Building a Linux Based MythTV PVR

By Thomas Weeks
Lead Systems Engineer
tweeks@rackspace.com
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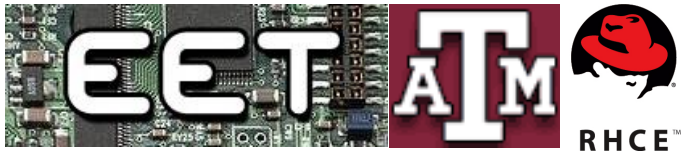
About Me

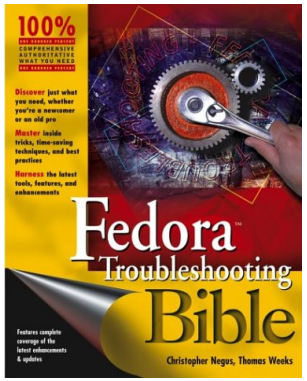
- Thomas Weeks
  Lead Systems Engineer

- BS-EET / Telecom, RHCE



- President of XCSSA.ORG
  (X-otic Computer Sys. Of S.A. TX)

- Co-Author with Chris Negus of
  "The Linux Troubleshooting Bible"



- Writer for "Linux Toys II"

About Rackspace

Vital Statistics

- Founded in 1998
- Based in San Antonio, TX
- 100% Focused on Managed Hosting
- 700+ Employees
- 5 Data Centers: Texas (x3), Virginia, & London, UK
- 15,000 Servers (~8,000 Linux)
- Net Income Positive Since February 2001 - $100+ Million in Revenue
- 97% of Our Customers Would Refer us to a Business Colleague

Industry Leadership

- The only MySQL Certified Hosting Provider
- Redhat Advanced HostingProvider
- More Red Hat Certified Engineers than any other hoster on the planet
- 100% Network Uptime for 4+ Years Running – Cisco Powered Network™
- Linux Journal's Readers' Choice Awards "Favorite Web Hosting Service" 2003-2005
- Customers include Atari, Best Buy, EMI Records, Miller Brewing, Hershey's, Motorola & National Geographic

Why MythTV over TiVo or others?

MythTV Features over other PVR (commercial or free)

- Live or Recorded nonlinear TV watching
- Commercial flagging AND deleting (!!)
- Client/Server for multi-playback stations
- Video jukebox features + DVD/VCD ripping & playback
- Audio compiling and jukebox features
- Digital Photo Gallery scrapbook
- On line News and RSS feeds + Internet Browser
- MAME/S/nes/Atari/Odyssey2/Linux Video game consoles

What We're Covering...

- Choosing your Hardware
- Installing and preparing the OS
- Installing MythTV and drivers
- Configuring and testing MythTV
- Other tricks and tips

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Choosing Your Hardware

MythTV Frontend + Backend, or Frontend Only?

- **Frontend + Backend Requirements**
  - 2 to 3GHz system
  - 512MB of RAM (or more)
  - one/two 250GB SATA drives
- **Frontend Only Requirements**
  - 1 to 2GHz system
  - 256MB of RAM
  - a 10GB hard drive/CDROM

Choosing Your Hardware

Video Input Options (signal capture technology)

- **Analog Cable RF/Video Service**
  - Hauppauge PVR150, PVR250, PVR500MCE (dual tuner)
  - Cable RF in, composite or SVideo in
- **Broadcast HDTV Service**
  - HD3000 (http://pchdtv.com)
- **Digital Cable/Dish Firewire Service**
  - Digital cable boxes like MotorolaDCT6200 (both SD and HD)
  - Unencrypted mpeg 2 TS stream direct into MythTV Firewire in

Choosing Your Hardware

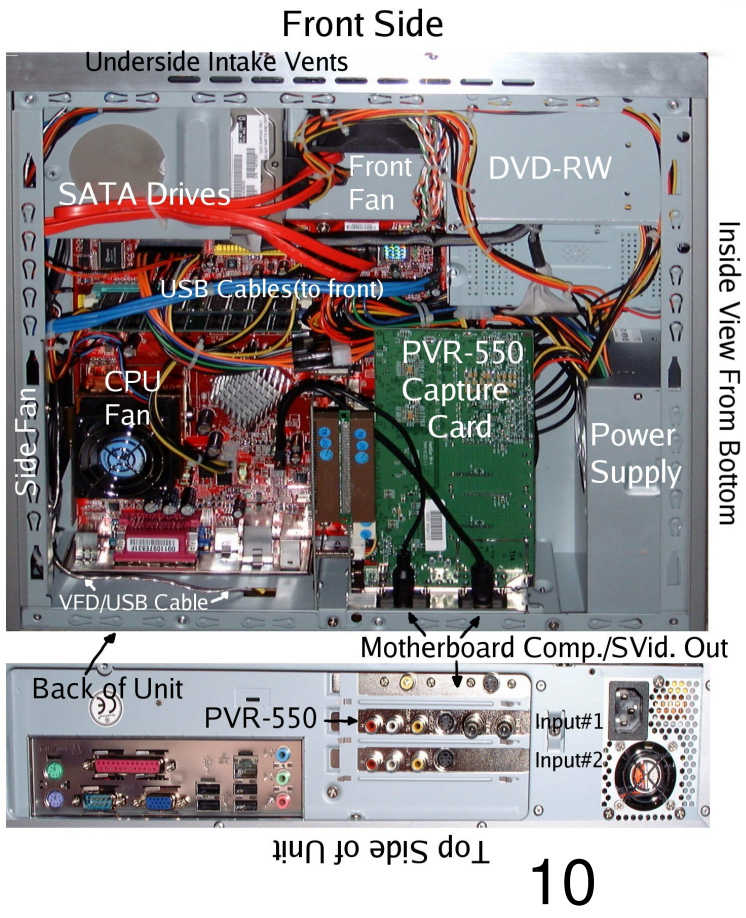
Video Output Options (out to TV/Monitor)

- **Analog TV/RF to Television**
  - Hauppauge PVR350 RF out to TV
- **Analog SVideo to TV/Monitor**
  - nVidia GeForce3/4 SVideo out to TV/Video switcher
- **Analog RGB/xVGA out to TV/Monitor/LCD/DLP Projector**
  - nVidia GeForce3/4 RGB out to monitor/projector
- **Digital DVI or HDMI to HDTV TV/Monitor**
  - nVidia eVGA GFX 5200 fan-less video card

Choosing Your Hardware

MythTV FE+BE, Analog In, SVideo Out Parts List/Diagram

Part	*Part Description **	*Price*
Motherboard	MSI K7N2GM2-LSR, 3200+, 400FSB, nForce/NVidia+snd (use MSI K7N2GM2-IL if you need firewire/IEEE1394)	$70.00
CPU	Athlon XP3000+/512M (AXDA2800DKV4D)	$140.00
CPU Fan	Apache Copper K7 CPU Cooler, AP2CA-725(34dBA)	$28.00
Memory	2x 512MB PC2700/DDR333 Kensington	$100.00
Case	SilverStone Lascala SST-LC11M HTPC w/VFD and remote	$150.00
Capture Card	Video: Hauppauge PVR-500MCE Dual Tuner Card	$150.00
Hard Drive	Hitachi T7K250 250GB SATA-I/II, 7200, 8MB (x2)	$200.00
DVD RW	NEC Dual Layer 16x DVD+-RW Burner	$60.00
Keybd/mse	BTC Wireless 9019URF w/Integrated Joystick/Mouse	$45.00
	**** See www.linuxtoys.net for URLs*** ***Total =***	**$943.00**



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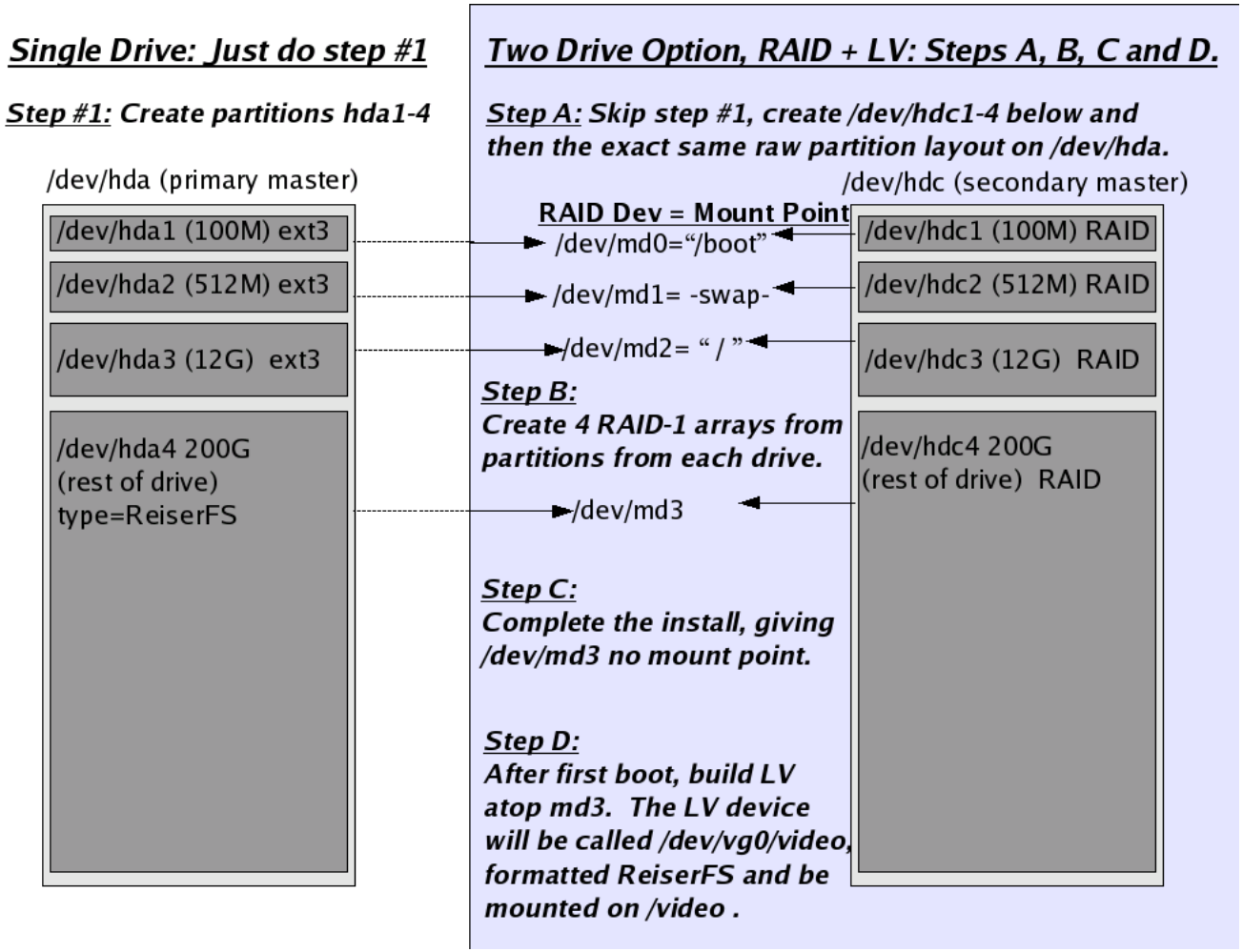
Partition Planning for a LVM on sw RAID-1 Layout



Installing and Preparing the OS

Boot from Install CD/DVD with Special Boot Parameter

boot: **linux reiserfs ***

* NOTE: In Fedora/RedHat, this gets you install time and kernel/initrd support for ReiserFS.

Recommended Partitioning Sizes on RAID-1 Devices

Device	Mount Point	Filesystem	Size
/dev/md0	/boot	ext3	100MB
/dev/md1	-swap-	swap	512MB
/dev/md2	/	ext3	12GB
/dev/md3	-not used yet-	(Reiserfs)	-rest of drive(s)- **

** NOTE: This partition will eventually be the /video partition, but it will be LVM atop of sw-RAID-1. This complex configuration is not supported at install time in Fedora Core/RedHat yet. If you are not running both LVM and RAID on this partition, you may go ahead and assign a mount point of /video and format as Resierfs.

Custom Install of Fedora Core X

Networking and Security Settings

- Use DHCP (if on a DHCP network, but use static IP if possible)
- Firewall on, allow SSH, HTTP, and HTTPS
- Set seLinux = warn

Fedora Packages to Install

- X Window System
- KDE Desktop Environment
- Web Server
- MySQL Database + mysql-server
- Xfce-desktop (for slower systems)
- Editors +vim-X11
- Graphical Internet
  - +Gaim +Firefox
- Text-internet
- Sound and Video +dvgrab (for firewire inputs)
- Windows File Server
- Network Servers + vnc-server (for remote access
- Development-tools (for compiling)
- Admin-tools
- System-tools +tsclient
- Printing Support (photo printers)

See Jarod's Guide for Details: http://wilsonet.com/mythtv/fcmyth.php

Final Fedora Sourced Package Updates

Import the RPM GPG signature keys:

```
# updatedb
# rpm --import $(locate GPG-KEY|grep rhn | tr \\n " ")
```

Patch the system with the stock Fedora Core RPM repositories:

```
# up2date-nox -uf --nosig
```

Install the “usbutils” package if not already installed:

```
# up2date-nox -i usbutils
```

Installing and Preparing the OS

Setting Up System for the ATRPMs.net Repository

- Import the ATRPM repo GPG RPM signature key:

```
# rpm --import http://atrpms.net/RPM-GPG-KEY.atrpms
```

- Install the atrpms-kickstart package from atrpms.net:

```
# rpm -Uvh  http://dl.atrpms.net/all/atrpms-kickstart-27-
1.rhfc3.at.i386.rpm
```

  or whatever the URL is for the atrpms-kickstart package for you distro.

- Upgrade against ATRPMs.net, setup the “KVER” and reboot:

```
# apt-get update
# apt-get dist-upgrade
# apt-get install synaptic
# apt-get install libiec61883-utils (if using firewire)
# echo “echo KVER=\'uname -r\'" >> /etc/profile.d/kver.sh &&
  chmod 755 /etc/profile.d/kver.sh && reboot
```

Installing and Preparing the OS

Build /video LVM & ReiserFS on the sw RAID-1 Array

- **Mark md3 as a "PV", create your Volume Group pool, then your 225GB "Logical Volume", and format your LV using the ReiserFS filesystem.**

```
# pvcreate /dev/md3
# pvdisplay
...
# vgcreate -s 32M vg0 /dev/md3
Volume group "vg0" successfully created
# vgdisplay
...
# lvcreate -l 7032 vg0 -n videoLVM
  /dev/cdrom: open failed: Read-only file system
  Logical volume "videoLVM" created
# lvdisplay
...
# ls -la /dev/vg0/videoLVM
lrwxrwxrwx 1 root root 24 Jul 1 01:03 /dev/vg0/videoLVM ->
/dev/mapper/vg0-videoLVM
# mkreiserfs /dev/mapper/vg0-videoLVM
#
```

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Installing MythTV and Drivers

Install MythTV Suite from the ATRPMS Repository

```
# apt-get update
# apt-get install mythtv-suite
```

which installs around 70-80 different packages.

Intalling AV an IR Hardware drivers (follow Jarod's guide)

- The NVidia GeForce 4 video card, for S-Video rendered output (if using)
- The lm_sensors, for controlling fan PCM/speed
- The ivtv audio codecs and video kernel modules for Hauppage capture cards
- The lirc infrared receiver/interpreter system for your IR remote
- The kernel source (if you're recompiling any kernel modules)
- Optional drivers for the USB-based VF display on your case (if using the recommended SilverStone case)

System Service & Driver Startup Ordering

MythTV requires that the various related drivers and services start up in a fairly controlled and ordered manner. Here is the order you should make sure your system starts up in:

1. OS boot
2. MySQL server (not using SysV init scripts)
3. i2c/lm_sensors modules and fan control
4. ivtv hardware drivers and related modules and settings
5. LCD/VFD kernel module/driver (lirc_imon in my case)
6. LCDd
7. mythbackend service
8. mythfrontend application (can start in KDE as the mythtv user)

Although not normally recommended, this specific ordering is most easily controlled from the single startup file: /etc/rc.d/rc.local (in Fedoroa)

Installing MythTV and Drivers

Example /etc/modprobe.conf File

```
...
## TWW: Here is what I've added for my specific system thus far
# I2C module options
alias char-major-89 i2c-dev
## nvidia kernel module
alias char-major-195 nvidia-1_0-7174
alias nvidia nvidia-1_0-7174
## Setup ivtv (PVR-500MCE)
alias char-major-81 videodev
alias char-major-81-0 ivtv
alias char-major-81-1 ivtv
alias tveeprom tveeprom-ivtv
alias tuner tuner-ivtv
alias msp3400 msp3400-ivtv
## Added this to fix tuner a/v probs
options ivtv tuner=57,57        # New usage
install ivtv /sbin/modprobe --ignore-install ivtv
options msp3400 once=1 simple=1
## Setup if using FireWire
#install ohci1394 /sbin/modprobe –ignore-install ;
  ohci1394;/sbin/modprobe raw1394
```

Installing MythTV and Drivers

Example /etc/rc.d/rc.local File

```
echo "--------Running rc.local--------"
############## TWW: First, set up mobo specific i2c drivers and lm_sensors & fans
echo "-Setting up i2c drivers and fan control"
modprobe i2c-nforce2
modprobe i2c-isa
############## I2C chip drivers
modprobe eeprom
modprobe w83627hf # from sensors-detect, just for my motherboard..
# sleep 2 # optional
/usr/bin/sensors -s      # recommended
echo 40 > /sys/bus/i2c/devices/2-0290/pwm2  # Playing with fan speeds
sleep 2 # optional
echo 240 > /sys/bus/i2c/devices/2-0290/pwm2
sleep 1
echo 200 > /sys/bus/i2c/devices/2-0290/pwm2 # The final speed I want
echo
############### TWW: Putting ivtv here and restarting mythbackend further down
echo "-Installing IVTV Vid.Card Drivers..."
/sbin/modprobe ivtv tuner=57,57
echo
############### TWW: My VFD/LIRC Driver, and LCDd service startup
echo "-Installing my VFD & LIRC/iMON Drivers"
modprobe lirc_imon
echo -n " " >7dev/lcd0
echo -n "MythTV 0.18   Hello World ;\)" >/dev/lcd0
sleep 3
/etc/init.d/LCDd restart
############### TWW: Here's where I restart the mythbackend to bind to ivtv
echo "-Restarting Mythbackend"
/etc/init.d/mythbackend restart
echo "-Done"
```

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Configuring and Testing MythTV

Now that you have MythTV installed and the drivers in place, you next need to do the following before you can use MythTV:

- Configure the MySQL database for MythTV use
  # mysql -u root -p < /usr/share/doc/mythtv-0.18.1/database/mc.sql
- Register your MythTV's channel data service with labs.zap2it.com (aka “DataDirect”).
- Configure MythTV backend inputs and startup (previously in rc.local)
- Configure MythTV frontend and startup (via KDE userspace config)
- Make KDE-specific adjustments (KDE as default WMm, sound, autologin)

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Other Tricks and Tips

Configuring and Testing MythTV

- For DVD Playback, use xine instead of default mplayer
- Set up /etc/aliases “root” alias to point to your email address (and run newaliases)
- Record using MPeg HiRes, then Transcode to lower res Mpeg4
- Wireless MythTV requires at least 15-25Mbps. Don't use less than 54G.
- Watch CPU & System load and temperature (lap heatsink if too warm)

Closing...

For a More Detailed Step By Step

Either Follow Jarod's Guide:

http://wilsonet.com/mythtv/fcmyth.php

or By our new Book, "Linux Toys II":

http://amazon.com/gp/product/0764579959/

Thank you!