VTS and Logical Paths

This paper is intended to explain the S/390 host attachment options of a Magstar Virtual Tape Server when multiple host systems are attached to a single VTS. It shows different configuration samples and gives some guidance for larger configurations with multiple hosts attaching to a single VTS.

General Considerations

The Magstar Virtual Tape Server can be attached to S/390 hosts through 2 ,4 or 8 ESCON channels:

- Two standard ESCON channels
- Two or four Enhanced ESCON channels
- Two, four, or eight Extended ESCON channels

Each channel attachment provides **64 logical paths** between hosts and control units for a total of 128, 256, or 512 logical paths.

The Magstar VTS provides up to 64 virtual tape devices:

- 32 virtual devices with 72GB of tape volume cache
- 64 virtual devices with 144GB or more of tape volume cache

For every 16 virtual devices, you need to define one control unit (CU) in the HCD dialogue. Per control unit, you can define up to eight channel paths, depending on how many ESCON channels are available from the VTS.

To calculate the number of logical paths required in an installation, the following formula can be used:

of hosts * # of CUs * # of ESCON channels = # of logical paths

Configuration with Two ESCON Channels and 32 Devices

Figure 1 shows the configuration for a VTS with two ESCON channels and 32 virtual devices, attached to four host systems through an ESCON director.

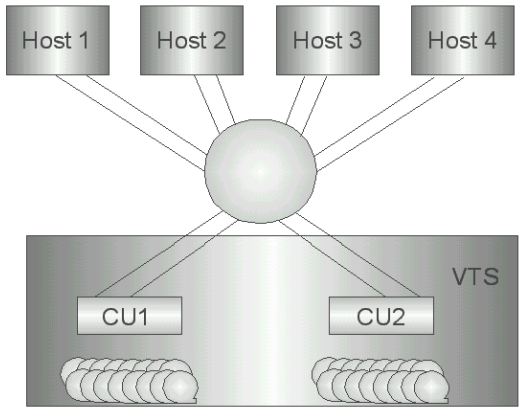

Figure 1

For the configuration shown in Figure 1, **16 logical paths** are required, because each of the four attached hosts uses four logical paths to the control units. Because a total of 128 logical paths is available, a total of 32 host systems could be attached to a single VTS.

Attaching 32 host systems to a VTS with 72 GB of tape volume cache is not realistic and would be beyond the performance capabilities of a single VTS with minimum tape volume cache and channel configuration.

Configuration with Two ESCON Channels and 64 Devices

Figure 2 shows the configuration of a single VTS with 64 virtual devices and four control units attached to four host systems via two ESCON channels through an ESCON director.

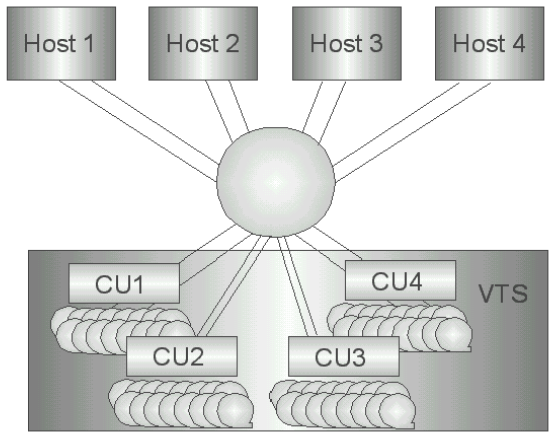

Figure 2

For the configuration shown in Figure 2, **32 logical paths** are required, because each of the four attached hosts uses eight logical paths to the control units (four control units times two channel paths). Because a total of 128 logical paths is available, up to sixteen host systems could be defined this way connected to a single VTS.
If more than sixteen host systems should be attached to a single VTS, it is highly recommended to install four ESCON channels in order to avoid throughput bottlenecks on the channel attachments.

Configuration with Four ESCON Channels and 64 Devices

Figure 3 shows the configuration of a single VTS with 64 virtual devices and four control units attached to four host systems via four ESCON channels through ESCON directors.

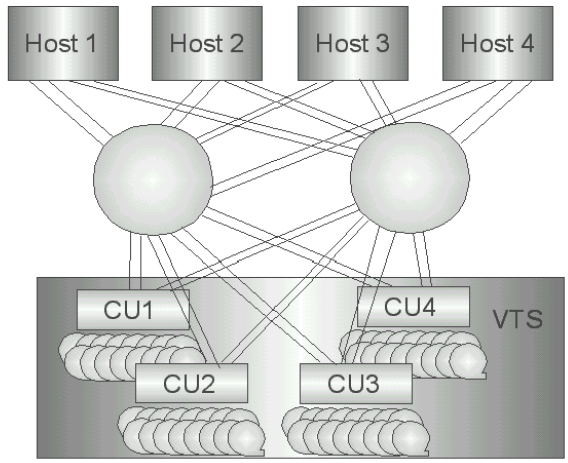

Figure 3

For the configuration shown in Figure 3, **64 logical paths** are required, because each of the four attached hosts uses sixteen logical paths to the control units (four control units times four channel paths). Because a total of 256 logical paths is available, up to sixteen host systems could be defined this way connected to a single VTS.

If more than sixteen host systems should be attached to a single VTS with four ESCON channel attachments, there are several options to circumvent the restriction of 256 logical paths:

- **Install additional four ESCON channels**
  See the next section for details on attachment options of a VTS with eight ESCON channel attachments .

- **Define only two channel paths per host system and control unit:**
  This extends the number of host systems to be attached to 32, because each host requires only eight logical paths. All hosts still have 64 virtual devices defined.

- **Define only two control units per host system:**
  This extends the number of host systems to be attached to 32, because each host requires only eight logical paths. However, each host will only have 32 virtual devices defined.

- **Define only two control units and two channel paths per host system**

This extends the number of host systems to be attached to 64, because each host requires only four logical paths. However, each host will only have 32 virtual devices defined.

- **Define fewer control units and / or fewer channel paths individually per host system**
  It is most likely in an environment, where more than 16 host systems are attached to a VTS, that not all host systems have the same throughput requirements. Therefore it may be the best solution, to define four control units and four channels at those hosts that have the highest throughput requirements, and to define fewer channels and control units at those host systems that do not have the high throughput requirements.

Configuration with Eight ESCON Channels and 64 Devices

If the VTS provides 8 ESCON channel attachments, a total of 512 logical channel paths is available. If each of the hosts attaches through 4 ESCON channels paths as shown in Figure 3, up to 32 host systems can attach to this VTS.

The following table shows the number of hosts which can attach to a single VTS, depending on the number of ESCON channels and control units defined at each of the hosts.

# Virt. Drives	# of Channels	# of CUs	# of Hosts
64	8	4	16
64	4	4	32
64	2	4	64
32	8	2	32
32	4	2	64
32	2	2	128

Table 1

The configurations shown in Table 1 are just a few examples for possible combinations. It is not very likely that 128 systems need to be attached to one VTS with 64 virtual tape drives.

Peer-to-Peer VTS Configuration

The Peer-to-Peer VTS currently provides exactly eight ESCON channel attachments and 64 virtual devices. However, the Peer-to-Peer VTS is defined to the host like four independent 3490E control units, each with 16 devices and attached through two ESCON channel attachments. Each of the ESCON channel attachments supports 64 logical path for a total of 128 logical paths per logical control unit in a Peer-to-Peer VTS configuration. Up to 64 host systems can attach to one single logical control unit.

With the standalone VTS, it is not important to distribute the mounts evenly across all defined virtual tape devices and tape control units to achieve the maximum throughput. This is because the tape control unit is not a limiting factor, and because all tape drives are available through all defined channel paths. Figure 4 shows the logical view for the standalone and the Peer-to-Peer VTS.

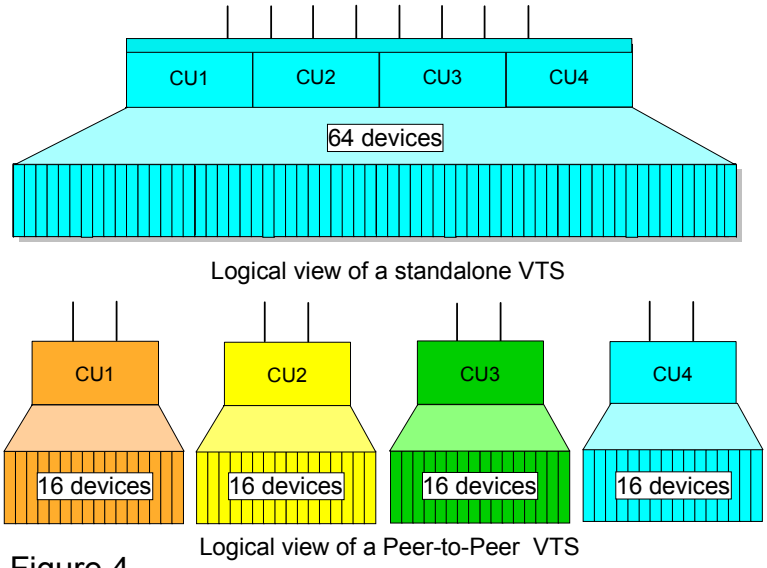

Figure 4

Figure 4 shows the physical borders of a Peer-to-Peer VTS configuration. In order to allow for peak performance of the Peer-to-Peer VTS, the workload must be distributed evenly across the four control units. The Peer-to-Peer VTS, in this respect, is similar to four physical tape control units, each of them having their own tape devices and channel paths. Therefore, the host allocation algorithm is important for the overall performance of the Peer-to-Peer VTS. For additional information on host workload balancing in a Peer-to-Peer VTS environment, please refer to *Magstar Peer-to-Peer Virtual Tape Server: A Comprehensive Implementation Guide*, SG24-6115.