

南昌大学实验报告

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课程名称：云计算

实验项目名称

Lab 1 Introduction to Cloud Computing – Virtualized Services

实验目的

熟悉搭建IaaS流程，使用Docker

实验基础

1. build an OS
2. Initialize a Service
3. Docker Image Deployment

实验步骤

1. build an OS

- successfully install a Linux system with all basic capabilities

```
root@vps-sfo181022: ~
文件(F) 编辑(E) 查看(V) 搜索(S) 终端(T) 帮助(H)
root@ccogito.xyz's password:
Welcome to Ubuntu 18.04.1 LTS (GNU/Linux 4.15.0-36-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

System information as of Mon Apr  8 14:49:05 UTC 2019

System load:  0.0               Processes:    96
Usage of /:   14.3% of 24.06GB   Users logged in: 0
Memory usage: 51%              IP address for eth0: 159.65.70.253
Swap usage:   0%                IP address for docker0: 172.17.0.1

Get cloud support with Ubuntu Advantage Cloud Guest:
http://www.ubuntu.com/business/services/cloud

 * Canonical Livepatch is available for installation.
   - Reduce system reboots and improve kernel security. Activate at:
     https://ubuntu.com/livepatch

99 packages can be updated.
0 updates are security updates.

*** System restart required ***
Last login: Mon Apr  8 09:19:03 2019 from 171.34.164.20
root@vps-sfo181022:~#
```

操作系统如上

- Create your own user, and make it into sudoer list
 - `sudo adduser username`
 - Provide your own way to implement sudo group privilege
 - `sudo usermod -G sudo username`

2. Initialize a Service

- 构建一个IaaS服务系统——Docker

`sudo apt-get remove docker docker-engine docker.io containerd runc //卸载旧版本`

```
root@vps-sfo181022:~# sudo apt-get remove docker docker-engine docker.io containerd runc
Reading package lists... Done
Building dependency tree
Reading state information... Done
Package 'docker-engine' is not installed, so not removed
Package 'containerd' is not installed, so not removed
Package 'docker' is not installed, so not removed
Package 'docker.io' is not installed, so not removed
Package 'runc' is not installed, so not removed
0 upgraded, 0 newly installed, 0 to remove and 107 not upgraded.
```

`sudo apt-get update //更新索引包`

```
root@vps-sfo181022:~# sudo apt-get update
Hit:1 http://mirrors.digitalocean.com/ubuntu bionic InRelease
Get:2 http://mirrors.digitalocean.com/ubuntu bionic-updates InRelease [88.7 kB]
Get:3 http://mirrors.digitalocean.com/ubuntu bionic-backports InRelease [74.6 kB]
Get:4 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Fetched 252 kB in 1s (322 kB/s)
Reading package lists... Done
```

```
sudo apt-get install \
apt-transport-https \
ca-certificates \
curl \
gnupg-agent \
software-properties-common //安装包以允许apt通过HTTPS使用存储库
```

```
root@vps-sfo181022:~# sudo apt-get install \
> apt-transport-https \
> ca-certificates \
> curl \
> gnupg-agent \
> software-properties-common
Reading package lists... Done
Building dependency tree
Reading state information... Done
ca-certificates is already the newest version (20180409).
curl is already the newest version (7.58.0-2ubuntu3.6).
The following additional packages will be installed:
python3-software-properties
The following NEW packages will be installed:
apt-transport-https gnupg-agent
The following packages will be upgraded:
python3-software-properties software-properties-common
2 upgraded, 2 newly installed, 0 to remove and 105 not upgraded.
Need to get 38.5 kB of archives.
After this operation, 196 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://mirrors.digitalocean.com/ubuntu bionic-updates/universe
```

```
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add - //添加
Docker的官方GPG密钥
```

```
root@vps-sfo181022:~# curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
OK $ sudo apt-key fingerprint 0EBFCD88
```

```
sudo apt-key fingerprint 0EBFCD88 //通过搜索指纹的最后8个字符，验证您现在拥有
带指纹的密钥。
```

```
root@vps-sfo181022: ~
文件(F) 编辑(E) 查看(V) 搜索(S) 终端(T) 帮助(H)
root@vps-sfo181022:~# sudo apt-key fingerprint 0EBFCD88
pub   rsa4096 2017-02-22 [SCEA]
      9DC8 5822 9FC7 DD38 854A  E2D8 8D81 803C 0EBF CD88
uid       [ unknown] Docker Release (CE deb) <docker@docker.com>
sub   rsa4096 2017-02-22 [S]

root@vps-sfo181022:~#
root@vps-sfo181022:~# pub   rsa4096 2017-02-22 [SCEA]

Command 'pub' not found, did you mean:

  command 'hub' from snap hub (v2.11.1)
  command 'dub' from snap dub (1.14.0)
  command 'pubb' from deb python-pubb
  command 'pcb' from deb pcb-gtk
  command 'pcb' from deb pcb-lesstif
  command 'dub' from deb dub
  command 'pua' from deb pglister
  command 'puf' from deb puf
  command 'pdb' from deb python
  command 'publ' from deb atfs

See 'snap info <snapname>' for additional versions.

root@vps-sfo181022:~#          9DC8 5822 9FC7 DD38 854A  E2D8 8D81 803C 0EBF CD88
9DC8: command not found
root@vps-sfo181022:~# uid       [ unknown] Docker Release (CE deb) <docker@docker.com>
-bash: syntax error near unexpected token `('
root@vps-sfo181022:~# sub   rsa4096 2017-02-22 [S]
```

```
sudo add-apt-repository \
"deb [arch=amd64] https://download.docker.com/linux/ubuntu \
$(lsb_release -cs) \
stable" //设置稳定存储库
```

```
root@vps-sfo181022:~# sudo add-apt-repository \
> "deb [arch=amd64] https://download.docker.com/linux/ubuntu \
> $(lsb_release -cs) \
> stable"
Hit:1 http://mirrors.digitalocean.com/ubuntu bionic InRelease
Hit:2 http://mirrors.digitalocean.com/ubuntu bionic-updates InRelease
Hit:3 http://mirrors.digitalocean.com/ubuntu bionic-backports InRelease
Get:4 https://download.docker.com/linux/ubuntu bionic InRelease [64.4 kB]
Hit:5 http://security.ubuntu.com/ubuntu bionic-security InRelease
Get:6 https://download.docker.com/linux/ubuntu bionic/stable amd64 Packages [5673 B]
Fetched 60.1 kB in 1s (134 kB/s)
Reading package lists... Done
$ sudo apt-get update
```

```
sudo apt-get update //更新apt包索引。
```

```
root@vps-sfo181022:~# sudo apt-get update
Hit:1 http://mirrors.digitalocean.com/ubuntu bionic InRelease
Hit:2 http://mirrors.digitalocean.com/ubuntu bionic-updates InRelease
Hit:3 http://mirrors.digitalocean.com/ubuntu bionic-backports InRelease
Hit:4 https://download.docker.com/linux/ubuntu bionic InRelease
Get:5 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Fetched 88.7 kB in 1s (112 kB/s)
Reading package lists... Done
```

```
sudo apt-get install docker-ce docker-ce-cli containerd.io //安装最新版本的Docker CE和containerd
```

```
root@vps-sfo181022: ~
文件(F) 编辑(E) 查看(V) 搜索(S) 终端(T) 帮助(H)
root@vps-sfo181022:~# sudo apt-get install docker-ce docker-ce-cli containerd.io
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  aufs-tools cgroupfs-mount pigz
The following NEW packages will be installed:
  aufs-tools cgroupfs-mount containerd.io docker-ce docker-ce-cli pigz
0 upgraded, 6 newly installed, 0 to remove and 105 not upgraded.
Need to get 50.7 MB of archives.
After this operation, 243 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://mirrors.digitalocean.com/ubuntu bionic/universe amd64 pigz amd64 2.4-1 [57.4 kB]
Get:2 http://mirrors.digitalocean.com/ubuntu bionic/universe amd64 aufs-tools amd64 1:4.9+20170918-1ubuntu1 [104
kB]
Get:3 https://download.docker.com/linux/ubuntu bionic/stable amd64 containerd.io amd64 1.2.5-1 [19.9 MB]
Get:4 http://mirrors.digitalocean.com/ubuntu bionic/universe amd64 cgroupfs-mount all 1.4 [6320 B]
Get:5 https://download.docker.com/linux/ubuntu bionic/stable amd64 docker-ce-cli amd64 5:18.09.4~3-0~ubuntu-bioni
c [13.2 MB]
Get:6 https://download.docker.com/linux/ubuntu bionic/stable amd64 docker-ce amd64 5:18.09.4~3-0~ubuntu-bionic [1
7.4 MB]
Fetched 50.7 MB in 1s (48.6 MB/s)
Selecting previously unselected package pigz.
(Reading database ... 105372 files and directories currently installed.)
Preparing to unpack .../0-pigz_2.4-1_amd64.deb ...
Unpacking pigz (2.4-1) ...
Selecting previously unselected package aufs-tools.
Preparing to unpack .../1-aufs-tools_1%3a4.9+20170918-1ubuntu1_amd64.deb ...
Unpacking aufs-tools (1:4.9+20170918-1ubuntu1) ...
Setting up docker-ce (5:18.09.4~3-0~ubuntu-bionic) ...
update-alternatives: using /usr/bin/dockerd-ce to provide /usr/bin/dockerd (dockerd) in auto mode
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /lib/systemd/system/docker.service.
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /lib/systemd/system/docker.socket.
Processing triggers for ureadahead (0.100.0-20) ...
Processing triggers for systemd (237-3ubuntu10.13) ...
which may not be appropriate for Supported storage drivers
```

sudo docker run hello-world //通过运行hello-world 映像验证是否正确安装了Docker CE。

```
root@vps-sfo181022: ~
文件(F) 编辑(E) 查看(V) 搜索(S) 终端(T) 帮助(H)
root@vps-sfo181022:~# sudo docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
1b930d010525: Pull complete
Digest: sha256:2557e3c07ed1e38f26e389462d03ed943586f744621577a99efb77324b0fe535
Status: Downloaded newer image for hello-world:latest

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (amd64)
 3. The Docker daemon created a new container from that image which runs the
    executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent it
    to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/
root@vps-sfo181022:~#
```

docker --version //查看docker版本信息

```
root@vps-sfo181022: ~  
文件(F) 编辑(E) 查看(V) 搜索(S) 终端(T) 帮助(H)  
root@vps-sfo181022:~# docker --version  
Docker version 18.09.4, build d14af54266  
root@vps-sfo181022:~# docker info  
Containers: 1  
  Running: 0  
  Paused: 0  
  Stopped: 1  
Images: 1  
Server Version: 18.09.4  
Storage Driver: overlay2  
  Backing Filesystem: extfs  
  Supports d_type: true  
  Native Overlay Diff: true  
Logging Driver: json-file  
Cgroup Driver: cgroupfs  
Plugins:  
  Volume: local  
  Network: bridge host macvlan null overlay  
  Log: awslogs fluentd gcplogs gelf journald json-file local logentries splunk syslog  
Swarm: inactive  
Runtimes: runc  
Default Runtime: runc  
Init Binary: docker-init  
containerd version: bb71b10fd8f58240ca47fbb579b9d1028eea7c84  
runc version: 2b18fe1d885ee5083ef9f0838fee39b62d653e30  
init version: fec3683  
Security Options:  
  apparmor
```

```
root@vps-sfo181022: ~  
文件(F) 编辑(E) 查看(V) 搜索(S) 终端(T) 帮助(H)  
containerd version: bb71b10fd8f58240ca47fbb579b9d1028eea7c84  
runc version: 2b18fe1d885ee5083ef9f0838fee39b62d653e30  
init version: fec3683  
Security Options:  
  apparmor  
  seccomp  
    Profile: default  
Kernel Version: 4.15.0-36-generic  
Operating System: Ubuntu 18.04.1 LTS  
OSType: linux  
Architecture: x86_64  
CPUs: 1  
Total Memory: 985.5MiB  
Name: vps-sfo181022  
ID: 732X:PG5K:NHM3:KBSK:4YGN:WB2V:BSXZ:N7SM:YJYH:4IUM:GWCE:HHKN  
Docker Root Dir: /var/lib/docker  
Debug Mode (client): false  
Debug Mode (server): false  
Registry: https://index.docker.io/v1/  
Labels:  
Experimental: false  
Insecure Registries:  
  127.0.0.0/8  
Live Restore Enabled: false  
Product License: Community Engine  
  
WARNING: No swap limit support  
root@vps-sfo181022:~#
```

docker image ls //查看已有镜像信息

```
WARNING: No swap limit support  
root@vps-sfo181022:~# docker image ls  
REPOSITORY: 部署您的应用程序 TAG IMAGE ID CONTAINER ID CREATED SIZE  
hello-world latest fce289e99eb9 5414984ed6a8 3 months ago 1.84kB
```

docker container ls -all //查看所有容器列表

```
root@vps-sfo181022:~# docker container ls --all  
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS  
Seb37539a41b  hello-world /hello                  5 minutes ago Exited (0) 5 minutes ago
```

3. Docker Image Deployment

docker pull golang //下载 golang 的 Docker 镜像

```
root@vps-sfo181022:~# docker pull golang
Using default tag: latest
latest: Pulling from library/golang
e79bb959ec00: Pull complete
d4b7902036fe: Pull complete
1b2a72d4e030: Pull complete
d54db43011fd: Pull complete
963c818ebafc: Pull complete
17355b0ffe5d: Extracting [====>]
7eca7cce1124: Download complete
```

```
root@vps-sfo181022:~# docker pull golang
Using default tag: latest
latest: Pulling from library/golang
e79bb959ec00: Pull complete
d4b7902036fe: Pull complete
1b2a72d4e030: Pull complete
d54db43011fd: Pull complete
963c818ebafc: Pull complete
17355b0ffe5d: Pull complete
7eca7cce1124: Pull complete
Digest: sha256:3ef8291198fc8feb556b122f63a6c1244536f6881d9d618d16d80803be73d0f7
Status: Downloaded newer image for golang:latest
```

docker images golang //查看镜像

```
root@vps-sfo181022:~# docker images golang
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
golang               latest             root@9e4617942203692b    2 days ago         774MB
```

docker run -it --rm golang bash //使用golang镜像

```
root@vps-sfo181022:~# docker images golang
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
golang               latest             root@9e4617942203692b    2 days ago         774MB
root@vps-sfo181022:~# docker run -it --rm golang bash
```

go version //查看golang版本

```
root@690efe5ffce8:/go# go version
go version go1.12.2 linux/amd64
```

apt-get update

apt-get install -y vim //下载 vim

实验数据或结果

```
root@690efe5ffce8:/go# vim hello-world.go
root@690efe5ffce8:/go# ls
bin hello-world.go
root@690efe5ffce8:/go# go run hello-world.go
hello world
root@690efe5ffce8:/go#
```

直接运行：
go run hello.go

常用链接
[root@local
hello world

实验结果包含在实验步骤中。

实验思考

参考资料

- [使用 Docker 镜像构建 GO 语言环境-郝峰波博客](#)
- [Get Docker CE for Ubuntu——docs.docker.com](#)
- <https://docs.docker.com/get-started/>