MAINFLUX

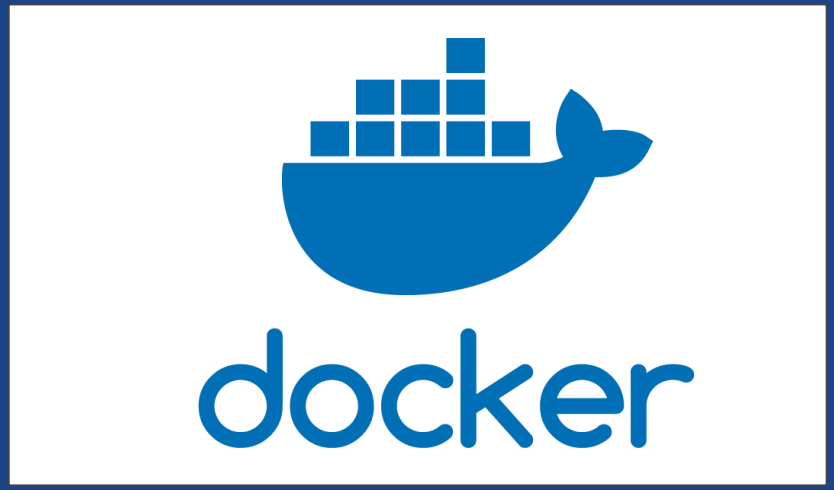
Open Source Internet of Things Technology & Consulting Services

Technology Overview – IoT Fuse 2019

Part 2 – Mainflux Deployment

MAINFLUX

Local Deployment – Docker



All the scripts and slide are in the github repo

https://github.com/janko-isidorovic/iotfuse2019

Docker scripts are in:

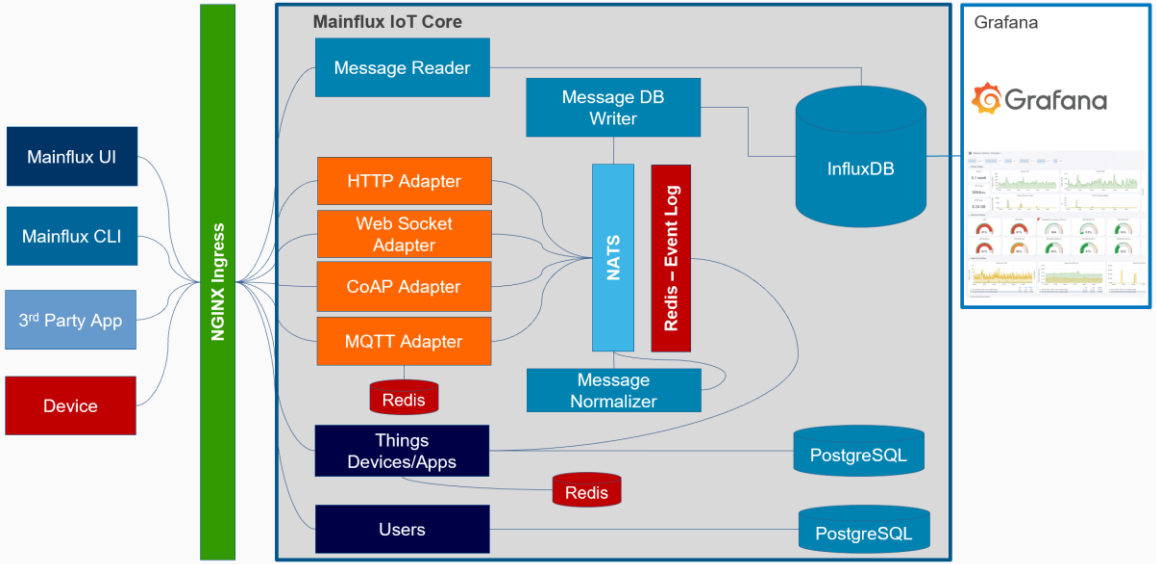
https://github.com/janko-isidorovic/iotfuse2019/tree/master/docker

Kubernetes scripts are in:

https://github.com/janko-isidorovic/iotfuse2019/tree/master/k8s

MAINFLUX – Local Deployment Using Docker Compose

- Mainflux Components - Infrastructure
  - Postgres Databases
    - Users
    - Things
  - Redis Cache
    - MQTT Adapter
    - Things
    - Event Stream
  - NATS
- Mainflux Components – Core Services
  - Users
  - Things
  - HTTP, WS, MQTT, CoAP Adapters
  - Normalizer
  - Mainflux UI
- Mainflux Add-ons
  - InfluxDB
  - InfluxDB Writer
  - InfluxDB Reader
  - Grafana



MAINFLUX – Docker Compose – 1

Install Docker and Docker Compose

https://www.docker.com/get-started

Download Mainflux docker compose scripts

git clone https://github.com/mainflux/mainflux.git

cd mainflux/docker

Modify the ports to fit your laptop

9080:80

9443:443

```
22  services:
23    nginx:
24      image: nginx:1.14.2
25      container_name: mainflux-nginx
26      restart: on-failure
27      volumes:
28        - ./nginx/nginx-${AUTH-key}.conf:/etc/nginx/nginx.conf
29        - ./ssl/authorization.js:/etc/nginx/authorization.js
30        - ./ssl/certs/mainflux-server.crt:/etc/ssl/certs/mainflux-server.crt
31        - ./ssl/certs/ca.crt:/etc/ssl/certs/ca.crt
32        - ./ssl/certs/mainflux-server.key:/etc/ssl/private/mainflux-server.key
33        - ./ssl/dhparam.pem:/etc/ssl/certs/dhparam.pem
34      ports:
35        - 80:80
36        - 443:443
37        - 8883:8883
38      networks:
39        - mainflux-base-net
```

MAINFLUX – Docker Compose – 2

Start docker compose script

docker-compose -f docker/docker-compose.yml up –d

For InfluxDB support start addon docker composition

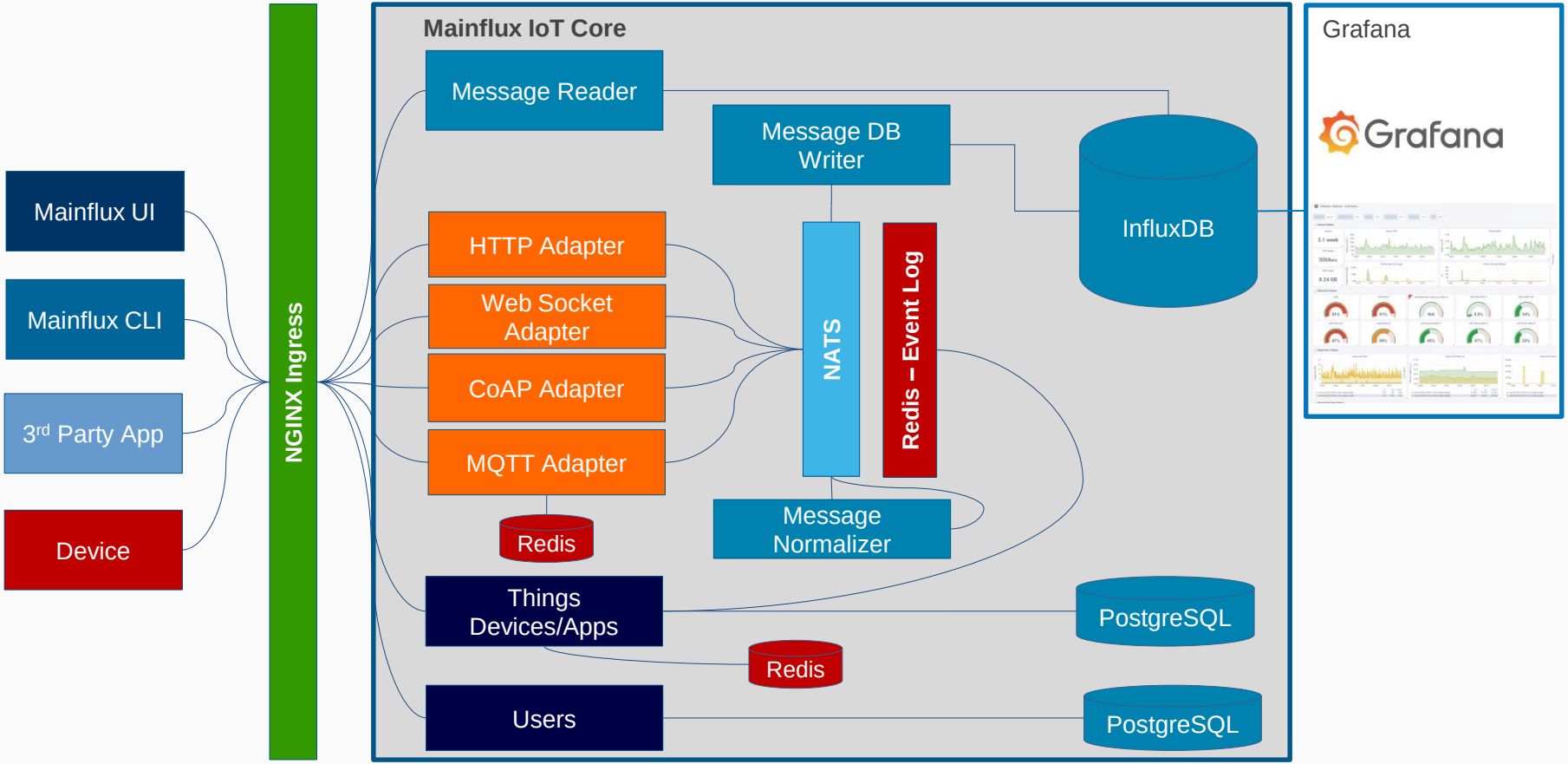
docker-compose -f docker/addons/influxdb-writer/docker-compose.yml up –d

For InfluxDB Message Reader start addon docker composition

docker-compose -f docker/addons/influxdb-reader/docker-compose.yml up -d

CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
abcc3454c3ca	mainflux-influxdb-reader	0.00%	2.156MiB / 1.934GiB	0.11%	1.12kB / 554B	0B / 0B	8
43dafbbec5ce	mainflux-influxdb-writer	0.00%	2.164MiB / 1.934GiB	0.11%	1.75kB / 729B	7.96MB / 0B	9
dcbcb0463705	mainflux-grafana	0.06%	18.23MiB / 1.934GiB	0.92%	46.6kB / 5.18MB	4.13MB / 7.9MB	10
6764e5fe2514	mainflux-influxdb	0.14%	9.652MiB / 1.934GiB	0.49%	9.08kB / 2.65kB	23.9MB / 172kB	11
22c5a0cb0fab	mainflux-ws	0.00%	2.375MiB / 1.934GiB	0.12%	3.92kB / 2.37kB	7.16MB / 0B	10
a209359ebe03	mainflux-http	0.00%	2.27MiB / 1.934GiB	0.11%	4.17kB / 2.47kB	8.65MB / 0B	10
1e9136c6230d	mainflux-coap	0.00%	2.332MiB / 1.934GiB	0.12%	4.3kB / 2.65kB	3.87MB / 0B	8
1aceb3e93ba9	mainflux-mqtt	0.00%	47.02MiB / 1.934GiB	2.37%	24.5kB / 10.6kB	37.8MB / 0B	12
7bb4fefb1477	mainflux-things	0.00%	3.496MiB / 1.934GiB	0.18%	11.1kB / 8.26kB	4.47MB / 0B	9
5cc74e34525d	mainflux-users	0.00%	3.066MiB / 1.934GiB	0.15%	6.41kB / 3.4kB	2.37MB / 0B	10
850795de109c	mainflux-normalizer	0.00%	2.238MiB / 1.934GiB	0.11%	4.31kB / 2.02kB	2.68MB / 0B	8
87cb2ef2a3ff	mainflux-es-redis	0.30%	1.637MiB / 1.934GiB	0.08%	3.44kB / 4.04kB	4.1kB / 0B	4
8c9ebbd32d3d	mainflux-mqtt-redis	0.24%	1.664MiB / 1.934GiB	0.08%	10.7kB / 16.8kB	766kB / 0B	4
50c85763a303	mainflux-ui	0.00%	2.082MiB / 1.934GiB	0.11%	5.57kB / 2.92kB	4.53MB / 0B	2
1a750f15b3e0	mainflux-users-db	0.01%	6.816MiB / 1.934GiB	0.34%	3.86kB / 1.49kB	2.96MB / 664kB	8
9e3131ff5b39	mainflux-nats	0.07%	6.652MiB / 1.934GiB	0.34%	12.3kB / 9.54kB	5.71MB / 0B	9
690cfee74686	mainflux-things-redis	0.27%	1.656MiB / 1.934GiB	0.08%	2.77kB / 0B	2.96MB / 0B	4
4d402764a81e	mainflux-things-db	0.02%	6.949MiB / 1.934GiB	0.35%	5.47kB / 3.16kB	4.33MB / 672kB	9
88e8105f2a31	mainflux-nginx	0.00%	3.117MiB / 1.934GiB	0.16%	12.3kB / 11.5kB	8.07MB / 0B	3

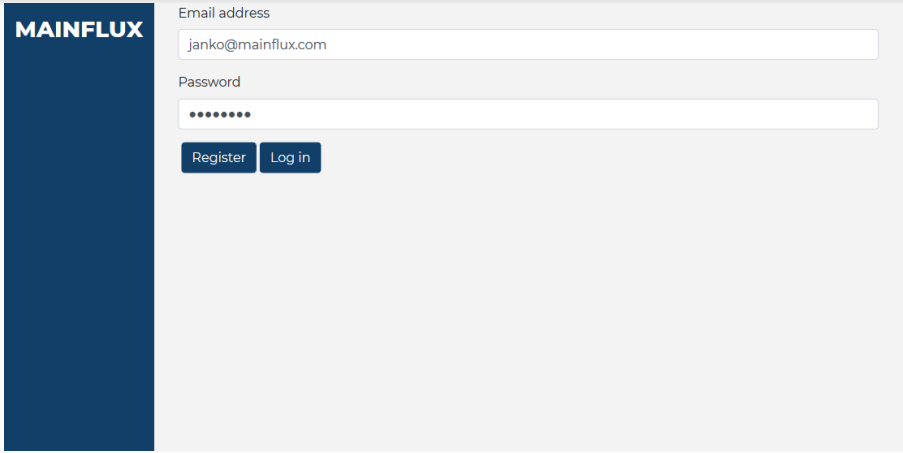
MAINFLUX – Docker Compose – 3



MAINFLUX – Docker Compose – 4

Login to Mainflux UI

http://localhost:9080/



Login to Grafana

http://localhost:3001/

User: admin

Pass: admin

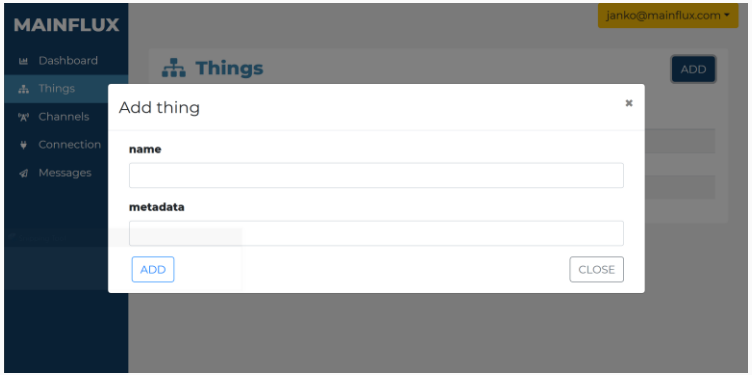
MAINFLUX – Docker Compose – 5

Create thing using API

curl -s -S -i --cacert docker/ssl/certs/mainflux-server.crt --insecure -X POST -H "Content-Type: application/json" https://localhost/tokens -d '{"email":"john.doe@email.com", "password":"123"}'

curl -s -S -i --cacert docker/ssl/certs/mainflux-server.crt --insecure -X POST -H "Content-Type: application/json" -H "Authorization: <user_auth_token>" https://localhost/things -d '{"name":“dev02"}’

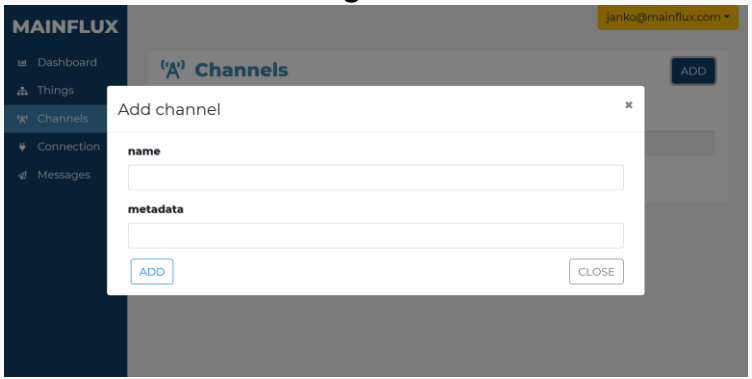
Create thing using UI



Create channel using API

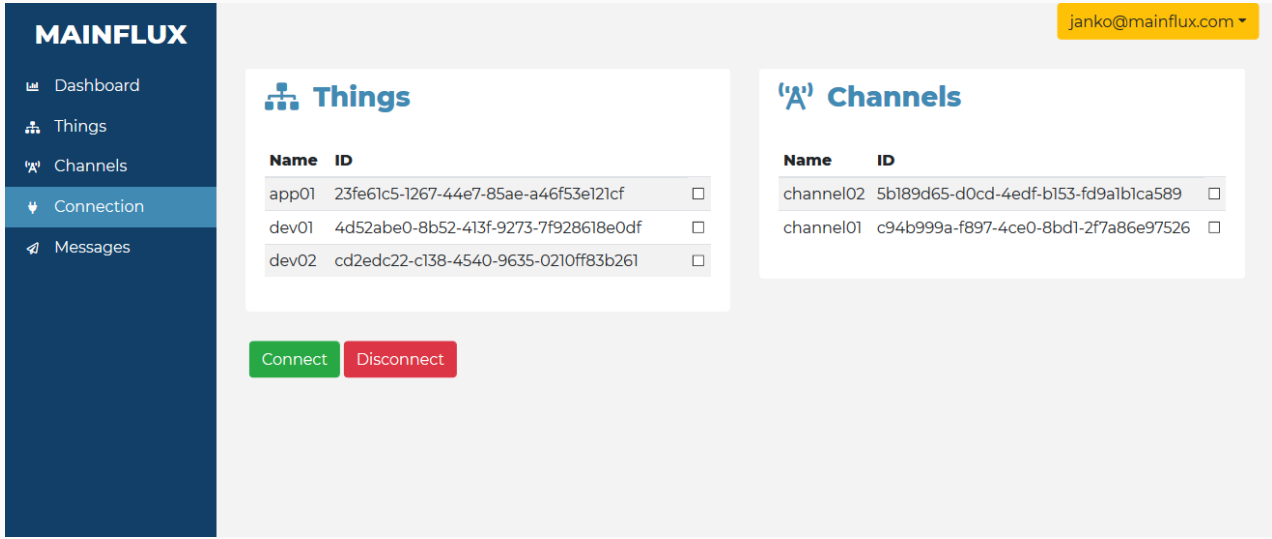
curl -s -S -i --cacert docker/ssl/certs/mainflux-server.crt --insecure -X POST -H "Content-Type: application/json" -H "Authorization: <user_auth_token>" https://localhost/channels -d '{"name":"mychan"}'

Create channel using UI



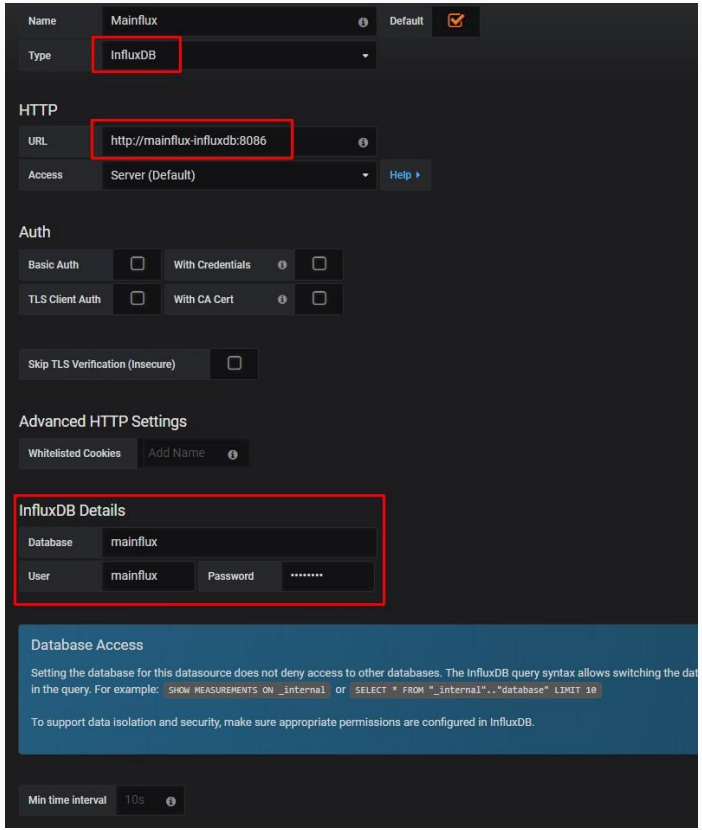
MAINFLUX – Docker Compose – 6

Connect thing to channel

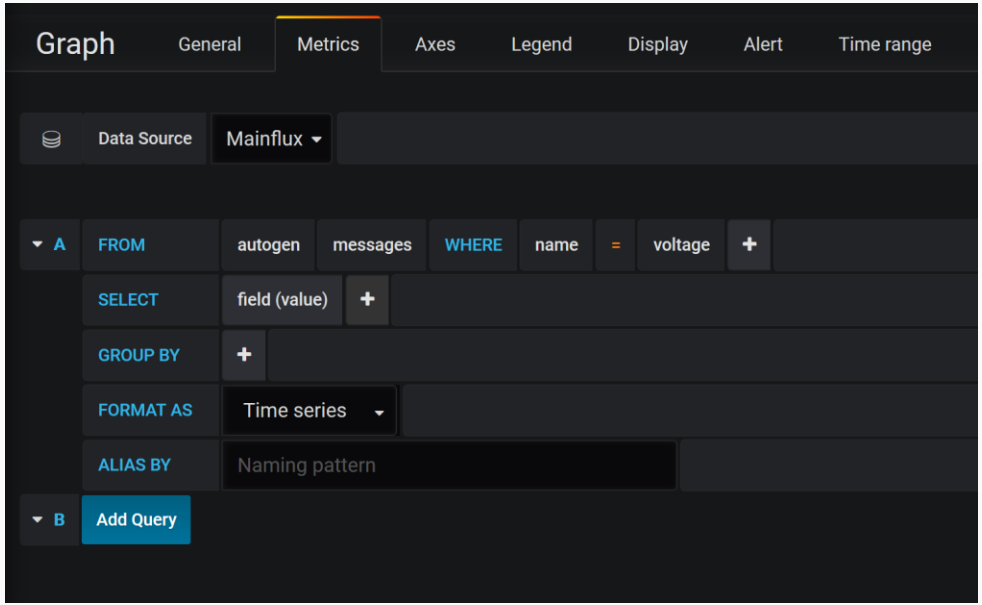


MAINFLUX – Configure Grafana

Configure Datasource



Configure Graph



MAINFLUX – Send Message to Local Mainflux

Linux

*curl -X POST http://localhost:9080/http/channels/**ChannelID**/messages -H 'Authorization: **DeviceKey**' -H 'Content-Type: application/senml+json' -d '[{"n":"voltage", "u":"V", "v":120}]'*

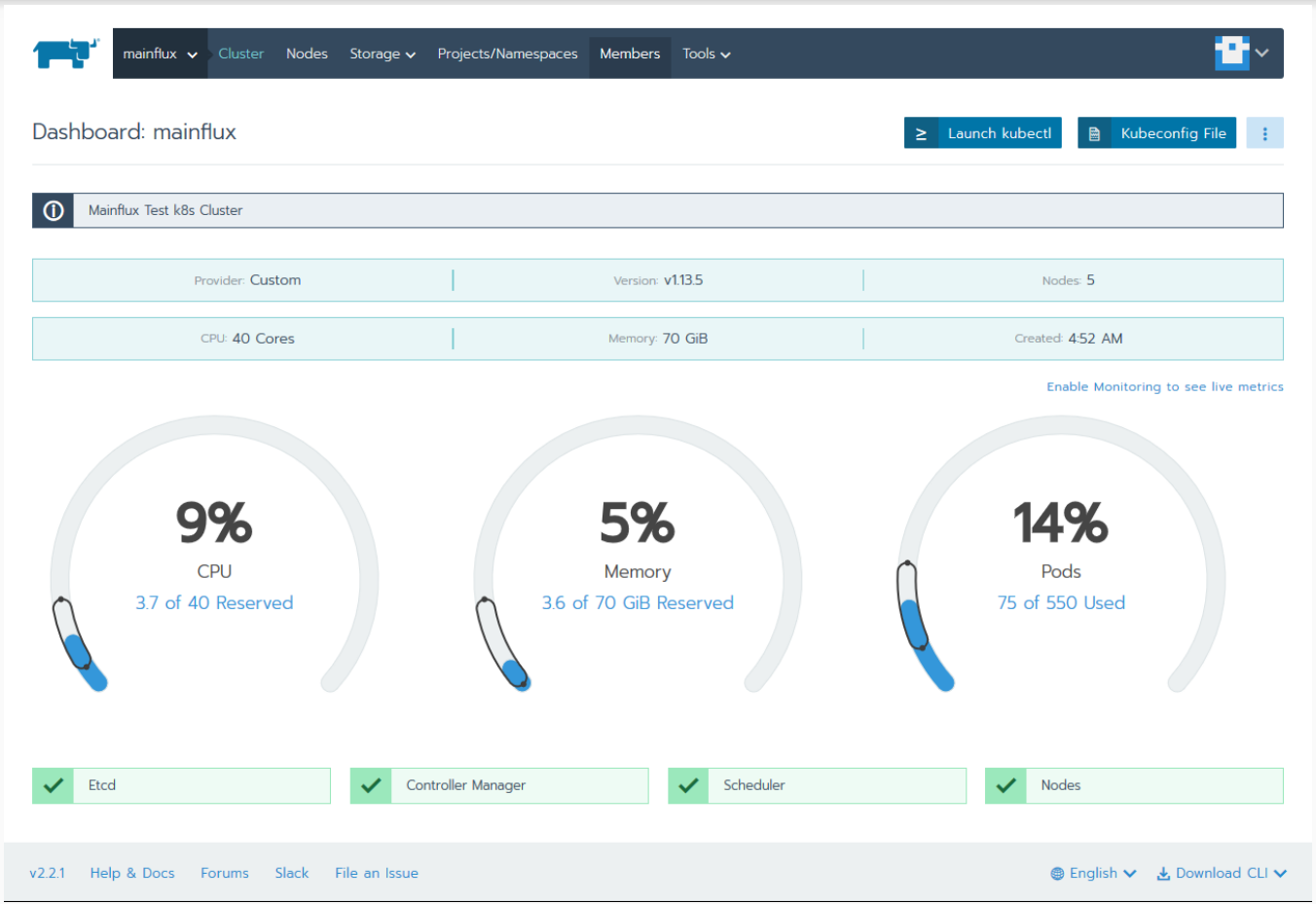
Windows

*curl -X POST "http://localhost:9080/http/channels/**ChannelID**/messages" -H "Authorization: **DeviceKey**" -H "Content-Type: application/senml+json" -d "[{\"n\":\"voltage\", \"u\":\"V\", \"v\":123.2}]"*

MAINFLUX

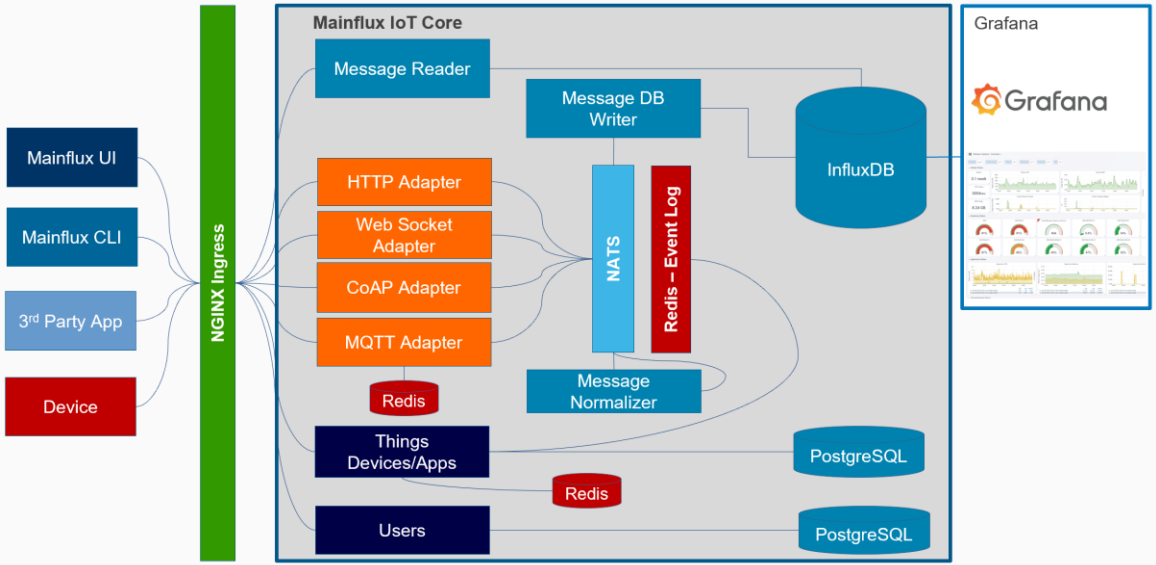
Kubernetes Deployment

MAINFLUX – Kubernetes Deployment Using Rancher and YAML Files



MAINFLUX – Kubernetes Deployment Using k8s YAML Files

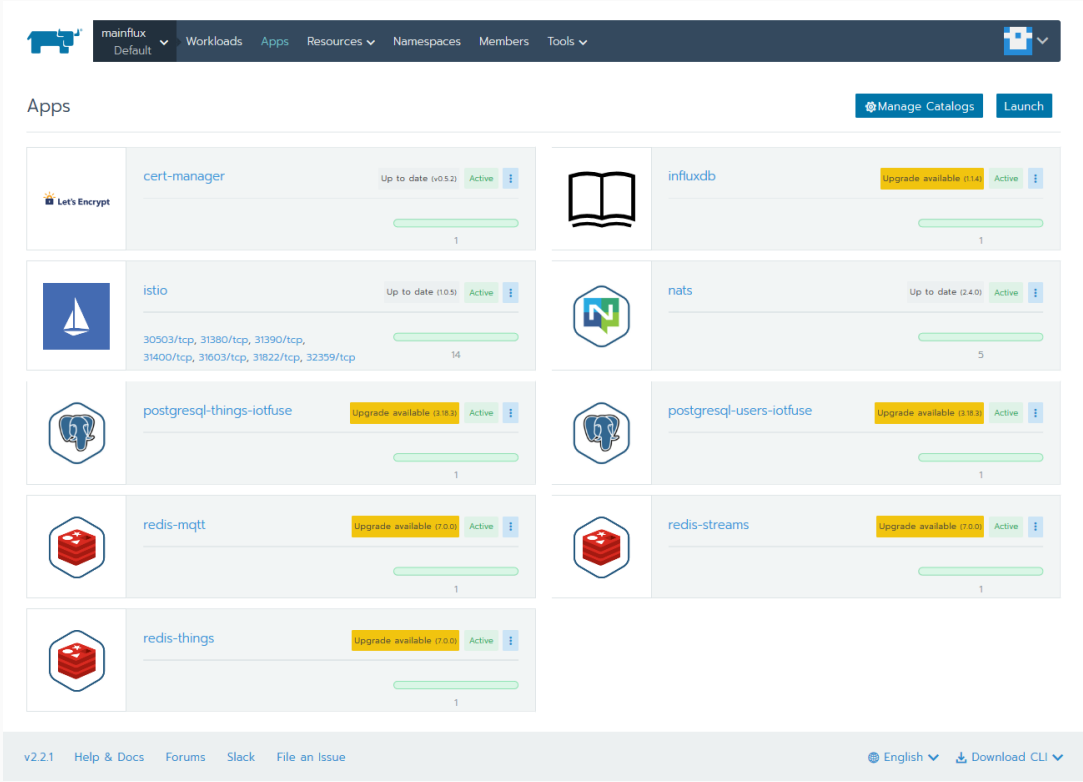
- Mainflux Components - Infrastructure
  - Postgres Databases
    - Users
    - Things
  - Redis Cache
    - MQTT Adapter
    - Things
    - Event Stream
  - NATS
  - ISTIO
- Mainflux Components – Core Services
  - Users
  - Things
  - HTTP, WS, MQTT, CoAP Adapters
  - Normalizer
  - Mainflux UI
- Mainflux Add-ons
  - InfluxDB
  - InfluxDB Writer
  - InfluxDB Reader
  - Grafana



Rancher – Setup Infrastructure Components

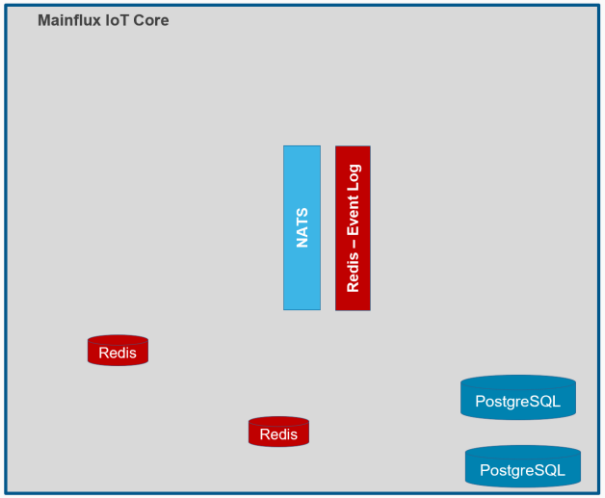
Mainflux Components - Infrastructure

- Postgres Databases
  - Users
  - Things
- Redis Cache
  - MQTT Adapter
  - Things
  - Event Stream
- NATS
- Istio – for gRPC load balancing
- Cert manager – Lets Encrypt



Rancher – Setup Infrastructure Components

- Setup *mainflux* namespaces:
- *mainflux* - Enable Istio side cart injection
- *nats*
- *redis*
- *postgres*
- *Influxdb*
- *istio*

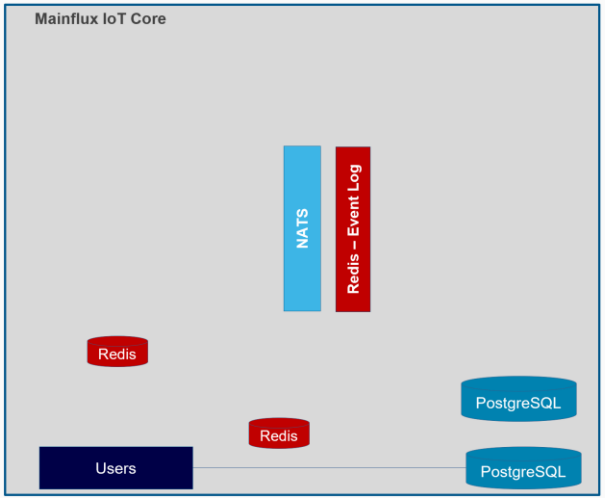


kubectl – Setup Users

Mainflux Users

```
25      spec:
26        containers:
27        - env:
28          - name: MF_USERS_DB
29            value: users
30          - name: MF_USERS_DB_HOST
31            value: postgresql-users-iotfuse-postgresql.mainflux-postgresql
32          - name: MF_USERS_DB_PASS
33            value: mainflux
34          - name: MF_USERS_DB_PORT
35            value: '5432'
36          - name: MF_USERS_DB_USER
37            value: mainflux
38          - name: MF_USERS_GRPC_PORT
39            value: '8181'
40          - name: MF_USERS_HTTP_PORT
41            value: '8180'
42          - name: MF_USERS_LOG_LEVEL
43            value: debug
44          - name: MF_USERS_SECRET
45            value: secret
46          image: mainflux/users:latest
47          imagePullPolicy: Always
48          name: users
```

kubectl create -f 1-users.yml

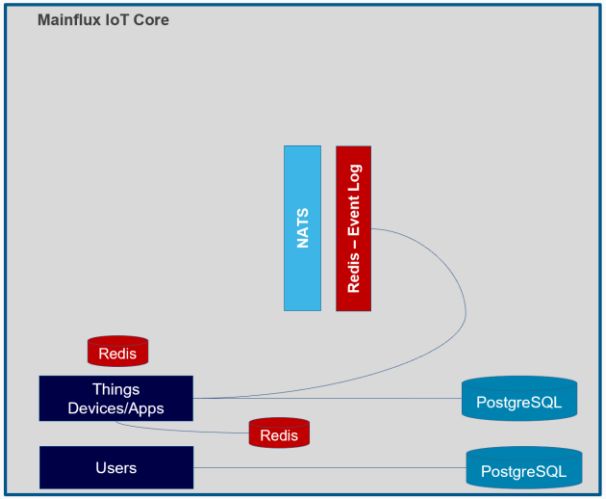


kubectl – Setup Things

Mainflux Things

kubectl create -f 2-things.yml

```
27          - env:
28            - name: MF_THINGS_CACHE_URL
29              value: redis-things-master.mainflux-redis:6379
30            - name: MF_THINGS_DB
31              value: things
32            - name: MF_THINGS_DB_HOST
33              value: postgresql-things-iotfuse-postgresql.mainflux-postgresql
34            - name: MF_THINGS_DB_PASS
35              value: mainflux
36            - name: MF_THINGS_DB_PORT
37              value: '5432'
38            - name: MF_THINGS_DB_USER
39              value: mainflux
40            - name: MF_THINGS_ES_URL
41              value: redis-streams-master.mainfux-redis:6379
```



kubectl – Setup Protocol Adapters

- Mainflux HTTP

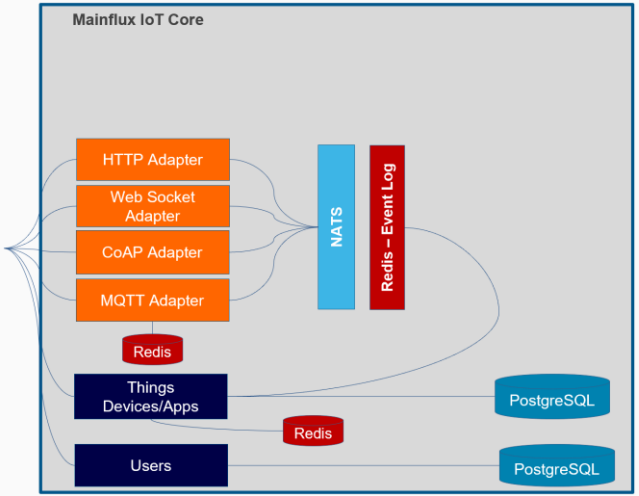
```
29          - env:
30            - name: MF_HTTP_ADAPTER_LOG_LEVEL
31              value: debug
32            - name: MF_HTTP_ADAPTER_PORT
33              value: '8185'
34            - name: MF_NATS_URL
35              value: nats://nats-nats-client.mainflux-nats:4222
36            - name: MF_THINGS_URL
37              value: things:8183
38            image: mainflux/http:latest
```

- Mainflux MQTT

```
88          - env:
89            - name: MF_MQTT_ADAPTER_LOG_LEVEL
90              value: debug
91            - name: MF_MQTT_ADAPTER_PORT
92              value: '1883'
93            - name: MF_MQTT_ADAPTER_REDIS_HOST
94              value: redis-mqtt-master.mainflux-redis
95            - name: MF_MQTT_ADAPTER_WS_PORT
96              value: '8880'
97            - name: MF_MQTT_INSTANCE_ID
98              value: mqtt-adapter-1
99            - name: MF_NATS_URL
100             value: nats://nats-nats-client.mainflux-nats:4222
101           - name: MF_THINGS_URL
102             value: things:8183
```

- Mainflux WebSocket
- Mainflux CoAP

kubectl create -f 3-protocol-adapters.yml



kubectl – Setup Normalizer

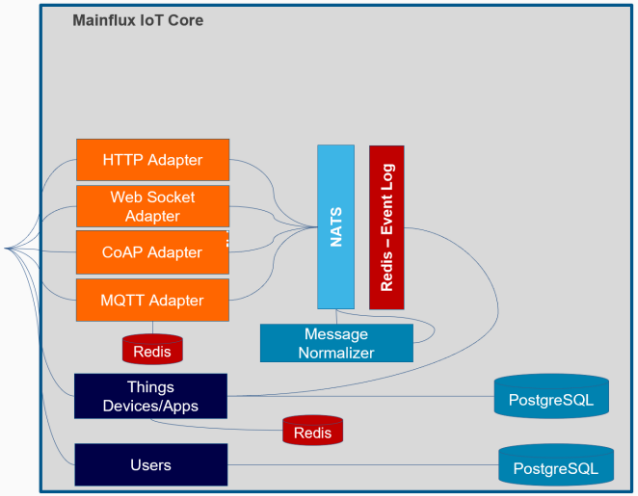
Mainflux Normalizer

Disable istio side car injection

```
22      annotations:
23        sidecar.istio.io/inject: 'false'
```

```
28      - env:
29        - name: MF_NATS_URL
30          value: nats://nats-nats-client.mainflux-nats:4222
31        - name: MF_NORMALIZER_LOG_LEVEL
32          value: debug
33        - name: MF_NORMALIZER_PORT
34          value: '8184'
```

kubectl create –f 4-normalizer.yml



kubectl – Setup Ingress Controller

Two Ingress Controllers

We need different rewrite targets for users, things and Protocol adapters

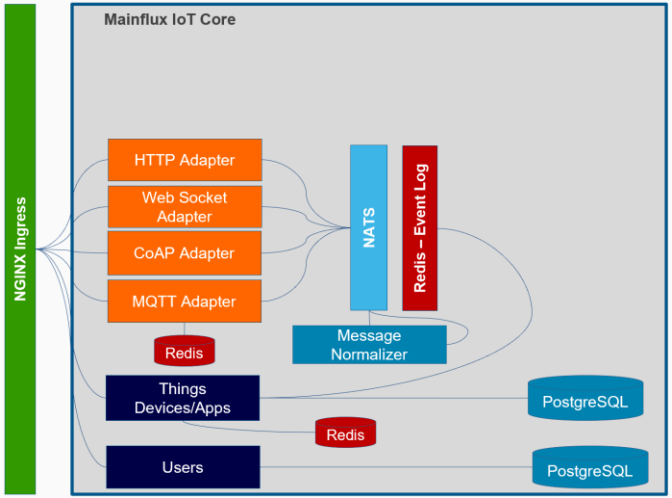
```
4   annotations:
5     certmanager.k8s.io/cluster-issuer: letsencrypt-prod
6     kubernetes.io/tls-acme: '"true"'
7     nginx.ingress.kubernetes.io/rewrite-target: /
8     nginx.ingress.kubernetes.io/secure-backends: '"true"'
```

http://localhost/users -> users:8180

http://localhost/http -> http:8185/http

kubectl create –f 5-ingress.yaml

kubectl create -f 5-ingress-http-ws.yaml

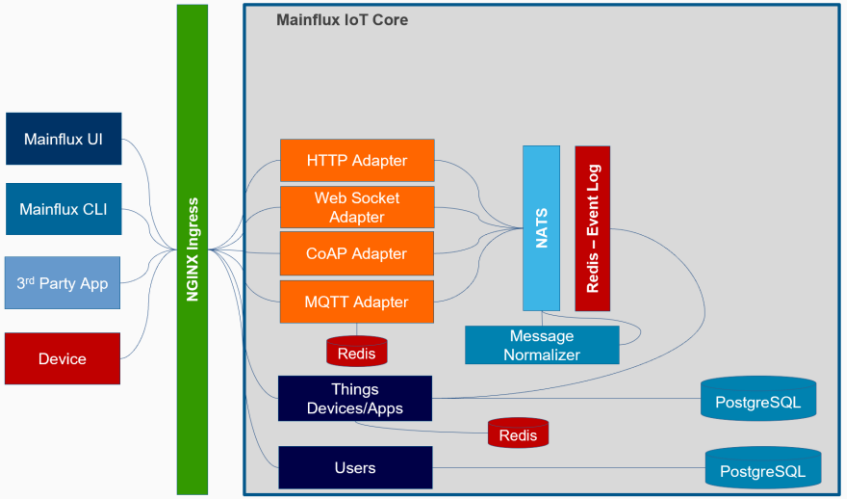


kubectl – Setup UI

- Mainflux UI

```
annotations:
sidecar.istio.io/inject: 'false'
```

kubectl create –f 6-ui.yml



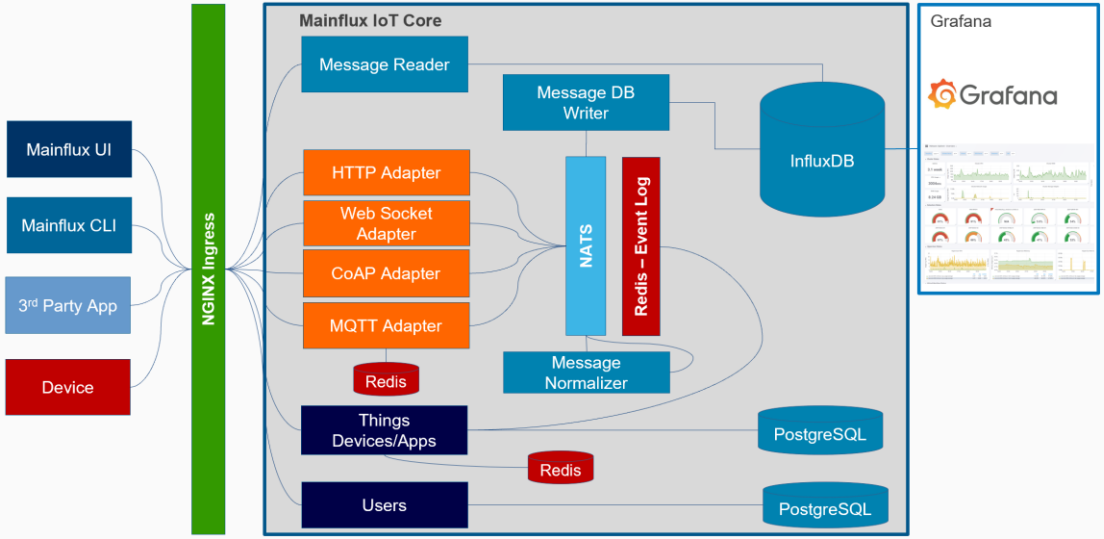
kubectl – Setup Add-ons – DB Writer, DB Reader, Grafana

Add DB Writer, DB Reader, Grafana

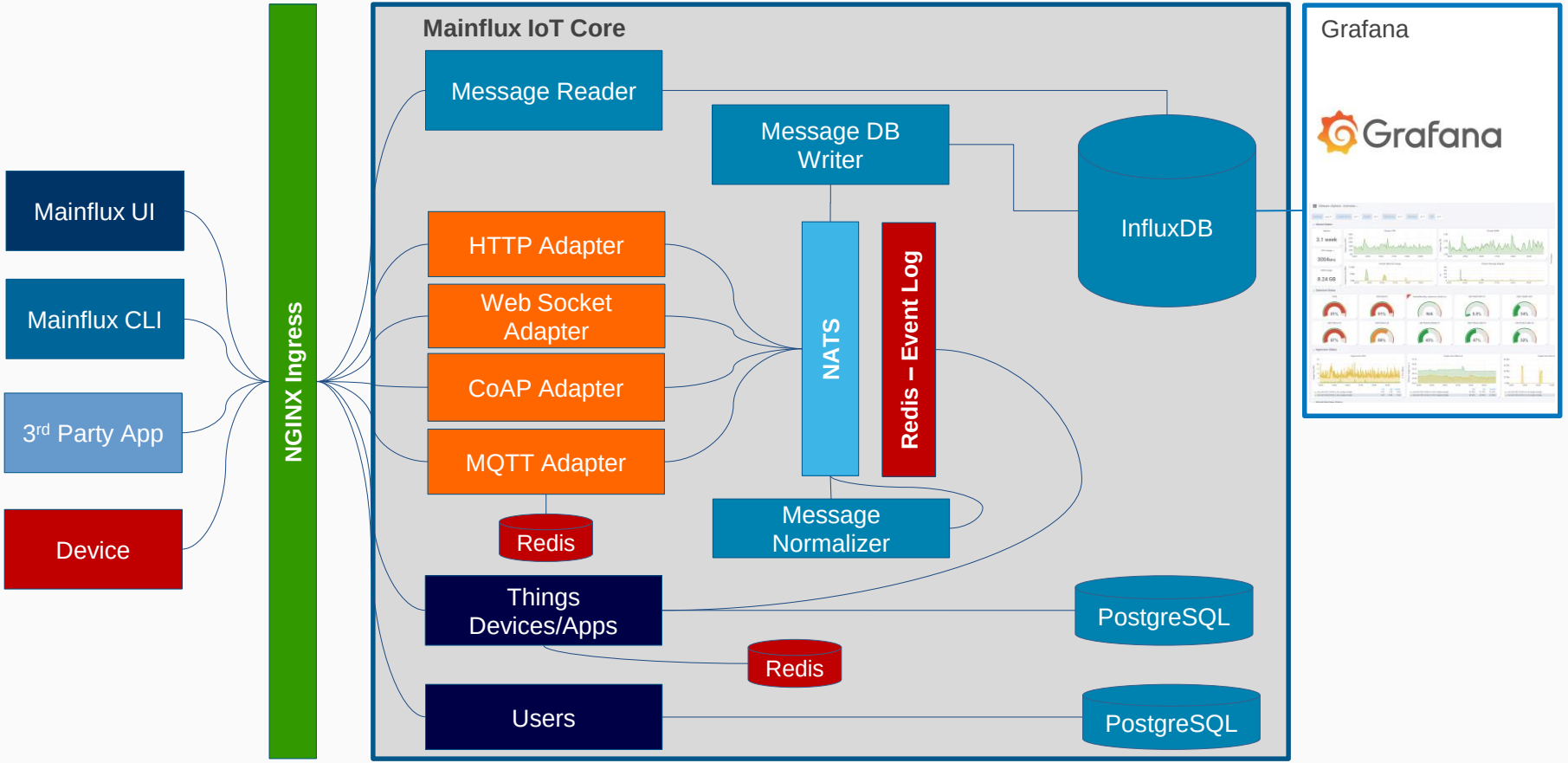
```
92        annotations:
93          sidecar.istio.io/inject: 'false'
```

kubectl create -f 7-add-ons-influxdb.yml

```
98        - env:
99          - name: MF_INFLUX_WRITER_BATCH_SIZE
100           value: '5000'
101         - name: MF_INFLUX_WRITER_BATCH_TIMEOUT
102           value: '5'
103         - name: MF_INFLUX_WRITER_DB_HOST
104           value: influxdb.mainflux-influxdb
105         - name: MF_INFLUX_WRITER_DB_NAME
106           value: mainflux
107         - name: MF_INFLUX_WRITER_DB_PASS
108           value: mainflux
109         - name: MF_INFLUX_WRITER_DB_PORT
110           value: '8086'
111         - name: MF_INFLUX_WRITER_DB_USER
112           value: mainflux
113         - name: MF_INFLUX_WRITER_LOG_LEVEL
114           value: debug
115         - name: MF_INFLUX_WRITER_PORT
116           value: '8900'
117         - name: MF_NATS_URL
118           value: nats://nats-nats-client.mainflux-nats:4222
```



MAINFLUX + InfluxDB + Grafana

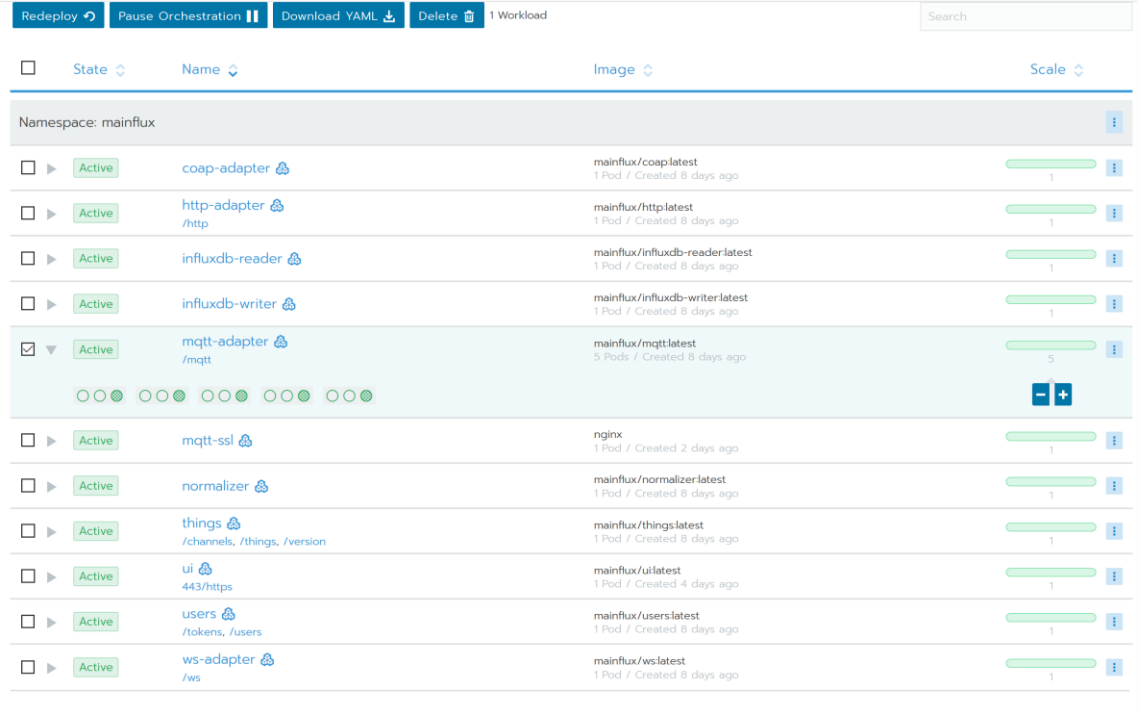


MAINFLUX – Kubernetes Scaling

- Create Kubernetes Horizontal POD Auto Scaler

```
kubectl autoscale deployment mqtt-adapter --cpu-percent=50 --min=1 --max=10
```

- Manual Scaling using Rancher UI



MAINFLUX – Send Message to Mainflux on Kubernetes

LINUX

```
curl -X POST   https://k8s-dev.mainflux.com/http/channels/7830ec4d-d506-45a0-945d-4a3249d2c417/messages   -H 'Authorization: 80cca27f-5572-4f98-9102-62b5dd01ce45'   -H 'Content-Type: application/senml+json'   -d '[{"n":"voltage", "u":"V", "v":120}]'
```

WINDOWS

```
curl -X POST   https://k8s-dev.mainflux.com/http/channels/7830ec4d-d506-45a0-945d-4a3249d2c417/messages   -H "Authorization: 80cca27f-5572-4f98-9102-62b5dd01ce45"   -H "Content-Type: application/senml+json"   -d "[{\"n\":\"voltage\", \"u\":\"V\", \"v\":123.2}]"
```

MAINFLUX – Send Message to Mainflux on Kubernetes

THANK YOU!

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