



Introduction to Azure & Cloud Concepts

Aligned with Microsoft Certification Exam AZ-900



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Course Topics

Cloud Concepts
Azure Management Tools
Azure Subscriptions
Azure Cost Management
Azure Support

AZ-900 Objective Domains

- + Understand cloud concepts (15-20%)
- + Understand core Azure services (30-35%)
- + Understand security, privacy, compliance, and trust (25-30%)
- + Understand Azure pricing and support (20-25%)

Exam AZ-900: Microsoft Azure Fundamentals

- + Describe the benefits and considerations of using cloud services
 - + understand terms such as high availability, scalability, elasticity, agility, fault tolerance, and disaster recovery
 - + understand the principles of economies of scale
 - + understand the differences between Capital Expenditure (CapEx) and Operational Expenditure (OpEx)
 - + understand the consumption-based model
- + Describe the differences between Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS)
 - + describe Infrastructure-as-a-Service (IaaS)
 - + describe Platform-as-a-Service (PaaS)
 - + describe Software-as-a-Service (SaaS)
 - + compare and contrast the three different service types
- + Describe the differences between public, private and hybrid cloud models
 - + describe public cloud
 - + describe private cloud
 - + describe hybrid cloud
 - + compare and contrast the three different cloud models

Exam AZ-103: Microsoft Azure Fundamentals

+ Understand Azure subscriptions

- + describe an Azure subscription
- + understand the uses and options with Azure subscriptions such as access control and offer types
- + understand subscription management using Management groups

+ Understand planning and management of costs

- + understand options for purchasing Azure products and services
- + understand options around Azure Free account
- + understand the factors affecting costs such as resource types, services, locations, ingress, and egress traffic
- + understand Zones for billing purposes
- + understand the Pricing calculator
- + understand the Total Cost of Ownership (TCO) calculator
- + understand best practices for minimizing Azure costs such as performing cost analysis, creating spending limits and quotas, using tags to identify cost owners, using Azure reservations, and using Azure Advisor recommendations
- + describe Azure Cost Management

Exam AZ-103: Microsoft Azure Fundamentals

- + Understand the support options available with Azure
 - + understand support plans that are available such as Dev, Standard, Professional Direct, and Premier
 - + understand how to open a support ticket
 - + understand available support channels outside of support plan channels
 - + describe the Knowledge Center
- + Describe Azure Service Level Agreements (SLAs)
 - + describe a Service Level Agreement (SLA)
 - + understand Composite SLAs
 - + understand how to determine an appropriate SLA for an application
- + Understand service lifecycle in Azure
 - + understand public and private preview features
 - + understand the term General Availability (GA)
 - + understand how to monitor feature updates and product changes

Pre-requisites

- Understanding of basic information technology (IT) concepts

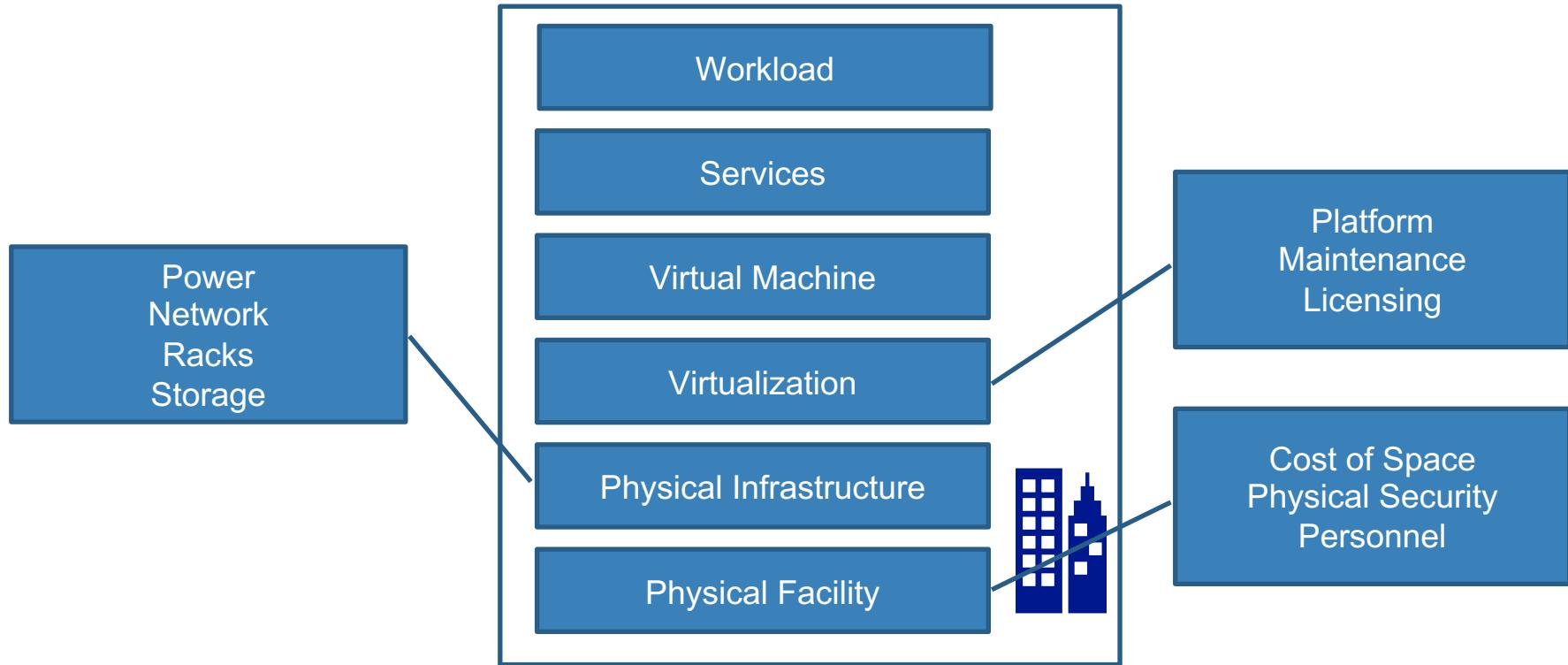


What is the Cloud?

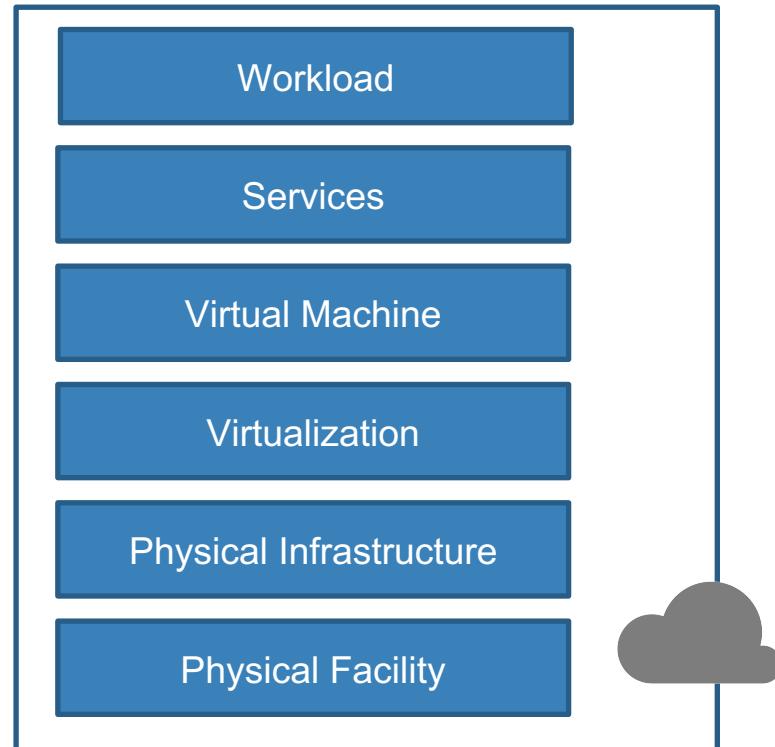
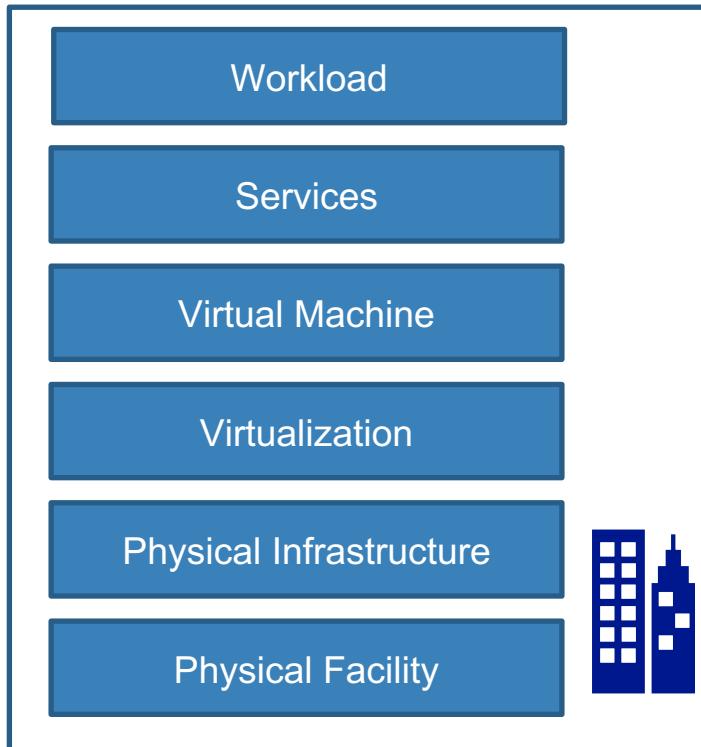
What is the Cloud?

- + Cloud Architecture
- + Types of Cloud Services
- + Accessing Cloud Services
- + Demo: Why I Love the Cloud

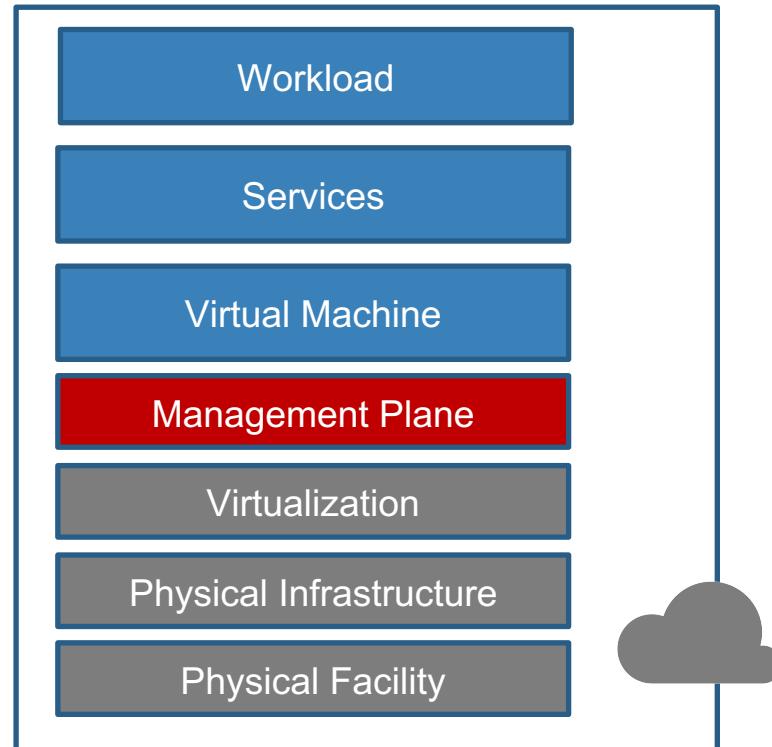
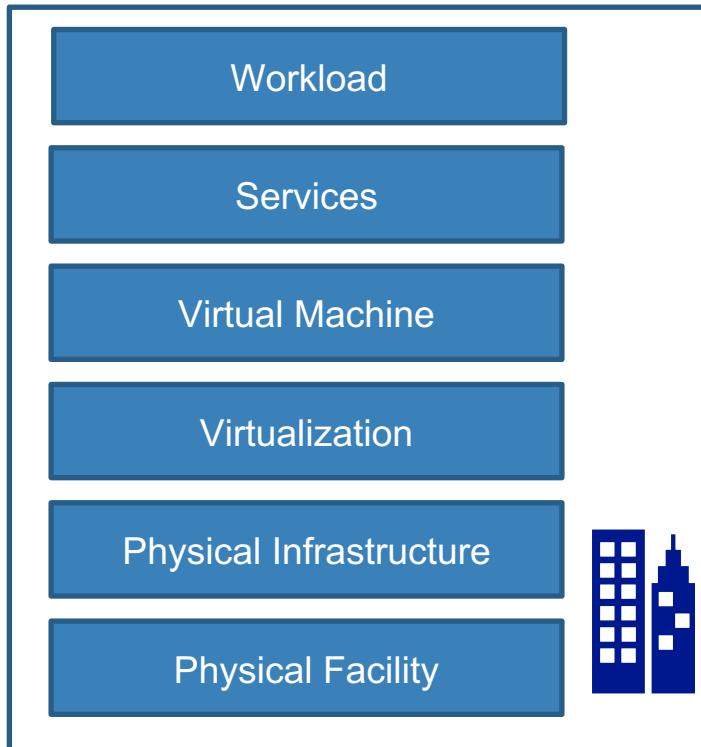
On-Premises Information Systems Architecture



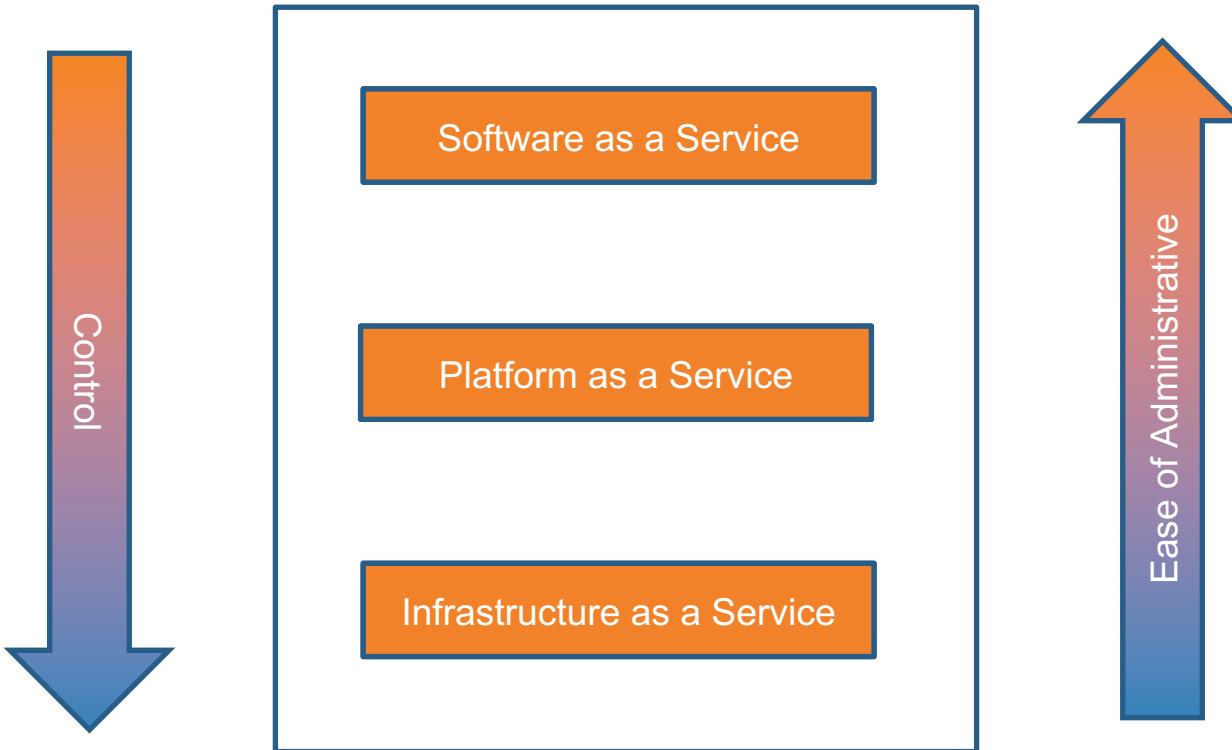
Cloud Architecture



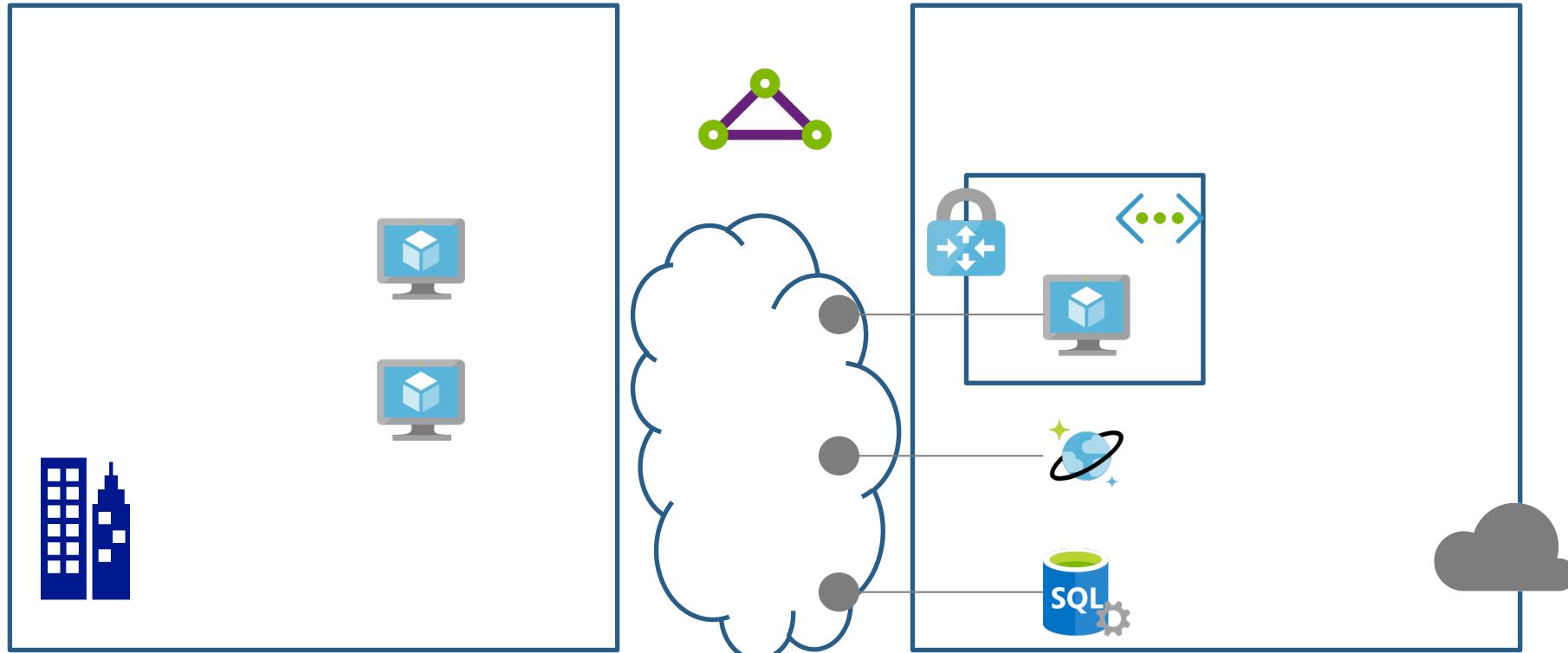
Cloud Architecture



Types of Cloud Services



Accessing Cloud Services



Demo: Why I Love the Cloud



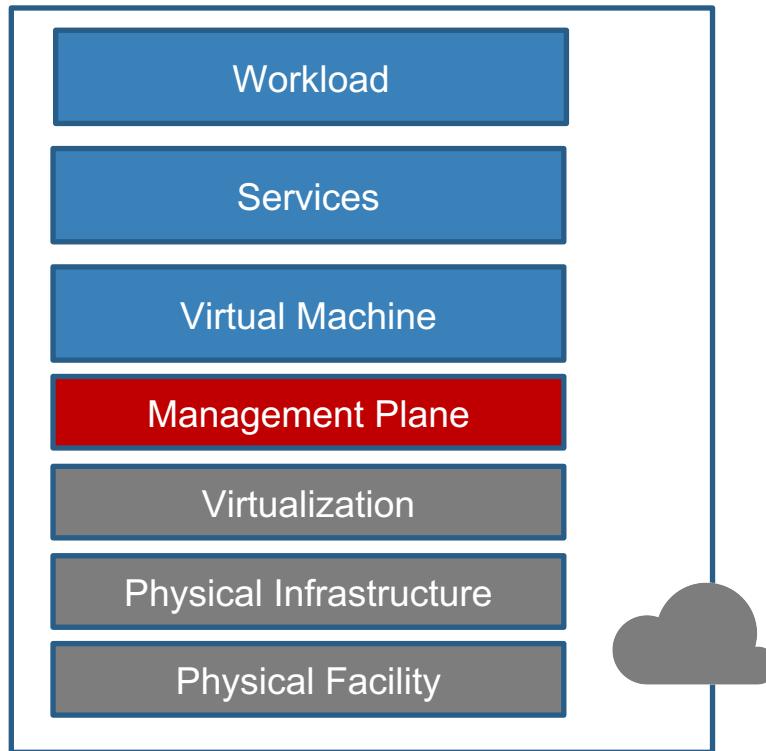


What is Azure?

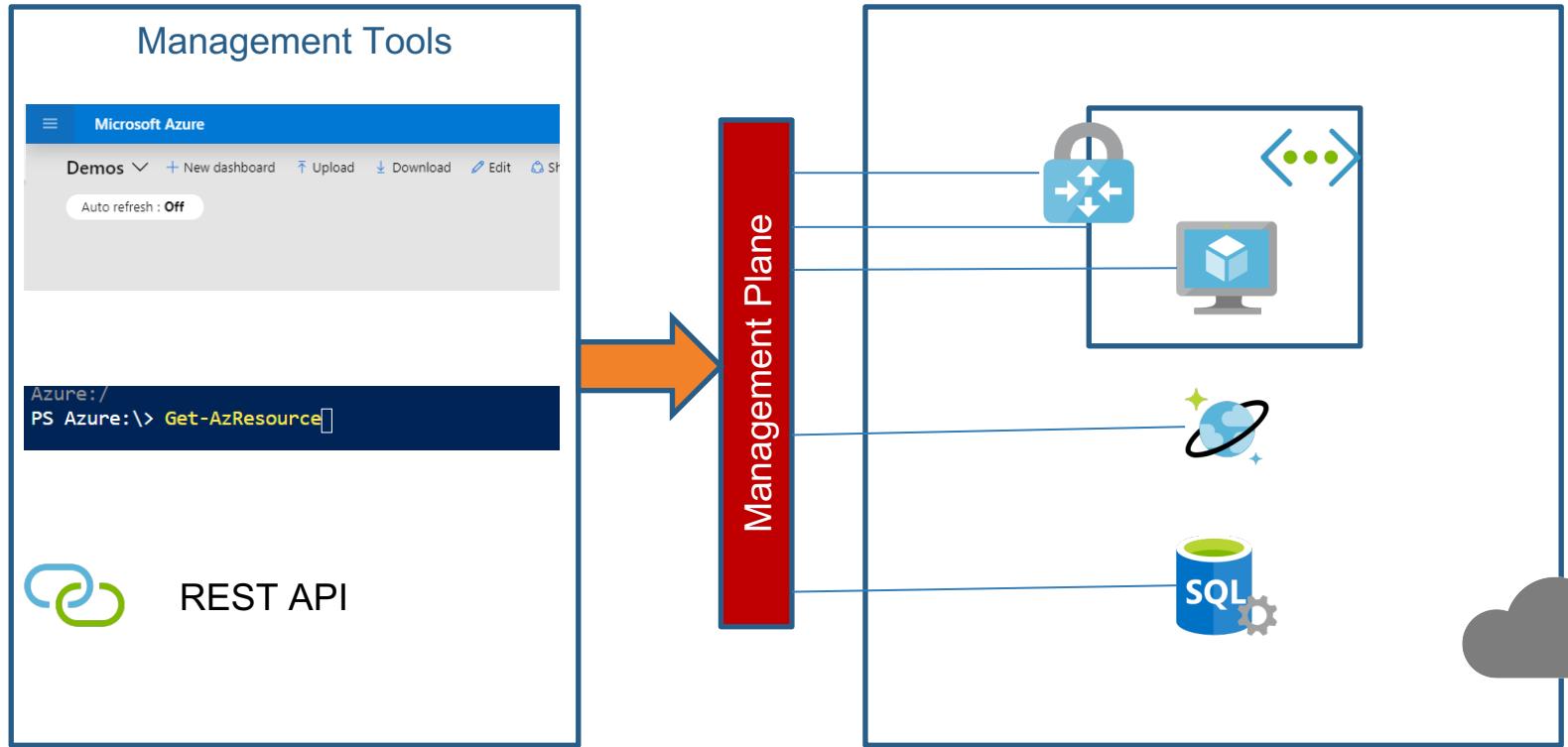
What is Azure?

- + Azure as a Cloud Provider
- + Azure Clouds
- + Demo: Azure Regions
- + Azure Billing Models

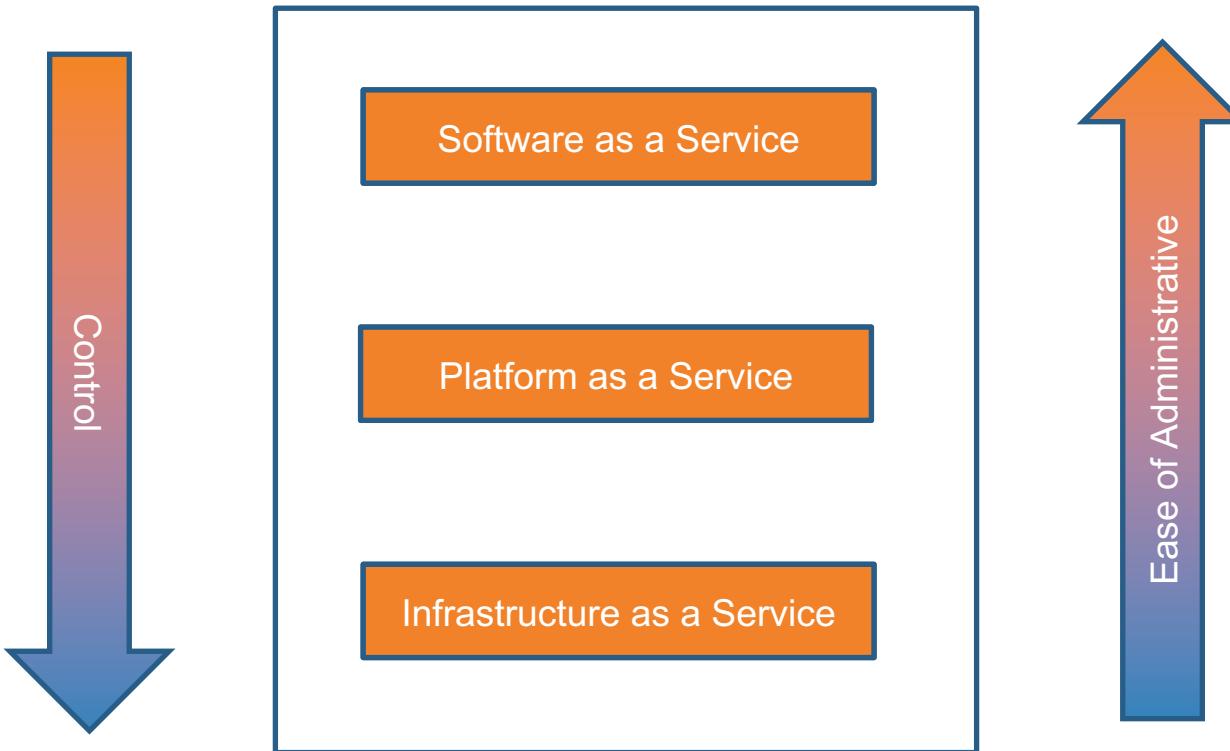
Azure as a Cloud Provider



Azure as a Cloud Provider



Azure as a Cloud Provider



Azure Clouds

- + Azure Public Cloud
- + Microsoft Cloud for US Government
- + Microsoft Cloud Germany
- + Azure and Office 365 operated by 21Vianet in China

Demo: Azure Regions



Azure Billing Models

- + Capacity based billing
- + Consumption based billing
- + Fee-based billing

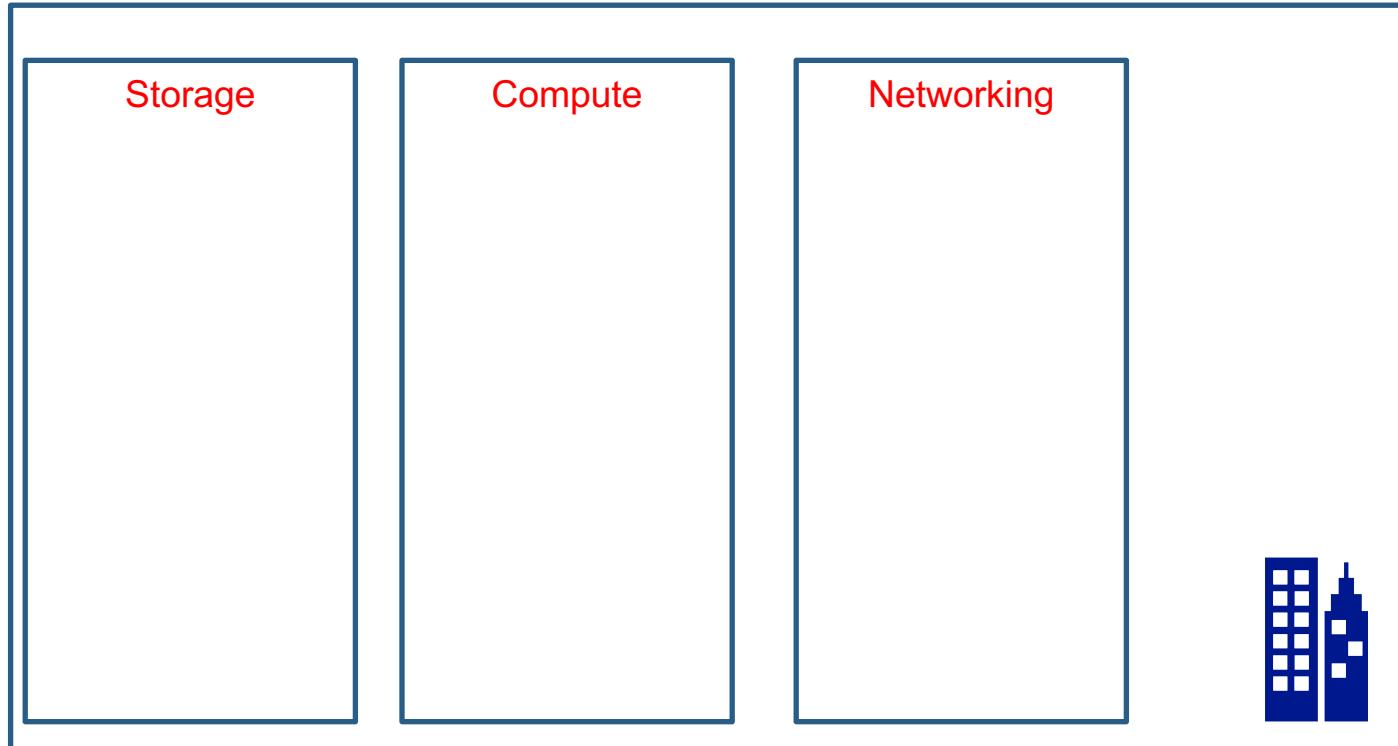


Why Choose the Cloud?

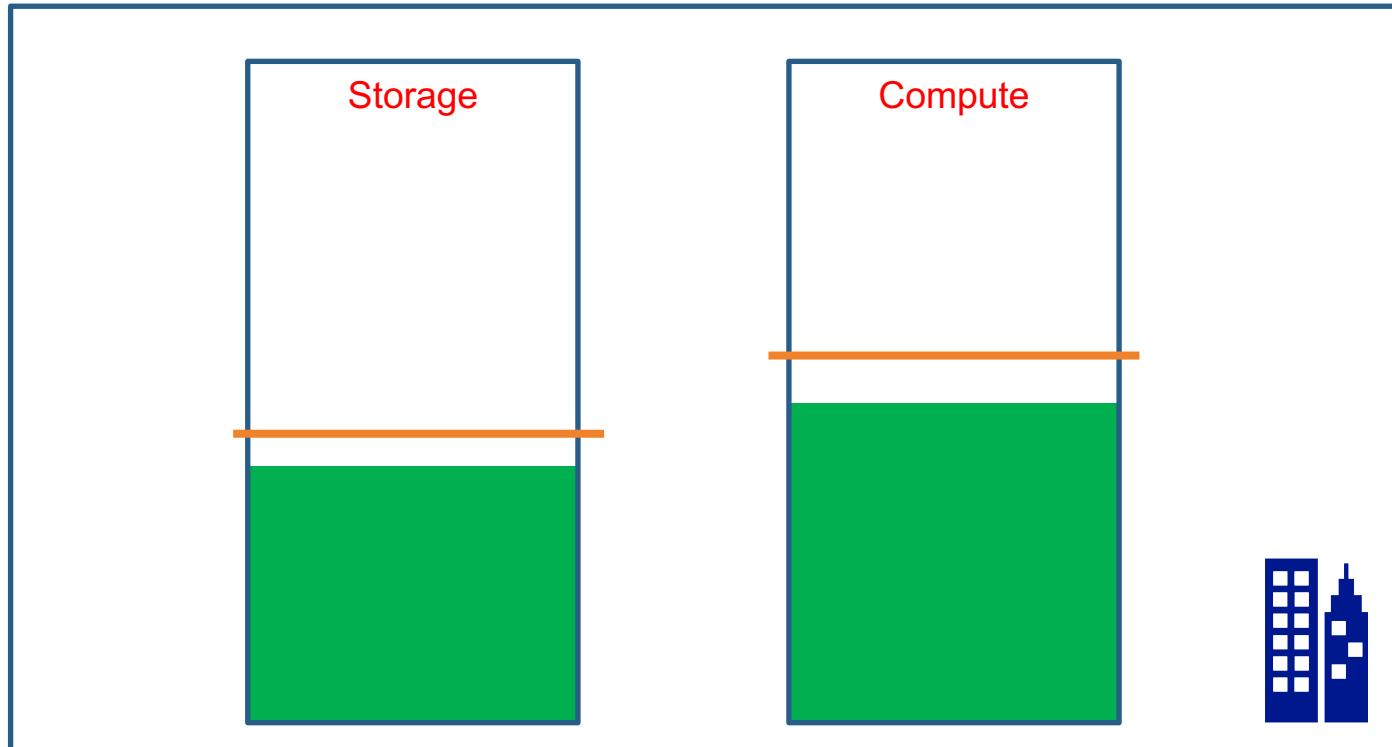
Why Choose the Cloud?

- + Cloud Economics
- + CapEx vs. OpEx
- + Consumption-Based Spending
- + Functional Advantages
- + Also, Maybe Not

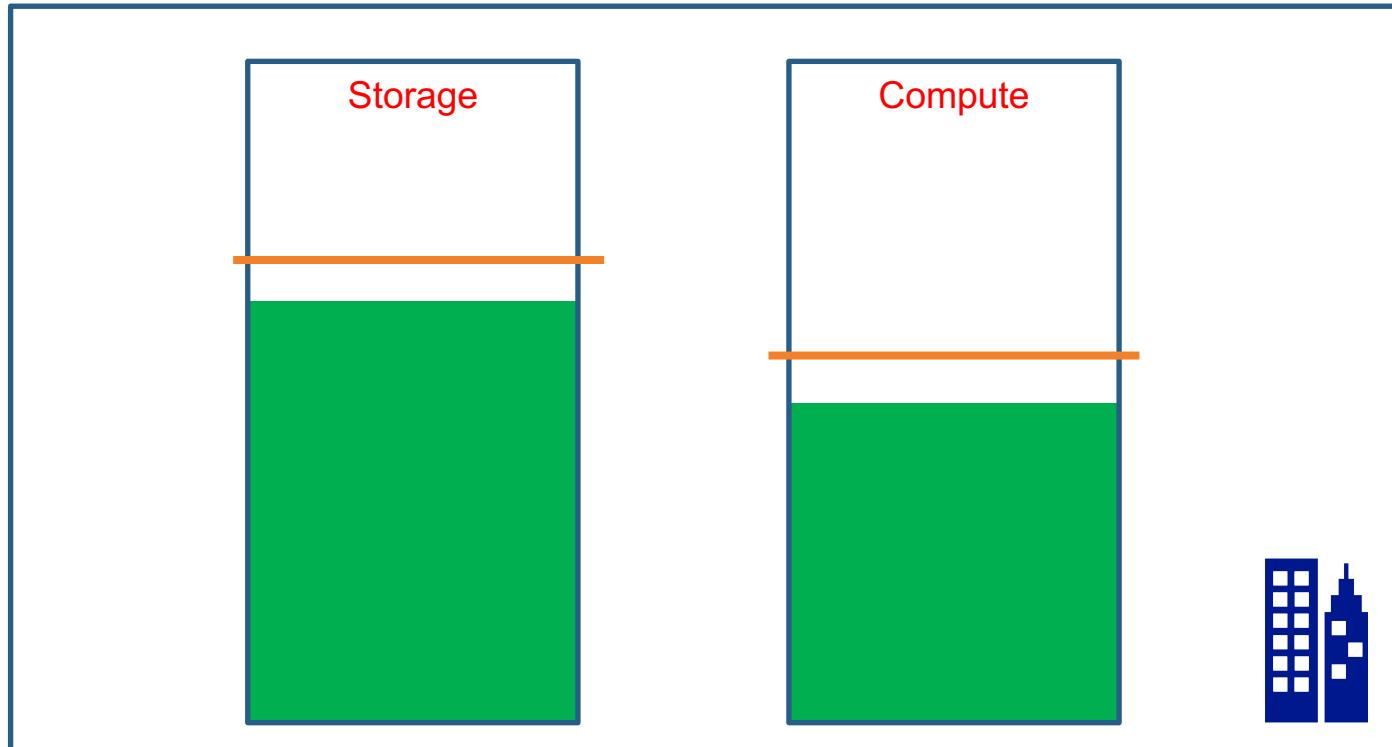
Cloud Economics



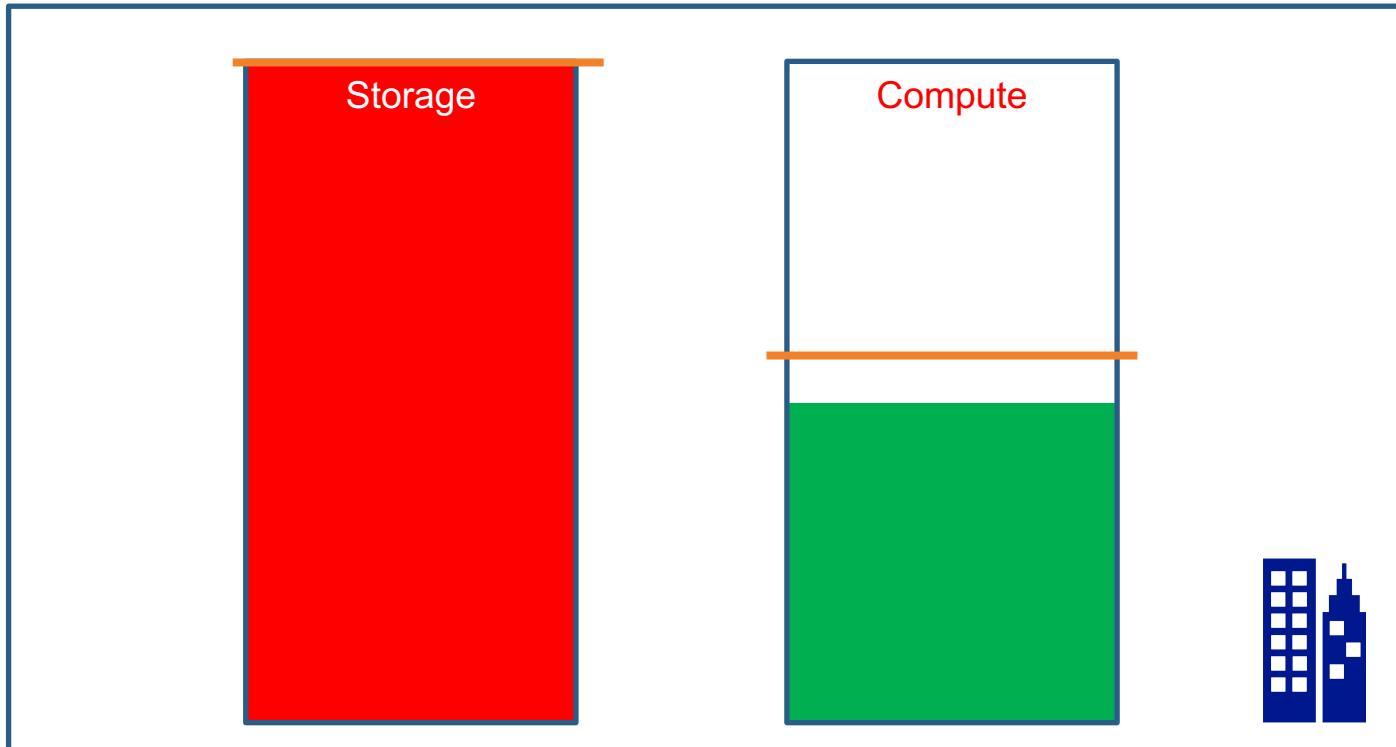
Cloud Economics



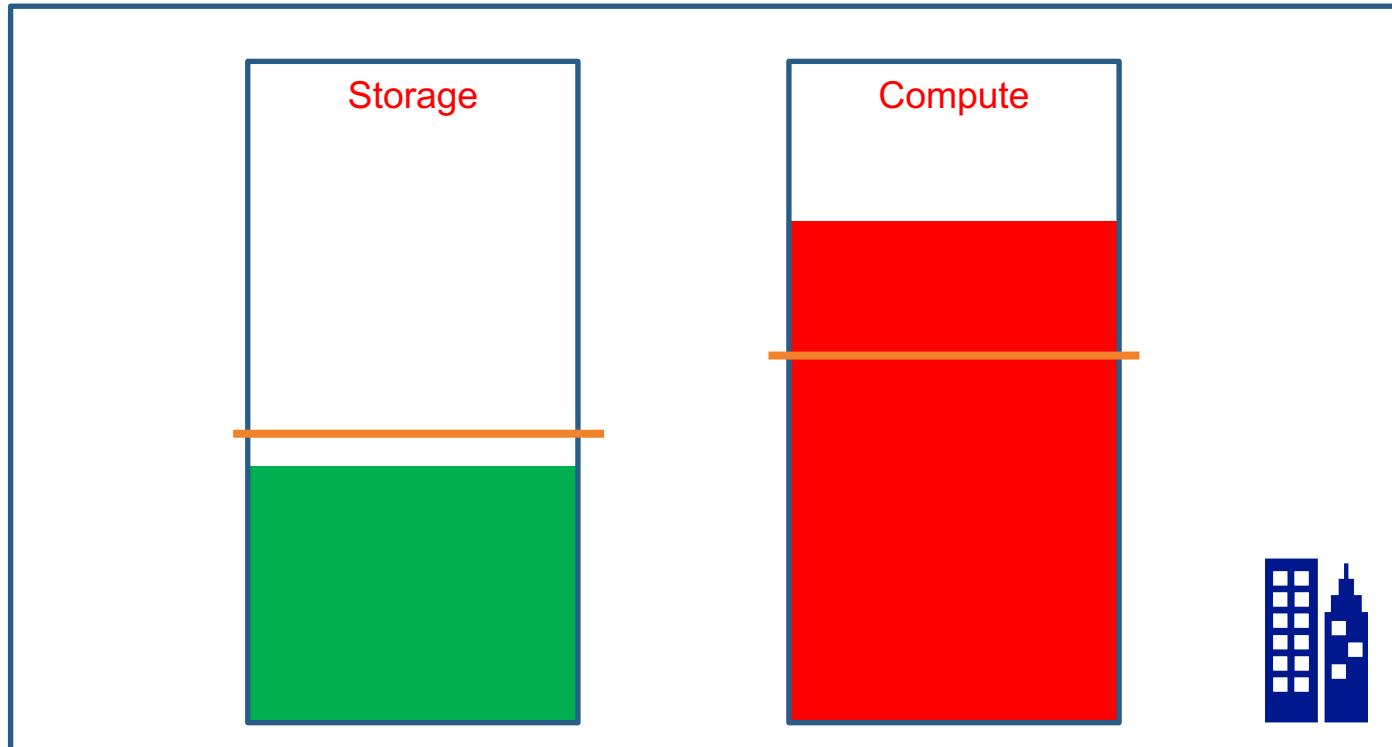
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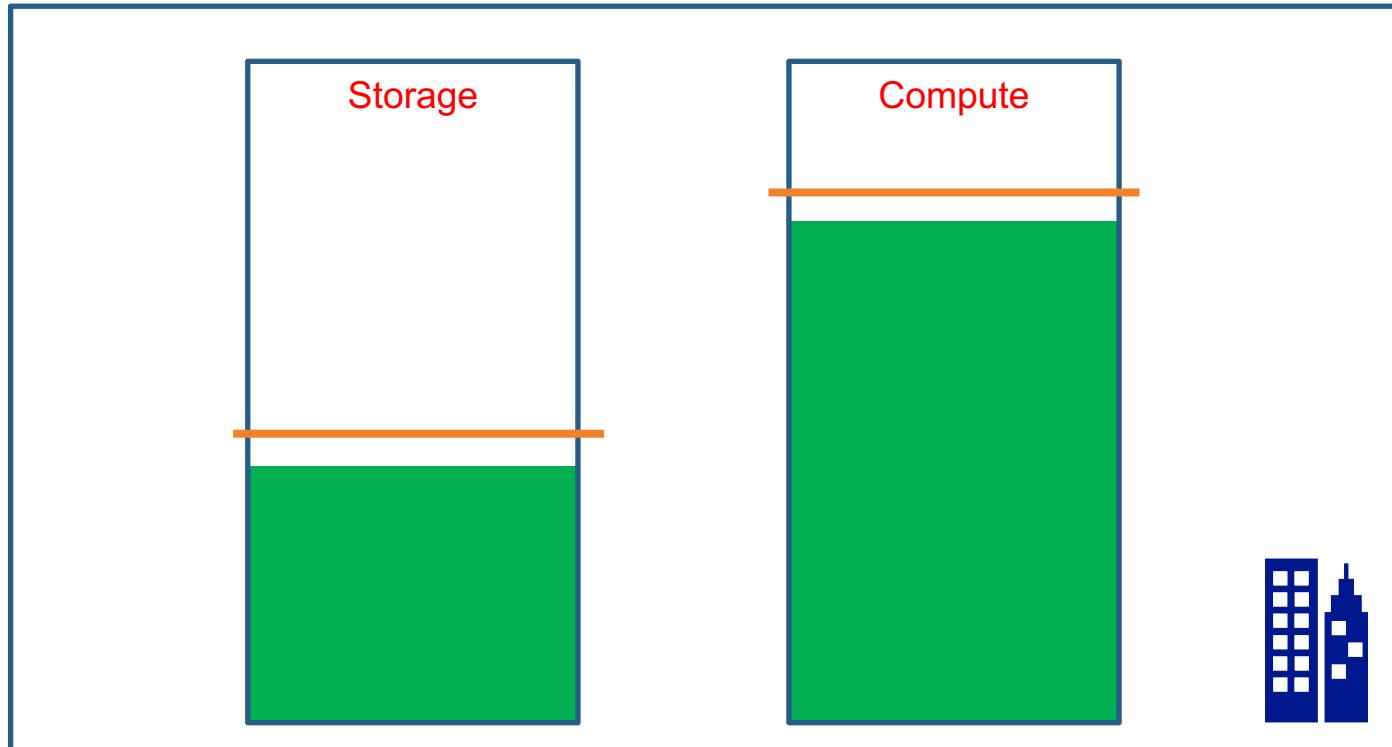
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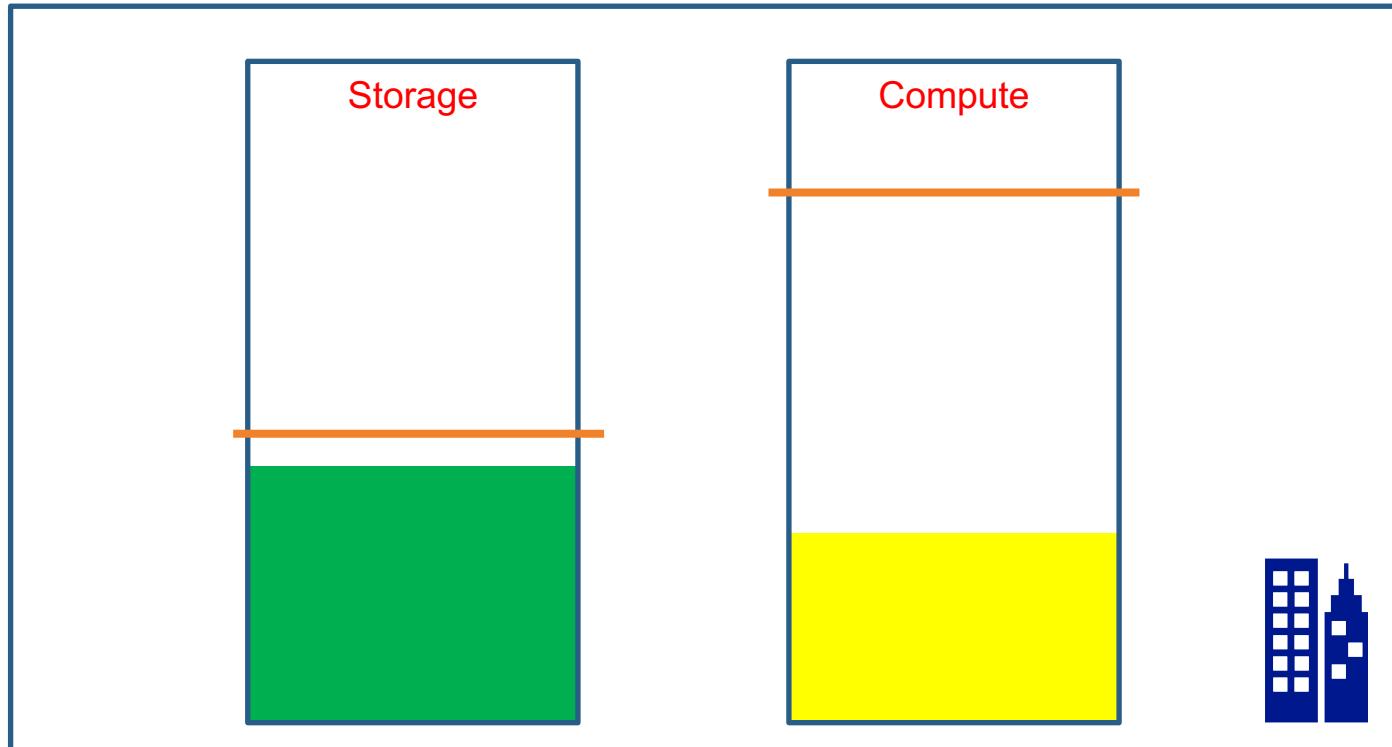
Cloud Economics



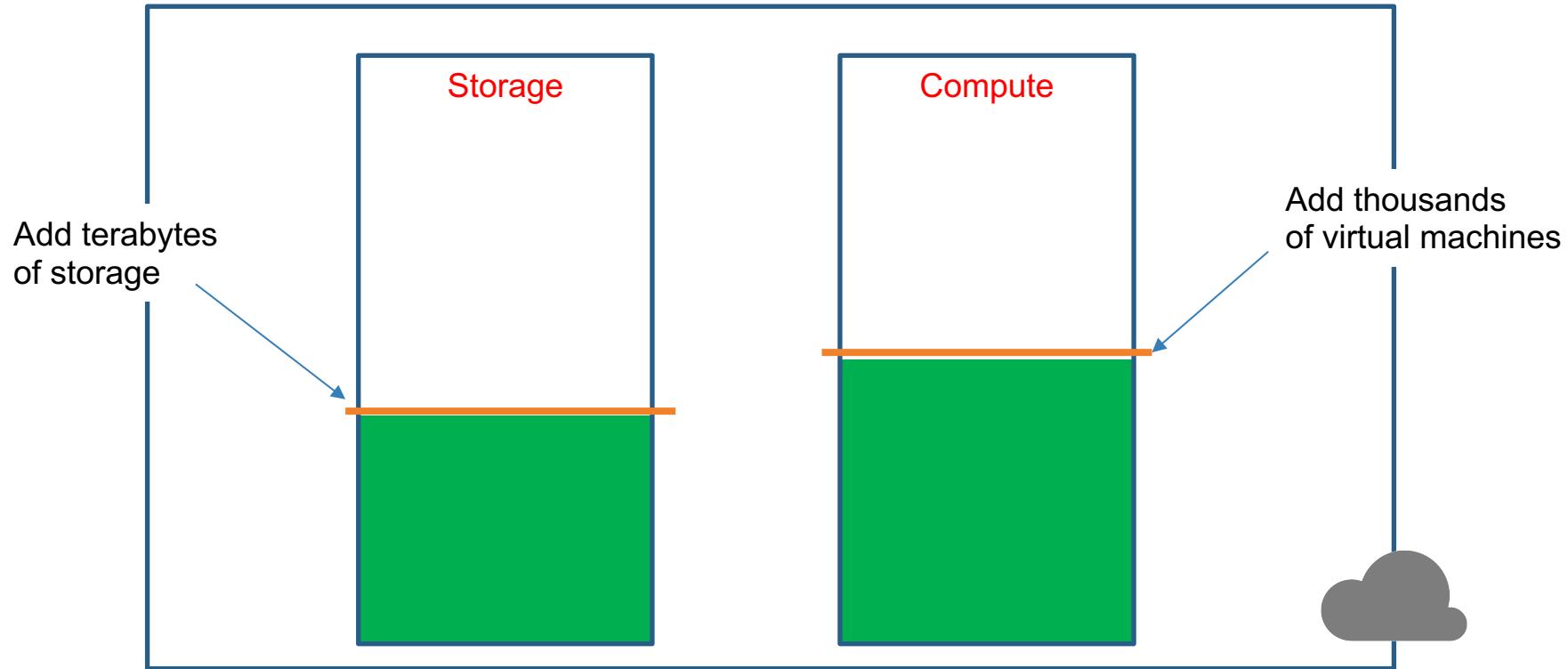
Cloud Economics



Cloud Economics



Cloud Economics



CapEx vs. OpEx

- + On-premises capacity expansion = capital expense
 - + Purchase equipment and licensing up-front
 - + Depreciate and replace equipment
 - + Renew licenses
- + Cloud-base capacity expansion = operational expense
 - + Billed monthly for what is used
 - + No equipment purchase
 - + May or may not require license purchase
- + Capacity reduction
 - + On-premises – possibly sell excess equipment
 - + Cloud – reduce monthly cost

Consumption-Based Spending

- + Capacity-based spending
 - + On-premises resources
 - + Some Azure resources – virtual machines
- + Consumption-based spending
 - + Pay only for what is used
 - + Function apps, logic apps, storage accounts

Functional Advantages

- + Provision environments in minutes rather than days, weeks, or months
 - + No capital equipment purchases
 - + Streamlined provisioning process
- + Built-in access and allocation management
- + Reduced administrative overhead

Also, Maybe Not

- + Existing capital investment
- + On-going operational expenses
- + Data fencing
- + Regulatory compliance

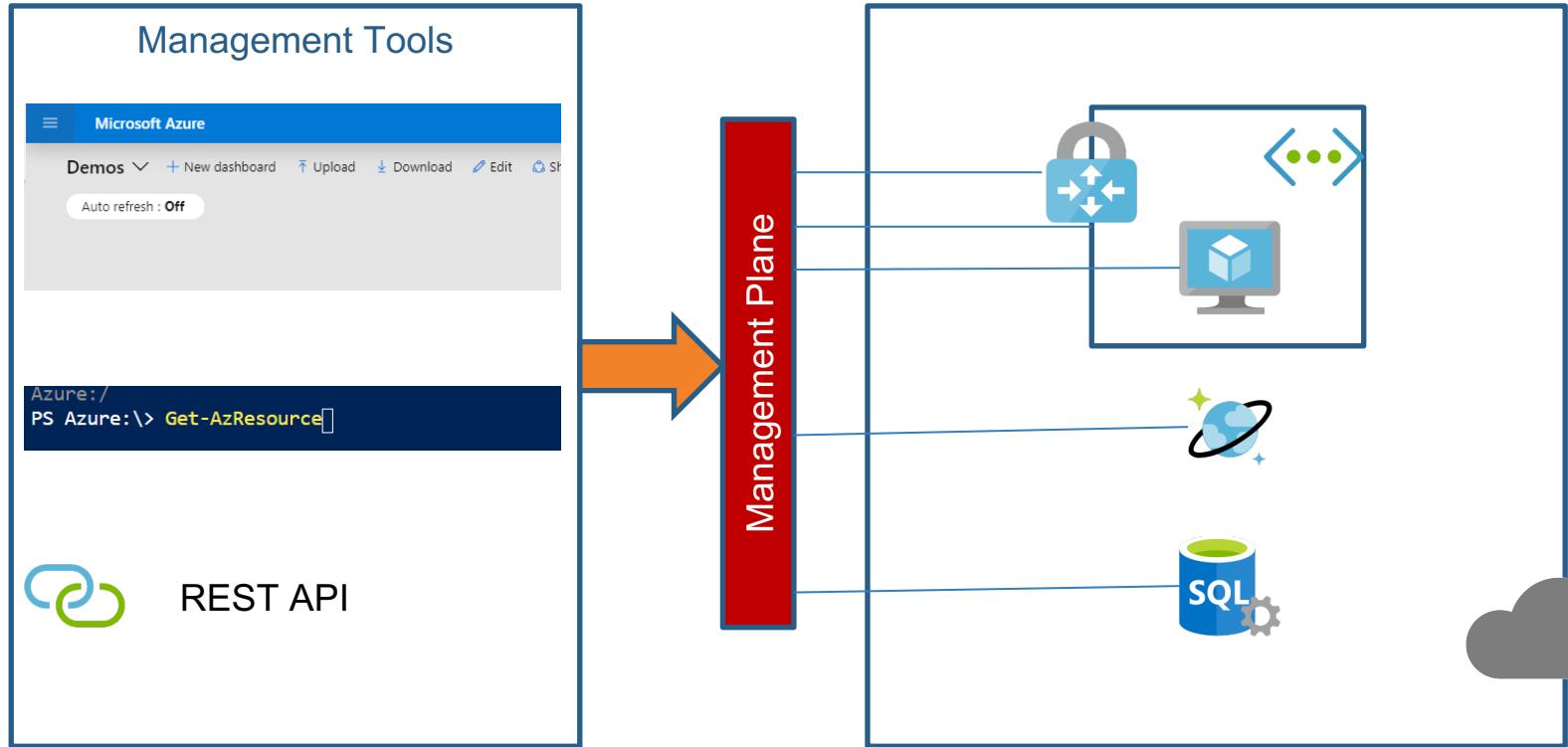


Azure Management Tools

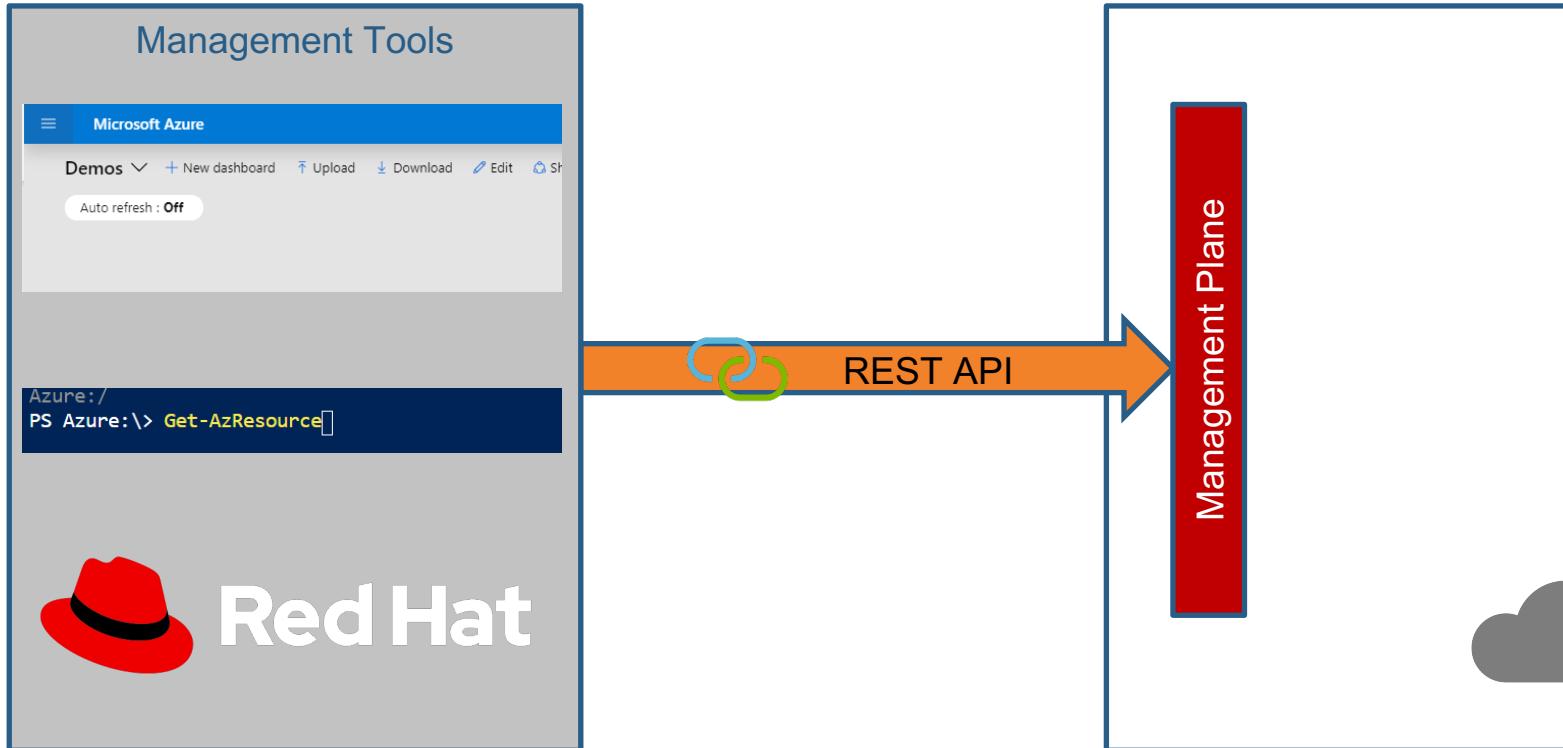
Azure Management Tools

- + Azure Management Plane
- + Azure Portal
- + Azure Command Line Tools
- + Azure REST API
- + Azure Cloud Shell
- + Demo: Azure Management Tools

Azure Management Plane



Azure Management Plane



Azure Portal

Dashboard > New > Create a virtual machine

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. Looking for classic VMs? [Create VM from Azure Marketplace](#)

Project details

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

Subscription * ⓘ INE Demonstrations

Resource group * ⓘ Select existing... Create new

Instance details

Virtual machine name * ⓘ

Region * ⓘ (US) Central US

Availability options ⓘ No infrastructure redundancy required

Image * ⓘ Windows Server 2016 Datacenter [Browse all public and private images](#)

Azure Spot instance ⓘ Yes No

Size * ⓘ Standard DS1 v2
1 vcpu, 3.5 GiB memory (\$93.74/month)
[Change size](#)

Administrator account

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

Azure Command Line Tools

```
PS D:\> New-AzVm -ResourceGroupName demo -Location eastus -Name demo-vm
```

```
az vm create -n MyVm -g MyResourceGroup --image Centos --zone 1
```

Azure REST API

Status Code:

OK

Headers:

```
Cache-Control          : no-cache
Pragma                : no-cache
x-ms-ratelimit-remaining-subscription-reads: 11999
x-ms-request-id       :
x-ms-correlation-request-id   :
x-ms-routing-request-id    : WESTUS:20200106T163034Z:240cfa4c-1666-4900-9463-9c6c8e80627f
Strict-Transport-Security : max-age=31536000; includeSubDomains
X-Content-Type-Options  : nosniff
Date                  : Mon, 06 Jan 2020 16:30:34 GMT
```

Body:

```
{
  "value": [
    {
      "id": "/subscriptions/vso-rg-25fe413/resourceGroups/vso-rg-25fe413",
      "name": "vso-rg-25fe413",
      "type": "Microsoft.Resources/resourceGroups",
      "location": "eastus",
      "properties": {
        "provisioningState": "Succeeded"
      }
    },
    {
      "id": "/subscriptions/vso-rg-25fe413/resourceGroups/vso-rg-25fe413/providers/Microsoft.Web/sites/func-1",
      "name": "func-1",
      "type": "Microsoft.Web/sites",
      "location": "eastus",
      "properties": {
        "siteConfig": {
          "bindings": [
            {
              "name": "httpInbound",
              "protocol": "Http"
            }
          ],
          "hostNameSku": "Standard"
        }
      }
    }
  ]
}
```



Azure Cloud Shell

- + Web-based console interface
 - + Bash shell
 - + PowerShell
 - + Cross-platform
- + <https://shell.azure.com>

Demo: Azure Management Tools





Azure Subscription Management

Azure Subscription Management

- + Azure Subscriptions
- + Subscription Types
- + Subscription Access
- + Demo: Subscription Access
- + Management Groups
- + Demo: Management Groups
- + Enterprise License Management
- + Azure Service Lifecycle

Azure Subscriptions

Subscription Types

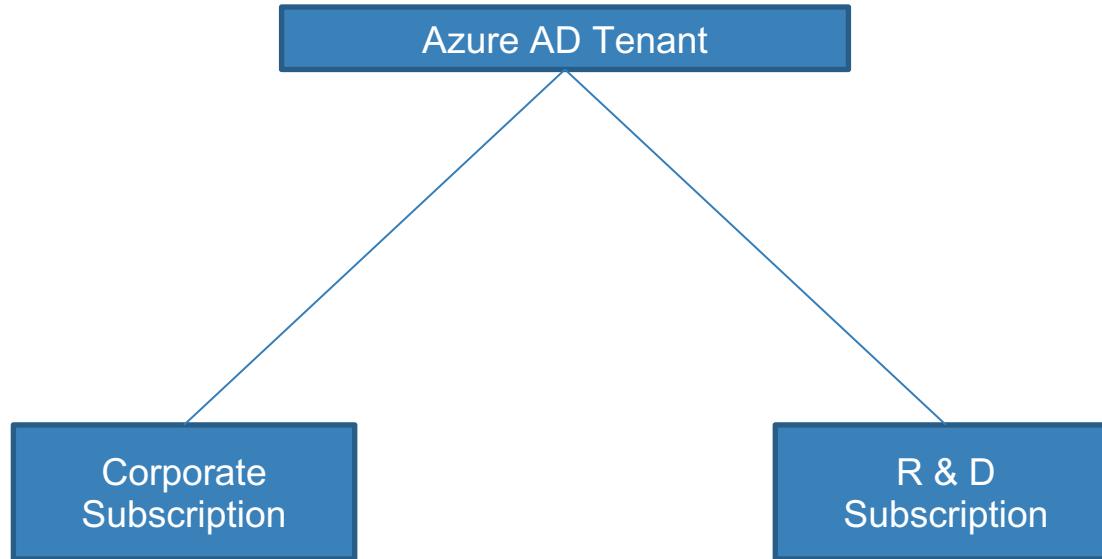
- + Pay as you go
- + Enterprise
- + 3rd party
- + Free
- + Credit

Subscription Access

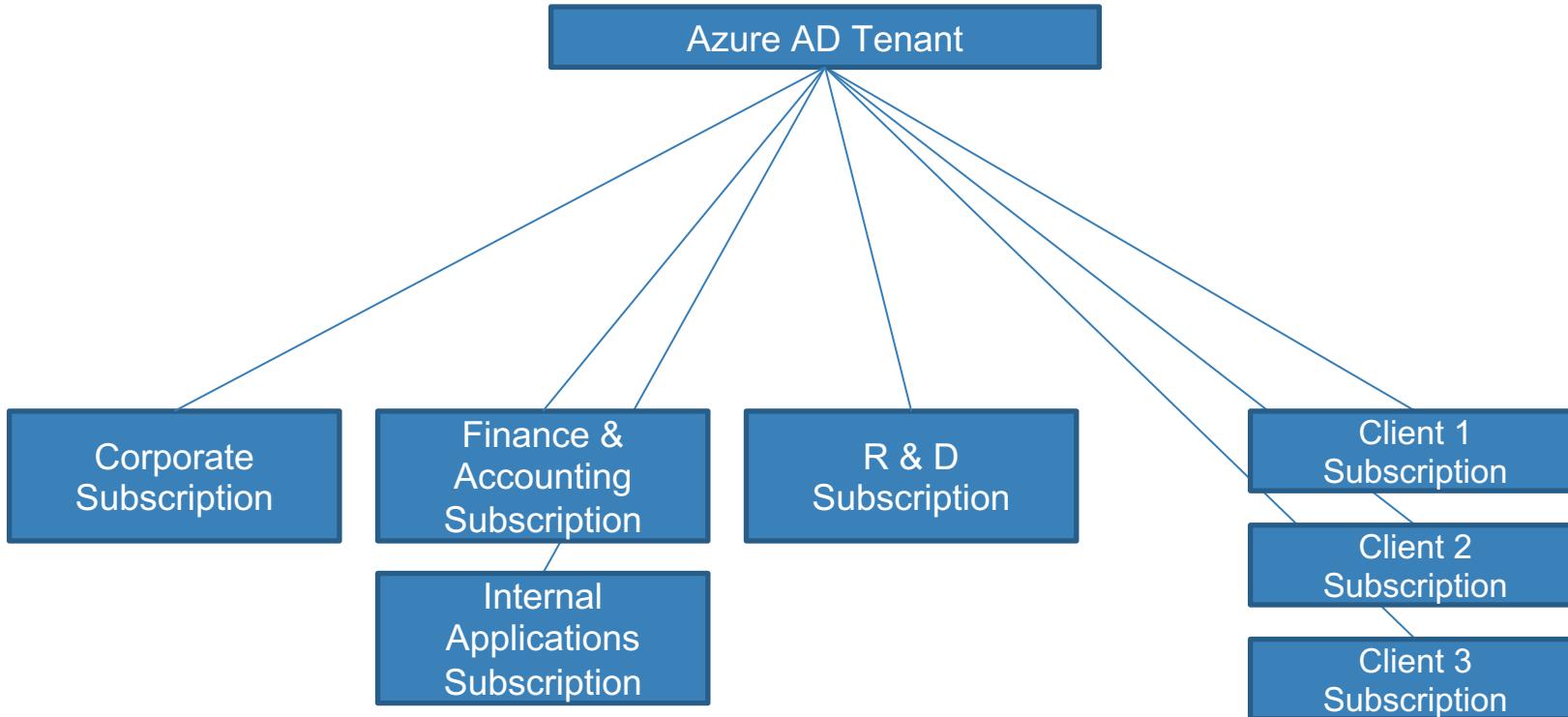
Demo: Subscription Access



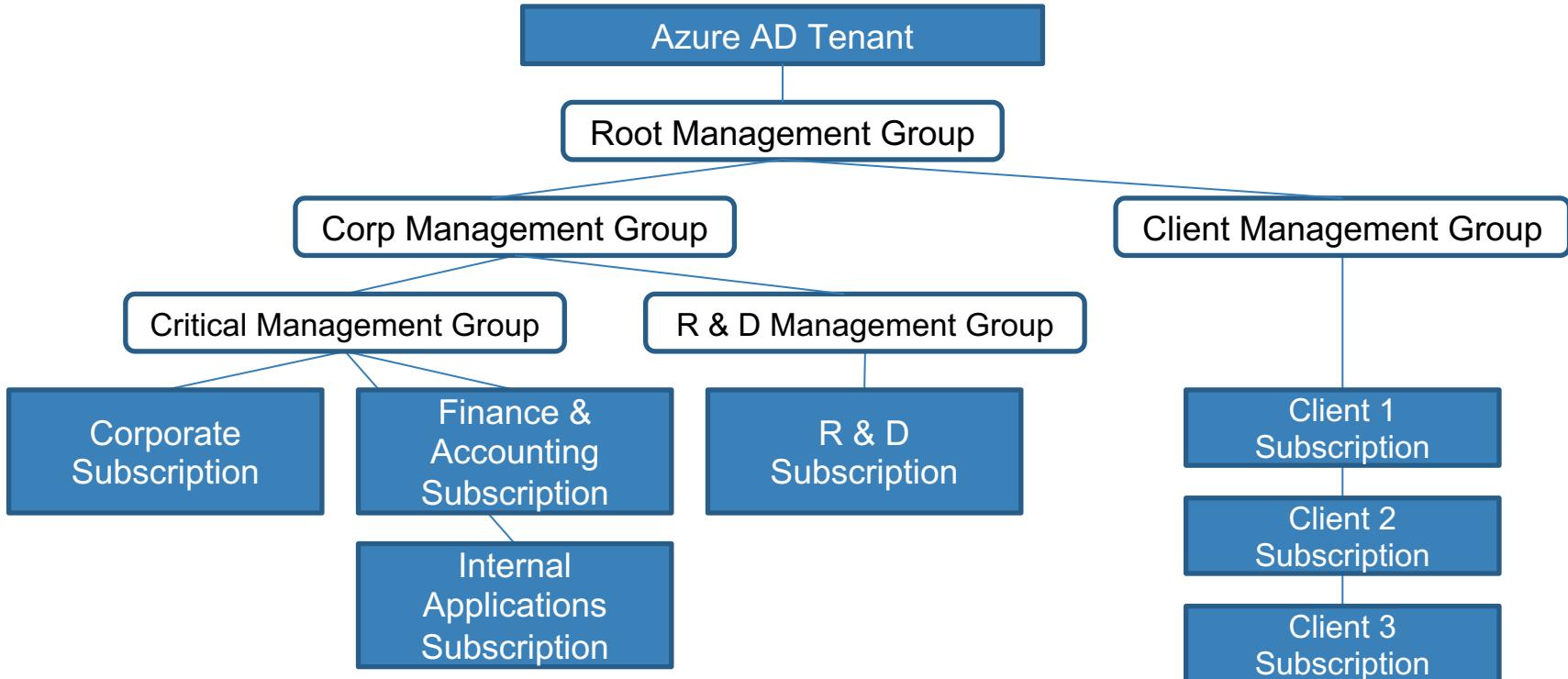
Management Groups



Management Groups



Management Groups



Demo: Management Groups



Enterprise License Agreement

- + Azure stand-alone enrollment or as part of on-premises enrollment
- + Azure EA portal
 - + Departments, accounts, subscriptions
 - + Roles – enterprise administrator, department administrator
- + Cost reporting is different
 - + Spending Quota – department level
- + Enterprise Dev/Test Subscriptions
 - + Lower cost
 - + No SLA
 - + Licensed for dev/test only

Azure Service Lifecycle

- + General availability
- + Public preview
- + Private preview



Azure Cost Planning

Azure Cost Planning

- + Azure Service Purchasing Options
- + Azure Free Accounts
- + Azure Pricing Models
- + Demo: Azure Pricing
- + Key Azure Cost Factors

Azure Service Purchasing Options

- + Reserved instances
- + Low priority compute
- + Performance and feature tiers
- + Free accounts
- + Free services

Azure Pricing Models

- + Capacity-based pricing
 - + Virtual machines
 - + Virtual network gateways
 - + Charges typically accrue per minute
- + Consumption-based pricing
 - + Function and logic apps
 - + Storage accounts
- + Combination pricing
 - + Cosmos DB
 - + Service bus
- + Almost consumption-based
 - + Container instances – charges accrue per second

Demo: Azure Pricing



Key Azure Cost Factors

- + Size/capacity
- + Pricing tier
- + Infrastructure versus platform functionality
- + Region
- + Regional zone
- + Data transfer costs

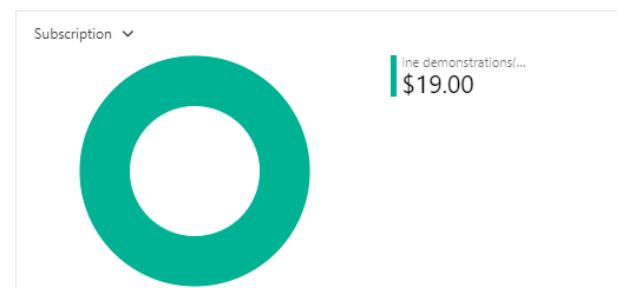
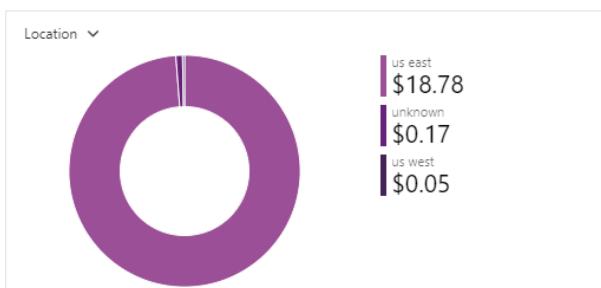
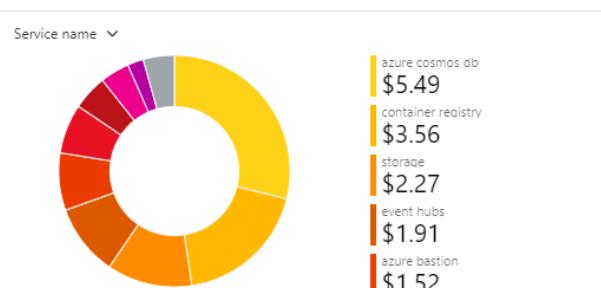
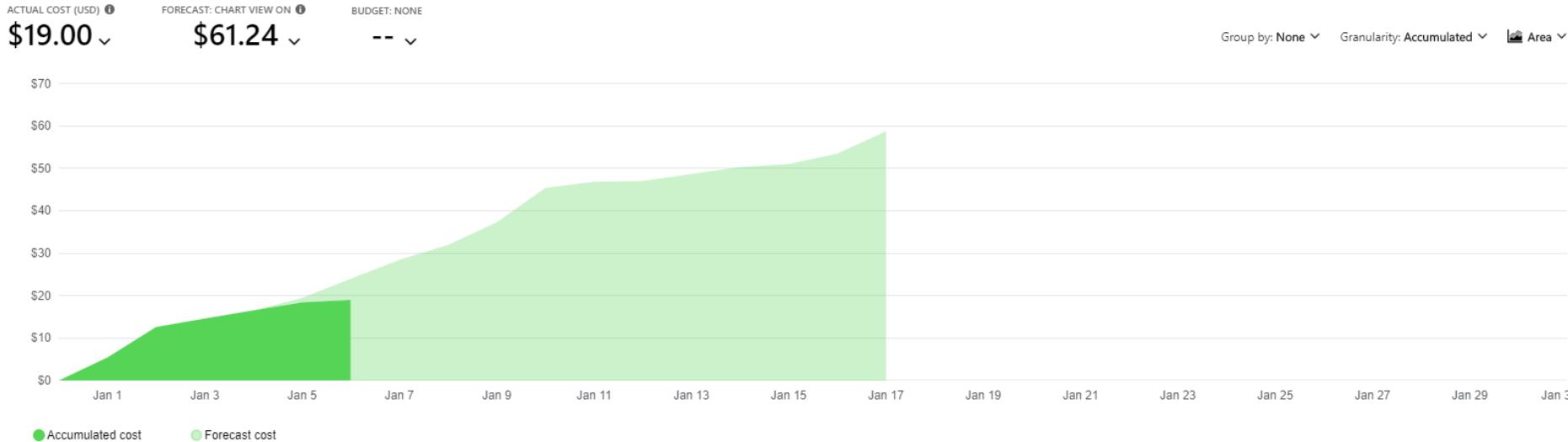


Azure Cost Management Best Practices

Azure Cost Management Best Practices

- + Cost Analysis
- + Spending Limits & Quotas
- + Using Tags
- + Using Policies
- + Azure Reservations & Spot Pricing
- + Optimizing Location
- + Using Azure Cost Tools

Cost Analysis



Spending Limits & Quotas

- + Spending Limits
 - + Apply to credit-based subscriptions – MSDN, Trial
 - + Subscription is disabled
- + Spending Quotas
 - + At the enterprise department level
 - + Subscriptions are not disabled
 - + Sends notifications at 50%, 75%, 90%, and 100% of quota
- + Budgets
 - + At the subscription level
 - + Subscription is not disabled
 - + Custom set alert/notification levels

Using Tags

Scope : Demonstrations * Cost by resource Dec 2019

ACTUAL COST FORECAST: CHART VIEW ON BUDGET: NONE

-- -- --

Group by: displayname Granularity: None Table

Filter items 26 rows

TagValue	Cost
Untagged	332.19
public vm	12.64
hub vm	4.48
vm	4.23
back office vm	3.80
virtualmachine	2.70
op vm	2.64
public public ip	2.31
web server vm	1.16
op public ip	0.77
back office public ip	0.76
hub public ip	0.73
app service plan	0.20
public ip address	0.16
storageaccount	0.12

Using Policies

- + Restrict resource type and SKU via policy

Assign policy

Basics Parameters Remedation Review + create

Specify parameters for this policy assignment.

Allowed SKUs * ⓘ

3 selected

SKU	Status
Basic_A0	<input type="checkbox"/>
Basic_A1	<input type="checkbox"/>
Basic_A2	<input type="checkbox"/>
Basic_A3	<input type="checkbox"/>
Basic_A4	<input type="checkbox"/>
Standard_A0	<input type="checkbox"/>
Standard_A1	<input checked="" type="checkbox"/>
Standard_A1_v2	<input checked="" type="checkbox"/>
Standard_A10	<input type="checkbox"/>
Standard_A11	<input type="checkbox"/>
Standard_A2	<input checked="" type="checkbox"/>

Azure Reservations & Spot Pricing

Add to estimate	Instance	vCPU(s)	RAM	Temporary storage	Pay as you go with AHB	1 year reserved with AHB (% Savings)	3 year reserved with AHB (% Savings)	Spot with AHB (% Savings)
+	D2a v4	2	8 GiB	50 GiB	\$0.096/hour	\$0.0572/hour (~40%)	\$0.0369/hour (~62%)	\$0.0192/hour (~80%)
+	D4a v4	4	16 GiB	100 GiB	\$0.192/hour	\$0.1144/hour (~40%)	\$0.0737/hour (~62%)	\$0.0384/hour (~80%)
+	D8a v4	8	32 GiB	200 GiB	\$0.384/hour	\$0.2288/hour (~40%)	\$0.1474/hour (~62%)	\$0.0768/hour (~80%)
+	D16a v4	16	64 GiB	400 GiB	\$0.768/hour	\$0.4576/hour (~40%)	\$0.2947/hour (~62%)	\$0.154/hour (~80%)
+	D32a v4	32	128 GiB	800 GiB	\$1.536/hour	\$0.9151/hour (~40%)	\$0.5894/hour (~62%)	\$0.307/hour (~80%)
+	D48a v4	48*	192 GiB	1,200 GiB	\$2.304/hour	\$1.3726/hour (~40%)	\$0.8841/hour (~62%)	\$0.461/hour (~80%)
+	D64a v4	64*	256 GiB	1,600 GiB	\$3.072/hour	\$1.8302/hour (~40%)	\$1.1787/hour (~62%)	\$0.614/hour (~80%)
+	D96a v4	96*	384 GiB	2,400 GiB	\$4.608/hour	\$2.7453/hour (~40%)	\$1.7681/hour (~62%)	\$0.922/hour (~80%)

Optimizing Location

- + Regional cost differences
 - + East US

	D2 v3	2	8 GiB	50 GiB	\$0.096/hour
---	-------	---	-------	--------	--------------

- + Brazil South

	D2 v3	2	8 GiB	50 GiB	\$0.159/hour
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- + Pricing zones

Azure Content Delivery Network Standard from Verizon (S1), Akamai (S2), and Microsoft (S3)

OUTBOUND DATA TRANSFERS ¹	ZONE 1 ²	ZONE 2 ²	ZONE 3 ²	ZONE 4 ²	ZONE 5 ²
First 10 TB /Month	\$0.081 per GB	\$0.129 per GB	\$0.233 per GB	\$0.13 per GB	\$0.158 per GB
Next 40 TB (10–50 TB)/Month	\$0.075 per GB	\$0.121 per GB	\$0.186 per GB	\$0.126 per GB	\$0.121 per GB
Next 100 TB (50–150 TB)/Month	\$0.056 per GB	\$0.112 per GB	\$0.168 per GB	\$0.112 per GB	\$0.102 per GB

Using Azure Cost Tools

- + Azure Cost Advisor
- + Azure Pricing Calculator
- + Total Cost of Ownership (TCO) Calculator
- + Azure Cost Management



Azure Cost Management Tools

Azure Cost Management Tools

- + Azure Cost Advisor
- + Demo: Azure Cost Advisor
- + Demo: Azure Pricing Calculator
- + Demo: Total Cost of Ownership (TCO) Calculator
- + Demo: Azure Cost Management

Azure Cost Advisor

- + Reduce costs by eliminating unprovisioned ExpressRoute circuits
- + Buy reserved virtual machine instances to save money over pay-as-you-go costs
- + Delete unassociated public IP addresses to save money
- + Use Standard Snapshots for Managed Disks

Demo: Azure Cost Advisor



Demo: Azure Pricing Calculator



Demo: Total Cost of Ownership (TCO) Calculator



Demo: Azure Cost Management





Azure Support

Azure Support

- + Azure Support Plans
- + Support Tickets
- + Demo: Creating a Support Ticket
- + Outside Support Channels
- + Azure Knowledge Center
- + Demo: Azure Knowledge Center

Azure Support Plans

- + Basic
 - + Billing and subscription support
 - + Azure advisors
- + Developer
 - + Business hours e-mail support
 - + < 8 hour response time
- + Standard
 - + < 8 for minimal impact incidents
 - + < 1 hour response for critical business impact incidents
 - + 24/7 access via e-mail and phone
- + Professional direct
 - + < 4 hour for minimal impact incidents
 - + Architecture guidance, operational support, training
- + Premier
 - + Dedicated architecture guidance and review
 - + On-demand training
 - + < 15 minute response with Azure Rapid Response or Azure Event Management

Support Tickets

Help + support - New support request

Search (Ctrl+ /) < Basics Solutions Details Review + create

Overview

Support

New support request

All support requests

Support Plans

Service Health

Advisor

Get started with Azure

Create a new support request to get assistance with billing, subscription, technical (including advisory) or quota management issues.

Complete the Basics tab by selecting the options that best describe your problem. Providing detailed, accurate information can help to solve your issues faster.

* Issue type: Technical

* Subscription: INE Demonstrations (678111e9-5c2b-4751-8ce5-47...)

Can't find your subscription? [Show more](#)

* Service: My services All services

Virtual Machine running Linux

* Resource: demo-workload-vm-docker

* Summary: This is a demonstration

* Problem type: VM restarted or stopped unexpectedly

My guest OS is causing restarts

[Change](#)



Demo: Creating a Support Ticket



Outside Support Channels

- + Social Media
 - + Twitter - @AzureSupport
 - + Reddit – r/AZURE
 - + Facebook - <https://www.facebook.com/groups/MsftAzure/>
- + Discussions
 - + social.msdn.microsoft.com
 - + Stack Exchange
 - + Stack Overflow (development)

Demo: Azure Knowledge Center





Azure Service Level Agreements

Azure Service Level Agreements

- + Azure SLAs
- + Qualifying for SLAs
- + Composite SLAs

Azure Service Level Agreements (SLAs)

- + Many services at 99% or 99.5% SLA for availability and performance
- + Virtual Machine availability
 - + 99.9% - single, premium VM
 - + 99.95% - 2 or more VMs in availability set
 - + 99.99% - 2 or more VMs in availability zones
- + Web apps – 99.95% available*
- + Azure SQL database availability– up to 99.995% *
- + Azure CosmosDB – up to 99.99% throughput, 99,999% availability*

*SLAs dependent on service tier and configuration

<https://azure.microsoft.com/en-us/support/legal/sla/summary/>



Composite SLAs

- + Solutions may implement multiple services with independent SLAs
- + Services may be dependent or independent
 - + Dependent – Use the sum of downtime. Example
 - + Solution includes a web app (99.95% available) which is dependent on a service running in a premium virtual machine (99.9% available)
 - + Downtime minutes per month (assuming 43,200 minutes/month):
 - + Web app – 21.6
 - + Virtual machine – 43.2
 - + Total – 64.8
 - + Composite availability – 99.85%



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AZ-900 Objective Domains

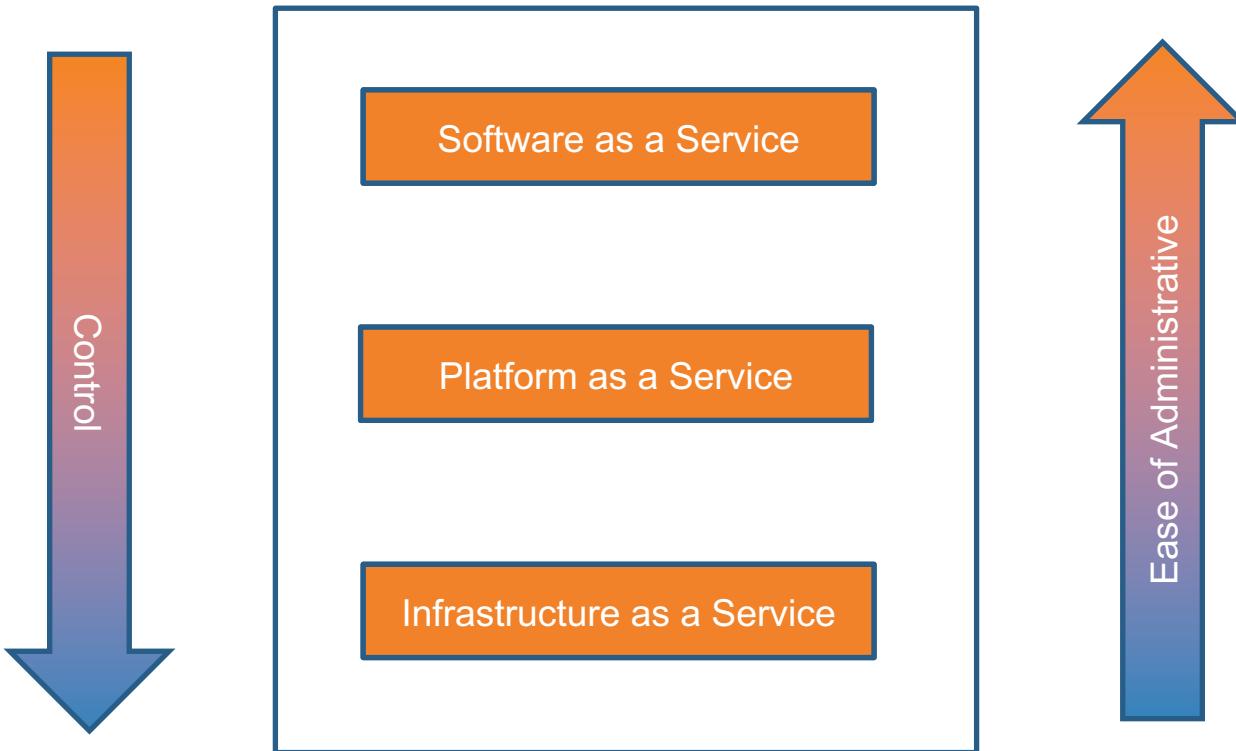
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- + Understand Azure pricing and support (20-25%)



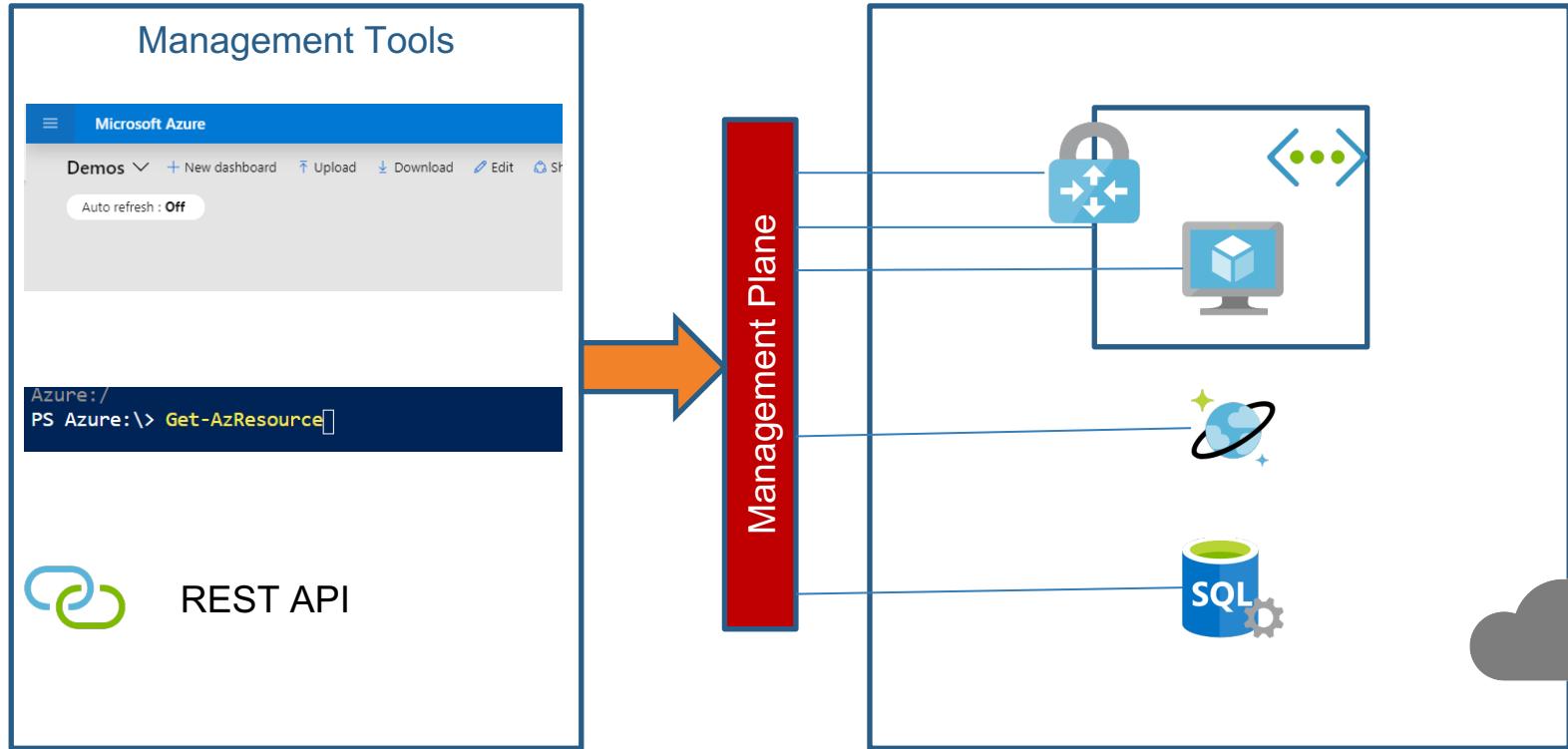
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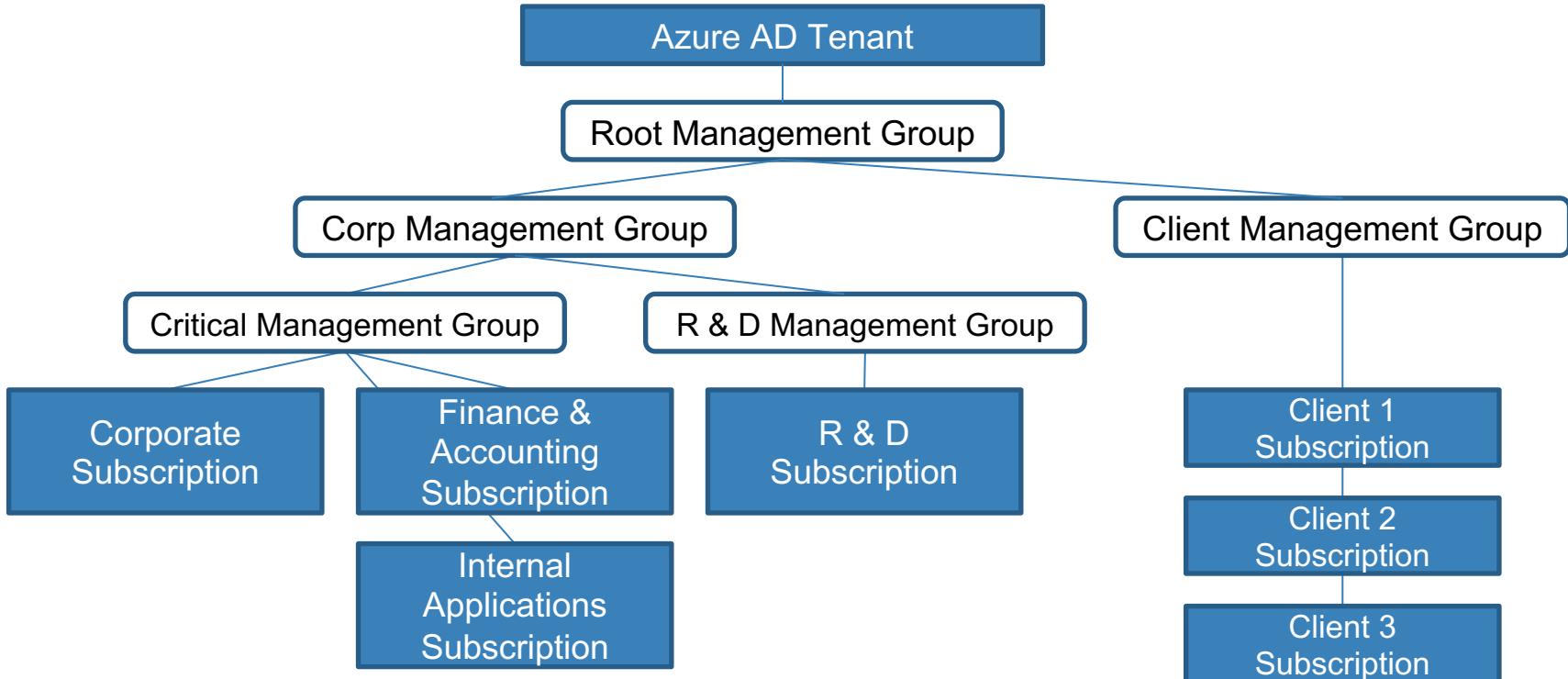
Cloud Concepts



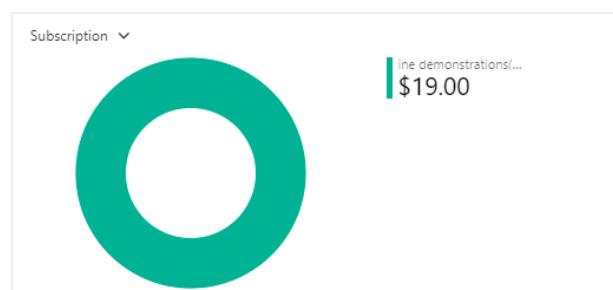
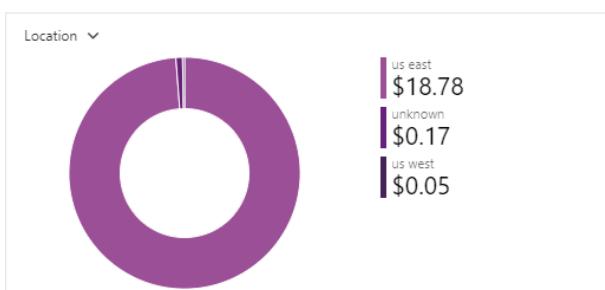
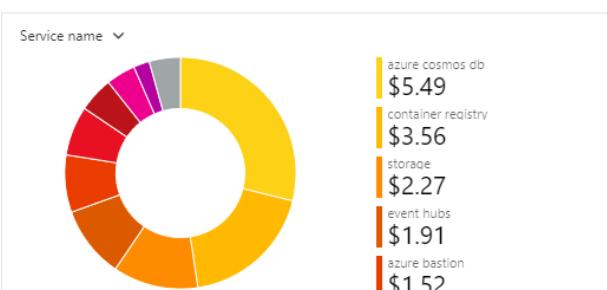
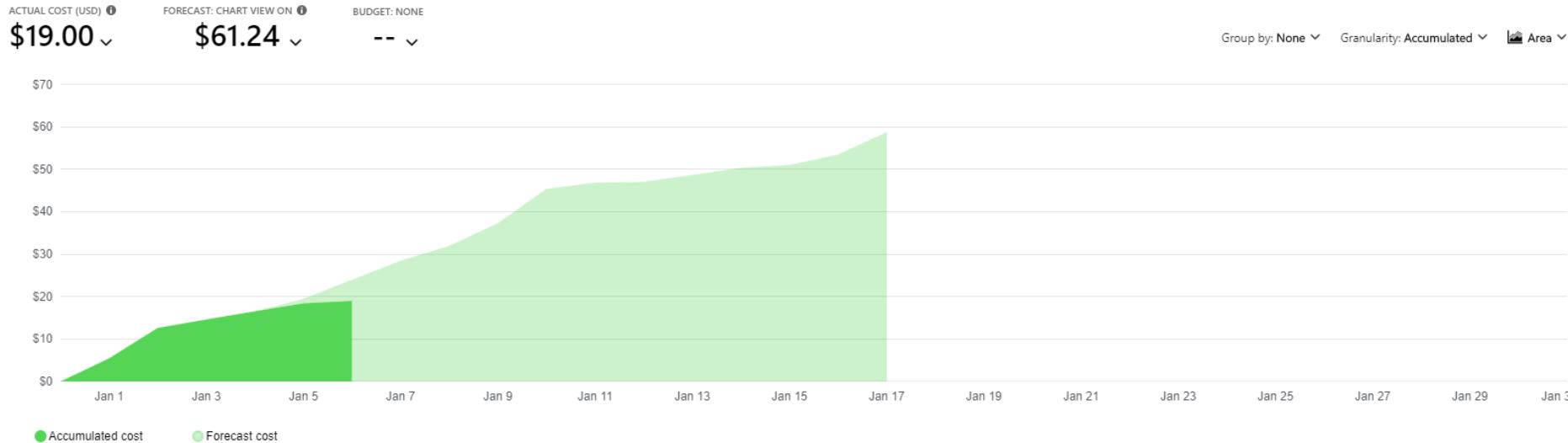
Azure Management Tools



Management Groups



Azure Cost Management



Azure Support

Help + support - New support request

Search (Ctrl+ /) < Basics Solutions Details Review + create

Overview

Support

New support request

All support requests

Support Plans

Service Health

Advisor

Get started with Azure

Create a new support request to get assistance with billing, subscription, technical (including advisory) or quota management issues.

Complete the Basics tab by selecting the options that best describe your problem. Providing detailed, accurate information can help to solve your issues faster.

* Issue type: Technical

* Subscription: INE Demonstrations (678111e9-5c2b-4751-8ce5-47...)

Can't find your subscription? [Show more](#)

* Service: My services All services

Virtual Machine running Linux

* Resource: demo-workload-vm-docker

* Summary: This is a demonstration

* Problem type: VM restarted or stopped unexpectedly

My guest OS is causing restarts

[Change](#)

