Let’s Embrace Green CloudNative Engineering

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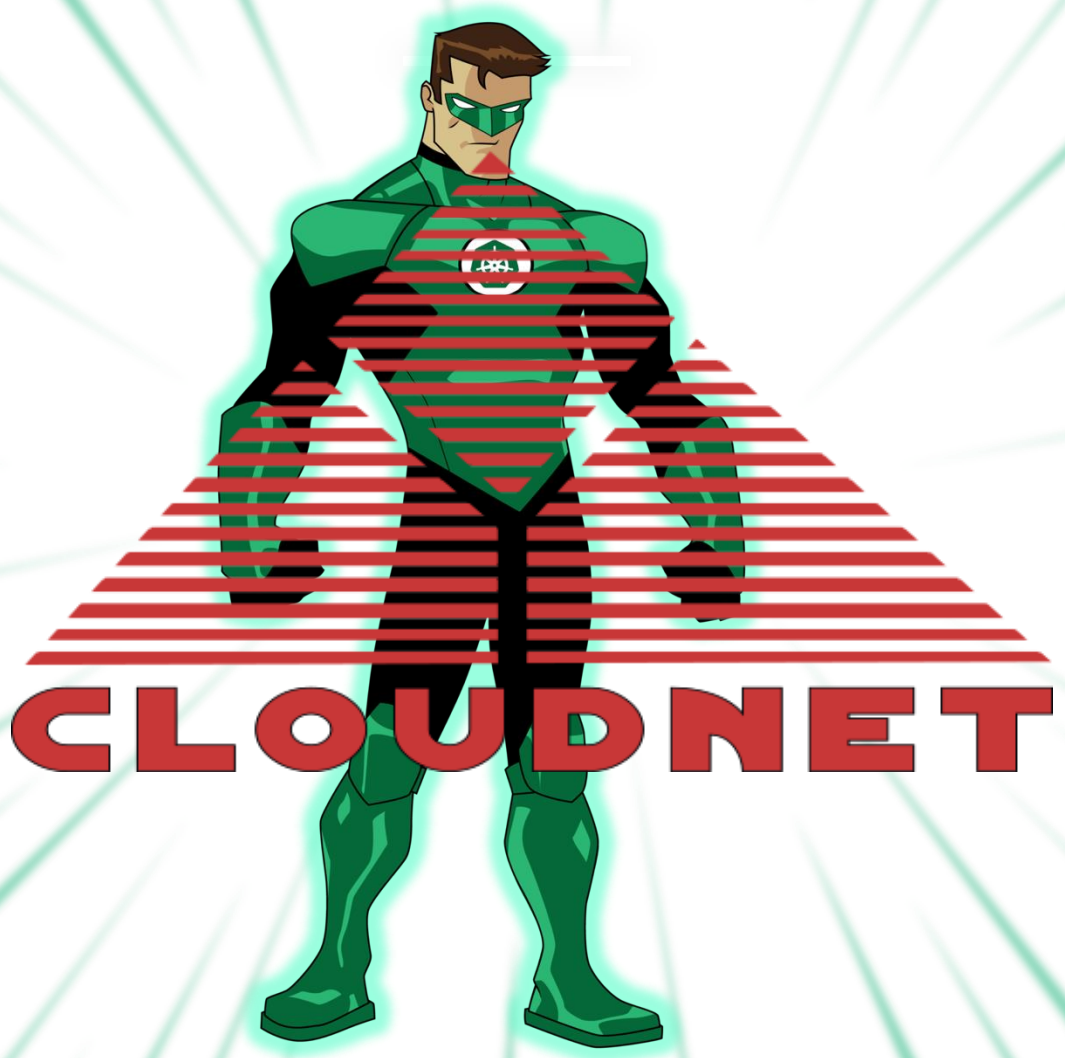
CNCF Ambassador & Cloud Native Advocate

- 15+ years of Performance engineering
- Owner of

  Producer of

Kaptain Green



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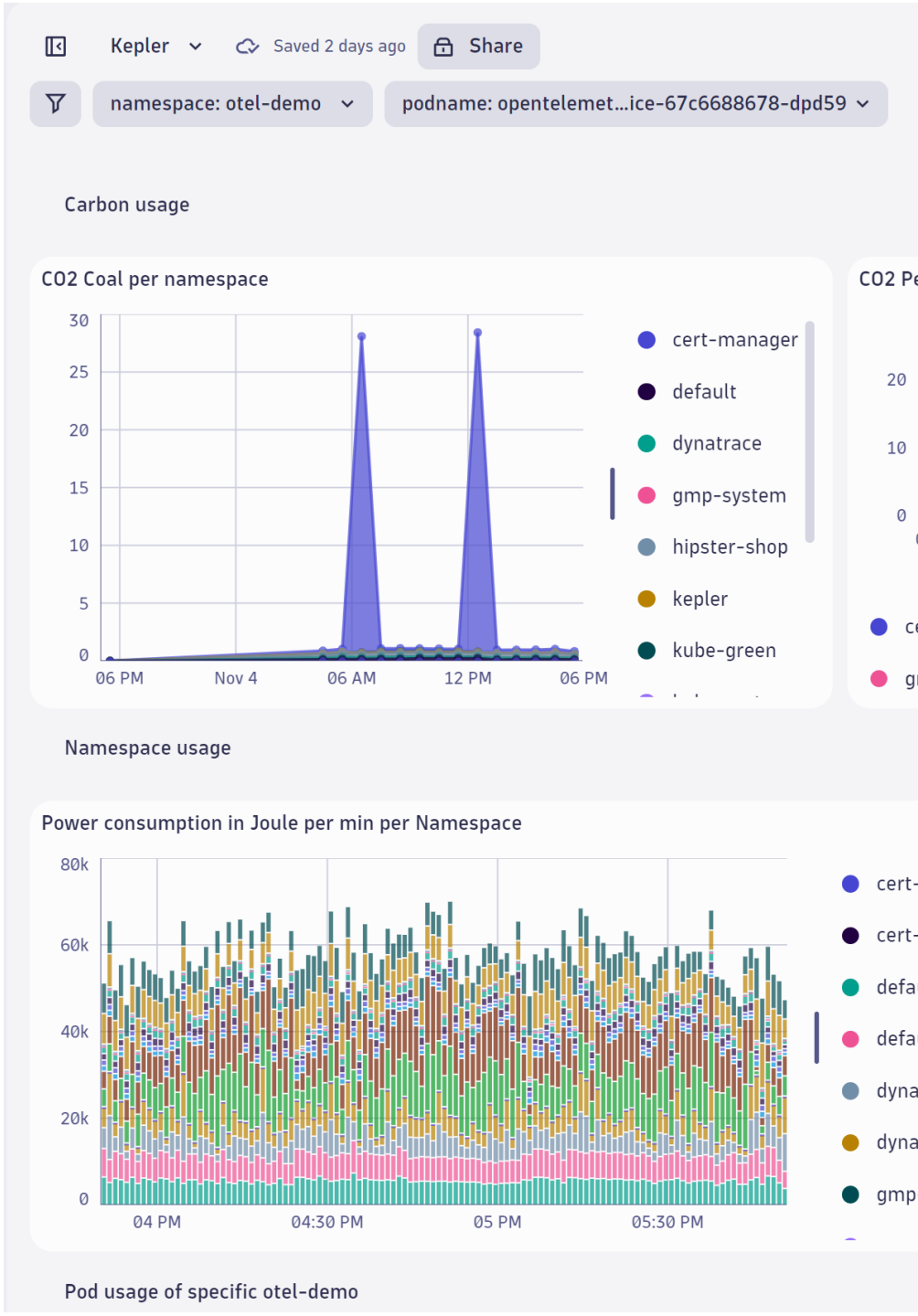
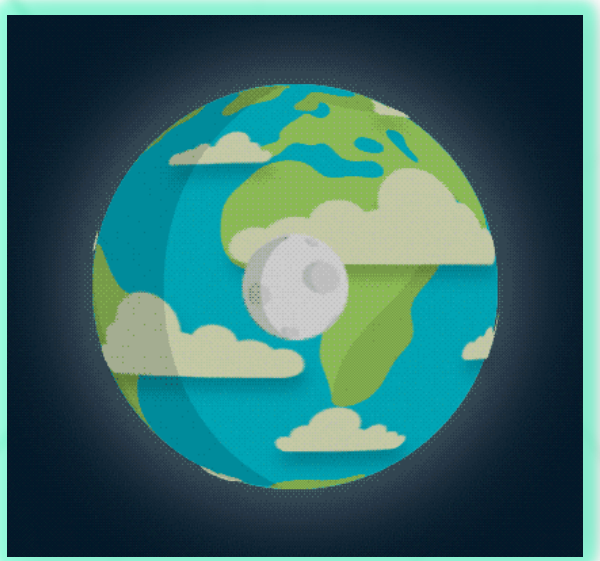
If you stay with me you will ...

- Learn about the **importance** of reducing the energy footprint of y**our k8s workload**
- The **impact of not optimized** resource allocation
- The various way of saving energy
- Finaly we will present :
  - Kepler
  - KubeGreen



We need to save our planet



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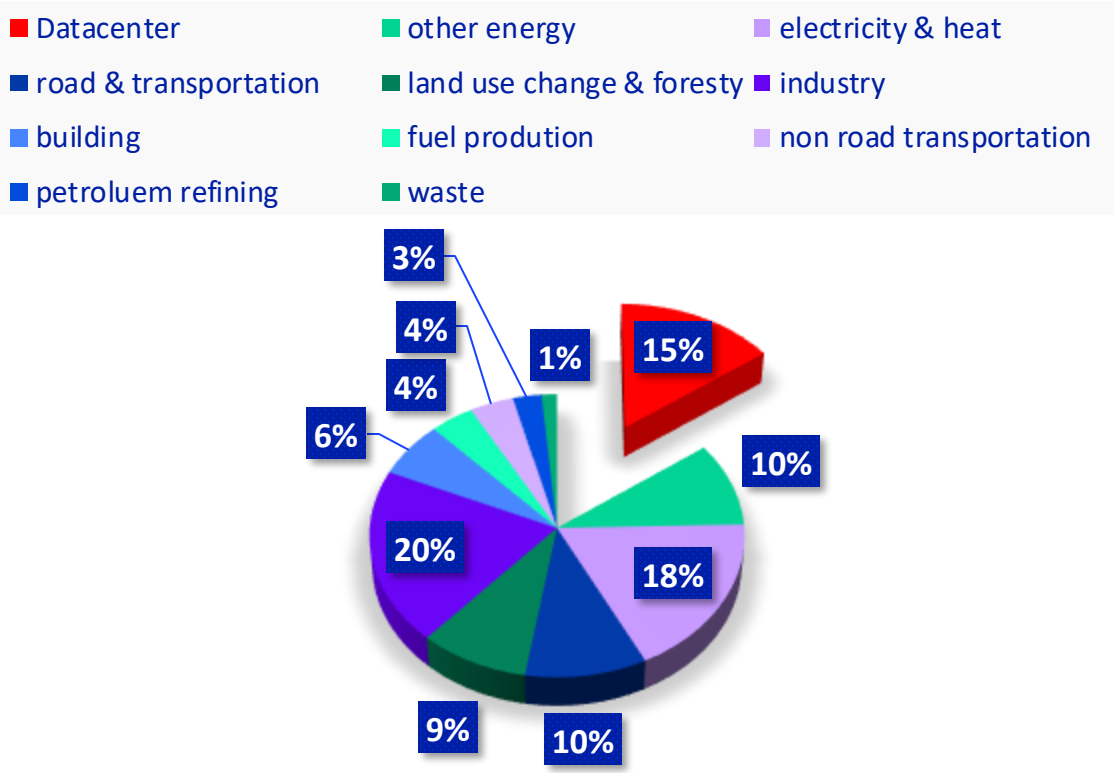
Everything started with

Carbon footprint



Number shared from Kaptain Green

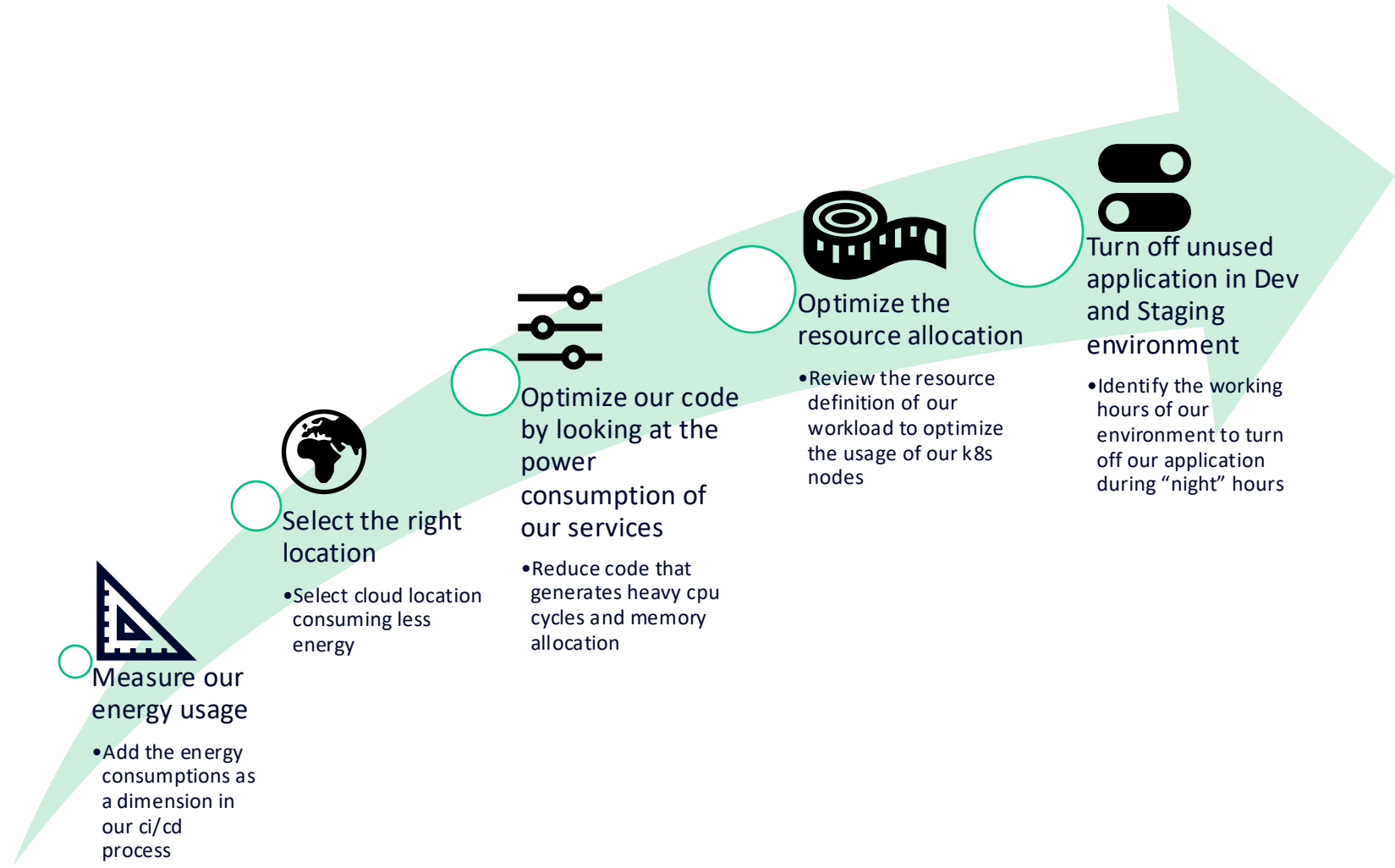
But the usage of datacenter kept increasing

- Every industry relies on datacenter to manage :
  - software managing sales…and more
  - The usage of AI is increasing
  - The explosion of data required for any AI applications

- The energy required for our datacenter is increasing by 1-2% per year.

- The energy usage of our datacenter should reach 15 by 2040

How can we avoid the disaster?



How can we measure ?

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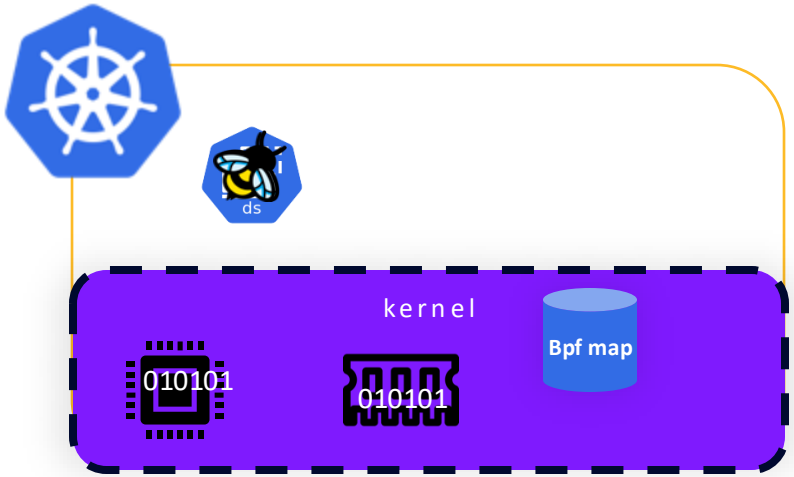
Kepler

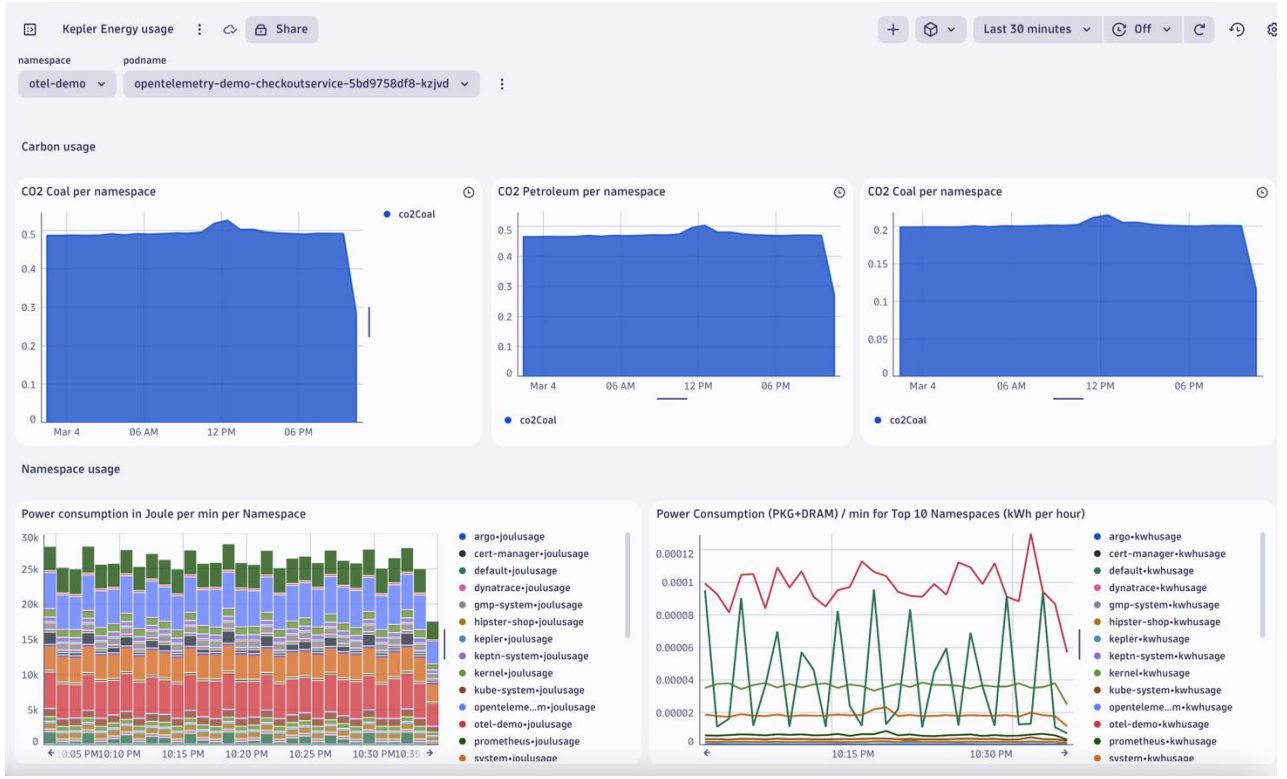
- Kepler utilize ebpf programs to estimate the power consumption of our workload

- Kepler will estimate the power usage by measuring :
  - the number of cpu cylces required for a process
  - The memory allocation requested by a process

- It adds the k8s metadata to the generated Prometheus metrics

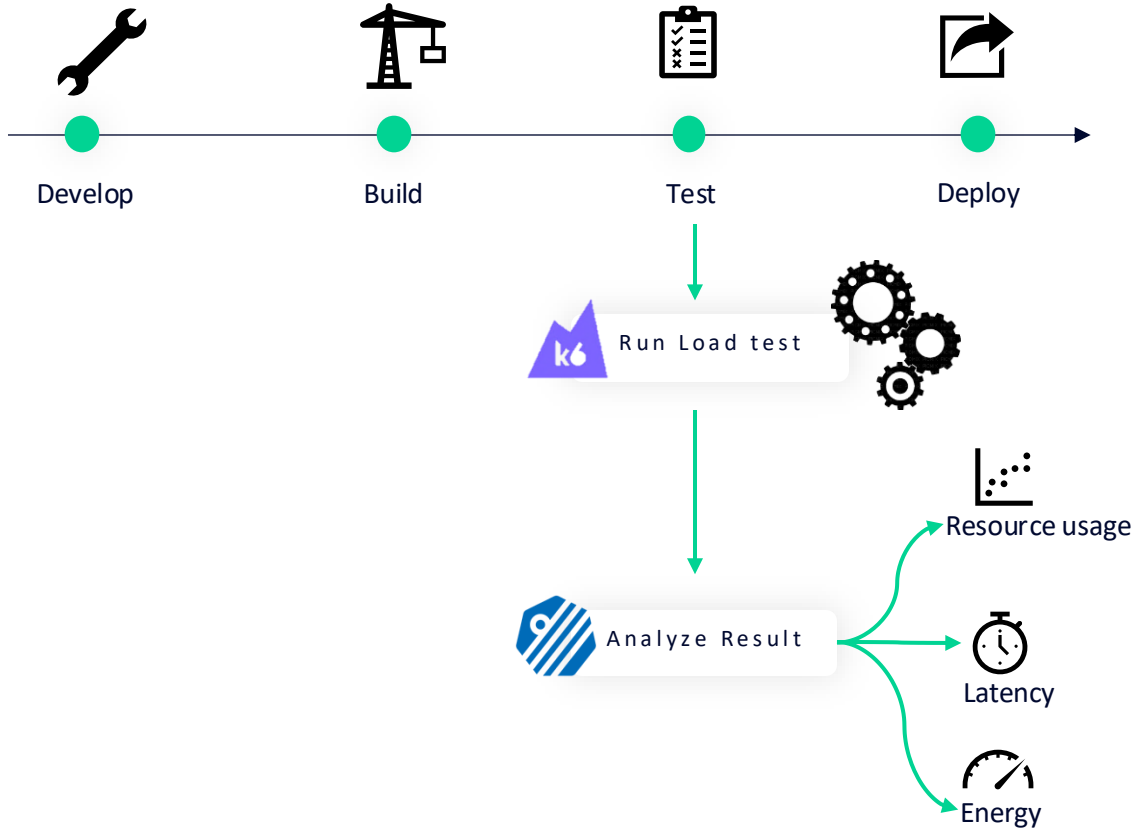


Tools required for our journey



Include Energy Consumption into your pipeline

- Energy usage should be considered to be one our key kpi to evaluate a successful pipeline
- You can use any CI/CD system of your choice, but need a solution helping you to evaluate based on metrics
- Keptn project provides k8s CRD to build your evaluation based on external metrics.



Keptn Analyse Defintion

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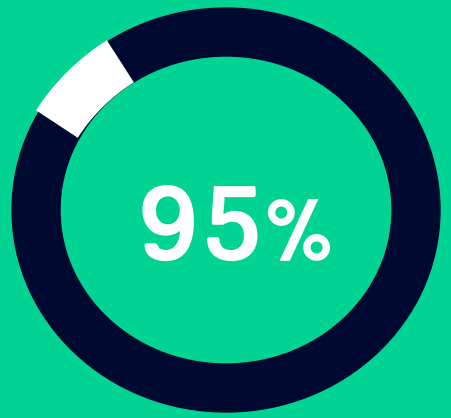
SERVICE LEVEL INDICATOR

METRIC

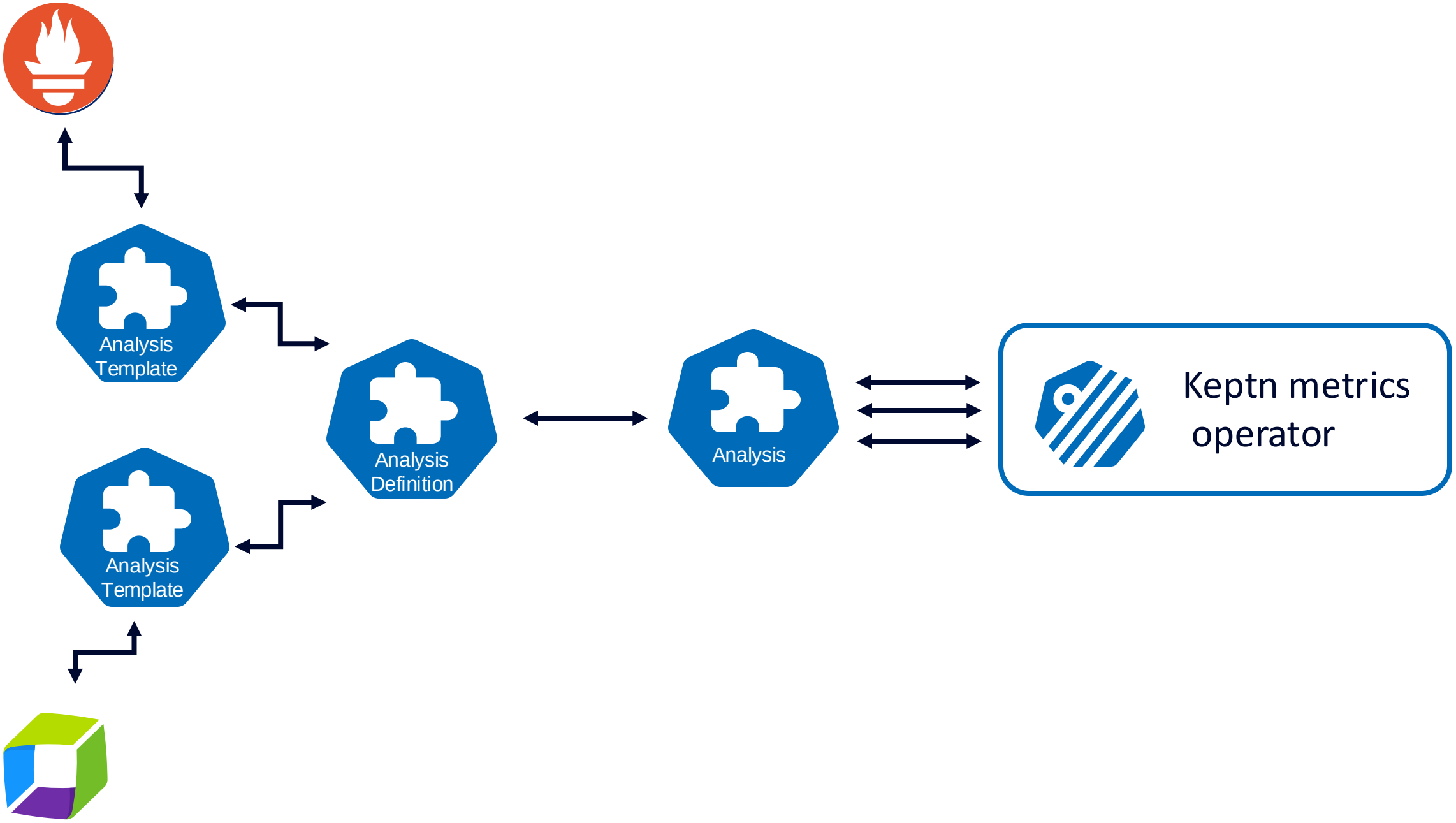
SERVICE LEVEL OBJECTIVE

GOAL



SERVICE LEVEL AGREEMENT

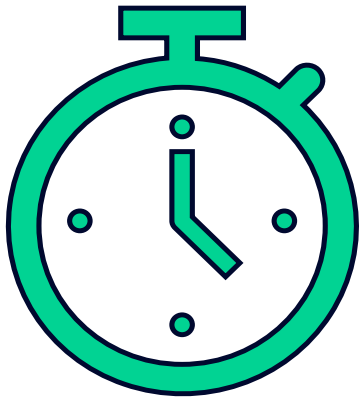
CONTRACT


Analysis Template
Analysis Template
Analysis Definition
Analysis
Keptn metrics operator

```yaml
apiVersion: metrics.keptn.sh/v1alpha3
kind: AnalysisValueTemplate
metadata:
  name: value-sample
spec:
    provider:
        name: my-provider
    query:
'(sum(kepler_container_joules_total{pod
_name=~"{{.pod}}.*"})/sum(kepler_conta
iner_joules_total{container_namespace=
"{{.ns}}"}))*100'
```

SERVICE LEVEL INDICATOR

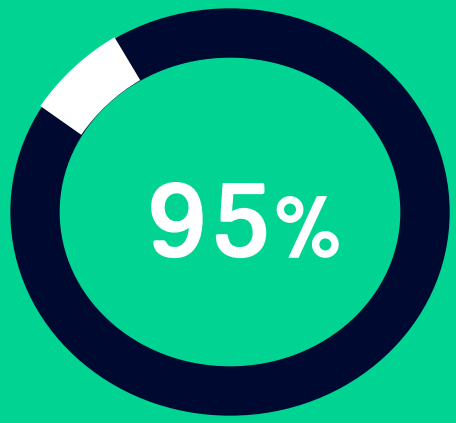
METRIC



```yaml
apiVersion: metrics.keptn.sh/v1alpha3
kind: AnalysisDefinition
metadata:
  name: definition-sample
spec:
  objectives:
    - analysisValueTemplateRef:
        name: value-sample
      target:
        failure:
          lessThan:
            fixedValue: 15
      weight: 2
      keyObjective: false
  totalScore:
    passPercentage: 75
    warningPercentage: 50
```

SERVICE LEVEL OBJECTIVE

GOAL



```
apiVersion: metrics.keptn.sh/v1alpha3
kind: Analysis
metadata:
  name: analysis-sample
spec:
  timeframe:
    recent: 5m
  args:
    ns: „otel-demo„
    pod:“opentelemetry-demo-checkoutservice“
  analysisDefinition:
    name: definition-sample
status:
        RESULTS GO HERE
```

SERVICE LEVEL AGREEMENT

CONTRACT

Demo

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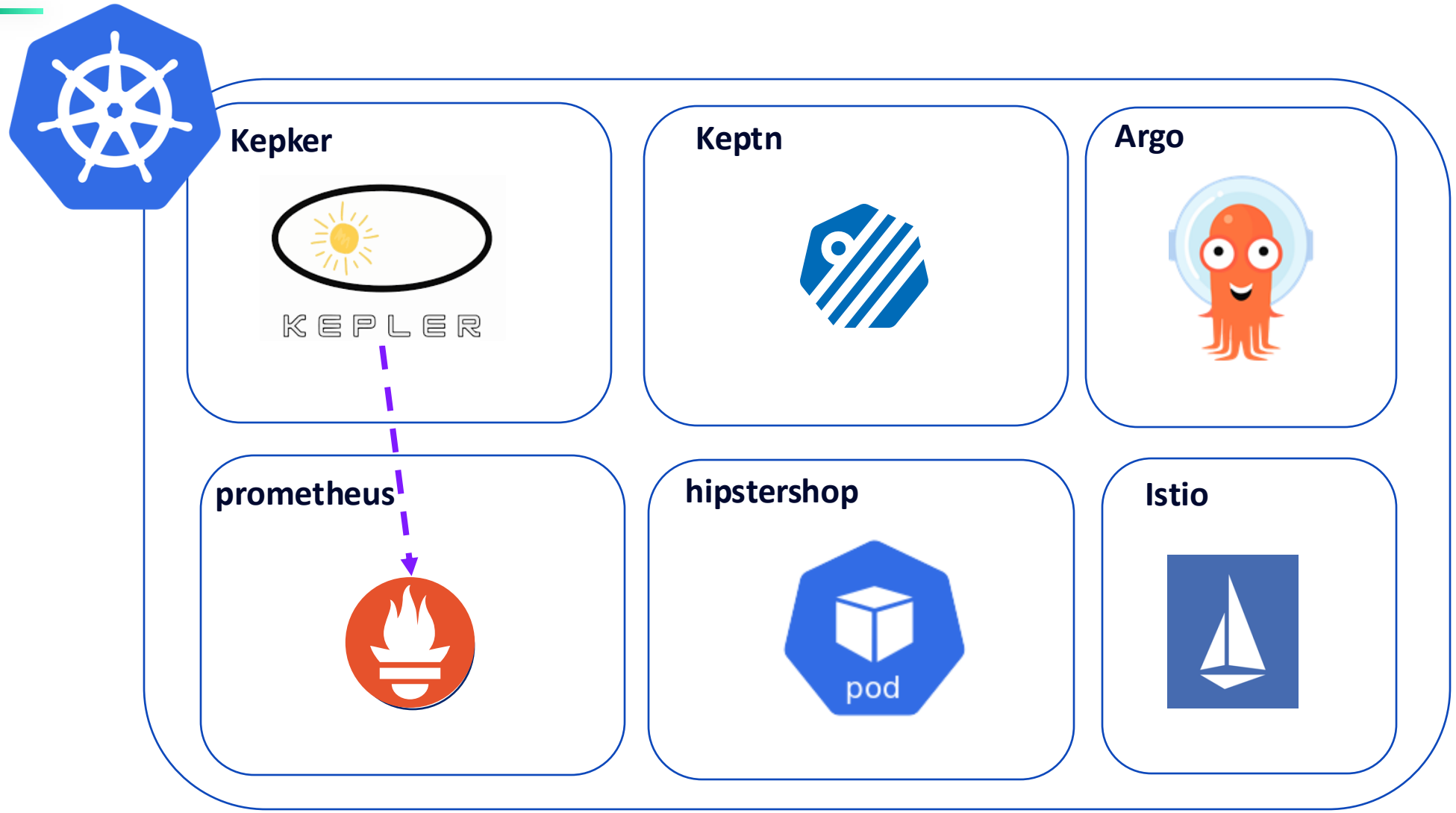
Our Technical Environment



Move your workload To sweden

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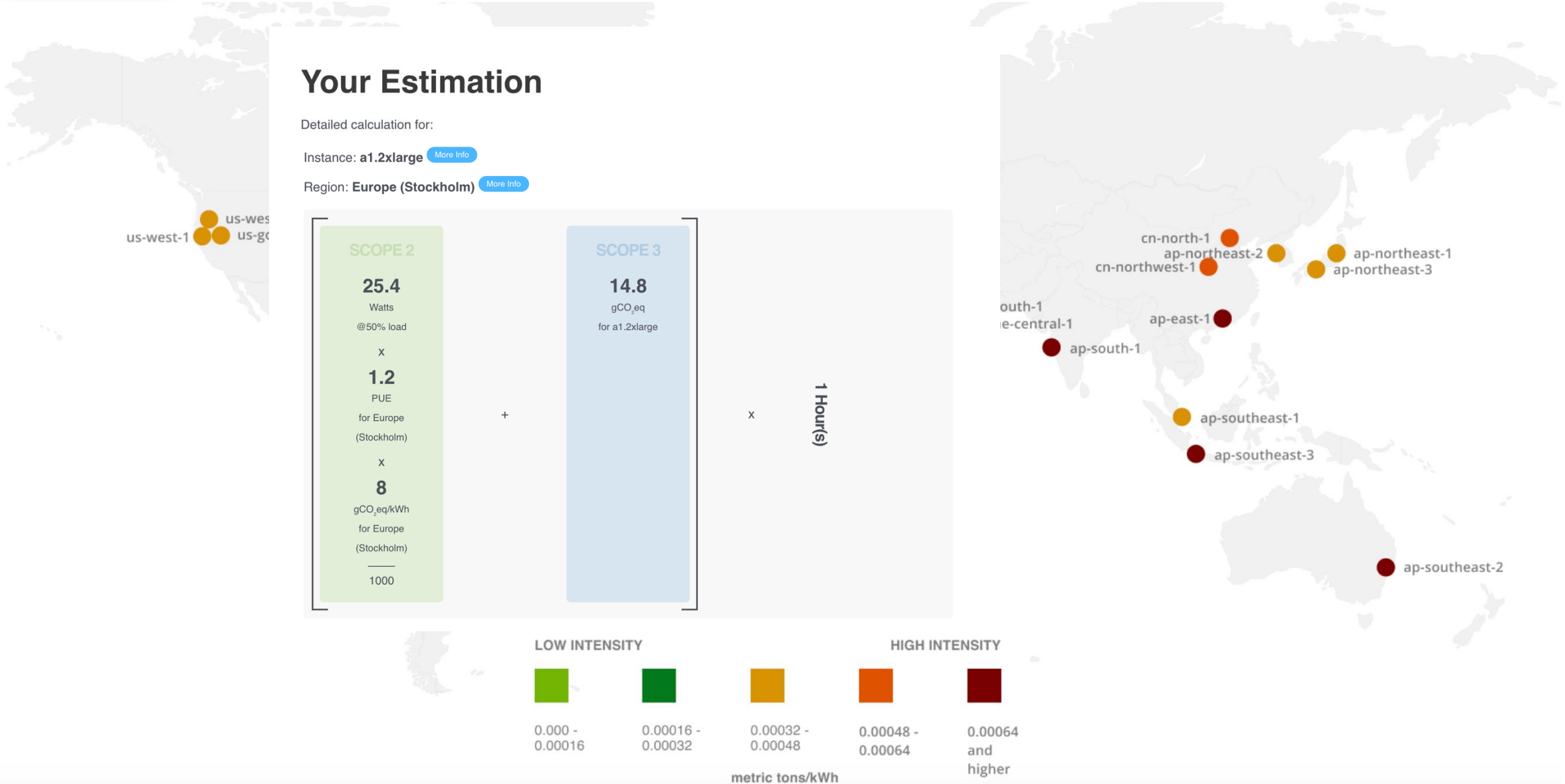
All locations are not equal…



How to optimize our resource allocations?

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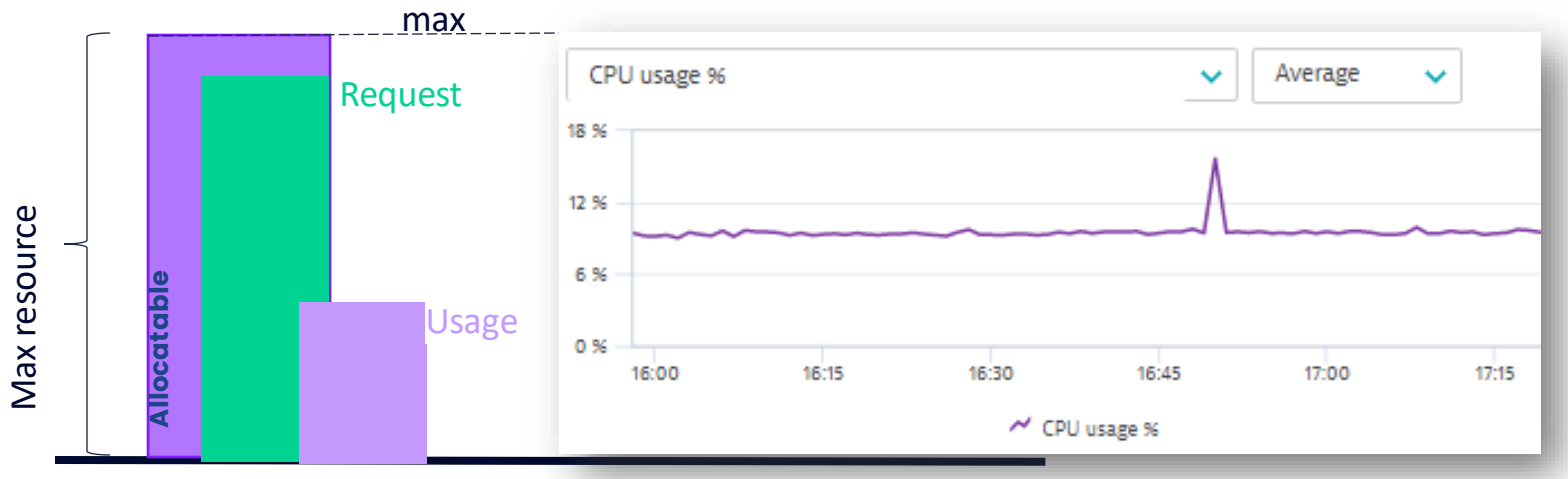
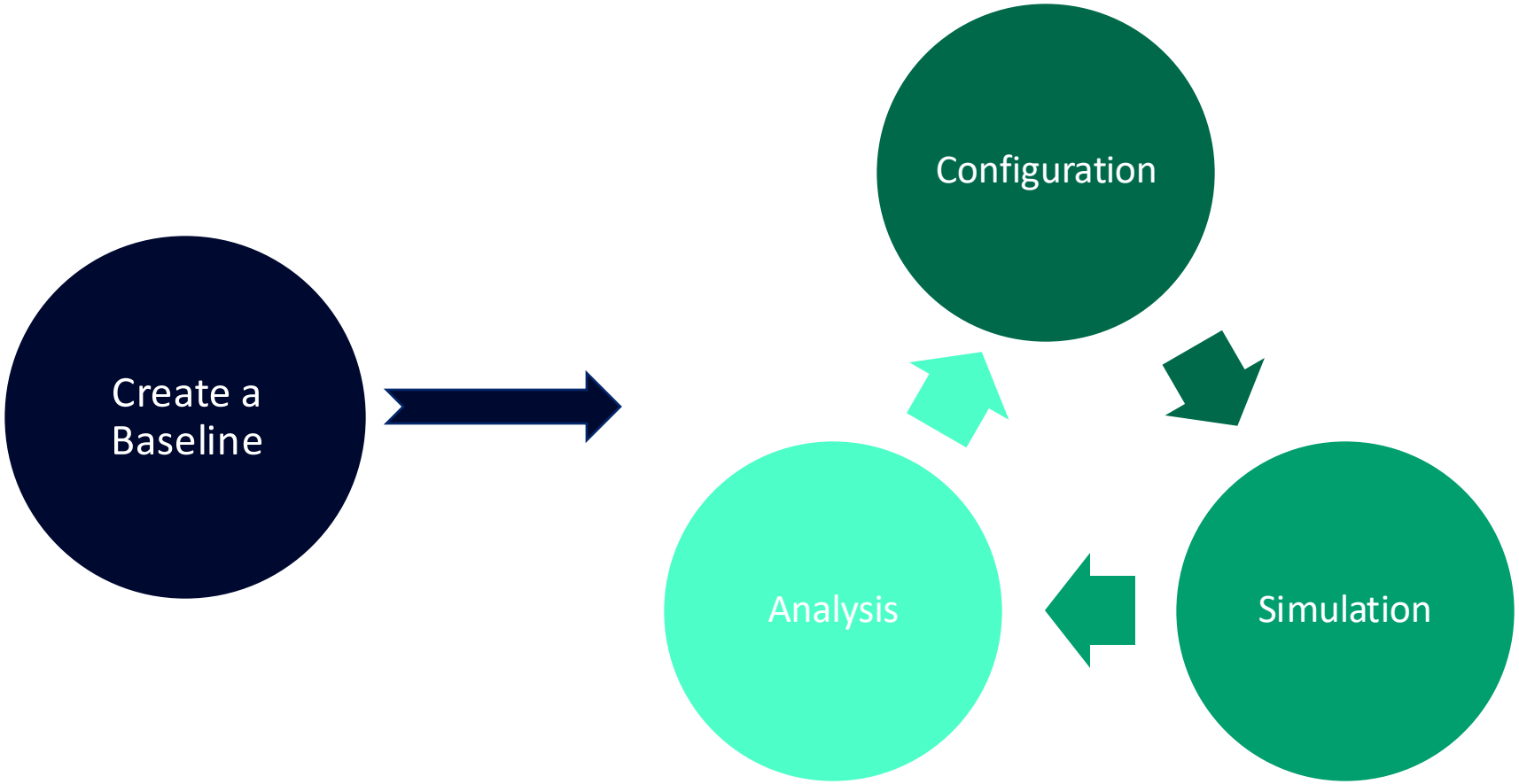
Resize your Workload Size

- Node resource allocation is based on our workload definition

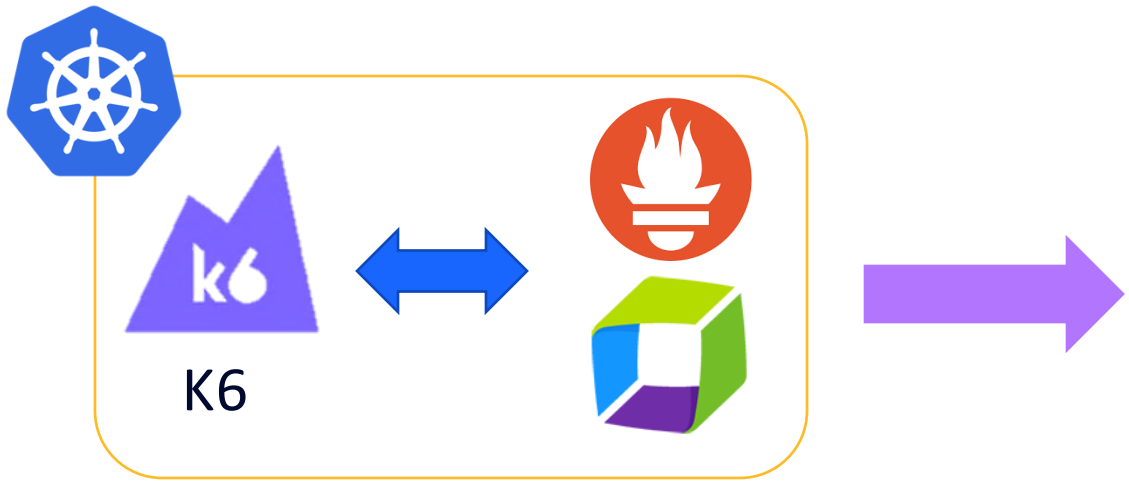


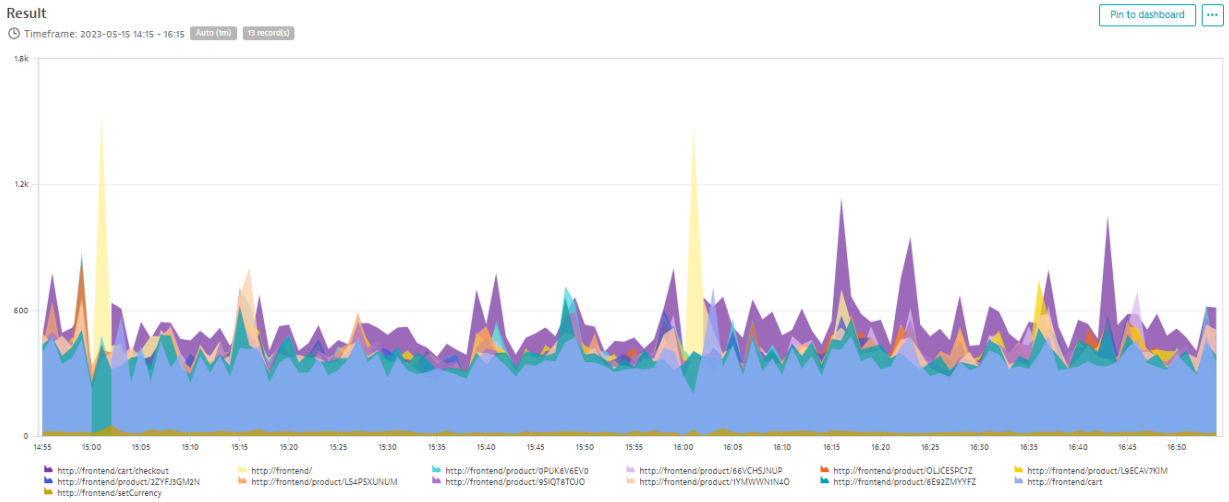
- So, we need reduce our Request/Limit
  - Look at the usage vs request
  - Look at the usage vs limit

Optimize : What is the approach?

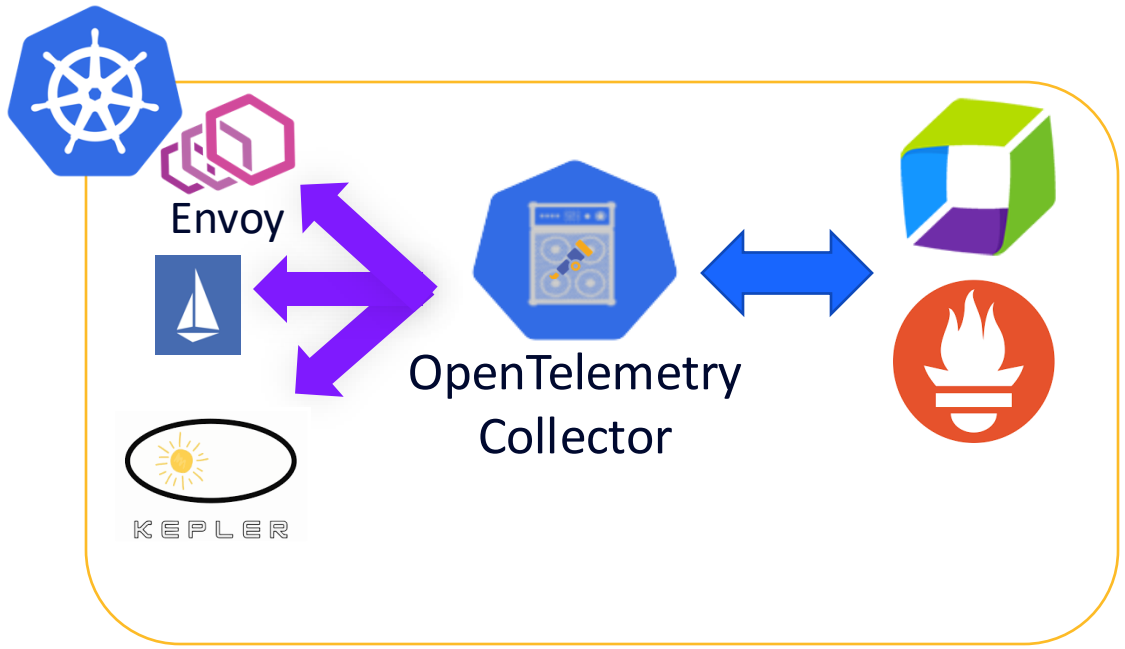


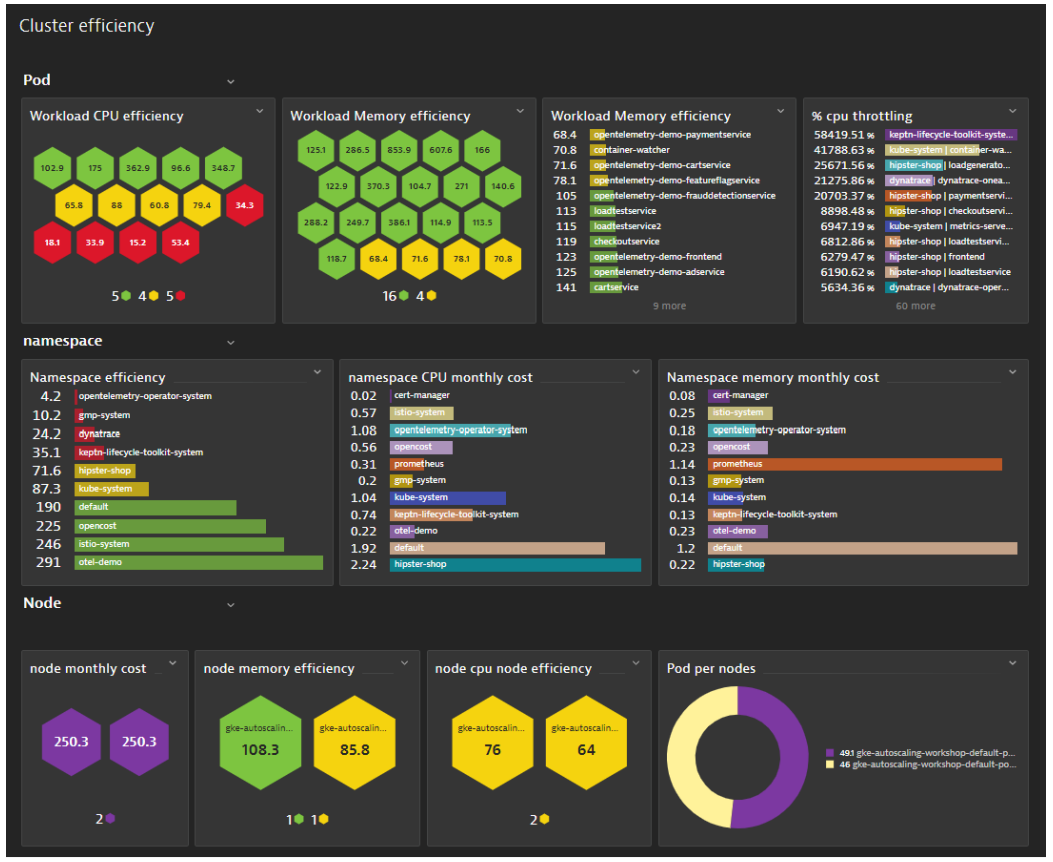
K6 – The Dynatrace integration





Kepler to report the energy usage of the workload



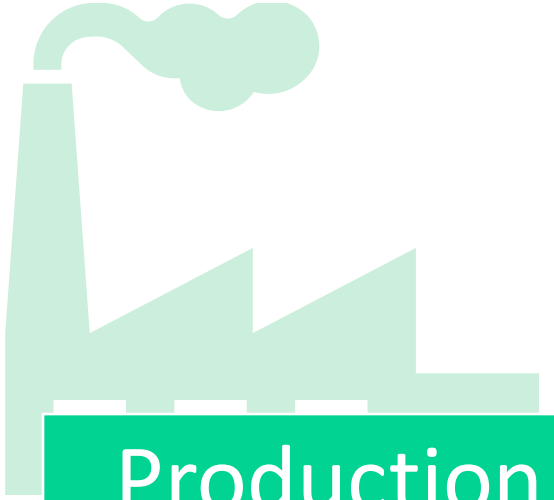


How to remove unuseful workload

Our environments

Dev

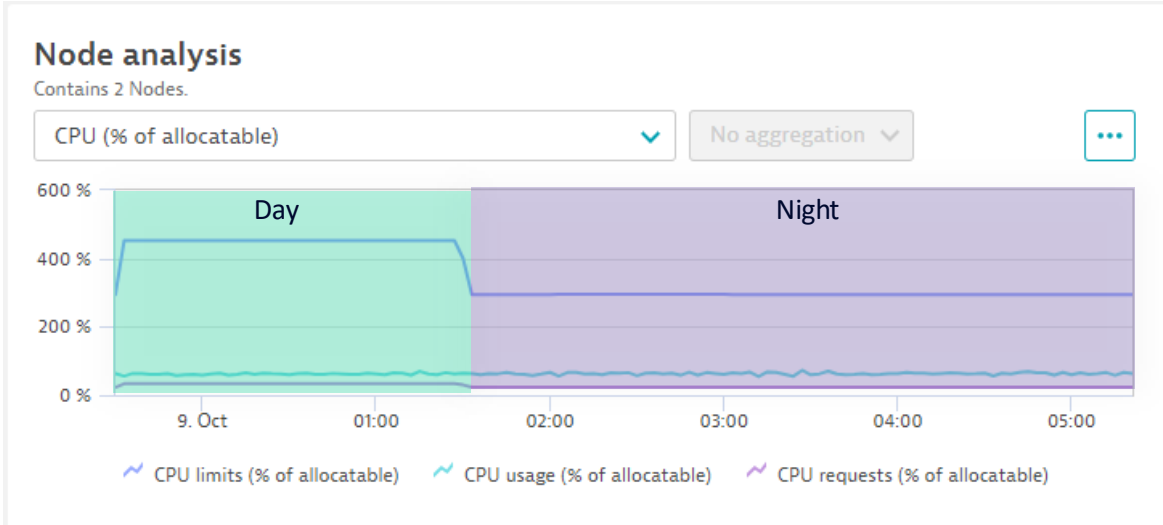
Testing



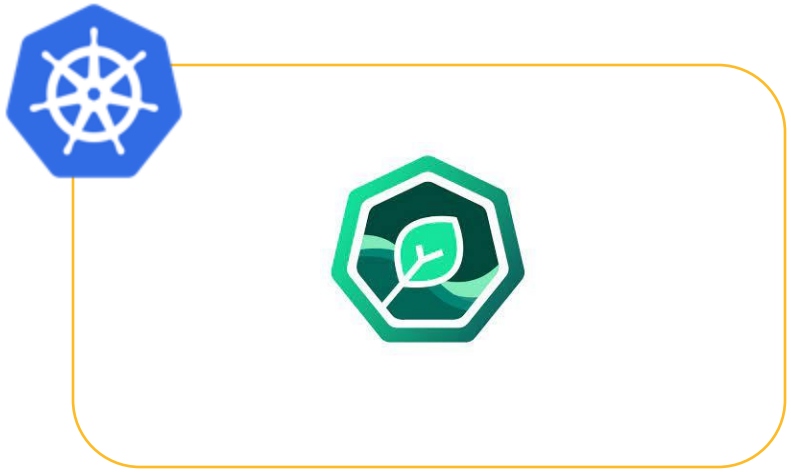
Production

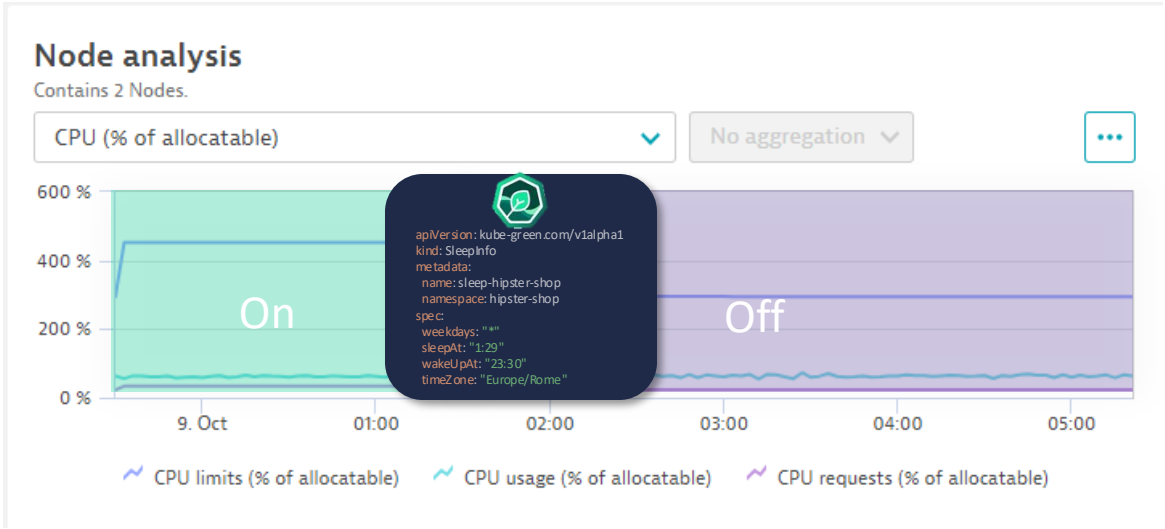
Testing Environment

- There are always several hours where our non production environment are not handling any traffic.
- We should remove the workload when they are not required.
- The project KubeGreen is designed for that



KubeGreen




Node analysis
Contains 2 Nodes.
CPU (% of allocatable)
No aggregation
600 %
400 %
200 %
0 %
On
Off
apiVersion: kube-green.com/v1alpha1
kind: SleepInfo
metadata:
name: sleep-hipster-shop
namespace: hipster-shop
spec:
weekdays: "*"
sleepAt: "1:29"
wakeUpAt: "23:30"
timeZone: "Europe/Rome"
9. Oct
01:00
02:00
03:00
04:00
05:00
CPU limits (% of allocatable)
CPU usage (% of allocatable)
CPU requests (% of allocatable)

Demo

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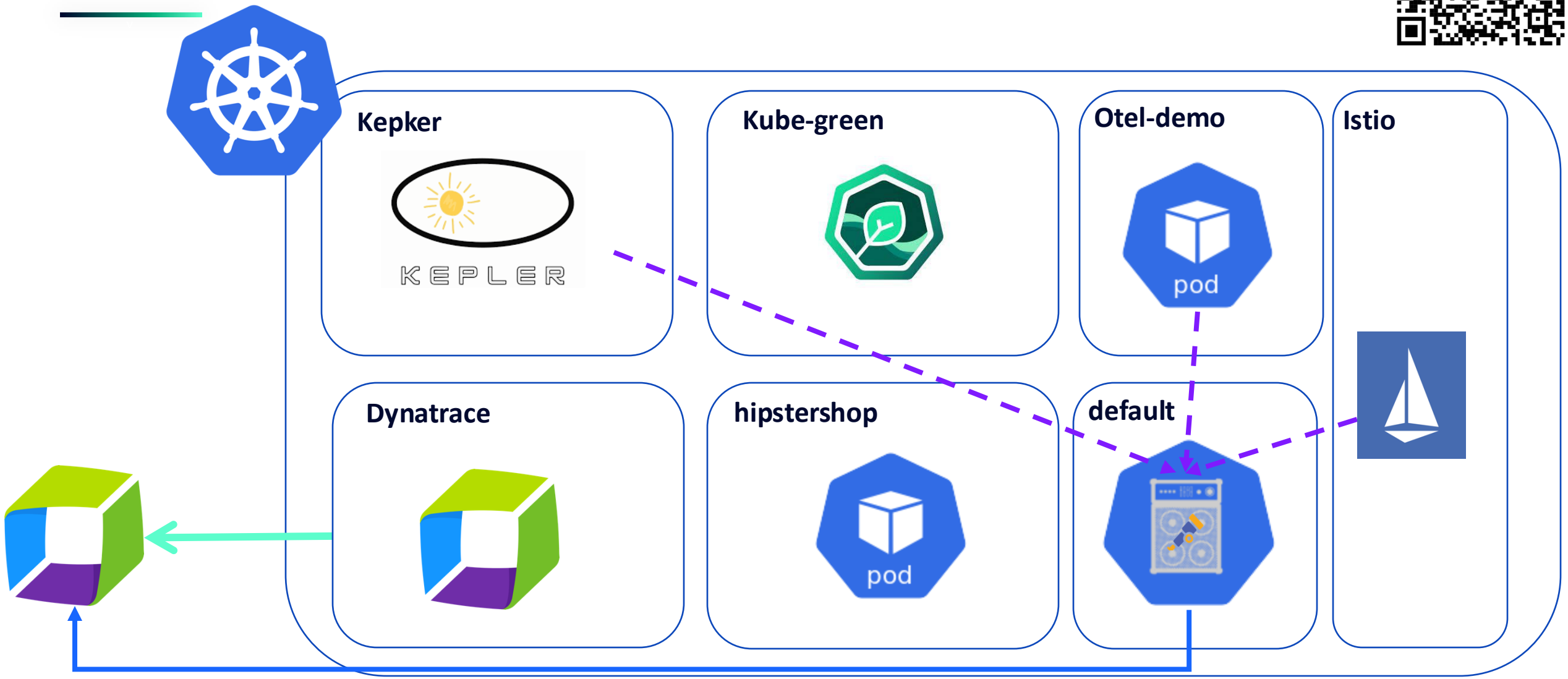
Our Technical Environment



Take Away

Measure

- Deploy Kepler to report energy usage

CI/CD

- Include energy consumption in your CICD pipeline
- Create QualityQuates to automate the feedback loop

Optimize

- Use Profiling solutions to identify code consuming CPU
- Guide your optimization with Kepler metrics

Sleep

- Use Kubegreen to remove un-useful workload
- Make your application sleep in Testing environment

Is it observable

- Looking for educational content on Observability , Checkout the YouTube Channel :

Is It Observable

Is it Observable ?

Thank you