

# Hardware Definitions for the

# Virtual Tape Server

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## 1.1.1 Basic Hardware Definition Steps for the VTS

Before you can use the VTS, you need to define it to the MVS system and Processor through IOCP or through Hardware Configuration Definition (HCD). If you will be using BTLS (Basic Tape Library Support) to control the library functions of the VTS, then either HCD or IOCP/MVSCP may be used. If you will be using DFSMS/OAM (System Managed Tape) to control the library functions of the VTS, then you must use HCD. You may need to update missing interrupt handling (MIH) values as well.

The necessary implementation steps are listed below for the configuration illustrated in Figure 1, a VTS attached through two 9032-3 ESCON Directors. This paper assumes that the VTS is being attached to existing ESCON Directors. If you are installing ESCON Directors for the first time, then the ESCON Directors themselves will also have to be defined in the IOCP or HCD IODF. Please refer to IOCP User's Guide GC38-0401 and/or HCD User's Guide SC33-6468 for information on defining the ESCON Directors themselves. A CNTLUNIT and an IODEVICE macro need to be coded for each ESCON Director.

We also note in this paper the differences in the definitions if you are NOT attaching through ESCON Directors.

### 1. Define the devices through IOCP (BTLS only).

An IOCP example of the VTS strings has been included showing the virtual drives configured using the CUADD statements:

#### WITH ESCON DIRECTORS:

```
Virtual Tape Server IOCP
CHPID PATH = 40,TYPE=CNC,SWITCH=01
CHPID PATH = 50,TYPE=CNC,SWITCH=02
CNTLUNIT CUNUMBR=440,PATH=(40,50),UNIT=3490,          X
          UNITADD=((00,16)),LINK=(D6,D7),CUADD=0
IODEVICE ADDRESS=(A40,16),UNIT=3490,CUNUMBR=(440),    X
          UNITADD=00
CNTLUNIT CUNUMBR=441 PATH=(40,50),UNIT=3490,          X
          UNITADD=((00,16)),LINK=(D6,D7),CUADD=1
IODEVICE ADDRESS=(A50,16),UNIT=3490,CUNUMBR=(441),    X
          UNITADD=00
```

#### WITHOUT ESCON DIRECTORS:

```
Virtual Tape Server IOCP
CHPID PATH = 40,TYPE=CNC
CHPID PATH = 50,TYPE=CNC
CNTLUNIT CUNUMBR=440,PATH=(40,50),UNIT=3490,          X
          UNITADD=((00,16)),CUADD=0
IODEVICE ADDRESS=(A40,16),UNIT=3490,CUNUMBR=(440),    X
          UNITADD=00
CNTLUNIT CUNUMBR=441 PATH=(40,50),UNIT=3490,          X
          UNITADD=((00,16)),CUADD=1
IODEVICE ADDRESS=(A50,16),UNIT=3490,CUNUMBR=(441),    X
          UNITADD=00
```

### 2. Define devices through HCD.

APAR OW25291 is available. This APAR allows the user to supply, through HCD interactive panels, the information obtained from Tape Library resident devices at IPL time. This user supplied data is redundant if the devices are available (powered on, and enabled to the channel and NOT busy on another system). If the devices were not so enabled, then this optional data will suffice

to allow the devices to be varied online, without another IPL or an HCD re-activate.

The APAR changes the tape UIM (CBDUS005). It introduces two additional parameters for the tape library. This changes the HCD device definition dialog (panel CBDDPDV13) because these new parameters are now shown up in the Define Device Parameters/Features panel. The change is done by DFSMS.

The updated CBDDPDV13 panels are shown with notes pointing to the fields added by this APAR.

To properly define a single VTS subsystem, it is necessary to define 2 Tape Control Units, and 2 strings of drives, 16 drives each.

Figure 1 on page 4 and Figure 2 on page 5 show the two important panels for specifying one of the VTS tape control units.

```
----- Add Control Unit -----
CBDPCU10

Specify or revise the following values.

Control unit number . . . . 0440 +
Control unit type . . . . . 3490      +

Serial number . . . . . _____
Description . . . . . _____

Connected to switches . . . 01 02  _ _ _ _ _ +
Ports . . . . . D6 D7  _ _ _ _ _ +

If connected to a switch, select whether to have CHPIDs/link
addresses, and unit address range proposed.

Auto-assign . . . . . 2  1. Yes
                   2. No

F1=Help  F2=Split  F3=Exit  F4=Prompt  F5=Reset  F9=Swap
F12=Cancel
```

Figure 1. Adding the first VTS Control Unit through HCD, Part 1

Note that if you are not connecting the VTS through ESCON Directors, then the Connected to Switches fields and Ports fields would be blank. After you have specified the control unit number and the type (here, 3490) as shown in Figure 1 on page 4, and after you have chosen the processor, the control unit is connected to, the panel shown in Figure 2 on page 5 is displayed.

```

----- Add Control Unit -----
CBDPCU12

Specify or revise the following values.

Control unit number . : 0440          Type . . . . . : 3490
Processor ID . . . . . : PROC1        This is the main processor

Channel path IDs . . . . . 40 50  _ _ _ _ _ +
Link address . . . . . D6 D7  _ _ _ _ _ +

Unit address . . . . . 00  _ _ _ _ _ +
Number of units . . . . . 16  _ _ _ _ _

Logical address . . . . . 0 + (same as CUADD)

Protocol . . . . . _ + (D,S or S4)
I/O concurrency level . 2 + (1, 2 or 3)

F1=Help   F2=Split   F4=Prompt   F5=Reset   F9=Swap   F12=Cancel

```

Figure 2. Adding the first VTS Control Unit through HCD, Part 2, Specifying Logical address (CUADD) = 0

Note again, that if the VTS is not being attached via ESCON Directors, then the Link address fields would be blank. Figure 3 on page 5 and Figure 4 on page 6 show the two important panels for specifying the second VTS tape control unit.

```

----- Add Control Unit -----
CBDPCU10

Specify or revise the following values.

Control unit number . . . . . 0441 +
Control unit type . . . . . 3490      +

Serial number . . . . . _____
Description . . . . . _____

Connected to switches . . . 01 02  _ _ _ _ _ +
Ports . . . . . D6 D7  _ _ _ _ _ +

If connected to a switch, select whether to have CHPIDs/link
addresses, and unit address range proposed.

Auto-assign . . . . . 2  1. Yes
                       2. No

F1=Help   F2=Split   F3=Exit   F4=Prompt   F5=Reset   F9=Swap
F12=Cancel

```

Figure 3. Adding the Second VTS Control Unit through HCD, Part 1

Note that if you are not connecting the VTS through ESCON Directors, then the Connected to Switches fields and Ports fields would be blank. After you have specified the control unit number and the type (here, 3490) as shown in Figure 3 on page 5, and after you have chosen the processor, the control unit is connected to, the panel shown in Figure 4 on page 6 is displayed.

```

----- Add Control Unit -----
CBDPCU12

Specify or revise the following values.

Control unit number . : 0441          Type . . . . . : 3490
Processor ID . . . . . : PROC1        This is the main processor

Channel path IDs . . . . . 40 50  _ _ _ _ _ +
Link address . . . . . D6 D7  _ _ _ _ _ +

Unit address . . . . . 00  _ _ _ _ _ +
Number of units . . . . . 16  _ _ _ _ _

Logical address . . . . . 1 + (same as CUADD)

Protocol . . . . . _ + (D,S or S4)
I/O concurrency level . 2 + (1, 2 or 3)

F1=Help   F2=Split   F4=Prompt   F5=Reset   F9=Swap   F12=Cancel

```

Figure 4. Adding the Second VTS Control Unit through HCD, Part 2, Specifying Logical address (CUADD) = 1

Note again, that if the VTS is not being attached via ESCON Directors, then the Link address fields would be blank.

The number of drives to be specified for a IBM VTS control unit is always 32, but you must specify these in two strings, each string associated with one of the previously defined control units.

To define the IBM 3490E virtual drives, you need to go to the Device List Panel either from the Main Panel by entering 1 and then 5, or via the Control Unit List Panel by using action s. To add the VTS virtual drives, press PF11. The screen shown in Figure 5 on page 6 is displayed.

```

----- Add Device -----
CBDPDV10

Specify or revise the following values.

Device number . . . . . 0A40 (0000 - FFFF)
Number of devices . . . . . 16
Device type . . . . . 3490  _ _ _ _ _ +

Serial number . . . . . _____
Description . . . . . _____

Connected to CUs . . 0440  _ _ _ _ _ +

F1=Help   F2=Split   F3=Exit   F4=Prompt   F5=Reset   F9=Swap
F12=Cancel

```

Figure 5. Adding The First 16 Drives through HCD, Part 1

After entering the required information and specifying to which processors and operating systems the devices are connected, the screen in Figure 6 on page 7 is displayed, where you can update the device parameters.

```

CBDPDV13          Define Device Parameters / Features          Row 1 of 6
Command ==> _____ Scroll ==> PAGE

Specify or revise the values below.

Configuration ID . : AB          MVS operating system
Device number . . : OA40        Number of devices :16
Device type . . . : 3490

Parameter/ Value  P Req.  Description
Feature
OFFLINE  yes      Device considered online or offline at IPL
DYNAMIC  yes      Device supports dynamic configuration
LOCANY   .         UCB can reside in 31 bit storage
LIBRARY  yes      Device supports auto tape library
AUTOSWITCH No     Device is automatically switchable
LIBRARY-ID 10382  5 digit library serial number
LIBPORT-ID 01    2 digit library string ID ( port number)
SHARABLE  yes      Device is Sharable between systems
COMPACT  yes      Compaction
***** Bottom of data *****

F1=Help      F2=Split      F4=Prompt      F5=Reset      F7=Backward
F8=Forward   F9=Swap       F12=Cancel     F22=Command

```

Figure 6. Adding First 16 VTS Drives through HCD, Part 2

- Note:** 1. If you are defining drives that are installed in an system-managed IBM 3494 or 3495 VTS Library, you must specify LIBRARY=yes. For BTLS-managed library drives, specify LIBRARY=no.
- Note:** 2. If your system has APAR OW25291 installed, you will see this field. In the event that the library drives are not available st IPL, this field will supply the Library ID at IPL time, so that the drives may be varied online without re-activating the HCD. See the last section of this paper for a description of this field
- Note:** 3. If your system has APAR OW25291 installed, you will see this field. In the event that the library drives are not available st IPL, this field will supply the Port ID at IPL time, so that the drives may be varied online without re-activating the HCD. See the last section of this paper for a description of this field
- Note:** 4. If more than one MVS system will be sharing the virtual drives in the VTS, then specify yes for SHARABLE. This will force OFFLINE = yes.

To define the second 16 VTS 3490E virtual drives, you need to go back to the Device List Panel from the Main Panel by entering 1 and then 5. To add the VTS virtual drives, press PF11. The screen shown in Figure 7 on page 8 is displayed.

```

----- Add Device -----
CBDPDV10

Specify or revise the following values.

Device number . . . . . 0A50 (0000 - FFFF)
Number of devices . . . . . 16
Device type . . . . . 3490 _____ +

Serial number . . . . . _____
Description . . . . . _____

Connected to CUs . . 0441 _____ +

F1=Help   F2=Split   F3=Exit   F4=Prompt   F5=Reset   F9=Swap
F12=Cancel

```

Figure 7. Adding Second 16 VTS Virtual drives through HCD, Part 1

After entering the required information and specifying to which processors and operating systems the devices are connected, the screen in Figure 8 on page 8 is displayed, where you can update the device parameters.

```

CBDPDV13          Define Device Parameters / Features          Row 1 of 6
Command ==> _____ Scroll ==> PAGE

Specify or revise the values below.

Configuration ID . . : AB          MVS operating system
Device number . . . : 0A50        Number of devices :16
Device type . . . . : 3490

Parameter/ Value   P Req.  Description
Feature
OFFLINE   yes      Device considered online or offline at IPL
DYNAMIC   yes      Device supports dynamic configuration
LOCANY
LIBRARY    yes      Device supports auto tape library
AUTOSWITCH No       Device is automatically switchable
LIBRARY-ID 10382    5 digit library serial number
LIBPORT-ID 02      2 digit library string ID ( port number)
SHARABLE   yes      Device is Sharable between systems
COMPACT    yes      Compaction
***** Bottom of data *****

F1=Help   F2=Split   F4=Prompt   F5=Reset   F7=Backward
F8=Forward F9=Swap    F12=Cancel  F22=Command

```

Figure 8. Adding Magstar Tape Drives through HCD, Part 2

- Note:** 1. If you are defining drives that are installed in an system-managed IBM 3494 or 3495 VTS Library, you must specify LIBRARY=yes. For BTLS-managed library drives, specify LIBRARY=no.
- Note:** 2. If your system has APAR OW25291 installed, you will see this field. In the event that the library drives are not available st IPL, this field will supply the Library ID at IPL time, so that the drives may be varied online without re-activating the HCD. See the last section of this paper for an explanation of this field.
- Note:** 3. If your system has APAR OW25291 installed, you will see this field. In the event that the library drives are not available st IPL, this field will supply the Port ID at IPL time, so that the drives may be varied online without re-activating the HCD. See the last section of this paper for an explanation of this field.

**Note:** 4. If more than one MVS system will be sharing the virtual drives in the VTS, then specify yes for SHARABLE. This will force OFFLINE = yes.



If you define esoteric device names containing multiple tape-device types, the default device preference list is built in the following order:

- a. 3590-1
- b. 3490
- c. 3480

3. Update or set values for the missing interrupt handler (MIH).

The VTS emulates 3490E devices and does not automatically upload the MIH timeout values to the host operating system in Read Configuration Data. It is necessary that you specify MIH timeout values for IBM 3490E devices.

The 3590 A00 returns recommended MIH timeout values to the host operating system in Read Configuration Data. It is not necessary that you specify MIH timeout values for IBM 3590 devices; the device-supplied values handle all MIH timeouts.

If you currently specify your own MIH timeout values for non-3590 tape devices, we recommend that you review your procedures to see if a timeout value other than the IBM-supplied default of 3 minutes needs to be used. If so, specify the timeout for each individual device. MIH timeout values can be specified only by class (for example; all tapes) or on an individual device basis. Specification of an MIH timeout value for the entire tape class would negate the 3590 device's recommended values and adversely affect MIH recovery processing on 3590 devices. You can specify the MIH values either in PARMLIB member IECIOSxx or by the MVS operator command SETIOS.

Figure 9 on page 10 shows how to specify MIH values for IBM 3480 devices (addresses 800 to 807), for IBM 3490E drives using CST cartridges (addresses 900 to 907), for IBM 3490E drives with ECCST cartridges (addresses 9E0 to 9EF), and for the VTS virtual drives at 25 minutes. This is a starting point. Under certain conditions you may experience Missing Interrupts at 25 minutes. If you experience missing interrupts, then increase the time to 45 minutes.

```
MIH=(0800-0807),TIME=03:00  
MIH=(0900-0907),TIME=10:00  
MIH=(09E0-09EF),TIME=20:00  
MIH=(0A40-0A5F),TIME=25:00
```

Figure 9. Sample MIH Specification in PARMLIB member IECIOSxx

In Figure 10 on page 10, we give an example of the operator commands to specify the MIH values on a device basis.

```
SETIOS MIH=(0800-0807),TIME=03:00  
SETIOS MIH=(0900-0907),TIME=10:00  
SETIOS MIH=(09E0-09EF),TIME=20:00  
SETIOS MIH=(0A40-0A5F),TIME=25:00
```

Figure 10. Sample Operator Commands to Set MIH Value

4. Explanation of the LIBRARY-ID and LIBPORT-ID fields

If you have APAR OW25291 installed, there are two new fields on the Device Features panel called LIBRARY-ID and LIBPORT-ID. See entry #21 below.

When adding the devices in a 3494 library through HCD, you can optionally supply default information for those two fields. Host software uses the information to understand the association of the subsystems to automated tape libraries and their configuration within the library. If you do not provide the information, the operating system will attempt to obtain the information from the tape subsystem at IPL or I/O activation time. If it cannot get the information from the subsystem (as is the case if the subsystem is not powered on during IPL), the devices cannot be used, so providing the default is a good idea.

The LIBRARY-ID is the library sequence number that was entered via the library manager console during the installation of the library.

The LIBPORT-ID is assigned by the library manager to each tape subsystem associated with a library sequence number. It is also called the Subsystem ID and identifies the subsystems sequential position in the library configuration.

If the library does not contain a Virtual Tape Server subsystem, there is only one library sequence number and one associated sequence of subsystem IDs. For a library that contains both a Virtual Tape Server subsystem and non-VTS subsystems, two library sequence numbers, each with their own associated set of subsystem IDs, are maintained by the library manager.

The values to enter for the virtual drives in the VTS subsystem:

- For LIBRARY-ID

Open the OPERATIONAL STATUS panel on the Library Manager Console. The LIBRARY-ID is the 5 character field under "VTS 1" in the Library Sequence Number section of the panel.

- For LIBPORT-ID

In IOCDS (see #5), two control units with device ranges of 16 drive addresses each are defined for the virtual devices. One control unit is defined with the CUADD=0, the other with CUADD=1. For the devices associated with the control unit defined for CUADD=0, use a LIBPORT-ID of 01. For the devices associated with the control unit defined for CUADD=1, use a LIBPORT-ID of 02.

NOTE: The above values are used whether or not the 3494 library has only a VTS subsystem or a VTS and non-VTS subsystems.

The values to enter for the non-VTS drives:

- For LIBRARY-ID

Open the OPERATIONAL STATUS panel on the Library Manager Console. The LIBRARY-ID is the 5 character field under "non-VTS" in the Library Sequence Number section of the panel.

- For LIBPORT-ID

Enter the subsystem ID, xx, determined as follows:

- Subsystem IDs are assigned started with the subsystems (if any) in the Lxx frame of the 3494 library and incremented for each subsystem located in frames farther from the Lxx frame, EXCEPT for the Model D12 frame that contains the 3590 Model B1A drives associated with a 3494 Model B16 Virtual Tape Server Controller and the virtual subsystem represented by the VTS itself.
- The first subsystem is assigned a subsystem ID of 01, each subsequent subsystem ID is incremented by 1, with the highest subsystem ID of 32

- A separate subsystem ID is assigned to:
  - a. Each direct SCSI host attached 3590 Model B1A drive
  - b. Each 3590 Model A00 but not its associated 3590 drives
  - c. Each 3490 Model C1A or C2A regardless of how it attaches to a host

This is how the subsystem IDs are determined for the non-VTS portion of the following 3494 library configuration:

- Model L12, with two 3590 Model B1A drives
  - o Two subsystem IDs are assigned, 01 and 02
- Model S10
  - o No subsystem IDs are assigned
- Model D12, with six 3590 Model B1A drives attached to a VTS
  - o No subsystem IDs are assigned because these drives are associated with the model B16, Virtual Tape Server Controller
- Model B16
  - o No subsystem IDs are assigned
- Model D14, with a 3590 Model A00 and four 3590 Model B1A drives
  - o One subsystem ID is assigned, 03
- Model D10, with a 3490 Model C2A subsystem
  - o One subsystem ID is assigned, 04
- Model D12, with four 3590 Model B1A drives, not attached to a VT
  - o Four subsystem IDs are assigned, 05, 06, 07 and 08

NOTE: Not all drives will be defined for every host. You will need to determine which drives are attached to the host you are providing the information for.