디자이너를 위한 Docker 입문

행스모 7월 3주차

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- 가상화의 시대
- Docker 맛보기
- Docker 이해하기
- 컨테이너가 필요한 이유
- Wordpress / Deepdream 실행하기

시대는 바야흐로 가상화

하드웨어 가상화

소프트웨어로 구현된 가상의 하드웨어

물리적 하드웨어 위의 소프트웨어로 구현된 하드웨어

VirtualBox [1]
Parallels [2]
VMWare [3]

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[1] https://www.docker.com/

[2] http://www.parallels.com/products/desktop/

[3] http://www.vmware.com/

이미 일상적인 기술

인프라스트럭처

하드웨어 파편화 최소화

서버 없는 사무실
거의 무한한 확장성

그리고 새로이 등장한 재발견된

Container?

Docker[1]

[1] https://www.docker.com/

Hello, Docker

간단한 예제

xaos

내 컴퓨터 - xaos가 없는 환경

```
$ xaos
command not found: xaos

$ which xaos
xaos not found
```

원격 서버 - Ubuntu에서 설치하기

```
$ apt-get update
$ apt-get install xaos
$ xaos
```

다시 내컴퓨터 - xaos가 없는 환경

```
$ xaos
command not found: xaos

$ docker run --rm -it wernight/funbox
: <8>
```

Demo

프로세스가 실행되는 두 가지 환경

1. 내 컴퓨터의 환경
2. xaos가 설치된 Docker 이미지의 환경

내 컴퓨터의 환경

```
$ which xaos
xaos not found
```

xaos가 설치된 Docker 이미지의 환경

```
$ # 내 컴퓨터의 환경
$ docker run --rm -it wernight/funbox bash

ShellInDockerContainer$ # 컨테이너 환경
ShellInDockerContainer$ which xaos
/usr/bin/xaos
```

소프트웨어 패키지가 아니라 설치된 환경 자체

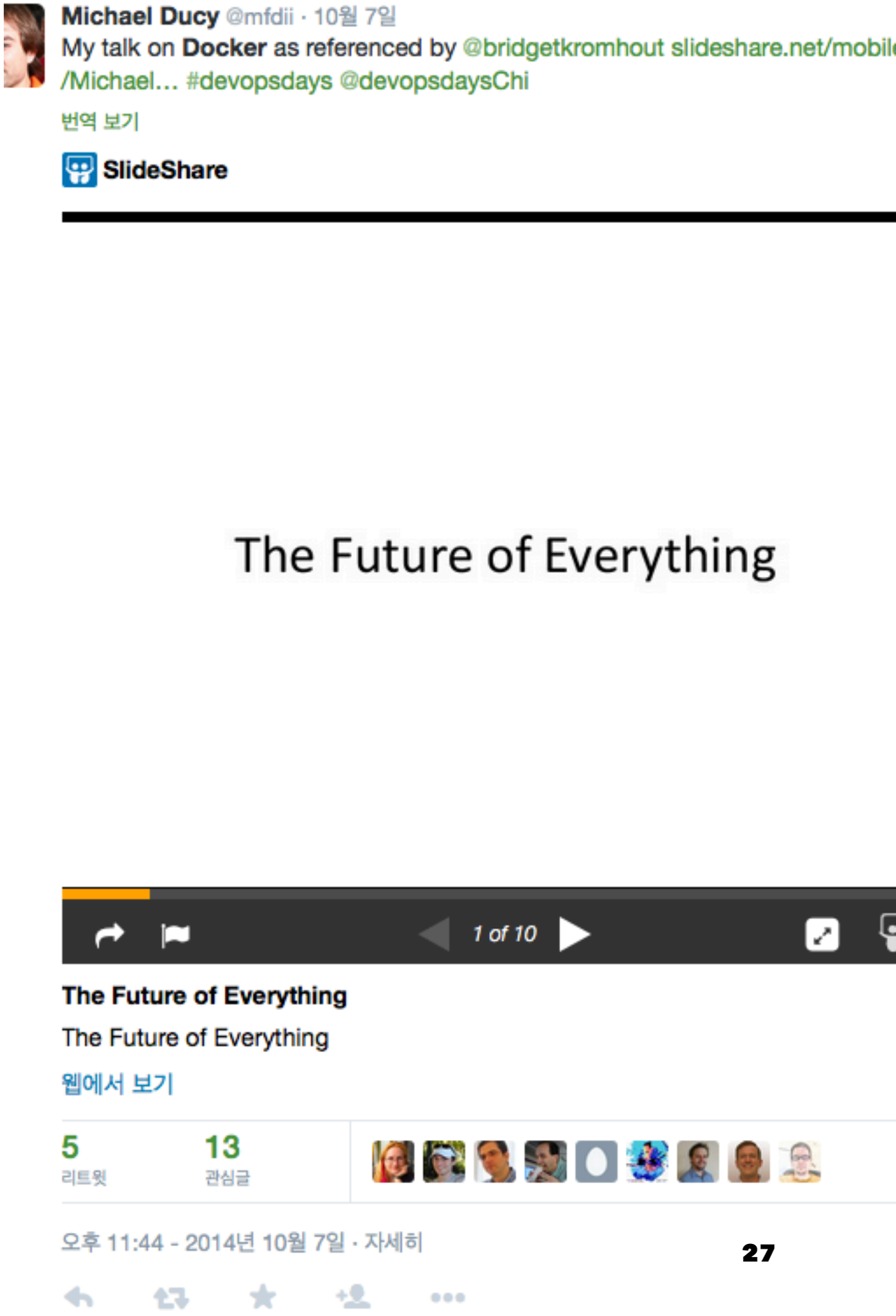
하드웨어 가상화 없는 격리된 환경의 프로세스

Container!

그래서 대단한 거야?

The Future of Everything

Link



docker

docker

docker

docker


그런데
그것이
실제로 일어났습니다. ㅋㅋ
ㅋㅋ
ㅋㅋ

실전으로 배우는 Dokcer

이미지

프로세스를 실행하기 위해 미리 준비된 환경

컨테이너

이미지로부터
실행된 프로세스

원시적인 컨테이너

chroot

프로세스의 root를 속이자

Container = chroot + @

Docker

이미지 관리 인터페이스

컨테이너 관리 인터페이스

계층화된 파일 시스템

Docker 설치

Docker 설치

- 리눅스 : apt-get / yum을 이용해 설치
- 윈도/OSX : boot2docker로 설치

boot2docker

http://boot2docker.io/

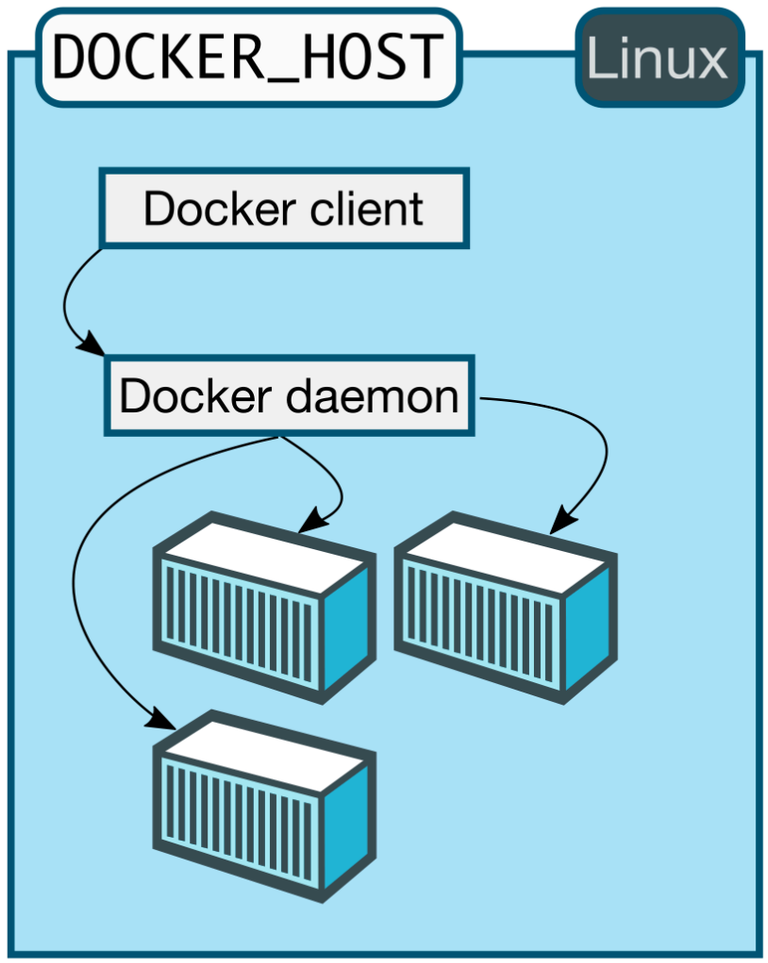
boot2docker (1)

- Docker는 리눅스 커널만 지원
- 윈도/OSX에서는 Docker를 지원하지 않음
- 따라서 리눅스 가상 머신이 필요
- boot2dokcer = CoreLinux on VirtualBox

boot2docker (2)

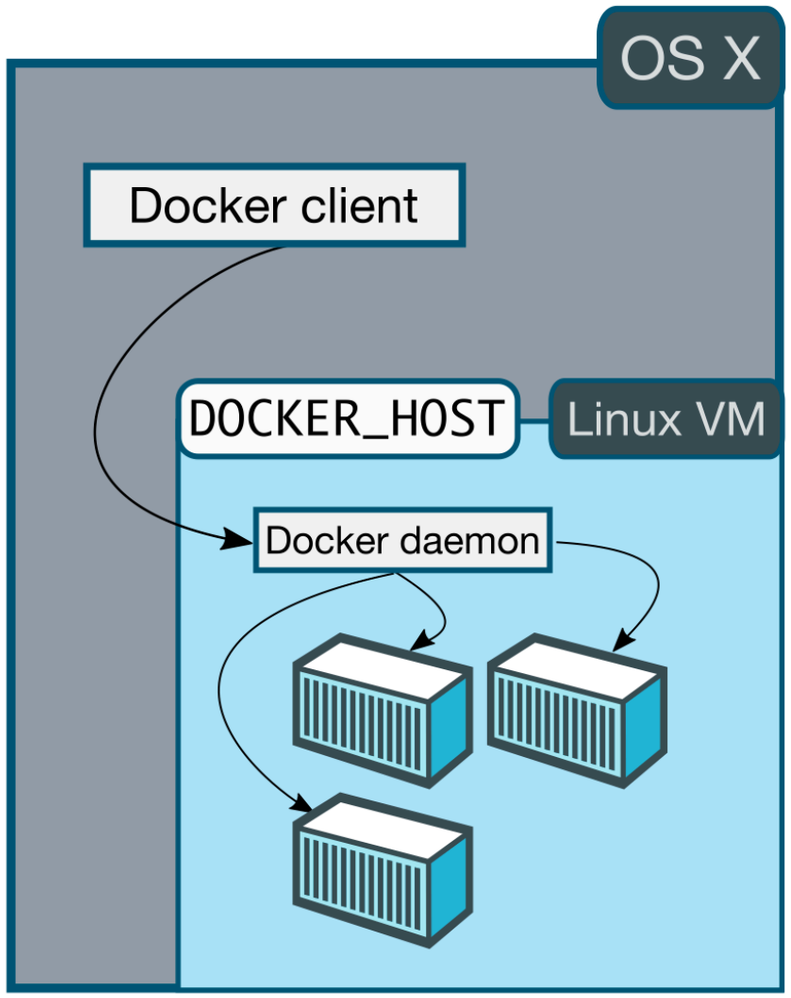
- 가상머신을 쓰면서까지 Docker를 써야하나?
  - 성능 면에서는 분명히 불리함
  - 이미지/컨테이너 개념은 여전히 강력함
  - 실배포에서는 클라우드에서 리눅스 머신을 사용

Docker 원리 이해하기



from

boot2dokcer 원리 이해하기



from

boot2docker 설치

1. 먼저 boot2docker 에서 OS별 인스톨러 다운로드
2. 인스톨러로 설치
    - docker와 boot2docker 명령어가 설치
3. 터미널에서 `boot2docker init` 실행
    - CoreLinux 가상머신 생성
4. `boot2docker up` 실행
5. `eval $(boot2docker shellinit)` 실행

`eval $(boot2docker shellinit)`

- `docker` 명령어로 가상머신의 데몬을 사용하도록 지정
  - `docker` = Docker Client
  - 가상머신의 `Docker` 데몬 = Docker Server
    - 명령을 내리면 실제론 가상머신에서 실행
- 터미널을 새로 열 때마다 실행해야함
- 귀찮다면 `~/.bashrc` 파일을 열어 맨 뒤에 추가
  - `eval $(boot2docker shellinit)`

Docker GUI 인터페이스

Kitematic

이런 것도 있어요

준비 완료!

이미지를 만들어보자!

새로운 환경 정의하기

wget이 설치된 Ubuntu 이미지

docker pull

이미지를 받아오는 명령어

```
$ docker pull <IMAGE_NAME>
```

```
$ docker pull ubuntu:14.04
```

docker images

도커에서 사용가능한 이미지 목록

```
$ docker images
REPOSITORY    TAG       IMAGE ID          ...
ubuntu        14.04     d2a0ecffe6fa      ...
```

docker run

이미지로부터 컨테이너 실행하기

```
$ docker run -it <IMAGE_NAME> <COMMAND>
```

```
# ubuntu:14.04 이미지에서 bash 명령어를 실행
$ # <- 여기는 호스트의 셸
$ docker run -it ubuntu:14.04 bash
root@8b7290edaa5c:/$ # <- 새로운 환경 안의 셸
```

Conatiner ID

8b7290edaa5c

docker ps

실행중인 컨테이너 목록

```
# 호스트의 다른 셸에서 실행
$ docker ps
CONTAINER ID    IMAGE                COMMAND    ...
8b7290edaa5c    ubuntu:14.04    "bash"     ...
```

컨테이너에서 wget 설치하기

```
root@8b7290edaa5c:/# wget
bash: wget: command not found

root@8b7290edaa5c:/# apt-get update
root@8b7290edaa5c:/# apt-get install -y wget
```

```
root@8b7290edaa5c:/# wget
wget: missing URL
Usage: wget [OPTION]... [URL]...

Try `wget --help' for more options.
```

docker diff

실행한 이미지로부터 현재 컨테이너의 변경사항 출력

```
$ docker diff <CONTAINER_ID>

# 호스트의 다른 셸에서 실행
$ docker diff 8b7290edaa5c
A /.wh..wh.plnk/101.138481 # 파일 추가
A /.wh..wh.plnk/361.138462 # 파일 추가
C /etc                     # 변경 사항
A /etc/ca-certificates     # 파일 추가
...
```

docker commit

실행한 이미지로부터 현재 컨테이너의 변경사항 저장

```
$ docker commit <CONTAINER_ID> <IMAGE_NAME>

$ docker commit 8b7290 nacyot/wget:latest
9ea5dab42924a2a7cbb4a...
# 새로 생성된 이미지 ID

$ docker images
REPOSITORY   TAG      IMAGE ID         ...
ubuntu       14.04    d2a0ecffe6fa     ...
nacyot/wget  latest   9ea5dab42924     ...
```

nacyot/wget 실행해보기

```
$ docker run -it ubuntu:14.04 bash
root@c30e6fa29017:/# wget
bash: wget: command not found

$ docker run -it nacyot/wget bash
root@f87cd323f346:/# wget
wget: missing URL
Usage: wget [OPTION]... [URL]...

Try `wget --help' for more options.
```

Dockerfile

이미지 빌드 과정을 파일로 기술

```
FROM ubuntu:14.04

RUN apt-get update
RUN apt-get install -y wget
```

docker build

Dockerfile로 이미지 빌드하기

```
$ docker build -t <IMAGE_NAME> <TARGET_DIR>
```

```
$ ls
Dockerfile
```

```
$ dokcer build -t nacyot/wget:latest .
```

Demo

더 공부하기

도커(Docker) 튜토리얼 : 깐 김에 배포까지

컨테이너가 필요한 이유

보편적 물리법칙

언제 어디서나

컴퓨터의 환경은 보편적이지 않다

특수한 환경

특정 하드웨어

특정 OS

특정 시점의 시스템 설정

설치된 소프트웨어들

컴퓨터를 수리하는 가장 일반적인 알고리즘

재부팅

그래도 안 되면...

재설치

그래도 안 되면...

OS 재설치

윈도우 다시 깔아.

상태 관리는 원래 어렵다

서버도 어렵다

데스크탑도 똑같이 어렵다

깨끗한 환경

Dockerfile이란

깨끗한 환경으로부터
애플리케이션 실행 환경까지 최단경로

이미지 = 작동되는 상태

10명의 맥북

10개의 서로 다른 환경

하나의 이미지

항상 같은 환경

Docker is

Docker is

뽕 맞은 chroot

Docker is

초강력한 포터블 앱

재현성

이미지로 만들면 공유가능
여기서 되면, 저기서도 됨

Docker hub

- 도커 공식 이미지 공유를 위한 서비스
- 다양한 이미지가 미리 준비되어 있음
  - 기본 운영체제 : Ubuntu, CentOS, ...
  - CMS: Wordpress, Ghost, drupal, ...
  - Ipython, Jira, Gitlab, Deepdream, ...
- `docker run` 명령어 하나면 실행 가능

Wordpress

난이도: 중

Wordpress on Docker

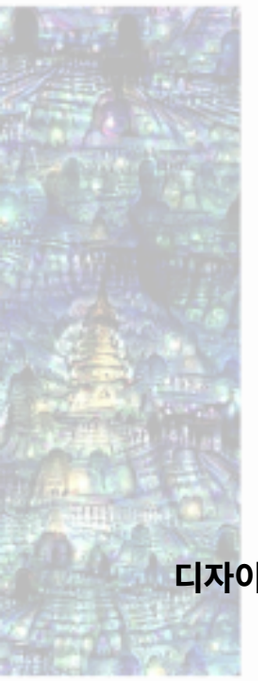
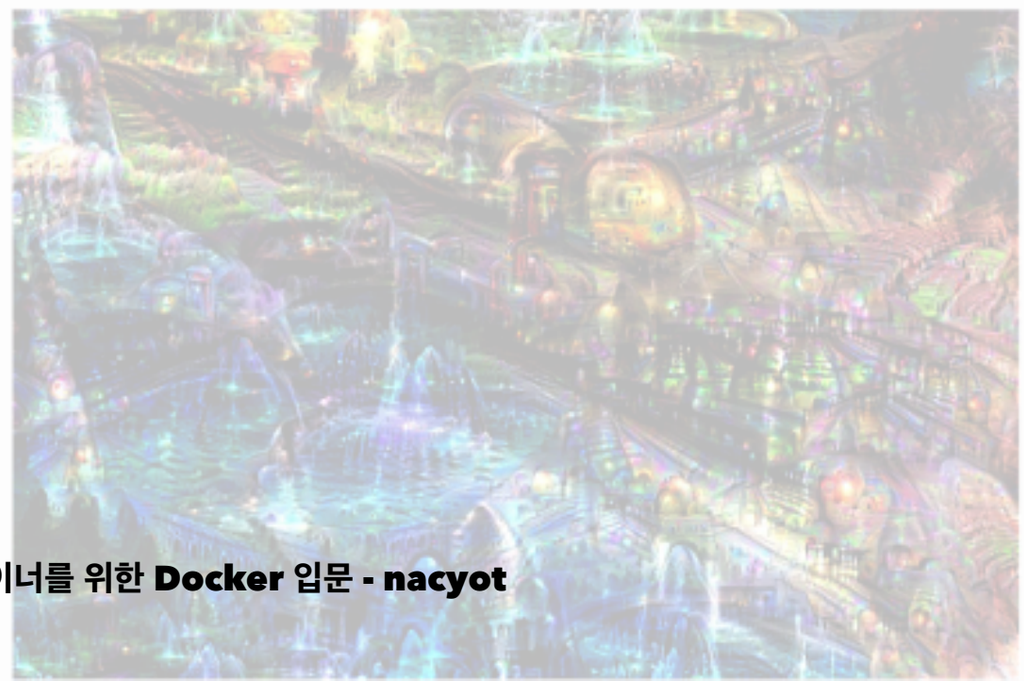
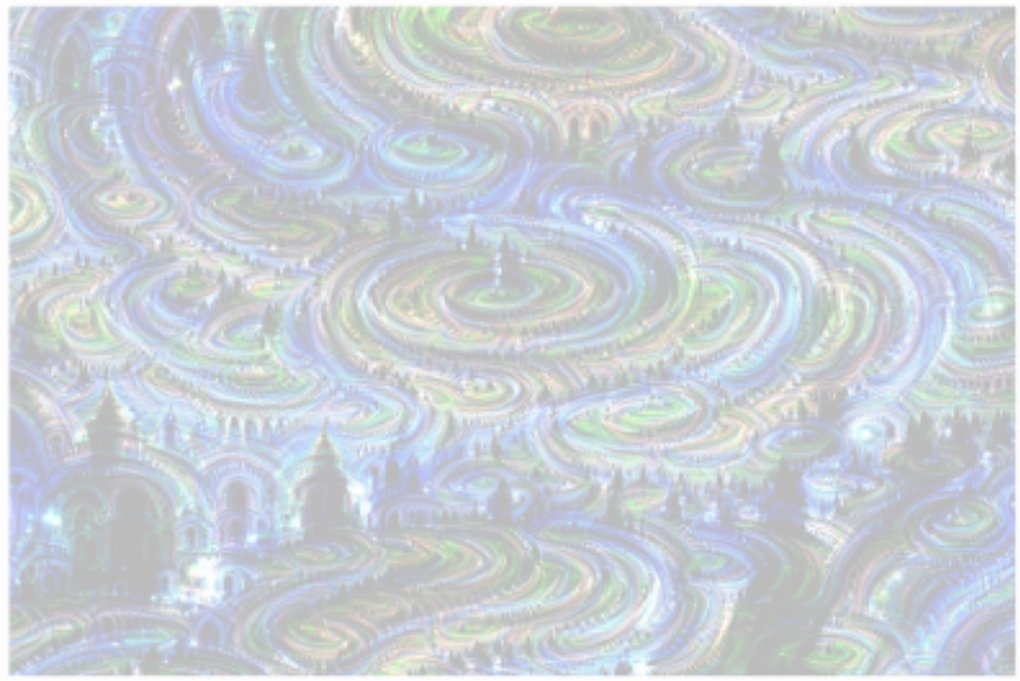
```
$ docker run --name wp-mysql -e MYSQL_ROOT_PASSWORD=password -d mysql
$ docker run --link wp-mysql:mysql -p 8000:80 -d wordpress
```

http://192.168.59.103:8000

Deepdream

from

난이도: 상


Deepdream

- Deep Learning을 통해 컴퓨터의 눈으로 보는 세계
- Deep Learning 프레임워크 caffe를 사용

나도 한 번 해보자

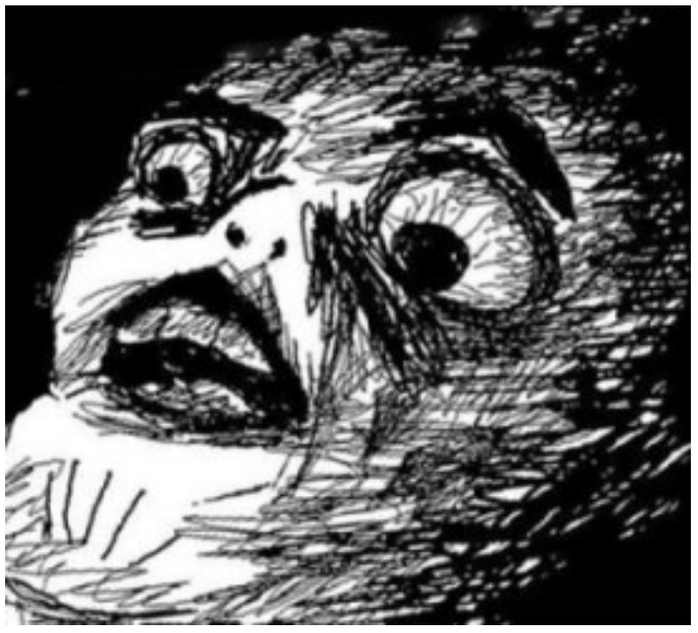
Deepdream

그럼 먼저 caffe를 설치해ㅂ.....

OS X Installation

```
We highly recommend using the Homebrew package manager. Ideally you could start from a clean /usr/local to avoid conflicts. In the following, we assume that you're using Anaconda Python and Homebrew.

CUDA: Install via the NVIDIA package that includes both CUDA and the bundled driver. CUDA 7 is strongly suggested. Older CUDA require libstdc++ while clang++ is the default compiler and libc++ the default standard library on OS X 10.9+. This disagreement makes it necessary to change the compilation settings for each of the dependencies. This is prone to error.

Library Path: We find that everything compiles successfully if $LD_LIBRARY_PATH is not set at all, and $DYLD_FALLBACK_LIBRARY_PATH is set to provide CUDA, Python, and other relevant libraries (e.g. /usr/local/cuda/lib:$HOME/anaconda/lib:/usr/local/lib:/usr/lib). In other ENV settings, things may not work as expected.

General dependencies

brew install -vd snappy leveldb gflags glog szip lmdb
# need the homebrew science source for OpenCV and hdf5
brew tap homebrew/science
brew install hdf5 opencv

If using Anaconda Python, a modification to the OpenCV formula might be needed. Do brew edit opencv and change the lines that look like the two lines below to exactly the two lines below.

  -DPYTHON_LIBRARY=#{py_prefix}/lib/libpython2.7.dylib
  -DPYTHON_INCLUDE_DIR=#{py_prefix}/include/python2.7

If using Anaconda Python, HDF5 is bundled and the hdf5 formula can be skipped.

Remaining dependencies, with / without Python

# with Python pycaffe needs dependencies built from source
brew install --build-from-source --with-python -vd protobuf
brew install --build-from-source -vd boost boost-python
# without Python the usual installation suffices
brew install protobuf boost

BLAS: already installed as the Accelerate / vecLib Framework. OpenBLAS and MKL are alternatives for faster CPU computation.

Python (optional): Anaconda is the preferred Python. If you decide against it, please use Homebrew. Check that Caffe and dependencies are linking against the same, desired Python.

Continue with compilation.
libstdc++ installation

This route is not for the faint of heart. For OS X 10.10 and 10.9 you should install CUDA 7 and follow the instructions above. If that is not an option, take a deep breath and carry on.

In OS X 10.9+, clang++ is the default C++ compiler and uses libc++ as the standard library. However, NVIDIA CUDA (even version 6.0) currently links only with libstdc++. This makes it necessary to change the compilation settings for each of the dependencies.

We do this by modifying the Homebrew formulae before installing any packages. Make sure that Homebrew doesn't install any software dependencies in the background; all packages must be linked to libstdc++.

The prerequisite Homebrew formulae are

boost snappy leveldb protobuf gflags glog szip lmdb homebrew/science/opencv

For each of these formulas, brew edit FORMULA, and add the ENV definitions as shown:

  def install
    # ADD THE FOLLOWING:
    ENV.append "CXXFLAGS", "-stdlib=libstdc++"
    ENV.append "CFLAGS", "-stdlib=libstdc++"
    ENV.append "LDFLAGS", "-stdlib=libstdc++ -lstdc++"
    # The following is necessary because libtool likes to strip LDFLAGS:
    ENV["CXX"] = "/usr/bin/clang++ -stdlib=libstdc++"
    ...

To edit the formulae in turn, run
for x in snappy leveldb protobuf gflags glog szip boost boost-python lmdb homebrew/science/opencv; do brew edit $x; done

After this, run
for x in snappy leveldb gflags glog szip lmdb homebrew/science/opencv; do brew uninstall $x; brew install --build-from-source -vd $x; done
brew uninstall protobuf; brew install --build-from-source --with-python -vd protobuf
brew install --build-from-source -vd boost boost-python

If this is not done exactly right then linking errors will trouble you.

Homebrew versioning that Homebrew maintains itself as a separate git repository and making the above brew edit FORMULA changes will change files in your local copy of homebrew's master branch. By default, this will prevent you from updating Homebrew using brew update, as you will get an error message like the following:
$ brew update
error: Your local changes to the following files would be overwritten by merge:
  Library/Formula/lmdb.rb
Please, commit your changes or stash them before you can merge.
Aborting
Error: Failure while executing: git pull -q origin refs/heads/master:refs/remotes/origin/master

One solution is to commit your changes to a separate Homebrew branch, run brew update, and rebase your changes onto the updated master. You'll have to do this both for the main Homebrew repository in /usr/local/ and the Homebrew science repository that contains OpenCV in /usr/local/Library/Taps/homebrew/homebrew-science, as follows:

cd /usr/local
git checkout -b caffe
git add .
git commit -m "Update Caffe dependencies to use libstdc++"
cd /usr/local/Library/Taps/homebrew/homebrew-science
git checkout -b caffe
git add .
git commit -m "Update Caffe dependencies"

Then, whenever you want to update homebrew, switch back to the master branches, do the update, rebase the caffe branches onto master and fix any conflicts:
# Switch batch to homebrew master branches
cd /usr/local
git checkout master
cd /usr/local/Library/Taps/homebrew/homebrew-science
git checkout master

# Update homebrew; hopefully this works without errors!
brew update

# Switch back to the caffe branches with the formulae that you modified earlier
cd /usr/local
git rebase master caffe
# Fix any merge conflicts and commit to caffe branch
cd /usr/local/Library/Taps/homebrew/homebrew-science
git rebase master caffe
# Fix any merge conflicts and commit to caffe branch

At this point, you should be running the latest Homebrew packages and your Caffe-related modifications will remain in place.
```

Done!



Docker 등판

ryankennedyio/deepdream

```
$ git clone https://github.com/ryankennedyio/deep-dream-generator.git
$ cd deep-dream-generator
$ docker run -d \
    -p 443:8888 \
    -e "PASSWORD=password" \
    -v $(pwd):/src \
    ryankennedyio/deepdream
...
a4ea7d082a79e6251a4
```

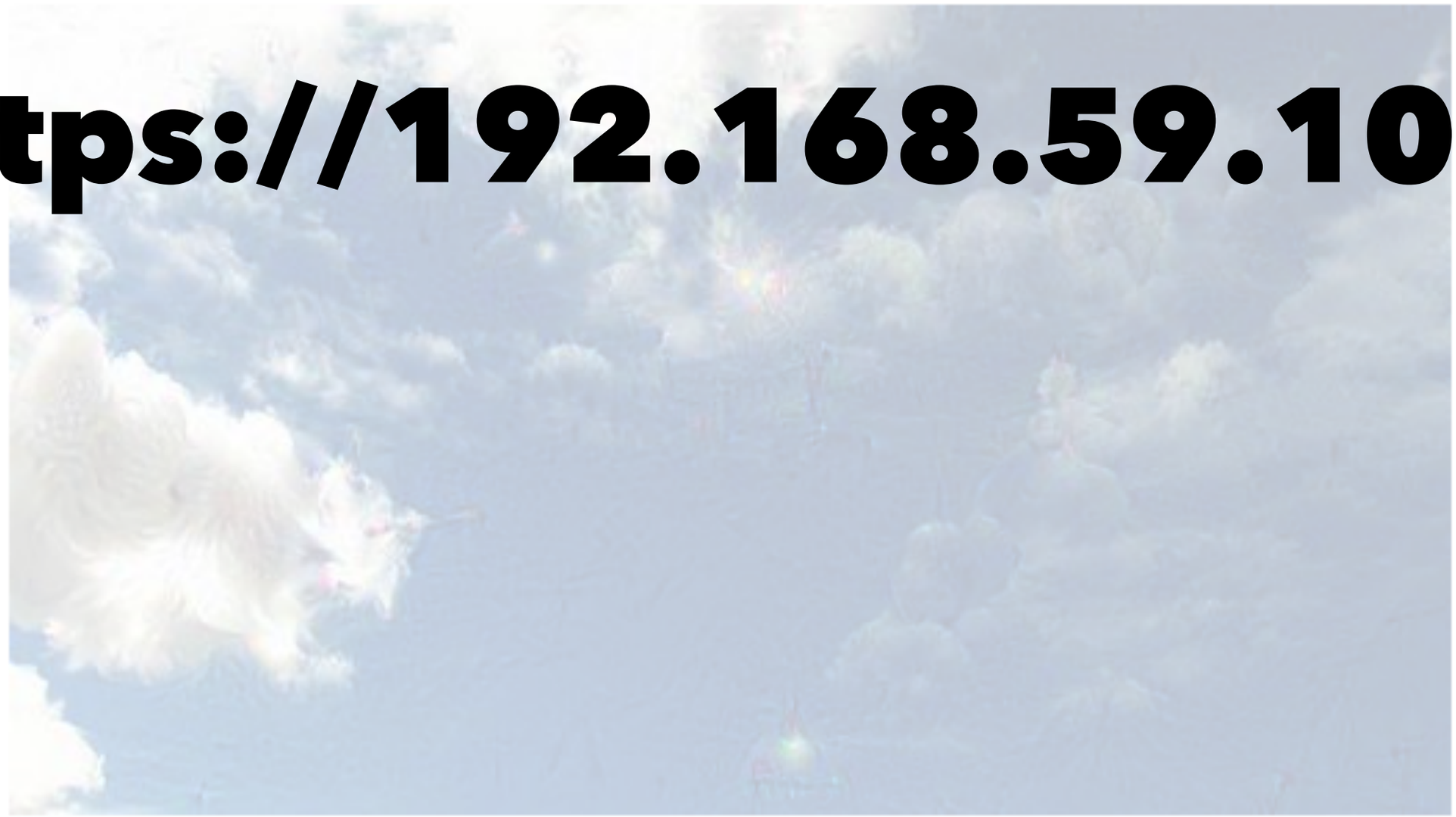
IP[y]: Notebook dream (unsaved changes)

File Edit View Insert Cell Kernel Help

Code Cell Toolbar: None

Running the next code cell starts the detail generation process. You may see how new patterns

In [*]: _=deepdream(net, img)



https://192.168.59.103

더 자세히 이해하기

Running deep dream on Windows and OSX

Gitlab

난이도: 최상

Gitlab?

- Github와 비슷한 설치형 오픈소스 Git 호스팅 서비스
- 서비스도 있고, 직접 설치해서 사용하는 것도 가능
- 개발자에게도 어려운 설치
    - 한때 설치하기 어렵기레 정평이 나있었음
- Git, ssh, Database, Redis, Ruby, Rails...

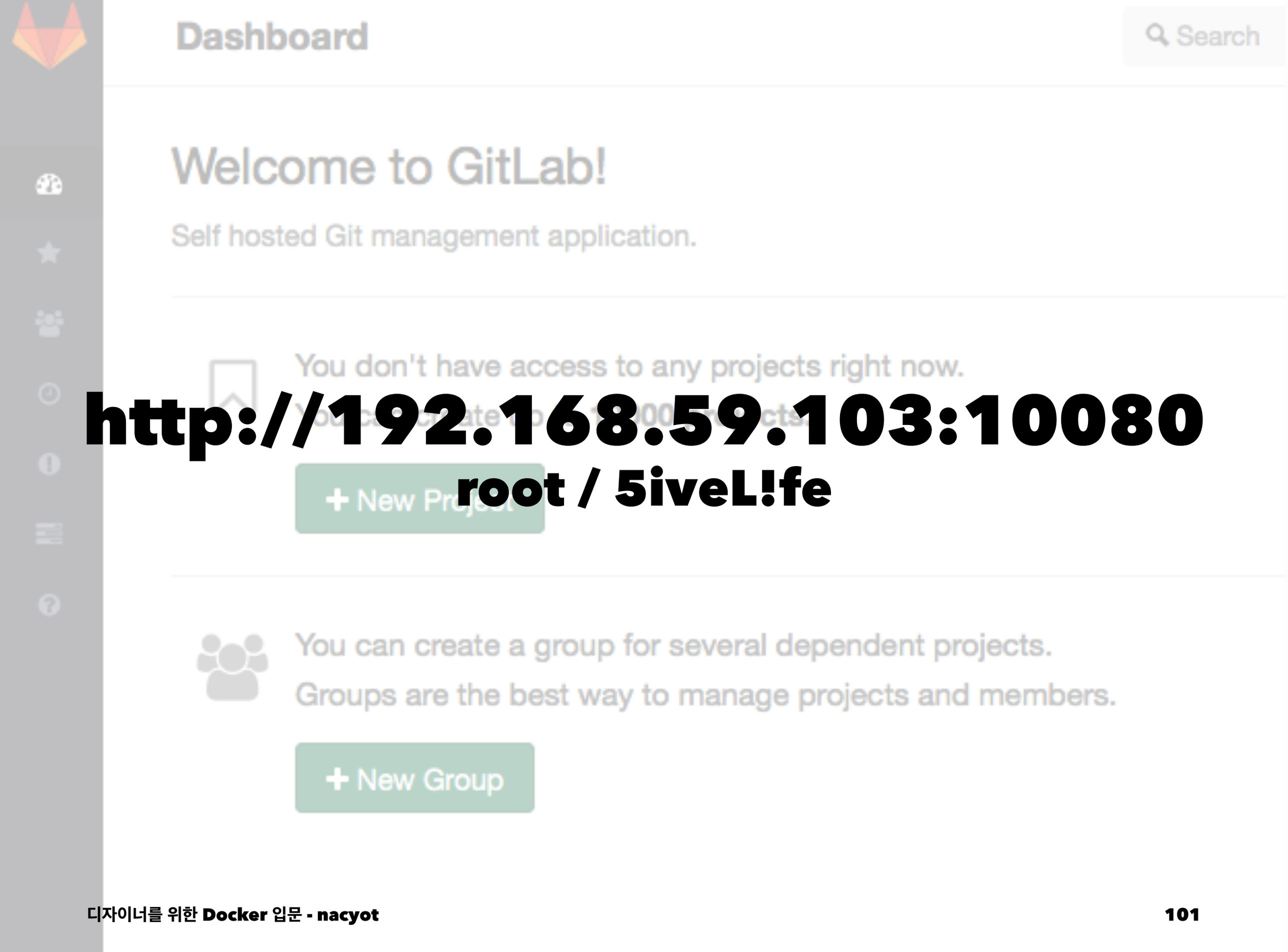
sameersbn/docker-gitlab

```
# Run Postgres Container
$ docker run --name gitlab-postgresql -d \
    --env 'DB_NAME=gitlabhq_production' \
    --env 'DB_USER=gitlab' --env 'DB_PASS=password' \
    --volume /srv/docker/gitlab/postgresql:/var/lib/postgresql \
    sameersbn/postgresql:9.4-2

# Run Redis Container
$ docker run --name gitlab-redis -d \
    --volume /srv/docker/gitlab/redis:/var/lib/redis \
    sameersbn/redis:latest # Redis Container

# Run Gitlab Container
$docker run --name gitlab -d \
    --link gitlab-postgresql:postgresql --link gitlab-redis:redisio \
    --publish 10022:22 --publish 10080:80 \
    --env 'GITLAB_PORT=10080' --env 'GITLAB_SSH_PORT=10022' \
    --volume /srv/docker/gitlab/gitlab:/home/git/data \
    sameersbn/gitlab:7.13.3
```

```
nf: falling back to frontend: Teletype
ing SSH2 RSA key; this may take some time ...
ing SSH2 DSA key; this may take some time ...
ing SSH2 ECDSA key; this may take some time ...
ing SSH2 ED25519 key; this may take some time ...
e-rc.d: policy-rc.d denied execution of restart.
ng for database server to accept connections
ng up GitLab for firstrun. Please be patient, this could take a while...
bhq_production already exists
ting database...
ling assets. Please be patient, this could take a while...
ng for database server to accept connections
ng up GitLab for firstrun. Please be patient, this could take a while...
ting database...
ling assets. Please be patient, this could take a while...
ing supervisord.
08-07 05:47:17,79
08-07 05:47:17,791
```

Wait 5 minute

```
08-07 05:47:17,791 WARN Included extra file "/etc/supervisor/conf.d/unicorn.conf" during parsing
08-07 05:47:17,791 WARN Included extra file "/etc/supervisor/conf.d/nginx.conf" during parsing
08-07 05:47:17,791 WARN Included extra file "/etc/supervisor/conf.d/cron.conf" during parsing
08-07 05:47:17,791 WARN Included extra file "/etc/supervisor/conf.d/sshd.conf" during parsing
08-07 05:47:17,842 INFO RPC interface 'supervisor' initialized
08-07 05:47:17,843 CRIT Server 'unix_http_server' running without any HTTP authentication checking
08-07 05:47:17,843 INFO supervisord started with pid 1
08-07 05:47:18,849 INFO spawned: 'sidekiq' with pid 563
08-07 05:47:18,870 INFO spawned: 'unicorn' with pid 564
08-07 05:47:18,879 INFO spawned: 'cron' with pid 565
08-07 05:47:18,884 INFO spawned: 'nginx' with pid 566
08-07 05:47:18,935 INFO spawned: 'sshd' with pid 568
08-07 05:47:20,130 INFO success: sidekiq entered RUNNING state, process has stayed up for > than 1 seconds (sta
08-07 05:47:20,131 INFO success: unicorn entered RUNNING state, process has stayed up for > than 1 seconds (sta
08-07 05:47:20,131 INFO success: cron entered RUNNING state, process has stayed up for > than 1 seconds (starts
08-07 05:47:20,131 INFO success: nginx entered RUNNING state, process has stayed up for > than 1 seconds (start
08-07 05:47:20,131 INFO success: sshd entered RUNNING state, process has stayed up for > than 1 seconds (starts
```



http://192.168.59.103:10080

root / 5iveL!fe

Build once, Run anywhere

감사합니다 :)

@nacyo_t