

Level Up your Kubernetes Scaling with KEDA

Wolfgang Ofner



Wolfgang Ofner

Freelance Cloud Architect, Toronto, Canada

Focus on Azure, Kubernetes, DevOps and .NET

<https://programmingwithwolfgang.com>

<https://www.linkedin.com/in/wolfgangofner>

https://twitter.com/wolfgang_ofner

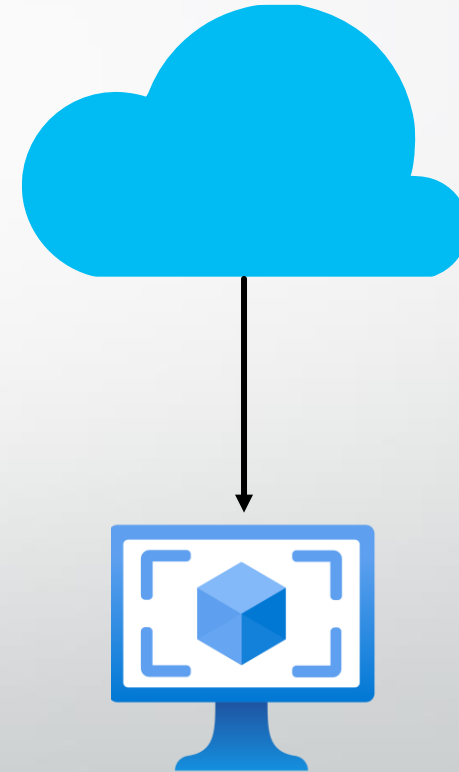


Agenda

- Architecture in SW projects
- Introduction to KEDA
- Scaling with messages in Azure Service Bus Queue
- Scaling Azure DevOps Agents in Kubernetes
- KEDA Conclusion
- Q&A

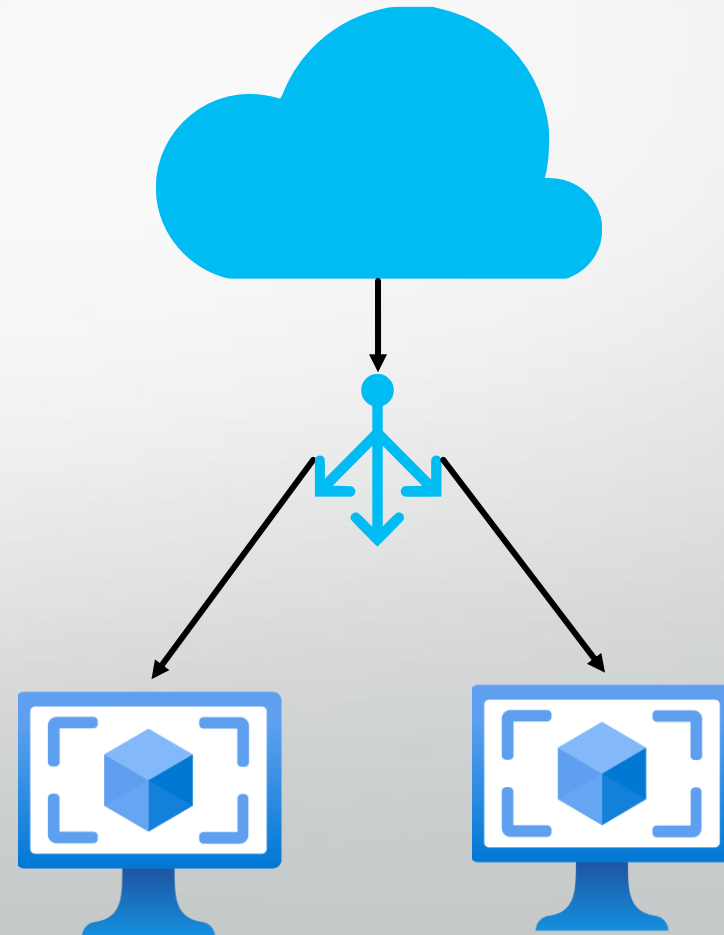
Simplified Architecture History

- Server – Client Architecture
- Only few clients
- No redundancy
- No high availability



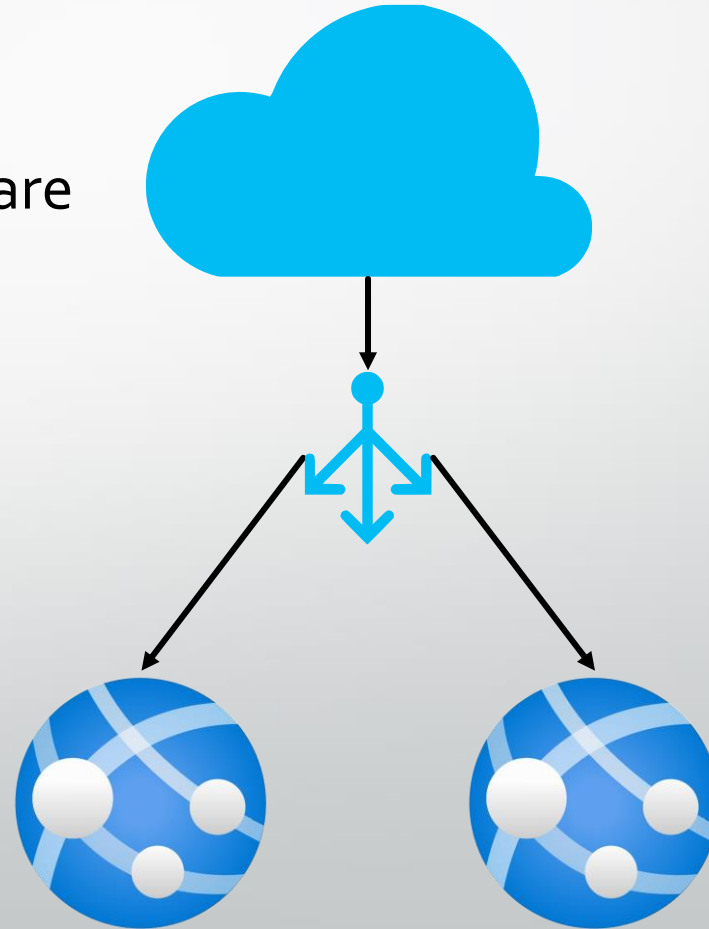
Simplified Architecture History

- Static load balancing
- New VMs need to be added by hand
- Expensive on-premises hardware

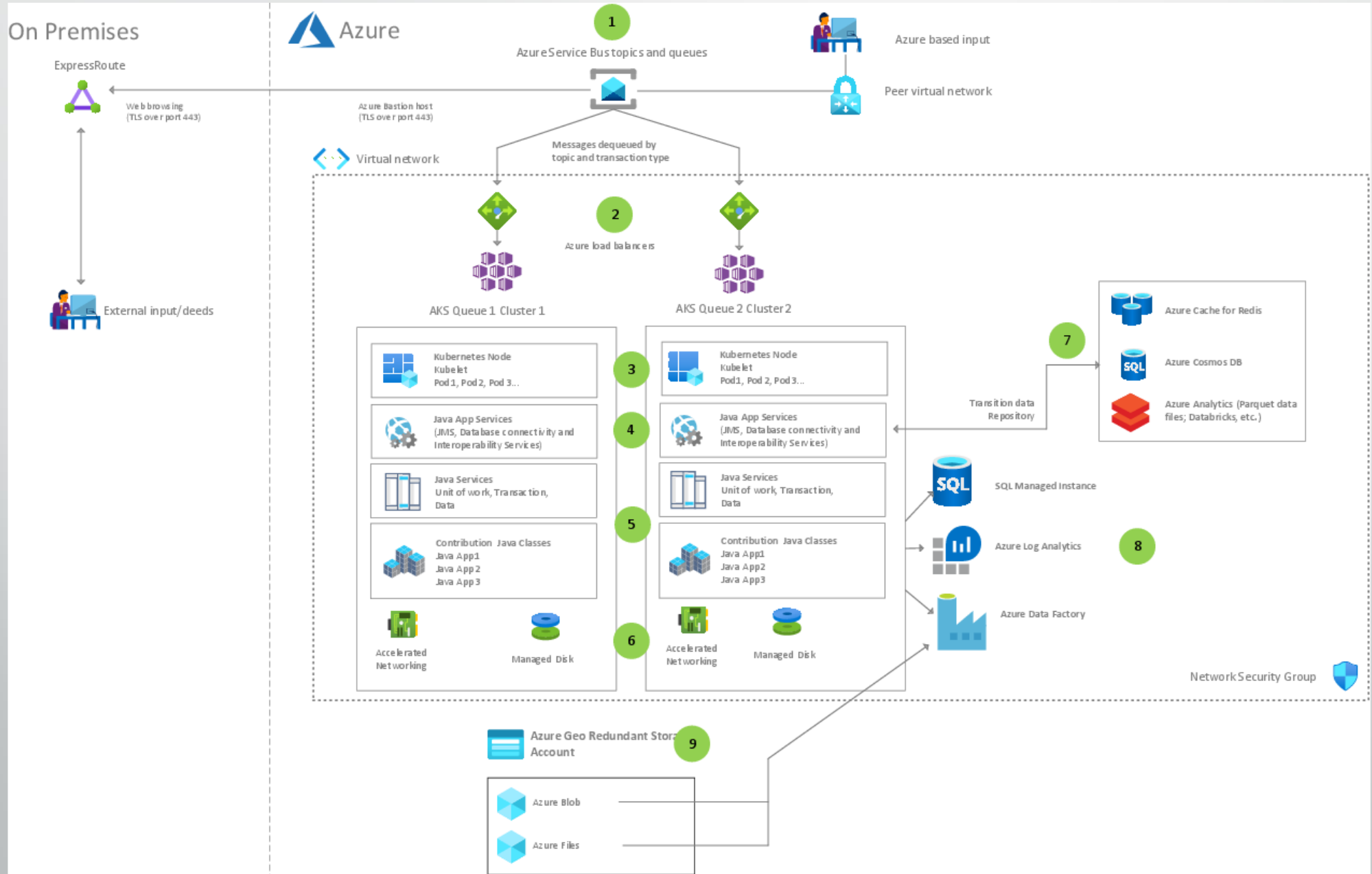


Simplified Architecture History

- Automatically adding additional hardware
- Pay only what you need
- Mostly CPU or RAM based scaling



Modern Architecture



Kubernetes

- Horizontal Pod Autoscaler (HPA)
 - Scaling according to CPU and/or RAM
- Architectures get more and more complex
- Dependencies on external components
- Applications have to react to events
 - Database
 - Service Bus
 - Streams

Horizontal Pod Autoscaler

- Scales Deployments or StatefulSets
- Adds or removes pods
- Scaling based on CPU or RAM usage
- Scaling on custom metrics
 - Query custom metrics from Kubernetes API
 - Prometheus
 - requests per second

Horizontal Pod Autoscaler Configuration

```
apiVersion: autoscaling/v1
kind: HorizontalPodAutoscaler
metadata:
  name: customerapi
  namespace: customerapi-test
spec
  maxReplicas: 10
  minReplicas: 1
  averageCpuUtilization: 50
  scaleTargetRef
    apiVersion: apps/v1
    kind: Deployment
    name: customerapi
  behavior:
    scaleDown:
      policies:
        - type: Pods
          value: 4
          periodSeconds: 60
        - type: Percent
          value: 10
          periodSeconds: 60
      selectPolicy: Min
    scaleUp:
      policies:
        - type: Pods
          value: 5
          periodSeconds: 60
        - type: Percent
          value: 12
          periodSeconds: 60
      selectPolicy: Max
```

Limitation of the HPA

- Black Friday
- Thousands of orders are stored in a queue
- Scaling using CPU or RAM is not sufficient
- No option for scaling in this scenario

KEDA – Kubernetes Event-driven Autoscaling

- Kubernetes Event-driven Autoscaling
- Open source
- CNCF Project
- Maintained by
 - Docplanner Tech
 - Microsoft
 - Red Hat

KEDA

- 62 built-in Scaler
 - Apache Kafka
 - Azure Blob Storage
 - Azure Monitor
 - Azure Service Bus
 - Elastic Search
 - MongoDB
 - Prometheus
 - Redis Streams

KEDA Use Cases

- Scale according to external events
- Scale to Zero
 - Bring serverless to your datacenter
 - Recreate Azure Functions architecture
 - Better resource usage

KEDA Installation

- Installation via Helm charts
- Namespace: keda

KEDA Installation

```
kubectl create namespace keda
```

```
helm repo add kedacore https://kedacore.github.io/charts
```

```
helm repo update
```

```
helm install keda kedacore/keda --namespace keda
```


KEDA Resources

```
PS C:\Users\Wolfgang> kubectl get all -n keda
```

NAME	READY	STATUS	RESTARTS	AGE
pod/keda-operator-5748df494c-mxz9p	1/1	Running	0	124m
pod/keda-operator-metrics-apiserver-cb649dd48-jjhpc	1/1	Running	0	124m

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
service/keda-operator-metrics-apiserver	ClusterIP	10.0.241.182	<none>	443/TCP,80/TCP	124m

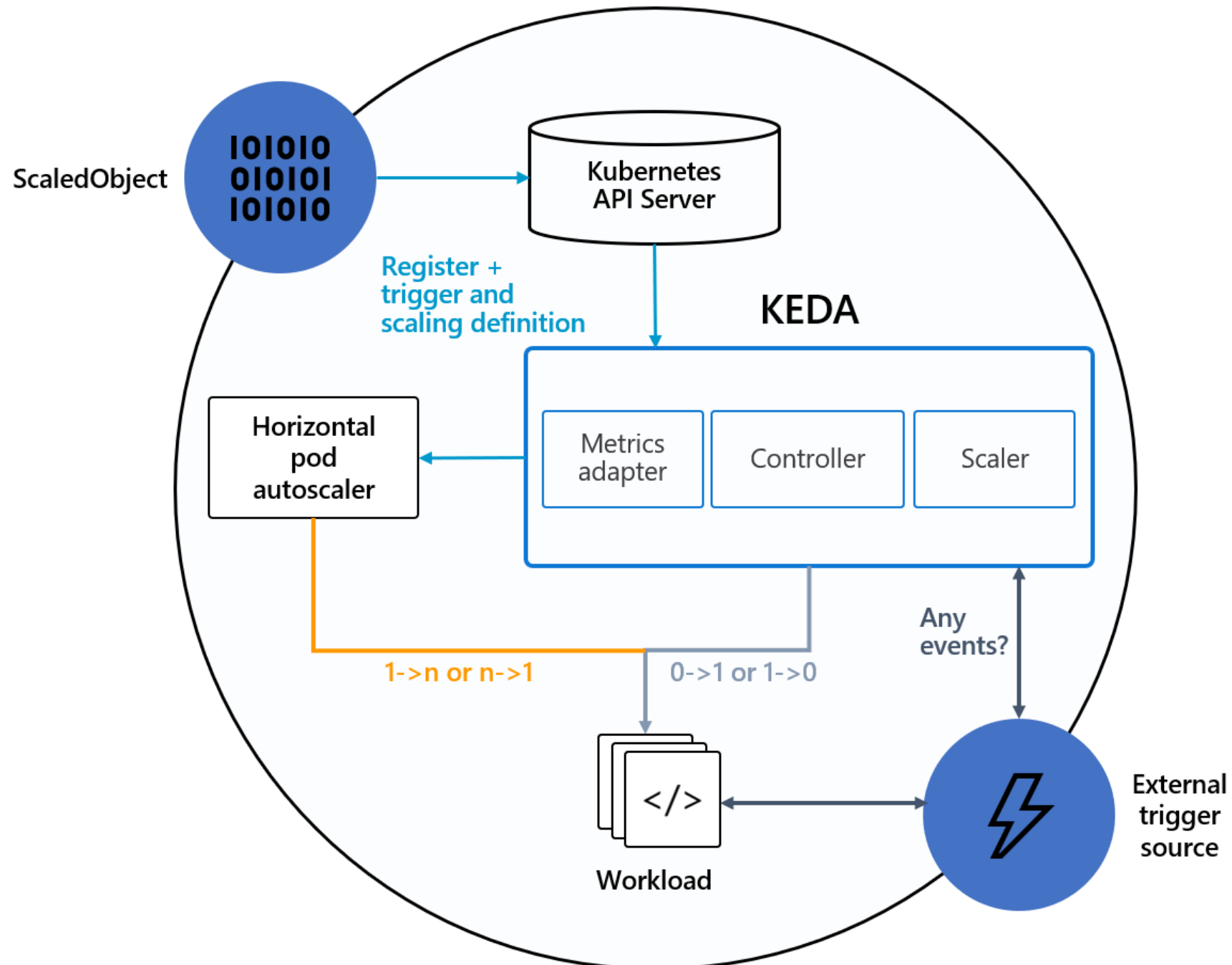
NAME	READY	UP-TO-DATE	AVAILABLE	AGE
deployment.apps/keda-operator	1/1	1	1	124m
deployment.apps/keda-operator-metrics-apiserver	1/1	1	1	124m

NAME	DESIRED	CURRENT	READY	AGE
replicaset.apps/keda-operator-5748df494c	1	1	1	124m
replicaset.apps/keda-operator-metrics-apiserver-cb649dd48	1	1	1	124m

KEDA Architecture

- 2 components for KEDA
 - Agent or Operator
 - Metrics Server
- Uses HPA for scaling
- Seamless integration into existing architecture

Kubernetes cluster



KEDA Architecture

- 2 components for KEDA
 - Agent
 - Metrics Server
- Uses HPA for scaling
- Seamless integration into existing architecture
- 2 custom K8s resources for scaler
 - ScaledObject
 - TriggerAuthentication

ScaledObject

```
apiVersion:
keda.sh/v1alpha1
kind: ScaledObject
metadata:
  name: kedademoapi-scaler
spec:
  scaleTargetRef:
    name: kedademoapi
  minReplicaCount: 0
  maxReplicaCount: 10
  pollingInterval: 30
  cooldownPeriod: 30
  triggers:
    - type: azure-servicebus
      metadata:
        queueName: KedaDemo
        queueLength: '5'
        authenticationRef:
          name: trigger-
            authentication-kedademoapi
```

TriggerAuthentication

```
apiVersion: keda.sh/v1alpha1
kind: TriggerAuthentication
metadata:
  name: trigger-authentication-kedademoapi
spec:
  secretTargetRef:
    - parameter: connection
      name: kedademoapi-connectionstrings
      key: AzureServiceBus__ConnectionString
```

Kubernetes Secret

```
PS C:\Users\Wolfgang> kubectl get secrets
```

NAME	TYPE	DATA	AGE
default-token-88lzb	kubernetes.io/service-account-token	3	26h
kedademoapi-connectionstrings	Opaque	1	26h
kedademoapi-tls	kubernetes.io/tls	2	26h
sh.helm.release.v1.kedademoapi-kedademoapi-test.v1	helm.sh/release.v1	1	26h
sh.helm.release.v1.kedademoapi-kedademoapi-test.v2	helm.sh/release.v1	1	22h

```
PS C:\Users\Wolfgang> kubectl describe secret kedademoapi-connectionstrings
```

```
Name:          kedademoapi-connectionstrings
Namespace:     kedademoapi-test
Labels:        app.kubernetes.io/managed-by=Helm
Annotations:   meta.helm.sh/release-name: kedademoapi-kedademoapi-test
               meta.helm.sh/release-namespace: kedademoapi-test
```

```
Type:  Opaque
```

```
Data
====
AzureServiceBus__ConnectionString: 165 bytes
```

Kubernetes Secret

Namespace Overview ▾ > Config and Storage ▾ > Secrets ▾ > kedademoapi-connectionstrings

kedademoapi-connectionstrings


Summary

Metadata

Resource Viewer

YAML

```
1 ---
2 apiVersion: v1
3 data:
4   AzureServiceBus__ConnectionString: RW5kcG9pbnQ9c2I6Ly93b2xmZ2FuZ2t1ZGFkZW1vLnNlcr
5 kind: Secret
```


Scaling based on Azure Service Queue Messages

Demo

- Scale with messages in an Azure Service Bus Queue
- Scale to 0
- Scale to 1


PS C:\Users\Wolfgang> kubectl get pods

NAME	READY	STATUS	RESTARTS	AGE
kedademoapi-6f986c4b76-hvbrq	1/1	Running	0	13m






kedademo (wolfgangkedademo/kedademo) | Service Bus Explorer


Service Bus Queue


 Search (Ctrl+/)

<<  Refresh

-  Overview
-  Access control (IAM)
-  Diagnose and solve problems

Settings

 Shared access policies

 Service Bus Explorer (preview)

 Properties


 Locks


Authentication type ⓘ


Access key Active Directory

Send Receive Peek

Receive performs a destructive read ([ReceiveAndDelete](#)) from Queue **kedademo**.
from the Queue. Messages shown here are no longer stored.

 Active
1 MESSAGES

 Dead-Lettered
0 MESSAGES

 Scheduled
0 MESSAGES

Please Select Queue or DeadLetter

☒ Queue ☐ DeadLetter

POST**/v1/ServiceBusProcessing** Action to add new messages to the queue.

Parameters

Name

Description

numberOfQueueItems

integer(\$int32)

(query)

Execute

Responses

Curl

```
curl -X 'POST' \  
  'https://test.kedademo.programmingwithwolfgang.com/v1/ServiceBusProcessing?numberOfQueueItems=270' \  
  -H 'accept: */*' \  
  -d ''
```

Request URL

```
https://test.kedademo.programmingwithwolfgang.com/v1/ServiceBusProcessing?numberOfQueueItems=270
```

Server response

Code

Details

200

Response headers

```
content-length: 0  
date: Fri, 18 Feb 2022 15:45:21 GMT  
strict-transport-security: max-age=15724800; includeSubDomains
```

```
PS C:\Users\Wolfgang> kubectl get pods --sort-by=.status.phase
```

NAME	READY	STATUS	RESTARTS	AGE
kedademoapi-6f986c4b76-9gnd7	0/1	Pending	0	3m10s
kedademoapi-6f986c4b76-cl4p6	0/1	Pending	0	3m10s
kedademoapi-6f986c4b76-w8fs5	0/1	Pending	0	2m55s
kedademoapi-6f986c4b76-z8dkd	0/1	Pending	0	3m10s
kedademoapi-6f986c4b76-jzxp7	0/1	Pending	0	3m10s
kedademoapi-6f986c4b76-l59bb	0/1	Pending	0	3m25s
kedademoapi-6f986c4b76-pb5z7	0/1	Pending	0	2m55s
kedademoapi-6f986c4b76-srkdj	1/1	Running	0	3m25s
kedademoapi-6f986c4b76-h6gbz	1/1	Running	0	3m25s
kedademoapi-6f986c4b76-hvbrq	1/1	Running	0	18m

GET**/v1/ServiceBusProcessing** Action to start processing the queue items.

Parameters

No parameters

Execute

Responses

Curl

```
curl -X 'GET' \  
  'https://test.kedademo.programmingwithwolfgang.com/v1/ServiceBusProcessing' \  
  -H 'accept: application/json'
```

Request URL

```
https://test.kedademo.programmingwithwolfgang.com/v1/ServiceBusProcessing
```

Server response

Code

Details

200

Response body

271

Response headers

```
content-type: application/json; charset=utf-8  
date: Fri,18 Feb 2022 15:51:31 GMT  
strict-transport-security: max-age=15724800; includeSubDomains
```

```
PS C:\Users\Wolfgang> kubectl get pods  
No resources found in kedademoapi-test namespace.
```






kedademo (wolfgangkedademo/kedademo) | Service Bus Explorer

Service Bus Queue

Search (Ctrl+/)



Refresh



Overview



Access control (IAM)



Diagnose and solve problems

Settings



Shared access policies



Service Bus Explorer (preview)



Properties



Locks

Authentication type ⓘ

Access key

Active Directory

Send

Receive


Peek

Send Message to Queue **kedademo**

Content Type *


Text/Plain

new message






kedademo (wolfgangkedademo/kedademo) | Service Bus Explorer


Service Bus Queue


 Search (Ctrl+/)

<<  Refresh

-  Overview
-  Access control (IAM)
-  Diagnose and solve problems

Settings

 Shared access policies

 Service Bus Explorer (preview)

 Properties


 Locks


Authentication type ⓘ


Access key Active Directory

Send Receive Peek

Receive performs a destructive read ([ReceiveAndDelete](#)) from Queue **kedademo**.
from the Queue. Messages shown here are no longer stored.

 Active
1 MESSAGES

 Dead-Lettered
0 MESSAGES

 Scheduled
0 MESSAGES

Please Select Queue or DeadLetter

☒ Queue ☐ DeadLetter

```
PS C:\Users\Wolfgang> kubectl get pods
```

NAME	READY	STATUS	RESTARTS	AGE
kedademoapi-6f986c4b76-b8pgj	1/1	Running	0	40s



Swagger

Supported by SMARTBEAR

KedaDemo Api v1 OAS3

</swagger/v1/swagger.json>

A simple API to read items from an Azure Service Bus Queue

[Wolfgang Ofner - Website](#)

[Send email to Wolfgang Ofner](#)

ServiceBusProcessing

GET**/v1/ServiceBusProcessing** Action to start processing the queue items.**POST****/v1/ServiceBusProcessing** Action to add new messages to the queue.

KEDA Scaling Logs

- keda-operator pod writes logs during scaling events

KEDA Scaling Logs











- keda-operator pod writes logs during scaling events

```
{ "scaledObject.Name": "kedademoapi-scaler", "scaledObject.Namespace": "kedademoapi-test", "scaleTarget.Name": "kedademoapi", "Original Replicas Count": 6, "New Replicas Count": 0 }  
er kind": "ScaledObject", "name": "kedademoapi-scaler", "namespace": "kedademoapi-test"}  
 "scaledObject.Namespace": "kedademoapi-test", "scaleTarget.Name": "kedademoapi", "Original Replicas Count": 0, "New Replicas Count": 1 }
```

Limitations

- Scaler not available for used technology
- Cluster runs out of resources

Pods

	Name	Labels	Ready	Phase	Restarts	Node
⋮	 kedademoapi-6f986c4b76-2zfxc	<div>app:kedademoapi</div> <div>draft:draft-app</div> <div>1+</div>	0/1	Pending	0	<not scheduled>
⋮	 kedademoapi-6f986c4b76-6w9tc	<div>app:kedademoapi</div> <div>draft:draft-app</div> <div>1+</div>	0/1	Pending	0	<not scheduled>
⋮	 kedademoapi-6f986c4b76-777r8	<div>app:kedademoapi</div> <div>draft:draft-app</div> <div>1+</div>	0/1	Pending	0	<not scheduled>
⋮	 kedademoapi-6f986c4b76-9vs76	<div>app:kedademoapi</div> <div>draft:draft-app</div> <div>1+</div>	1/1	Running	0	aks-nodepool1-35436033-vmss000000
⋮	 kedademoapi-6f986c4b76-jdd8x	<div>app:kedademoapi</div> <div>draft:draft-app</div> <div>1+</div>	0/1	Pending	0	<not scheduled>
⋮	 kedademoapi-6f986c4b76-mdj62	<div>app:kedademoapi</div> <div>draft:draft-app</div> <div>1+</div>	1/1	Running	0	aks-nodepool1-35436033-vmss000000
⋮	 kedademoapi-6f986c4b76-qg298	<div>app:kedademoapi</div> <div>draft:draft-app</div> <div>1+</div>	0/1	Pending	0	<not scheduled>
⋮	 kedademoapi-6f986c4b76-rzgfm	<div>app:kedademoapi</div> <div>draft:draft-app</div> <div>1+</div>	0/1	Pending	0	<not scheduled>
⋮	 kedademoapi-6f986c4b76-s56q6	<div>app:kedademoapi</div> <div>draft:draft-app</div> <div>1+</div>	0/1	Pending	0	<not scheduled>
⋮	 kedademoapi-6f986c4b76-wb7rr	<div>app:kedademoapi</div> <div>draft:draft-app</div> <div>1+</div>	0/1	Pending	0	<not scheduled>

Pods


	Name	Labels	Ready	Phase	Restarts	Node
⋮	kedademoapi-6f986c4b76-2zfxc	app:kedademoapi draft:draft-app 1+	0/1	Pending	0	<not scheduled>
⋮	kedademoapi-6f986c4b76-6w9tc	app:kedademoapi draft:draft-app 1+	0/1	Pending	0	<not scheduled>
⋮	kedademoapi-6f986c4b76-777r8	app:kedademoapi draft:draft-app 1+	0/1	Pending	0	<not scheduled>
⋮	kedademoapi-6f986c4b76-9vs76	app:kedademoapi draft:draft-app 1+	1/1	Running	0	aks-nodepool1-35436033-vmss000000
⋮	kedademoapi-6f986c4b76-jdd8x	app:kedademoapi draft:draft-app 1+	0/1	Pending	0	<not scheduled>
⋮	kedademoapi-6f986c4b76-mdj62	app:kedademoapi draft:draft-app 1+	1/1	Running	0	aks-nodepool1-35436033-vmss000000
⋮	kedademoapi-6f986c4b76-qg298	app:kedademoapi draft:draft-app 1+	0/1	Pending	0	<not scheduled>
⋮	kedademoapi-6f986c4b76-rzgfm	app:kedademoapi draft:draft-app 1+	0/1	Pending	0	<not scheduled>
⋮	kedademoapi-6f986c4b76-s56q6	app:kedademoapi draft:draft-app 1+	0/1	Pending	0	<not scheduled>
⋮	kedademoapi-6f986c4b76-wb7rr	app:kedademoapi draft:draft-app 1+	0/1	Pending	0	<not scheduled>

Events

Message	Reason
0/1 nodes are available: 1 Insufficient cpu.	FailedScheduling

Limitations

- Scaler not available for used technology
- Cluster runs out of resources
 - Azure Cluster Autoscaler
 - Define replica limit
 - Monitor cluster usage



Azure DevOps Agent with KEDA

Scaling ADO Agent with KEDA

- Azure DevOps preparation
- Build Docker image
- Test locally
- Deploy to Kubernetes
- Apply KEDA scaling



User settings

Wolfgang Ofner

Account

Profile

Time and Locale

Permissions

Preferences

Notifications

Theme

Usage

Security

Personal access tokens

SSH public keys

Authorizations

Personal Access Tokens

These can be used instead of a password for

+ New Token

Token name

Git: https://dev.azure.com/programming
Code (Read & write); Packaging (Read)Git: https://dev.azure.com/programming
Code (Read & write); Packaging (Read)Git: https://dev.azure.com/programming
Code (Read & write); Packaging (Read)

Create a new personal access token



Name

KedaAdoAgent

Organization

programmingwithwolfgang

Expiration (UTC)

30 days

4/11/2023

Scopes

Authorize the scope of access associated with this token

Scopes ☐ Full access☒ Custom defined

Agent Pools

Manage agent pools and agents

☒ Read☒ Read & manage

Analytics

Read data from the analytics service

☐ Read

Copy the PAT

Success!



You have successfully added a new personal access token. Copy the token now!
KedaAdoAgent token

qqjw2cvvhwtc4crqxpype2!



Warning - Make sure you copy the above token now.
We don't store it and you will not be able to see it again.

Organization Settin...

programmingwithwolfgang

Search Settings

General

Overview

Projects

Users

Billing

Global notifications

Usage

Extensions

Azure Active Directory

Security

Policies

Permissions

Boards

Process

Pipelines

Agent pools

Settings

Deployment pools

Agent pools



Security

Add pool

Name

Queued jobs

Running jobs



Azure Pipelines

Azure Pipelines



Default

Azure Pipelines

Add agent pool



Agent pools are shared across an organization.

Pool type:

Self-hosted



A pool of agents that you set up and manage on your own to run jobs. [Learn more.](#)

Name:

Keda

Description (optional):

 [Markdown supported.](#)

Pipeline permissions:

- ☒ Grant access permission to all pipelines
- ☒ Auto-provision this agent pool in all projects

Building the ADO Docker Image

- Dockerfile
- start.sh (with LF EOF)

```
FROM ubuntu:20.04
RUN DEBIAN_FRONTEND=noninteractive apt-get update
RUN DEBIAN_FRONTEND=noninteractive apt-get upgrade -y

RUN DEBIAN_FRONTEND=noninteractive apt-get install -y -qq --no-install-recommends \
    apt-transport-https \
    apt-utils \
    ca-certificates \
    curl \
    git \
    iputils-ping \
    jq \
    lsb-release \
    software-properties-common \
    wget

RUN curl -sL https://aka.ms/InstallAzureCLIDeb | bash

RUN wget https://packages.microsoft.com/config/ubuntu/20.04/packages-microsoft-prod.deb -O packages-microsoft-prod.deb
RUN dpkg -i packages-microsoft-prod.deb
RUN rm packages-microsoft-prod.deb
RUN apt-get update && apt-get install -y dotnet-sdk-6.0
RUN apt-get update && apt-get install -y dotnet-sdk-7.0

# Can be 'linux-x64', 'linux-arm64', 'linux-arm', 'rhel.6-x64'.
ENV TARGETARCH=linux-x64

WORKDIR /azp

COPY ./start.sh .
RUN chmod +x start.sh

ENTRYPOINT [ "./start.sh" ]
```

```
PS C:\Users\Wolfgang\source\repos\Ado-Agent-Keda> docker build . -t adoagentkeda
[+] Building 376.5s (18/18) FINISHED
=> [internal] load build definition from Dockerfile
=> => transferring dockerfile: 954B
=> [internal] load .dockerignore
=> => transferring context: 2B
=> [internal] load metadata for docker.io/library/ubuntu:20.04
=> [ 1/13] FROM docker.io/library/ubuntu:20.04@sha256:9fa30fcef427e5e88c76bc41ad37b7cc573e1d79cecb23035e413c4be6e476ab
=> => resolve docker.io/library/ubuntu:20.04@sha256:9fa30fcef427e5e88c76bc41ad37b7cc573e1d79cecb23035e413c4be6e476ab
=> => sha256:9fa30fcef427e5e88c76bc41ad37b7cc573e1d79cecb23035e413c4be6e476ab 1.13kB / 1.13kB
=> => sha256:3626dff0d616e8ee7065a9ac8c7117e904a4178725385910eeecd7f1872fc12d 424B / 424B
=> => sha256:61c45d0e97988ff0cfa876e9ec145445974b9b384fe0a150b057ffc46039b3a0 2.30kB / 2.30kB
=> => sha256:47c7644723910b6dfc6ec8b3bd9fed3ac32778cf485ce3a6535ff6b6da06f743 27.50MB / 27.50MB
=> => extracting sha256:47c7644723910b6dfc6ec8b3bd9fed3ac32778cf485ce3a6535ff6b6da06f743
=> [internal] load build context
=> => transferring context: 2.52kB
=> [ 2/13] RUN DEBIAN_FRONTEND=noninteractive apt-get update
=> [ 3/13] RUN DEBIAN_FRONTEND=noninteractive apt-get upgrade -y
=> [ 4/13] RUN DEBIAN_FRONTEND=noninteractive apt-get install -y -qq --no-install-recommends apt-transport-https
=> [ 5/13] RUN curl -sL https://aka.ms/InstallAzureCLIDeb | bash
=> [ 6/13] RUN wget https://packages.microsoft.com/config/ubuntu/20.04/packages-microsoft-prod.deb -O packages-microsoft-prod.deb
=> [ 7/13] RUN dpkg -i packages-microsoft-prod.deb
=> [ 8/13] RUN rm packages-microsoft-prod.deb
=> [ 9/13] RUN apt-get update && apt-get install -y dotnet-sdk-6.0
=> [10/13] RUN apt-get update && apt-get install -y dotnet-sdk-7.0
=> [11/13] WORKDIR /azp
=> [12/13] COPY ./start.sh .
=> [13/13] RUN chmod +x start.sh
=> exporting to image
=> => exporting layers
=> => writing image sha256:11167e8091f1222ebe05f84e4f7e711e20fcb1c9ec0bddc75276047477f39d03
```

Building the ADO Docker Image

- Dockerfile
- start.sh (with LF EOF)
- Azure DevOps values:
 - PAT
 - Pool Name
 - URL

```
PS C:\Users\Wolfgang\source\repos\Ado-Agent-Keda> docker run -e AZP_URL=https://dev.azure.com/programmingwithwolfgang -e AZP_TOKEN=qqjw2cvvhwtc4crqxpbye2gbrumtirgdf6wh6fvjlqir32qfzsa -e AZP_AGENT_NAME=agent -e AZP_POOL=Keda adoagentkeda
```

1. Determining matching Azure Pipelines agent...
2. Downloading and extracting Azure Pipelines agent...
3. Configuring Azure Pipelines agent...

```

agent v2.217.2                                     (commit ef0b5a5)

```

>> End User License Agreements:

Building sources from a TFVC repository requires accepting the Team Explorer Everywhere End User License Agreement. This step is not required for building sources from Git repositories.

A copy of the Team Explorer Everywhere license agreement can be found at:
</azp/license.html>

>> Connect:

Connecting to server ...

>> Register Agent:

main ▾

K8sAdoAgent / azure-pipelines.yml

```
1 trigger: none
2
3 pool: Keda
4
5 variables:
6   buildConfiguration: 'Release'
7   ...
8 jobs:
9   - job: job1
10    steps:
11      Settings
12      - task: Bash@3
13        inputs:
14          targetType: 'inline'
15          script: ''
16          displayName: Check if job is running
```


← Jobs in run #20230312.1

K8sAdoAgent

Jobs

✓	job1	6s
✓	Initialize job	<1s
✓	Checkout K8sAdoAgent...	1s
✓	Check if job is running	<1s
✓	Post-job: Checkout K8...	<1s
✓	Finalize Job	<1s
✓	Report build status	<1s

✓ job1

```
1 Pool: Keda
2 Queued: Just now [manage_parallel_jobs]
3 Agent: agent
4 Started: Just now
5 Duration: 6s
6
7 The agent request is already running or has already completed.
8 ► Job preparation parameters
9 Job live console data:
10 Starting: job1
11 Finishing: job1
```

>> Connect:

Connecting to server ...

>> Register Agent:

Scanning for tool capabilities.

Connecting to the server.

Successfully added the agent

Testing agent connection.

2023-03-12 11:12:31Z: Settings Saved.

4. Running Azure Pipelines agent...

Scanning for tool capabilities.

Connecting to the server.

2023-03-12 11:12:33Z: Listening for Jobs

2023-03-12 11:15:50Z: Running job: job1

2023-03-12 11:16:01Z: Job job1 completed with result: Succeeded

Cleanup. Removing Azure Pipelines agent...

Removing agent from the server

Connecting to server ...

Succeeded: Removing agent from the server

Removing .credentials

Succeeded: Removing .credentials

Removing .agent

Succeeded: Removing .agent

Push the Docker Image

```
PS C:\Users\Wolfgang\source\repos\Ado-Agent-Keda> docker tag adoagentkeda wolfgangofner/adoagentkeda
PS C:\Users\Wolfgang\source\repos\Ado-Agent-Keda> docker push wolfgangofner/adoagentkeda
Using default tag: latest
The push refers to repository [docker.io/wolfgangofner/adoagentkeda]
9ab694b94e06: Pushed
95d099e671b0: Pushed
f5f935017b9d: Pushing [=====>] 132.4MB/518.1MB
b5f309652342: Pushing [=====>] 74.44MB/509.2MB
acd9adb1ef6d: Pushed
b79abcab2382: Pushing [=====>] 726.5kB
ed3d14f25ed7: Pushed
e82e11b3ff01: Pushing [=>] 30.55MB/1.185GB
85d422d04b2e: Waiting
76674757e35e: Waiting
587658be1954: Waiting
6021993d84a2: Waiting
```

Create a Secret with the PAT


```
apiVersion: v1
kind: Secret
metadata:
  name: ado-agent-secret
data:
  AZP_TOKEN: cXFqdzJjdnZod3RjNGNycXhweXl1MmdicnVtdGlyZ2RmZjZ3aDZmdmpscWlyMzJxZnpzYQ== # replace with your value / (base64 encoded)
```

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: ado-agent-deployment
  labels:
    app: ado-agent
spec:
  replicas: 1
  selector:
    matchLabels:
      app: ado-agent
  template:
    metadata:
      labels:
        app: ado-agent
    spec:
      containers:
        - name: ado-agent
          image: wolfgangofner/adoagentkeda # replace with your value
          env:
            - name: AZP_URL
              value: https://dev.azure.com/programmingwithwolfgang # replace with your value
            - name: AZP_POOL
              value: Keda # replace with your value
            - name: AZP_TOKEN
              valueFrom:
                secretKeyRef:
                  name: ado-agent-secret
                  key: AZP_TOKEN
```

Deploy the ADO Agent in K8s

```
PS C:\Users\Wolfgang\source\repos\Ado-Agent-Keda> kubectl create ns ado-agent
namespace/ado-agent created
PS C:\Users\Wolfgang\source\repos\Ado-Agent-Keda> kubectl config set-context --current --namespace=ado-agent
Context "microservice-aks" modified.
PS C:\Users\Wolfgang\source\repos\Ado-Agent-Keda> kubectl apply -f ./deployment.yaml
secret/ado-agent-secret created
deployment.apps/ado-agent-deployment created
PS C:\Users\Wolfgang\source\repos\Ado-Agent-Keda> kubectl get pod --watch
```

NAME	READY	STATUS	RESTARTS	AGE
ado-agent-deployment-5cdc9bc464-4sq65	0/1	ContainerCreating	0	4s
ado-agent-deployment-5cdc9bc464-4sq65	1/1	Running	0	88s



Keda

Update all agents

Jobs

Agents

Details


Security

Settings

Maintenance History

Analytics

Name	Last run	Current status	Agent version	Enabled
ado-agent-deployment-5cdc9bc464-4sq65 <div>● Online</div>		Idle	2.217.2	<div><div></div>On</div>



Keda

Update all agents

Jobs

Agents

Details

Security

Settings

Maintenance History

Analytics

Name	Last run	Current status	Agent version	Enabled
ado-agent-deployment-5cdc9bc464-4sq65 <div>● Online</div>		Idle	2.217.2	<div><div></div>Off</div>


```
apiVersion: keda.sh/v1alpha1
kind: ScaledJob
metadata:
  name: ado-scaledjob
spec:
  jobTargetRef:
    template:
      spec:
        containers:
          - name: ado-agent-job
            image: wolfgangofner/adoagentkeda # replace with your value
            imagePullPolicy: Always
            env:
              - name: AZP_URL
                value: https://dev.azure.com/programmingwithwolfgang # replace with your value
              - name: AZP_TOKEN
                valueFrom:
                  secretKeyRef:
                    name: ado-agent-secret
                    key: AZP_TOKEN
              - name: AZP_POOL
                value: Keda # replace with your value
        pollingInterval: 10
        successfulJobsHistoryLimit: 5
        failedJobsHistoryLimit: 5
        maxReplicaCount: 10
        scalingStrategy:
          strategy: "default"
        triggers:
          - type: azure-pipelines
            metadata:
              poolID: "10" # <azure-devops-pool-id> (must be a string) (https://dev.azure.com/{Organization}/\_apis/distributedtask/pools?api-version=7.0)
              organizationURLFromEnv: "AZP_URL"
              personalAccessTokenFromEnv: "AZP_TOKEN"
```

Deploy the KEDA Scale Job

```
PS C:\Users\Wolfgang\source\repos\Ado-Agent-Keda> kubectl apply -f ./keda-scaled-jobs.yaml  
scaledjob.keda.sh/ado-scaledjob created
```

```
1 trigger: none
2
3 pool: Keda
4
5 variables:
6   buildConfiguration: 'Release'
7
8 jobs:
9   - job: job1
10    steps:
11      Settings
12      - task: Bash@3
13        inputs:
14          targetType: 'inline'
15          script: 'sleep 5m'
16          displayName: Wait for 5 minutes
17    - job: job2
18      steps:
19        Settings
20        - task: Bash@3
21          inputs:
22            targetType: 'inline'
23            script: 'sleep 5m'
24            displayName: Wait for 5 minutes
25      - job: job3
26        steps:
27          Settings
28          - task: Bash@3
29            inputs:
30              targetType: 'inline'
31              script: 'sleep 5m'
32              displayName: Wait for 5 minutes
```


```
PS C:\Users\Wolfgang\source\repos\Ado-Agent-Keda> kubectl get pod --watch
NAME                                READY   STATUS    RESTARTS   AGE
ado-agent-deployment-5cdc9bc464-4sq65 1/1     Running   0           22m
ado-scaledjob-xlgcg-6ts6h             0/1     Pending   0           0s
ado-scaledjob-6nvks-9x5wm             0/1     Pending   0           0s
ado-scaledjob-45s68-st64h             0/1     Pending   0           0s
ado-scaledjob-xlgcg-6ts6h             0/1     Pending   0           0s
ado-scaledjob-vwbxw-dr5wf             0/1     Pending   0           0s
ado-scaledjob-45s68-st64h             0/1     Pending   0           0s
ado-scaledjob-6nvks-9x5wm             0/1     Pending   0           0s
ado-scaledjob-vwbxw-dr5wf             0/1     Pending   0           0s
ado-scaledjob-j6vcg-jvpn6             0/1     Pending   0           0s
ado-scaledjob-xlgcg-6ts6h             0/1     ContainerCreating   0           0s
ado-scaledjob-j6vcg-jvpn6             0/1     Pending             0           0s
ado-scaledjob-45s68-st64h             0/1     ContainerCreating   0           0s
ado-scaledjob-vwbxw-dr5wf             0/1     ContainerCreating   0           0s
ado-scaledjob-6nvks-9x5wm             0/1     ContainerCreating   0           0s
ado-scaledjob-j6vcg-jvpn6             0/1     ContainerCreating   0           0s
ado-scaledjob-6nvks-9x5wm             1/1     Running             0           2s
ado-scaledjob-j6vcg-jvpn6             1/1     Running             0           3s
ado-scaledjob-vwbxw-dr5wf             1/1     Running             0          13s
ado-scaledjob-45s68-st64h             1/1     Running             0          20s
ado-scaledjob-xlgcg-6ts6h             1/1     Running             0          20s
```

Summary

Manually run by  Wolfgang Ofner


View change

Repository and version

 K8sAdoAgent

 main  b96efdac

Time started and elapsed

 Just now


 32s

Related

 0 work items

 0 artifacts

Tests and coverage


 [Get started](#)

Jobs


Name

Status


Duration

 job1

Queued


 job2

Queued

 job3


Running

 24s

 job4

Running

 24s

 job5

Queued

Azure DevOps Limitations

- ADO Pipelines support scale to zero but need at least one agent registered
- ADO Pipelines can not queue a job with an empty agent pool
- Licensing limits parallel jobs

KEDA ADO Scaling Limitations

- Cancelling a pipeline does not stop running pods
- KEDA does not remove completed pods
- Azure DevOps does not remove offline agents from the agent pool

KEDA in Production

- Microsoft uses KEDA for Azure Services
 - Azure Container Apps
 - Azure App Services with Azure Arc
- KEDA 1.0.0 → 17. Nov 2019
- Currently 2.10
- Over 6k GitHub stars

Resources

- Demo Application
 - <https://github.com/WolfgangOfner/MicroserviceDemo/tree/master/KedaDemoApi>
 - <https://github.com/WolfgangOfner/Ado-Agent-Keda>
- KEDA
 - <https://keda.sh>
- KEDA GitHub
 - <https://github.com/kedacore/keda>
- KEDA Architecture Screenshot
 - <https://keda.sh/docs/2.6/concepts/#architecture>



Q&A

Level Up your Kubernetes Scaling with KEDA

Wolfgang Ofner

<https://programmingwithwolfgang.com>

<https://www.linkedin.com/in/wolfgangofner>

https://twitter.com/wolfgang_ofner