Docker: Beyond the Basics

CI/CD (Day Two)

Instructor

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Follow Along Guide

Textual Slides

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Relaunch Services

```
$ cd ~/class-docker-cicd/layout
$ cd compose/final/{unix,windows}
$ docker-compose up -d
```

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Getting Started with Jenkins

- Navigate web browser to:
  - http://127.0.0.1:10081/
- Login to Jenkins
  Click: `create new jobs`

Note: If you have not configured Jenkins, you can login using the `admin` user and the `initialAdminPassword`.

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Creating The Jenkins Job

Enter an item name: `outyet`
Click: `Freestyle project`
Click: `OK`

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Configuring the Job

Description: `build and test outyet`

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Gogs Webhook

- None

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Source Code Management

Repository URL: http://gogs:3000/myuser/outyet.git
Branch Specifier (blank for 'any'): ``

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Build Triggers

- None

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Build Environment

Check: `Delete workspace before build starts`
Check: `Mask passwords and regexes`
Name/Password Pairs:

- **Name**: `DOCKER_PW`
- **Password**: `myuser-pw!`

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The Build Script

```
docker login --username=myuser --password=${DOCKER_PW} 127.0.0.1:5000
docker build -t 127.0.0.1:5000/myuser/outyet:${GIT_COMMIT} .
docker push 127.0.0.1:5000/myuser/outyet:${GIT_COMMIT}
```

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Post-Build Actions

- None

Click: Save

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Build The Code

Click: `Build Now`

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Build The Code

Click: `#1`
Click: `Console Output`

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Build Results

Looking for:

```
Finished: SUCCESS
```

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Automate Builds

- Navigate web browser to:
  - http://127.0.0.1:10080/
    Click: `outyet`
    Click: `Settings`
    Click: `Webhooks`

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Automate Builds

Click: `Add Webhook`
Click: `Gogs`
Payload URL:
`http://jenkins:8080/gogs-webhook/?job=outyet`
Content Type: `application/json`
When should this web hook be triggered?: `Just the push event`
Check: `Active`
Click: `Add Webhook`

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Automate Builds

Click: `http://jenkins:8080/gogs-webhook/?job=outyet`
Click: `Test Delivery`

- Confirm Green Checkmark

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Add a Bug

```
$ cd ~/class-docker-cicd/code/outyet
$ vi main.go
```

- Modify to look like this:
  - Add `"net/url"`

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Result

```
import (
    "expvar"
    "flag"
    "fmt"
    "html/template"
    "log"
    "net/http"
    "net/url"
    "os"
    "sync"
    "time"
)
```

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Commit the Bug

- git add .
- git commit -m "Introducing bug"
- git push origin master

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Failed Tests

```
./main.go:28: imported and not used: "net/url"
[0mThe command '/bin/sh -c \
  go get -v -d && go install -v && go test -v && \
  go build -ldflags "-s" -a -installsuffix cgo -o outyet .' \
  returned a non-zero code: 2
Build step 'Execute shell' marked build as failure
Finished: FAILURE
```

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Fix The Error

```
$ cd ~/ class-docker-cicd/code/outyet
$ vi main.go
```

- Modify to look like this:
  - Remove `"net/url"`

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Result

```
import (
    "expvar"
    "flag"
    "fmt"
    "html/template"
    "log"
    "net/http"
    "os"
    "sync"
    "time"
)
```

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Commit the Fix

```
$ git add .
$ git commit -m "Removing bug"
$ git push origin master
```

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Successful Tests

```
deploy_e0ebf86decf4795cee332523e68017ce7952e094:
  digest:
  sha256:a31bc49ececbac7d79b1dd080b5167ee55b34c385e967e48bfd107f8ba5afbee
  size: 738
Finished: SUCCESS
```

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Orchestration Tools

- Kubernetes
  - https://kubernetes.io/
- Docker Swarm
  - https://docs.docker.com/engine/swarm/
- DC/OS Community Edition (Mesos/Marathon)
  - https://dcos.io/

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Terraform

- https://www.terraform.io/

```
$ cd ~/class-docker-cicd/layout/terraform
$ terraform plan
$ terraform apply
Apply complete! Resources: 4 added, 0 changed, 4 destroyed.
Outputs:
manager.ip = ...
worker.ips = ..
```

```
$ source ./bin/ip_vars.sh
```

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Primary Swarm Manager

```
$ ssh -i ~/.ssh/${KEY} ubuntu@${MASTER_IP}
```

```
$ sudo docker swarm init
$ sudo docker swarm join-token --quiet worker
$ sudo docker swarm join-token --quiet manager
$ exit
```

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Secondary Swarm Managers

```
$ export SWARM_TOKEN_MANAGER=${MANAGER_TOKEN}
$ ./bin/setup_managers.sh
$ docker -H ${primary_manager_ip}:2375 node list
```

- We are running this command on each node:
  - ```
    sudo docker swarm join --token ${MANAGER_TOKEN}
    ${MASTER_IP}:2377
    ```

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    ```

Swarm Workers

```
$ export SWARM_TOKEN_WORKER=${WORKER_TOKEN}
$ ./bin/setup_workers.sh
$ docker -H ${primary_manager_ip}:2375 node list
```

- We are running this command on each node:
  - ```
    sudo docker swarm join --token ${WORKER_TOKEN}
    ${MASTER_IP}:2377
    ```

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    ```

Create Network

```
$ docker -H ${primary_manager_ip}:2375 network create --driver=overlay my-net
```

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Create a Service

```
$ docker -H ${primary_manager_ip}:2375 service create \
    --detach=true --name outyet0 --replicas 4 \
    --publish published=80,target=18088 \
    --network my-net spkane/outyet:1.9.3
$ curl http://${primary_manager_ip}:80
```

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Examining the Service

```
$ docker -H ${primary_manager_ip}:2375 service ls
$ docker -H ${primary_manager_ip}:2375 service inspect --pretty outyet0
$ docker -H ${primary_manager_ip}:2375 service ps outyet0
```

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Scaling the Service

```
$ docker -H ${primary_manager_ip}:2375 service scale --detach=false outyet0=8
$ docker -H ${primary_manager_ip}:2375 service ps outyet0
$ docker -H ${primary_manager_ip}:2375 service scale --detach=false outyet0=4
```

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Self Healing

```
$ ./bin/self_healing.sh
```

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Update the Service

```
$ docker -H ${primary_manager_ip}:2375 service update \
    --update-delay 10s --update-failure-action rollback \
    --update-monitor 2s --update-order start-first \
    --update-parallelism 1 --detach=false \
    --image spkane/outyet:1.9.4 outyet0
$ curl http://${primary_manager_ip}:80
```

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Rollback the Service

```
$ docker -H ${primary_manager_ip}:2375 service rollback outyet0
$ curl http://${primary_manager_ip}:80
```

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Build & Deploy Script

- ${MANAGER_IP} and ${HUB_USER} must be replaced with real values in the script below.

```
docker login --username=myuser --password=${DOCKER_PW} 127.0.0.1:5000
docker build -t 127.0.0.1:5000/myuser/outyet:${GIT_COMMIT} .
docker push 127.0.0.1:5000/myuser/outyet:${GIT_COMMIT}
export IMAGE=`docker image ls 127.0.0.1:5000/myuser/outyet:${GIT_COMMIT} --format "{{.ID}}"`
docker tag ${IMAGE} ${HUB_USER}/outyet:${GIT_COMMIT}
docker push ${HUB_USER}/outyet:${GIT_COMMIT}
docker -H ${MANAGER_IP}:2375 service update \
  --update-delay 10s --update-failure-action rollback \
  --update-monitor 2s --update-order start-first \
  --update-parallelism 1 --detach=false \
  --image ${HUB_USER}/outyet:${GIT_COMMIT} outyet0
```

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Drain a Node

```
$ docker -H ${primary_manager_ip}:2375 service ps outyet0
$ docker -H ${primary_manager_ip}:2375 node ls
$ docker -H ${primary_manager_ip}:2375 node update --availability drain ${NODE_NAME}
$ docker -H ${primary_manager_ip}:2375 node inspect --pretty ${NODE_NAME}
$ docker -H ${primary_manager_ip}:2375 service ps outyet0
$ docker -H ${primary_manager_ip}:2375 node update --availability active ${NODE_NAME}
```

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Deleting the Services

```
$ docker -H ${primary_manager_ip}:2375 service rm outyet0
$ docker -H ${primary_manager_ip}:2375 service inspect outyet0
$ docker -H ${primary_manager_ip}:2375 network rm my-net
```

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Destroying Infrastructure

```
$ cd ~/class-docker-cicd/layout/terraform
terraform destroy
Destroy complete! Resources: # destroyed.
```

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What We Have Learned

- Configuring Jenkins
- Building & Testing with Jenkins
- Automating builds with web hooks
- Overview of orchestration tooling
- Building a Docker swarm-mode cluster
- Creating and managing scalable services

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Additional Reading

- The 12-Factor App
  - http://12factor.net/
- Official Docker Documentation
  - https://docs.docker.com/
- Docker: Up and Running
  - http://shop.oreilly.com/product/0636920153566.do

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Additional Learning Resources

https://www.safaribooksonline.com/

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Student Survey

Please take a moment to fill out the class survey linked to in the chat channel.

O'Reilly and I value your comments about the class.

Thank you!

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Any Questions?

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