[Tech Forum] RobotFramework With Docker

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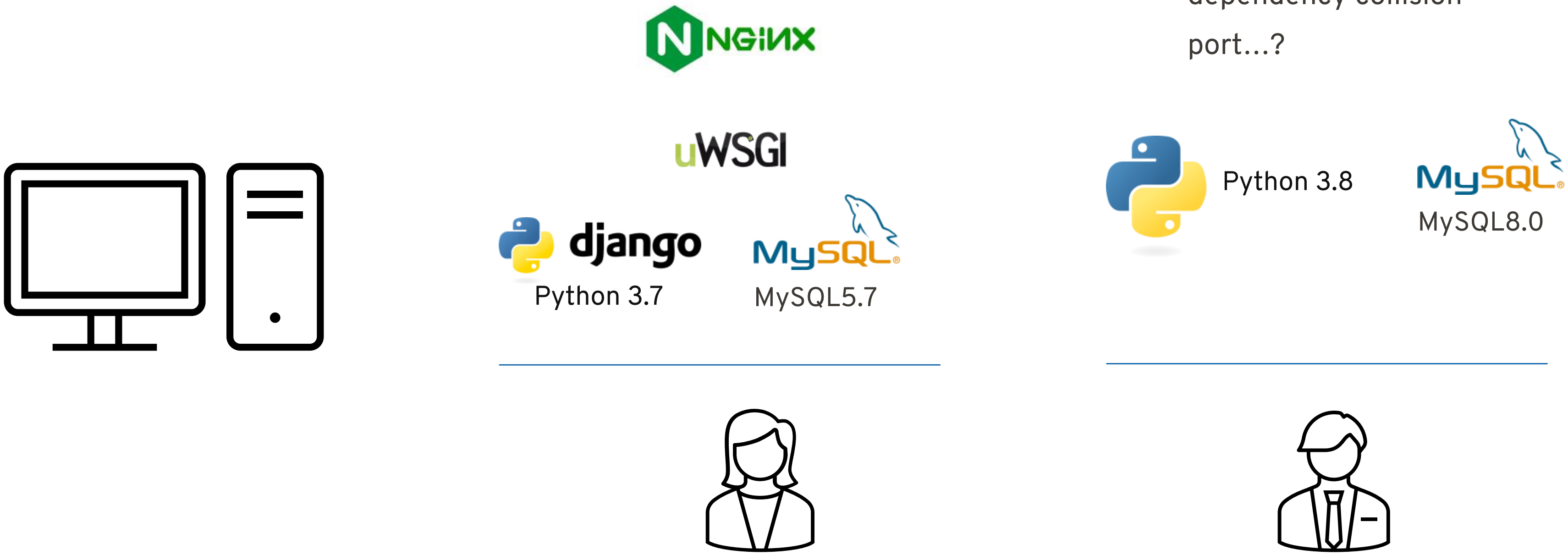
1. What is Docker

Support that...

dependency collision

port...?



Python 3.7

MySQL5.7

Python 3.8

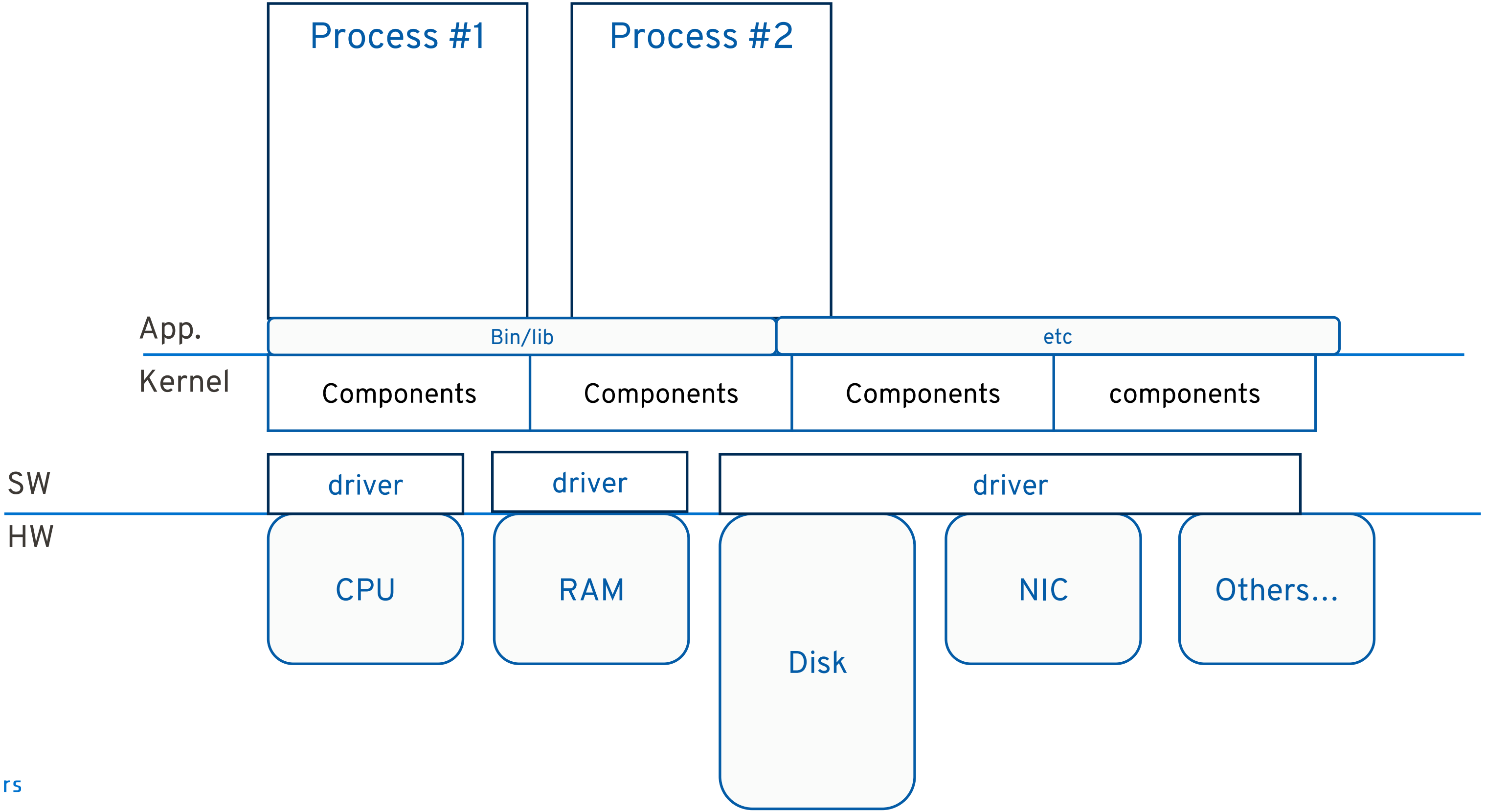
MySQL8.0

1. What is Docker

Why Developers want “Virtualization”

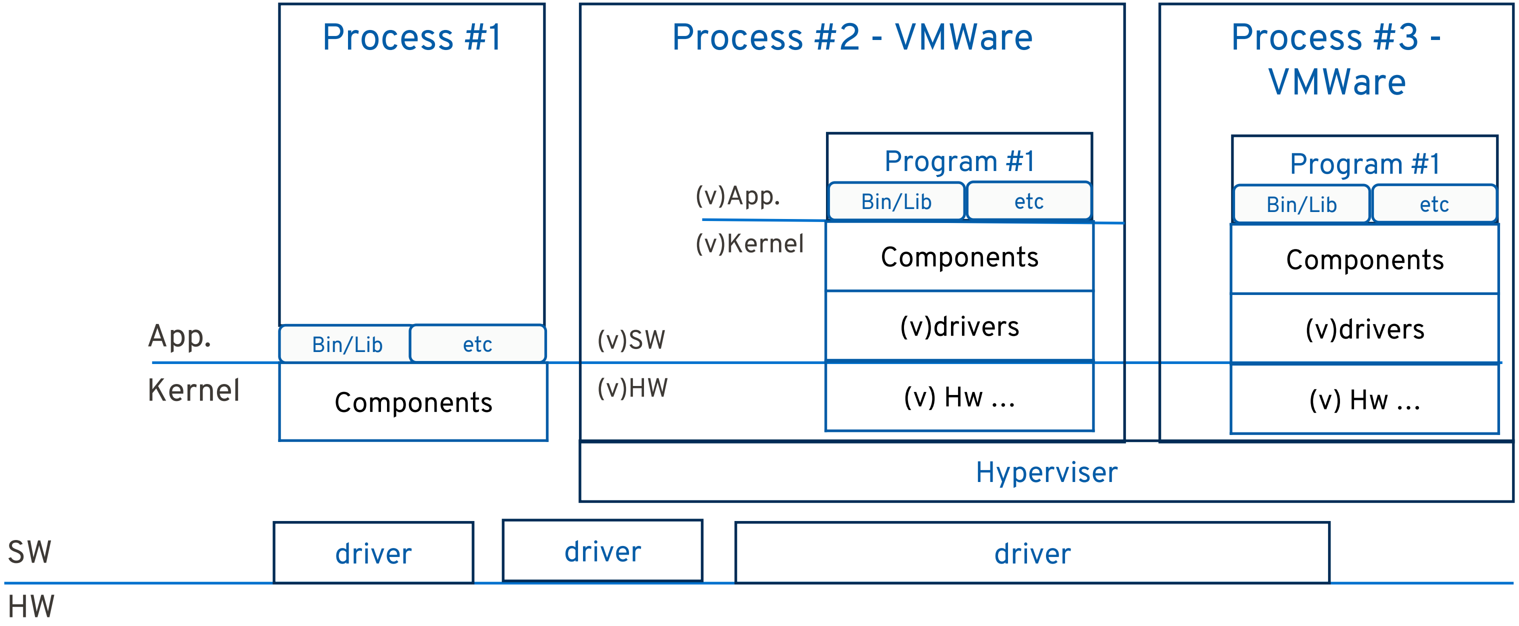
- **Dependency version mismatch:** Python 3.8 vs Python 3.9
- **Port conflicts**
- **System library conflicts**
- **Framework conflicts:** I want to use different versions of Express.js alongside different versions of Node
- **Environment variable conflicts**
- **OS dependency issues**
- **Inconsistency between development, testing, and deployment environments**

1. What is Docker



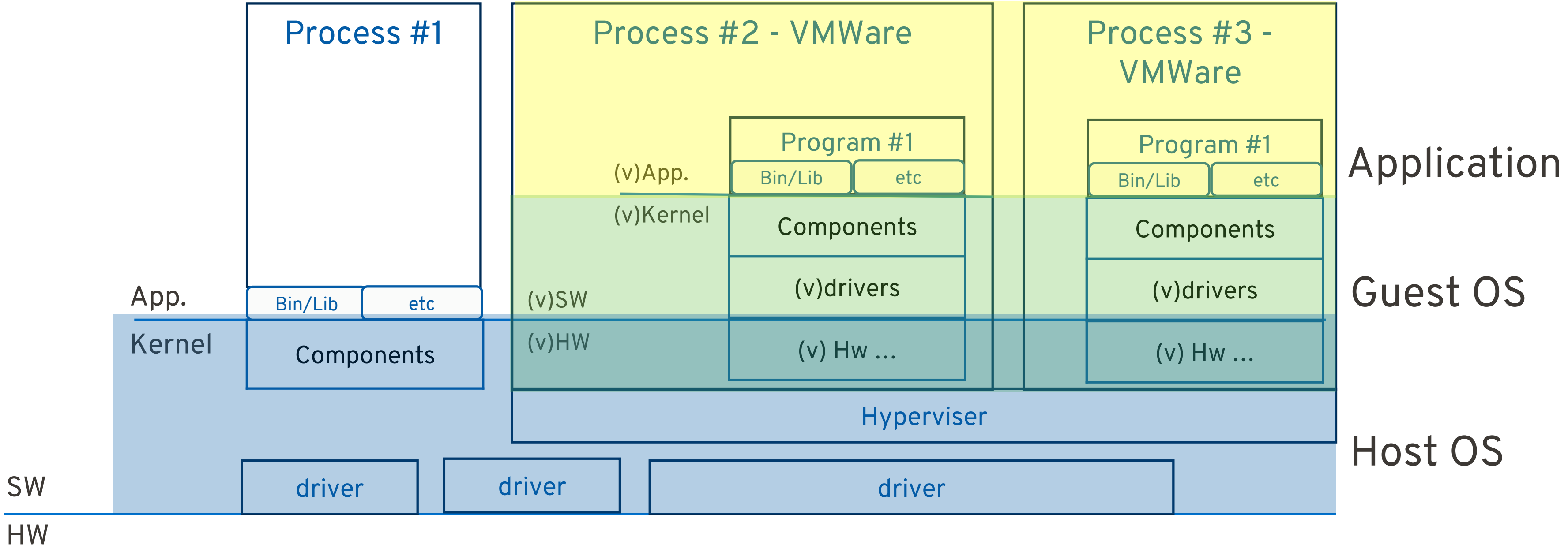
1. What is Docker

Using VM

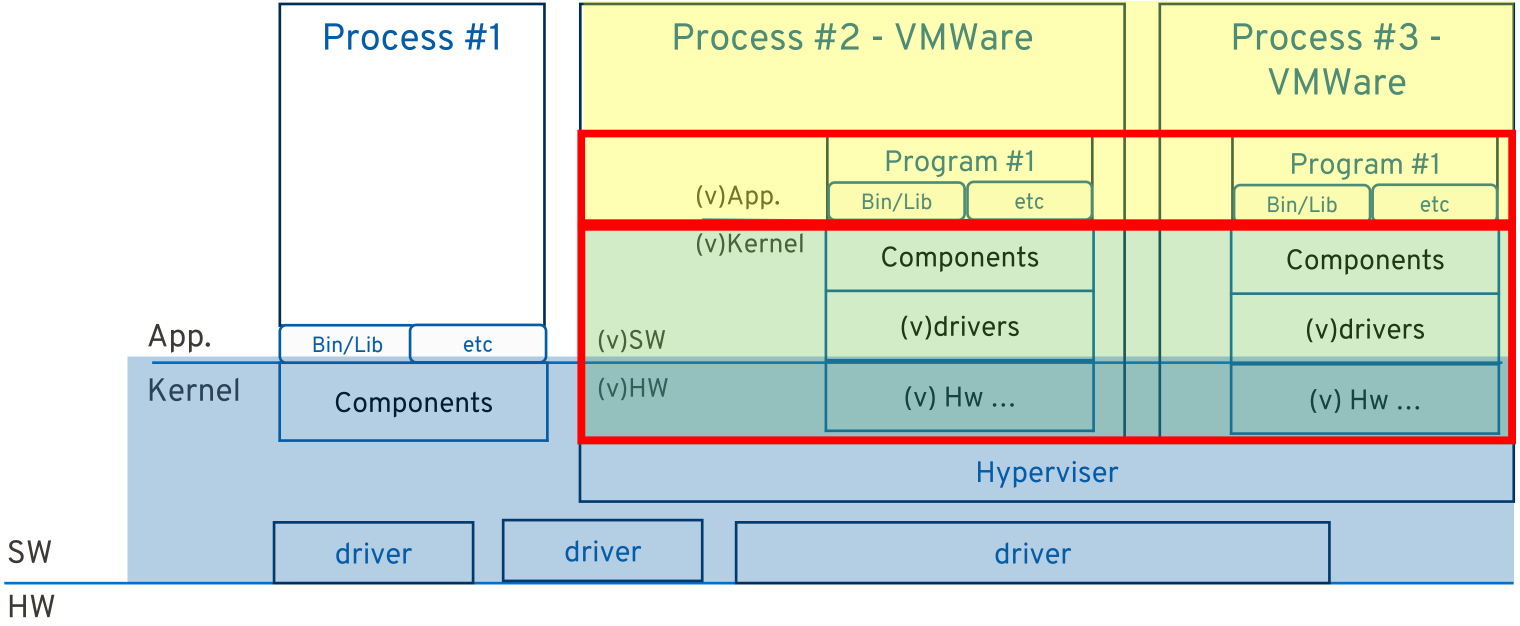


1. What is Docker

Using VM Ware

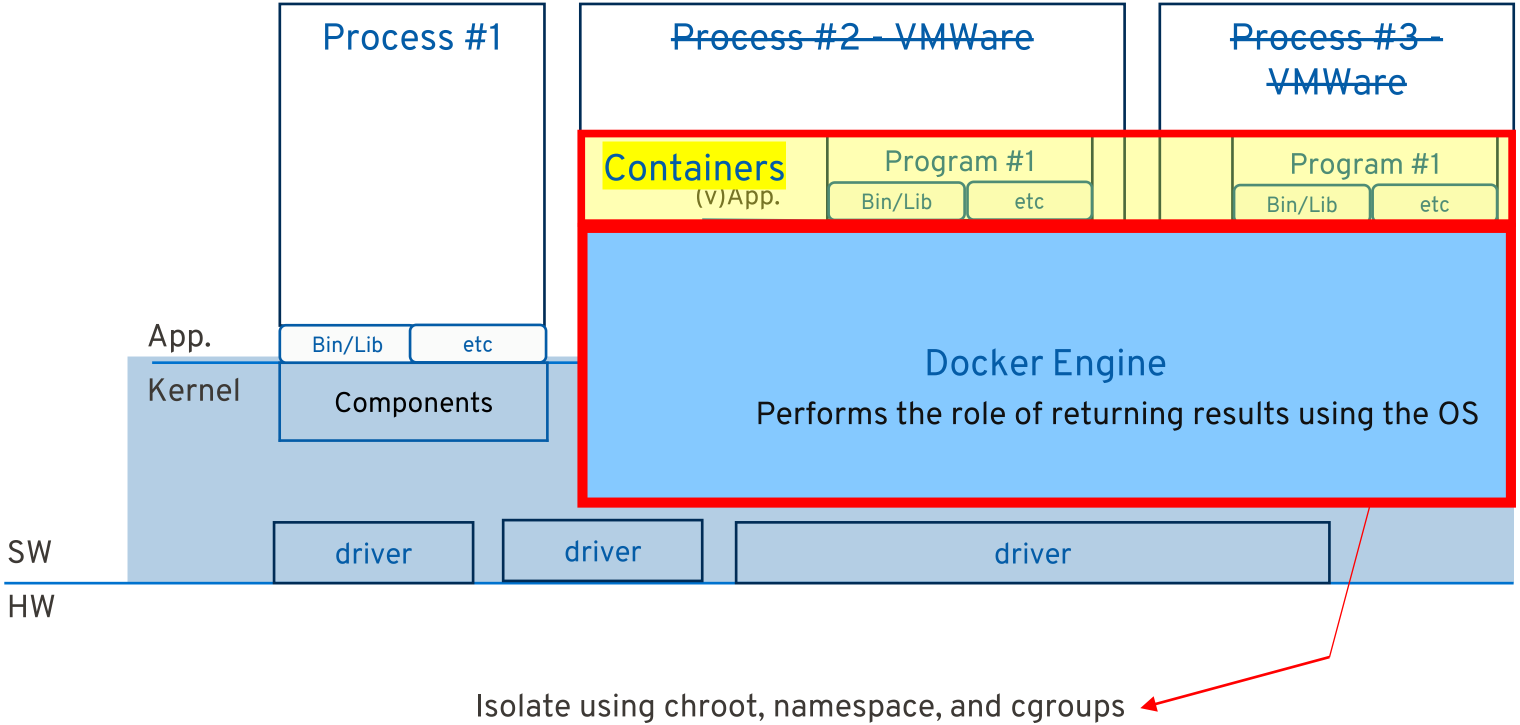


1. What is Docker



Bin/Lib 를 위해서
동일한 guestOS 를
띄워야할까요?

1. What is Docker



Isolate using chroot, namespace, and cgroups

2. Advantages of Using Docker

(Advantages)

- lighter than Virtual Machine
- Independence and scalability of multiple applications
- Standardized dev/test/deploy environment
- You don’t need to setup the environment multiple times !!!

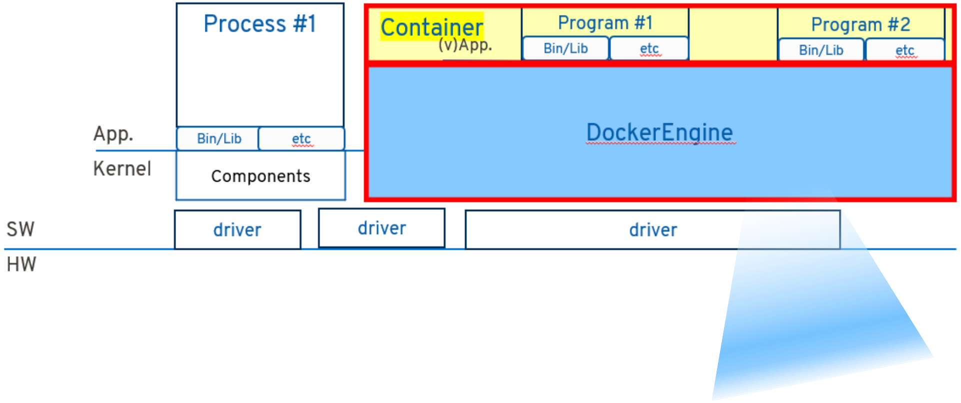
(Disadvantages)

- Storage Issues
- Complex Network configuration between containers
- **Frequent I/O can relatively impact performance negatively**

=> Kubernates : Container Management!

- Service Discovery & Load Balancing
- Storage Ochestration
- rollback/rollout

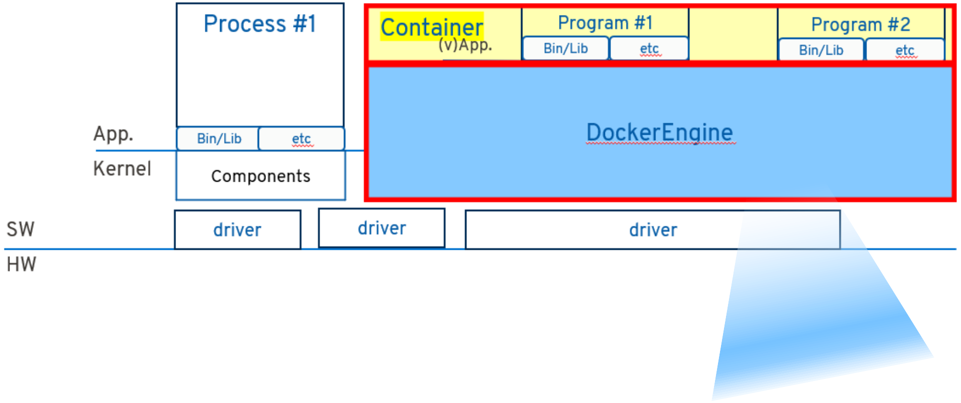
Appendix. Docker inside…



chroot (change root)

- A command that allows a specific process and its child processes to recognize a designated directory as the root, instead of the system’s /root
- When using the filesystem, the user perceives the specified directory as ‘/’

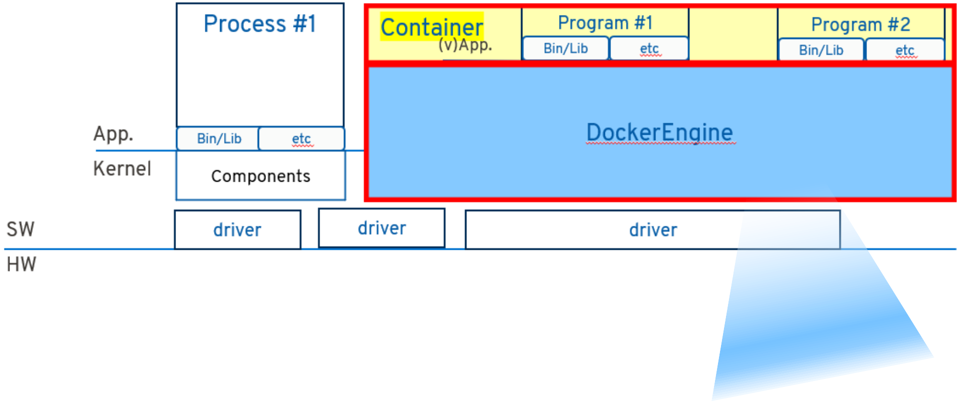
Appendix. Docker inside…



namespace

- Isolates the resources of processes: Allows each container to use resources independently.
- Ensures an independent resource view: Each container has its own PID space and isolates NIC, MNT, UTS, etc.

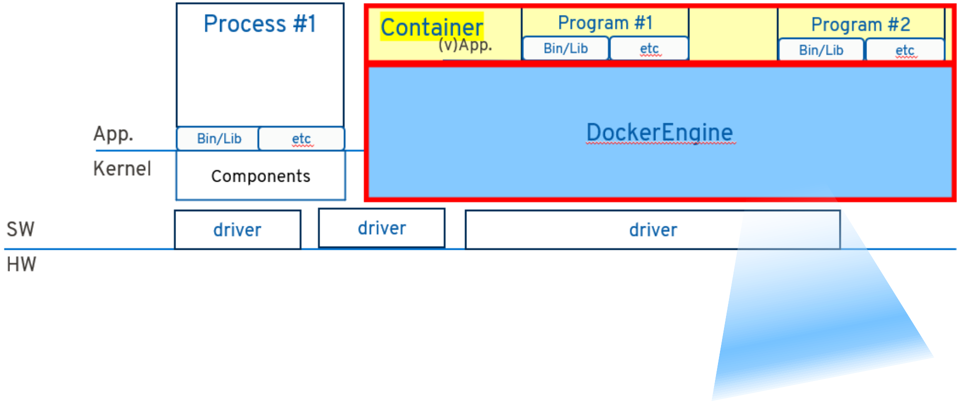
Appendix. Docker inside...



cgroup (control group)

- Limitation, monitoring, and management of resources on a per-process group basis
- CPU, memory, Disk I/O, network bandwidth…

Appendix. Docker inside…

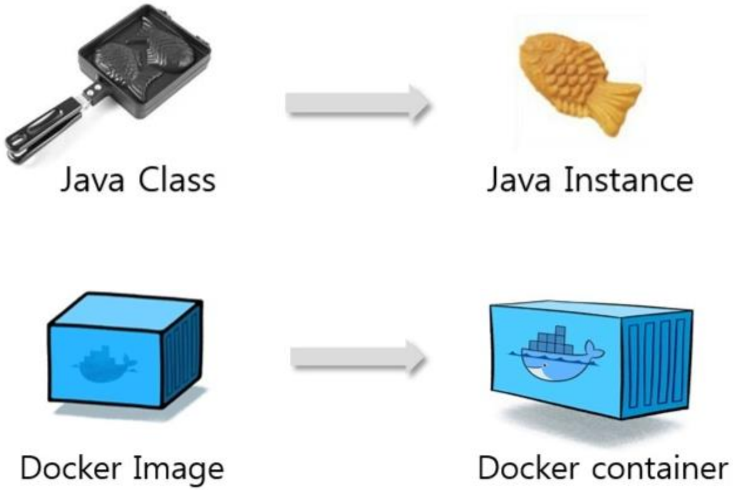


- **chroot** : Isolates files and maintains an independent view of the file system
- **namespace** : Isolates resource (processes, networks, IPC)
- **cgroup** : Manages and limits resources

Appendix. Terms

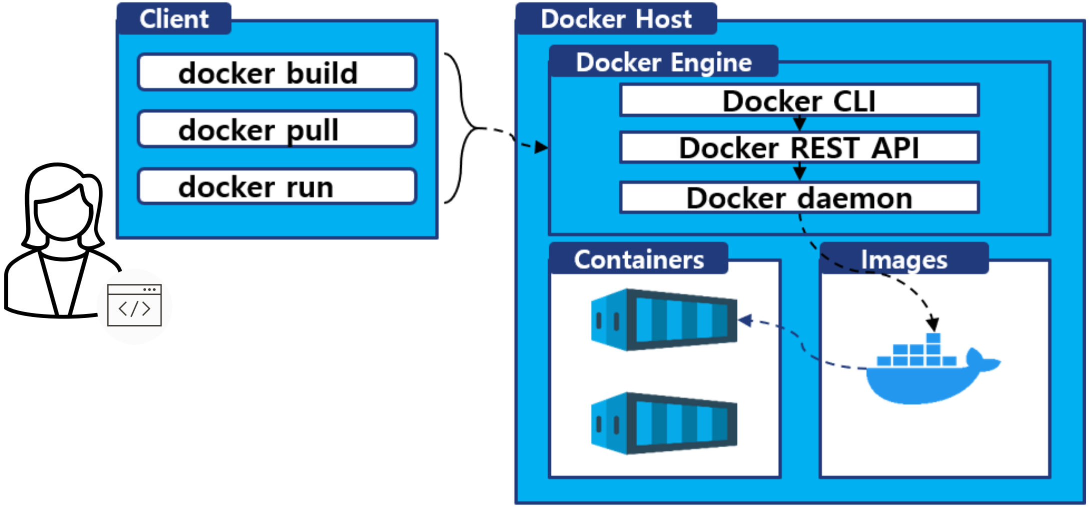
- **Docker** : An open-source project that runs and manages Linux applications in containers using process isolation technology.

- **Image & Container**



Appendix. Terms

- Docker Engine & Docker Daemon



▲그림. 도커 엔진을 포함시킨 도커 아키텍처

3. Case Studies in Env Setup

Dev/Test Environment Setup without Docker

1. Setting up Test Environment

   - Configure environments for applications – Python, Java …

2. **Individual Configuration**

   - Each Developer must set up the env on their own computer

3. Clone the Repository

   - download the latest code

4. Build or Download Executable Files

3. Case Studies in Env Setup

Dev/Test Environment Setup with Docker

1. Install and Setup Docker
2. Pull the Base Image

```
docker pull <base-image-name>
```

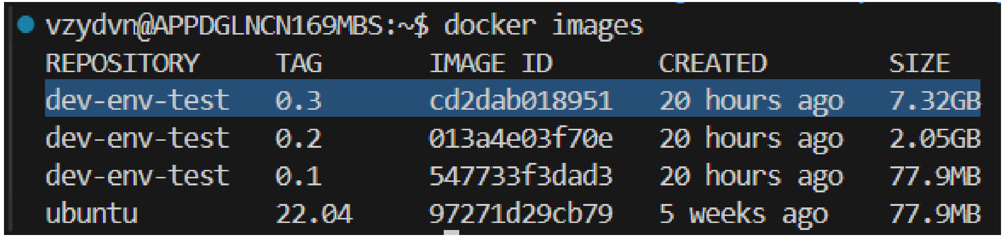
3. Open the Container and Set up the Test Environment

   – configure the environment for application(python, java …) **only Once.**

   - **Each Developer only needs to install the Docker, and the env setup should be done just once!**

4. Commit the Image and Deploy

```
docker commit <container-id> <new_image_name>:<tag>\
```



```
vzydvn@APPDGLNCN169MBS:~$ docker images
REPOSITORY     TAG       IMAGE ID       CREATED         SIZE
dev-env-test   0.3       cd2dab018951   20 hours ago    7.32GB
dev-env-test   0.2       013a4e03f70e   20 hours ago    2.05GB
dev-env-test   0.1       547733f3dad3   20 hours ago    77.9MB
ubuntu         22.04     97271d29cb79   5 weeks ago     77.9MB
```

Issue : The image size is too large.
How should we share/manage it?”

3. Case Studies in Env Setup

Dev/Test Environment Setup with Dockerfile

1. Create a Dockerfile and Define the base image (python, nodejs, java…)
2. Upload and Manage Dockerfile(text) in Github – **light and track changes easily!**
3. Download Dockerfile and Build the image at local

   ```
   docker build -t <image_name>:<tag> <dockerfile_dir>
   ```

4. Run the Docker Container

4. RobotFramework with Docker

Parallel Testing with Appium-Robot Framework Using Android Emulator and Docker

Goal

- Run Multiple Android Emulator locally – GUI / TestBench
- Execute automated test in Parallel – Time Saving

Required Tools

- Android Studio with Emulator
- Docker, **Docker Compose**
- Appium, Robot Framework, pabot(parallel execution tool for Robot Framework)

4. RobotFramework with Docker

What is Docker Compose?

- A tool for defining and running multi-container
- Define multiple containers as a single service in a YAML file

"You don't have to write commands one by one to launch multiple containers!"

4. RobotFramework with Docker

Parallel Testing with Appium-Robot Framework Using Android Emulator and Docker

1. **Write Test Scripts for Parallel Testing and Git Push**

   - Remind that we have to connect to each Appium Container and Emulator

```
*** Variables***
${APPIUM_1}          http://localhost:4723/wd/hub
${APPIUM_2}          https://localhost:4725/wd/hub

*** Test Cases ***
Test on Emulator1
    # Specify the adb-device id
Test on Emulator2
    # Specify the adb-device id
```

4. RobotFramework with Docker

Parallel Testing with Appium-Robot Framework Using Android Emulator and Docker

2. Create the Dockerfile for running Robot Framework Tests

```
FROM python:3.8

RUN pip install robotframework
RUN pip install robotframework-appiumlibrary pabot
…(download github, java, nodejs, etc and setup)

RUN git clone <test code repository> <working dir>
WORKDIR <working dir>
CMD [“pabot”, “--process”, “2”, “test_suite.robot”]
```

4. RobotFramework with Docker

Parallel Testing with Appium-Robot Framework Using Android Emulator and Docker

3. Create Docker Compose Configuration File (.yml)

- Service

```
version: ‘3’
services:
    appium1:
               image : /appium    #or create dockerfile for appium server
               ports :
               (etc… ip, port)
    appium2:

    robot_tests:
               build: <dockerfile dir>
               depends on:
```

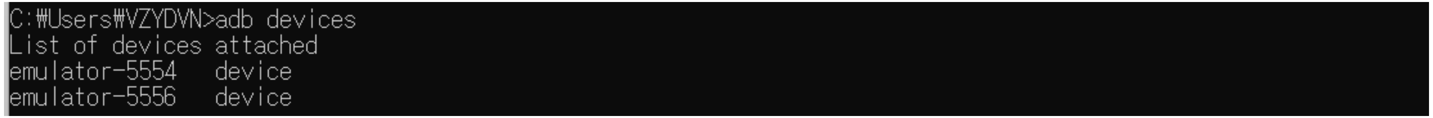
4. RobotFramework with Docker

Parallel Testing with Appium-Robot Framework Using Android Emulator and Docker

4. Running Multiple Android Emulators Locally

- Run multiple emulators, but in the GM Emulator Launcher, you need to import multiple system images to execute them. (ref. GM Launcher User Guide)

- Each instance is assigned two consecutive ports.



```
C:₩Users₩VZYDVN>adb devices
List of devices attached
emulator-5554   device
emulator-5556   device
```

4. Robot Framework with Docker

Parallel Testing with Appium-Robot Framework Using Android Emulator and Docker

5. Execute Parallel Tests

- Run Docker Compose & Parallel Tests

```
docker-compose up --build
```

4. Robot Framework with Docker

Parallel Testing with Appium-Robot Framework Using Android Emulator and Docker

(Advantages)

- Improved Testing Efficiency
- Scalability
- Environment Consistency

+) Building an automated CI/CD pipeline using Jenkins

(Disadvantages/Limits)

- ADB I/O Bottlenecks : frequent communication between containers and ADB
- Complex Setup and maintenance

+) To reduce resource contention, assigning memory limit/CPU cores to each Containers

Q & A