



CHARON-VAX V4.7 for Linux - Users Guide



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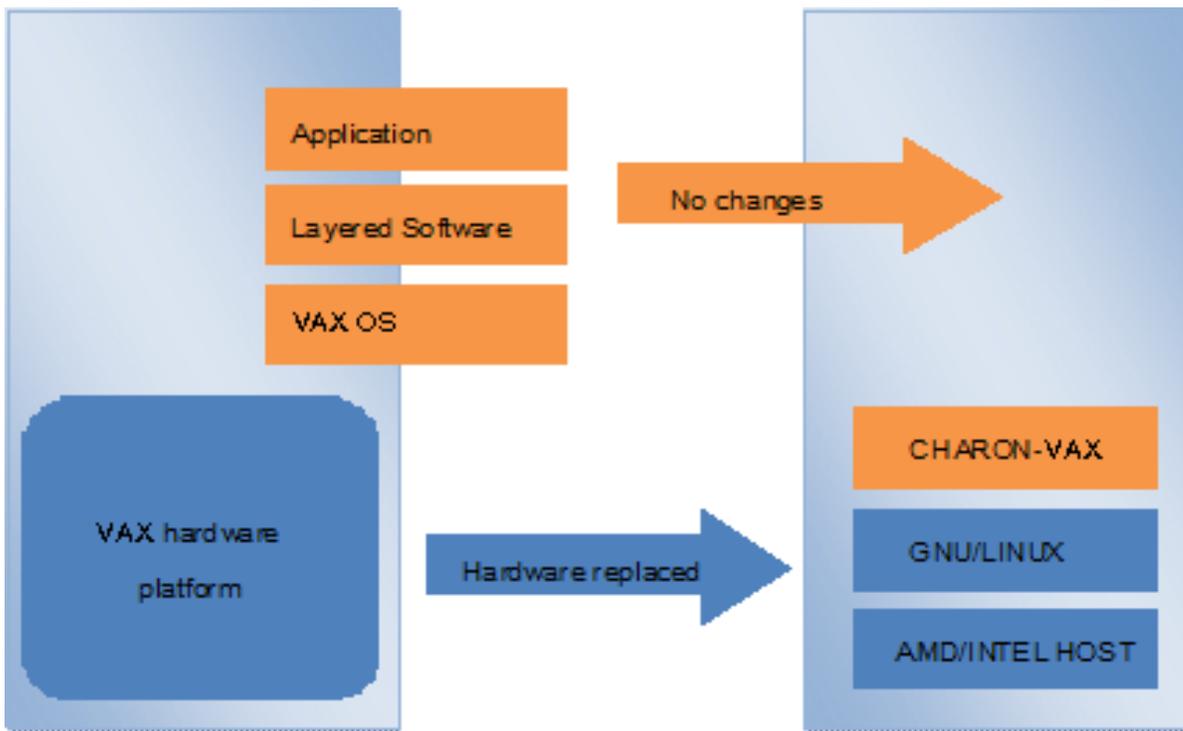
Introduction

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General Description

VAX Hardware Virtualization allows users of HP VAX computers to move application software and user data to a non-VAX platform without having to make changes to software and data. VAX Hardware Virtualization is a software solution that replaces VAX hardware.



This approach is best understood when the VAX Hardware Virtualization Software is viewed as a special interface between the old VAX software and a new hardware platform. Basically, the CHARON software presents a VAX hardware interface to the original VAX software, so that the existing software cannot detect a difference. This means no changes have to be made to the existing software. User programs and data can be copied to a new modern industry standard server (64-bit or 32-bit Intel or AMD) and continue to run for many more years.

The VAX virtualization software is designed to replace single and multi-CPU VAX computer systems, including:

- MicroVAX II
- MicroVAX 3600
- MicroVAX 3900
- MicroVAX 3100 models 96 and 98
- VAXserver 3600
- VAXserver 3900
- VAXstation 4000 models 90, 106, 108, 700 and 705
- VAX 6310
- VAX 6610, 6620, 6630, 6640, 6650 and 6660

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The principles of VAX Hardware Virtualization

In order to make the correct decisions regarding how to apply VAX Hardware Virtualization or Emulation, it is important to make a distinction between the VAX hardware that is virtualized or emulated and the (non-VAX) hardware from the (non-VAX) hardware host platform that carries the VAX Virtualization Software.

Virtualized hardware

CHARON-VAX virtualizes various VAX architectures and meets or exceeds the performance level of these VAX systems when run on the recommended hardware platform. Our VAX emulator product currently contains the following VAX models:

- MicroVAX II
- MicroVAX 3600
- MicroVAX 3900
- VAXserver 3600 (depending on license supports up to 512 MB of emulated memory)
- VAXserver 3900 (depending on license supports up to 512 MB of emulated memory)
- MicroVAX 3100 models 96 and 98
- VAX 4000 models 106, 108, 700 and 705
- VAXstation 4000 model 90
- VAX 6310
- VAX 6610
- VAX 6620
- VAX 6630
- VAX 6640
- VAX 6500
- VAX 6660

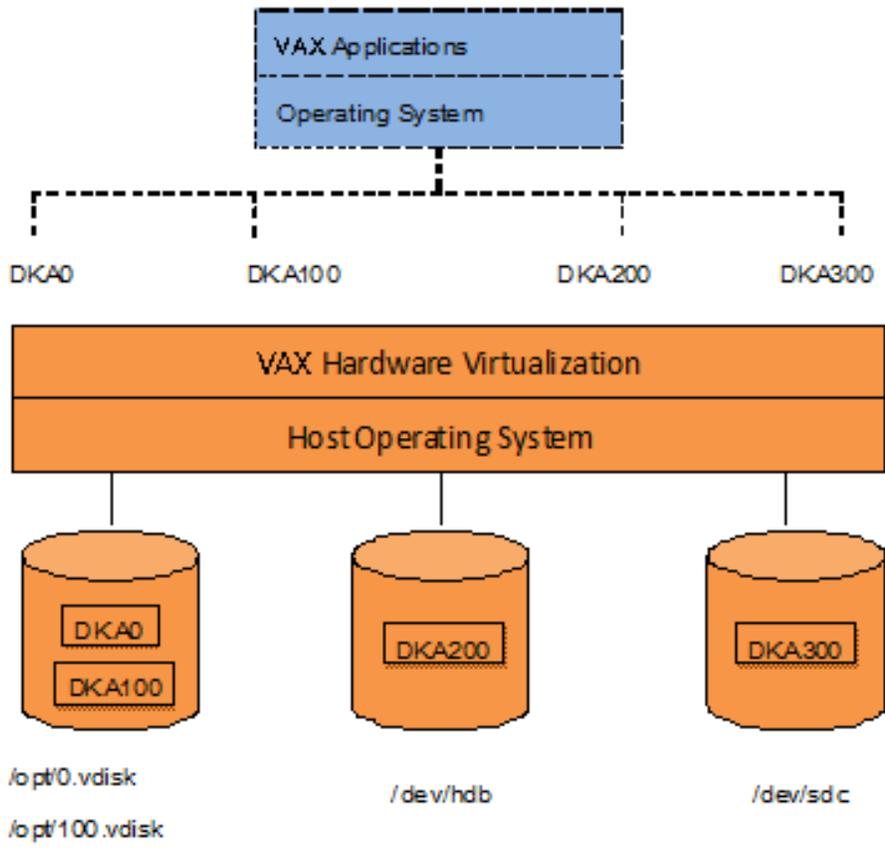
The following table explains which hardware boards we virtualize:

Subsystem	Covered VAX hardware
Serial Lines Controllers	UART, QUART, CXA16, CXB16, CXY08, DHQ11, DHV11, DZV11, DZQ11, DL11, DLV11, DZ11, DHW42-AA, DHW42-BA, DHW42-CA
QBUS Disks/Tapes Controllers	RQDX3, KDB50, TQK50, TUK50, KDM70
SCSI Controllers	NCR53C94
DSSI Subsystem	SHAC, HSD50
CI Subsystem	CIXCD, HSJ50
Network Controllers	DEQNA, DESQA, DELQA, DEUNA, DELUA, DEMNA, DEBNI, PMADAA

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Host platform

The Virtualization Software presents standard VAX devices to the VAX operating system, allowing the OS to function as though it were still running on a VAX computer. For example, virtual disk container files in a directory or device files in /dev directory of the host Linux platform are presented by the Virtualization Software to the VAX OS as emulated SCSI disks attached to a SCSI adapter.



With the use of current storage technology, disks do not have to be physically attached to the Host platform, they can also reside on a SAN or iSCSI storage structure.

A similar translation process is also valid for other emulated hardware devices.

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Conventions

Throughout the document(s) these conventions are followed

Notation	Description
\$	The dollar sign in interactive examples indicates an operating system prompt for VMS. The dollar sign can also indicate non superuser prompt for UNIX / Linux.
#	The number sign represents the superuser prompt for UNIX / Linux.
>	The right angle bracket in interactive examples indicates an operating system prompt for Windows command (cmd.exe).
User input	Bold monospace type in interactive examples indicates typed user input.
<path>	Bold monospace type enclosed by angle brackets indicates command parameters and parameter values.
Output	Monospace type in interactive examples, indicates command response output.
[]	In syntax definitions, brackets indicate items that are optional.
...	In syntax definitions, a horizontal ellipsis indicates that the preceding item can be repeated one or more times.
<i>disk0</i>	Italic monospace type, in interactive examples, indicates typed context dependent user input.

The following definitions apply

Term	Description
Host	The system on which the emulator runs, also called the Charon server
Guest	The operating system running on a Charon instance, for example, Tru64 UNIX, OpenVMS, Solaris or MPE

CHARON-VAX for Linux installation

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Introduction

CHARON-VAX products are distributed in form of archive TAR.GZ files that contain RPM modules for different components. Generally it is recommended to install all the RPM modules, but it is possible to omit some RPMs if they are not needed.

CHARON installation consists of the following steps:

- Host system checks (hardware and software) to ensure the host platform meets minimum CHARON-VAX installation requirements
- Installation of any 3rd party material, for example, utilities required for CHARON-VAX
- Extracting CHARON-VAX RPM modules from the TAR.GZ archive, and their individual installation
- Installation of CHARON-VAX license (hardware dongle or software license)
- CHARON-VAX host system configuration. It assumes creating a specific user, network configuration etc.

Let's go through CHARON-VAX installation sequence step by step.

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Hardware Requirements

Number of CPU cores

Each CHARON emulated CPU requires a corresponding physical core. So the total number of the host CPUs must exceed the number of emulated CPUs.

Below please find a table describing minimal and recommended number of CPUs required for each product:

CHARON-VAX model	Minimal number of CPU cores	Recommended number of CPU cores
VAX 6610	2	4
VAX 6620	3	4
VAX 6630	4	6
VAX 6640	6	8
VAX 6650	8	12
VAX 6660	8	12
Other models	2	2

Hyper-threading must be switched off completely. Disable hyper-threading in the BIOS settings of the physical host or, for a VMware virtual machine, edit the virtual machine properties, select the Resources tab then select Advanced CPU. Set the Hyper-threaded Core Sharing mode to *None*.

CPU type and speed

Since CHARON-VAX utilizes LAHF instruction in VAX CPU emulation please avoid usage of early AMD64 and Intel 64 CPUs in CHARON host system since they lack it. AMD introduced the instruction with their Athlon 64, Opteron and Turion 64 revision D processors in March 2005 while Intel introduced the instruction with the Pentium 4 G1 stepping in December 2005.

Concerning CPU speed the general recommendation is that higher CPU frequency is better since it allows better emulated VAX performance. The minimal recommendation is at least 3 GHz.

Operative memory

The minimum host memory size depends on the amount of VAX memory to be emulated and on the number of CHARON-VAX instances to be run on one host.

The minimum host memory is calculated according to the following formula:

The minimum host memory = (2Gb + the amount of VAX memory emulated) per CHARON-VAX instance.

Maximum amount of VAX memory that can be created in the CHARON-VAX/66x0 products and supported by OpenVMS/VAX is 3584 Mb. For details, see the memory size specification

Disk storage

When installed, CHARON-VAX takes approximately 50 MB of disk space for its files, not counting any virtual VAX disks/tapes (which appear as standard files).

When virtual VAX disks/tapes are used to represent VAX disk drives / magnetic tapes, the disk/tape image files have the same size as the equivalent VAX diskhardware, regardless of their degree of utilization. So the total amount of a disk space required for CHARON-VAX can be calculated as a sum of the disk/tape images sizes plus 50 MB plus space required for the normal host system.

Ethernet adapters

CHARON-VAX networking assumes dedicated host Ethernet adapters; their number must be equal to the emulated adapters to be configured in CHARON-VAX. One adapter (optionally) can be left to the host for TCP/IP networking etc. It is also possible to use [virtual network interfaces](#), but in consideration of performance, it is recommended to use physical ones only.

In case of VMware-based CHARON host it is mandatory to use "E1000" virtual network adapter. "E1000E" adapters are not supported.

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Software Requirements

- Linux Red Hat Enterprise 7.0 and 7.1
- Linux FedoraCore 20, 21, and 22
- VMware ESXi 5.x and 6.0 (requires a supported Linux operating system on top of a ESXi virtual machine)

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Host system preparation

The automatic installation of updates must be disabled. Updates to the CHARON host must be done only in specific service maintenance periods established by the system administrator. Before applying new updates one must shutdown the operating system running on CHARON and stop all the running CHARON instances and services.

In case network-wide license (red dongle or software license) is going to be used, do the following:

- *On server side (where network license will reside):* open port 1947 for both TCP and UDP
- *On clients side:* open UDP ports 30000-65535
- *Both on server and client sides:* setup default gateway

Please consult with your Linux User's Guide on details.

If stricter firewall rules are required, it is possible to open the ports 30000-65535 and 1947 only for the `"/usr/sbin/hasplmd"` daemon.

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Before installation

1. Login as the superuser ("root") on the host system. Because Sentinel HASP runtime relies on 32-bit compatibility libraries to run on Linux, the 32-bit compatibility libraries must be installed before continuing. If the emulator host has access to a package repository, either local or remote, use the following command:

```
# yum install glibc.i686
```

Sometimes it is not possible to use an online repository for the installation of 32-bit glibc package. In this case the following procedure should be followed:

1. If you have a Linux distributibe CD-ROM, insert it into CD-ROM drive

- 1.1. If auto-mount is not enabled, mount the CD-ROM. Example:

```
# mount /dev/sr0 /mnt
```

2. If you have an ISO image of the distribution CD, you can mount it using a loopback device:

```
# mount /path/to/ISO-image.iso /mnt -o loop
```

3. Switch to the directory containing the packages. This directory depends on your Linux distribution. Example:

```
# cd /mnt/Packages/
```

4. Locate the target "glibc.i686" package:

```
# ls -la glibc-*i686.rpm
```

5. Install the "glibc.i686" and the packages it depends on. Example:

```
# rpm -i glibc-2.17-157.el7.i686.rpm nss-softokn-freebl-3.16.2.3-14.4.el7.i686.rpm
```

6. If the above command reports additional unsatisfied dependencies, add the corresponding packages to the above command line.

7. Umount the CD-ROM or ISO file if necessary:

```
# umount /mnt
```

2. Create a special directory for the CHARON-VAX distribution and copy the TAR.GZ files there. Set this directory as the default with a "cd" command as shown in the following example:

```
# mkdir /charon_dist
# cp /temp/charon-vax-4.7-17101.68704.fc20.tar.gz /charon_dist
# cd /charon_dist
```

WARNING

- If you plan to install CHARON-AXP on the same server, both products, CHARON-AXP and CHARON-VAX, will have to be the same build number
- If you upgrade from a previous version of CHARON-VAX, please stop all running CHARON virtual machines and uninstall CHARON products before proceeding with the installation steps described below

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Distribution preparation

1. Extract the content of the distribution TAR.GZ files to the current directory:

```
# tar -xvzf charon-vax-<VER>-<BN>.<VC>.<ZZ>.tar.gz
```

where:

	Description
VER	Version of CHARON-VAX product, for example 4.7
BN	Build Number of CHARON-VAX product, for example 17101
VC	68704 - CHARON-VAX product vendor code
ZZ	CHARON-VAX target operating system identifier. For Fedora Core 20 'ZZ' value is 'fc20', for Red Hat Linux 7.1 the value is 'el71'

Example:

```
# tar -xvzf charon-vax-4.7-17101.68704.fc20.tar.gz
```

As result, a new directory "*charon-vax-<VER>-<BN>.<VC>.<ZZ>*" will be created.

2. Switch to the directory, created by "tar" on the previous step:

```
# cd charon-vax-<VER>-<BN>.<VC>.<ZZ>
```

Example:

```
# cd charon-vax-4.7-17101.68704.fc20
```

3. The distribution directory contains the following RPM files with additional material, libraries and utilities:

File name	Description
charon-vax-VER-BN.VC.ZZ.x86_64.rpm	CHARON-VAX
aksusbd-2.5-1.i386.rpm	HASP Run-time
charon-license-VER-BN.VC.ZZ.x86_64.rpm	CHARON Libraries
charon-utils-VER-BN.VC.ZZ.x86_64.rpm	CHARON Utilities

Example:

```
# ls
aksusbd-2.5-1.i386.rpm
charon-vax-4.7-17101.68704.fc20.x86_64.rpm
charon-license-4.7-17101.68704.fc20.x86_64.rpm
charon-utils-4.7-17101.68704.fc20.x86_64.rpm
```

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Installation

Issue the following command to install all the RPMs in the directory:

```
# yum install *.rpm
```

Enter "y" to agree to install all the listed packages.

Example:

Dependencies Resolved

```

=====
Package Arch Version Repository Size
=====
Installing:
aksusbd i386 2.5-1 /aksusbd-2.5-1.i386 2.9 M
charon-vax x86_64 4.7-17101 /charon-vax-4.7-17101.68704.fc20.x86_64 260 M
charon-license
x86_64 4.7-17101 /charon-license-4.7-17101.68704.fc20.x86_64 2.9 M
charon-utils
x86_64 4.7-17101 /charon-utils-4.7-17101.68704.fc20.x86_64 1.8 M

Transaction Summary
=====
Install 4 Packages

Total size: 267 M
Installed size: 267 M
Is this ok [y/d/N]:y

```

Check that the installation process has completed successfully.

Example:

```

Downloading packages:
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction (shutdown inhibited)
Installing : aksusbd-2.5-1.i386 1/4
Starting aksusbd (via systemctl): [ OK ]
Installing : charon-utils-4.7-17101.x86_64 2/4
ln -s '/usr/lib/systemd/system/ncu.service' '/etc/systemd/system/multi-user.target.wants/ncu.service'
Installing : charon-license-4.7-17101.x86_64 3/4
Installing : charon-vax-4.7-17101.x86_64 4/4
Verifying : aksusbd-2.5-1.i386 1/4
Verifying : charon-license-4.7-17101.x86_64 2/4
Verifying : charon-vax-4.7-17101.x86_64 3/4
Verifying : charon-utils-4.7-17101.x86_64 4/4

Installed:
aksusbd.i386 0:2.5-1 charon-vax.x86_64 0:4.7-17101
charon-license.x86_64 0:4.7-17101 charon-utils.x86_64 0:4.7-17101

Complete!

```

Re-login (as "root") to apply *PATH* settings or execute the following command:

```
# . /etc/profile.d/charon.sh
```

Note that [Network Configuration Utility](#) ("ncu") package has the following dependencies:

- ethtool
- bridge-utils
- net-tools
- iproute
- NetworkManager

During "ncu" installation using "yum", these packages will be installed automatically if some of them are absent on the host system.

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CHARON-VAX home directory

By default CHARON is installed in the "/opt/charon" directory. It has the following subdirectories:

Directory	Description

/bin	Contains all executables
/cfg	Contains templates of configuration files
/doc	Contains documentation
/log	Contains log files
/disks	Contains disk containers
/drivers	Contains CHARON drivers

The most important at this stage is the "/cfg" directory since it contains template configuration files with examples of typical configuration parameters and commentaries. We will pay our attention to this subject in the next chapter.

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Specific user account creation

Create a specific account "charon" for running CHARON:

```
# useradd -G disk,tape,cdrom,dialout,lock -c "Charon User" -m charon
# passwd charon
```

Any existing user can also be used to run CHARON. In this case issue the following command to include this existing user to specific groups:

```
# usermod -G disk,tape,cdrom,dialout,lock -g <user name> <user name>
```

Example:

```
# usermod -G disk,tape,cdrom,dialout,lock -g tommy tommy
```

The specific account created above does not allow to use virtual consoles "/dev/tty<N>" as CHARON consoles. If you plan to map CHARON console to "/dev/tty<N>" use only "root" account for CHARON running.

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License installation

Regular HASP USB dongle

If CHARON license represents a regular USB dongle just connect it to the host USB port.

If CHARON host is accessed remotely please note that regular HASP licenses cannot be displayed and used in this case. As workaround it is possible to install CHARON as daemon. This procedure will be described later.

Network HASP USB dongle

If CHARON license is a network license (red USB dongle) it is possible either to connect it to the host USB port (to use it locally providing it to other hosts on local network in the same time) or to install it on some local network "server" for remote access from this particular host.

In case of remote usage:

- Copy aksusbd-2.5-1.i386.rpm and charon-license-4.7-<build>.68704.<OS identifier>.x86_64.rpm files (see above) to the server to some directory, for example "/temp"
- Login as "root" to the server
- Switch to that directory
- Install the copied file using "yum"

Example:

```
# cd /temp
# yum install aksusbd* charon-license-*
```

- Connect the network HASP dongle to the server USB port.

Network HASP (red dongles) licenses have no restrictions with remote access

Software license

If CHARON license is a software license (SL) it is required to install it on the host using the following procedure:

1. Run `hasp_srm_view` utility in the following way to get the host fingerprint file ("my_host.c2v" in this example):

```
# hasp_srm_view -fgp my_host.c2v
```

2. Send the resulting file to STROMASYS. In return STROMASYS will provide you with a "*.v2c" file, for example "your_license.v2c"
3. Copy the received "your_license.v2c" file to CHARON host to any folder then invoke the system default web browser and enter URL <http://localhost:1947> to display "**Sentinel Admin Control Center**" (**ACC**) web interface. This interface allows you to view and manage CHARON licenses.
4. In the **ACC** use the following menu items: first "**Browse**" for the "your_license.v2c" file and then secondly "**Apply File**"
5. Ensure that the software license appears now in the "**Sentinel Keys**" menu of the **ACC**.

Alternatively it is also possible to use "`hasp_update`" utility for applying ".v2c" file.

Network-wide software licenses have no restrictions with remote access, whereas regular software licenses cannot be displayed and used in this case

So called "Provisional" (demo) license does not require collecting fingerprint. For its installation proceed right with the action (4) of the sequence above

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License validity verification

Check available CHARON license validity. To do that invoke the `hasp_srm_view` utility to make sure that CHARON license is visible and looks Ok:

- Text of the license is displayed correctly by the `hasp_srm_view` utility, no error messages are shown
- Content of the license looks correct. For example license number, major and minor versions, minimum and maximum build numbers, CHARON-VAX products and allowed hardware (CHARON-VAX models) should be checked. More details on the license content can be found in the [CHARON-VAX Licensing chapter](#) of this Guide.

Example:

```
# hasp_srm_view

License Manager running at host: dlao.msc.masq
License Manager IP address: 192.168.1.129

HASP Net key detected

The Physical KeyId: 1422726238
CHARON Sentinel HASP License key section
Reading 4032 bytes

The License Number: 000.msc.sanity.tests
The License KeyId: 1422726238
The Master KeyId: 827774524
Release date: 21-SEP-2015
Release time: 15:15:15
Update number: 1
End User name: MSC
Purchasing Customer name: STROMASYS
...
```

Reminder: If CHARON host is accessed remotely please note that regular HASP licenses cannot be displayed and used in this case. As workaround it is possible to install CHARON as daemon. This procedure will be described later.

Troubleshooting

If CHARON license content cannot be displayed by [hasp_srm_view](#) utility or it is incorrect, check the license is available and correctly used:

1. Invoke the system default web browser and enter URL <http://localhost:1947> to display "**Sentinel Admin Control Center**" (**ACC**) web interface.
2. Click on "**Sentinel Keys**" link to open up "**Sentinel Keys Section**" page
3. Make sure that one and only one CHARON HASP or SL license is present.

If no license is displayed make sure that all the recommendations above about remote access to the host are fulfilled (if remote access takes place), HASP USB key is not broken and its LED indicator is lit (meaning that it is used by the host).

If only one License key / SL is seen and its content is incorrect please contact STROMASYS as soon as possible.

If several License keys / SLs are displayed remove all of them and leave only the one provided by STROMASYS for just installed version of CHARON.

Removing licenses can be done by physical disconnection of the corresponding USB HASP keys from CHARON host and physical disconnection of the network HASP keys from all hosts on local network (or by disabling remote access to network licenses from CHARON host - see detailed explanations below). Software licenses can also be uninstalled with [hasp_srm_view](#) utility "-tfr" option in the following way:

```
# hasp_srm_view -tfr <Key ID>
```

Example:

```
# hasp_srm_view -tfr 12345678
```

It is also possible to disable access to network licenses if just a local license must be used: Click on "**Configuration**" link to open up "**Configuration for Sentinel Manager**" page. Uncheck "**Allow Access to Remote Licenses**" and "**Broadcast Search for Remote Licenses**" checkboxes from the "**Access to Remote License Managers**" tab, then press "**Submit**" button to apply changes.

It is also possible to leave several licenses available to CHARON-VAX at the same time, but in this case you have to specify in CHARON-VAX configuration file what license must be used.

Example:

```
set session license_key_id[0]=1877752571
```

It is also possible to have one "main" and one "backup" licence in case if the main license becomes not accessible:

```
set session license_key_id[0]=1877752571 license_key_id[1]=354850588
```

CHARON-VAX checks its licences from time to time starting from main license and if it is not accessible it tries to access backup license

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Network configuration

In most cases it is assumed that CHARON will use network. In this case some important steps must be performed, since CHARON requires a dedicated network interface cleared from any other protocols including TCP/IP.

Two ways of network configuration are possible:

- Manual
- With a help of "ncu" utility

The second way is a way simpler, so use manual approach only in absence of "ncu" utility or impossibility to use it.

Configuration with NCU utility

Login as root. Type "ncu" and press Enter. The following menu will appear:

```
# ncu
CHARON Network Configuration Utility, STROMASYS (c) 2015 Version 1.5

Interfaces Dedicated to State
-----
eth0      host      connected to host
eth1      host      connected from host
lo        host      unmanaged from host

=====
bridge name      bridge id      STP enabled      interfaces

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
:> 1
```

The utility lists available network interfaces (both physical and virtual) and indicates whether they are dedicated to the host or to CHARON and whether they are currently in use by host operating system.

"ncu" offers several options:

- Dedicate interface to CHARON (press "1")
- Release interface to host (press "2")
- Create a bridge between a chosen physical network interface and the Linux virtual network and create a number of virtual network interfaces (press "3")
- Remove the Linux virtual network and all the created virtual network interfaces (press "4")
- Print status (press "5") - use it to display status of network interfaces and the menu shown above
- Exit (press "6")

In the example above we see 2 network interfaces - "eth0" and "eth1", both of them are dedicated to host, but host uses only the interface "eth0".

Let's dedicate the interface "eth1" to CHARON-VAX.

Enter "1", then type "eth1" and press Enter:

```
Specify the interface to dedicate to CHARON:eth1
Turning off offloading for eth1.. Please wait

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
:> 5
```

Now the interface "eth1" is dedicated to CHARON-VAX:

```
Interfaces Dedicated to State
-----
eth0      host      connected to host
eth1      CHARON    disconnected from host
lo        host      unmanaged from host

=====
bridge name  bridge id      STP enabled
interfaces

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
```

Enter "6" to return to console prompt.

Now "eth1" can be used by CHARON-VAX.

Manual Configuration

Choosing network interface

To choose an interface to be used for CHARON networking do the following:

```
# ifconfig
eth0 Link encap:Ethernet HWaddr 00:60:52:0A:A9:1E
...
eth1 Link encap:Ethernet HWaddr 00:C0:26:60:FB:15
...
eth2 Link encap:Ethernet HWaddr 00:1A:92:E1:3F:7F
```

Choose some interface to be used by CHARON, for example "eth1"

Designation of network interface to CHARON

To designate the chosen interface to CHARON open up the file "/etc/sysconfig/network-scripts/ifcfg-ethN" (where N is the number of the interface to be used for CHARON, in our case it is "1") and make sure that all the IP-setup related parameters are removed. Basically the file must look like this ("eth1" is used as example):

```
DEVICE="eth1"
HWADDR="00:06:2B:00:6A:87"
NM_CONTROLLED="no"
ONBOOT="no"
```

Switching off the offload parameters

A first step is to find what additional parameters are currently set to "on" on the host network adapter to be used by CHARON. To do that issue:

```
# ethtool -k <device>
```

Example:

```
# ethtool -k eth1
Offload parameters for eth1:
rx-checksumming: on
tx-checksumming: on
scatter-gather: on
tcp-segmentation-offload: off
udp-fragmentation-offload: off
generic-segmentation-offload: on
generic-receive-offload: off
large-receive-offload: off
```

Then use ethtool to switch off all the offload parameters:

```
# ethtool -K <device> <parameter> off
```

Example:

```
# ethtool -k eth1
Offload parameters for eth1:
rx-checksumming: on
tx-checksumming: on
scatter-gather: on
tcp-segmentation-offload: off
udp-fragmentation-offload: off
generic-segmentation-offload: on
generic-receive-offload: off
large-receive-offload: off
```

For the example above let's create a temporary file containing the commands to be run on system startup, since the offload parameters must be switched off on each reboot:

```
ethtool -K eth1 rx off
ethtool -K eth1 tx off
ethtool -K eth1 sg off
ethtool -K eth1 gso off
ethtool -K eth1 gro off
```

Let's suppose that the name of the file is "offload_off_eth1.txt". In this case running it on system startup can be done in the following ways:

On Red Hat Linux:

```
# cat offload_off_eth1.txt >> /etc/rc.d/rc.local
```

On Fedora Core:

```
# echo '#!/usr/bin/bash' > /etc/rc.d/rc.local
# cat offload_off_eth1.txt >> /etc/rc.d/rc.local
# chmod 755 /etc/rc.d/rc.local
# ln -s /usr/lib/systemd/system/rc-local.service /etc/systemd/system/rc-local.service
# systemctl daemon-reload
```



Do not use double quotes, use single ones

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Final steps

- Reboot the host system to apply the offload parameters switching off
- Login as user "*charon*"

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Upgrade to new version

To upgrade already installed CHARON-VAX kit to more recent one:

1. Ensure your license allows you to upgrade. If not, please generate a C2V file and send it to STROMASYS for update. See [CHARON-VAX for Linux utilities - 'hasp_srm_view' utility](#)
2. Prepare the new kit RPM files as it is described in "[Before Installation](#)" and "[Distribution preparation](#)" sections.
3. Stop all running CHARON-VAX instances.
4. Make sure that no template files (i.e. "mv3k6.cfg.template") have been used for your specific configuration. Otherwise copy those files to some save place.
5. Login as "root" user.
6. Remove the old CHARON-VAX version as described in the "[CHARON-VAX for Linux deinstallation](#)" chapter.
7. Proceed with the same instructions on the new kit installation as described in "[Installation](#)" section.
8. Install the license for the new CHARON-VAX it as described in "[License installation](#)" section.
9. Start all the CHARON-VAX services stopped on the step (3).

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Running CHARON-VAX for Linux

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CHARON-VAX symbolic links

Use the following symbolic link to run different models of CHARON-VAX:

Link name	Emulator to run
mv3k6	MicroVAX 3600
mv3k9	MicroVAX 3900
mv3k196	MicroVAX 3100 Model 96
mv3k198	MicroVAX 3100 Model 98
mvii	MicroVAX II
vs4k90	VAXStation 4000 Model 90
vx3k6	VAXserver 3600
vx3k6_128	VAXserver 3600 (128Mb of RAM is available)
vx3k6_512	VAXserver 3600 (512Mb of RAM is available)
vx3k9	VAXserver 3900
vx3k9_128	VAXserver 3900 (128Mb of RAM is available)
vx3k9_512	VAXserver 3900 (512Mb of RAM is available)
vx4k106	VAX 4000 Model 106
vx4k108	VAX 4000 Model 108
vx4k700	VAX 4000 Model 700
vx4k705	VAX 4000 Model 705
vx6k310	VAX 6310
vx6k610	VAX 6610
vx6k620	VAX 6620
vx6k630	VAX 6630
vx6k640	VAX 6640
vx6k650	VAX 6650
vx6k660	VAX 6660

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Running CHARON-VAX emulators

It is possible to run one or several instances of CHARON-VAX at the same time if your license allows it.

In case of multiple instances please note to use only absolute paths and unique names to all the files referenced in configuration file of each CHARON-VAX instance (log, toy clock, nvram files and all the other data such as disk images - all these objects will be discussed later; at this stage just pay attention to the files specified in the configuration file) and to specify only unique for each instance hardware devices to avoid clashing. .

For example:

```
...
set session log="/charon_instances/first/mv3k6.log"
set toy container="/charon_instances/first/mv3k6.dat"

load RQDX3/RQDX3 DUA
set DUA container[0]="/charon_instances/first/mv3k6_boot_disk.vdisk"
...
```

Please refer to the next chapters for more details concerning CHARON-VAX configuration details.

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Running from console

Copy required configuration template from "/opt/charon/cfg/" directory to some local file and set correct privileges to that file to be able to edit it:

```
$ cp /opt/charon/cfg/mv3k6.cfg.template my_mv3k6.cfg
$ chmod 644 my_mv3k6.cfg
```

Now let's execute CHARON using this template configuration file:

```
$ mv3k6 my_mv3k6.cfg
```

You will see normal VAX test sequence, followed by prompt sign (">>>"):

```
KA650-A V5.3, VMB 2.7
Performing normal system tests.

40..39..38..37..36..35..34..33..32..31..30..29..28..27..26..25..
24..23..22..21..20..19..18..17..16..15..14..13..12..11..10..09..
08..07..06..05..04..03..
Tests completed.
>>>
```

The next stage can be either installation of new VAX/VMS system using a distributive provided by HP or transfer of data from some existing VAX system. These possibilities will be discussed in details in next chapters.

If for some reason CHARON-VAX refuses to start please look for files with .log extension (CHARON-VAX log files) located in the directory from which CHARON-VAX starts, open them in some editing tool and analyze their content. In most cases those files contain very helpful information on what may possible went wrong.

To exit from CHARON-VAX emulator use the following methods:

Configuration	How to exit
No changes to the template configuration file (not recommended)	Kill the console from where CHARON runs or kill CHARON process
Enable "F6" button in configuration file to trigger exit from CHARON: <pre>#----- # # Uncomment to allow 'F6' to terminate the running emulator. # #----- set OPA0 stop_on = F6</pre>	Press "F6"

 Please note that before stopping CHARON-VAX, one must shutdown the operating system running by CHARON-VAX.

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Running as system service (daemon)

It is possible to run CHARON-VAX as a daemon. In this case CHARON-VAX process will be detached from its parent process and from the terminal window in which it runs.

Follow the description below to establish and run CHARON-VAX as daemon:

Installation and start of CHARON-VAX service

- Copy the sample script "/opt/charon/bin/charon" ("/opt/charon/bin/charon.service" for Fedora Core Linux) to your home directory (Red Hat Linux) or to "/usr/lib/systemd/system/" directory (Fedora Core), for example:

Red Hat Linux	<pre>\$ cp /opt/charon/bin/charon /my_services/mv3k6_service \$ chmod 755 /my_services/mv3k6_service</pre>
Fedora Core	<pre>\$ cp /opt/charon/bin/charon.service /usr/lib/systemd/system/mv3k6.service \$ chmod 755 /usr/lib/systemd/system/mv3k6.service</pre>

- Edit the renamed file to replace sample values of the following parameters, for example:

Red Hat Linux	<pre>exec="/opt/charon/bin/mv3k6" prog="my_mv3k6" config="/my_services/mv3k6-service.cfg"</pre>
Fedora Core	<pre>ExecStart=/opt/charon/bin/mv3k6 -d /my_services/mv3k6-service.cfg WorkingDirectory=/my_services</pre>

- Create and edit configuration file ("/my_services/mv3k6-service.cfg" in the examples above) the way it was described before and make sure that the following pre-requisites are met:
 - OPA0 must be configured as virtual port or physical console, not as operator console, for example:

```
load virtual_serial_line OPA0 port=10003
#load operator_console OPA0
```

- Use only absolute paths to log, toy clock, nvram files and all the other data such as disk images etc. The names of the references files must be unique too, for example

```
...
set session log="/my_services/my_mv3k6.log"
set toy container="/my_services/my_mv3k6.dat"

load RQDX3/RQDX3 DUA
set DUA container[0]="/my_services/mv3k6_daemon_boot_disk.vdisk"
...
```

- Make sure the same physical devices are not used by other CHARON-VAX daemon, same for the OPA0 console port number.

Once configuration file is ready issue the following commands (the specifics belongs to the examples above) to install and start CHARON-VAX as daemon:

Red Hat Linux	# ln -sf /my_services/mv3k6_service /etc/init.d/mv3k6_service # chkconfig mv3k6_service on # service mv3k6_service start
Fedora Core	# systemctl enable mv3k6.service # systemctl start mv3k6.service

Note that a certain delay may appear in finding network license by Sentinel Run-time on CHARON-VAX host system startup. So if CHARON-VAX service is starting automatically on host system startup it may report "License not found" error and exit.

This problem can be avoided by specifying "license_key_lookup_retry" parameter in the following way:

```
set session license_key_lookup_retry = "N [, T]"
```

where:

- N - Number of retries looking for license key (or keys)
- T - Time between retries in seconds. If not specified 60 seconds is used

Example:

```
set session license_key_lookup_retry = 5
```

In this example if the license key is not found during initial scan, CHARON-VAX will do 5 more attempts waiting 60 seconds between them.

See [General Settings](#) section for more details.

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Stopping CHARON-VAX service

To stop CHARON-VAX daemon use the following command, for example:

Red Hat Linux	# service mv3k6_service stop
Fedora Core	# systemctl stop mv3k6

 Please note that before stopping CHARON-VAX service, one must shutdown the operating system running by CHARON-VAX.

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Removing CHARON-VAX service

To remove CHARON-VAX daemon use the following commands, for example:

Red Hat Linux	<pre># chkconfig mv3k6_service off # chkconfig --del mv3k6_service # rm -f /etc/init.d/mv3k6_service</pre>
Fedora Core	<pre># systemctl disable mv3k6.service # rm -f /usr/lib/systemd/system/mv3k6.service</pre>

 Please note that before removing CHARON-VAX service one must shutdown the operating system running by CHARON-VAX and then stop corresponding CHARON-VAX service.

 Please refer to the next chapters for more details concerning CHARON-VAX configuration details

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CHARON-VAX for Linux configuration

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Creation of your own configuration file using a template

By default, all the CHARON templates are located in the "/opt/charon/cfg" folder. Copy the appropriate template configuration file(s) to your home directory (or to any directory intended for CHARON-VAX). Name them meaningfully and set proper privileges.

For example:

```
$ cp /opt/charon/cfg/mv3k6.cfg.template /my_charon_cfg/my_mv3k6.cfg
$ chmod 644 /my_charon_cfg/my_mv3k6.cfg
```

Please do not edit the original template configuration files since they can be updated or even removed on update/deinstallation of CHARON-VAX

Once the file has been created you can open it in your favorite editing tool and proceed with modification to reflect the exact features of the system you are going to emulate.

We will review all the parameters step by step issuing some recommendations and guidelines.

Note: lines preceeded by the comment sign "#" inside the configuration files will not be interpreted. You can use this sign to debug your configuration.

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VAX model specification

The first configuration statement is the specification of the exact VAX hardware model to emulate, for example:

```
set session hw_model = MicroVAX_3600
```

You must leave this line untouched.

If you create the CHARON-VAX configuration file from scratch it must be the very first uncommented line in the configuration file.

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Configuration name

The next configuration statement is the "Configuration name" option:

```
#set session configuration_name = MicroVAX_3600
```

You can optionally uncomment this line to differentiate this CHARON-VAX instance from all others in a multi-instance environment. The configuration name can be any label that is meaningful. The example below shows the configuration name incorporated into the log file name.

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Log file parameters

Execution of CHARON-VAX creates one log file or a set of log files reflecting the progress of its start-up and ongoing operation - start and end time of execution, system information, license and configuration details, warnings, reports on problems that may occur, etc. In case of possible problems either with the running CHARON-VAX or the emulated system configuration (such as the absence or malfunction of certain devices), the log file(s) is the primary source to be analyzed for troubleshooting. If it becomes necessary to contact Stromasys for support, the cfg and log files often will be requested to begin problem resolution.

Here is an example of a field test CHARON-VAX log file:

```
20150922:083215:INFO :0:000003A5:hexane.cxx(5312): session is loading built-in configuration "VAX_6610"...
20150922:083215:INFO :0:000003A6:hexane.cxx(5336): session has finished loading built-in configuration
"VAX_6610".
20150922:083215:INFO :0:000003AA:hexane.cxx(5425): session is loading configuration file "vx6k610.cfg"...
20150922:083215:INFO :0:000003AB:hexane.cxx(5455): session has finished loading configuration file
"vx6k610.cfg".
20150922:083215:INFO :0:000003F2:sesmgr.cxx(1394): session: default log file size limit is 4194304 bytes
20150922:083215:INFO :0:0000032B:hexane.cxx(2547): Start request received.
20150922:083216:INFO :0:000003AC:hexane.cxx(1287): session's process affinity is 000000000000000F, system
affinity is 000000000000000F.
20150922:083216:INFO :0:000003D1:hexane.cxx(1541): session's I/O domain affinity is 0000000000000001, CPU
domain affinity is 000000000000000E
20150922:083216:INFO :0:000003BA:ll_sentine( 725): Looking for a license key ...
20150922:083217:INFO :0:000003DC:ll_sentine( 820): ... found license key 1422726238.
20150922:083217:INFO :0:0000024D:hexane.cxx(2688): STROMASYS SA, (C) 2009-2015
20150922:083217:INFO :0:00000350:hexane.cxx(2734): CHARON-VAX (VAX 6000 Model 610), V 4.7 B 17101, Sep 22 2015
/ 000.msc.sanity.tests / 1422726238
20150922:083217:INFO :0:00000336:hexane.cxx(2761): The end user of this software has agreed to STROMASYS' Terms
and Conditions for Software License and Limited Warranty, as described at: http://www.stromasys.com/pub/doc/30-
17-033.pdf
20150922:083217:INFO :0:0000009D:hexane.cxx(2838): License info:
CHARON product code: "CHVAX-460xx-WI".
Licensed to: "MSC".

20150922:083217:INFO :0:00000097:hexane.cxx(2847): OS Environment: Linux 3.19.8-100.fc20.x86_64 #1 SMP Tue May
12 17:08:50 UTC 2015 x86_64.
20150922:083217:INFO :0:00000098:hexane.cxx(2852): Host CPU: GenuineIntel, Family 6, Model 42, Stepping 1,
Intel Xeon E312xx (Sandy Bridge), 1 Cores per Chip, 1 Threads per Core, at ~2593 MHz, 4 cpu's available
20150922:083217:INFO :0:00000099:hexane.cxx(2857): Host Memory: 4096Mb
20150922:083217:INFO :0:00000348:mcpdisk.c( 333): PUA0 is being set OFFLINE
20150922:083217:INFO :0:00000001:tpool.cxx(1370): cpu: The ACE option is omitted; enable ACE as license
default.
20150922:083218:INFO :0:00000133:tpool.cxx(1602): Advanced CPU Emulation (ACE) enabled.
20150922:083218:INFO :0:0000032C:hexane.cxx(2589): "VAX_6610" started.
20150922:083300:INFO :0:00000347:mcpdisk.c(3656): PUA0 is being set ONLINE
container = "/home/charon/Charon/test/performancecomparison-66x0.vdisk"
media_type = ""
geometry = ""
use_io_file_buffering = false
```

The next group of parameters defines the name of CHARON-VAX log file and how CHARON-VAX will use it:

```
#set session log_method = append
#set session log_method = overwrite
#set session log = "MicroVAX_3600.log"
```

Rotating log (default)

By default CHARON-VAX utilizes a so called "rotating log". This means that a new default log file is always created each time CHARON starts and can switch to another log file if the size of the log file exceeds 64Kb (This behavior can be changed with "set session log_file_size" and "set session log_rotation_period" commands; see more details in "General Settings" chapter of this guide). This mode is turned on if all the log parameters above are disabled (commented out) or the "session_log" parameter is pointing to a directory rather than to a file. If a directory is specified, the log files will be created in that directory.

Names of the rotating log files are composed as follows:

```
configuration_name-YYYY-MM-DD-hh-mm-ss-xxxxxxxxx.log
```

If the "Configuration name" parameter described before is omitted (commented out), the log name has the following format instead:

```
hw_model-YYYY-MM-DD-hh-mm-ss-xxxxxxxxx.log
```

Note that "xxxxxxxx" is an increasing decimal number starting from "00000000" to separate log files with the same time of creation.

Single log

Alternatively it is possible to use just a single log file. Uncomment the "set session log" line and specify the desired CHARON-VAX log file name. Optionally, a path can be added to the log file name.

The log file can be extended ("log_method = append") or overwritten ("log_method = overwrite") by CHARON-VAX.

Below is a specification of a CHARON-VAX log file located in the "/my_logs" directory which will be overwritten each time CHARON-VAX starts:

```
set session log_method = overwrite
set session log = "/my_logs/my_vax.log"
```

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TOY, ROM and EEPROM containers

The next objects to be configured are TOY, ROM and EEPROM containers (their presence depends on the VAX model). It is always recommended to enable them. If a container file of the given name does not exist, CHARON-VAX will create it. Specific paths can be added to the file name specification.

TOY means "Time of Year"; its container records time, date and some console parameters while CHARON-VAX is not running. To enable, uncomment the following line:

```
set toy container="charon.dat"
```

The ROM container stores an intermediate state of the Flash ROM and some console parameters. So its container is also recommended to keep uncommented:

```
set rom container="vx4kl06.rom"
```

EEPROM stores the NVRAM content, so its container is also recommended to keep uncommented:

```
set eeprom container="charon.rom"
```

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Emulated memory (RAM) size

The next parameter defines the amount of host memory the chosen CHARON-VAX model reserves for the emulation:

```
set ram size=64
```

The amount of RAM is specified in MB. It cannot exceed or be lower than certain values specific for each VAX model. It is very important to keep the listed predefined increment between possible memory values.

The following table shows all the parameters:

Hardware Model	RAM size (in MB)			
	Min	Max	Default	Increment
MicroVAX_II	1	16	16	1,8,16
MicroVAX_3600	16	64	16	16
MicroVAX_3900	16	64	16	16
VAXserver_3600	16	64	16	16
VAXserver_3900	16	64	16	16
VAXserver_3600_128	32	128	32	32
VAXserver_3900_128	32	128	32	32
MicroVAX_3100_Model_96	16	128	16	16
VAXstation_4000_Model_90	16	128	16	16
VAX_4000_Model_106	16	128	16	16
VAX_6000_Model_310	32	512	32	32
VAXserver_3600_512	32	512	32	32
VAXserver_3900_512	32	512	32	32
MicroVAX_3100_Model_98	16	512	16	16
VAX_4000_Model_108	16	512	16	16
VAX_4000_Model_700	64	512	64	64
VAX_4000_Model_705	64	512	64	64
VAX_6610	128	3584	128	128
VAX_6620	128	3584	128	128
VAX_6630	128	3584	128	128
VAX_6640	128	3584	128	128
VAX_6650	128	3584	128	128
VAX_6660	128	3584	128	128

It is possible to leave the RAM line commented out. In this case the model's default RAM amount is used.

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Console

Mapping to system resources

The next step is the specification of VAX console (OPA0) serial line:

```
#load physical_serial_line OPA0 line="/dev/ttyN"
#load virtual_serial_line OPA0 port=10003
load operator_console OPA0
```

The goal of this configuration step is to tell CHARON-VAX what host device to use as the virtual system console. The following options are available:

Option	Description
physical_serial_line	Mapping to host serial line, both physical and virtual. Use the following mapping for different types of host serial lines: <ul style="list-style-type: none"> • /dev/tty<N> - virtual serial lines • /dev/ttyS<N> - onboard serial lines • /dev/ttyUSB<N> - modem or usb serial lines adapters
virtual_serial_line	Mapping to an IP port of CHARON-VAX host. Using this mapping it is possible to connect to CHARON-VAX console and disconnect from it at any time.
operator_console	Mapping to the current TTY console

The default setting is "operator_console".

Note that the VAX 4000 and MicroVAX 3100 models have a 4-line QUART adapter onboard, so their configuration for the console line looks a bit different:

```
#load physical_serial_line/chserial TTA0 line="/dev/tty<N>"
#load virtual_serial_line/chserial TTA0 port=10000
#set quart line[0]=TTA0
...

#load physical_serial_line/chserial TTA2 line="/dev/tty<N>"
#load virtual_serial_line/chserial TTA2 port=10002
#set quart line[2]=TTA2

#load physical_serial_line OPA0 line="/dev/tty<N>"
#load virtual_serial_line OPA0 port=10003

load operator_console OPA0
set quart line[3]=OPA0
```

In case of VAX 4000 and MicroVAX 3100 models it is possible to configure up to 4 independent console lines: OPA0, TT0, TT1 and TT2. The main one is OPA0.

Note there are a number of additional parameters for CHARON-VAX serial line configuration. Follow [this link](#) for details.

Exit on pressing F6 button

The next parameter in the template configuration file relevant to the console is the specification of a hot key to trigger an exit from CHARON-VAX:

```
set OPA0 stop_on = F6
```

It is strongly recommended to uncomment this line to provide CHARON-VAX the ability to exit by pressing the "F6" button.

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Disk subsystem

The next step is configuration of the disk subsystem and mapping it to system resources using the samples given in the template configuration files.

CHARON-VAX supports MSCP, DSSI, CI and SCSI disk controllers. The examples below are for MSCP and SCSI controllers only. DSSI controllers are discussed in details in the [following section](#), CI controllers - in [this section](#).

MSCP disk controllers (RQDX3, KDB50, KDM70)

Below is a typical configuration sample for MSCP disk controller RQDX3:

```
load RQDX3 DUA

#set DUA container[0]="<file-name>.vdisk"
#set DUA container[1]="/dev/sdN"
#set DUA container[2]="/dev/srN"
#set DUA container[3]="<file-name>.iso"

#load RQDX3 DUB address=...
#load RQDX3 DUC address=...
```

The first line ("load RQDX3 DUA") loads disk controller RQDX3 with name DUA, followed by 4 lines showing different ways of mapping to the host resources:

Type of mapping	Description
"<file-name>.vdisk"	Mapping to files representing physical disks of the VAX system (disk images). These files can be created from scratch with "mkdiskcmd" utility. Data and OS disk backups are transferred from the original system via tapes or network and restored into these container files. Mapping may also include the full path, for example: "/my_disks/my_boot_disk.vdisk"
"/dev/sd<L>"	Mapping to physical disks. "L" is letter here. Be careful not to destroy all the information from the disk dedicated to CHARON-VAX by mistake! These disks can not be formatted by the host OS.  It is also possible to use not a whole disk, but previously created partitions on it. In this case the syntax is the following: "/dev/sd<L><N>" where N is the number of partition to be used. <div style="border: 1px solid #ffc107; padding: 5px; background-color: #fff3cd;"> <p>Since "/dev/sd<L>" addressing is not persistent, so it is strongly recommended to use "/dev/disk/by-id/wwn-*" syntax instead to refer the disk by its WWID - especially in the environments utilizing FC and SAN storages (see below).</p> </div>
"/dev/dm-<N>" "/dev/mapper/mpath<N>" "/dev/mapper/disk<N>"	Mapping to multipath disk.  Be careful not to destroy all the information from the disk dedicated to CHARON-VAX by mistake. These disks must not be formatted by the host OS.
"/dev/disk/by-*"	Mapping to physical disk. <ul style="list-style-type: none"> by-id (addressing by the disk ID, for example "/dev/disk/by-id/ata-ST1000DM003-9YN162_S1D01QJ4") by-label (addressing by the disk label, for example "/dev/disk/by-label/MyStorage") by-uuid (addressing by the disk UUID, for example "/dev/disk/by-uuid/0e808a2f-cdd3-4944-a245-f729ffd73882")  Be careful not to destroy all the information from the disk dedicated to CHARON-VAX by mistake. These disks must not be formatted by the host OS.
"/dev/sr<N>"	Mapping to CD-ROMs. There are some variants of this mapping: "/dev/cdrom<N>" or "/dev/cdrom"
"<file-name>.iso"	Mapping to an ISO file for reading distribution CD-ROM images.

Numbers in the square brackets represent unit numbers associated with each container of the MSCP controller. For example, line 3 of the configuration sample above creates disk "DUA2". The maximum unit number allowed is 9999, significantly more than the original hardware provided.

It is possible to load several RQDX3 controllers DUB, DUC, etc. (see lines 6-7, above) by configuring specific addresses for them on the Qbus. Use the "CONFIGURE" utility available on the VAX console to determine the addresses. Please refer to specific HP documentation for further information.

Please also refer to HP documentation for information on placement of additional KDM70 controllers on an XMI bus (VAX 6000 models) and additional KDB50 controllers on a BI bus (VAX 6310).

Note that the KDM70 controller is capable of mapping to files representing tapes (tape images) and physical tape devices:

```
set PUA container[600] = "<file-name>.vtape"
set PUA container[601] = "/dev/sg<N>"
```

Follow this link for details of (T)MSCP controllers configuration.

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SCSI controller NCR53C94

The VAX 4000 and MicroVAX 3100 have an NCR53C94 SCSI controller onboard for support of different types of SCSI devices including disks and tapes. Optionally a second controller can be added.

Below is a typical configuration template for a preloaded "PKA" NCR53C94 SCSI controller:

```
# Mapping to disk image
load virtual_scsi_disk pka_0 scsi_bus=pka scsi_id=0
set pka_0 container="<file-name>.vdisk"

# Mapping to physical disk
load virtual_scsi_disk pka_1 scsi_bus=pka scsi_id=1
set pka_1 container="/dev/sd<L>"

# Mapping to some SCSI device connected to the host
load physical_scsi_device pka_2 scsi_bus=pka scsi_id=2
set pka_2 container="/dev/sg<N>"

# Mapping to host CD-ROM or DVD-ROM
load virtual_scsi_cdrom pka_3 scsi_bus = pka scsi_id = 3
set pka_3 container = "/dev/cdrom<N>"
#set pka_3 container = "/dev/sr<N>"

# Mapping to *.ISO image
load virtual_scsi_cdrom pka_4 scsi_bus=pka scsi_id=4
set pka_4 container="<file-name>.iso"

# Mapping to tape drive
load physical_scsi_device pka_5 scsi_bus=pka scsi_id=5
set pka_5 container="/dev/sg<N>"

# Mapping to tape image
load virtual_scsi_tape pka_6 scsi_bus=pka scsi_id=6
set pka_6 container="<file-name>.vtape"

# Include this line to get access to "PKB" adapter
include kzdda.cfg

# Mapping to host floppy drive
load virtual_scsi_disk pkb_6 scsi_bus=pkb scsi_id=6
set pkb_6 container="/dev/fd<N>"
```

Note that NCR53C94 SCSI controller mapping to system resources is done via specific auxiliary objects:

Mapping Object	Description
virtual_scsi_disk	<p>Mapping to a file representing VAX disk (disk image) on the host physical disk:</p> <ul style="list-style-type: none"> "<file-name>.vdisk" These files can be created from scratch with "mkdiskcmd" utility. Data and OS disk backups are transferred from the original system via tapes or network and restored into these container files. Mapping may also include the full path, for example: "/my_disks/my_boot_disk.vdisk" "/dev/sd<L>" - name of a physical disk. "L" is letter here. "/dev/dm-<N>", "/dev/mapper/mpath<N>", "/dev/mapper/disk<N>" - for multipath disks. N is 0,1,2... "/dev/disk/by-id/..." - addressing by the disk ID, for example "/dev/disk/by-id/ata-ST1000DM003-9YN162_S1D01QJ4" "/dev/disk/by-label/..." - addressing by the disk label, for example "/dev/disk/by-label/MyStorage" "/dev/disk/by-uuid/..." - addressing by the disk UUID, for example "/dev/disk/by-uuid/0e808a2f-cdd3-4944-a245-f729ffd73882" "/dev/df<N>" - name of host CD-ROM drive. N is 0,1,2... This parameter can be omitted. <p>Be careful not to destroy all the information from the disk dedicated to CHARON-VAX by mistake! These disks can not be formatted by the host OS.</p> <div style="border: 1px solid orange; padding: 5px; margin: 10px 0;"> <p>Since "/dev/sd<L>" addressing is not persistent, so it is strongly recommended to use "/dev/disk/by-id/wwn-*" syntax instead to refer the disk by its WWID - especially in the environments utilizing FC and SAN storages.</p> </div> <p> It is also possible to use not a whole disk, but previously created partitions on it. In this case the syntax is the following: "/dev/sd<L><N>" where N is the number of partition to be used.</p>

physical_scsi_device	Mapping to a host SCSI device: <ul style="list-style-type: none"> "/dev/sg<N>" - name of the SCSI device for direct mapping, for example, a SCSI disk or tape reader.
virtual_scsi_cdrom	Mapping to a host CD-ROM (not only SCSI) or to ISO image: <ul style="list-style-type: none"> "/dev/sr<N>", "/dev/cdrom", "/dev/cdrom<N>" - name of host CD-ROM drive "<file-name>.iso" - name of ISO image. It may contain the full path, for example: "/my_disks/vms_distributive.iso"
virtual_scsi_tape	Mapping to a file representing tape (tape image). It may contain a path, for example: "/my_tapes/backup.vtape"

Let's look at the syntax of the mapping objects. All of them have several important parameters:

Mapping objects parameters	Description
scsi_bus	The name of the NCR53C94 SCSI controller. A typical value for the first and only preloaded NCR53C94 SCSI controller is "PKA"
scsi_id	SCSI address of this particular mapped device. Note that the preloaded NCR53C94 SCSI controller claims address "7"; addresses 0-6 are vacant and useable. The resulting names of virtual SCSI devices as they are seen in VAX/VMS are made up of the VMS name of the SCSI controller and the device address. For PKA, the device names in VMS will be DKA0, DKA1 etc
container	A keyword for specification of which host device is mapped to a particular virtual SCSI device. It can be disk or tape image, physical disk etc

It is possible to configure another NCR53C94 SCSI controller "PKB" by uncommenting the "include kzdda.cfg" line:

```
include kzdda.cfg

load virtual_scsi_disk pkb_0 scsi_bus=pkb scsi_id=0
set pkb_0 container="<file-name>.vdisk"
...
```

In the example above "pkb_0" virtual SCSI device uses "PKB" controller by specifying a parameter "scsi_bus=pkb"

Note that versions of VAX/VMS older than 5.5-2H4 do not support the optional SCSI controller and might fail to boot if it is loaded.

Follow this link for details of NCR53C94 SCSI controller controllers configuration.

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Tape subsystem

Some MSCP and SCSI controllers support tape devices, however CHARON-VAX also emulates specific MSCP tape devices such as TQK50 and TUK50.

Follow this link for more details of (T)MSCP controllers configuration.

TQK50 controller

Example statements to configure TQK50 are shown below:

```
#load TQK50 MUA

#set MUA container[0]="<file-name>.vtape"
#set MUA container[1]="/dev/sg<N>"

#load TQK50 MUB address=...
#load TQK50 MUC address=...
```

The first line ("load TQK50 MUA") loads tape controller TQK50 with a name of MUA. The following 2 lines demonstrate different ways of mapping to host resources:

Type of mapping	Description
"<file-name>.vtape"	Mapping to files representing tapes (tape images). Such files can be created automatically or transferred from physical tapes with "mtd" utility Mapping may also include a full path, for example: "/my_tapes/backup.vtape"

"/dev/sg<N>"	Mapping to host tape devices.
--------------	-------------------------------

Numbers in the square brackets represent unit numbers associated with each container of the TQK50 controller. For example, line 3 of the configuration sample above creates tape drive "MUA1". The maximum unit number allowed is 9999, significantly more than the original hardware provided

It is possible to load several TQK50 controllers (see the lines 4-5) by configuring specific addresses for them on the Qbus. Use the "CONFIGURE" utility available on the VAX console to determine the addresses. Please refer to specific HP documentation for further information.

TUK50 controller

TUK50 is a UNIBUS controller used by the VAX 6310:

```
load DWBUA UBA vax_bi_node_id = 14

load TUK50 MUA

#set MUA container[0] = "<file-name>.vtape"
#set MUA container[0] = "/dev/sg<N>"
```

The first line loads a UNIBUS BI adapter "DWBUA". Then configure the "TUK50" tape controller the same way as the TQK50.

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Serial Lines

CHARON-VAX supports the following serial lines controllers: CXA16, CXB16, CXY08, DHQ11, DHV11, DZV11, DZQ11, DL11, DLV11, DZ11, DHW42-AA, DHW42-BA and DHW42-CA.

All of them are configured according to the following template:

```
#load DHV11/DHV11 TXA
load DHQ11/DHV11 TXA
#load CXY08/DHV11 TXA
#load CXA16/DHV11 TXA
#load CXB16/DHV11 TXA

load physical_serial_line/chserial TXA0 line="/dev/tty0"
#load virtual_serial_line/chserial TXA0 port=10010
set TXA line[0]=TXA0

#load physical_serial_line/chserial TXA1 line="/dev/tty<N>"
#load virtual_serial_line/chserial TXA1 port=10011
#set TXA line[1]=TXA1

...

#load DHV11 TXB address=...
#load DHQ11 TXB address=...
#load CXY08 TXB address=...
#load CXA16 TXB address=...
#load CXB16 TXB address=...
```

The first 5 lines of the example above demonstrate loading serial line controllers of different types. The name of the controller (in this example) will be "TXA"

Once the controller is loaded it can be mapped to system resources (lines 6-11). The following options are available:

Option	Description
physical_serial_line	Mapping to host serial line, both physical and virtual. Use the following mapping for different types of host serial lines: <ul style="list-style-type: none"> • /dev/tty<N> - virtual serial lines • /dev/ttyS<N> - onboard serial lines • /dev/ttyUSB<N> - modem or usb serial lines adapters
virtual_serial_line	Mapping to an IP port of CHARON-VAX. This mapping makes it possible to connect to and disconnect from the CHARON-VAX console at any time.

The example above loads a DHQ11 serial line controller with one "TXA0" line mapped to the host virtual serial line "/dev/tty0"

Look at the line "set TXA line[0]=TXA0" in the example. This one and the following lines of similar syntax map the loaded virtual controller ("TXA") to

instances of host serial lines ("TXA<N>").

The number of serial lines possible for each controller depends on its type and corresponds to the HP specification on a given controller.

It is possible to load several CXA16, CXB16, CXY08, DHQ11, DHV11, DZV11, DZQ11, DL11, DLV11 and DZ11 controllers (see the lines 12-16) by configuring specific addresses for them on the Qbus. Use the "CONFIGURE" utility available on the VAX console to determine the addresses. Please refer to specific HP documentation for further information.

VAX 4000 and MicroVAX3100 support DHW42-AA, DHW42-BA and DHW42-CA serial lines adapters:

```
#load DHW42AA/DHV11 TXA
#load DHW42BA/DHV11 TXA
#load DHW42CA/DHV11 TXA

#load physical_serial_line/chserial TXA0 line="/dev/tty<N>"
#load virtual_serial_line/chserial TXA0 port=10010
#set TXA line[0]=TXA0
```

Configuring these adapters is the same as above, except it is possible to load one and only one instance of DHW42-AA, DHW42-BA or DHW42-CA.

Note that additional parameters exist for CHARON-VAX serial lines configuration, follow [this link](#) for details.

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Networking

CHARON-VAX supports DEQNA, DESQA, DELQA, DEUNA, DELUA, DEMNA, DEBNI and PMADAA virtual network adapters.

All of them are configured in a similar way:

```
load DELQA/DEQNA XQA

load packet_port/chnetwrk XQA0 interface="eth1"
set XQA interface=XQA0

#load DELQA XQB address=...
#load DELQA XQC address=...
```

In the example above the first line loads DELQA virtual adapter with a name "XQA"; the following 2 lines map it to host network interface "eth1". Note that the mapping is performed in 2 steps:

1. A mapping object "packet_port" with a name "XQA0" is loaded and connected to host interface "eth1", so CHARON-VAX will use this interface for its networking
2. The loaded DELQA virtual adapter "XQA" is connected to the "packet_port" object "XQA0"

It is possible to load several DEQNA, DESQA, DELQA, DEUNA and DELUA controllers (see the lines 4-5) by configuring specific addresses for them on the Qbus. Use the "CONFIGURE" utility available on the VAX console to determine the addresses. Please refer to specific HP documentation for further information.

Some network adapters available in CHARON-VAX are preloaded (for example, the SGEC controller for the MicroVAX 3100 with the predefined name "EZA"), so their configuration is even more simple:

```
load packet_port/chnetwrk EZA0 interface="eth1"
set EZA interface=EZA0
```

Follow [this link](#) for more details of CHARON-VAX network controllers configuration.

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Auto boot

CHARON-VAX can be configured to automatically boot an operating system at start up.

MicroVAX 3100, VAX 6310 and VAX 4000 boot automatically if correct boot flags are set with VAX console:

```
>>>set halt reboot
```

Please check that the TOY, EEPROM and ROM containers (see above) are enabled so console command changes are saved between reboots.

The ROM of certain VAXes (MicroVAX II, MicroVAX 3600, MicroVAX 3900, VAXserver 3600 and VAXserver 3900) does not allow the SRM console to accept the commands to enable auto booting. In this case, use a configuration file setting instead:

```
set bdr boot=auto
```

CHARON-VAX 6000 models have a similar configuration setting:

```
set xmi boot=auto
```

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Host load balance for SMP systems

VAX 6620 through VAX 6660 models emulate 2-6 CPUs respectively. In this situation, loading of the host system can be tuned with the following configuration file settings:

Setting	Description	Example
affinity	<p>This setting binds the running instance of the emulator CPUs to particular host CPUs. This should be used for soft partitioning host CPU resources or for isolating multiple CHARON instances on the same host from each other.</p> <p>By default the emulator instance allocates as many host CPUs as possible.</p> <p>“Affinity” overrides the default and allows explicit specification of which host CPUs will be used by the instance. Affinity does not reserve the CPU for exclusive use.</p>	<pre>set session affinity = "0, 2, 4, 6"</pre>
n_of_io_cpus	<p>Reserves host CPUs (of those specified by “affinity” parameter, if any) for use by the emulator for I/O handling.</p> <p>By default the emulator instance reserves one third of available host CPUs for I/O processing (round down, at least one).</p> <p>The “n_of_io_cpus” overrides the default by specifying the number of I/O host CPUs explicitly.</p>	<pre>set session n_of_io_cpus = 2</pre>

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Migration to CHARON-VAX for Linux

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Introduction

This section describes how to migrate your VAX system to CHARON-VAX. We will use a sample MicroVAX 3600 system to demonstrate the migration procedure. The process is similar for all CHARON-VAX models.

If CHARON-VAX based virtual system needs to be created from scratch, refer to [this Application Note](#) describing how to find proper Qbus addresses and Vectors for each virtul device.

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Collecting information about the source VAX system

The first step is to determine the exact configuration of your VAX hardware in order to create the CHARON-VAX configuration file.

Turn on your source VAX system. At the ">>>" prompt, issue "show qbus" and "show device" commands:

```
>>>show qbus
Scan of Qbus I/O Space
-200000DC (760334) = FFFF (300) RQDX3/KDA50/RRD50/RQC25/KFQSA-DISK
-200000DE (760336) = 0B40
-20000124 (760444) = FFFF (304) TQK50/TQK70/TU81E/RV20/KFQSA-TAPE
-20000126 (760446) = 0BC0
-20000140 (760500) = 0080 (310) DHQ11/DHV11/CXA16/CXB16/CXY08
-20000142 (760502) = F081
-20000144 (760504) = DD18
-20000146 (760506) = 0140
-20000148 (760510) = 0000
-2000014A (760512) = 0000
-2000014C (760514) = 8000
-2000014E (760516) = 0000
-20000150 (760520) = 0080 (320) DHQ11/DHV11/CXA16/CXB16/CXY08
-20000152 (760522) = F081
-20000154 (760524) = DD18
-20000156 (760526) = 0140
-20000158 (760530) = 0000
-2000015A (760532) = 0000
-2000015C (760534) = 8000
-2000015E (760536) = 0000
-20001468 (772150) = FFFF (154) RQDX3/KDA50/RRD50/RQC25/KFQSA-DISK
-2000146A (772152) = 0B40
-20001920 (774440) = FF08 (120) DELQA/DEQNA/DESQA
-20001922 (774442) = FF00
-20001924 (774444) = FF01
-20001926 (774446) = FF02
-20001928 (774450) = FFD2
-2000192A (774452) = FF14
-2000192C (774454) = C000
-2000192E (774456) = 1030
-20001940 (774500) = FFFF (260) TQK50/TQK70/TU81E/RV20/KFQSA-TAPE
-20001942 (774502) = 0BC0
-20001F40 (777500) = 0020 (004) IPCR

Scan of Qbus Memory Space
>>>
```

```
>>>show device
UQSSP Disk Controller 0 (772150)
-DUA0 (RZ23)
-DUA1 (RZ24)

UQSSP Disk Controller 1 (760334)
-DUB2 (RZ25)
-DUB3 (RZ26)

UQSSP Tape Controller 0 (774500)
-MUA0 (TK50)

UQSSP Tape Controller 1 (760444)
-MUB3 (TK50)

Ethernet Adapter 0 (774440)
-XQA0 (08-00-01-02-D3-CC)
```

The source VAX configuration in this example is:

Controller	Address	Devices on controller
RQDX3	772150	-DUA0 (RZ23) -DUA1 (RZ24)
RQDX3	760334	-DUB2 (RZ25) -DUB3 (RZ26)
TQK50	774500	-MUA0 (TK50)
TQK50	760444	-MUB3 (TK50)
DHQ11	760520	
DHQ11	760500	
DESQA	774440	-XQA0

To find out the exact types of controllers please refer to documentation on the source VAX system.

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Creation of CHARON-VAX configuration file

Using the above info, the following configuration can be created:

```
...
#
# First RQDX3 controller on address 772150
#
load RQDX3/RQDX3 DUA address=017772150
set DUA container[0]="/my_disks/rz23.vdisk"
set DUA container[1]="/my_disks/rz24.vdisk"

#
# Second RQDX3 controller on address 760334
#
load RQDX3/RQDX3 DUB address=017760334
set DUB container[2]="/my_disks/rz25.vdisk"
set DUB container[3]="/my_disks/rz26.vdisk"

#
# First TQK50 controller on address 774500
#
load TQK50/TQK50 MUA address=017774500
set MUA container[0]="/my_tapes/tape1.vtape"

#
# Second TQK50 controller on address 760444
#
load TQK50/TQK50 MUB address=017760444
set MUB container[3]="/my_tapes/tape2.vtape"

#
# First DHQ11 controller on address 760500
#
load DHQ11/DHV11 TXA address=017760500
load virtual_serial_line/chserial TXA0 port=10010
set TXA line[0]=TXA0

#
# Second DHQ11 controller on address 760520
#
load DHQ11/DHV11 TXB address=017760520
load virtual_serial_line/chserial TXB0 port=10011
set TXB line[0]=TXB0

#
# DESQA controller on address 774440
#
load DESQA/DEQNA XQA address=017774440 interface=XQA0
load packet_port/chnetwrk XQA0 interface="eth1"
...

```

Note the Qbus addresses specification: The number is prefixed with "0", meaning it is an octal value. The number of digits reflects the 22 bit Qbus architecture.

Additional DHQ11 serial lines can be mapped later. For now, only 2 lines are configured. They are mapped to IP ports 10010 and 10011.

DESQA is mapped to the "eth1" network interface. This interface will be used for CHARON-VAX (see the [Installation section](#) for more details) on this particular host.

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Making disk images

In our example, possible mappings of RQDX3 and TQK50 tapes include physical devices and disk and tape images. Tape images should not be manually created, whereas you have to provision disk images, as described below.

Our example creates disk images of the original physical type. In reality, this step is the best opportunity in the migration to provision bigger disks to get extra storage space.

Create special directories for storing disk and tape images, as needed. Created directories are referenced in the sample configuration file above.

```
$ mkdir /my_disks
$ mkdir /my_tapes
```

Next, create disk images using the "mkdiskcmd" utility:

```
$ mkdiskcmd -d rz24 -o /my_disks/rz24.vdisk
Please wait...
100% done
Success.
$ mkdiskcmd -d rz25 -o /my_disks/rz25.vdisk
Please wait...
100% done
Success.
$ mkdiskcmd -d rz26 -o /my_disks/rz26.vdisk
Please wait...
100% done
Success.
$ mkdiskcmd -d rz27 -o /my_disks/rz27.vdisk
Please wait...
100% done
Success.
```

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Installation of VAX operating system

The next step is to transfer the data from the source VAX system to CHARON-VAX. The easiest way to do it is via backup over the network. But for this operation we need a bootable, network-enabled operating system on a CHARON-VAX disk image or physical disk.

The example configures the CHARON-VAX MicroVAX 3600 system for installation of VAX/VMS from a distribution CD-ROM:

```
#
# First RQDX3 controller on address 772150 with addition of 3 units: a disk for VAX/VMS, storage disk and
# CD-ROM drive
#
load RQDX3/RQDX3 DUA address=017772150
set DUA container[0]="/my_disks/rz23.vdisk"
set DUA container[1]="/my_disks/rz24.vdisk"
set DUA container[2]="/my_disks/new_vms_system.vdisk"
set DUA container[3]="/my_disks/backup_storage.vdisk"
set DUA container[4]="/dev/cdrom"
```


Create an empty disk image for installation of VAX/VMS and another one for storing backups from the source VAX system:

```
$ mkdiskcmd -d rz27 -o /my_disks/new_vms_system.vdisk
Please wait...
100% done
Success.
$ mkdiskcmd -d rz59 -o /my_disks/backup_storage.vdisk
Please wait...
100% done
Success.
```

Run CHARON-VAX and boot from "dua4" ("migration.cfg" is the configuration file we use in this example):

```
$ mv3k6 migration.cfg
KA650-A V5.3, VMB 2.7
Performing normal system tests.
40..39..38..37..36..35..34..33..32..31..30..29..28..27..26..25..
24..23..22..21..20..19..18..17..16..15..14..13..12..11..10..09..
08..07..06..05..04..03..
Tests completed.
>>>boot dua4
```

Install VAX/VMS including DECnet on "dua2". DECnet address must belong to the same area as the source VAX system.

Initialize the disk intended for backups storage:

```
$ INIT DUA300: SCRATCH
$ MOUNT/SYS/NOASSIST DUA300: SCRATCH
```

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Making remote backups

Now we are ready to create disk backups from the source VAX system to CHARON-VAX.

Boot CHARON-VAX and make sure that the source VAX system is available via DECnet.

Login to the source VAX system. Shut down all the batch queues, kick off the users, and close any databases. The commands in SYS\$MANAGER:SYSHUTDOWN.COM may be helpful. The goal is to close as many files as possible. The system disk will have several files opened (pagefile, swapfile, etc.), but this is normal.

Issue (let's assume that the CHARON-VAX system is node 1.400 in this example):

```
$ BACKUP/IMAGE/IGNORE=INTER DUA0: 1.400"username password"::DUA3:[000000]DUA0.BCK/SAVE
$ BACKUP/IMAGE/IGNORE=INTER DUA1: 1.400"username password"::DUA3:[000000]DUA1.BCK/SAVE
$ BACKUP/IMAGE/IGNORE=INTER DUB0: 1.400"username password"::DUA3:[000000]DUB0.BCK/SAVE
$ BACKUP/IMAGE/IGNORE=INTER DUB1: 1.400"username password"::DUA3:[000000]DUB1.BCK/SAVE
```

Once the backup procedure completes the disk "DUA3" of CHARON-VAX will contain 4 savesets: "DUA0.BCK", "DUA1.BCK", "DUB0.BCK" and "DUB1.BCK"

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Restore backups to CHARON-VAX disks

Next, restore the new savesets to their corresponding virtual disks. Login to CHARON-VAX and issue this sequence of commands to restore all the savesets created on the previous step:

```
$ MOUNT/FOR DUA0:
$ BACKUP/IMAGE DUA3:[000000]DUA0.BCK/SAVE DUA0:
$ DISMOUNT DUA0:

$ MOUNT/FOR DUA1:
$ BACKUP/IMAGE DUA3:[000000]DUA1.BCK/SAVE DUA1:
$ DISMOUNT DUA1:

$ MOUNT/FOR DUB0:
$ BACKUP/IMAGE DUA3:[000000]DUB0.BCK/SAVE DUB0:
$ DISMOUNT DUB0:

$ MOUNT/FOR DUB1:
$ BACKUP/IMAGE DUA3:[000000]DUB1.BCK/SAVE DUB1:
$ DISMOUNT DUB1:
```

Now reboot CHARON-VAX and boot from the same boot disk as you do on the source VAX system.

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Alternative ways of data transfer

Some alternative methods of data transfer are also possible, for example:

- Connect SCSI tape drive to CHARON-VAX host via PCI card
 - Map the tape drive in CHARON-VAX configuration file
 - a. Restore source VAX system backups from tape to disk images via VAX/VMS running on CHARON-VAX
 - b. Boot from standalone backups and restore its content to CHARON-VAX virtual disks
 - Dump source VAX system backups to tape images with "mtd" utility and:
 - a. Boot from freshly installed VAX/VMS system and restore the tape images to CHARON-VAX virtual disks
 - b. Boot from standalone backups and restore its content to CHARON-VAX virtual disks
- Create a network cluster between the source VAX system and CHARON-VAX (it is possible to use the source system as boot server); then simple backup from one disk to another:

```
$ BACKUP/IMAGE/IGNORE=INTER REAL$DUA0: DUA0:
```

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CHARON-VAX for Linux DSSI cluster

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- General description
- Configuration steps
- Example 1: Dual node DSSI cluster with 4 shared disks
- Example 2: Triple node DSSI cluster with multiple iSCSI disks

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Introduction

This section will describe how to configure DSSI cluster in CHARON-VAX for Linux.

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General description

The DSSI storage subsystem for the CHARON VAX 4000 106, 108, 700 and 705 models is based on the emulation of "SHAC" host adapters. Routing of SCS cluster information among the emulated "SHAC" host adapters of multiple nodes is done via separate TCP/IP links.

The DSSI storage subsystem is functionally emulated and operates at a much higher throughput than the original hardware. Connection to physical DSSI hardware is neither possible nor planned for future releases.

The current version of DSSI emulation for CHARON-VAX supports up to 3 VAX nodes in a virtual DSSI cluster and handles a maximum cluster size of 8 nodes. A single virtual DSSI network supports up to 256 storage elements.

For more details on DSSI configuration follow [this link](#).

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Configuration steps

To create a CHARON-VAX DSSI cluster, the following elements must be configured:

1. "SHAC" host adapter
2. "HSD50" storage controller

DSSI hardware topology is emulated by establishing TCP/IP channels between the emulated SHAC host adapters of each CHARON-VAX system. The emulated HSD50 storage controllers are then connected to every SHAC host adapter in the virtual DSSI network.

Cluster operation requires (virtual) disks that are simultaneously accessible by all CHARON-VAX nodes involved. This can be implemented for instance by using a properly configured iSCSI initiator / target structure or a fiber channel storage back-end. Disks on a multiport SCSI switch are not acceptable, as a SCSI switch does not provide true simultaneous access to multiple nodes.

Steps to configure DSSI cluster:

1. Set unique ID for SHAC controller of each node

Configuration	<p>IDs of SHAC is set using console (and stored in ROM file, so make sure the ROM file is specified in configuration file) in the following way:</p> <pre style="border: 1px solid black; padding: 5px;"> >>>sho dssi_id DSSI_ID Bus 0/A = 1 DSSI_ID Bus 1/B = 1 >>>set dssi_id 0 2 >>>set dssi_id 1 2 </pre>
Description	<p> Note that value of "dssi_id" must be unique for each SHAC instances and HSD50 controllers must not use them; for example if 0 and 1 is used as SHAC ID of different VAX nodes the HSD50 controller instance cannot use ID 0 and 1.</p>

2. Configure preloaded SHAC adapters PAA

Configuration	<pre style="border: 1px solid black; padding: 5px;"> set PAA port[<ID of the node to connect to>]=<port to receive connection from the node specified by ID> host[<ID of the node to connect to>]="<connected node host>:<connected node port>" </pre> <p>Example:</p> <pre style="border: 1px solid black; padding: 5px;"> set PAA port[2]=11012 host[2]="pollux:11021" </pre> <p>In this example a VAX node SHAC adapter connects to a node "pollux" (having ID=2) to its port 11021 and expects connection from it on the port 11012.</p>
Description	<p>The second step is to interconnect SHAC adapters of different nodes.</p> <p>Use ID of the nodes as a reference for interconnections as it is shown in the example at left.</p> <p>Detailed meaning of the parameters is explained in "Example 1" section below</p>

3. Load HSD50 adapter

Configuration	<pre style="border: 1px solid black; padding: 5px;"> load HSD50 <instance name> dssi_host=<SHAC instance> dssi_node_id=<HSD50 node ID> </pre> <p>Example:</p> <pre style="border: 1px solid black; padding: 5px;"> load HSD50 DISKS dssi_host=PAA dssi_node_id=3 </pre> <p>In this example HSD50 controller instance "DISKS" is loaded, connected to "PAA" SHAC controller and assigned with ID 3.</p>
Description	<p>Load HSD50 instance, assign ID for it and connect it to "PAA" SHAC adapter.</p> <p>For each member of cluster an identical definition of HSD50 controllers must be loaded. It is convenient to introduce a specific include configuration file containing the same configuration commands as it is shown in "Example 2" section below.</p> <p> Note that <HSD50 node ID> parameter must be unique for each SHAC and HSD50 instances; for example if 0 and 1 are used as IDs for nodes (see the Step 1) the HSD50 instance cannot use 0 or 1, but it can be set to 3, for example.</p>

4. Set SCS system ID and allocation class

Configuration	<pre>set <HSD50 instance name> scs_system_id=<SCS ID> mscp_allocation_class=<allocation class></pre> <p>Example:</p> <pre>set DISKS scs_system_id=3238746238 mscp_allocation_class=1</pre> <p>In this example HSD50 instance "DISKS" (configured at the previous step) is assigned with SCS ID "3238746238" and MSCP allocation class 1.</p>
Description	<p>Set SCS system ID and the MSCP allocation class.</p> <p> These setting must be the same for all HSD50 controllers loaded!</p> <div style="border: 1px solid red; padding: 10px; margin-top: 10px;"> <p>Note that the MSCP allocation class must be different from the allocation class of the VAX node (excluding some special cases when they can be the same - please refer to OpenVMS Guides on Clusters configuration for more details).</p> <p>For nodes it is set using MODPARAMS.DAT and AUTOGEN</p> <p>Refer to OpenVMS User's Guides for details</p> </div>

5. Configure mapping to the system resources

Configuration	<pre>set <HSD50 instance name> container[<unit number>] = <mapping></pre> <p>Example:</p> <pre>set DISKS container[0]="/mnt/share/dua0-rz24-vms-v6.2.vdisk"</pre> <p>In this example the Unit 0 of the HSD50 controller instance "DISKS" is mapped to some disk image, located in some shared directory on disk server.</p>
Description	<p>The final step is specifying HSD50 mapping to the system resources.</p> <p>Since the disks should be distributed between different VAX nodes they should be located as disk images on some shared space or - alternatively - CHARON host should use such mechanism as iSCSI to address the common disks on some disk storage.</p> <p>See the sections below for different examples of the mapping</p>

It is advisable to start any field test with implementing the cluster examples provided below

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Example 1: Dual node DSSI cluster with 4 shared disks

To setup two emulated VAX 4000 Model 108 nodes, we need two host machines, preferably running the same version of Linux.

Assume that these host systems have network host names *CASTOR* and *POLLUX* in the host TCP/IP network.

The following are CHARON-VAX configuration files for the emulated VAX 4000 Model 108 nodes running on *CASTOR* and *POLLUX*:

CASTOR node

```
...
set PAA port2=11012 host[2]="pollux:11021"

load HSD50 DISKS dssi_host=PAA dssi_node_id=3

set DISKS scs_system_id=3238746238 mscp_allocation_class=1

set DISKS container[0]="/mnt/share/dua0-rz24-vms-v6.2.vdisk"
set DISKS container[1]="/mnt/share/dual-rz24-vms-v6.2.vdisk"
set DISKS container[2]="/mnt/share/dua2-rz24-vms-v6.2.vdisk"
set DISKS container[3]="/mnt/share/dua3-rz24-vms-v6.2.vdisk"
...
```

POLLUX node

```
...
set PAA port1=11021 host[1]="castor:11012"

load HSD50 DISKS dssi_host=PAA dssi_node_id=3

set DISKS scs_system_id=3238746238 mscp_allocation_class=1

set DISKS container[0]="/mnt/share/dua0-rz24-vms-v6.2.vdisk"
set DISKS container[1]="/mnt/share/dual-rz24-vms-v6.2.vdisk"
set DISKS container[2]="/mnt/share/dua2-rz24-vms-v6.2.vdisk"
set DISKS container[3]="/mnt/share/dua3-rz24-vms-v6.2.vdisk"
...
```

Let's review both configurations step-by-step.

1. The first line of both configuration files establishes parameters for the preloaded "PAA" SHAC host adapter. Only 2 parameters of SHAC are important for us in this situation:

Parameter	Description
port	An integer value that specifies the TCP/IP port number on which an emulated SHAC host adapter listens for connections from another emulated SHAC host adapter. Possible port values are from 1024 through 32767.
host	A string value that specifies the TCP/IP host name (and optionally TCP/IP port number) to connect to another emulated SHAC host adapter. The syntax for the string is "host-name[:port-no]", with possible values for "port-no" in the range from 1024 through 32767.

Thus, *CASTOR* connects to *POLLUX*'s port 11021 and listens for *POLLUX*'s connection on port 11012, *POLLUX* connects to *CASTOR*'s port 11012 and listens for *CASTOR*'s connection on port 11021

2. Second and third lines of both configuration files are for loading "DISKS" HSD50 storage controller and its parametrization:

Parameter	Description
dssi_host	A string value that specifies an instance name of the emulated SHAC host adapter serving virtual DSSI network. If this value is not set, CHARON-VAX tries to locate the host adapter automatically. This automatic lookup works only if the CHARON-VAX configuration has exactly one instance of emulated SHAC host adapter.
dssi_node_id	An integer value that specifies address of emulated HSD50 storage controller on virtual DSSI network. Possible values are from 0 through 7 (initially set to 0).
scs_system_id	A string value that specifies <i>SCSNODENAME</i> of emulated HSD50 storage controller. The string is up to 10 characters long. Possible characters are uppercase letters A through Z , figures 0 through 9.
mscp_allocation_class	An integer value that specifies <i>ALLOCLASS</i> of emulated HSD50 storage controller. Possible values are from 0 through 255 (initially set to 0).

In both configuration files, the data related to the emulated HSD50 storage controller "DISKS" **must be identical**. Not following this rule can cause data corruption on the (virtual) disks.

3. The next lines demonstrate mapping "DISKS" HSD50 storage controller to disk images, shared between both hosts.. A "container" parameter is used for this purpose. This example assumes that all disk images are accessible from both host machines via network share (NFS, SAMBA) or some other realization.

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Example 2: Triple node DSSI cluster with multiple iSCSI disks

In this example we assume that all three host systems have a iSCSI initiator and are connected to a common iSCSI server. The iSCSI disk server provides 8 virtual disks with R/W access on all hosts. These disks are configured as "/dev/sdc0" ... "/dev/sdc7" on each of the host machines.

Since the storage configuration must be identical on all three nodes, it is recommended to describe the storage structure in a separate configuration file (to be included in each CHARON-VAX configuration file with "include" instruction and name of the configuration file "disksets.cfg") and store it on a common network share ("/mnt/share") (NFS, SAMBA, etc):

```
load HSD50 DISKS1 dssi_host=PAA dssi_node_id=4

set DISKS1 scs_system_id=3238746238 mscp_allocation_class=1

set DISKS1 container[1]="/dev/sdc0"
set DISKS1 container[2]="/dev/sdc1"
set DISKS1 container[3]="/dev/sdc2"
set DISKS1 container[4]="/dev/sdc3"

load HSD50 DISKS2 dssi_host=PAA dssi_node_id=5

set DISKS2 scs_system_id=1256412654 mscp_allocation_class=2

set DISKS2 container[5]="/dev/sdc4"
set DISKS2 container[6]="/dev/sdc5"
set DISKS2 container[7]="/dev/sdc6"
set DISKS2 container[8]="/dev/sdc7"
```

CHARON-VAX configuration file for the emulated VAX 4000 Model 108 node running on *HOST001* is as follows:

```
...  
set PAA port[2]=11012 host[2]="host002:11021"  
set PAA port[3]=11013 host[3]="host003:11031"  
  
include /mnt/share/disksets.cfg  
...
```

CHARON-VAX configuration file for the emulated VAX 4000 Model 108 node running on *HOST002* is as follows:

```
...  
set PAA port[1]=11021 host[1]="host001:11012"  
set PAA port[3]=11023 host[3]="host003:11032"  
  
include /mnt/share/disksets.cfg  
...
```

CHARON-VAX configuration file for the emulated VAX 4000 Model 108 node running on *HOST003* is as follows:

```
...  
set PAA port[1]=11031 host[1]="host001:11013"  
set PAA port[2]=11032 host[2]="host002:11023"  
  
include /mnt/share/disksets.cfg  
...
```

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CHARON-VAX for Linux CI cluster

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Introduction

This section describes how to configure a CHARON-VAX for Linux CI cluster.

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General description

The virtual CIXCD is the functional equivalent of a hardware CIXCD host adapter, with the exception that there is no physical layer to connect to a hardware CI infrastructure. Since the current host hardware is much faster than the physical CI implementation, such a connection - if it were possible - would greatly limit the virtual system throughput.

For data storage, the CIXCD connects to one or more virtual HSJ50 controllers that are loaded as separate components in the configuration file. To configure VAX CI clusters, the virtual CIXCDs of the multiple CHARON-VAX/66X0 instances are interconnected via TCP/IP links.

It is advisable to start any field test based on the cluster examples provided below

Configuring (large) virtual VAX CI clusters requires many configurable parameters and a replicated identical definition of the shared virtual HSJ50 storage controllers in each virtual VAX instance.

The current CI implementation for CHARON-VAX/66x0 supports up to 8 VAX nodes in a virtual CI cluster and handles a maximum cluster size of 128 nodes. A single virtual CI network supports up to 256 storage elements.

For more details on CI configuration follow [this link](#).

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Configuration steps

To create CHARON-VAX CI cluster, both of the two elements must be configured:

1. "CIXCD" host adapter
2. "HSJ50" storage controller

CI hardware topology is emulated by establishing TCP/IP channels between the emulated CIXCD host adapters of each CHARON-VAX system. The emulated HSJ50 storage controllers are then connected to every CIXCD host adapter in the virtual CI network.

Cluster operation requires (virtual) disks that are simultaneously accessible by all CHARON-VAX nodes involved. This can be implemented for instance by using a properly configured iSCSI initiator / target structure or a fiber channel storage back-end. Disks on a multiport SCSI switch are not acceptable, as a SCSI switch does not provide true simultaneous access to multiple nodes.

It is advisable to start any field test with implementing the cluster examples provided below

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Example 1: Dual node CI cluster with 4 shared disks

To setup two emulated VAX 6610 nodes, we need two host machines, preferably running the same version of Linux.

Assume that these host systems have network host names *CASTOR* and *POLLUX* in the host TCP/IP network.

The following are CHARON-VAX configuration files for the emulated VAX 6610 nodes running on *CASTOR* and *POLLUX*:

CASTOR node

```
...
load CIXCD PAA ci_node_id=1

set PAA port[2]=11012 host[2]="pollux:11021"

load HSJ50 DISKS ci_host=PAA ci_node_id=101

set DISKS scs_system_id=3238746238 mscp_allocation_class=1

set DISKS container[0]="/mnt/share/dua0-rz24-vms-v6.2.vdisk"
set DISKS container[1]="/mnt/share/dua1-rz24-vms-v6.2.vdisk"
set DISKS container[2]="/mnt/share/dua2-rz24-vms-v6.2.vdisk"
set DISKS container[3]="/mnt/share/dua3-rz24-vms-v6.2.vdisk"
...
```

POLLUX node

```
...
load CIXCD PAA ci_node_id=2

set PAA port[1]=11021 host[1]="castor:11012"

load HSJ50 DISKS ci_host=PAA ci_node_id=101

set DISKS scs_system_id=3238746238 mscp_allocation_class=1

set DISKS container[0]="/mnt/share/dua0-rz24-vms-v6.2.vdisk"
set DISKS container[1]="/mnt/share/dua1-rz24-vms-v6.2.vdisk"
set DISKS container[2]="/mnt/share/dua2-rz24-vms-v6.2.vdisk"
set DISKS container[3]="/mnt/share/dua3-rz24-vms-v6.2.vdisk"
...
```

Let's review both configurations step-by-step.

1. The first two lines of both configuration files load and establish parameters for the "PAA" CIXCD host adapter. Only 3 CIXCD parameters are important for us in this situation:

Parameter	Description
ci_node_id	An integer value that specifies the address of the virtual CIXCD host adapter on the virtual CI network. Possible values are from 0 through 127 (Initially set to 127).
port	An integer value that specifies the TCP/IP port number at which the emulated CIXCD host adapter listens for connections from another emulated CIXCD host adapter with a certain CI node id. Possible values are from 1024 through 32767.
host	A string value that specifies the TCP/IP host name (and optional TCP/IP port number) to connect to another emulated CIXCD host adapter with certain CI node. The syntax for the string is "host-name[:port-no]", with possible values for "port-no" in the range from 1024 through 32767.

Thus, *CASTOR* connects to *POLLUX*'s port 11021 and listens for *POLLUX*'s connection on port 11012, *POLLUX* connects to *CASTOR*'s port 11012 and listens for *CASTOR*'s connection on port 11021

2. The third and fourth lines of both configuration file "DISKS" HSJ50 storage controller and its parameters:

Parameter	Description
ci_host	A string value that specifies an instance name of the emulated CIXCD host adapter serving the virtual CI network. If this value is not set, CHARON-VAX tries to locate the host adapter automatically. This automatic lookup works only if the CHARON-VAX configuration has exactly one instance of an emulated CIXCD host adapter.
ci_node_id	An integer value that specifies the address of the emulated HSJ50 storage controller on a virtual CI network. Possible values are from 0 through 7 (initially set to 0).

scs_system_id	A string value that specifies <i>the SCSNODENAME</i> of the emulated HSJ50 storage controller. The string is up to 10 characters long. Possible characters are uppercase letters A through Z , figures 0 through 9.
mscp_allocation_class	An integer value that specifies the <i>ALLOCCLASS</i> of an emulated HSJ50 storage controller. Possible values are from 0 through 255 (initially set to 0).

In both configuration files, the data related to the emulated HSJ50 storage controller "DISKS" **must be identical**. Not following this rule can cause data corruption on the (virtual) disks.

- The next lines demonstrate mapping the "DISKS" HSJ50 storage controller to disk images, shared between both hosts. A "container" parameter is used for this purpose. This example assumes that all disk images are accessible from both host machines via network share (NFS, SAMBA) or some other realization.

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Example 2: Triple node CI cluster with multiple iSCSI disks

In this example we assume that all three host systems have a iSCSI initiator and are connected to a common iSCSI server. The iSCSI disk server provides 8 virtual disks with R/W access on all hosts. These disks are configured as "/dev/sdc0" ... "/dev/sdc7" on each of the host machines.

Since the storage configuration must be identical on all three nodes, it is recommended to describe the storage structure in a separate configuration file (to be included in each CHARON-VAX configuration file with "include" instruction and name of the configuration file "disksets.cfg") and store it on a common network share ("/mnt/share") (NFS, SAMBA, etc):

```
load HSJ50 DISKS1 ci_node_id=4

set DISKS1 scs_system_id=3238746238 mscp_allocation_class=1

set DISKS1 container[1]="/dev/sdc0"
set DISKS1 container[2]="/dev/sdc1"
set DISKS1 container[3]="/dev/sdc2"
set DISKS1 container[4]="/dev/sdc3"

load HSJ50 DISKS2 ci_node_id=5

set DISKS2 scs_system_id=1256412654 mscp_allocation_class=2

set DISKS2 container[5]="/dev/sdc4"
set DISKS2 container[6]="/dev/sdc5"
set DISKS2 container[7]="/dev/sdc6"
set DISKS2 container[8]="/dev/sdc7"
```

CHARON-VAX configuration file for the emulated VAX 6610 node running on *HOST001* is as follows:

```
...

load CIXCD PAA ci_node_id=1

set PAA port[2]=11012 host[2]="host002:11021"
set PAA port[3]=11013 host[3]="host003:11031"

include /mnt/share/disksets.cfg
...
```

CHARON-VAX configuration file for the emulated VAX 6610 node running on *HOST002* is as follows:

```
...

load CIXCD PAA ci_node_id=2

set PAA port[1]=11021 host[1]="host001:11012"
set PAA port[3]=11023 host[3]="host003:11032"

include /mnt/share/disksets.cfg
...
```

CHARON-VAX configuration file for the emulated VAX 6610 node running on *HOST003* is as follows:

```
...  
load CIXCD PAA ci_node_id=3  
  
set PAA port[1]=11031 host[1]="host001:11013"  
set PAA port[2]=11032 host[2]="host002:11023"  
  
include /mnt/share/disksets.cfg  
...
```

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CHARON-VAX for Linux virtual network

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- Using "ncu" utility to establish CHARON virtual network
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 - Virtual interface creation
 - Bridge creation
 - Starting bridge
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General description

It is strongly recommended to use only physical network adapters for CHARON-VAX networking to gain maximum performance. In situations where the host has only one network adapter, you can use the LINUX virtual network Interfaces ("TUN/TAP") and map individual CHARON-VAX instances to their own virtual interfaces.

There are 2 ways to create the LINUX virtual network Interfaces ("TUN/TAP"):

- Using "ncu" utility
- Manually

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Using "ncu" utility to establish CHARON virtual network

Login a root. Start "ncu" utility:

```
# ncu

CHARON Network Configuration Utility, STROMASYS (c) 2015 Version
1.5

Interfaces Dedicated to State
-----
eth0      host      connected to host
eth1      host      connected to host
lo        host      unmanaged from host

=====
bridge name   bridge id   STP enabled   interfaces

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Destroy Bridge
5 - Print status
6 - Exit
:> 3
```

Enter "3" to create a bridge between the host physical network adapter and the LINUX virtual network Interfaces (TAP) and specify the physical network interface ("eth1" in our example) and a number of the virtual network Interfaces to be created (2 in our example):

```
Specify the interface to be used for BRIDGE:eth1
How many tap should be created:2
Forming the bridge: ..1..2..3..4..5.. addif tap0 .. addif tap1 ..7..8 done!
Formed bridge br0_eth1 attached over eth1...

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
:> 5
```

Now enter "5" to see the created virtual interfaces:

```
Interfaces    Dedicated to    State
-----
eth0          host            connected to host
eth1          bridge          connected to bridge
lo            host            unmanaged from host
tap0          bridge          connected to bridge
tap1          bridge          connected to bridge

=====
bridge name    bridge id        STP enabled    interfaces
br0_eth1       8000.525400698995a  no             tap0
tap1

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
:> 5
```

In the example above we see 2 virtual network Interfaces "tap0" and "tap1" connected to the created bridge. The physical network interface "eth1" is used for the bridge to the virtual network interfaces.

The interfaces "tap0" and "tap1" are ready to be used in CHARON configurations - they do not need to be additionally dedicated to CHARON.

Enter "6" to quit "ncu" utility.

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Manual configuration of CHARON virtual network

Preparation of the host to create the virtual network

1. Login as "root" user.
2. Configure the physical network interface to run in promiscuous mode using the following command. This interface will be dedicated to the whole network bridge (created later).

```
# ifconfig eth<N> 0.0.0.0 promisc up
```

Promiscuous mode allows the physical (or virtual) network interface to accept the entire volume of incoming packets. This mode is essential for consistency of the information transfer.

3. In case the firewall is enabled on the host system, the following command should be executed to allow the bridge to forward IP packets:

```
# /sbin/iptables -I FORWARD -m physdev --physdev-is-bridged -j ACCEPT
```

This command can also be performed from the bridge configuration script. It has to be executed each time the *iptables* service is (re)started.

It is also possible to make this setting system-wide. Either:

- a. Issue the given command from the firewall control panel.
- b. Add the following line to the end of the "/etc/sysconfig/iptables" file:

```
-I FORWARD -m physdev --physdev-is-bridged -j ACCEPT
```

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Virtual interface creation

Creation of the desired number of virtual network interfaces (TAPs) can be performed in the following way:

```
# tuncctl [-t tap<N>]
```

where “tap<N>” is a name of an instance of the virtual network interface, i.e. “tap0”, “tap1” etc.

Once each virtual network interface instance is created it must be set to promiscuous mode:

```
# /sbin/ifconfig tap<N> promisc up
```

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Bridge creation

To interconnect the physical and virtual network interfaces created in the previous step the network bridge must be introduced in the following way:

```
# /usr/sbin/brctl addbr br0
```

where “br0” stands for a name of the created bridge.

Now it is possible to add the network interfaces to the created bridge:

```
# /usr/sbin/brctl addif br0 eth<N>
# /usr/sbin/brctl addif br0 tap0
...
# /usr/sbin/brctl addif br0 tap<N>
```

Example:

```
# /usr/sbin/brctl addif br0 eth1
# /usr/sbin/brctl addif br0 tap0
```

The proposed configuration assumes one and only one network bridge, so loops are not possible. It is required to turn off the spanning tree protocol with the following command:

```
# /usr/sbin/brctl stp br0 off
```

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Starting bridge

To start the created bridge “br0” use the following command:

```
# /sbin/ifconfig br0 up
```

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Usage of the virtual interface in CHARON-VAX configuration

Once the “tap<N>” interfaces have been created, the load command maps those interfaces to CHARON-VAX:

```
...
load tap_port/chnetwrk XQA0 interface="tap<N>"
...
```

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CHARON-VAX for Linux licensing

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- License management
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 - General Description
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- Transferring and removing CHARON-VAX software licenses
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 - Cloned Software License Removal
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- Special "backup" license keys

General description

CHARON-VAX product is protected by licenses, issued by STROMASYS for each customer individually. The CHARON-VAX license defines all the specifics of the particular CHARON-VAX distribution and its usage.

The license is implemented in the form of a hardware dongle (a Sentinel HASP key) or a software license. Please be careful with your license key. In case of loss or damage, CHARON-VAX will not run or start unless the license key is replaced. For extra protection, STROMASYS recommends the use of a backup license key (purchased separately) that can replace the main license key for a restricted period of time. It is possible to specify the backup license in the CHARON-VAX configuration file to prevent CHARON-VAX from stopping in case its main license is no longer accessible.

The CHARON-VAX license is read upon the start of each instance of CHARON-VAX and at a specified interval (defined by the license content) during the emulated system execution. If CHARON-VAX detects the absence (or malfunction) of the license key / software license, CHARON will try to use a backup license (if specified in the configuration file). If the license is not available / not specified, CHARON displays a warning message in the log file requesting license key reconnection or software license reactivation. If the license is not reconnected within a given period of time (the check interval), CHARON-VAX exits.

Note that if the time-restricted license is used and it expires, CHARON-VAX tries to find its replacement automatically and, if found, CHARON-VAX proceeds using the replacement license.

The present CHARON-VAX implementation requires that the expired license be removed to allow the running CHARON-VAX to switch to some other (valid) one.

The CHARON-VAX software license is not distributed in case of Proof-of-Concept and evaluation installations. Only hardware dongles are used in this case.

It is important to connect HASP license keys to the computer from time to time even if CHARON-VAX is not used. The keys contain a built-in accumulator that needs to be charged. If the accumulator is completely discharged, a license key can be fatally damaged.

Update of the CHARON-VAX license can be performed on the fly without stopping CHARON-VAX. At the next license check, CHARON-VAX will use the updated license normally.

The following sections list all the main parameters of the CHARON-VAX licensing mechanism.

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Parameters defined by CHARON-VAX license

The following table represents all the parameters defined by CHARON-VAX license:

General	Products relevant	Optional
<ul style="list-style-type: none"> Physical key ID License Number End user name Master key ID License release date and time Update Number Purchasing Company name. In most cases the company to which the key was issued originally 	<ul style="list-style-type: none"> Commercial product name Commercial product code Commercial product version and range of build numbers suitable for running Range of CHARON-VAX virtual models available for running Type of host CPU required Host operating system required Number of virtual CPUs enabled for virtual SMP systems Minimum number of host CPU cores required Minimum host memory required Maximum memory emulated. If not present the value defaults to the maximum memory possible for the particular virtual system. Note that the maximum memory may not be available to the virtual system if the host computer has insufficient physical memory. Maximum number of CHARON-VAX instances that can be run concurrently Whether or not CHAPI (CHARON-VAX API) can be used with this product Product and Field Test expiration dates (if any) Product and Field Test executions counter (if any) Maximum number of hosts that may run CHARON-VAX concurrently (in the case of a networking license) Level of support (if any), end date of any support contract, the "First Line" Service Provider Frequency of CHARON-VAX license checking during CHARON-VAX execution 	<ul style="list-style-type: none"> Possibility to attach hardware QBUS/UNIBUS hardware via adapter Parameter that reduces the maximum speed of the program Parameter that enables the product to support additional serial lines through an option board from a company such as DIGI Parameter that prohibits use of Advanced CPU Emulation. If not present the Advanced CPU Emulation is enabled Parameter that enables emulation of IEQ11-A IEEE488 Controller (on top of DCI-3100 IEEE488 Controller) Parameter that enables emulation of DRV11-WA I/O controller (on top of DCI-1100 I/O controller)

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CHARON-VAX licensing models

CHARON-VAX licensing models are divided in 3 groups:

Regular Sentinel HASP keys

This is most common way of CHARON-VAX licensing.

The CHARON-VAX license is embedded in a Sentinel HASP dongle. This license is available only on the host where the dongle is physically installed.

The CHARON-VAX installation procedure takes care of the Sentinel HASP run-time (driver) installation. Once the CHARON-VAX product has been installed, it is possible to plug-in the regular license key and proceed with CHARON-VAX usage without additional configuration steps.

The number of CHARON-VAX instances allowed to run on a particular host may be restricted by the license content (see above).

Network Sentinel HASP keys

The Network Sentinel HASP key (red dongle) can be shared between several hosts running CHARON-VAX (including the host on which the network license is installed).

If CHARON-VAX is installed on the host where the network key is connected, no additional steps are required. The Sentinel driver is activated as part of the CHARON-VAX installation. If the host does not have CHARON-VAX installed, the host can still distribute the connected network license to CHARON-VAX instances running on other hosts. In this case the Sentinel driver must be installed on the host manually.

The Sentinel run-time driver is distributed as a separate RPM package in the CHARON-VAX kit. Please see the "[License installation](#)" section of this chapter for details.

Once the Sentinel run-time driver is installed and the network license is connected, CHARON-VAX can be started on any appropriate host on the LAN network segment.

The Network license key contains a specific parameter to restrict the number of hosts allowed to run CHARON-VAX at the same time. Together with a parameter defining the number of CHARON-VAX instances that may run at the same time, the network license sets the total number of running CHARON-VAX instances on the allowed number of hosts.

Software licenses

The CHARON-VAX Software License is a "virtual" key with exactly the same functionality as the hardware dongle.

The CHARON-VAX software license does not require any hardware but it requires installation of the Sentinel run-time environment.

Software licenses are always network-wide on Linux, so they behave the same way as Network HASP keys.

Software Licenses are highly dependent on hardware configuration of CHARON host. Do not change hardware configuration since it leads to disabling of installed Software License!

If CHARON host has to be upgraded use the following procedure:

1. [Transfer Software License](#) to some other host.
2. Upgrade CHARON host.
3. [Transfer Software License](#) back to CHARON host.

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Multiple licenses configuration and backup license

For any type of licensing, CHARON-VAX can use **only one valid ("active") license (of given vendor code) at a time.**

The "hasp_srm_view" utility displays the "active" license by default, but it is able to display all available licenses with "-all" parameter. It is also possible to check some specific license by its number using "-key" parameter.

The utility provides the license number and ID / IP address of the host where the active license is installed.

CHARON-VAX **cannot**: check all the available license keys / software licenses, choose one, automatically switch from one key to another, etc.

The general recommendation is to avoid usage of multiple keys in one network segment. Use only one locally installed license per host or one network license per local network segment containing several CHARON-VAX hosts.

When needed, it is possible to use a special parameter in the CHARON-VAX configuration file to specify exactly which license must be used by each particular instance of CHARON-VAX:

Parameter	Type	Value
license_key_id[N], N=0 or 1	Numeric	<p>A number (decimal Sentinel key ID) that specifies regular (N=0) and backup (N=1) license keys to be used by CHARON-VAX.</p> <p>Example:</p> <pre>set session license_key_id[0]=1877752571 set session license_key_id[1]=354850588</pre> <p>It is also possible to specify both regular and backup key in one line.</p> <p>Example:</p> <pre>set session license_key_id[0]=1877752571 license_key_id[1]=354850588</pre> <p>Depending on the presence of the regular and/or backup license key IDs in the configuration file, CHARON-VAX behaves differently:</p> <ol style="list-style-type: none"> No keys are specified CHARON-VAX behaves as usual (performs unqualified search for any suitable key). If no keys are found, CHARON-VAX exits. Both keys are specified CHARON-VAX performs qualified search for regular license key. If it is not found, CHARON-VAX performs qualified search for backup license key. If it is not found, CHARON-VAX exits. Only regular key is specified CHARON-VAX performs qualified search for regular license key. If it is not found, CHARON-VAX performs unqualified search for any suitable key. If it is not found, CHARON-VAX exits. Only backup key is specified CHARON-VAX behaves as usual (performs unqualified search for any suitable key). If no keys are found, CHARON-VAX exits.

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License installation

Installation of Regular and Network license keys

Installation of CHARON-VAX regular and network licenses consists of:

- Installation of the Sentinel run-time environment on the CHARON-VAX host (regular and network keys) or on the host that will distribute CHARON-VAX licenses over a local network segment (network key only). The Sentinel software (the "aksusbd" RPM package) is installed automatically by CHARON-VAX for Linux.
- Physical connection of the HASP license dongle to the CHARON-VAX host or to the host distributing the CHARON-VAX license over the local network segment.

When manual installation of Sentinel run-time is required (in the case of the network license server that does not have CHARON-VAX installed), open the CHARON-VAX kit folder and proceed the following way:

```
# rpm --nodeps -ihv aksusbd-2.5-1.i386.rpm charon-license-4.7-17101.68704.e171.x86_64.rpm
```

In case of network-wide license (red dongle) do the following:

- *On server side (where network license will reside):* open port 1947 for both TCP and UDP
- *On clients side:* open UDP ports 30000-65535
- *Both on server and client sides:* setup default gateway

Please consult with your Linux User's Guide on details.

If stricter firewall rules are required, it is possible to open the ports 30000-65535 and 1947 only for the "/usr/sbin/hasplmd" daemon.

Some additional packages may be needed in certain cases, for example "glibc.i686"

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Replacement of currently installed Sentinel run-time

Replacement of currently installed Sentinel Run-time may be needed in case of:

- Upgrade to a newer version of CHARON-VAX
- Installation of a specific CHARON-VAX license Run-time provided by STROMASYS

Run-time replacement is a two step process:

- Remove the current run-time (and the package "charon-license-<...>.rpm" containing the run-time customization) with the command

```
# rpm --nodeps -e aksusbd charon-license-<...>
```

- Change to the directory where the new run-time RPM resides (along with the corresponding "charon-license-<...>.rpm" customization package) and issue the command:

```
# rpm --nodeps -ihv aksusbd<...>.rpm charon-license-<...>.rpm
```

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Installation and update of CHARON-VAX Software License or HL/HASP dongle License

CHARON-VAX software licenses can be installed according to the following procedure:

- Install CHARON-VAX together with Sentinel run-time (Sentinel run-time is an essential part of CHARON-VAX for Linux distribution)
- Reboot host system
- In case of Software License installation and if there are already installed network-wide SL's in local network disable access to network licenses in the following way:
 - Go to <http://localhost:1947> to access the "Sentinel HASP Admin Control Center" (ACC).
 - Select "Configuration" option at the left panel, then "Access to Remote License Managers" tab.
 - Uncheck the highlighted options:



Sentinel Admin Control Center

Configuration for Sentinel License Manager on KIRILL

Options: Sentinel Keys, Products, Features, Sessions, Update/Attach, Access Log

Basic Settings | Users | **Access to Remote License Managers** | Access from Remote Clients | Detachable Licenses | Network

Allow Access to Remote Licenses You may experience a delay of a few minutes before your changes will take effect.

Broadcast Search for Remote Licenses

Aggressive Search for Remote Licenses

Specify Search Parameters

- Press "Submit" button to apply settings
- Select "Network" tab.
- Switch "Network visibility" to "None":



Sentinel Admin Control Center

Configuration for Sentinel License Manager on KIRILL

Options: Sentinel Keys, Products, Features, Sessions, Update/Attach, Access Log, Configuration, Diagnostics

Basic Settings | Users | Access to Remote License Managers | Access from Remote Clients | Detachable Licenses | **Network**

Network Visibility All Network Adapters None (Local Access Only)

A change to this setting may disrupt existing local and remote sessions with this License Manager.

When this setting is changed, License Manager will be unavailable for several seconds.

If set to "None", keys containing FQDN-protected licenses will be disabled.

Warning: If this browser session is with a remote Admin Control Center, and you set that remote License Manager service to "None", your session terminates. You will not be able to reconnect to that License Manager service or Admin Control Center.

- Press "Submit" button to apply setting.
- Do not forget to return these settings back after SL installation.
- Connect HASP dongle to host system (in case of update of a license in a dongle)

- Collect CHARON-VAX host fingerprint file (".c2v") - in case of first installation of Software License:

```
# hasp_srm_view -fgp my_host.c2v
```

or collect ".c2v" file in case if already installed Software License or connected HL/HASP dongle needs updating:

```
# hasp_srm_view -c2v current_license.c2v
```

- Send the ".c2v" file ("my_host.c2v" / "current_license.c2v" in the examples above) to STROMASYS
- Receive a ".v2c" file in return and put it somewhere on the CHARON-VAX host.
- Start any web browser on this system and go to <http://localhost:1947> to access the "Sentinel HASP Admin Control Center" (ACC) or configure ACC for remote access (see the details below).
- In ACC, under the Options menu, select Update/Attach, "Browse" for the "*.v2c" file and then "Apply File".
- Ensure that the license appears in the "Sentinel Keys" menu.

Alternatively it is also possible to use "hasp_update" utility for applying ".v2c" file.

Content of the installed software license is not shown by the Sentinel HASP Admin Control Center. To see it please run "hasp_srm_view" utility from local console or configure remote access according to the instructions given in the "hasp_srm_view" utility section

In case of network-wide software license do the following:

- *On server side (where network license will reside):* open port 1947 for both TCP and UDP
- *On clients side:* open UDP ports 30000-65535
- *Both on server and client sides:* setup default gateway

Please consult with your Linux User's Guide on details.

If stricter firewall rules are required, it is possible to open the ports 30000-65535 and 1947 only for the "/usr/sbin/hasplmd" daemon.

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License management

CHARON-VAX license management is performed by the Sentinel Admin Control Center and specific utilities. These are described in the sub-sections below.

Sentinel Admin Control Center

General Description

The Sentinel Admin Control Center (ACC) is the web-interface to the Sentinel run-time environment. It allows viewing/managing available keys, enabling and disabling them, controlling usage of remote keys etc.

To access the ACC, start any web browser and go to <http://localhost:1947>

Sentinel Admin Control Center is not able to display CHARON-VAX licenses - to view key contents, use the "hasp_srm_view" utility.

To access Sentinel Admin Control Center start any web browser, enter <http://localhost:1947> and press Enter. Web interface of the Sentinel Admin Control Center will appear.

The screenshot below gives an example of its interface:



Options

Sentinel Keys

Products

Features

Sessions

Update/Attach

Access Log

Configuration

Diagnostics

Help

About

Sentinel Keys Available

#	Location	Vendor	Key ID	Key Type	Configuration	Version	Sessions	Actions
1	XEON4WAYW7	68704	961833018	HASP HL NetTime 50	-	3.25	-	<input type="checkbox"/> Browse Net Features
2	Local	68704	354850588	HASP HL NetTime 50	-	3.25	-	Products Sessions Features Blink on
3	Local	68704	1351199824	HASP HL Time	-	3.25	-	Products Sessions Features Blink on
4	rh64	DEMOMA - evaluation	464243137687019632	HASP SL AdminMode Rehostable	-	2.31	1	<input type="checkbox"/> Browse Net Features

Details for HL NetTime 50 (ID:961833018) on 192.168.1.22

Key Hardware Version: 6.2

Sentinel License Manager Version: 12.50 Build 1.16926

Uptime: 7 days 23 hours 45 minutes

Host: XEON4WAYW7 running Windows 7 Ultimate Build 7601 Service Pack 1 (x86 Family 15 Model 2 Stepping 5)

This example demonstrates that 4 license keys are available:

1. Network key ("HASP-HL NetTime") on the host "XEON4WAYW7"
2. Network key installed locally
3. HASP-HL installed locally
4. Network-wide software license on the host "RH64"

Sentinel Admin Control Center reports that there is one opened session on key (4). The other keys are not being used at the moment

Using Sentinel Admin Control Center it is possible to check available keys, verify hosts on which they reside, verify opened sessions etc. For a more detailed description of Sentinel Admin Control Center, please refer to its "Help" section.

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Disable remote keys access

A helpful feature of Sentinel Admin Control Center is the ability to disable access to remote keys. If the network key is installed locally, access to the key from remote hosts can be disabled. The following examples demonstrate how this can be done.

To disable access to remote keys switch to the "Access to Remote License managers" tab and uncheck the "Allow Access to Remote Licenses" checkbox. Then press "Submit" button to apply this setting:



Sentinel Admin Control Center

Options

- Sentinel Keys
- Products
- Features
- Sessions
- Update/Attach
- Access Log
- Configuration
- Diagnostics
- Help
- About

Configuration for Sentinel License Manager

Basic Settings
Users
Access to Remote License Managers
Access from Remote Clients
Detachable Licenses

Allow Access to Remote Licenses You may experience a delay of a few minutes before your changes will take effect.

Broadcast Search for Remote Licenses

Aggressive Search for Remote Licenses

Specify Search Parameters

To disable access to the locally installed license key from remote hosts switch to the "Access from Remote Clients" tab and uncheck the "Allow Access from Remote Clients" checkbox. Then press "Submit" button to apply this setting:



Sentinel Admin Control Center

Options

- Sentinel Keys
- Products
- Features
- Sessions
- Update/Attach
- Access Log
- Configuration
- Diagnostics
- Help
- About

Configuration for Sentinel License Manager

Basic Settings
Users
Access to Remote License Managers
Access from Remote Clients
Detachable Licenses

Allow Access from Remote Clients You may experience a delay of a few minutes before your changes will take effect.

Access Restrictions

```
allow=all
```

The entries are evaluated in the order in which they are specified. As soon as a match is found, evaluation stops.
allow=all is implicitly added to end of list

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Accessing Sentinel Admin Control Center from remote hosts

By default, Sentinel Admin Control Center forbids accessing its web interface from remote machines. To allow access, configure ACC for remote management.

The first step is to edit the "hasplm.ini" file:

```
# vi /etc/hasplm/hasplm.ini
```

Allow remote access by changing the "ACCremote" parameter from "0" to "1". Then restart Sentinel Admin Control Center run-time:

```
# /etc/init.d/aksusbd restart
```

If the CHARON-VAX host firewall is blocking remote access to the Sentinel Admin Control Center, please configure the firewall to open the port 1947 (TCP protocol). Refer to Linux documentation for details on how to configure the firewall. It is also possible to use SSH port forwarding with the following command (put the real CHARON-VAX host name instead of "CHARON_MACHINE"):

```
# ssh -L8080:CHARON_MACHINE:1947 root@CHARON_MACHINE
```

This will expose Sentinel Admin Control Center on port 8080 to any computer, and Sentinel Admin Control Center will believe commands are coming from the local host.

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License management utilities

CHARON-VAX for Linux provides a specific utility for license management - "hasp_srm_view". This utility is used to display CHARON-VAX license content, and to collect key status information and host fingerprint (C2V) files.

Applying updates (".v2c" files) is typically done using Sentinel Admin Control Center (see above), but alternatively it is also possible to use a specific "hasp_update" utility for that.

Please refer to the [Utilities](#) section of this Guide for more details.

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Transferring and removing CHARON-VAX software licenses

Software Licenses Transfer

Software Licenses (SL) can be transferred from one host to another using the "hasp_srm_view" utility and "Sentinel Admin Control Center" (ACC).

The following example demonstrates the transfer procedure. Let's suppose a Software License must be transferred from a host "SourceHost" to a host "RecipientHost":

1. Collect the specific information about the "RecipientHost" to issue a transfer license. To do that run "hasp_srm_view" utility on the "RecipientHost" with the following parameters:

```
$ hasp_srm_view -idf
```

The file "recipient.id" will be created in the current directory.

2. Copy the "recipient.id" file to the "SourceHost".

"recipient.id" file is an ASCII file, so use "ascii" option in case of FTP transfer.

3. On "SourceHost", open "Sentinel Admin Control Center" (ACC) (browse to <http://localhost:1947>). Note the number of the software license you are going to transfer.
4. Run the "hasp_srm_view" utility in the following way to create a transfer license for the host "RecipientHost":

```
$ hasp_srm_view -tfr <license number> recipient.id
```

The "license number" is the value collected at step 3. Example of collecting a transfer license:

```
$ hasp_srm_view -tfr 12345678 recipient.id
```

The file "<license number>.v2c" will then be created in the current directory. In the example above the name of the transfer license will be "12345678.v2c"

- Copy the resulting "<license number>.v2c" file to the "RecipientHost".

"<license number>.v2c" file is an ASCII file, so use "ascii" option in case of FTP transfer.

- On "RecipientHost", open "Sentinel Admin Control Center" (ACC) (browse to <http://localhost:1947>). Apply the "<license number>.v2c" file as described above

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Software License Removal

It is also possible to remove Software License completely from a host, the license will then be dumped to a specific license file "*.v2c", so it can be re-applied if needed.

To remove the Software License completely from a host, do the following:

- Open "Sentinel Admin Control Center" (ACC) (browse to <http://localhost:1947>). Note the number of the software license you are going to remove.
- Run the "hasp_srm_view" utility in the following way to remove the license:

```
$ hasp_srm_view -tfr <license number>
```

The "license number" is the value collected at the step 1. Example:

```
$ hasp_srm_view -tfr 12345678
```

The "<license number>.v2c" file will then be created in the current directory. In the example above the name of the transfer license will be "12345678.v2c"

- It is always possible to re-apply the created ".v2c" file to restore the deleted software license.

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Cloned Software License Removal

In certain situations Software License may become "Cloned" (disabled). In this case the following procedure must be applied to remove the cloned license:

- Go to <http://localhost:1947> to access the "Sentinel HASP Admin Control Center" (ACC).
- In the "Sentinel HASP Admin Control Center" (ACC), locate the target "Sentinel SL AdminMode" license.
- Press the "Certificates" button at the right side of the SL description:



Sentinel Admin Control Center

Options

Sentinel Keys Available on charontest.msc.masq

Sentinel Keys
 Products
 Features

#	Location	Vendor	Key ID	Key Type	Configuration	Version	Sessions	Actions
1	Local	68704	387285561437702475	HASP SL AdminMode Inactive (Cloned)	-	2.33	-	Certificates

- Note the name of the correspondent certificate and path to the certificates base in the "Certificates" section.
- Remove the target certificate file from the specified directory (in most cases it is "/var/hasplm/installed/68704/").
- Reboot CHARON host.
- Start "Sentinel HASP Admin Control Center" (ACC) again to ensure that the SL has been removed.

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License Deinstallation

To completely remove a CHARON-VAX license from a host, it is enough to remove the Sentinel run-time daemon (and the package "charon-license-<...>.rpm" containing the run-time customization) using the following command:

```
# rpm --nodeps -e aksusbd charon-license-<...>
```

Then just physically disconnect the license key (in the case of protection by dongles).

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Special "backup" license keys

Backup keys are provided by STROMASYS along with standard license dongles. It is strongly recommended to order a backup key to recover immediately from damage or loss of the main license key. Backup keys use a counter (integer) value hardcoded inside the key. This integer value is a number of hours CHARON-VAX is allowed to run. Each time CHARON-VAX checks the license (every hour), the value is decreased (by 1 hour). Please note that backup keys have restricted functionality:

- CHARON run time is typically limited to 720 hours (30 days). This should be more than enough time to get a replacement from STROMASYS.
- Backup license may be valid only until a certain date. Please check with STROMASYS management.

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CHARON-VAX for Linux utilities

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- General description
- 'mkdskcmd' utility
 - Creating disk images
 - Transferring disk images
- 'mtd' utility
- 'hasp_srm_view' utility
 - Remote collection of status information
 - Software Licenses Transfer
 - Software Licenses Removal
- 'hasp_update' utility
- 'ncu' utility
 - Dedication of a host physical interface to CHARON
 - Release of a host physical interface back to host
 - Creation of a virtual network
 - Removal of a virtual network

General description

CHARON-VAX provides the following set of utilities:

Utility	Description
mkdskcmd	Used to create CHARON virtual disk containers of custom or standard types. This utility also may be used to transfer virtual disks of one type to virtual disks of another type.
hasp_srm_view	Used to display the CHARON license contents, to collect the host system fingerprint and to transfer software licenses from one host to another.
hasp_update	Sentinel standard utility used to retrieve Sentinel protection key information, detach a license from a Sentinel SL key and rehost a license from a Sentinel SL key
ncu	Used to dedicate a host interface to CHARON-VAX, to release it back to the host and to manage CHARON virtual interfaces (TAPs).
mtd	Used to create CHARON tape images from physical tapes and to write tape images back to physical tapes.

All these utilities are invoked from Linux console command line.

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'mkdskcmd' utility

Creating disk images

The "mkdskcmd" utility:

- Creates empty disk images of a given standard disk type or a custom disk size
- Transfers existing disk images of one type to disk images of another type.

The first step is to obtain the name of the disk that needs to be created:

```
$ mkdskcmd --list
```

This command results in a list of all supported disk types.

Choose the desired disk (for example "RZ22"), then use the "mkdskcmd" command to create the virtual disk image as shown below:

```
$ mkdskcmd --disk rz22 --output rz22.vdisk
```

A disk container "rz22.vdisk" will be created in the current directory.

A file "rz22.avdisk" will also be created. This file helps CHARON accurately recognize a specific disk image type. It is recommended to put the ".avdisk" file in the same directory as the created disk image.

It is also possible to create custom disk images using "--blcount" (blocks count) and "--blsize" (blocks size) switches.

To get all the available parameters please use the "--help" switch:

```

mkdisk for CHARON utility v. 1.14
Copyright: STROMASYS, 2015

Usage:
mkdiskcmd [Options]

Options:
--help - to see help screen
-h - to see help screen

--output <full name> - to specify output file name
-o <full name> - to specify output file name

--disk <disk name> - to specify the disk name from Disk table
-d <disk name> - to specify the disk name from Disk table

--blsize <number> - to specify the block size in bytes (custom disk image)
-z <number> - to specify the block size in bytes (custom disk image)

--blcount <number> - to specify number of the blocks (custom disk image)
-c <number> - to specify number of the blocks (custom disk image)

--avtable <full_name> - to specify AVDISK table file
-a <full_name> - to specify AVDISK table file

-t - please see the '--transform' options description
--transform <source_disk_name> <source_disk_params> - to transform the the disk image (change actual size)
<source_disk_name> - the file name of the disk image to be transformed
<source_disk_params> - the name of the disk from the list of available at the Disk table
The source disk size will changed accordingly the reach the specified parameters.
To specify the transform parameters manually, follow the option below:
--transform <source_disk_name> --blsize <number> --blcount <number>

--shrink - parameter which needs to be EXPLICITLY provided, if the disk size is to be decreased
-k - parameter which needs to be EXPLICITLY provided, if the disk size is to be decreased

--list <full_name> - to display AVDISK table
-l <full_name> - to display AVDISK table

--silent - silent mode running
-s - silent mode running

Return value:
0 - for Success
Non zero - in case of failure

Examples:
mkdiskcmd -h
mkdiskcmd -l
mkdiskcmd -a /opt/charon/utils/mkdisk.vtable -o /etc/rk07.vdisk -d rk07
mkdiskcmd -o /etc/custom.vdisk -z 512 -c 16384
mkdiskcmd -t /etc/rz22.vdisk rz25 -a /opt/charon/utils/mkdisk.vtable
mkdiskcmd -t /etc/rz22.vdisk rz25 -a /opt/charon/utils/mkdisk.vtable -z 512 -c 262134

```

The "--avtable" parameter is used to work with an alternative disk specification database (or to point to the standard database ("mkdisk.vtable") if it is in a location other than the current directory).

The "--blcount" (blocks count) and "--blsize" (blocks size) switches are used to create custom disk images.

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Transferring disk images

The "mkdiskcmd" utility is able to transfer (copy) disk images of one type to a disk image of another type.

This operation is needed, for example, to obtain more free space on a disk image that already contains data.

Note: it is not possible to add more free space dynamically. CHARON-VAX must be stopped before performing this operation.

If a source disk image is larger than the target disk image, the extra data is lost. If the source disk image is smaller, it will be extended and padded with null bytes ('\0').

An example of the syntax follows:

```
$ mdkdiskcmd --transfer <source disk file name> <source disk parameters> [--shrink] [-k]
```

where:

- <source disk file name> - a file name of the disk image to be transferred
- <source disk parameters> - the name of the disk from the list of available on "mkdiskcmd --list" request or the disk geometry specification (see below).
- --shrink or -k - used in the case when the target disk is transferred to a smaller disk.

Example:

```
$ mdkdiskcmd --transfer /etc/rz22.vdisk rz25
```

It is also possible to specify the disk parameters manually with "--blcount / -c" (blocks count) and "--blsize / -z" (blocks size) switches:

```
$ mdkdiskcmd --transfer <source disk file name> -blsize <number> -blcount <number>
```

Example:

```
$ mdkdiskcmd -t /etc/custom.vdisk -z 512 -c 262134
```

There is a certain delay between the moment when the utility reports that a disk image has been transferred and its actual availability to CHARON. This delay can reach to several minutes in case of very big disks transfers. It happens because the host operating systems needs some time for actual allocation of the enlarged file on HDD.

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'mtd' utility

The "mtd" utility is used to:

- Create a CHARON tape image from a physical tape
- Write a tape image to a physical tape.

Usage is the following:

```
$ mtd [options] <tape device name> <tape container name>
```

where the options are:

Parameter	Description
-l <file name>	Creates an execution log "file name".
-r <number>	Specifies a number of attempts to read a damaged data bock
-i	Directs to ignore bad blocks and continue processing w/o interruption. It implies "-r 0"
-n	Do not rewind tape
-p	Disable progress reporting
-v	Enable verbose trace of data transfer (implies "-p")

Example:

```
$ mtd -l tape1.txt -r 10 /dev/st5 /charon/tapes/tape1.vtape
```

Use the following syntax to write the content of a tape container to a physical tape:

```
$ mtd <tape container name> <tape device name>
```

Example:

```
$ mtd /charon/tapes/tape1.vtape /dev/st5
```

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'hasp_srm_view' utility

The "hasp_srm_view" utility displays content of CHARON-AXP licenses.

Run the utility with one of the following parameters to see the license(-s) details:

- "-l" (or without parameters) - CHARON default license details
- "-all" - all available CHARON licenses details
- "-key <key number>" - specific CHARON license (defined by its "key number") details

The "hasp_srm_view" utility provides the following functionality:

- Display the CHARON-AXP licenses details. It is possible to view all available license or some specific one.
- Collecting license status information
- Collecting host fingerprint information
- Managing software license transfer procedure.

Run the utility without any options to display the license details.

```
# hasp_srm_view -help

CHARON Sentinel HASP utility
Copyright: STROMASYS, 2015

Options:
-? or -h or -help - to see help screen

-l - to see CHARON license details (for default key)
-all - to see CHARON license details (for all available keys)
-key <key number> - to see CHARON license details (for specific key)

-c2v <C2V file> - to collect the key status information (C2V file)
-fgp <C2V file> - to collect the host fingerprint information (C2V file)

-tfr <LicenseID> <recipient file> - to transfer SL license (V2C file)
-tfr <LicenseID> - to remove SL license (V2C file) from the local host
-idf - to get transfer recipient (ID) file "recipient.id"
```

The specific type of CHARON license defines what switches may be used in each case.

Collecting the "c2v" file can be done only from the CHARON host console.

Remote collection of status information

For remote collection of status information it is recommended to use "ssh" as shown in the following examples:

```
# ssh root@CHARON_HOST /opt/charon/bin/hasp_srm_view -c2v /opt/charon/bin/my_hasp_key.c2v
# ssh root@CHARON_HOST /opt/charon/bin/hasp_srm_view -fgp /opt/charon/bin/my_host_fingerprint.c2v
```

To see the license text on the console:

```
# ssh root@localhost /opt/charon/bin/hasp_srm_view
```

To collect license text to an output file on host server:

```
# ssh root@localhost /opt/charon/bin/hasp_srm_view > /opt/charon/bin/hasp_srm_view.txt
```

The "hasp_srm_view" utility always reports the ID and IP address of the host(s) where active licenses are found.

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Software Licenses Transfer

Software Licenses (SL) can be transferred from one host to another one with the help of "hasp_srm_view" utility and "Sentinel Admin Control Center" (ACC).

The following example demonstrates the transfer procedure.

Let's suppose a Software License must be transferred from a host "SourceHost" to a host "RecipientHost":

1. Run "hasp_srm_view" utility on the "RecipientHost" with the following parameters to collect the host ID info:

```
$ hasp_srm_view -idf
```

The "recipient.id" file will be created in the current directory.

2. Copy the "recipient.id" file to the "SourceHost".

"recipient.id" is an ASCII file, so use the "ascii" option for FTP transfer.

3. On the "SourceHost", open the "Sentinel Admin Control Center" (ACC) (<http://localhost:1947>). Note the number of the software license you are going to transfer.
4. Run the "hasp_srm_view" utility in the following way to create a transfer license for the host "RecipientHost":

```
$ hasp_srm_view -tfr <license number> recipient.id
```

The "license number" is the value collected at the step 3.

Example of collecting a transfer license:

```
$ hasp_srm_view -tfr 12345678 recipient.id
```

A "<license number>.v2c" file will be created in the current directory. In the example above, the name of the transfer license will be "12345678.v2c"

- Copy the resulting "<license number>.v2c" file to the "RecipientHost".

"<license number>.v2c" is an ASCII file, so use the "ascii" option for FTP transfer.

- On the "RecipientHost", open "Sentinel Admin Control Center" (ACC) (<http://localhost:1947>) and apply the "<license number>.v2c" file as described above.

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Software Licenses Removal

When a Software License is removed completely from a host, the license is dumped to a specific license file ".v2c". The license is not destroyed and can be re-applied if needed.

To remove a software license from a host do the following:

- Open "Sentinel Admin Control Center" (ACC) (<http://localhost:1947>). Note the number of the software license you are going to remove.
- Run the "hasp_srm_view" utility in the following way to remove the license:

```
$ hasp_srm_view -tfr <license number>
```

The "license number" is the value collected at the step 1.

Example:

```
$ hasp_srm_view -tfr 12345678
```

The "<license number>.v2c" file will then be created in the current directory. In the example above the name of the transfer license will be "12345678.v2c"

- It is always possible to re-apply the created ".v2c" file to restore the deleted software license.

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'hasp_update' utility

The "hasp_update" is a Sentinel standard utility for license management included in CHARON-VAX kit.

To invoke the "hasp_update" utility login as "root" and use the following syntax:

```
# hasp_update <option> [filename]
```

where:

Parameter	Value	Description
<option>	u	Updates a Sentinel protection key / attaches a detached license
	i	Retrieves Sentinel protection key information
	d	Detaches a license from a Sentinel Software License (SL) key
	r	Rehost a license from a Sentinel Software License (SL) key
	h	Display help
[filename]		Path to the V2C/H2R file (in case of 'update/attach)
		Path to the C2V file Optional: uses "stdout" if file name is not specified (in case of 'info)

Example:

```
# hasp_update u license_update.v2c
```

We recommend to use this tool only for "Update a Sentinel protection key / attach a detached license" function ("u" option). For the rest use "ha

sp_srm_view" utility.

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'ncu' utility

The "ncu" ("Network Control Utility") is used to dedicate a host interface to CHARON-VAX, to release it back to the host and to manage CHARON virtual interfaces (TAPs).

The utility allocates chosen network interfaces (both physical and virtual) and configures the offload parameters.

The NetworkManager service must be running in order to have all the functionalities enabled with "ncu". If the service is not enabled please configure the network using the manual operations described in the section "[Manual configuration of CHARON networking](#)" of the [Installation chapter](#) of this Guide.

Dedication of a host physical interface to CHARON

Login as root. Type "ncu" and press Enter. The following menu will appear:

```
# ncu
CHARON Network Configuration Utility, STROMASYS (c) 2015 Version 1.5

Interfaces Dedicated to State
-----
eth0      host      connected to host
eth1      host      connected from host
lo        host      unmanaged from host

=====
bridge name      bridge id      STP enabled      interfaces

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
:> 6
```

The utility lists available network interfaces (both physical and virtual) and indicates whether they are dedicated to the host or to CHARON and whether they are currently in use by host operating system.

"ncu" offers several options:

- Dedicate interface to CHARON (press "1")
- Release interface to host (press "2")
- Create a bridge between a chosen physical network interface and the Linux virtual network and create a number of virtual network interfaces (press "3")
- Remove the Linux virtual network and all the created virtual network interfaces (press "4")
- Print status (press "5") - use it to display status of network interfaces and the menu shown above
- Exit (press "6")

In the example above we see 2 network interfaces - "eth0" and "eth1", both of them are dedicated to host, but host uses only the interface "eth0".

Let's dedicate the interface "eth1" to CHARON-VAX.

Enter "1", then type "eth1" and press Enter:

```
Specify the interface to dedicate to CHARON:eth1
Turning off offloading for eth1.. Please wait
```

```
select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
:> 5
```

Now the interface "eth1" is dedicated to CHARON-VAX:

```
Interfaces Dedicated to State
-----
eth0      host      connected to host
eth1      CHARON    disconnected from host
lo        host      unmanaged from host

=====
bridge name  bridge id      STP enabled      interfaces

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
```

Enter "6" to return to console prompt.

Now "eth1" can be used by CHARON-VAX.

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Release of a host physical interface back to host

Login as root. Type "ncu" and press Enter. The following menu will appear:

```
# ncu
CHARON Network Configuration Utility, STROMASYS (c) 2015 Version 1.5

Interfaces Dedicated to State
-----
eth0      host      connected to host
eth1      CHARON    disconnected from host
lo        host      unmanaged from host

=====
bridge name  bridge id      STP enabled      interfaces

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
:> 2
```

Let's say that we want to return the interface "eth1" (currently dedicated to CHARON) back to host. To do that enter "2" then "eth1":

```
Specify the interface to release to HOST:eth1
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/3)

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
:> 6
```

Enter "6" to quit the "ncu" utility.

The interface "eth1" is released back to host system now.

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Creation of a virtual network

Login a root. Start "ncu" utility:

```
# ncu
CHARON Network Configuration Utility, STROMASYS (c) 2015 Version 1.5

Interfaces Dedicated to State
-----
eth0      host      connected to host
eth1      host      connected to host
lo        host      unmanaged from host

=====
bridge name   bridge id   STP enabled   interfaces

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Destroy Bridge
5 - Print status
6 - Exit
:> 3
```

Enter "3" to create a bridge between the host physical network adapter and the LINUX virtual network Interfaces (TAP) and specify the physical network interface ("eth1" in our example) and a number of the virtual network Interfaces to be created (2 in our example):

```
Specify the interface to be used for BRIDGE:eth1
How many tap should be created:2
Forming the bridge: ..1..2..3..4..5.. addif tap0 .. addif tap1 ..7..8 done!
Formed bridge br0_eth1 attached over eth1...

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
:> 5
```

Now enter "5" to see the created virtual interfaces:

```

Interfaces   Dedicated to   State
-----
eth0         host           connected to host
eth1         bridge         connected to bridge
lo           host           unmanaged from host
tap0         bridge         connected to bridge
tap1         bridge         connected to bridge

=====
bridge name   bridge id       STP enabled    interfaces
br0_eth1     8000.525400698995a  no            tap0
                                                    tap1

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
:> 6

```

In the example above we see 2 virtual network Interfaces "tap0" and "tap1" connected to the created bridge. The physical network interface "eth1" is used for the bridge to the virtual network interfaces.

The interfaces "tap0" and "tap1" are ready to be used in CHARON configurations - they do not need to be additionally dedicated to CHARON.

Enter "6" to quit "ncu" utility.

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Removal of a virtual network

Login a root. Start "ncu" utility:

```

# ncu

CHARON Network Configuration Utility, STROMASYS (c) 2015 Version
1.5

Interfaces   Dedicated to   State
-----
eth0         host           connected to host
eth1         bridge         connected to bridge
lo           host           unmanaged from host
tap0         bridge         connected to bridge
tap1         bridge         connected to bridge

=====
bridge name   bridge id       STP enabled    interfaces
br0_eth1     8000.525400698995a  no            tap0
                                                    tap1

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
:> 4

```

Enter "4", after that specify the interface that is a bridge to the Linux virtual network on this host ("eth1" in our example) and press Enter:

```
Specify the phys interface used for BRIDGE:eth1
Cleanup bridge br0_eth1 with ip over eth1...
Removing the bridge: ..1..2 delif eth1
delif tap0
delif tap1
..5..6..7..8 done!

select action:
1 - Dedicate to CHARON
2 - Release to host
3 - Create Bridge with TAPs
4 - Remove Bridge
5 - Print status
6 - Exit
:> 6
```

Enter "6" to quit "ncu" utility.

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CHARON-VAX for Linux configuration details

Introduction

This chapter describes in detail all configuration parameters of the devices emulated by CHARON-VAX for Linux, with corresponding examples of their loading and parameters.

Emulated devices are loaded with "load" command (if device has not been already loaded) and parameters are made active the "set" command. It is possible to specify parameters directly in the "load" command.

Example:

```
load RQDX3/RQDX3 DUA
set DUA container[0]="/charon/disks/user.vdisk"
```

In this example, an instance of an RQDX3 controller is loaded with a name "DUA". Its first unit ("container[0]") is mapped to "/charon/disks/user.vdisk" disk image.

The Controller name is accompanied with a "/<module name>". The module name is a CHARON-VAX component that specifies the controller load module. Its name can be the same as the loaded controller, but that is not required. Once a module name is specified there is no need to specify it again for additional references of the same controller..

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General Settings

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Session

General settings that control execution of CHARON-VAX belong to an object called "session". It is a preloaded object; therefore, only "set" commands apply.

Example:

```
set session <parameter>=<value>
```

The following tables describe all available "session" parameters, their meaning and examples of usage:

hw_model

Parameter	hw_model
Type	Text string
Value	<p>Virtual VAX system hardware model to be emulated.</p> <p>Use a default configuration template for each particular model as a starting point for a custom configuration. This would ensure that the parameter is set correctly.</p> <p>Example:</p> <pre>set session hw_model="VAX_6610"</pre> <p>The models are:</p> <ul style="list-style-type: none"> • MicroVAX_3100_Model_96 • MicroVAX_3100_Model_98 • MicroVAX_3600 • MicroVAX_3900 • MicroVAX_II • VAXserver_3600 • VAXserver_3600 • VAXserver_3600_128 • VAXserver_3600_512 • VAXserver_3900 • VAXserver_3900_128 • VAXserver_3900_512 • VAX_4000_Model_106 • VAX_4000_Model_108 • VAX_4000_Model_700 • VAX_4000_Model_705 • VAX_6000_Model_310 • VAXstation_4000_Model_90 • VAX_6610 • VAX_6620 • VAX_6630 • VAX_6640 • VAX_6650 • VAX_6660

configuration_name

Parameter	configuration_name
Type	Text string
Value	<p>Name of CHARON-VAX instance (unique):</p> <pre>set session configuration_name="MSCDV1"</pre> <p>The value of this parameter is used as prefix to the event log file name when multiple log files are configured (see below).</p> <p>From the example above, the CHARON-VAX log file will have the following name:</p> <pre>MSCDV1-YYYY-MM-DD-hh-mm-ss-xxxxxxxxx.log</pre> <p>xxxxxxxxx is an increasing decimal number starting from 000000000 to separate log files with the same time of creation (in case the log is being written faster than one log file per second).</p>

log

Parameter	log
Type	Text string
Value	<p>The log file or directory name is where the log file for each CHARON-VAX execution session is stored.</p> <div style="border: 1px solid #0070C0; padding: 10px; margin: 10px 0;"> <p style="text-align: center; background-color: #0070C0; color: white; margin: 0;">Log specified as a file name</p> <p>It is possible to overwrite the existing log file or to extend it using the "log_method" parameter.</p> <p>i The "log_method" parameter is effective only when a single log file is specified, not a directory.</p> <p>Example:</p> <pre style="border: 1px solid #ccc; padding: 5px;">set session log="/charon/vax4106prod.log"</pre> </div> <div style="border: 1px solid #0070C0; padding: 10px; margin: 10px 0;"> <p style="text-align: center; background-color: #0070C0; color: white; margin: 0;">Log specified as a directory</p> <p>CHARON-VAX automatically creates individual log files for each CHARON-VAX execution session. If the log parameter is omitted, CHARON-VAX creates a log file for each CHARON-VAX execution session in the directory where the emulator was started. In these two cases, the log rotation mode is enabled, meaning a new log file is created each time the virtual machine is started and when the log file size exceeds the one specified (see log_file_size) and/or when the log file is older than a specified number of days (see log_rotation_period).</p> <p>i A symbolic link located in the same directory will be created, pointing to the active log file. Its name is based on the <code>hw_model</code> parameter or the <code>configuration_name</code> parameter if specified.</p> <p>If the "configuration_name" parameter of the session is specified, the log file name is composed as follows:</p> <pre style="border: 1px solid #ccc; padding: 5px;"><configuration_name>-YYYY-MM-DD-hh-mm-ss-xxxxxxxxx.log</pre> <p>If the "configuration_name" parameter is omitted, the log file name will have the following format:</p> <pre style="border: 1px solid #ccc; padding: 5px;"><hw_model>-YYYY-MM-DD-hh-mm-ss-xxxxxxxxx.log</pre> <p>where "xxxxxxxxx" is an increasing decimal integer, starting from 00000000 to separate log files with the same time of creation (in case the log is being created faster than one log file per second).</p> <p>! Only existing directory can be specified. If the directory specified does not exist, this will be considered as a flat file.</p> <p>Example:</p> <pre style="border: 1px solid #ccc; padding: 5px;">set session configuration_name="vax4106prod" set session log="/charon/logs"</pre> <p>The execution of the virtual machine will create a log file, named <code>/charon/logs/vax4106prod-2016-10-13-10-00-00-00000000.log</code> (for example) and a symbolic link named <code>/charon/logs/vax4106prod.log</code> pointing to this file. The link will be updated when the log rotation will occur.</p> </div>

log_method

Parameter	log_method
Type	Text string
Value	<ul style="list-style-type: none">• "overwrite" (default)• "append" <p>Determines if previous log information is maintained.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;">This parameter must be specified only in addition to "log" parameter on the same line.</div> <p>This parameter is applicable only if the CHARON-VAX log is stored in a file that is specified explicitly with the "log" parameter.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"><pre>set session log="log.txt" log_method="append"</pre></div>

log_file_size

Parameter	log_file_size
Type	Text string
Value	<p>If log rotation is enabled, the log_file_size parameter determines the log file size threshold at which the log is automatically rotated.</p> <ul style="list-style-type: none"> • "unlimited" or "0" (default) - the feature is disabled • "default" - default size is used (4Mb) • <size>[KMG] - size of the current log file in bytes with additional multipliers: <ul style="list-style-type: none"> • K - Kilobyte - multiply by 1024 • M - Megabyte - multiply by 1024*1024 • G - Gigabyte - multiply by 1024*1024*1024 <p>Examples:</p> <pre>set session log_file_size="default"</pre> <pre>set session log_file_size=10M</pre> <p> Minimum LOG File size is 64K, maximum is 1G. Setting size less than 64K effectively makes the LOG File unlimited.</p>

log_rotation_period

Parameter	log_rotation_period
Type	Text string
Value	<ul style="list-style-type: none"> • "default" - default value, 7 days. This value is used even if the "log_rotation_period" is not specified. • "daily" or "1" • "weekly" or "7" • "never" or "0" • <N> - in N days <p>If the rotation log mode is enabled this parameter controls switching to next log file based on period of time passed. If enabled the switching to next log file appears at midnight.</p> <p>Examples:</p> <pre>set session log_rotation_period="weekly"</pre> <pre>set session log_rotation_period=14</pre> <p> If enabled the switching to next log file appears at midnight</p>

license_key_id

Parameter	license_key_id[N] N=0 or 1
Type	Numeric
Value	<p>A number (decimal Sentinel key ID) that specifies regular (N=0) and backup (N=1) license keys to be used by CHARON-VAX.</p> <pre>set session license_key_id[0]=1877752571 set session license_key_id[1]=354850588</pre> <p>It is also possible to specify both regular and backup key in one line:</p> <pre>set session license_key_id[0]=1877752571 license_key_id[1]=354850588</pre> <p>Based on the presence of the regular and/or backup license key IDs in the configuration file, CHARON-VAX behaves as follows:</p> <ol style="list-style-type: none"> No keys are specified CHARON-VAX performs an unqualified search for any suitable key. If no key is found, CHARON-VAX exits. Both keys are specified CHARON-VAX performs a qualified search for a regular license key. If it is not found, CHARON-VAX performs a qualified search for backup license key. If it is not found, CHARON-VAX exits. Only regular key is specified CHARON-VAX performs a qualified search for a regular license key. If it is not found, CHARON-VAX performs an unqualified search for any suitable key. If none are found, CHARON-VAX exits. Only backup key is specified CHARON-VAX performs an unqualified search for any suitable key. If no key is found, CHARON-VAX exits.

license_key_lookup_retry

Parameter	license_key_lookup_retry
Type	Text String
Value	<p>In case the CHARON-VAX license connection is not present at guest startup, this parameter specifies how many times CHARON-VAX will try to reestablish the connection and, optionally, a period of time between retries.</p> <p>Syntax:</p> <pre>set session license_key_lookup_retry = "N [, T]"</pre> <p>where:</p> <ul style="list-style-type: none"> • N - Number of retries looking for license key (or keys) • T - Time between retries in seconds. If not specified 60 seconds is used <p>Example 1</p> <pre>set session license_key_lookup_retry = 1</pre> <p>If license key is not found during initial scan, do only one more attempt after 60 seconds.</p> <p>Example 2</p> <pre>set session license_key_lookup_retry = "1,30"</pre> <p>Same as above but retry in 30 seconds.</p> <p>Example 3</p> <pre>set session license_key_lookup_retry = "3,10"</pre> <p>If license key not found during initial scan, do 3 more attempts waiting 10 seconds between them.</p> <p>Example 4</p> <pre>set session license_key_lookup_retry = "5"</pre> <p>If license key is not found during initial scan, do 5 more attempts waiting 60 seconds between them.</p>

affinity

Parameter	affinity
Type	Text string
Value	<p>Overrides any initial process affinity mask provided by the host operating system. Once specified it binds the running instance of the emulator to particular host CPUs. Can be used for soft partitioning host CPU resources and/or for isolating host CPUs for other applications. By default CHARON-VAX emulator instance allocates as many host CPUs as possible. The "affinity" parameter overrides that and allows explicit specification on which host CPU the instance must run.</p> <p>The "affinity" parameter defines the total number of host CPUs to be used both for emulated VAX CPUs and for CHARON-VAX / CHARON-PDP application itself (including the CPUs to be used for I/O - they are controlled by "n_of_io_cpus" parameter described below).</p> <p>Host CPUs are enumerated as a comma separated list of host system assigned CPU numbers:</p> <pre>set session affinity="0, 2, 4, 6"</pre>

n_of_io_cpus

Parameter	n_of_io_cpus
Type	Numeric
Value	<p>This parameter specifies how many host CPUs CHARON-VAX must use for I/O handling. Use of the "affinity" parameter may limit the number of CPUs available. By default the CHARON-VAX instance reserves one third of available host CPUs for I/O processing (round down, at least one). The "n_of_io_cpus" parameter overrides that by specifying the number of CHARON I/O CPUs explicitly.</p> <p>Example:</p> <pre>set session n_of_io_cpus=2</pre>

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CPU

ace_mode

The CHARON-VAX emulated CPU is configured with the "ace_mode" parameter.

Two VAX CPU implementations are available: the standard VAX instruction decoder and the optional high performance Advanced CPU Emulation mode ("ACE"). The ACE option optimizes VAX instruction interpretation and significantly improves performance. It also requires approximately twice the host memory to store the optimized code.

ACE optimization is performed dynamically during execution. Since it does not need to write optimized code back to disk, ACE provides its full capability instantly. The optimization does not compromise VAX instruction decoding; CHARON-VAX remains fully VAX hardware compatible and completely transparent to the VAX operating systems and applications.

Both CPU implementations passed the HP VAX Architecture (AXE) tests, the standard qualification for VAX instruction execution correctness.

The default VAX CPU mode is determined by the specific CHARON-VAX product license.

Parameter	ace_mode
Type	Boolean
Value	true or false.

This statement enables ACE mode if the CHARON-VAX license permits it. If this statement is omitted from the CHARON-VAX configuration file and the license permits it, "true" is the default. Otherwise "false" is the default. For test purposes the ACE mechanism can be disabled with:

```
set cpu ace_mode=false
```

"set cpu ace_mode=true" is ignored when the license does not permit ACE operation.

The CHARON-VAX log file displays the status of the ACE option. ACE mode is disabled when the host system does not meet the minimum physical requirements for operation. If the emulator appears not to run at its normal performance, check the log file for a change in ACE mode and verify that sufficient host resources, especially memory, are available.

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RAM

The CHARON-VAX memory subsystem is permanently loaded and has the logical name "ram".

size

Parameter	size
Type	Numeric
Value	Size of emulated memory in MB.

Example:

```
set ram size = 512
```

The amount of memory is capped at a maximum, defined in the CHARON license key. If the host system cannot allocate enough memory to map the requested emulated memory, CHARON-VAX generates an error message in the log file and reduces its effective memory size.

The following table lists the values of emulated RAM for various hardware models of virtual VAX systems:

Hardware Model	RAM size (in MB)			
	Min	Max	Default	Increment
MicroVAX_II	1	16	16	1,8,16
MicroVAX_3600	16	64	16	16
MicroVAX_3900	16	64	16	16
VAXserver_3600	16	64	16	16
VAXserver_3900	16	64	16	16
VAXserver_3600_128	32	128	32	32
VAXserver_3900_128	32	128	32	32
MicroVAX_3100_Model_96	16	128	16	16
VAXstation_4000_Model_90	16	128	16	16
VAX_4000_Model_106	16	128	16	16
VAX_6000_Model_310	32	512	32	32
VAXserver_3600_512	32	512	32	32
VAXserver_3900_512	32	512	32	32
MicroVAX_3100_Model_98	16	512	16	16
VAX_4000_Model_108	16	512	16	16
VAX_4000_Model_700	64	512	64	64
VAX_4000_Model_705	64	512	64	64
VAX_6610	128	3584	128	128
VAX_6620	128	3584	128	128
VAX_6630	128	3584	128	128
VAX_6640	128	3584	128	128
VAX_6650	128	3584	128	128
VAX_6660	128	3584	128	128

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TOY

CHARON-VAX maintains its time and date via the "toy" (time-of-year) component. In order to preserve time and date while a virtual system is not running, the TOY component uses a binary file on the host system to store date and time relevant data. The name of the file is specified by the "container" option of the "toy" component.

container

Parameter	container
Type	Text string
Value	<p>Specifies a name of a file in which CHARON-VAX preserves time and date during its "offline" period.</p> <p>This file also keeps some console parameters (such as default boot device).</p> <p>By default it is left unspecified.</p> <p> It is recommended to specify the full path to the file</p>

Example:

```
set toy container="/charon/my_virtual_system.dat"
```

The CHARON-VAX time zone may be different from that of the host system. Correct CHARON time relies on the correctness of the host system time to calculate the duration of any CHARON "offline" periods. (i.e. while virtual system is not running). Every time CHARON comes on line it calculates a Delta time (the system time is used if there is no TOY file). Therefore, if the host system time is changed while CHARON is not running, the CHARON time may be incorrect when CHARON is restarted and the CHARON time must be set manually.

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ROM

The System Flash ROM file conserves specific parameters between reboots.

container

Parameter	container
Type	Text string
Value	<p>Specifies the name of a file in which CHARON-VAX stores an intermediate state of its Flash ROM.</p> <p>This state includes, for example, most of the console parameters.</p> <p>By default it is left unspecified.</p> <p> It is recommended to specify the full path to the file</p>

Example:

```
set rom container="/charon/my_virtual_system.rom"
```

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EEPROM

container

Parameter	container
Type	Text string
Value	<p>A string specifying a file name to store content of EEPROM.</p> <p>Example:</p> <pre>set eeprom container="vx6k610.rom"</pre> <p>This command enables EEPROM parameters (e.g., default boot drive) to be automatically saved to a specified file.</p> <p>The EEPROM file is created in the directory in which CHARON-VAX starts and is created or overwritten each time any parameter relevant to EEPROM content is changed.</p> <p> It is recommended to specify the full path to the file</p>

Example:

```
set eeprom container="/charon/my_virtual_system.rom"
```

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Auto boot

CHARON-VAX systems may be configured to boot the operating system automatically at start up.

MicroVAX3100, VAXstation 4000, VAX6310 and VAX 4000

Those models boot automatically if correct boot flags are set (and saved in the VAX console files) using the following command:

halt

Console Parameter	halt
Description	<p>Determines whether the MicroVAX3100, VAXstation 4000, VAX6310 and VAX 4000 boot automatically if correct boot flags are set (and saved in the VAX console files).</p> <p>The value is:</p> <ul style="list-style-type: none"> • "reboot" <p>Example:</p> <pre>>>>set halt reboot</pre>

Please check that the "toy container" and "rom container" parameters are specified in the configuration file to store the boot flags.

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MicroVAX II, MicroVAX 3600/3900 and VAXserver 3600/3900

The ROM of the MicroVAX II, MicroVAX 3600, MicroVAX 3900, VAXserver 3600 and VAXserver 3900 does not allow the VAX console to accept the command setting "auto-boot". Instead, automatic boot on startup can be specified in the CHARON-VAX configuration file as follows:

bdr boot

Parameter	bdr boot
Type	Text string
Value	<p>Determines whether the MicroVAX II, MicroVAX 3600, MicroVAX 3900, VAXserver 3600 and VAXserver 3900 boot automatically if correct boot flags are set (and saved in the VAX console files).The value is:</p> <ul style="list-style-type: none"> • "auto" <p>Example:</p> <pre>set bdr boot=auto</pre>

Please check that the "toy container" and "rom container" parameters are specified in the configuration file to store the boot flags.

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VAX66x0

xmi boot

Parameter	xmi boot
Type	Text string
Value	<p>Determines whether the CHARON VAX66x0 startup procedure stops at the ">>>" prompt after self-tests.</p> <p>The values are:</p> <ul style="list-style-type: none"> • "auto" • "manual" (default) <p>Example:</p> <pre>set xmi boot = "auto"</pre> <p>The value "auto" enables automatic boot from a default boot specification previously configured in the VAX console. The value "manual" disables automatic boot once the self tests are passed.</p>

Please check that the "toy container" and "rom container" parameters are specified in the configuration file to store the boot flags.

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Serial lines

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General Description

Configuration of CHARON-VAX serial lines is performed in 3 steps:

1. Loading virtual serial lines controller, for example:

```
load DHV11/DHV11 TXA
```

In this example, an instance of a "DHV11" serial line controller is loaded and named "TXA"

Note that VAX console adapters ("UART", "QUART") do not need to be loaded; they are preloaded.

2. Mapping an object type to host resources, for example:

```
load physical_serial_line TTA1
set OPA0 line="/dev/ttyS1"
```

In this example the object "physical_serial_line" is loaded, named "TTA1", and mapped to the "/dev/ttyS1" host physical serial port.

3. Connect the loaded virtual line controller and the mapped object:

```
set TXA line[5]=TTA1
```

In this example, the 6th line of the DHV11 controller "TXA" loaded at step 1 is connected to the mapping object "TTA1" loaded at the step 2.

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Console

CHARON-VAX offers a one- or four-port serial console depending on the specified VAX model. The one line serial line controller is identified in CHARON-VAX with the name UART. The four serial lines controller is identified in CHARON-VAX with the name QUART.

UART is used in Qbus systems only (e.g. the MicroVAX/VAXserver 3600/3900).

QUART is used in SCSI (e.g. MicroVAX 3100 model 96/98, VAXstation 4000 model 90) and SCSI/Qbus systems (e.g. VAX4000 model 106/108). The last QUART line (*line[3]*) is the console port (known in VAX/VMS as *OPA0*).

CHARON-VAX console ports can be configured to connect to an external terminal via the host system COM/TTY port or can be connected via TCP/IP.

rts

Parameter	rts[<line>]
Type	Text string
Value	<ul style="list-style-type: none"> "On" - assert RTS (Request To Send) signal "Off" - clear RTS signal (default) "DTR" - assert RTS signal as soon as DTR signal is asserted (⚠ Applicable only for QUART)

dsr

Parameter	dsr[<line>]
Type	Text string
Value	<ul style="list-style-type: none"> "On" - always reports DSR signal asserted "Off" - always reports DSR signal deasserted "DSR" - use DSR signal of physical serial line (if configured) "CD", "DCD", "RLSD" - use CD (carrier detect) signal of physical serial line (if configured) <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>This parameter is applicable only for line "2" of QUART. UART has no such parameter.</p> </div>

communication

Parameter	communication[<line>]
Type	Text string
Value	<ul style="list-style-type: none"> "ASCII" - for connection to terminals (default) "BINARY" - for serial lines carrying binary (packet) protocols, which are used mainly for communicating with PLCs

line

Parameter	line[<line>]
Type	Identifier
Value	This parameter is used to connect a particular serial line interface to the controller. See below for details.

Note that the "line" parameter in the table above is applicable only in the case of QUART.

All the values in this table are case insensitive.

Example:

```
set QUART rts[2]="DTR"
set QUART dsr[2]="On"
set QUART communication[2]="binary"
```

Line 2 of the QUART is the only one which can be used for connecting modems. Therefore, the "DSR" parameter for that line (i.e. "dsr[2]") is internally set to the appropriate value ("CD") but can be changed from the configuration file. Values for the "rts" and "dsr" parameters for the lines other than 2 are not visible for any applications running on CHARON-VAX / CHARON-PDP.

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Serial line controllers

Asynchronous serial line multiplexers are capable of serving up to 8 asynchronous serial lines (the DHW42-BA supports 16 lines).The following asynchronous serial line multiplexers are supported:

VAX model	Asynchronous serial line emulation
MicroVAX II, MicroVAX 3600, MicroVAX 3900, VAXserver 3600, VAXserver 3900 (QBUS systems)	CXA16, CXB16, CXY08, DHQ11, DHV11, DZV11, DZQ11, DL11, DLV11, DZ11
MicroVAX 3100 - 96, MicroVAX 3100 - 98 (SCSI systems)	DHW42-AA, DHW42-BA, DHW42-CA
VAX4000 - 106, VAX4000 – 108, VAX4000 – 700, VAX4000 – 705 (QBUS/SCSI systems)	CXA16, CXB16, CXY08, DHQ11, DHV11, DZV11, DZQ11, DLV11, DHW42-AA, DHW42-BA, DHW42-CA
VAX6310, VAXstation 4090	N/A

The following names are used for the multiplexers:

Device name	Module name
DHV11	DHV11
DHQ11	DHV11
CXY08	DHV11
CXA16	DHV11
CXB16	DHV11
DHW42AA	DHV11
DHW42BA	DHV11
DHW42CA	DHV11
DZV11, DZ11	DZ11
DZQ11	DZ11
DL11, DLV11	DL11

The following example loads an instance of an asynchronous serial line multiplexer:

```
load DHQ11/DHV11 TXA
```

Only one instance of DHW42 can be loaded. There is no restriction on the number of the other multiplexers.

The multiplexers offer the following configuration parameters, specified with the "set" command:

address

Parameter	address
Type	Numeric
Value	Specifies CSR address. The address must be valid QBUS 22-bit wide address in I/O space. Default values are 017760440 for DHV11-family controllers and 017760100 for DZV11/DZQ11, which are the factory settings for asynchronous serial line multiplexers.
	This parameter is not applicable to DHW42-xx serial line controllers

vector

Parameter	vector
Type	Numeric
Value	Specifies interrupt vector. Default value is 0300 which is the factory setting for asynchronous serial line multiplexers.
	This parameter is not applicable to DHW42-xx serial line controllers

line

Parameter	line[N] N=0...3 (7,15)
Type	Identifier
Value	Specifies a name of the serial line interface object in configuration to which the N-th line of the multiplexer is connected. See below for details.

communication

Parameter	communication[N] N=0...4 (7,15)
Type	Text String
Value	<ul style="list-style-type: none"> "ASCII" - for connection to terminals (default) "BINARY" - for serial lines carrying binary (packet) protocols, which are used mainly for communicating with PLCs

rts

Parameter	rts[N] N=0...3 (7,15)
Type	Text String
Value	Controls RTS signal of the Nth line of the multiplexer. <ul style="list-style-type: none"> "On" - assert RTS (Request To Send) signal "Off" - clear RTS signal (default) "DTR" - assert RTS signal as soon as DTR signal is asserted <p>When left blank (initial state), the level of the RTS signal is as requested by the VAX software.</p>

dsr

Parameter	dsr[N] N=0...(7,15)
Type	Text String
Value	<ul style="list-style-type: none"> "On" - always reports DSR signal asserted "Off" - always reports DSR signal deasserted "DSR" - use DSR signal of physical serial line (if configured) "CD", "DCD", "RLSD" - use CD (carrier detect) signal of physical serial line (if configured) <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>This parameter is applicable only for DZV11 and DZQ11 serial lines controllers</p> </div>

tx_q_max_depth

Parameter	tx_q_max_depth[N] N=0...3 (7,15)
Type	Numeric
Value	Specifies depth of the TX FIFO for the N-th line of the multiplexer. Possible values are 1...1000, initially it is set to 1 to properly represent the hardware limitation of certain multiplexers. Values greater than 1 improve transmission rate of corresponding line, but break correspondence to the original hardware. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>This parameter is applicable only for DHV11 serial lines controller</p> </div>

To load several instances of Qbus multiplexers, use the "address" and "vector" parameters. Both "address" and "vector" parameter values must be unique for every instance of a QBUS multiplexer. Read the VAX hardware documentation and the VM system management documentation to understand how to correctly assign the "address" and "vector" parameters.

Example of loading 2 instances of DHV11:

```
load DHV11/DHV11 TXA address=017760440 vector=0300
load DHV11/DHV11 TXB address=017760460 vector=0310
```

Example of loading DHW42CA:

```
load DHW42CA/DHV11 TXA
set TXA communication[0]="binary"
```

[Back to Table of Contents](#)**Mapping Serial line controllers to system resources****Types of serial line mapping**

Type	Function
physical_serial_line	This type of mapping associates some TTY port on host system with an emulated VAX serial line controller virtual "line". The TTY port can be physical hardware port or a logical TTY port.
virtual_serial_line	This type of mapping associates a network connection on the host system with an emulated VAX serial line controller virtual "line"
operator_console	This type of mapping associates the current TTY console with the OPA0 console port (if CHARON-VAX does not run as service)

Example:

```
load physical_serial_line OPA0
```

[Back to Table of Contents](#)**physical_serial_line****line**

Parameter	line
Type	Text string
Value	<p>A defined TTY port on host system:</p> <ul style="list-style-type: none"> • <code>/dev/tty<N></code> - virtual serial lines • <code>/dev/ttyS<N></code> - onboard serial lines • <code>/dev/ttyUSB<N></code> - modem or usb serial lines adapters • <code>/dev/tty<XXX></code> - proprietary (depending on a driver) devices such as DIGI or MOXA cards <div style="border: 1px solid red; padding: 5px; margin-top: 10px;"> <p>A specific account for running CHARON ("charon") does not allow usage of virtual consoles <code>/dev/tty<N></code> as CHARON consoles. If you plan to map CHARON console or serial lines to <code>/dev/tty<N></code> use only "root" account for CHARON running.</p> </div>

baud

Parameter	baud
Type	Numeric
Value	<p>Forces the baud rate of the corresponding TTY port to a specified value. The variety of supported values depends on the underlying physical communication resource (TTY port).</p> <p>The most widely used values are: 300, 1200, 9600, 19200, 38400.</p> <p>Example:</p> <pre>set OPA0 baud=38400</pre>

break_on

Parameter	break_on
Type	Text string
Value	<p>Specifies what byte sequences received over the physical serial line will trigger a HALT command.</p> <p> This parameter works only for the console line (for the one UART line and "line[3]" of QUART).</p> <p>Specify the following values: "Ctrl-P", "Break" or "none" ("none" disables triggering HALT condition).</p> <p>Example:</p> <pre>set OPA0 break_on="Ctrl-P"</pre> <p>The default value is "Break" for line 3 of QUART and "none" for other lines.</p>

stop_on

Parameter	stop_on
Type	Text string
Value	<p>Specifies what byte sequences received over the physical serial line will trigger a STOP condition.</p> <p> This parameter works only for the console line (for the one UART line and "line[3]" of QUART).</p> <p>The STOP condition causes CHARON-VAX to exit. Specify the value as the following: "F6" or "none" ("none" disables triggering STOP condition).</p> <p>Example:</p> <pre>set OPA0 stop_on="F6"</pre> <p>The default value is "none".</p> <p>Setting "F6" triggers the STOP condition upon receipt of the "<ESC>[17~" sequence. Terminals usually send these sequences on pressing F6 button</p>

log

Parameter	log
Type	Text string
Value	<p>A string specifying a file name to store content of console sessions or a directory where log files for each individual session will be stored. If an existing directory is specified, CHARON-VAX automatically enables creation of individual log files for each session.</p> <p>If the "log" parameter is omitted, CHARON-VAX does not create a console log.</p> <p>Examples:</p> <pre>set OPA0 log="log.txt"</pre> <pre>set OPA0 log="/opt/charon/logs"</pre>

log_file_size

Parameter	log_file_size
Type	Text string
Value	<p>If log rotation is enabled, the log_file_size parameter determines the log file size threshold at which the log is automatically rotated.</p> <ul style="list-style-type: none"> • "unlimited" or "0" (default) - the feature is disabled • "default" - default size is used (4Mb) • <size>[KMG] - size of the current log file in bytes with additional multipliers: <ul style="list-style-type: none"> • K - Kilobyte - multiply by 1024 • M - Megabyte - multiply by 1024*1024 • G - Gigabyte - multiply by 1024*1024*1024 <p>Examples:</p> <pre>set OPA0 log_file_size="default"</pre> <pre>set OPA0 log_file_size=10M</pre> <p> Minimum log file size is 64K, maximum is 1G. Setting size less than 64K effectively makes the log file unlimited.</p>

Example of mapping a console line to an onboard serial line:

```
load physical_serial_line OPA0
set OPA0 line="/dev/ttyS1"
```

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virtual_serial_line

host

Parameter	host
Type	Text string
Value	<p>A remote host's IP address or a host name (and optional remote TCP/IP port number) for the virtual serial line connection. If omitted, the virtual serial line does not initiate a connection to the remote host and will listen for incoming connection requests. Specify the value in the following form:</p> <pre>set OPA0 host="<host-name>[:<port-no>]"</pre> <p>If "<port-no>" is not specified, the virtual serial line uses the TCP/IP port number specified by the "port" parameter (see below).</p>

port

Parameter	port
Type	Numeric
Value	TCP/IP port number for the virtual serial line. A virtual serial line always listens on this port for incoming connection requests.

break_on

Parameter	break_on
Type	Text string
Value	<p>Specifies what byte sequences received over virtual serial line must trigger HALT command.</p> <p> This parameter works only for console line (for CHARON-VAX it is the only line of UART and the "line[3]" of QUART). Specify the following values: "Ctrl-P", "Break" or "none" to disable triggering HALT condition.</p> <p>Example:</p> <pre>set OPA0 break_on="Ctrl-P"</pre> <p>The default value is "Break" for line 3 of QUART and "none" for other lines.</p>

stop_on

Parameter	stop_on
Type	Text string
Value	<p>Specifies what byte sequences received over the virtual serial line will trigger a STOP condition. The STOP condition causes CHARON-VAX to exit.</p> <p> This parameter works only for console line (for CHARON-VAX it is the only line of UART and the "line[3]" of QUART). Specify the value as the following: "F6" or "none" ("none" disables triggering STOP condition).</p> <p>Example:</p> <pre>set OPA0 stop_on="F6"</pre> <p>The default value is "none". Setting "F6" triggers the STOP condition upon receipt of the "<ESC>[17~" sequence.</p>

log

Parameter	log
Type	Text string
Value	<p>A string specifying a file name to store content of console sessions or a directory where log files for each individual session will be stored. If an existing directory is specified, CHARON-VAX automatically enables creation of individual log file for each session.</p> <p>If the "log" parameter is omitted CHARON-VAX does not create any console log.</p> <p>Examples:</p> <pre>set OPA0 log="log.txt"</pre> <pre>set OPA0 log="/opt/charon/logs"</pre>

log_file_size

Parameter	log_file_size
Type	Text string
Value	<p>If log rotation is enabled, the log_file_size parameter determines the log file size threshold at which the log is automatically rotated.</p> <ul style="list-style-type: none"> "unlimited" or "0" (default) - the feature is disabled "default" - default size is used (4Mb) <size>[KMG] - size of the current log file in bytes with additional multipliers: <ul style="list-style-type: none"> K - Kilobyte - multiply by 1024 M - Megabyte - multiply by 1024*1024 G - Gigabyte - multiply by 1024*1024*1024 <p>Examples:</p> <pre>set OPA0 log_file_size="default"</pre> <pre>set OPA0 log_file_size=10M</pre> <p> Minimum log file size is 64K, maximum is 1G. Setting size less than 64K effectively makes the log file unlimited.</p>

Example of mapping a console line to an onboard serial line:

```
load virtual_serial_line OPA0
set OPA0 port=10003 stop_on="F6"
```

Notes on "virtual_serial_line" options:

1. Use the combination of "port" and "host" parameters as follows to connect a 3rd party terminal emulator or similar program.

```
load virtual_serial_line/chserial TTA0 host="192.168.1.1" port=10000
```

In this example CHARON-VAX connects to port 10000 of a host with TCP/IP address "192.168.1.1" and at the same time it accepts connections on local port 10000.

2. It is possible to specify a port on a remote host (note that CHARON always acts as a server). The syntax is:

```
load virtual_serial_line/chserial TTA0 host="192.168.1.1:20000" port=10000
```

In this example CHARON-VAX accepts connection on local port 10000 and connects to remote port 20000 of a host with TCP/IP address "192.168.1.1"

Note that the examples above are mainly used for inter-CHARON communications. They are used to connect CHARON-VAX to an application that communicates to CHARON-VAX as described below.

Example of two CHARON systems connected to each other: *On host "A"*:

```
load virtual_serial_line/chserial TXA0 port=5500 host="B"
```

On host "B":

```
load virtual_serial_line/chserial TXA0 port=5500 host="A"
```

On two hosts executing CHARON-VAX, the two TXA0 lines connect to each other, thus creating a "serial" cable between the two emulated VAXes. The sequential order in which the instances of CHARON-VAX are started makes no difference.

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operator_console

break_on, stop_on

Parameter	break_on, stop_on
Type	Text string
Value	<p>These two parameters are hardcoded to the following values and cannot be changed:</p> <pre>stop_on="F6" break_on="Ctrl-P,F5"</pre>

Example:

```
load operator_console OPA0
```

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"ttyY" notation specifics

Note that the "ttyY" notation can have different forms depending on the nature of the device used:

1. Linux virtual tty (switchable by **alt+F1** - **alt+F12** on a text console) – are represented as "/dev/tty<N>" where N is from 0 to 11. Those tty devices must be free from the Linux "getty/mgetty" and similar programs (specified in "/etc/inittab")
2. Onboard serial lines are represented as "/dev/ttyS<N>" where N is a number. For example "/dev/ttyS1"
3. Proprietary (depending on a driver) devices are represented as "/dev/tty<XXX>" where XXX is a complex letter/number notation. For example "/dev/ttyR01" is the first port of a MOXA card and "/dev/ttyaa" stands for the first port of a DIGI card.

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Linking serial controller port to host connection

The final step of CHARON-VAX serial line configuration is the association of each loaded serial port with a CHARON-VAX host connection instance as follows:

```
set <serial controller instance name> line[<line number>]=<serial line instance name>
```

Example:

```
set quart line[0]=TTA0
```

This command connects the first serial line ("line[0]") of a "QUART" serial line controller to a CHARON-VAX connection instance named "TTA0". As explained earlier, TTA0 may be a virtual serial line connected to port, or a physical serial line connected to host serial port or virtual terminal. In an

example below, the command connects the sixth serial line of a previously loaded controller (named "TXA") to "TTA1". "TTA1" could be defined, for example, as a physical serial line connected to COM/TTY port:

```
set TXA line[5]=TTA1
```

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Disks and tapes

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MSCP and TMSCP Controllers

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Introduction

CHARON-VAX provides MSCP controllers for hardware disks (including floppy and CD/DVD) and disks images. TMSCP controllers provide support for hardware tapes and tape images.

MSCP and TMSCP controllers are added to the configuration using the "load" command. The individual units are defined by using the container parameter.

MSCP devices appear in VMS as DUA for the first controller and DUB for the second controller, etc.
 TMSCP devices appear in VMS as MUA, MUB, etc.

When adding multiple MSCP or TMSCP controllers, follow Qbus addressing conventions.

When a tape or disk image connected to an emulated TMSCP or MSCP controller is disconnected in VAX/VMS, it is disconnected from CHARON-VAX and can be manipulated. It may even be replaced with a different disk image if it keeps the same name. This capability may be useful when designing back-up and restore procedures. When copying CHARON-VAX disk images while CHARON-VAX is running, please take care to minimize the risk of overloading a heavily loaded CHARON-VAX host system. For example using a sequential series of simple ftp binary copies is less resource intensive and thus less disruptive than multiple, simultaneous copies.

Empty disk images are created with the "mkdskcmd" utility. Tape images (vtapes) will be created if they don't exist.

CHARON-VAX is able to boot disk images of any VAX/VMS version (for VAX/VMS starting with 4.5 or higher for MicroVAX II or VAX 3600 and VAX/VMS 5.5-2 or higher for the VAX4000).

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RQDX3 Controller

The CHARON-VAX QBUS system provides support for RQDX3 disk controllers. The original RQDX3 disk controller is capable of serving up to 4 disk units. CHARON-VAX extends this limit so that the RQDX3 disk controller can be configured with up to 256 disk units. Normally all 256 disks can be connected to one MSCP disk controller but, if an application does intensive simultaneous I/O to more than 16 disks on one MSCP controller, it is recommended to configure additional RQDX3 controllers.

Use the following command to load an instance of an RQDX3 disk controller:

```
load RQDX3/RQDX3 <logical name>
```

Example:

```
load RQDX3/RQDX3 DUA
```

The RQDX3 offers the following configuration parameters, which can be specified with the "set" command:

address

Parameter	address
Type	Numeric
Value	<p>Specifies the CSR address. The address must be a valid QBUS 22-bit wide address in IO space.</p> <p>Initial value is 017772150 which is the factory setting for the RQDX3 disk controller.</p> <p>Use the "address" parameter for loading several instances of RQDX3. The "address" parameter value must be unique for every instance of the controller.</p>

max_n_of_units

Parameter	max_n_of_units
Type	Numeric
Value	<p>Specifies the maximum number of units supported by the controller. Possible values are 4...9999.</p> <p>Default is 9999.</p>

container

Parameter	container[N] N=0...9999
Type	Text String
Value	<p>Specifies the location of the disk container. It can be either the name of a ".vdisk" file or the name of a physical disk:</p> <ul style="list-style-type: none"> ▪ Local fixed disks (IDE, SCSI, SATA) <ul style="list-style-type: none"> ▪ <code>/dev/sd<L></code> where "L" is letter ▪ <code>/dev/disk/by-id/...</code> - addressing by the disk ID, for example <code>/dev/disk/by-id/ata-ST1000DM003-9YN162_S1D01QJ4</code> ▪ <code>/dev/disk/by-label/...</code> - addressing by the disk label, for example <code>/dev/disk/by-label/MyStorage</code> ▪ <code>/dev/disk/by-uuid/...</code> - addressing by the disk UUID, for example <code>/dev/disk/by-uuid/0e808a2f-cdd3-4944-a245-f729ffd73882</code> <div style="border: 1px solid #f0e68c; padding: 10px; margin: 10px 0;"> <p>Since <code>/dev/sd<L></code> addressing is not persistent, so it is strongly recommended to use <code>/dev/disk/by-id/wwn-*</code> syntax instead to refer the disk by its WWID - especially in the environments utilizing FC and SAN storages.</p> </div> <p> It is also possible to use not a whole disk, but previously created partitions on it. In this case the syntax is the following: <code>/dev/sd<L><N></code> where N is the number of partition to be used.</p> <ul style="list-style-type: none"> ▪ Floppy drives <ul style="list-style-type: none"> ▪ <code>/dev/fd<N></code> ▪ CD-ROM and DVD drives (IDE, SCSI, ...) <ul style="list-style-type: none"> ▪ <code>/dev/cdrom<N></code>, ▪ <code>/dev/sr<N></code> ▪ Multipath disks <ul style="list-style-type: none"> ▪ <code>/dev/dm-<N></code>, ▪ <code>/dev/mapper/mpath<N></code>, ▪ <code>/dev/mapper/disk<N></code>

media_type

Parameter	media_type[N] N=0...9999
Type	Text String
Value	<p>Overrides default (automatically determined) MSCP media type of the device.</p> <p>Syntax:</p> <pre>"<device-name> [, <device-type>]"</pre> <p>where:</p> <ul style="list-style-type: none"> <device-name> is one of "DU", "DK", "SCSI", "DI", "DSSI", "DJ" <device-type> is of the form "LLD" or "LLLD", where "L" is letter from A through Z, and "D" is decimal number from 0 through 99 <p>If not specified, the device name is set to "DU", and the device type is selected based on disk size.</p> <p>Initially not specified.</p>

geometry

Parameter	geometry[N] N=0...9999
Type	Text String
Value	<p>This formatted string value specifies the explicit geometry of the disk storage element with DSSI node id N and MSCP unit number N. This parameter is not applicable to tape storage elements.</p> <p>The string format is <X>"/<Y>["/<Z>] where:</p> <ol style="list-style-type: none"> X is number of sectors on track; Y is number of tracks on cylinder; Z (optional) is the number of cylinders on the unit. If omitted, Z is calculated based on X, Y and the total number of sectors on the unit that reflects the size of the disk storage element; <p>If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type.</p>

use_io_file_buffering

Parameter	use_io_file_buffering[N] N=0...9999
Type	Boolean
Value	<p>Enables use of host OS I/O buffering.</p> <p>Initially set to "false" (buffering disabled).</p>

Example 1:

```
load RQDX3/RQDX3 DUA address=017772150 max_n_of_units=4
set DUA container[0] = "/charon/disks/rx23.vdisk"
set DUA container[1] = "/dev/sdb"

load RQDX3/RQDX3 DUB address=017760334
set DUB container[5] = "/dev/cdrom"
```

In the above example, "rx23.vdisk" will be seen in VMS as DUA0, "/dev/sdb" as DUA1 and "/dev/cdrom" as DUB5.

Example 2:

```
load RQDX3/RQDX3 DIA address=017772150 max_n_of_units=4

set DIA container[0] = "/charon/disks/rx23.vdisk"
set DIA media_type[0] = "dssi"
set DIA container[1] = "/dev/sdc2"
set DIA media_type[1] = "dssi"
```

In the above example, "rx23.vdisk" will be seen in VMS as DIA0 and "/dev/sdc2" as DIA1.

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TQK50 and TUK50 Controllers

The CHARON-VAX QBUS system provides support for the TQK50 tape controller. UNIBUS systems support the TUK50 tape controller.

The original TQK50/TUK50 tape controller is capable of serving only 1 tape unit. CHARON-VAX extends the limit to 10000 tape units.

Use the following commands to load an instance of a TQK50/TUK50 tape controller:

```
load TQK50/TQK50 <logical name 1>
load TUK50/TUK50 <logical name 2>
```

Example:

```
load TQK50/TQK50 MUA1
load TUK50/TUK50 MUA2
```

The TQK50/TUK50 controllers have the following configuration parameters, which can be specified with the "set" command:

address

Parameter	address
Type	Numeric
Value	<p>Specifies the CSR address. The address must be a valid QBUS 22-bit wide address in IO space for TQK50 and a valid QBUS 18-bit wide address in I/O space for TUK50.</p> <p>The initial values are 017774500 (TQK50) and 0774500 (TUK50) which is the factory setting for those tape controllers.</p> <p>Use the "address" parameter to load several instances of TQK50/TUK50. The "address" parameter value must be unique for each instance of TQK50/TUK50.</p>

container

Parameter	container[N] N=0...9999
Type	Text String
Value	<p>Specifies the location of the tape container. It can be either the name of a ".vtape" (".mtd") file or the name of a physical tape drive:</p> <p>"dev/sg<N>" – for the local physical tape drive.</p>

media_type

Parameter	media_type[N] N=0...9999
Type	Text String
Value	<p>Overrides default (automatically determined) TMSCP media type of the device.</p> <p>Syntax:</p> <pre>"<device-name>[, <device-type>]"</pre> <p>where:</p> <ul style="list-style-type: none"> • <device-name> is one of "MU", "MK", "SCSI", "MI", "DSSI", or "MJ" • <device-type> is of the form "LLD" or "LLLD", where "L" is letter from A through Z, and "D" is decimal number from 0 through 99 <p>If not specified, the device name is set to "MU", and the device type is set to "TK50"</p> <p>Initially not specified.</p>

geometry

Parameter	geometry[N] N=0.9999
Type	Text String
Value	<p>Specifies the size of the tape image and (optionally) the size of an "early-warning" area at the end of tape image.</p> <p>Syntax:</p> <pre>"<image-size>[, <early-warning-zone-size>]"</pre> <p>where:</p> <ul style="list-style-type: none"> • <image-size> is the tape size in MB • <early-warning-zone-size> is the size (in KB) of space left on the tape that, when reached, issues a warning to the OS. If omitted, 64K is assumed. <p>Example:</p> <pre>load TQK50 MUA set MUA geometry[0] = 90</pre>

Example:

```
load TQK50 MUA address=017774500
set MUA container[0] = "/dev/sg4"
set MUA container[1] = "/charon/tapes/tape1.vtape"
```

Multi-volume tape images may be handled as follows:

```
set MUA container[0] = "... "
set MUA container[1] = "... "
set MUA container[2] = "... "
set MUA container[3] = "... "
```

Once this configuration is established, the following VMS command (for example) could be used:

```
$ BACKUP MUA0 : BACKUP . SAV , MUA1 , MUA2 , MUA3 / SAVE_SET DUA0 : . . .
```

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KDM70 Controller

KDM70 is an MSCP/TMSCP disk and tape controller for the VAX 6000.

The CHARON-VAX virtual KDM70 controller supports 9999 disks and tapes instead of the 8 disk limitation of the original hardware. This design modification has the advantage of using only one XMI slot for up to 9999 disk and tape devices.

The I/O behavior of the virtual KDM70 is as follows:

- Up to 16 connected disks operate in parallel without any I/O performance degradation.
- For systems with more than 16 heavily used disks, configure two controllers and distribute the heavily loaded disks evenly.
- As in the hardware KDM70, VMS can be booted only from the first 10 devices on the KDM70 (DU0 - DU9).
- Hardware KDM70's do not support tape drives. The virtual KDM70's support a transparent extension for data tapes (boot from tape is not supported).

The line below loads an emulated KDM70 storage controller:

```
load KDM70/KDM70 PUA
```

The KDM70 emulation has the following configuration parameters:

xmi_node_id

Parameter	xmi_node_id
Type	Numeric
Value	Specifies the XMI slot in which virtual KDM70 controller is placed. For CHARON-VAX/66X0 a free slot between 10 (A) and 14 (E) must be chosen.

container

Parameter	container[N] N=0...9999
Type	Text String
Value	<p>Possible values of the parameter are strings in one of the following forms:</p> <ul style="list-style-type: none"> ▪ Physical disk drives <ul style="list-style-type: none"> ▪ <code>/dev/sd<L></code>, where L is letter <p> It is also possible to use not a whole disk, but previously created partitions on it. In this case the syntax is the following: <code>/dev/sd<L><N></code> where N is the number of partition to be used.</p> <ul style="list-style-type: none"> ▪ <code>/dev/disk/by-id/...</code> - addressing by the disk ID, for example <code>/dev/disk/by-id/ata-ST1000DM003-9YN162_S1D01QJ4</code> ▪ <code>/dev/disk/by-label/...</code> - addressing by the disk label, for example <code>/dev/disk/by-label/MyStorage</code> ▪ <code>/dev/disk/by-uuid/...</code> - addressing by the disk UUID, for example <code>/dev/disk/by-uuid/0e808a2f-cdd3-4944-a245-f729ffd73882</code> <div style="border: 1px solid #f0e68c; padding: 5px; margin: 10px 0;"> <p>Since <code>/dev/sd<L></code> addressing is not persistent, so it is strongly recommended to use <code>/dev/disk/by-id/wwn-*</code> syntax instead to refer the disk by its WWID - especially in the environments utilizing FC and SAN storages.</p> </div> ▪ Physical tape drives <ul style="list-style-type: none"> ▪ <code>/dev/sg<X></code>, where X is 0, 1, ... ▪ Floppy drives <ul style="list-style-type: none"> ▪ <code>/dev/fd<X></code>, where X is 0, 1, ... ▪ CD-ROM drives (read-only) <ul style="list-style-type: none"> ▪ <code>/dev/cdrom<X></code> or ▪ <code>(/dev/sr<X>)</code>, where X is 0, 1, ... ▪ Multipath disks <ul style="list-style-type: none"> ▪ <code>/dev/dm-<N></code>, ▪ <code>/dev/mapper/mpath<N></code>, ▪ <code>/dev/mapper/disk<N></code> ▪ CHARON-VAX disk images <ul style="list-style-type: none"> ▪ <code>[<path-name>/"<file-name>".vdisk]</code> ▪ CHARON-VAX tape images <ul style="list-style-type: none"> ▪ <code>[<path-name>/"<file-name>".vtape]</code> <p>This parameter is initially not set, thus creating NO storage elements on the controller</p>

media_type

Parameter	media_type[N] N=0...9999
Type	Text String
Value	<p>Overrides default (automatically determined) MSCP media type of the device.</p> <p>Syntax:</p> <div style="border: 1px solid #ccc; padding: 5px; margin: 5px 0;"> <pre>"<device-name>,<device-type>"</pre> </div> <p>where:</p> <ul style="list-style-type: none"> • <code><device-name></code> is one of "DU", "MU", "DK", "MK", "SCSI", "DI", "MI", "DSSI", "DJ", "MJ" • <code><device-type></code> is of the form "LLD" or "LLLD", where "L" is letter from A through Z, and "D" is decimal number from 0 through 99 <p>If not specified, the device name is set to "DI", and the device type is selected based on disk size for disk storage elements. For tape storage elements, the device name and type are set to "MI" and "TF86", respectively.</p> <p>Initially not specified.</p>

geometry

Parameter	geometry[N] N=0...9999
Type	Text String
Value	<p>This formatted string value specifies the explicit geometry of the disk storage element with DSSI node id N and MSCP unit number N. This parameter is not applicable to tape storage elements.</p> <p>The string format is <X>"/"<Y>["/"<Z>] where:</p> <ol style="list-style-type: none"> 1. X is number of sectors on track 2. Y is number of tracks on cylinder 3. Z (optional) is the number of cylinders on the unit. If omitted, Z is calculated based on X, Y and the total number of sectors on the unit that reflects the size of the disk storage element <p>If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type.</p> <p>Initially not set.</p> <p>The syntax described above is applicable only to disk storage elements. If the container is a tape image, the following format is used instead:</p> <p>Syntax:</p> <pre>"<image-size>[, <early-warning-zone-size>]"</pre> <p>where:</p> <ul style="list-style-type: none"> • <image-size> is the tape size in MB • <early-warning-zone-size> is a size (in KB) of a space left on the tape when a warning to the OS is issued. If omitted, 64K is assumed.

use_io_file_buffering

Parameter	use_io_file_buffering[N] N=0...9999
Type	Boolean
Value	Enables use of host OS I/O buffering. Initially set to "false" (buffering disabled).

Example:

Create a KDM70 (T)MSCP controller in XMI slot 10:

```
load KDM70/KDM70 PUA xmi_node_id=10
```

Configure on this controller a system disk to show up as DUA0: in VMS:

```
set PUA container[0]="/charon/disks/vms72-66X0.vdisk"
```

Configure a user disk to show up as DUA1: in VMS:

```
set PUA container[1]="/charon/disks/usertest.vdisk"
```

Configure the first SCSI tape drive connected to the host to show up as MUA4: in VMS:

```
set PUA container[4]="/dev/sg0"
```

The file my_tape.vtape in the default directory is used by VMS as MUA5:

```
set PUA container[5]="/charon/tapes/my_tape.vtape"
```

The first host system CD-ROM can be used to read VMS CDs and shows up as DUA9:

```
set PUA container[9]="/dev/sr0"
```

The host system floppy drive '/dev/fd0' can be used inVMS as DUA10:

```
set PUA container[10]="/dev/fd0"
```

The virtual KDM70 examines the file extension (`vdisk` or `vtape`) to distinguish between a disk image and a tape image. Configured physical devices or tape/disk images that do not exist on the host system will, in general, cause VAX/VMS to report the unit offline. In some cases this will result in a VMS BUG CHECK. In this case, an error message will be written to the log file.

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KDB50 Controller

KDB50 is an MSCP controller for the VAX 6000. The CHARON-VAX virtual KDB50 controller supports up to 9999 disks instead of the 4 disk limitation of the original hardware. This design modification has the advantage of using only one VAXBI slot for up to 9999 disk and tape devices.

The I/O behavior of the virtual KDB50 is as follows:

1. Up to 16 connected disks operate in parallel without any I/O performance degradation.
2. For systems with more than 16 heavily used disks, configure two controllers and distribute the heavily loaded disks evenly.
3. Like the hardware KDB50, VMS can boot only from the first 10 devices on the KDB50 (DU0 - DU9).

The line below loads an emulated KDB50 storage controller:

```
load KDB50 PUA
```

The KDB50 emulation has the following configuration parameters:

vax_bi_node_id

Parameter	vax_bi_node_id
Type	Numeric
Value	Specifies the VAXBI slot in which the virtual KDB50 controller is placed. For CHARON-VAX a free slot between 1 (1) and 15 (F) must be chosen. Initially set to 14.

container

Parameter	container[N] N=0...9999
Type	Text String
Value	<p>Possible values of the parameter are strings in one of the following forms:</p> <ul style="list-style-type: none"> ▪ Physical disk drives <ul style="list-style-type: none"> ▪ <code>/dev/sd<L></code>, where L is letter ▪ <code>/dev/disk/by-id/...</code> - addressing by the disk ID, for example <code>/dev/disk/by-id/ata-ST1000DM003-9YN162_S1D01QJ4</code> ▪ <code>/dev/disk/by-label/...</code> - addressing by the disk label, for example <code>/dev/disk/by-label/MyStorage</code> ▪ <code>/dev/disk/by-uuid/...</code> - addressing by the disk UUID, for example <code>/dev/disk/by-uuid/0e808a2f-cdd3-4944-a245-f729ffd73882</code> <div style="border: 1px solid #f0e68c; padding: 10px; margin: 10px 0;"> <p>Since <code>/dev/sd<L></code> addressing is not persistent, so it is strongly recommended to use <code>/dev/disk/by-id/wwn-*</code> syntax instead to refer the disk by its WWID - especially in the environments utilizing FC and SAN storages.</p> </div> <p>i It is also possible to use not a whole disk, but previously created partitions on it. In this case the syntax is the following: <code>/dev/sd<L><N></code> where N is the number of partition to be used.</p> <ul style="list-style-type: none"> ▪ Floppy drives <ul style="list-style-type: none"> ▪ <code>/dev/fd<X></code>, where X is 0, 1, ... ▪ CD-ROM drives (read-only) <ul style="list-style-type: none"> ▪ <code>/dev/cdrom<X></code> or ▪ <code>(/dev/sr<X>)</code>, where X is 0, 1, ... ▪ Multipath disks <ul style="list-style-type: none"> ▪ <code>/dev/dm-<N></code>, ▪ <code>/dev/mapper/mpath<N></code>, ▪ <code>/dev/mapper/disk<N></code> ▪ CHARON-VAX disk images <ul style="list-style-type: none"> ▪ <code>[<path-name>/"<file-name>[".vdisk"]</code> <p>This parameter is initially not set, thus creating NO storage elements on the controller</p>

media_type

Parameter	media_type[N] N=0...9999
Type	Text String
Value	<p>Overrides default (automatically determined) MSCP media type of the device.</p> <p>Syntax:</p> <div style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;"> <pre>"<device-name>,<device-type>"</pre> </div> <p>where:</p> <ul style="list-style-type: none"> • <code><device-name></code> is one of "DU", "DK", "SCSI", "DI", "DSSI", "DJ" • <code><device-type></code> is of the form "LLD" or "LLL", where "L" is letter from A through Z, and "D" is decimal number from 0 through 99 <p>If not specified, the device name is set to "DU", and the device type is selected based on disk size for disk storage elements. For tape storage elements, the device name and type are set to "MI" and "TF86", respectively. Initially not specified.</p>

geometry

Parameter	geometry[N] N=0...9999
Type	Text String
Value	<p>This formatted string value specifies the explicit geometry of the disk storage element with MSCP unit number N.</p> <p>This parameter is not applicable to tape storage elements.</p> <p>he string format is <X>"<Y>["<Z>] where:</p> <ol style="list-style-type: none"> 1. X is number of sectors on track 2. Y is number of tracks on cylinder 3. Z (optional) is the number of cylinders on the unit. If omitted, Z is calculated based on X, Y and the total number of sectors on the unit that reflects the size of the disk storage element <p>If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type. Initially not set.</p>

use_io_file_buffering

Parameter	use_io_file_buffering[N] N=0...9999
Type	Boolean
Value	<p>Enables use of host OS I/O buffering.</p> <p>Initially set to "false" (buffering disabled).</p>

Example:

Create a KDB50 MSCP controller in VAX BI slot 1:

```
load KDB50/KDB50 PUA vax_bi_node_id=1
```

Configure on this controller a system disk to show up as DUA0: in VMS:

```
set PUA container[0]="/charon/disks/vms72-66X0.vdisk"
```

Configure a user disk to show up as DUA1: in VMS:

```
set PUA container[1]="/charon/disks/usertest.vdisk"
```

The first host system CD-ROM can be used to read VMS CDs and shows up as DUA9:

```
set PUA container[9]="/dev/sr0"
```

The host system floppy drive `/dev/fd0` can be used in VMS as DUA10:

```
set PUA container[10]="/dev/fd0"
```

Configured physical devices or tape/disk images that do not exist on the host system will, in general, cause VAX/VMS to report the unit offline. In some cases this will result in a VMS BUG CHECK. In this case, an error message will be written to the log file.

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SCSI Controllers

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Introduction

CHARON-VAX provides two SCSI controllers for the SCSI and SCSI/QBUS models of VAX.

Hardware disks, disk images, hardware tapes, tape images, floppy devices and CD-ROM devices can be connected to these SCSI controllers. Each device has to be configured to connect to a specific SCSI address in CHARON-VAX.

Use the following emulated device types to map real peripherals to the emulated SCSI devices:

Type of mapping	Description
virtual_scsi_disk	For disk image containers and physical disks
virtual_scsi_tape	For tape image containers
virtual_scsi_cdrom	For host CD-ROM and *.iso images
physical_scsi_device	For physical tapes and other SCSI devices connected to a host

CHARON-VAX disk/tape devices can be SCSI disk/tape devices connected to a host system or disk/tape containers that are presented to the operating system environment as files.

Two SCSI controllers are provided ("PKA" and "PKB") in CHARON-VAX, with 7 addresses each.

Beyond the capabilities of the hardware, VAX 3100/9x and 4000/10x, CHARON-VAX/XX implements extended SCSI addressing. Each of the seven device addresses, of a SCSI controller, supports up to eight disk/tape images. Thus the number of disks supported becomes 2x Controllers*7 addresses*8 Disks/Tapes, a total of 112 disks/tapes.

SCSI devices with the same ID but different LUNs (logical units) appear in the VAX console with different names. The naming convention is as follows:

Each SCSI device has the name in the form of "xKcIn:", where:

- "x" stands for the device type (D means disks, M means magnetic tapes, G is reserved by VAX/VMS for special purposes)
- "c" stands for the controller letter (A - the first controller, B - the second controller, ...)
- "I" stands for the SCSI device ID (usually 0 through 6, and 7 is allocated by the controller itself)
- "n" stands for a particular logical unit number, LUN.

Most of the 'normal' SCSI devices have only one logical unit - 0. Therefore, under normal conditions, disks in VAX/VMS appear as DKA0 (which is really DKA000), DKA100, DKA200, ..., tapes as MKA0 (which is really MKA000), MKA100, MKA200, ...

As soon as there is a disk/tape device with LUNs 0 and 1, VMS identifies them as, for example, DKA300 and DKA301 (MKA300 and MKA301)

respectively.

The boot ROM of CHARON-VAX detects SCSI devices with multiple LUNs and builds proper device names for them.

 To display a list of devices on the VAX console (SRM), enter ">>> show device" .

This list is passed to VAX/VMS at boot time.

 VAX/VMS creates devices only for logical unit 0 for each device detected in the boot ROM. To add additional logical units, use the following SYSGEN command:

```
$ MCR SYSGEN CONNECT DKxxx/NOADAPTER
```

where DKxxx (or MKxxx) stands for the correct VAX/VMS name of the logical unit to be connected. You can find its name from the SRM console using the ">>> show scsi" command.

This command is not boot persistent, so it must be included in the VAX/VMS "SYSTARTUP_VMS.COM" file to ensure it is executed with each startup.

Also note: that the following rules are applied for logical units.

1. Each SCSI device must implement logical unit 0.
2. A SCSI device must implement all logical unit numbers between the highest and the lowest numbers implemented.

Empty disk images can be created with the "mkdiskcmd utility".

CHARON-VAX is able to boot from disk images of any VAX/VMS version, starting with 4.5 or higher for MicroVAX II or VAX 3600 and VMS 5.5-2 or higher for the VAX4000.

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Mapping to host resources

Load a mapping device with the "load" command. Specify the name of the device instance, the emulated SCSI bus to connect the device to and the SCSI identifier of the CHARON-VAX device.

scsi_bus

Parameter	scsi_bus
Type	Identifier
Value	Name of the emulated SCSI disk controller: "pka" or "pkb"

scsi_id

Parameter	scsi_id
Type	Numeric
Value	A value between 0 and 7. This is the ID number of the emulated SCSI device. The SCSI adapter is preloaded with address 7. If required, set it to another value in the range of 0-7 from the VAX console.

There is no direct correspondence between the host hardware SCSI ID and these CHARON-VAX SCSI addresses. Set the correspondence between the physical SCSI addresses on the host system and the CHARON-VAX SCSI bus ID in the configuration file.

Syntax:

```
load <instance type>/<module name> <instance name> scsi_bus=<bus name> scsi_id=<number>
```

Example:

```
load virtual_scsi_disk/chscsi pka_0 scsi_bus=pka scsi_id=0
```

CHARON-VAX/XX has only one preloaded SCSI adapter, named: PKA. If a second adapter (PKB) is required then add the following line to the configuration file before loading and configuring any device on the second SCSI adapter PKB:

```
include kzdda.cfg
```

"kzdda.cfg" loads the second SCSI adapter.

 OpenVMS version 5.5-2H4, or above, is required to use the "pkb" controller.

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virtual_scsi_disk

Use the "virtual_scsi_disk" mapping for disk containers and physical disks. This is the most convenient way of connecting disks to SCSI adapters in CHARON-VAX

The "virtual_scsi_disk" mapping has the following parameters:

container

Parameter	container[N] N=0...7
Type	Text String
Value	<p>A string containing the device name to map to the emulator.</p> <ul style="list-style-type: none"> ▪ Disk images <ul style="list-style-type: none"> ▪ [<code><path-name>/<file-name>[.vdisk]</code>] <p>Format: A string containing the full path to a disk container.</p> <p>If only the name of the disk container is specified, CHARON-VAX will look for the container in the folder CHARON is running from.</p> ▪ Local fixed disks (IDE, SCSI, SATA) <ul style="list-style-type: none"> ▪ <code>/dev/sd<L></code> where "L" is letter ▪ <code>/dev/disk/by-id/...</code> - addressing by the disk ID, for example <code>/dev/disk/by-id/ata-ST1000DM003-9YN162_S1D01QJ4</code> ▪ <code>/dev/disk/by-label/...</code> - addressing by the disk label, for example <code>/dev/disk/by-label/MyStorage</code> ▪ <code>/dev/disk/by-uuid/...</code> - addressing by the disk UUID, for example <code>/dev/disk/by-uuid/0e808a2f-cdd3-4944-a245-f729ffd73882</code> <div style="border: 1px solid #f0e68c; padding: 5px; margin: 5px 0;"> <p>Since <code>/dev/sd<L></code> addressing is not persistent, so it is strongly recommended to use <code>/dev/disk/by-id/wwn-*</code> syntax instead to refer the disk by its WWID - especially in the environments utilizing FC and SAN storages.</p> </div> <p> It is also possible to use not a whole disk, but previously created partitions on it. In this case the syntax is the following: <code>/dev/sd<L><N></code> where N is the number of partition to be used.</p> ▪ Multipath disks <ul style="list-style-type: none"> ▪ <code>/dev/dm-<X></code>, ▪ <code>/dev/mapper/mpath<X></code>, ▪ <code>/dev/mapper/disk<X></code> where X is 0,1,2... ▪ Floppy drives <ul style="list-style-type: none"> ▪ <code>/dev/fd<X></code> where X is 0,1,2... <p>This parameter is initially not set, thus creating NO storage elements on the controller</p>

media_type

Parameter	media_type[N] N=0...7
Type	Text String
Value	Overrides the PRODUCT ID in the default SCSI INQUIRY data. Valid values may contain uppercase letters, integers and spaces. The length of the string cannot exceed 16 characters. If not specified, synthetic SCSI INQUIRY data is returned containing a PRODUCT ID selected based on the disk size. Initially left unspecified.

geometry

Parameter	geometry[N] N=0...7
Type	Text String
Value	This formatted string value specifies the explicit geometry of the disk storage element The string format is <X>"/<Y>["/<Z>] where: <ul style="list-style-type: none"> "X" is the number of sectors per track; "Y" is the number of tracks per cylinder; "Z" (optional) is the number of cylinders on the unit. If omitted, Z is calculated based on X, Y and the total number of sectors on the unit that reflects the size of the disk storage element; If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type.

use_io_file_buffering

Parameter	use_io_file_buffering[N] N=0...7
Type	Boolean
Value	Enables use of the host OS I/O buffering. Initially set to "false" (buffering disabled).

removable

Parameter	removable[N] N=0...7
Type	Boolean
Value	Enables the logical unit to appear as a removable SCSI disk drive. Initially set to "false" (fixed, non-removable).

 In the table above N stands for logical unit number. The first unit must be 0 with no gaps in subsequent numbering.

Example:

```
load virtual_scsi_disk/chscsi pka_0 scsi_bus=pka scsi_id=0
set pka_0 container[0] = "/charon/disks/disk1.vdisk"
set pka_0 container[1] = "/dev/sdc"
```

If only one LUN is configured, the LUN number can be omitted:


```
set pka_0 container = "/charon/disks/disk1.vdisk"
set pka_0 media_type = "RZ1ED"
```

When a virtual SCSI disk image is dismounted in VMS, it is no longer open by CHARON and may be copied. This capability can be useful when designing back-up and restore procedures. If copying CHARON-VAX disk images while CHARON-VAX is running, take care to minimize the risk of overloading the host system.

Unlike MSCP controlled disk images, a disk image connected to a SCSI controller as a virtual SCSI disk CANNOT be replaced by another disk image unless "removable" parameter is set for this particular disk image.

Example:

```
set pka_0 container = "/charon/disks/my_removable_disk.vdisk"
set pka_0 removable = true
```

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virtual_scsi_tape

Use "virtual_scsi_tape" for tape containers. This is the most convenient way of connecting tapes to SCSI adapters in CHARON-VAX.

"virtual_scsi_tape" has the following parameters:

container

Parameter	container[N] N=0...7
Type	Text String
Value	A string containing the full path to a tape container. If the specified tape image does not exist, CHARON-VAX creates it. If only the name of the tape container is specified, CHARON-VAX will look for the container in the folder CHARON is running from.

media_type

Parameter	media_type[N] N=0...7
Type	Text String
Value	Overrides PRODUCT ID in the default SCSI INQUIRY data. Valid values may contain uppercase letters, integers and spaces. Length of this string cannot exceed 16 characters. By default the PRODUCT ID returned is "TLZ04"

geometry

Parameter	geometry[N] N=0..7
Type	Text String
Value	<p>Specifies the size of the tape image and (optionally) the size of the "early-warning" area at the end of the tape image.</p> <p>Syntax:</p> <pre>"<image-size>[, <early-warning-zone-size>]"</pre> <p>where:</p> <ul style="list-style-type: none"> • <image-size> is the tape size in MB • <early-warning-zone-size> is the size (in KB) of the space remaining on the tape when a warning to the OS is issued. If omitted, 64K is assumed. <p>Example:</p> <pre>load virtual_scsi_tape/chscsi pka_0 set pka_0 geometry[0] = 90</pre>

 In the table above N stands for logical unit number. The first unit must be 0 with no gaps in subsequent numbering.

Example:

```
load virtual_scsi_tape/chscsi pka_0 scsi_bus=pka scsi_id=0
set pka_0 container[0] = "/charon/tapes/tape1.vtape"
set pka_0 container[1] = "/charon/tapes/tape2.vtape"
```

If only one LUN is configured, the LUN number can be omitted:

```
set pka_0 container = "/charon/tapes/tape1.vtape"
set pka_0 media_type = "TLZ08"
```

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virtual_scsi_cdrom

Use "virtual_scsi_cdrom" to connect IDE or SATA host CD-ROM or *.iso file to CHARON-VAX.

"virtual_scsi_cdrom" has the following parameters:

container

Parameter	container[N] N=0...7
Type	Text String
Value	<p>A string containing the device name to map to the emulator.</p> <ul style="list-style-type: none"> ▪ ISO images <ul style="list-style-type: none"> ▪ [<code><path-name>"/"<file-name>[".iso"]</code> <p>Format: A string containing the full path to an *.iso image.</p> <p>If only the name of the *.iso image is specified, CHARON-VAX will look for it in the folder CHARON is running from.</p> ▪ CD-ROM or DVD drives <ul style="list-style-type: none"> ▪ <code>"/dev/cdrom<X>"</code> or ▪ <code>"/dev/sr<X>"</code> where X is 0,1,2... <p>This parameter is initially not set, thus creating NO storage elements on the controller</p>

media_type

Parameter	media_type[N] N=0...7
Type	Text String
Value	<p>Overrides the PRODUCT ID in the default SCSI INQUIRY data.</p> <p>Valid values may contain uppercase letters, integers and spaces. The length of the string cannot exceed 16 characters.</p> <p>If not specified, synthetic SCSI INQUIRY data is returned containing a PRODUCT ID selected based on the disk size.</p> <p>Initially left unspecified.</p>

geometry

Parameter	geometry[N] N=0...7
Type	Text String
Value	<p>This formatted string value specifies the explicit geometry of the disk storage element</p> <p>The string format is <code><X>"/"<Y>["/"<Z>]</code> where:</p> <ul style="list-style-type: none"> • "X" is the number of sectors per track; • "Y" is the number of tracks per cylinder; • "Z" (optional) is the number of cylinders on the unit. If omitted, Z is calculated based on X, Y and the total number of sectors on the unit that reflects the size of the disk storage element; <p>If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type.</p>

use_io_file_buffering

Parameter	use_io_file_buffering[N] N=0...7
Type	boolean
Value	<p>Enables use of the host OS I/O buffering.</p> <p>Initially set to "false" (buffering disabled).</p>

 In the table above N stands for logical unit number. The first unit must be 0 with no gaps in subsequent numbering. If only one LUN is configured, the

LUN number can be omitted

Example:

```
load virtual_scsi_cdrom/chscsi pka_0 scsi_bus=pka scsi_id=0
set pka_0 container="/dev/sr0"
```

This example associates an unallocated CD-ROM drive "/dev/sr0" with virtual_scsi_cdrom "pka_0".

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physical_scsi_device

Use "physical_scsi_device" to connect any host "raw" SCSI device to CHARON-VAX. This mapping type is suitable only for tape drives and other specific SCSI devices connected to CHARON host.

"physical_scsi_device" has the following parameters:

container

Parameter	container[N] N=0...7
Type	Text String
Value	A string containing the device name to map to the emulator. <ul style="list-style-type: none"> ▪ Physical tape drives and other SCSI devices connected to CHARON host <ul style="list-style-type: none"> ▪ "/dev/sg<X>", where X is 0, 1, ...

media_type

Parameter	media_type[N] N=0...7
Type	Text String
Value	Overrides the PRODUCT ID in the default SCSI INQUIRY data. Valid values may contain uppercase letters, integers and spaces. The length of the string cannot exceed 16 characters. If not specified, synthetic SCSI INQUIRY data is returned containing a PRODUCT ID selected based on the disk size. Initially left unspecified.

geometry

Parameter	geometry[N] N=0...7
Type	Text String
Value	This formatted string value specifies the explicit geometry of the disk storage element The string format is <X>"/"<Y>["/"<Z>] where: <ul style="list-style-type: none"> • "X" is the number of sectors per track; • "Y" is the number of tracks per cylinder; • "Z" (optional) is the number of cylinders on the unit. If omitted, Z is calculated based on X, Y and the total number of sectors on the unit that reflects the size of the disk storage element; <p>If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type.</p>

use_io_file_buffering

Parameter	use_io_file_buffering[N] N=0...7
Type	boolean
Value	Enables use of the host OS I/O buffering. Initially set to "false" (buffering disabled).

removable

Parameter	removable[N] N=0...7
Type	boolean
Value	Enables the logical unit to appear as a removable SCSI disk drive. Initially set to "false" (fixed, non-removable).

disconnect_timeout

Parameter	disconnect_timeout[N] N=0...7
Type	Numeric
Value	<p>Sets logical unit disconnect timeout. This parameter helps if a connected SCSI device performs a given SCSI command for a very long time.</p> <p>The default value depends on the type of the SCSI device attached. For example for a disk it is 10 seconds, for a tape - an hour. If the type of the device is not known the timeout is 1 hour.</p> <p>Example with 48 days timeout:</p> <pre>set pka_0 disconnect_timeout[1] = 0x400000</pre>

 In the table above N stands for logical unit number. The first unit must be 0 with no gaps in subsequent numbering. If only one LUN is configured, the LUN number can be omitted.

Example:

```
load physical_scsi_device/chscsi pka_0 scsi_bus=pka scsi_id=0
set pka_0 container="/dev/sg3"
```

This example associates a host tape device "/dev/sg3" with physical_scsi_device "pka_0".

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DSSI Subsystem

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Introduction

The DSSI storage subsystem for the VAX 4000 Models 106, 108, 700 and 705 emulators is based on the emulation of SHAC host adapters and the ability to route SCS cluster information between the emulated SHAC host adapters of multiple nodes via separate TCP/IP links.

The DSSI storage subsystem is functionally emulated, but the emulation is incompatible with the physical DSSI and operates at a much higher throughput than the original hardware. Connection to physical DSSI hardware is neither possible nor planned for future releases.

This version of DSSI emulation for CHARON-VAX supports up to 3 VAX nodes in a virtual DSSI cluster and handles a maximum cluster size of 8 nodes. A single virtual DSSI network supports up to 256 storage elements.

To use a **single** CHARON-VAX system with DSSI emulation, either or both of two elements must be configured:

1. A DSSI storage element (disk or tape).
2. A DSSI storage controller. Currently an emulated HSD50 storage controller is provided. The emulated HSD50 supports physical host drives, CD-ROM drives, physical tapes, removable disks, virtual disks and virtual tapes.

To create a **cluster** of DSSI interconnected CHARON-VAX systems, the DSSI hardware topology is emulated by establishing TCP/IP channels between the emulated SHAC host adapters of each CHARON-VAX system (The use of TCP/IP for the interconnects makes the cluster in principle routable in a WAN). The emulated HSD50 storage controllers are then connected to every SHAC host adapter in the virtual DSSI network.

Cluster operation requires (virtual) disks that are simultaneously accessible by all CHARON-VAX nodes involved. This can be implemented for instance by using a properly configured iSCSI initiator / target structure or a fiber channel storage back-end. Disks on a multiport SCSI switch are not acceptable, as a SCSI switch does not provide true simultaneous access to multiple nodes.

i When a tape or disk image connected to an emulated DSSI controller is dismantled in VAX/VMS, it is disconnected from CHARON-VAX and can be manipulated. It may even be replaced with a different disk image if it keeps the same name. This capability may be useful when designing back-up and restore procedures.

The emulated DSSI subsystem has many configurable parameters when multiple nodes on a single DSSI bus are to be connected. Incorrect configuration, in particular non-identical specification of emulated HSD50 disks in the DSSI nodes, is likely to cause data corruption. It is advisable to start any field test by implementing a single node.

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SHAC host adapter

To connect an emulated VAX 4000 model 106, 108, 700 and 705 node to a virtual DSSI network, CHARON-VAX configuration must load at least one emulated SHAC host adapter.

Emulated VAX 4000 models 106, 108, 700 and 705 have two pre-loaded SHAC host adapters named "PAA" and "PAB" There is no need to load any extra instances of SHAC in configuration file.

Note that VAX/VMS running on an emulated VAX 4000 model 106 or 108 node enumerates the emulated SHAC host adapters and assigns them the VMS internal names "PAA" and "PAB". It is recommended for clarity to keep the same naming scheme in the CHARON-VAX configuration file for these emulated SHAC host adapters.

The SHAC emulation has the following configuration parameters:

port

Parameter	port[N] N=0...7
Type	Numeric
Value	An integer value that specifies the TCP/IP port number at which the emulated SHAC host adapter listens for connections from another emulated SHAC host adapter with DSSI node id N. Possible values are from 1024 through 32767. Initially not set.

host

Parameter	host[N] N=0...7
Type	Text String
Value	A string value that specifies the TCP/IP host name (and optionally the TCP/IP port number) to connect to another emulated SHAC host adapter with DSSI node id N. The syntax for the string is "host-name[:port-no]", with possible values for port-no in the range from 1024 through 32767. Initially not set.

scs_node_name

Parameter	scs_node_name[N] N=0...7
Type	Text String
Value	A string value that specifies the SCSNODENAME of the emulated storage element. The string is up to 6 characters long. Possible characters are uppercase letters A through Z , figures 0 through 9. Initially set to an arbitrary value that is guaranteed to be unique within the running emulated VAX 4000 model 106, 108, 700 or 705 node.

scs_system_id

Parameter	scs_system_id[N] N=0...7
Type	Numeric
Value	An integer value that specifies the SCSSYSTEMID of the emulated storage element. Initially set to an arbitrary value that is guaranteed to be unique within the running emulated VAX 4000 model 106, 108, 700 or 705 node.

mscp_allocation_class

Parameter	mscp_allocation_class[N] N=0...7
Type	Numeric
Value	An integer value that specifies the ALLOCLASS of the emulated storage element. Possible values are from 0 through 255. Initially set to 0 which means no allocation class assigned.

container

Parameter	container[N] N=0...7
Type	Text String
Value	<p>A string value that specifies the container of the storage element with DSSI node id N and MSCP unit number N. This storage element might be either a (virtual) disk or tape. In VMS running on an emulated VAX 4000 model 106 or 108 node, these storage elements appear as DSSI disks (DIAN:) or DSSI (TF86) tapes (MIAN:).</p> <p>Possible values of the parameter are strings in one of the following forms:</p> <ul style="list-style-type: none"> ▪ Physical disk drives <ul style="list-style-type: none"> ▪ <code>/dev/sd<L></code>, where L is letter ▪ <code>/dev/disk/by-id/...</code> - addressing by the disk ID, for example <code>/dev/disk/by-id/ata-ST1000DM003-9YN162_S1D01QJ4</code> ▪ <code>/dev/disk/by-label/...</code> - addressing by the disk label, for example <code>/dev/disk/by-label/MyStorage</code> ▪ <code>/dev/disk/by-uuid/...</code> - addressing by the disk UUID, for example <code>/dev/disk/by-uuid/0e808a2f-cdd3-4944-a245-f729ffd73882</code> <div style="border: 1px solid #f0e68c; padding: 10px; margin: 10px 0;"> <p>Since <code>/dev/sd<L></code> addressing is not persistent, so it is strongly recommended to use <code>/dev/disk/by-id/wwn-*</code> syntax instead to refer the disk by its WWID - especially in the environments utilizing FC and SAN storages.</p> </div> <ul style="list-style-type: none"> ▪ Physical tape drives <ul style="list-style-type: none"> ▪ <code>/dev/sg<X></code>, where X is 0, 1, ... ▪ Floppy drives <ul style="list-style-type: none"> ▪ <code>/dev/fd<X></code>, where X is 0, 1, ... ▪ CD-ROM drives (read-only) <ul style="list-style-type: none"> ▪ <code>/dev/cdrom<X></code> or ▪ <code>(/dev/sr<X>)</code>, where X is 0, 1, ... ▪ Multipath disks <ul style="list-style-type: none"> ▪ <code>/dev/dm-<X></code>, ▪ <code>/dev/mapper/mpath<X></code>, ▪ <code>/dev/mapper/disk<X></code>, where X is 0, 1, ... ▪ CHARON-VAX disk images <ul style="list-style-type: none"> ▪ <code>[<path-name>/"<file-name>["<file-name>".vdisk]]</code> ▪ CHARON-VAX tape images <ul style="list-style-type: none"> ▪ <code>[<path-name>/"<file-name>".vtape]</code> <p>This parameter is initially not set, thus creating NO storage elements on the bus with corresponding DSSI node id.</p>

media_type

Parameter	media_type[N] N=0..7
Type	Text String
Value	<p>Overrides default (automatically determined) MSCP media type of the device.</p> <p>Syntax:</p> <pre>"<device-name>,<device-type>"</pre> <p>where:</p> <ul style="list-style-type: none"> • <device-name> is one of "DU", "MU", "DK", "MK", "SCSI", "DI", "MI", "DSSI", "DJ", "MJ" • <device-type> is of the form "LLD" or "LLLD", where "L" is letter from A through Z, and "D" is decimal number from 0 through 99 <p>If not specified, the device name is set to "DI", and the device type is selected based on disk size for disk storage elements. For tape storage elements, the device name and type are set to "MI" and "TF86", respectively.</p> <p>Initially not specified.</p>

geometry

Parameter	geometry[N] N=0..7
Type	Text String
Value	<p>This formatted string value specifies the explicit geometry of the disk storage element with DSSI node id N and MSCP unit number N. This parameter is not applicable to tape storage elements.</p> <p>The string format is <X>"/"<Y>["/"<Z>] where:</p> <ol style="list-style-type: none"> 1. X is number of sectors on track 2. Y is number of tracks on cylinder 3. Z (optional) is the number of cylinders on the unit. If omitted, Z is calculated based on X, Y and the total number of sectors on the unit that reflects the size of the disk storage element <p>If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type.</p> <p>Initially not set.</p> <p>The syntax above is applicable only to disk storage elements.</p> <p>If the container is a tape image, the following format is used instead:</p> <p>Syntax:</p> <pre>"<image-size>[, <early-warning-zone-size>]"</pre> <p>where:</p> <ul style="list-style-type: none"> • <image-size> is the tape size in MB • <early-warning-zone-size> is a size (in KB) of a space left on the tape when a warning to the OS is issued. If omitted, 64K is assumed.

use_io_file_buffering

Parameter	use_io_file_buffering[N] N=0...7
Type	Boolean
Value	Enables use of host OS I/O buffering. Initially set to "false" (buffering disabled).

These parameters are configured with the "set" command.

Example of a Standalone VAX system with 2 disks on a PAA SHAC controller:

```
set session hw_model="VAX_4000_Model_108"
set session log="example1.log"
set toy container="example1.dat"
set rom container="example1.rom"

load operator_console OPA0

set PAA container[0]="/charon/disks/dia0-rz24-vms-v6.2.vdisk"
set PAA container[1]="/charon/disks/dia1-rz24-vms-v6.2.vdisk"
```

The emulated VAX 4000 model 106 or 108 can then boot VMS with the following command:

```
>>> BOOT DIA0
```

After logging into VMS, the "SHOW DEVICE" command displays the following:

```
$ show devices d

Device          Device          Error   Volume          Free  Trans  Mnt
Name           Status          Count   Label           Blocks Count  Cnt
004200$DIA0:   Mounted         0       DSSI01          32022  147   1
004201$DIA1:   Online          0
```

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HSD50 storage controller

To connect a storage controller to the virtual DSSI network, the CHARON-VAX configuration file must load at least one emulated HSD50 storage controller. In most cases one emulated HSD50 storage controller per virtual DSSI network is enough. The CHARON-VAX configuration file must supply a unique reference name for that instance. Even though this name is only valid within the configuration file, it is recommended for clarity to use the VMS SC SNODENAME as the instance name.

The line below loads an emulated HSD50 storage controller, assigns it the instance name SCSNOD and connects it to the primary built-in DSSI controller:

```
load HSD50 MYDISKS dssi_host=PAA
```

The HSD50 emulation has the following configuration parameters:

dssi_host

Parameter	dssi_host
Type	Text String
Value	<p>A string value that specifies the instance name of an emulated SHAC host adapter serving the virtual DSSI network.</p> <p>If this value is not set, CHARON-VAX will try to locate the host adapter automatically. This automatic lookup works only if the CHARON-VAX configuration has exactly one instance of an emulated SHAC host adapter.</p>

dssi_node_id

Parameter	dssi_node_id
Type	Numeric
Value	<p>An integer value that specifies the address of an emulated HSD50 storage controller on the virtual DSSI network.</p> <p>Possible values are from 0 through 7 (initially set to 0).</p>

scs_node_name

Parameter	scs_node_name
Type	Text String
Value	<p>A string value that specifies the SCSNODENAME of the emulated HSD50 storage controller.</p> <p>The string is up to 6 characters long. Possible characters are uppercase letters A through Z, figures 0 through 9.</p> <p>Initially set to the name of the emulated HSD50 controller. Therefore, the name of emulated HSD50 controller should follow the above rules.</p>

scs_system_id

Parameter	scs_system_id
Type	Numeric
Value	<p>An integer value that specifies the SCSSYSTEMID of the emulated HSD50 storage controller.</p> <p>Initially set to an arbitrary value that is guaranteed to be unique within the running emulated VAX 4000 model 106, 108, 700 and 705 node.</p>

mscp_allocation_class

Parameter	mscp_allocation_class
Type	Numeric
Value	<p>An integer value that specifies the ALLOCLASS of the emulated HSD50 storage controller.</p> <p>Possible values are from 0 through 255 (initially set to 0).</p>

container

Parameter	container[N] N=0...9999
Type	Text String
Value	<p>A string value that specifies the container of the storage element with MSCP unit number N. This storage element might be either a (virtual) disk or tape. In VMS running on an emulated VAX 4000 node, these storage elements appear as HSX00 disks (DUAN:) or HST00 tapes (MUAN:).</p> <p>Possible values of the parameter are strings in one of the following forms:</p> <ul style="list-style-type: none"> ▪ Physical disk drives <ul style="list-style-type: none"> ▪ <code>"/dev/sd<L>"</code>, where L is letter ▪ <code>"/dev/disk/by-id/..."</code> - addressing by the disk ID, for example <code>"/dev/disk/by-id/ata-ST1000DM003-9YN162_S1D01QJ4"</code> ▪ <code>"/dev/disk/by-label/..."</code> - addressing by the disk label, for example <code>"/dev/disk/by-label/MyStorage"</code> ▪ <code>"/dev/disk/by-uuid/..."</code> - addressing by the disk UUID, for example <code>"/dev/disk/by-uuid/0e808a2f-cdd3-4944-a245-f729ffd73882"</code> <div style="border: 1px solid #f4a460; padding: 10px; margin: 10px 0;"> <p>Since <code>"/dev/sd<L>"</code> addressing is not persistent, so it is strongly recommended to use <code>"/dev/disk/by-id/wwn-..."</code> syntax instead to refer the disk by its WWID - especially in the environments utilizing FC and SAN storages.</p> </div> <ul style="list-style-type: none"> ▪ i It is also possible to use not a whole disk, but previously created partitions on it. In this case the syntax is the following: <code>"/dev/sd<L><N>"</code> where N is the number of partition to be used. ▪ Physical tape drives <ul style="list-style-type: none"> ▪ <code>"/dev/sg<X>"</code>, where X is 0, 1, ... ▪ Floppy drives <ul style="list-style-type: none"> ▪ <code>"/dev/fd<X>"</code>, where X is 0, 1, ... ▪ CD-ROM drives (read-only) <ul style="list-style-type: none"> ▪ <code>"/dev/cdrom<X>"</code> or ▪ <code>("/dev/sr<X>")</code>, where X is 0, 1, ... ▪ Multipath disks <ul style="list-style-type: none"> ▪ <code>"/dev/dm-<X>"</code>, ▪ <code>"/dev/mapper/mpath<X>"</code>, ▪ <code>"/dev/mapper/disk<X>"</code>, where X is 0, 1, ... ▪ CHARON-VAX disk images <ul style="list-style-type: none"> ▪ <code>[<path-name>"/"]<file-name>[".vdisk"]</code> ▪ CHARON-VAX tape images <ul style="list-style-type: none"> ▪ <code>[<path-name>"/"]<file-name>".vtape"</code> <p>This parameter is initially not set, thus creating NO storage elements on the controller</p>

media_type

Parameter	media_type[N] N=0...9999
Type	Text String
Value	<p>Overrides default (automatically determined) MSCP media type of the device.</p> <p>Syntax:</p> <pre>"<device-name>,<device-type>"</pre> <p>where:</p> <ul style="list-style-type: none"> <device-name> is one of "DU", "MU", "DK", "MK", "SCSI", "DI", "MI", "DSSI", "DJ", "MJ" <device-type> is of the form "LLD" or "LLLD", where "L" is letter from A through Z, and "D" is decimal number from 0 through 99 <p>If not specified, the device name is set to "DI" and the device type is selected based on disk size for disk storage elements. For tape storage elements, the device name and type are set to "MI" and "TF86" respectively .</p> <p>Initially not specified.</p>

geometry

Parameter	geometry [N] N=0...9999
Type	Text String
Value	<p>This formatted string value specifies the explicit geometry of the disk storage element with DSSI node id N and MSCP unit number N. This parameter is not applicable to tape storage elements.</p> <p>The string format is <X>"/"<Y>["/"<Z>] where:</p> <ol style="list-style-type: none"> X is number of sectors on track Y is number of tracks on cylinder Z (optional) is the number of cylinders on the unit. If omitted, Z is calculated based on X, Y and the total number of sectors on the unit that reflects the size of the disk storage element <p>If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type.</p> <p>Initially not set.</p> <p>The syntax above is applicable only to disk storage elements.</p> <p>If the container is a tape image, the following format is used instead:</p> <p>Syntax:</p> <pre>"<image-size>[, <early-warning-zone-size>]"</pre> <p>where:</p> <ul style="list-style-type: none"> <image-size> is the tape size in MB <early-warning-zone-size> is a size (in KB) of a space left on the tape when a warning to the OS is issued. If omitted, 64K is assumed.

use_io_file_buffering

Parameter	use_io_file_buffering[N] N=0...9999
Type	Boolean
Value	Enables use of host OS I/O buffering. Initially set to "false" (buffering disabled).

Example:

```
load HSD50 DISKS dssi_host=PAA dssi_node_id=5
```

The configuration file below emulates a VAX 4000 Model 108 node, one HSD50 storage controller serving two disks and another instance of an HSD50 controller that serves a tape drive to the VAX over a virtual DSSI:

```
set session hw_model="VAX_4000_Model_108"
set session log="example2.log"
set toy container="example2.dat"
set rom container="example2.rom"

load operator_console OPA0

load HSD50 DISKS dssi_host=PAA dssi_node_id=1

set DISKS container[0]="/charon/disks/dua0-rz24-vms-v6.2.vdisk"
set DISKS container[1]="/charon/disks/dual-rz24-vms-v6.2.vdisk"

load HSD50 TAPES dssi_host=PAA dssi_node_id=2

set TAPES container[3]="/dev/sg5"
```

In this example we emulate two HSD50 instances. Since they are both connected to the same virtual DSSI bus, we must assign them different DSSI node id values.

The emulated VAX 4000 Model 108 can then boot VMS with the following command:

```
>>> BOOT DUA0
```

After logging into VMS, the "SHOW DEVICE" command displays the following:

```
$ show devices d

Device          Device      Error   Volume      Free  Trans Mnt
Name            Status     Count   Label        Blocks Count Cnt
DISKS$DUA0:     Mounted    0       DSSI01       31932  147  1
DISKS$DUA1:     Online     0

$ show devices m

Device          Device      Error   Volume      Free  Trans Mnt
Name            Status     Count   Label        Blocks Count Cnt
TAPES$MUA3:     Online     0
```

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CI Subsystem

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Introduction

The virtual CIXCD is the functional equivalent of a hardware CIXCD host adapter, with the exception that there is no physical layer to connect to a hardware CI infrastructure. Since the current host hardware is an order of magnitude faster than the physical CI implementation, such connection - if it were possible - would greatly limit the virtual system throughput.

For data storage, the CIXCD connects to one or more virtual HSJ50 controllers that are loaded as a separate component in the configuration file. To configure VAX CI clusters, the virtual CIXCDs of the multiple CHARON-VAX/66X0 instances are interconnected via TCP/IP links.

Configuring (large) virtual VAX CI clusters requires many configurable parameters and a replicated identical definition of the shared virtual HSJ50 storage controllers in each virtual VAX instance.

To connect a virtual VAX 66x0 to a virtual CI network, the CHARON-VAX configuration file must load at least one virtual CIXCD host adapter; one unit is sufficient in all practical cases.

VAX/VMS enumerates the virtual CIXCD host adapters in the order of increasing XMI node IDs, and assigns them the VMS internal names PAA, PAB, etc. It is recommended for clarity to keep the same naming scheme for virtual CIXCD host adapters in the configuration file.

The emulated CI subsystem has many configurable parameters when multiple nodes on a single CI bus are to be configured. Incorrect configuration, in particular non-identical specification of the emulated HSJ50 disks in the CI nodes, is likely to cause data corruption. It is advisable to start any field test by implementing a single node.

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CIXCD host adapter

To connect an emulated VAX 66x0 node to a virtual CI network, the CHARON-VAX configuration must load at least one emulated CIXCD host adapter.

To load the adapter and assign it an instance name of "PAA", enter the following line in the configuration file:

```
load CIXCD PAA
```

The CIXCD emulation has the following configuration parameters:

port

Parameter	port[N] N=0...127
Type	Numeric
Value	An integer value that specifies the TCP/IP port number at which the emulated CIXCD host adapter listens for connections from another emulated CIXCD host adapter with address N. Possible values are from 1024 through 32767. Initially not set.

host

Parameter	host[N] N=0...127
Type	Text String
Value	A string value that specifies the TCP/IP host name (and optionally the TCP/IP port number) to connect to another emulated CIXCD host adapter with address N. The syntax for the string is "host-name[:port-no]", with possible values for port-no in the range from 1024 through 32767. Initially not set.

xmi_node_id

Parameter	xmi_node_id
Type	Numeric
Value	An integer value that specifies the location of the virtual CIXCD host adapter on the XMI bus. Possible values are from 11 through 14 (Initially set to 14).

ci_node_id

Parameter	ci_node_id
Type	Numeric
Value	An integer value that specifies the address of the virtual CIXCD host adapter on the virtual CI network. Possible values are from 0 through 127 (Initially set to 127).

These parameters can be added to the "load" command or specified separately with the "set" command.

The example below shows how to configure a virtual CIXCD adapter with a location on the XMI bus other than the default. It declares a CIXCD adapter in slot 11 (0xB = decimal 11) of the virtual XMI bus:

```
load CIXCD PAA xmi_node_id=0xB
```

The configuration file below creates a virtual VAX 6610 (single CPU) node with one virtual HSJ50 storage controller serving two disks to the VAX over a virtual CI network:


```

set session hw_model="VAX_6000_Model_610"
set session log="vax6610.log"
set toy container="vax6610.dat"
set eeprom container="vax6610.rom"

load operator_console OPA0

load CIXCD PAA

load HSJ50 DISKS

set DISKS container[0]="/charon/disks/dua0-rz24-vms-v6.2.vdisk"
set DISKS container[1]="/charon/disks/dua1-rz24-vms-v6.2.vdisk"

```

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HSJ50 storage controller

The virtual HSJ50 storage controller functionally replaces a physical HSJ50 CI storage unit. It supports virtual and physical disks, tapes and removable storage devices that are mapped on local or remote host platform storage. The virtual HSJ50 cannot connect to a physical CI infrastructure.

In a single CHARON-VAX/66X0 instance without a CI cluster, the virtual HSJ50 is located as a separate entity on the same host platform. In a CI cluster, the definition of each HSJ50 is replicated exactly in each CHARON-VAX CI node. In most cases one HSJ50 storage controller per virtual CI network is enough.

When loading an instance of a virtual HSJ50 storage controller, the CHARON-VAX configuration file must supply a unique reference name for that instance. While this name is only valid within the configuration file, it is recommended for clarity to use the VAX/VMS SCSNODENAME as an instance name.

The line below loads an emulated HSJ50 storage controller and assigns it the instance name SCSNOD:

```
load HSJ50 MYDISKS
```

The HSJ50 emulation has the following configuration parameters:

ci_host

Parameter	ci_host
Type	Text String
Value	A string value that specifies the instance name of the emulated CIXCD host adapter serving the virtual CI network. If this value is not set, CHARON-VAX will try to locate the host adapter automatically. Automatic lookup works only if the CHARON-VAX configuration has exactly one instance of an emulated CIXCD host adapter.

ci_node_id

Parameter	ci_node_id
Type	Numeric
Value	An integer value that specifies the address of an emulated HSJ50 storage controller on the virtual CI network. Possible values are from 0 through 127 (initially set to 0).

scs_node_name

Parameter	scs_node_name
Type	Text String
Value	<p>A string value that specifies the SCSNODENAME of the emulated HSJ50 storage controller.</p> <p>The string is up to 6 characters long. Possible characters are uppercase letters A through Z, figures 0 through 9.</p> <p>Initially set to the name of the emulated HSJ50 controller. Therefore name of emulated HSJ50 controller must follow the above rules.</p>

scs_system_id

Parameter	scs_system_id
Type	Numeric
Value	<p>An integer value that specifies the SCSSYSTEMID of the emulated HSJ50 storage controller.</p> <p>Initially set to an arbitrary value that is guaranteed to be unique within the running emulated VAX 66x0 node.</p>

mscp_allocation_class

Parameter	mscp_allocation_class
Type	Numeric
Value	<p>An integer value that specifies the ALLOCLASS of the emulated HSJ50 storage controller.</p> <p>Possible values are from 0 through 255 (initially set to 0).</p>

container

Parameter	container[N] N=0...9999
Type	Text String
Value	<p>Possible values of the parameter are strings in one of the following forms:</p> <ul style="list-style-type: none"> ▪ Physical disk drives <ul style="list-style-type: none"> ▪ <code>/dev/sd<L></code>, where L is letter ▪ <code>/dev/disk/by-id/...</code> - addressing by the disk ID, for example <code>/dev/disk/by-id/ata-ST1000DM003-9YN162_S1D01QJ4</code> ▪ <code>/dev/disk/by-label/...</code> - addressing by the disk label, for example <code>/dev/disk/by-label/MyStorage</code> ▪ <code>/dev/disk/by-uuid/...</code> - addressing by the disk UUID, for example <code>/dev/disk/by-uuid/0e808a2f-cdd3-4944-a245-f729ffd73882</code> <div style="border: 1px solid #f0e68c; padding: 10px; margin: 10px 0;"> <p>Since <code>/dev/sd<L></code> addressing is not persistent, so it is strongly recommended to use <code>/dev/disk/by-id/wwn-*</code> syntax instead to refer the disk by its WWID - especially in the environments utilizing FC and SAN storages.</p> </div> <p>i It is also possible to use not a whole disk, but previously created partitions on it. In this case the syntax is the following: <code>/dev/sd<L><N></code> where N is the number of partition to be used.</p> <ul style="list-style-type: none"> ▪ Physical tape drives <ul style="list-style-type: none"> ▪ <code>/dev/sg<X></code>, where X is 0, 1, ... ▪ Floppy drives <ul style="list-style-type: none"> ▪ <code>/dev/fd<X></code>, where X is 0, 1, ... ▪ CD-ROM drives (read-only) <ul style="list-style-type: none"> ▪ <code>/dev/cdrom<X></code> or ▪ <code>/dev/sr<X></code>, where X is 0, 1, ... ▪ Multipath disks <ul style="list-style-type: none"> ▪ <code>/dev/dm-<X></code>, ▪ <code>/dev/mapper/mpath<X></code>, ▪ <code>/dev/mapper/disk<X></code>, where X is 0, 1, ... ▪ CHARON-VAX disk images <ul style="list-style-type: none"> ▪ <code>[<path-name>/"<file-name>".vdisk]</code> ▪ CHARON-VAX tape images <ul style="list-style-type: none"> ▪ <code>[<path-name>/"<file-name>".vtape]</code> <p>This parameter is initially not set, thus creating NO storage elements on the controller</p>

media_type

Parameter	media_type[N] N=0...9999
Type	Text String
Value	<p>Overrides default (automatically determined) MSCP media type of the device.</p> <p>Syntax:</p> <div style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;"> <pre>"<device-name>, <device-type>"</pre> </div> <p>where:</p> <ul style="list-style-type: none"> • <code><device-name></code> is one of "DU", "MU", "DK", "MK", "SCSI", "DI", "MI", "CI", "DJ", "MJ" • <code><device-type></code> is of the form "LLD" or "LLLD", where "L" is letter from A through Z, and "D" is decimal number from 0 through 99 <p>If not specified, the device name is set to "DI" and the device type is selected based on disk size for disk storage elements. For tape storage elements, the device name and type are set to "MI" and "TF86" respectively.</p> <p>Initially not specified.</p>

geometry

Parameter	geometry[N] N=0...9999
Type	Text String
Value	<p>This formatted string value specifies the explicit geometry of the disk storage element with CI node id N and MSCP unit number N. This parameter is not applicable to tape storage elements.</p> <p>The string format is <X>"/"<Y>["/"<Z>] where:</p> <ol style="list-style-type: none"> 1. X is number of sectors on track 2. Y is number of tracks on cylinder 3. Z (optional) is the number of cylinders on the unit. If omitted, Z is calculated based on X, Y and the total number of sectors on the unit that reflects the size of the disk storage element <p>If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type.</p> <p>Initially not set.</p> <p>The syntax above is applicable only to disk storage elements.</p> <p>If the container is a tape image, the following format is used instead:</p> <p>Syntax:</p> <pre style="border: 1px solid black; padding: 5px; width: fit-content;">"<image-size>[, <early-warning-zone-size>]"</pre> <p>where:</p> <ul style="list-style-type: none"> • <image-size> is the tape size in MB • <early-warning-zone-size> is a size (in KB) of a space left on the tape when a warning to the OS is issued. If omitted, 64K is assumed.

use_io_file_buffering

Parameter	use_io_file_buffering[N] N=0...9999
Type	Boolean
Value	Enables use of host OS I/O buffering. Initially set to "false" (buffering disabled).

The following example configures a virtual HSJ50 storage controller with a non-default CI network address of 11:

```
load HSJ50 DISKS ci_node_id=0x0B
```

The configuration file below emulates a VAX 6610 node, one HSJ50 storage controller serving two disks:

```
set session hw_model="VAX_6000_Model_610"
set session log=" vax6610.log"
set toy container="vax6610.dat"
set eeprom container="vax6610.rom"

load operator_console OPA0

load CIXCD PAA xmi_node_id=0x0C

load HSJ50 DISKS ci_node_id=0x0B

set DISKS container[0]="/charon/disks/dua0-rz24-vms-v6.2.vdisk"
set DISKS container[1]="/charon/disks/dua1-rz24-vms-v6.2.vdisk"
```

When this configuration file is executed and "container[0]" points to a valid VMS system disk image, a virtual VAX 6610 can boot VAX/VMS with the

following command:

```
>>> BOOT /XMI:C /NODE:B DU0
```

In the above boot command, "/XMI:C" and "/NODE:B" instruct the boot ROM to connect to the disk via the host adapter in XMI slot C (the hex value C stands for decimal 12).

Then via the storage controller with CI node id B (decimal 11), DU0 is reached (defined as container[0]) and the boot command is executed for the associated file on the host system.

After logging into VMS, the "SHOW DEVICE" command displays the following:

```
$ show devices
```

Device Name	Device Status	Error Count	Volume Label	Free Blocks	Trans Count	Mnt Cnt
DISKS\$DUA0:	Mounted	0	DSSI01	32022	147	1
DISKS\$DUA1:	Online	0				

Device Name	Device Status	Error Count
OPA0:	Online	0
FTA0:	Offline	0

Device Name	Device Status	Error Count
PAA0:	Online	0

i When a tape or disk image connected to an emulated HSJ50 controller is dismounted in VAX/VMS, it is disconnected from CHARON-VAX and can be manipulated. It may even be replaced with a different disk image if it keeps the same name. This capability may be useful when designing back-up and restore procedures.

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Finding the target "/dev/sg" device

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- Procedures of finding the target "/dev/sg" device
 - First method
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General description

This section describes how to find proper "/dev/sg" device for CHARON mapping

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Procedures of finding the target "/dev/sg" device

First method

In xterm console issue:

```
# cat /proc/scsi/sg/device_hdr; cat /proc/scsi/sg/devices
```

The output will look something like:

host	chan	id	lun	type	opens	qdepth	bus	online
4	0	0	0	5	1	1	0	1
5	0	0	0	0	1	1	0	1

The fifth field ("type") is the device type.

Value	Device
0	Disk
1	Tape
5	CD-ROM

The "N" in the "/dev/sgN" is the line number in this table (starting from 0) corresponded to the devices CHARON-AXP will use.

Thus "/dev/sg0" will be CD-ROM mapping in this example.

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Second method

On a freshly booted system please issue the following command:

```
# dmesg | grep sg
```

The output will look like that:

```
[ 1.503622] sr 4:0:0:0: Attached scsi generic sg0 type 5  
[ 1.780897] sd 5:0:0:0: Attached scsi generic sg1 type 0
```

 This table lists all the devices, not only the real SCSI ones (SATA/IDE for example). CHARON supports only real SCSI devices.

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Networking

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Introduction

To configure CHARON-VAX networking, follow these 3 steps:

1. Load network adapter (if required)

If you are configuring a DEQNA, DESQA, DELQA, DEUNA, DELUA, DEMNA, DEBNI or PMADAA adapter, use the "load" command as shown below. CHARON-VAX 3100/96/98 and 4000/106/108 emulations automatically load SGEC (with the name "eza") and therefore no "load" command is required.

Example:

```
load DELQA/DEQNA NIC
```

2. Load "packet_port" or "tap_port"

Load "packet_port" or "tap_port" to connect the SGEC, DEQNA, DESQA, DELQA, DEUNA, DELUA, DEMNA, DEBNI or PMADAA adapter to the host hardware network card (or to a virtual network interface).

Example:

```
load packet_port/chnetwrk NDIS interface = "eth0"
```

3. Connect the loaded "packet_port" ("tap_port") to the loaded virtual network adapter

Connect the SGEC, DEQNA, DESQA, DELQA, DEUNA, DELUA, DEMNA, DEBNI or PMADAA adapter to the "packet_port" ("tap_port") by setting the interface name.

Example:


```
set NIC interface = NDIS
```

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SGEC Ethernet Controller

The built-in SGEC controller emulator ("eza") has the following parameters that are specified with the "set" command:

interface

Parameter	interface
Type	Text String
Value	Name of corresponding instance of "packet_port" or "tap_port" component

station_address

Parameter	station_address
Type	Text String
Value	<p>"station_address" provides the ability to configure the adapter's permanent address. By default the adapter's permanent address is read from the host system's NIC.</p> <p>Set the "station_address" when you need to configure a satellite (remotely booted) system that will run DECnet or when the migrated software uses the permanent address on the network adapter.</p> <p>Format:</p> <pre>XX-XX-XX-XX-XX-XX</pre> <p>or</p> <pre>XX:XX:XX:XX:XX:XX</pre> <p>Example:</p> <pre>set eza station_address="AF:01:AC:78:1B:CC"</pre>

rx_fifo_size

Parameter	rx_fifo_size
Type	Numeric
Value	<p>"rx_fifo_size" sets the receive FIFO size.</p> <p>The value is specified in Kb and by default is pre-calculated from the connected port's size of receive queue.</p> <p>Typically, you do not need to change the "rx_fifo_size" parameter. It is available for extended tuning and bug hunting purposes.</p>

Example:

```
load packet_port/chnetwrk EZA0 interface = "eth0"
set EZA interface = EZA0
set EZA station_address="0C:FE:35:AA:67:3B"
```

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DEQNA / DESQA / DELQA Ethernet Controller

CHARON-VAX Q-bus systems provide support for DEQNA, DESQA, DELQA, DEUNA and DELUA Ethernet controllers.

Use the following command to load an instance of DEQNA, DESQA, DELQA, DEUNA and DELUA Ethernet controllers:

```
load DEQNA/DEQNA <logical name>
load DESQA/DEQNA <logical name>
load DELQA/DEQNA <logical name>
load DEUNA/DEUNA <logical name>
load DELUA/DEULA <logical name>
```

Example:

```
load DESQA/DEQNA XQA
```

DEQNA, DESQA, DELQA, DEUNA and DELUA offer the following configuration parameters that can be specified with "set" command:

address

Parameter	address
Type	Numeric
Value	<p>Specifies the CSR address. The address must be a valid QBUS and UNIBUS address in I/O space. Initial value is 017774440 which is the factory setting for DEQNA, DESQA and DELQA Ethernet controllers.</p> <p>Use the address parameter if loading several instances of DEQNA, DESQA, DELQA, DEUNA and DELUA.</p> <p>"address" parameter value must be unique for every instance of DEQNA, DESQA, DELQA, DEUNA and DELUA.</p> <p>Example:</p> <pre>load DEQNA/DEQNA XQA address=017774440 load DEQNA/DEQNA XQB address=017764460</pre>

interface

Parameter	interface
Type	Text String
Value	Name of corresponding instance of "packet_port" or "tap_port" component

station_address

Parameter	station_address
Type	Text String
Value	<p>"station_address" provides the ability to configure the adapter's permanent address. By default the adapter's permanent address is read from the host system's NIC.</p> <p>Set the "station_address" when you need to configure a satellite (remotely booted) system that will run DECnet or when the migrated software uses the permanent address on the network adapter.</p> <p>Format:</p> <pre>XX-XX-XX-XX-XX-XX</pre> <p>or</p> <pre>XX:XX:XX:XX:XX:XX</pre> <p>Example:</p> <pre>set QNA station_address="AF:01:AC:78:1B:CC"</pre>

rx_fifo_size

Parameter	rx_fifo_size
Type	Numeric
Value	<p>"rx_fifo_size" sets the receive FIFO size.</p> <p>The value is specified in Kb and by default is pre-calculated from the connected port's size of receive queue.</p> <p>Typically, you do not need to change the "rx_fifo_size" parameter. It is available for extended tuning and bug hunting purposes.</p>

Example:

```
load DESQA/DEQNA QNA interface = QNA0
set QNA station_address="0C:FE:35:AA:67:3B"
load packet_port/chnetwrk QNA0 interface = "eth0"
```

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DEMNA Ethernet Adapter

CHARON-VAX/66X0 systems provide support for the DEMNA Ethernet controller.

Use the following command to load an instance of the DEMNA Ethernet controller:

```
load DEMNA/DEMNA <logical name>
```

Example:

```
load DEMNA/DEMNA EXA
```

DEMNA Ethernet controller offers the following configuration parameters that can be specified with "set" command:

xmi_node_id

Parameter	xmi_node_id
Type	Number
Value	Specifies the XMI slot in which the virtual DEMNA controller is placed. For CHARON-VAX/66X0 a free slot between 10 (A) and 14 (E) must be chosen.

interface

Parameter	interface
Type	Text String
Value	Name of corresponding instance of "packet_port" or "tap_port" component

station_address

Parameter	station_address
Type	Text String
Value	<p>"station_address" provides the ability to configure the adapter's permanent address. By default the adapter's permanent address is read from the host system's NIC.</p> <p>Set the "station_address" when you need to configure a satellite (remotely booted) system which will run DECnet or when the migrated software uses the permanent address on the network adapter.</p> <p>Format:</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px 0;">XX-XX-XX-XX-XX-XX</div> <p>or</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px 0;">XX:XX:XX:XX:XX:XX</div> <p>Example:</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px 0;">set EXA station_address="AF:01:AC:78:1B:CC"</div>

rx_fifo_size

Parameter	rx_fifo_size
Type	Numeric
Value	<p>"rx_fifo_size" sets the receive FIFO size.</p> <p>The value is specified in Kb and by default is pre-calculated from the connected port's size of receive queue.</p> <p>Typically, you do not need to change the "rx_fifo_size" parameter. It is available for extended tuning and bug hunting purposes.</p>

Example:

```
load DEMNA/DEMNA EXA xmi_node_id = 11 interface = EXA0
set EXA station_address = "0C:FE:35:AA:67:3B"
load packet_port/chnetwrk EXA0 interface = "eth0"
```

[Back to Table of Contents](#)**DEBNI Ethernet Adapter**

CHARON-VAX/63X0 systems provide support for the DEBNI Ethernet controller.

Use the following command to load an instance of the DEBNI Ethernet controller:

```
load DEBNI/DEMNA <logical name>
```

Example:

```
load DEBNI/DEMNA EXA
```

DEBNI Ethernet controller offers the following configuration parameters that can be specified with "set" command:

vax_bi_node_id

Parameter	vax_bi_node_id
Type	Number
Value	Specifies the VAXBI slot in which the virtual DEBNI controller is placed.

interface

Parameter	interface
Type	Text String
Value	Name of corresponding instance of "packet_port" or "tap_port" component

station_address

Parameter	station_address
Type	Text String
Value	<p>"station_address" provides the ability to configure the adapter's permanent address. By default the adapter's permanent address is read from the host system's NIC.</p> <p>Set the "station_address" when you need to configure a satellite (remotely booted) system which will run DECnet or when the migrated software uses the permanent address on the network adapter.</p> <p>Format:</p> <pre>XX-XX-XX-XX-XX-XX</pre> <p>or</p> <pre>XX:XX:XX:XX:XX:XX</pre> <p>Example:</p> <pre>set EXA station_address="AF:01:AC:78:1B:CC"</pre>

rx_fifo_size

Parameter	rx_fifo_size
Type	Numeric
Value	<p>"rx_fifo_size" sets the receive FIFO size.</p> <p>The value is specified in Kb and by default is pre-calculated from the connected port's size of receive queue.</p> <p>Typically, you do not need to change the "rx_fifo_size" parameter. It is available for extended tuning and bug hunting purposes.</p>

Example:

```
load DEBNI/DEMNA EXA vax_bi_node_id = 11 interface = EXA0
set EXA station_address = "0C:FE:35:AA:67:3B"
load packet_port/chnetwrk EXA0 interface = "eth0"
```

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PMAD-AA TurboChannel Ethernet Adapter

The CHARON-VAX VAXstation 4000 Model 90 system provides support for a PMAD-AA TurboChannel Ethernet controller (in addition to the preloaded SGEC "EZA").

Use the following command to load an instance of a PMAD-AA Ethernet controller:

```
load PMADAA/PMADAA <logical name>
```

Example:

```
load PMADAA/PMADAA EXA
```

PMAD-AA TurboChannel Ethernet controller offers the following configuration parameters that can be specified with "set" command:

interface

Parameter	interface
Type	Text String
Value	Name of corresponding instance of "packet_port" or "tap_port" component

station_address

Parameter	station_address
Type	Text String
Value	<p>"station_address" provides the ability to configure the adapter's permanent address. By default the adapter's permanent address is read from the host system's NIC.</p> <p>Set the "station_address" when you need to configure a satellite (remotely booted) system which will run DECnet or when the migrated software uses the permanent address on the network adapter.</p> <p>Format:</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px 0;">XX-XX-XX-XX-XX-XX</div> <p>or</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px 0;">XX:XX:XX:XX:XX:XX</div> <p>Example:</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px 0;">set ECA station_address="AF:01:AC:78:1B:CC"</div>

rx_fifo_size

Parameter	rx_fifo_size
Type	Numeric
Value	<p>"rx_fifo_size" sets the receive FIFO size.</p> <p>The value is specified in Kb and by default is pre-calculated from the connected port's size of receive queue.</p> <p>Typically, you do not need to change the "rx_fifo_size" parameter. It is available for extended tuning and bug hunting purposes.</p>

Example:

```
load PMADAA/PMADAA ECA interface = ECA0
set ECA station_address = "0C:FE:35:AA:67:3B"
load packet_port/chnetwrk ECA0 interface = "eth0"
```

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Packet Port

The CHARON-specific "packet_port" interface establishes a connection between an Ethernet adapter in the Linux host system and a network adapter in the virtual VAX system.

For every virtual adapter instance loaded, one dedicated host Ethernet physical adapter is required.

To create instances of "packet_port", use the "load" command in the configuration file as follows:

```
load packet_port/chnetwrk <instance-name>
```

Example:

```
load packet_port/chnetwrk pp_1
```

"packet_port" offers several configuration parameters controlling its behavior.

interface

Parameter	interface
Type	Text string
Value	<p>This parameter identifies an Ethernet adapter of the host system dedicated to CHARON-VAX.</p> <p>Syntax:</p> <pre>set <name> interface="<adapter>"</pre> <p>Example:</p> <pre>set pp_1 interface="eth0"</pre>

port_enable_mac_addr_change

Parameter	port_enable_mac_addr_change
Type	Boolean
Value	<p>If "true" is specified, CHARON sets the appropriate Ethernet address automatically.</p> <p>If "false" is specified, set the Ethernet address manually. The default value is "true".</p> <p>Example:</p> <pre>set pp_1 port_enable_mac_addr_change=false</pre>

port_retry_on_tx

Parameter	port_retry_on_tx
Type	Numeric
Value	<p>The "port_retry_on_tx" parameter controls the number of times the port will attempt to transmit the packet before giving up.</p> <p>By default, the value is 3.</p> <p>Increasing this value may introduce problems in carrier loosing logic because not all NIC drivers support carrier status query.</p> <p>Typically, you do not need to increase the value.</p> <p>Example:</p> <pre>set pp_1 port_retry_on_tx=8</pre>

port_pending_rx_number

Parameter	port_pending_rx_number
Type	Numeric
Value	<p>"port_pending_rx_number" parameter sets the number of pending receive buffers.</p> <p>The default value is 63. The maximum value allowed is 195.</p> <p>You may want to increase the "port_pending_rx_number" when you have very busy networking and experience problems like losing connections not related to the carrier loss.</p> <p>Typically, you do not need to change this parameter.</p> <p>Example:</p> <pre>set pp_1 port_pending_rx_number=128</pre>

port_pending_tx_number

Parameter	port_pending_tx_number
Type	Numeric
Value	<p>"port_pending_tx_number" parameter sets the number of buffers the port uses to transmit.</p> <p>The default value is 62.</p> <p>You may want to increase the "port_pending_tx_number" value if the log file indicates dropped TX packets due to TX queue overflow.</p> <p>Typically, you do not need to change this parameter.</p> <p>Example:</p> <pre>set pp_1 port_pending_tx_number=128</pre>

log

Parameter	log
Type	Text string
Value	<p>If this parameter is set to some valid file name or a directory where the log files for each individual session will be stored CHARON logs Recv and Xmit packets at the emulated port layer.</p> <p>If an existing directory is specified, CHARON automatically enables creation of individual log files, one for each session using the same scheme as used for the generation of the rotating log files. If the "log" parameter is omitted, CHARON does not create log.</p> <p>In certain situations enabling this parameter may help to detect loss of packets.</p> <p>Example:</p> <pre>set pp_1 log="pp_1.log"</pre> <pre>set pp_1 log="/charon/logs"</pre> <div style="border: 1px solid orange; padding: 5px; margin-top: 10px;"> <p>Only existing directory can be used as a value of the "log" parameter.</p> </div>

"tap_port" parameters are the same as "packet_port" ones

Example:

```
load DEQNA/DEQNA XQA
load packet_port/chnetwrk XQA0 interface="eth0"
set XQA interface=XQA0
```

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Supported Ethernet Q-bus Adapters for DECnet OSI (DECnet Plus)

The only supported Q-bus device is the DELQA adapter model.

During DECnet OSI installation or DECnet OSI interface reconfiguration, DEQNA and DESQA models are not recognized as valid devices. (DECnet OSI SPD).

The integrated SGEC Ethernet "EZA" on MicroVAX 3100 & VAX 4000-106/108 is supported by DECnet OSI.

The integrated ESA (AMD Lance 7990) device is not currently implemented in Charon-VAX.

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Ethernet Q-bus Adapter and Cluster configuration rules

In a VMS Cluster using VMS V 5.5 and above, use only DELQA and DESQA Ethernet adapters that are supported (VMS Cluster SPD).

The default DEQNA device is not supported for SCS Cluster protocol and the emulated VAX will fail with a CLUEXIT Bugcheck.

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Sample configuration files

Contents

- VAX 4000 Model 108 configuration file
- VAX 6310 configuration file
- VAX 6610 configuration file

VAX 4000 Model 108 configuration file

```

#
# Copyright (C) 1999-2014 STROMASYS
# All rights reserved.
#
# The software contained on this media is proprietary to and embodies
# the confidential technology of STROMASYS. Possession, use, duplication,
# or dissemination of the software and media is authorized only pursuant
# to a valid written license from STROMASYS.
#
#=====
#
# Sample configuration file for VAX 4000 Model 108.
#
# Specify the hw_model prior to any other commands. This parameter informs
# the emulator what type of VAX it should build and enables all other
# commands.
#-----

set session hw_model = VAX_4000_Model_108

#=====
#
# Choose a name for the instance, if needed, to differentiate it among other
# instances running on the same host.
#-----

#set session configuration_name = VAX_4000_Model_108

#=====
#
# Use the following commands to disable the rotating LOG files and enable
# a single LOG file. Select either append or overwrite (for each time the
# instance starts) and specify desired log path and file name.
#-----

#set session log_method = append
#set session log_method = overwrite
#set session log = VAX_4000_Model_108.log

#=====
#
# The following line tells the emulator where to preserve NVRAM content.
# The file maintains the current time of the emulated VAX (when it is not
# running) and other console parameters (such as default boot device).
#-----

#set toy container="vx4k108.dat"

#=====
#
# The following line tells the emulator where to store intermediate state
# of the Flash ROM and console parameters. It is highly recommended to enable
# this and the previous toy file for the emulator to be able to correctly
# preserve the saved state of the console.
#-----

#set rom container="vx4k108.rom"

#=====
#
# Specify the size of RAM (default is 16MB). Note that the license might
# limit the maximum amount of memory.
#-----

```

```

#set ram size=32
#set ram size=64
#set ram size=80
#set ram size=128
#set ram size=256
#set ram size=512

#=====
#
# Assign four built-in serial lines as necessary. Currently the emulator
# offers two ways to use built-in serial lines:
#
# 1) connection to COM ports (via physical_serial_line) and
# 2) attach a third party terminal emulator (virtual_serial_line).
#
# Once the desired connection is chosen and the corresponding line is
# enabled, connect it to the preloaded controller QUART by choosing the QUART
# line number (in square brackets). See OPA0 example, below.
#
#-----

#load physical_serial_line/chserial TTA0 line="/dev/ttyN"
#load virtual_serial_line/chserial TTA0 port=10000
#set quart line[0]=TTA0

#load physical_serial_line/chserial TTA1 line="/dev/ttyN"
#load virtual_serial_line/chserial TTA1 port=10001
#set quart line[1]=TTA1

#load physical_serial_line/chserial TTA2 line="/dev/ttyN"
#load virtual_serial_line/chserial TTA2 port=10002
#set quart line[2]=TTA2

#=====
#
# Select the connection method for the console serial line OPA0.
#
#-----

#load physical_serial_line OPA0 line="/dev/ttyN"
#load virtual_serial_line OPA0 port=10003
load operator_console OPA0
set quart line[3]=OPA0

#-----
#
# Uncomment to allow 'F6' to terminate the running emulator.
#
#-----

#set OPA0 stop_on = F6

#=====
#
# The VAX 4000 Model 108 contains built-in PCI SCSI adapter called PKA
# within the configuration file.
#
#-----
#
# Uncomment to connect the emulator's DKA0 to the disk image.
#
#-----

#load virtual_scsi_disk pka_0 scsi_bus=pka scsi_id=0
#set pka_0 container="<file-name>.vdisk"

#=====
#
# Uncomment to connect the emulator's DKA100 to a host disk drive.
#
#-----

#load virtual_scsi_disk pka_1 scsi_bus=pka scsi_id=1

```

```

#set pka_1 container="/dev/sd<L>"

#####
#
# Uncomment to connect the emulator's GKA200 to an unknown SCSI device.
#
#-----

#load physical_scsi_device pka_2 scsi_bus=pka scsi_id=2
#set pka_2 container="/dev/sg<N>"

#####
#
# Uncomment to connect the emulator's DKA300 to the host's CD/DVD-ROM drive.
#
# Device name may be different depending on particular version of host
# operating system. Choose one which suits best.
#
#-----

#load virtual_scsi_cdrom pka_3 scsi_bus = pka scsi_id = 3

#set pka_3 container = "/dev/cdrom"
#set pka_3 container = "/dev/cdrom1"
#set pka_3 container = "/dev/cdrom<N>"
#set pka_3 container = "/dev/sr0"
#set pka_3 container = "/dev/sr<N>"

#####
#
# Uncomment to connect the emulator's DKA400 to an .ISO file (CD/DVD image).
#
#-----

#load virtual_scsi_cdrom pka_4 scsi_bus=pka scsi_id=4
#set pka_4 container="<file-name>.iso"

#####
#
# Uncomment to connect the emulator's MKA500 to the host's SCSI tape drive.
#
#-----

#load physical_scsi_device pka_5 scsi_bus=pka scsi_id=5
#set pka_5 container="/dev/sg<N>"

#####
#
# Uncomment to connect the emulator's MKA600 to a .VTAPE file (tape image).
#
#-----

#load virtual_scsi_tape pka_6 scsi_bus=pka scsi_id=6
#set pka_6 container="<file-name>.vtape"

#####
#
# If necessary, load an optional SCSI controller SCSI_B (PKB).
#
# ATTENTION! Old versions of VAX/VMS (older then 5.5-2H4) do not support
# the optional SCSI controller and may fail to boot if this option is loaded.
#
#-----

#include kzdda.cfg

#####
#
# Uncomment to enable the built-in SGEN Ethernet Adapter (EZA).
#
#-----

#set EZA interface=EZA0

#####

```

```

#
# Connect the SGEC Ethernet Adapter (EZA) to the host's NIC.
#
#-----

#load packet_port EZA0 interface="(disabled)"
#load packet_port EZA0 interface="ethN"

#=====
#
# Load an optional DHW42-AA (or DHW42-BA, or DHW42-CA) serial line controller
# (C-DAL).
#
# Only one instance of DHW42AA/BA/CA can be loaded.
#
#-----

#load DHW42AA/DHV11 TXA
#load DHW42BA/DHV11 TXA
#load DHW42CA/DHV11 TXA

#load physical_serial_line/chserial TXA0 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA0 port=10010
#set TXA line[0]=TXA0

#load physical_serial_line/chserial TXA1 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA1 port=10011
#set TXA line[1]=TXA1

#load physical_serial_line/chserial TXA2 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA2 port=10012
#set TXA line[2]=TXA2

#load physical_serial_line/chserial TXA3 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA3 port=10013
#set TXA line[3]=TXA3

#load physical_serial_line/chserial TXA4 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA4 port=10014
#set TXA line[4]=TXA4

#load physical_serial_line/chserial TXA5 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA5 port=10015
#set TXA line[5]=TXA5

#load physical_serial_line/chserial TXA6 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA6 port=10016
#set TXA line[6]=TXA6

#load physical_serial_line/chserial TXA7 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA7 port=10017
#set TXA line[7]=TXA7

#=====
#
# Configure an optional RQDX3 storage controller (MSCP/QBUS). It handles disk
# images, disk drives, CD-ROM drives, magneto-optical drives, floppy drives.
#
#-----

#load RQDX3 DUA

#set DUA container[0]="<file-name>.vdisk"
#set DUA container[1]="/dev/sd<L>"
#set DUA container[2]="/dev/sr<N>"
#set DUA container[3]="<file-name>.iso"

#load RQDX3 DUB address=...
#load RQDX3 DUC address=...

#=====
#
# Configure an optional TQK50 tape storage controller (TMSCP/QBUS). It handles

```

```

# tape images, and physical tape drives attached to the host.
#
#-----

#load TQK50 MUA

#set MUA container[0]="<file-name>.vtape"
#set MUA container[1]="/dev/sg<N>"

#load TQK50 MUB address=...
#load TQK50 MUC address=...

#=====
#
# Configuring an optional DELQA Ethernet adapters (QBUS).
#
#-----

#load DELQA/DEQNA XQA

#load packet_port/chnetwrk XQA0 interface="ethN"
#set XQA interface=XQA0

#load DELQA XQB address=...
#load DELQA XQC address=...

#=====
#
# Configure an optional DHV11 (or DHQ11, CXY08, CXA16, CXB16) serial line
# controller (QBUS). The address and vector must be set as required by the
# guest operating system.
#
#-----

#load DHV11/DHV11 TXA
#load DHQ11/DHV11 TXA
#load CXY08/DHV11 TXA
#load CXA16/DHV11 TXA
#load CXB16/DHV11 TXA

#load physical_serial_line/chserial TXA0 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA0 port=10010
#set TXA line[0]=TXA0

#load physical_serial_line/chserial TXA1 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA1 port=10011
#set TXA line[1]=TXA1

#load physical_serial_line/chserial TXA2 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA2 port=10012
#set TXA line[2]=TXA2

#load physical_serial_line/chserial TXA3 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA3 port=10013
#set TXA line[3]=TXA3

#load physical_serial_line/chserial TXA4 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA4 port=10014
#set TXA line[4]=TXA4

#load physical_serial_line/chserial TXA5 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA5 port=10015
#set TXA line[5]=TXA5

#load physical_serial_line/chserial TXA6 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA6 port=10016
#set TXA line[6]=TXA6

#load physical_serial_line/chserial TXA7 line="/dev/ttyN"
#load virtual_serial_line/chserial TXA7 port=10017
#set TXA line[7]=TXA7

#load DHV11 TXB address=...
#load DHQ11 TXB address=...
#load CXY08 TXB address=...

```



```
#load CxA16 TXB address=...
```

```
#load CxB16 TXB address=...
```

```
# this is the end of the configuration file #####
```

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VAX 6310 configuration file

```

#
# Copyright (C) 1999-2014 STROMASYS
# All rights reserved.
#
# The software contained on this media is proprietary to and embodies
# the confidential technology of STROMASYS. Possession, use, duplication,
# or dissemination of the software and media is authorized only pursuant
# to a valid written license from STROMASYS.
#
#=====
#
# Sample configuration file for VAX 6000 Model 310.
#
#-----

set session hw_model = VAX_6310

#=====
#
# Choose a name for the instance, if needed, to differentiate it among other
# instances running on the same host.
#
#-----

#set session configuration_name = VAX_6310

#=====
#
# Use the following commands to disable the rotating LOG files and enable
# a single LOG file. Select either append or overwrite (for each time the
# instance starts) and specify desired log path and file name.
#
#-----

#set session log_method = append
#set session log_method = overwrite
#set session log = VAX_6310.log

#=====
#
# The following line tells the emulator where to preserve NVRAM content.
# The TOY file maintains the current time of the emulated VAX (when it is not
# running) and other console parameters (such as default boot device).
#
# Both files must be enabled to correctly preserve the saved state of the console.
#
#-----

#set toy container = "charon.dat"
#set eeprom container = "charon.rom"

#=====
#
# Specify the size of RAM (default 32MB). Note that the dongle license might
# limit the maximum amount of memory.
#
#-----

#set ram size = 64
#set ram size = 128
#set ram size = 256
#set ram size = 512

#=====
#
# Select the connection method for the console serial line OPA0.
#
#-----

```

```

#load physical_serial_line OPA0 line = "/dev/tty<N>"
#load virtual_serial_line OPA0 port = 10003
load operator_console OPA0

#-----
#
# Uncomment to allow 'F6' to terminate the running emulator.
#
#-----

#set OPA0 stop_on = F6

#-----
#
# DWMBB XMI VAXBI Adapter
#
# Slots 1 - 15 (1 - F) of the VAXBI are able to handle I/O adapters.
#
#-----

load DWMBB XBA xmi_node_id = 14

#-----
#
# KDB50 VAXBI Disk Controller
#
#-----

#load KDB50 DUA vax_bi_node_id = 1

#-----
#
# Uncomment to connect the emulator's DUA0 to the disk image.
#
#-----

#set DUA container[0] = "<file-name>.vdisk"

#-----
#
# Uncomment to connect the emulator's DUA1 to the physical disk drive.
#
#-----

#set DUA container[1] = "/dev/sg<N>"

#-----
#
# Uncomment to connect the emulator's DUA9 to host's CD/DVD-ROM drive or
# to an .ISO file (CD/DVD image).
#
#-----

#set DUA container[9] = "/dev/sg<N>"
#set DUA container[9] = "<file-name>.iso"

#-----
#
# DEBNI VAXBI Ethernet Adapter
#
#-----

#load DEBNI/DEMNA ETA vax_bi_node_id = 2 interface = ETA0
#load packet_port ETA0 interface = "(disabled)"
#set ETA0 interface = "eth<N>"

#-----
#
# DWBUA VAXBI UNIBUS Adapter
#
#-----

load DWBUA UBA vax_bi_node_id = 14

#-----

```

```
#
# TUK50 UNIBUS Tape Controller
#
#-----
#load TUK50 MUA
#=====
#
# Uncomment to connect the emulator's MUA0 to the physical tape drive or
# to a .VTAPE file (tape image).
#
#-----
#set MUA container[0] = "/dev/sg<N>"
#set MUA container[0] = "<file-name>.vtape"
# this is the end of the configuration file #####
```

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VAX 6610 configuration file

```

#
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# the confidential technology of STROMASYS. Possession, use, duplication,
# or dissemination of the software and media is authorized only pursuant
# to a valid written license from STROMASYS.
#
#=====
#
# Sample configuration file for VAX 6000 Model 610.
#
#-----

set session hw_model = VAX_6610

#=====
#
# Choose a name for the instance, if needed, to differentiate it among other
# instances running on the same host.
#
#-----

#set session configuration_name = VAX_6610

#=====
#
# Use the following commands to disable the rotating LOG files and enable
# a single LOG file. Select either append or overwrite (for each time the
# instance starts) and specify desired log path and file name.
#
#-----

#set session log_method = append
#set session log_method = overwrite
#set session log = VAX_6610.log

#=====
#
# To enable automatic boot, define the default boot device in the VAX
# console and uncomment the line below.
#
#-----

#set xmi boot = auto

#=====
#
# The following line tells the emulator where to preserve NVRAM content.
# The TOY file maintains the current time of the emulated VAX (when it is not
# running) and other console parameters (such as default boot device).
#
# Both files must be enabled to correctly preserve the saved state of the console.
#
#-----

#set toy container = "charon.dat"
#set eeprom container = "charon.rom"

#=====
#
# Specify the size of RAM (default 32MB). Note that DIT (when enabled)
# also needs certain amount of memory which grows linearly following
# the size of memory specified here. Also remember that the dongle
# license might limit the maximum amount of memory.
#
#

```

```

# The valid settings are: 32,64,128,256,512,768,1024, ... 3072,
#
#-----

#set ram size = 512
#set ram size = 768
#set ram size = 1024
#set ram size = 2048
#set ram size = 3584

#=====
#
# Select the connection method for the console serial line OPA0.
#
#-----

#load physical_serial_line OPA0 line = "/dev/tty<N>"
#load virtual_serial_line OPA0 port = 10003
load operator_console OPA0

#-----
#
# Uncomment to allow 'F6' to terminate the running emulator.
#
#-----

#set OPA0 stop_on = F6

#=====
#
# Uncomment to enable emulation of KDM70 storage controller.
#
#-----

#load KDM70 PUA xmi_node_id = 11

#=====
#
# Uncomment to connect the emulator's DUA0 to the disk image.
#
#-----

#set PUA container[0] = "<file-name>.vdisk"

#=====
#
# Uncomment to connect the emulator's DUA100 to a host disk drive.
#
#-----

#set PUA container[100] = "/dev/sd<L>"

#=====
#
# Uncomment to connect the emulator's DUA300 to the host's CD/DVD-ROM drive.
#
# Device name may be different depending on particular version of host
# operating system. Choose one which suits best.
#
#-----

#set PUA container[300] = "/dev/cdrom"
#set PUA container[300] = "/dev/cdrom1"
#set PUA container[300] = "/dev/cdrom<N>"
#set PUA container[300] = "/dev/sr0"
#set PUA container[300] = "/dev/sr<N>"

#=====
#
# Uncomment to connect the emulator's DUA400 to an .ISO file (CD/DVD image).
#
#-----

#set PUA container[400] = "<file-name>.iso"

```

```

=====
#
# Uncomment to connect the emulator's MUA600 to a .VTAPE file (tape image).
#
#-----

#set PUA container[600] = "<file-name>.vtape"

=====
#
# Support of CI:
#
# Load CIXCD adapter into slot 12 (C) of the XMI.
#
#-----

#load CIXCD PAA xmi_node_id = 12 ci_node_id = 0x01

=====
#
# Support of CI:
#
# Connect HSJ50 storage controller to the CIXCD adapter PAA.
#
#-----

#load HSJ50 PUA ci_node_id = 0x0B mscp_allocation_class = 1

=====
#
# Uncomment to connect the emulator's DUA0 to the disk image.
#
#-----

#set PUA container[0] = "<file-name>.vdisk"

=====
#
# Uncomment to connect the emulator's DUA100 to a host disk drive.
#
#-----

#set PUA container[100] = "/dev/sd<L>"

=====
#
# DEMNA XMI Ethernet Adapter EXA
#
#-----

#load DEMNA EXA xmi_node_id = 13 interface = EXA0
#load packet_port EXA0 interface = "(disabled)"
#set EXA0 interface = "eth<N>"

=====
#
# DEMNA XMI Ethernet Adapter EXB
#
#-----

#load DEMNA EXB xmi_node_id = 14 interface = EXB0
#load packet_port EXB0 interface = "(disabled)"
#set EXB0 interface = "eth<N>"

# this is the end of the configuration file #####

```

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CHARON-VAX for Linux deinstallation

Deinstallation procedure

To uninstall CHARON-VAX product:

1. Stop all running CHARON-VAX instances, remove all CHARON-VAX services.
2. Login as "root" user.
3. Issue the following command:

```
# yum remove aksusbd `rpm -q -a | grep charon`
```

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