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Apa yang saya pelajari selama minggu ke-11 Sysprog?

Minggu ini saya mempelajari cara meng-compile kernel dari binary yang disediakan dan meng-instalnya ke dalam device Virtual Box.

Download source code linux kernel dan lakukan ekstraksi:

- `wget http://kambing.ui.ac.id/linux/v4.x/linux-4.15.1.tar.xz`
- `tar -xvJf linux-4.15.1.tar.xz`

```
user@sysprog-ova:~$ ls -l
total 99904
-rwxrwxr-x  1 user user      427 Dec  1 06:25 aa.sh
-rw-rw-r--  1 user user         0 Oct  6 12:28 dummy_file
drwxrwxr-x 26 user user    4096 Dec  8 04:47 linux-4.15.1
-rw-rw-r--  1 user user 102176316 Feb  3  2018 linux-4.15.1.tar.xz
-rw-rw-r--  1 user user         54 Sep 29 05:02 listing
-rw-rw-r--  1 user user      1571 Oct 20 08:11 modified_free_and_sbrk.c
```

Selanjutnya kita memerlukan config file untuk mendefinisikan apa saja komponen kernel yang ingin dicompile, saya menggunakan config file yang tersedia pada directory /boot/.

Salin file config-4.15.0-122-generic ke dalam folder linux-4.15.1, lalu ubah nama file menjadi .config.

```
user@sysprog-ova:~$ ls /boot
config-4.15.0-121-generic  grub
config-4.15.0-122-generic  initrd.img-4.15.0-121-generi
user@sysprog-ova:~$
```

Install dependency :

- `sudo apt-get install kernel-package build-essential linux-source bc kmod cpio flex bison libncurses5-dev libelf-dev libssl-dev`

Memilih module apa saja yang ingin diinstall :

- `make menuconfig`

[illegible]

```
GNU nano 2.9.3 include/linux/uts.h
```

```
/* SPDX-License-Identifier: GPL-2.0 */
#ifndef _LINUX_UTS_H
#define _LINUX_UTS_H

/*
 * Defines for what uname() should return
 */
#ifndef UTS_SYSNAME
#define UTS_SYSNAME "Linux Compiled by DimasAditya"
#endif

#ifndef UTS_NODENAME
#define UTS_NODENAME CONFIG_DEFAULT_HOSTNAME /* set by sethostname() */
#endif

#ifndef UTS_DOMAINNAME
#define UTS_DOMAINNAME "(none)" /* set by setdomainname() */
#endif
```

[Read 20 lines]

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Melakukan compile (proses ini cukup memakan waktu):

- `make-kpkg -j 4 --initrd --append-to-version=deb-dimasaditya-version kernel_image kernel_headers`

Parameter :

Opsi `-j 4` : melakukan multithreading job ke 4 CPU cores. Semakin banyak core yang digunakan maka proses akan semakin cepat

Opsi `--append-to-version` : bertujuan untuk menamai versi dari kernel custom yang ingin di-compile

```
CC [M] net/sctp/transport.o
CC [M] drivers/input/joystick/tmdc.o
CC [M] drivers/infiniband/hw/i40iw/i40iw_puda.o
CC [M] drivers/gpu/drm/nouveau/nvkm/subdev/fb/nv41.o
CC [M] drivers/input/joystick/turbografx.o
CC [M] drivers/gpu/drm/nouveau/nvkm/subdev/fb/nv44.o
CC [M] net/sctp/chunk.o
CC [M] drivers/input/joystick/twidjoy.o
CC [M] drivers/gpu/drm/nouveau/nvkm/subdev/fb/nv46.o
CC [M] drivers/infiniband/hw/i40iw/i40iw_uk.o
CC [M] drivers/input/joystick/warrior.o
CC [M] net/sctp/sm_make_chunk.o
CC [M] drivers/gpu/drm/nouveau/nvkm/subdev/fb/nv47.o
CC [M] drivers/input/joystick/xpad.o
CC [M] drivers/gpu/drm/nouveau/nvkm/subdev/fb/nv49.o
CC [M] drivers/infiniband/hw/i40iw/i40iw_utils.o
CC [M] drivers/input/joystick/zhenhua.o
CC [M] drivers/gpu/drm/nouveau/nvkm/subdev/fb/nv4e.o
CC [M] drivers/input/joystick/walkera0701.o
CC [M] net/sctp/ulpevent.o
CC [M] drivers/gpu/drm/nouveau/nvkm/subdev/fb/nv50.o
CC [M] drivers/input/joystick/force/force-ff.o
CC [M] drivers/infiniband/hw/i40iw/i40iw_verbs.o
```

instalasi kernel image dan headers

- `dpkg -i linux-headers-4.15.1deb-dimasaditya-version_4.15.1deb-dimasaditya-version-10.00.Custom_amd64.deb`
- `dpkg -i linux-image-4.15.1deb-dimasaditya-version_4.15.1deb-dimasaditya-version-10.00.Custom_amd64.deb`

Instalasi Module :

- `make modules_install`, hasilnya dapat dilihat di directory `/boot`

```

user@sysprog-ova:~/linux-4.15.1$ ls \boot
ls: cannot access 'boot': No such file or directory
user@sysprog-ova:~/linux-4.15.1$ ls /boot
config-4.15.0-121-generic
config-4.15.0-122-generic
config-4.15.1deb-dimasaditya-version
grub
initrd.img-4.15.0-121-generic
initrd.img-4.15.0-122-generic
initrd.img-4.15.1deb-dimasaditya-version
System.map-4.15.0-121-generic
System.map-4.15.0-122-generic
System.map-4.15.1deb-dimasaditya-version
vmlinuz-4.15.0-121-generic
vmlinuz-4.15.0-122-generic
vmlinuz-4.15.1deb-dimasaditya-version
user@sysprog-ova:~/linux-4.15.1$

```

Update initramfs :

- `update-initramfs -c -k vmlinuz-4.15.1deb-dimasaditya-version`

```

user@sysprog-ova:~/linux-4.15.1$ sudo update-initramfs -c -k vmlinuz-4.15.1deb-
imasaditya-version
update-initramfs: Generating /boot/initrd.img-vmlinuz-4.15.1deb-dimasaditya-ver
ion
WARNING: missing /lib/modules/vmlinuz-4.15.1deb-dimasaditya-version
Ensure all necessary drivers are built into the linux image!
depmod: ERROR: Bad version passed vmlinuz-4.15.1deb-dimasaditya-version
dpkg: warning: version 'vmlinuz-4.15.1deb-dimasaditya-version' has bad syntax:
ersion number does not start with digit
dpkg: warning: version 'vmlinuz-4.15.1deb-dimasaditya-version' has bad syntax:
ersion number does not start with digit
dpkg: warning: version 'vmlinuz-4.15.1deb-dimasaditya-version' has bad syntax:
ersion number does not start with digit
dpkg: warning: version 'vmlinuz-4.15.1deb-dimasaditya-version' has bad syntax:
ersion number does not start with digit
depmod: ERROR: Bad version passed vmlinuz-4.15.1deb-dimasaditya-version

```

Update group :

- `cd /boot`
- `update-grub`

```
user@sysprog-ova:~/linux-4.15.1$ cd /boot
user@sysprog-ova:/boot$ update-grub
grub-mkconfig: You must run this as root
user@sysprog-ova:/boot$ sudo update-grub
Sourcing file '/etc/default/grub'
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-4.15.1deb-dimasaditya-version
Found initrd image: /boot/initrd.img-4.15.1deb-dimasaditya-version
Found linux image: /boot/vmlinuz-4.15.0-122-generic
Found initrd image: /boot/initrd.img-4.15.0-122-generic
Found linux image: /boot/vmlinuz-4.15.0-121-generic
Found initrd image: /boot/initrd.img-4.15.0-121-generic
done
user@sysprog-ova:/boot$
```

Hasil akhir :

Cek pada terminal bahwa kernel yang digunakan sudah sesuai dengan custom kernel yang dibuat

```
user@sysprog-ova:~$ -a
-a: command not found
user@sysprog-ova:~$ uname -a
Linux Compiled by DimasAditya sysprog-ova 4.15.1deb-dimasaditya-version #3
C 2020 x86_64 x86_64 x86_64 GNU/Linux
user@sysprog-ova:~$ _
```