nsrd.info micromanual

Configuring LinuxVTL on CentOS for NetWorker

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1 Introduction

1.1 What is a micromanual?

To understand what a *micromanual* is, we first need to revisit what a standard IT or computer book looks like. Typically it will run into the size of several hundred pages, most of which the average power user will rarely use.

On the other hand, a micromanual is instead a short, concise guide aimed at providing a comprehensive overview of, and instructions for a specific topic in as small a space as possible. The three principles of a micromanual are:

- Your time as the reader is precious
- You don't want to read stuff targeted at beginners
- You'd prefer to spend less money and get just what you need

1.2 What is this micromanual?

This micromanual is *Configuring LinuxVTL on CentOS for NetWorker*, and will document the following topics:

- 1. Overview
- 2. Setting up a suitable virtual machine
- 3. Installing the LinuxVTL Software
- 4. Configuring LinuxVTL with NetWorker
- 5. Confirming basic operations of the VTLs

1.3 Expected Audience

It is expected that the reader of this manual:

- Has administrator familiarity with NetWorker.
- Has system administrator familiarity with Linux (preferably CentOS Linux).
- Has access to the latest (v5.5 as of writing) CentOS Linux distribution.
- Has a spare host (physical or virtual) that NetWorker can be installed on in evaluation mode for practice sessions. Approximately 80GB of space should be available on the host.

This manual will assume that a virtual machine is to be configured and used, rather than a physical machine. Note that the SCSI configuration of physical machines may interfere with successful operations of the LinuxVTL software.

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2 Warning

This micromanual describes the process of configuring the open source virtual tape library software, LinuxVTL, with CentOS Linux and EMC NetWorker.

Both the author of the manual, and the developer of the software strongly advocate that the LinuxVTL software is only intended for lab testing, practising or training purposes, and is not intended to be a replacement to enterprise class virtual tape library software.

No warranties are made as to the reliability of LinuxVTL for ongoing running of a backup system.

The author takes no responsibility for any damage to a system, or loss of functionality caused by running either the commands within this micromanual, or commands adapted from this micromanual against a NetWorker environment.

The author takes no responsibility for data loss caused by using the LinuxVTL software.

3 End Goal

The end goal of this micromanual will have a NetWorker server running on Linux, with 2 x 22-slot VTLs configured, each with 4 x virtual LTO-4 drives.

4 Document Conventions

Throughout the document, the following conventions will be used for formatting:

Boxed text in a standard weight text represents output of commands.

<Boxed, italicised text in angle brackets represent an in-session comment, not output expected to be seen during the session.>

Boxed text in a bold weight text represents commands to be typed in.

Boxed text that is bold and italicised is part of a command to be typed in, but you should substitute with local text (e.g., replacing a hostname).

Text in a dotted box represents scripts that should be saved to file, then executed at a later step.

5 Getting Started – Preparing a Suitable Virtual Machine

For the purposes of this micromanual, we will step through the creation of a virtual machine hosted by Parallels Desktop for Mac.

First, source CentOS v5.5 installation media – you can find links to nearby repositories from:

http://www.centos.org

Note that your success in configuring LinuxVTL may depend on which distribution of Linux you install – for instance, it is known that several SuSE variants do not successfully run the VTL. Additionally, the 32-bit instance of the software tends to be more reliable across upgrades, so it is recommended that you configure a 32-bit system rather than a 64-bit system.

5.1 Installation Process

Within the virtualisation environment, create a new virtual host, configuring storage locations appropriately, and selecting to customise settings:

00	New Virtual Machine Assistant	
	Name and Loca	tion
Paralle	Name: Location:	IinuxvtI Share with other users of this Mac
		Customize settings before installation
		Go Back Create

Figure 1: Setup guest machine in Parallels, initial creation

When customising settings, 512MB of RAM should be more than sufficient for the purposes of a test/training host:

General Options Hardware	linuxvtl – General	
Name: linuxvtl CentOS Linux CPUs: 1 Memory: 512 MB	1 GB 2 GB 4 GB 8 GB Recommended	512 MB 🗘
Click the lock to prevent f	urther changes.	cel OK

Figure 2: Configure RAM for guest

If necessary, adjust the network interface to be used by the virtual machine. Also, change the disk size to be 80GB so that there will be sufficient space:

0 0	linuxvtl – Hardware
General Options Hardware	
the part of the	
W Boot Order	✓ Connected
Video	
🚽 Floppy Disk	Source: 🔲 linuxvtl–0.hdd 🛟
💮 CD/DVD 1	
💻 Hard Disk 1	Expanding disk, 80.0 GB Edit
😽 Network 1	
🧕 Sound	Location: SATA 0:1
USB Controller	
	Compress
+ -	?
Click the lock to preve	ent further changes.

Figure 3: Adjust hard drive configuration for guest

(You may also wish to take the time to configure the virtual disk to be pre-allocated, rather than allocated on demand.)

Once your virtual machine's hardware has been appropriately configured, you should be ready to start the guest:



Figure 4: Guest, ready for boot

Much of the standard CentOS setup should be followed, and is not outlined here. However, when the hard drive is to be configured, intervene and choose a custom layout:

Instal By de reaso to use	Inuxvti – Parallels Centos Idation requires partitioning of your hard drive. efault, a partitioning layout is chosen which is inable for most users. You can either choose e this or create your own.	. Desktop		
Crea	ite custom layout.	ŧ		
Er	Crypt system Select the drive(s) to use for this installation. ☑ sda 81917 MB ATA Virtual HDD [0]			
	♣ Advanced storage configuration]		
⊠ Re	eview and modify partitioning layout	[♦ <u>B</u> ack	▶ <u>N</u> ext
<u>с</u> р	arallels Tools are not installed. From the Virtual Machine menu, choos	e Install Parallels Tools.	•	* 🕒 🗕 //.

Figure 5: Electing for a custom layout of partitions in CentOS

Assuming the system will be used only for test/training, the following sizes are recommended:

- / filesystem 9GB
- **Swap** partition 1GB
- **/opt** filesystem 60GB

Сег	Iinuxvtl - Parallels Desktop	
	Drive /dev/sda (81917 MB) (Model: ATA Virtual HDD [0]) sda1 9216 MB 71672 MB	
New	Edit Delete Reset RAID LVM	
Device	Mount Point/ RAID/Volume Format Size (MB) Start End	
✓ Hard Drives		
▽ /dev/sda		
/dev/sdal	/ ext3 🖌 9216 1 1175	1
/dev/sda2	swap 🖌 1027 1176 1306	
/dev/sda3	/opt ext3 ✓ 71672 1307 10443	-
☐ Hide RAID device	e/LVM Volume <u>G</u> roup members	t
Ů → Parallels Tools a	are not installed. From the Virtual Machine menu, choose Install Parallels Tools.	- //.

Figure 6: Completed custom partition layout

Even for testing purposes, it is strongly recommend that a NetWorker server or storage node have a dedicated IP address. Therefore, you should modify the network settings to use a fixed IP address, and either add a host entry to your local DNS server for the testing, or be prepared to use /etc/hosts files on the guest. In the following screens, a dedicated IP address has been setup in DNS:

	■ linuxvtl – Parallels Desktop	Y
	Edit Interface	500
Network Devi	Intel Corporation 82545EM Gigabit Ethernet Controller (Copper) Hardware address: 00:1C:42:7F:5C:7D	
Active on Boo	✓ Enable IPv4 support	
	 Dynamic IP configuration (DHCP) 	
	 Manual configuration 	
	IP Address Prefix (Netmask)	
	192.168.50.25 / 255.255.0.0	
Hostname	C Enable IPv6 support	
Set the hostnar	Automatic neighbor discovery	
automatica	 Dynamic IP configuration (DHCPv6) 	
O manually	Manual configuration	
, (IP Address Prefix	7
Miscellaneous		
<u>G</u> ateway:		
Primary DNS:	💥 <u>C</u> ancel 🥥 <u>O</u> K	
Secondary DNS		
Decondury pract		1
<u>R</u> elease Note	s 🖉 🛱 Back	▶ <u>N</u> ext
(신 - Parallels Too	s are not installed. From the Virtual Machine menu, choose Install Parallels Tools.	• * •

Figure 7: Manual network configuration, step 1

Disable DHCP and use an appropriate IP address/netmask for your environment, if you are setting up a new virtual machine.

0 0	💻 linuxvtl – Parallels Desktop 🗢
🛞 Се	ntOS
Network Devic	es
Active on Boot	Device IPv4/Netmask IPv6/Prefix <u>E</u> dit
	eth0 192.168.50.25/16 Auto
Hostname	
Set the hostnam	e:
O <u>a</u> utomatically	y via DHCP
⊚ <u>m</u> anually li	nuxvtl.pmdg.lab (e.g., host.domain.com)
Miscellaneous	Settings
<u>G</u> ateway:	192.168.100.99
Primary DNS:	192.168.50.254
Secondary DNS:	
<u>R</u> elease Notes	; rack rack rack acksim Next
· Parallels Tools	s are not installed. From the Virtual Machine menu, choose Install Parallels Tools.

Figure 8: Manual network configuration, step 2

Be sure to enter appropriate host/gateway/DNS details for your environment in the above network setup dialog.

When prompted for package installation, the default of "Desktop – Gnome" can be left selected; we will install other packages as required using yum:

	💻 linuxvtl -	- Parallels Desktop	
🛞 Cent	05		
The default installation usage. What additional	of CentOS includes a set of sof tasks would you like your syste	tware applicable for general inte em to include support for?	rnet
🗹 Desktop - Gnome			
Desktop - KDE			
Server	•		-
Please select any addit	ional repositories that you wan	t to use for software installation.	
Packages from Cen	tOS Extras		
♣ <u>A</u> dd additional sof	tware repositories		
You can further custom management application	ize the software selection now, ວກ.	or after install via the software	
Oustomize later	O Customize now		
<u>R</u> elease Notes			<u>■ Back</u> <u>■ Next</u>
O ▼ Parallels Tools are no	t installed. From the Virtual Machine m	enu, choose Install Parallels Tools.	• 🗙 🖵 - //

Figure 9: Choosing default package configuration

5.2 Finalising the Installation

Once the installation has completed and the CentOS Linux system reboots, you will be prompted to finalise the configuration of the virtual machine. For ease of use (given this should be in an isolated lab environment), you should:

- Disable the firewall.
- Disable Security Enhanced Linux.

Disabling these features will prompt a new reboot. **NOTE**: No allowance is made in the remainder of the micromanual for leaving these features turned on.

5.3 Recommended Post-Install Actions

After the installation has been completed, it is recommended you perform the following actions:

- 1. Change system to run-level 3, and adjust /etc/inittab to make run-level 3 the default.
- 2. Erase any large packages from the system that are not required (e.g., **yum erase openoffice***).
- 3. Perform a package update (yum update -y).
- 4. Reboot if the kernel or associated drivers have been updated.
- 5. Install Parallels Tools (or if configuring under VMware, VMware tools). This will maximise disk performance.

6 Installing the LinuxVTL Software

6.1 Download the LinuxVTL software

The LinuxVTL software can be downloaded from:

http://sites.google.com/site/linuxvtl2/

Scroll through down to the "Download" section, and download:

- mhvtl-<version>.i586.rpm
- mhvtl-<date>.tgz

6.2 Install the LinuxVTL software

There are two components to the LinuxVTL software – the user-level software, and the kernel-level drivers.

First, install the user level drivers:

Next, decompress and extract the source, so that the kernel drivers may be compiled:

```
[root@linuxvtl ~]# gunzip -c mhvtl-2010-05-09.tgz | tar xvpf -
mhvtl-0.16/man/
mhvtl-0.16/man/make_vtl_devices.1
mhvtl-0.16/man/library_contents.5
mhvtl-0.16/man/mhvtl.conf.5
mhvtl-0.16/man/mhvtl.1
mhvtl-0.16/man/vtlcmd.1
mhvtl-0.16/man/vtllibrary.1
mhvtl-0.16/man/build_library_config.1
mhvtl-0.16/man/mktape.1
mhvtl-0.16/man/vtltape.1
mhvtl-0.16/doc/
mhvtl-0.16/doc/index.html
mhvtl-0.16/doc/4_library_example/
mhvtl-0.16/doc/4_library_example/mhvtl.conf
mhvtl-0.16/doc/4_library_example/library_contents.10
mhvtl-0.16/doc/4_library_example/device.conf
mhvtl-0.16/doc/4_library_example/library_contents.40
mhvtl-0.16/doc/4_library_example/library_contents.20
mhvtl-0.16/doc/4_library_example/library_contents.30
mhvtl-0.16/kernel/
mhvtl-0.16/kernel/fetch27.c
mhvtl-0.16/kernel/fetch24.c
mhvtl-0.16/kernel/fetch.c
mhvtl-0.16/kernel/fetch26.c
mhvtl-0.16/kernel/Makefile
mhvtl-0.16/kernel/vtl_common.h
mhvtl-0.16/kernel/mhvtl.c
mhvtl-0.16/usr/
mhvtl-0.16/usr/vtltape.c
mhvtl-0.16/usr/be_byteshift.h
```

mhvtl-0.16/usr/scsi.h mhvtl-0.16/usr/mktape.c mhvtl-0.16/usr/security_protocol.h mhvtl-0.16/usr/vtltape.h mhvtl-0.16/usr/make_vtl_devices mhvtl-0.16/usr/dump_tape.c mhvtl-0.16/usr/make_vtl_media.in mhvtl-0.16/usr/Makefile mhvtl-0.16/usr/make_scsi_dev mhvtl-0.16/usr/q.h mhvtl-0.16/usr/vtllib.h mhvtl-0.16/usr/vtllib.c mhvtl-0.16/usr/build_library_config mhvtl-0.16/usr/q.c mhvtl-0.16/usr/vtlcmd.c mhvtl-0.16/usr/spc.c mhvtl-0.16/usr/dump_messageQ.c mhvtl-0.16/usr/spc.h mhvtl-0.16/usr/vtllibrary.c mhvtl-0.16/etc/ mhvtl-0.16/etc/mhvtl mhvtl-0.16/etc/Makefile mhvtl-0.16/etc/mhvtl.in mhvtl-0.16/etc/library_contents.sample mhvtl-0.16/scripts/ mhvtl-0.16/scripts/update_device.conf.in mhvtl-0.16/scripts/Makefile mhvtl-0.16/scripts/checkpatch.pl mhvtl-0.16/include/ mhvtl-0.16/include/vtl_u.h mhvtl-0.16/Makefile mhvtl-0.16/README mhvtl-0.16/INSTALL mhvtl-0.16/mhvtl.spec

Change directory into the mhvtl-<version>/kernel directory created, and run "make", then "make install":

```
[root@linuxvtl ~]# cd mhvtl-0.16/kernel
[root@linuxvtl kernel]# make
make -C /lib/modules/2.6.18-194.17.1.el5/build SUBDIRS=/root/mhvtl-0.16/kernel modules
make[1]: Entering directory `/usr/src/kernels/2.6.18-194.17.1.el5-i686'
CC [M] /root/mhvtl-0.16/kernel/mhvtl.o
Building modules, stage 2.
MODPOST
CC /root/mhvtl-0.16/kernel/mhvtl.mod.o
LD [M] /root/mhvtl-0.16/kernel/mhvtl.ko
make[1]: Leaving directory `/usr/src/kernels/2.6.18-194.17.1.el5-i686'
[root@linuxvtl kernel]# make install
install -o root -g root -m 644 mhvtl.ko /lib/modules/`uname -r`/kernel/drivers/scsi/
depmod -ae
```

6.3 First Start

Once the software has been installed, we can do an initial start of the VTL system. This will generate a default configuration that will *not* work in NetWorker, but will at least allow us to subsequently edit the templates.

Using the /etc/init.d/mhvtl script, first start, then stop the VTL:

```
[root@linuxvtl kernel]# /etc/init.d/mhvtl start
```

```
Could not locate library config file: /etc/mhvtl/library_contents.10
Creating a default one
Please stop mhvtl & edit /etc/mhvtl/library_contents.10 to suit your requirements
Could not locate library config file: /etc/mhvtl/library_contents.30
Creating a default one
Please stop mhvtl & edit /etc/mhvtl/library_contents.30 to suit your requirements
vtltape: version 0.16.13
vtllibrary: version 0.16.13
vtllibrary process PID is 15894
vtllibrary: version 0.16.13
vtllibrary process PID is 15897
[root@linuxvtl kernel]# /etc/init.d/mhvtl stop
shutdown of mhvtl
   Sending exit to 11
   Sending exit to 12
   Sending exit to 13
   Sending exit to 14
   Sending exit to 31
   Sending exit to 32
   Sending exit to 33
   Sending exit to 34
   Sending exit to 10
   Sending exit to 30
```

6.4 Adjusting LinuxVTL Configuration

Now that the configuration has been created, we need to adjust it to suit NetWorker. In the /etc/mhvtl directory, you will find 4 files that have been created by the initial startup. These are:

- **device.conf** Provides details of the virtual devices to be emulated.
- **library_contents.10** Provides contents (tape listing) for the first virtual tape library
- **library_contents.30** Provide contents (tape listing) for the second virtual tape library
- **mhvtl.conf** Overall configuration file for the LinuxVTL.

We will edit each of these files. First, edit the 'mhvtl.conf' file, and change the default capacity for media from 500 (MB) to 1024 (i.e., 1 GB). The finished file is shown below:

```
[root@linuxvtl mhvtl]# cat mhvtl.conf
# Home directory for config file(s)
MHVTL_CONFIG_PATH=/etc/mhvtl
# Default media capacity (500 M)
CAPACITY=1024
# Set default verbosity [0|1|2|3]
VERBOSE=1
# Set kernel module debuging [0|1]
VTL_DEBUG=0
```

(While the software will have created some virtual tapes in /opt/mhvtl with a default capacity of 500 MB, we will delete those before we restart the VTL.)

We then need to edit the 'device.conf' file to adjust the SCSI paths of the tape drives and libraries to something that NetWorker will work with (the default does not work). Specifically, for each device there will be a line of the form:

{DrivelLibrary}: ID CHANNEL: x TARGET: y: LUN: z

For each of these devices defined in the default configuration, the LUN will be set to 0. For reasons unknown, NetWorker will not correctly identify the units if all LUNs are 0 (even though there is SCSI separation). Therefore, work your way through the file, incrementing the LUN number by 1 for each device/library found. The final file will look like the following, with the changed entries underlined:

```
[root@linuxvtl mhvtl]# cat device.conf
VERSION: 4
# VPD page format:
# <page #> <Length> <x> <x+1>... <x+n>
# NAA format is an 8 hex byte value seperated by ':'
# Note: NAA is part of inquiry VPD 0x83
#
# Each 'record' is separated by one (or more) blank lines.
# Each 'record' starts at column 1
# Serial num max len is 10.
# Compression: factor X enabled 0|1
      Where X is zlib compression factor
                                            1 = Fastest compression
#
#
                                            9 = Best compression
      enabled 0 == off, 1 == on
#
Library: 10 CHANNEL: 00 TARGET: 00 LUN: 00
Vendor identification: SPECTRA
Product identification: PYTHON
Product revision level: 550V
Unit serial number: XYZZY_A
NAA: 10:22:33:44:ab:00:00:00
Drive: 11 CHANNEL: 00 TARGET: 01 LUN: 01
Library ID: 10 Slot: 01
Vendor identification: IBM
Product identification: ULT3580-TD4
 Product revision level: 550V
Unit serial number: XYZZY_A1
NAA: 10:22:33:44:ab:00:01:00
Compression: factor 1 enabled 1
Drive: 12 CHANNEL: 00 TARGET: 02 LUN: 02
Library ID: 10 Slot: 02
Vendor identification: IBM
Product identification: ULT3580-TD4
 Product revision level: 550V
Unit serial number: XYZZY_A2
NAA: 10:22:33:44:ab:00:02:00
Compression: factor 1 enabled 1
Drive: 13 CHANNEL: 00 TARGET: 03 LUN: 03
Library ID: 10 Slot: 03
Vendor identification: IBM
 Product identification: ULT3580-TD4
 Product revision level: 550V
Unit serial number: XYZZY_A3
```

NAA: 10:22:33:44:ab:00:03:00 Compression: factor 1 enabled 1 Drive: 14 CHANNEL: 00 TARGET: 04 LUN: 04 Library ID: 10 Slot: 04 Vendor identification: IBM Product identification: ULT3580-TD4 Product revision level: 550V Unit serial number: XYZZY_A4 NAA: 10:22:33:44:ab:00:04:00 Compression: factor 1 enabled 1 Library: 30 CHANNEL: 01 TARGET: 00 LUN: 05 Vendor identification: SPECTRA Product identification: PYTHON Product revision level: 550V Unit serial number: XYZZY_B NAA: 30:22:33:44:ab:01:00:00 Drive: 31 CHANNEL: 01 TARGET: 01 LUN: 06 Library ID: 30 Slot: 01 Vendor identification: IBM Product identification: ULT3580-TD4 Product revision level: 550V Unit serial number: XYZZY_B1 NAA: 30:22:33:44:ab:01:01:00 Compression: factor 1 enabled 1 Drive: 32 CHANNEL: 01 TARGET: 02 LUN: 07 Library ID: 30 Slot: 02 Vendor identification: IBM Product identification: ULT3580-TD4 Product revision level: 550V Unit serial number: XYZZY_B2 NAA: 30:22:33:44:ab:01:02:00 Compression: factor 1 enabled 1 Drive: 33 CHANNEL: 01 TARGET: 03 LUN: 08 Library ID: 30 Slot: 03 Vendor identification: IBM Product identification: ULT3580-TD4 Product revision level: 550V Unit serial number: XYZZY_B3 NAA: 30:22:33:44:ab:01:03:00 Compression: factor 1 enabled 1 Drive: 34 CHANNEL: 01 TARGET: 04 LUN: 09 Library ID: 30 Slot: 04 Vendor identification: IBM Product identification: ULT3580-TD4 Product revision level: 550V Unit serial number: XYZZY_B4 NAA: 30:22:33:44:ab:01:04:00 Compression: factor 1 enabled 1

Next we will edit each of the library_contents.X files to adjust the tape configuration. The default setup is a mix of media types; since the drives in use for the purpose of this micromanual will be LTO-4 drives only, having mixed media defined in the libraries will be counter-productive. Additionally, the default configuration specifies 2 cleaning media per library. Our final configurations will either use a single cleaning cartridge per virtual library, or preferably, none. (I.e., you may choose to leave a cleaning cartridge defined if you wish.)

Adjust the library_contents.10 file so that it resembles the following:

```
[root@linuxvtl mhvtl]# cat library_contents.10
Drive 1:
Drive 2:
Drive 3:
Drive 4:
Picker 1:
MAP 1:
MAP 2:
MAP 3:
MAP 4:
# Slot 1 - ?, no gaps
# Slot N: [barcode]
# [barcode]
# a barcode is comprised of three fields: [Leading] [identifier] [Trailing]
# Leading "CLN" -- cleaning tape
# Leading "W" -- WORM tape
# Leading "NOBAR" -- will appear to have no barcode
# If the barcode is at least 8 character long, then the last two characters are Trailing
# Trailing "S3" - SDLT600
# Trailing "X4" - AIT-4
# Trailing "L1" - LTO 1
# Trailing "TA" - T10000+
# Trailing "JA" - 3592+
# Trailing "JB" - 3592E05+
# Trailing "JW" - WORM 3592+
# Trailing "JX" - WORM 3592E05+
#
Slot 1: 800840L4
Slot 2: 800841L4
Slot 3: 800842L4
Slot 4: 800843L4
Slot 5: 800844L4
Slot 6: 800845L4
Slot 7: 800846L4
Slot 8: 800847L4
Slot 9: 800848L4
Slot 10: 800849L4
Slot 11: 800850L4
Slot 12: 800851L4
Slot 13: 800852L4
Slot 14: 800853L4
Slot 15: 800854L4
Slot 16: 800855L4
Slot 17: 800856L4
Slot 18: 800857L4
Slot 19: 800858L4
Slot 20: 800859L4
Slot 21: 800860L4
Slot 22: 800861L4
```

NOTE: Be certain when adjusting the configuration that you do not have multiple tapes with the same barcode.

Similarly, the library_contents.30 file when edited should resemble the following:

```
[root@linuxvtl mhvtl]# cat library_contents.30
Drive 1:
Drive 2:
Drive 3:
Drive 4:
Picker 1:
MAP 1:
MAP 2:
MAP 3:
MAP 4:
# Slot 1 - ?, no gaps
# Slot N: [barcode]
# [barcode]
# a barcode is comprised of three fields: [Leading] [identifier] [Trailing]
# Leading "CLN" -- cleaning tape
# Leading "W" -- WORM tape
# Leading "NOBAR" -- will appear to have no barcode
# If the barcode is at least 8 character long, then the last two characters are Trailing
# Trailing "S3" - SDLT600
# Trailing "X4" - AIT-4
# Trailing "L1" - LTO 1
# Trailing "TA" - T10000+
# Trailing "JA" - 3592+
# Trailing "JB" - 3592E05+
# Trailing "JW" - WORM 3592+
# Trailing "JX" - WORM 3592E05+
#
Slot 1: 900840L4
Slot 2: 900841L4
Slot 3: 900842L4
Slot 4: 900843L4
Slot 5: 900844L4
Slot 6: 900845L4
Slot 7: 900846L4
Slot 8: 900847L4
Slot 9: 900848L4
Slot 10: 900849L4
Slot 11: 900850L4
Slot 12: 900851L4
Slot 13: 900852L4
Slot 14: 900853L4
Slot 15: 900854L4
Slot 16: 900855L4
Slot 17: 900856L4
Slot 18: 900857L4
Slot 19: 900858L4
Slot 20: 900859L4
Slot 21: 900860L4
Slot 22: 900861L4
```

NOTE: Be certain that no virtual volumes defined in this file match virtual volume barcodes defined in the other library contents file. In the example files given, volumes have been labelled in a sequence starting 800840L4 for library_contents.10, and in a sequence starting 900840L4 for library_contents.30.

6.5 Clear the Existing Virtual Volumes

When the VTL first started, using the bootstrapped configuration it will have created a set of "default" virtual volumes in /opt/vtl. We need to delete these:

```
[root@linuxvtl ~]# unalias rm
[root@linuxvtl ~]# cd /opt/vtl
[root@linuxvtl vtl]# ls
CLN100S3 DD1001S3 DD1005S3 DD1009S3 DD3003S3 DD3007S3 UD1011L4 UD1015L4 UD1019L4
UD3013L4 UD3017L4
CLN101L4 DD1002S3
                  DD1006S3
                           DD1010S3
                                     DD3004S3
                                               DD3008S3
                                                        UD1012L4 UD1016L4 UD1020L4
UD3014L4 UD3018L4
CLN300S3 DD1003S3
                  DD1007S3
                            DD3001S3
                                     DD3005S3
                                               DD3009S3
                                                        UD1013L4 UD1017L4 UD3011L4
UD3015L4 UD3019L4
CLN301L4 DD1004S3 DD1008S3 DD3002S3 DD3006S3 DD3010S3 UD1014L4 UD1018L4 UD3012L4
UD3016L4 UD3020L4
[root@linuxvtl vtl]# rm *
```

Now we are ready to restart the VTL.

6.6 Start VTL and Visibility

With the default virtual tape entries removed, and our configuration slotted into place, restart the VTL:

```
[root@linuxvtl vtl]# /etc/init.d/mhvtl start
vtltape: version 0.16.13
vtllibrary: version 0.16.13
vtllibrary process PID is 17034
vtllibrary process PID is 17115
```

Now, perform a directory listing of /opt/vtl to confirm the 'correct' virtual volumes exist:

```
[root@linuxvtl vtl]# ls /opt/vtl
800840L4 800844L4 800848L4 800852L4 800856L4 800860L4 900842L4 900846L4 900850L4
900854L4 900858L4
800841L4 800845L4 800849L4 800853L4 800857L4 800861L4 900843L4 900847L4 900851L4
900855L4 900859L4
800842L4 800846L4 800850L4 800854L4 800858L4 900840L4 900844L4 900848L4 900852L4
900856L4 900860L4
800843L4 800847L4 800851L4 800855L4 800859L4 900841L4 900845L4 900845L4 900853L4
900857L4 900861L4
```

Finally, check the output of "cat /proc/scsi/scsi" – you should see output similar to the following, bearing in mind that the configuration of your guest may result in other SCSI devices being visible:

```
[root@linuxvtl vtl]# cat /proc/scsi/scsi
Attached devices:
Host: scsi0 Channel: 00 Id: 00 Lun: 00
Vendor: ATA Model: Virtual HDD [0] Rev: FWR1
Type: Direct-Access ANSI SCSI revision: 05
```

Host: scsi6 Channel: 00 Id: 01 Lun: 01	
Times Convertical Access	REV: 550V
Type: Sequential-Access	ANSI SUSI revision: 05
HOST: SCS16 Channel: 00 1a: 02 Lun: 02	
Vendor: IBM Model: ULI3580-ID4	Rev: 550V
Type: Sequential-Access	ANSI SUSI revision: 05
HOST: SCS16 Channel: 00 1a: 03 Lun: 03	
Vendor: IBM Model: ULI3580-ID4	Rev: 550V
Type: Sequential-Access	ANSI SUSI revision: 05
HOST: SCS16 Channel: 00 1a: 04 Lun: 04	
Vendor: IBM Model: ULI3580-ID4	Rev: 550V
Type: Sequential-Access	ANSI SCSI revision: 05
Host: scsib Channel: 01 Id: 01 Lun: 06	5 5504
Vendor: IBM Model: ULI3580-ID4	Rev: 550V
Type: Sequential-Access	ANSI SCSI revision: 05
Host: scsi6 Channel: 01 Id: 02 Lun: 07	
Vendor: IBM Model: ULT3580-TD4	Rev: 550V
Type: Sequential-Access	ANSI SCSI revision: 05
Host: scsi6 Channel: 01 Id: 03 Lun: 08	
Vendor: IBM Model: ULT3580-TD4	Rev: 550V
Type: Sequential-Access	ANSI SCSI revision: 05
Host: scsi6 Channel: 01 Id: 04 Lun: 09	
Vendor: IBM Model: ULT3580-TD4	Rev: 550V
Type: Sequential-Access	ANSI SCSI revision: 05
Host: scsi6 Channel: 00 Id: 00 Lun: 00	
Vendor: SPECTRA Model: PYTHON	Rev: 550V
Type: Medium Changer	ANSI SCSI revision: 05
Host: scsi6 Channel: 01 Id: 00 Lun: 05	
Vendor: SPECTRA Model: PYTHON	Rev: 550V
Type: Medium Changer	ANSI SCSI revision: 05

In particular, you should see at least the following:

- 2 Spectra/Python Media Changers
- 8 x LTO-4 tape drives.

Finally, confirm the VTL processes are operating:

[root@	linuxvtl	vtl]#	ps	-eaf	Т	grep	vtl
avahi	2602	1	0	11:04	?		00:00:00 avahi-daemon: running [linuxvtl.local]
vtl	16989	1	0	14:45	?		00:00:00 vtltape -q 11 -v
vtl	16992	1	0	14:45	?		00:00:00 vtltape -q 12 -v
vtl	16996	1	0	14:45	?		00:00:00 vtltape -q 13 -v
vtl	16999	1	0	14:45	?		00:00:00 vtltape -q 14 -v
vtl	17002	1	0	14:45	?		00:00:00 vtltape -q 31 -v
vtl	17005	1	0	14:45	?		00:00:00 vtltape -q 32 -v
vtl	17027	1	0	14:45	?		00:00:00 vtltape -q 33 -v
vtl	17030	1	0	14:45	?		00:00:00 vtltape -q 34 -v
vtl	17034	1	0	14:45	?		00:00:00 vtllibrary -q 10 -v
vtl	17115	1	0	14:45	?		00:00:00 vtllibrary -q 30 -v
root	17486	2939	0	14:48	pt	s/0	00:00:00 grep vtl

NOTE: The 'vtl' user will own all VTL associated processes.

7 Install and Configure NetWorker

Once the VTL has been installed and configured, you'll need NetWorker running on the system. For the purposes of this manual, we will install and configure NetWorker 7.6 SP1.

7.1 Software Installation

Install the following NetWorker packages:

- Client
- Man Pages
- Storage Node
- Server
- Management Console

```
[root@linuxvtl vtl]# cd /root
[root@linuxvtl ~]# ls
anaconda-ks.cfg install.log
                                    mhvtl-0.16
                                                            mhvtl-2010-05-09.tgz
                install.log.syslog mhvtl-0.16-13.i586.rpm nw76sp1_linux_x86.tar.gz
Desktop
[root@linuxvtl ~]# mkdir 761
[root@linuxvtl ~]# cd 761
[root@linuxvtl 761]# gunzip -c ../nw76sp1_linux_x86.tar.gz | tar xvpf -
linux_x86/
linux_x86/lgtoclnt-7.6.1-1.i686.rpm
linux_x86/lgtolicm-7.6.1-1.i686.rpm
linux_x86/lgtoman-7.6.1-1.i686.rpm
linux_x86/lgtonode-7.6.1-1.i686.rpm
linux_x86/lgtoserv-7.6.1-1.i686.rpm
linux_x86/lgtofr-7.6.1-1.i686.rpm
linux_x86/lgtoja-7.6.1-1.i686.rpm
linux_x86/lgtoko-7.6.1-1.i686.rpm
linux_x86/lgtozh-7.6.1-1.i686.rpm
linux_x86/lgtonmc-7.6.1-1.i686.rpm
linux_x86/LGTO_METAFILE.linuxx86
linux_x86/sd_products.res
[root@linuxvtl 761]# mv linux_x86/* . && rmdir linux_x86
[root@linuxvtl 761]# ls
lgtoclnt-7.6.1-1.i686.rpm lgtoko-7.6.1-1.i686.rpm
                                                     LGTO_METAFILE.linuxx86
                                                                                lgtoserv-
7.6.1-1.i686.rpm
lgtofr-7.6.1-1.i686.rpm
                          lgtolicm-7.6.1-1.i686.rpm lgtonmc-7.6.1-1.i686.rpm
                                                                                lgtozh-
7.6.1-1.i686.rpm
lgtoja-7.6.1-1.i686.rpm
                          lgtoman-7.6.1-1.i686.rpm
                                                    lgtonode-7.6.1-1.i686.rpm
sd_products.res
[root@linuxvtl 761]# rpm -ivh lgtoclnt-7.6.1-1.i686.rpm lgtoman-7.6.1-1.i686.rpm
lgtonode-7.6.1-1.i686.rpm lgtoserv-7.6.1-1.i686.rpm lgtonmc-7.6.1-1.i686.rpm
error: Failed dependencies:
      openmotif is needed by lgtoclnt-7.6.1-1.i686
      libXp.so.6 is needed by lgtoclnt-7.6.1-1.i686
      libstdc++.so.5 is needed by lgtoclnt-7.6.1-1.i686
      libstdc++.so.5(CXXABI_1.2) is needed by lgtoclnt-7.6.1-1.i686
      libstdc++.so.5(GLIBCPP_3.2) is needed by lgtoclnt-7.6.1-1.i686
      libstdc++.so.5(GLIBCPP_3.2.2) is needed by lgtoclnt-7.6.1-1.i686
      libstdc++.so.5 is needed by lgtoserv-7.6.1-1.i686
      libstdc++.so.5(CXXABI_1.2) is needed by lgtoserv-7.6.1-1.i686
      libstdc++.so.5(GLIBCPP_3.2) is needed by lgtoserv-7.6.1-1.i686
      libstdc++.so.5(GLIBCPP_3.2.2) is needed by lgtoserv-7.6.1-1.i686
      libstdc++.so.5 is needed by lgtonmc-7.6.1-1.i686
      libstdc++.so.5(CXXABI_1.2) is needed by lgtonmc-7.6.1-1.i686
      libstdc++.so.5(GLIBCPP_3.2) is needed by lgtonmc-7.6.1-1.i686
```

NOTE: The above error indicates that NetWorker dependency packages are not on the system. To get around this, use the yum 'localinstall' command, which will trigger the download of packages NetWorker depends on:

[root@linuxvtl 761]# yum locali lgtoman-7.6.1-1.i686.rpm lgto	nstallnogp onode-7.6.1-1.	Jcheck lgtoclnt-7.6.1-1.i686.rpm i686.rpm lgtoserv-7.6.1-1.i686.rpm						
lgtonmc-7.6.1-1.1686.rpm								
Loaded plugins: fastestmirror								
Setting up Local Package Process								
Examining lgtoclnt-7.6.1-1.1686.	pm: lgtoclnt-7.	6.1-1.1686						
Marking Igtocint-7.6.1-1.1686.rpr	Marking lgtoclnt-7.6.1-1.i686.rpm to be installed							
Lodaing mirror speeds from cached	a nostfile							
* dadons: mirror.optus.net								
* base: mirror.optus.net								
* extrus: mirror.optus.net								
* updates: mirror.optus.net	ame latoman 7 6	1 1 1 696						
Examining Lytoman 7.6.1.1 i686 ppm	to be installed	1-1.1080						
Framining latonodo 7 6 1 1 i686	nm. latonodo 7	6 1 1 j6%						
Marking latonode_7.6.1-1.1686 rpr	"pm. lyconode-7. n to be installe	d						
Examining latoseny -7 6 1-1 i686	n = 10 De installe	$6 \ 1_{-1} \ i \ 686$						
Marking latoserv $_{7}$ 6 1-1 i686 rpr	n to be installe	d						
Examining laton $mc_7 = 7.0.1 - 1.1000.1 \text{ p}$	$m \cdot la + onmc_7 6$	u 1_1 i686						
Marking latonmc-7 6 1-1 i686 rpm	to be installed	1-1.1000						
Resolving Dependencies								
> Running transaction check								
> Package latoclat i686 0.7 6	1-1 set to be	ndated						
> Processing Dependency: openmo	ntif for package	: latocint						
> Processing Dependency: libXp	so.6 for package	e: latocint						
> Processing Dependency: libsto	dc++.so.5 for p	ckage: latocint						
> Processing Dependency: libsto	dc++.so.5(CXXAB]	1.2) for package: latoclnt						
> Processing Dependency: libsto	dc++.so.5(GLIBC	P 3.2) for package: latoclnt						
> Processing Dependency: libsto	dc++.so.5(GLIBC	P 3.2.2) for package: latoclat						
> Package latoman.i686 0:7.6.	L-1 set to be up	dated						
> Package lgtonmc.i686 0:7.6.2	L-1 set to be u	dated						
> Package lgtonode.i686 0:7.6	1-1 set to be i	pdated						
> Package lgtoserv.i686 0:7.6	.1-1 set to be ι	, pdated						
> Running transaction check								
> Package compat-libstdc++-33	.i386 0:3.2.3-61	set to be updated						
> Package libXp.i386 0:1.0.0-8	3.1.el5 set to b	e updated						
> Package openmotif.i386 0:2.3	3.1-2.el5_4.1 se	t to be updated						
addons/filelists								
195 B 00:00								
base/filelists_db								
3.4 MB 00:09								
extras/filelists_db								
197 kB 00:00								
updates/filelists_db								
2.8 MB 00:08								
> Finished Dependency Resolution	on							
Dependencies Resolved								
	Anch	Vancion						
Package	Arch	version						
	512e							
Installina:								
latoclnt	i686	7.6.1-1						
/latoclnt-7 6 1-1 i686	160 M							
latoman	1686	7.6.1-1						
/latoman-7.6.1-1.i686	1 3 M	1.0.1 1						
, 1900mart 1.0.1 1.1000	1.5 1							

lgtonmc		i686		7.6.1-1
/lgtonmc-7.6.1-1.i	.686	115	Μ	
lgtonode /latonode-7 6 1-1	i686	1686 35	м	7.6.1-1
lgtoserv		i686		7.6.1-1
/lgtoserv-7.6.1-1.	i686	42	М	
Installing for dep	endencies:			
compat-libstdc++-	-33	1386	k	3.2.3-61
libXp		i 386	ĸ	1.0.0-8.1.e15
base		23	k	
openmotif		i386		2.3.1-2.el5_4.1
base		1.5	М	
Transaction Summar	'y ====================================	:		
		=====		
Install 8 Pa	ickage(s)			
opgrade 0 Pd	ickuge(s)			
Total size: 356 M				
Total download siz	e: 1.8 M			
Is this ok [y/N]:	У			
$(1/3) \cdot lih Xn - 1 0 0$	Jes:)-8 1 el5 i386 rom			
23 kB 00:00)			
(2/3): compat-libs	tdc++-33-3.2.3-61.	i386.	rpm	
232 kB 00:00		~		
(3/3): openmotit-2	2.3.1-2.el5_4.1.138	b.rpm		
	·			
Total				
323 kB/s 1.8 MB	00:05			
Running Transactic	uebug n Test			
Finished Transacti	on Test			
Transaction Test S	Succeeded			
Running Transactic	on -			
Installing : 1/8	compat-libstdc++-	33		
Installing : 2/8	lgtoman			
Installing :	libXp			
3/8 Installing	openmotif			
4/8	opermoter			
Installing :	lgtoclnt			
[######################################	+######################################	#####	##############	#######################################
] 5/8^ Installing	g : lgtoclnt			
5/8 Installing Home ba	ico agont			
FMC HomeBase Agent	is not supported (on the	e Red Hat vers	ion.
EMC HomeBase Agent	is supported only	on fo	ollowing platfo	orms.
1) Red Hat Linux V	/ersion 4 or 5 on x	86 an	d amd64	
2) Solaris Version	8 or 9 on SPARC.			
HomeBase Agent not	latonode			
6/8	Lyconoue			
Installing :	lgtoserv			
7/8				
Installing :	lgtonmc			
8/8				
NOTE: To complete	configuration exec	ute tl	ne following s	cript as root:

/opt/lgtonmc/bin/nmc_config Installed: lgtoclnt.i686 0:7.6.1-1 lgtoman.i686 0:7.6.1-1 lgtonmc.i686 0:7.6.1-1 lgtonode.i686 0:7.6.1-1 lgtoserv.i686 0:7.6.1-1 Dependency Installed: compat-libstdc++-33.i386 0:3.2.3-61 libXp.i386 0:1.0.0-8.1.el5 openmotif.i386 0:2.3.1-2.el5_4.1 Complete!

After NetWorker has installed, start it:

[root@linuxvtl 761]# /etc/init.d/networker start

If you wish to access NetWorker via NMC, you will need to run the NMC configuration script as well:

```
[root@linuxvtl 761]# /opt/lgtonmc/bin/nmc_config
For optimum security, the embedded web server inside this product must
run as a non root user. Please specify a local user name and group name
the web server must run as. It is recommended that the user and group
you specify have limited privileges and file access permissions. Please
create such a local user and group first if required.
Please specify in the format user/group. For example nobody/nobody.
Please specify the user/group for the web server [nobody/nobody]?
Using nobody as user name and nobody as group name
What port should the web server use [9000]?
What port should the GST server use [9001]?
What directory should be used for the LGTOnmc database [/opt/lgtonmc/lgto_gstdb]?
Where are the NetWorker binaries installed [/usr/sbin]?
Start daemons at end of configuration [n]? y
Creating installation log in /opt/lgtonmc/logs/install.log.
Performing initialization. Please wait...
Starting GST:
GST Services, Version 7.6.1.Build.397
done.
Installation successful.
```

7.2 Verify NetWorker can Communicate with the VTLs

After NetWorker has been installed and started, you should verify that it can see and communicate with the Virtual Tape Libraries prior to starting the configuration. Use the 'inquire' and 'sjirdtag' commands for this:

```
[root@linuxvtl 761]# inquire -l
```

-l flag found: search for some fibre	ing all LUNs, v channel adapte	which may take over 10 minutes per adapter rs. Please be patient.
scsidev@0.0.0:ATA	Virtual HDD [[0]FWR1 Disk, /dev/sg0 S/N: 01415926535897932384 VENN=01415926535897932384 ATNN=ATA Virtual HDD [0]
01415926535897932384		
scsidev@1.0.0:SPECTRA	PYTHON	550V Autochanger (Jukebox), /dev/sg9 S/N: XYZZY_A
		ATNN=SPECTRA PYTHON XYZZY_A WWNN=10223344AB000000
scsidev@1.1.1:IBM	ULT3580-TD4	550V Tape, /dev/nst0 S/N: XYZZY_A1
		ATNN=IBM ULT3580-TD4 XYZZY_A1 WWNN=10223344AB000100
scsidev@1.2.2:IBM	ULT3580-TD4	550V Tape, /dev/nst1 S/N: XYZZY_A2
		ATNN=IBM ULT3580-TD4 XYZZY_A2 WWNN=10223344AB000200
scsidev@1.3.3:1BM	UL13580-1D4	S/N: XYZZY_A3
		ATNN=IBM ULT3580-TD4 XYZZY_A3 WWNN=10223344AB000300
SCSIGEV@1.4.4:IBM	UL13580-1D4	S/N: XYZZY_A4
scsider@2 @ 5·SDECTRA	ργτησν	$\frac{1}{1} = 100 \qquad 0 = 13366 - 104 \qquad \times 1221_{A4}$ $\frac{1}{1} = 10223344AB000400$ $\frac{550}{1} = 10223344AB000400$
SCSTUEVEZ.0.J.JILCINA	TTHON	S/N: XYZZY_B ATNN-SPECTRA PYTHON XYZZY B
scsidev@2 1 6.TBM	UI T3580-TD4	WWNN=30223344AB010000 550VLTape /dev/nst4
		S/N: XYZZY_B1 ATNN=IBM ULT3580-TD4 XYZZY B1
scsidev@2.2.7:IBM	ULT3580-TD4	WWNN=30223344AB010100 550VITape, /dev/nst5
		S/N: XYZZY_B2 ATNN=IBM ULT3580-TD4 XYZZY_B2
scsidev@2.3.8:IBM	ULT3580-TD4	WWNN=30223344AB010200 550VITape, /dev/nst6
		S/N: XYZZY_B3 ATNN=IBM ULT3580-TD4 XYZZY_B3
scsidev@2.4.9:IBM	ULT3580-TD4	WWNN=30223344AB010300 550V Tape, /dev/nst7
		S/N: XYZZY_B4 ATNN=IBM ULT3580-TD4 XYZZY_B4 WWNN=30223344AB010400

In particular, scan the inquire output to confirm that each virtual library is followed by 4 virtual drives.

If this returns successfully, run 'sjirdtag' against each of the VTL SCSI paths in turn:

```
[root@linuxvtl 761]# sjirdtag 1.0.0
Tag Data for 1.0.0, Element Type DATA TRANSPORT:
    Elem[001]: tag_val=0 pres_val=1 med_pres=0 med_side=0
    Elem[002]: tag_val=0 pres_val=1 med_pres=0 med_side=0
    Elem[003]: tag_val=0 pres_val=1 med_pres=0 med_side=0
    Elem[004]: tag_val=0 pres_val=1 med_pres=0 med_side=0
Tag Data for 1.0.0, Element Type STORAGE:
    Elem[001]: tag_val=1 pres_val=1 med_pres=1 med_side=0
    VolumeTag=<800840L4 >
    Elem[002]: tag_val=1 pres_val=1 med_pres=1 med_side=0
```

		VolumeTag=<800841L4			>			
	Elem[003]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	<pre>med_side=0</pre>				
		VolumeTag=<800842L4			>			
	Elem[004]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	<pre>med_side=0</pre>				
		VolumeTag=<800843L4			>			
	Elem[005]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	<pre>med_side=0</pre>				
		VolumeTag=<800844L4			>			
	Elem[006]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	<pre>med_side=0</pre>				
		VolumeTag=<800845L4			>			
	Elem[007]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	<pre>med_side=0</pre>				
		VolumeTag=<800846L4			>			
	Elem[008]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	<pre>med_side=0</pre>				
		VolumeTag=<800847L4			>			
	Elem[009]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	<pre>med_side=0</pre>				
		VolumeTag=<800848L4			>			
	Elem[010]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	<pre>med_side=0</pre>				
		VolumeTag=<800849L4			>			
	Elem[011]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	<pre>med_side=0</pre>				
		VolumeTag=<800850L4			>			
	Elem[012]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	<pre>med_side=0</pre>				
		VolumeTag=<800851L4			>			
	Elem[013]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	<pre>med_side=0</pre>				
		VolumeTag=<800852L4			>			
	Elem[014]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	<pre>med_side=0</pre>				
		VolumeTag=<800853L4			>			
	Elem[015]:	<pre>tag_val=1 pres_val=1</pre>	med_pres=1	med_side=0				
		VolumeTag=<800854L4			>			
	Elem[016]:	tag_val=1 pres_val=1	med_pres=1	med_side=0				
		VolumeTag=<800855L4			>			
	Elem[017]:	tag_val=1 pres_val=1	med_pres=1	med_side=0				
		VolumeTag=<800856L4			>			
	Elem[018]:	tag_val=1 pres_val=1	med_pres=1	med_side=0				
		Volumelag=<800857L4			>			
	Elem[019]:	tag_val=1 pres_val=1	med_pres=1	med_side=0				
	F1 F0007	Volumelag=<800858L4			>			
	Elem[020]:	tag_val=1 pres_val=1	med_pres=1	med_side=0				
	53 50043	Volumelag=<800859L4			>			
	Elem[021]:	tag_val=1 pres_val=1	med_pres=1	med_side=0				
	F1 F0007	volumelag=<800860L4			>			
	Elem[022]:	tag_val=1 pres_val=1	med_pres=1	med_side=0				
T. D.		Volumelag=<800861L4	TRANCDORT		>			
Tag Da	ta for 1.0.	v, Element Type MEDIA	TRANSPORT:	mad at to 0				
Tag D-		tug_val=0 pres_val=1	mea_pres=0	mea_siae=0				
rag Da	$\tau u \ \tau or \ 1.0.$	v, Element Type IMPOF	inn angk 1	ave angle 1		£11 A	ima ava 1	
		tag_val=0 pres_val=1	inp_enab=1	exp_enab=1	uccess=1		imp_exp=1	
		tag_val=0 pres_val=1	inp_enab=1	exp_enab=1	uccess=1	full=0	imp_exp=1	
		tag_val=0 pres_val=1	inp_enab=1	exp_enab=1	uccess=1	full=0	<pre>imp_exp=1</pre>	
	Elem[004]:	tug_val=0 pres_val=1	inp_enab=1	exp_enab=1	uccess=1	TULL=0	rmp_exp=1	

Running sjirdtag against the SCSI control port for the second library should present similar output:

[root@linuxvtl 761]# sjirdtag 2.0.5 Tag Data for 2.0.5, Element Type DATA TRANSPORT: Elem[001]: tag_val=0 pres_val=1 med_pres=0 med_side=0 Elem[002]: tag_val=0 pres_val=1 med_pres=0 med_side=0 Elem[004]: tag_val=0 pres_val=1 med_pres=0 med_side=0 Tag Data for 2.0.5, Element Type STORAGE: Elem[001]: tag_val=1 pres_val=1 med_pres=1 med_side=0 VolumeTag=<900840L4 > Elem[002]: tag_val=1 pres_val=1 med_pres=1 med_side=0 VolumeTag=<900841L4 > Elem[003]: tag_val=1 pres_val=1 med_pres=1 med_side=0

	VolumeTag=<900842L4			>			
Elem[004]:	tag_val=1 pres_val=1 me	ed_pres=1 r	med_side=0				
	VolumeTag=<900843L4	-		>			
Elem[005]:	tag_val=1 pres_val=1 me	ed_pres=1 r	med_side=0				
	VolumeTag=<900844L4			>			
Elem[006]:	tag_val=1 pres_val=1 me	ed_pres=1 r	med_side=0				
	VolumeTag=<900845L4			>			
Elem[007]:	tag_val=1 pres_val=1 me	ed_pres=1 r	med_side=0				
	VolumeTag=<900846L4	-		>			
Elem[008]:	<pre>tag_val=1 pres_val=1 me</pre>	ed_pres=1 r	med_side=0				
	VolumeTag=<900847L4			>			
Elem[009]:	<pre>tag_val=1 pres_val=1 me</pre>	ed_pres=1 r	med_side=0				
	VolumeTag=<900848L4			>			
Elem[010]:	<pre>tag_val=1 pres_val=1 me</pre>	ed_pres=1 r	med_side=0				
	VolumeTag=<900849L4			>			
Elem[011]:	<pre>tag_val=1 pres_val=1 me</pre>	ed_pres=1 r	med_side=0				
	VolumeTag=<900850L4			>			
Elem[012]:	<pre>tag_val=1 pres_val=1 me</pre>	ed_pres=1 r	med_side=0				
	VolumeTag=<900851L4			>			
Elem[013]:	<pre>tag_val=1 pres_val=1 me</pre>	ed_pres=1 r	med_side=0				
	VolumeTag=<900852L4			>			
Elem[014]:	<pre>tag_val=1 pres_val=1 me</pre>	ed_pres=1 r	ned_side=0				
	VolumeTag=<900853L4			>			
Elem[015]:	<pre>tag_val=1 pres_val=1 me</pre>	ed_pres=1 r	ned_side=0				
	VolumeTag=<900854L4			>			
Elem[016]:	<pre>tag_val=1 pres_val=1 me</pre>	ed_pres=1 r	ned_side=0				
	VolumeTag=<900855L4			>			
Elem[017]:	<pre>tag_val=1 pres_val=1 me</pre>	ed_pres=1 r	med_side=0				
	VolumeTag=<900856L4			>			
Elem[018]:	<pre>tag_val=1 pres_val=1 me</pre>	ed_pres=1 r	med_side=0				
	VolumeTag=<900857L4			>			
Elem[019]:	<pre>tag_val=1 pres_val=1 me</pre>	ed_pres=1 r	med_side=0				
	VolumeTag=<900858L4			>			
Elem[020]:	tag_val=1 pres_val=1 me	ed_pres=1 r	ned_side=0				
	VolumeTag=<900859L4			>			
Elem[021]:	tag_val=1 pres_val=1 me	ed_pres=1 r	ned_side=0				
	VolumeTag=<900860L4			>			
Elem[022]:	tag_val=1 pres_val=1 me	ed_pres=1 r	ned_side=0				
	Volumelag=<900861L4			>			
Tag Data for 2.0	.5, Element Type MEDIA TI	RANSPORT:					
ELem[001]:	tag_val=0 pres_val=1 me	ed_pres=0 r	ned_side=0				
lag Data for 2.0	.5, Element Type IMPORT/	EXPORT:			C 11 C		
ELem[001]:	tag_val=0 pres_val=1 in	ip_enab=1 e	exp_enab=1	access=1	tull=0	<pre>imp_exp=1</pre>	
ELem[002]:	tag_val=0 pres_val=1 in	ip_enab=1 e	exp_enab=1	access=1	tull=0	<pre>imp_exp=1</pre>	
Elem[003]:	tag_val=0 pres_val=1 in	ip_enab=1 e	exp_enab=1	access=1	tull=0	<pre>imp_exp=1</pre>	
Elem[004]:	tag_val=0 pres_val=1 in	np_enab=1 e	exp_enab=1	access=1	tull=0	lmp_exp=1	

7.3 Exclude VTL region from NetWorker Backups

To avoid any situation where NetWorker might attempt to backup the VTL files to the VTL, create a directive file in /opt/vtl to skip all files in that directory:

[root@linuxvtl ~]# cat /opt/vtl/.nsr
<< . >>
skip: *

Once this has been completed, the VTLs can be configured in NetWorker.

8 Configuring the VTLs in NetWorker

There are two ways the VTLs can be configured – either via the command line, using *jbconfig*, or via NMC. We will present both options, allowing you to choose the option you would prefer to use.

8.1 Configuring the VTLs via jbconfig

Configuring the VTLs using *jbconfig* is trivial, and rather than detailed instructions, a full sequence of the *jbconfig* run is presented below. Simply follow the process outlined below:

```
[root@linuxvtl 761]# jbconfig
Jbconfig is running on host linuxvtl.pmdg.lab (Linux 2.6.18-194.17.1.el5),
  and is using linuxvtl.pmdg.lab as the NetWorker server.
       1) Configure an AlphaStor Library.
       2) Configure an Autodetected SCSI Jukebox.
       3) Configure an Autodetected NDMP SCSI Jukebox.
       4) Configure an SJI Jukebox.
       5) Configure an STL Silo.
What kind of Jukebox are you configuring? [1] 2
14484: jbconfig: Scanning SCSI buses; this may take a while ...
These are the SCSI Jukeboxes currently attached to your system:
  1) scsidev@1.0.0: Spectralogic
 2) scsidev@2.0.5: Spectralogic
Which one do you want to install? 1
Installing 'Spectralogic' jukebox - scsidev@1.0.0.
What name do you want to assign to this jukebox device? VTL1
15814: jbconfig: Attempting to detect serial numbers on the jukebox and drives ...
15815: jbconfig: Will try to use SCSI information returned by jukebox to configure drives.
Turn NetWorker auto-cleaning on (yes / no) [yes]? no
The drives in this jukebox cannot be auto-configured with the available
information. You will need to provide the path for the drives.
Is (any path of) any drive intended for NDMP use? (yes / no) [no] no
Is any drive going to have more than one path defined? (yes / no) [no] no
Please enter the device path information in one of the following formats:
/dev/nst0 --for local path or
host:device-path --for remote node or NDMP device(s) or
host:drive-letter:directory path --for Windows disk file
Drive 1, element 1
Drive path ? /dev/nst0
Drive 2, element 2
Drive path ? /dev/nst1
Drive 3, element 3
Drive path ? /dev/nst2
Drive 4, element 4
Drive path ? /dev/nst3
Please select the appropriate drive type number:
  1) 3480
                           25) 9840C
                                                     49) SAIT-1
```

<pre>2) 3570 3) 3590 4) 3592 5) 4890 6) 4mm 7) 4mm 12GB 8) 4mm 20GB 9) 4mm 4GB 10) 4mm 8GB 10) 4mm 8GB 11) 4mm DAT160 12) 4mm DAT72 13) 8mm 14) 8mm 20GB 15) 8mm 5GB 16) 8mm AIT 17) 8mm AIT-2 18) 8mm AIT-3 19) 8mm AIT-4 20) 8mm AIT-5 21) 8mm Mammoth-2 22) 9490 23) 9840 24) 9840b</pre>	<pre>26) 9840D 27) 9940 28) 9940B 29) adv_file 30) Atmos COS 31) Data Domain 32) dlt 33) dlt vs160 34) dlt-s4 35) dlt-v4 36) dlt1 37) dlt7000 38) dlt8000 39) file 40) himt 41) logical 42) LTO Ultrium 43) LTO Ultrium-2 44) LTO Ultrium-3 45) LTO Ultrium-4 46) LTO Ultrium-5 47) optical 48) gic</pre>	50) SAIT-2 51) SD3 52) sdlt 53) sdlt320 54) sdlt600 55) SLR 56) T10000 57) T10000B 58) tk290 59) travan10 60) TS1120 61) TS1130 62) tz85 63) tz86 64) tz87 65) tz88 66) tz89 67) tz90 68) tzs20 69) VXA 70) VXA-172 71) VXA-2 72) VXA-320				
Enter the drive type of dr Are all the drives the sam	ive 1? 45 e model? (yes / no) [yes]	у				
Jukebox has been added suc	cessfully					
The following configuratio	n options have been set:					
 > Jukebox description to t > Autochanger control port > Autocleaning off. > Barcode reading to on. > Volume labels that match 	he control port and model. to the port at which we f the barcodes.	ound it.				
You can review and change associated devices u	the characteristics of the sing the NetWorker Manager	e autochanger and its ment Console.				
<pre>Would you like to configure another jukebox? (yes/no) [no]yes 1) Configure an AlphaStor Library. 2) Configure an Autodetected SCSI Jukebox. 3) Configure an Autodetected NDMP SCSI Jukebox. 4) Configure an SJI Jukebox. 5) Configure an STL Silo.</pre>						
What kind of Jukebox are y Installing 'Spectralogic'	ou configuring? [1] 2 jukebox - scsidev@2.0.5.					
What name do you want to a 15814:jbconfig: Attempting	ssign to this jukebox devi to detect serial numbers	ce? VTL2 on the jukebox and drives				
15815:jbconfig: Will try t	o use SCSI information ret	urned by jukebox to configure drives.				
<pre>Turn NetWorker auto-cleaning on (yes / no) [yes]? no The drives in this jukebox cannot be auto-configured with the available information. You will need to provide the path for the drives. Is (any path of) any drive intended for NDMP use? (yes / no) [no] no Is any drive going to have more than one path defined? (yes / no) [no] no</pre>						
Please enter the device path information in one of the following formats:						
/dev/nst0for local path	or					

host:device-path --for remote node or NDMP device(s) or host:drive-letter:directory path --for Windows disk file Drive 1, element 1 Drive path ? /dev/nst4 Drive 2, element 2 Drive path ? /dev/nst5 Drive 3, element 3 Drive path ? /dev/nst6 Drive 4, element 4 Drive path ? /dev/nst7 Please select the appropriate drive type number: 27) 9840D 27) 9940 28) 9940 1) 348025) 9840C49) SAIT-12) 357026) 9840D50) SAIT-23) 359027) 994051) SD34) 359228) 9940B52) sdlt5) 489029) adv_file53) sdlt3206) 4mm30) Atmos COS54) sdlt6007) 4mm 12GB31) Data Domain55) SLR8) 4mm 20GB32) dlt56) T100009) 4mm 4GB33) dlt vs16057) T10000B10) 4mm 8GB34) dlt-s458) tkz9011) 4mm DAT16035) dlt-v459) travan1012) 4mm DAT7236) dlt160) TS112013) 8mm37) dlt700061) TS113014) 8mm 20GB38) dlt800062) tz8515) 8mm 5GB39) file63) tz8616) 8mm AIT-241) logical65) tz8818) 8mm AIT-342) LTO Ultrium66) tz8919) 8mm AIT-443) LTO Ultrium-368) tzs2020) 8mm AIT-544) LTO Ultrium-368) tzs2021) 8mm Mammoth-245) LTO Ultrium-469) VXA22) 949046) LTO Ultrium-570) VXA-17223) 984047) optical71) VXA-224) 9840b48) qic72) VXA-320 1) 3480 49) SAIT-1 2) 3570 50) SAIT-2 Enter the drive type of drive 1? 45 Are all the drives the same model? (yes / no) [yes] yes Jukebox has been added successfully The following configuration options have been set: > Jukebox description to the control port and model. > Autochanger control port to the port at which we found it. > Autocleaning off. > Barcode reading to on. > Volume labels that match the barcodes. You can review and change the characteristics of the autochanger and its associated devices using the NetWorker Management Console. Would you like to configure another jukebox? (yes/no) [no]no

8.2 Configuring the VTLs via NMC

Start by launching NMC and running through the initial configuration of the console, as necessary.

Once NMC has launched, drill down to the 'linuxvtl' NetWorker server, and from click the 'Devices' button:

0 0		linu	xvtl.pmdg.lab -	NetWorker	Adm	ninistration – ad	lministr	ator					
Monitoring C	Configuration	Devices	Media	<i></i>									
File Edit View	Devices Start V	Vindow Help	,				_	_			_		
+ 0 X 2 🔍	3 🖛 🕶 📷		• • • • • • • • •										
☐ — ₩ linuxvtl.pmdg.	lab odes in Systems eduplication Nodes												
. .						41							•
Log	6	Catal		004;	×	Alerts		Cotton				ı P	X
Thursday 3:2	1:49 event	server	Server notice: star	ted	•	Thursday 3	:22:22	regist	NetWorker eval	uation mode v	/ill expi	ire in	30

Figure 10: Devices configuration panel in NMC

Before proceeding, go to the "View" menu and choose "Diagnostic Mode" so that in subsequent activities we can access all the configuration options for jukeboxes.

Right click on the "Libraries" entry and choose "Scan for Devices..." This will bring up a dialog similar to the following:

00	Scan for Devices						
Select existing or crea	te new storage nodes to scan						
Create a new Storage	Create a new Storage Node						
Sean Starage Nede I	Name - Searce Use Bergist Evolude SCSI Baths						
Inuxytl.pmdg	lab No No						
• maxraphag.							
Update storage node p	properties if required						
Storage Node Name:	linuxvtl.pmdg.lab Exclude SCSI Paths:						
Search all LUNs:	No						
Use Persistent Names:	No						
Device Scan Type:	⊙ scsi⊖ ndmp						
NDMP User Name:							
NDMP Password:							
Start Scan Cancel							

Figure 11: Scan for Devices Dialog

Click "Start Scan" to commence the scanning operation.

0	Message	
The Scan for dev Please see the Mo	ces process has started. nitoring->Log screen for its status.	
	ОК	_



Either use the "Monitoring" section of NMC, or wait approximately 2-3 minutes for the scanning to complete.

Once scanning is complete, click away from then back onto the 'Libraries' configuration option to see the tape libraries that have been detected:

0 0		linuxvt	l.pmdg.lab – Ne	tWorker Admi	nistration – admi	nistrator			
Monitoring	Configuration	Devices	Media						
File Edit View	w Devices Start	Window Help							
+ 0 × 0 •	🔪 i 🍼 i 🖾 💭 📾	2 12 12 12 1	<u></u>						1
□-11 linuxvtl.pm □-11 Librarie	ldg.lab 25	👔 Libraries							
🗉 🕙 SPE	CTRA@1.0.0	Name 🔻	Description	Number drives	Number devices	Cleaning slots	Control port	Enabled	R
i → SPE	CTRA@2.0.5	SPECTRA@	<spectra pyt<="" td=""><td>4</td><td>4</td><td></td><td>scsidev@1.0.0</td><td></td><td></td></spectra>	4	4		scsidev@1.0.0		
- Contraction -	Nodor	SPECTRA@	<spectra pyt<="" td=""><td>4</td><td>4</td><td></td><td>scsidev@2.0.5</td><td></td><td></td></spectra>	4	4		scsidev@2.0.5		
a 🔓 Data Du	omain Systems r Deduplication Nodes								
A T		4			33333				
Log				□	erts			07	д×
Prio Time 🔻	Source	Categ Me	ssage	Pri	o Time 🔻	Categ Me	ssage		
Thursday	3:21:49 event	server Ser	ver notice: started		L Thursday 3:22:	22 regist Ne	tWorker evaluation	mode will expir	e in 30

Figure 13: NMC detected libraries

Next, right-click on "Libraries" and choose "Configure All Libraries...", and step through the Wizard accepting the defaults:

00	Configure All Libraries						
Provide General Configuration Information							
Select library type to configure for use w	ith NetWorker server						
You can choose to auto configure SCSI/NDI Software	MP libraries, or set up libraries controlled by the Silo,						
 SCSI/NDMP STL Silo 							
Adjust the Enable new device option if ne	cessary						
"Yes" NetWorker will automatically enable n "No" NetWorker will not automatically enal to enable the devices manually.	ew backup devices found. ole new backup devices found. The user is required						
Yes 🔻							
Current server sharing policy							
Server sharing policy defines the default be policy set at the storage node level override	havior for sharing library devices. Device sharing s this value.						
maximal sharing							
	< Back Next > Cancel						

Figure 14: Configure All Libraries Wizard 1 of 3

Select Target Storage Nodes Select existing or create new storage nodes to configure SCSI or NDMP libraries Create a new Storage Node Configure Storage Storage N Sharing Po Search all Use Persis Exclude SCSI Paths Inuxvtl.p scsi server def No No A Scan for Devices operation is always suggested to ensure storage node configuration is current Update storage node properties if required Storage Node Name: linuxvtl.pmdg.lab Exclude SCSI Paths: Sharing Policy: server default Search all LUNs: No Use Persistent Names: No Use Persistent Names: No	00	Configure All Libraries
Select existing or create new storage nodes to configure SCSI or NDMP libraries Create a new Storage Node Configure Storag → Storage N Sharing Po Search all Use Persis Exclude SCSI Paths	Select Target S	storage Nodes
Create a new Storage Node Configure Storag ▼ Storage N Sharing Po Search all Use Persis Exclude SCSI Paths Inuxvtl.p scsi server def No No A Scan for Devices operation is always suggested to ensure storage node configuration is current Update storage node properties if required Storage Node Name: linuxvtl.pmdg.lab Exclude SCSI Paths: Sharing Policy: server default Search all LUNs: No Use Persistent Names: No Library Configuration Type: ③ scsi ◯ ndmp NDMP User Name:	Select existing or o	reate new storage nodes to configure SCSI or NDMP libraries
Configure Storage N Sharing Po Search all Use Persis Exclude SCSI Paths Inuxvtl.p scsi server def No No A Scan for Devices operation is always suggested to ensure storage node configuration is current Update storage node properties if required Storage Node Name: Inuxvtl.pmdg.lab Exclude SCSI Paths: Sharing Policy: server default Search all LUNs: No Use Persistent Names: No VDMP User Name: Storage: Storag	Create a new Stora	ige Node
Iinuxvtl.p scsi server def No No A Scan for Devices operation is always suggested to ensure storage node configuration is current Update storage node properties if required Storage Node Name: Iinuxvtl.pmdg.lab Exclude SCSI Paths: Sharing Policy: server default Search all LUNs: No Use Persistent Names: No Library Configuration Type: • scsi ndmp NDMP User Name: NDMP Password: Start Configuration Start Configuration Cancel	Configure Stora	g 🔻 Storage N Sharing Po Search all Use Persis Exclude SCSI Paths
▲ A Scan for Devices operation is always suggested to ensure storage node configuration is current Update storage node properties if required Storage Node Name: linuxvtl.pmdg.lab Exclude SCSI Paths: Sharing Policy: server default Search all LUNs: No Use Persistent Names: No Library Configuration Type: ③ scsi Ondmp NDMP User Name:	🔽 linux	vtl.p scsi server def No No
▲ Scan for Devices operation is always suggested to ensure storage node configuration is current Update storage node properties if required Storage Node Name: linuxvtl.pmdg.lab Exclude SCSI Paths: Sharing Policy: server default Search all LUNs: No Use Persistent Names: No Library Configuration Type: ③ scsi ◯ ndmp NDMP User Name:		
▲ Scan for Devices operation is always suggested to ensure storage node configuration is current Update storage node properties if required Storage Node Name: linuxvtl.pmdg.lab Exclude SCSI Paths: Sharing Policy: server default Search all LUNs: No Use Persistent Names: No Library Configuration Type: scsi NDMP User Name:		
▲ Scan for Devices operation is always suggested to ensure storage node configuration is current Update storage node properties if required Storage Node Name: linuxvtl.pmdg.lab Exclude SCSI Paths: Sharing Policy: server default Search all LUNs: No Use Persistent Names: No Library Configuration Type: scsi NDMP User Name:		
▲ Scan for Devices operation is always suggested to ensure storage node configuration is current Update storage node properties if required Storage Node Name: linuxvtl.pmdg.lab Exclude SCSI Paths: Sharing Policy: server default Search all LUNs: No Use Persistent Names: No Library Configuration Type: scsi NDMP User Name:		
Update storage node properties if required Storage Node Name: linuxvtl.pmdg.lab Sharing Policy: server default Search all LUNs: No Use Persistent Names: No Library Configuration Type: scsi NDMP User Name:	🌂 🛛 A Scan fo	r Devices operation is always suggested to ensure storage node configuration is current
Storage Node Name: linuxvtl.pmdg.lab Storage Node Name: linuxvtl.pmdg.lab Sharing Policy: server default Search all LUNs: No Use Persistent Names: No Library Configuration Type: scsi ndmp NDMP User Name: NDMP Password:		
Storage Node Name: linuxvtl.pmdg.lab Sharing Policy: server default Search all LUNs: No Use Persistent Names: No Library Configuration Type: scsi ndmp NDMP User Name: NDMP Password:	Update storage no	de properties it required
Sharing Policy: server default Search all LUNs: No Use Persistent Names: No Library Configuration Type: scsi nDMP User Name: NDMP User Name: NDMP Password:	Storage Node Nam	IE: linuxvtl.pmdg.lab Exclude SCSI Paths:
Search all LUNs: No Use Persistent Names: No Library Configuration Type: Scsi ndmp NDMP User Name: NDMP Password: Scsi ndmp NDMP Configuration Cancel	Sharing Policy:	server default
Use Persistent Names: No Library Configuration Type: Scsi ndmp NDMP User Name: NDMP Password:	Search all LUNs:	
Use Persistent Names: No Library Configuration Type: Scsi ndmp NDMP User Name: NDMP Password:	Sear en an Eoris.	
Library Configuration Type: scsi ndmp NDMP User Name: NDMP Password:	Use Persistent Nar	nes: No 👻
NDMP User Name: NDMP Password:	Library Configura	tion Type:) scsi Ondmp
NDMP Password:	NDMP User Name:	
< Back Start Configuration Cancel	NDMP Password:	
< Back Start Configuration Cancel		
		< Back Start Configuration Cancel

Figure 15: Configure All Libraries Wizard 2 of 3

00	Configure All Libraries	
Start Configuration		
	The Configuration All Libraries process has started.	
	Please see the Monitoring->log screen for its status.	
		< Back Finish Cancel

Figure 16: Configure All Libraries Wizard 3 of 3

Once the library configuration is complete, each library will be ready for use. However, because we elected not to use cleaning cartridges, we will need to adjust the library configuration. Additionally, we'd like to rename the jukeboxes, which requires temporarily disabling them.

Repeat the instructions below for each jukebox, renaming the first jukebox to VTL1, and the second to VTL2.

First, right-click on the first jukebox to be adjusted and click the "Enable/Disable" option. Then, right-click the jukebox again and choose "Properties" in order to access its configuration dialog:

6 0 6	Pro	operties		
Information (Cont.) \ Mec General \ Co	lia \ Timers \ Operations \ Operations (Cont. onfiguration \ NDMP \ STL \	.) \ Operations (Cont) \ System RSM \ AlphaStor	m \ \ Advanced \ Information)
Identity Name: Comment: Description: Model: Control port: Jukebox serial number:	SPECTRA@1.0.0 <spectra python<="" td=""> Spectralogic scsidev@1.0.0 WWNN=10223344AB000000</spectra>	Status Enabled: Ready: Cleaning Auto clean: Cleaning slots:	 Yes ● No ○ Service ✓ 22-22 	
Hardware id: Virtual jukebox: Virtual jukebox frameid:	SPECTRA PYTHON WWNN=10223344	Default cleanings:	5	
0	ОК	Reset		

Figure 17: First pane of VTL configuration dialog

Adjust the following settings:

- Change the **Name** to "VTL1" (or "VTL2" if adjusting the second VTL).
- Clear the "Cleaning Slots" field.
- Uncheck the "**Auto clean**" field.

Once done, this should resemble the following:

6 0 0	Pro	operties	
Information (Cont.) \ Med General \ Co	lia \ Timers \ Operations \ Operations (Cont. onfiguration \ NDMP \ STL \	.) \ Operations (Cont) \ System RSM \ AlphaStor	m \setminus Advanced \setminus Information \setminus
Identity		Status	
Name:	VTL1	Enabled:	○ Yes No Service
Comment:		Ready:	
Description:	<spectra 550v="" at="" bus<="" python="" scsi="" th=""><th></th><th></th></spectra>		
Model:	Spectralogic	Cleaning	
Control port:	scsidev@1.0.0	Auto clean:	
Jukebox serial number:	WWNN=10223344AB000000	Cleaning slots:	
		Default cleanings:	5
Hardware id:	SPECTRA PYTHON WWNN=10223344		
Virtual jukebox:			
Virtual jukebox frameid:			
0	ОК	Reset	

Figure 18: First pane of VTL configuration dialog with adjustments made

Do not click OK at this point. Instead, click the "Advanced" tab and edit the "Available slots" field so that it reads "1-22":

0 0		Proper	ties		
Information (Cont.) Medi	ia \ Timers \ Operations \ Operation	ns (Cont.) \ C	Operations (Cont) \ Sy	stem	
General Con	nfiguration \NDMP \	STL \ RS	SM \ AlphaStor	Advanced	Information
Library Configuration			Media Management		
Jukebox features:	elements_status volume_tags barcode autoeject two_sided doorlock init_inlet_rqd no_trnsport_source_dest		Available slots:	1-22	
Jukebox options:			Minimum space: ASCAPI: Storage Nodes Server network inter	Yes face:	
Reset class:	initialize unload	-			
Event tag:	1287031531				
Debug trace level:		0 🜩			
0		OK Rese	t Cancel		

Figure 19: Advanced pane of VTL configuration dialog with adjustments made

After making this adjustment, click OK. Then, right-click the new jukebox name (VTL1 or VTL2), and choose the "Enable/Disable" option to bring the jukebox back on-line.

It will then be necessary to inventory slot 22 of the jukebox so that NetWorker recognises it is not a cleaning cartridge. To do this, double-click on the jukebox, select slot 22 and then choose an inventory operation. At the conclusion of this, the jukebox operations screen should resemble the following:

Monitoring Configuration Devices Media File Edit View Devices Statu Window Help File Edit View Devices Statu Devices Devices File Edit View Devices Devices Devices Devices File Devices Devices Devices Device Volume Writ Message Stot = Volume Barcode Pool Last Access TL File Devices Volume Writ Message Stot = Volume Barcode Pool Last Access TL File Odev/nst0 ejected Stot = Volume Barcode Pool Last Access TL File Odev/nst0 ejected Stot = Volume Stot = Volu	0 🔿 🔿	linuxvtl.pmdg.lab – NetWorker Ad	ministration – administrator	
File Edit View Devices Start Window Help Imaxvil,pmdg.lab Imaxvil,pmdg.lab Imaxvil,pmdg.lab Imaxvil,pmdg.lab Imaxvil,pmdg.lab Imaxvil,pmdg.lab Imaxvil,pmdg.lab Imaxvil,pmdg.lab Imaxvil,pmdg.lab Imaxvil,pmdg.lab Imaxvil,pmdg.lab Imaxvil,pmdg.lab	Monitoring Configuration	Devices Media		
Image:	e Edit View Devices Start V	Nindow Help		
Inuxvtl.pmdg.lab Itbraries Ubraries Spectral.ogic Control Port: scsidev@1.0.0 Device v Volume Writ Message Sot v Volume Vamar Deduplication Nodes Vdev/nst0 e /dev/nst2 Vdev/nst3 Vdev/nst3 Vdev/nst3 Vdev/nst3 Vdev/nst3 Vdev/nst4 Vdev/nst3 Vdev/nst3 Vdev/nst4 Vdev/nst3 Vdev/nst3 Vdev/nst4 Vdev/nst3 Vdev/nst3 Vdev/nst4 Vdev/nst3 Vdev/nst4 Vdev/nst3 Vdev/nst3 Vdev/nst4 Vdev/nst4 Vdev/nst3 Vdev/nst4 Vdev/nst4 Vdev/nst3 Vdev/nst4 Vdev/nst4 Vdev/nst3 Vdev/nst4 Vdev/nst4 <th>📵 🗙 🛛 🔌 🛛 🖉 🖾 📾</th> <th><mark>図 12 12 12 12 12 12 12 12 12 12 12 12 12 </mark></th> <th></th> <th>16</th>	📵 🗙 🛛 🔌 🛛 🖉 🖾 📾	<mark>図 12 12 12 12 12 12 12 12 12 12 12 12 12 </mark>		16
 Bota Domain Systems Avamar Deduplication Nodes Avamar Deduplication Data Avamar Deduplication Data A	ilinuxvtl.pmdg.lab → fil Libraries → fil SPECTRA@2.0.5 → fil SPECTRA@2.5 → fil SPECTRA@3.5 → fil SPECTRA@3.5	Library: VTL1 Model: Spectralogic Control Port: scsidev@1.0.0 Device Volume Writ Mass:	uga Slat ▼ Voluma	Barrode Pool Last Arress Ti %11
Birling Data Domain Systems idev/nst1 idev/nst2 idev/nst3 idev/nst3 idev/nst3 idev/nst3 idev/nst4 idev/nst3 idev/nst4 idev/nst4 idev/nst3 idev/nst4 idev/nst4 idev/nst3 idev/nst4 idev/nst4 idev/nst3 idev/nst4 idev/nst4	🗄 🜈 Storage Nodes	Sevice ♥ Volume Witt Wessa	d is 1 <unlabe< td=""><td>ed> 800840</td></unlabe<>	ed> 800840
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Image: Stat User In Operation Data Message Dur Stat User In Operation Data Message	Namar Dedupication Nodes	🥪 /dev/nst2	🗭 3 <unlabe< td=""><td>ed> 800842</td></unlabe<>	ed> 800842
Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Image: Value V		🥪 /dev/nst3	📴 4 <unlabe< td=""><td>ed> 800843</td></unlabe<>	ed> 800843
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Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur Stat User In Operation Data Message Dur			6 <unlabe< td=""><td>led> 800845</td></unlabe<>	led> 800845
Stat User In Operation Data Message Dur			/ <unlabe< td=""><td>ed> 800846</td></unlabe<>	ed> 800846
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Stat User In Operation Data Message Dur Message Dur In an and the leade 800859			10 cunlabe	ed> 800849
Stat User In Operation Data Message Dur Stat User In Operation Tata Message Dur			10 cunlabe	ed> 800850
Stat User In Operation Data Message Dur Stat User In Operation Tata Message Dur Stat User In Operation Tata Message Dur			12 <unlabe< td=""><td>ed> 800851</td></unlabe<>	ed> 800851
Stat User In Operation Data Message Dur Image: State in the image: Sta			🗭 13 <unlabe< td=""><td>ed> 800852</td></unlabe<>	ed> 800852
Stat User In Operation Data Message Dur Stat User In Operation Cata Message Dur			📴 14 <unlabe< td=""><td>ed> 800853</td></unlabe<>	ed> 800853
Stat User In Operation Data Message Dur Dur Dur 20 <unlabeled> 800855 Stat User In Operation Cata Message Dur Dur 20 <unlabeled> 800856 Main Message Dur 20 <unlabeled> 800859</unlabeled></unlabeled></unlabeled>			🗭 15 <unlabe< td=""><td>ed> 800854</td></unlabe<>	ed> 800854
Stat User In Operation Data Message Dur Image:			📴 16 <unlabe< td=""><td>ed> 800855</td></unlabe<>	ed> 800855
Stat User In Operation Data Message Dur Dur 19 <unlabeled> 800857 Stat User In Operation Data Message Dur 20 <unlabeled> 800859</unlabeled></unlabeled>			🗭 17 <unlabe< td=""><td>ed> 800856</td></unlabe<>	ed> 800856
Stat User In Operation Data Message Dur			■ 18 <unlabe< td=""><td>ed> 800857</td></unlabe<>	ed> 800857
Stat User In Operation Data Message Dur Dur 21 <unlabeled> 800859</unlabeled>			19 <unlabe< td=""><td>led> 800858</td></unlabe<>	led> 800858
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V Operation: Reset ; Succeeded / IRE 22 / unlabeled > 800861		operation: "Reset"; succeeded	7 21 <uniabe< td=""><td>ed> 800861</td></uniabe<>	ed> 800861
operation: "Inventor succeeded 32		operation: "Inventor succeeded	32	800801
	_			
Log 고부× Alerts 고라 구	g		Alerts	
Prio Time ▼ Source Categ Message Prio Time ▼ Categ Message	o Time 🔻 Source	Categ Message	Prio Time 🔻 Cateo	Message
🚺 Thursday 3:44:29 event media Media info: Could not find NSR devic 🍯 🛕 Thursday 3:22:22 regist NetWorker evaluation mode will expire in 30 day	Thursday 3:44:29 event	media Media info: Could not find NSR devic	A Thursday 3:22:22 regist	NetWorker evaluation mode will expire in 30 days

Figure 20: VTL operations panel after slot 22 inventory

Repeat the above steps for the second VTL, renaming it to 'VTL2' as you do so.

The final configuration should resemble the following:



Figure 21: NMC showing both jukeboxes reconfigured

8.3 Optional – Configure devices to have a standard capacity of 1GB

You may wish to configure the NetWorker virtual devices to have a default capacity of 1GB. For each device, edit the device properties:

00	Р	roperties	
General \ Configuration \ A	dvanced \int Information \int Volume \int Operations \int Cloud \int System	em \	
Device Configuration		Storage Node Devices	
Device block size:	handler default 🗸	Server network interface:	
Device file size:		Save mount timeout:	30 🔹
Device load time:		Save lockout:	0
Device eject time:]	
Device poll interval:		Library Devices	
Device min load tries:		Idle device timeout:	0 🔹
Device default capacity:	1GB	Unconfig parent jukebox:	
Device tape flags:]	
CDI:	○ Not used SCSI commands	Sony DTF Devices	
Reserve/Release:	None O Simple	Auto recover dtf:	None
	O Persistent Persistent + APTPL		
Persistent Reserve Key:]	
Access weight:	1]	
Max consecutive errors:	20]	
0	ОК	Reset Cancel	

Figure 22: Adjusting the 'Device default capacity' setting

Note that this should be done *before* any volumes are labelled.

9 Using the VTLs with NetWorker

The remainder of examples will focus on the command line and will demonstrate steps you may wish to undertake for preliminary confirmation of successful jukebox operations with the VTL:

9.1 Jukebox Contents Check

Run "nsrjb –C –j VTL1" and "nsrjb –C –j VTL2" to verify basic contents of the jukeboxes:

```
[root@linuxvtl ~]# nsrjb -C -j VTL1
Jukebox VTL1: (Ready to accept commands)
14119:nsrjb: No volumes labeled.
slot volume pool barcode
                             volume id recyclable
  1: -*
                   800840L4
                             _
  2: -*
                   800841L4
                             _
  3: -*
                   800842L4
  4: -*
                   800843L4
                             _
  5: -*
                   800844L4
                             _
  6: -*
                   800845L4
                             _
  7: -*
                   800846L4
                             -
  8: -*
                   800847L4
                             -
  9: -*
                   800848L4
                             -
  10: -*
                   800849L4
                             _
 11: -*
                   80085014
                             _
 12: -*
                   800851L4
                             _
 13: -*
                   800852L4
                             _
  14: -*
                   800853L4
                             _
 15: -*
                   800854L4
                             _
 16: -*
                   800855L4
                             _
 17: -*
                   800856L4
                             -
 18: -*
                   800857L4
  19: -*
                   800858L4
                             _
 20: -*
                   800859L4
                             _
 21: -*
                   800860L4
  22: -*
                   800861L4
                             _
       *not registered in the NetWorker media data base
drive 1 (/dev/nst0) slot
                         :
drive 2 (/dev/nst1) slot
                         :
drive 3 (/dev/nst2) slot
                          :
drive 4 (/dev/nst3) slot
                          :
[root@linuxvtl ~]# nsrjb -C -j VTL2
Jukebox VTL2: (Ready to accept commands)
14119:nsrjb: No volumes labeled.
slot volume pool barcode
                             volume id recyclable
  1: -*
                   900840L4
                             _
  2: -*
                   900841L4
                             -
  3: -*
                   900842L4
                             -
   4: -*
                   900843L4
                             -
  5: -*
                   900844L4
                             -
  6: -*
                   900845L4
                             _
  7: -*
                   900846L4
                             _
  8: -*
                   900847L4
                              _
  9: -*
                   900848L4
  10: -*
                   900849L4
                             _
  11: -*
                   900850L4
                             _
  12: -*
                   900851L4
                             _
  13: -*
                   900852L4
                             _
```

```
14: -*
                    900853L4 -
 15: -*
                    900854L4 -
 16: -*
                    900855L4 -
 17: -*
                    900856L4 -
  18: -*
                    900857L4
                             _
  19: -*
                    900858L4
                              -
  20: -*
                    900859L4
  21: -*
                    900860L4
  22: -*
                    900861L4
        *not registered in the NetWorker media data base
drive 1 (/dev/nst4) slot
                          :
drive 2 (/dev/nst5) slot
                          :
drive 3 (/dev/nst6) slot
                          :
drive 4 (/dev/nst7) slot
                         :
```

9.2 Label Volumes

For the purposes of this document, we will:

- Label all volumes in VTL1 into the "Default" pool.
- Label all volumes in VTL2 into the "Default Clone" pool.

9.2.1 Label VTL1 volumes

Issue the label command for VTL1; if you wish to see what the VTL is up to at each step, include '-vvv' in the command. For completeness, a verbose run of the label operation for VTL1 only is shown below:

```
[root@linuxvtl ~]# nsrjb -LYvvv -j VTL1 -b Default -S 1-22
setting verbosity level to `3'
Info: Preparing to load volume `-' from slot 1 into device `/dev/nst1'.
Info: Loading volume `-' from slot `1' into device `/dev/nst1'.
Info: Preparing to load volume `-' from slot 2 into device `/dev/nst2'.
Info: Loading volume `-' from slot `2' into device `/dev/nst2'.
Info: Preparing to load volume `-' from slot 3 into device `/dev/nst3'.
Info: Loading volume `-' from slot `3' into device `/dev/nst3'.
Info: Load sleep for 5 seconds.
Info: Load sleep for 5 seconds.
Info: Load sleep for 5 seconds.
Info: Performing operation `Verify label' on device `/dev/nst3'.
Info: Operation `Verify label' in progress on device `/dev/nst3'
Info: Performing operation `Verify label' on device `/dev/nst2'.
Info: Operation `Verify label' in progress on device `/dev/nst2'
Info: Performing operation `Verify label' on device `/dev/nst1'.
Info: Operation `Verify label' in progress on device `/dev/nst1'
Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not
recognised by Networker: Input/output error'.
Info: nsrmmgd assumes the volume is unlabeled and will write a new label.
Info: Performing operation `Label without mount' on device `/dev/nst2'.
Info: Operation `Label without mount' in progress on device `/dev/nst2'
Info: Label: `800841L4', pool: `Default', capacity: `<NULL>'.
Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not
recognised by Networker: Input/output error'.
Info: nsrmmgd assumes the volume is unlabeled and will write a new label.
Info: Performing operation `Label without mount' on device `/dev/nst1'.
Info: Operation `Label without mount' in progress on device `/dev/nst1'
Info: Label: `800840L4', pool: `Default', capacity: `<NULL>'
Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not
recognised by Networker: Input/output error'.
Info: nsrmmgd assumes the volume is unlabeled and will write a new label.
```

Info: Performing operation `Label without mount' on device `/dev/nst3'. Info: Operation `Label without mount' in progress on device `/dev/nst3' Info: Label: `800842L4', pool: `Default', capacity: `<NULL>'. Info: Performing operation `Eject' on device `/dev/nst1'. Info: Operation `Eject' in progress on device `/dev/nst1' Info: Performing operation `Eject' on device `/dev/nst2'. Info: Operation `Eject' in progress on device `/dev/nst2' Info: Performing operation `Eject' on device `/dev/nst3'. Info: Operation `Eject' in progress on device `/dev/nst3' Info: Eject sleep for 5 seconds. Info: Eject sleep for 5 seconds. Info: Eject sleep for 5 seconds. Info: Preparing to unload volume `800842L4' from device `/dev/nst3' to slot 3. Info: Unloading volume `800842L4' from device `/dev/nst3' to slot 3. Info: Preparing to unload volume `800840L4' from device `/dev/nst1' to slot 1. Info: Unloading volume `800840L4' from device `/dev/nst1' to slot 1. Info: Preparing to unload volume `800841L4' from device `/dev/nst2' to slot 2. Info: Unloading volume `800841L4' from device `/dev/nst2' to slot 2. Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Preparing to load volume `-' from slot 4 into device `/dev/nst1'. Info: Loading volume `-' from slot `4' into device `/dev/nst1'. Info: Preparing to load volume `-' from slot 5 into device `/dev/nst2'. Info: Loading volume `-' from slot `5' into device `/dev/nst2'. Info: Preparing to load volume `-' from slot 6 into device `/dev/nst3'. Info: Loading volume `-' from slot `6' into device `/dev/nst3'. Info: Load sleep for 5 seconds. Info: Load sleep for 5 seconds. Info: Load sleep for 5 seconds. Info: Performing operation `Verify label' on device `/dev/nst1'. Info: Operation `Verify label' in progress on device `/dev/nst1' Info: Performing operation `Verify label' on device `/dev/nst2'. Info: Operation `Verify label' in progress on device `/dev/nst2' Info: Performing operation `Verify label' on device `/dev/nst3'. Info: Operation `Verify label' in progress on device `/dev/nst3' Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst3'. Info: Operation `Label without mount' in progress on device `/dev/nst3' Info: Label: `800845L4', pool: `Default', capacity: `<NULL>'. Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst1'. Info: Operation `Label without mount' in progress on device `/dev/nst1' Info: Label: `800843L4', pool: `Default', capacity: `<NULL>'. Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst2'. Info: Operation `Label without mount' in progress on device `/dev/nst2' Info: Label: `800844L4', pool: `Default', capacity: `<NULL>'. Info: Performing operation `Eject' on device `/dev/nst3'. Info: Operation `Eject' in progress on device `/dev/nst3' Info: Performing operation `Eject' on device `/dev/nst2'. Info: Operation `Eject' in progress on device `/dev/nst2' Info: Performing operation `Eject' on device `/dev/nst1'. Info: Operation `Eject' in progress on device `/dev/nst1' Info: Eject sleep for 5 seconds. Info: Eject sleep for 5 seconds. Info: Eject sleep for 5 seconds. Info: Preparing to unload volume `800843L4' from device `/dev/nst1' to slot 4. Info: Unloading volume `800843L4' from device `/dev/nst1' to slot 4.

Info: Preparing to unload volume `800844L4' from device `/dev/nst2' to slot 5. Info: Unloading volume `800844L4' from device `/dev/nst2' to slot 5. Info: Preparing to unload volume `800845L4' from device `/dev/nst3' to slot 6. Info: Unloading volume `800845L4' from device `/dev/nst3' to slot 6. Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Preparing to load volume `-' from slot 7 into device `/dev/nst1'. Info: Loading volume `-' from slot `7' into device `/dev/nst1'. Info: Preparing to load volume `-' from slot 8 into device `/dev/nst2'. Info: Loading volume `-' from slot `8' into device `/dev/nst2'. Info: Preparing to load volume `-' from slot 9 into device `/dev/nst3'. Info: Loading volume `-' from slot `9' into device `/dev/nst3'. Info: Load sleep for 5 seconds. Info: Load sleep for 5 seconds. Info: Load sleep for 5 seconds. Info: Performing operation `Verify label' on device `/dev/nst1'.
Info: Operation `Verify label' in progress on device `/dev/nst1' Info: Performing operation `Verify label' on device `/dev/nst2'. Info: Operation `Verify label' in progress on device `/dev/nst2' Info: Performing operation `Verify label' on device `/dev/nst3'. Info: Operation `Verify label' in progress on device `/dev/nst3' Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst3'. Info: Operation `Label without mount' in progress on device `/dev/nst3' Info: Label: `800848L4', pool: `Default', capacity: `<NULL>' Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmqd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst1'. Info: Operation `Label without mount' in progress on device `/dev/nst1' Info: Label: `800846L4', pool: `Default', capacity: `<NULL>'. Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst2'. Info: Operation `Label without mount' in progress on device `/dev/nst2' Info: Label: `800847L4', pool: `Default', capacity: `<NULL>'. Info: Performing operation `Eject' on device `/dev/nst1'. Info: Operation `Eject' in progress on device `/dev/nst1' Info: Performing operation `Eject' on device `/dev/nst3'. Info: Operation `Eject' in progress on device `/dev/nst3' Info: Performing operation `Eject' on device `/dev/nst2'. Info: Operation `Eject' in progress on device `/dev/nst2' Info: Eject sleep for 5 seconds. Info: Eject sleep for 5 seconds. Info: Eject sleep for 5 seconds. Info: Preparing to unload volume `800846L4' from device `/dev/nst1' to slot 7. Info: Unloading volume `800846L4' from device `/dev/nst1' to slot 7. Info: Preparing to unload volume `800847L4' from device `/dev/nst2' to slot 8. Info: Unloading volume `800847L4' from device `/dev/nst2' to slot 8. Info: Preparing to unload volume `800848L4' from device `/dev/nst3' to slot 9. Info: Unloading volume `800848L4' from device `/dev/nst3' to slot 9. Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Preparing to load volume `-' from slot 10 into device `/dev/nst1'. Info: Loading volume `-' from slot `10' into device `/dev/nst1'. Info: Preparing to load volume `-' from slot 11 into device `/dev/nst2'. Info: Loading volume `-' from slot `11' into device `/dev/nst2'. Info: Preparing to load volume `-' from slot 12 into device `/dev/nst3'. Info: Loading volume `-' from slot `12' into device `/dev/nst3'. Info: Load sleep for 5 seconds.

Info: Load sleep for 5 seconds. Info: Load sleep for 5 seconds. Info: Performing operation `Verify label' on device `/dev/nst1'. Info: Operation `Verify label' in progress on device `/dev/nst1' Info: Performing operation `Verify label' on device `/dev/nst2'. Info: Operation `Verify label' in progress on device `/dev/nst2' Info: Performing operation `Verify label' on device `/dev/nst3'. Info: Operation `Verify label' in progress on device `/dev/nst3' Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst1'. Info: Operation `Label without mount' in progress on device `/dev/nst1' Info: Label: `800849L4', pool: `Default', capacity: `<NULL>'. Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmqd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst3'. Info: Operation `Label without mount' in progress on device `/dev/nst3' Info: Label: `800851L4', pool: `Default', capacity: `<NULL>'. Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst2'. Info: Operation `Label without mount' in progress on device `/dev/nst2' Info: Label: `800850L4', pool: `Default', capacity: `<NULL>'. Info: Performing operation `Eject' on device `/dev/nst2'. Info: Operation `Eject' in progress on device `/dev/nst2'
Info: Eject sleep for 5 seconds. Info: Performing operation `Eject' on device `/dev/nst1'. Info: Operation `Eject' in progress on device `/dev/nst1' Info: Performing operation `Eject' on device `/dev/nst3'. Info: Operation `Eject' in progress on device `/dev/nst3' Info: Eject sleep for 5 seconds. Info: Eject sleep for 5 seconds. Info: Preparing to unload volume `800849L4' from device `/dev/nst1' to slot 10. Info: Unloading volume `800849L4' from device `/dev/nst1' to slot 10. Info: Preparing to unload volume `800851L4' from device `/dev/nst3' to slot 12. Info: Unloading volume `800851L4' from device `/dev/nst3' to slot 12. Info: Preparing to unload volume `800850L4' from device `/dev/nst2' to slot 11. Info: Unloading volume `800850L4' from device `/dev/nst2' to slot 11. Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Preparing to load volume `-' from slot 13 into device `/dev/nst1'. Info: Loading volume `-' from slot `13' into device `/dev/nst1'. Info: Preparing to load volume `-' from slot 14 into device `/dev/nst2'. Info: Loading volume `-' from slot `14' into device `/dev/nst2'. Info: Preparing to load volume `-' from slot 15 into device `/dev/nst3'. Info: Loading volume `-' from slot `15' into device `/dev/nst3'. Info: Load sleep for 5 seconds. Info: Load sleep for 5 seconds. Info: Load sleep for 5 seconds. Info: Performing operation `Verify label' on device `/dev/nst1'. Info: Operation `Verify label' in progress on device `/dev/nst1' Info: Performing operation `Verify label' on device `/dev/nst2'. Info: Operation `Verify label' in progress on device `/dev/nst2' Info: Performing operation `Verify label' on device `/dev/nst3'. Info: Operation `Verify label' in progress on device `/dev/nst3' Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst1'. Info: Operation `Label without mount' in progress on device `/dev/nst1' Info: Label: `800852L4', pool: `Default', capacity: `<NULL>'.

Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst2'. Info: Operation `Label without mount' in progress on device `/dev/nst2' Info: Label: `800853L4', pool: `Default', capacity: `<NULL>'. Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst3'. Info: Operation `Label without mount' in progress on device `/dev/nst3' Info: Label: `800854L4', pool: `Default', capacity: `<NULL>'. Info: Performing operation `Eject' on device `/dev/nst1'. Info: Operation `Eject' in progress on device `/dev/nst1' Info: Eject sleep for 5 seconds. Info: Performing operation `Eject' on device `/dev/nst3'. Info: Operation `Eject' in progress on device `/dev/nst3' Info: Performing operation `Eject' on device `/dev/nst2'. Info: Operation `Eject' in progress on device `/dev/nst2' Info: Eject sleep for 5 seconds. Info: Eject sleep for 5 seconds. Info: Preparing to unload volume `800853L4' from device `/dev/nst2' to slot 14. Info: Unloading volume `800853L4' from device `/dev/nst2' to slot 14. Info: Preparing to unload volume `800854L4' from device `/dev/nst3' to slot 15. Info: Unloading volume `800854L4' from device `/dev/nst3' to slot 15. Info: Preparing to unload volume `800852L4' from device `/dev/nst1' to slot 13. Info: Unloading volume `800852L4' from device `/dev/nst1' to slot 13. Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Preparing to load volume `-' from slot 16 into device `/dev/nst1'. Info: Loading volume `-' from slot `16' into device `/dev/nst1'. Info: Preparing to load volume `-' from slot 17 into device `/dev/nst2'. Info: Loading volume `-' from slot `17' into device `/dev/nst2'. Info: Preparing to load volume `-' from slot 18 into device `/dev/nst3'. Info: Loading volume `-' from slot `18' into device `/dev/nst3'. Info: Load sleep for 5 seconds. Info: Load sleep for 5 seconds. Info: Load sleep for 5 seconds. Info: Performing operation `Verify label' on device `/dev/nst1'. Info: Operation `Verify label' in progress on device `/dev/nst1' Info: Performing operation `Verify label' on device `/dev/nst2'. Info: Operation `Verify label' in progress on device `/dev/nst2' Info: Performing operation `Verify label' on device `/dev/nst3'. Info: Operation `Verify label' in progress on device `/dev/nst3' Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst2' Info: Operation `Label without mount' in progress on device `/dev/nst2' Info: Label: `800856L4', pool: `Default', capacity: `<NULL>' Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst1'. Info: Operation `Label without mount' in progress on device `/dev/nst1' Info: Label: `800855L4', pool: `Default', capacity: `<NULL>'. Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst3'. Info: Operation `Label without mount' in progress on device `/dev/nst3' Info: Label: `800857L4', pool: `Default', capacity: `<NULL>'. Info: Performing operation `Eject' on device `/dev/nst3'. Info: Operation `Eject' in progress on device `/dev/nst3'

Info: Eject sleep for 5 seconds. Info: Performing operation `Eject' on device `/dev/nst2'. Info: Operation `Eject' in progress on device `/dev/nst2' Info: Performing operation `Eject' on device `/dev/nst1'. Info: Operation `Eject' in progress on device `/dev/nst1' Info: Eject sleep for 5 seconds. Info: Eject sleep for 5 seconds. Info: Preparing to unload volume `800855L4' from device `/dev/nst1' to slot 16. Info: Unloading volume `800855L4' from device `/dev/nst1' to slot 16. Info: Preparing to unload volume `800856L4' from device `/dev/nst2' to slot 17. Info: Unloading volume `800856L4' from device `/dev/nst2' to slot 17. Info: Preparing to unload volume `800857L4' from device `/dev/nst3' to slot 18. Info: Unloading volume `800857L4' from device `/dev/nst3' to slot 18. Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Preparing to load volume `-' from slot 19 into device `/dev/nst1'.
Info: Loading volume `-' from slot `19' into device `/dev/nst1'. Info: Preparing to load volume `-' from slot 20 into device `/dev/nst2'. Info: Loading volume `-' from slot `20' into device `/dev/nst2'. Info: Preparing to load volume `-' from slot 21 into device `/dev/nst3'. Info: Loading volume `-' from slot `21' into device `/dev/nst3'. Info: Load sleep for 5 seconds. Info: Load sleep for 5 seconds. Info: Load sleep for 5 seconds. Info: Performing operation `Verify label' on device `/dev/nst1'. Info: Operation `Verify label' in progress on device `/dev/nst1' Info: Performing operation `Verify label' on device `/dev/nst2'. Info: Operation `Verify label' in progress on device `/dev/nst2' Info: Performing operation `Verify label' on device `/dev/nst3'. Info: Operation `Verify label' in progress on device `/dev/nst3' Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst3'. Info: Operation `Label without mount' in progress on device `/dev/nst3' Info: Label: `800860L4', pool: `Default', capacity: `<NULL>'. Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst2'. Info: Operation `Label without mount' in progress on device `/dev/nst2' Info: Label: `800859L4', pool: `Default', capacity: `<NULL>'. Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst1'. Info: Operation `Label without mount' in progress on device `/dev/nst1' Info: Label: `800858L4', pool: `Default', capacity: `<NULL>'. Info: Performing operation `Eject' on device `/dev/nst2'. Info: Operation `Eject' in progress on device `/dev/nst2' Info: Performing operation `Eject' on device `/dev/nst3'. Info: Operation `Eject' in progress on device `/dev/nst3' Info: Performing operation `Eject' on device `/dev/nst1'. Info: Operation `Eject' in progress on device `/dev/nst1' Info: Eject sleep for 5 seconds. Info: Eject sleep for 5 seconds. Info: Eject sleep for 5 seconds. Info: Preparing to unload volume `800858L4' from device `/dev/nst1' to slot 19. Info: Unloading volume `800858L4' from device `/dev/nst1' to slot 19. Info: Preparing to unload volume `800859L4' from device `/dev/nst2' to slot 20. Info: Unloading volume `800859L4' from device `/dev/nst2' to slot 20. Info: Preparing to unload volume `800860L4' from device `/dev/nst3' to slot 21. Info: Unloading volume `800860L4' from device `/dev/nst3' to slot 21. Info: Unload sleep for 5 seconds.

Info: Unload sleep for 5 seconds. Info: Unload sleep for 5 seconds. Info: Preparing to load volume `-' from slot 22 into device `/dev/nst1'. Info: Loading volume `-' from slot `22' into device `/dev/nst1'. Info: Load sleep for 5 seconds. Info: Performing operation `Verify label' on device `/dev/nst1'. Info: Operation `Verify label' in progress on device `/dev/nst1' Info: Cannot read the current volume label `Tape label read for volume ? in pool ?, is not recognised by Networker: Input/output error'. Info: nsrmmgd assumes the volume is unlabeled and will write a new label. Info: Performing operation `Label without mount' on device `/dev/nst1'. Info: Operation `Label without mount' in progress on device `/dev/nst1' Info: Label: `800861L4', pool: `Default', capacity: `<NULL>'. Info: Performing operation `Eject' on device `/dev/nst1'. Info: Operation `Eject' in progress on device `/dev/nst1' Info: Eject sleep for 5 seconds. Info: Preparing to unload volume `800861L4' from device `/dev/nst1' to slot 22. Info: Unloading volume `800861L4' from device `/dev/nst1' to slot 22. Info: Unload sleep for 5 seconds. Jukebox operation finished with status: succeeded

Once the label operation has completed, confirm the jukebox contents again:

[root@linuxvtl ~]# nsrjb -C -j VTL1						
Jukebox VTL1: (Ready to accept commands)						
slot	volume	pool	barcode	volume id	recyclable	
1:	800840L4	Default	800840L4	11964469	no	
2:	800841L4	Default	800841L4	4290154549	no	
3:	800842L4	Default	800842L4	4273377334	no	
4:	800843L4	Default	800843L4	4223045720	no	
5:	800844L4	Default	800844L4	4239822936	no	
6:	800845L4	Default	800845L4	4256600152	no	
7:	800846L4	Default	800846L4	4206268540	no	
8:	800847L4	Default	800847L4	4172714108	no	
9:	800848L4	Default	800848L4	4189491324	no	
10:	800849L4	Default	800849L4	4155936920	no	
11:	800850L4	Default	800850L4	4139159704	no	
12:	800851L4	Default	800851L4	4122382488	no	
13:	800852L4	Default	800852L4	4072050871	no	
14:	800853L4	Default	800853L4	4088828087	no	
15:	800854L4	Default	800854L4	4105605303	no	
16:	800855L4	Default	800855L4	4021719255	no	
17:	800856L4	Default	800856L4	4038496471	no	
18:	800857L4	Default	800857L4	4055273687	no	
19:	800858L4	Default	800858L4	3988164853	no	
20:	800859L4	Default	800859L4	4004942069	no	
21:	800860L4	Default	800860L4	3971387638	no	
22:	800861L4	Default	800861L4	3954610452	no	
drive	1 (/dev/nst0)	slot :				
drive	2 (/dev/nst1)	slot :				
drive	3 (/dev/nst2)	slot :				
drive	4 (/dev/nst3)	slot :				

NOTE: Volume IDs will differ.

9.2.2 Label VTL2 volumes

Issue the nsrjb command to label all the volumes in VTL2 into the "Default Clone" pool. This is shown below, with verbose mode *not* used. Following the label operation, again use the show-contents command to confirm the label operation has completed successfully:

[root@linuxvtl ~]# nsrjb -LY -b "[Default Cl	lone" -j VTL2 -	S 1-22
Info: Operation `Eject' in progress	on device	`/dev/nst5'	
Info: Operation `Eject' in progress	on device	`/dev/nst6'	
Info: Operation `Eject' in progress	on device	`/dev/nst5'	
<pre>Info: Operation `Eject' in progress</pre>	on device	`/dev/nst7'	
<pre>Info: Operation `Eject' in progress</pre>	on device	`/dev/nst6'	
<pre>Info: Operation `Eject' in progress</pre>	on device	`/dev/nst5'	
<pre>Info: Operation `Eject' in progress</pre>	on device	`/dev/nst5'	
<pre>Info: Operation `Eject' in progress</pre>	on device	`/dev/nst7'	
Info: Operation `Eject' in progress	on device	`/dev/nst7'	
Info: Operation `Eject' in progress	on device	`/dev/nst6'	
<pre>Info: Operation `Eject' in progress</pre>	on device	`/dev/nst7'	
Info: Operation `Eject' in progress	on device	`/dev/nst6'	
Info: Operation `Eject' in progress	on device	`/dev/nst5'	
Info: Operation `Eject' in progress	on device	`/dev/nst6'	
Jukebox operation finished with stat	tus: succee	eded	
[root@linuxvtl ~]# nsrjb -C -j VTI	L2		
Jukebox VTL2: (Ready to accept commo	ands)		
slot volume pool	barcode	volume id	recyclable
1: 900840L4 Default Clone	900840L4	3921056277	no
2: 900841L4 Default Clone	900841L4	3904279061	no
3: 900842L4 Default Clone	900842L4	3937833492	no
4: 900843L4 Default Clone	900843L4	3870724661	no
5: 900844L4 Default Clone	900844L4	3887501877	no
6: 900845L4 Default Clone	900845L4	3853947445	no
7: 900846L4 Default Clone	900846L4	3803615829	no
8: 900847L4 Default Clone	900847L4	3837170261	no
9: 900848L4 Default Clone	900848L4	3820393045	no
10: 900849L4 Default Clone	900849L4	3786838646	no
11: 900850L4 Default Clone	900850L4	3753284214	no
12: 900851L4 Default Clone	900851L4	3770061430	no
13: 900852L4 Default Clone	900852L4	3736507031	no
14: 900853L4 Default Clone	900853L4	3719729815	no
15: 900854L4 Default Clone	900854L4	3702952599	no
16: 900855L4 Default Clone	900855L4	3686175417	no
17: 900856L4 Default Clone	900856L4	3652620985	no
18: 900857L4 Default Clone	900857L4	3669398201	no
19: 900858L4 Default Clone	900858L4	3602289369	no
20: 900859L4 Default Clone	900859L4	3619066585	no
21: 900860L4 Default Clone	900860L4	3635843801	no
22: 900861L4 Default Clone	900861L4	3585512187	no
drive 1 (/dev/nst4) slot :			
drive 2 (/dev/nst5) slot :			
drive 3 (/dev/nst6) slot :			
drive 4 (/dev/nst7) slot :			

9.3 Backup the Server

Now that the VTL has been configured, run a backup of the server. By virtue of the default bootstrap process, you will be able to do this by running:

savegrp -l full Default

While this is running, use *nsrwatch* to monitor the backup process:

\varTheta 🔿 🔿 root@linuxvtl:~ — ssh — 80×40	
Server: linuxvtl.pmdg.lab Thu Oct 14 16:38:05 2010	
Up since: Thu Oct 14 15:21:49 2010 Version: NetWorker 7.6.1.Build.397 Eval Saves: 1 session(s), 3 KB total Recovers: 0 session(s) Device type volume /dev/nst0 (J) LTO Ultrium-4 800840L4 writing at 12 MB/s, 78 MB /dev/nst1 (J) LTO Ultrium-4 (none) ejected /dev/nst2 (J) LTO Ultrium-4 (none) ejected /dev/nst3 (J) LTO Ultrium-4 (none) ejected /dev/nst4 (J) LTO Ultrium-4 (none) ejected /dev/nst5 (J) LTO Ultrium-4 (none) ejected /dev/nst6 (J) LTO Ultrium-4 (none) ejected /dev/nst7 (J) LTO Ultrium-4 (none) ejected	4 + (
<pre>Sessions: linuxvtl.pmdg.lab:/media/psf done saving to pool 'Default' (800840L4) 3 KB linuxvtl.pmdg.lab:/opt saving to pool 'Default' (800840L4) 32 MB linuxvtl.pmdg.lab:/ saving to pool 'Default' (800840L4) 16 MB</pre> Messages: Thu 04:19:52 PM media warning: /dev/nst5 reading: Tape label read for volume Thu 04:19:52 PM /dev/nst5 Tape label read for volume ? in pool ?, is not rec Thu 04:19:52 PM /dev/nst5 Label without mount operation in progress Thu 04:19:58 PM /dev/nst5 labeled LT0 Ultrium-4 tape 900861L4 Thu 04:19:58 PM /dev/nst5 Eject operation in progress Thu 04:19:58 PM /dev/nst5 Eject operation in progress	
Thu 04:37:58 PM /dev/nst0 mounted LTO Ultrium-4 tape 800840L4 Thu 04:37:58 PM media event cleared: Waiting for 1 writable volume(s) to bac Thu 04:37:58 PM linuxvtl.pmdg.lab:/media/psf saving to pool 'Default' (800840L4) Thu 04:37:59 PM linuxvtl.pmdg.lab:/opt saving to pool 'Default' (800840L4) Thu 04:37:59 PM linuxvtl.pmdg.lab:/ saving to pool 'Default' (800840L4) Thu 04:38:02 PM linuxvtl.pmdg.lab:/media/psf done saving to pool 'Default' (
Pending: Thu 03:22:22 PM registration warning: NetWorker evaluation mode will expire	•

Figure 23: nsrwatch showing backup in progress to VTL

NOTE: Because compression is enabled by default, a virtual volume may hold more than 1024MB, and the backup may run faster than a non-compressed backup.

9.4 Clone the Backup

At the conclusion of the backup, run the command:

```
[root@linuxvtl ~]# nsrclone -b "Default Clone" -S -e now -t today -g Default
80470:nsrclone: Following volumes are needed for cloning
80471:nsrclone: 800841L4 (Regular)
80471:nsrclone: 800840L4 (Regular)
```

This will trigger a clone of all backups done since the VTL was started (assuming all activities have been performed in a single day – if this is not the case, adjust the start and end times of the clone command accordingly). During the clone session, use *nsrwatch* to observe the status:



Figure 24: Monitoring the cloning operation using nsrwatch

9.5 Recover Data

Recover data on the backup server to confirm that savesets written to the VTL can be retrieved successfully:

```
[root@linuxvtl ~]# cd /root
[root@linuxvtl ~]# recover -s linuxvtl
```

```
Current working directory is /root/
recover> add -q 761
13 file(s) marked for recovery
recover> volumes
Volumes needed (all on-line):
        800841L4 at /dev/nst2
recover> relocate /tmp/761
recover> recover
Recovering 13 files within /root/ into /tmp/761
Volumes needed (all on-line):
        800841L4 at /dev/nst2
Total estimated disk space needed for recover is 207 MB.
Requesting 13 file(s), this may take a while...
Requesting 1 recover session(s) from server.
./761/LGTO_METAFILE.linuxx86
./761/lgtozh-7.6.1-1.i686.rpm
./761/lgtonmc-7.6.1-1.i686.rpm
./761/sd_products.res
./761/lgtoman-7.6.1-1.i686.rpm
./761/lgtolicm-7.6.1-1.i686.rpm
./761/lgtofr-7.6.1-1.i686.rpm
./761/lqtoja-7.6.1-1.i686.rpm
./761/lgtoclnt-7.6.1-1.i686.rpm
./761/lgtonode-7.6.1-1.i686.rpm
./761/lgtoko-7.6.1-1.i686.rpm
./761/lgtoserv-7.6.1-1.i686.rpm
. /761/
Received 13 file(s) from NSR server `linuxvtl'
Recover completion time: Thu 14 Oct 2010 04:54:22 PM EST
```

Once the recovery is complete, use the 'md5sum' utility to confirm that all files recovered match their original versions:

```
[root@linuxvtl ~]# cd /tmp/761/761
[root@linuxvtl 761]# for i in *
> do
> md5sum $i /root/761/$i
> done
59997ba545582659e44a55ab983109df
                                  lgtoclnt-7.6.1-1.i686.rpm
                                  /root/761/lgtoclnt-7.6.1-1.i686.rpm
59997ba545582659e44a55ab983109df
9bae0c9de0a0aeb8e61b14c17ac5c77e
                                  lqtofr-7.6.1-1.i686.rpm
9bae0c9de0a0aeb8e61b14c17ac5c77e
                                  /root/761/lgtofr-7.6.1-1.i686.rpm
390938a0998c822d0f3964a6b2e794c4
                                  lgtoja-7.6.1-1.i686.rpm
390938a0998c822d0f3964a6b2e794c4
                                  /root/761/lgtoja-7.6.1-1.i686.rpm
3ed773f122cbd8af4535cfe9828addab
                                  lgtoko-7.6.1-1.i686.rpm
3ed773f122cbd8af4535cfe9828addab
                                  /root/761/lgtoko-7.6.1-1.i686.rpm
522d7b390c29102d7b99bab05eeb0766
                                  lgtolicm-7.6.1-1.i686.rpm
522d7b390c29102d7b99bab05eeb0766
                                  /root/761/lgtolicm-7.6.1-1.i686.rpm
dc451b003a1421d710e0da46c3698ab4
                                  lgtoman-7.6.1-1.i686.rpm
dc451b003a1421d710e0da46c3698ab4
                                  /root/761/lgtoman-7.6.1-1.i686.rpm
                                  LGTO_METAFILE.linuxx86
5879c47e049d699b4b800b49d68b1df8
5879c47e049d699b4b800b49d68b1df8
                                  /root/761/LGT0_METAFILE.linuxx86
d7b8e0b05da72d5de3c2200b3d6f88e7
                                  lgtonmc-7.6.1-1.i686.rpm
d7b8e0b05da72d5de3c2200b3d6f88e7
                                  /root/761/lgtonmc-7.6.1-1.i686.rpm
                                  lgtonode-7.6.1-1.i686.rpm
0167ce4babb898adfc3367cac0a9326b
0167ce4babb898adfc3367cac0a9326b
                                  /root/761/lgtonode-7.6.1-1.i686.rpm
91fd19ac08f55c5f9af1c202b133229e
                                  lgtoserv-7.6.1-1.i686.rpm
91fd19ac08f55c5f9af1c202b133229e
                                  /root/761/lgtoserv-7.6.1-1.i686.rpm
cd9a9bd10542472eecfa90b6017ac25c
                                  lgtozh-7.6.1-1.i686.rpm
cd9a9bd10542472eecfa90b6017ac25c
                                  /root/761/lgtozh-7.6.1-1.i686.rpm
9faeb5e2f10f5b9d1fa0004ee881129d
                                  sd_products.res
9faeb5e2f10f5b9d1fa0004ee881129d
                                  /root/761/sd_products.res
```

10 Wrapping Up

During the course of this micromanual, we have:

- Configured a CentOS server.
- Installed and configured the LinuxVTL software on the CentOS server.
- Installed and configured NetWorker on the CentOS server.
- Configured the VTLs in NetWorker.
- Tested basic operations of the VTLs.

From here on in, the VTLs are ready and available for you to use for testing or training purposes.