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ASSIGNMENT #3 Dockers and Containerization
(Student Weekly Study Plan)

History of Docker and Containerization

Containerization originated from the **UNIX "chroot" command (1979)**, which enabled process isolation. Later, systems such as **FreeBSD Jails (2000)** and **Linux Containers (LXC, 2008)** expanded on this concept.
In **2013**, **Solomon Hykes** introduced **Docker**, transforming containerization by offering an intuitive **CLI** and introducing **image layers** and **Docker Hub** for image sharing.

According to **Turnbull (2019)** in *The Docker Book*, Docker simplified application deployment by allowing developers to package software and dependencies into a single, portable unit that can run anywhere — marking a major milestone in **DevOps** and **cloud-native** development.

Best Practices in Implementing Docker and Containerization

Based on *The Docker Book* (Turnbull, 2019), *Docker Tutorial* (Baire, 2020), and *Docker CLI Cheat Sheet*, the following best practices are recommended:

1. **Use lightweight base images** (e.g., Alpine Linux) to reduce image size and attack surfaces.

2. **Avoid running containers as root**; always follow the principle of least privilege.

3. **Regularly update images and dependencies** to ensure security patches are applied.

4. **Use Docker Compose** for managing multi-container applications.

5. **Keep Dockerfiles and Compose files under version control** for reproducibility.

6. **Secure environment variables** by avoiding hardcoded credentials.

7. **Use Docker volumes** for persistent and shared data management.

8. **Scan images for vulnerabilities** before deployment using trusted tools.

9. **Monitor container resource usage** (CPU, memory, I/O) to maintain performance.

10. **Apply security benchmarks** from Docker Bench and **OWASP** to audit and harden deployments.

Docker and Containerization

Goal: To understand the fundamental concepts, architecture, and best practices of Docker and containerization.

Table of Contents:

Requirements:

- A personal computer or laptop capable of running Docker Desktop
- Stable internet connection

WEEK	TOPIC/CONTENT	INTENDED LEARNING OUTCOME/OBJECTIVES	RESOURCES
1	Introduction to Containerization	Understand what containers are, their advantages over virtual machines, and real-world use cases.	Docker docs, Youtube, Books, Tbl
2	Docker Installation and Architecture	Install Docker, explore its architecture (client-server model, daemon, registry, and images).	Docker Tutorial (Baire, 2020); Docker Docs

3	Working with Images and Containers	Learn Docker commands for creating, running, and managing containers; understand Docker images.	Docker CLI Cheat Sheet; Docker Docs
4	Building Images using Dockerfile	Understand the syntax and structure of Dockerfiles and how to build custom images.	Dockerfile Reference
5	Networking and Volumes	Learn how Docker handles networking and data persistence with volumes and bind mounts.	Docker Tutorial; Docker Docs
6	Multi-Container Applications with Docker Compose	Use Docker Compose to define and run multi-container applications.	Docker Docs
7	Security and Optimization	Understand container security, least privilege principles, and image optimization techniques.	Docker Bench for Security; OWASP Docker Cheat Sheet
8	Capstone Project	Build and deploy a simple web app using multiple Docker containers connected with Docker Compose.	All references above

References (APA 7th Edition)

Baire, A. (2020, December 2). *Docker Tutorial (handout)* [PDF]. Université de Rennes 1 / UMR IRISA. https://tbl.umak.edu.ph/pluginfile.php/72516/mod_resource/content/2/docker_cheatsheet.pdf

Docker CLI Cheat Sheet. (n.d.). Docker CLI Cheat Sheet; .

Hykes, S. (2013). *Introducing Docker.* Docker Blog. Retrieved from https://www.docker.com/blog/introducing-docker/

OWASP Foundation. (n.d.). *OWASP Docker Security Cheat Sheet.* OWASP Cheat Sheet Series.

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Turnbull, J. (2019). *The Docker Book: Containerization is the new virtualization.* Turnbull Press.

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YouTube. (n.d.). *The Only Docker Tutorial You Need To Get Started* [Video]. YouTube. https://youtu.be/DQdB7wFEygo