**OpenHack – Containers**

**Overview**

**This OpenHack enables attendees to** modernize an application by moving to containers so that they can meet the demands of large - and scaling – workloads by working through challenges inspired from real-world scenarios.

**During the “hacking” attendees will focus on** configuring an AKS cluster with production concerns in mind such as security (secret management and RBAC) and observability (logging and monitoring).

**This OpenHack simulates a real-world scenario** where an insurance company’s current compute power on their core business application is not meeting the demands of their large, and scaling, workloads. The goal is to modernize the application and move it to the cloud.

**By the end of the OpenHack**, attendees will have built out a technical solution that has cluster(s) ready for production and that meet top-quality security, observability and networking requirements.

**Technologies**

[Linux](https://www.redhat.com/en/topics/containers#:~:text=Linux%20containers%20are%20technologies%20that%20allow%20you%20to,%28dev%2C%20test%2C%20production%2C%20etc.%29%20while%20retaining%20full%20functionality.) and [Windows Containers](https://docs.microsoft.com/en-us/virtualization/windowscontainers/), [Azure Kubernetes Service](https://azure.microsoft.com/en-us/services/kubernetes-service/?&OCID=AID2100365_SEM_XwNeogAAAIOzPhXi:20200729201238:s&msclkid=a6027893570d12311fb527b28f39de13&ef_id=XwNeogAAAIOzPhXi:20200729201238:s), [Azure Container Registry](https://azure.microsoft.com/en-us/services/container-registry/), [Azure Virtual Machine](https://azure.microsoft.com/en-us/services/virtual-machines/), [Networking](https://azure.microsoft.com/en-us/product-categories/networking/), [Azure Storage](https://azure.microsoft.com/en-us/services/storage/), [Azure Monitor](https://azure.microsoft.com/en-us/services/monitor/), [Key Vault](https://azure.microsoft.com/en-us/services/key-vault/), [Service Fabric Mesh](https://docs.microsoft.com/en-us/azure/service-fabric-mesh/service-fabric-mesh-overview)

**Prerequisites**

**Knowledge Prerequisites**

To be successful and get the most out of this OpenHack, it is highly recommended that participants have previous experience with:

* *Container basics*
* *Command line interface*
* *Web applications*

Required knowledge of [Azure fundamentals](https://docs.microsoft.com/en-us/learn/paths/azure-fundamentals/).

**Language-Specific Prerequisites**

* Recommended that participants have knowledge of programing languages like C#, JavaScript, Node.JS or Java.

**Tooling Prerequisites**

To avoid any delays with downloading or installing tooling, have the following ready to go ahead of the OpenHack:

* A modern laptop running Windows 10 (1703 or higher), Mac OS X (10.13 or higher), or one of [these Ubuntu versions](https://github.com/Azure/azure-functions-core-tools#linux)
* Install your choice of Integrated Development Environment (IDE) software, such as [Visual Studio](https://visualstudio.microsoft.com/vs/community/) or [Visual Studio Code](https://code.visualstudio.com/download)
* Download the latest version of [Azure CLI](https://docs.microsoft.com/en-us/cli/azure/install-azure-cli?view=azure-cli-latest).
* [Docker for Windows](https://docs.docker.com/docker-for-windows/install/) or [Docker for Mac](https://docs.docker.com/docker-for-mac/install/)
* Terminal environment: PowerShell or [Bash](https://docs.microsoft.com/en-us/windows/wsl/install-win10)
* [Download the latest Kubectl](https://kubernetes.io/docs/tasks/tools/install-kubectl/) in the terminal of choice
* [Install the latest release of Helm](https://helm.sh/docs/intro/install/)
* [Git](https://git-scm.com/downloads)

**Development Environment Configuration**

* Pull the SQL Server Docker image with the shell command:   
  docker pull mcr.microsoft.com/mssql/server:2017-latest

**Links & Resources**

* Review the following links and resources:
  + [Introduction to Kubernetes](https://docs.microsoft.com/en-us/learn/modules/intro-to-kubernetes/)
  + [Introduction to Kubernetes on Azure](https://docs.microsoft.com/en-us/learn/paths/intro-to-kubernetes-on-azure/)
  + [Docker Networking](https://docs.docker.com/v17.09/engine/userguide/networking)
  + [Yaml Basics](https://linuxacademy.com/blog/devops/learn-the-yaml-basics/)
  + [Kubernetes Basics Tutorial](https://kubernetes.io/docs/tutorials/kubernetes-basics/)

Optional [AKS self-paced workshop](https://docs.microsoft.com/en-us/learn/modules/aks-workshop/) for more hands on preparation prior to the OpenHack event

**Post Learning Recommendations**

* [Administer containers in Azure](https://docs.microsoft.com/learn/paths/administer-containers-in-azure/)
* [Kubernetes Best Practices](https://learning.oreilly.com/library/view/kubernetes-best-practices/9781492056461/)
* [Kubernetes Patterns](https://learning.oreilly.com/library/view/kubernetes-patterns/9781492050278/)

**Challenges**

**Challenge 1: But First, Containers**

In this challenge, you will familiarize yourself with container basics.

Learning objectives:

* Use Docker to build and run containers locally
* Push images to Azure Container Registry

**Challenge 2: Getting Ready for Orchestration**

In this challenge, you will familiarize yourself with the Kubernetes basics.

Learning objectives:

* Deploy microservices to a basic Azure Kubernetes Service cluster
* Get familiar with basic Kubernetes concepts

**Challenge 3: To Orchestration and Beyond**

In this challenge, you will deploy into existing network space and implement some security measures.

Learning objectives:

* Use Azure Kubernetes Service to configure and create an RBAC enabled Kubernetes cluster in an existing VNET
* Use namespaces to logically separate microservices

**Challenge 4: Putting the Pieces Together**

In this challenge, you will better secure workload secrets and create routing rules for traffic to your microservices.

Learning objectives:

* Manage and secure secrets with Azure Key Vault

**Challenge 5: Wait, What’s Happening?**

In this challenge, you will improve the observability of your cluster.

Learning objectives:

* Use Azure Monitor or Prometheus and Grafana to monitor the health of the AKS cluster
* Create alerts to detect issues

**Challenge 6: Locking it Down**

In this challenge, you will further improve the security of your cluster.

Learning objectives:

* Improve cluster security using network policies and pod security policies
* Further configure RBAC roles and permissions for the AKS cluster
* Update a microservice to use managed identity authentication via Pod Identity

**Challenge 7: Mixed Emotions**

In this challenge, you will deploy a mixed workload (Linux and Windows) into a single cluster.

Learning objectives:

* Add Windows nodes to AKS cluster and deploy a legacy Windows app
* Use Taints and Tolerations to implement best practices when running mixed workloads in a cluster
* Upgrade a deployment in the cluster

**Challenge 8: Doing More with Service Mesh**

In this challenge, you will explore the capabilities of a Service Mesh.

Learning objectives:

* Use service mesh technology to expand on security and observability

**Value Proposition**

* **Deliver value to end-users** of your application faster, with zero-downtime deployment
* **Focus on what matters** – code and scale out! Rather than tediously manage compute on your own, use Kubernetes containers orchestration services (AKS) to easily real-time manage your clusters

**Technical Scenarios**

* Application Containerization: Move services to container technology and leverage the cloud using AKS
* Security: Networking, RBAC and secret management to ensure correct permissions for each cluster
* Mixed-Workloads: Running both Windows and Linux workloads in a single cluster
* Observability: The ability to understand and manage the health of your applications through tools like Azure Monitor

**Audience**

* Target Audience:
  + Microsoft – CSE, CSA, GBB, ATT, SE, TPM
  + Customer – App Developers/Ops
* Target verticals: Cross-Industry
* Customer profile:
  + Customers that are looking to modernize their applications by leveraging AKS
  + Customers that are looking to improve their skillset and knowledge of running production workloads in AKS

**Registration Questions**

|  |  |  |
| --- | --- | --- |
| **Required** | **Field** | **Response Options** |
| Yes | What is your level of understanding using Azure today? | None Some understanding I have some pilot work on Azure I rely on Azure today for cloud |
| Yes | How much time have you spent using containers? | [Drop down or Radio Buttons]  < 3 months  3-6 months  6 months - 1 year  > 1 year |
| Yes | How much time have you spent using Kubernetes? | [Drop down or Radio Buttons]  < 3 months  3-6 months  6 months - 1 year  > 1 year |
| Yes | How much time have you spent using Azure Kubernetes Service (AKS)? | [Drop down or Radio Buttons]  < 3 months  3-6 months  6 months - 1 year  > 1 year |

**Competitive Landscape**

Kubernetes as a Service

|  |  |  |
| --- | --- | --- |
| *Microsoft*  [AKS](https://azure.microsoft.com/en-us/services/kubernetes-service/) | *Amazon*  [EKS](https://aws.amazon.com/eks/) | *Google*  [GKE](https://cloud.google.com/kubernetes-engine) |

**Coach sourcing questions**

The following questions can be used to source coaches with appropriate knowledge. See Coach Selection in the [OpenHack Playbook](https://aka.ms/openhackplaybook) for additional information.

|  |  |  |
| --- | --- | --- |
| Question # | Question | What to look for in answer |
| 1 | What is your level of experience using containers? | 1. I have basic understanding of containers 2. I have deployed and debugged containers (Linux or Windows) extensively 3. I have containerized various production workloads and am fluent using docker and/or other container tooling |
| 2 | What is your level of experience using Kubernetes? | 1. I have basic understanding of Kubernetes 2. I have working knowledge of deploying and managing Kubernetes clusters using kubectl and helm. 3. I have experience with production considerations for Kubernetes including security, networking and monitoring. |
| 3 | What is your level of experience deploying, configuring and AKS? | 1. I have basic understanding of AKS 2. I have successfully deployed the AKS voting app 3. I rely on AKS for production workloads and have experience with network configurations, pod identity, secret management, volume mapping etc. in the context of the AKS cluster |
| 4 | What is your level of experience managing identity and authentication considerations in AKS? | 1. None 2. I have an understanding of AAD and can enable AKS with RBAC 3. I have implemented AKS authentication and security solution in test/production workloads as per best practices |
| 5 | What is your level of experience configuring and monitoring using both Azure and Opensource tools in AKS? | 1. No experience 2. I have experience configuring observability in AKS and using Azure Monitor, Container Insights and Application Insights for monitoring application and cluster state 3. I have experience with open source monitoring tools like Grafana and Prometheus |
| 6 | What is your level of experience using Service meshes like Istio, Linkerd or Consul ? | 1. None 2. Some prior experience with Service Mesh (Not Service Fabric Mesh) 3. Working knowledge of Meshes |
| 7 | What is your level of experience scaling AKS cluster deployments? | 1. No experience scaling AKS 2. I understand the different types of scaling like manual, cluster, HPA and ACI based scenarios. 3. I have successfully implemented scale strategies in AKS based deployments for prod/test workloads |
| 8 | What is your level of experience running mixed container workloads in Kubernetes? | 1. No experience 2. I have some experience with Windows Containers in AKS |

**FAQs**

Q: Is there a suggested flow of OpenHacks which an attendee should attend first, before going to yours?

A: No, but it might be good to know some general concepts around containerization, orchestration using Kubernetes before diving into the production level concerns. A great place to start are these introduction videos. You can also access the Kubernetes learning path to gain more comprehensive skills.

Q: I have already deployed my application using Kubernetes – do I need to attend this OpenHack?

A: Even if you have successfully deployed your application to Kubernetes, it may be beneficial to learn more about running production workloads using AKS and understanding how to address concerns around Security, Monitoring, Service Meshes and Mixed Container Workloads.

Q: If I am only interested in using FaaS for compute, should I attend this OpenHack?

A: No, Serverless services are not covered in this OpenHack – only Containers will be addressed. Additionally, the OpenHack is geared towards challenge-based learning of the Kubernetes fundamentals such as Deployments, Services, Ingress, and RBAC. Given the time timeframe we have chosen to forgo DevOps pipelines which is heavily focused in the DevOps OpenHack.

Q: What tools will I need?

A: You will need Docker, Command Prompt access (Powershell/bash/wsl), kubectl, and Helm. The Kubernetes extension for VSCode is also useful.