

Taller 2: Pruebas y lanzamiento

1. Introducción

Este documento presenta el desarrollo del Taller 2 de Ingeniería de Software v, enfocado en la implementación de pipelines CI/CD, pruebas automatizadas y despliegue de microservicios en Kubernetes. El proyecto se basa en una aplicación de e-commerce conformada por seis microservicios principales: `order`, `payment`, `product`, `user`, `favourite` y `shipping`, así como servicios esenciales como `zipkin`, `service discovery` y `cloud-config`.

2. Jenkinsfile y Entornos

Se implementó un Jenkinsfile en el que se definen tres entornos: `dev`, `stage` y `prod`. Cada uno realiza diferentes fases del pipeline como se pidió en el taller, desde el despliegue básico hasta pruebas y lanzamiento. Las herramientas empleadas incluyen Jenkins, Docker, Kubernetes (minikube), Postman (Newman) y Locust.

3. Pipeline por Entorno

3.1 Entorno Dev

Configuración

El entorno Dev despliega los servicios esenciales (zipkin, service discovery, cloud-config) y los microservicios principales usando archivos YAML en Kubernetes.

The screenshot shows the Jenkins Pipeline interface for a project named 'ecommerce'. The pipeline step is titled 'Branch master'. On the left, there's a sidebar with links like Status, Changes, Build with Parameters, Ver Configuración, Stages, GitHub, and Pipeline Syntax. A dropdown menu for 'ENVIRONMENT' is open, showing options 'dev', 'dev' (which is selected), 'stage', and 'prod'. Below this, a 'Builds' section lists several previous builds, each with a status icon, build number, and timestamp. At the bottom of the pipeline step, there are download, copy, and view as plain text buttons.

Salida de consola

```
Started by user Samuel Gutierrez
09:36:15 Connecting to https://api.github.com using SamuelGutierrez24/*****
Obtained Jenkinsfile from 63f4bbb6fb86127c387b490a1f829fib9e0397a8
[Pipeline] Start of Pipeline
[Pipeline] node
[Pipeline] Running on Jenkins in /var/jenkins_home/workspace/Pipeline_master
[Pipeline] {
[Pipeline] stage
[Pipeline] { (Declarative: Checkout SCM)
[Pipeline] checkout
The recommended git tool is: NONE
using credential 4feaae26-8346-4c74-9c12-c546417eadde
Cloning the remote Git repository
Cloning with configured refspecs honoured and without tags
Cloning repository https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git
> git init /var/jenkins_home/workspace/Pipeline_master # timeout=10
Fetching upstream changes from https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git
> git --version # timeout=10
> git --version # 'git version 2.39.5'
using GIT_ASKPASS to set credentials
> git fetch --no-tags --force --progress -- https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git +refs/heads/master:refs/remotes/origin/master # timeout=10
> git config remote.origin.url https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git # timeout=10
> git config --add remote.origin.fetch +refs/heads/master:refs/remotes/origin/master # timeout=10
Avoid second fetch
Checking out Revision 63f4bbb6fb86127c387b490a1f829fib9e0397a8 (master)
> git config core.sparsecheckout # timeout=10
> git checkout -f 63f4bbb6fb86127c387b490a1f829fib9e0397a8 # timeout=10
Commit message: "jenkins32"
> git rev-list --no-walk 63f4bbb6fb86127c387b490a1f829fib9e0397a8 # timeout=10
[Pipeline] }
```

```
[Pipeline] { (Deploy Application Manifests to Minikube)
[Pipeline] dir (hide)
Running in /var/jenkins_home/workspace/Pipeline_master/k8s
[Pipeline] {
[Pipeline] script
[Pipeline] {
[Pipeline] echo
Deploying for environment: dev to namespace: jenkins...
[Pipeline] echo
Applying manifest: zipkin.yml...
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f zipkin.yml -n jenkins
deployment.apps/zipkin created
service/zipkin created
[Pipeline] echo
Applying manifest: service-discovery.yml...
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f service-discovery.yml -n jenkins
deployment.apps/service-discovery created
service/service-discovery created
[Pipeline] echo
Describing Service Discovery deployment...
[Pipeline] sh
+ /usr/local/bin/kubectl describe deployment service-discovery -n jenkins
Name:           service-discovery
Namespace:      jenkins
CreationTimestamp: Sat, 31 May 2025 09:36:45 +0000
Labels:          <none>
Annotations:    deployment.kubernetes.io/revision: 1
Selector:        app=service-discovery
Replicas:        1 desired | 1 updated | 1 total | 0 available | 1 unavailable
StrategyType:   RollingUpdate
MinReadySeconds: 0
RollingUpdateStrategy: 25% max unavailable, 25% max surge
Pod Template:
```

```
[Pipeline] echo
Applying Kubernetes manifest: payment-service.yml
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f payment-service.yml -n jenkins
deployment.apps/payment-service created
service/payment-service created
[Pipeline] echo
Applying Kubernetes manifest: favourite-service.yml
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f favourite-service.yml -n jenkins
deployment.apps/favourite-service created
service/favourite-service created
[Pipeline] echo
All selected application manifests applied for dev.
```

```
[WS-CLEANUP] Deleting project workspace...
[WS-CLEANUP] Deferred wipeout is used...
[WS-CLEANUP] done
[Pipeline] }
[Pipeline] // catchError
[Pipeline] echo
Pipeline completed successfully for environment: dev!
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline
```

GitHub has been notified of this commit's build result

Finished: SUCCESS

Resultado

Todos los pods fueron desplegados exitosamente en Kubernetes.

Este entorno se utiliza para validar el despliegue base sin ejecutar pruebas.

3.2 Entorno Stage

Configuración

Este entorno incluye ejecución de pruebas automatizadas: unitarias en **UserService**, integración en **ProductRepository**, E2E con una colección de Postman y pruebas de estrés con Locust.

Salida de consola

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```
Started by user Samuel Gutierrez
08:18:58 Connecting to https://api.github.com using SamuelGutierrez24/*****
Obtained Jenkinsfile from 63f4bbb6fb86127c387b490a1f829f1b9e0397a8
[Pipeline] Start of Pipeline
[Pipeline] node
Running on Jenkins in /var/jenkins_home/workspace/Pipeline_master
[Pipeline] {
[Pipeline] stage
[Pipeline] { (Declarative: Checkout SCM)
[Pipeline] checkout
The recommended git tool is: NONE
using credential 4feaee26-8346-4c74-9c12-c546417eadde
Cloning the remote Git repository
Cloning with configured refspecs honoured and without tags
Cloning repository https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git
> git init /var/jenkins_home/workspace/Pipeline_master # timeout=10
Fetching upstream changes from https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git
> git --version # timeout=10
> git --version # 'git version 2.39.5'
using GIT_ASKPASS to set credentials
> git fetch --no-tags --force --progress -- https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git +refs/heads/master:refs/remotes/origin/master # timeout=10
> git config remote.origin.url https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git # timeout=10
> git config --add remote.origin.fetch +refs/heads/master:refs/remotes/origin/master # timeout=10
Avoid second fetch
Checking out Revision 63f4bbb6fb86127c387b490a1f829f1b9e0397a8 (master)
> git config core.sparseCheckout # timeout=10
> git checkout -f 63f4bbb6fb86127c387b490a1f829f1b9e0397a8 # timeout=10
Commit message: "Jenkins32"
> git rev-list --no-walk 63f4bbb6fb86127c387b490a1f829f1b9e0397a8 # timeout=10
[Pipeline] }
[Pipeline] // stage
```

Verificamos el ambiente para que se puedan ejecutar todas las pruebas correctamente.

```
Preparing build environment for: stage
[Pipeline] sh
+ mkdir -p /root/bin
[Pipeline] echo
Checking for Java 11 in /root/java11...
[Pipeline] sh
+ [ ! -d /root/java11 ]
[Pipeline] echo
Installing Java 11 to /root/java11...
[Pipeline] sh
+ cd /tmp
+ curl -L -o openjdk-11.tar.gz https://download.java.net/java/GA/jdk11/9/GPL/openjdk-11.0.2_linux-x64_bin.tar.gz
% Total    % Received % Xferd  Average Speed   Time   Time    Time  Current
                                         Dload  Upload   Total Spent    Left  Speed
0     0     0     0     0     0      0  --::-- --::-- --::--     0
0     0     0     0     0     0      0  --::-- --::-- --::--     0
9  178M  9 17.7M  0     0  15.6M    0  0:00:11  0:00:01  0:00:10 15.6M
15  178M 15 27.5M  0     0  12.9M    0  0:00:13  0:00:02  0:00:11 12.9M
25  178M 25 45.4M  0     0  14.4M    0  0:00:12  0:00:03  0:00:09 14.4M
36  178M 36 66.0M  0     0  15.9M    0  0:00:11  0:00:04  0:00:07 15.9M
62  178M 62 112M   0     0  15.7M    0  0:00:11  0:00:07  0:00:04 16.9M
93  178M 93 167M   0     0  16.5M    0  0:00:10  0:00:10  --::-- 18.0M
100 178M 100 178M  0     0  16.6M    0  0:00:10  0:00:10  --::-- 18.7M
+ tar -xzf openjdk-11.tar.gz
+ mkdir -p /root/java11
+ mv jdk-11.0.2/bin jdk-11.0.2/conf jdk-11.0.2/include jdk-11.0.2/jmods jdk-11.0.2/legal jdk-11.0.2/lib jdk-11.0.2/release /root/java11/
+ rm openjdk-11.tar.gz
+ cd -
/var/jenkins_home/workspace/Pipeline_master
[Pipeline] echo
Verifying Java for Maven:
[Pipeline] sh
+ java -version
openjdk version "11.0.2" 2019-01-15
OpenJDK Runtime Environment 18.9 (build 11.0.2+9)
java -version
[Pipeline] sh
+ [ ! -d /root/maven ]
[Pipeline] echo
Installing Maven to /root/maven...
[Pipeline] sh
+ cd /tmp
+ curl -sL https://archive.apache.org/dist/maven/maven-3/3.8.6/binaries/apache-maven-3.8.6-bin.tar.gz -o apache-maven-3.8.6-bin.tar.gz
+ tar -xzf apache-maven-3.8.6-bin.tar.gz
+ mkdir -p /root/maven
+ mv apache-maven-3.8.6/LICENSE apache-maven-3.8.6/NOTICE apache-maven-3.8.6/README.txt apache-maven-3.8.6/bin apache-maven-3.8.6/boot apache-maven-3.8.6/conf apache-maven-3.8.6/lib
/root/maven/
+ rm apache-maven-3.8.6-bin.tar.gz
+ cd -
/var/jenkins_home/workspace/Pipeline_master
[Pipeline] echo
Verifying Maven:
[Pipeline] sh
+ mvn --version
Apache Maven 3.8.6 (84538c9988a25aec085021c365c560670ad80f63)
Maven home: /root/maven
Java version: 11.0.2, vendor: Oracle Corporation, runtime: /root/java11
Default locale: en, platform encoding: UTF-8
OS name: "linux", version: "5.16.7.4-microsoft-standard-wsl2", arch: "amd64", family: "unix"
[Pipeline] echo
Checking for Node.js in /root/nodejs...
[Pipeline] sh
+ [ ! -d /root/nodejs ]
[Pipeline] echo
Installing Node.js to /root/nodejs...
[Pipeline] sh
+ cd /tmp
+ curl -L -o node-v18.19.0-linux-x64.tar.gz https://nodejs.org/dist/v18.19.0/node-v18.19.0-linux-x64.tar.gz
% Total    % Received % Xferd  Average Speed   Time   Time    Time  Current
                                         Dload  Upload   Total Spent    Left  Speed
66 42.6M  66 28.4M  0     0  15.1M    0  0:00:02  0:00:01  0:00:01 15.1M
100 42.6M 100 42.6M  0     0  15.6M    0  0:00:02  0:00:02  --::-- 15.6M
+ tar -xzf node-v18.19.0-linux-x64.tar.gz
```

Desplegamos los manifiestos:

```

Deploying for environment: stage to namespace: jenkins...
[Pipeline] echo
Applying manifest: zipkin.yml...
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f zipkin.yml -n jenkins
deployment.apps/zipkin created
service/zipkin created
[Pipeline] echo
Applying manifest: service-discovery.yml...
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f service-discovery.yml -n jenkins
deployment.apps/service-discovery created
service/service-discovery created
[Pipeline] echo
Describing Service Discovery deployment...
[Pipeline] sh
+ /usr/local/bin/kubectl describe deployment service-discovery -n jenkins
Name:           service-discovery
Namespace:      jenkins
CreationTimestamp: Sat, 31 May 2025 08:21:17 +0000
Labels:          <none>
Annotations:    deployment.kubernetes.io/revision: 1
Selector:        app=service-discovery
Replicas:       1 desired | 1 updated | 1 total | 0 available | 1 unavailable
StrategyType:   RollingUpdate
MinReadySeconds: 0
RollingUpdateStrategy: 25% max unavailable, 25% max surge
Pod Template:
  Labels:  app=service-discovery
  Containers:
    service-discovery:
      Image:      samuelgutierrez24/service-discovery-eCommerce-boot:lastest
      Port:       8761/TCP
      Host Port:  0/TCP
      Limits:
        cpu:      500m
        memory:   1Gi
      Requests:
        cpu:      500m
        memory:   1Gi
  Requests:
  Limits:
  Hash:         f9b79b98-2r2p8
  [Pipeline] echo
Waiting for Service Discovery (label: app=service-discovery) to be ready...
[Pipeline] sh
+ /usr/local/bin/kubectl wait --for=condition=ready pod -l app=service-discovery -n jenkins --timeout=5m
pod/service-discovery-f9b79b98-2r2p8 condition met
[Pipeline] echo
Applying manifest: cloud-config.yml...
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f cloud-config.yml -n jenkins
deployment.apps/cloud-config created
service/cloud-config created
[Pipeline] echo
Waiting for Cloud Config (label: app=cloud-config) to be ready...
[Pipeline] sh
+ /usr/local/bin/kubectl wait --for=condition=ready pod -l app=cloud-config -n jenkins --timeout=5m
pod/cloud-config-959d96874-zh5zs condition met
[Pipeline] echo
Applying manifest: api-gateway.yml...
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f api-gateway.yml -n jenkins
deployment.apps/api-gateway created
service/api-gateway created
[Pipeline] echo
Deploying ALL business services for stage...
[Pipeline] echo
Applying Kubernetes manifest: order-service.yml
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f order-service.yml -n jenkins
deployment.apps/order-service created
service/order-service created
[Pipeline] echo
Applying Kubernetes manifest: payment-service.yml
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f payment-service.yml -n jenkins
deployment.apps/payment-service created

```

Ejecutamos pruebas unitarias y de integración:

```
deployment.apps/shipping-service created
service/shipping-service created
[Pipeline] echo
All selected application manifests applied for stage.
[Pipeline] }
[Pipeline] // script
[Pipeline] }
[Pipeline] // dir
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Run Unit and Integration Tests)
[Pipeline] script
[Pipeline] {
[Pipeline] echo
Running targeted tests for stage environment...
[Pipeline] echo
Running Unit Tests in user-service...
[Pipeline] dir
Running in /var/jenkins_home/workspace/Pipeline_master/user-service
[Pipeline] {
[Pipeline] sh
+ mvn clean test
[INFO] Scanning for projects...
Downloading from central: https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-starter-parent/2.5.7/spring-boot-starter-parent-2.5.7.pom
Progress (1): 2.7/8.6 kB
Progress (1): 5.5/8.6 kB
Progress (1): 8.2/8.6 kB
Progress (1): 8.6 kB

Downloaded from central: https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-starter-parent/2.5.7/spring-boot-starter-parent-2.5.7.pom (8.6 kB at 1.4 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-dependencies/2.5.7/spring-boot-dependencies-2.5.7.pom
Progress (1): 2.7/109 kB
Progress (1): 8.2/109 kB
Progress (1): 11/109 kB
Progress (1): 14/109 kB
Progress (1): 16/109 kB
```

```
[INFO] Tests run: 7, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 5.941 s - in com.selimhorri.app.resource.UserResourceTest
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 7, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 02:39 min
[INFO] Finished at: 2025-05-31T08:27:21Z
[INFO] -----
[Pipeline] }
[Pipeline] // dir
[Pipeline] echo
Running Integration Tests in product-service (skipping its unit tests)...
[Pipeline] dir
Running in /var/jenkins_home/workspace/Pipeline_master/product-service
[Pipeline] {
[Pipeline] sh
+ mvn clean verify -DskipTests
[INFO] Scanning for projects...
[INFO]
[INFO] -----< com.selimhorri:product-service >-----
[INFO] Building product-service 0.1.0
[INFO] -----[ jar ]-----
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-jar-plugin/3.2.0/maven-jar-plugin-3.2.0.pom
Progress (1): 2.7/7.3 kB
Progress (1): 5.5/7.3 kB
Progress (1): 7.3 kB

Downloaded from central: https://repo.maven.anarke.nre/maven2/nre/anarke/maven/nluuin/maven-jar-nluuin/3.2.0/maven-jar-nluuin-3.2.0.nnn (7.3 kB at 15 kB/s)
----->
Progress (1): 2.4/2.6 MB
Progress (1): 2.5/2.6 MB
Progress (1): 2.6/2.6 MB
Progress (1): 2.6/2.6 MB
Progress (1): 2.6/2.6 MB
Progress (1): 2.6/2.6 MB
Progress (1): 2.6 MB

Downloaded from central: https://repo.maven.apache.org/maven2/com/google/guava/guava/28.2-android/guava-28.2-android.jar (2.6 MB at 2.2 MB/s)
[INFO] Replacing main artifact with repackaged archive
[INFO]
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 19.358 s
[INFO] Finished at: 2025-05-31T08:27:43Z
[INFO] -----
[Pipeline] }
[Pipeline] // dir
[Pipeline] echo
Finished Unit and Integration tests for stage.
[Pipeline] }
[Pipeline] // script
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Ejecutar Pruebas E2E)
[Pipeline] script
```

Pruebas E2E:

```
[Pipeline] echo
Ejecutando pruebas E2E desde la carpeta 'E2E test'...
[Pipeline] dir
Running in /var/jenkins_home/workspace/Pipeline_master/E2E test
[Pipeline] {
[Pipeline] sh
+ newman run TestE2E.postman_collection1.json
newman
```

Test E2E

```
✗ users
  ↳ Create User
    POST api-gateway:8080/user-service/api/users [200 OK, 648B, 4s]
    ✓ Status code is 200 (OK)

  ↳ Create Credential
    POST api-gateway:8080/user-service/api/credentials [200 OK, 638B, 450ms]
    ✓ Status code is 200 (OK)

  ↳ get created user
    GET api-gateway:8080/user-service/api/users/5 [200 OK, 648B, 166ms]
    ✓ Status code is 200 (OK)

✗ Products
  ↳ Create Category
    POST api-gateway:8080/product-service/api/categories [200 OK, 407B, 1089ms]
    ✓ Status code is 200 (OK)

  ↳ Create Product
    POST api-gateway:8080/product-service/api/products [200 OK, 459B, 157ms]
    ✓ Status code is 200 (OK)

  ↳ Get category
    GET api-gateway:8080/product-service/api/categories/4 [200 OK, 410B, 660ms]
    ✓ Status code is 200 (OK)
```

✓ Status code is 200 (OK)

✗ User delete

```
  ↳ Delete user
    DELETE api-gateway:8080/user-service/api/users/7 [200 OK, 209B, 172ms]
    ✓ Status code is 200 (OK)
```

↳ Check delete

```
  GET api-gateway:8080/user-service/api/users/7 [500 Internal Server Error, 352B, 479ms]
  ✓ Status code is 500 Internal Server Error
```

	executed	failed
iterations	1	0
requests	29	0
test-scripts	58	0
prerequest-scripts	32	0
assertions	29	0
total run duration:	21.3s	
total data received:	8.29kB (approx)	
average response time:	702ms [min: 17ms, max: 4s, s.d.: 1033ms]	

```
[Pipeline] }
```

```
[Pipeline] // dir
```

```
[Pipeline] echo
```

Pruebas E2E completadas.

```
[Pipeline] }
```

Por ultimo, pruebas de estrés con Locust:

```

Ejecutando pruebas de carga con Locust desde la carpeta 'locust'...
[Pipeline] dir
Running in /var/jenkins_home/workspace/Pipeline_master/locust
[Pipeline] {
[Pipeline] sh
+ ls -l locustfile.py
-rw-r--r-- 1 root root 638 May 31 08:18 locustfile.py
[Pipeline] sh
+ python3 -m locust -f locustfile.py --headless -u 100 -r 20 -t 30s --csv=load_test_report --html=load_test_report.html
[2025-05-31 08:28:14,977] jenkins-7b466f98b6-s9ccg/INFO/locust.main: Starting Locust 2.37.6
[2025-05-31 08:28:14,979] jenkins-7b466f98b6-s9ccg/INFO/locust.main: Run time limit set to 30 seconds
Type      Name                                # reqs    # fails |   Avg     Min     Max     Med |   req/s failures/s
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
Aggregated                                     0        0(0.00%) |   0       0       0       0 |   0.00    0.00

[2025-05-31 08:28:14,980] jenkins-7b466f98b6-s9ccg/INFO/locust.runners: Ramping to 100 users at a rate of 20.00 per second
Type      Name                                # reqs    # fails |   Avg     Min     Max     Med |   req/s failures/s
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
GET      /order-service/api/orders/           10        0(0.00%) | 1399     733    1671    1671 |   0.00    0.00
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
Aggregated                                     10        0(0.00%) | 1399     733    1671    1671 |   0.00    0.00

Type      Name                                # reqs    # fails |   Avg     Min     Max     Med |   req/s failures/s
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
GET      /order-service/api/orders/           17        0(0.00%) | 1274     553    1671    1500 |   0.00    0.00
GET      /payment-service/api/payments/       2         0(0.00%) | 3360    2821    3899    2821 |   0.00    0.00
GET      /product-service/api/products/       14        0(0.00%) | 1179     339    2660    500 |   0.00    0.00
GET      /user-service/api/users/            17        0(0.00%) | 761      350    2063    610 |   0.00    0.00
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
Aggregated                                     50        0(0.00%) | 1156     339    3899    810 |   0.00    0.00

[2025-05-31 08:28:19,075] jenkins-7b466f98b6-s9ccg/INFO/locust.runners: All users spawned: {"MyUser": 100} (100 total users)
Type      Name                                # reqs    # fails |   Avg     Min     Max     Med |   req/s failures/s
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
GET      /order-service/api/orders/           27        0(0.00%) | 1240     553    1829    1500 |   3.00    0.00
GET      /payment-service/api/payments/       10        0(0.00%) | 4009    2577    5319    3800 |   0.00    0.00
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
GET      /order-service/api/orders/           136       0(0.00%) | 832      36    2530    730 |   4.55    0.00
GET      /payment-service/api/payments/       116       0(0.00%) | 3080     131    7124    3400 |   3.88    0.00
GET      /product-service/api/products/       130       0(0.00%) | 331      16    2660    190 |   4.35    0.00
GET      /shipping-service/api/shippings/     110       0(0.00%) | 4475     256    11759   3400 |   3.68    0.00
GET      /user-service/api/users/            128       0(0.00%) | 219      12    2063    110 |   4.29    0.00
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
Aggregated                                     620       0(0.00%) | 1667     12    11759   590 |   20.76   0.00

Response time percentiles (approximated)
Type      Name                                50%    66%    75%    80%    90%    95%    98%    99%    99.9% 99.99% 100% # reqs
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
GET      /order-service/api/orders/           740    1100    1300    1500    1700    1900    2200    2500    2500    2500    136
GET      /payment-service/api/payments/       3400   4300    4700    4900    5600    6000    6500    6700    7100    7100    116
GET      /product-service/api/products/       190    240    300    360    760    1200    2400    2600    2700    2700    130
GET      /shipping-service/api/shippings/     3500   6800    7700    7900    8600    9100    9900   10000   12000   12000   110
GET      /user-service/api/users/            110    190    260    350    550    690    1000   1100    2100    2100    128
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
Aggregated                                     600    1300    2000    3100    5400    7500    8400    8900   12000   12000   12000   620

+ echo Pruebas de Locust completadas. Listando reportes generados:
Pruebas de Locust completadas. Listando reportes generados:
+ ls -la load_test_report.html load_test_report_exceptions.csv load_test_report_failures.csv load_test_report_stats.csv load_test_report_stats_history.csv
-rw-r--r-- 1 root root 1481595 May 31 08:28 load_test_report.html
-rw-r--r-- 1 root root 31 May 31 08:28 load_test_report_exceptions.csv
-rw-r--r-- 1 root root 31 May 31 08:28 load_test_report_failures.csv
-rw-r--r-- 1 root root 1311 May 31 08:28 load_test_report_stats.csv
-rw-r--r-- 1 root root 4992 May 31 08:28 load_test_report_stats_history.csv
[Pipeline] }
[Pipeline] // dir
[Pipeline] }
[Pipeline] // script
Post stage
[Pipeline] echo
Archivando reportes de Locust...
[Pipeline] archiveArtifacts
Archiving artifacts

```

Y termina la pipeline:

```
[WS-CLEANUP] Deleting project workspace...
[WS-CLEANUP] Deferred wipeout is used...
[WS-CLEANUP] done
[Pipeline] }
[Pipeline] // catchError
[Pipeline] echo
Pipeline completed successfully for environment: stage!
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline

GitHub has been notified of this commit's build result

Finished: SUCCESS
```

Resultado

Las pruebas unitarias, de integración, locust y E2E fueron ejecutadas exitosamente.

Análisis

- Las pruebas unitarias validan el controlador de usuario.
 - Las pruebas de integración garantizan la operación sobre la base H2.
 - Las pruebas E2E prueban flujos completos: crear usuario, producto, carrito, orden y pago.
-

3.3 Entorno Prod (Master)

Configuración

Este entorno repite el despliegue y ejecuta pruebas unitarias, de integración y E2E, además de generar Release Notes automáticas en el repositorio Git.

```
Started by user Samuel Gutierrez
09:23:23 Connecting to https://api.github.com using SamuelGutierrez24/*****
Obtained Jenkinsfile from 63f4bbb6fb86127c387b490a1f829f1b9e0397a8
[Pipeline] Start of Pipeline
[Pipeline] node
Running on Jenkins in /var/jenkins_home/workspace/Pipeline_master
[Pipeline] {
[Pipeline] stage
[Pipeline] { (Declarative: Checkout SCM)
[Pipeline] checkout
The recommended git tool is: NONE
using credential 4feaee26-8346-4c74-9c12-c546417eadde
Cloning the remote Git repository
Cloning with configured refspecs honoured and without tags
Cloning repository https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git
> git init /var/jenkins_home/workspace/Pipeline_master # timeout=10
Fetching upstream changes from https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git
> git --version # timeout=10
> git --version # 'git version 2.39.5'
using GIT_ASKPASS to set credentials
> git fetch --no-tags --force --progress -- https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git +refs/heads/master:refs/remotes/origin/master # timeout=10
> git config remote.origin.url https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git # timeout=10
> git config --add remote.origin.fetch refs/heads/master:refs/remotes/origin/master # timeout=10
Avoid second fetch
Checking out Revision 63f4bbb6fb86127c387b490a1f829f1b9e0397a8 (master)
> git config core.sparsecheckout # timeout=10
> git checkout -f 63f4bbb6fb86127c387b490a1f829f1b9e0397a8 # timeout=10
Commit message: "jenkins32"
> git rev-list --no-walk 63f4bbb6fb86127c387b490a1f829f1b9e0397a8 # timeout=10
[Pipeline] }
```

Antes de desplegar los manifiestos verificamos si estos no se estan ejecutando actualmente:

```

Deploying for environment: prod to namespace: jenkins...
[Pipeline] echo
Applying manifest: zipkin.yml...
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f zipkin.yml -n jenkins
deployment.apps/zipkin unchanged
service/zipkin unchanged
[Pipeline] echo
Applying manifest: service-discovery.yml...
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f service-discovery.yml -n jenkins
deployment.apps/service-discovery unchanged
service/service-discovery unchanged
[Pipeline] echo
Describing Service Discovery deployment...
[Pipeline] sh
+ /usr/local/bin/kubectl describe deployment service-discovery -n jenkins
Name:           service-discovery
Namespace:      jenkins
CreationTimestamp: Sat, 31 May 2025 08:21:17 +0000
Labels:         <none>
Annotations:   deployment.kubernetes.io/revision: 1
Selector:       app=service-discovery
Replicas:      1 desired | 1 updated | 1 total | 1 available | 0 unavailable
StrategyType:  RollingUpdate
MinReadySeconds: 0
RollingUpdateStrategy: 25% max unavailable, 25% max surge
Pod Template:
  Labels:  app=service-discovery
  Containers:
    service-discovery:
      Image:      samuelgutierrez24/service-discovery-eCommerce-boot:lastest
      Port:       8761/TCP
      Host Port:  0/TCP

```

```

Getting all pods in namespace jenkins...
[Pipeline] sh
+ /usr/local/bin/kubectl get pods -n jenkins -o wide --show-labels
NAME          READY   STATUS    RESTARTS   AGE     IP           NODE   NOMINATED NODE   READINESS GATES   LABELS
api-gateway-6f498869bb-xts9r   1/1    Running   0          59m    10.244.0.132   minikube   <none>   <none>   app=api-gateway,pod-template-hash=6f498869bb
cloud-config-959d96874-zh5zs   1/1    Running   0          61m    10.244.0.131   minikube   <none>   <none>   app=cloud-config,pod-template-hash=959d96874
favourite-service-7dcf94774-42vfr 1/1    Running   0          59m    10.244.0.137   minikube   <none>   <none>   app=favourite-service,pod-template-hash=7dcf94774
jenkins-7b466f98b6-s9ccg     1/1    Running   8 (68m ago)  31h    10.244.0.128   minikube   <none>   <none>   app=jenkins,pod-template-hash=7b466f98b6
order-service-f096f9975-7k1p7  1/1    Running   0          59m    10.244.0.133   minikube   <none>   <none>   app=order-service,pod-template-hash=f096f9975
payment-service-57776f76c6-smw2k 1/1    Running   0          59m    10.244.0.134   minikube   <none>   <none>   app=payment-service,pod-template-hash=57776f76c6
product-service-54d66c8b8c-crg9g 1/1    Running   0          59m    10.244.0.135   minikube   <none>   <none>   app=product-service,pod-template-hash=54d66c8b8c
service-discovery-f9b79b98-2r2p8  1/1    Running   0          62m    10.244.0.130   minikube   <none>   <none>   app=service-discovery,pod-template-hash=f9b79b98
shipping-service-f4cc546bd-xjx2r  1/1    Running   0          59m    10.244.0.138   minikube   <none>   <none>   app=shipping-service,pod-template-hash=f4cc546bd
user-service-574bc456f7-9km97   1/1    Running   0          59m    10.244.0.136   minikube   <none>   <none>   app=user-service,pod-template-hash=574bc456f7
zipkin-5645ddcf4b-Slrbv        1/1    Running   0          62m    10.244.0.129   minikube   <none>   <none>   app=zipkin,pod-template-hash=5645ddcf4b
[Pipeline] echo
Waiting for Service Discovery (label: app=service-discovery) to be ready...
[Pipeline] sh
+ /usr/local/bin/kubectl wait --for=condition=ready pod -l app=service-discovery -n jenkins --timeout=5m
pod/service-discovery-f9b79b98-2r2p8 condition met
[Pipeline] echo
Applying manifest: cloud-config.yml...
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f cloud-config.yml -n jenkins
deployment.apps/cloud-config unchanged
service/cloud-config unchanged
[Pipeline] echo
Waiting for Cloud Config (label: app=cloud-config) to be ready...
[Pipeline] sh
+ /usr/local/bin/kubectl wait --for=condition=ready pod -l app=cloud-config -n jenkins --timeout=5m
pod/cloud-config-959d96874-zh5zs condition met
[Pipeline] echo
Applying manifest: api-gateway.yml...
[Pipeline] sh
+ /usr/local/bin/kubectl apply -f api-gateway.yml -n jenkins

```

Realizamos pruebas unitarias y de integración:

```
[INFO] Results:  
[INFO]  
[INFO] Tests run: 7, Failures: 0, Errors: 0, Skipped: 0  
[INFO]  
[INFO] -----  
[INFO] BUILD SUCCESS  
[INFO] -----  
[INFO] Total time: 17.531 s  
[INFO] Finished at: 2025-05-31T09:24:31Z  
[INFO] -----  
[Pipeline] }  
[Pipeline] // dir  
[Pipeline] echo  
Running Integration Tests in product-service (skipping its unit tests)...  
[Pipeline] dir  
Running in /var/jenkins_home/workspace/Pipeline_master/product-service  
[Pipeline] s  
[INFO]  
[INFO] --- spring-boot-maven-plugin:2.5.7:repackage (repackage) @ product-service ---  
[INFO] Replacing main artifact with repackaged archive  
[INFO] -----  
[INFO] BUILD SUCCESS  
[INFO] -----  
[INFO] Total time: 7.966 s  
[INFO] Finished at: 2025-05-31T09:24:41Z  
[INFO] -----  
[Pipeline] }  
[Pipeline] // dir  
[Pipeline] echo  
Finished Unit and Integration tests for prod.  
[Pipeline] }  
[Pipeline] // script
```

Ejecutamos E2E:

```

↳ GET /favourites
  GET api-gateway:8080/favourite-service/api/favourites/find [200 OK, 671B, 38ms]
    ✓ Status code is 200 (OK)

  □ User delete
    ↳ Delete user
      DELETE api-gateway:8080/user-service/api/users/10 [200 OK, 209B, 23ms]
        ✓ Status code is 200 (OK)

  ↳ Check delete
    GET api-gateway:8080/user-service/api/users/10 [500 Internal Server Error, 353B, 19ms]
      ✓ Status code is 500 Internal Server Error

```

	executed	failed
iterations	1	0
requests	29	0
test-scripts	58	0
prerequest-scripts	32	0
assertions	29	0
total run duration:	1938ms	
total data received:	8.27kB (approx)	
average response time:	34ms [min: 8ms, max: 152ms, s.d.: 35ms]	

Generamos Release Notes:

```

Generating Release Notes for PROD environment...
[Pipeline] sh
Current directory: /var/jenkins_home/workspace/Pipeline_master
Verifying Git and GitHub CLI versions...
git version 2.39.5
gh version 2.74.0 (2025-05-29)
https://github.com/cli/cli/releases/tag/v2.74.0
Configuring Git with user: Jenkins CI and email: jenkins-ci@ecommerce.com
Configuring Git to use GitHub token for authentication with github.com...
Creating Git tag: v2025.05.31.0924
Pushing Git tag v2025.05.31.0924 to remote repository 'origin'...
To https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app.git
 * [new tag]          v2025.05.31.0924 -> v2025.05.31.0924
Creating formatted release notes file...
Creating GitHub release for tag v2025.05.31.0924 with title ' Production Release v2025.05.31.0924'...
https://github.com/SamuelGutierrez24/ecommerce-microservice-backend-app/releases/tag/v2025.05.31.0924
Successfully created GitHub release for tag v2025.05.31.0924.
cannot use `--web` with `--json`
Release URL:
[Pipeline] echo
Release notes generation stage completed for tag v2025.05.31.0924.

```

Quedan desplegadas en el repositorio de github:

E-Commerce Microservices Backend - Production Release

Release Information

- Version: v2025.05.31.0924
- Release Date: May 31, 2025 at 09:24
- Environment: Production
- Build Number: [SelimHorri#35](#)

Architecture Overview

This release includes the complete microservices architecture:

Core Infrastructure Services

- Service Discovery - Eureka service registry
- Cloud Config - Centralized configuration management
- API Gateway - Single entry point for all services
- Zipkin - Distributed tracing and monitoring

Business Services

- User Service - User management and authentication
- Product Service - Product catalog and inventory
- Order Service - Order processing and management
- Payment Service - Payment processing
- Favourite Service - User favorites management

Quality Assurance

This release has been thoroughly tested with:

- Unit Tests (user-service)

Resultado

Despliegue exitoso, pruebas unitarias, de integración y E2E realizadas y release notes generadas.

4. Análisis de rendimiento locust fuera de la pipeline

Durante las pruebas de rendimiento se simularon **80 usuarios concurrentes**, con una tasa de llegada de **4 usuarios por segundo**.

LOCUST											Host http://localhost:8080	Status STOPPED	RPS 18.3	Failures 42%	NEW	RESET	⚙️
STATISTICS		CHARTS		FAILURES		EXCEPTIONS		CURRENT RATIO		DOWNLOAD DATA		LOGS	LOCUST CLOUD				
Type	Name	# Requests	# Fails	Median (ms)	95%ile (ms)	99%ile (ms)	Average (ms)	Min (ms)	Max (ms)	Average size (bytes)	Current RPS	Current Failures/s					
GET	/order-service/api/orders/	111	0	26	9600	13000	1031.19	11	17675	779	2.5	0					
GET	/payment-service/api/payments/	134	1	78	21000	23000	2738.19	35	30009	959.78	2.7	0					
GET	/product-service/api/products/	117	117	2700	9100	18000	3438	105	19034	223.05	2.9	2.9					
GET	/shipping-service/api/shippings/	155	155	7800	11000	30000	6638.35	20	30011	133.26	7	7					
GET	/user-service/api/users/	142	1	36	13000	20000	1428.46	14	30009	2291.75	3.2	0					
Aggregated		659	274	140	14000	22000	3210.03	11	30011	891.14	18.3	9.9					

Métricas observadas:

- Total de solicitudes:** 659
- Tasa de errores:** 42% (274 fallos)
- Promedio de throughput (RPS):** 18.3 solicitudes por segundo
- Pico de RPS:** 21
- Tiempos de respuesta promedio por servicio:**
 - /payment-service/api/payments: 2738 ms
 - /shipping-service/api/shippings: 6638 ms
 - /product-service/api/products: 3438 ms
 - /user-service/api/users: 1428 ms
 - /order-service/api/orders: 1031 ms

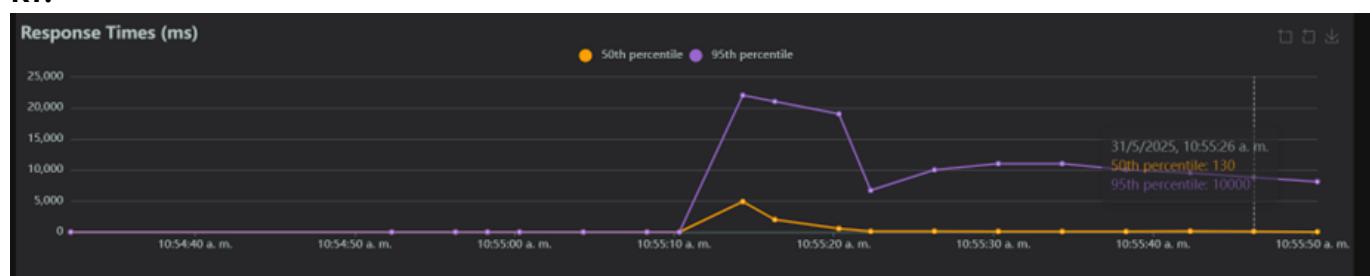
Análisis gráfico:

LOCUST																		
STATISTICS		CHARTS		FAILURES		EXCEPTIONS		CURRENT RATIO		DOWNLOAD DATA		Host http://localhost:8080	Status STOPPED	RPS 18.3	Failures 42%	NEW	RESET	⚙️
Type	Name	# Requests	# Fails	Median (ms)	95%ile (ms)	99%ile (ms)	Average (ms)	Min (ms)	Max (ms)	Average size (bytes)	Current RPS							
GET	/order-service/api/orders/	111	0	26	9600	13000	1031.19	11	17675	779	2.5	0						
GET	/payment-service/api/payments/	134	1	78	21000	23000	2738.19	35	30009	959.78	2.7	0						
GET	/product-service/api/products/	117	117	2700	9100	18000	3438	105	19034	223.05	2.9	2.9						
GET	/shipping-service/api/shippings/	155	155	7800	11000	30000	6638.35	20	30011	133.26	7	7						
GET	/user-service/api/users/	142	1	36	13000	20000	1428.46	14	30009	2291.75	3.2	0						
Aggregated		659	274	140	14000	22000	3210.03	11	30011	891.14	18.3	9.9						

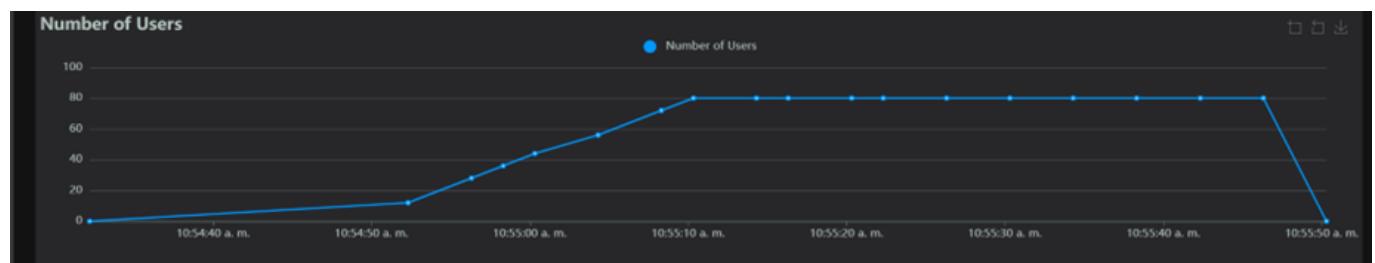
RPS:



RT:



Usuarios:



- La gráfica de RPS muestra un crecimiento progresivo hasta alcanzar un pico de 21 req/s, estabilizándose cerca de los 18.
- La línea de fallos por segundo crece de manera proporcional, lo que indica que algunos servicios presentan **problemas de estabilidad o cuellos de botella bajo carga.
- La gráfica de percentiles de respuesta revela que el percentil 95 alcanzó hasta 22 segundos, siendo los picos más altos entre los segundos 10 y 25 del test. El percentil 50 se mantuvo bajo, alrededor de 130 ms, indicando que algunos usuarios experimentaron respuestas aceptables, pero hubo mucha variabilidad.
- La gráfica de **número de usuarios** muestra cómo se alcanzó y mantuvo la carga máxima de 80 usuarios durante el test.

Conclusión:

El sistema es capaz de manejar una carga moderada, pero **bajo condiciones de estrés presenta una tasa de error significativa**, especialmente en los servicios de shipping y payment, cuyos tiempos de respuesta y porcentaje de fallos fueron los más altos.

5. Release Notes

A continuación, se presenta un ejemplo de notas generadas automáticamente por el pipeline:

 Production Release v2025.05.31.0924 Latest

SamuelGutierrez24 released this 6 minutes ago v2025.05.31.0... -o- 63f4bbb

E-Commerce Microservices Backend - Production Release

Release Information

- Version: v2025.05.31.0924
- Release Date: May 31, 2025 at 09:24
- Environment: Production
- Build Number: [SelimHorri#35](#)

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- Payment Service - Payment processing
- Favourite Service - User favorites management

Quality Assurance

This release has been thoroughly tested with:

- Unit Tests (user-service)

6. Conclusiones

Se logró automatizar el ciclo completo de desarrollo, pruebas y despliegue de la aplicación de e-commerce. Las pruebas garantizan la calidad del sistema, y el uso de pipelines mejora la eficiencia del equipo de desarrollo.

7. Anexos

Se Adjunta todo el proyecto en un .zip.
