

CSGE602055 Operating Systems

CSF2600505 Sistem Operasi

Minggu 03: BIOS, Loader, Systemd, & I/O

Rahmat M. Samik-Ibrahim

Universitas Indonesia

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

REV64 5-Sep-2017

Minggu 00	29 Aug - 05 Sep 2017	Intro & Review
Minggu 01	07 Sep - 12 Sep 2017	IPR, REGEX, & Scripting
Minggu 02	14 Sep - 19 Sep 2017	Protection, Security, Privacy, & C-language
Minggu 03	26 Sep - 30 Sep 2017	BIOS, Loader, Systemd, & I/O
Minggu 04	03 Okt - 07 Okt 2017	Addressing, Shared Lib, Pointer & I/O Programming
Minggu 05	10 Okt - 14 Okt 2017	Virtual Memory
Ming. UTS	15 Okt - 24 Okt 2017	
Minggu 06	26 Okt - 31 Okt 2017	Concurrency: Processes & Threads
Minggu 07	02 Nov - 07 Nov 2017	Synchronization
Minggu 08	09 Nov - 14 Nov 2017	Scheduling & Network Sockets Programming
Minggu 09	16 Nov - 21 Nov 2017	File System & Persistent Storage
Minggu 10	23 Nov - 28 Nov 2017	Special Topic: Blockchain
Cadangan	30 Nov - 09 Des 2017	
Ming. UAS	10 Des - 23 Des 2017	

Agenda

- 1 Start
- 2 Agenda
- 3 Week 03
- 4 Legacy BIOS
- 5 UEFI
- 6 UEFI Boot
- 7 Operating System (Boot) Loader
- 8 GRUB Map
- 9 init (SYSV legacy)
- 10 UpStart - Ubuntu
- 11 The All New "systemd"
- 12 X
- 13 The End

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

- 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).

- A Firmware Specification, not an Implementation!
- No (INT) service after boot.
- HII: Human Interface Infrastructure.
- Protected Mode.
- Flexible.
 - Technology of 2000s.
 - written 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 Process¹.

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

GNU GRUB 2

Locations of *boot.img*, *core.img* and the */boot/grub* directory

Example 1: an MBR-partitioned harddisc with sector size of 512 or 4096Bytes



Example 2: a GPT-partitioned harddisc with sector size of 512 or 4096Bytes



Figure: GRUB¹.

¹Source 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.

- 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.

- 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.