CHARON™-VAX/XM for Windows
CHARON™-VAX/XM Plus for Windows
CHARON™-VAX/XK Plus for Windows
CHARON™-VAX/XL for Windows
CHARON™-VAX/XL Plus for Windows
CHARON™-PDP11 for Windows

Version 4.1 Build 134-02

User Manual

STROMASYS
VIRTUALIZATION TECHNOLOGIES

Stromasys SA

User Manual for CHARON-VAX/XX (Plus) and CHARON-PDP11 version 4.1 for Windows Server 2008 R2 64bit, Standard and Enterprise Editions and Windows 7 Professional and Ultimate Editions, 32bit and 64bit.

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Life support applications

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Preface

The VAX/PDP11 processor family made by Digital Equipment Corporation has largely earned its place in the history of computing. Over two decades of development and sales exposed millions of computer users to these well-designed and reliable systems, which were even copied in the former East block as the best architecture available. But technology has moved on, and the quest for ever faster, smaller and cheaper components has made VAX/PDP11 hardware obsolete.

While system hardware will eventually wear out, fall apart, burn up or simply stand in the way, its software can remain to be of significant value to its users. However, application migration to another system architecture is not trivial and might even be impossible if no source code is available.

Modern computer systems can do complex tasks much faster than their ancestors of three decades ago. That makes it feasible to design a very precise software model of computer hardware in such a way that it can execute the original binary code but on a new host platform. CHARON-VAX/XX / CHARON-PDP11 provide such a model, providing models of various PDP11, VAX/PDP11 and MicroVAX systems supporting Q-bus systems and SCSI systems with a range of peripheral devices in a selection of VAX/PDP11 models supporting up to 512 MB VAX/PDP11 memory. The peripherals include serial lines, high performance SCSI disks, SCSI tapes, disk images, SCSI or ATAPI CD-ROM support, Ethernet adapters and 3.5 inch floppy support.

CHARON-VAX/XX / CHARON-PDP11 are designed to replace mid-range and large single CPU VAX/PDP11 systems and clusters with Windows servers as well as PDP11 systems like PDP11/93 and PDP11/94. There is no need to modify, convert or upgrade your existing VAX/VMS or RSX11/RT11 operating system or VAX/PDP11 applications. With its high performance CPU option and the ability to form VMS clusters, it is an efficient replacement product for departmental VAX/PDP11 servers that handle a heavy network and/or disk I/O load.

CHARON-VAX/XX / CHARON-PDP11

This manual has been updated for CHARON-VAX/XX / CHARON-PDP11 version 4.1. Note that throughout this manual we use the term CHARON-VAX/XX / CHARON-PDP11 as a collective name for the six products; CHARON-VAX/XM for Windows, CHARON-VAX/XM Plus for Windows, CHARON-VAX/XK Plus for Windows, CHARON-VAX/XL for Windows, CHARON-VAX/XL Plus for Windows and CHARON-PDP11 for Windows.

The VAX/PDP11 models emulated by these products are:

CHARON-VAX/XM (Plus) includes the MicroVAX II, MicroVAX 3600, MicroVAX 3900, VAXserver 3600 (includes both the standard version supporting 64 MB of RAM and a custom version supporting up to 128Mb of RAM), VAXserver 3900 (both standard and special version allowing to configure up to 128Mb of RAM), MicroVAX 3100 model 96, a VAX/PDP11 4000 model 106, and VAXstation 4000 Model 90. Note that the maximum memory emulated is 128 MB

CHARON-VAX/XK Plus includes the MicroVAX 3100 model 98, the VAX4000 model 108, VAX6310 and custom versions of the VAXserver 3600 and VAXserver 3900 all with a maximum of emulated memory of 256 MB

CHARON-VAX/XL (Plus) includes the MicroVAX 3100 model 98, the VAX4000 model 108, VAX6310 and custom versions of the VAXserver 3600 and VAXserver 3900 all with a maximum of emulated memory of 512 MB

CHARON-PDP11 includes the PDP11/93 and the PDP11/94 all with a maximum of emulated memory of 4 MB

All of these models are delivered as individual executables that may be run as an application from the CHARON-VAX/CHARON-PDP11 launcher or run as a Windows Service.

CHARON Utilities

Chapter 4 describes CHARON-VAX/CHARON-PDP11 utilities: Launcher, Service Manager, MKdisk, SCSI Check, Network Control Center, MTD, HOSTprint, vt30tv, HASP HLView, HASP View and Idle VMS Package.

Further product information

www.stromasys.com web site provides information about the CHARON-VAX/CHARON-PDP11 products including a set of application notes.

Hewlett-Packard provides transfer licenses to maintain the VAX/VMS software warranties when CHARON-VAX is running on Hewlett-Packard computer systems. Further information is available at:

http://h71000.www7.hp.com/openvms/sri-charon-vax-emulator.html

If you have questions or suggestions, you can contact us by sending an Email to **info@stromasys.com,** or contact us by phone at **+41 22 794 1070**.

Conventions

The following conventions are used in this manual:

Notation	***Description***
`$ or >`	The dollar sign or the right angle bracket in interactive examples indicates operating system prompt.
`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 the output the command responds with.
`[]`	In syntax definitions, brackets indicate items that are optional. This convention is not applicable to the syntax of CHARON-VAX/XX / CHARON-PDP11 configuration files.
…	In syntax definitions, a horizontal ellipsis indicates that the preceding item can be repeated one or more times.

1. Overview

1.1. Introduction

The CHARON-VAX/XX / CHARON-PDP11 software packages provide an exact mathematical model of VAX/PDP11 system hardware. They emulate all essential components (CPU, disks, Ethernet adapter, memory subsystem) required to execute a VAX/PDP11 operating system and applications in the same way as on a hardware VAX/PDP11.

It is a bit confusing: CHARON-VAX/XX / CHARON-PDP11 are **software** packages, but they emulate VAX/PDP11 **hardware** (not a specific VAX/PDP11 operating system) on top of which you run your VAX/PDP11 operating system (VAX/VMS, ULTRIX-32, RSX11, RT11, VAX/ELN etc) and your VAX/PDP11 applications.

As the emulator executes the same binary VAX/PDP11 code as the original hardware, your existing VAX/PDP11 software will run without any modifications. There are no source code conversion costs, and the existing application behavior and user interface are preserved. When running CHARON-VAX/XX / CHARON-PDP11, you have effectively created on its host system a virtual VAX/PDP11 system. You can use that system as a hardware VAX/PDP11, run your copy of VAX/VMS, RSX11 etc, network and/or cluster it with other systems, all without having to maintain your VAX/PDP11 hardware.

An additional advantage of CHARON-VAX/XX / CHARON-PDP11 over a hardware-based emulator is the scalability with its host system. The CHARON-VAX/XX / CHARON-PDP11 performance is proportional to the CPU clock frequency of its host system, and every time you move to a faster host system your 'virtual VAX/PDP11' will also get faster.

1.2. CHARON-VAX/XX / CHARON-PDP11 system components

CHARON-VAX/XM provides an extended MicroVAX 3100 model 96 server configuration. This includes the NVAX CPU, two SCSI controllers (each supporting up to 56 disk or tape drives, disk images, CD drives and Floppy drives), up to 128 MB of VAX memory, and its integrated Ethernet controller (SGEC). SCSI disks can be much larger than the maximum size (4.3 GB) originally shipped with the MicroVAX 3100 model 96.

MicroVAX 3600 & 3900 are small Q-bus VAX supporting up to 64 MB of main memory. They are offered in two formats: the MicroVAX 3600 or 3900 and the VAX 3600 or VAX 3900. The VAX 3600/3900 is a server system. Both the VAX 3600 and 3900 can also be configured as Workstations, without graphics support, by loading the VCB02 stub. CHARON-VAX/XX also offers custom versions of the VAX3600 and VAX 3900 that offer emulated memory up to the limit permitted by the CHARON-VAX product license see the paragraph on Product Versions below.

The VAX4000 model 106 is a general purpose mid-size VAX supporting the same memory (128MB) and peripherals as the 3100 model 96 plus support for Q-bus peripherals. (DHV11/MSCP/TMSCP/DEQNA, etc)

The VAXstation 4090, code named "*Cougar*", is a mid-size VAXstation based on KA49-A processor. It includes 128 MB of memory, integrated QUART console port, TOY clock, a timer, a SCSI adapter and one integrated SGEC network adapter. However, its graphic subsystem is not emulated by CHARON-VAX/XX / CHARON-PDP11.

CHARON-VAX/XK Plus is an extended memory system supporting the VAX3600 and VAX 3900, the VAX6310, MicroVAX 3100 model 98 and the VAX 4000 model 108 that provide a maximum of emulated memory of 256MB.

(The VAX6310 is the Calypso/XCP (Hyperion) VAX based on VAXBI bus and KA62B processor. It includes 256 MB of memory, integrated UART console port, TOY clock, a timer, XMI to VAX-BI bus adapter, and VAX-BI to UNIBUS bus adapter.)

CHARON-VAX/XL is an extended memory system supporting the VAX3600 and VAX 3900, the VAX6310, the MicroVAX 3100 model 98 and the VAX 4000 model 108 that provide a maximum of emulated memory of 512MB.

Note that with the MicroVAX 3100 model 96/98 and the 4000 models 106 and 108 there are certain limitations imposed by VMS. Like the real VAX, the CHARON-VAX MicroVAX 3100 model 96/98 and 4000 106/108 need a minimum VMS version of 5.5-2 or later.

CHARON-PDP11 is a system supporting the PDP11/93 and the PDP11/94 that provide a maximum of emulated memory of 4MB.

As a server configuration, CHARON-VAX/XX / CHARON-PDP11 do not emulate graphics hardware. Graphic and character cell terminals can be connected via Ethernet. Pathworks-32 is recommended as a flexible tool for DECnet networking and X-terminal and VT525 emulation, in addition to its Windows VMS file access utility (see Appendix Pathworks 32).

The various VAX/PDP11 models emulated in CHARON-VAX/XX / CHARON-PDP11 provide the following characteristics (for the Plus versions see chapter 1.5):

VAX/PDP11 model	**Max memory**	**SCSI Subsystem**	**VAXBI Subsystem**	**Qbus Subsystem**	**Earliest VMS /RSX1 version**
MicroVAX II	16 MB	No	No	Yes	4.5
MicroVAX 3600	64 MB	No	No	Yes	4.5

VAX/PDP11 model	**Max memory**	**SCSI Subsystem**	**VAXBI Subsystem**	**Qbus Subsystem**	**Earliest VMS /RSX1 version**
MicroVAX 3900	64 MB	No	No	Yes	4.5
VAXserver 3600	512 MB	No	No	Yes	4.5
VAXserver 3900	512 MB	No	No	Yes	4.5
MicroVAX 3100 – 96	128 MB	Yes	No	No	5.5-2H4
VAX4000–106	128 MB	Yes	No	Yes	5.5-2H4
MicroVAX 3100 – 98	512 MB	Yes	No	No	5.5-2H4
VAX4000–108	512 MB	Yes	No	Yes	5.5-2H4
VAXstation 4000 – 90	128 MB	Yes	No	No	5.5-2H4
VAX6000–310	512 MB	No	Yes	No	5.5-2
PDP11/93	4 MB	No	No	Yes	4.1
PDP11/94	4 MB	No	No	Yes	4.1

Consider the following when selecting emulated controllers.

SCSI disk devices are seen as DKA or DKB devices and MSCP (RQDX3, KDB50) disk devices as DUA, DUB etc. For convenience and considering the existing VAX VMS configuration you may wish to select DK or DU devices.

SCSI commands directly address the hardware with direct SCSI addressing. Thus direct SCSI addressing may be appropriate if dealing with unusual SCSI devices without a driver.

As the MSCP controller always requires at least a default Windows driver for hardware disks, if you cannot find an appropriate driver for your device, it will be easier to select the SCSI controller with direct SCSI addressing.

SCSI controllers generate many more interrupts than MSCP controllers. MSCP controllers do some pre-processing of the I/O which results in less fragmented operations and thus fewer interrupts. Where higher throughput is required, choose an MSCP controller as CHARON-VAX/XX / CHARON-PDP11 will have to process less controller interrupts.

Use a TQK50 (QBUS), TUK50 (UNIBUS) controllers if tape images are required.

1.3. Hardware compatibility

CHARON-VAX/XX / CHARON-PDP11 have been tested with AXE, the VAX architecture compatibility verification tool used by Digital in the design of VAX hardware and MDM tests. HP has verified CHARON-VAX/XX compatibility with AXE, and provides VMS and layered product licenses for the transfer from hardware VAX to the CHARON-VAX/XX emulator. When CHARON-VAX/XX / CHARON-PDP11 are running on HP products, the transfer license maintains the HP VAX/PDP11 software warranties.

Further information is available at:

http://www.openvms.compaq.com/openvms/sri-CHARON-VAX-emulator.html

The VAX/PDP11 replacement components provided by CHARON-VAX/XX / CHARON-PDP11 are designed to operate like their hardware equivalents. CHARON-VAX/XX / CHARON-PDP11 do not include specific hardware diagnostic modes not used in normal operation. Time delays that would be required for diagnostic software to correctly verify mechanical device behavior are not included.

CHARON-VAX/XX / CHARON-PDP11 can in principle execute any VAX/PDP11 operating system or binary application within the scope of its components. However, it is optimized for its main application area: the replacement of larger single CPU and clustered VMS servers in administrative applications. CHARON-VAX/XX has been tested to work with VMS 4.5, 5.5-2H4, VMS 6.2, and VMS 7.3, CHARON-VAX/PDP11 - with various versions of RSX11 and RT11. See the notes on VMS in the appendices. CHARON-VAX/XX / CHARON-PDP11 are not designed to replace VAX/PDP11 systems in real-time process control applications. Other CHARON-VAX/CHARON-PDP11 products are designed to meet such needs.

When running OpenVMS/VAX or RSX11/RT11, CHARON-VAX/XX / CHARON-PDP11 can replace most modern VAX/PDP11 systems, also outside the models described above, as VMS/RSX11/RT11 strictly separate the applications from the underlying hardware characteristics. CHARON-VAX/XX / CHARON-PDP11 systems running OpenVMS/RSX11/RT11 can be networked or clustered with other OpenVMS

RSX11/RT11 systems running on CHARON-VAX/XX / CHARON-PDP11 or on VAX/PDP11 or Alpha hardware.

1.4. Product versions

The difference between CHARON-VAX/XM (Plus), CHARON-VAX/XK Plus and CHARON-VAX/XL (Plus) is the number of provided VAX models and the emulated VAX memory size: CHARON-VAX/XM has a maximum of 128 MB in the allowed models; CHARON-VAX/XK Plus emulates up to 256 MB; CHARON-VAX/XL emulates the full 512 MB.

VAX product variations are available in two CPU performance levels: The standard VAX CPU emulator or the Advanced CPU Emulation mode (ACE, previously known as DIT) mode (see the Chapter on VAX/PDP11 CPU's).

CHARON-VAX/XM (Plus):

VAX CPU type	Max. VAX memory	Product code
Standard	128 MB	CHVX-021-PD-WI
Plus (ACE enabled)	128 MB	CHVX-221-PD-WI

CHARON-VAX/XK Plus:

VAX CPU type	Max. VAX memory	Product code
Plus (ACE enabled)	256 MB	CHVX-221-PE-WI

CHARON-VAX/XL (Plus):

VAX CPU type	Max. VAX memory	Product code
Standard	512 MB	CHVX-021-PF-WI
Plus (ACE enabled)	512 MB	CHVX-221-PF-WI

CHARON-PDP11:

PDP CPU type	Max. PDP11 memory	Product code
Standard	4 MB	CHVX-XXX-WI

1.5. Performance

The CHARON-VAX/XX / CHARON-PDP11 CPU performance scales with the clock frequency of the host CPUs provided the host memory latency is increased by the same factor.

The performance also depends on the CHARON-VAX version. The "Plus" versions are identical to the standard version with the exception that they contain a sophisticated subsystem providing an advanced VAX CPU emulation mode (ACE) significantly improving VAX CPU emulation speed at the expense of additional host CPU cycles and memory.

Depending on the host platform, the CHARON-VAX/XX (Plus) / CHARON-PDP11 VAX/PDP11 CPU performance can over perform original hardware up to few times. The disk I/O performance with modern SCSI disks exceeds that of any hardware VAX system.

1.6. Host system requirements

The CHARON-VAX/XX / CHARON-PDP11 emulators are available for Windows Server 2008 R2 Standard and Enterprise Editions and Windows 7 Professional and Ultimate Editions; 32 bit and 64 bit systems with dual Intel or AMD CPUs. Please notice that licenses are only available as HASP dongles.

A dual CPU host system is required for adequate performance, especially if the ACE CPU optimization or intensive I/O is used. A single CPU with Hyper-Threading enabled will not meet the needs of a second CPU.

Running multiple instances of CHARON-VAX/CHARON-PDP11 is possible; using multiple instances require specific license.

To function correctly, CHARON-VAX/XX / CHARON-PDP11 require a host system with a CPU clock frequency of at least 1 GHz. At startup, the emulator will issue a warning if it detects a CPU with a lower frequency, and will terminate execution when the detected frequency is lower than 600 MHz.

Note that the host system must be dedicated to CHARON-VAX/XX / CHARON-PDP11 for reliable stability. In a typical system the emulated VAX/PDP11 CPU will load one host CPU for 100%. The second host CPU handles the emulation of the remaining emulated VAX/PDP11 components, in particular disk and network I/O. The second host CPU retains enough capacity for the Windows system resources and a local (X) terminal emulator.

The table below lists the memory requirements for each VAX/PDP11 CPU emulation mode and the maximum amount of VAX/PDP11 memory:

Product	Product code	VAX memory	Host memory
CHARON-VAX/XM	CHVX-021-PD-WI	128MB	1 GB
CHARON-VAX/XM Plus	CHVX-221-PD-WI	128MB	1 GB
CHARON-VAX/XK Plus	CHVX-221-PE-WI	256MB	2 GB
CHARON-VAX/XL	CHVX-021-PF-WI	512MB	3 GB
CHARON-VAX/XL Plus	CHVX-221-PF-WI	512MB	3GB

Product	Product code	VAX memory	Host memory
CHARON-PDP11	CHVX-XXX-WI	4MB	512 MB

CHARON-VAX/CHARON-PDP11 disks can be assigned to host system SCSI drives (not formatted by Windows) or are represented as a disk image file. Disk images are standard local or remote Windows files. The CHARON-VAX/XX / CHARON-PDP11 executables require approximately 30 MB disk space and can be stored on the IDE drive.

CHARON-VAX/XX / CHARON-PDP11 can also use SCSI tapes, a SCSI or ATAPI CD-ROM or PC floppy drives. CHARON-VAX/XX / CHARON-PDP11 require a dedicated Ethernet adapter for networking and a free USB port for the USB license key.

2. CHARON-VAX/XX / CHARON-PDP11 installation

This chapter explains how to install CHARON-VAX/XX / CHARON-PDP11, how to configure a basic system in CHARON-VAX/XX / CHARON-PDP11 allowing installation of a VAX/PDP11 operating system, and how to transfer your applications.

2.1. Before you start

Please read the Release Notes…

The CHARON-VAX/XX and CHARON-PDP11 distribution kits contain release notes, and we recommend that you read these notes before installing and using the product. The release notes may contain information about changes to the application since the publication of this manual.

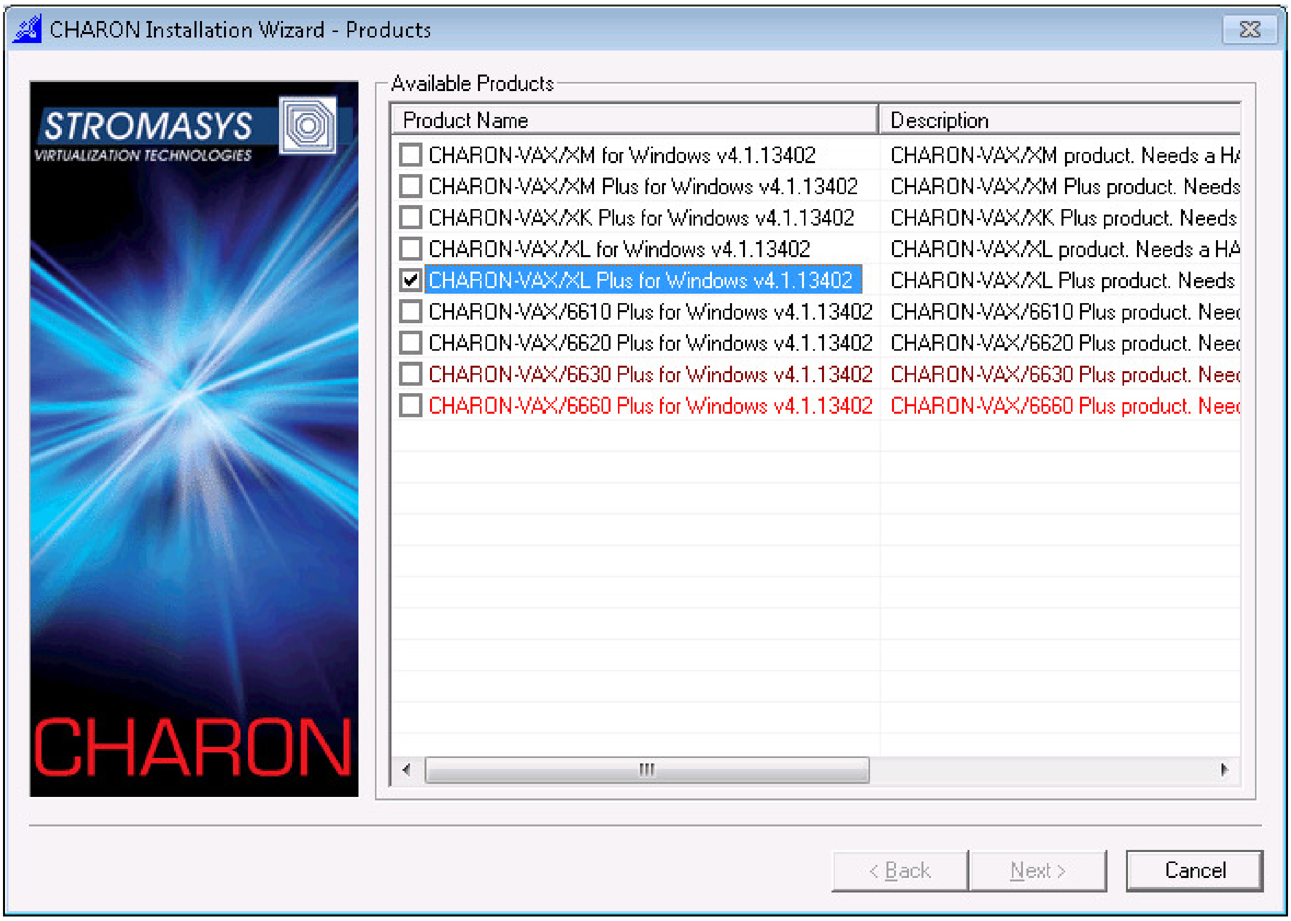
Check the contents of the software distribution kit

The packing list specifies the number and contents of your media. Be sure to verify the contents of your kit with this information. If your kit is damaged or if you find that parts of it are missing, please contact Stromasys SA or your sales contact.

Version 4.1 of CHARON-VAX/XX / CHARON-PDP11 is available with HASP license dongles only.

2.1.1. Installation overview

The CHARON-VAX/XX and CHARON-PDP11 installation kits are provided on a CD, or can be downloaded from Stromasys ftp site (the link is available on request). The installation menu is started by running the InstallShell.exe CHARON installation manager in one of the folders on the CD. In the appeared dialog review the list of the CHARON products and select the product you have a license for (if the product you have a license for is absent in the list please report this problem to the Stromasys SA):



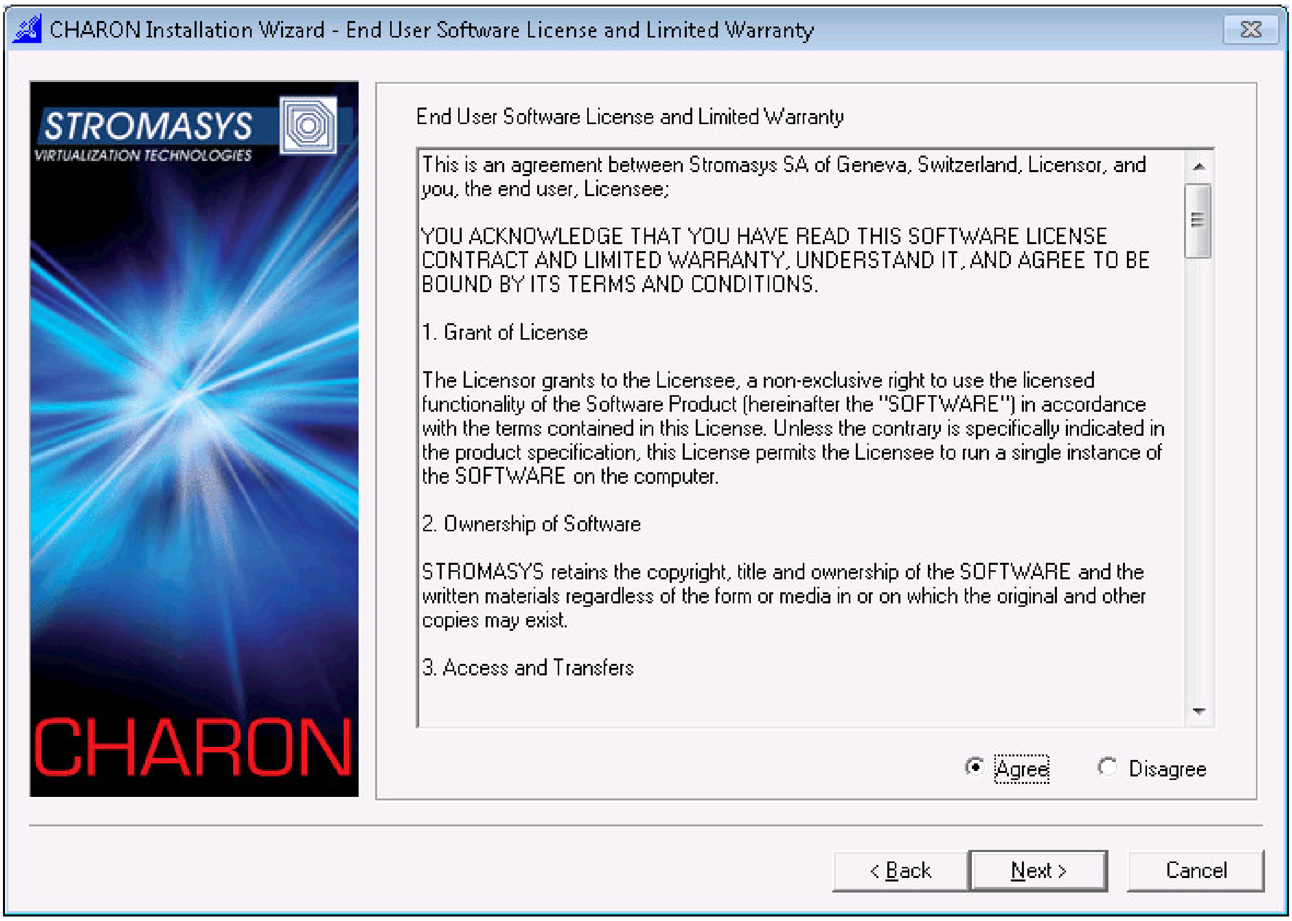
CHARON Installation Wizard - Products
STROMASYS
VIRTUALIZATION TECHNOLOGIES
CHARON
Available Products
< Back
Next >
Cancel

Product Name	Description
□ CHARON-VAX/XM for Windows v4.1.13402	CHARON-VAX/XM product. Needs a HA
□ CHARON-VAX/XM Plus for Windows v4.1.13402	CHARON-VAX/XM Plus product. Needs
□ CHARON-VAX/XK Plus for Windows v4.1.13402	CHARON-VAX/XK Plus product. Needs
□ CHARON-VAX/XL for Windows v4.1.13402	CHARON-VAX/XL product. Needs a HA
☑ CHARON-VAX/XL Plus for Windows v4.1.13402	CHARON-VAX/XL Plus product. Needs
□ CHARON-VAX/6610 Plus for Windows v4.1.13402	CHARON-VAX/6610 Plus product. Neec
□ CHARON-VAX/6620 Plus for Windows v4.1.13402	CHARON-VAX/6620 Plus product. Neec
□ CHARON-VAX/6630 Plus for Windows v4.1.13402	CHARON-VAX/6630 Plus product. Neec
□ CHARON-VAX/6660 Plus for Windows v4.1.13402	CHARON-VAX/6660 Plus product. Neec

The products marked with red cannot be installed on the systems because of the hardware requirements. It's possible to get more details by pointing by the cursor at the target product name in the list.

Press Next to continue.

The installation procedure will display the EULA license. Please read it carefully, select "Agree" if you agree with the terms of the license and then press the button "Next". Cancel the installation procedure with the "Cancel" button if you are disagree with the terms of the license.



CHARON Installation Wizard - End User Software License and Limited Warranty
STROMASYS
VIRTUALIZATION TECHNOLOGIES
CHARON

End User Software License and Limited Warranty

This is an agreement between Stromasys SA of Geneva, Switzerland, Licensor, and you, the end user, Licensee;

YOU ACKNOWLEDGE THAT YOU HAVE READ THIS SOFTWARE LICENSE CONTRACT AND LIMITED WARRANTY, UNDERSTAND IT, AND AGREE TO BE BOUND BY ITS TERMS AND CONDITIONS.

1. Grant of License

The Licensor grants to the Licensee, a non-exclusive right to use the licensed functionality of the Software Product (hereinafter the "SOFTWARE") in accordance with the terms contained in this License. Unless the contrary is specifically indicated in the product specification, this License permits the Licensee to run a single instance of the SOFTWARE on the computer.

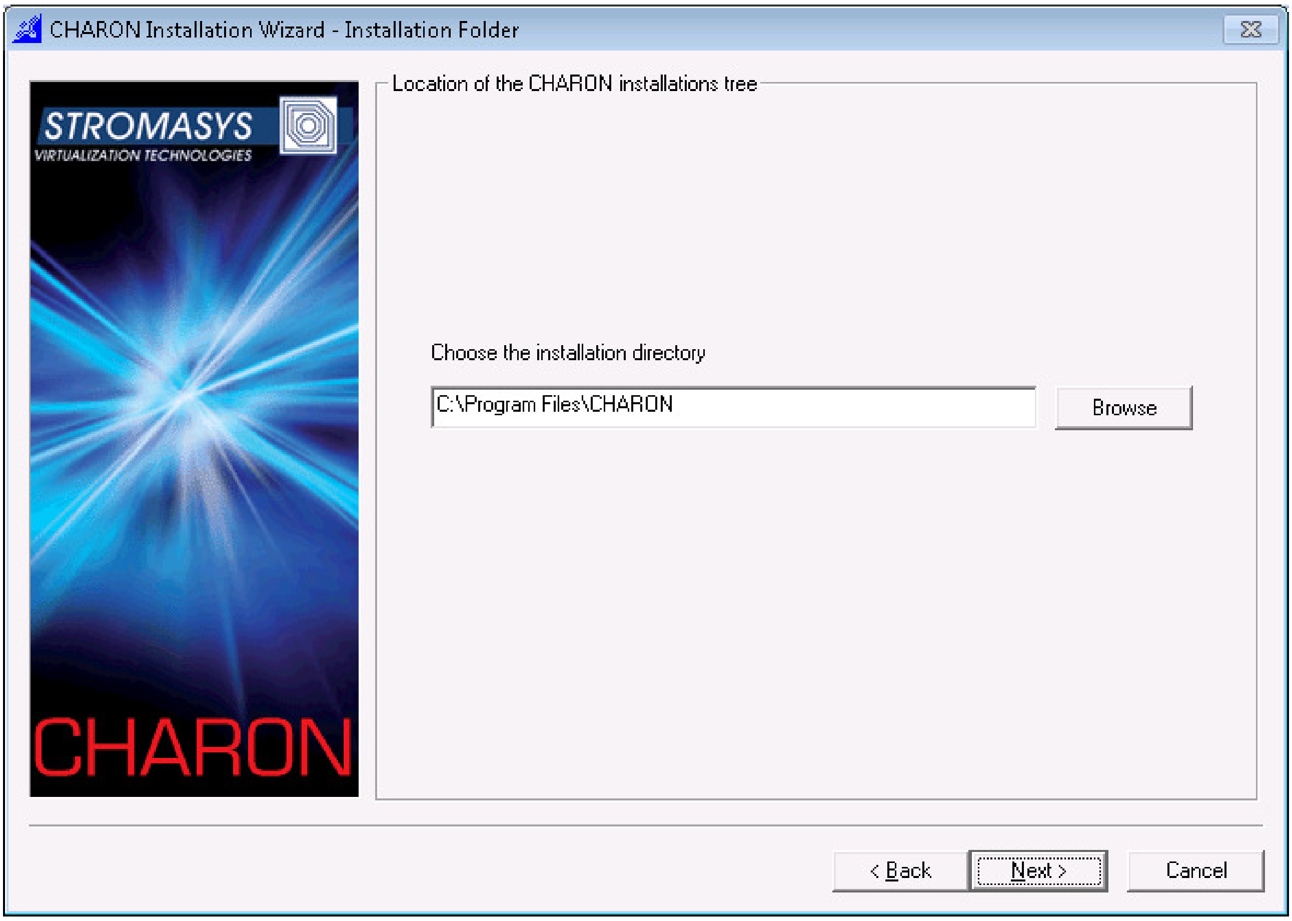
2. Ownership of Software

STROMASYS retains the copyright, title and ownership of the SOFTWARE and the written materials regardless of the form or media in or on which the original and other copies may exist.

3. Access and Transfers

● Agree ○ Disagree

In the following dialog select the directory that will be “CHARON base”. Since this moment this directory will be used to store all the CHARON products – the being installed and future ones:



CHARON Installation Wizard - Installation Folder

Location of the CHARON installations tree

Choose the installation directory

C:\Program Files\CHARON

Unless directed elsewhere, the installation tool will place the software in the directory C:\Program Files\CHARON if there is enough space on the disk C:. Otherwise the installation directory will be located at one of other available drives – in this case it will look like <X>:\CHARON, where X is the first drive containing enough space for the installation.

It is possible to change the CHARON base if it is required – using the “Browse” button or by typing the desired path in the edit box.

Press “Next” once the directory is set.

The procedure will install the driver for the HASP license key and several redistributives required for normal functioning of CHARON-VAX/XX or CHARON-PDP11. Note that if you are upgrading from an older version of CHARON-VAX/CHARON-PDP11 your license may not be recognized on CHARON emulators starting. Uninstall the HASP/Hardlock driver (Control panel -> Add/Remove programs) and install a fresh version from Sentinel web site. Remove the CHARON-VAX/XX / CHARON-PDP11 Emulator using the CHARON installation wizard (called from the Add/Remove Programs applet) and the HASP/Hardlock device driver using the standard Windows procedure.

`Start > Settings > Control Panel > Add/Remove programs.`

2.1.2. Installing the HASP license key drivers.

CHARON-VAX/XX / CHARON-PDP11 for Windows are protected with a “HASP” USB license key. You must use a computer system with a free and properly installed USB port as without the license key the software cannot be installed or run. The HASP device driver must be installed as the first step of the installation process, before connecting the key to the PC.

Note: If you inserted the key before its driver is installed, the Windows operating system will automatically look for the USB driver. In that case, cancel the USB installation and remove the license key. Install the License key driver manually by running the installation program found in the Hardlock folder of the CHARON-VAX/XX / CHARON-PDP11 installation CD. Once the driver installation program is completed, re-insert the license key and continue with the CHARON-VAX/XX / CHARON-PDP11 installation.

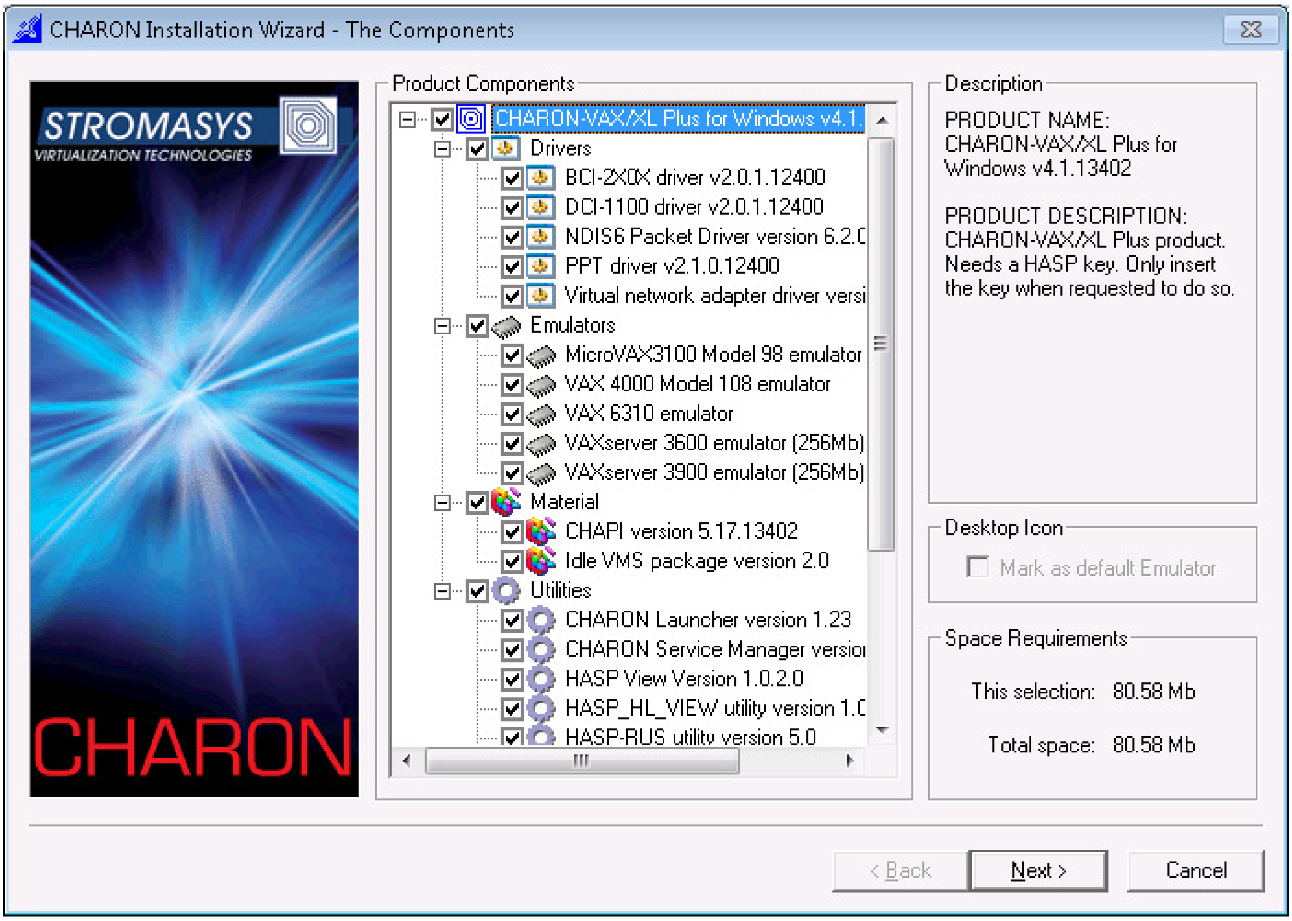
When CHARON-VAX/XX or CHARON-PDP11 starts, the license checking procedure takes a few seconds. When checking, a verification message is displayed. If you remove the license key while CHARON-VAX/XX / CHARON-PDP11 is running, a warning message is given after a few minutes, and you have a maximum of 10 minutes to ensure that the license key is connected and recognized. Otherwise CHARON would shut down.

However it is possible to switch to other license without stopping CHARON-VAX/XX / CHARON-PDP11. To do that disconnect the current license and replace it with new one as soon as possible. It is also possible to update the license content without stopping CHARON-VAX/XX / CHARON-PDP11 with HASPRUS utility (see the Utilities chapter).

Please be careful with the license key as it represents the full value of the license and will not be replaced if lost. The average time between failures of the license key is approximately 100 years. For the customers under support, in case the license key is broken, a replacement will be supplied on return of the broken key. If you want to ensure continuous processing in case of critical applications schedules and where there is a risk of license key damage, please contact your supplier or Stromasys SA for more information.

2.1.3. Review the product components to be installed

Once the installation of the HASP driver and several additional re-distributives took place the following dialog of the installation procedure invites user to review/select/deselect particular components of the chosen product(s):



CHARON Installation Wizard - The Components

Product Components

- ☑ CHARON-VAX/XL Plus for Windows v4.1.
  - ☑ Drivers
    - ☑ BCI-2X0X driver v2.0.1.12400
    - ☑ DCI-1100 driver v2.0.1.12400
    - ☑ NDIS6 Packet Driver version 6.2.0
    - ☑ PPT driver v2.1.0.12400
    - ☑ Virtual network adapter driver versi
  - ☑ Emulators
    - ☑ MicroVAX3100 Model 98 emulator
    - ☑ VAX 4000 Model 108 emulator
    - ☑ VAX 6310 emulator
    - ☑ VAXserver 3600 emulator (256Mb)
    - ☑ VAXserver 3900 emulator (256Mb)
  - ☑ Material
    - ☑ CHAPI version 5.17.13402
    - ☑ Idle VMS package version 2.0
  - ☑ Utilities
    - ☑ CHARON Launcher version 1.23
    - ☑ CHARON Service Manager versio
    - ☑ HASP View Version 1.0.2.0
    - ☑ HASP_HL_VIEW utility version 1.0
    - ☑ HASP-RUS utility version 5.0

Description

PRODUCT NAME:
CHARON-VAX/XL Plus for Windows v4.1.13402

PRODUCT DESCRIPTION:
CHARON-VAX/XL Plus product. Needs a HASP key. Only insert the key when requested to do so.

Desktop Icon

□ Mark as default Emulator

Space Requirements

This selection: 80.58 Mb

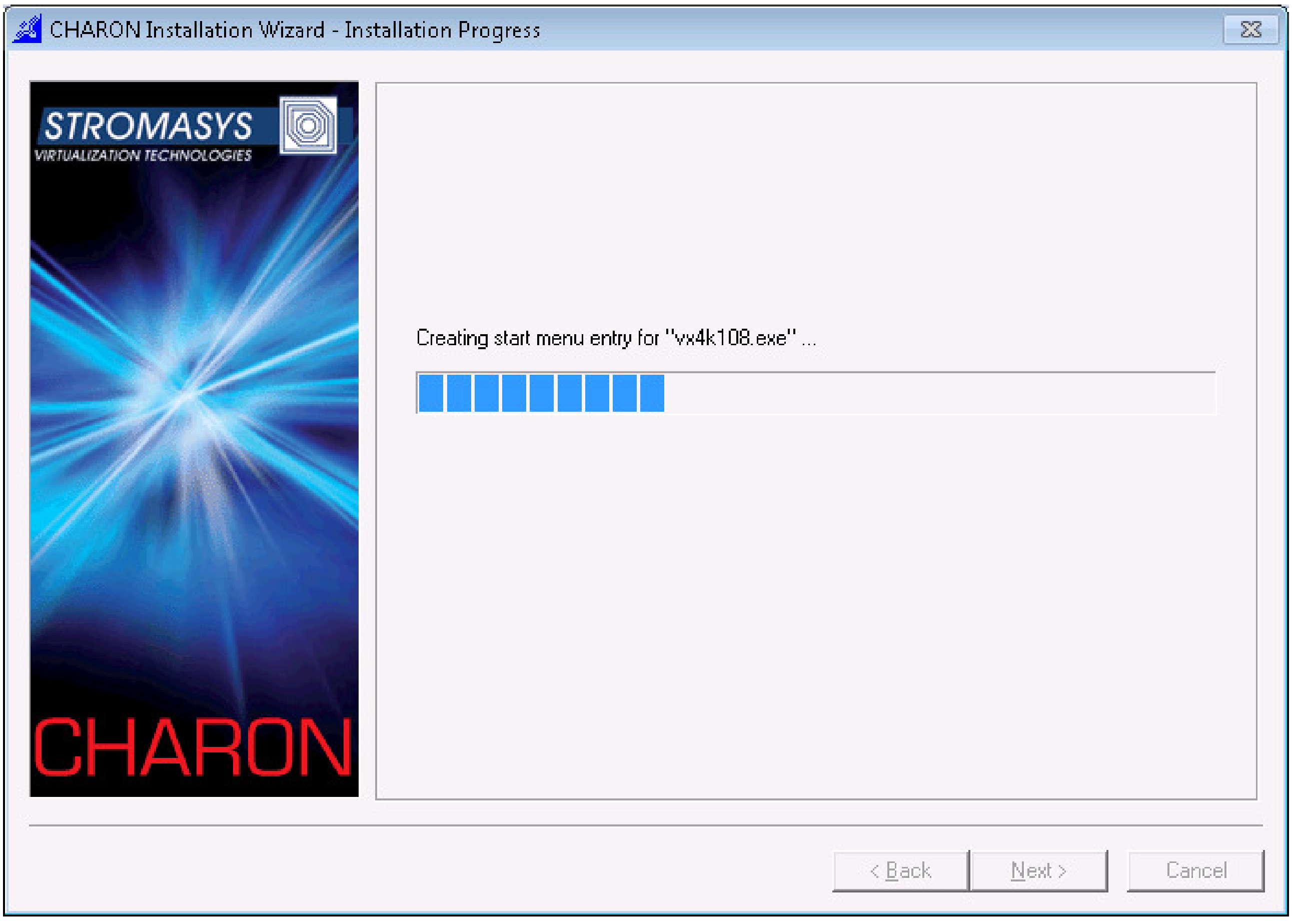
Total space: 80.58 Mb

Note the “Desktop Icon” setting for the emulator that should be “default” one. It means that its shortcut will be placed at the desktop.

Once the selection/review is done press “Next” to proceed with the executables installation

2.1.4. Installing the CHARON-VAX/XX / CHARON-PDP11 executables

See the following dialog to understand the phase of the product(s) installation:


CHARON Installation Wizard - Installation Progress
STROMASYS
VIRTUALIZATION TECHNOLOGIES
CHARON
< Back
Next >
Cancel

Creating start menu entry for "vx4k108.exe" ...

The installation procedure may ask a confirmation to replace certain files if they already persist on the system in the CHARON base folder and have later date of modification than the files to be installed. The options are “Yes”, “No” or “Yes to All”/”No to All”.

2.1.5. Network installation

CHARON-VAX/XX / CHARON-PDP11 require a dedicated Ethernet adapter. Since in principle your Windows host system should be dedicated to CHARON-VAX/XX / CHARON-PDP11, you do not need to install an additional adapter, as you can use the same adapter for occasional tasks in Windows (e.g. network backup) when CHARON-VAX/XX / CHARON-PDP11 is not running.

While stable operations should be possible on network adapters set to 100Mbps or higher, in case of problems manually set the dedicated network adapter to 10Mbps half duplex to match the capability of a VAX/PDP11.

CHARON-VAX/XX / CHARON-PDP11 network installation and configuration involves three steps. The first step installs the CHARON-VAX/CHARON-PDP11 specific NDIS6 packet driver. The second step is to obtain the NIC device name you want to use for networking (please refer to Network Control Center utility description in the section 4.3). The third step inserts the NIC device name in the CHARON-VAX/XX / CHARON-PDP11 configuration file.

The CHARON installation tool performs the first step automatically. However, in case of any troubles concerning the NDIS6 Packet driver installation here is a description on how to install the driver manually.

1. Installing the NDIS6 packet driver.

It is strongly recommended to use special utility called “Network Control Center” (NetDiag.exe) for all the operations relevant to host networking configuration for CHARON, because not all the protocols and bindings could be managed through the Windows GUI. If it is impossible for any reasons please use the procedure described below.

Open the ‘Network Connections’ applet from the Start | Settings menu. Select the Local Area Connection to be used with CHARON-VAX/XX / CHARON-PDP11, click the right mouse button and open the ‘Property’ applet. Switch to the ‘General’ panel and check the list of the installed protocols.

If you have previous versions of the CHARON’s packet protocol drivers, uninstall these first. To do so, select the protocol driver, click uninstall and follow the Windows questions. Don’t forget to reboot the system when complete.

If you do not have a previous NDIS6 driver installed, click the ‘Install’ button, select ‘Protocol’ from the list of the ‘Network Components’ and click the ‘Add…’ button. In the ‘Select Network Protocol’ applet, click the ‘Have Disk’ button. In the ‘Install from Disk’ applet select the directory in the CHARON folder under “Drivers” subdirectory with name “NDIS6_6.0.0.xxx” for the NDIS6 packet driver. The Applet should automatically pick up the sripacket.inf file with the driver information. Click ‘Ok’ to install the driver. Do not forget to reboot the system after the driver installation.

You can also install a Virtual Ethernet driver from the directory ndis5_mux. This driver creates a virtual Ethernet adapter on your host allowing CHARON-VAX/XX / CHARON-PDP11 to use it as if it was a physical Ethernet adapter.

It is strongly recommended to use the “CHARON Network Control Center” utility for installation of the Virtual Ethernet driver. If it is impossible please follow the instructions below.

To install a virtual adapter, firstly install srimux.inf driver the same way as described above for the NDIS6 installation (the driver is in the "MUX_5.2.0.xxx" folder under the “Drivers” directory). Enable the "CHARON Virtual LAN Adapter Protocol Driver" on the selected network interface, and choose "Properties" of the driver. Select "Add a Miniport" and click "Ok". An additional Virtual Ethernet adapter will be created. After enabling "CHARON Virtual LAN Adapter Protocol Driver" and "Charon’s Packet Protocol (NDIS6)" protocols, the adapter is ready to be used by CHARON-VAX/XX / CHARON-PDP11.

After system reboot, come back to the ‘Network and Dialup connections’ applet and check that ‘Charon’s Packet Protocol (NDIS6)’ is present and enabled in the list of the installed components on the selected Network adapter. Disable all other components since CHARON must have exclusive access to this network card.

2. *Obtain the NIC device name.*

Open the "Start | Settings | Network and Dial Up Connections" configuration dialog. Select the connection you want to use for CHARON networking, click the right mouse button and open Connection’s Properties applet. Check that the ‘CHARON Packet Protocol (NDIS6)’ connection is the only one enabled. Write down carefully or copy to the clipboard the connection name. You will need to write exactly this connection name (case sensitive) in the interface option of the packet_port instance of the configuration file.

3. *Enter the ID in the configuration file.*

Configure the packet_port component in your configuration file by pasting the clipboard after the "connection:" keyword in this load command:

```
load packet_port/chnetwrk eza_0 interface="connection:<paste here>"
```

Please read the section on configuring the Ethernet Adapter for a description of other parameters and additional actions required.

2.1.6. Configuring the replacement VAX or PDP11.

After installation you must configure your CHARON-VAX/XX / CHARON-PDP11 system to install VAX/VMS or RSX11/RT11. Assuming a default installation and CHARON-VAX product, you can edit the configuration file (e.g. **mv3k196.cfg** (XM) or **mv3k198.cfg** (XK and XL)) with Notepad or any other text editor. This file is available in the CHARON-VAX/CHARON-PDP11 target directory in the Build_xxx (xxx stands for the build number) folder. The configuration file should be saved in text format. You can write your own configuration file based on the default. You may find it useful to keep a copy of your configuration file for further reference or security.

Read the Chapter on Configuration to prepare a configuration file for the desired VAX/PDP11 system (within the limits of the CHARON-VAX/XX / CHARON-PDP11 hardware). The commented configuration file examples in Appendix A illustrate the structure and content of the configuration file parameters.

2.1.7. Starting CHARON-VAX/XX / CHARON-PDP11

CHARON-VAX/CHARON-PDP11 must be installed from an account with administrator privileges but the installation process creates a CHARON-GRP with the minimum requirements to be able to run CHARON-VAX/CHARON-PDP11. To run CHARON-VAX/CHARON-PDP11 from another account than the administrator account create a user account with CHARON-GRP privileges or add CHARON-GRP privileges to an existing user account.

To add a user account to the CHARON-GRP Go to My Computer->Manage->Local Users and Groups->Groups. Right click CHARON-GRP and press "Properties". Press "Add" to see a dialog for adding users. Specify a name of the user (press button "Check names" to verify that the name is correct). Press Ok in all the dialogs.

Once you are logged in to an account with CHARON privileges start CHARON-VAX/XX / CHARON-PDP11 using one of the following methods.

Use the desktop shortcut that was created at installation time to run CHARON-VAX/XX / CHARON-PDP11 with the default configuration file.

You may wish to create your own configuration file. In this case you can either create a new shortcut for your alternative configuration or start CHARON-VAX/XX / CHARON-PDP11 from the console, using the following syntax:

><name of selected exe file> <configuration file>

Example:

>**mv3k6.exe c:\my_cfg\my_configuration.cfg**

Issue such a command from the Build_xxx sub-folder of the CHARON installation directory, where xxx stands for the build number.

The CHARON Launcher utility allows you to select a configuration file to run and to view the errors or log file from the Launcher Window. Access the CHARON Launcher from the “CHARON” entry of the Windows Start | Programs Menu. The CHARON Launcher is useful for debugging configuration changes. See the Utilities Chapter for a full description of the CHARON Launcher.

2.1.8. Running CHARON-VAX/CHARON-PDP11 as a service

Once the desired configuration has been tested, install the configuration as a service using the CHARON Launcher and manage the initiation of that service using the CHARON Service Manager. See the Chapter Utilities for details. The separation of the CHARON Launcher and the CHARON Service Manager allows the system manager to manage the content of available services and allows operational staff to run the services without risk of making unauthorized or unintentional changes to the installed services. To make it impossible to modify installed services, remove the CHARON Launcher. It is possible to configure a CHARON-VAX/CHARON-PDP11 service to automatically start when Windows is booted.

In this case right after system boot there will be no terminal emulator windows opened even if they have been configured in the running CHARON service configuration file on its installation steps. To activate the configured terminal emulators use the CHARON Service manager shortcut in the system tray. See the Utilities Chapter for more details.

2.1.9. Additional drivers included to the CHARON-VAX/CHARON-PDP11

CHARON-VAX/XX / CHARON-PDP11 provided the following additional drivers to support CHAPI (CHARON API) functionality.

ATTENTION! Those drivers could be used on a Windows 32 bit platform only (i.e. on Windows 7, 32 bit). If you plan to use the functionality provided by those drivers, you must use 32 bit Windows hosting platform.

- BCI2X0X.SYS – The BCI-2104/BCI-2004 bus adapter driver used by the CHAPI_QBUS and CHAPI_UNIBUS examples.
- S3QBUS_PPT.SYS – The S3QBUS bus adapter driver for CESYS PCIS3BASE FPGA board used by the CHAPI_S3QBUS example.
- DCI1100.SYS – The DCI-1100 adapter driver used by the CHAPI_DRV11WA example.
- PPT.SYS – A generic PCI 'Pass-through' device driver that is used for DR11©/DRV11, DRV11-WA ports mapped to a Sensoray 621 digital I/O board and DPV11 mapped to SEALEVEL SYNC SERIAL BOARD 5102S board.

For more information on usage of these drivers please refer to the “CHAPI User’s Guide”.

2.1.10. Running multiple instances of CHARON-VAX/CHARON-PDP11

CHARON-VAX/XX / CHARON-PDP11 supports several instances of the emulators running on the same host. To install such configuration the following steps should be taken:

1. The host system should have enough CPUs and memory to provide them to all the emulators.

   Each VAX or PDP11 CPU emulation occupies one host CPU, so the total number of CPUs should be bigger, than a sum of all the emulated CPUs. Note that some CPUs needs to be used for I/O processing and at least one CPU – for the operating system housekeeping. Thus the total amount of the host CPUs depends on the number of the CPUs needed for I/O. The general recommendation is to leave at least 1/3 of the CPUs available to an instance for the instance I/O, but depending on data flow this number can be increased / decreased for each instance separately.

   The minimal host memory is calculated as a sum of emulated memory of each the CHARON-VAX/XX / CHARON-PDP11 instances plus at least 1.5 Gb of additional memory.

2. Configuration file of each CHARON-VAX/XX / CHARON-PDP11 instance should exactly specify the following:

   a) The number of CPUs chosen for I/O operations (**“n_of_io_cpus”**). By default this parameter is equal to 1/3 of the CPUs available for certain emulator (round by 1) and of course this value cannot be less than one. But it is possible to dedicate a chosen number of CPUs for I/O processing in case of intensive or, in opposite case, very shallow data flow.

   b) Number of the CPUs the instance allocates. By default CHARON-VAX/XX / CHARON-PDP11 instance grabs as many CPUs as possible. To balance the number of host CPUs between different instances a special parameter **“affinity”** is provided. This parameter specifies what CPUs in particular each instance can allocate.

   c) The instance name (“**configuration_name**”) helps to distinguish the particular CHARON-VAX/XX / CHARON-PDP11 instance. The name specified in this parameter is displayed at the CHARON-VAX/XX / CHARON-PDP11 tray icon

Using those 3 parameters it’s possible to balance all the running instances and thus achieve desired performance.

Note that log, rom, nvram and toy containers should have different names for every instance.

3. Once the configuration files are updated for each particular instance CHARON-VAX/XX / CHARON-PDP11 that’s the time to run them. At the moment the Launcher utility does not support multi-instance running, so it is possible:

   a) Run each instance from a shortcut. In this case a shortcut should contain a proper configuration file name for each instance as parameter.

   b) Run each instance as service.

   c) Run each instance from command line. Open up the cmd.exe (Start->Run, type “cmd.exe”, cd to the directory where CHARON-VAX/XX / CHARON-PDP11 executables are installed, type “<name of the executable> <name of the configuration file>” and press Enter, Repeat the last actions for all the instances to be run in the same time. Note that the configuration files must be different for each one!

      Example:

      - mv3k6.exe vax1.cfg
      - mv3k6.exe vax2.cfg

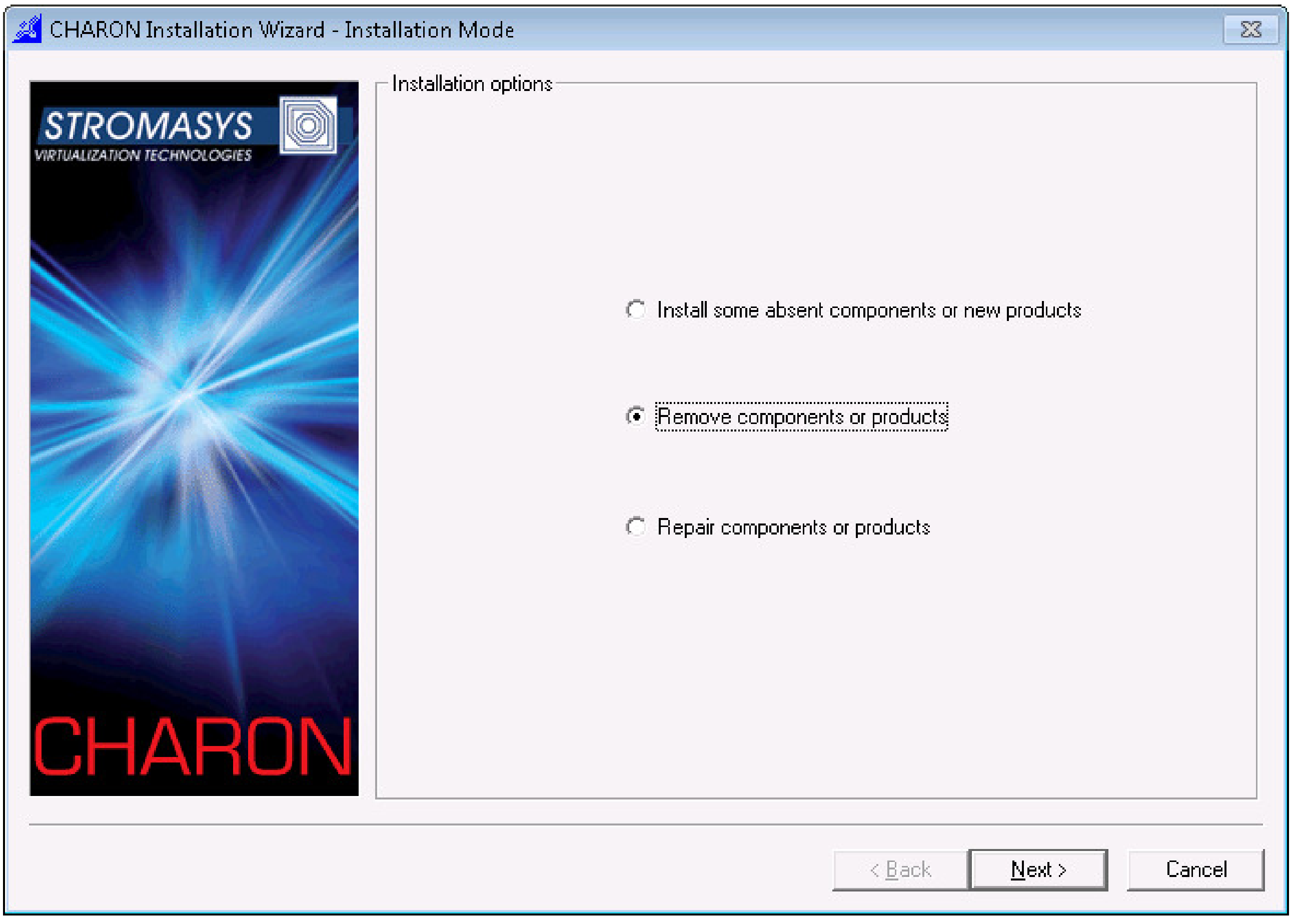
See the chapter 2.7 for detailed description of the “n_of_io_cpus”, “configuration_name”.and “affinity” parameters.

2.1.11. Repairing and removing CHARON-VAX/XX / CHARON-PDP11

Before removing or repairing CHARON-VAX/CHARON-PDP11 products please make sure, that:

1. All the running CHARON services are stopped.
2. The CHARON Service Manager utility is stopped. Use its system tray icon to stop the application.

To repair or remove CHARON-VAX/CHARON-PDP11 products run the installation procedure again or follow the corresponding link in the “Add Remove Programs” applet (in this case the installation procedure may ask to provide the CHARON media or specify a path to it). The following dialog will appear:



CHARON Installation Wizard - Installation Mode

Installation options

○ Install some absent components or new products

● Remove components or products

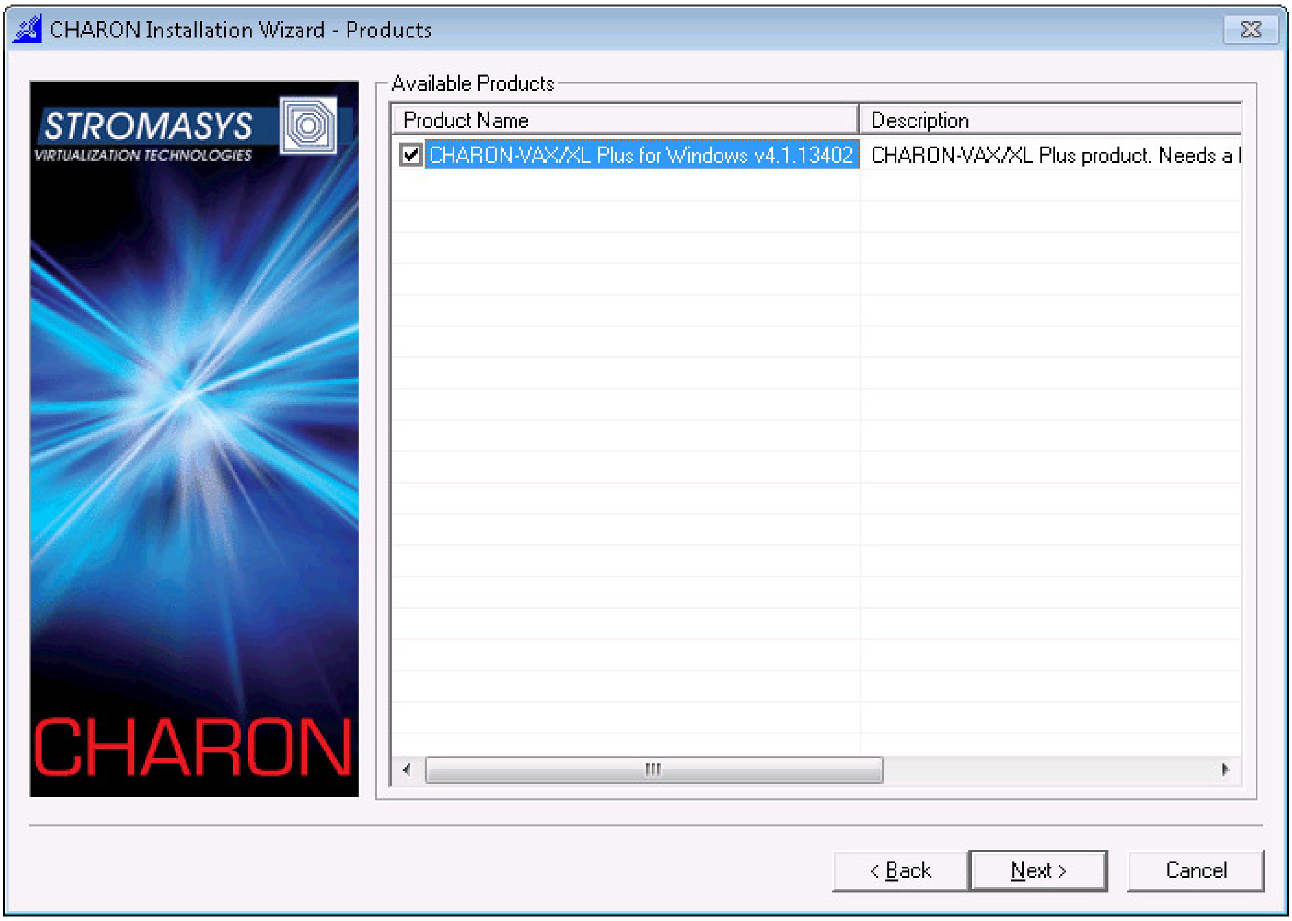
○ Repair components or products

Choose “Install some absent components or new products” if some modification of the existing installation is required, “Remove components or products” for de-installation of some CHARON products and “Repair components or products” for repairing.

Press “Next”.

In case of the first option please follow the description on the CHARON-VAX/XX / CHARON-PDP11 installation. Note that the CHARON installation procedure will not re-install any components if they have been already installed by the other CHARON products.

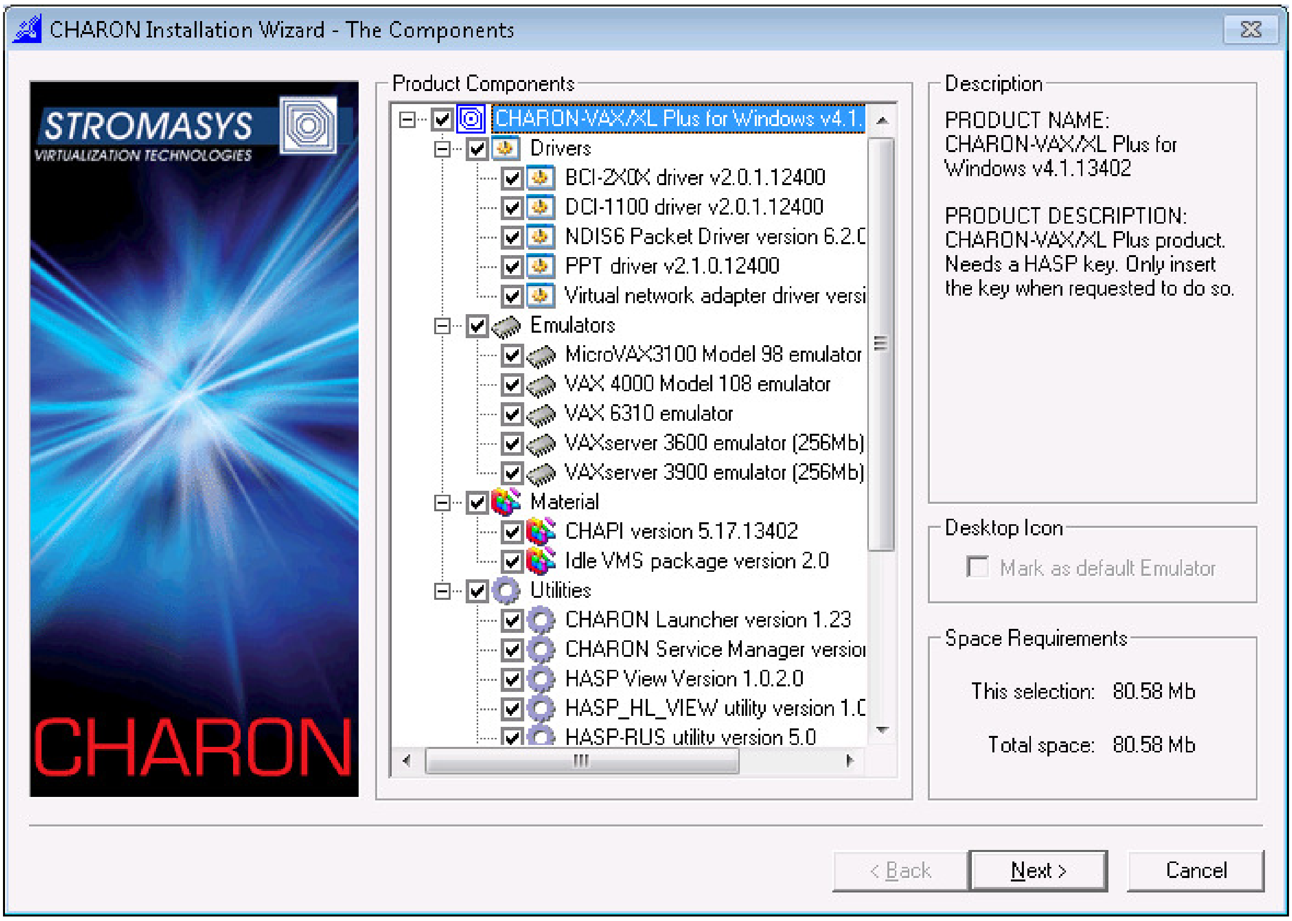
The following dialog will appear in case of “Remove” and “Repair” choice:


CHARON Installation Wizard - Products
STROMASYS
VIRTUALIZATION TECHNOLOGIES
CHARON
Available Products

Product Name	Description
☑ CHARON-VAX/XL Plus for Windows v4.1.13402	CHARON-VAX/XL Plus product. Needs a l

Select the whole products to process all its components or just press “Next” to select required components.

The following dialog will appear:



- ☑ CHARON-VAX/XL Plus for Windows v4.1.
  - ☑ Drivers
    - ☑ BCI-2X0X driver v2.0.1.12400
    - ☑ DCI-1100 driver v2.0.1.12400
    - ☑ NDIS6 Packet Driver version 6.2.0
    - ☑ PPT driver v2.1.0.12400
    - ☑ Virtual network adapter driver versi
  - ☑ Emulators
    - ☑ MicroVAX3100 Model 98 emulator
    - ☑ VAX 4000 Model 108 emulator
    - ☑ VAX 6310 emulator
    - ☑ VAXserver 3600 emulator (256Mb)
    - ☑ VAXserver 3900 emulator (256Mb)
  - ☑ Material
    - ☑ CHAPI version 5.17.13402
    - ☑ Idle VMS package version 2.0
  - ☑ Utilities
    - ☑ CHARON Launcher version 1.23
    - ☑ CHARON Service Manager versio
    - ☑ HASP View Version 1.0.2.0
    - ☑ HASP_HL_VIEW utility version 1.0
    - ☑ HASP-RUS utility version 5.0

PRODUCT NAME:
CHARON-VAX/XL Plus for Windows v4.1.13402

PRODUCT DESCRIPTION:
CHARON-VAX/XL Plus product. Needs a HASP key. Only insert the key when requested to do so.

□ Mark as default Emulator

This selection: 80.58 Mb

Total space: 80.58 Mb

Again, please review what components should be removed/repaired and press “Next” to proceed.

Note that even if only one component of some products remains the whole product is considered as installed. Uninstall all the product components to remove the product completely.

2.2. Transferring data to CHARON-VAX/CHARON-PDP11

There are several ways to transfer data from a VAX/PDP11 system to CHARON-VAX/XX / CHARON-PDP11:

2.2.1. Using the Local Area Network

First perform a standard installation of your VAX/PDP11 Operating System from the manufacturer's original media using the Windows CD-ROM drive. Then configure a network (DECnet and/or TCP/IP) to add your CHARON-VAX/XX / CHARON-PDP11 to your existing Network with a unique address and use DECnet or TCP/IP to copy your applications and data to your CHARON-VAX/XX / CHARON-PDP11. If for any reason building an Operating system from scratch is a problem, call your CHARON-VAX/XX / CHARON-PDP11 sales contact for help in preparing a temporary alternative.

Once you have a CHARON-VAX/XX / CHARON-PDP11 connected to your Network, you may use standard utilities to copy across the required data. Before copying the data you will have to configure CHARON-VAX/XX / CHARON-PDP11 with adequate free space on disks or on disk images that can be created with the MKDISK utility. The installation also creates a folder named VDISK containing empty disk images in zipped form.

2.2.2. Using a physical disk drive

You can remove a SCSI disk from your VAX/PDP11 system and reconnect it to a SCSI adapter in your Windows system. Assign the SCSI disk in the CHARON-VAX/XX / CHARON-PDP11 configuration file to a disk controller and it becomes a disk drive in the CHARON-VAX/XX / CHARON-PDP11. If the SCSI disk is a bootable VAX/VMS or RSX11/RT11 disk, you can boot the corresponding replacement VAX/PDP11 model from it.

Note: As the CHARON-VAX/XX / CHARON-PDP11 emulator is based on certain models of VAX/PDP11, there are certain limitations imposed by VMS. For instance: like the hardware VAX system, the emulated MicroVAX 3100 model 96 and 98, VAX 4000 Model 106 and 108 need VMS version 5.5-2 or later.

2.2.3. Using a tape

CHARON-VAX/XX / CHARON-PDP11 support the connection of a SCSI tape drive to a SCSI adapter in your Windows system. Assign the tape drive in the CHARON-VAX/XX / CHARON-PDP11 configuration file to operate the tape drive as usual by the VAX/PDP11 operating system. This way you can boot from standalone tape to restore your system backup.

For Qbus/VAXBI systems it is also possible to use tape images previously created using physical tapes with the MTD utility. See the CHARON-VAX/CHARON-PDP11 Utilities and interconnects manual for details

Older tape drives that do not have a Windows driver can still work with the CHARON-VAX/XX / CHARON-PDP11. See SCSI and (T)MSCP chapters and the utility SCSI check for details. Note that the reliability of a physical tape connection depends on factors like SCSI controller type, tape drive model and host CPU speed. Tape connections are not guaranteed to work in all cases.

2.2.4. The VAX/ELN transfer disk

The CHARON-VAX installation CD contains a VAXELN disk image with utilities to copy VAX/VMS system disk contents via DECnet from a VAX system on the network. Before the disk image copy procedure is initiated, check the size of the VAX VMS system disk in order to be sure that there is enough free space for the image backup save-set file on your CHARON-VAX/XX system.

1. Login from the CHARON-VAX system running the VAXELN system to the hardware VAX system from which the VMS system disk image is to be copied:

```
SET HOST <VAX DECnet address>
```

2. On the hardware VAX, backup the system disk image to a file on VAXELN FAL:

```
BACKUP/IMAGE/LOG DUA0: <CHARON-VAX DECnet address>::VAX_IMAGE.BCK/SAV
```

3. Once the disk image backup is completed, the user can restart CHARON-VAX using the VAXELN stand-alone backup:

```
BOOT/B0000000 DUA0:
```

Restore the VAX/VMS system disk from the stand-alone backup:

```
BACKUP/IMAGE/LOG DKA0:[000000]VAX_IMAGE.BCK/SAV DKA1:
```

Timing estimation:

A network backup (10 Mbps) of a VAX2000 RD54 disk (170 MB) takes about 40 minutes (120MB size of the backup file). Restoring this VAX/VMS system image to CHARON-VAX/XX disk image file requires about 6 minutes.

3. CHARON-VAX/XX / CHARON-PDP11 configuration

At startup, CHARON-VAX/XX / CHARON-PDP11 assembles a complete ‘virtual’ VAX/PDP11 system by loading the emulated CPU, memory, system bus and peripheral components, based on the information coded in the licensing mechanism.

‘Assembling’ and starting the system is automatic, but information is required about the location of the VAX/PDP11 disks, the Ethernet adapter and other configuration options. This information is listed in the configuration file, a text file read by CHARON-VAX/XX / CHARON-PDP11 at startup.

With this information, CHARON-VAX/XX or CHARON-PDP11 starts the execution of the internal diagnostics and subsequently, if the diagnostics complete correctly, starts the boot sequence from the indicated VAX/PDP11 boot disk.

Start CHARON-VAX/XX / CHARON-PDP11 from the desktop or start menu shortcuts created by the installation tool.

You may also run CHARON-VAX/XX / CHARON-PDP11 from "Start->Programs->CHARON->CHARON-XX v 4.1.xxx->Utility->Launcher v1.xx" (see the chapter on the Launcher in the Utilities section). It is also possible to run CHARON-VAX/XX / CHARON-PDP11 from command line as follows:

```
><name of selected exe file> <configuration file>
```

Example:

```
>mv3k6.exe c:\my_cfg\my_configuration.cfg
```

Note that this way you can run multiple instances of CHARON-VAX/XX / CHARON-PDP11 if it is allowed by your license.

Use the CHARON-VAX/CHARON-PDP11 Launcher to diagnose and correct configuration errors recorded in the configuration file.

Once your CHARON-VAX/XX / CHARON-PDP11 configuration is defined, it may be configured as a Windows system service. Once installed, the service may be started and stopped manually or automatically using the CHARON-VAX/CHARON-PDP11 Service Manager (its icon is located in the system tray). When installing a service, the configuration parameters in the configuration file are stored in the system registry and the service would read the registry, not the configuration file. Thus, once a service is installed, any subsequent changes to the configuration file will not change the settings of the installed service. To change the settings of an installed service, please remove the service, test the changes to the configuration file and recreate the service.

It is possible to install several different CHARON-VAX/XX / CHARON-PDP11 services and to run them one by one or in the same time - if the license allows it.

When CHARON-VAX/XX or CHARON-PDP11 starts, it creates an icon on the taskbar menu with the name specified in the “configuration_name” parameter. Clicking on this icon with the right button of your mouse gives 2 options: "Stop Emulator & Exit" and "Halt (Reset)" which is the analogue of the HALT button on a physical VAX/PDP11. "Stop Emulator & Exit" is disabled if CHARON-VAX/XX or CHARON-PDP11 is running as a service.

See the Utilities Chapter for further details on configuring, installing, running and managing CHARON-VAX/XX / CHARON-PDP11.

3.1. Configuration file parameters

In a CHARON-VAX/XX / CHARON-PDP11 configuration file the use the LOAD command as follows to add devices:

```
LOAD <device name>/<DLL name> <logical name>
```

Where <device name> defines the device to load; <DLL name> defines the DLL for that device and <logical name> defines a name for this device for use within the configuration file. Note that the logical name used in the CHARON-VAX/CHARON-PDP11 sample configuration files may be similar to the VMS/RSX11/RT11 name of the device but it is **not** visible to VMS/RSX11/RT11.

For example:

```
load DHQ11/DHV11 TXA
```

In this example an instance of the serial line controller DHQ11 with the logical name TXA is loaded from the DLL DHV11.DLL.

Depending on the VAX/PDP11 model some devices are pre-loaded by CHARON-VAX/CHARON-PDP11. For example: the UART console port (MicroVAX 3600, PDP11/93, PDP11/94), the QUART console port (MicroVAX 3100), the PKA SCSI controller (MicroVAX 3100) and the EZA Ethernet adapter (MicroVAX 3100). Pre-loaded devices do not need a LOAD command.

The LOAD command may also define parameters for that device. For example:

```
load RQDX3/RQDX3 DUA address=017772150 max_n_of_units=4
```

For pre-loaded devices use the SET command to define parameters. In addition, use the SET command for any device to simplify complex commands. For example:

```
load RQDX3/RQDX3 DUA
set DUA address=017772150
set DUA max_n_of_units=4
```

Parameters used in a LOAD/SET command can be of the following types:

- **Boolean**. Valid values are **true**, **false**. A value of true means that the option is enabled, a value false means that the option is disabled.
- **Identifier**. Used to set devices instances and their parameters.
- **Character**. Values of this type are character strings enclosed by quotation marks ("string parameter").
- **Numeric**. Where numeric data is required, it can be entered in the following formats:
- **Octal**: as a number starting with 0; use the symbols 0 – 7.
- **Decimal**: a number starting with 1 - 9.
- **Hexadecimal**: a number starting with 0x; 0 - 9 and a – f. Example: 0x1234abc

3.2. Session

Use the SESSION parameter to define the CHARON-VAX/XX / CHARON-PDP11 model to be run and how to save the log file.

The following SESSION parameters are available:

Parameter	Type	Value
log	Character	A string specifying the file name for the CHARON-VAX/XX / CHARON-PDP11 log.
log_method	Character	A string specifying whether the previous session log, if present, is to be overwritten or appended. Possible values are "APPEND" or "OVERWRITE". Default value is "OVERWRITE". If the value specified is other then "append" or "overwrite", then "overwrite" is used. This parameter must be specified prior to the "log" parameter to let CHARON-VAX/CHARON-PDP11 know what type of file access will be used when the log file is opened with "log" parameter. Generally it is recommended to specify both "log" and "log_method" in one line as it is shown in Example 2 below. Note that any "log_method", specified after the specification of "log" will be skipped without notice.
log_show_messages	Character	Defines the message types that should be shown. The parameter is a string of comma delimited words: "all", "info", "warning" and "error" which defines which message types should be logged. The default value is "all" message types.

Parameter	Type	Value
log_repeat_filter	Character	Specifies if repeated messages should be filtered or not. Possible values are "on" and "off" (default). If the value is "on", immediately following messages with the same identifier and system error code are not listed in the log, but they are counted. When a different log message is generated, the repeat count of the earlier log message is reported with "The previous message has been repeated N times.", and the counter is cleared
hw_model	Character	A string specifying the CPU type. Mandatory parameter. Choices are: • MicroVAX_3100_Model_96 • MicroVAX_3100_Model_98 • MicroVAX_3600 • MicroVAX_3900 • MicroVAX_II • 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_6310 • VAXstation_4000_Model_90 • PDP1193 • PDP1194
configuration_name	Character	A string specifying the name of the CHARON-VAX/XX / CHARON-PDP11 instance. It is displayed by the CHARON-VAX/XX / CHARON-PDP11 tray icon. The main use is distinguishing one instance from another one in case of the simultaneous running.
log_locale	Character	Tells the language of message database. So far the following values are recognized: “Dutch”, “English”, “Swedish”, “Spanish”, “Chinese-Simplified”. By default it is set to “English”. If specified an unsupported value, “English” is used. For example: `set session log_locale=”Dutch”`

Parameter	Type	Value
affinity	Character	Overrides initial process's affinity mask provided by host operating system Once specified it allows binding the running instance of emulator to particular host CPUs. Might be used for soft partitioning host CPU resources, for isolating host CPUs for other applications. By default the emulator instance allocates as many host CPUs as possible. The "affinity" overrides that and allows explicit specification on which host CPU the instance shall run. Host CPUs are enumerated as comma separated list of host system assigned CPU numbers, for example: **set session affinity="0, 2, 4, 6"**
n_of_io_cpus	Numeric	Says how many host CPUs (of those specified by "affinity" parameter, if any) the emulator shall use for I/O handling. By default the emulator instance reserves one third of available host CPUs for I/O processing (round down, at least one). The "n_of_io_cpus" overrides that by specifying number of I/O host CPUs explicitly, for example: **set session n_of_io_cpus=2**

The CHARON-VAX/XX / CHARON-PDP11 parameters file can be specified as follows:

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

Example 1:

```
set session hw_model="MicroVAX_3100_Model_98"
```

Note: Specify the *hw_model* value before any other settings in the configuration file. The *hw_model* specification cannot be omitted.

Example 2:

```
set session log="charon.log"
```

or

```
set session log="charon.log" log_method="append"
set session log="emulator.log" log_method="overwrite"
```

Example 3:

```
set session log="charon.log" log_show_messages="warning, error"
```

```
Example 4:
set session log="emulator.log" log_repeat_filter="on"
```

3.3. VAX CPUs

For CHARON-VAX 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 the VAX instruction interpretation. This significantly improves performance, but requires approximately two times as much host memory to store the optimized code.

As this optimization is performed dynamically during execution, it does not need to write optimized code back to disk, and provides its full capability instantly. The optimization does not compromise the VAX instruction decoding; CHARON-VAX remains fully VAX hardware compatible and completely transparent to VAX operating systems and applications.

Both CPU models pass the HP VAX Architecture (AXE) tests, which is the qualification for VAX instruction execution correctness.

The default VAX CPU mode is determined by the specific CHARON-VAX/XX product license.

Parameter	***Type***	***Values***
ace_mode	boolean	true or false.

This statement can enable the ACE mode, if the CHARON-VAX license permits it. If this statement is omitted in the 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
```

Note that

```
set cpu ace_mode=true
```

is ignored when the license does not permit ACE operation.

The status of the ACE option is listed in the log file. As the ACE mode is switched off if the host system does not meet the minimal requirements for this mode, a verification is useful if the emulator appears not to run at its normal performance.

CHARON-PDP11 product does not have any specific parameters relevant to CPUs of the emulated PDP11 models.

3.4. Auto boot feature

CHARON-VAX/XX / CHARON-PDP11 VAX/PDP11 systems may be configured to boot the operating system automatically at start up.

The MicroVAX3100 model 96/98, VAXstation 4000 model 90, VAX6310 and the VAX 4000 model 106/108 will boot automatically if the correct boot flags are set and saved from the SRM console using the command >>>set halt reboot

The ROM of the MicroVAX II, MicroVAX 3600, MicroVAX 3900, VAXserver 3600 and VAXserver 3900 does not allow the SRM console to accept a command setting auto-boot. However an automatic boot on start up can be specified by in the CHARON-VAX/XX configuration file for the stated VAX models:

set bdr boot=auto

3.5. PDP11 CPUs

The PDP11 CPU is identified as **`cpu_0`** and has three configuration options: `‘auto_boot’`, `‘frequency’` and `‘instruction_time_table’` – first option is relative to boot device selection while two last ones are related to controlling instruction timings.

Parameter	Type	Value
auto_boot	Character	The string parameter ‘auto_boot’ specifies the name and unit number for the device to be used as autoboot device. Name is two letters mnemonic for device based on its type, e.g. DU for MSCP, DL for RL01/RL02 and so on. Specified device/unit should be within boot devices list in EEPROM. If specified device/unit is not configured in the boot devices list then PDP-11 Video terminal will be started and it is up to user which device to select for the boot. **# Boot from the second unit of MSCP controller on default address** **set cpu_0 auto_boot="DU2"**
frequency	Number	The integer parameter ‘frequency’ specifies the emulated CPU frequency in Megahertz; possible values for the option are in range [0, 30]. The value of 0 means that the exact instruction timing mechanism will be switched off. The non-zero values can only be achieved if the host system is capable of delivering the requested emulated performance.

instruction_time_ table		The string parameter ‘instruction_time_table’ specifies how the instruction timing mechanism is specified: “off” means that the mechanism is switched off and that the emulator is running at the maximum speed available in the host system. If the parameter ‘instruction_time_table is not specified, “off” is assumed. “default” means that the emulator is running at approximately the same clock speed as the hardware system that is emulated (provided the host system is capable to deliver this emulated speed). The original frequency of the PDP-11 hardware that is emulated must be specified. “file://<file_name>“ defines the file that contains the requested timing of the individual instructions in a specific format. This file must be used in combination with the ‘frequency’ parameter to specify the original frequency of the PDP-11 hardware that is emulated. If the specified file does not exist, the file is created with the original instruction timings - this is a convenient way to get a template for further experiments

Below are some configuration examples for these parameters:

```
# Default instruction timings for PDP-11/93 are used.
# It is assumed that the emulated CPU frequency is 15Mhz
set cpu_0 frequency=15 instruction_time_table=”default”

# Instruction timings are taken from a file.
# It is assumed that emulated CPU frequency is 15Mhz
set cpu_0 frequency=15 instruction_time_table=”file://mypdp.ins”

# Instruction timings are taken from the default settings.
# But as it set to 0, the frequency mechanism is switched off
# Hence the system will run at maximum speed.
set cpu_0 frequency=0 instruction_time_table=”default”

# Same as above: maximum speed of emulation
set cpu_0 frequency=15 instruction_time_table=”off”
```

```
# Speed of emulation approximates a 15 MHz PDP-11/93
set cpu_0 frequency=15 instruction_time_table="default"
```

3.6. Setting memory size

The maximum amount of memory depends on the CHARON-VAX/XX / CHARON-PDP11 license and type of the emulator used. Assign the required memory size to the CHARON variable **ram** as follows:

Parameter	Type	Value
Size	Numeric	A value of N * 16 MB with N between 1 and the limits of the license – for VAX models Only two values are valid for PDP-11/9x – 2 and 4 (2Mb and 4Mb). In case if value less than 2Mb is specified – 2Mb is used and warning message is send to the log; in case if value is greater than 4Mb – 4Mb is used and warning message is sent to the log file

For example:

VAX emulation:

```
set ram size=128
```

PDP11 emulation:

```
set ram size=4
```

3.7. PDP11 Boot ROM

PDP11 Boot ROM has two parameters: 'ext_rom' and 'ext_rom_address'. It is possible to specify external ROM file and offset within the file to load ROM from. This feature allows changing used boot ROM to custom one:

```
    # Use external boot ROM instead of original PDP-11 ROM
    set ROM ext_rom="custom_rom.bin"
    set ROM ext_rom_address=0_
```

The ROM file should contain binary dump.

3.8. PDP11 KW11-L and KW11-P Timers

The KW11-L timer is used in PDP-11 system emulation. It supports a 50Hz, 60Hz and 70Hz frequency. A time correction mechanism assures corrects for any time slips between the emulated and the host system time. The KW11-L frequency can be set in the configuration file as follows:

```
set kw11 frequency=50
```

For PDP-11 configurations this device is loaded automatically.

The KW11-P is a programmable timer for PDP-11 systems. The hardware KW11-P timer runs on a 100KHz clock and can be programmed to interrupt at any frequency up to 100KHz. The software KW11-P implementation is limited to 1KHz due to Windows limitations; it can programmed to interrupt at any frequency up to 1KHz.

Note that the current implementation does not contain time slip recovery from the host system time. This can lead to time skew between the emulated and host system time when the programmed frequencies are not devisors of 1000.

The KW11-P is loaded automatically. It does not have any configuration file parameters as it is set by the PDP-11 software.

3.9. VAX/PDP11 console ports

CHARON-VAX/XX / CHARON-PDP11 implement a one or a four port serial console depending on the VAX/PDP11 model. The four line serial line controller is identified within CHARON-VAX/XX with the name **QUART**. The one line serial line controller is identified within CHARON-VAX/XX / CHARON-PDP11 with the name **UART**.

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 line of the QUART (line[3]) is the VAX/PDP11 Console port (known in VAX/VMS as OPA0). UART is used in Qbus only systems (e.g. the MicroVAX/VAXserver 3600/3900, PDP11/93, PDP11/94).

The CHARON-VAX/CHARON-PDP11 console ports can be configured to connect to an external terminal via a host system COM port or can be connected to a process via TCP/IP UART/QUART Parameters. Note that <line> is applicable only in the case of QUART.

Parameter	Type	Value
RTS[<line>]	Character	"On" - assert the RTS (Request To Send) signal "Off" – clear the RTS signal (default) "DTR" - assert the RTS signal as soon as the DTR signal is asserted
DSR[<line>]	Character	"On" - always reports the DSR signal asserted "Off" - always reports the DSR signal deasserted "DSR" - use the DSR signal of the physical serial line (if configured) "CD", "DCD", "RLSD" - use the CD (carrier detect) signal of the physical serial line (if configured) **Note:** this parameter is applicable only for line 2 of the QUART.

Communication [<line>]	Character	"ASCII" – for connection to terminals (default) "BINARY" - for serial lines carrying binary (packet) protocols, which are used mainly for communicating with PLCs
Line[<line>]	Identifier	This parameter is used to connect a particular serial line interface to the controller. See below for details.

All the values in this table are case insensitive.

Example:

```
set QUART rts[2]="DTR"
set QUART dsr[2]="On"
set QUART communication[1]="binary"
```

Note that the UART/QUART does not allow applications to manipulate RTS directly (as there are no controlling bits in the registers).

Note that line 2 of the QUART is the only one, which might 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.

Both the RTS and DSR parameters were introduced mainly for supporting modems. Following the original design, the CHARON-VAX QUART provides input modem signals only for line 2. Therefore, values of the DSR parameter for lines other than 2 are not visible for the application.

3.10. Serial line controllers

The CHARON-VAX/XX / CHARON-PDP11 QBUS systems support DHV11, DHQ11, CXY08, CXA16, CXB16, DZV11 and DZQ11 asynchronous serial line multiplexers. The SCSI systems support the DHW42 serial line multiplexer. The Qbus/SCSI systems support all of them. Asynchronous serial line multiplexers generally are capable of serving up to 8 asynchronous serial lines but the DHW42-BA supports 16 lines.

The VAX/PDP11 models emulated in CHARON-VAX/XX / CHARON-PDP11 support the following asynchronous serial line multiplexers:

VAX/PDP11 model	**Asynchronous serial line emulation**
MicroVAX II, MicroVAX 3600, MicroVAX 3900, VAXserver 3600, VAXserver 3900, PDP11/93, PDP11/94	CXA16, CXB16, CXY08, DHQ11, DHV11, DZV11, DZQ11
MicroVAX 3100 - 96, MicroVAX 3100 - 98	DHW42-AA, DHW42-BA, DHW42-CA
VAX4000 - 106, VAX4000 - 108	CXA16, CXB16, CXY08, DHQ11, DHV11, DZV11, DZQ11, DHW42-AA, DHW42-

VAX/PDP11 model	Asynchronous serial line emulation
	BA, DHW42-CA
VAX6310, VAXstation 4090	N/A

The following names are used for the multiplexers:

Device name	DLL name to load
DHV11	-
DHQ11	DHV11
CXY08	DHV11
CXA16	DHV11
CXB16	DHV11
DHW42AA	DHV11
DHW42BA	DHV11
DHW42CA	DHV11
DZV11	DZ11
DZQ11	DZ11

Use the following command to load an instance of an asynchronous serial line multiplexer:

```
LOAD <device name>/<DLL name> <logical name>
```

Example

```
load DHQ11/DHV11 TXA
```

The DLL name can be omitted if it has already been loaded by a previous instance. Note that you can only load one instance of DHW42. There is no restriction on the number of the other multiplexers.

The multiplexers offer the following configuration parameters, which can be specified with the SET command:

Parameter	Type	Value

Parameter	Type	Value
address	Numeric	Specifies the CSR address. The address must be a valid QBUS 22-bit wide address in IO space. Default values are 017760440 for DHV11-family controllers and 017760100 for DZV11/DZQ11, which are the factory settings for asynchronous serial line multiplexers. Not applicable to the DHW42.
vector	Numeric	Specifies the interrupt vector. Default value is 0300 which is the factory setting for asynchronous serial line multiplexers. Not applicable for DHW42.
line[N] N=0…3(7,15)	Identifier	Specifies the name of the serial line interface object in the configuration to which the Nth line of the multiplexer is connected.
communication[N] N=0…4(7,15)	Character	Specifies the type of communication over the Nth line of the multiplexer. Two values are supported: "ASCII" and "BINARY". Default value is "ASCII".
rts[N] N=0…3(7,15)	String	Controls RTS signal of the Nth line of the multiplexer. "ON" - asserts the RTS signal; "OFF" – clears the RTS signal; "DTR" - asserts the RTS signal as soon as the DTR signal is asserted; When left blank (initial state), the level of the RTS signal is as requested by the VAX/PDP11 software.
dsr[N] N=0…3(7,15)	Character	"ON" - always reports the DSR signal asserted "OFF" - always reports the DSR signal reasserted "DSR" - use the DSR signal of the physical serial line (if configured) "CD", "DCD", "RLSD" - use the CD (carrier detect) signal of the physical serial line (if configured) **Note:** This parameter is only applicable for DZV11 and DZQ11
tx_q_max_depth[N] N=0…3(7,15)	Numeric	Only for DHV11. Specifies depth of the TX FIFO for the Nth 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 do improve the transmission rate of the corresponding line, but break the correspondence to the original hardware.

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/PDP11 hardware documentation and the VMS/RSX11/Rt11 system management documentation to understand how to correctly assign the ADDRESS and VECTOR parameters. See also the CHARON-VAX and CHARON-PDP11 Application Notes on Configuring devices on the Qbus.

Example 1:

```
load DHV11 TXA address=017760440 vector=0300
load DHV11 TXB address=017760460 vector=0310
```

Example 2:

```
load DHW42CA/DHV11 TXA
```

Note that, while the serial line multiplexers require loading, the UART/QUART console is preloaded by CHARON-VAX/XX and CHARON-PDP11.

3.10.1. Mapping emulated serial lines to the host

Once the serial controllers are loaded (UART/QUART do not need loading) their lines can be mapped to physical COM ports of your system or to terminal emulators. The syntax is the following:

```
load <type of serial line>/<DLL name> <serial controller instance name>
set <serial controller instance name> line[<line number>] = <name>
```

Some tips on configuring physical serial lines for use with CHARON-VAX/XX / CHARON-PDP11:

Open Computer Management, select Device Manager, open Ports (COM&LPT), select the desired COM port, open the Properties dialogue, select the tab Port Settings, then click "Advanced". There you will see FIFO settings. Set the TX FIFO depth to 1 (lowest possible). Otherwise CHARON-VAX/XX / CHARON-PDP11 are not able to properly detect when the TX FIFO is empty. For the same reason, it is strongly recommend not enabling the option "COMPLETE WRITE REQUESTS IMMEDIATELY".

Types of serial lines

Host system connection	CHARON-VAX/CHARON-PDP11 connection name
COM ports	physical_serial_line
Connecting via TCP/IP	virtual_serial_line

Example for the UART:

```
load virtual_serial_line/chserial OPA0
set uart line=OPA0
```

Example for the DHV11:

```
load DHV11 TXA
load physical_serial_line/chserial TXA0 line="\\.\COM1"
set TXA line[0]=TXA0
```

Connect to a physical port:

Use the CHARON-VAX/CHARON-PDP11 connection name **physical_serial_line** to prepare for a connection to a COM port on the host system. The following **set** options are available:

Parameter	Type	Value
line	Character	Connects a CHARON-VAX/XX / CHARON-PDP11 serial line to a host system COM port. Example: "\\.\COM2"
break_on	Character	Defines a key (combination of keys) for the break operation. Works only for the console line! (The only line of the UART and line[3] of QUART) "Ctrl-P" or/and "Break" – specify one of them or both separating with comma (",") "none" – No break key is defined The default value is "Break" for line 3 of the QUART and "none" – for other lines.

Note that in the examples below DEF and GHI are logical names for the serial line emulation. These names are only used as a reference within a configuration file. They have no influence on the naming of the devices inside a VAX/PDP11 operating system. The names used can be helpful identifiers, use any character string you wish.

Example:

```
load physical_serial_line/chserial DEF
set DEF break_on="Ctrl-P,Break" line="\\.\COM2"
set quart line[3]=DEF
```

Provided that the physical serial line connects a terminal to CHARON-VAX/XX / CHARON-PDP11, pressing the "Break" button on the terminal's keyboard will generate a SPACE condition on the serial line. Setting the **break_on** parameter value to "Break" in the configuration file will trigger the HALT (Reset) condition in CHARON-VAX/XX / CHARON-PDP11 upon detection of the SPACE condition on the associated COM port.

Set the **break_on** parameter value to "Ctrl-P" to trigger the HALT condition in the emulated VAX/PDP11 upon reception of Ctrl-P character (ASCII code 10 (hex)).

The **break_on** parameter is ignored for all the lines except the console line.

Connect via TCP/IP

Use the CHARON-VAX/CHARON-PDP11 connection type **virtual_serial_line** to prepare for a connection to a 3rd party terminal emulator or other incoming connections over TCP/IP. There are the following **set** options**:**

Parameter	Type	Value
host[:port]	Character	The TCP/IP host name to connect to and, optional, the number of the remote port.
port	Numeric	Specifies the TCP/IP port on which CHARON-VAX/XX / CHARON-PDP11 requests connection. Note that if the "host" parameter is present and no "[:port]" parameter is specified, CHARON-VAX/XX / CHARON-PDP11 will connect to the remote port, specified by this parameter.
application	Character	The application to run. For example a 3rd party terminal emulator or default HyperTerm terminal emulator.
break_on	Character	Defines a key (or combination of keys) for the break operation. Works only for the console line! "Ctrl-P" and/or "Break" and/or "F5" Separate parameters with a comma. "none" – No break key is defined The default value is "F5, Break" for console lines UART and QUART (line[3]) only and "none" for the other lines.
stop_on	Character	Defines a key (combination of keys) to tell the emulator which external events could trigger a STOP condition Works only for the console line! "F6" or/and "Application"– specify one of them or all separating with comma (",") "none" – No stop key is defined The default value is "F6" for the console line of QUART (line[3]) and for the only line of the UART and "none" – for the other lines. Set to "Application" to trigger the STOP condition when the associated application terminates. Use this option only for virtual_serial_lines configured for automatic application invocation (where the APPLICATION parameter specifies a valid application). Press the "F6" button to trigger the STOP condition upon reception of the sequence "<ESC>[17~". Terminal emulators may send these sequences when pressing the F6 button.

Example:

```
load virtual_serial_line/chserial GHI break_on="Ctrl-P,F5"
set GHI port=10000 stop_on="F6,Application"
```

or (short form):

```
load virtual_serial_line/chserial GHI port=10000
```

Notes on the **virtual_serial_line** option:

1. Use the combination of parameters port and application as follows to start a 3rd party terminal emulator or similar program.

```
load virtual_serial_line/chserial TTA0 port=10000
    application="putty.exe –load OPA0"
```

In this example CHARON-VAX/XX / CHARON-PDP11 creates port 10000 and waits for a connection. Then it immediately starts Putty.exe (using the configuration OPA0), which will connect to the port 10000.To connect CHARON-VAX/XX / CHARON-PDP11 to a port on a specific host use the parameters host and port:

```
load virtual_serial_line/chserial TTA0 host="192.168.1.1" port=10000
```

In this example CHARON-VAX/XX / CHARON-PDP11 connects to port 10000 of the host with TCP/IP address 192.168.1.1 and at the same time it accepts connections on local port 10000.

2. It is also possible to specify port on a remote host (note that CHARON-VAX/XX / CHARON-PDP11 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/XX / CHARON-PDP11 will accept connection on local port 10000 and connects to remote port 20000 of the host 192.168.1.1

Note that examples 2 and 3 above are mainly used for inter-CHARON-VAX/XX / CHARON-PDP11 communications. They are used to connect CHARON-VAX/XX / CHARON-PDP11 to an application that communicates to CHARON-VAX/XX / CHARON-PDP11 as described below.

If in example 2 two CHARON-VAX/XX / CHARON-PDP11 systems are connected as follows:

On host "A":

```
load virtual_serial_line/chserial TXA0 port=5500 host="B"
```

On host "B":

```
load virtual_serial_line/chaserial TXA0 port=5500 host="A"
```

And both hosts execute CHARON-VAX/XX / CHARON-PDP11, the two TXA0 lines will connect to each other, thus creating a "serial" cable between the two emulated VAXes/PDPs. The order in which the instances of CHARON-VAX/XX / CHARON-PDP11 are started makes no difference.

3.10.2. Link a serial controller port to a host connection.

Associate each loaded serial port with a CHARON-VAX/XX / CHARON-PDP11 host connection instance as follows:

```
set <serial controller instance name> line[<line number>]=<instance name>
```

Example 1:

```
set quart line[0]=TTA0
```

This set command connects the first serial line (line[0]) of the QUART serial line controller to the CHARON-VAX connection instance named TTA0. As explained earlier TTA0 may be a virtual serial line connected to a terminal emulator. Similarly for the UART connect the serial port to the controller in the following way:

```
set uart line=OPA0
```

Example 2:

```
set TXA line[5]=TTA1
```

In this example the set command connects the sixth serial line of the previously loaded controller (with name TXA) to TTA1. TTA1 could be defined, for example, as a physical serial line connected to a COM port.

3.11. MSCP and TMSCP Controllers

CHARON-VAX/XX / CHARON-PDP11 provide MSCP controllers for hardware disks (including floppy and CD/DVD) and disks images. TMSCP controllers provide support for hardware tapes and tape images. For a comparison between SCSI and (T)MSCP controllers see the chapter CHARON-VAX/XX / CHARON-PDP11 system components.

MSCP and TMSCP controllers are added to the configuration using the LOAD command. The individual units are defined by using the container parameter. Note that 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 the Qbus addressing conventions. For more information see the Application Note 32 on how to configure addresses on a Qbus.

Empty disk images can be created with the MKDISK utility (See the Utilities Chapter). CHARON-VAX/XX / CHARON-PDP11 are able to boot OpenVMS/RSX11/RT11 disk images of any OpenVMS/RSX11/RT11 version (for OpenVMS starting with 4.5 or higher for MicroVAX II or VAX/PDP11 3600 and VMS 5.5-2 or higher for the VAX4000). It is not recommended to use Windows data compression. The performance impact of data compression might be negative.

Physical disks used by CHARON-VAX/XX / CHARON-PDP11 must not contain a file system known to the Windows operating system; otherwise the drive will not be available for use in CHARON-VAX/XX / CHARON-PDP11. With the utility "Disk Management" (Control Panel | Administrative Tools | Computer Management | Disk Management) you can verify that Windows has not allocated the disks. If the required disk has a Windows system present, use the disk management tool to delete the partition (i.e. remove the Windows file system) and thus release the disk.

Physical tapes used by CHARON-VAX/XX / CHARON-PDP11 must be disabled in the Windows media pool. Go to Control Panel | Administrative Tools | Computer Management | Removable Storage | Media. Select the device, click on the Properties icon and de-select the "enable media" check box.

A driver is required to address physical disks or tapes using the MSCP controller. Direct SCSI addressing may be attempted when a Windows driver is not available for a SCSI tape controller.

When a tape or disk image connected to an emulated TMSCP or MSCP controller is dismounted in VMS/RSX11/RT11 it is disconnected from CHARON-VAX/CHARON-PDP11 and may be manipulated. It may even be replaced with a different disk image provided it has the same name. This capability can be useful when designing back-up and restore procedures. If copying CHARON-VAX/CHARON-PDP11 disk images while CHARON-VAX/CHARON-PDP11 is running take care to minimize the risk of overloading a heavily loaded CHARON-VAX/CHARON-PDP11 host system. For example using a sequential series of simple ftp binary copies is less resource intensive and thus less disruptive than using parallel multiple file copy from Windows explorer.

3.11.1. The RQDX3 MSCP Controller

The CHARON-VAX/XX / CHARON-PDP11 QBUS systems provide support for RQDX3 disk controllers. The original RQDX3 disk controller is capable of serving up to 4 disk units. CHARON-VAX/XX / CHARON-PDP11 extend 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** IO 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 <logical name>
```

```
Example:
```

```
load RQDX3 DUA
```

Note that the specification of RQDX3.DLL can be omitted in this case since the name of the device is the same as the name of the DLL.

The RQDX3 offers the following configuration parameters, which can be specified with the SET command:

Parameter	Type	Value

Parameter	Type	Value
Address	Numeric	Specifies the CSR address. The address must be a valid QBUS 22-bit wide address in IO space. Initial value is 017772150 which is the factory setting for the RQDX3 disk controller.
max_n_of_units	Numeric	Specifies the maximum number of units supported by the controller. Possible values are 4…9999. Default is 9999.
container[N] N=0…9999	Character	Specifies the location of the disk container. It can be either the name of a .VDISK (.DSK) file or the name of a physical disk: "\\.\PhysicalDriveX" – for local fixed disks (IDE, SCSI, SATA); "\\.\CdRomX" or "\\.\<Letter>:" – for CD-ROM, DVD drives (IDE, SCSI, …); "\\.\A:" or \\.\B: or whatever – for floppy drives (1.2, 1.44, 2.88MB); Direct SCSI addressing is NOT supported.
media_type[N] N=0…9999	Character	Overrides default (automatically determined) MSCP media type of the device. Syntax: "<device-name>,<device-type>" Where: <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. If not specified device name is set to "DU", and device type is selected based on disk size. Initialy not specified.

Parameter	Type	Value
geometry[N] N=0…9999	Character	This string value with a special format 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. The string format is <X>"/"<Y>["/"<Z>] where: • 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; If this parameter is not set, CHARON-VAX/CHARON-PDP11 will configure the geometry based on the most probable disk type.
use_io_file_buffering[N] N=0…9999	Boolean	Enables use of host OS I/O buffering. Initially set to "NO" (buffering disabled).

Use the ADDRESS parameter if loading several instances of RQDX3. The ADDRESS parameter value must be unique for every instance of the RQDX3. (See the Application Note 32 on how to configure addresses on a Qbus).

Examples:

```
load RQDX3 DUA address=017772150 max_n_of_units=4
set DUA container[0]="C:\charon\disks\rx23.vdisk"
set DUA container[1]= "\\.\PhysicalDrive1"
load RQDX3 DUB address=017760334
set DUB container[5]="\\.\CdRom0"
```

In the above example (in case of CHARON-VAX) the rx23.vdisk will be seen in VMS as DUA0, the PhysicalDrive1 as DUA1 and the CD-Rom will be seen as DUB5.

Or alternatively

```
load RQDX3 DIA address=017772150 max_n_of_units=4
set DIA container[0]="C:\charon\disks\rx23.vdisk"
set DIA media_type[0]="dssi"
set DIA container[1]= \\.\PhysicalDrive1
set DIA media_type[1]="dssi"
```

In the above example (in case of CHARON-VAX) the rx23.vdisk will be seen in VMS as DIA0, the PhysicalDrive1 as DIA1.

3.11.2. The TQK50 TMSCP QBUS Controller

The CHARON-VAX/XX / CHARON-PDP11 QBUS systems provide support for a TQK50 tape controller. The original TQK50 tape controller is capable of serving only 1 tape unit. But the CHARON-VAX/XX / CHARON-PDP11 extend this limit so that the TQK50 tape controller can be configured with up to 10000 tape units. Use the following command to load an instance of a TQK50 tape controller:

```
LOAD TQK50 <logical name>
```

Example:

```
load TQK50 MUA
```

Note that the specification of TQK50.DLL can be omitted in this case since the name of the device is the same as the name of DLL. The TQK50 has the following configuration parameters, which can be specified with the SET command:

Parameter	Type	Value
address	Numeric	Specifies the CSR address. The address must be a valid QBUS 22-bit wide address in IO space. Initial value is 017774500 which is the factory setting for TQK50 tape controllers.
container[N] N=0…9999	String	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: "\\.\TapeX" – for the local physical tape drive (SCSI) for which a driver is loaded. Direct SCSI addressing may be used if no Windows driver is available.
media_type[N] N=0…9999	Character	Overrides default (automatically determined) MSCP media type of the device. Syntax: "<device-name>,<device-type>" Where: <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. If not specified device name is set to "MU", and device type is set to "TK50". Initially not specified.

Use the ADDRESS parameter if loading several instances of TQK50. The ADDRESS parameter value must be unique for every instance of TQK50. (See the Application Note 32 for advice on configuring Qbus adapters.) Example:

```
load TQK50 MUA address=017774500
set MUA container[0]="\\.\Tape2"
set MUA container[1]="C:\charon\tapes\tape1.mtd"
set MUA container[2]="\\.\scsi2:0:4"
```

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]="..."
```

In VMS (for example):

```
BACKUP/RESTORE MUA0:BACKUP.SAV,MUA1,MUA2,MUA3/SAVE_SET DUA0:...
```

3.11.3. The TUK50 TMSCP UNIBUS Controller

The CHARON-VAX/XX / CHARON-PDP11 provide support for a TUK50 tape controller (only used in the VAX6310 and PDP11/94 emulators). The original TUK50 tape controller is capable of serving only 1 tape unit. But the CHARON-VAX/XX / CHARON-PDP11 extend this limit so that the TUK50 tape controller can be configured with up to 10000 tape units. Use the following command to load an instance of a TUK50 tape controller:

```
LOAD TUK50 <logical name>
```

Example:

```
load TUK50 MUA
```

Note that the specification of TUK50.DLL can be omitted in this case since the name of the device is the same as the name of DLL. The TUK50 has the following configuration parameters, which can be specified with the SET command:

Parameter	Type	Value
address	Numeric	Specifies the CSR address. The address must be a valid UNIBUS 18-bit wide address in IO space. Initial value is 0774500 which is the factory setting for TUK50 tape controllers.
container[N] N=0…9999	String	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: "\\.\TapeX" – for the local physical tape drive (SCSI) for which a driver is loaded. Direct SCSI addressing may be used if no Windows driver is available.

media_type[N] N=0…9999	Character	Overrides default (automatically determined) MSCP media type of the device. Syntax: "<device-name>,<device-type>" Where: <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. If not specified device name is set to "MU", and device type is set to "TK50". Initially not specified.

Example:

```
load TUK50 MUA
set MUA container[0]="\\.\Tape2"
set MUA container[1]="C:\charon\tapes\tape1.mtd"
set MUA container[2]="\\.\scsi2:0:4"
```

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]="..."
```

In VMS (for example):

```
BACKUP/RESTORE MUA0:BACKUP.SAV,MUA1,MUA2,MUA3/SAVE_SET DUA0:...
```

3.12. SCSI Controller

CHARON-VAX/XX provides two SCSI controllers for SCSI models and SCSI/QBUS models of VAX. For a comparison between SCSI and (T)MSCP controllers see the chapter CHARON-VAX/XX / CHARON-PDP11 system components. Hardware disks, Disk images, Hardware tapes, Tape images, floppy devices and CD devices may be connected to these SCSI controllers. Each device has to be configured to connect to a specific SCSI address in CHARON-VAX/XX.

Use the following emulated device types to map real peripherals to the emulated SCSI devices:

- ***virtual_scsi_disk*** – for disk image containers and physical disks

- ***virtual_scsi_tape*** – for tape image containers

- ***physical_scsi_device*** – for physical SCSI devices on the host. This instance type can be used also for any SCSI device, for example disk, tape drives or SCSI CD-ROM/DVD-ROM drives.

- ***atapi_scsi_device*** – for any host ATAPI CD-ROMs and DVD-ROMs.

- ***floppy_scsi_device*** - for host floppy disk drives.

CHARON-VAX/XX uses SCSI disks/tape devices connected to the Windows host system as VAX disks/tape devices or disk/tape containers that are represented in the operating system environment as files. Two SCSI controllers are provided (PKA and PKB) in CHARON-VAX/XX, with 7 addresses each. The utility SCSI_CHECK (see the “Utilities” chapter) helps to locate a SCSI device in the Windows host system if mapping to physical devices is required.

Beyond the capabilities of the hardware VAX 3100/9x and 4000/10x, CHARON-VAX/XX has implemented extended SCSI addressing. Each of the seven device addresses of a SCSI controller can support up to eight disks/tape images. Thus the total number of disks supported becomes 2 Controllers*7 addresses*8 Disks/Tapes, which gives a theoretical 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 of the form "xKct0n:", where 'x' stands for device type (D means disks, M means magnetic tapes, G is reserved by OpenVMS for special purposes), 'c' stands for controller letter (A - the first controller, B - the second controller, ...), 't' stands for SCSI device ID (usually 0 through 6, and 7 is allocated by the controller itself), and finally '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 OpenVMS appear as DKA0 (which is really DKA000), DKA100, DKA200, ..., tapes - MKA0 (which is really MKA000), MKA100, MKA200, ... As soon as there is a disk/tape device with LUNs 0 and 1, VMS handles them as, let us say, DKA300 and DKA301 (MKA300 and MKA301) respectively.

The boot ROM of the CHARON-VAX/XX detects SCSI devices with multiple LUNs, and builds proper device names for them ('show dev' at the VAX console prompt to see a list). This list is passed to OpenVMS when you start booting. OpenVMS only creates devices for logical units 0 for each device detected in the boot ROM. Add additional logical units by using the following SYSGEN command:

```
$ MCR SYSGEN CONNECT DKxxx/NOADAPTER
```

Where DKxxx (MKxxx) stands for correct OpenVMS name of the logical unit to be connected. You can find this name in the SRM console with "show scsi" command. Add this command to the VMS SYSTARTUP_VMS.COM file to ensure that it is executed on 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 MKDISK utility (See the “Utilities” Chapter). CHARON-VAX/XX is able to boot OpenVMS disk images of any OpenVMS version (starting with 4.5 or higher for MicroVAX II or VAX 3600 and VMS 5.5-2 or higher for the VAX4000). Disk/tape images may be compressed using standard Windows data compression. The performance impact of data compression is minimal in most cases.

Physical SCSI disks used by CHARON-VAX/XX must not contain a file system known to the Windows operating system; otherwise the drive will not be available for use in CHARON-VAX/XX. With the utility "Disk Management" (Control Panel | Administrative Tools | Computer Management | Disk Management) you can verify that Windows has not allocated the disks. If they do, use the disk management tool to delete the partition (i.e. remove the Windows file system) and thus release the disk.

Firstly load a SCSI device with the **load** command. At the same time specify the name of the device instance, the emulated SCSI bus to connect the device to and the SCSI identifier of the CHARON-VAX/XX device.

Parameter	Type	Value
scsi_bus	Identifier	Name of emulated SCSI disk controller: pka or pkb
scsi_id	Numeric	A value between 0 and 7. 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 0-7 from the SRM console.

Note that there is no direct correspondence between the host hardware SCSI ID and these CHARON-VAX/XX SCSI addresses. Set the correspondence between physical SCSI addresses on the host system and the CHARON-VAX/XX SCSI bus ID in the configuration file. Devices are loaded as follows:

```
load <instance type>/<DLL name> <instance name> scsi_bus=<bus name>
    scsi_id=<number>
```

Note that CHARON-VAX/XX has only one preloaded SCSI adapter with the name PKA. If a second adapter (PKB) is required then add the following line to the configuration file before loading and configuring any devices on the second SCSI adapter PKB:

```
include kzdda.cfg
```

kzdda.cfg loads the second SCSI adapter. Note that once the PKB has been loaded it’s not possible to use VMS5.5-2. In this case the minimal version must be VMS5.5-2H4.

3.12.1. virtual_scsi_disk

Use **virtual_scsi_disk** for disk containers and physical disks. This is the most convenient way of connecting disks to SCSI adapters of CHARON-VAX/XX.

virtual_scsi_disk has the following parameters**:**

Parameter	Type	Value
container[N] N=0…7	Character	A string containing the full path to a disk container or name of the host physical disk to map. N stands for logical unit number. It must begin with 0 and must have no gaps. If only a name of the disk container is specified CHARON-VAX/XX will look for the container in the installation directory, in the directory Build_<xxx>\x86.
media_type[N] N=0…7	character	Overrides PRODUCT ID in the default SCSI INQUIRY data. Valid values may contain uppercase letters, decimal figures, spaces. Length of string shall not exceed 16 characters. If not specified, synthetic SCSI INQUIRY data is returned containing PRODUCT ID selected based on disk size. Initially left unspecified.
geometry[N] N=0…7	character	This string value with a special format 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. The string format is <X>"/"<Y>["/"<Z>] where: • 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; If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type.
use_io_file_buffering[N] N=0…7	boolean	Enables use of host OS I/O buffering. Initially set to "NO" (buffering disabled).
removable[N] N=0…7	boolean	Enables the logical unit to appear as removable SCSI disk drive. Initially set to "NO" (fixed, non-removable).

Example:

```
load virtual_scsi_disk/chscsi pka_0 scsi_bus=pka scsi_id=0
set pka_0 container[0]="C:\Charon\disk1.vdisk"
set pka_0 container[1]= "\\.\PhysicalDrive1"
```

This second string associates the 1st unallocated SCSI drive (disk) in Windows with device **pka_0**

If only one LUN is configured, the LUN number can be omitted:

```
set pka_0 container="C:\Charon\disk1.vdisk"
set pka_0 media_type="RZ1ED"
```

When virtual SCSI disk image is dismounted in VMS it is no longer read by CHARON-VAX 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 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 using parallel multiple file copy from Windows explorer. Note that, unlike MSCP controlled disk images, a disk image connected to a SCSI controller as a virtual SCSI disk may NOT be replaced by another disk image.

3.12.2. virtual_scsi_tape

Use **virtual_scsi_tape** for tape containers. This is the most convenient way of connecting tapes to SCSI adapters of CHARON-VAX/XX.

virtual_scsi_tape has the following parameters**:**

Parameter	Type	Value
container[N] N=0…7	character	A string containing the full path to a tape container. N stands for logical unit number. It must begin with 0 and must have no gaps. If only a name of the tape container is specified CHARON-VAX/XX will look for the container or created it in the installation directory, in the directory Build_<xxx>\x86. If the specified tape image does not exist CHARON-VAX/XX creates it.
media_type[N] N=0…7	character	Overrides PRODUCT ID in the default SCSI INQUIRY data. Valid values may contain uppercase letters, decimal figures, spaces. Length of string shall not exceed 16 characters. By default the PRODUCT ID returned is “TLZ04”

Example:

```
load virtual_scsi_tape/chscsi pka_0 scsi_bus=pka scsi_id=0
set pka_0 container[0]="C:\Charon\tape1.vtape"
set pka_0 container[1]="C:\Charon\tape2.vtape"
```

If only one LUN is configured, the LUN number can be omitted:

```
set pka_0 container="C:\Charon\tape1.vtape"
set pka_0 media_type="TLZ08"
```

3.12.3. physical_scsi_device

Use **physical_scsi_device** to connect any host SCSI device to the emulator.

physical_scsi_device has the following parameter**:**

Parameter	Type	Value
container[N] N=0…7	Character	A string containing the device name to map to the emulator. N stands for logical unit number. It must begin from 0 and have no gaps. If there is only one logical unit it can be omitted. Default is 0.
media_type[N] N=0…7	character	Overrides PRODUCT ID in the default SCSI INQUIRY data. Valid values may contain uppercase letters, decimal figures, spaces. Length of string shall not exceed 16 characters. If not specified, synthetic SCSI INQUIRY data is returned containing PRODUCT ID selected based on disk size. Initially left unspecified.
geometry[N] N=0…7	character	This string value with a special format 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. The string format is <X>"/"<Y>["/"<Z>] where: • 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; If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type.
use_io_file_buffering[N] N=0…7	boolean	Enables use of host OS I/O buffering. Initially set to "NO" (buffering disabled).
removable[N] N=0…7	boolean	Enables the logical unit to appear as removable SCSI disk drive. Initially set to "NO" (fixed, non-removable).

Find the number of a SCSI disk device from the Device Manager or from the SCSI_Check utility. The syntax for SCSI disks is the following:

```
load physical_scsi_device/chscsi pka_0 scsi_bus=pka scsi_id=0
```

```
set pka_0 container="\\.\PhysicalDrive4"
```

This example will associate the 4th unallocated SCSI drive in Windows with device **pka_0**.

CHARON-VAX/XX supports SCSI CD-ROM drives. The SCSI CD-ROM drives appear in the Windows operating system as '\\.\CdRom0', '\\.\CdRom1' etc. Use these names in the configuration file to attach the SCSI controller to the SCSI CD-ROM drive of the host computer. For example:

```
set pka_0 container="\\.\CdRom0"
```

CHARON-VAX/XX also supports SCSI tapes. All SCSI tape devices appear in the Windows operating system as '\\.\Tape0', '\\.\Tape1', etc. Use these names in the configuration file to attach the SCSI controller to the tape devices of the host computer. For example:

```
set pka_0 container = "\\.\Tape0"
```

CHARON-VAX/XX supports direct SCSI addressing of tapes.

If you have a SCSI tape and the tape does not have a Windows driver, or the driver is not working correctly, you may instruct CHARON-VAX/XX to address the tape directly. Before you try this method **disable** any Windows driver associated with this tape unit.

Attach the SCSI tape unit to the emulated SCSI controller as shown in the following example.

```
load physical_scsi_device/chscsi tapeb1 scsi_bus=pkb scsi_id=1
set tapeb1 container="\\.\scsi<scsi-port>:<scsi-bus>:<scsi-id>:<lun>"
```

Where:

`<scsi-port>` stands for the number assigned by the Windows operating system to the controller to which the tape drive is connected,

`<scsi-bus>` stands for the number of the SCSI bus to which the tape drive is connected (usually 0; in general, it depends on the type of SCSI controller),

`<scsi-id>` stands for SCSI ID of the tape drive.

`<lun>` stands for logical unit number. Can be omitted if 0.

The SCSI port can be found in registry: HKEY_Local_Machine\Hardware\Devicemap\Scsi key. The bus and id can be determined from "Start Settings / Control Panel / Administrative Tools / Computer Management / Device Manager / SCSI tape device". Note the properties of the SCSI device that represent your tape. If not specified, the LUN number defaults to zero. Example:

```
load physical_scsi_device/chscsi tapeb1 scsi_bus=pkb scsi_id=1
Set tapeb1 container="\\.\scsi2:0:4"
```

The **SCSI_Check** utility can be used to identify the correct device string used in the CHARON-VAX/XX / CHARON-PDP11 configuration file (see the "Utilities" chapter).

3.12.4. atapi_scsi_device

CHARON-VAX/XX supports IDE CD-ROM drives on the host system. See the **physical_scsi_device** for support of SCSI CD-ROM devices. The device location is specified in the configuration file using the full device name. Use the **atapi_scsi_device** for mapping IDE CD-ROM to CHARON-VAX/XX. **atapi_scsi_device** has the following parameter**:**

Parameters	Type	Value
container[N] N=0…7	Character	A string containing IDE or SCSI CD-ROM to map to the emulator. N stands for logical unit number. It must begin from 0 and has no gaps. If there is only one logical unit it can be omitted.

Example:

```
load atapi_scsi_device pka_0 scsi_bus=pka scsi_id=0
set pka_0 container="\\.\CdRom0"
```

This example assigns the first CD-ROM drive installed on your host system (CdRom0) as a SCSI device **pka_0**. Use the **SCSI_Check** utility to display the name of the CDROM drive.

3.12.5. floppy_scsi_device

It is possible to attach one of the SCSI devices in the configuration file to the 3.5" floppy drive of the host computer. The attached floppy drive appears as RX26 SCSI floppy drive in OpenVMS/VAX running on CHARON-VAX/XX. The following configuration line shows how to attach floppy drives to the SCSI controller of the emulator as DKB600:

```
load floppy_scsi_device pkb_6 scsi_bus=pkb scsi_id=6
```

CHARON-VAX/XX will make any installed floppy drives available to the emulated VAX as emulated SCSI devices.

3.12.6. atapi_scsi_burner

This facility is offered "as-is" without support from Stromasys SA.

CHARON-VAX/XX allows VAX programs to write to a DVD burner. Users may use the atapi_scsi_burner to replace tapes or optical drives like a RWZ52 or a RV20.

Use the atapi_scsi_burner to extend the capability of your existing VMS systems by installing a DVD driver in VMS. For example Eberhard Heuser-Hofmann (vaxinf@chemie.uni-konstanz.de) sells a product which is CD/DVD reading/writing software for VMS on both Alpha and VAX.

Using the VAX driver and the CHARON-VAX atapi_scsi_burner you can now backup 8 GB files.

The device location is specified in the configuration file using the full device name. Use the **atapi_scsi_burner** for mapping IDE and SCSI DVD-RW to CHARON-VAX/XX. **atapi_scsi_ burner** has the following parameter**:**

Parameters	Type	Value
container[N] N=0…7	Character	A string containing IDE or SCSI CD-ROM to map to the emulator. N stands for logical unit number. It must begin from 0 and has no gaps. If there is only one logical unit it can be omitted.

Example:

```
load atapi_scsi_burner/chscsi pka_0 scsi_bus=pka scsi_id=0
set pka_0 container="\\.\CdRom0"
```

You cannot use the atapi_scsi_burner device for reading but you may define a atapi_scsi_device that points to the same device but with a different scsi-id. The VAX/PDP11 configuration might look like this:

# connect an BURNER to the PKA at SCSI ID 2

```
load atapi_scsi_burner/chscsi pka_2 scsi_bus=pka scsi_id=2
set pka_2 container="\\.\CdRom0"
```

# connect an ATAPI CDROM drive to the PKA at SCSI ID 3

```
load atapi_scsi_device/chscsi pka_3 scsi_bus=pka scsi_id=3
set pka_3 container="\\.\CdRom0"
```

Then the VAX can burn through dka200: and compare/read through dka300:.

3.13. DSSI

The DSSI storage subsystem for the VAX 4000 Models 106 and 108 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.

This first implementation was tested with CHARON-VAX and can only be used on a 32 bits Windows host system. The DSSI storage subsystem is functionally emulated, but physically incompatible with 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 for Windows 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 the two elements must be configured:

- A DSSI storage element (disk or tape).

- A DSSI storage controller. For the moment an emulated HSD50 storage controller is provided. The emulated HSD50 supports physical host drives, CDRom drives, physical tapes, removable disks, virtual disks and tapes.

To create a ***cluster*** of DSSI interconnected CHARON-VAX/XX systems, the DSSI hardware topology is emulated by establishing TCP/IP channels between the emulated SHAC host adapters of each CHARON-VAX/XX 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. The Windows remote shares can be also used, but these do not offer the reliability required for a VAX cluster. Disks on a multiport SCSI switch are not acceptable, as a SCSI switch does not provides true simultaneous access to multiple nodes.

Note that the emulated DSSI subsystem has many configurable parameters when multiple nodes on a single DSSI bus are to be configured. Incorrect configuration, in particular non-identical specification of emulated HSD50 disks in the DSSI nodes are likely to case data corruption. It is advisable to start any field test with implementing the single node and cluster examples that are provided in these notes.

3.13.1. CHARON-VAX DSSI configuration parameters

To connect an emulated VAX 4000 model 106 or 108 node to a virtual DSSI network, the CHARON-VAX configuration must load at least one emulated SHAC host adapter. Emulated VAX 4000 model 106 or 108 has two built-in SHAC host adapters are pre-loaded with names PAA and PAB corresponding to VMS names. So 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 for emulated SHAC host adapters in the CHARON-VAX configuration. The SHAC emulation has the following configuration parameters:

Parameter	Type	Value
port[N] N=0…7	Numeric	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[N] N=0…7	Character	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[N N=0…7	Character	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 or 108 node.
scs_system_id[N] N=0…7	Numeric	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 or 108 node.
mscp_allocation_class[N] N=0…7	Numeric	An integer value which specified the ALLOCLASS of the emulated storage element. Possible values are from 0 through 255. Initially set to 0 which means no allocation class assigned.

Parameter	Type	Value
container [N] N=0…7	Character	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 (DIA*N*:) or DSSI (TF86) tapes (MIA*N:).* Possible values of the parameter are strings in one of the following forms: 1. “\\.\PhysicalDrive”X, where X is 0, 1, … for accessing non-removable physical disk drives 2. “\\.\CdRom”X, where X is 0, 1, … for accessing compact disk drives (read-only); 3. “\\.\Tape”X, where X is 0, 1, … for accessing physical tape drives; 4. “\\.\”L, where L is A, B, … for accessing removable disk drives (floppies, some optical media, …); 5. [<path-name>”\”]<file-name>[“.vdisk”] for accessing CHARON disk images, or CHARON virtual disks; 6. [<path-name>”\”]<file-name>[“.dsk”] for accessing CHARON disk images, or CHARON virtual disks; 7. [<path-name>”\”]<file-name>“.vtape” for accessing CHARON tape images, or CHARON virtual tapes; 8. [<path-name>”\”]<file-name>“.mtd” for accessing CHARON tape images, or CHARON virtual tapes; This parameter is initially not set, thus creating NO storage elements on the bus with corresponding DSSI node id.

Parameter	Type	Value
media_type[N] N=0…7	Character	Overrides default (automatically determined) MSCP media type of the device. Syntax: "<device-name>,<device-type>" Where: <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. If not specified device name is set to "DI", and device type is selected based on disk size for disk storage elements, and to "MI" and "TF86" respectively for tape storage element. Initialy not specified.
geometry [N] N=0…7	Character	This string value with a special format 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. The string format is <X>"/"<Y>["/"<Z>] where: • 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; If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type. Initially not set. Applicable only to disk storage elements.
use_io_file_buffering[N] N=0…7	Boolean	Enables use of host OS I/O buffering. Initially set to "NO" (buffering disabled).

These parameters can be specified in a SET command.

3.13.2. Connecting storage controller to a virtual DSSI network

To connect storage controller to 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.

When loading an instance of emulated HSD50 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 that the VMS SCSNODENAME is used as instance name.

The line below loads an emulated HSD50 storage controller and assigns it the instance name MYDISKS, and connects it to the primary built-in DSSI controller:

```
load HSD50 DISKS dssi_host=PAA
```

The HSD50 emulation has the following configuration parameters (as per CHARON configuration file syntax, all integer values can be entered in Hex, Decimal or Octal form):

Parameter	Type	Value
dssi_host_name	Character	A string value which specifies the instance name of emulated SHAC host adapter serving the same virtual DSSI network. 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.
dssi_node_id	Numeric	An integer value which specifies the address of an emulated HSD50 storage controller on the virtual DSSI network. Possible values are from 0 through 7 (initially set to 0).
scs_node_name	Character	A string value that specifies the SCSNODENAME of the emulated HSD50 storage controller. The string is up to 6 characters long. Possible characters are uppercase letters A through Z , figures 0 through 9. Initially set to the name of the emulated HSD50 controller. Therefore name of emulated HSD50 controller shal follow the above rule.

Parameter	Type	Value
scs_system_id	Numeric	An integer value that specifies the SCSSYSTEMID of the emulated HSD50 storage controller. Initially set to an arbitrary value that is guaranteed to be unique within the running emulated VAX 4000 model 106 or 108 node.
mscp_allocation_class	Numeric	An integer value which specified the ALLOCLASS of the emulated HSD50 storage controller. Possible values are from 0 through 255 (initially set to 0).

Parameter	Type	Value
container[N] N=0…9999	Character	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 (DUA*N*:) or HST00 tapes (MUA*N*:). Possible values of the parameter are strings in one of the following forms: 1. “\\.\PhysicalDrive”X, where X is 0, 1, … for accessing non-removable physical disk drives 2. “\\.\CdRom”X, where X is 0, 1, … for accessing compact disk drives (read-only) 3. “\\.\Tape”X, where X is 0, 1, … for accessing physical tape drives 4. “\\.\”L, where L is A, B, … for accessing removable disk drives (floppies, some optical media, …) 5. [<path-name>”\”]<file-name>[“.vdisk”] for accessing CHARON disk images, or CHARON virtual disks 6. [<path-name>”\”]<file-name>[“.dsk”] for accessing CHARON disk images, or CHARON virtual disks 7. [<path-name>”\”]<file-name>“.vtape” for accessing CHARON tape images, or CHARON virtual tapes 8. [<path-name>”\”]<file-name>“.mtd” for accessing CHARON tape images, or CHARON virtual tapes This parameter is initially not set, thus creating NO storage elements on the controller

Parameter	Type	Value
media_type[N] N=0…9999	Character	Overrides default (automatically determined) MSCP media type of the device. Syntax: “<device-name>,<device-type>” Where: <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. If not specified device name is set to “DU”, and device type is set to “HSX00” for disk unit, and to “MU” and “HST00” respectively for tape unit. Initialy not specified.
geometry[N] N=0…9999	Character	This string value with a special format 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. The string format is <X>”/”<Y>[“/”<Z>] where: • 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; If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type.
use_io_file_buffering[N] N=0…9999	Boolean	Enables use of host OS I/O buffering. Initially set to “NO” (buffering disabled).

The following example configures an emulated HSD50 storage controller with a non-default DSSI network address of 5:

```
load HSD50 DISKS dssi_host=PAA dssi_node_id=5
```

Configuration Example 1.

Standalone VAX system with 2 disks.

```
set session hw_model="VAX_4000_Model_108"
set session log="example1.log"
set toy container="example1.dat"
set rom container="example1.rom"

load virtual_serial_line OPA0 port=10003 application="opa0.ht"

set PAA container[0]="C:\mydisks\dia0-rz24-vms-v6.2.vdisk"
set PAA container[1]="C:\mydisks\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:

```
$ sho dev 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
$ _
```

Configuration Example 2.

Standalone VAX, 2 disks, and a tape drive on a separate HSD50 controllers

The configuration file below emulates a VAX 4000 Model 108 node, one HSD50 storage controller serving two disks and another instance of a HSD50 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 virtual_serial_line OPA0 port=10003 application="opa0.ht"

load HSD50 DISKS dssi_host=PAA dssi_node_id=1
set DISKS container[0]="C:\mydisks\dua0-rz24-vms-v6.2.vdisk"
set DISKS container[1]="C:\mydisks\dua1-rz24-vms-v6.2.vdisk"

load HSD50 TAPES dssi_host=PAA dssi_node_id=2
set TAPES container[3]="\\.\Tape0"
```

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:

```
$ sho dev 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
$ sho dev m

Device                 Device           Error    Volume         Free  Trans Mnt
 Name                  Status           Count     Label        Blocks Count Cnt
TAPES$MUA3:           Online               0
$                                                                                   _
```

3.13.3. Virtual DSSI cluster configurations for the VAX 4000 emulator

The hardware DSSI bus establishes private node-to-node communication channels between any two DSSI nodes that are part of the same DSSI bus. In this context, the DSSI storage controllers are also nodes like VAX computers, but are running special software.

The CHARON DSSI emulation replicates this structure by establishing TCP/IP channels between each pair of emulated SHAC host adapters, and by connecting the emulated HSD50 storage controllers to every SHAC on the same virtual DSSI network.

Consider a pair of emulated VAX 4000 model 106 or 108 nodes: **VAX_A** and **VAX_B** running on host system **HOST_A** and **HOST_B** respectively.

The two emulated VAX nodes have their own emulated SHAC host adapters interconnected with the virtual DSSI bus. In order to communicate properly, these two adapters must have different DSSI node id’s (DSSI_NODE_ID_A and DSSI_NODE_ID_B), which must be explicitly specified in the corresponding VAX consoles.

Next, every emulated SHAC host adapter participating in the virtual DSSI cluster must be able to communicate to every other emulated SHAC host adapter in the same virtual DSSI cluster. Such communication is performed over TCP/IP links established between every two emulated SHAC host adapters.

A virtual DSSI cluster consisting of N emulated VAX 4000 nodes has $\frac{N \cdot (N-1)}{2}$ such links.

Each end of the link is identified by the pair:

{<TCP/IP-HOST-NAME>,<TCP/IP-PORT-NO>}.

Hence, on HOST_A the CHARON-VAX configuration file describes connection to HOST_B as follows:

```
set PAA port[DSSI_NODE_ID_B]=TCPIP_PORT_A_FOR_B
set PAA host[DSSI_NODE_ID_B]="HOST_B:TCPIP_PORT_B_FOR_A"
```

And on HOST_B the CHARON-VAX configuration file describes connection to HOST_A as follows:

```
set PAA port[DSSI_NODE_ID_A]=TCPIP_PORT_B_FOR_A
set PAA host[DSSI_NODE_ID_A]="HOST_A:TCPIP_PORT_A_FOR_B"
```

Next, every emulated SHAC host adapter must also connect to all emulated storage controllers on the same virtual DSSI bus. This is similar to the non-clustered configurations described before, except for the MSCP allocation class:

The VAX Cluster architecture requires every VAX node participating in the cluster be assigned the MSCP allocation class. The same requirement applies to DSSI storage controllers, which are also nodes on the DSSI. Therefore, when configuring an instance of an emulated HSD50 storage controller, the MSCP allocation class for that controller must be supplied through the corresponding parameter. For example, the following line:

```
load HSD50 DISKS dssi_host=PAA dssi_node_id=5 mscp_allocation_class=5
```

assigns the DISKS emulated storage controller the MSCP allocation class 5.

Configuration Example 3.

A dual node VAX 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 Windows. Assume that these host systems have Windows host names CASTOR and POLLUX in the host TCP/IP network.

The following is the CHARON-VAX configuration file for the emulated VAX 4000 Model 108 node named VAX001 running on CASTOR:

```
set session hw_model="VAX_4000_Model_108"
set session log="vax001.log"
set toy container="vax001.dat"
set rom container="vax001.rom"
```

```

load virtual_serial_line OPA0 port=10003 application="opa0.ht"

set PAA port[2]=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]="H:\ourdisks\dua0-rz24-vms-v6.2.vdisk"
set DISKS container[1]="H:\ourdisks\dua1-rz24-vms-v6.2.vdisk"
set DISKS container[2]="H:\ourdisks\dua2-rz24-vms-v6.2.vdisk"
set DISKS container[3]="H:\ourdisks\dua3-rz24-vms-v6.2.vdisk"
```

And the following is the CHARON-VAX configuration file for the emulated VAX 4000 Model 108 node named VAX002 running on POLLUX:

```
set session hw_model="VAX_4000_Model_108"
set session log="vax002.log"
set toy container="vax002.dat"
set rom container="vax002.rom"

load virtual_serial_line OPA0 port=10003 application="opa0.ht"

set PAA port[1]=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]="H:\ourdisks\dua0-rz24-vms-v6.2.vdisk"
set DISKS container[1]="H:\ourdisks\dua1-rz24-vms-v6.2.vdisk"
set DISKS container[2]="H:\ourdisks\dua2-rz24-vms-v6.2.vdisk"
set DISKS container[3]="H:\ourdisks\dua3-rz24-vms-v6.2.vdisk"
```

Note that in the both configuration files, the data related to the emulated HSD50 storage controller DISKS must be identical. Not following this rule will very likely cause data corruption on the (virtual) disks. In this respect note the explicit specification of SCS_SYSTEM_ID for the storage controllers.

As mentioned earlier, CHARON-VAX loads an initial (default) value for the SCS_SYSTEM_ID that is guaranteed to be unique within the running emulator. But with two instances of the emulator these default values are likely to be different. Therefore, the SCS_SYSTEM_ID value must be specified explicitly for both emulated HSD50 storage controllers to obtain an identical value.

This example also assumes that drive “H” is a network share, so that all disk images are accessible from both host machines.

Configuration Example 4.

A triple node VAX cluster with multiple iSCSI disks

In this example we assume that all three host systems have a iSCSI initiator (for example the Microsoft 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 \\.\PhysicalDrive1 ... \\.\PhysicalDrive8 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 separate configuration file (to be included in each CHARON configuration file) and store it on a common Windows network share (H:):

```
load HSD50 DISKS1 dssi_host=PAA dssi_node_id=4
set DISKS1 scs_system_id=3238746238 mscp_allocation_class=1
set DISKS1 container[1]="\\.\PhysicalDrive1"
set DISKS1 container[2]="\\.\PhysicalDrive2"
set DISKS1 container[3]="\\.\PhysicalDrive3"
set DISKS1 container[4]="\\.\PhysicalDrive4"

load HSD50 DISKS2 dssi_host=PAA dssi_node_id=5
set DISKS2 scs_system_id=1256412654 mscp_allocation_class=2
set DISKS2 container[5]="\\.\PhysicalDrive5"
set DISKS2 container[6]="\\.\PhysicalDrive6"
set DISKS2 container[7]="\\.\PhysicalDrive7"
set DISKS2 container[8]="\\.\PhysicalDrive8"
```

The following is the CHARON-VAX configuration file for the emulated VAX 4000 Model 108 node named VAX001 running on HOST001:

```
set session hw_model="VAX_4000_Model_108"
set session log="vax001.log"
set toy container="vax001.dat"
set rom container="vax001.rom"

load virtual_serial_line OPA0 port=10003 application="opa0.ht"

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

include h:\ourdisks\disksets.cfg
```

The CHARON-VAX configuration file for the emulated VAX 4000 Model 108 node named VAX002 running on HOST002 is as follows:

```
set session hw_model="VAX_4000_Model_108"
set session log="vax002.log"
set toy container="vax002.dat"
set rom container="vax002.rom"

load virtual_serial_line OPA0 port=10003 application="opa0.ht"

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

include h:\ourdisks\disksets.cfg
```

And the following is the CHARON-VAX configuration file for the emulated VAX 4000 Model 108 node named VAX003 running on HOST003:

```
set session hw_model="VAX_4000_Model_108"
set session log="vax003.log"
set toy container="vax003.dat"
set rom container="vax003.rom"

load virtual_serial_line OPA0 port=10003 application="opa0.ht"

set PAA port[1]=11031 host[1]=”host001:11013”
set PAA port[2]=11032 host[2]=”host002:11023”

include h:\ourdisks\disksets.cfg
```

3.14. KDB50

The KDB50 is an MSCP disk controller for the VAX 6000. MSCP controllers are highly autonomous units that offload the VAX CPU significantly.

The virtual KDB50 controller in CHARON-VAX supports up to 256 disks instead of the 4 disk limitation in the original hardware. The 256 devices are recognized by the VAX/VMS operating system. This design modification has the advantage to utilize only one VAXBI slot for up to 256 disk and tape devices.

The I/O behavior of the virtual KDB50 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 KDB50, VMS can be booted only from the first 10 devices on the KDB50 (DU0 - DU9).

3.14.1. KDB50 configuration parameters

Load parameter	Function
KDB50	This command creates an instance of the KDB50 MSCP controller and associates it with a logical name.

Example:

```
load KDB50 PUA
```

Parameter	Type	Value
vax_bi_node_id	Numeric	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[N] N=0…9999	Character	Specifies the location of the disk container. It can be either the name of a .VDISK (.DSK) file or the name of a physical disk: "\\.\PhysicalDriveX" – for local fixed disks (IDE, SCSI, SATA); "\\.\CdRomX" or "\\.\<Letter>:" – for CD-ROM, DVD drives (IDE, SCSI, …); "\\.\A:" or \\.\B: or whatever – for floppy drives (1.2, 1.44, 2.88MB); Direct SCSI addressing is NOT supported.
media_type[N] N=0…9999	Character	Overrides default (automatically determined) MSCP media type of the device. Syntax: "<device-name>,<device-type>" Where: <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. If not specified device name is set to "DU", and device type is selected based on disk size. Initially not specified.

Parameter	Type	Value
geometry[N] N=0…9999	Character	This string value with a special format 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. The string format is <X>"/"<Y>["/"<Z>] where: • 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; If this parameter is not set, CHARON-VAX will configure the geometry based on the most probable disk type.
use_io_file_buffering[N] N=0…9999	Boolean	Enables use of host OS I/O buffering. Initially set to "NO" (buffering disabled).

Examples:

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]="vms72-66X0.vdisk"
```

Configure a user disk to show up as DUA1: in VMS:

```
set PUA container[1]="usertest.vdisk"
```

The first host system CD-ROM can be used to read VMS CDs and shows up as DUA9:

```
set PUA container[9]="\\.\CdRom0"
```

The host system floppy drive A: can be used in VMS as DUA10:

```
set PUA container[10]="\\.\A:"
```

Notes:

*The default setting in the Windows operating system is to checkpoint **.dsk** files, causing slow disk operation or disk offline errors in CHARON-VAX/CHARON-PDP11.*

Attempts to use a file name with another extension will result in a "DISK OFFLINE" message.

- Configured physical devices or tape/disk images that do not exist on the host system will in general cause VAX/VMS/RSX11/RT11 to report that the unit is offline. In some cases this can result in a VMS BUG CHECK, but in this case the error is noted in the log file.

3.15. Ethernet adapters

To configure CHARON-VAX/XX / CHARON-PDP11 for networking follow the steps described in the section on Network installation. Here we describe the parameters for the SGEC (SCSI systems), DEQNA/DESQA/DELQA (Qbus systems), DEUNA/DELUA (PDP Unibus system) and the CHARON NDIS6 Packet Driver.

Note the difference between MicroVAX II / VAX3600 / VAX3900 / PDP11/93 / PDP11/94 which use DEQNA/DELQA/DESQA/DEUNA/DELUA, the MicroVAX 3100 which has SGEC adapter and the VAX4000 which may use any of these adapters.

The network subsystem is built as follows.

1. If you are configuring a DEQNA/DESQA/DELQA/DEUNA/DELUA first load the desired adapter. The CHARON-VAX/XX 3100/96/98 and 4000/106/108 automatically loads the SGEC thus no LOAD command is required for the SGEC (eza).

   ```
   LOAD <device name> <logical name>
   ```

   Example: `LOAD DELQA/DEQNA NIC`

2. Load the **packet_port** to connect the SGEC or the DEQNA/DESQA/DELQA/DEUNA/DELUA to the hardware network card.

   ```
   load packet_port/chnetwrk <logical name>
   interface="connection:<network connection name>"
   ```

   Example:
   ```
   load packet_port/chnetwrk NDIS
   interface="connection:CHARON"
   ```

3. Connect the SGEC or the DEQNA/DESQA/DELQA/DEUNA/DELUA adapter to the **packet_port** by setting the interface name.

   ```
   set <device name> interface= <logical name>

   Example: set NIC interface= NDIS
   ```

See below for configuration options.

3.15.1. SGEC Ethernet Controller

The built-in SGEC controller emulator ("**eza**") has the following additional parameters that you may specify with the set command:

Parameter	Type	Value
station_address	Character	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. 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. Format: XX-XX-XX-XX-XX-XX Or XX:XX:XX:XX:XX:XX
Interface	Character	Name of corresponding instance of packet_port component
rx_fifo_size	Numeric	rx_fifo_size sets the receive FIFO size. The value is specified in Kb and by default is pre-calculated from the connected port's size of receive queue. Typically, you don't need to change the rx_fifo_size parameter. It is available for extended tuning and bug hunting purposes.

Example:

```
set eza station_address="AF:01:AC:78:1B:CC"
```

3.15.2. DEQNA / DESQA / DELQA Ethernet Controllers

The CHARON-VAX/XX Q-bus systems and CHARON-PDP11 provide support for DEQNA / DESQA / DELQA / DEUNA / DELUA Ethernet controllers. Use the following command to load an instance of DEQNA / DESQA / DELQA / DEUNA / DELUA Ethernet controllers:

```
LOAD DEQNA <logical name>
LOAD DELQA/DEQNA <logical name>
LOAD DESQA/DEQNA <logical name>
LOAD DEUNA/DEUNA <logical name>
LOAD DELUA/DEUNA <logical name>
```

Example:

```
load DEQNA XQA
```

You may specify the name of the DLL, from which the corresponding device is loaded – DEQNA.DLL (for Qbus system) or DEUNA.DLL (for Unibus PDP system). However, for the DEQNA (or DEUNA) Ethernet controller the DLL name can be omitted, as it is the same as the name of the device. The DEQNA / DESQA / DELQA / DEUNA / DELUA offer the following configuration parameters which can be specified with the SET command:

Parameter	Type	Value
Address	Numeric	Specifies the CSR address. The address must be a valid QBUS 22-bit wide address in IO space. Initial value is 017774440 which is the factory setting for DEQNA / DESQA / DELQA Ethernet controllers.
station_address	Character	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. 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. Format: XX-XX-XX-XX-XX-XX or XX:XX:XX:XX:XX:XX where XX represents 8-bit value in hexadecimal form.
Interface	Character	Name of corresponding Instance of packet_port component.
rx_fifo_size	Numeric	The RX_FIFO_SIZE sets the receive FIFO size. The value is specified in KB and by default is pre-calculated from the connected port's size of the receive queue. Typically, you don't need to change the RX_FIFO_SIZE parameter. It is available for extended tuning and debugging purposes.

Use the ADDRESS and VECTOR parameters if loading several instances of DEQNA / DESQA / DELQA / DEUNA / DELUA. The ADDRESS and VECTOR parameters value must be unique for every instance of DEQNA / DESQA / DELQA / DEUNA / DELUA. (See the Application Note 32 for advice on configuring Qbus adapters.) Example:

```
load DEQNA XQA address=017774440
load DEQNA XQB address=017764460
```

3.15.3. PMAD-AA TurboChannel Ethernet Adapter

The CHARON-VAX/XX VAXstation 4000 Model 90 system provides support for additional (to preloaded EZA) PMAD-AA TurboChannel Ethernet controller. Use the following command to load an instance of PMAD-AA Ethernet controller:

```
LOAD PMADAA <logical name>
```

Example:

```
load PMADAA ECA
```

The PMAD-AA TurboChannel Ethernet controller offers the following configuration parameters which can be specified with the SET command:

Parameter	Type	Value

Parameter	Type	Value
station_address	Character	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. 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. Format: XX-XX-XX-XX-XX-XX Or XX:XX:XX:XX:XX:XX
Interface	Character	Name of corresponding instance of packet_port component
rx_fifo_size	Numeric	rx_fifo_size sets the receive FIFO size. The value is specified in Kb and by default is pre-calculated from the connected port's size of receive queue. Typically, you don't need to change the rx_fifo_size parameter. It is available for extended tuning and bug hunting purposes.

Example:

```
load PMADAA ECA interface=ECA0

load packet_port ECA0 interface="connection:CHARON"
```

3.15.4. DEBNI Ethernet Controller

Load parameter	Function
DEBNI	This command creates an instance of the DEBNI VAXBI Ethernet controller and associates it with a logical name.

```
Example: load DEBNI/DEMNA EXA
```

Set parameter for DEBNI	Type	Value
vax_bi_node_id	Number	Specifies the VAXBI slot in which the virtual DEBNI controller is placed. For CHARON-VAX/ /66X0 a free slot between 10 (A) and 14 (E) must be chosen.
interface	Text string	This connects the logical name representing a DEBNI instance with the logical name of a host

Set parameter for DEBNI	Type	Value
		network port, after the host network port is loaded.
station_address	Ethernet address	Station_address allows to specify the permanent address of the adapter. The default permanent address is read from the host system's NIC. Setting the station_address is required when configuring a satellite (remotely booted) system that runs DECnet or when a VAX application uses the NIC permanent address for license protection. Format: XX-XX-XX-XX-XX-XX or XX:XX:XX:XX:XX:XX
rx_fifo_size	Numeric	rx_fifo_size sets the receive FIFO size. The value is specified in Kb and by default is pre-calculated from the connected port's size of receive queue. Typically, you don't need to change the rx_fifo_size parameter. It is available for extended tuning and bug hunting purposes.

Examples:

```
set EXA vax_bi_node_id =11
set EXA station_address="XX:XX:XX:XX:XX:XX"
```

Any of the above **set** parameters can also be incorporated in the load command. Example:

```
load DEBNI/DEMNA EXA vax_bi_node_id =11
```

Assuming that the network packet port (see next paragraph) is defined as **EXA0**, the following command connects the configured DEBNI with this logical packet port:

```
set EXA interface=EXA0
```

It is recommended to use Network Control Center to get the correct configuration lines, or to refer to sample configuration files.

If your VAX/VMS system disk is configured for automatic TCP/IP startup and you use UCX, not loading an Ethernet adapter in the CHARON-VAX configuration can cause a VMS crash. The problem appears only if UCX is enabled while the networking device is missing. DECnet works correctly.

3.15.5. Network interface

Use the LOAD command to create an instance of the NDIS6 packet port and to connect it to the hardware network card:

Parameter	Type	Value
Interface	Character	Host system Interface name. Mandatory parameter.

```
load packet_port/chnetwrk <logical name> interface="connection:<network
    connection name>"
```

The following additional **packet_port** parameters can also be specified:

Parameters	Type	Value
port_enable_mac_addr_change	Boolean	If true is specified, CHARON-VAX/XX / CHARON-PDP11 set the appropriate Ethernet address automatically. If false is specified, set the Ethernet address manually with the NETSETUP utility. The default value is true.
port_ignore_on_rx	Numeric	port_ignore_on_rx provides the ability to shutdown the port when the sequential errors "on receive" exceeds the specified number. Typically, errors on receive indicate serious (unrecoverable) errors. By default, the value is set to the value of the port_pending_rx_number parameter. Value of ‘0’ means infinite.
port_retry_on_tx	Numeric	port_retry_on_tx controls the number of times the port attempt to transmit the packet until giving up. By default, the value is 3. Increasing this value might introduce problems in carrier loosing logic, because not all NIC drivers support carrier status query. Typically, you do not need to increase the value.
port_pending_rx_number	Numeric	port_pending_rx_number sets the number of pending receive buffers. The default value is 63. The maximum value allowed by “CHARON Protocol Driver (NDIS6)", is 195. 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. Typically, you do not need to change this parameter.
port_pending_tx_number	Numeric	port_pending_tx_number sets the number of buffers the port uses to transmit. The default value is 62. You may want to increase the port_pending_tx_number value if the log file indicates dropped TX packets due to TX queue overflow. Typically, you do not need to change this parameter.

Parameters	Type	Value
suspend_msg_on_mac_change	Boolean	To avoid confusion arrising from non critical errors during MAC address change, by default, logging is supressed (default value is **true**). To enable tracing during MAC address change set this parameter to **false**

```
Example:
set eza_0 suspend_msg_on_mac_change=false
```

Once you have loaded one of the packet interfaces connect the built-in Ethernet Controller EZA or loaded instance(s) of DEQNA / DELQA / DESQA to this port in the following way:

```
set eza interface=<instance name>, example:
set eza interface=eza_0
```

Example for the DEQNA / DESQA / DELQA:

```
load DEQNA XQA
load packet_port/chnetwrk XQA0 interface="connection:CHARON"
set XQA interface = XQA0
```

3.15.6. Ethernet Q-bus Adapter and Cluster configuration rules

With VMS Cluster using VMS V 5.5 and above only use DELQA and DESQA Ethernet adapters that are supported (VMS Cluster SPD). The default DEQNA device is not supported for SCS Cluster protocol and emulated VAX will fail with CLUEXIT Bugcheck.

3.15.7. 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).

Note integrated SGEC Ethernet "EZA" on MV3100 & VAX 4000-106/108 is supported by DECnet OSI.

Integrated ESA (AMD Lance 7990) device is supported too but it is not implemented by Charon-VAX/XX at the moment.

3.16. VAX Non Volatile Memory (NVRAM)

Parameter	Type	Value
container	Character	This parameter tells the emulator where to preserve NVRAM content. It will keep the current time of the emulated VAX/PDP11 (when you do not run the emulator) and some (but not all!) of the console parameters.

The NVRAM container can be specified as follows:

```
set toy <parameter>=<Value>
```

Example:

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

In the above, TOY is an abbreviation for TIME-OF-YEAR. If your VAX/PDP11 operating system cannot determine the date and time automatically the NVRAM file is probably corrupted. To fix this, delete the file; reboot your system, and set the date and time in the VAX/PDP11 operating system again. To verify that it now works correctly, shut down the VAX/PDP11 operating system and close CHARON-VAX/XX / CHARON-PDP11. Start the emulator again and check that the VAX/PDP11 operating system can determine the correct date and time from the emulated system clock.

The CHARON-VAX/XX / CHARON-PDP11 system time is stored as an offset to the host system time. Thus do not reset the host system time. Note that, if you are using a date limited CHARON-VAX/XX / CHARON-PDP11 license, re-setting the host system time can permanently disable the license.

3.17. The Flash ROM state

The Flash ROM stores the VAX console parameters including any saved boot settings.

Parameter	Type	Value
Container	Character	This parameter tells the emulator where to store intermediate state of the Flash ROM if changed. The container file is only created or updated if the defaults are changed. Note that the Flash ROM device emulation is only present in the emulated MicroVAX3100/96/98 and VAX4000/106/108.

The ROM file of the emulated VAXes can be specified as follows:

```
set rom <parameter>=<value>
```

Example:

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

If your operating system cannot determine the boot parameters, the Flash ROM file is probably corrupted. Delete the file and restart the emulator. Now set the boot parameters and check that the emulator can determine the boot parameters automatically at the next restart.

3.18. The LPV11 Line printer Controller

CHARON-VAX/XX / CHARON-PDP11 Q-bus systems provide support for the LPV11 Parallel Line Printer controller. The LPV11 emulation is implemented using the CHARON Qbus API (CHAPI). This interface is designed to allow third-parties to custom design emulated Qbus peripherals. To enable CHAPI modules request an update to the CHARON-VAX/CHARON-PDP11 license. For details on CHAPI read the CHARON-VAX/CHARON-PDP11 CHAPI user manual available from the CHARON-VAX/CHARON-PDP11 website.

Use the following command to load an instance of an LPV11 Parallel Line Printer controller:

```
load CHAPI <logical name> dll=LPV11
```

Example:

```
load CHAPI LPA0 dll=LPV11
```

The LPV11 (being a CHAPI component) provides the following configuration parameters, to be specified with a SET command:

Parameter	Type	Value
Address	Numeric	Specifies the CSR address. The address must be a valid QBUS 22-bit wide address in IO space. Initial value is 017777514 which is the factory setting for the LPV11.
Vector	Numeric	Specifies the interrupt vector. Initial value is 0200 which is the factory setting for the LPV11.
Parameters	Character	Specifies the name of the file to which the LPV11 prints the text, the name of a physical printer or a TCPIP port to connect to external utility like HOSTprint (along with some additional parameters): "\\.\LPT<n>:" – physical port to connect to a physical printer. "port" – TCPIP port to connect to external application "application" – application to run after creating the port. Note that the name of the application including its own parameters must be framed with ‘ symbol.

It’s possible to load as many LPV11 devices as you wish and the system running on the emulated VAX/PDP11 allows. To do it use the standard Qbus parameters "address" and "vectors" to load the LPV11 instance to correct place on Qbus.

The following example demonstrates how to load 2 instances of LPV11 mapped to 2 host system LPT ports:

```
load chapi lpv1 address=017777514 vector=0200
set lpv1 dll=lpv11.dll parameters="\\.\LPT1"

load chapi lpv2 address=017764004 vector=0170
set lpv2 dll=lpv11.dll parameters="\\.\LPT2"
```

In this case the printers must be printers that can understand the LPV11 driver of the emulated VAX/PDP11. Use printers that work with a hardware VAX/PDP11.

Use "configure" utility (VAX) available from the SRM console to find out the correct Qbus addresses and interrupt vectors for multiple LPV11 instances.

It is also possible to redirect output of LPV11 to some external application, like, for example, HOSTprint (see the “Utilities” chapter). This application allows printing to the Windows system printers using the desired font.

The following additional parameters are typically used to tune the HOSTprint for correct printing with LPV11:

- **-port** – the TCP/IP port the HOSTprint should connect to. It is the same port opened by the given LPV11 instance.
- **-fontsize** – the font size to be used for printing.
- **-font** – the font to be used for printing. The font name must be framed with "\’ symbols.

In the following example LPV11 instance called *lpv1* opens host port 10004 and starts HOSTprint application, directing it to connect to the port 10004 and use the font "Courier New", 12 for printing:

```
load chapi lpv1 address=017777514 vector=0200
set lpv1 dll=lpv11.dll parameters="port=10004 application='VAXprint -
port=10004 -fontsize=12 -font=\Courier New\'"
```

3.19. The DUMMY_VCB02 device

This chapter applies only to: MicroVAX 3600, MicroVAX 3900, VAXserver 3900 and VAXserver 3600 emulation. The dummy VCB02 device emulates the Qbus registers of a VCB02 graphic controller (at the secondary VCB02 device address) but does not implement graphic display functionality. Its purpose is to be able to use a workstation version of VMS. When this device is loaded and VAX/VMS boots with a "D" (workstation) type license, the license is accepted as VMS recognizes that a VCB02 is present. As the dummy VCB02 is located on the secondary address (0x3fff02), VMS boots using the normal console terminal without graphics capability. The format is as follows:

```
load dummy_vcb02/null_vcb02 dummy
```

Note that since this dummy device cannot draw graphics, CHARON-VAX will fail the initial hardware diagnostics, but it will still boot correctly.

3.20. Creating a VAX configuration manually.

This chapter explains step by step how to create a simple configuration file for CHARON-VAX/XX for a VAX 4000 Model 108. Configuration files for other VAX and PDP11 models can be created in a similar way. In this example the following configuration will be created:

- 256Mb of memory.
- ACE (the Advanced VAX CPU Emulation) disabled.
- A VAX console emulated with the Putty terminal emulator.
- One disk on a SCSI adapter, emulated by a disk image
- One Floppy disk on a SCSI adapter, mapped to the A: device.
- One SCSI CD-ROM drive.

- One SGEC Ethernet Adapter.
- One RQDX3 disk controller with a disk image mapped to this controller.
- One DHQ11 serial line controller, line 0 of which is mapped to the Windows COM1: port.
- One DELQA Ethernet Adapter, mapped to the second network card of the host.

See the Chapter on Device Configuration and the configuration examples in the Appendix for more complete explanations. This is a relatively simple configuration that can rely on default values for address and vector. Note that the parameters ADDRESS and VECTORS may be specified for a complex Qbus configuration. Use the SRM console or SYSGEN CONFIGURE option to identify the correct values of the Qbus addresses and vectors.

3.20.1. Set the model type

The first line in the configuration file must be an exact specification of the target VAX model to be emulated. In our case it is the VAX4000 Model 108:

```
set session hw_model="VAX_4000_Model_108"
```

3.20.2. Create log, NVRAM and ROM files

Configure files for the system log, the NVRAM and the ROM file with the following lines:

```
set session log="charon.log" log_method="append"
set toy container="charon.dat"
set rom container="charon.rom"
```

By default these files are stored in the folder from where the CHARON-VAX/XX image is executed. If you like, you can specify some exact path for your log file, for instance:

```
set session log="C:\Logs\charon.log" log_method="append"
```

Note: Specify the **log_method** before or in the same line as the **log** parameter. The **rom** definition is only applicable to the MicroVAX3100 Models 96, 98 and VAX4000 Models 106, 108.

3.20.3. Optionally specify the ACE mode (VAX emulators only)

By default the system configures ACE (Advanced VAX CPU emulation) as defined by your license key (the "Plus" versions of the CHARON-VAX emulator products include ACE). To see the effect of running the emulator without ACE when you have a "Plus" license, code the option as follows:

```
set cpu ace_mode=false
```

To specifically set the ACE option, enter "true" instead of "false". Note that ACE is switched off, if the host system configuration does not meet the host system CPU or memory requirements to run ACE.

3.20.4. Specify the VAX memory

Set the required amount of VAX memory (in our example 256Mb) with the following line:

```
set ram size=256
```

The maximum emulated memory is limited by four elements

1. The CHARON-VAX license key restricts the maximum emulated memory, i.e. CHARON-VAX/XM is limited to 128MB, CHARON-VAX/XK is limited to 256MB and CHARON-VAX/XL is limited to 512MB of memory.
2. The emulated VAX/PDP11 model may be limited. For example the standard versions of the MicroVAX 3600/3900 and VAXserver 3600/3900 are limited to a maximum of 64 MB, PDP11/93 and PDP11/94 are limited to a maximum of 4MB.
3. The version of your operating system may not support the maximum memory offered by your CHARON-VAX/CHARON-PDP11 license.
4. The original VAX/PDP11 may have had less memory and thus the operating system may need to be reconfigured to take advantage of the extended memory.

3.20.5. Set the default VAX console

The default VAX console is connected to the 4th port (#3) of the QUART adapter and connected to the putty.exe emulator provided as a part of the kit. The Putty emulator is started by calling it in the following way: "**putty.exe –load OPA0**":

```
load virtual_serial_line/chserial OPA0 port=10003 application="putty.exe
    -load OPA0"
set quart line[3]=OPA0
```

3.20.6. Define the disk drive

Connect a VAX disk image to the first built-in SCSI adapter named PKA. The SCSI address of this disk will be defined as "0", so it will appear in the VAX/VMS environment as DKA0:

```
load virtual_scsi_disk/chscsi pka_0 scsi_bus=pka scsi_id=0
set pka_0 container[0]="system.vdisk"
```

Note that the emulator will look for the disk image in the subdirectory "Build_XXX" of your CHARON-VAX/XX / CHARON-PDP11 installation directory if you use this syntax. It is recommended to specify the full path to your disk image as shown in this example:

```
set pka_0 container[0]="C:\Charon\Disks\system.vdisk"
```

In this example the notation container [0] is used. As zero is the default logical unit number (LUN) of a container, the following statement has the same effect:

```
set pka_0 container="C:\Charon\Disks\system.vdisk"
```

3.20.7. Configure the Floppy disk

To configure the A: floppy disk drive on the host system as the VAX floppy drive DKA100: (PKA adapter, SCSI address 1) write the following in your configuration file:

```
load floppy_scsi_device/chscsi pka_1 scsi_bus=pka scsi_id=1
```

PKA_1 is the logical name for this device, which is only used as a reference in the configuration file. In this case all necessary parameters are specified in a single load command, and **PKA_1** is not referenced elsewhere.

SCSI-BUS and **SCSI_ID** define the VAX bus and VAX SCSI address of the mapped VAX floppy drive.

3.20.8. Configure a SCSI CD-ROM drive

To configure an IDE CD-ROM drive on the host system (in this case identified as \\.\CdRom0) on the emulated VAX as SCSI CD-ROM drive DKA200: (PKA adapter, SCSI address 2) configure as follows:

```
load atapi_scsi_device pka_2 scsi_bus=pka scsi_id=2
set pka_2 container="\\.\CdRom0"
```

3.20.9. Configure the default Ethernet Adapter

The next step is to configure your emulated Ethernet adapter. In this case the default SCEG device that is always present in a VAX/PDP11 4000-108. If not present, install first the CHARON NDIS6 packet driver on the host system. Follow the description in the chapter on network installation.

The connection name used for CHARON-VAX/CHARON-PDP11 must be entered in the configuration file. Open "Network connections" and copy the connection name to the clipboard, to paste it in the configuration command.

If the clipboard contains "CHARON" connection, enter the following in your configuration file:

```
load packet_port/chnetwrk eza_0 interface= "connection:CHARON"
```

and connect the packet port to the built-in SGEC by defining:

```
set eza interface=eza_0
```

For the **EZA** device it is not strictly required to specify the DLL name of the Ethernet emulator component (chnetwrk.dll). The SCEG controller is automatically loaded with the name **EZA** and all required DLLs for networking.

3.20.10. Configure the RQDX3 disk controller

To load the RQDX3 disk controller use the following syntax:

```
load RQDX3/RQDX3 DUA
```

Note that the name of the rqdx3.dll (that contains the RQDX3 controller model) is not strictly required here since its name is the same as the disk controller name.

As the next step specify the host disks or disk images that are going to represent VAX/PDP11 disks. In our example we have a single VAX disk mapped to a host file:

```
set DUA container[0]=" C:\Charon\Disks\user.vdisk"
```

3.20.11. The DHQ11 serial line controller

To configure the DHQ11 serial line controller, first load the controller and then load and connect a *virtual_serial_line* or a *physical_serial_line* interface to the corresponding line of the DHQ11 controller as it was shown for a virtual_serial_line in the chapter on serial lines:

```
load DHQ11/DHV11 TXA
load physical_serial_line/chserial TXA0 line="\\.\COM1"
set TXA line[0]=TXA0
```

The "/DHV11" specification tells the emulator that the DHV11.DLL must be loaded for the DHQ11 controller. This DLL needs to be loaded only once; you can omit this specification for subsequent instances of the DHV11, DHQ11, CXY08, CXA16 and CXB16 serial line controllers.

3.20.12. The DELQA Ethernet adapter

First load the controller itself:

```
load DELQA/DEQNA XQA
```

Once the DLL is loaded you can omit the "/DEQNA" specification for the next instances of the DELQA / DESQA. Note that the DEQNA does not need a specific request to load its DLL since the device name is the same as the name of the DLL.

```
load packet_port/chnetwrk XQA0 interface="connection:CHARON2"
set XQA interface=XQA0
```

Note that, if the packet_port is loaded before any Ethernet adapter, you should load its DLL as well:

```
load packet_port/chnetwrk XQA0
```

In this configuration example the DELQA and SGEC are already loaded, causing the loading of all the required DLLs belonging to the network emulation. Hence the specification "/chnetwrk" is not strictly required here.

3.20.13. The resulting configuration

The resulting configuration file looks like this (the # character is the comment character):

```
#The CHARON-VAX model

set session hw_model="VAX_4000_Model_108"

#Logs and system parameters
    set toy container="charon.dat"
    set rom container="charon.rom"
    set session log="C:\Logs\charon.log" log_method="append"
    set cpu ace_mode=false
    set ram size=256

#Console
    load virtual_serial_line/chserial OPA0 port=10003
    application="putty.exe -load OPA0"
    set quart line[3]=OPA0

#SCSI system disk
    load virtual_scsi_disk/chscsi pka_0 scsi_bus=pka scsi_id=0
    set pka_0 container="C:\Charon\Disks\system.vdisk"

#SCSI Floppy disk
    load floppy_scsi_device/chscsi pka_1 scsi_bus=pka scsi_id=1

#ATAPI CDROM as SCSI device
    load atapi_scsi_device/chscsi pka_2 scsi_bus=pka scsi_id=2
    set pka_2 container="\\.\CdRom0"

#Network on SGEC
    load packet_port/chnetwrk eza_0 interface="connection:CHARON"
    set eza interface=eza_0

#RQDX3 disk controller on Qbus

    load RQDX3/RQDX3 DUA

    set DUA container[0]=" C:\Charon\Disks\user.vdisk"

#DHQ11 serial line controller on Qbus

    load DHQ11/DHV11 TXA

    load physical_serial_line/chserial TXA0 line="\\.\COM1"

    set TXA line[0]=TXA0

#DELQA Ethernet Adapter on Qbus

    load DELQA/DEQNA XQA

    load packet_port/chnetwrk XQA0 interface="connection:CHARON2"

    set XQA interface=XQA0
```

3.21. Starting the sample configuration

Save your configuration file under the CHARON-VAX/XX installation directory in subdirectory “Build_XXX”. Use the default configuration file to start CHARON-VAX/XX from the desktop or start menu shortcuts, if available. If, for example, you name the configuration file **mycfg.cfg** you can create your own shortcut or start CHARON-VAX/XX with this configuration file from the CHARON Launcher.

The CHARON Launcher is also useful to debug a configuration file. It displays any errors and the log file from the same window from which you can edit and start your configuration. Alternatively open up a DOS window, set the directory to "Build_XXX" and issue the following command:

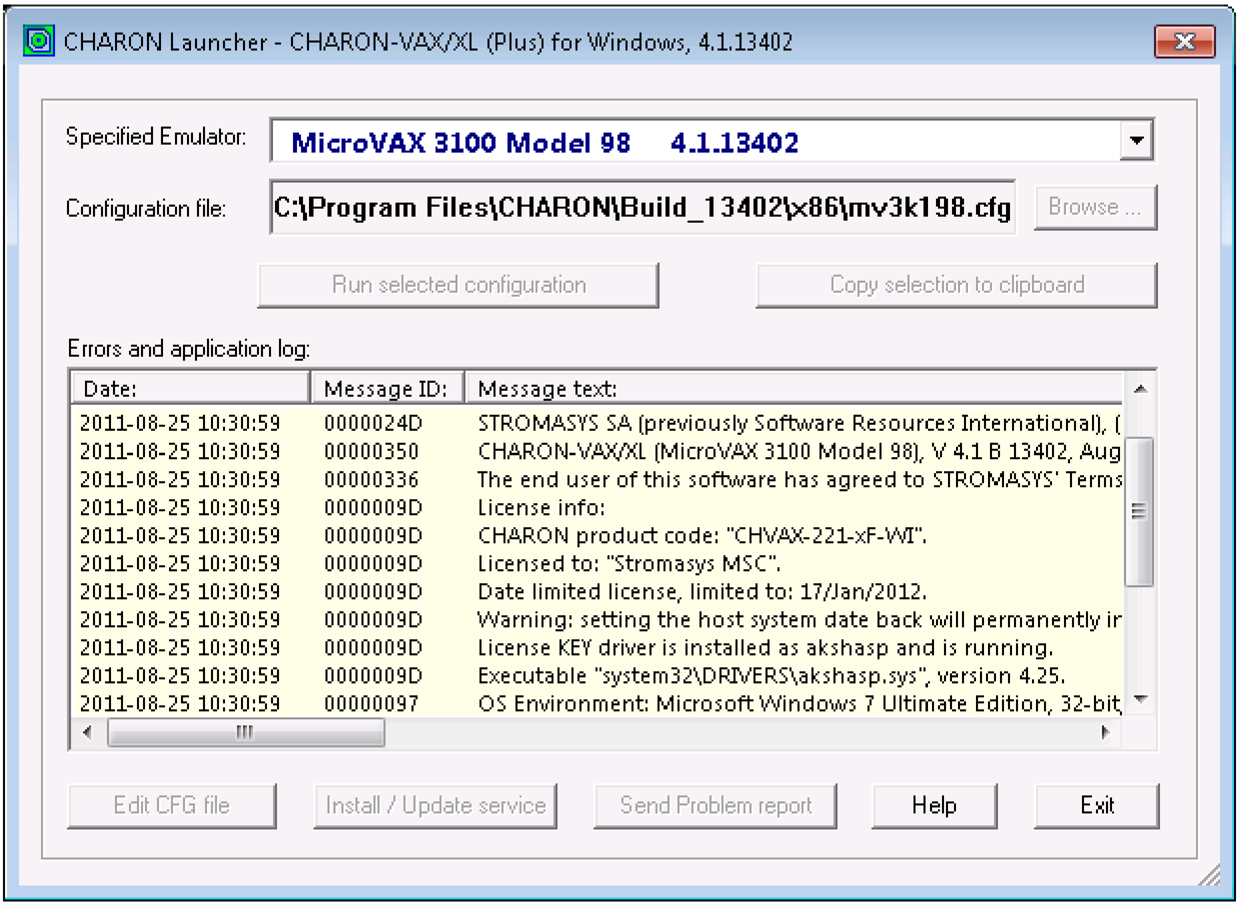
```
> vx4k108.exe mycfg.cfg
```

4. Utilities

4.1. CHARON Launcher

CHARON Launcher is used to configure and run a CHARON-VAX/XX / CHARON-PDP11 instance. Browse to a CHARON-VAX/XX / CHARON-PDP11 configuration file you want to use, and select the product version. In case of only one version is installed the Launcher will select it automatically. CHARON-Launcher will display the VAX/PDP11 model specified in this configuration file.

Click Help or press F1 for help.



CHARON Launcher - CHARON-VAX/XL (Plus) for Windows, 4.1.13402

Specified Emulator: MicroVAX 3100 Model 98   4.1.13402

Configuration file: C:\Program Files\CHARON\Build_13402\x86\mv3k198.cfg

Errors and application log:

```
Date:                Message ID:   Message text:
2011-08-25 10:30:59  0000024D      STROMASYS SA (previously Software Resources International), (
2011-08-25 10:30:59  00000350      CHARON-VAX/XL (MicroVAX 3100 Model 98), V 4.1 B 13402, Aug
2011-08-25 10:30:59  00000336      The end user of this software has agreed to STROMASYS' Terms
2011-08-25 10:30:59  0000009D      License info:
2011-08-25 10:30:59  0000009D      CHARON product code: "CHVAX-221-xF-WI".
2011-08-25 10:30:59  0000009D      Licensed to: "Stromasys MSC".
2011-08-25 10:30:59  0000009D      Date limited license, limited to: 17/Jan/2012.
2011-08-25 10:30:59  0000009D      Warning: setting the host system date back will permanently ir
2011-08-25 10:30:59  0000009D      License KEY driver is installed as akshasp and is running.
2011-08-25 10:30:59  0000009D      Executable "system32\DRIVERS\akshasp.sys", version 4.25.
2011-08-25 10:30:59  00000097      OS Environment: Microsoft Windows 7 Ultimate Edition, 32-bit,
```

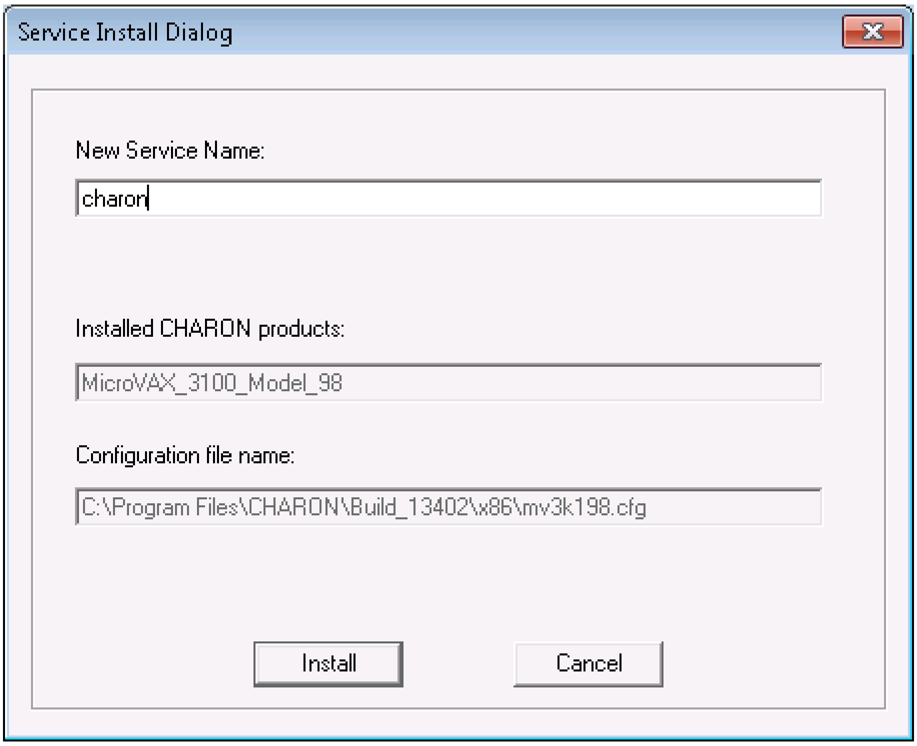
Click "Run selected configuration" to run CHARON-VAX/XX / CHARON-PDP11. Launcher displays the CHARON log (including any configuration and run-time errors) in the Launcher Window. While CHARON-VAX/XX or CHARON-PDP11 is running, the CHARON Launcher updates the log file contents every 60 seconds. After CHARON-VAX/XX / CHARON-PDP11 stops the Launcher refreshes log window.

The log file language depends on the locale settings of your system. English, Chinese Simplified, Dutch, Spanish and Swedish versions are available.

Click "Edit CFG file" to edit the selected configuration file using Notepad editor. The ability of running a configuration, displaying the log and editing the configuration makes the CHARON Launcher a useful tool for setting up and troubleshooting CHARON instances.

You can prepare and send a problem report file to your support team by clicking on the "Send Problem report" button. Complete the message by filling in the blanks in the draft message generated by CHARON.

You can configure CHARON-VAX/XX / CHARON-PDP11 as a Windows service by pressing the button "Install / Update service". The following dialog is displayed:



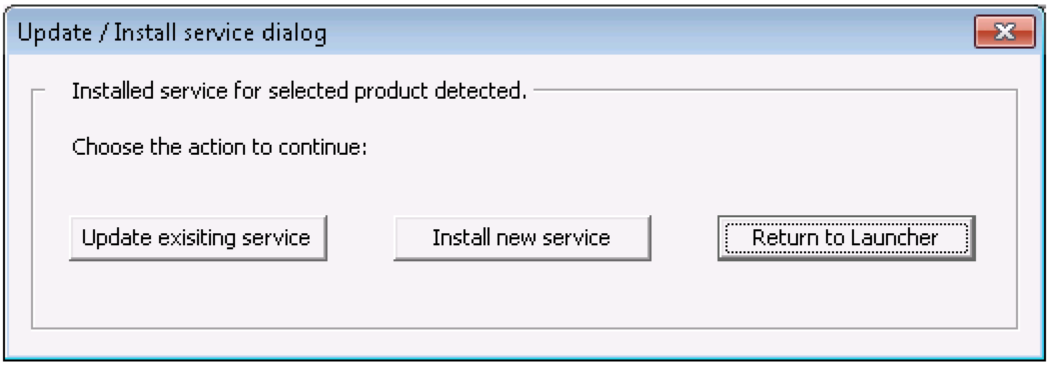
Service Install Dialog

New Service Name: charon

Installed CHARON products: MicroVAX_3100_Model_98

Configuration file name: C:\Program Files\CHARON\Build_13402\x86\mv3k198.cfg

Enter the desired service name in "New Service Name" and press the "Install" button. Note that the name of the service cannot have spaces. If the service already exists the following dialog is displayed:

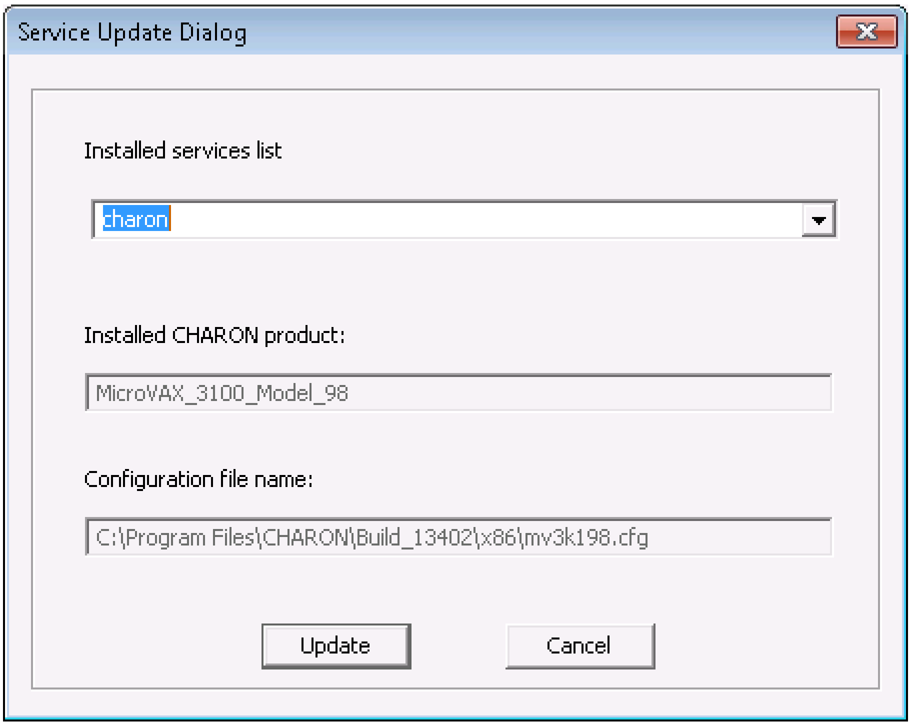


Update / Install service dialog

Installed service for selected product detected.

Choose the action to continue:

If "Install new service" button is pressed the CHARON Launcher displays the dialog for creating new service shown above. Otherwise the following dialog is displayed:



Installed services list

charon

Installed CHARON product:

MicroVAX_3100_Model_98

Configuration file name:

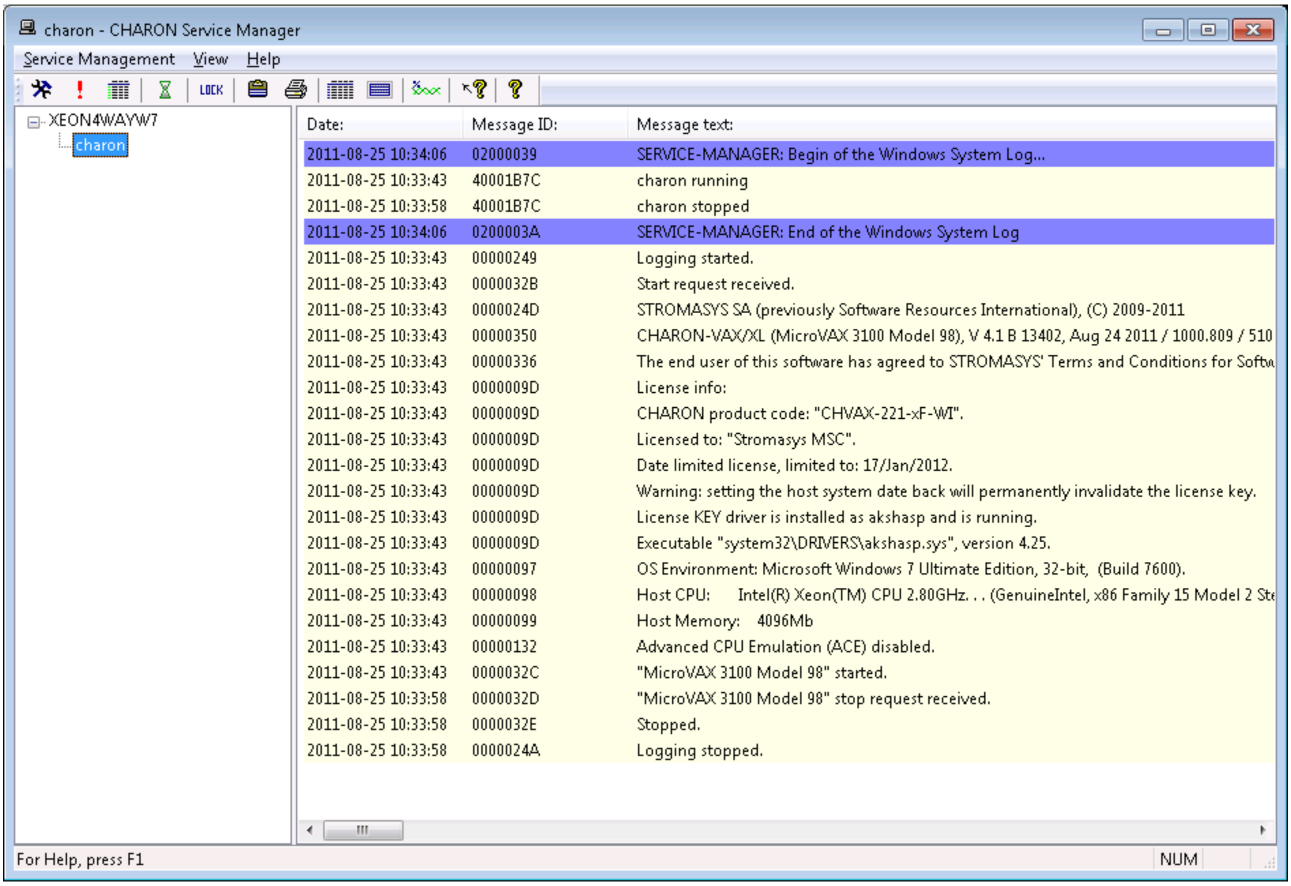
C:\Program Files\CHARON\Build_13402\x86\mv3k198.cfg

Press "Update" button. Once the "Service Update Dialog" has disappeared press "Back" button in the "Update / Install Service Dialog". The Launcher will update the service and inform if the service was successfully updated.

Use the "Copy selection to clipboard" button to copy selected lines of the log to the clipboard.

4.2. CHARON Service Manager

CHARON Service Manager manages CHARON services (i.e. VAX/PDP11 instances, configured as Windows services) available on your computer. The utility starts automatically on login to the host system and creates an icon in the system tray. Click on the icon to invoke the CHARON Service Manager main window. If the utility is not running, it is possible to start it directly from the tray icon with the right click and the "Start" button.



```
Date:                Message ID:  Message text:
2011-08-25 10:34:06  02000039     SERVICE-MANAGER: Begin of the Windows System Log...
2011-08-25 10:33:43  40001B7C     charon running
2011-08-25 10:33:58  40001B7C     charon stopped
2011-08-25 10:34:06  0200003A     SERVICE-MANAGER: End of the Windows System Log
2011-08-25 10:33:43  00000249     Logging started.
2011-08-25 10:33:43  0000032B     Start request received.
2011-08-25 10:33:43  0000024D     STROMASYS SA (previously Software Resources International), (C) 2009-2011
2011-08-25 10:33:43  00000350     CHARON-VAX/XL (MicroVAX 3100 Model 98), V 4.1 B 13402, Aug 24 2011 / 1000.809 / 510
2011-08-25 10:33:43  00000336     The end user of this software has agreed to STROMASYS' Terms and Conditions for Softw
2011-08-25 10:33:43  0000009D     License info:
2011-08-25 10:33:43  0000009D     CHARON product code: "CHVAX-221-xF-WI".
2011-08-25 10:33:43  0000009D     Licensed to: "Stromasys MSC".
2011-08-25 10:33:43  0000009D     Date limited license, limited to: 17/Jan/2012.
2011-08-25 10:33:43  0000009D     Warning: setting the host system date back will permanently invalidate the license key.
2011-08-25 10:33:43  0000009D     License KEY driver is installed as akshasp and is running.
2011-08-25 10:33:43  0000009D     Executable "system32\DRIVERS\akshasp.sys", version 4.25.
2011-08-25 10:33:43  00000097     OS Environment: Microsoft Windows 7 Ultimate Edition, 32-bit,  (Build 7600).
2011-08-25 10:33:43  00000098     Host CPU:     Intel(R) Xeon(TM) CPU 2.80GHz. . . (GenuineIntel, x86 Family 15 Model 2 Ste
2011-08-25 10:33:43  00000099     Host Memory:   4096Mb
2011-08-25 10:33:43  00000132     Advanced CPU Emulation (ACE) disabled.
2011-08-25 10:33:43  0000032C     "MicroVAX 3100 Model 98" started.
2011-08-25 10:33:58  0000032D     "MicroVAX 3100 Model 98" stop request received.
2011-08-25 10:33:58  0000032E     Stopped.
2011-08-25 10:33:58  0000024A     Logging stopped.
```

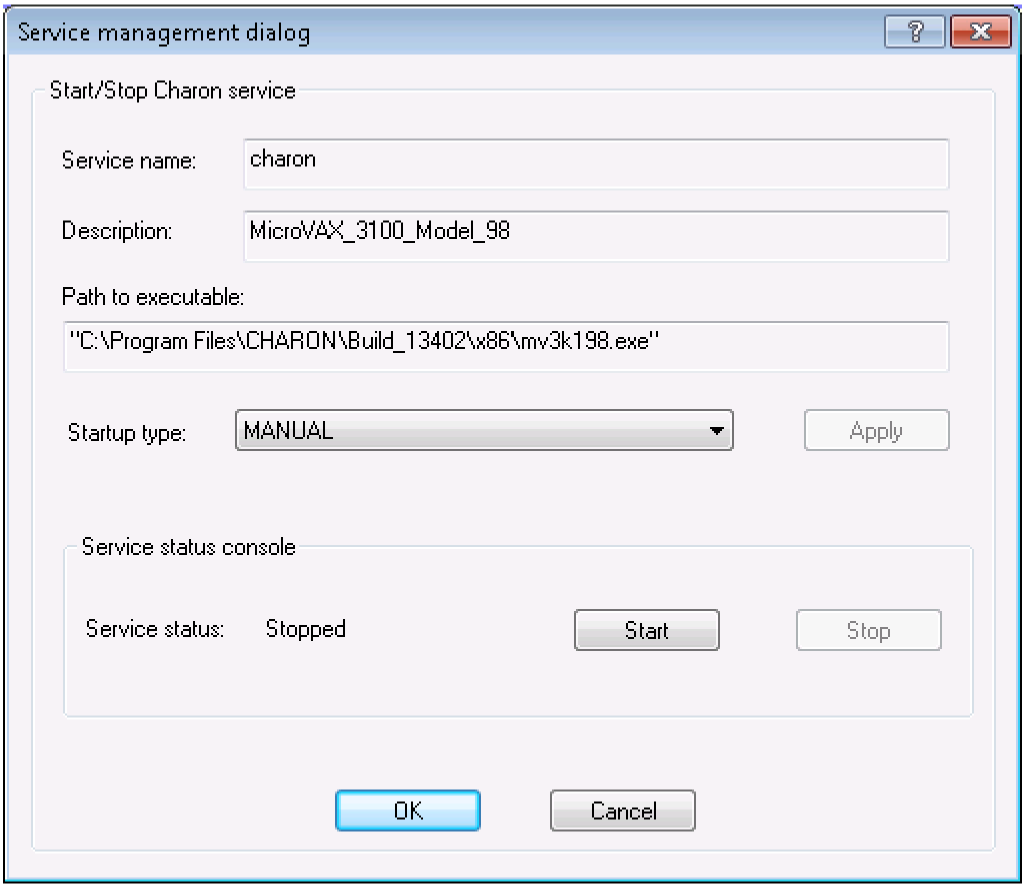
In the Services Manager, the tree structure on the left shows all CHARON services installed on the host system. Initially the right hand panel displays the product license key information. Clicking on a service name shows the most recent event log display for this service in the right hand panel.

The buttons on the panel have the following meaning (left to right):

1. Manage CHARON services invokes a panel with the following options:

   "Service Name" stands for the name of the chosen service, "Description" displays the CHARON model, and "Path to executable" refers to the executable to run.

   "Startup type" can be "Manual", "Automatic" or "Disabled". Type or choose the desired type and press "Apply" to apply the setting.



Service management dialog

Start/Stop Charon service

Service name: charon

Description: MicroVAX_3100_Model_98

Path to executable: "C:\Program Files\CHARON\Build_13402\x86\mv3k198.exe"

Startup type: MANUAL

Service status console

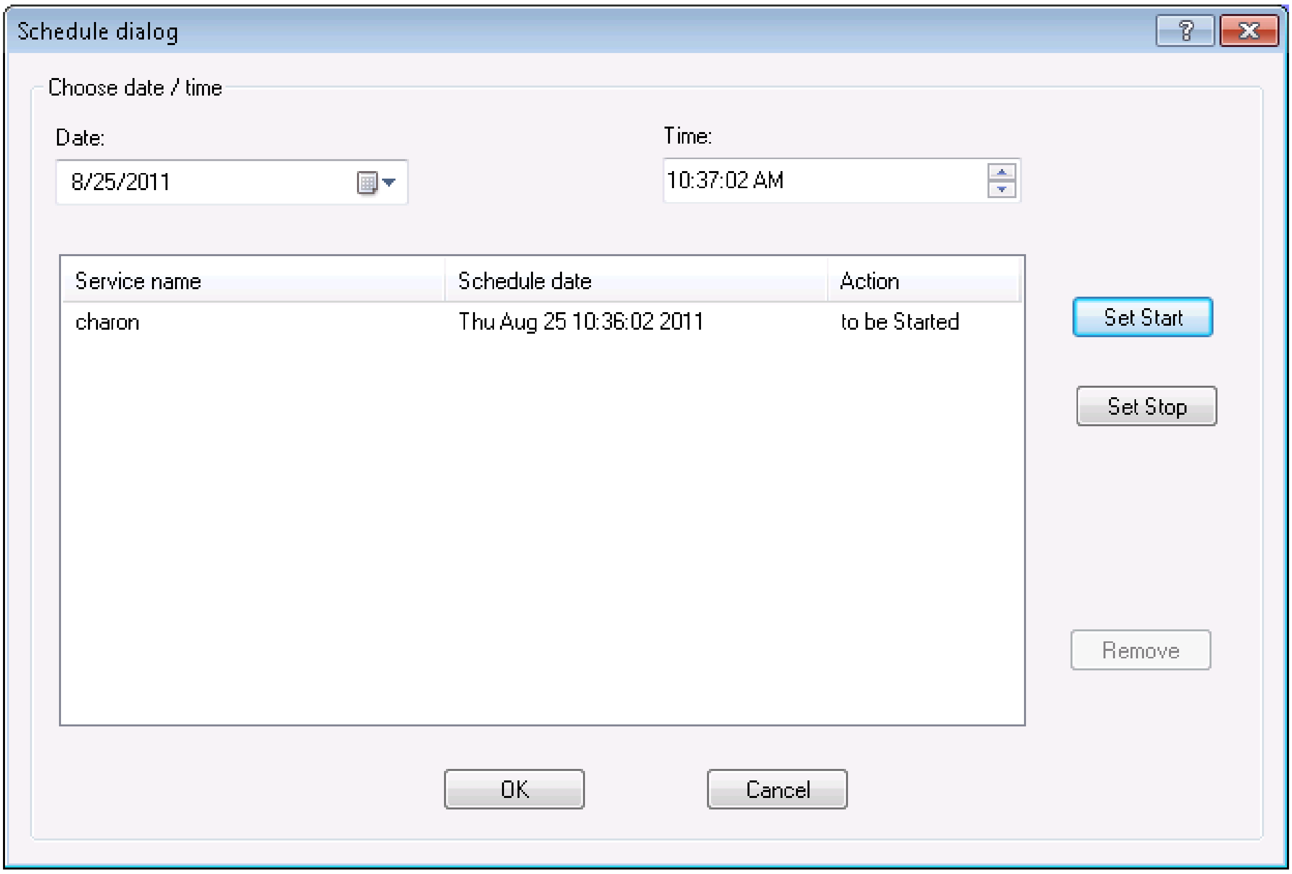
Service status: Stopped

"Service Status" gives information about the current status of the service. You can start the service or stop it depending on its actual status.

2. *"Remove selected CHARON services"* removes the service you currently selected.

3. *"Update the list of installed CHARON services"* updates the service list shown in the left pane of the application window. This button is useful if you add new services while the CHARON Service manager runs. Just added services are invisible until you restart the CHARON Service manager or update this list. This item is also available through the corresponding item on the "Service Management" submenu.

4. *"Schedule start service" (al*so available through the corresponding item on the "Service Management" submenu) sets the start and, if necessary, stop time of a selected service. It invokes the following dialogue:



Schedule dialog

Choose date / time

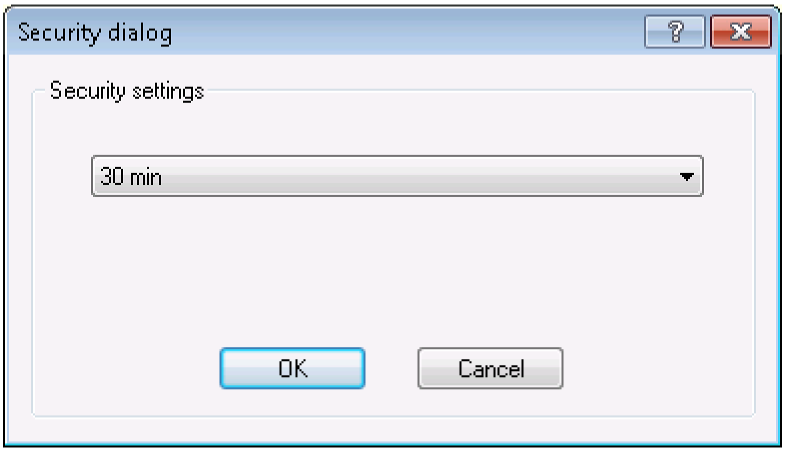
Date: 8/25/2011

Time: 10:37:02 AM

Service name	Schedule date	Action
charon	Thu Aug 25 10:36:02 2011	to be Started

Press the "Set start" or "Set Stop" buttons to apply the date and time. To remove any schedule date, choose it and press the "Remove" button. Note that all scheduled tasks proceed only if the CHARON Service manager runs. No scheduled information is stored in the system registry. When the CHARON service manager restarts, the scheduled task queue will be empty.

5. *Security Setting* (also available through the corresponding item on the "Service Management" submenu). This function locks the computer after a selected amount of time.



Security dialog

Security settings: 30 min

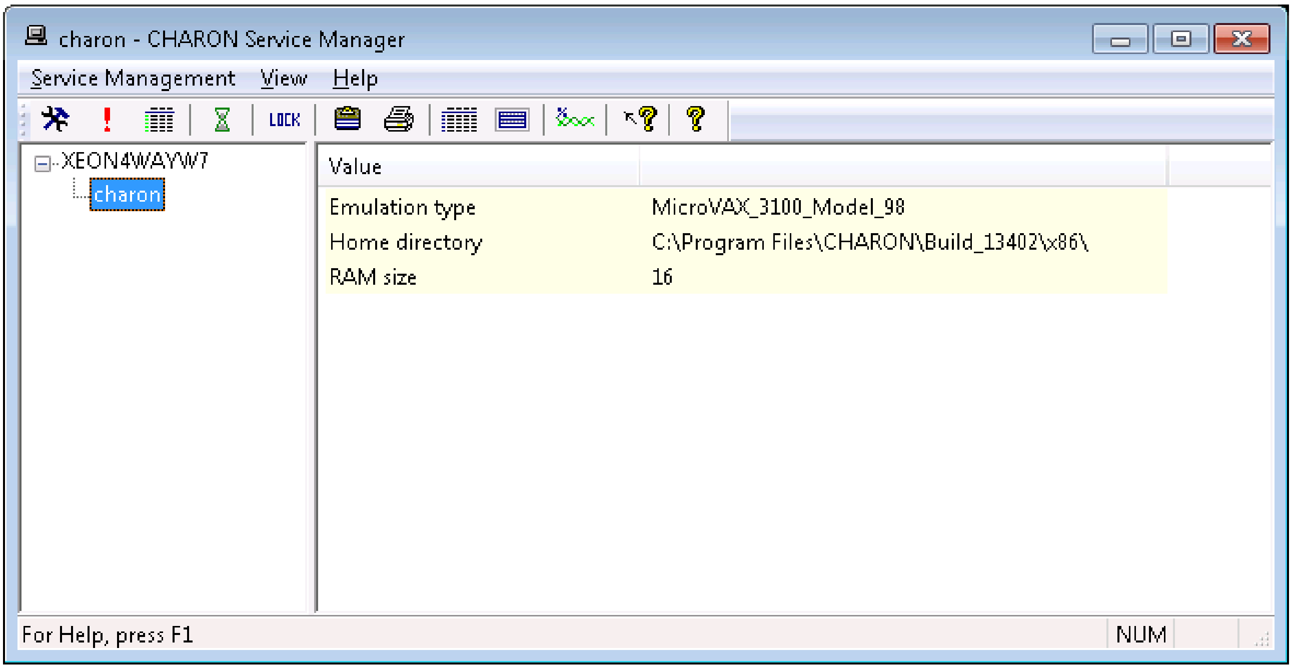
Enter the Windows User name/password combination in the standard Windows box to regain access. By default this function is disabled.

6. *The Mail Problem Report* (also available through the mail item on the "Service Management" submenu) automatically formats a problem report file to being sending at the support team for investigation.

7. *Print the active document* opens up the standard printer dialogue to print the right hand panel of the application. Use the submenu "Service Management" to customize printing through "Print Preview" and "Print Setup".

8. *Display service startup and error log* displays the service startup and event log of a chosen service in the right panel of the application. This function is also available on the "View" submenu.

9. *Display the configuration* displays the configuration of the chosen service on the right panel of the application. This function is also available on the "View" submenu.

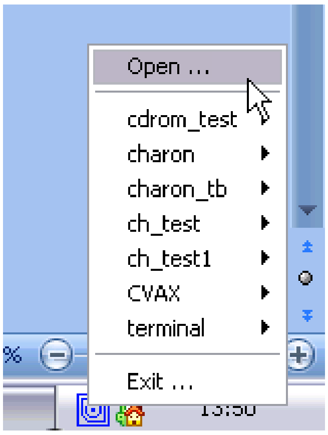


Value	
Emulation type	MicroVAX_3100_Model_98
Home directory	C:\Program Files\CHARON\Build_13402\x86\
RAM size	16

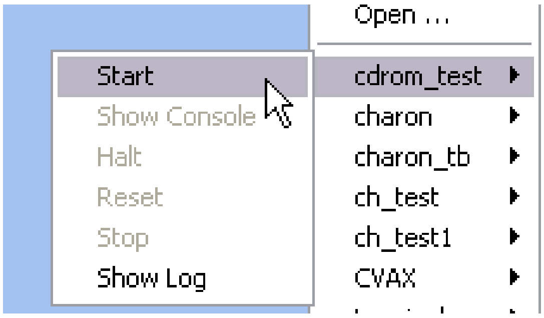
10. The System Monitor invokes the Windows system monitor to trace the chosen service activity. This function is also available on the "View" submenu.

11. The "question mark" buttons provide access to the help system.

It is possible to use the system tray menu to manage CHARON services w/o opening the main window of the utility. Click at it with the right button of the mouse and the following pop-up menu will appear:



The tray menu lists all the installed CHARON services. For each service the full range of essential operations is available:



So it is possible to start the service ("Start" option), stop it ("Stop" option), halt ("Halt" option) and reset ("Reset" option) it.

It is also possible to view the service log ("Show Log" option).

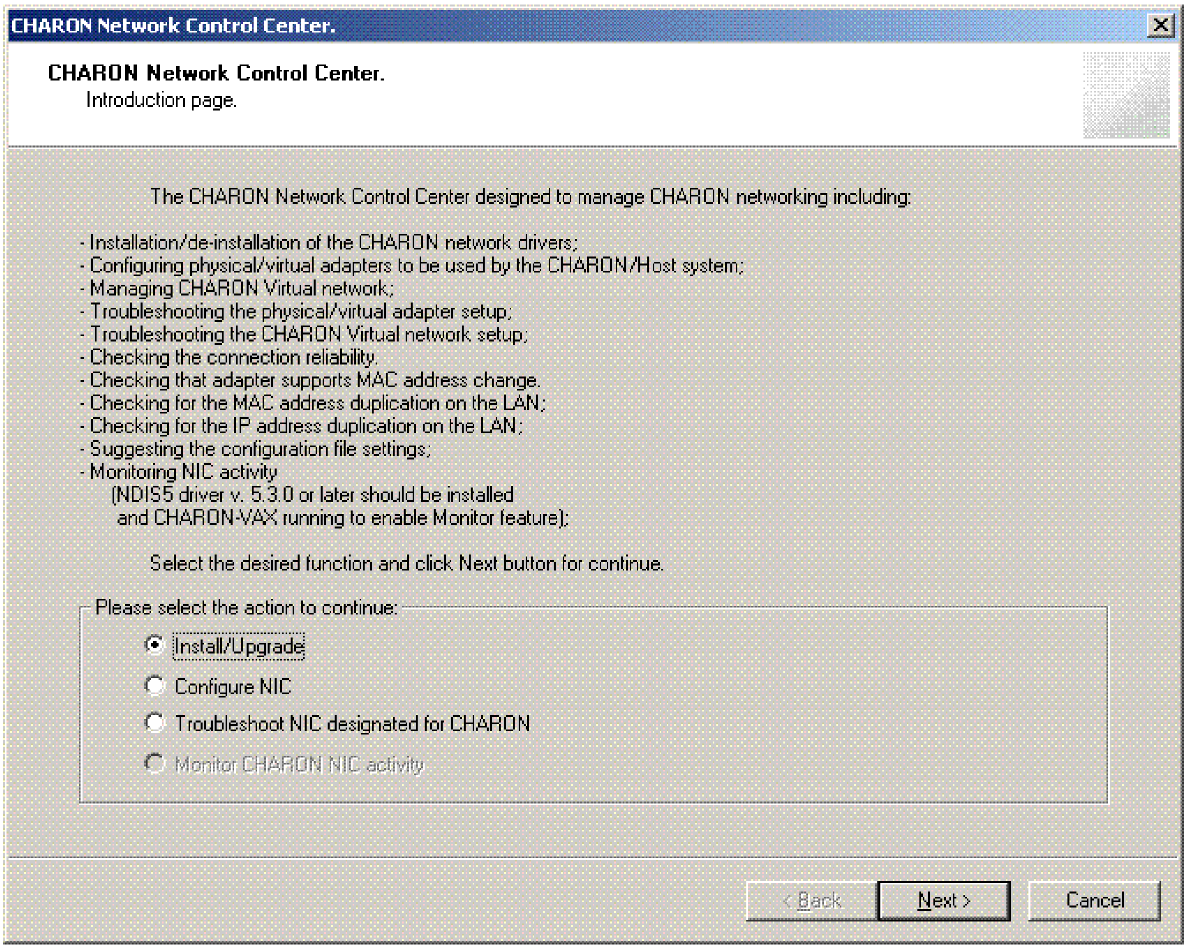
Option "Show Console" is very important if the CHARON service has console configured for terminal emulator (like the default "PuTTY"). If the service is set to "Automatic" mode the console will not appear on system reboot despite the fact that CHARON service will be up and running normally. To access the console use the "Show Console" option.

4.3. CHARON Network Control Center

CHARON Network Control Center (NCC) performs the following operations:

- Installation/deinstallation/upgrade of the NDIS6 Packet and MUX Drivers
- Configuring physical/virtual adapters for CHARON
- Troubleshooting physical/virtual adapters
- Checking the connection reliability
- Checking the MAC/IP address duplication on LAN

- Suggesting the configuration file settings
- Monitoring the network activity
- The start dialog of the utility provides a choice of the basic operations that can be performed using this utility:



CHARON Network Control Center.
Introduction page.

The CHARON Network Control Center designed to manage CHARON networking including:

- Installation/de-installation of the CHARON network drivers;
- Configuring physical/virtual adapters to be used by the CHARON/Host system;
- Managing CHARON Virtual network;
- Troubleshooting the physical/virtual adapter setup;
- Troubleshooting the CHARON Virtual network setup;
- Checking the connection reliability.
- Checking that adapter supports MAC address change.
- Checking for the MAC address duplication on the LAN;
- Checking for the IP address duplication on the LAN;
- Suggesting the configuration file settings;
- Monitoring NIC activity
  (NDIS5 driver v. 5.3.0 or later should be installed
  and CHARON-VAX running to enable Monitor feature);

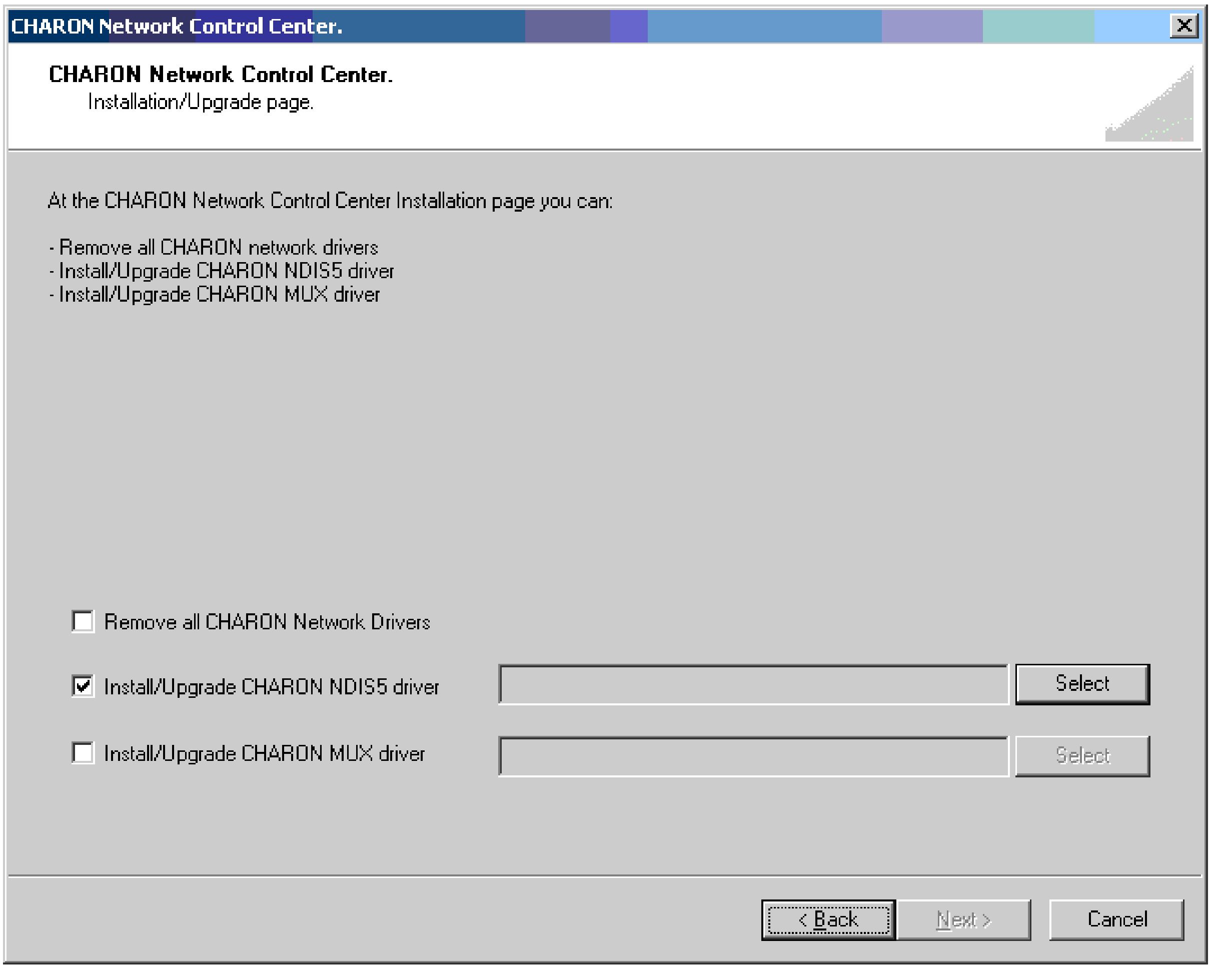
Select the desired function and click Next button for continue.

Please select the action to continue:

● Install/Upgrade
○ Configure NIC
○ Troubleshoot NIC designated for CHARON
○ Monitor CHARON NIC activity

Each dialog of the Network Control Center contains detailed information on available options and actions that can be done on each particular page.

Once “Install/Upgrade” is selected and the “Next “ button is pressed the following dialog specifies the action desired and the path to the driver if required. Once the option is selected and the drivers are specified (if needed) press the “Next” button to proceed.



CHARON Network Control Center.

Installation/Upgrade page.

At the CHARON Network Control Center Installation page you can:

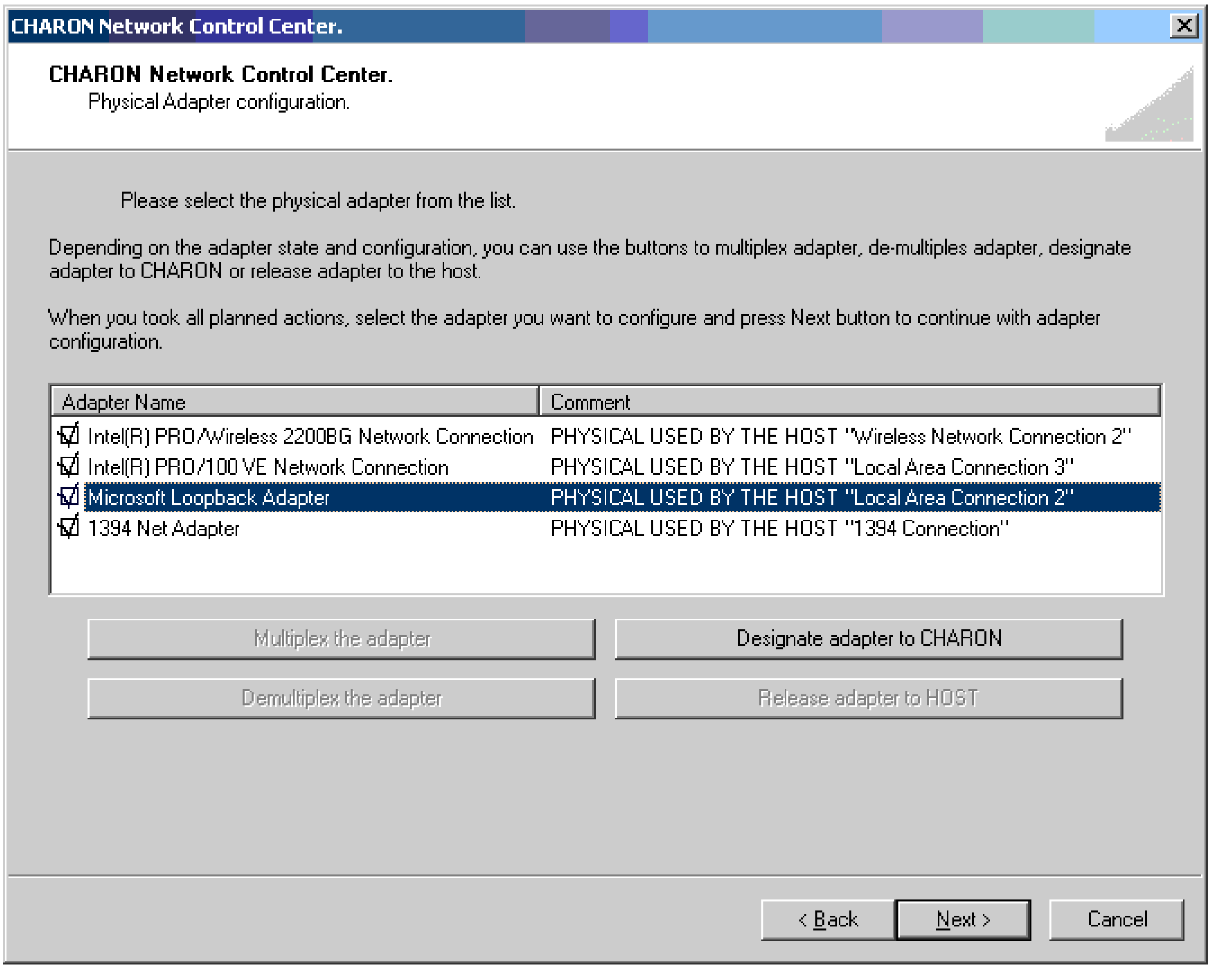
- Remove all CHARON network drivers
- Install/Upgrade CHARON NDIS5 driver
- Install/Upgrade CHARON MUX driver

□ Remove all CHARON Network Drivers

☑ Install/Upgrade CHARON NDIS5 driver

□ Install/Upgrade CHARON MUX driver

Use the following dialog to configure a particular network adapter:



CHARON Network Control Center.

CHARON Network Control Center.

Physical Adapter configuration.

Please select the physical adapter from the list.

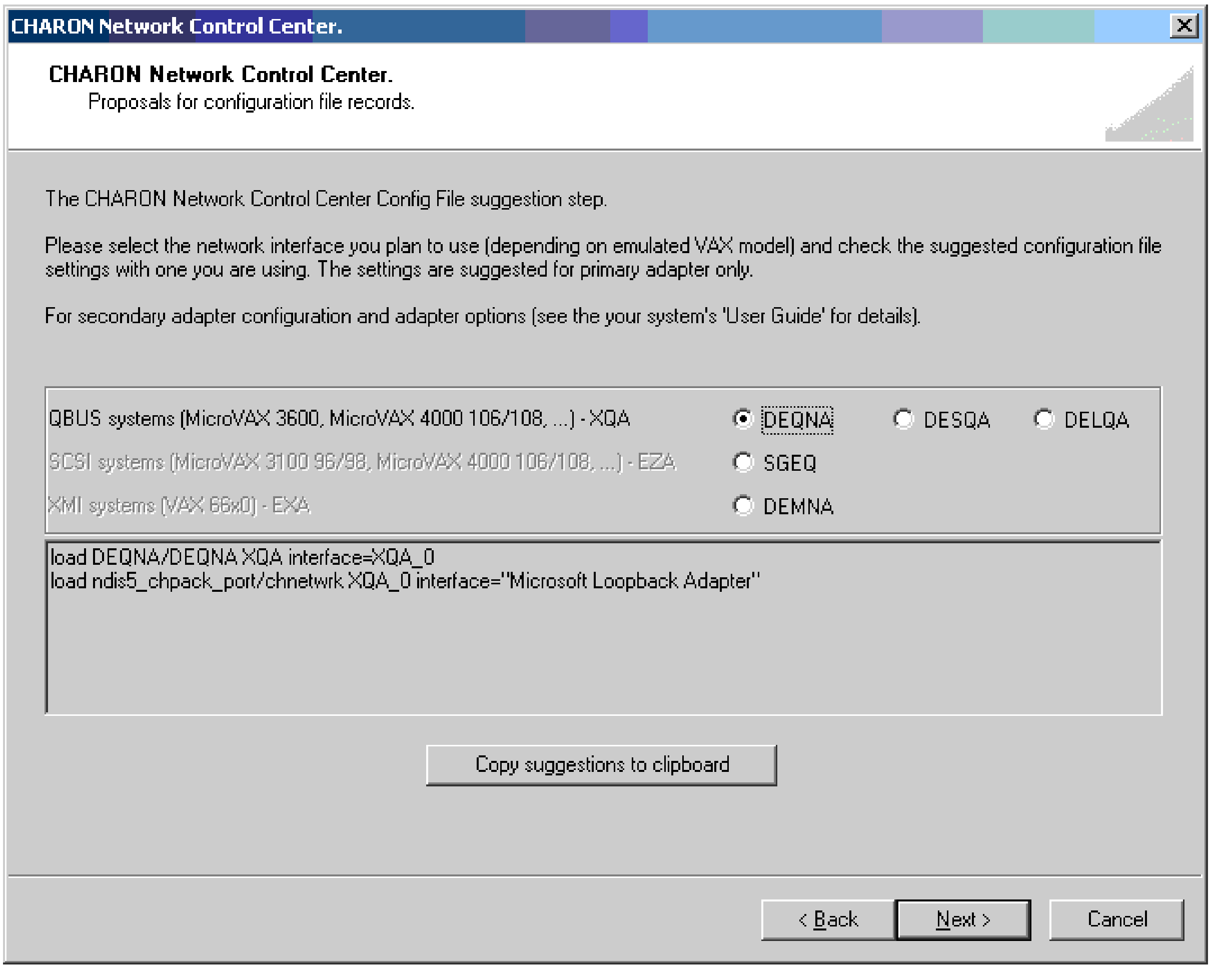
Depending on the adapter state and configuration, you can use the buttons to multiplex adapter, de-multiples adapter, designate adapter to CHARON or release adapter to the host.

When you took all planned actions, select the adapter you want to configure and press Next button to continue with adapter configuration.

Adapter Name	Comment
☑ Intel(R) PRO/Wireless 2200BG Network Connection	PHYSICAL USED BY THE HOST "Wireless Network Connection 2"
☑ Intel(R) PRO/100 VE Network Connection	PHYSICAL USED BY THE HOST "Local Area Connection 3"
☑ Microsoft Loopback Adapter	PHYSICAL USED BY THE HOST "Local Area Connection 2"
☑ 1394 Net Adapter	PHYSICAL USED BY THE HOST "1394 Connection"

Press "Next" to dedicate selected adapter(s) for CHARON. It is also possible to multiplex the chosen adapter if the MUX driver is installed.

Once an adapter is dedicated to CHARON the Network Control Center provides information to be inserted into the configuration file for this particular adapter.



CHARON Network Control Center.
Proposals for configuration file records.

The CHARON Network Control Center Config File suggestion step.

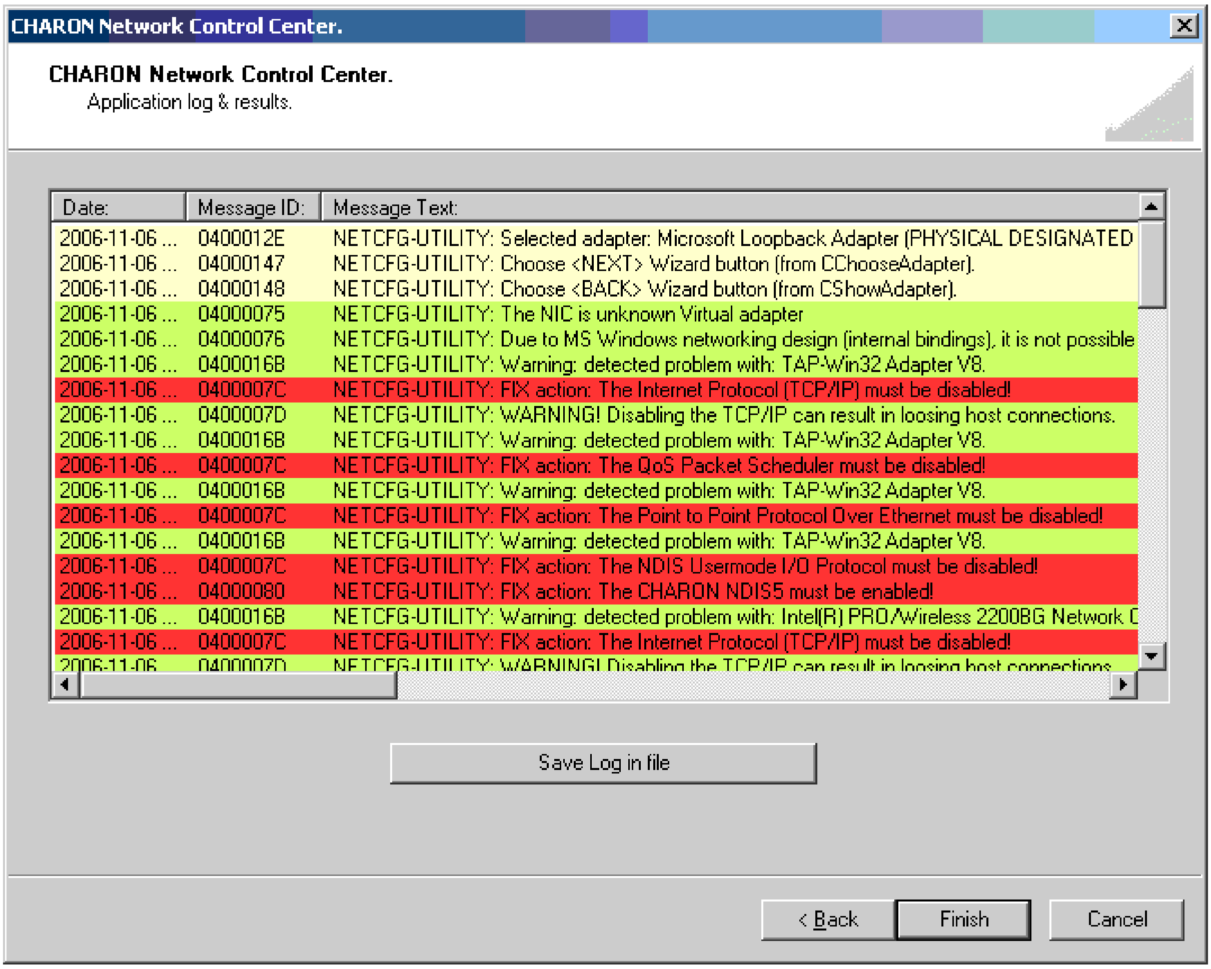
Please select the network interface you plan to use (depending on emulated VAX model) and check the suggested configuration file settings with one you are using. The settings are suggested for primary adapter only.

For secondary adapter configuration and adapter options (see the your system's 'User Guide' for details).

QBUS systems (MicroVAX 3600, MicroVAX 4000 106/108, ...) - XQA ● DEQNA ○ DESQA ○ DELQA
SCSI systems (MicroVAX 3100 96/98, MicroVAX 4000 106/108, ...) - EZA ○ SGEQ
XMI systems (VAX 66x0) - EXA ○ DEMNA

```
load DEQNA/DEQNA XQA interface=XQA_0
load ndis5_chpack_port/chnetwrk XQA_0 interface="Microsoft Loopback Adapter"
```

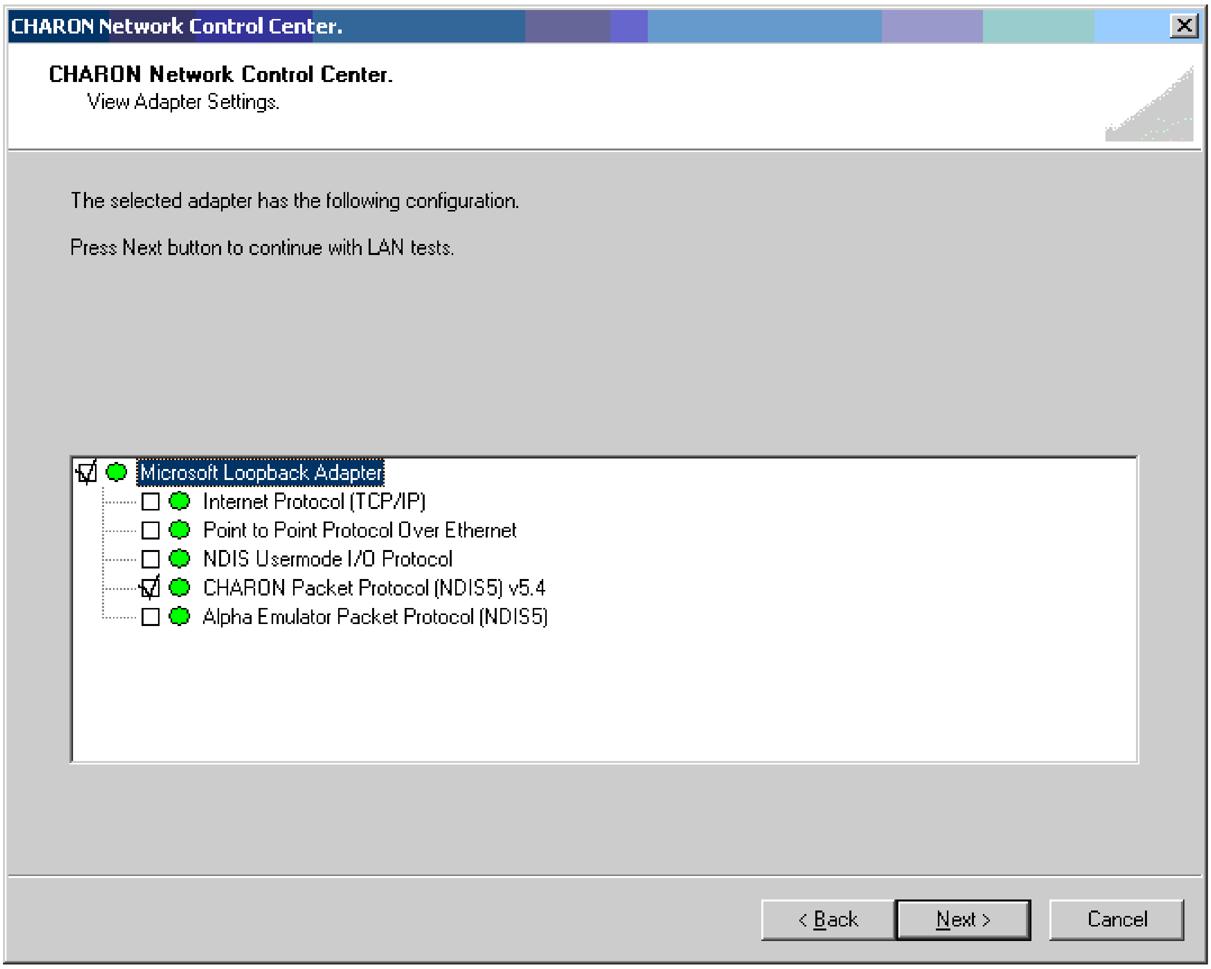
At the end of each operation with a network interface the following dialog file is displayed providing a log:



CHARON Network Control Center.
Application log & results.

```
Date:           Message ID:   Message Text:
2006-11-06 ...  0400012E      NETCFG-UTILITY: Selected adapter: Microsoft Loopback Adapter (PHYSICAL DESIGNATED
2006-11-06 ...  04000147      NETCFG-UTILITY: Choose <NEXT> Wizard button (from CChooseAdapter).
2006-11-06 ...  04000148      NETCFG-UTILITY: Choose <BACK> Wizard button (from CShowAdapter).
2006-11-06 ...  04000075      NETCFG-UTILITY: The NIC is unknown Virtual adapter
2006-11-06 ...  04000076      NETCFG-UTILITY: Due to MS Windows networking design (internal bindings), it is not possible
2006-11-06 ...  0400016B      NETCFG-UTILITY: Warning: detected problem with: TAP-Win32 Adapter V8.
2006-11-06 ...  0400007C      NETCFG-UTILITY: FIX action: The Internet Protocol (TCP/IP) must be disabled!
2006-11-06 ...  0400007D      NETCFG-UTILITY: WARNING! Disabling the TCP/IP can result in loosing host connections.
2006-11-06 ...  0400016B      NETCFG-UTILITY: Warning: detected problem with: TAP-Win32 Adapter V8.
2006-11-06 ...  0400007C      NETCFG-UTILITY: FIX action: The QoS Packet Scheduler must be disabled!
2006-11-06 ...  0400016B      NETCFG-UTILITY: Warning: detected problem with: TAP-Win32 Adapter V8.
2006-11-06 ...  0400007C      NETCFG-UTILITY: FIX action: The Point to Point Protocol Over Ethernet must be disabled!
2006-11-06 ...  0400016B      NETCFG-UTILITY: Warning: detected problem with: TAP-Win32 Adapter V8.
2006-11-06 ...  0400007C      NETCFG-UTILITY: FIX action: The NDIS Usermode I/O Protocol must be disabled!
2006-11-06 ...  04000080      NETCFG-UTILITY: FIX action: The CHARON NDIS5 must be enabled!
2006-11-06 ...  0400016B      NETCFG-UTILITY: Warning: detected problem with: Intel(R) PRO/Wireless 2200BG Network C
2006-11-06 ...  0400007C      NETCFG-UTILITY: FIX action: The Internet Protocol (TCP/IP) must be disabled!
2006-11-06 ...  0400007D      NETCFG-UTILITY: WARNING! Disabling the TCP/IP can result in loosing host connections.
```

It is also possible to check the status of the adapter dedicated to CHARON. Green means that the adapter is ready for use with CHARON, red means some problems are detected:

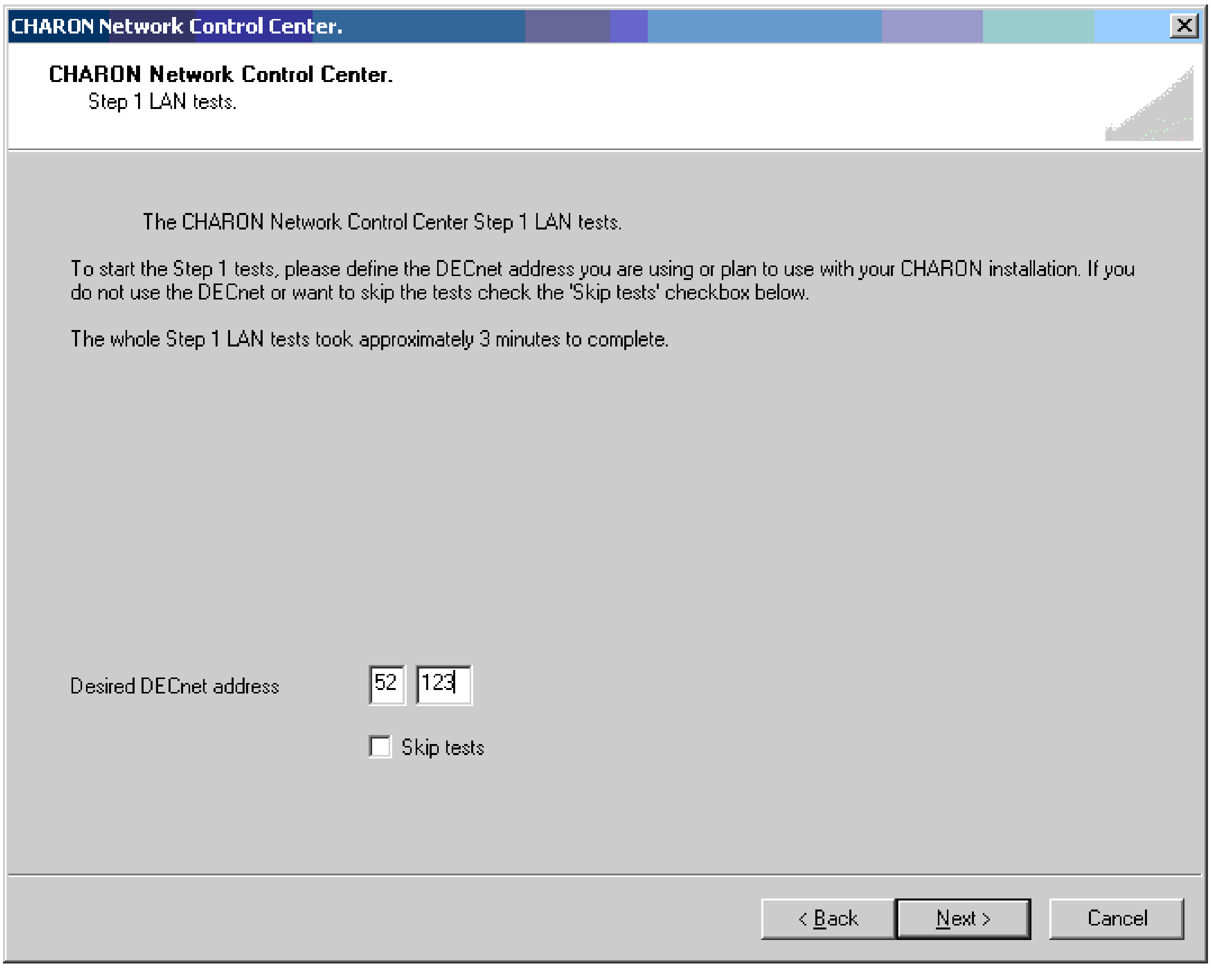

CHARON Network Control Center.
CHARON Network Control Center.
View Adapter Settings.

The selected adapter has the following configuration.

Press Next button to continue with LAN tests.

- ☑ ● Microsoft Loopback Adapter
  - □ ● Internet Protocol (TCP/IP)
  - □ ● Point to Point Protocol Over Ethernet
  - □ ● NDIS Usermode I/O Protocol
  - ☑ ● CHARON Packet Protocol (NDIS5) v5.4
  - □ ● Alpha Emulator Packet Protocol (NDIS5)

The following 2 screenshots demonstrate an ability of the utility to check whether chosen DECnet or TCPIP addresses are free for CHARON:



CHARON Network Control Center.

Step 1 LAN tests.

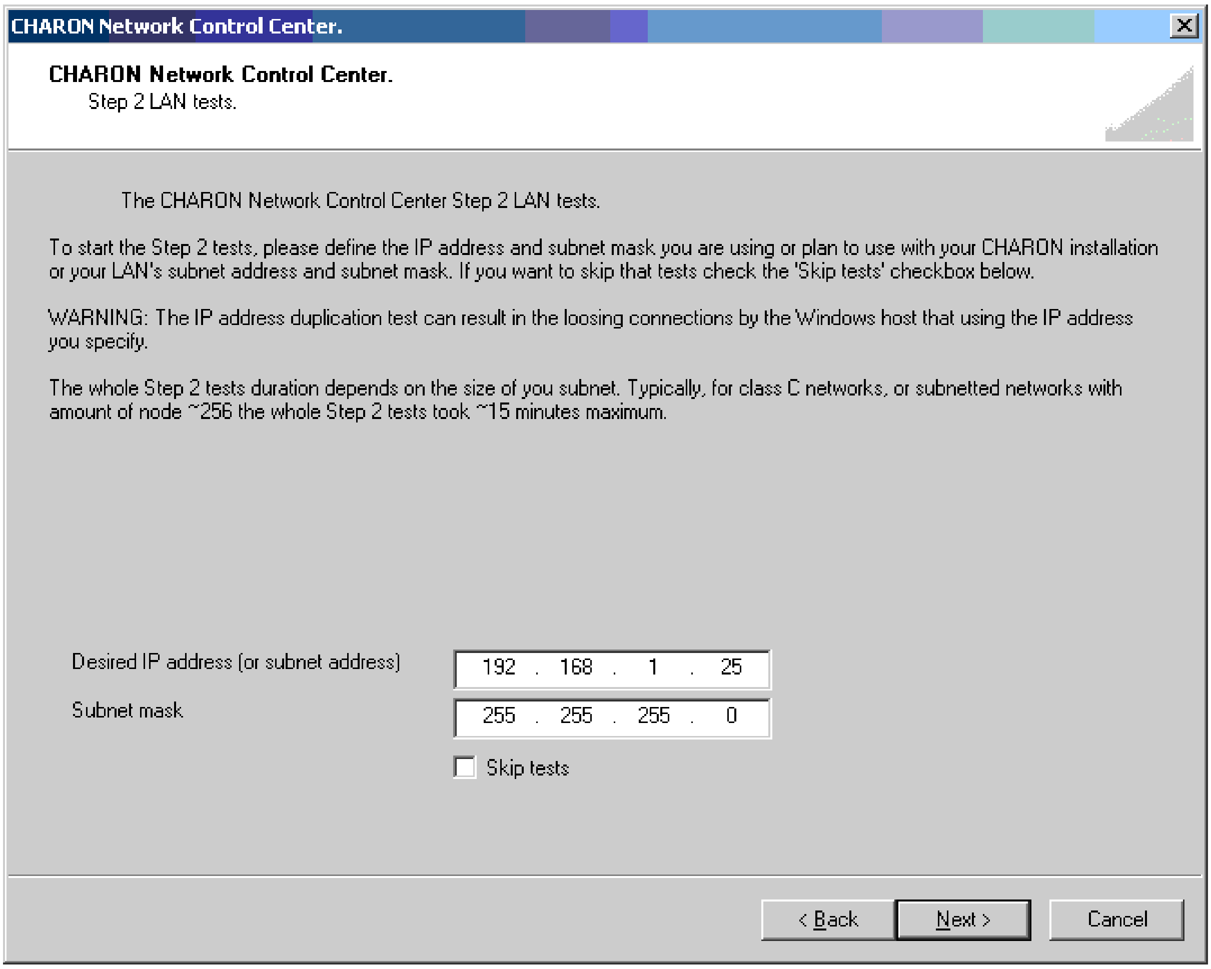
The CHARON Network Control Center Step 1 LAN tests.

To start the Step 1 tests, please define the DECnet address you are using or plan to use with your CHARON installation. If you do not use the DECnet or want to skip the tests check the 'Skip tests' checkbox below.

The whole Step 1 LAN tests took approximately 3 minutes to complete.

Desired DECnet address 52 123

□ Skip tests



CHARON Network Control Center.

CHARON Network Control Center.

Step 2 LAN tests.

The CHARON Network Control Center Step 2 LAN tests.

To start the Step 2 tests, please define the IP address and subnet mask you are using or plan to use with your CHARON installation or your LAN's subnet address and subnet mask. If you want to skip that tests check the 'Skip tests' checkbox below.

WARNING: The IP address duplication test can result in the loosing connections by the Windows host that using the IP address you specify.

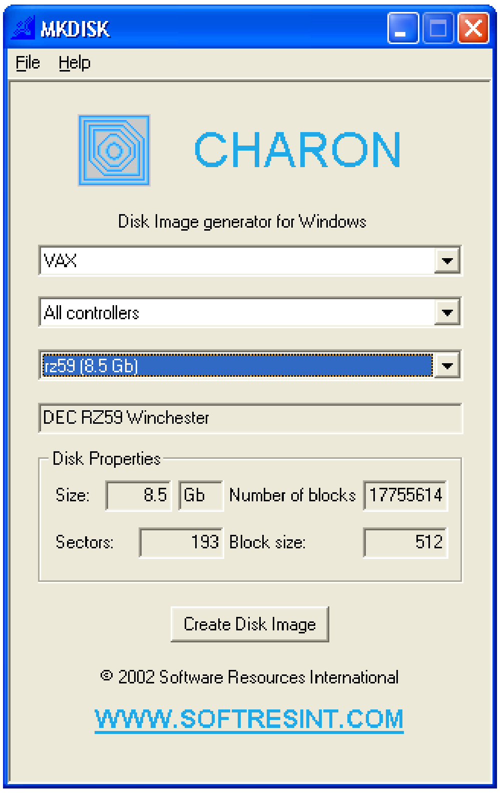
The whole Step 2 tests duration depends on the size of you subnet. Typically, for class C networks, or subnetted networks with amount of node ~256 the whole Step 2 tests took ~15 minutes maximum.

Desired IP address (or subnet address) 192 . 168 . 1 . 25

Subnet mask 255 . 255 . 255 . 0

☐ Skip tests

4.4. MKDISK utility



Disk Image generator for Windows

VAX

All controllers

rz59 (8.5 Gb)

DEC RZ59 Winchester

Disk Properties

Size: 8.5 Gb Number of blocks 17755614

Sectors: 193 Block size: 512

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The MKDISK utility creates empty disk images of given standard disk drive types or of custom disk images. It is available in the utilities folder under Start->Programs->CHARON-><product>->Utility.

Choose the system in the first drop-down box, specify "All controllers" in the second and choose the desired disk in the third one. After that press the "Create Disk Image" button, select the destination folder, enter the desired disk image name and press "Save".

To generate disk images with any size use the "Custom" type and enter the number of blocks and block size. In the disk properties you see the size of the disk to be created.

4.5. Sentinel HASPRUS utility

HASPRUS utility allows applying a license update to the CHARON-VAX/CHARON-PDP11 HASP license dongle. It provides the following functionality:

1. Collecting HASP key license information and creating a special “.c2v” file which should be sent to STROMASYS.
2. Updating CHARON-VAX/CHARON-PDP11 license with “.v2c” file received from STROMASYS.

To collect license information select “Collect Status Information”, and press “Collect Information” button. The utility will ask for name of the “.c2v” file to be created and its location. Once the file is created it should be provided to STROMASYS for getting update to the license.

To update the current license select “Apply License Update”, choose “.v2c” file provided by STROMASYS with the “…” bottom at the lower edge of the dialog and press “Apply Update”. HASP RUS will display information whether the update was successful or not. In case of failure it is required to provide the displayed status to STROMASYS to trace the updating problem.

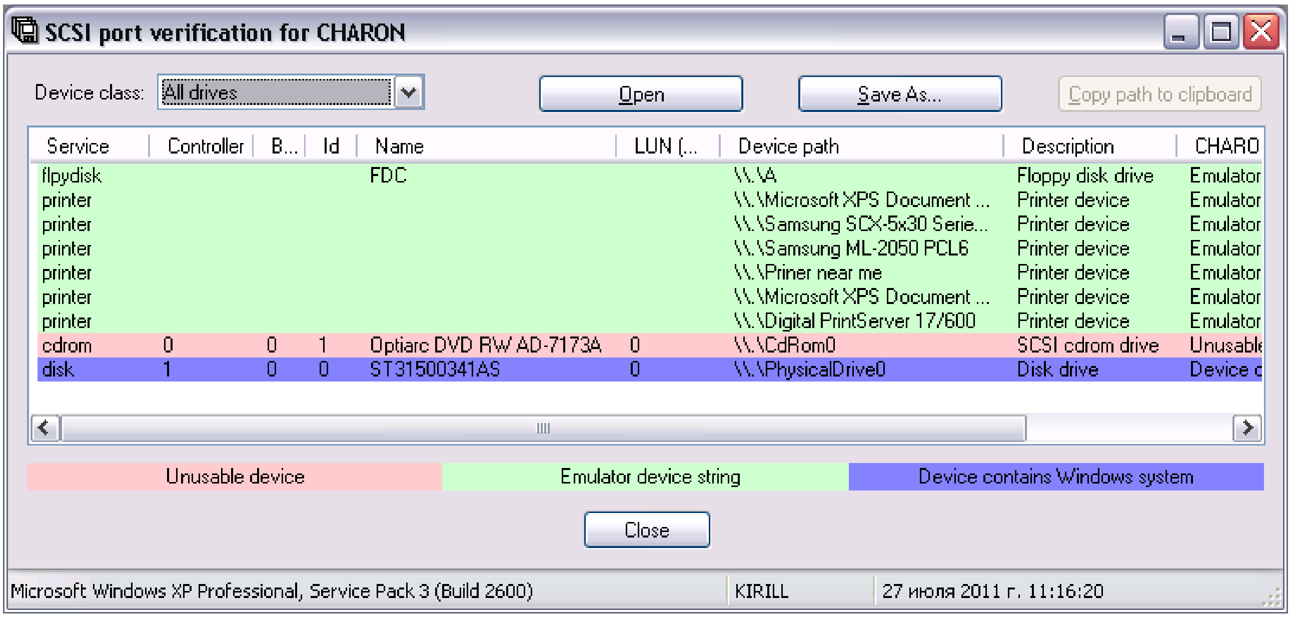
It is possible to update CHARON-VAX/CHARON-PDP11 license “on fly”, while CHARON-VAX/CHARON-PDP11 is running. But it is still recommended to stop the emulator, update the license and run the emulator again.

4.6. HASP View utility

“HASP View” utility allows reading the content of CHARON-VAX/CHARON-PDP11 license. The Utility reads a connected HASP-HL or HASP-SRM dongle and provides content of the license in its main window. The license text can be scrolled up and down and copied to clipboard. Use “Refresh” button to reread the license dongle.

4.7. SCSI Check

The SCSI check utility is designed to locate the correct CHARON names for physical disks, tapes, CD-ROM drives, floppies and other SCSI devices found on the system. At startup the utility presents you with a list of disk drives found on your system:



Device class: All drives

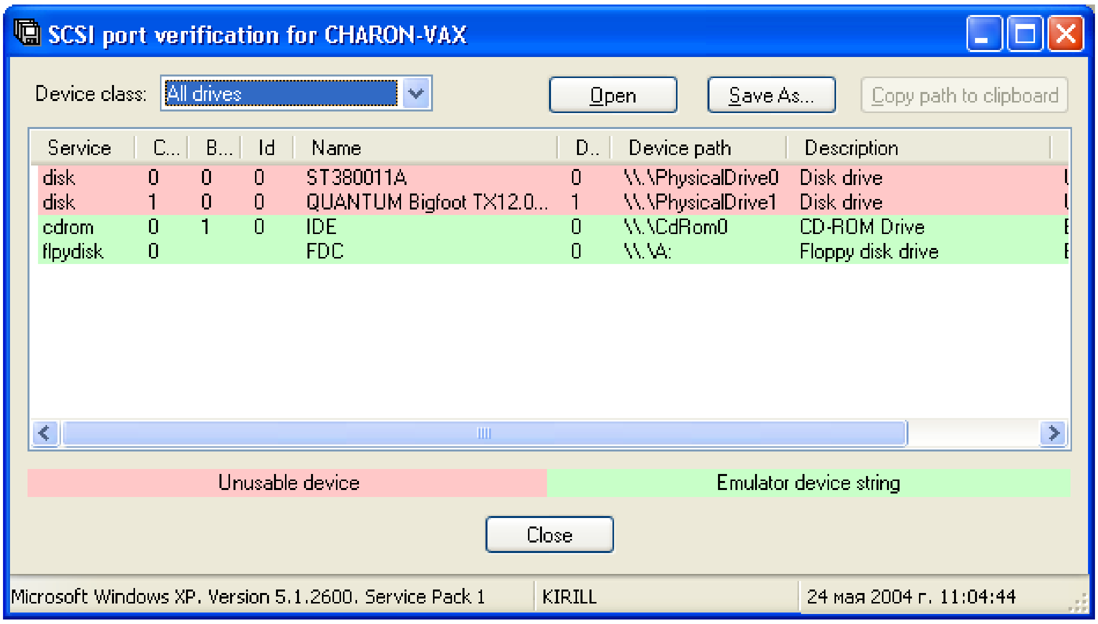
Service	Controller	B...	Id	Name	LUN (...	Device path	Description	CHARO
flpydisk				FDC		\\.\A	Floppy disk drive	Emulator
printer						\\.\Microsoft XPS Document ...	Printer device	Emulator
printer						\\.\Samsung SCX-5x30 Serie...	Printer device	Emulator
printer						\\.\Samsung ML-2050 PCL6	Printer device	Emulator
printer						\\.\Priner near me	Printer device	Emulator
printer						\\.\Microsoft XPS Document ...	Printer device	Emulator
printer						\\.\Digital PrintServer 17/600	Printer device	Emulator
cdrom	0	0	1	Optiarc DVD RW AD-7173A	0	\\.\CdRom0	SCSI cdrom drive	Unusabl
disk	1	0	0	ST31500341AS	0	\\.\PhysicalDrive0	Disk drive	Device c

Microsoft Windows XP Professional, Service Pack 3 (Build 2600) | KIRILL | 27 июля 2011 г. 11:16:20

The green color indicates the devices, which are not allocated by the host operating system, thus can be used in the CHARON-VAX/XX / CHARON-PDP11 environment.

It is possible to choose a specific device class from the following list: "Disk drives", "Tape drives", "CD-ROM drives", "Floppy disk drives", “Printers”, "Unknown devices". You can select "All drives" to inspect your host system.

Note that the current version of SCSI Check does not correctly report iSCSI devices.



Service	C...	B...	Id	Name	D..	Device path	Description	
disk	0	0	0	ST380011A	0	\\.\PhysicalDrive0	Disk drive	U
disk	1	0	0	QUANTUM Bigfoot TX12.0...	1	\\.\PhysicalDrive1	Disk drive	U
cdrom	0	1	0	IDE	0	\\.\CdRom0	CD-ROM Drive	E
flpydisk	0			FDC	0	\\.\A:	Floppy disk drive	E

🟥 Unusable device 🟩 Emulator device string

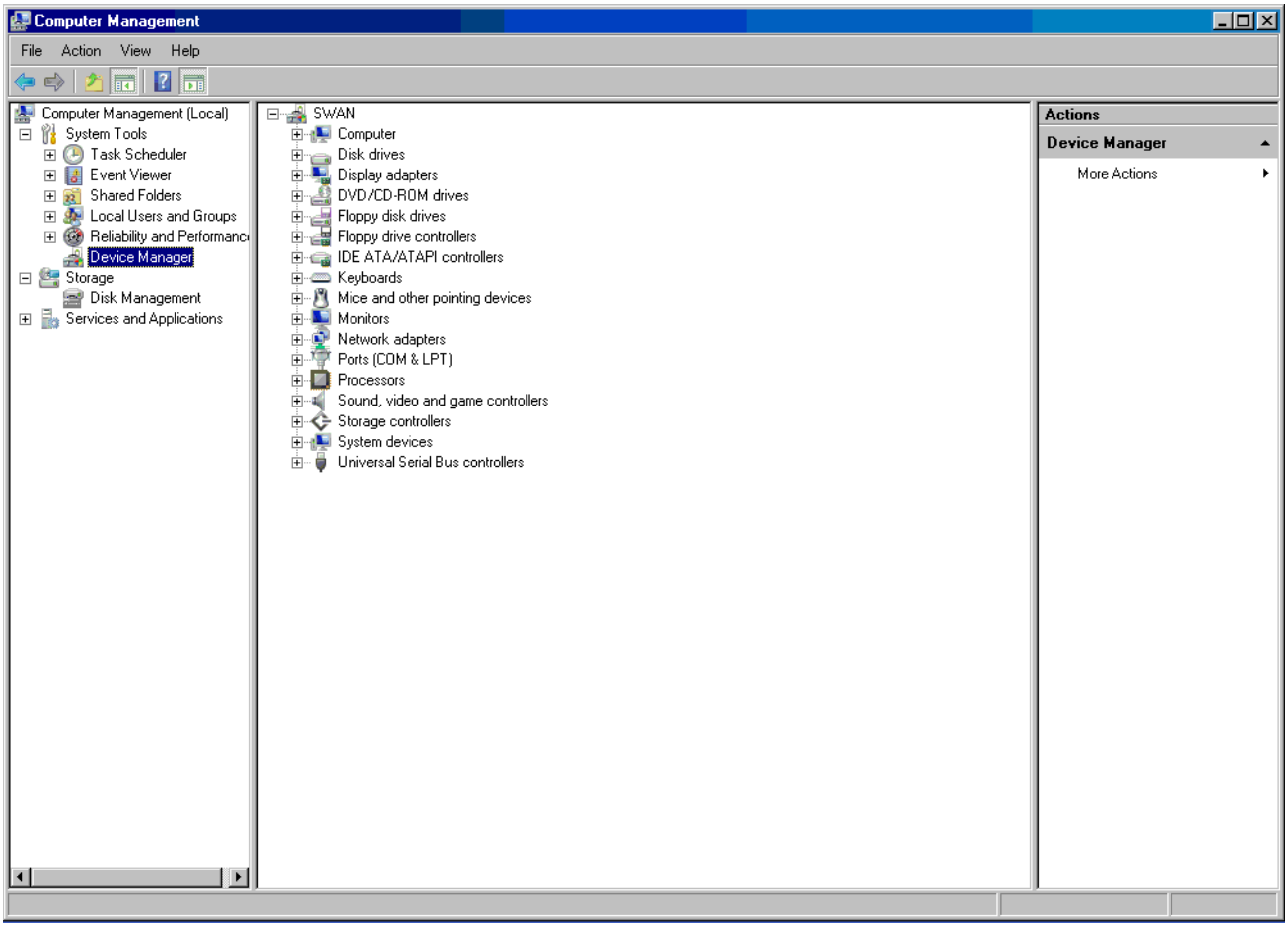
Microsoft Windows XP. Version 5.1.2600. Service Pack 1 | KIRILL | 24 мая 2004 г. 11:04:44

You can store the configuration as found with SCSI Check using the "Save As…" button and re-display this configuration by pressing the "Open" button.

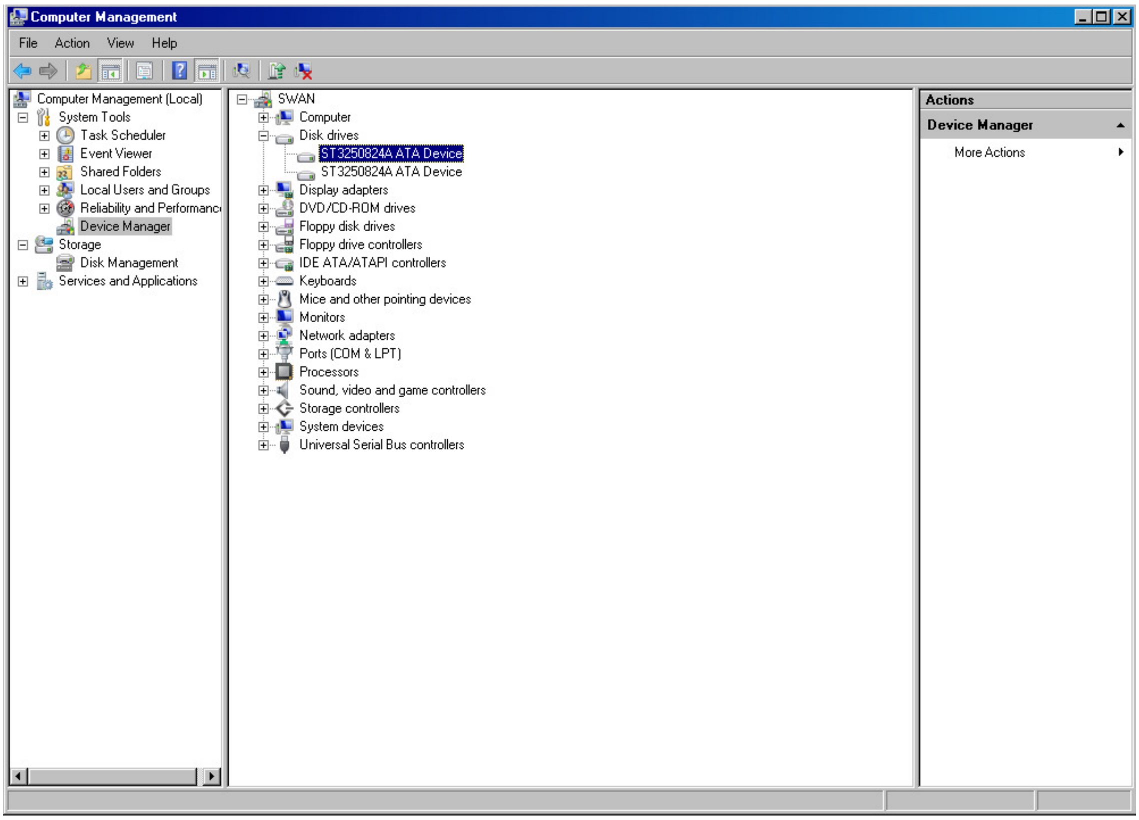
Selecting any specific device from the list makes the "Copy path to clipboard" button available. Copying to clipboard helps to avoid a typing error when entering the device name into a CHARON-VAX/XX / CHARON-PDP11 configuration file.

If SCSIcheck cannot be used for some reason (for example, for some kind of NAS / SAN network storage devices), the alternative way to find out SCSI configuration details it to use Windows build-in tools.

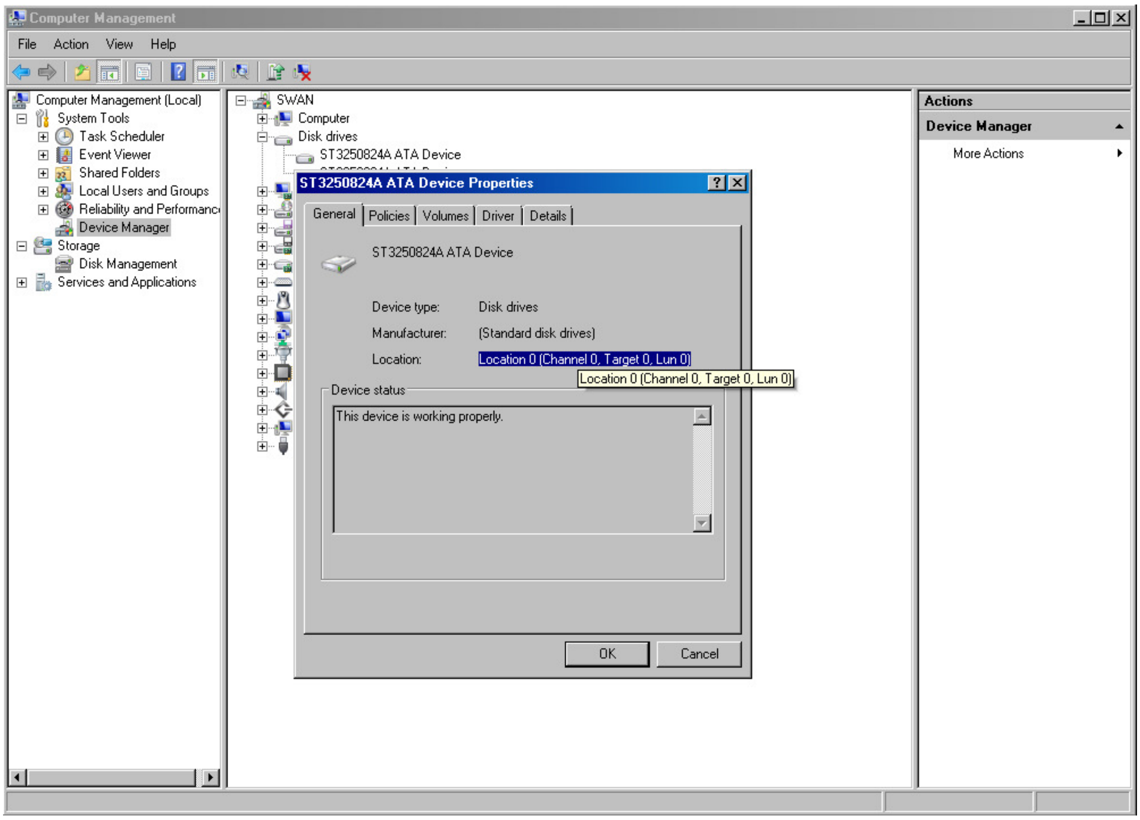
To find proper SCSI device information (to be used as a CHARON emulator configuration file parameter), open "*Computer Management*" application and select "*Device Manager*":



On the right panel please select the proper physical device:



Click right mouse button and choose the “*Property*” item at the pop-up menu appears.



ST3250824A ATA Device Properties

ST3250824A ATA Device

Device type: Disk drives

Manufacturer: (Standard disk drives)

Location: Location 0 (Channel 0, Target 0, Lun 0)

Device status

This device is working properly.

The information from ”*Location*” field to be used for selected device configuration.

4.8. MTD utility

The "MTD" utility allows creating CHARON tape image from a physical tape and writing tape image to a physical tape. It is a command line utility. Usage is the following:

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

Where the “options” are:

`/log = <file name>` – create the execution log in the file “file name”.

`/reads = <number>` – a number of attempts to read a damaged data bock

`/ignore` – ignore bad blocks and continue processing w/o interruption

Example:

```
>mtd \\.\Tape0  C:\TapeImages\tape1.vtape /log=”tape1.txt”
/reads=10 /ignore
```

Using the following syntax it is possible to write a content of a tape container to a physical tape:

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

Example:

```
>mtd C:\TapeImages\tape1.vtape \\.\Tape0.
```

4.9. HOSTPRINT utility

HOSTprint is a Windows application that receives data from an emulated LPV11 on CHARON via a TCP/IP socket and prints the data received on the default Windows printer (if no printer specified at the utility command line) of the host computer.

As HOSTprint relays on CHAPI emulated LPV11 Q-bus parallel port, it is only available for use with Q-bus based emulated VAX models.

There are two operation modes supported by HOSTprint application:

1. **Line-printer (Digital LA75) emulation**

   In this mode the utility emulates ESC-sequences of the selected line printer (see the LA75 manual for details). Once a page is completely filled with data it is sent to the printer output (to emulate line-printer functionality). To use this mode, you should properly configure the OpenVMS printing queue and use OpenVMS “PRINT” command.

2. **Working in old version of the utility compatible printing mode**

   Access popup menu and set Flush buffer delay time. Recommended value is 5 seconds. Under OpenVMS type: "COPY MY_PRINTED_FILE LPA0:"

Both modes supports print preview of the last page in the printing buffer.

Command line parameters:

```
-host=<hostname>
```

```
-port=<connection port number>
```

```
-delay=<delay for automatically buffer flush in seconds>
```

0 - wait infinite

5..10800 - timeout for flush

```
-printer=[PrinterDeviceName]
```

Example:

```
-printer=[\\.\Microsoft Office Document Image Writer]
```

```
-printer=[\\mscdc\MSCLPS]
```

Parameters used only for compatibility with old version of the utility (HOSTprint allow to change font settings from popup menu):

```
-font=<default font face>

-fontsize=<default font size>
```

It is strongly recommended to used fixed-size fonts (by default the `"Courier"` font is used) to avoid any problems relevant to proper calculation of the printing line length.

Configuration file examples:

```
load chapi lpv1

set lpv1 dll=lpv11.dll

set lpv1 port=10015 application="hostprint.exe -port=10015 -printer=[\\mscdc\MSCPS2] -font=\Courier New\ -fontsize=10"

load chapi lpv2 address=017764004

set lpv2 dll=lpv11.dll

set lpv2 port=10016 application="hostprint.exe -port=10016 -printer=[\\mscdc\MSCLPS] -font=\Courier New\ -fontsize=12"
```

After initialization, HOSTprint creates the icon at the Windows toolbar. There are two colors of the icon:

Green - indicated Idle (or Ready) state;

Yellow - indicated BUSY (processing) mode.

To access the HOSTprint application popup menu point the mouse cursor at its icon in the system tray menu and click the right button. Then you can preview the last page content, change utility mode via the flush buffer delay and change the default font settings.

4.10. Host CPU optimization package

The CHARON CPU usage optimization package is a collection of utilities: IDLE, SHUTDOWN, SHUTDOWN_R, SPEEDUP, SLOWDOWN, SLOWDOWN_R and SLOW_TEST for VAX/VMS. These utilities are located in the IDLE_VMS_PKG.VDISK disk image present in the CHARON-VAX/XX installation subdirectory VDISK. Specify this image in the CHARON-VAX/XX configuration file, boot from the system disk and mount the disk with the following VAX/VMS command:

$ MOUNT <device name> /OVERRIDE=IDENTIFICATION

In the root of this disk you will see the following executable files and the COM file designed for the VAX/VMS system running on CHARON-VAX:

IDLE.EXE – Significantly reduces the CHARON-VAX/XX host CPU usage whenever a VAX/VMS system running on CHARON-VAX is idle. To ensure automatic start up you may include a call to the IDLE.EXE in the system start-up file. IDLE.EXE stalls the emulated CPU when it detects an OpenVMS idle condition. While Idle is running the emulated CPU consumes, on average, less host system CPU time. It is not recommended to employ IDLE.EXE in real-time process control environments. IDLE.EXE cannot be applied to the VAX 6000 emulators.

IDLE_VMS55.EXE – IDLE.EXE version for VMS 5.5-2 and VMS 5.5-2H4

SHUTDOWN.EXE – Stops the CHARON-VAX/XX emulator after 30 seconds after the utility is called. These 30 seconds are intended to shutdown VAX/VMS running on CHARON-VAX/XX.

SHUTDOWN3.EXE – Stops CHARON-VAX/XX after 3 minutes after the utility is called.

SHUTDOWN5.EXE – Stops CHARON-VAX/XX after 5 minutes after the utility is called.

*Note: The **SHUTDOWNn.EXE** routines do NOT initiate a shutdown of the VAX/VMS system running on CHARON-VAX/XX, only of the emulator itself. Establish a VMS shutdown procedure that can complete within the specified time.*

SHUTDOWN_R.EXE – Cancels a pending request to SHUTDOWN.

SLOWDOWN.EXE – Slows down the CHARON-VAX/XX execution. Repeated execution further slows down the execution.

SLOWDOWN_R.EXE – Restores the normal CHARON-VAX/XX execution speed.

SPEEDUP.EXE – Raises the CHARON-VAX/XX execution speed by certain amount of steps. Only works if SLOWDOWN.EXE has been applied.

SLOW_TEST.COM – Test, demonstrates the impact of the slowdown mechanism.

To run any of those utilities issue the following command:

```
$ RUN <name of the utility>
```

4.11. TV30-TV

The CHAPI package included to the CHARON-VAX/XX / CHARON-PDP11 products supports VT30-TV virtual color television monitor implemented in **vt30-tv.exe**. The VT30-TV virtual color television monitor should be connected to a PDP-11 via VT30-H. It should be started with desktop color quality equally 8-bit, 16-bit or 32-bit.

The CHAPI VT30-TV can be started by means of user defined configuration options as follows:

```
vt30-tv.exe --address=<host(vt30-h) IP address> --port=<host(vt30-h) IP port> --
     log=<log file name> --trace_level=<level>
```

- **address** – IP address for connection to VT30-H.

- **port** --- IP port for connection to VT30-H.

Example:

```
chapi_vt30tv.exe --address=127.0.0.1 --port=10020 --log="chapi_vt30tv.log" --
     trace_level=0
```

Appendix A   Sample configuration files

CHARON-VAX/XX and CHARON-PDP11 use configuration files, which are located by default in the directory "CHARON->Build_XXX->x86". Three sample configuration files are shown below.

VAX 4000 Model 108 configuration file

```
#
# Copyright (C) 1999-2011 STROMASYS.
# All rights reserved.
#
# The software contained on this media is proprietary to and embodies the
# confidential technology of STROMASYS. Posession, 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 hw_model prior to any other commands. This parameter informs the
# emulator what type of VAX it should emulate. All the other commands
# availability and possibility to use depend on this specification.
#
#-----------------------------------------------------------------------------

set session hw_model="VAX_4000_Model_108"

#=============================================================================
#
# Comment the following line if you do not want the log to be saved into
# file (change name of the file as well if needed). Default is "overwrite".
#
# If "append" is chosen each new session of the emulator appends its log to
# this file, therefore it grows bigger with time. Note that the log_method
# should be specified prior to the log parameter - generally it is
# recommended to specify both of them in one line exactly as it's shown
# below.
#
#-----------------------------------------------------------------------------
```

```
#set session log="vx4k108.log" log_method="append"
set session log="vx4k108.log" log_method="overwrite"

#============================================================================
#
# The following line tells the emulator where to preserve NVRAM content. It
# will keep the current time of the emulated VAX (when you do not run the
# emulator) and 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. It will keep the rest of console parameters. It is
# recommended to keep both previous and this line uncommented for the
# emulator to be able to correctly preserve the saved state of the console.
#
#----------------------------------------------------------------------------

#set rom container="vx4k108.rom"

#============================================================================
#
# Disable or enable dynamic instruction translation by the cpu (ACE). The use
# of DIT may be also prohibited by the license. If not specified (i.e. when
# both lines remain commented out) the DIT is enabled as soon as the license
# allows to do so and is disabled otherwise ...
#
#----------------------------------------------------------------------------

#set cpu ace_mode=false
#set cpu ace_mode=true

#============================================================================
#
# Specify the size of RAM (default is 16MB). 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.
#
#-----------------------------------------------------------------------------

#set ram size=32
#set ram size=64
#set ram size=80
#set ram size=128
#set ram size=256
#set ram size=512

#=============================================================================
#
# Now assign four built-in serial lines. Currently the emulator offers two
# possible ways of using built-in serial lines. First of them is connection
# to COM ports (via physical_serial_line). The second is to attach a third
# party terminal emulator (virtual_serial_line).
#
# Once desired way of connection is chosen and the corresponding line is
# uncommented connect it to preloaded controller QUART by chosing the QUART
# line number (in square brackets) to connect the interface to. See OPA0
# below, for example.
#
#-----------------------------------------------------------------------------

#load physical_serial_line/chserial TTA0 line="\\.\COMn"
#load virtual_serial_line/chserial TTA0 port=10000
#load virtual_serial_line/chserial TTA0 port=10000 application="tta0.ht"
#load virtual_serial_line/chserial TTA0 port=10000 application="putty.exe -load
     TTA0"
#set quart line[0]=TTA0

#load physical_serial_line/chserial TTA1 line="\\.\COM1"
#load virtual_serial_line/chserial TTA1 port=10001
#load virtual_serial_line/chserial TTA1 port=10001 application="tta1.ht"
#load virtual_serial_line/chserial TTA1 port=10001 application="putty.exe -load
     TTA1"
#set quart line[1]=TTA1

#load physical_serial_line/chserial TTA2 line="\\.\COM2"
#load virtual_serial_line/chserial TTA2 port=10002
#load virtual_serial_line/chserial TTA2 port=10002 application="tta2.ht"
```

```
#load virtual_serial_line/chserial TTA2 port=10002 application="putty.exe -load
     TTA2"
#set quart line[2]=TTA2

#=============================================================================
#
# Select connection for the console serial line OPA0.
#
#-----------------------------------------------------------------------------

#load physical_serial_line/chserial OPA0 line="\\.\COM3"
#load virtual_serial_line/chserial OPA0 port=10003
#load virtual_serial_line/chserial OPA0 port=10003 application="opa0.ht"
load virtual_serial_line/chserial OPA0 port=10003 application="putty.exe -load
     OPA0"
set quart line[3]=OPA0

#=============================================================================
#
# 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 host's disk drive.
#
#-----------------------------------------------------------------------------

#load virtual_scsi_disk pka_1 scsi_bus=pka scsi_id=1
#set pka_1 container="\\.\PhysicalDrive0"
#set pka_1 container="\\.\PhysicalDriveN"

#=============================================================================
#
```

```
# 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="\\.\ScsiN:X:Y:Z"

#=============================================================================
#
# Uncomment to connect the emulator's DKA300 to host's CD/DVD-ROM drive.
#
#-----------------------------------------------------------------------------

#load virtual_scsi_cdrom pka_3 scsi_bus=pka scsi_id=3
#set pka_3 container="\\.\CdRom0"
#set pka_3 container="\\.\CdRomN"

#=============================================================================
#
# Uncomment to connect the emulator's DKA400 to .ISO file (CD/DVD-ROM 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 host's SCSI tape drive.
#
#-----------------------------------------------------------------------------

#load physical_scsi_device pka_5 scsi_bus=pka scsi_id=5
#set pka_5 container="\\.\Tape0"
#set pka_5 container="\\.\TapeN"

#=============================================================================
#
# Uncomment to connect the emulator's MKA600 to .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 optional SCSI controller SCSI_B (PKB).
#
# ATTENTION! Old versions of VAX/VMS (older then 5.5-2H4) do not support
# optional SCSI controller and might fail to boot when SCSI option is loaded.
#
#----------------------------------------------------------------------------

#include kzdda.cfg

#============================================================================
#
# Uncomment to connect the emulator's DKB600, DKB601 to host's floppy disk
# drives (A:, B:, if any).
#
#----------------------------------------------------------------------------

#load floppy_scsi_device pkb_6 scsi_bus=pkb scsi_id=6

#============================================================================
#
# Uncomment to enable built-in SGEC Ethernet Adapter (EZA).
#
#----------------------------------------------------------------------------

#set EZA interface=EZA0

#============================================================================
#
# Connect the SGEC Ethernet Adapter (EZA) to host's NIC.
#
#----------------------------------------------------------------------------

#load ndis5_chpack_port EZA0 interface="(disabled)"
#load ndis5_chpack_port EZA0 interface="connection:<connection-name>"

#============================================================================
#
```

```
# Load 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="\\.\COMn"
#load virtual_serial_line/chserial TXA0 port=10010
#load virtual_serial_line/chserial TXA0 port=10010 application="txa0.ht"
#set TXA line[0]=TXA0

#load physical_serial_line/chserial TXA1 line="\\.\COMn"
#load virtual_serial_line/chserial TXA1 port=10011
#load virtual_serial_line/chserial TXA1 port=10011 application="txa1.ht"
#set TXA line[1]=TXA1

#load physical_serial_line/chserial TXA2 line="\\.\COMn"
#load virtual_serial_line/chserial TXA2 port=10012
#load virtual_serial_line/chserial TXA2 port=10012 application="txa2.ht"
#set TXA line[2]=TXA2

#load physical_serial_line/chserial TXA3 line="\\.\COMn"
#load virtual_serial_line/chserial TXA3 port=10013
#load virtual_serial_line/chserial TXA3 port=10013 application="txa3.ht"
#set TXA line[3]=TXA3

#load physical_serial_line/chserial TXA4 line="\\.\COMn"
#load virtual_serial_line/chserial TXA4 port=10014
#load virtual_serial_line/chserial TXA4 port=10014 application="txa4.ht"
#set TXA line[4]=TXA4

#load physical_serial_line/chserial TXA5 line="\\.\COMn"
#load virtual_serial_line/chserial TXA5 port=10015
#load virtual_serial_line/chserial TXA5 port=10015 application="txa5.ht"
#set TXA line[5]=TXA5

#load physical_serial_line/chserial TXA6 line="\\.\COMn"
```

```
#load virtual_serial_line/chserial TXA6 port=10016
#load virtual_serial_line/chserial TXA6 port=10016 application="txa6.ht"
#set TXA line[6]=TXA6

#load physical_serial_line/chserial TXA7 line="\\.\COMn"
#load virtual_serial_line/chserial TXA7 port=10017
#load virtual_serial_line/chserial TXA7 port=10017 application="txa7.ht"
#set TXA line[7]=TXA7

#============================================================================
#
# Configure optional RQDX3 storage controller (MSCP/QBUS). 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]="\\.\PhysicalDriveN"
#set DUA container[2]="\\.\CdRomN"
#set DUA container[3]="<file-name>.iso"
#set DUA container[4]="\\.\H:"

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

#============================================================================
#
# Configure optional TQK50 tape storage controller (TMSCP/QBUS). 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]="\\.\TapeN"

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

```
#============================================================================
#
# Configuring the optional DELQA Ethernet adapters (QBUS).
#
#----------------------------------------------------------------------------

#load DELQA/DEQNA XQA

#load ndis5_chpack_port XQA0 interface="connection:<connection-name>"
#set XQA interface=XQA0

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

#============================================================================
#
# Configure optional DHV11 (or DHQ11, CXY08, CXA16, CXB16) serial line
# controller (QBUS). Address and vector must be set as required by 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="\\.\COMn"
#load virtual_serial_line/chserial TXA0 port=10010
#load virtual_serial_line/chserial TXA0 port=10010 application="txa0.ht"
#set TXA line[0]=TXA0

#load physical_serial_line/chserial TXA1 line="\\.\COMn"
#load virtual_serial_line/chserial TXA1 port=10011
#load virtual_serial_line/chserial TXA1 port=10011 application="txa1.ht"
#set TXA line[1]=TXA1

#load physical_serial_line/chserial TXA2 line="\\.\COMn"
#load virtual_serial_line/chserial TXA2 port=10012
#load virtual_serial_line/chserial TXA2 port=10012 application="txa2.ht"
#set TXA line[2]=TXA2
```

```
#load physical_serial_line/chserial TXA3 line="\\.\COMn"
#load virtual_serial_line/chserial TXA3 port=10013
#load virtual_serial_line/chserial TXA3 port=10013 application="txa3.ht"
#set TXA line[3]=TXA3

#load physical_serial_line/chserial TXA4 line="\\.\COMn"
#load virtual_serial_line/chserial TXA4 port=10014
#load virtual_serial_line/chserial TXA4 port=10014 application="txa4.ht"
#set TXA line[4]=TXA4

#load physical_serial_line/chserial TXA5 line="\\.\COMn"
#load virtual_serial_line/chserial TXA5 port=10015
#load virtual_serial_line/chserial TXA5 port=10015 application="txa5.ht"
#set TXA line[5]=TXA5

#load physical_serial_line/chserial TXA6 line="\\.\COMn"
#load virtual_serial_line/chserial TXA6 port=10016
#load virtual_serial_line/chserial TXA6 port=10016 application="txa6.ht"
#set TXA line[6]=TXA6

#load physical_serial_line/chserial TXA7 line="\\.\COMn"
#load virtual_serial_line/chserial TXA7 port=10017
#load virtual_serial_line/chserial TXA7 port=10017 application="txa7.ht"
#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
```

PDP11/93 configuration file

```
#
# Copyright (C) 1999-2011 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.
#
#=============================================================================

set session hw_model="PDP1193"

#set session log="pdp1193.log" log_method="append"
set session log="pdp1193.log" log_method="overwrite"
set toy container="pdp1193.dat"

#
# Specify KW11-L timer frequency here (default is 50). Note, that appropriate
# disk image supports appropriate frequency because system clock
# frequency is the system configuration parameter.
#

#set KW11 frequency = 50
#set KW11 frequency = 60

#
# Now assign console built-in serial line. Currently the emulator offers two
# possible ways using serial lines. First of them is connection to COM ports
# (via physical_serial_line). The second is to attach a third party terminal
# emulator (virtual_serial_line).
#

#load physical_serial_line TT0 line="COM1:"
#load virtual_serial_line TT0 port=10003
#load virtual_serial_line TT0 port=10003 application="opa0.ht"
load virtual_serial_line TT0 port=10003 application="putty -load OPA0"
set uart line=TT0

#
```

```
# Configure optional RQDX3 storage controller (MSCP/QBUS). Handles disk
# images, disk drives, CD-ROM drives, magneto-optical drives, floppy drives.
#

#load RQDX3 DU
#set DU container[0]="..."
#set DU container[1]="..."
#set DU container[2]="..."
#set DU container[3]="..."

# Boot from DU0 MSCP disk
#set cpu_0 auto_boot="DU0"

# this is the end of the configuration file
```

VAX 6310 configuration file

```
#
# Copyright (C) 1999-2011 Software Resources International.
# All rights reserved.
#
# The software contained on this media is proprietary to and embodies
# the confidential technology of Software Resources International.
# Posession, use, duplication, or dissemination of the software and
# media is authorized only pursuant to a valid written license from
# Software Resources International.
#

#
# Sample configuration file for HYPERION machines:
#
#  *  VAX 6000 Model 310
#  *  VAX 6000 Model 320
#  ...
#  *  VAX 6000 Model 380
#
# Should be used for education only - your own configurations is better
# to base on most appropriate one from supplied configuration files.
# Their description can be found in CHARON-TB Manual in config files
# Index.
#



#
# Specify hw_model prior to any other commands. This parameter
# informs the emulator what type of HYPERION it should emulate.
# All the other commands availability and possibility to use depend
# on this specification
#

set session hw_model="VAX_6310"

#
# Comment the following line if you do not want the log to be saved
# into file (change name of the file as well if you'd like). Each new
# session of the emulator appends its log to this file, therefore it
# grows bigger with time.
```

```
#

#set session log="vx6k310.log" log_method="append"
set session log="vx6k310.log" log_method="overwrite"

#
# It is possible to reduce the size of the log file using filtering
# possibilities:
#
# 1) Based on message type (info, warning, error)
# 2) Based on repeatetive messages removing.
#
# You can specify which type of messages should be logged using option
# 'log_show_messages' which is a string option containing mentioned above
# message types delimited by comma. Default is "all" which means to log
# all existing message types.
#
# You can specify that repeatetive messages should be filtered out using
# 'log_repeat_filter' "on"/"off" option. Default value is "off"
#

# The same as default "all"
set session log_show_messages="info, warning, error"

# Show only information and error messages
#set session log_show_messages="info, error"

# Show only error messages
#set session log_show_messages="error"

# Filter repeatetive messages out
#set session log_repeat_filter="on"

#
# The following lines tell the emulator where to preserve NVRAM content.
# It will keep the current time of the emulated VAX (when you do not
# run the emulator) and console parameters (such as default boot device).
# Note, both storages must be enabled for preserving NVRAM state.
#

#set toy container="charon.dat"
#set eeprom container="charon.rom"
```

```
#
# Specify the size of RAM (default 512MB). Remember that the dongle
# license might limit the maximum amount of memory.
#

set ram size=32
#set ram size=64
#set ram size=128
#set ram size=256
#set ram size=512

#
# Now assign console built-in serial line. Currently the
# emulator offers three possible ways using serial lines. First
# of them is connection to COM ports (via physical_serial_line).
# The second is to attach a third party terminal emulator
# (virtual_serial_line). And the third one is to connect to MOXA
# NPort 5210 box ports (via np5210_serial_line).
#
# Once desired way of connection is chosen load the interface
# like OPA0 which is expected by built-in console controller.
#

# MOXA NPort 5210 box connection
#load np5210_serial_line/chserial OPA0
#set OPA0 ip="xxx.xxx.xxx.xxx" rs_port=n

# Physical COM port connection
#load physical_serial_line/chserial OPA0 line="COM1:"

#
# Virtual serial line connection listening for the TCP/IP port
# number 10003 on the host system. It is possible to connect to
# this port from any appropriate application (standard terminal,
# user written terminal, etc...).
#
#load virtual_serial_line/chserial OPA0 port=10003

#
# Virtual serial line connection listening for the TCP/IP port
# number 10003 on the host system. Specified program is started
# automatically.
#
load virtual_serial_line/chserial OPA0
#set OPA0 port=10003 application="opa0.ht"
set OPA0 port=10003 application="putty.exe -load OPA0"
#set OPA0 port=10003 application="c:\kea\user\opa0.ktc"

# load DWMBB XMI-to-VAXBI adapter into slot 14 of the XMI
load DWMBB XBA xmi_node_id=14

#
# Slots 1 - 15 (1 - F) of the VAXBI are able to handle I/O adapters.
#

# load KDB50 MSCP disk controller into slot 1 of the VAX BI
load KDB50 PUA vax_bi_node_id=1

#
# Attach unit 0 of the PUA controller to disk image (.dsk or .vdisk);
# VMS would see it as "DUA0:"
#
#set PUA container[0]="..\vdisk\vmssys.vdisk"

#
# Attach unit 1 of the PUA controller to physical disk drive (N to be
# replaced with decimal number); VMS would see it as "DUA1:"
#set PUA container[1]="\\.\PhysicalDriveN"
#

# ...

#
# Attach unit 9 of the PUA controller to CDROM drive (0 might to be
# replaced with another decimal number, if necessary); VMS would see
# it as "DUA9:"
#set PUA container[9]="\\.\CdRomN"

#
# Attach unit 10 of the PUA controller to floppy disk drive ('A' to be
# replaced with 'B', if necessary); VMS would see it as "DUA10:"
#set PUA container[10]="\\.\A:"
```

```
# ...

# load DEBNI Ethernet Controller into slot 2 of the VAXBI
load DEBNI/DEMNA ETA vax_bi_node_id=2

# connect the ETA Ethernet controller to host network interface
#load ndis5_chpack_port/chnetwrk ETA0 interface="..."
#set ETA interface=ETA0

# Load VAXBI to UNIBUS adapter
load DWBUA UBA vax_bi_node_id=14

# Load TMSCP tape to have the tape instead of non-implemented TBK70
load TUK50 MUA

#
# Attach MUA controller to tape image (.mtd or .vtape); VMS would see
# it as "MUA0:"
#
set MUA container[0]="mua0.mtd"

#
# Attach MUA controller to physical tape drive (N to be replaced with
# decimal number); VMS would see it as "MUA0:"
#
#set MUA container[0]="\\.\TapeN"

# ...

# this is the end of the configuration file
```

Appendix B Pathworks 32

HP PATHWORKS 32 is recommended as a useful addition to CHARON-VAX/CHARON-PDP11.

HP PATHWORKS 32 is a member of the PATHWORKS family of software products that provides PC connectivity in local and wide area networks. Windows 7 and Windows 2008 R2 PCs can be connected to the RSX11/RT11, the HP OpenVMS Operating System (VAX and Alpha), the HP Tru64 UNIX Operating System (Alpha only), and other Windows 7 and Windows 2008 R2 systems and can use selected resources of those systems.

PATHWORKS 32 contains network connectivity components (DECnet and TCP/IP), the eXcursion X Server and the PowerTerm 525 terminal emulator.

CHARON-VAX/CHARON-PDP11 customers can use Pathworks 32 as a File transfer system for PC to OpenVMS file transfers, an X-Windows emulator to replace their DEC workstation graphics or a terminal emulator to replace their Digital VTxxx Terminals. For details of HP Pathworks 32 see:

http://h71000.www7.hp.com/pathworks32/

PATHWORKS 32 configuration steps

1. On the hosting server:

Make sure that the CHARON Packet Protocol (NDIS6) is installed and selected from the Windows Network Properties. If another Internet Protocol (TCP/IP) has been enabled, disable it. (See the CHARON-VAX/CHARON-PDP11 network installation for detailed instructions)

Start CHARON-VAX/XX product.

Make sure that VAX/VMS contains:

- DECwindows Motif installed and licensed.
- UCX or TCP/IP Services for OpenVMS installed, licensed and properly configured.

The XDM service is started using the **`$ @SYS$MANAGER:TCPIP$CONFIG.COM`**

To provide access to your host by eXcursion you need to copy and rename the file `XACCESS.TEMPLATE` to `XACCESS.TXT`. Edit the file `XACCESS.TXT` and check that the following line is uncommented:

```
*   #any host can get a login window.
```

2. Configure the eXcursion Control Panel

- In the XDMCP tab check the box Enable XDMCP
- In the XDMCP Startup Mode, choose Broadcast Mode and Max Host : 256
- Click on the Start Server Button

A list box appears and displays the available XDMCP Hosts.

For more information about eXcursion see the eXcursion User Guide.

Appendix C FAQ and troubleshooting

Q: When emulating a VAX with 512 MB of memory CHARON-VAX/XX cannot allocate enough resources for the emulated memory.

A: Check that your host PC has sufficient memory to support your model of CHARON-VAX/XX. See the section in this manual on host system requirements.

Q: I have previously used CHARON-VAX/Industrial. Can I use my existing configuration file with CHARON-VAX/XX?

A: No, the configuration files for these two products are quite different. Even if you have configuration file from an older version of CHARON-VAX/XX please check the difference. For example "ndis5_packet_port" device does not exist anymore – "packet_port" is used instead. If in doubt on how to convert your configuration file, contact your software supplier or Stromasys SA.

Q: I am unsure about when and if geometry has to be specified for my disk images.

A: The geometry command was implemented for compatibility with early versions of VMS. CHARON-VAX/XX starting from the version 1.2 will determine the disk geometry for real disks and disk images from the physical characteristics of the disk so you should not need to specify the disk geometry anymore.

Q: I have configured several disks on the same device of an emulated SCSI controller by using logical unit numbers, but the devices are not visible in VMS

A: Use the connect command in VMS as described in the chapter of this manual on CHARON-VAX/XX disk drives.

Q: I cannot save the boot parameters of my emulated VAX/PDP11 from run to run.

A: Make sure you have defined files to hold the time of year (TOY) parameters and read only memory (ROM) parameters (VAX only). Make sure that no corrupted versions of these files exist. If no file of that name exists, CHARON-VAX/XX / CHARON-PDP11 will create the TOY or ROM container file if required.

Start the emulator and use the SRM console (VAX) to set the boot parameters you need. Do not boot the operating system. Exit from the emulator and check that a ROM file has been saved. CHARON-VAX/XX will only save a ROM file if you have changed the any ROM parameters. Re-enter CHARON-VAX/XX and check that the boot parameters you need have been saved. Boot the operating system and set the time.

When you close down the operating system and exit the emulator a TOY container file will be created. Give the emulator a few seconds to save the details in the ROM and TOY containers.

If in doubt delete the old ROM or TOY container file and start again. Once these files have been created correctly, they will be maintained as required by CHARON-VAX/XX / CHARON-PDP11 and will not normally need to be re-created.

Q: My application uses the physical Ethernet address as a license key. It works on my original VAX/PDP11, but not on the emulator.

A: Use the STATION_ADDRESS parameter to set the desired physical address on your emulated Ethernet card.

Q: The emulator warns you that your physical Ethernet connection is too fast. Example: "WARNING - 100 Mbps Network card or possibility to negotiate line speed over 10 Mbs has been detected on the interface. The emulated VAX/PDP11 may not be able to maintain reliable Network operations over such a card.

A: If you are running CHARON-VAX/XX / CHARON-PDP11 version 3 and later you will be able to achieve stable operations on a network adapter set to 100 Mbs. You will still see the above warning but Network operations will be maintained in most cases if you have a fast host system. If significant packet loss or an application malfunctions due to Network errors, the first thing to try is setting the card down to 10 Mbs Half Duplex.

The message is generated if the network adapter specified in the configuration file is operates in auto-sense or any mode that can result in a connection speed over 10 Mbps. Hardware PDPs/VAXes and CHARON-VAX/XX / CHARON-PDP11 version 1 did not support a Network speed in excess of 10 Mbps.

The host system performance influences potential packet loss. With a faster Network card, the CHARON-VAX/XX / CHARON-PDP11 packet port can deliver too many packets to the emulator, more than the VAX/PDP11 Operating System running under the emulator may be able to process. This causes packets to be dropped or a protocol times out. Even connection-oriented protocols with re-transition logic can be broken because the number of re-transition attempts can be exceeded.

Eventually VMS may disable the network card as a result of repeated errors that will be seen as a network hang-up. Note that hardware VAX systems react the same way in case of traffic overload.

Q: I have been using CHARON-VAX/XX / CHARON-PDP11 and I wish to reset the MAC address of my Ethernet adapter. Or I have found that after using CHARON-VAX/XX / CHARON-PDP11 on two systems the MAC address on the Ethernet

adapters is set to the same value and this is disrupting my Network traffic, how can I correct this?

A: Open the properties of your Network adapter:

- Select Configure.
- Select advanced.
- Select Network address.
- Click on "Not present" to reset it to the default address.

The MAC address is the actual address on which a network adapter responds. Protocols like TCP/IP leave the MAC address unmodified, but DECnet sets it to a specific value. Two identical MAC addresses on the LAN can block all network communication.

To reset the MAC address to the default manufacturing value (unique for each adapter), clear the Address Resolution Protocol (ARP) cache in the host system, which stores recently used network addresses. You do that by typing **`ARP -d`** at a DOS prompt (you can use **`ARP -a`** to list the current settings). You may need to repeat this operation on other local systems that may have cached an erroneous MAC address.

To reset the TCP/IP protocol "right click" on the network adapter icon, disable the adapter, and then re-enable it. You should now be back to normal operations.

Q: The emulator is unable to start. The message is "Your CHARON-VAX/CHARON-PDP11 license does not permit production software."

A: You have tried to start CHARON-VAX/CHARON-PDP11 with a Field Test license key.

Appendix D VAX/VMS notes

Host system load and performance

The VAX/VMS operating system has an "idle" process that runs when the CPU is not used by any other processes. This means that, even when the emulated VAX CPU has no useful work to do, it runs at full speed. It thereby claims all capacity of the host CPU on which the VAX CPU component is running.

The CHARON-VAX host CPU optimization package is designed to correct this situation by slowing down the VAX CPU emulator component when VAX is running the idle process. See “Utilities” chapter for details.

CHARON-VAX/XX is a Windows application that can co-exist with other applications, although this is not a recommended situation. In case sharing is required (e.g. to run an Xterminal emulator), the Windows scheduler handles the load distribution between applications.

When running on a single CPU host system with no Hyper-threading, the VAX CPU components is impacted significantly and shuts down the ACE mode to preserve VAX peripheral response time. This mode is signaled in the CHARON-VAX log file.

For best performance a dual CPU host system is required. The load distribution of the CHARON-VAX/XX components over both CPUs is automatic. CHARON-VAX/XX will not use more than two host CPUs. It can only run with one instance.

VAX/VMS clustering

CHARON-VAX/XX for Windows systems can be clustered together over the Ethernet (NI cluster), they may also join existing VAX or Alpha VMS clusters. When using the VAX 4000-10X system models, the emulated MSCP controllers permit sharing disks directly provided the appropriate host hardware is used.

To add a CHARON-VAX/XX to a cluster use the standard cluster licenses and commands. See the following OpenVMS documentation for detailed instructions:

- OpenVMS Cluster Systems (AA-PV5WE-TK)
- Guidelines for OpenVMS Cluster Configurations (AA-Q28LE-TK)

The following is an example assuming that you are adding the emulated CHARON-VAX/XX system to an existing system set up to receive an additional cluster member.

1. Add the cluster licenses to VAX/VMS with the LICENSE REGISTER DCL command.
2. Rename the CHARON-VAX/XX disk to any unique name:

```
$ SET VOLUME/LABEL=CHRVAX DUA0:
$ PRODUCT REGISTER VOLUME OVMSVAXSYS DUA0:
```

3. Configure the VMS cluster on CHARON-VAX (in this example the system name is TST711):

```
$ @CLUSTER_CONFIG
Cluster Configuration Procedure
Executing on a VAX System
DECnet Phase IV is installed on this node.
This procedure has detected that the LANACP LAN server process is
 running on this node.
....
Do you want LANACP instead of DECnet for cluster boot serving? [YES]
 NO
MAIN MENU
1. ADD TST711 to existing cluster, or form a new cluster.
2. MAKE a directory structure for a new root on a system disk.
3. DELETE a root from a system disk.
4. EXIT from this procedure.
 Enter choice [1]:
....
Will the LAN be used for cluster communications (Y/N)? Y
Enter this cluster's group number: 4000
Will TST711 be a boot server [Y]? N
Will TST711 be a disk server (Y/N)? Y
Does this cluster contain a quorum disk [N]? N
....
Do you want to run AUTOGEN now [Y]? N
```

4. Edit the file MODPARAMS.DAT: Change value of the parameter VOTES to 0.

5. Run the AUTOGEN utility

```
   $ @SYS$UPDATE:AUTOGEN GETDATA REBOOT
```

Reader's Comments

We appreciate your comments, suggestions, criticism and updates of this manual. You can Email us your comments at: **info@stromasys.com**

Please mention the document reference number: 30-16-038-003.

If you found any errors, please list them with their page number.