

# MICROSOFT AZURE

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SCIENCE

GitHub:<https://github.com/AnusuyaSanjeevirajan/anusuya-MICROSOFTAZURE.git>

**REQUESTING A CLOUD SHELL SUCCEEDED.  
CONNECTING TERMINAL...**

## Welcome to Azure Cloud Shell

- `az vm create --resource-group "learn-1dd151f8-37c6-44cc-a975-8f08e65c30c2" --name my-vm --public-ip-sku Standard --image Ubuntu2204 --admin-username azureuser --generate-ssh-keys`
- `az vm extension set --resource-group "learn-1dd151f8-37c6-44cc-a975-8f08e65c30c2" --vm-name my-vm --name customScript --publisher Microsoft.Azure.Extensions --version 2.1 --settings '{"fileUri":["https://raw.githubusercontent.com/MicrosoftDocs/mslearn-welcome-to-azure/master/configure-nginx.sh"]}' --protected-settings '{"commandToExecute": "./configure-nginx.sh}"'`
- `sudo apt-get update`
- `ssh azureuser@40.83.129.77`
- `echo "sudo apt-get update -y"`

- `sudo apt-get install nginx -y`
- `sudo systemctl start nginx`
- `sudo systemctl enable nginx" > setup_nginx.sh`
- `chmod +x setup_nginx.sh`
- `./setup_nginx.sh`
- `echo "<html><body><h2>Welcome to Azure! My name is $(hostname).</h2></body></html>" | sudo tee -a /var/www/html/index.html`
- `sudo systemctl status nginx`
- `az vm open-port --resource-group "learn-89376140-1999-4d15-a385-6cb5d6644676" --name my-vm --port 80`
- `az vm list-ip-addresses --resource-group "learn-89376140-1999-4d15-a385-6cb5d6644676" --name my-vm --output table`
- `ssh azureuser@40.83.129.77`
- `sudo apt-get update`
- `gitclonehttps://github.com/AnusuyaSanjeevirajan/certificate-management.git`
- `sudo cp -r html/* /var/www/html/`
- `sudo chown -R www-data:www-data /var/www/html`
- `sudo chmod -R 755 /var/www/html`
- `sudo systemctl restart nginx`

## WORKING:

```
^ | Azure Cloud Shell
Switch to PowerShell Restart Manage files New session Editor ...
Requesting a Cloud Shell.Succeeded.
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

ansiraji [ ~ ]$ az vm create --resource-group "learn-89376f40-1999-4d15-a385-6cb5d6644676" --name my-vm --public-ip-sku Standard --image Ubuntu2204 --admin-username azureuser --generate-ssh-keys
SSH key files '/home/ansiraji/.ssh/id_rsa' and '/home/ansiraji/.ssh/id_rsa.pub' have been generated under ~/.ssh to allow SSH access to the VM. If using machines without permanent storage, back up your keys to a safe location.
{
  "fqdns": "",
  "id": "/subscriptions/4d43e8c9-4583-4435-a75d-5fa0b9865f65/resourceGroups/learn-89376f40-1999-4d15-a385-6cb5d6644676/providers/Microsoft.Compute/virtualMachines/my-vm",
  "location": "westus",
  "macAddress": "00-0D-3A-37-BA-BD",
  "powerState": "VM running",
  "privateIpAddress": "10.0.0.4",
  "publicIpAddress": "40.83.129.77",
  "resourceGroup": "learn-89376f40-1999-4d15-a385-6cb5d6644676",
  "zones": ""
}
```

```
ansiraji [ ~ ]$ sudo apt-get update

We trust you have received the usual lecture from the local System
Administrator. It usually boils down to these three things:

#1) Respect the privacy of others.
#2) Think before you type.
#3) With great power comes great responsibility.

For security reasons, the password you type will not be visible.
```

```
ansiraji [ ~ ]$ ssh azureuser@40.83.129.77
The authenticity of host '40.83.129.77 (40.83.129.77)' can't be established.
ED25519 key fingerprint is SHA256:NUu3P6Eb00ZQuM5NSudqMvG+iCUBjKxRZgoFzPuzzjg.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '40.83.129.77' (ED25519) to the list of known hosts.
Welcome to Ubuntu 22.04.4 LTS (GNU/Linux 6.5.0-1025-azure x86_64)
```

```
* Documentation:  https://help.ubuntu.com
* Management:    https://landscape.canonical.com
* Support:       https://ubuntu.com/pro
```

System information as of Fri Aug 9 08:22:38 UTC 2024

|               |                 |                        |          |
|---------------|-----------------|------------------------|----------|
| System load:  | 0.15            | Processes:             | 112      |
| Usage of /:   | 6.0% of 28.89GB | Users logged in:       | 0        |
| Memory usage: | 9%              | IPv4 address for eth0: | 10.0.0.4 |
| Swap usage:   | 0%              |                        |          |

Expanded Security Maintenance for Applications is not enabled.

10 updates can be applied immediately.  
10 of these updates are standard security updates.  
To see these additional updates run: `apt list --upgradable`

Enable ESM Apps to receive additional future security updates.  
See <https://ubuntu.com/esm> or run: `sudo pro status`

```
azureuser@my-vm:~$ echo "sudo apt-get update -y
sudo apt-get install nginx -y
sudo systemctl start nginx
sudo systemctl enable nginx" > setup_nginx.sh
chmod +x setup_nginx.sh
./setup_nginx.sh
Hit:1 http://azure.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://azure.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://azure.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 http://azure.archive.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists... Done
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
nginx is already the newest version (1.18.0-6ubuntu14.4).
0 upgraded, 0 newly installed, 0 to remove and 13 not upgraded.
Synchronizing state of nginx.service with SysV service with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable nginx
azureuser@my-vm:~$
```

```
d-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable nginx
azureuser@my-vm:~$ echo "<html><body><h2>Welcome to Azure! My name is $(hostname).</h2>
</body></html>" | sudo tee -a /var/www/html/index.html
<html><body><h2>Welcome to Azure! My name is my-vm.</h2></body></html>
azureuser@my-vm:~$
```

```

Executing: /lib/systemd/systemd-sysv-install enable nginx
azureuser@my-vm:~$ echo "<html><body><h2>Welcome to Azure! My name is $(hostname).</h2></body></html>" | sudo tee -a /var/www/html/index.html
<html><body><h2>Welcome to Azure! My name is my-vm.</h2></body></html>
azureuser@my-vm:~$ sudo systemctl status nginx

● nginx.service - A high performance web server and a reverse proxy server
   Loaded: loaded (/lib/systemd/system/nginx.service; enabled; vendor preset: enable>
   Active: active (running) since Fri 2024-08-09 08:19:33 UTC; 5min ago
     Docs: man:nginx(8)
  Main PID: 2383 (nginx)
    Tasks: 2 (limit: 4011)
   Memory: 4.6M
      CPU: 31ms
   CGroup: /system.slice/nginx.service
           └─2383 "nginx: master process /usr/sbin/nginx -g daemon on; master_proce>
             └─2386 "nginx: worker process" "" "" "" "" "" "" "" "" "" "" "" "" "" "" "">

Aug 09 08:19:33 my-vm systemd[1]: Starting A high performance web server and a revers>
Aug 09 08:19:33 my-vm systemd[1]: Started A high performance web server and a reverse>
lines 1-14/14 (END)

```

```

azureuser@my-vm:~$ exit
logout
Connection to 40.83.129.77 closed.
ansiraji [ ~ ]$

```

```

ansiraji [ ~ ]$ az vm open-port --resource-group "learn-89376f40-1999-4d15-a385-6cb5d6644676" --name my-vm --port 80
{
  "defaultSecurityRules": [
    {
      "access": "Allow",
      "description": "Allow inbound traffic from all VMs in VNET",
      "destinationAddressPrefix": "VirtualNetwork",
      "destinationAddressPrefixes": [],
      "destinationPortRange": "*",
      "destinationPortRanges": [],
      "direction": "Inbound",
      "etag": "W/\"b35deb2a-043d-41f0-8b2b-2ee6c0f8c402\"",
      "id": "/subscriptions/4d43e8c9-4583-4435-a75d-5fa0b9865f65/resourceGroups/learn-89376f40-1999-4d15-a385-6cb5d6644676/providers/Microsoft.Network/networkSecurityGroups/my-vmNSG/defaultSecurityRules/AllowVnetInBound",
      "name": "AllowVnetInBound",
      "priority": 65000,
      "protocol": "*",
      "provisioningState": "Succeeded",
      "resourceGroup": "learn-89376f40-1999-4d15-a385-6cb5d6644676",
      "sourceAddressPrefix": "VirtualNetwork",
      "sourceAddressPrefixes": [],
      "sourcePortRange": "*",
      "sourcePortRanges": [],
      "type": "Microsoft.Network/networkSecurityGroups/defaultSecurityRules"
    },
  ],
}

```

```

}
ansiraji [ ~ ]$ az vm list-ip-addresses --resource-group "az vm list-ip-addresses --re
source-group "learn-6be6874e-0957-486f-a28f-895aa6db1625" --name my-vm --output table
--name my-vm --output table

ansiraji [ ~ ]$ az vm list-ip-addresses --resource-group "learn-89376f40-1999-4d15-a38
5-6cb5d6644676" --name my-vm --output table
VirtualMachine      PublicIPAddresses    PrivateIPAddresses
-----
my-vm                40.83.129.77         10.0.0.4
ansiraji [ ~ ]$

```

```

| Azure Cloud Shell
Switch to PowerShell Restart Manage files New session Editor ...
VirtualMachine      PublicIPAddresses    PrivateIPAddresses
-----
my-vm                13.93.217.183        10.0.0.4
ansiraji [ ~ ]$ ssh azureuser@13.93.217.183
Welcome to Ubuntu 22.04.4 LTS (GNU/Linux 6.5.0-1025-azure x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Fri Aug 9 04:36:13 UTC 2024

System load: 0.02          Processes:            115
Usage of /:   7.8% of 28.89GB Users logged in:        0
Memory usage: 16%          IPv4 address for eth0: 10.0.0.4
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

10 updates can be applied immediately.
10 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

Last login: Fri Aug 9 04:00:15 2024 from 4.188.107.221
azureuser@my-vm:~$

```

Cloud Computing Services | Learning Path - Microsoft Azure | Exercise - Create an Azure VM | raw.githubusercontent.com | (5) WhatsApp | 13.93.217.183

← → 🔍 Not secure 13.93.217.183 ☆ 📁 📄 📱 ⚙️

Welcome to Azure! My name is my-vm.

Welcome to Azure! My name is my-vm.

```
dharsхинidivya2422 [ ~ ]$ ssh azureuser@ 13.93.204.63
ssh: Could not resolve hostname : Name or service not known
dharsхинidivya2422 [ ~ ]$ ssh azureuser@13.93.204.63
Welcome to Ubuntu 22.04.4 LTS (GNU/Linux 6.5.0-1025-azure x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Fri Aug  9 08:27:45 UTC 2024

System load:  0.0               Processes:            107
Usage of /:   6.0% of 28.89GB   Users logged in:     0
Memory usage: 9%               IPv4 address for eth0: 10.0.0.4
Swap usage:   0%

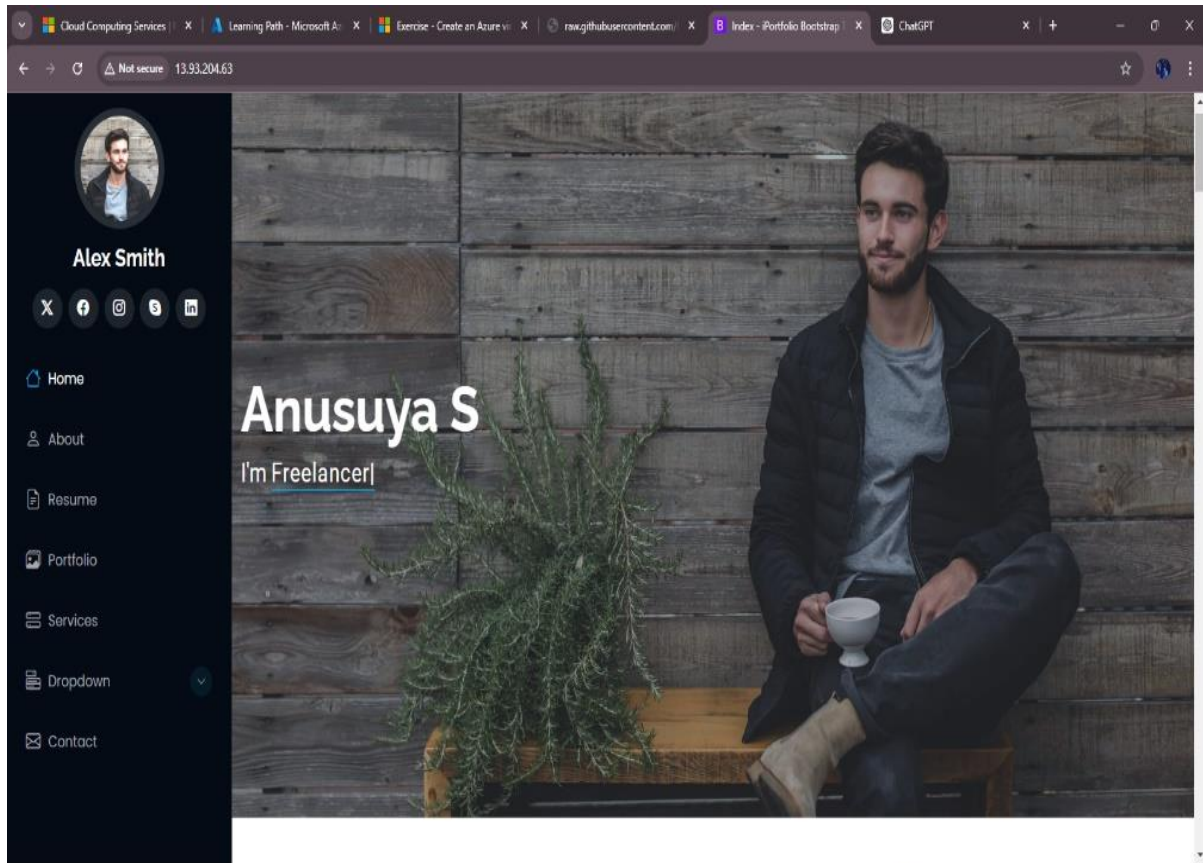
Expanded Security Maintenance for Applications is not enabled.

10 updates can be applied immediately.
```

```
setup_nginx
azureuser@my-vm:~$ git clone https://github.com/AnusuyaSanjeevirajan/certificate-management.git
Cloning into 'certificate-management'...
remote: Enumerating objects: 135, done.
remote: Counting objects: 100% (135/135), done.
remote: Compressing objects: 100% (98/98), done.
remote: Total 135 (delta 33), reused 135 (delta 33), pack-reused 0
Receiving objects: 100% (135/135), 2.63 MiB | 12.34 MiB/s, done.
Resolving deltas: 100% (33/33), done.
azureuser@my-vm:~$ sudo cp -r certificate-management/* /var/www/html/
azureuser@my-vm:~$ sudo chown -R www-data:www-data /var/www/html
azureuser@my-vm:~$ sudo chmod -R 755 /var/www/html
azureuser@my-vm:~$ sudo systemctl restart nginx
azureuser@my-vm:~$
```



## OUTPUT:





## 2. DESCRIBE AZURE STORAGE SERVICES

### WORK WITH BLOB STORAGE

In this section, you'll create a Blob container and upload a picture.

1. Under **Data storage**, select **Containers**.
2. Select + **Container** and complete the information.
3. Select Create.

#### Note

Step 4 will need an image. If you want to upload an image you already have on your computer, continue to Step 4. Otherwise, open a new browser window and search Bing for an image of a flower. Save the image to your computer.

4. Back in the Azure portal, select the container you created, then select Upload.
5. Browse for the image file you want to upload. Select it and then select upload.

#### Note

You can upload as many blobs as you like in this way. New blobs will be listed within the container.

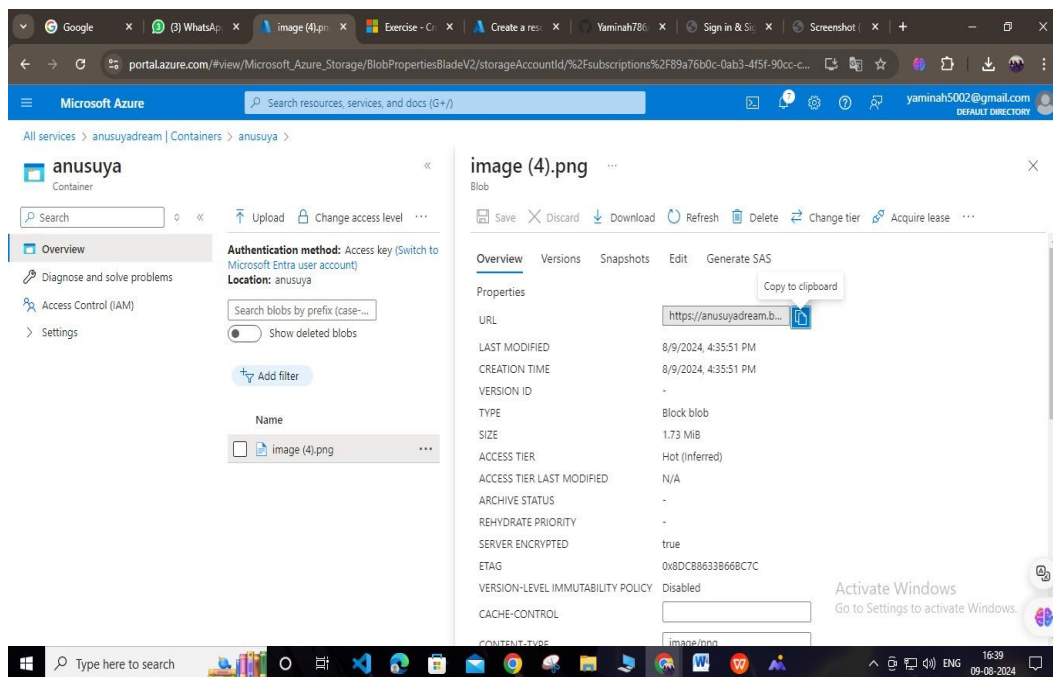
6. Select the Blob (file) you just uploaded. You should be on the properties tab.
7. Copy the URL from the URL field and paste it into a new tab.

- **Change the access level of your blob**

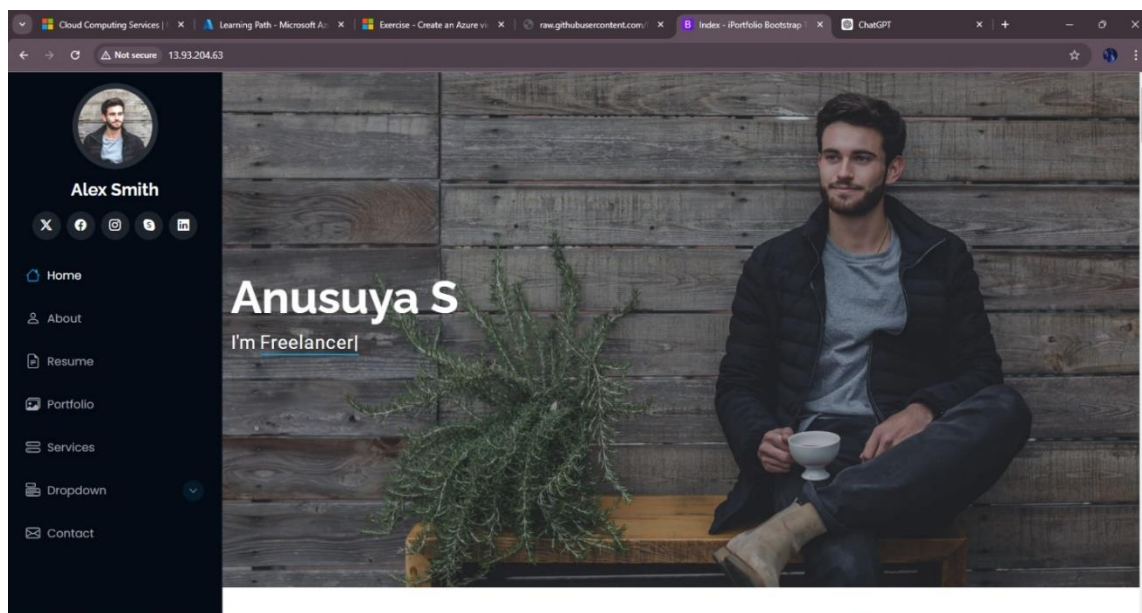
1. Go back to the Azure portal.
2. Select Change access level.

3. Set the Anonymous access level to Blob (anonymous read access for blobs only).
4. Select OK.
5. Refresh the tab where you attempted to access the file earlier.

## WORKING:



## OUTPUT :

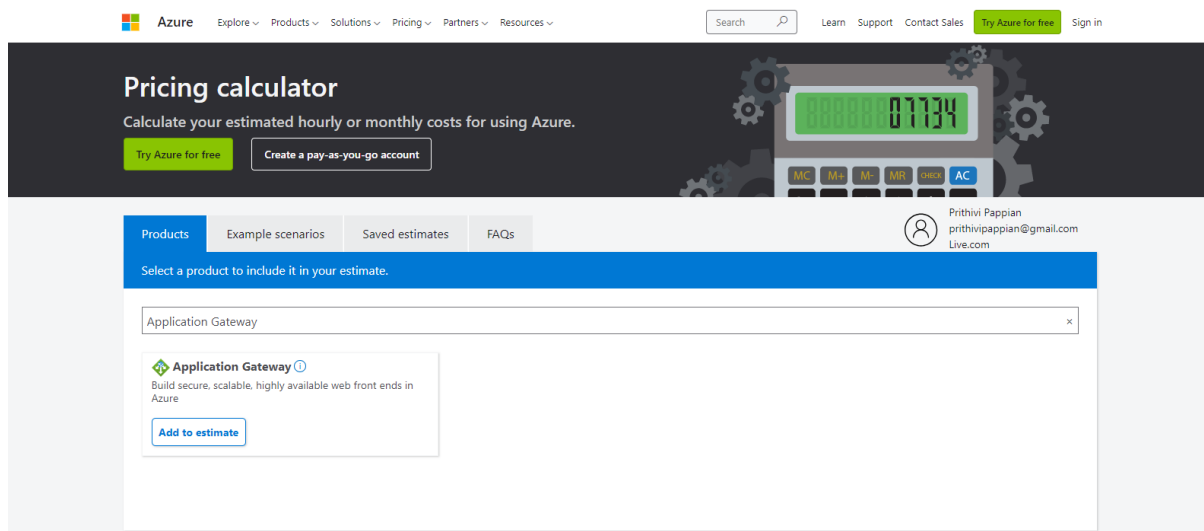


### 3. ESTIMATE WORKLOAD COSTS BY USING THE PRICING CALCULATOR

- Explore the Pricing calculator
  1. Go to the [Pricing calculator](#).
  2. Notice the following tabs:
    - Products This is where you choose the Azure services that you want to include in your estimate. You'll likely spend most of your time here.
    - Example scenarios Here you'll find several *reference architectures*, or common cloud-based solutions that you can use as a starting point.
    - Saved estimates Here you'll find your previously saved estimates.
  3. Estimate your solution
- Here you add each Azure service that you need to the calculator. Then you configure each service to fit your needs.
- Tip
- Make sure you have a clean calculator with nothing listed in the estimate. You can reset the estimate by selecting the trash can icon next to each item.
- Add services to the estimate
  1. On the Products tab, select the service from each of these categories:
  2. Scroll to the bottom of the page. Each service is listed with its default configuration.
- Configure services to match your requirements:
  1. Under Virtual Machines, set values.

2. Under Azure SQL Database, set values.
  3. Under Application Gateway, set values.
- Review, share, and save your estimate
  - At the bottom of the page, you see the total estimated cost of running the solution. You can change the currency type if you want.
  - At this point, you have a few options:
    - Select Export to save your estimate as an Excel document.
    - Select Save or Save as to save your estimate to the Saved Estimates tab for later.
    - Select Share to generate a URL so you can share the estimate with your team.

## WORKING :



# Explore the Pricing calculator

Let's start with a quick tour of the Pricing calculator.

1. Go to the [Pricing calculator](#).
2. Notice the following tabs:

|  |                   |                 |      |
|--|-------------------|-----------------|------|
| Products   | Example scenarios | Saved estimates | FAQs |
| Select a product to include it in your estimate. |                   |                 |      |

- **Products** This is where you choose the Azure services that you want to include in your estimate. You'll likely spend most of your time here.
- **Example scenarios** Here you'll find several *reference architectures*, or common cloud-based solutions that you can use as a starting point.
- **Saved estimates** Here you'll find your previously saved estimates.
- **FAQs** Here you'll discover answers to frequently asked questions about the Pricing calculator.

## ADD SERVICES TO THE ESTIMATE:

The screenshot displays the Azure Pricing calculator interface. The top section, 'Your Estimate', shows a configuration for 2 D2 v3 Virtual Machines (2 vCPUs, 8 GB RAM) for 730 hours, with an upfront cost of \$0.00 and a monthly cost of \$305.14. Below this, the 'Virtual Machines' section allows users to select a region (West US), operating system (Windows), type (OS Only), and tier (Standard). The instance series is set to D2-series, and the instance type is D2 v3: 2 vCPUs, 8 GB RAM, 50 GB Temporary storage, \$0.209/hour. The quantity is 2, and the duration is 730 hours.

The bottom section, 'Savings Options', provides details on pricing models and discounts. It includes a 'Learn more' button and a table comparing the current configuration with potential savings from the 1-year and 3-year savings plans. The current configuration has a monthly cost of \$170.82, while the 1-year savings plan offers a discount of approximately 31%, resulting in a monthly cost of \$134.32. The 3-year savings plan offers a discount of approximately 53%, resulting in a monthly cost of \$104.32. The total estimated cost for the 1-year savings plan is \$305.14.

| Configuration                       | Monthly Cost | Upfront Cost |
|-------------------------------------|--------------|--------------|
| Current Configuration               | \$170.82     | \$0.00       |
| 1-year savings plan (~31% discount) | \$134.32     | \$0.00       |
| 3-year savings plan (~53% discount) | \$104.32     | \$0.00       |

The total estimated cost for the 1-year savings plan is \$305.14.

|   |   |  |
|---|---|--|
| <div> <span>Azure</span> </div>   |   | <div> <div>Contact Sales</div> <div>Try Azure for free</div> </div>  |
| <div> <div>\$170.82</div> <div>Average per month</div> <div>(\$0.00 charged upfront)</div> </div> | <div> <div>\$134.32</div> <div>Average per month</div> <div>(\$0.00 charged upfront)</div> </div>                                 | <div> <div>=</div> <div>\$305.14</div> <div>Average per month</div> <div>(\$0.00 charged upfront)</div> </div> |
| <div> <div>Managed Disks</div> <div>\$0.00</div> </div>   |   |  |
| <div> <div>Storage transactions</div> <div>\$0.00</div> </div>                                    |   |  |
| <div> <div>Bandwidth</div> <div>\$0.00</div> </div>   |   |  |
|   | <div>Upfront cost</div> <div>\$0.00</div>   |  |
|   | <div>Monthly cost</div> <div>\$305.14</div>   |  |
| <div> <div> <div>^</div> <div>Azure SQL Database</div> </div> </div>                              | <div> <div>①</div> <div>Single Database, vCore, General Purpose, Provision...</div> <div> <div>📄</div> <div>📄</div> </div> </div> | <div> <div>Upfront: \$0.00</div> <div>Monthly: \$1,567.39</div> </div>   |

Azure

Contact Sales

Try Azure for free

Azure SQL Database

Get \$200 credit plus free monthly amounts of popular services for 12 months—including Azure SQL Database. [See free amounts](#)

×

Region:

West US

Type: ①

Single Database

Purchase Model: ①

vCore

Service Tier: ①

General Purpose

Compute Tier: ①

Provisioned

Hardware Type: ①

Standard-series (Gen 5)

Instance: ①

8 vCore

Disaster Recovery: ①

Primary or Geo replica

Compute ①

Redundancy: ①

Locally Redundant

1

Databases

×

730

Hours

①

Savings Options

Save up to 73% on pay as you go prices with 1 year or 3 year reserved options.

Compute

●

Pay as you go

○

1 year reserved

○

3 year reserved

SQL License

●

Pay as you go

○

Azure Hybrid Benefit

○

Failover rights, standby replica

\$977.84

Average per month

(\$0.00 charged upfront)

\$583.80

Average per month

(\$0.00 charged upfront)

=

\$1,561.65

Average per month

(\$0.00 charged upfront)

Storage ①

Data

32

GB

×

1

Databases

×

\$0.138

Per GB/month

=

\$4.42

Log ①

9.6

×

1

×

\$0.138

=

\$1.32

### Backup Storage

Redundancy: [?](#)

RA-GRS

### Point-In-Time Restore

0

GB

\$0.240

Per GB/month

= \$0.00

### Long Term Retention

Average backup size during retention period

5

GB

### Retention Policy

Weekly Backup Retention

0

Number of weeks

Monthly Backup Retention

0

Number of months

Yearly Backup Retention

0

Number of years

Application Gateway

Web Application Firewall tier, Medium Instance size...

Upfront: \$0.00

Monthly: \$206.04

### Application Gateway

Region:

West US

Tier:

Web Application Firewall

Size:

Medium

[?](#) No charge for the first 10 TB of data processed for a Medium instance.

### Gateway hours

2

Instances

730

Hours

= \$206.04

### Data processed

1

TB

= \$0.00

### Outbound Data Transfer

5

GB

= \$0.00

Azure

Contact Sales

Try Azure for free

Upfront cost

\$0.00

Monthly cost

\$206.04

Virtual Machines

1 D2 v3 (2 vCPUs, 8 GB RAM) x 730 Hours (Pay as y...

Upfront: \$0.00

Monthly: \$137.24

Application Gateway

Basic tier, Small Instance size: 0 Gateway hours insta...

Upfront: \$0.00

Monthly: \$0.00

### Application Gateway

Region:

East US

Tier:

Basic

Size:

Small

### Gateway hours

0

Instances

730

Hours

= \$0.00

### Data processed

0

GB

= \$0.00

### Outbound Data Transfer



|  |              |        |
|--|--------------|--------|
|  | Upfront cost | \$0.00 |
|  | Monthly cost | \$0.00 |

Support

SUPPORT:

Basic (Included)

\$0.00

Select your program/offer

LICENSING PROGRAM:

Microsoft Customer Agreement (MCA)

Selected billing profile:  
None selected (change)

Show Dev/Test Pricing

Estimated upfront cost

\$0.00

Estimated monthly cost

\$2,215.80

Export

Save

Save as

Share

CURRENCY

United States - Dollar (\$) USD

Estimated upfront cost

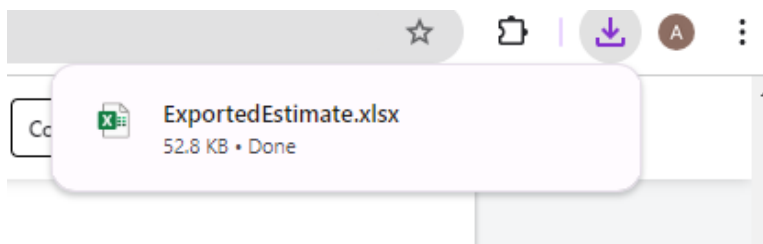
Estimated monthly cost

Export

Save

Share

[Log in](#) to save and share cost estimates.



Save estimate

Your estimate has been saved. Click on the Saved Estimates tab to view all your saved estimates

Done

OUTPUT :

|  |                          |                     |             |                   |   |                        |
|--|--------------------------|---------------------|-------------|-------------------|---|------------------------|
| ExportedEstimate (1) [Protected View] - Excel  |                          |                     |             |                   |   |                        |
| File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do  |                          |                     |             |                   |   |                        |
| PROTECTED VIEW Be careful—files from the Internet can contain viruses. Unless you need to edit, it's safer to stay in Protected View. Enable Editing |                          |                     |             |                   |   |                        |
| A1   | Microsoft Azure Estimate |                     |             |                   |   |                        |
|  | A                        | B                   | C           | D                 | E   | F                      |
| 1  | Microsoft Azure Estimate |                     |             |                   |   |                        |
| 2  | Your Estimate            |                     |             |                   |   |                        |
| 3  | Service category         | Service type        | Custom name | Region            | Description   | Estimated monthly cost |
| 4  | Compute                  | Virtual Machines    |             | West US           | 2 D2 v3 (2 vCPUs, 8 GB RAM) x 730 Hours (Pay as you go). Windows (License included). OS Only; 0 managed disks – 54; Inter Region transfer type. 5 GB outbound data transfer from West US to East Asia   | \$305.14               |
| 5  | Databases                | Azure SQL Database  |             | West US           | Single Database, vCore, General Purpose, Provisioned, Standard-series (Gen 5), Primary or Geo replica Disaster Recovery, Locally Redundant, 1 – 8 vCore Database(s) x 730 Hours, 32 GB Storage, SQL License (Pay as you go), RA-GRS Backup Storage Redundancy, 0 GB Point-in-Time Restore, 0 x 5 GB Long Term Retention | \$1,567.39             |
| 6  | Networking               | Application Gateway |             | West US           | Web Application Firewall tier, Medium Instance size: 2 Gateway hours instance(s) x 730 Hours, 1 TB Data processed unit(s), 5 GB Zone unit(s)  | \$206.04               |
| 7  | Compute                  | Virtual Machines    |             | East US           | 1 D2 v3 (2 vCPUs, 8 GB RAM) x 730 Hours (Pay as you go). Windows (License included). OS Only; 0 managed disks – 54; Inter Region transfer type. 5 GB outbound data transfer from East US to East Asia   | \$137.24               |
| 8  | Networking               | Application Gateway |             | East US           | Basic tier, Small Instance size: 0 Gateway hours instance(s) x 730 Hours, 0 GB Data processed unit(s), 5 GB Zone unit(s)  | \$0.00                 |
| 9  | Support                  |                     |             | Support           |   | \$0.00                 |
| 10   |                          |                     |             | Licensing Program | Microsoft Customer Agreement (MCA)  | \$0.00                 |
| 11   |                          |                     |             | Billing Account   |   |                        |
| 12   |                          |                     |             | Billing Profile   |   |                        |
| 13   |                          |                     |             | Total             |   | \$2,215.80             |

|  |   |                     |   |                   |   |            |
|--|---|---------------------|---|-------------------|---|------------|
| ExportedEstimate (1) [Protected View] - Excel  |   |                     |   |                   |   |            |
| File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do  |   |                     |   |                   |   |            |
| PROTECTED VIEW Be careful—files from the Internet can contain viruses. Unless you need to edit, it's safer to stay in Protected View. Enable Editing |   |                     |   |                   |   |            |
| A1   | Microsoft Azure Estimate  |                     |   |                   |   |            |
|  | A   | B                   | C | D                 | E   | F          |
| 5  |   |                     |   |                   | Standard-series (Gen 5), Primary or Geo replica Disaster Recovery, Locally Redundant, 1 – 8 vCore Database(s) x 730 Hours, 32 GB Storage, SQL License (Pay as you go), RA-GRS Backup Storage Redundancy, 0 GB Point-in-Time Restore, 0 x 5 GB Long Term Retention |            |
| 6  | Networking  | Application Gateway |   | West US           | Web Application Firewall tier, Medium Instance size: 2 Gateway hours instance(s) x 730 Hours, 1 TB Data processed unit(s), 5 GB Zone unit(s)  | \$206.04   |
| 7  | Compute   | Virtual Machines    |   | East US           | 1 D2 v3 (2 vCPUs, 8 GB RAM) x 730 Hours (Pay as you go). Windows (License included). OS Only; 0 managed disks – 54; Inter Region transfer type. 5 GB outbound data transfer from East US to East Asia   | \$137.24   |
| 8  | Networking  | Application Gateway |   | East US           | Basic tier, Small Instance size: 0 Gateway hours instance(s) x 730 Hours, 0 GB Data processed unit(s), 5 GB Zone unit(s)  | \$0.00     |
| 9  | Support   |                     |   | Support           |   | \$0.00     |
| 10   |   |                     |   | Licensing Program | Microsoft Customer Agreement (MCA)  | \$0.00     |
| 11   |   |                     |   | Billing Account   |   |            |
| 12   |   |                     |   | Billing Profile   |   |            |
| 13   |   |                     |   | Total             |   | \$2,215.80 |
| 14   |   |                     |   |                   |   | \$0.00     |
| 15   | Disclaimer  |                     |   |                   |   |            |
| 16   | All prices shown are in United States – Dollar (\$) USD. This is a summary estimate, not a quote. For up to date pricing information please visit <a href="https://azure.microsoft.com/pricing/calculator/">https://azure.microsoft.com/pricing/calculator/</a> |                     |   |                   |   |            |
| 17   | This estimate was created at 8/10/2024 4:06:36 AM UTC.  |                     |   |                   |   |            |
| 18   |   |                     |   |                   |   |            |

## 4. COMPARE WORKLOAD COSTS USING THE TCO CALCULATOR

- Define your workloads

Enter the specifications of your on-premises infrastructure into the TCO Calculator.

1. Go to the [TCO Calculator](#).
  2. Under **Define your workloads**, select **Add server workload** to create a row for your bank of Windows Server VMs.
  3. Under **Servers**, set the value for each of these settings.
  4. Select **Add server workload** to create a second row for your bank of Linux VMs. Then specify these settings.
  5. Under **Storage**, select **Add storage**. Then specify these settings.
  6. Under **Networking**, set **Outbound bandwidth** to **15 TB**.
  7. Select **Next**.
- In practice, you would adjust any cost assumptions and make any adjustments to match your current on-premises environment.
  - At the top of the page, select your currency. This example uses **US Dollar (\$)**.
  - Select **Next**.
  - **View the report**
  - Take a moment to review the generated report.
  - Remember, you've been tasked to investigate cost savings for your European datacenter over the next three years.

To make these adjustments:

1. Set **Timeframe** to **3 Years**.
2. Set **Region** to **North Europe**.

Scroll to the summary at the bottom. You see a comparison of running your workloads in the datacenter versus on Azure.

## WORKING :

The screenshot shows the Azure TCO Calculator web application. The header includes the Azure logo, navigation links (Explore, Products, Solutions, Pricing, Partners, Resources), a search bar, and links for Learn, Support, Contact Sales, Try Azure for free, and Sign in. The main heading is "Total Cost of Ownership (TCO) Calculator" with the subtitle "Estimate the cost savings you can realize by migrating your workloads to Azure". Below this is a progress bar with three steps: 1. Define your workloads, 2. Adjust assumptions, and 3. View report. The current step is "Define your workloads". On the right, there are links for "Bulk Upload", "My saved reports", and a user profile for "Prithivi Pappian" with the email "prithivipappian@gmail.com".

### 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.

The "Servers" section contains a form for adding a workload. It includes a "Workload" dropdown (Windows/Linux Server), an "Environment" dropdown (Virtual Machines), an "Operating system" dropdown (Windows), an "Operating System License" dropdown (Datacenter), a "VMs" input field (50), a "Virtualization" dropdown (Hyper-V), a "Core(s)" input field (8), a "RAM (GB)" input field (16), an "Optimize by" dropdown (CPU), and a "Windows Server 2008/2008 R2" checkbox. A "Chat with Sales" button is located at the bottom right.

The screenshot shows the "Databases" and "Storage" sections. The "Databases" section has a heading "Databases" and a description: "Enter the details of your on-premises database infrastructure. After adding a database, enter the details of your on-premises database infrastructure in the Source section. In the Destination section, select the Azure service you would like to use." Below this is an "Add database" button. The "Storage" section has a heading "Storage" and a description: "Enter the details of your on-premises storage infrastructure. After adding storage, select the storage type and enter the remaining details." Below this is a "Server Storage" section with a "Storage type" dropdown (Local Disk/SAN), a "Disk type" dropdown (HDD), a "Capacity" input field (60), a "Backup" input field (120), and an "Archive" input field (0). A "Shipping Tool" notification box is visible in the bottom right corner, stating "Screenshot copied to clipboard and saved. Select here to mark up and share."

Azure
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### Storage

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

Server Storage
+

Storage type <sup>ⓘ</sup>

Local Disk/SAN

Disk type <sup>ⓘ</sup>

HDD

Capacity <sup>ⓘ</sup>

60

TB

(1 - 5000)

Backup <sup>ⓘ</sup>

120

TB

(0 - 5000)

Archive <sup>ⓘ</sup>

0

TB

(0 - 5000)

+ Add storage

Outbound bandwidth <sup>ⓘ</sup>

15

TB

(1 - 2000)

Destination Region

East Asia

Next

Pricing Calculator | Microsoft
Total Cost of Ownership (TCO)

[azure.microsoft.com/en-us/pricing/tco/calculator/](#)

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## Total Cost of Ownership (TCO) Calculator

Estimate the cost savings you can realize by migrating your workloads to Azure

1 Define your workloads
2 Adjust assumptions
3 View report

My saved reports

Prithivi Pappian  
prithivipappian@gmail.com

### Adjust assumptions

The following assumptions in the TCO model are industry averages accredited by Nucleus Research. To get a more accurate TCO report, update and customize these values to reflect your situation, which can vary by industry and location.

Currency
United States - Dollar (\$) U

Software Assurance coverage (provides Azure Hybrid Benefit)

Enable this if you have purchased this benefit for your on-premises Windows or SQL Servers. If enabled, Azure Hybrid Benefit (AHB) will be applied to Azure estimates. AHB helps you get more value from your on-premises licenses — save up to 40 percent on virtual machines and up to 82 percent with Azure Reserved Virtual Machines (VM) instances.

Windows Server Software Assurance coverage

Software Assurance coverage (provides Azure Hybrid Benefit)

Enable this if you have purchased this benefit for your on-premises Windows or SQL Servers. If enabled, Azure Hybrid Benefit (AHB) will be applied to Azure estimates. AHB helps you get more value from your on-premises licenses — save up to 40 percent on virtual machines and up to 82 percent with Azure Reserved Virtual Machines (VM) instances.

Windows Server Software Assurance coverage

SQL Server Software Assurance coverage

[Learn more about Software Assurance >](#)
[Learn more about Azure Hybrid Benefit >](#)

Geo-redundant storage (GRS)

GRS replicates your data to a secondary region that is hundreds of miles away from the primary region.

[Learn more about GRS >](#)

Virtual Machine costs

Enable this for the Calculator to not recommend Bs-series virtual machines <sup>ⓘ</sup>

[Learn more about Bs-series virtual machines >](#)

Electricity costs

Price per KW hour <sup>ⓘ</sup>

0.1334 USD

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Storage costs

Storage procurement cost/GB for local disk/SAN-SSD ⓘ

0.4

USD

Storage procurement cost/GB for local disk/SAN-HDD ⓘ

0.2

USD

Storage procurement cost/GB for NAS/file storage ⓘ

0.2

USD

Storage procurement cost/GB for Blob storage ⓘ

0.2

USD

Annual enterprise storage software support cost ⓘ

10

%

Cost per tape drive ⓘ

160

USD

IT labor costs

Number of physical servers that can be managed by a full time administrator

100

Number of virtual machines that can be managed by a full time administrator

120

Hourly rate for IT administrator ⓘ

23

USD

Other assumptions

The following assumptions also affect the TCO model, but typically require less adjustment by customers. You can come back to this section at any time and adjust the assumptions.

Hardware costs ⓘ

Chat with Sales

Azure

Contact Sales

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Other assumptions

The following assumptions also affect the TCO model, but typically require less adjustment by customers. You can come back to this section at any time and adjust the assumptions.

Hardware costs ⓘ

Software costs ⓘ

Electricity costs ⓘ

Virtualization costs

Data center costs

Networking costs

Database costs ⓘ

Data warehouse costs

Back

Next

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Total Cost of Ownership (TCO) Calculator

Estimate the cost savings you can realize by migrating your workloads to Azure

1

2

3

Define your workloads

Adjust assumptions

View report

My saved reports

Prithivi Papplan  
prithivipapplan@gmail.com

View report

Timeframe ⓘ

5 Years

Region ⓘ

East US

Licensing program ⓘ

Microsoft Online Services Program

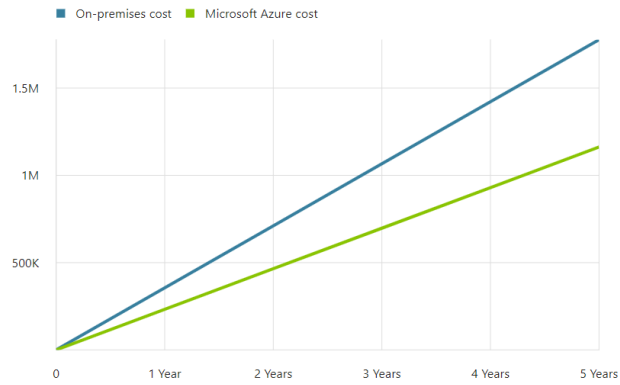
Show Dev/Test Pricing ⓘ

Over 5 year(s) with Microsoft Azure, your estimated cost savings could be as much as \$614,638

Chat with Sales

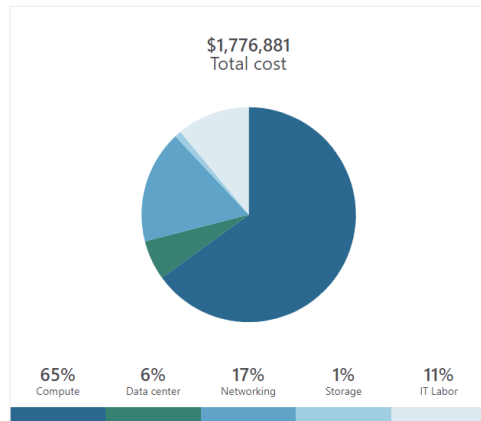
### Total on-premises vs. Azure cost over time

Savings from running workloads in Azure accrue over time. The following shows how those savings add up over years.



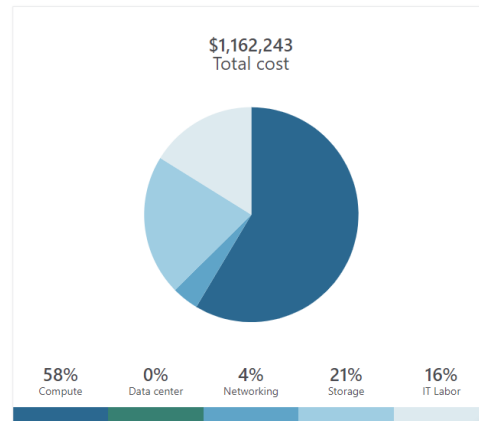
### Total on-premises over 5 year(s)

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



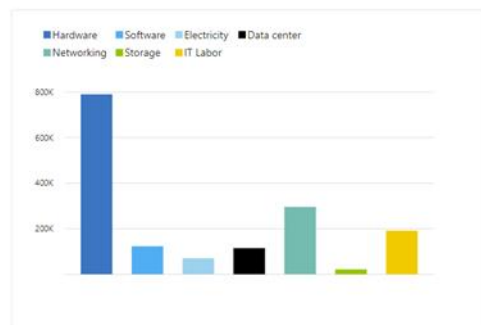
### Total Azure cost over 5 year(s)

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



### Total on-premises cost breakdown

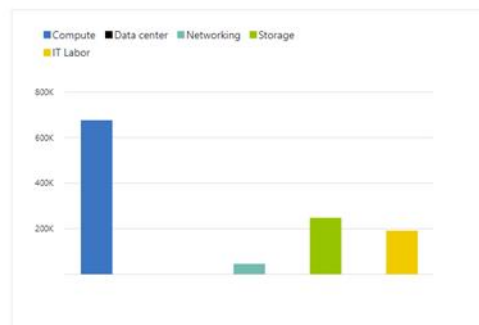
In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.



**\$1,776,881**  
Cost over 5 year(s)

### Total Azure cost breakdown

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



**\$1,162,243**  
Cost over 5 year(s)



| On-premises cost breakdown summary |                | Azure cost breakdown summary |                |
|------------------------------------|----------------|------------------------------|----------------|
| Category                           | Cost           | Category                     | Cost           |
| Compute                            | \$1,152,920.80 | Compute                      | \$676,416.00   |
| Hardware                           | \$790,280.00   | Data Center                  | \$0.00         |
| Software                           | \$123,100.00   | Networking                   | \$46,065.00    |
| Electricity                        | \$70,276.80    | Storage                      | \$248,094.72   |
| Virtualization                     | \$169,264.00   | IT Labor                     | \$191,667.05   |
| Data Center                        | \$114,862.60   |                              |                |
| Networking                         | \$295,798.05   |                              |                |
| Storage                            | \$21,632.00    |                              |                |
| IT Labor                           | \$191,667.05   |                              |                |
| Total                              | \$1,776,881.00 | Total                        | \$1,162,243.00 |

| Estimated on-premises cost (5 year(s)) | Estimated Azure cost (5 year(s)) |
|--|----------------------------------|
|--|----------------------------------|

|  |                        |
|--|------------------------|
| <input checked="" type="checkbox"/> Data center cost | Azure data center cost |
| <input checked="" type="checkbox"/> Networking cost  | Azure networking cost  |
| <input checked="" type="checkbox"/> Storage cost     | Azure storage cost     |
| <input checked="" type="checkbox"/> IT labor cost    | Azure IT labor cost    |

|   |                |                                    |                |
|---|----------------|------------------------------------|----------------|
| Total on-premises cost over five year(s)                    | \$1,776,881.00 | Total Azure cost over five year(s) | \$1,162,243.00 |
| A total savings of <b>\$614,638.00</b> with Microsoft Azure |                |                                    |                |

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## Total Cost of Ownership (TCO) Calculator

Estimate the cost savings you can realize by migrating your workloads to Azure

My saved reports

Prithivi Pappian  
prithivipappian@gmail.com

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## My saved reports

Select one of the saved reports below to view, adjust a TCO assessment or start another assessment.

| ASSESSMENT  | TIMEFRAME | SAVINGS   | CREATED              |  |
|-------------|-----------|-----------|----------------------|--|
| Windows VMs | 5 Years   | \$614,638 | 8/10/2024 9:46:13 AM |  |

Start Another Assessment