

Date: 6th March 2023.

Andrew Nwajei

Sonal Feb06 Batch

Project 1:

Problem Statement

AppleBite Co. is using Cloud for one of their products. The project uses modular components, multiple frameworks and want the components to be developed by different teams or by 3rd-party vendors.

The company's goal is to deliver the product updates frequently to production with High quality &

Reliability. They also want to accelerate software delivery speed, quality and reduce feedback time between developers and testers.

As development progressed, they are facing multiple problems, because of various technologies involved in the project. Following are the problems:

Building Complex builds is difficult.

Incremental builds are difficult to manage and deploy.

To solve these problems, they need to implement Continuous Integration & Continuous Deployment with DevOps using following tools:

Git

For version control for tracking changes in the code files

Jenkins

For continuous integration and continuous deployment

Docker

For deploying containerized applications

Ansible

Configuration management tools

This project will be about how to do deploy code to dev/stage/prod etc, just on a click of button.

Link for the sample PHP application:

<https://github.com/andrewogho/DevOpsCodeDemo.git>

Business challenge/requirement

As soon as the developer pushes the updated code on the GIT master branch, a new test server should be provisioned with all the required software. Post this, the code should be containerized and deployed on the test server.

The deployment should then be built and pushed to the prod server.

All this should happen automatically and should be triggered from a push to the GitHub master branch.

SOLUTION

- Click the github link to get the DevOpsCodeDemo:

Sonal0409 / DevOpsCodeDemo Public

<> Code Issues Pull requests 4 Actions Projects Security Insights

master 1 branch 0 tags

Go to file Add file <> Code

File	Commit	Time
.settings	commit files	last year
src	commit it local	last year
.classpath	commit files	last year
.project	commit files	last year
Jenkinsfile	Update Jenkinsfile	4 months ago
Newfiletraigger	Update Newfiletraigger	3 weeks ago
README.md	commit files	last year
addressbook_screenshot.png	commit files	last year
build.properties	commit files	last year
build.xml	commit files	last year
demofile	Update demofile	3 months ago
jenkinsfile2	Update jenkinsfile2	2 weeks ago
newcommit	Create newcommit	4 months ago
newdemofile	Create newdemofile	2 weeks ago
newfileDemo1	Create newfileDemo1	4 months ago
newfilejenkins	Create newfilejenkins	3 months ago
pollscmcommit	Create pollscmcommit	2 weeks ago
pom.xml	Update pom.xml	6 months ago

About

No description, website, or topics provided.

Readme 3 stars 3 watching 350 forks

Releases

No releases published

Packages

No packages published

Languages

Java 88.5% XSLT 11.5%

- In EC2-instance install java 11 jdk and setup Jenkins as root user: `sudo su -`
- Start Jenkins on instance:

```
aws Services Search [Option+S]
[root@ip-172-31-6-199 ~]# systemctl start jenkins
[root@ip-172-31-6-199 ~]# systemctl status jenkins
jenkins.service - Jenkins Continuous Integration Server
   Loaded: loaded (/usr/lib/systemd/system/jenkins.service; disabled; vendor preset: disabled)
   Active: active (running) since Mon 2023-03-06 13:39:18 UTC; 13s ago
     Main PID: 3966 (java)
    CGroup: /system.slice/jenkins.service
            └─3966 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/jav...

Mar 06 13:39:16 ip-172-31-6-199.ec2.internal jenkins[3966]: 2023-03-06 13:39...
Mar 06 13:39:16 ip-172-31-6-199.ec2.internal jenkins[3966]: 2023-03-06 13:39...
Mar 06 13:39:17 ip-172-31-6-199.ec2.internal jenkins[3966]: 2023-03-06 13:39...
Mar 06 13:39:17 ip-172-31-6-199.ec2.internal jenkins[3966]: 2023-03-06 13:39...
Mar 06 13:39:17 ip-172-31-6-199.ec2.internal jenkins[3966]: 2023-03-06 13:39...
Mar 06 13:39:17 ip-172-31-6-199.ec2.internal jenkins[3966]: 2023-03-06 13:39...
Mar 06 13:39:17 ip-172-31-6-199.ec2.internal jenkins[3966]: 2023-03-06 13:39...
Mar 06 13:39:18 ip-172-31-6-199.ec2.internal jenkins[3966]: 2023-03-06 13:39...
Mar 06 13:39:18 ip-172-31-6-199.ec2.internal jenkins[3966]: 2023-03-06 13:39...
Mar 06 13:39:28 ip-172-31-6-199.ec2.internal jenkins[3966]: 2023-03-06 13:39...
Mar 06 13:39:28 ip-172-31-6-199.ec2.internal systemd[1]: Started Jenkins Con...
Hint: Some lines were ellipsized, use -l to show in full.
[root@ip-172-31-6-199 ~]#
```

- Using EC2-Instance Public IP:8080 - Connect to Jenkins Server.
- Install Maven plugin and any other dependencies required from plugins in jenkins.
- Create a new job/item on the Jenkins Dashboard. Name job (Integration pipeline & select pipeline build.
- Configure the SCM and Build Triggers.

Dashboard > IntegrationPipeline > Configuration

Configure

General

Advanced Project Options

Pipeline

☐ Pipeline speed/durability override ?

☐ Preserve stashes from completed builds ?

☐ This project is parameterised ?

☐ Throttle builds ?

Build Triggers

☐ Build after other projects are built ?

☐ Build periodically ?

☐ GitHub hook trigger for GITScm polling ?

☒ Poll SCM ?

Schedule ?

☐ Ignore post-commit hooks ?

☐ Quiet period ?

☐ Trigger builds remotely (e.g., from scripts) ?

Advanced Project Options

Advanced

Save

Apply

- Create a Jenkinsfile-Pipeline Script; to clone repo from github, compile, test, review and package code.

Dashboard > IntegrationPipeline > Configuration

Configure

- General
- Advanced Project Options
- Pipeline**

Definition

Pipeline script

Script ?

```
1 pipeline{
2
3
4   tools{
5     maven 'AndMaven'
6   }
7
8   agent any
9   stages {
10    stage('1.Clonerepo')
11    {
12      steps{
13        git "https://github.com/andrewogho/DevOpsCodeDemo.git"
14      }
15    }
16
17    stage('2.Compile')
18    {
19      steps{
20        sh 'mvn compile'
21      }
22    }
23    stage('3.Codereview')
24    {
25      steps{
26        catchError(buildResult: 'SUCCESS', stageResult: 'Failure') {
27          sh 'mvn pmd:pmd'
28        }
29      }
30    }
31    stage('4.Unititest')
32    {
33      steps{
34        sh 'mvn test'
35      }
36    }
37    post{
38      success{
39        junit 'target/surefire-reports/*.xml'
40      }
41    }
42  }
43 }
```

Save Apply

Dashboard > IntegrationPipeline > Configuration

Configure

- General
- Advanced Project Options
- Pipeline**

Pipeline script

Script ?

```
12   steps{
13     git "https://github.com/andrewogho/DevOpsCodeDemo.git"
14   }
15 }
16
17 stage('2.Compile')
18 {
19   steps{
20     sh 'mvn compile'
21   }
22 }
23 stage('3.Codereview')
24 {
25   steps{
26     catchError(buildResult: 'SUCCESS', stageResult: 'Failure') {
27       sh 'mvn pmd:pmd'
28     }
29   }
30 }
31
32 stage('4.Unititest')
33 {
34   steps{
35     sh 'mvn test'
36   }
37 }
38 post{
39   success{
40     junit 'target/surefire-reports/*.xml'
41   }
42 }
43
44 stage('5. Package')
45 {
46   steps{
47     sh 'mvn package'
48   }
49 }
50 }
51 }
```

☒ Use Groovy Sandbox ?

Save Apply

- Build the pipeline (Job).

Dashboard > IntegrationPipeline > #10

```
Tests run: 5, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.058 sec - in com.mydemo.utilities.TestLogger
Running com.mydemo.utilities.TestHexAsciiConversion
74657374696e6720617363696920636f6e766572746969676e20696e74662068657861646563696d616c
testing ascii conversion into hexadecimal
Tests run: 4, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.031 sec - in com.mydemo.utilities.TestHexAsciiConversion
Running com.mydemo.utilities.TestGenericComparator
Tests run: 14, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.057 sec - in com.mydemo.utilities.TestGenericComparator

Results :

Tests run: 23, Failures: 0, Errors: 0, Skipped: 0

[INFO]
[INFO] --- war:3.3.2:war (default-war) @ addressbook ---
[INFO] Packaging webapp
[INFO] Assembling webapp [addressbook] in [/var/lib/jenkins/workspace/IntegrationPipeline/target/addressbook]
[INFO] Processing war project
[INFO] Building war: /var/lib/jenkins/workspace/IntegrationPipeline/target/addressbook.war
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 9.471 s
[INFO] Finished at: 2023-03-06T13:52:39Z
[INFO] -----
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline
Finished: SUCCESS
```

REST API Jenkins 2.375.3

- Click on workspace to view if files have been successfully made in “/target” folder.

Jenkins

Search (🔍+K)

🛡️ 2 👤 Andrew Nwajei 🚪 log out

Dashboard > IntegrationPipeline > #10 > Allocate node : Start > Workspace

↑ Up

🔍 Status

📄 Console Output

📁 Workspace

Workspace

/ →

📁 .git

📁 .settings

📁 src

📁 target

📁 .classpath

📁 .project

📁 addressbook_screenshot.png

📁 build.properties

📁 build.xml

📁 demofile

📁 goal

📁 Jenkinsfile

📁 jenkinsfile2

📁 newcommit

📁 newdemofile

📁 newfileDemo1

📁 newfilejenkins

📁 Newfiletraigger

📁 pollscmcommit

📁 pom.xml

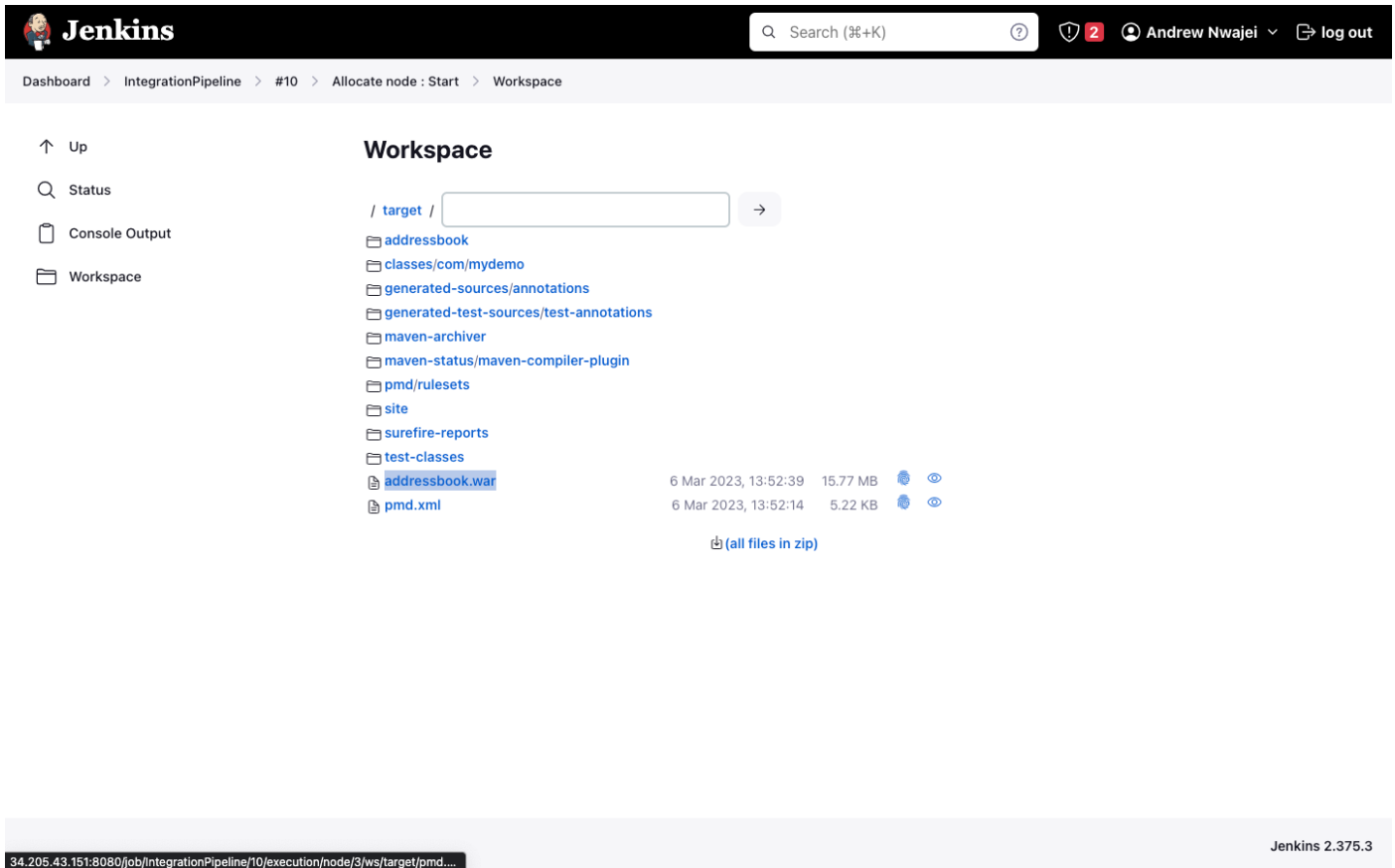
📁 README.md

17 Feb 2023, 18:40:21	1.25 KB	🔍	👁
17 Feb 2023, 18:40:21	540 B	🔍	👁
17 Feb 2023, 18:40:21	114.16 KB	🔍	👁
17 Feb 2023, 18:40:21	4.39 KB	🔍	👁
17 Feb 2023, 18:40:21	22.87 KB	🔍	👁
17 Feb 2023, 18:40:21	1.09 KB	🔍	👁
17 Feb 2023, 18:40:21	6 B	🔍	👁
17 Feb 2023, 18:40:21	871 B	🔍	👁
6 Mar 2023, 13:51:49	71 B	🔍	👁
17 Feb 2023, 18:40:21	1 B	🔍	👁
6 Mar 2023, 13:51:49	1 B	🔍	👁
17 Feb 2023, 18:40:21	1 B	🔍	👁
17 Feb 2023, 18:40:21	15 B	🔍	👁
17 Feb 2023, 18:40:21	79 B	🔍	👁
6 Mar 2023, 13:51:49	1 B	🔍	👁
17 Feb 2023, 18:40:21	19.96 KB	🔍	👁
17 Feb 2023, 18:40:21	3.21 KB	🔍	👁

📁 (all files in zip)

34.205.43.151:8080/job/integrationPipeline/10/execution/node/3/ws/target Jenkins 2.375.3

- “addressbook.war” file should be present.



Jenkins

Search (⌘+K)

Dashboard > IntegrationPipeline > #10 > Allocate node : Start > Workspace

Up

Status

Console Output

Workspace

Workspace

/ target /

- addressbook
- classes/com/mydemo
- generated-sources/annotations
- generated-test-sources/test-annotations
- maven-archiver
- maven-status/maven-compiler-plugin
- pmd/rulesets
- site
- surefire-reports
- test-classes
- addressbook.war**
- pmd.xml

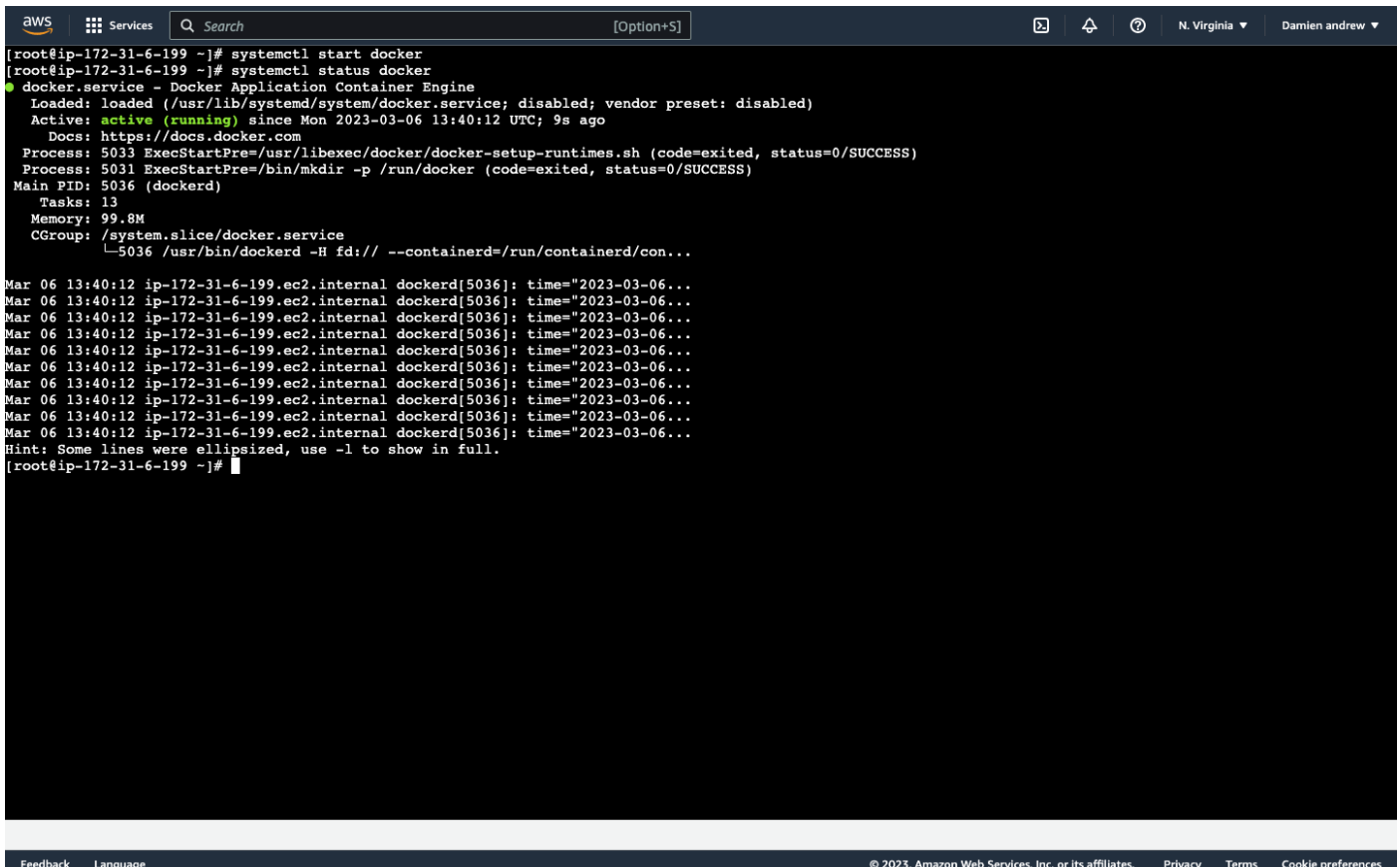
6 Mar 2023, 13:52:39 15.77 MB

6 Mar 2023, 13:52:14 5.22 KB

(all files in zip)

34.205.43.151:8080/job/IntegrationPipeline/10/execution/node/3/ws/target/pmd.... Jenkins 2.375.3

- Install docker and its necessary packages. Then “systemctl start docker”. Make sure docker is up and running.



aws Services Search [Option+S]

N. Virginia Damien andrew

```
[root@ip-172-31-6-199 ~]# systemctl start docker
[root@ip-172-31-6-199 ~]# systemctl status docker
● docker.service - Docker Application Container Engine
   Loaded: loaded (/usr/lib/systemd/system/docker.service; disabled; vendor preset: disabled)
   Active: active (running) since Mon 2023-03-06 13:40:12 UTC; 9s ago
     Docs: https://docs.docker.com
   Process: 5033 ExecStartPre=/usr/libexec/docker/docker-setup-runtimes.sh (code=exited, status=0/SUCCESS)
   Process: 5031 ExecStartPre=/bin/mkdir -p /run/docker (code=exited, status=0/SUCCESS)
  Main PID: 5036 (dockerd)
    Tasks: 13
   Memory: 99.8M
   CGroup: /system.slice/docker.service
           └─5036 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/con...
```

Mar 06 13:40:12 ip-172-31-6-199.ec2.internal dockerd[5036]: time="2023-03-06..."

Mar 06 13:40:12 ip-172-31-6-199.ec2.internal dockerd[5036]: time="2023-03-06..."

Mar 06 13:40:12 ip-172-31-6-199.ec2.internal dockerd[5036]: time="2023-03-06..."

Mar 06 13:40:12 ip-172-31-6-199.ec2.internal dockerd[5036]: time="2023-03-06..."

Mar 06 13:40:12 ip-172-31-6-199.ec2.internal dockerd[5036]: time="2023-03-06..."

Mar 06 13:40:12 ip-172-31-6-199.ec2.internal dockerd[5036]: time="2023-03-06..."

Mar 06 13:40:12 ip-172-31-6-199.ec2.internal dockerd[5036]: time="2023-03-06..."

Mar 06 13:40:12 ip-172-31-6-199.ec2.internal dockerd[5036]: time="2023-03-06..."

Mar 06 13:40:12 ip-172-31-6-199.ec2.internal dockerd[5036]: time="2023-03-06..."

Mar 06 13:40:12 ip-172-31-6-199.ec2.internal dockerd[5036]: time="2023-03-06..."

Hint: Some lines were ellipsized, use -l to show in full.

[root@ip-172-31-6-199 ~]#

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Go to the `/etc/sudoers` file and give Jenkins root permissions under “root”.

```
aws Services Search [Option+S] N. Virginia Damien andrew

## Next comes the main part: which users can run what software on
## which machines (the sudoers file can be shared between multiple
## systems).
## Syntax:
##
##     user    MACHINE=COMMANDS
##
## The COMMANDS section may have other options added to it.
##
## Allow root to run any commands anywhere
root    ALL=(ALL)        ALL
Jenkins ALL=NOPASSWD: ALL
## Allows members of the 'sys' group to run networking, software,
## service management apps and more.
# %sys ALL = NETWORKING, SOFTWARE, SERVICES, STORAGE, DELEGATING, PROCESSES, LOCATE, DRIVERS

## Allows people in group wheel to run all commands
%wheel  ALL=(ALL)        ALL

## Same thing without a password
# %wheel    ALL=(ALL)        NOPASSWD: ALL

## Allows members of the users group to mount and unmount the
## cdrom as root
"/etc/sudoers" [readonly] 120L, 4353B 101,25 92%
```

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- Add Deploy stage to Jenkins pipeline script, to integrate with docker using shell script.

Dashboard > IntegrationPipeline > Configuration

Configure

- General
- Advanced Project Options
- Pipeline**

Script ?

```
37 }
38 }
39 post{
40     success{
41         junit 'target/surefire-reports/*.xml'
42     }
43 }
44 stage('5. Package')
45 {
46     steps{
47         sh 'mvn package'
48     }
49 }
50 stage('6. Deploy '){
51     agent any
52     steps{
53         sh label: '', script: '''rm -rf mydockerfile
54 mkdir mydockerfile
55 cd mydockerfile
56 cp /var/lib/jenkins/workspace/IntegrationPipeline/target/addressbook.war .
57 touch dockerfile
58 cat <<EOT>> dockerfile
59 FROM tomcat:9
60 ADD addressbook.war /usr/local/tomcat/webapps
61 EXPOSE 8080
62 CMD ["catalina.sh", "run"]
63 EOT
64 sudo docker build -t myimage:$BUILD_NUMBER .
65 sudo docker run -itd -P myimage:$BUILD_NUMBER'''
66 }
67 }
68 }
69 }
```

☒ Use Groovy Sandbox ?

[Pipeline Syntax](#)

Save Apply

REST API Jenkins 2.375.3

- Run “Build now” again with Deploy stage added.

Jenkins

2
Andrew Nwajei
log out

Dashboard > IntegrationPipeline >

Status

</> Changes

▶ Build Now

⚙️ Configure

🗑️ Delete Pipeline

🔍 Full Stage View

✎ Rename

❓ Pipeline Syntax

📄 Git Polling Log

Pipeline IntegrationPipeline

Add description

Disable Project

Test Result Trend

Stage View

	Declarative: Tool Install	1.Clonerepo	2.Compile	3.Codereview	4.Unittest	5. Package	6. Deploy
Average stage times: (Average full run time: ~56s)	186ms	1s	9s	9min 29s	12s	13s	2s
#13 Mar 06 17:41 No Changes	93ms	549ms	8s	15s	10s	14s	4s

Build History

trend ▾

#13 6 Mar 2023, 17:41

#12 6 Mar 2023, 17:34

#11 6 Mar 2023, 16:43

#10 6 Mar 2023, 13:51

Dashboard > IntegrationPipeline > #13

```

+ cp /var/lib/jenkins/workspace/IntegrationPipeline/target/addressbook.war .
+ touch dockerfile
+ cat
+ sudo docker build -t myimage:13 .
Sending build context to Docker daemon 16.54MB

Step 1/4 : FROM tomcat:9
--> b07e16b11088
Step 2/4 : ADD addressbook.war /usr/local/tomcat/webapps
--> 4e01b283018b
Step 3/4 : EXPOSE 8080
--> Running in ee529a89b5bd
Removing intermediate container ee529a89b5bd
--> e5fff4ce9176
Step 4/4 : CMD ["catalina.sh", "run"]
--> Running in e2b6b2fea3c0
Removing intermediate container e2b6b2fea3c0
--> cdc24679b9ea
Successfully built cdc24679b9ea
Successfully tagged myimage:13
+ sudo docker run -itd -P myimage:13
d52a17b9330ae9ba933e3df7d00234f123a7609e101bbd273c2d945dcce1b267

[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // node
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline
Finished: SUCCESS

```

REST API Jenkins 2.375.3

- In order to take screenshot of addressbook app deployed, Jenkins job was ran again.

Status

</> Changes

Build Now

Configure

Delete Pipeline

Full Stage View

Rename

Pipeline Syntax

Git Polling Log

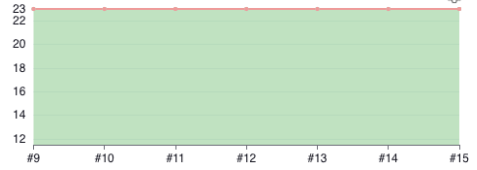
Pipeline IntegrationPipeline

Add description

Disable Project

Test Result Trend

Passed Skipped Failed



Build History

trend

Filter builds...

#17
8 Mar 2023, 02:33

#16
8 Mar 2023, 02:24

#15
8 Mar 2023, 02:22

#14
8 Mar 2023, 01:46

#13
6 Mar 2023, 17:41

#12
6 Mar 2023, 17:34

#11
6 Mar 2023, 16:43

Stage View

Average stage times:
(Average full run time: ~1min 10s)

	Declarative: Tool Install	1.Clonerepo	2.Compile	3.Codereview	4.Unittest	5. Package	6. Deploy
#17 Mar 08 02:33 No Changes	251ms	1s	11s	6min 27s	12s	12s	7s
#16 Mar 08 02:24 No Changes	252ms	2s	13s	16s	18s	13s	21s
#15 Mar 08 02:22 No Changes	101ms	849ms	25s	9min 48s aborted	9s aborted	161ms aborted	90ms aborted
#14 Mar 08 02:22 No Changes	573ms	2s	10s	15s	9s	13s	4s

- Screenshot of image created in docker, showing its port number.

aws

Services

Search

[Option+S]

N. Virginia

Damien andrew

```
[root@ip-172-31-6-199 ~]# docker ps
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS                               NAMES
c9d5bc692210   myimage:17     "catalina.sh run"       About a minute ago    Up About a minute    0.0.0.0:49153->8080/tcp, :::49153->8080/tcp    blissful_to
rvalds
90ffcd3e5a0    sonal04/samplepyapp:v1 "python myapp.py"       3 minutes ago        Up 3 minutes        3000/tcp                                     mysec.2.usc
234z456tos44fjimnps7rm
c1a36fc856df   sonal04/samplepyapp:v1 "python myapp.py"       3 minutes ago        Up 3 minutes        3000/tcp                                     mysec.1.k71
yzuoou9ombmj6ww51023yv
[root@ip-172-31-6-199 ~]#
```

i-Offe29d4e777d5f9d (MasterJenkins)

PublicIPs: 44.214.178.19 PrivateIPs: 172.31.6.199

Feedback

Language

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Privacy

Terms

Cookie preferences

- This was then used to access the addressbook on the web by using the format below.

http://ec2-instancepublicIP:49153/addressbook/

Filter contacts...		New contact
First Name	Last Name	Email
George	White	george@white.com
Daniel	Thompson	daniel@thompson.com
Timothy	Jones	timothy@jones.com
Peter	Wilson	peter@wilson.com
Dan	Robinson	dan@robinson.com
Dan	Davis	dan@davis.com
Olivia	Davis	olivia@davis.com
Dan	Smith	dan@smith.com
Daniel	Anderson	daniel@anderson.com
Alice	Thomas	alice@thomas.com
Linda	Harris	linda@harris.com
Daniel	Robinson	daniel@robinson.com
Mike	Young	mike@young.com
Umberto	Anderson	umberto@anderson.com
Scott	Thompson	scott@thompson.com
Rene	Martin	rene@martin.com
Lisa	Martin	lisa@martin.com
Peter	Martin	peter@martin.com
Brian	Wilson	brian@wilson.com
Scott	Miller	scott@miller.com
John	White	john@white.com
Peter	Johnson	peter@johnson.com

- Name edited in addressbook GUI to show it is working.

Filter contacts...		New contact
First Name	Last Name	Email
Andrew	Nwajei	edujkidhincjnk
George	White	george@white.com
Daniel	Thompson	daniel@thompson.com
Timothy	Jones	timothy@jones.com
Peter	Wilson	peter@wilson.com
Dan	Robinson	dan@robinson.com
Dan	Davis	dan@davis.com
Olivia	Davis	olivia@davis.com
Dan	Smith	dan@smith.com
Daniel	Anderson	daniel@anderson.com
Alice	Thomas	alice@thomas.com
Linda	Harris	linda@harris.com
Daniel	Robinson	daniel@robinson.com
Mike	Young	mike@young.com
Umberto	Anderson	umberto@anderson.com
Scott	Thompson	scott@thompson.com
Rene	Martin	rene@martin.com
Lisa	Martin	lisa@martin.com
Peter	Martin	peter@martin.com
Brian	Wilson	brian@wilson.com
Scott	Miller	scott@miller.com
John	White	john@white.com

The End. Thank you.
Andrew Nwajei

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