

Cloud & Infrastructure as a Service (IaaS)

Key Takeaways

Throughout the DevOps Bootcamp, we will install and configure



Nexus
Artifact Repository



Jenkins
Build Automation



Deploy own
Applications on Servers

&
more

- We **don't install** it **locally** on our laptop!
- **More realistic:** Install them on remote dedicated servers in cloud

What is Infrastructure as a Service (IaaS)?

- Offers **compute, storage and networking resources on demand**
- Instead of:

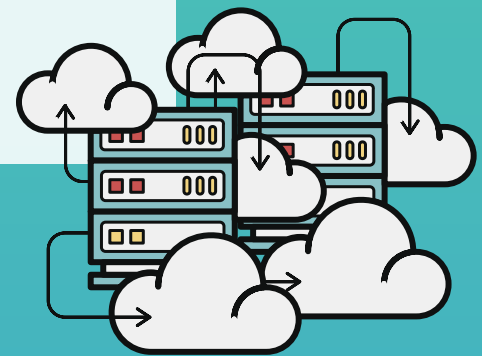
Company buys own server

- You manage own servers and infrastructure
- If something breaks, you need to fix it



Delegate Infrastructure Management

- Move your physical infrastructure to cloud
- You just rent the servers on demand



What is Cloud Computing?

- Cloud Computing is the **delivery of computing services** - including servers, storage, databases, networking, software - **over the internet** ("the cloud")
- **IaaS is 1 of 4 types of cloud services.** Others: Software as a Service (SaaS), Platform as a Service (PaaS) and Serverless

Infrastructure as a Service Providers

Most used IaaS Providers



- AWS is the most used : **Powerful, but complex (learn in later module)**

- **DigitalOcean:** Easier to start



Setup Server on DigitalOcean (DO) - 1

to run packaged java application (jar file)

- Servers on DigitalOcean are called "Droplets"
- Droplets are Linux-based virtual machines (VMs)



Summary of Steps:

1. **Pre-Requisite:** Create DigitalOcean account (with new signup credits - free tier)
2. **Configure SSH keys**
3. **Create a Droplet** with Linux Ubuntu distribution
4. **Open SSH port 22** on server using firewall configuration
5. **SSH into the server** using its public IP address
6. **Install Java** to run Java applications on it

Setup Server on DigitalOcean (DO) - 2

to run packaged java application (jar file)

Configure SSH keys

- To be able to access any server on DO from local computer using SSH

Create Droplets - DigitalOcean x +

cloud.digitalocean.com/droplets/new?i=5290ba®ion=fra1&size=s-1vcpu-512mb-10gb

Search by resource name or public IP (Cmd+B)

Create

My Team Estimated costs: \$0.00

Add public SSH key

Copy your public SSH key and paste it in the space below. For instructions on how, follow the steps on the right.

SSH key content *

Name *

Add SSH Key

SSH Keys

Follow these instructions to create or add SSH keys on Linux, MacOS & Windows. Windows users without OpenSSH [can install and use PuTTY](#) instead.

Create a new key pair, if needed

Open a terminal and run the following command:

```
ssh-keygen
```

Copy

You will be prompted to save and name the key.

```
Generating public/private rsa key pair. Enter file in which to save
```

Collect and graph expanded system-level metrics, track performance, and set up alerts instantly within the control panel.

\$4.00/month
\$0.006/hour

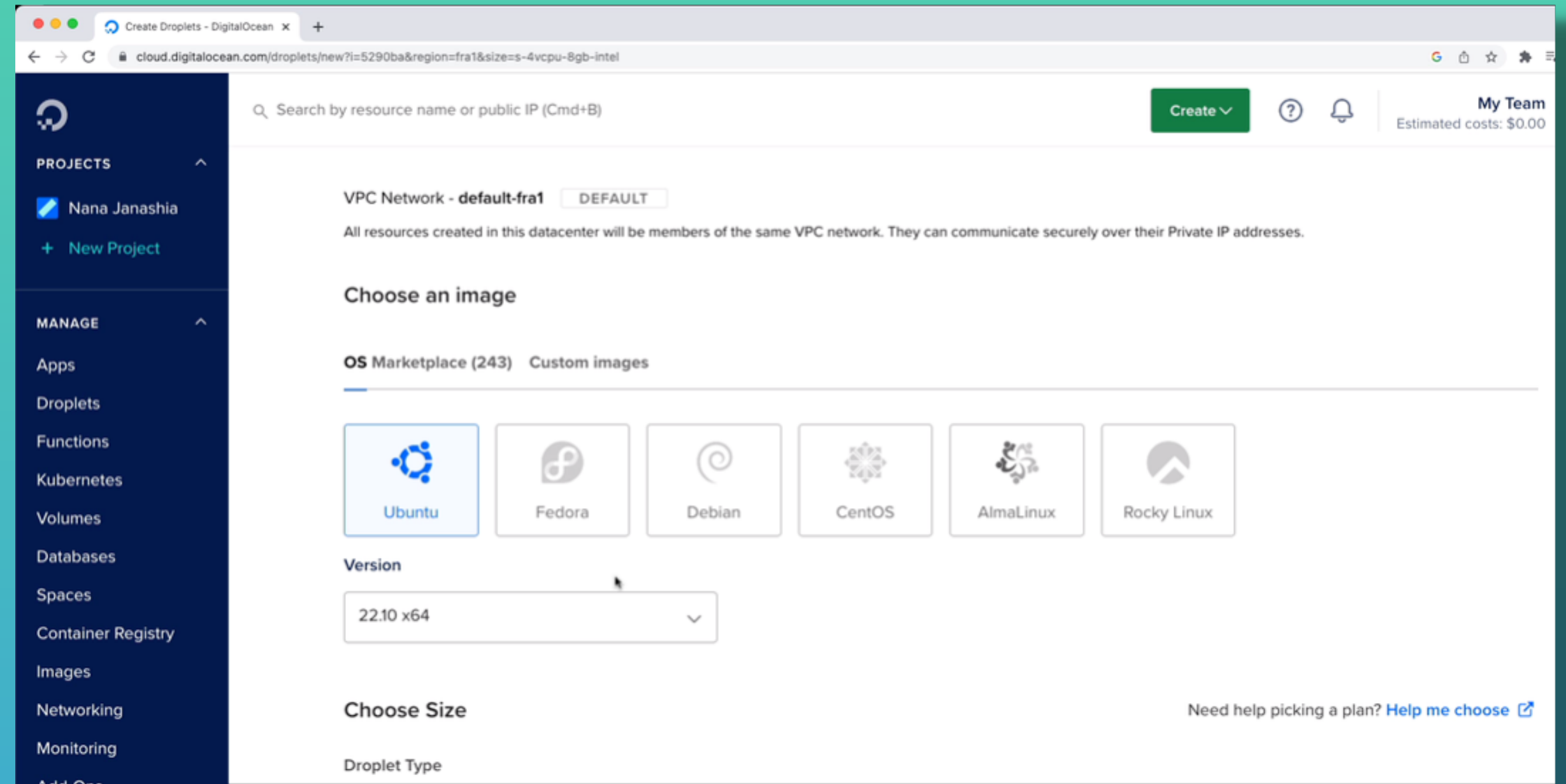
[CREATE VIA COMMAND LINE](#) Create Droplet

Setup Server on DigitalOcean (DO) - 3

to run packaged java application (jar file)

Create a Droplet

- With Linux Ubuntu distribution



Setup Server on DigitalOcean (DO) - 4

to run packaged java application (jar file)

Open SSH port 22

- Open SSH port 22 on the server by creating a new **Firewall configuration**
- **Inbound** Rules = for incoming traffic
- **Outbound** Rules = for outgoing traffic

cloud.digitalocean.com/networking/firewalls/new?i=5290ba

MANAGE

- Apps
- Droplets
- Functions
- Kubernetes
- Volumes
- Databases
- Spaces
- Container Registry
- Images
- Networking
- Monitoring
- Add-Ons

Billing

Support

Settings

API

Search by resource name or public IP (Cmd+B)

Create

My Team

Estimated costs: \$0.00

← Firewalls

Create Firewall

Name

my-droplet-firewall

Inbound Rules

Set the Firewall rules for incoming traffic. Only the specified ports will accept inbound connections. All other traffic will be dropped.

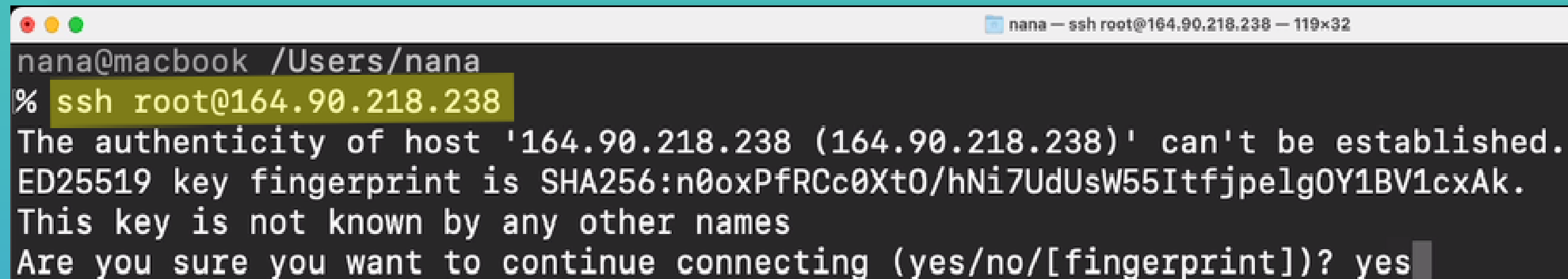
Type	Protocol	Port Range	Sources	
SSH	TCP	22	All IPv4 All IPv6	Delete
New rule				

Setup Server on DigitalOcean (DO) - 5

to run packaged java application (jar file)

SSH into the server

- By using its public IP address

A terminal window titled 'nana — ssh root@164.90.218.238 — 119x32'. The prompt is 'nana@macbook /Users/nana'. The user enters '% ssh root@164.90.218.238'. The terminal displays a warning about host authenticity: 'The authenticity of host '164.90.218.238 (164.90.218.238)' can't be established. ED25519 key fingerprint is SHA256:n0oxPfRCc0Xt0/hNi7UdUsW55ItfjpeIg0Y1BV1cxAk. This key is not known by any other names'. It then asks 'Are you sure you want to continue connecting (yes/no/[fingerprint])?' with 'yes' entered.

```
nana@macbook /Users/nana
% ssh root@164.90.218.238
The authenticity of host '164.90.218.238 (164.90.218.238)' can't be established.
ED25519 key fingerprint is SHA256:n0oxPfRCc0Xt0/hNi7UdUsW55ItfjpeIg0Y1BV1cxAk.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
```

Setup Server on DigitalOcean (DO) - 6

to run packaged java application (jar file)

Install Java

1. Check if java is installed and get **installation commands**

2. **Install java** to run Java applications on it

```
root@ubuntu-s-1vcpu-1gb-fra1-01:~# apt install openjdk-8-jre-headless
```

```
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  ca-certificates-java fontconfig-config fonts-dejavu-core java-common libavahi-client3
  libavahi-common-data libavahi-common3 libcups2 libfontconfig1 libjpeg-turbo8 libjpeg8 liblcms2-2
  libnspr4 libnss3 libpcsclite1 libxi6 libxrender1 libxtst6 x11-common
Suggested packages:
  default-jre cups-common liblcms2-utils pcsd libnss-mdns fonts-dejavu-extra fonts-ipafont-gothic
  fonts-ipafont-mincho fonts-wqy-microhei fonts-wqy-zenhei fonts-indic
The following NEW packages will be installed:
  ca-certificates-java fontconfig-config fonts-dejavu-core java-common libavahi-client3
  libavahi-common-data libavahi-common3 libcups2 libfontconfig1 libjpeg-turbo8 libjpeg8 liblcms2-2
  libnspr4 libnss3 libpcsclite1 libxi6 libxrender1 libxtst6 openjdk-8-jre-headless x11-common
0 upgraded, 20 newly installed, 0 to remove and 16 not upgraded.
Need to get 30.7 MB of archives.
After this operation, 111 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
```

```
root@ubuntu-s-1vcpu-1gb-fra1-01:~# java
```

Command 'java' not found, but can be installed with:

```
apt install openjdk-11-jre-headless # version 11.0.8+10-0ubuntu1~20.04, or
apt install default-jre             # version 2:1.11-72
apt install openjdk-8-jre-headless  # version 8u265-b01-0ubuntu2~20.04
apt install openjdk-13-jre-headless # version 13.0.3+3-1ubuntu2
apt install openjdk-14-jre-headless # version 14.0.1+7-1ubuntu1
```

```
root@ubuntu-s-1vcpu-1gb-fra1-01:~# apt update
```

Run packaged Java Application - 1

on prepared DigitalOcean server



In **real world**, applications will run on a remote server!



Server prepared to run java application

Summary of Steps:

1. **Build jar file**
2. **Copy to remote server**
3. **Run the application**

Run packaged Java Application - 2

on prepared DigitalOcean server

1. Build Jar File

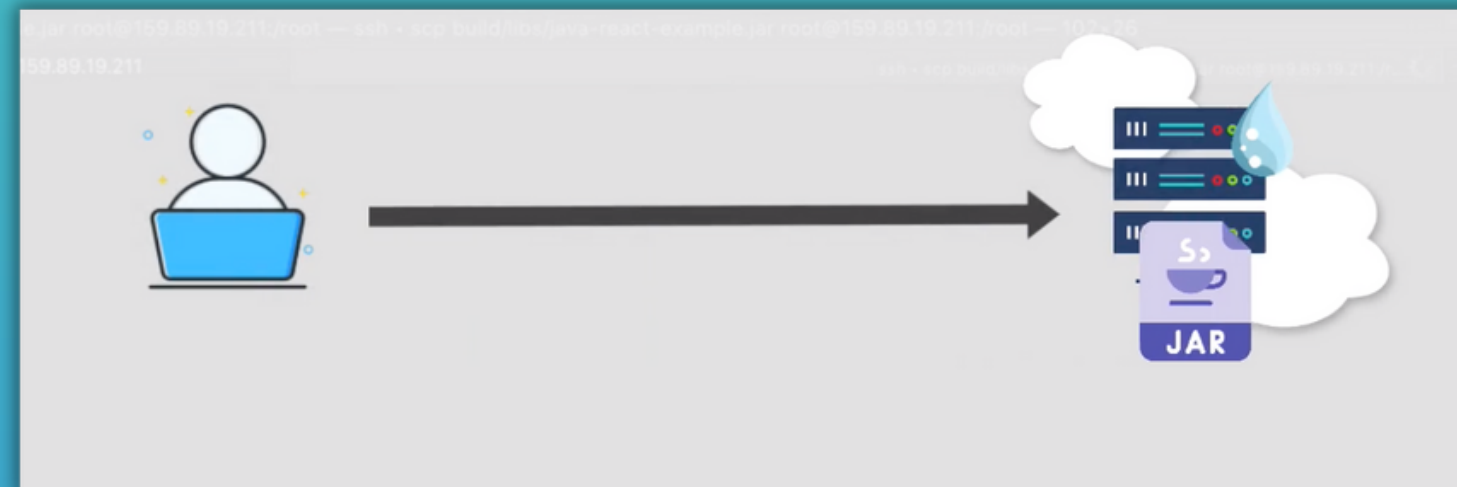
```
nana@macbook /Users/nana/java-react-example  
% gradle build  
  
BUILD SUCCESSFUL in 8s  
7 actionable tasks: 7 executed
```

2. Copy to Remote Server

```
nana@macbook /Users/nana/java-react-example [master]  
% scp build/libs/java-react-example.jar root@164.90.218.238:/root  
java-react-example.jar
```

command .jar file source locally user public IP destination

remote server information



Run packaged Java Application - 3

on prepared DigitalOcean server

3. Run the application

```
nana — root@ubuntu-s-1vcpu-512mb-10gb-fra1-01: ~ — ssh root@164.90.218.238 — 119x31
~ — root@ubuntu-s-1vcpu-512mb-10gb-fra1-01: ~ — ssh root@164.90.218.238
root@ubuntu-s-1vcpu-512mb-10gb-fra1-01:~# ls
java-react-example.jar snap
root@ubuntu-s-1vcpu-512mb-10gb-fra1-01:~# java -jar java-react-example.jar

  ____ _
 / ___ \| | | |
/ /___ \| |_| |
\___)___|_____|
:: Spring Boot :: (v2.7.11)

2023-05-01 17:25:16.636 INFO 5170 --- [main] com.coditrium.sandbox.Application
n using Java 1.8.0_362 on ubuntu-s-1vcpu-512mb-10gb-fra1-01 with PID 5170 (/root/java-react-
in /root)
2023-05-01 17:25:16.649 INFO 5170 --- [main] com.coditrium.sandbox.Application
et, falling back to 1 default profile: "default"
```

Security Best Practices



- **Create separate Linux user on remote server (as you learned in Linux module)**
 - Every cloud platform's configuration for their remote servers is different
 - On a droplet, by default you work with the "root" user
 - Create a new "admin" user
 - Using the "admin" user, create own users for each application you run (e.g. nexus, jenkins, my-app)
- Give it only the permission it needs to run that application
- **Don't work with the root user!**