CSCE604227 System Programming
CSCE604227 Pemrograman Sistem
Week 02: Revisit Linux From Scratch

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https://docOS.vlsm.org/SPSlides/sp00.pdf
Always check for the latest revision!

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SP241[1]): System Progamming

Week	Topic
Week 00	Overview
Week 01	Linux Kernel and Programming Interface
Week 02	Revisit Linux From Scratch
Week 03	FUSE: Filesystem in Userspace
Week 04	GetOpt
Week 05	Autoconf and Automake
Week 06	Boxing/Unboxing
Week 07	Sync, SETUID, and MMAP
Week 08	Kernel Modules I
Week 09	Kernel Modules II
Week 10	Kernel Modules III

[1]) This information will be on **EVERY** page two (2) of this course material.

STARTING POINT — https://sp.vlsm.org/

- **Text Book** — The Linux Programming Interface, 2010, No Starch Press, ISBN 978-1-59327-220-3 — https://man7.org/tlpi/.
- **Resources**
  - **SCELE** — https://scele.cs.ui.ac.id/course/view.php?id=3742. The enrollment key is **XXX**.
  - **Download Slides and Demos from GitHub.com** https://github.com/os2xx/docOS/:
    sp00.pdf (W00), sp01.pdf (W01), sp02.pdf (W02), sp03.pdf (W03), sp04.pdf (W04), sp05.pdf (W05), sp06.pdf (W06), sp07.pdf (W07), sp08.pdf (W08), sp09.pdf (W09), sp10.pdf (W10).
  - **LFS** — http://www.linuxfromscratch.org/lfs/view/stable/
  - **OSP4DISS** — https://osp4diss.vlsm.org/
  - **This is How Me DO IT!** — https://doit.vlsm.org/
    - PS: "Me" rhymes better than "I" duh!

Agenda

1. Start
2. Schedule
3. Agenda
4. LFS: Linux From Scratch
5. Gnulib — The GNU Portability Library
6. Autotools
7. Small Autotools "Hello World" Example

LFS: Linux From Scratch

- THIS IS HOW WE DOIT!
- http://www.linuxfromscratch.org/lfs/view/stable/
- To build a GNU/Linux system from scratch (source code).
- To learn a GNU/Linux system inside out.
- To use a Virtual Machine.
- A Chicken and Egg dependency problem:
  - It would be best if you had the tools to build an Operating System.
  - You need an Operating System to build tools.
  - To build a cross-toolchain (compiler and its libraries).
  - To build cross utilities using the cross-toolchain.
  - To build an Operating System in a chroot environment.
  - To do iterations (if necessary).
- How deep would you like to know of a "real" Operating System?
- **YOU** decide!

Gnulib — The GNU Portability Library[1])

- a central location for common GNU code
- intended to be shared among GNU packages at the source level
- no distribution tarball
- See also:
  - GNU Coding Standards — https://www.gnu.org/prep/standards/
  - Information for maintainers — https://www.gnu.org/prep/maintain/
  - Licenses — https://www.gnu.org/licenses/
  - Config — https://savannah.gnu.org/projects/config/

[1]) Adopted from https://www.gnu.org/software/gnulib/

Autotools[1])

- Refers to the software packages, consists of programs:
  - Autoconf: helps create portable configure and testsuite scripts.
    - URL: https://www.gnu.org/software/autoconf/
    - autoreconf
    - autoconf
    - autoheader
    - autoscan
  - Automake: helps create portable Makefiles.
    - URL: https://www.gnu.org/software/automake/
    - aclocal
    - automake
  - Libtool: helps create and use shared libraries portably.
    - URL: https://www.gnu.org/software/libtool/
    - libtoolize
- See also:
  - Autotools Mythbuster — https://autotools.info/
  - Small Autotools "Hello World" Example

[1]) Adopted from https://www.gnu.org/software/automake/faq/

Small Autotools "Hello World" Example (1)[1])

- Try this and push it to https://github.com/UI-FASILKOM-OS/sharesp241/
  - Work inside your autotools/ folder.
- **Filename:** src/main.c

```
#include <config.h>
#include <stdio.h>

int
main (void)
{
  puts ("Hello World!");
  puts ("I am cbkadal and this is " PACKAGE_STRING ".");
  return 0;
}
```

[1]) Adopted from https://www.gnu.org/savannah-checkouts/gnu/automake/manual/automake.html#Hello-World

Small Autotools "Hello World" Example (2)

- **Filename:** `README`

```
This is a demonstration package for GNU Automake.
Type 'info Automake' to read the Automake manual.
Makefile.am and src/Makefile.am contain Automake instructions
for these two directories.
```

- **Filename:** `src/Makefile.am`

```
bin_PROGRAMS = hello
hello_SOURCES = main.c
```

- **Filename:** `Makefile.am`

```
SUBDIRS = src
dist_doc_DATA = README
```

Small Autotools "Hello World" Example (3)

- **Filename:** `configure.ac`

```
AC_INIT([amhello], [1.0], [bug-automake@gnu.org])
AM_INIT_AUTOMAKE([-Wall -Werror foreign])
AC_PROG_CC
AC_CONFIG_HEADERS([config.h])
AC_CONFIG_FILES([
   Makefile
   src/Makefile
])
AC_OUTPUT
```

- **RUN:**

```
autoreconf --install
./configure
make
src/hello
```