator's Guide"

Operations

- **Starting & Stopping JES2**
  - Understand all the options (hot, warm, cold, noreq, ckpt...)
  - Without IPLing: $PJES2,ABEND before IPL: $PJES2,TERM
- **Wildcard & Filtering for Control & Display Commands**
  - Very powerful - See "JES2 Commands" Chapter 5 intro
- **SDSF to Manage Devices & Queues, & Browse Syslog**
  - Devices (readers, printers, lines, nodes, spool offload)
  - JES2 Initators (not WLM inits)
  - Job & Output Queues
  - SYSLOG - Commands & Messages
  - System (MAS, SE, RES, JobClasses)

- Commands start with "$" (get to know them)
- Messages start with "$HASP" (see "JES2 Messages")

SDSF to Operate/Manage JES2

- **End-users, Programmers**
  - Job & Output Displays
- **Specialized Operators, Production Control**
  - Devices (readers, printers, lines, nodes, spool offload)
  - JES2 Initators (not WLM inits)
  - Job & Output Queues
- **Lead Operators - above plus ...**
  - SYSLOG - Commands & Messages
- **Systems Programmers - above plus ...**
  - MAS - Members of the Complex
  - Scheduling Environments & RESources
  - JobClasses

- Commands start with "$" (get to know them)
- Messages start with "$HASP" (see "JES2 Messages")

JES2 Systems Management

- **Systems Management Facility (SMF) records**
  - Controlled by SMF and JES2 parameter settings
  - Job related:
    - Purge (26)
    - Output (6)
    - NJE Sysout Transmission (57)
  - RJE/NJE Line/Session:
    - Start Line, RMT Signon (BSC - 47, SNA - 52)
    - Stop Line, RMT Signoff (BSC - 48, SNA - 53)
    - Line or RMT Password Error (BSC - 49, SNA - 54)
  - JES2 Subsystem:
    - Start (43)
    - Stop (45)

JES2 System Automation

- **JES2 already automates many functions**
  - Set init parms to allow this to happen:
    - MASDEF AUTOEMEM=ON, RESTART=YES
    - CKPTDEF NEWCKPTn=xxxx, OPVERIFY=NO
- **Common house-keeping chores . . .**
  - Clean up old spool files:
    - $PO JOBQ,/Q=S,/Days >4 /*Class S output */
    - $PJQ,/DAYS >7 /* Jobs */
    - $TA,I=86400,'$PJQ,/DAYS >7' /* Use Automatic Commands*/
  - Keep Lines started & Nodes connected:
    - $TASLNE,I=3599,'$SLINE(2-27)' /* Start all SNA Lines */
    - $TASNL2,I=3600,'$SN,LINE2,N=WSCNEXT'

External Automation

- **System/Message-based Automation**
  - Resource Shortages - $HASP050 message
    - Spool (Track-Groups), JQEs, JOEs at 80%
    - Free up resources (Re-route or Delete old jobs)
    - Add spool volume or use Spool Offload
    - Notify Systems Programmers
  - RJE/NJE Line Monitoring
    - $HASP203, $HASP210, (OW43270) Line Dropped
    - Restart the line, session
    - Periodically issue $SLINE(*) command

New JES2 features

- **Initiators**
  - ►WLM initiator managment - Rel.4 $ACTIVATE (Sess.# 2660)
- **Routing jobs to specific members**
  - ►Scheduling Environments (WLM) - Rel.4 $ACTIVATE
- **NJE Networks**
  - ►Subnets, Dynamic Connects, $DPATH, $DCONN
- **RJE workstations**
  - ►Dynamic changes, enhanced diagnostics
- **Spool Offload**
  - ►Archive abilities enhanced with Rel. 1
- **FTP site filetype=jes**
  - ►put, dir, get - enhanced with OS/390 R.10 Comm. Server

JES2 Maintenace

- **JES2 is "Source-Maintained"**
  - Use SMP/E set-up jobs in SHASSAMP
- **Stay Current on JES2 Maintenance!**
  - Latest RSU level if possible
  - Avoids re-discovery of errors
    - If you have problems, IBM service may want you to get current and re-create problem
- **Read the PSP bucket**
  - Review HIPERs

Testing - use "Poly-JES"

... also known as "Secondary JES", or "Alternate JES"

- **Configurations: Same MAS as Primary, or Separate**
  - Each subsystem in an MVS system requires a unique ComChar
- **Member of Primary MAS:**
  - Share Spool, Checkpoint, Queues, ...
  - Load modules usually the same
- **Separate MAS (Separate NJE Node):**
  - Own Spool, Ckpt, Queues, Load Modules,...
  - Connect to Primary JES via NJE
  - More isolated for "risky" testing

Debugging

- **Recognizing a Problem:**
  - Messages, Commands, SDSF, Syslog, User phone call
- **Diagnosis - Use these before you need them**
  - Commands/ Messages (eg, $HASP088 ABEND Analysis)
  - $TRACE (IDs) & formatters
  - DEBUG Facility
  - Dumps - IPCS - JES2 Formatters
    - Multi-system dumps (OS/390 Rel. 10)
  - LogRec - SymRecs - EREP
  - CTRACE - under direction of IBM Level 2
  - FSS, GTF, VTAM, NCP, etc. Traces
- **See "JES2 Diagnosis" & "JES2 Messages"**

JES2 IPCS Support

- **You must be proactive to install JES2 IPCS.**
  - Make sure JES2 IPCS support works before you need it
  - Set up for all combinations of JES2 and MVS releases
- **Use the correct libraries for JES2 ctl blocks:**
  - SHASPARM in the PARMLIB concatenation
  - SHASMIG in the STEPLIB concatenation
  - SHASPNL0 in the ISPPLIB concatenation
- **For more information, see:**
  - "JES2 Diagnosis"
  - "JES2 Migration Notebook"
  - "MVS IPCS Customization"
  - Enhancements in APAR OW33073 (SUP0005)

Tuner's View of JES2

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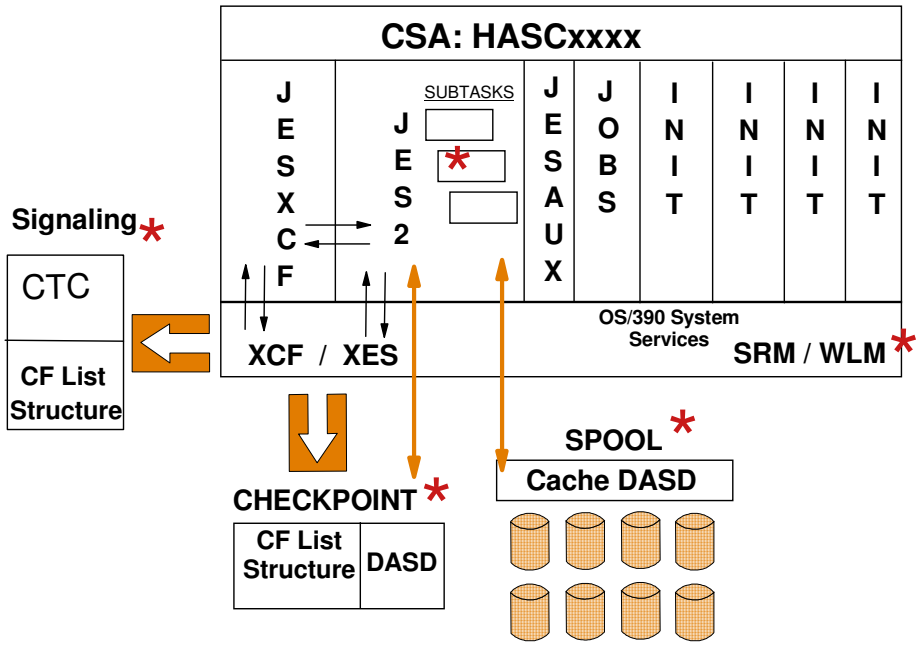

Performance

- **In general, JES2 takes minimal Resources**
  - Exceptions: Large Q's, Many Devices, Exits, OEM subsystems
- **Monitoring JES2 Performance**
  - SDSF, RMF, $TRACE (1, 2, 17, 20, 30, 31)
  - Main Task CPU utilization detailed with $D PERFDATA cmd
  - Watch "Sympathy Sickness" (delays caused by other members)
- **Tuning JES2**
  - Spool most important (see session #s 2657, 2658)
  - Make sure you have enough resources (TGs, JQEs, JOEs, Bufs)
  - Checkpoint performance is usually not an issue
- **Don't worry - be happy**
  - Get Baseline #s - Know your "Happy Values"

JES2 Capacity Planning

- **As workload grows, so does ...**
  - JES2 internal capacity requirements
    - # of Jobs
    - # of Output Elements
    - Spool Space
    - Checkpoint Size
  - JES2 CPU, I/O, & Storage Activity
    - Devices, Initiators
    - Buffers
    - Queue length
  - # of Members in the MAS Complex
    - Spool Contention
    - Checkpoint Contention
    - Systems Management Complexity

Summary

1. **Understand the peculiarities of JES2**
   - ►Read, Read, Read
   - ►Experiment with Poly-JES
2. **Keep it simple ...**
   - ►Minimize Mods & Exits
   - ►Discourage non-standard uses
3. **Automate the management of JES**
   - ►Set it up once, keep it up forever

Appendix

- History of JES2
- Current Releases
- Reference Material
  - Books, ...

31 Flavors of JES2 !

HASP 1967-1973

HASP I V.1	OS/MFT-I
HASP I V.2	RJE (STR)
HASP II V.1	MVT-II, MVT
HASP II V.2	BSC RJE
HASP II V.3	S/370
HASP II V.31	(maint.)
HASP II V.4	SVS + PRPQs

MVS 1974-1977

JES2 R.2	MVS
JES2 R.3	Shared Spool
JES2 R.4	3800, SNA RJE
JES2 R.4.1	3790 MLU RJE

NJE 1976-1978

NJE R.1	NJE
NJE R.2	3790 RJE
NJE R.3	SNA NJE

MVS/SP 1987-1995

SP 130/210	Exits, Spool Offload
SP 133/211	Dynamic Spool
SP 134/212	AFP
SP 136/215	Spool Constraint Relief
SP 2.2.0	Checkpt Enhancements
SP 3.1.1	Constraint Relief, CSO
SP 3.1.3	RACF Security
SP 4.1.0	Output, NJE
SP 4.2.0	APPC, Dynamic I/O
SP 4.3.0	CUPRIMD Quality
SP 5.1.0	Parallel (32-Way MAS)
SP 5.2.0	Sysplex, ARM, JobQ

OS/390 1996-2000?

OS/390 1.1	OS/390 Packaging
OS/390 1.3	SAPI
OS/390 2.4	WLM Batch
OS/390 2.5	Open Print
OS/390 2.7	FiCon Channel support
OS/390 2.8	CF Auto-Rebuild Ckpt

Current JES2 Releases

- **FMIDs, Birthdays & Obituaries**

JES2 Rel.#	FMID	First Available	No Longer Available	End of Service
MVS/SP 5.1	HJE5510	6/94	6/95	1/2001
MVS/SP 5.2	HJE5520	6/95	3/00	3/2001
OS/390 R.1/2	HJE6601	3/96	3/97	1/2001
OS/390 R.3	HJE6603	3/97	9/97	3/2001
OS/390 R.4	HJE6604	9/97	3/98	3/2001
OS/390 R.5/6	HJE6605	3/98	3/99	9/2001
OS/390 R.7	HJE6607	3/99	9/99	3/2002
OS/390 R.8/9	HJE6608	9/99	9/00	9/2002
OS/390 R.10	HJE7703	9/00		

JES2/MVS Compatibility

MVS BCP Releases	JES2 Rel: **MVS/SP** 5.1.0	5.2.0	**OS/390 JES2 . . . .** R.1/2	R.3	R.4	R.5/6	R.7	R.8/9	R.10
MVS/SP 5.1.0	x								
MVS/SP 5.2.0	x	x							
OS/390 R.1	X	X	X						
OS/390 R.2	X	X	X						
OS/390 R.3	X	X	X	X					
OS/390 R.4	X	X	X	X	X				
OS/390 R.5	X	X	X	X	X	X			
OS/390 R.6	X	X	X	X	X	X			
OS/390 R.7	X	X	X	X	X	X	X		
OS/390 R.8	X	X	X	X	X	X	X	X	
OS/390 R.9	X	X	X	X	X	X	X	X	
OS/390 R.10						X	X	X	X

"JES release will coexist w/BCP if JES can coexist w/JES from that BCP."

References

- **JES2 Library:** Hard-copy, CDROM, WWW
- **JES2 Source Code:** xx.SHASSRC &SHASMAC
- **JES2 Samples:** xx.SHASSAMP
- SHARE Presentations
- Education ?
- IBMLink (Q & A), Forums, Listserv-JES2, ..
- www.ibm.com/support/TechDocs - Flashes,..

OS/390 JES2 LIBRARY

GC28-1794	JES2 Introduction *
GC28-1797	JES2 Migration Notebook
SC28-1791	JES2 Initialization & Tuning Guide
SC28-1792	JES2 Initialization & Tuning Reference
GC28-1796	JES2 Messages
GC28-1790	JES2 Commands
GX22-0041	JES2 Commands Summary
SC28-1793	JES2 Installation Exits
SC28-1795	JES2 Macros
LY28-1086	JES2 Diagnosis
LY28-1096	JES2 Data Areas, V.1 $A - $E *
LY28-1097	JES2 Data Areas, V.2 $F - $O *
LY28-1098	JES2 Data Areas, V.3 $P - $X *

* Soft-copy only
+ all JES2 books are unlicensed

OS/390 Softcopy Books

- http://www.s390.ibm.com/products/softcopy
- OS/390 Online Collection
  - CD-ROMs: SK2T-6700 (Unlicensed only)
  - Available on Tape (Optional, No-Charge)
- S/390 Rainbow Books Collection
  - CD-ROM: SK2T-2177
  - 300+ Systems Center Technical Bulletins in BookManager and PDF formats
  - RedBooks (ITSC), Orange (WSC), Yellow (NS)

All Updated Quarterly

Other JES2-Related Documents

- NJE Formats & Protocols, SC23-0070-3
- VSE to OS/390 Migration Notebook, SG24-2043
- DFW & Dual Copy - JES2 Spool & Checkpoint, GG66-3230
- NJE with JES2 and Other Systems, GG22-9339-1
- SDSF/RACF 1.9.2 Conversion, GG24-4085 (softcopy only)
- MVS/ESA JES2 Exit Coding, GG24-4127 (softcopy only)

Deleted (obsolete) - save your old copies

- ~~OS/390 R.4 Implementation, SG24-2089~~
- ~~OS/390 R.5 Implementation, SG24-5151~~
- ~~JES2 MAS in Sysplex Environment, GG66-3263~~
- ~~MVS Parallel Sysplex Config. Cookbk, SG24-4706~~
- ~~MVS/ESA JES2 V.5 Implementation, GG24-4583~~

OS/390 Web Sites

- **OS/390 Coexistance, Migration info**
  - http://www.s390.ibm.com/stories/year2000/coexist.html
- **OS/390 Publications (view, print, order books)**
  - http://www.s390.ibm.com/os390/bkserv
- **JES2 home page (under construction)**
- **SDSF home page**
  - http://www.s390.ibm.com/products/sdsf
- **Advanced Tech. Support (Washington System Center)**
  - http://www.ibm.com/support/techdocs (Flashes, Papers etc.)
- **SHARE Proceedings**
  - http://www.share.org
- **Redbooks**
  - http://www.redbooks.ibm.com

Questions