

Virtual Library Extension

Configuring the MSP Host Software for VLE

Version 1.1



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Preface

Audience

This guide is for StorageTek or customer personnel who are responsible for configuring theMSP host software for Oracle's StorageTek™ Virtual Library Extension (VLE).

What is Virtual Library Extension?

Oracle's StorageTek™ Virtual Library Extension (VLE) is back-end disk storage for VTSS. VLE provides:

- An additional storage tier in the VSM solution. VTVs can now migrate from VTSS to VLE to provide fast access to recent data. Additionally, VTVs can transition from VLE storage to tape media (MVCs) for long term archive. You can control how VTVs are migrated and archived via the existing HSC Management and Storage Classes, providing full backward compatibility with previous configurations.
- Back-end disk storage shared between multiple VTSS systems ensuring high-availability access to data.

Note – For VLE 1.1, a “VLE” is a collection of nodes interconnected with a private network.

To VTCS, a VLE looks like a tape library except that the VTVs are stored in Virtual Multi-Volume Cartridges (VMVCs) on disk. With VLE, you can configure either a VLE and tape or a VLE only (for example, with Tapeless VSM configurations) back-end VTV storage solution. A VTSS can migrate VTVs to and recall them from a VLE, just as is done with a real tape library.

Caution –

- **Note that** if you have a VLE system, HSC/VTCS uses SMC communication services to communicate with the VLE. To ensure that these services are available during VTCS startup, Oracle recommends that you first issue the start command for HSC, then immediately issue the start command for SMC, while HSC is initializing.
- **Also note that** stopping SMC stops VTCS from sending messages to the VLE, which effectively stops data transfer. Therefore, you should ensure that VTCS activity is quiesced or VTCS is terminated before stopping SMC.
- You cannot use AT-TLS with the SMC HTTP server if you are using VLE.
- **Note that** in Tapeless VSM configurations, if you have only a single-node VLE attached to a specific VTSS and that VLE goes offline, you lose access to any VTVs migrated to the VLE that are not resident in the VTSS until the VLE comes back online.

The VLE solution consists of:

- Virtual Tape Storage Subsystem (VTSS) hardware and microcode.
- Virtual Tape Control Subsystem (VTCS) software and Storage Management Component (SMC).
- VLE hardware and software.

Single Node VLE Configuration

FIGURE 1-1 shows a single node VLE configuration.

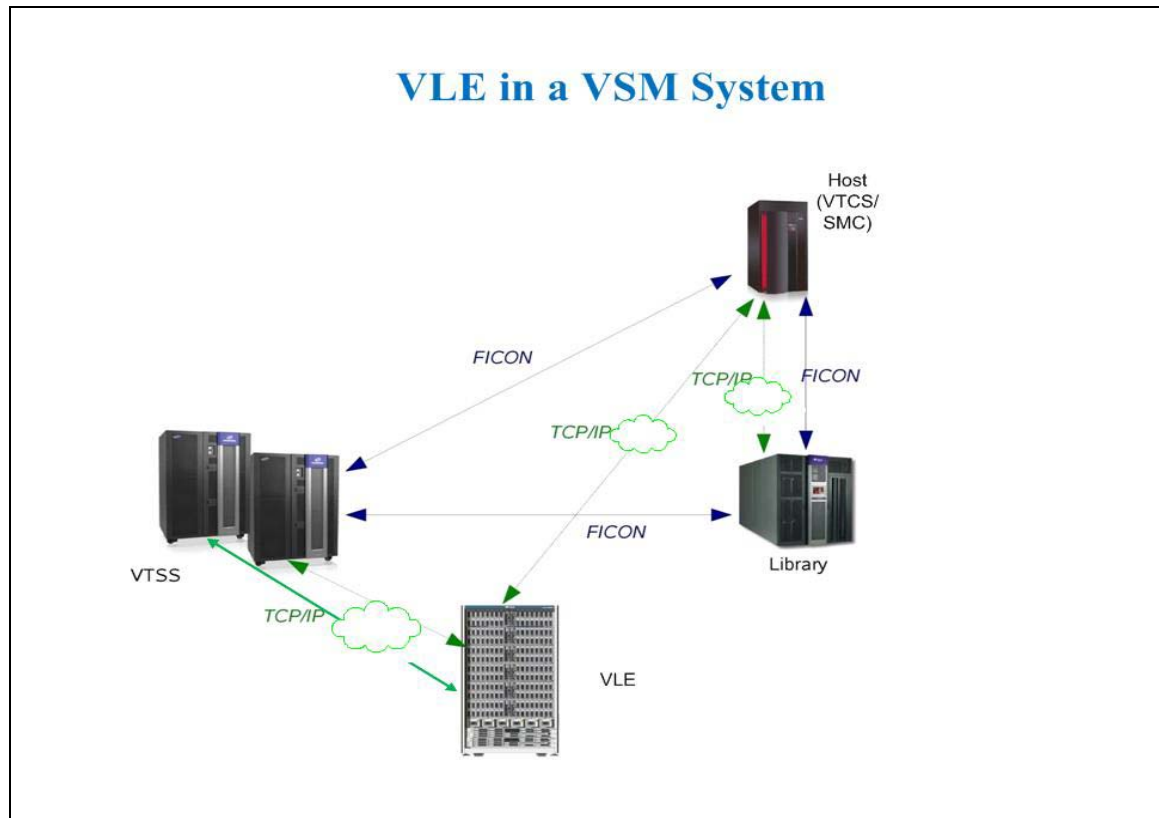


FIGURE 1-1 Single VLE in a VSM System

As [FIGURE 1-1](#) shows:

- Multiple TCP/IP connections (between the VTSS's IP ports and the VLE's IP ports) are supported as follows:
 - A single VLE can connect up to 8 VTSSs, so VTSSs can share VLEs.
 - A single VTSS can connect to up to 4 VLEs to increase buffer space for heavy workloads.
- A single VTSS can be attached to:
 - Only RTDs
 - Only other VTSSs (clustered)
 - Only VLEs
 - Any combination of the above.
- TCP/IP is the only supported protocol for connections between the VLE and the VTSS and for connections between the VLE and hosts running SMC and VTCS.

What's New in VLE 1.1?

VLE 1.1 provides the following enhancements:

- **Enables massive scaling of the VLE storage system.** VLE 1.0 is *single node system*. With VLE 1.1, you can construct *multi-node systems* that can consist of one to 64 nodes, with multiple nodes interconnected by a private network. A multi-node VLE appears to SMC/VTCS as a single VLE. A single VLE, therefore, can scale between 330 TB (for a single-node VLE with two JBODs) and 82.5 PB (for a fully populated 64-node VLE).

Note – These are effective capacities, assuming 4:1 compression.

Also note that VLE is **architected** for up to 64 nodes, but has only been **validated** for up to 7 nodes.

- **The VLE storage system** can manage data transfers independently of the VTSS, which frees VTSS resources for front-end (host) workload, which improves the overall VTSS through-put. For example, if your migration policies specify that there should be two VLE copies of a VTV (either in the same or separate VLEs), then the first migrate to a VLE will cause data to be transferred from the VTSS and all subsequent VLE migrates for the VTV may be achieved via a VLE to a VLE copy. This reduces the VTSS cycle times required to migrate all copies of a VTV.
- **Encryption**, which enables encryption of VMVCs written to the VLE system.

[FIGURE 1-2 on page 11](#) shows a VLE 1.1 complex, where the nodes are cross connected into a dedicated 10GE switch so that each node can access any other node in the complex.

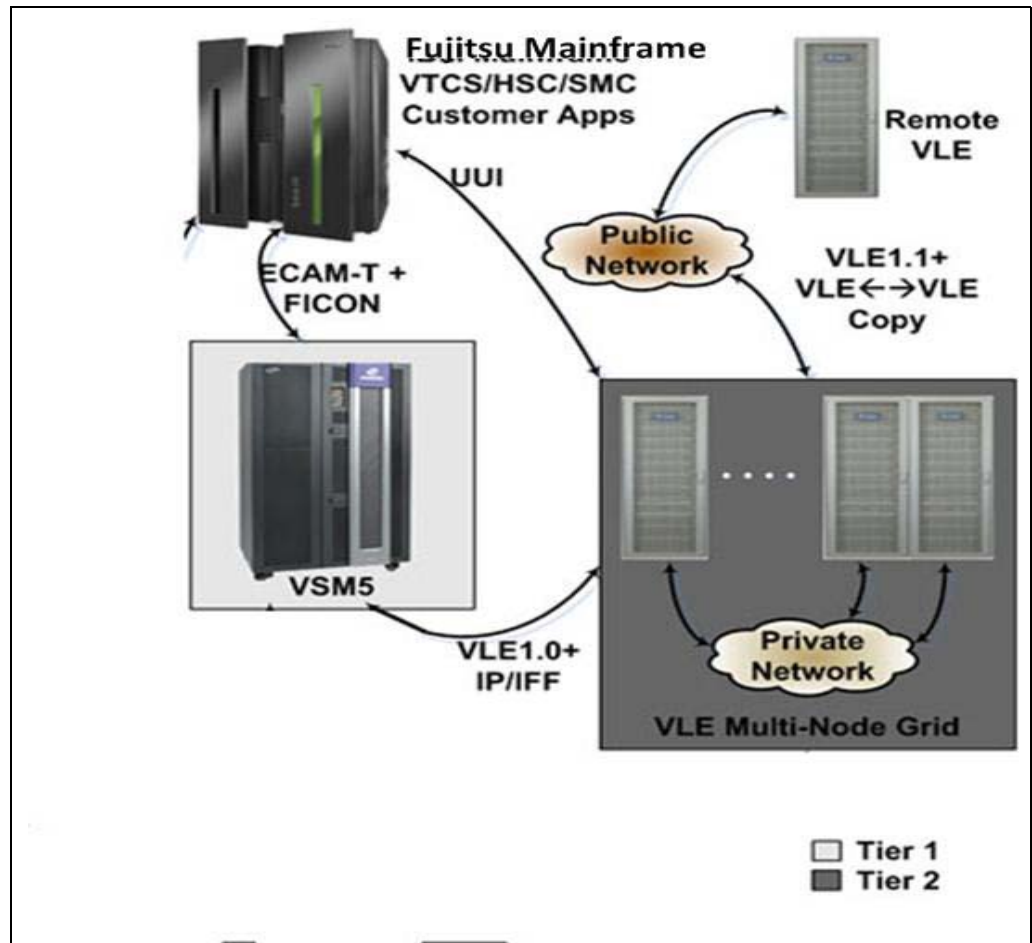


FIGURE 1-2 VLE Multi-Node Complex

VLE Hardware and Software

The VLE, which is a factory-assembled unit in a Sun Rack II Model 1242, consists of the following hardware:

- A server built on a 4470 platform.
- Four 1GigE ports for a combination of SMC UUI connections and service connections.
- A service (ILOM) port.
- Four Quad-port 1GigE cards, which provide 16 ethernet ports for data transfer.
- J4410 JBODs in a ZFS RAID array, available in effective capacities of 330TB, 660TB, 990TB, or 1320TB (assuming a 4 to 1 compression ratio when the data is migrated to the VLE).
- Two dual-port 10GigE NIC cards per server, which are required for the internal network connections for VLEs with 3 or more nodes.

The VLE software consists of:

- Oracle Solaris 11 Operating System.
- ZFS file system and MySQL database.
- The VLE application software.

FIGURE 1-3 shows the VLE subsystem architecture.

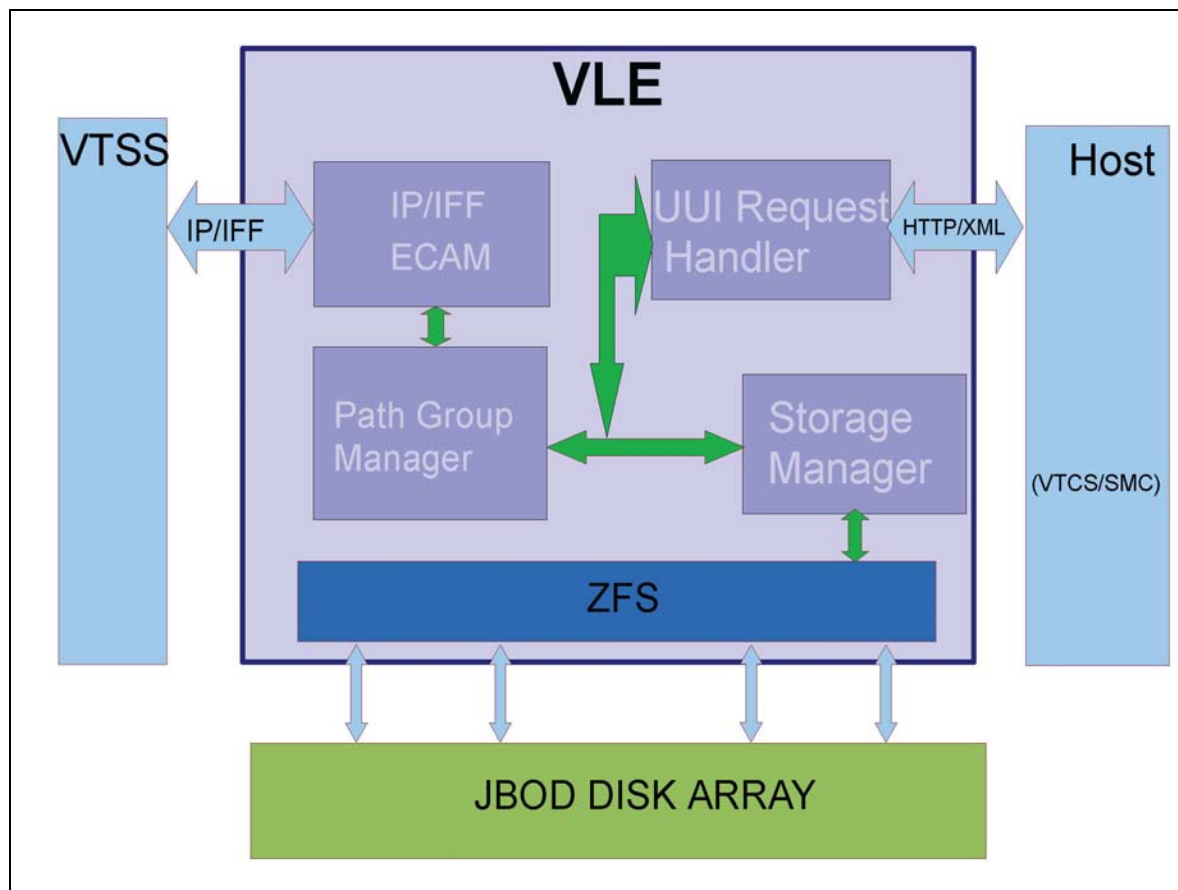


FIGURE 1-3 VLE Subsystem Architecture

As [FIGURE 1-3 on page 12](#) shows, the VLE application software is comprised of:

- HTTP/XML is the data protocol for host to VLE communications.
- The Universal User Interface (UII) Request Handler, which processes UII requests from and produces responses to Storage Management Component (SMC) and Virtual Tape Control Software (VTCS). The UII Request Handler determines which VLE components are used to service a request.

UII Request Handler calls:

- The PathGroup Manager to schedule VTV migrates and recalls. The PathGroup Manager manages all Path Groups, where each Path Group manages a single VTV data transfer between the VTSS and the VLE.
- The Storage Manager to schedule all report generation.
- The VLE Storage Manager component manages the VMVC/VTV data and meta data on the VLE. The VLE Storage Manager stores VTV data on and retrieves it from the ZFS on the JBOD array.
- TCP/IP/IFF is the data protocol for host to VLE communications, where the IP/IFF/ECAM component handles communications between the VTSS and the VLE.

MSP/EX Host Software Requirements for VLE 1.1

Support for VLE 1.1 is provided in ELS/MSP 7.1 base.

Configuring the MSP Host Software

This chapter provides the MSP host software configuration for VLE as described in the following sections:

- [“Key Configuration Values” on page 16](#)
- [“MSP Host Software Configuration Tasks” on page 17](#)

Note – Support for VLE 1.1 is provided in ELS/MSP 7.1 base.

Key Configuration Values

The following sections describes values required for software configuration that must match values that are typically already set in the hardware configuration and recorded in the `IP_and_VMVC_Configuration.xls` worksheet.

Subsystem Name

The subsystem name of the VLE, which is set by the VLE GUI, is specified in the following:

- Either the VTCS `CONFIG TAPEPLEX STORMNGR` parameter or the `CONFIG STORMNGR NAME` parameter.
- The VTCS `CONFIG RTD STORMNGR` parameter.
- The SMC `STORMNGR NAME` parameter.
- The SMC `SERVER STORMNGR` parameter.
- The HSC `STORCLAS STORMNGR` parameter.

VLE Data Port and VSM5 IFF3 Card Target IP Addresses

These IP addresses are initially set on the VSM5 DOP IFF IP Configuration Status panel and at the VLE GUI and the values must match. On the DOP panel, they are set as IP addresses with their equivalent `c:ip` addresses shown, which are required for the `CONFIG RTD IPIF` parameter.

IP Addresses of VLE Ports for Host (UI) Communication

These addresses are required for the `SMC SERVER IP` parameter.

VMVC Volsers

Required to define VMVCs to SMC/VTCS, method of definition depends on the software version, see [“Defining the VLE VMVCs to the MSP Host Software and Including VMVCs in an MVC Pool”](#) on page 20.

VMVC Reclamation Threshold

For more information, see [“Specifying the Reclamation Policy for VMVCs”](#) on page 19.

MSP Host Software Configuration Tasks

Adding VLE to a VSM system requires the tasks described in the following sections:

- [“Satisfying the RACF Requirement”](#)
- [“Modifying the SMC SCMDS file” on page 18](#)
- [“Updating the VTCS CONFIG Deck to Define VLE” on page 19](#)
- [“Defining the VLE VMVCs to the MSP Host Software and Including VMVCs in an MVC Pool” on page 20](#)
- [“Updating the MSP Host Software Policies” on page 21](#)

Satisfying the RACF Requirement

To allow the VLE to communicate with SMC via a TCP/IP connection, RACF must be installed and active on the host where SMC is running.

Modifying the SMC SCMDS file

SMC manages all communication between VTCS and VLE, so SMC must know how to connect to the VLE server. You do so by adding an SMC `STORMNGR` statement for each VLE system plus one or more SMC `SERVER` statements that define the TCP/IP control paths for the VLE. For 7.0 and above, you may want to do this in your SMC CMDS file as shown in [CODE EXAMPLE 2-1](#).

```
TAPEPLEX NAME(TMSPA) LOCSUB(SLS0)
SERVER NAME(ALTSESV) TAPEPLEX(TMSPA) +
HOSTNAME(MSPX) PORT(8888)
STORMNGR NAME(VLE1)
SERVER NAME(VLESESV1) +
STORMNGR(VLE1) IP(192.168.1.10) PORT(60000)
```

CODE EXAMPLE 2-1 SMC Commands for VLE

[CODE EXAMPLE 2-1](#) contains:

- A `TAPEPLEX` statement, which defines a single TapePlex, `TMSPA`, with an HSC/VTCS running on the same MSP host (`SLS0`).
- A `SERVER` statement, which defines a backup HSC/VTCS subsystem (`ALTSESV`) running on another host.
- A `STORMNGR` command that defines a VLE (`VLE1`) .
- A second `SERVER` command that defines a UUI communication path to the VLE, where:
 - The server name is `VLESESV1`.
 - The `STORMNGR` parameter value is `VLE1` .
 - The `IP` parameter value is the VLE port IP address of 192.168.1.10 for UUI communications.
 - The `PORT` parameter value is 60000; this value is always used for the `SERVER PORT` parameter for SMC communication with a VLE.

Updating the VTCS CONFIG Deck to Define VLE

You must update VTCS CONFIG deck to define the VLE and the connectivity from the VTSS systems to the VLE. The CONFIG TAPEPLEX statement defines the TapePlex that VTCS is running under and provides the list of defined VLEs on the CONFIG TAPEPLEX STORMNGR parameter as shown in [CODE EXAMPLE 2-2](#).

```
TAPEPLEX THISPLEX=TMVSA STORMNGR=VLE1
VTSS NAME=VTSS1 LOW=70 HIGH=80 MAXMIG=8 MINMIG=4 RETAIN=5
RTD  NAME=VL1RTD1 STORMNGR=VLE1 IPIF=0A:0
RTD  NAME=VL1RTD2 STORMNGR=VLE1 IPIF=0A:1
RTD  NAME=VL1RTD3 STORMNGR=VLE1 IPIF=0I:0
RTD  NAME=VL1RTD4 STORMNGR=VLE1 IPIF=0I:1
RTD  NAME=VL1RTD5 STORMNGR=VLE1 IPIF=1A:0
RTD  NAME=VL1RTD6 STORMNGR=VLE1 IPIF=1A:1
RTD  NAME=VL1RTD7 STORMNGR=VLE1 IPIF=1I:0
RTD  NAME=VL1RTD8 STORMNGR=VLE1 IPIF=1I:1
VTD  LOW=6900 HIGH=69FF
```

CODE EXAMPLE 2-2 VLE 1.1 CONFIG Example

In [CODE EXAMPLE 2-2](#), note:

- The CONFIG TAPEPLEX statement, which defines TMVSA as the TapePlex that VTCS is running under and the names of all connected VLEs (which in this example is a single VLE called VLE1).
- The CONFIG RTD statements, which define a single VLE RTD for each path from the VTSS to the VLE. In this example, the CONFIG RTD statements for VTSS1 specify:
 - The connections to the defined VLEs (VLE1).
- The IPIF value and an RTD

Specifying the Reclamation Policy for VMVCS

VLE MVC media (VMVCs) is subject to fragmentation and must be reclaimed just like real MVCs. The VMVC reclaim process, however, uses far fewer resources than a standard reclaim. The reclaim threshold for a VMVC is specified via the CONFIG RECLAIM VLTHRES parameter. The lower that you set VLTHRES, the more frequent VTCS will run reclaim on the VMVCs and the greater the effective capacity of the VMSP (less fragmentation).

Defining the VLE VMVCs to the MSP Host Software and Including VMVCs in an MVC Pool

VMVC volsers must be defined both to the MSP host software and to the VLE. The VMVCs are defined to the VLE as part of the VLE configuration. The following sections tell how to define the VMVCs to the MSP host software.

▼ Creating VMVC Volume Pools (7.0 and Above)

1. Code HSC POOLPARM/VOLPARM statements to define the VMVC pools.

For example, to define two separate pools for VLE1 and VLE2:

```
POOLPARM NAME (LEPOOL1) TYPE (MVC)
VOLPARM VOLSER (VL0000-VL880)
```

```
POOLPARM NAME (LEPOOL2) TYPE (MVC)
VOLPARM VOLSER (VL2000-VL2880)
```

2. Run SET VOLPARM to validate the POOLPARM/VOLPARM statements.

```
SET VOLPARM APPLY (NO)
```

APPLY (NO) validates the statements without loading them. If you like the results, go to [Step 3](#). Otherwise, rework your volume definitions, rerun this step, and if the definitions are valid, then go to [Step 3](#).

3. Run SET VOLPARM to load the POOLPARM/VOLPARM statements.

```
SET VOLPARM APPLY (YES)
```

Updating the MSP Host Software Policies

The following sections tell how to update the MSP host software policies to direct data to the VLE system.

Creating Storage and Management Classes for VLE

Management Classes specify how VTCS manages VTVs. The HSC MGMTclas control statement defines a Management Class and its attributes. For example, the DELSCR parameter of the MGMTclas statement specifies whether VTCS deletes scratched VTVs from the VTSS. Management Classes can also point to *Storage Classes*, which specify where migrated VTVs reside. The HSC STORclas control statement defines a Storage Class and its attributes.

You specify the VLE system as the destination for migrated VTVs via the STORCLAS STORMNGR keyword. For example:

```
STOR NAME (VLOCAL) STORMNGR (VLESERV1)
STOR NAME (VREMOTE) STORMNGR (VLESERV2)
```

The preceding statements define a “local” Storage Class (VLOCAL) on the VLSERV1 and a “remote” Storage Class (VREMOTE) on the on the VLSERV2. As these STORCLAS statements specify, all migrations to storage class VLOCAL or VREMOTE **must** go to the specified VLEs. You can be less restrictive than this if desired. For example, if you define an MVCPOOL that contains both VMVCs and MVCs you can set up the migration policies to migrate to a VLE but if the VLE becomes full or not available, to continue to migrate to real tape media (MVCs). For example the MVC pool DR is defined as follows:

```
POOLPARM NAME (DR) TYPE (MVC)
VOLPARM VOLSER (VL0000-VL0100)
VOLPARM VOLSER (ACS000-ACS099)
```

Pool DR, therefore, contains both MVCs and VMVCs. A Storage Class that specifies pool DR will migrate first to VMVCs and only use MVCs if VMVCs are not available. For example:

```
STOR NAME (DRCLASS) MVCPOOL (DR)
```

This method is valuable if you have a configuration where both an ACS and a VLE are connected to the VTSS systems.

Next, to specify migration to VLE, you specify the VLE Storage Classes you defined via the MGMTCLAS MIGPOL parameter. For example:

```
MGMT NAME (M1) MIGPOL (VLOCAL, VREMOTE)
MGMT NAME (M2) MIGPOL (DRCLASS)
```

Management Class M1 migrates one VTV copy to the “remote” VLE, one copy to the “local” VLE. Management Class M2 migrates a single VTV copy to the Storage Class that points to the “mixed” MVC pool that contains both MVCs and VMVCs.

Note – In addition to directing migration to a VLE also consider:

1. You can use the ARCHAge and ARCHPol parameters of the MGMTclas statement to set an Archive Policy for VTVs in a Management Class. When the VTV's age exceeds the ARCHAge value, the VTV is eligible for archive per the Storage Class(es) specified on the ARCHPol parameter. You can use Archive Policies to archive (move) VTVs from VMVCs to MVCs as the VTVs age. For more information, see *Managing HSC and VTCS*.
2. You can use STORSEL statements to cause VTCS to preference recalls from VLE media. For more information, see *Managing HSC and VTCS*.
3. If you are running at ELS 7.1 or above, you can use HSC MIGRSEL and MIGRVTV to fine tune migration to VLE. Using these statements, you can cause migration of data in a Management Class to start to one Storage Class before another. This method is typically used to ensure that a critical DR copy is made as soon as possible. For more information, see *Configuring HSC and VTCS*
4. On a VLE 1.1 system, if multiple VLEs are connected to each other and to the VTSS, **by default**, VTCS preferences VLE to VLE connections to make multiple VTV copies. In a DR scenario, for example, where you have a "local" and a "remote" VLE, you typically want the remote copy made as quickly as possible (using VTSS to VLE connections) and the local copy using VLE to VLE connections. The local copy, by default, uses VLE to VLE TCP/IP connections. You use the STORCLAS FROMLST parameter to specify VTSS to VLE connections for the "remote" copy. For example:

```
STOR NAME (VREMOTE) STORMNGR (VLE2) FROMLST (VTSSA1,VTSSA2)
```

In this example, for Storage Class VREMOTE, migrations to VLE2 come from either VTSSA1 or VTSSA2, thus using VTSS to VLE connections for the "remote" copy.

Routing Data to VLE

To route data to VLE, first create an SMC POLICY command that specifies a VLE Management Class. Next, create SMC TAPEREQ statements that route the desired workload to the SMC VLE policy. For example

```
POLICY NAME (VLEWORK) MEDIA (VIRTUAL) MGMT (VLECLASS)  
TAPEREQ DSN (VLETEST.***) POLICY (VLEMIGR)
```

The preceding example assigns the VLEWORK policy to all tape datasets with an HLQ of VLETEST.

Ensure that your SMC Started task JCL includes the TISPAPPL DD statement. This statement points to a member of a PDS containing a single statement which is TCPAPPLNAME=STKHAPPL. This statement is used to control the TISP APPL that SMC uses for its TCP/IP socket services, and must be defined in the VTAM-G TISP TAPPL NODESET.