



## Red Hat 9 and Trouble (116)

Troubleshoot booting and rooting problems with Jim Griffin's troublemaker. A VM has been created using Red Hat 9 with Jim's trouble program is loaded. Trouble will apply booting and rooting startup problems that need to be manually repaired. This Howto documents the healthy state of the Trouble VM, shows how to make a simple rescue floppy, how to back up the MBR and finally how to start making *trouble!*

Requirements:

- Trouble VM  
(available in classroom, lab and CTC)
- VMWare Server 1.05 or higher  
<http://www.vmware.com/products/server/>

Trouble VM: MBR and Partitions (in normal state):

Location	Type	Boot Code	Usage	Start	End
<b>MBR</b>		DOS			
<b>/dev/sda1</b>	Primary	GRUB	/boot	1	13
<b>/dev/sda2</b>	Primary		/	14	587
<b>/dev/sda3</b>	Primary		swap	588	652

Trouble VM: Partition Table (in normal state)

```
[root@trouble root]# fdisk -l

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

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1  *           1           13      104391   83  Linux
/dev/sda2                14          587      4610655   83  Linux
/dev/sda3                588          652       522112+   82  Linux swap
[root@trouble root]#
```

Trouble VM: Mounts (in normal state)

```
[root@trouble root]# mount
/dev/sda2 on / type ext3 (rw)
none on /proc type proc (rw)
/dev/sda1 on /boot type ext3 (rw)
none on /dev/pts type devpts (rw,gid=5,mode=620)
```

```
none on /dev/shm type tmpfs (rw)
[root@trouble root]#
```

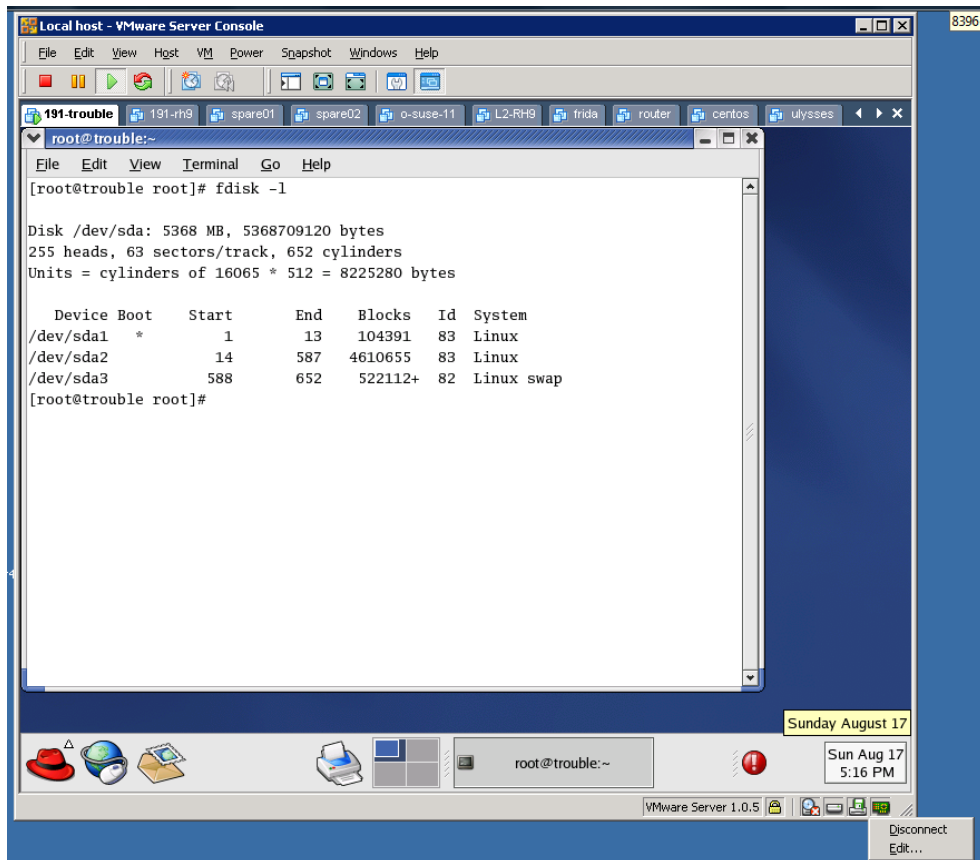
```
[root@trouble root]# cat /etc/fstab
LABEL=/ / ext3 defaults 1 1
LABEL=/boot /boot ext3 defaults 1 2
none /dev/pts devpts gid=5,mode=620 0 0
none /proc proc defaults 0 0
none /dev/shm tmpfs defaults 0 0
/dev/sda3 swap swap defaults 0 0
/dev/cdrom /mnt/cdrom udf,iso9660 noauto,owner,kudzu,ro 0 0
/dev/fd0 /mnt/floppy auto noauto,owner,kudzu 0 0
[root@trouble root]#
```


### Trouble VM: MBR (in normal state)

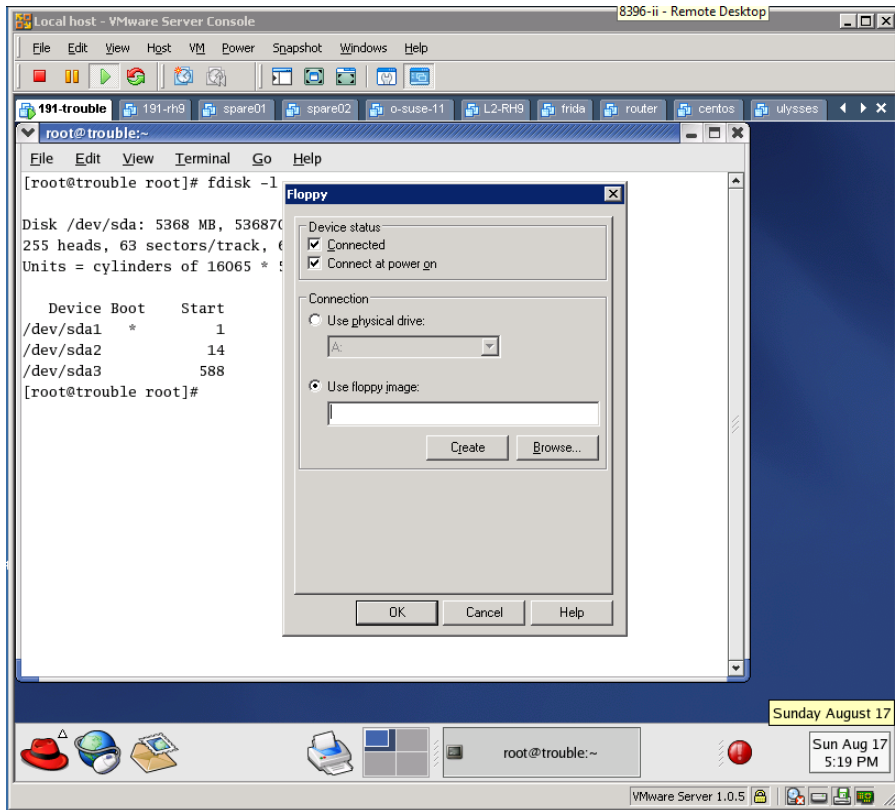
```
[root@trouble root]# xxd /dev/sda | more
0000000: fa33 c08e d0bc 007c 8bf4 5007 501f fbfc  .3.....|..P.P...
0000010: bf00 06b9 0001 f2a5 ea1d 0600 00be be07  .....
0000020: b304 803c 8074 0e80 3c00 751c 83c6 10fe  ...<.t.<.u.....
0000030: cb75 efc4 188b 148b 4c02 8bee 83c6 10fe  .u.....L.....
0000040: cb74 1a80 3c00 74f4 be8b 06ac 3c00 740b  .t.<.t.....<.t.
0000050: 56bb 0700 b40e cd10 5eeb f0eb febf 0500  V.....^.....
0000060: bb00 7cb8 0102 57cd 135f 730c 33c0 cd13  ..|...W...s.3...
0000070: 4f75 edbe a306 ebd3 bec2 06bf fe7d 813d  Ou.....}.=
0000080: 55aa 75c7 8bf5 ea00 7c00 0049 6e76 616c  U.u.....|..Inval
0000090: 6964 2070 6172 7469 7469 6f6e 2074 6162  id partition tab
00000a0: 6c65 0045 7272 6f72 206c 6f61 6469 6e67  le.Error loading
00000b0: 206f 7065 7261 7469 6e67 2073 7973 7465  operating syste
00000c0: 6d00 4d69 7373 696e 6720 6f70 6572 6174  m.Missing operat
00000d0: 696e 6720 7379 7374 656d 0000 0000 0000  ing system.....
00000e0: 0000 0000 0000 0000 0000 0000 0000 0000  .....
00000f0: 0000 0000 0000 0000 0000 0000 0000 0000  .....
000100: 0000 0000 0000 0000 0000 0000 0000 0000  .....
000110: 0000 0000 0000 0000 0000 0000 0000 0000  .....
000120: 0000 0000 0000 0000 0000 0000 0000 0000  .....
000130: 0000 0000 0000 0000 0000 0000 0000 0000  .....
000140: 0000 0000 0000 0000 0000 0000 0000 0000  .....
000150: 0000 0000 0000 0000 0000 0000 0000 0000  .....
000160: 0000 0000 0000 0000 0000 0000 0000 0000  .....
000170: 0000 0000 0000 0000 0000 0000 0000 0000  .....
000180: 0000 0000 0000 0000 0000 0000 0000 0000  .....
000190: 0000 0000 0000 0000 0000 0000 0000 0000  .....
0001a0: 0000 0000 0000 0000 0000 0000 0000 0000  .....
0001b0: 0000 0000 0000 0000 0000 0000 0000 0000  .....
0001c0: 0100 83fe 3f0c 3f00 0000 8e2f 0300 0000  ....??.?..../....
0001d0: 010d 83fe bf4a cd2f 0300 beb4 8c00 0000  ....J./.....
0001e0: 814b 82fe bf8b 8be4 8f00 01ef 0f00 0000  .K.....
0001f0: 0000 0000 0000 0000 0000 0000 0000 55aa  .....U.
```

## Step 1 – Create a virtual floppy

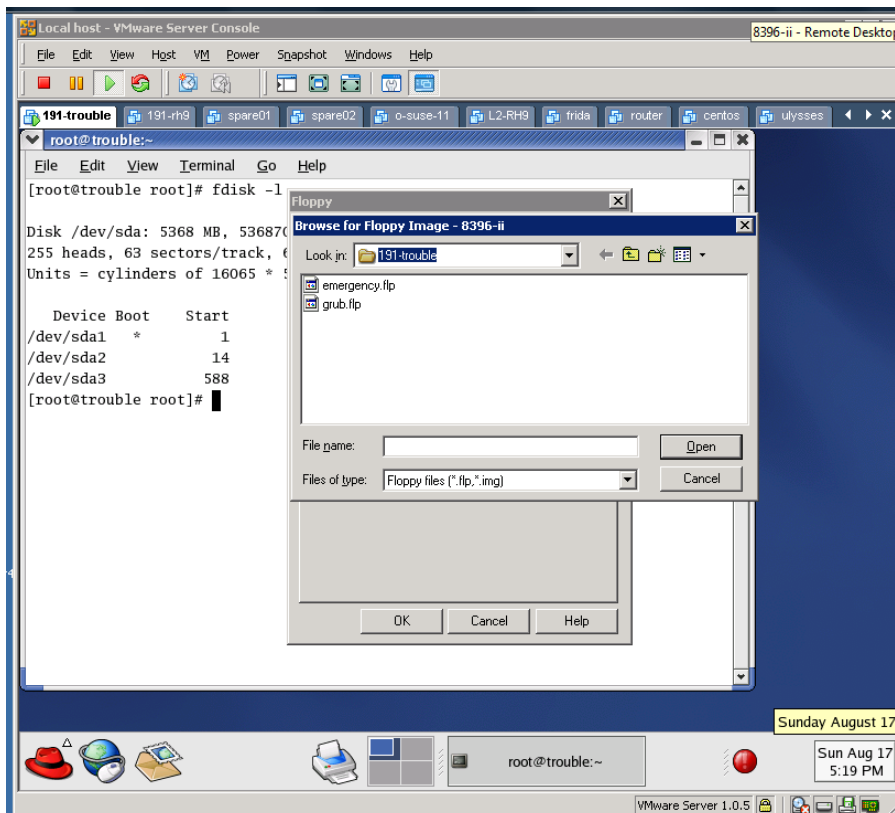
- Startup trouble VM



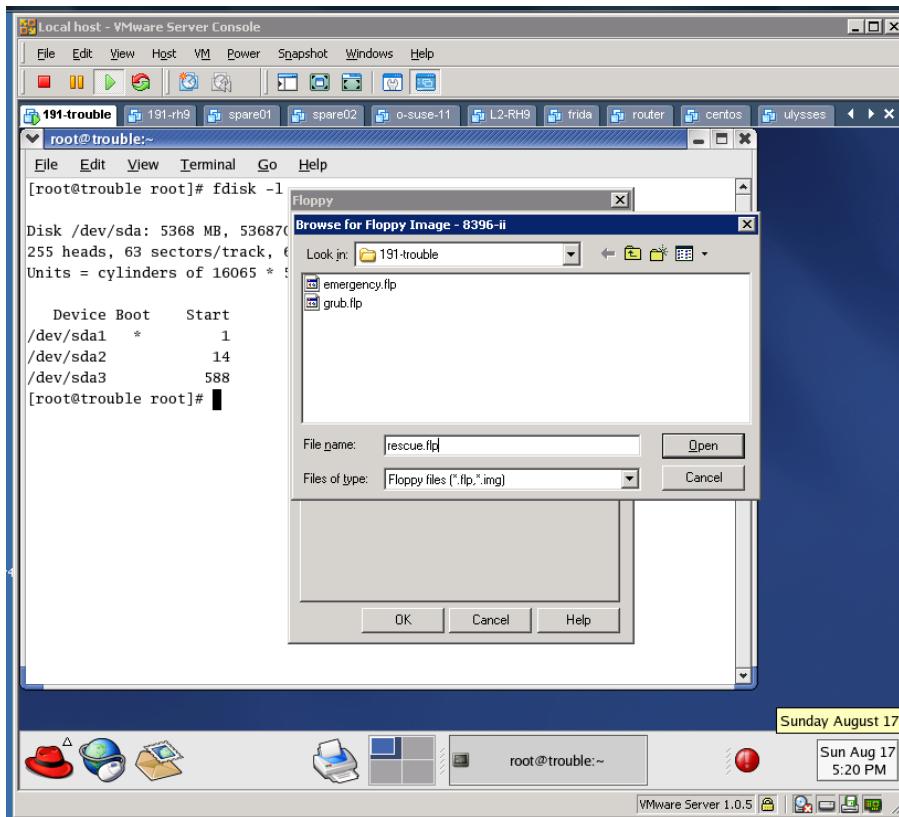
- Right click on small floppy icon in lower right of VM window 
- On pop-up menu, click Edit...



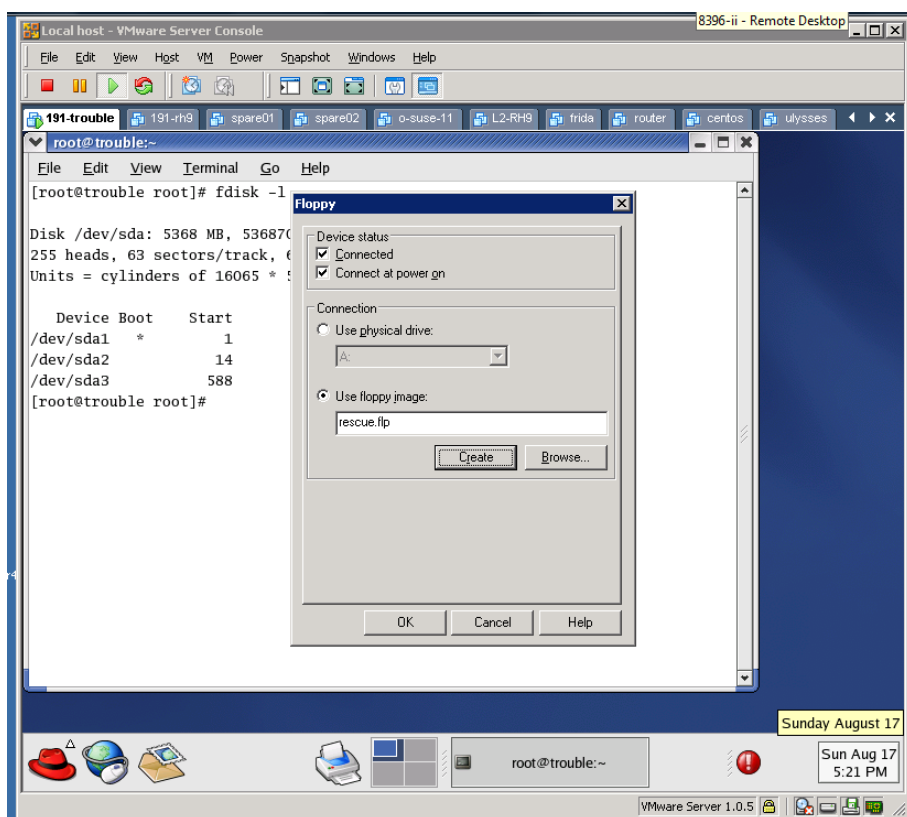
- Select Use floppy image:
- Click Create button



- Type rescue.flp into **File name** field



- Click Open



- Click OK

## Step 2 – Format floppy and put an ext2 file system on it.

```
[root@trouble root]# fdformat /dev/fd0
Double-sided, 80 tracks, 18 sec/track. Total capacity 1440 kB.
Formatting ... done
Verifying ... done
[root@trouble root]# mkfs -t ext2 -L /rescue /dev/fd0
mke2fs 1.32 (09-Nov-2002)
Filesystem label=/rescue
OS type: Linux
Block size=1024 (log=0)
Fragment size=1024 (log=0)
184 inodes, 1440 blocks
72 blocks (5.00%) reserved for the super user
First data block=1
1 block group
8192 blocks per group, 8192 fragments per group
184 inodes per group

Writing inode tables: done
Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 25 mounts or
180 days, whichever comes first. Use tune2fs -c or -i to override.
[root@trouble root]#
```

### Step 3 – Mount floppy and copy GRUB files to it

- Create boot directory and grub sub-directory on floppy
- Copy pristine versions of stage1 and stage2
- Copy splash image and grub.conf from /boot/grub

```
[root@trouble root]# mount /dev/fd0 /mnt
[root@trouble root]# cd /mnt
[root@trouble mnt]# ls
lost+found
[root@trouble mnt]# mkdir -p boot/grub
[root@trouble mnt]# cd boot/grub/
[root@trouble grub]# cp /usr/share/grub/i386-redhat/stage[12] .
[root@trouble grub]# cp /boot/grub/grub.conf .
[root@trouble grub]# cp /boot/grub/splash.xpm.gz .
[root@trouble grub]# ls -l
total 118
-rw-----  1 root    root      541 Aug 17 17:39 grub.conf
-rw-r--r--  1 root    root    11050 Aug 17 17:39 splash.xpm.gz
-rw-r--r--  1 root    root     512 Aug 17 17:39 stage1
-rw-r--r--  1 root    root   106364 Aug 17 17:39 stage2
[root@trouble grub]#
```

### Step 4 – Modify grub.conf file on floppy

- Increase timeout to 60 seconds
- Use splash image on floppy
- Modify title so you know when VM is booting from floppy

```
[root@trouble grub]# vi grub.conf
[root@trouble grub]# cat grub.conf
# grub.conf generated by anaconda
#
# Note that you do not have to rerun grub after making changes to this file
# NOTICE:  You have a /boot partition.  This means that
#           all kernel and initrd paths are relative to /boot/, eg.
#           root (hd0,0)
#           kernel /vmlinuz-version ro root=/dev/sda2
#           initrd /initrd-version.img
#boot=/dev/sda
default=0
timeout=60
splashimage=(fd0)/boot/grub/splash.xpm.gz
title Floppy Rescue Boot
    root (hd0,0)
    kernel /vmlinuz-2.4.20-6 ro root=LABEL=/
    initrd /initrd-2.4.20-6.img
[root@trouble grub]#
```

### Step 5 – Insert GRUB boot code into floppy boot record

- Un-mount floppy first (to save files we just copied to it)
- Do GRUB setup

```
[root@trouble grub]# cd
[root@trouble root]# umount /mnt
```

```
[root@trouble root]#  
[root@trouble root]# grub  
Probing devices to guess BIOS drives. This may take a long time.
```

```
GRUB version 0.93 (640K lower / 3072K upper memory)
```

```
[ Minimal BASH-like line editing is supported. For the first word, TAB  
lists possible command completions. Anywhere else TAB lists the possible  
completions of a device/filename.]
```

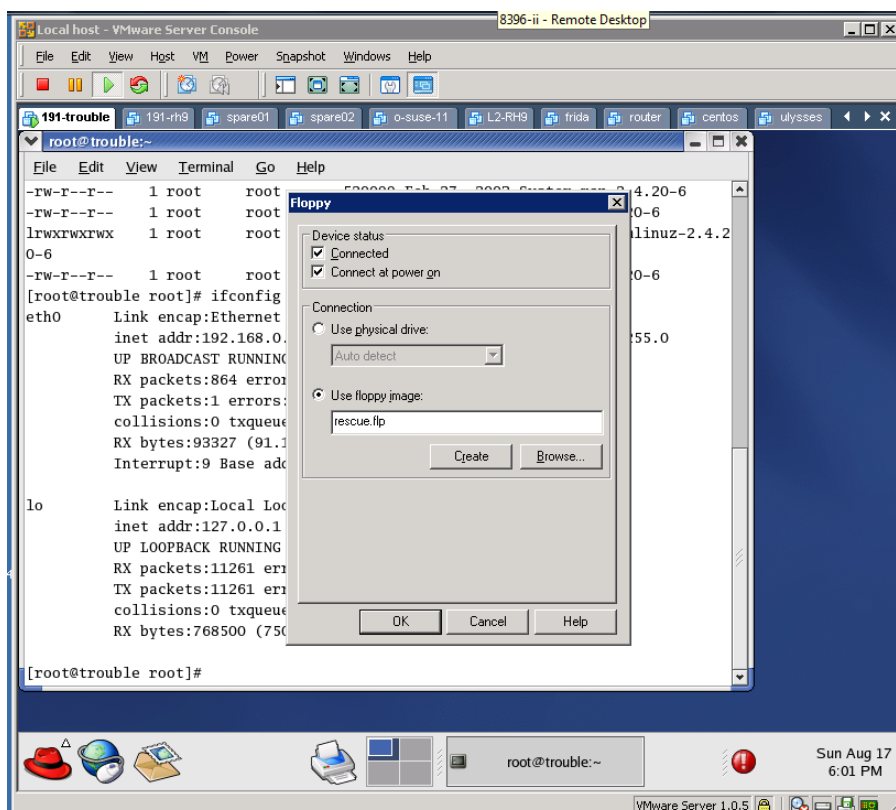
```
grub> root (fd0)  
Filesystem type is ext2fs, using whole disk
```

```
grub> setup (fd0)  
Checking if "/boot/grub/stage1" exists... yes  
Checking if "/boot/grub/stage2" exists... yes  
Checking if "/boot/grub/e2fs_stage1_5" exists... no  
Running "install /boot/grub/stage1 (fd0) /boot/grub/stage2 p  
/boot/grub/grub.c  
onf "... succeeded  
Done.
```

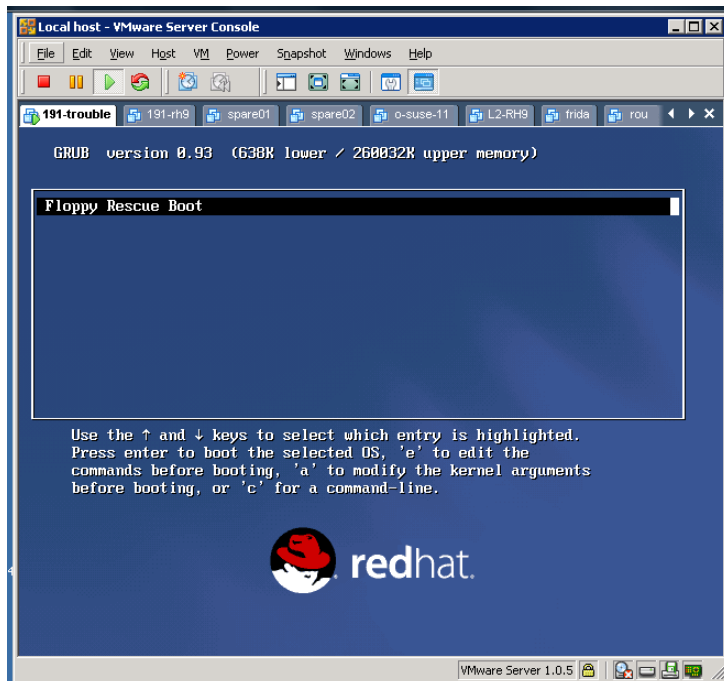
```
grub> quit  
[root@trouble root]#
```

## Step 6 – Test Rescue Floppy

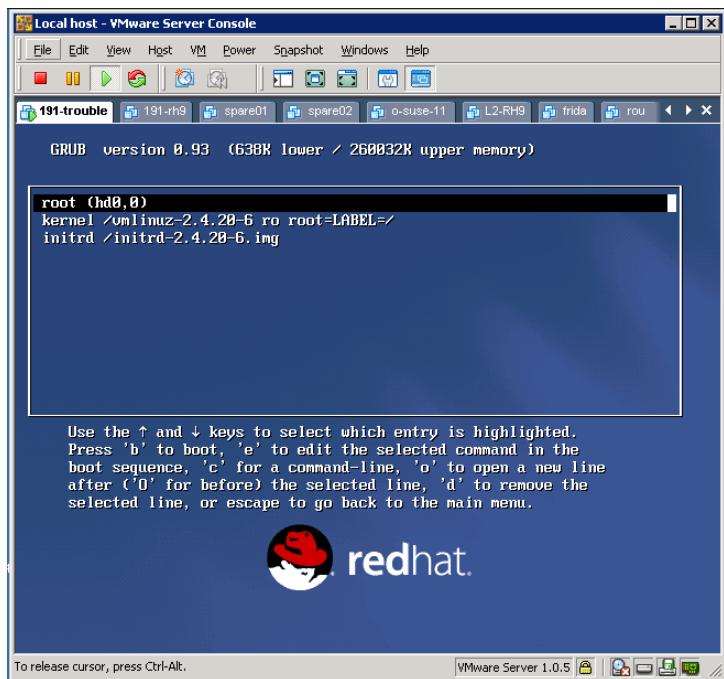
- Make sure VMware floppy status options **Connected** and **Connect at power on** are checked
- Reboot and look for custom title on GRUB boot







- Type e to edit boot options



- Type b to boot

## Step 7 – Put backup of MBR on rescue floppy

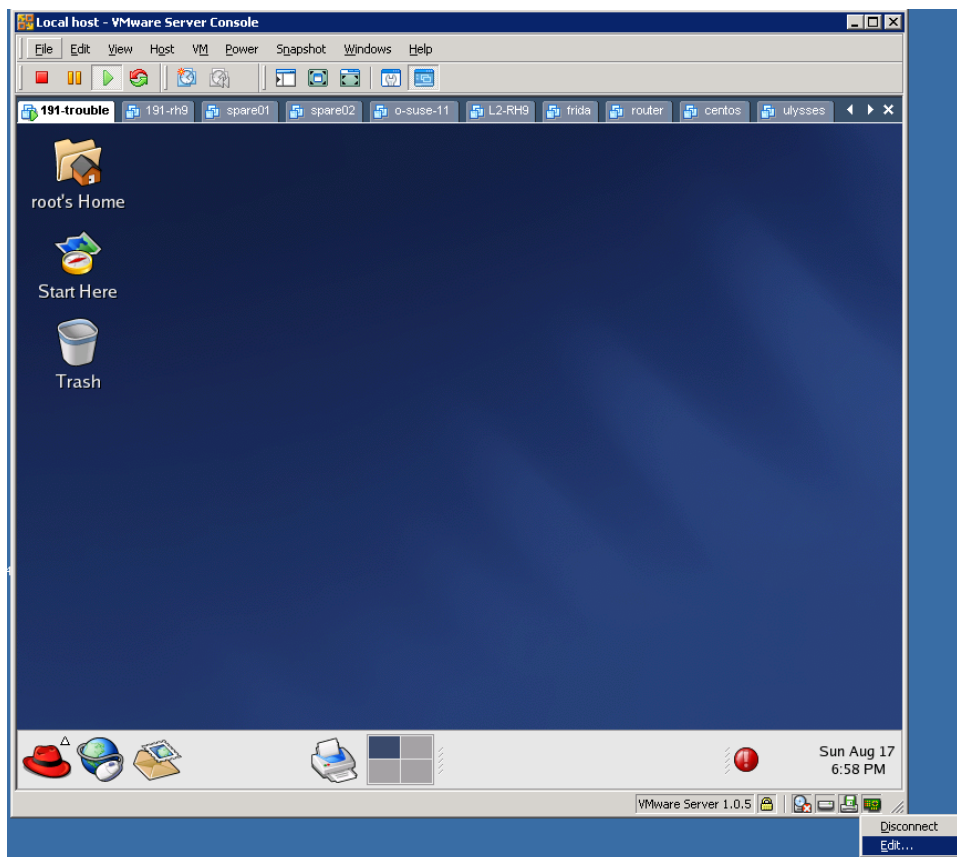
- Mount floppy
- Copy first 512 bytes of floppy to a file named mbr

- Un-mount floppy

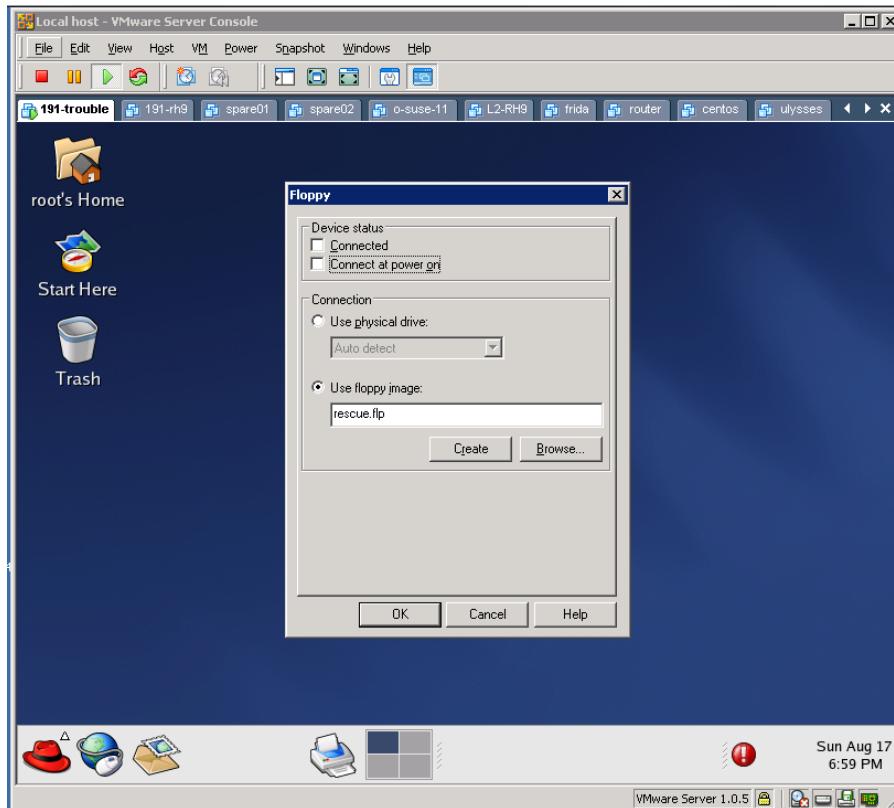
```
[root@trouble root]# mount /dev/fd0 /mnt
[root@trouble root]# cd /mnt
[root@trouble mnt]# ls
boot  lost+found
[root@trouble mnt]# dd if=/dev/sda of=mbr bs=512 count=1
1+0 records in
1+0 records out
[root@trouble mnt]# ls
boot  lost+found  mbr
[root@trouble mnt]#
[root@trouble mnt]# cd
[root@trouble root]# umount /mnt
```

## Step 8 – Pull out the floppy

- It is a virtual floppy so to “pull it out” ...
- Right click on little floppy icon.



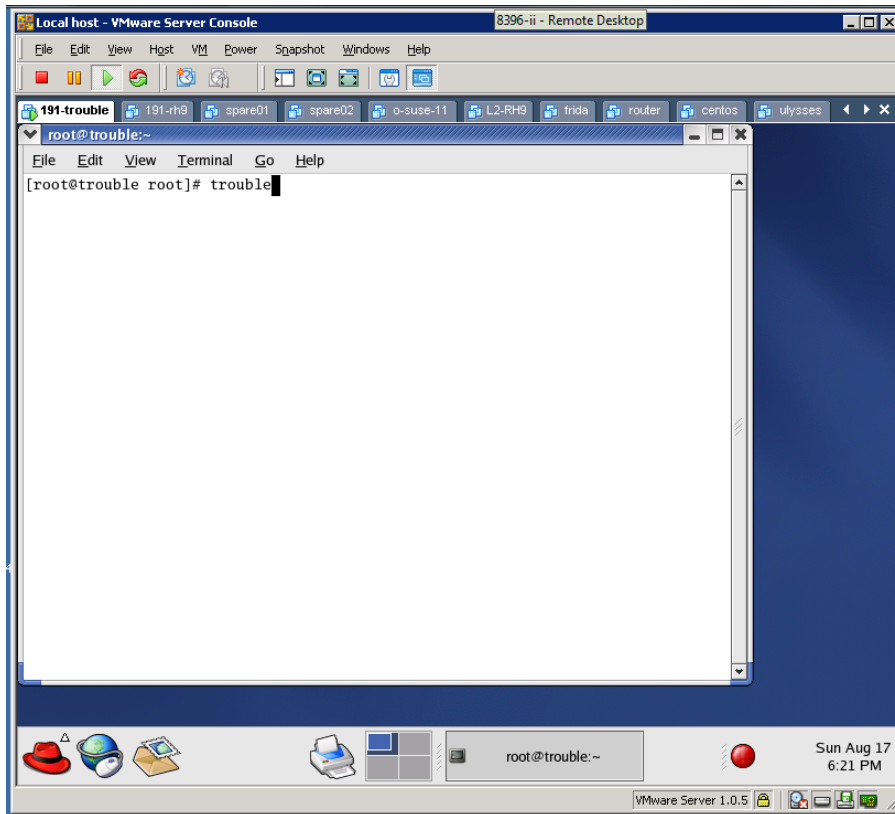
- Select Edit...



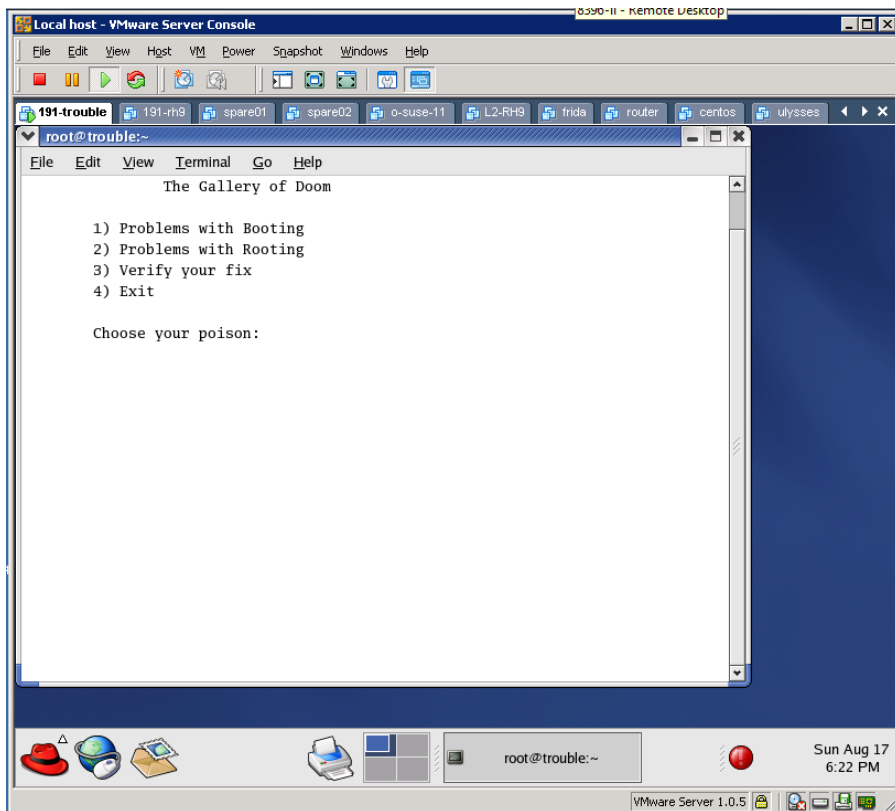
- Remove checks from **Con**ected and **C**onnect at power **o**n options
- Click OK

### Step 9 – Start making trouble and doing the repairs

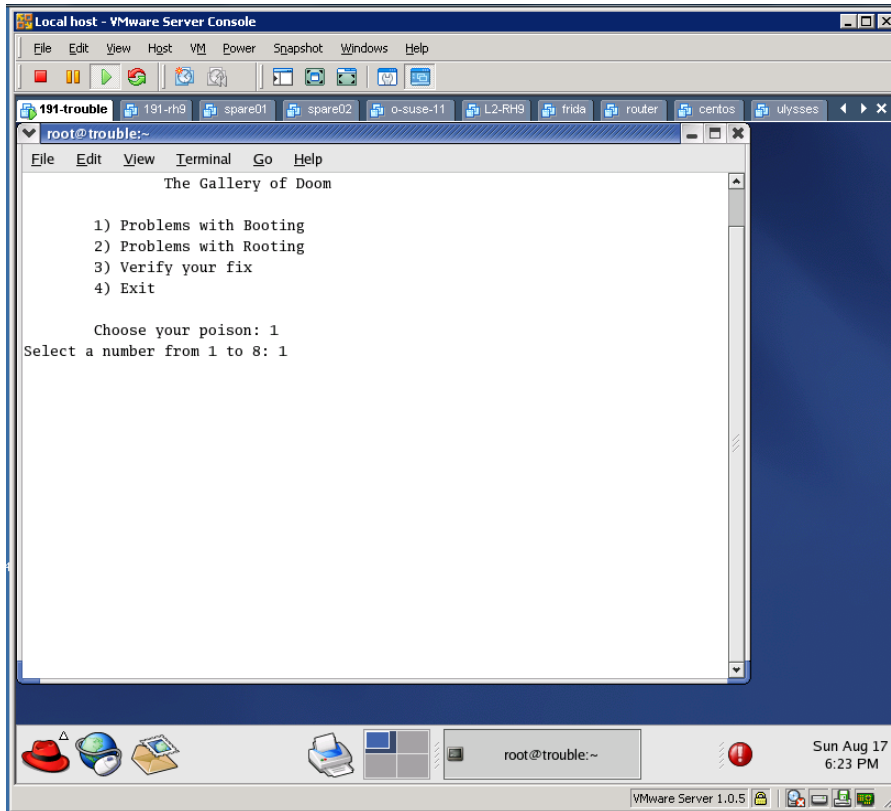
- Logon as root
- Run trouble program
- Choose a problem (trouble will apply it then reboot)
- After you fix a problem reboot to verify
- We will show the first boot problem here as an example



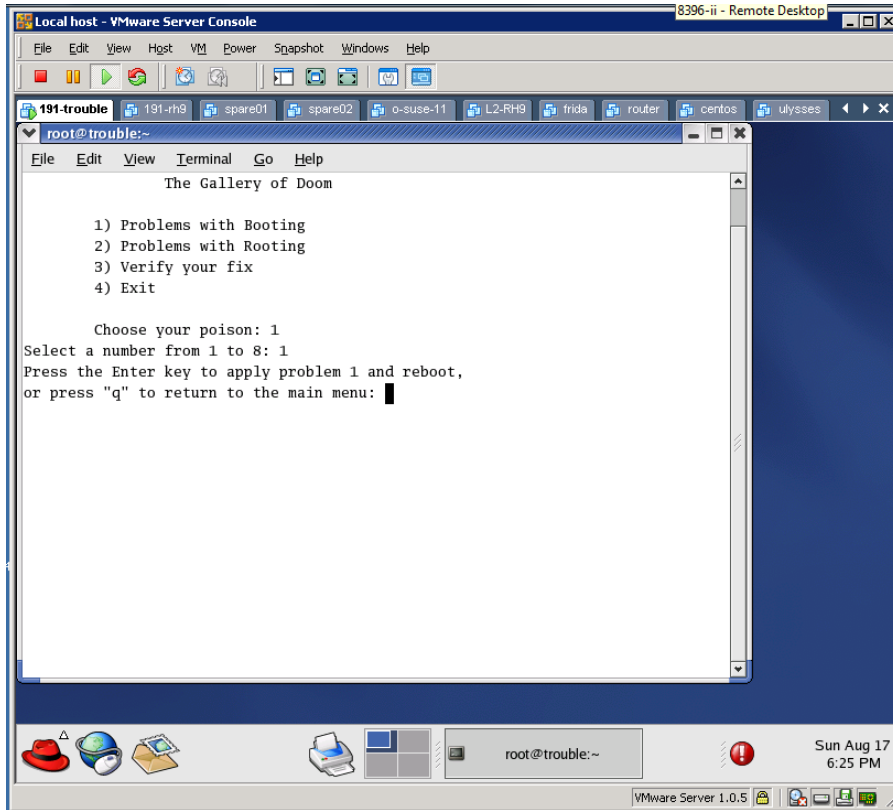
- Type trouble, and enter



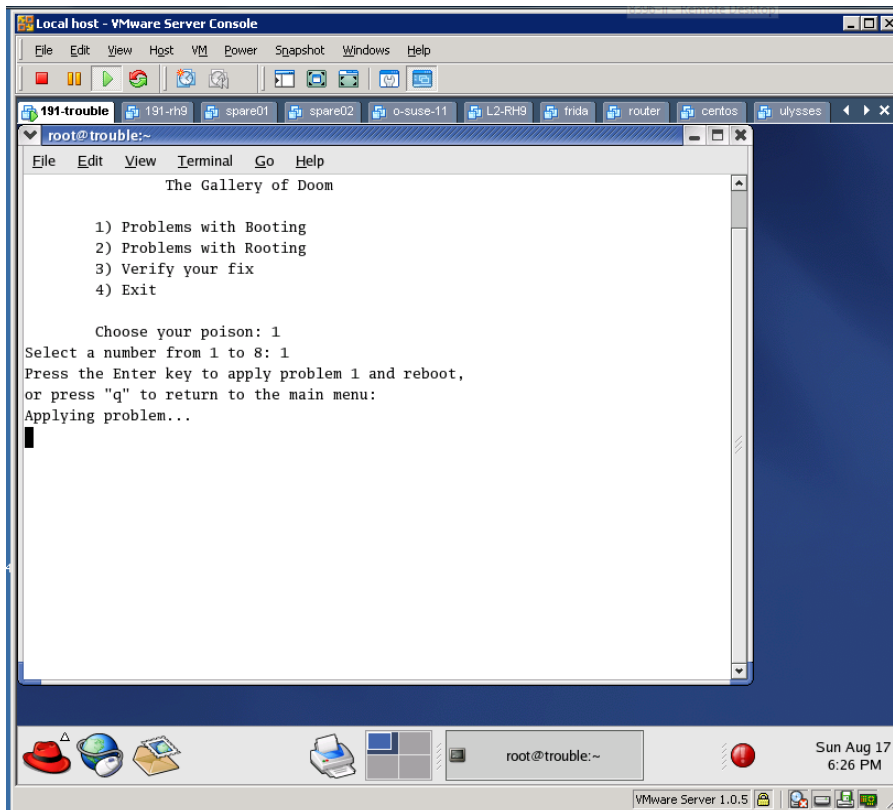
- Enter 1



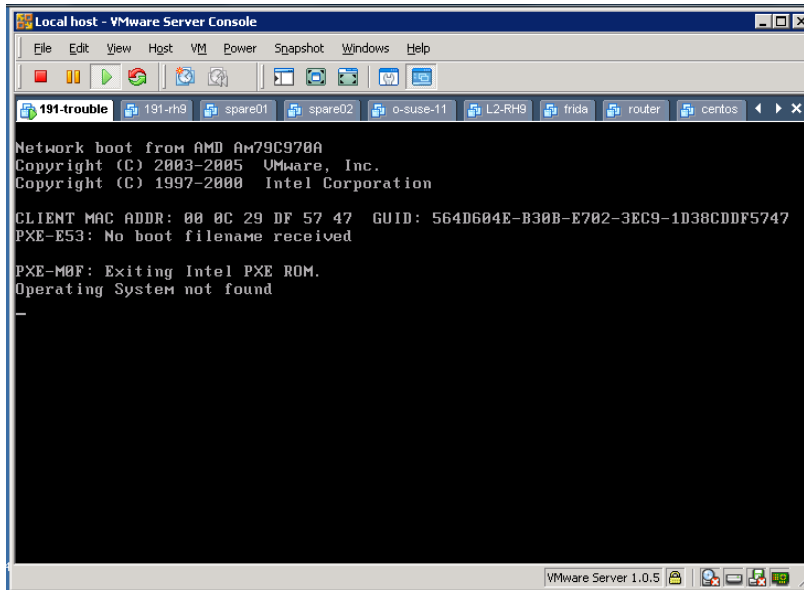
- Enter 1



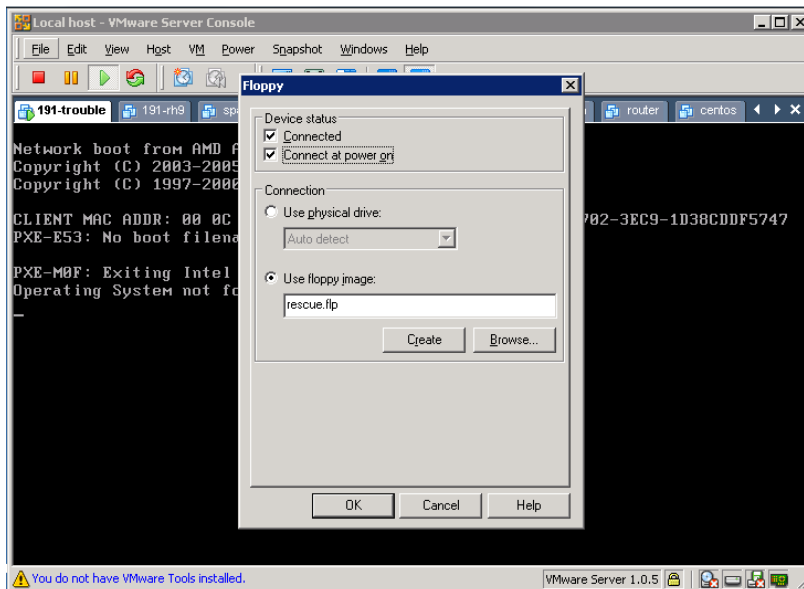
- Press Enter key



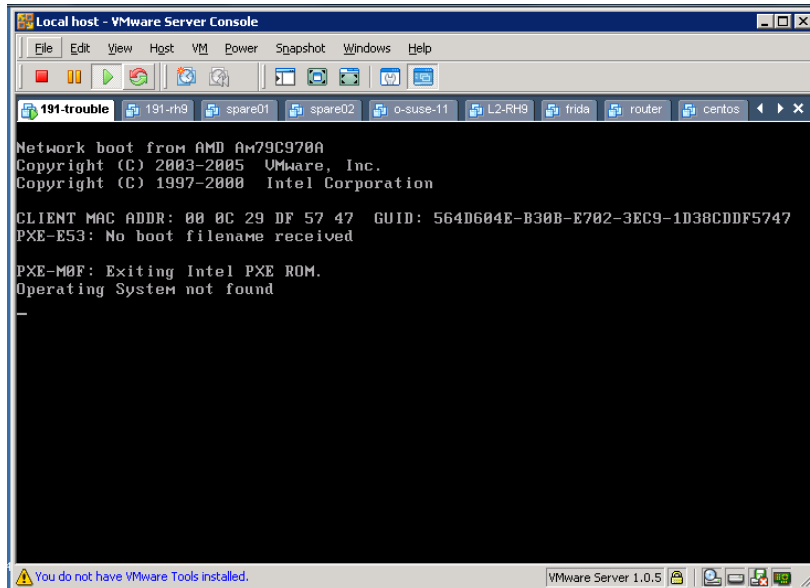
- System now reboots



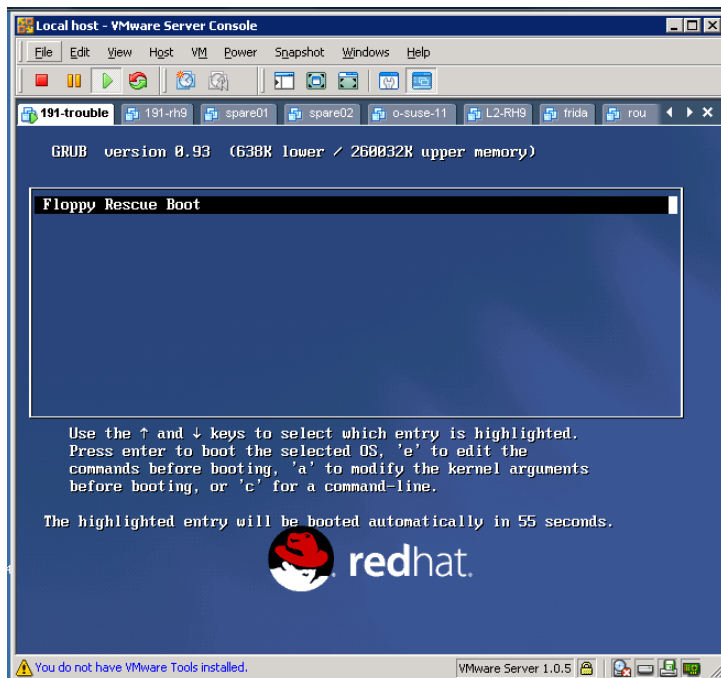
- Oh crud !!!!###\$@!%&, ... what has Jim's program done to our VM?
- Well, lets think it through, starting at the beginning of the Linux startup sequence. The BIOS came up and executed just fine. However when it came time to start up the OS on the hard drive the OS was never found. So ... lets check the MBR and its partition table to see if everything is hunkey-dorey.
- Hmmmm, how do we do that when we don't have an OS?
- Well, ... we do have our rescue floppy!
- So "insert our floppy into the floppy drive" by configuring VMware server floppy status to have **Cononnected** and **Cononnect at power on** checked.



- Check **Cononnected** and **Cononnect at power on**
- Make sure image is still rescue.flp
- Click OK



- Click VMware Reset icon to reboot: 



- Press enter to boot
- Bring up a terminal window
- Use fdisk to examine partition table

```
[root@trouble root]# fdisk /dev/sda
```

```
Command (m for help): p
```

```
Disk /dev/sda: 5368 MB, 5368709120 bytes
255 heads, 63 sectors/track, 652 cylinders
```



Units = cylinders of 16065 \* 512 = 8225280 bytes

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1		1	13	104391	83	Linux
/dev/sda2		14	587	4610655	83	Linux
/dev/sda3		588	652	522112+	82	Linux swap

Command (m for help):

- There is the problem, do you see what is missing?
- There is no active partition.
- Let's set the active partition and reboot.
- If you had noted what the partition table was when the system was healthy you would know that /dev/sda1 is the boot partition.
- Tip: Always record in your system log book the latest partitions and mount points (the output you get from the `fdisk -l` and `mount` commands) This is invaluable for any subsequent troubleshooting!

Command (m for help): **a**  
Partition number (1-4): **1**

Command (m for help): **p**

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

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	1	13	104391	83	Linux
/dev/sda2		14	587	4610655	83	Linux
/dev/sda3		588	652	522112+	82	Linux swap

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

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.

The kernel still uses the old table.

The new table will be used at the next reboot.

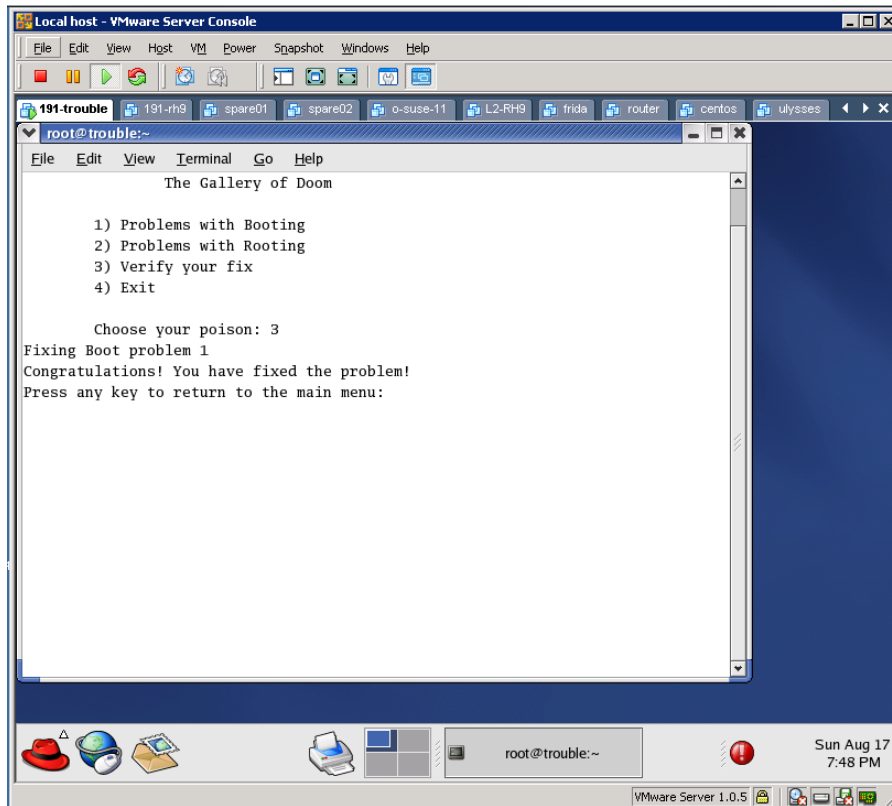
Syncing disks.

[root@trouble root]#

- OK, "remove the rescue floppy" (see step 8) and reboot

[root@trouble root]# reboot

- OK, now it should boot up fine without the rescue floppy.
- Get a terminal window and type `trouble`
- Enter 3 to verify your fix:



- OK, have some fun now and see how many other problems you can solve !!

## Rescue Floppies

There are some floppy images that come with the Trouble VM to aid in troubleshooting:

- rescue.flp
- emergency.flp

Contents of the rescue.flp:

```
[root@trouble root]# mount /dev/fd0 /mnt
[root@trouble root]# ls -lR /mnt
/mnt:
total 14
drwxr-xr-x    3 root    root        1024 Aug 17 17:38 boot
drwx-----   2 root    root        12288 Aug 17 17:34 lost+found
-rw-r--r--    1 root    root         512 Aug 17 18:09 mbr

/mnt/boot:
total 1
drwxr-xr-x    2 root    root        1024 Aug 17 17:44 grub

/mnt/boot/grub:
total 118
-rw-----   1 root    root         538 Aug 17 17:44 grub.conf
```

```
-rw-r--r--    1 root    root          11050 Aug 17 17:39 splash.xpm.gz
-rw-r--r--    1 root    root           512 Aug 17 17:39 stagel
-rw-r--r--    1 root    root        106364 Aug 17 17:39 stage2
```

```
/mnt/lost+found:
total 0
```

Contents of emergency.flp:

Note: this floppy was made using: `mkbootdisk --device /dev/fd0 $(uname -r)`

```
[root@trouble root]# mount /dev/fd0 /mnt
[root@trouble root]# ls -lR /mnt
/mnt:
total 1354
-rwxr-xr-x    1 root    root           203 Aug 17 11:46 boot.msg
-rwxr-xr-x    1 root    root        253677 Aug 17 11:30 initrd.img
-r-xr-xr-x    1 root    root         7836 Aug 17 11:46 ldlinux.sys
-rwxr-xr-x    1 root    root          125 Aug 17 11:46 syslinux.cfg
-rwxr-xr-x    1 root    root       1122363 Feb 27 2003 vmlinuz

[root@trouble root]# cat /mnt/syslinux.cfg
default linux
prompt 1
display boot.msg
timeout 100
label linux
    kernel vmlinuz
    append initrd=initrd.img ro root=/dev/sda2
[root@trouble root]#

[root@trouble root]# cd /tmp
[root@trouble tmp]# mkdir initrd
[root@trouble tmp]# cd initrd
[root@trouble initrd]# cp /mnt/initrd.img .
[root@trouble initrd]# mv initrd.img initrd.img.gz
[root@trouble initrd]# gunzip initrd.img.gz
[root@trouble initrd]# umount /mnt
[root@trouble initrd]# mount -t ext2 -o loop initrd.img /mnt
[root@trouble initrd]# ls -lR /mnt
/mnt:
total 8
drwxr-xr-x    2 root    root          1024 Aug 17 11:30 bin
drwxr-xr-x    2 root    root          1024 Aug 17 11:30 dev
drwxr-xr-x    2 root    root          1024 Aug 17 11:30 etc
drwxr-xr-x    2 root    root          1024 Aug 17 11:30 lib
-rwxr-xr-x    1 root    root           603 Aug 17 11:30 linuxrc
drwxr-xr-x    2 root    root          1024 Aug 17 11:30 loopfs
drwxr-xr-x    2 root    root          1024 Aug 17 11:30 proc
lrwxrwxrwx    1 root    root           3 Aug 17 11:30 sbin -> bin
drwxr-xr-x    2 root    root          1024 Aug 17 11:30 sysroot

/mnt/bin:
total 154
-rwxr-xr-x    1 root    root       124132 Aug 17 11:30 insmod
lrwxrwxrwx    1 root    root          10 Aug 17 11:30 modprobe -> /sbin/nash
-rwxr-xr-x    1 root    root       30132 Aug 17 11:30 nash

/mnt/dev:
```

```
total 0
crw-r--r-- 1 root root 5, 1 Aug 17 11:30 console
crw-r--r-- 1 root root 1, 3 Aug 17 11:30 null
brw-r--r-- 1 root root 1, 1 Aug 17 11:30 ram
crw-r--r-- 1 root root 4, 0 Aug 17 11:30 systty
crw-r--r-- 1 root root 4, 1 Aug 17 11:30 tty1
crw-r--r-- 1 root root 4, 2 Aug 17 11:30 tty2
crw-r--r-- 1 root root 4, 3 Aug 17 11:30 tty3
crw-r--r-- 1 root root 4, 4 Aug 17 11:30 tty4
```

```
/mnt/etc:
total 0
```

```
/mnt/lib:
total 418
-rw-r--r-- 1 root root 109648 Feb 27 2003 BusLogic.o
-rw-r--r-- 1 root root 88727 Feb 27 2003 ext3.o
-rw-r--r-- 1 root root 67277 Feb 27 2003 jbd.o
-rw-r--r-- 1 root root 136169 Feb 27 2003 scsi_mod.o
-rw-r--r-- 1 root root 18864 Feb 27 2003 sd_mod.o
```

```
/mnt/loopfs:
total 0
```

```
/mnt/proc:
total 0
```

```
/mnt/sysroot:
total 0
[root@trouble initrd]#
```