2021년 광주대학교 특강

OSS를 활용한 Docker DevOps Toolchain

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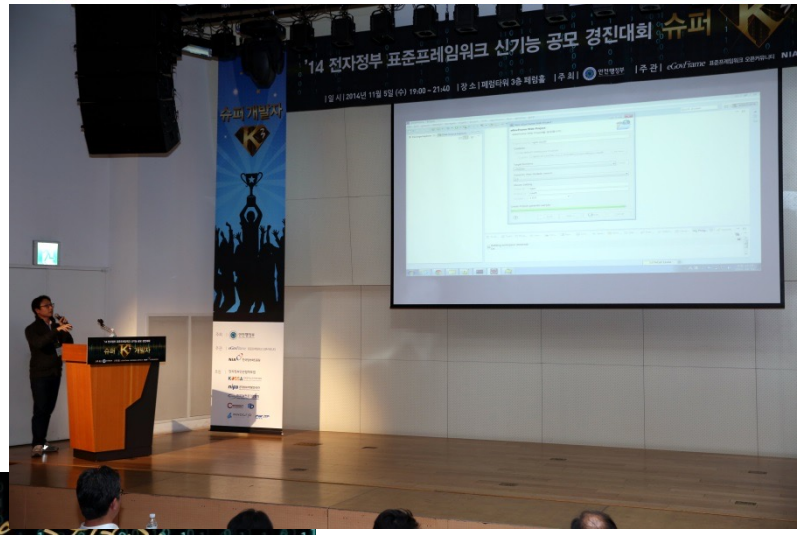
목 차

1. 발표자 소개

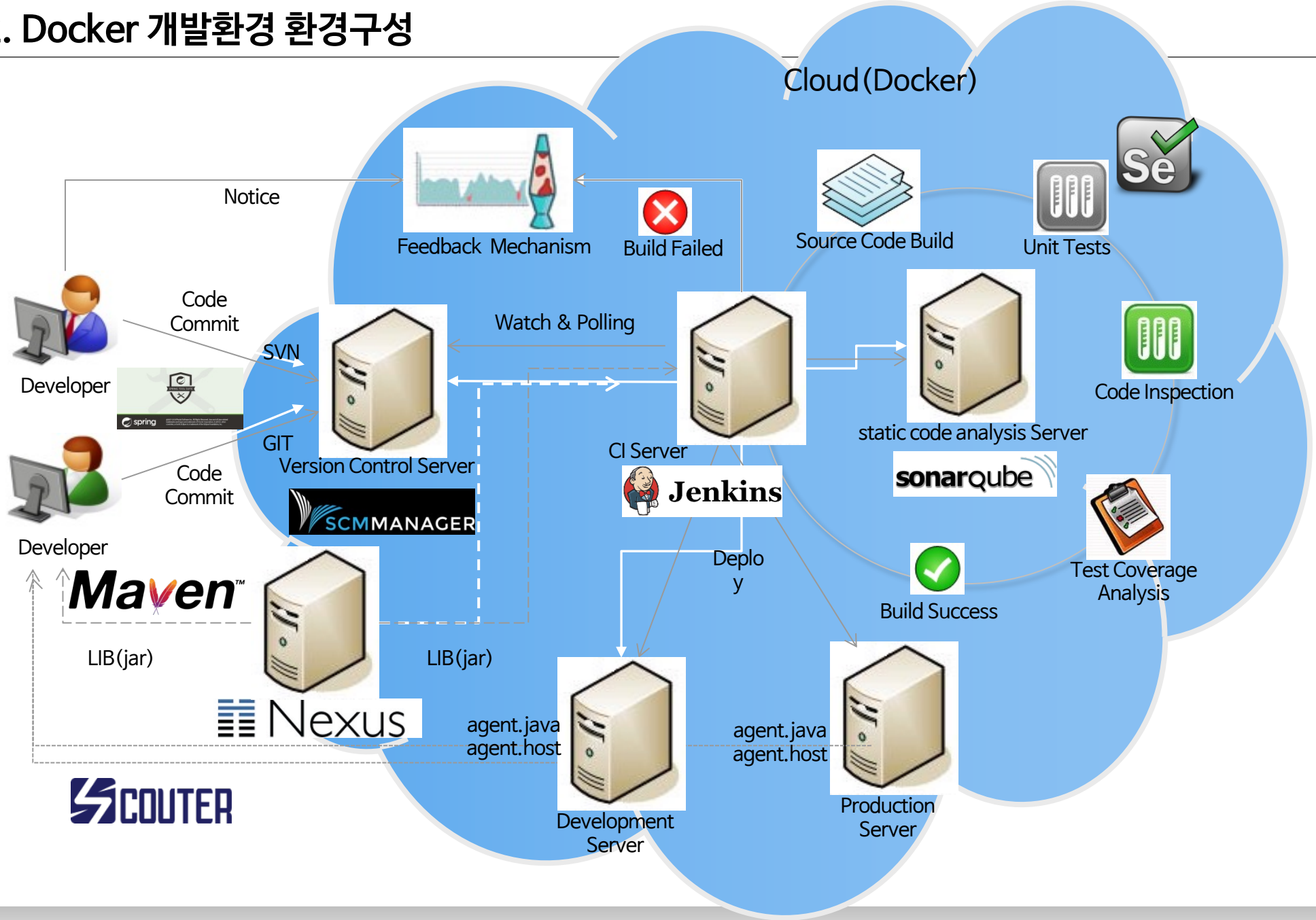
- ❑ **現한화시스템 ICT부문(2021~)**
  - HKS(Hanwha Kubernetes Service) Platform 개발 리딩
- ❑ **前SK주식회사 C&C(2012 ~ 2021)**
  - Cloud 프로젝트 다수 구축(2017 ~ 2020)
  - 사내 강의 다수
  - 사내 개발자 대회 다수 분야 3등(2018)
- ❑ **〈나도 해보자! 시리즈〉 오픈커뮤니티 세미나 발표**
  - 나도 해보자! 표준프레임워크 개발환경 구축
  - 나도 해보자! Cloud Project with Kubernetes 등
- ❑ **오픈플랫폼(PaaS) 전문가과정 강의(2016)**
- ❑ **슈퍼개발자K 시즌3 동상 수상(2014)**
- ❑ **現오픈커뮤니티 리더(2015 ~)**
- ❑ **前T-Hub(SK그룹 기술커뮤니티)**
  - DevOps Master(2020~2021)

표준프레임워크 오픈커뮤니티

eGovFrame



2. Docker 개발환경 환경구성



2. Docker 개발환경 환경구성

❑ 설치

- opdc-ide-naru-64bit.exe 파일을 C드라이브에서 실행

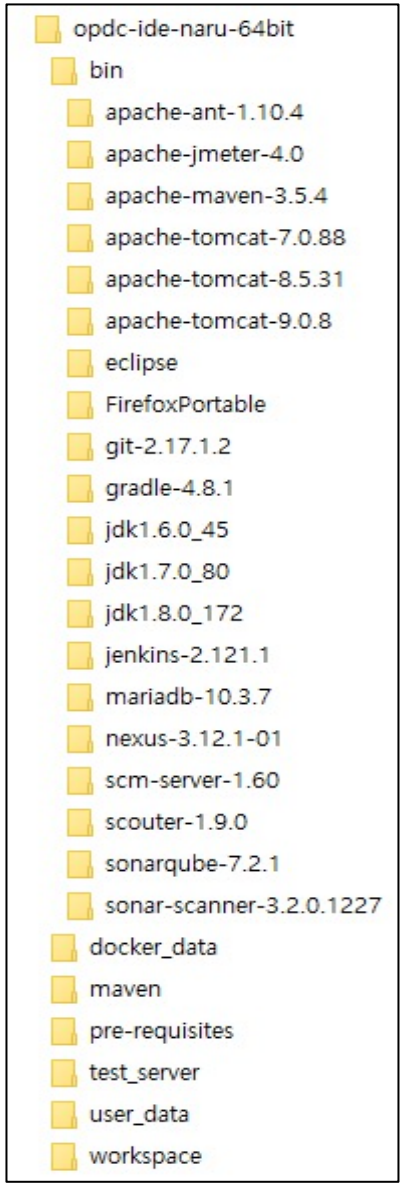
❑ 디렉토리 정보

디렉토리	설명
bin	실행파일
docker_data	Cloud(Docker) 사용자 디렉토리
maven/repository	Local Maven Repository
pre-requisites	사전 설치 프로그램 (DockerToolBox, Firefox 등)
test_server	테스트용 tomcat
user_data	사용자 디렉토리 (jenkins, scm-manager, nexus)
workspace	Eclipse Workspace

- 별도의 JDK 설치가 불필요

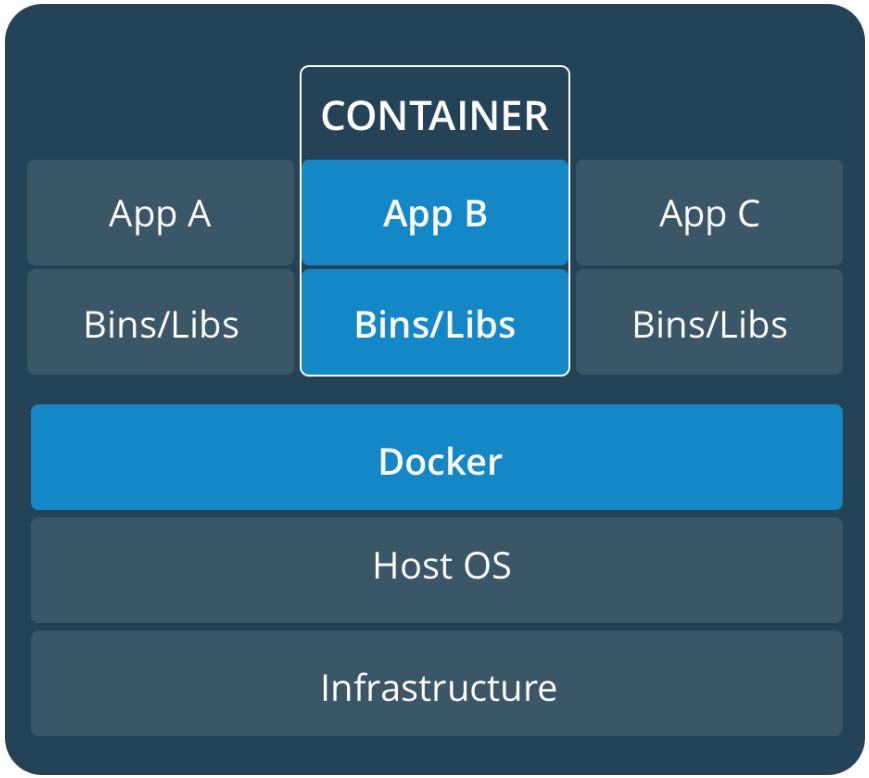
❑ 기본설정 설치경로

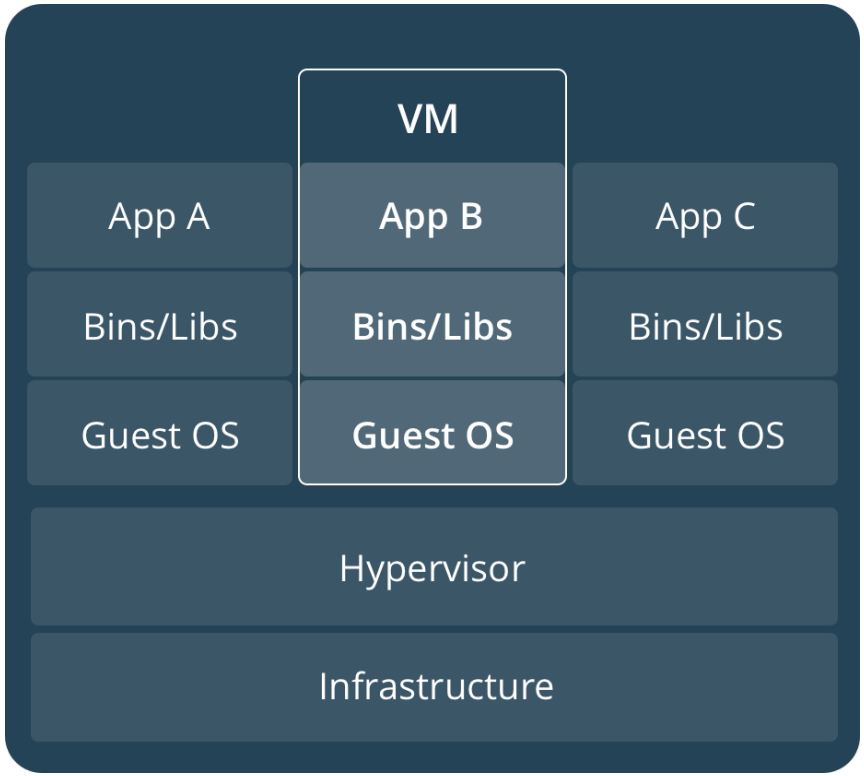
- C:/opdc-ide-naru-64bit



❑ Docker 정의

- 개발자와 관리자가 컨테이너를 사용하여 애플리케이션을 개발, 배포 및 실행하기 위한 플랫폼
- 리눅스 컨테이너를 사용하여 응용 프로그램을 배포하는 것을 컨테이너화라고 함
- 컨테이너는 새로운 것은 아니지만, 애플리케이션을 쉽게 배치하기 위해 사용
- Containers and virtual machines





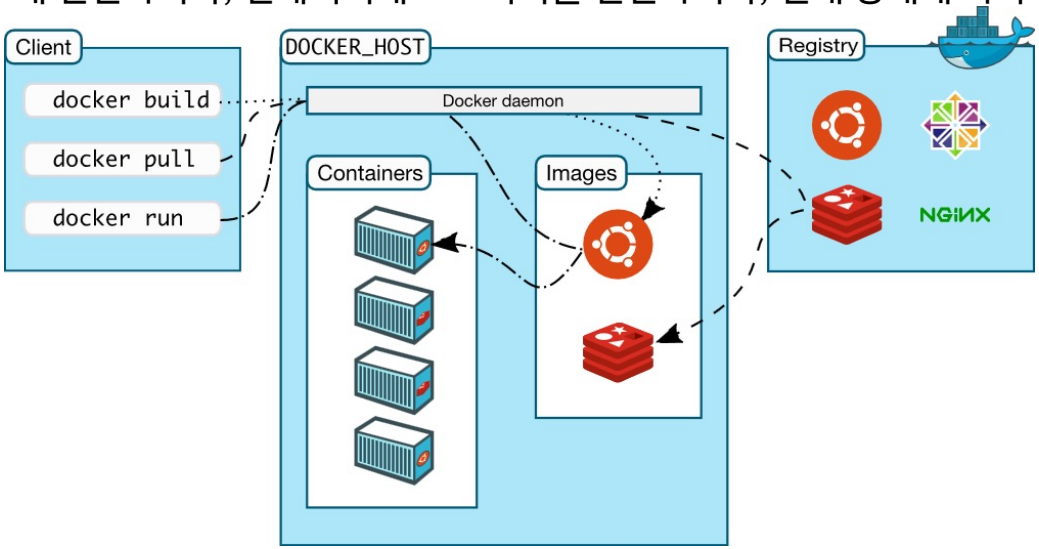
2. Docker 개발환경 환경구성

❑ IMAGES

- 도킹된 컨테이너를 생성하기 위한 지침이 포함된 읽기 전용 템플릿
- 종종 추가적인 사용자 지정과 함께 다른 이미지를 기반으로 함
- 다른 가상화 기술에 비해 이미지를 매우 가볍고 작고 빠르게 만드는 요소 중 하나임

❑ CONTAINERS

- 실행 가능한 이미지의 인스턴스
- DockerAPI또는 CLI를 사용하여 컨테이너를 생성, 시작, 중지, 이동 또는 삭제
- 하나 이상의 네트워크에 연결하거나, 컨테이너에 스토리지를 연결하거나, 현재 상태에 따라 새 이미지를 만들 수도 있음



❑ Docker 기본 명령어

- docker images

- 가지고 있는 이미지 출력

```
Usage:  docker images [OPTIONS] [REPOSITORY[:TAG]]

List images

Options:
  -a, --all             Show all images (default hides intermediate images)
      --digests         Show digests
  -f, --filter filter   Filter output based on conditions provided
      --format string   Pretty-print images using a Go template
      --no-trunc        Don't truncate output
  -q, --quiet           Only show numeric IDs
```

```
docker@default:~$ docker images
REPOSITORY                      TAG             IMAGE ID        CREATED         SIZE
spring-petclinic-docker         latest          32832b6d776a    40 hours ago    499MB
ljhiyh/scouter-server           latest          bc8fbffc688b    7 days ago      567MB
ljhiyh/scouter-host-agent       latest          dff6e676a255    8 days ago      481MB
jenkins                         latest          cd14cecfdb3a    2 weeks ago     696MB
mariadb                         latest          13814daf85b2    2 weeks ago     403MB
openjdk                         8-jre-alpine    ccfb0c83b2fe    3 weeks ago     83MB
selenium/standalone-firefox     3.13.0-argon    f37c8870b832    3 weeks ago     731MB
sonarqube                       latest          4595fdec7170    4 weeks ago     803MB
sonatype/nexus3                 latest          292674e848ae    7 weeks ago     502MB
registry.centos.org/centos/centos latest        355ad2ea5e32    2 months ago    200MB
sdorra/scm-manager              latest          c87c4c47af83    2 months ago    329MB
```

❑ Docker 기본 명령어

- docker ps

- docker 컨테이너 상태확인

```
Usage:  docker ps [OPTIONS]

List containers

Options:
  -a, --all             Show all containers (default shows just running)
  -f, --filter filter   Filter output based on conditions provided
      --format string   Pretty-print containers using a Go template
  -n, --last int        Show n last created containers (includes all states) (default -1)
  -l, --latest          Show the latest created container (includes all states)
      --no-trunc        Don't truncate output
  -q, --quiet           Only display numeric IDs
  -s, --size            Display total file sizes
```

```
docker@default:~$ docker ps
CONTAINER ID   IMAGE                                  COMMAND                  CREATED        STATUS         PORTS                                                                                  NAMES
0c52c8e7ee44   spring-petclinic-docker:latest         "./entrypoint.sh"        43 hours ago   Up 3 hours     0.0.0.0:38180->8080/tcp                                                                spring-petclinic-docker
fc103d53ad44   ljhiyh/scouter-host-agent:latest       "/opt/host-agent/ent…"   46 hours ago   Up 3 hours                                                                                            scouter-host-agent
f56ffd18a700   ljhiyh/scouter-server:latest           "/opt/server/entrypo…"   46 hours ago   Up 3 hours     0.0.0.0:38003->6100/tcp, 0.0.0.0:38003->6101/udp, 0.0.0.0:38010->6188/tcp   scouter-server
fb5f8b183655   jenkins:latest                         "/bin/tini -- /usr/l…"   3 days ago     Up 3 hours     0.0.0.0:50000->50000/tcp, 0.0.0.0:38000->8080/tcp                                      jenkins
e564beecedfe   selenium/standalone-firefox:3.13.0-argon "/opt/bin/entry_poin…" 6 days ago     Up 3 hours     0.0.0.0:34444->4444/tcp                                                                selenium-firefox
2bb9b06e980b   sonarqube:latest                       "./bin/run.sh"           7 days ago     Up 3 hours     0.0.0.0:38004->9000/tcp                                                                sonarqube
50e4d7378cd9   mariadb:latest                         "docker-entrypoint.s…"   7 days ago     Up 3 hours     0.0.0.0:33306->3306/tcp                                                                mariadb
27e8dd5e47f5   sdorra/scm-manager:latest              "/opt/scm-server/bin…"   7 days ago     Up 3 hours     0.0.0.0:38002->8080/tcp                                                                scm
5bcf87c33e38   sonatype/nexus3:latest                 "sh -c ${SONATYPE_DI…"   7 days ago     Up 3 hours     0.0.0.0:38001->8081/tcp                                                                nexus3
```

❑ Docker 기본 명령어

- docker rm
  - docker 컨테이너 삭제

```
Usage: docker rm [OPTIONS] CONTAINER [CONTAINER...]

Remove one or more containers

Options:
 -f, --force    Force the removal of a running container (uses SIGKILL)
 -l, --link     Remove the specified link
 -v, --volumes  Remove the volumes associated with the container
```

- docker rmi
  - docker 이미지 삭제

```
Usage: docker rmi [OPTIONS] IMAGE [IMAGE...]

Remove one or more images

Options:
 -f, --force     Force removal of the image
    --no-prune   Do not delete untagged parents
```

❑ Docker 기본 명령어

- docker build

- docker 이미지 생성

```
Usage:  docker build [OPTIONS] PATH | URL | -

Build an image from a Dockerfile

Options:
      --add-host list         Add a custom host-to-IP mapping (host:ip)
      --build-arg list        Set build-time variables
      --cache-from strings    Images to consider as cache sources
      --cgroup-parent string  Optional parent cgroup for the container
      --compress              Compress the build context using gzip
      --cpu-period int        Limit the CPU CFS (Completely Fair Scheduler) period
      --cpu-quota int         Limit the CPU CFS (Completely Fair Scheduler) quota
  -c, --cpu-shares int        CPU shares (relative weight)
      --cpuset-cpus string    CPUs in which to allow execution (0-3, 0,1)
      --cpuset-mems string    MEMs in which to allow execution (0-3, 0,1)
      --disable-content-trust Skip image verification (default true)
  -f, --file string           Name of the Dockerfile (Default is 'PATH/Dockerfile')
      --force-rm              Always remove intermediate containers
      --iidfile string        Write the image ID to the file
      --isolation string      Container isolation technology
      --label list            Set metadata for an image
  -m, --memory bytes          Memory limit
      --memory-swap bytes     Swap limit equal to memory plus swap: '-1' to enable unlimited swap
      --network string        Set the networking mode for the RUN instructions during build (default "default")
      --no-cache              Do not use cache when building the image
      --pull                  Always attempt to pull a newer version of the image
  -q, --quiet                 Suppress the build output and print image ID on success
      --rm                    Remove intermediate containers after a successful build (default true)
      --security-opt strings  Security options
      --shm-size bytes        Size of /dev/shm
  -t, --tag list              Name and optionally a tag in the 'name:tag' format
      --target string         Set the target build stage to build.
      --ulimit ulimit         Ulimit options (default [])
```

❑ Docker 기본 명령어

- docker run

- docker 컨테이너 생성 및 실행

```
Usage:  docker run [OPTIONS] IMAGE [COMMAND] [ARG...]

Run a command in a new container

Options:
      --add-host list          Add a custom host-to-IP mapping (host:ip)
  -a, --attach list            Attach to STDIN, STDOUT or STDERR
      --blkio-weight uint16    Block IO (relative weight), between 10
and 1000, or 0 to disable (default 0)
      --blkio-weight-device list   Block IO weight (relative device
weight) (default [])
      --cap-add list           Add Linux capabilities
      --cap-drop list          Drop Linux capabilities
      --cgroup-parent string   Optional parent cgroup for the container
      --cidfile string         Write the container ID to the file
      --cpu-period int         Limit CPU CFS (Completely Fair Scheduler)
period
      --cpu-quota int          Limit CPU CFS (Completely Fair Scheduler)
quota
      --cpu-rt-period int      Limit CPU real-time period in
microseconds
      --cpu-rt-runtime int     Limit CPU real-time runtime in
microseconds
  -c, --cpu-shares int         CPU shares (relative weight)
      --cpus decimal           Number of CPUs
      --cpuset-cpus string     CPUs in which to allow execution (0-3,
0,1)
      --cpuset-mems string     MEMs in which to allow execution (0-3,
0,1)
  -d, --detach                 Run container in background and print
container ID
      --detach-keys string     Override the key sequence for detaching
a container
      --device list            Add a host device to the container
      --device-cgroup-rule list   Add a rule to the cgroup allowed
devices list
      --device-read-bps list   Limit read rate (bytes per second) from
a device (default []）
      --device-read-iops list  Limit read rate (IO per second) from a
device (default []）
      --device-write-bps list  Limit write rate (bytes per second) to a
device (default []）
      --device-write-iops list Limit write rate (IO per second) to a
device (default []）
      --disable-content-trust  Skip image verification (default true)
      --dns list               Set custom DNS servers
      --dns-option list        Set DNS options
      --dns-search list        Set custom DNS search domains
      --entrypoint string      Overwrite the default ENTRYPOINT of the
image
  -e, --env list               Set environment variables
      --env-file list          Read in a file of environment variables
      --expose list            Expose a port or a range of ports
      --group-add list         Add additional groups to join
      --health-cmd string      Command to run to check health
      --health-interval duration   Time between running the check
(ms|s|m|h) (default 0s)
      --health-retries int     Consecutive failures needed to report
unhealthy
      --health-start-period duration   Start period for the container to
initialize before starting health-retries countdown (ms|s|m|h) (default
0s)
      --health-timeout duration   Maximum time to allow one check to
run (ms|s|m|h) (default 0s)
      --help                   Print usage
  -h, --hostname string        Container host name
      --init                   Run an init inside the container that forwards
signals and reaps processes
  -i, --interactive            Keep STDIN open even if not attached
      --ip string              IPv4 address (e.g., 172.30.100.104)
      --ip6 string             IPv6 address (e.g., 2001:db8::33)
      --ipc string             IPC mode to use
      --isolation string       Container isolation technology
      --kernel-memory bytes    Kernel memory limit
  -l, --label list             Set meta data on a container
      --label-file list        Read in a line delimited file of labels
      --link list              Add link to another container
      --link-local-ip list     Container IPv4/IPv6 link-local addresses
      --log-driver string      Logging driver for the container
      --log-opt list           Log driver options
      --mac-address string     Container MAC address (e.g.,
92:d0:c6:0a:29:33)
  -m, --memory bytes           Memory limit
      --memory-reservation bytes   Memory soft limit
      --memory-swap bytes      Swap limit equal to memory plus swap:
'-1' to enable unlimited swap
      --memory-swappiness int  Tune container memory swappiness
(0 to 100) (default -1)
      --mount mount            Attach a filesystem mount to the container
      --name string            Assign a name to the container
      --network string         Connect a container to a network (default
"default")
      --network-alias list     Add network-scoped alias for the
container
      --no-healthcheck         Disable any container-specified
HEALTHCHECK
      --oom-kill-disable       Disable OOM Killer
      --oom-score-adj int      Tune host's OOM preferences (-1000 to
1000)
      --pid string             PID namespace to use
      --pids-limit int         Tune container pids limit (set -1 for
unlimited)
      --privileged             Give extended privileges to this container
  -p, --publish list           Publish a container's port(s) to the host
  -P, --publish-all            Publish all exposed ports to random ports
      --read-only              Mount the container's root filesystem as read
only
      --restart string         Restart policy to apply when a container exits
(default "no")
      --rm                     Automatically remove the container when it exits
      --runtime string         Runtime to use for this container
      --security-opt list      Security Options
      --shm-size bytes         Size of /dev/shm
      --sig-proxy              Proxy received signals to the process (default
true)
      --stop-signal string     Signal to stop a container (default
"SIGTERM")
      --stop-timeout int       Timeout (in seconds) to stop a container
      --storage-opt list       Storage driver options for the container
      --sysctl map             Sysctl options (default map[])
      --tmpfs list             Mount a tmpfs directory
  -t, --tty                    Allocate a pseudo-TTY
      --ulimit ulimit          Ulimit options (default []）
  -u, --user string            Username or UID (format:
〈name|uid〉[:〈group|gid〉])
      --userns string          User namespace to use
      --uts string             UTS namespace to use
  -v, --volume list            Bind mount a volume
      --volume-driver string   Optional volume driver for the container
      --volumes-from list      Mount volumes from the specified
container(s)
  -w, --workdir string         Working directory inside the container
```

❑ Docker 기본 명령어

- docker start

- docker 컨테이너 실행

```
Usage:  docker start [OPTIONS] CONTAINER [CONTAINER...]

Start one or more stopped containers

Options:
  -a, --attach            Attach STDOUT/STDERR and forward signals
      --detach-keys string   Override the key sequence for detaching a container
  -i, --interactive         Attach container's STDIN
```

- docker stop

- docker 컨테이너 중지

```
Usage:  docker start [OPTIONS] CONTAINER [CONTAINER...]

Start one or more stopped containers

Options:
  -a, --attach            Attach STDOUT/STDERR and forward signals
      --detach-keys string   Override the key sequence for detaching a container
  -i, --interactive         Attach container's STDIN
docker@default:~$ docker stop --help

Usage:  docker stop [OPTIONS] CONTAINER [CONTAINER...]

Stop one or more running containers

Options:
  -t, --time int   Seconds to wait for stop before killing it (default 10)
```

2. Docker 개발환경 환경구성

❑ 설치 순서

- pre-requisites/DockerToolbox.exe
  - VirtualBox, Git, Docker 설치
- pre-requisites/docker_setting.bat
  - boot2docker 설치
  - VirtualBox 공유 폴더 설정(C:₩opdc-ide-naru-64bit₩docker_data)

```
@echo off
echo boot2docker 설치 중입니다.
docker-machine create -d "virtualbox" default

echo VitualBox에 공유폴더 설정 중입니다.
echo C:₩opdc-ide-naru-64bit₩docker_data -^> docker_data
cd C:₩"Program Files"₩Oracle₩VirtualBox
VBoxManage.exe sharedfolder add "default" --name "docker_data" --hostpath
"C:₩opdc-ide-naru-64bit₩docker_data" -automount
cd C:₩opdc-ide-naru-64bit₩pre-requisites
```

- docker 이미지 생성
- docker 컨테이너 실행

❑ 설치 순서

- docker 이미지 생성

```
docker load -i /docker_data/images/scouter-server.tar
docker load -i /docker_data/images/scouter-host-agent.tar
docker load -i /docker_data/images/jenkins.tar
docker load -i /docker_data/images/mariadb.tar
docker load -i /docker_data/images/standalone-firefox.tar
docker load -i /docker_data/images/sonarqube.tar
docker load -i /docker_data/images/nexus3.tar
docker load -i /docker_data/images/centos.tar
docker load -i /docker_data/images/scm-manager.tar
docker load -i /docker_data/images/spring-petclinic-docker.tar
```

- docker 컨테이너 실행

❑ jenkins 구축

- 사용포트 : 38000, 50000(slave port)
- 사용자디렉토리 : /docker_data/jenkins_home
- 계정 : admin/admin123
- 실행

```
docker run -d ₩
  --name jenkins ₩
  --restart always ₩
  -p 38000:8080 -p 50000:50000 ₩
  -v /var/run/docker.sock:/var/run/docker.sock ₩
  -v /docker_data/jenkins_home:/jenkins_home ₩
  -v /docker_data/maven/repository:/maven_repository ₩
  -e JENKINS_HOME=/jenkins_home ₩
  jenkins:latest
```

-d, --detach : 백그라운드에서 실행

--name : 컨테이너 이름

컨테이너 중지시 자동 재기동

port 열기(host : container)

volume 마운트

환경변수 설정

이미지:버전

2. Docker 개발환경 환경구성

❑ jenkins docker plugin(docker-builder-step) 설정

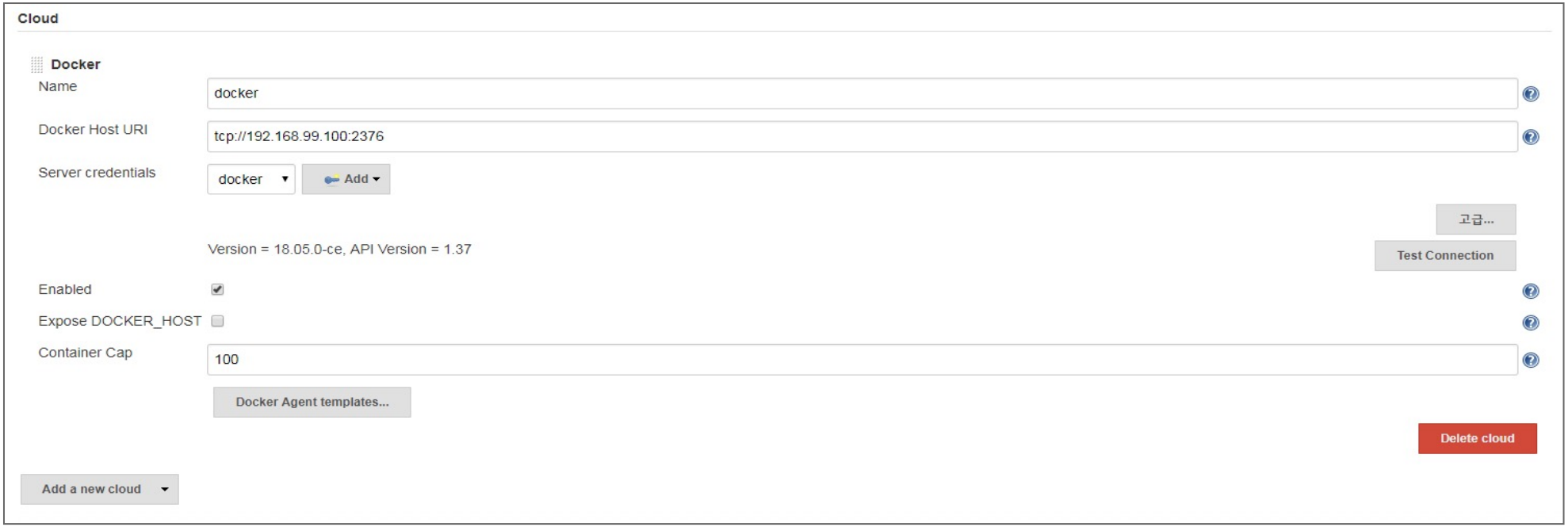
- Jenkins 관리 → 플러그인 관리

- Jenkins 관리 → 시스템 설정
- Docker URL : tcp://192.168.99.100:2376
- cert file path: /jenkins_home/certs
  - cert 파일위치 : C:₩Users₩사용자 계정₩.docker₩machine₩cert 에서 복사

❑ jenkins docker plugin(Docker plugin) 설정

- Jenkins 관리 → 플러그인 관리

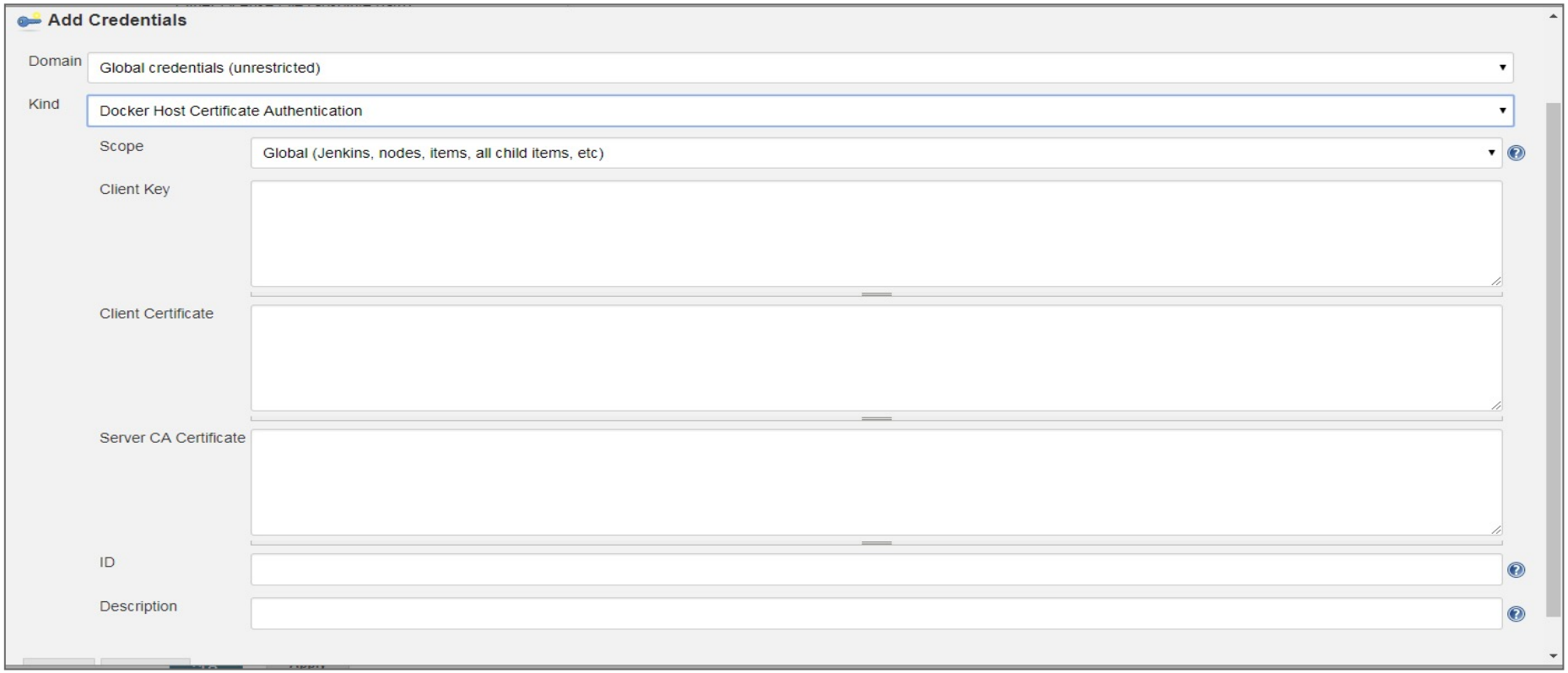
- Jenkins 관리 → 시스템 설정
- Docker Host URI : tcp://192.168.99.100:2376



❑ jenkins docker plugin(Docker plugin) 설정

- Add credentials → Docker Host Certificate Authentication

ClientKeyPath : C:/Users/사용자계정/.docker/machine/certs/key.pem
ClientCertPath : C:/Users/사용자계정/.docker/machine/certs/cert.pem
ServerCertPath : C:/Users/사용자계정/.docker/machine/machines/default/server.pem



❑ nexus3 구축

- 사용포트 : 38001
- 사용자디렉토리 : /docker_data/sonatype-work
- 계정 : admin/admin123
- 실행

```
docker run -d ₩
  --name nexus3 ₩
  --restart always ₩
  -p 38001:8081 ₩
  -v /docker_data/sonatype-work:/opt/sonatype/sonatype-work ₩
  -v /docker_data/sonatype-work/nexus-data:/nexus-data ₩
  sonatype/nexus3:latest
```

❑ scm-server 구축

- 사용포트 : 38002
- 사용자디렉토리 : /docker_data/scm_home
- 계정 : admin/admin123
- 실행

```
docker run -d ₩
  --name scm ₩
  --restart always ₩
  -p 38002:8080 ₩
  -v /docker_data/scm_home:/scm_home ₩
  -e SCM_HOME=/scm_home ₩
  sdorra/scm-manager:latest
```

2. Docker 개발환경 환경구성

❑ scouter 구축

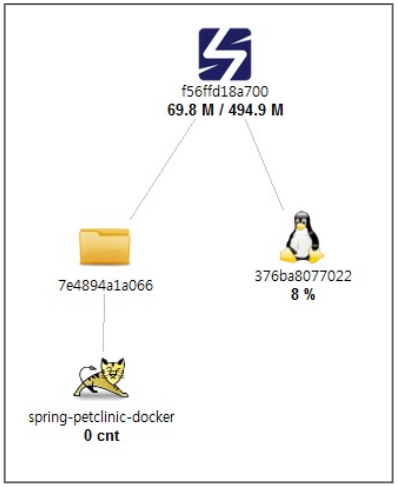
- 사용포트 : 38003
- 계정 : admin/admin
- 실행
  - server

```
docker run -d ₩
  --name scouter-server ₩
  --restart always ₩
  -p 38003:6100/tcp -p 38003:6101/udp -p 38010:6188 ₩
  ljhiyh/scouter-server:latest
```

  - Host Agent

```
docker run -d ₩
  --name scouter-host-agent ₩
  --restart always ₩
  --link scouter-server ₩
  ljhiyh/scouter-host-agent:latest
```

다른 컨테이너 연결



❑ sonarqube 구축

- 사용포트 : 38004
- 계정 : admin/admin123
- login token : 4ffdc54b9912808cdd58bda4d721822ca2fae150
- 실행

```
docker run -d ₩
  --name sonarqube ₩
  --restart always ₩
  -p 38004:9000 ₩
  sonarqube:latest
```

❑ mariadb 구축

- 사용포트 : 33306
- 계정 : root
- 실행

```
docker run -d ₩
  --name mariadb ₩
  --restart always ₩
  -p 33306:3306 ₩
  -e MYSQL_ROOT_PASSWORD=my-secret-pw ₩
  mariadb:latest
```

❑ Selenium Server 구축

- 사용포트 : 34444
- 접근 URL : http://192.168.99.100:34444/wd/hub
- 실행

```
docker run -d ₩
  --name selenium-firefox ₩
  --restart always ₩
  --link jenkins ₩
  -p 34444:4444 ₩
  -v /dev/shm:/dev/shm ₩
  selenium/standalone-firefox:3.13.0-argon
```

❑ test app 구축

- 사용포트 : 38180
- 실행
  - 이미지 구축

```
docker build -t spring-petclinic-docker:latest .
```

  - 컨테이너 구축 및 실행

```
docker run -d ₩
  --name spring-petclinic-docker ₩
  -p 38180:8080 ₩
  --link scouter-server ₩
  spring-petclinic-docker:latest
```

- test app 구축
  - Dockerfile

```
FROM registry.centos.org/centos/centos
RUN yum install -y java-1.8.0-openjdk
COPY target/spring-petclinic-*.jar app.jar
RUN  mkdir /scouter-agent.java
RUN  mkdir /scouter-agent.java/plugin
COPY src/main/resources/scouter-agent.java /scouter-agent.java
COPY entrypoint.sh entrypoint.sh
CMD  ["./entrypoint.sh"]
```

사용한 이미지를 선택

쉘 스크립트 및 명령어 실행

컨테이너 시작 시 실행 할 쉘 스크립트 및 명령어 실행

2. Docker 개발환경 환경구성

❑ 프로그램 / 포트

프로그램	접속 URL	계정	비고
jenkins 2.60.3	http://192.168.99.100:38000	admin/admin123	사용자디렉토리 : /docker_data/jenkins_home
nexus 3.12.1-01	http://192.168.99.100:38001		사용자디렉토리 : /docker_data/sonatype-work
scm-server 1.60	http://192.168.99.100:38002		사용자디렉토리 : /docker_data/scm_home
scouter 1.9.0	http://192.168.99.100:38003		Host agent 별도 container 실행 필요
sonarQube 7.1	http://192.168.99.100:38004		login token :: 4ffdc54b9912808cdd58bda4d721822ca2fae150
standalone-firefox 3.13.0-argon	http://192.168.99.100:34444/wd/hub		Selenium TEST를 위한 서버
test app	http://192.168.99.100:38180	N/A	spring-petclinic-docker
mariadb-10.3.7	port : 33306	root(비번 없음)	

3. Demo

- **Eclipse 소스 생성**
  - 샘플 템플릿 추가
  - SonarQube 프로퍼티 생성
  - Pom.xml에 Nexus 설정(필요 시)
- **형상관리 repository 생성**
- **Eclipse 소스 형상관리 연결**
- **Jenkins job 생성**
  - 형상관리 web hook 설정
  - docker 컨테이너 삭제
  - docker 이미지 삭제
  - docker 이미지 생성
  - docker 컨테이너 생성
  - docker 컨테이너 실행
- **Scouter 모니터링**

참고 문헌

- ❑ **Mariadb**
  - https://mariadb.com/kb/ko/mariadb/
- ❑ **Jenkins**
  - https://jenkins.io
- ❑ **Scm-manager**
  - https://www.scm-manager.org/category/scm-manager-2/
- ❑ **Scouter**
  - https://github.com/scouter-project/scouter
- ❑ **Nexus**
  - https://www.sonatype.com/nexus-repository-sonatype
- ❑ **SonarQube**
  - http://docs.SonarQube.org
- ❑ **Docker**
  - https://www.docker.com
  - https://github.com/Jooho/scouter-docker

감사합니다