

CI/CD java application

To consolidate knowledge, in the Final Project I attempted to utilize all DevOps tools which was studied in the course, such as Terraform, Ansible, Jenkins, and Docker and build infrastructure on AWS.

In this project, I attempted to describe the entire software development process (in a simplified form) as I understand it after listening to the course.

The goal is to provide automatic delivery of the Java application to the end-user, eliminate downtime, and ensure failure tolerance.

Terraform: https://github.com/edmitrenko/final_project.git

Ansible: <https://github.com/edmitrenko/ansible-roles.git>

Application: <https://github.com/edmitrenko/jenkins-java-app2.git>

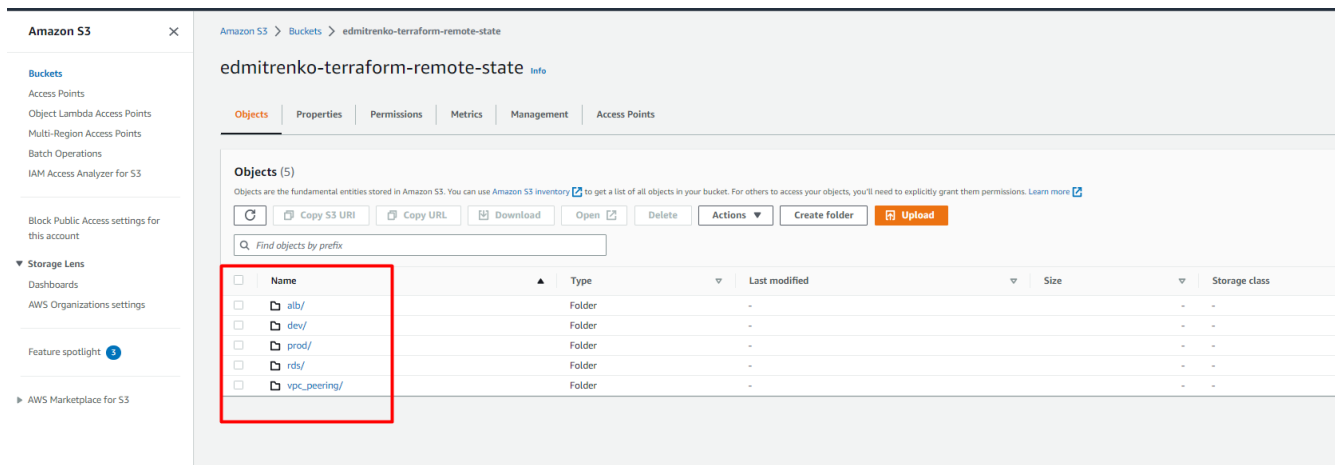
Build infrastructure for the final project on AWS using Terraform.

Terraform

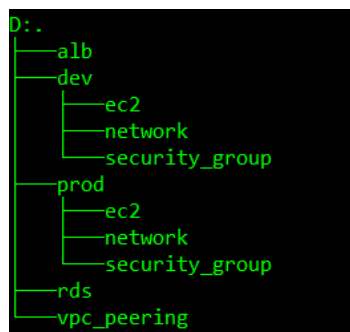
We use Terraform modules that are saved on GitHub.

https://github.com/edmitrenko/final_project.git

Files of Terraform state will be saved in an AWS S3 Bucket. The S3 Bucket was specially created on AWS with this structure:



Structure of Terraform folders on my laptop:



Build infrastructure for development environment.

Configure network infrastructure for development environment:

Go to the "dev/network" folder containing Terraform configuration files to create the network. Then, run the following command:

'terraform init' to initialize the modules and set up the backend for saving the state, and ensure that the necessary Terraform provider is loaded:

```
D:\Terraform\L1\final_project_remote\final_project\dev\network>terraform init
Initializing modules...
Downloading git::https://github.com/edmitrenko/terraform_modules.git for vpc-dev...
- vpc-dev in .terraform\modules\vpc-dev\aws_network
Initializing the backend...
Successfully configured the backend "s3"! Terraform will automatically
use this backend unless the backend configuration changes.
Initializing provider plugins...
- Finding latest version of hashicorp/aws...
- Installing hashicorp/aws v4.53.0...
- Installed hashicorp/aws v4.53.0 (signed by HashiCorp)
Terraform has created a lock file .terraform.lock.hcl to record the provider
selections it made above. Include this file in your version control repository
so that Terraform can guarantee to make the same selections by default when
you run "terraform init" in the future.
Terraform has been successfully initialized!
You may now begin working with Terraform. Try running "terraform plan" to see
any changes that are required for your infrastructure. All Terraform commands
should now work.
If you ever set or change modules or backend configuration for Terraform,
rerun this command to reinitialize your working directory. If you forget, other
commands will detect it and remind you to do so if necessary.
D:\Terraform\L1\final_project_remote\final_project\dev\network>
```

'terraform plan' – we can see what will be done

```
}
Plan: 5 to add, 0 to change, 0 to destroy.
Changes to Outputs:
+ dev_public_subnet_ids = [
    + (known after apply),
  ]
+ dev_route_table_id    = (known after apply)
+ dev_vpc_cidr          = "10.20.0.0/16"
+ dev_vpc_id            = (known after apply)
```

'terraform apply' - to apply future changes. To confirm, enter 'YES' and press Enter (you can use the **'terraform apply -auto-approve'** command for automation). The output of the terraform apply command will be displayed. The most important information is stored in the outputs.tf file:

```
Outputs:
dev_public_subnet_ids = [
  "subnet-08fa4d2d1b34fb4a5",
]
dev_route_table_id = "rtb-04d17de2173e77a0b"
dev_vpc_cidr = "10.20.0.0/16"
dev_vpc_id = "vpc-0c1439b78911868dd"
```

As a result we have network for development environment.

Configure security group for development environment

Go to the dev/security_group folder with Terraform configuration files to create the security groups in the dev environment and launch the commands:

```
terraform init
terraform apply
```

As a result security groups were created for development environment.

Configure servers for development environment:

Go to the dev/ec2 folder with Terraform config files for creating EC2 servers in the dev environment and launch the commands:

```
terraform init
terraform apply
```

As a result, servers were created for the dev environment. In the output, we get the result of the terraform apply command. The most important information is entered in the outputs.tf file:

```
Apply complete! Resources: 3 added, 0 changed, 0 destroyed.
Outputs:
dev-ansible_arn = "arn:aws:ec2:eu-west-2:860300666219:instance/i-089066eb144f44844"
dev-ansible_id = "i-089066eb144f44844"
dev-ansible_private_ip = "10.20.1.242"
dev-ansible_public_ip = "18.130.175.71"
dev-jenkins_arn = "arn:aws:ec2:eu-west-2:860300666219:instance/i-040f47875614843b4"
dev-jenkins_id = "i-040f47875614843b4"
dev-jenkins_private_ip = "10.20.1.178"
dev-jenkins_public_ip = "35.177.60.28"
dev-tomcat_arn = "arn:aws:ec2:eu-west-2:860300666219:instance/i-05a0ba901f1a91490"
dev-tomcat_id = "i-05a0ba901f1a91490"
dev-tomcat_private_ip = "10.20.1.10"
dev-tomcat_public_ip = "18.135.96.70"
```

As a result, we have three servers:

dev-jenkins - CI/CD Jenkins server from which Pipelines will be launched

dev-ansible - the server on which the Configuration Management Tool (Ansible) will be installed and used for the initial configuration of the prod environment. This server will also be added as the second node of Jenkins, and Docker will be installed on it to run future pipelines in Docker. The required software (Java, Docker, Ansible) will be automatically installed using the user_data script during the server configuration in AWS EC2.

user_data script:

```
locals {
  user_data_amazon = <<-EOT
  #!/bin/bash
  amazon-linux-extras install -y ansible2 java-openjdk11
  yum update -y
  yum install -y git docker
  usermod -aG docker ec2-user
  EOT
}

locals {
  user_data_ubuntu = <<-EOT
  #!/bin/bash
  apt install -y apt-transport-https ca-certificates curl software-properties-common
  curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
  add-apt-repository -y "deb [arch=amd64] https://download.docker.com/linux/ubuntu focal stable"
  add-apt-repository --yes --update ppa:ansible/ansible
  apt update
  apt install -y software-properties-common
  apt install -y ansible default-jdk git docker-ce
  usermod -aG docker ubuntu
  EOT
}
```

dev-tomcat – machine for the Tomcat server in dev environment

I have created the SSH key in advance in the appropriate AWS region

Build infrastructure for the Production environment.

Configure network infrastructure for prod environment

Go to the prod/network folder with Terraform configuration files to create the network and launch the commands:

```
terraform init
terraform apply
```

As a result, the network was created for the prod environment.

Configure security group for the production environment

Go to the prod/security_group folder with Terraform config files for creating security groups in the prod environment and launch the commands:

terraform init

terraform apply

As a result, security groups were created for the prod environment:

| <input type="checkbox"/> | Name ▾ | Security group ID ▾ | Security group name ▾ | VPC ID ▾ | Description ▾ | C |
|--------------------------|---------------|----------------------|-----------------------|---|----------------------------|---|
| <input type="checkbox"/> | prod-80-tcp | sg-06d4fb5414fc8886b | prod-80-tcp | vpc-0fa0ed7e9750d6bd3 🔗 | Security Group manag... | 8 |
| <input type="checkbox"/> | - | sg-075b9e487f3cd1fc6 | default | vpc-0fa0ed7e9750d6bd3 🔗 | default VPC security gr... | 8 |
| <input type="checkbox"/> | prod-3306-tcp | sg-033c0d86dc542421f | prod-3306-tcp | vpc-0fa0ed7e9750d6bd3 🔗 | Security Group manag... | 8 |
| <input type="checkbox"/> | - | sg-02da5293fb2657a80 | default | vpc-0c1439b78911868dd 🔗 | default VPC security gr... | 8 |
| <input type="checkbox"/> | prod-all-icmp | sg-01c7a1f4de23ac84f | prod-all-icmp | vpc-0fa0ed7e9750d6bd3 🔗 | Security Group manag... | 8 |
| <input type="checkbox"/> | dev-all-icmp | sg-0457ec53056c9ca23 | dev-all-icmp | vpc-0c1439b78911868dd 🔗 | Security Group manag... | 8 |
| <input type="checkbox"/> | dev-8080-tcp | sg-00585226e5dfdb2b2 | dev-8080-tcp | vpc-0c1439b78911868dd 🔗 | Security Group manag... | 8 |
| <input type="checkbox"/> | prod-22-tcp | sg-06694fc3bc51f43e9 | prod-22-tcp | vpc-0fa0ed7e9750d6bd3 🔗 | Security Group manag... | 8 |
| <input type="checkbox"/> | - | sg-0adfc95835b56b4a9 | default | vpc-0601d3201c5fb8e0c 🔗 | default VPC security gr... | 8 |
| <input type="checkbox"/> | prod-tomcat | sg-0dcd6a545ff889d5a | prod-tomcat | vpc-0fa0ed7e9750d6bd3 🔗 | Security Group manag... | 8 |
| <input type="checkbox"/> | dev-80-tcp | sg-0c06ffeabe8f69708 | dev-80-tcp | vpc-0c1439b78911868dd 🔗 | Security Group manag... | 8 |
| <input type="checkbox"/> | dev-22-tcp | sg-0d6ee4bf34abd9be6 | dev-22-tcp | vpc-0c1439b78911868dd 🔗 | Security Group manag... | 8 |

Configure servers for prod environment.

Go to the prod/ec2 folder with Terraform config files for creating EC2 servers in the prod environment and launch the commands:

terraform init

terraform apply

As a result, a server for the prod environment was created. In the output, we get the result of the terraform apply command. The most important information is entered in the outputs.tf file:

```
Apply complete! Resources: 2 added, 0 changed, 0 destroyed.

Outputs:

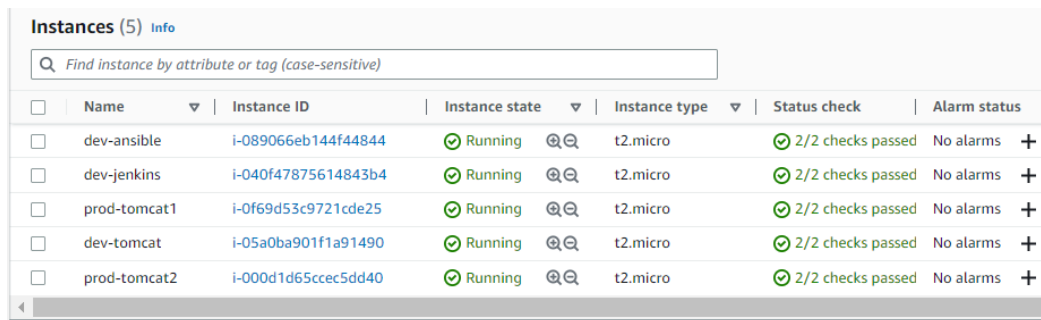
prod-tomcat1_arn = "arn:aws:ec2:eu-west-2:860300666219:instance/i-0f69d53c9721cde25"
prod-tomcat1_id = "i-0f69d53c9721cde25"
prod-tomcat1_private_ip = "10.30.1.228"
prod-tomcat1_public_ip = "13.40.73.162"
prod-tomcat2_arn = "arn:aws:ec2:eu-west-2:860300666219:instance/i-000d1d65ccec5dd40"
prod-tomcat2_id = "i-000d1d65ccec5dd40"
prod-tomcat2_private_ip = "10.30.1.25"
prod-tomcat2_public_ip = "3.8.77.49"
```

As a result, two servers were created:

prod-tomca1 prod-tomca2

A cluster of two Tomcat servers will be configured to ensure failure tolerance (using Ansible). The servers will work using an AWS Application Load Balancer (which we will configure later with Terraform).

As a result, in the AWS console, we have five servers:



| <input type="checkbox"/> | Name | Instance ID | Instance state | Instance type | Status check | Alarm status |
|--------------------------|--------------|---------------------|----------------|---------------|-------------------|--------------|
| <input type="checkbox"/> | dev-ansible | i-089066eb144f44844 | Running | t2.micro | 2/2 checks passed | No alarms |
| <input type="checkbox"/> | dev-jenkins | i-040f47875614843b4 | Running | t2.micro | 2/2 checks passed | No alarms |
| <input type="checkbox"/> | prod-tomcat1 | i-0f69d53c9721cde25 | Running | t2.micro | 2/2 checks passed | No alarms |
| <input type="checkbox"/> | dev-tomcat | i-05a0ba901f1a91490 | Running | t2.micro | 2/2 checks passed | No alarms |
| <input type="checkbox"/> | prod-tomcat2 | i-000d1d65ccec5dd40 | Running | t2.micro | 2/2 checks passed | No alarms |

Configuring VPC Peering between the Dev and Prod Environment networks

Go to the vpc_peering folder with Terraform configuration files to configure VPC peering and launch the commands:

```
terraform init
terraform apply
```

As a result, a connection will be established between the networks in the Dev and Prod environments.

Configuring an AWS RDS MySQL database

The base will be necessary for the future application.

Go to the RDS folder that contains Terraform configuration files to configure the RDS database and launch the necessary commands:

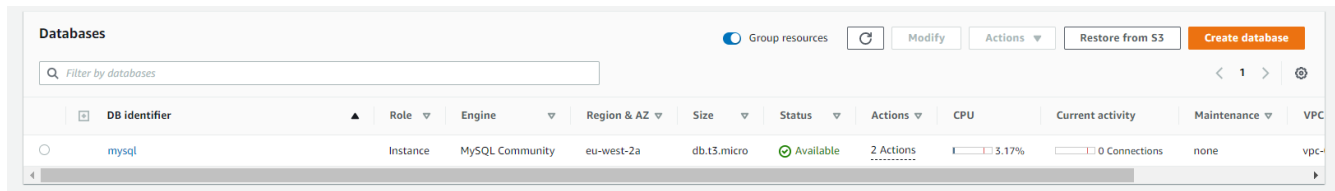
```
terraform init
terraform apply
```

As a result, a database for future applications was created. The output of the 'terraform apply' command provides the result. The most important information is entered in the 'outputs.tf' file:

```
Outputs:

db_instance_address = "mysql.cruawvpngh1q.eu-west-2.rds.amazonaws.com"
db_instance_arn     = "arn:aws:rds:eu-west-2:860300666219:db:mysql"
db_instance_endpoint = "mysql.cruawvpngh1q.eu-west-2.rds.amazonaws.com:3306"
db_instance_name    = "UserDB"
db_instance_password = "x89hysWZ1q4"
db_instance_port    = 3306
db_instance_username = "admin"
```

RDS Database in AWS Console:



By using Terraform, I created a table in the RDS database using the 'rds/initial.sql' script.

Configuring the Application Load Balancer for Prod Environment

Go to the ALB folder that contains Terraform configuration files to configure the application load balancer and launch the necessary commands:

```
terraform init
terraform apply
```

The data of the command's output is noted. It will be required to access the application in the future.

```
Outputs:
dns_name_alb = "tomcat1.dmitrenko.pp.ua"
```

As a result, the application load balancer for the production environment was created. The application load balancer is necessary to balance the load between the nodes of Tomcat servers in the production environment. The application load balancer connects to the **tomcat1.dmitrenko.pp.ua** DNS name. The DNS zone 'dmitrenko.pp.ua' was connected to AWS Route 53 during the completion of the AWS homework.

EC2 > Load balancers > terraform-alb

terraform-alb Actions

Details
arn:aws:elasticloadbalancing:eu-west-2:86030066219:loadbalancer/app/terraform-alb/407ffc1f11a358bf

| | | | |
|---|---|---|------------------------------|
| Load balancer type Application | DNS name terraform-alb-136800102.eu-west-2.elb.amazonaws.com (A Record) | Status Active | VPC vpc-0fa0ed7e9750d6bd3 |
| IP address type IPv4 | Scheme Internet-facing | Availability Zones subnet-06c711d4:eu-west-2a (euw2-az2) subnet-040d5c13f43e01ed9:eu-west-2b (euw2-az3) | Hosted zone ZHURV8PSTC4K8 |
| Date created February 5, 2023, 15:50 (UTC+03:00) | | | |

Listeners Network mapping Security Monitoring Integrations Attributes Tags

Listeners (1)
A listener checks for connection requests on its port and protocol. Traffic received by the listener is routed according to its rules.

Search

| Protocol:Port | ARN | Security policy | Default SSL cert | Default routing rule | Rules | Tags |
|---------------|-----|-----------------|------------------|---|-------|------|
| HTTP:80 | ARN | Not applicable | Not applicable | Forward to <ul style="list-style-type: none"> Target-group-tomcat-node1: 1 (50%) Target-group-tomcat-node2: 1 (50%) Group-level stickiness: Off | 1 | 0 |

Configure Jenkins using Ansible

Access the **dev-ansible** server via the SSH protocol using the MobaXterm program (using the address obtained from the Terraform outputs during the configuration of servers in the Development Environment, as well as the SSH key that was pre-generated via the AWS Console for the region in which the infrastructure was configured).

I have configured Ansible on that server through the 'user_data' script for AWS EC2 during the configuration of servers in the development environment using Terraform:

```
ubuntu@ip-10-20-1-242:~$ ansible --version
ansible [core 2.14.2]
  config file = /etc/ansible/ansible.cfg
  configured module search path = ['/home/ubuntu/.ansible/plugins/modules', '/usr/share/ansible/plugins/modules']
  ansible python module location = /usr/lib/python3/dist-packages/ansible
  ansible collection location = /home/ubuntu/.ansible/collections:/usr/share/ansible/collections
  executable location = /usr/bin/ansible
  python version = 3.10.6 (main, Nov 14 2022, 16:10:14) [GCC 11.3.0] (/usr/bin/python3)
  jinja version = 3.0.3
  libyaml = True
```

Clone the Ansible roles for Jenkins and Tomcat from GitHub:

git clone <https://github.com/edmitrenko/ansible-roles.git>

Add the SSH key for the appropriate region to the "dev-ansible" server. I just copied the contents of the key to a file and added the necessary permissions to the key:


```
touch key.pem
nano key.pem (insert key content)
chmod 400 key.pem
```

Go to the **ansible-jenkins** folder and edit the **hosts** file - add the IP address of the 'dev-jenkins' server (data from the Terraform output from one of the previous steps), add the username and path to the SSH key:

[jenkins]

10.20.1.178 ansible_user=ubuntu ansible_ssh_private_key_file=/home/ubuntu/key.pem

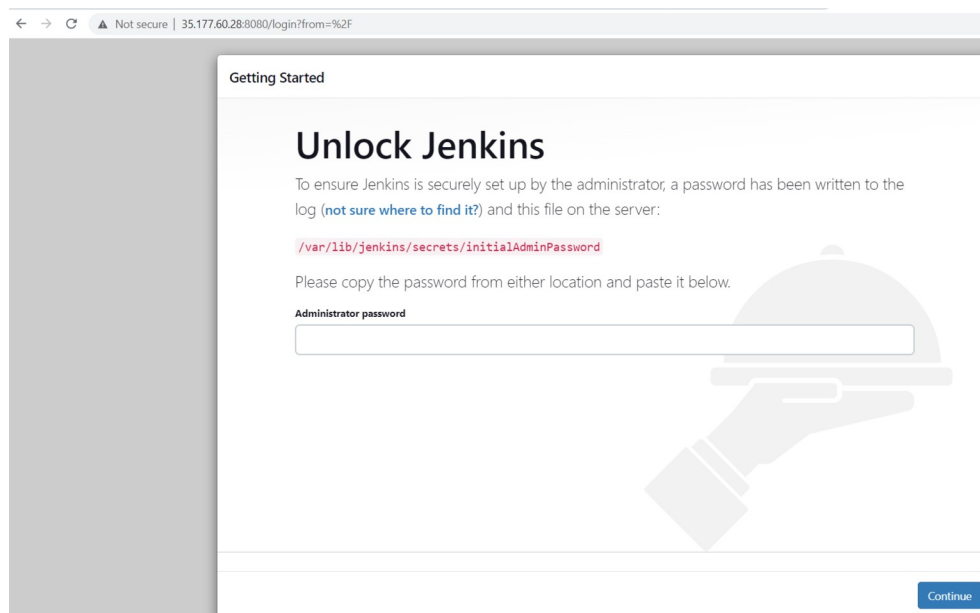
Run playbook:

ansible-playbook -i hosts playbook-jenkins.yml

As a result we obtain the password for further Jenkins configuration:

```
TASK [jenkins : print init password jenkins] *****
ok: [10.20.1.178] => {
  "result.stdout": "ec55dd45f7dc4a18948688b0efb322ec"
}
PLAY RECAP *****
10.20.1.178 : ok=16 changed=5 unreachable=0 failed=0 skipped=2 rescued=0 ignored=0
ubuntu@ip-10-20-1-242:~/ansible-jenkins$
```

Go to the Jenkins web interface for further configuration (the IP address of Jenkins can be obtained from the Terraform outputs from one of the previous steps):



Enter the Administrator password which we obtained in the previous step. Select the necessary plugins (in my case: SSH Agent, SSH Build Agents, Copy Artifact, Deploy to Container, pipeline, git, docker, docker pipeline) and press the 'Continue' button. Add a new user and password, and then we can access Jenkins.

Add credentials for connecting to the second node in Jenkins and for connecting to the Tomcat servers:

Manage jenkins → Credentials → System → Global Credential → Add Credentials

| ID | Name | Kind | Description |
|--------------------|-----------------------------|-------------------------------|--------------------|
| node-1 | ubuntu (node-1) | SSH Username with private key | node-1 |
| tomcat-server-prod | ubuntu (tomcat-server-prod) | SSH Username with private key | tomcat-server-prod |
| tomcat-server-dev | ubuntu (tomcat-server-dev) | SSH Username with private key | tomcat-server-dev |

Add second node to Jenkins server:

Manage jenkins → Mange Nodes and Clouds → New Node → set name Node-1

You need to specify the following:

- **Remote root directory:** /tmp
- **Labels:** it will be used in the Jenkinsfile to specify on which node the Jenkins task will be performed (if you want to specify multiple labels, separate them with a space)
- **Launch method:** Launch Agent via SSH.

Dashboard > Manage Jenkins > Nodes >

1 idle

2 idle

Remote root directory ?

/tmp

Labels ?

docker java ansible

Usage ?

Use this node as much as possible

Launch method ?

Launch agents via SSH

Host ?

10.20.1.242

Credentials ?

ubuntu (node-1)

+ Add

Host Key Verification Strategy ?

Manually trusted key Verification Strategy

☐ Require manual verification of initial connection ?

Advanced...

Availability ?

Keep this agent online as much as possible

Node Properties

☐ Disable deferred wipeout on this node ?

☐ Environment variables

☐ Prepare jobs environment ?

☐ Tool Locations

Now Jenkins is ready to work.

Configuring Tomcat via Ansible

Enter the 'dev-ansible' server via the SSH protocol using the MobaXterm program (using the address that was obtained from Terraform outputs during configuring servers in the Dev Environments, as well as the SSH key that was pre-generated via the AWS console for the region in which the infrastructure was configured) or return to the ssh console that was open in the previous step.

Go to the ansible-tomcat folder and edit the hosts file - add the IP address of the 'dev-tomcat' server and the addresses of the 'prod-tomcat' servers (data from Terraform output in one of the previous steps), add the username and path to the ssh key:

[dev]

10.20.1.10 ansible_user=ubuntu ansible_ssh_private_key_file=/home/ubuntu/key.pem

[prod1]

10.30.1.228 ansible_user=ubuntu ansible_ssh_private_key_file=/home/ubuntu/key.pem

[prod2]

10.30.1.25 ansible_user=ubuntu ansible_ssh_private_key_file=/home/ubuntu/key.pem

Also, you need to configure the `playbook-tomcat.yml` file. To configure the Tomcat server in the Prod environment, it is necessary to specify the port numbers on which the Tomcat server will operate. To set up the Tomcat server cluster, the port numbers should differ on the first and second node.

Install the Tomcat server on `dev-tomcat` by using the correct `playbook-tomcat.yml`:

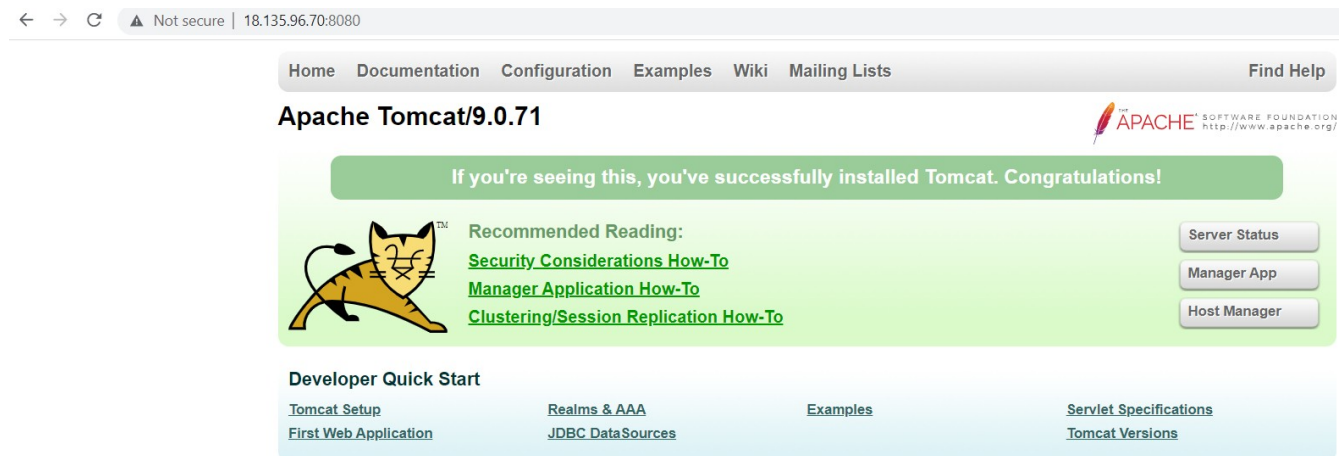
hosts: dev

env: dev

and start:

ansible-playbook -i hosts playbook-tomcat.yml

As a result, we have a tomcat server running on `dev-tomcat`, whose IP address can be obtained from the Terraform outputs taken in an earlier step:



Install tomcat server on `prod-tomcat1`. Configure `playbook-tomcat.yml`:

hosts: prod1

env: prod

server_port: 8006

http_port: 8081

arj_port: 8009

and start:

ansible-playbook -i hosts playbook-tomcat.yml

Install tomcat server on `'prod-tomcat'2`. Configure `playbook-tomcat.yml`:

hosts: prod2

env: prod

server_port: 8007

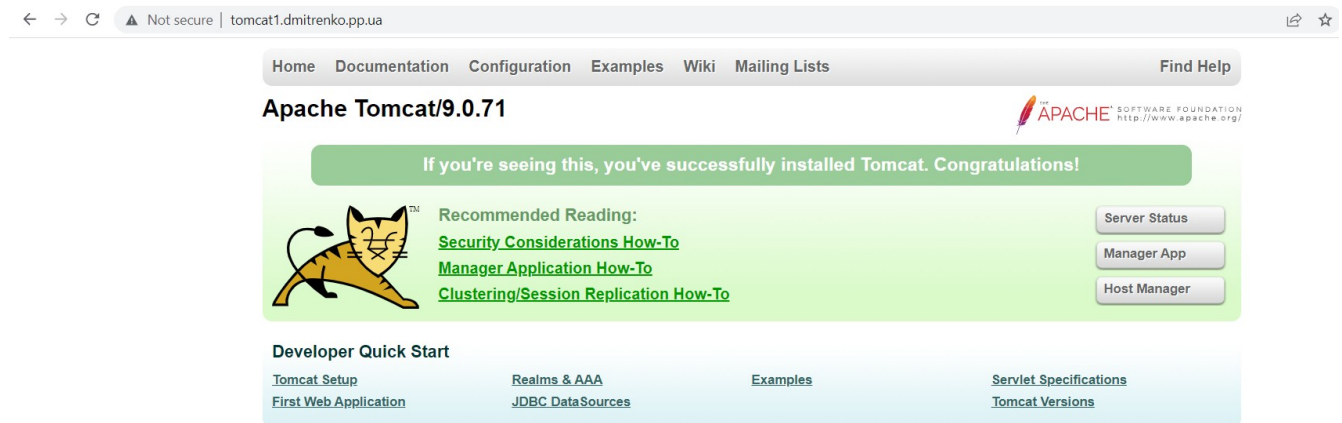
http_port: 8082

arj_port: 8010

and start:

ansible-playbook -i hosts playbook-tomcat.yml

Now we can use the DNS name of the application load balancer to connect to the Tomcat cluster - <http://tomcat1.dmitrenko.pp.ua/>:



Configure Pipeline in Jenkins

For the final project, I have selected a small Java web application that has a database for storing user accounts.

This application will be built with Maven on a Jenkins node in a Docker container (the latest Docker Image Maven will be used). As a result, we will have a .war file.

Delivery of artifacts will occur using the Jenkins-SSH Agent plugin (for storing credentials) and by starting a shell scp command to copy the .war file. The .war file will be in the format of **name##version**.

The old version of the application will be deleted from the Tomcat servers.

server.xml:

```
<Host name="localhost" appBase="webapps"
    unpackWARs="true" autoDeploy="true"
    undeployOldVersions="true" >

    <Valve className="org.apache.catalina.valves.AccessLogValve" directory="logs"
        prefix="localhost_access_log" suffix=".txt"
        pattern="%h %l %u %t &quot;%r&quot; %s %b" />
</Host>
```

I also reduced the session timeout to 5 minutes in the web.xml file:

```
<session-config>
  <session-timeout>5</session-timeout>
</session-config>
```

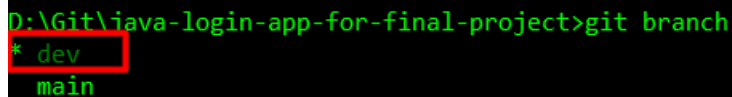
The Java application is located on GitHub:

<https://github.com/edmitrenko/jenkins-java-app2.git>

The Jenkins file is also located in this repository.

Before configuring the pipeline in Jenkins, we need to edit the Jenkinsfile and specify the addresses of the Tomcat servers. We also need to point to the path to the database that was created previously. The information about the database can be obtained from the Terraform outputs from previous steps. This information can be found in **src\main\resources\application.properties**.

A programmer should clone the Git repository to their local computer and create a new branch, such as **dev**, for development. All changes should be pushed to the central repository, and after they have been checked, the **dev** branch should be merged with the main branch:

A terminal window with a black background and green text. The command 'git branch' has been executed, showing the output: '# dev' and 'main'. The '# dev' line is highlighted with a red rectangular box.

```
D:\Git\java-login-app-for-final-project>git branch
# dev
main
```

A programmer pushes changes to the central repository and creates a pull request. Then, a GitHub webhook is triggered, which starts the pipeline in Jenkins. All changes from the dev branch are deployed to the dev-tomcat server.

After the branches are merged (dev with main), the GitHub webhook is triggered again, and the Jenkins pipeline starts to build and deploy the application to the prod servers.

Create Jenkins pipeline for dev server

Configure

- General
- Advanced Project Options
- Pipeline

General

Description

dev-java-maven

[Plain text] [Preview](#)

☒ Discard old builds ?

Strategy

Log Rotation

Days to keep builds
if not empty, build records are only kept up to this number of days

5

Max # of builds to keep
if not empty, only up to this number of build records are kept

5

[Advanced...](#)

☐ Do not allow concurrent builds

☐ Do not allow the pipeline to resume if the controller restarts

☒ GitHub project

Project url ?

<https://github.com/edmitrenko/jenkins-java-app2.git>

[Advanced...](#)

☐ Permission to Copy Artifact

☐ Pipeline speed/durability override ?

☐ Preserve stashes from completed builds ?

Rebuild options: ?

☐ Rebuild Without Asking For Parameters

☐ Disable Rebuilding for this job

☐ This project is parameterized ?

☐ Throttle Concurrent Builds

☐ Throttle builds ?

☐ Prepare an environment for the run ?

Configure



General



Advanced Project Options



Pipeline

Build Triggers

- ☐ Build after other projects are built ?
- ☐ Build periodically ?
- ☐ Build when a change is pushed to BitBucket
- ☒ GitHub hook trigger for GITScm polling ?
- ☐ Perform triggered build.
- ☐ Poll SCM ?
- ☐ Quiet period ?
- ☐ Trigger builds remotely (e.g., from scripts) ?

Advanced Project Options

Advanced...

Pipeline

Definition

Pipeline script from SCM

SCM ?

Git

Repositories ?

Repository URL ?

https://github.com/edmitrenko/jenkins-java-app2.git

Credentials ?

- none -

+ Add

Advanced...

Add Repository

Branches to build ?

Branch Specifier (blank for 'any') ?

*/dev

Add Branch

Configure

- General
- Advanced Project Options
- Pipeline

Pipeline

Definition

Pipeline script from SCM

SCM ?

Git

Repositories ?

Repository URL ?

https://github.com/edmitrenko/jenkins-java-app2.git

Credentials ?

- none -

+ Add

Advanced...

Add Repository

Branches to build ?

Branch Specifier (blank for 'any') ?

*/dev

Add Branch

Repository browser ?

(Auto)

Additional Behaviours

Add ~

Script Path ?

Jenkins/Jenkinsfile_dev

☒ Lightweight checkout ?

[Pipeline Syntax](#)

Save Apply

Add a github webhook:

General

Access

Collaborators

Moderation options

Code and automation

Branches

Tags

Actions

Webhooks

Environments

Codespaces

Pages

Security

Code security and analysis

Deploy keys

Secrets and variables

Integrations

GitHub apps

Email notifications

Webhooks / Manage webhook

Settings Recent Deliveries

We'll send a POST request to the URL below with details of any subscribed events. You can also specify which data format you'd like to receive (JSON, x-www-form-urlencoded, etc). More information can be found in [our developer documentation](#).

Payload URL *

http://35.177.60.28:8080/github-webhook/

Content type

application/json

Secret

Which events would you like to trigger this webhook?

☒ Just the push event.

☐ Send me **everything**.

☐ Let me select individual events.

☒ **Active**
We will deliver event details when this hook is triggered.

Update webhook Delete webhook

Push changes to Github:

```
D:\Git\java-login-app-for-final-project>git add .
D:\Git\java-login-app-for-final-project>git commit -m "final_v1.0"
[dev 1125efb] final_v1.0
 2 files changed, 2 insertions(+), 2 deletions(-)
D:\Git\java-login-app-for-final-project>git push --set-upstream origin dev
Enumerating objects: 9, done.
Counting objects: 100% (9/9), done.
Delta compression using up to 4 threads
Compressing objects: 100% (5/5), done.
Writing objects: 100% (5/5), 425 bytes | 425.00 KiB/s, done.
Total 5 (delta 3), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (3/3), completed with 3 local objects.
To https://github.com/edmitrenko/jenkins-java-app2.git
   0ee700d..1125efb  dev -> dev
branch 'dev' set up to track 'origin/dev'.
```

The Jenkins pipeline has started:

The Jenkins Pipeline View for 'dev-java-maven' displays the 'Stage View' and 'Build History'.

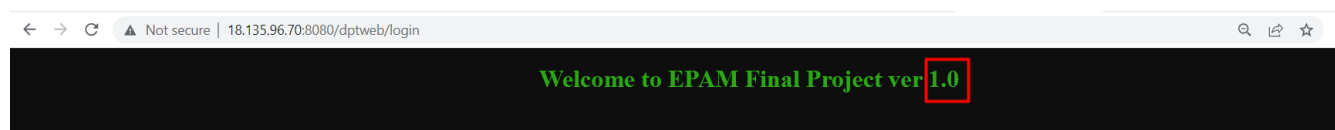
Stage View: Shows the pipeline stages and their execution times for the last six builds.

| | Declarative: Checkout SCM | Build | Deploy |
|---|---------------------------|---------|-----------|
| Average stage times: (Average full run time: ~29s) | 2s | 34s | 1s |
| #6 Feb 05 20:32 1 commit | 847ms | 24s | 1s |
| #5 Feb 05 20:25 1 commit | 3s | 25s | 1s |
| #4 Feb 05 20:10 No Changes | 902ms | 26s | 1s |
| #3 Feb 05 20:00 No Changes | 5s | 1min 2s | 1s failed |
| #2 Feb 05 19:46 No Changes | | | |

Build History: Shows the list of builds with their status and timestamps.


| Build | Status | Timestamp |
|-------|---------|----------------------|
| #6 | Success | Feb 5, 2023, 5:32 PM |
| #5 | Success | Feb 5, 2023, 5:25 PM |
| #4 | Success | Feb 5, 2023, 5:10 PM |
| #3 | Failure | Feb 5, 2023, 5:00 PM |
| #2 | Failure | Feb 5, 2023, 4:46 PM |

As a result, the application version 1.0 was deployed to the dev-tomcat server:






Configure the Jenkins pipeline for the prod environment similarly to the dev environment, but change the path to the Jenkinsfile and the GitHub branch.


Create a pull request:









 dev had recent pushes 24 minutes ago

[Compare & pull request](#)


 main ▾  2 branches  0 tags


[Go to file](#) [Add file ▾](#) [Code ▾](#)


 edmitrenko Merge pull request #2 from edmitrenko/dev ... 658d6cb 19 hours ago 🕒 91 commits

| | | |
|--|-----------------|--------------|
|  .mvn/wrapper | fix | 2 weeks ago |
|  Jenkins | build in docker | 19 hours ago |
|  src | build in docker | 19 hours ago |
|  HELP.md | first | 3 weeks ago |
|  README.md | first | 3 weeks ago |
|  mvnw | fix | 2 weeks ago |
|  mvnw.cmd | first | 3 weeks ago |
|  pom.xml | build in docker | 19 hours ago |

Merge the pull request:

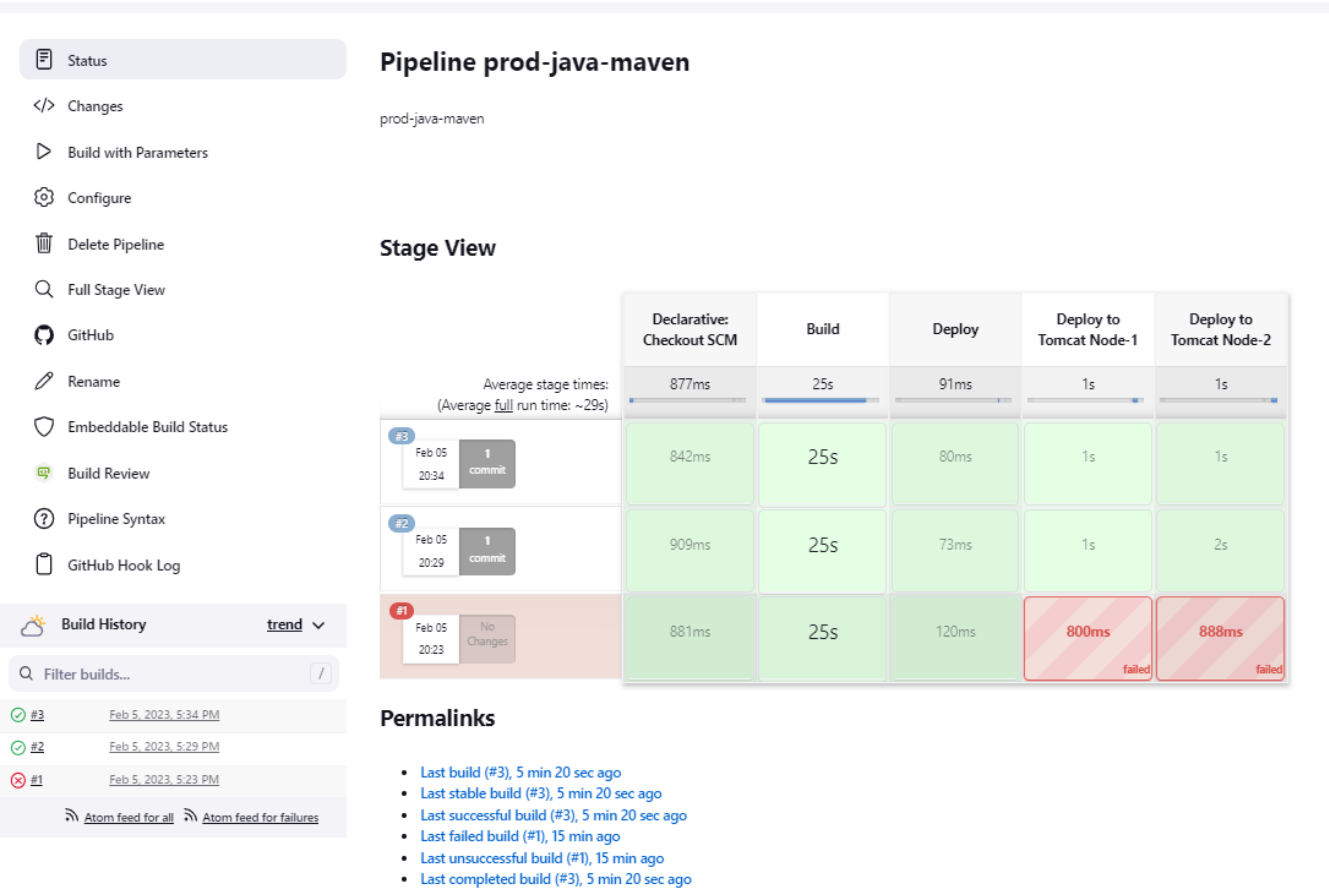


 **Continuous integration has not been set up**
GitHub Actions and several other apps can be used to automatically catch bugs and enforce style.

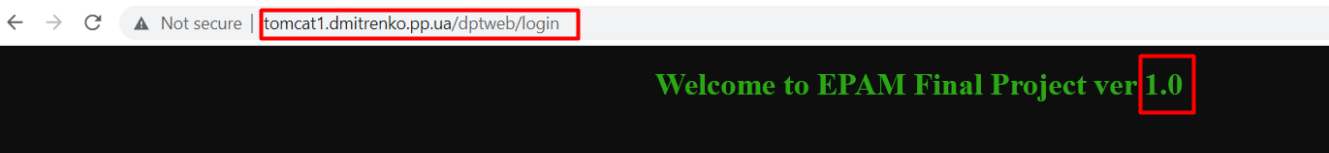
 **This branch has no conflicts with the base branch**
Merging can be performed automatically.

[Merge pull request](#) ▾ You can also [open this in GitHub Desktop](#) or view [command line instructions](#).

The pipeline for the prod environment was started:



As a result, the application version 1.0 was deployed to the prod-Tomcat servers:



We can see version 1.0 of the application in the Tomcat manager:

Tomcat Web Application Manager

Message:

OK

Manager

List ApplicationsHTML Manager HelpManager Help

Applications

| Path | Version | Display Name | Running | Sessions | Commands |
|---------------|----------------|---------------------------------|---------|----------|---|
| / | None specified | Welcome to Tomcat | true | 0 | <div>StartStopReloadUndeploy</div> <div>Expire sessions with idle ≥ 5 minutes</div> |
| /docs | None specified | Tomcat Documentation | true | 0 | <div>StartStopReloadUndeploy</div> <div>Expire sessions with idle ≥ 5 minutes</div> |
| /dptweb | 1.0 | | true | 0 | <div>StartStopReloadUndeploy</div> <div>Expire sessions with idle ≥ 5 minutes</div> |
| /examples | None specified | Servlet and JSP Examples | true | 0 | <div>StartStopReloadUndeploy</div> <div>Expire sessions with idle ≥ 5 minutes</div> |
| /host-manager | None specified | Tomcat Host Manager Application | true | 0 | <div>StartStopReloadUndeploy</div> <div>Expire sessions with idle ≥ 5 minutes</div> |
| /manager | None specified | Tomcat Manager Application | true | 1 | <div>StartStopReloadUndeploy</div> <div>Expire sessions with idle ≥ 5 minutes</div> |

We make changes in the code, such as changing the version on the web page and the version in the Pom.xml file, and send the changes to GitHub in the dev branch.

As a result, the Jenkins pipeline **dev-java-maven** should automatically start, build, and deploy the new version of the application to the dev-tomcat server

The screenshot shows the Jenkins Dashboard. On the left is a sidebar with navigation links: New Item, People, Build History, Project Relationship, Check File Fingerprint, Manage Jenkins, My Views, and P4 Trigger. The main area displays a table of recent builds. Below this, there are sections for 'Build Queue' (showing no builds) and 'Build Executor Status' (showing two idle executors). A red box highlights the 'node-1' executor, which is currently running the 'dev-java-maven' build #7. The build progress bar is partially filled, and a red error icon is visible next to the build name.

| S | W | Name ↓ | Last Success |
|---|---|-----------------|--------------|
| ✓ | ☁ | dev-java-maven | 12 min #6 |
| ✓ | ☀ | prod-java-maven | 10 min #3 |

Icon: S M L

Build Queue ▾
No builds in the queue.

Build Executor Status ▾
Built-In Node

1 Idle

2 Idle

node-1

1 dev-java-maven #7 (Build)

The screenshot shows a web browser window. The address bar displays '18.135.96.70:8080/dptweb/login'. The main content area is black with green text that reads 'Welcome to EPAM Final Project ver 2.0'. A red box highlights the version number '2.0'.

Not secure | 18.135.96.70:8080/dptweb/login

Welcome to EPAM Final Project ver 2.0

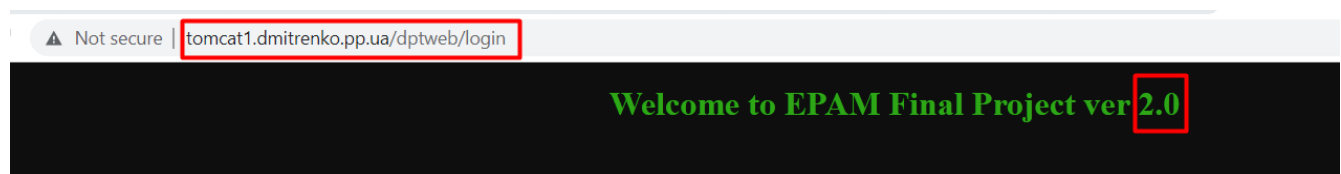
On GitHub, create a pull request → merge request → confirm merge. The GitHub webhook is triggered, and the Jenkins pipeline **prod-java-maven** for the prod environment should start automatically:

The screenshot shows the Jenkins dashboard with a sidebar on the left containing links: New Item, People, Build History, Project Relationship, Check File Fingerprint, Manage Jenkins, My Views, and P4 Trigger. The main area displays a table of recent builds:

| S | W | Name ↓ | Last Success |
|---|---|-----------------|--------------|
| ✓ | ☁ | dev-java-maven | 12 min #6 |
| ✓ | ☁ | prod-java-maven | 10 min #3 |

Below the table, there are filters for 'Icon' (S, M, L) and a 'Build Queue' section showing 'No builds in the queue.' The 'Build Executor Status' section shows two idle nodes: 'Built-In Node' and 'node-1'. Under 'node-1', a build for 'prod-java-maven' is shown as '#4 (Build)' with a progress bar and a red error icon.

And the new version of the application was built and deployed to the prod servers:



And we can see the version of the application on the Tomcat manager page:



Tomcat Web Application Manager

Message: OK

| | | | |
|-----------------------------------|-----------------------------------|------------------------------|--|
| Manager | | | |
| List Applications | HTML Manager Help | Manager Help | |

| Applications | | | | | | |
|---------------------|----------------|---------------------------------|---------|----------|----------------------------|---------------------------------------|
| Path | Version | Display Name | Running | Sessions | Commands | |
| / | None specified | Welcome to Tomcat | true | 0 | Start Stop Reload Undeploy | Expire sessions with idle ≥ 5 minutes |
| /docs | None specified | Tomcat Documentation | true | 0 | Start Stop Reload Undeploy | Expire sessions with idle ≥ 5 minutes |
| /dpweb | 2.0 | | true | 2 | Start Stop Reload Undeploy | Expire sessions with idle ≥ 5 minutes |
| /examples | None specified | Servlet and JSP Examples | true | 0 | Start Stop Reload Undeploy | Expire sessions with idle ≥ 5 minutes |
| /host-manager | None specified | Tomcat Host Manager Application | true | 0 | Start Stop Reload Undeploy | Expire sessions with idle ≥ 5 minutes |
| /manager | None specified | Tomcat Manager Application | true | 1 | Start Stop Reload Undeploy | Expire sessions with idle ≥ 5 minutes |

| | |
|--|--|
| Deploy | |
| Deploy directory or WAR file located on server | |