/bin/rm -rf *

The power of the Linux command line is awesome; but just use '`/bin/rm -rf *`' once too many times, at the wrong time, or in the wrong directory, and you'll soon start being obsessed with making backups.

What Directories Should You Back Up ?

Generally, these directories: `/home` – all your data and applications; `/etc` – all your configuration files; `/boot` – a copy of your boot stanzas; `/var/log` – your log files; `/usr/local/bin` – any of your own installed programs.

Data Tends to Double Regularly ...

at 64 MB I first used floppy discs, but after a while I had a box of about one hundred floppies, and I just lost the ability to keep track of them.

at 256 MB Then I put backups onto 1GB USB sticks, but soon found that they can fail completely at any time.

at 4096 MB Next came CDs, but eventually I had about 5GB to back up, which took about seven CDs, each taking about 30 minutes to prepare and write.

at 16384 MB I turned to DVDs, and gradually got up to 18GB from my half-dozen computers. This began to take 5 DVDs along with all the time apportioning the files and loading the DVDs.

at 32768 MB I got desperate. Eventually, I gave in, and began searching the internet for information about that venerable Unix medium: magnetic tape.

Unix has a long tradition of backup to magnetic tape, and the command structure, *via* the `SCSI` command set, is very mature. Unix and Linux both provide the command `mt`. I had never used tapes before, so I took an absolute *punt* when I came across an IDE-interface magnetic tape drive. I knew that Linux invoked its `ide-scsi` module for CDs, which works fine, so I assumed that would happen for this tape drive. (It did!)

What Method to Use for BackUp?

It is important to...	*... and thus*
simply just perform the backup	the method should be simple
have enough storage	the method should allow for future capacity
get the backup off-site	it should be easily transported
make data last a long time	the media should be reliable

What Media to Use for BackUp?

	Media	*features*
1	floppy discs	far too small for whole system backup
2	USB sticks	far too unreliable for data retention long-term
3	hard drives	difficult to remove from home for transport
4	DVDs	onerous to write a number at a time
5	magnetic tape	the preferred media: simple, small, long-term

Which Magnetic Tape Drives are Available?

You'll be hard-pressed to find these drives in the normal computer press, because they are not run-of-the-mill consumer items. In addition, they are usually quite complicated to get working in windoze, so most comsumers avoid them. The IDE drive is now declared *end-of-life*, but is still listed in stock at:

`http://www.techflare.com.au/sales/Tape_Drives/External/474/Certance_20GB_TR5_Drive/`

Here is the cheapest place you can get the SATA drive over the internet in Australia:

`http://www.alphastore.com.au/catalogue/details.jsp?productID=463461`

This table shows some of the cheaper drives and tapes – note that ordinary users do not have SCSI.

Drive Make	Interface	Drive Cost	Tape Type	Capacity	Tape Cost
Quantum	IDE	$ 476	Travan 40	20 Gb	$ 54
Quantum	SATA	$ 746	DAT 72	36 Gb	$ 19
Sony	SCSI	$ 1049	AIT 4	40GB	$ 48

After Installation, What Do You Look for in the System Logs?

```
# /bin/ls -l /dev/st0 /dev/nst0   #### check that character devices were created
crw-rw----  1 root tape 9, 0 2005-02-26 17:08 /dev/st0
crw-rw----  1 root tape 9, 128 2005-02-26 17:08 /dev/nst0


# dmesg       ######### Quantum Travan40 IDE appears in the bootup sequence?
Linux version 2.4.27-2-386 (Debian 1:3.3.5-13))
hdd: Seagate STT3401A, ATAPI TAPE drive
scsi0 : SCSI host adapter emulation for IDE ATAPI devices
  Vendor: Seagate   Model: STT3401A          Rev: 310C
  Type:   Sequential-Access                  ANSI SCSI revision: 02


# dmesg       ######### Quantum DAT72 SATA appears in the bootup sequence?
Linux version 2.6.26-1-686 (Debian 2.6.26-5)
SCSI subsystem initialized
libata version 3.00 loaded.
ata1: SATA max UDMA/133 cmd 0xd080 ctl 0xd000 bmdma 0xc800 irq 19
ata1.01: ATAPI: QUANTUM DAT    DAT72-000, VC07A000, max UDMA/133
scsi 0:0:1:0: Sequential-Access QUANTUM  DAT    DAT72-000 C07A PQ: 0 ANSI: 3
sda:<6>osst :I: Tape driver with OnStream support version 0.99.4
st: Version 20080224, fixed bufsize 32768, s/g segs 256
st 0:0:1:0: Attached scsi tape st0


# lsmod       ######### Quantum DAT72 SATA: were the necessary modules loaded?
st                  30748  0
scsi_mod           129356  7 sg,usb_storage,st,sr_mod,osst,sd_mod,libata


# lsmod       ######### Quantum Travan40 IDE: were the necessary modules loaded?
ide-scsi             8272  0
scsi_mod            86052  1 [ide-scsi]
```

And for Backup, Here are the Commands You Can Use

After you have physically installed the tape drive, open a command terminal, become root (su root) and note the difference between use of the rewinding tape device '/dev/st0' and the non-rewinding tape device '/dev/nst0' below. Note that there are many ways to script this backup process; shown here is the quick-and-dirty simplest.

```
  [check the tape status to see if it's recognised (use 'man mt' for help on SCSI commands)]
# mt -f /dev/nst0 status
drive type=114  drive status=1191182848  file number=0  block number=0


  [backup all your data, assuming that we shall backup everything discussed above]
  [(note the block-size conversions when piped through 'dd' to increase the writing speed)]
  [on a Celeron 466MHz with the IDE drive, to backup 18GB takes about three and a half hours]
  [on a Pentium Duo 2GHz with the SATA drive, to backup 23GB takes about 90 minutes]
# tar cf - /boot /etc /home /var/log /usr/local/bin | dd ibs=5k cbs=560k obs=14k of=/dev/nst0


  [when done, eject the tape and write-protect it]
# mt -f /dev/st0 rewoffl
```