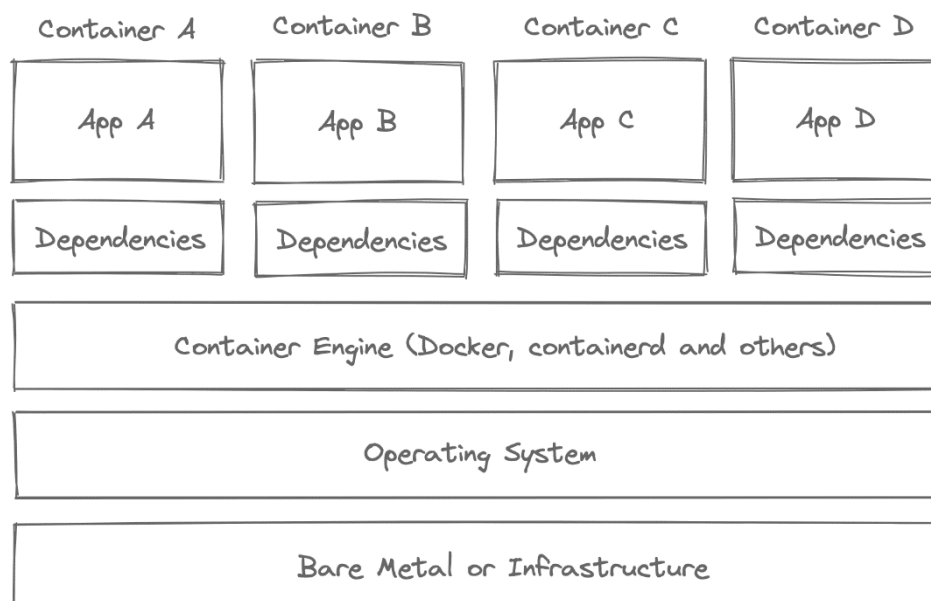
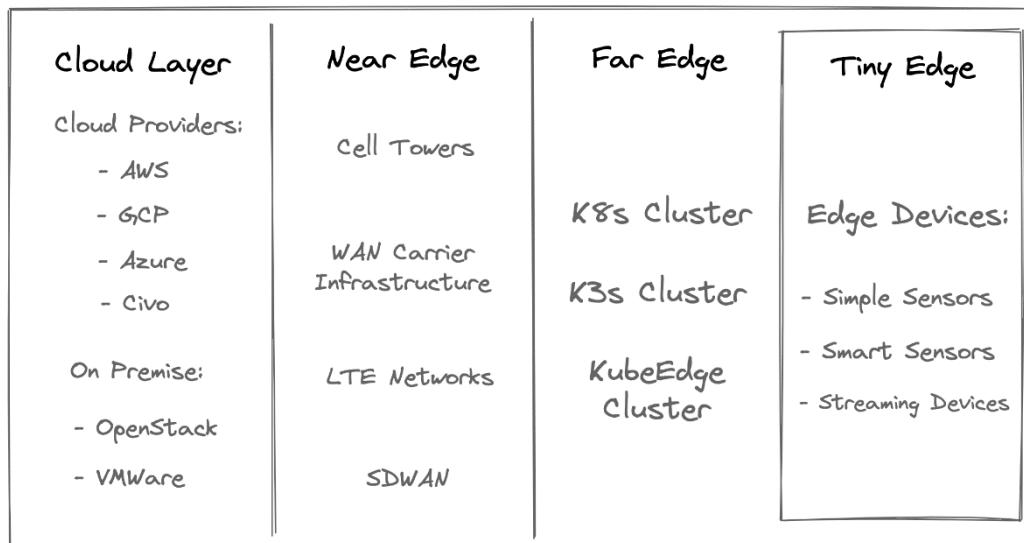
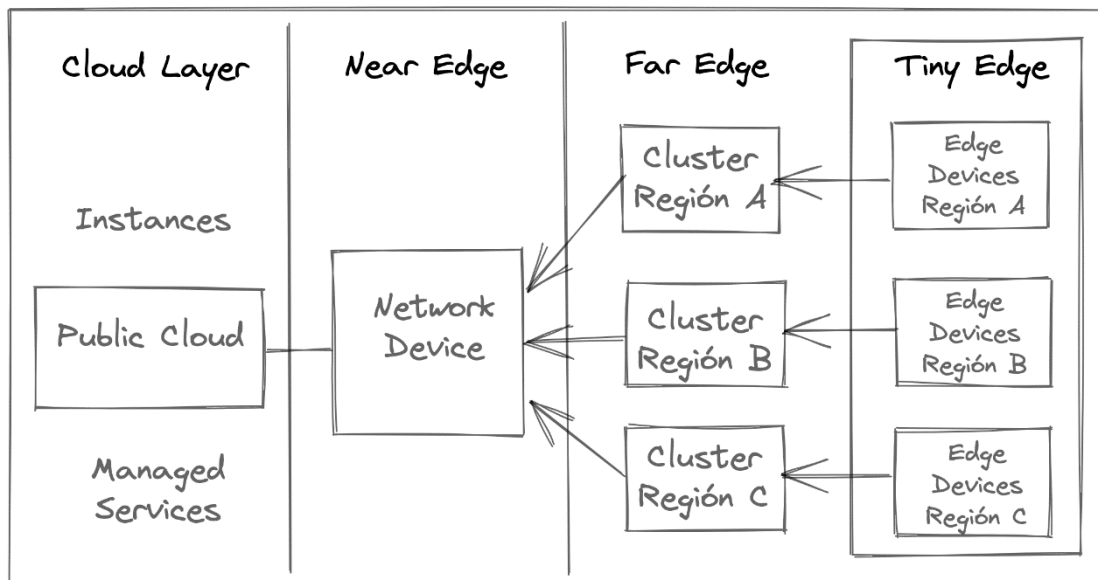
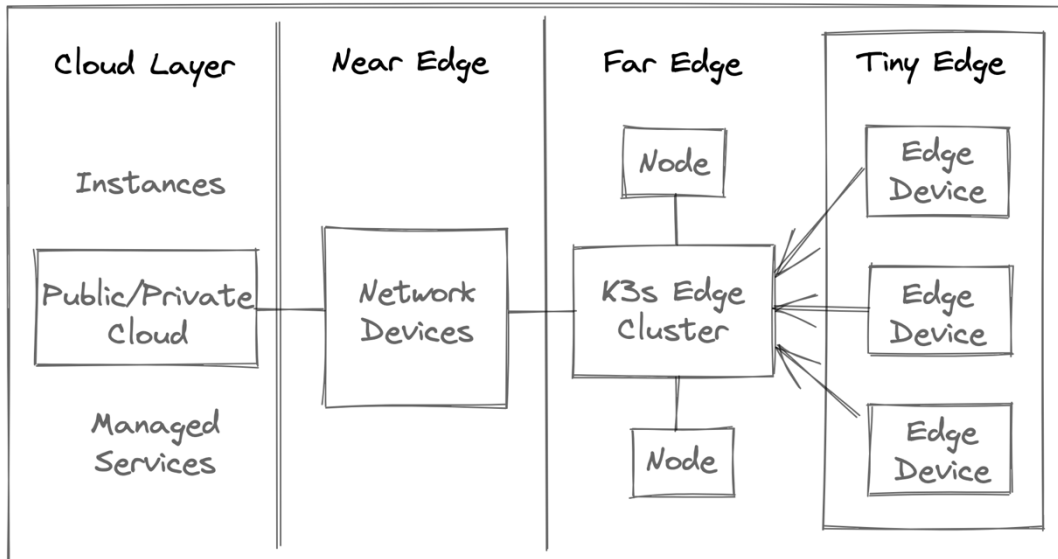
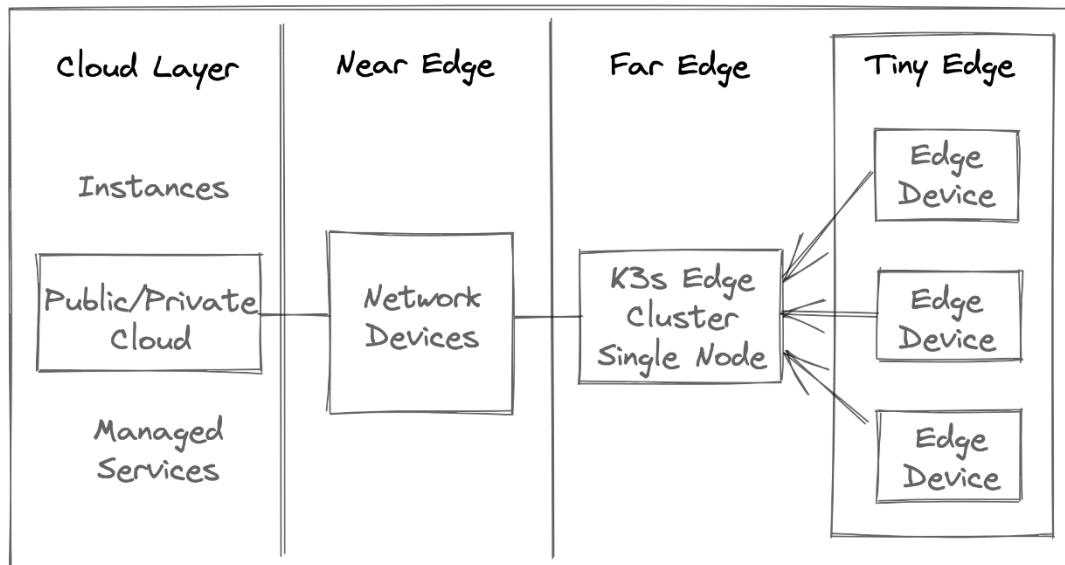


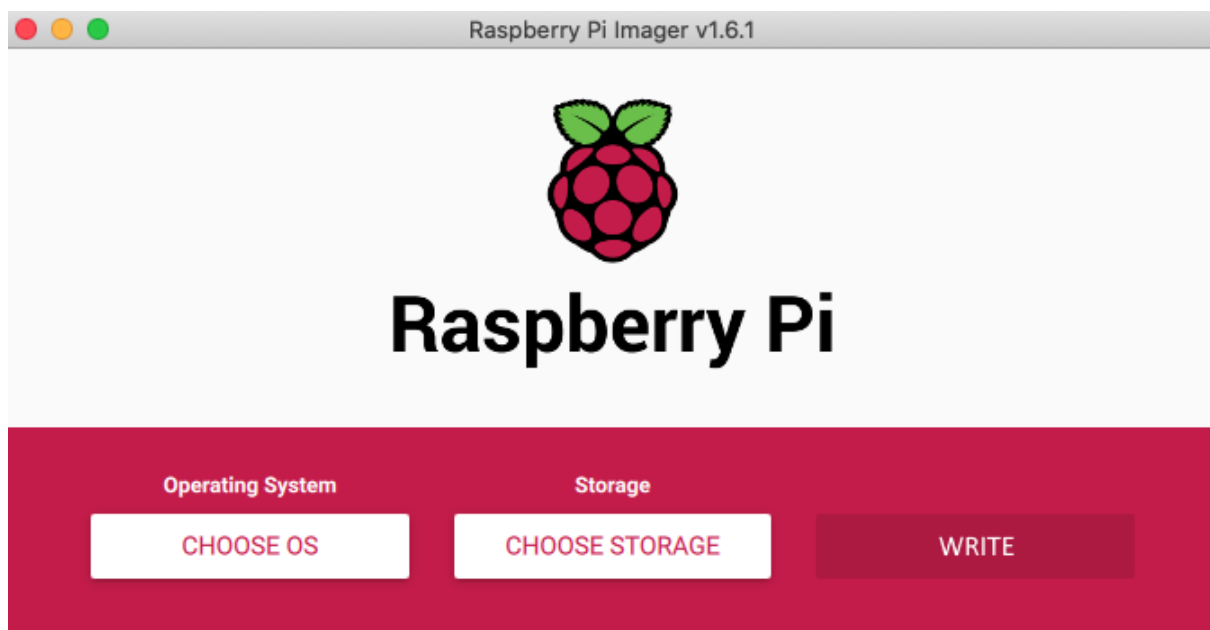
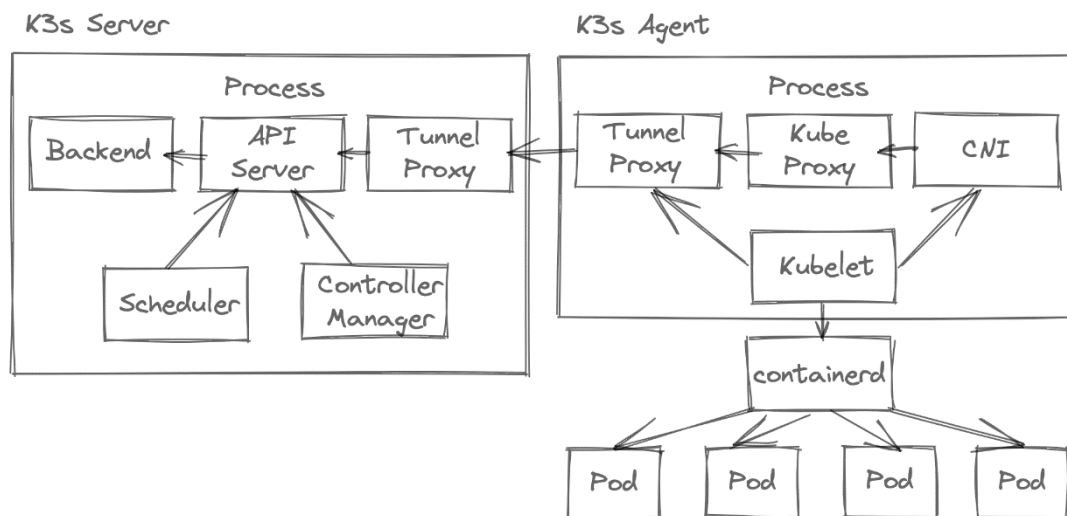
Chapter 1: Edge Computing with Kubernetes

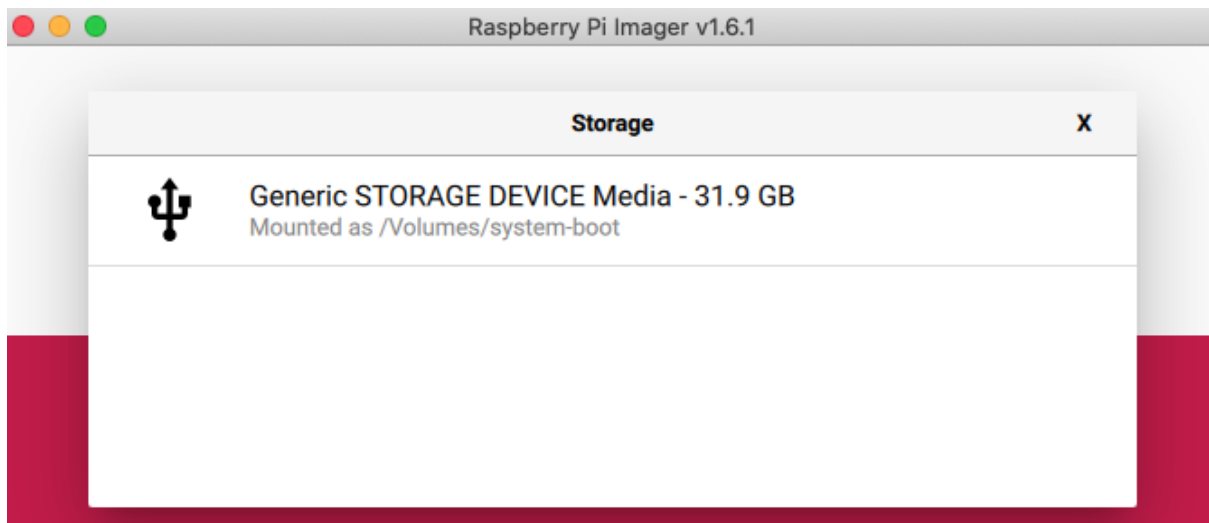
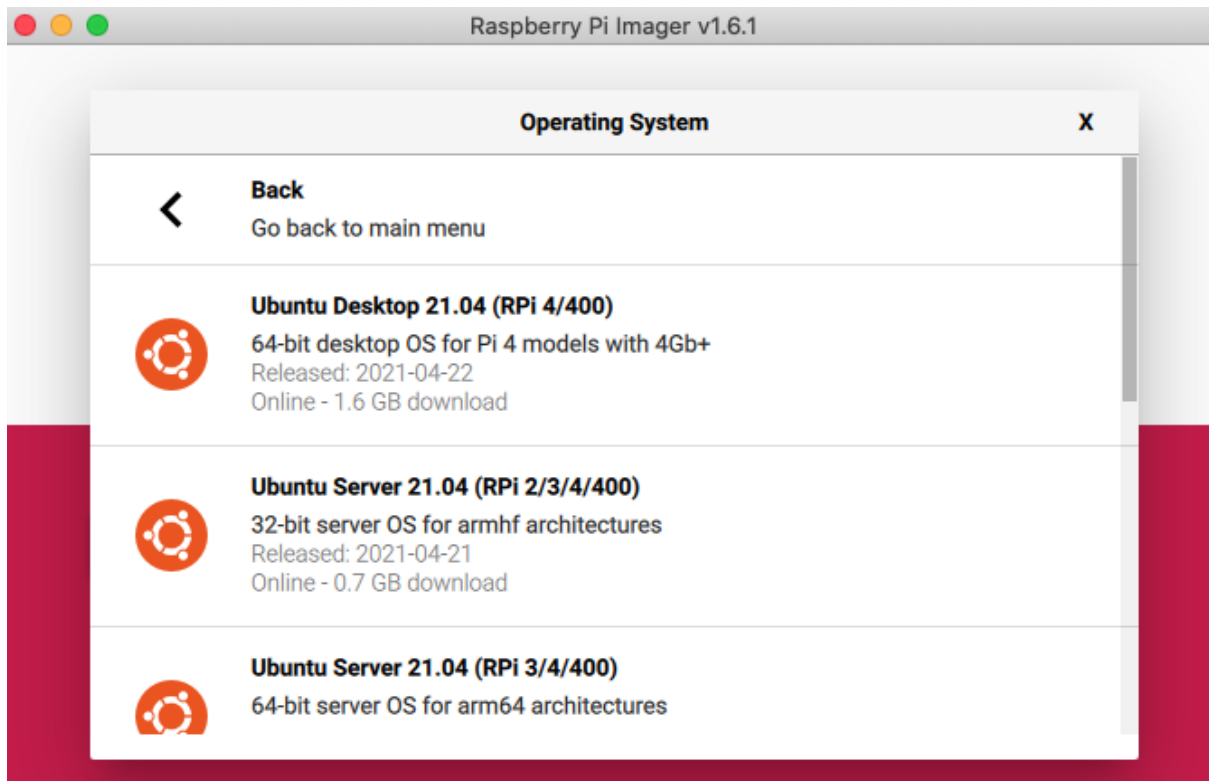


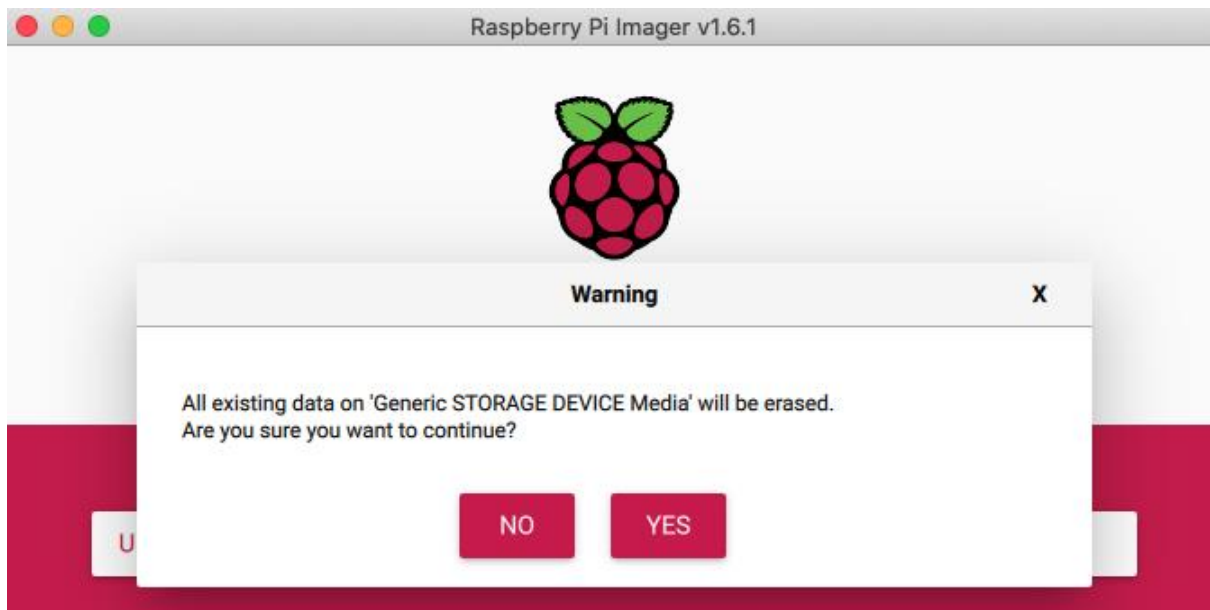
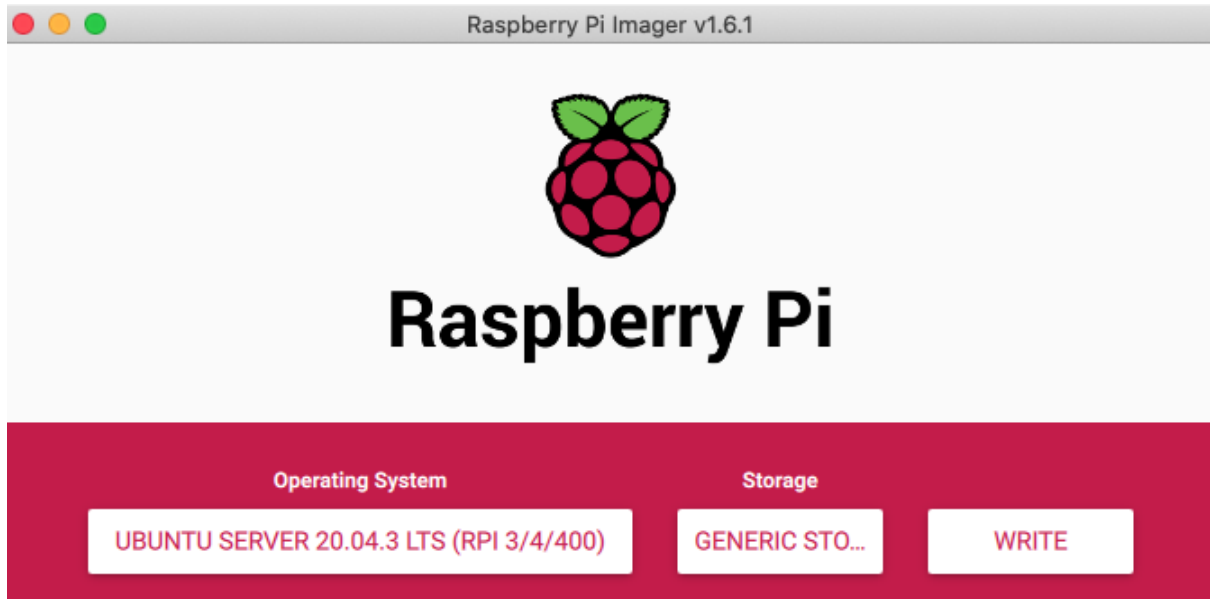




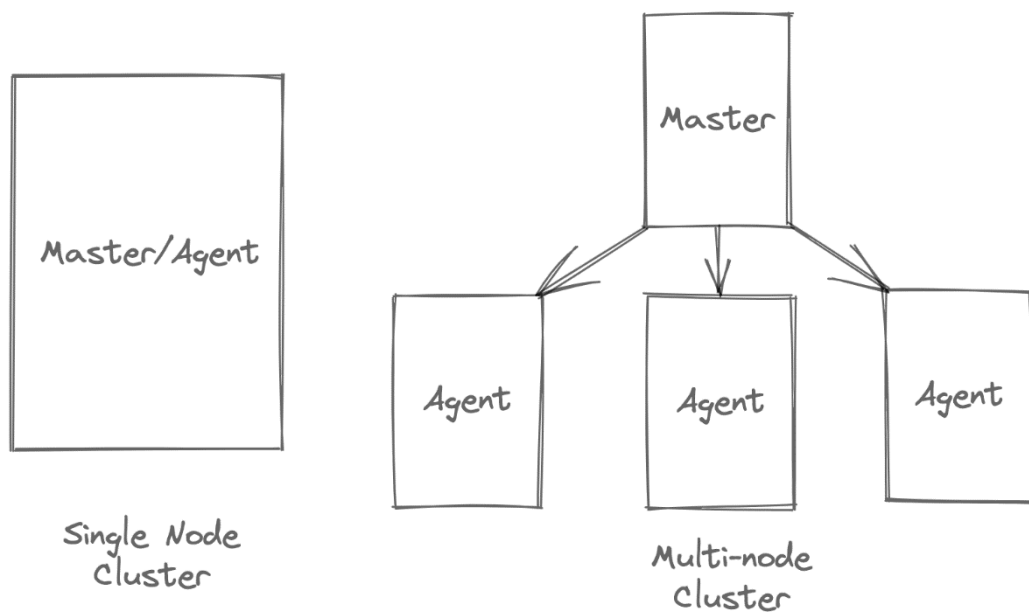
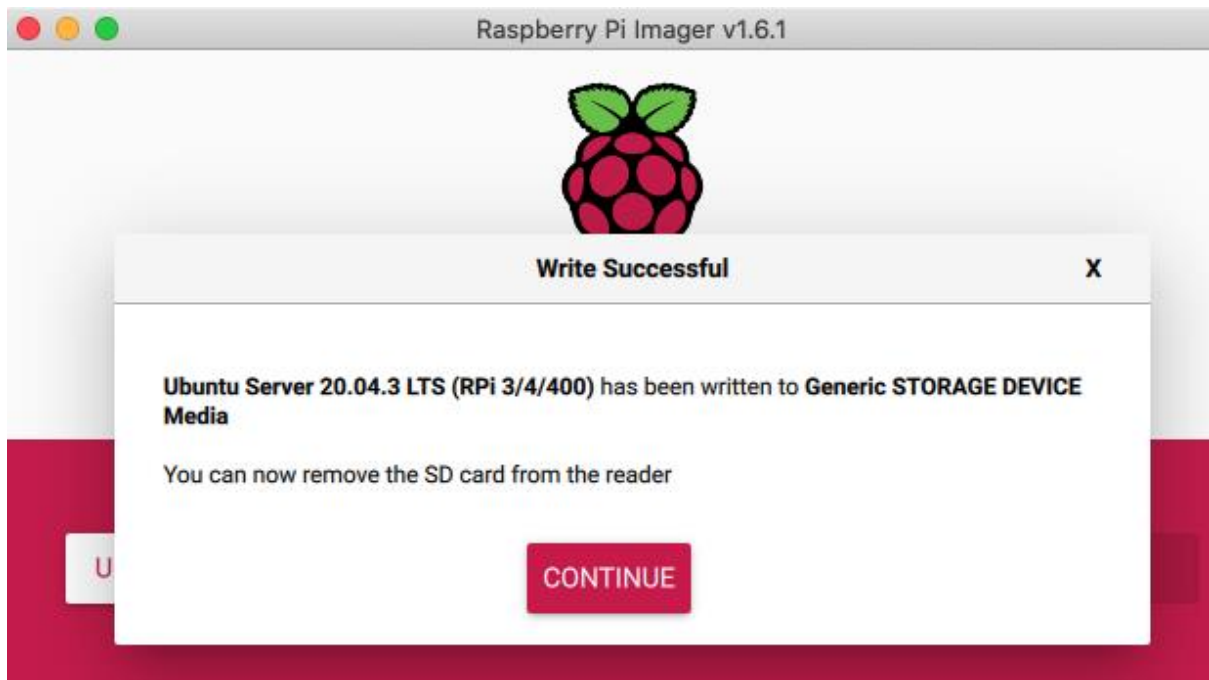
Chapter 2: K3s Installation and Configuration



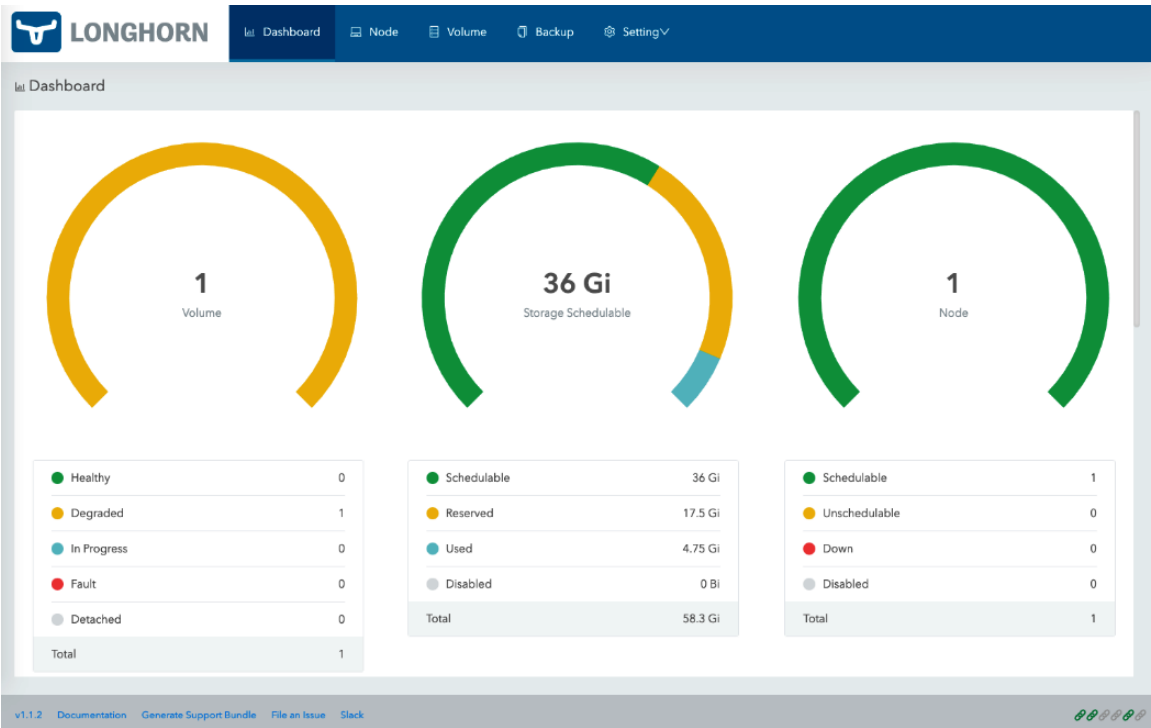




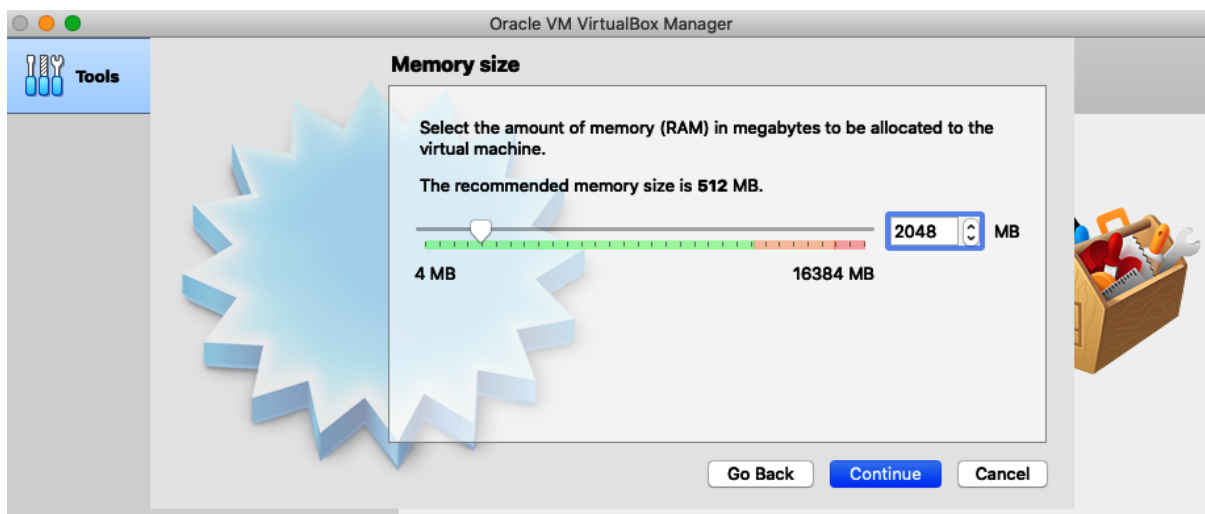
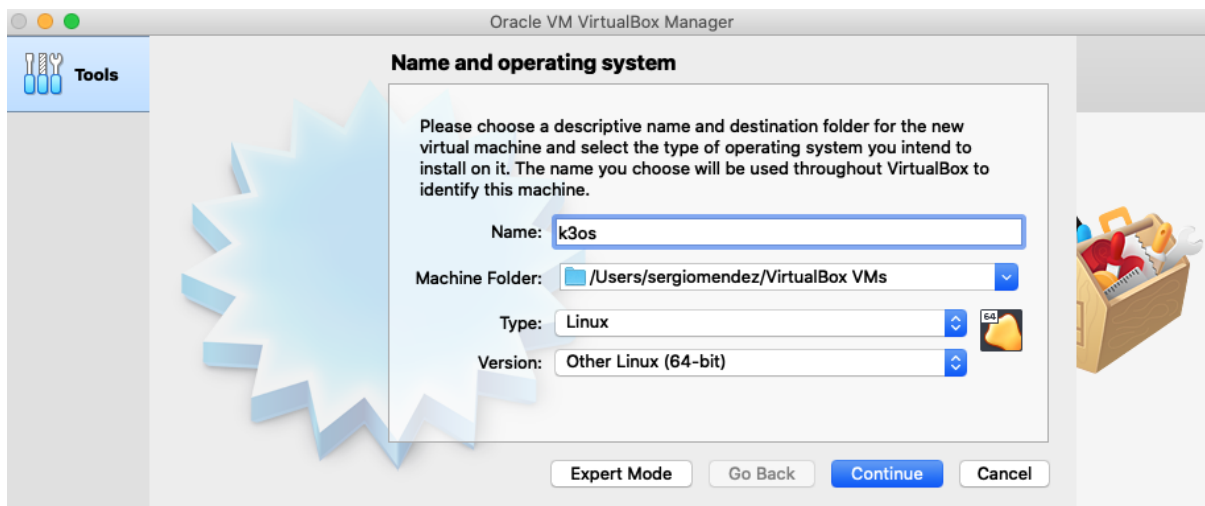


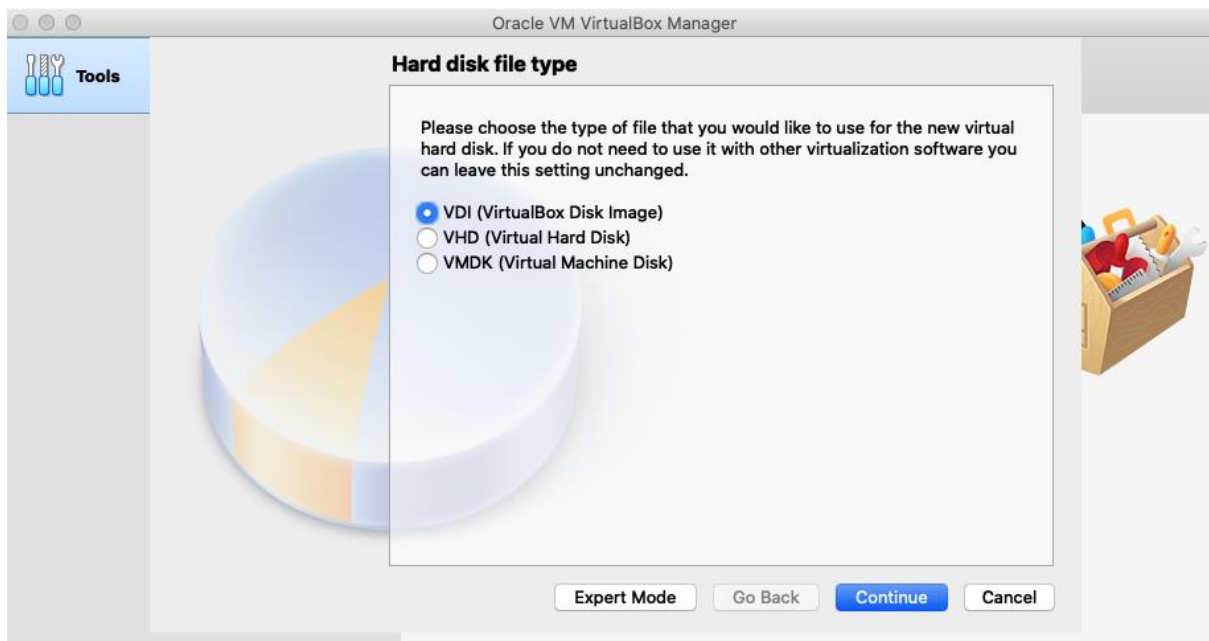


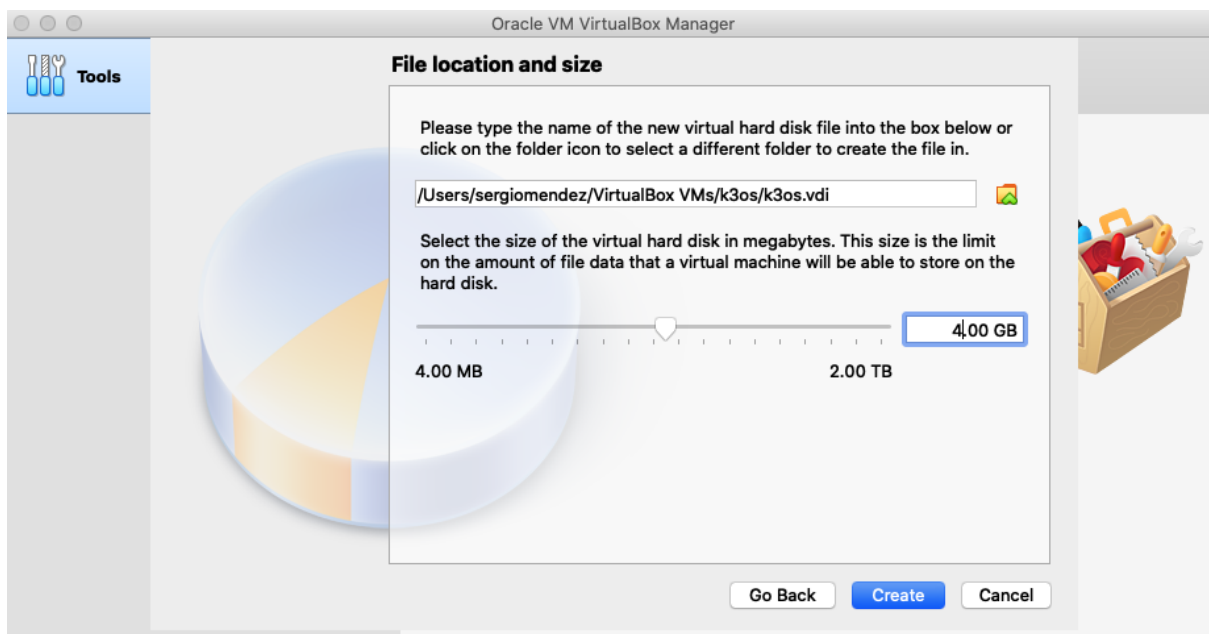
Chapter 3: K3s Advanced Configurations and Management

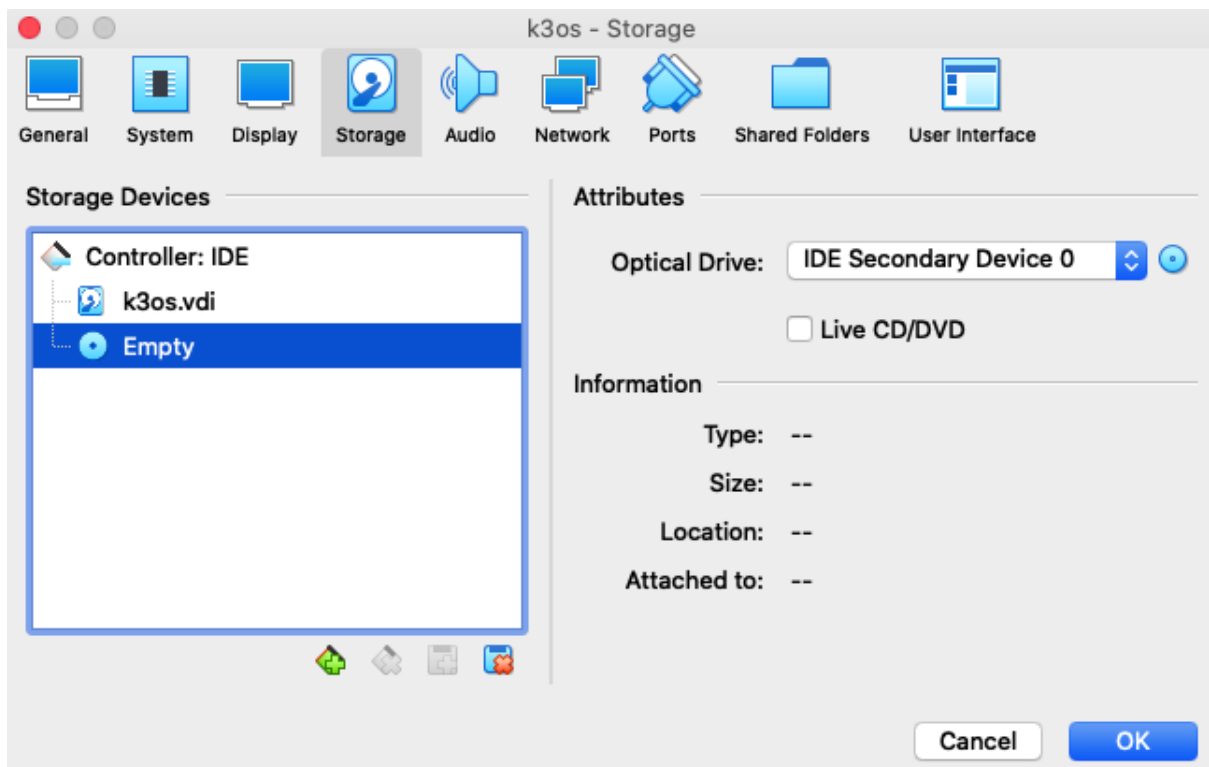
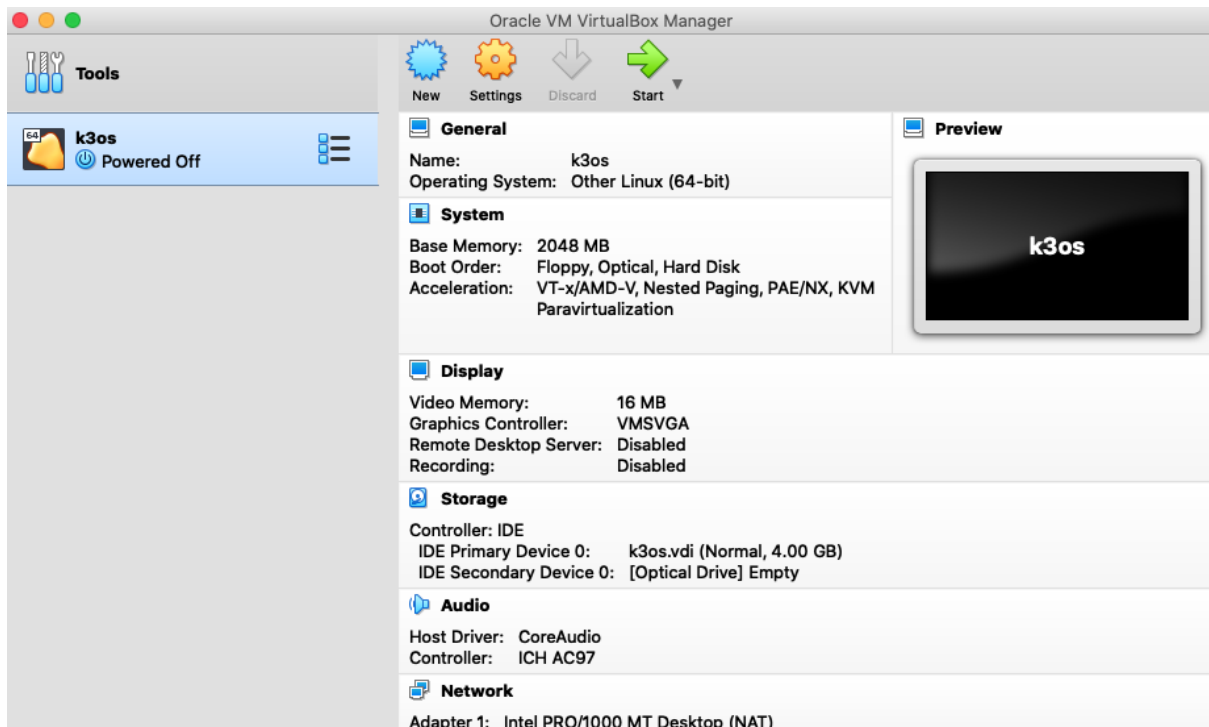


Chapter 4: k3OS Installation and Configurations





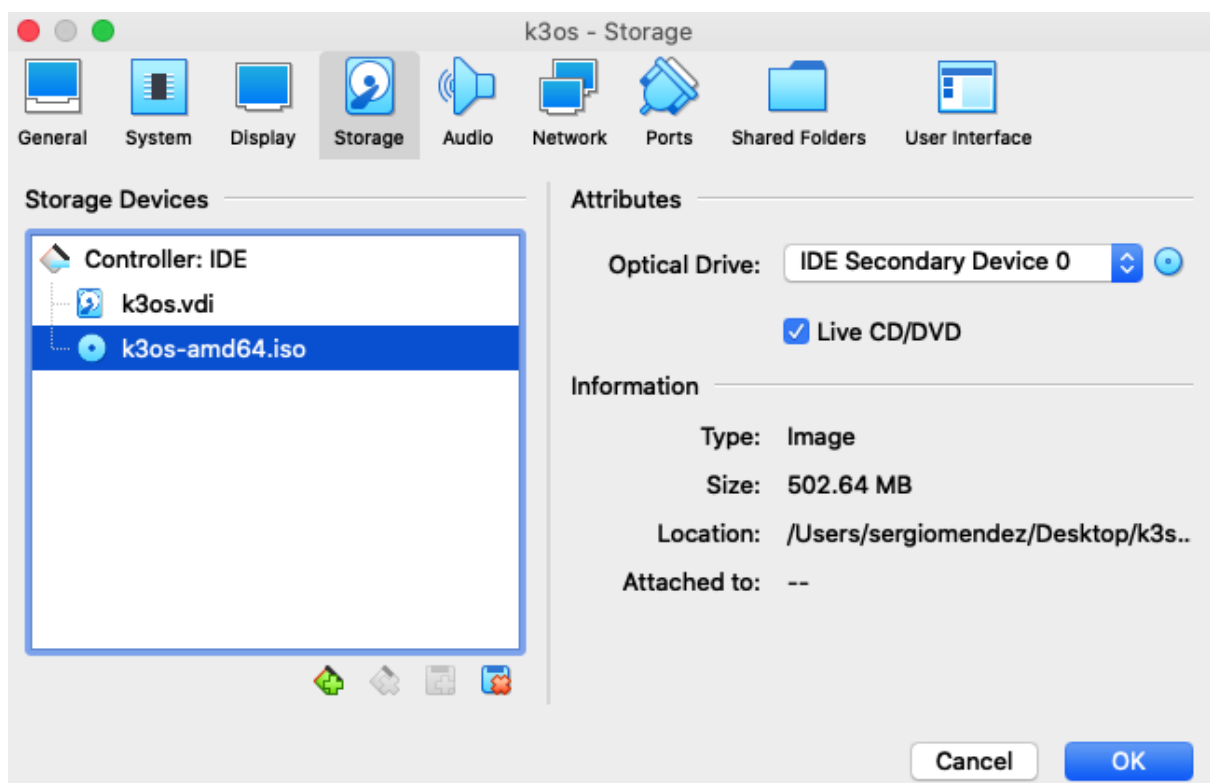
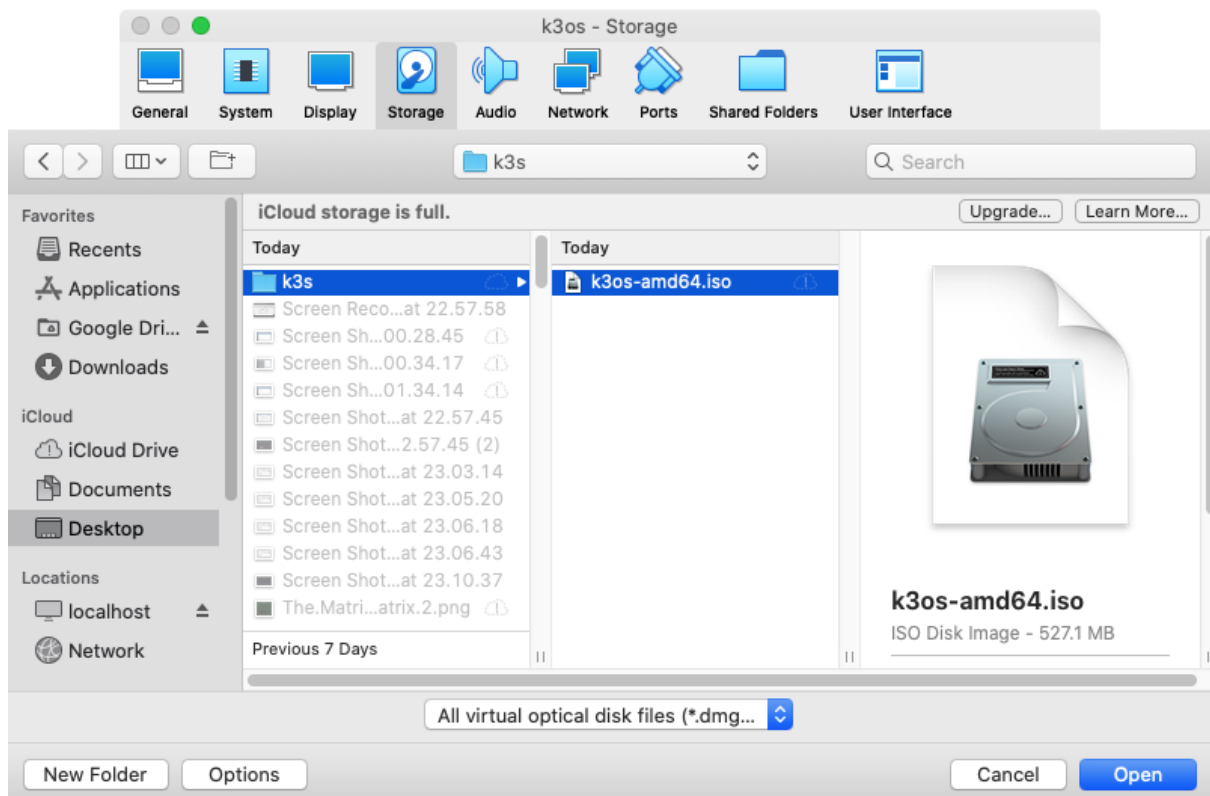




Choose/Create a Virtual Optical Disk...

Choose a disk file...

Remove Disk from Virtual Drive




```

iscsiadm: No records found [ !! ]
* Starting k3s-service ... [ ok ]
* Starting issue ... [ ok ]
* Starting QEMU Guest Agent ... [ ok ]
ssh-keygen: generating new host keys: RSA DSA ECDSA ED25519
* Starting sshd ... [ ok ]
* Starting local ... [ ok ]

      _ _ _ _ _
     /   /   /
    /___/___/___/___/___/___/
   /   /   /   /   /   /   /
  /___/___/___/___/___/___/
 /   /   /   /   /   /   /
/___/___/___/___/___/___/

k3OS v0.20.7-k3s1r0
Kernel 5.4.0-73-generic on an x86_64 (/dev/tty1)

=====
NIC                State      Address
eth0               UP        10.0.2.15/24 fe80::a00:27ff:fecc:5f1c/64
=====

Welcome to k3OS (login with user: rancher)
k3os-1815 login: rancher
Welcome to k3OS!

Refer to https://github.com/rancher/k3os for README and issues

By default mode of k3OS is to run a single node cluster. Use "kubect1"
to access it. The node token in /var/lib/rancher/k3s/server/node-token
can be used to join agents to this server.

You can configure this system or install to disk using "sudo k3os install"
k3os-1815 [~]$

```

```
Welcome to k3OS (login with user: rancher)
k3os-1815 login: rancher
Welcome to k3OS!
```

Refer to <https://github.com/rancher/k3os> for README and issues

By default mode of k3OS is to run a single node cluster. Use "kubect1"
to access it. The node token in /var/lib/rancher/k3s/server/node-token
can be used to join agents to this server.

You can configure this system or install to disk using "sudo k3os install"

```
k3os-1815 [~] $ sudo k3os install
```

Running k3OS configuration

Choose operation

1. Install to disk
2. Configure server or agent

Select Number [1]: 1

Config system with cloud-init file? [y/N]: N

Authorize GitHub users to SSH? [y/N]: N

Please enter password for [rancher]: *****

Confirm password for [rancher]: *****

Configure WiFi? [y/N]: N

Run as server or agent?

1. server
2. agent

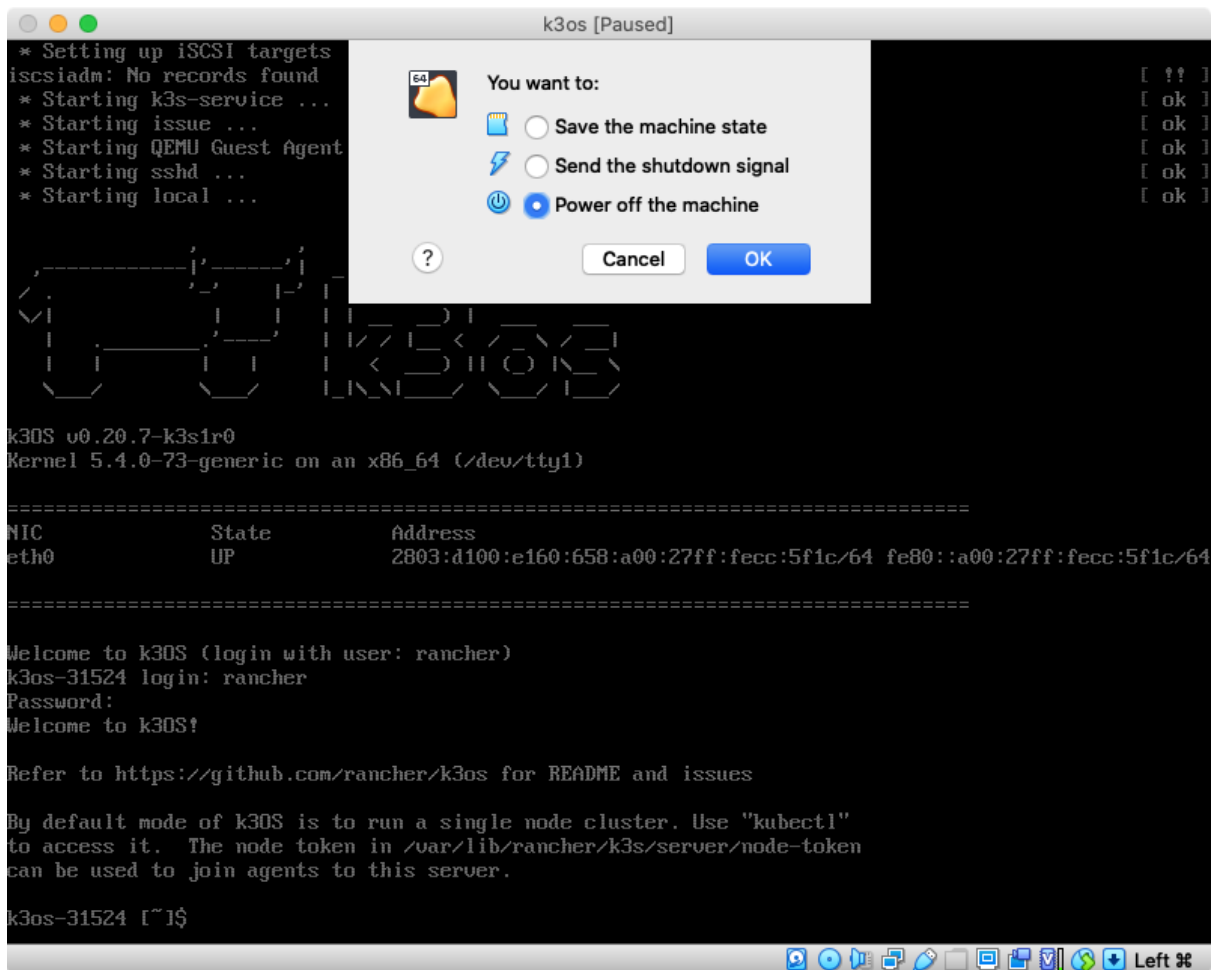
Select Number [1]:

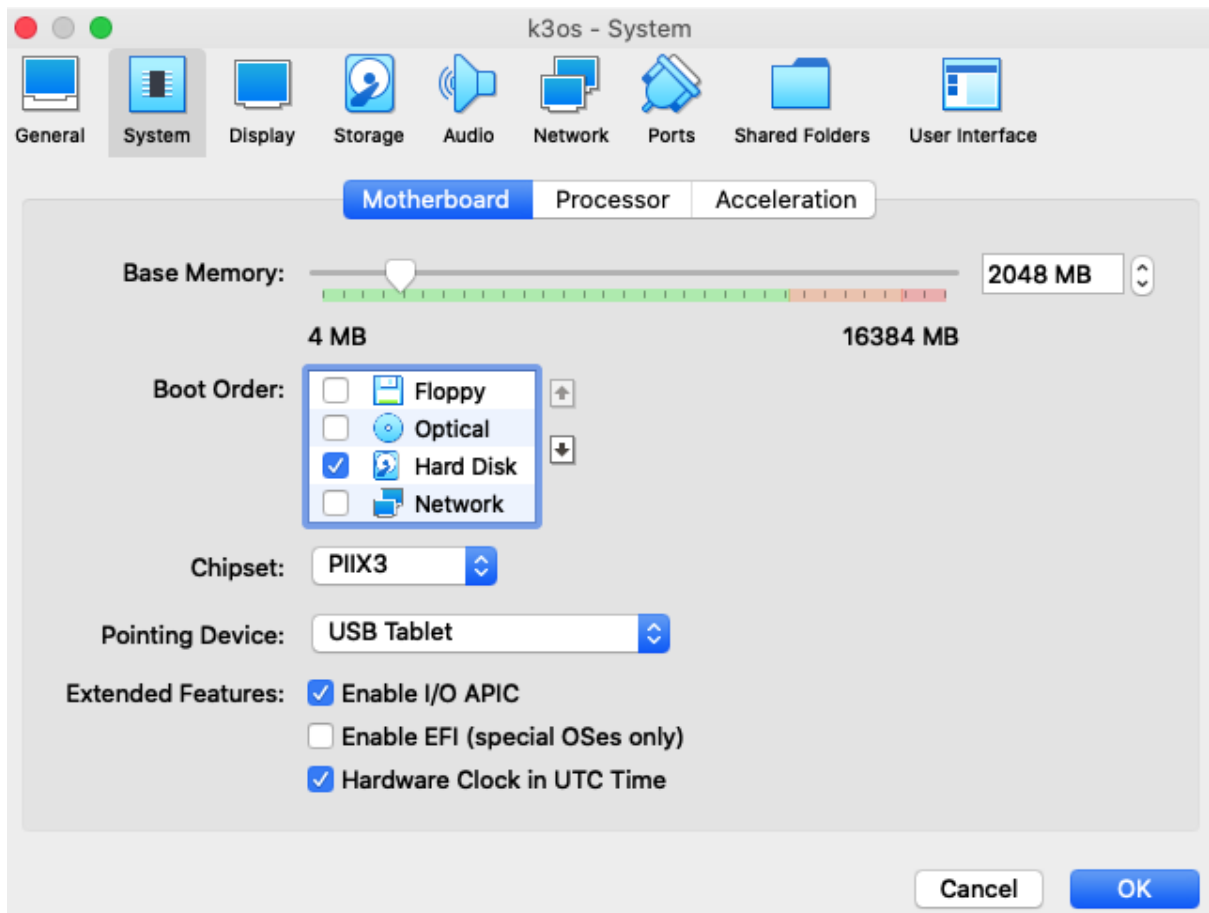
Token or cluster secret (optional):

Configuration

device: /dev/sda

Your disk will be formatted and k3OS will be installed with the above configuration.
Continue? [y/N]: y





```

* Setting up iSCSI targets ...
iscsiadm: No records found
* Starting k3s-service ...
* Starting issue ...
* Starting QEMU Guest Agent ...
* Starting sshd ...
* Starting local ...

          _.-'-----'-. _
         /  _  _  _  _  \
        /  _  _  _  _  \
       /  _  _  _  _  \
      /  _  _  _  _  \
     /  _  _  _  _  \
    /  _  _  _  _  \
   /  _  _  _  _  \
  /  _  _  _  _  \
 /  _  _  _  _  \
/  _  _  _  _  \

k3OS v0.20.7-k3s1r0
Kernel 5.4.0-73-generic on an x86_64 (/dev/tty1)

=====
NIC                State      Address
eth0               UP        2803:d100:e160:658:a00:27ff:fecc:5f1c/64 fe80::a00:27ff:fecc:5f1c/64
=====

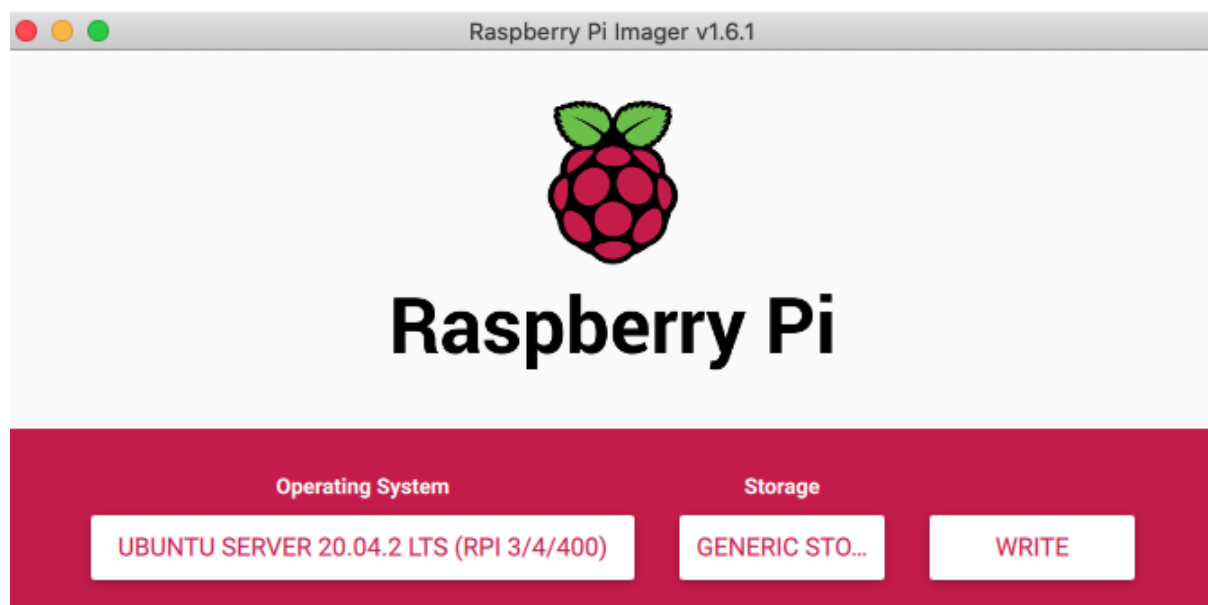
Welcome to k3OS (login with user: rancher)
k3os-31524 login: rancher
Password:
Welcome to k3OS!

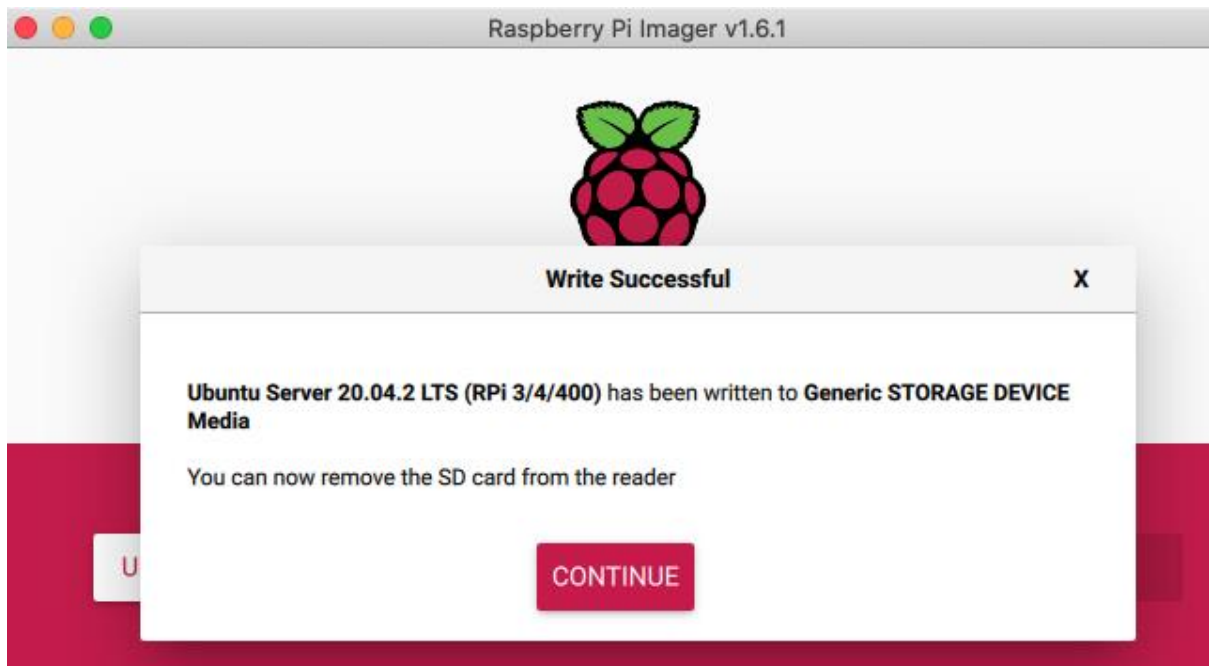
Refer to https://github.com/rancher/k3os for README and issues

By default mode of k3OS is to run a single node cluster. Use "kubectl"
to access it. The node token in /var/lib/rancher/k3s/server/node-token
can be used to join agents to this server.

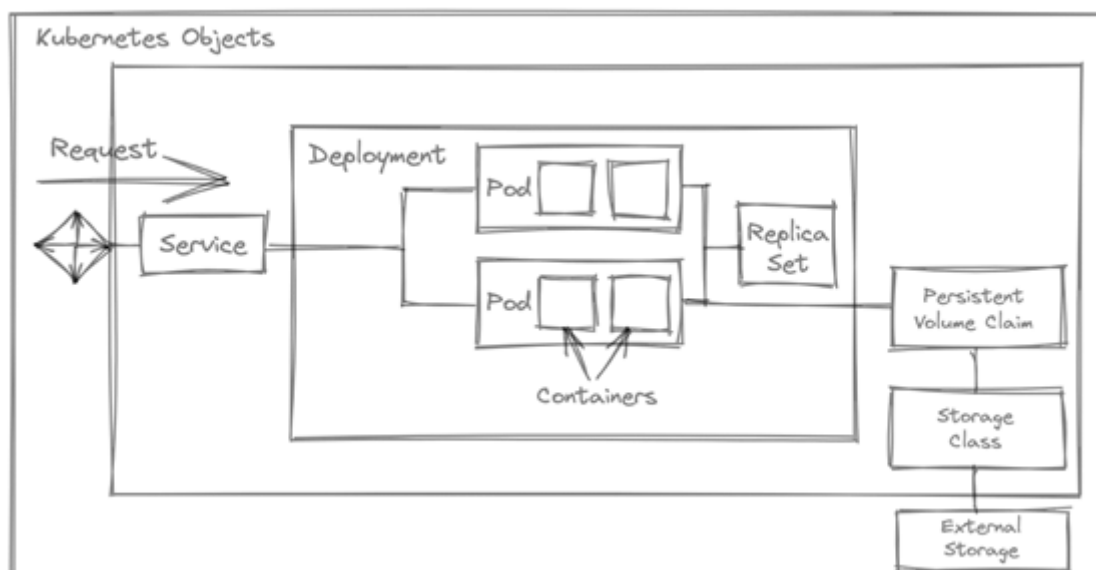
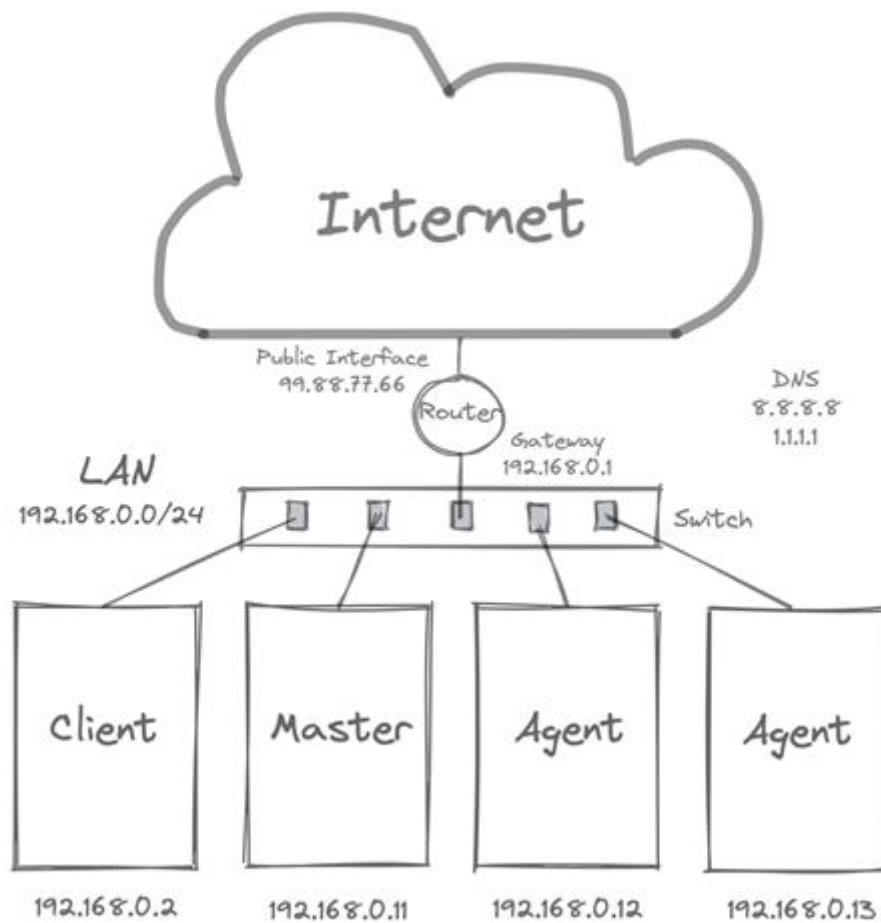
k3os-31524 [~] $

```





Chapter 5: K3s Homelab for Edge Computing Experiments



Kubernetes Dashboard

☒ Token

Every Service Account has a Secret with valid Bearer Token that can be used to log in to Dashboard.

☐ Kubeconfig

Please select the kubeconfig file that you have created to configure access to the cluster. To find out

Enter token *

Sign in

 **kubernetes**

default

 Search

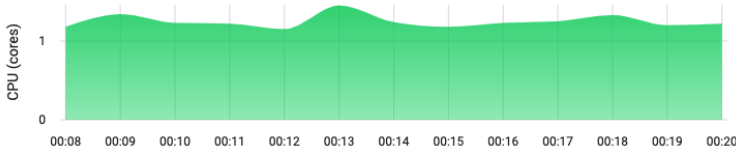
Cluster > Nodes

Workloads N
Cron Jobs
Daemon Sets
Deployments
Jobs
Pods
Replica Sets
Replication Controllers
Stateful Sets

Service N
Ingresses
Services

Config and Storage
Config Maps N

CPU Usage



00:08 00:09 00:10 00:11 00:12 00:13 00:14 00:15 00:16 00:17 00:18 00:19 00:20

Memory

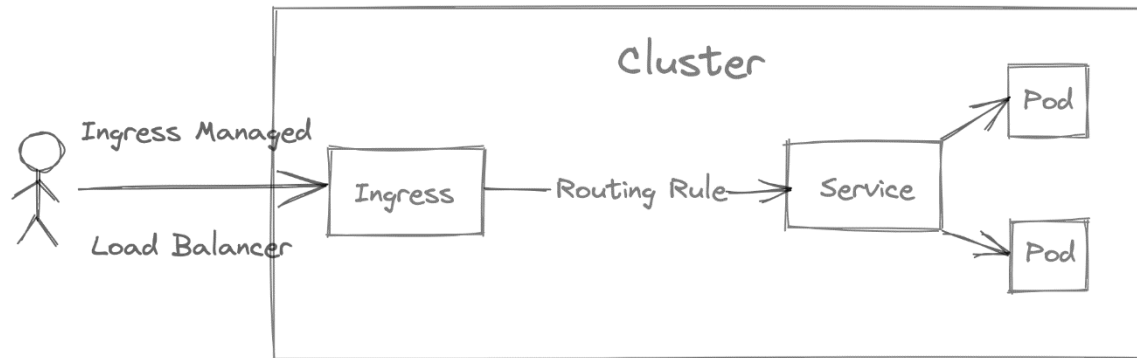


0 Gi 5 Gi 10 Gi

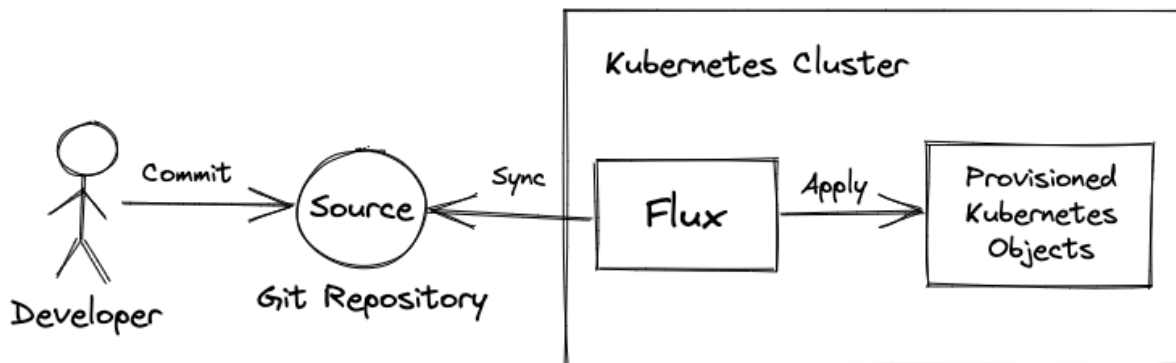
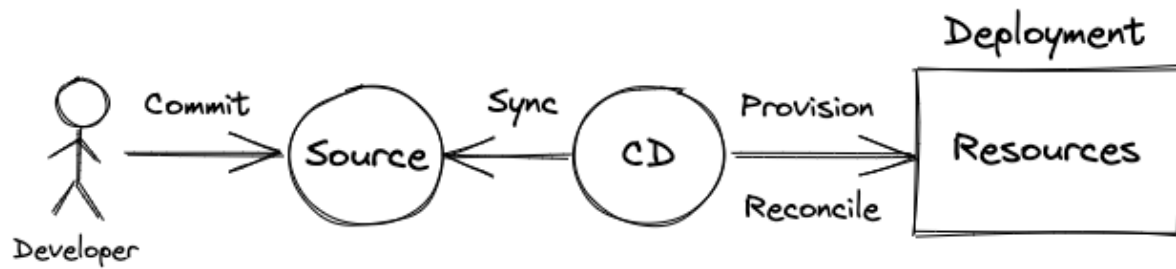
Nodes

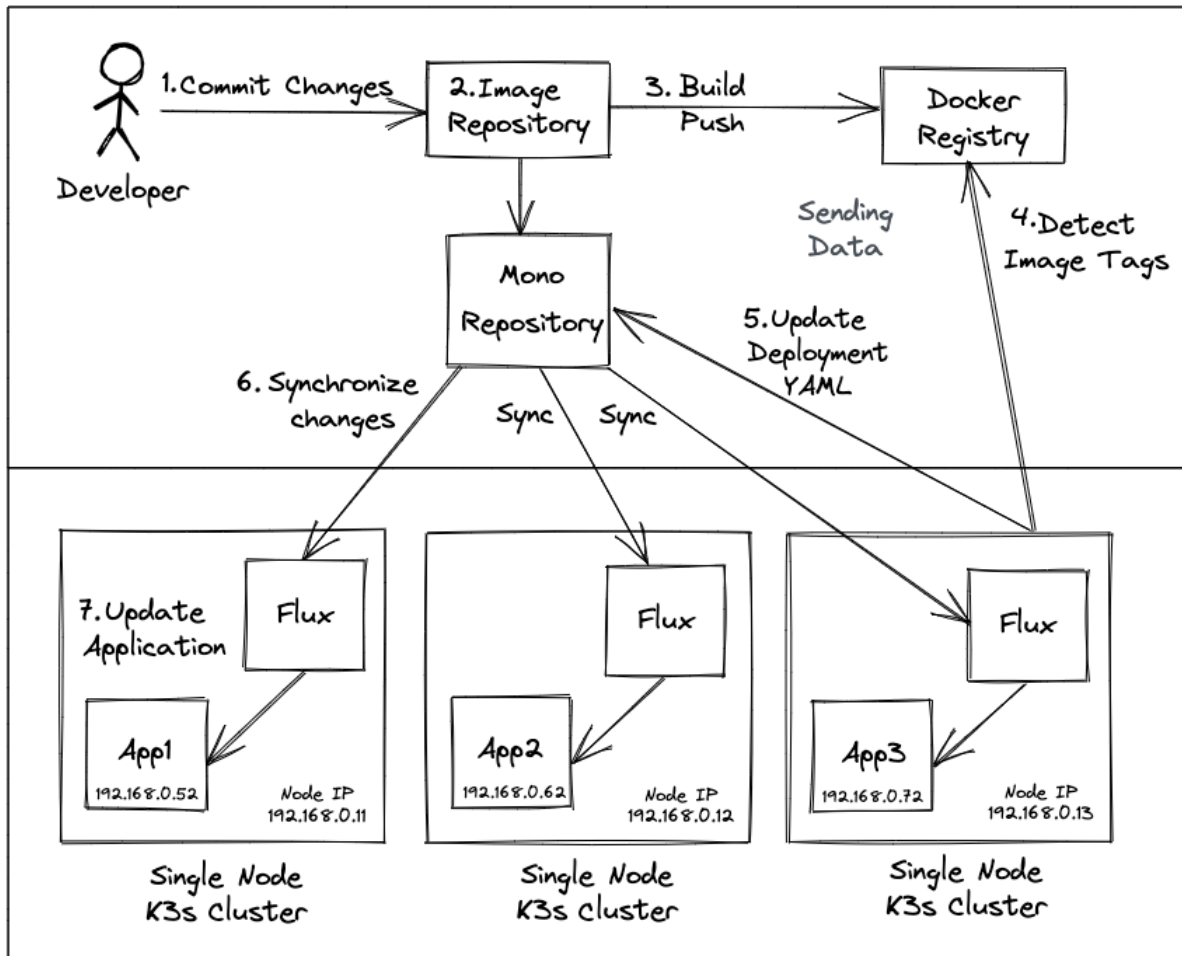
Name	Labels	Ready	CPU requests (cores)	CF
 node02	beta.kubernetes.io/arch: arm64 beta.kubernetes.io/instance-type: k3s beta.kubernetes.io/os: linux Show all beta.kubernetes.io/arch: arm64	True	960.00m (24.00%)	0.0

Chapter 6: Exposing Your Applications Using Ingress Controllers and Certificates



Chapter 7: GitOps with Flux for Edge Applications





```

└─ clusters
    └─ cluster1
        └─ flux-system
            └─ gotk-components.yaml
            └─ gotk-sync.yaml
            └─ kustomization.yaml
        └─ manifests
            └─ namespace.yaml
            └─ helm-charts.yaml
            └─ helm-release.yaml
            └─ app-demo-registry.yaml
            └─ app-demo-policy.yaml
            └─ flux-system-automation.yaml
    └─ cluster2
    └─ cluster3

```


[sergioarmgp/fluxappdemo](#)
Public
Pin

<> Code
Issues
Pull requests
Actions
Projects
Wiki
Security
Insights
Settings

main
1 branch
0 tags
Go to file
Add file
Code

Sergio Méndez feat: changes		✓ 6c586b8 on Jan 21 21 commits
.github/workflows	fix: on tag format	3 months ago
src	feat: changes	2 months ago
LICENSE	Initial commit	3 months ago
README.md	feat: Flux Demo App	3 months ago

README.md

fluxappdemo

Flux Demo Application

sergioarmgpl / fluxappdemoPublic

<> Code

Issues

Pull requests

Actions

Projects

Wiki

Security

Insights

Settings

main

fluxappdemo / src /

Sergio Méndez feat: changes

..

Dockerfile	feat: added python simple unit test
Operations.py	feat: Added initial content to the application
build_push.sh	feat: changes on build_push
index.py	feat: changes
requirements.txt	feat: Added initial content to the application
tests.py	feat: Added initial content to the application

sergioarmgpl / fluxappdemoPublic

<> Code

Issues

Pull requests

Actions

Projects

Wiki

Security

Insights

Settings

main

fluxappdemo / .github / workflows /

Sergio Méndez fix: on tag format

..

github-actions-fluxappdemo.yml	fix: on tag format
--------------------------------	--------------------



ExploreRepositoriesOrganizationsHelp ▾

Upgrade

sergioarmgpl ▾

sergioarmgpl>Repositories>fluxappdemo>

Using 0 of 1 private repositories. [Get more](#)

GeneralTagsBuildsCollaboratorsWebhooksSettings



Advanced Image Management
View all your images and tags in this repository, clean up unused content, recover untagged images. Available [View preview](#) with Pro, Team and Business subscriptions.

☐ Sort by Newest ▾

Delete

☐

TAG

[RELEASE.2022-01-17T02-11-04Z](#)

Last pushed 3 hours ago by sergioarmgpl

docker pull sergioarmgpl/fluxappde...



DIGEST	OS/ARCH	LAST PULL	COMPRESSED SIZE ⓘ
8455fd844559	linux/arm64	a few seconds ago	23.82 MB



Welcome to Grafana

Email or username

Password



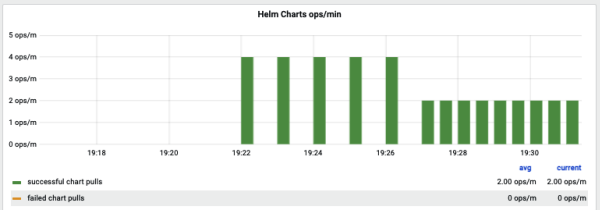
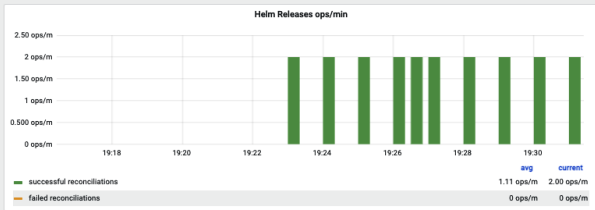
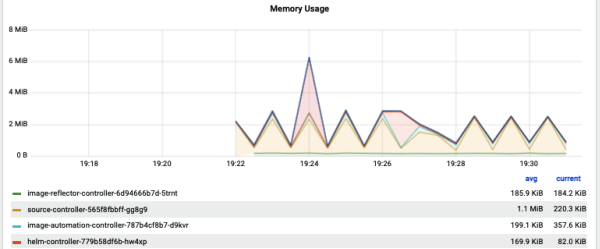
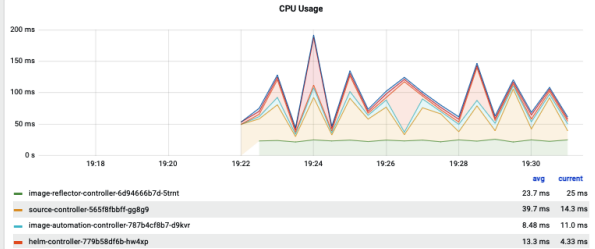
Log in

[Forgot your password?](#)

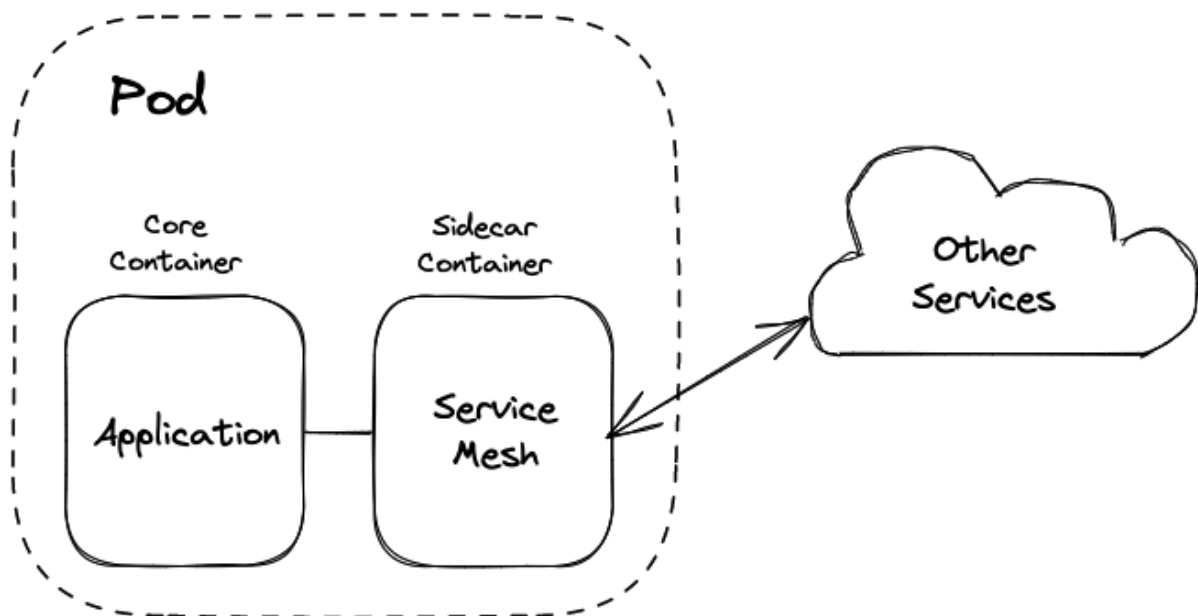
namespaces flux-system

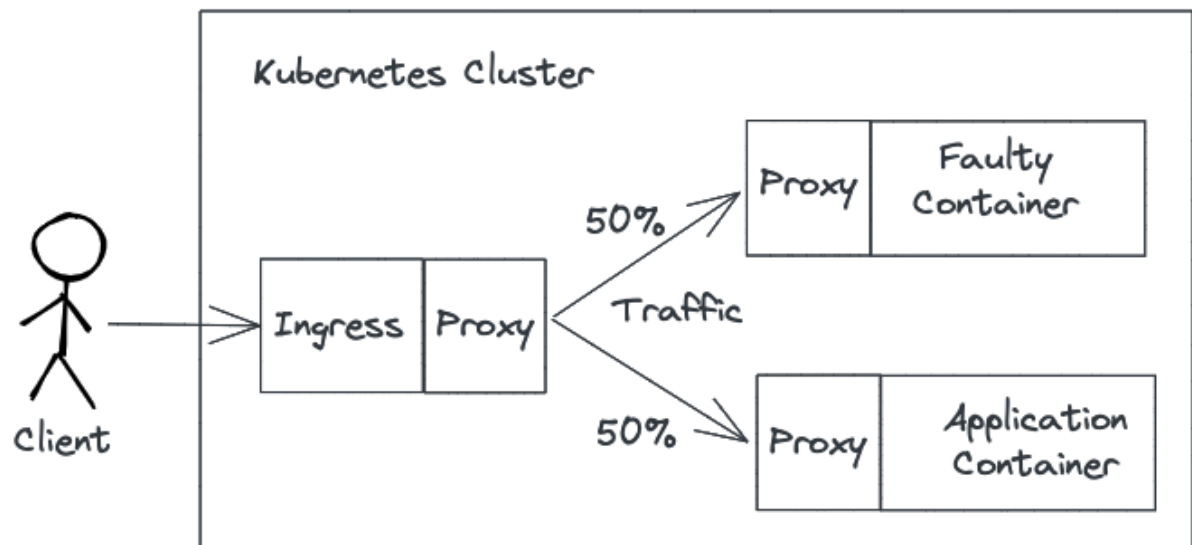
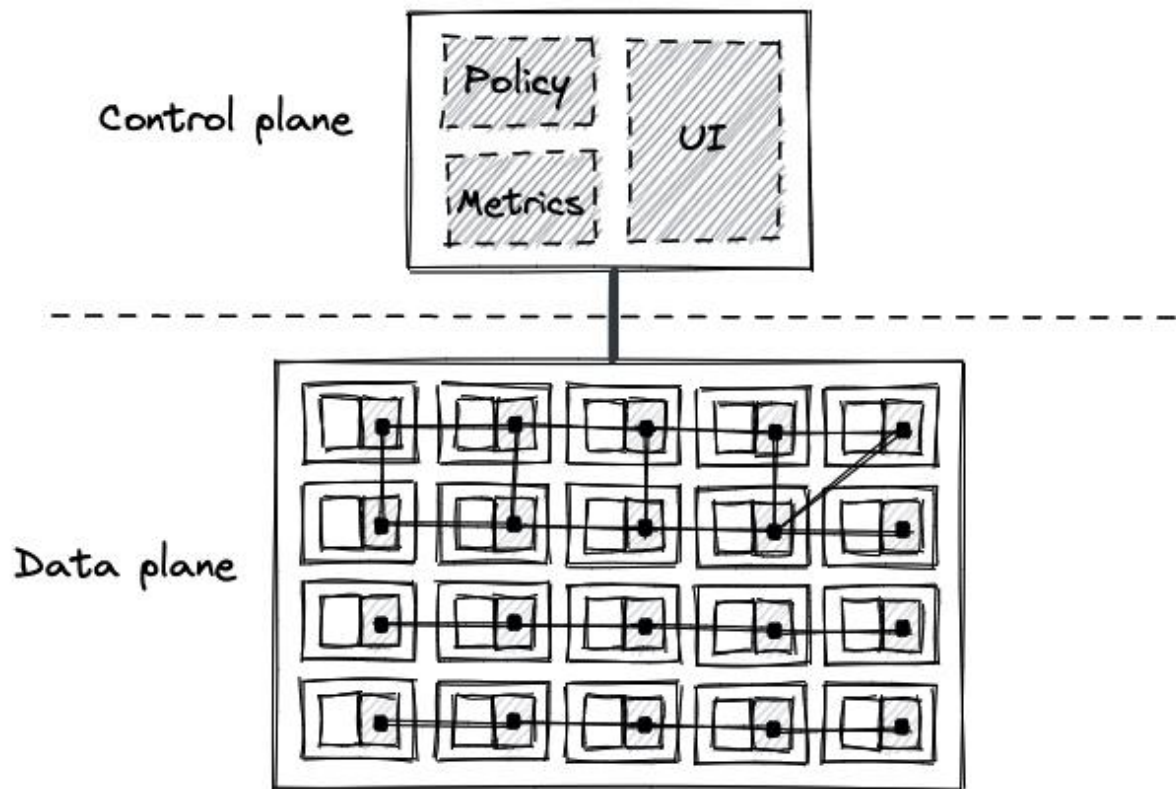


Resource Usage



Chapter 8: Observability and Traffic Splitting Using Linkerd





LINKERD

CLUSTER

Namespaces

Control Plane

MYAPPS

WORKLOADS

Cron Jobs

Daemon Sets

Deployments

Jobs

Pods

Replica Sets

Replication Controllers

Stateful Sets

CONFIGURATION

Traffic Splits

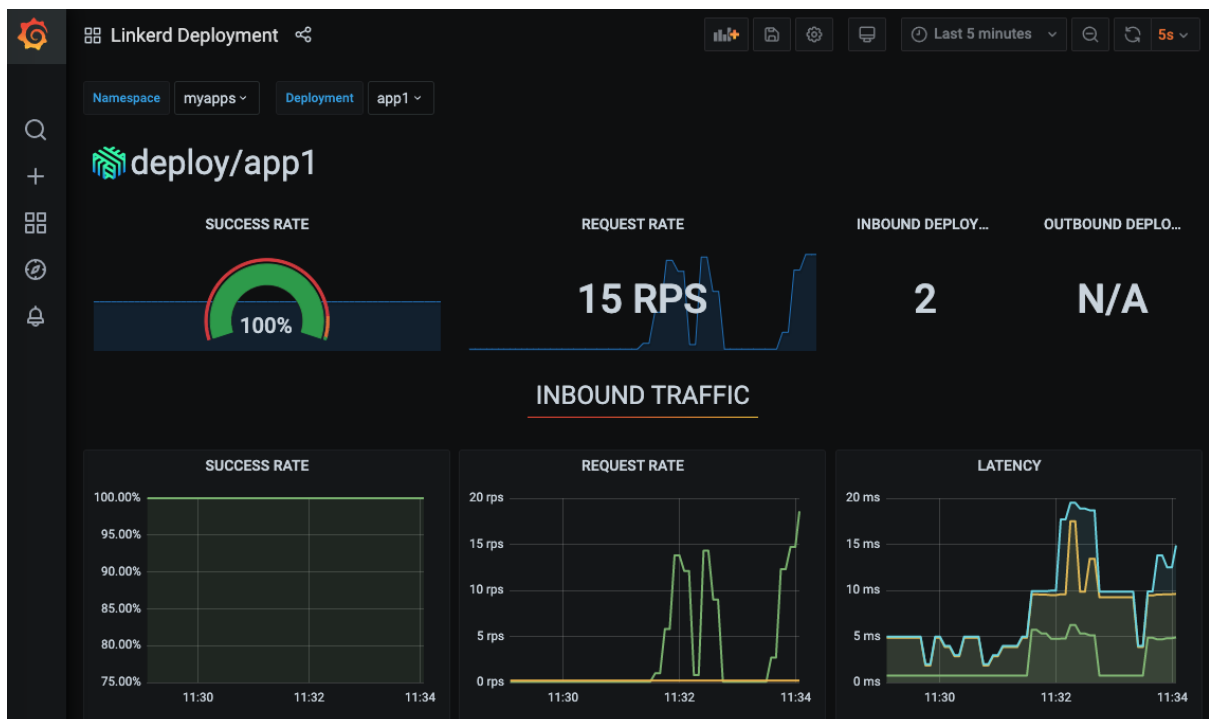
Namespace > myapps > Deployments

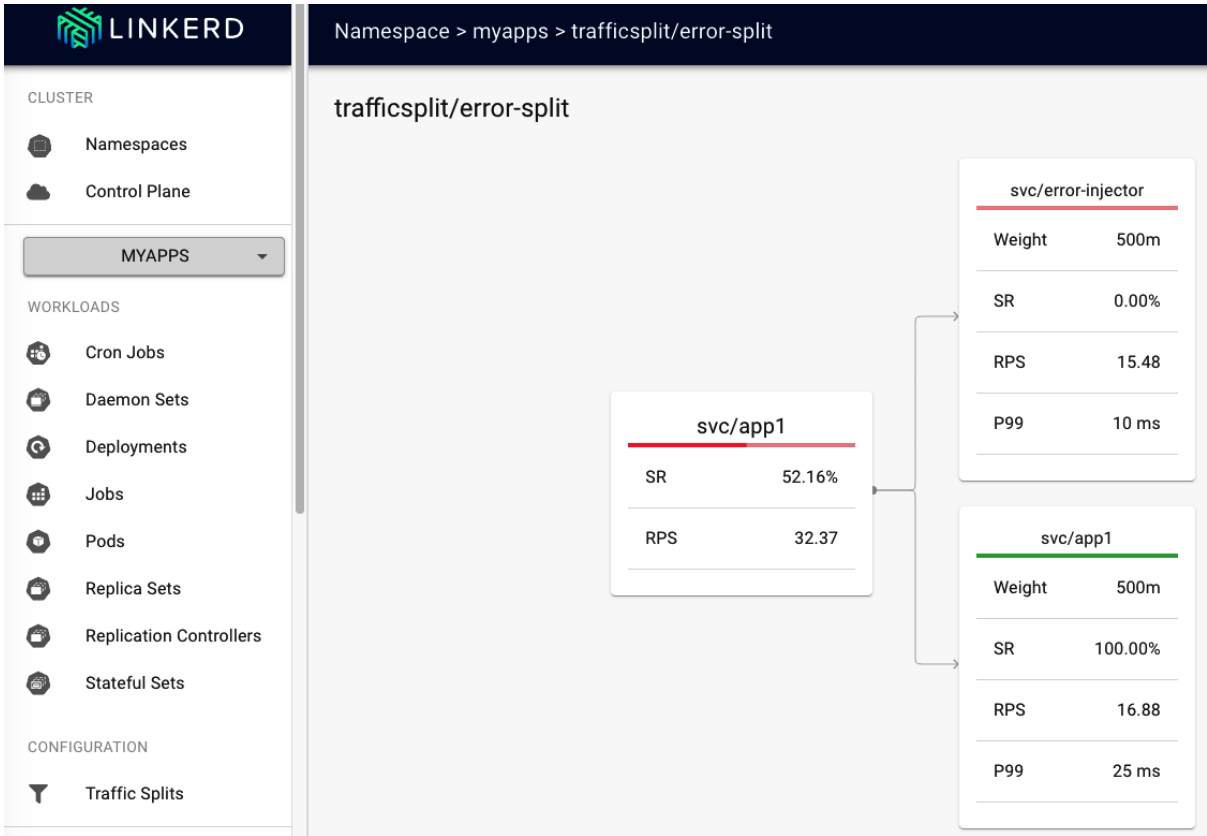
HTTP Metrics

Deployment ↑	↑ Meshed	↑ Success Rate	↑ RPS	↑ P50 Latency	↑ P95 Latency	↑ P99 Latency	Grafana
app1	1/1	100.00% ●	16.53	5 ms	9 ms	10 ms	🔧
error-injector	1/1	1.96% ●	15.3	1 ms	2 ms	4 ms	🔧

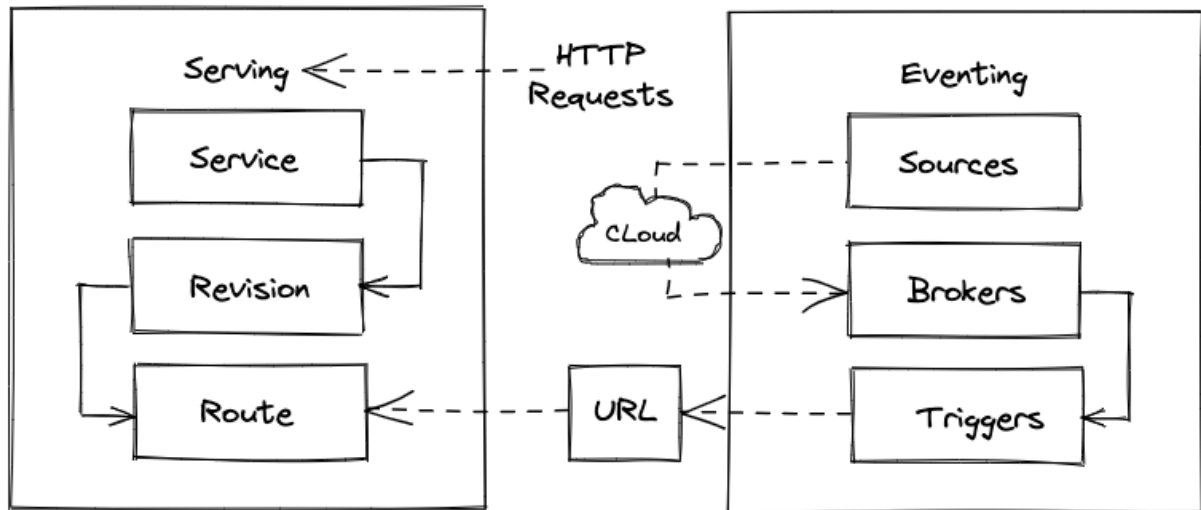
TCP Metrics

Deployment ↑	↑ Meshed	↑ Connections	↑ Read Bytes / sec	↑ Write Bytes / sec	Grafana
app1	1/1	2	913.28B/s	1.953kB/s	🔧
error-injector	1/1	2	842.32B/s	3.513kB/s	🔧

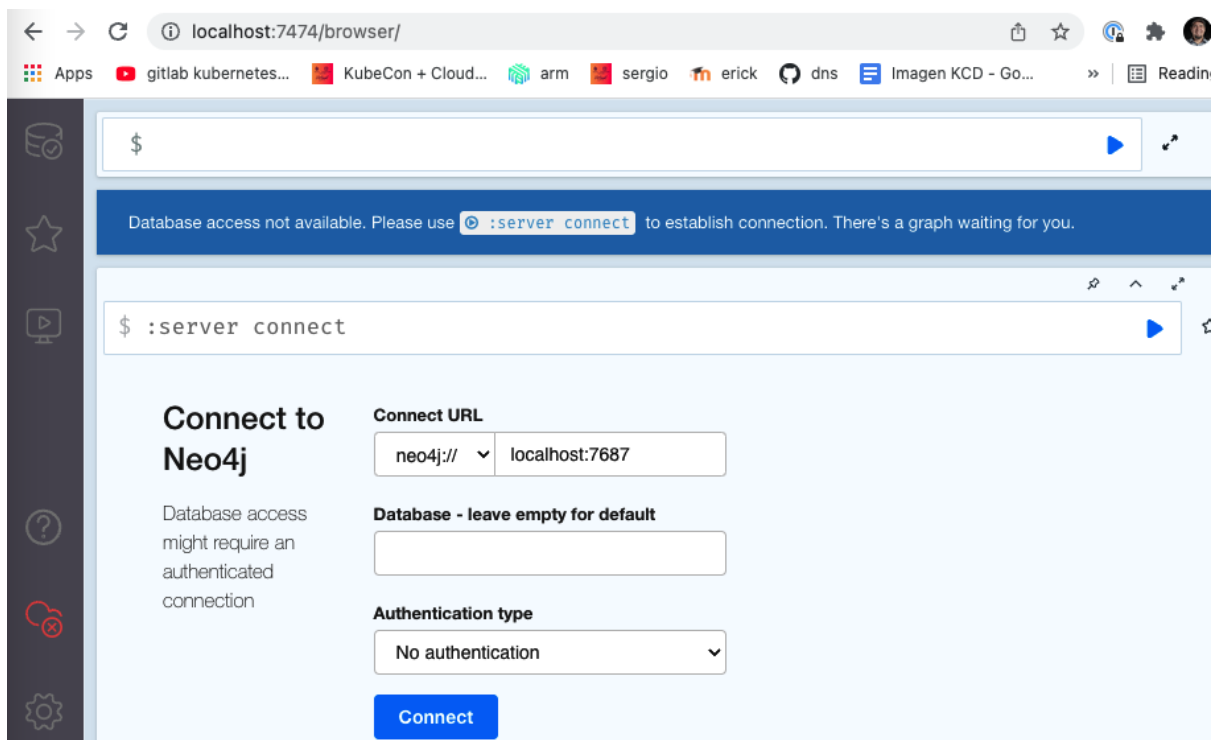
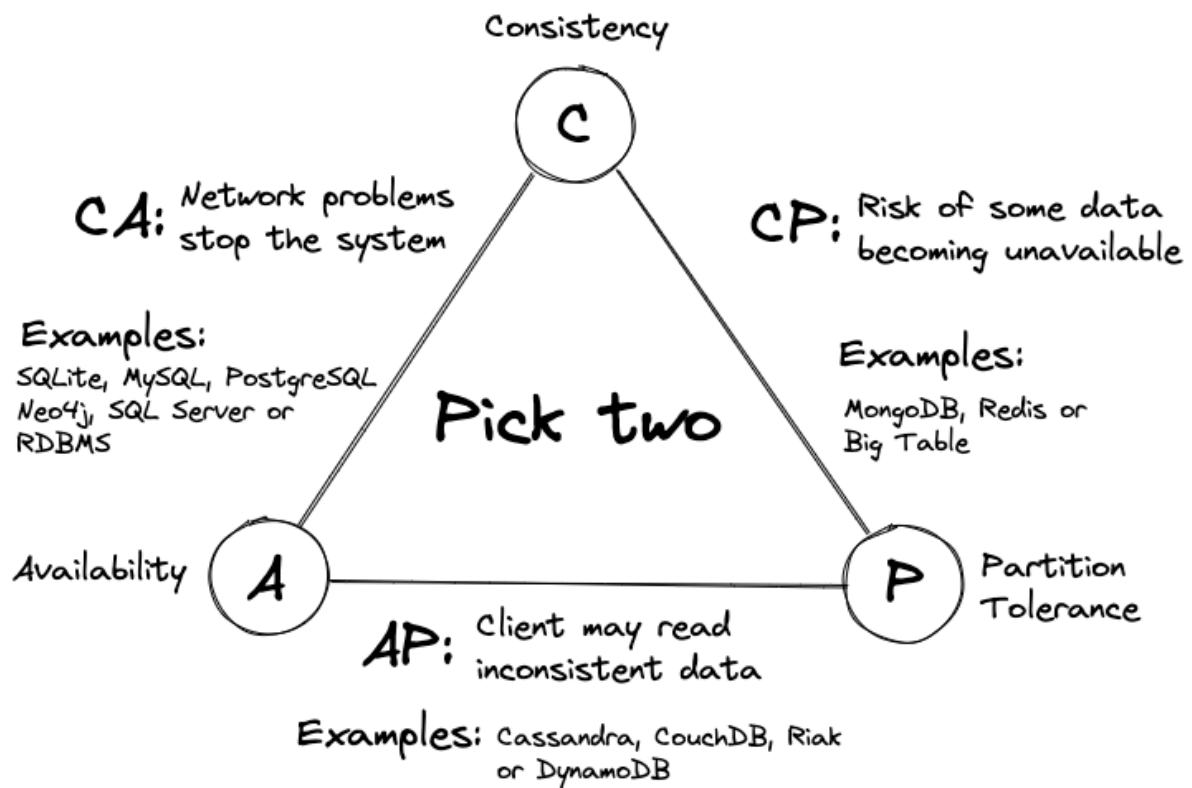




Chapter 9: Edge Serverless and Event-Driven Architectures with Knative and Cloud Events



Chapter 10: SQL and NoSQL Databases at the Edge



neo4j\$

\$:play start



Getting started with Neo4j

Browser

Neo4j Browser user interface guide

[Get started](#)

Try Neo4j with live data

A complete example graph that demonstrates common query patterns.

Actors & movies in cross-referenced pop culture.

[Open guide](#)

Cypher basics

Intro to Graphs with Cypher

What is a graph database?
How can I query a graph?

[Start querying](#)

Copyright © Neo4j, Inc 2002–2022

[Sign up](#) for a free Neo4j cloud instance with 

\$:server connect

Connected to Neo4j

Nice to meet you.

You have a working connection and server auth is disabled.

neo4j\$

1 CREATE (IronMan:Hero{name: "Tony Stark"})

2 CREATE (Thanos:Villainous {name: "Thanos"})

3 CREATE (Thanos)-[r:ENEMY_OF]→(IronMan)

4 RETURN IronMan, Thanos

Graph

Table

Text

Code

Tony Stark

Thanos

ENEMY_OF

Overview

Node labels

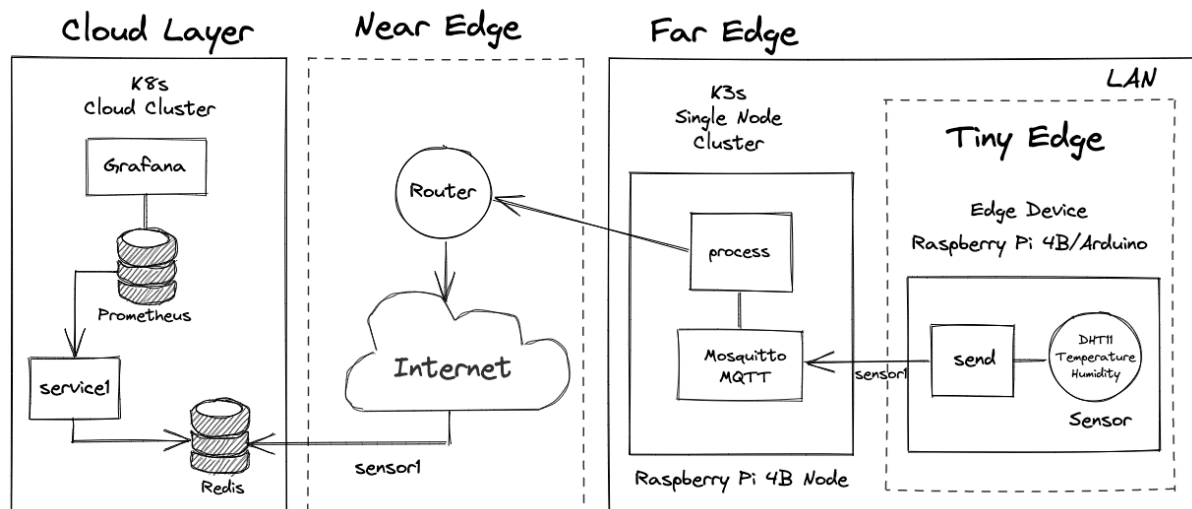
* (2) Hero (1) Villainous (1)

Relationship Types

* (1) ENEMY_OF (1)

Displaying 2 nodes, 1 relationships.

Chapter 11: Monitoring the Edge with Prometheus and Grafana



 Prometheus Alerts Graph Status ▾ Help

☐ Use local time ☐ Enable query history ☒ Enable autocomplete ☒ Enable highlighting ☒ Enable linter

 Expression (press Shift+Enter for newlines)

 Execute

Table

Graph

<

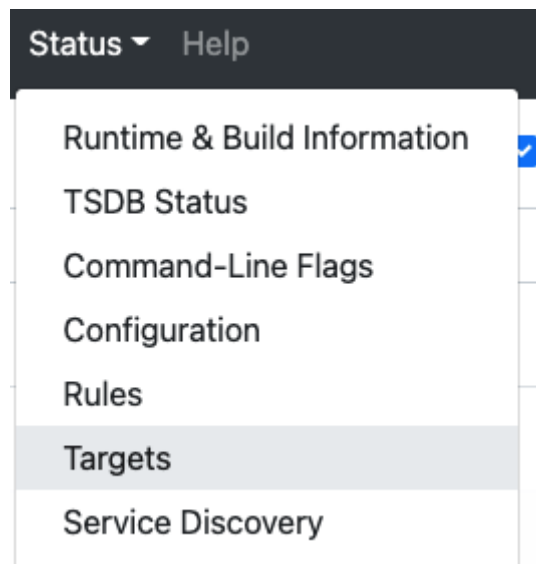
Evaluation time

>

No data queried yet

Remove Panel

Add Panel



Targets

All Unhealthy Collapse All

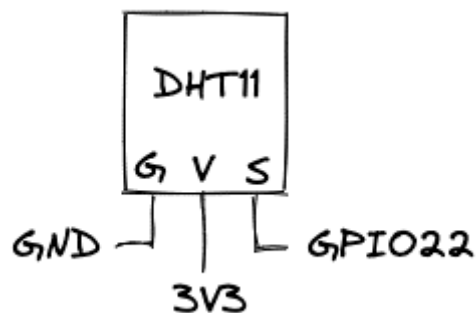
Filter by endpoint or labels

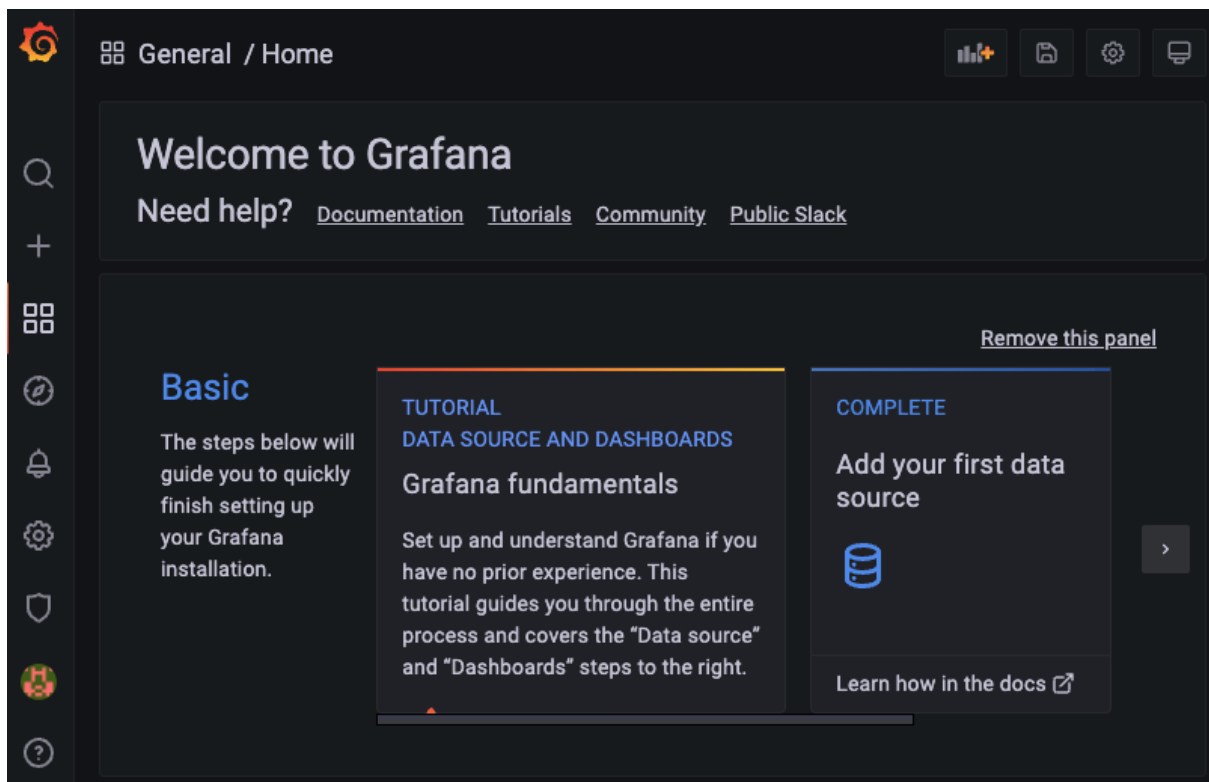
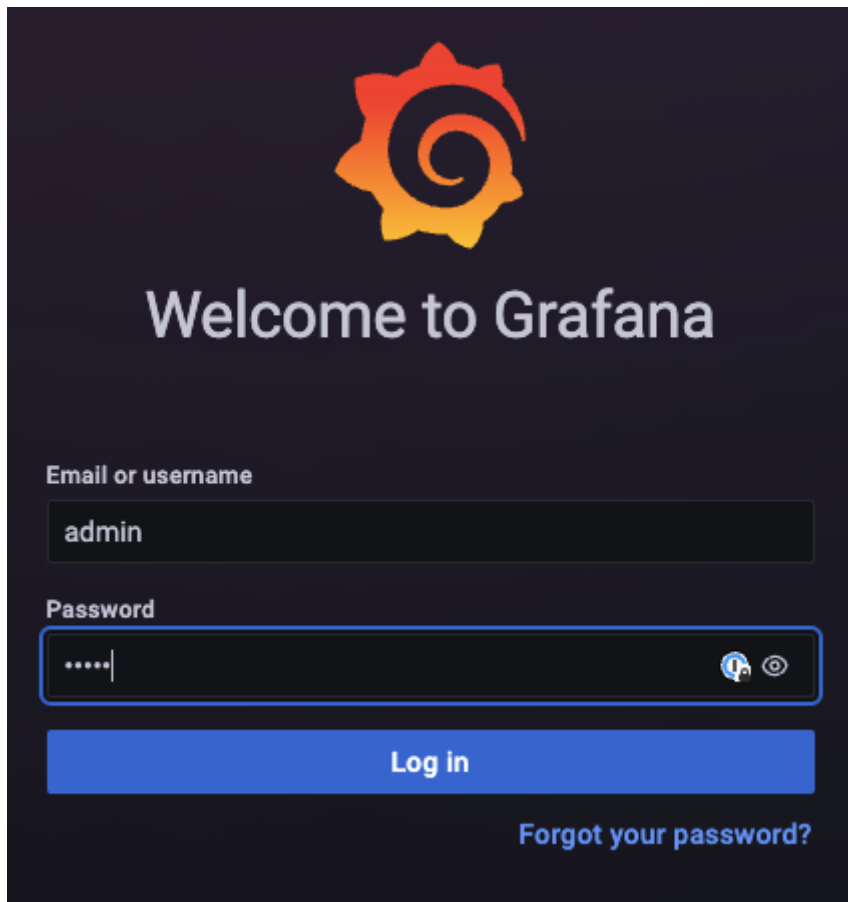
MonitoringJob1 (0/1 up) [show less](#)

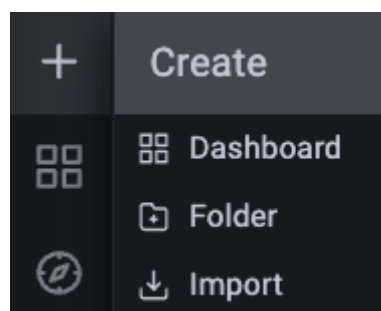
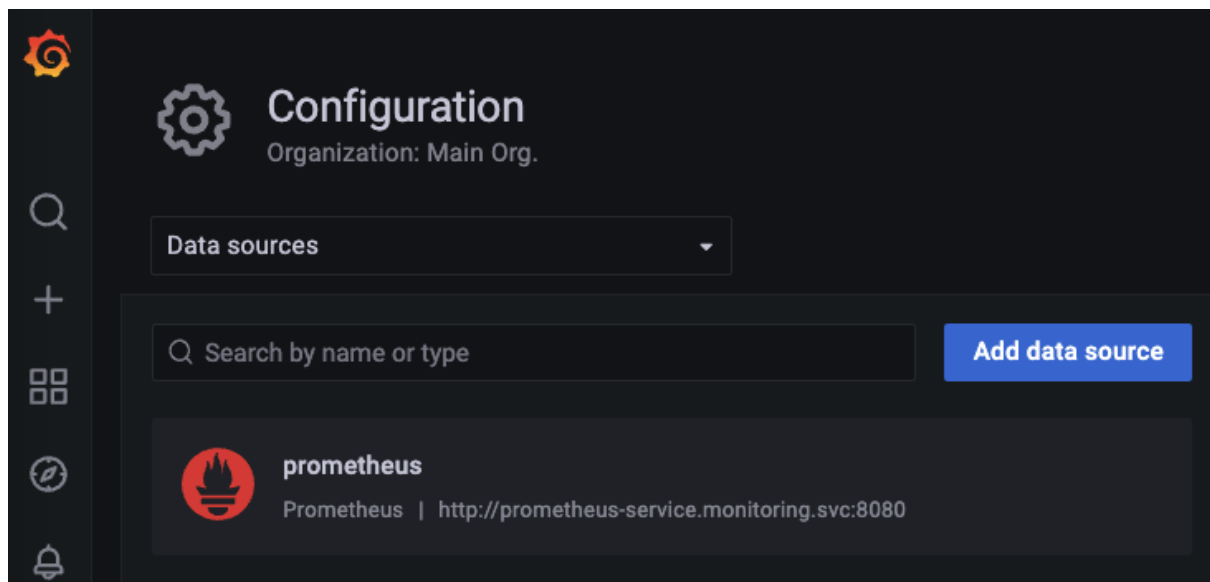
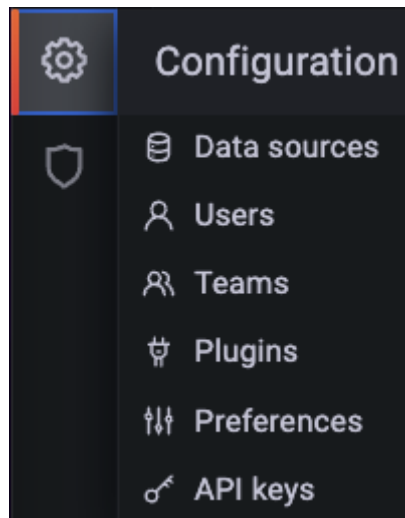
Endpoint	State	Labels	Last Scrape	Scrape Duration	Error
http://service1:5555/metrics	DOWN	instance="service1:5555" job="MonitoringJob1"	6.863s ago	5.1s	Get "http://service1:5555/metrics": context deadline exceeded

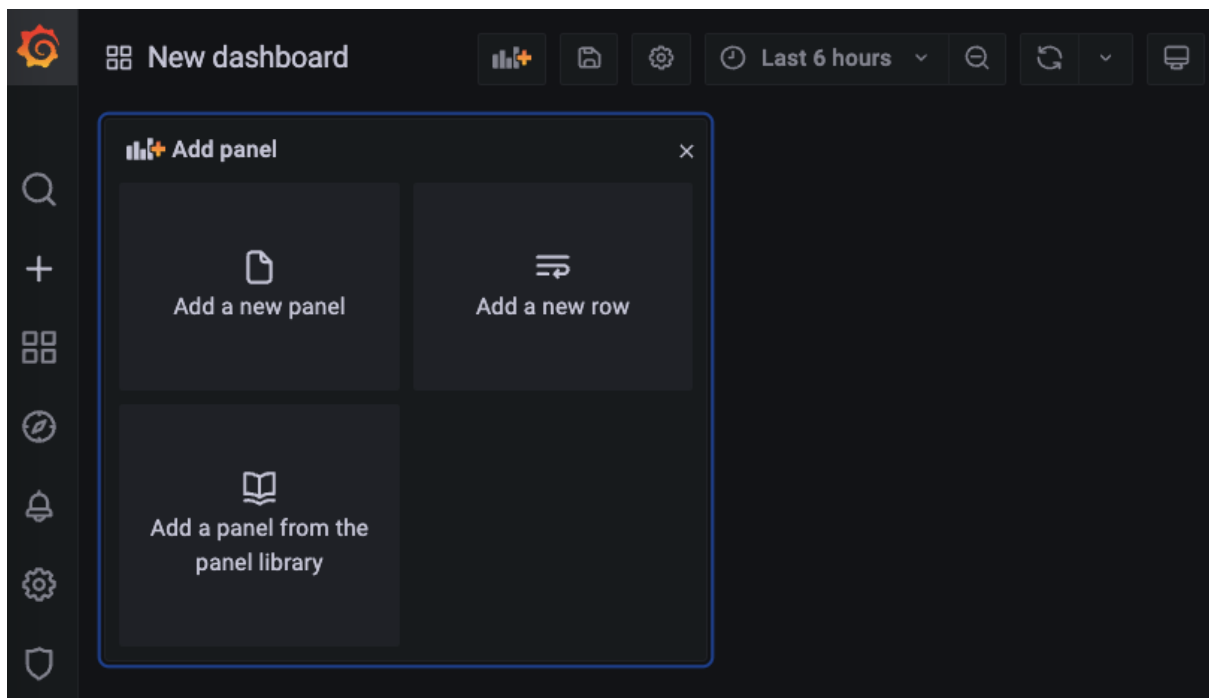
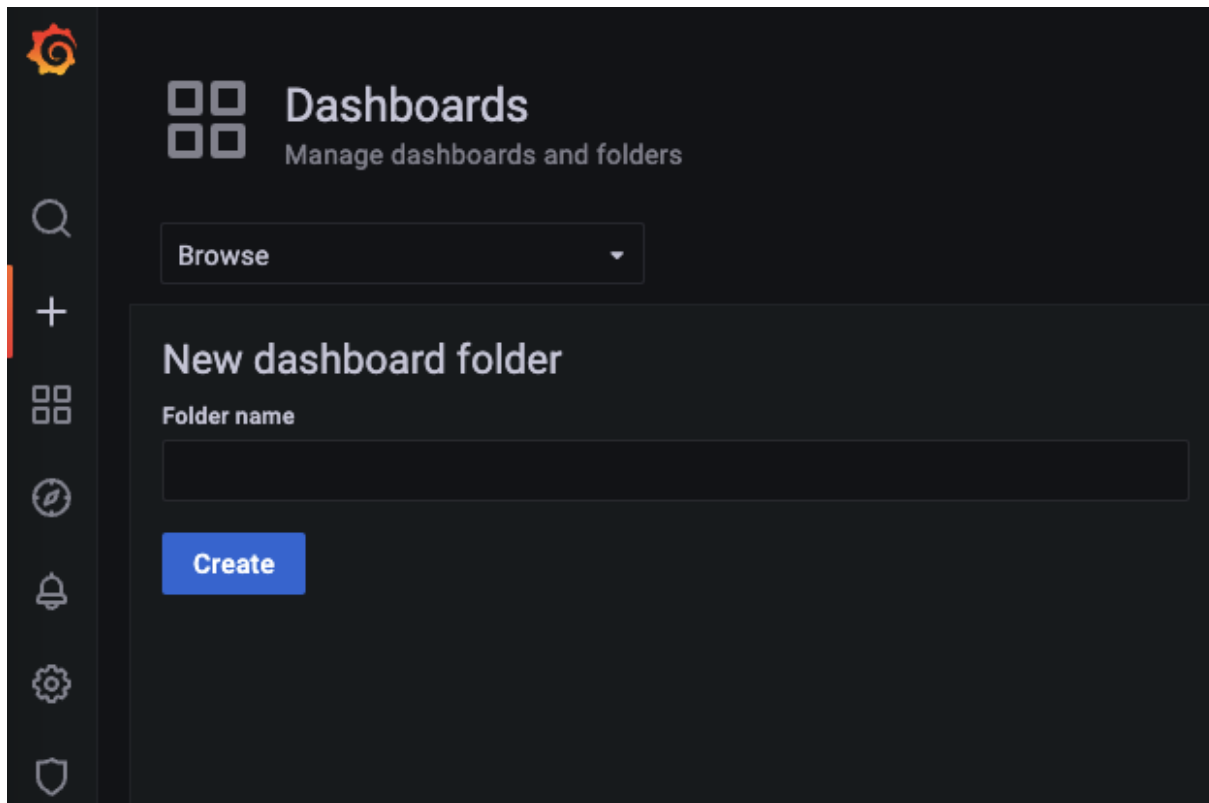
MonitoringJob2 (0/1 up) [show less](#)

Endpoint	State	Labels	Last Scrape	Scrape Duration	Error
http://service2:5555/metrics	DOWN	instance="service2:5555" job="MonitoringJob2"	5.666s ago	5.0s	Get "http://service2:5555/metrics": context deadline exceeded









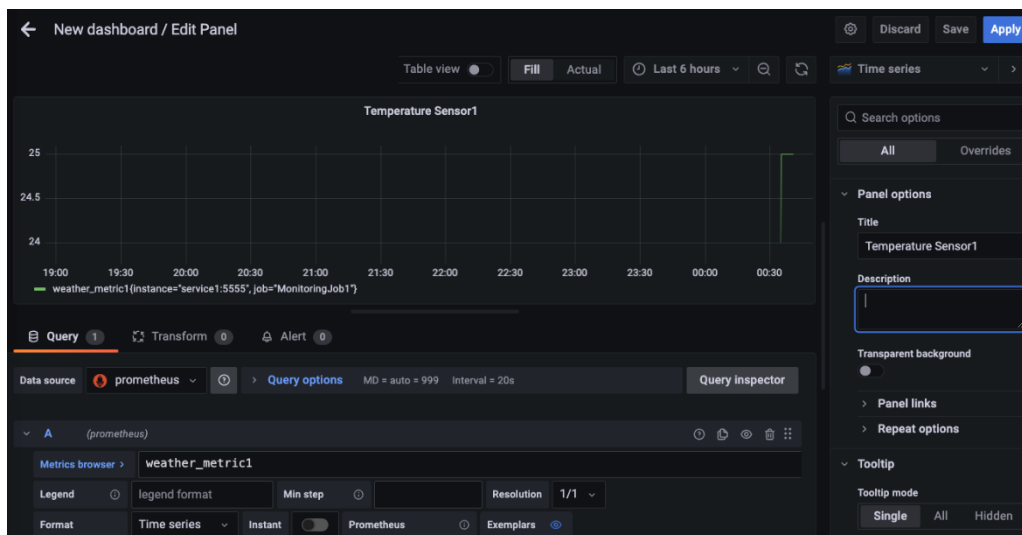


Table view ☐ ☒ Fill Actual Last 1 hour

Absolute time range

From now-1h

To now

Apply time range

It looks like you haven't used this time picker before. As soon as you enter some time intervals, recently used intervals will appear here.

[Read the documentation](#) to find out more about how to enter custom time ranges.

Search quick ranges

Last 5 minutes

Last 15 minutes

Last 30 minutes

Last 1 hour

Last 3 hours

Last 6 hours

Last 12 hours

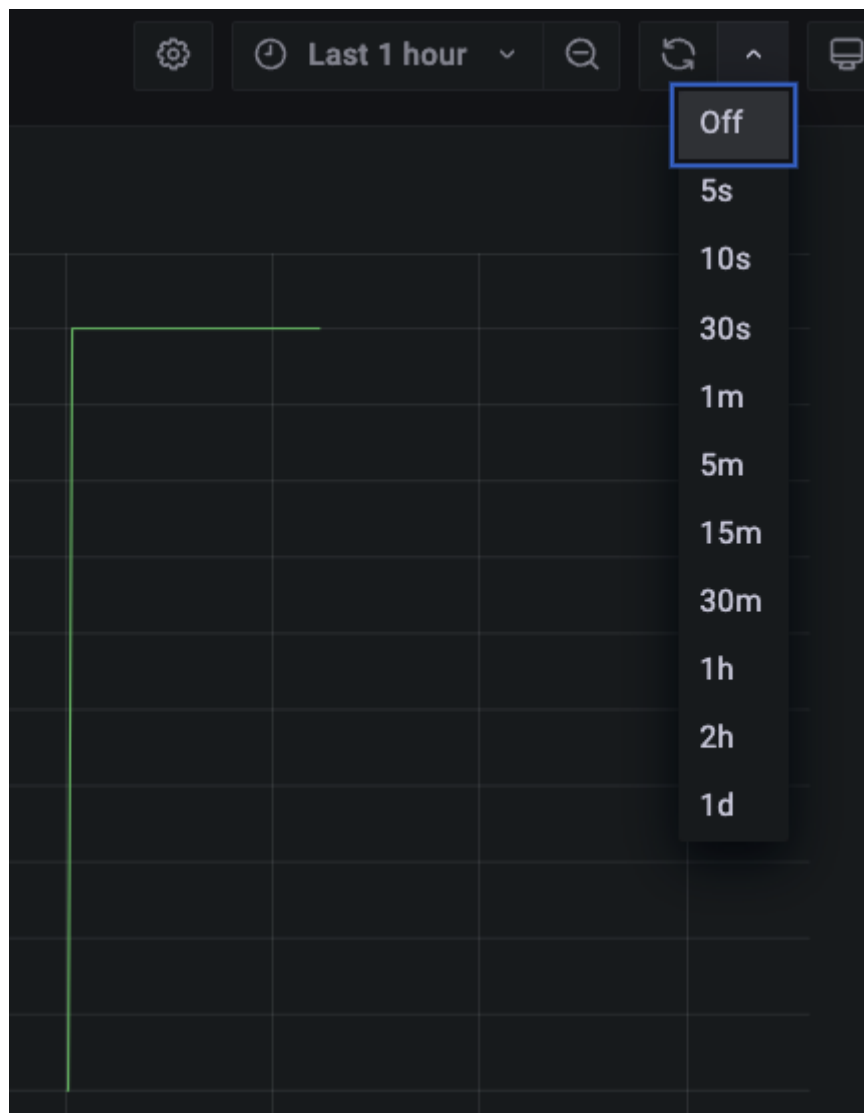
Last 24 hours

Last 2 days

Browser Time Guatemala, CST UTC-06:00 Change time settings

Data source  prometheus   Query options 

Max data points		999	=	Width of panel
Min interval		5s		
Interval		5s	=	Time range / max data points
Relative time		1h		
Time shift		1h		



Save dashboard as...

×

Dashboard name

Dashboard sensors

Folder

General

▼

Copy tags

Cancel

Save

⚙️

Discard

Save

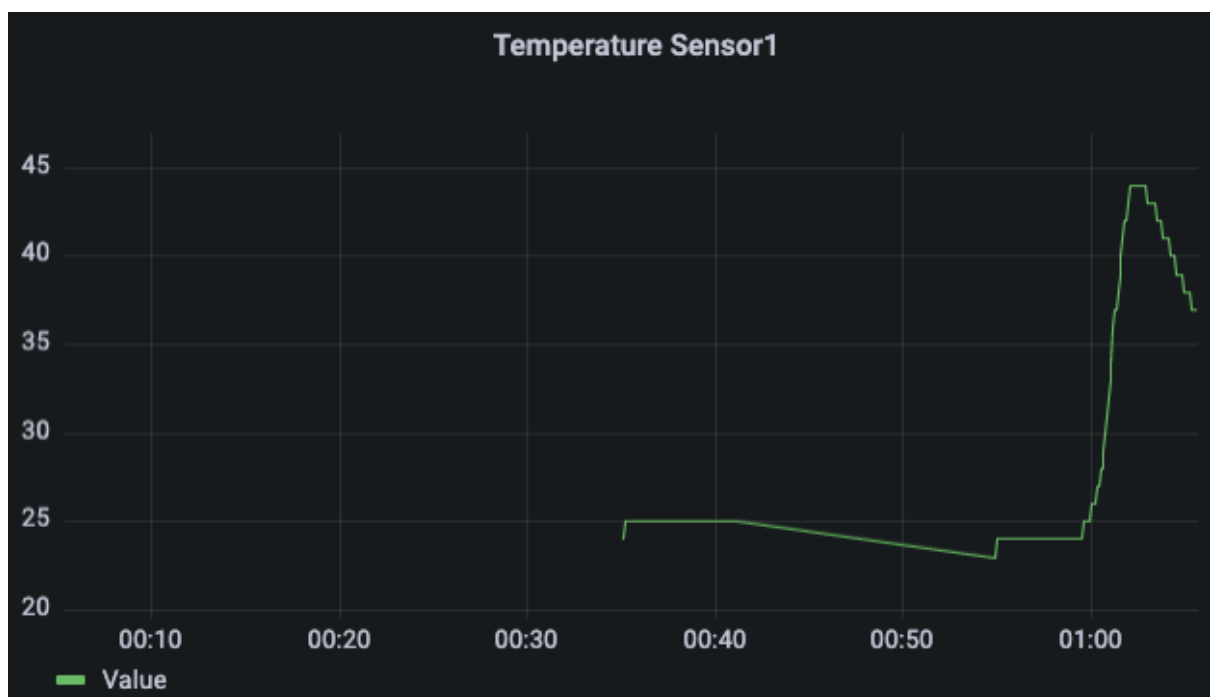
Apply

📈

Time series

▼

>





Search dashboards by name



Search dashboards



Sort (Default A-Z)



Recent

Dashboard sensors

General

Reports

General

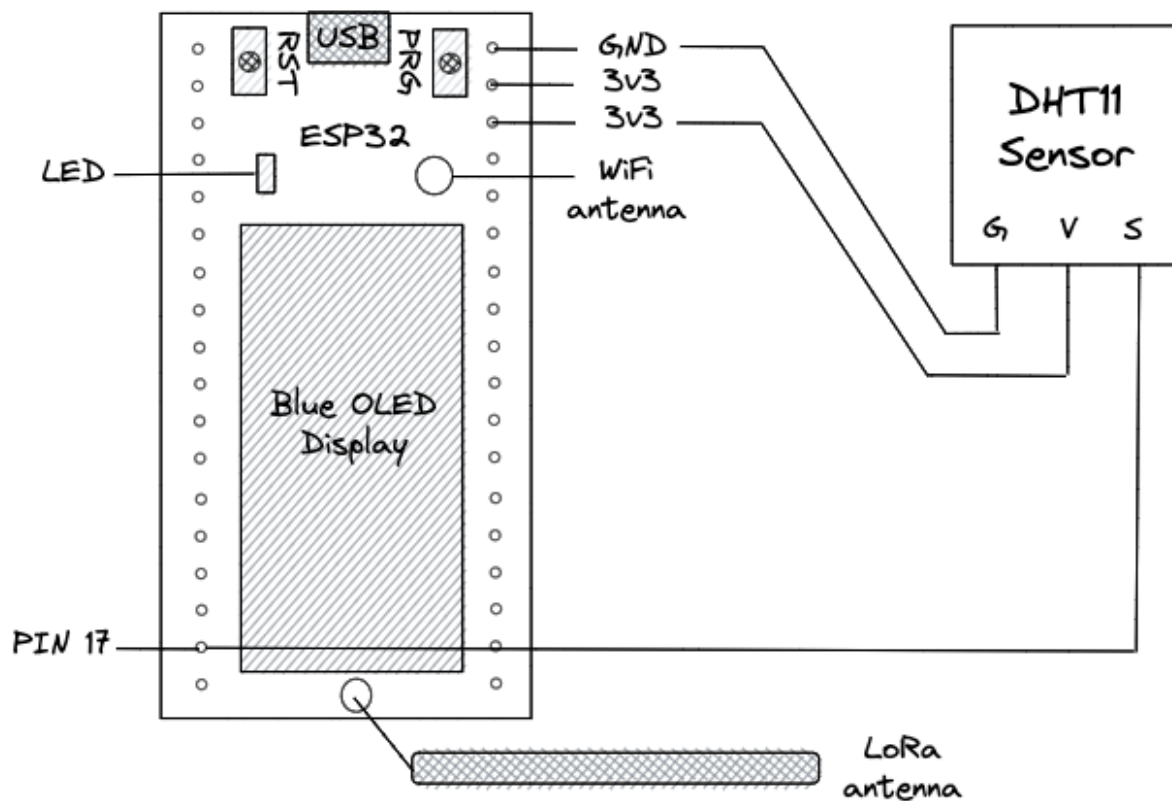
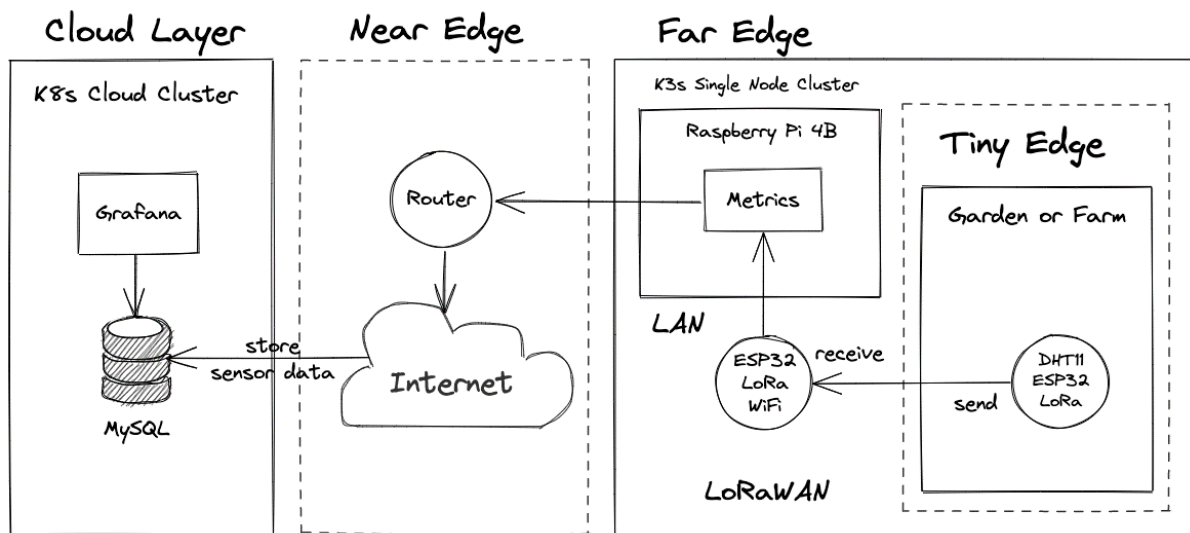
Reports

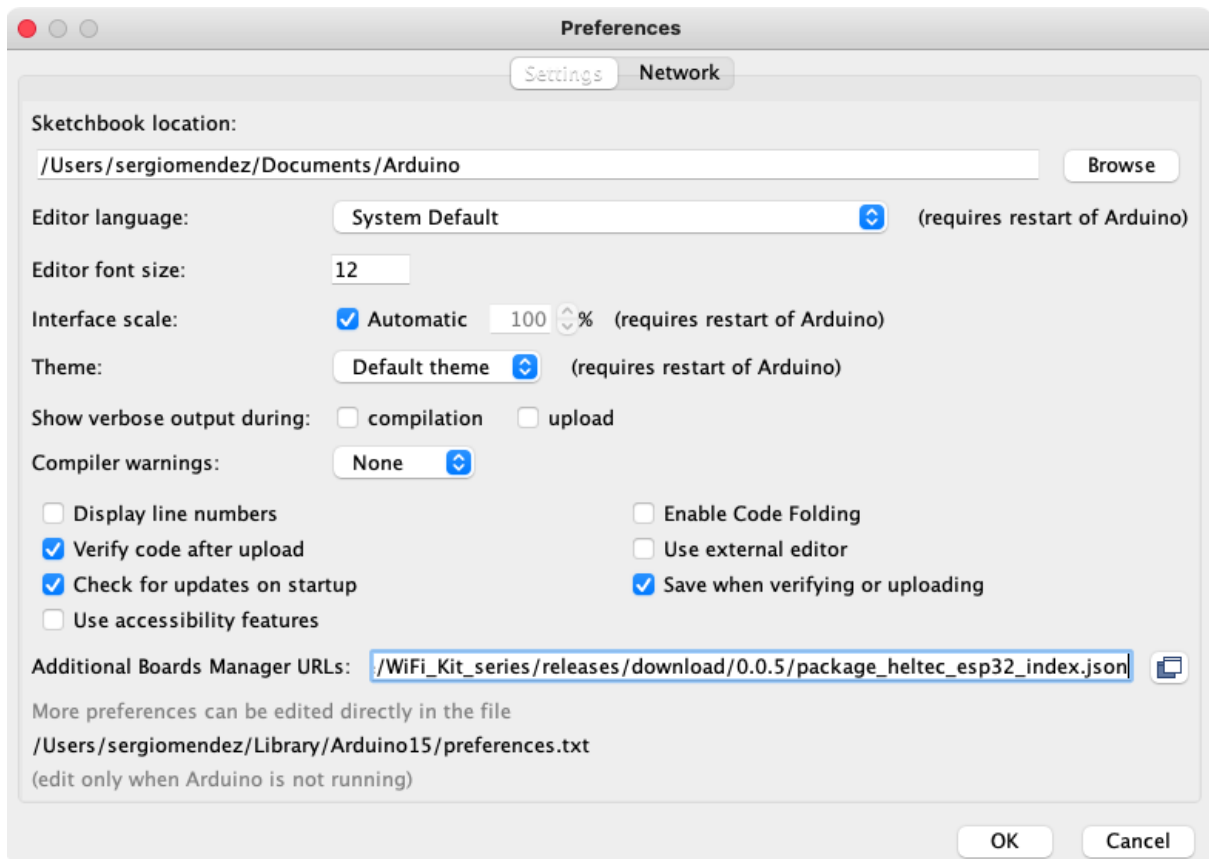
General

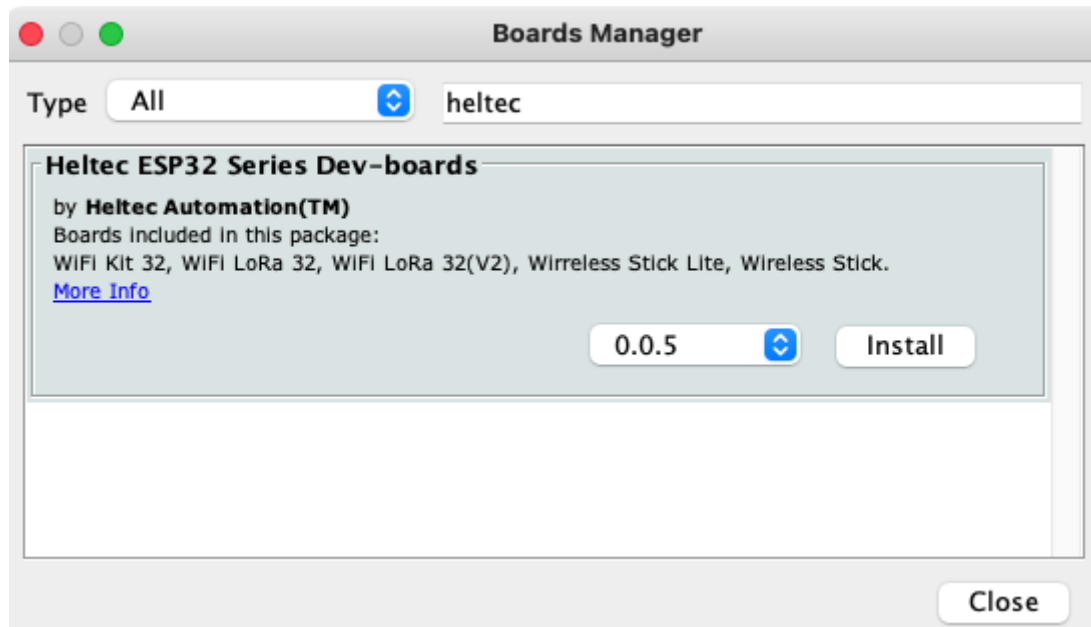
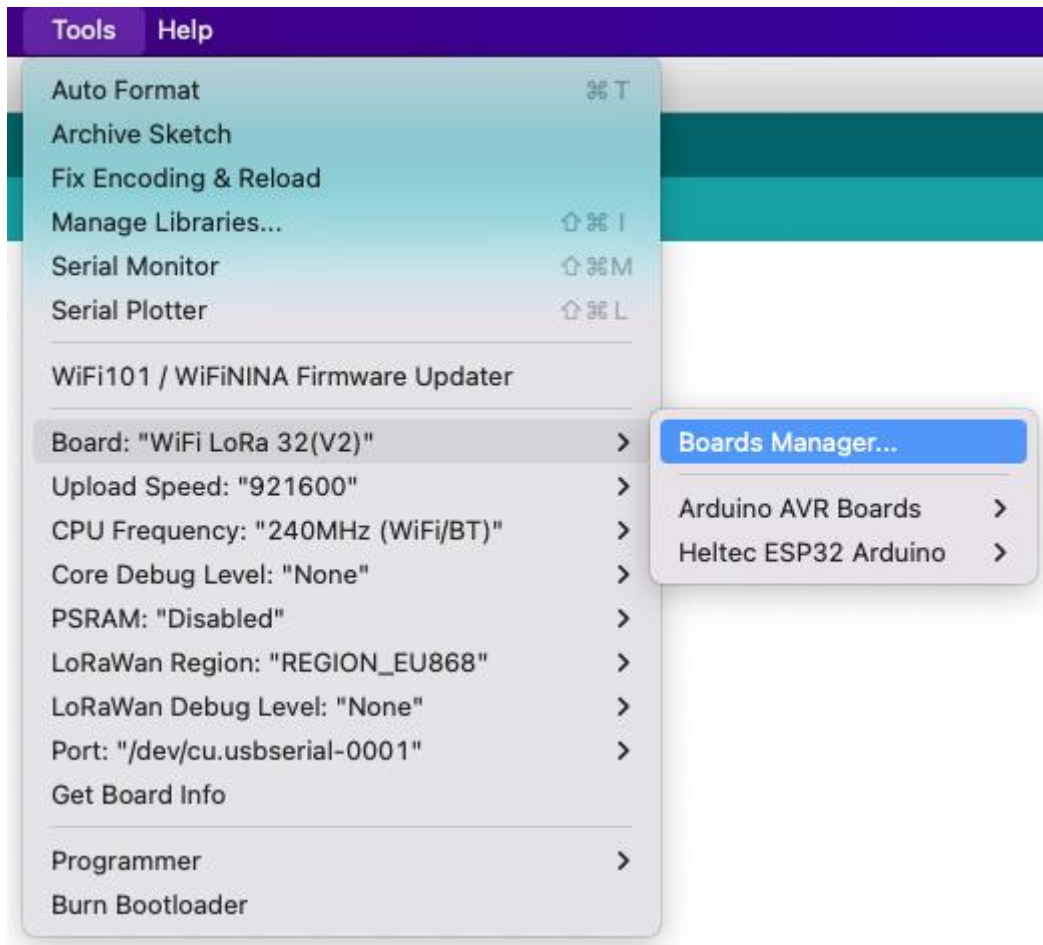
Dashboard sensors

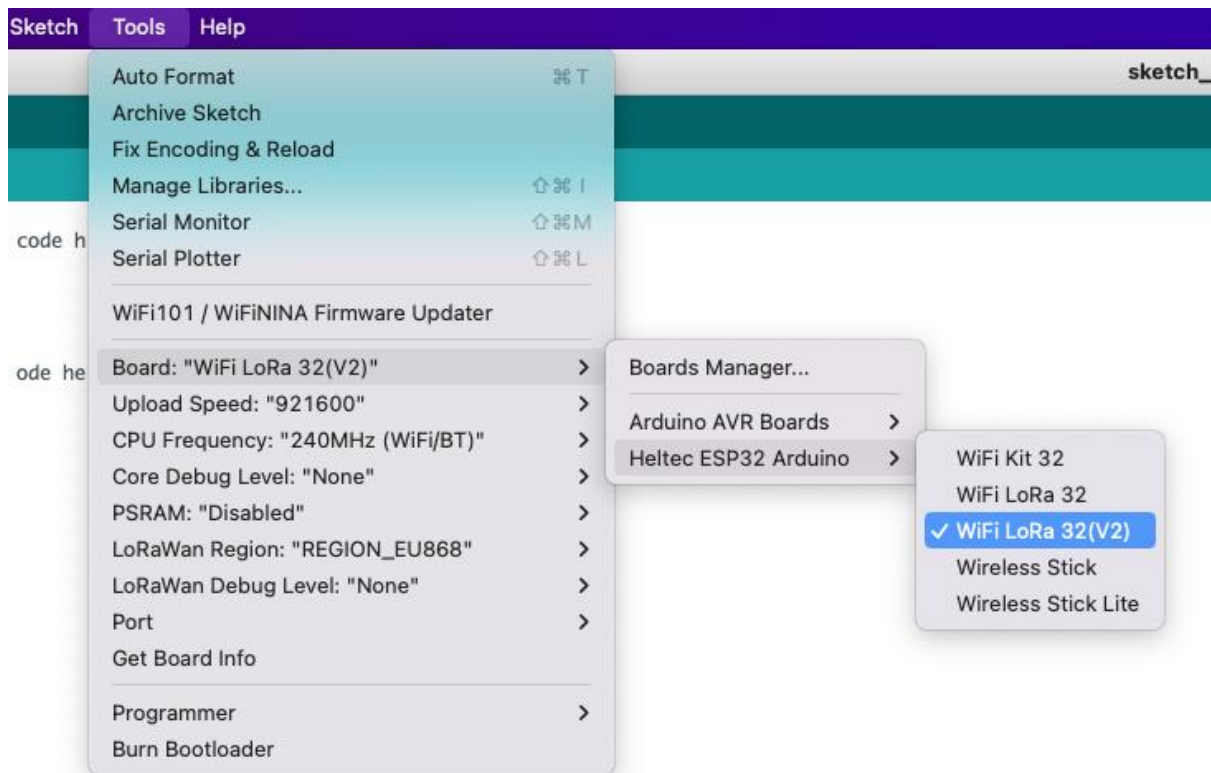
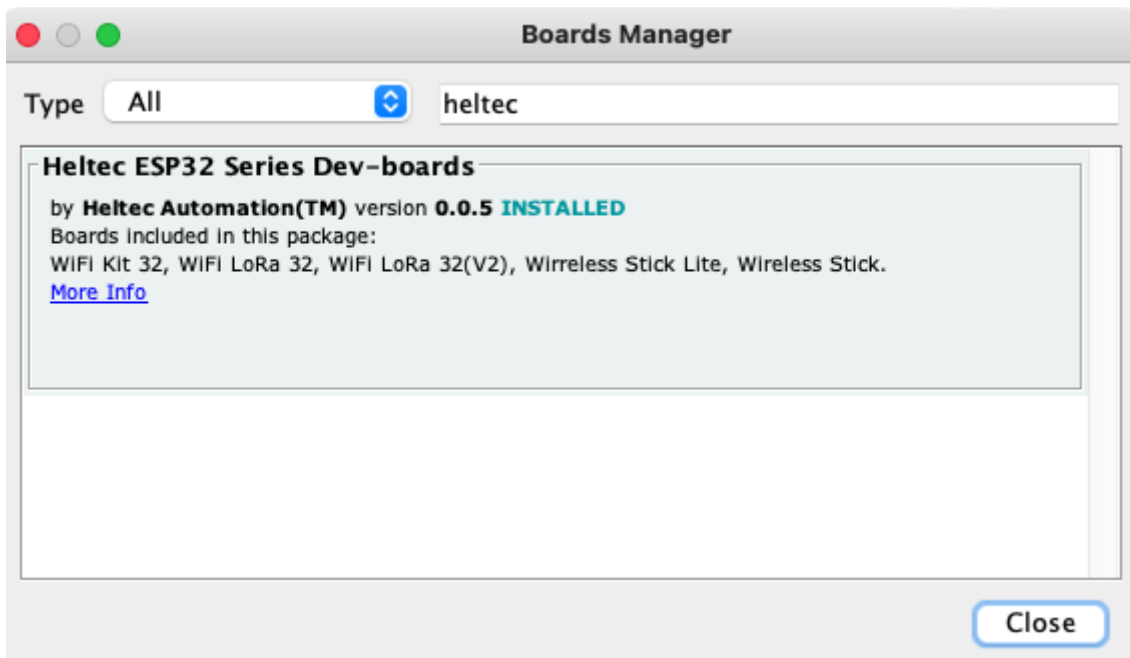
General

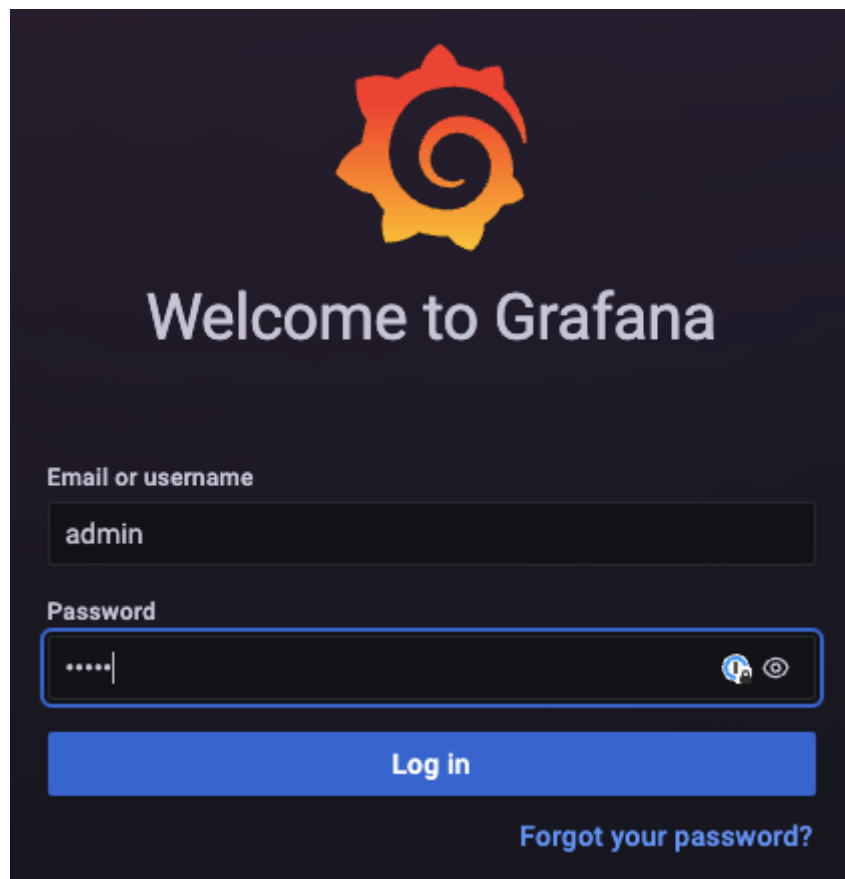
Chapter 12: Communicating with Edge Devices across Long Distances Using LoRa

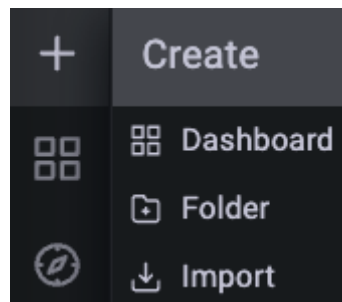
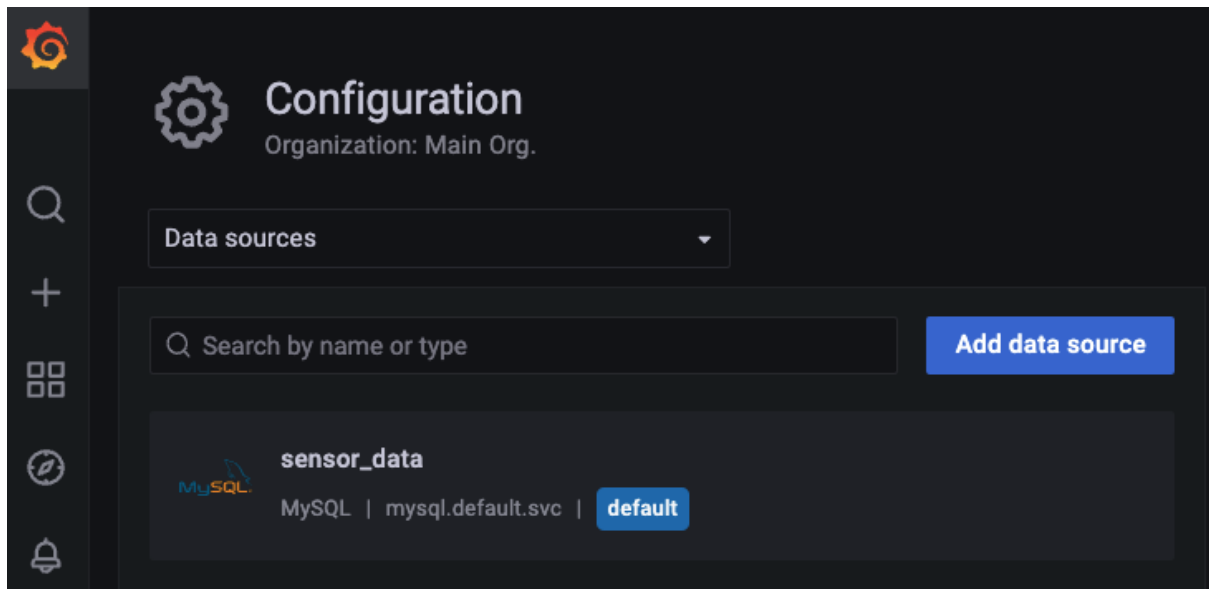
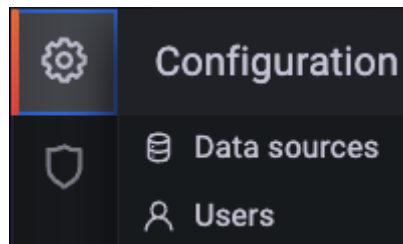


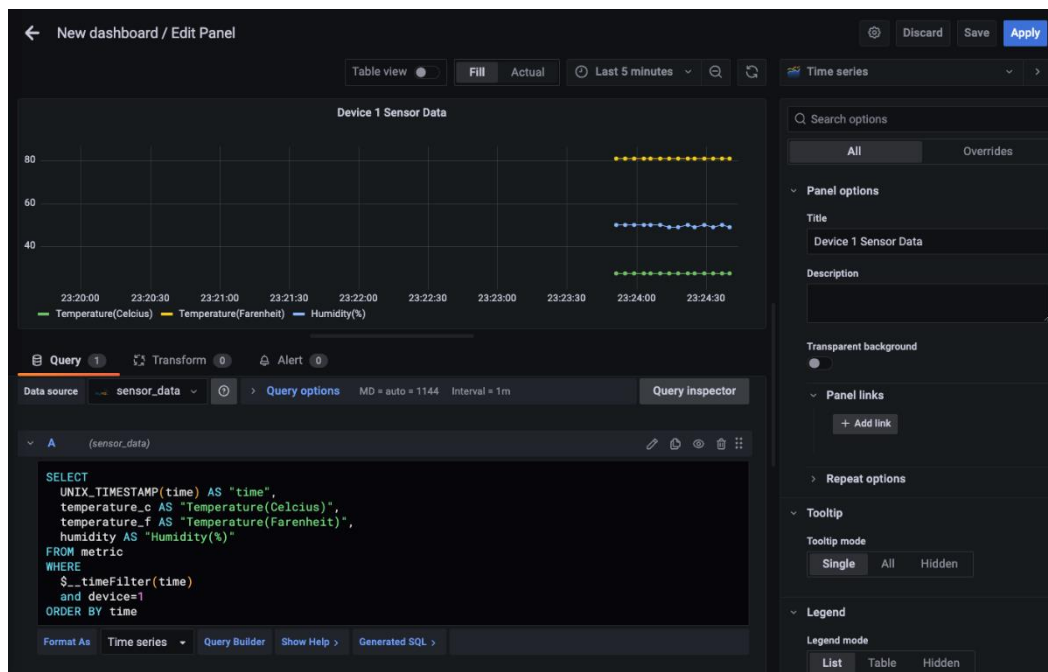
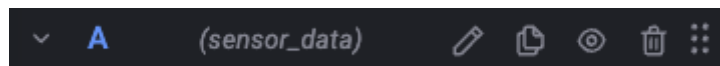
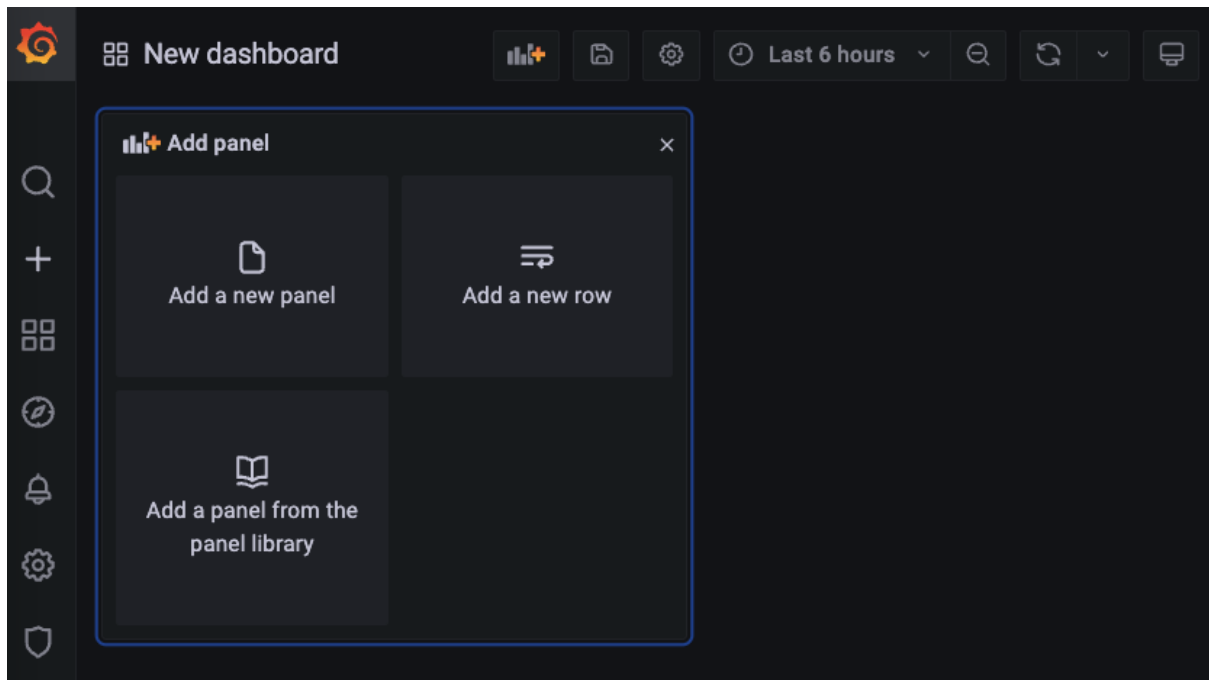














New dashboard



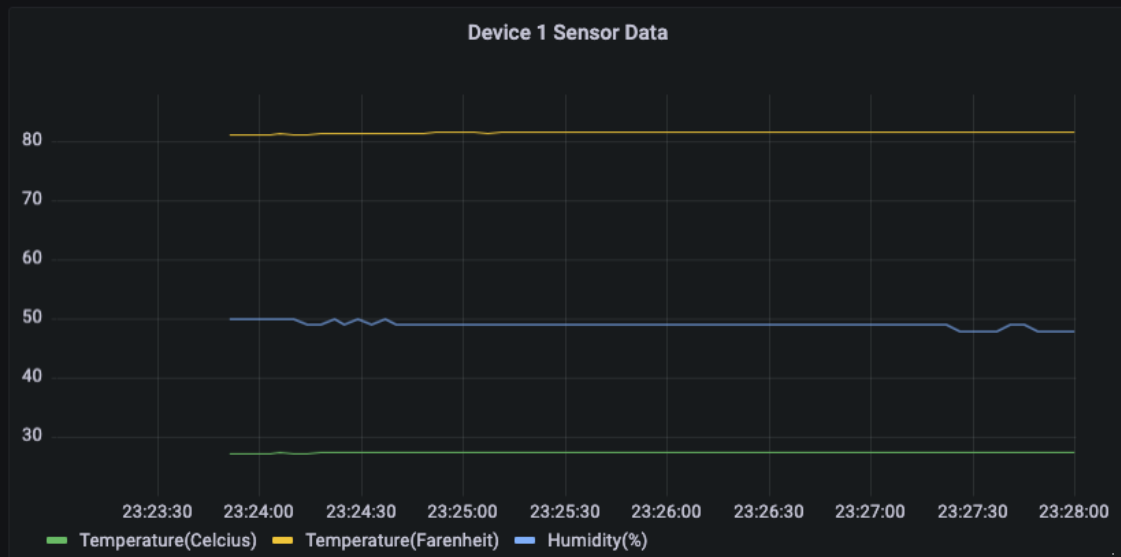
Last 5 minutes



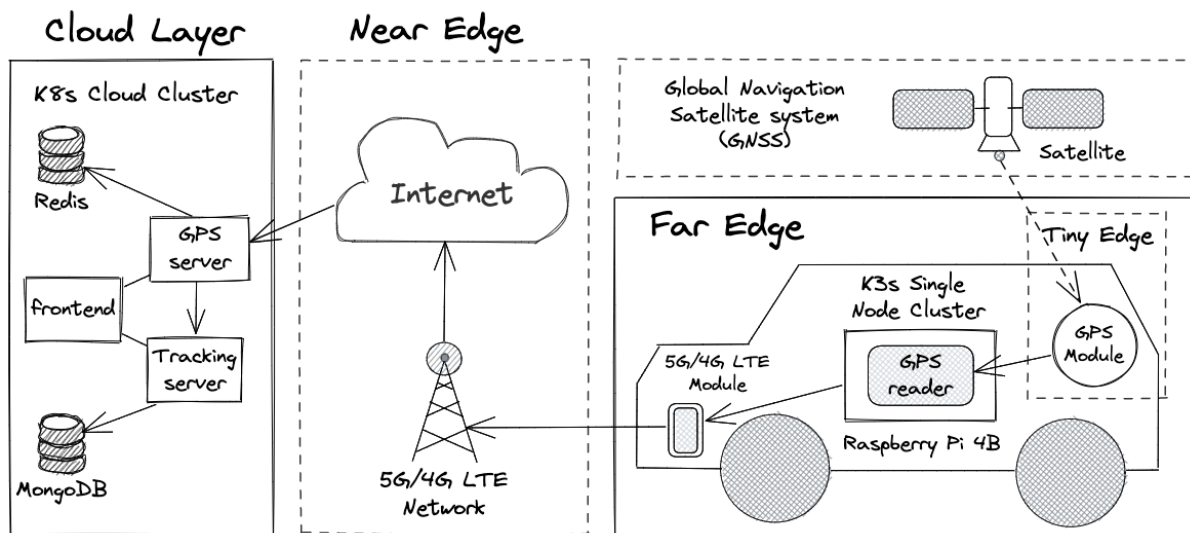
5s



Device 1 Sensor Data



Chapter 13: Geolocation Applications Using GPS, NoSQL, and K3s Clusters



```
sergioarmgpl@raspberrypi: ~  
Raspberry Pi 4 Model B Rev 1.4  
Raspberry Pi Software Configuration Tool (raspi-config)  
1 System Options          Configure system settings  
2 Display Options        Configure display settings  
3 Interface Options      Configure connections to peripherals  
4 Performance Options    Configure performance settings  
5 Localisation Options   Configure language and regional settings  
6 Advanced Options       Configure advanced settings  
8 Update                 Update this tool to the latest version  
9 About raspi-config     Information about this configuration tool  
  
<Select>                <Finish>
```

```

eth0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether e4:5f:01:06:1f:e1 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

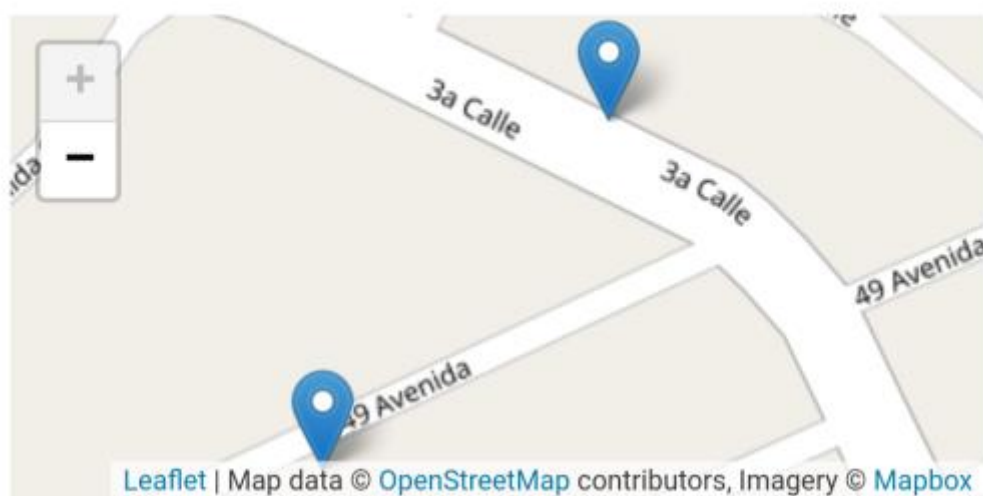
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 11 bytes 1657 (1.6 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 11 bytes 1657 (1.6 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.0.53 netmask 255.255.255.0 broadcast 192.168.0.255
    inet6 fe80::ef3d:ab41:53a7:4653 prefixlen 64 scopeid 0x20<link>
    inet6 ::f0e4:5d1a:704a:90f3 prefixlen 64 scopeid 0x0<global>
    ether e4:5f:01:06:1f:e2 txqueuelen 1000 (Ethernet)
    RX packets 463 bytes 44673 (43.6 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 1364 bytes 198250 (193.6 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

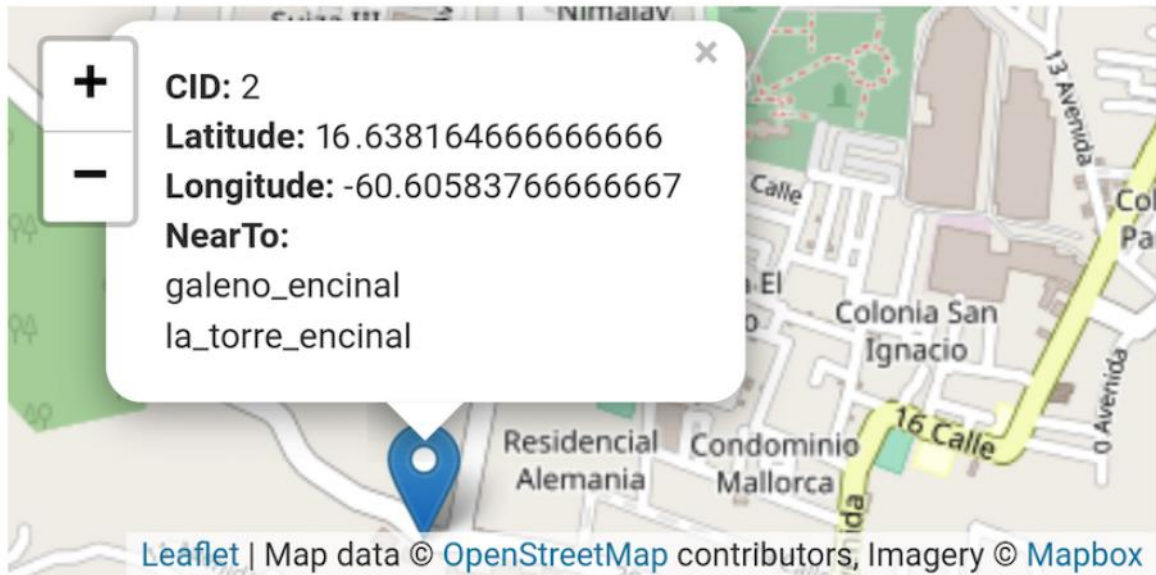
```

NAME	STATUS	ROLES	AGE	VERSION
raspberrypi	Ready	control-plane,master	53s	v1.23.6+k3s1

Geo Tracking



Geo Tracking



Vehicles Routes Report

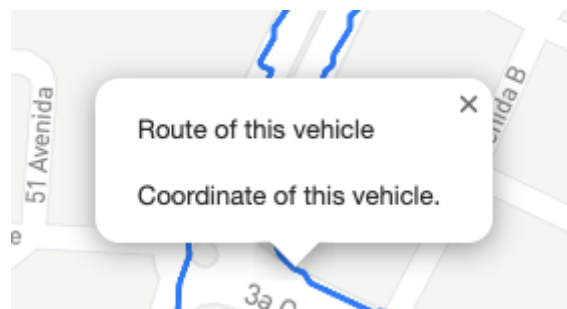
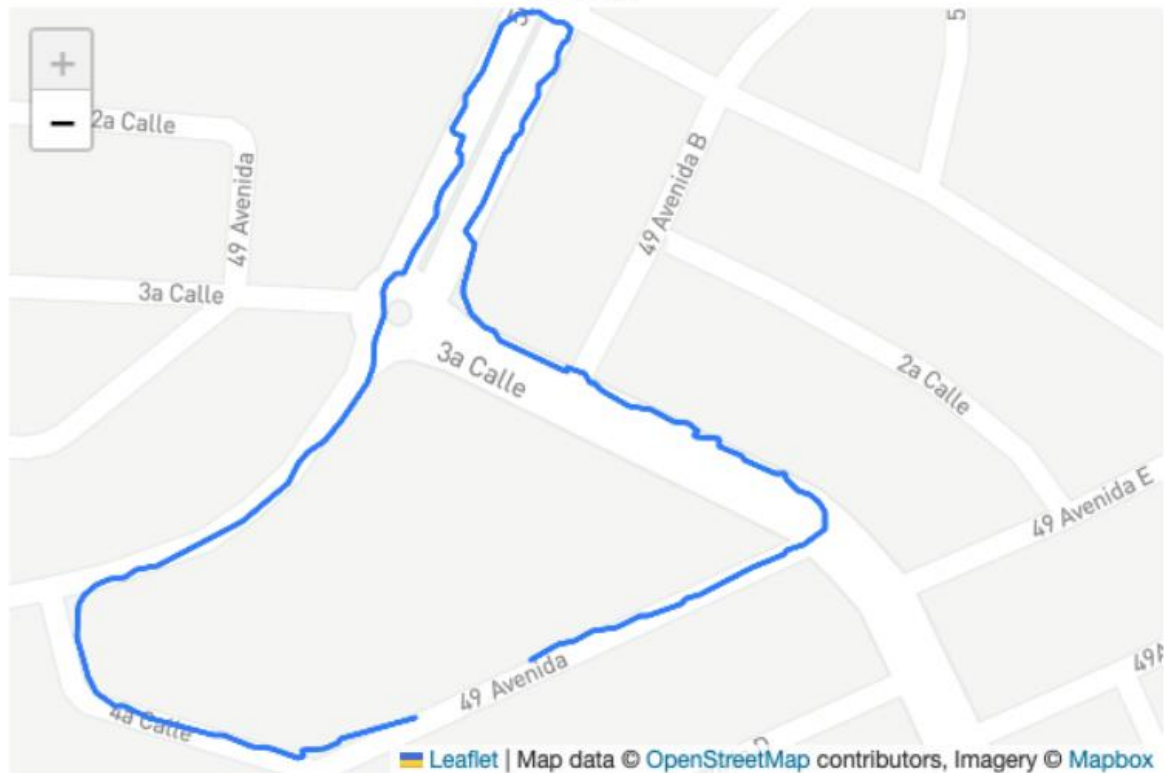
Vehicle Number: 2

Start Date: 04-06-22-00:35:00

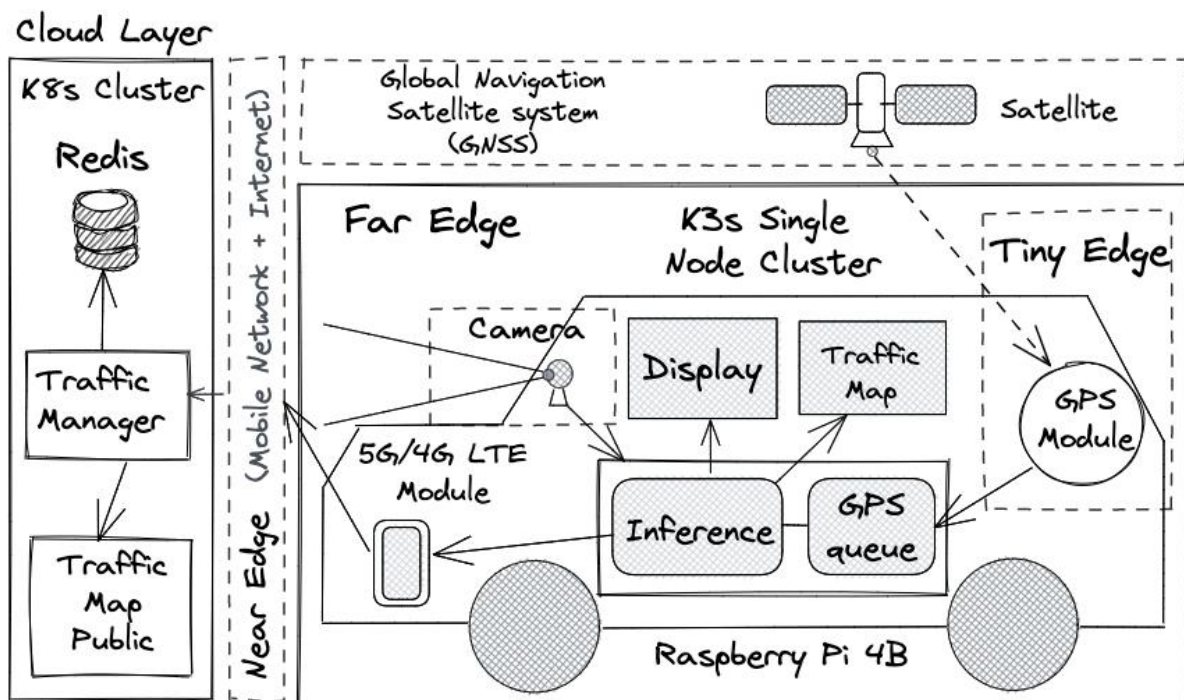
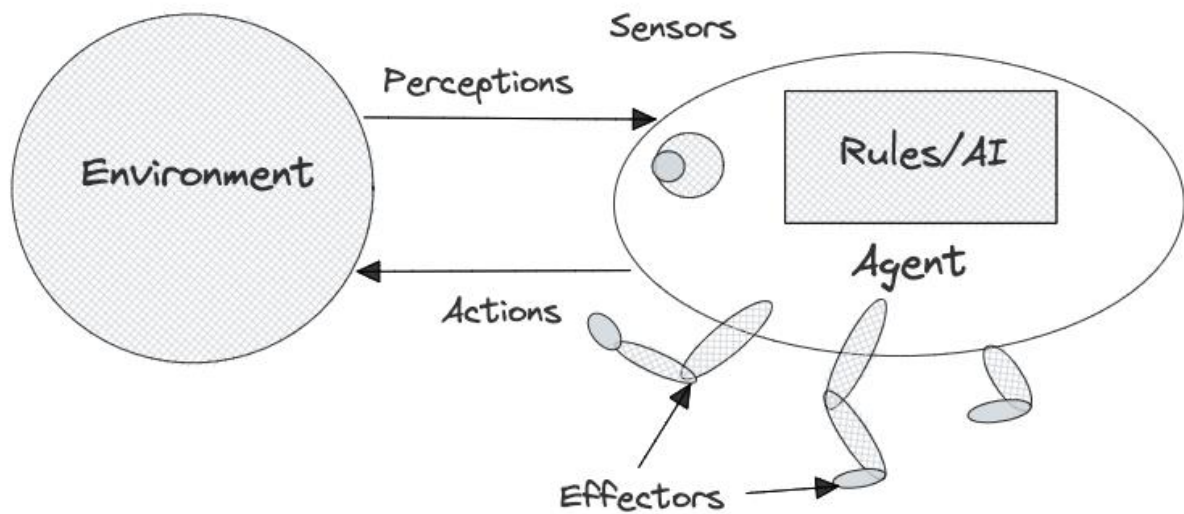
End Date: 04-06-22-00:47:00

Show Route History

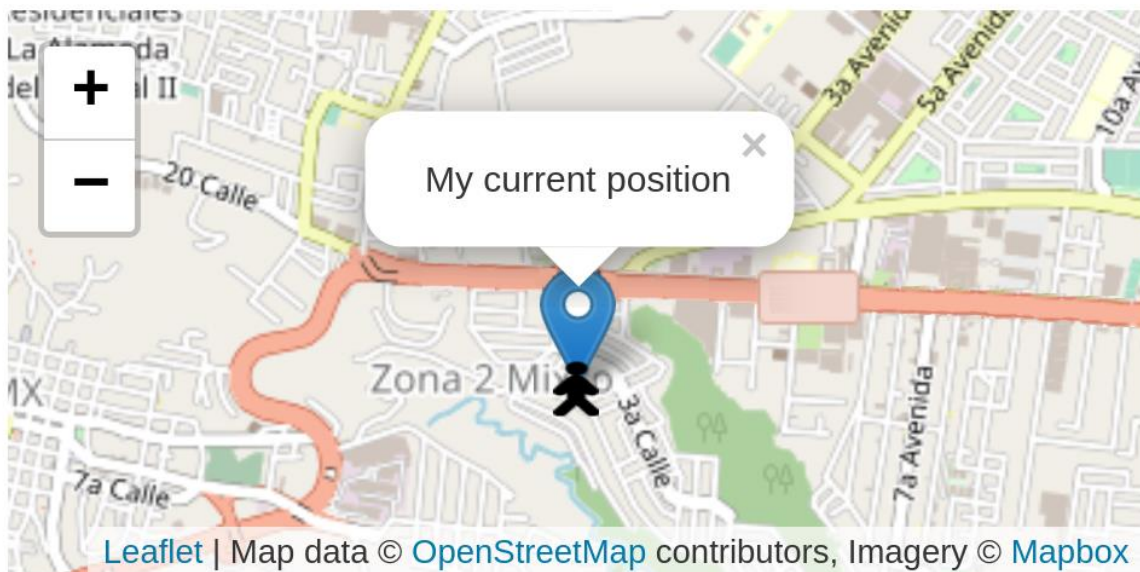
Routes



Chapter 14: Computer Vision with Python and K3s Clusters

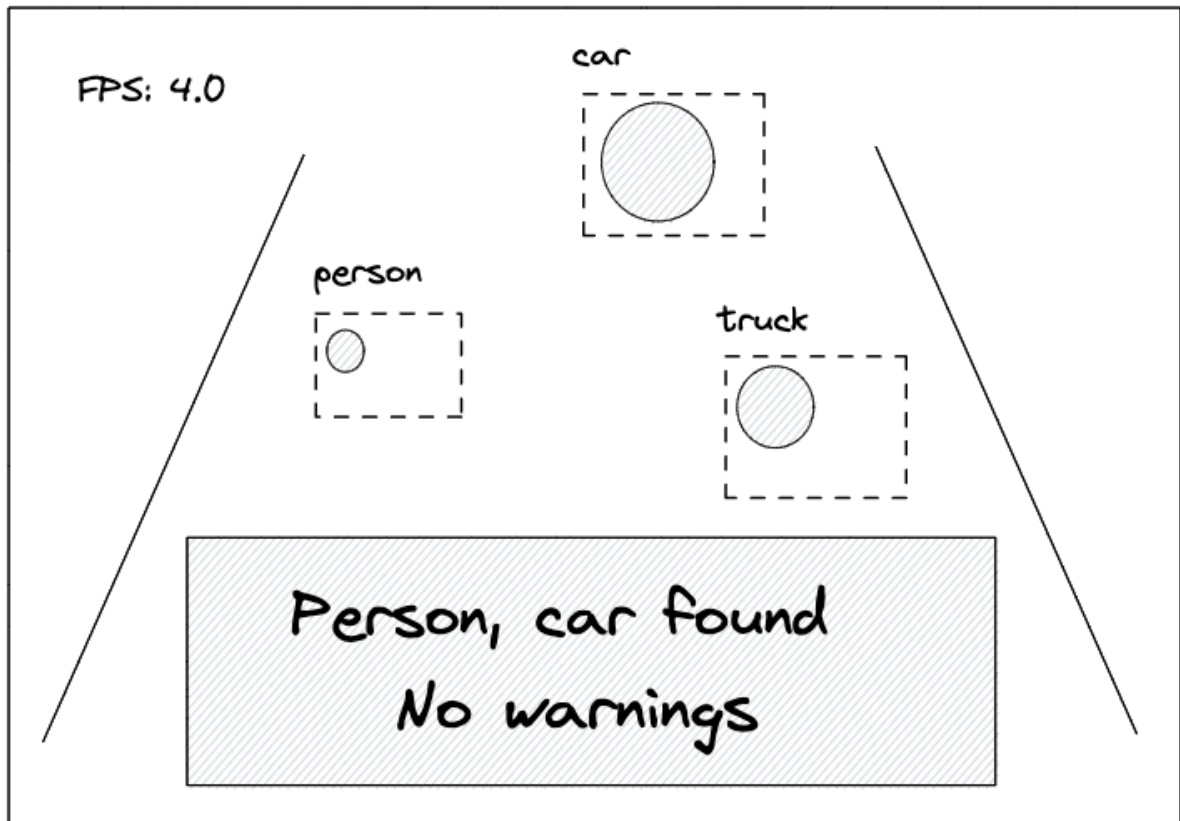


Traffic Events



Traffic Events





Chapter 15: Designing Your Own Edge Computing System

Edge Computing System Design Canvas

1. Purpose	2. Features	9. Edge	12. Cloud
3. Challenges			
4. People	6. Automation	10. Devices	13. Communication
	7. Data		
5. Costs	8. Security	11. Sensors	14. Metrics