

# Introduction to JES2 for System Operators

SHARE Winter 2001, Long Beach - Session # 2662

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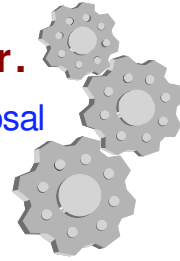
- ▶ Your experienced JES2 system programmer just left!
- ▶ Now YOU have to care for JES along with everything else! - You never paid much attention to JES, and wonder why you even needed one(?)
- ▶ Here's how to keep JES2 alive and healthy (and keep your job.)
- ▶ Don't touch it? NO! - Read on ...

## What do you need to know to be a good JES2 Systems Operator?



### ■ How JES2 works & why it needs an operator.

- ▶ Job & Output Spooling, Queuing, Selection & Disposal
- ▶ Device Monitoring & Management
- ▶ Security & Authorization



### ■ See what's going on, what's wrong, & how to fix it.

### ■ Mastering the \$Command language

### ■ Advanced Topics

- ▶ Poly-JES, Automation, ...

### ■ References .... (where to turn for help)

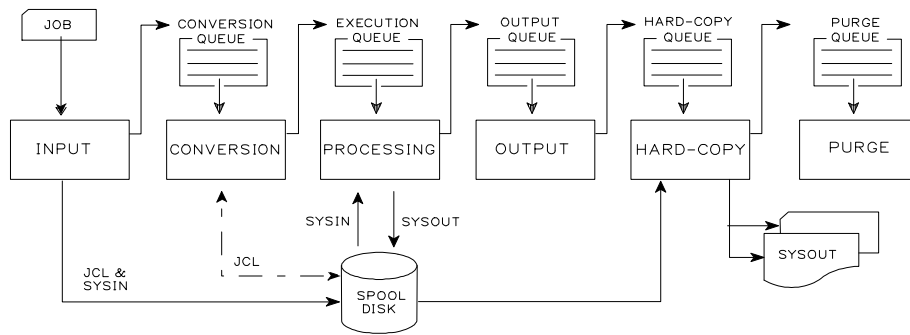
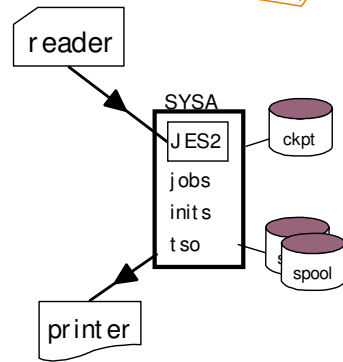


- ▶ 2662 Intro to JES2 for Operations Staff
  - ▶ Room Request: T 80 - AV: OLI
  - ▶ Tue 01:30 PM - 224 - Room 203B (T-105)
  - ▶ SP: John Hutchinson (IBM) -- (301) 240-8573 -- HUTCHJM@US.IBM.COM
- ▶ Help your operations staff learn the power and pitfalls of JES2 commands, understand the rich messages, and efficiently manage your JES2 subsystem. Focus will be on the critical aspects of JES2 operations that are key to keeping JES2 and your OS/390 plex alive and healthy. Topics will also include starting and stopping JES2, authorization of commands, message filtering, remote operations, and automation.
- ▶ How JES2 works
  - ▶ - (It does a lot without operations.)
  - ▶ - How do see what's going on?
  - ▶ - How do you know when to intervene?
  - ▶ - How to fix/improve things?
- ▶ Advanced Topics
  - ▶ - Poly-JES,
  - ▶ References .... (where to turn for help)

# Why do you need JES, anyway?



- **Enter Jobs, TSO Users, STCs**
  - ▶ Local, remote readers, NJE nodes, of f load, int rdrs
- **Schedule Batch Job Execution**
  - ▶ Queue jobs before and after execution
  - ▶ Temporary storage for spool files
- **Distribute Output**
  - ▶ Printers, punches, remot es, NJE nodes, of f load, and ot her programs

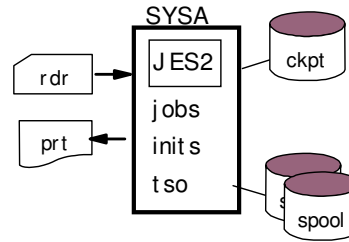


# JES2 Configurations

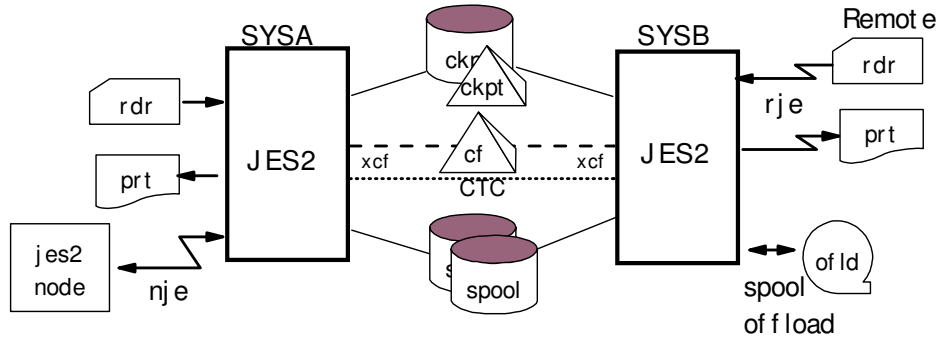


■ **Single system**

- ▶ Local Readers & Writers
- ▶ Remote Readers & Writers (RJE)
- ▶ Connect to remote systems (NJE)



■ **MultiAccess Spool (MAS) node w/ 1 - 32 Members:**

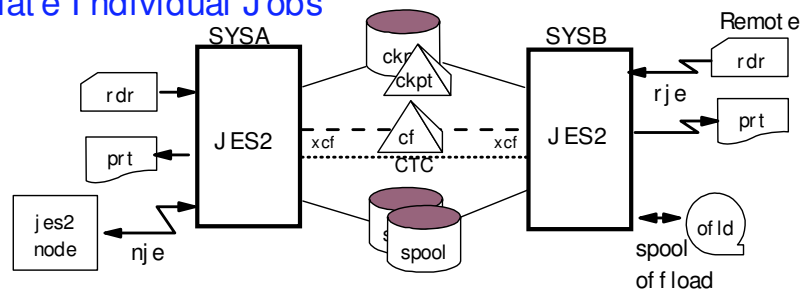


■ **Multiple nodes (JES, VM, etc.) connected via NJE**

# Why do you need an Operator, anyway?



- **Control JES2**
  - ▶ Start, Stop JES2
  - ▶ Restart, Diagnose, Fix, & Recover
- **Control Devices**
  - ▶ Start, Stop, Change Attributes & Behavior
- **Control Jobs & Output**
  - ▶ Input and Print Queues
  - ▶ Manipulate Individual Jobs



## JES2 Start- up



### ■ Automatically Started at IPL if Primary Subsystem

- ▶ Make your JES2 procedure "bullet-proof"
- ▶ Specify 'warm,noreq' options so operator is not prompted.

### ■ Manual Start- up (after a failure)

```
s jes2,parm='warm,noreq, ...'
```

- ▶ Other Options to List or Change Params, Validate Spool, Reconfigure, Use CKPT2, etc.

### ■ Initialization Parameters

- ▶ Define size, attributes & status of JES2 resources
- ▶ Customer specific processing options & Devices

# JES2 Init Deck



## ■ Member(s) in SYS1.PARMLIB (or PROCLIB)

- ▶ Pointed to by JES2 procedure
- ▶ Basic Configuration: Spool, Checkpoint, Queue Sizes, Buffers
- ▶ Operational characteristics based on historical preferences
- ▶ Device definitions and settings
- ▶ lots of anachronistic miscellaneous things

**CONDEF** CONCHAR=\$, DISPLEN=64, DISPMAX=100, BUFNUM=100, ...

**CKPTDEF** CKPT1=(STR=xxxx, INUSE=YES),  
CKPT2=(DSN=SYS1.JES2.CKPT1, VOL=CKPTV1),  
NEWCKPT1=(DSN=SYS1.JES2.CKPTBK1),

**SPOOLDEF** DSNAME=SYS1.HASPACE, VOLUME= SPOL, SPOOLNUM=32,

**PRINTER(1)** CLASS=A, FORM=STD7, ...

# Sample JES2 procedure



```

//JES2    PROC DSN1='SYS1.PROCLIB',          * PRIMARY PROCLIB      *
//        DSN2='SYS2.USRPROC',            * USER PROCLIB        *
//        STEPLIB='SYS1.JES2.SHASLINK',    * JES2 PGM LIBRARY    *
//        TYPE=HAS,                        * DEFAULT NAME ALTERNATE *
//        MBR=JES2PARM,                    * EMERGENCY PARMS     *
//        OPT='WARM,NOREQ'                  * REPLY TO INIT OPTIONS *
//IEFPROC EXEC PGM=HASJES20,DPRTY=(15,15),TIME=1440,
//        PARM=(&OPT.)                      * INIT. OPTIONS       *
//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),DISP=SHR
//        DD DSN=SYS1.PROCLIB(&TYPE.LOCL),DISP=SHR
//        DD DSN=SYS1.PROCLIB(&TYPE.NJE),DISP=SHR
//OTHER DD DSN=SYS1.PROCLIB(&MBR),DISP=SHR    * ALTERNATE PARMS    *
//HASPLIST DD DDNAME=IEFRDERR                * LISTING FILE       *
  
```

## ■ Starting JES2

- ▶ s jes2,parm='warm,noreq'
- ▶ s jes2,haspparm=testparms



## JES2 Start-up Options

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- **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 continue running . . .

## JES2 Parameter Changes



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

## Stopping JES2



### ■ Reasons for Stopping JES2

- ▶ Scheduled outage (hardware or software maintenance)
- ▶ Change parameters (e.g., JES2 exits)
- ▶ Unscheduled outage

### ■ Types of JES2 termination

- ▶ **\$PJES2** requires a totally dormant system (see \$HASP607)
- ▶ If you plan to IPL, use: **\$PJES2, TERM**
- ▶ If you don't want to IPL (hot start JES2): **\$PJES2, ABEND**
- ▶ JES2 Catastrophic error

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

## Availability Issues



- **JES2 System Availability**
  - ▶ Use automated restart functions - minimize JES2 downtime
- **Spool - Job input & output, JCL, & Control Blocks**
  - ▶ Use \$SSPOOL; \$PSPOOL to add and delete
    - Never use DFDSS, etc.!
  - ▶ Spool Offload 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!
- **Other operations - wide range of JES2 Commands**
  - ▶ Watch out for Unauthorized & Dangerous Commands: \$PJQ
  - ▶ Secure all these with SAF/ RACF

## Running Jobs



- **More than just decks from card readers:**
  - ▶ **Jobs run under an Initiator, managed by Job Class:**
    - Batch jobs from local & remote readers
    - Jobs from other NJE nodes
    - Jobs from Internal Readers
    - Initiators managed according to  
JOBCLASS(x) MODE=JES | WLM
  - ▶ **No Initiator needed:**
    - TSO Logons
    - Started Tasks, Started Jobs (operator initiated)
    - APPC Users
    - OS/390 Unix Shells

# JES2 Job Queues

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## ■ Order & 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 Class

## ■ Display and Manipulating

- ▶ By Queue, By Job, By Groups of Jobs (Filters)

## ■ JES2 Initiators

- ▶ Managed by JES2 Parameters & Operators
- ▶ Managed by Vendor Scheduling Products

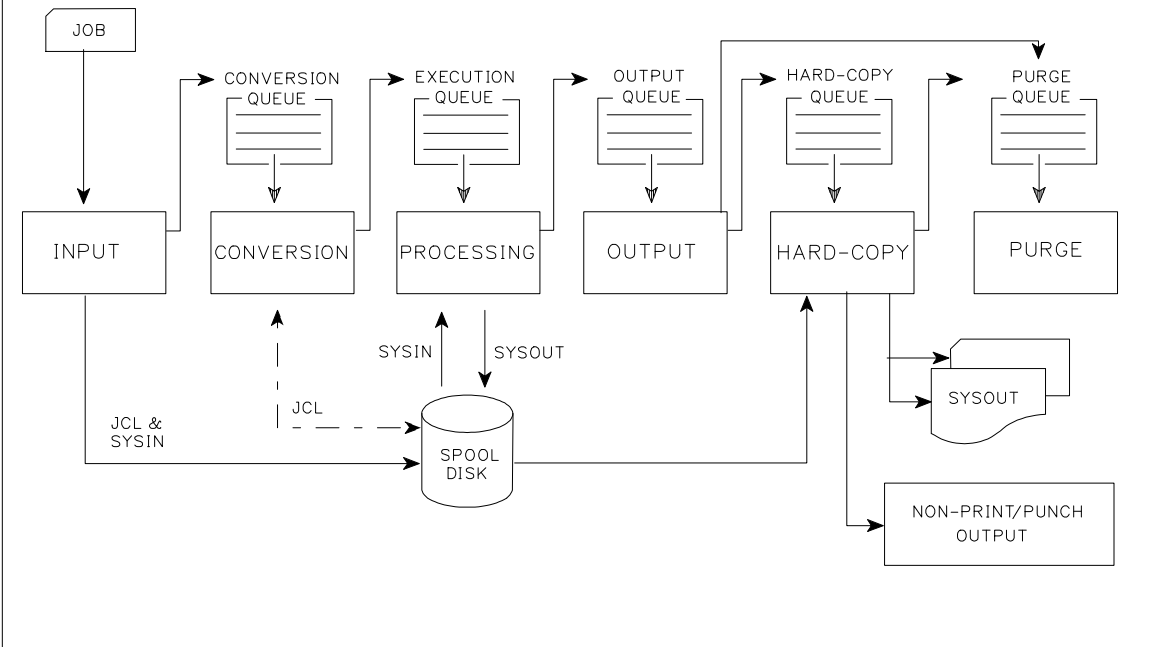
## ■ WLM Initiators

- ▶ Managed by Workload Manager

# Phases of Job Processing



■ Every Job (& STC & TSU) has gotta be somewhere!



## Why isn't this Job running?



### ■ Job attributes:

- ▶ Held? Duplicate job name?
- ▶ Job Class (JES mode) match available Initiator
- ▶ System Affinity, or Scheduling Environment, or IND mode

### ■ WLM Mode Initiator

- ▶ WLM in Goal Mode, Resources Available, Service Obj. & PI
- ▶ QHELD=YES? XEQCOUNT=MAX=limit exceeded?

### ■ System resources available:

- ▶ System Draining, or \$PXEQ
- ▶ SPOOL volumes not available
- ▶ System in INDependent mode



## Why won't this job run?



### ■ Display commands:

- ▶ \$Djob,DELAY or \$DJOBQ,DELAY= ...
  - Hold, Sysaff, Schenv, Limit, Locked, Busy, Spools, Member
- ▶ \$Djob,LONG
- ▶ \$DJOBCLASS(x)
- ▶ \$DMEMBER
- ▶ \$DI <watch for INELIGIBLE\_CLASS=(x-rsn,...)>
- ▶ \$DSPOOL
- ▶ \$S <watch for system draining>
- ▶ DWLM [,SYSTEMS] [,SCHENV=x] [,RESOURCE=x]
- ▶ \$DPERFDATA(SAMPDATA)

## Managing Individual Jobs



- **\$C (cancel) job** sends it to the output queue
- **\$P (purge) job** sends it to purge (no output)
- **\$H (hold) job** holds it until released
- **\$A (release) job** that was held
- **\$E (restart) job** in execution will run it again
  - ▶ requeues it for re-selection by an initiator
  - ▶ **\$EJob,Cancel** same as **\$Hj, \$Ej, \$Cj**
- **\$Dj, \$Tj, \$Rj, . . .**

## Output Distribution & Disposal



- **Output created by Jobs, TSUs, STCs, APPC..**
  - ▶ Managed by Job Output Elements (JOEs)
  - ▶ Queued by class
    - Local
    - Remote
    - User
    - Held
    - NJE node
  - ▶ Selected by printer, punch, transmitter, or Other Programmed APIs (PSO, SAPI, FSS)
  - ▶ Disposed by OUTDISP, \$PURGE, "Garbage Collection"

# JES2 Output Queues



## ■ Order & Selection

- ▶ 110 Queues (Hold, NJE, 36 local, 36 Rmt, 36 User)
  - Ordered FI FO within Prty within User/ Dest ID
- ▶ Output Elements (JOEs) selected FI FO by Queue

## ■ Display and Manipulating

- ▶ By Queue, By Job, By Groups of Job Elements (Filters)

## ■ JES2 Printers & Punches (& Transmitters)

- ▶ Work Selection Criteria WS=(a,b,c/ x,y,z)

## ■ FSS, PSO, & SAPI

- ▶ PSF for page-mode printing
- ▶ InfoPrint to TCP/IP connected printers
- ▶ Print Output & Distribution systems (OnDemand) & Archivers

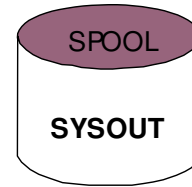
# Why won't this Job Print?



## ■ Job Output Element (JOE)

### attributes:

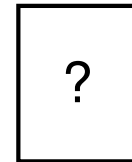
- ▶ Job Held? OUTDI SP=WRI TE?
- ▶ Out put Class mat ch available Print er
- ▶ Form, Writ er I D, Rout e code, et c.
  - at t r i b u t e s mat ch Print er ?



## ■ Security Authorizations:

- ▶ WRI TER class per missions
- ▶ SECLABEL set tings

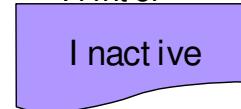
JES2



## ■ Printer attributes:

- ▶ Available & I dle
- ▶ Mat ching char act er i s t i c s
- ▶ Work Selection criteria WS=(a.b.c/x.v.z)

Printer

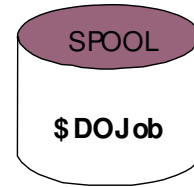


# It still won't Print!



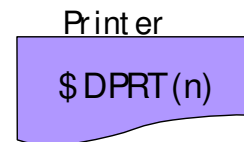
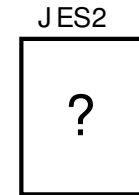
## ■ System resources available:

- ▶ System Draining, or \$PXEQ
- ▶ SPOOL volumes not available
- ▶ JOE Shortage?
- ▶ Output Queues "Clogged Up"?



## ■ Helpful Commands:

- ▶ \$Djob, LONG
- ▶ \$DOjob
- ▶ \$TOjob
- ▶ \$DPRTn
- ▶ \$TPRTn
- ▶ \$DSPOOL
- ▶ \$S



# Managing Devices

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- **Readers, Printers & Punches**
  - ▶ Local, Remote, & FSS
- **Communication Lines**
  - ▶ RJE & NJE; BSC & SNA
- **NJE Nodes**
  - ▶ Logon(n), Lines, Xmitters, Receivers, Connections, Paths
- **Spool Offload Devices**
  - ▶ Similar to NJE Xmitters & Receivers
- **Spools & Checkpoints**
- **Initiators**
  - ▶ JES2 & WLM-managed

## \$C, \$E, \$I, \$P, or \$Z ???



- **\$C device**
  - ▶ Cancels (and purges) the job on that device.
- **\$E device**
  - ▶ restarts the job on that device.
- **\$I device**
  - ▶ Interrupts activity with this job; go to next job.
- **\$P device**
  - ▶ Drains device when finished with this job.
- **\$Z device**
  - ▶ Temporarily Halts device without requeuing job



## NJE Operations Examples



### ■ Starting NJE sessions:

- ▶ \$slogon1      <J ES2 appll D to VTAM if SNA>
- ▶ \$sline10
- ▶ \$sn,node=pokjes2

### ■ Stopping NJE sessions:

- ▶ \$pline10; eline10
- ▶ \$plogon1

### ■ Display Nodes & Paths, etc,

- ▶ \$dnode(pokjes2)
- ▶ \$dpath(pokjes2)

### ■ Control Nodes, Lines, Connections, etc.

# Spool Offload Operations

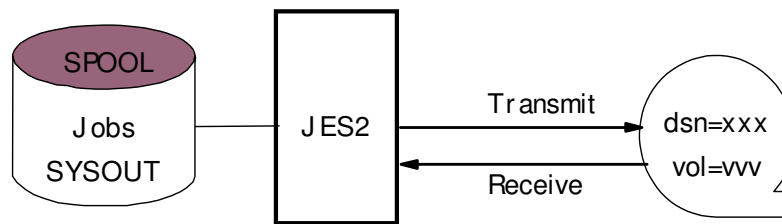


## Job & SYSOUT Transmitters

- ▶ \$T OFFLOADn,DSN=xxx,VOL=vvv
- ▶ \$T OFFn.JT,Class=x,WS=(CL)
- ▶ \$T OFFn.ST,Rout ecde=rrr,WS=(R)
- ▶ \$S OFFLOADn,TYPE=TRANSMIT
- ▶ \$POFFLOADn

## Job & SYSOUT Receivers

- ▶ \$T OFFLOADn,DSN=xxx,VOL=vvv
- ▶ \$T OFFn.JR,Class=x,WS=(CL)
- ▶ \$T OFFn.SR,Rout ecde=rrr,WS=(R)
- ▶ \$S OFFLOADn,TYPE=RECEIVE
- ▶ \$POFFLOADn



Similar to NJE



## Spool Volumes



- **Always use JES2 commands to manage spool volumes**
  - ▶ Don't manage with DFDSS or other utilities
- **Understand the different status characteristics:**

	Status	In Use	Allocatable	Selectable
\$ Sspl,v=	STARTING	No	No	No
	ACTIVE	Yes	Yes	Yes
\$ Pspl,v=	DRAINING	Yes	No	Yes
	DRAINED	No	No	No
\$ Zspl,v=	HALTING	Yes	No	No
	INACTIVE	No	No	No

- **Display Spool Volumes Status: \$ dspl,all**
- **Display Jobs on Spool Volumes: \$ dojq, spl=spoolv, t gm**

# JES2 Command Syntax



## ■ JES2 Commands in general:

- ▶ Start with \$, Folded to upper case, Blanks removed
- ▶ Multiple commands on 1 line w/ semicolons: \$da;du;dn,all
- ▶ /\* Comments delimited as in REXX \*/
- ▶ Powerful syntax can also be a curse!

## ■ Filters

- ▶ Subscript ranges (1 - \*)
- ▶ Keyword limiting
- ▶ Range limiting
- ▶ Jobmask for Jobnames: \$xJOBQ,JM=A%C\*, . . .
- ▶ Wildcards: \* for multiple characters, % for 1 character

## JES2 Command Filters



- **Display limiting keywords reduce the info per element:**
  - ▶ `$DPRT,CLASS` returns just the class of all printers
- **Selection Limiting Keywords limit number of elements:**
  - ▶ `$DPRT(*),CLASS=a*c`
  - ▶ `$DPRT(1-4,7)`
  - ▶ `$DNODE(WSC*),NAME`
- **Use the slash '/' to filter elements on \$T commands**
  - ▶ `$TPRT(*),/Q=ab*,Q=abc`
  - ▶ `$TOJQ,/Q=x,/DEST=LOCAL,/OUTD=W,Q=y`
- **See "JES2 Commands" Chapter 5 introduction**

## Routing JES2 Commands & Messages



### ■ Route command to another system:

- ▶ MVS ROut e command: RO sysb,\$DA
- ▶ \$M2,'\$DA'

### ■ Routing to another NJE Node

- ▶ \$N175,'\$D A'
- ▶ \$N,D=pokjes2,'\$D LI NE(10)'

### ■ Routing Messages & Command Responses

- ▶ L= parm to route to MCS console, syst em, or display area
- ▶ \$DPERFDATA,L=Z sends it to the out-of-line display area
  - Bypasses CONDEF DI SPMAX limiting

# Command Authorization



## ■ JES2 Command Authorities

- ▶ RDR/INTRDR: System, Device, Job
- ▶ NODE: System, Network, Device, Job
- ▶ JOBCLASS: ALL, SYS, IO, CONS, INFO

## ■ SAF/RACF OPERCMDS class

- ▶ If active, all JES2 commands protected by profiles:
  - general format structure is: j esx.verb.modifier
  - Required READ, UPDATE, CONTROL access depends on 'verb.modifier'

## ■ References:

- ▶ "JES2 Init & Tuning Guide" - Chapter 7
- ▶ "JES2 Commands" - Each command shows "Authority Req'd"

## You can do it all with SDSF !



### "System Display and Search Facility"

- **Browse Syslog & Issue Commands**
  - ▶ Programmers also use it to browse job output
- **Manage Devices**
  - ▶ Printers, Lines, Nodes, Spool Offload, Spool
- **Manage Job & Output Queues**
  - ▶ Input, Active, Held, Output, Local & Remote
- **Monitor & Manage JES2 & System Resources**
  - ▶ RMF data for active address spaces
  - ▶ MAS use of Checkpoint
  - ▶ Scheduling Environments
  - ▶ Job Class Definitions



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



## SDSF to Operate/ Manage JES2



- **End- users, Programmers**
  - ▶ Job & Out put Displays
- **Specialized Operators, Production Control**
  - ▶ Devices (readers, printers, lines, nodes, spool of f load)
  - ▶ JES2 I nit at ors (not WLM init s)
  - ▶ Job & Out put Queues
- **Lead Operators - above plus ...**
  - ▶ SYSLOG - Commands & Messages
- **Systems Programmers - above plus ...**
  - ▶ MAS - Members of t he Complex
  - ▶ Scheduling Envir onment s & RESour ces
  - ▶ Job Classes

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

# JES2 System Automation



## ■ JES2 already automates several 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:

- \$POJOBQ, /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 Short ages - \$HASP050 message**
    - Spool (Track-Groups), JQEs, JOEs at 80%
    - Free up resources (Re-route or Delete old jobs)
    - Add spool volume or use Spool Off load
    - Notify Systems Programmers
  - ▶ **RJE/ NJE Line Monitoring**
    - \$HASP203, \$HASP210, (OW43270) Line Dropped
    - Restart the line, session
    - Periodically issue \$SLINE(\*) command

# 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 (I Ds) & f o r m a t t e r s
  - ▶ DEBUG Facility
  - ▶ Dumps - I PCS - 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"**

## Appendix



### ■ Education:

- JES2 for OS/390 Operations (ES280- Classroom)
- System Operations for OS/390 (ES270 - Classroom)
- JES2 Operations (DN115 - Download & Play)
- others

### ■ JES2 Library:

- Hard-copy
- CDROM
- WWW

### ■ Other Operators, Systems Programmers

# OS/390 JES2 LIBRARY

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GC28-1794	JES2 Introduction *
GC28-1797	JES2 Migration
SC28-1791	JES2 Initialization & Tuning Guide
SC28-1792	JES2 Initialization & Tuning Reference
GC28-1796	<b>JES2 Messages</b>
GC28-1790	<b>JES2 Commands</b>
GX22-0041	<b>JES2 Commands Summary</b>
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 *

Command Syntax in railroad track format  
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# Questions

