

# 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.

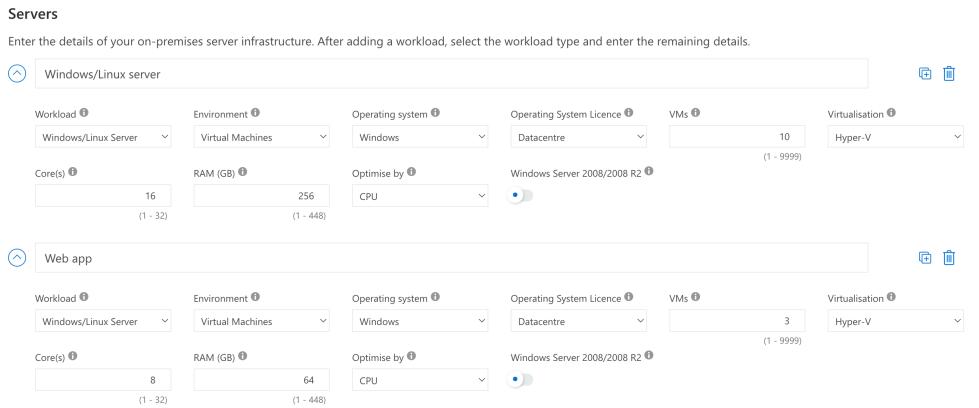
Server(s):	<p><b>Purpose:</b> Windows/Linux Server <b>Environment:</b> Physical Servers <b>Operating System:</b> Windows <b>Operating System License:</b> DataCenter <b>Servers:</b> 10 <b>Procs per server:</b> 2 <b>Core(s) per proc:</b> 8 Cores <b>RAM:</b> 256 GB <b>Optimize By:</b> CPU <b>GPU:</b> None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

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

	SQL Server backup: 0
Storage	<b>Purpose:</b> Storage <b>Type:</b> Local Disk / SAN <b>Disk Type:</b> HDD <b>Capacity:</b> 1 TB <b>Back-Up:</b> None currently <b>Archive:</b> 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.

<b>Current Environment/Background</b>  Make a list of all current on-premises servers and services.	There are 10 Windows VM's which are used for engineering purposes. There are 3 web apps servers which host the front end of the company. There are 3 database servers. There is a storage which is also used to store data.
<b>Matching Azure Services</b>  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.  <b>Hint:</b> <ul style="list-style-type: none"><li>For VM's and Web Apps: The operating system license is always Standard and Virtualization is always Hyper-V.</li><li>For databases: The purchase model is vCore, the Service Tier is Business Critical, and no SQL Server Backup is needed.</li><li>For networking: The defaults of 200 GB for outbound bandwidth are used.</li></ul>
<b>Screenshot 1</b>  Submit the screenshot for each of the above configurations from Azure TCO. <u><a href="#">VM and Web Apps</a></u> <u><a href="#">Server</a></u> screenshot should be submitted here.	 <p>The screenshot shows the Azure TCO configuration interface with two main sections: "Servers" and "Web app".</p> <p><b>Servers Configuration:</b></p> <ul style="list-style-type: none"><li>Workload: Windows/Linux Server</li><li>Environment: Virtual Machines</li><li>Operating system: Windows</li><li>Operating System Licence: Datacentre</li><li>VMs: 10</li><li>Virtualisation: Hyper-V</li><li>Core(s): 16 (1 - 32)</li><li>RAM (GB): 256 (1 - 448)</li><li>Optimise by: CPU</li><li>Windows Server 2008/2008 R2</li></ul> <p><b>Web app Configuration:</b></p> <ul style="list-style-type: none"><li>Workload: Windows/Linux Server</li><li>Environment: Virtual Machines</li><li>Operating system: Windows</li><li>Operating System Licence: Datacentre</li><li>VMs: 3</li><li>Virtualisation: Hyper-V</li><li>Core(s): 8 (1 - 32)</li><li>RAM (GB): 64 (1 - 448)</li><li>Optimise by: CPU</li><li>Windows Server 2008/2008 R2</li></ul>

## Screenshot 2

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

Database screenshot should be submitted here.

### Databases

Enter the details of your on-premises database infrastructure. After adding a database, enter the details of your on-premises database infrastructure in the Source section. In the Destination section, select the Azure service you would like to use.

Database

Source	Database	Licence	Environment	Operating system	Operating System Licence	VMs
Microsoft SQL Server	Enterprise	Virtual Machines	Windows	Datacentre	3	(1 - 9999)
Virtualisation	Core(s)	RAM (GB)	Optimise by	SQL Server 2008/2008 R2		
Hyper-V	16	64	CPU			
Destination	Service	Purchase Model	Service Tier	Instance cores	SQL Server storage	SQL server back up
SQL Database	vCore	Business Critical	2	5	0	0
				GB	GB	GB
				(5 - 4000)	(0 - 5000)	(0 - 5000000)

## Screenshot 3

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

Storage configuration screenshot should be submitted here.

### Storage

Enter the details of your on-premises storage infrastructure. After adding storage, select the storage type and enter the remaining details.

Storage

Storage type	Disk type	Capacity	Back up	Archive
Local Disk/SAN	HDD	1 TB	0 TB	0 TB
		(1 - 5000)	(0 - 5000)	(0 - 5000)

## Screenshot 4

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

Networking configuration screenshot should be submitted here.

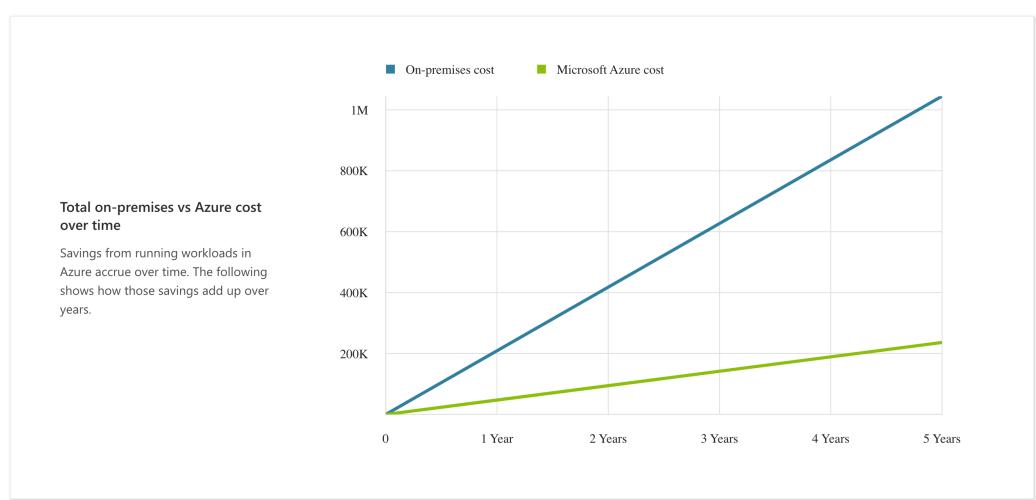
### Networking

Enter the amount of network bandwidth you currently consume in your on-premises environment.

Outbound bandwidth	Destination Region
1 GB	East US
(1 - 2000000)	

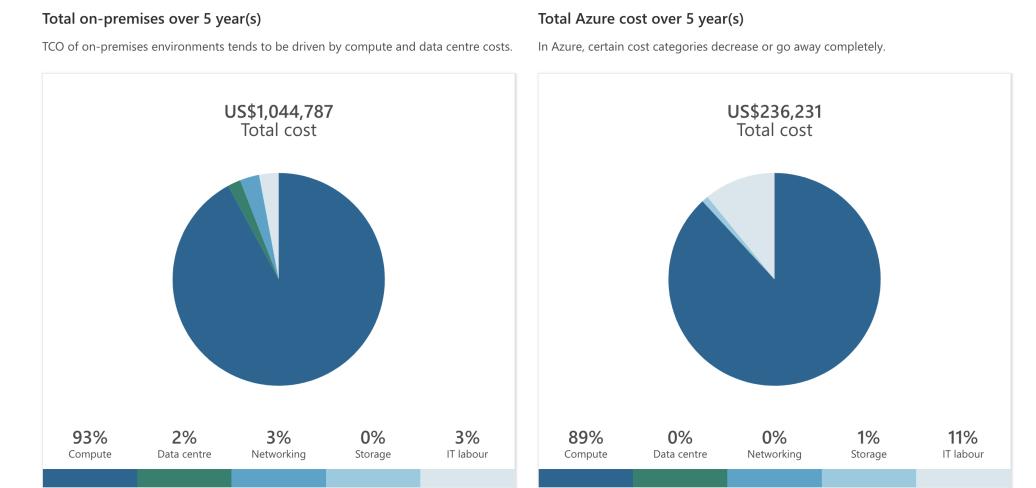
## Screenshot 5

Once the TCO Report is generated, submit a screenshot of the price comparison graph (line graph) here.



## Screenshot 6

Once the TCO Report is generated, submit a screenshot of the price comparison graph (pie chart) here.



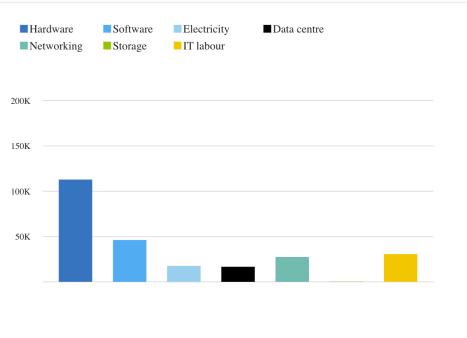
## Screenshot 7

Once the TCO Report is generated, submit a screenshot of the price comparison chart

(tabular format) here.

#### Total on-premises cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.

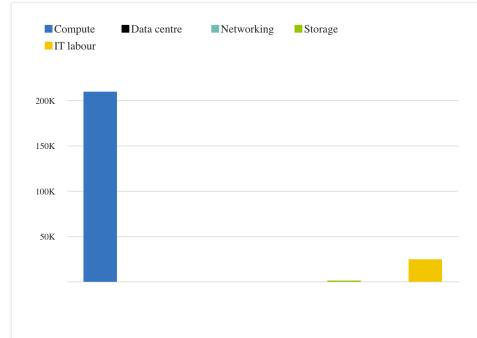


**US\$1,044,787**

Cost over 5 year(s)

#### Total Azure cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.



**US\$236,231**

Cost over 5 year(s)

#### On-premises cost breakdown summary

Cost over 5 year(s)

#### Azure cost breakdown summary

Cost over 5 year(s)

Category	Cost	Category	Cost
Compute	US\$969,745.70	Compute	US\$209,886.72
Hardware	US\$112,868.00	Data centre	US\$0.00
Software	US\$46,162.50	Networking	US\$0.00
Electricity	US\$17,592.00	Storage	US\$1,427.40
Virtualisation	US\$25,459.20	IT labour	US\$24,917.05
Database	US\$767,664.00		
Data centre	US\$16,624.85		
Networking	US\$27,441.77		
Storage	US\$307.20		
IT labour	US\$30,667.05		
<b>Total</b>	<b>US\$1,044,787.00</b>	<b>Total</b>	<b>US\$236,231.00</b>

## Explanation 1

Explain the breakdown of the costs and show your understanding of how on-prem costs versus Azure compare

According to the above screenshots, we can clearly understand that from the start itself we can see a huge amount of savings and cost reduction.

- ⇒ Computer cost
- Azure manage all the hardware cost, azure being a cloud provider (PaaS), has this included in the charges of its compute service. As soon as new hardware is related azure buys it and makes it available for its clients. If the client's requirements change, they can change the hardware or scale.
- Also a lot of these software costs like OS licenses can be saved with Azure
- Electricity costs on azure is generally lower than on-prem
- ⇒ Data center costs
- There are no datacenter costs on azure. It's free or may also say that it's already include in the paid services cost
- ⇒ Networking cost
- Free until 100GBs per month on Azure
- ⇒ Storage costs

- Azure storage costs are based on storage capacity and transactions
- Only usage will be priced  
⇒ IT labor costs
- IT Labor Cost decreases due to virtualization of Hardware, Azure (PaaS) makes Administration easy with many of its other free services.

## 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.

Here is the VM configuration you will pick.

- 5 VM's will be in US East Coast, and 5 will be in US West Coast.
- Choose the instance you want to create in both the regions from the possible VM sizes mentioned in the classroom.
- Compute Option will be pay-as-you-go; so, there are no upfront costs.
- The default of 730 hours is selected.

### Screenshot 1

Submit the screenshot for each of the above

configurations from the Azure Pricing Calculator. Submit the [US East Coast](#) monthly costs here.

The screenshot shows the Azure Pricing Calculator interface for Virtual Machines. At the top, it displays the configuration: 5 B16ms (16 Cores, 64 GB RAM) x 730 Hours (Pay as you go), with an Upfront cost of \$0.00 and a Monthly cost of \$2,664.50. Below this, the 'Virtual Machines' section is shown with filters for Region (East US 2), Operating system (Windows), Type ((OS Only)), Tier (Standard), Category (All), Instance Series (Bs-series), and a summary of the selected instance (B16ms: 16 Cores, 64 GB RAM, 128 GB Temporary storage, \$0.730/hour). A search bar is also present. The 'Savings Options' section includes links to explore pricing models and a 'Learn more' button. On the left, there are sections for Compute (B16ms) savings plan (Pay as you go selected), OS (Windows) options (License included selected), Reserved instances (1 year reserved selected), and cost breakdowns for Compute (\$2,430.90) and OS (\$233.60), totaling \$2,664.50.

## Screenshot 2

Submit the screenshot for each of the above configurations from the Azure Pricing Calculator. Submit the [US West Coast](#) monthly costs here.

**Virtual Machines**

Region: West US 2 | Operating system: Windows | Type: (OS Only) | Tier: Standard

Category: All | Instance Series: Bs-series | INSTANCE: (Need help finding the right VM?) B16ms: 16 Cores, 64 GB RAM, 128 GB Temporary storage, \$0.730/hour

Virtual machines: 5 x 730 Hours

**Savings Options**

Explore pricing models to help optimize your Azure costs. [Learn more](#)

Compute (B16ms)	OS (Windows)	= \$2,664.50
<input checked="" type="radio"/> Pay as you go	<input checked="" type="radio"/> License included	Average per month (\$0.00 charged upfront)
<b>Savings plan ⓘ</b>	<input type="radio"/> 1 year savings plan (~33% discount)	
	<input type="radio"/> 3 year savings plan (~55% discount)	
<b>Reserved instances ⓘ</b>	<input type="radio"/> 1 year reserved (~38% discount)	
	<input type="radio"/> 3 year reserved (~57% discount)	
\$2,430.90 Average per month (\$0.00 charged upfront)	\$233.60 Average per month (\$0.00 charged upfront)	
		<b>= \$2,664.50</b> Average per month (\$0.00 charged upfront)

### Screenshot 3

Submit the screenshot for total cost per month for both US East and West Coasts.

#### Your Estimate

▼ Virtual Machines	① 5 B16ms (16 Cores, 64 GB RAM) x 730 Hours (Pay as...)			Upfront: \$0.00	Monthly: \$2,664.50
▼ Virtual Machines	① 5 B16ms (16 Cores, 64 GB RAM) x 730 Hours (Pay as...)			Upfront: \$0.00	Monthly: \$2,664.50

#### Support

SUPPORT:	<input type="text" value="Included"/>	① \$0.00
LICENSING PROGRAM:	<input type="text" value="Microsoft Customer Agreement (MCA)"/>	①
<input checked="" type="radio"/> Show Dev/Test Pricing ⓘ		

#### Estimated upfront cost

\$0.00

#### Estimated monthly cost

\$5,329.00

### Explanation 1

Explain how resilience is built in by

We have resiliency as our VMs are located on both West as well as East Coast hence it is highly available.

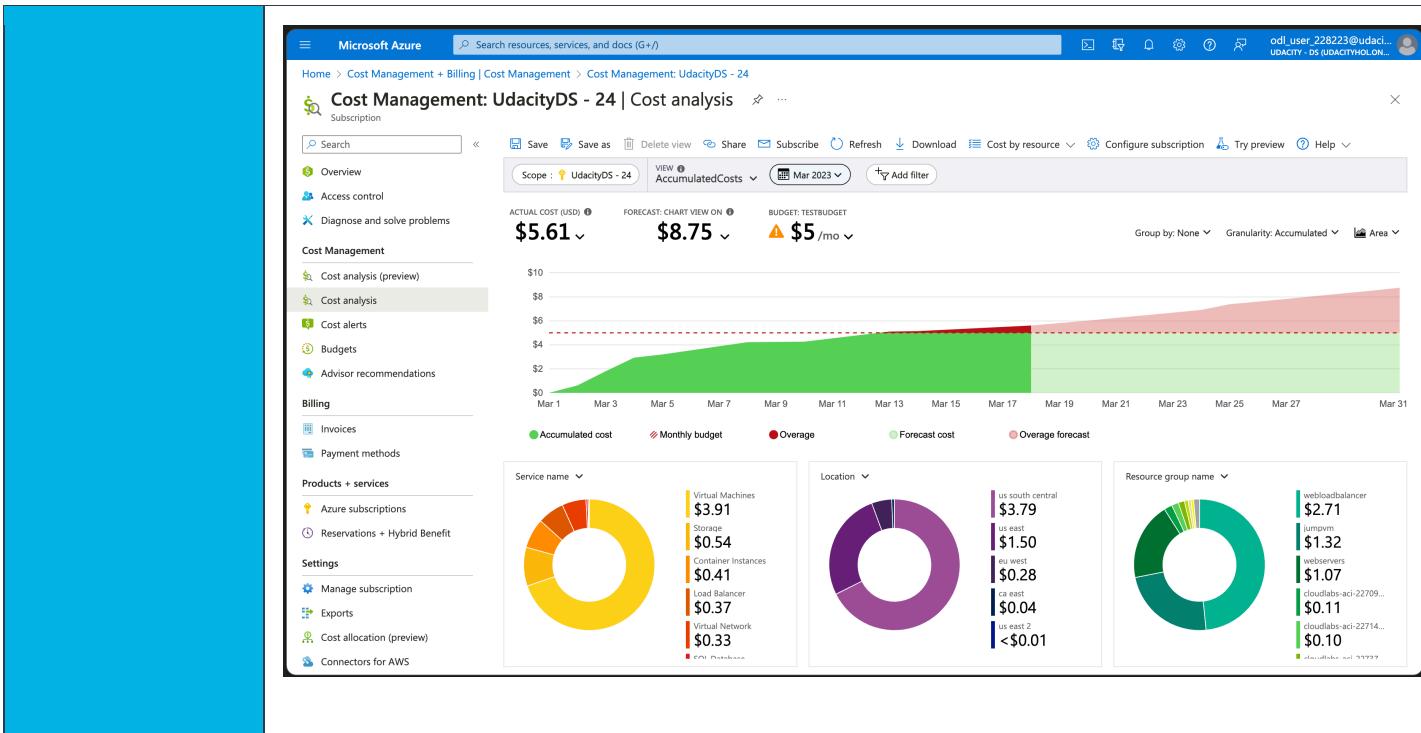
- Resilience is defined as the ability of a system to recover from failures and continue operating.
- In addition Azure Disaster Recovery can be deployed to reduce downtime due to outages etc.

moving to  
Azure

- In Azure we can use availability zones to improve our system/server reliability.

## STEP 3: Azure Cost Management + Billing

<b>Background</b>	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.
<b>Question 1</b>  Submit the explanation	What is the purpose of Azure Cost Mgmt + billing Dashboard?
<b>Explanation 1</b>	Azure Cost Management + Billing is a set of FinOps tools that enable you to analyze, manage, and optimize your costs. It helps you understand your Azure invoice (bill), manage your billing account and subscriptions, monitor and control Azure spending and optimize resource use.
<b>Screenshot 2</b>  Submit the screenshot for main Cost Mgmt + Billing Dashboard.	<b>Hint:</b> Navigate to the Cost Management Section on the left and then click "Cost Analysis" to reach this dashboard. Students need to submit the main screenshot of the 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.

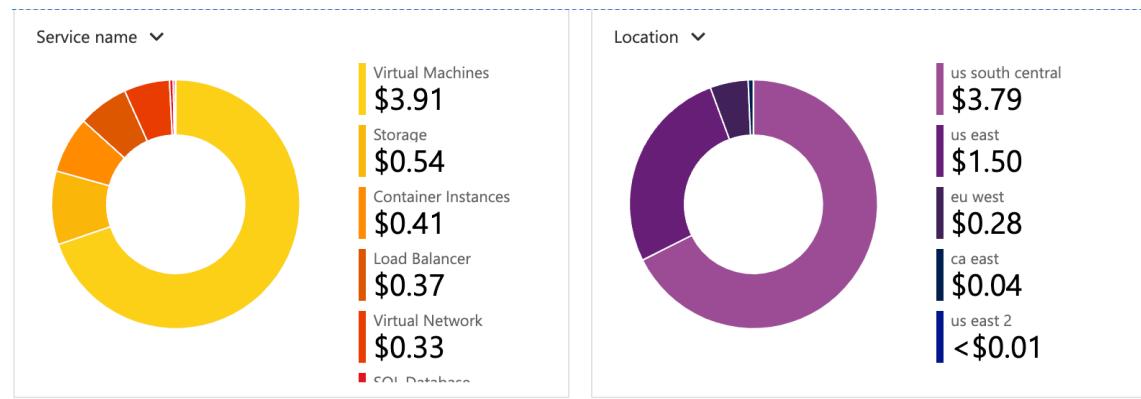
**Hint:** Make sure the right time period is selected to see the data.

- The top part of the graph shows an area chart for the appropriate date selected (top dropdown Mar 2023) and for the right scope.
- The top graph shows the accumulated costs of all resources whereas the three pie charts at the bottom show the costs per service type, location, and resource group respectively
- With the area dropdown we can change the style of the top graph.
- We can also choose an area, line, stacked, or table.

## Screenshot 3

**Hint:** Navigate to Cost Management Section on the left, and then click "Cost Analysis" to reach this dashboard. These pie charts are under the above graph submitted.

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



### Explanation 3

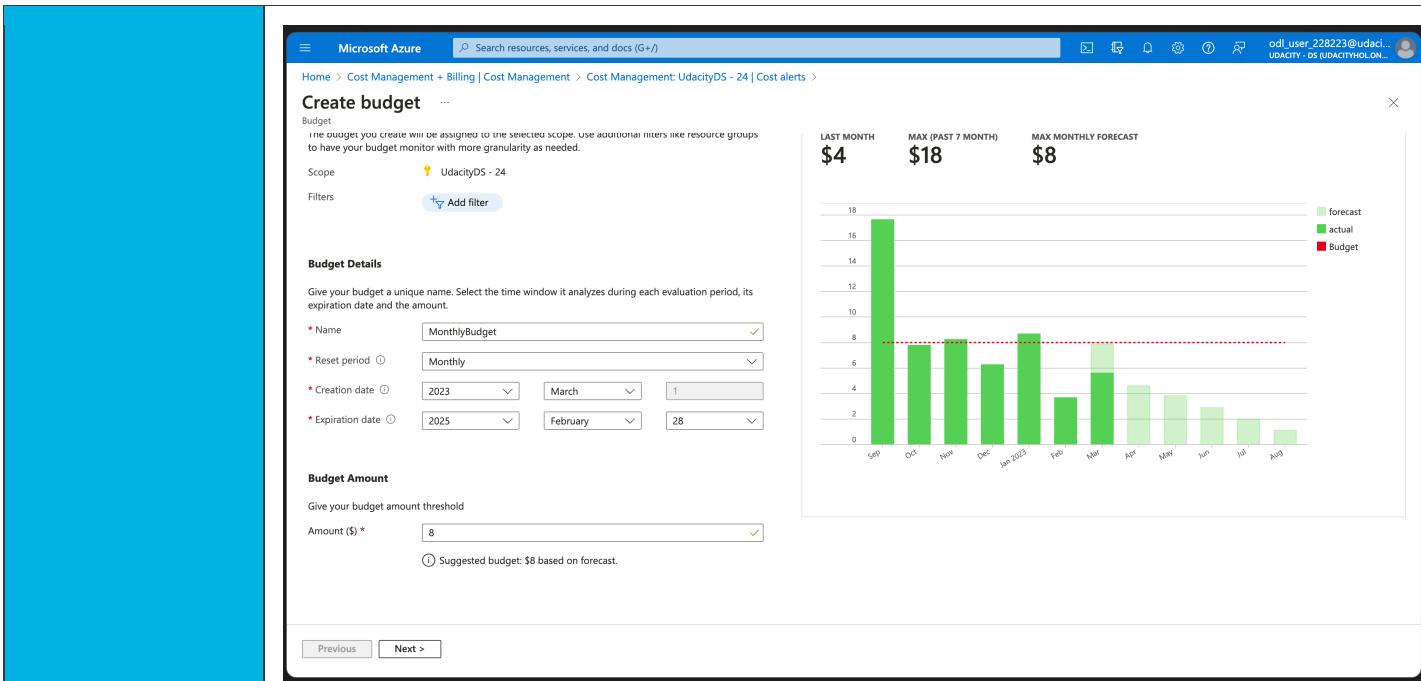
Explain the key components of the screenshot submitted.

- The left doughnut chart shows the costs per resource type and also we can see that the virtual network has cost more in my account of azure.
- The right doughnut chart shows the costs per region.
- As in mine it's a fairly new azure account it shows a nominal amount for US sound central, us east, eu west, ca east, etc..

### Screenshot 4

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

**Hint:** Navigate to Cost Management Section on the left and then click "Cost Alert" to reach this wizard. Next, click on "Add button" on top left under this tab. This is Part 1 of the wizard (of the 2-part process).



#### Explanation 4

Explain the key components of the screenshot submitted.

- For cost-controlling budgets used and it can be scoped.
- One can always narrow down their budget based on what resources one needs.
- With the help of the API we can be notified via email when a budget threshold hits.
- One can create a monthly, quarterly, or annual budget and set the maximum threshold for their respective organization.

#### Screenshot 5

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

**Hint:** This is Part 2 of the wizard (of the 2-part process).

**Create budget**

**Alert conditions**

Type	% of budget	Amount	Action group
Actual	70	5.60	None
Select type	Enter %	-	None

**Alert recipients (email)**

tdangkhoa.dante@gmail.com  
example@email.com

**Language preference**

Select your preferred language for receiving the alert email for all recipients provided above. Default is the language associated to your enrollment.

**VIEW OF MONTHLY COST DATA**

Sep 2022 - Aug 2023

Month	Actual	Budget	Forecast
Sep 2022	\$4	\$18	\$8
Oct 2022	~\$6	~\$8	~\$6
Nov 2022	~\$6	~\$8	~\$6
Dec 2022	~\$6	~\$8	~\$6
Jan 2023	~\$8	~\$8	~\$6
Feb 2023	~\$4	~\$8	~\$6
Mar 2023	~\$6	~\$8	~\$6
Apr 2023	~\$4	~\$8	~\$6
May 2023	~\$4	~\$8	~\$6
Jun 2023	~\$4	~\$8	~\$6
Jul 2023	~\$4	~\$8	~\$6
Aug 2023	~\$4	~\$8	~\$6

**Create action group**

**Basics**

An action group invokes a defined set of notifications and actions when an alert is triggered. [Learn more](#)

**Project details**

Subscription: UdacityDS - 24  
Resource group: Udacity  
Region: Global

**Instance details**

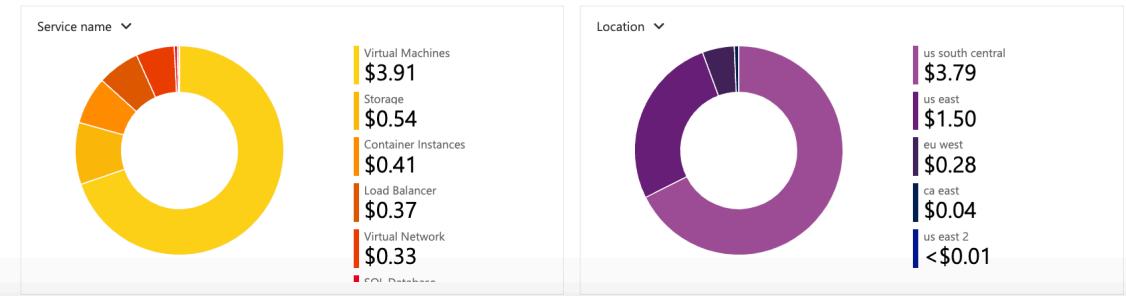
Action group name:   
Display name:

**Review + create**

## Explanation 5

Explain the key components of the

- In the above steps we are setting an alert and setting a limit of 70% as the threshold for the alert.
- When this alert threshold is hit the specified email would receive a mail

Screenshot submitted.																											
<b>Screenshot 6</b> Submit the screenshot for breakdown of costs by Service Name and Location.	 <p>The image displays two donut charts side-by-side, representing the breakdown of Azure costs.</p> <p><b>Service name:</b></p> <table border="1"> <thead> <tr> <th>Service</th> <th>Cost (\$)</th> </tr> </thead> <tbody> <tr> <td>Virtual Machines</td> <td>\$3.91</td> </tr> <tr> <td>Storage</td> <td>\$0.54</td> </tr> <tr> <td>Container Instances</td> <td>\$0.41</td> </tr> <tr> <td>Load Balancer</td> <td>\$0.37</td> </tr> <tr> <td>Virtual Network</td> <td>\$0.33</td> </tr> <tr> <td>SQL Database</td> <td>&lt;\$0.01</td> </tr> </tbody> </table> <p><b>Location:</b></p> <table border="1"> <thead> <tr> <th>Location</th> <th>Cost (\$)</th> </tr> </thead> <tbody> <tr> <td>us south central</td> <td>\$3.79</td> </tr> <tr> <td>us east</td> <td>\$1.50</td> </tr> <tr> <td>eu west</td> <td>\$0.28</td> </tr> <tr> <td>ca east</td> <td>\$0.04</td> </tr> <tr> <td>us east 2</td> <td>&lt;\$0.01</td> </tr> </tbody> </table>	Service	Cost (\$)	Virtual Machines	\$3.91	Storage	\$0.54	Container Instances	\$0.41	Load Balancer	\$0.37	Virtual Network	\$0.33	SQL Database	<\$0.01	Location	Cost (\$)	us south central	\$3.79	us east	\$1.50	eu west	\$0.28	ca east	\$0.04	us east 2	<\$0.01
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us east 2	<\$0.01																										
<b>Explanation 6</b> Explain the key components of the screenshot submitted.																											
<b>Explanation 7</b> Explain the summarized highlights of this part of the project, Azure Cost Mgmt + Billing	<p>This part of the project is about managing Azure costs and billing. It involves creating a budget, setting up alerts, and analyzing costs. The budget is created to set a spending limit for the resources used in Azure. The alerts are set up to notify the user when the spending limit is reached or exceeded. The costs are analyzed to identify the areas where the user can save money. The Azure Cost Management + Billing is used to manage the costs and billing of the Azure services used by Company "X"</p>																										

## STEP 4: Azure Policy to create and enforce policies

<b>Background</b>	<p>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.</p> <p>You now decide to leverage Azure Policy features to ensure that appropriate controls are put in place.</p>
<b>Screenshots 1 through 5</b>  Submit the screenshots for Azure Policy steps.	<p><b>Hint:</b> 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.</p> <p><b><u>Very important note:</u></b></p> <ol style="list-style-type: none"><li>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</li><li>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</li></ol>

## Step 1:

The screenshot shows the Microsoft Azure Policy Definitions page. The policy name is "Allowed virtual machine size SKUs". The "Definition" tab is selected, showing the JSON configuration. The JSON code defines a policy that allows specific virtual machine sizes and denies others.

```
1  {
2      "properties": {
3          "displayName": "Allowed virtual machine size SKUs",
4          "policyType": "BuiltIn",
5          "mode": "Indexed",
6          "description": "This policy enables you to specify a set of virtual machine size SKUs that your organization can deploy.",
7          "metadata": {
8              "version": "1.0.1",
9              "category": "Compute"
10         },
11         "parameters": {
12             "listOfAllowedSKUs": {
13                 "type": "Array",
14                 "metadata": {
15                     "description": "The list of size SKUs that can be specified for virtual machines.",
16                     "displayName": "Allowed Size SKUs",
17                     "strongType": "VM SKUs"
18                 }
19             },
20         },
21         "policyRule": {
22             "if": {
23                 "allOf": [
24                     {
25                         "field": "type",
26                         "equals": "Microsoft.Compute/virtualMachines"
27                     }
28                 ]
29             }
30         }
31     }
32 }
```

## Step 2:

The screenshot shows the Microsoft Azure Policy Assignment page for the "Allowed virtual machine size SKUs" policy. The "Basics" tab is selected. The assignment is named "Allowed virtual machine size SKUs" and is assigned to the "Azure subscription 1/demo" scope. The policy definition is set to "Enabled".

**Basics**

Scope: Azure subscription 1/demo

Exclusions: Optionally select resources to exclude from the policy assignment.

Policy definition: Allowed virtual machine size SKUs

Assignment name: Allowed virtual machine size SKUs

Description:

Policy enforcement: Enabled

Assigned by: Dang Khoa

### Step 3

The screenshot shows the 'Parameters' step of creating a policy definition. The URL is [Home > Policy | Definitions > Allowed virtual machine size SKUs >](#). The page title is 'Allowed virtual machine size SKUs'. The 'Parameters' tab is selected. A search bar 'Search by parameter name...' and a checkbox 'Only show parameters that need input or review' are at the top. Below is a dropdown labeled 'Allowed Size SKUs \*' containing 'Standard\_B1s'. At the bottom are buttons for 'Review + create', 'Cancel', 'Previous', and 'Next'.

### Step 4:

The screenshot shows the 'Non-compliance messages' step of creating a policy definition. The URL is [Home > Policy | Definitions > Allowed virtual machine size SKUs >](#). The page title is 'Allowed virtual machine size SKUs'. The 'Non-compliance messages' tab is selected. A note says 'Non-compliance messages help users understand why a resource is not compliant with the policy. The message will be displayed when a resource is denied and in the evaluation details of any non-compliant resource.' Below is a text input field 'Non-compliance message' containing 'Allowed the B1s size only'. At the bottom are buttons for 'Review + create', 'Cancel', 'Previous', and 'Next'.

## Step 5:

The screenshot shows the 'Allowed virtual machine size SKUs' policy definition in the Azure portal. The 'Review + create' tab is selected. The 'Basics' section shows the scope as 'Azure subscription 1/demo', the policy name as 'Allowed virtual machine size SKUs', and it is assigned to 'Dang Khoa'. The 'Advanced' section shows no resource selectors or overrides. The 'Parameters' section contains a single parameter 'listOfAllowedSKUs' with the value 'standard\_b1s'. The 'Remediation' section is currently empty. At the bottom, there are 'Create', 'Cancel', 'Previous', and 'Next' buttons.

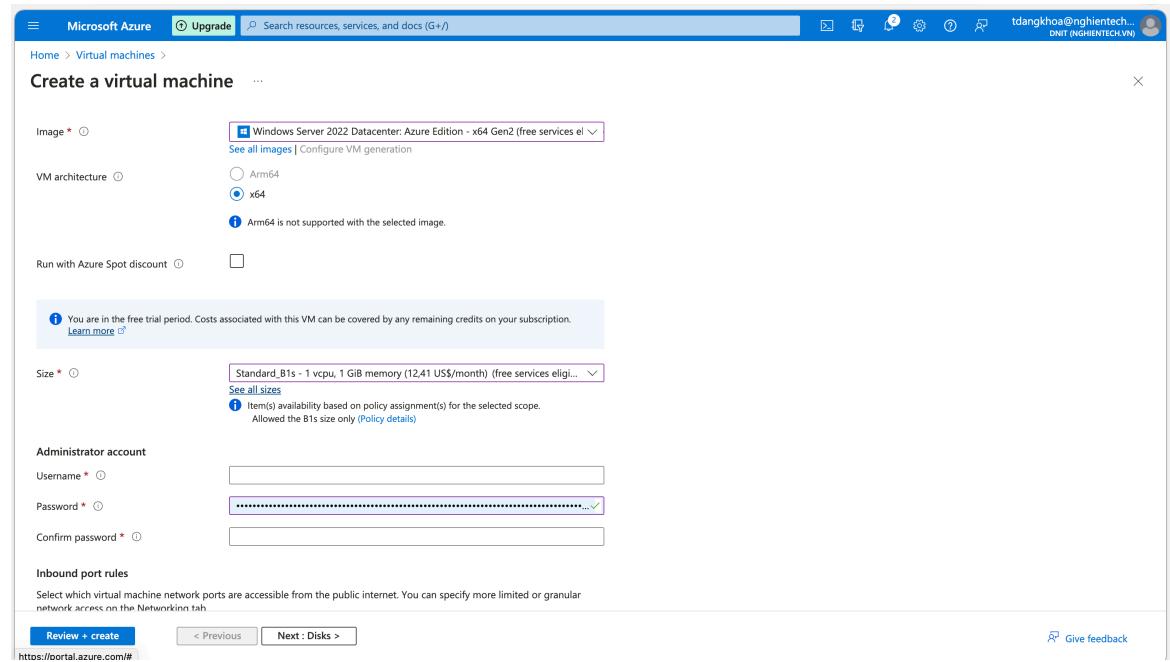
## Screenshot 6

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

Once the Azure policy creation is complete, try to create a VM which is of a "NOT ALLOWED" size.

**Hint:** pick any size; it doesn't matter as long as it's not in the allowed list in Azure policy you just created.

Once you go through the wizard, in the final step you will see the following screenshot, which needs to be submitted.



I can't select other VM size.

VM Size ↑	Type ↑	vCPUs ↑	RAM (GiB) ↑	Data disks ↑	Max IOPS ↑	Temp storage (GiB) ↑	Premium disk ↑	Cost/month ↑
Most used by Azure users	The most used sizes by users in Azure							
B1s (free)	General purpose	1	1	2	320	4	Supported	12.41 US\$
Allowed the B1s size only (Policy details)	Ideal for workloads that do not need continuous full CPU performance							
Blocked by Policy	Your organization has Azure Policies in place that restrict these sizes.							

## Explanation 1

Explain the summarized

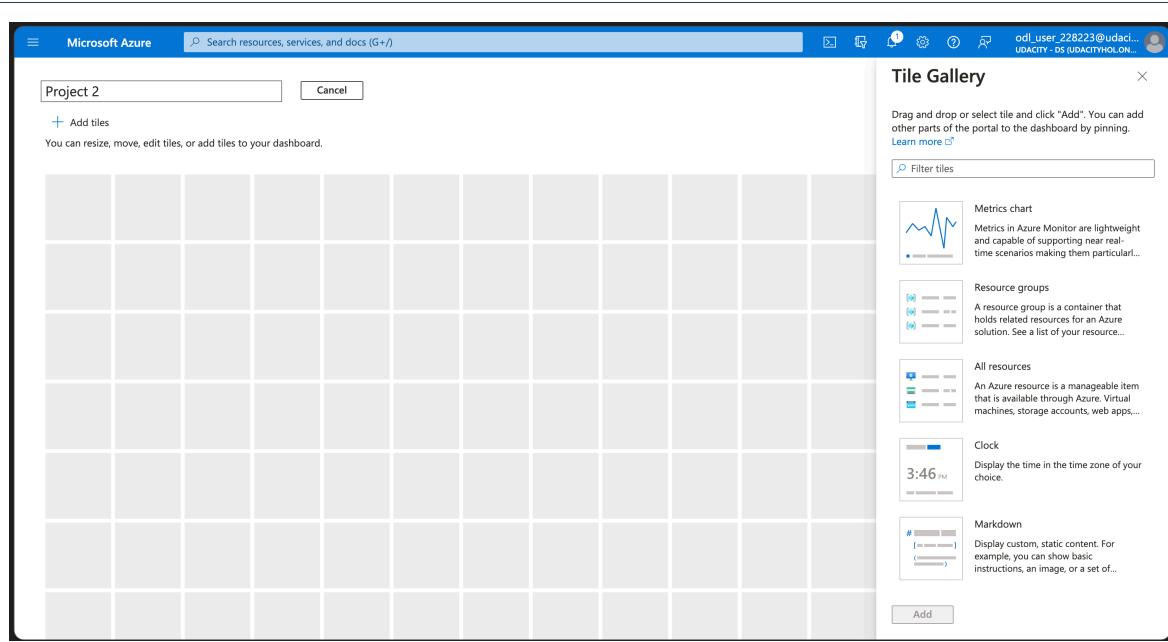
In this part, azure policy is used to enforce standards and access compliance at scale

We can use the policies to allow/disallow certain resource types, sizes, and regions or force to add specific tag to resources groups.

highlights of  
this part of  
the project,  
Azure Policy.

## STEP 5: Azure Dashboards

<b>Background</b>	Azure Dashboards are a one stop shop to monitor <ul style="list-style-type: none"><li>• Your logs</li><li>• Your infrastructure</li><li>• Your applications</li></ul>
<b>Task 1</b>	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.
<b>Screenshots 1 through 3</b>  You will submit the screenshots for Overview tab.	<b>Step 1:</b>



## Step 2:

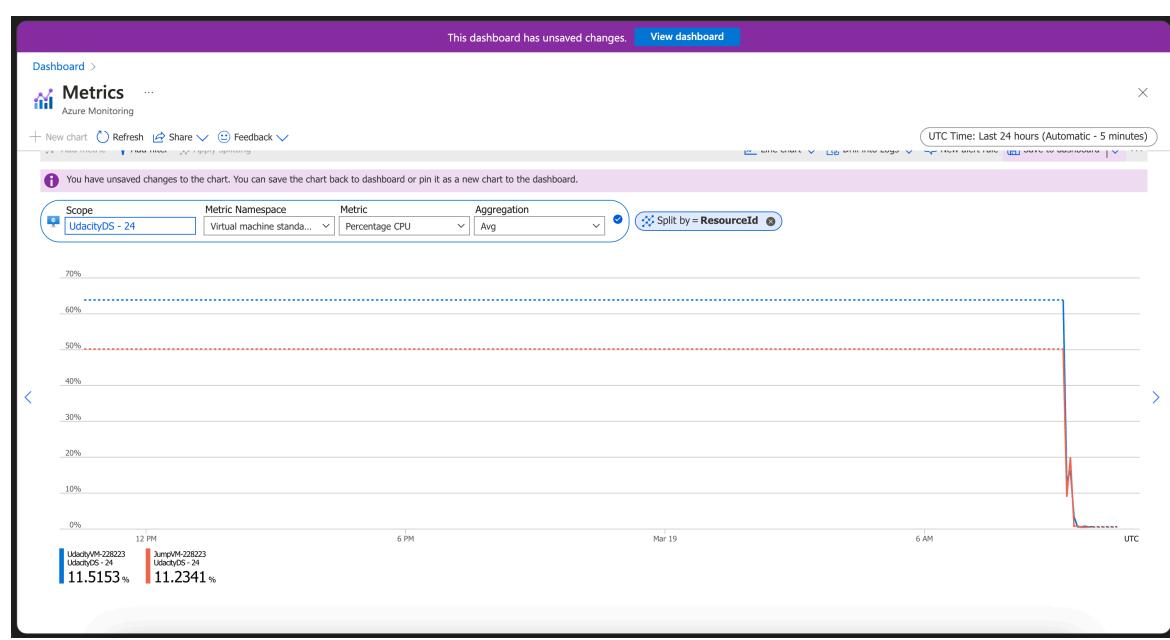
This screenshot shows the Azure Metrics dashboard configuration screen. At the top, it says "This dashboard has unsaved changes." and has a "View dashboard" button. The main area is titled "Metrics" and shows a chart with a Y-axis from 0 to 100 and an X-axis from 12 PM to 6 PM. The chart area includes fields for "Scope" (with a dropdown menu showing "+ Select a scope"), "Metric Namespace" (dropdown), "Metric" (dropdown), and "Aggregation". To the right of the chart is a "Select a scope" panel:

- Browse** (selected) vs **Recent**
- Resource types**: All resource types (dropdown)
- Locations**: All locations (dropdown)
- Search to filter items...**
- Scope**: UdacityDS - 24 (checkbox checked)
- Resource type**: Subscription
- Location**: -

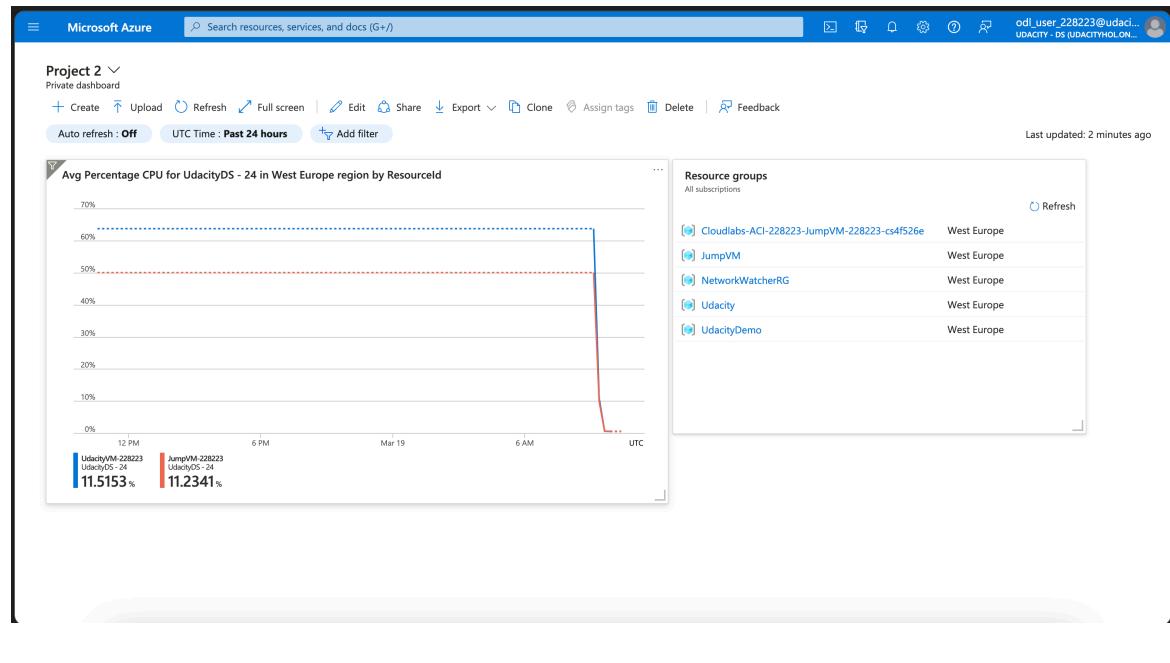
Below this panel is a note: "Why can't I select multiple resources? Azure limits selections to one resource type and one location. Please refine your scope." Further down is a "Refine scope" section:

- Resource type \***: Virtual machines (dropdown)
- Location \***: West Europe (dropdown)

At the bottom of the panel are "Selected scopes" (1 scope), "Apply" (button), "Cancel" (button), and "Clear all selections" (button).



### 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.

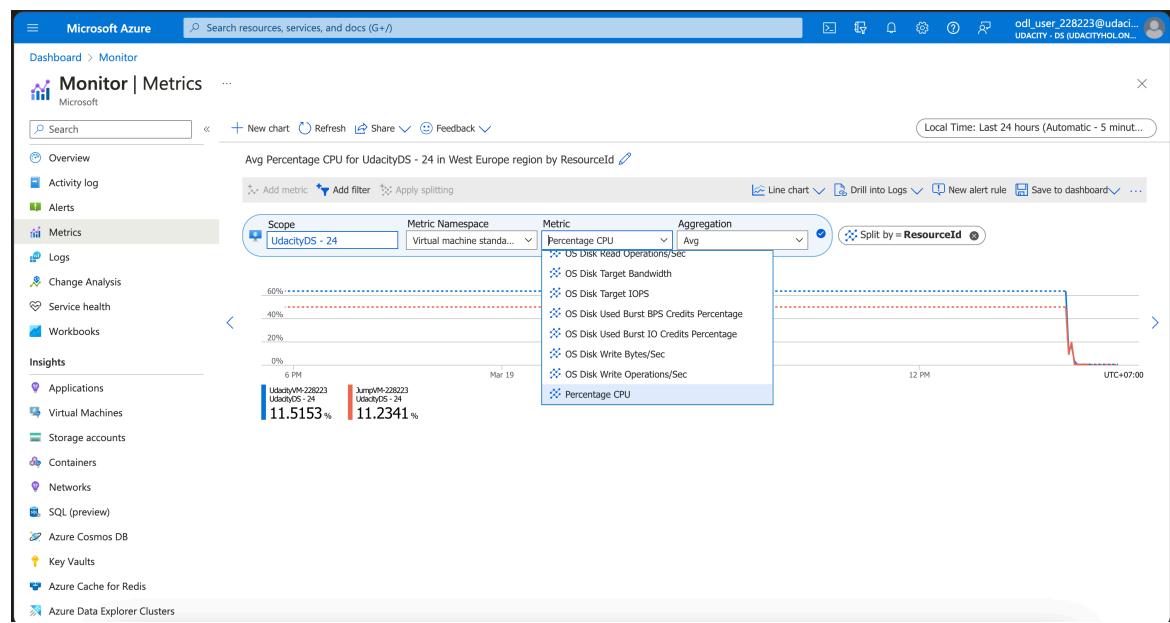
### Screenshots 1 through 3

You will submit the screenshots for Monitor | Metrics screen as you are setting up

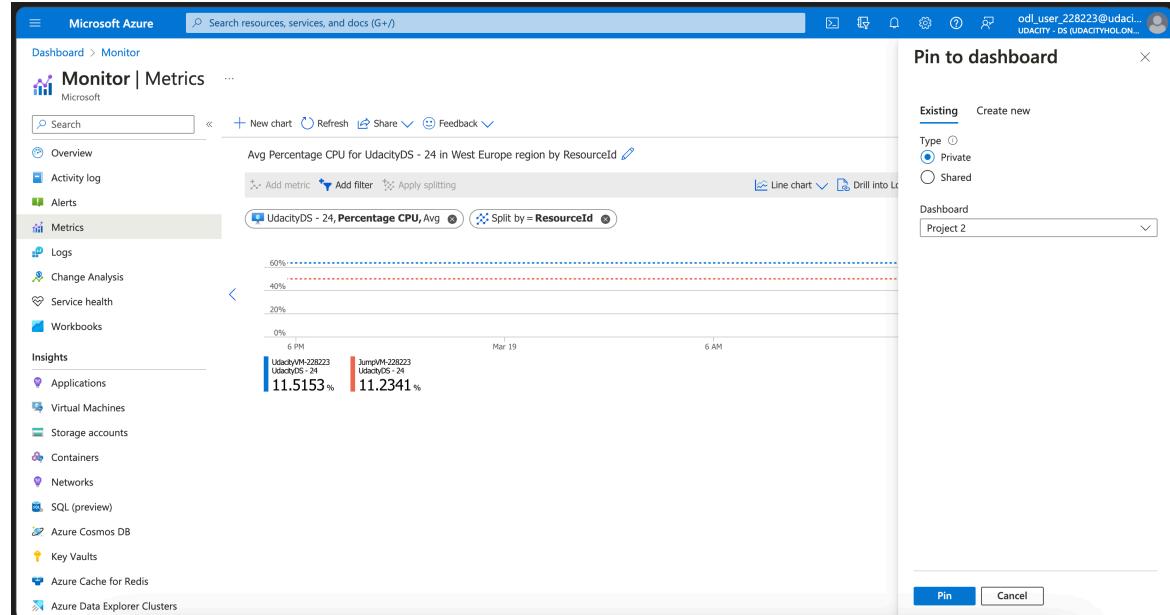
#### Step 1:

The screenshot shows the Microsoft Azure interface with the 'Monitor | Metrics' page selected. On the left, there's a sidebar with 'Overview', 'Activity log', 'Alerts', 'Metrics' (which is highlighted), 'Logs', 'Change Analysis', 'Service health', and 'Workbooks'. Below that is an 'Insights' section with 'Applications', 'Virtual Machines', 'Storage accounts', 'Containers', 'Networks', 'SQL (preview)', 'Azure Cosmos DB', 'Key Vaults', 'Azure Cache for Redis', and 'Azure Data Explorer Clusters'. The main area displays a chart titled 'Percentage CPU' with a Y-axis from 0 to 100 and an X-axis from 6 PM to Mar 1. A legend indicates 'Scope' and 'Metric Namespace'. To the right, a modal window titled 'Select a scope' is open. It has tabs for 'Browse' and 'Recent', dropdowns for 'Resource types' (set to 'All resource types') and 'Locations' (set to 'All locations'), and a search bar. A table lists resources under 'Scope': 'UdacityDS - 24' (Subscription, checked), 'Cloudlabs-ACI-228223-JumpVM-228223-cs4f526e' (Resource group), 'JumpVM' (Resource group), 'NetworkWatcherRG' (Resource group), and 'Udacity' (Resource group). A note at the bottom says 'Why can't I select multiple resources? Azure limits selections to one resource type and one location. Please refine your scope.' Below the table is a 'Refine scope' section with dropdowns for 'Resource type' (set to 'Virtual machines') and 'Location' (set to 'West Europe'). At the bottom of the modal are 'Selected scopes' (1 scope), 'Apply' (button), and 'Cancel' (button).

#### Step 2:



### Step 3:



## 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.

**Create an alert rule**

**Scope** **Condition** **Actions** **Details** **Tags** **Review + create**

Create an alert rule to identify and address issues when important conditions are found in your monitoring data. [Learn more](#)

+ Select scope

**Resource** **Hierarchy**

All virtual machines (West Europe) UdacityDS - 24

**Review + create** **Previous** **Next: Condition >**

**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 \*** Percentage CPU

**Alert logic**

**Threshold**  Static  Dynamic

**Aggregation type** Average

**Operator** Greater than

**Threshold value \*** 0.3 %

**Split by dimensions**

Use dimensions to monitor specific time series and provide context to the fired alert. Dimensions can be either number or string columns. If you select more than one dimension value, each time series that results from the combination will trigger its own alert and will be charged separately. [About monitoring multiple time series](#)

**When to evaluate**

**Check every** 1 minute

**Lookback period** 5 minutes

**Preview**

Whenever the average Percentage CPU is greater than 0.3% \$0.20 USD/month

Time range : Over the last 6 hours Time series : JumpVM-228223; Aggregate

Percentage CPU (Avg)  
JumpVM-228223  
11.23 %

The screenshot shows two consecutive steps of the 'Create an alert rule' wizard in the Microsoft Azure portal.

**Step 1: Actions**

This step allows you to define the actions taken when an alert is triggered. It includes sections for 'Scope', 'Condition', and 'Actions'. The 'Actions' tab is selected, showing a list of action groups:

- + Select action groups
- + Create action group

An action group is described as a set of actions that can be applied to an alert rule. There is a link to 'Learn more'.

**Step 2: Details**

This step involves defining the project details and alert rule settings. The 'Details' tab is selected.

**Project details**

Select the subscription and resource group:

- Subscription: UdcityOS - 24
- Resource group: JumpVM

**Alert rule details**

Configure the alert rule settings:

- Severity: 3 - Informational
- Alert rule name: MyAlert
- Alert rule description: (empty)

**Advanced options**

Under the 'Settings' section, the following options are checked:

- Enable upon creation
- Automatically resolve alerts

**Navigation**

At the bottom of each step, there are navigation buttons: 'Review + create' (highlighted in blue), 'Previous', and 'Next: [Step Name] >'. The 'Review + create' button is highlighted in blue, indicating the current step.

Microsoft Azure

Search resources, services, and docs (G+)

Home > Monitor | Metrics > Create an alert rule ...

Scope Condition Actions Details Tags Review + create

Metric alert rule Total pricing  
1 Condition Variable Pricing  
[Terms of use](#) | [Privacy statement](#)

**Scope**  
Resource ⚠ UdacityDS - 24 > 🌐 All virtual machines (West Europe)

**Condition**

Signal name	Percentage CPU
Operator	Greater than
Aggregation type	Average
Threshold value	0.3
Lookback period	5 minutes
Check every	1 minute

**Details**

**Project details**

Subscription	UdacityDS - 24
Resource group	JumpVM
Region	global

**Alert rule details**

Alert rule name	MyAlert
Alert rule description	3 - Informational
Severity	<input checked="" type="checkbox"/> 3 - Informational
Enable upon creation	<input checked="" type="checkbox"/>
Automatically resolve alerts	<input checked="" type="checkbox"/>

**Create** **Previous**

The screenshot shows the Azure Monitor Alerts interface. On the left, there's a navigation pane with links like Home, Monitor, Overview, Activity log, Alerts, Metrics, Logs, Change Analysis, Service health, Workbooks, and Insights. Under Insights, several services are listed: Applications, Virtual Machines, Storage accounts, Containers, Networks, SQL (preview), Azure Cosmos DB, Key Vaults, Azure Cache for Redis, Azure Data Explorer Clusters, Log Analytics workspaces, Azure Stack HC (preview), and Service Bus (preview). At the bottom, there are Managed Services and Managed Prometheus sections.

The main area displays an alert titled "MyAlert" from "UdacityVM-228223 - udacityvm228223.westeurope.cloudapp.azure.com:3389". The alert details show it's a Critical alert with one occurrence. The alert summary table includes columns for Name, Severity, and Occurrences, with "MyAlert" being the only entry. Below the table, a search bar and a time range selector are visible.

On the right side of the screen, a large window titled "MyAlert" is open, showing a Windows desktop environment with a blue theme. The taskbar at the bottom has icons for Start, Search, Edge, File Explorer, and Task View. The system tray shows the date as 3/19/2023 and the time as 11:10 AM. The user's name, "odl\_user\_228223@udaci...", is also visible in the top right corner.

**Microsoft Azure Monitor | Alerts**

Search:  Alert rules: Action groups: Alert processing rules: Columns: Refresh: Export:

Overview Activity log Alerts Metrics Logs Change Analysis Service health Workbooks Insights Application Virtual Machines Storage accounts Containers Networks SQL (preview) Azure Cosmos DB Key Vaults Azure Cache for Redis Azure Data Explorer Clusters Log Analytics workspaces Azure Stack HCI (preview) Service Bus (preview) Insights Hub Managed Services Managed Prometheus

Total alerts: 1 Critical: 0 Error: 0 Warning: 0 Informational: 1 Verbose: 0

Name: MyAlert Severity: 3 - Informational Affected resource: udaciyvm-228223

Time range: Past 24 hours Subscription: all Alert condition: Fired

**MyAlert** Alert details

Summary History

Fired time: 3/19/2023, 6:06 PM Affected resource: udaciyvm-228223 Hierarchy: UdacityDS - 24 > [udacity]

User response: New Alert condition: Fired Change user response

Why did this alert fire?

Percentage CPU (Avg last 24 hours): 7.69%

Evaluation window start time (for which alert fired): 3/19/2023, 5:58 PM Evaluation window end time (for which alert fired): 3/19/2023, 6:03 PM

Criterion Metric name: microsoft.compute/virtualmachines Operator: GreaterThan Time aggregation: Average Threshold: 0.3 Dimension name: No results to display Dimension value: No results to display

**Avg Percentage CPU for UdacityDS - 24 in West Europe region by ResourceId**

Time	UdacityVM-228223 (%)	JumpVM-228223 (%)
12 PM	~5	~5
6 PM	~5	~5
Mar 19, 6:00 PM UTC	62	50
Mar 19, 7:52 AM UTC	~5	~5

12 PM 6 PM Mar 19 6 AM Mar 19 7:52 AM UTC

UdacityVM-228223 UdacityDS - 24

JumpVM-228223 UdacityDS - 24

# 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

You will submit the screenshots for Log Analytics workspace creation screens.

### Step 1:

This screenshot shows the 'Create Log Analytics workspace' wizard on the 'Basics' step. The page title is 'Create Log Analytics workspace'. At the top, there are tabs for 'Basics', 'Tags', and 'Review + Create'. A note at the top left says: 'A Log Analytics workspace is the basic management unit of Azure Monitor Logs. There are specific considerations you should take when creating a new Log Analytics workspace. Learn more'. Below this, the 'Project details' section includes fields for 'Subscription' (set to 'UdacityOS - 24') and 'Resource group' (set to 'Create new'). Under 'Instance details', there are fields for 'Name' (empty) and 'Region' (set to 'East US'). At the bottom of the screen, there are navigation buttons: 'Review + Create' (highlighted in blue), '< Previous', and 'Next : Tags >'.

### Step 2:

This screenshot shows the 'Create Log Analytics workspace' wizard on the 'Tags' step. The page title is 'Create Log Analytics workspace'. The 'Tags' tab is selected. A note at the top left says: 'Tags are name/value pairs that enable you to categorize resources and view consolidated billing by applying the same tag to multiple resources and resource groups. Learn more'. Below this, there is a 'Name' field followed by a colon and a 'Value' field, both currently empty. At the bottom of the screen, there are navigation buttons: 'Review + Create' (highlighted in blue), '< Previous', and 'Next : Review + Create >'.

## Step 3:

Validation passed

Basics Tags Review + Create

Log Analytics workspace by Microsoft

Subscription: UdecityOS - 24  
Resource group: Udecity  
Name: MyLogWorkspace  
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

## Step 4:

Deployment

Deployment name: MicrosoftLogAnalyticsOMS  
Subscription: UdecityOS - 24  
Resource group: Udecity

Start time: 3/19/2023, 6:16:58 PM  
Correlation ID: 55a316e9-07bb-46f9-b69f-c93b7dc5879

Deployment details

Resource	Type	Status	Operation details
No results.			

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Secure your apps and infrastructure  
[Go to Microsoft Defender for Cloud](#)

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Work with an expert  
Azure experts are service provider partners who can help manage your assets on Azure and be your first line of support.  
[Find an Azure expert](#)

Microsoft Azure | Microsoft Log Analytics OMS | Overview

MyLogWorkspace

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](#)

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 custom logs

Legacy activity log connector

Legacy storage account logs

Legacy computer groups

Legacy solutions

System center

Workspace summary (deprecated)

Service map (deprecated)

Search

Delete

Resource group (move) : `idacity`

Status : Active

Location : East US

Subscription (move) : `idacityDS-24`

Subscription ID : `37ddca16-67cc-43e8-a92f-62164ea50288`

Tags (edit) : [Click here to add tags](#)

Workspace Name : MyLogWorkspace

Workspace ID : `5a82c6f-6793-4472-9a97-3c4ba1e9e46e`

Pricing tier : Pay-as-you-go

Access control mode : Use resource or workspace permissions

Operational issues : [OK](#)

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

Select one or more data sources to connect to the workspace

Azure virtual machines (VMs)

Windows and Linux Agents management

Storage account log

System Center Operations Manager

2 Configure monitoring solutions

Add monitoring solutions that provide insights for applications and services in your environment

[View solutions](#)

3 Monitor workspace health

Create alerts to proactively detect any issue that arise in your workspace

[Learn more about monitor workspace health](#)

Useful links

Documentation site

Community

Maximize your Log Analytics experience

4 Search and analyze logs

Use Log Analytics rich query language to analyze logs

[View logs](#)

5 Manage alert rules

Notify or take action in response to important information in your data

[Set alerts](#)

6 Manage usage and costs

Understand your usage of Log Analytics and estimate your costs for each month

[Manage costs](#)

7 Create and Share Workbooks

Use Workbooks to create rich interactive reports with your data

[Create Workbooks](#)

## STEP 8: Azure Insights

### Background

Azure Insights can only be created once you have the Log Analytics workspace completed.

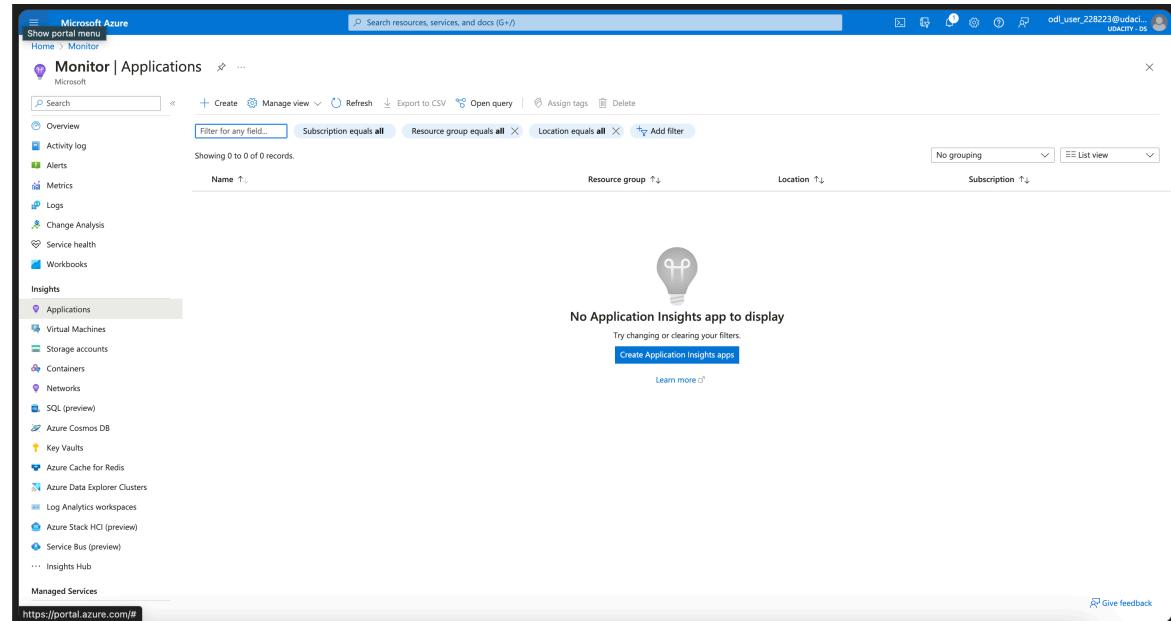
### Screenshots 1 through 6

You will submit the screenshots for the Monitor | Metrics screen as you are setting up.

**Hint 1:** Navigate to Insights > Applications and then click Add button

**Hint 2:** The Log Analytics workspace you created before will be used here

### Step 1:



## Step 2:

The screenshot shows the 'Basics' tab of the Application Insights creation wizard. It includes fields for Subscription (UdacityOS - 24), Resource Group (Udacity), Name (MyAppInsights), Region ((Europe) West Europe), and Resource Mode (Workspace-based). Below these are 'INSTANCE DETAILS' and 'WORKSPACE DETAILS' sections, both sharing the same subscription and workspace. At the bottom are 'Review + create' and navigation buttons.

## Step 3:

The screenshot shows the 'Tags' tab of the Application Insights creation wizard. It displays a table with one row: 'Name' and 'Value'. The 'Review + create' button is at the bottom.

## Step 4:

The screenshot shows the Microsoft Azure Application Insights creation interface. At the top, there's a green banner indicating "Validation passed". Below it, the "Review + create" tab is selected. The "SUMMARY" section displays the following details for the "Application Insights" resource:

Subscription	UdacityDS - 24
Resource Group	Udacity
Name	MyAppInsights
Region	West Europe
Workspace	MyLogWorkspace [eastus]

At the bottom, there are buttons for "Create" and "Download a template for automation".

## Step 5:

The screenshot shows the Microsoft App Insights Overview page. The main message is "Your deployment is complete". Deployment details are listed as follows:

- Deployment name: Microsoft.AppInsights
- Subscription: UdacityDS - 24
- Resource group: Udacity

Deployment started at 3/19/2023, 6:20:49 PM with Correlation ID: f35e465d-bd71-4d66-8b9b-3ac6da393c3c.

On the right side, there are promotional cards for Cost Management, Microsoft Defender for Cloud, and Work with an expert.

## Step 6: Click "Go to resource"

The screenshot shows the Microsoft Azure Application Insights Overview page for a resource group named 'MyApplnights'. The left sidebar contains navigation links for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Investigate (with sub-options like Application map, Live metrics, Transaction search, Availability, Failures, Performance, Troubleshooting guides (preview)), Monitoring (Alerts, Metrics, Diagnostic settings, Logs, Workbooks), and Usage (Users, Sessions, Events, Funnels). The main content area displays four cards: Failed requests, Server response time, Server requests, and Availability. Each card includes a chart and a summary table. The 'Failed requests' card shows 0 failed requests. The 'Server response time' card shows 0ms response time. The 'Server requests' card shows 0 server requests. The 'Availability' card shows 100% availability. At the top right, there are links for JSON View, Instrumentation Key, Connection String, and Workspace.

### Screenshots 7 through 12

You will submit screenshots of you enabling the VM.

**Hint 1:** So now that you have created Azure Insights for the Resource group, you need to go to Virtual Machines tab and actually enable it for the VM itself.

**Hint 2:** The key is to select the Log Analytics workspace which you created above in STEP 7: Azure Monitor – Log Analytics.

### Step 7:

**Step 8:**

**Monitoring configuration**

Virtual machine Insights now supports data collection using the Azure Monitor agent. Configuring using the Azure Monitor Agent is currently in preview mode.

Enable insights using  Azure Monitor agent (Recommended)  Log Analytics agent

Subscription \*

Data collection rule  [Create New](#) [MSVMI-MyLogWorkspace](#)

Guest performance Enabled

Processes and dependencies (Map) Disabled

Log Analytics workspace MyLogWorkspace

[Configure](#) [Cancel](#)

**Step 8:**

**Monitoring configuration**

\*\*\* Initializing deployment... Initializing template deployment to resource group Udacity.

Virtual machine Insights now supports data collection using the Azure Monitor agent. Configuring using the Azure Monitor Agent is currently in preview mode.

Enable insights using  Azure Monitor agent (Recommended)  Log Analytics agent

Subscription \*  [Create New](#) [MSVMI-DefaultWorkspace-f18a911a-a635-4aca-9b98-fc8baaf0786e-EUS](#)

Guest performance Enabled

Processes and dependencies (Map) Disabled

Log Analytics workspace DefaultWorkspace-f18a911a-a635-4aca-9b98-fc8baaf0786e-EUS

[Validating...](#) [Cancel](#)

## Step 9:

The screenshot shows the Azure VM Insights page for a virtual machine named 'MyVirtualMachine'. The top navigation bar includes links for 'Resource Group Monitoring', 'Azure Monitor', 'Run Diagnostics', 'Refresh', 'Monitoring configuration', and 'Provide Feedback'. The left sidebar lists various monitoring options: Updates, Inventory, Change tracking, Automate, Configuration management (Preview), Policies, Run command, Monitoring (with 'Insights' selected), Alerts, Metrics, Diagnostic settings, Logs, Connection monitor (classic), Workbooks, Automation (with 'Tasks (preview)' selected), and Export template. The main content area features a section titled 'Monitor the health and performance of virtual machines' with a brief description of VM insights. It includes two cards: 'Analyze data' (with a blue icon) and 'Create alerts' (with a green exclamation mark icon). A large 'Analyze data' button is centered below these cards.

## Step 10:

The screenshot shows the 'Performance' tab of the Azure VM Insights page for 'MyVirtualMachine'. The top navigation bar includes 'Refresh' and 'Provide Feedback' buttons. The main interface has tabs for 'Get started', 'Overview', 'Performance' (which is selected), and 'Map'. At the top, there are filters for 'Subscription: Azure subscription 1', 'Resource Group: Uadacity', 'Type: Virtual Machine', and a time range of 'Last hour as of 19 Mar 19:31'. On the right, there are buttons for 'View Workbooks', 'Azure', and 'Hybrid'. Below these, there are two chart sections: 'CPU Utilization %' and 'Available Memory'. The 'CPU Utilization %' chart shows a single data series for 'MyVirtualMachine' at 29.47% utilization over a one-hour period. The 'Available Memory' chart shows memory usage in MB, with a value of 190.7MB displayed.

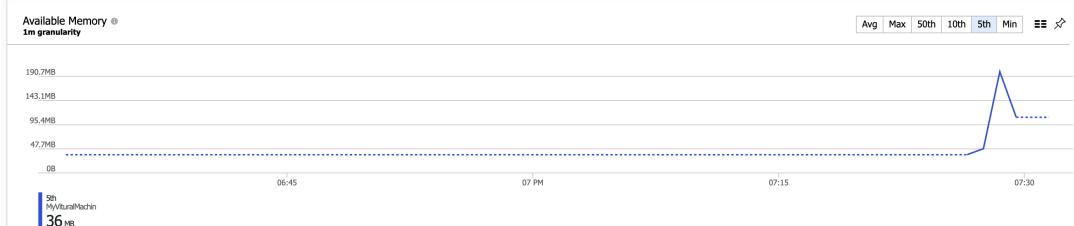
## Step 11:

Dashboard > Virtual machines > MyVirtualMachine | Insights >

### Insights

Insights

⟳ Refresh ⚡ Provide Feedback



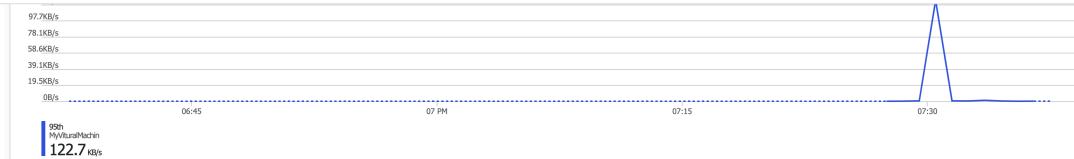
## Step 12:

Dashboard > Virtual machines > MyVirtualMachine | Insights >

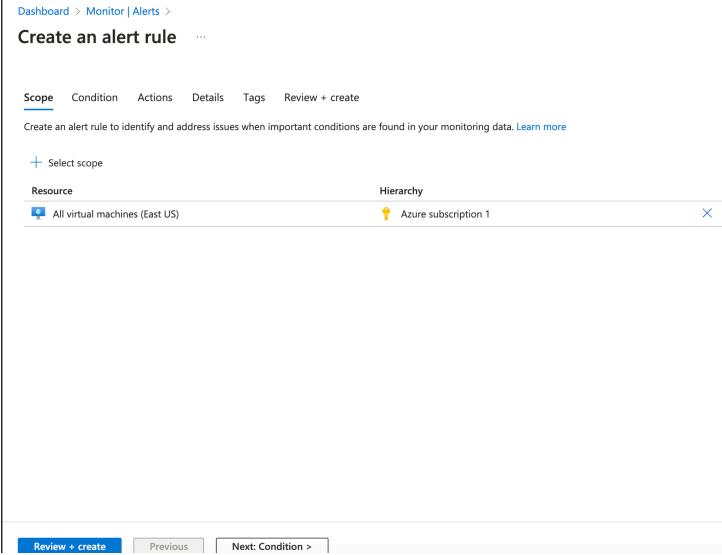
### Insights

Insights

⟳ Refresh ⚡ Provide Feedback



## STEP 9: Azure Monitor - Smart Alerts

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

## Step 2:

Dashboard > 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 \* Percentage CPU

Alert logic

We have set the condition configuration automatically based on popular settings for this metric. Please review and make changes as needed.

Threshold  Static  Dynamic

Aggregation type Average

Operator Greater than

Threshold value \* 0.3 %

Split by dimensions

Use dimensions to monitor specific time series and provide context to the fired alert. Dimensions can be either number or string columns. If you select more than one dimension value, each time series that results from the combination will trigger its own alert and will be charged separately. [About monitoring multiple time series](#)

Dimension name	Operator	Dimension values	Include all future values
Select dimension	=	0 selected	<input type="checkbox"/>
Add custom value			

Review + create Previous Next: Actions >

Preview

Whenever the average Percentage CPU is greater than 0.3%

Time range: Over the last 6 hours Time series: None

\$0.00 USD/month

## Step 3:

Dashboard > Monitor | Alerts >

### Create an alert rule

Threshold  Static  Dynamic

Aggregation type Average

Operator Greater than

Threshold value \* 0.3 %

Split by dimensions

Use dimensions to monitor specific time series and provide context to the fired alert. Dimensions can be either number or string columns. If you select more than one dimension value, each time series that results from the combination will trigger its own alert and will be charged separately. [About monitoring multiple time series](#)

Dimension name	Operator	Dimension values	Include all future values
Select dimension	=	0 selected	<input type="checkbox"/>
Add custom value			

When to evaluate

Check every 1 minute

Lookback period 1 minute

+ Add condition

Review + create Previous Next: Actions >

Preview

Whenever the average Percentage CPU is greater than 0.3%

Time range: Over the last 6 hours Time series: None

\$0.00 USD/month

## Step 4:

Dashboard > 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 action groups + Create action group

Action group name Contains actions

No action group selected yet

Review + create Previous Next: Details >

## Step 5:

Dashboard > Monitor | Alerts >

### Create an alert rule

Scope Condition Actions **Details** Tags Review + create

**Project details**

Select the subscription and resource group in which to save the alert rule.

Subscription \*

Resource group \*

**Alert rule details**

Severity \*

Alert rule name \*

Alert rule description

**Settings**

Enable upon creation

Automatically resolve alerts

Review + create Previous Next: Tags >

## Step 6 (Summary after above steps):

Screenshot of the 'Create an alert rule' wizard in the Azure portal. The 'Review + create' step is selected. The alert rule is named 'MyAlert' and is set to monitor 'All virtual machines (East US)' for 'Percentage CPU' being 'Greater than' 0.3 over a '1 minute' lookback period.

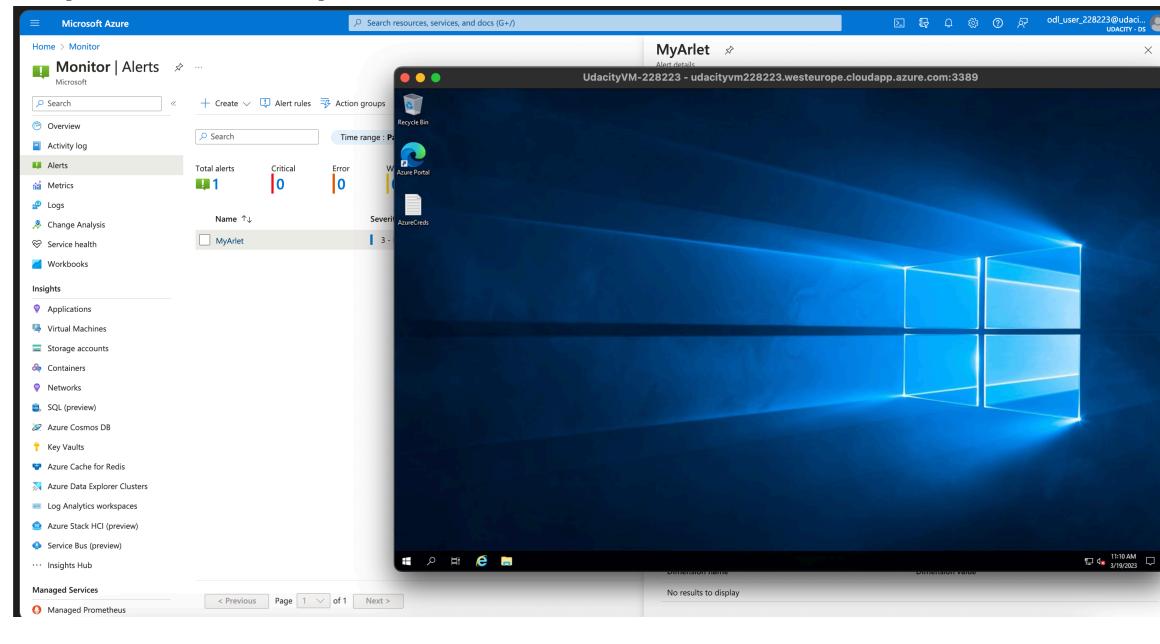
Scope	Condition	Actions	Details	Tags
Metric alert rule 1 Condition Terms of use   Privacy statement	Total pricing Variable Pricing			

**Scope**  
Resource: Azure subscription 1 > All virtual machines (East US)

**Condition**  
Signal name: Percentage CPU  
Operator: Greater than  
Aggregation type: Average  
Threshold value: 0.3  
Lookback period: 1 minute  
Check every: 1 minute

**Details**  
**Project details**  
Subscription: Azure subscription 1  
Resource group: Udacity  
Region: global  
**Alert rule details**  
Alert rule name: MyAlert  
Alert rule description: 1 -> Informational  
Severity: Informational  
Enable upon creation: checked  
Automatically resolve alerts: checked

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



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

The screenshot shows the Microsoft Azure Monitor Alerts interface. On the left, there's a navigation sidebar with links like Overview, Activity log, Alerts (which is selected), Metrics, Logs, Change Analysis, Service health, Workbooks, and Insights. The main area displays a summary of alerts: Total alerts (1), Critical (0), Error (0), Warning (0), Informational (1), and Verbose (0). A table lists the single alert: Name (MyAlert), Severity (Informational), and Affected resource (udacityvm-228223). The alert details pane on the right shows the alert was fired at 3/19/2023, 6:06 PM, for the user 'New' under the condition 'Fire'. It includes a chart showing Percentage CPU (Avg) over time, starting at 7.89% and dropping to 0%. Below the chart, it says the evaluation window start time was 3/19/2023, 5:58 PM and end time was 3/19/2023, 6:03 PM. The criterion section specifies Metric name: Percentage CPU, Time aggregation: Average, Threshold: 0.3, Metric namespace: microsoft.compute/virtualmachines, Operator: GreaterThan, and Metric value (when alert fired): 36.975.

### Explanation 1

Explain the purpose of Azure Dashboards, Azure Monitor and alerts

Azure Dashboards is a service that provides a customizable view of the Azure resources used by Company "X". It allows the user to monitor the performance of the resources and to identify any issues that may arise. Azure Monitor is a service that provides a centralized view of the performance and health of the Azure resources used by Company "X". It allows the user to monitor the performance of the resources and to identify any issues that may arise. Alerts are set up to notify the user when the performance of the resources falls below a certain threshold.

# 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. Navigate to Azure Monitor > Settings > Autoscale. You will create an Autoscale rule as part of this project.

## Screenshots 1-5

You will submit step-by-step screenshots for creating an autoscale rule under Azure Monitor.

### Step 1 (Browse to Monitor > Autoscale):

This screenshot shows the Azure Monitor interface with the 'Autoscale' section selected. A single resource, 'MyVirtualMachine', is listed under the 'Virtual machine scale set' category. The details show it's associated with the 'Udacity' resource group, located in the 'East US' region, and has an 'Instance count' of 2. The 'Autoscale status' is currently 'Not configured'.

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

This screenshot shows the 'Autoscale setting' configuration page for the 'MyVirtualMachine' scale set. The 'Custom autoscale' option is selected. A new rule is being added, with the 'Autoscale setting name' set to 'MyVirtualMachine-Autoscale-595'. The 'Resource group' is 'Udacity'. The 'Mode' is set to 'Disabled'. Under the 'Default' section, there is a note about deleting the last rule. The 'Scale mode' is set to 'Scale based on a metric'. A warning message states that if no rule is defined, the resource will be set to default instance count. The 'Instance limits' are set to a minimum of 2, maximum of 2, and default of 2. The 'Schedule' section indicates the condition is executed when none of the other scale condition(s) match.

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

**Scale rule**

Metric source  
Current resource (MyVirtualMachine)

Resource type  
Virtual machine scale sets  
Resource  
MyVirtualMachine

Criteria

Metric namespace \*  
Virtual Machine Host  
Metric name  
Percentage CPU  
1 minute time grain

Dimension Name      Operator      Dimension Values      Add

VMName      =      All values      +

If you select multiple values for a dimension, autoscale will aggregate the metric across the selected values, not evaluate the metric for each values individually.

Percentage CPU (Average)  
39.33 %

Enable metric divide by instance count ⓘ

Operator \*  
Greater than  
Metric threshold to trigger scale action \* ⓘ  
70 %

Duration (minutes) \* ⓘ  
10  
Time grain (minutes) ⓘ  
1

Time grain statistic \* ⓘ  
Average  
Time aggregation \* ⓘ  
Average

**Action**

Operation \*  
Increase count by  
instance count \*  
1

Cool down (minutes) \* ⓘ  
5

Add

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

Home > Monitor | Autoscale >

### Autoscale setting

MyVirtualMachine (Virtual machine scale set)

Save Discard Refresh Logs Feedback

New! Autoscale has added another powerful feature. Predictive autoscale [Learn more about Predictive autoscale](#).

Configure Scale-In Policy Predictive charts Run history JSON Notify Diagnostic settings

Autoscale is a built-in feature that helps applications perform their best when demand changes. You can choose to scale your resource manually to a specific instance count, or via a custom Autoscale policy that scales based on metric(s) thresholds, or schedule instance count which scales during designated time windows. Autoscale enables your resource to be performant and cost effective by adding and removing instances based on demand. [Learn more about Azure Autoscale](#) or [view the how-to video](#).

Choose how to scale your resource

Manual scale Maintain a fixed instance count

Custom autoscale Scale on any schedule, based on any metrics

Custom autoscale

Autoscale setting name \* MyVirtualMachine-Autoscale-607

Resource group Uadacity

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 [Edit](#)

Delete warning (i) 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 (i) It is recommended to have at least one scale in rule. To create new rules, click [Add a rule](#)

Scale out When MyVirtualMachine (Average) Percentage CPU > 70 Increase count by 1

+ Add a rule

Instance limits Minimum \* 2 Maximum \* 2 Default \* 2

Schedule This scale condition is executed when none of the other scale condition(s) match

+ Add a scale condition

✓ Resource 'MyVirtualMachine' updated

Successfully updated configuration for 'MyVirtualMachine'

a few seconds ago

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

Name	Resource type	Resource group	Location	Instance count	Autoscale status
MyVirtualMachine	Virtual machine scale set	Udacity	East US	2	Enabled

### Explanation

1

Explain the key details of autoscale screenshots you have submitted.

- Autoscaling can be done manually or through customization.
- We can do it in 2 ways:
  - Scale-based metric
  - Scale to specific instance count
- We can also choose scale based on the metric count
- We can add rules for metric to scale in/out
  - Metric name - Percentage CPU
  - Most important is the metric threshold to trigger scale action.
- The other defaults suggested by Azure are duration and cool down period. Min, Max, and default are instance parameters
  - Default is 2 VMs
  - Min no of 2 VMs in case of scaling in
  - Max no of 2 VMs in case of scaling out