



linux from scratch

The Linux Boot Process

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Overview

- BIOS
- Disk Geometry and Partitioning
- Boot Loader
- Kernel
- User Space Initialization

BIOS

- Classic
 - Initialize Hardware
 - Set the clock
 - Enable/Disable Components
 - User Interface – Usually Text Mode
 - Load Boot Sector
 - CPU Real Mode

BIOS

- Unified Extensible Firmware Interface (UEFI)
 - Legacy support for BIOS
 - Intel initiated (Itanium 64-bit motivation)
 - Multi-architecture (x86, x86_64, ARM)
 - Ability to boot from > 2T drives
 - Network capability
 - Maintain OS queryable data

Unified Extensible Firmware Interface (UEFI)

ASUS EFI BIOS Utility - EZ Mode EXIT/Advanced Mode

00:37
Friday[12/17/2010]

P8P67
BIOS Version : 0804
CPU Type : Intel(R) Core(TM) i7-2600K CPU @ 3.40GHz
Total Memory : 4096 MB (DDR3 1333MHz)

English

Build Date : 11/25/2010
Speed : 3490 MHz

Temperature
CPU +104.0° F/+40.0° C
MB +78.0° F/+26.0° C

Voltage
CPU 1.312V 5V 5.160V
3.3V 3.376V 12V 12.000V

Fan Speed
CPU_FAN 1586RPM PWR_FAN N/A
CHA_FAN1 N/A CHA_FAN2 N/A

System Performance
Quiet
Performance Energy Saving
The advanced options on the hardware setup have been changed

Boot Priority
Use the mouse to drag or keyboard to navigate to decide the boot priority.

Boot **Benchmark Reviews.com**

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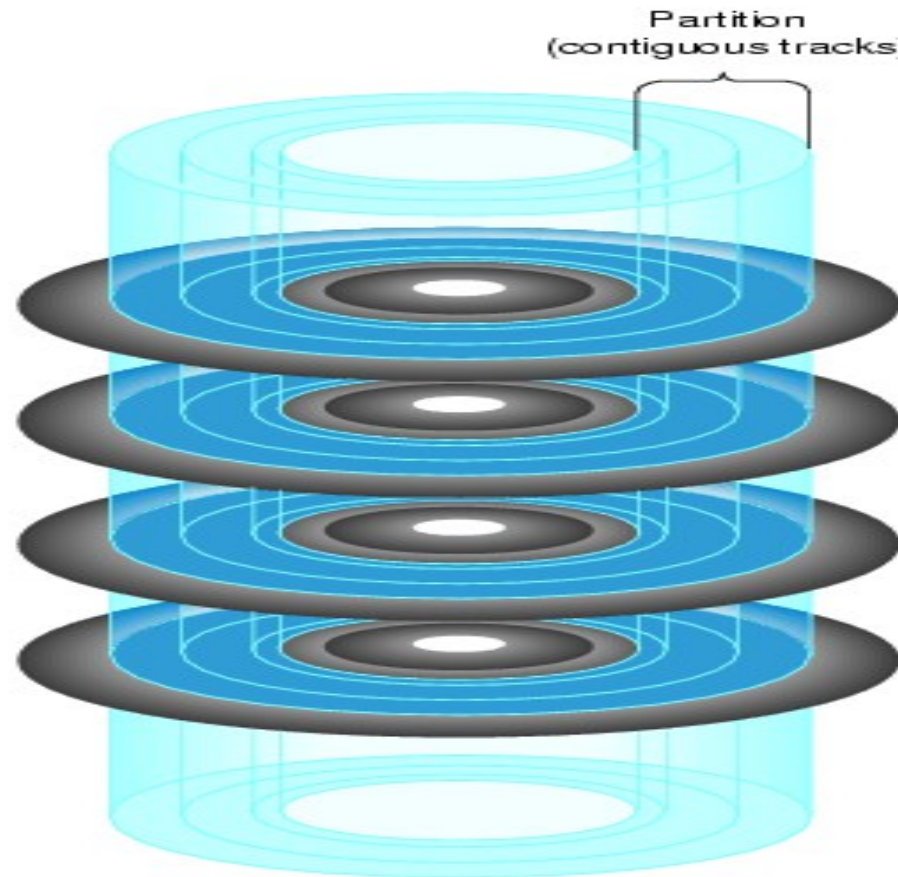
Disk Geometry and Partitioning

- Traditional Disk Drives
 - 512 Byte Sectors
 - Cylinder/Track/Head
 - 63 Sectors/Track
 - 512 B Sectors + 32-bit Partition Table = 2^{41} bytes = 2 TiB



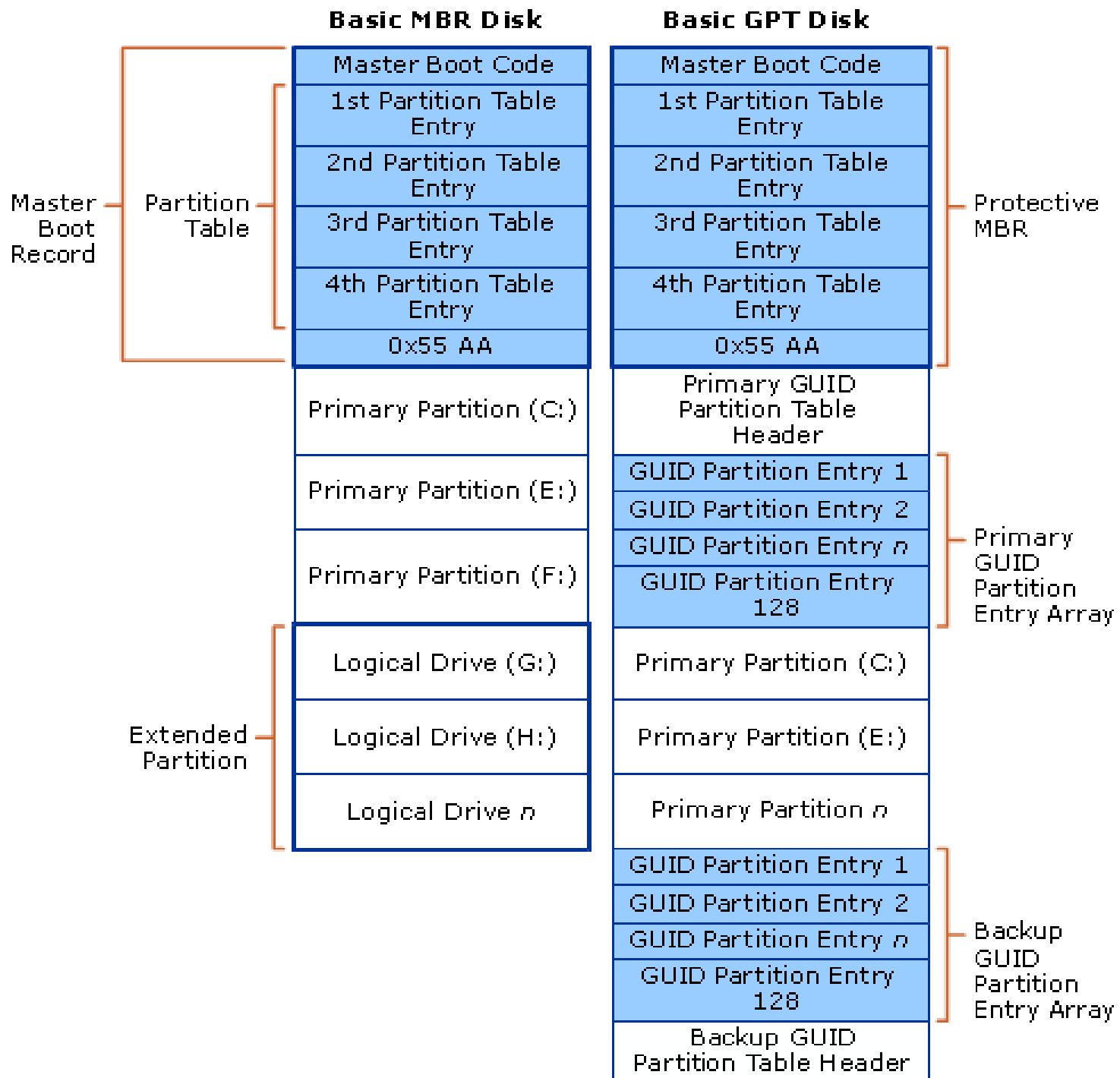
Disk Geometry and Partitioning

What's wrong with this picture?



Disk Geometry and Partitioning

- Disk Drives > 2TiB
 - GUID Partition Table (GPT)
 - 4K Sectors (512 B sector emulation)
 - Write Issues
 - Partitions should be at 1 MiB boundaries
 - parted
 - gdisk
 - fdisk (coming soon)
 - GPT support required in kernel
 - Needs GRUB2 for booting



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Boot Loader

- Legacy Loaders
 - 32-bit only
- GRUB2
 - Supports classic BIOS and UEFI
 - Support GPT
 - Needs BIOS Boot Partition
 - Install Issues

/boot/grub/grub.cfg

```
# Begin /boot/grub/grub.cfg
```

```
set default=0  
set timeout=5  
insmod ext2
```

```
# /dev/sda2  
set root=(hd0,2)
```

```
menuentry "GNU/Linux, Linux 3.6-lfs-SVN-20121002" {  
    linux /boot/vmlinuz-3.6-lfs-SVN-20121002 root=/dev/sda2 ro  
}
```

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Linux Kernel

- Decompress itself
- Initialize memory and internal data structures
- Initialize built-in drivers
- Checks for initrd
- Mounts root file system
- Runs `/sbin/init`

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User Space Initialization

- `sysvinit`
 - `/etc/inittab`
 - Series of scripts
 - Mount virtual file systems (`/proc`, `/sys`, etc)
 - Start `udev`
 - Set up swap
 - Check/mount file systems
 - Load modules
 - Start other services (initialize network, `syslog`, `cron`, `ntpd`, `sshd`, `apache`, etc)
 - Start `agetty` (login prompt)

User Space Initialization

- systemd
 - Complex set of executables
 - Parallel execution of startup processes
 - Automount
 - Quotas
 - Auditing
 - sysv compatibility
 - Complex management
 - Binary logs

Discussion



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