

NAVIGATING TOWARDS CARBON-AWARE SCHEDULING AND REPORTING



What we do & who we are

We enable people to manage the complexity of investment decision making

Ortec Finance is a global technology and solutions provider



Global client base



North America

OMERS

THE
WORLD
BANK

OPTrust

HOOPP
Healthcare of Ontario
Pension Plan



UNIVERSITY
OF
CALIFORNIA

Office of the
Chief Investment
Officer

Europe

BT PENSION
SCHEME

USS

AP
FJÄRDE AP-FONDEN

Andra AP-fonden
Second Swedish National Pension Fund - APF

G.S.R.
de nederlandse
verzekerings
maatschappij
voor alle
verzekeringen

SEB

apg

ST. JAMES'S PLACE
WEALTH MANAGEMENT

KEVA

PGGM

ING

pensionskasse
STADT ZÜRICH

Investment Data Services
A company of Allianz

achmea
Investment Management

ABB

ROBECO
The Investment Engineers

elo

CERN

ABN·AMRO

PGB
pensioendiensten

AEGON

Pensioenfond
Rail & OV

Asia

Korea Fixed Income Research Institute
한국채권연구원

income
made different

Great
Eastern
A member of the OCBC Group

AIA

Pacific

QIC

APF

cbus

futurefund
Australia's Sovereign Wealth Fund
Super

NEW ZEALAND
SUPERANNUATION
FUND

AustralianSuper

Utrecht 2023

ORTC
FINANCE

Public

Today's use case

- Environmental:
 - How many kg CO2 is associated to Job X?
 - What is the CO2 reduction (in kg) in comparison with a carbon ignorant cloud operation?
 - What footprint do we report in our annual statements?
- Computational context:
 - Job sizes 10s of minutes to 10s of hours
 - Distributed
 - Data volumes up to 1 TB



HPC workloads in Managed Kubernetes

Performance

At least at par with
current bare metal

Concurrency

Ability to perform multiple
tenants at ease

Scalability

Scale the infrastructure from
zero to N, based on the need

Vendor independence

The ability to switch vendors
without substantial costs is a
strategic benefit





Framework Design

Open-source based

Application

Templated for you +/- 300 LoC



Components

Kustomize YAMLS included



Orchestration

Kubernetes



Infrastructure

Does not matter

Framework Design

Managed over DIY

We Manage

Managed by Vendor

Application

Templated for you +/- 300 LoC



Components

Kustomize YAMLS included



Orchestration

Kubernetes



Infrastructure

Does not matter

Framework Design

Fully Red Hat supported

Managed by Vendor

Components

Red Hat supported Operators



Red Hat

Prometheus Operator
provided by Red Hat

Manage the full lifecycle of
configuring and managing
Prometheus and Alertmanager...



Red Hat

Custom Metrics Autoscaler
provided by Red Hat

Custom Metrics Autoscaler
Operator, an event-driven
autoscaler based upon KEDA



Red Hat

Red Hat OpenShift Serverless
provided by Red Hat

Deploy and manage event-drive...



Red Hat

Red Hat Integration - AMQ
Broker for RHEL 8 (Multiarch)
provided by Red Hat

AMQ Broker Operator for RHEL ...

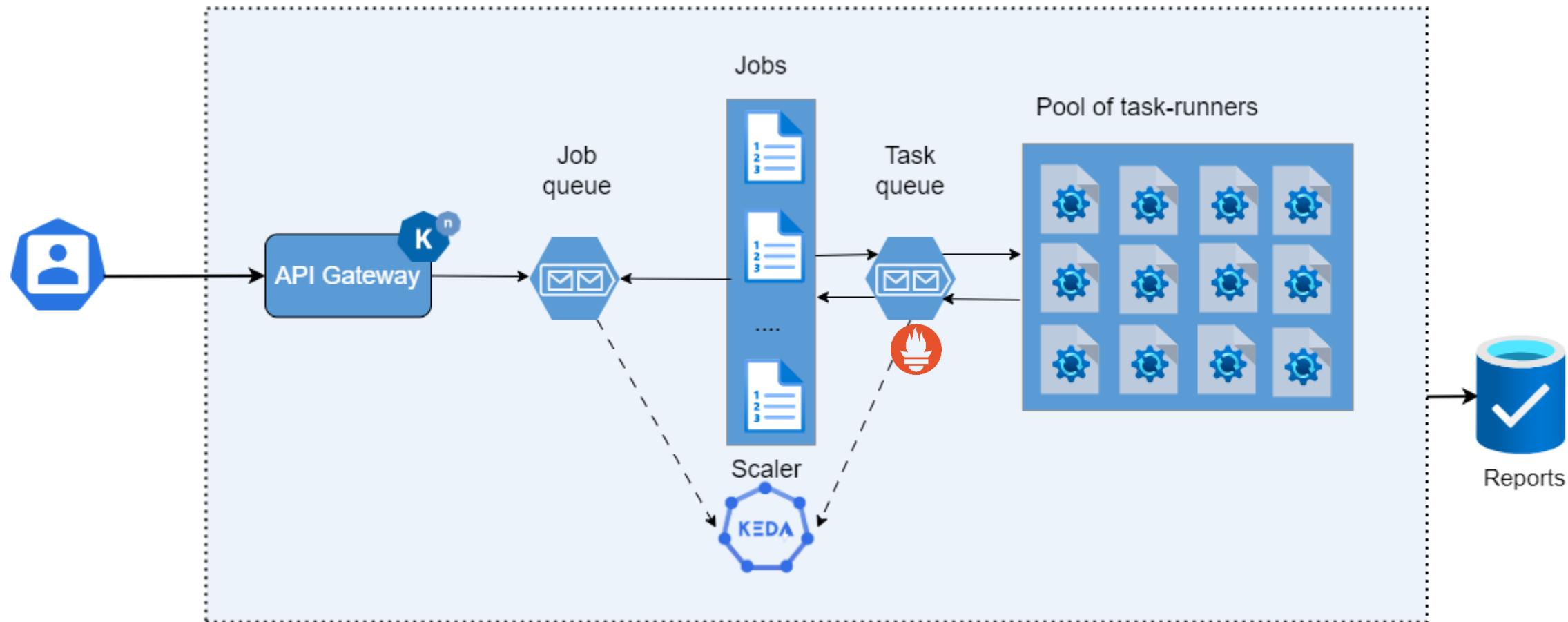
Orchestration + Infrastructure



AZURE RED HAT
OPENSIFT

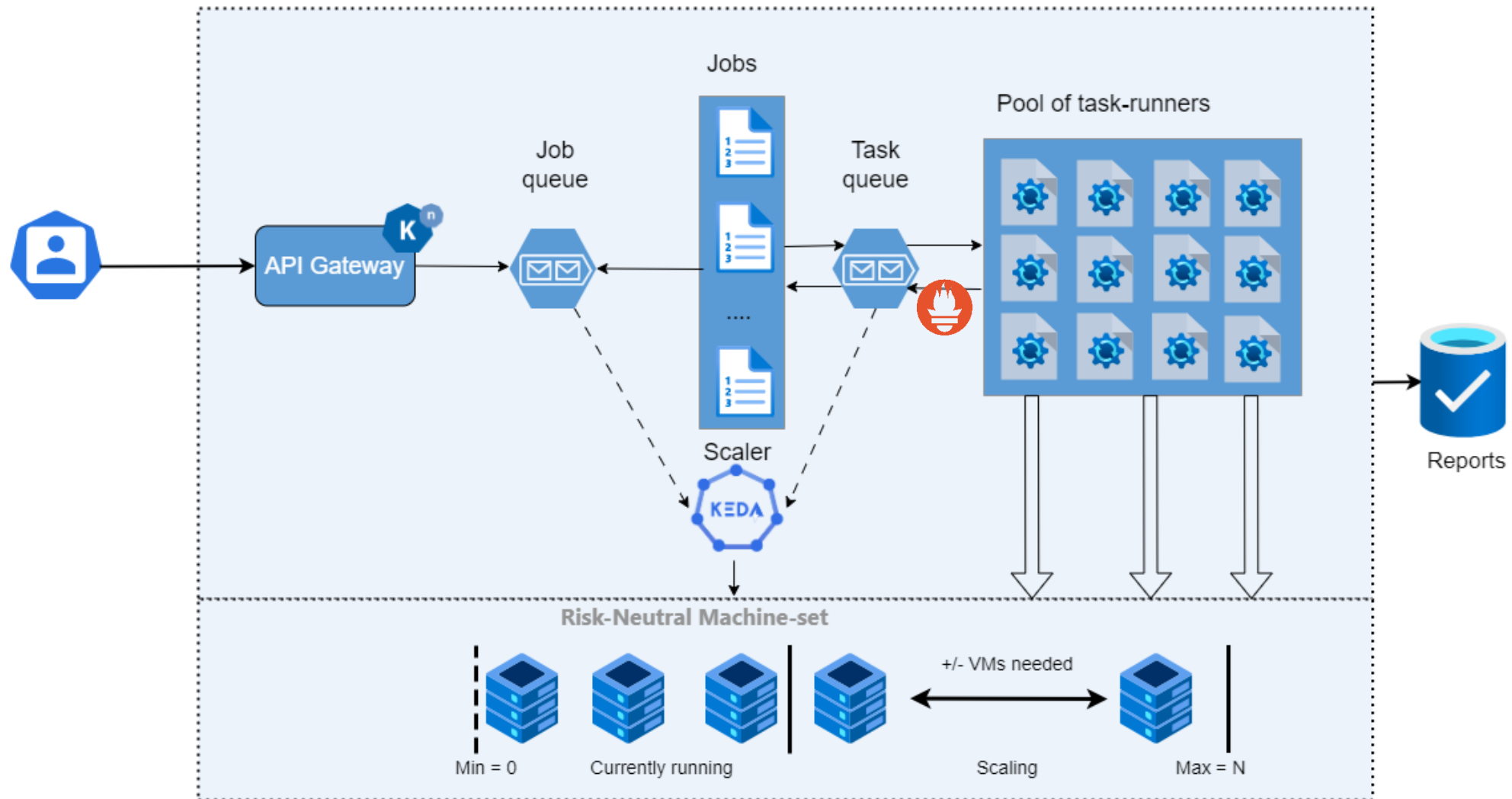


Architecture



Architecture

Scaling Pods & Infrastructure



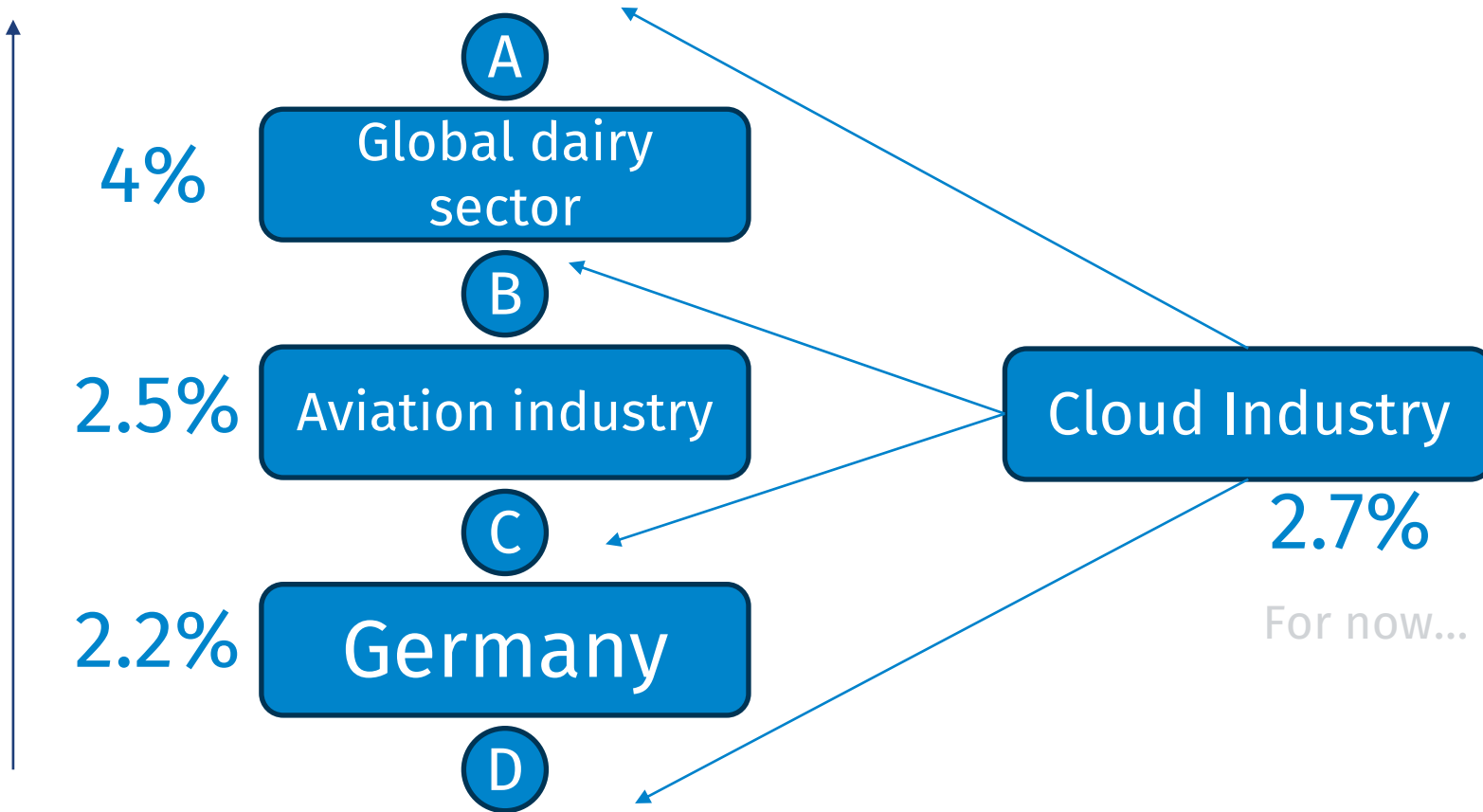


Learn more about Project Sailfish

Code, Docs , Talks and Demos



Global carbon emissions



Relevant regulation



Greenhouse Gas Protocol



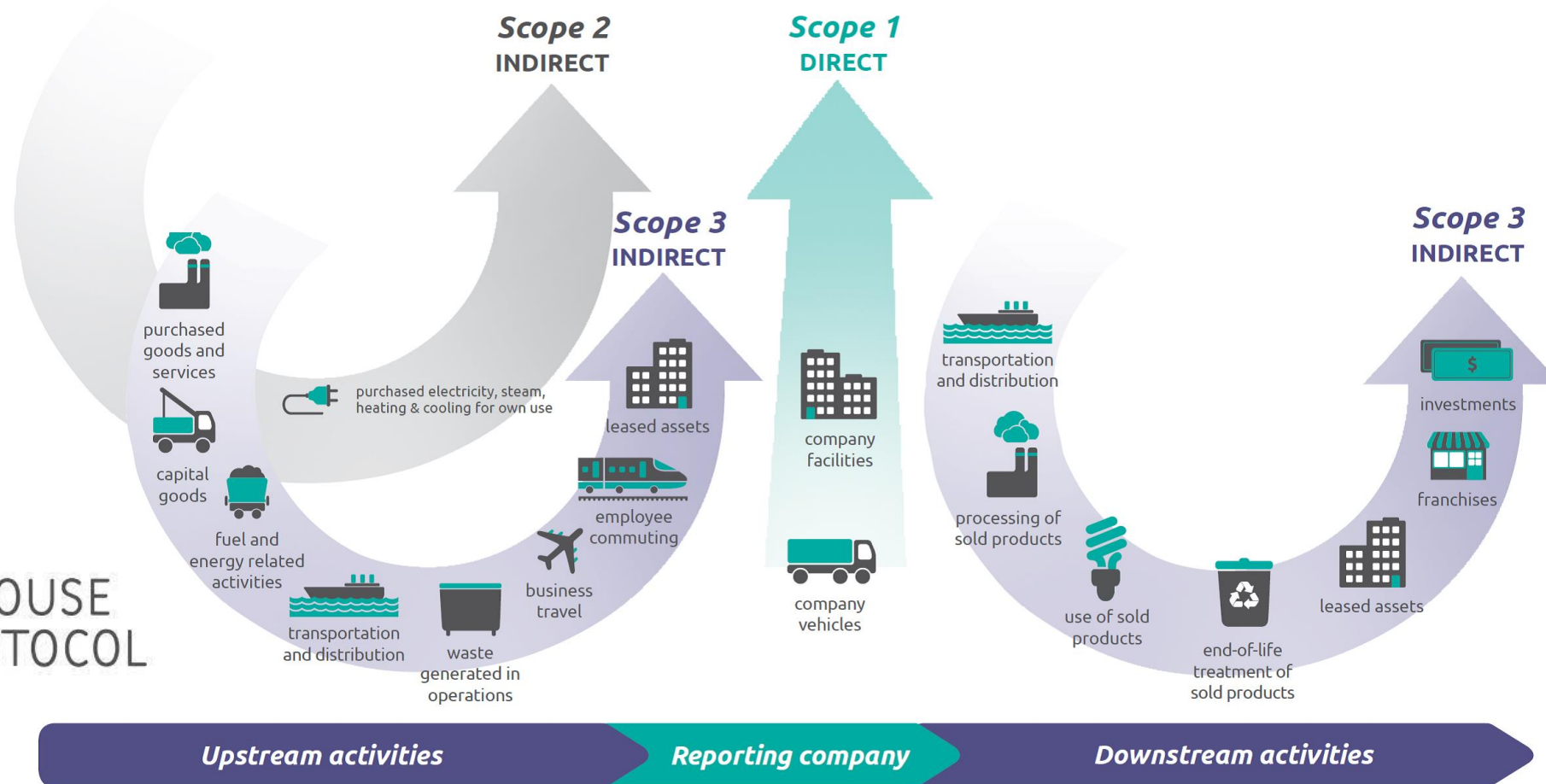
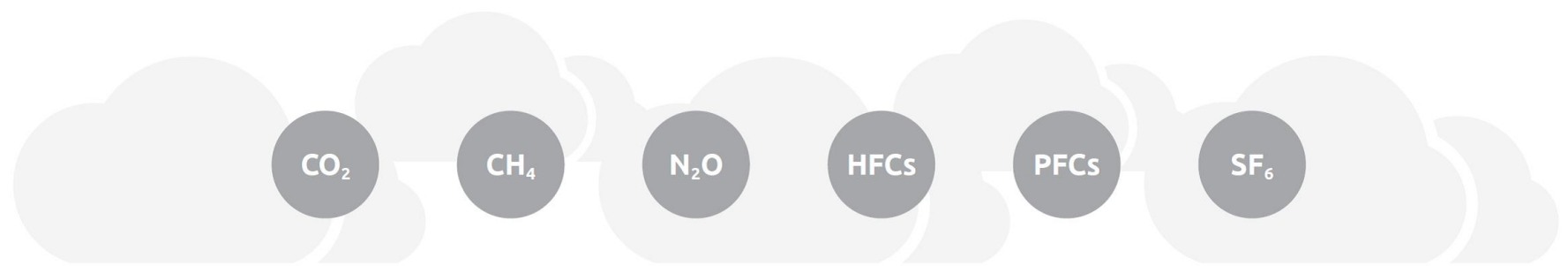
EU Corporate Sustainability Reporting Directive (CSRD)



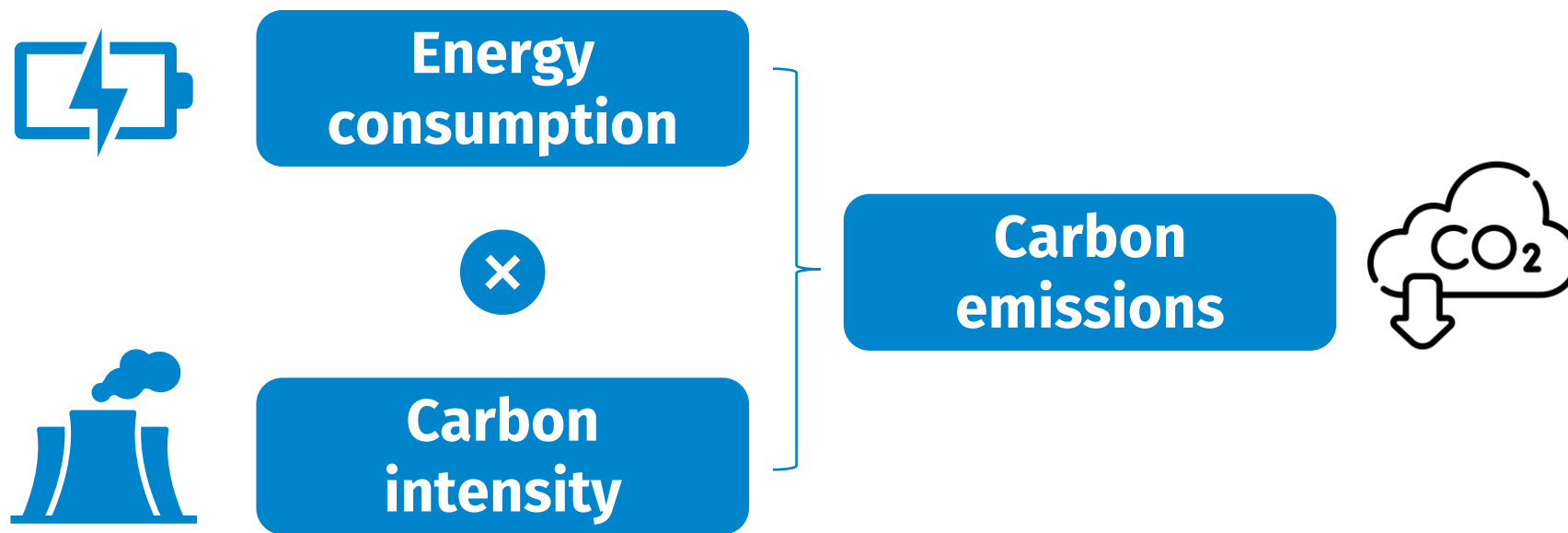
EU Energy Efficiency Directive



United States Energy Independence and Security Act



Quantifying CO2 emissions in cloud





Energy consumption





Energy consumption

Challenges in the cloud

- Resource sharing
- Hardware diversity
- Type of jobs
- Cooling systems
- Lack of information disclosure by cloud providers

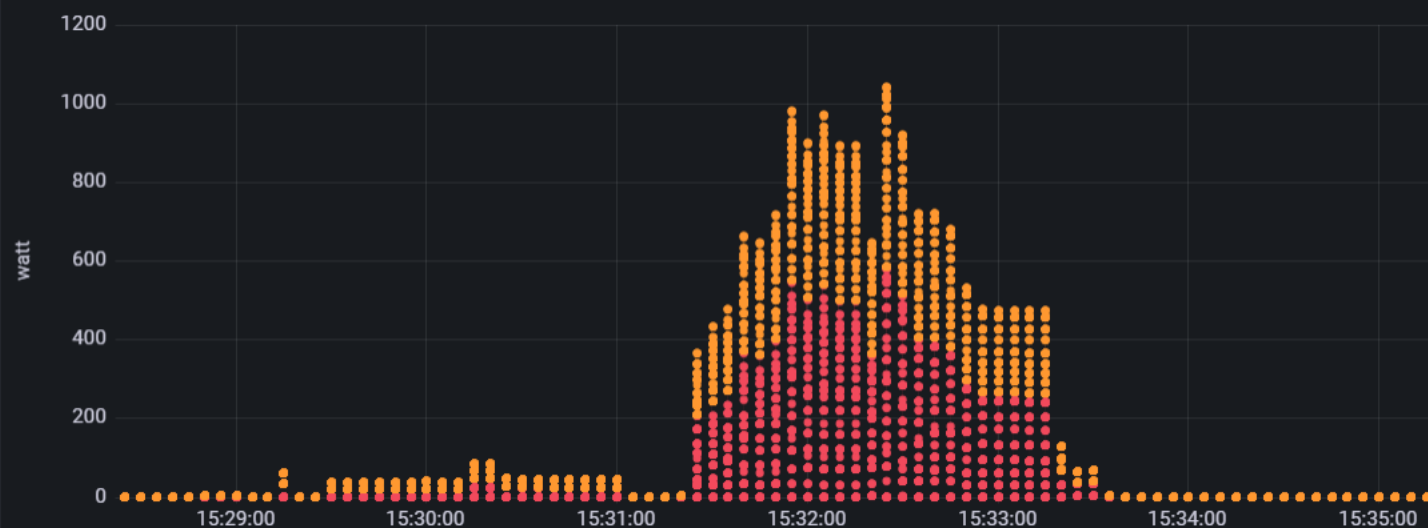
Solutions

- Kepler Project (CNCF Sandbox Project)
- Cloud Carbon Footprint (ThoughtWorks)



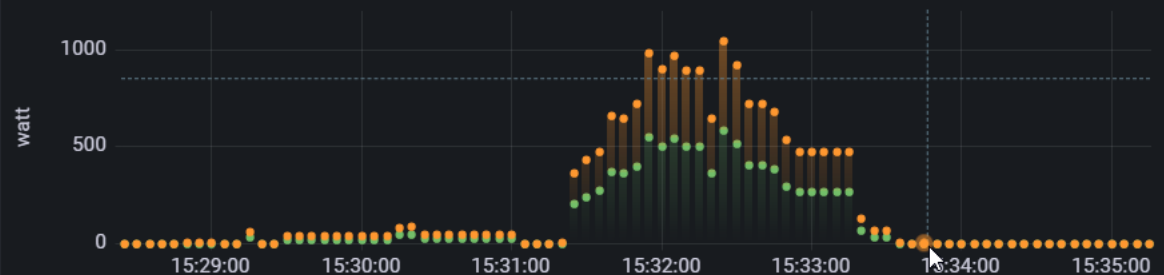


Pod/Process Power Consumption (W) in Namespace: redhat-summit-demo



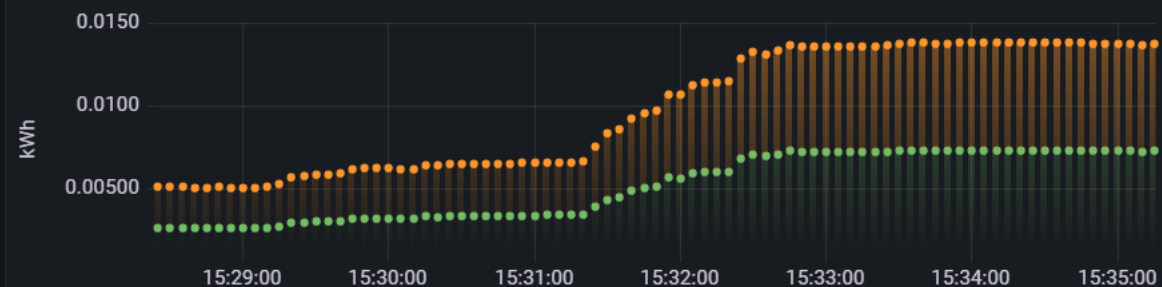
	Mean
sailfish-runner-autoscaler-fn4fn-q7dhk / redhat-summit-demo / PKG	39.7
sailfish-runner-autoscaler-2zjp4-mt7tl / redhat-summit-demo / PKG	39.2
sailfish-runner-autoscaler-7kxb2-qlmhc / redhat-summit-demo / PKG	38.2
sailfish-runner-autoscaler-kzzhf-fdnr2 / redhat-summit-demo / PKG	37.8
sailfish-runner-autoscaler-qkxb-9j7cp / redhat-summit-demo / PKG	37.8
sailfish-runner-autoscaler-dg2qq-z5pl9 / redhat-summit-demo / PKG	36.4
sailfish-runner-autoscaler-zlz4l-28srw / redhat-summit-demo / PKG	35.5
sailfish-runner-autoscaler-mv5wl-9fp6t / redhat-summit-demo / PKG	33.0
sailfish-runner-autoscaler-2btcf-8tx5 / redhat-summit-demo / PKG	32.2
sailfish-runner-autoscaler-8s75q-wjnhl / redhat-summit-demo / PKG	32.0
sailfish-runner-autoscaler-qkxb-9j7cp / redhat-summit-demo / DRAM	31.5
sailfish-runner-autoscaler-9m25k-qt88f / redhat-summit-demo / PKG	31.3
sailfish-runner-autoscaler-6fmwt-kxpxv / redhat-summit-demo / PKG	30.7

Power Consumption (W) of Top10 processes in Namespace: redhat-summit-demo or Top 10 Namespace if ...



	Mean	Max
PKG	113	584
DRAM	88.5	459

Total Power Consumption (kWh per day) of Top10 processes in Namespace: redhat-summit-demo or Top10 ...



	Mean	Max
PKG (CORE+UNCORE)	0.00515	0.00737
DRAM	0.00460	0.00648



Carbon intensity

Factors that influence carbon intensity

- Energy mix
- Time of day
- Geographical location

Available APIs

- [ElectricityMap](#)
- [WattTime](#)

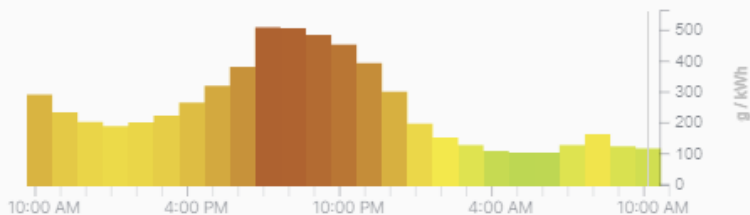


Netherlands

estimated Oct 3, 2023, 10:00 AM

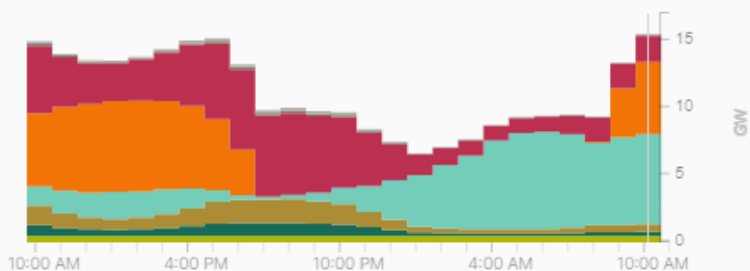
Carbon intensity in the last 24 hours

↓ Get hourly historical, live, and forecast data with Electricity Maps API



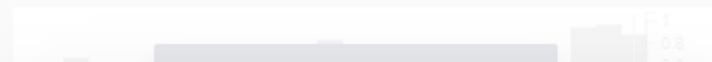
Electricity production in the last 24 hours

↓ Get hourly historical, live, and forecast data with Electricity Maps API



Electricity prices in the last 24 hours

↓ Get hourly historical, live, and forecast data with Electricity Maps API



Display data from the past

Oct 3, 2023, 10:00 AM

24 hours

30 days

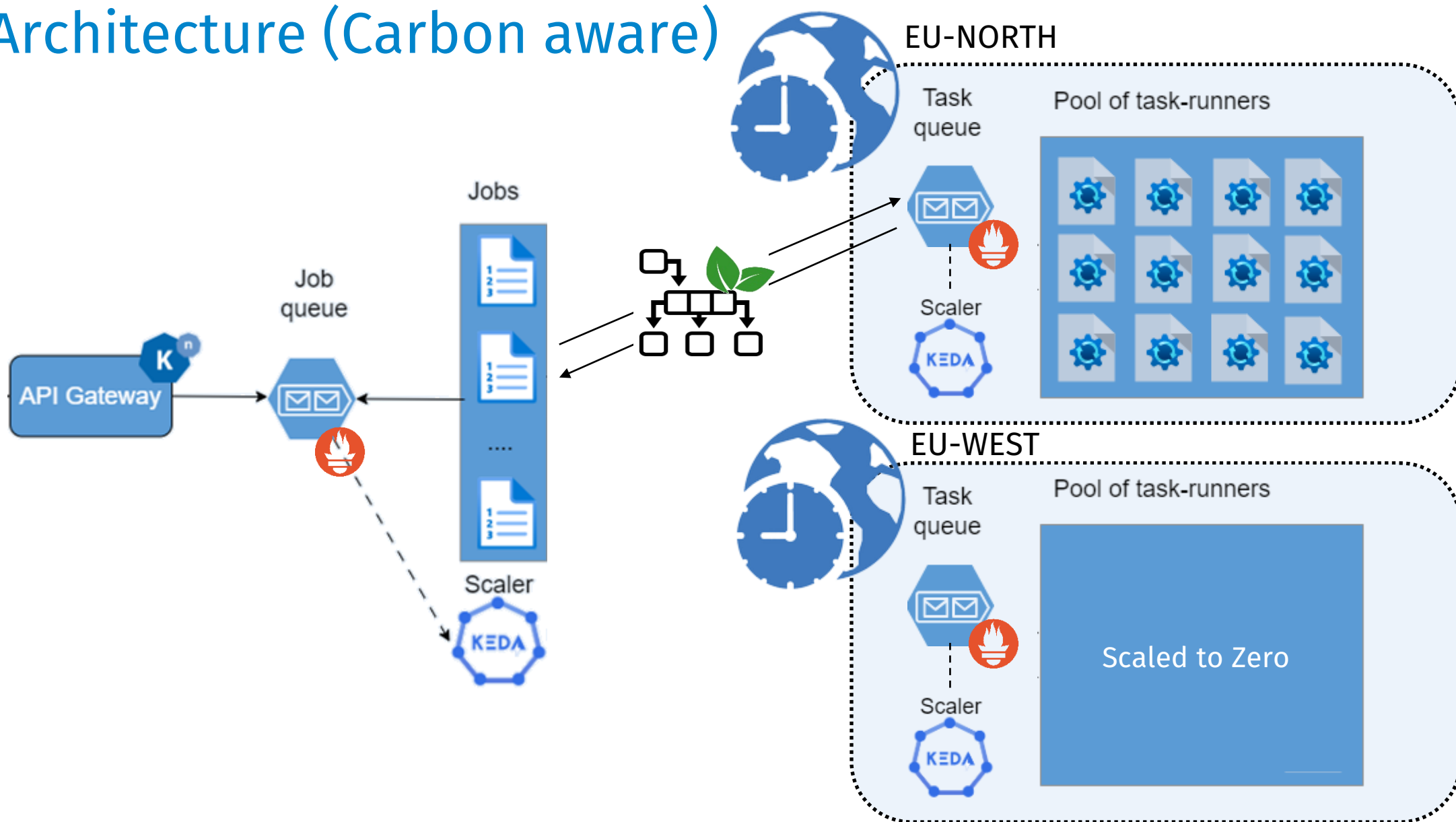
12 months

6 years



LIVE

Architecture (Carbon aware)



Framework Design (Carbon aware)

Open-source based

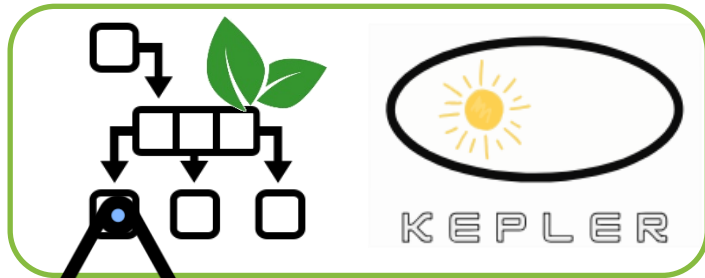
Application

Templated for you +/- 300 LoC



Components

Kustomize YAMLS included



Orchestration

Kubernetes



Infrastructure

Does not matter



**WORK IN
PROGRESS**

Thank you!
Questions?

Public