Linux Box — Rev

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2023-08-13

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1 Introduction

1.1 Objective

- Provide detailed instructions on the current Linux installation on my machine. This is a rescue procedure, in case I have to re-install everything.
- Provide new Linux users with a general example of how a Linux machine can be installed and configured.

The OS is Fedora 38. I downloaded the DVD version from Fedora's website, 2023-08-06. The installation was done 2023-08-11, as an upgrade. I now have a 1TB solid state drive (SSD) which is my primary OS device.

1.2 Copyright

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1.3 Why GNU/Linux?

GNU/Linux is Free Software. Your computer should not be encumbered by copyrights and Digital Rights Management (DRM). Proprietary software publishers are trying so hard to prevent unathorized copying that they can prevent you from installing and using copies you purchased, and are authorized to use. Also, if you cannot run the application you used to create your data, you don't own your data!

GNU/Linux is not hard to install on most computers. The latest "bleeding edge" video and sound cards may give you trouble. If you are buying a new computer, you should do some research on the hardware. If your computer is older, GNU/Linux should have all the drivers you need. You need to research GNU/Linux support on printers and scanners. Not everything works.

A basic GNU/Linux install will include some very good graphics programs, particularly GIMP, a good substitute for Adobe Photoshop. Just about every programming tool is available for GNU/Linux, except for the proprietary Microsoft ones like Visual Basic and C#.

GNU/Linux can run efficiently on older, slower computers, because you can select smaller, faster user interfaces and applications. Install the window managers XFCE and LXDE. Libre Office is a credible alternative to Microsoft Office because it is just about as bloated as Microsoft Office. Try the word processor AbiWord, and the spreadsheet Gnumeric. You could learn to use LaTeX, whose files are edited with a text editor.[1]

[1] This document is maintained in LaTeX. The best reference on LaTeX is *A Guide to LaTeX 2ε* by Helmut Kopka and Patrick W. Daly, Addison Wesley books. This book provides good document templates. I have not found other references to be useful.

GNU/Linux is less capable at video games and multimedia. There are lots of Free Software computer games out there, but the best stuff is commercial and proprietary. Few publishers support GNU/Linux.

The big problem with GNU/Linux and multi-media is ideological. Most media formats are proprietary. GNU and Linux are the work of Free Software people, who are reluctant to support proprietary formats. If you spend an hour or so surfing GNU.org , you will understand who you are dealing with. The GNU "Copyleft" really is a copyright. All copyrights are supported by the Free Software community.

GNU/Linux *can* be made to support multi-media. I watch YouTube and Netflix on my GNU/Linux box. I can watch most commercial DVDs. Don't expect the Free Software community to knock itself out to help you.

For more information on the thinking behind Free Software, just follow the links. You can get support for most media formats. Just search Google for Linux multi-media support.

1.4 Summary

1.4.1 Installation

I spent several days trying to figure out this install. The installs went smoothly, but GNU/Linux would not boot afterwards. After several days, many attempts and lots of Googling, I searched my BIOS settings. I was set to "Legacy+UEFI Boot". I switched to "UEFI Boot",[2] and everything worked fine.

Fedora does not touch your hard drive in any way until you tell it to start installing. A Fedora Linux DVD is very safe to play with.

Fedora 38 still is installable by ordinary mortals, as long as the ordinary mortal has a USB backup drive, they have copied all their files to it, and they don't mess with their BIOS settings. They will wind up with a system with a web browser, email, an office suite, graphics, and good security.

1.4.2 DVDs

Download install ISO images from the internet. These can be burned to DVDs, or copied to USB sticks. New computers generally do not have DVDs or Blue-rays. There are instructions on the internet for creating bootable USB sticks from ISO files.

If you are interested in Linux, buy one of the books. You get documentation, and you support the community. David Clinton's and Christopher Negus' *Ubuntu Bible* continues to be updated as of 2021. I cannot find a *Linux Bible* or a *Fedora Bible* less than ten years old. I have not seen these in a book store

[2] UEFI means Unified Extensible Firmware Interface, and my Googling indicates that is it is a replacement for BIOS.

Figure 1: Virtual Windows on FVWM

lately. They can be ordered online. Make sure you are buying something recent. There are lots of older books for sale.

1.4.3 Gnome 3 and 4

The default GUI with Fedora is Gnome. In the past, Gnome has been a very nice user interface, predictable to anyone coming out of the Windows world. The new Gnomes are very much fancier than Gnome 2, and they introduce all sorts of new paradigms to the user. I don't like them.

Maybe *you* will like Gnome 3! Install the window managers XFCE and LXDE. These are small and fast, ideal for older, slower computers with limited RAM. They are predictable to a user coming out of the Windows world.

The thing that actually pisses me off about Gnome 3 and 4 is the implementation of virtual windows. This is a convenient feature of most X11 window managers, as shown by the figure. I have set up my FVWM desktop to show nine windows, each selectable by a mouse click. I scatter my applications around these windows. Usually, I drop my email and web browser in one window, my file manager in another window. Each big application I have running gets its own window. I am one click away from whatever it is I want to do. Gnome 3 supports virtual windows, but selection requires several mouse clicks. It is much less convenient. On most window managers, look for something called a *pager*.

A Microsoft Windows user probably is not aware of virtual windows, and might find Gnome to be okay. The other window managers still are better.

I know nothing about Macs. I have no idea of how all this looks to a Mac user.

1.4.4 SElinux

SEcurity Enhanced Linux, according to Wikipedia[3] ...

> is a Linux kernel security module that provides the mechanism for supporting access control security policies, including United States Department of Defense style mandatory access controls (MAC).

SElinux is pissing me off less than it used to. I can always switch from `enforcing` mode to `permissive` mode.

Security is good, I suppose. The command for checking SElinux is `sealert`.

1.4.5 MBR and GPT Formatted Disks

If you are buying a new hard drive for an old computer, you need to read the following carefully.

New computers are being shipped with GPT formatted hard drives, and motherboards that can use them. GPT is a more advanced disk format. Among other things, it allows many more primary partitions. The old MBR format[4] only allows four. For my Fedora 26 install onto my new hard drive, this was a very nasty surprise. My Gigabyte GA-990FXA-UD3 Version 1.1, motherboard[5] did not work with my new hard drive, a Western Digital WD2003FZEX-0. The installed system showed the boot screens, then "Loading Operating System ...", then it stopped. After a week of futile hacking, I bought a new 2TB hard drive, and now everything works! the WD drive now is my `/archive` drive. It works. I just cannot boot from it.

If you are installing Linux on an old clunker computer and an old drive, you should have no problems. If you are installing Linux on a new computer with a new, GPT capable motherboard and GPT formatted drive, you should have no problems. The fun starts when you replace the hard drive on your old clunker.

If you are buying a new hard drive for your old computer, ask questions at the store. My non-functional drives were from Western Digital. My functional drive is from Seagate.

A crude rule of thumb is that if your "new" machine is working with whatever operating system you have, your Linux install will work.

2 Hardware

This desktop has evolved from something I bought at a local computer shop. I have replaced the motherboard, the hard drive and the case, so this is a new computer.

[3] Wikipedia as of 2014Aug15.

[4] MBR stands for Master Boot Record. GPT means GUID Partition Table. GUID means Globally Uniquie IDentifiers. I don't know the significance of any of this.

[5] The Gigabyte GA-990FXA-UD3 Version 3.0 *is* capable of booting GPT drives.

2.1 Motherboard

MSI B450 Tomahawk. This comes with sound. I failed to notice that it has video connectors. Also, there is no floppy drive connector. I installed this 2022/02/28. My Fedora 33 installation continued to work. I expect no more problems with MBR drives. This one should be GPT.

2.2 CPU

AMD Ryzen 5 3600. This is described on the box as 6 Core, 12 thread processor. 4.2GHz max boost, 3.6GHz base. It needs a "discrete graphics card". Oh oh.

The processor comes with a heat sink that has a thermal compound on the contact face. If you try to remove the heat sink, the processor comes off with it. When I removed a similar heat sink, I was unable to re-install the processor, and I had to buy this new one.

2.3 Memory

G.Skill "Ripjaws" 8GB DDR4 sticks. This comes as two 8GB sticks with heat sinks. The heat sinks, in addition to dumping heat, provide a nice handhold, nowhere near the static vulnerable live surfaces that you must not touch. My old DDR3 sticks do not work with this board.

2.4 Networking

- Built into the motherboard: Ethernet controller: Realtek Semiconductor Co., Ltd. RTL8111/8168/8411 PCI Express Gigabit Ethernet Controller (rev 06) – This thing is not compatible with current Linux kernels!
- Added on: D-link DWA-582 Wireless AC1200 Dual Band PCI Express Adapter – Realtek Semiconductor Co., Ltd. RTL8812AE 802.11ac PCIe Wireless Network Adapter (rev 01)

2.5 Hard Drives

- Seagate "Desktop HDD" 2TB SATA. ST2000DM001. The Fedora loader call it ATA ST2000DM001-1ER1
- Western Digital WD BLue 4000GB. The Fedora loader calls it ATA WDC WD40E31X-OOH.
- Western Digital 2000GB SATA The Fedora loader calls it ATA WDC WD2003FZEX-0.

Figure 2: My SSD in its M.2 Slot

- Western Digital "Blue" 3D NAND SATA SSD WDS100T2B0B solid state drive 1TB. This attaches to an M.2 2280 SATA Gb/s connector. See Figure 2 . Note the M.2 connector at the right.[6]

2.6 External Drives

Nothing at the moment.

2.7 Interfaces

Where would we be without `lspci`?

- 00:00.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse Root Complex
- 00:00.2 IOMMU: Advanced Micro Devices, Inc. [AMD] Starship/Matisse IOMMU
- 00:01.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse PCIe Dummy Host Bridge

[6]Note the use of my old manual typewriter to do the labels. I typed this onto Avery *Sticker Project Paper*.

- 00:01.3 PCI bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse GPP Bridge
- 00:02.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse PCIe Dummy Host Bridge
- 00:03.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse PCIe Dummy Host Bridge
- 00:03.1 PCI bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse GPP Bridge
- 00:04.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse PCIe Dummy Host Bridge
- 00:05.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse PCIe Dummy Host Bridge
- 00:07.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse PCIe Dummy Host Bridge
- 00:07.1 PCI bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse Internal PCIe GPP Bridge 0 to bus[E:B]
- 00:08.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse PCIe Dummy Host Bridge
- 00:08.1 PCI bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse Internal PCIe GPP Bridge 0 to bus[E:B]
- 00:08.3 PCI bridge: Advanced Micro Devices, Inc. [AMD] Starship/Matisse Internal PCIe GPP Bridge 0 to bus[E:B]
- 00:14.0 SMBus: Advanced Micro Devices, Inc. [AMD] FCH SMBus Controller (rev 61)
- 00:14.3 ISA bridge: Advanced Micro Devices, Inc. [AMD] FCH LPC Bridge (rev 51)
- 00:18.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Matisse/Vermeer Data Fabric: Device 18h; Function 0
- 00:18.1 Host bridge: Advanced Micro Devices, Inc. [AMD] Matisse/Vermeer Data Fabric: Device 18h; Function 1
- 00:18.2 Host bridge: Advanced Micro Devices, Inc. [AMD] Matisse/Vermeer Data Fabric: Device 18h; Function 2
- 00:18.3 Host bridge: Advanced Micro Devices, Inc. [AMD] Matisse/Vermeer Data Fabric: Device 18h; Function 3

- 00:18.4 Host bridge: Advanced Micro Devices, Inc. [AMD] Matisse/Vermeer Data Fabric: Device 18h; Function 4
- 00:18.5 Host bridge: Advanced Micro Devices, Inc. [AMD] Matisse/Vermeer Data Fabric: Device 18h; Function 5
- 00:18.6 Host bridge: Advanced Micro Devices, Inc. [AMD] Matisse/Vermeer Data Fabric: Device 18h; Function 6
- 00:18.7 Host bridge: Advanced Micro Devices, Inc. [AMD] Matisse/Vermeer Data Fabric: Device 18h; Function 7
- 03:00.0 USB controller: Advanced Micro Devices, Inc. [AMD] 400 Series Chipset USB 3.1 XHCI Controller (rev 01)
- 03:00.1 SATA controller: Advanced Micro Devices, Inc. [AMD] 400 Series Chipset SATA Controller (rev 01)
- 03:00.2 PCI bridge: Advanced Micro Devices, Inc. [AMD] 400 Series Chipset PCIe Bridge (rev 01)
- 20:00.0 PCI bridge: Advanced Micro Devices, Inc. [AMD] 400 Series Chipset PCIe Port (rev 01)
- 20:01.0 PCI bridge: Advanced Micro Devices, Inc. [AMD] 400 Series Chipset PCIe Port (rev 01)
- 20:04.0 PCI bridge: Advanced Micro Devices, Inc. [AMD] 400 Series Chipset PCIe Port (rev 01)
- 21:00.0 USB controller: Renesas Technology Corp. uPD720201 USB 3.0 Host Controller (rev 03). I think this is the USB 3 card I installed. I can use the extra USB ports.
- 22:00.0 Ethernet controller: Realtek Semiconductor Co., Ltd. RTL8111/8168/8411 PCI Express Gigabit Ethernet Controller (rev 15)
- 26:00.0 PCI bridge: Advanced Micro Devices, Inc. [AMD/ATI] Navi 10 XL Upstream Port of PCI Express Switch (rev c1)
- 27:00.0 PCI bridge: Advanced Micro Devices, Inc. [AMD/ATI] Navi 10 XL Downstream Port of PCI Express Switch
- 28:00.0 VGA compatible controller: Advanced Micro Devices, Inc. [AMD/ATI] Navi 24 [Radeon RX 6400/6500 XT/6500M] (rev c1)
- 28:00.1 Audio device: Advanced Micro Devices, Inc. [AMD/ATI] Navi 21/23 HDMI/DP Audio Controller
- 29:00.0 Non-Essential Instrumentation [1300]: Advanced Micro Devices, Inc. [AMD] Starship/Matisse PCIe Dummy Function

- 2a:00.0 Non-Essential Instrumentation [1300]: Advanced Micro Devices, Inc. [AMD] Starship/Matisse Reserved SPP
- 2a:00.1 Encryption controller: Advanced Micro Devices, Inc. [AMD] Starship/Matisse Cryptographic Coprocessor PSPCPP
- 2a:00.3 USB controller: Advanced Micro Devices, Inc. [AMD] Matisse USB 3.0 Host Controller
- 2a:00.4 Audio device: Advanced Micro Devices, Inc. [AMD] Starship/Matisse HD Audio Controller
- 31:00.0 SATA controller: Advanced Micro Devices, Inc. [AMD] FCH SATA Controller [AHCI mode] (rev 51)

One of these USB controllers supports USB 3. SATA is built into the motherboard. This machine runs mainly on SATA.

2.8 Case

A Corsair mid-sized ATX case of some sort. I cannot find a part number. It has two external slots for 3-1/2 drives, and controls on the front where my cats cannot step on them.

2.9 Power Supply

EVGA "supernova" 750B2. This is a 750W power supply, with cables long enough for the Corsair 780T case.

2.10 CD DVD and Blu-ray

- Blu Ray writer: LG model WH16NS40, ROM version 1.02. This is my third internal Blu Ray writer, replacing an ASUS model BW-12B1ST, whose case is nearly identical to the LG one.

2.11 SATA Controller

Built into the motherboard.

2.12 Sound Card

Built into the motherboard. Audio device: nVidia Corporation High Definition Audio Controller (rev a1)

2.13 Modem

U.S. Robotics external 56K Faxmodem, model number 5686E.

My motherboard no longer has a DE9 serial port. There is a serial port header, and I can apparently get a cable for it.

I am using a cable that converts USB to serial.

2.14 Keyboard and Mouse

My keyboard and mouse are from Logitech, and they are wireless. The part number on the keyboard is K350.

I keep a battery charger loaded with batteries. If my keyboard or mouse acts up, I replace the batteries. If I were administering a network at work, there would be no wireless keyboards or mice.

2.15 Video Card

As of 2022/07/23, I have bought an AMD Radeon RX 6500 XT, to replace my Nvidia GeForce GTX650. The Nvidia card worked completely without my installing the Nvidida drivers as I have done in the past. Unfortunately, it was ten years old, and it was crashing my computer.

The AMD card has cable connections for HDMI and DP. My old Nvidia card had a pair of DVI connectors.

Here is what all the initialisms mean...

SVGA	Super VGA – VGA means Video Graphics Array
DVI	Digital Visual Interface
HDMI	High-Definition Multimedia Interface
DP	DisplayPort

I failed to notice that my new motherboard has video connections. The AMD card probably is way better video.

2.16 Monitors

Samsung SyncMaster P2250 21" The resolution is 1920×1080. The VGA cable it came with was faulty. I use the HDMI cable. It has connections for SVGA and DVI.

Samsung CF391 Curved 32" The resolution is 1920×1080. It has connections for HDMI and DP.

2.17 Monitor Cables

This is surprisingly complicated. When you buy new video cards and monitors, the video connections are different, and you need new cables.

I have an additional constraint. I bring home a work laptop which I plug into my 32" monitor. The laptop has an HDMI connection.

I need...

Rev	DVI	to	HDMI	Samsung 21"
Rev	DP	to	DP	Samsung 32"
Work	DVI	to	DVI	Samsung 32"

2.18 Scanner

Epson Perfection V550 Photo. This is supported by `xsane`, and by Epson's (Avasys') `iscan`. The support is not very good, and it took a lot of Googling to get it working.

3 Installation

Before installing, I need to go into my BIOS and make sure my system is set to "UEFI Boot". "Legacy+UEFI Boot" was a disaster!

3.1 Planning

This machine is a desktop which lives in my computer room at home. I use email, web browers, office suites, graphics, simple CAD, and I do some coding of HTML, LaTeX and other languages.

3.1.1 Partitioning

I want to be able to upgrade my system without disturbing my working files, or any applications I may have installed. This mostly affects the way I partition the hard drives. Linux distributions can upgrade themselves by various means. These do not work perfectly. I want to separate the OS from my working files. I want to be able to blow away the OS partition and replace it with a new system, possibly something other than Fedora.[7]

Another concern is my ability to remove and replace drives. Any drive with the operating system on it cannot be removed. Don't scatter system files and directories over several drives. My `/archive` and `/backup` drives, listed below, are not critical for day to day operations.

[7] Ubuntu? If I get fed up with Linux, I can switch to FreeBSD , or Solaris . :)

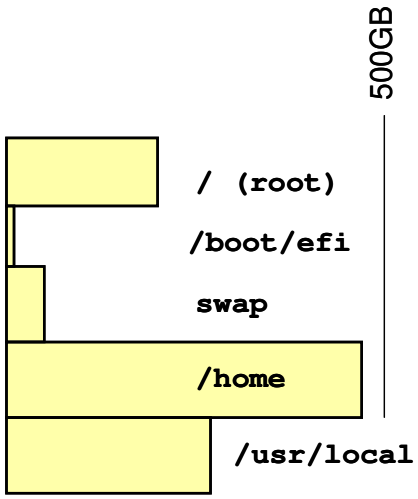

Figure 3: Disk Space – 1 Terabyte

My new SSD drive has half the capacity of my old disk drive. This is not a problem. The size of my `/home` partition is limited by my backup. My off-machine backup media is 50GB Blu-ray. I archive and catalogue my photo collection.

I had problems some time ago with Fedora 18 Their new disk formatting tools could not manage root and swap partitions separated by some other directory you were not willing to format. This was a problem on my laptop. Fortunately, my last install was from scratch, and Fedora formatted the drive, appropriately.

Drive	Partition	Size	Type
`/dev/sda`	`/data`	2TB	ATA ST2000DM001...
`/dev/sdb`	`/backup`	4000GB	ATA ST4000DM004...
`/dev/sdc`	`/archive`	2000GB	ATA WD2003FZEX...
`/dev/sdd`	`/`	200GB	ATA WDC WDS100T2B...
	`/boot/efi`	10GB	
	swap	50GB	
	`/home`	470GB	
	`/usr/local`	270GB	
	Total:	1000GB	

I bought the SDD because my `/dev/sda` drive was acting up. I don't trust it. It may get retired.

Once, way back in the prehistoric past, I would have kept a `/boot` filesystem within the first 512MB of the hard drive. For a long time, `/boot` partititons were not required. For the new GTP formatted drives, you need a `/boot` partition again. The install program implies that I need a `/boot/efi` partition.

3.1.2 Security

I used to connect my desktop to the internet through a 56K modem. I assumed that security was not an issue.

Back in 2003, just as I disconnected from the internet, I noticed that my hard drive was spinning frantically. I was running `top`, and I noticed that `egrep` was using up a lot of CPU and memory. I tried to use `ps`, but permission was denied. I logged in as root and I ran `ps` again, and I found the following line...

```
egrep -ri "mastercharge|visa" /home
```

This command scans through `/home` and prints out each line in each file containing the sequence "mastercharge" or "visa". The search is case insensitive.

I had been scanned and cracked. I had to reformat my OS partition and reinstall Linux.

There are several morals to this tragic little tale...

- I need a firewall. Fedora sets up a firewall at installation. Ethernet hubs and internet modems also have firewalls. You can go to Gibson Research (no relation), and look for his Shields Up program. This tests your firewall to see what responds to probing from the internet.
- If you have personal information on your computer, you should not regard it as secure. If someone breaks into your system, or if it is taken in for repairs, the files on your hard drive are accessible. Leave sensitive information off your computer. If you must keep information on it, encrypt it, and/or keep testing your firewall and make sure it works. Learn to do basic computer repairs, yourself. It is really not that difficult to replace drives, video cards and power supplies.
- If you are determined to store credit card data, yours or or anyone else's, encrypt the file. At the very least, do not include the text "Mastercharge" or "Visa" in the file with the actual credit card numbers. Note how the above search was case insensitive.
- If you have left your credit card number online with a vendor, all the above notes apply to them. Just how good is their security?
- My home directories were not on the root partition. When I reformatted the root partition, all my personal files were left intact. This made my cracking recovery a lot easier.

3.1.3 Backups

My backup plan is to write the `/home` partition to a file in the `/backup` directory, each day. This will be an archive of some kind. Periodically, I will write these

backup files to a disk of some sort. With CDs DVDs and Blu-rays, there is no need to write ISO9660 file systems to the CD-ROM. Any type of file can be recovered from disk, as long as you know what you wrote. There are security advantages to being obscure.

My current backup format is either compressed or uncompressed tar. If I keep archiving my photos, my backups fit within the 50GB Blu-Ray.

If I have to compress, I prefer to use gzip. Apparently, `bzip2` can lose a corrupt sector, but recover everything downstream of it. If gzip loses a sector, you lose everything downstream. Bzip runs very slowly. It will take a lot of time to recover individual files. I have not had problems with corrupt tar files as far as I can tell.

I have also used `dump`. I was warned that this backs up the actual filesystem. It you recover one of these backups onto another filesystem, you could be in for a disaster.

3.2 /usr/local

The `/usr/local` partition is a traditional feature of UNIX and Linux. This partition is used to install optional software, usually compiled from source code. When the operating system is upgraded or re-istalled, `/usr/local` is left untouched. A more recent concept is the `/opt` partition, often used for commercial software. Back in the day, Linux geeks compiled the kernel, and when they wanted to install some new application, they downloaded the source code, and they installed the executables and libraries in `/usr/local`. As applications get more complex, it gets more and more complicated to debug the Makefiles. Installation programs like `dnf` and `apt-get` are able to update stuff they have installed, including your kernel, and any applications you are relying on.

If you are not a dedicated UNIX/Linux geek, you need not bother with `/usr/local` or `/opt`. Alternately, you can make the partitions small.

3.3 Text Editing

This document is written mostly with the text editor `vim`, a version of `vi`. This is an extremely efficient and productive editor once you learn it, especially if you are a touch typist, like me. It is especially efficient with large documents, since you can navigate by doing the text seaches through the command line. It is the text editor of UNIX and Linux geeks everywhere. Unfortunately, it is mindbogglingly *not* user friendly.

Linux newbies need to try something else. You need a text editor that runs in a terminal session. You don't always have the X Window System running when you do administration.

The text editor `nano`, is available and strongly recommended. You navigate around the text file using the arrow keys, just like you think it should. It has a **CTRL** key menu at the bottom of the screen.

When you are told to edit configuration files, use `nano`.

3.4 Upgrading Fedora

This subsection is valid if you already have Fedora, version 21 on, installed. Otherwise, you must follow the instructions, below, to *install* Fedora.

It is now possible to upgrade any version of Fedora. Docs for this are up on Fedora's website. I am typing this stuff in as I follow the instructions. I don't use `sudo`. I am showing the hash symbol because I am logged in as root. This all was done 2017/09/01.

1. Back up all your data. I don't need to do this because my system automatically does them. Probably, you do need to do this.
2. Update your system:
   `# dnf upgrade --refresh` [8]
3. Install upgrade plug-in:
   `# dnf install dnf-plugin-system-upgrade`
4. Download packages:
   `# dnf system-upgrade download --refresh --releasever=26`
   Note how we specify version 26. There were notes on how to install unstable versions of Fedora, but we don't want to do that.

This was as far as I got. The process tried to sort out dependencies.

Package	Dependency
gnash-1:0.8.10-19.fc23.x86_64	libboost_date_time.so.1.58.0()(64bit)
libkdcraw-15.04.2-2.fc23.x86_64	libraw_r.so.10()(64bit)

Maybe if my system was a pristine Free Software machine this would have worked.

3.5 Root Access

On any UNIX OS, there are two ways to access the computer for system administration. You can log in as root, or you can use the command `sudo`.

Root is the super user. Root has read and write access to everything on the computer. Otherwise, root is a conventional account with password, and a home directory. In Fedora, this is `/root`. When you launch a terminal and log in as root, your terminal prompt changes from "$" to "#". When you are logged in as root, you are able to do serious damage to your computer.

To do system administration, you enter the command...

[8] I don't think this did anything. Updates only work two versions back. I was going from Fedora 23 to Fedora 26.

```
$ su -l
Password:
# nano /etc/passwd
```

You will be prompted for root's password. Once you type it in successfully, the prompt will change to "#", and you will have complete access to everything on your computer. When the "#" prompt is visible, be very, very careful.

The alternative to having a root account is to set your system up for Sudo. There is no root account. To perform system administration tasks, you go...

```
$ sudo nano /etc/passwd
```

In this case, you will be prompted for *your* password. Once you type this in, your terminal has all the powers of a root account. Be very, very careful.

The older Fedoras set up the root account. As of Fedora 29, it's `sudo`. Ubuntu and Macs set up Sudo.

In my notes that follow, any line starting with "#" is a command entered as root.

3.6 Installation

3.7 Booting and Installing

Boot the Fedora 38 DVD. You get the following menu.

- Start Fedora-Workstation-Live 38
- Test this media & start Fedora-Workstation-Live 38
- Troubleshooting

I already have tested the media, so I just started the install.

1. The system started up in the Gnome window. There was a Gnome control bar across the top of the screen. There was a window entitled "Welcome to Fedora" giving me the options either to "Install Fedora" or to "Not Now".
2. There is a cluster of icons on the right-hand side of the control bar. I clicked on this and I verified that I am connected to my wired network. I can connect to WiFi if I want. [9]
3. I clicked "Install to Hard Drive".

[9] I had problems making Fedora 23 connect to the network. I had no problems with Fedora 38. WiFi works better when you have a WiFi card.

4. The next window is "Welcome to Fedora 38". What language would I like to use during the installation? English (Canada)! I clicked **[Continue]** at the bottom of the page. [10]

5. The next window is "Installation Summary".

LOCALIZATION	**SYSTEM**
`Keyboard`	Installation Destination
`Time & Date`	

6. It takes a minute or so before you can click on anything. The `Keyboard` is set to ENGLISH (US). That is what my keyboard is, so I did not touch the setting.

7. `Time & Date` says "Americas/Toronto timezone".[11] This is correct, and there was no need to click on it. I did anyway. In the past, I had no problems clicking Toronto (Ontario) on the map. The timezone icon is located much closer to Huntsville, Ontario. I can select my city off a pull-down menu, but the selection is fairly limited. It is too bad if you live in a small town, or a small city for that matter. My timezone now is "Americas/Toronto timezone". An icon at the top right hand of my screen shows that Network Time is turned on. If I were not connected to the network, a window a the bottom of the screen would have told me I needed to set up networking if I want to use NTP.[12] A working network connection makes things way easier.

8. I clicked **[Done]** at the top left of the screen.

9. On this installation, I am replacing the OS, leaving my data directories (with all my data) intact. For installation onto a new hard drive, see the appendix, below. I clicked on `Installation Destination`, which is set to Automatic partitioning. The new screen shows the following drives...

Space	ID	Device
1.82 TiB	ATA ST2000DM001...	sda
3.64 TiB	ATA ST4000DM004	sdb
1.82 TiB	ATA WDC WD2003FZEX...	sdc
931.51GiB	ATA WDC WDS100T2BOB...	sdd

   Which drive is which?[13] Drive `sda` is a data drive. Drive `sdb` is my backup drive, Drive `sdc` is my archive drive. Drive `sdd` is the solid state drive where I install my OS.

10. I selected *only* `sdd`. I will set up the other drives later.

[10] It guessed that I am located in Canada. This is a good indication that the network is working.

[11] This behaves differently if the network is not running. Fedora used to not recognize I am in Toronto.

[12] NTP is Network Time Protocol.

[13] See the appendix for instructions on how to investigate mysterious drives.

11. I ignored the line "Specialized & Network Disks".

12. Under "Storage Configuration" I had three choices...

    - `Automatic`
    - `Custom`
    - `Advanced Custom (Blivet GUI)`

    I clicked `Custom`. I first saw the Blivet GUI on Fedora 33, I have since used it. As far as I can tell, it reformats all my partitions. This is precisely what I don't want to do.

13. I ignored the Encryption option. This is a desktop that stays at home![14]

14. I clicked [**Done**] at the top of the screen.

15. The "MANUAL PARTITIONING" window There is a large button called [**Btrfs**]. Change this to [**Standard Partition**].

16. At the bottom of the screen is a pink box indicating "AVAILABLE SPACE", and a grey box indicating "TOTAL SPACE". Above these boxes are buttons labeled "+", "-", and one with an undo symbol. I can use this to delete and add partitions. For this install, my partitioning will not change. I will just reformat a couple of them.

17. Here is my disk drive configuration...

Mount Point	Partion	Capacity	Label	Device Type
DATA				
/home	`sdd2`	437.72GiB	Home	Standard
/usr/local	`sdd3`	251.46GiB	UsrLocal	Standard
SYSTEM				
/boot/efi	`sdd1`	9.31GiB	BootEFI	EFI System
/	`sdd4`	186.26GiB	Root	Standard
swap	`sdd5`	46.57GiB	Swap	Swap

    You don't *need* to fill in the labels, but it makes your boot more robust when you swap drives.

18. I clicked [**Done**] again.

19. I was warned about all the partitions that were being formatted and reformatted. Fine. I accepted the changes. Fedora does nothing until I tell the main window to begin installation.

20. Back in the Installation Summary screen, I hit [**Begin installation**].

21. The install takes a bit over ten minutes on my SSD. The completion bar is highly non-linear.

[14] When I clicked `Custom`, the encryption option disappeared. I can encrypt at the next stage of install.

22. When it finished, I clicked [**Finish Installation**] to get out of the installer, then I rebooted the machine.

23. When I rebooted, I went into the BIOS and set the primary boot device to a hard drive. My BIOS is password protected. I don't want unauthorised people booting this thing with their devices.

On older Fedora installs, I was prompted for root's password, and a user account. It did not happen this time.

3.8 Booting for the first time

"Welcome to Fedora Linux 38!"

You are somehow logged in as the first user. Eventually, you will be prompted for your name, username and password.

I clicked on [**Start Setup**]

The "Privacy" window came up. I left "Location Services" and "Automatic Problem Reporting" turned on. I hit [**Next**].

The "Third-Party Respositories" came up. I hit the button. I plan to install this stuff.

The next window was "Connect Your Online Accounts". I skipped this. I will sort this out later.

"About You". I filled in my full name and my user name, and I hit [**Next**].

"Set a Password". I set one.

At "Set Complete", I hit [**Start Using Fedora Linux**].

3.9 Logging in for the first time

I logged out and then I logged in. Gnome 4 did not find my Gnome 3 configuration.

I pulled down the "Activities" menu and it displayed a list of buttons at the bottom of the screen...

Firefox web browser

Calendar

Files probably Nautilus

Software download more of it

Text Editor probably because Gnome is showing me my autorun setup.

Show Apps see all the apps installed on my system

There were no email tools installed. I strongly prefer to download my email and manage it locally. I will have to fix this. Gnome 4 found stuff attached to my user account, like Telegram.

When you use `sudo` for the first time, it gives you a warning message...

1. Respect the privacy of others.
2. Think before you type.
3. With great power comes great responsibility.

3.10 Firewall

Firewalld has improved since the first time I encountered it. To configure it, log in as root and...

```
$ sudo dnf -y install firewall-config
$ sudo systemctl enable firewalld.service
$ sudo systemctl start firewalld.service
$ sudo firewall-config
```

This brings up a GUI tool, and you can click on the services you are willing to run across your network. Since this is not a laptop, I am willing to allow stuff.[15]

The "Configuration", you should see the button [**Runtime**]. Make you changes. Change that button to [**Permament**], and make your change again.

If you do not know what it does and/or you do not need it, turn it off. On my laptop, I have turned off everything.

3.11 sshd

I want to do secure shell logins to my system from my laptop. I would never run this on my laptop, but my desktop sits behind a firewall. Now I can watch TV, and work on my computer.

```
$ sudo systemctl enable sshd.service
$ sudo systemctl start sshd.service
```

Make sure the firewall allows this.

[15] On a laptop that runs outside your home network, you need to disable everything and line your hat with aluminium foil. Damn the black helicopters!

3.12 Updates

```
$ sudo dnf -y update
```

This takes a while, especially if Wi-Fi is used.

3.13 Disk Configuration

Let's run `fdisk` and `df`. The command `fdisk` is a disk formatter. It requires root/sudo permission, and exteme caution. Note how `/dev/sda4` is a logical partition, containing the partitions `/dev/sda5` and `/dev/sda6`.

All `df` does is tell you much space you are using.

```
[howard@fedora ~]$ sudo fdisk /dev/sdd
[sudo] password for howard:

Welcome to fdisk (util-linux 2.38.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

This disk is currently in use - repartitioning is probably a bad idea.
It's recommended to umount all file systems, and swapoff all swap
partitions on this disk.


Command (m for help): p

Disk /dev/sdd: 931.51 GiB, 1000204886016 bytes, 1953525168 sectors
Disk model: WDC  WDS100T2B0B
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: 3ECAA65E-299F-4DE1-BA54-9BAC37E79B3F

Device          Start        End   Sectors   Size Type
/dev/sdd1        2048   19531775  19529728   9.3G EFI System
/dev/sdd2    19531776  937498623 917966848 437.7G Linux filesystem
/dev/sdd3   937498624 1464842239 527343616 251.5G Linux filesystem
/dev/sdd4  1464842240 1855465471 390623232 186.3G Linux filesystem
/dev/sdd5  1855465472 1953120255  97654784  46.6G Linux swap

Command (m for help): q
```

```
[howard@fedora ~]$ df
Filesystem     1K-blocks     Used Available Use% Mounted on
devtmpfs            4096        0      4096   0% /dev
tmpfs            4019760     6556   4013204   1% /dev/shm
tmpfs            1607908     4492   1603416   1% /run
/dev/sdd4      191134604  6816548 174536092   4% /
tmpfs            4019764       64   4019700   1% /tmp
/dev/sdd3      258423140  2312404 242910764   1% /usr/local
/dev/sdd2      450656976 97238040 330453384  23% /home
/dev/sdd1        9755288    17832   9737456   1% /boot/efi
tmpfs             803952      184    803768   1% /run/user/1000
/dev/sr0         2050246  2050246         0 100% /run/media/howard/Fedora-WS-Live-38-1-
[howard@fedora ~]$
```

3.14 Apache (httpd)

I want to run web pages from my personal account. Apache can be fairly easily made to offer up html files sitting in the user's `public_html` directory. Apache's default behavior is to not do this.

As of 2013Feb15, Fedora 18 installed httpd-2.4.3. The configuration files have changed a bit, and Fedora is not doing things exactly the way the Apache manual says.

The configuration file still is `/etc/httpd/conf/httpd.conf`. To activate user directories, Apache wants to uncomment the line...

```
#Include conf/extra/httpd-userdir.conf
```

This line is not in there anywhere. Nor is there a filesystem `extra`.

At the end of Fedora's `httpd.conf` is the heading `# Supplemental configuration`, and the text...

```
IncludeOptional conf.d/*.conf
```

My interpretation of this is that all the `*.conf` files in there are being read.

Let us edit `/etc/httpd/conf.d/userdir.conf`.

Search for the string `public_html`. There are two lines of code, separated by a few lines of comments as follows...

```
<IfModule mod_userdir.c>
    #
    # UserDir is disabled by default since it can confirm the presence
    # of a username on the system (depending on home directory
    # permissions).
```

```
    #
    UserDir disabled

    #
    # To enable requests to /~user/ to serve the user's public_html
    # directory, remove the "UserDir disable" line above, and uncomment
    # the following line instead:
    #
    #UserDir public_html

</IfModule>
```

You want to comment out `UserDir disable`, and uncomment `UserDir public_html` as follows...

```
    # UserDir disable
    ...
    UserDir public_html
```

Leave all the other stuff in, of course.

I enabled CGI scripts written in Perl.

Look below the UserDir section for the following lines...

```
<Directory /home/*/public_html>
   AllowOverride FileInfo AuthConfig Limit
   Options MultiViews Indexes SymLinksIfOwnerMatch IncludesNoExec ExecCGI
   ...
</Directory>
```

Add `ExecCGI` to the end of the `Options` if it is not already there.

Load `/etc/httpd/conf/httpd.conf`, and search for the line...

```
#AddHandler cgi-script .cgi
```

Uncomment it, and add `.pl` to the end of it so that we can execute Perl scripts.

I want to active a 404 error message for when people type in invalid web pages.

Edit `/etc/httpd/conf/httpd.conf`. There are a series of commented out lines starting "ErrorDocument 404". Add the following...

```
ErrorDocument 404 "Document not found!"
```

To activate httpd...

```
$ sudo systemctl enable httpd.service
$ sudo systemctl start httpd.service
```

To halt and restart httpd...

```
$ sudo service httpd restart
```

In the past, SElinux did not allow access to my `public_html`, but it's logging routine provided instructions for disabling this. There are instructions up on the internet for disabling SElinux. I reset it to permissive mode. I can still check the logs when I want.

3.15 Cron

To system for running administrative tasks automatically, you use `cron`. This used to just work. Now, I have to install it and activate it.

```
$ sudo dnf -y install cronie
$ sudo systemctl enable crond.service
$ sudo systemctl start crond.service
```

3.16 Other Hard Drives

My drives `/dev/sda1`, and `/dev/sdc1` are to be set up as `/data` and `/archive`, respectively. I need to edit the file `/etc/fstab`, and add the following to the bottom.

```
# Device  Filesystem Type Options   Dump?   PassNo
/dev/sda1 /data      ext4 defaults  0       1
/dev/sdc1 /archive   ext4 defaults  0       1
```

Then I need to update `fstab` and create the mount points...

```
$ sudo systemctl daemon-reload
$ sudo mkdir /data
$ sudo mkdir /archive
$ sudo mount /data
$ sudo mount /archive
```

When the machine reboots, these drives will be remounted automatically.

I have a backup script that creates the mount point and mounts my backup partition, unmounting when done. I am hoping that if someone hacks into my machine, they won't see any of this. Hopefully, they are not reading this article.

3.17 The system will suspend now

It had better not.

Gnome has set up its system to suspend after fifteen minutes of inactivity. It suspends completely. I found I was unable to do large software installs without the system suspending. This machine runs as a server here at home. The suspending seems to have prevented my backup from happening.

```
$ sudo mkdir /etc/systemd/sleep.conf.d
$ sudo vi /etc/systemd/sleep.conf.d/no.conf
```

The file could contain...

```
[Sleep]
AllowSuspend=no
```

When you are done, restart GDM...

```
$ sudo systemctl restart gdm
```

3.18 Extra Software

At this point, you have a GNU/Linux[16] operating system with a browser, email and an office suite. So far, so good. This might be all you need. There is a lot of extra software out there, some of which you might want. The following packages are things I insist on installing. Probably, you want some of these.

emacs vim Text editors. The `vi` editor is not user friendly. If you don't understand this, you need `nano`, which *is* installed by default by Fedora. Emacs is the original GNU text editor, originally written by Richard M. Stallman. Xemacs is a hacked version of it with more features, that has not been updated in quite some time. `vim` is a fancier version of vi.

dvd+rw-tools Command line tools for buring CDs, DVDs and BlueRays. I need this for my backups.

gimp Bitmap graphics. If you have a digital camera, you need the GIMP to fix and edit your pictures. Why is this not installed as part of the distribution?

[16]The Free Sofware people want this to be called GNU/Linux. Most of the software you have just installed is from GNU. Linux is just the kernal.

ufraw ufraw-gimp rawtherapee Manage raw files from your digital camera.

darktable Read raw files – remote control your camera. Professional photographers do this.

perl-Image-ExifTool.noarch ExifTool is another useful utility for processing graphics files. It allows you to attach metadata to your files. I use it in one of my scripts.

xsane GNU support for your scanner (or my scanner anyway).

xsane-gimp Integrate scanning with GIMP.

htop A process monitor fancier than top.

inkscape Another drawing program that may be interesting.

texlive* latex2rtf xfig transfig pstoedit latex2html This is the Fedora distribution of LaTeX the text preparation language, used among other things, to prepare this document. Xfig is a nice vector graphics program in its own right. Pstoedit converts PostScript files to Xfig format, among other things. and `htlatex`, part of the tetex package, does.[17]

xreader file reader that works well with LaTeX.

libreoffice-base Libre Office database. This is required for mail merge. Why is this not installed as part of Libre Office?

linuxdoc-tools This gives me `sgml2html`. I need this for an article on my website.

librecad This is Free Software CAD that writes DXF files. There is commercial Freeware[18] out there, but these could be discontinued at any time. Do not rely on it. LibreCAD is not suitable for commercial work, but it is fine for home projects.

openscad 3D CAD of some sort. I have not tried it yet.

freecad 3D parametric CAD!

blender 3D design program.

sylpheed My favourite email program. I started using this because it works well offline, an issue for me at the time. I am kind of stuck with it because it uses the `mh` format, rather then the more popular `mbox` format files. I *like* plain text email.

thunderbird evolution More email programs. Why are these not installed by default?

[17] I used to install the `tetex` distribution, but it no longer seems to work.

[18] *Freeware* is free as in free beer, but otherwise, commercial software. *Free Software* is free as in free speech, although it tends to be free, as in free beer.

xpdf A small, faster, more secure PDF reader. Adobe Acrobat is no longer available for GNU/Linux.

okular Document reader – PDF PS and all sorts of other things. It allows annotation.

pdfgrep Use grep to search through PDF files.

epiphany midori lynx seamonkey icecat Alternate browsers. Epiphany and Midori are small, fast browsers. Lynx is a text based browser. Seamonkey is the complete web package put out by Mozilla. Icecat is a GNU approved gekko browser.

freeglut-devel gcc-c++ libpng-devel yasm netpbm Software development tools.

indent Fix the indenting of your software source files.

flex *gtk-devel* glew-devel imake libsoup-devel Programming tools

ftp gftp File Transfer Protocol – useful for updating websites. `ftfp` is a GUI version of this. I find it amazing that `ftp` is not installed by default on a Linux box!

filezilla This is FTP with secure shell protocol

abiword Smaller word processor.

gnumeric Smaller spreadsheet.

alpine Command line email tool (`mbox` format). This comes with the text editor `pico`.

lxterminal `pcmanfm` wants to run this.

octave A cool and very useful math program. Gnuplot is a dependency, so this is installed too.

audacity Sound processing

k3b brasero CD/DVD/Blu-Ray burning

efax Every once in a blue moon, I send faxes.

aspell aspell-en Spelling checker and English dictionary

tnef Extract files from Microsoft TNEF email attachments.

minicom Terminal program for my telephone modem

wings 3D modeller

asunder CD ripper

FlightGear wesnoth freeciv Games. What fun!

nmap Security tool.

android-file-transfer android-tools I have an Android cellphone. Actually, the problem is that you have to locate the USB configuration, and turn on file transfer. Now, your file managers work!

pulseaudio-libs-devel alsa-lib-devel glew xa svn byacc needed to compile `vice`, "the versatile Commodore emulator".

libXt-devel libXaw-devel mesa-libGLw-devel I want to compile and install the FEA program Felt. I need these libraries. I had to edit the source code a bit to do the install.

strace This is a useful debugging tool.

To get YouTube and other videos working on Firefox, you need to...

```
$ sudo dnf install gstreamer1-plugins-{bad-\*,good-\*,base} \
  gstreamer1-plugin-openh264 gstreamer1-libav \
  --exclude=gstreamer1-plugins-bad-free-devel
```

You can install all of this with one call of `dnf`...

```
$ sudo dnf -y install nano emacs vim gimp ...
```

Find something else to do for a couple of hours. Find something else to do for quite a few hours if you are doing a wireless install.

Locate an rpm for `epstopdf` and install it. I use this with LaTeX.

I went to Google and I downloaded and installed Google-chrome. This no longer is available for 32 bit machines, but Rev is not a 32 bit machine!

I also downloaded and installed Vivaldi, and Brave Brower, a couple more web browsers.

3.19 Not Free Software

Please read the sections above on Free Software. A big benefit of Free Software is that your data is stored in an open format. If your personal files are stored by a proprietary program in a proprietary format, it's not really your data, is it?

Free Software is a good thing, but sometimes we are determined to read proprietary files. Google "rpmfusion". There are free repositories which are okay. There are not-free repositories which are less okay. I installed both rpmfusions, then I installed the following...

xine Video program for Linux (available again).

gxine User friendly front end for xine.

lame MP3 encoder for Linux

unrar Unpack proprietary `rar` archives.

Linux kernels from 5.4 on, support Microsoft exfat file systems. There is no longer a need to add software for this.

The programs `xine` and `gxine` are no longer available. The approved GNU/Linux player seems to be `totem` which is installed as part of the OS.

3.20 /opt

This is some sort of an alternative to `/usr/local`. I used to symbolically link this to `/usr/local`.

3.21 Interesting stuff I have selected in the past

I can grab these using `dnf`.

gpsd A GPS server for mediating access to a GPS. Also, look into gypsy.

gonvert Units conversion utility.

kdm I don't like Gnome's display manager.

kbibtex A BibTeX editor for KDE.

koverartist Create CD/DVD covers

conglomerate Extensible XML editor

kile (La)TeX source editor and TeX shell

ooo2txt Convert OpenOffice documents to plain text

ipe A vector graphics program

pinta An easy to use drawing and image editing program

sK1 An advanced vector graphics editor

cssed CSS editor and validator

TeXmacs Structured scientific text editor

geomview Interactive 3D viewing program

gnucap The GNU circuit analysis package

plotutils GNU vector and raster graphics utilities and libraries

tgif 2-D drawing tool

xcircuit Electronic circuit schematic drawing program

ntop A network traffic probe similar to UNIX top command

htmldoc Converter from HTML into indexed HTML, PostScript or PDF.

youtube-dl Small command-line tool for downloading videos from YouTube.

3.22 Window Managers

On a GNU/Linux desktop, the operating system boots. The X Window System is launched, then a Window Manager is launched. X11 provides the graphical screen and the mouse. The window manager provides the actual user interface. With multiple window managers, GNU/Linux can be made unrecognizable from one login to the next. What fun!

I do not like the eye candy of Gnome and KDE. It looks cool, but it takes memory and CPU cycles away from my applications. GNU/Linux is a popular way to keep older computers running. Smaller, faster window managers are good.

A good reason to install several window managers is that they all have their own utilities, some of which work better than others.

3.22.1 Gnome 3 and 4

I hate it. This is one of the reasons I install everything else.

The objective of Gnome 3 is to unclutter everyone's desktop. I am not sure this is a problem. Some people like to work this way. If they get their work done, who cares? Meanwhile, it seems to take a maximum number of mouse clicks to get from one application to another.

Also, I do not like eye candy. Most of the time, you use the user interface to locate your files and launch applications. Any resources consumed by the window manager are not available for your application. This could be a problem if your application is a resource hog.

If you do not have Gnome installed on your Fedora machine, do this...

```
$ sudo  dnf -y group install "Fedora Workstation"
```

3.22.2 KDE

I have never liked KDE much. I don't like excessive eye candy. I never found the interface to be all that intuitive, although I might, if I used it more.

```
$ sudo dnf -y install @kde-desktop
```

There is nothing called KDE in the list of desktops you select from the GDM window. Look for "Plasma".

3.22.3 XFCE

XFCE is a "lightweight" desktop environment. Its behaviour will be familiar to traditional Microsoft Windows users. It loads quickly. If you are not a dedicated GNU/Linux geek, I strongly recommend this.

```
$ sudo dnf -y install @xfce
```

3.22.4 FVWM

This is my favourite window manager. I have been running it since 1996, and I have it working exactly the way I want it to.

```
$ sudo dnf -y install fvwm stalonetray gkrellm blueman xclock xload
```

I use `stalonetray` to embed Gnome and XFCE applets in FVWM's buttons. Gkrellm is a system monitor I can embed in FVWM's buttons.

3.22.5 LXDE

I like LXDE because I use its file manager, PCmanFM, in FVWM.

Like XFCE, it is a small, fast window manager that behaves a lot like a Microsoft Windows PC.

```
$ sudo dnf -y install lxde-common
```

3.22.6 Cinnamon

Cinnamon is the old Gnome 2 interface, which I always liked.

```
$ sudo dnf -y install @cinnamon
```

3.23 Login Window (Display Managers)

3.23.1 GDM Login (Preferred)

Username display is unacceptable. I investigated, and found out how to turn off user display on GDM. It used to not be possible to do this, which is why I got interested on alternate display managers. I got the following from the help files on `http://www.gnome.org`.

1. Create the GDM profile `/etc/dconf/profile/gdm`, with the following...

   ```
   user-db:user
   system-db:gdm
   file-db:/usr/share/gdm/greeter-dconf-defaults
   ```

2. If necessary, create the directory `/etc/dconf/db/gdm.d`.[19]

   ```
   $ sudo mkdir /etc/dconf/db/gdm.d
   ```

3. Create the keyfile `/etc/dconf/db/gdm.d/00-login-screen` containing the following...

   ```
   [org/gnome/login-screen]
   # Do not show the user list
   disable-user-list=true
   ```

4. Exit any applications you are running. When you restart GDM, you will be logged out.

5. Update the system databases, and restart GDM...

   ```
   $ sudo dconf update
   $ sudo systemctl restart gdm.service
   ```

They used to have a convenient graphical tool that did this.

The original display manager, XDM, is still available to be downloaded and run, but it is absolutely basic, allowing you only to login. There is no control over your window manager, or over rebooting and shutting down.

[19] This directory exists on Fedora 38.

3.23.2 SDDM Login (If GDM doesn't work)

GDM can have problems with Nvidia cards. If you have an Nvidia card, you may *have* to run SDDM.

Open SDDM's configuration file `/etc/sddm.conf`, for editing. Select a theme that does not display the user list

```
[Theme]
# Current theme name
#Current=01-breeze-fedora
Current=02-fedora               # Use this theme!
#Current=breeze
```

To restart SDDM, exit any applications you are running[20] and...

```
$ sudo systemctl restart sddm.service
```

The theme itself is configured by a file in `/usr/share/sddm/themes`. When I used this on my desktop, I replaced the background graphic.

3.24 NVidia Video Card

I have a long history of problem making my NVidia card work. This time, I installed FlightGear and it worked! If it ain't broke, don't fix it.

3.25 NFS

On my home desktop, I want to share file systems. Let us pretend for the moment that my shared file system is called `/lone/ranger`. Maybe it is! Who knows?

First, we need to export the file system. I only want to export it to my laptop `Lenovo` with permission to read and write. Edit `/etc/exports`.

```
/lone/ranger   Lenovo(rw)
```

Second, we need to tell Linux that the file is to be exported. Log in as root and run...

```
$ sudo exportfs -av
```

[20] Restarting the display manager logs you out.

This exports everything in your `/etc/exports` file in verbose mode. You should see a list of the file systems exported.

Firewall configuration is explained elsewhere in this document. You need to allow NFS sharing.

Update the file `/etc/idmapd.conf`. Find the line starting with `#Domain`. Uncomment it and add your domain name as follows...

```
Domain = Rev
```

Now, start it...

```
$ sudo systemctl start rpcbind nfs-server
$ sudo systemctl enable rpcbind nfs-server
```

NFS should work now. If it does not, check your firewall again.

3.26 Fortune Cookie

It ain't *NIX if there is no joke printed at the opening of each command shell.

If worst comes to worst, this is installable from a command line terminal, such as the Gnome terminal. Fedora 38 installs Fortune!

Red Hat (Fedora)	Debian (Ubuntu)
`$ sudo dnf -y install fortune-mod`	`$ sudo apt -y install fortune-mod`
I activated the fortune cookie by adding the following lines to the very bottom of `/etc/profile`	I activated the fortune cookie by adding the following lines to the very bottom of `/etc/profile`

`$ sudo nano /etc/profile`
`FORTUNE=/usr/bin/fortune`
`if [ -x ${FORTUNE} ]; then`
`  ${FORTUNE}`
`fi`
	`$ sudo nano /etc/profile`
	`FORTUNE=/usr/games/fortune`
	`if [ -x ${FORTUNE} ]; then`
	`  ${FORTUNE}`
	`fi`

Make sure you scroll all the way to the bottom of `/etc/profile` before typing anything in.

The terminal that is launched by Gnome does not automatically run the Fortune Cookie. Pull down the edit menu. Select Preferences. Select Profiles. You should see highlighted a profile called "Unnamed". Click the Edit button. Select Command. Ensure you have highlighted the button "Run command as a login shell".

It will be worth it.

3.27 Development Tools

Fedora 38 comes *without* development tools! I find this incredible. Linux without even the GNU C compiler? GNU `make` gets installed, but not any compilers.

```
$ sudo dnf -y group install "Development Tools"
$ sudo dnf -y install gcc-c++
```

3.28 Services

Up until now, Fedora's tool for managing services has been `system-config-services`. This allowed you to log in as root, turn stuff on and off, and make things turn on at boot.

No more.

You can still turn things on and off. Boot services are configured from the command line as follows...

```
# systemctl enable httpd.service
# systemctl enable network.service
```

3.29 Networking

I was not prompted for my computer name while installing.

```
$ nano /etc/hostname
```

My computer is named "rev". Change `localhost.localdomain` to `rev`.

The network was configured by my install program. I added my printer to `/etc/hosts`, so that I could call it `WF3720`.

3.30 Games

It turns out you can search, using dnf.

```
$ sudo dnf -y search game
```

You also can search through the software package manager.

3.31 Multimedia

Linux and Fedora are Free Software . Most multi-media formats are proprietary. The primary problem with multi-media on Linux is the ideological assumption that you should not have non-free software on your computer. If you are determined to run only Free Software, your multi-media experience will be limited.

If this is less important to you, you can search the internet for "Fedora notfree software". This reveals sites that tell you what to install. It also reveals Fedora's page telling you why many packages are not included with their distribution.

For Fedora, `xine` and `gxine` play most commercial DVDs. When you install these, you get `ffmpeg` and `lame` as dependencies.

I have installed Adobe Flash back in the past, but this is buggy, no longer supported by Apple, or Google Chrome. Don't bother.

3.32 Printer Configuration

I now have an Epson WorkForce Pro WF-3720. This is a combined printer, scanner and fax. I just wanted a printer,[21] but this is what was available for a reasonable price.

You can check your printers from a command line.

```
[howard@rev RevLinux]$ lpstat -t
scheduler is running
no system default destination
lpstat: No destinations added.
lpstat: No destinations added.
lpstat: No destinations added.
lpstat: No destinations added.
[howard@rev RevLinux]$
```

Under FVWM, Gnome Control Center will not give me sudo access. I have to launch it from the command line.

```
$ sudo gnome-control-center
```

Now, I can scroll down the menu on the left hand side, and look for printer configuration.

Under Fedora 36, the control centre pops up with a configuration for the printer it found on my network. It is called `EPSON_WF_3720_Series`. Pretty cool! It does not seem to do anything. Let's add a printer.

[21] I have a fancy scanner that digitizes 120 film. I can send faxes through my modem, which I have not turned on in a very long time.

1. Click on [**Add Printer**].
2. When the window comes up, it should see your printer. When I did, I got...
   - WF-3720
   - CUPS-BRF-Printer
   - WF-3720 Address EPSON WF-3720 Series_ipps_tcp.local

   I clicked on the third choice and I clicked [**Add**].
3. The system searched for driver and it added the printer! I can now see two configured printers...
   - EPSON_WF_3720_Series
   - WF-3720
4. On the `WF-3720` configuration, I clicked on the circley, sunny icon, and I selected `Printer Details`.
5. When the window "WF-3720 Details" came up, I changed the name to `lpr`. A lot of old GNU/Linux applications assume your default printer is named `lpr`.
6. My printer is in my computer room for some reason.

I can stop and restart the printer as follows...

```
$ sudo systemctl halt cups.service
$ sudo systemctl start cups.service
$ sudo systemctl restart cups.service
```

The scanner works. From a command line, type...

```
$ ls -l /usr/bin/*scan*
```

The command `simple-scan` finds the printer, and uses the loading tray to scan multiple page documents into PDF. You will have to play with the other stuff.

3.33 Scanner

I want my Epson V550 Perfection to work.

Epson scanners are recognized by `sane`, but Epson has official drivers. Xsane's GIMP connection is very sophisticated, and I really ought to learn it.

```
$ sudo dnf -y install xsane xsane-gimp
```

Epson's `iscan` seems to be obsolete. Now, I am supposed to download "Epson Scan 2".

```
epsonscan2-bundle-6.6.42.0.x86_64.rpm.tar.gz
```

This looks weird. `rpm` is a distribution format, and `tar.gz` is a distribution format. Let's examine the `tar.gz` file, then unpack it.[22]

```
[howard@rev ~]$ tar ztvf epsonscan2-bundle-6.6.42.0.x86_64.rpm.tar.gz
[howard@rev ~]$ tar zxvf epsonscan2-bundle-6.6.42.0.x86_64.rpm.tar.gz
```

What you get is a distribution directory containing your `rpm` files, plus an install script.

```
[howard@rev mess]$ cd epsonscan2-bundle-6.6.42.0.x86_64.rpm
[howard@rev epsonscan2-bundle-6.6.42.0.x86_64.rpm]$ ls -l
total 16
drwxr-xr-x. 2 howard howard 4096 Jul  4 03:23 core
-rwxr-xr-x. 1 howard howard 7396 Jul  4 03:01 install.sh
drwxr-xr-x. 2 howard howard 4096 Jul  4 03:23 plugins
[howard@rev epsonscan2-bundle-6.6.42.0.x86_64.rpm]$ sudo ./install.sh
```

Note how I like to download stuff into a directory called `mess`.

The command `epsonscan2` finds the scanner and scans stuff. There is no integration with GIMP. I will have to learn `xsane`.

[22] Always examine `tar` files before unpacking. Usually, they unpack into subdirectories. This is good. Sometimes, they unpack into your current working directory, which can be messy if there already is a lot of stuff there.

3.34 Modem

We need `wvdial`. To search for a modem...

```
$ sudo dnf -y install wvdial
$ sudo wvdialconf /etc/create
```

This locates the modem,[23] then it creates a configuration file for it. My modem is at `/dev/ttyUSB0`. I created the group `dialout`, and I have assigned authorized users (me) to it. I have assigned the modem to it.

```
$ sudo chgrp dialout /dev/ttyUSB0
$ sudo chmod 660 /dev/ttyUSB0
$ sudo minicom -s
```

You need to tell `minicom` where the modem is.

3.35 /usr/local/src

I want to provide controlled write accesss to `/usr/local/src`. this makes it easier to install software from source, and keep the source distribution online with any modifications I had to make to get it to compile.

I change the group ownership of the directory of `prg`, and I turned on the sticky bit, so that anything written to the directory would belong to `prg`.

```
# chgrp prg /usr/local/src
# chmod 1775 /usr/local/src
```

Now, I need the `/usr/local/lib` directory to be included in the library search path. I need to configure and run `/sbin/ldconfig`.

Create the file `/etc/ld.so.conf.d/usrlocal.conf`. Add the line...

```
/usr/local/lib
```

Issue the command...

```
$ sudo /sbin/ldconfig -v
```

[23] This works better if the modem is turned on.

A Installing Fedora on New Hard Drive

For most Linux installs, I reformat and re-install the root and the swap partitions. The remaining partitions contain valuable data, and I do not want to touch them.

- I clicked on INSTALLATION DESTINATION, which is set to Automatic partitioning. No way! The new screen shows the following drives...
  - 1.82TiB ATA ST2000DL003-9VT1 sda
  - 465.76GiB ATA WDC WD5000AAKX-0 sdb

  Drive `sda` is where I will install Fedora. Drive `sdb` is my archive drive.
- I selected `sda` and `sdb` by clicking on them. I will sort out my backup drive later.
- I ignored the line "Specialized & Network Disks".
- Under "Storage Configuration" I had three choices...
  - `Automatic`
  - `Custom`
  - `Advanced Custom (Blivet GUI)`

  I clicked `Custom`. The Blivet GUI is something new.
- I ignored the Encryption option. This is a desktop that stays at home!
- I clicked [**Done**] at the top of the screen.
- The "MANUAL PARTITIONING" window showed me two headings, "New Fedora 26 Installation", and "Unknown". Under "Unknown", it showed `ext4`, `sdb1` with 3.64TiB space, and `ext4`, `sdc1` with 465.76GiB space. I panicked when I did not see drive `sda`, but nothing on it has been formatted. It *is* there. Ha ha ha.
- At the bottom of the screen is a pink box indicating "AVAILABLE SPACE", and a grey box indicating "TOTAL SPACE". Above these boxes are buttons labeled "+", "-", and one with an undo symbol. In the middle of the screen is a pull-down button labeled "LVM". I can use this to define a different type of default partition. I can set this on each individual partition, and that is what I will do.
- Start defining partitions by clicking on [+]. A window pops up with entries for "Mount Point", and for "Desired Capacity". I set up the following partitions...

Mount Point	Desired Capacity	Label	Device Type
/	200GB	Root	Standard Partition
swap	60GB	Swap	Standard Partition
/home	1200GB	Home	Standard Partition
/usr/local	540GB	UsrLocal	Standard Partition
/archive	2000TB	Archive	Standard Partition

You don't need to fill in the labels, but it makes your boot more robust when you swap drives. The partitions were assigned automatically.

- I set `sdc1` to `/archive`.

Mount	Partition	Size	Format?	Device Type
DATA				
/archive	sdb1	1.82 TiB	yes	
/home	sda1	1.09 TiB	yes	LVM
/usr/local	sda2	502.91 GiB	yes	LVM
SYSTEM				
/	sda3	186.26 GiB	yes	Standard Partition
swap	sda5	55.88 GiB	yes	swap

B Blivet Installer

Finally I tried the Blivet GUI disk partitioner. It provides a far clearer picture of your partitions, particularly the extended partitions. The standard Anaconda partinioner does not show this, and you cannot see how it is assigning partitions. The boot partion `/boot/efi` must be a primary partition. Anaconda did not indicate this point in its error messages, and I was unable to do this install. From Blivet, I was able to see what I was doing, and make everything work. Unfortunately, I was unable to tell Blivet to *not* reformat mounted partitions. My `/home` and `/usr/local` partitions got reformatted. Fortunately, I do backups.

From Blivet, I made a point of *not* mounting my backup and my archive drives. Reformatting these would have been a disaster, altough I had copied my latest `/home` partition ot Blu-Ray.

If you do not understand disk partitioning, you need an external USB drive to save all your files during a re-install.

C Checking mysterious hard drives

While you are starting your install, you can investigate mysterious drives, to see if there are partitions and data on them. Note how I have two drives, identifed as `sda` and `sdb`.

1. Hit **[Ctrl]** **[F3]** to get a command line terminal.

2. At the login prompt, type `root`, then hit [**Enter**]. This gives you a root shell, with a command line prompt ending in a "#".

3. Let's start by looking at drive `sda`. At the root prompt, very carefully [24] type

```
# fdisk /dev/sda
```

4. If your drive is not formatted, you will get an error message. Otherwise, at the prompt, type "p". This will show you the partition table of the drive.

5. Hit "q" to exit fdisk.

6. Let's assume you saw a partition you are curious about. Let's assume it is `/dev/sda2`

```
# mkdir /testing
# mount /dev/sda2 /testing
# ls /testing
# umount /testing
# exit
```

7. Hit [**Ctrl**] [**F1**] to get back into the X Window system, and your install program.

I am not sure how intelligent the mount command is. Hopefully, it identifies non-Linux partitions and mounts them. I had no Microsoft partitions to test with this.

D Fedora Networking

As of Fedora 23, networking has been a pain in the butt! My ethernet and my wireless connections appeared to be working. I could see the networks, including all sorts of wireless servers, including mine. The system simply would not connect. There is all sorts of stuff up on the internet about the Realtek RTL8111/8168 ethernet chip. Much of this goes back to Fedora versions prior to ones that worked fine for me.[25]

I have solved the problem, at least for my machine. I am not sure I understand the problem. On my KFedora installation, I select network configuration. I click

[24] Be very, very careful with fdisk. This command's job is to create and destroy disk partitions. Probably, you don't want to do this.

[25] Fedora 20.

on my desired network, preferably Ethernet. I click on [**IPv4**]. On KFedora, the relevant line is "Method". On my Fedora 22 laptop, the line is called "Addresses". This defaults to the selection [**Automatic (DHCP)**]. Change this to [**Link-Local**].

Once I have Fedora installed, this should be set to [**Automatic**]. Damn!

E Fedora Partitioning

Fedora recommends the following scheme for Fedora 23...

Mount	Size	Partition
/boot	500MB	EFI
/	10GB	ext4
/home	10GB	ext4

There is a lot of stuff on swap partitions. How about 10GB?

These all are minimums.

Lots of people, including me, create `/usr/local` partitions. These allow you to install software somewere outside the operating system partitions. You can reformat the operating system partitionl, and leave your installed software alone. This is particularly useful if you are installing software from source code.

If you replace your computer and drives annually, you can follow Fedora's instructions. If you plan to keep your computer for a few years, plan on upgrades, and larger partitions. Here is my partition scheme from back in 2007...

```
[root@rev howard]# df
Filesystem           1K-blocks      Used Available Use% Mounted on
/dev/hde1             14802404   5662284   8376060  41% /
/dev/hdf1              6198404   4578956   1304576  78% /backup
tmpfs                   298764         0    298764   0% /dev/shm
/dev/hde3             10078852   2062248   7504616  22% /home
/dev/hde2             10078852   5448296   4118568  57% /usr/local
/dev/hde6              2419788    230140   2064748  11% /var
[root@rev howard]#
```

Fedora's insistence on a `/boot` partition is new as of Fedora 23.

F Sudo

There are two ways to administer UNIX/Linux. You can have a root account, or you can use `sudo`.

Historically, UNIX type systems are installed with a super user account called `root`. This account has complete write access to everything on the computer. This is dangerous. Good practise is not use this account for anything other than system administration. When you are logged in as a regular user, your ability to damage your system is drastically reduced.

When you open any sort of UNIX/Linux terminal or shell, you are prompted by a text string ending in a dollar sign, $.[26]

When you log in as root, the prompt changes to a pound sign, #, also called a hash sign in the computer world. This is a sign of danger. The hash sign says you are root, and that you can trash the system if you are not careful.

An alternate approach for all this is to *not* have a root account. A group of users are designated as administrators. To issue a root command, they go...

```
$ sudo nano /etc/group
```

The system prompts for the *user* password. The resulting increased access continues for several minutes.

This is used on MacOS, Ubuntu and now, Fedora. I would prefer to keep the root account. When I am logged in as root, I can see the hash sign, and I know there is a threat. On a single user machine, like mine, `sudo` makes administration easier, and reduces the number of strong passwords I need to track. This may be one of those six of one, half dozen other issues.

G libc5

My libc5 notes are obsolete, because I did not install libc5. They are kept here for reference only. Do not toss out your old Linux install media. Do not use them unless you have to.

When you run a number of old applications and tools, they exit with the error "file not found". This can be caused if libc5 is required. this is not installed on Red Hat 7 and up. As of Red Hat 8, I am not bothering to install it.

Libc5 can be useful. If you have WordPerfect 8 or openwin installed, you need it.

For Red Hat 7.2, I located and installed the following rpms...

```
ld.so-1.9.5-11.i386.rpm
libc-5.3.12-31.i386.rpm
```

[26]The command line prompt is configurable. Fedora's current default is to show the user name, the computer name and the current directory. If you want to change this, you will have to read up on it.

The `ld.so` rpm is required as a dependency of `libc-5.3.12-31`

Now, you must open up `/etc/ld.so.conf`, and add the line...

```
/usr/i486-linux-libc5/lib
```

...to the end.

Run `/sbin/ldconfig -v` to set up the library path.

H Disasters

I sometimes have one of these with a Linux install of new hardware.

When I installed Fedora 38 on my laptop, it went without a hitch. When I installed Fedora 38 on my desktop, the system would not boot. I saw the BIOS screen, and then nothing. I set the BIOS up to boot from the hard drive first, and then the optical drive. When I left the install DVD in the drive, it booted. I Googled problems with Fedora 38 boots, but I saw nothing interesting. I then decided to install *only* my primary SSD drive `/dev/sdd`. I will install my other drives by updating `/etc/fstab`. The installer announced that I needed a "BIOS Boot" partition.

I searched through my BIOS settings. Somehow, I switched a parameter from "UEFI Boot" to "Legacy+UEFI Boot"! Aaaaarrrgh!

My install of Fedora 36 was messy. Fedora 36 requires a `/boot/efi` partition. I was able to create one by deleting the swap partition, and then creating `/boot/efi` and a new swap. The system when most of the way through the installation, then it reported that the `/boot/efi` did not work.

The boot `/boot/efi` partition must be a primary partition. The standard Anaconda disk partitioner creates extended partitions, but it does tell you or otherwise indicate anything.

I tried the Blivet GUI. The Blivet partitioner *does* show primary and extended partitions. I was able to reorganize everything with `/boot/efi` as a primary partition. I was *not* able to accept partitions without reformatting them. Luckily, I suspected Blivet would reformat everything, and I did not allow it anywhere near my other drives, containing my backups and my archives.

Shortly after I installed Fedora 33, I noticed that my computer was running very, very hard. I logged in, opened a terminal. and I ran the command `top`. This revealed something called `baloo`, which was building some sort of file database. I Googled this to find out what was going on, and I determined that `baloo` was a part of KDE. The web page recommended killing it with...

```
$ balooctl disable
```

Note how I did not use `sudo`. I owned the process. I have no idea of how it started. The next day, I looked at my backup, and I found that my latest one was six gigabytes bigger than my previous one. I did a search for enormous files less than a day old...

```
$ find ~ -type f -mtime -2 -size +10000 -ls
```

I found something called `./.local/share/baloo/index` which turned out to be over eighteen gigabytes in size. I was compressing my backup at the time, so this makes sense. Whatever `baloo` was doing, it was not worth the CPU cycles and the disk space. I deleted the index, and the `baloo` directory. If weird things are happening, `top` shows your processes in order of CPU time. The command `find` does a whole lot of stuff. This is described in my *Unix Command Line HOWTO*, and by its `man` page.

When my 4TB hard drive failed, it took most of my SATA down with it. When I tried to boot, I got the message "Loading Operating System ...". Everything worked when I unplugged the drive. Fortunately, it was my backup drive, and the system booted without it. Had it been my system drive, I would have had backups to recover.

When my 2TB hard drive failed, I bought a Western Digital WD2003FZEX-0. This turned out to be configured for GPT, a format not supported by my motherboard. This is similar to my 4TB drive, noted below. When I finished installing and I rebooted, the boot screens came up, then it said "Loading Operating System ...", them it stopped. After many, many hours of frustrated hacking around, I purchased a Seagate "Desktop HDD". This worked fine. See my notes above on MBR and GPT .

When I first tried to install Fedora 23, Anaconda rejected my partitioning scheme, insisting that I needed a `/boot` partition. I tried to create a `/boot` partition, but nothing worked. I was very frustrated. I Googled and posted on the GTALUG forum. There was a lot of stuff about MBR versus GTP partitioned disks. At the time, I had a 2TB drive for my working files, a 500MB drive as an archive, and a brand new 4TB drive as a backup. The 4TB drive was GTP partitioned. I unplugged it, and Anaconda treated my system as MBR, and I was able to install.

I had fun connecting to the network, as noted above, under networking.

When I first installed Fedora 12, it would not boot. The BIOS message came up, the all I saw was a gray, flashing cursor. There was no sign of Linux. I had already installed Fedora 10 on this machine.

I put a message up on the Toronto Linux User Group message base asking about this. Someone replied that the machine probably was confused about which hard drive was to have the bootloader. I needed to disconnect my old IDE drive during the install process.

Eventually, I looked at my BIOS and determined that the IDE drive was being recognized as a boot device, and that the SATA drive was not being recognized. There was a screen in the BIOS that allowed me to swap this. Everything worked fine after that.

On my Red Hat 8 install, I completed everything, and I booted the system up. I transfered data from my old 2GB hard drive, and I shut down.

I replaced the 2GB drive with my 6GB drive and rebooted. It took quite a lot of frustration before I realized that the 6GB and 40GB drives had a set of partitions with the same labels. I fixed this from the install shell using the command `e2label`

When I installed my new sound card, all the hard drive numbers changed. I did not notice or understand what happened until the system completed booting and started complaining that it could not find some partitions. The root partition, /home and /usr/local showed up properly because of the drive labels. The drive labels look a little weird, but this is very robust.

I think my SCSI burner failed after my first Fedora Core 3 install. This messed up all sorts of things including my USB devices. I had a persistent error message about no disk being in the drive, which I traced to my CF card reader. My sound card failed too. I removed the SCSI burner and re-did the install. Everything worked fine afterwards.

The first time I installed Fedora 6, my serial port and my floppy disks did not work. I was still using a serial modem, so this put me of the internet. I assumed I had hardware problems and I ripped stuff out and tried all sorts of new hardware, up to an external modem with a USB to serial converter. Eventually, I found out that the problem was Xen. When Xen runs, you lose your serial port and your floppy drives. I have idea what Xen actually *does*.

I Setting Up New SCSI Devices

I did not install my SCSI card. These notes are for historical interest, only.

I forget what it was like installing my SCSI card for my CD writer. When you install Linux, all this stuff works, if you can figure out what they are called. Since I installed Red Hat 7.0, I have connected an old Sun Desktop pack with a 9GB SCSI hard drive. I wanted to write stuff out to CD.

I plugged in the desktop pack, then I halted and restarted the computer. Linux and Kudzu autodetected and configured the device at boot. Now, all I had to do is figure out what the damn thing is called!

The naming convention in Linux SCSI is as follows...

hard drives	`/dev/sd[a-z], /dev/sd[a-c][a-z], /dev/sdd[a-x]`
CD-ROMs	`/dev/scd[1-7]`
Tapes	`/dev/st[0-7]`

The Sun hard drive I was playing with turned out to be `/dev/sda1`. I am not quite sure how this corresponds to the logical device number 2, which was dialed up on the back.

J Xen

I saw no sign of Xen on Fedora 10. These notes are for historical purposes only, and as a warning!

Fedora 6's default is to install a Xen compatible kernel and run the Xen daemon. This allows "paravirtualization", and it messes up the serial port and the floppy drives. An ordinary person running Fedora as a desktop has no need for virtual environments but very likely wants floppies and modems. Xen is a pain in the butt.

You need to install the non-xen kernel, and you need to configure GRUB so it boots this kernel. The Fedora 6 DVD contains several kernels. You probably installed kernel-xen-2.6.18-1.2798.fc6.i686.rpm. You want to search for and install kernel-2.6.18-1.2798.fc6.i686.rpm.

In addition, I installed kernel-devel-2.6.18-1.2798.fc6.i686.rpm and kernel-headers-2.6.18-1.2798.fc6.i386.rpm.

Update `/boot/grub/grub.conf`, setting `default=0`. This causes GRUB to boot the first of the two kernels listed. The RPM install updated GRUB.