Docker零距离

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快捷通

2013年左右，CloudFoundry等paas项目基本完成了市场培育

paas项目应用打包机制饱受诟病，本地环境与云端环境差异性带来部署困难

Paas应用部署

打包本地可执行文件及部署脚本打包

上传云端存储，调度可运行虚拟机，代理下载压缩包

建立沙箱，多用户应用隔离运行

启动应用前耗时耗力地摸索修改配置

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快捷通

2013年,dotCloud开源docker项目,docker宣告面世

docker镜像打包整个操作系统，解决了环境差异导致的打包问题

Cloudfoundry等项目未引起重视，替换原有打包方案

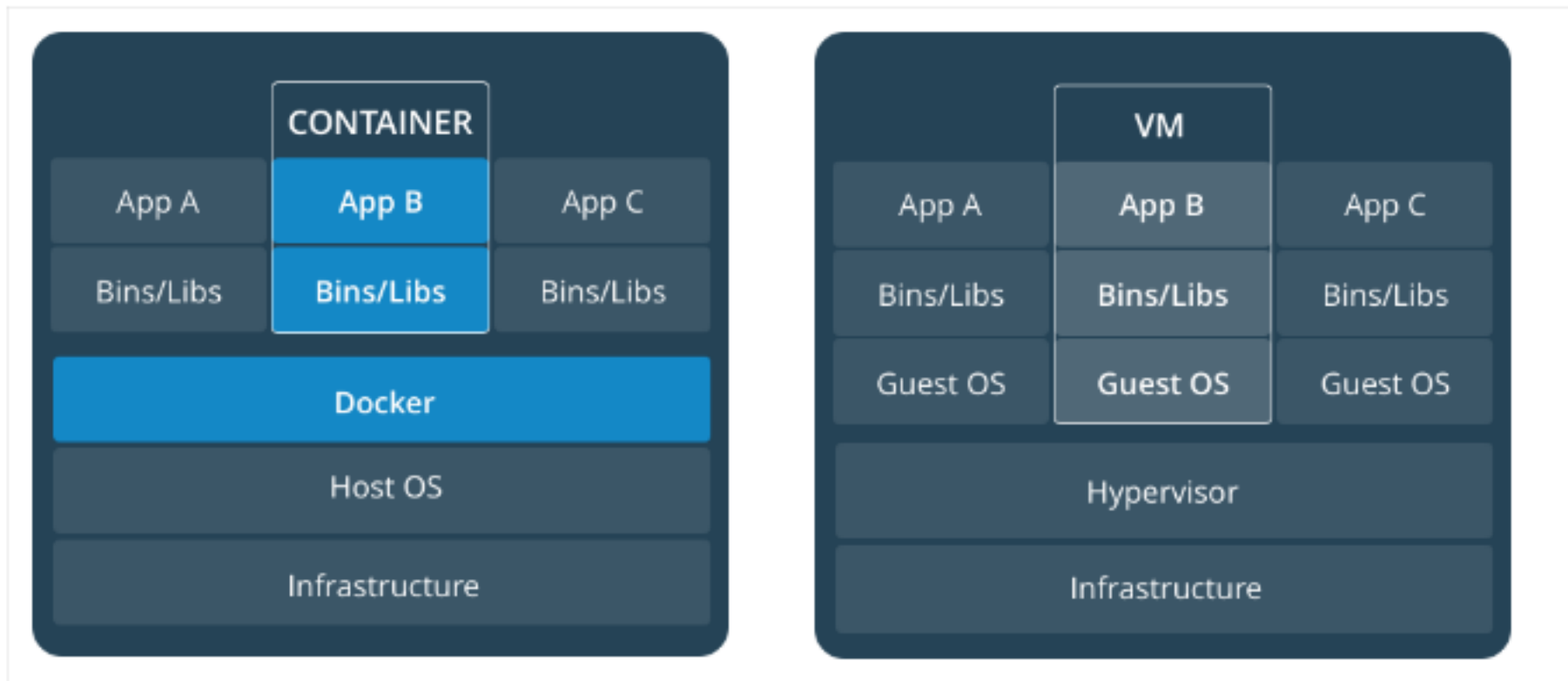生态内广受欢迎，涌现很多基于docker创业项目

Docker VS 虚拟机(一)

Docker VS 虚拟机(二)

优劣对比

- 启动
  - 秒级
  - 分钟级

- 磁盘占用
  - 一般MB
  - 一般GB

- 性能
  - 接近原生
  - 弱于原生

- 单机容量
  - 上千个容器
  - 一般几十个

- 隔离性
  - 操作系统级隔离
  - 隔离较彻底

基本概念

客户端命令行工具

服务端守护进程，接收客户端命令并操作容器

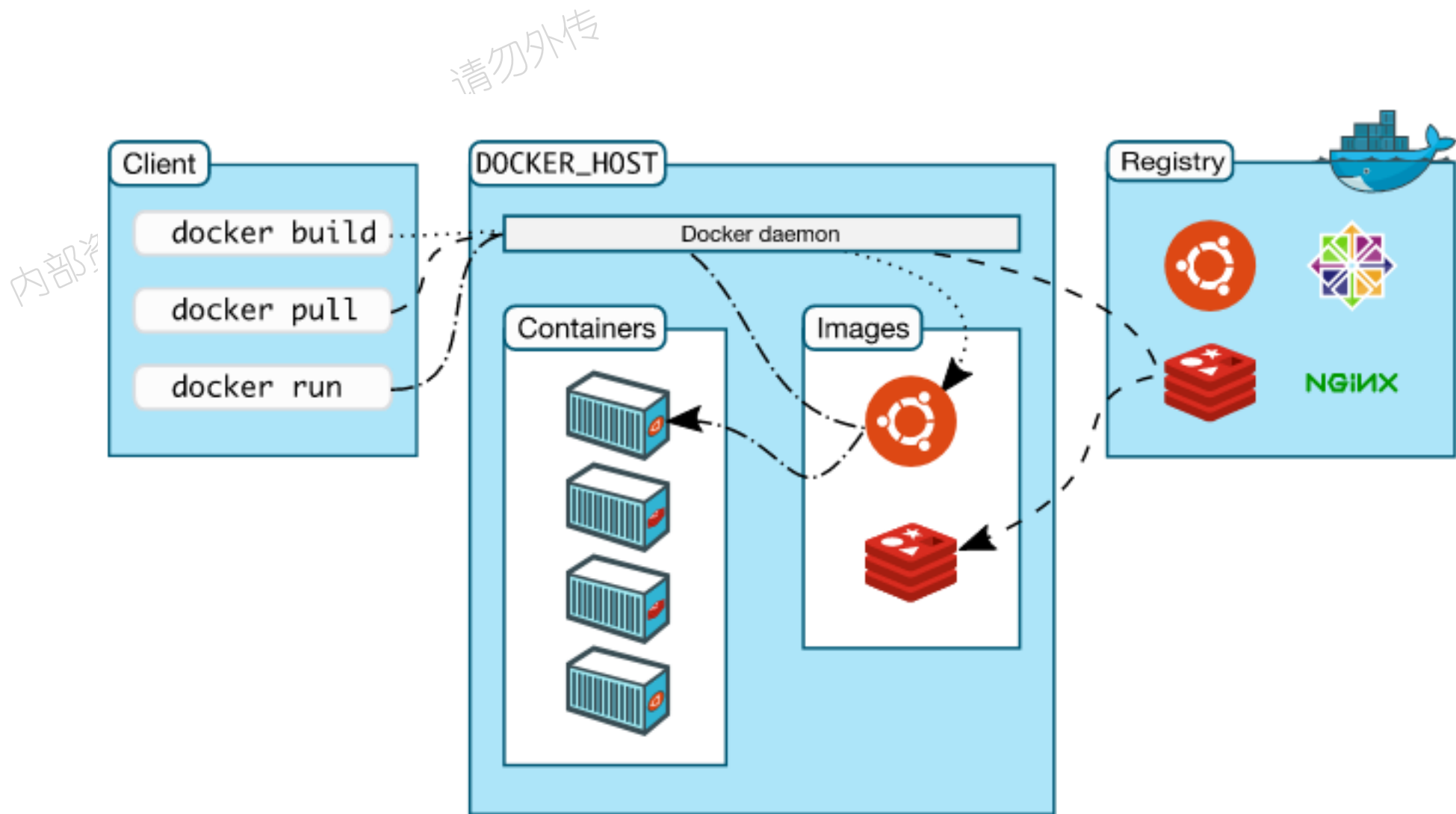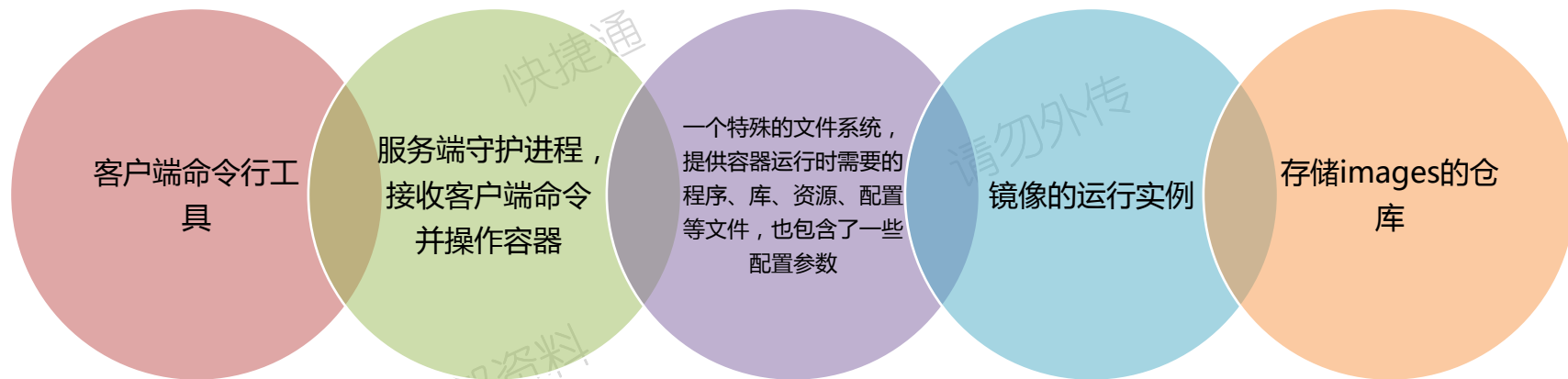一个特殊的文件系统，提供容器运行时需要的程序、库、资源、配置等文件，也包含了一些配置参数

镜像的运行实例

存储images的仓库

安装

快捷通
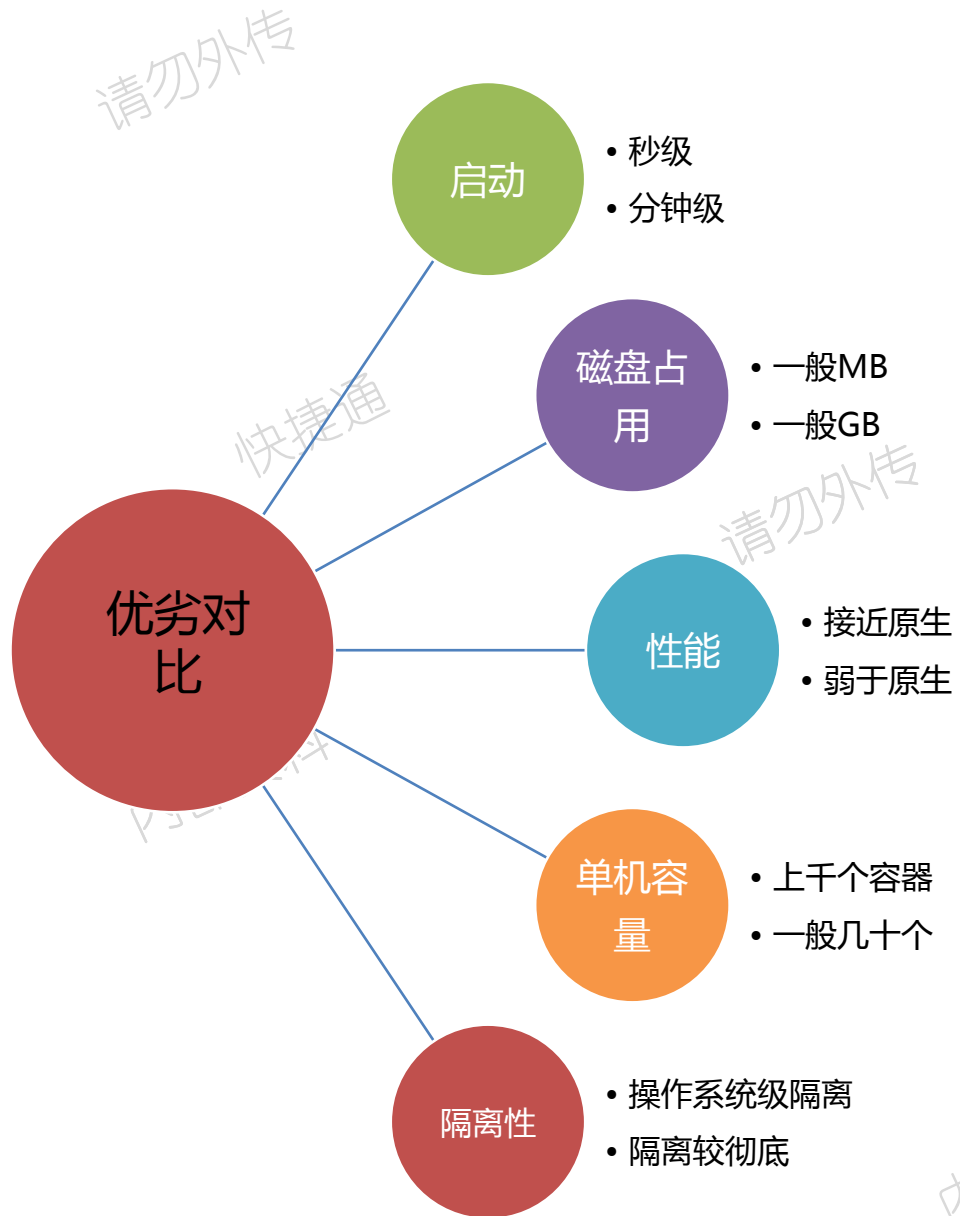
检查前置条件 → 卸载老版本 → 安装新版本

centos 7为例

```
[miaolc@localhost ~]$ curl -fsSL https://get.docker.com -o get-docker.sh
[miaolc@localhost ~]$ sudo sh get-docker.sh
[sudo] password for miaolc:
# Executing docker install script, commit: 6bf300318ebaab958c4adc341a8c7bb9f3a54a1a
+ sh -c 'yum install -y -q yum-utils'
Package yum-utils-1.1.31-50.el7.noarch already installed and latest version
+ sh -c 'yum-config-manager --add-repo https://download.docker.com/linux/centos/docker-ce.repo'
Loaded plugins: fastestmirror
adding repo from: https://download.docker.com/linux/centos/docker-ce.repo
WARNING: Adding a user to the "docker" group will grant the ability to run
         containers which can be used to obtain root privileges on the
         docker host.
         Refer to https://docs.docker.com/engine/security/security/#docker-daemon-attack-surface
         for more information.
[miaolc@localhost ~]$ sudo usermod -aG docker miaolc
[miaolc@localhost ~]$ docker -v
Docker version 19.03.1, build 74b1e89
```

管理容器(一)

```
[miaolc@localhost ~]$ systemctl start docker.service
=== AUTHENTICATING FOR org.freedesktop.systemd1.manage-units ===
Authentication is required to manage system services or units.
Authenticating as: root
Password:
=== AUTHENTICATION COMPLETE ===
```

启动容器

```
[miaolc@localhost ~]$ docker info
Client:
 Debug Mode: false

Server:
 Containers: 0
  Running: 0
  Paused: 0
  Stopped: 0
 Images: 0
 Server Version: 19.03.1
 Storage Driver: overlay2
  Backing Filesystem: xfs
  Supports d_type: true
  Native Overlay Diff: true
 Logging Driver: json-file
 Cgroup Driver: cgroupfs
```

查看容器信息

```
[miaolc@localhost ~]$ systemctl stop docker
==== AUTHENTICATING FOR org.freedesktop.systemd1.manage-units ====
Authentication is required to manage system services or units.
Authenticating as: root
Password:
==== AUTHENTICATION COMPLETE ====
```

停止容器

```
[miaolc@localhost ~]$   docker run --name test_container -it ubuntu /bin/bash
root@7dffeb3d86c2:/#
```

运行容器

```
[miaolc@localhost ~]$ docker ps -a
CONTAINER ID       IMAGE         COMMAND          CREATED         STATUS         PORTS          NAMES
7dffeb3d86c2       ubuntu        "/bin/bash"      2 hours ago     Up 2 hours                    test_containe
r
```

查看容器列表

```
[miaolc@localhost ~]$ docker ps -a
CONTAINER ID          IMAGE              COMMAND                CREATED              STATUS
7dffeb3d86c2          ubuntu             "/bin/bash"            2 hours ago          Up 2 hours
r
[miaolc@localhost ~]$ docker exec -ti 7dffeb3d86c2 /bin/bash
root@7dffeb3d86c2:/#
```

容器内执行命令

```
[miaolc@localhost ~]$ docker inspect test_container
[
    {
        "Id": "7dffeb3d86c26e10dfe8c2d9d04616a60caefaddc1533e96f9356aa1651da885",
        "Created": "2019-07-29T10:52:28.592638787Z",
        "Path": "/bin/bash",
        "Args": [],
        "State": {
            "Status": "running",
            "Running": true,
            "Paused": false,
            "Restarting": false,
            "OOMKilled": false,
            "Dead": false,
            "Pid": 3764,
            "ExitCode": 0,
            "Error": "",
            "StartedAt": "2019-07-29T10:52:29.300771203z",
            "FinishedAt": "0001-01-01T00:00:00z"
        },
        "Image": "sha256:3556258649b2ef23a41812be17377d32f568ed9f45150a26466d2ea2
```

深入查看容器信息

管理镜像(一)

```
[miaolc@localhost ~]$ docker images
REPOSITORY          TAG               IMAGE ID           CREATED          SIZE
ubuntu              latest            3556258649b2       5 days ago       64.2MB
```

查看本地镜像
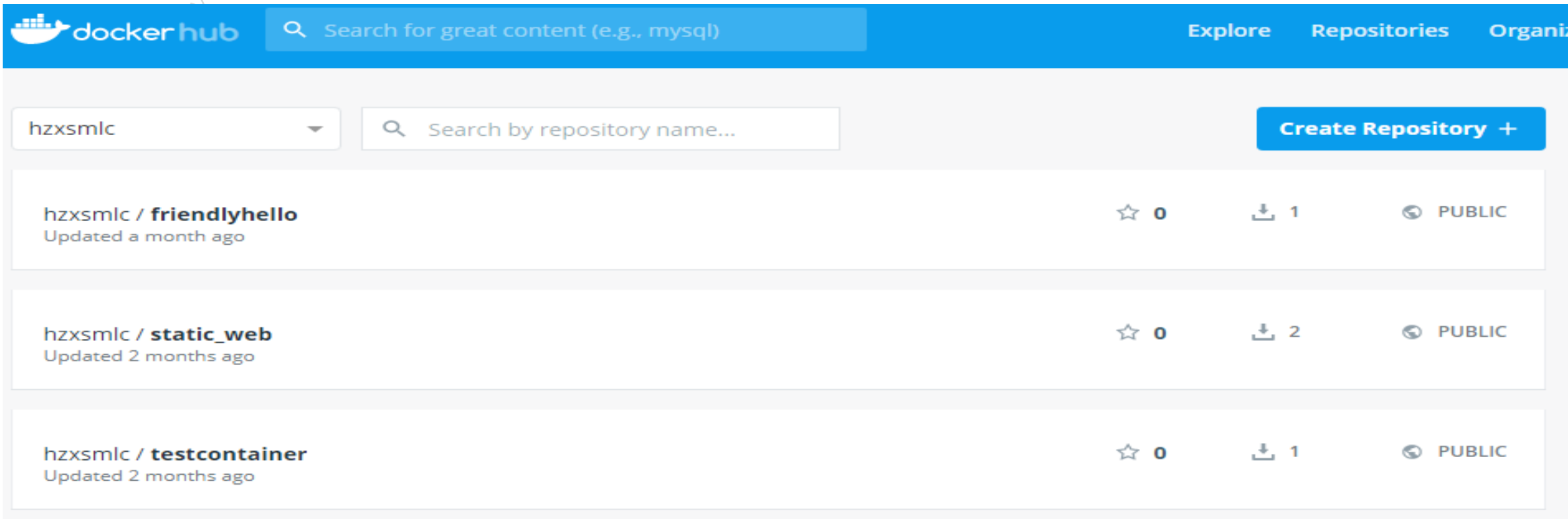
公有镜像库

```
[miaolc@localhost ~]$ docker run --name new_test_container -it ubuntu:12.04 /bin/bash --private-registry=https://
edu.cn
Unable to find image 'ubuntu:12.04' locally
12.04: Pulling from library/ubuntu
d8868e50ac4c: Pull complete
83251ac64627: Pull complete
589bba2f1b36: Pull complete
d62ecaceda39: Pull complete
6d93b41cfc6b: Pull complete
Digest: sha256:18305429afa14ea462f810146ba44d4363ae76e4c8dfc38288cf73aa07485005
Status: Downloaded newer image for ubuntu:12.04
/bin/bash: --private-registry=https://docker.mirrors.ustc.edu.cn: invalid option
Usage:  /bin/bash [GNU long option] [option] ...
        /bin/bash [GNU long option] [option] script-file ...
GNU long options:
        --debug
```

拉取镜像

```
[miaolc@localhost ~]$ docker images
REPOSITORY              TAG                 IMAGE ID            CREATED             SIZE
ubuntu                  latest              3556258649b2        5 days ago          64.2MB
ubuntu                  12.04               5b117edd0b76        2 years ago         104MB
```

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```
[miaolc@localhost ~]$ docker search puppet
NAME                                    DESCRIPTION                                    STARS
        AUTOMATED
puppet/puppetserver                     A Docker Image for running Puppet Server. Wiâ€¦   79

alekzonder/puppeteer                    GoogleChrome/puppeteer image and screenshotsâ€¦   58
        [OK]
puppet/puppetserver-standalone          An image for running a Puppet Server standalâ€¦   32

devopsil/puppet                         Dockerfile for a container with puppet instaâ€¦   30
        [OK]
```

查找镜像

```
[miaolc@localhost ~]$ docker images
REPOSITORY              TAG        IMAGE ID        CREATED             SIZE
jamtul01/tomcat7        latest     d01f6a9adf6c    About an hour ago   447MB
jamtur01/fetcher        latest     9d2ef03e5b56    2 hours ago         208MB
hzxsmlc/static_web      latest     577608841273    6 hours ago         222MB
miaolc/static_web       latest     577608841273    6 hours ago         222MB
hzxsmlc/hzxsmlc001      latest     1263ad896c24    7 hours ago         143MB
ubuntu                  latest     3556258649b2    6 days ago          64.2MB
ubuntu                  14.04      2c5e00d77a67    2 months ago        188MB
ubuntu                  12.04      5b117edd0b76    2 years ago         104MB
[miaolc@localhost ~]$ docker rmi hzxsmlc/hzxsmlc001
Untagged: hzxsmlc/hzxsmlc001:latest
Deleted: sha256:1263ad896c24bd7863ce6e239423d1e934dc0be1053b58a5614041cae6ec43c8
Deleted: sha256:68db0a4bad673022176829c841e4d7450ef4d21bbe0078dfde66193a804cb55e
[miaolc@localhost ~]$ docker images
REPOSITORY              TAG        IMAGE ID        CREATED             SIZE
jamtul01/tomcat7        latest     d01f6a9adf6c    About an hour ago   447MB
jamtur01/fetcher        latest     9d2ef03e5b56    2 hours ago         208MB
hzxsmlc/static_web      latest     577608841273    6 hours ago         222MB
miaolc/static_web       latest     577608841273    6 hours ago         222MB
ubuntu                  latest     3556258649b2    6 days ago          64.2MB
ubuntu                  14.04      2c5e00d77a67    2 months ago        188MB
ubuntu                  12.04      5b117edd0b76    2 years ago         104MB
```

删除镜像

docker commit

```
[miaolc@localhost ~]$ docker ps -a
CONTAINER ID        IMAGE               COMMAND                 CREATED              STATUS
NAMES
426cea364561        ubuntu:12.04        "/bin/bash --private…"   47 minutes ago        Exite
 new_test_container
7dffeb3d86c2        ubuntu              "/bin/bash"              3 hours ago          Up 3 ho
test_container
[miaolc@localhost ~]$ docker attach test_container
root@7dffeb3d86c2:/#
```

```
root@7dffeb3d86c2:/# apt-get -yqq update
root@7dffeb3d86c2:/# apt-get -y install nginx
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  fontconfig-config fonts-dejavu-core geoip-database libbsd0 libexpat1 libfontconfig1
```

```
[miaolc@localhost ~]$ docker commit test_container hzxsmlc/
sha256:1263ad896c24bd7863ce6e239423d1e934dc0be1053b58a5614041cae6ec43c8
[miaolc@localhost ~]$ docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
hzxsmlc/hzxsmlc001  latest              1263ad896c24        5 seconds ago       143MB
ubuntu              latest              3556258649b2        6 days ago          64.2MB
ubuntu              12.04               5b117edd0b76        2 years ago         104MB
```

构建镜像(二)

Dockerfile+ docker build

```
[miaolc@localhost ~]$ mkdir static_web
[miaolc@localhost ~]$ cd static_web/
[miaolc@localhost static_web]$ touch Dockerfile
```

一个简单的Dockerfile

```
# Version: 0.0.1
FROM ubuntu:14:04
MAINTAINER miaolc "xxx@example.com"
RUN apt-get update
RUN apt-get install -y nginx
RUN echo 'Hi, I am in your container' \
    >/usr/share/nginx/html/index.html
EXPOSE 80
```

Dockerfile执行流程

- 从基础镜像运行容器
- 执行一条指令，从上到下依次执行
- 执行类似docker commit的操作，重新提交一个新的镜像层
- 基于新的镜像层，重新运行一个容器
- 按上述流程执行指令，直至运行完毕

Dockerfile基本指令

- \# : 代表该行是comment
- FROM : 指定从基础镜像运行容器, ubuntu:14.04代表base image和tag
- MAINTAINER: 指定镜像的author、email
- RUN: 指定在容器内运行一条指令
- EXPOSE : 指定容器暴露服务的端口
- CMD
- ENTRYPOINT
- WORKDIR
- ENV
- USER
- VOLUME
- ADD
- COPY

```
[miaolc@localhost static_web]$ docker build -t="miaolc/static_web" .
Sending build context to Docker daemon  2.048kB
Step 1/6 : FROM ubuntu:14.04
14.04: Pulling from library/ubuntu
a7344f52cb74: Pull complete
515c9bb51536: Pull complete
e1eabe0537eb: Pull complete
4701f1215c13: Pull complete
Digest: sha256:2f7c79927b346e436cc14c92bd4e5bd778c3bd7037f35bc639ac1589a7acfa90
Status: Downloaded newer image for ubuntu:14.04
 ---> 2c5e00d77a67
Step 2/6 : MAINTAINER miaolc "xxx@example.com"
 ---> Running in 6abca49c4f37
Removing intermediate container 6abca49c4f37
 ---> 76b9899f4603
Step 3/6 : RUN apt-get update
 ---> Running in f6534fd6b0bd
Ign http://archive.ubuntu.com trusty InRelease
Get:1 http://security.ubuntu.com trusty-security InRelease [65.9 kB]
Get:2 http://archive.ubuntu.com trusty-updates InRelease [65.9 kB]
Get:3 http://security.ubuntu.com trusty-security/main amd64 Packages [1032 kB]
Get:4 http://security.ubuntu.com trusty-security/restricted amd64 Packages [18.1 kB]
Get:5 http://security.ubuntu.com trusty-security/universe amd64 Packages [377 kB]
Successfully tagged miaolc/static_web:latest
[miaolc@localhost static_web]$ docker images
REPOSITORY            TAG        IMAGE ID        CREATED         SIZE
miaolc/static_web     latest     577608841273    2 hours ago     222MB
hzxsmlc/hzxsmlc001    latest     1263ad896c24    3 hours ago     143MB
```

推送镜像

```
[miaolc@localhost static_web]$ docker tag miaolc/static_web hzxsmlc/static_web
[miaolc@localhost static_web]$ docker images
REPOSITORY              TAG              IMAGE ID            CREATED          SIZE
hzxsmlc/static_web      latest           577608841273        2 hours ago      222MB
miaolc/static_web       latest           577608841273        2 hours ago      222MB
[miaolc@localhost static_web]$ docker login
Login with your Docker ID to push and pull images from Docker Hub. If you don't have a Docker ID, h
 to create one.
Username: hzxsmlc
Password:
WARNING! Your password will be stored unencrypted in /home/miaolc/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
[miaolc@localhost static_web]$ docker push hzxsmlc/static_web
The push refers to repository [docker.io/hzxsmlc/static_web]
7b791100d203: Pushed
80aef86ef241: Pushed
0acd6ad8c490: Pushed
66285ac4bf24: Pushed
48334332ed8d: Mounted from library/ubuntu
46c1a22ffea5: Mounted from library/ubuntu
b057ab380990: Mounted from library/ubuntu
latest: digest: sha256:562f359257067c60f2aab94f55938a940842b75b1650106a0edf43cd0eb6b11a size: 1782
```

快捷通

```
FROM ubuntu:14.04
MAINTAINER James Turnbull <james@example.com>
ENV REFRESHED_AT 2014-06-01

RUN apt-get -yqq update
RUN apt-get -yqq install wget

VOLUME ["/var/lib/tomcat7/webapps/"]
WORKDIR /var/lib/tomcat7/webapps/

ENTRYPOINT ["wget"]
CMD ["-?"]
```

```
[miaolc@localhost fetcher]$ docker build -t jamtur01/fetcher .
Sending build context to Docker daemon  2.048kB
Step 1/9 : FROM ubuntu:14.04
 ---> 2c5e00d77a67
Step 2/9 : MAINTAINER James Turnbull <james@example.com>
 ---> Running in 9d40e3cb38f8
Removing intermediate container 9d40e3cb38f8
 ---> 45f5b347df8d
Step 3/9 : ENV REFRESHED_AT 2014-06-01
 ---> Running in 3a1c45ad93fa
Removing intermediate container 3a1c45ad93fa
 ---> cee75217fee3
Step 4/9 : RUN apt-get -yqq update
```

搭建应用(二)

```
[miaolc@localhost ~]$ docker run -it --name sample jamtur01/fetcher \
> https://tomcat.apache.org/tomcat-7.0-doc/appdev/sample/sample.war
FROM ubuntu:14.04
MAINTAINER James Turnbull <james@example.com>
ENV REFRESHED_AT 2014-06-01

RUN apt-get -yqq update
RUN apt-get -yqq install tomcat7 default-jdk

ENV CATALINA_HOME  /usr/share/tomcat7
ENV CATALINA_BASE  /var/lib/tomcat7
ENV CATALINA_PID   /var/run/tomcat7.pid
ENV CATALINA_SH    /usr/share/tomcat7/bin/catalina.sh
ENV CATALINA_TMPDIR /tmp/tomcat7-tomcat7-tmp

RUN mkdir -p $CATALINA_TMPDIR

VOLUME ["/var/lib/tomcat7/webapps/"]

EXPOSE 8080

ENTRYPOINT ["/usr/share/tomcat7/bin/catalina.sh", "run"]
~
```

搭建应用(三)

```
[miaolc@localhost ~]$ docker run --name sample_app --volumes-from sample -d -P jamtul01/tomcat7
3fadd115dac3b093041f5a2fa09cf5f95a4aceb93a9725c2aa31652050d84bea
[miaolc@localhost ~]$ docker port sample_app 8080
0.0.0.0:32768
```

https://tomcat.apache.org/tomcat-7.0-doc/appdev/sample/

应用   主页面 - Confluence   高效源于协同 - OA   System Dashboar...   人人都是产品经理 |...   通讯录 - 技术部 -...   GEMS系统登录   Guardian系统统一...   DUBBO MONITOR

Sample Application

The example app has been packaged as a war file and can be downloaded here (Note: make sure your browser doesn't change file extension or append a new one).

The easiest way to run this application is simply to move the war file to your **CATALINA_HOME/webapps** directory. Tomcat will automatically expand and deploy the application for you. You can view it with the following URL (assuming that you're running tomcat on port 8080 as is the default):
http://localhost:8080/sample

If you just want to browse the contents, you can unpack the war file with the **jar** command.

```
jar -xvf sample.war
```

尝试用docker搭建一个含web应用、数据库、缓存的多容器应用

- Docker官方文档：https://docs.docker.com/
- 第一本docker书
- 深入浅出docker

Thank you！