

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.

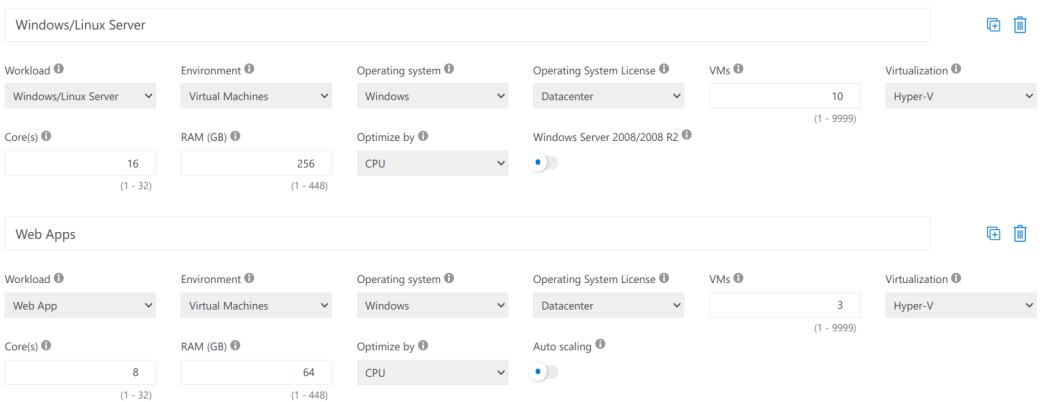
Server(s):	<p>Purpose: Windows/Linux Server Environment: Physical Servers Operating System: Windows Operating System License: DataCenter Servers: 10 Procs per server: 2 Core(s) per proc: 8 Cores RAM: 256 GB Optimize By: CPU GPU: None Usage: These are the servers where all your engineering workloads happen.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

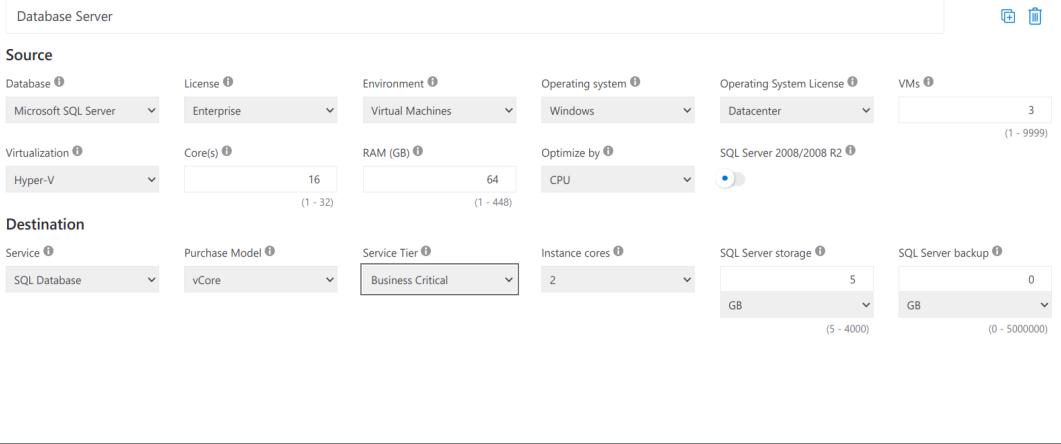
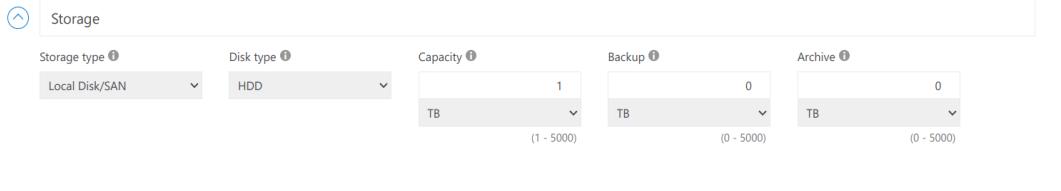
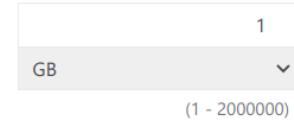
	<p>Operating System License: DataCenter</p> <p>Servers: 3</p> <p>Procs per server: 1</p> <p>Core(s) per proc: 8 Cores</p> <p>RAM: 64 GB</p> <p>Optimize By: CPU</p> <p>GPU: None</p> <p>Usage: These are the web app servers for your company. Currently they all are being leveraged at regular capacity.</p>
Server(s):	<p>Source: Database Server</p> <p>Database: Microsoft SQL Server</p> <p>License: Enterprise</p> <p>Environment: Physical Servers</p> <p>Operating System: Windows</p> <p>Operating System License: Datacenter</p> <p>Servers: 3</p> <p>Procs per server: 1</p> <p>Cores per proc: 16 Cores</p> <p>RAM: 64 GB</p> <p>Optimize By: CPU</p> <p>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.</p> <p>Destination</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	Purpose: Storage Type: Local Disk / SAN Disk Type: HDD Capacity: 1 TB Back-Up: None currently 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

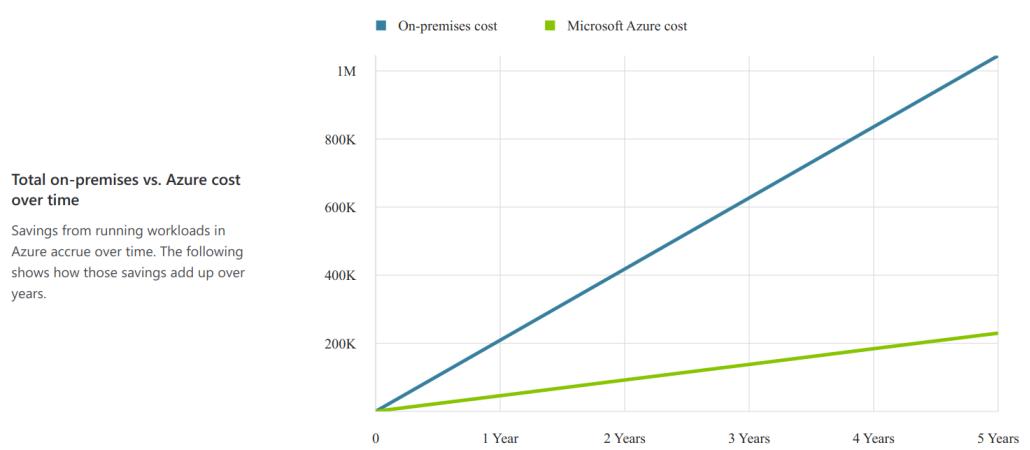
Purpose: To identify the Azure services needed to ensure Company "X"'s business continuity in the cloud.

Current Environment/Background 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.
Matching Azure Services Match the list of on-premises servers and services to the corresponding Azure ones.	→ 10 Vms of Standard_E32-16ads_v5 i.e. 16 vCPUs along with 256 GB RAM and as the specs are the same as on-prem servers it should be fine. → 3 VMs of Standard_A8m_v2 i.e. 8 vCPUs along with 64 GB RAM for the web apps also these are the same so it should be fine. → 3 VMs of Standard_B16ms i.e. 16 vCPUs along with 64 GB RAM for the database servers, should be fine as it's the same as on-prem servers. → Lastly, Azure Storage can be used along with the database servers to host the data.
Screenshot 1 Submit the screenshot for each of the above configurations from Azure TCO. <u>VM and Web Apps Server screenshot</u>	 <p>The screenshot displays two configuration panels from the Azure TCO tool:</p> <p>Windows/Linux Server Configuration:</p> <ul style="list-style-type: none">Workload: Windows/Linux ServerEnvironment: Virtual MachinesOperating system: WindowsOperating System License: DatacenterVMs: 10Virtualization: Hyper-VCore(s): 16 (1 - 32)RAM (GB): 256 (1 - 448)Optimize by: CPU <p>Web Apps Configuration:</p> <ul style="list-style-type: none">Workload: Web AppEnvironment: Virtual MachinesOperating system: WindowsOperating System License: DatacenterVMs: 3Virtualization: Hyper-VCore(s): 8 (1 - 32)RAM (GB): 64 (1 - 448)Optimize by: CPUAuto scaling: Enabled

<p>should be submitted here.</p>	
<p>Screenshot 2</p> <p>Submit the screenshot for each of the above configurations from Azure TCO.</p> <p><u>Database</u> screenshot should be submitted here.</p>	 <p>The screenshot shows the 'Database Server' configuration page. It is divided into 'Source' and 'Destination' sections. In the Source section, 'Database' is set to Microsoft SQL Server, 'License' to Enterprise, 'Environment' to Virtual Machines, 'Operating system' to Windows, 'Operating System License' to Datacenter, and 'VMs' to 3. Under 'Virtualization', 'Hyper-V' is selected. 'Core(s)' is set to 16 (1 - 32), 'RAM (GB)' to 64 (1 - 448), and 'Optimize by' is set to CPU. In the Destination section, 'Service' is set to SQL Database, 'Purchase Model' to vCore, 'Service Tier' to Business Critical, 'Instance cores' to 2, 'SQL Server storage' to 5 GB (5 - 4000), and 'SQL Server backup' to 0 GB (0 - 5000000).</p>
<p>Screenshot 3</p> <p>Submit the screenshot for each of the above configurations from Azure TCO.</p> <p><u>Storage configuration</u> screenshot should be submitted here.</p>	<p>Storage</p> <p>Enter the details of your on-premises storage infrastructure. After adding storage, select the storage type and enter the remaining details.</p>  <p>The screenshot shows the 'Storage' configuration page. It includes fields for 'Storage type' (Local Disk/SAN), 'Disk type' (HDD), 'Capacity' (1 TB, 1 - 5000), 'Backup' (0 TB, 0 - 5000), and 'Archive' (0 TB, 0 - 5000).</p>
<p>Screenshot 4</p> <p>Submit the screenshot for each of the above configurations from Azure TCO.</p> <p><u>Networking configuration</u> screenshot should be submitted here.</p>	<p>Networking</p> <p>Enter the amount of network bandwidth you currently consume in your on-premises environment.</p> <p>Outbound bandwidth</p>  <p>The screenshot shows the 'Networking' configuration page. It has a dropdown menu for 'Outbound bandwidth' set to 1 GB (1 - 2000000).</p>

Screenshot 5

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

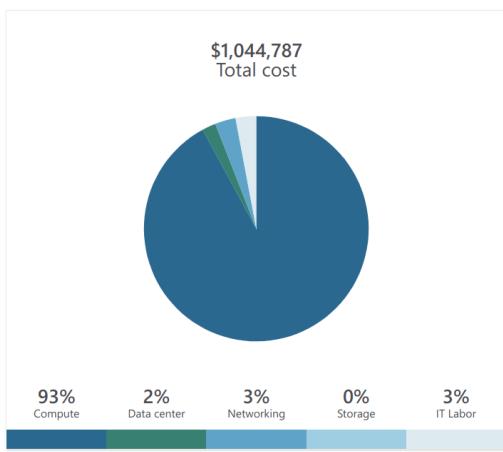


Screenshot 6

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

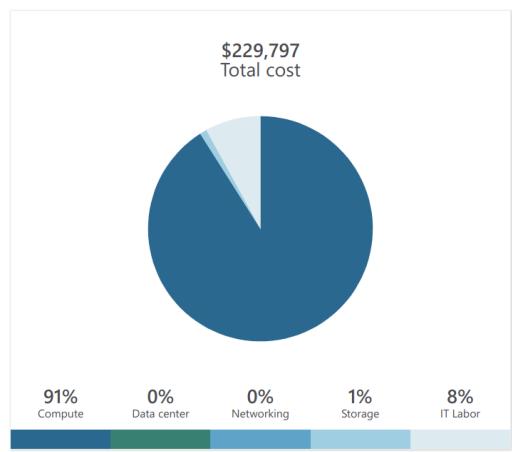
Total on-premises over 5 year(s)

TCO of on-premises environments tends to be driven by compute and data center costs.



Total Azure cost over 5 year(s)

In Azure, certain cost categories decrease or go away completely.

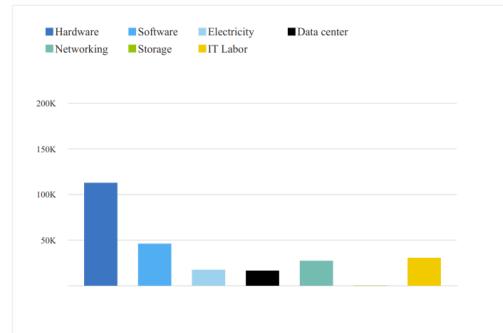


Screenshot 7

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

Total on-premises cost breakdown

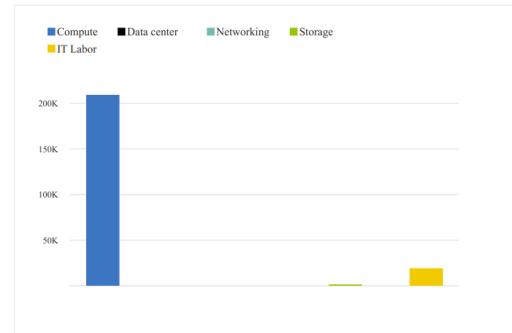
In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.



\$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.



\$229,797
Cost over 5 year(s)

Explanation 1

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

→ So from the above screenshots we can clearly understand that from the start itself we can see a huge amount of saving and cost reduction. So let's understand this more clearly and shed some light on each one of them.

1 → Compute Cost

- Azure manages all the hardware costs and it owns up the responsibility of providing the best hardware or the latest hardware to its clients which isn't the same with on-prem servers.
- Also in Azure changes can be made instantly whenever required but on-prem it's not that feasible sometimes.
- Also a lot of these software costs like OS licenses, etc can be saved with Azure.
- Electricity costs on Azure is generally lower than on-prem as it also uses green energy from power plants.

2 → Networking Cost

- In Azure we get free 100 GB per month after which a very minimal price will be charged for every GB unlike on-prem which is more expensive.

3 → Data Center Cost

- Data center costs are taken care of with Azure but the same isn't the case with on-prem.

4 → Storage Cost

- In Azure storage costs are based on the capacity and transactions and it is very scalable and you pay for what you use.
- In on-prem storage is scalable but there is maintenance cost.

5 → Labour Cost

- With Azure the labour cost decreases drastically as there are many free services like Azure policies which otherwise on-prem would have cost us as many things would be needed to be taken care of.

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 on US East Coast, and 5 will be on US West Coast.
- Choose the instance you want to create in both 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.

Virtual Machines

REGION: East US 2 OPERATING SYSTEM: Windows TYPE: (OS Only) TIER: Standard

CATEGORY: All INSTANCE SERIES: Bs-series INSTANCE: B16ms: 16 Cores, 64 GB RAM, 128 GB Temporary storage, \$0.730/hour

Virtual machines 5 x 730 Hours

Savings Options

Save up to 72% on pay-as-you-go prices with 1-year or 3-year Reserved Virtual Machine Instances. Reserved Instances are great for applications with steady-state usage and applications that require reserved capacity. [Learn more about Reserved VM Instances pricing.](#)

Compute (B16ms)	OS (Windows)	
<input checked="" type="radio"/> Pay as you go	<input checked="" type="radio"/> License included	= \$2,664.50
<input type="radio"/> 1 year reserved (~42% discount)	<input type="radio"/> Azure Hybrid Benefit	Average per month (\$0.00 charged upfront)
\$2,430.90	\$233.60	
Average per month (\$0.00 charged upfront)	Average per month (\$0.00 charged upfront)	

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: B16ms: 16 Cores, 64 GB RAM, 128 GB Temporary storage, \$0.730/hour

Virtual machines 5 x 730 Hours

Savings Options

Save up to 72% on pay-as-you-go prices with 1-year or 3-year Reserved Virtual Machine Instances. Reserved Instances are great for applications with steady-state usage and applications that require reserved capacity. [Learn more about Reserved VM Instances pricing.](#)

Compute (B16ms)	OS (Windows)	
<input checked="" type="radio"/> Pay as you go	<input checked="" type="radio"/> License included	= \$2,664.50
<input type="radio"/> 1 year reserved (~42% discount)	<input type="radio"/> Azure Hybrid Benefit	Average per month (\$0.00 charged upfront)
\$2,430.90	\$233.60	
Average per month (\$0.00 charged upfront)	Average per month (\$0.00 charged upfront)	

Screenshot 3

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

The screenshot shows the Azure Pricing calculator interface. It displays two rows of virtual machine configurations, each costing \$2,664.55 monthly. The configuration is 5 B16ms (16 vCPUs, 64 GB RAM) x 730 Hours (Pay a...). Below this, there's a 'Support' section with a dropdown set to 'Included'. A 'Select your programme/offer' section follows, with a dropdown for 'LICENSING PROGRAMME' set to 'Microsoft Customer Agreement (MCA)'. Underneath, there's a link to 'SHOW DEV/TEST PRICING'. At the bottom, it shows an 'Estimated upfront cost' of \$0.00 and an 'Estimated monthly cost' of \$5,329.10.

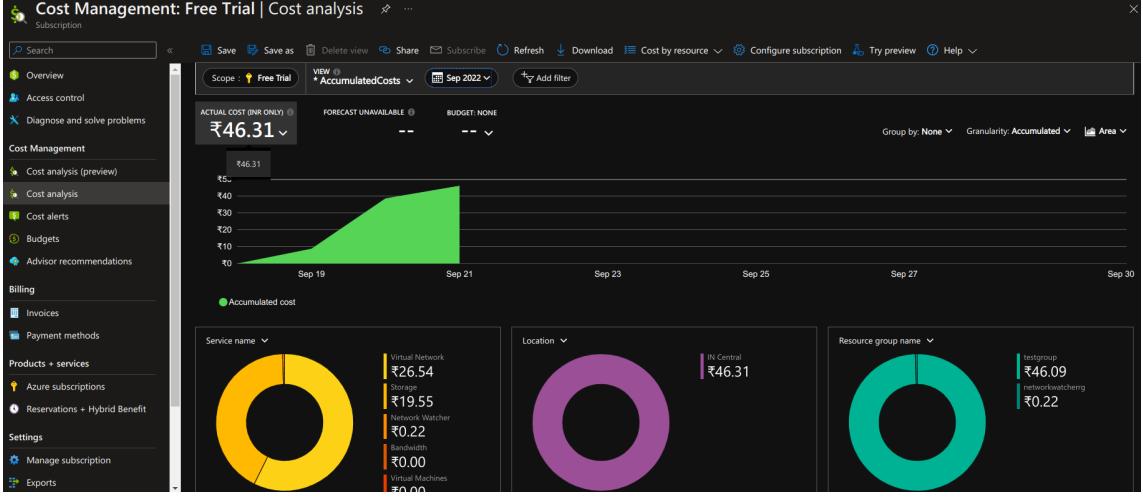
Virtual Machines	5 B16ms (16 vCPUs, 64 GB RAM) x 730 Hours (Pay a...)	Upfront: \$0.00	Monthly: \$2,664.55
Virtual Machines	5 B16ms (16 vCPUs, 64 GB RAM) x 730 Hours (Pay a...)	Upfront: \$0.00	Monthly: \$2,664.55
Support			
SUPPORT:			
Included			\$0.00
Select your programme/offer			
LICENSING PROGRAMME:		Selected billing profile:	
Microsoft Customer Agreement (MCA)		None selected (change)	
SHOW DEV/TEST PRICING			
Estimated upfront cost		\$0.00	
Estimated monthly cost		\$5,329.10	

Explanation 1

Explain how resilience is built in by moving to Azure

- We have resiliency as our VMs are located on both West as well as East Coast hence it is highly available.
- Resiliency is defined as a system's ability to recover from failures and continue to function.
- In Azure, we can use availability zones to improve the reliability of our systems/servers.
- Also Azure Disaster Recovery can be implemented to reduce downtime due to an outage, etc.

STEP 3: Azure Cost Management + Billing

Background	<p>You have now configured your Azure Production Workload environment and have 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 regard to cost management, which were not previously available.</p>
Question 1 Submit the explanation	<p>What is the purpose of Azure Cost Mgmt + billing Dashboard?</p>
Explanation 1	<ul style="list-style-type: none"> → Azure Cost Management & Billing Dashboard helps us with analyzing, managing, and optimizing the costs of our Azure resources hence its a very important tool. → We can track our usage set limits as well as make our bill payments.
Screenshot 2 Submit the screenshot for main Cost Mgmt + Billing Dashboard.	<p>Hint: 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</p>  <p>The screenshot displays the Azure Cost Management & Billing Dashboard. On the left, a sidebar menu includes sections like Overview, Access control, Diagnose and solve problems, Cost Management (with Cost analysis (preview) selected), Cost analysis, Cost alerts, Budgets, Advisor recommendations, Billing (Invoices, Payment methods), Products + services, Azure subscriptions, Reservations + Hybrid Benefit, Settings, Manage subscription, and Exports. The main area shows a chart titled 'Accumulated costs' from Sep 19 to Sep 30, with a total cost of ₹46.31. Below the chart are three donut charts: one for service name (Virtual Network: ₹26.54, Storage: ₹19.55, Network Watcher: ₹0.22, Bandwidth: ₹0.00, Virtual Machines: ₹0.00), one for location (IN Central: ₹46.31), and one for resource group name (testgroup: ₹46.09, networkwatcher: ₹0.22).</p>
Explanation 2	<p>Hint: Make sure the right time period is selected to see the data.</p>

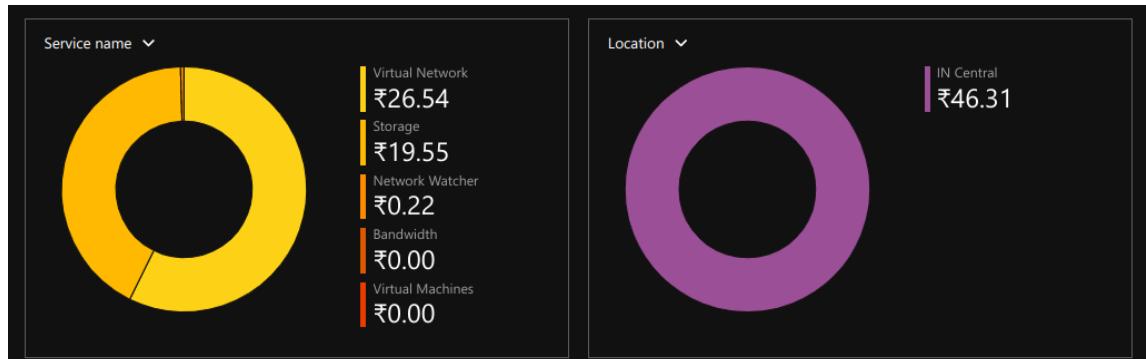
Explain the key components of the screenshot submitted. An explanation to be provided for Scope and Area dropdown from the screenshot submitted.

- The top part of the graph shows an area chart for the appropriate date selected (top dropdown September 2022) 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

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 Analysis" to reach this dashboard. These pie charts are under the above graph submitted.



Explanation 3

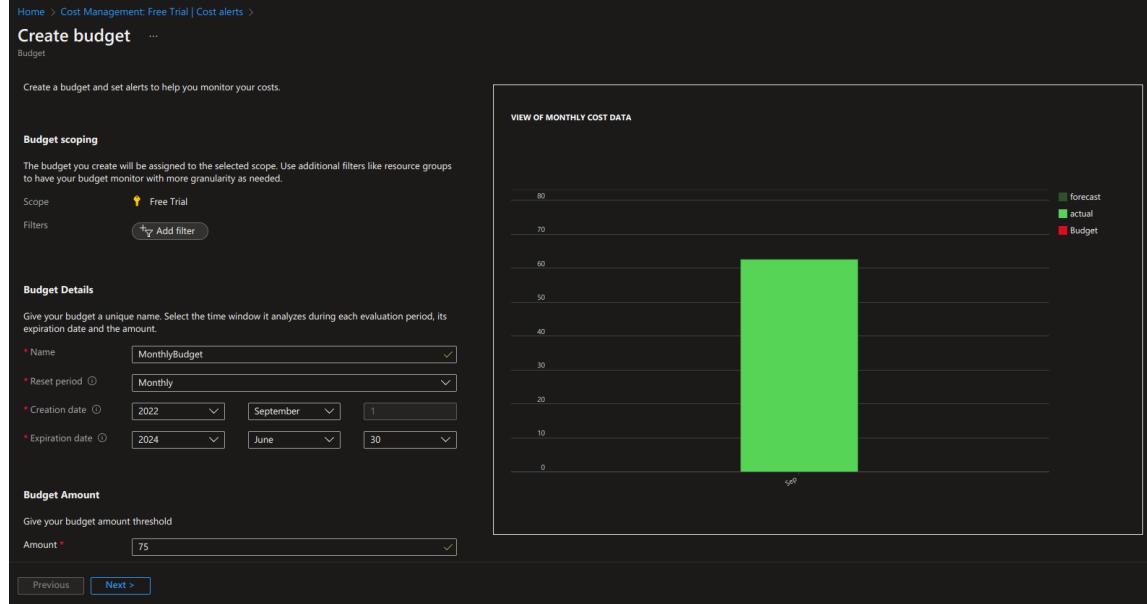
Explain the key components of the screenshot submitted.

- 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 Central India.

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 budgets based on what resources they need.
- 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).

Home > Cost Management: Free Trial | Cost alerts >

Create budget

Budget

*** Alert conditions**

Type	% of budget	Amount	Action group
Actual	70	52.50	None
Select type	Enter %	-	None

Manage action group ⓘ

*** Alert recipients (email)**

Alert recipients (email)

It is recommended to add azure-noreply@microsoft.com to your email white list to ensure alert mails do not go to your spam folder.

Language preference

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

Languages * Default

Previous Create

VIEW OF MONTHLY COST DATA

Home > Cost Management: Free Trial | Budgets > MonthlyBudget > Edit budget > Action groups >

Create an action group

Basics Notifications Actions Tags Review + create

An action group invokes a defined set of notifications and actions when an alert is triggered. [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 * ⓘ Free Trial

Resource group * ⓘ Create new

Region * Global

Instance details

Action group name * ⓘ

Display name * ⓘ This display name is limited to 12 characters

Review + create Previous Next: Notifications >

Explanation 5 Explain the key components of the screenshot submitted.	<ul style="list-style-type: none"> → In the above steps we are setting an alert and set a limit of 70% as the threshold for the alert. → When this alert threshold is hit the specified email would receive a mail. → There is also an action group that one can use to execute a task. → Budget alerts provide both costs based as well as usage-based budgets. → Whenever the alert conditions are met the alert is triggered.
Screenshot 6 Submit the screenshot for breakdown of costs by Service Name and Location.	<p>This is the same as screenshot 3 as well as the below one.</p>
Explanation 6 Explain the key components of the screenshot submitted.	
Explanation 7 Explain the summarized highlights of this part of the project, Azure Cost Mgmt + Billing	<ul style="list-style-type: none"> → Azure Cost Mgmt + Billing tools are some key tools provided by Azure that help analyze, manage and optimize the costs of the resources. → These tools help to make the most of the cloud. <p>A few of the key features provided are</p> <ul style="list-style-type: none"> • Data analysis of costs • Set thresholds • Pay bills from this portal • Download cost and usage data

STEP 4: Azure Policy to create and enforce policies

Background	<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>
Screenshots 1 through 5 Submit the screenshots for Azure Policy steps.	<p>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.</p> <p><u>Very important note:</u></p> <ol style="list-style-type: none">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 though2. 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

Step 1:

The screenshot shows the 'Policy definition' blade for the 'Allowed virtual machine size SKUs' policy. It includes the following details:

- Essentials**:
 - Name: Allowed virtual machine size SKUs
 - Description: This policy enables you to specify a set of virtual machine size SKUs that your organization can... (truncated)
 - Available Effects: Deny
 - Category: Compute
- Definition location: ...
- Definition ID: /providers/Microsoft.Authorization/policyDefinitions/cccc23c7-8427-4f53-ad12-b6a63eb452...
- Type: Built-in
- Mode: Indexed

The JSON definition is displayed in the main pane:

```
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": "VMSKUs"
18      }
19    }
20  }
```

Step 2:

The screenshot shows the 'Assign policy' blade for the 'Allowed virtual machine size SKUs' policy. It includes the following sections:

- Scope**:
 - Scope: Learn more about setting the scope *
 - Free Trial
- 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**: (empty text area)
 - Policy enforcement** ⓘ:
 - Enabled
 - Disabled
 - Assigned by**: 06 Abey George

At the bottom are buttons for **Review + create**, **Cancel**, **Previous**, and **Next**.

Step 3

All services > Policy | Definitions > Allowed virtual machine size SKUs >

Allowed virtual machine size SKUs

Assign policy

Basics **Parameters** Remediation Non-compliance messages Review + create

Search by parameter name

Only show parameters that need input or review

Allowed Size SKUs * ⓘ

Standard_B1s

Review + create

Cancel

Previous

Next

Step 4:

Allowed virtual machine size SKUs

Assign policy

Basics Parameters Remediation Non-compliance messages Review + create

By default, this assignment will only take effect on newly created resources. Existing resources can be updated via a remediation task after the policy is assigned. For deployIfNotExists policies, the remediation task will deploy the specified template. For modify policies, the remediation task will edit tags on the existing resources.

Managed Identity

Policies with the deployIfNotExists and modify effect types need the ability to deploy resources and edit tags on existing resources respectively. To do this, choose between an existing user assigned managed identity or creating a system assigned managed identity. [Learn more about Managed Identity](#).

Create a Managed Identity ⓘ

Permissions

⚠️ This policy does not contain any role definitions. deployIfNotExists and modify policies must specify role definitions in order to create the correct role assignments for the managed identity.

[Review + create](#)

[Cancel](#)

[Previous](#)

[Next](#)

Step 5:

Allowed virtual machine size SKUs

Assign policy

Basics

Parameters

Remediation

Non-compliance messages

Review + create

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.

Non-compliance message

Only B1s is allowed



Review + create

Cancel

Previous

Next

Allowed virtual machine size SKUs

Assign policy

Basics Parameters Remediation Non-compliance messages Review + create

Basics

Scope	Free Trial
Exclusions	--
Policy definition	Allowed virtual machine size SKUs
Assignment name	Allowed virtual machine size SKUs
Description	--
Policy enforcement	Enabled
Assigned by	06 Abey George

Parameters

listOfAllowedSKUs	standard_b1s
-------------------	--------------

Remediation

i No managed identity associated with this assignment.

Non-compliance messages

Default non-compliance message	Only B1s is allowed
--------------------------------	---------------------

Create

Cancel

Previous

Next

Screenshot 6

Explain through screenshots what happens when you create a VM which is in

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.

violation with
the policy
you just
created.

VM Size ↑	Type ↑↓	vCPUs ↑↓	RAM (GiB) ↑↓	Data disks ↑↓	Max IOPS ↑↓	Temp storage (GiB) ↑↓	Premium disk ↑↓	Cost/month ↑↓
The most used sizes by users in Azure								
DS1_v2 ↗	General purpose	1	3.5	4	3200	7	Supported	₹4,417.82
D2s_v3 ↗	General purpose	2	8	4	3200	16	Supported	₹5,522.27
D2as_v4 ↗	General purpose	2	8	4	3200	16	Supported	₹3,271.29
B2s ↗	General purpose	2	4	4	1280	8	Supported	₹2,356.17
B1s ↗ (free services eligible)	General purpose	1	1	2	320	4	Supported	₹589.04
B2ms ↗	General purpose	2	8	4	1920	16	Supported	₹6,712.34
B1ls ↗	General purpose	1	0.5	2	320	4	Supported	₹294.52
DS2_v2 ↗	General purpose	2	7	8	6400	14	Supported	₹8,888.22
The latest generation D family sizes recommended for your general purpose needs								
The 4th generation D family sizes for your general purpose needs								
Ideal for workloads that do not need continuous full CPU performance								
The latest generation E family sizes for your high memory needs								
The 4th generation E family sizes for your high memory needs								

Select Prices presented are estimates in your local currency that include only Azure infrastructure costs and any discounts for the subscription and location. The prices don't include any applicable software costs. Final charges will appear in your local currency in cost analysis and billing views. [View Azure pricing calculator.](#)

Since all are already blocked by the policy, I can't select a VM.
This is the error shown

Errors

Summary **Raw Error**

ERROR DETAILS

Resource 'Test2' was disallowed by policy. (Code: RequestDisallowedByPolicy)

Policy: Allowed virtual machine size SKUs
Reason: Only B1s is allowed

As we can see above only B1s are allowed

Explanation 1

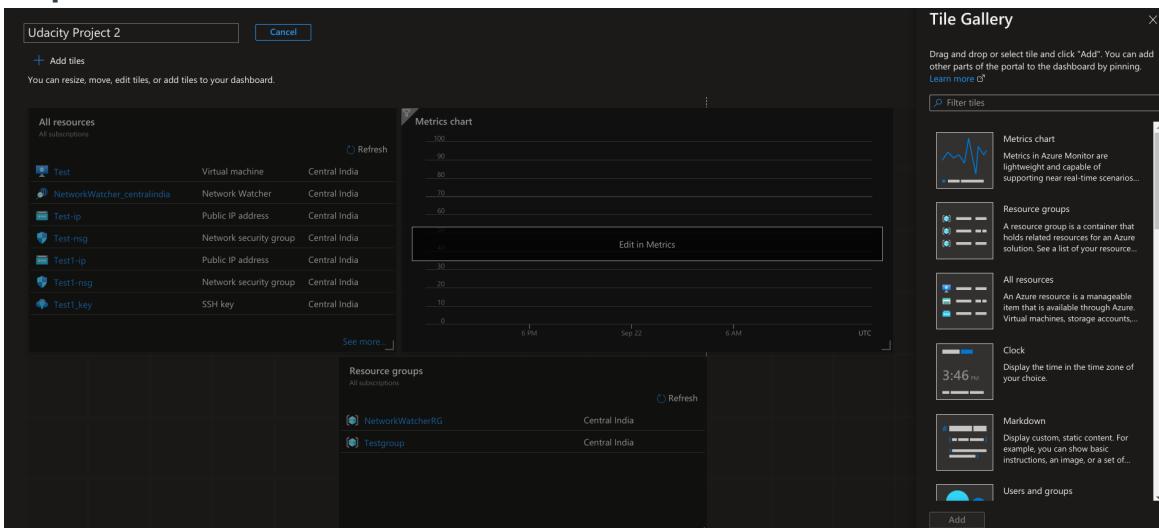
Explain the summarized highlights of this part of

- Azure policy is used to enforce standards and to assess compliance at scale.
- Basically these policies permit us to allow/disallow certain resource types, sizes, and regions or force us to add specific tags to resource groups.
- Policies can be applied through multiple levels and are inherited from the top to the bottom starting from the root management.

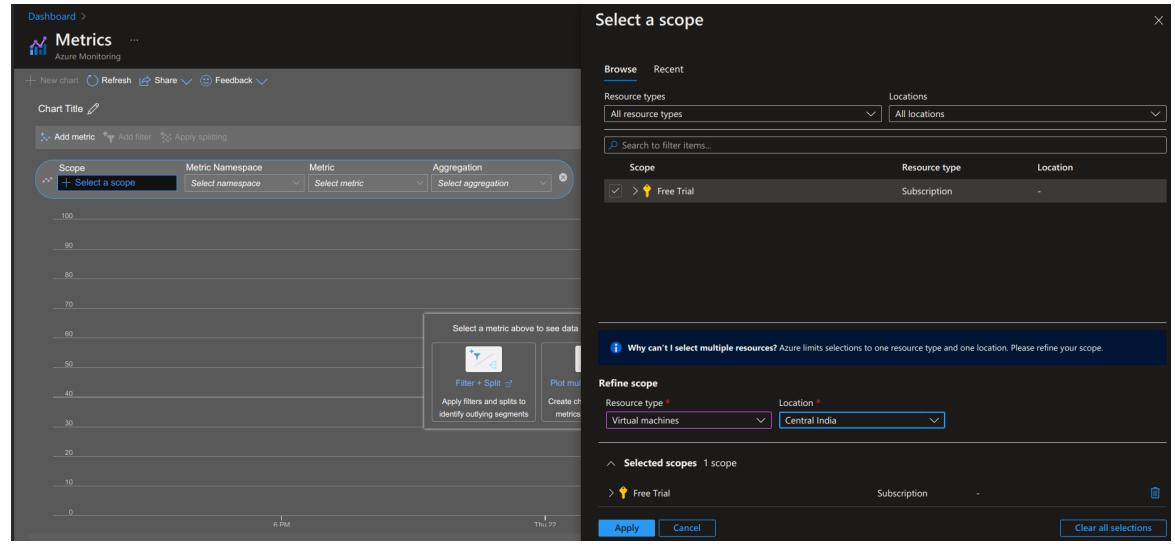
the project,
Azure Policy.

- Azure Policy starts with a policy definition with conditions for enforcement.
- If those certain conditions are met then we can deny, remediate, or audit.

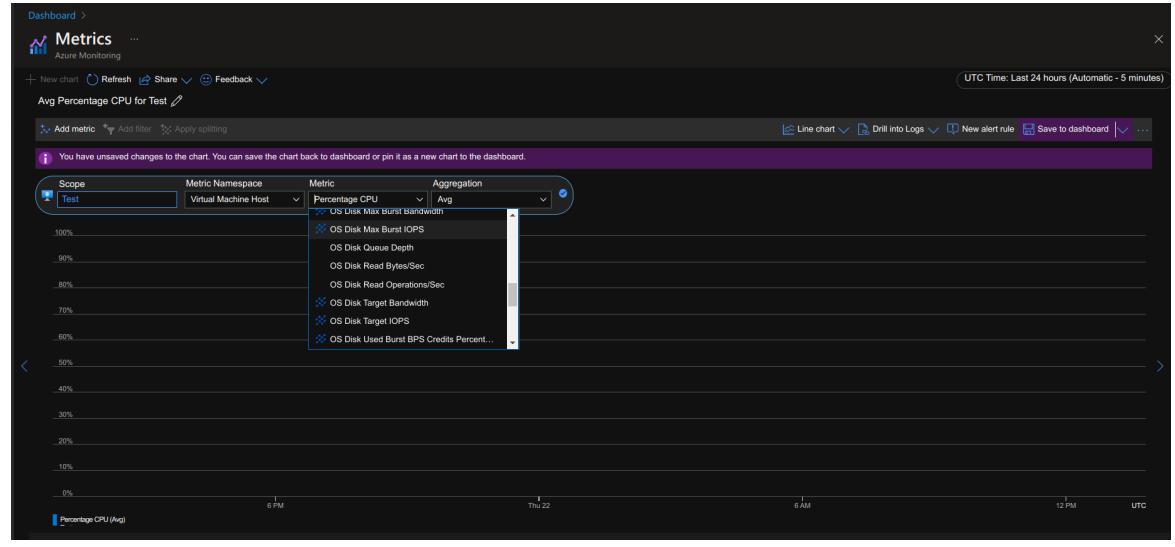
STEP 5: Azure Dashboards

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

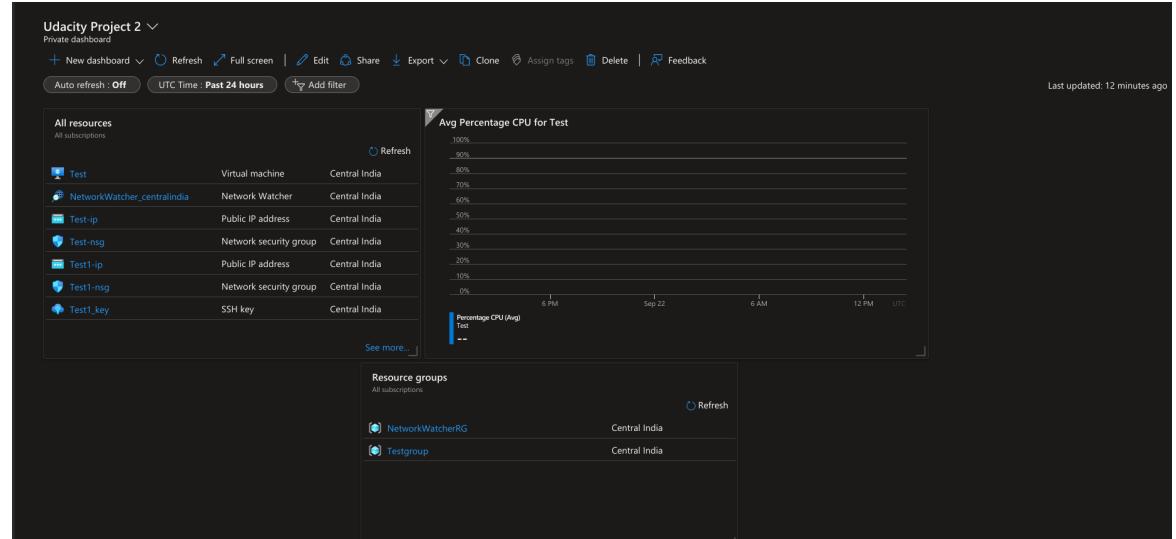
Step 2: Percentage CPU



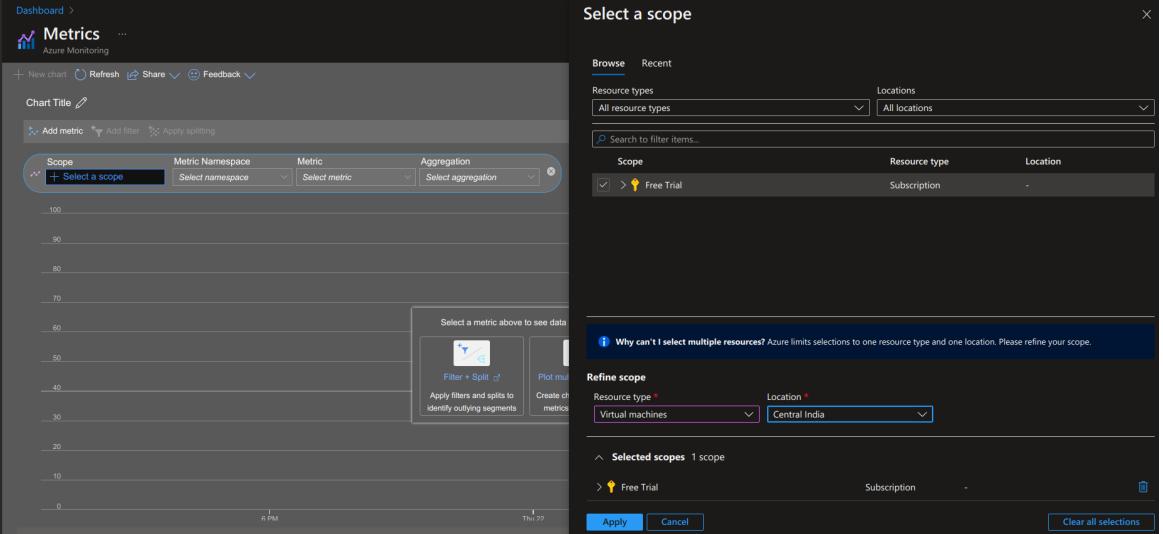
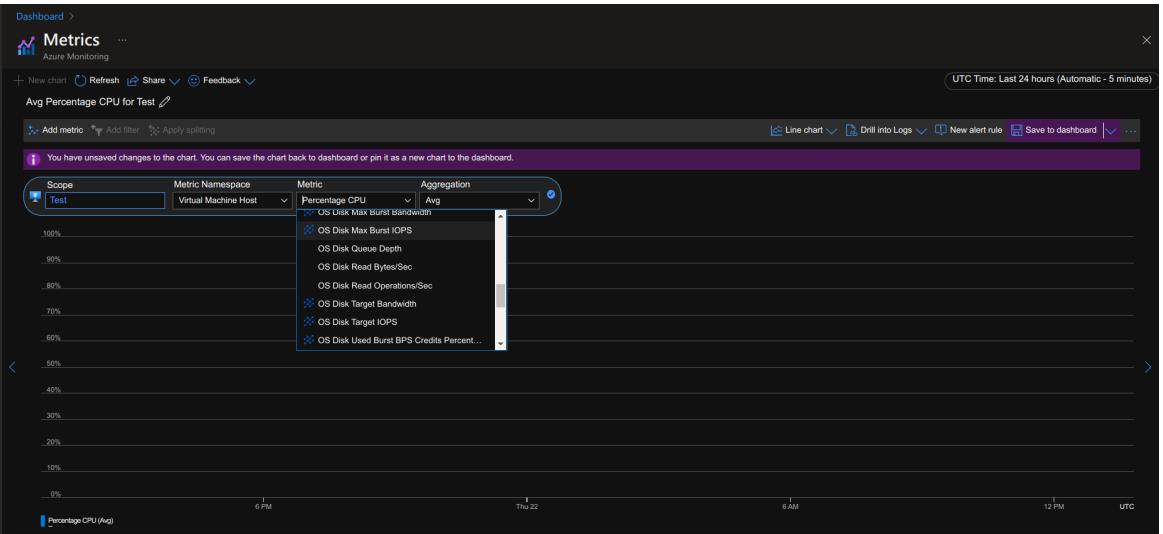
The screenshot shows the Azure Metrics blade. A modal window titled "Select a scope" is open, allowing the user to choose a resource type and location. The "Resource types" dropdown is set to "All resource types" and the "Locations" dropdown is set to "All locations". A search bar at the top of the modal contains the text "Free Trial". Below the search bar, a table lists a single item: "Scope: Free Trial, Resource type: Subscription, Location: -". A note at the bottom of the modal states: "Why can't I select multiple resources? Azure limits selections to one resource type and one location. Please refine your scope." At the bottom of the modal are "Apply" and "Cancel" buttons.



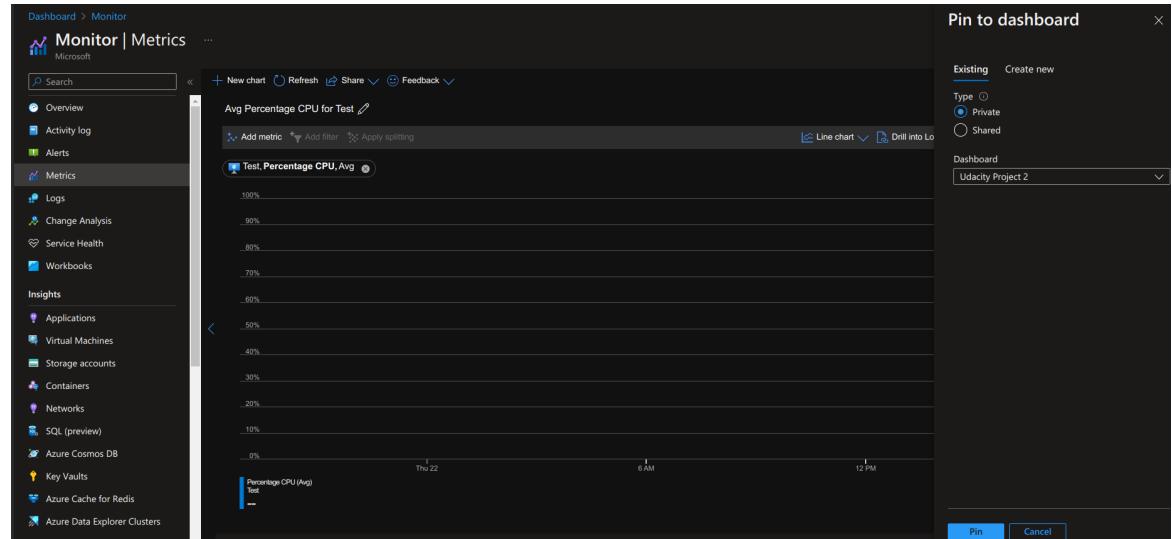
Step 3 (Final Output):



STEP 6: Azure Monitor - Metrics

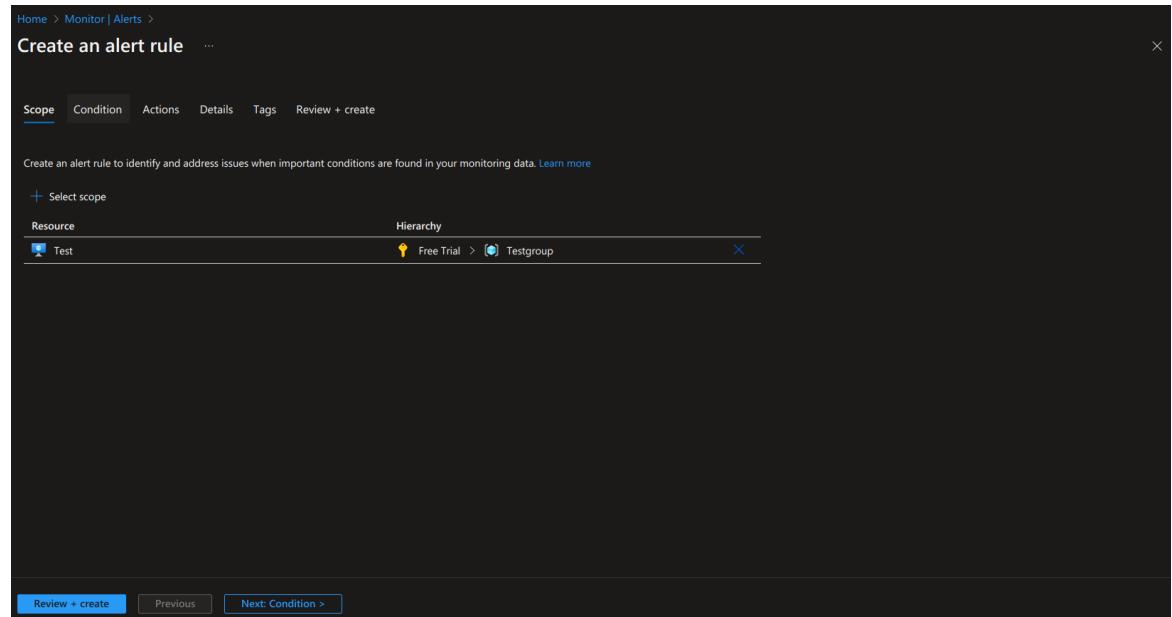
Task 1	You need to navigate to Azure Monitor > Metrics screen and create a Percentage CPU as a metric and submit screenshot of the graph generated and pin to dashboard.
Screenshots 1 through 3 You will submit the screenshots for Monitor Metrics screen as you are setting up	<p>Step 1:</p>  <p>The screenshot shows the Azure Monitor Metrics interface. On the left, there's a chart area with a Y-axis from 0 to 100 and an X-axis from 6 PM to Thu 22. On the right, a modal window titled 'Select a scope' is open. It has sections for 'Resource types' (set to 'All resource types') and 'Locations' (set to 'All locations'). Below that is a 'Scope' section with a checkbox checked next to 'Free Trial'. 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.' At the bottom of the modal are 'Refine scope' and 'Selected scopes' buttons, along with 'Apply' and 'Cancel' buttons.</p> <p>Step 2:</p>  <p>The screenshot shows the Azure Monitor Metrics interface with a chart titled 'Avg Percentage CPU for Test'. The chart displays a single line from 6 PM to Thu 22. The Y-axis ranges from 0% to 100%. The X-axis shows time points: 6 PM, Thu 22, 8 AM, and 12 PM UTC. The chart area has a legend 'Percentage CPU (Avg)'. Above the chart, the 'Metric Namespace' is set to 'Virtual Machine Host' and the 'Metric' is set to 'Percentage CPU' with 'Avg' aggregation. A dropdown menu is open over the 'Metric' dropdown, showing a list of metrics including 'OS Disk Max burst bandwidth', 'OS Disk Max IOPS', 'OS Disk Queue Depth', 'OS Disk Read Bytes/Sec', 'OS Disk Read Operations/Sec', 'OS Disk Target Bandwidth', 'OS Disk Target IOPS', and 'OS Disk Used Burst BPS Credits Percent...'. At the top right, it says 'UTC Time: Last 24 hours (Automatic - 5 minutes)'.</p>

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.



Home > Monitor | Alerts >

Create an alert rule

Condition

Configure when the alert rule should trigger by selecting a signal and defining its logic.

Percentage CPU

Alert logic

Threshold Static Dynamic

Aggregation type: Average

Operator: Greater than

Threshold value: 0.3 %

Evaluation frequency

Check every: 1 minute

Look at data from the last: 5 minutes

Add condition

Preview

Whenever the average Percentage CPU is greater than 0.3%

Time range: Over the last 6 hours Time series: Aggregate

0.10 USD/month

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%

2 PM 3 PM 4 PM 5 PM 6 PM UTC+05:30

Percentage CPU (Avg) test --

Actions

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 >**

Home > 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 * [Create new](#)

Alert rule details

Severity *

Alert rule name *

Alert rule description

Advanced options

Settings

Enable upon creation

Automatically resolve alerts

[Review + create](#) [Previous](#) [Next: Tags >](#)

Home > Monitor | Alerts >

Create an alert rule

Scope Condition Actions Details Tags Review + create

Tags are name and 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 about using tags](#)

Note that if you later change resource settings on other tabs, your tags will be automatically updated.

Name Value

[Review + create](#) [Previous](#) [Next: Review + create >](#)

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

Scope Condition Actions Details Tags Review + create

Metric alert rule Total pricing
1 Condition Variable
Terms of use | Privacy statement Pricing

Scope Resource Free Trial > Testgroup > Test

Condition Signal name Percentage CPU
Operator Greater than
Aggregation type Average
Threshold value 0.3
Look at data from the last 5 minutes
Check every 1 minute

Details Project details Subscription Free Trial
Resource group Testgroup
Region global

Alert rule details Alert rule name CpuIncreaseAlert
Alert rule description
Severity 3 - Informational
Enable upon creation
Automatically resolve alerts

Create Previous

Home > Monitor | Alerts Microsoft

+ Create Alert rules Action groups Alert processing rules Columns Refresh Export to CSV Open query ...

Search Overview Activity log Alerts Metrics Logs Change Analysis Service Health Workbooks

Search Time range: Past 24 hours Subscription: all Alert condition: Fired Add filter More (1)

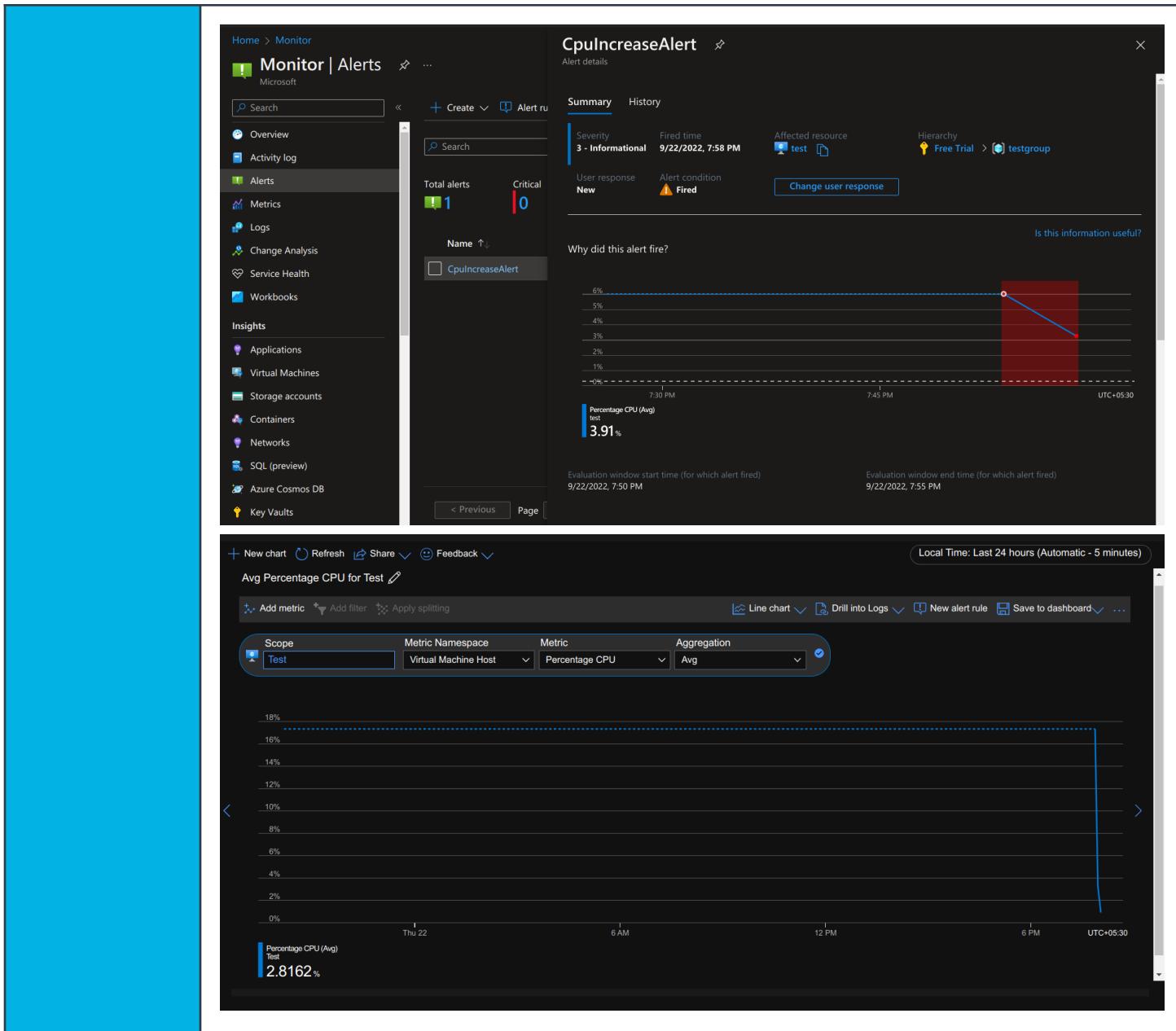
Total alerts Critical Error Warning Informational Verbose

Name: CpuIncreaseAlert

gabey14@Test:~\$ sudo apt install okular
Reading package lists... Done
Building dependency tree
Reading state information... Done

No apt package "okular", but there is a snap with that name.
Try "snap install okular"

E: Unable to locate package okular
gabey14@Test:~\$ snap install okular
error: access denied (try with sudo)
gabey14@Test:~\$ sudo snap install okular
Automatically connect eligible plugs and slots of snap "okular"
Automatically connect eligible plugs and slots of snap "okular"
okular 22.08.0 from KDE/ installed
gabey14@Test:~\$



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	Step 1:

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

Home > Log Analytics workspaces >

Create Log Analytics workspace

Basics Tags Review + Create

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](#)

With Azure Monitor Logs you can easily store, retain, and query data collected from your monitored resources in Azure and other environments for valuable insights. A Log Analytics workspace is the logical storage unit where your log data is collected and stored.

Project details

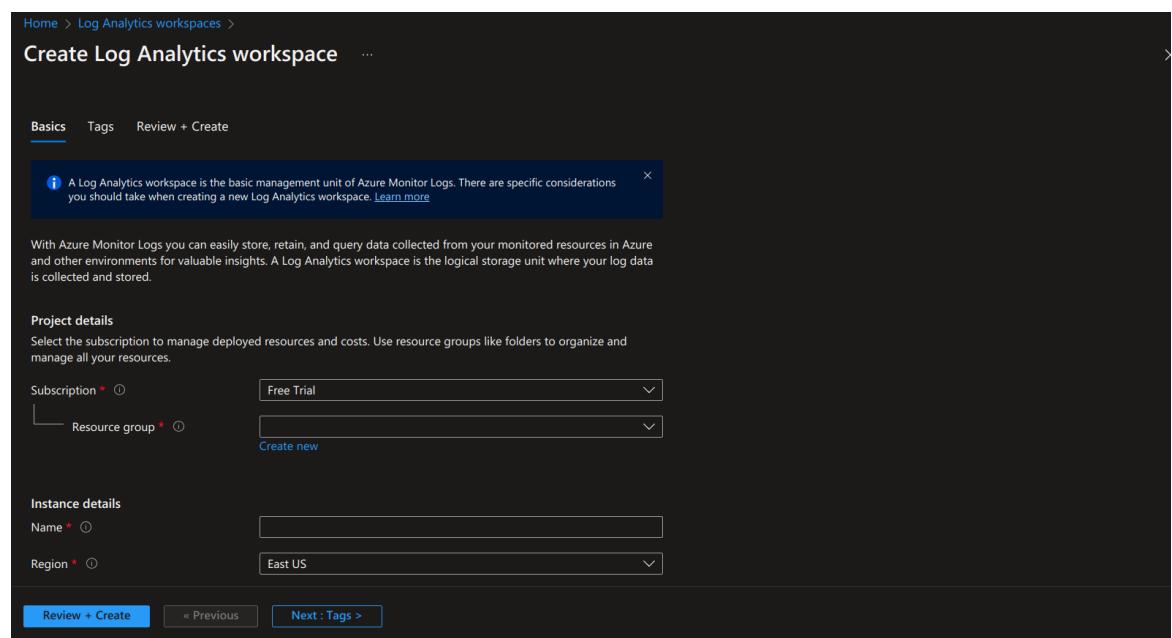
Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * Resource group *
[Create new](#)

Instance details

Name * Region *

[Review + Create](#) [« Previous](#) [Next : Tags >](#)



Step 2:

Home > Log Analytics workspaces >

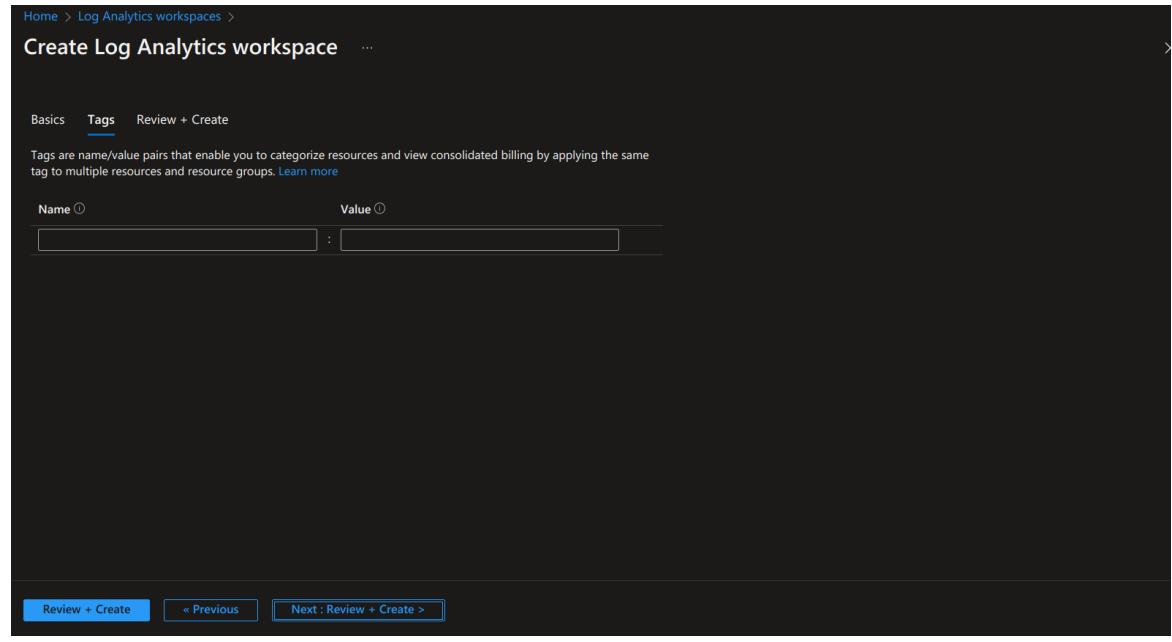
Create Log Analytics workspace

Basics Tags Review + Create

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](#)

Name ⓘ	Value ⓘ	
<input type="text"/>	:	<input type="text"/>

[Review + Create](#) [« Previous](#) [Next : Review + Create >](#)



Step 3:

Home > Log Analytics workspaces >
Create Log Analytics workspace ...

Validation passed

Basics Tags Review + Create

Log Analytics workspace
by Microsoft

Basics

Subscription	Free Trial
Resource group	Testgroup
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:

Home >
Microsoft.LogAnalyticsOMS | Overview ↗ ...
Deployment

Search Delete Cancel Redeploy Download Refresh

We'd love your feedback! →

Overview Inputs Outputs Template

Deployment is in progress

Deployment name: Microsoft.LogAnalyticsOMS Start time: 9/22/2022, 8:16:38 PM
Subscription: Free Trial Correlation ID: f1324748-37e3-4388-8b99-4f52727eff25

Deployment details

Resource	Type	Status	Operation details
No results.			

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and be your first line of support.
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Home >

MyLogWorkspace

Log Analytics workspace

Search Delete

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Settings

Locks

Agents management

Legacy agents management

Custom logs

Computer Groups

Data Export

Linked storage accounts

Network Isolation

Tables (preview)

General

Workspace summary

Essentials

Resource group (move) : testgroup

Status : Active

Location : East US

Subscription (move) : Free_Trial

Subscription ID : b7a24163-c5f0-4389-a149-0c93859eed8b

Tags (edit) : Click here to add tags

Workspace Name : MyLogWorkspace

Workspace ID : 31ce3761-841d-4643-98aa-98fb36b9ae19

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

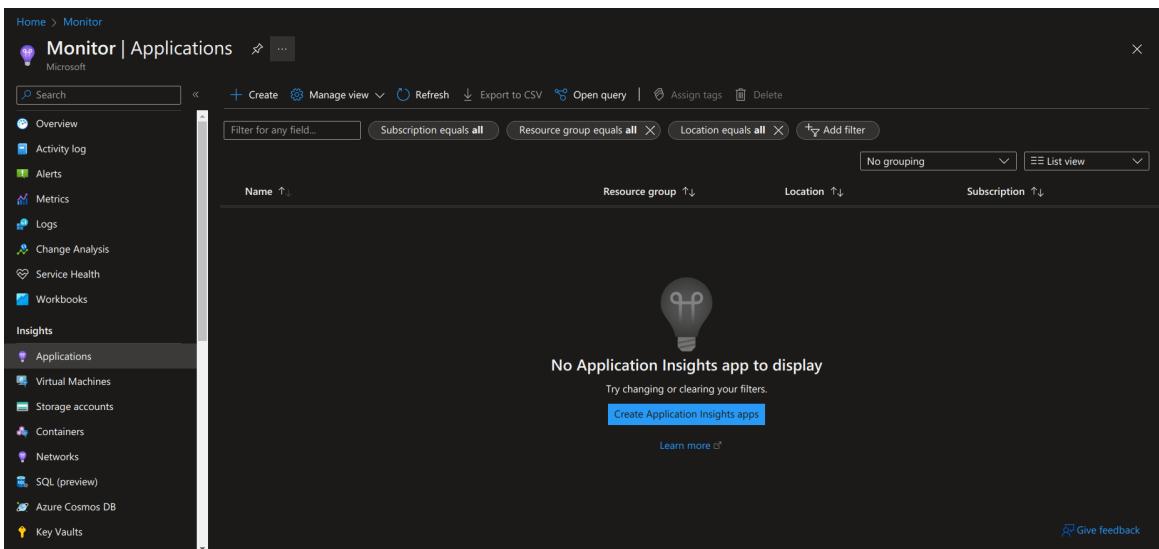
Create alerts to proactively detect any issue that arise in your workspace

Learn more about monitor workspace health

Useful links

This screenshot shows the 'Overview' page of a Log Analytics workspace named 'MyLogWorkspace'. The left sidebar contains navigation links for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Settings (Locks, Agents management, Legacy agents management, Custom logs, Computer Groups, Data Export, Linked storage accounts, Network Isolation, Tables (preview)), General, and Workspace summary. The main content area is titled 'Essentials' and displays workspace metadata: Resource group (testgroup), Status (Active), Location (East US), Subscription (Free_Trial), Subscription ID (b7a24163-c5f0-4389-a149-0c93859eed8b), and Tags (with a link to edit). It also shows operational status: Workspace Name (MyLogWorkspace), Workspace ID (31ce3761-841d-4643-98aa-98fb36b9ae19), Pricing tier (Pay-as-you-go), Access control mode (Use resource or workspace permissions), and Operational issues (OK). Below this, a section titled 'Get started with Log Analytics' provides an overview of the service's capabilities and links to 'Connect a data source', 'Configure monitoring solutions', and 'Monitor workspace health'. A 'Useful links' section is also present at the bottom.

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.	<p>Hint 1: Navigate to Insights > Applications and then click Add button</p> <p>Hint 2: The Log Analytics workspace you created before will be used here</p> <p>Step 1:</p>  <p>The screenshot shows the Azure Monitor Applications page. The left sidebar lists various monitoring categories like Overview, Activity log, Alerts, Metrics, Logs, Change Analysis, Service Health, Workbooks, and Insights. Under Insights, the 'Applications' option is selected. The main pane displays a table with columns for Name, Resource group, Location, and Subscription. A large lightbulb icon is centered in the middle of the page with the text 'No Application Insights app to display'. Below it, there's a message 'Try changing or clearing your filters.' and a blue button labeled 'Create Application Insights apps'. At the bottom right, there are 'Learn more' and 'Give feedback' links.</p> <p>Step 2:</p>

Home > Monitor | Applications >

Application Insights

Monitor web app performance and usage

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 * Free Trial [Change](#)

Resource Group * Testgroup [Create new](#)

INSTANCE DETAILS

Name * MyApplicationInsights [Change](#)

Region * (Asia Pacific) Central India [Change](#)

Resource Mode * Classic Workspace-based

WORKSPACE DETAILS

Subscription * Free Trial [Change](#)

*Log Analytics Workspace MyLogWorkspace [eastus] [Create new](#)

[Review + create](#) [« Previous](#) [Next : Tags »](#)

Step 3:

Home > Monitor | Applications >

Application Insights

Monitor web app performance and usage

Basics Tags Review + create

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](#)

Name ⓘ	Value ⓘ

[Review + create](#) [« Previous](#) [Next : Review + create >](#)

Step 4:

Home > Monitor | Applications >

Application Insights

Monitor web app performance and usage

Validation passed

Basics Tags Review + create

SUMMARY

Application Insights by Microsoft

Subscription: Free Trial
Resource Group: Testgroup
Name: MyApplicationInsights
Region: Central India
Workspace: MyLogWorkspace [eastus]

Create < Previous Download a template for automation

Step 5:

Home >

Microsoft.AppInsights | Overview

Deployment

Search < Delete Cancel Redeploy Download Refresh

We'd love your feedback! →

... Deployment is in progress...

Deployment name: Microsoft.AppInsights
Subscription: Free Trial
Resource group: Testgroup

Start time: 5/22/2022, 8:30:56 PM
Correlation ID: 4e66ff61-bae6-462b-9109-302c01028c6c

Deployment details

Resource	Type	Status	Operation details
No results.			

... Deployment in progress... Deployment to resource group 'Testgroup' is in progress.

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portal.azure.com/#@05abeygeorge@gmail799.onmicrosoft.com/re...

Step 6: Click “Go to resource”

The screenshot shows the Microsoft Application Insights Overview page for the resource group 'MyApplicationInsights'. The left sidebar includes links for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Investigate (Application map, Smart detection, Live metrics, Transaction search, Availability, Failures, Performance, Troubleshooting guides (preview)), and Monitoring (Alerts, Metrics). The main content area displays the following details:

- Resource group (move) : Testgroup
- Location : Central India
- Subscription (move) : Free Trial
- Subscription ID : b7a24163-c5f0-4389-a149-0c93859eed8b
- Tags (edit) : Click here to add tags

Show data for last: 30 minutes, 1 hour, 6 hours, 12 hours, 1 day, 3 days, 7 days, 30 days.

Three charts are displayed:

- Failed requests**: Shows 0 failed requests from myapplicationinsights between 7:45 PM and 8:15 PM UTC+05:30.
- Server response time**: Shows 0ms server response time (Avg) from myapplicationinsights between 7:45 PM and 8:15 PM UTC+05:30.
- Server requests**: Shows 0 server requests from myapplicationinsights between 7:45 PM and 8:15 PM UTC+05:30.

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:

The screenshot shows the Azure portal's 'Monitoring configuration' blade for a virtual machine. The top right corner indicates 'Deployment in progress...' with the message 'Deployment to resource group 'testgroup' is in progress.' The main area is titled 'Monitoring configuration' and contains the following information:

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

Data collection rule: (new) MSVMI-MyLogWorkspace

Guest performance: Enabled

Processes and dependencies: Disabled

Log Analytics workspace: MyLogWorkspace

A note at the bottom states: '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'.

Have more questions? Learn more about virtual machine monitoring, What is VM Insights?, Learn more about pricing, Support Matrix, FAQ, Update Azure Agent.

Validation... Cancel

Step 8:

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:

Monitor the health and performance of virtual machines

VM insights monitors the performance and health of your virtual machines and virtual machine scale sets, including their running processes and dependencies on other resources. It can help deliver predictable performance and availability of vital applications by identifying performance bottlenecks and network issues. [Learn more](#)

Enable VM Insights

Implement complete monitoring of your Azure and hybrid virtual machine environment. [Learn more](#)

Analyze data

Analyze the health and performance for a single machine or multiple machines and drill into logs for troubleshooting. [Learn more](#)

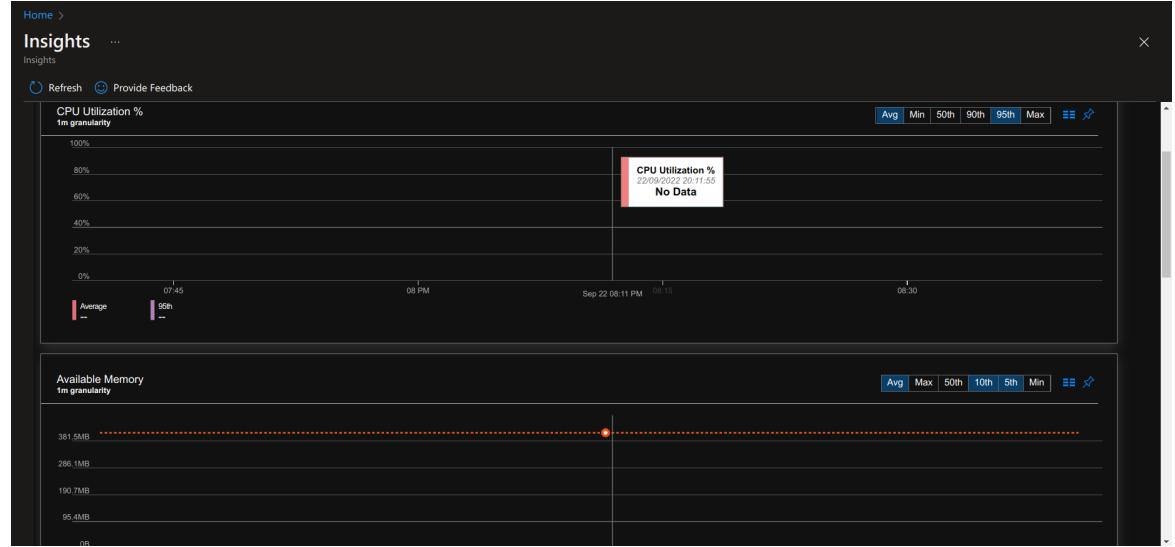
Create alerts

Alerts in Azure Monitor proactively notify you of interesting data and patterns in your monitoring data and potentially take automated actions based on triggers. [Learn more](#)

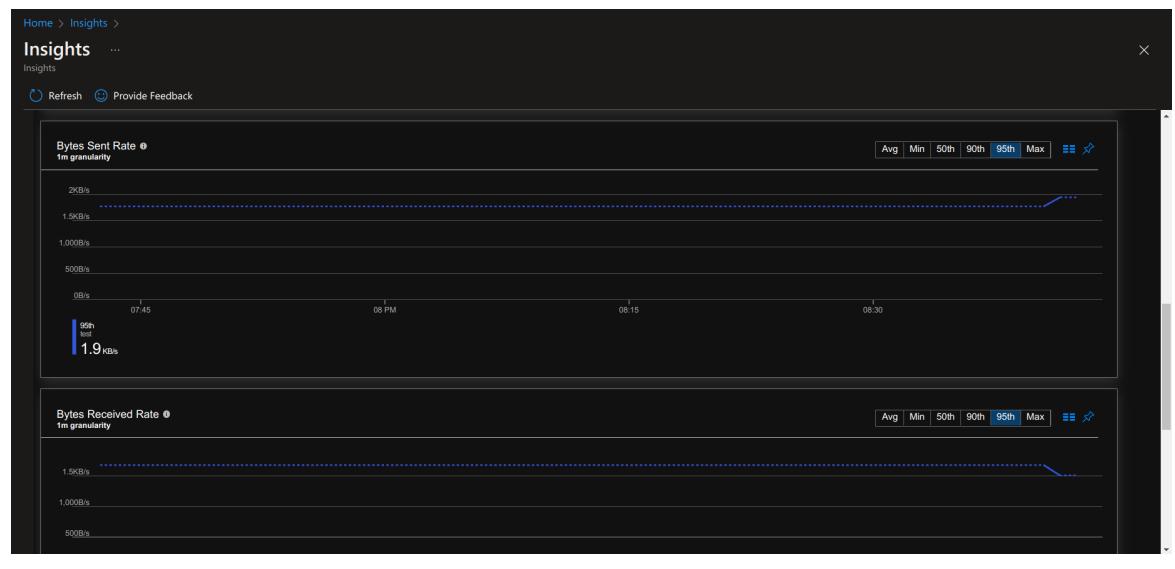
Configure Insights

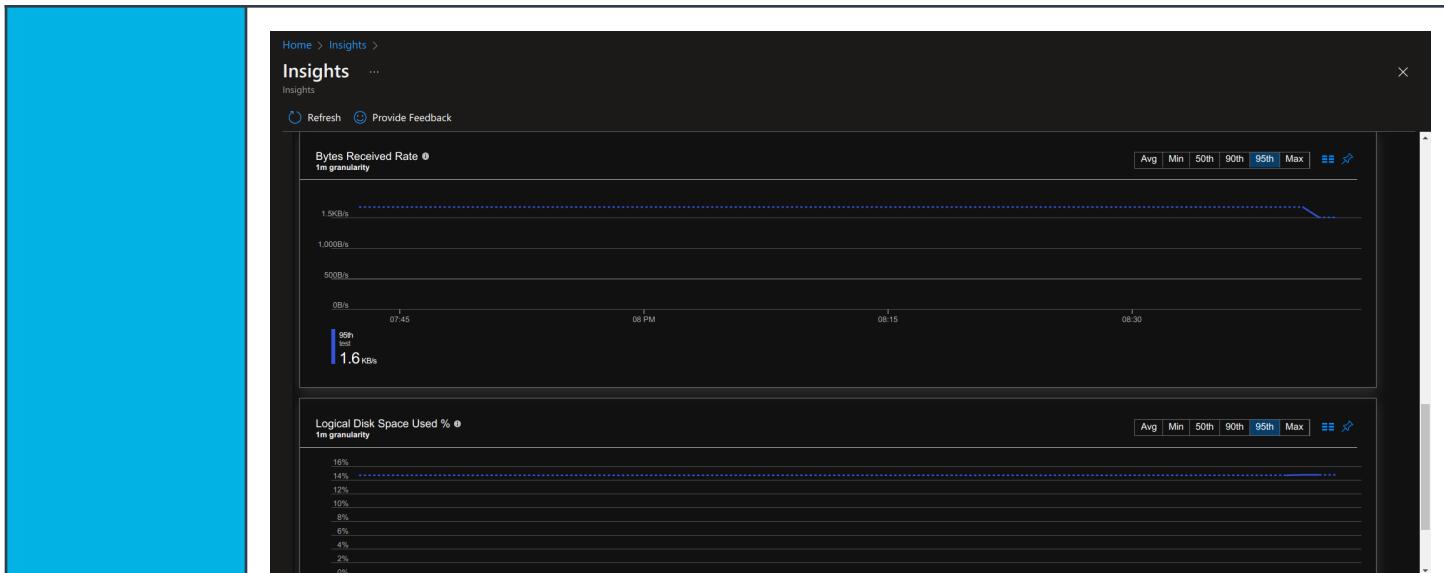
Analyze data

Step 10:

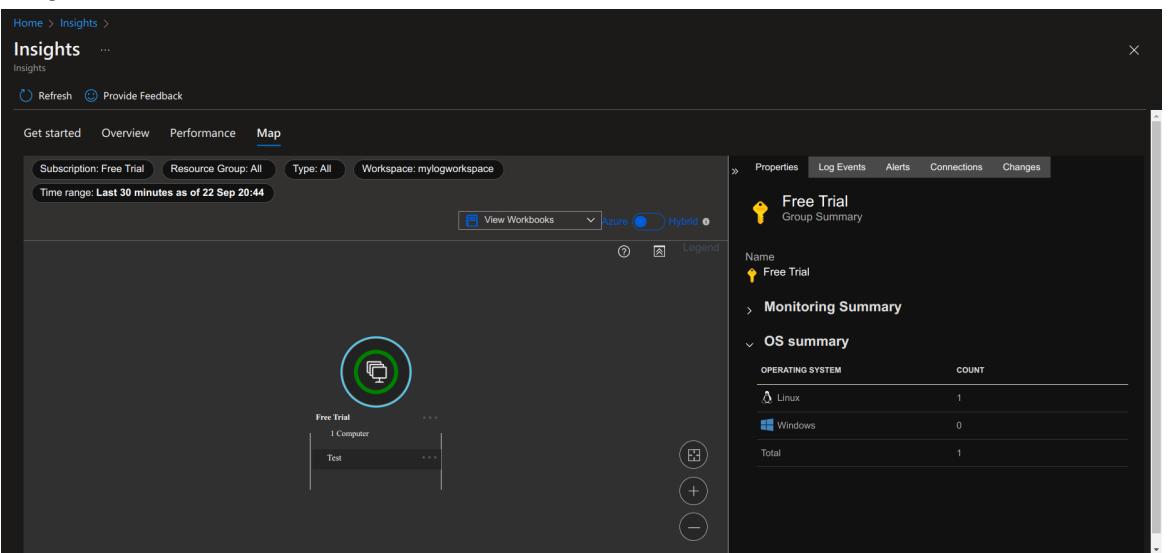


Step 11:

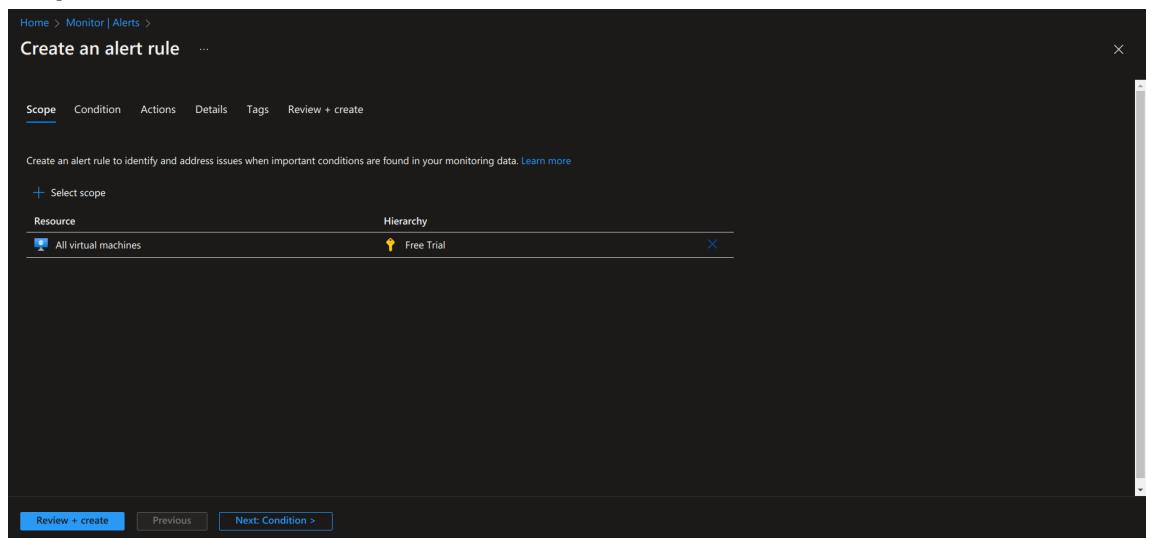
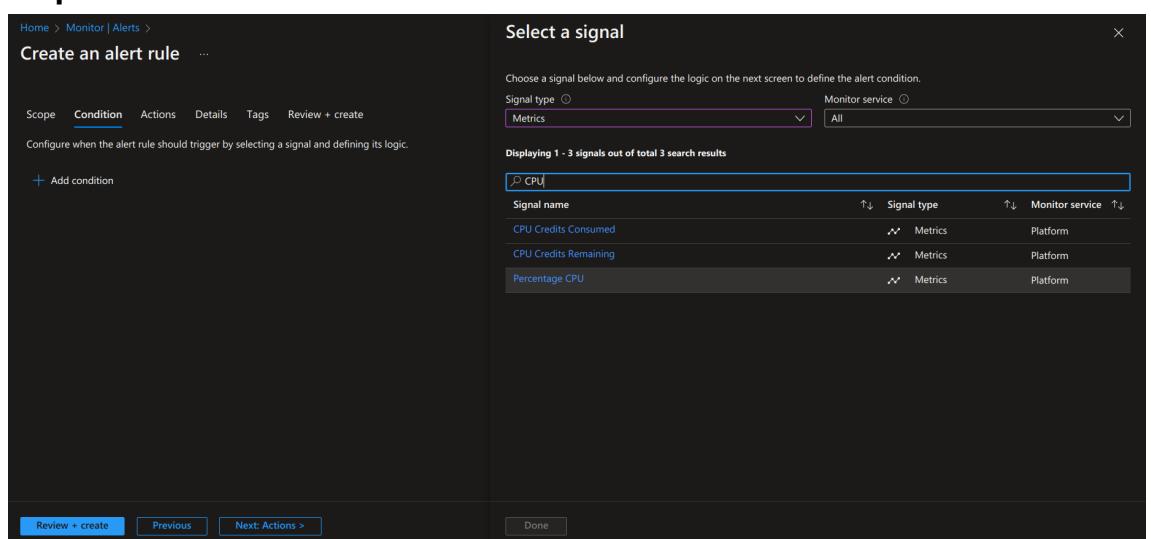




Step 12:



STEP 9: Azure Monitor - Smart Alerts

Task 1	<p>Navigate to Setup Alert & Actions under Azure Monitor >Overview.</p> <p>The condition name should be CPU units consumed and its value should be greater than 0.3.</p>
Screenshots 1 through 8 You will submit step-by-step screenshots for creating a Setup Alert & Actions.	<p>Step 1:</p>  <p>Step 2:</p> 

Step 3:

Home > Monitor | Alerts >

Create an alert rule

Percentage CPU

Alert logic

Threshold Static Dynamic

Aggregation type Average Sum

Operator Greater than Less than

Threshold value * %

Evaluation frequency

Check every Look at data from the last

Preview

Whenever the average Percentage CPU is greater than 0.3%

Time range: Over the last 6 hours Time series: Aggregate

0.10 USD/month

4.07%

Review + create Previous Next Actions >

Step 4:

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 action groups + Create action group

Action group name Contains actions

No action group selected yet

Review + create Previous Next Details >

Step 5:

Home > 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 * [Create new](#)

Alert rule details

Severity *

Alert rule name *

Alert rule description

Advanced options

Settings

Enable upon creation

Automatically resolve alerts

[Review + create](#) [Previous](#) [Next: Tags >](#)

Home > Monitor | Alerts >

Create an alert rule

Scope Condition Actions Details Tags Review + create

Tags are name and 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 about using tags](#).

Note that if you later change resource settings on other tabs, your tags will be automatically updated.

Name	:	Value
<input type="text"/>	:	<input type="text"/>

[Review + create](#) [Previous](#) [Next: Review + create >](#)

Step 6 (Summary after above steps):

The screenshot shows the 'Create an alert rule' wizard in the 'Review + create' step. The alert rule is named 'CpuincreaseAlert'. It has one condition: 'Percentage CPU' is greater than or equal to 0.3 over 5 minutes, checked every 1 minute. The alert is set to 'Informational' severity and is enabled upon creation. It is associated with the 'Free Trial' subscription, 'Testgroup' resource group, and 'global' region. The alert rule details include the name 'CpuincreaseAlert', description '3 - Informational', and checkboxes for 'Enable upon creation' and 'Automatically resolve alerts'. The 'Create' button is highlighted.

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

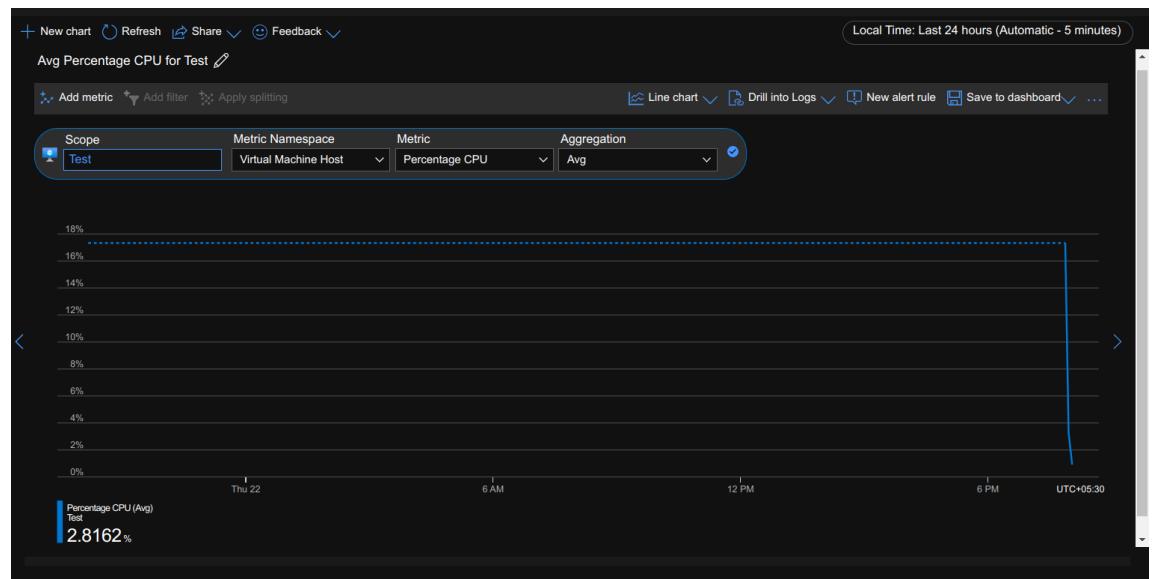
The screenshot shows the Azure Monitor Alerts dashboard. The left sidebar lists 'Overview', 'Activity log', 'Alerts' (which is selected), 'Metrics', 'Logs', 'Change Analysis', 'Service Health', and 'Workbooks'. The main area displays 'Total alerts' (1), 'Critical' (0), 'Error' (0), 'Warning' (0), 'Informational' (1), and 'Verbose' (0). A detailed view of the single informational alert 'CpuincreaseAlert' is shown, containing a terminal log entry:

```
gabey14@Test:~$ sudo apt install okular
Reading package lists... Done
Building dependency tree
Reading state information... Done
No apt package "okular", but there is a snap with that name.
Try "snap install okular"

E: Unable to locate package okular
gabey14@Test:~$ snap install okular
error: access denied (try with sudo)
gabey14@Test:~$ sudo snap install okular
Automatically connect eligible plugs and slots of snap "okular"
Automatically connect eligible plugs and slots of snap "okular"
okular 22.08.0 from KDE/ installed
gabey14@Test:~$
```

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

The screenshot shows the 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, Applications, Virtual Machines, Storage accounts, Containers, Networks, SQL (preview), Azure Cosmos DB, and Key Vaults. The main area displays a summary of alerts: Total alerts (1 Critical, 0 Severe), a list of alerts (CpuIncreaseAlert), and details for the selected alert. The alert details show it was fired at 9/22/2022, 7:58 PM, affected resource 'test', and user response 'New'. A chart titled 'Why did this alert fire?' shows Percentage CPU (Avg) for 'test' from 7:30 PM to 7:45 PM, with a value of 3.91%. Evaluation window start time is 9/22/2022, 7:50 PM and end time is 9/22/2022, 7:55 PM.



Explanation 1

Explain the purpose of Azure Dashboards,

- Azure Dashboards is a tool that can show us data through charts of important metrics such as e.g. we can see the CPU utilization of our servers running in Azure.
- Azure Monitor is used to maximise the availability and performance of our applications and servers.
- It can recognise and diagnose issues and can assist by automatically handling them.

Azure Monitor and alerts

→ Alerts are a very important tool for us. If we set up the right alerts, we get informed about anomalies in our tools.
→ If a server has a high CPU utilization over a long period of time, something might be wrong with it and we would be alerted about it hence we can check-in time.

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):

Name	Resource type	Resource group	Location	Instance count	Autoscale status
UdacityDemo-208357	Virtual machine scale set	UdacityDemo	South Central US	2	Not configured

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

The screenshot shows the Microsoft Azure portal interface for managing autoscale settings. At the top, there's a navigation bar with 'Microsoft Azure' and a search bar. Below it, the URL 'Home > Monitor | Autoscale > Autoscale setting' is visible. A notification bar at the top right says 'New! Autoscale has added another powerful feature. Predictive autoscale (public preview). Learn more about Predictive autoscale.'

The main content area is titled 'Autoscale setting' and shows a summary for 'UdacityDemo-208357 (Virtual machine scale set)'. It includes tabs for 'Configure', 'Scale-In Policy', 'Predictive charts', 'Run history', 'JSON', 'Notify', and 'Diagnostic settings'. A note below the tabs states: '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.'

The 'Choose how to scale your resource' section offers two options: 'Manual scale' (selected) and 'Custom autoscale'. Under 'Custom autoscale', the 'Autoscale setting name' is 'UdacityDemo-208357-Autoscale-510', and the 'Resource group' is 'UdacityDemo'. The 'Mode' is set to 'Disabled'. There's also a checkbox for 'Enable Forecast only or Predictive autoscale'.

The 'Default' scale condition is shown, which is 'Auto created default scale condition'. It includes a warning message: 'The very last or default recurrence rule cannot be deleted. Instead, you can disable autoscale to turn off autoscale.' The 'Scale mode' is set to 'Scale based on a metric'. The 'Rules' section contains a note: '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.' The 'Instance limits' section shows 'Minimum' as 2, 'Maximum' as 2, and 'Default' as 2. The 'Schedule' section notes: 'This scale 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

X

Metric source

Current resource (UdacityDemo-208357)

Resource type

Virtual machine scale sets

Resource

UdacityDemo-208357

Criteria

Metric namespace *

Virtual Machine Host

Metric name

Percentage CPU

1 minute time grain

Dimension Name

Operator

Dimension Values

Add

VMName

=

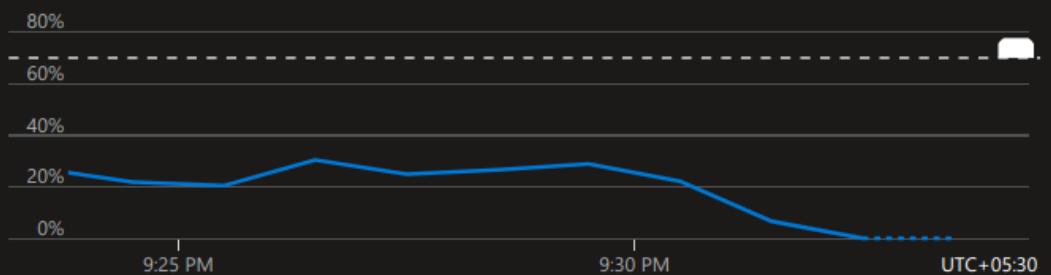
▼

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)

23.72 %

Enable metric divide by instance count ⓘ

Operator * Metric threshold to trigger scale action * ⓘ

Greater than 70 %

Duration (minutes) * ⓘ Time grain (minutes) ⓘ

10 1

Time grain statistic * ⓘ Time aggregation * ⓘ

Average Average

Action

Operation * Cool down (minutes) * ⓘ

Increase count by 5

instance count *

1 ✓

Add

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-208357 (Average) Percentage CPU > 70 Increase count by 1

+ Add a rule

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

Home > Monitor | Autoscale >

Autoscale setting ...

UdacityDemo-208357 (Virtual machine scale set)

Save Discard Refresh Logs Feedback

New! Autoscale has added another powerful feature. Predictive autoscale (public preview). [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 * UdacityDemo-208357-Autoscale-841

Resource group UdacityDemo

Predictive autoscale (public preview) Mode Disabled Pre-launch setup of instances (minutes)

Enable Forecast only or Predictive autoscale. [Learn more about Predictive autoscale.](#)

Home > Monitor | Autoscale >

Autoscale setting ...

UdacityDemo-208357 (Virtual machine scale set)

Save Discard Refresh Logs Feedback

Predictive autoscale (public preview) 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](#)

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

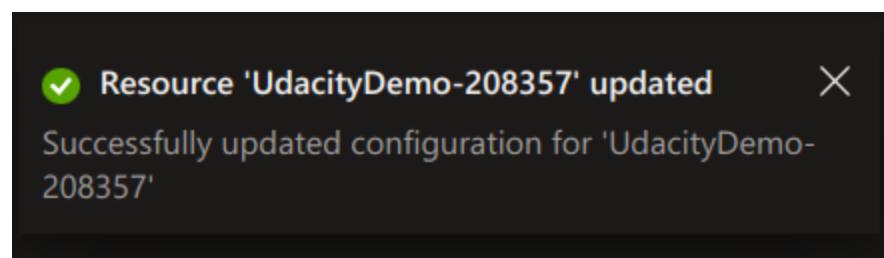
Rules i It is recommended to have at least one scale in rule. To create new rules, click [Add a rule](#)

Scale out When UdacityDemo-208357 (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



Step 5 (Screenshot for “Autoscale Enabled”):

A screenshot of the Azure Monitor | Autoscale interface. On the left, there's a sidebar with various service icons like Cache for Redis, Data Explorer Clusters, Log Analytics Workspaces, Stack HCI (preview), Service Bus (preview), and Insights Hub. The main area shows a table with the following data:

Name	Resource type	Resource group	Location	Instance count	Autoscale status
UdacityDemo-208357	Virtual machine scale set	UdacityDemo	South Central US	2	Enabled

The "Autoscale status" column shows a green checkmark next to "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 scaled-based on the metric count
 - Leverage metrics such as Percentage CPU to scale our or scale in
- We can add a rule for metric-based scale in/out.
 - Time Aggregation as Average is selected
 - 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