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 to be a good JES2 Systems Programmer?

- **How your company uses JES2.**
  - ► Understand how JES2 supports it
  - ► Configuration options

- **How to keep JES2 alive and healthy.**
  - ► Customized for your environment
  - ► Available & Secure
  - ► Well Managed
  - ► Up-to-date, Maintained, & Well Tested
  - ► Performing like a Top
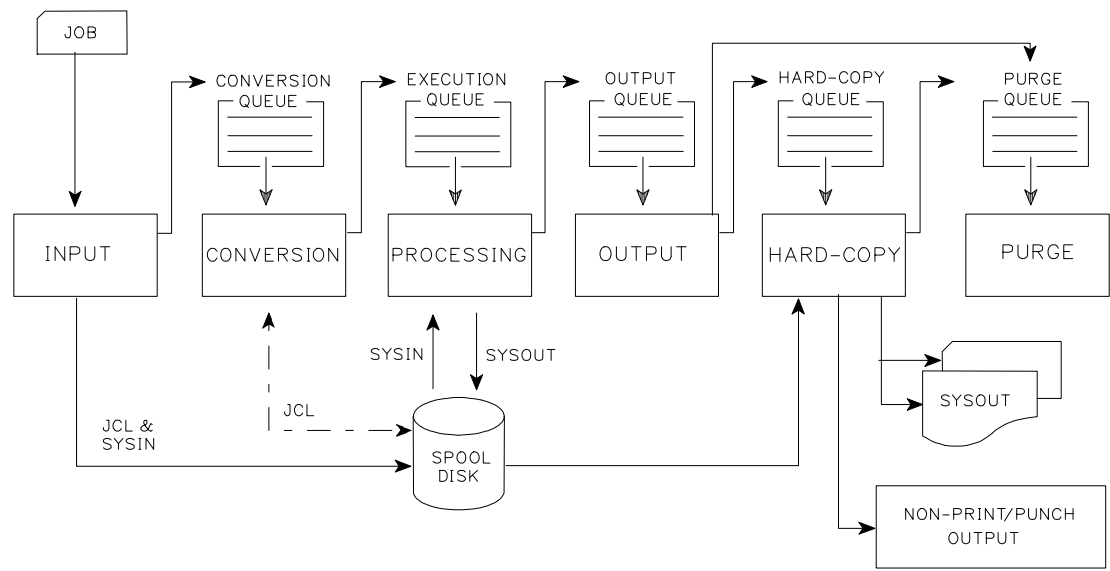
- **References** .... (where to turn for help)

Why do you need JES, anyway?   JES2

- **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

Phases of Job Processing

JES2

```
   JOB

            CONVERSION        EXECUTION         OUTPUT          HARD-COPY        PURGE
              QUEUE            QUEUE             QUEUE            QUEUE           QUEUE


  INPUT      CONVERSION      PROCESSING        OUTPUT          HARD-COPY        PURGE


                           SYSIN   SYSOUT

                                                                             SYSOUT
  JCL &           JCL
  SYSIN
                           SPOOL                                        NON-PRINT/PUNCH
                           DISK                                            OUTPUT
```

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

JES2 Queuing Mechanisms

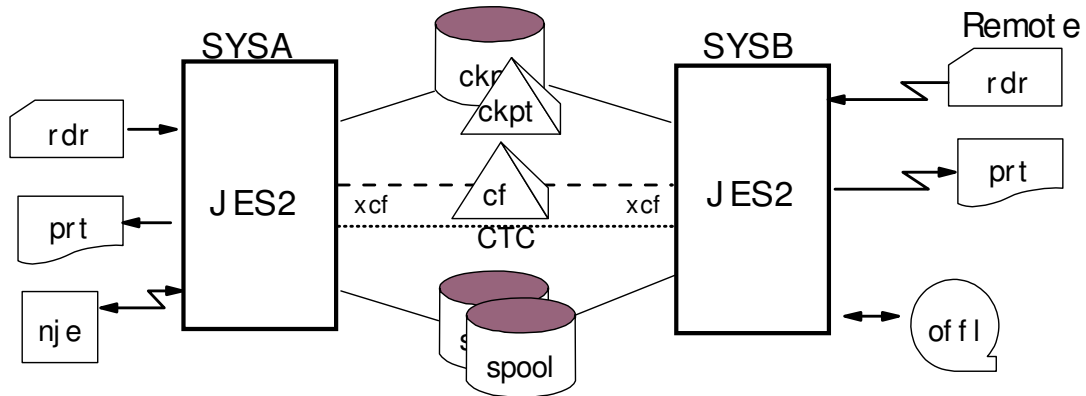- **Job Queuing & Selection**
  - ▶ 38 Execution Class Queues (A-Z, 0-9, STC, TSU)
    - – Ordered FIFO within Priority (may be Priority Aged - optional)
  - ▶ Jobs (JQEs) Selected First-come-First-served by Job Queue PCEs (CNVTs, XEQs, HOPEs, XMITs, PURGs) across the MAS
    - – Using $QGET, Work-Select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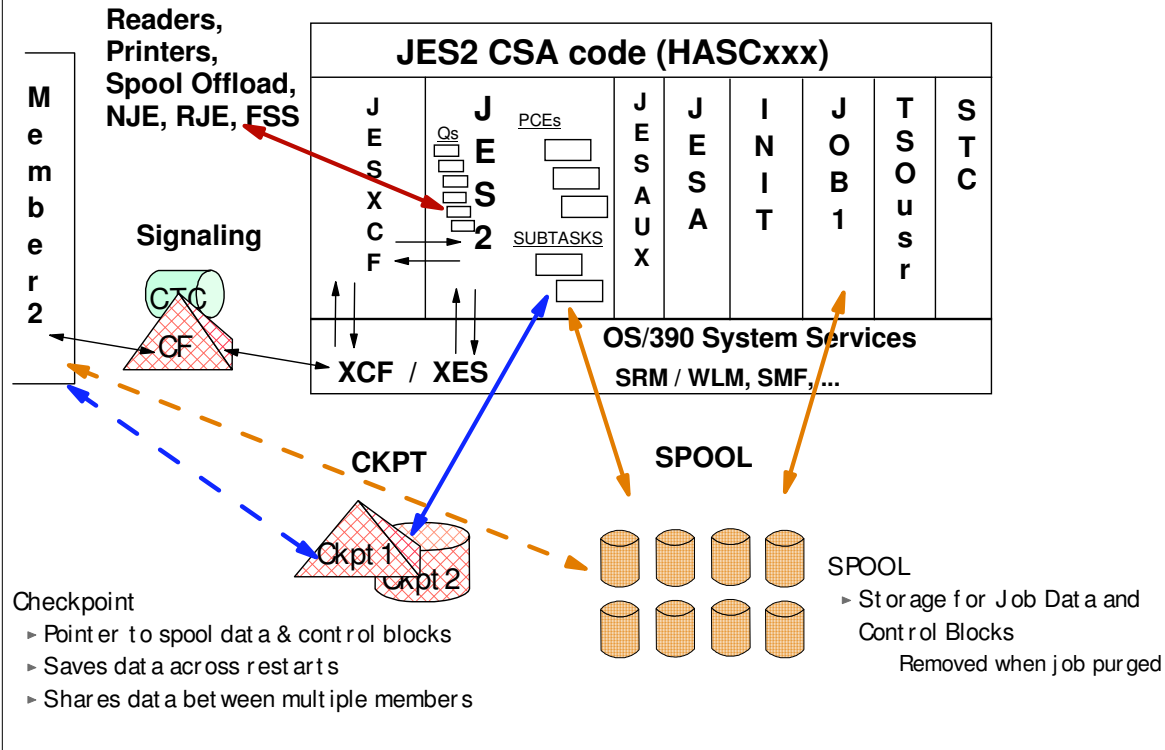
- **Output Queuing & Selection**
  - ▶ 110 Output Qs (Hold, NJE, 36 local (A-Z, 0-9), 36 Rmt, 36 Usr)
    - – Ordered FIFO within Prty within User/DestID (may be Priority Aged)
  - ▶ Output Elements (JOEs) selected First-come-First-served by Output Queue PCEs (PRTs, PUNs, XMITs, FSSs) across MAS
   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

JES2 Multi-Access Spool (MAS) JES2

- **"MAS" Complex can have up to 32 Members:**
  - ► Must be in the same Sysplex (Timer, XCF, CDS)
    - – Parallel sysplex NOT required (only for Ckpt on coupling facility)
  - ► Must be "Compatible" (usually + or - 3 Releases)
  - ► Are Peer-Coupled; no master-slave; Devices anywhere
  - ► Share Queues by taking turns reading/writing Checkpoint

JES2 has many Parts ...

**Readers,
Printers,
Spool Offload,
NJE, RJE, FSS**

JES2 CSA code (HASCxxx)

| J E S X C F | J E S 2 | J E S A U X | J E S A | I N I T | J O B 1 | T S O u s r | S T C |

Qs
PCEs
SUBTASKS

M e m b e r 2

Signaling

CTC
CF

XCF / XES

OS/390 System Services
SRM / WLM, SMF,...

CKPT

SPOOL

Ckpt 1
Ckpt 2

SPOOL

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

 ▸ Storage for Job Data and
   Control Blocks
       Removed when job purged

Customizing your JES2 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 ...**
  - ► "start JES2" on top of an already running JES2 (it won't get far)
  - ► Use Poly-JES (more later)

JES2 Start-up Options

JES2

- **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 - samples

```
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,
         TGBPERVL=255, TGSIZE=30, TRKCELL=12, FENCE= ...

MASDEF   HOLD=50,DORM=(50,500)

JOBCLASS(*) JOURNAL=NO, SWA=ABOVE, ...

PCEDEF     xxxNUM=10

NODE29   NAME=WSCJES2

PRINTER(3)  xxxNUM=10

LINE(10-30)  UNIT=SNA
```

Plus 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 (IPL):** Exits
  - ►**All-Member Warm start:** CKPTDEF
  - ►**Cold-start Parms:** SPOOLDEF

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Availability Issues

JES2

- **JES2 System Availability**
  - ► Throughly test all maintenance & exits in all your environments
  - ► Use JES2 automated restart functions - minimize JES2 down time

- **Reliable Spool** (Job input & output, JCL, & Control Blocks)
  - ► Use reliable DASD (or use hardware duplexing)
  - ► Minimum volume fencing can limit the damage (but hurt performance)
  - ► Spool Offload can be used to archive important jobs/SYSOUT
  - ► Use $SSPOOL; $PSPOOL to add and delete - Never use DFDSS, etc.!

- **Protect your Checkpoints** (contain the pointers to all spool data)
  - ► Always use CKPT1 & CKPT2, NEWCKPT1 & NEWCKPT2
  - ► Use Reconfiguration Dialog to recover or move - Never use DFDSS!

- **Other operations - wide range of JES2 Commands**
  - ► Watch out for Unauthorized & Dangerous Commands: $PJQ

- **Secure all these with SAF/RACF**

JES2 Security

JES2

- **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"

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)

New JES2 features

- **Initiators**
  - ►WLM initiator managment - Rel.4 $ACTIVATE
- **Routing jobs to specific resources**
  - ►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**
  - ► Upgrade=OS390Rnn, Subset=JES2
  - ► Upgrade=ZOSV1Rnn, Subset=JES2
  - ► Review HIPERs
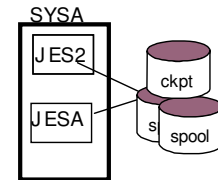
Testing - use "Poly-JES"

... 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
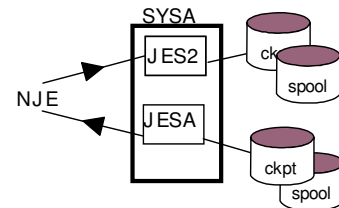
a. **Member of Primary MAS:**
  - Share Spool, Checkpoint, Queues, ...
  - Load modules usually the same

b. **Separate MAS (Separate NJE Node):**
  - Own Spool, Ckpt, Queues, Load Modules,...
  - Connect to Primary JES via NJE
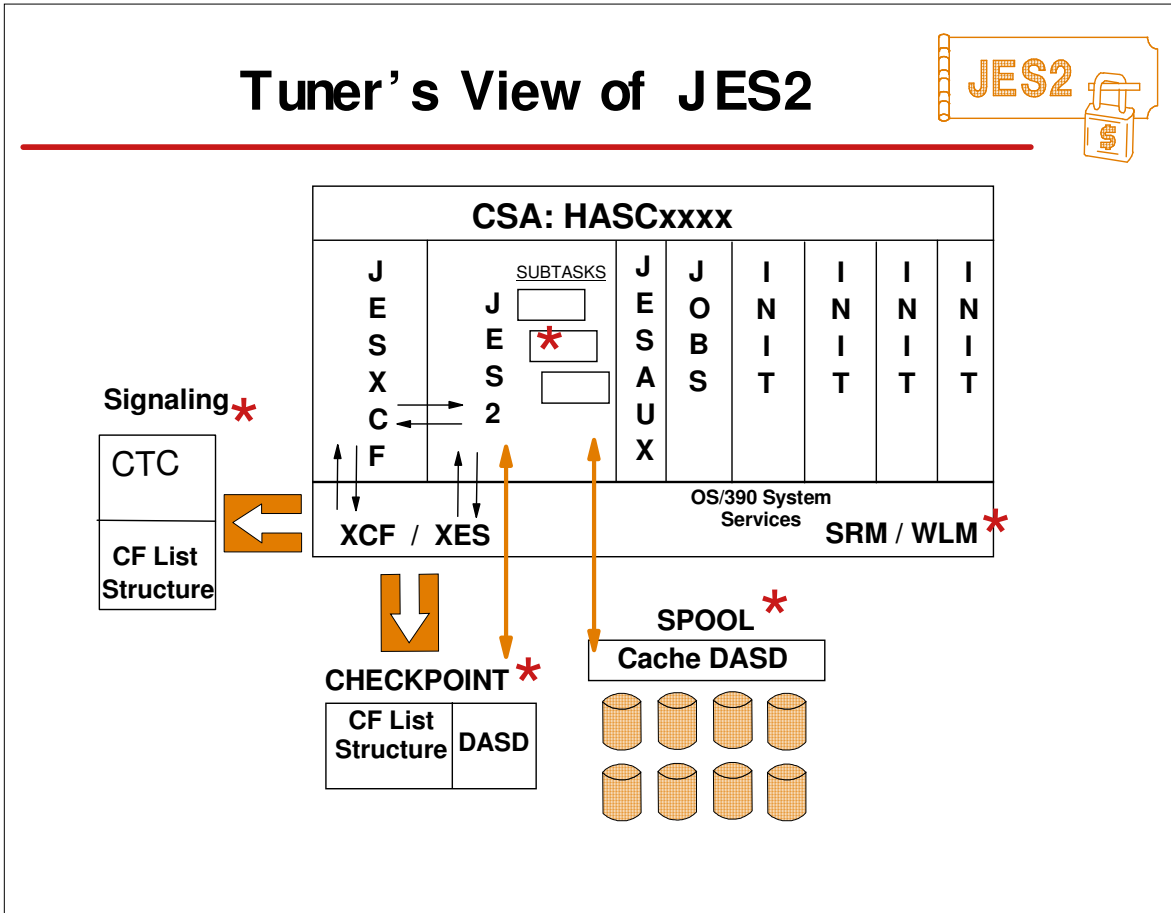 - More isolated for "risky" testing

Debugging

JES2

- **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

CSA: HASCxxxx

J E S X C F	J E S 2 SUBTASKS *	J E S A U X	J O B S	I N I T	I N I T	I N I T	I N I T

Signaling *

CTC

CF List Structure

XCF / XES

OS/390 System Services

SRM / WLM *

CHECKPOINT *

CF List Structure	DASD

SPOOL *

Cache DASD

Performance

JES2

- **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
  - ► Make sure you have enough resources (TGs, JQEs, JOEs, Bufs)
  - ► Checkpoint performance is usually <u>not</u> an issue

- **Don't worry - be happy**
  - ► Get Baseline #s - Know your "Happy Values"

JES2 Capacity Planning

JES2

- **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

JES2

1. **Understand the peculiarities of JES2**
   - ► Read and Experiment
   - ► Test 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

JES2

- **History of JES2**

- **Current Releases**

- **Reference Material**
  - ► Books, ...

32 Flavors of JES2 !

JES2

HASP

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.4	SVS + PRPQs	

MVS

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

NJE

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

MVS/SP

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	CUPRI MD Quality
SP 5.1.0	Parallel (32-Way MAS)
SP 5.2.0	Sysplex, ARM, JobQ

OS/390

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
OS/390 2.10	Spool Fencing, Zap Job

z/OS

z/OS V1.R1 = OS/390 R. 10

Current JES2 Releases

JES2

■ 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		3/2004
z/OS R.1	HJE7703	3/01		3/2004

JES2/MVS Compatibility

JES2 Rel:	MVS/SP		OS/390 JES2						
MVS BCP Releases	5.1.0	5.2.0	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

- **Education:**
  - ►**JES2 for OS/390 Facilities & Implementation (ES710)**
- **JES2 Library: Hard-copy, CDROM, WWW**
- **JES2 Source Code: xx.SHASSRC & xx.SHASMAC**
- **JES2 Samples: xx.SHASSAMP**
- **www.ibm.com/support/TechDocs - Flashes,..**
- **IBMLink (Q & A), Forums, Listserv-JES2, ..**
- **SHARE Presentations**
- **Other JES2 SysProgs: SHARE & local user groups, your predecessor!**

OS/390 JES2 LIBRARY

GC28-1794	JES2 Introduction *
GC28-1797	JES2 Migration
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
SY28-1086	JES2 Diagnosis
SY28-1096	JES2 Data Areas, V.1 $A - $E *
SY28-1097	JES2 Data Areas, V.2 $F - $O *
SY28-1098	JES2 Data Areas, V.3 $P - $X *

* Soft-copy only

OS/390 Softcopy Books

JES2

- **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

JES2

- **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