Scientific Computing
Exercise 01

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1 Installing AlmaLinux 9 on Docker with macOS (Apple Silicon)

This guide will help install AlmaLinux 9 on Docker for macOS with Apple Silicon (M1, M2, or M3 chips).

1.1 Prerequisites

Before you begin, ensure you have the following:

- A Mac with an Apple Silicon chip (M1, M2, or M3)
- An active internet connection
- A terminal to run commands

1.2 Step 1: Install Docker on macOS (Apple Silicon)

If you have Homebrew installed, you can quickly install Docker with:

```
brew install --cask docker
```

Alternatively, download the Apple Silicon version of Docker Desktop from the official website[1] and follow the installation instructions.

Note: Homebrew offers a quicker setup, automatic updates, and cleaner uninstallation, while manual installation requires manual updates and may leave residual files. In short: Homebrew = efficient, manual = messier.

After installation, verify Docker is working by running:

```
docker --version
docker run hello-world
```

[1] https://www.docker.com/products/docker-desktop/

1.3 Step 2: Pull the AlmaLinux 9 Docker Image

AlmaLinux 9 is available as a pre-built image on Docker Hub. To pull the image, run:

```
docker pull almalinux:9
```

1.4 Step 3: Create an AlmaLinux Container

Once the image is downloaded, start a new container with:

```
docker run -it --name almalinux9-container almalinux:9 /bin/bash
```

This will open a Bash shell inside the container, where you can begin working.

1.5 Step 4: Update and Install Necessary Packages

Inside the container, update the system and install development tools:

```
dnf update -y
dnf groupinstall -y "Development Tools"
```

If you need SSH access, install and start the SSH server:

```
dnf install -y openssh-server
systemctl enable sshd
systemctl start sshd
```

1.6 Step 5: Exit and Manage the Container

To verify the operating system inside the container, run:

```
cat /etc/os-release
```

To check running containers, open a new terminal and type:

```
docker ps
```

When you're done, exit the container:

```
exit
```

To restart it:

```
docker start -ai almalinux9-container
```

To remove it:

```
docker rm almalinux9-container
```

1.7 Conclusion

Congratulations! AlmaLinux 9 is now up and running on Docker on your macOS Apple Silicon. Enjoy!

2 Install Docker on Windows and Set Up AlmaLinux 9

2.1 Prerequisites

- Windows 10/11 (64-bit) or Windows Server 2019/2022
- WSL 2 enabled (for best performance)
- Virtualization enabled in BIOS
- Administrator privileges
- Internet connection

2.2 Step 1: Install Docker Desktop

1. Download Docker Desktop from the official website[2]
2. Run the installer and follow the setup instructions.
3. Ensure that WSL 2 integration is enabled in Docker settings (if applicable).
4. Restart your computer if prompted.
5. Verify installation by opening a terminal (PowerShell or Command Prompt) and running:

   ```
   docker --version
   ```

6. Test Docker functionality by running:

   ```
   docker run hello-world
   ```

   If Docker is working correctly, you should see a message confirming that the installation is successful.

2.2.1 Wow, You Did It!

Docker is now installed! That was intense, right? Give yourself a pat on the back—you just clicked a few buttons and typed a command. Truly groundbreaking.

2.2.2 Possible Issues and Fixes

- **Error: WSL 2 is not enabled**: Run `wsl --set-default-version 2` and restart Docker.
- **Error: Docker failed to start**: Check if virtualization is enabled in BIOS.

[2] `https://www.docker.com/products/docker-desktop/`

- **Slow performance**: Ensure WSL 2 is used instead of Hyper-V.

2.3 Step 2: Enable WSL 2 (Optional but Recommended)

1. Open PowerShell as Administrator and run:

   ```
   wsl --install
   ```

2. Set WSL 2 as the default version:

   ```
   wsl --set-default-version 2
   ```

3. Restart your machine if needed.
4. Check if WSL 2 is working:

   ```
   wsl -l -v
   ```

   This should list installed Linux distributions and their versions.

2.4 Step 3: Pull and Run AlmaLinux 9 Container

1. Open a terminal and pull the AlmaLinux 9 image from Docker Hub:

   ```
   docker pull almalinux:9
   ```

2. Verify the image is downloaded:

   ```
   docker images
   ```

3. Run a new AlmaLinux 9 container:

   ```
   docker run -it --name almalinux9_container almalinux:9 /bin/bash
   ```

   - `-it` allows interactive mode
   - `--name almalinux9_container` gives the container a recognizable name
   - `/bin/bash` starts a shell inside the container

2.4.1 Incredible Achievement!

Congratulations, you have now launched a Linux container. Nobel Prize in System Administration incoming! Enjoy this glorious moment before embarking on the next steps.

2.4.2 Possible Issues and Fixes

- **Error: Cannot connect to Docker daemon**: Restart Docker Desktop and check if the service is running.
- **Error: Image not found**: Ensure internet access and run `docker pull almalinux:9` again.

2.5 Step 4: Basic Configuration inside the Container

Once inside the AlmaLinux 9 container, update the package manager:

```
sudo dnf update -y
```

To install additional packages, use:

```
sudo dnf install <package-name> -y
```

To exit the container:

```
exit
```

2.6 Step 5: Manage the AlmaLinux Container

To list running containers:

```
docker ps
```

To start/stop the container:

```
docker start almalinux9_container
docker stop almalinux9_container
```

To access the container after it has been created:

```
docker exec -it almalinux9_container /bin/bash
```

To remove the container:

```
docker rm almalinux9_container
```

To remove the AlmaLinux 9 image:

```
docker rmi almalinux:9
```

2.7 Conclusion

You have successfully installed Docker on Windows and set up an AlmaLinux 9 container. You can now use this container for development, testing, or running applications in an isolated environment. If you encounter any issues, check Docker logs using:

```
docker logs almalinux9_container
```