

Introduction

In this module, you'll be introduced to factors that impact costs in Azure and tools to help you both predict potential costs and monitor and control costs.

Learning objectives

After completing this module, you'll be able to:

- Describe factors that can affect costs in Azure.
- Compare the Pricing calculator and Total Cost of Ownership (TCO) calculator.
- Describe the Microsoft Cost Management Tool.
- Describe the purpose of tags.

Describe factors that can affect costs in Azure

Azure shifts development costs from the capital expense (CapEx) of building out and maintaining infrastructure and facilities to an operational expense (OpEx) of renting infrastructure as you need it, whether it's compute, storage, networking, and so on.

That OpEx cost can be impacted by many factors. Some of the impacting factors are:

- Resource type
- Consumption
- Maintenance
- Geography
- Subscription type
- Azure Marketplace

Resource type

A number of factors influence the cost of Azure resources. The type of resources, the settings for the resource, and the Azure region will all have an impact on how much a resource costs. When you provision an Azure resource, Azure creates metered instances for that resource. The meters track the resources' usage and generate a usage record that is used to calculate your bill.

Examples

With a storage account, you specify a type such as blob, a performance tier, an access tier, redundancy settings, and a region. Creating the same storage account in different regions may show different costs and changing any of the settings may also impact the price.

Blob storage

Enable SFTP ⓘ ☐

i To enable SFTP, 'hierarchical namespace' must be enabled.

Enable network file system v3 ⓘ ☐

i To enable NFS v3 'hierarchical namespace' must be enabled. [Learn more about NFS v3](#)

Allow cross-tenant replication ⓘ ☒

Access tier ⓘ

☒ Hot: Frequently accessed data and day-to-day usage scenarios

☐ Cool: Infrequently accessed data and backup scenarios

Figure 1: Screenshot of storage blob settings showing hot and cool access tiers.

With a virtual machine (VM), you may have to consider licensing for the operating system or other software, the processor and number of cores for the VM, the attached storage, and the network interface. Just like with storage, provisioning the same virtual machine in different regions may result in different costs.

Consumption

Pay-as-you-go has been a consistent theme throughout, and that's the cloud payment model where you pay for the resources that you use during a billing cycle. If you use more compute this cycle, you pay more. If you use less in the current cycle, you pay less. It's a straight forward pricing mechanism that allows for maximum flexibility.

However, Azure also offers the ability to commit to using a set amount of cloud resources in advance and receiving discounts on those “reserved” resources. Many services, including databases, compute, and storage all provide the option to commit to a level of use and receive a discount, in some cases up to 72 percent.

When you reserve capacity, you're committing to using and paying for a certain amount of Azure resources during a given period (typically one or three years). With the back-up of pay-as-you-go, if you see a sudden surge in demand that eclipses what you've pre-reserved, you just pay for the additional resources in excess of your reservation. This model allows you to recognize significant savings on reliable, consistent workloads while also having the flexibility to rapidly increase your cloud footprint as the need arises.

Maintenance

The flexibility of the cloud makes it possible to rapidly adjust resources based on demand. Using resource groups can help keep all of your resources organized.

Create a virtual machine ...

[Basics](#) [Disks](#) [Networking](#) [Management](#) [Advanced](#) [Tags](#) [Review + create](#)

Create a virtual machine that runs Linux or Windows. Select an image from Azure marketplace or use your own customized image. Complete the Basics tab then Review + create to provision a virtual machine with default parameters or review each tab for full customization. [Learn more](#)

Project details

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

Subscription *	Visual Studio Enterprise Subscription
Resource group *	(New) Resource group

[Create new](#)

Instance details

Virtual machine name *	
Region *	
Availability options	
Security type	
Image *	
Azure Spot instance	
Size *	<div><div>Your recently used sizes</div><div>Standard_D2s_v3 - 2 vcpus, 8 GiB memory</div><div>Recommended by image publisher</div><div>Standard_DS1_v2 - 1 vcpu, 3.5 GiB memory</div><div>Standard_D4s_v3 - 4 vcpus, 16 GiB memory</div><div>Standard_E2s_v3 - 2 vcpus, 16 GiB memory</div><div>See all sizes</div><div>Standard_D2s_v3 - 2 vcpus, 8 GiB memory</div></div>

Figure 2: Screenshot of Azure virtual machine settings showing the virtual machine size options.

In order to control costs, it's important to maintain your cloud environment. For example, every time you provision a VM, additional resources such as storage and networking are also provisioned. If you deprovision the VM, those additional resources may not deprovision at the same time, either intentionally or unintentionally. By keeping an eye on your resources and making sure you're not keeping around resources that are no longer needed, you can help control cloud costs.

Geography

When you provision most resources in Azure, you need to define a region where the resource deploys. Azure infrastructure is distributed globally, which enables you to deploy your services centrally or closest to your customers, or something in between. With this global deployment comes global pricing differences. The cost of power, labor, taxes, and fees vary depending on the location. Due to these variations, Azure resources can differ in costs to deploy depending on the region.

Network traffic is also impacted based on geography. For example, it's less expensive to move information within Europe than to move information from Europe to Asia or South America.

Network Traffic

Billing zones are a factor in determining the cost of some Azure services.

Bandwidth refers to data moving in and out of Azure datacenters. Some inbound data transfers (data going into Azure datacenters) are free. For outbound data transfers (data leaving Azure datacenters), data transfer pricing is based on zones.

A zone is a geographical grouping of Azure regions for billing purposes. The bandwidth pricing page has additional information on pricing for data ingress, egress, and transfer.

Subscription type

Some Azure subscription types also include usage allowances, which affect costs.

For example, an Azure free trial subscription provides access to a number of Azure products that are free for 12 months. It also includes credit to spend within your first 30 days of sign-up. You'll get access to more than 25 products that are always free (based on resource and region availability).

Azure Marketplace

Azure Marketplace lets you purchase Azure-based solutions and services from third-party vendors. This could be a server with software preinstalled and

configured, or managed network firewall appliances, or connectors to third-party backup services. When you purchase products through Azure Marketplace, you may pay for not only the Azure services that you're using, but also the services or expertise of the third-party vendor. Billing structures are set by the vendor.

All solutions available in Azure Marketplace are certified and compliant with Azure policies and standards. The certification policies may vary based on the service or solution type and Azure service involved. Commercial marketplace certification policies has additional information on Azure Marketplace certifications.

Compare the Pricing and Total Cost of Ownership calculators

The pricing calculator and the total cost of ownership (TCO) calculator are two calculators that help you understand potential Azure expenses. Both calculators are accessible from the internet, and both calculators allow you to build out a configuration. However, the two calculators have very different purposes.

Pricing calculator

The pricing calculator is designed to give you an estimated cost for provisioning resources in Azure. You can get an estimate for individual resources, build out a solution, or use an example scenario to see an estimate of the Azure spend. The pricing calculator's focus is on the cost of provisioned resources in Azure.

[!info] Note The Pricing calculator is for information purposes only. The prices are only an estimate. Nothing is provisioned when you add resources to the pricing calculator, and you won't be charged for any services you select.

With the pricing calculator, you can estimate the cost of any provisioned resources, including compute, storage, and associated network costs. You can even account for different storage options like storage type, access tier, and redundancy.

TCO calculator

The TCO calculator is designed to help you compare the costs for running an on-premises infrastructure compared to an Azure Cloud infrastructure. With the TCO calculator, you enter your current infrastructure configuration, including servers, databases, storage, and outbound network traffic. The TCO calculator then compares the anticipated costs for your current environment with an Azure environment supporting the same infrastructure requirements.

With the TCO calculator, you enter your configuration, add in assumptions like power and IT labor costs, and are presented with an estimation of the cost difference to run the same environment in your current datacenter or in Azure.

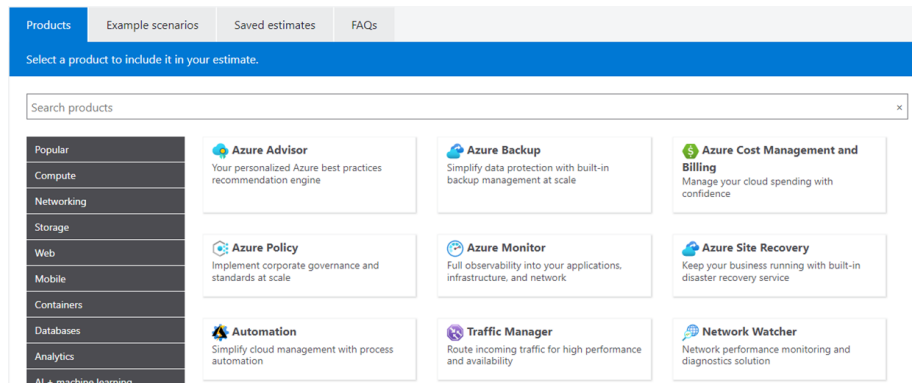


Figure 3: Screenshot of the pricing calculator for reference.

1

2

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Define your workloads

Adjust assumptions

View report

[Bulk Upload](#)
[My saved reports](#)

Define your workloads

Enter the details of your on-premises workloads. This information will be used to understand your current TCO and recommended services in Azure.

Servers

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

Workload 1

Workload

Environment

Operating system

Servers

Procs per server

Core(s) per proc

RAM (GB)

Optimize by

GPU

Windows/Linux Server

Physical Servers

Linux

2

2

6

128

CPU

None

(1 - 448)

(1 - 4)

(1 - 8)

(1 - 9999)

[Add server workload](#)

Figure 4: Screenshot of the Total Cost of Ownership calculator.

Describe the Microsoft Cost Management tool

Microsoft Azure is a global cloud provider, meaning you can provision resources anywhere in the world. You can provision resources rapidly to meet a sudden demand, or to test out a new feature, or on accident. If you accidentally provision new resources, you may not be aware of them until it's time for your invoice. Cost Management is a service that helps avoid those situations.

What is Cost Management?

Cost Management provides the ability to quickly check Azure resource costs, create alerts based on resource spend, and create budgets that can be used to automate management of resources.

Cost analysis is a subset of Cost Management that provides a quick visual for your Azure costs. Using cost analysis, you can quickly view the total cost in a variety of different ways, including by billing cycle, region, resource, and so on.

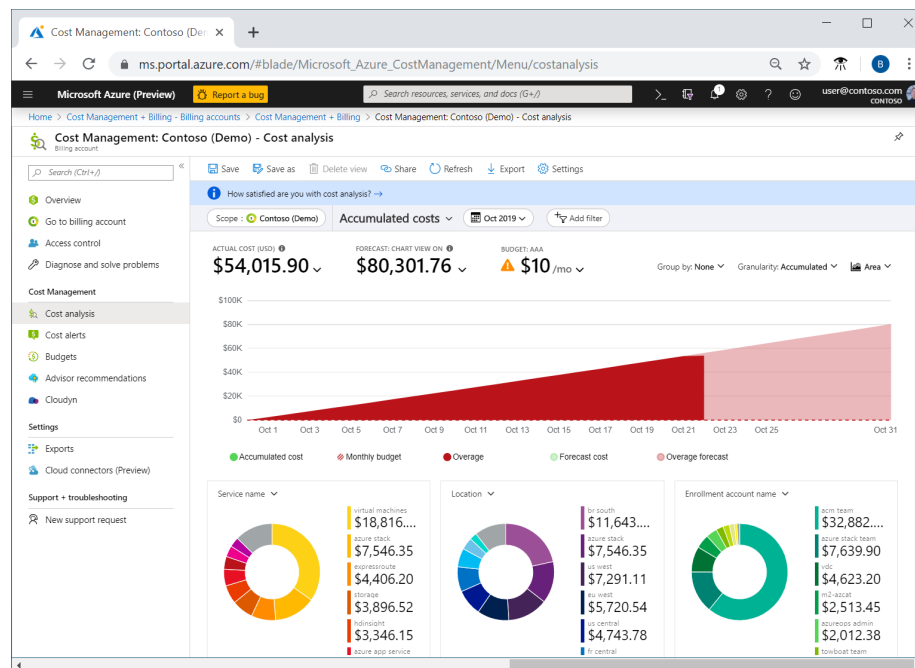


Figure 5: Screenshot of initial view of cost analysis in the Azure portal.

You use cost analysis to explore and analyze your organizational costs. You can view aggregated costs by organization to understand where costs are accrued and to identify spending trends. And you can see accumulated costs over time to estimate monthly, quarterly, or even yearly cost trends against a budget.

Cost alerts

Cost alerts provide a single location to quickly check on all of the different alert types that may show up in the Cost Management service. The three types of alerts that may show up are:

- Budget alerts
- Credit alerts
- Department spending quota alerts.

Budget alerts

Budget alerts notify you when spending, based on usage or cost, reaches or exceeds the amount defined in the alert condition of the budget. Cost Management budgets are created using the Azure portal or the Azure Consumption API.

In the Azure portal, budgets are defined by cost. Budgets are defined by cost or by consumption usage when using the Azure Consumption API. Budget alerts support both cost-based and usage-based budgets. Budget alerts are generated automatically whenever the budget alert conditions are met. You can view all cost alerts in the Azure portal. Whenever an alert is generated, it appears in cost alerts. An alert email is also sent to the people in the alert recipients list of the budget.

Credit alerts

Credit alerts notify you when your Azure credit monetary commitments are consumed. Monetary commitments are for organizations with Enterprise Agreements (EAs). Credit alerts are generated automatically at 90% and at 100% of your Azure credit balance. Whenever an alert is generated, it's reflected in cost alerts, and in the email sent to the account owners.

Department spending quota alerts

Department spending quota alerts notify you when department spending reaches a fixed threshold of the quota. Spending quotas are configured in the EA portal. Whenever a threshold is met, it generates an email to department owners, and appears in cost alerts. For example, 50 percent or 75 percent of the quota.

Budgets

A budget is where you set a spending limit for Azure. You can set budgets based on a subscription, resource group, service type, or other criteria. When you set a budget, you will also set a budget alert. When the budget hits the budget alert level, it will trigger a budget alert that shows up in the cost alerts area. If configured, budget alerts will also send an email notification that a budget alert threshold has been triggered.

A more advanced use of budgets enables budget conditions to trigger automation that suspends or otherwise modifies resources once the trigger condition has occurred.

Describe the purpose of tags

As your cloud usage grows, it's increasingly important to stay organized. A good organization strategy helps you understand your cloud usage and can help you manage costs.

One way to organize related resources is to place them in their own subscriptions. You can also use resource groups to manage related resources. Resource tags are another way to organize resources. Tags provide extra information, or metadata, about your resources. This metadata is useful for:

- **Resource management** Tags enable you to locate and act on resources that are associated with specific workloads, environments, business units, and owners.
- **Cost management and optimization** Tags enable you to group resources so that you can report on costs, allocate internal cost centers, track budgets, and forecast estimated cost.
- **Operations management** Tags enable you to group resources according to how critical their availability is to your business. This grouping helps you formulate service-level agreements (SLAs). An SLA is an uptime or performance guarantee between you and your users.
- **Security** Tags enable you to classify data by its security level, such as public or confidential.
- **Governance and regulatory compliance** Tags enable you to identify resources that align with governance or regulatory compliance requirements, such as ISO 27001. Tags can also be part of your standards enforcement efforts. For example, you might require that all resources be tagged with an owner or department name.
- **Workload optimization and automation** Tags can help you visualize all of the resources that participate in complex deployments. For example, you might tag a resource with its associated workload or application name and use software such as Azure DevOps to perform automated tasks on those resources.

How do I manage resource tags?

You can add, modify, or delete resource tags through Windows PowerShell, the Azure CLI, Azure Resource Manager templates, the REST API, or the Azure portal.

You can use Azure Policy to enforce tagging rules and conventions. For example, you can require that certain tags be added to new resources as they're provisioned. You can also define rules that reapply tags that have been removed. Resources

don't inherit tags from subscriptions and resource groups, meaning that you can apply tags at one level and not have those tags automatically show up at a different level, allowing you to create custom tagging schemas that change depending on the level (resource, resource group, subscription, and so on).

An example tagging structure

A resource tag consists of a name and a value. You can assign one or more tags to each Azure resource.

Name	Value
AppName	The name of the application that the resource is part of.
CostCenter	The internal cost center code.
Owner	The name of the business owner who's responsible for the resource.
Environment	An environment name, such as "Prod," "Dev," or "Test."
Impact	How important the resource is to business operations, such as "Mission-critical," "High-impact," or "Low-impact."

Keep in mind that you don't need to enforce that a specific tag is present on all of your resources. For example, you might decide that only mission-critical resources have the Impact tag. All non-tagged resources would then not be considered as mission-critical.