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): | **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. |
| --- | --- |
| Server(s): | **Purpose:** Web App  **Environment:** Physical Servers  **Operating System:** Windows  **Operating System License:** DataCenter  **Servers:** 3  **Procs per server:** 1  **Core(s) per proc:** 8 Cores  **RAM:** 64 GB  **Optimize By:** CPU  **GPU:** None  **Usage:** These are the web app servers for your company. Currently they all are being leveraged at regular capacity. |
| Server(s): | **Source:** Database Server  **Database:** Microsoft SQL Server  **License:** Enterprise  **Environment:** Physical Servers  **Operating System:** Windows  **Operating System License:** Datacenter  **Servers:** 3  **Procs per server:** 1  **Cores per proc:** 16 Cores  **RAM:** 64 GB  **Optimize By:** CPU  **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.  **Destination**  Service: SQL Database  Purchase Model: vCore  Service Tier: Business Critical  Instance Cores: 2  SQL Server Storage: 5  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. | Make a list of all servers and services you would create on Azure and explain why you chose each.  **Hint**:   * For VM’s and Web Apps: The operating system license is always Standard and Virtualization is always Hyper-V. * For databases: The purchase model is vCore, the Service Tier is Business Critical, and no SQL Server Backup is needed. * For networking: The defaults of 200 GB for outbound bandwidth are used. |
| **Screenshot 1**  Submit the screenshot for each of the above configurations from Azure TCO.  VM and Web Apps Server screenshot should be submitted here. | C:\Users\Dell\Pictures\step1screenshot1.png |
| **Screenshot 2**  Submit the screenshot for each of the above configurations from Azure TCO.  Database screenshot should be submitted here. | C:\Users\Dell\Pictures\step1Screenshot2.png |
| **Screenshot 3**  Submit the screenshot for each of the above configurations from Azure TCO.  Storage configuration screenshot should be submitted here. | C:\Users\Dell\Pictures\step1Screenshot3.png |
| **Screenshot 4**  Submit the screenshot for each of the above configurations from Azure TCO.  Networking configuration screenshot should be submitted here. | C:\Users\Dell\Pictures\step1screenshot4.png |
| **Screenshot 5**  Once the TCO Report is generated, submit a screenshot of the price comparison graph (line graph) here. | C:\Users\Dell\Pictures\step1screenshot5.png |
| **Screenshot 6**  Once the TCO Report is generated, submit a screenshot of the price comparison graph (pie chart) here. | C:\Users\Dell\Pictures\step1screenshot6.png |
| **Screenshot 7**  Once the TCO Report is generated, submit a screenshot of the price comparison chart (tabular format) here. | C:\Users\Dell\Pictures\step1screenshot7.png |
| **Explanation 1**  Explain the breakdown of the costs and show your understanding of how on-prem costs versus Azure compare | 1. Azure provides TCO as a web-based calculator to estimate the costs of migrating your data and applications to Azure and predict potential savings. Azure TCO calculator is used to understand your five-year cost projections. 2. In the solution above, the costs to move to Azure will lower the overall costs by $799,395. 3. From the line graph, we get visual representation of the total costs can be saved over five-years. 4. Over 5 years Data Center and Networking costs decreases or go away completely in Azure. 5. Compute, Data Center, Networking, IT Labor costs are relatively more expensive in on-premises, whereas in Azure, we see only Storage costs are being expensive of about $1,427 for over 5 years. 6. The total on-premises costs over 5 years is $961,072 which higher than compared to that of Azure is $161,677. 7. Besides considering the costs, there are no other implications to moving to Azure. |

# **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](https://portal.azure.com/#create/Microsoft.VirtualMachine) *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. | C:\Users\Dell\Pictures\step2Screenshot1.png |
| **Screenshot 2**  Submit the screenshot for each of the above configurations from the Azure Pricing Calculator. Submit the US **West Coast** monthly costs here. | C:\Users\Dell\Pictures\step2Screenshot2.png |
| **Screenshot 3**  Submit the screenshot for total cost per month for both US East and West Coasts. | C:\Users\Dell\Pictures\step2Screenshot3.png |
| **Explanation 1**  Explain how resilience is built in by moving to Azure | 1. Moving on-premises resources to Azure, Resilience can built by Scaling resources. Scaling is defined as the ability for a IT resource to handle growing or decreasing demands in capable manner. 2. Autoscaling allows to have the right amount of resources running to handle the load. It involves adding or removing resources. Azure monitor autoscale applies only to – Virtual Machine Scale Sets, Cloud Services, App Services, API Management Services. 3. Horizontal Scaling is one of the most popular and beneficial features of cloud computing. It involves adding /removing the number of instances while keeping the same machine configurations for the new machines.    * Scale Out – Increase the number of instances    * Scale In – Decrease the number of instances 4. Vertical Scaling involves adding more resources to the existing system to reach the desired state of performance. It keeps the same number of virtual machines but generally increases the size of either CPU, Disk Space, etc.    * Scale Up – makes virtual machines more powerful    * Scale Down – makes virtual machines less powerful. |

# **STEP 3: Azure Cost Management + Billing**

| **Background** | You have now configured your Azure Production Workload environment and been using Azure for a few days. You have now been tasked by your CIO to present some metrics on how the costs are being billed within Azure and also what other functionalities Azure has in regards to cost management, which were not previously available. |
| --- | --- |
| **Question 1**  Submit the explanation | What is the purpose of Azure Cost Mgmt + billing Dashboard? |
| **Explanation 1** | 1. Azure Cost Management + Billing Dashboard is a suite of tools provided by Microsoft that helps you analyze, manage and optimize the costs of your workloads. These tools help to ensure the benefits of the cloud are utilized. 2. Azure Cost Management + Billing Dashboard has the following features which help with monitoring cost efficiency.    * Proactively apply data analysis to your costs    * Identify opportunities that can optimize your spending    * Set spending thresholds    * Pay your bill from here    * Download the cost and usage data 3. The top part of the Azure Cost Management + Billing Dashboard shows:    * The total aggregate daily costs for a billing period    * It also shows how accrued costs are tracking versus the budget set. 4. The bottom donut charts shows the charges by the following options:    * Service Name – costs broken down by service name    * Location – costs broken down by region where the Azure infrastructure stood up    * Subscription – costs broken down by subscriptions. |
| **Screenshot 2**  Submit the screenshot for main Cost Mgmt + Billing Dashboard. | **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  C:\Users\Dell\Pictures\step3Screenshot2.png |
| **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.  From the above Area chart, we have selected Accumulated Costs as the View and Selected Time as Jul-Sep 2022, which is the current quarter.  Accumulated cost – shown by the shaded green part and indicated what the total cost for the Azure plant.  Monthly Budget – is the amount set by Azure Architect for which you want to be alerted when the budget is exceeded.  Overage – is the amount which shows that you have exceeded by.  Forecast – your total expected expense for the month.  We see that the actual cost is $18.27 USD. |
| **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.  C:\Users\Dell\Pictures\step3Screenshot3.png |
| **Explanation 3**  Explain the key components of the screenshot submitted. | 1. The bottom Donut Charts shows the charges by Service Name and Location. 2. In Charges by Service Name Donut chart, we see that Virtual Machines costs $14.27 and also Azure App Service, Storage, Container Instances, Virtual Network cost charges. 3. In Charges by Locations Donut chart, we see that charges of US South Central is $12.73 USD and also charges of US East, US Central and other locations. |
| **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).  C:\Users\Dell\Pictures\step3Screenshot4.png |
| **Explanation 4**  Explain the key components of the screenshot submitted. | 1. Creating a Budget with Name as UdacityProjectBudget. 2. Monthly as Reset Period 3. Creation date as September 2022 4. Set Budget amount threshold as $30. |
| **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).  C:\Users\Dell\Pictures\step3Screenshot5.png |
| **Explanation 5**  Explain the key components of the screenshot submitted. | 1. Creating Alerts, In Alert conditions, Alert type of Actual was selected. 2. Set 75% as % of budget 3. Alert recipient email, [test@gmail.com](mailto:test@gmail.com) was entered for just demo. 4. Alert was created successfully. |
| **Screenshot 6**  Submit the screenshot for breakdown of costs by Service Name and Location. | C:\Users\Dell\Pictures\step3Screenshot6.png |
| **Explanation 6**  Explain the key components of the screenshot submitted. | 1. From the above screenshot, from the top area chart, we see that the red dotted line which is appeared as a result of setting a budget alerts. 2. Any overage will be shown, and a budget alert is triggered. |
| **Explanation 7**  Explain the summarized highlights of this part of the project, Azure Cost Mgmt + Billing | 1. From the Area chart, we have selected Accumulated Costs as the View and Selected Time as Jul-Sep 2022, which is the current quarter.    * Accumulated cost – shown by the shaded green part and indicated what the total cost for the Azure plant.    * Monthly Budget – is the amount set by Azure Architect for which you want to be alerted when the budget is exceeded.    * Overage – is the amount which shows that you have exceeded by.    * Forecast – your total expected expense for the month.    * We see that the actual cost is $18.27 USD. 2. The bottom Donut Charts shows the charges by Service Name and Location.    * In Charges by Service Name Donut chart, we see that Virtual Machines costs $14.27 and also Azure App Service, Storage, Container Instances, Virtual Network cost charges.    * In Charges by Locations Donut chart, we see that charges of US South Central is $12.73 USD and also charges of US East, US Central and other locations. 3. Creating Budget Alert, Part 1:    1. Creating a Budget with Name as UdacityProjectBudget.    2. Monthly as Reset Period    3. Creation date as September 2022    * Set Budget amount threshold as $30. 4. Creating Budget Alert, Part 2:    * Creating Alerts, In Alert conditions, Alert type of Actual was selected.    * Set 75% as % of budget    * Alert recipient email, [test@gmail.com](mailto:test@gmail.com) was entered for just demo.    * Alert was created successfully. |

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

| **Background** | You have now configured your Azure Production Workload environment and been using Azure for a few days. You realize that many infrastructure administrators are creating VM sizes without doing proper due diligence, thus having a direct impact on cost.  You now decide to leverage Azure Policy features to ensure that appropriate controls are put in place. |
| --- | --- |
| **Screenshots 1 through 5**  Submit the screenshots for Azure Policy steps. | **Hint**: Navigate to and select the built-in Azure policy “Allowed virtual machine size SKUs;” then follow the wizard steps. Submit a screenshot for every single step of the wizard so that any mistakes in the final step can be caught by your reviewer.  **Very important note:**   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 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   **Step 1:**  C:\Users\Dell\Pictures\step4Screenshot1.png **Step 2:**  **C:\Users\Dell\Pictures\step4Screenshot2.png**  **Step 3:**  C:\Users\Dell\Pictures\step4Screenshot3.png  **Step 4:**  **C:\Users\Dell\Pictures\step4Screenshot4.png**  **Step 5:**  C:\Users\Dell\Pictures\step4Screenshot5.png |
| **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.  C:\Users\Dell\Pictures\step4Screenshot6.png |
| **Explanation 1**  Explain the summarized highlights of this part of the project, Azure Policy. | 1. Created a built-in policy “Allowed Virtual Machine Sizes”. Screenshots Step1-Step5 shows the steps/wizards taken to create a built-in policy. 2. Once you reach the policy home page – you look for Authoring – Assignments option on the left hand side. 3. Upon clicking that you see the full list of built in policies. You use the filters on top to find the appropriate policy you are looking for. 4. Once you find the appropriate policy – which in this case is “Allowed Virtual Machine Sizes SKU” - you then click on it and reach the policy home page. 5. You click on assign and then there are 3 tabs which are most important to be filled:    * Basics tab – allows you to fill in the Assignment name, description    * Parameter tab – this is the most important part of the policy creation tab – here in the dropdown you select which series of VMs will be allowed    * Non Compliance tab – This is the tab wherein you fill the non-compliance message if the user is creating another VM series which is not allowed by the Azure Policy. 6. Once all these details are filled in – you can successfully create Azure Policy. |

**STEP 5: Azure Dashboards**

| **Background** | Azure Dashboards are a one stop shop to monitor   * Your logs * Your infrastructure * Your applications |
| --- | --- |
| **Task 1** | You need to create an Azure dashboard that will pull in a few widgets: Percentage CPU, All Resources, Resource Groups & Avg CPU Credits Consumed. Submit the screenshots and explain the key components of the Dashboard. Be sure to include a screenshot of the final Dashboard. |
| **Screenshots1 through 3**  You will submit the screenshots for Overview tab. | **Step 1:**  D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step5Screenshots\step5screenshot1.png  **Step 2:**  D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step5Screenshots\step5screenshot2.png  **Step 3 (Final Output):**  D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step5Screenshots\step5screenshot3.png |

# **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:**  **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step6Screenshots\step6screenshot1.png**  **Step 2:**  **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step6Screenshots\step6screenshot2.png**  **Step 3:**  **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step6Screenshots\step6screenshot3.png** |
| **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. | D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step6Screenshots\step6screenshot4.png |

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# **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:**  D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step7Screenshots\step7screenshot1.png **Step 2:**  **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step7Screenshots\step7screenshot2.png**  **Step 3:**  **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step7Screenshots\step7screenshot3.png**  **Step 4:**  D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step7Screenshots\step7screenshot4.png |

**STEP 8: Azure Insights**

| **Background** | Azure Insights can only be created once you have the Log Analytics workspace completed. |
| --- | --- |
| **Screenshots1 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:** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step8Screenshots\step8screenshot1.png**  **Step 2:** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step8Screenshots\step8screenshot2.png**  **Step 3:** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step8Screenshots\step8screenshot3.png**  **Step 4:** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step8Screenshots\step8screenshot4.png**  **Step 5:** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step8Screenshots\step8screenshot5.png**  **Step 6: Click “Go to resource”** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step8Screenshots\step8screenshot6.png** |
| **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:**  **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step8Screenshots\step8screenshot7.png**  **Step 8:** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step8Screenshots\step8screenshot8.png**  **Step 9:** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step8Screenshots\step8screenshot9.png**  **Step 10:** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step8Screenshots\step8screenshot10.png**  **Step 11:** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step8Screenshots\step8screenshot11.png**  **Step 12:**  **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step8Screenshots\step8screenshot12.png** |

# **STEP 9: Azure Monitor – Smart Alerts**

| **Task 1** | Navigate to Setup Alert & Actions under Azure Monitor >Overview.  The condition name should be CPU units consumed and its value should be greater than 0.3. |
| --- | --- |
| **Screenshots 1 through 8**  You will submit step-by-step screenshots for creating a Setup Alert & Actions. | **Step 1:**  D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step9Screenshots\step9screenshot1.png **Step 2:** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step9Screenshots\step9screenshot2.png**  **Step 3:** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step9Screenshots\step9screenshot3.png**  **Step 4:** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step9Screenshots\step9screenshot4.png**  **Step 5:**  **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step9Screenshots\step9screenshot5.png**  **Step 6 (Summary after above steps):** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step9Screenshots\step9screenshot6.png**  **Step 7 (Screenshot post-creation of the alert):** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step9Screenshots\step9screenshot7.png**  **Step 8 (If you had any alerts, they would be submitted here):** |
| **Explanation 1**  Explain the purpose of Azure Dashboards, Azure Monitor and alerts | 1. Azure Dashboards are a key tool for Solutions Architects to monitor operational efficiency. Dashboards are a focused and customized view of you cloud resources and metrics in the Azure portal.    * Azure Dashboard provides a customized view of your cloud metrics by adding the appropriate widgets.    * Azure Dashboard provides a unified place to monitor resources quickly.    * Building a custom Dashboard can enable you to quickly consume relevant information, identify issues. 2. Azure Application Insights provides a unified dashboard to allow a quick analysis of your application’s health and performance. Configuring and using Azure Application Insights in the context of virtual machines:    * Once you configure Azure Application Insights for VMs, it gives you the ability to monitor your VM’s by collecting detailed logs from your VM and having an ability to display it meaningfully within the unified dashboard.    * VM insights helps to monitor the vital performance metrics of the VMs within the Virtual Machine Scale Sets. It helps to visualize where the dependencies of your running processes are, which can help analyze performance bottlenecks and networks issues.    * VM insights leverages the Azure Monitor Logs to store its data, thus enabling easy-yet powerful-analysis through aggregation and filtering of data.    * VM insights does not cost anything, but an organization is charged for storing data in Log Analytics workspace. 3. Alerts proactively notify you when issues are found within your infrastructure or application using your monitoring data in Azure Monitor. They also allow you to identify and address issues before the users of your system notice them.    * The key components of alert rules are, Target Resource – Defines the scope and signals available for alerting. A target can be any Azure resource such as Storage Account, VMs, etc.    * Signal – Emitted by the target resource. Signals can be of the following types: metric, activity log, Application Insights, and log.    * Criteria – A combinations of signal and logic applied to a target resource. |

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# **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):** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step10Screenshots\step10screenshot1.png**  **Step 2 (Select the option for Custom autoscale and within that Scale based on metric and then click “Add Rule”):** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step10Screenshots\step10screenshot2.png**  **Step 3 (Create the scale rule. They key part on this screen is that Percentage CPU metric is selected):** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step10Screenshots\step10screenshot3.png**  **Step 4 (Once scale rule is created, submit the summary screenshot):** **D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step10Screenshots\step10screenshot4.png**  **Step 5 (Screenshot for “Autoscale Enabled”):**  D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\CostOptimizationAndMonitoring\step10Screenshots\step10screenshot5.png |
| **Explanation 1**  Explain the key details of autoscale screenshots you have submitted. | 1. Configuring Autoscale options for Virtual Machine Scale Sets, On the VMSS created VM’s navigate to the following option:    * Settings – Scaling Tab which opens a wizard for autoscaling with 2 different options: Manual Scale and Custom Autoscale    * In Custom Autoscale, within this scale mode – Scale based on metric is selected    * Add a rule option is selected which lets you add the add a rule for that metric.      + Another wizard opens up wherein all the defaults are selected      + Time Aggregation as Average is selected – so the scale is applied to the average metric      + Metric Name – Percentage CPU is selected      + Operator such as Greater than is selected      + Most importantly metric threshold to trigger scale action is then entered is 70      + Other defaults such as duration and cool down period are set as per suggested by Azure    * Instance details are defaulted which essentially define what happens when the autoscale triggers. |