CSGE602055 Operating Systems
CSF2600505 Sistem Operasi
Week 01: Overview 2, Virtualization & Scripting

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https://os.vlsm.org/
Always check for the latest revision!

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Operating Systems 2019-1

A (Rm 3114) [Tu/Th 10-12] — B (Rm 3114) [Tu/Th 13-15] — C (Rm 3114) [Tu/Th 16-18] — D (Rm 2401) [Tu/Th 10-12] — E (Rm 2306) [Tu/Th 13-15]

Week	Schedule	Topic	OSC10
Week 00	07 Feb - 13 Feb 2019	Overview 1, Virtualization & Scripting	Ch. 1, 2, 18.
Week 01	14 Feb - 20 Feb 2019	Overview 2, Virtualization & Scripting	Ch. 1, 2, 18.
Week 02	21 Feb - 27 Feb 2019	Security, Protection, Privacy, & C-language	Ch. 16, 17
Week 03	28 Feb - 06 Mar 2019	File System & FUSE	Ch. 13, 14, 15
Week 04	12 Mar - 18 Mar 2019	Addressing, Shared Lib, & Pointer	Ch. 9
Week 05	19 Mar - 25 Mar 2019	Virtual Memory	Ch. 10
Mid-Term	23-30 Mar 2019 (tba)	MidTerm (UTS)	
Week 06	02 Apr - 08 Apr 2019	Concurency: Processes & Threads	Ch. 3, 4
Week 07	09 Apr - 15 Apr 2019	Synchronization & Deadlock	Ch. 6, 7, 8
Week 08	16 Apr - 22 Apr 2019	Scheduling	Ch. 5
Week 09	23 Apr - 29 Apr 2019	Storage, BIOS, Loader, & Systemd	Ch. 11
Week 10	30 Apr - 06 May 2019	I/O & Programming	Ch. 12
Reserved	07 May - 17 May 2019		
Final	18-25 May 2019 (tba)	Final (UAS)	This schedule is subject to change.
Extra	27 Jun 2019	Extra assignment confirmation	

The Weekly Check List

- **Resources**: `https://os.vlsm.org/`
  - **Download Slides and Demos from GitHub.com**
    `https://github.com/UI-FASILKOM-OS/SistemOperasi/`
  - **Problems** — `https://rms46.vlsm.org/2/`:
    `195.pdf` (Week 00), `196.pdf` (Week 01), `197.pdf` (Week 02),
    `198.pdf` (Week 03), `199.pdf` (Week 04), `200.pdf` (Week 05),
    `201.pdf` (Week 06), `202.pdf` (Week 07), `203.pdf` (Week 08),
    `204.pdf` (Week 09), `205.pdf` (Week 10).
  - **Badak All in One** — `BADAK.cs.ui.ac.id:///extra/`
- **Text Book**: any recent/decent OS book. Eg. (**OSC10**) Silberschatz et. al.: **Operating System Concepts**, 10^{th} Edition, 2018. See also `http://codex.cs.yale.edu/avi/os-book/OS10/`.
- Encode your **QRC** with size upto 7cm x 7cm (ca. 400x400 pixels):
  "OS191 CLASS ID SSO-ACCOUNT Your-Full-Name"
- Write your Memo (with QRC) **every week**.
- Login to `badak.cs.ui.ac.id` via `kawung.cs.ui.ac.id` for at least **10 minutes** every week. Copy the weekly demo folders into your own badak home directory.
  Eg.: `cp -r /extra/Demos/* ~/mydemos/`

Agenda

Agenda (2)

Week 01 Overview II: Topics[1]

- Types of virtualization (including Hardware/Software, OS, Server, Service, Network)
- Paging and virtual memory
- Virtual file systems
- Hypervisors
- Portable and cost of virtualization; emulation vs. isolation
- Cloud services: IAAS, PAAS and Platform APIs, SAAS
- Introduction to Scripting and REGEX.

[1] Source: ACM IEEE CS Curricula 2013

Week 01 Overview II: Learning Outcomes[1]

- Explain the concept of virtual memory and how it is realized in hardware and software. [Familiarity]
- Discuss hypervisors and the need for them in conjunction with different types of hypervisors. [Usage]
- Differentiate emulation and isolation. [Familiarity]
- Evaluate virtualization trade-offs. [Assessment]
- Discuss the importance of elasticity and resource management in cloud computing. [Familiarity]
- Explain the advantages and disadvantages of using virtualized infrastructure. [Familiarity]

[1] Source: ACM IEEE CS Curricula 2013

Week 01: Review 2 & Scripting

- Pengenalan Lisensi Perangkat Lunak Bebas: `https://rms46.vlsm.org/1/70.pdf`
- The Minix3 Notes: `https://rms46.vlsm.org/2/166.pdf`
- Linux Help: `https://www.mediacollege.com/linux/`
- Intelectual Property Right (IPR)
- Operating System Services
- User Operating System Interface
- System Calls
- Types of System Calls
- System Programs
- Operating System Design and Implementation
- Operating System Structure

Intelectual Property Right (IPR)

- Rahasia Dagang *(Trade Sceret)* — UU no. 30/2000.
- Desain Industri *(Industrial Design)* — UU no. 31/2000.
- Desain Tata Letak Sirkuit Terpadu *(Integrated Circuit Layout Design)* — UU no. 32/2000.
- Paten *(Patent)* — UU no. 14/2001.
- Hak Cipta *(Copyright)* — UU no. 19/2002.
- Konsekuensi HKI
- HKI Perangkat Lunak
- Lisensi Perangkat Lunak: GNU GPL, EULA. Public Domain, Apache, Microsoft Public License.

Free Software

- Free Software Definition (FSF)
  0. The freedom to run the program as you wish, for any purpose (freedom 0).
  1. The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
  2. The freedom to redistribute copies so you can help your neighbor (freedom 2).
  3. The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.
- Free Software vs. Open Source Software.
- Copyleft Software.

Software Licenses

- 3-clause BSD license and 2-clause BSD license (BSD-X-Clause)
- Apache License 2.0 (Apache-2.0)
- Artistic License 2.0 (ArtisticLicense2)
- Common Development and Distribution License (CDDL-1.0)
- Eclipse Public License (EPL-1.0)
- Educational Community License 2.0 (ECL2.0)
- Expat License (Expat) aka. MIT license (MIT)
- GNU Affero General Public License v3 (AGPL-3.0)
- GNU All-Permissive License (GNUAllPermissive)
- GNU General Public License (GPL)
- GNU Lesser General Public License (LGPL)
- Microsoft Public License (MS-PL)
- Mozilla Public License 2.0 (MPL-2.0)
- "Public Domain" (PublicDomain)
- X11 License (X11License)

Potpourri

- Mobile/Distributed/Client-Server/Peer-to-Peer Computing.
- Real-Time Computing: Hard Real-Time vs. Soft Real-Time.
- Operating System Comparison: Android, *BSD, GNU/Linux, iOS, Mac OS, Windows.
- Operating System Services: UI (GUI, CLI); Program Executing; I/O Operations; File Systems Manipulation; Communication; Error Detection; Resource Allocation; Accounting; Protection & Security.
- System Calls: Process Control; File Management; Device Management; Information Maintenance; Communications; Protection.
- Application Programming Interface (API)
- Standard C Library.
- System Programs.
- Microkernel System Structure.
- Loadable Kernel Modules.
- Virtualization and Cloud System.

Scripting

- Readings (do Google!)
  - Machtelt Garrels: Bash Guide for Beginners.
  - Mendel Cooper: An in-depth exploration of the art of shell scripting — Advanced Bash-Scripting Guide.
  - Jan Goyvaerts: Regular Expressions — The Complete Tutorial.
- The ATM Way (Amati, Tiru, Modifikasi)[1].
  - *Clone* Demo
    `https://github.com/UI-FASILKOM-OS/SistemOperasi.git`
  - **GSGS — ATM**: Google Sana, Google Sini: Amati, Tiru, Modifikasi!
  - Medium: `badak.cs.ui.ac.id`
  - Opsi: BYOD, WSL (Windows 10), CYGWIN.
  - Belajar **login** dan **logout** dengan `ssh` atau `putty`[2].
  - Belajar editor yang bagus punya buatan (**vi**).
- Belajar beberapa perintah **Command-Line Interface** (CLI).
  - shell (Bash)
  - basic CLI: cat, cd, cp, ls, man, more, mv, rm, touch, wc.
  - vi, sed, awk, git.

[1] Romi Satria Wahono sudah menggunakan istilah ini sejak tahun 2007 (Google).

[2] Sesuai dengan keyakinan dan kepercayaan masing-maing.

External Resources

- Linux Resources:
  `http://www.mediacollege.com/linux/`
- Tutorial:
  `https://www.mediacollege.com/linux/command-tutorial/`
- Commands:
  `https://www.mediacollege.com/linux/command/linux-command.html`
- Shell:
  `https://www.mediacollege.com/linux/command/shell-command.html`

Some Essential Command Line Commands part 1

man	manual. Eg. "man man"
passwd	changes passwords.
ls	list directory contents. Eg. "ls -al"
cd	change the working directory. Eg. "cd /tmp"
cp	copy file(s). Eg. "cp SOURCE DEST"
rm	remove file(s). Eg. "rm AFILE"
mv	move files(s). Eg. "mv FROMFILE TOFILE"
mkdir	make directories(s). Eg. "mkdir ADIRECTORY"
rmdir	remove directories(s). Eg. "rmdir ADIRECTORY"
cat	read file(s) Eg. "cat AFILE"
more	read file(s) per screen Eg. "more AFILE"
ln	make a link of a file. Eg. "ln -s file sfile"
grep	search string aword inside file. Eg. "grep aworld file"
sort	sort lines of text files. Eg. "sort file1.txt"
top	display systems task. Eg. "top"
find	Eg. "find / -name minix3.iso -print". Find from "/".

Some Essential Command Line Commands part 2

chmod	Eg. `"chmod 755 file"`. Change file with access mode 755.
chown	Eg. `"chown user file"`. Change owner file to user.
chgrp	Eg. `"chgrp other file"`. Change group file to other.
tar	tape archive file. Eg.
	`"tar cf /tmp/tfile.tar dir/"`. Archive "dir/" into tfile.tar.
	`"tar tf /tmp/tfile.tar"`. List tfile.tar.
	`"tar xf /tmp/tfile.tar"`. Extract tfile.tar.
date	print or set the system date and time. Eg. `"date +%Y"`
tee	read from standard input and write to standard output and files.
	Eg. `"ls -al | tee listing.txt"`
diff	compare files line by line. Eg. `"diff file1.txt file2.txt"`
wc	print newline, word, and byte counts for each file.
	Eg. `"wc file.txt"`

Regex: Regular Expressions

- ⌈`^`⌋ — matches a beginning-of-line (meaningless).
- ⌈`^$`⌋ — matches a beginning-of-line + end-of-line (empty line).
- ⌈`^hello$`⌋ — matches just "hello" in a line.
- ⌈`^(From|To|CC):`⌋ — matches ⌈`^(From:`⌋ or ⌈`^(To:`⌋ or ⌈`^(CC:`⌋.
- ⌈`[01]?[0-9]|2[0-3]`⌋ — 00-23.
- ⌈`[01]?[4-9]|[012]?[0-3]`⌋ — 00-23.
- ⌈`[0-9]{10}`⌋ — 10 digits.

The "vi" editor

	Basics		More Commands
i	insert mode	d^	delete from ^ (beginning) to the cursor
a	append mode	d$	delete from the cursor to $ (end)
<ESC>	escape mode	dd	delete the whole line
q!	quit	5dd	delete 5 lines
wq!	write and quit	yy	yank (copy) the line
ZZ	write and quit	p	put (paste) the line
h j k l	move [left, down, up, right]	J	joint current and next line
r	replace a character	:r file.txt	read (insert) file.txt
d	delete a character	:w! file.txt	write into file.txt
u	undo	:1,8 w! file.txt	write line 1 to 8 into file.txt

sed — the stream editor

- `sed 'G' file.txt` — double space.
- `sed 'G;G' file.txt` — triple space.
- `sed -n '4,6p' file.txt` — show only line 4 to 6.
- `sed -n '4,6p' file.txt > newfile.txt` — write line 4 to 6 to newfile.txt.
- `sed '/[0-9]\{2\}/p' file.txt` — show only lines with two digits.
- `sed '4,6d' file.txt` — show all except line 4 to 6.
- `sed '$d' file.txt` — show all except last line.
- `sed '5,/HABATS/d'` — show all except from line 5 to a line with HABATS.
- `sed 's/Joko/Bowo/' file.txt` — replace Joko with Bowo.
- `sed 's/Joko/Bowo/2' file.txt` — replace the second Joko with Bowo.
- `sed 's/Joko/Bowo/g' file.txt` — replace every Joko with Bowo.
- `sed 's/Bowo\|bowo/Joko/g' file.txt` – replace every Bowo or bowo with Joko.

awk — Aho - Weinberger - Kernighan

- `awk '{print "Hello awk!"}' file.txt` — print "Hello awk!" for every file.txt line.
- `awk '{print $0}' file.txt` — print every file.txt line.
- `awk '{print $1}' file.txt` — print first field of every file.txt line.
- `awk '{print $2}' file.txt` — print second field of every file.txt line.

Login into BADAK.cs.ui.ac.id

```
demo@badak:~$ PS1=">>>>> $ "

>>>>> $ git clone https://github.com/UI-FASILKOM-OS/SistemOperasi.git
Cloning into 'SistemOperasi'...
remote: Enumerating objects: 51, done.
remote: Counting objects: 100% (51/51), done.
remote: Compressing objects: 100% (23/23), done.
remote: Total 972 (delta 29), reused 34 (delta 27), pack-reused 921
Receiving objects: 100% (972/972), 24.63 MiB | 4.65 MiB/s, done.
Resolving deltas: 100% (637/637), done.

>>>>> $ ls -F SistemOperasi/
CNAME  _config.yml  demos/  LICENSE  OLDREADME.md  pdf/  README.md

>>>>> $ ls -al SistemOperasi/demos/
total 56
drwxr-xr-x 14 demo demo 4096 Jan 16 14:24 .
drwxr-xr-x  5 demo demo 4096 Jan 16 14:24 ..
drwxr-xr-x  2 demo demo 4096 Jan 16 14:24 Week00
drwxr-xr-x  2 demo demo 4096 Jan 16 14:24 Week01
drwxr-xr-x  4 demo demo 4096 Jan 16 14:24 Week02
drwxr-xr-x  2 demo demo 4096 Jan 16 14:24 Week03
drwxr-xr-x  2 demo demo 4096 Jan 16 14:24 Week04
drwxr-xr-x  2 demo demo 4096 Jan 16 14:24 Week05
drwxr-xr-x  2 demo demo 4096 Jan 16 14:24 Week06
drwxr-xr-x  2 demo demo 4096 Jan 16 14:24 Week07
drwxr-xr-x  2 demo demo 4096 Jan 16 14:24 Week08
drwxr-xr-x  4 demo demo 4096 Jan 16 14:24 Week09
drwxr-xr-x  2 demo demo 4096 Jan 16 14:24 Week10
drwxr-xr-x  2 demo demo 4096 Jan 16 14:24 WeekTMP
>>>>> $
```

Inside the "week01-scripting" folder

```
>>>>> $ pwd
/home/demo/mydemo/W01-demos

>>>>> $ ls -al
total 96
drwxr-xr-x  2 demo demo 4096 Jan 23 18:38 .
drwx------ 14 demo demo 4096 Jan 23 18:38 ..
-rw-r--r--  1 demo demo 1797 Jan 23 18:38 1-READ-THIS-FIRST.txt
-rw-r--r--  1 demo demo 4880 Jan 23 18:38 a01-READ-ME
-rw-r--r--  1 demo demo 5644 Jan 23 18:38 a02-sort-n-prepare
-rw-r--r--  1 demo demo 4644 Jan 23 18:38 a03-command-lines-demo
-rw-r--r--  1 demo demo 1193 Jan 23 18:38 a04-does-it-exist
-rw-r--r--  1 demo demo 1204 Jan 23 18:38 a05-finding-EXIST
-rw-r--r--  1 demo demo 1114 Jan 23 18:38 a06-loop
-rw-r--r--  1 demo demo 1518 Jan 23 18:38 a07-tester
-rw-r--r--  1 demo demo 1577 Jan 23 18:38 a08-append-a-file
-rw-r--r--  1 demo demo 1168 Jan 23 18:38 a09-add-numbers
-rw-r--r--  1 demo demo 1569 Jan 23 18:38 a10-mysha1
-rw-r--r--  1 demo demo 2271 Jan 23 18:38 a11-banding
-rw-r--r--  1 demo demo 2110 Jan 23 18:38 a12-fixfs
-rw-r--r--  1 demo demo 1576 Jan 23 18:38 a13-last
-rw-r--r--  1 demo demo  752 Jan 23 18:38 a14-absen
-rw-r--r--  1 demo demo 1187 Jan 23 18:38 a15-uts171
-rw-r--r--  1 demo demo  522 Jan 23 18:38 a16-uts181
-rw-r--r--  1 demo demo  536 Jan 23 18:38 a17-uts182
-rw-r--r--  1 demo demo  404 Jan 23 18:38 .head
>>>>> $
```

Demo Files(1)

- 1-READ-THIS-FIRST.txt
- a01-READ-ME: Yes, read that!
- a02-sort-n-prepare: folder sorting; preparing and deleting folder ".ZTEST".
- a03-command-lines-demo: demo beberapa perintah CLI.
- a04-does-it-exist
- a05-finding-EXIST
- a06-loop
- a07-tester

Demo Files(2)

- a08-append-a-file
- a09-add-numbers
- a10-mysha1
- a11-banding
- a12-fixfs
- a13-last
- a14-absen
- a15-uts171
- a16-uts181
- a17-uts182

Week 01: Summary

- Reference: (OSC10 chapter 1 + chapter 2 + chapter 18)

Week 01: Check List

- [ ] **How to improve this document?**

The End

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