JES2 Product update: Planning/positioning for future JES2 releases

SHARE 104, Session 2655
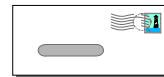
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Agenda

- ■ New changes in "next" release
  - – NJE over TCP/IP
  - – Reader/NJE exit changes
  - – Table pair enhancements
  - – $SCAN from non-main task environments
  - – SSI for JES2 monitor information
  - – SAPI and extended status enhancements
  - – Large (>64K track) SPOOL Data Sets
  - – Other goodies (requirements!!!!)
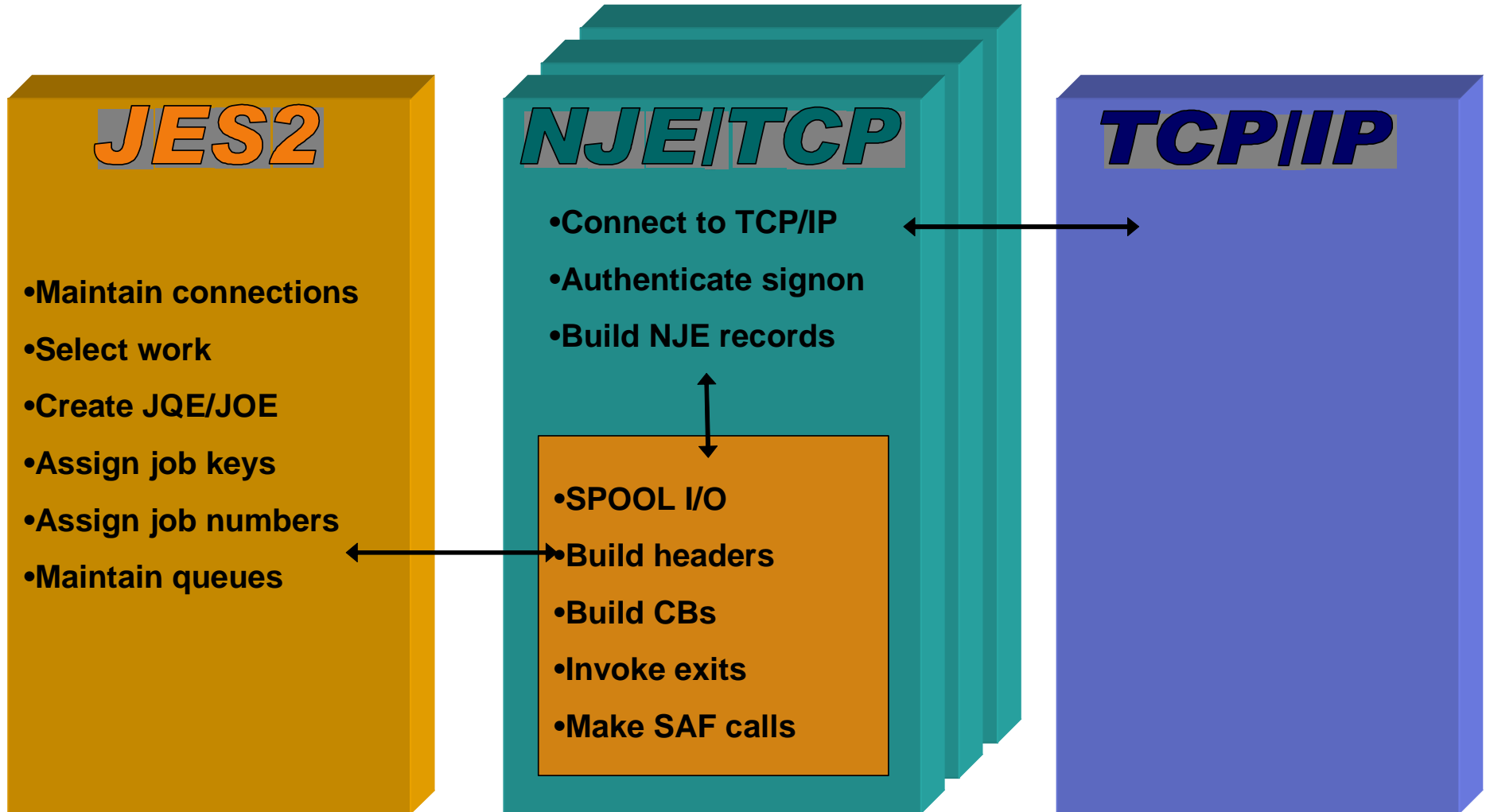 - – Drop of support for release 4 mode

NJE over TCP/IP

- **Currently JES2 supports NJE over SNA and BSC networks**
- **TCP/IP is the standard for networking today**
- **VM (RSCS), AS/400, and VSE/POWER all have NJE over TCP/IP**

- **Will support established TCP/NJE protocol**
  - Modified BSC CTC protocol
- **Enhancements to protocol will also be included for**
  - IPv6 connections
  - Enhanced security
  - Large LRECL SYSIN data streams

- **Overall better RAS characteristic designed in**
  - Fewer outages than current NJE
  - Better performance

NJE over TCP/IP

JES2

- Maintain connections
- Select work
- Create JQE/JOE
- Assign job keys
- Assign job numbers
- Maintain queues

NJE/TCP

- Connect to TCP/IP
- Authenticate signon
- Build NJE records

- SPOOL I/O
- Build headers
- Build CBs
- Invoke exits
- Make SAF calls

TCP/IP

NJE over TCP/IP

- Protocol to be used is that originally developed for VM
  - Assigned port is 175, port name is VMNET
  - Originally described as BITNET II protocol
  - Documentation is in NJE formats and protocols
    - ► http://publibfp.boulder.ibm.com/cgi-bin/bookmgr/BOOKS/iea1m503/6.5
  - Essentially BSC CTCA protocol with TCP/IP wrappers
  - Support for IPv6
  - Support for SSL/TLS
  - Binary IP addresses will be optional in data records
    - ► Better support for NAT
  - Stronger authentication available (using SAF/RACF)
    - ► Controlled by **NODEnnn SIGNON=SECURE|COMPAT**

NJE over TCP/IP

- Within JES2, the externals parallel what is defined for SNA

SNA	NJE/TCP	Description
LOGON	NETSERV	Represents a NJE/TCP address space
APPL	SOCKET	Maps an NJE node name to a TCP/IP address (either explicit or a name)
LINE	LINE	Logical connection

- Commands to start and stop networking/devices similar to SNA
- NETSERVs can bind to all defined IP addresses or a specific address
- Intend to support multiple stacks, VIPA, SYSPLEX distributor

NJE over TCP/IP Externals

- ## **NETSRV** statement

```
NETSRV1      SOCKET=,STACK=,
             TRACEIO=(JES=NO,COMMON=NO,VERBOSE=NO)
```

- ## **SOCKET** statement

```
SOCKET(LOCAL)       IPADDR=*LOCAL,PORTNAME=VMNET,
                    SECURE=NO,LINE=0,NODE=2,REST=0,
                    NETSRV=0
SOCKET(OTHER)       IPADDR=9.117.234.95,PORTNAME=VMNET,
                    SECURE=NO,LINE=0,NODE=82,REST=0,
                    NETSRV=0
```

- ## **LINE** statement

```
LINE12       UNIT=TCP,STATUS=DRAINED,LOG=NO,
             PASSWORD=(NOTSET),REST=0,TRACEIO=(JES=NO,
             COMMON=NO,VERBOSE=NO),JRNUM=DEFAULT,
             JTNUM=DEFAULT,SRNUM=DEFAULT,STNUM=DEFAULT
```

NJE NODE Definition Changes

- NJE node definitions are now MAS scope
  - Changes on one member reflected on others
  - Data is stored in the JES2 checkpoint
  - Applies to **NAME=, SUBNET=, PATHMGR=, ENDNODE=, PRIVATE=**, and **DIRECT=**
  - Init deck changes accepted when other members active
    - ► Warning message if incompatible, option to continue or terminate
- Change node names when node is active (no restart)
  - **$TNODE(*nodename*),NAME=*newname***
    - ► Indicates node is renamed, not redefined
  - Applies to local node name as well
- Change maximum node number via command
  - **$T NJEDEF,NODENUM=** (was all member warm start)
  - Value can only be increased

NJE Security Changes

- Support for SSL/TLS included in NJE over TCP/IP
- Secure form of NJE signon now supported
  - Exchanges encrypted passwords in I/J signon records
  - Controlled by **SIGNON=SECURE|COMPAT** on NODE statement
  - Uses APPCLU class in RACF/SAF
    - ▸ Entity is **NJE.*node1.node2***
    - ▸ Uses SESSKEY associated with profile for encryption

  - Can be used by SNA or BSC nodes as well as TCP/IP

N1

I (*s1*) →

J (*e_s1,s2*) ←

L (*e_s2*) →

N2
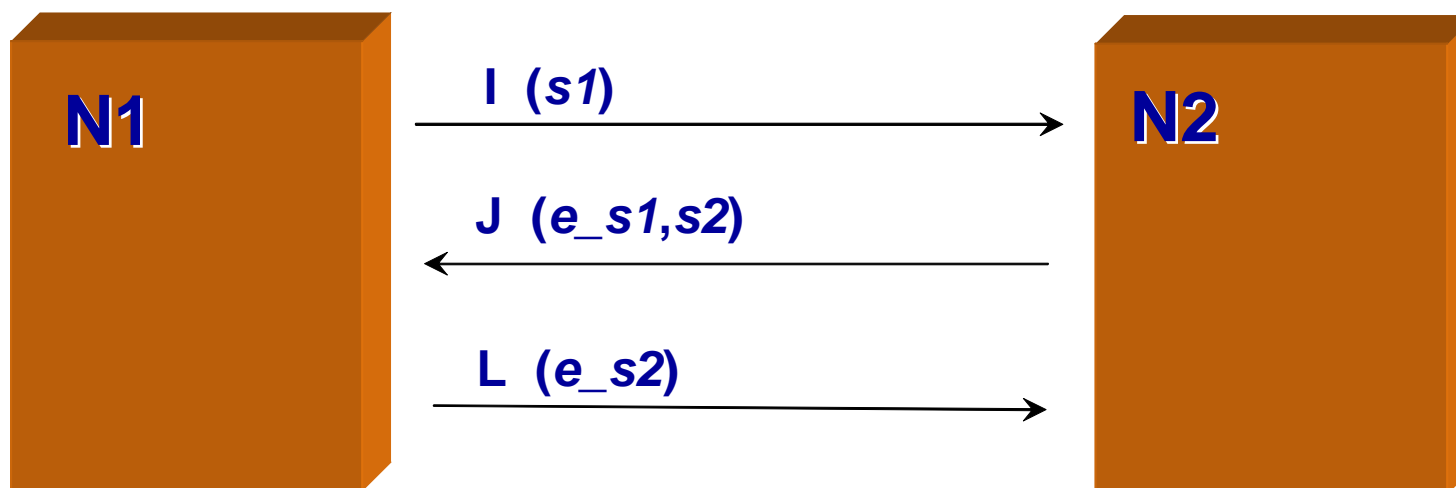
Reader/NJE Exit Changes

- TCP/IP NJE processing occurs outside the JES2 main task

- INTRDR processing also moving outside JES2 main task

- Main task exits no longer get control for TCP/NJE and INTRDR jobs
  - New exits were added corresponding to current exits
  - Additional main task exits have been defined
    - When jobs are added to the job queue

Reader/NJE Exit Changes

- New exits added corresponding to these main task exits
  - **2** – JCL job card
  - **3** – Job card accounting field
  - **4** – JCL and JES2 control (JECL) statement
  - **20** – End of input
  - **39** – NJE SYSOUT SAF rejection
  - **46** – NJE header transmit exit
  - **47** – NJE header receive exit
- New exits will be defined for
  - Move JQE to next phase ($QMOD)
- Other exits affected:
  - **7**/**8** – Control block I/O
  - **13** – TSO/E NETMAIL notify (deleted)
  - **36**/**37** – Pre and post SAF exit

Reader/NJE Exit Changes

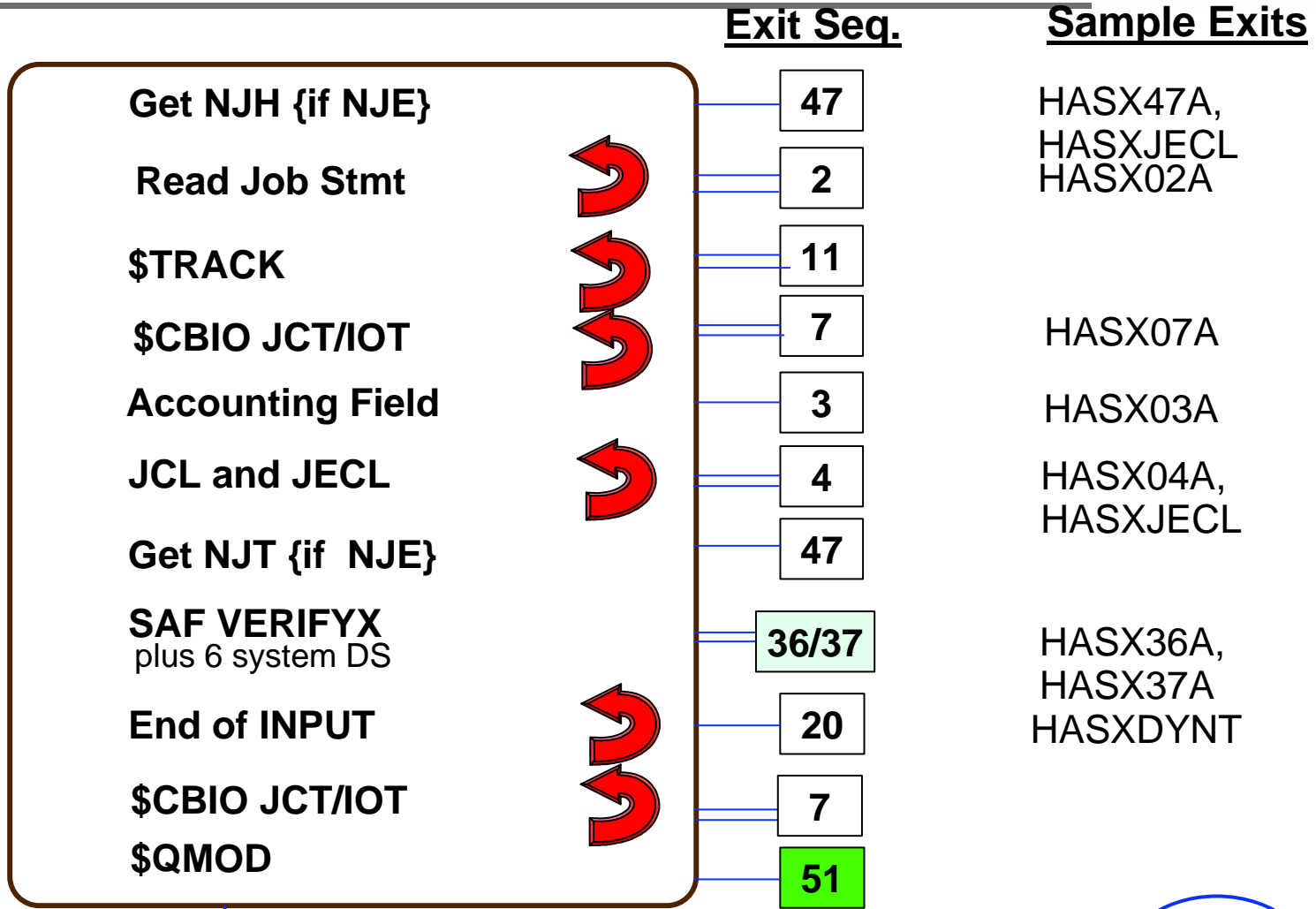| New Exit	Similar exit	Environ	Function
50	20	USER	End of input
51	*	JES2	$QMOD (job phase change)
52	2	USER	Input processing - JOB card
53	3	USER	Input processing - Accounting field
54	4	USER	Input processing - JCL/JECL
55	39	USER	NJE SAF rejection
56	46	USER	NJE header/trailer transmit
57	47	USER	NJE header/trailer receive

- All exits (new and changed) will be passed XPLs
- XPLs for new and similar exit will be the same
- New data areas will contain former PCE/DCT fields
  - Passed to both exits
- Old exits will be passed same data as in previous releases

Reader/NJE Exit Changes

- **Old style exits (2, 3, 4, 20, 39, 46, 47) still used for:**
  - ▶ Local card readers
  - ▶ RJE readers
  - ▶ SNA and BSC NJE transmitters and receivers
  - ▶ Spool Offload transmitters and receivers
- **New style exits (52, 53, 54, 50, 55, 56, 57) used for:**
  - ▶ Batch Internal readers
  - ▶ STC and TSU internal readers
  - ▶ TCP/IP NJE transmitters and receivers
- **New exit 51 receives control for all phase changes:**
  - − Job moves from $INPUT ro $XEQ, etc.
  - − Job requeued for execution

Job Input Processing - Main Task

Process	Exit Seq.	Sample Exits
Get NJH {if NJE}	47	HASX47A, HASXJECL
Read Job Stmt	2	HASX02A
$TRACK	11	
$CBIO JCT/IOT	7	HASX07A
Accounting Field	3	HASX03A
JCL and JECL	4	HASX04A, HASXJECL
Get NJT {if NJE}	47	
SAF VERIFYX plus 6 system DS	36/37	HASX36A, HASX37A HASXDYNT
End of INPUT	20	
$CBIO JCT/IOT	7	
$QMOD	51	

$XEQ Queue

= Exit may be called multiple times

Job Input Processing - USER environment

	Exit Seq.	Sample Exits
Get NJH {if NJE}	57	HASX57A, HASXJECL
Read Job Stmt	52	HASX52A
$TRACK	12	
$CBIO JCT/IOT	8	
Accounting Field	53	HASX53A
JCL and JECL	54	HASX54A, HASXJECL
Get NJT {if NJE}	57	
SAF VERIFYX plus 6 system DS	36/37	HASX36A, HASX37A
End of INPUT	50	HASXDYNT
$CBIO JCT/IOT	8	
$QMOD	51	
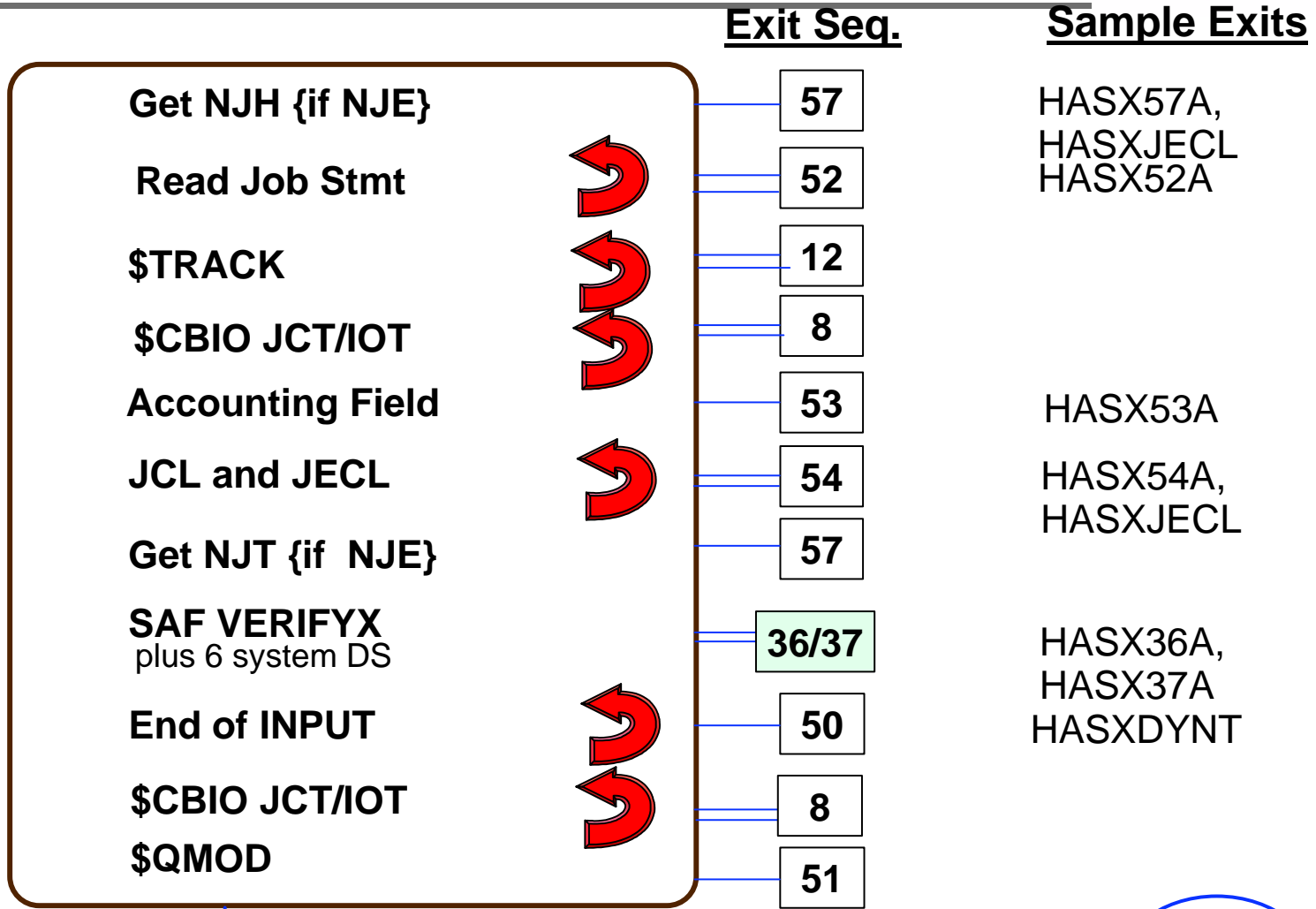
$XEQ Queue

= Exit may be called multiple times

Reader/NJE Exit Changes

- **New assembly environment**
  - **$MODULE ENVIRON=(USER,ANY)**
  - **$ENVIRON SET,ENVIRON=(USER,ANY)**
    - ▶ Influences $SAVE/$RETURN services
      - ▶ R11 = HCCT on entry
      - ▶ If R13 = PCE address, uses main task $SAVE/$RETURN services
      - ▶ If not, creates PSV chained to current save area
      - ▶ No linkage stack entry created (allows $WAIT if JES2 main task)
  - Allows for common coding of routines which must run in both main task and user environments
  - Used extensively by:
    - ▶ $SCAN, $BLDMSG
    - ▶ NJE service routines
    - ▶ Sample exits

Reader/NJE Exit Changes

- **$EXIT 13 has been deleted**
  - $HASP548/$HASP549 no longer issued from SYSOUT receiver
    - ‣ Too early anyway
    - ‣ No way to force for locally created output
  - $HASP548/$HASP549 now issued during OUTPUT processing
    - ‣ When job is actually available to TSO RECEIVE
    - ‣ Can now force message out for locally created output
- **$EXIT 13 functionality replaced by:**
  - **NJEDEF MAILMSG=YES/NO** (since SP 4.3.0!!!)
  - **$EXITs 47/57** (SYSOUT receiver DSH reception)
    - ‣ Process data set header fields in SYSOUT receiver
  - **$EXIT 40** (JOE creation)
    - ‣ Flags in $XPL to influence whether messages issued
    - ‣ Flag in PDDB to influence job eligibility for message

$EXIT 49 enhancements

- **$EXIT 49 enhancements**
  - Now called for $SJ command processing and $SJ selection
  - X049IND reflects call type
    - ‣ Should not commit resources to job in $SJ command processing call
  - Response byte to bypass duplicate job checking
    - ‣ For exits that need to do it themselves

What can I do right now????

- Familiarize yourself with current exits
  - Exits 2, 3, 4, 20, 39, 46, 47
    - ► VERY commonly used exits
    - ► If you use internal readers, you WILL need to change them soon.
    - ► Check for main task dependencies
    - ► In general, updateable JQE and JCT will be available for reader/receiver exits in user environment
  - Exit 13
    - ► Use NJEDEF MAILMSG= to influence message issuance
    - ► Use Exit 47 to manipulate fields based on dataset header
  - Exit 7, 8, 36, 37
    - ► Understand reason for exit
    - ► For example, last write of JCT under reader PCE
    - ► Determine whether exits are still required
- **Session 2665, JES2 Exits Overview, Tuesday, 4:30**

Table Pair Enhancements

- **Problem:** Table pairs often require fields in $UCT data area
  - Only one $UCT per installation
  - Only one $EXIT 0 per installation
  - Difficult for multiple vendors to share $UCT
  - Up to installation to merge multiple vendor exit 0 routines or $UCTs
- **Solution:** Create alternatives for UCT fields
  - ADCON or VCON
  - Named token pointer to data area
    - ▶ Can be TASK, HOME, PRIMARY, SYSTEM or SUBSYS level
    - ▶ CB address assumed in 1st 4 bytes of token
    - ▶ New $TOKENSR service to create/retrieve/delete
- **Solution:** use MVS dynamic exit service to allow multiple exit 0s
  - Exit name is **HASP.$EXIT0**
  - Old exit 0 implementation remains
  - Parameter list is unchanged

Table Pair Enhancements

- **Updated macros and operands**
  - $DCTTAB
    - ► CHAIN=, CHAINTK=, COUNT=, COUNTTK= PCEPTR=, PCEPTRTK=,
  - $DTETAB
    - ► EPLOC=, HEAD=, HEADTK=
  - $PCETAB
    - ► CHAIN=, CHAINTK=, COUNTS=, COUNTTK=, ENTRYPT=
  - $PCTAB
    - ► ENTRYPT=, RECOVPT=
  - $SCANTAB
    - ► CB=
  - $WSTAB
    - ► DEVCB=, MODSCB=

$SCAN from outside JES2 main task

- **$SCAN services are now available outside the JES2 main task**
  - USER, SUBTASK and FSS environment supported
- **Includes $BLDMSG service**
- **Can be used from new input service exits to parse JCL cards (for example)**
- **User and dynamic tables supported**
  - Tables must be in CSA if called from user environment
  - CCTMGTP table pair in HCCT for dynamic BLDMSG tables outside JES2 address space
- **Many new $SCANTAB functions allowed**
  - CB=HCCT, CB=DTE, CB=(TOKEN,name)
  - CONV=NUMS (signed), CONV=NUMU (unsigned)
  - CONV=NUMT (format with thousands separator)
  - Four digit MSGID= values

SSI for JES2 Monitor information

- New function on the JOB information SSI (SSI 71)
- 2 new functions added to IAZSSJI
  - Get monitor information and return storage
- New data area (IAZMOND) for new function
- Returns all information available via monitor commands
  - Resource usage statistics
  - Main task CPU statistics
  - JES2 ERROR statistics
  - Main task WAIT statistics
  - JES2 Alerts
  - JES2 Notices
  - JES2 Tracks
  - Monitor status information
- Some additional data returned

SAPI Enhancements

- **SAPI read only access to data sets**
  - RACF JESSPOOL UPDATE access not needed
    - ▸ New bit SSS2SRON (on GET) indicates intent to only read data
    - ▸ New error SSS2RRON if attempt to modify anything on PUT
  - Support to modify SYSOUT PRIORITY on PUT
    - ▸ SSS2RPRI bit and SSS2DPRI field
  - Return max return code/last ABEND code for job (if available)

Extended Status enhancements

- Additional SYSOUT data returned from extended status
  - "VERBOSE" calls
    - ➤ Data set level information (STATOUTV)
    - ➤ Other information that requires I/O to retrieve (STATVRBO)
  - Additional SYSOUT filters

Large Spool Dataset Support (>64k tracks)

- JES2 will support SPOOL data set of up to 1,048,575 (was 64K)
  - Change the format of a SPOOL address
    - ► MTTR is really MTT0r for most installations
    - ► Changed to MTTtr (still 4 bytes)
    - ► 8 bits of M, 20 bits of T, and 4 bits of R
  - Changes to format of allocation IOT
    - ► TGAE goes from MTT (3 bytes) to MTTTT (5 bytes)
- Cannot be used if >15 records per track
  - buffer sizes less than 2943 on a 3390
  - **Action:** increase spool buffer size
    - ► Requires COLD start (so schedule well in advance!)

Large Spool Dataset support (>64k tracks)

- **New external, SPOOLDEF LARGEDS=**
  - **FAIL** causes start to fail if data set is >64K tracks
  - **ALLOWED** will permit the start and use new MTTtr if >64K tracks
  - **ALWAYS** will permit all starts and always use new MTTtr
    - ALWAYS intended for testing
  - Applies when volume started
- **$T to switch to any values (FAIL to ALLOWED or visa versa)**
- **Once LARGEDS=ALLOWED or ALWAYS is specified,z5 or lower release CANNOT be started.**
  - SPOOL data areas incompatible with older releases (allocation IOTs)
- **Action:** use SPOOL read SSI to access SPOOL data directly

Large Spool Dataset support (>64k tracks)

- **JES2 will no longer support SPOOLDEF RELADDR=**
  - Relative track addressing available in all supported releases of JES2 (z/OS 1.2)
  - In particular, RELADDR=NEVER is no longer supported
  - All new volumes will use relative track addressing
  - Will continue to support absolute track addressing for volumes started on previous releases

Other Goodies

- ■ Job list command enhancements
  - OS/390 R4 only implemented filters on commands equivalent to existing commands
  - Almost all keywords now filterable on all commands
  - Many new filters added
    - ► **BUSY=** on job-level commands ($xJ)
    - ► **CC=** on output-level commands ($xOJ)
    - ► **OUTGRPS**, **RECORDS**, **PAGES** on $LJ

Other goodies

- **Offload device creation time**
  - **Problem:** Spool reload always assigned new creation times for jobs and output
    - Resets counter for purging based on age
  - **Solution: OFFLOADn CRTIME=**
    - **RESET** – assigns new creation time
    - **RESTORE** – uses original creation time
- **Reachable nodes display**
  - **$DLINE(** *nnnn* **),NODES**
    - Displays list of all nodes reachable via the line
  - **$DLINE(** *nnnn* **),NODE=** *name*
    - Displays all lines by which node is reachable

$ACTIVATE

- JES2 currently support 2 modes of checkpoint operation
  - R4 mode to be compatible with pre z/OS 1.2 members
  - z2 mode to support new features added in z/OS 1.2
  - $ACTIVATE is used to switch between 2 modes
- "N-3" release is z/OS 1.2
  - All compatible releases support z2 mode
- Will require MAS to be in z2 mode to migrate to or coexist
  - $ACTIVATE command deleted in new release
- **Action:** Issue $ACTIVATE,LEVEL=z2 prior to migration