CSGE602055 Operating Systems
CSF2600505 Sistem Operasi
Minggu 03: BIOS, Boot & Systemd

Rahmat M. Samik-Ibrahim

Universitas Indonesia

http://rms46.vlsm.org/2/207.html

REV56 27-Aug-2017

Agenda

Week 03: BIOS, Boot and Systemd

- Reference: (Any Related Tutorial) (ETC 300-324) (SUP WEEK03)
- Firmware
  - BIOS: Basic Input Output System.
  - UEFI: Unified Extensible Firmware Interface.
  - ACPI: Advanced Configuration and Power Interface.
- Operating System (Boot) Loader
  - BOOTMGT: Windows Bootmanager / Bootloader.
  - LILO: Linux Loader.
  - GRUB: GRand Unified Bootloader.
- Operating System Initialization
  - Init (legacy)
  - UpStart
  - Systemd
- Lab
  - Scripting
  - Simple Programs

Legacy BIOS

- Check Settings.
- Initialize CPU & RAM.
- POST: Power-On Self-Test.
- Initialize ports, LANS, etc.
- Load a Boot Loader.
- Handover to the Boot Loader.
- Provides "Native" (obsolete) Drivers only (not loadable).
- Provides "INT" services .
- Limitation.
  - Technology of 1970s.
  - 16 bits software.
  - 20 bits address space (1 MB).
  - 31 bits disk space (2 TB).

UEFI

- A Firmware Specification, not an Implementation!
- No (INT) service after boot.
- HII: Human Interface Infrastructure.
- Protected Mode.
- Flexible.
  - Technology of 2000s.
  - writen in C.
  - (third party) loadable drivers and tools.
  - Emulate Legacy BIOS transition (MBR block, INT service).
  - UEFI Shell: environment shell for diagnostic (no need for DOS).
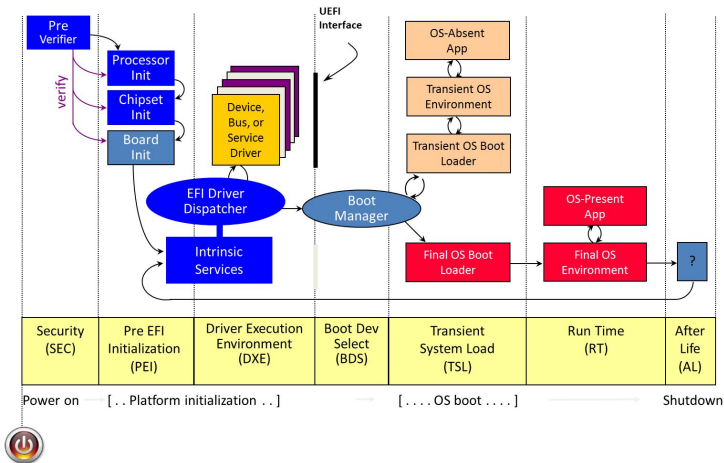
Platform Initialization (PI) Boot Phases

Figure: UEFI Boot Process[1].

Operating System (Boot) Loader

- General
    - How/Where to start the operating system?
    - What to do?
    - How many ways to boot?
    - How many types of OS?
- GRUB/GRUB2: GRand Unified Boot system
    - Stage 1 (boot.img): MBR (Master Boot Record) – Where is everything
    - Stage 1.5 (image.img): generated from diskboot.img
    - Stage 2: Kernel Selection: Windows, Linux, BSD, etc.
- GRUB2
    - More flexible than GRUB legacy
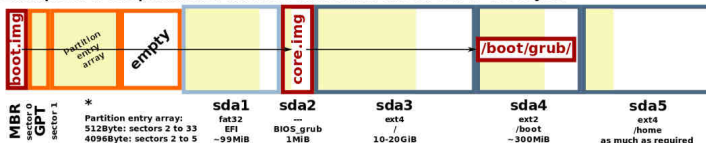   - More automated than GRUB legacy
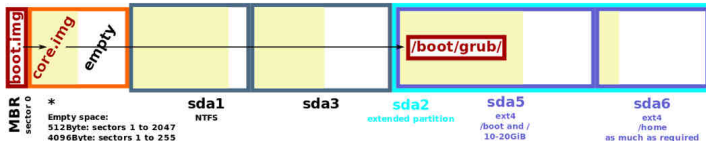
Figure: GRUB[1].

---

[1]Source Shmuel Csaba Otto Traian 2013

init (SYSV legacy)

- File: /etc/inittab.
- Folders: /etc/rcX.d — X = runlevel.
    - Seven (7) different runlevels:
        - 0 (shutdown).
        - 1 (single-user/admin).
        - 2 (multi-user non net).
        - 3 (standard).
        - 4 (N/A).
        - 5 (3+GUI).
        - 6 (reboot).
    - SXX-YYY: Start
    - KXX-YYY: Kill.
- One script at a time in order.
- dependency is set manually.

UpStart - Ubuntu

- Developer: Ubuntu.
- Folder: /etc/init/.
- Control: initctl.
    - initctl list – listing all processes managed by upstart.
- better support for hotplug devices.
- cleaner service management.
- faster service management.
- asynchronous.

The All New "systemd"

- Replaces (SYSV) init and UpStart.
  - better concurrency handling: Faster!
  - better dependencies handling: No more "S(tarts)" and "K(ills)".
  - better crash handling: automatic restart option.
  - better security: group protection from anyone including superusers.
  - simpler config files: reliable and clean scripts.
  - hotplug: dynamic start/stop.
  - supports legacy systems (init).
  - overhead reducing.
  - unified management way for all distros.
  - bloated: doing more with more resources.
  - linux specific: NOT portable.

X

- Control: `systemctl`.
- `systemctl`
- `systemctl list-units`
- `systemctl start XXXX`
- `systemctl status ssh.service`
  - status, start, restart, stop, disable.

The End

- This is the end of the presentation.