



JES2 Checkpoint Reconfiguration

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This presentation describes the JES2 checkpoint reconfiguration process and its usage. It also describes the relationship between system managed rebuild and the JES2 checkpoint reconfiguration process. A basic understanding of JES2 and the JES2 checkpoint is assumed.

This presentation was created using examples from the OS/390 release 10 level of JES2. Some differences may exist in older levels of JES2.

Overview

This presentation will cover the following:

- ▶ Why should I care about CKPT reconfiguration?
- ▶ Types of checkpoint reconfiguration
- ▶ Operator initiated reconfiguration
- ▶ Error reconfiguration
- ▶ Reconfiguration at initialization
- ▶ System managed rebuild Vs reconfiguration
- ▶ Hints and tips

In this presentation I will go over the various ways a checkpoint reconfiguration can be entered. For each form of reconfiguration I will go through an examples of what how to respond to the various messages to complete the task.

There will also be a discussion of System managed Rebuild (a feature of Release 8) and how that relates to checkpoint reconfiguration. Finally, as time permits, I will review some situations that came up over the years and how checkpoint reconfiguration was used to handle the situation.

The examples in this presentation were done at the release 10 level of JES2. There may be some minor differences in the message text when compared to other releases. Most notable is the change in text for the HASP272 message. Also, the sequence of messages is different if you are forwarding to or resume using a checkpoint on a coupling facility and you have set CKPTDEF to ignore volatility. Finally, an extra message was added in release 7 it you attempt to terminate a error reconfiguration. However, the overall logic of the checkpoint reconfiguration has not changed significantly since MVS SP 5.1

What is checkpoint reconfiguration?

- Checkpoint reconfiguration is the only supported way to move a JES2 checkpoint data set to a new location.
- Can also suspend and resume use of a checkpoint data set.
- Ensures no loss of data if there is a checkpoint error
 - ▶ Data is written from memory thus ensuring currency
 - ▶ If you cancel out of error reconfiguration, JES2 terminates, losing some data

Checkpoint reconfiguration provides a mechanism to alter the current checkpoint configuration. It can be used to move a checkpoint data set to a new location, suspend use of an existing checkpoint data set, or resume using a data set that was suspended. Reconfiguration can move a checkpoint to a different device type including from DASD to coupling facility and back.

Checkpoint reconfiguration gets control when there is an error on a checkpoint data set (either a physical error accessing the device or a logical error with the data being accessed). Since it uses the instorage copy of the checkpoint data to create a new checkpoint data set, it can recover from even a total failure of the checkpoint. If instead of completing an error reconfiguration, you cancel out of it, the members that experienced the error will ABEND, causing any checkpoint data in memory to be lost. This could result in jobs failing or systems that must be IPLed. In the worst case, a cold start may be needed to recover from the error.

Forms of Checkpoint Reconfiguration

- Operator initiated
 - ▶ The result of a \$TCKPTDEF,RECONFIG=YES
 - ▶ Used to move, suspend, or resume a CKPT
- Error reconfiguration
 - ▶ The result of
 - I/O error reading CKPT
 - Logic error reading or processing CKPT
 - ▶ Used to move or suspend CKPT with error
 - ▶ Can be performed "automatically"

An operator initiated reconfiguration is started with a \$TCKPTDEF,RECONFIG=YES command. This command is entered on any member of the MAS and places all members into the reconfiguration. This form of the reconfiguration is used to move, suspend or resume a checkpoint data set. Either data set can be processed at this time. Canceling out of this reconfiguration will return JES2 to normal operation.

An error reconfiguration is entered when JES2 detects an error on the checkpoint data set (either with the device or with the data that was read). This reconfiguration is used to process an error with a specific data set. The data set can be moved to a new location or use of the data set can be suspended. Optionally, an installation can set up to automatically forward the error data set in the event of an error. Canceling out of an error reconfiguration will cause all members that encountered the error to be ABENDED.

Forms of Checkpoint Reconfiguration (*continued*)

- Initialization reconfiguration
 - ▶ Processing based on reason for entering
 - Checkpoint specifications are forced to match what is specified
 - Little verification is done
 - ▶ Initialization cannot locate correct CKPT
 - Initialization does normal processing with data sets specified
 - Full verification done
 - Can switch to RECONFIG format

The final form of checkpoint reconfiguration is the initialization format. This is very different from the other reconfiguration processes. During initialization there is no instorage copy of the checkpoint available to create a new checkpoint data set. You must specify a recently used checkpoint to read the data from. Initialization reconfiguration is also the only form that is a single member processes. In general, it can only be used on an all member warm start or if there are no JES2 address spaces active in a MAS. There are 2 forms of the initialization reconfiguration. The first is the result of a RECONFIG being specified on the JES2 start PARM=. This form allows installations to change the checkpoint specifications JES2 uses. When you complete this dialog, JES2 will use the current checkpoint specifications (the ones displayed in the messages) in preference to what is currently defined in the checkpoint control record. Getting this wrong has resulted in cold starts.

The other form is entered as the result of JES2 initialization being unable to locate the correct data sets to use. In this situation, JES2 will not start unless it can allocate (and read) the same checkpoint data sets it was using when JES2 was last active. You can convert from this format to a RECONFIG format if there is a problem accessing the data sets that were previously used (and this is an all member warm start). When you complete this dialog, JES2 will use the current checkpoint specifications just as though you specified them in the initialization deck. Normal processing and verification is done (including any forwarding processing).

Operator Initiated Reconfiguration

```

$TKPTDEF,RECONFIG=YES
*$HASP233 REASON FOR JES2 CHECKPOINT RECONFIGURATION IS OPERATOR
REQUEST
*$HASP285 JES2 CHECKPOINT RECONFIGURATION STARTED - DRIVEN BY
MEMBER IBM1
*$HASP271 CHECKPOINT RECONFIGURATION OPTIONS

VALID RESPONSES ARE:

'1' - FORWARD CKPT1 TO NEWCKPT1
'2' - FORWARD CKPT2 TO NEWCKPT2
'5' - SUSPEND THE USE OF CKPT1
'6' - SUSPEND THE USE OF CKPT2
'CANCEL' - EXIT FROM RECONFIGURATION
CKPTDEF (NO OPERANDS) - DISPLAY MODIFIABLE
                        SPECIFICATIONS
CKPTDEF (WITH OPERANDS) - ALTER MODIFIABLE
                        SPECIFICATIONS
*05 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP271 FOR RELATED MSG)

```

The \$TKPTDEF RECONFIG=YES option is issued on one member of the MAS. All messages are directed to the console that issued the command. As a result, the messages may be issued by a JES2 MAS member that is not normally displayed on the console.

There are a total of 6 options that can appear on the HASP271 message (sometimes referred to as the *gateway to the west* message). These options are:

```

'1' - FORWARD CKPT1 TO NEWCKPT1
'2' - FORWARD CKPT2 TO NEWCKPT2
'5' - SUSPEND THE USE OF CKPT1
'6' - SUSPEND THE USE OF CKPT2
'7' - UPDATE AND START USING CKPT1
'8' - UPDATE AND START USING CKPT2

```

Only those options that are currently valid (based on the environment) are displayed. Options 3 and 4 are not used (retired in SP 5.1.0).

The HASP272 message was updated in the Release 10 level of JES2. The additional text identifies the related WTO.

A common error at this point is looking for an option that is not there. If it is missing, that is because it is not valid at this time. For example, you cannot suspend CKPT1 if CKPT2 has been suspended. That would leave you with no checkpoints.

Select forward option

```
IEE600I REPLY TO 05 IS;1
*$HASP273 JES2 CKPT1 DATA SET WILL BE ASSIGNED TO NEWCKPT1
SYS2.JESCKPT1 ON CKTPK

VALID RESPONSES ARE:

'CONT' - PROCEED WITH ASSIGNMENT
'CANCEL' - EXIT FROM RECONFIGURATION
CKPTDEF (NO OPERANDS) - DISPLAY MODIFIABLE
                        SPECIFICATIONS
CKPTDEF (WITH OPERANDS) - ALTER MODIFIABLE
                        SPECIFICATIONS
*06 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP273 FOR RELATED MSG)
```

In this example, I decided that CKPT1 was to be forwarded. Forwarding is the process of creating a new copy of the checkpoint, writing all the current checkpoint data to the new checkpoint, updating all internal pointers to the new checkpoint, and suspending the use of the old data set. This process is coordinated with all members of the MAS. JES2 will ensure that all MAS members can access the new checkpoint data set before completing the process. Any problem will result in an error message and this message being re-displayed.

In this case, there was a NEWCKPT1 data set specified. Before JES2 allocates the new data set, it will confirm that this is the data set you want to forward to. At this point you can change the target for the forwarding. A CKPTDEF command with NEWCKPT1 (the file name from the HASP273 message) can be used as a response to change the target of the forwarding. Some common errors at this point are:

- Trying to specify CKPTDEF,CKPT1=.... instead of NEWCKPT1
- Using a \$TCKPTDEF command to try to alter NEWCKPT1
- Simply forgetting the CKPTDEF and specifying NEWCKPT1 or CKPT1

Continue with Forwarding

```
r 6,cont
IEE600I REPLY TO 06 IS;CONT
$HASP414 MEMBER IBM1 -- OBTAIN FAILED FOR NEWCKPT1 SYS2.JESCKPT1 ON
CKPTPK WITH CC 8
*$HASP278 UNABLE TO LOCATE OR UNABLE TO USE NEWCKPT1
SYS2.JESCKPT1 ON CKPTPK
DOES NOT EXIST OR IS NOT USABLE - REFER TO PREVIOUS
MESSAGE(S)
```

VALID RESPONSES ARE:

```
'CANCEL' - EXIT FROM RECONFIGURATION
'CREATE' - CREATE DATA SET
CKPTDEF (NO OPERANDS) - DISPLAY MODIFIABLE
SPECIFICATIONS
CKPTDEF (WITH OPERANDS) - ALTER MODIFIABLE
SPECIFICATIONS
*07 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP278 FOR RELATED MSG)
```

Even though the data set was specified as NEWCKPT1, the data set does not exist on the volume. Before JES2 creates the data set, it will again confirm that it is using the correct data set specification. If a response of CREATE is given JES2 will allocate a new data set with the correct amount of space for the checkpoint (note: this works for DASD specifications only). This is useful if you need to place a checkpoint in an unexpected location. However, it is recommended that the NEWCKPT1 and NEWCKPT2 data set exist so that the space on the volume is not accidentally used by some other data set.

At this point, you can also change the target data set specification. If you do, JES2 will confirm the new specifications before allocating a new data set. In general, if you respond to any reconfiguration message with a CKPTDEF operand, you will get another WTO/WTOR to confirm the new values you have specified.

We're done!

```

07create
IEE600I REPLY TO 07 IS;CREATE
$HASP280 JES2 CKPT1 DATA SET (SYS2.JESCKPT1 ON CKPTPK) IS NOW IN USE
IEE400I THESE MESSAGES CANCELLED - 08.
*$HASP256 FUTURE AUTOMATIC FORWARDING OF CKPT1 IS SUSPENDED UNTIL
NEWCKPT1 IS RESPECIFIED.
ISSUE $T CKPTDEF,NEWCKPT1=(...) TO RESPECIFY
$HASP255 JES2 CHECKPOINT RECONFIGURATION COMPLETE

      $dckptdef
      $HASP829 CKPTDEF
$HASP829 CKPTDEF  CKPT1=(DSNAME=SYS2.JESCKPT1,VOLSER=CKPTPK,
$HASP829           INUSE=YES,VOLATILE=NO),
$HASP829           CKPT2=(DSNAME=SYS1.JESCKPT2,VOLSER=CKPTPK,
$HASP829           INUSE=YES,VOLATILE=NO),NEWCKPT1=(DSNAME=,
$HASP829           VOLSER=),NEWCKPT2=(DSNAME=SYS2.JESCKPT2,
$HASP829           VOLSER=CKPTPK),MODE=DUAL,DUPLEX=ON,LOGSIZE=4,
$HASP829           APPLCOPY=NONE,

```

That's it. The response of 'CREATE' caused a new data set to be allocated and assigned as the CKPT1 data set. The NEWCKPT1 specification has been cleared. As stated in the HASP256 message, automatic forwarding in the event of an I/O error has been suspended because there is no NEWCKPT1 specification. At this point, if the movement of the checkpoint is to be permanent, the JES2 initialization decks should be updated and a new NEWCKPT1 established.

If you forget to update the initialization decks, then there are 2 ways JES2 will attempt to find the new checkpoints. During warm start, if there are existing JES2 MAS members active, an XCF message is sent to them asking where the checkpoint currently resides. The values from the initialization deck are updated with the response and warm start continues. If there are no other JES2 members active, then warm start will attempt to read the forwarding information in the header of the checkpoint. Also, since each checkpoint has the names of both checkpoint data sets, JES2 can use this to try and find a consistent checkpoint specification. It is when this process fails that JES2 enters the initialization reconfiguration and asks the operator where the checkpoint is.

Suspending CKPT1

```
$TCKPTDEF,RECONFIG=YES
*$HASP285 JES2 CHECKPOINT RECONFIGURATION STARTING
*$HASP233 REASON FOR JES2 CHECKPOINT RECONFIGURATION IS OPERATOR
REQUEST
*$HASP285 JES2 CHECKPOINT RECONFIGURATION STARTED - DRIVEN BY
MEMBER IBM1
*$HASP271 CHECKPOINT RECONFIGURATION OPTIONS

VALID RESPONSES ARE:

'1' - FORWARD CKPT1 TO NEWCKPT1
'2' - FORWARD CKPT2 TO NEWCKPT2
'5' - SUSPEND THE USE OF CKPT1
'6' - SUSPEND THE USE OF CKPT2
'CANCEL' - EXIT FROM RECONFIGURATION
CKPTDEF (NO OPERANDS) - DISPLAY MODIFIABLE
                        SPECIFICATIONS
CKPTDEF (WITH OPERANDS) - ALTER MODIFIABLE
                        SPECIFICATIONS
*14 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP271 FOR RELATED MSG)
```

Let's suspend the use of CKPT1. This would not normally be done using an operator reconfiguration. Normally this happens when an error is encountered and the best action is to suspend the use of the checkpoint with the problem. It is highly recommended that you always run with 2 checkpoint data sets.

This process starts the same as the forwarding case. We get the gateway message (HASP271) and reply option 5. This requests that CKPT1 be suspended.

CKPT1 Suspended

```
r 14,5
IEE600I REPLY TO 14 IS;5
$HASP280 JES2 CKPT1 DATA SET (SYS2.JESCKPT1 ON CKPTPK) IS NO LONGER
IN USE
$HASP255 JES2 CHECKPOINT RECONFIGURATION COMPLETE
```

```
      $dckptdef
      $HASP829 CKPTDEF
$HASP829 CKPTDEF  CKPT1=(DSNAME=SYS2.JESCKPT1,VOLSER=CKPTPK,
$HASP829           INUSE=NO),CKPT2=(DSNAME=SYS1.JESCKPT2,
$HASP829           VOLSER=CKPTPK,INUSE=YES,VOLATILE=NO),
$HASP829           NEWCKPT1=(DSNAME=,VOLSER=),
$HASP829           NEWCKPT2=(DSNAME=SYS2.JESCKPT2,VOLSER=CKPTPK),
$HASP829           MODE=DUAL,DUPLEX=ON,LOGSIZE=4,APPLCOPY=NONE,
```

And we are done! CKPT1 is no longer in use. As you can see this is one of the easiest things to do using CKPT reconfiguration. A \$D CKPTDEF shows that CKPT1 is no longer in use. (Note the INUSE=NO). The actual specification for CKPT1 is still there to simplify resuming the use of the data set.

Resuming CKPT1

```
$tckptdef,reconfig=yes
*$HASP285 JES2 CHECKPOINT RECONFIGURATION STARTING
*$HASP233 REASON FOR JES2 CHECKPOINT RECONFIGURATION IS OPERATOR
REQUEST
*$HASP285 JES2 CHECKPOINT RECONFIGURATION STARTED - DRIVEN BY
MEMBER IBM1
*$HASP271 CHECKPOINT RECONFIGURATION OPTIONS

VALID RESPONSES ARE:

'2' - FORWARD CKPT2 TO NEWCKPT2
'7' - UPDATE AND START USING CKPT1
'CANCEL' - EXIT FROM RECONFIGURATION
CKPTDEF (NO OPERANDS) - DISPLAY MODIFIABLE
                        SPECIFICATIONS
CKPTDEF (WITH OPERANDS) - ALTER MODIFIABLE
                        SPECIFICATIONS
*15 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP271 FOR RELATED MSG)
```

OK, now let's resume using CKPT1. Again, we start with the gateway message. Notice that there are less options on this message than in previous examples. Also, option '7' has appeared for the first time. This is the option we will use this time.

Confirm CKPT1 data set

```
r 15,7
IEE600I REPLY TO 15 IS;7
*$HASP273 JES2 CKPT1 DATA SET WILL BE ASSIGNED TO
SYS2.JESCKPT1 ON CKPTPK

VALID RESPONSES ARE:

'CONT' - PROCEED WITH ASSIGNMENT
'CANCEL' - EXIT FROM RECONFIGURATION
CKPTDEF (NO OPERANDS) - DISPLAY MODIFIABLE
                        SPECIFICATIONS
CKPTDEF (WITH OPERANDS) - ALTER MODIFIABLE
                        SPECIFICATIONS
*16 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP273 FOR RELATED MSG)
```

Again, before JES2 allocates a data set, it asks you to confirm that the data set is correct. In this case, let's say it is not correct. We want to resume CKPT1 to where it was when we started playing with reconfiguration. In our case, CKPT1=(DSN=SYS1.JESCKPT1, VOL=PRCKPT).

Specifying a new CKPT1

```
16,ckptdef ckpt1=(dsn=sys1.jesckpt1,vol=prckpt)
IEE600I REPLY TO 16 IS;CKPTDEF CKPT1=(DSN=SYS1.JESCKPT1,VOL=PRCKPT
*$HASP829 CKPTDEF CKPT1=(DSNAME=SYS1.JESCKPT1,VOLSER=PRCKPT),
NEWCKPT1=(DSNAME=,VOLSER=),
NEWCKPT2=(DSNAME=SYS2.JESCKPT2,VOLSER=CKPTPK),
DUPLEX=ON
*$HASP273 JES2 CKPT1 DATA SET WILL BE ASSIGNED TO
SYS1.JESCKPT1 ON PRCKPT
```

VALID RESPONSES ARE:

```
'CONT' - PROCEED WITH ASSIGNMENT
'CANCEL' - EXIT FROM RECONFIGURATION
CKPTDEF (NO OPERANDS) - DISPLAY MODIFIABLE
SPECIFICATIONS
CKPTDEF (WITH OPERANDS) - ALTER MODIFIABLE
SPECIFICATIONS
*17 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP273 FOR RELATED MSG)
```

Whenever the HASP273 message is displayed, JES2 is asking to confirm the data set to use for the checkpoint. At this point, you can use the file name specified (CKPT1, CKPT2, NEWCKPT1 or NEWCKPT2) to update the target data set specification. In this case we respecified our normal CKPT1 specifications.

Completed resuming CKPT1

```
17,cont
IEE600I REPLY TO 17 IS;CONT
$HASP280 JES2 CKPT1 DATA SET (SYS1.JESCKPT1 ON PRCKPT) IS NOW IN USE
$HASP255 JES2 CHECKPOINT RECONFIGURATION COMPLETE

      $dckptdef
      $HASP829 CKPTDEF
$HASP829 CKPTDEF  CKPT1=(DSNAME=SYS1.JESCKPT1,VOLSER=PRCKPT,
$HASP829          INUSE=YES,VOLATILE=NO),
$HASP829          CKPT2=(DSNAME=SYS1.JESCKPT2,VOLSER=CKPTPK,
$HASP829          INUSE=YES,VOLATILE=NO),NEWCKPT1=(DSNAME=,
$HASP829          VOLSER=),NEWCKPT2=(DSNAME=SYS2.JESCKPT2,
$HASP829          VOLSER=CKPTPK),MODE=DUAL,DUPLEX=ON,LOGSIZE=4,
$HASP829          APPLCOPY=NONE,
```

This completes the resuming of CKPT1.

The resuming of CKPT1 to a new location has confused many customers over the years. Most never get past the gateway message, thinking that there is an option missing (resume to a new place). Others get stuck on the confirmation message, never thinking of specifying CKPT1 instead of NEWCKPT1. Seeing it on these charts makes it look easy. But the only way it will be easy for you, is if you get familiar with the process on a test JES2 system. When the system is down and there are managers staring over your shoulder watching you type, the VP is on the phone, this is not the time to become familiar with how reconfiguration works.

Error reconfiguration

```

$HASP291 MEMBER IBM1 -- JES2 CKPT2 DATA SET I/O ERROR
VOL=CKPTPK DSN=SYS2.JESCKPT2
*** CHECKPOINT DATA SET NOT DAMAGED BY THIS MEMBER ***
EXCP COMP CODE = 41   IOS COMP CODE = 51
CSW UNIT STATUS = 00   CSW CHNL STATUS = 06
CSW RESIDUAL CT = 0000 IOB SENSE DATA = 0000
NO CURRENT CCW
*$HASP275 MEMBER IBM1 -- JES2 CKPT2 DATA SET - I/O ERROR - REASON CODE
K10
*$HASP233 REASON FOR JES2 CHECKPOINT RECONFIGURATION IS CKPT2 I/O
ERROR(S) ON 1 MEMBER(S)
*$HASP285 JES2 CHECKPOINT RECONFIGURATION STARTED - DRIVEN BY
MEMBER IBM1
*$HASP282 NEWCKPT2 DSNAME, VOLUME AND STRNAME ARE NULL

VALID RESPONSES ARE:

'TERM'      - TERMINATE MEMBERS WITH I/O ERROR ON CKPT2
'DELETE'    - DISCONTINUE USING CKPT2
CKPTDEF (NO OPERANDS)  - DISPLAY MODIFIABLE
                    SPECIFICATIONS
CKPTDEF (WITH OPERANDS) - ALTER MODIFIABLE
                    SPECIFICATIONS
*24 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP282 FOR RELATED MSG)

```

Lets go through a simple device error on a checkpoint data set with no new checkpoint data set set up (bonus points to the person that identifies how I got an I/O error to test this form of reconfiguration). JES2 bypasses the gateway message (HASP271) and proceeds as if the checkpoint is being forwarded. Notice that "DELETE" is now a valid response. This will suspend the error checkpoint and is a fast way to continue normal operations in the event of a error. "DELETE" in only an option if you have 2 checkpoint data sets in use. Though "DELETE" is a simple way out of a reconfiguration, automatic forwarding is the best option.

Specifying a new CKPT2 data set

```
24ckptdef newckpt2=(dsn=sys1.jesckpt2,vol=spool1)
IEE600I REPLY TO 24 IS;CKPTDEF NEWCKPT2=(DSN=SYS1.JESCKPT2,VOL=SPO
*$HASP829 CKPTDEF NEWCKPT1=(DSNAME=,VOLSER=),
          NEWCKPT2=(DSNAME=SYS1.JESCKPT2,VOLSER=SPOOL1),
          DUPLEX=ON
*$HASP273 JES2 CKPT2 DATA SET WILL BE ASSIGNED TO NEWCKPT2
SYS1.JESCKPT2 ON SPOOL1

VALID RESPONSES ARE:

'CONT'   - PROCEED WITH ASSIGNMENT
'TERM'   - TERMINATE MEMBERS WITH I/O ERROR ON CKPT2
'DELETE' - DISCONTINUE USING CKPT2
CKPTDEF (NO OPERANDS) - DISPLAY MODIFIABLE
                        SPECIFICATIONS
CKPTDEF (WITH OPERANDS) - ALTER MODIFIABLE
                        SPECIFICATIONS
*25 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP273 FOR RELATED MSG)
```

Using CKPTDEF, we specify where we want CKPT2 to be placed. As with the operator reconfiguration, JES2 confirms the data set that will be used for the checkpoint.

Error Reconfig complete

```
25,cont
IEE600I REPLY TO 25 IS;CONT
IEF524I 1004, VOLUME CKPTPK PENDING OFFLINE
IOS000I 1004,**,SIM,**,**06,,,CKPTPK,JES2
IOS000I 1004,**,SIM,**,**06,,,CKPTPK,JES2
IOS000I 1004,**,SIM,**,**06,,,CKPTPK,JES2
$HASP280 JES2 CKPT2 DATA SET (SYS1.JESCKPT2 ON SPOOL1) IS NOW IN USE
*$HASP256 FUTURE AUTOMATIC FORWARDING OF CKPT2 IS SUSPENDED UNTIL
NEWCKPT2 IS RESPECIFIED.
ISSUE $T CKPTDEF,NEWCKPT2=(...) TO RESPECIFY
$HASP255 JES2 CHECKPOINT RECONFIGURATION COMPLETE
```

Once you confirm the new data set specifications, JES2 completes the forwarding of the checkpoint data set. The I/O errors are a result of JES2 trying to write forwarding information in the old checkpoint data set. These can be ignored.

In case you haven't figured out how the error was introduced, the SIM in the IOS message should be a give away. What I did was place the checkpoint on a volume by itself and then did a V xxxx,OFFLINE,FORCE. IOS will BOX the device, failing all I/O to it. This way I can test I/O error processing and get my DASD back when I need it (using V xxxx,ONLINE,UNCOND).

Error RECONFIG with no operator intervention

```
$HASP291 MEMBER IBM1 -- JES2 CKPT2 DATA SET I/O ERROR
VOL=CKPTPK DSN=SYS1.JESCKPT2
*** CHECKPOINT DATA SET NOT DAMAGED BY THIS MEMBER ***
EXCP COMP CODE = 41   IOS COMP CODE = 51
CSW UNIT STATUS = 00   CSW CHNL STATUS = 06
CSW RESIDUAL CT = 0000 IOB SENSE DATA = 0000
NO CURRENT CCW
$HASP285 JES2 CHECKPOINT RECONFIGURATION STARTING
*$HASP275 MEMBER IBM1 -- JES2 CKPT2 DATA SET - I/O ERROR - REASON CODE
K10
*$HASP233 REASON FOR JES2 CHECKPOINT RECONFIGURATION IS CKPT2 I/O
ERROR(S) ON 1 MEMBER(S)
*$HASP285 JES2 CHECKPOINT RECONFIGURATION STARTED - DRIVEN BY
MEMBER IBM1
IOS000I 1004,**,SIM,**,**06,,,CKPTPK,JES2
IOS000I 1004,**,SIM,**,**06,,,CKPTPK,JES2
IOS000I 1004,**,SIM,**,**06,,,CKPTPK,JES2
$HASP280 JES2 CKPT2 DATA SET (SYS1.JESCKPT2 ON SPOOL1) IS NOW IN USE
*$HASP256 FUTURE AUTOMATIC FORWARDING OF CKPT2 IS SUSPENDED UNTIL
NEWCKPT2 IS RESPECIFIED.
ISSUE $T CKPTDEF,NEWCKPT2=(...) TO RESPECIFY
$HASP255 JES2 CHECKPOINT RECONFIGURATION COMPLETE
```

This is the same error as the previous case. However, this time NEWCKPT2 was specified along with OPVERIFY=NO. This time, there are no WTORs, everything is processed with no operator intervention. Some of these messages had to be retrieved from SYSLOG since they never made it to my screen. The highlighted HASP256 message is the best way to know that something happened.

What happens if you say TERM?

```
*$HASP275 MEMBER IBM1 -- JES2 CKPT2 DATA SET - I/O ERROR - REASON CODE
K15
*$HASP233 REASON FOR JES2 CHECKPOINT RECONFIGURATION IS CKPT2 I/O
ERROR(S) ON 1 MEMBER(S)
*$HASP285 JES2 CHECKPOINT RECONFIGURATION STARTED - DRIVEN BY
MEMBER IBM1
*$HASP282 NEWCKPT2 DSNAME, VOLUME AND STRNAME ARE NULL

VALID RESPONSES ARE:

' TERM' - TERMINATE MEMBERS WITH I/O ERROR ON CKPT2
' DELETE' - DISCONTINUE USING CKPT2
CKPTDEF (NO OPERANDS) - DISPLAY MODIFIABLE
                        SPECIFICATIONS
CKPTDEF (WITH OPERANDS) - ALTER MODIFIABLE
                        SPECIFICATIONS
*15 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP282 FOR RELATED MSG)
```

Lets do through the same error and this time, lets just give up and say 'TERM' to exit the reconfiguration. Everything starts the same way.

What happens if you say TERM?

```

IEE600I REPLY TO 15 IS;TERM
*$HASP281 ARE YOU SURE THAT YOU WANT TO END THE CHECKPOINT
RECONFIGURATION BY CAUSING THE 1 MEMBER(S) WITH I/O ERRORS
TO ABEND? THIS COULD RESULT IN A LOSS OF THE JOB QUEUE AND
THE OUTPUT QUEUE REQUIRING A COLD START.

VALID RESPONSES ARE:

' TERM' - CONFIRM THAT 1 MEMBERS SHOULD BE TERMINATED
OTHER - CONTINUE RECONFIGURATION (RE-ISSUE LAST WTOR)
*16 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP281 FOR RELATED MSG)
  16,term
  IEE600I REPLY TO 16 IS;TERM
*17 $HASP279 MEMBER IBM1 -- SPECIFY EMERGENCY CKPT VOLUME SERIAL OR
  '*NONE*'
  17*none*
  IEE600I REPLY TO 17 IS;*NONE*
*$HASP095 JES2 CATASTROPHIC ERROR.  CODE = $K15

s jes2,parm=(warm,noreq)
IEF403I JES2 - STARTED - TIME=17.50.07
$HASP490 HOT START DENIED -- RE-IPL REQUIRED
$HASP085 JES2 TERMINATION COMPLETE

```

When you reply 'TERM' JES2 (as of release 7) tries to let you know that this may not be a smart thing to do. This is to help those who did not attend this presentation know that they are throwing out data and may have to cold start. Any reply other than 'TERM' will put them back where they were when they said 'TERM'.

In this case, I was stubborn, and just replied 'TERM'

This gets us the EMERGENCY CKPT message. This message comes out in 2 cases, when you TERM out of an error reconfiguration or when there is an error in the reconfiguration code itself. An emergency ckpt is a copy of the current checkpoint written out (to DASD) that JES2 can use to restart. The data set does not have to exist. The name is hard coded as SYS1.EMERGENCY.HASPCKPT. You reply a volume with space and we create the data set on the volume. Over the years, this has saved a number of installation that terminated out of an error reconfiguration, created one of these data sets (just in case) and then found their CKPT1 and CKPT2 data sets unusable (often there was no CKPT2). If you ever get this message, it is worth the time to create an emergency checkpoint, just in case.

I chose not to and JES2 came down with a \$K15. At this point, hot starts are denied (since some checkpoint data has been lost).

Initialization Reconfiguration

- Specifying PARM=RECONFIG allows parameters to be updated.
- Only valid on all-member-warm start
- JES2 will confirm new values
- What you specify is what you get
- If changing CKPT specifications, you should specify which data set to read from

To alter the checkpoint configuration during JES2 initialization, use PARM=RECONFIG when performing an all member warm start of JES2. This instructs JES2 to override the checkpoint parameters it reads from the checkpoint and use the values from initialization instead. JES2 will confirm the checkpoint configuration before it uses them.

RECONFIG is a very powerful option. If not used properly, this can damage the CKPT data sets and require a cold start. Development is looking at ways to reduce the chance of causing permanent damage, but current releases are exposed to forced cold starts if this option is not used with care.

Changing from DUAL to DUPLEX mode

```
S JES2, PARM=(WARM, NOREQ, RECONFIG)
IEF403I JES2 - STARTED - TIME=13.45.33
  IXZ0001I CONNECTION TO JESXCF COMPONENT ESTABLISHED,
GROUP POK      MEMBER POK$IBM1
*$HASP283 JES2 IS PROCESSING A 'RECONFIG' REQUEST TO
OVERRIDE THE SAVED CHECKPOINT SPECIFICATIONS WITH THE VALUES
SPECIFIED BELOW

CKPT1=(DSNAME=SYS1.JESCKPT1,VOLSER=PRCKPT, INUSE=YES),
CKPT2=(DSNAME=SYS1.JESCKPT2,VOLSER=CKPTPK, INUSE=YES),
MODE=DUAL,
LOGSIZE=4,
READFROM=HIGHEST

VALID RESPONSES ARE:

KEYWORD=VALUE - TO CHANGE THE VALUE OF ANY KEYWORD LISTED
'CONT' - TO CONTINUE INITIALIZATION WITH THE VALUES LISTED
'TERM' - TERMINATE JES2 INITIALIZATION ON THIS MEMBER
*09 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP283 FOR RELATED MSG)
```

In this simple example, we are changing mode from DUAL to DUPLEX (in anticipation of using a coupling facility). You can tell this is a RECONFIG type call from the text of the HASP283 message. The exact checkpoint specifications JES2 will use are listed. In this case, the data sets specified for CKPT1 and CKPT2 are the same data sets we were using when JES2 came down. I confirmed that by checking the values before I restarted JES2. The MODE and LOGSIZE are from the initialization deck.

Setting mode to duplex

```
IEE600I REPLY TO 09 IS;MODE=DUPLEX
*$HASP283 JES2 IS PROCESSING A 'RECONFIG' REQUEST TO
OVERRIDE THE SAVED CHECKPOINT SPECIFICATIONS WITH THE VALUES
SPECIFIED BELOW

CKPT1=(DSNAME=SYS1.JESCKPT1,VOLSER=PRCKPT,INUSE=YES),
CKPT2=(DSNAME=SYS1.JESCKPT2,VOLSER=CKPTPK,INUSE=YES),
MODE=DUPLEX,
LOGSIZE=4,
READFROM=HIGHEST

VALID RESPONSES ARE:

KEYWORD=VALUE - TO CHANGE THE VALUE OF ANY KEYWORD LISTED
'CONT' - TO CONTINUE INITIALIZATION WITH THE VALUES LISTED
'TERM' - TERMINATE JES2 INITIALIZATION ON THIS MEMBER
*10 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP283 FOR RELATED MSG)
IEE600I REPLY TO 10 IS;CONT
$HASP478 INITIAL CHECKPOINT READ IS FROM CKPT2 090
      (SYS1.JESCKPT2 ON CKPTPK)
      LAST WRITTEN MONDAY, 17 JUL 2000 AT 13:44:25 (LOCAL TIME)
```

I have requested that the MODE parameter be updated. If I had updated my initialization deck with the new values, this would not have been needed. At this point I am satisfied that all the parameters are as I wanted them so I reply 'CONT'. JES2 then starts with the values I specified.

Initialization Reconfiguration (not RECONFIG option)

- Reconfiguration can also be entered because initialization cannot locate CKPTs
- JES2 will not restart until it has allocated the same checkpoints it had when JES2 came down
- Also entered if error reading checkpoints
- Can be transformed into the PARM=RECONFIG form

Calling this a reconfiguration is really a misnomer. It is more like a cry for help. The goal of JES2 initialization is to get back to the CKPT data sets that were in use when JES2 came down. For any one of a number of reasons, JES2 cannot figure out how to do this. It could be that reply an operator gave to a WTOR lead initialization to suspect the checkpoint data sets are not correct. Or perhaps the forwarding information is missing or cannot be read from a data set. In any case, this form of the initialization reconfiguration is not trying to change anything, just put things back the way they were before.

Error starting JES2

```
$HASP536 MEMBER IBM1 -- CONNECT TO STRNAME SPOOLCKPT1 FOR CKPT1
FAILED, RC=00000000 RSN=00000000
ERRCODE=07, STRUCTURE NOT ALREADY USED
*$HASP284 JES2 INITIALIZATION CHECKPOINT DIALOG STARTED
*$HASP277 JES2 CAN NOT FIND OR USE THE CHECKPOINT DATA SET(S)
THAT WERE IN USE WHEN THE MAS WAS LAST ACTIVE BECAUSE CKPT1
STRUCTURE NOT ALREADY USED

CURRENT CHECKPOINT VALUES:
CKPT1=(STRNAME=SPOOLCKPT1,INUSE=YES),
CKPT2=(DSNAME=SYS1.JESCKPT2,VOLSER=CKPTPK,INUSE=YES)

VALID RESPONSES ARE:
CKPT1=... - UPDATE CURRENT CHECKPOINT SPECIFICATION WITH
CKPT2=... THE VALUES USED WHEN JES2 MAS WAS LAST ACTIVE
'RECONFIG' - THE CHECKPOINT DATA SET(S) THAT WERE IN USE
            WHEN JES2 WAS LAST ACTIVE ARE NO LONGER
            AVAILABLE (ALL-MEMBER WARM START ONLY)
'CONT'     - ATTEMPT INITIALIZATION WITH THE VALUES LISTED
'TERM'     - TERMINATE JES2 INITIALIZATION ON THIS MEMBER
*06 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP277 FOR RELATED MSG)
```

Well, as you can see I have started using the coupling facility for checkpoint. But now, I am warm starting and initialization seems to be having a problem reading data from the CF. The problem is, while the system was down, I applied maintenance to my CF and did a POR (Power on reset). Since I did not move my CKPT off the coupling facility, I lost all my data. But I still have CKPT2 on DASD so what I want to do is read from that data set.

Switching to RECONFIG mode

```
IEE600I REPLY TO 06 IS;RECONFIG
*$HASP283 JES2 IS PROCESSING A 'RECONFIG' REQUEST TO
OVERRIDE THE SAVED CHECKPOINT SPECIFICATIONS WITH THE VALUES
SPECIFIED BELOW

CKPT1=(STRNAME=SPOOLCKPT1, INUSE=YES) ,
CKPT2=(DSNAME=SYS1.JESCKPT2, VOLSER=CKPTPK, INUSE=YES) ,
MODE=DUPLEX,
LOGSIZE=4,
READFROM=HIGHEST

VALID RESPONSES ARE:

KEYWORD=VALUE - TO CHANGE THE VALUE OF ANY KEYWORD LISTED
'CONT' - TO CONTINUE INITIALIZATION WITH THE VALUES LISTED
'TERM' - TERMINATE JES2 INITIALIZATION ON THIS MEMBER
*07 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP283 FOR RELATED MSG)
```

Since there is no way to "put things back" the way there were before JES2 shut down (CKPT1's data is gone), I need to RECONFIG to something that will work. I know that what I have specified for CKPT2 has good checkpoint data, I just want to read that data set.

Indicating what data set to read

```

IEE600I REPLY TO 07 IS;READFROM=CKPT2
*$HASP283 JES2 IS PROCESSING A 'RECONFIG' REQUEST TO
OVERRIDE THE SAVED CHECKPOINT SPECIFICATIONS WITH THE VALUES
SPECIFIED BELOW

CKPT1=(STRNAME=SPOOLCKPT1, INUSE=YES) ,
CKPT2=(DSNAME=SYS1.JESCKPT2, VOLSER=CKPTPK, INUSE=YES) ,
MODE=DUPLEX,
LOGSIZE=4,
READFROM=CKPT2

VALID RESPONSES ARE:

KEYWORD=VALUE - TO CHANGE THE VALUE OF ANY KEYWORD LISTED
'CONT' - TO CONTINUE INITIALIZATION WITH THE VALUES LISTED
'TERM' - TERMINATE JES2 INITIALIZATION ON THIS MEMBER
*08 $HASP272 ENTER RESPONSE (ISSUE D R,MSG=$HASP283 FOR RELATED MSG)

```

To recover from this error I have a number of options:

- Suspend use of CKPT by saying CKPT1=(INUSE=NO)
- If the CF was not available for some reason, I could specify a DASD data set for CKPT1 by specifying CKPT1=(DSN=SYS1.JESCKPT1,VOL=SPOOL1). Since I know that only CKPT2 has good checkpoint data, I will also specify READFROM=CKPT2
- How about CKPT1=(DSN=SYS1.JESCKPT2,VOL=SPOOL1),CKPT2=(INUSE=NO)

There are lots of options. Since the CF is there and working, I chose the simplest option. Just tell JES2 to read from CKPT2.

The READFROM= parameter is very important. When it indicates HIGHEST, JES2 will read the checkpoint data sets and make its best determination what data set to read from. If one of the data sets is known to not contain the latest checkpoint data (or has trash on it) it is possible that the trash in the data set may trigger JES2 to read the wrong data set. If you know (as in this case) that only CKPT2 had current data, then you should specify the data set to read from.

Completing the warm start

```
IEE600I REPLY TO 08 IS;CONT
$HASP478 INITIAL CHECKPOINT READ IS FROM CKPT2
(SYS1.JESCKPT2 ON CKPTPK)
LAST WRITTEN MONDAY, 17 JUL 2000 AT 17:21:28 (LOCAL TIME)
*$HASP493 JES2 ALL-MEMBER WARM START IS IN PROGRESS
```

At this point we are done. JES2 read from CKPT2 and completed the all member warm start.

Another way to have handled this problem would have been to terminate JES2 when the first dialog was entered and then restart JES2 with PARM=(WARM,CKPT2). This would have had the same effect as this example (though it would not have given me a chance to illustrate how initialization reconfiguration works). However, this is not a worthless example. Some installation have a problem restarting JES2 with a specific start parm. Though that could cause other problem over time, this illustrates how to how to use reconfiguration to get past that problem.

System managed rebuild

- OS/390 function to move structures from one coupling facility to another
- Operator initiated (SETXCF START,REBUILD)
- Only works if there is no existing problem
 - ▶ If connectivity is lost, cannot use
- Only moves to another CF (not to DASD)
- For normal maintenance, makes JES2 consistent with other CF exploiters

System managed rebuild is new support added in release 8 of MVS and JES2. It is not intended as a replacement for CKPT reconfiguration. It is an attempt to make JES2's usage of CF more consistent (operationally) with other components. System Managed rebuild address the problem of taking a CF off-line for maintenance. It is mostly OS/390 code (with some JES2 code) that allows the data in a structure to be moved to another coupling facility. It only works if there are no problems with the current coupling facility. There do not have to be any active users of the structure to use the service (JES2 can be down and it can move the CKPT). The command to use the service is:

```
SETXCF START,REBUILD,STRNAME=nnnnnnn or  
SETXCF START,REBUILD,CF=nnnnnnn
```

While the structure is being moved, JES2 cannot access the checkpoint. No jobs are started, no new SYSOUT can start printing, etc.

Using System-managed Rebuild

```
setxcf start,rebuild,strname=spoolckpt1
IXC570I SYSTEM-MANAGED REBUILD STARTED FOR STRUCTURE
SPOOLCKPT1 IN COUPLING FACILITY JESSES1
PHYSICAL STRUCTURE VERSION: B45AF995 0B62C202
LOGICAL STRUCTURE VERSION: B45AF995 0B62C202
START REASON: OPERATOR-INITIATED
AUTO VERSION: B45AF9D6 9C5C9441
IXC367I THE SETXCF START REBUILD REQUEST FOR STRUCTURE
SPOOLCKPT1 WAS ACCEPTED.
IXC578I SYSTEM-MANAGED REBUILD SUCCESSFULLY ALLOCATED
STRUCTURE SPOOLCKPT1.
OLD COUPLING FACILITY: JESSES1
OLD PHYSICAL STRUCTURE VERSION: B45AF995 0B62C202
NEW COUPLING FACILITY: TESTCF
NEW PHYSICAL STRUCTURE VERSION: B45AF9D7 83F9A509
LOGICAL STRUCTURE VERSION: B45AF995 0B62C202
AUTO VERSION: B45AF9D6 9C5C9441
IXC577I SYSTEM-MANAGED REBUILD HAS BEEN COMPLETED
FOR STRUCTURE SPOOLCKPT1
STRUCTURE NOW IN COUPLING FACILITY TESTCF
PHYSICAL STRUCTURE VERSION: B45AF9D7 83F9A509
LOGICAL STRUCTURE VERSION: B45AF995 0B62C202
AUTO VERSION: B45AF9D6 9C5C9441
```

This is the series of messages you can expect to see. Notice, there are no JES2 messages about the process. OS/390 handles the move. The OS/390 messages do indicate where the structure was moved from/to. For more information on this, consult the related SYSPLEX documentation.

Other Hits and Tips

- Read messages carefully and if needed the descriptions in the books
- Specify CKPTn start option or READFROM= when altering CKPT specifications with RECONFIG start parm
 - ▶ READFROM=HIGHEST is NOT the best choice. You know which data set to read from
- Ensure operations knows what to do in the event of a reconfiguration
 - ▶ Preset NEWCKPTn and use OPVERIFY=NO

Maybe this sounds too simple but careful reading them messages and the descriptions in the book often solves most problems with reconfiguration. There are some subtle differences in message texts that can help clarify what is going on.

Letting READFROM= default to HIGHEST has resulted in COLD starts in the past. At this point in processing, JES2 logic cannot always decide the correct data set to read from. The right garbage has fooled the logic in the past. We have taken action to prevent this but if you are changing the checkpoint specification with RECONFIG and know that only one data set has the latest checkpoint data, give that information to JES2.

If you think RECONFIG is complicated now, ask someone about how it worked prior to SP 5.1.0. But don't let the relative simplicity lull you into thinking you do not need to practice this on a test system. The more familiar you are with the process, the easier it is to deal with if you have a problem. This includes the system programmers and the operations staff.

Use OPVERIFY=NO with a preset NEWCKPT (that was pre-allocated and you know works). This will reduce the impact of an error and prevent the middle of the night call. Automate on the HASP256 message to send a message to someone when it is issued. This way you know there has been a reconfiguration and you need to reset NEWCKPTn.

Other Hits and Tips (*continued*)

- You can forward a data set to itself.
 - ▶ When you get the confirmation message, set NEWCKPTn to the same value as CKPTn
 - ▶ This rebuilds the data structures, writes out the current checkpoint data, and you continue using the same data set
 - ▶ Useful if the cause of the problem was fixed and you don't want to move to a new data set
- Keep a list of where you can place a CKPT available for operations
- Keep track of where you last placed your checkpoint

There have been times when an error was only temporary. Someone pulled the wrong cable, configured the wrong DASD off a system, etc. For these cases, if you did not automatically forward your checkpoint, you can fix the problem and specify NEWCKPT1 the same as CKPT1 and forward CKPT1. This may not be the best option but it is good to know that it is an option.

Keeping a list of places where you can safely place your checkpoint in the event of an error can greatly reduce recovery time. This is especially true if the failure involves multiple devices and not just the one the checkpoint is currently using. This same list can also be used to keep track of where the checkpoint is currently located. It does no good to move the checkpoint, save the queues, and then loose them on the next IPL because no one knows where the checkpoint went.

Questions?