CSGE602055 Operating Systems
CSF2600505 Sistem Operasi
Week 02: Security, Protection, Privacy, & C-language

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Always check for the latest revision!

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Operating Systems 2019-2

A (Rm 3113?) [Tu/Th 08-10] — I (Rm A714) [Tu 13-15/Th 14-16]

Week	Schedule	Topic	OSC10
Week 00	03 Sep - 09 Sep 2019	Overview 1, Virtualization & Scripting	Ch. 1, 2, 18.
Week 01	10 Sep - 16 Sep 2019	Overview 2, Virtualization & Scripting	Ch. 1, 2, 18.
Week 02	17 Sep - 23 Sep 2019	Security, Protection, Privacy, & C-language	Ch. 16, 17
Week 03	24 Sep - 30 Sep 2019	File System & FUSE	Ch. 13, 14, 15
Week 04	01 Oct - 07 Oct 2019	Addressing, Shared Lib, & Pointer	Ch. 9
Week 05	08 Oct - 14 Oct 2019	Virtual Memory	Ch. 10
Reserved	15 Oct - 18 Oct 2019	Q & E	
MidTerm	19 Oct - 25 Oct 2019	TBA — MidTerm (UTS)	
Week 06	29 Oct - 04 Nov 2019	Concurency: Processes & Threads	Ch. 3, 4
Week 07	05 Nov - 11 Nov 2019	Synchronization & Deadlock	Ch. 6, 7, 8
Week 08	12 Nov - 18 Nov 2019	Scheduling + W06/W07	Ch. 5
Week 09	19 Nov - 25 Nov 2019	Storage, Firmware, Bootldr, & Systemd	Ch. 11
Week 10	26 Nov - 02 Dec 2019	I/O & Programming	Ch. 12
Reserved	03 Dec - 13 Dec 2019	Q & E	
Final	14 Dec - 21 Dec 2019	TBA — Final (UAS)	This schedule is subject to change.
Extra	09 Jan 2020	Extra assignment confirmation	

STARTING POINT — https://os.vlsm.org/

- **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/.
- **Weekly**
  - Encode your **QRC** with size about 5cm x 5cm (ca. 400x400 pixels): **"OS191 CLASS ID SSO-ACCOUNT Your-Full-Name"**
    Write your Memo (with QRC) **every week**.
    See also Assignment#0: Generate your QR Code.
  - Login to badak.cs.ui.ac.id via kawung.cs.ui.ac.id for at least **10 minutes** every week. Copy all weekly demo folders into your own badak home directory.
    Eg.: `cp -r /extra/Demos/* ~/mydemos/`
- **Resources**
  - **All In One** — BADAK.cs.ui.ac.id:///extra/ (**FASILKOM only!**).
  - **Download Slides and Demos from GitHub.com**
    https://github.com/UI-FASILKOM-OS/SistemOperasi/
  - **Problems** — https://rms46.vlsm.org/2/:
    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).

Agenda

Week 02 Security & Protection: Topics[1]

- Overview of system security
- Policy/mechanism separation
- Security methods and devices
- Protection, access control, and authentication
- Backups

[1] Source: ACM IEEE CS Curricula 2013

Week 02 Security & Protection: Learning Outcomes[1]

- 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]

[1] Source: ACM IEEE CS Curricula 2013

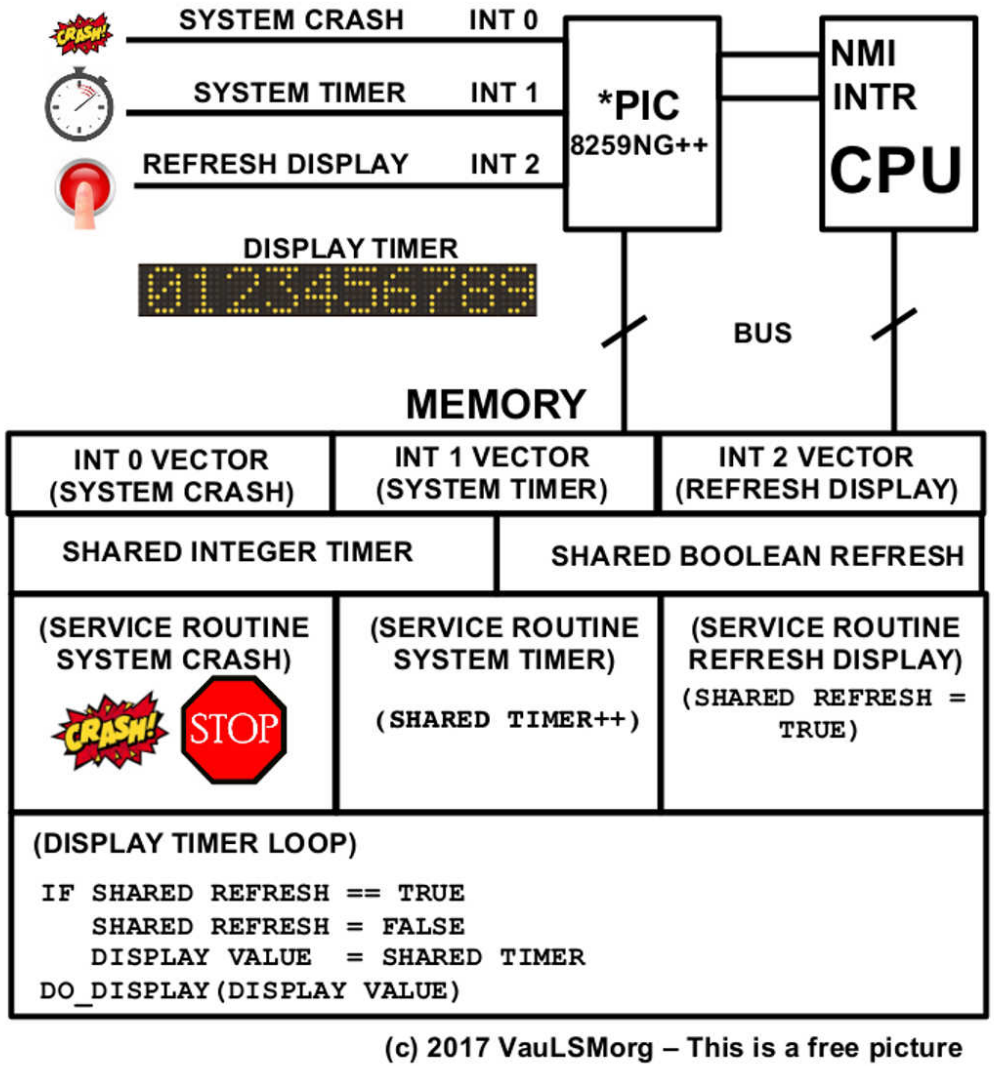

Figure: How to protect and secure this design?

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 (Wikipedia)

- 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

C Language

- Reference: (Any C Language Tutorial)

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

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

The End

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