# Provisioning for Azure
# Cost Optimization & Monitoring Project
# Project Starter Template

## STEP 0: Problem Background

Company "X" is an engineering company that has offices in both the US East & West Coast. They currently host all their data and applications in a single East coast data center and are constantly worried about both cost and resiliency. Below is how their current servers are configured.

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| Server(s): | **Purpose:** Windows/Linux Server<br>**Environment:** Physical Servers<br>**Operating System:** Windows<br>**Operating System License:** DataCenter<br>**Servers:** 10<br>**Procs per server:** 2<br>**Core(s) per proc:** 8 Cores<br>**RAM:** 256 GB<br>**Optimize By:** CPU<br>**GPU:** None<br>**Usage:** These are the servers where all your engineering workloads happen. Currently they all are being leveraged at regular capacity. |
| Server(s): | **Purpose:** Web App<br>**Environment:** Physical Servers<br>**Operating System:** Windows<br>**Operating System License:** DataCenter |

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| | **Servers:** 3<br>**Procs per server:** 1<br>**Core(s) per proc:** 8 Cores<br>**RAM:** 64 GB<br>**Optimize By:** CPU<br>**GPU:** None<br>**Usage:** These are the web app servers for your company. Currently they all are being leveraged at regular capacity. |
| Server(s): | **Source:** Database Server<br>**Database:** Microsoft SQL Server<br>**License:** Enterprise<br>**Environment:** Physical Servers<br>**Operating System:** Windows<br>**Operating System License:** Datacenter<br>**Servers:** 3<br>**Procs per server:** 1<br>**Cores per proc:** 16 Cores<br>**RAM:** 64 GB<br>**Optimize By:** CPU<br>**Usage:** These three servers are running Microsoft SQL Server and provide the database for your engineering company. It is critical that they are always running.<br>**Destination**<br>Service: SQL Database<br>Purchase Model: vCore<br>Service Tier: Business Critical<br>Instance Cores: 2<br>SQL Server Storage: 5<br>SQL Server backup: 0 |

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| Storage | **Purpose:** Storage<br>**Type:** Local Disk / SAN<br>**Disk Type:** HDD<br>**Capacity:** 1 TB<br>**Back-Up:** None currently<br>**Archive:** None |
| Networking | Amount of network bandwidth you currently consume in your on-premises environment: 1 GB |

# STEP 1: Assessing the On-Premises Environment & Generating Total Cost of Ownership (TCO) Report

Purpose: To identify the Azure services needed to ensure Company "X"'s business continuity in the cloud.

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| **Current Environment/ Background**<br><br>Make a list of all current on-premises servers and services. | There are 10 Windows VM's which are used for engineering purposes.<br>There are 3 web apps servers which host the front end of the company.<br>There are 3 database servers.<br>There is a storage which is also used to store data. |
| **Matching Azure Services**<br><br>Match the list of on-premises servers and services to the corresponding Azure ones. | Make a list of all servers and services you would create on Azure and explain why you chose each.<br><br>- Azure Virtual Machine for Windows Server(CPU: 8Core, RAM: 16GB, OS license: Standard, Virtualization: Hyper-V) x10<br><br>- Azure Virtual Machine for Web App Server(CPU: 8Core, RAM: 16GB, OS license: Standard, Virtualization: Hyper-V) x3<br><br>- Azure Virtual Machine for MS SQL Server(CPU: 16Core, RAM: 64GB, Purchase model: vCore, Service Tier: Business Critical, SQL Server Backup: No ) x3<br><br>- Azure Storage(HDD: !TB, Backup/Archive: No) x1<br><br>- Azure Network(Outbound Bandwidth: 1GB) x1 |

**Screenshot 1**

Submit the screenshot for each of the above configurations from Azure TCO.
VM and Web Apps Server screenshot should be submitted here.

**Screenshot 2**

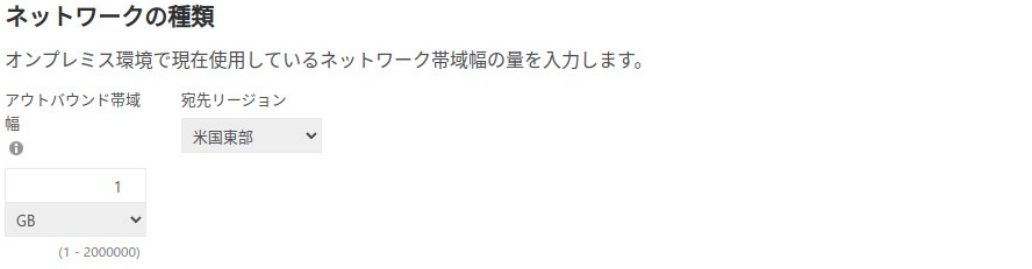
Submit the screenshot for each of the above configurations from Azure TCO. Database screenshot should be submitted here.


**Screenshot 3**

Submit the screenshot for each of the above configurations from Azure TCO. Storage configuration screenshot should be submitted here.


**Screenshot 4**

Submit the screenshot for each of the above configurations from Azure TCO.



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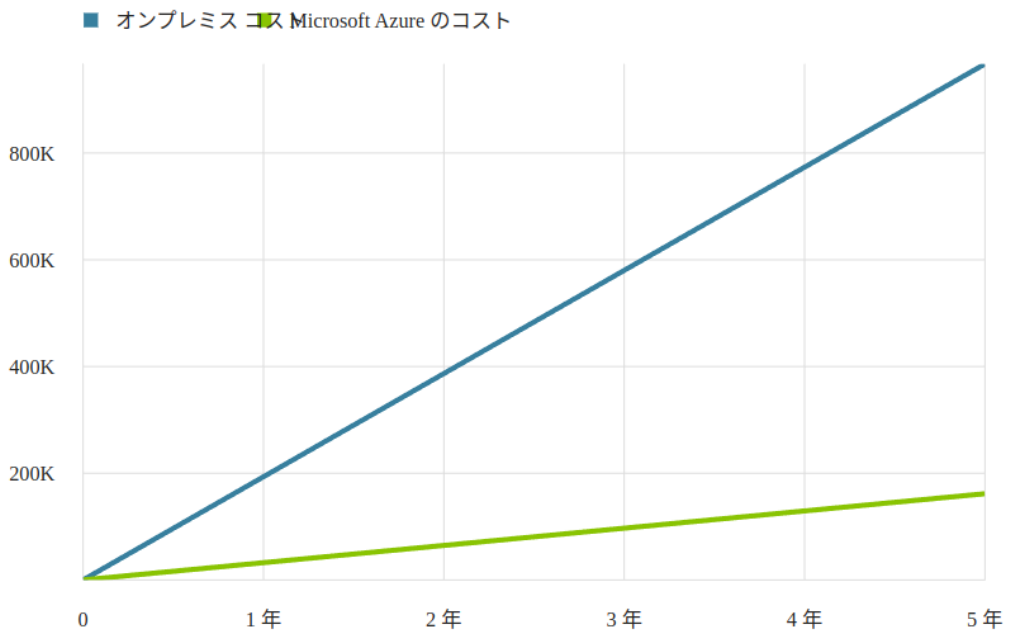
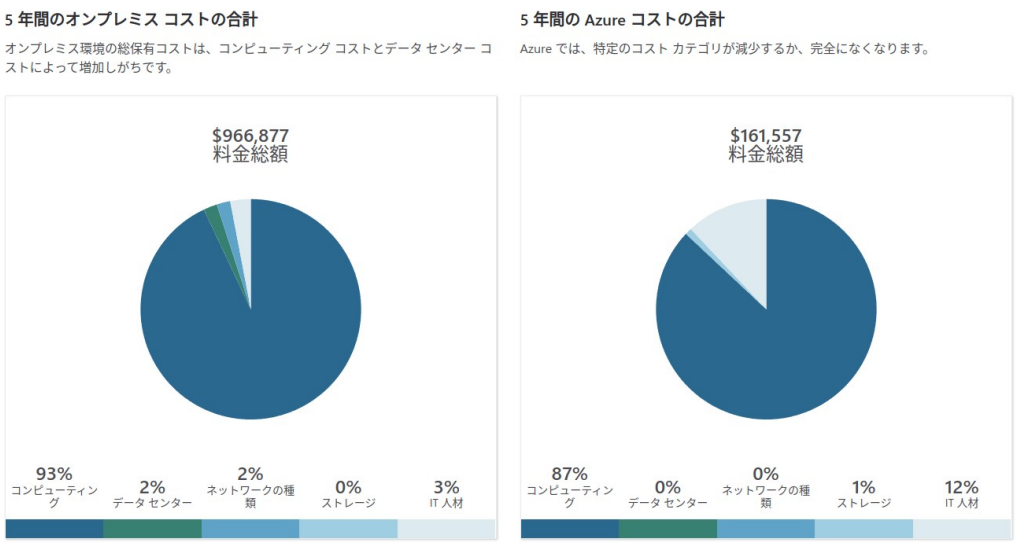
| Networking configuration screenshot should be submitted here. | |
| **Screenshot 5**<br><br>Once the TCO Report is generated, submit a screenshot of the price comparison graph (line graph) here. |  |
| **Screenshot 6**<br><br>Once the TCO Report is generated, submit a screenshot of the price comparison graph (pie chart) here. |  |

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| **Screenshot 7**<br><br>Once the TCO Report is generated, submit a screenshot of the price comparison chart (tabular format) here. |  <br>$966,877<br>5 年間でかかるコスト<br><br>$161,557<br>5 年間でかかるコスト<br><br>**オンプレミス コストの内訳概要**<br><br>**Azure コストの内訳概要**<br><br>**カテゴリ** / **コスト**<br>コンピューティング $902,606.95<br>ハードウェア $85,254.00<br>ソフトウェア $11,338.75<br>電力 $12,891.00<br>仮想化 $25,459.20<br>データベース $767,664.00<br>データ センター $16,624.85<br>ネットワークの種類 $16,671.25<br>ストレージ $307.20<br>IT 人材 $30,667.05<br>**合計** $966,877.00<br><br>**カテゴリ** / **コスト**<br>コンピューティング $140,962.80<br>データ センター $0.00<br>ネットワークの種類 $0.00<br>ストレージ $1,427.40<br>IT 人材 $19,167.05<br>**合計** $161,557.00 |
| **Explanation 1**<br><br>Explain the breakdown of the costs and show your understanding of how on-prem costs versus Azure compare | In the case of on-premise, there are computing costs including hardware, data center costs, network construction costs, storage costs, and IT personnel costs. On the other hand, with Azure, only slightly more expensive computing costs (excluding hardware!), storage costs, and IT personnel costs are incurred. and storage costs, and IT human resource costs. In total, Azure is more cost-effective. |

# STEP 2: Azure Pricing Calculator Cost Estimates

Purpose: You want to only move the engineering workloads (so just your VM's) to Azure first to try and understand how Azure cloud works. In addition, this will also help you demonstrate to your CIO that by doing that small migration your company can achieve resiliency. You want to provide precise monthly costs to your CIO.

Use the Azure Pricing Calculator to submit the following screenshots.

**Note:** *If you are using Udacity Cloud Labs, you will be allowed to create a few VM sizes only. Visit this link to see all possible VM sizes and go through the classroom instructions for more details.*

| **Task 1** | Matching Azure Services: Match the list of on-premises servers and services to the corresponding Azure ones.<br><br>Here is the VM configuration you will pick.<br>● 5 VM's will be in US East Coast, and 5 will be in US West Coast.<br>● Choose the instance you want to create in both the regions from the possible VM sizes mentioned in the classroom.<br>● Compute Option will be pay-as-you-go; so, there are no upfront costs.<br>● The default of 730 hours is selected. |
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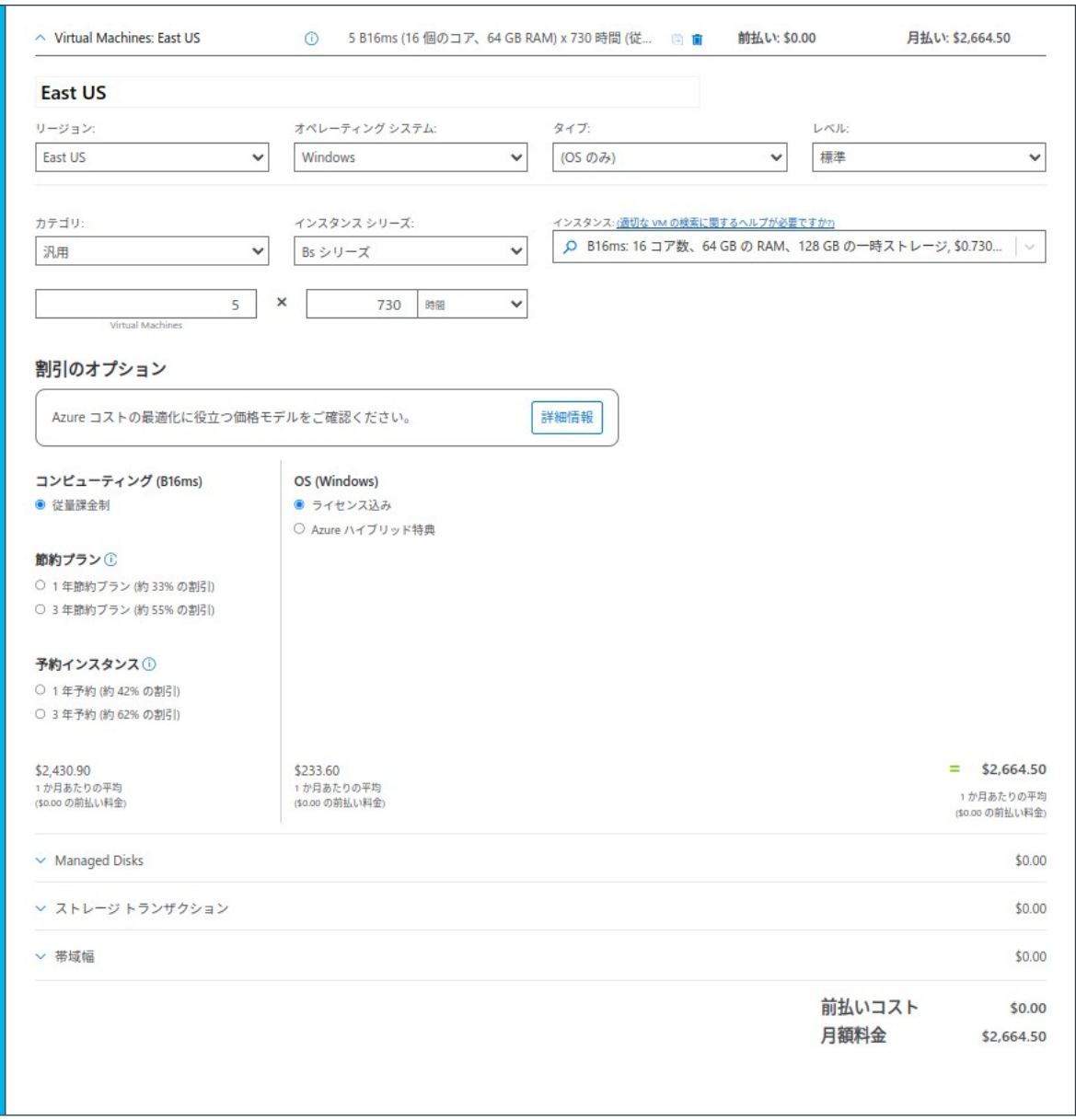
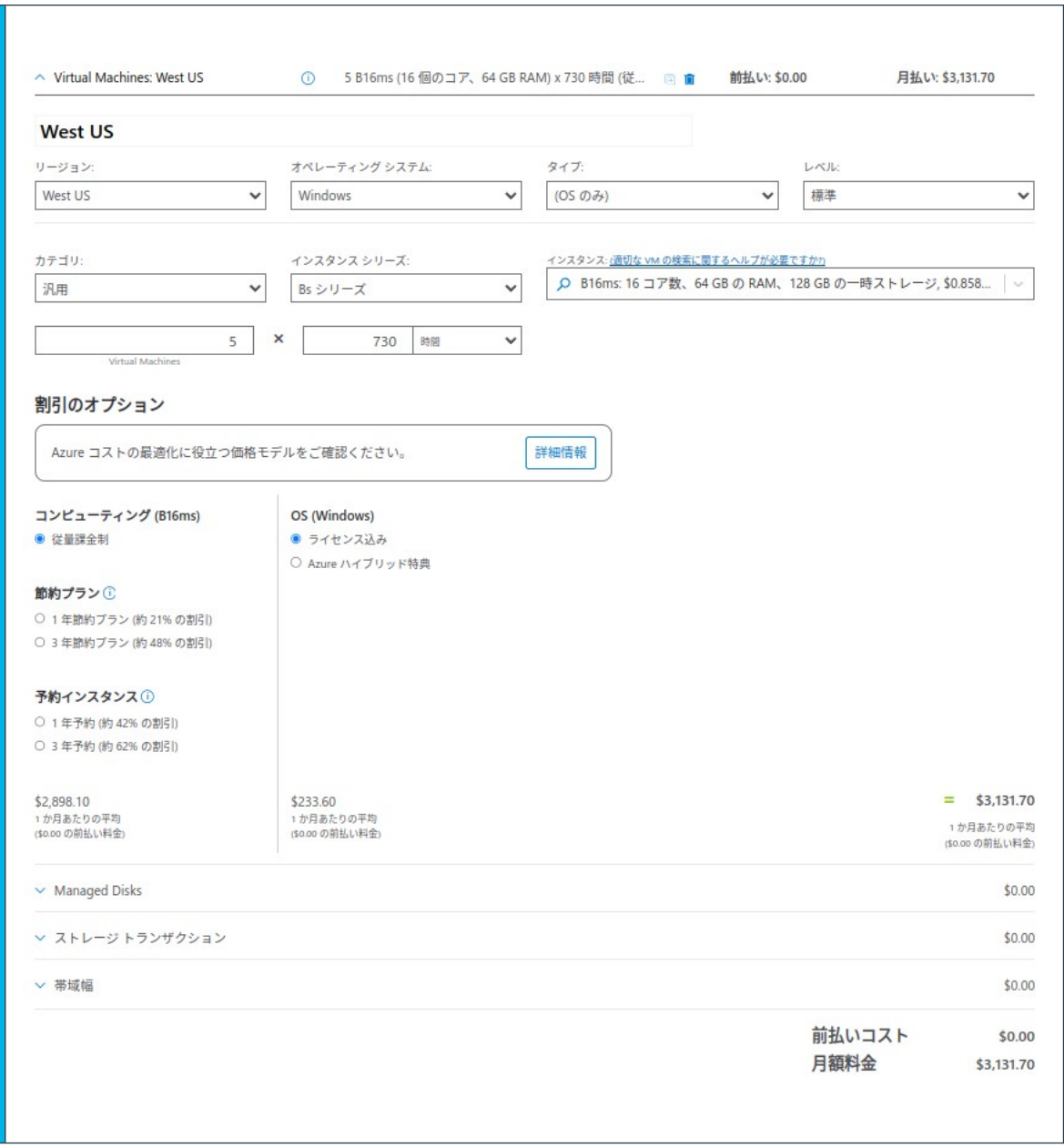
## Screenshot 1

Submit the screenshot for each of the above configurations from the Azure Pricing Calculator. Submit the US East Coast monthly costs here.



## Screenshot 2

Submit the screenshot for each of the above configurations from the Azure Pricing Calculator. Submit the **US West Coast** monthly costs here.



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| **Screenshot 3**<br><br>Submit the screenshot for total cost per month for both US East and West Coasts. |  |
| **Explanation 1**<br><br>Explain how resilience is built in by moving to Azure | Moving to Azure can enhance resilience in multiple ways.<br><br>Firstly, Azure offers high availability features such as availability sets and availability zones, which distribute resources across fault domains to ensure continuous operation even in the face of hardware or software failures.<br>Secondly, Azure provides disaster recovery options like Azure Site Recovery and Azure Backup, enabling replication of applications and data to a secondary Azure region for failover in case of primary site failure.<br>Lastly, Azure's scalability features, such as Virtual Machine Scale Sets and App Service, allow for automatic scaling of resources based on demand, ensuring that applications can handle increased traffic or workload without performance degradation. |

# STEP 3: Azure Cost Management + Billing

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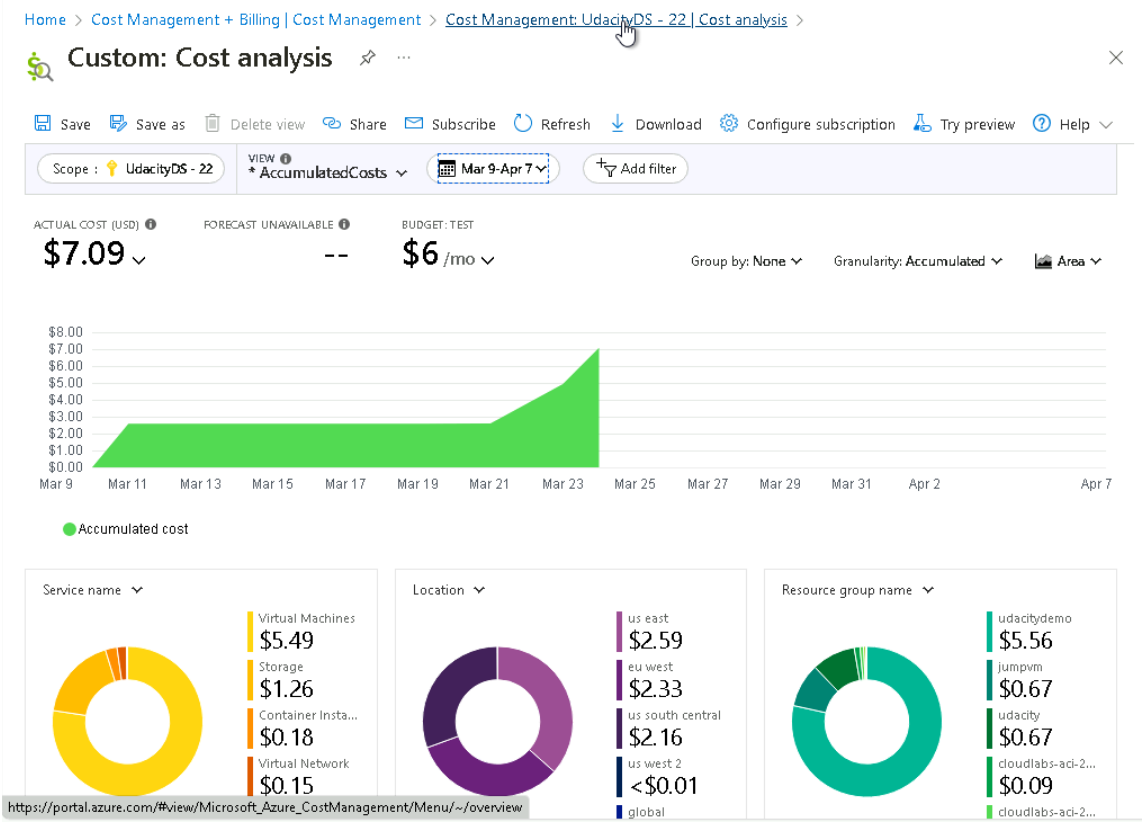
| **Background** | You have now configured your Azure Production Workload environment and been using Azure for a few days. You have now been tasked by your CIO to present some metrics on how the costs are being billed within Azure and also what other functionalities Azure has in regards to cost management, which were not previously available. |
| **Question 1**<br><br>Submit the explanation | What is the purpose of Azure Cost Mgmt + billing Dashboard? |
| **Explanation 1** | The purpose of the Azure Cost Management + Billing Dashboard is to provide insights and control over the costs associated with your Azure resources. It allows you to monitor and analyze your usage and spending patterns, helping you optimize costs and stay within budget. |

**Screenshot 2**

Submit the screenshot for main Cost Mgmt + Billing Dashboard.




**Explanation 2**

Explain the key components of the screenshot submitted. An explanation to be provided for Scope and Area dropdown from the screenshot submitted.

Key components:

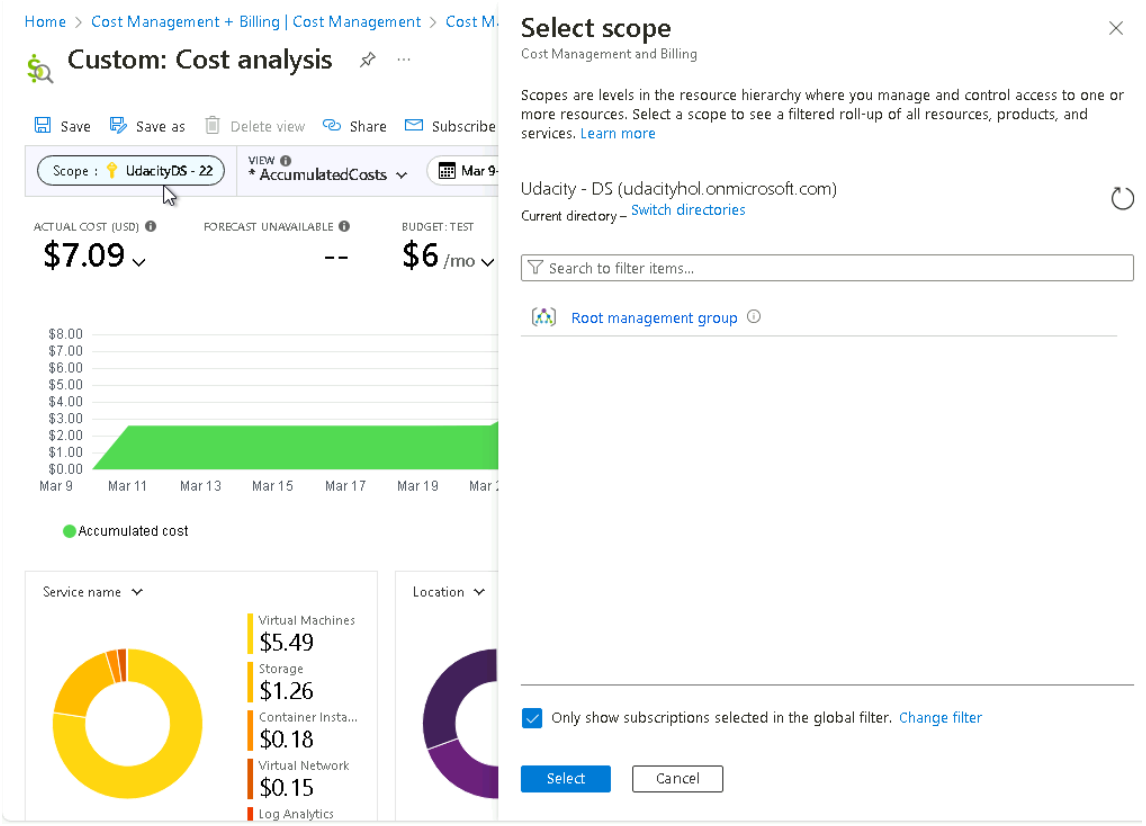
- Actual cost (USD): This component displays the actual cost incurred in USD for the selected time period.

- FORECAST UNAVAILABLE: This component indicates that the forecast for future costs is currently unavailable.

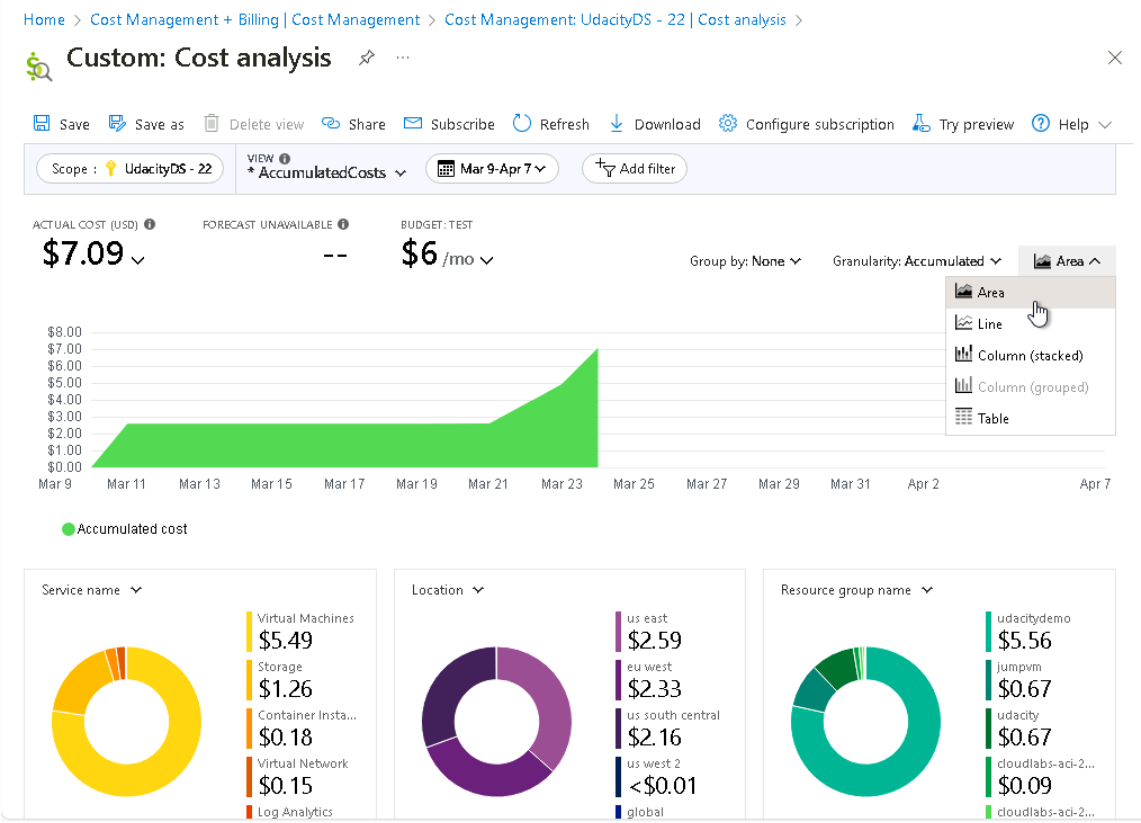
- BUDGE:The budget component allows you to set a specific spending limit or budget for your Azure resources and services.

- Area chart: This component shows the accumulated cost of all resources in last 30 days.

- Pie chart: This component shows the accumulated cost per service type, location, and resource group.



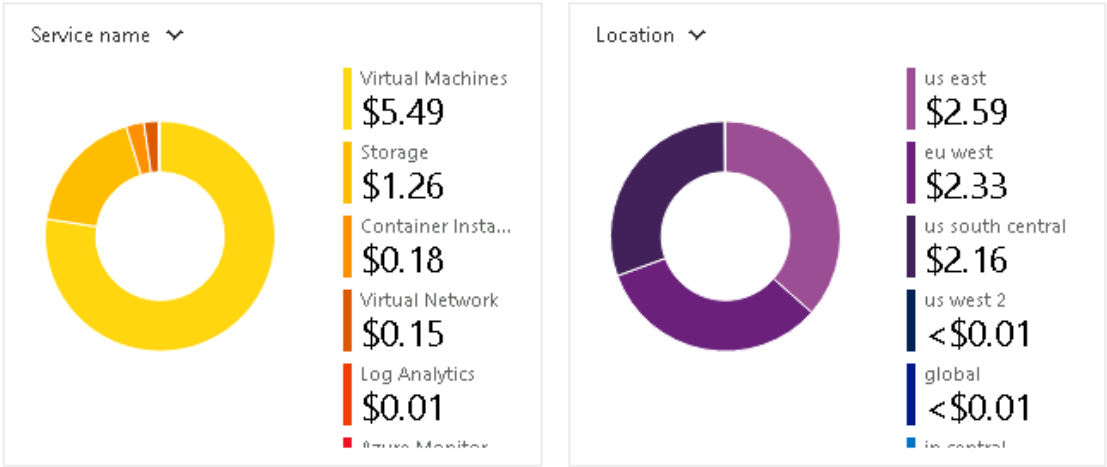

With the “Scope” dropdown, we can choose the level of hierarchy for our report.




With the “Area” dropdown we can change the style of the top graph.

**Screenshot 3**

Submit the screenshot for breakdown of costs by Service Name and Location.




**Explanation 3**

Explain the key

The pie charts on the left and right provide insights into the cost distribution based on resource type and region, respectively. The left pie chart reveals that virtual machines account for the majority of our expenses, indicating

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| components of the screenshot submitted. | that they are the most costly resource type we are utilizing. On the other hand, the right pie chart highlights that our highest expenses are associated with resources located in the us east region. |
| **Screenshot 4**<br><br>Submit the screenshot for breakdown of costs by Service Name and Location. | Same as Screenshot 3 |
| **Explanation 4**<br><br>Explain the key components of the screenshot submitted. | Same as Explanation 3 |
| **Screenshot 5**<br><br>Submit the screenshot for breakdown of costs by Service Name and Location | Same as Screenshot 3 |
| **Explanation 5**<br><br>Explain the key components | Same as Explanation 3 |

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| of the screenshot submitted. | |
| **Screenshot 6**<br><br>Submit the screenshot for breakdown of costs by Service Name and Location. | Same as Screenshot 3 |
| **Explanation 6**<br><br>Explain the key components of the screenshot submitted. | Same as Explanation 3 |
| **Explanation 7**<br><br>Explain the summarized highlights of this part of the project, Azure Cost Mgmt + Billing | Azure Cost Management + Billing is a comprehensive tool provided by Azure to help users evaluate and manage their costs effectively. It serves as a one-stop location for users to monitor and analyze their cloud costs.<br><br>The main purpose of Azure Cost Management + Billing is to provide transparency and visibility into the costs associated with Azure resources. It allows users to track and analyze their spending patterns, identify cost-saving opportunities, and optimize resource allocation.<br><br>By using Azure Cost Management + Billing, users can:<br><br>Monitor Costs: The dashboard provides a consolidated view of cost-related information, including cost breakdown by resource, service, and subscription. It helps users understand how their spending is distributed and identify areas where costs can be optimized. |

Budgeting and Forecasting: Users can set up budgets and receive alerts when their spending exceeds the defined thresholds. This feature helps users stay within their budget and avoid unexpected cost overruns.

Cost Analysis: Azure Cost Management + Billing offers powerful analytics capabilities to analyze cost trends over time. Users can generate reports, visualize cost data, and gain insights into cost drivers. This information enables users to make informed decisions and optimize their resource usage.

Cost Optimization Recommendations: The tool provides recommendations for cost optimization based on usage patterns and historical data. Users can leverage these recommendations to identify opportunities for cost savings and implement necessary changes.

Resource Tagging: Azure Cost Management + Billing supports resource tagging, which allows users to categorize and organize their resources. This feature helps in cost allocation, tracking, and reporting.

Overall, Azure Cost Management + Billing is a valuable tool for managing and optimizing costs in Azure. It provides users with the necessary insights and controls to effectively monitor, analyze, and optimize their cloud spending.

# STEP 4: Azure Policy to create and enforce policies

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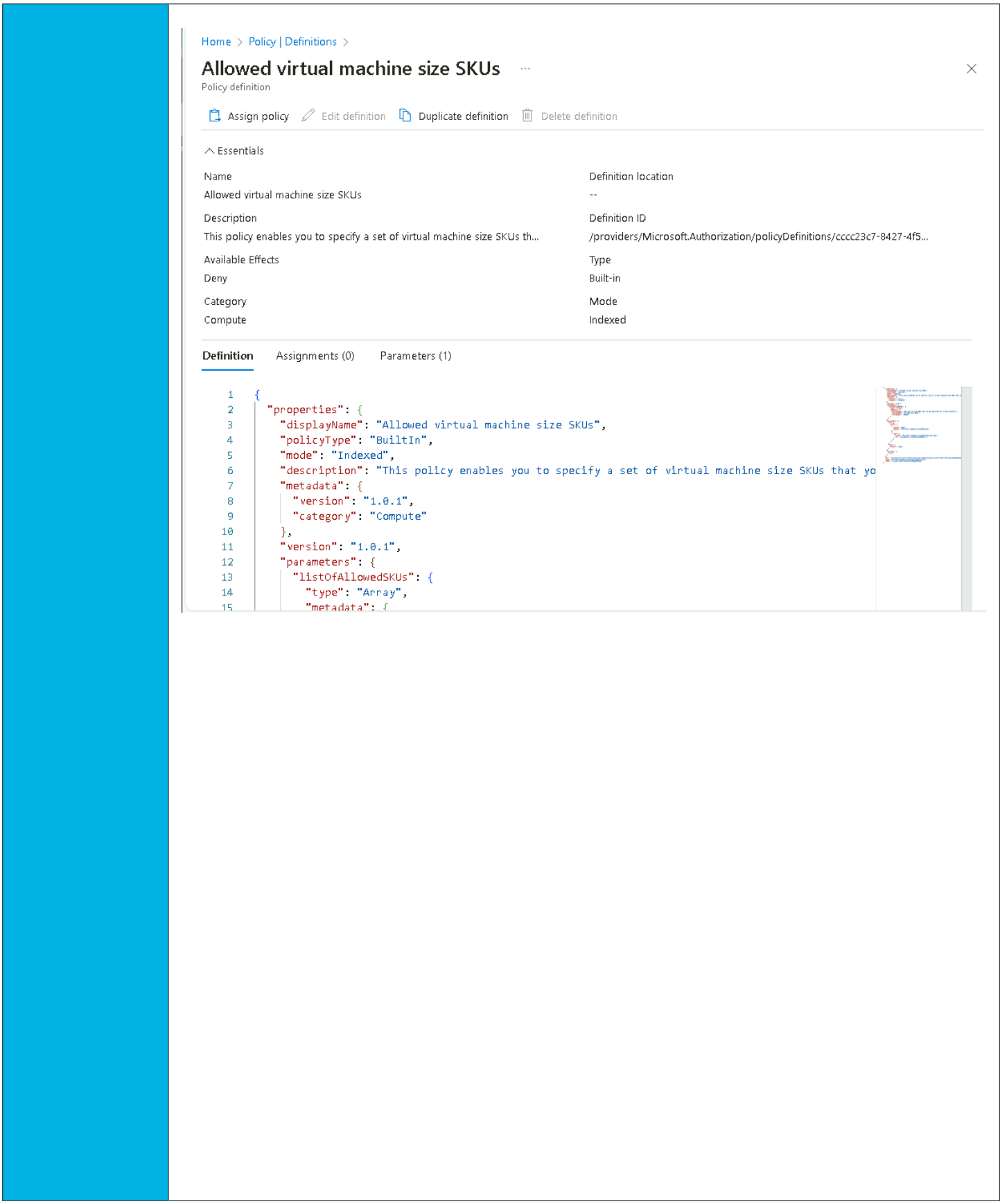
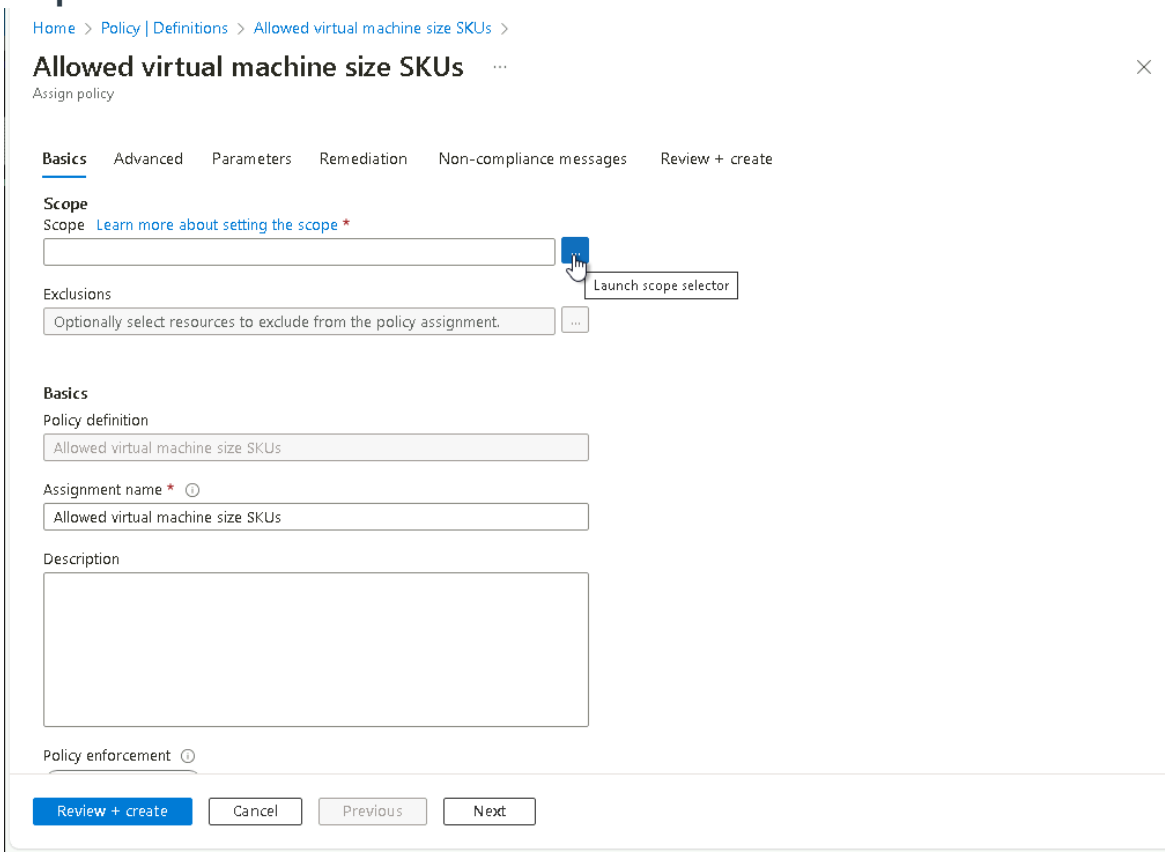
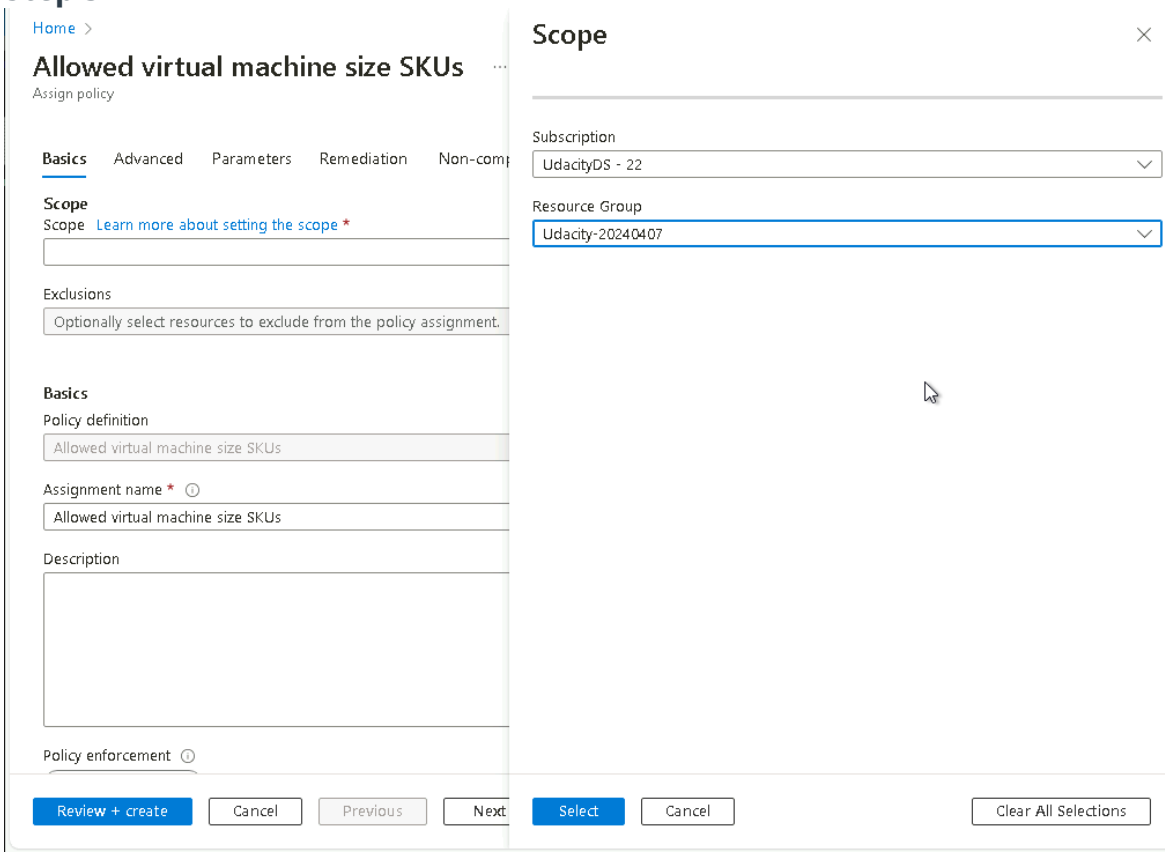
| **Background** | You have now configured your Azure Production Workload environment and been using Azure for a few days. You realize that many infrastructure administrators are creating VM sizes without doing proper due diligence, thus having a direct impact on cost.<br><br>You now decide to leverage Azure Policy features to ensure that appropriate controls are put in place. |
| **Screenshots 1 through 5**<br><br>Submit the screenshots for Azure Policy steps. | **Hint**: Navigate to and select the built-in Azure policy "Allowed virtual machine size SKUs;" then follow the wizard steps. Submit a screenshot for every single step of the wizard so that any mistakes in the final step can be caught by your reviewer.<br><br>**Very important note:**<br>1. Due to lab restrictions, while you go through the wizard, you will not be allowed to create the policy in the final step. Please submit all screenshots though<br>2. So for the Part 2 of this project to be submitted, a successful policy has already been created in the lab for you, which can be used to test the VM creation scenario. Please ensure to double check which VM series is allowed to be created in the lab and ensure that you do not use the same series for passing this part of the project<br><br>**Step 1:** |


Home > Policy | Definitions >
Allowed virtual machine size SKUs
Policy definition
Assign policy
Edit definition
Duplicate definition
Delete definition
Essentials
Name
Allowed virtual machine size SKUs
Definition location
--
Description
This policy enables you to specify a set of virtual machine size SKUs th...
Definition ID
/providers/Microsoft.Authorization/policyDefinitions/cccc23c7-8427-4f5...
Available Effects
Deny
Type
Built-in
Category
Compute
Mode
Indexed
Definition
Assignments (0)
Parameters (1)
{
"properties": {
"displayName": "Allowed virtual machine size SKUs",
"policyType": "BuiltIn",
"mode": "Indexed",
"description": "This policy enables you to specify a set of virtual machine size SKUs that yo
"metadata": {
"version": "1.0.1",
"category": "Compute"
},
"version": "1.0.1",
"parameters": {
"listOfAllowedSKUs": {
"type": "Array",
"metadata": {

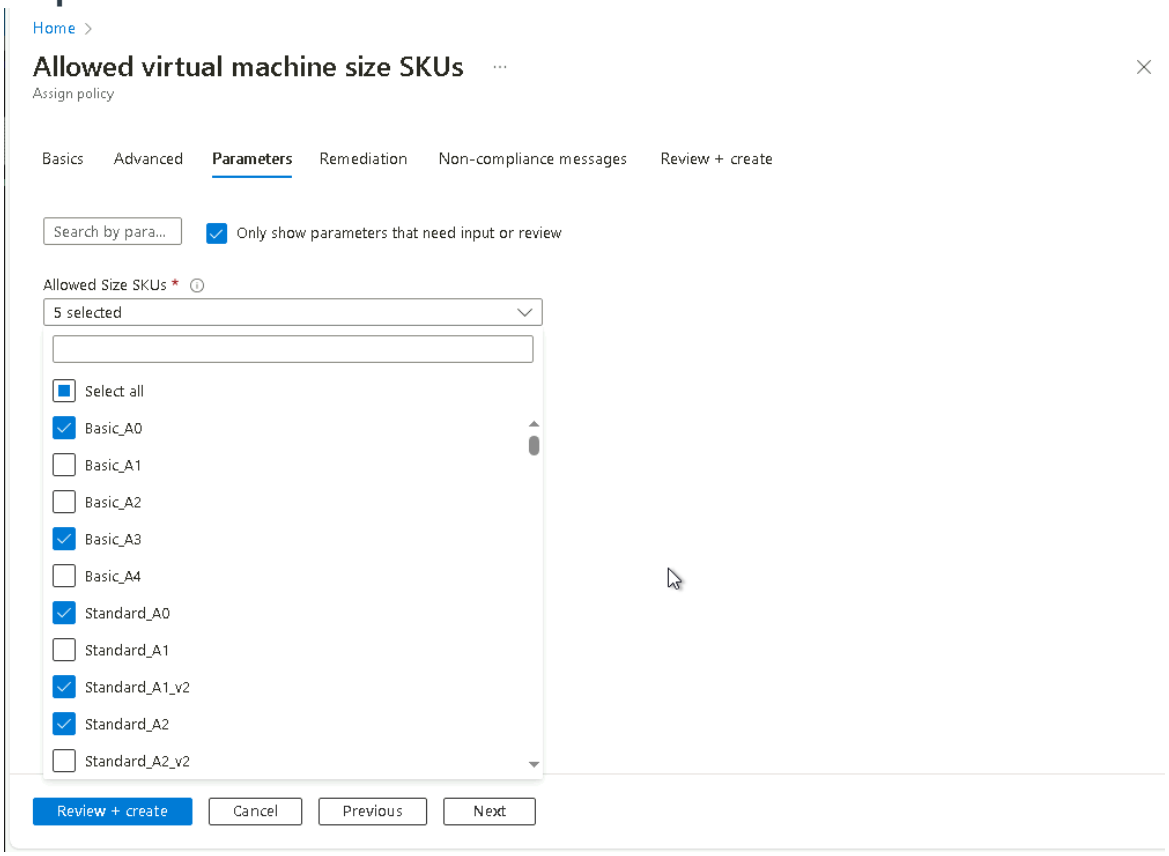
## Step 2:


Home > Policy | Definitions > Allowed virtual machine size SKUs >
Allowed virtual machine size SKUs
Assign policy
Basics
Advanced
Parameters
Remediation
Non-compliance messages
Review + create
Scope
Scope
Learn more about setting the scope *
Launch scope selector
Exclusions
Optionally select resources to exclude from the policy assignment.
Basics
Policy definition
Allowed virtual machine size SKUs
Assignment name *
Allowed virtual machine size SKUs
Description
Policy enforcement
Review + create
Cancel
Previous
Next

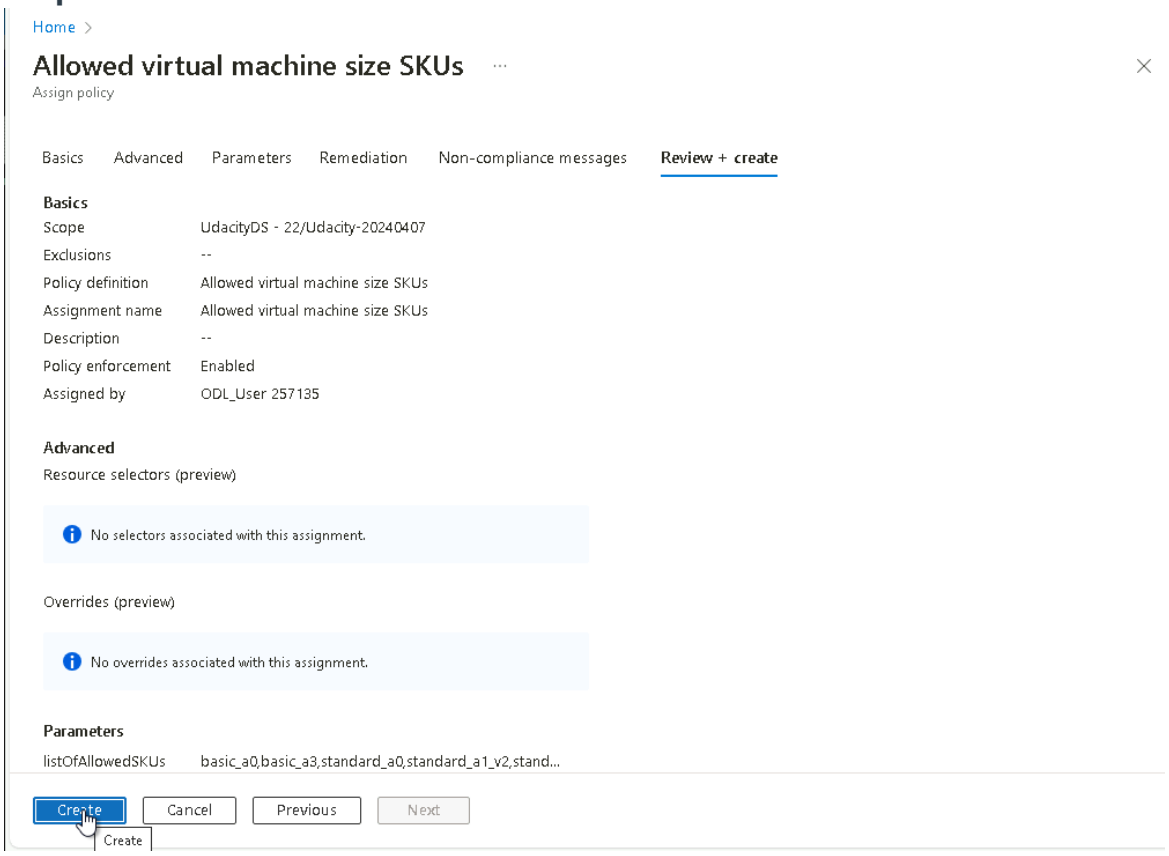
## Step 3


Home
Allowed virtual machine size SKUs
Assign policy
Basics
Advanced
Parameters
Remediation
Non-comp
Scope
Scope
Learn more about setting the scope *
Exclusions
Optionally select resources to exclude from the policy assignment.
Basics
Policy definition
Allowed virtual machine size SKUs
Assignment name *
Allowed virtual machine size SKUs
Description
Policy enforcement
Review + create
Cancel
Previous
Next
Scope
Subscription
UdacityDS - 22
Resource Group
Udacity-20240407
Select
Cancel
Clear All Selections

## Step 4:

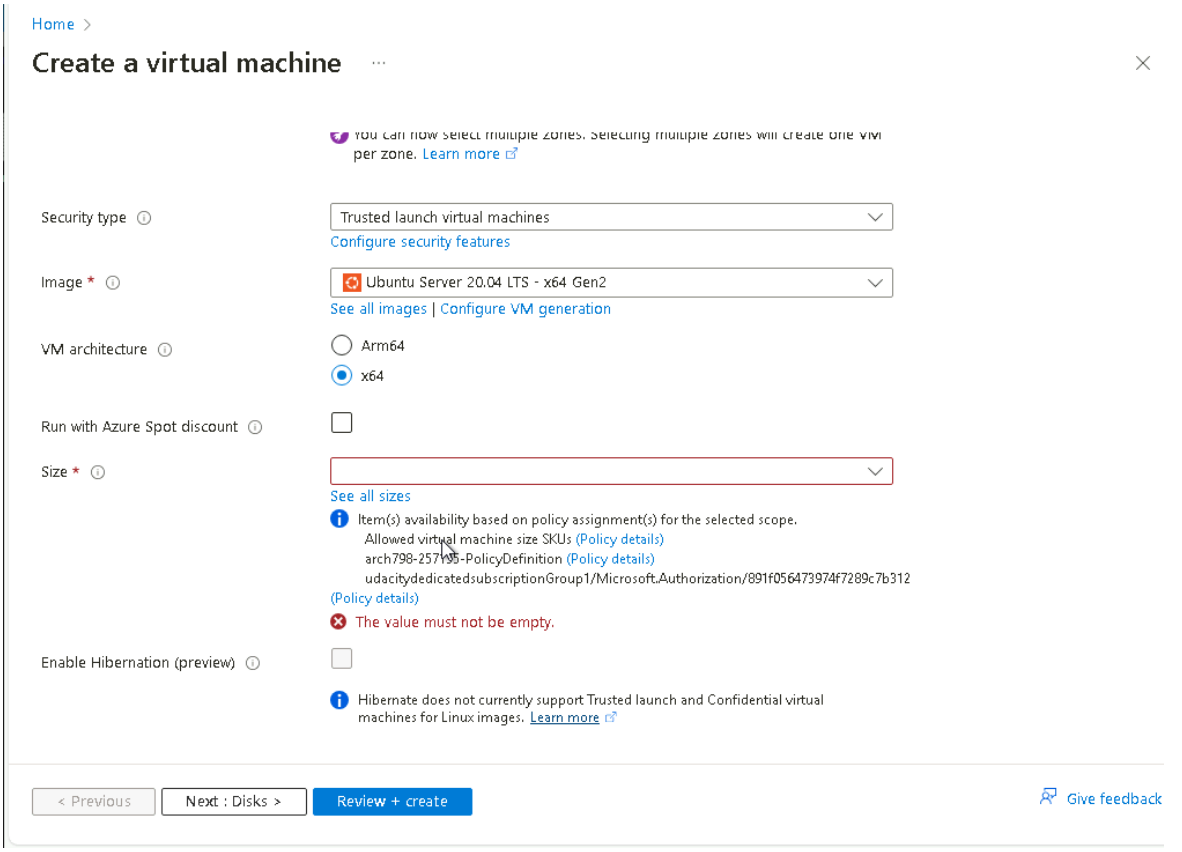

Home
Allowed virtual machine size SKUs
Assign policy
Basics
Advanced
Parameters
Remediation
Non-compliance messages
Review + create
Search by para...
Only show parameters that need input or review
Allowed Size SKUs *
5 selected
Select all
Basic_A0
Basic_A1
Basic_A2
Basic_A3
Basic_A4
Standard_A0
Standard_A1
Standard_A1_v2
Standard_A2
Standard_A2_v2
Review + create
Cancel
Previous
Next

## Step 5:


Home
Allowed virtual machine size SKUs
Assign policy
Basics
Advanced
Parameters
Remediation
Non-compliance messages
Review + create
Basics
Scope
UdacityDS - 22/Udacity-20240407
Exclusions
--
Policy definition
Allowed virtual machine size SKUs
Assignment name
Allowed virtual machine size SKUs
Description
--
Policy enforcement
Enabled
Assigned by
ODL_User 257135
Advanced
Resource selectors (preview)
No selectors associated with this assignment.
Overrides (preview)
No overrides associated with this assignment.
Parameters
listOfAllowedSKUs
basic_a0,basic_a3,standard_a0,standard_a1_v2,stand...
Create
Cancel
Previous
Next
Create

**Screenshot 6**

Explain through screenshots what happens when you create a VM which is in violation with the policy you just created.




**Explanation 1**

Explain the summarized highlights of this part of the project, Azure Policy.

Azure Policy is a powerful tool that allows administrators to set controls on how infrastructure is created in Azure. It helps ensure compliance and governance by enforcing rules and regulations. By using Azure Policy, you can define and enforce specific requirements for resources, such as virtual machines, storage accounts, and more.

The purpose of Azure Policy is to provide centralized control over cost management and resource deployment. It helps organizations maintain consistency and security by enforcing specific policies across their Azure environment. With Azure Policy, you can prevent the creation of resources that don't comply with your organization's standards, ensuring that only approved resources are deployed.

By setting up Azure Policy, administrators can effectively manage costs by controlling resource usage and preventing unnecessary spending. It allows you to define policies related to cost optimization, such as limiting the size or type of virtual machines that can be deployed. This helps ensure that

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| | resources are provisioned efficiently and cost-effectively.<br><br>Overall, Azure Policy is a crucial component of cost optimization and governance in Azure. It provides administrators with the ability to set appropriate controls on resource creation, ensuring cost management and compliance with organizational standards. |

## STEP 5: Azure Dashboards

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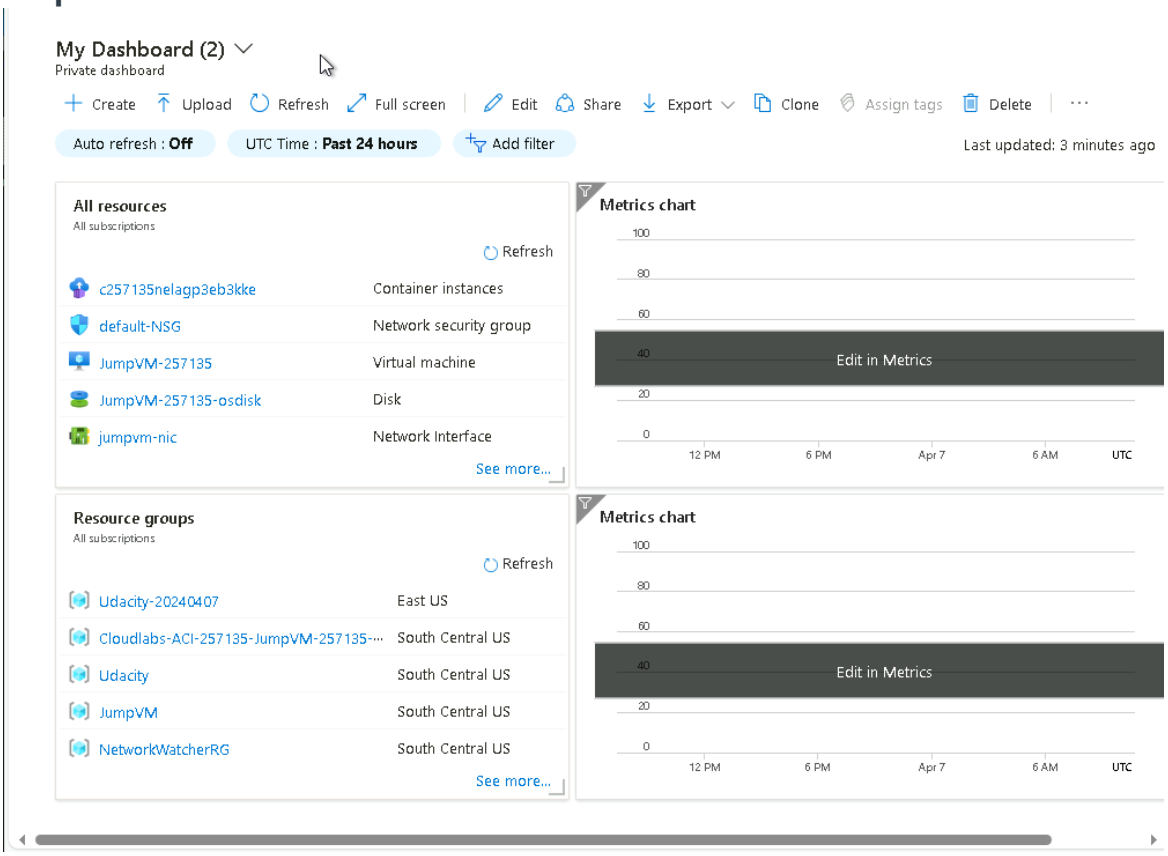
| **Background** | Azure Dashboards are a one stop shop to monitor<br>● Your logs<br>● Your infrastructure<br>● Your applications |
| **Task 1** | You need to create an Azure dashboard that will pull in a few widgets: Percentage CPU, All Resources, Resource Groups & Avg CPU Credits Consumed. Submit the screenshots and explain the key components of the Dashboard. Be sure to include a screenshot of the final Dashboard. |

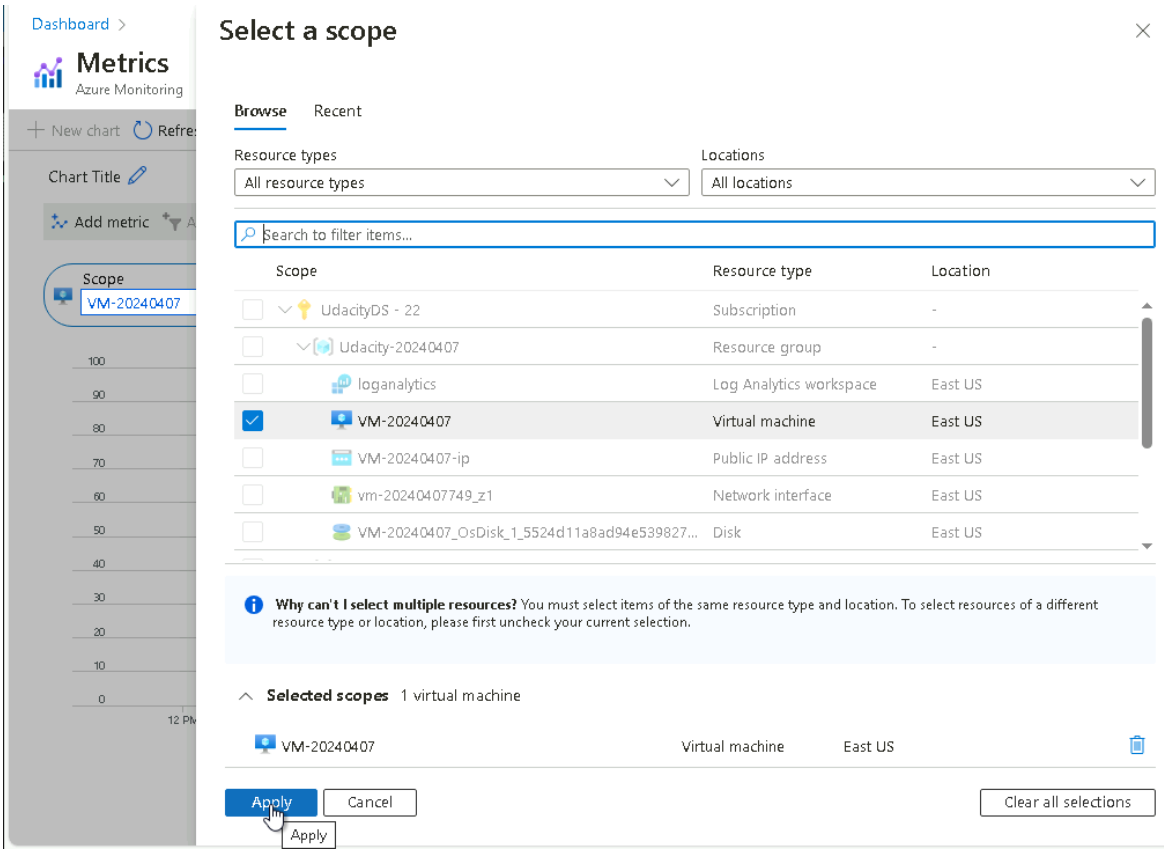
**Screenshots 1 through 3**

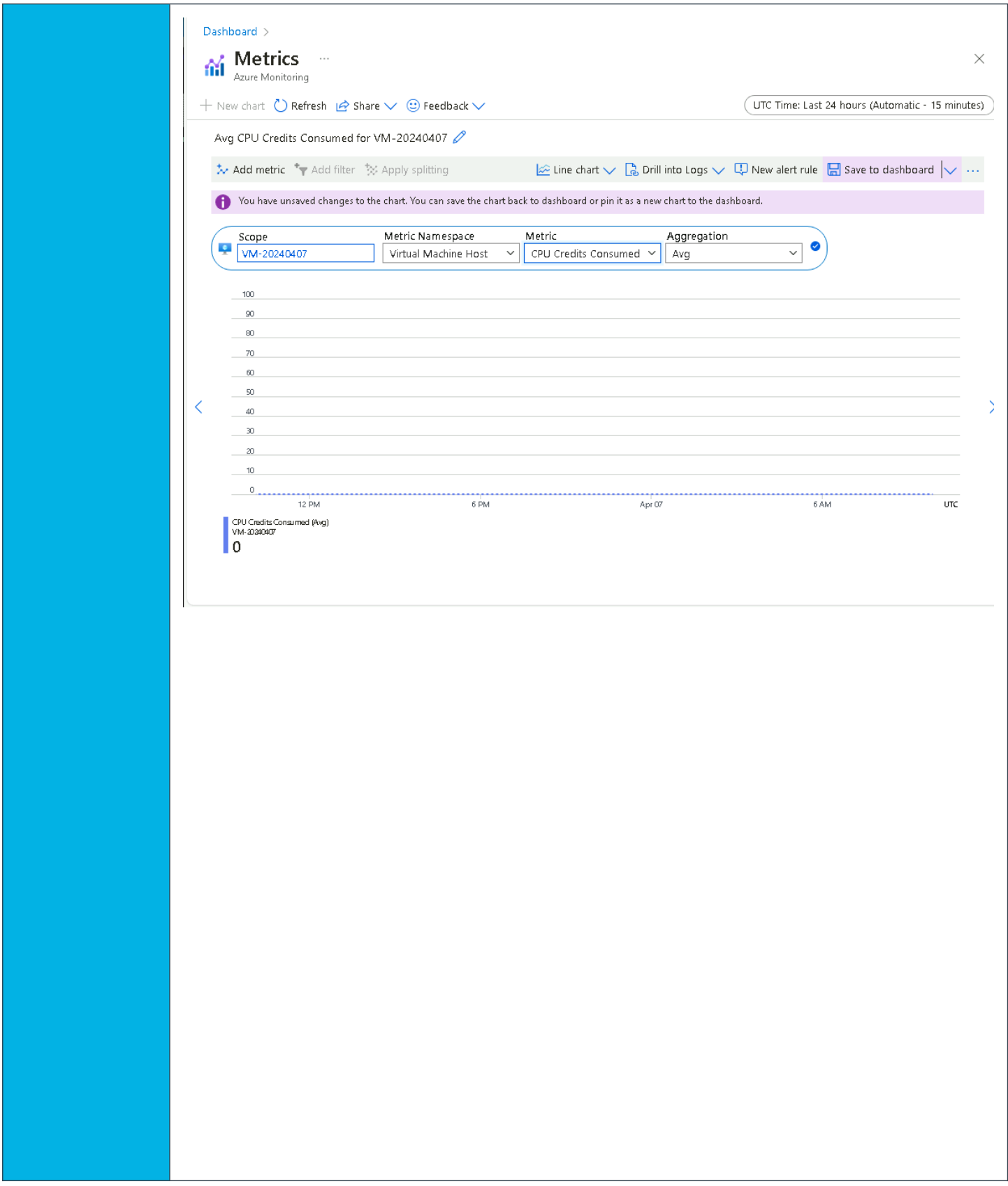
You will submit the screenshots for Overview tab.

## Step 1:

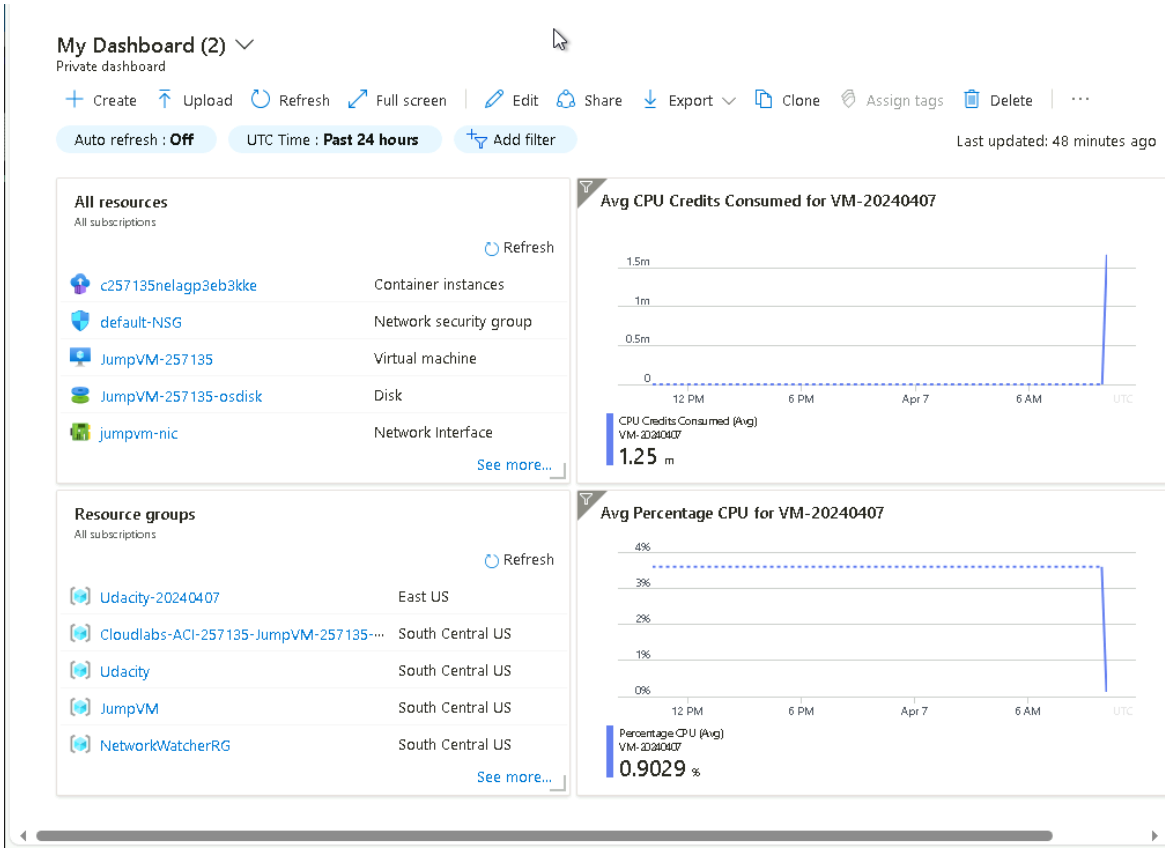


## Step 2:

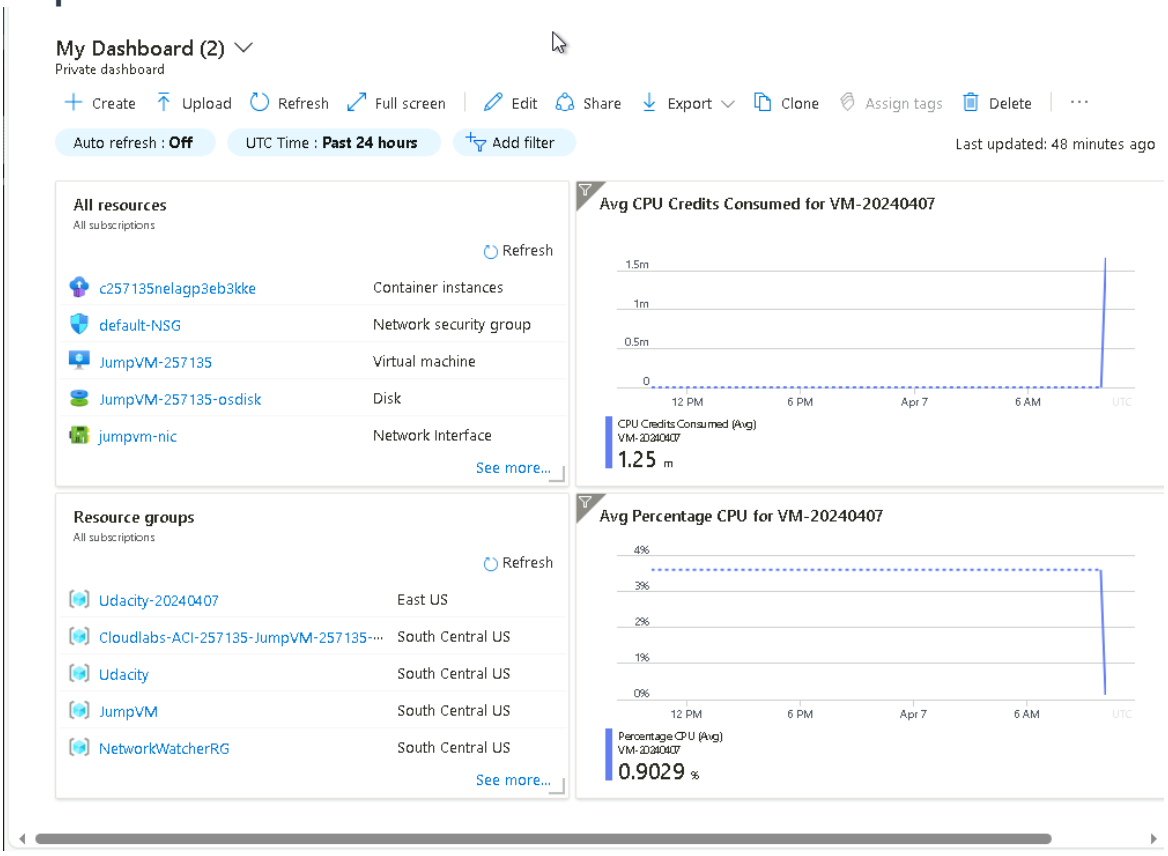

Dashboard
Metrics
Azure Monitoring
New chart
Chart Title
Add metric
Scope
VM-20240407
Select a scope
Browse
Recent
Resource types
All resource types
Locations
All locations
Search to filter items...
Scope
Resource type
Location
UdacityDS - 22
Subscription
Udacity-20240407
Resource group
loganalytics
Log Analytics workspace
East US
VM-20240407
Virtual machine
East US
VM-20240407-ip
Public IP address
East US
vm-20240407749_z1
Network interface
East US
VM-20240407_OsDisk_1_5524d11a8ad94e539827...
Disk
East US
Why can't I select multiple resources? You must select items of the same resource type and location. To select resources of a different resource type or location, please first uncheck your current selection.
Selected scopes 1 virtual machine
VM-20240407
Virtual machine
East US
Apply
Cancel
Clear all selections
Apply


Dashboard
Metrics
Azure Monitoring
New chart
Refresh
Share
Feedback
UTC Time: Last 24 hours (Automatic - 15 minutes)
Avg CPU Credits Consumed for VM-20240407
Add metric
Add filter
Apply splitting
Line chart
Drill into Logs
New alert rule
Save to dashboard
You have unsaved changes to the chart. You can save the chart back to dashboard or pin it as a new chart to the dashboard.
Scope
VM-20240407
Metric Namespace
Virtual Machine Host
Metric
CPU Credits Consumed
Aggregation
Avg
100
90
80
70
60
50
40
30
20
10
0
12 PM
6 PM
Apr 07
6 AM
UTC
CPU Credits Consumed (Avg)
VM-20240407
0

## Step 3 (Final Output):

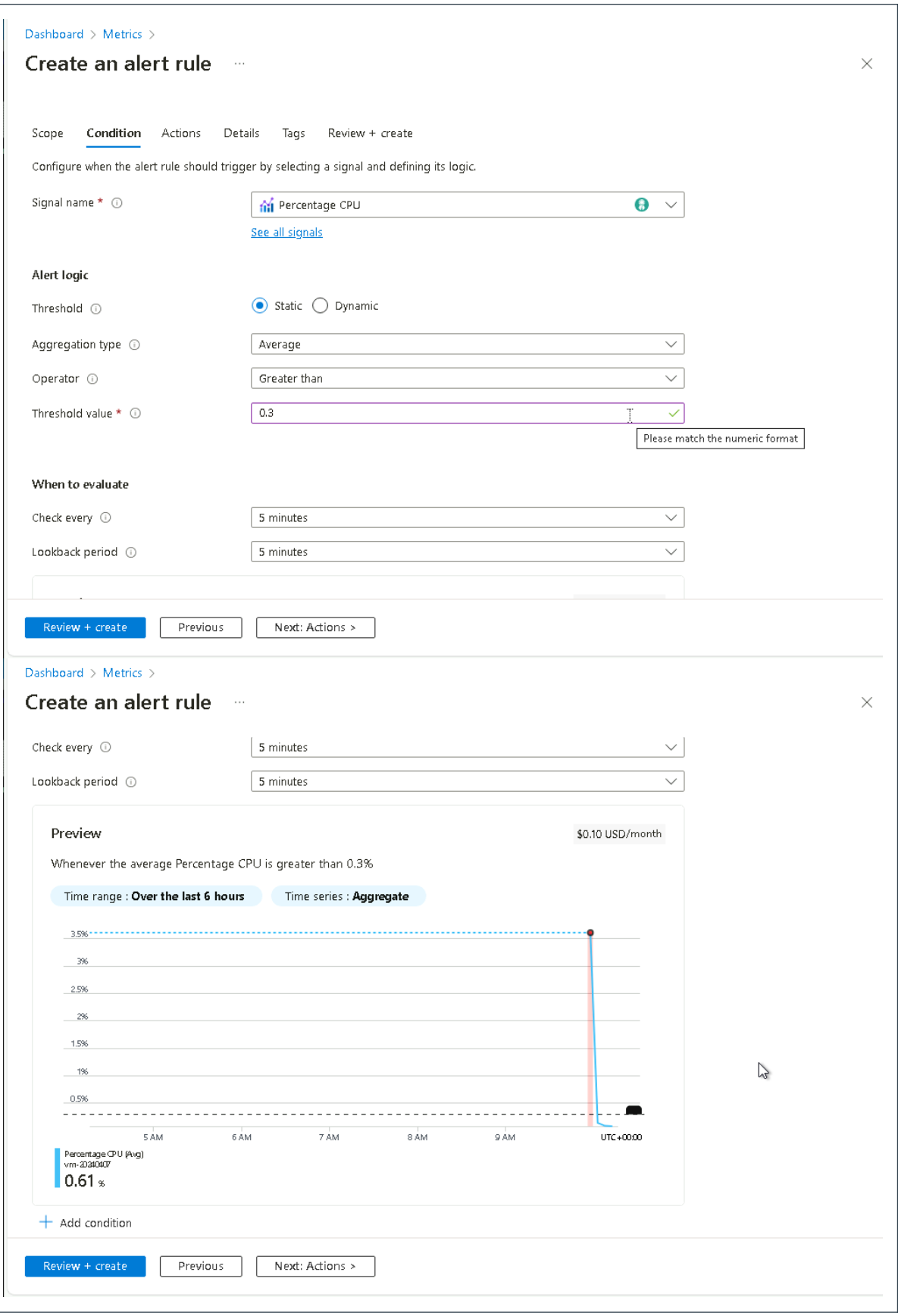


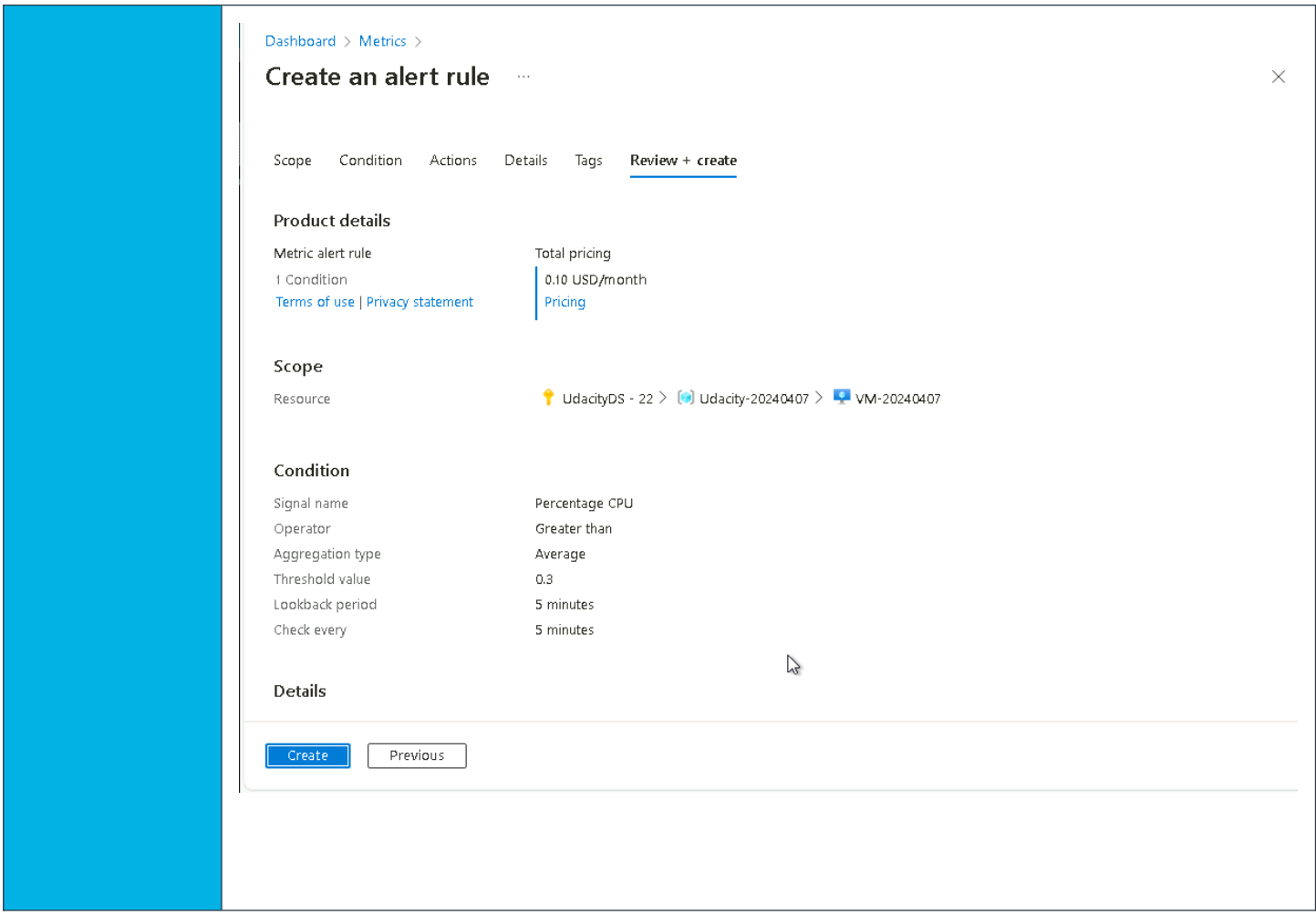
# STEP 6: Azure Monitor – Metrics

| | |
|---|---|
| **Task 1** | You need to navigate to Azure Monitor > Metrics screen and create a Percentage CPU as a metric and submit screenshot of the graph generated and pin to dashboard. |
| **Screenshots 1 through 3**<br><br>You will submit the screenshots for Monitor \| Metrics screen as you are setting up | **Step 1:**<br>  |

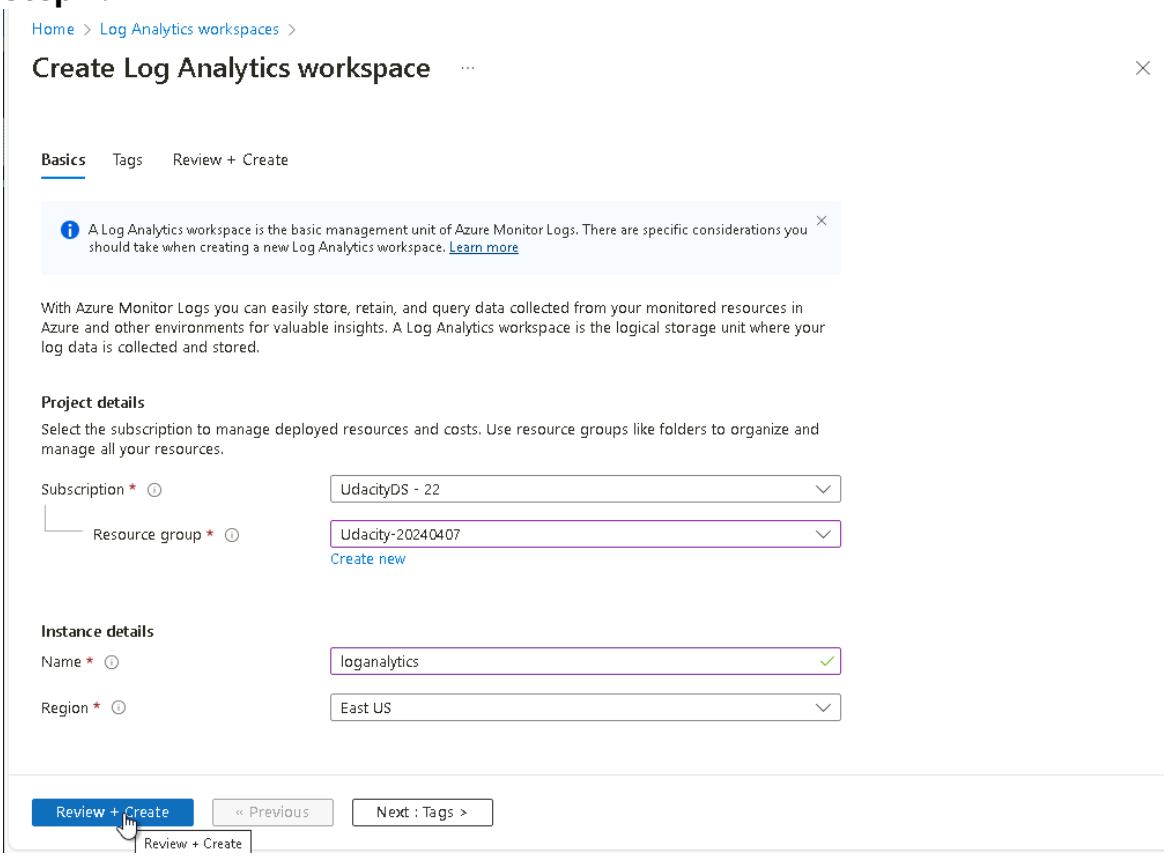
**Screenshot 4**

Now that Azure Metrics Monitor is configured, please set an alert for that metric. The alert is whenever the Avg % CPU is greater than 0.3; then the alert will be triggered.

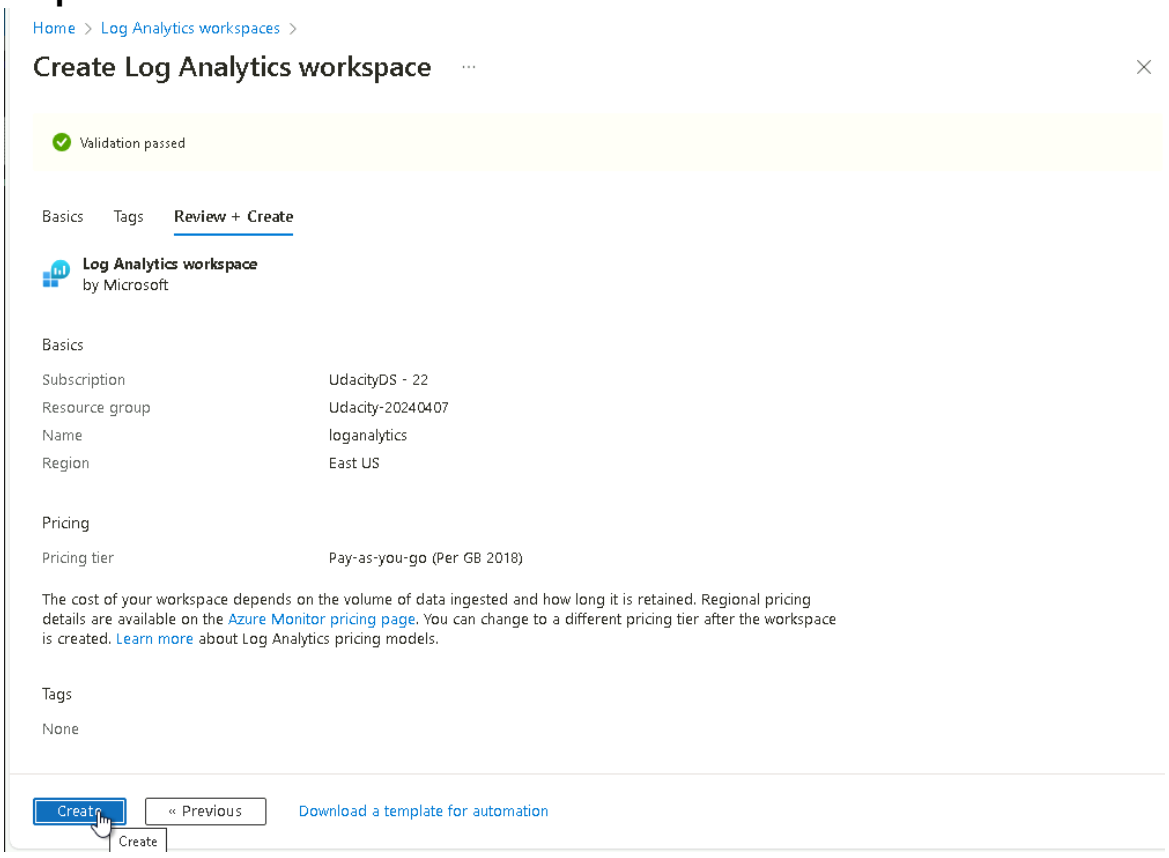



Dashboard > Metrics >
Create an alert rule
Scope
Condition
Actions
Details
Tags
Review + create
Product details
Metric alert rule
1 Condition
Terms of use | Privacy statement
Total pricing
0.10 USD/month
Pricing
Scope
Resource
UdacityDS - 22 > Udacity-20240407 > VM-20240407
Condition
Signal name
Percentage CPU
Operator
Greater than
Aggregation type
Average
Threshold value
0.3
Lookback period
5 minutes
Check every
5 minutes
Details
Create
Previous

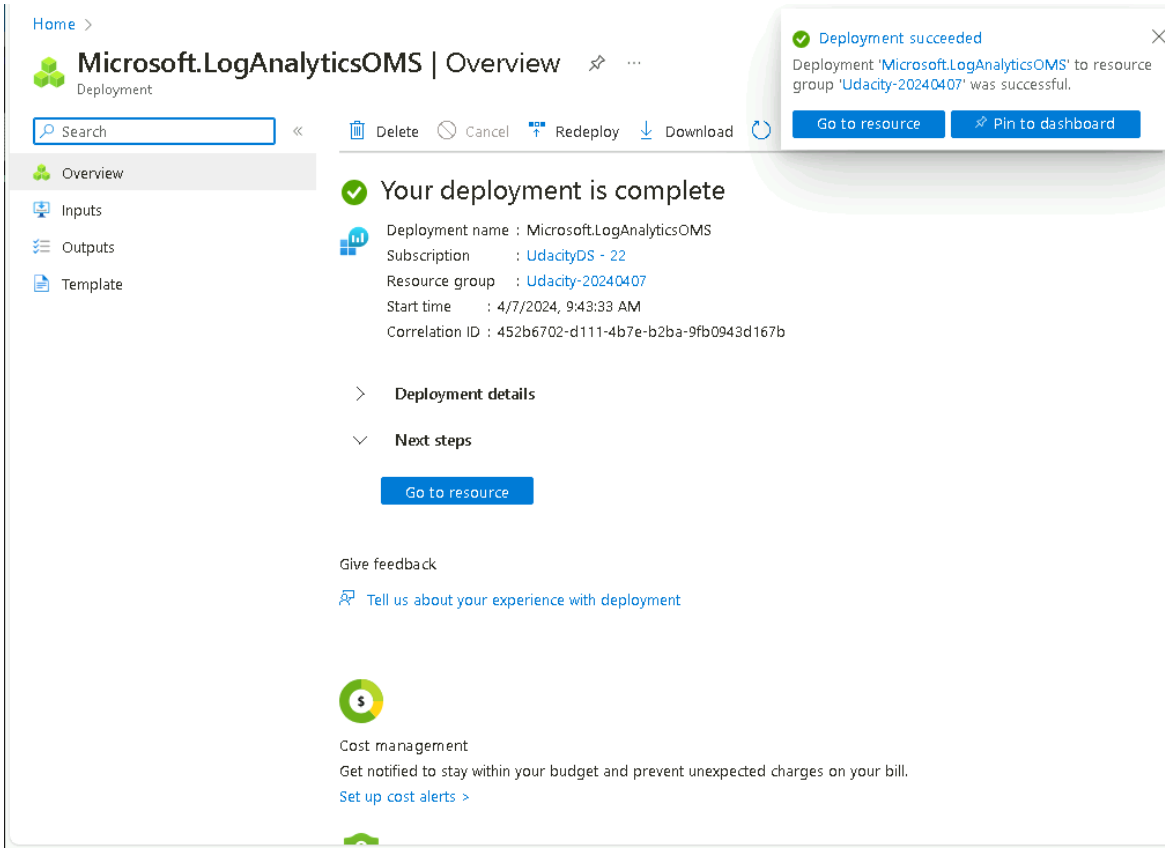
# STEP 7: Azure Monitor – Log Analytics

| | |
|---|---|
| **Task 1** | You need to create a Log Analytics workspace and submit step-by-step screenshots. |
| **Screenshots 1 through 4**<br><br>You will submit the screenshots for Log Analytics workspace creation screens. | **Step 1:**<br>  |

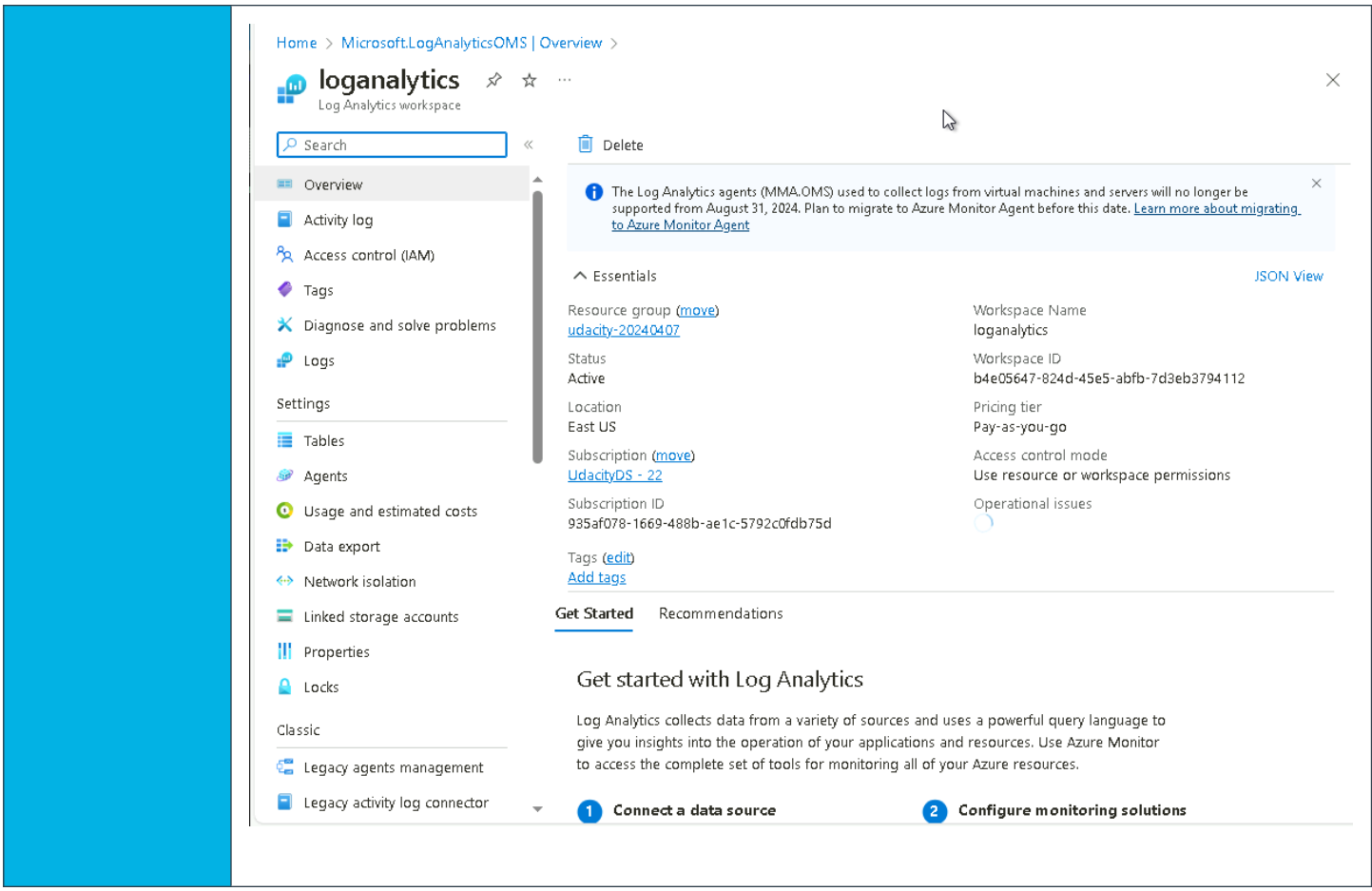
## Step 2:


Home > Log Analytics workspaces >
Create Log Analytics workspace
Validation passed
Basics
Tags
Review + Create
Log Analytics workspace
by Microsoft
Basics
Subscription
UdacityDS - 22
Resource group
Udacity-20240407
Name
loganalytics
Region
East US
Pricing
Pricing tier
Pay-as-you-go (Per GB 2018)
The cost of your workspace depends on the volume of data ingested and how long it is retained. Regional pricing details are available on the Azure Monitor pricing page. You can change to a different pricing tier after the workspace is created. Learn more about Log Analytics pricing models.
Tags
None
Create
« Previous
Download a template for automation
Create

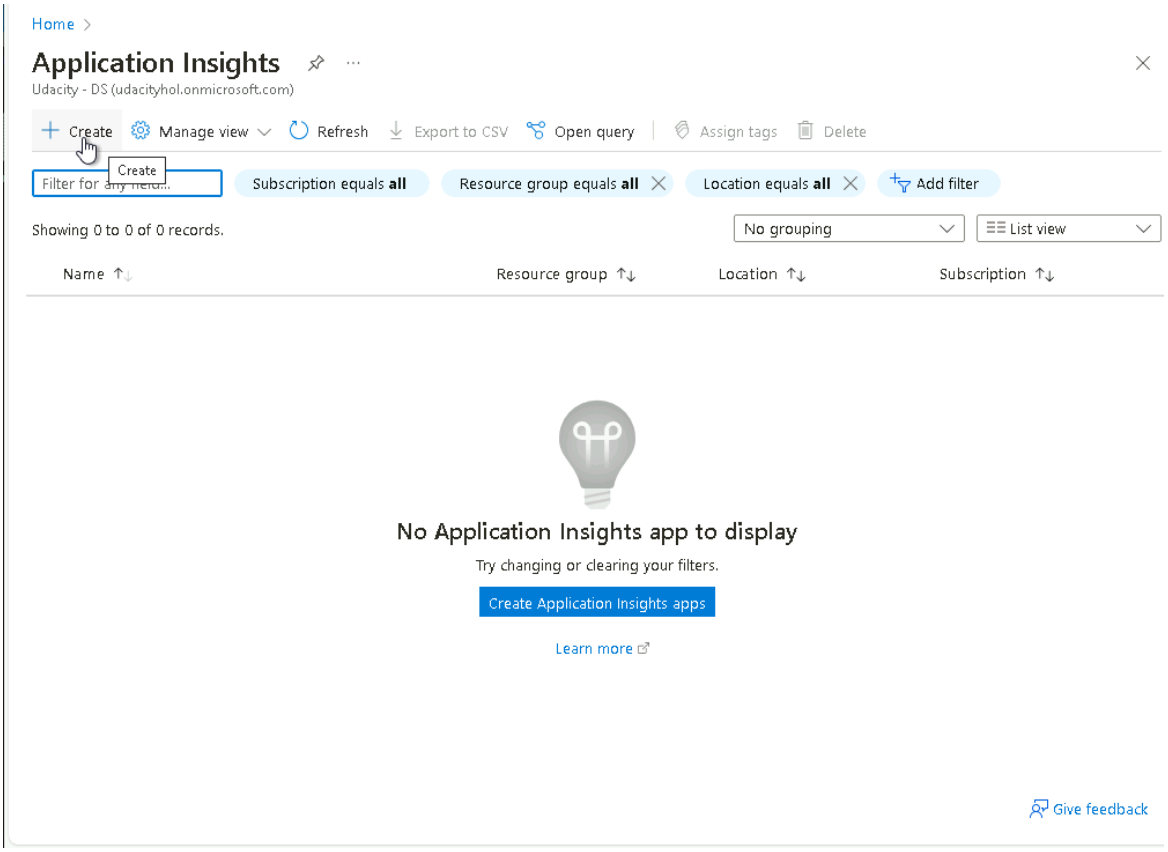
## Step 3:


Home
Microsoft.LogAnalyticsOMS | Overview
Deployment
Search
Overview
Inputs
Outputs
Template
Delete
Cancel
Redeploy
Download
Deployment succeeded
Deployment 'Microsoft.LogAnalyticsOMS' to resource group 'Udacity-20240407' was successful.
Go to resource
Pin to dashboard
Your deployment is complete
Deployment name : Microsoft.LogAnalyticsOMS
Subscription : UdacityDS - 22
Resource group : Udacity-20240407
Start time : 4/7/2024, 9:43:33 AM
Correlation ID : 452b6702-d111-4b7e-b2ba-9fb0943d167b
Deployment details
Next steps
Go to resource
Give feedback
Tell us about your experience with deployment
Cost management
Get notified to stay within your budget and prevent unexpected charges on your bill.
Set up cost alerts >

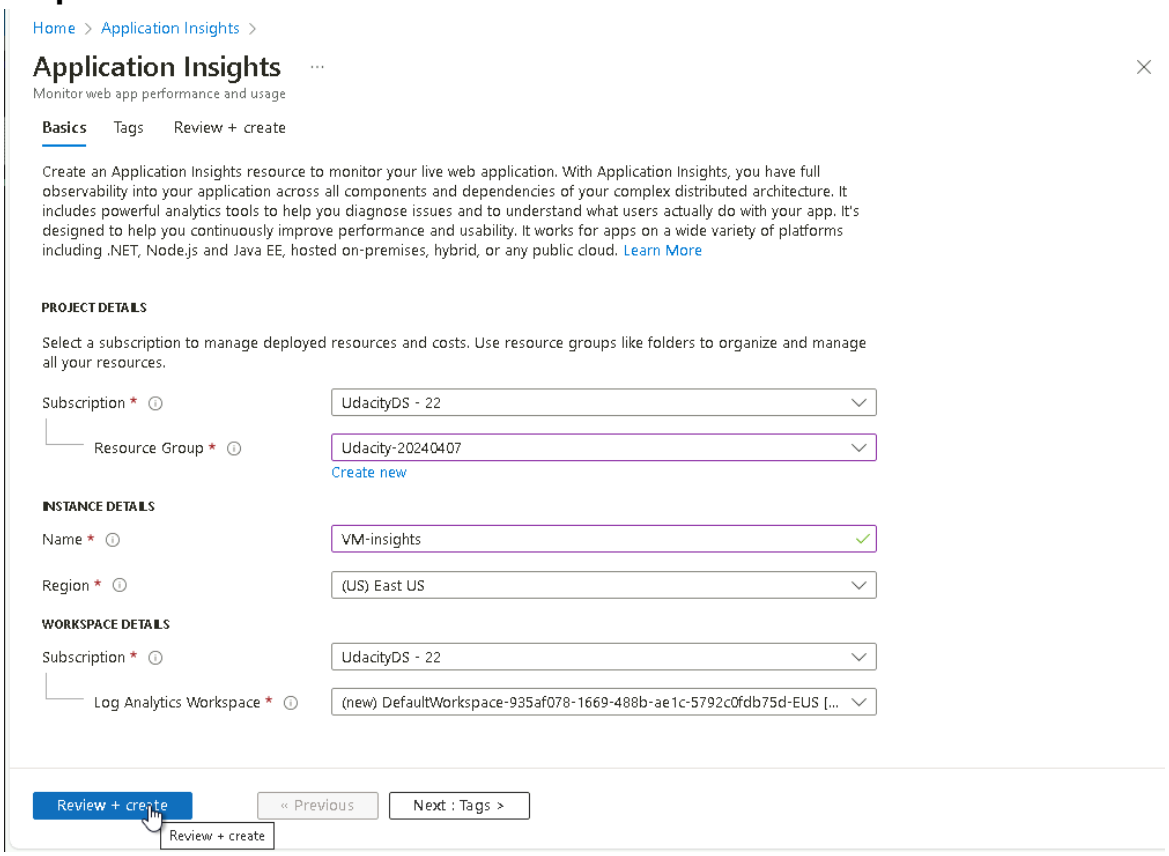
**Step 4:**


Home > Microsoft.LogAnalyticsOMS | Overview >
loganalytics
Log Analytics workspace
Search
Overview
Activity log
Access control (IAM)
Tags
Diagnose and solve problems
Logs
Settings
Tables
Agents
Usage and estimated costs
Data export
Network isolation
Linked storage accounts
Properties
Locks
Classic
Legacy agents management
Legacy activity log connector
Delete
The Log Analytics agents (MMA.OMS) used to collect logs from virtual machines and servers will no longer be supported from August 31, 2024. Plan to migrate to Azure Monitor Agent before this date. Learn more about migrating to Azure Monitor Agent
Essentials
JSON View
Resource group (move)
udacity-20240407
Status
Active
Location
East US
Subscription (move)
UdacityDS - 22
Subscription ID
935af078-1669-488b-ae1c-5792c0fdb75d
Tags (edit)
Add tags
Workspace Name
loganalytics
Workspace ID
b4e05647-824d-45e5-abfb-7d3eb3794112
Pricing tier
Pay-as-you-go
Access control mode
Use resource or workspace permissions
Operational issues
Get Started
Recommendations
Get started with Log Analytics
Log Analytics collects data from a variety of sources and uses a powerful query language to give you insights into the operation of your applications and resources. Use Azure Monitor to access the complete set of tools for monitoring all of your Azure resources.
1 Connect a data source
2 Configure monitoring solutions

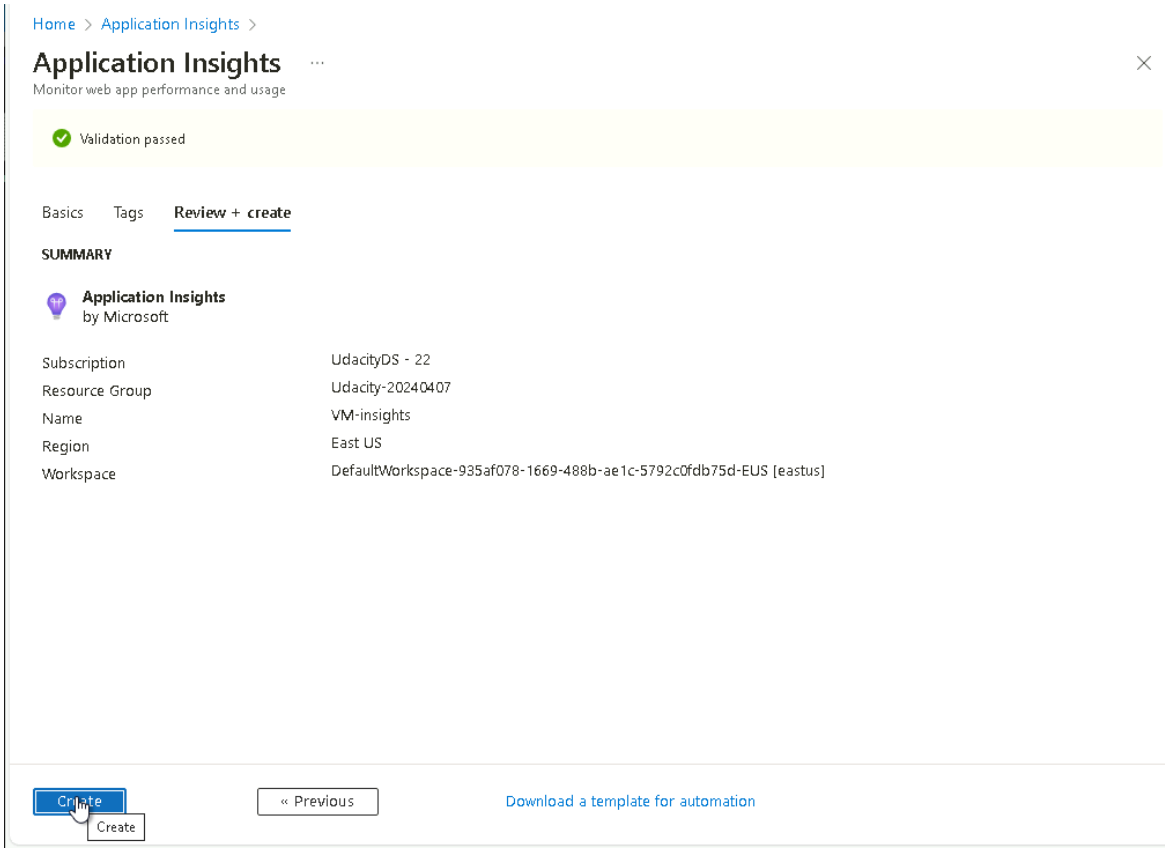
# STEP 8: Azure Insights

| | |
|---|---|
| **Background** | Azure Insights can only be created once you have the Log Analytics workspace completed. |
| **Screenshots 1 through 6**<br><br>You will submit the screenshots for the Monitor \| Metrics screen as you are setting up. | **Step 1:**<br>  |

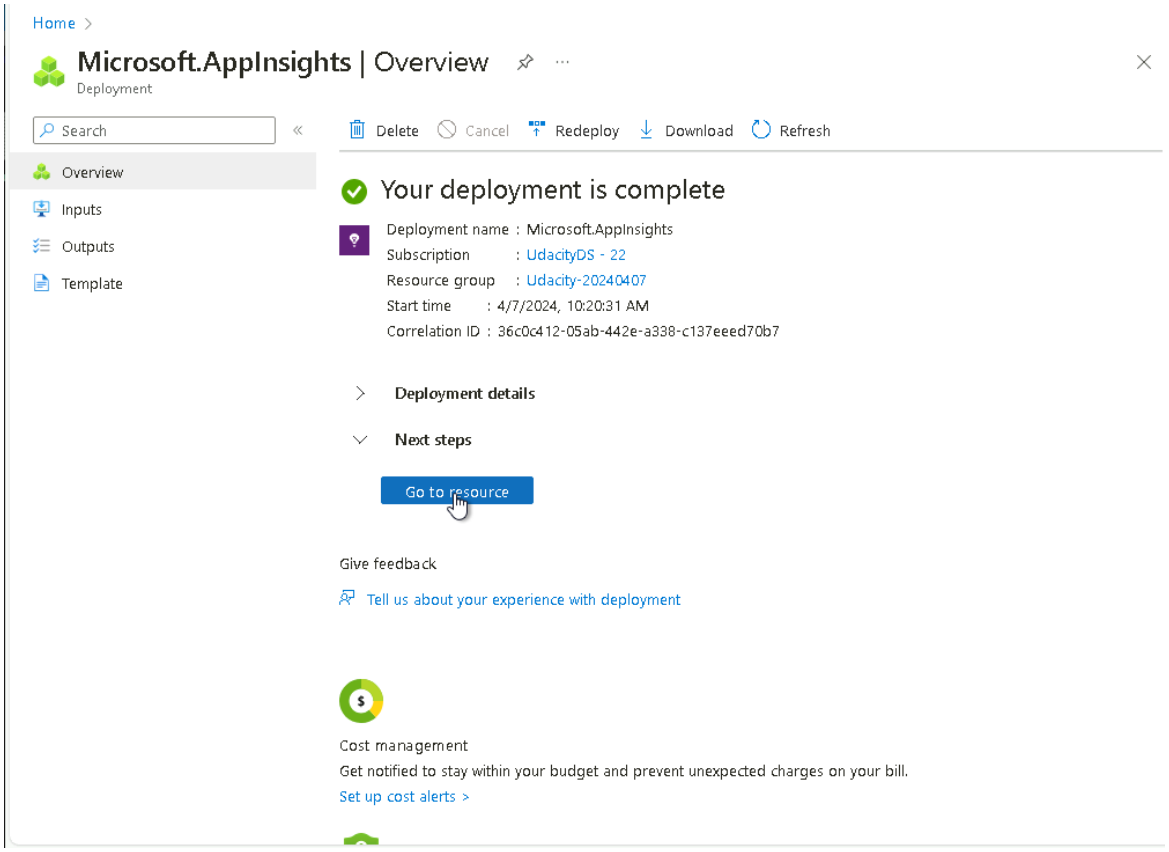
## Step 2:


Home > Application Insights >
Application Insights
Monitor web app performance and usage
Basics
Tags
Review + create
Create an Application Insights resource to monitor your live web application. With Application Insights, you have full observability into your application across all components and dependencies of your complex distributed architecture. It includes powerful analytics tools to help you diagnose issues and to understand what users actually do with your app. It's designed to help you continuously improve performance and usability. It works for apps on a wide variety of platforms including .NET, Node.js and Java EE, hosted on-premises, hybrid, or any public cloud. Learn More
PROJECT DETAILS
Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.
Subscription *
UdacityDS - 22
Resource Group *
Udacity-20240407
Create new
INSTANCE DETAILS
Name *
VM-insights
Region *
(US) East US
WORKSPACE DETAILS
Subscription *
UdacityDS - 22
Log Analytics Workspace *
(new) DefaultWorkspace-935af078-1669-488b-ae1c-5792c0fdb75d-EUS [...
Review + create
« Previous
Next : Tags >
Review + create

## Step 3:


Home > Application Insights >
Application Insights
Monitor web app performance and usage
Validation passed
Basics
Tags
Review + create
SUMMARY
Application Insights
by Microsoft
Subscription
UdacityDS - 22
Resource Group
Udacity-20240407
Name
VM-insights
Region
East US
Workspace
DefaultWorkspace-935af078-1669-488b-ae1c-5792c0fdb75d-EUS [eastus]
Create
Create
« Previous
Download a template for automation

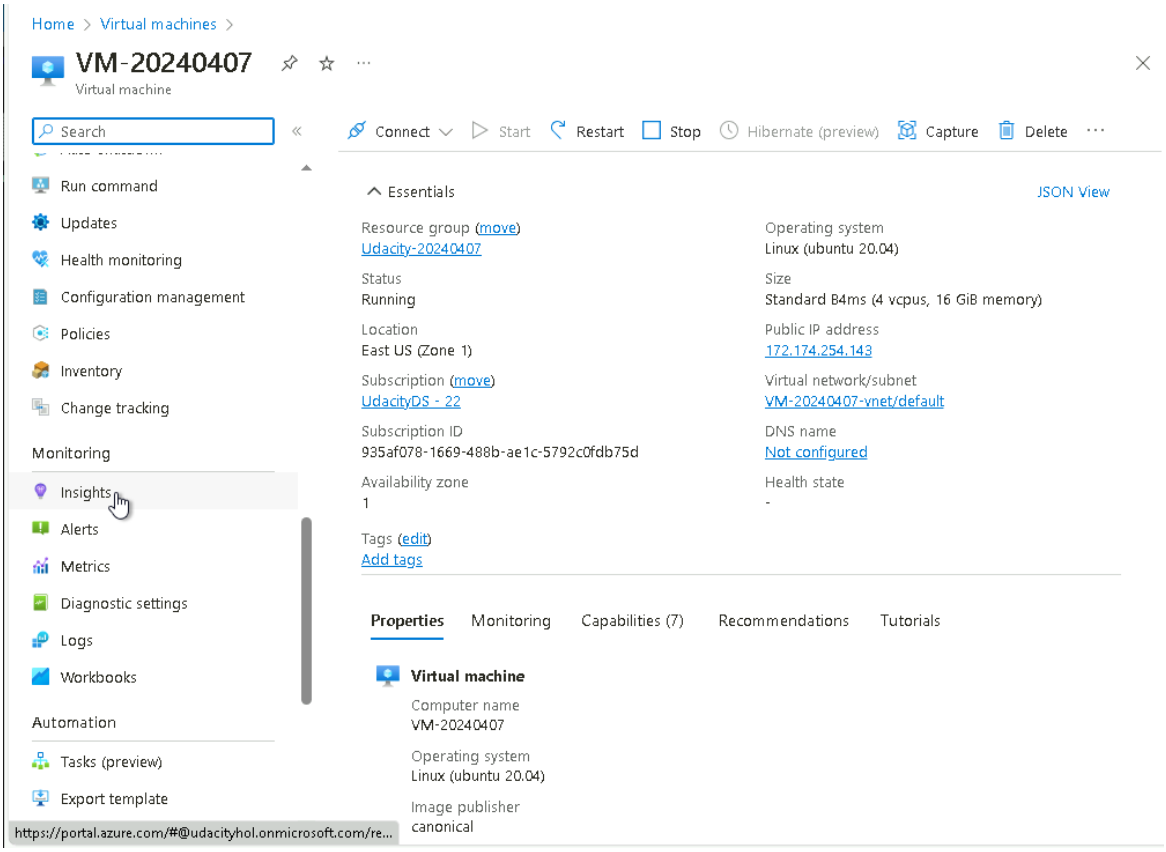
## Step 4: Click “Go to resource”



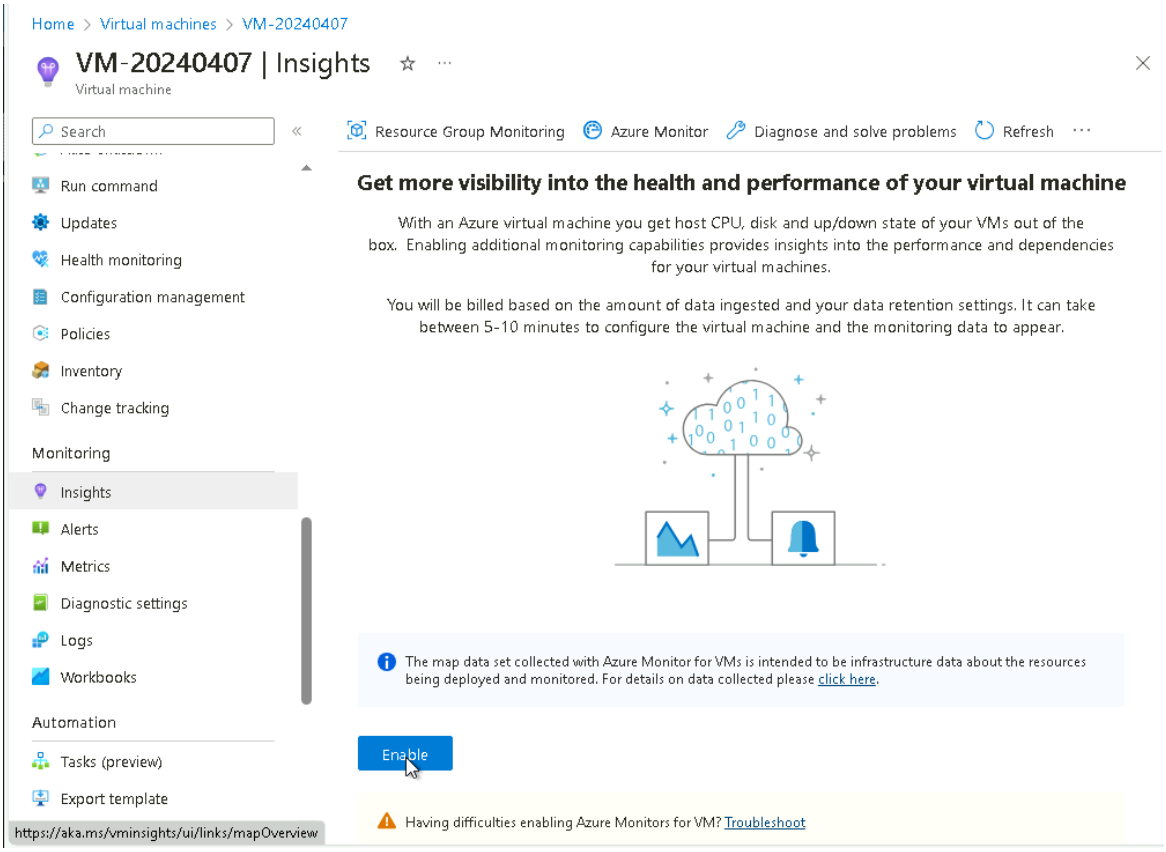
**Screenshots 7 through 12**

**You will submit screenshots of you enabling the VM.**

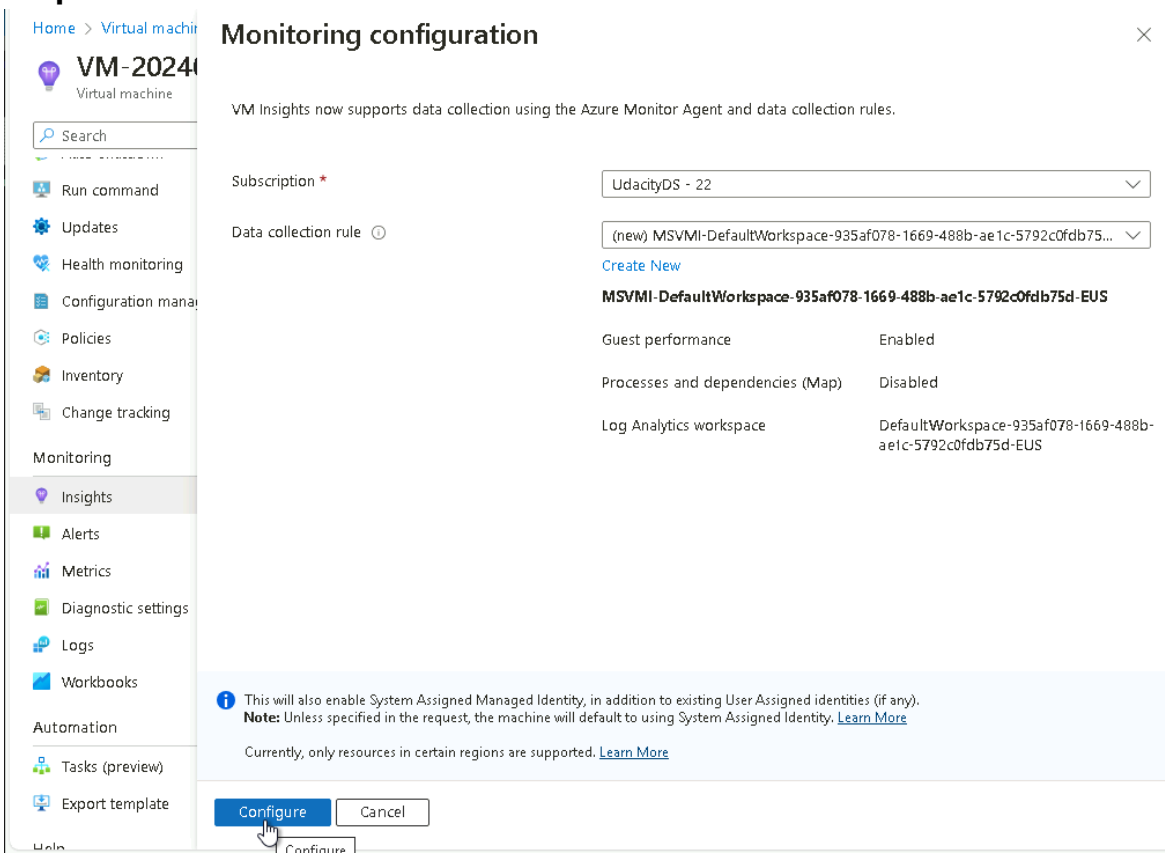
## Step 7:



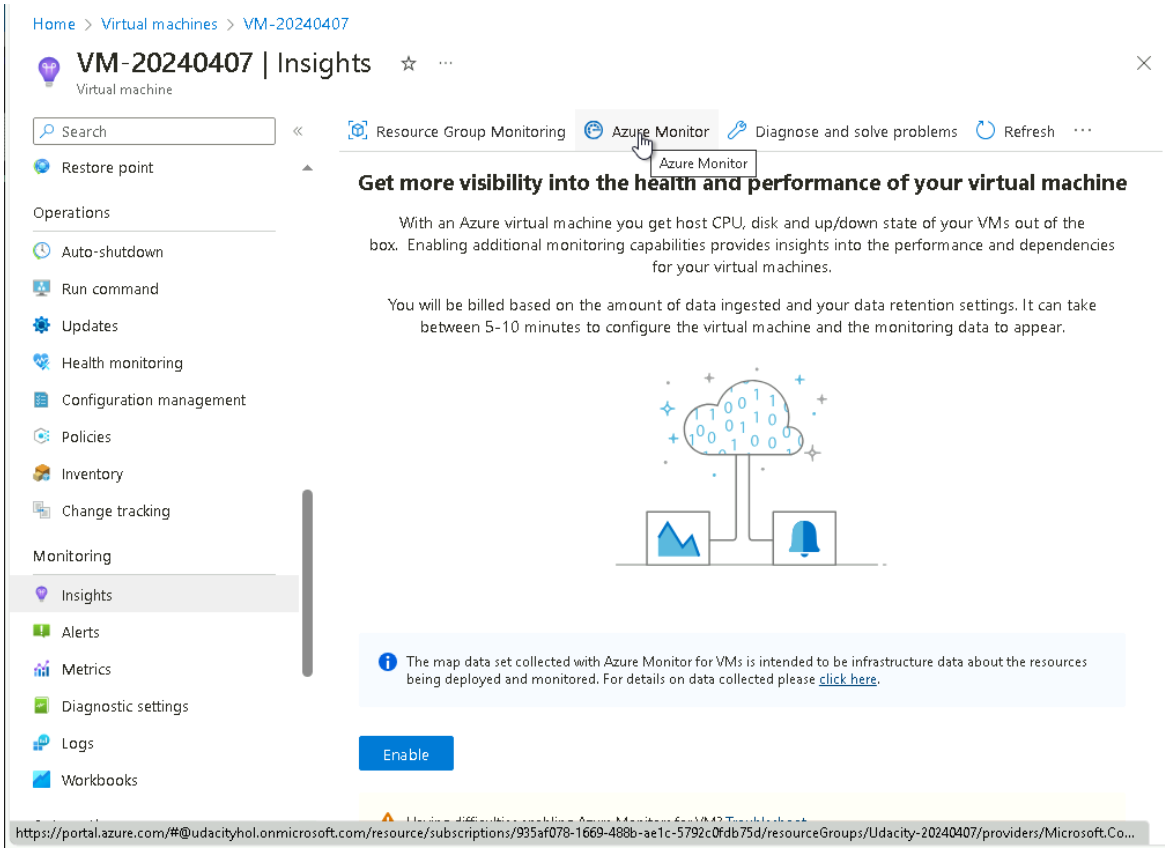
## Step 8:


Home > Virtual machines > VM-20240407
VM-20240407 | Insights
Virtual machine
Search
Resource Group Monitoring
Azure Monitor
Diagnose and solve problems
Refresh
Run command
Updates
Health monitoring
Configuration management
Policies
Inventory
Change tracking
Monitoring
Insights
Alerts
Metrics
Diagnostic settings
Logs
Workbooks
Automation
Tasks (preview)
Export template
https://aka.ms/vminsights/ui/links/mapOverview
Get more visibility into the health and performance of your virtual machine
With an Azure virtual machine you get host CPU, disk and up/down state of your VMs out of the box. Enabling additional monitoring capabilities provides insights into the performance and dependencies for your virtual machines.
You will be billed based on the amount of data ingested and your data retention settings. It can take between 5-10 minutes to configure the virtual machine and the monitoring data to appear.
The map data set collected with Azure Monitor for VMs is intended to be infrastructure data about the resources being deployed and monitored. For details on data collected please click here.
Enable
Having difficulties enabling Azure Monitors for VM? Troubleshoot

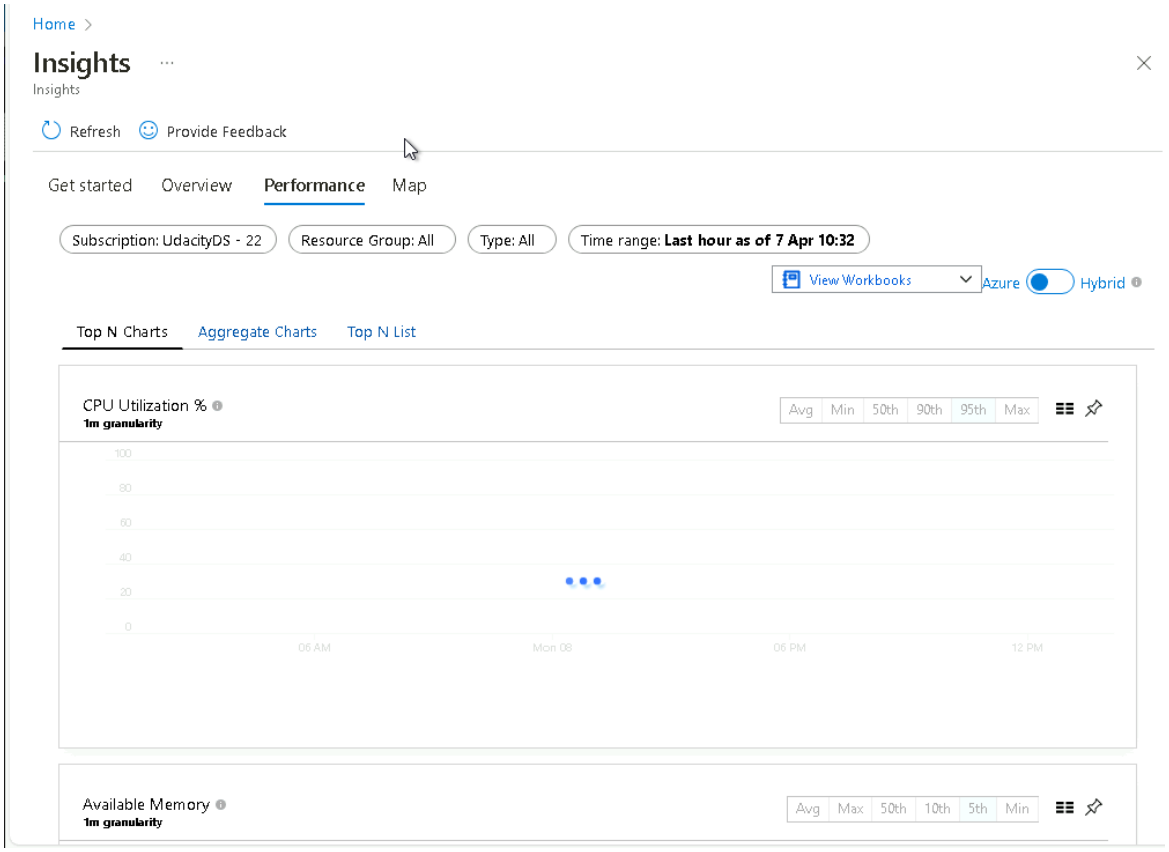
## Step 9:


Home > Virtual machi
VM-2024
Virtual machine
Search
Run command
Updates
Health monitoring
Configuration mana
Policies
Inventory
Change tracking
Monitoring
Insights
Alerts
Metrics
Diagnostic settings
Logs
Workbooks
Automation
Tasks (preview)
Export template
Help
Monitoring configuration
VM Insights now supports data collection using the Azure Monitor Agent and data collection rules.
Subscription *
UdacityDS - 22
Data collection rule
(new) MSVMI-DefaultWorkspace-935af078-1669-488b-ae1c-5792c0fdb75...
Create New
MSVMI-DefaultWorkspace-935af078-1669-488b-ae1c-5792c0fdb75d-EUS
Guest performance
Enabled
Processes and dependencies (Map)
Disabled
Log Analytics workspace
DefaultWorkspace-935af078-1669-488b-ae1c-5792c0fdb75d-EUS
This will also enable System Assigned Managed Identity, in addition to existing User Assigned identities (if any).
Note: Unless specified in the request, the machine will default to using System Assigned Identity. Learn More
Currently, only resources in certain regions are supported. Learn More
Configure
Cancel
Configure

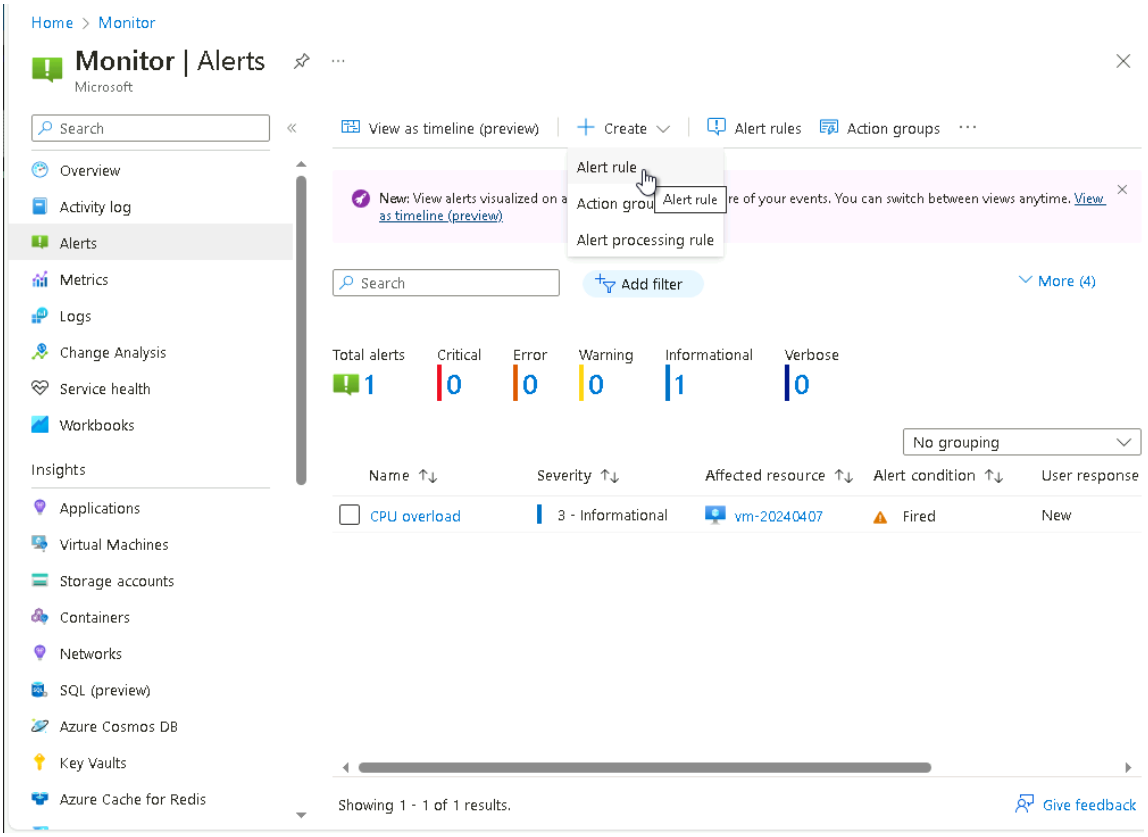
## Step 10:


Home > Virtual machines > VM-20240407
VM-20240407 | Insights
Virtual machine
Search
Restore point
Operations
Auto-shutdown
Run command
Updates
Health monitoring
Configuration management
Policies
Inventory
Change tracking
Monitoring
Insights
Alerts
Metrics
Diagnostic settings
Logs
Workbooks
Resource Group Monitoring
Azure Monitor
Diagnose and solve problems
Refresh
Azure Monitor
Get more visibility into the health and performance of your virtual machine
With an Azure virtual machine you get host CPU, disk and up/down state of your VMs out of the box. Enabling additional monitoring capabilities provides insights into the performance and dependencies for your virtual machines.
You will be billed based on the amount of data ingested and your data retention settings. It can take between 5-10 minutes to configure the virtual machine and the monitoring data to appear.
The map data set collected with Azure Monitor for VMs is intended to be infrastructure data about the resources being deployed and monitored. For details on data collected please click here.
Enable
https://portal.azure.com/#@udacityhol.onmicrosoft.com/resource/subscriptions/935af078-1669-488b-ae1c-5792c0fdb75d/resourceGroups/Udacity-20240407/providers/Microsoft.Co...

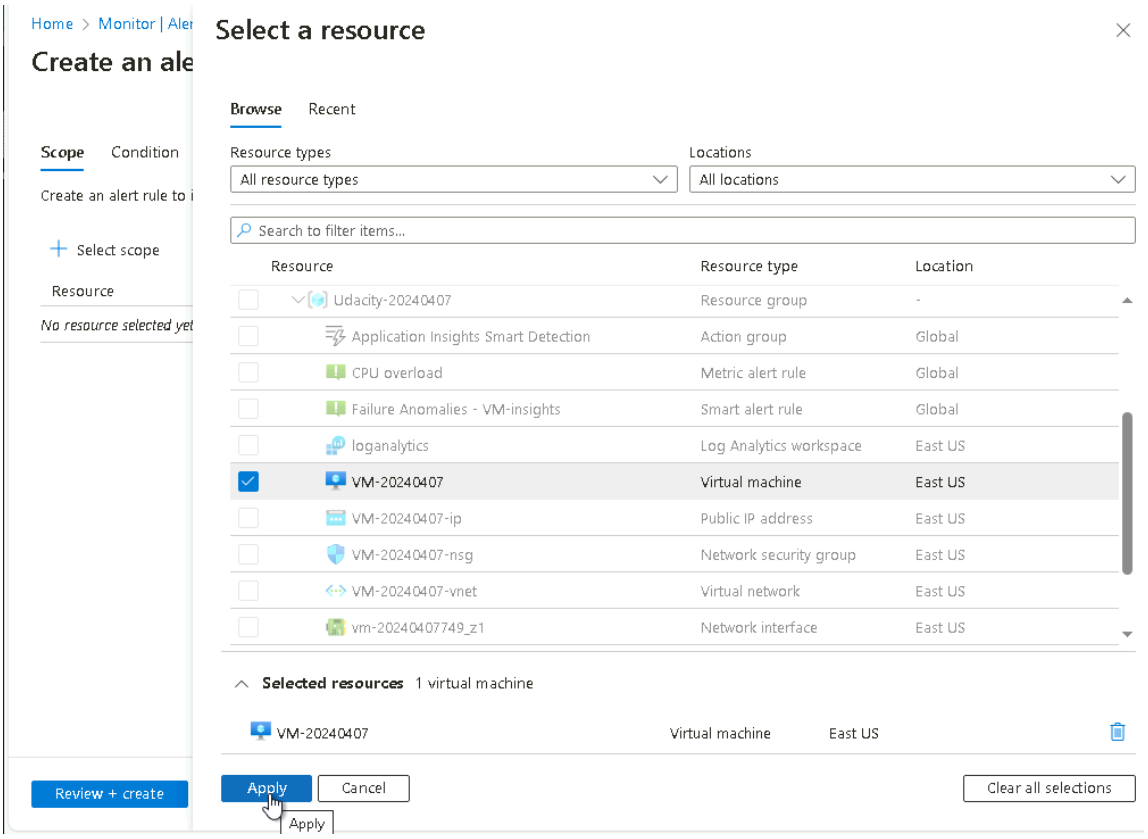
## Step 11:


Home
Insights
Insights
Refresh
Provide Feedback
Get started
Overview
Performance
Map
Subscription: UdacityDS - 22
Resource Group: All
Type: All
Time range: Last hour as of 7 Apr 10:32
View Workbooks
Azure
Hybrid
Top N Charts
Aggregate Charts
Top N List
CPU Utilization %
1m granularity
Avg
Min
50th
90th
95th
Max
100
80
60
40
20
0
06 AM
Mon 08
06 PM
12 PM
Available Memory
1m granularity
Avg
Max
50th
10th
5th
Min

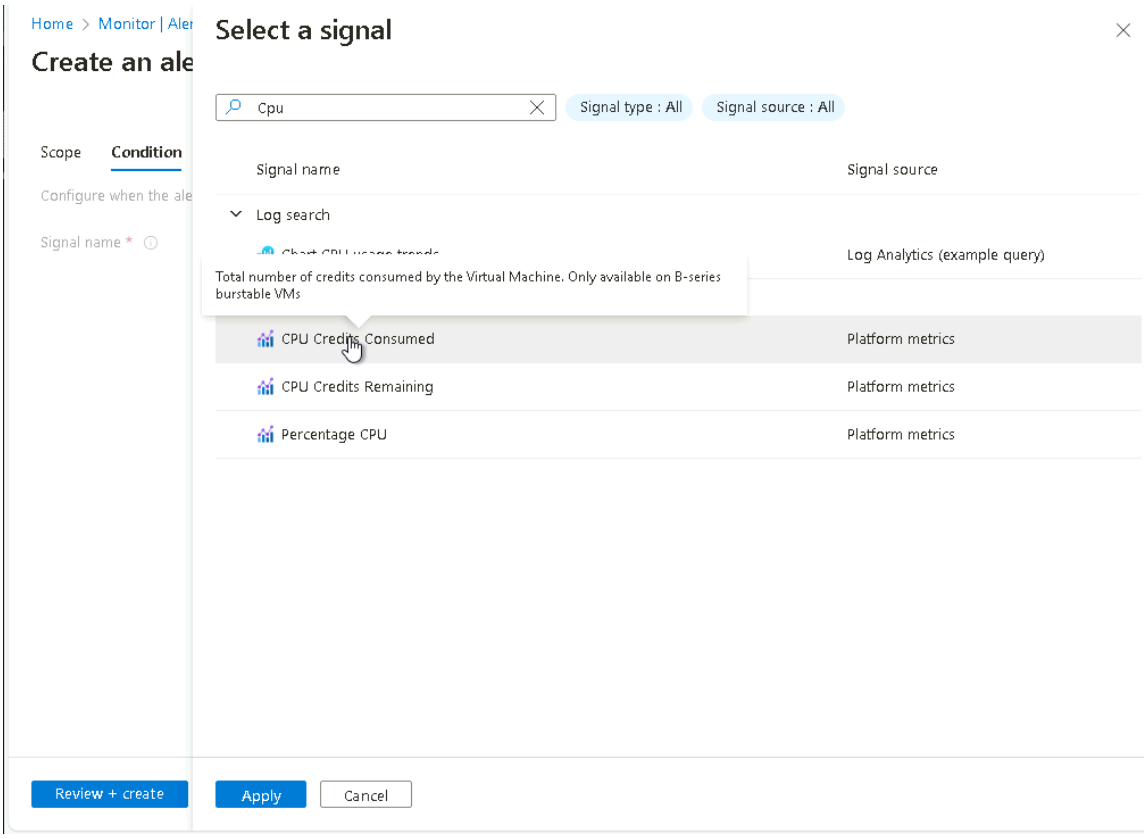
# STEP 9: Azure Monitor – Smart Alerts

| | |
|---|---|
| **Task 1** | Navigate to Setup Alert & Actions under Azure Monitor >Overview.<br><br>The condition name should be CPU units consumed and its value should be greater than 0.3. |
| **Screenshots 1 through 8**<br><br>You will submit step-by-step screenshots for creating a Setup Alert & Actions. | **Step 1:**<br>  |

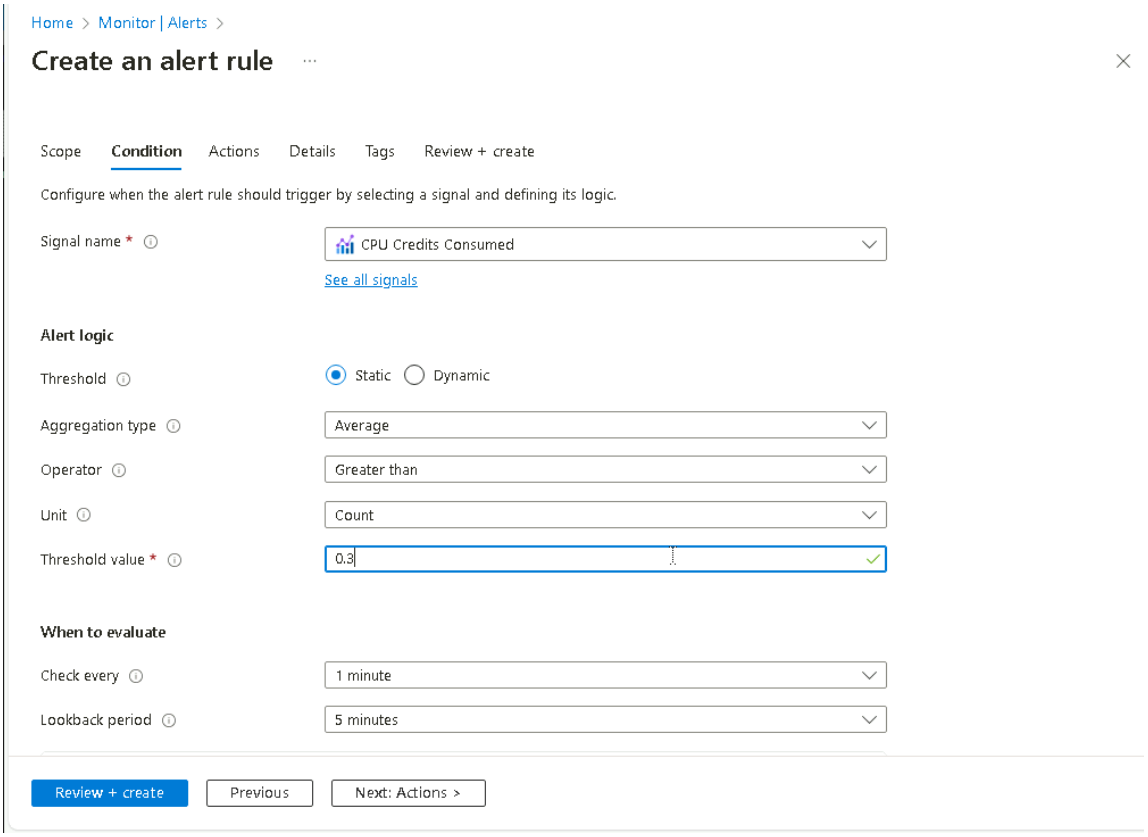
## Step 2:


Home > Monitor | Aler
Create an ale
Scope
Condition
Create an alert rule to i
Select scope
Resource
No resource selected yet
Review + create
Select a resource
Browse
Recent
Resource types
All resource types
Locations
All locations
Search to filter items...
Resource
Resource type
Location
Udacity-20240407
Resource group
-
Application Insights Smart Detection
Action group
Global
CPU overload
Metric alert rule
Global
Failure Anomalies - VM-insights
Smart alert rule
Global
loganalytics
Log Analytics workspace
East US
VM-20240407
Virtual machine
East US
VM-20240407-ip
Public IP address
East US
VM-20240407-nsg
Network security group
East US
VM-20240407-vnet
Virtual network
East US
vm-20240407749_z1
Network interface
East US
Selected resources 1 virtual machine
VM-20240407
Virtual machine
East US
Apply
Cancel
Clear all selections
Apply

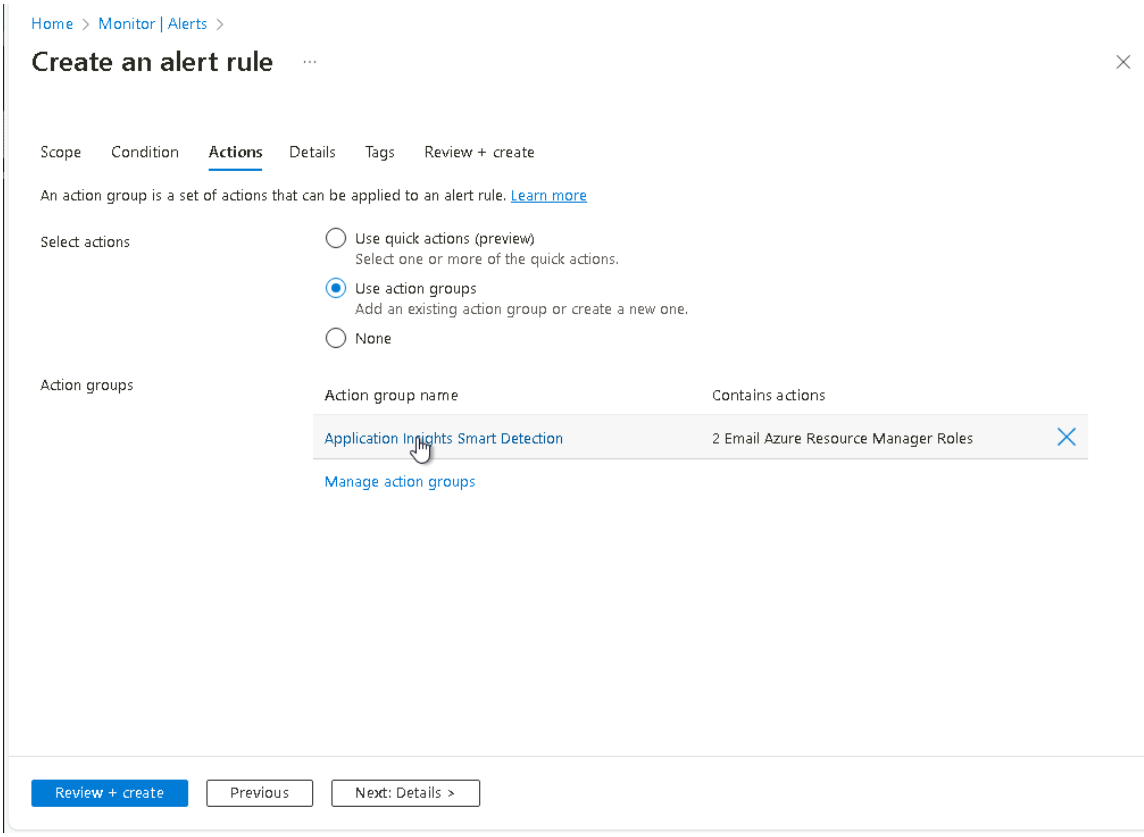
## Step 3:


Home > Monitor | Aler
Create an ale
Scope
Condition
Configure when the ale
Signal name *
Select a signal
Cpu
Signal type : All
Signal source : All
Signal name
Signal source
Log search
Log Analytics (example query)
Total number of credits consumed by the Virtual Machine. Only available on B-series burstable VMs
CPU Credits Consumed
Platform metrics
CPU Credits Remaining
Platform metrics
Percentage CPU
Platform metrics
Review + create
Apply
Cancel

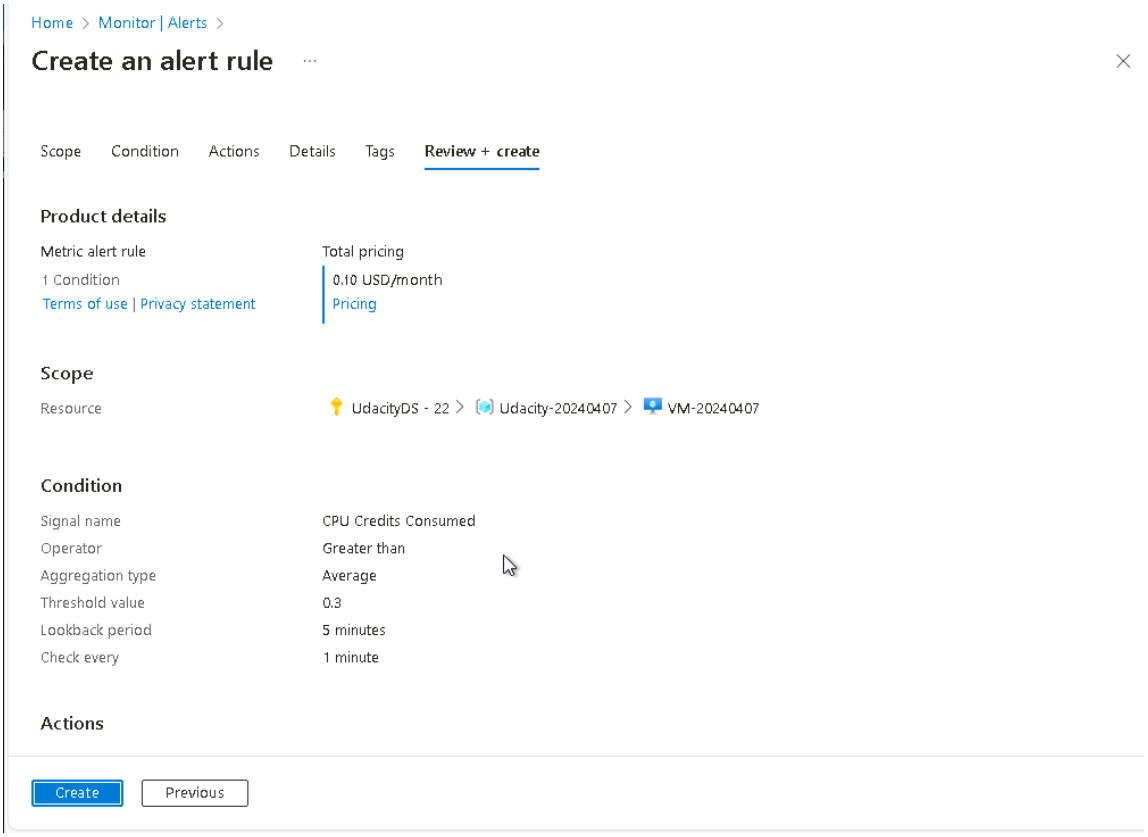
## Step 4:


Home > Monitor | Alerts >
Create an alert rule
Scope
Condition
Actions
Details
Tags
Review + create
Configure when the alert rule should trigger by selecting a signal and defining its logic.
Signal name *
CPU Credits Consumed
See all signals
Alert logic
Threshold
Static
Dynamic
Aggregation type
Average
Operator
Greater than
Unit
Count
Threshold value *
0.3
When to evaluate
Check every
1 minute
Lookback period
5 minutes
Review + create
Previous
Next: Actions >

## Step 5:


Home > Monitor | Alerts >
Create an alert rule
Scope
Condition
Actions
Details
Tags
Review + create
An action group is a set of actions that can be applied to an alert rule. Learn more
Select actions
Use quick actions (preview)
Select one or more of the quick actions.
Use action groups
Add an existing action group or create a new one.
None
Action groups
Action group name
Contains actions
Application Insights Smart Detection
2 Email Azure Resource Manager Roles
Manage action groups
Review + create
Previous
Next: Details >

**Step 6 (Summary after above steps):**



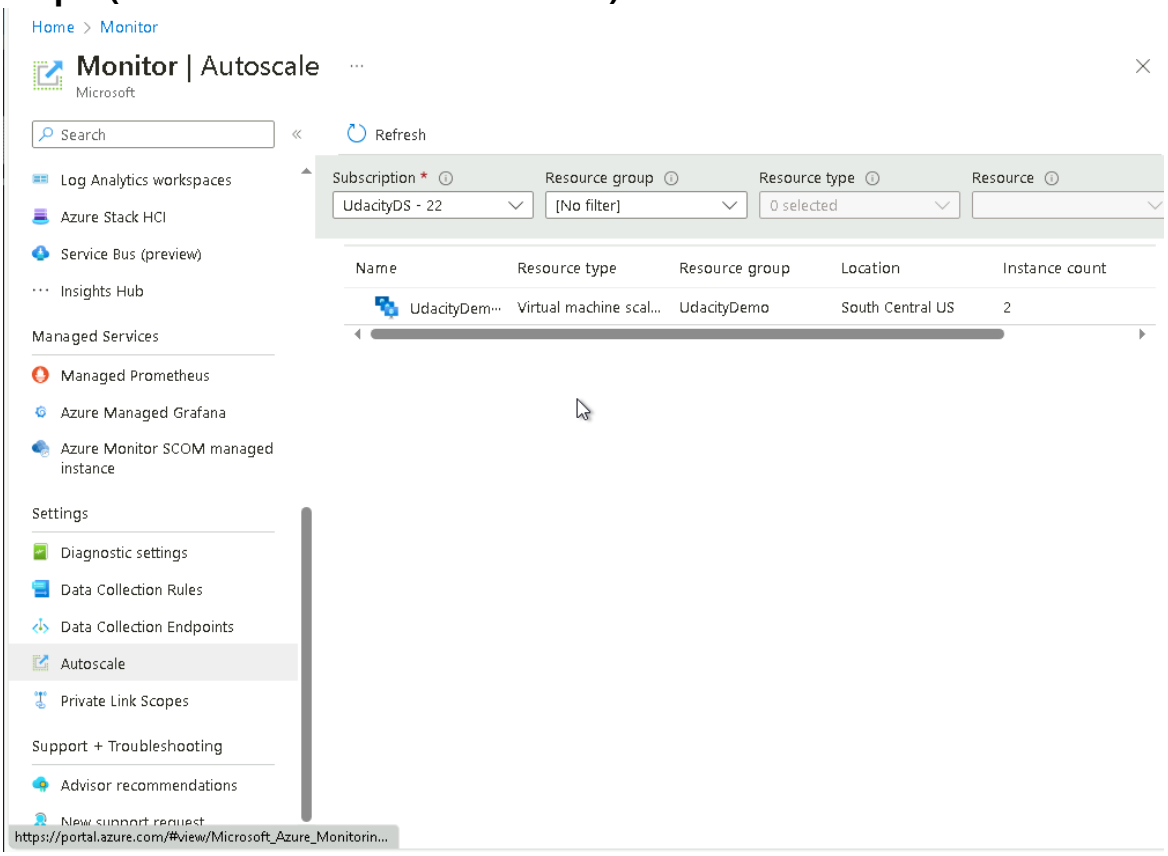

**Step 7 (Screenshot post-creation of the alert):**

**Step 8 (If you had any alerts, they would be submitted here):**

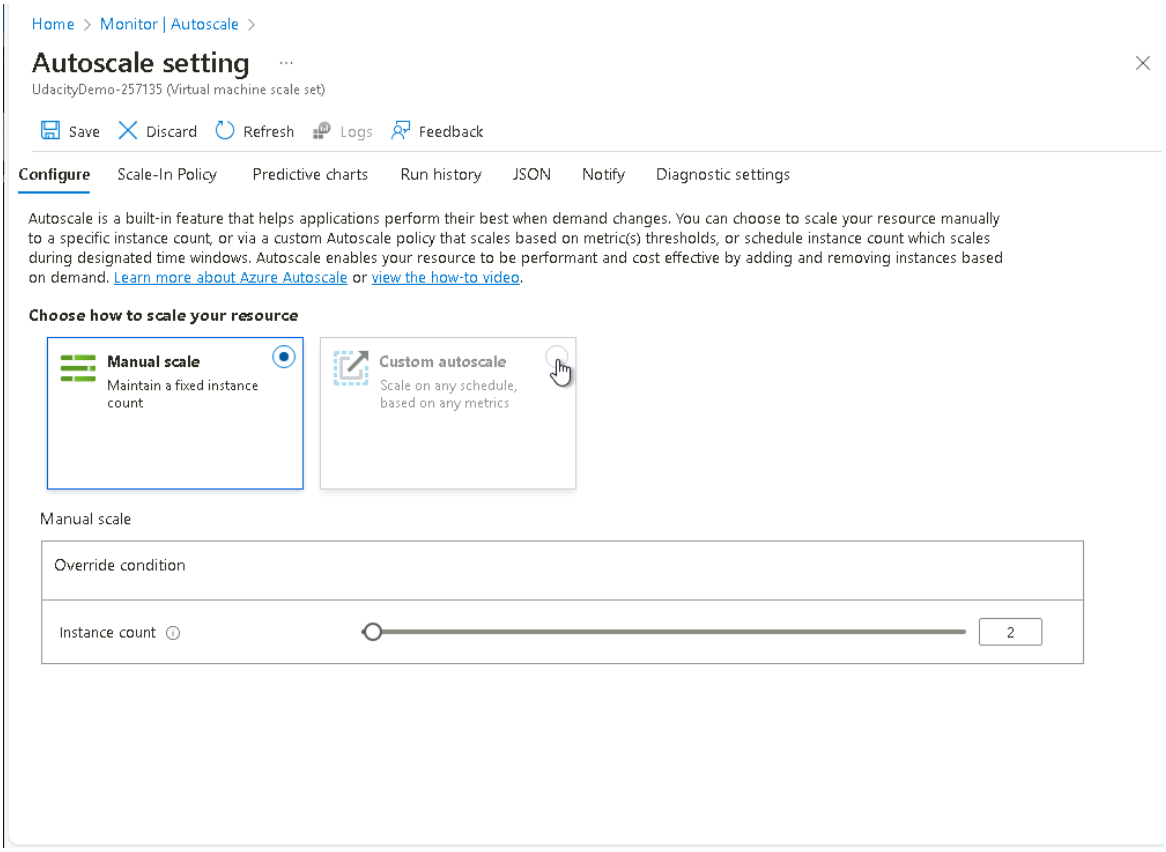
| | |
|---|---|
| **Explanation 1**<br><br>Explain the | Azure Dashboards, Azure Monitor, and alerts are important tools in Azure that help monitor and manage your resources effectively. Let's break down each of these tools and understand their purpose: |

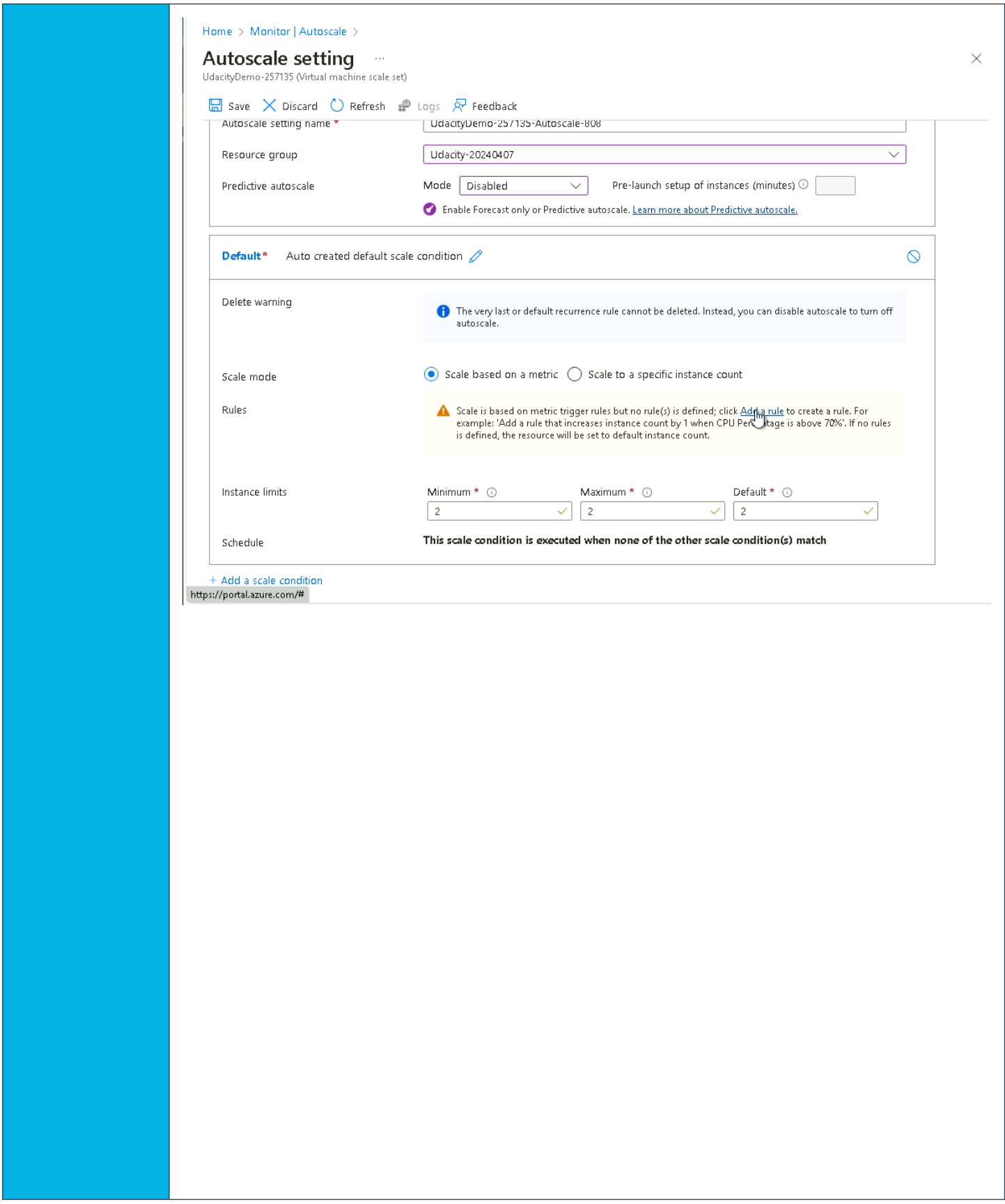
| | |
|---|---|
| purpose of Azure Dashboards, Azure Monitor and alerts | Azure Dashboards: Azure Dashboards allow you to create customized dashboards to monitor and visualize the performance and health of your Azure resources in a single view. You can add various widgets to the dashboard, such as charts, graphs, and metrics, to track the important metrics and key performance indicators (KPIs) of your resources. With Azure Dashboards, you can have a centralized view of your resources' status, which helps in monitoring and troubleshooting.<br><br>Azure Monitor: Azure Monitor is a comprehensive monitoring solution that provides insights into the performance and availability of your applications and resources in Azure. It collects data from various sources, such as Azure resources, operating systems, and custom applications, and provides a unified view of the health and performance of your entire environment. Azure Monitor helps you identify and diagnose issues, optimize resource utilization, and ensure the overall reliability of your applications.<br><br>Alerts: Azure Monitor Alerts allow you to set up proactive notifications based on specific conditions or thresholds. You can define alert rules to monitor metrics, logs, or events and trigger actions when the conditions are met. For example, you can set up an alert to notify you when the CPU usage of a virtual machine exceeds a certain threshold. Alerts can be configured to send notifications via email, SMS, or even trigger automated actions like running a script or scaling resources. By using alerts, you can stay informed about critical events and take timely actions to resolve issues.<br><br>In summary, Azure Dashboards provide a centralized view of your resources, Azure Monitor helps monitor and diagnose the performance of your applications and resources, and alerts enable proactive notifications and actions based on specific conditions. These tools work together to ensure effective monitoring, troubleshooting, and optimization of your Azure environment. |

# STEP 10: Autoscale In-Out Based on Number of Users per CPU Core

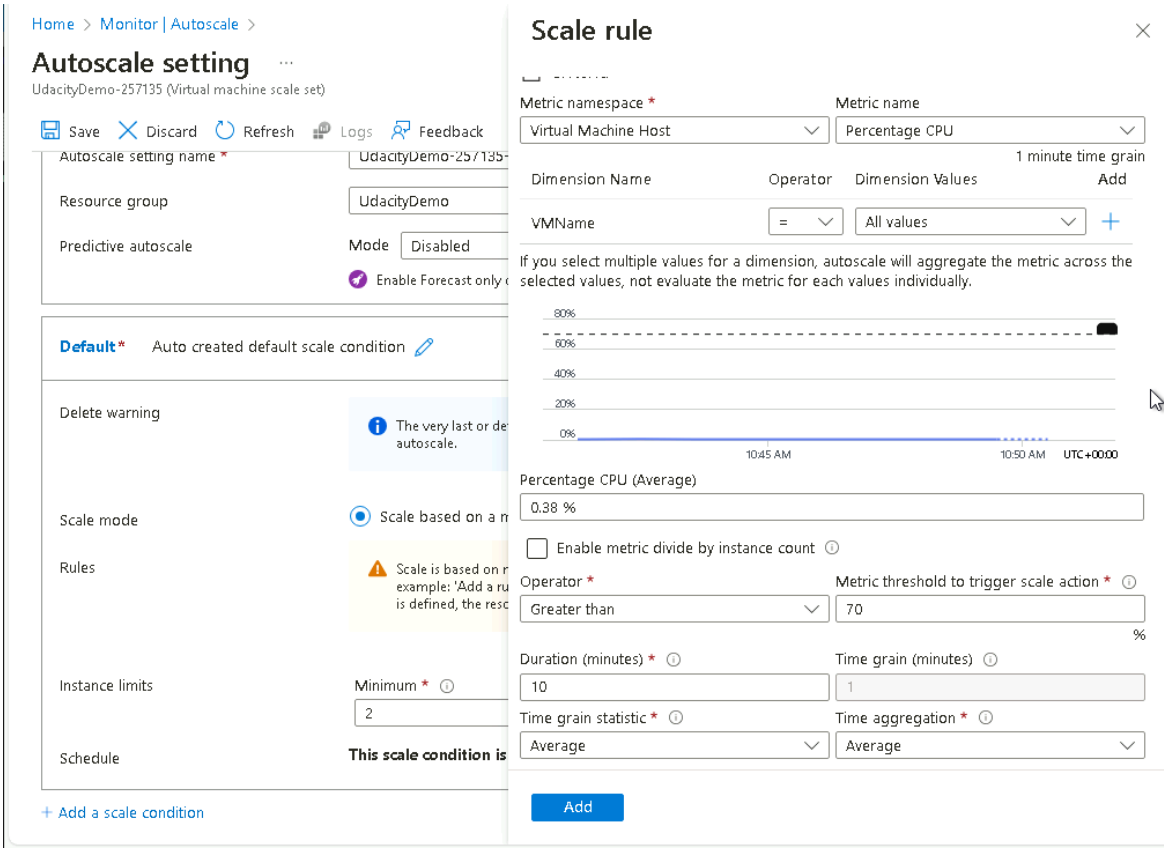
| | |
|---|---|
| **Task 1** | The lab will have a Virtual Machine Scale set already created.<br>Navigate to Azure Monitor > Settings > Autoscale.<br>You will create an Autoscale rule as part of this project. |
| **Screenshots 1-5**<br><br>You will submit step-by-step screenshots for creating an autoscale rule under Azure Monitor. | **Step 1 (Browse to Monitor > Autoscale):**<br>  |

## Step 2 (Select the option for Custom autoscale and within that Scale based on metric and then click “Add Rule”):

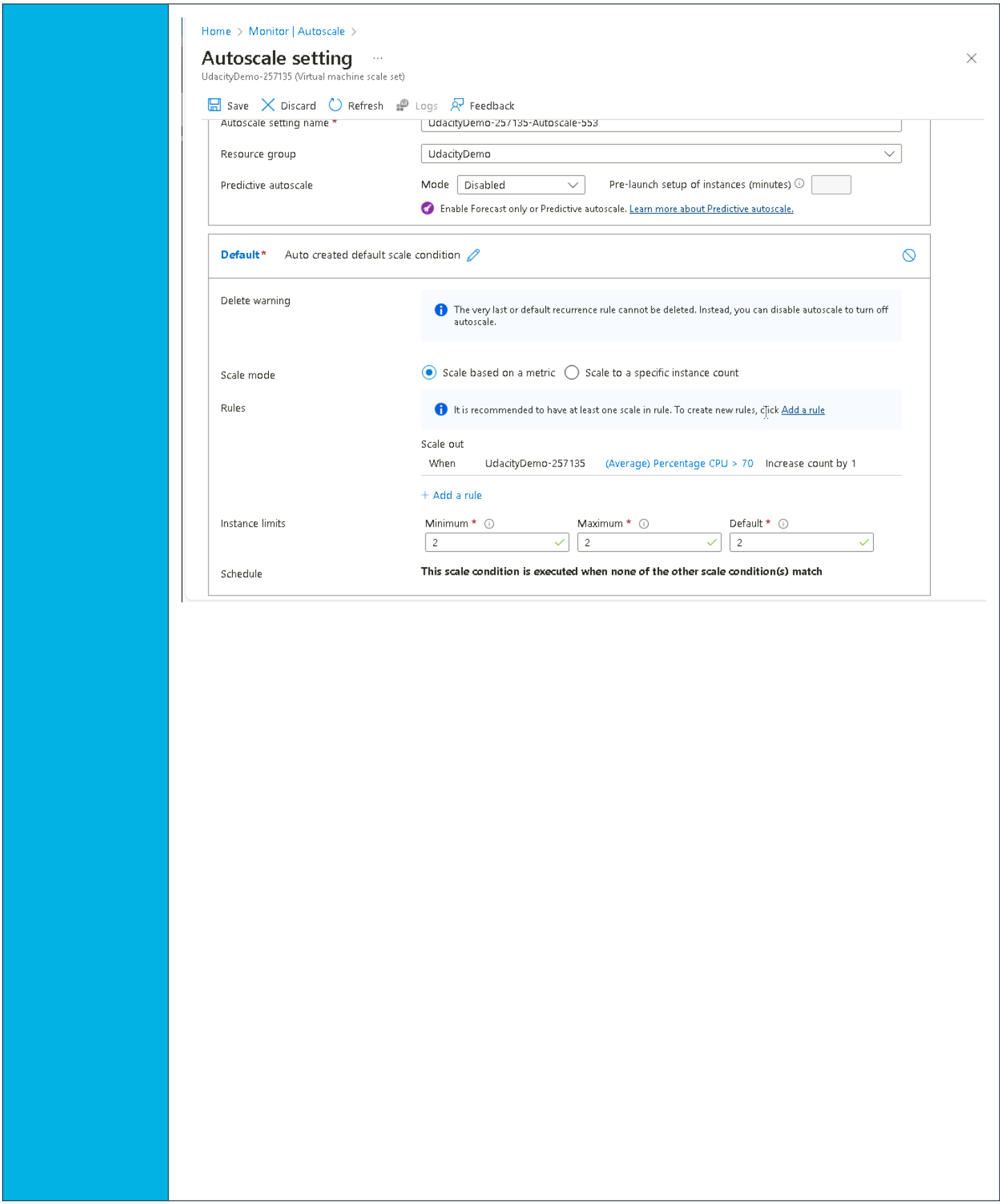



Home > Monitor | Autoscale >
Autoscale setting
UdacityDemo-257135 (Virtual machine scale set)
Save
Discard
Refresh
Logs
Feedback
Autoscale setting name *
UdacityDemo-257135-Autoscale-808
Resource group
Udacity-20240407
Predictive autoscale
Mode
Disabled
Pre-launch setup of instances (minutes)
Enable Forecast only or Predictive autoscale. Learn more about Predictive autoscale.
Default*
Auto created default scale condition
Delete warning
The very last or default recurrence rule cannot be deleted. Instead, you can disable autoscale to turn off autoscale.
Scale mode
Scale based on a metric
Scale to a specific instance count
Rules
Scale is based on metric trigger rules but no rule(s) is defined; click Add a rule to create a rule. For example: 'Add a rule that increases instance count by 1 when CPU Percentage is above 70%'. If no rules is defined, the resource will be set to default instance count.
Instance limits
Minimum *
Maximum *
Default *
2
2
2
Schedule
This scale condition is executed when none of the other scale condition(s) match
+ Add a scale condition
https://portal.azure.com/#

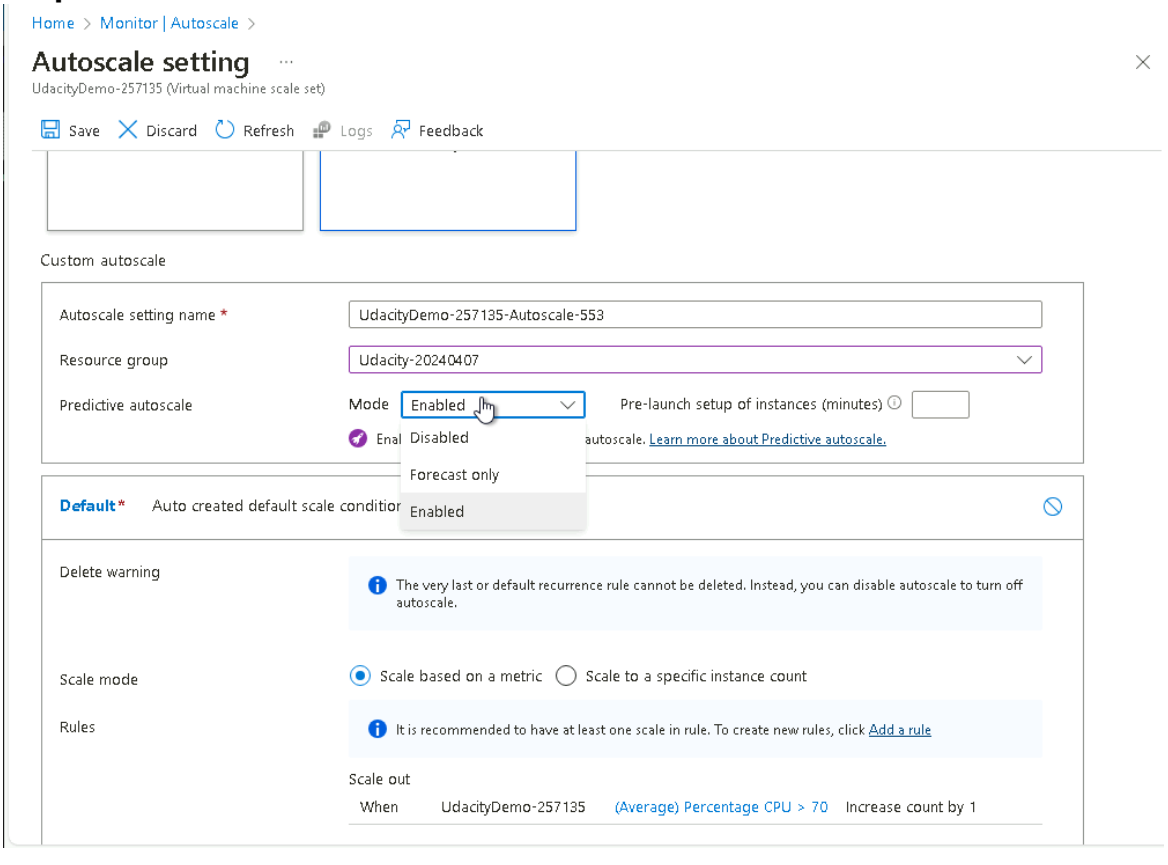
**Step 3 (Create the scale rule. They key part on this screen is that Percentage CPU metric is selected):**




**Step 4 (Once scale rule is created, submit the summary screenshot):**


Home > Monitor | Autoscale >
Autoscale setting
UdacityDemo-257135 (Virtual machine scale set)
Save
Discard
Refresh
Logs
Feedback
Autoscale setting name *
UdacityDemo-257135-Autoscale-553
Resource group
UdacityDemo
Predictive autoscale
Mode
Disabled
Pre-launch setup of instances (minutes)
Enable Forecast only or Predictive autoscale. Learn more about Predictive autoscale.
Default*
Auto created default scale condition
Delete warning
The very last or default recurrence rule cannot be deleted. Instead, you can disable autoscale to turn off autoscale.
Scale mode
Scale based on a metric
Scale to a specific instance count
Rules
It is recommended to have at least one scale in rule. To create new rules, click Add a rule
Scale out
When
UdacityDemo-257135
(Average) Percentage CPU > 70
Increase count by 1
+ Add a rule
Instance limits
Minimum *
Maximum *
Default *
2
2
2
Schedule
This scale condition is executed when none of the other scale condition(s) match

## Step 5 (Screenshot for “Autoscale Enabled”):



| | |
|---|---|
| **Explanation 1**<br><br>Explain the key details of autoscale screenshots you have submitted. | The VMSS had a manual scale set to 2. So the scale set was always running with 2 Vms.<br>We then updated it to a custom autoscale.<br>We added a new rule to increase the VM count by 1 if the average CPU percentage is greater than 70%. |