

CSGE602055 Operating Systems

CSF2600505 Sistem Operasi

Week 02: Security, Protection, Privacy, & C-language

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<https://os.vlsm.org/Slides/os02.pdf>

Always check for the latest revision!

REV360 07-Nov-2021

OS212⁴): Operating Systems 2021 - 2

OS A	OS B	OS C	OS INT
Every first day of the Week, Quiz#1: (07:40-07:50) and Quiz#2: 07:20-07:40			
Monday/Thursday 13:00 — 14:40 14:00 — finish	Monday/Thursday 15:00 — 16:40 ¹ 16:00 — finish	Monday/Thursday 13:00 — 14:40 13:00 — 14:40	Monday/Wednesday 08:00 — 09:40 09:00 — finish

Week	Schedule & Deadline ²⁾	Topic	OSC10 ³⁾
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 - 31 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⁾ **OS B:** Week00-Week05 (RMS); Week06-Week10 (MAM).

²⁾ The **DEADLINE** of Week 00 is 05 Sep 2021, whereas the **DEADLINE** of Week 01 is 12 Sep 2021, and so on...

³⁾ Silberschatz et. al.: **Operating System Concepts**, 10th Edition, 2018.

⁴⁾ This information will be on **EVERY** page two (2) of this course material.

STARTING POINT — <https://os.vlsm.org/>

- ❑ **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

- 1 Start
- 2 Schedule
- 3 Agenda
- 4 Week 02 Security & Protection
- 5 Cyber Security Introduction
- 6 Protection & Security Design
- 7 The Security Problem
- 8 Protection
- 9 Privacy
- 10 C Language
- 11 Week 02: Summary
- 12 Week 02: Check List
- 13 The End

Week 02 Security & Protection: Topics¹

- Overview of system security
- Cyber Security Introduction
- Policy/mechanism separation
- Security methods and devices
- Protection, access control, and authentication
- Backups
- Safety and Privacy
- Threads
- Cryptography: (Symmetric and Asymmetric) Encryption,
- C Language

¹Source: ACM IEEE CS Curricula 2013

Week 02 Security & Protection: Learning Outcomes¹

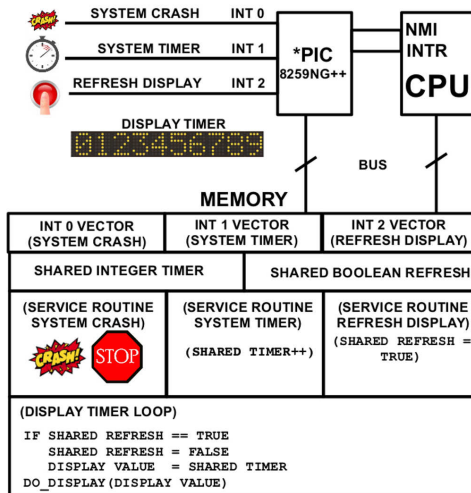
- Articulate the need for protection and security in an OS (cross-reference IAS/Security Architecture and Systems Administration/Investigating Operating Systems Security for various systems). [Assessment]
- Summarize the features and limitations of an operating system used to provide protection and security [Familiarity]
- Explain the mechanisms available in an OS to control access to resources [Familiarity]
- Carry out simple system administration tasks according to a security policy, for example creating accounts, setting permissions, applying patches, and arranging for regular backups [Usage]

¹Source: ACM IEEE CS Curricula 2013

Visit:

- <https://youtu.be/rcD08km6R6c>
- https://youtu.be/CivG_2UqKMg (culture part).
 - Point of Cybersecurity
 - Good Administration
 - Zero Trust Environment
 - Successful Security Attack
 - Potential Security Threats
 - Security Problems
 - Disaster Recovery
 - Employee Security Policy
 - Culture

Protection & Security Design



(c) 2017 VauLSMorg – This is a free picture

Figure: How to protect and secure this design?

The Security Problem

- **OSC10:**

- **Security** is a measure of confidence that the integrity of a system and its data will be preserved.
 - **Protection** is the set of mechanisms that control the access of processes and users to the resources defined by a computer system.
- Secure System, Intruders, Threat, Attack.
- Security Violation Categories: Breach of (confidentiality, integrity, availability), theft of service, DOS.
- Security Violation Methods: Masquerading, Replay attack, Human-in-the-middle attack, Session hijacking, Privilege escalation.
- Security Measure Levels: Physical, Network, Operating System, Application.
- Program, System, and Network Threats
 - Social Engineering: Phishing.
 - Security Hole: Code Review.
 - Principle of least privilege.

The Security Problem (cont)

- Threats: Malware, Trojan Horse, Spyware, Ransomware, Trap (back Door, Logic Bomb, Code-injection Attack, Overflow, Script Kiddie.
- Viruses: Virus Dropper, Virus Signature, Keystroke Logger.
- Worm, Sniffing, Spoofing, Port Scanning, DOS (Denial of Service).
- Cryptography: (Symmetric and Asymmetric) Encryption, Public/Private Key Pairs, Key Distribution, Digital Certificate.
- User Authentication:
 - Password: One Time Password, Two-Factor Authentication,
 - Biometrics.
- Implementing Security Defenses: Policy, Assesment, Prevention, Detection, Protection, Auditing.
- Linux Security
- gnupg & sha1sum

Protection

- Principle of Least Privilege
- Domain Structure and Access Matrix
- ACL: Access Control List
 - Domain = set of Access-rights (eg. **user-id**).
 - Access-right = <object-name, rights-set> (eg. object: file).

	File1	File2	File3	Printer
User1	Read		Read	
User2				Print
User3		Read	Execute	Print
User4	R/W		R/W	Print

- Access-right Plus Domain (Users) as Objects

	F1	F2	F3	Printer	U1	U2	U3	U4
U1	R		R			SW		
U2				Print			SW	SW
U3		R	EXEC	Print				
U4	R/W		R/W	Print	SW			

Copy Rights

- Start

	File1	File2	File3
User1	Exec		Write*
User2	Exec	Read*	Exec
User3	Exec		

- User3: Read access to File2 (by User2)

	File1	File2	File3
User1	Exec		Write*
User2	Exec	Read*	Exec
User3	Exec	Read	

- Owner Rights

	File1	File2	File3
User1	O & E		W
User2		O & R* & W*	O & R* & W
User3		W	W

- Privacy can mean different things in different contexts; different people, cultures, and nations have different expectations about how much privacy a person is entitled to or what constitutes an invasion of privacy.
- Considering all discussions as one of these concepts
 - Right to be let alone (such as one's own home).
 - Limited access (no information collection).
 - Control over information (in the era of big data).
 - States of privacy: solitude, intimacy, anonymity, and reserve.
 - Secrecy: does not apply for any already publicly disclosed.
 - Personhood and autonomy.
 - Self-identity and personal growth.

Beginner's Guide to Internet Safety & Privacy

- **URL:** <https://choosetoencrypt.com/privacy/complete-beginners-guide-to-internet-safety-privacy/>
- Who Are You Protecting Yourself From?
 - Governments
 - ISPs
 - (H)Crackers
 - Trackers
 - Advertisers/Malwertisers
- Which Information Should You Keep Private?
 - Metadata
 - Personal Information
 - Passwords
 - Financial Data
 - Medical Records
 - History
 - Communication

- Reference: (Any C Language Tutorial)
- Visit <https://github.com/UI-FASILKOM-OS/SistemOperasi/tree/master/Demos/Week02/c-language>

Week 02: Summary

- Reference: (OSC10-ch16 OSC10-ch17 demo-w02)
- Goals of Protection
- Domain and Access Matrix
- ACL: Access Control List
- The Security Problem
- Threats: Trojan Horse, Trap Door, Overflow, Viruses, Worms, Port Scanning, DOS (Denial of Service).
- Cryptography: (Symmetric and Asymmetric) Encryption,
- User Authentication: Password, Biometrics.
- Implementing Security Defenses: Policy, Assesment, Prevention, Detection, Protection, Auditing.
- Privacy.

Week 02: Check List (Deadline: 19 Sep 2021).

□ Week 02: Assignment (**os02.pdf**). (Eg. **cbkadal**).

- Visit <https://osp4diss.vlsm.org/#idx07>

- 1 Read OSC10 chapter 16 + chapter 17
- 2 Try Demos in <https://github.com/UI-FASILKOM-OS/SistemOperasi/tree/master/Demos/>.
- 3 Watch: **Cyber Security Introduction part 1** and the beginning of part 2.
- 4 Generate a GnuPG Key Pair <https://osp4diss.vlsm.org/CBKadal2.html>.
- 5 List of all GnuPG Keys <https://osp4diss.vlsm.org/W02-01.html>.
- 6 Importing **ospubkey.txt** Key from <https://osp4diss.vlsm.org/W02-02.html>.
- 7 Signing the Operating Systems public key (Optional).
- 8 Export **YOUR PUBLIC KEY** to your repo file "TXT/mypubkey.txt".
- 9 Update your bookmark links. See C.B. Kadal's "LINKS/".
- 10 Review your peer links.
- 11 Write (or copy) a simple and useful bash script (<https://cbkadal.github.io/os212/TXT/myscript.sh>).
- 12 Update your log. See C.B. Kadal's "mylog.txt"
- 13 Run "myscript.sh" script to generate SHA256SUM and SHA256SUM.asc.

The End

- ☐ This is the end of the presentation.
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