

# CSCE604227 System Programming

## CSCE604227 Pemrograman Sistem

### Week 02: Revisit Linux From Scratch

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<https://sp.vlsm.org/Slides/sp02.pdf>  
Always check for the latest revision!

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# SP221<sup>1</sup>): System Programming

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	Project FUSE 1
Week 05	Project FUSE 2
Week 06	Project FUSE 3
Week 07	Project FUSE 4
Week 08	Project FUSE 5
Week 09	Project FUSE 6
Week 10	Project FUSE Presentation

<sup>1</sup>) This information will be on **EVERY** page two (2) of this course material.

- ❑ **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=3545>.  
The enrollment key is **XXX**.
  - ❑ **Download Slides and Demos from GitHub.com**  
<https://github.com/os2xx/sysprog/>:  
[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

- 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!

- 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/>

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<sup>1)</sup> Adopted from <https://www.gnu.org/software/gnulib/>

# Autotools<sup>1)</sup>

- 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](#)

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<sup>1)</sup> Adopted from <https://www.gnu.org/software/automake/faq/>

# Small Autotools "Hello World" Example (1)<sup>1)</sup>

- Try this and push it to <https://github.com/os2xx/sharesp221/>
  - 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;
}
```

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<sup>1)</sup> 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
```