nsrd.info micromanual

Configuring LinuxVTL on CentOS for NetWorker

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Date: October 2010
Version: 1.0

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:

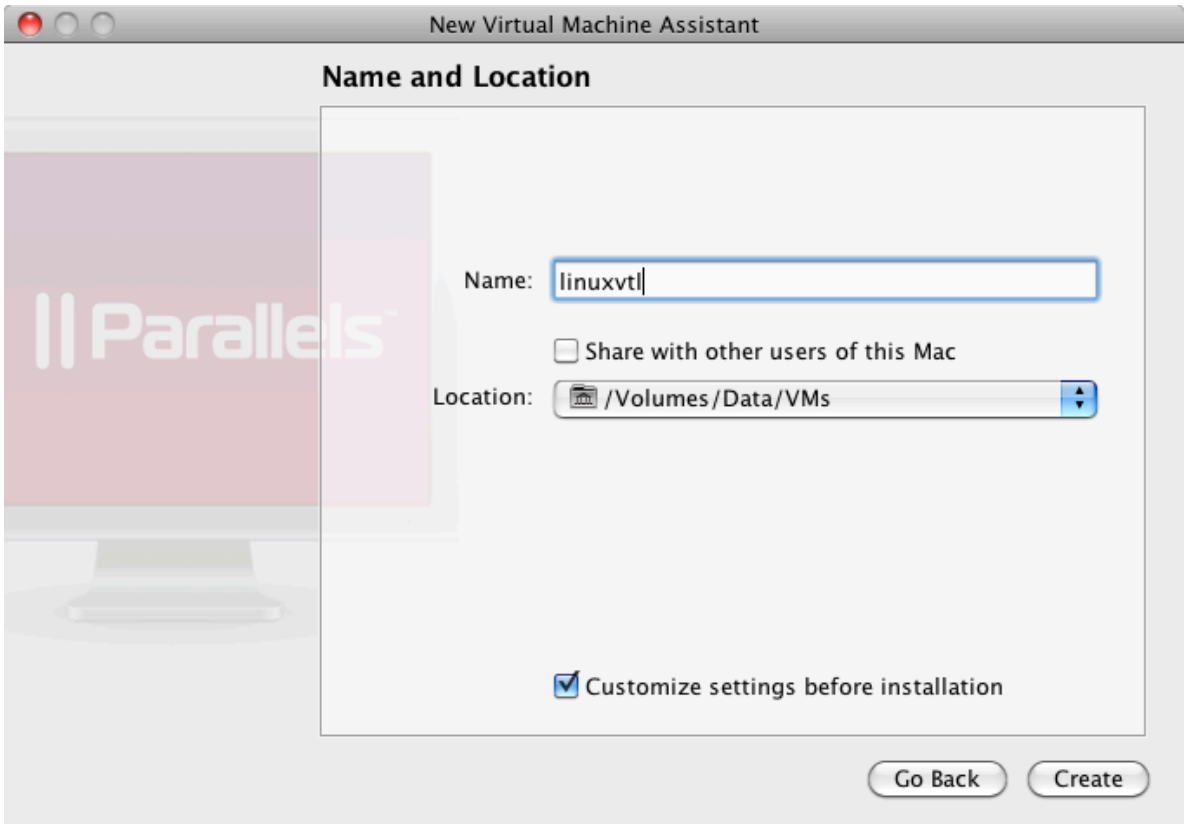

Figure 1: Setup guest machine in Parallels, initial creation

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

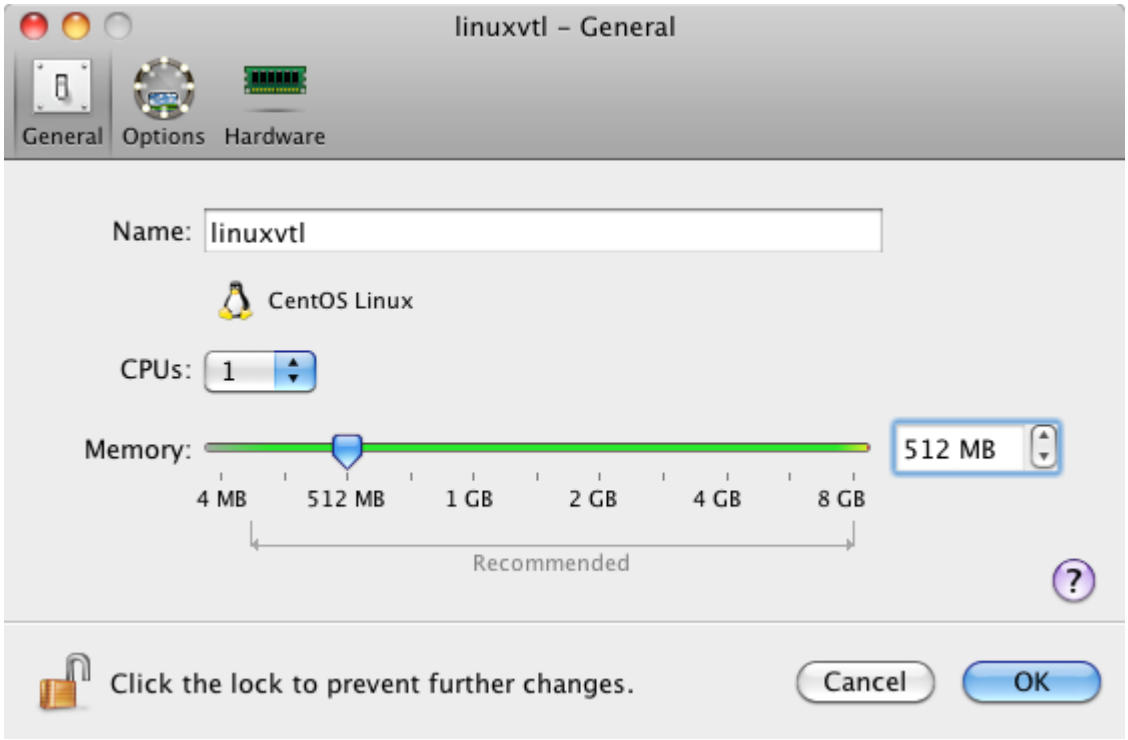

Figure 2: Configure RAM for guest

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:

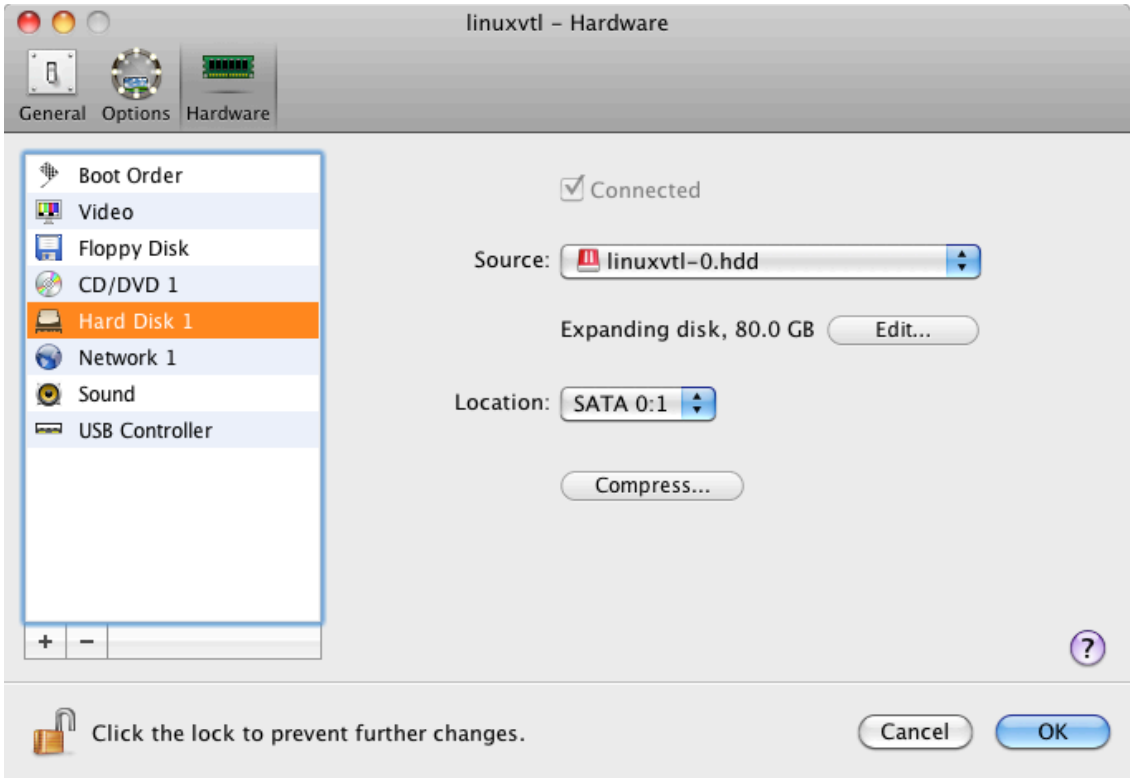

Figure 3: Adjust hard drive configuration for guest

(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:

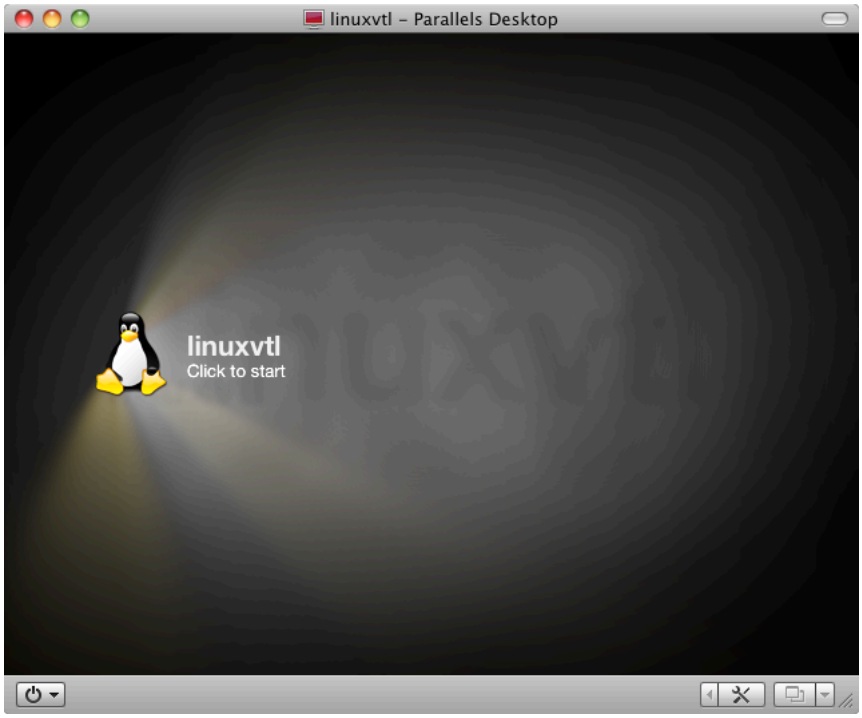

Figure 4: Guest, ready for boot

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:

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

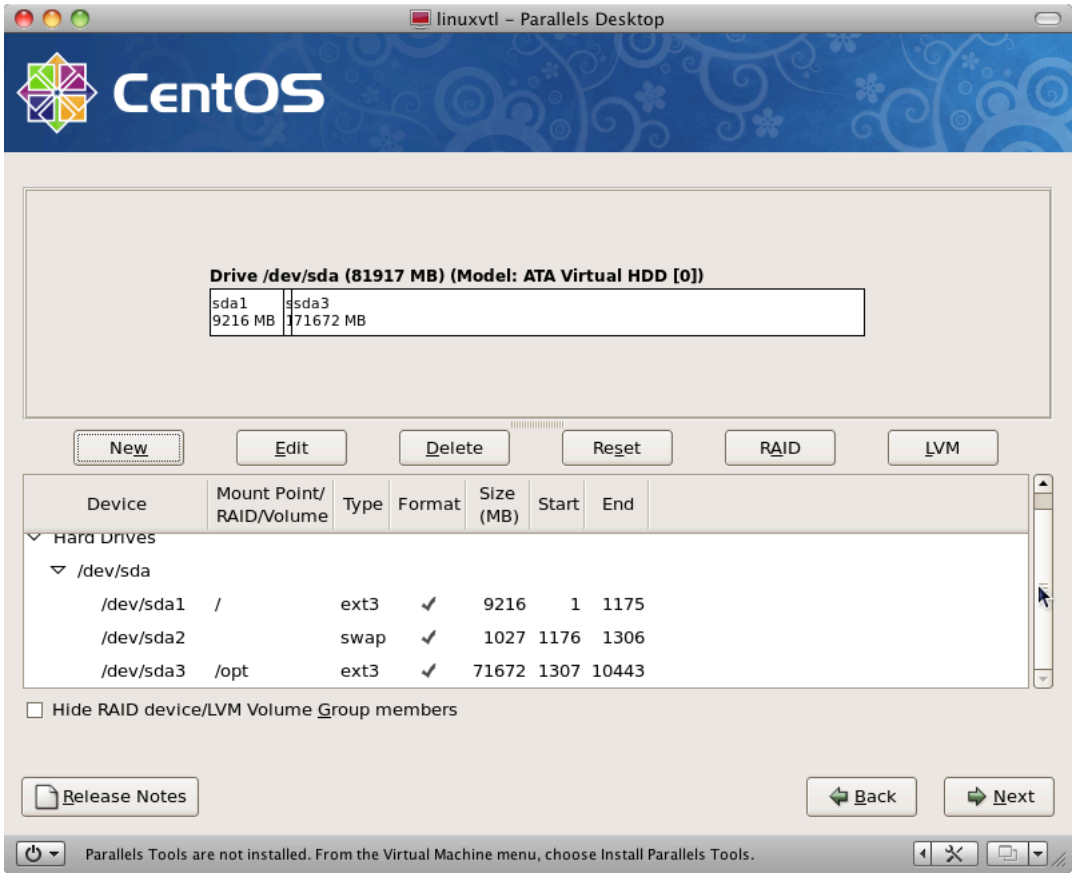

Figure 6: Completed custom partition layout

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:

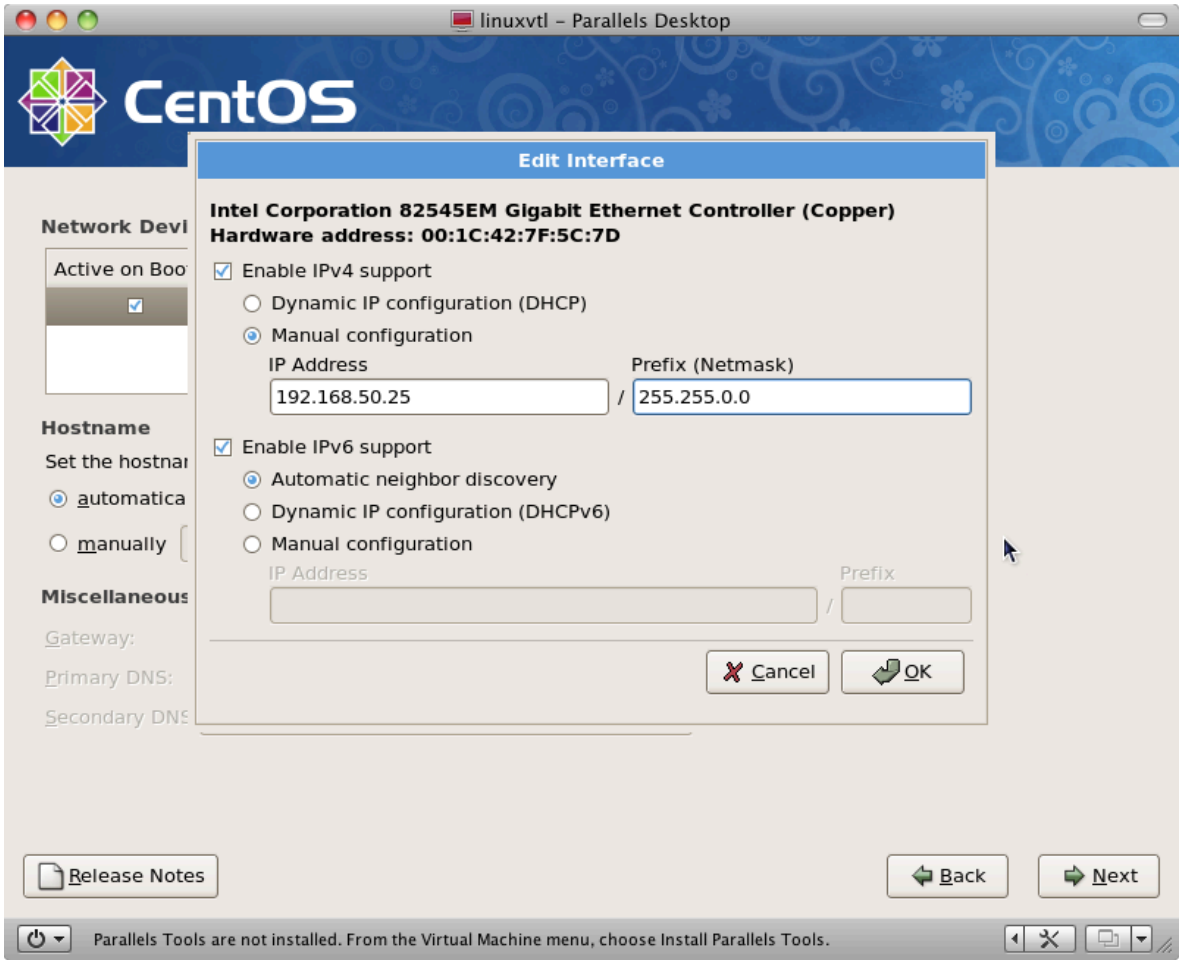

Figure 7: Manual network configuration, step 1

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

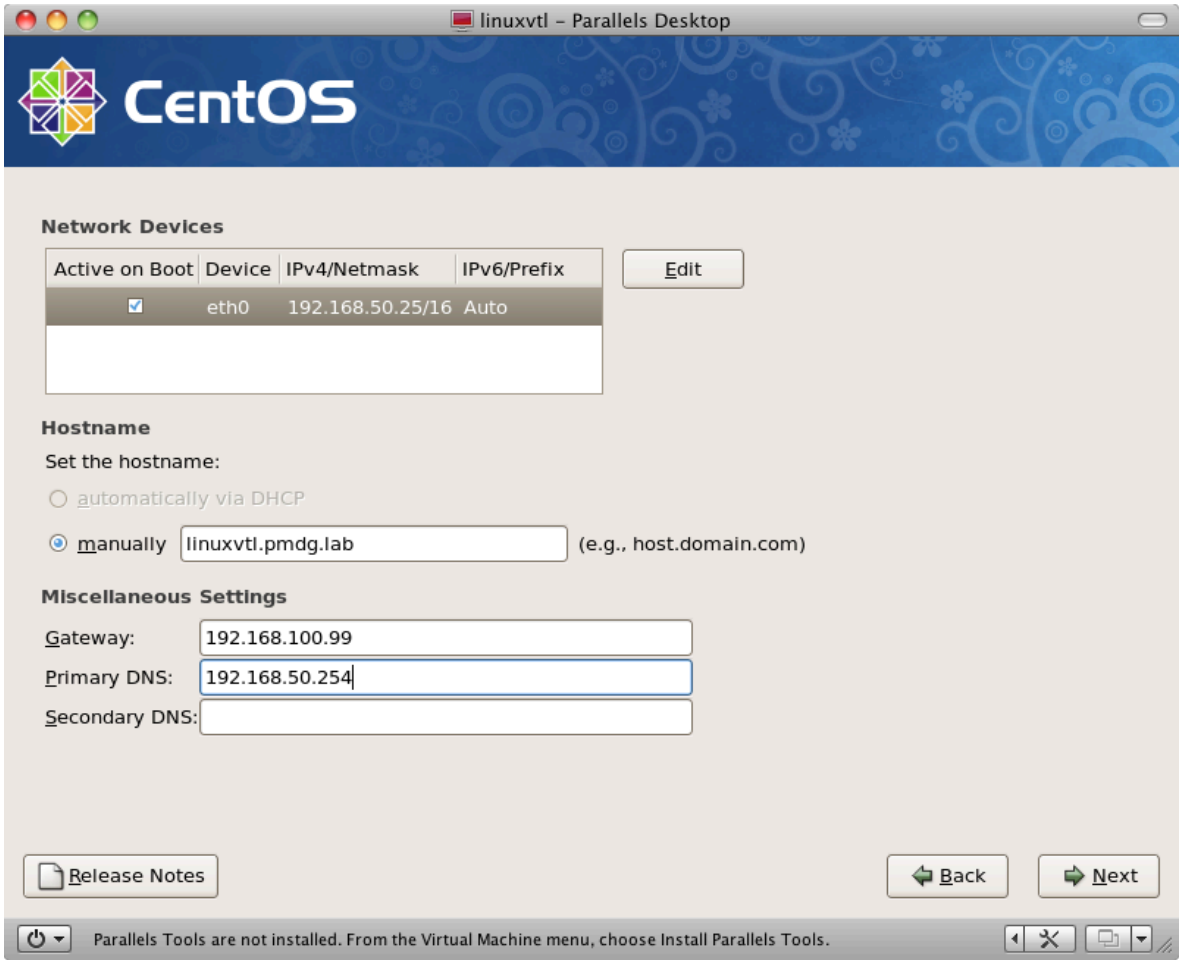

Figure 8: Manual network configuration, step 2

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:

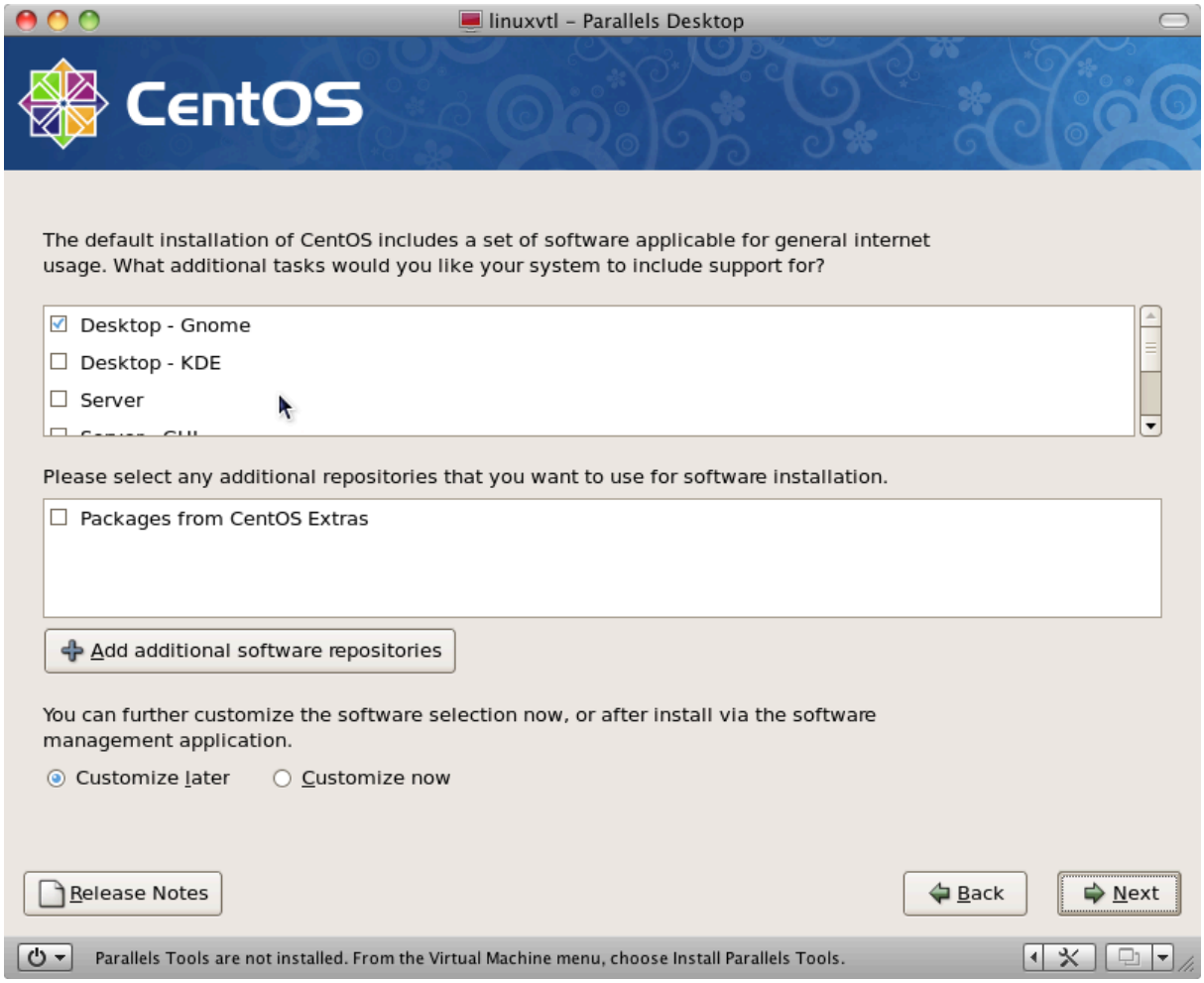

Figure 9: Choosing default package configuration

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:

```
[root@linuxvtl ~]# rpm -ivh mhvtl-0.16-13.i586.rpm
Preparing...                ########################################### [100%]
   1:mhvtl                  ########################################### [100%]
```

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
vtltape: version 0.16.13
vtltape: version 0.16.13
vtltape: version 0.16.13
vtltape: version 0.16.13
vtltape: version 0.16.13
vtltape: version 0.16.13
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:

```
{Drive|Library}: 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
vtltape: version 0.16.13
vtltape: version 0.16.13
vtltape: version 0.16.13
vtltape: version 0.16.13
vtltape: version 0.16.13
vtltape: version 0.16.13
vtltape: version 0.16.13
vtllibrary: version 0.16.13
vtllibrary process PID is 17034
vtllibrary: version 0.16.13
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  900849L4  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
  Vendor: IBM      Model: ULT3580-TD4      Rev: 550V
  Type:   Sequential-Access                ANSI SCSI revision: 05
Host: scsi6 Channel: 00 Id: 02 Lun: 02
  Vendor: IBM      Model: ULT3580-TD4      Rev: 550V
  Type:   Sequential-Access                ANSI SCSI revision: 05
Host: scsi6 Channel: 00 Id: 03 Lun: 03
  Vendor: IBM      Model: ULT3580-TD4      Rev: 550V
  Type:   Sequential-Access                ANSI SCSI revision: 05
Host: scsi6 Channel: 00 Id: 04 Lun: 04
  Vendor: IBM      Model: ULT3580-TD4      Rev: 550V
  Type:   Sequential-Access                ANSI SCSI revision: 05
Host: scsi6 Channel: 01 Id: 01 Lun: 06
  Vendor: IBM      Model: ULT3580-TD4      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 | 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 pts/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
Desktop          install.log.syslog  mhvtl-0.16-13.i586.rpm  nw76sp1_linux_x86.tar.gz
[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 localinstall --nogpgcheck 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
Loaded plugins: fastestmirror
Setting up Local Package Process
Examining lgtoclnt-7.6.1-1.i686.rpm: lgtoclnt-7.6.1-1.i686
Marking lgtoclnt-7.6.1-1.i686.rpm to be installed
Loading mirror speeds from cached hostfile
 * addons: mirror.optus.net
 * base: mirror.optus.net
 * extras: mirror.optus.net
 * updates: mirror.optus.net
Examining lgtoman-7.6.1-1.i686.rpm: lgtoman-7.6.1-1.i686
Marking lgtoman-7.6.1-1.i686.rpm to be installed
Examining lgtonode-7.6.1-1.i686.rpm: lgtonode-7.6.1-1.i686
Marking lgtonode-7.6.1-1.i686.rpm to be installed
Examining lgtoserv-7.6.1-1.i686.rpm: lgtoserv-7.6.1-1.i686
Marking lgtoserv-7.6.1-1.i686.rpm to be installed
Examining lgtonmc-7.6.1-1.i686.rpm: lgtonmc-7.6.1-1.i686
Marking lgtonmc-7.6.1-1.i686.rpm to be installed
Resolving Dependencies
--> Running transaction check
---> Package lgtoclnt.i686 0:7.6.1-1 set to be updated
--> Processing Dependency: openmotif for package: lgtoclnt
--> Processing Dependency: libXp.so.6 for package: lgtoclnt
--> Processing Dependency: libstdc++.so.5 for package: lgtoclnt
--> Processing Dependency: libstdc++.so.5(CXXABI_1.2) for package: lgtoclnt
--> Processing Dependency: libstdc++.so.5(GLIBCPP_3.2) for package: lgtoclnt
--> Processing Dependency: libstdc++.so.5(GLIBCPP_3.2.2) for package: lgtoclnt
---> Package lgtoman.i686 0:7.6.1-1 set to be updated
---> Package lgtonmc.i686 0:7.6.1-1 set to be updated
---> Package lgtonode.i686 0:7.6.1-1 set to be updated
---> Package lgtoserv.i686 0:7.6.1-1 set to be updated
--> Running transaction check
---> Package compat-libstdc++-33.i386 0:3.2.3-61 set to be updated
---> Package libXp.i386 0:1.0.0-8.1.el5 set to be updated
---> Package openmotif.i386 0:2.3.1-2.el5_4.1 set 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

Dependencies Resolved

=================================================================================================
========================================
 Package                            Arch                Version
Repository                             Size
=================================================================================================
========================================
Installing:
 lgtoclnt                           i686                7.6.1-1
/lgtoclnt-7.6.1-1.i686                160 M
 lgtoman                            i686                7.6.1-1
/lgtoman-7.6.1-1.i686                 1.3 M
```

```
 lgtonmc                            i686                7.6.1-1
/lgtonmc-7.6.1-1.i686                 115 M
 lgtonode                           i686                7.6.1-1
/lgtonode-7.6.1-1.i686                 35 M
 lgtoserv                           i686                7.6.1-1
/lgtoserv-7.6.1-1.i686                 42 M
Installing for dependencies:
 compat-libstdc++-33                i386                3.2.3-61
base                                  232 k
 libXp                              i386                1.0.0-8.1.el5
base                                   23 k
 openmotif                          i386                2.3.1-2.el5_4.1
base                                  1.5 M

Transaction Summary
=================================================================================================
========================================
Install       8 Package(s)
Upgrade       0 Package(s)

Total size: 356 M
Total download size: 1.8 M
Is this ok [y/N]: y
Downloading Packages:
(1/3): libXp-1.0.0-8.1.el5.i386.rpm
|  23 kB     00:00
(2/3): compat-libstdc++-33-3.2.3-61.i386.rpm
| 232 kB     00:00
(3/3): openmotif-2.3.1-2.el5_4.1.i386.rpm
| 1.5 MB     00:04
-------------------------------------------------------------------------------------------------
----------------------------------------
Total
323 kB/s | 1.8 MB     00:05
Running rpm_check_debug
Running Transaction Test
Finished Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing     : compat-libstdc++-33
1/8
  Installing     : lgtoman
2/8
  Installing     : libXp
3/8
  Installing     : openmotif
4/8
  Installing     : lgtoclnt
[##############################################################################
] 5/8^  Installing     : lgtoclnt
5/8
Installing Home base agent........
EMC HomeBase Agent is not supported on the Red Hat version .
EMC HomeBase Agent is supported only on following platforms.
1) Red Hat Linux Version 4 or 5 on x86 and amd64
2) Solaris Version 8 or 9 on SPARC.
HomeBase Agent not installed
  Installing     : lgtonode
6/8
  Installing     : lgtoserv
7/8
  Installing     : lgtonmc
8/8

NOTE: To complete configuration execute the following script 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: searching all LUNs, which may take over 10 minutes per adapter
      for some fibre channel adapters.  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:IBM     ULT3580-TD4     550V|Tape, /dev/nst2
                                        S/N: XYZZY_A3
                                        ATNN=IBM     ULT3580-TD4     XYZZY_A3
                                        WWNN=10223344AB000300
scsidev@1.4.4:IBM     ULT3580-TD4     550V|Tape, /dev/nst3
                                        S/N: XYZZY_A4
                                        ATNN=IBM     ULT3580-TD4     XYZZY_A4
                                        WWNN=10223344AB000400
scsidev@2.0.5:SPECTRA PYTHON          550V|Autochanger (Jukebox), /dev/sg10
                                        S/N: XYZZY_B
                                        ATNN=SPECTRA PYTHON          XYZZY_B
                                        WWNN=30223344AB010000
scsidev@2.1.6:IBM     ULT3580-TD4     550V|Tape, /dev/nst4
                                        S/N: XYZZY_B1
                                        ATNN=IBM     ULT3580-TD4     XYZZY_B1
                                        WWNN=30223344AB010100
scsidev@2.2.7:IBM     ULT3580-TD4     550V|Tape, /dev/nst5
                                        S/N: XYZZY_B2
                                        ATNN=IBM     ULT3580-TD4     XYZZY_B2
                                        WWNN=30223344AB010200
scsidev@2.3.8:IBM     ULT3580-TD4     550V|Tape, /dev/nst6
                                        S/N: XYZZY_B3
                                        ATNN=IBM     ULT3580-TD4     XYZZY_B3
                                        WWNN=30223344AB010300
scsidev@2.4.9:IBM     ULT3580-TD4     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]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800842L4                        >
      Elem[004]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800843L4                        >
      Elem[005]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800844L4                        >
      Elem[006]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800845L4                        >
      Elem[007]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800846L4                        >
      Elem[008]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800847L4                        >
      Elem[009]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800848L4                        >
      Elem[010]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800849L4                        >
      Elem[011]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800850L4                        >
      Elem[012]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800851L4                        >
      Elem[013]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800852L4                        >
      Elem[014]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800853L4                        >
      Elem[015]: tag_val=1 pres_val=1 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
                  VolumeTag=<800857L4                        >
      Elem[019]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800858L4                        >
      Elem[020]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800859L4                        >
      Elem[021]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800860L4                        >
      Elem[022]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<800861L4                        >
Tag Data for 1.0.0, Element Type MEDIA TRANSPORT:
      Elem[001]: tag_val=0 pres_val=1 med_pres=0 med_side=0
Tag Data for 1.0.0, Element Type IMPORT/EXPORT:
      Elem[001]: tag_val=0 pres_val=1 inp_enab=1 exp_enab=1 access=1 full=0 imp_exp=1
      Elem[002]: tag_val=0 pres_val=1 inp_enab=1 exp_enab=1 access=1 full=0 imp_exp=1
      Elem[003]: tag_val=0 pres_val=1 inp_enab=1 exp_enab=1 access=1 full=0 imp_exp=1
      Elem[004]: tag_val=0 pres_val=1 inp_enab=1 exp_enab=1 access=1 full=0 imp_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[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 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 med_pres=1 med_side=0
                  VolumeTag=<900843L4                        >
      Elem[005]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900844L4                        >
      Elem[006]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900845L4                        >
      Elem[007]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900846L4                        >
      Elem[008]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900847L4                        >
      Elem[009]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900848L4                        >
      Elem[010]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900849L4                        >
      Elem[011]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900850L4                        >
      Elem[012]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900851L4                        >
      Elem[013]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900852L4                        >
      Elem[014]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900853L4                        >
      Elem[015]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900854L4                        >
      Elem[016]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900855L4                        >
      Elem[017]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900856L4                        >
      Elem[018]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900857L4                        >
      Elem[019]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900858L4                        >
      Elem[020]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900859L4                        >
      Elem[021]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900860L4                        >
      Elem[022]: tag_val=1 pres_val=1 med_pres=1 med_side=0
                  VolumeTag=<900861L4                        >
Tag Data for 2.0.5, Element Type MEDIA TRANSPORT:
      Elem[001]: tag_val=0 pres_val=1 med_pres=0 med_side=0
Tag Data for 2.0.5, Element Type IMPORT/EXPORT:
      Elem[001]: tag_val=0 pres_val=1 inp_enab=1 exp_enab=1 access=1 full=0 imp_exp=1
      Elem[002]: tag_val=0 pres_val=1 inp_enab=1 exp_enab=1 access=1 full=0 imp_exp=1
      Elem[003]: tag_val=0 pres_val=1 inp_enab=1 exp_enab=1 access=1 full=0 imp_exp=1
      Elem[004]: tag_val=0 pres_val=1 inp_enab=1 exp_enab=1 access=1 full=0 imp_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
```

```
  2) 3570                  26) 9840D                 50) SAIT-2
  3) 3590                  27) 9940                  51) SD3
  4) 3592                  28) 9940B                 52) sdlt
  5) 4890                  29) adv_file              53) sdlt320
  6) 4mm                   30) Atmos COS             54) sdlt600
  7) 4mm 12GB              31) Data Domain           55) SLR
  8) 4mm 20GB              32) dlt                   56) T10000
  9) 4mm 4GB               33) dlt vs160             57) T10000B
 10) 4mm 8GB               34) dlt-s4                58) tkz90
 11) 4mm DAT160            35) dlt-v4                59) travan10
 12) 4mm DAT72             36) dlt1                  60) TS1120
 13) 8mm                   37) dlt7000               61) TS1130
 14) 8mm 20GB              38) dlt8000               62) tz85
 15) 8mm 5GB               39) file                  63) tz86
 16) 8mm AIT               40) himt                  64) tz87
 17) 8mm AIT-2             41) logical               65) tz88
 18) 8mm AIT-3             42) LTO Ultrium           66) tz89
 19) 8mm AIT-4             43) LTO Ultrium-2         67) tz90
 20) 8mm AIT-5             44) LTO Ultrium-3         68) tzs20
 21) 8mm Mammoth-2         45) LTO Ultrium-4         69) VXA
 22) 9490                  46) LTO Ultrium-5         70) VXA-172
 23) 9840                  47) optical               71) VXA-2
 24) 9840b                 48) qic                   72) VXA-320

Enter the drive type of drive 1? 45
Are all the drives the same model? (yes / no) [yes] y


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]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.

What kind of Jukebox are you configuring? [1] 2
Installing 'Spectralogic' jukebox - scsidev@2.0.5.

What name do you want to assign to this jukebox device? VTL2
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/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:
  1) 3480                  25) 9840C                 49) SAIT-1
  2) 3570                  26) 9840D                 50) SAIT-2
  3) 3590                  27) 9940                  51) SD3
  4) 3592                  28) 9940B                 52) sdlt
  5) 4890                  29) adv_file              53) sdlt320
  6) 4mm                   30) Atmos COS             54) sdlt600
  7) 4mm 12GB              31) Data Domain           55) SLR
  8) 4mm 20GB              32) dlt                   56) T10000
  9) 4mm 4GB               33) dlt vs160             57) T10000B
 10) 4mm 8GB               34) dlt-s4                58) tkz90
 11) 4mm DAT160            35) dlt-v4                59) travan10
 12) 4mm DAT72             36) dlt1                  60) TS1120
 13) 8mm                   37) dlt7000               61) TS1130
 14) 8mm 20GB              38) dlt8000               62) tz85
 15) 8mm 5GB               39) file                  63) tz86
 16) 8mm AIT               40) himt                  64) tz87
 17) 8mm AIT-2             41) logical               65) tz88
 18) 8mm AIT-3             42) LTO Ultrium           66) tz89
 19) 8mm AIT-4             43) LTO Ultrium-2         67) tz90
 20) 8mm AIT-5             44) LTO Ultrium-3         68) tzs20
 21) 8mm Mammoth-2         45) LTO Ultrium-4         69) VXA
 22) 9490                  46) LTO Ultrium-5         70) VXA-172
 23) 9840                  47) optical               71) VXA-2
 24) 9840b                 48) qic                   72) VXA-320

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:

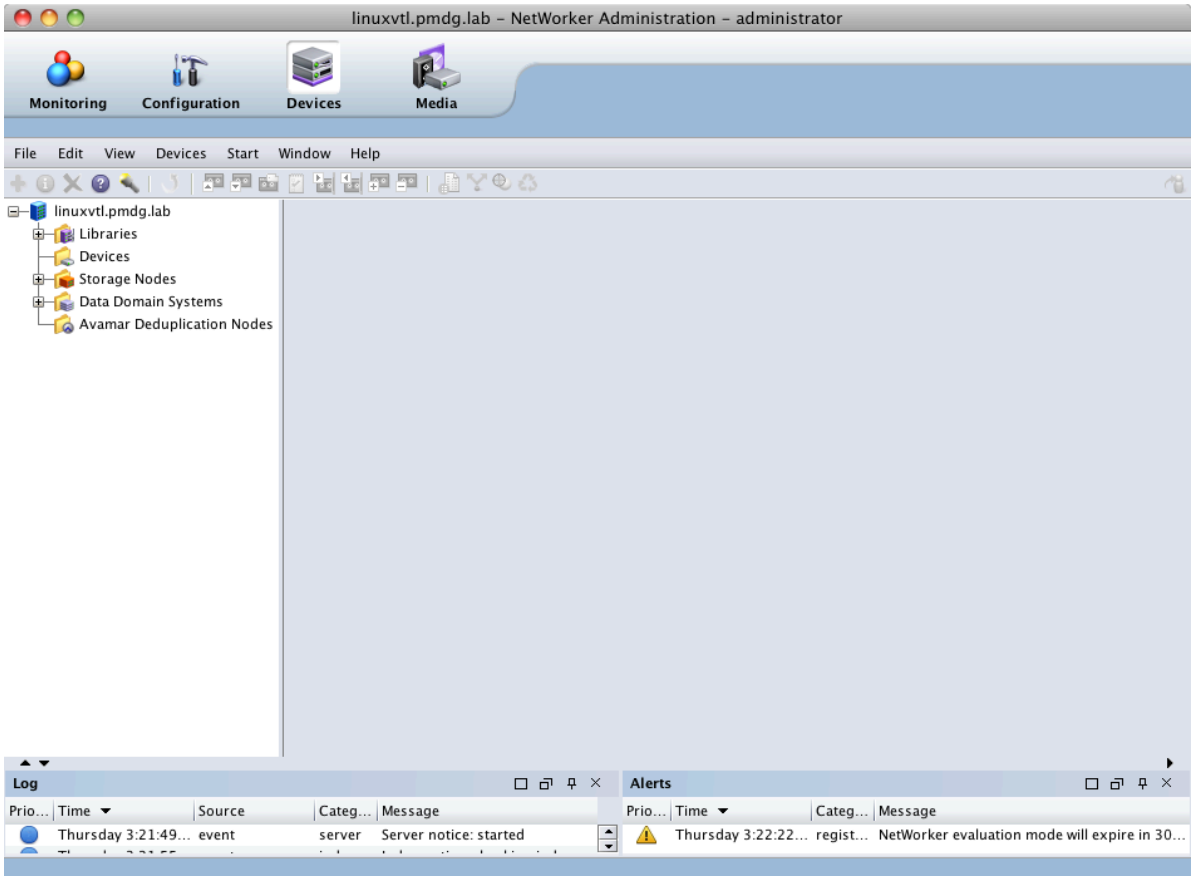

Figure 10: Devices configuration panel in NMC

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:

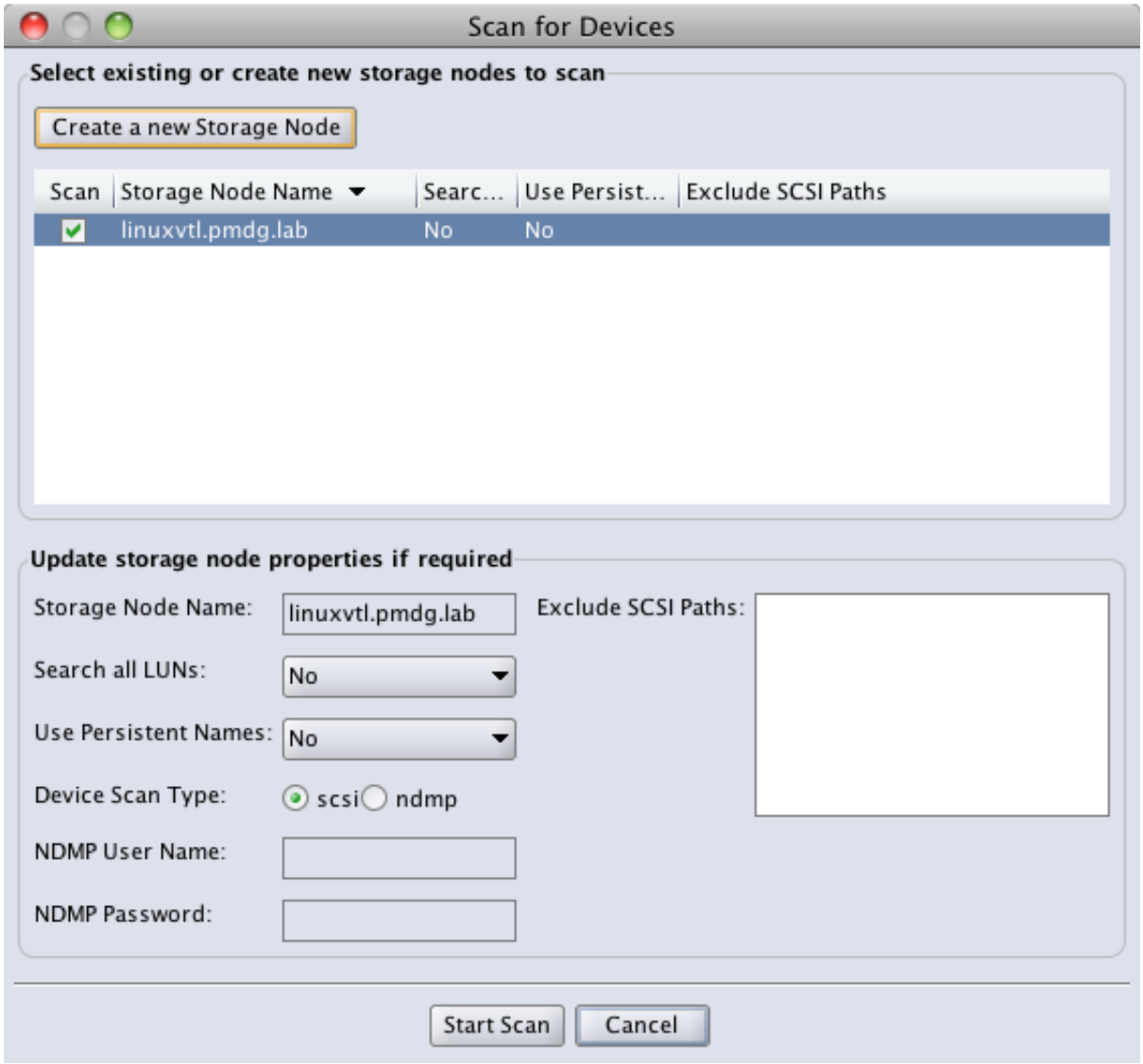

Figure 11: Scan for Devices Dialog

Click "Start Scan" to commence the scanning operation.

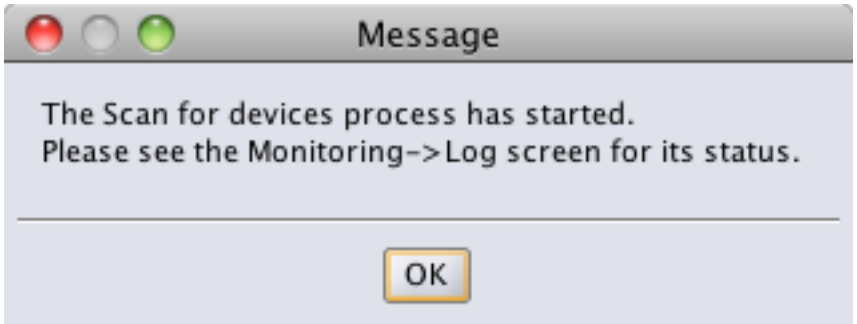

Figure 12: Monitoring prompt

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:

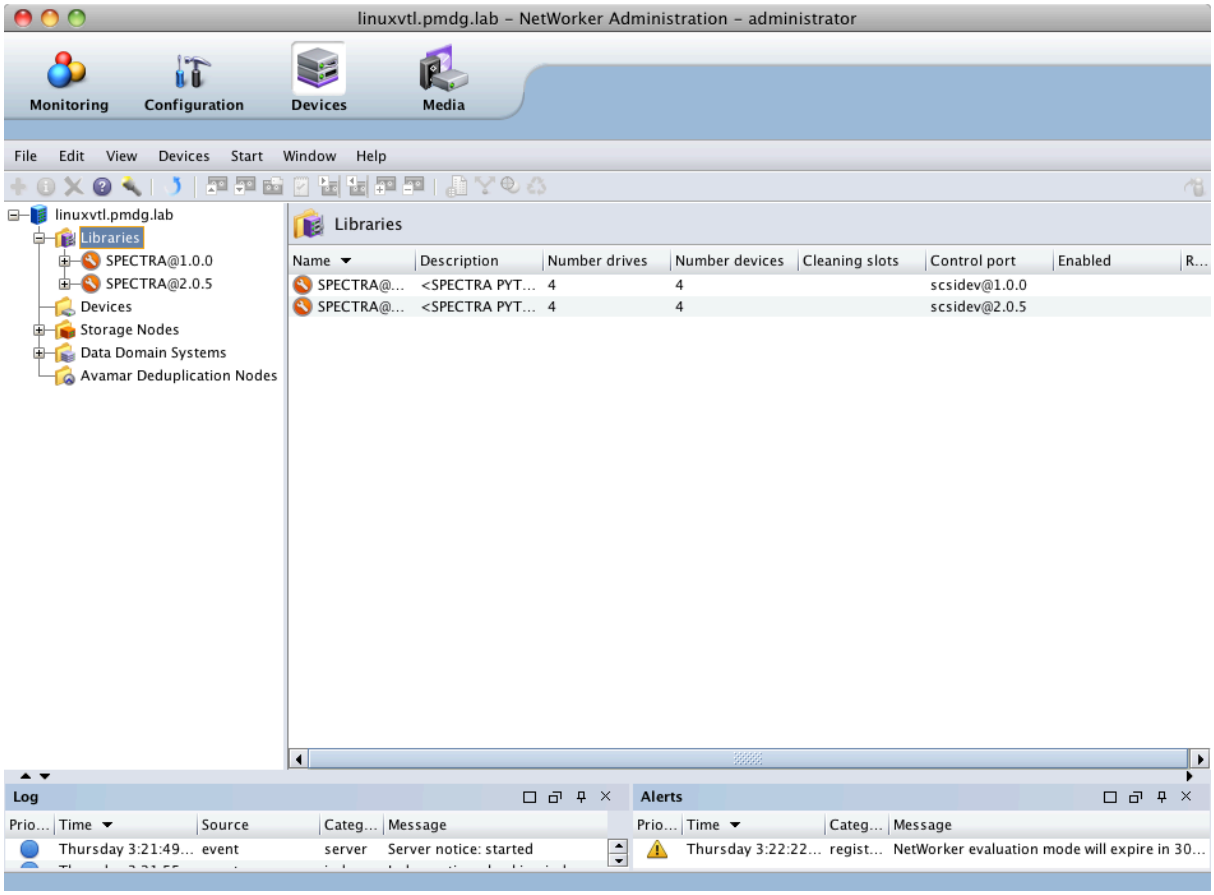

Figure 13: NMC detected libraries

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

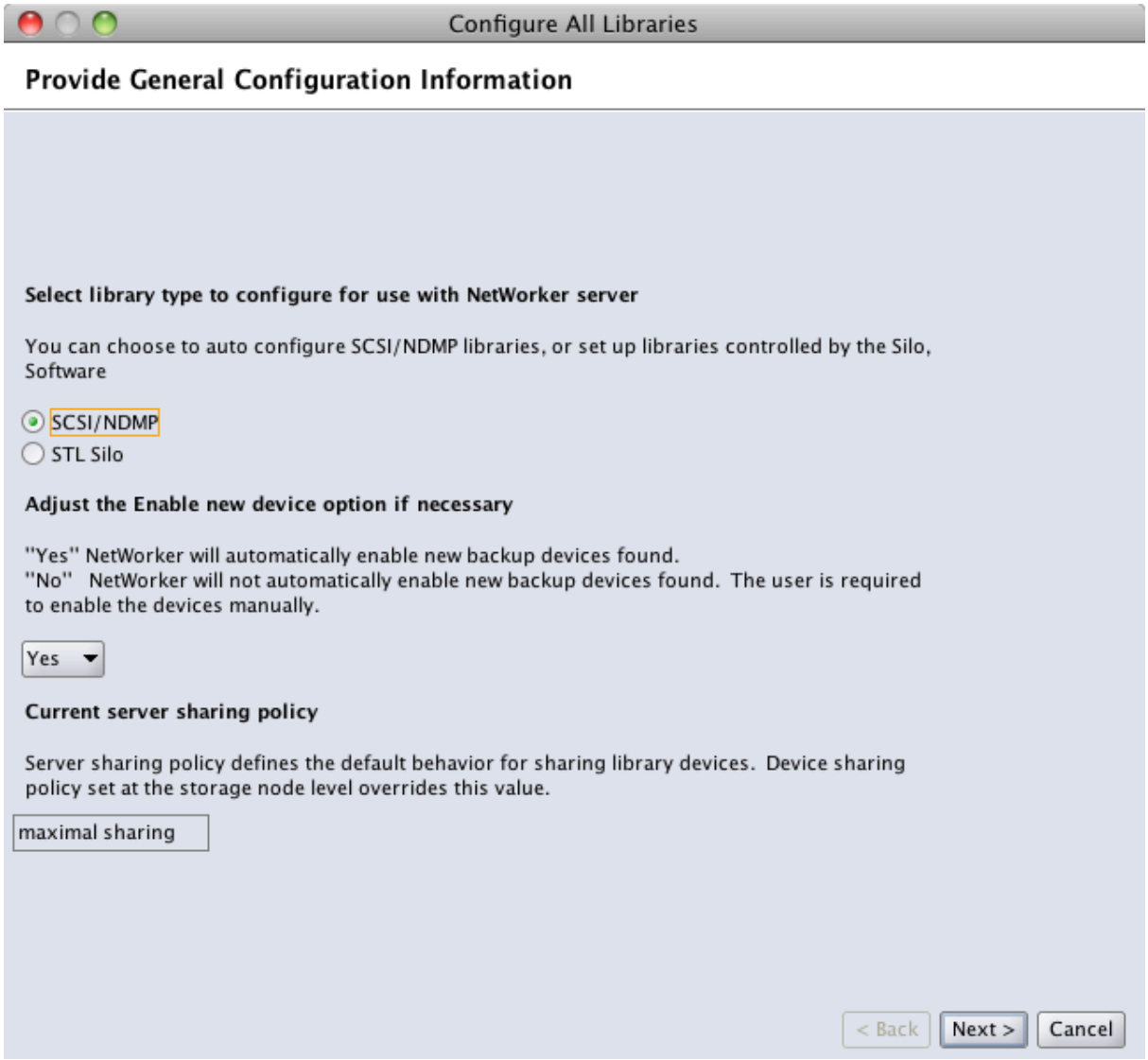

Figure 14: Configure All Libraries Wizard 1 of 3

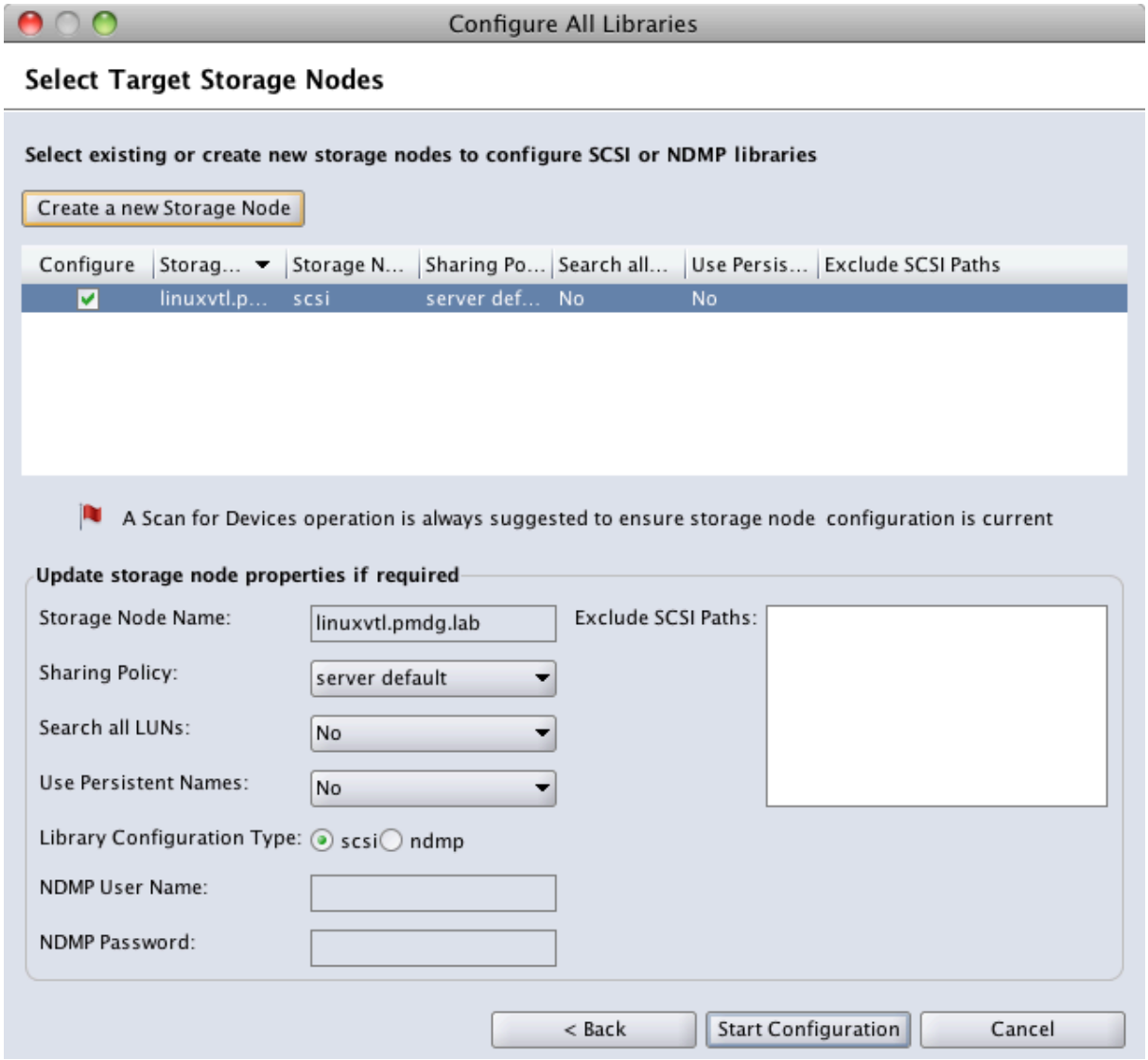

Figure 15: Configure All Libraries Wizard 2 of 3

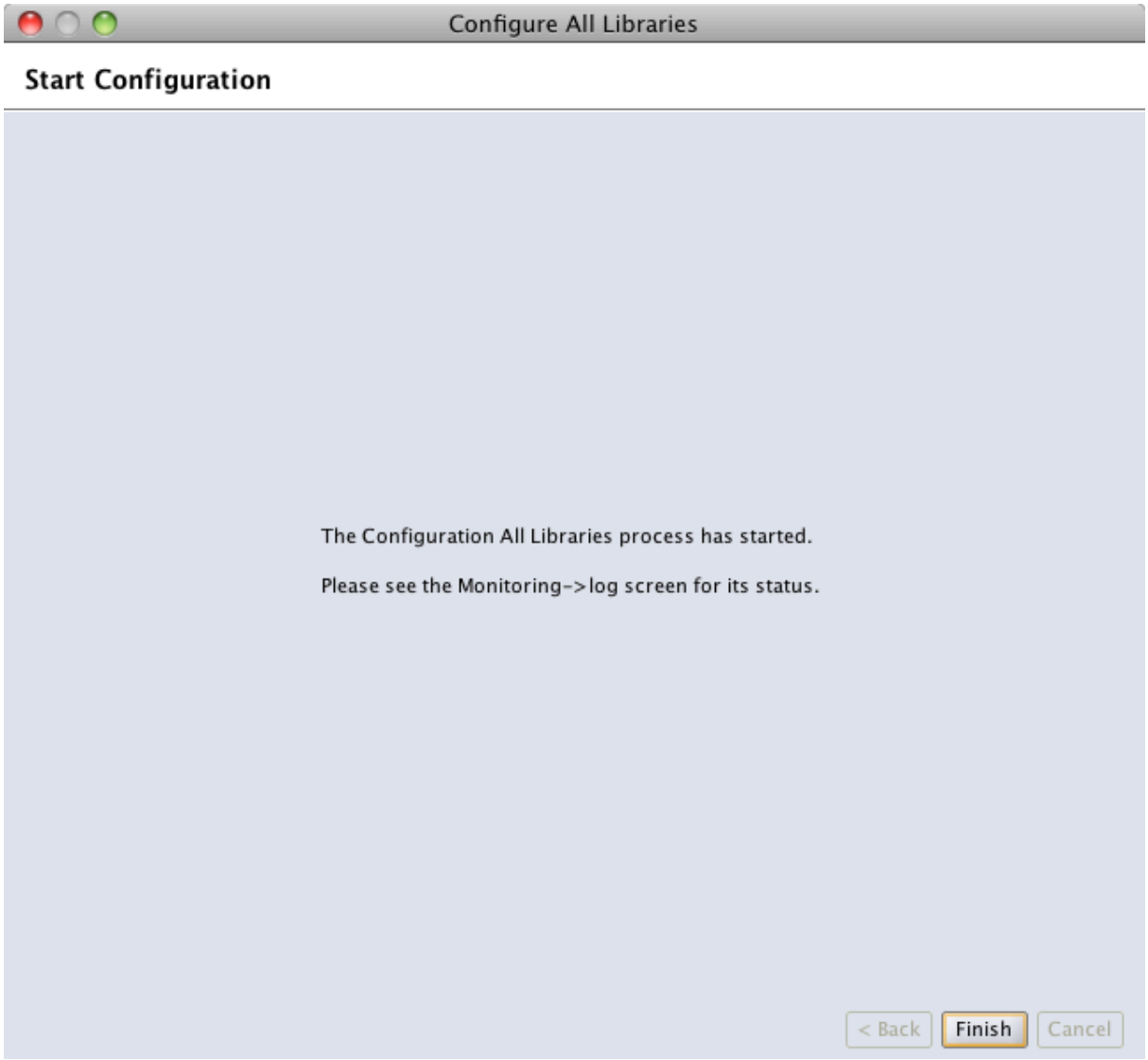

Figure 16: Configure All Libraries Wizard 3 of 3

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:

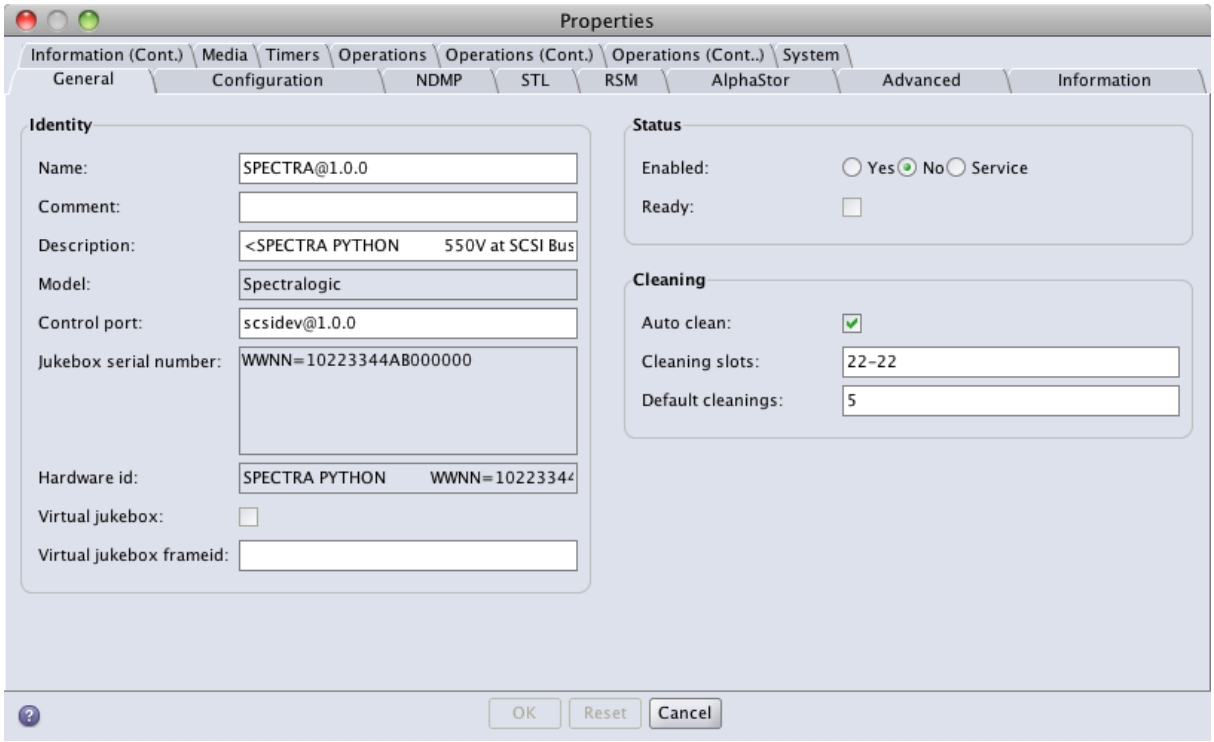

Figure 17: First pane of VTL configuration dialog

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:

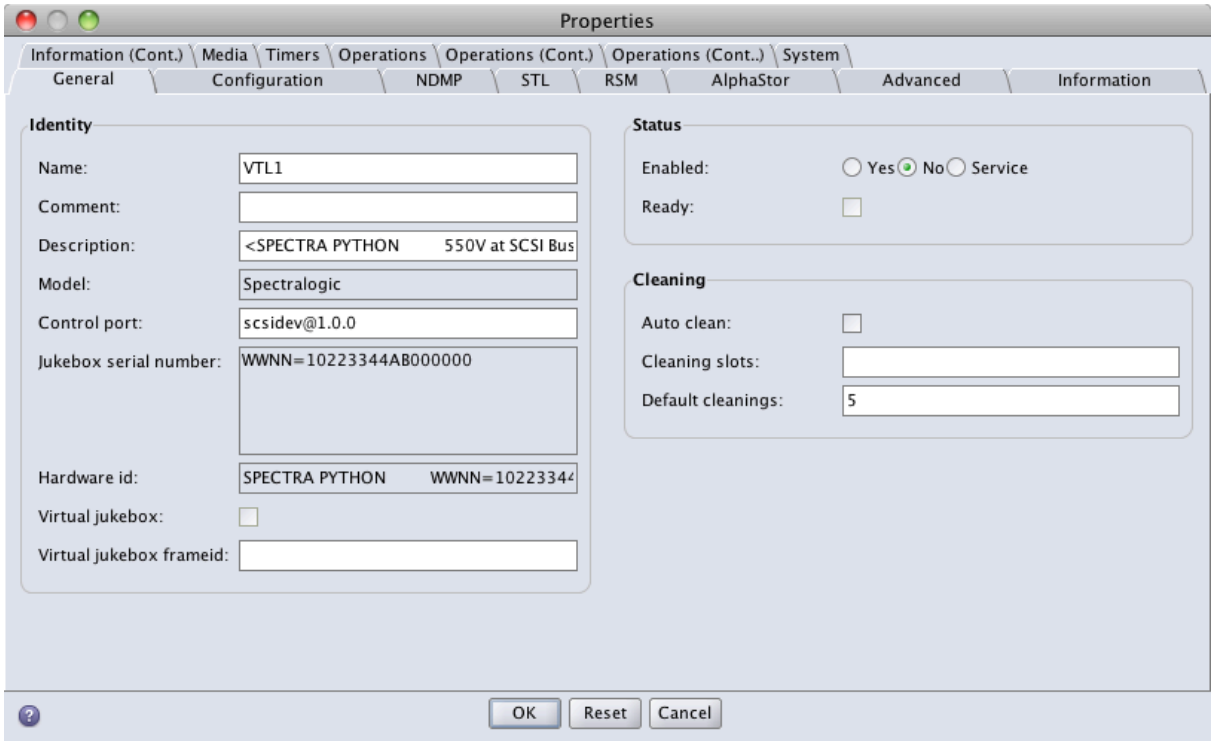

Figure 18: First pane of VTL configuration dialog with adjustments made

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

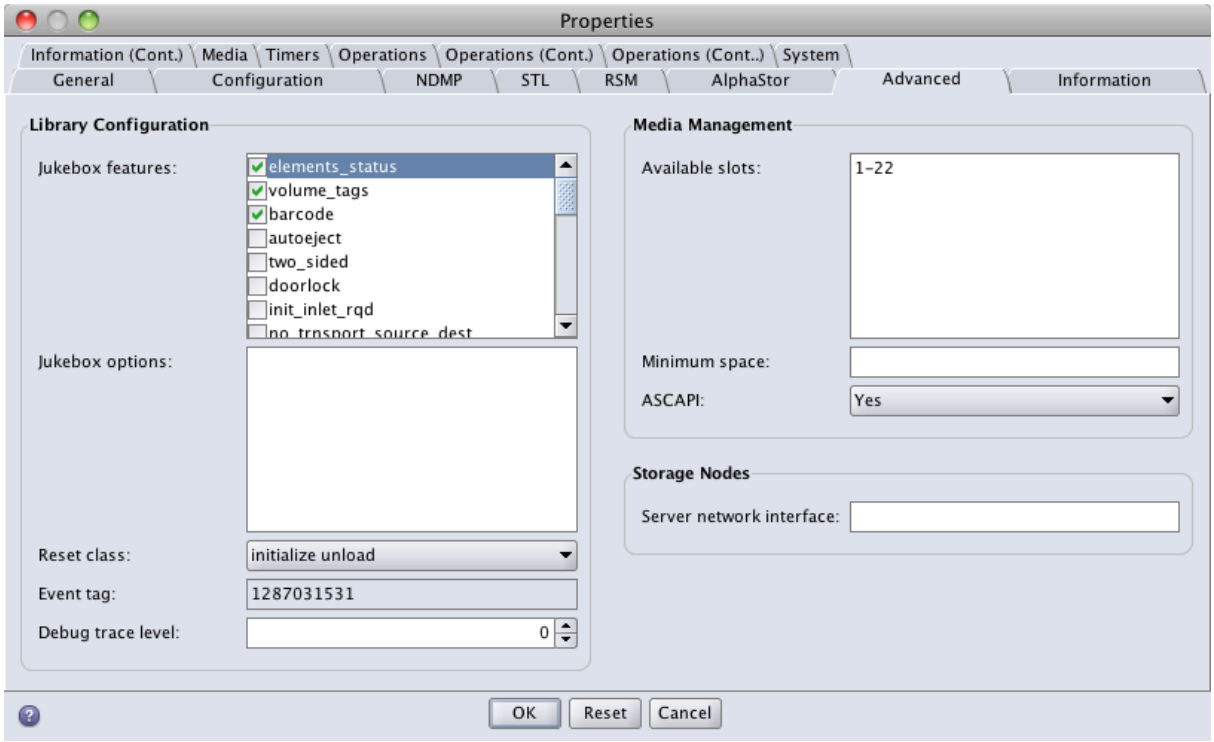

Figure 19: Advanced pane of VTL configuration dialog with adjustments made

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:

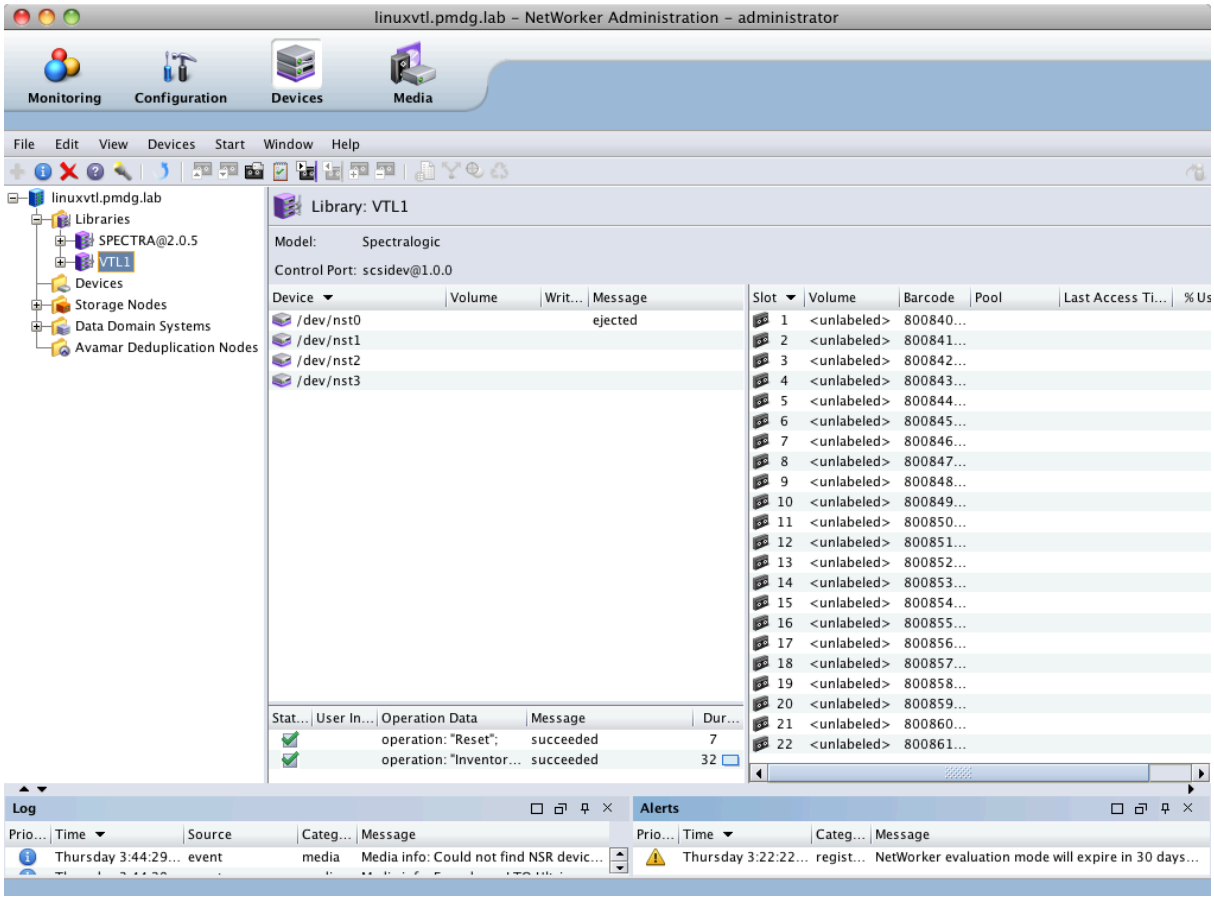

Figure 20: VTL operations panel after slot 22 inventory

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

The final configuration should resemble the following:

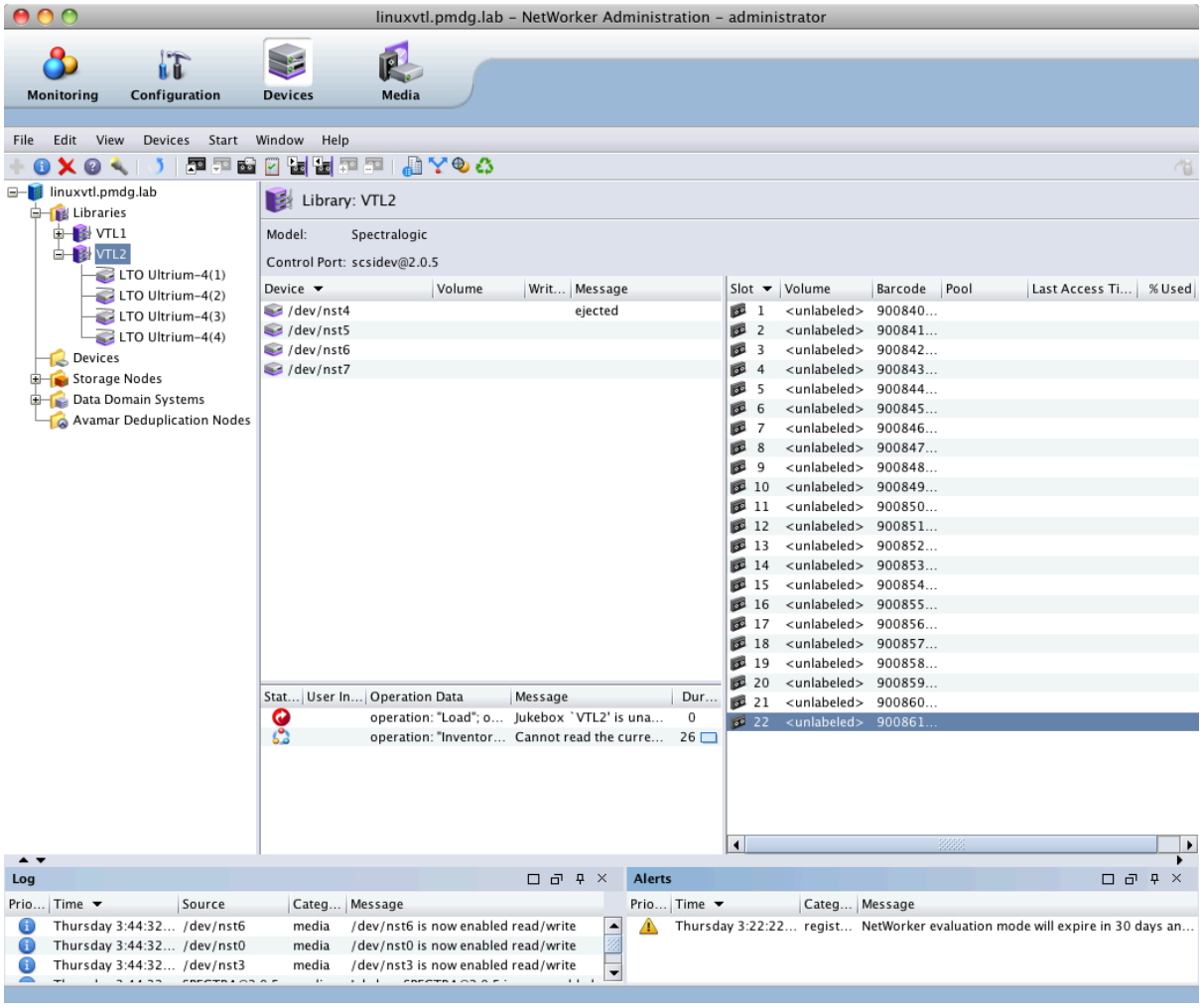

Figure 21: NMC showing both jukeboxes reconfigured

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:

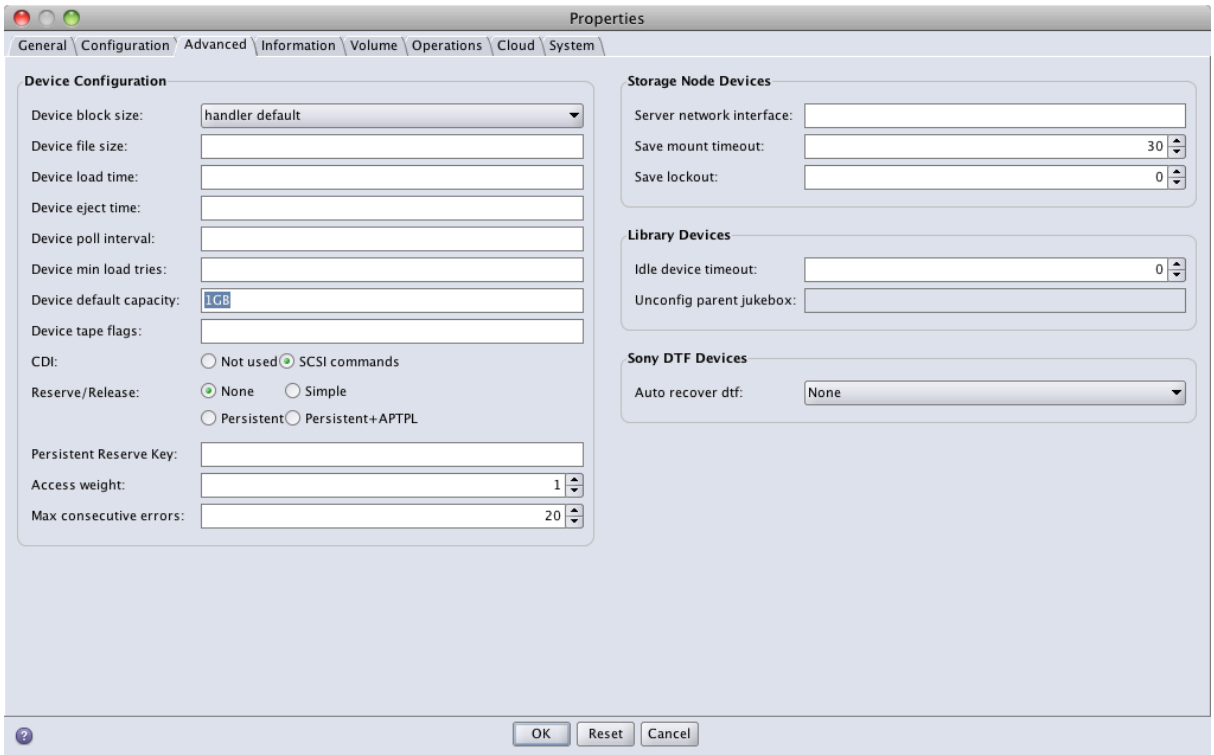

Figure 22: Adjusting the 'Device default capacity' setting

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: -*            800850L4  -
  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: 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: `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: 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: `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 Clone" -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'
Info: Operation `Eject' in progress 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/nst5'
Info: Operation `Eject' in progress on device `/dev/nst7'
Info: Operation `Eject' in progress on device `/dev/nst7'
Info: Operation `Eject' in progress on device `/dev/nst6'
Info: Operation `Eject' in progress 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 status: succeeded
[root@linuxvtl ~]# nsrjb -C -j VTL2

Jukebox VTL2: (Ready to accept commands)
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:

```
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


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


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 LTO Ultrium-4 tape 900861L4
 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' (80084
 Thu 04:37:58 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:

```
root@linuxvtl:~ — ssh — 80×40
Server: linuxvtl.pmdg.lab          Thu Oct 14 16:49:22 2010

 Up since: Thu Oct 14 15:21:49 2010 Version: NetWorker 7.6.1.Build.397 Eval
 Saves: 5 session(s), 2989 MB total  Recovers: 0 session(s)
Device            type          volume
 /dev/nst0    (J) LTO Ultrium-4 800840L4     reading, data
 /dev/nst1    (J) LTO Ultrium-4 (none)
 /dev/nst2    (J) LTO Ultrium-4 800841L4     writing, done
 /dev/nst3    (J) LTO Ultrium-4 (none)       ejected
 /dev/nst4    (J) LTO Ultrium-4 900842L4     writing at 6465 KB/s, 1059 MB
 /dev/nst5    (J) LTO Ultrium-4 (none)       ejected
 /dev/nst6    (J) LTO Ultrium-4 (none)       ejected
 /dev/nst7    (J) LTO Ultrium-4 (none)       ejected


Sessions:
 cloning session: 5 save set(s) reading from 800840L4 1060 MB of 2989 MB
 linuxvtl.pmdg.lab:cloning session saving to pool 'Default Clone' (900842L4)


Messages:
 Thu 04:43:48 PM index notice: nsrim has finished crosschecking the media db
 Thu 04:44:21 PM write completion notice: Writing to volume 800841L4 complete
 Thu 04:46:46 PM media waiting event: Waiting for 1 writable volume(s) to bac
 Thu 04:46:50 PM /dev/nst0 mounted LTO Ultrium-4 tape 800840L4 (write protect
 Thu 04:46:57 PM /dev/nst4 Verify label operation in progress
 Thu 04:47:00 PM /dev/nst4 verified label of 900842L4
 Thu 04:47:01 PM /dev/nst4 Mount operation in progress
 Thu 04:47:04 PM /dev/nst4 mounted LTO Ultrium-4 tape 900842L4
 Thu 04:47:04 PM media event cleared: Waiting for 1 writable volume(s) to bac
 Thu 04:47:04 PM linuxvtl.pmdg.lab:cloning session saving to pool 'Default Cl
 Thu 04:47:05 PM cloning session: 5 save set(s) reading from 800840L4 1912 KB

Pending:
 Thu 03:22:22 PM registration warning: NetWorker evaluation mode will expire
```

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/lgtoja-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
59997ba545582659e44a55ab983109df  /root/761/lgtoclnt-7.6.1-1.i686.rpm
9bae0c9de0a0aeb8e61b14c17ac5c77e  lgtofr-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
5879c47e049d699b4b800b49d68b1df8  LGTO_METAFILE.linuxx86
5879c47e049d699b4b800b49d68b1df8  /root/761/LGTO_METAFILE.linuxx86
d7b8e0b05da72d5de3c2200b3d6f88e7  lgtonmc-7.6.1-1.i686.rpm
d7b8e0b05da72d5de3c2200b3d6f88e7  /root/761/lgtonmc-7.6.1-1.i686.rpm
0167ce4babb898adfc3367cac0a9326b  lgtonode-7.6.1-1.i686.rpm
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.