



Microsoft Cloud Workshop

Optimized architecture

Hands-on lab step-by-step

March 2018

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Optimized architecture hands-on lab step-by-step

Abstract and learning objectives

In this workshop, students will learn how to optimize a lift and shift style IaaS architecture in Azure to improve cost savings. You will also compare IaaS and PaaS hosting options to save cost even further using Azure App Service. Additionally, students will learn to improve resiliency and high availability through multi-region deployment.

Attendees will learn how to:

- Optimize Azure IaaS for cost savings
- Migrate an Azure IaaS optimized
- Compare cost between Azure IaaS versus Azure PaaS
- Setup SQL Database geo-replication
- Configure multi-region deployment

Overview

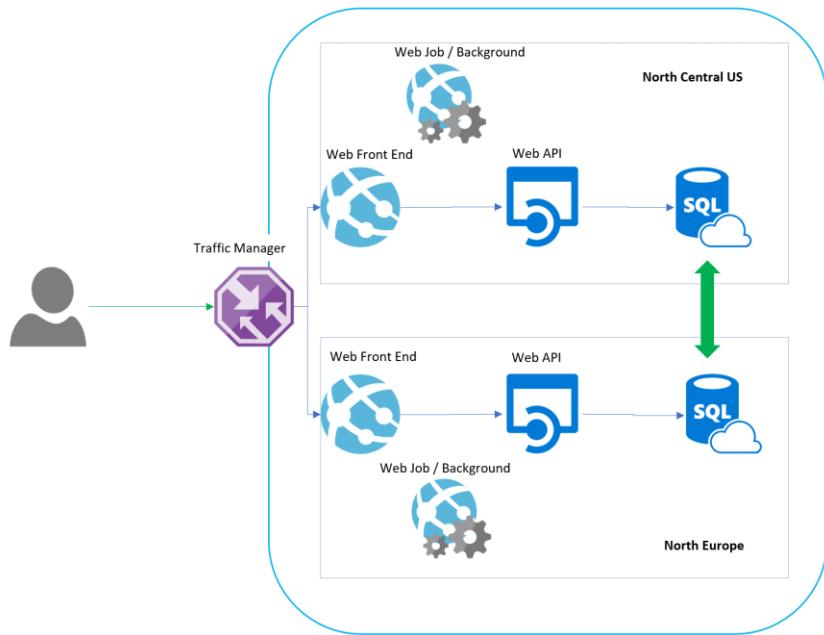
The Optimized Architecture hands-on lab (HOL) is a hands-on exercise that will challenge you to calculate Azure spending optimizations by comparing IaaS and PaaS services using a supplied sample application (a 3-tier application written in C# and ASP.NET MVC) that is based on Microsoft Azure IaaS services such as Virtual Machines, Virtual Network, Load Balancers, Storage and SQL Database. In addition to calculating estimated Azure cost of the existing architecture, you will need to calculate the estimated cost of hosting the sample application using Azure PaaS services. The scenario will include migrating the full sample application to be hosted on Azure PaaS services such as Azure App Service Web Apps, Web Jobs, and Traffic Manager as well as implementing a secondary hosting region for the Web App tier and database replication.

The HOL can be implemented on your own, but it is highly recommended to pair up with other members at the HOL to model a real-world experience much closer and to allow each member to share their expertise for the overall solutions.

Requirements

1. Microsoft Azure subscription
2. Local machine or a virtual machine configured with Visual Studio 2017 Community Edition or better

Solution architecture



Before the hands-on lab

Duration: 20 minutes

In this exercise, you will set up an environment to use for the rest of the exercises.

Task 1: Create a virtual machine for your lab environment

1. Launch a browser using incognito or in-private mode, and navigate to <https://portal.azure.com>. Once prompted, login with your Microsoft Azure credentials. If prompted, choose whether your account is an organization account or just a Microsoft Account.
2. Click on +NEW, and in the search box, type in Visual Studio Community 2017 on Windows Server 2016 (x64), and press enter. Click the Visual Studio Community 2017 image running on Windows Server 2016 and with the latest update.
3. In the returned search results, click the image name.

NAME	PUBLISHER
Visual Studio Community 2017 on Windows Server 2016 (x64)	Microsoft
Visual Studio Community 2017 on Windows 10 Enterprise N (x64)	Microsoft
Visual Studio Community 2017 (version 15.2) on Windows Server 2016 (x64)	Microsoft
Visual Studio Community 2017 (latest release) on Windows Server 2016 (x64)	Microsoft

4. In the Marketplace solution blade, click **Create**.
5. Set the following configuration on the Basics tab, and click **OK**.
 - Name: **LABVM**
 - VM disk type: **SSD**
 - User name: **demouser**
 - Password: **demo@pass123**
 - Subscription: **If you have multiple subscriptions choose the subscription to execute your labs in.**
 - Resource Group: **OPSLABRG**
 - Location: **Choose the closest Azure region to you.**
6. Choose the **DS1_V2 Standard** instance size on the Size blade.
7. Accept the remaining default values on the Settings blade, and click **OK**. On the Summary page, click **OK**. The deployment should begin provisioning. It may take more than 10 minutes for the virtual machine to complete provisioning.



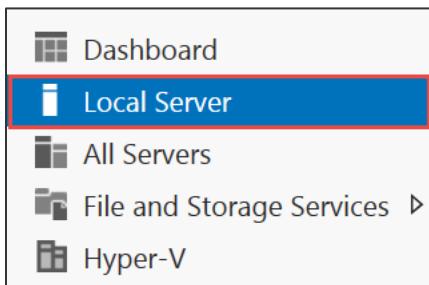
Task 2: Disable IE Enhanced Security

Note: Sometimes this image has IE ESC disabled. Sometimes it does not.

1. On the new VM, you just created, click the **Server Manager** icon.



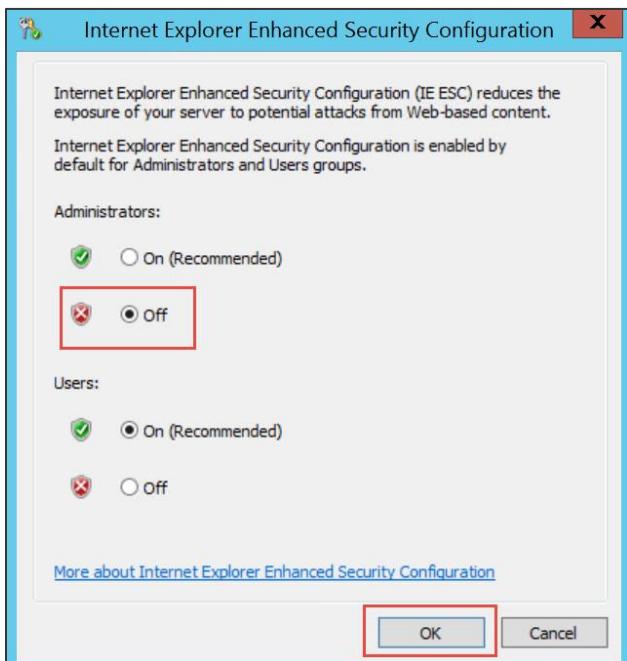
2. Click **Local Server**.



3. On the right side of the pane, click **On** by IE Enhanced Security Configuration.



4. Change to **Off** for Administrators, and click **OK**.

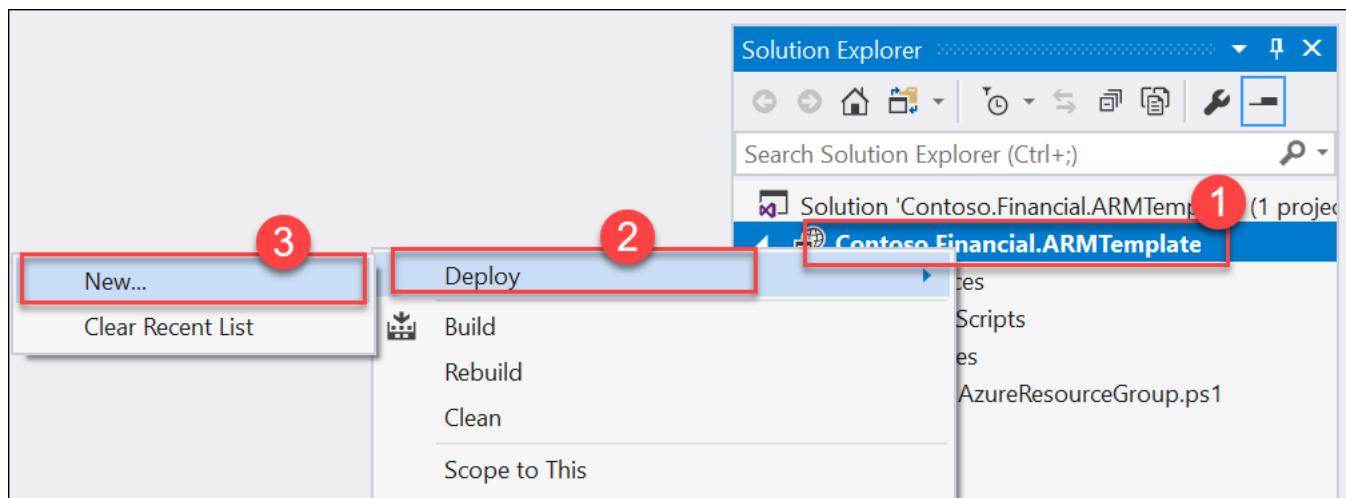


Task 3: Download the Sample App Files

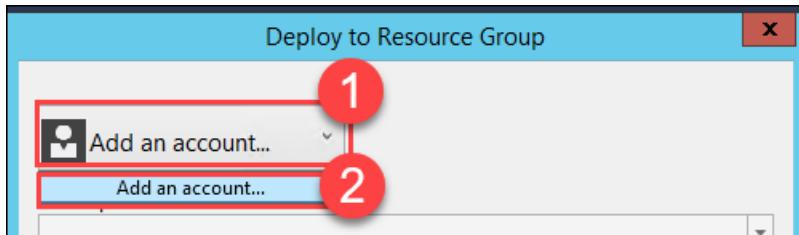
1. Create a new folder on your C: drive named **HOL**.
1. Download the sample application and ARM template (optimized-architecture-student.zip) from here:
<https://cloudworkshop.blob.core.windows.net/optimized-architecture/OptimizedArchitecture-StudentFiles-6-2017.zip>.
2. Right click on the downloaded .zip file, and click **Properties**. On the properties pane, check **Unblock** to ensure the files are marked safe.
3. Extract the zip file contents to the **HOL** folder.
4. From the **ARMTemplate** folder under **HOL**, open the Visual Studio Solution file:
Contoso.Financial.ARMTemplate.sln.

Task 4: Deploy Sample App and “Existing” environment

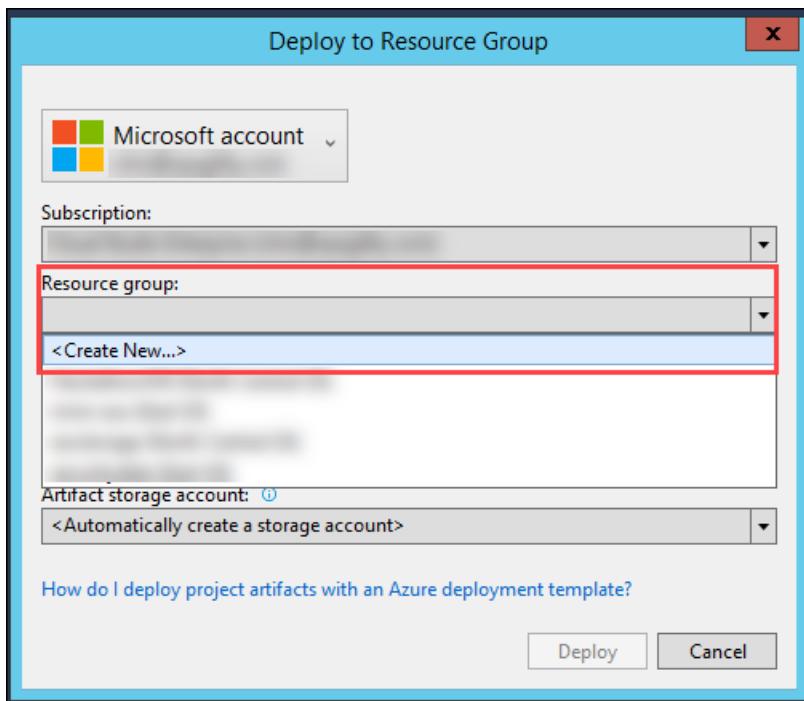
1. From the C:\HOL\ARMTemplate folder, open the Visual Studio Solution: **Contoso.Financial.ARMTemplate.sln**
2. In the **Solution Explorer** window, right-click on the **Contoso.Financial.ARMTemplate** project, click **Deploy**, and then click **New...**



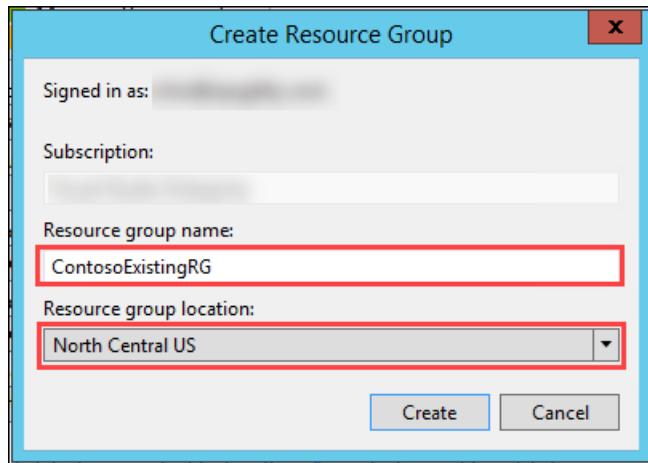
3. If your Microsoft or Organization account for your Azure Subscription has not been added to Visual Studio yet, click on **Add an account**, then **Add an account...**, and follow the prompts to login.



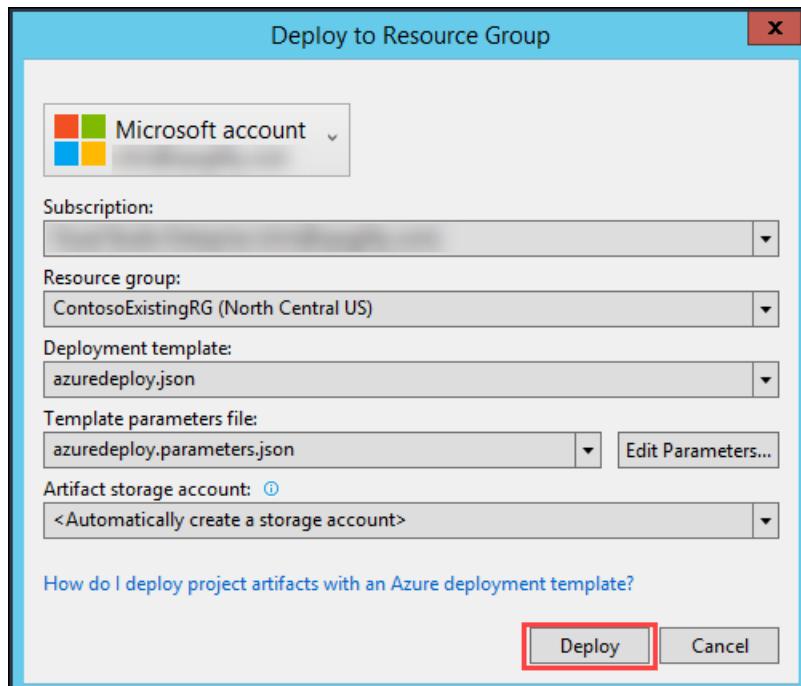
4. Click on the **Resource group** dropdown, followed by selecting <Create New...>.



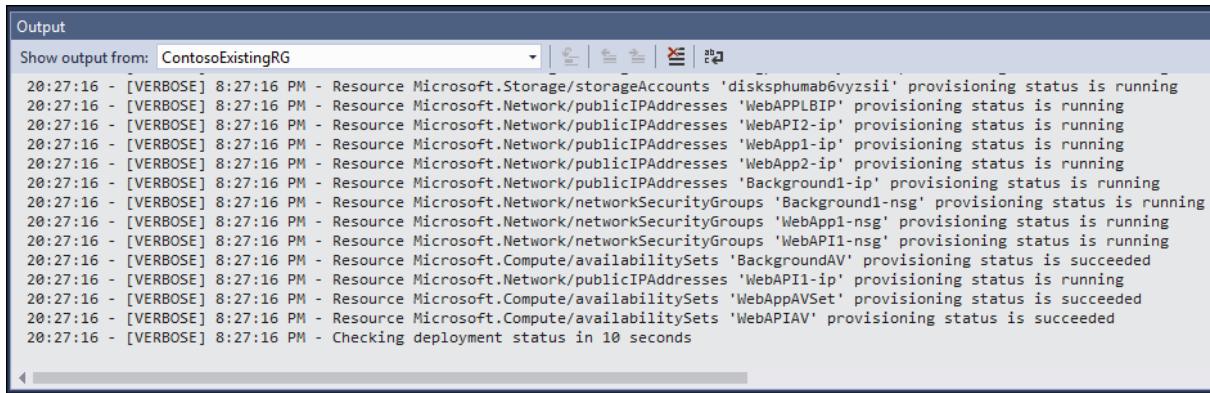
5. On the **Create Resource Group** dialog, enter the following values:
 - Resource group name: **ContosoExistingRG**
 - Resource group location: **North Central US (note if your subscription allows this otherwise pick up subscription where you are allowed to deploy to)**



6. Click the **Create** button.
7. In the **Deploy to Resource Group** dialog, click the **Deploy** button to deploy the ARM Template to the newly created Resource Group.

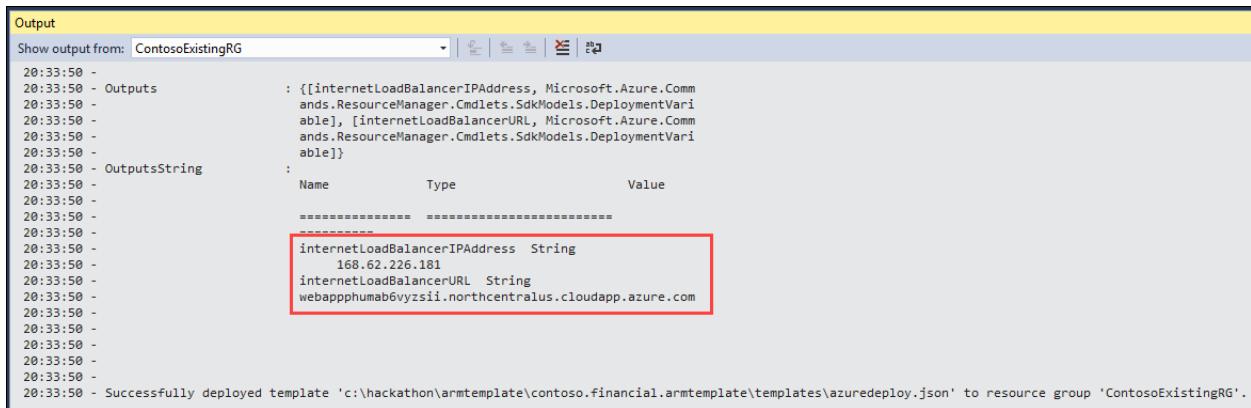


8. Deployment status of the ARM Template will be displayed in the **Output** window within Visual Studio.



The screenshot shows the Visual Studio Output window with the title 'Output' and the dropdown 'Show output from: ContosoExistingRG'. The window displays a series of log entries starting with '[VERBOSE] 8:27:16 PM - Resource Microsoft.Storage/storageAccounts' and ending with '[VERBOSE] 8:27:16 PM - Checking deployment status in 10 seconds'. The logs indicate the provisioning status of various Azure resources like storage accounts, network security groups, and compute availability sets.

9. Once the deployment has completed successfully, the **IP Address** and **FQDN** of the External / Internet Load Balancer for the Web App tier will be displayed in the output window.



The screenshot shows the Visual Studio Output window with the title 'Output' and the dropdown 'Show output from: ContosoExistingRG'. The window displays deployment logs and a table titled 'OutputsString' showing output parameters. A red box highlights the row for 'internetLoadBalancerIPAddress' with the value '168.62.226.181' and the row for 'internetLoadBalancerURL' with the value 'webappphumab6vyzsii.northcentralus.cloudapp.azure.com'.

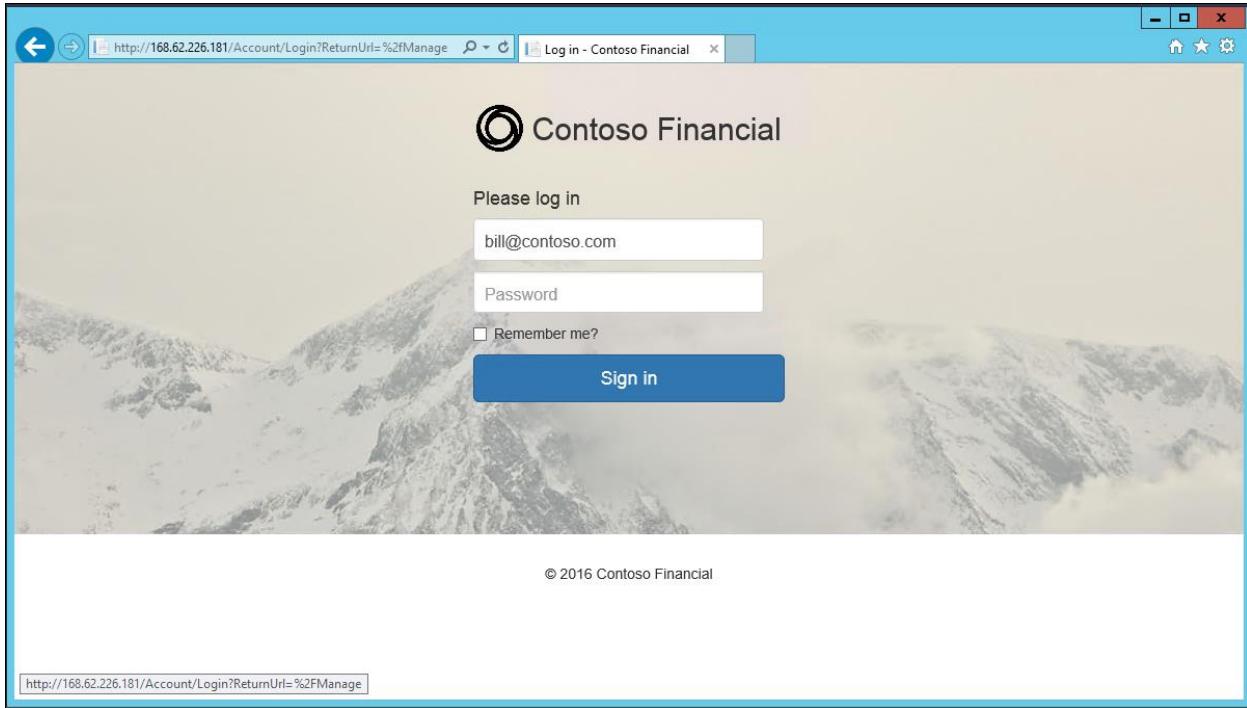
	Name	Type	Value
internetLoadBalancerIPAddress	String		168.62.226.181
internetLoadBalancerURL	String		webappphumab6vyzsii.northcentralus.cloudapp.azure.com

The **Username** and **Password** for the VMs and SQL Database created by the ARM Template are:

Username: **demouser**

Password: demo@pass123

10. Open a new **Web Browser** window, and navigate to the Web App tier using the **Internet Load Balancer IP Address**.



11. To login to the Web App Tier of the Contoso Financial sample application, simply enter **any email address and password** followed by clicking on **Sign in**. If you can't immediately sign in, give the site a few minutes to run the background process and then attempt to sign in again.

12. Once logged in, the sample application will display a simple **Account Transaction** ledger.

The screenshot shows the 'Account Overview' page for Contoso Financial. On the left, a sidebar menu includes 'Overview' (selected), 'Reports', 'Analytics', 'Export', 'Accounts' (selected), 'Checking', 'Savings', 'Log off', 'Help', and 'Terms of use'. The main content area displays the 'Available Balance' as '\$1,238,240.27'. Below this is a table titled 'Transactions' showing the following data:

Date/Time (UTC)	Description	Amount	Balance
09/09/2016 09:33:11	Blue Yonder Coffee	-\$9,115.22	\$1,238,240.27
09/09/2016 09:32:11	Acme Airlines	\$7,769.70	\$1,247,355.49
09/09/2016 09:31:11	Fabrikam Traders	-\$751.42	\$1,239,585.79
09/09/2016 09:30:12	WingTip Bank	-\$9,662.79	\$1,240,337.21
09/09/2016 08:32:34	Opening Balance	\$1,250,000.00	\$1,250,000.00

At the bottom of the page, a footer note reads: © 2016 Contoso Financial.

Leaving the browser open to the Account Overview page will automatically load new transactions as they are generated by the background process, since the web page has a JavaScript timer that checks for new transactions periodically.

You should follow all steps provided *before* attending the HOL.

Exercise 1: Determine Appropriate Service Tiers and Estimate Cost Savings

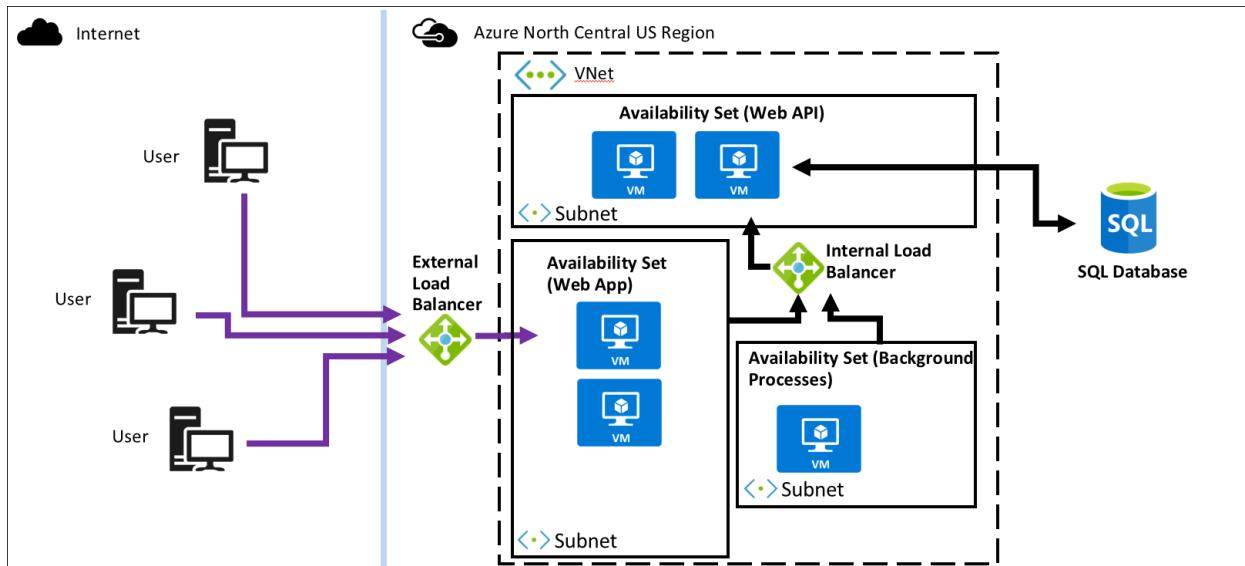
Contoso Financial has asked you to optimize their Azure spending by migrating their existing Azure IaaS based architecture over to Azure PaaS services. You will need to determine the appropriate hosting tiers and estimate the total cost savings on a monthly and annual basis.

Help references

Azure Pricing Calculator	https://azure.microsoft.com/en-us/pricing/calculator
Virtual Machines Pricing	https://azure.microsoft.com/en-us/pricing/details/virtual-machines/
App Service Pricing	https://azure.microsoft.com/en-us/pricing/details/app-service

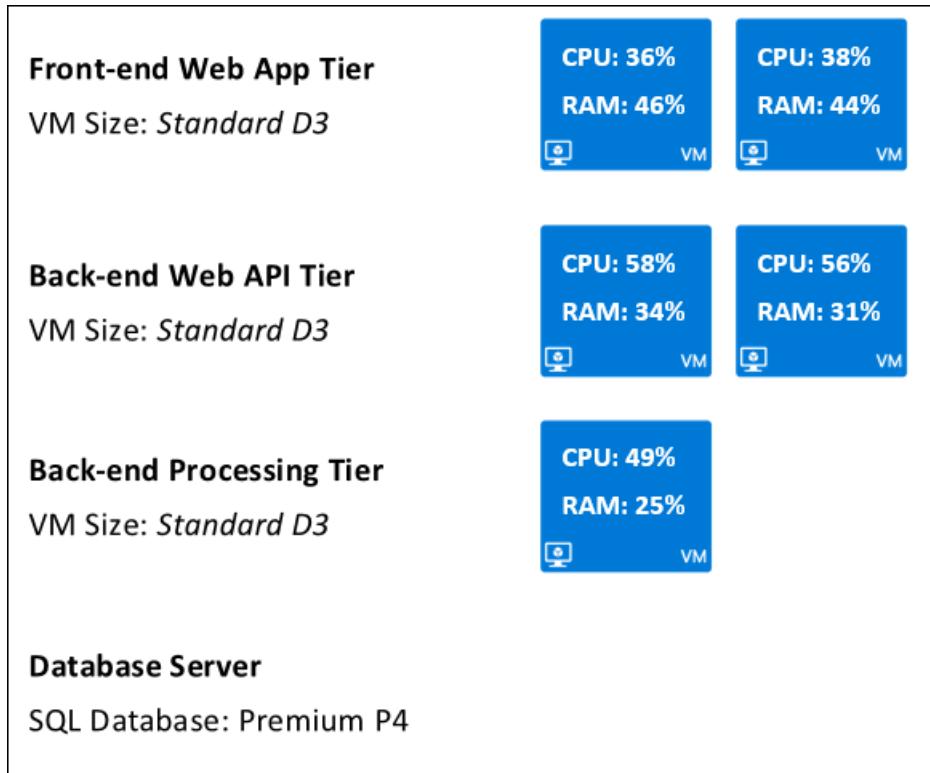
Scenario

Contoso Financial recently performed a lift-and-shift to move their application into Microsoft Azure using the North Central US region. As a result, the existing architecture of the application is implemented with Virtual Machines, Load Balancers, Availability Sets, SQL Database, and a Virtual Network.



You have also been provided with the following metrics showing the average CPU / RAM utilization of the Virtual Machines hosting the solution that are all on the Standard D3 pricing tier.

When calculating the pricing for the environment, there may be some differences depending if you use the prices listed in the Azure Portal or the Azure Pricing Calculator.

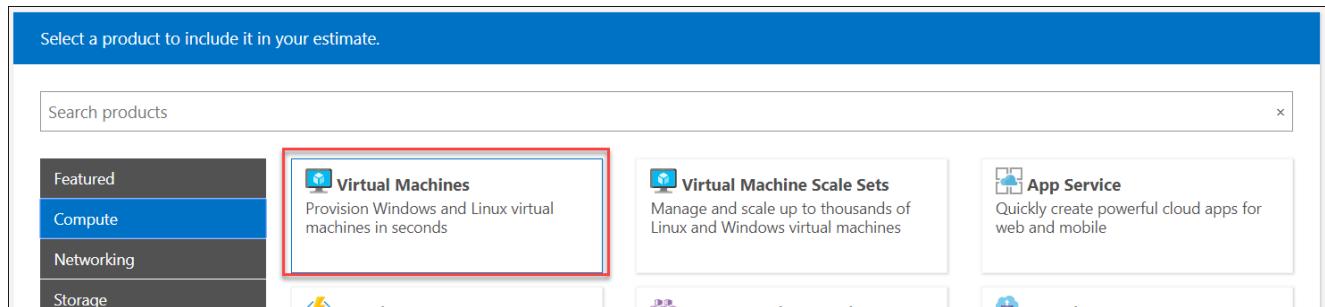


Additionally, the Azure SQL Database is hosted using the Premium P4 pricing tier.

The VM sizes from the Existing architecture that was deployed using the ARM Template will be slightly different from the diagram above for this scenario. The reason for this was to make the ARM Template deployment quicker and cheaper while still deploying enough to allow you to perform the exercises in this lab.

Task 1: Calculate Estimated Hosting Cost of Existing Solution

1. From a new browser tab or instance, navigate to the **Azure Pricing Calculator** <https://azure.microsoft.com/en-us/pricing/calculator>.
2. Click on **Compute**, followed by **Virtual Machines**.



Select a product to include it in your estimate.

Search products

Featured

Compute

Networking

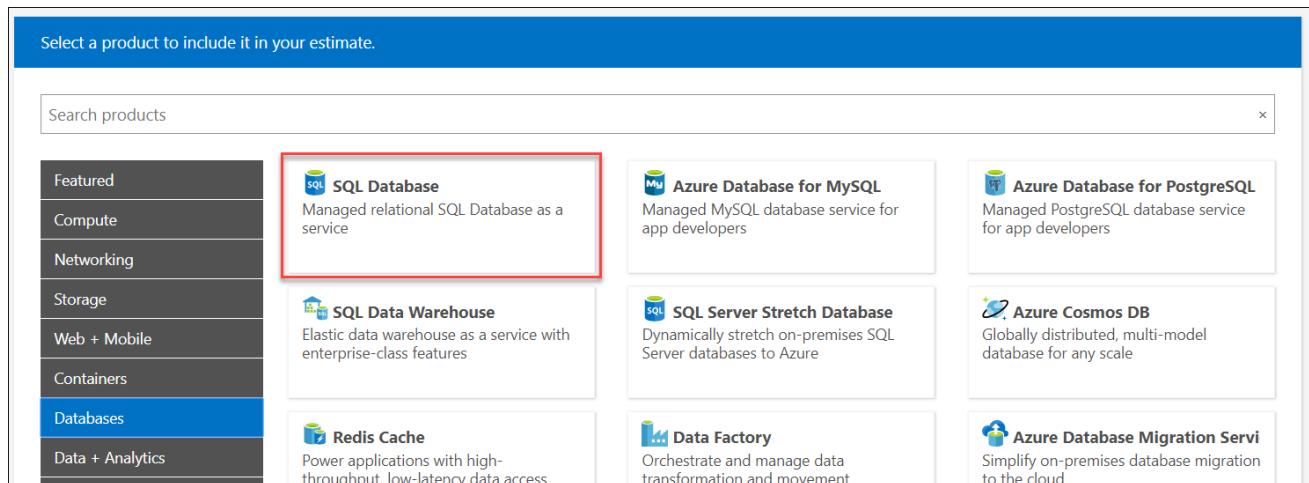
Storage

Virtual Machines
Provision Windows and Linux virtual machines in seconds

Virtual Machine Scale Sets
Manage and scale up to thousands of Linux and Windows virtual machines

App Service
Quickly create powerful cloud apps for web and mobile

3. Click on **Databases**, followed by **SQL Database**.



Select a product to include it in your estimate.

Search products

Featured

Compute

Networking

Storage

Web + Mobile

Containers

Databases

Data + Analytics

SQL Database
Managed relational SQL Database as a service

Azure Database for MySQL
Managed MySQL database service for app developers

Azure Database for PostgreSQL
Managed PostgreSQL database service for app developers

SQL Data Warehouse
Elastic data warehouse as a service with enterprise-class features

SQL Server Stretch Database
Dynamically stretch on-premises SQL Server databases to Azure

Azure Cosmos DB
Globally distributed, multi-model database for any scale

Redis Cache
Power applications with high-throughput, low-latency data access

Data Factory
Orchestrate and manage data transformation and movement

Azure Database Migration Service
Simplify on-premises database migration to the cloud

4. Scroll down to the **Your Estimate** section of the page.

The screenshot shows the 'Your Estimate' section of the Microsoft Cloud Workshop. At the top, there are two tabs: 'Developer tools' and 'Monitoring + Management'. Below this, the 'Your Estimate' section displays a summary of resources: 'Virtual Machines' (1 D1 (1 vCPU(s), 3.5 GB RAM) x 732 Hours; Windows ...), a cost of '\$102.48', and three icons for 'Edit', 'Clone', and 'Delete'. A large icon for 'Virtual Machines' is shown below the summary.

5. On the **SQL Database**, set the following values:

- Region: **North Central US**
- Pricing Tier: **Premium**

The screenshot shows the 'SQL Database' configuration page. It includes a header with a '+' icon, a save icon, and the text 'Single Database, Premium tier, P1 level, 125 DTUs, 10...'. Below this, there is a 'SQL Database' icon and fields for 'REGION', 'TYPE', and 'TIER'. The 'REGION' dropdown is set to 'North Central US' (highlighted with a red box). The 'TYPE' dropdown is set to 'Single Database'. The 'TIER' dropdown is set to 'Premium' (highlighted with a red box). There is also a 'PERFORMANCE LEVEL' dropdown below the main settings.

6. Set the **Performance Level** to **P4**.

REGION: North Central US
TYPE: Single Database
PERFORMANCE LEVEL: P4: 500 DTUs, 500 GB included storage per DB, \$2.5000/hour

7. On **Virtual Machines**, set the following values:

- Region: **North Central US**
- Pricing Tier: **Standard**

Virtual Machines
REGION: North Central US
OPERATING SYSTEM: Windows
TYPE: (OS Only)
TIER: Standard
INSTANCE: D3: 4 vCPU(s), 14 GB RAM, 200 GB Temporary storage, \$0.560/hour

8. Change the **Instance Size** to **D3**.

TIER: Standard
INSTANCE: D3: 4 vCPU(s), 14 GB RAM, 200 GB Temporary storage, \$0.560/hour
Billing Option

9. Change the **Billing Option** to **Pay as you go**, and change the **Virtual Machines Count** to **5**. The count now includes the 2x Web App Tier, 2x API Tier, and 1x Background Tier virtual machines.

The screenshot shows the 'Billing Option' section of the Azure Pricing Calculator. It displays three options: 'Pay as you go' (selected), '1 year reserved', and '3 year reserved'. Below this, there's a summary table:

5 Virtual machines	x	732 Hours	= \$2,049.60
-----------------------	---	--------------	--------------

10. Click the **Collapse all** button, and Record the **Estimated monthly cost**. This is the total estimated cost of the existing environment Virtual Machines and SQL Database only.

The screenshot shows the 'Your Estimate' section of the Azure Pricing Calculator. It lists the components and their costs:

Virtual Machines	5 D3 (4 vCPU(s), 14 GB RAM) x 732 Hours; Windows – ...	\$2,049.60
SQL Database	Single Database, Premium tier, P4 level, 500 DTUs, 10...	\$1,830.00

Below this, the 'Support' section shows 'Included' support at \$0.00. The 'Programs and Offers' section shows 'Microsoft Online Services Program (MOSP)' selected. The 'Estimated monthly cost' is highlighted with a red box and shows a value of \$3,879.60. The currency dropdown is set to 'US Dollar (\$)'.

Task 2: Calculate Estimated Hosting Cost of VMs with Reserved instances

- From a new browser tab or instance, navigate to the **Azure Pricing Calculator** <https://azure.microsoft.com/en-us/pricing/calculator>.

2. Click on **Compute**, followed by **Virtual Machines**.

Select a product to include it in your estimate.

Search products

Featured

Compute

Networking

Storage

Virtual Machines
Provision Windows and Linux virtual machines in seconds

Virtual Machine Scale Sets
Manage and scale up to thousands of Linux and Windows virtual machines

App Service
Quickly create powerful cloud apps for web and mobile

3. Click on **Databases**, followed by **SQL Database**.

Select a product to include it in your estimate.

Search products

Featured

Compute

Networking

Storage

Web + Mobile

Containers

Databases

Data + Analytics

SQL Database
Managed relational SQL Database as a service

Azure Database for MySQL
Managed MySQL database service for app developers

Azure Database for PostgreSQL
Managed PostgreSQL database service for app developers

SQL Data Warehouse
Elastic data warehouse as a service with enterprise-class features

SQL Server Stretch Database
Dynamically stretch on-premises SQL Server databases to Azure

Azure Cosmos DB
Globally distributed, multi-model database for any scale

Redis Cache
Power applications with high-throughput, low-latency data access

Data Factory
Orchestrate and manage data transformation and movement

Azure Database Migration Service
Simplify on-premises database migration to the cloud

4. Scroll down to the **Your Estimate** section of the page.

Developer tools

Monitoring + Management

Your Estimate

Virtual Machines

1 D1 (1 vCPU(s), 3.5 GB RAM) x 732 Hours; Windows -... \$102.48

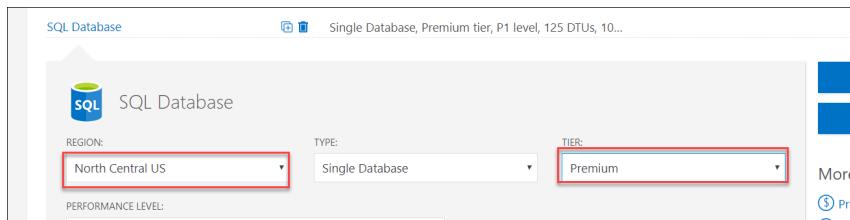
Virtual Machines

Clone

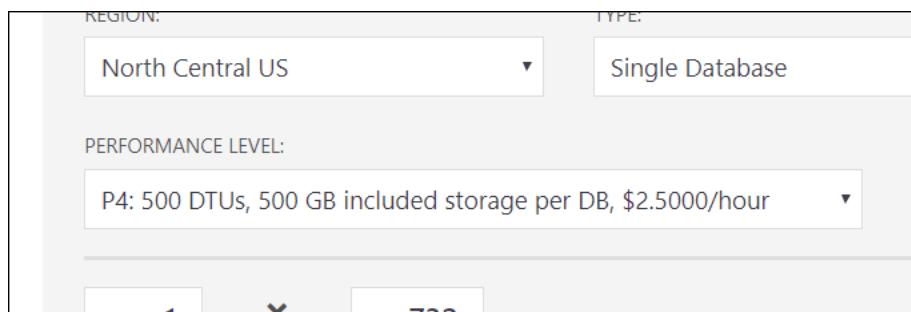
Delete

5. On the **SQL Database**, set the following values:
- Region: **North Central US**

- Pricing Tier: **Premium**

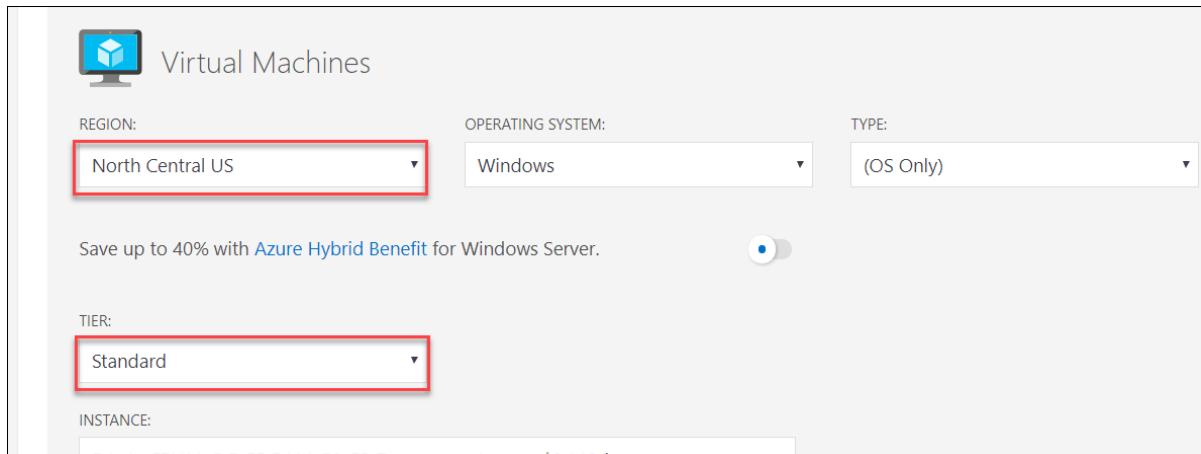


6. Set the **Performance Level** to **P4**.



7. On **Virtual Machines**, set the following values:

- Region: **North Central US**
- Pricing Tier: **Standard**



8. Change the **Instance Size** to **D3**.

The screenshot shows the 'TIER' dropdown set to 'Standard'. Below it, the 'INSTANCE' dropdown shows 'D3: 4 vCPU(s), 14 GB RAM, 200 GB Temporary storage, \$0.560/hour'. A section titled 'Billing Option' is visible at the bottom.

9. Change the **Billing Option** to **3-year reserved**, and change the **Virtual Machines Count** to **5**, so the count includes the 2x Web App Tier, 2x API Tier, and 1x Background Tier virtual machines.

The screenshot shows the 'Billing Option' section. It highlights the '3 year reserved' radio button, which is enclosed in a red box. To its right, the 'Virtual machines' input field contains the value '5', also enclosed in a red box. To the right of the count, the total cost is listed as '\$1,054.83' with a note '(~49% savings)'. A tooltip at the bottom states: 'Virtual Machines are billed per-second. Learn more about Virtual Machines pricing.'

10. Click the **Collapse all** button, and Record the **Estimated monthly cost**. This is the total estimated cost of the existing environment Virtual Machines and SQL Database only using **Reserved Instances**.

The screenshot shows the 'Your Estimate' section of the Azure Cost Estimator. It lists two items: 'SQL Database' (Single Database, Premium tier, P4 level, 500 DTUs, 10...) with a cost of '\$1,830.00' and 'Virtual Machines' (5 D3 (4 vCPU(s), 14 GB RAM); Windows – (OS Only); 3 ...) with a cost of '\$1,054.83'. A red box highlights the total estimated monthly cost of '\$2,884.83' at the bottom right. The 'Support' section shows 'Included' support at \$0.00. The 'Programs and Offers' section shows 'Microsoft Online Services Program (MOSP)' selected. A 'SHOW DEV/TEST PRICING' button is also present. The 'Estimated monthly cost' section includes an 'Export' button and a currency dropdown set to 'US Dollar (\$)'.

Task 3: Estimate Necessary App Service Tiers

Subtask 1: Find Existing VM Instance Size Specifications (CPU Cores and RAM)

1. From a new browser tab or instance, navigate to the **Windows Virtual Machines Pricing** page.
<https://azure.microsoft.com/en-us/pricing/details/virtual-machines/windows/>
2. Scroll down to the **Explore all VM options** section of the page.

The screenshot shows the 'Explore all VM options' section of the Windows Virtual Machines Pricing page. It contains a heading 'Explore all VM options' and a descriptive text: 'Explore options in Azure Virtual Machines. Choose your OS and storage requirements.'

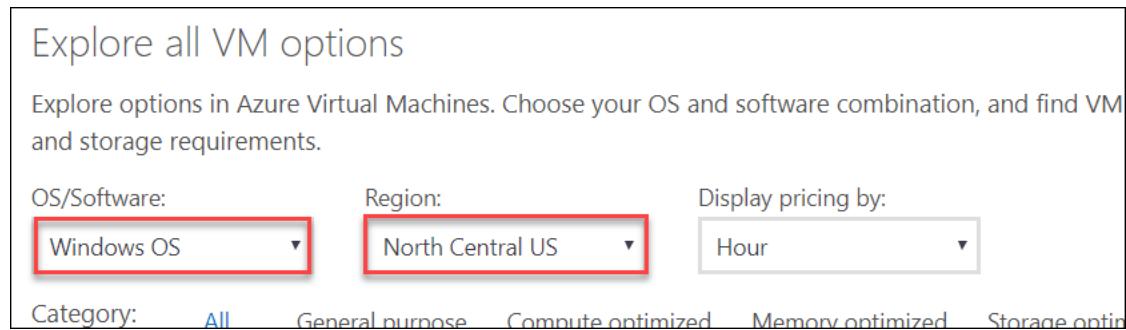
3. Set the **OS/Software** drop down to **Windows OS**, and the **Region** to **North Central US**.

Explore all VM options

Explore options in Azure Virtual Machines. Choose your OS and software combination, and find VM and storage requirements.

OS/Software: Windows OS Region: North Central US Display pricing by: Hour

Category: All General purpose Compute optimized Memory optimized Storage optimized

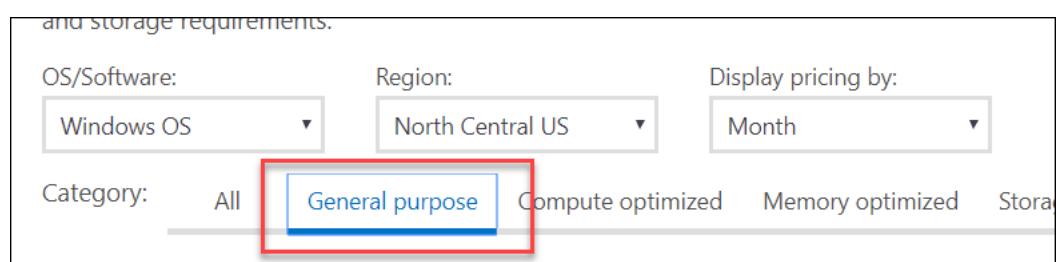


4. Click on **General purpose**.

and storage requirements.

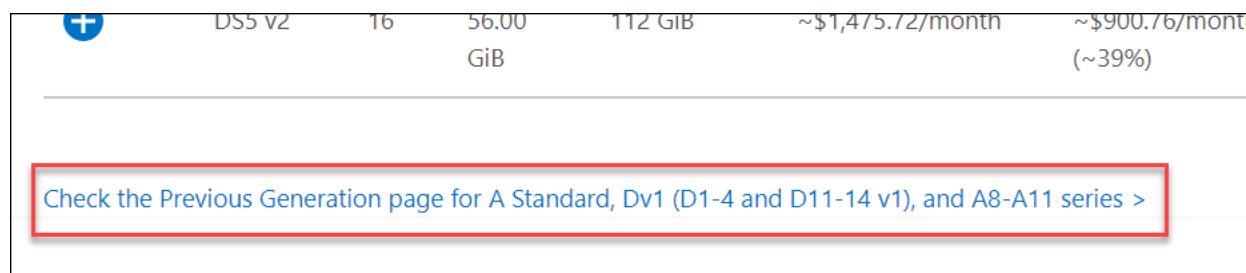
OS/Software: Windows OS Region: North Central US Display pricing by: Month

Category: All General purpose Compute optimized Memory optimized Storage optimized



5. Scroll down below the VM Instance Size listings, and click on the **Check the Previous Generation page...** link.

	D5s v2	16	56.00	112 GiB	~\$1,475.72/month	~\$900.76/month (~39%)
Check the Previous Generation page for A Standard, Dv1 (D1-4 and D11-14 v1), and A8-A11 series >						

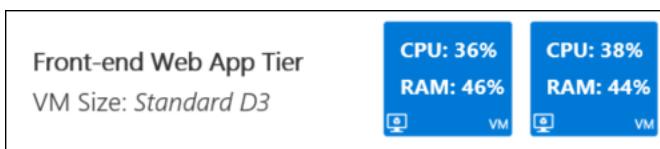


6. Scroll down to the **D1-4 v1** section and make note of the VM Instance specs, specifically the **CPU Cores** and **RAM** for the **D3** instance size.

D1-4 – v1						
ADD TO ESTIMATE	INSTANCE	vCPU	RAM	TEMPORARY STORAGE	PAY AS YOU GO	1 YR (%)
	D1	1	3.50 GiB	50 GiB	\$0.14/hour	\$0
	D2	2	7.00 GiB	100 GiB	\$0.28/hour	\$0
	D3	4	14.00 GiB	200 GiB	\$0.56/hour	\$0
	D4	8	28.00 GiB	400 GiB	\$1.12/hour	\$0

Subtask 2: Calculate Web App Tier VM Utilization

1. Calculate the **Average CPU Utilization** between the 2 Web App Tier VMs with individual CPU utilization of **36%** and **38%**.
- $36 + 38 = 74$
 - $74 / 2 = \mathbf{37\% \text{ Average CPU Utilization}}$

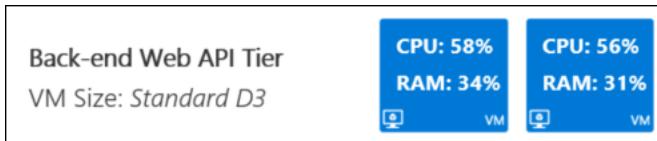


2. Calculate the amount of **CPU Cores** the **Average CPU Utilization** represents:
- $4 \text{ (CPU Cores)} * \mathbf{0.37 \text{ (37\%)}} = \mathbf{1.48 \text{ CPU Cores}}$
3. Calculate the **Average RAM Utilization** between the 2 Web App Tier VMs with individual RAM Utilization of **46%** and **44%**.
- $46 + 44 = 90$
 - $90 / 2 = \mathbf{45\% \text{ Average RAM Utilization}}$

4. Calculate the amount of **RAM** the **Average RAM Utilization** represents:
 - **14 GB (RAM) * 0.45 (45%) = 6.3 GB RAM**

Subtask 3: Calculate API Tier VM Utilization

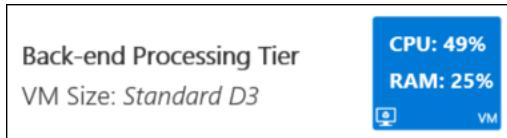
1. Calculate the **Average CPU Utilization** between the 2 API Tier VMs with individual CPU utilization of **58%** and **56%**.
 - $58 + 56 = 114$
 - $114 / 2 = \mathbf{57\% \ Average \ CPU \ Utilization}$



2. Calculate the amount of **CPU Cores** the **Average CPU Utilization** represents:
 - **4 (CPU Cores) * 0.57 (57%) = 2.28 CPU Cores**
3. Calculate the **Average RAM Utilization** between the 2 API Tier VMs with individual RAM utilization of **34%** and **31%**.
 - $34 + 31 = 65$
 - $65 / 2 = \mathbf{32.5\% \ Average \ RAM \ Utilization}$
4. Calculate the amount of **RAM** the **Average RAM Utilization** represents:
 - **14 GB (RAM) * 0.325 (32.5%) = 4.55 GB RAM**

Subtask 4: Calculate Background Tier VM Utilization

1. The **Average CPU Utilization** of the single Background Tier VM is **49%**.



2. Calculate the amount of **CPU Cores** the **Average CPU Utilization** represents:
 - a. **4 (CPU Cores) * 0.49 (49%) = 1.96 CPU Cores**
3. The **Average RAM Utilization** of the single Background Tier VM is **25%**.
4. Calculate the amount of **RAM** the **Average RAM Utilization** represents:
 - a. **14 GB (RAM) * 0.25 (25%) = 3.5 GB RAM**

Subtask 5: Identify Appropriate App Service Tier

1. From a new browser tab or instance, navigate to the **App Service Pricing** page <https://azure.microsoft.com/en-us/pricing/details/app-service>
2. Set the **Region** filter to **North Central US**.

The figure shows a screenshot of the Azure App Service Pricing page. It has two dropdown menus: "Region:" with "North Central US" selected and "Currency:" with "US Dollar (\$)" selected.

3. Scroll down to the **Standard Service Plan** section.

Standard Service Plan				
INSTANCE	CORES	RAM	STORAGE	PRICES
S1	1	1.75 GB	50 GB	\$0.10/hour
S2	2	3.50 GB	50 GB	\$0.20/hour
S3	4	7 GB	50 GB	\$0.40/hour

4. Map the **CPU / RAM Utilization** of the **Web App Tier (1.48 CPU Cores / 6.3 GB RAM)** to the closest **Standard Service Plan** tier. These maps to be the **Standard S3** pricing tier.
5. Map the **CPU / RAM Utilization** of the **API Tier (2.28 CPU Cores / 4.55 GB RAM)** to the closest **Standard Service Plan** tier. These maps to be the **Standard S3** pricing tier.
6. Map the **CPU / RAM Utilization** of the **Background Tier (1.96 CPU Cores / 3.5 GB RAM)** to the closest **Standard Service Plan** tier. These maps to be the **Standard S3** pricing tier.

The **Background Tier** matches almost identical to 100% of the CPU / RAM resources of the **Standard S2** pricing tier. However, 100% utilization would hinder the performance of the server since the resources would be at their maximum. For this reason, it is appropriate to go with the **Standard S3** pricing tier instead to leave extra room for best performance and possible spikes in load / usage.

7. Overall, it has been identified that the **Standard S3** is the appropriate **App Service Plan** pricing tier to use for the Web App, API, and Background tiers.

Task 4: Calculate Estimated Hosting Cost of Azure App Service

1. From a new browser tab or instance, navigate to the **Azure Pricing Calculator** <https://azure.microsoft.com/en-us/pricing/calculator>
2. Click on **App Service**.

The screenshot shows the Azure Pricing Calculator interface. At the top, a blue bar says "Select a product to include it in your estimate." Below it is a search bar labeled "Search products". To the left is a sidebar with categories: "Featured" (highlighted in blue), "Compute", "Networking", "Storage", "Web + Mobile", "Containers", "Databases", and "Data + Analytics". In the main area, there are several service cards: "Virtual Machines" (Provision Windows and Linux virtual machines in seconds), "Storage" (Durable, highly-available, and massively-scalable cloud storage), "SQL Database" (Managed relational SQL Database as a service), "Azure Cosmos DB" (Globally distributed, multi-model database for any scale), "Machine Learning Studio" (Easily build, deploy, and manage predictive analytics solutions), "Functions" (Process events with serverless code), and "Cognitive Services" (Add smart API capabilities to enable). The "App Service" card, which says "Quickly create powerful cloud apps for web and mobile", is highlighted with a red box.

3. If the **SQL Database** is not in the calculator from the previous VM estimation, scroll up, add it, and set it to **Premium P4** performance level.

The screenshot shows the configuration for a SQL Database. The 'REGION' is set to 'East US', 'TYPE' is 'Single Database', and 'TIER' is 'Premium'. The 'PERFORMANCE LEVEL' dropdown is set to 'P4: 500 DTUs, 500 GB included storage per DB, \$2.5000/hour'. Below this, there are input fields for 'Databases' (set to 1) and 'Hours' (set to 732), resulting in a total cost of '\$1,830.00'.

4. On **App Service**, change the **Region** to **North Central US**.

The screenshot shows the configuration for an App Service. The 'REGION' is set to 'North Central US'. There is also an 'INSTANCE' dropdown which is partially visible.

5. Change the **Tier** to **Standard** and the **Instance Size** to **S3** to reflect the App Service Plan tier identified as the appropriate hosting tier for the Web App, API, and Background application tiers.

The screenshot shows the configuration for an App Service. The 'REGION' is set to 'North Central US'. The 'TIER' dropdown is set to 'Standard' (highlighted with a red box). The 'INSTANCE' dropdown is set to 'S3: 4 vCPU(s), 7 GB RAM, 50 GB Storage, \$0.400' (also highlighted with a red box).

6. Change the **Instances** count to **5** to reflect the same number of instances of the existing VM architecture (2x Web App Tier, 2x API Tier, 1x Background Tier).

The screenshot shows the Azure App Service configuration interface. It includes fields for REGION (North Central US), TIER (Standard), INSTANCE (S3: 4 vCPU(s), 7 GB RAM, 50 GB Storage, \$0.400), and a summary section showing 5 Instances, 732 Hours, and a total cost of \$1,464.00.

Category	Value
REGION	North Central US
TIER	Standard
INSTANCE	S3: 4 vCPU(s), 7 GB RAM, 50 GB Storage, \$0.400
Instances	5
Hours	732
Total Cost	\$1,464.00

The **Instance Count** should remain **5** since the application will still need the same amount of resources to host; it is just the Azure Service hosting them that is changing. For example, since the Web App Tier needs 2 VM instances, the App Service Plan will also use 2 instances for hosting.

7. Record the **Estimated monthly cost**. This is the total estimated cost of the new environment App Service Instances and SQL Database only.

The screenshot shows the Azure Cost Estimator interface. It displays the estimated monthly cost for the new environment, which includes the cost for the App Service and the SQL Database. The total estimated monthly cost is \$3,294.00.

Category	Value
App Service	5 instance(s) x 732 Hours, Size: S3, Standard tier0 SNI ...
SQL Database	Single Database, Premium tier, P4 level, 500 DTUs, 10...
Estimated monthly cost	\$3,294.00

Task 5: Calculate Estimated Cost Savings

1. Copy the **Estimated Cost** of the **Existing Architecture** (VMs and SQL Database).

The original **Existing Architecture** cost that was estimated came to approximately **\$6,902**. Your estimate may vary, depending on current Azure pricing.

2. Copy the **Estimated Cost** of the **New Architecture** (App Service and SQL Database).

The **New Architecture** cost that was estimated came to approximately **\$3,582**. Your estimate may vary, depending on current Azure pricing.

3. **Subtract** the estimated cost of the **New Architecture** from the **Existing Architecture** to calculate the **Estimated Monthly Cost Savings**.

- Existing – New = Estimated Monthly Cost Savings

From the estimates above this would be:

$$\$6,902 - \$3,582 = \$3,320$$

Remember your results may vary, depending on current Azure pricing.

4. To calculate the **Annual Cost Savings**, take the **Monthly Cost Savings** and multiply it by **12**.

- Monthly Cost Savings * 12 = Annual Cost Savings

From the estimates above this would be:

$$\$3,320 * 12 = \$39,840$$

Remember your results may vary, depending on current Azure pricing.

5. Make note that these **Estimated Cost Savings** do not include bandwidth, storage and other charges that will be incurred in hosting the application. The estimates calculated above only pertain to the **App Service Plans** and **SQL Database**.

From the estimates above this would be:

Estimated Monthly Cost Savings: \$3,320

Estimated Annual Cost Savings: \$39,840

Exercise 2: Integrate Traffic Manager

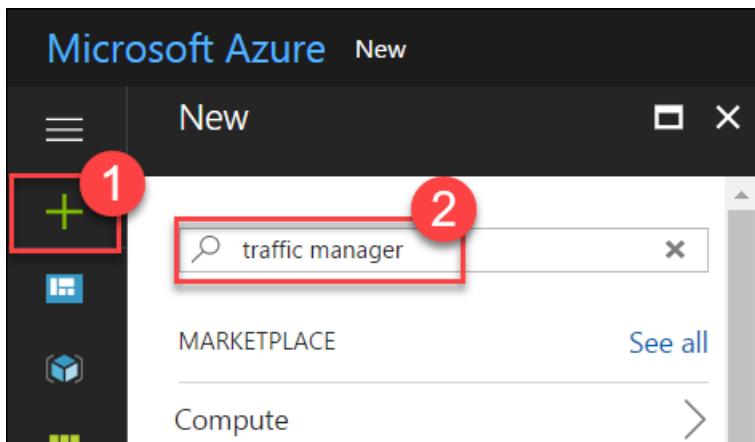
Contoso Financial needs new load balancing solutions implemented using Azure Traffic Manager. The existing architecture uses a Load Balancer, but that does not accommodate the growth of Contoso Financial appropriately where they will need to add additional hosting regions in Europe.

Help references

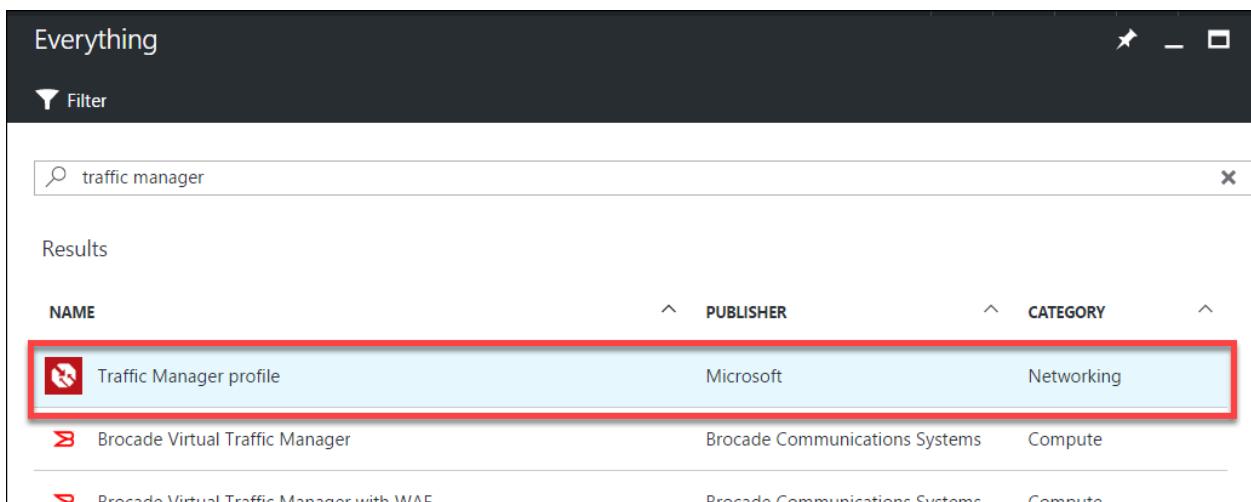
Azure Load Balancer	https://azure.microsoft.com/en-us/services/load-balancer/
Azure Traffic Manager	https://azure.microsoft.com/en-us/services/virtual-network/

Task 1: Create Traffic Manager

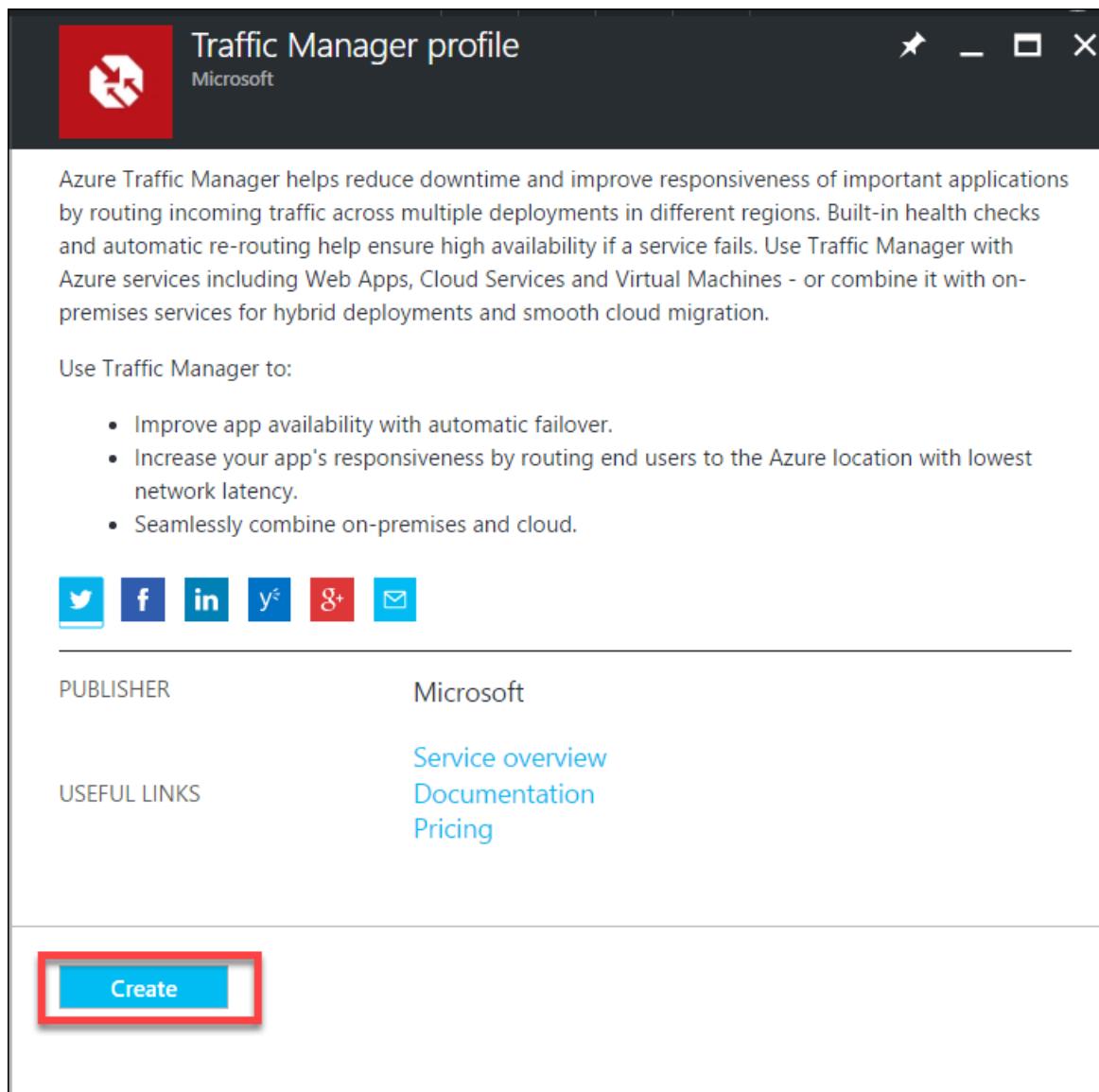
1. From the Azure Management portal <http://portal.azure.com>, using a new tab or instance, click on **+New**, type **Traffic Manager** into the **Search the marketplace** box and press **Enter**.



2. Click on **Traffic Manager profile** in the list.



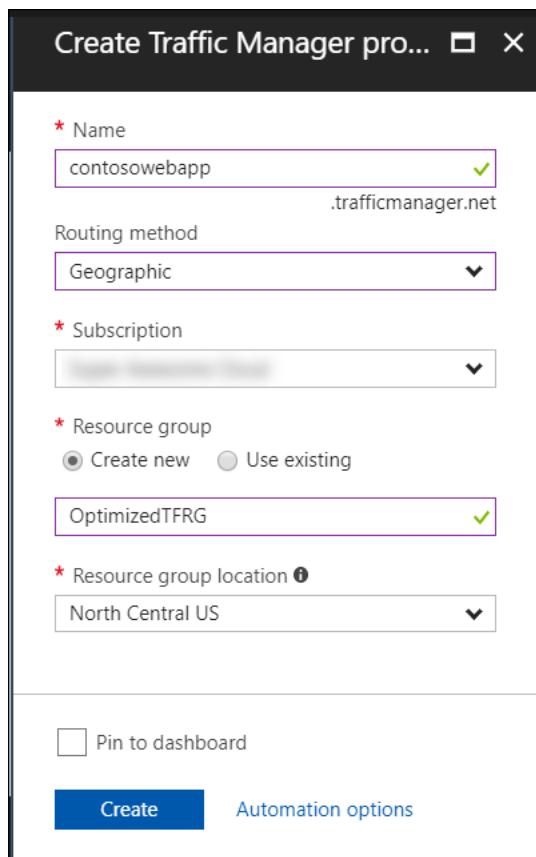
3. Click **Create**.



4. On the **Create Traffic Manager profile** blade, enter the following values:

- Name: **enter a unique name for the Traffic Manager**
- Routing method: **Geographic**
- Resource group: **Create New - OptimizedTFRG**

- Resource group location: **North Central US**



- Click **Create**.

Task 2: Point Traffic Manager to External / Internet Load Balancer

- Click on **Resource groups**, select the **OptimizedTFRG** resource group, and click on the **Traffic Manager** that was just created.

The screenshot shows the Azure Resource groups blade. On the left, there is a sidebar with icons for 'Resource groups', 'Subscriptions', 'Activity log', 'Access control (IAM)', 'Tags', 'Quickstart', 'Resource costs', 'Deployments', and 'Policies'. A red circle labeled '1' is over the 'Add' button. A red circle labeled '2' is over the 'OptimizedTFRG' resource group. A red circle labeled '3' is over the 'contosowebapp' Traffic Manager profile listed in the main pane.

2. On the **Traffic Manager** blade, click on **Endpoints** under Settings.



3. On the **Endpoints** blade, click on the **Add** button.

A screenshot of the 'Endpoints' blade for the 'contosowebapp' Traffic Manager profile. The title bar says 'contosowebapp - Endpoints' and 'Traffic Manager profile'. On the left, there's a sidebar with 'Overview', 'Activity log', 'Access control (IAM)', and 'Tags'. The main area has a search bar 'Search (Ctrl+ /)' and a 'Refresh' button. A large red box highlights the '+ Add' button. Below it is a search bar 'Search endpoints' and a table header 'NAME' with a row 'No results.'

4. On the **Add endpoint** blade, enter the following values:

- Type: **Azure endpoint**
- Name: **External Load Balancer**
- Target resource type: **Public IP address**

A screenshot of the 'Add endpoint' blade. The title bar says 'Add endpoint' and 'contosowebapp'. The form has the following fields:

- Type: **Azure endpoint**
- Name: **External Load Balancer**
- Target resource type: **Public IP address**
- Target resource: **Choose a public IP address**
- Checkboxes: **Add as disabled**

Red boxes highlight the 'Type' dropdown, 'Name' input field, and 'Target resource type' dropdown.

5. Click on **Choose a public IP address**, and select the **WebAPPLBIP** IP Address in the **ContosoExistingRG** resource group.

The screenshot shows two windows side-by-side. On the left is the 'Add endpoint' dialog for a resource group named 'contosowebapp'. It has fields for 'Name' (set to 'External Load Balancer'), 'Target resource type' (set to 'Public IP address'), and a 'Target resource' dropdown containing 'WebAPPLBIP'. A red box highlights the 'Target resource' dropdown. On the right is the 'Resource' blade, which lists several resources: 'WebAPPLBIP' (selected and highlighted with a red box), 'Background1-ip', 'WebAPI1-ip', 'WebAPI2-ip', and 'WebApp1-ip', all located in the 'ContosoExistingRG' resource group and 'North Central US' region.

6. Set **Regional grouping** to **All (World)** so this endpoint will load balanced against all traffic going to Traffic Manager for now.

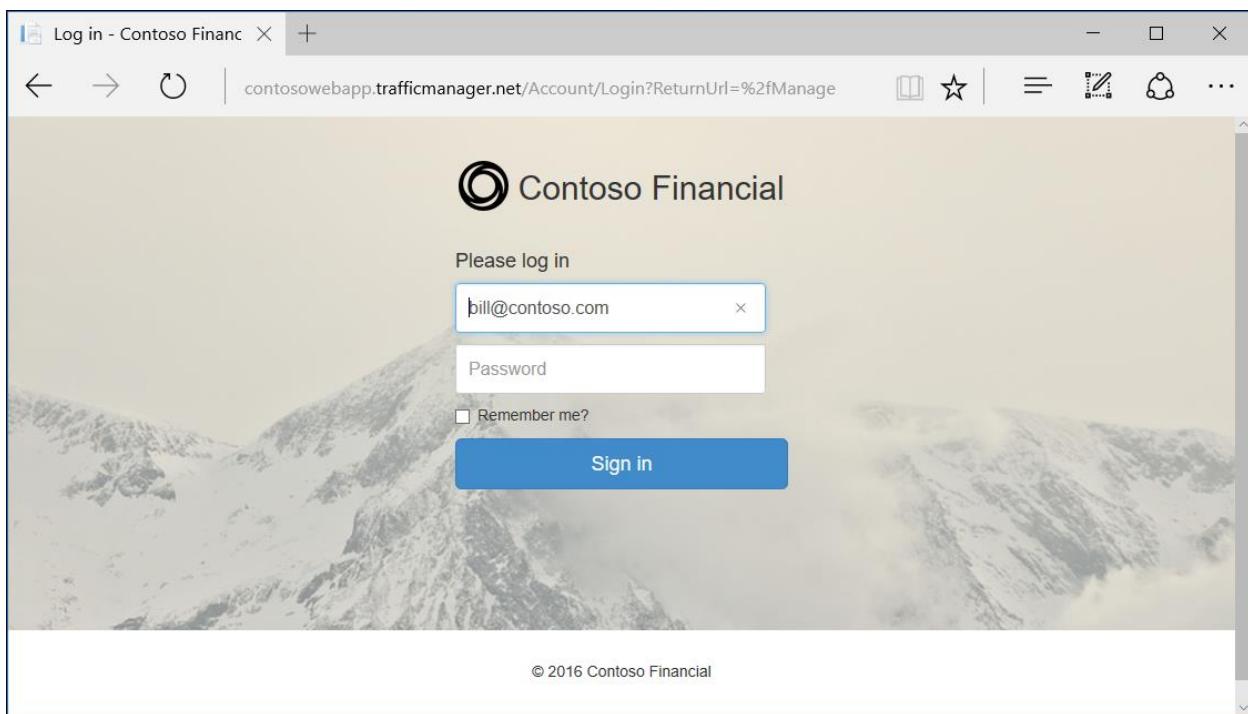
This screenshot shows the 'Add endpoint' dialog with the 'Regional grouping' field set to 'All (World)', which is highlighted with a red box. Other visible fields include 'Name' (External Load Balancer), 'Target resource type' (Public IP address), and 'Target resource' (WebAPPLBIP).

7. Click **OK**.

8. Click on **Overview**, and select the **DNS Name** for the Traffic Manager to navigate to the sample application in a new browser window

The screenshot shows the Azure portal interface for a 'Traffic Manager profile'. The title bar says 'contosowebapp' and 'Traffic Manager profile'. On the left, there's a navigation menu with 'Overview' (highlighted with a red box) and 'Activity log'. The main area has a toolbar with 'Enable', 'Disable', 'Refresh', 'Move', and 'Delete' buttons. Below the toolbar, under 'Essentials', it shows 'Resource group (change)' as 'OptimizedTRFG' and 'Status' as 'Enabled'. To the right, there's a section for 'DNS name' with a value of 'contosowebapp.trafficmanager.net', which is also highlighted with a red box. Below that, it says 'Monitor status' and 'Checking endpoints'.

9. The sample application loading will indicate the **Traffic Manager** was configured correctly.



Exercise 3: Setup API Tier in Azure App Service

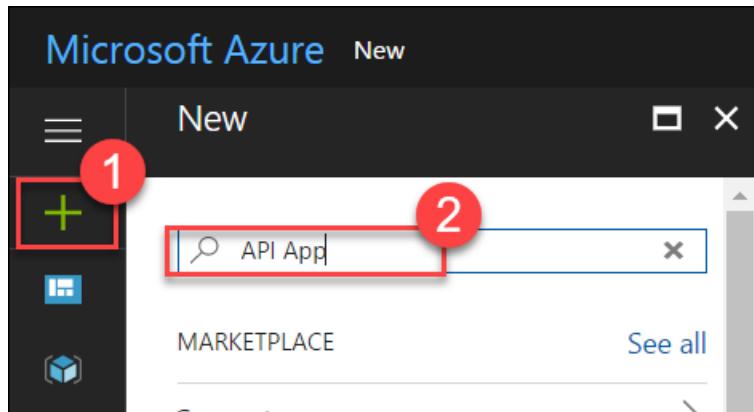
In the migration of IaaS to PaaS, the API Tier of Contoso Financials application needs to be migrated to run in an Azure App Service Web App without requiring any code changes to the application.

Help references

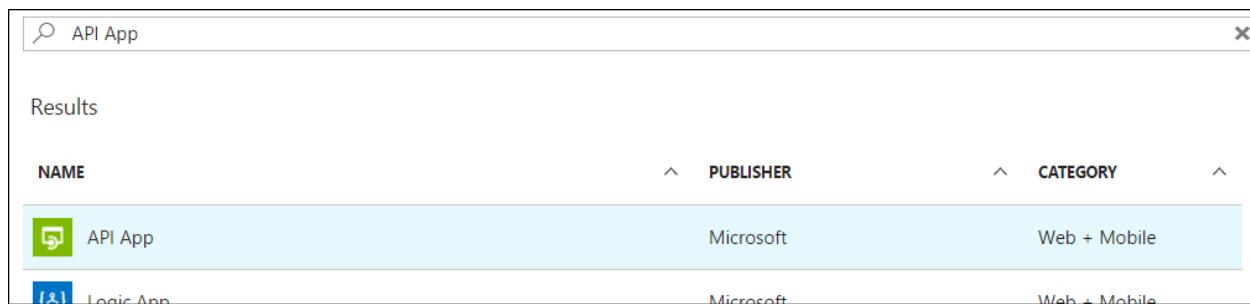
API Apps overview	https://docs.microsoft.com/en-us/azure/app-service-api/app-service-api-apps-why-best-platform
Deploy an ASP.NET web app to Azure App Service, using Visual Studio	https://azure.microsoft.com/en-us/documentation/articles/web-sites-dotnet-get-started/
Configure web apps in Azure App Service	https://azure.microsoft.com/en-us/documentation/articles/web-sites-configure/

Step 1: Create App Service for Web API Tier

1. From the Azure Management portal <http://portal.azure.com>, using a new tab or instance, click on **+New**, and type **API App** into the search box, and press **Enter**.

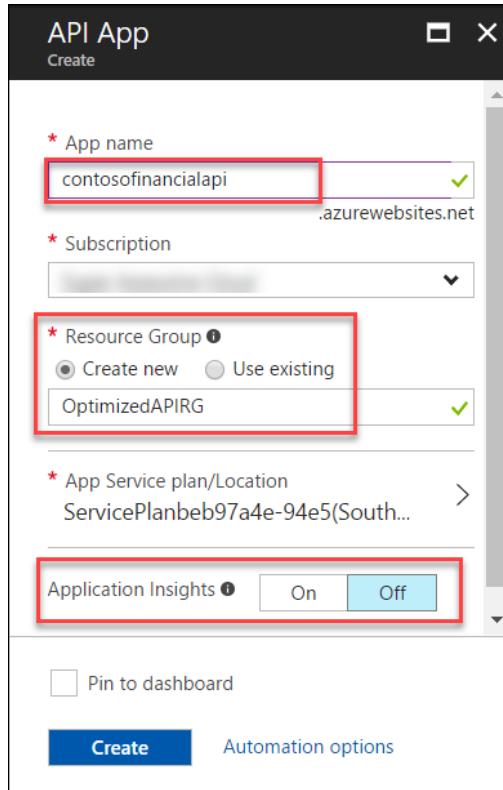


2. Click on **API App** in the search results, and click **Create**.



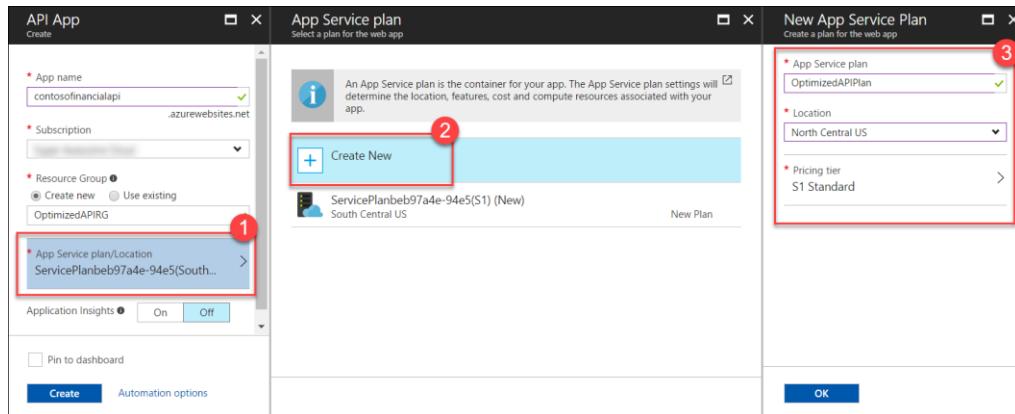
3. On the **API App** blade, enter the following values:

- App name: **enter a unique name**
- Resource group: **Create New - OptimizedAPIRG**
- App Insights: **Off**



4. Click on **App Service plan/Location**, followed by **Create New**, and fill in the following values:

- App Service plan: **OptimizedAPIPlan**
- Location: **North Central US**
- Pricing tier: **S1 Standard**



5. Click **OK**.

6. Click **Create**.

Step 2: Setup App Settings

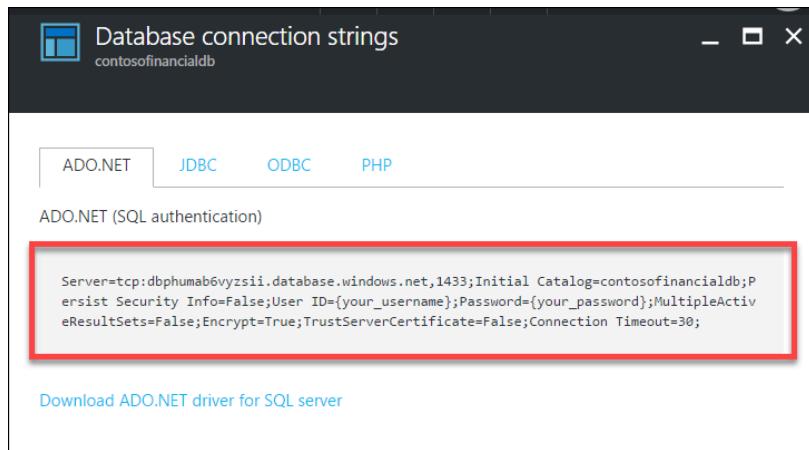
1. Click on **Resource groups**, select the **ContosoExistingRG** resource group, and click on the **contosofinancialdb** SQL Database.

The screenshot shows the Microsoft Azure Resource groups blade. On the left, there's a sidebar with icons for different services. A red circle labeled '1' is over the 'Resource groups' icon. The main area shows a list of resource groups under 'Subscriptions'. One group, 'ContosoExistingRG', is highlighted with a red box and a red circle labeled '2'. To the right, the 'ContosoExistingRG' resource group blade is open, showing its overview and a list of resources. A red box highlights the 'contosofinancialdb' SQL database, with a red circle labeled '3' over it.

2. On the **SQL database** blade, click on **Show database connection strings**.

The screenshot shows the Microsoft Azure SQL database blade for the 'contosofinancialdb' database. The 'Overview' tab is selected. In the 'Essentials' section, there's a list of properties like Resource group, Status, and Location. To the right, there are sections for Server name, Connection strings, and Pricing tier. A red box highlights the 'Connection strings' link, with a red circle labeled '4' over it.

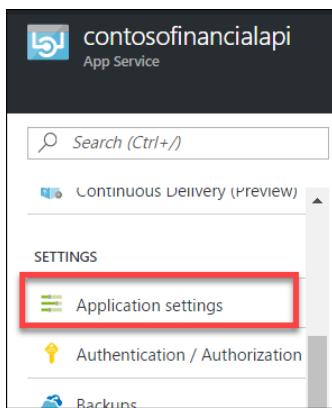
3. On the **Database connection strings** blade, copy the **ADO.NET (SQL authentication)** connection string to use later.



4. Click on **Resource groups**, click on the **OptimizedAPIRG** resource group, and then, click on the previously created **API App**.

NAME	TYPE
contosofinancialapi	App Service
OptimizedAPIPlan	App Service plan

5. On the **App Service** blade, click on **Application settings**.



6. Scroll down to the **Connection strings** section, and add a **new** connection string with the following values:
 - Name: **TransactionDb**
 - Value: **paste in the database connection string that was copied earlier**
 - Type: **SQL Database**

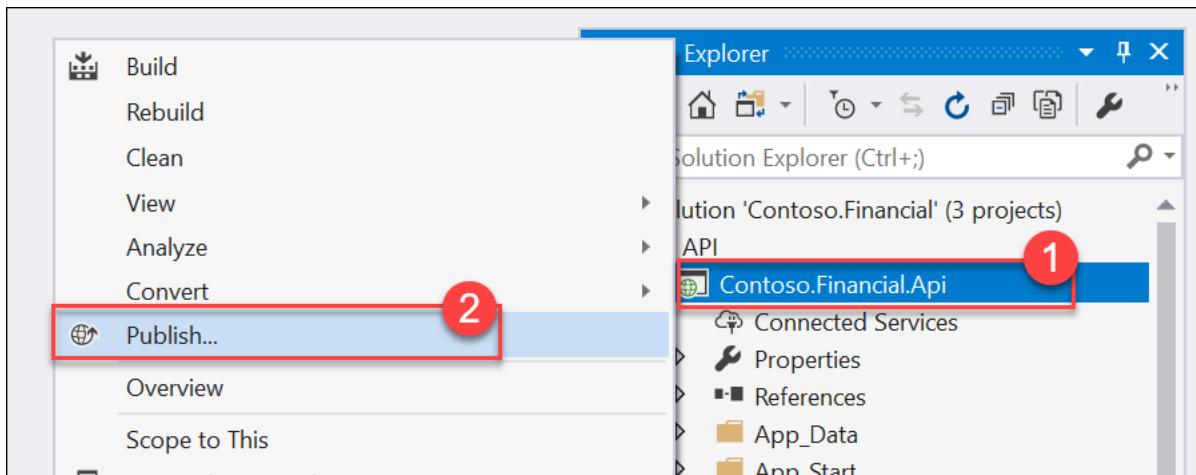
A screenshot of the 'Application settings' blade for the 'contosofinancialapi' App Service. The 'Connection strings' section shows a new entry for 'TransactionDb' with the value 'Server=tcp:dbphumab6yyzsi.database...'. This entry is highlighted with a red box.

7. Replace the value **{your_username}** with **demouser** in the connection string.
8. Replace the value **{your_password}** with **demo@pass123** in the connection string.
9. Click **Save**.

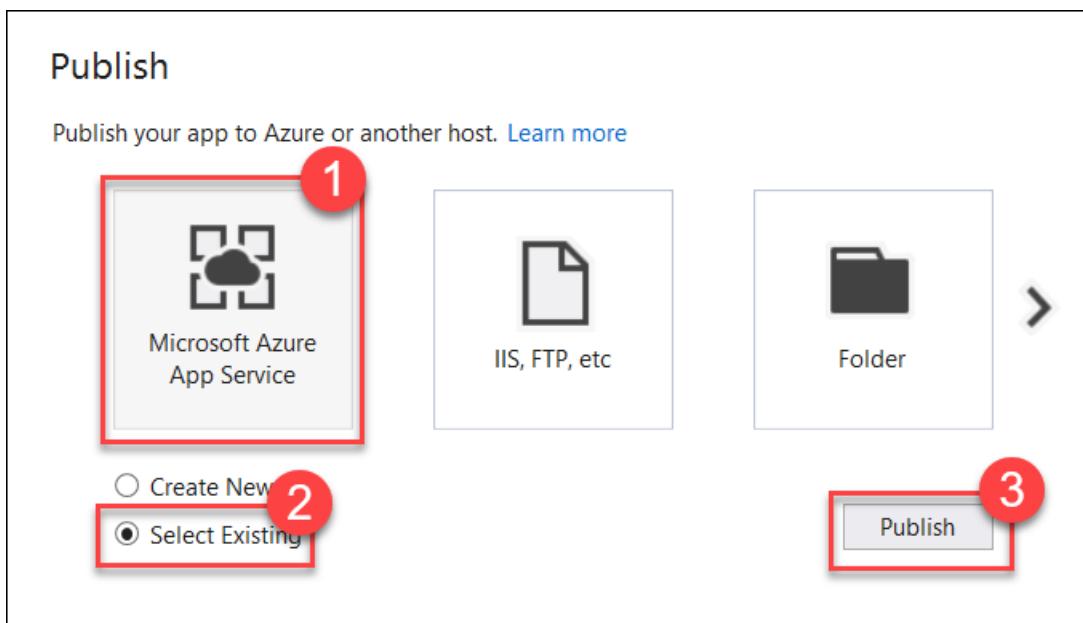
Step 3: Deploy API to App Service

1. From the C:\HOL\Contoso.Financial folder, open the Visual Studio Solution: **Contoso.Financial.sln**.

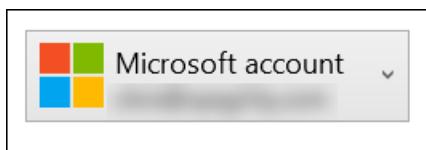
2. In the **Solution Explorer** window, expand the **API** folder, right-click the **Contoso.Financial.Api**, and click on **Publish...**



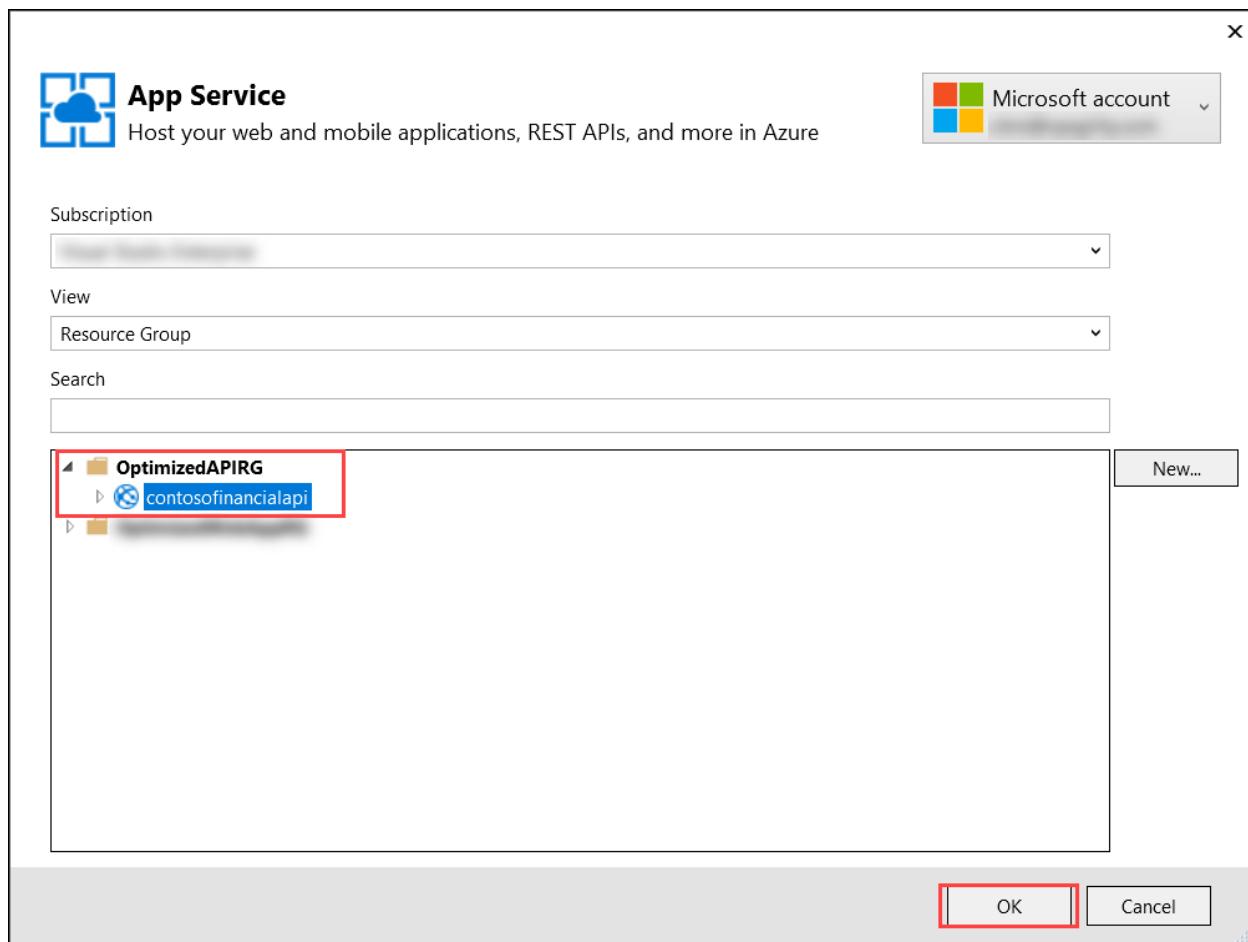
3. On the **Publish** window, click on **Microsoft Azure App Service**, check the **Select Existing** option, and click **Publish**.



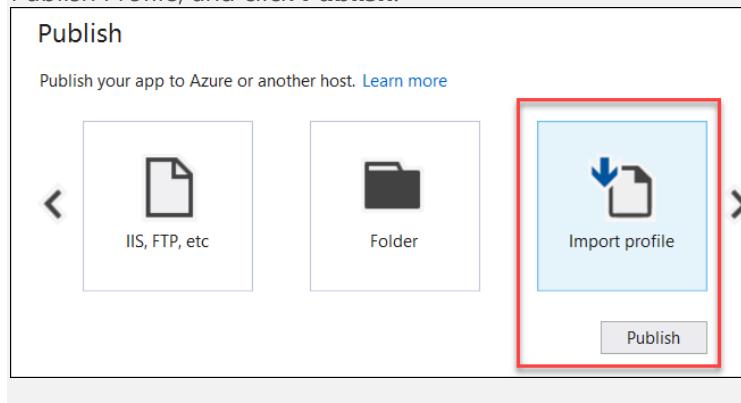
4. In the top-right corner of the **App Service** dialog, make sure your account is selected. If it is not, click on the button, and add it.



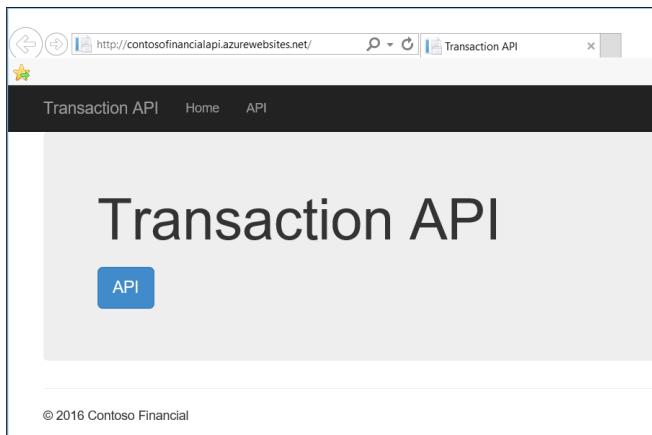
5. Expand the **OptimizedAPIRG** resource group, select the **App Service Web App**, and click **OK**.



If your API App does not show in the list of App Services, then you will need to go to the API App in the Azure Portal, and click the **Get Publish Profile** option to download a publish profile for it. Then, go back to the Visual Studio Publish window, and select the **Import profile** option followed by selecting the saved Publish Profile, and click **Publish**.



- Once the deployment has completed, Visual Studio will automatically open a new browser window navigating to the **App Service** app. This window can be closed.



Exercise 4: Migrate Web App Tier to App Service

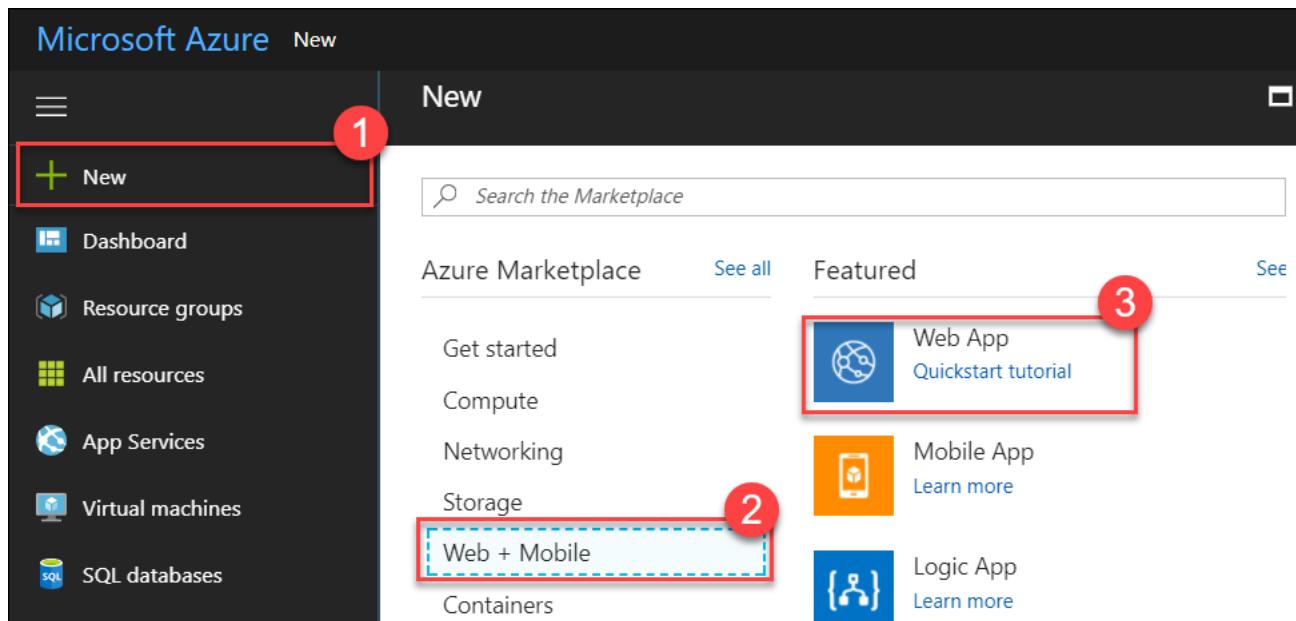
In the migration of IaaS to PaaS, the Front-end Web App Tier of Contoso Financials application needs to be migrated to run in an Azure App Service Web App without requiring any code changes to the application.

Help references

Azure Web Apps overview	https://azure.microsoft.com/en-us/documentation/articles/app-service-web-overview/
Deploy an ASP.NET web app to Azure App Service, using Visual Studio	https://azure.microsoft.com/en-us/documentation/articles/web-sites-dotnet-get-started/
Configure web apps in Azure App Service	https://azure.microsoft.com/en-us/documentation/articles/web-sites-configure/

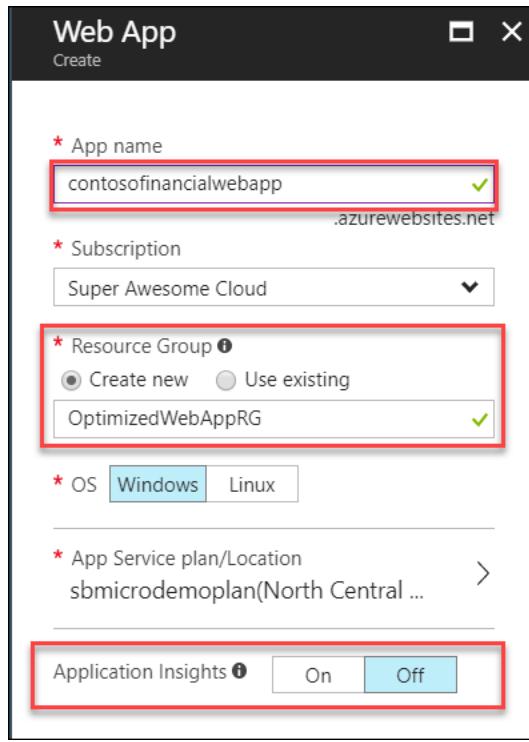
Step 1: Create App Service for Web App Tier

1. From the Azure Management portal <http://portal.azure.com>, using a new tab or instance, click on **+New**, then **Web + Mobile**, and then click on **Web App**.



2. On the **Web App** blade, enter the following values:

- App name: **enter a unique name**
- Resource Group: **Create New - OptimizedWebAppRG**
- App Insights: **Off**



3. Click on **App Service plan/Location**, then **Create New**, and fill in the following values:

- App Service plan: **OptimizedWebAppPlan**
- Location: **North Central US**
- Pricing tier: **S1 Standard**

4. Click **OK**.

5. Click **Create**.

Step 2: Setup App Settings

1. Click on **Resource groups**, click on the **OptimizedWebAppRG** resource group, then click on the **Web App**.

The screenshot shows the Microsoft Azure Resource Groups blade. On the left sidebar, 'Resource groups' is highlighted with a red box and a red number '1'. In the main area, the 'OptimizedWebAppRG' resource group is selected and highlighted with a red box and a red number '2'. On the right, the 'Essentials' blade for the resource group is open, showing details like 'Subscription name' (redacted), 'Subscription ID' (redacted), 'Last deployment' (redacted), 'Location' (West US), and a table of resources. A specific app service named 'contosofinancialwebapp' is highlighted with a red box and a red number '3'.

2. On the **Web App** blade, click on **Application settings**

The screenshot shows the 'contosofinancialwebapp' Web App blade. The 'SETTINGS' section on the left has 'Application settings' highlighted with a red box. Other options like 'Authentication / Authorization' and 'Backups' are also visible.

3. Scroll down to the **App settings** section, and create a **new** app setting with the following values:
 - Key: **transactionAPIUrl**

4. Value: **paste in the URL of the App Service API App that is hosting the API Tier.**

A screenshot of the Azure portal showing the 'Application settings' for an 'App Service'. The left sidebar shows 'Continuous Delivery (Preview)', 'SETTINGS', 'Application settings' (which is selected and highlighted in blue), and 'Authentication / Authorization'. The main area shows 'App settings' with a table. One row is selected and highlighted with a red box: 'transactionAPIUrl' (Key) and 'http://contosofinanciala...' (Value). There are three checkboxes for 'Slot setting' next to each row, all of which are unchecked.

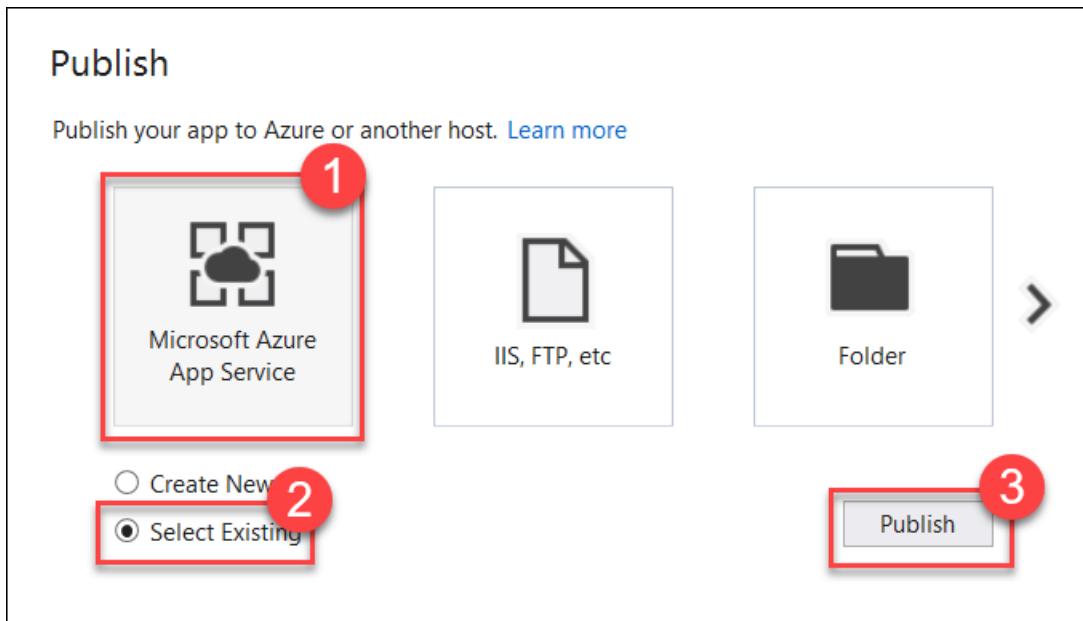
5. Click **Save**.

Step 3: Deploy App to Web App

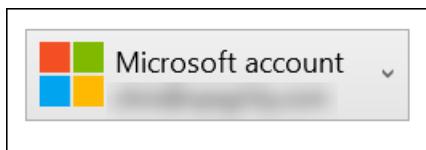
1. From the C:\HOL\Contoso.Financial folder, open the Visual Studio Solution: **Contoso.Financial.sln**.
2. In the **Solution Explorer** window, expand the **Web** folder, right-click the **Contoso.Financial.Website** project, and click on **Publish...**

A screenshot of the Visual Studio interface. On the left, the 'Build' menu is open, showing options like 'Build', 'Rebuild', 'Clean', 'View', 'Analyze', 'Convert', and 'Publish...', with 'Publish...' highlighted by a red box and circled with a red number '2'. On the right, the 'Solution Explorer' window shows a solution with three projects: 'API', 'Background', and 'Web'. The 'Web' folder is expanded, and the 'Contoso.Financial.Website' project is selected and highlighted with a red box and circled with a red number '1'. Below the project list are 'Connected Services', 'Properties', and 'References'.

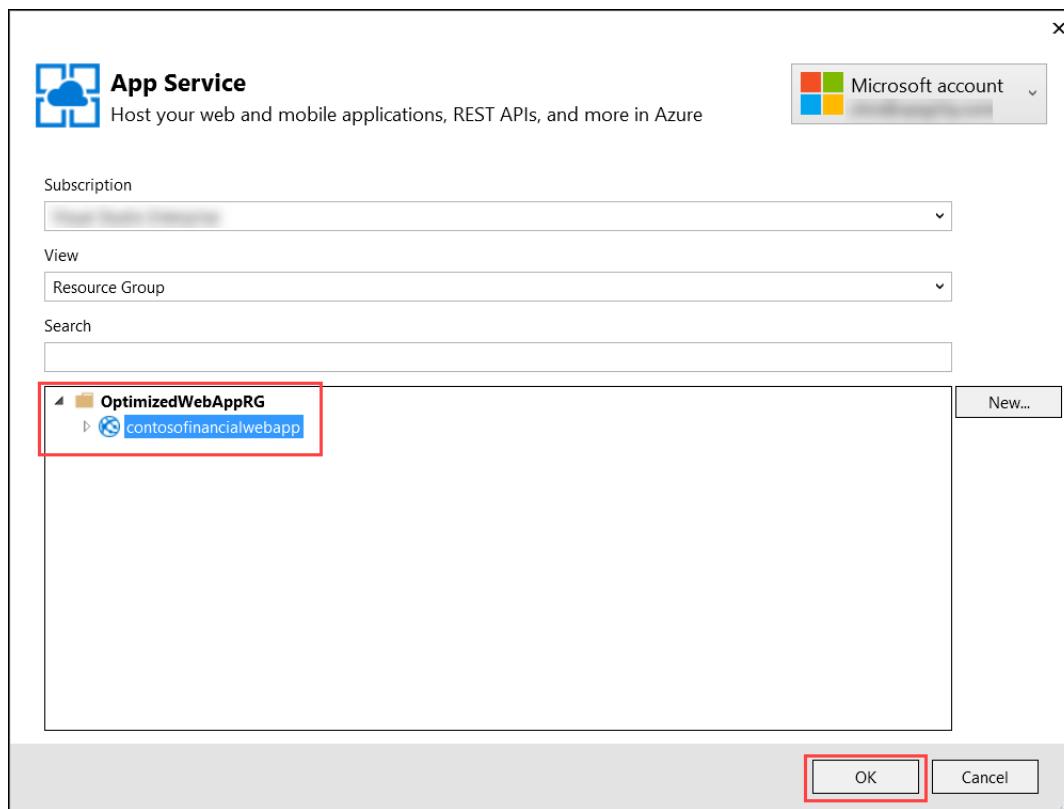
3. On the **Publish** window, click on **Microsoft Azure App Service**, check the **Select Existing** option, and click **Publish**.



4. In the top-right corner of the **App Service** dialog, make sure your account is selected. If it is not, click on the button, and add it.



5. Expand the **OptimizedWebAppRG** resource group, select the **Web App**, and click **OK**.



6. Once the deployment has completed, Visual Studio will automatically open a new browser window navigating to the **Web App**.

Step 4: Add Web App to Traffic Manager

- From the Azure Management portal <http://portal.azure.com>, using a new tab or instance, click on **Resource groups** followed by the **OptimizedTFRG** resource group, and then, click on the **Traffic Manager**.

The screenshot shows the Azure Resource Groups blade. On the left, under 'Resource groups', the 'OptimizedTFRG' resource group is highlighted with a red box and a red number '2'. On the right, the 'Overview' section of the 'OptimizedTFRG' blade is shown, with the 'contosowebapp' Traffic Manager profile highlighted with a red box and a red number '3'.

- On the **Traffic Manager profile** blade, click on **Endpoints**.

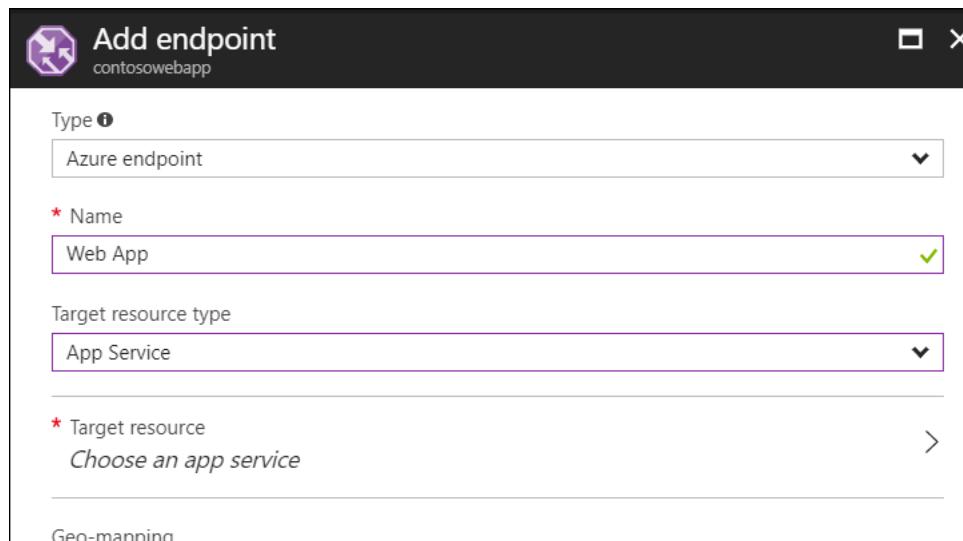


- Click **Add**.

The screenshot shows the 'contosowebapp - Endpoints' blade. The 'Add' button, located at the top center, is highlighted with a red box and a red number '1'. The 'Overview' tab is visible on the left.

4. On the **Add endpoint** blade, enter the following values:

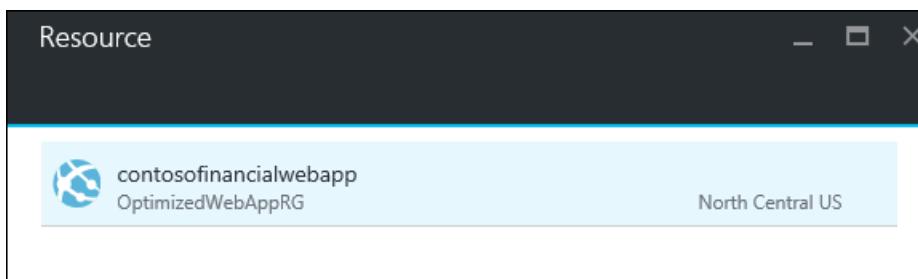
- Type: **Azure endpoint**
- Name: **Web App**
- Target resource type: **App Service**



5. Click on **Choose an app service**.



6. Click on the previously created **Web App**.



7. Set **Regional grouping** to **North America / Central America / Caribbean**.

contosofinancialwebapp

Geo-mapping

You may choose to distribute traffic based on specific geographic locations. The same location can't be specified in two endpoints.

* Regional grouping
North America / Central America / Caribbean 

Country/Region
Choose a Country/Region (optional) 

+ Add geo-mapping

Add as disabled

If you are geographically located outside of the "North America / Central America / Caribbean" region specified, then choose the next closest region to where you are located. It is important that you choose a "Regional grouping" here that matches where you are located so you can run and test the rest of this HOL.

8. Click **OK**.
9. Click on the **External Load Balancer** Endpoint.

NAME	STATUS	MONITOR STATUS
External Load Balancer	Enabled	Degraded
Web App	Enabled	Checking endpoint

10. Select the **Disabled Status**, and click **Save**.

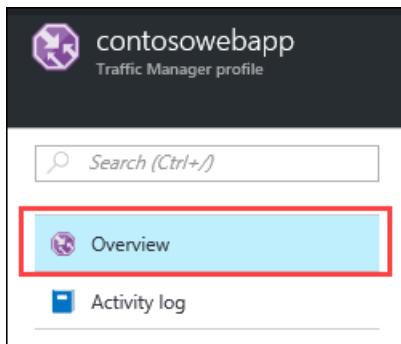
External Load Balancer
contosowebapp

 Save  Discard  Delete

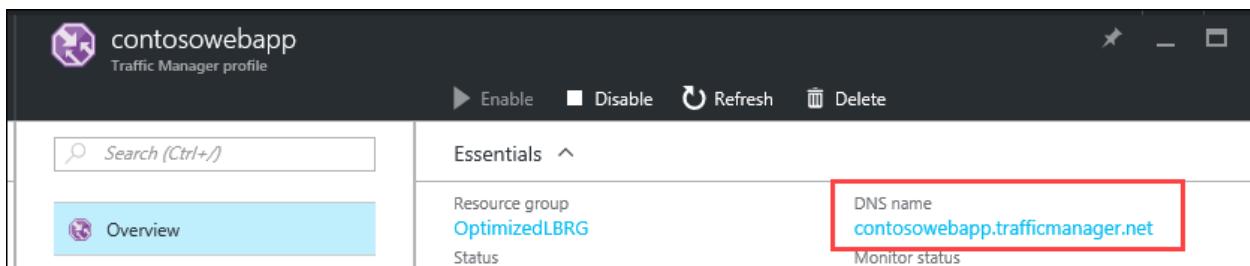
Status
 Disabled  Enabled

Monitor status
Degraded

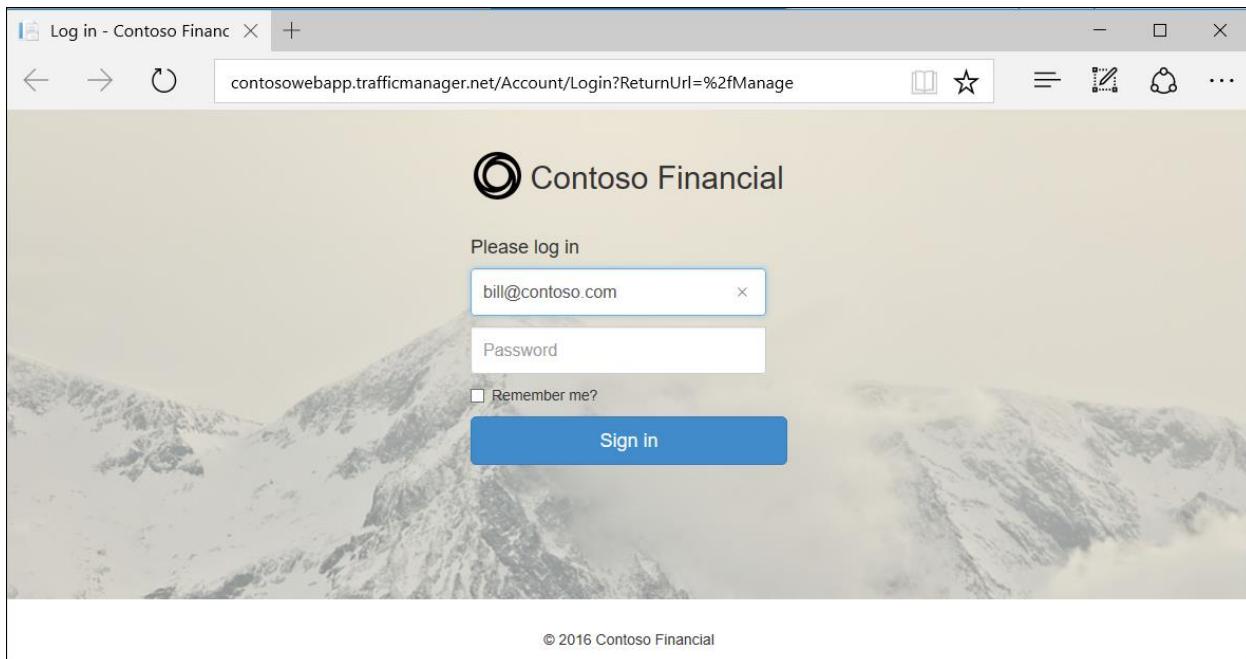
11. On the **Traffic Manager**, click on **Overview**.



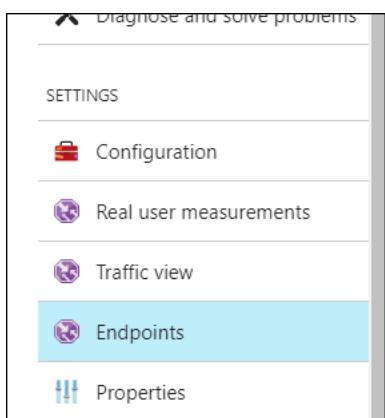
12. Click on the **DNS name** to open it in a new browser window.



13. Verify the site still loads as expected.



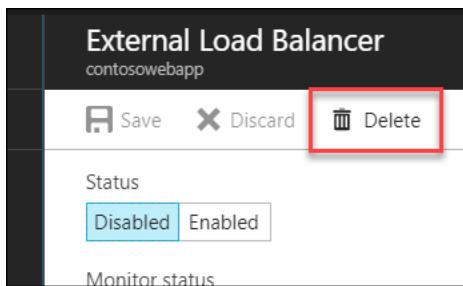
14. Click on **Endpoints**.



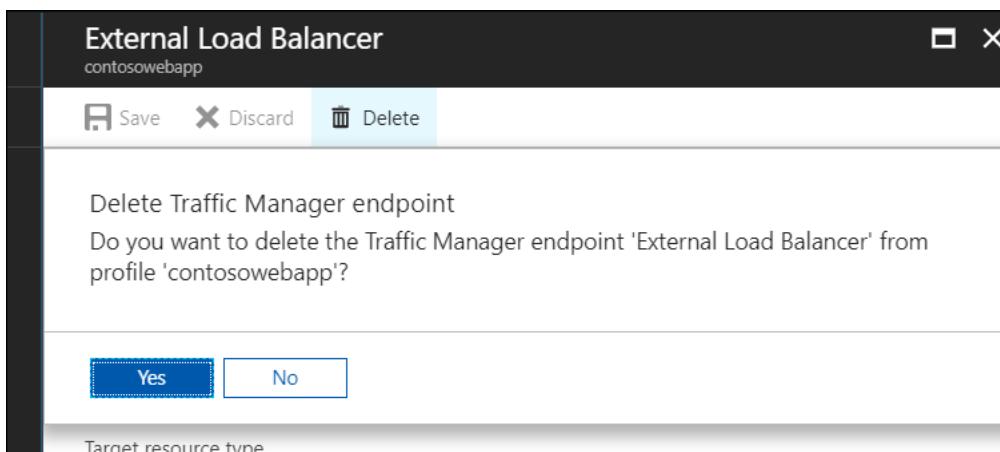
15. Click on the **External Load Balancer** endpoint.

NAME	STATUS	MONITOR STATUS
External Load Balancer	Enabled	Degraded
Web App	Enabled	Checking endpoint

16. Click **Delete**.



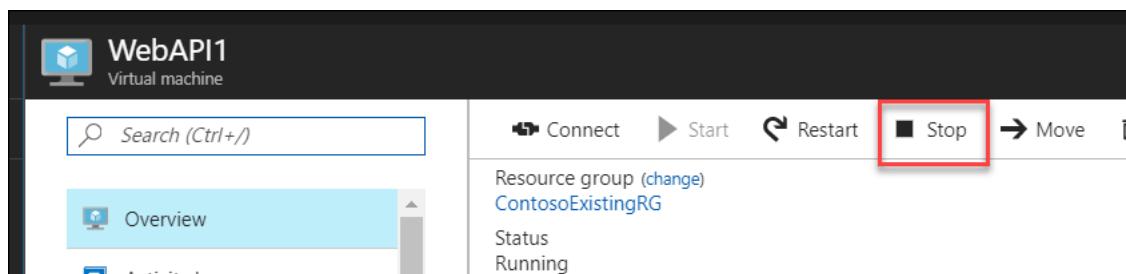
17. On the **Delete Traffic Manager endpoint** prompt, click **Yes**.



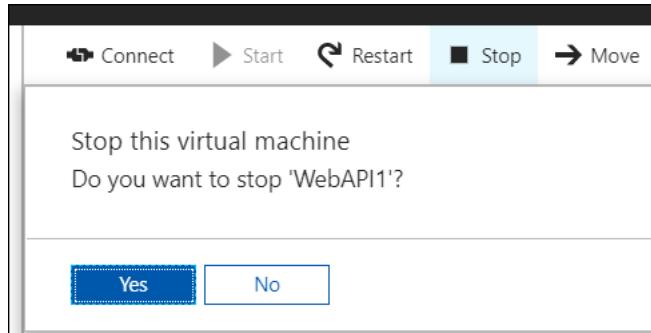
Following this step, the Web App Tier's Load Balancer and VMs will no longer receive requests through the Traffic Manager.

Step 5: Take down Web App and API VMs

1. Click on **Resource groups**, and then click on the **ContosoExistingRG** resource group.
2. Click on the **WebApp1** virtual machine.
3. Click the **Stop** button.



4. On the **Stop this virtual machine** prompt, click **Yes**.



5. Repeat the last three steps for the **WebApp2**, **WebAPI1**, and **WebAPI2** virtual machines.
6. Open a new browser window / tab, and navigate to the URL for the **Traffic Manager endpoint**.

7. **Login** to the Web App, and ensure it loads all data as expected to test out the **App Service** hosted Web App and API tiers are functioning properly. FYI, the password can be anything, just type something in the password and click Sign in to login to the sample app.

The screenshot shows a web browser window with the title "Account Overview - Cor X". The URL in the address bar is "contosowebapp.trafficmanager.net/Manage". The left sidebar has a logo for "Contoso Financial" and links for "Overview", "Reports", "Analytics", "Export", "Accounts", "Checking", "Savings", "Log off", "Help", and "Terms of use". The main content area is titled "Account Overview" and shows "Available Balance" of "\$1,245,719.29". Below that is a section titled "Transactions" with a table. The table has columns for "Date/Time (UTC)", "Description", "Amount", and "Balance". The data in the table is as follows:

Date/Time (UTC)	Description	Amount	Balance
09/09/2016 09:34:11	Fabrikam Online Services	\$7,479.02	\$1,245,719.29
09/09/2016 09:33:11	Blue Yonder Coffee	-\$9,115.22	\$1,238,240.27
09/09/2016 09:32:11	Acme Airlines	\$7,769.70	\$1,247,355.49
09/09/2016 09:31:11	Fabrikam Traders	-\$751.42	\$1,239,585.79
09/09/2016 09:30:12	WingTip Bank	-\$9,662.79	\$1,240,337.21
09/09/2016 08:32:34	Opening Balance	\$1,250,000.00	\$1,250,000.00

At the bottom of the page, there is a copyright notice: "© 2016 Contoso Financial".

8. After validating the app, close the browser window.

Exercise 5: Migrate Background Tier to App Service

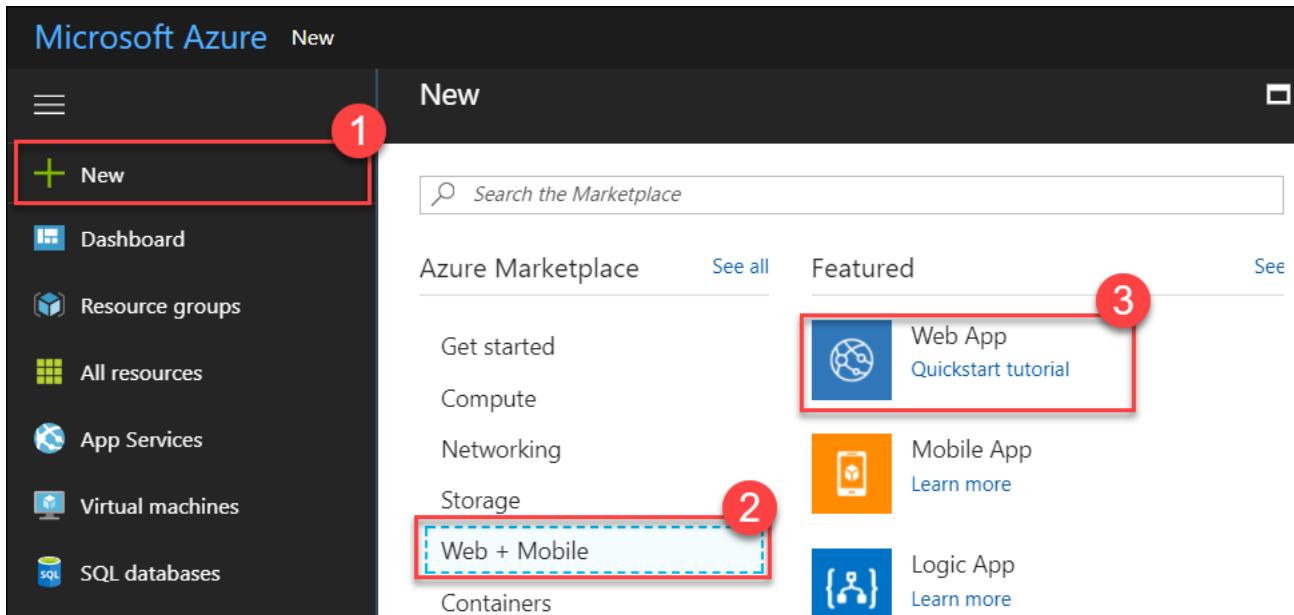
In the migration of IaaS to PaaS, the Background Tier (written as a console app) of Contoso Financials application needs to be migrated to run in an Azure App Service Web Job without requiring any code changes to the application.

Help references

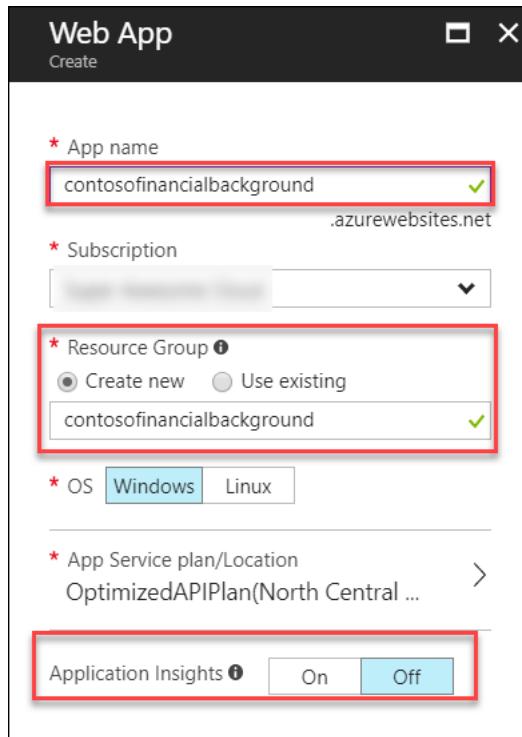
Using WebJobs in Azure App Service	https://azure.microsoft.com/en-us/documentation/articles/app-service-webjobs-readme/
Run Background tasks with WebJobs	https://azure.microsoft.com/en-us/documentation/articles/web-sites-create-web-jobs/
Configure web apps in Azure App Service	https://azure.microsoft.com/en-us/documentation/articles/web-sites-configure/

Step 1: Create App Service for Background Tier

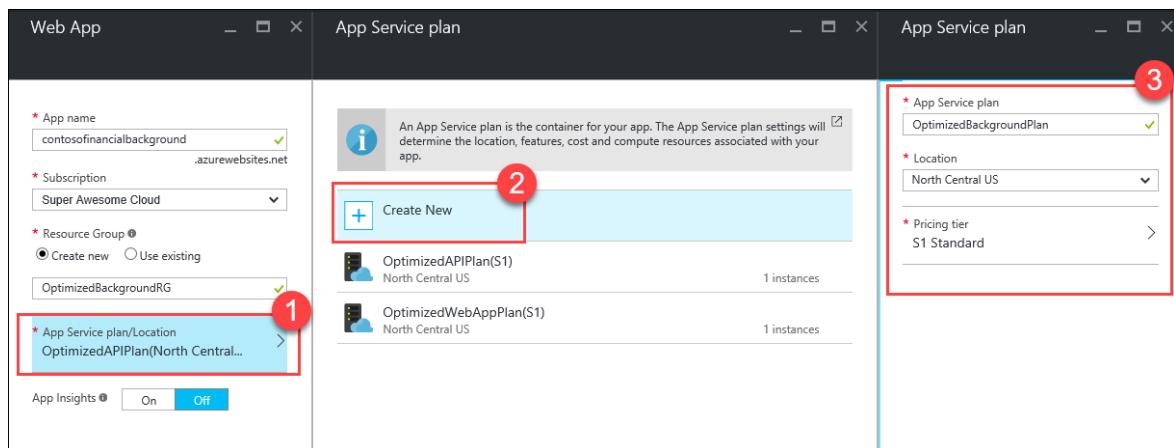
1. From the Azure Management portal <http://portal.azure.com>, using a new tab or instance, click on **+New** followed by **Web + Mobile**, and then, click on **Web App**.



2. On the **Web App** blade, enter the following values:
- App name: **enter a unique name**
 - Resource Group: **OptimizedBackgroundRG**
 - App Insights: **Off**



3. Click on **App Service plan/Location**, select **Create New**, and fill in the following values:
- App Service plan: **OptimizedBackgroundPlan**
 - Location: **North Central US**
 - Pricing tier: **S1 Standard**



4. Click **OK**.

5. Click **Create**.

Step 2: Setup App Settings

- Click on **Resource groups**, select the **OptimizedBackgroundRG** resource group, and select the **App Service**.

The screenshot shows the Microsoft Azure Resource Groups blade. On the left sidebar, the 'Resource groups' option is highlighted with a red box and a number 1. In the main pane, the 'OptimizedBackgroundRG' resource group is selected and highlighted with a red box and a number 2. On the right, under the 'Essentials' section, there is a table listing resources. One row for an 'App Service plan' named 'OptimizedBackgroundPlan' is highlighted with a red box and a number 3. The table columns are NAME, TYPE, and SETTINGS.

NAME	TYPE
OptimizedBackgroundPlan	App Service plan
contosofinancialbackground	App Service

- On the **Web app** blade, click on **Application settings**.

The screenshot shows the 'contosofinancialbackground' App Service blade. On the left sidebar, the 'Application settings' option is highlighted with a red box and a number 2. The main pane displays various settings sections like Continuous Delivery (Preview), SETTINGS, Application settings, Authentication / Authorization, and Backups.

- Scroll down to the **Connection strings** section, and add a **new** connection string with the following values:

- Name: **TransactionDb**
- Value: **past in the database connection string that was copied earlier**
- Type: **SQL Database**

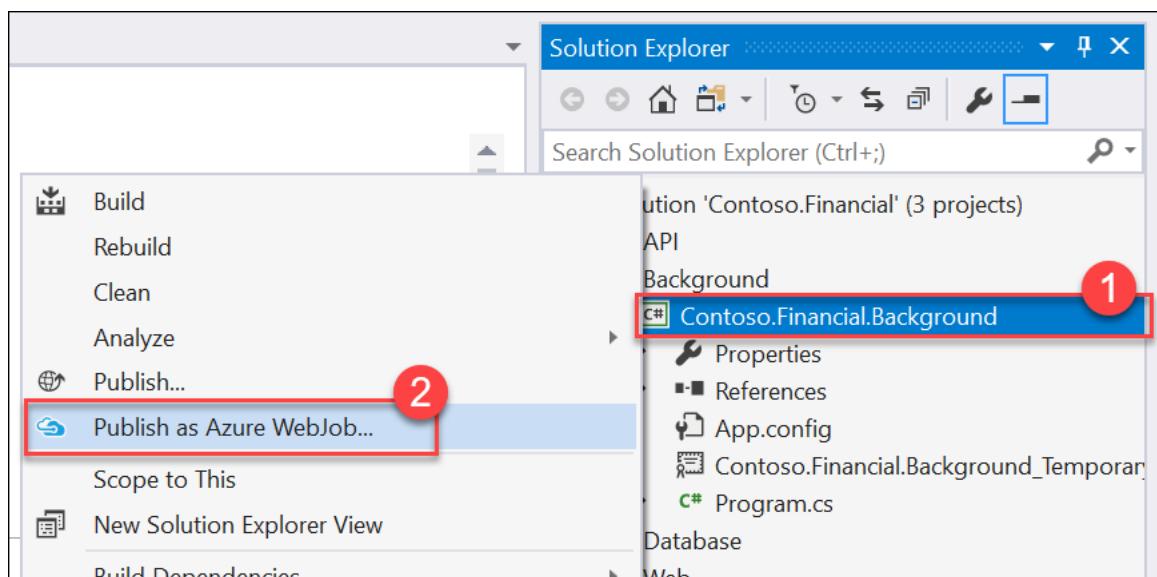
The screenshot shows the 'Application settings' blade for the 'contosofinancialbackground' App Service. The 'SETTINGS' sidebar has 'Application settings' selected. In the main pane, the 'Connection strings' section is shown with a table. A new connection string 'TransactionDb' is added, highlighted with a red box and a number 2. The table columns are Key, Value, Slot setting, and ...

Key	Value	Slot setting	...
TransactionDb	Server=tcp:db...	SQL Database	...

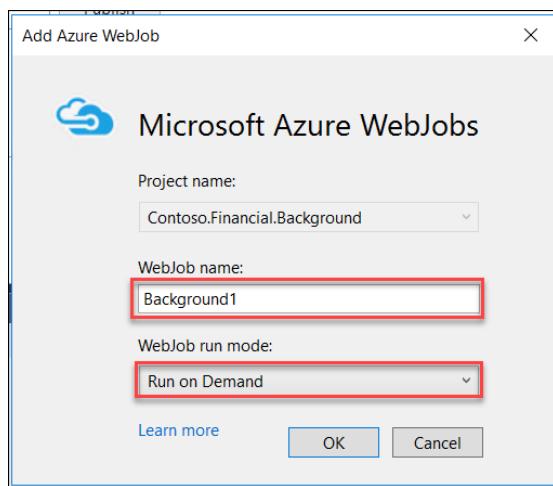
4. Replace the value **{your_username}** with **demouser** in the connection string.
5. Replace the value **{your_password}** with **demo@pass123** in the connection string.
6. Click **Save**.

Step 3: Deploy App to App Service

1. From the C:\HOL\Contoso.Financial folder, open the Visual Studio Solution: **Contoso.Financial.sln**
2. In the **Solution Explorer** window, expand the **Background** folder, and right-click the **Contoso.Financial.Background** project followed by clicking on **Publish as Azure WebJob...**

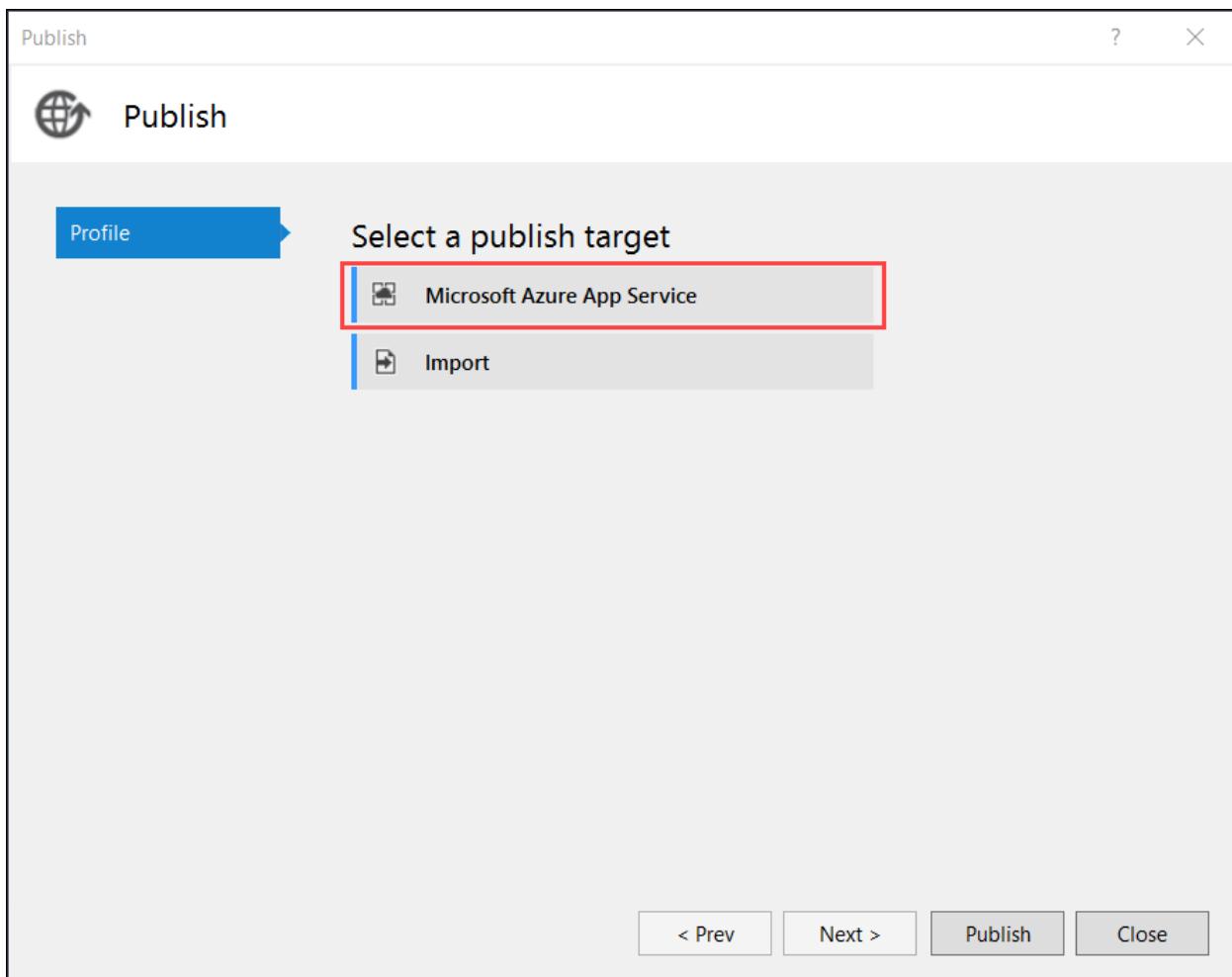


3. On the **Add Azure WebJob** dialog, enter the following values:
- WebJob name: **Background1**
 - WebJob run mode: **Run on Demand**

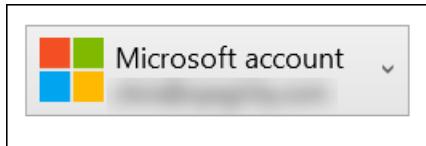


4. Click **OK**.

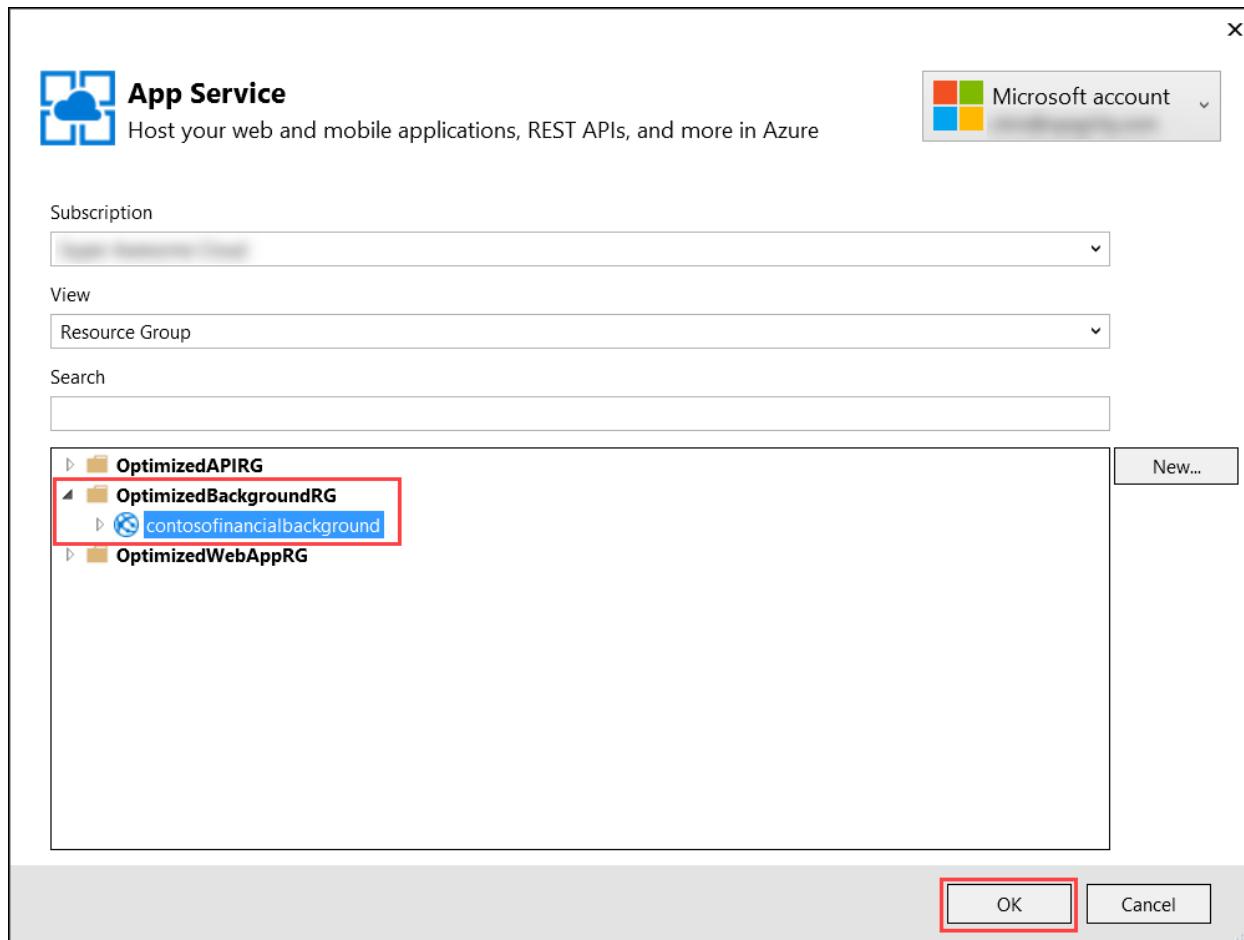
5. On the **Publish** dialog, click on **Microsoft Azure App Service**.



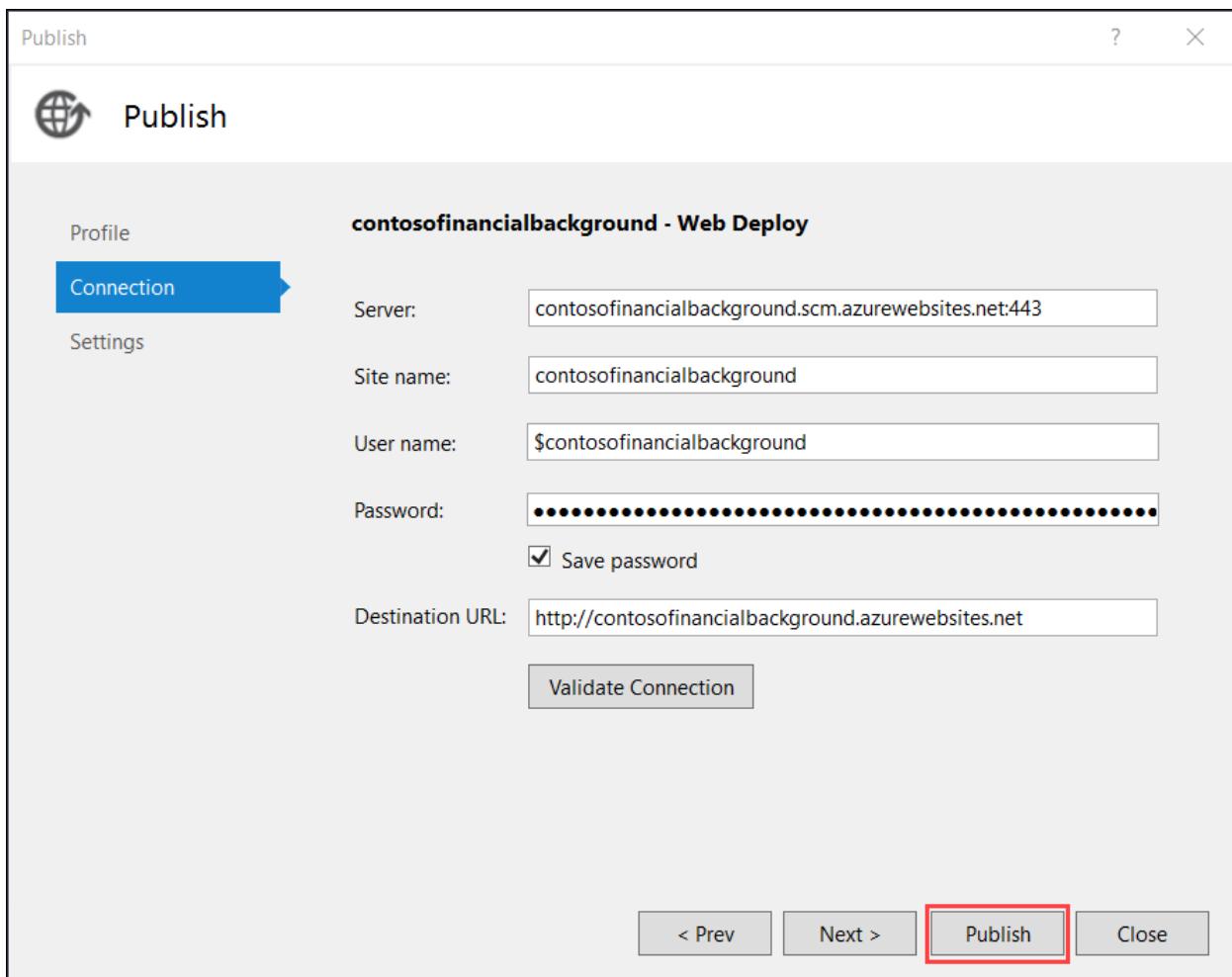
6. In the top-right corner of the **App Service** dialog, make sure your account is selected. If it is not, click on the button, and add it.



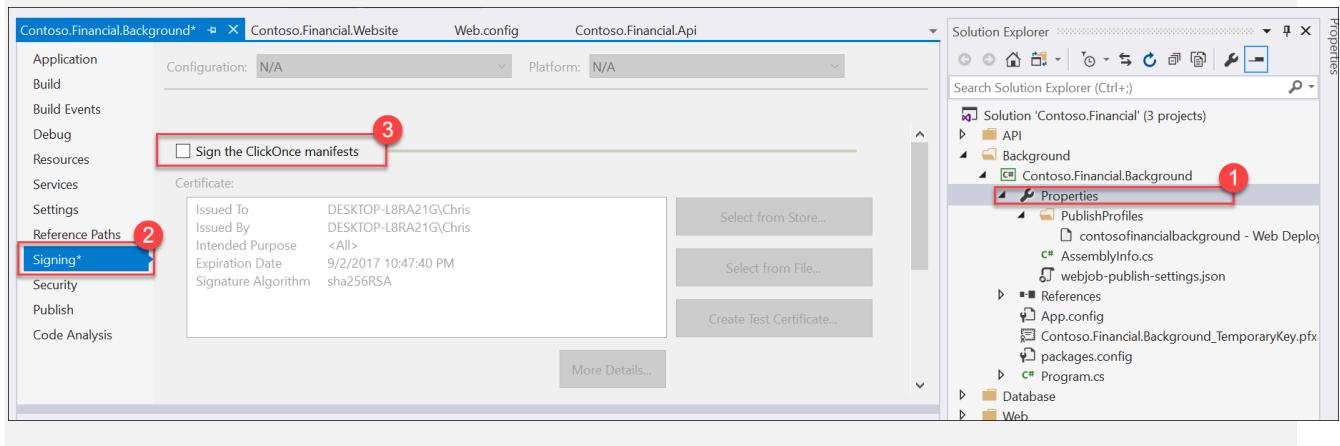
7. Expand the **OptimizedBackgroundRG** resource group, and select the **App Service Web App**, followed by clicking **OK**.



8. Click **Publish**.



If the WebJob deployment fails due to a code signing error message, simply open up the **Project Properties** for the Contoso.Financial.Background project by right-clicking it in **Solution Explorer**. Then, go to the **Signing** tab, and **uncheck** the **Sign the ClickOnce manifests** checkbox. Upon completion, Publish the WebJob project again.



9. Navigate to the **contosofinancialbackground** Web App in the Azure Portal, click on the **WebJobs** pane. Then, click on the **Background1** WebJob, and select **Properties**

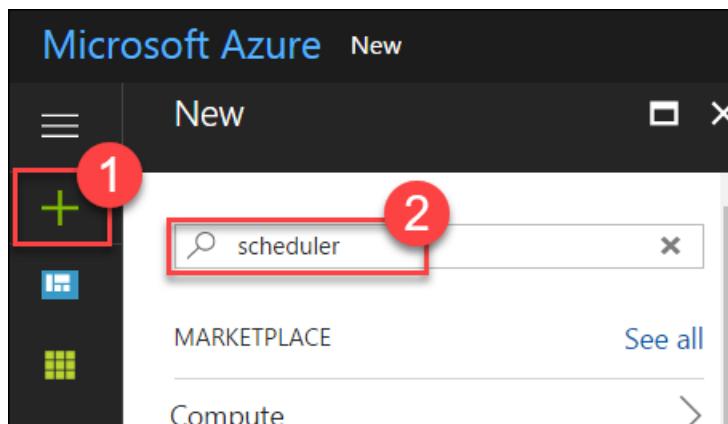
The screenshot shows the Azure Portal interface for the 'contosofinancialbackground' app service. On the left, a sidebar lists various management options: Networking, Scale up (App Service plan), Scale out (App Service plan) (highlighted with a red box and number 1), WebJobs (highlighted with a red box and number 1), Push, MySQL In App, and Properties. The main area is titled 'WebJobs' and contains a brief description: 'WebJobs provide an easy way to run scripts or programs as background processes.' Below this is a table with columns: NAME, TYPE, STATUS, and SCHEDULE. A single row is shown for 'Background1', which is of type 'Triggered' and has a status of 'Ready'. The 'SCHEDULE' column shows 'n/a'. The top right of the page features a toolbar with icons for Add, Refresh, Logs, Delete, Run, and Properties (highlighted with a red box and number 3).

10. Copy the **Web Hook URL, User Name, and Password**. Save these properties for setting up the Scheduler next.

The screenshot shows the 'Properties' dialog for the 'Background1' WebJob. The dialog is titled 'Properties' and includes the application name 'contosofinancialbackground'. It displays the following details:

NAME	Background1
STATUS	Ready
TYPE	triggered
WEB HOOK	https://contosofinancialbackground.scm.azurewebsites.net/api/triggeredwebjobs/Background1
USER NAME	\$contosofinancialbackground
PASSWORD	*****

11. From the Azure Portal, click on **+New**, and type “**scheduler**” into the search box. Press **Enter**.

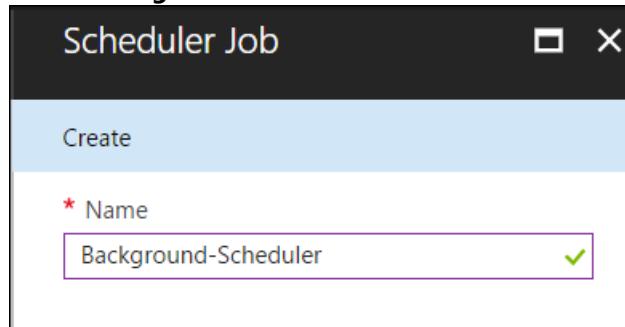


12. Select **Scheduler** from the search results, and click **Create**.

A screenshot of the Azure Marketplace search results for 'scheduler'. At the top, there's a search bar with 'scheduler' typed into it. Below it, the word 'Results' is displayed. A table lists two items: 'Scheduler' (published by Microsoft, category Enterprise Integration) and 'ActiveEon Workload Scheduler - Free Plan' (published by Activeeon, category Compute). The 'Scheduler' row is highlighted with a light blue background.

13. On the **Scheduler Job** blade, enter the following values:

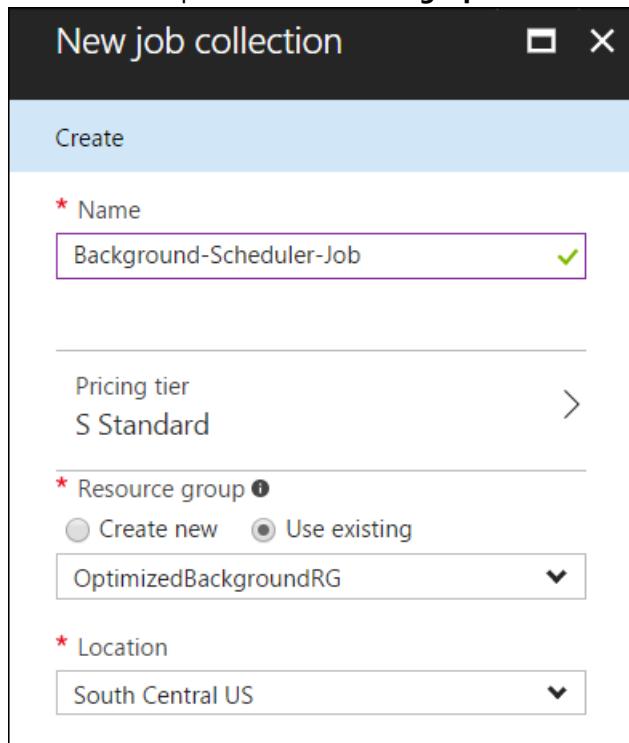
- Name: **Background-Scheduler**



14. Click on **Job Collection**, click on **Create new**, enter the following values, and click **OK**.

- Name: **Background-Scheduler-Job**

- Resource Group: **select the existing OptimizedBackgroundRG.**



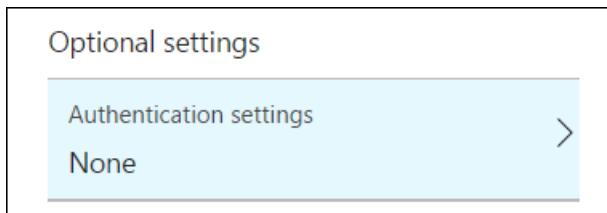
15. Click on **Configure Action settings**



16. On the **Action settings** pane, enter the **Web Hook URL** copied earlier to the **URL** field, set the **Action** to **Https**, and set the **Method** equal to **Post**.

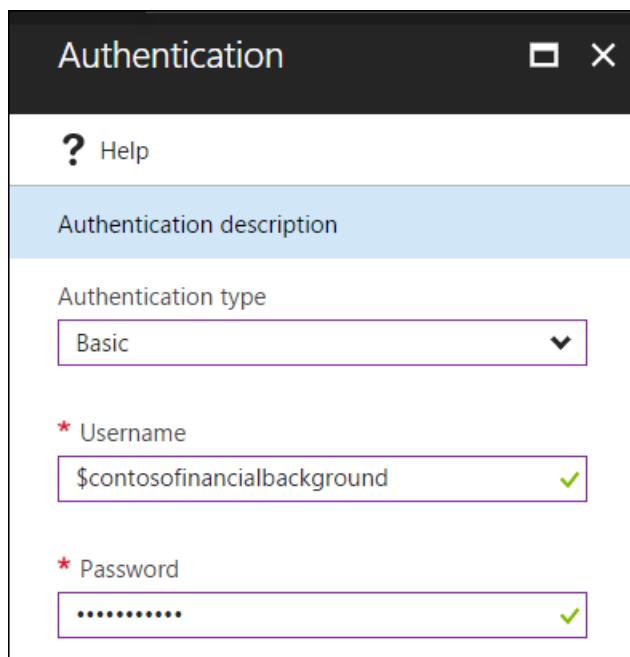


17. Click on **Authentication settings**.



18. Enter the following values, and click **OK**.

- Authentication type: **Basic**
- Username: **Webhook username copied earlier**
- Password: **Webhook password copied earlier**

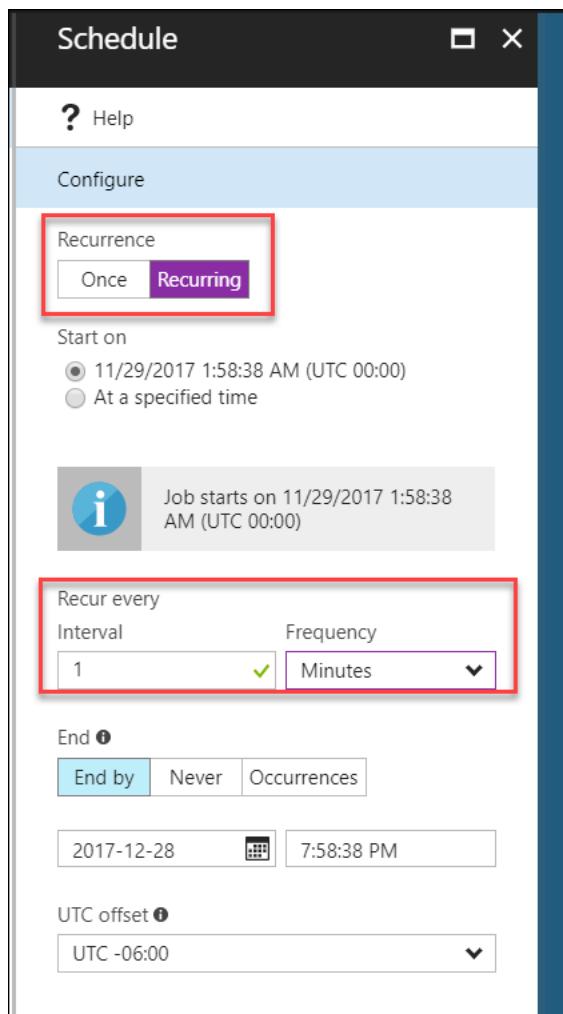


19. Click **OK** then click **OK** again.

20. Click on **Configure Schedule**.

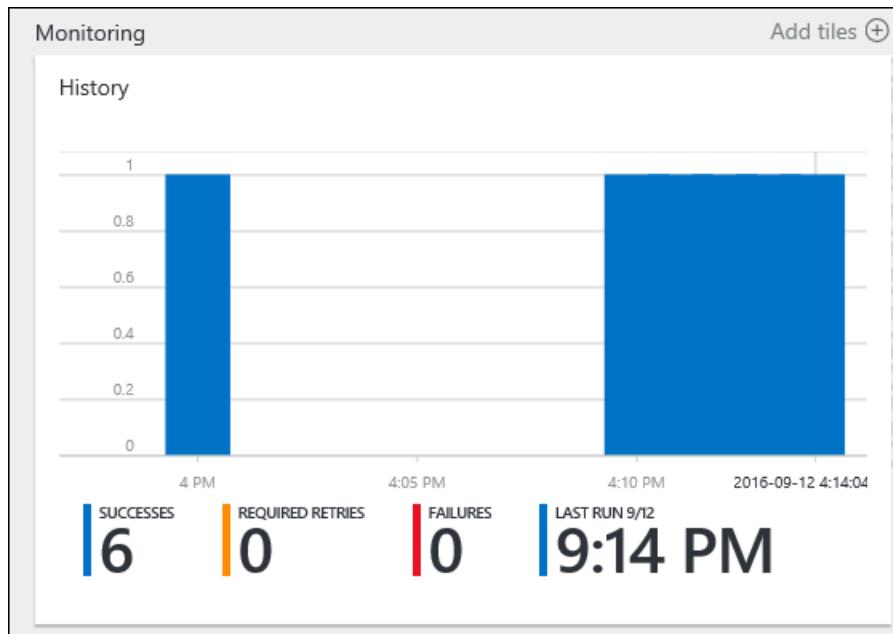


21. Select **Recurring**, and specify Recur every **1 minute** followed by clicking **OK**.



22. Click **Ok** and then click **Create**.

23. Wait a couple minutes, and then, look at the **History** tile of the **Scheduler Job** blade to verify the scheduled job is running. The **bar graph** and **successes count** will reflect that it is running.



24. Open a new browser window or tab navigating to the **URL** for the **Traffic Manager** for the application, and verify the transactions generated by the background process are showing up.

The screenshot shows a web browser window titled 'Account Overview - Cor'. The URL is 'contosowebapp.trafficmanager.net/Manage'. The left sidebar has a 'Contoso Financial' logo and navigation links: Overview (selected), Reports, Analytics, Export, Accounts (Checking, Savings), Log off, Help, and Terms of use. The main content area is titled 'Account Overview'. It shows an 'Available Balance' of '\$1,188,186.62'. Below that is a 'Transactions' section with a table. The table header includes columns for Date/Time (UTC), Description, Amount, and Balance. The table body lists several transactions:

Date/Time (UTC)	Description	Amount	Balance
09/12/2016 09:16:00	Acme Coffee	-\$4,156.69	\$1,188,186.62
09/12/2016 09:15:00	WingTip Bank	-\$4,787.98	\$1,192,343.31
09/12/2016 09:14:01	TailSpin & Co.	-\$8,076.50	\$1,197,131.29
09/12/2016 09:13:02	Fabrikam Bros.	-\$7,179.49	\$1,205,207.79
09/12/2016 09:12:01	AdventureWorks Grocery	-\$3,998.87	\$1,212,387.28
09/12/2016 09:11:01	Fabrikam Online Services	-\$9,048.40	\$1,216,386.15
09/12/2016 09:10:00	Fabrikam School of Fine Arts	-\$7,860.70	\$1,225,434.55

Step 4: Take down Background Tier VM

- From the Azure Management Portal (<http://portal.azure.com>), click on **Resource groups**, and then, click on the **ContosoExistingRG** resource group.

The screenshot shows the Azure Resource groups blade. On the left, there's a sidebar with links: 'New', 'Resource groups' (which is highlighted with a red box and labeled '1'), 'All resources', 'Recent', 'App Services', and 'Virtual machines'. The main area shows a list of resource groups under 'Subscriptions'. One resource group, 'ContosoExistingRG', is highlighted with a red box and labeled '2'. Other visible resource groups include 'CS-WebJobs-NorthCentralUS-sche...' and 'O...'. There's also a 'Filter items...' search bar.

- Click on the **Background1** virtual machine.
- Click the **Stop** button.

The screenshot shows the Azure Virtual machine blade for 'Background1'. At the top, there's a toolbar with buttons for 'Connect', 'Start', 'Restart', 'Stop' (which is highlighted with a red box), 'Move', and a delete icon. Below the toolbar, it says 'Resource group (change) ContosoExistingRG'. The main area has tabs for 'Overview' (which is selected and highlighted in blue) and 'Status'. On the far left, there's a vertical sidebar with a list of other virtual machines.

- On the **Stop this virtual machine** prompt, click **Yes**.

The screenshot shows a confirmation dialog box. It asks 'Stop this virtual machine' and 'Do you want to stop 'Background1'?'. At the bottom, there are two buttons: 'Yes' (highlighted with a red box) and 'No'. Below the buttons, it says 'Subscription ID 41850220-19f0-49c6-87ea-766c9b0da1f1'.

Exercise 6: Setup SQL Database Geo-Replication

Due to the rush into Production, the Staging SQL Database currently remains as the Production database for the application. You have been asked to implement Geo-Replication to the SQL Database in order to add the appropriate redundancy to safeguard against failures. This will both help eliminate data loss in case of a data center failure as well as greatly reduce the potential system downtime in the event of such a failure.

Help references

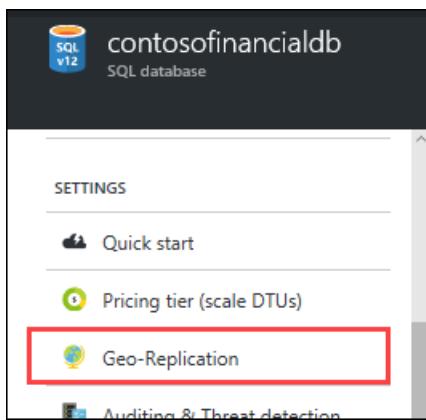
Introduction to SQL Database	https://azure.microsoft.com/en-us/documentation/articles/sql-database-technical-overview/
SQL Database Active Geo-Replication	https://azure.microsoft.com/en-us/documentation/articles/sql-database-geo-replication-overview/

Step 1: Setup SQL Database Geo-Replication

1. Click on **Resource groups**, click on the **ContosoExistingRG** resource group followed by clicking on the **contosofinancialdb** SQL Database.

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu is visible with items like 'Resource groups', 'All resources', 'Recent', 'App Services', etc. A red circle labeled '1' highlights the 'Resource groups' option. In the main content area, the 'Resource groups' blade is open, showing a list of resource groups. One resource group, 'ContosoExistingRG', is highlighted with a red box and a red circle labeled '2'. To the right, the details for 'ContosoExistingRG' are shown, including an 'Overview' section and a list of resources. A red box highlights the 'contosofinancialdb' SQL database entry in the list, which is also circled with a red circle labeled '3'.

2. On the **SQL database** blade, click on **Geo-Replication**.

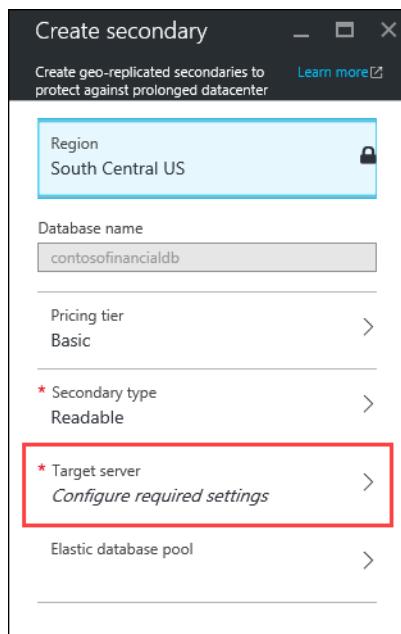


3. Click on the **Recommended Target Region** to replicate to.

The screenshot shows the 'Geo-Replication' blade for the 'contosofinancialdb' database. It displays a world map with various regions marked. The 'South Central US' region is highlighted with a red box and labeled 'Recommended'.

SERVER/DATABASE	STATUS
North Central US dbphumab6vyzsiicontosofin...	Online
SECONDARIES	
Geo-Replication is not configured	
TARGET REGIONS	
South Central US	Recommended
West US	

4. On the **Create secondary** blade, click on **Target server**.



5. On the **New server** blade, enter the following values:

- Server name: **enter a unique name**
- Server admin login: **demouser**
- Password: **demo@pass123**

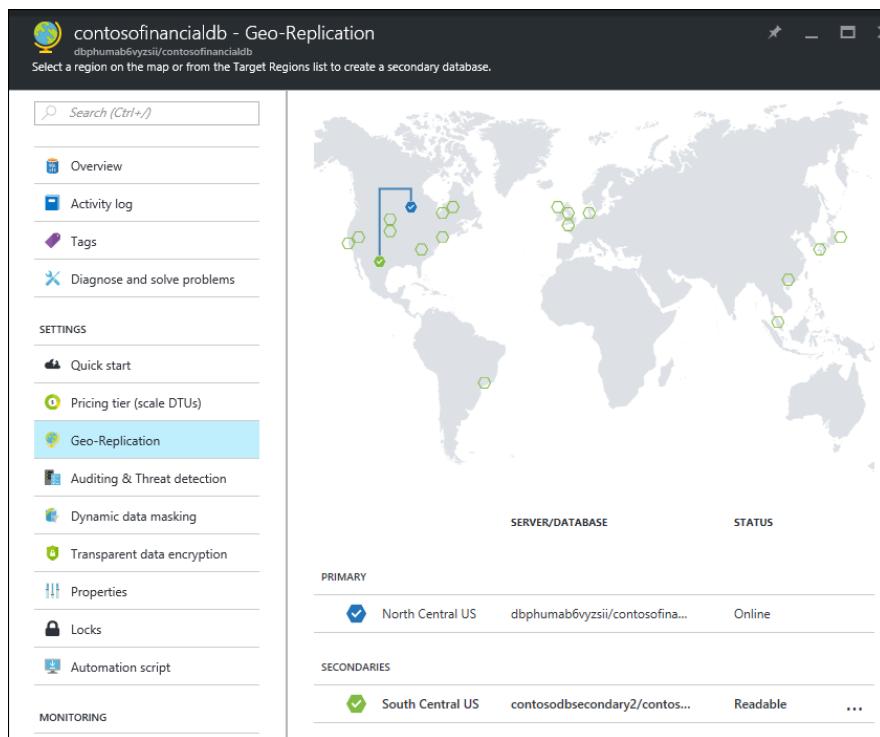
The screenshot shows the 'New server' blade with the following fields filled in:

- * Server name:** contosodbsecondary
- * Server admin login:** demouser
- * Password:** (redacted)
- * Confirm password:** (redacted)
- * Location:** South Central US
- Allow azure services to access server:** (checkbox checked)

6. Click **Select**.

7. Click **OK**.

8. Database replication is now configured.



Exercise 7: Take down old architecture / resources

Since the Contoso Financial application has now been migrated to Azure PaaS services utilizing Azure App Service, the older, existing architecture no longer being used needs to be removed. Since the application has been validated to work as expected, you have been asked to delete the Azure IaaS components hosting the VM infrastructure.

Step 1: Remove Old VM-based tiers

1. Click on **Resource groups**, and then click on the **ContosoExistingRG** resource group.
2. Delete the following resources that are hosting the OLD Web App, API, and Background tiers.
 - **BackgroundAV**
 - **WebAPIAV**
 - **Background1**
 - **WebAPI1**
 - **WebAPI2**
 - **WebApp1**
 - **WebApp2**
 - **WebAPILB**
 - **WebAppLB**
 - **background1nic**
 - **webapi1nic**
 - **webapi2nic**
 - **webapp1nic**
 - **webapp2nic**
 - **Background1-ip**
 - **WebAPI1-ip**
 - **WebAPI2-ip**
 - **WebApp1-ip**
 - **WebApp2-ip**
 - **WebAPPLBIP**
 - **AppVNET**
 - **Background1-nsg**
 - **WebAPI1-nsg**
 - **WebApp1-nsg**

The screenshot shows the Azure portal interface. On the left, the 'Resource groups' menu item is highlighted with a red circle labeled '1'. In the center, the 'ContosoExistingRG' resource group is selected, with its name highlighted with a red circle labeled '2'. On the right, a list of resources within the group is shown, with the entire list highlighted with a red circle labeled '3'.

NAME	TYPE	LOCATION
BackgroundAV	Availability set	North Central US
WebAPIAV	Availability set	North Central US
WebAppAVSet	Availability set	North Central US
BackgroundI	Virtual machine	North Central US
WebAPI1	Virtual machine	North Central US
WebAPI2	Virtual machine	North Central US

Be sure not to delete the Azure SQL Database (**contosofinancialdb**) and Azure SQL Server. These are still in use!

3. Delete the **Storage Accounts** with the following name prefixes:

- **diag**
- **disk**

diagphumab6vyzsii	Storage accou...	North Central US	...
disksphumab6vyzsii	Storage accou...	North Central US	...

4. Once all of the resources for the VMs that are no longer needed have been deleted / removed from the **ContosoExistingRG** resource group, the only resources left in that resource group should be the **SQL Databases and Servers**.

NAME	TYPE	LOCATION
contosodbsecondary2	SQL server	South Central US
contosofinancialdb	SQL database	South Central US

Exercise 8: Setup European Web App Tier Instance

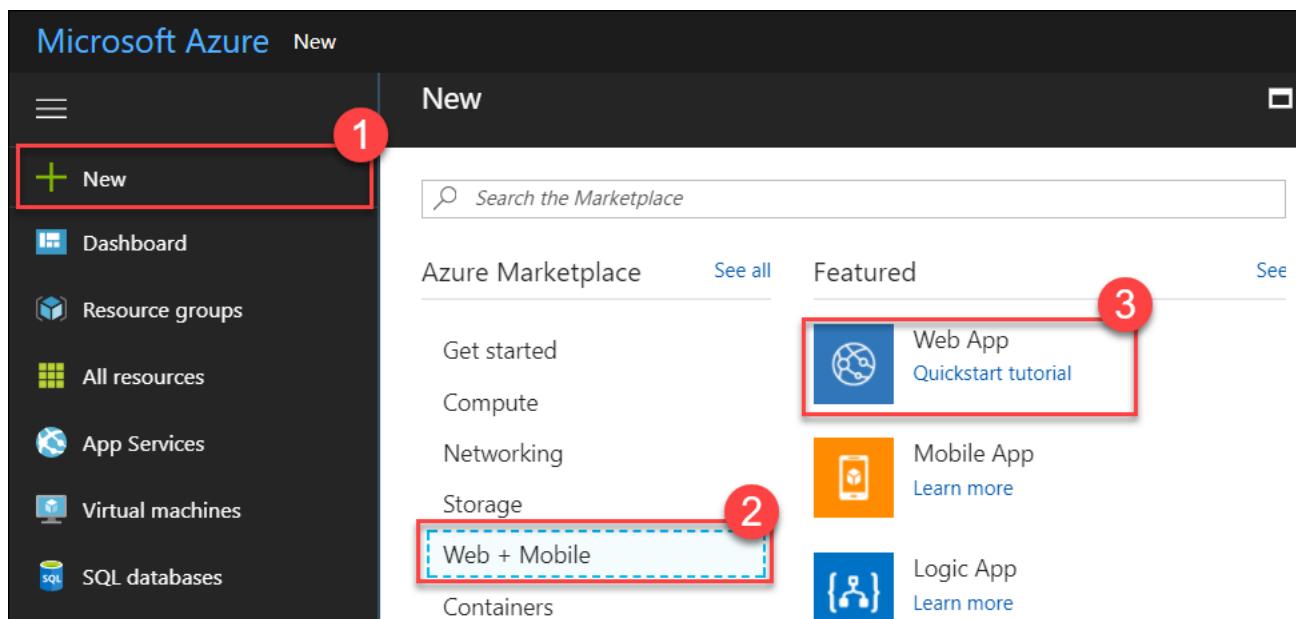
As Contoso Financial expands into Europe, they need to handle the additional growth while maintaining the same application performance. While to fully support global scale, there are pieces of the application that will need to be refactored, as you have been asked to setup a secondary region for the Front-end Web App Tier in the Azure North Europe region.

Help references

Azure Web Apps overview	https://azure.microsoft.com/en-us/documentation/articles/app-service-web-overview/
Deploy an ASP.NET web app to Azure App Service, using Visual Studio	https://azure.microsoft.com/en-us/documentation/articles/web-sites-dotnet-get-started/
Configure web apps in Azure App Service	https://azure.microsoft.com/en-us/documentation/articles/web-sites-configure/

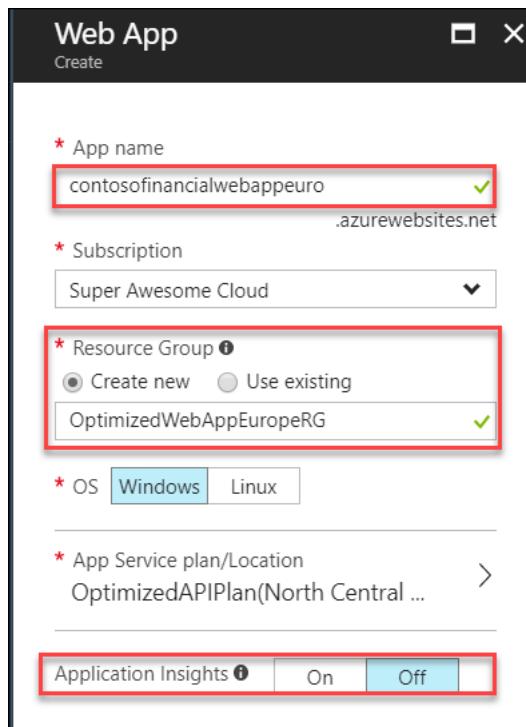
Step 1: Create European App Service

1. From the Azure Management portal: <http://portal.azure.com>, using a new tab or instance, click on **+New**, then **Web + Mobile**, and then click on **Web App**.



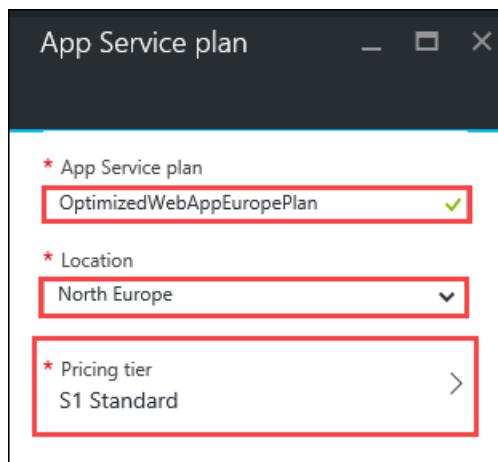
2. On the **Web App** blade, enter the following values:

- App name: **enter a unique name**
- Resource Group: **OptimizedWebAppEuropeRG**
- App Insights: **Off**



3. Click on **App Service plan/Location**, then **Create New**, and fill in the following values:

- App Service Plan: **OptimizedWebAppEuropePlan**
- Location: **North Europe**
- Pricing tier: **S1 Standard**



4. Click **OK**.

5. Click **Create**.

Step 2: Set App Settings

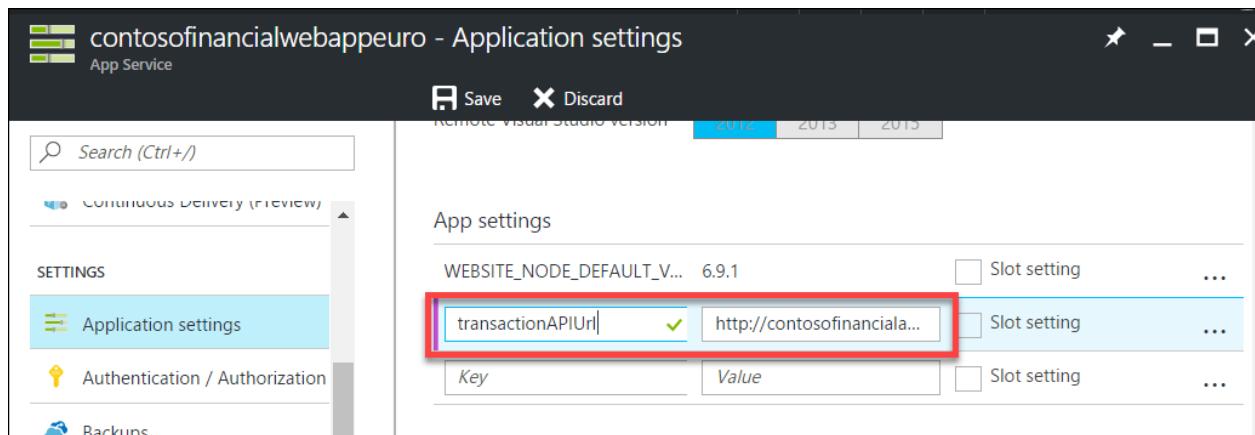
1. Click on **Resource groups**, and select the **OptimizedWebAppEuropeRG** resource group. Then, click on the **Web App**.

The screenshot shows the Microsoft Azure Resource Groups blade. On the left sidebar, 'Resource groups' is highlighted with a red box and a circled '1'. In the main pane, a list of resource groups is shown, with 'OptimizedWebAppEuropeRG' highlighted with a red box and a circled '2'. On the right, the 'OptimizedWebAppEuropeRG' Resource group blade is open, showing its details. A specific web app named 'contosofinancialwebappeuro' is highlighted with a red box and a circled '3'.

2. On the **Web App** blade, click on **Application settings**.

The screenshot shows the Microsoft Azure Web App blade for the 'contosofinancialwebappeuro' app service. The 'SETTINGS' section on the left has 'Application settings' highlighted with a red box. Other options like 'Authentication / Authorization' and 'Backups' are also visible.

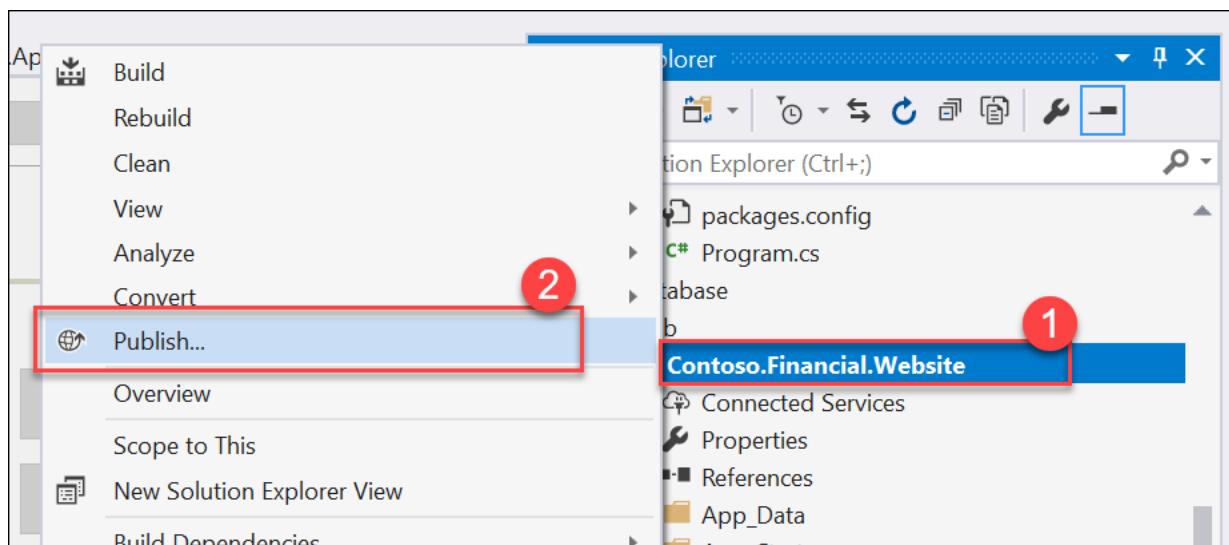
3. Scroll down to the **App settings** section, and create a **new** app setting with the following values:
- Key: **transactionAPIUrl**
 - Value: **paste in the URL of the App Service Web App that is hosting the API tier. This should be set to the same value used for the Web App Tier in the North Central US region.**



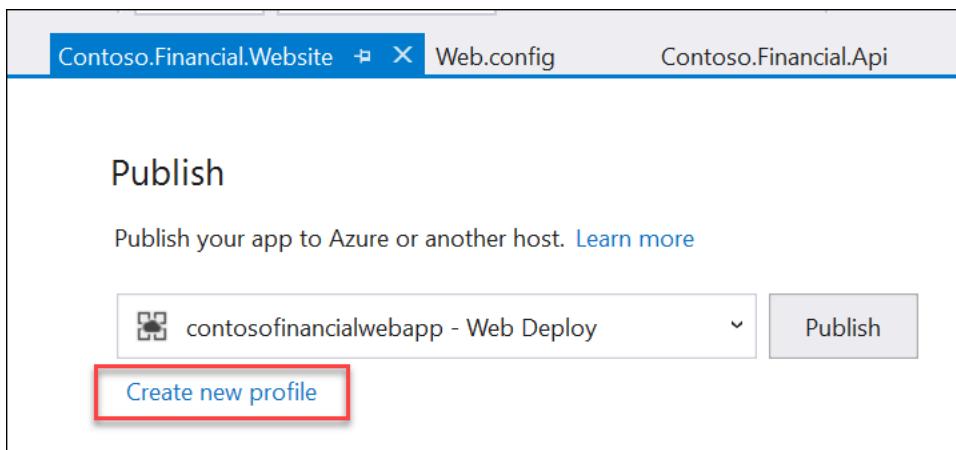
4. Click **Save**.

Step 3: Deploy Web App to European Region

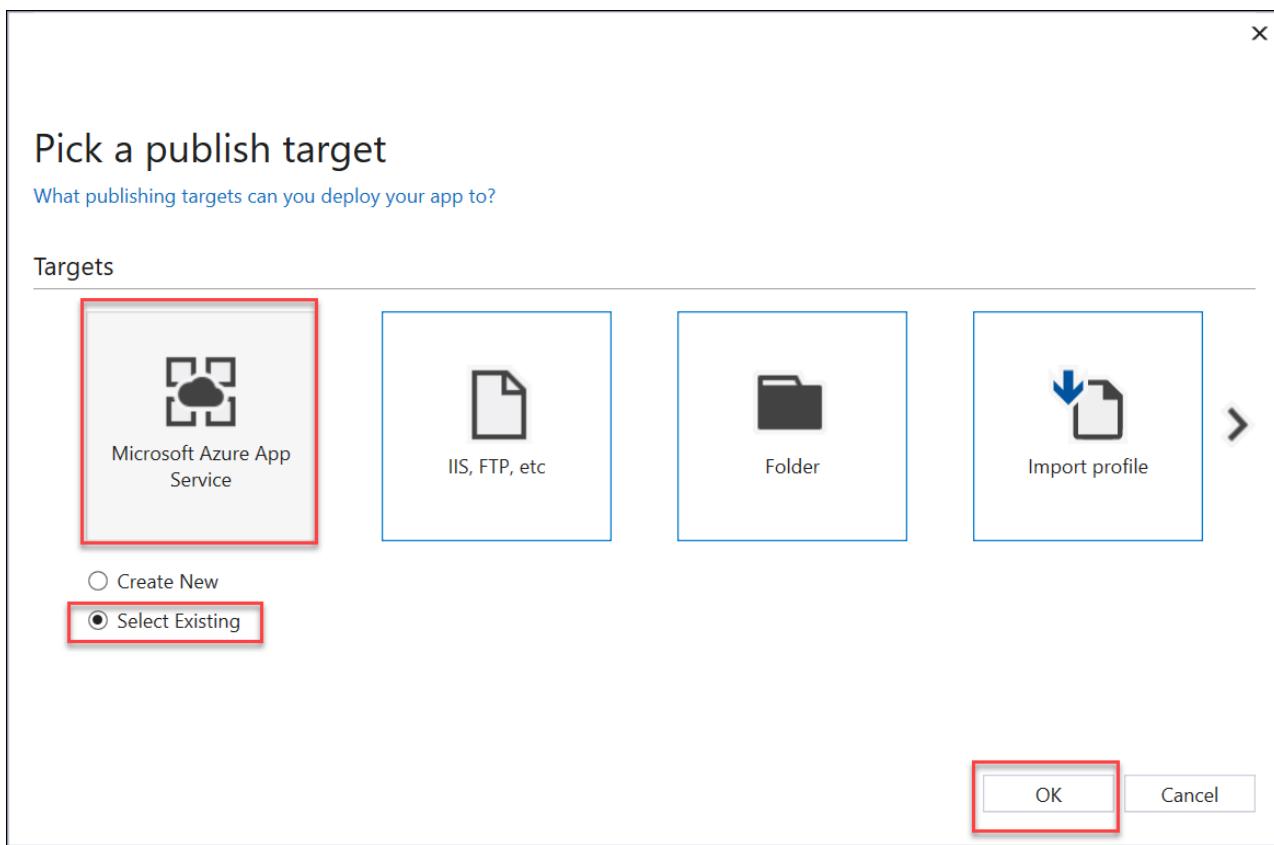
1. From the C:\HOL\Contoso.Financial folder, open the Visual Studio Solution: **Contoso.Financial.sln**.
2. In the **Solution Explorer** window, expand the **Web** folder, then right-click the **Contoso.Financial.Website** project, and click on **Publish...**



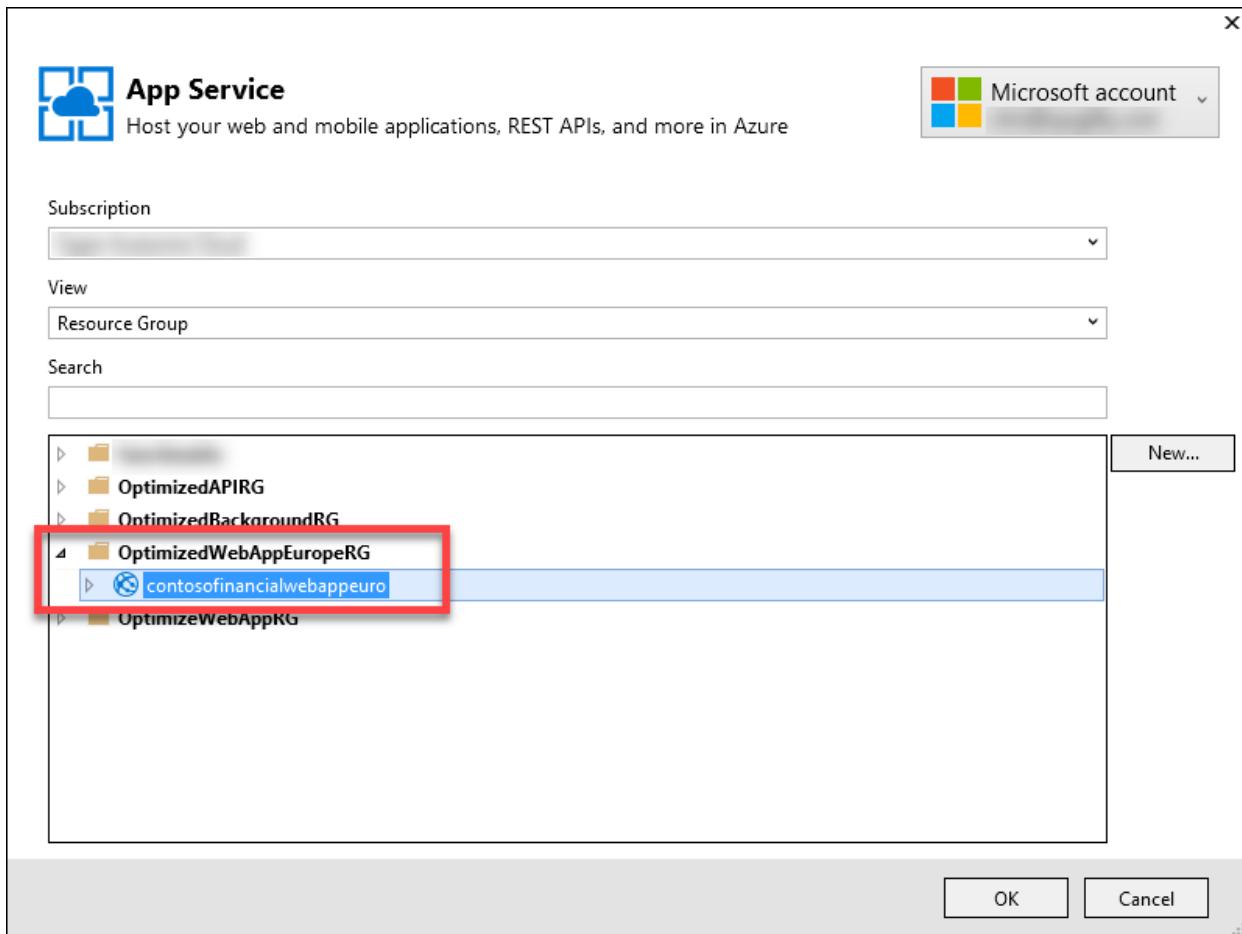
3. Click the **Create new profile** link.



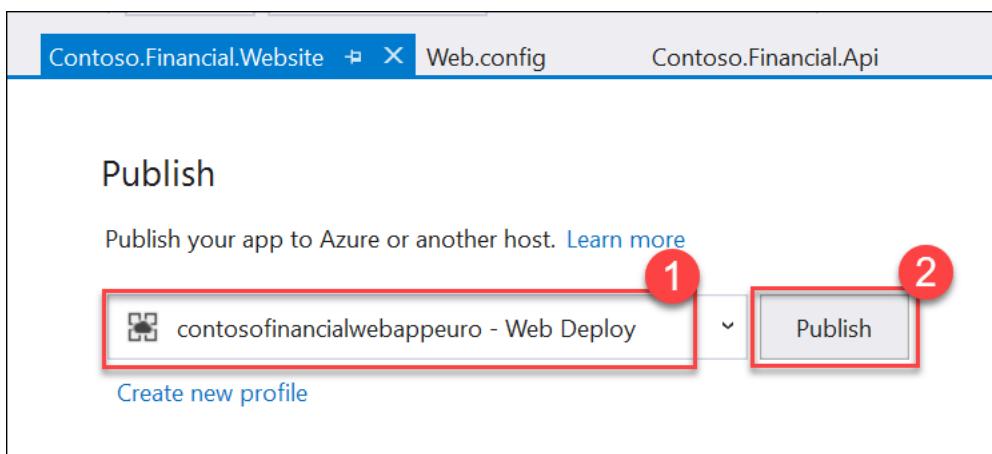
4. On the **Pick a publish target** dialog, click on **Microsoft Azure App Service**, and choose **Select Existing**, Then, click **OK**.



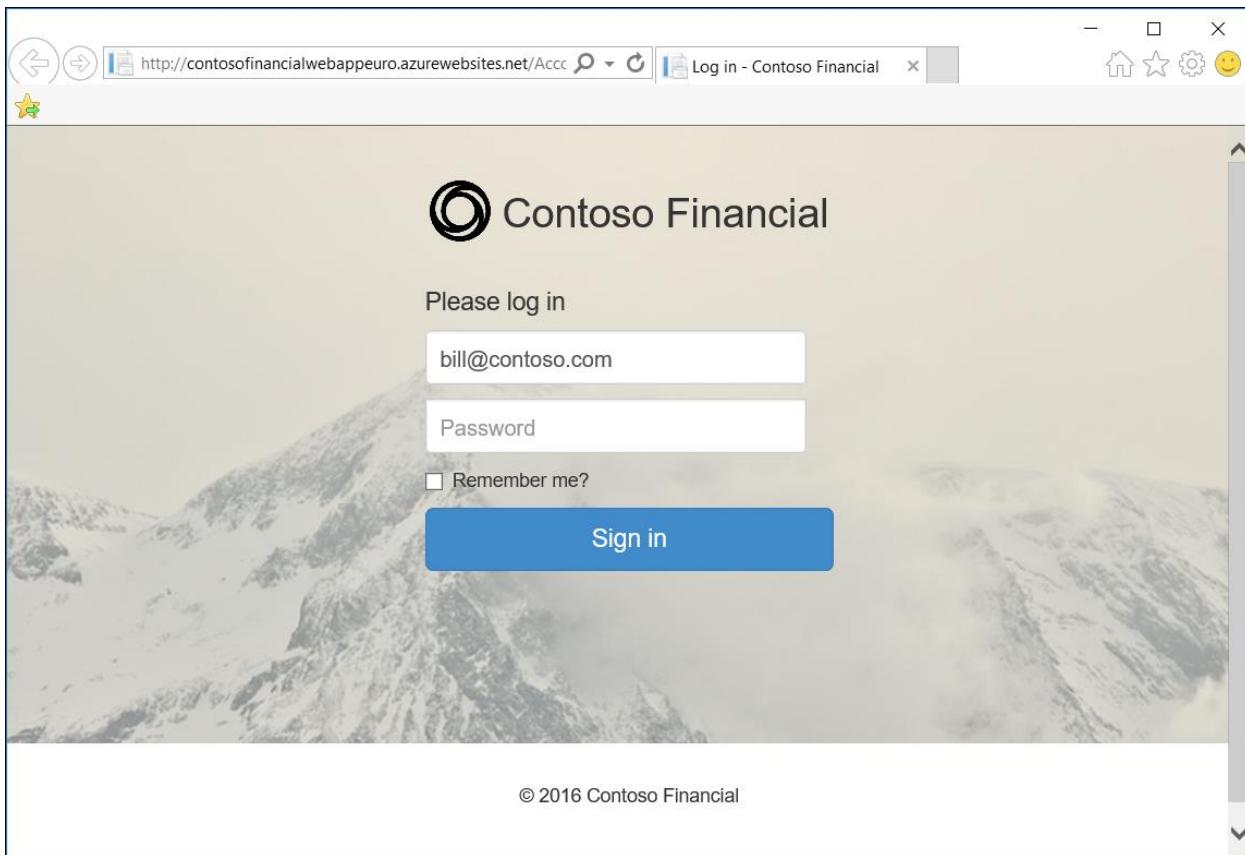
5. On the **App Service** dialog, expand the **OptimizedWebAppEuropeRG** resource group, select the **Web App** in the North Europe region, and then, click **OK**.



6. Select the Deployment Profile for the European instance, and click **Publish**.



- Once the deployment has completed, Visual Studio will automatically open a new browser window navigating to the **Web App**.



Step 4: Add European Region to Traffic Manager

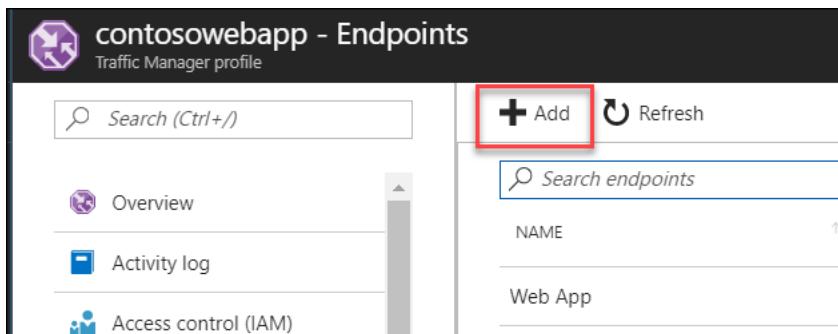
- From the Azure Management Portal <http://portal.azure.com>, using a new tab or instance, click on **Resource groups**, click on the **OptimizedTFRG** resource group, then click on the **Traffic Manager**.

The screenshot shows the Azure Resource Groups blade. On the left, there's a sidebar with links like "New", "Resource groups" (which is highlighted with a red circle labeled '1'), "All resources", "Recent", "App Services", "Virtual machines", "Virtual machines (classic)", "SQL databases", and "Security Center". The main area shows a list of resource groups: "OptimizedTFRG" (highlighted with a red circle labeled '2') and "contosowebapp" (highlighted with a red circle labeled '3'). The "contosowebapp" entry is expanded, showing its properties: "Subscription name" (contosofinancialwebappeuro), "Subscription ID" (00000000-0000-0000-0000-000000000000), "Last deployment" (not shown), "Location" (North Central US), and "TYPE" (Traffic Manag...).

2. On the **Traffic Manager profile** blade, click on **Endpoints**.

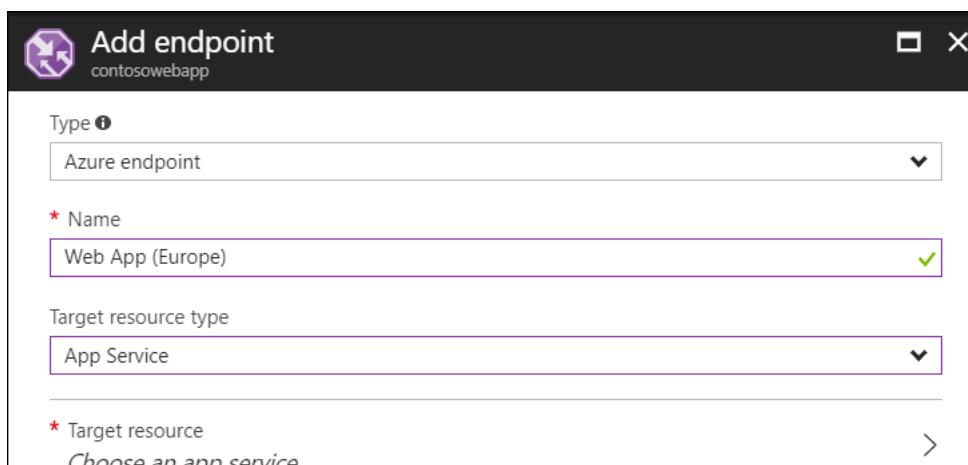


3. Click **Add**.

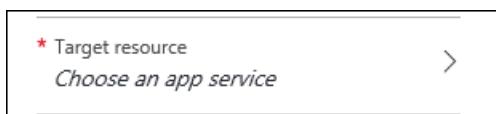


4. On the **Add endpoint** blade, enter the following values:

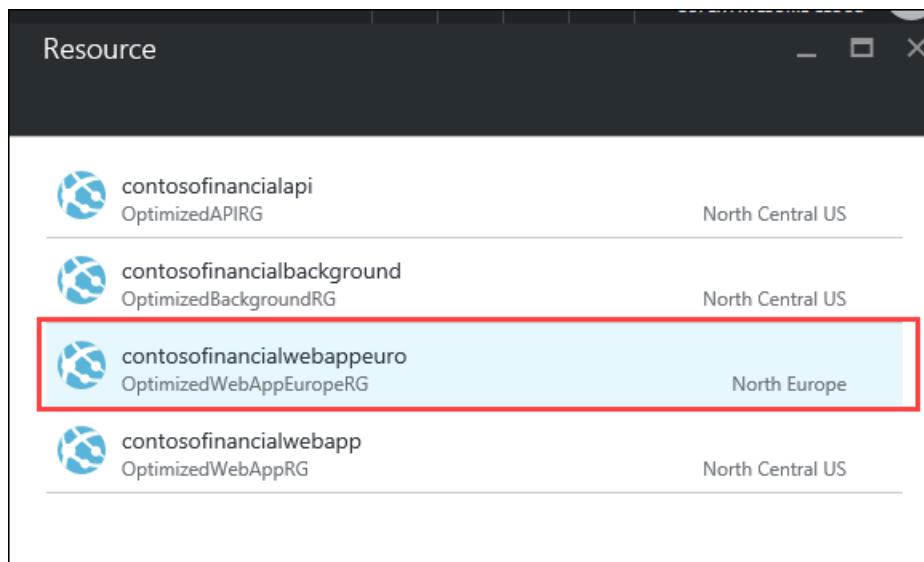
- Type: **Azure endpoint**
- Name: **Web App (Europe)**
- Target resource type: **App Service**



5. Click on **Choose an app service**.



6. Click on the **Web App** created in the **North Europe** region.



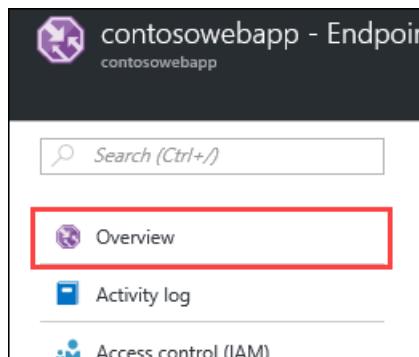
7. Set the **Regional grouping** to **Europe**.

The screenshot shows the 'Geo-mapping' configuration page with the following fields:

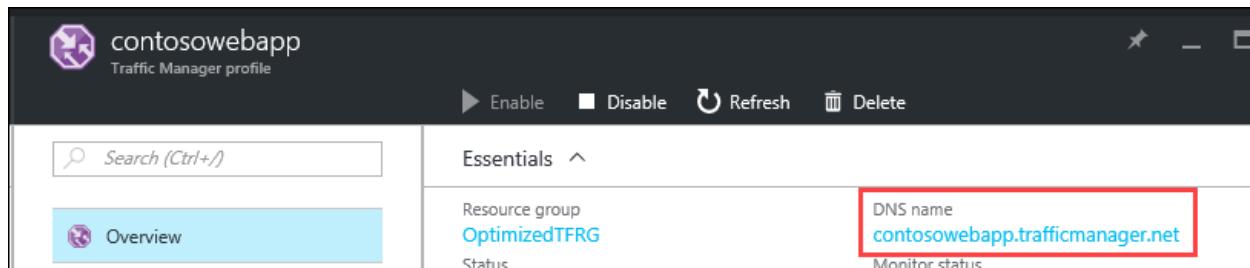
- * Regional grouping:** Europe (highlighted with a red box)
- Country/Region:** Choose a Country/Region (optional) (dropdown menu)
- + Add geo-mapping:** (button)
- Add as disabled:** (checkbox)

8. Click **OK**.

9. Click on **Overview**.

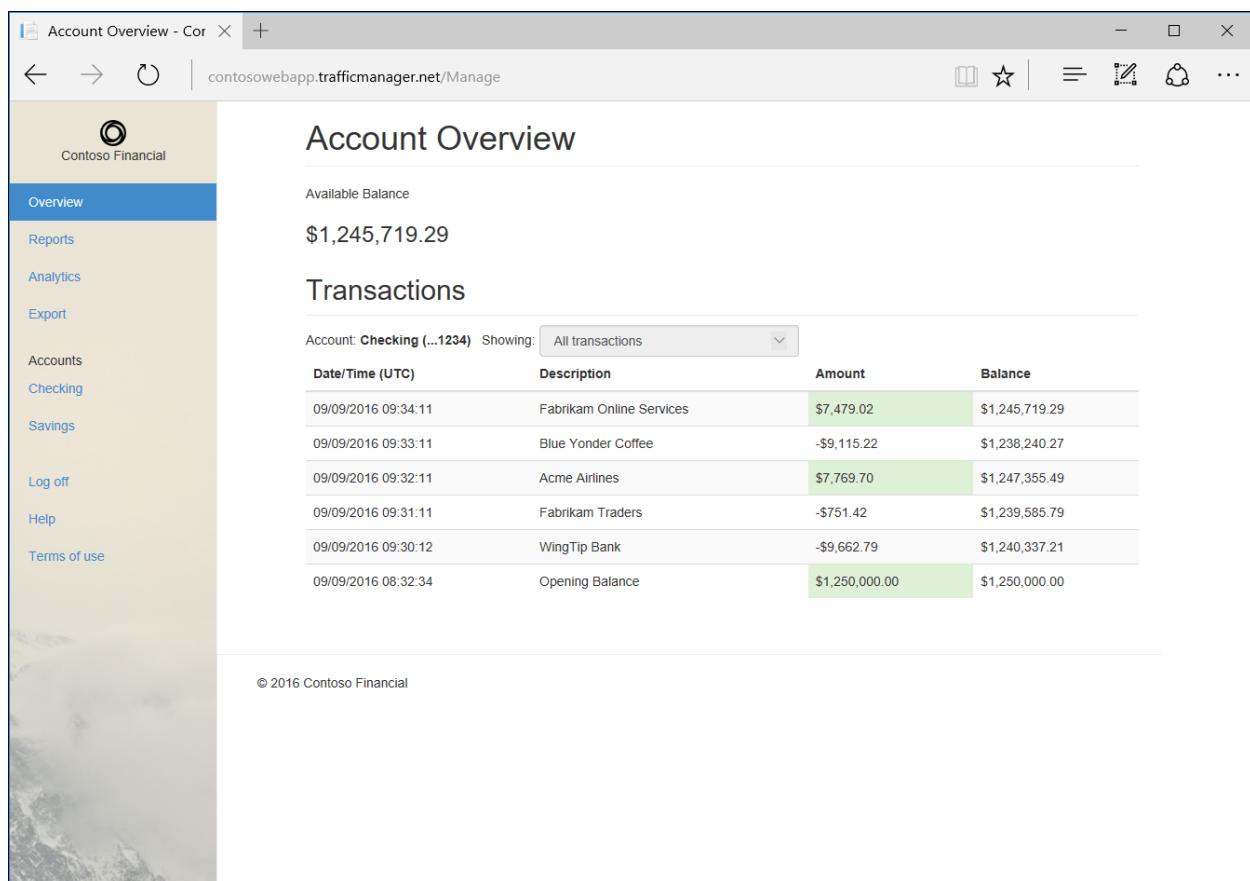


10. On the **Traffic Manager profile** blade, click on the **DNS name** to open a new browser window navigating to the **Traffic Manager** endpoint.



The screenshot shows the 'contosowebapp' Traffic Manager profile page. At the top, there are buttons for 'Enable', 'Disable', 'Refresh', and 'Delete'. Below that is a search bar and an 'Overview' button. The 'Essentials' section displays the 'Resource group' as 'OptimizedTFRG' and the 'DNS name' as 'contosowebapp.trafficmanager.net', which is highlighted with a red box. There is also a 'Monitor status' link.

11. Login to the Web App and ensure it loads all data as expected to test out the App Service hosted Web App and API App tiers are functioning properly.



The screenshot shows a web browser window titled 'Account Overview - Cor...' with the URL 'contosowebapp.trafficmanager.net/Manage'. The left sidebar has a 'Contoso Financial' logo and links for 'Overview' (which is selected and highlighted in blue), 'Reports', 'Analytics', 'Export', 'Accounts', 'Checking', 'Savings', 'Log off', 'Help', and 'Terms of use'. The main content area is titled 'Account Overview' and shows an 'Available Balance' of '\$1,245,719.29'. Below that is a 'Transactions' table:

Date/Time (UTC)	Description	Amount	Balance
09/09/2016 09:34:11	Fabrikam Online Services	\$7,479.02	\$1,245,719.29
09/09/2016 09:33:11	Blue Yonder Coffee	-\$9,115.22	\$1,238,240.27
09/09/2016 09:32:11	Acme Airlines	\$7,769.70	\$1,247,355.49
09/09/2016 09:31:11	Fabrikam Traders	-\$751.42	\$1,239,585.79
09/09/2016 09:30:12	WingTip Bank	-\$9,662.79	\$1,240,337.21
09/09/2016 08:32:34	Opening Balance	\$1,250,000.00	\$1,250,000.00

At the bottom of the page, it says '© 2016 Contoso Financial'.

12. After validating the app, close the browser window.

After the hands-on lab

Task 1: Delete Resources

1. Now that the HOL is complete, go ahead and delete all of the Resource Groups created for this HOL. You will no longer need those resources, and it will be beneficial to clean up your Azure Subscription.

You should follow all steps provided *after* attending the HOL.