**General Questions**

**What is Amazon Virtual Private Cloud?**  
Amazon VPC allows you to create an isolated virtual network in AWS. You can define IP ranges, subnets, and configure routes, with options for VPN connections to extend your corporate network securely.

**What are the components of Amazon VPC?**

* **VPC**: Virtual network in AWS.
* **Subnet**: Segment within a VPC.
* **Internet Gateway, NAT Gateway**: Access to the internet.
* **Virtual Private Gateway**: For VPN connections.
* **Peering Connection**: Private traffic routing between VPCs.
* **VPC Endpoints**: Private AWS service access.
* **Egress-only Internet Gateway**: IPv6-only egress access.

**Why should I use Amazon VPC?**  
Amazon VPC offers a customizable, secure network with control over resource exposure, allowing for granular access control in a virtual environment.

**How do I get started with Amazon VPC?**  
A default VPC is set up by AWS. You can create additional VPCs through the AWS Management Console, with templates for different network configurations.

**What are the different types of VPC endpoints available on Amazon VPC?**

* **Gateway Endpoints**: For services like S3 and DynamoDB, routes via AWS private network.
* **Interface Endpoints**: PrivateLink-powered for AWS and SaaS services, with Direct Connect support.

**Billing**

**How will I be charged and billed for my use of Amazon VPC?**  
No charge for the VPC itself, but other resources incur standard AWS rates. VPN connections have hourly charges, with additional data transfer fees.

**What usage charges will I incur if I use other AWS services, such as Amazon S3, from Amazon EC2 instances in my VPC?**  
Standard rates apply. No data transfer charges for accessing AWS services via an Internet Gateway, but VPN traffic incurs data transfer costs.

**Connectivity**

**What are the connectivity options for my Amazon VPC?**  
Connect your VPC to the internet, corporate datacenters, other AWS services, or other VPCs via various gateways and peering options.

**How do I connect my VPC to the Internet?**  
Use an Internet Gateway for direct access or an Egress-only Internet Gateway for IPv6-only outbound access.

**Are there any bandwidth limitations for Internet gateways? Do I need to be concerned about its availability? Can it be a single point of failure?**  
No bandwidth limits. Internet Gateway is redundant and highly available.

**How do instances in a VPC access the Internet?**  
Instances use public IPs like Elastic IPs or Global Unique Addresses (GUA) for direct internet access.

**When is an IP address considered a Public IP address?**  
A public IP address is one that allows internet access. Only public IPv4 or IPv6 GUAs are routable online.

**How do instances without public IP addresses access the Internet?**  
Use a NAT gateway/instance or VPN connection via a datacenter for internet-bound traffic.

**Can I connect to my VPC using a software VPN?**  
Yes, third-party software VPNs can connect to VPCs via the Internet Gateway.

**Does traffic go over the internet when two instances communicate using public IP addresses, or when instances communicate with a public AWS service endpoint?**  
No, traffic stays on the AWS private network.

**How does an AWS Site-to-Site VPN connection work with Amazon VPC?**  
The VPN connection encrypts data between VPC and datacenter over IPSec for secure access.

**IP Addressing**

**What IP address ranges can I use within my Amazon VPC?**  
Use any IPv4 range, including RFC 1918, for primary CIDR blocks. Certain restrictions apply to secondary CIDRs.

**How do I assign IP address ranges to Amazon VPCs?**  
Assign a primary CIDR at VPC creation and add up to four secondary CIDRs as needed.

**What IP address ranges are assigned to a default Amazon VPC?**  
Default VPCs use 172.31.0.0/16, with /20 subnets.

**Can I use my IP addresses in VPC and access them over the Internet?**  
Yes, public IPs can be brought in and used, requiring the correct routing setup.

**How large of a VPC can I create?**  
Up to five IPv4 address ranges; IPv6 VPC size is fixed at /56.

**Can I change the size of a VPC?**  
Yes, expand by adding secondary IPv4 and IPv6 ranges or shrink by deleting added ranges.

**How many subnets can I create per VPC?**  
200 subnets per VPC; request more via AWS support.

**Is there a limit on how large or small a subnet can be?**  
IPv4 subnets: Minimum /28, up to VPC size. IPv6 subnets are /64.

**Can I use all the IP addresses that I assign to a subnet?**  
No, five IPs are reserved for networking in every subnet.

**How do I assign private IP addresses to Amazon EC2 instances within a VPC?**  
Instances get primary private IPs automatically or manually and can have additional secondary IPs.

**Can I change the private IP addresses of an Amazon EC2 instance while it is running and/or stopped within a VPC?**  
Primary IPs are fixed per instance, but secondary IPs and IPv6 addresses are flexible.

**If an Amazon EC2 instance is stopped within a VPC, can I launch another instance with the same IP address in the same VPC?**  
Only if the original instance is terminated; IPv6 GUAs can be reassigned after removal.

**Can I assign IP addresses for multiple instances simultaneously?**  
No, assign IPs one instance at a time.

**Can I assign any IP address to an instance?**  
Yes, if it’s within the subnet’s range, unreserved, and unassigned.

**Can I assign multiple IP addresses to an instance?**  
Yes, assign multiple secondary IPs based on instance type.

**Can I assign one or more Elastic IP (EIP) addresses to VPC-based Amazon EC2 instances?**  
Yes, EIPs can be used for IPv4 instances with direct internet routes but not for NAT setups. EIPs are not supported for IPv6.

**Topology**

* **Can I specify which subnet will use which gateway as its default?**  
  Yes, you can set a default route for each subnet to use the Internet gateway, virtual private gateway, or NAT gateway.

**Default VPCs**

* **What is a default VPC?**  
  A default VPC is a pre-configured, isolated virtual network automatically created in your AWS account for EC2 resources.
* **What are the benefits of a default VPC?**  
  It provides Amazon VPC features with EC2-Classic ease, like security group egress filtering, multiple IPs, and network interfaces.
* **What accounts are enabled for default VPC?**  
  Accounts created after March 18, 2013, in supported regions, or prior accounts in regions where EC2 resources haven’t been launched.
* **Do I need to know about VPCs to use a default VPC?**  
  No, AWS automatically creates and configures the default VPC, so you can launch instances as you would with EC2-Classic.
* **Differences between instances in EC2-Classic and EC2-VPC?**  
   **Networking Model**
* *EC2 Classic*: Single, shared network with limited control.
* *EC2 VPC*: Private, isolated network with customizable IP ranges and subnets.
*  **IP Addressing**
* *EC2 Classic*: Auto-assigned public IP, limited private IP options.
* *EC2 VPC*: Flexible IP assignment with both public and private subnets.
*  **Security Groups**
* *EC2 Classic*: Basic instance-level security.
* *EC2 VPC*: Enhanced control with security at both subnet and instance levels, plus network ACLs.
* **Do I need a VPN to use a default VPC?**  
  No, instances in default subnets automatically receive public IPs, but you can add a VPN if desired.
* **Can I create other VPCs in addition to my default VPC?**  
  Yes, specify a subnet-ID to launch instances in non-default VPCs.
* **Can I create additional subnets in my default VPC?**  
  Yes, specify the subnet during instance launch.
* **How many default VPCs can I have?**  
  One default VPC per region.
* **How many default subnets are in a default VPC?**  
  One default subnet per Availability Zone.
* **Can I specify my default VPC?**  
  No, you cannot select a specific VPC as the default.
* **Can I specify default subnets?**  
  No, you cannot choose specific subnets as default.
* **Can I delete a default VPC?**  
  Yes, and you can recreate it from the VPC Console or CLI.
* **Can I delete a default subnet?**  
  Yes, and you can create a new default subnet in the Availability Zone.
* **Can I get a default VPC with an existing EC2-Classic account?**  
  Yes, by using a new region or creating a new account in a default VPC-enabled region.
* **Can I convert an existing EC2 account to use a default VPC?**  
  Yes, if there are no EC2-Classic resources in the region. Submit a request in the AWS support portal.
* **How are IAM accounts impacted by default VPC?**  
  IAM accounts use the same default VPC as the AWS account.

**Peering Connections**

* **Can I create a peering connection to a VPC in a different region?**  
  Yes, inter-region peering is available globally.
* **Can I peer with a VPC in another AWS account?**  
  Yes, if the other VPC owner accepts your request.
* **Cost of VPC peering connections?**  
  No charge for peering connections, but data transfer fees apply.
* **Do I need an Internet Gateway for peering?**  
  No, peering connections do not require an Internet Gateway.
* **Is intra-region VPC peering traffic encrypted?**  
  No, traffic remains private but is not encrypted.
* **If I delete my side of a peering connection, does the other side retain access?**  
  No, either side can terminate the connection, stopping traffic flow.
* **Are peering connections transitive?**  
  No, if VPC A is peered with VPC B and VPC B with VPC C, A and C are not connected.
* **What if a peering connection goes down?**  
  It relies on the VPC’s infrastructure, with no single point of failure. Inter-region peering won’t route traffic over the internet if it fails.
* **Bandwidth limitations on peering connections?**  
  Bandwidth is similar to that within the same VPC but doesn’t guarantee full-bisection bandwidth.
* **Is Inter-Region VPC Peering traffic encrypted?**  
  Yes, it’s encrypted with AEAD algorithms and managed by AWS.
* **How do DNS translations work with Inter-Region VPC Peering?**  
  Public hostname queries resolve to public IPs by default, but Route 53 private DNS can resolve to private IPs.
* **Can security groups be referenced across Inter-Region VPC Peering?**  
  No, security groups cannot be referenced across regions.
* **Does Inter-Region VPC Peering support IPv6?**  
  Yes, it supports IPv6.
* **Can Inter-Region VPC Peering be used with EC2-Classic Link?**  
  No, it cannot be used with EC2-ClassicLink.

**EC2**

 **What is Amazon EC2?**  
Amazon EC2 provides resizable compute capacity in the cloud, designed to simplify web-scale computing.

 **What can I do with Amazon EC2?**  
EC2 allows users to acquire and configure compute resources quickly, scaling capacity as needed. You pay only for what you use.

 **How can I get started with Amazon EC2?**  
Sign up on the EC2 detail page, create an AWS account if needed, and follow the Getting Started Guide.

 **Why verify my phone number?**  
Verification ensures AWS can contact you if necessary.

 **What new opportunities does EC2 offer developers?**  
Small developers can access scalable compute resources with no upfront cost, allowing for easy scaling and innovation.

 **How do I run systems in EC2?**  
After setting up an account, use the RunInstances API to launch instances, and monitor or manage them through the DescribeInstances and TerminateInstances APIs or the AWS Management Console.

 **Local instance store vs. Amazon EBS for root device?**  
EBS persists data beyond the instance’s life, allowing you to restart the instance later. Local instance stores last only while the instance is running, suitable for short-lived data.

 **How quickly are instances available?**  
Typically, instances begin booting within 10 minutes, although factors like AMI size and previous launches can impact time.

 **How do I load and store systems with EC2?**  
Create and bundle an AMI, using Amazon EBS or S3 for storage, to set up and deploy instances quickly. You may also select pre-configured AMIs.

 **How do I access my systems?**  
The RunInstances call provides DNS names for each instance, allowing standard data center access.

 **Is EC2 used with Amazon S3?**  
Yes, EC2 pairs with S3 for instances with local storage, providing scalable compute (EC2) and reliable data storage (S3).

 **How many instances can I run?**  
Limits are based on your vCPU, Reserved Instance, and Spot Instance quotas. Request limit increases if needed.

 **Are there email limitations from EC2 instances?**  
Yes, to maintain quality, there are limits on sending email from EC2. To send more, request a limit removal.

 **How quickly can I scale capacity?**  
EC2 allows for minute-level scaling up or down, with hundreds or thousands of instances available via the RunInstances call.

 **Supported operating systems?**  
EC2 supports Amazon Linux, Ubuntu, Windows Server, Red Hat, SUSE, Debian, CentOS, Oracle Linux, and others.

 **Does EC2 use ECC memory?**  
Yes, Amazon EC2 uses ECC memory, which is essential for reliable server infrastructure.

**Accelerated Computing Instances**

* **What are Accelerated Computing instances?**  
  Instances with hardware accelerators (e.g., GPUs, AWS Trainium, Inferentia) for efficient tasks like floating-point calculations and graphics processing.
* **When to use GPU-based instances?**  
  Best for applications requiring massive parallelism, such as generative AI, deep learning, and gaming. NVIDIA GPU-based instances are ideal for models needing proprietary libraries like CUDA.
* **G-series vs. P-series GPU instances?**  
  G-series is optimal for graphics and AI/ML inference, while P-series is suited for training large AI models.
* **When to use AWS Trainium and AWS Inferentia?**  
  Designed for deep learning and generative AI, these instances offer high performance with up to 50% cost savings for training and inference.
* **NVIDIA drivers and tools for P-series and G-series?**  
  Available as pre-installed AMIs on AWS Marketplace, or download from NVIDIA. NVIDIA AI Enterprise also offers tools and frameworks for AI tasks.
* **What are Amazon EC2 UltraClusters?**  
  UltraClusters provide access to thousands of GPUs or ML chips like Trainium, enabling supercomputing-level performance for ML, AI, and HPC without setup costs.

**Flex Instances**

* **Differences of Flex instances (M7i-flex and C7i-flex)?**  
  Lower-priced than M7i and C7i, offering 19% better price-performance. Ideal for workloads not fully utilizing compute resources, scaling to full CPU 95% of the time.
* **Performance of Flex instances?**  
  Delivers 40% baseline CPU with ability to scale to 100% for 95% of the time over a 24-hour window.
* **Use cases for M7i-flex instances?**  
  Suitable for workloads on T3 instances, providing better price performance, fixed pricing, and sizes up to 8xlarge (32 vCPUs and 128 GB), avoiding CPU credits.

**Burstable Instances**

* **What are Burstable Performance Instances?**  
  T2 instances offer a baseline CPU level with bursting capability. CPU performance is managed through CPU Credits, which allow the instance to accumulate and use credits as needed for active workloads.

**S3**

**Q: What is Amazon S3?**

* Amazon S3 is an object storage service built to store and retrieve any amount of data from anywhere. It offers industry-leading durability, availability, performance, security, and virtually unlimited scalability at low costs.

**Q: What can I do with Amazon S3?**

* Amazon S3 provides a web service interface to store and retrieve any amount of data at any time from anywhere. It’s scalable and flexible, enabling applications to use cloud-native storage while maintaining performance and reliability.

**Q: How can I get started using Amazon S3?**

* To start using Amazon S3, you need to sign up via the S3 console, which requires an AWS account. Once signed up, refer to the S3 documentation and other resources to begin.

**Q: What can I do with Amazon S3 that I cannot do with an on-premises solution?**

* Amazon S3 leverages Amazon's large-scale infrastructure to offer simple, low-cost, and highly accessible storage that avoids up-front investments and performance compromises typical of on-premises solutions.

**Q: What kind of data can I store in Amazon S3?**

* You can store virtually any kind of data in any format. Refer to the AWS Licensing Agreement for specific details.

**Q: How much data can I store in Amazon S3?**

* The total volume of data you can store in S3 is unlimited. Individual objects can range from 0 bytes to 5 TB, with objects larger than 100 MB recommended for multipart uploads.

**Q: What is an S3 general-purpose bucket?**

* A general-purpose bucket is the original type of S3 bucket. It can store objects across all storage classes except S3 Express One Zone and is recommended for most use cases and access patterns.

**Q: What is an S3 directory bucket?**

* S3 directory buckets are limited to storing objects in the S3 Express One Zone storage class, designed for low-latency use cases. They support hundreds of thousands of transactions per second (TPS), independent of the number of directories.

**Q: What is the difference between a general-purpose bucket and a directory bucket?**

* A general-purpose bucket stores objects across multiple storage classes, suitable for most use cases. A directory bucket, on the other hand, is optimized for low-latency use cases and stores objects in the S3 Express One Zone storage class.

**Q: What does Amazon do with my data in Amazon S3?**

* Amazon stores your data and tracks its usage for billing purposes, but does not access your data outside of the Amazon S3 service, except as required by law.

**Q: Does Amazon store its own data in Amazon S3?**

* Yes, Amazon uses Amazon S3 internally for a variety of projects, including business-critical operations, relying on S3 as their authoritative data store.

**Q: How is Amazon S3 data organized?**

* Amazon S3 uses a simple key-based object store. Data is accessed through unique object keys. You can also use S3 Object Tagging to help organize data across buckets or prefixes.

**Q: How do I interface with Amazon S3?**

* Amazon S3 offers a standards-based REST web services interface designed to work with most internet-development toolkits. Operations are kept simple for easier protocol additions and functionality.

**Q: How reliable is Amazon S3?**

* Amazon S3 is highly scalable and available, designed for 99.99% availability in the S3 Standard storage class. Other classes like S3 Glacier and One Zone-IA offer varying availability levels based on storage needs.

**Q: How will Amazon S3 perform if traffic from my application suddenly spikes?**

* S3 is designed to handle traffic spikes without disruption. Its massive scale and pay-as-you-go model ensure costs remain manageable while keeping services uninterrupted.

**Q: Does Amazon S3 offer a Service Level Agreement (SLA)?**

* Yes, the Amazon S3 SLA provides service credits if a customer’s monthly uptime percentage falls below the service commitment in a billing cycle.

**Q: What is the consistency model for Amazon S3?**

* S3 delivers strong read-after-write consistency for all objects, so after a write or overwrite, any subsequent read request immediately reflects the latest version. This consistency applies to list operations as well.

**Q: Why does strong read-after-write consistency help me?**

* Strong read-after-write consistency ensures that after an object is written or overwritten, all subsequent reads reflect the most recent data, which is crucial for high-performance computing or applications that need real-time data.

**AWS Regions**

**Q: Where is my data stored?**

* You choose an AWS Region when creating an S3 bucket. Data for most storage classes (S3 Standard, S3 Glacier, etc.) is stored across at least three Availability Zones (AZs), ensuring durability. The S3 One Zone-IA class stores data within a single AZ.

**Q: What is an AWS Region?**

* An AWS Region is a geographic location where AWS has multiple data centers, known as Availability Zones (AZs). Each Region has a minimum of three AZs, offering better availability, fault tolerance, and scalability.

**Q: What is an AWS Availability Zone (AZ)?**

* An AZ is a data center with redundant power, networking, and connectivity. AZs are interconnected via high-bandwidth, low-latency networks, offering highly available and fault-tolerant infrastructure.

**Q: How do I decide which AWS Region to store my data in?**

* You should consider factors like proximity to customers or other AWS resources, geographic redundancy, disaster recovery needs, regulatory compliance, and cost when choosing a Region for storing data.

**Q: In which parts of the world is Amazon S3 available?**

* Amazon S3 is available in multiple AWS Regions worldwide. You can select the Region that best suits your needs for latency, redundancy, and cost savings.
* **Q: How much does Amazon S3 cost?**  
  A: Amazon S3 costs based on what you use, with no minimum charge. Pricing varies by region, and there are charges for storage, data transfer, and requests. You can estimate your bill with the AWS Pricing Calculator.
* **Q: How will I be charged and billed for my use of Amazon S3?**  
  A: There are no setup charges or commitments. Billing is monthly, and charges depend on usage. You can track usage on the 'Billing Dashboard' in your AWS account.
* **Q: How does the AWS Free Usage Tier work for Amazon S3?**  
  A: New AWS customers get 5 GB of S3 Standard storage, 20,000 Get Requests, 2,000 Put Requests, and 100 GB of data transfer out for free for one year.
* **Q: What factors influence Amazon S3 pricing?**  
  A: Pricing is influenced by factors such as storage used, the amount of data transferred, and the number of requests. It also varies by region.
* **Q: How is storage billed on Amazon S3?**  
  A: Storage is billed based on average usage during the month. Charges are calculated in “TimedStorage-ByteHrs,” which are converted to GB-months.
* **Q: How does data transfer affect costs?**  
  A: Data transfer between Amazon S3 and other AWS services within the same region is free, but transfers between regions incur additional charges.
* **Q: What are data requests, and how are they billed?**  
  A: Data requests include PUT, GET, and DELETE operations. Charges are based on the number of requests made, with rates varying by type.
* **Q: Why do prices vary depending on the region?**  
  A: AWS charges less where its costs are lower, such as in the US East (Northern Virginia) compared to the US West (Northern California).
* **Q: How am I charged for Versioning in S3?**  
  A: Charges apply to every version of an object, and the cost is based on the storage and requests for each version stored.
* **Q: How am I charged for accessing S3 through the AWS Management Console?**  
  A: Normal S3 pricing applies. The console may execute multiple requests depending on the operation being performed.
* **Q: What happens when my S3 buckets are accessed from another AWS account?**  
  A: Normal charges apply unless your bucket is a Requester Pays bucket, in which case the requester is charged.
* **Q: Do the prices include taxes?**  
  A: AWS prices exclude taxes. Customers in some regions (e.g., Japan) may be subject to additional taxes like VAT.
* **Q: Will I incur charges for data transfer out to the internet when moving data off AWS?**  
  A: AWS may offer free data transfer out under specific conditions, such as moving all data off AWS.
* **Q: How can I request free data transfer out to move my data off AWS?**  
  A: Contact AWS Customer Support, provide your move details, and they may approve free data transfer under certain conditions.
* **Q: Why must I request AWS' pre-approval for free data transfer out?**  
  A: AWS needs to ensure that the transfer is for moving data off AWS, not for other purposes.
* **Q: What is IPv6, and how does it work with Amazon S3?**  
  A: IPv6 is a new addressing scheme that provides more internet addresses. S3 supports IPv6, allowing easier integration and compliance without needing translation software.
* **Q: What are Amazon S3 Event Notifications?**  
  A: Event Notifications allow you to be notified of specific events (e.g., PUT, POST, DELETE) in your S3 bucket, which can trigger automated workflows or alerts.
* **Q: What is S3 Transfer Acceleration?**  
  A: It speeds up file uploads to S3 over long distances using AWS Edge locations and optimized network paths.
* **Q: How do I get started with S3 Transfer Acceleration?**  
  A: Enable S3 Transfer Acceleration on your bucket through the S3 console, API, or AWS CLI, then use the accelerate endpoint for faster uploads.
* **Q: How fast is S3 Transfer Acceleration?**  
  A: It can significantly reduce upload time, especially for distant locations or large files, by optimizing the transfer route.
* **Q: How secure is S3 Transfer Acceleration?**  
  A: It provides the same security as regular transfers, including access controls, and uses standard TCP with no data stored at Edge locations.
* **Q: Can I use S3 Transfer Acceleration with multipart uploads?**  
  A: Yes, S3 Transfer Acceleration supports multipart uploads.