



Scaling in the AKS Wonderland

Festive Tech Calendar 2023



 **Microsoft**
Solutions Partner
Digital & App Innovation
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Specialist
Migrate Enterprise Applications
to Microsoft Azure

Who we are



Philip Welz

(Senior DevOps & Kubernetes Engineer,
Azure MVP)

☎ +49 8031 230159-0

✉ philip.welz@whiteduck.de

🐦 @philip_welz

in www.linkedin.com/in/philip-welz



Nico Meisenzahl

(Head of DevOps Consulting & Operations,
Cloud Solution Architect)

☎ +49 8031 230159-0

✉ nico.meisenzahl@whiteduck.de

🐦 @nmeisenzahl

in www.linkedin.com/in/nicomeisenzahl

Agenda

- Kubernetes Scheduler
- Horizontal Pod Autoscaler (HPA)
- Vertical Pod Autoscaler (VPA)
- Kubernetes Event-driven Autoscaling (KEDA)
- Kubernetes Cluster Autoscaler (CA)
- Karpenter



Kubernetes Scheduler

- is one of the main components of the control plane, responsible for managing pod scheduling
- is responsible for resource allocation within a cluster
- schedulers are swappable (currently not with AKS)
- you can also have multiple (currently not with AKS)
- “kube-scheduler” is the default one
 - customizable and extendable scheduling in a two-step process (filtering & storing)
 - does not reschedule!
- <https://kubernetes.io/docs/concepts/scheduling-eviction>

Scheduling details

- resource quotas
- taints and tolerations
- selectors and affinity (node & inter-pod affinity and anti-affinity)
- pod distribution across zones
- disk dependencies/limitations

Horizontal Pod Autoscaler (HPA)

- scales the number of pod replicas based on CPU, memory or custom metrics
 - also supports multiple metrics
- relies on the metrics server (available by default with AKS)
- works with every scalable resource (Deployment, StatefulSet, ...)
- supports scaling based on container metrics since 1.27

Vertical Pod Autoscaler (VPA)

- automatically adjusts the resource requests and limits of containers based on their actual usage
- helps increasing cluster efficiency
 - optimizing resource allocation, reducing resource waste
- consists out of “Recommender”, “Updater” and an Admission controller
- GA on AKS since Sep 2023
- tips & best practices
 - do use with pod disruption budget
 - don't use with HPA (based on CPU & memory metrics) or JVM-based workloads
 - don't use in big clusters (scaling issues)

Kubernetes Event-driven Autoscaling (KEDA)

- scales based on events instead of predefined metrics
- supports
 - Deployments, StatefulSets and custom resources
 - 60+ scalers (and bring-your-own scalers)
 - scaling to/from zero
- integrates with HPA
- GA on AKS since Nov 2023
- examples: scales up from zero on
 - a message in a queue (ServiceBus, Redis, ...)
 - a blob upload in a Storage Container
 - any Azure event (Event Hub)
 - a HTTP Get call or CI/CD pipeline queue

Kubernetes Cluster Autoscaler (CA)

- automatically resizes a cluster based on demand by scaling nodes up/down
- is key when using HPA, VPA, KEDA or any other autoscaler
- acts on
 - pods that failed to run in the cluster due to insufficient resources (pod pending)
 - nodes in the cluster that are underutilized, and pods can be rescheduled
- scales VMMS to and from zero on AKS

Karpenter

- offers a more granular approach than traditional cluster autoscalers
- scaling lifecycle
 - watching for pods that the scheduler has marked as unschedulable
 - evaluating scheduling constraints (requests, selectors, affinities, tolerations, ...)
 - provisioning nodes that meet the requirements of the pods
 - does not rely on AKS node pools / VMMS
 - removing the nodes when the nodes are no longer needed
 - also reschedules pods
- available (alpha) on AKS since Nov 23 – early stage
 - no AKS-related docs
 - no node-upgrade support
 - ...

Getting started

- Slides & Demos
 - <https://github.com/whiteducksoftware/aks-scaling-examples>



Questions?



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🐦 @nmeisenzahl

in www.linkedin.com/in/nicomeisenzahl



Thank you!