# CSGE602055 Operating Systems CSF2600505 Sistem Operasi Minggu 03: BIOS, Loader, Systemd, & I/O

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

REV64 5-Sep-2017

## Jadwal OS172

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	Concurency: 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	

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# 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).

#### **UEFI** Boot

# Platform Initialization (PI) Boot Phases

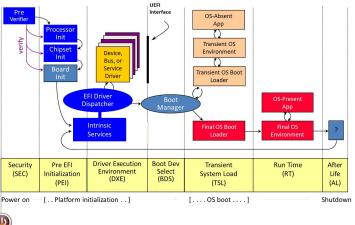




Figure: UEFI Boot Process<sup>1</sup>.

# Operating System (Boot) Loader

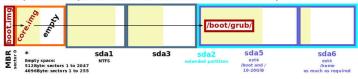
- General
  - How/Where to start the operating system?
  - What to do?
  - How many ways to boot?
  - How many types of OS?
- GRUB/GRUB2: GRand Unified Boot system
  - Stage 1 (boot.img): MBR (Master Boot Record) Where is everything
  - Stage 1.5 (image.img): generated from diskboot.img
  - Stage 2: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

## **GRUB Map**

#### **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

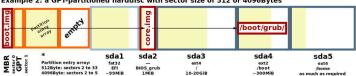


Figure: GRUB<sup>1</sup>.

<sup>&</sup>lt;sup>1</sup>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 concurency 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.