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

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https://os.vlsm.org/Slides/os01.pdf
Always check for the latest revision!

REV336 30-Aug-2021

OS A	OS B	OS C	OS INT
Every first day of the Week, **Quiz#1** and **Quiz#2**: 07:15-08:00			
Monday/Thursday 13:00 — 14:40	Monday/Thursday 15:00 - 16:40	Monday/Thursday 13:00 — 14:40	Monday/Wednesday 08:00 — 09:40

Week	Schedule & Deadline[1])	Topic	OSC10[2])
Week 00	30 Aug - 05 Sep 2021	Overview 1, Virtualization & Scripting	Ch. 1, 2, 18.
Week 01	06 Sep - 12 Sep 2021	Overview 2, Virtualization & Scripting	Ch. 1, 2, 18.
Week 02	13 Sep - 19 Sep 2021	Security, Protection, Privacy, & C-language.	Ch. 16, 17.
Week 03	20 Sep - 26 Sep 2021	File System & FUSE	Ch. 13, 14, 15.
Week 04	27 Sep - 03 Oct 2021	Addressing, Shared Lib, & Pointer	Ch. 9.
Week 05	04 Oct - 10 Oct 2021	Virtual Memory	Ch. 10.
Week 06	11 Oct - 17 Oct 2021	Concurrency: Processes & Threads	Ch. 3, 4.
Week 07	01 Nov - 07 Nov 2021	Synchronization & Deadlock	Ch. 6, 7, 8.
Week 08	08 Nov - 14 Nov 2021	Scheduling + W06/W07	Ch. 5.
Week 09	15 Nov - 21 Nov 2021	Storage, Firmware, Bootloader, & Systemd	Ch. 11.
Week 10	22 Nov - 28 Nov 2021	I/O & Programming	Ch. 12.

[1]) The **DEADLINE** of Week 00 is 05 Sep 2021, whereas the **DEADLINE** of Week 01 is 12 Sep 2021, and so on...

[2]) Silberschatz et. al.: **Operating System Concepts**, 10th Edition, 2018.

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

- ☐ **Text Book** — Any recent/decent OS book. Eg. (**OSC10**) Silberschatz et. al.: **Operating System Concepts**, 10th Edition, 2018. See also https://www.os-book.com/OS10/.
- ☐ **Resources**
  - ☐ **SCELE OS212** — https://scele.cs.ui.ac.id/course/view.php?id=3268. The enrollment key is **XXX**.
  - ☐ **Download Slides and Demos from GitHub.com** https://github.com/UI-FASILKOM-OS/SistemOperasi/: os00.pdf (W00), os01.pdf (W01), os02.pdf (W02), os03.pdf (W03), os04.pdf (W04), os05.pdf (W05), os06.pdf (W06), os07.pdf (W07), os08.pdf (W08), os09.pdf (W09), os10.pdf (W10).
  - ☐ **Problems** 195.pdf (W00), 196.pdf (W01), 197.pdf (W02), 198.pdf (W03), 199.pdf (W04), 200.pdf (W05), 201.pdf (W06), 202.pdf (W07), 203.pdf (W08), 204.pdf (W09), 205.pdf (W10).
  - ☐ **LFS** — http://www.linuxfromscratch.org/lfs/view/stable/
  - ☐ **OSP4DISS** — https://osp4diss.vlsm.org/
  - ☐ **DOIT** — https://doit.vlsm.org/001.html
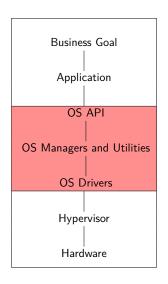
Agenda

Agenda (2)

- 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.

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[1]Source: ACM IEEE CS Curricula 2013

- 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 the virtualized infrastructure. [Familiarity]

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[1]Source: ACM IEEE CS Curricula 2013

The Operating System


```
┌─────────────────────────────────┐
│          Business Goal          │
│               │                 │
│           Application           │
├─────────────────────────────────┤
│             OS API              │
│               │                 │
│    OS Managers and Utilities    │
│               │                 │
│           OS Drivers            │
├─────────────────────────────────┤
│            Hypervisor           │
│               │                 │
│            Hardware             │
└─────────────────────────────────┘
```

Week 01: Review 2 & Scripting

- Pengenalan Lisensi Perangkat Lunak Bebas: https://rms46.vlsm.org/1/70.pdf
- Intellectual Property Rights (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 Rights (IPR)

- Trade Secret (Rahasia Dagang) — UU no. 30/2000.
- Industrial Design (Desain Industri) — UU no. 31/2000.
- Integrated Circuit Layout Design (Desain Tata Letak Sirkuit Terpadu) — UU no. 32/2000.
- Paten *(Patent)* — UU no. 14/2001.
- Copyright (Hak Cipta) — UU no. 19/2002.
- The problem of Intelectual Property Rights (IPR).
- Software IPR.
- Software Licenses: GNU GPL, EULA. Public Domain, Apache, Microsoft Public License.

Is this a Software Patent or Not?

The AV1 Video Codec — Timothy B. Terriberry

EUROPEAN PATENT SPECIFICATION

(11) EP 0 460 751 B1

Date of filing: **03.06.1991**

Method of transmitting audio and/or video signals

1

EP 0 460 751 B1
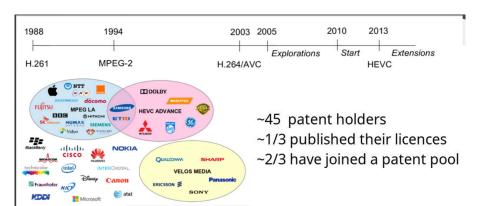
Description

The invention relates to a method of transmitting audio and/or video signals *via* some transmission medium. More particularly the transmission medium is constituted by an optically readable disc. However, the transmission medium may also be a magnetic tape or disc or a direct connection between a transmitter and a receiver. The invention also relates to the transmission medium on which the audio and/or video signals are recorded, to an encoding apparatus for transmitting the audio and/or video signals, and to a decoding apparatus for receiving these signals.

Timeline: 1988 H.261 — 1994 MPEG-2 — 2003/2005 H.264/AVC — Explorations — 2010 Start — 2013 HEVC — Extensions

~45 patent holders

~1/3 published their licences

~2/3 have joined a patent pool

Courtesy of
Jonatan Samuelsson
Divideon
Co-founder and CEO

Founding Members

amazon · Apple · arm · cisco · facebook · Google · intel

Microsoft · moz://a · NETFLIX · NVIDIA · SAMSUNG · Tencent

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ARGON DESIGN · BBC R&D · BROADCOM · 金山云 · BITMOVIN · CableLabs · Chips Media

· gfycat · hulu · iCue · NGCODEC · Ittiam · 爱奇艺

Polycom · V-SILICON · REALTEK · socionext · VeriSilicon · vimeo · Vidyo

· VLC · 微顺 · XILINX

Source (per 21-Sep-2020): https://aomedia.org/membership/members/

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 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.

Virtualization & Cloud Computing

- Virtual Machine
    - Host & Guest
    - Hypervisor (Virtual Machine Manager)
        - Type 0, 1, 2 Hypervisor
        - ParaVirtualization
        - Programming-environment Virtualization
        - Emulators
    - Application Containment (OS-Level)
        - Containers: LXC, Solaris Containers, Docker.
        - Zones: Solaris Containers
        - Virtual Private Servers: OpenVZ
        - Virtual Kernels: DragonFly BSD
        - Jails: FreeBSD Jail/ Chroot Jail
    - Kubernetes (K8s): A (open source) system for managing CONTAINERIZED applications.
- Cloud Computing
    - SAAS: Software As A Service.
    - PAAS: Platform As A Service.
    - IAAS: Infrastructure As A Service.

Week 01: Assignment #1: VirtualBox Guest Preparation

- Visit `https://osp4diss.vlsm.org/#idx00b`.
- You need a hypervisor (VirtualBox), which can be installed on Windows 10, macOS, or Linux.
  - Downloading and Installing VirtualBox `https://www.virtualbox.org/`
- A Download Manager might help for a less reliable internet.
  - FDM: Free Download Manager (Optional) `https://www.freedownloadmanager.org/`
- For Windows 10, you also need to install PUTTY and WINSCP.
  - Visit `https://osp4diss.vlsm.org/SSHGuest.html`
- For MacOs, visit: `https://fxdros.github.io/virtualbox-on-macos/`.
- Understand how to Import / Export / Delete a Virtual Guest
  - Visit `https://osp4diss.vlsm.org/#idx01`.
  - Exporting OVA
  - Importing OVA
  - Export / Import OVA
  - Deleting OVA

Week 01: Assignment #2: Importing or Installing?

- **Option 1 or Option 2?**
  - Option 1: You might **import** a pre-installed OVA file.
    - README: `https://bit.ly/3g5lwkX` (452 bytes)
    - Debian 11 OVA for VirtualBox: `https://bit.ly/3yQDL4V` (360 MB)
    - See also `https://osp4diss.vlsm.org/#idx01`.
  - Option 2: You might **install** a Debian Guest from scratch.
    - Visit `https://osp4diss.vlsm.org/#idx02b`. Set an **EMPTY VIRTUAL GUEST**, General, System, Display, Storage, Audio, Network.
    - Download Debian Netinst (ISO).
    - Installing Debian NetInst (guest).
- Running a VirtualBox Debian Guest (OVA or ISO)
  - Visit `https://osp4diss.vlsm.org/#idx03`.
  - Try to startup, console login, console log out, and shutdown.
  - Try ssh (or putty) and scp (or winscp).
  - Study some Command Lines, Editor, Regular Expression, and String Processing. (See also assignment #3).
  - Shut down and export your virtual guest (Guest-01a.ova).

- Do the **ATM Way**[1]: **GSGS**[2] and Read!
    - **REVISIT** https://osp4diss.vlsm.org/Welcome2GNULinux.html
        - Linux Sucks 2021 https://youtu.be/WtJ9T_IJOPE?t=87
        - Basic Linux Commands https://youtu.be/CpTfQ-q6MPU and https://linoxide.com/linux-command/essential-linux-basic-commands/
        - The Complete Linux Course: Beginner to Power User (7:23 hours) – https://youtu.be/wBp0Rb-ZJak
        - Basic vi commands https://youtu.be/ggSyF1SVFr4 and https://www.cs.colostate.edu/helpdocs/vi.html.
        - Learn REGEX in 15 minutes https://youtu.be/bgBWp9EIlMM
        - BASH https://tldp.org/LDP/abs/abs-guide.pdf, https://youtu.be/F-gskSl4pwQ, https://youtu.be/_n5ZegzieSQ.
        - SED https://www.gnu.org/software/sed/manual/sed.pdf
        - GAWK https://www.gnu.org/software/gawk/manual/gawk.pdf
        - Essential Awk https://youtu.be/9YOZmI-zWok
        - Linux Man Pages https://youtu.be/uJnrh9hAQR0
        - The Minix3 Notes: https://rms46.vlsm.org/2/166.pdf
    - **VISIT** https://osp4diss.vlsm.org/osp-115.html

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[1]Amati, Tiru, Modifikasi. Romi Satria Wahono has been using this term since 2007.
[2]Google Sana, Google Sini

- Revisit https://osp4diss.vlsm.org/
- Learn basic **Command**-**Line Interface** (CLI) commands: bash, cat, cd, cp, ls, man, more, mv, rm, touch, wc, vi, sed, awk, git.
- Learn how to **turn on** and **turn off** (shutdown) your Virtual Guest.
- Learn how to **login** and **logout** with ssh or putty.
- Learn some essential Regular Expression (regex).
- Learn the concept of a Stream Editor (sed).
- Learn the concept of a Git, GitHub, and GitHub Pages.
- Learn the concept of a AWK.
- Learn the concept of a SCRIPTING.
- Pick and learn how to use an editor, e.g. (**vi**).

Week 01: Assignment #3 (2): Some Essential Commands

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

chmod	E.g. `"chmod 755 file"`. Change file with access mode 755.
chown	E.g. `"chown user file"`. Change owner file to user.
chgrp	E.g. `"chgrp other file"`. Change group file to other.
tar	tape archive file. E.g.
	`"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. E.g. `"date +%Y"`
tee	read from standard input and write to standard output and files.
	E.g. `"ls -al	tee listing.txt"`
diff	compare files line by line. E.g. `"diff file1.txt file2.txt"`
wc	print newline, word, and byte counts for each file.
	E.g. `"wc file.txt"`

- VI Basics

Basics		More Commands	
i	insert mode	d^	delete from ^ (beginning) to the curs
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

- Basic vi Commands
  https://www.cs.colostate.edu/helpdocs/vi.html
- Vim Basics in 8 Minutes https://youtu.be/ggSyF1SVFr4

Week 01: Assignment #4: Dress Up Your Virtual Guest

- See https://osp4diss.vlsm.org/#idx04.
- Rename Guest as Guest-01b.ova
- PASTE: passing "NEW LINE" or not?
- Update Your Debian Guest
- Adding Debian Packages
- Your Virtual Guest Account should be == Your GitHub Account.
  E.g., "cbkadal". See Adding User Name
- Your Virtual Guest Account should be == Your Virtual Hostname.
  E.g., "cbkadal". See Rename a Hostname
- Create/Edit ".bash_profile"
- Create/Edit ".vimrc"
- Create/Edit ".bash_aliases"
- SUPERUSER
- Export Guest as Guest-01b.ova

- See https://osp4diss.vlsm.org/#idx05.
- Rename Guest as Guest-01c.ova
- SSH: Generating public/private RSA key pair
- SSH: Put a Public Key at GitHub.com (e.g. cbkadal)
- GIT: .gitconfig
- GIT: cloning from GitHub.com

Week 01: Assignment #6: Dress Up Your GitHub Page

- GSGS about the Markdown (MD) markup language.
  - See `https://github.com/adam-p/markdown-here/wiki/Markdown-Cheatsheet`.
  - See `https://doit.vlsm.org/003.html`
  - See `https://template.vlsm.org/`. You may want to download `https://template.vlsm.org/template.zip`
- Create an MD file "links.md" with front-matter `"permalink: /LINKS/."`
  - Fill the page with links that (you think) are helpful for this Operating Systems course. Add to each link two or more sentences:
    - what the link is about
    - why you think the link is interesting.
  - From next week, the links will be **peer-reviewed**.
- For example, see `cbkadal`'s:
  - GitHub Page at `https://cbkadal.github.io/os212/LINKS/`.
  - `https://raw.githubusercontent.com/cbkadal/os212/master/links.md`.
- Your links may appear next semester in `https://osp4diss.vlsm.org/osp-115.html`.

- mylog: Updating add commit push
  - With your favorite editor (perhaps "vi"?), update file mylog.txt.
- See https://osp4diss.vlsm.org/ETC/logCodes.txt for the Code list.
- **PUSH BACK** your repo into GitHub.com!
- Always remember the **4 Git Mantras**:

```
git pull
git add -A
git commit
git push
```

- Export Guest as Guest-01c.ova

- awk
  - `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.
- regex
  - to search patterns
  - BRE (Basic Regular Expression) vs ERE (Extended Regular Expression)
  - Flavors: Grep, Java, JavaScript, PHP, POSIX, Python, sed, XML, . . .

Week 01: Assignment #8 (2): bash, regex, sed, and awk

- ≪^$≫ — matches a beginning-of-line + end-of-line (empty line).
    - ≪^≫ — matches a beginning-of-line (meaningless).
    - ≪^hello$≫ — matches just "hello" in a line.
- ≪.≫ — matches any character.
    - ≪hell.≫ — matches "hellA", "hella", "hellB", "hellb", . . .
- ≪[AB]≫ — matches "A" or "B" only.
    - ≪[0-3]≫ — matches "0", "1", "2", or "3" only.
    - ≪[^4-9]≫ — not match "4", "5", "6", "7", "8", or "9".
- ≪?≫ — matches preceding zero or one time.
    - ≪a?b≫ — matches "b" or "ab" only.
- ≪*≫ — matches preceding zero or more times.
    - ≪a*b≫ — matches "b" or "ab" or "aab" or . . .
    - ≪A.*Z≫ — matches "AZ" or "AaZ" or "AabZ" or . . .
- ≪+≫ — matches preceding one or more times.
    - ≪a+b≫ — matches "ab", "aab", "aaab", . . .
- ≪{}≫ — matches numbers in {}.
    - ≪a{2}≫ — matches "aa".
    - ≪a{2,5}≫ — matches "aa", "aaa", "aaaa", and "aaaaa".
    - ≪a{2,}≫ — matches "aa", "aaa", "aaaa", "aaaaa", . . .

- ≪\≫ — escape character.
- ≪\0≫ — NULL.
- ≪\b≫ — word boundary.
- ≪\B≫ — non-word boundary.
- ≪\d≫ — any digit. E.g. ≪\d{1,3}≫ = 0 - 999.
- ≪\D≫ — any non-digit.
- ≪\n≫ — new line.
- ≪\t≫ — tab.
- ≪\s≫ — white space character.
- ≪\S≫ — non white space character.

- ≪(...)≫ — group.
    - ≪(?:...)≫ — passive group.
    - ≪(regex)|(regex)≫ — matches left regex or right regex.
    - ≪(a|b)≫ — matches either a or b.
    - ≪^(From|To):≫ — matches either ≪^From:≫ or ≪^To:≫.
- ≪[0-9]{10}≫ — 10 digits.
- ≪0[0-9]|1[0-9]|2[0-3]):[0-5][0-9]≫ — 00:00–23:59.
- ≪([0-9]|0[0-9]|1[0-9]|2[0-3]):[0-5][0-9]≫ — (0)0:00–23:59.

Week 01: Assignment #8 (5): bash, regex, sed, and awk

- ≪[:alnum:]≫ — alpha-numerics.
- ≪[:alpha:]≫ — alphabets
- ≪[:blank:]≫ — spaces and tabs.
- ≪[:digit:]≫ — digits.
- ≪[:lower:]≫ — lower case.
- ≪[:space:]≫ — spaces.
- ≪[:upper:]≫ — upper case.
- ≪[:xdigit:]≫ — hexadecimal digits.
- ≪[:punct:]≫ — punctuation.
- ≪[:cntrl:]≫ — control characters.
- ≪[:graph:]≫ — printed characters.
- ≪[:print:]≫ — printed and spaces.
- ≪[:word:]≫ — alpha-numerics and underscore.

```
\b(?:(?:25[0-5]|2[0-4]\d|[01]?\d\d?)\.){3}
(?:25[0-5]|2[0-4]\d|[01]?\d\d?)\b
```

```
\b(?:(?:25[0-5]|2[0-4]\d|[01]?\d\d?)\.){3}
(?:25[0-5]|2[0-4]\d|[01]?\d\d?)\b
```

```
# file.txt

1. This is no. 1.
2. This is no. 22.
3. This is no. 333.
4. This is no. 4 4 4 4.
5. This is Joko.
6. This is Joko Joko.
7. This is joko.
8. This is Bowo.
9. This is bowo.
sed    'G'    ZA-thisfile1.txt
sed    'G;G'  ZA-thisfile1.txt
sed -n '4,6p' ZA-thisfile1.txt
sed -n '4,6p' ZA-thisfile1.txt > ZA-thisfile2.txt
sed -n '/[0-9]\{2\}/p' ZA-thisfile1.txt
sed    '4,6d' ZA-thisfile1.txt
sed    '$d' ZA-thisfile1.txt
sed    '5,/HABATS/d'   ZA-thisfile1.txt
sed    's/Joko/Bowo/'   ZA-thisfile1.txt
sed    's/Joko/Bowo/2' ZA-thisfile1.txt
sed    's/Joko/Bowo/g' ZA-thisfile1.txt
sed    's/Bowo\|bowo/Joko/g' ZA-thisfile1.txt
awk    '{print "Hello awk!"}' ZA-thisfile1.txt
awk    '{print $0}' ZA-thisfile1.txt
awk    '{print $1}' ZA-thisfile1.txt
awk    '{print $2}' ZA-thisfile1.txt
HABATS: This is the last line, dude!
```

- `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.

☐ This page is `https://os.vlsm.org/Slides/check01.pdf`.

☐ **Starting Point:** `https://os.vlsm.org/`

☐ Week 01: Assignment (more details in **os01.pdf**).

1. VirtualBox Guest Preparation
2. Importing (OVA) or Installing (ISO)?
3. Do the ATM way: GSGS and Read!
4. Dress Up Your Virtual Guest
5. SSH Keys for Git
6. Dress Up Your GitHub Page
7. Update mylog.txt
8. More awk, bash, regex, sed

The End

- ☐ This is the end of the presentation.
- ☒ This is the end of the presentation.
- This is the end of the presentation.