System Diagram:-

A deployment YAML file contains two parts:

- Deployment – containers to be deployed
- Service – will create a LoadBalancer to expose our containers to the internet as both requires an endpoint that we are going to make request to.

- **µ-service-2 (backend) will reverse the string when it receives a POST on /reverse endpoint .**

```
curl -X POST http://192.168.56.103:32529/reverse -d '{"messages" : "digineadsax"}' --header 'Content-Type: application/json'
```

It is going to respond with

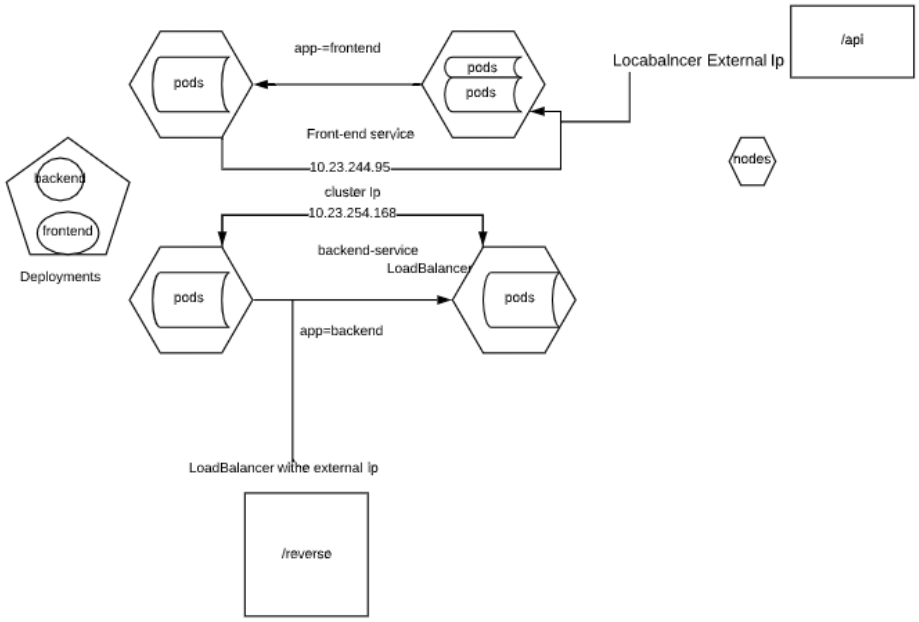
```
{"messages": "xasdaenigid"}
```

- **µ-service-1 (frontend) will reverse the string by communicating or sending a post request internally to the backend service which we it resolves with the help of kubedns and service name when it receives a POST on /api endpoint . Then it will seed a random number and add it to the payload and then responds .**

```
curl -X POST http://35.202.24.221:8081/api -d '{"messages" : "digineadsax"}' --header 'Content-Type: application/json'
```

Response

```
{"messages": "xasdaenigid", "rand": 0.8474337369372327}
```



Since we are using two load balancers for each service which is not idle and when working in a Production environment . We can Use ingress Controller like Nginx with a single load balancer and let it do the path based routing for our endpoints to serve the request to service which it is mapped to using type type: ClusterIP and we can map a domain name to this load balancer .

CI/CD Integration :-

Continuous integration with Gitlab .

1) Create a GitLab repo for each Microservice .
2) For CI , Create a .gitlab-ci.yml in the root directory of each microservice . For our microservice we are going to do a static analysis and linting to test the code quality .
3) Using the gitlab YMl we have to create pipeline which consist set of tests to run against a single git commit every time in each stage of development .
4) We are using a share runner to run all the jobs in the pipeline but we can also create our own runner (nodes) and authorize it with gitlab .

```
image: "python:3.7-alpine"
before_script:
 - python --version
 - pip3 install flake8 pylint
stages:
 - Static Analysis
flake8:
 stage: Static Analysis
 script:
 - flake8 --max-line-length=120 app.py
pylint:
 stage: Static Analysis
 allow_failure: true
 script:
 - pylint -d C0301 app*.py
```

5). We are using a docker container to run the tests which usage same base image as our application .

6) Based upon the stages defined in pipeline gitlab will execute the CI Pipeline and shows the

the status according to the commit that happens in different branches of our VCS .

7) We can now create a different branches in our VCS according to the organisation Branch and release strategy of the code release and organisation .

For simplicity this is what it should be :

- Every commit (every branch and PR) triggers a build. Built artifacts are tagged with a version string after passing the test cases (branch-yyyy-mm-dd.buildnumber.gitcommithash)
- Manual approval step required for Pull Request approval, required for merge from feature to other stages .
- From master branch create a release branch where we take all changes with git rebase so we can track every release instead of the commits which we are doing in other stages to test the code and application either manually or through automation .
- For every successful build and for the deployments test we can push to artifacts to a central repository from where we can do the deployments .
- Branching stratgey also depends on the size of the organization , number of people that are working in the team . For an alternative we can also use this .
  https://nvie.com/posts/a-successful-git-branching-model/

CD:-

Continuous delivery

1) In the CI pipeline we are testing our application in an integrated state continuously . In this stage we are making sure after every successful test the code artifacts will get stored in a central/remote repository .

2) For that we are expanding our GitLab yml file to build a container with every commit and push it to the remote docker repo with the formatted tags .

```
variables:
  DOCKER_DRIVER: "overlay2"
  REPOSITORY_URL: ""
  tag: "$BRANCH_$DATE_$HASH"
services:
  - docker:dind

build-app:
  stage: build

  script:
    - mkdir -p $HOME/.docker
    - apk add --no-cache curl jq python py-pip
    - pip install awscli
    - $(aws ecr get-login --no-include-email --region ap-southeast-1)
    - docker info
    - docker build -t ${REPOSITORY_URL}-app:$tag .
    - docker push ${REPOSITORY_URL}-app:$tag
```

This Job will executed in CI/CD pipeline of Gitlab and gitlab will push it to the docker repo with the formatted tag of branch name , commit hash and date , to track the deployment artifacts

.

Continuous Deployments

1) Till now we have resolved the delivery and integration aspects of our application . We are now going to deploy it on kubernetes cluster with our pipeline . Either we can create a new Cluster on GKE or authenticate the existing one with gitlab .

```
stages:
- test
- deploy
test:


deploy to staging:
 stage: deploy
 script: make deploy
 environment:
   name: staging
   url: https://staging.example.com/
deploy to production:
 stage: deploy
 script: make deploy
 environment:
   name: production
   url: https://example.com/
```

2) To Counter the downtime we will use Rolling deployments of our container app in kubernetes with Readiness Probe config option , so the old pods will only get terminated when new pods are able to return a valid request according to the config option .

3) Another thing we can do is to define the rolling upgrade strategy in deployment config .which specifies the maximum number of Pods that can be unavailable during the update process .