

## Section 1: Selling CI/CD to your Team/Organization

Continuous integration, delivery and deployment (CI/CD) have enabled many organizations to release on a more frequent basis without compromising on quality. With CI/CD, code changes are shepherded through an automated pipeline that handles the repetitive build, test and deployment tasks and alerts you about any issues.

### **Faster time to market:**

The primary goal of a CI/CD pipeline is to deliver working software to users quickly and frequently.

Understanding your users' needs, coming up with innovative features, and turning them into robust code is not necessarily enough if your competition is moving more quickly. With an automated CI/CD pipeline you can ship changes weekly, daily or even hourly

### **Better code quality**

Automating tests ensures they are performed consistently, making the results more reliable. Because automated tests are quicker to run than their manual equivalents, it becomes feasible to test much more frequently.

Testing your code regularly and thoroughly means you'll discover bugs sooner, making it easier to fix them as less functionality has been built on top of them. Over time this results in better quality code.

### **Faster bug fixes**

Even with improved code quality thanks to automated testing, bugs will still occasionally sneak their way through to production. If you're committing changes regularly and shipping frequently, each release to production will contain a relatively small number of code changes, making it much easier to identify the cause of an issue. As your commits are more granular, if you decide to back out the change, you're less likely to take other useful changes with it.

When it's urgent to get a fix out to production, it can be tempting to skimp on manual testing in order to save time, despite the risk of introducing a new failure to production. With a CI/CD pipeline, running automated tests is no longer a significant overhead, so there's less temptation to compromise on quality.

### **Reduce costs And increase revenue for businesses**

CI/CD helps to accelerate the product release process leading to lower development costs

CI/CD helps to continuously integrate and continuously deliver to help products keep up with market trends, thus helping to increase revenue

CI/CD helps to quickly deploy the infrastructure, so it avoids errors when manually deploying, leading to saving production costs.

CI/CD helps the error correction process take place quickly, so it saves production costs.

...

## Section 2&3: Deploying Working, Trustworthy Software & Turn Errors into Sirens

Public Url to GitHub repository [URL01]:

<https://github.com/TUANTA256/udapeople-final>

Public URL for your S3 Bucket [URL02]:

<http://udapeople-001b6e2.s3-website-us-east-1.amazonaws.com>

### 1. Build Jobs that failed because of compile errors (SCREENSHOT01)

```
▶ ✓ Checkout code

▶ ✓ Restoring cache

▼ ! Back-end build
26 found 641 vulnerabilities (2 low, 144 moderate, 370 high, 125 critical)
27   run 'npm audit fix' to fix them, or 'npm audit' for details
28
29 > glee2@1.0.0 build /home/circleci/project/backend
30 > tsc
31
32 src/main.ts:31:21 - error TS1005: ',', expected.
33
34 31   .addBearerAuth()x // here is an intentional compile error. Remove the "x" and the backend should compile.
35    ~
36
37 src/main.ts:32:5 - error TS1128: Declaration or statement expected.
38
39 32   .build();
40    ~
41
42
43 Found 2 errors.
44
45 npm ERR! code ELIFECYCLE
46 npm ERR! errno 2
47 npm ERR! glee2@1.0.0 build: `tsc`
48 npm ERR! Exit status 2
49 npm ERR!
50 npm ERR! Failed at the glee2@1.0.0 build script.
51 npm ERR! This is probably not a problem with npm. There is likely additional logging output above.
52
53 npm ERR! A complete log of this run can be found in:
54 npm ERR!     /home/circleci/.npm/_logs/2022-09-25T19_46_45_560Z-debug.log
55
56
57 Exited with code exit status 2
58 CircleCI received exit code 2
```

## 2. Failed unit tests (SCREENSHOT02):

▶ Restoring cache

0s

▼ Run back-end test

54s

268	status	71.43	100	100	80
269	status.controller.ts	100	100	100	100
270	status.module.ts	0	100	100	0

Summary of all failing tests

FAIL src/modules/domain/employees/commands/handlers/employee-activator.handler.spec.ts

• Employee Remover › when a user activates an employee › should activate the employee from the repository

expect(jest.fn()).toBeCalledWith(...expected)

Expected: 100

Received: 101

Number of calls: 1

33 |  
34 | // Assert  
35 | expect(employeeRepository.findById).toBeCalledWith(100);  
36 | expect(employeeRepository.save).toBeCalled();  
37 | });  
38 | });

at src/modules/domain/employees/commands/handlers/employee-activator.handler.spec.ts:35:43

at fulfilled (src/modules/domain/employees/commands/handlers/employee-activator.handler.spec.ts:5:58)

▶ Restoring cache

0s

▼ Run front-end test

1m 14s

117	index.tsx	0	0	0	0	... 44,247,257,262
118	containers/Employee/components/ViewEmployee	0	0	0	0	
119	index.tsx	0	0	0	0	... 95,498,508,513
120	containers/Employee/models	0	0	0	0	
121	EmployeeModel.ts	0	0	0	0	1,2,3,6,7,8,66,67
122	index.ts	0	100	100	0	1
123	containers/Employee/reducer	38.89	33.33	37.5	38.89	
124	employees.ts	50	33.33	42.86	50	... 28,29,30,36,62
125	sampleData.ts	0	100	0	0	1,4,7,32
126	containers/Employee/services	30	0	10	30.77	
127	employees.ts	30	0	10	30.77	... 50,54,57,61,62

Test Suites: 1 failed, 4 passed, 5 total

Tests: 1 failed, 11 passed, 12 total

Snapshots: 0 total

Time: 49.084s

Ran all test suites.

npm ERR! code ELIFECYCLE

npm ERR! errno 1

npm ERR! typescript-react-redux-boilerplate@1.0.0 test: `jest`

npm ERR! Exit status 1

npm ERR!

npm ERR! Failed at the typescript-react-redux-boilerplate@1.0.0 test script.

npm ERR! This is probably not a problem with npm. There is likely additional logging output above.

npm ERR! A complete log of this run can be found in:

npm ERR! /home/circleci/.npm/\_logs/2022-07-02T16:19:50.218Z-debug.log

### 3. Job that failed because of vulnerable packages (SCREENSHOT03):

Scan frontend25s

Your output is too large to display in the browser.  
Only the last 400000 characters are displayed.

Download the full output as a file

5581

Information to an unauthorized actor

5582

5583

Package

node-fetch

5584

5585

Patched in

>=2.6.7

5586

5587

Dependency of

react-foundation

5588

5589

Path

react-foundation > fbjs > isomorphic-fetch > node-fetch

5590

5591

More info

<https://github.com/advisories/GHSA-r683-j2x4-v87g>

5592

5593

5594

Low

The 'size' option isn't honored after following a redirect in node-fetch

5595

5596

5597

Package

node-fetch

5598

5599

Patched in

>=2.6.1

5600

5601

Dependency of

react-foundation

5602

5603

Path

react-foundation > fbjs > isomorphic-fetch > node-fetch

5604

Scan backend26s

Your output is too large to display in the browser.  
Only the last 400000 characters are displayed.

Download the full output as a file

5559

High

Crash in Headerrarser in dicer

5560

5561

Package

dicer

5562

5563

Patched in

No patch available

5564

5565

Dependency of

@nestjs/platform-express

5566

5567

Path

@nestjs/platform-express > multer > busboy > dicer

5568

5569

More info

<https://github.com/advisories/GHSA-wm7h-9275-46v2>

5570

5571

5572

Moderate

Got allows a redirect to a UNIX socket

5573

5574

Package

got

5575

5576

Patched in

>=11.8.5

5577

5578

Dependency of

nodemon [dev]

5579

5580

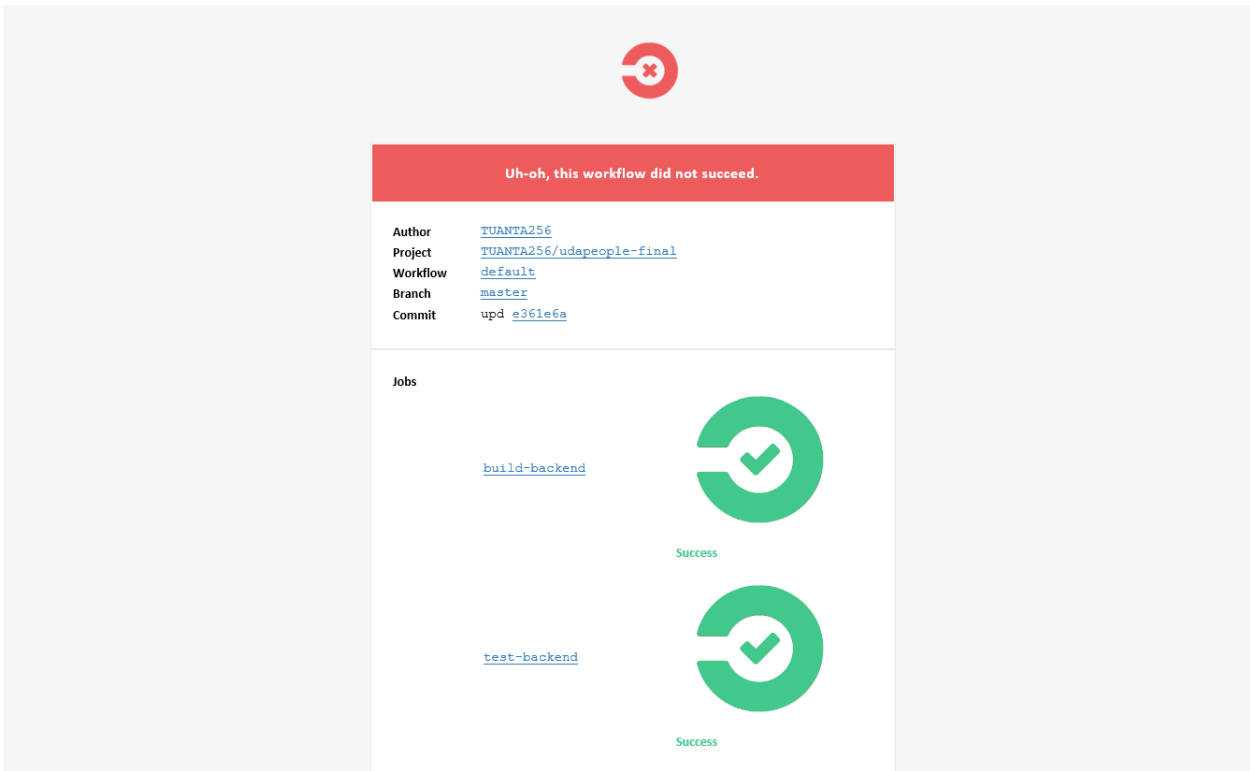
Path


nodemon > update-notifier > latest-version > package-json > got

5581

5582

#### 4. An alert from one of your failed builds (SCREENSHOT04):







Uh-oh, this workflow did not succeed.

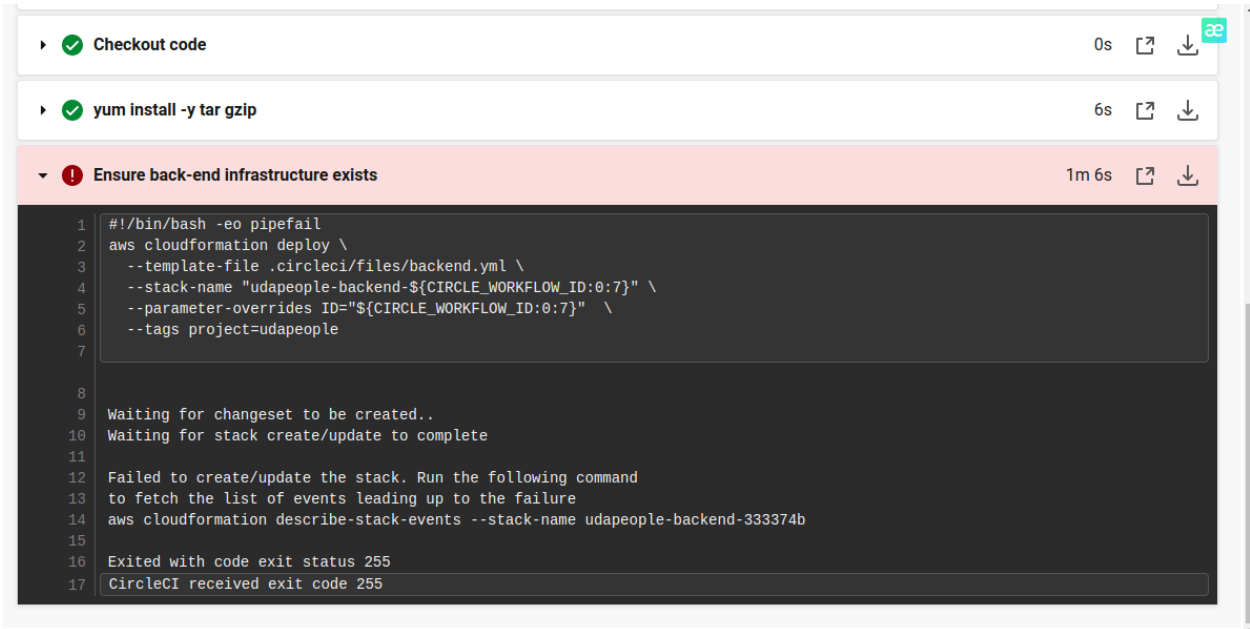
Author [TUANTA256](#)  
Project [TUANTA256/udapeople-final](#)  
Workflow [default](#)  
Branch [master](#)  
Commit upd [e361e6a](#)

Jobs

[build-backend](#)   
Success

[test-backend](#)   
Success

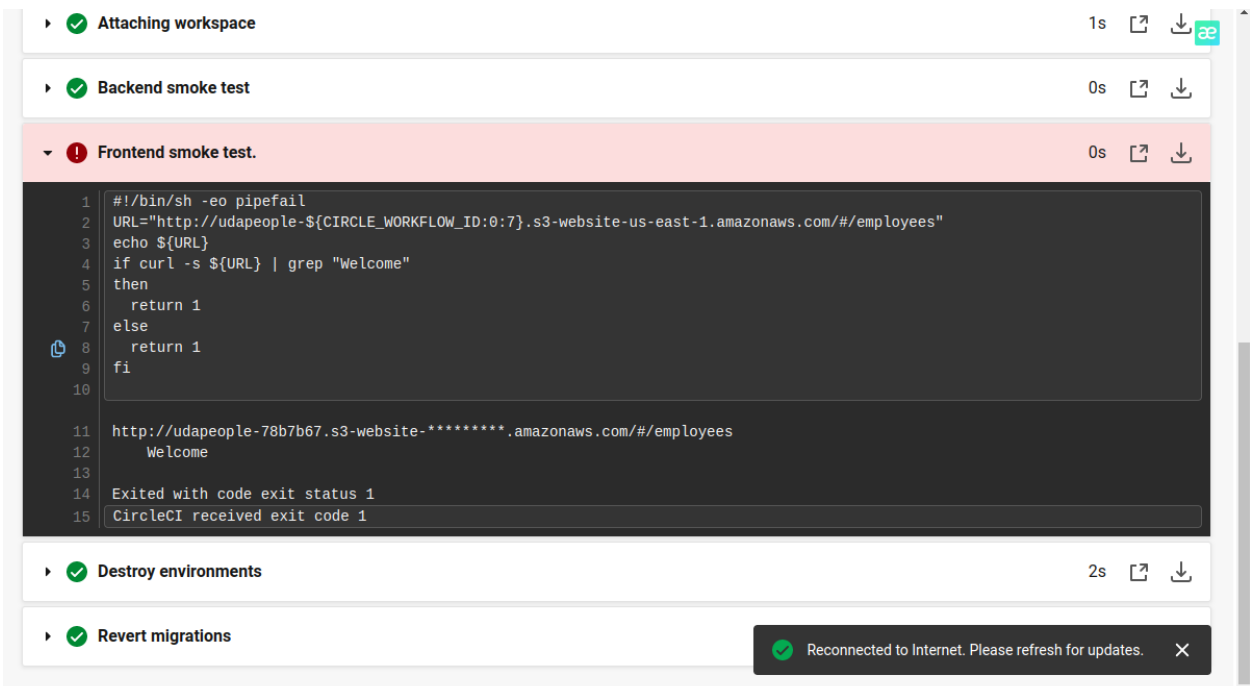
## 5. Appropriate job failure for infrastructure creation (SCREENSHOT05):



The screenshot displays a CircleCI job log with the following steps and output:

- Checkout code**: 0s, successful.
- yum install -y tar gzip**: 6s, successful.
- Ensure back-end infrastructure exists**: 1m 6s, failed. The output shows a shell script attempting to deploy an AWS CloudFormation stack. It fails with the message: "Failed to create/update the stack. Run the following command to fetch the list of events leading up to the failure: aws cloudformation describe-stack-events --stack-name udapeople-backend-333374b". The script exits with status 255, and CircleCI receives this exit code.

## 6. Appropriate job failure for the smoke test job (SCREENSHOT06):



The screenshot displays a CircleCI job log with the following steps and output:

- Attaching workspace**: 1s, successful.
- Backend smoke test**: 0s, successful.
- Frontend smoke test.**: 0s, failed. The output shows a shell script attempting to perform a smoke test on a website. It fails with the message: "Exited with code exit status 1". The script exits with status 1, and CircleCI receives this exit code.
- Destroy environments**: 2s, successful.
- Revert migrations**: successful.

A notification at the bottom right states: "Reconnected to Internet. Please refresh for updates."

## 7. Successful rollback after a failed smoke test (SCREENSHOT07):

```
▼ Destroy environments 2s [?] [↓]

1  #!/bin/bash -eo pipefail
2  echo "Destroying environment: ${CIRCLE_WORKFLOW_ID:0:7} "
3  aws s3 rm s3://udapeople-${CIRCLE_WORKFLOW_ID:0:7} --recursive
4  aws cloudformation delete-stack --stack-name udapeople-backend-${CIRCLE_WORKFLOW_ID:0:7}
5  aws cloudformation delete-stack --stack-name udapeople-frontend-${CIRCLE_WORKFLOW_ID:0:7}
6
7  Destroying environment: 4ebdf09
8  delete: s3://udapeople-4ebdf09/2fa692cd55bfc83c228c0ab271e4388c.woff
9  delete: s3://udapeople-4ebdf09/224b6d9d16679dab02826a2a7ea705eb.ttf
10 delete: s3://udapeople-4ebdf09/1ceff9123b6b50a7d3cb5b221160855.eot
11 delete: s3://udapeople-4ebdf09/index.html
12 delete: s3://udapeople-4ebdf09/bundle.js
13 delete: s3://udapeople-4ebdf09/49fd505d9ce8ccc832ae.js
14 delete: s3://udapeople-4ebdf09/images/6ab15f4239b7d187935cf6f4ec3313bf-kiwi.svg
15 delete: s3://udapeople-4ebdf09/7d234c755f55c47d2c5a.js
16 CircleCI received exit code 0

▼ Revert migrations 0s [?] [↓]

1  #!/bin/bash -eo pipefail
2  SUCCESS=$(curl -k https://kvdb.io/6h9wBbrfcMHfrSxfsDx2/migration_${CIRCLE_WORKFLOW_ID:0:7})
3  echo $SUCCESS
4
5  if(( $SUCCESS==1 ));
6  then
7      cd ~/project/backend
8      npm install
9      npm run migrations:revert
10 fi
11
12 % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
13      Dload  Upload   Total   Spent    Left   Speed
14 100    1  100    1    0    0    8    0 --:--:-- --:--:-- --:--:--    8
15 0
16 CircleCI received exit code 0
```

## 8. Successful promotion job (SCREENSHOT08):

```
► Spin up environment 5s [?] [↓]
► Preparing environment variables 0s [?] [↓]
► Checkout code 0s [?] [↓]
► Install dependencies 9s [?] [↓]
▼ Update cloudfront distribution 4m 12s [?] [↓]

1  #!/bin/bash -eo pipefail
2
3  aws cloudformation deploy \
4  --template-file .circleci/files/cloudfront.yml \
5  --stack-name InitialStack \
6  --parameter-overrides WorkflowID="${CIRCLE_WORKFLOW_ID:0:7}" \
7  --tags project=udapeople
8
9  echo workflow id: "${CIRCLE_WORKFLOW_ID:0:7}"
10
11
12 Waiting for changeset to be created..
13 Waiting for stack create/update to complete
14 Successfully created/updated stack - InitialStack
15 workflow id: 001b6e2
16 CircleCI received exit code 0
```

## 9. Successful cleanup job (SCREENSHOT09):

```
Remove old stacks and files 3s
```

```
1  #!/bin/bash -eo pipefail
2  export OldWorkflowID="$(cat ~/OldWorkflowID.txt)"
3  echo OldWorkflowID: "${OldWorkflowID}"
4  echo CIRCLE_WORKFLOW_ID "${CIRCLE_WORKFLOW_ID:0:7}"
5  # Fetch the stack names
6  export STACKS=$(aws cloudformation list-stacks --query "StackSummaries[*].StackName" \
7    --stack-status-filter CREATE_COMPLETE --no-paginate --output text)
8  echo Stack names: "${STACKS[@]}"
9  if [[ "udapeople-${CIRCLE_WORKFLOW_ID:0:7}" != "${OldWorkflowID}" ]]
10 then
11   aws s3 rm "s3://udapeople-${OldWorkflowID}" --recursive
12   aws cloudformation delete-stack --stack-name "udapeople-frontend-${OldWorkflowID}"
13   aws cloudformation delete-stack --stack-name "udapeople-backend-${OldWorkflowID}"
14 fi
15
16 OldWorkflowID: 3ddf087
17 CIRCLE_WORKFLOW_ID 476c750
18 Stack names: udapeople-frontend-476c750 udapeople-backend-476c750 udapeople-frontend-3ddf087 udapeople-backend-3ddf087
19 delete: s3://udapeople-3ddf087/2fa692cd55bfc83c228c0ab271e4388c.woff
20 delete: s3://udapeople-3ddf087/224b6d9d16679dab02826a2a7ea705eb.ttf
21 delete: s3://udapeople-3ddf087/1ceff9123b66b50a7d3cb5b221160855.eot
22 delete: s3://udapeople-3ddf087/7d234c755f55c47d2c5a.js
23 delete: s3://udapeople-3ddf087/34251533a768eb37d3df.js
24 delete: s3://udapeople-3ddf087/images/6ab15f4239b7d187935cf6f4ec3313bf-kiwi.svg
25 delete: s3://udapeople-3ddf087/index.html
26 delete: s3://udapeople-3ddf087/bundle.js
27 CircleCI received exit code 0
```



10. Only deploy on pushed to master branch (SCREENSHOT10):

Dashboard

Project

Branch

Workflow

All Pipelines

>

udapeople-final

>

dev

>

default

default

Success

Duration / Finished

Branch

Commit

Author

🕒 1m 52s / 21s ago

🧑 dev

🔑 e361e6a

👤 TUANTA256

✓ build-frontend

31s

✓ build-backend

31s

✓ scan-frontend

56s

✓ test-frontend

1m 15s

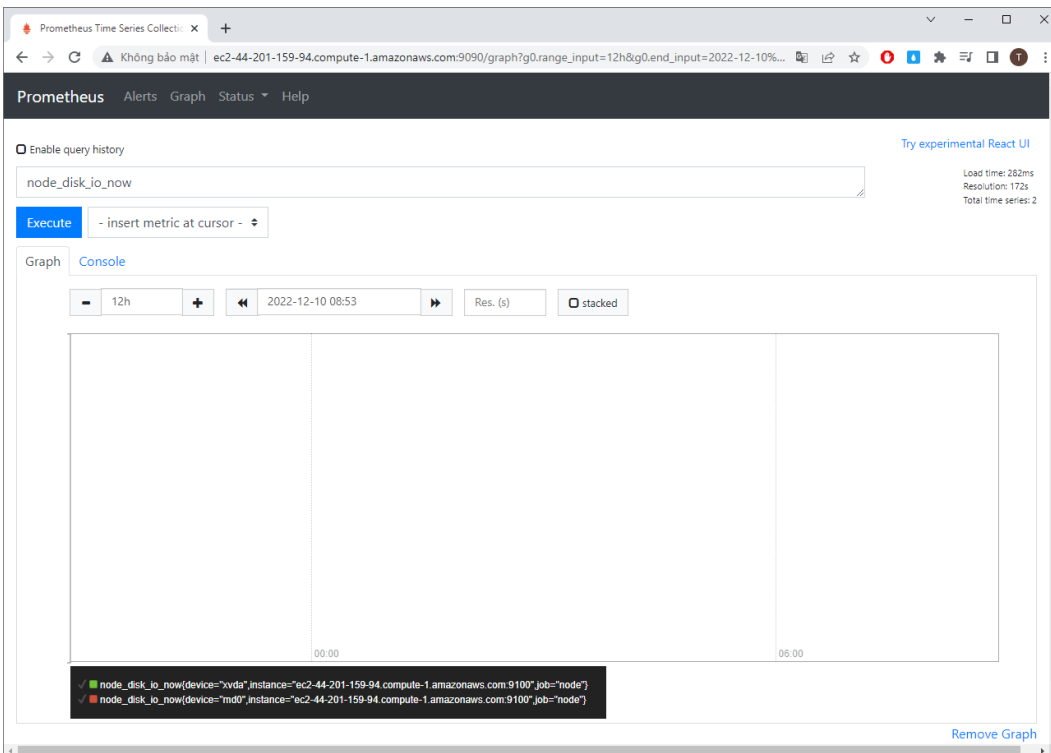
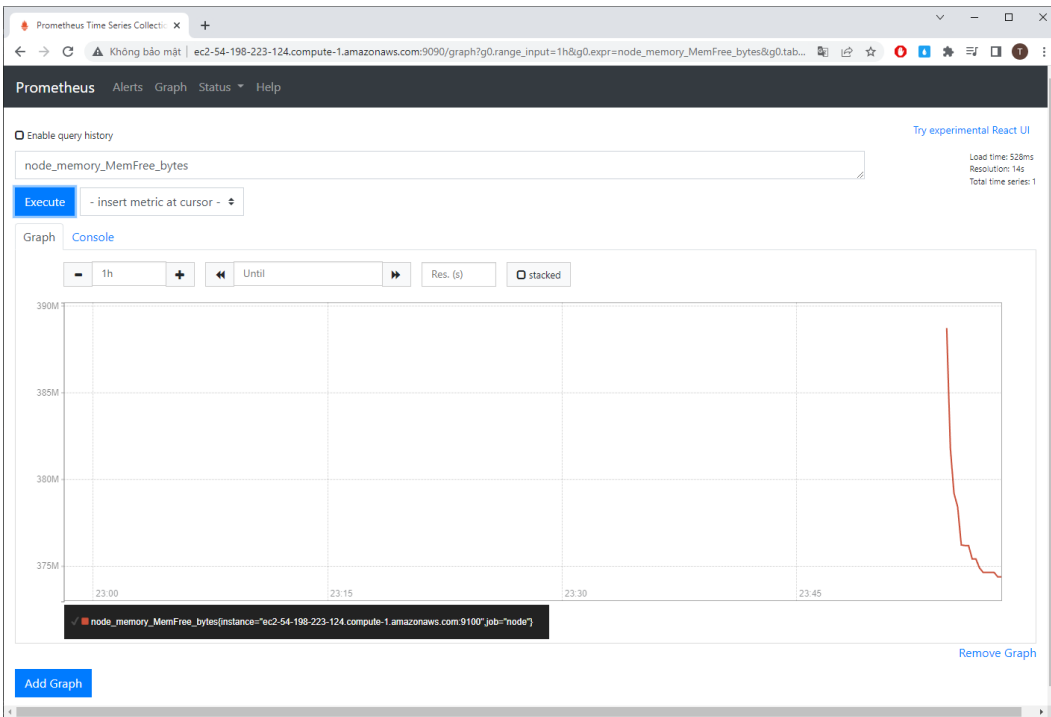
✓ scan-backend

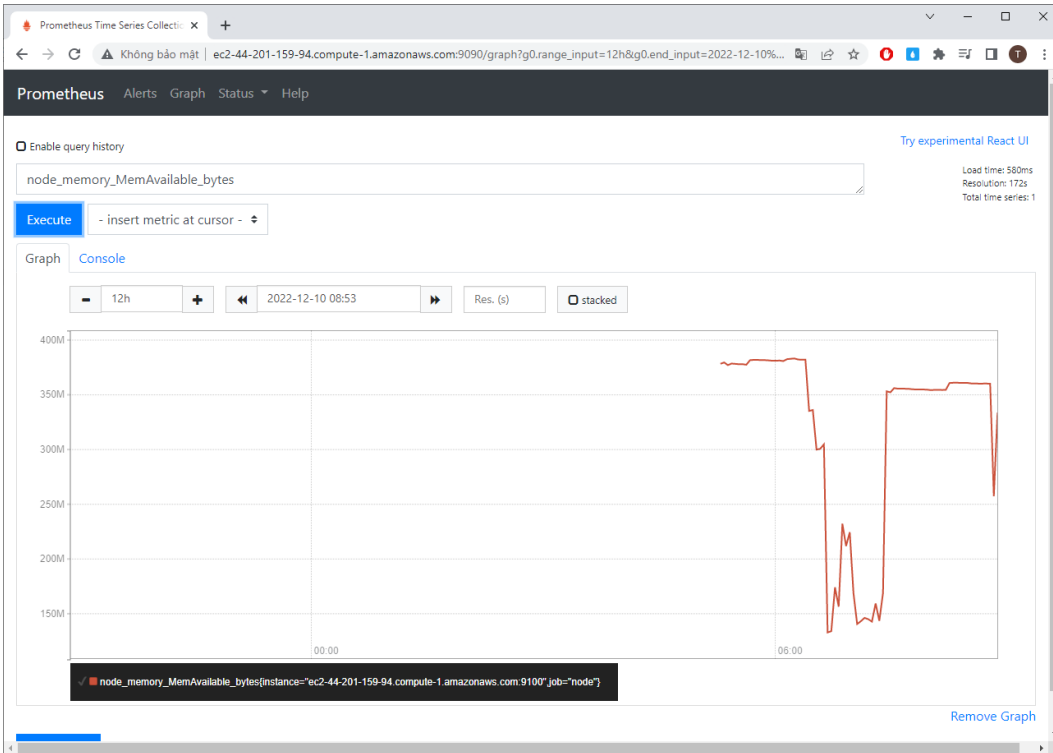
1m 2s

✓ test-backend

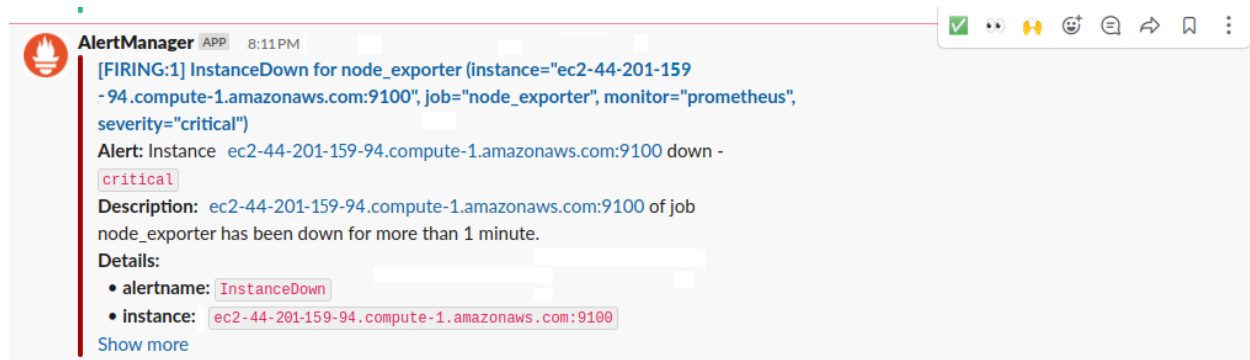
1m 6s

11. Provide a screenshot of a graph of your EC2 instance including available memory, available disk space, and CPU usage (SCREENSHOT11):

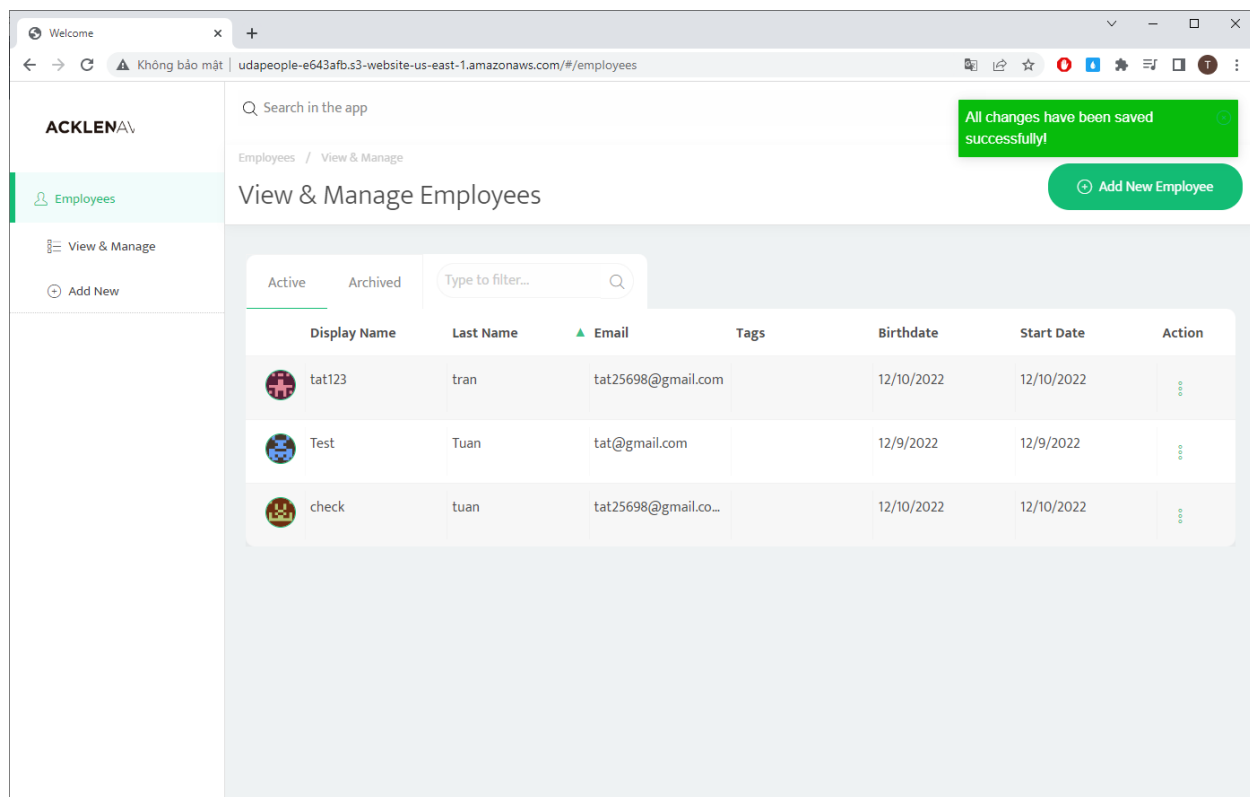




12. Provide a screenshot of an alert that was sent by Prometheus (SCREENSHOT12):



13. Provide a screenshot showing the evidence of deployed and functioning front-end application in S3 (URL2):



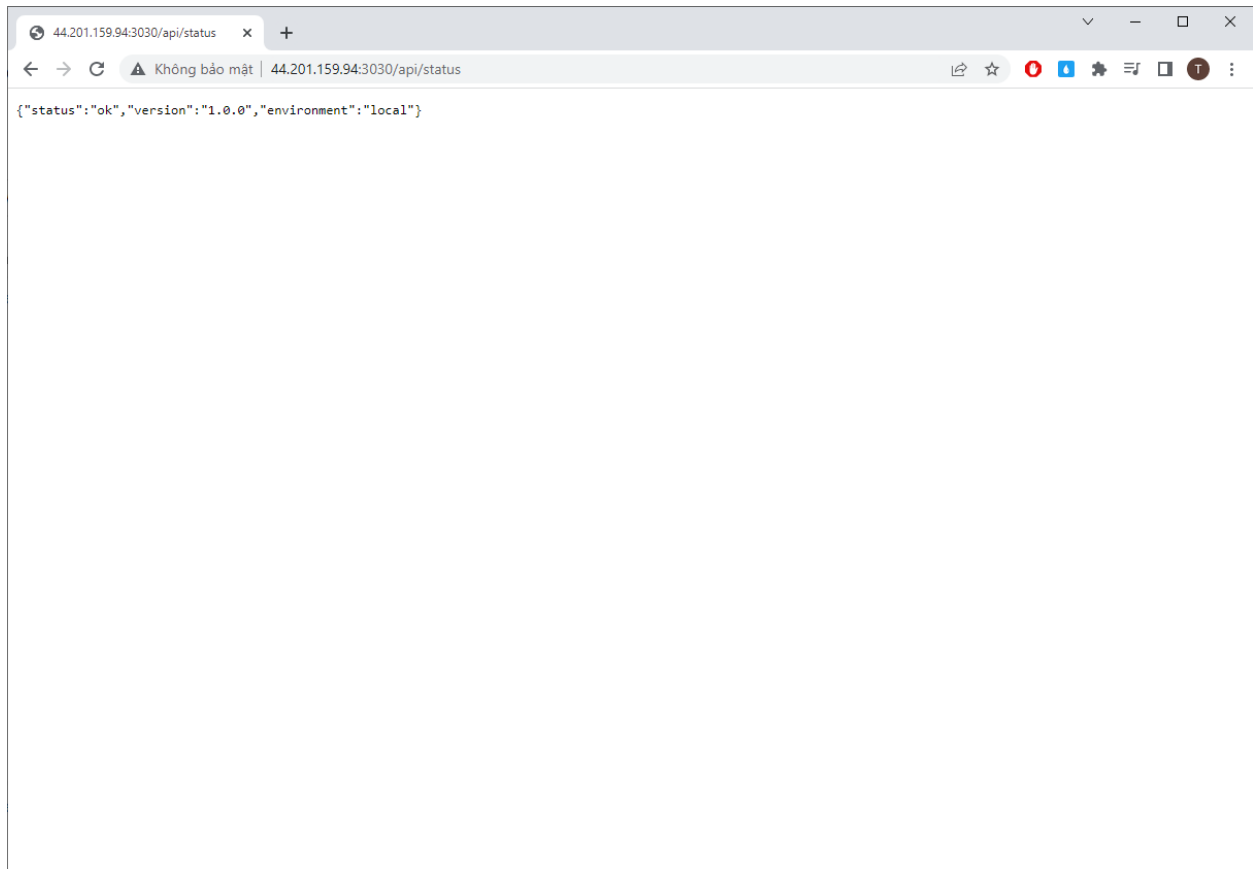
14. Provide a screenshot showing the evidence of deployed and functioning front-end application in CloudFront (aka, your production front-end) (URL3):

The screenshot shows a web browser window with the address bar displaying the URL: `diyqywddg2gd8.cloudfront.net/#/employees/new`. The application is titled "ACKLEN" and has a sidebar with navigation options: "Employees" (selected), "View & Manage", and "Add New". The main content area is titled "Add a New Employee" and includes a "Cancel" button and an "Add Employee" button. The form contains the following fields:

- Display Name \***: `check`
- First Name \***: `tran`
- Middle name**: (empty)
- Last Name \***: `anh`
- Second Last Name**: (empty)
- Gender \***: `Male` (dropdown menu)
- Start Date \***: `12/10/2022`
- SALARY**: ☒ Yearly ☐ Hourly
- Set amount \***: (empty)
- Effective Date \***: (empty)

There is also a "TAGS" section with an "Add a tag" button and a note: "Press tab to create tags."

15. Provide a screenshot showing the evidence of a healthy backend application. The backend endpoint status should show a healthy response (URL4):



16. Provide a screenshot of your Prometheus server showing UP state (URL5):

Instances | EC2 Management Co... xCloudFront xPipelines - TUANTA256/All xPrometheus Time Series Collectio... x

← → ↺ Không bảo mật | ec2-44-201-159-94.compute-1.amazonaws.com:9090/targets

Prometheus Alerts Graph Status ▾ Help

# Targets

All Unhealthy

node (1/1 up) show less

Endpoint	State	Labels	Last Scrape	Scrape Duration	Error
http://ec2-44-201-159-94.compute-1.amazonaws.com:9100/metrics	UP	instance="ec2-44-201-159-94.compute-1.amazonaws.com:9100" job="node"	9.901s ago	11.91ms	

prometheus (1/1 up) show less

Endpoint	State	Labels	Last Scrape	Scrape Duration	Error
http://localhost:9090/metrics	UP	instance="localhost:9090" job="prometheus"	1.937s ago	5.385ms	