
KubeCon
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TiKV

Unlocking the Potential of KEDA: New Features and Best Practices

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About us

KubeCon CloudNativeCon Europe 2023

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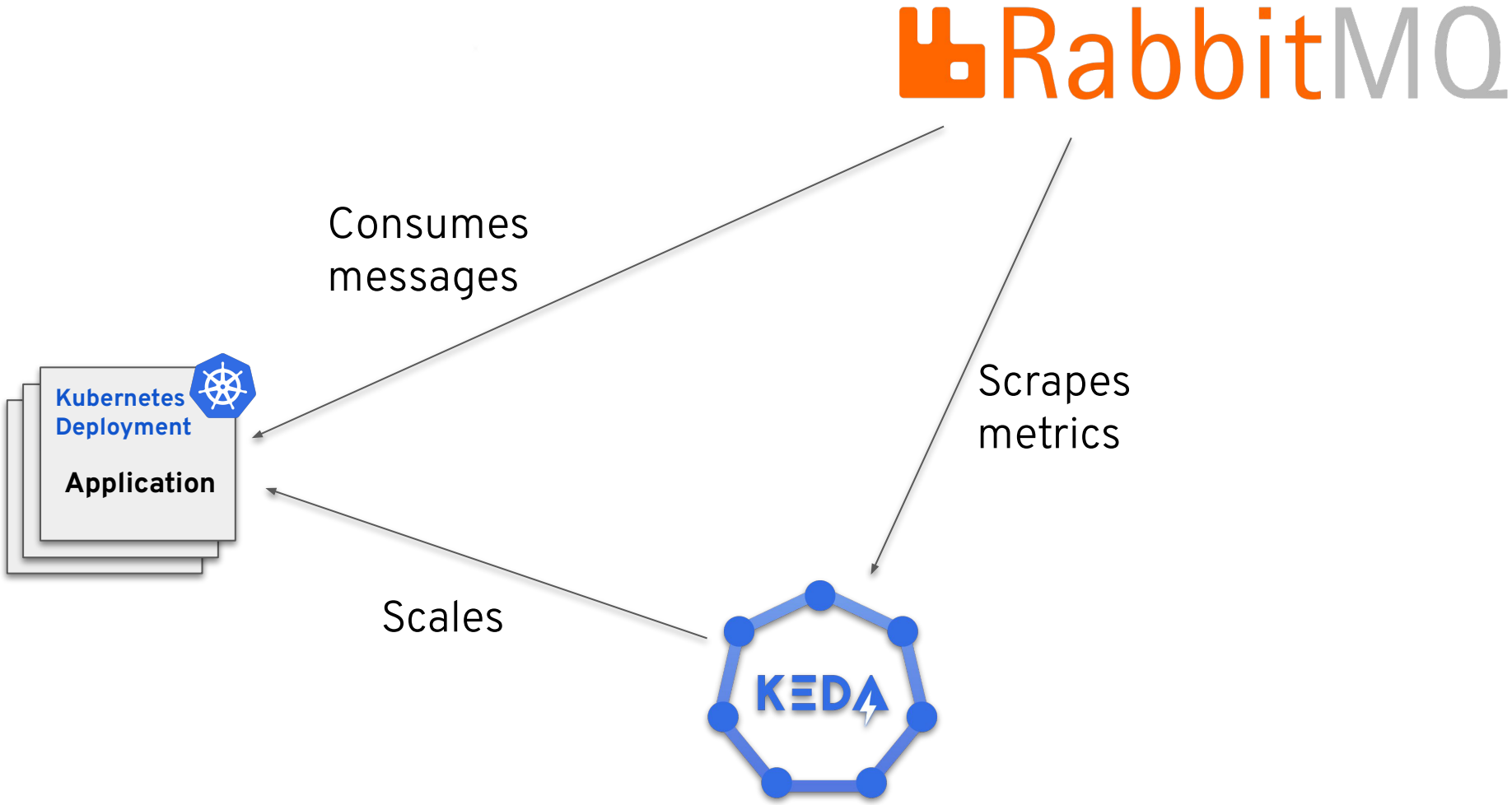
Agenda

- What is KEDA?
- New features
- Best practices
- Future

The problem


RabbitMQ
Consumes messages
Kubernetes Deployment
Application

The solution



What is KEDA?

- The Project aims to make **K**ubernetes **E**vent **D**riven **A**utoscaling dead simple
- Allows you to scale any deployment resource or job based on **events**, not only on CPU / Memory
- 60+ integrated event sources (Prometheus, RabbitMQ, Kafka, SQS, PostgreSQL, …..)
- https://keda.sh

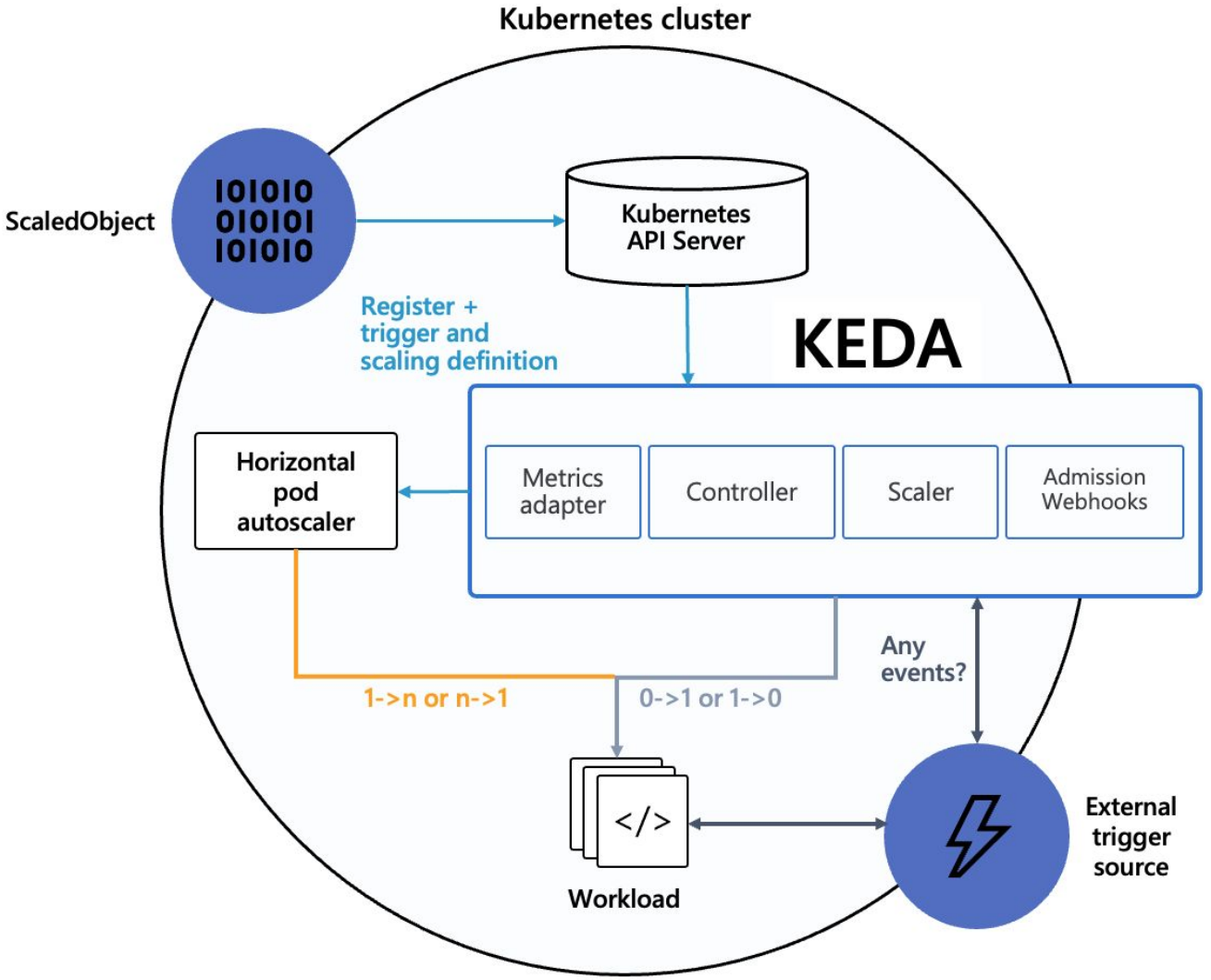
KEDA community

- 6,2k stars on GitHub
- ~260 contributors, incl.
  - Microsoft
  - Red Hat
  - SCRM Lidl International Hub
  - Reddit
  - IBM
- KEDA Users survey:

Alibaba Cloud · Ampify · Apache Airflow · Astronomer · baseten · Bold Desk by Syncfusion · Chattermill · Cisco · cloudtrade · Coralogix · cyera · Dig Security · Docplanner Tech · FedEx · fission · freepikcompany · Grafana Labs · HM Courts & Tribunals Service · intension · Intercept Empowering Azure · Kendaxa · KPMG · Meltwater · Metamaze Intelligent Document Processing · Microsoft · nemlig.com · OpsWorks Co. Springboard to IT innovations · Peninsular Research Operation · PureFacts · qonto · reddit · Roadwork · Schréder Hyperion · Lidl SCRM International Hub · Seldon · sharry · Stilingue · SwissLife · Teamleader · vitc · Workiva · zapier

KEDA architecture

- Built on top of Kubernetes
- **ScaledObject/ScaledJob** defines scaling metadata
- Manages workloads to scale to 0
- Publishes metrics HPA which makes most scaling decisions



ScaledObject

- Can target **Deployment**, **StatefulSet** or **Custom Resource** with **/scale**

- **Multiple scalers** can be defined as triggers for the target workload

- User can specify **HPA related settings** to tweak the scaling behavior

```
apiVersion: keda.sh/v1alpha1
kind: ScaledObject
metadata:
  name: example-so
spec:
  scaleTargetRef:
        name: example-deployment
  minReplicaCount: 0
  maxReplicaCount: 100
  triggers:
  - type: rabbitmq
    metadata:
        host: "ampq://user:PASWORD@my-rabbit.com:5672"
        queueName: "my-queue"
        queueLength: "5"
```

ScaledJob

- Schedule **Kubernetes Jobs** based on events

- Useful option to handle **processing long running executions**

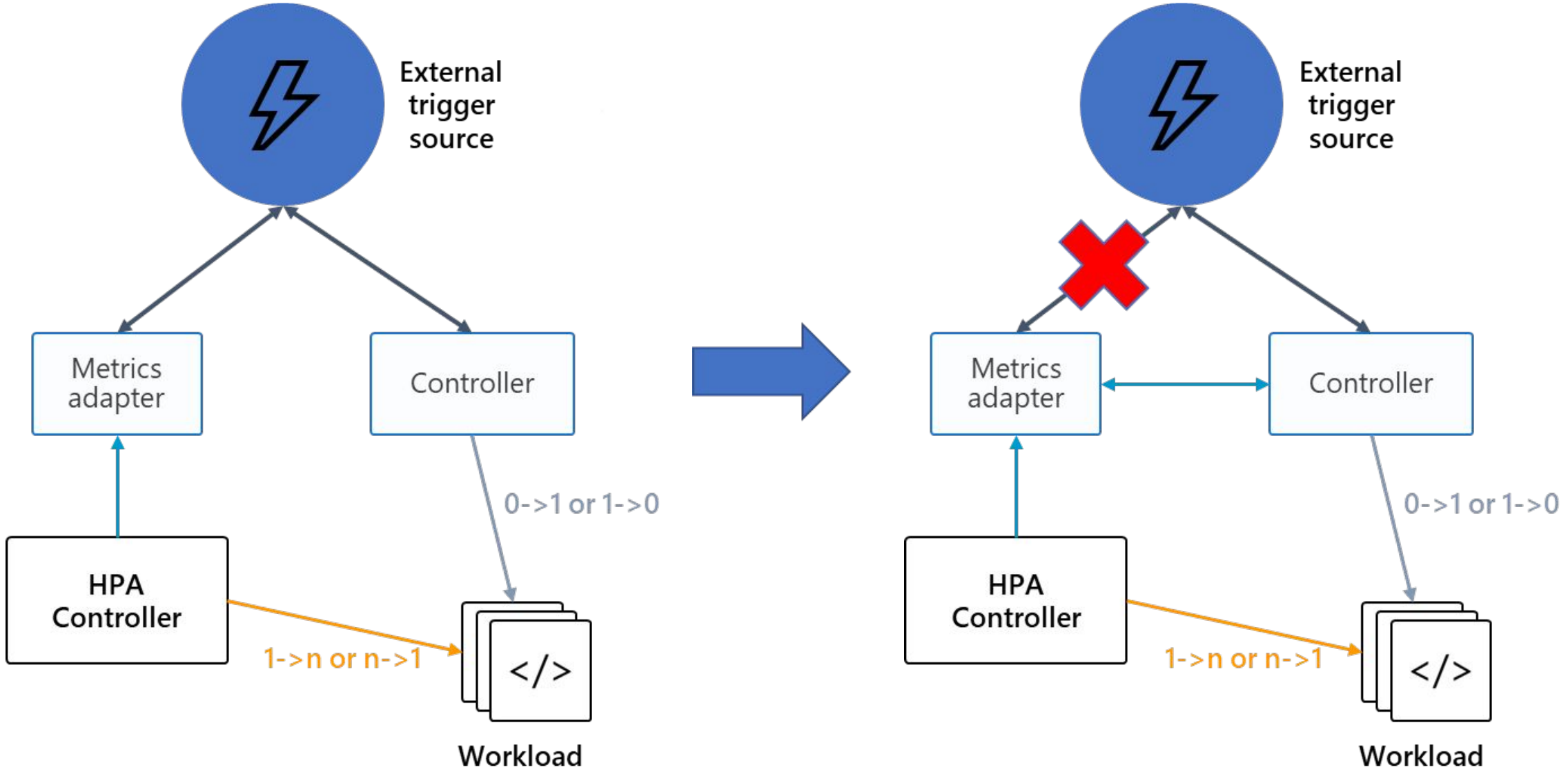
```
apiVersion: keda.sh/v1alpha1
kind: ScaledJob
metadata:
  name: example-sj
spec:
  jobTargetRef:
              ... #  standard Kubernetes Job definition

  maxReplicaCount: 100
  triggers:
  - type: rabbitmq
    metadata:
        host: "ampq://user:PASWORD@my-rabbit.com:5672"
        queueName: "my-queue"
        queueLength: "5"
```

New features

- Architecture changes
- Certificate management
- Validation webhooks
- Prometheus metrics
- Changelog

Architecture changes



Certificate management

- Certificates with for any internal communication
  - TLS1.3 encryption between components
  - CA validation for communications between API server and KEDA
  - Users can use their own certificates
    - Integration with cert-manager for helm chart
- Support to register custom CA in the trusted store
- Configurable minimal TLS version (with TLS1.2 as default)

Validation webhooks

ScaledObject validations:

- Is the scaled workload already autoscaled?
- (CPU/Memory) Does the workload have requests defined?

Prometheus metrics

- keda_scaler_activity
- keda_scaler_metrics_value
- keda_scaler_metrics_latency
- keda_scaler_errors
- keda_scaler_errors_total
- keda_scaled_object_errors
- keda_resource_totals
- keda_trigger_totals
- scaled_object_validation_total
- scaled_object_validation_errors

Integrate with Prometheus | KEDA

Operator

The KEDA Operator exposes Prometheus metrics which can be scraped on port `8080` at `/metrics`. The following metrics are being gathered:

- `keda_scaler_activity` - This metric marks whether the particular scaler is active (value == 1) or inactive (value == 0).
- `keda_scaler_metrics_value` - The current value for each scaler's metric that would be used by the HPA in computing the target average.
- `keda_scaler_metrics_latency` - The latency of retrieving current metric from each scaler.
- `keda_scaler_errors` - The number of errors that have occurred for each scaler.
- `keda_scaler_errors_total` - The total number of errors encountered for all scalers.
- `keda_scaled_object_errors` - The number of errors that have occurred for each ScaledObejct.
- `keda_resource_totals` - Total number of KEDA custom resources per namespace for each custom resource type (CRD).
- `keda_trigger_totals` - Total number of triggers per trigger type.
- Metrics exposed by the `Operator SDK` framework as explained here.

Admission Webhooks

The KEDA Webhooks expose Prometheus metrics which can be scraped on port `8080` at `/metrics`. The following metrics are being gathered:

- `scaled_object_validation_total` - The current value for scaled object validations.
- `scaled_object_validation_errors` - The number of validation errors.

Best practices

- Polling Interval & Metrics Caching
- HPA Scaling Behavior
- Kubernetes Metrics
- Best practices in action

Polling Interval & Metrics Caching

- **Polling Interval** is only relevant to 0<->1 scaling!
- Frequency of queries for 1<->N scaling is controller by HPA
  - default 15s, **--horizontal-pod-autoscaler-sync-period**
- Consider using **Metrics Caching** feature
  - metrics are scraped only each Polling Interval

https://keda.sh/docs/latest/concepts/scaling-deployments/#caching-metrics-experimental

HPA Scaling Behavior

- **Stabilization window** prevents replica count flapping
- **Scaling policies** control the rate of change of replicas while scaling

https://kubernetes.io/docs/tasks/run-application/horizontal-pod-autoscale/#configurable-scaling-behavior

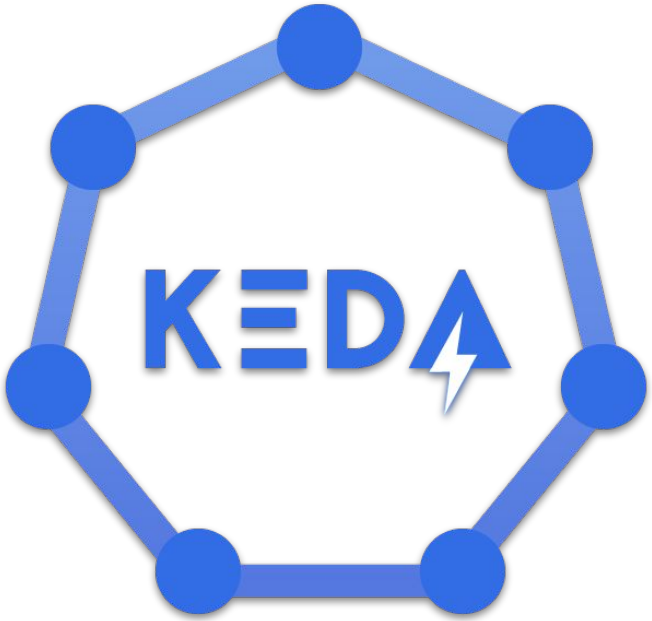
Kubernetes Metrics

- Why the HPA reports metrics like **4800m/5**?
- Metric types:
  - Average
  - Value
  - Utilization

https://kubernetes.io/docs/tasks/run-application/horizontal-pod-autoscale/#algorithm-details

Best practices in action

Demo time!



Future

- Custom logic for evaluation of multiple triggers in ScaledObject
- Multi-tenant installations
- Open interface for Predictive autoscaling
- CloudEvents integration
- Carbon aware autoscaling
  - - POC & recording

Thank you!

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