Preface

Audience

This guide is for Sun StorageTek or customer personnel who are responsible for installing and maintaining VSM4s and VSM5s and the associated software and microcode.
About This Book

*VSM4 and 5 Update Guide* provides update information about the following enhancements to the VSM4 and VSM5:

1. “VTSS Native IP Support” on page 1
2. “Tapeless VSM” on page 35
3. “VSM5 New Models” on page 51
4. “VSM5 ESCON/FICON Configurations” on page 53
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VTSS Native IP Support

The VTSS native IP connection feature lets you use TCP/IP protocol to connect two VTSSs for VTV replication. Each VTSS has IFF3 cards with Ethernet ports for connection to the TCP/IP network. Previously, you were limited to ESCON or FICON connections for replication. Using TCP/IP for CLINKs can provide improved replication performance over ESCON or FICON protocols and, if so desired, allows the existing ESCON or FICON ports to be used exclusively for RTD and host connections.

Native IP applies to only VSM5s. Configuring native IP consists of the following:

- “Satisfying Prerequisites” on page 2
- “The TCP/IP Environment” on page 4
- “Replacing IFF2 Cards with IFF3 Cards” on page 5
- “Configuring the IFF3 IP Addresses” on page 10
- “Configuring VTCS” on page 19

Also see “Changing the IP Address of an IFF3 Card” on page 25 for this procedure.
Satisfying Prerequisites

The following are prerequisites and recommendations for Native IP:

- VTSS microcode level H02.08 (for Models VSM5-45TB-IFF3, VSM5-68TB-IFF3, and VSM5-90TB-IFF3) or D02.08 (for all other models) is required.

- Network Infrastructure Requirements:
  - Gigabit Ethernet protocol is required on all network switches and routers that are directly attached to the IFF3 cards. The IFF3 card will only do speed negotiation to the 1 Gb speed.
  - StorageTek recommends a private Ethernet network for native IP connections.
  - Switches and Routers should support Jumbo(mtu=9000) packets for best performance.
  - Check that you are using the proper Ethernet cables:
    - CAT5 cables and below are not acceptable for GigE transmission from a VTSS.
    - CAT5E cable 90 meters is acceptable if run through a patch panel, 100 meters if straight cable.
    - CAT6 cable 100 meters is acceptable regardless of patch panel configuration.
  - Each VTSS must have installed 4 IFF3 cards, each of which supports a 1 gigabit RJ-45 ethernet connector. Each IFF3 can be configured to support up to 4 IP CLINK connections up to a maximum of 16 IP CLINKs per VTSS. Configurations can also include a mixture of ESCON/FICON and Native IP CLINKs.
  - CDSLEVEL F and above is required, with the following PTFs:
    - For 6.1:
      - L1H14II - SMS6100
      - L1H14IJ - SOS6100
      - L1H14IK - SWS6100
    - For 6.2:
      - L1A00P7 - SMC6200
      - L1H14IM - SMS6200
      - L1H14O2 - SOS6200
      - L1H14IL - SWS6200
    - For 7.0, L1H150G (SES7000)
    - For 7.1, support is included in the base.

Note –

The term “Jumbo" indicates supporting frame sizes greater that 1500 bytes Maximum Transmission Unit (MTU). MTU refers to the number of bytes of the largest protocol data unit (PDU) that a communications protocol layer can pass onwards to the other layers. A higher MTU means better efficiency since each packet carries more user data while protocol overheads (headers, and so forth) remain the same for each packet. So if the link supports larger packets with Jumbo MTU that means higher throughput. To achieve the optimal performance, the transfer of data requires frame sizes greater that 1500. Initially for native IP, it will be using an MTU size of 4880 bytes. To further increase performance the MTU size must increase to 9000 bytes.
The Path Maximum Transmission Unit Discovery (PMTUD) feature is required to let the VTSS IP know if a component in the network infrastructure can or cannot support the greater than 1500 frame size. For a router that does not support Jumbo/PMTUD, VTSS would send the router a Jumbo frame and the router would not let VTSS know that it cannot process that size and the frame would be discarded by the router. If the router supports PMTUD, it returns a message indicating that it cannot process that particular large frame size and VTSS resizes the Jumbo frame into the 1500 bytes (standard) size. The result is that the transmission is successful but at a lower performance. So for VTSS Native IP, the switch/router in the configuration must support JUMBO frames (Ethernet sends frames and IP sends packets) and PMTUD.
The TCP/IP Environment

TCP/IP attached CLINKs perform the same function as FICON or ESCON channel attached CLINKs. TCP/IP CLINKs originate from an Ethernet port on the IFF3 interface card instead of the ESCON or FICON ports on an ICE or VCF channel interface card. The TCP/IP connection is a standard copper Ethernet connector and must be attached either directly to another IFF3 card or a 1 Gb port on an Ethernet switch or router (connections at less than 1 Gb cannot perform replication). 

**FIGURE 1-1** shows Peer VTSSs, each with 3 IFF3 cards. The Ethernet cables from the IFF3 cards attach to Local Area Networks (LANs, one for each VTSS) and the LANs are connected via a Wide Area Network (WAN).

**FIGURE 1-1** The TCP/IP Environment with IFF3 Cards for TCP/IP CLINKs
Replacing IFF2 Cards with IFF3 Cards

**Note** – IF the VSM5 came from factory with IFF3 cards installed skip to step 8

To replace IFF2 Cards with IFF3 cards:

1. Power off the VTSS, disconnect the Fibre Channel cables, and remove the IFF2 cards.
2. Install the new IFF3 cards.

---

**FIGURE 1-2** IFF3 Card

As shown in **FIGURE 1-2**, each IFF3 card has one Ethernet port and one Fibre Channel SFP. **Also note** the **LED Status Indicators**, which are the small white squares above the Ethernet port. The **LEDs** have the following labels in white letters:

- **INT** - Interrupt to PPC440GX (Int 3), which is the LED furthest from the card edge. It comes on when the interrupt asserts, however in normal operation you cannot see it come on, because it is not on long enough.
- **LS2** - Link State 2.
- **LS1** - Link State.
- **ATN** - Activity LED, which is the LED closest to the card edge. It blinks when frames are coming or going.
TABLE 1-1 shows the meaning of the combination of the LS1 and LS2 LEDs.

<table>
<thead>
<tr>
<th>LS1 State</th>
<th>LS2 State</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>No Link</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>100Base-Tx</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>10Base-T</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>1000Base-T</td>
</tr>
</tbody>
</table>

3. Connect the Ethernet cables and Fibre Channel Cables as shown in FIGURE 1-3.

Note that in FIGURE 1-3, the white cables from the wiring harness connect to the Ethernet port on each card, while the black cables connect to the Fibre Channel SFP on each card.
4. Ensure that the VTSS is connected with Ethernet cable to the TCP/IP network via the IFF3 port at the bottom of the frame as shown in FIGURE 1-4.

![IFF3 Ethernet Port for Connection to TCP/IP Network](image)

**FIGURE 1-4** IFF3 Ethernet Port for Connection to TCP/IP Network

5. Power on the VTSS and IML VIP.

6. Upgrade the VTSS microcode to D02.08.00.00.
   
   The '6 MAC Feature' must be enabled before proceeding. This can be checked or enabled using Step 7.

7. Set the '6 MAC feature' in the ACMB Frudata:
   
   a. Select 'Subsystem Debug, Fru ID, ACMB.
      
      If MOD FLAGS=0x04, skip to Step 8. Otherwise, continue with Step b.
   
   b. Set MOD FLAGS to 0x04.
   
   c. Set new MAC address provided with Conversion Bill or from NPDC.
d. Press the 'Continue' button and verify that the new data is recorded.
8. **IML the D02.08.00.00 level VTSS Microcode.**

9. **Ensure that the ClusterVTSS StorageKey is installed.**
   
   For more information, see *VSM5 Installation and Service Guide*, Chapter 1.

10. **Install the IPCluster StorageKey.**
   
   For more information, see *VSM5 Installation and Service Guide*, Chapter 1.

11. **Obtain from the customer/network administrator:**
   
   - IP addresses for Primary and Secondary VTSS - IFF0-3.
   - Gateway addresses (if required) for Primary and Secondary VTSS - IFF0-3.
   - Subnet Mask for Primary and Secondary VTSS - IFF0-3.
   - IFF card Ethernet Port Target Addresses for Primary and Secondary VTSS - IFF0-3.

---

**Note** – For optimum throughput and redundancy, StorageTek recommends the following for Target Addresses:

- Allocate IP addresses to all Targets on all IFF cards. Even if you are not currently using all IFF cards for Native IP replication, this ensures that you have these addresses available for future expansion.

- If each card is on a different physical network, allocate different IP addresses to the same target on different IFF cards. If each IFF card is on the same physical network, you can use the same IP address for the same target on different IFF cards.
Configuring the IFF3 IP Addresses

To configure the VTSSs:

1. From DOP 'Configuration/Status' screen, select 'IFF IP Configuration'.

![Image of Configuration/Status Menu]

- Subsystem Availability
- Subsystem Configuration
- Disk Drive/Array Status
- Real Tape Drive Status
- Access Control
- Ethernet Setup
- DAC State
- FRU Status
- Subsystem Interface Status
- Channel Status
- ISP Information
- Code Versions
- IFF IP Configuration
2. From IFF IP Configuration screen you will configure each IFF card: IP address, Gateway Address, Subnet Mask, and Secondary Target IPs. You can also view the MAC Address assigned to each IFF ethernet port.

### IFF IP Configuration Status

<table>
<thead>
<tr>
<th>IFF</th>
<th>IP Address</th>
<th>Gateway Address</th>
<th>Subnet Mask</th>
<th>MAC Address</th>
<th>Target 0 (IFF 0A.0)</th>
<th>Target 1 (IFF 0A.1)</th>
<th>Target 2 (IFF 0A.2)</th>
<th>Target 3 (IFF 0A.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFF 0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>255.255.255.0</td>
<td>00:10:4F:00:47:A7</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>IFF 1</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>00:10:4F:00:47:B0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>IFF 2</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>00:10:4F:00:47:B1</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>IFF 3</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>00:10:4F:00:47:B2</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
<td>0.0.0.0</td>
</tr>
</tbody>
</table>
3. Hover the cursor over the IFF0 IP Address field to modify (field will highlight) and left click mouse.

This will bring up the data entry screen for IP Address. Fill in the IP address using the customer supplied IP then hit the Continue button. You will get a screen showing Success or Failure. Hit Continue button to take you back to the IFF IP Configuration screen for next entry.
The IFF IP configuration was successfully updated

OR
4. Hover the cursor over the Gateway Address field to modify (field will highlight) and left click mouse.

This will bring up the data entry screen for Gateway Address. Fill in the Gateway address using the customer supplied IP then hit the Continue button. You will get a screen showing Success or Failure. Hit Continue button to take you back to the IFF IP Configuration screen for next entry.
5. Hover the cursor over the Subnet Address field to modify (field will highlight) and left click mouse.

This will bring up the data entry screen for Subnet Address. Fill in the Subnet address using the customer supplied IP then hit the Continue button. You will get a screen showing Success or Failure. Hit Continue button to take you back to the IFF IP Configuration screen for next entry.
6. Hover the cursor over the Subnet Address field to modify (field will highlight) and left click mouse.

This will bring up the data entry screen for Subnet Address. Fill in the Subnet address using the customer supplied IP then hit the Continue button. You will get a screen showing Success or Failure. Hit Continue button to take you back to the IFF IP Configuration screen for next entry.
7. Hover the cursor over the Target Address field to modify (field will highlight) and left click mouse.
   This will bring up the data entry screen for Target Address. Fill in the Target address using the customer supplied IP then hit the **Continue** button. You will get a screen showing Success or Failure.

8. Hover the cursor over the Target Address field to modify (field will highlight) and left click mouse.
   This will bring up the data entry screen for Target Address. Fill in the Target address using the customer supplied IP then hit the **Continue** button. You will get a screen showing Success or Failure.

   If the Source and Target are fully cabled you can use the “Validate” button to send a test to the Target. If the validate is successful you will get a screen display showing the Target's Family ID and Serial Number. If the Validate is not successful you will get a message indicating to check Hic_Stat for failing FSC.

   Hit **Continue** button to take you back to the IFF IP Configuration screen for next entry. Repeat for Target 1, 2, and 3.
9. Repeat Step 3 through Step 8 for IFF1, IFF2, IFF3.

10. Repeat Step 1 through Step 9 for Secondary VTSS unit.
Configuring VTCS

CONFIG Utility Changes

The CONFIG CLINK statement now provides for two types of VTSS-to-VTSS connections via the following parameters:

CLINK CHANIF=nn or nn:n

existing parameter; allows connection of two FICON (or ESCON) ports.

CLINK IPIF=nn:n

new parameter; allows Ethernet connection of two Native IP ports, where the nn:n values are shown in parentheses before each Target IP Address on the IFF IP Configuration Status screen for each IFF ethernet port (see Step 2 on page 11).

For example, IPIF=0A:0 corresponds to the IP address for Target 0 on IFF0.

**Note** – CLINK statement must contain either the CHANIF or the IPIF parameter, but not both.
Example: Clustered VTSS with TCP/IP CLINKs

**FIGURE 1-5** shows an example of a Clustered VTSS configuration with TCP/IP CLINKs.

![Bi-Directional Clustered VTSS](image)

**FIGURE 1-5**  Clustered VTSS with TCP/IP IP CLINKs
In FIGURE 1-5 on page 20, assume that initially you will only use IFF0 on each VTSS for Native IP replication. In this situation, you would allocate all IP addresses for all Targets on all IFF cards, but would only code IPIF parameters for the four Targets on IFF0, as shown in TABLE 1-2 and TABLE 1-3.

<table>
<thead>
<tr>
<th>IFF0 Target Number</th>
<th>Example IP</th>
<th>Corresponding CLINK IPIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target 0</td>
<td>128.0.1.1</td>
<td>0A:0</td>
</tr>
<tr>
<td>Target 1</td>
<td>128.0.2.1</td>
<td>0A:1</td>
</tr>
<tr>
<td>Target 2</td>
<td>128.0.3.1</td>
<td>0A:2</td>
</tr>
<tr>
<td>Target 3</td>
<td>128.0.4.1</td>
<td>0A:3</td>
</tr>
</tbody>
</table>

TABLE 1-3  CLINK IPIF Values for IFF0, VSMPR2

<table>
<thead>
<tr>
<th>IFF0 Target Number</th>
<th>Example IP</th>
<th>Corresponding CLINK IPIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target 0</td>
<td>128.0.1.2</td>
<td>0A:0</td>
</tr>
<tr>
<td>Target 1</td>
<td>128.0.2.2</td>
<td>0A:1</td>
</tr>
<tr>
<td>Target 2</td>
<td>128.0.3.2</td>
<td>0A:2</td>
</tr>
<tr>
<td>Target 3</td>
<td>128.0.4.2</td>
<td>0A:3</td>
</tr>
</tbody>
</table>

FIGURE 1-6 shows example CONFIG JCL to define the configuration shown in FIGURE 1-5 on page 20 with the values shown in TABLE 1-2 and TABLE 1-3.
FIGURE 1-6  CONFIG example: Clustered VTSS with TCP/IP CLINKs

//CREATECF EXEC PGM=SLUADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SEALINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMULT.DBASESEC,DISP=SHR
//SSLSTBY DD DSN=FEDB.VSMULT.DBASETBY,DISP=SHR
//SLSPRINT DD SYSTOUT=*  
//SLSIN DD *

CONFIG CDSLEVEL(V61ABOVE)
GLOBAL MAXVTV=32000 MVCFREE=40 VTVATTR=SCRATCH RECALWER=YES
LOCKSTR=VTCS_LOCKS REPLICA=ALWAYS VTVPAGE=LARGE INITMVC=YES
SYNCHREP=YES MAXRTDS=16 FASTMIGR=YES
RECLAIM THRESHLD=70 MAXMVC=40 START=35

VTSS NAME=VSMPR1 LOW=70 HIGH=80 MAXMIG=8 MINMIG=4 RETAIN=5
  RTD NAME=VPR12A00 DEVNO=2A00 CHANIF=0C:0
  RTD NAME=VPR12A01 DEVNO=2A01 CHANIF=0C:1
  RTD NAME=VPR12A02 DEVNO=2A02 CHANIF=0C:2
  RTD NAME=VPR12A03 DEVNO=2A03 CHANIF=0C:3
  RTD NAME=VPR12A04 DEVNO=2A04 CHANIF=0G:0
  RTD NAME=VPR12A05 DEVNO=2A05 CHANIF=0G:1
  RTD NAME=VPR12A06 DEVNO=2A06 CHANIF=0G:2
  RTD NAME=VPR12A07 DEVNO=2A07 CHANIF=0G:3

VTD LOW=9900 HIGH=99FF
VTSS NAME=VSMPR2 LOW=70 HIGH=80 MAXMIG=8 MINMIG=4 RETAIN=5
  RTD NAME=VPR22B00 DEVNO=2B00 CHANIF=0C:0
  RTD NAME=VPR22B01 DEVNO=2B01 CHANIF=0C:1
  RTD NAME=VPR22B02 DEVNO=2B02 CHANIF=0C:2
  RTD NAME=VPR22B03 DEVNO=2B03 CHANIF=0C:3
  RTD NAME=VPR22B04 DEVNO=2B04 CHANIF=0G:0
  RTD NAME=VPR22B05 DEVNO=2B05 CHANIF=0G:1
  RTD NAME=VPR22B06 DEVNO=2B06 CHANIF=0G:2
  RTD NAME=VPR22B07 DEVNO=2B07 CHANIF=0G:3

VTD LOW=9900 HIGH=99FF
CLUSTER NAME=CLUSTER1 VTSSs(VSMPR1,VSMPR2)
  CLINK VTSS=VSMPR1 IPIF=0A:0
  CLINK VTSS=VSMPR1 IPIF=0A:1
  CLINK VTSS=VSMPR1 IPIF=0A:2
  CLINK VTSS=VSMPR2 IPIF=0A:0
  CLINK VTSS=VSMPR2 IPIF=0A:1
  CLINK VTSS=VSMPR2 IPIF=0A:2
  CLINK VTSS=VSMPR2 IPIF=0A:3
Other VTCS Changes

DECOM
The **DECOM** utility now outputs the IPIF parameter of the CLINK statement if the CLINK is on a Native IP interface.

DISPLAY CLINK

The **DISPLAY CLINK** command now displays the CLINK interface address with a prefix to show whether the CLINK is on an IP or FICON interface. For example:

```
SLS6603I Clink information: 141
VTSS     Id  IF    Status    Usage        Host
VTSS0001 00 C0M:0  Online    Free
          01 C1M:0  Online    Free
VTSS0002 00 C0M:1  Online    Free
          01 C0M:1  Online    Free
          02 I0A:3  Online    Free
          03 I1I:2  Online    Free
SLS5013I Command completed (0)
```

DISPLAY VTSS DETAIL

**DISPLAY VTSS DETAIL** displays if the VTSS supports IP replication over IP.

XML Processing

A new tag `<ipif_id>` displays the interface address of a CLINK attached to an IP interface.
Messages

The following messages are updated.

SLS6751I
CLINK CLINKID ON VTSS XXXXXXXX iftype ifaddr RETURNED ECAM ERROR CC=CCC RC=RRRRRRRR

SLS6754I
CLINK CLINKID iftype ifaddr XXXXXXXX FAILED TO DISMOUNT VTV VVVVVV

SLS6755I
CONFIGURING CLINK CLINKID iftype Ifaddr VTSS XXXXXXXX

SLS6756E
CLINK CLINKID iftype ifaddr VTSS XXXXXXXX CONFIGURATION MISMATCH ifid1:ifid2 ifaddr1:ifaddr2

SLS6757I
CLINK CLINKID iftype ifaddr VTSS XXXXXXXX FAILED INITIAL CONFIGURATION WITH CC=CCC RC=RRRRRR

SLS6758I
CLINK CLINKID iftype ifaddr VTSS XXXXXXXX FAILED TO REPLICATE VTV VVVVVV

SLS6759I
CLINK CLINKID iftype ifaddr VTSS XXXXXXXX NOW ONLINE:
Changing the IP Address of an IFF3 Card

As an example, the following procedure changes the IP address of Target 0 on IFF 3 from 10.80.38.6 to 10.80.38.5. **Note that** this changes **only** the IP address; it is not necessary to update the CONFIG CLINK statement that corresponds to this IP address.
To change the IP address of an IFF3 card:

1. From DOP 'Configuration/Status' screen, select 'IFF IP Configuration'.
2. The following shows the IFF IP Configuration screen with Target 0 on IFF 3 initially set to 10.80.38.6.

![IFF IP Configuration Screen](image)

<table>
<thead>
<tr>
<th>IFF 1</th>
<th>IFF 2</th>
<th>IFF 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IP Address</strong>: 10.80.41.5</td>
<td><strong>IP Address</strong>: 10.80.41.253</td>
<td><strong>IP Address</strong>: 10.80.41.3</td>
</tr>
<tr>
<td><strong>Gateway Address</strong>: 0.0.0.0</td>
<td><strong>Gateway Address</strong>: 10.80.41.253</td>
<td><strong>Gateway Address</strong>: 10.80.41.253</td>
</tr>
<tr>
<td><strong>Subnet Mask</strong>: 255.255.255.0</td>
<td><strong>Subnet Mask</strong>: 255.255.255.0</td>
<td><strong>Subnet Mask</strong>: 255.255.255.0</td>
</tr>
<tr>
<td><strong>MAC Address</strong>: 00:10:4E:08:AE:4D</td>
<td><strong>MAC Address</strong>: 00:10:4E:08:AE:4D</td>
<td><strong>MAC Address</strong>: 00:10:4E:08:AE:4D</td>
</tr>
<tr>
<td><strong>Target 0 (IPIF 0A:0)</strong>: 10.80.41.6</td>
<td><strong>Target 0 (IPIF 01C):</strong>: 10.80.38.0</td>
<td><strong>Target 0 (IPIF 1LC):</strong>: 10.80.38.6</td>
</tr>
<tr>
<td><strong>Target 1 (IPIF 0A:1)</strong>: 10.80.41.7</td>
<td><strong>Target 1 (IPIF 01A):</strong> 10.80.38.7</td>
<td><strong>Target 1 (IPIF 11A):</strong>: 10.80.38.7</td>
</tr>
<tr>
<td><strong>Target 2 (IPIF 0A:2)</strong>: 0.0.0.0</td>
<td><strong>Target 2 (IPIF 01B):</strong> 0.0.0.0</td>
<td><strong>Target 2 (IPIF 11B):</strong>: 0.0.0.0</td>
</tr>
<tr>
<td><strong>Target 3 (IPIF 0A:3)</strong>: 0.0.0.0</td>
<td><strong>Target 3 (IPIF 01C):</strong> 0.0.0.0</td>
<td><strong>Target 3 (IPIF 11C):</strong>: 0.0.0.0</td>
</tr>
</tbody>
</table>
3. Change Target 0 on IFF 3 to 0.0.0.0 as shown below.
4. The IP Address of IFF 3 is initially set to 10.80.38.6 as shown below.
5. Change the IP Address of IFF 3 to 0.0.0.0 as shown below.

<table>
<thead>
<tr>
<th>Status</th>
<th>IP Address</th>
<th>S/N</th>
<th>Master ISP</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFF 1</td>
<td>10.80.36.0</td>
<td>0667-000200028</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>10.80.38.253</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.80.41.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.80.41.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.80.41.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| IFF 2  | 10.80.36.7 | 0667-000200028 | 0         |
|        | 10.80.38.253 |       |            |
|        | 10.80.41.7 |       |            |
|        | 10.80.41.7 |       |            |
|        | 10.80.41.7 |       |            |

| IFF 3  | 0.0.0.0    | 0667-000200028 | 0         |
|        | 10.80.38.253 |       |            |
|        | 10.80.41.8 |       |            |
|        | 10.80.41.8 |       |            |
|        | 10.80.41.8 |       |            |
6. Change the IP address of the IFF3 card from 0.0.0.0 to 10.80.38.5, as shown below.
7. Change Target 0 on IFF 3 from 0.0.0.0 to 10.80.38.5 as shown below.
8. For the target just changed, press the “Validate” button.
9. You should get a confirmation message as shown below.

```
Request for IFF IP path validation for IFF 3 Target 0 successfully completed to 0567-00200028
```

Continued
Tapeless VSM

“Tapeless VSM” basically means that you can have a VTSS without any RTDs directly attached to the VTSS; in the CONFIG deck, there are no RTD statements for the tapeless VTSS. Tapeless VSM applies to VSM4s and VSM5s with the following PTFs installed:

- For 6.2:
  - L1H14XS - SMS6200
  - L1H14XT - SOS6200
  - L1H14Y7 - SWS6200
- For 7.0, L1H150Z - SES7000
How Does Tapeless VSM Work?

Configuring and managing a Tapeless VSM works as follows:

1. In the CONFIG deck, there are no RTD statements for the Tapeless VTSS.

**Note** – For clustered VTSS configurations, all VTSSs in the cluster must be Tapeless or all VTSSs in the cluster must have RTDs attached. You **cannot** mix Tapeless VTSSs and VTSSs with RTDs attached within a cluster.

2. The new MGMTCLAS NOMIGRAT parameter specifies that VTVs in the Management Class are **not** candidates for migration, consolidation or export, but are candidates to reside on a tapeless VTSS.

   VTSS selection is changed to prefer Tapeless VTSSs for VTVs in Management Classes with NOMIGRAT, and to disallow VTVs without NOMIGRAT from VTSSs with no RTDs.

   NOMIGRAT parameter is mutually exclusive with the ACSLIST, IMMEDMIG, DUPLEX, MIGPOL, ARCHAGE, ARCHPOL, RESTIME, CONSRC and CONTGT parameters.

3. A Management Class can specify DELSCR (YES), which is a proactive method to cause VSM to delete scratched VTVs, which frees VTSS buffer space and (logically) deletes any VTV copies from MVCs so that MVC space can be reclaimed. As an alternative, you can specify DELSCR (NO) and use the DELETSCR utility (which now provides a VTSS parameter to scratch VTVs on a per VTSS basis) to do demand deletes of scratched VTVs.

For two sample configurations, see:

- “Example 1: Mixed Tapeless VSM” on page 37
- “Example 2: Mixed Tapeless VSM with CTR” on page 41

**Note** – If you have an environment that is completely Tapeless (no RTDs attached to any VTSS system), then in your LIBGEN you need to code a dummy ACS as shown in the example in “LIBGEN Example for Tapeless ACS” on page 48.
Example 1: Mixed Tapeless VSM

FIGURE 2-1 shows two VTSSs (VTSS1 and VTSS2) where VTSS1 has no RTDs attached.
Configuring the System

To configure the example CTR system shown in FIGURE 2-1 on page 37, do the following:

1. Code a CONFIG deck as shown in FIGURE 2-2.

In this figure, note that there are no RTD statements for VTSS1 because it is Tapeless.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEDPLIB DD DSN=h1g.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//SLSPRINT DD SYSOUT=* 
//SLSIN DD *

CONFIG RESET CDSLEVEL(V62ABOVE)
GLOBAL MAXVTV=32000 MVCFREE=40 VTVCNTL=SCRATCH RECALWER=YES LOCKSTR=VTCS_LOCKS
REPLICAT=CHANGED VTVPAGE=LARGE MAXRTDS=32
RECLAIM THRESHLD=70 MAXMVC=40 START=35
VTTVOL LOW=905000 HIGH=999999 SCRATCH
VTTVOL LOW=900000 HIGH=925000 SCRATCH
VTTVOL LOW=RMM0000 HIGH=RMM0200 SCRATCH
MVCVOL LOW=N25980 HIGH=N25989
MVCVOL LOW=N35000 HIGH=N35999
VTSS NAME=VTSS1
VTD LOW=8900 HIGH=89FF
VTSS NAME=VTSS2 LOW=70 HIGH=80 MAXMIG=8 MINMIG=4 RETAIN=5
RTD NAME=VPR22B00 DEVNO=2B00 CHANIF=0C:0
RTD NAME=VPR22B01 DEVNO=2B01 CHANIF=0C:1
RTD NAME=VPR22B02 DEVNO=2B02 CHANIF=0C:2
RTD NAME=VPR22B03 DEVNO=2B03 CHANIF=0C:3
RTD NAME=VPR22B04 DEVNO=2B04 CHANIF=0C:0
RTD NAME=VPR22B05 DEVNO=2B05 CHANIF=0C:1
RTD NAME=VPR22B06 DEVNO=2B06 CHANIF=0C:2
RTD NAME=VPR22B07 DEVNO=2B07 CHANIF=0C:3
RTD NAME=VPR22B08 DEVNO=2B08 CHANIF=0K:0
RTD NAME=VPR22B09 DEVNO=2B09 CHANIF=0K:1
RTD NAME=VPR22B0A DEVNO=2B0A CHANIF=0K:2
RTD NAME=VPR22B0B DEVNO=2B0B CHANIF=0K:3
RTD NAME=VPR23B00 DEVNO=3B00 CHANIF=1C:0
RTD NAME=VPR23B01 DEVNO=3B01 CHANIF=1C:1
RTD NAME=VPR23B02 DEVNO=3B02 CHANIF=1C:2
RTD NAME=VPR23B03 DEVNO=3B03 CHANIF=1C:3
RTD NAME=VPR23B04 DEVNO=3B04 CHANIF=1G:0
RTD NAME=VPR23B05 DEVNO=3B05 CHANIF=1G:1
RTD NAME=VPR23B06 DEVNO=3B06 CHANIF=1G:2
RTD NAME=VPR23B07 DEVNO=3B07 CHANIF=1G:3
RTD NAME=VPR23B08 DEVNO=3B08 CHANIF=1K:0
RTD NAME=VPR23B09 DEVNO=3B09 CHANIF=1K:1
RTD NAME=VPR23B0A DEVNO=3B0A CHANIF=1K:2
RTD NAME=VPR23B0B DEVNO=3B0B CHANIF=1K:3
VTD LOW=9900 HIGH=99FF
```

FIGURE 2-2 CONFIG example: Mixed Tapeless VSM
## Defining Policies

To define policies for the example system shown in FIGURE 2-1 on page 37, do the following:

1. Enable the Advanced Management Feature.

2. Create the Storage Classes for VTSS2.

   ```
   STOR NAME(REMOTE1)
   STOR NAME(REMOTE2)
   ```

   **FIGURE 2-3** VTSS2 Storage Classes

3. Create the Management Classes that point to the Storage Classes in Step 2.

   ```
   MGMT NAME(REM1) STOR(REMOTE1) DELSCR(YES)
   MGMT NAME(REM2) STOR(REMOTE2) DELSCR(YES)
   MGMT NAME(TAPEL) NOMIGRAT DELSCR(YES)
   ```

   **FIGURE 2-4** Management Classes

   In **FIGURE 2-4** we created two Management Classes which point to the corresponding Storage Classes created in Step 2. Note that we also created a “Tapeless” Management Class for VTVs that permanently reside on VTSS1 or VTSS2.

   **Note** — Each Management Class in **FIGURE 2-4** specifies `DELSREC(YES)`, which is a proactive method to cause VSM to delete scratched VTVs, which frees VTSS buffer space and (logically) deletes any VTV copies from MVCs so that MVC space can be reclaimed. As an alternative, you can specify `DELSREC(NO)` and use the `DELETSCR` utility (which now provides a VTSS parameter to scratch VTVs on a per VTSS basis) to do demand deletes of scratched VTVs.

4. Create SMC Policies that specify virtual media and assign the Management Classes created in Step 2.

   ```
   POLICY NAME(PPAY) MEDIA(VIRTUAL) MGMT(REM1)
   POLICY NAME(PTEST) MEDIA(VIRTUAL) MGMT(REM2)
   POLICY NAME(PTAPEL) MEDIA(VIRTUAL) MGMT(TAPEL)
   ```
5. Create **TAPEREQ** statements to route three types of critical data to VSM and assign corresponding Policies to the data.

```
TAPEREQ DSN(*.PAYROLL.**) POLICY(REM1)
TAPEREQ DSN(*.TEST.**) POLICY(REM2)
TAPEREQ DSN(*.HR.**) POLICY(PTAPEL)
```

**FIGURE 2-5**  TAPEREQ Statement to Route Data, Assign Policies

In **FIGURE 2-5**, the TAPEREQ statement specifies:

> Route data sets with HLQ mask *.PAYROLL.** to VSM and assign Policy PPAY.
> Route data sets with HLQ mask *.TEST.** to VSM and assign Policy PTEST.
> Route data sets with HLQ mask *.HR.** to VSM and assign Policy PTEST.

**Note** — **Also note** the following:

> Although you can use SMC policies to direct your migrations to a specific esoteric, Sun StorageTek recommends using only **MGMTCLAS** so that the SMC/VTCS allocation influencing can use any VTSS that supports the **MGMTCLAS** requirements.
> You can use the **EEXPORT** command to do manual CTR. For more information, see **SMC/HSC/VTCS Command, Control Statement, and Utility Reference**.

6. **Check your SYS1 PARMLIB options to ensure that subtype 28 records are enabled.**

If enabled, VTSS writes a subtype 28 record that includes the target VTSS name for each CTR event.
Example 2: Mixed Tapeless VSM with CTR

FIGURE 2-6 shows an example of a Cross-Tapeplex Replication (CTR) Configuration with Tapeless VSM. In this system, VTSSs VMSPA1 and VSMPA2 reside in TapePlex TMVSA and have “partner” CLINKS to VTSS VSMPA3 in TapePlex TMVSB. VTVs replicated to VSMPA3 are now resident in TMVSB’s CDS, as are the MVCs to which the VTVs are subsequently migrated. That is, VTVs are replicated across TapePlexes, then migrated locally. VTSSs in the sending TapePlex (which are Tapeless) cannot have connections to RTDs in the receiving TapePlex.

Note – The following example shows a uni-directional cross-tapeplex replication. To do a bi-directional cross-tapeplex replication, you simply define the configuration and SMC client/server control statements the same way on both tapeplexes. Note that a single tapeplex can also receive VTVs from multiple other tapeplexes. To define a configuration where one tapeplex is receiving data from multiple other tapeplexes, you simply add additional tapeplex names to the CONFIG of TMVSB.

FIGURE 2-6  CTR Tapeless Configuration
Configuring and Starting the System

To configure and start the example CTR system shown in FIGURE 2-6 on page 41, do the following:

1. Ensure that your system has the Clustered VTSS prerequisites.

2. Start the HTTP server under the SMC running on TMVSB.
   You may want to do this in your SMC CMDS file. For example:
   
   ```
   HTTP START PORT(999)
   ```

3. Define your TAPEPLEX and SERVER commands on TMVSA.
   Again, you may want to do this in your SMC CMDS file. For example:
   
   ```
   TAPEPLEX NAME(TMVSA) LOCSUB(HSCA)
   TAPEPLEX NAME(TMVSB)
   SERVER NAME(REMB) TAPEPLEX(TMVSB) HOSTNAME(TMVSB) PORT(999)
   ```

   **Note** – VTCS uses the services of the SMC TCP/IP feature to send metadata between the TapePlexes.

4. Code a CONFIG deck for TapePlex A, as shown in FIGURE 2-7 on page 43.
   In this figure, note:
   - The TAPEPLEX statement, which defines this TapePlex and the receiving TapePlex
   - The CLINK statements:
     - Define the CLINKs that are used for CTR from VSMPA1 to VSMPA3 and from VSMPA2 to VSMPA3.
     - Include a REMPLEX parameter that specify that VSMPA3 is part of TMVSB.
     - The Conditional Replication setting on the CONFIG GLOBAL statement is CHANGED for TMVSA.
   - There are no RTD statements for VSMPA1 and VSMPA2 because they are Tapeless.

5. Code a CONFIG deck for TapePlex B, as shown in FIGURE 2-8 on page 44.
   In this figure, note:
   - The TAPEPLEX statement does not include a RECVPLEX parameter because TMVSB only receives VTVs from TMVSA.
   - There are no CLINK statements, because the CLINKs are defined in the CONFIG deck for TMVSA.
//CREATECFG EXEC PGM=SLUADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SEALINK,DISP=SHR
//SLSCNTL DD DSN=hlq.TMVSA.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=hlq.TMVSA.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=hlq.TMVSA.DBASESBY,DISP=SHR
//SLSPRINT DD SYSOUT=* 
//SLSIN DD *
CONFIG RESET CDSLEVEL(V62ABOVE) 
GLOBAL MAXVTV=65000 MVCFREE=60 VTVATTR=SCRATCH RECALWER=YES 
LOCKSTR=STK_VTCS_LOCKS VTVPAGE=LARGE REPLICAT=CHANGED 
RECLAIM THRESHLD=70 MAXMVC=30 START=40 CONMVC=5 
TAPEPLEX THISPLEX=TMVSA 
VTSS NAME=VSMPA1 
VTD LOW=7900 HIGH=79FF 
VTSS NAME=VSMPA2 
VTD LOW=8900 HIGH=89FF 
CLINK VTSS=VSMPA1 CHANIF=OG REMPLEX=TMVSB PARTNER=VSMPA3 
CLINK VTSS=VSMPA1 CHANIF=00 REMPLEX=TMVSB PARTNER=VSMPA3 
CLINK VTSS=VSMPA2 CHANIF=00 REMPLEX=TMVSB PARTNER=VSMPA3 
CLINK VTSS=VSMPA2 CHANIF=00 REMPLEX=TMVSB PARTNER=VSMPA3

FIGURE 2-7  CONFIG for Tapeless CTR Example - TapePlex TMVSA
FIGURE 2-8  CONFIG for Tapeless CTR Example - TapePlex TMVSB

//CREATCFG EXEC PGM=SLUADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SEALINK,DISP=SHR
//SLSCNTL DD DSN=hlq.TMVSB.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=hlq.TMVSB.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=hlq.TMVSB.DBASESBY,DISP=SHR
//SLSPRINT DD SYSOUT=*  
//SLSIN DD  
CONFIG RESET CDSLEVEL(V62ABOVE)
GLOBAL MAXVTV=65000 MVCFREE=60 VTVATTR=SCRATCH RECALWER=YES
LOCKSTR=STK_VTCS_LOCKS VTVPAGE=LARGE
RECLAIM THRESHLD=70 MAXMVC=30 START=40 CONMVC=5
TAPEPLEX THISPLEX=TMVSB RECVPLEX=TMVSA
VTSS NAME=VSMPA3 LOW=70 HIGH=80 MAXMIG=8 MINMIG=4 RETAIN=5
RTD  NAME=PA33A00 DEVNO=3A00 CHANIF=0C
RTD  NAME=PA33A01 DEVNO=3A01 CHANIF=0D
RTD  NAME=PA33A02 DEVNO=3A02 CHANIF=0K
RTD  NAME=PA33A03 DEVNO=3A03 CHANIF=0L
RTD  NAME=PA34A08 DEVNO=4A08 CHANIF=1C
RTD  NAME=PA34A09 DEVNO=4A09 CHANIF=1D
RTD  NAME=PA34A0A DEVNO=4A0A CHANIF=1K
RTD  NAME=PA34A0B DEVNO=4A0B CHANIF=1L
? Defining Policies

? Policies for the Sending TapePlex

To define policies for the sending TapePlex (TMVSA) of the example CTR system shown in FIGURE 2-6 on page 41, do the following:

1. Enable the Advanced Management Feature.

2. For TMVSA, code VTSSLST statements that select only VSMPA1 or VSMPA2.

   \[
   \begin{align*}
   &\text{VTSSLST NAME(1ONLY) VTSS(VSMPA1) PRI(9)} \\
   &\text{VTSSLST NAME(2ONLY) VTSS(VSMPA2) PRI(9)}
   \end{align*}
   \]

   FIGURE 2-9 TMVSA VTSSLST Statements

3. For TMVSA, create the Storage Classes for the CTR Storage Classes.

   \[
   \begin{align*}
   &\text{STOR NAME(EEPA1) TAPEPLEX(TMVSB) FROMLST(1ONLY)} \\
   &\text{STOR NAME(EEPA2) TAPEPLEX(TMVSB) FROMLST(2ONLY)}
   \end{align*}
   \]

   FIGURE 2-10 TMVSA Storage Classes

   In FIGURE 2-10, the STORclas statements define Storage Classes EEPA1 and EEPA2, which specify the receiving TapePlex (TMVSB), and a list of the sending VTSSs (FROMLST, which points to a VTSSLST statement). In this case, we wrote a VTSSLST statement that restricts each Storage Class to export from a single VTSS (VSMPA1 for EEPA1, and VSMPA2 for EEPA2). This way, we have a separate Storage Class for the exported VTVs from each VTSS. Note that each Storage Class points to its corresponding VTSSLST statement from Step 2.

4. Create the Management Classes that point to the Storage Classes in Step 3.

   \[
   \begin{align*}
   &\text{MGMT NAME(REMEX1) EEXPOL(EEPA1) DELSCR(YES)} \\
   &\text{MGMT NAME(REMEX2) EEXPOL(EEPA2) DELSCR(YES)} \\
   &\text{MGMT NAME(TAPEL) NOMIGRAT DELSCR(YES)}
   \end{align*}
   \]

   FIGURE 2-11 Management Classes for Replication

   In FIGURE 2-11 we created two Management Classes, one for VSMPA1 and one for VSMPA2, which point to the corresponding Storage Classes created in Step 3. Note that we also created a “Tapeless” Management Class for VTs that permanently reside on VSMPA1 or VSMPA2.

   **Note** – Each Management Class in FIGURE 2-11 specifies DELSCR(YES), which is a proactive method to cause VSM to delete scratched VTVs, which frees VTSS buffer space and (logically) deletes any VTV copies from MVCs so that MVC space can be reclaimed. As an alternative, you can specify DELSCR(NO) and use the DELETSCR utility (which now provides a VTSS parameter to scratch VTVs on a per VTSS basis) to do demand deletes of scratched VTVs.
5. Create SMC Policies that specify virtual media and assign the Management Classes created in Step 3.

```
POLICY NAME(PPAY) MEDIA(VIRTUAL) MGMT(REMEX1)
POLICY NAME(PTEST) MEDIA(VIRTUAL) MGMT(REMEX2)
POLICY NAME(PTAPEL) MEDIA(VIRTUAL) MGMT(TAPEL)
```

6. Create TAPEREQ statements to route three types of critical data to VSM and assign corresponding Policies to the data.

```
TAPEREQ DSN(*.PAYROLL.**) POLICY(PPAY)
TAPEREQ DSN(*.TEST.**) POLICY(PTEST)
TAPEREQ DSN(*.HR.**) POLICY(PTAPEL)
```

**FIGURE 2-12** TAPEREQ Statement to Route Data, Assign Policies

In **FIGURE 2-12**, the TAPEREQ statement specifies:

- Route data sets with HLQ mask *PAYROLL.* to VSM and assign Policy PPAY.
- Route data sets with HLQ mask *TEST.* to VSM and assign Policy PTEST.
- Route data sets with HLQ mask *HR.* to VSM and assign Policy PTEST.

**Note** — Also note the following:

- Although you can use SMC policies to direct your CTRs to a specific esoteric, Sun StorageTek recommends using only MGMTCLAS so that the SMC/VTCS allocation influencing can use any VTSS that supports the MGMTCLAS requirements.
- You can use the EEXPORT command to do manual CTR. For more information, see SMC/HSC/VTCS Command, Control Statement, and Utility Reference.

7. Check your SYS1 PARMLIB options to ensure that subtype 28 records are enabled.

If enabled, VTSS writes a subtype 28 record that includes the target VTSS name for each CTR event.
Policies for the Receiving TapePlex

To define policies for the receiving TapePlex (TMVSB) of the example CTR system shown in FIGURE 2-6 on page 41, do the following:

1. Enable the Advanced Management Feature.

2. Ensure that your POOLPARM/VOLPARM statements include the VTV volser that are received from TMVSA.

Modify your POOLPARM/VOLPARM parameters to include the range of VTVs that will be replicated from tapeplex TMVSA. In order to ensure that these volumes are never selected as scratch volumes by TMVSB, Sun recommends that you specify both a “dummy” scratch subpool name as well as a “dummy” host ID. For example:

```
POOLPARM NAME(FROMTMVSA) TYPE(SCRATCH) HOSTID(NOSCRTCH)
VOLPARM VOLSER(A10000-A19999) MEDIA(VIRTUAL)
```

3. For TMVSB, create the Storage Classes for local migration.

```
STOR NAME(TMVS1A) ACS(00) MEDIA(STK1R)
STOR NAME(TMVS2A) ACS(00) MEDIA(STK1R)
```

FIGURE 2-13 Storage Classes for Local and Remote Migrated VTVs

In FIGURE 2-10, the STORclas statements define Storage Classes TMVS1A and TMVSA2 for local migration. The Storage Class names allow us to segregate this work from the TMVSB local work.

4. Create the Management Classes that point to the Storage Classes in Step 3.

```
MGMT NAME(REMEX1) MIGPOL(TMVS1A) DELSCR(YES)
MGMT NAME(REMEX2) MIGPOL(TMVS2A) DELSCR(YES)
```

FIGURE 2-14 Management Classes for Replication

Note that we are using the same Management Class names that we used on TMVSA (these Management Classes are specified in the VTV metadata that is sent from the VTSS on TMVSA), but we reference the Storage Classes for local migration. The definitions of the Management and Storage Classes on TMVSB can use any parameters including EEXPOL to replicate to a third TapePlex.

Note – Each Management Class in FIGURE 2-14 specifies DELSCR (YES), which is a proactive method to cause VSM to delete scratched VTVs, which frees VTSS buffer space and (logically) deletes any VTV copies from MVCs so that MVC space can be reclaimed. As an alternative, you can specify DELSCR (NO) and use the DELETSCR utility (which now provides a VTSS parameter to scratch VTVs on a per VTSS basis) to do demand deletes of scratched VTVs.
LIBGEN Example for Tapeless ACS

FIGURE 2-15 and FIGURE 2-16 on page 49 show a LIBGEN example for a Tapeless ACS, where the SLISTATN ADDRESS=(0032) statement denotes a dummy ACS.

* LABELS WILL BE GENERATED IN THE OUTPUT LIBGEN AS FOLLOWS:
* ACS - "ACSXX" WHERE "XX" IS THE HEX ACS NUMBER 00-FF
  STARTING WITH ZERO
* LSM - "LSMXXYY" WHERE "XX" IS THE HEX ACS NUMBER OF THIS LSM
  AND "YY" IS THE HEX LSM NUMBER (00-FF) IN THAT
  ACS, STARTING AT ZERO FOR EACH NEW ACS
* STATION - "STXXH" WHERE "XX" IS THE HEX ACS NUMBER AND H IS THE
  HOST INDEX IN HEX (0-F)
* PANEL - "PXXYYPP" WHERE "XX" IS THE HEX ACS NUMBER, YY IS THE HEX
  LSM NUMBER, AND PP IS THE DECIMAL PANEL NUMBER
  OF THE DRIVE PANEL
* DRIVE - "DXXYYPPH" WHERE "XX" IS THE HEX ACS NUMBER, YY IS THE HEX
  LSM NUMBER, PP IS THE DRIVE PANEL NUMBER IN DEC
  AND H IS THE HOST INDEX IN HEX
* LIBGEN SLIRCVRY TCHNIQE=NONE
  SLILIBRY SMF=231, X
  ACSLIST=ACSLIST, X
  HOSTID=(EC20,EC21), X
  MAJNAME=STKALSQN, X
  CLNPRFX=CLN, X
  COMPRFX=!, X
  DRVHOST=, X
  SCRLABL=SL
* ACSLIST SLIALIST ACS00
  ACS00 SLIACS LSM=(LSM0000,LSM0001,LSM0002,LSM0003), X
  STATION=(ST000,ST001)
  ST000 SLISTATN ADDRESS=(0032)
  ST001 SLISTATN ADDRESS=(0032)
  LSM0000 SLILSM PASTHRU=((0,M),(0,M),(0,M)), X
  ADJACNT=(LSM0001,LSM0002,LSM0003), X
  DRIVE=(1), X
  DRVBLST=(P000001), X
  TYPE=8500, X
  DOOR=8500-2

FIGURE 2-15 LIBGEN Example for Tapeless ACS (Part 1)
FIGURE 2-16  LIBGEN Example for Tapeless ACS (Part 2)
VSM5 New Models

The VSM5 provides new models that offer the capacities shown in TABLE 3-1.

<table>
<thead>
<tr>
<th>Drive Capacity</th>
<th>1-Array TBE</th>
<th>2-Arrays TBE</th>
<th>3-Arrays TBE</th>
<th>4-Arrays TBE</th>
<th>VSM Model</th>
<th>Product Family ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>450GB</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td>VSM5-45TB-IFF3</td>
<td>580</td>
</tr>
<tr>
<td>450GB</td>
<td>68</td>
<td></td>
<td></td>
<td></td>
<td>VSM5-68TB-IFF3</td>
<td>580</td>
</tr>
<tr>
<td>450GB</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
<td>VSM5-90TB-IFF3</td>
<td>580</td>
</tr>
<tr>
<td>146GB</td>
<td>7.5/11/14</td>
<td></td>
<td></td>
<td>VSM5-1.25TB-IFF3</td>
<td>567</td>
<td></td>
</tr>
<tr>
<td>146GB</td>
<td>16/18/21</td>
<td></td>
<td></td>
<td>VSM5-16TB-IFF3</td>
<td>567</td>
<td></td>
</tr>
<tr>
<td>146GB</td>
<td>.8/1.25</td>
<td></td>
<td></td>
<td>VSM5E-.8TB</td>
<td>567</td>
<td></td>
</tr>
</tbody>
</table>

Note –

- TBE = The approximate maximum effective capacity in Terabytes (TB).
- Models VSM5-45TB-IFF3, VSM5-68TB-IFF3, and VSM5-90TB-IFF3 require the following PTFs:
  - For 6.2:
    - L1A00Q4 - SMC6200
    - L1H14UL - SMS6200
    - L1H14UK - SWS6200
  - For 7.0, L1H14UN (SES7000)
- These models can contain a maximum of 500,000 VTUs
- VSM5 new models require the following VTSS microcode:
  - For Models VSM5-45TB-IFF3, VSM5-68TB-IFF3, and VSM5-90TB-IFF3 only, VTSS microcode level H02.07.
  - For all other Models, VTSS microcode level D02.07.
- Models VSM5-1.25TB-IFF3, VSM5-16TB-IFF3, and VSM5-23TB-IFF3 support ESCON channel cards. For more information, see “VSM5 ESCON/FICON Configurations” on page 53.
TABLE 3-2 shows the supported channel card configurations for:

7 VSM5 - All models including VSM5c but **not including** VSM5e and VSM5escon. For information on VSM5escon, see “VSM5 ESCON/FICON Configurations” on page 53.

7 VSM5e.

**TABLE 3-2**  VSM5 New Model Supported Channel Card Configurations

<table>
<thead>
<tr>
<th>VSM Model</th>
<th>Storage Cluster 0</th>
<th>Storage Cluster 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>VCF</td>
<td>VCF</td>
</tr>
<tr>
<td></td>
<td>VCF</td>
<td>VCF</td>
</tr>
<tr>
<td></td>
<td>VCF</td>
<td>VCF</td>
</tr>
<tr>
<td>5e</td>
<td>VCF</td>
<td>VCF</td>
</tr>
<tr>
<td></td>
<td>ICE</td>
<td>ICE</td>
</tr>
</tbody>
</table>

For VSM5c, see “VSM5 ESCON/FICON Configurations” on page 53.
TABLE 4-1 summarizes the supported VCF (FICON) and ICE (ESCON) card configurations for VSM5. VSM5 ESCON support requires microcode level D02.07.00.00 or H01.07.00.00.

**TABLE 4-1**  
Supported Card Configurations for VSM5 ESCON/FICON

<table>
<thead>
<tr>
<th>VCF Cards</th>
<th>FICON Ports</th>
<th>ICE Cards</th>
<th>ESCON Ports</th>
<th>Total Ports</th>
<th>Total Logical Paths (16 per ICE Port, 64 per VCF Port)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>8</td>
<td>32</td>
<td>32</td>
<td>512</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>4</td>
<td>16</td>
<td>24</td>
<td>768</td>
</tr>
</tbody>
</table>
VSM5 ICE/VCF Card Options

VSM5 supports the following ICE/VCF card options:

- FIGURE 4-1 shows a VSM5 with 8 ICE cards.
- FIGURE 4-2 on page 55 shows a VSM5 with 4 ICE cards, 4 VCF cards.
FIGURE 4-2  VSM5 with 4 ICE cards, 4 VCF cards
Note –

7 In FIGURE 4-2 on page 55, the VCF cards must go in: Slots 3, 4, 13, and 14 in a four-VCF card configuration.

7 FICON ports are controlled by a FICON Interface processor (FIP), ESCON ports are controlled by a CIP. Regardless of the card configuration, there can be only a total of 14 Nearlink FIPs and/or CIPs.

Note – With microcode level D02.06.00.00 or higher, multiple Nearlink device connections via a FICON or ESCON switch or Director on the same port now allow:

7 **Up to a total of 16 simultaneous NearLink I/O transfers**, which can be spread across multiple targets on as many as 14 NearLink ports.

7 **Up to a total of 2 simultaneous NearLink I/O transfers** are allowed per port.

All FICON ports can be configured as either a Host port or Nearlink (RTD/CLINK origination) port. All ESCON ports continue to be configurable as host or Nearlink ports in pairs on a per CIP basis.

As shown in FIGURE 4-1 on page 54 and FIGURE 4-2 on page 55, the ports are shown with their channel interface identifiers. These channel interface identifiers are the values that are required for the CHANIF values that you code for the CONFIG utility. Each value is two characters in length and has a value from 0A to 1O. The first digit is the VTSS cluster ID (valid values are 0 or 1). The second digit is the group or adapter ID (valid values are A to P).

Each FICON port can attach to four RTDs, or two CLINKs, or an RTD/CLINK combination via a FICON director or supported switch (in FICON mode). **Note that**, as shown in these figures, for RTDs only, each FICON port has two CHANIF values **only if** the port is connected to a FICON director which is then connected to two RTDs. Nearlink RTD connections that are paired via a FICON switch or director on the same port dynamically alternate between both RTDs for atomic operations such as mount, migrate VTV, recall VTV, etc.

**Each ICE card** contains two pairs of ESCON ports. Each pair is controlled by its own Channel Interface Processor (CIP). Each CIP switches between the two ports, so that **only one port** can transfer data at a time, which emulates a FICON port attached to a director attached to RTDs.

Each host FICON channel supports 64 logical paths (times 16 logical units). However, in HCD:

7 From a single MVS host, you can only define 8 channels (CHPIDs) running to a single control unit (single VSM5).

7 You use the CNTLUNIT statement to define each VSM5 as 16 3490 control unit images.

7 You use the IODEVICE statement to define the 16 VTDs that are associated with each 3490 control unit image.

7 For a VSM5, each ESCON CIP or FICON FIP can operate with **only one** of two modes, which is set at the VTSS DOP:

7 **Host Mode**. In Host Mode, ports can connect to the host CPU channels, including via Director(s) or channel extenders. A port in Host Mode can also serve as a CLINK terminator.
Also note that for ESCON ports, you can have two physical paths from the same LPAR to the same CIP, as long as the two physical paths address different (not overlapping) logical control units. For example, a single host LPAR can address logical control units 0-7 on one CIP port, and 8-F on the other CIP port of the same CIP.

Nearlink Mode. In Nearlink Mode, ports can connect to an RTD. A port in Nearlink Mode can also serve as a CLINK originator.

**Caution – In bi-directional clustering, each CLINK must be attached to the same Storage Cluster on each VTSS, which is a requirement.** Failure to configure in this manner can produce Replicate, Channel, and Communication errors!
In both FICON and ESCON, what are Best Practices for optimizing port operations? See TABLE 4-2...

**TABLE 4-2** Optimizing VSM5 FICON/ESCON Port Operations

<table>
<thead>
<tr>
<th>Configuration - Two ESCON Ports on a CIP (ICE) or FiCON port attached to a FiCON Director (VCF)</th>
<th>Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple CLINKs (up to 4)</td>
<td>Attach a maximum of 2 ... because each port allows two active operations. <strong>Note, however,</strong> that these operations share the bandwidth of the port.</td>
</tr>
<tr>
<td>CLINK and RTD combinations</td>
<td>An advantage if you attach one CLINK originator/one RTD per director, because both can be active.</td>
</tr>
<tr>
<td>Up to 4 RTDs</td>
<td>An advantage for the following:</td>
</tr>
<tr>
<td></td>
<td><strong>Optimize use of local and remote RTDs.</strong> During busy shifts, use only local RTDs on the FIP. During quiet periods, switch to remote RTDs for deep archive and DR work. Because you can have two active devices, you can also simultaneously run one local and one remote RTD. <strong>Note, however,</strong> that these operations share the bandwidth of the port.</td>
</tr>
<tr>
<td></td>
<td><strong>Optimize use of different drive technologies.</strong> As described in the previous bullet, use a T9840 as a local RTD, then switch to a T9940 for deep archive. You can also use this feature to migrate from older drive technology (such as 9490) to newer technology (such as 9840). Use Management and Storage Classes to read in data from older media, then switch to the newer technology drive to place data on new media. This technique effectively gives you greater physical connectivity to different drive technologies without incurring the overhead of full time, real time FICON connections to each drive type. Also as above, because you can have two active devices, you can also simultaneously run two RTDs with different drive technologies. <strong>Note, however,</strong> that these operations share the bandwidth of the port.</td>
</tr>
</tbody>
</table>
VSM5 Configuration Example: 8 ICE Cards, 16 Host Ports, 16 RTD Ports

FIGURE 0-1 shows CONFIG channel interface identifiers of 16 for hosts, 16 for RTDs for a VSM5.

FIGURE 0-1  VSM5 with 16 Host Ports, 16 RTD Ports
**CONFIG Example for VSM5 with 16 Host Ports, 16 RTD Ports**

**FIGURE 0-2** shows example CONFIG JCL to define the VSM5 configuration shown in **FIGURE 0-1** on page 59.

```
//CREATECF EXEC PGM=SLUADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SEALINK,DISP=SHR
//SLSCNTL DD DSN=hlq.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=hlq.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=hlq.DBASESTBY,DISP=SHR
//SLSPRINT DD SYSOUT=* 
//SLSIN DD *

CONFIG
GLOBAL MAXVTV=32000 MVCFREE=40
RECLAIM THRESHLD=70 MAXMVC=40 START=35
VTSS NAME=VSM501 LOW=70 HIGH=80
MAXMIG=8 RETAIN=5
RTD NAME=VSM52A00 DEVNO=2A00 CHANIF=0C
RTD NAME=VSM52A01 DEVNO=2A01 CHANIF=0D
RTD NAME=VSM52A02 DEVNO=2A02 CHANIF=0G
RTD NAME=VSM52A03 DEVNO=2A03 CHANIF=0H
RTD NAME=VSM52A04 DEVNO=2A04 CHANIF=0K
RTD NAME=VSM52A05 DEVNO=2A05 CHANIF=0L
RTD NAME=VSM52A06 DEVNO=2A06 CHANIF=0O
RTD NAME=VSM52A07 DEVNO=2A07 CHANIF=0P
RTD NAME=VSM52A08 DEVNO=2A08 CHANIF=1C
RTD NAME=VSM52A09 DEVNO=2A09 CHANIF=1D
RTD NAME=VSM52A0A DEVNO=2A0A CHANIF=1G
RTD NAME=VSM52A0B DEVNO=2A0B CHANIF=1H
RTD NAME=VSM52A0C DEVNO=2A0C CHANIF=1K
RTD NAME=VSM52A0D DEVNO=2A0D CHANIF=1L
RTD NAME=VSM52A0E DEVNO=2A0E CHANIF=1O
RTD NAME=VSM52A0F DEVNO=2A0F CHANIF=1P
VTD LOW=9900 HIGH=99FF
```

**FIGURE 0-2**  CONFIG example: VSM5 with 16 Host Ports, 16 RTD Ports
IOCP Example for Single MVS Host Connected to a VSM5 Via ESCON Directors

FIGURE 0-3 shows a configuration diagram for a single MVS host connected to a VSM5 via ESCON Directors, and FIGURE 0-4 on page 62 shows example IOCP statements for this configuration. Note that:

- From MVSA, you define 8 CHPIDs, with each path switched in the ESCON Director, for a total of 8 channels running to the VSM5.
- You code 16 CNTLUNIT statements to define the VSM5 as 16 3490 images.
- You code IODEVICE statement to define the 16 VTDs that are associated with each 3490 image.

FIGURE 0-3  Configuration Diagram: Single MVS Host Connected to a VSM5 via ESCON Directors
FIGURE 0-4  IOCP Example: Single MVS Host Connected to a VSM5 via ESCON Directors

ESCD4C CHPID PATH=(20,70),TYPE=CNC,SWITCH=4C
ESCD4D CHPID PATH=(21,71),TYPE=CNC,SWITCH=4D
ESCD4E CHPID PATH=(30,80),TYPE=CNC,SWITCH=4E
ESCD4F CHPID PATH=(31,81),TYPE=CNC,SWITCH=4F

CU1  CNTLUNIT CUNUMBR=001,
     PATH=(20,21,30,31,70,71,80,81),
     LINK=(D0,D4,D0,D4,D4,D0,D4,D0),
     UNIT=3490, CUADD=0,
     UNITADD=((00,16))

STRING1  IODEVICE ADDRESS=(0500,16),
          CUNUMBER=(001),
          UNIT=3490,
          UNITADD=00, STADET=Y

CU2  CNTLUNIT CUNUMBR=002,
     PATH=(20,21,30,31,70,71,80,81),
     LINK=(D0,D4,D0,D4,D4,D0,D4,D0),
     UNIT=3490, CUADD=1,
     UNITADD=((00,16))

STRING2  IODEVICE ADDRESS=(0510,16),
          CUNUMBER=(002),
          UNIT=3490,
          UNITADD=00, STADET=Y

CU15  CNTLUNIT CUNUMBR=015,
      PATH=(20,21,30,31,70,71,80,81),
      LINK=(D0,D4,D0,D4,D4,D0,D4,D0),
      UNIT=3490, CUADD=E,
      UNITADD=((00,16))

STRING15  IODEVICE ADDRESS=(05E0,16),
          CUNUMBER=(015),
          UNIT=3490,
          UNITADD=00, STADET=Y

CU16  CNTLUNIT CUNUMBR=016,
      PATH=(20,21,30,31,70,71,80,81),
      LINK=(D0,D4,D0,D4,D4,D0,D4,D0),
      UNIT=3490, CUADD=F,
      UNITADD=((00,16))

STRING16  IODEVICE ADDRESS=(05F0,16),
           CUNUMBER=(016),
           UNIT=3490,
           UNITADD=00, STADET=Y