AZ-900: AZURE FUNDAMENTALS
COURSE ON UDEMY, document v1.0

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www.udemy.com/az900-azure

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SECTION 1: Intro to Course

The exam covers the topics on the following page:

- https://www.microsoft.com/en-us/learning/exam-az-900.aspx

Passing the exam gets you the "Microsoft Certified Azure Fundamentals" badge.

Optional exam. Not a prerequisite to any of the other Microsoft Exams. But it's a good way to get a solid understanding of Azure before jumping in to the future exams.

Currently $99 USD. Available in English, Japanese, Chinese (Simplified), and Korean

The exam covers:

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

Who's the Exam For?

- Candidates with non-technical backgrounds, such as those involved in selling or purchasing cloud based solutions and services or who have some involvement with cloud based solutions and services, and
- Candidates with a technical background who have a need to validate their foundational level knowledge around cloud services.

SECTION 2: Cloud Concepts (15-20%)

Benefits of Cloud Services

Availability - what percentage of time does a system respond properly to requests, expressed as a percentage over time

I.e. 99.99% availability implies up to 4 minutes per month of acceptable downtime

High Availability - a system specifically designed to be resilient when some component of the system fails

Scalability - the ability of a system to grow it's capacity "easily" when a system reaches it's maximum capacity

Elasticity - the ability of a system to automatically grow when maximum capacity is reached, and automatically shrink to minimize waste

Agility - the ability to respond to change "rapidly" based on changes to market or environment

Fault Tolerance - the ability to tolerate hardware failures in your system, required to achieve high availability

Disaster Recovery - the ability to recover from a big failure within an acceptable period of time, with an acceptable amount of data lost

Economies of Scale - the more you buy something, the cheaper it is per unit to buy

Microsoft (and Google and AWS) can buy and run a server cheaper that you could ever possibly do yourself

Capital Expenditure (CapEx) - a (usually large) amount of money invested in an asset (building, computers, equipment) spent up front, and it returns back profits slowly over time; major cash drain or loan required; cannot be deducted from your taxes in one year, depreciated over several years

Operating Expenditure (OpEx) - an amount of money spent "every month" as an operating expense; hopefully you earn more money in revenue from it than you spend; can be deducted from your taxes immediately; many accountants prefer OpEx over CapEx for the tax and cash flow benefits

Consumption-Based Model - paying for something based on how much you used, as opposed to paying for something no matter if you use it or not.

I.e. A monthly gym membership is a fixed-price model, you pay the same every month. But if you only paid when you actually went to the gym (like an entry fee), that would be a consumption model

Most cloud services charge only when you use the thing, not a fixed-price per month.

Paradigms for Hosting

Infrastructure-as-a-Service (IaaS) - this is the computing paradigm where Azure provides you the virtual hardware (Virtual machine, load balancer, virtual network), and you can have complete control over that. It replicates the exact function of equipment that you'd have in your own data center (like a server, firewall, router, etc)

IaaS Examples: Virtual machine, load balancer, application gateway, virtual network

Platform-as-a-Service (PaaS) - you lose some control over the hardware; generally, you upload your code and just configure the environment in Azure to run it

PaaS Examples: App Services, Web Apps

Software-as-a-Service (SaaS) - you lose even more control over the hardware and even the software; generally, Azure provides you an application that they developed and you just configure it to your usage. You are a tenant using their software.

SaaS Examples: Azure Database, Cosmos DB, Outlook 365

Azure Cloud Service Model - Comparing your responsibilities vs Azure across the three paradigms.

Source: https://dachou.github.io/2018/09/28/cloud-service-models.html
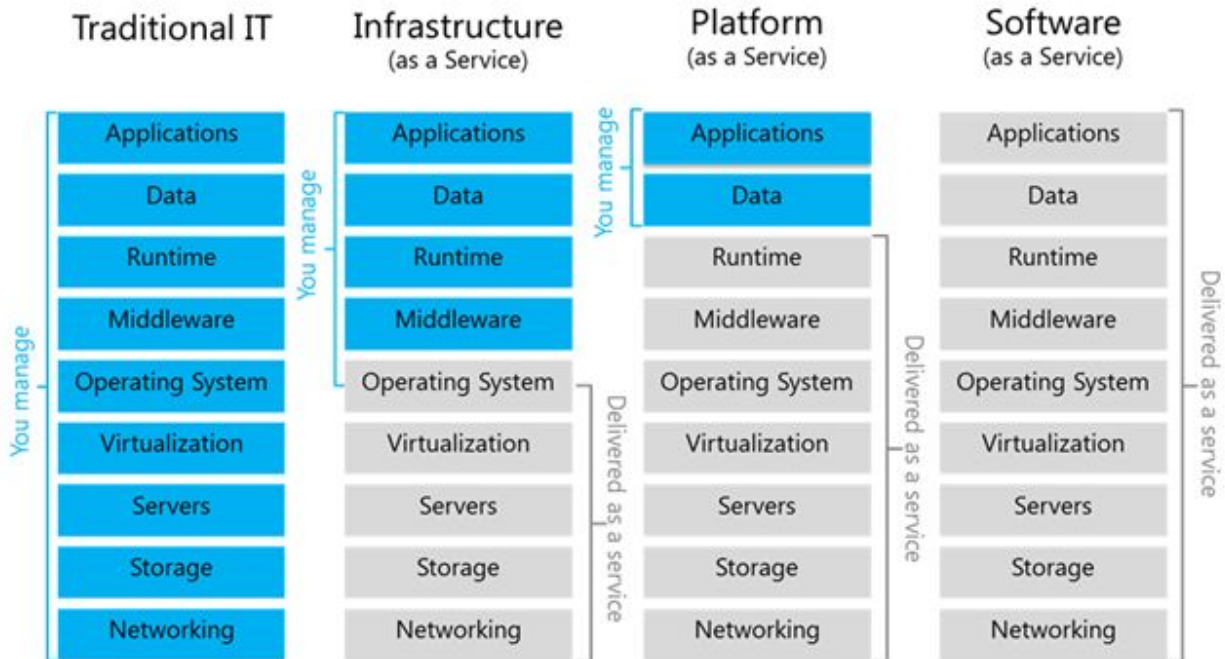
Public, Private and Hybrid Cloud

Public Cloud - Cloud services provided over the public Internet to anyone who wants to sign up for them.

Private Cloud - Cloud services offered only to select users. This is sometimes called an "internal cloud". Looks and acts like a cloud computing, but uses resources and servers available only to your company/organization.

Hybrid Cloud - A mixture between your own private networks and servers, and using the public cloud for some things. Typically used to take advantage of the unlimited, inexpensive growth benefits of the public cloud.

For Further Reading:

Azure Official definitions -

https://azure.microsoft.com/en-ca/overview/cloud-computing-dictionary/

What is IaaS - https://azure.microsoft.com/en-ca/overview/what-is-iaas/

What is PaaS - https://azure.microsoft.com/en-ca/overview/what-is-paas/

What is SaaS - https://azure.microsoft.com/en-ca/overview/what-is-saas/

What is a Public cloud - https://azure.microsoft.com/en-ca/overview/what-is-a-public-cloud/

What is a Private cloud -

https://azure.microsoft.com/en-ca/overview/what-is-a-private-cloud/

What is a Hybrid cloud -

https://azure.microsoft.com/en-ca/overview/what-is-hybrid-cloud-computing/

SECTION 3: Core Azure Services (30-35%)

Azure Architectural Components

Azure Datacenter - a group of interconnected buildings in the same location that contain all the servers, power, wiring and internet connectivity to run Azure services

Regions - a set of related, interconnected datacenters which are no more than a few miles apart; you must select a region when creating most Azure services; there are currently 54 active or planned worldwide; the most of any cloud computing provider; you will not have access to all 54 because some of them are restricted

Source: https://azure.microsoft.com/en-ca/global-infrastructure/regions/

Availability Zones - Unique physical locations within an Azure region, made up of one or more datacenters; there is a minimum of three zones in each region; you can manually place your resources in an availability zone for highest availability

Source: https://docs.microsoft.com/en-us/azure/availability-zones/az-overview
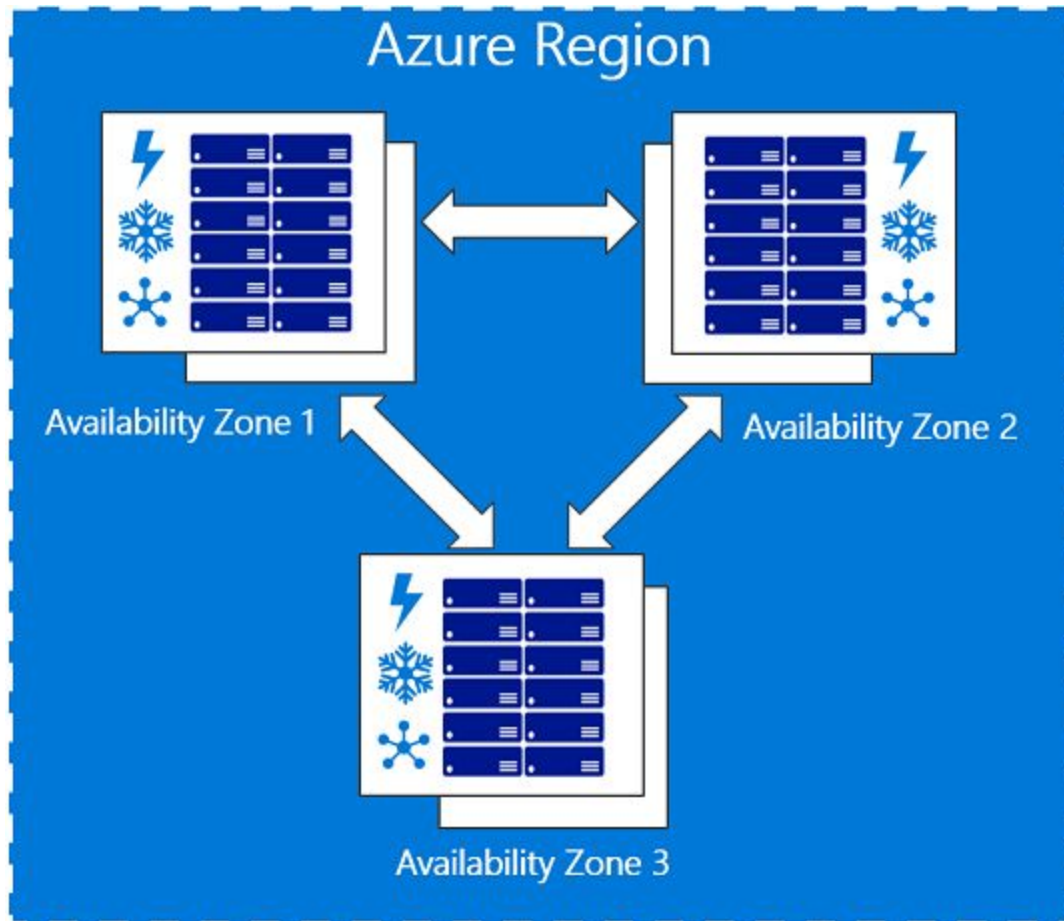
Resource Groups - a folder structure in Azure in which you organize resources like databases, virtual machines, virtual networks, or almost any resource

Azure Resource Manager (ARM) - this is the common resource deployment model that underlies all resource creation or modification; no matter whether you use the portal, powershell or the SDK, the Azure Resource Manager takes those commands and executes them

Core Azure Products

Compute Services - a category of services in Azure that provides CPU cycles for rent

Virtual Machines - looks, acts, feels, tastes like a real server in front of you; except it's running inside Azure's data center in a virtualized environment; Azure supports Windows and Linux virtual machines, with dozens of varities of each; IaaS

Hypervisor - a layer that runs on top of the physical server Operating System that allows multiple guest operating systems (virtual machines) to run in an isolated manner on top

Virtual Machine Scale Sets - these are a set of identical virtual machines (from 1 to 1000 instances) that are designed to auto-scale up and down based on user demand; IaaS

App Services - allows you to upload your code and configuration into Azure, and Azure will run the application as you specify; lots of integrations with Visual Studio, and other features and benefits provided on this platform; PaaS

Azure Functions - small pieces of code that are designed to perform some task quickly; these are like connector code designed to do small things; serverless model

Networking Services - a category of services in Azure that provides network connectivity, performance, and monitoring services for inter-server and Internet communication

Virtual Network - a representation of a real network; all virtual machines must be connected to a virtual network subnet, and this allows them to talk to each other and to the Internet as long as it follows the rules of the network that you define

Load Balancer - sometimes called a level-4 load balancer; allows you to improve performance by splitting work among two or more identical machines; allows for horizontal scaling of application performance by adding more servers; IaaS

VPN Gateway - a device that allows encrypted private communication between a single computer or a network of servers, and an Azure network; IaaS

Application Gateway - sometimes called a level-7 load balancer; a type of load balacer that operates at the application level and can understand HTTP syntax; it can make load balancing decisions off of a domain name, or part of a URL path; IaaS

Content Delivery Network - allows you to improve performance by removing the burden of serving static, unchanging files from the main server to a network of servers around the globe; a CDN can reduce traffic to a server by 50% or more, which means you can serve more users or serve the same users faster; SaaS

Storage Services - a category of services in Azure that provides cheap, infinite file storage

Azure Storage - a cheap place to store files, along with basic table and queue features; pay per Gigabyte; IaaS

Managed Disk - slightly more expensive, but this will allow Azure to provide some additional features that reduce the burden of managing your own storage account; pay per month for a provided GB limit; IaaS

Backup and Recovery Storage - as you'd expect, this is a specialized storage account that will manage your backups from virtual machines and perform recoveries

Database Services - a category of services in Azure that provides fast, structured and unstructured data storage

Cosmos DB - extremely low latency (fast) storage designed for smaller pieces of data quickly; SaaS

Azure SQL Database - a managed database solution that is compatible with SQL Server; SaaS

Azure Database Migration Service - will help you migrate your database

Azure SQL Data Warehouse - designed for analyzing and reporting on huge data sources; not for inserts or updates; just reports

Azure Marketplace - a place for Microsoft and third-parties to offer their own solutions that are compatible with Azure; you'll find lots of vendors you'll recognize like Cisco, Citrix, Barracuda Networks, Oracle, etc.

Core Azure Solutions

Internet of Things (IoT) - thousands or millions of devices around the world that collect data and send them back to the cloud for processing

Big Data - a set of open source (Apache Hadoop) products that can do analysis on millions and billions of rows of data; current tools like SQL Server are not good for this scale

HDInsight - the Azure equivalent of the open source Apache Hadoop tools

Artificial Intelligence (AI) - machine learning API's offered in Azure that can analyze voice, text, images, videos, natural language processing, and do various intelligent actions based on that; can do chat bots, real time transcription, translation, etc.

Serverless Computing - a set of Azure services that allow you to use execute code in the cloud but don't require (or even allow) you to manage the underlying server or have any control over it's performance; functions, logic apps, and app grid are examples of serverless computing in Azure

Azure Management Tools

Command Line Interface (CLI) - a command line tool that allows you to manage your Azure subscription and resources using scripts or commands

Powershell - another type of command line tool

Azure Portal - the website located at http://portal.azure.com that we use to manage your Azure subscription and resources using a friendly user interface

Cloud Shell - allows access to the CLI and Powershell consoles in the Azure Portal

Azure Advisor - a tool that will analyze your use of Azure and make you specific recommendations based on your usage across availability, security, performance and cost categories

For Further Reading:

Coming soon

SECTION 4: Security, Privacy, Compliance, Trust (25-30%)

Secure Networks

Azure Firewall - a managed service inside Azure that protects your virtual networks from unauthorized traffic

Distributed Denial of Service attacks (DDoS) -a type of attack that originates from the Internet that attemps to overwhelm a network with millions of packets of bad traffic that aims to prevent legitimate traffic from getting through

Azure DDoS Protection - basic level of protection is included free; there is a standard level that you can upgrade to (pay for) that will add logging, alerting and telemetry for you to see these attacks happening

Network Security Group (NSG) - a fairly basic set of rules that you can apply to both inbound traffic and outbound traffic that lets you specify what sources, destinations and ports are allowed to travel through from outside the virtual network to inside the virtual network

Best practices for security:

- All virtual networks should use an NSG
- Similar to locking the doors to your house, a basic level of security but not the ultimate
- Enhanced DDoS protection, should be used if you are likely to be a target
- Application Gateway with WAF is generally a good idea for production systems
- Security through layers is also a good idea because if one layer is breached, there are backups

Azure Identity Services

Authentication - you provide something that proves who you are, like userid and password; multi-factor authentication (sms or app) falls into this category

Authorization - once we know who you are, what permissions do they have

Admin/Root Access - should be reserved for the very few trusted people

Azure Active Directory (Azure AD) - Microsoft's preferred Identity as a Service solution

Azure AD revolves around users, groups, and applications and managing the permissions between those objects

Single-Sign On - the ability to use the same user id and password to log into every application that your company has; enabled by Azure AD

AD Connect - software that can synchronize your on premesis Active Directory with Azure Ad

Multi-Factor Authentication (MFA) - the concept of having something additional to a "password" that is required to log in; passwords are findable or guessable; but having your mobile phone on you to receive a phone call, text or run an app to get a code is harder for a unknown hacker to get

Security Tools and Features

Shared Security Model - Microsoft is responsible for physical security of the servers and buildings, the maintenance of the hardware in their environment, the security of their support tools, and malicious use by their employees

You are responsible for your data, your apps, the cryptographic keys that you generate, the access keys Microsoft gives you, your code, etc.

Source: https://dachou.github.io/2018/09/28/cloud-service-models.html
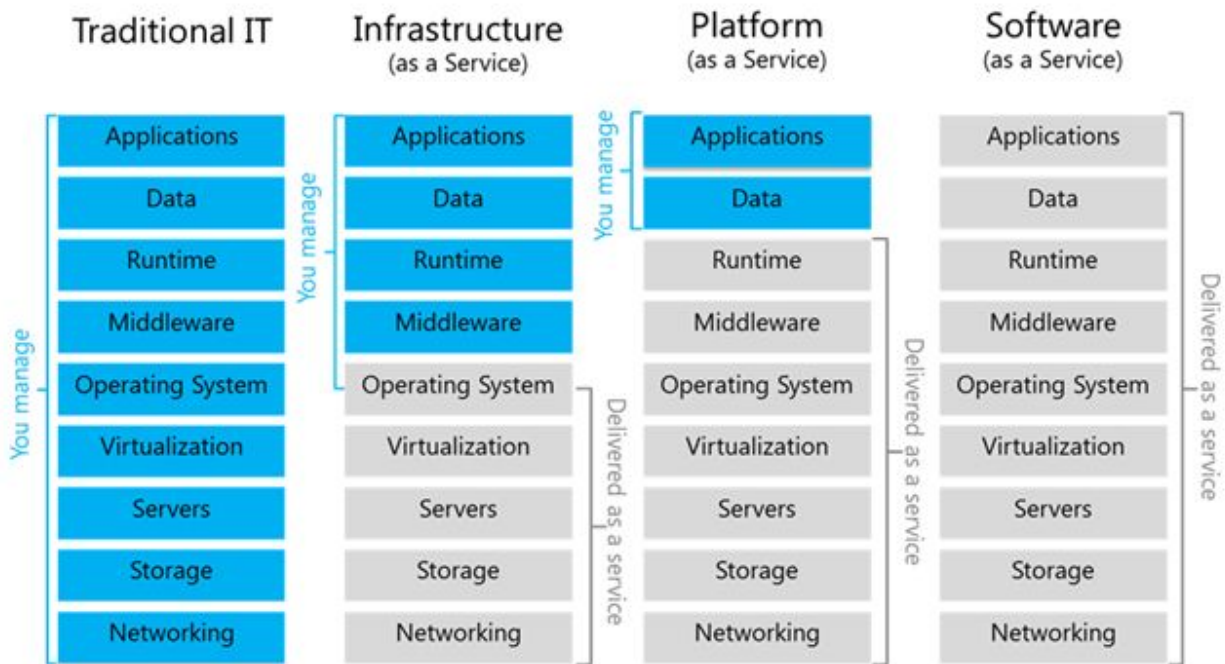
Security Layers (available to use in cloud computing):

- Data - i.e. virtual network endpoint, limit SQL Server user rights
- Application - i.e. run API management in front of APIs
- Compute - i.e. Limit remote desktop access, limit ssh, run Windows update
- Network - i.e. Set up an NSG, use subnets, deny traffic by default
- Perimeter - i.e. DDoS protection, firewalls
- Identity & access - i.e. Azure AD
- Physical - i.e. Door locks, fingerprint readers, and key cards

Azure Security Center - unified security management and threat protection; a security dashboard inside Azure Portal

Azure Key Vault - the modern way to store cryptographic keys, signed certificates and secrets in Azure

Azure Information Protection (AIP) - a way to classify emails and documents; like a DRM for documents; secret, top secret, public, etc.; enforced by Outlook 365

Azure Advanced Threat Protection (ATP) - monitor Azure AD and detect when users are behaving differently than they normally do; requires additional login requirements like MFA or even locks them out when they do

Azure Governance Methodologies

Governance - the policies and procedures of your company that protect your account and your data

Azure Policy - implement standards for your organization across Azure

Rules can be enforced by blocking the action or just reporting the action

Built-In Policies Examples:

- Require SQL Server 12.0
- Allowed Storage Account SKUs
- Allowed Regions for resources to be created in
- Allowed Virtual Machine SKUs
- Require resources have tags
- And others

Custom Policies - you can create your own policies if the built-in ones don't meet your needs

Role Based Access Control (RBAC) - assigning permissions by role instead of to individuals one by one

Locks - allows you to "lock" resources to prevent them from being changed without removing the lock; an easy way to stop someone from accidentally stopping or deleting an important resource

Locks Access Control - you can limit who has the ability to delete locks

Azure Advisor - mentioned earlier, but it has a security section that makes recommendations based on your specific account

Monitoring and Reporting

Azure Monitor - a centralized dashboard that collects all the logs, metrics and events from your resources

Azure Service Health - lets you know about any Azure-related service issues including region-wide downtime

Privacy, Compliance and Data Protection Standards

Compliance - meeting the terms of industry or government standards

General Data Protection Regulation (GDPR) - a law that covers how you collect, store, protect and report data of EU citizens

ISO - Azure is in compliance with a number of ISO standards

NIST Cybersecurity Framework (CSF) - requires an audit to see that you're following security and privacy best practices

Microsoft Privacy Statement - http://privacy.microsoft.com

Microsoft Trust Center - https://www.microsoft.com/en-us/trust-center/product-overview

Service Trust Portal - http://servicetrust.microsoft.com/

Compliance Manager - a tool that helps you manage your own regulatory compliance

Azure Government Services - http://portal.azure.us/ specific for US government agencies; a private cloud

Department of Defense (DoD) - another private isolated cloud for the US military

Private cloud accounts have different endpoint URLs for services than the public cloud

Azure Germany - follows strict data protection standards; has data trustee

For Further Reading:

Coming soon

SECTION 5: Pricing and Support (25-30%)

Azure Subscriptions

Subscriptions - a billing unit within Azure; all resources under a subscription get billed to a single owner

Multiple Subscriptions - possible to create multiple subscriptions to separate out billing

Management Groups - a hierarchy of subscriptions; can have many subscriptions, and group them, and put those groups into other groups

Planning and Management of Costs

How to Pay for an Azure Account:

- Purchase from Microsoft
    - Pay as you go
    - Enterprise Agreement
- Work with a Microsoft Partner
    - Cloud Solution Provider (CSP) partner

Azure Free Account - http://azure.microsoft.com/free

30 days of services up to US$200 limit, plus 12 months of services entirely free (VMs, storage, etc), plus some services are always free

Factors Affecting Your Bill:

- Understand by which metric each service you use is charged
    - Pay per usage, consumption model - Gigabytes used, or # of executions
    - Pay per time - pay per minute or per hour regardless if you use it

- Look at other models for application design that can save money
  - Web apps, functions, etc.
- Understand how traffic from inside Azure to the Internet is charged, and data transfers between regions
- Understand that Azure has dev/test options for licensing for some software

Pricing Calculator - https://azure.microsoft.com/en-ca/pricing/calculator/

Spend 20 minutes playing around with this before taking the exam.

Total Cost of Ownership (TCO) - the all-in price of running a server that includes the cost of the hardware, software, human labor for installation and maintenance, electricity, cooling, backups, real estate, internet connectivity, etc

TCO Calculator - https://azure.microsoft.com/en-ca/pricing/tco/calculator/

Best Practices for Reducing Costs in Azure:

- Use Azure Advisor cost tab for recommendations
- Auto shutdown of Dev/QA resources
- Utilize storage lifecycle - hot, cool, archive storage tiers
- Utilize reserved instances (1 or 3 year contract) if you're likely to use a VM for that long
- Configure alerts when billing exceeds an expected level
- Use Azure Policy to prevent excessive spending like restricting VM SKUs
- Implement automatic scaling to reduce costs
- Downsize resources like managed storage accounts that are a lot bigger than you actually need
- Use tags to more easily identify named owners/projects of running resources in Azure

Azure Cost Management - a tool to analyze historical spending in the cloud

Support Options in Azure

Support Plans - you can purchase support from Microsoft for Azure

Basic Plan - included free, mainly self-help through docs, Azure Advisor, etc

Developer Support - Business hours access to support via email, sev C tickets, general advice, $29 / month

Standard Support - 24 x 7 access to support via phone and email, sev A/B/C tickets, general advice, $100 / month

Professional Direct Support - 24 x 7 access to support via phone and email, sev A/B/C tickets, more specific advice, onboarding and consultation, $1000 / month

Premier Support - Most specific advice, review your designs, technical account manager, on demand training, price not published

Support Tickets - if you have a technical or billing error, or need to increase limits

Knowledge Center - like an FAQ, https://azure.microsoft.com/en-ca/resources/knowledge-center/

Azure SLAs

Service Level Agreements (SLA) - a financial guarantee that they will deliver the services as promised

Microsoft will refund 10% or 25% of your bill if their uptime guarantee doesn't meet the published standard

Azure Services Lifecycle

Preview Features - features available for testing but not ready for production use; could change significantly when they go live (or they might not go live)

Public Preview - anyone can use; marked inside Azure Portal as a Preview

Private Preview - you need to submit a request and Microsoft will let you in if you qualify

General Availability (GA) - when something is ready to leave preview and can be used for production; go live moment

Azure Updates - https://azure.microsoft.com/en-ca/updates/

For Further Reading:

Coming soon

SECTION 6: Is that the end?

Thanks!

Thank you for signing up for this course, and for following along with this study guide.

If you have not left a review for the course, I would LOVE it if you could leave your feedback publicly for future students to read. Reviews help the course get found.

If you have any questions, leave them in the Q&A section of the course.

Don't forget that the Azure User Facebook Group is available for anyone to join to discuss more about Azure. Be the first to know when significant changes happen in the exams or in Azure itself. https://www.facebook.com/groups/azureusergroupunofficial/

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