14 – Docker

CS 2043: Unix Tools and Scripting, Spring 2019 [1]

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CS2043: Docker

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The image above is a link. Click it.

The wonderful world of virtualization

Virtualization, Containers and VMs

- Virtualization is the creation and use of a virtual (logical) version of a resource
- People often use Virtual Machines (VMs) to use multiple operating systems on a single machine without any additional hardware
    - For example, run a copy of MacOS on your Windows 10 machine
    - Relies on a piece of software called a "Hypervisor" to create and manage virtual versions of computer hardware (processor, memory, network card, etc.)
    - Create the illusion that the VM operating system has exclusive access to physical hardware
- Containers are a much lighter form of virtualization - they virtualize the environment in which a process runs (runtime environment)
    - Package all code and dependencies so that you can run your program on any system

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Problem Development to Production Delay

Imagine yourself as a web developer who is developing a new feature. During the development phrase, you created a new feature in a development environment (let's say your laptop).

Later when you want to integrate that feature into your web application, you would have to apply the changes to your production environment (let's say your server in the cloud). This can be a nightmare! You must make sure that the code will also run flawlessly in the new environment. What if package X that your feature relies on is version 2.3 locally but is version 2.4 on the clouds and your feature no longer works? Let Docker come to the rescue.

Docker!

Figure 1: Docker Image

- "Docker is an open platform for developing, shipping, and running applications. Docker enables you to separate your applications from your infrastructure so you can deliver software quickly."
- Concept: build once run anywhere.
- Pro: reduce the delay between development and production.

Why is Docker useful?

- Standardized environment leads to faster development.
- Great for continuous integration and continuous delivery (CI/CD) workflows.
- Highly portable workloads. Docker containers can run on a developer's local laptop, on physical or virtual machines in a data center, on cloud providers, or in a mixture of environments.
- Lightweight and Fast Compared to VMs.

Differences

- No hypervisor (Virtual Machine Monitor).
- Run directly on Host Machine's Kernel.
- Each container run is a discrete process, takes up about the same amount of memory as any other executable.
- Light-weight

References

[1]   Stephen McDowell, Bruno Abrahao, Hussam Abu-Libdeh,
      Nicolas Savva, David Slater, and others over the years.
      "Previous Cornell CS 2043 Course Slides".