

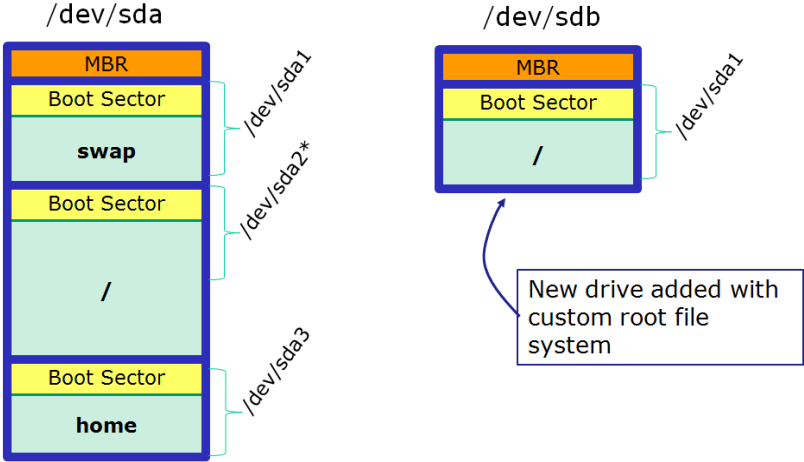
Create root file system on 2nd drive (112)

The OpenSUSE VM created in a previous Howto is expanded by adding a second hard drive. A small root file system is added to this new drive. The GRUB configuration is modified to boot using the original kernel and boot files on the first drive. It then roots to the new file system on the second drive. This root file system only has one binary which is the bash shell. The only commands available are the shell built-in commands.

Requirements:

- A previously created OpenSUSE VM
<http://simms-teach.com/howtos/110-openSUSE-11-install.pdf>
- VMWare Server 1.05 or higher
<http://www.vmware.com/products/server/>

Desired Configuration:



```

title openSUSE 11.0 - 2.6.25.5-1.1
root (hd0,1)
kernel /boot/vmlinuz-2.6.25.5-1.1-pae root=/dev/sda2 resume=/dev/sda1 splash=silent showopts vga=0x317
initrd /boot/initrd-2.6.25.5-1.1-pae

title My Linux root to 2nd drive
root (hd0,1)
kernel /boot/vmlinuz-2.6.25.5-1.1-pae ro root=/dev/sdb1
initrd /boot/initrd-2.6.25.5-1.1-pae
    
```

Step 1 - Initial state of VM:

Note: This is how they made the red prompt:

```
PS1=$'\[\[\E[1m\E[31m\]\]\h:\w # \[\E(B\E[m\]\]
```

```
opensuse11:~ # fdisk -l
```

```
Disk /dev/sda: 5368 MB, 5368709120 bytes
255 heads, 63 sectors/track, 652 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Disk identifier: 0x0002de72
```

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1		1	66	530113+	82	Linux swap / Solaris
/dev/sda2	*	98	652	4458037+	83	Linux
/dev/sda3		67	97	249007+	83	Linux

Partition table entries are not in disk order

```
opensuse11:~ #
```

Note that sda3 is listed after sda2. This is because we created it in the space freed up by shrinking the swap partition.

```
opensuse11:~ # mount
/dev/sda2 on / type ext3 (rw,acl,user_xattr)
proc on /proc type proc (rw)
sysfs on /sys type sysfs (rw)
debugfs on /sys/kernel/debug type debugfs (rw)
udev on /dev type tmpfs (rw)
devpts on /dev/pts type devpts (rw,mode=0620,gid=5)
/dev/sda3 on /home type ext3 (rw,acl,user_xattr)
securityfs on /sys/kernel/security type securityfs (rw)
fusectl on /sys/fs/fuse/connections type fusectl (rw)
none on /proc/sys/fs/binfmt_misc type binfmt_misc (rw)
none on /proc/fs/vmblock/mountPoint type vmblock (rw)
opensuse11:~ #
```

Note: We have swap space in sda1, / on sda2 and /home on sda3

```
opensuse11:~ # more /boot/grub/menu.lst
# Modified by YaST2. Last modification on Sat Aug  9 20:47:49 UTC 2008
default 0
timeout 8
##YaST - generic_mbr
gfxmenu (hd0,1)/boot/message
##YaST - activate

###Don't change this comment - YaST2 identifier: Original name: linux###
title openSUSE 11.0 - 2.6.25.5-1.1
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.25.5-1.1-pae root=/dev/sda2 resume=/dev/sda1
splash
=silent showopts vga=0x317
```

```

initrd /boot/initrd-2.6.25.5-1.1-pae

###Don't change this comment - YaST2 identifier: Original name: failsafe###
title Failsafe -- openSUSE 11.0 - 2.6.25.5-1.1
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.25.5-1.1-pae root=/dev/sda2 showopts ide=nodma
apm=
off acpi=off noresume nosmp noapic maxcpus=0 edd=off x11failsafe vga=0x317
    initrd /boot/initrd-2.6.25.5-1.1-pae

###Don't change this comment - YaST2 identifier: Original name: floppy###
title Floppy
    rootnoverify (hd0,1)
    chainloader (fd0)+1
opensuse11:~ #

```

Note: openSUSE's grub.conf file is menu.lst rather than grub.conf. This is like Ubuntu 8.04.

```

opensuse11:~ # xxd /dev/sda | more
00000000: 31c0 8ed0 bc00 7c8e c08e d8bf 1e06 be1e 1.....|.....
00000100: 7c50 57b9 e201 f3a4 b900 02f3 abcb 80fa |PW.....
00000200: 8f7e 02b2 8052 52bb 9407 8daf 2a00 8a46 .~...RR.....*..F
00000300: 0466 8b7e 0866 033e b306 84c0 740b 807e .f.~.f.>....t..~
00000400: 0080 7505 6689 3e84 0b83 c510 83c3 0980 ..u.f.>.....
00000500: fbb8 75da b8e1 00c1 e002 89c6 668b ac00 ..u.....f...
00000600: 0866 85ed 7519 b8c5 06be bb06 e8a5 0089 .f..u.....
00000700: c6e8 9a00 5a31 c0cd 13cd 18fb f4eb fc66 ....Z1.....f
00000800: 892e b306 beab 06b4 425a 52cd 13b8 d906 .....BZR.....
00000900: 72d7 a000 7c84 c074 03a1 fe7d 3d55 aab8 r...|.t...}=U..
00000a00: e906 75c5 6689 ee5a e955 7510 0001 0000 ..u.f..Z.Uu....
00000b00: 7c00 0000 0000 0000 0000 0045 7272 6f72 |.....Error
00000c00: 2000 0d0a 004e 6f20 6163 7469 7665 2070 ....No active p
00000d00: 6172 7469 7469 6f6e 0044 6973 6b20 7265 artition.Disk re
00000e00: 6164 2065 7272 6f72 004e 6f20 6f70 6572 ad error.No oper
00000f00: 6174 696e 6720 7379 7374 656d 0049 6e76 ating system.Inv
00001000: 616c 6964 2043 4853 2072 6561 6400 e803 alid CHS read...
00001100: 00be c206 60ac b40e bb01 00cd 10ac 84c0 ....`.....
00001200: 75f4 61c3 0000 0000 0000 0000 0000 0000 u.a.....
00001300: 0000 0000 0000 0000 0000 0000 0000 0000 .....
00001400: 0000 0000 0000 0000 0000 0000 0000 0000 .....
00001500: 0000 0000 0000 0000 0000 0000 0000 0000 .....
00001600: 0000 0000 0000 0000 0000 0000 0000 0000 .....
00001700: 0000 0000 0000 0000 0000 0000 0000 0000 .....
00001800: 0000 0000 0000 0000 0000 0000 0000 0000 .....
00001900: 1c80 b600 0000 0000 0000 0000 0000 0000 .....
00001a00: 0000 0000 0000 0000 0000 0000 0000 0000 .....
00001b00: 0000 0000 0000 0000 0000 72de 0200 0000 .....r.....
00001c00: 0100 82fe 3f41 3f00 0000 832d 1000 8000 ....?A?.....-....
00001d00: 0161 83fe bf8b 21c7 1700 6b0c 8800 0000 .a....!...k.....
00001e00: 0142 83fe 3f60 c22d 1000 5f99 0700 0000 .B..?`.~.._.....
00001f00: 0000 0000 0000 0000 0000 0000 0000 55aa .....U.
00002000: 0000 0000 0000 0000 0000 0000 0000 0000 .....
opensuse11:~ #

```

Note: MBR has conventional boot code in it.

```

opensuse11:~ # xxd /dev/sda2 | more

```

```

00000000: eb48 9000 0000 0000 0000 0000 0000 0000 0000 .H.....
00000010: 0000 0000 0000 0000 0000 0000 0000 0000 0000 .....
00000020: 0000 0000 0000 0000 0000 0000 0000 0000 0000 .....
00000030: 0000 0000 0000 0000 0000 0000 0000 0000 0302 .....
00000040: ff00 0080 b9c7 5900 0008 fa90 90f6 c280 .....Y.....
00000050: 7502 b280 ea59 7c00 0031 c08e d88e d0bc u....Y|.1.....
00000060: 0020 fba0 407c 3cff 7402 88c2 52be 817d . .@|<.t...R..}
00000070: e836 01f6 c280 7456 b441 bbaa 55cd 135a .6....tV.A..U..Z
00000080: 5272 4b81 fb55 aa75 45a0 417c 84c0 783e RrK..U.uE.A|..x>
00000090: 7505 83e1 0174 3766 8b4c 10be 057c c644 u....t7f.L...|.D
000000a0: ff01 668b 1e44 7cc7 0410 00c7 4402 0100 ..f..D|....D...
000000b0: 6689 5c08 c744 0600 7066 31c0 8944 0466 f.\..D..pf1..D.f
000000c0: 8944 0cb4 42cd 1372 05bb 0070 eb7d b408 .D..B..r...p.}..
000000d0: cd13 730a f6c2 800f 84e8 00e9 8d00 be05 ..s.....
000000e0: 7cc6 44ff 0066 31c0 88f0 4066 8944 0431 |.D..f1...@f.D.1
000000f0: d288 cac1 e202 88e8 88f4 4089 4408 31c0 .....@.D.1.
0000100: 88d0 c0e8 0266 8904 66a1 447c 6631 d266 .....f..f.D|f1.f
0000110: f734 8854 0a66 31d2 66f7 7404 8854 0b89 .4.T.f1.f.t..T..
0000120: 440c 3b44 087d 3c8a 540d c0e2 068a 4c0a D.;D.}<.T.....L.
0000130: fec1 08d1 8a6c 0c5a 8a74 0bbb 0070 8ec3 .....l.Z.t...p..
0000140: 31db b801 02cd 1372 2a8c c38e 0648 7c60 l.....r*....H|`
0000150: 1eb9 0001 8edb 31f6 31ff fcf3 a51f 61ff .....l.l.....a.
0000160: 2642 7cbe 877d e840 00eb 0ebe 8c7d e838 &B|..}.@.....}.8
0000170: 00eb 06be 967d e830 00be 9b7d e82a 00eb .....}.0...}.*...
0000180: fe47 5255 4220 0047 656f 6d00 4861 7264 .GRUB .Geom.Hard
0000190: 2044 6973 6b00 5265 6164 0020 4572 726f Disk.Read. Erro
00001a0: 7200 bb01 00b4 0ecd 10ac 3c00 75f4 c300 r.....<.u...
00001b0: 0000 0000 0000 0000 0000 0000 0000 0000 .....
00001c0: 0000 0000 0000 0000 0000 0000 0000 0000 .....
00001d0: 0000 0000 0000 0000 0000 0000 0000 0000 .....
00001e0: 0000 0000 0000 0000 0000 0000 0000 0000 .....
00001f0: 0000 0000 0000 0000 0000 0000 0000 55aa .....U.
0000200: 0000 0000 0000 0000 0000 0000 0000 0000 .....

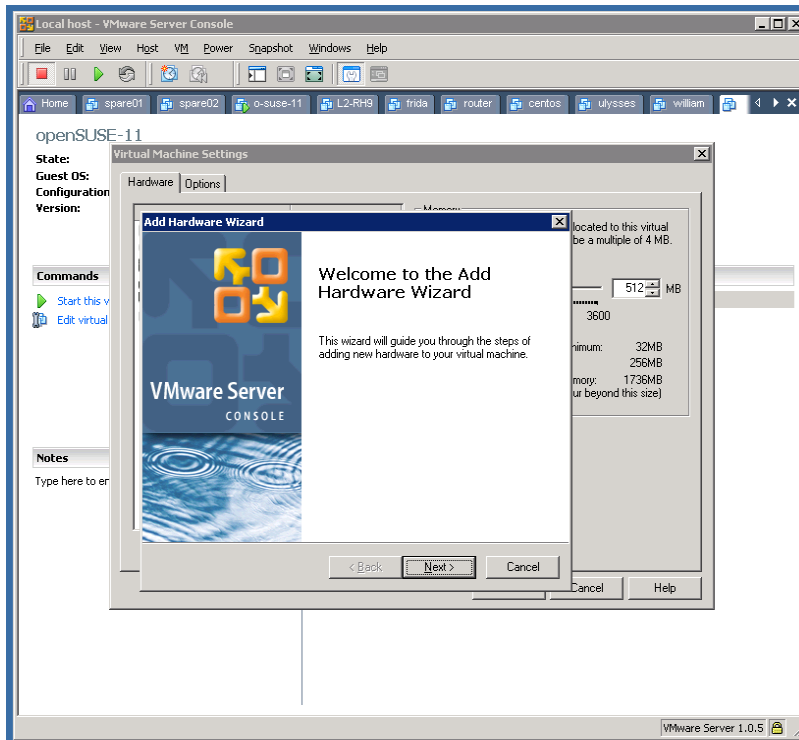
```

```
opensuse11:~ #
```

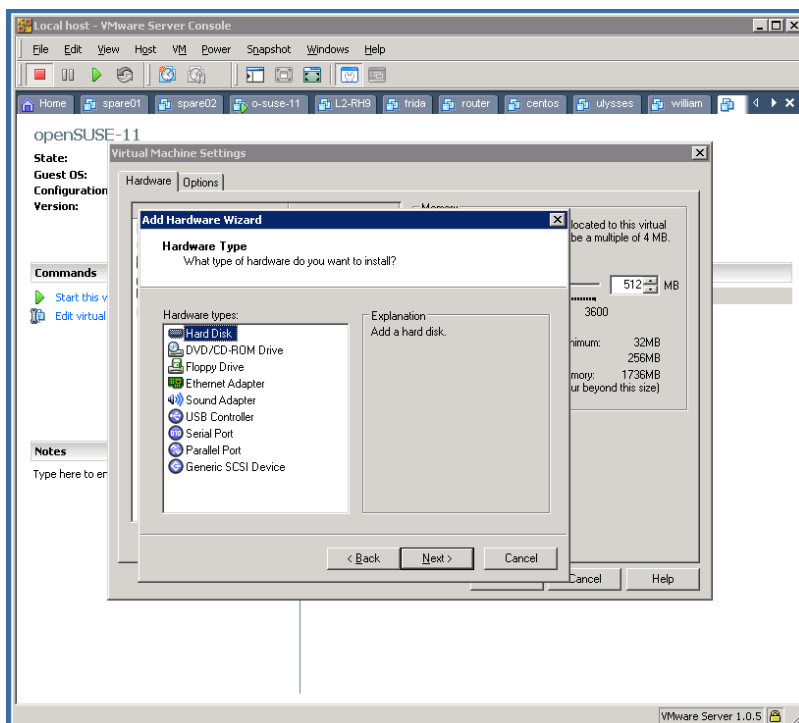
Note: Grub stage1 is in the /dev/sda2 boot sector

Step 2 – Add a 2nd drive to your OpenSUSE VM

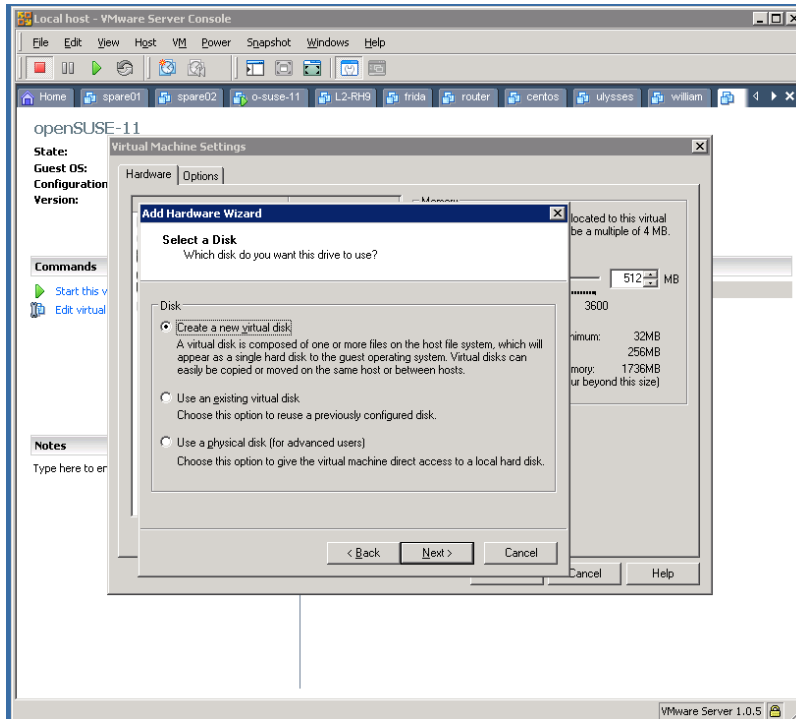
- Edit virtual machine settings
- Click Add...



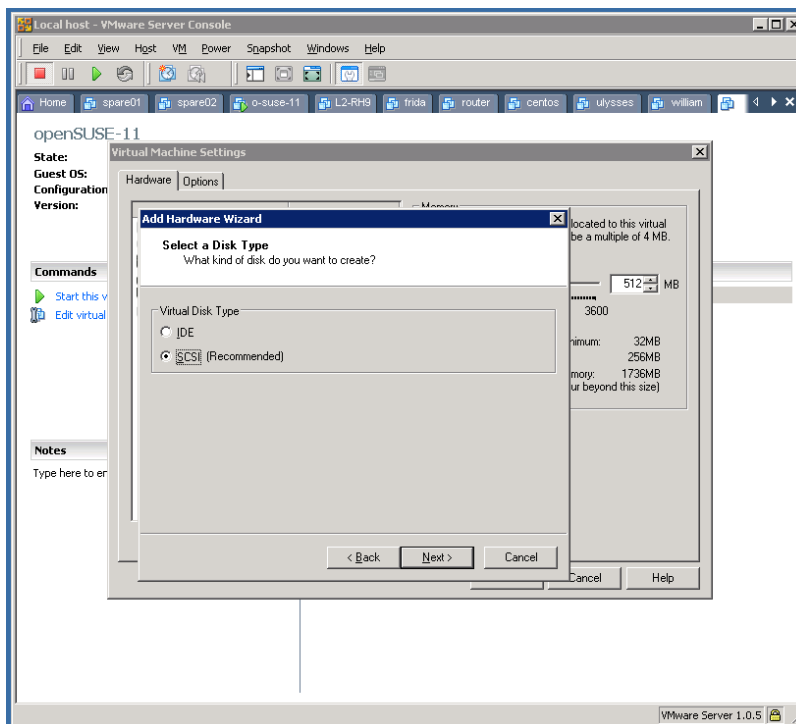
- Next >



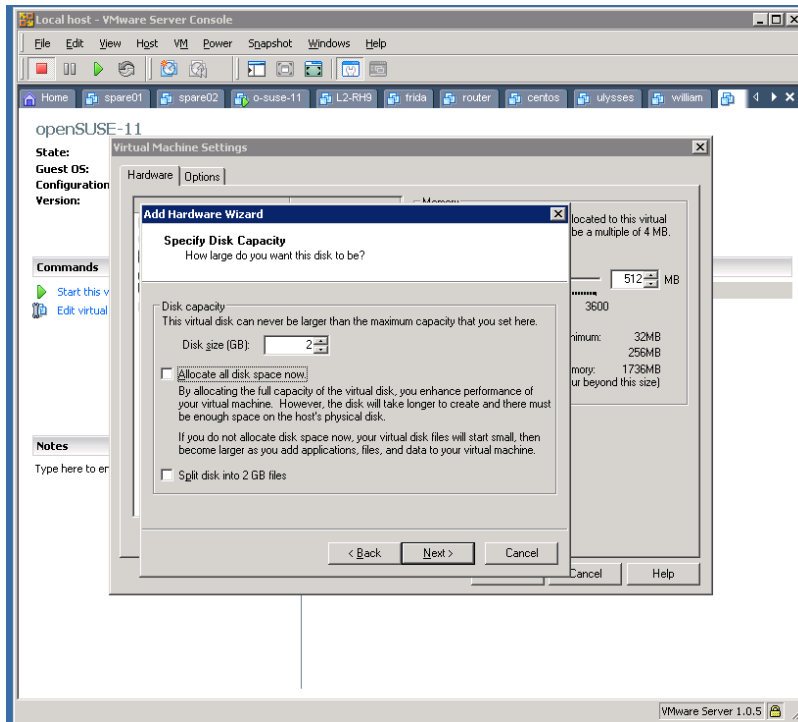
- Select Hard Drive
- Click Next >



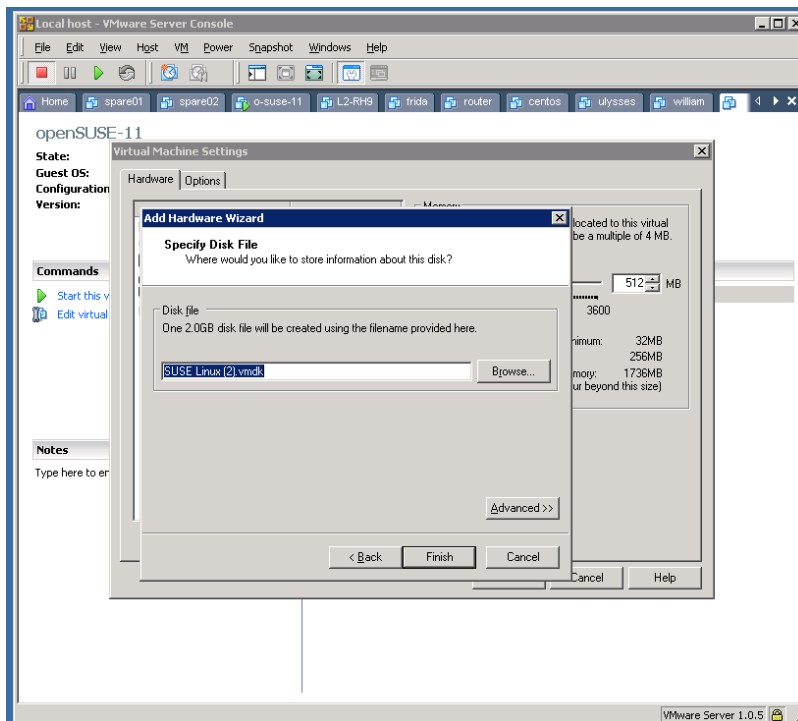
- Choose: Create a new virtual disk
- Click Next >



- Choose SCSI (Reommended)
- Click Next >



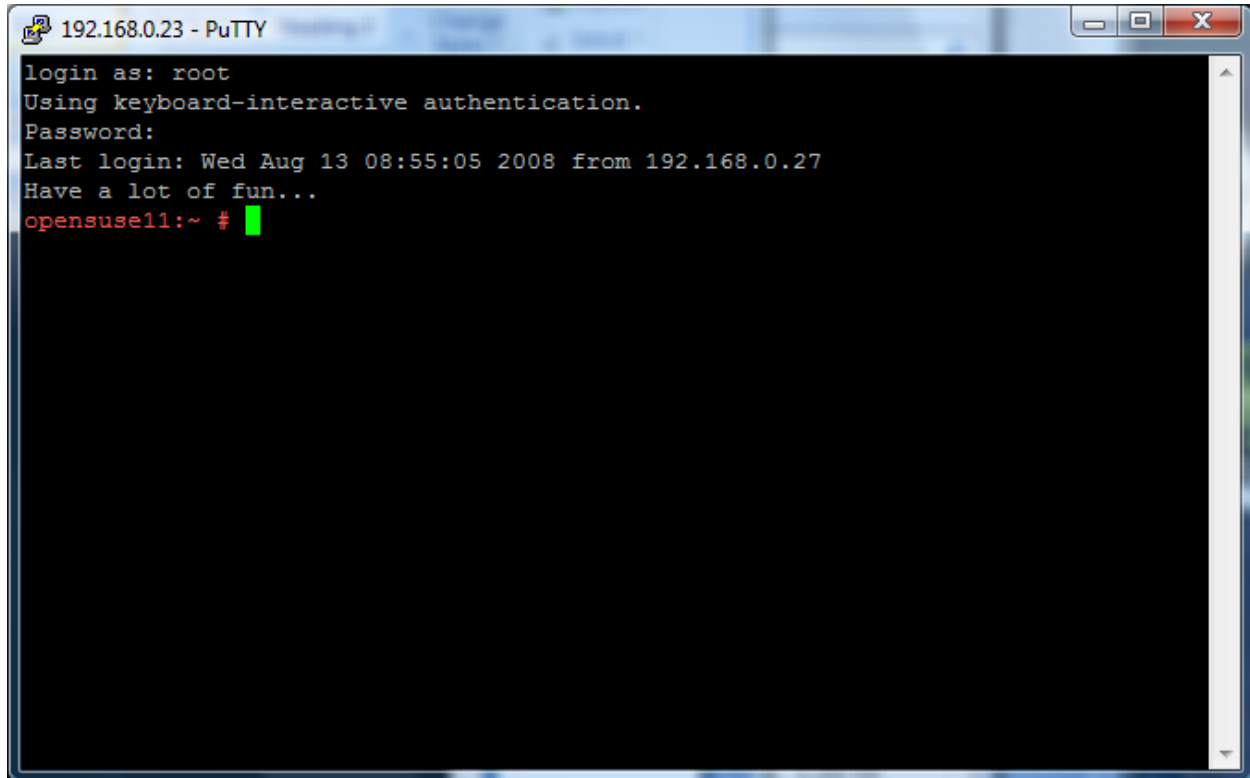
- Make it 2 GB
- Remove check from: Allocate all disk space now
- Click Next >



- Click Finish

Step 3 - Startup VM

Step 4 - Login as root (in VM or using PuTTY)



```
192.168.0.23 - PuTTY
login as: root
Using keyboard-interactive authentication.
Password:
Last login: Wed Aug 13 08:55:05 2008 from 192.168.0.27
Have a lot of fun...
opensuse11:~ # █
```

Step 5 – Create single partition on 2nd drive

```
opensuse11:~ # fdisk -l
```

```
Disk /dev/sda: 5368 MB, 5368709120 bytes
255 heads, 63 sectors/track, 652 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Disk identifier: 0x0002de72
```

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1		1	66	530113+	82	Linux swap / Solaris
/dev/sda2	*	98	652	4458037+	83	Linux
/dev/sda3		67	97	249007+	83	Linux

Partition table entries are not in disk order

```
Disk /dev/sdb: 2147 MB, 2147483648 bytes
255 heads, 63 sectors/track, 261 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Disk identifier: 0x00000000
```

Disk /dev/sdb doesn't contain a valid partition table


```

opensuse11:~ # fdisk /dev/sdb
Device contains neither a valid DOS partition table, nor Sun, SGI or OSF
disklabel
Building a new DOS disklabel with disk identifier 0xd1b95ee0.
Changes will remain in memory only, until you decide to write them.
After that, of course, the previous content won't be recoverable.

Warning: invalid flag 0x0000 of partition table 4 will be corrected by
w(rite)

Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
p
Partition number (1-4): 1
First cylinder (1-261, default 1):
Using default value 1
Last cylinder or +size or +sizeM or +sizeK (1-261, default 261):
Using default value 261

Command (m for help): p

Disk /dev/sdb: 2147 MB, 2147483648 bytes
255 heads, 63 sectors/track, 261 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Disk identifier: 0xd1b95ee0

   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1            1           261     2096451    83  Linux

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
opensuse11:~ #

```

Step 6 – Create an ext3 file system on new partition

```

opensuse11:~ # mkfs -t ext3 /dev/sdb1
mke2fs 1.40.8 (13-Mar-2008)
Warning: 256-byte inodes not usable on older systems
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
131072 inodes, 524112 blocks
26205 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=536870912
16 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:

```

```
32768, 98304, 163840, 229376, 294912
```

```
Writing inode tables: done
```

```
Creating journal (8192 blocks): done
```

```
Writing superblocks and filesystem accounting information: done
```

```
This filesystem will be automatically checked every 28 mounts or  
180 days, whichever comes first. Use tune2fs -c or -i to override.
```

```
opensuse11:~ #
```

Step 7 – Mount file system and create root directory structure

```
opensuse11:~ # mount /dev/sdb1 /mnt
opensuse11:~ # cd /mnt
opensuse11:/mnt # mkdir bin dev etc lib proc sbin sys tmp
opensuse11:/mnt # ls
bin dev etc lib lost+found proc sbin sys tmp
opensuse11:/mnt # chmod 1777 tmp
opensuse11:/mnt # ls -l /dev/console
crw----- 1 root root 5, 1 Aug  9 14:45 /dev/console
opensuse11:/mnt # cd dev
opensuse11:/mnt/dev # mknod console c 5 1
opensuse11:/mnt/dev # chmod 600 console
opensuse11:/mnt/dev # cd ..
opensuse11:/mnt # cp /bin/bash bin/
opensuse11:/mnt # cd bin/
opensuse11:/mnt/bin # ls
bash
opensuse11:/mnt/bin # ln -s bash sh
opensuse11:/mnt/bin # ldd bash
linux-gate.so.1 => (0xffffe000)
libreadline.so.5 => /lib/libreadline.so.5 (0xb7f8a000)
libhistory.so.5 => /lib/libhistory.so.5 (0xb7f81000)
libncurses.so.5 => /lib/libncurses.so.5 (0xb7f4a000)
libdl.so.2 => /lib/libdl.so.2 (0xb7f46000)
libc.so.6 => /lib/libc.so.6 (0xb7e03000)
/lib/ld-linux.so.2 (0xb7fd1000)
opensuse11:/mnt/bin # cd ../lib/
opensuse11:/mnt/lib # cp /lib/libreadline.so.5 .
opensuse11:/mnt/lib # cp /lib/libhistory.so.5 .
opensuse11:/mnt/lib # cp /lib/libncurses.so.5 .
opensuse11:/mnt/lib # cp /lib/libdl.so.2 .
opensuse11:/mnt/lib # cp /lib/libc.so.6 .
opensuse11:/mnt/lib # cp /lib/ld-linux.so.2 .
opensuse11:/mnt/lib # cd ..
opensuse11:/mnt # cd
opensuse11:~ # ls -lR /mnt
/mnt:
total 48
drwxr-xr-x 2 root root 4096 Aug 10 18:27 bin
drwxr-xr-x 2 root root 4096 Aug 10 18:21 dev
drwxr-xr-x 2 root root 4096 Aug 10 18:20 etc
drwxr-xr-x 2 root root 4096 Aug 10 18:32 lib
drwx----- 2 root root 16384 Aug 10 18:14 lost+found
drwxr-xr-x 2 root root 4096 Aug 10 18:20 proc
drwxr-xr-x 2 root root 4096 Aug 10 18:20 sbin
drwxr-xr-x 2 root root 4096 Aug 10 18:20 sys
```

```

drwxrwxrwt 2 root root 4096 Aug 10 18:20 tmp

/mnt/bin:
total 656
-rwxr-xr-x 1 root root 663704 Aug 10 18:26 bash
lrwxrwxrwx 1 root root 4 Aug 10 18:27 sh -> bash

/mnt/dev:
total 0
crw----- 1 root root 5, 1 Aug 10 18:21 console

/mnt/etc:
total 0

/mnt/lib:
total 1984
-rwxr-xr-x 1 root root 116820 Aug 10 18:32 ld-linux.so.2
-rwxr-xr-x 1 root root 1410320 Aug 10 18:30 libc.so.6
-rwxr-xr-x 1 root root 11060 Aug 10 18:30 libdl.so.2
-rwxr-xr-x 1 root root 31132 Aug 10 18:29 libhistory.so.5
-rwxr-xr-x 1 root root 229848 Aug 10 18:30 libncurses.so.5
-rwxr-xr-x 1 root root 204652 Aug 10 18:28 libreadline.so.5

/mnt/lost+found:
total 0

/mnt/proc:
total 0

/mnt/sbin:
total 0

/mnt/sys:
total 0

/mnt/tmp:
total 0
opensuse11:~ # umount /mnt

```

Step 8 – Modify menu.lst to root to new partition

Make a copy of the first boot option and paste it to the end. Modify the comment, title and have it root to the new partition as follows:

```

opensuse11:~ # vi /boot/grub/menu.lst
opensuse11:~ # cat /boot/grub/menu.lst
# Modified by YaST2. Last modification on Sat Aug 9 20:47:49 UTC 2008
default 0
timeout 8
##YaST - generic_mbr
gfxmenu (hd0,1)/boot/message
##YaST - activate

###Don't change this comment - YaST2 identifier: Original name: linux###
title openSUSE 11.0 - 2.6.25.5-1.1

```

```
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.25.5-1.1-pae root=/dev/sda2 resume=/dev/sda1
splash=silent showopts vga=0x317
    initrd /boot/initrd-2.6.25.5-1.1-pae

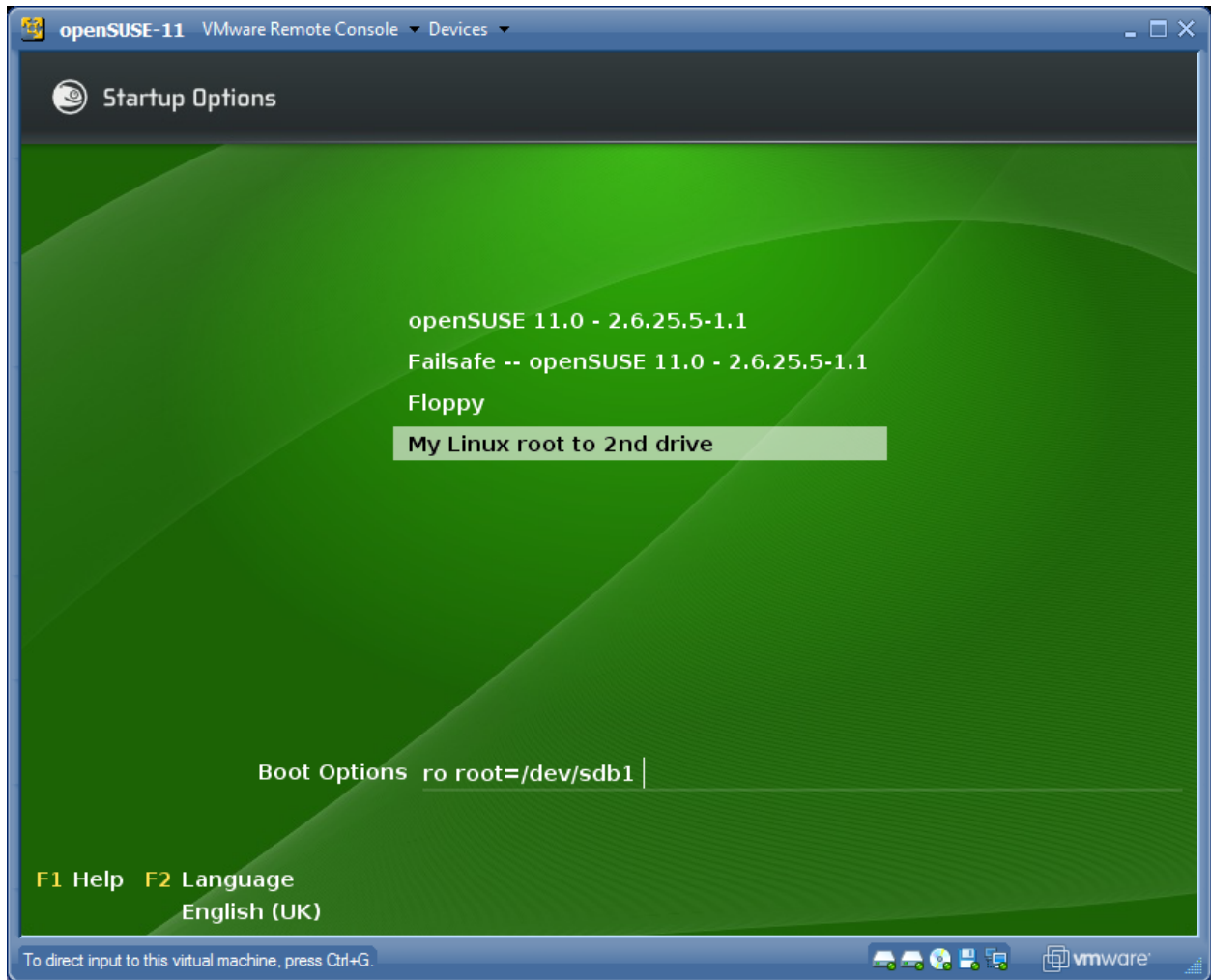
###Don't change this comment - YaST2 identifier: Original name: failsafe###
title Failsafe -- openSUSE 11.0 - 2.6.25.5-1.1
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.25.5-1.1-pae root=/dev/sda2 showopts ide=nodma
apm=off acpi=off noresume nosmp noapic maxcpus=0 edd=off x11failsafe
vga=0x317
    initrd /boot/initrd-2.6.25.5-1.1-pae

###Don't change this comment - YaST2 identifier: Original name: floppy###
title Floppy
    rootnoverify (hd0,1)
    chainloader (fd0)+1

# My Linux 2nd drive
title My Linux root to 2nd drive
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.25.5-1.1-pae ro root=/dev/sdb1
    initrd /boot/initrd-2.6.25.5-1.1-pae

opensuse11:~ #
```

Step 8 – Reboot (using init 6)



- Choose new boot option

```
openSUSE-11 VMware Remote Console Devices
ehci_hcd 0000:02:02.0: USB 2.0 started, EHCI 1.00, driver 10 Dec 2004
usb usb2: configuration #1 chosen from 1 choice
hub 2-0:1.0: USB hub found
hub 2-0:1.0: 6 ports detected
usb usb2: New USB device found, idVendor=1d6b, idProduct=0002
usb usb2: New USB device strings: Mfr=3, Product=2, SerialNumber=1
usb usb2: Product: EHCI Host Controller
usb usb2: Manufacturer: Linux 2.6.25.5-1.1-pae ehci_hcd
usb usb2: SerialNumber: 0000:02:02.0
resume device not found (ignoring)
Waiting for device /dev/sdb1 to appear: ok
fsck 1.40.8 (13-Mar-2008)
[/sbin/fsck.ext3 (1) -- /] fsck.ext3 -a -C0 /dev/sdb1
/dev/sdb1: clean, 28/131072 files, 17874/524112 blocks
fsck succeeded. Mounting root device read-only.
Mounting root /dev/sdb1
kjournald starting. Commit interval 5 seconds
EXT3-fs: mounted filesystem with ordered data mode.
sh-3.2# echo *
bin dev etc lib lost+found proc sbin sys tmp
sh-3.2# cd lib
sh-3.2# echo *
ld-linux.so.2 libc.so.6 libdl.so.2 libhistory.so.5 libncurses.so.5 libreadline.s
o.5
sh-3.2# _
```

To direct input to this virtual machine, press Ctrl+G.

- You have now rooted into your new partition
- Use cd to change directories
- Use echo * for ls
- To stop, power off or reset your VM.