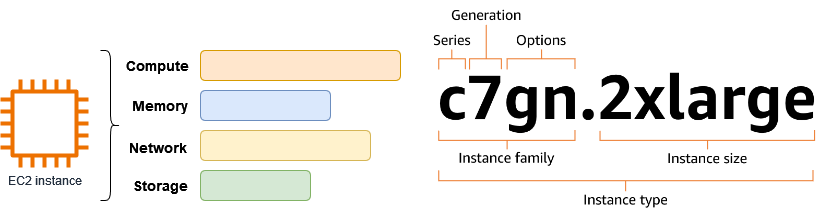
**EC2:Elastic cloud compute**

Provides on-demand, scalable computing capacity in the Amazon Web Services (AWS) Cloud.

An EC2 instance is a ***virtual machine runs as server*** in the AWS Cloud.

You can launch as many or as few virtual servers as you need, configure security and networking, and manage storage.



**Types of Ec2:**

1. General purpose
2. Compute optimized
3. Memory optimized
4. Storage optimized
5. Accelerated computing
6. High performance computing

|  |  |  |
| --- | --- | --- |
| Instance Type | Use case | Examples |
| General Purpose | Balanced CPU,Memory and networking | t3,M5 |
| Compute Optimized | High performance processor | c5,c6g |
| Memory Optimized | Large RAM for DB and caching | r5,x2idn |
| Storage Optimized | High disk throughput for big data processing | i3,d2 |
| Accelerated Computing | GPU or FPFA based instances for AI/ML | p4,inf1 |

**EC2 Pricing Models:**

|  |  |  |
| --- | --- | --- |
| **Purchasing Option** | **Cost** | **Use Cases** |
| *On-Demand Instance* | Pay per hour/second, no upfront commitment | Short-term, unpredictable workloads |
| *Savings Plans* | Discounted rates with 1 Or 3 year commitment | Flexible pricing for steady workloads |
| *Reserved Instance - Standard* | Up to 75% savings with 1 or 3 year commitment | Predictable, long-term workloads |
| *Reserved Instance - Convertible* | Offers flexibility to change instance type or family | Changing workload needs with savings |
| *Spot Instance* | Up to 90% discount for unused capacity | Fault-tolerant and flexible workloads |
| *Dedicated Host* | Physical server fully dedicated to your use | Compliance and regulatory needs |
| *Dedicated Instance* | Virtual machine on a dedicated server | Isolation for workloads with strict security requirements |
| *Capacity Reservations* | Reserved capacity without long-term commitment | Ensuring availability in a specific region |

**EC2 Storage Options:**

1.Amazon Elastic Block Store (**EBS**): Persistent block storage for EC2.

* Data remains even if the EC2 instance is stopped or terminated.
* SSD-backed storage for transactional workloads
* General Purpose SSD (gp3): Balanced performance for most workloads.
* Provisioned IOPS SSD (io2): High performance for I/O-intensive applications
* HDD-backed storage for throughput intensive workloads
* Throughput Optimized HDD (st1): For large, sequential workloads.
* Cold HDD (sc1): for infrequently accessed data

**EBS Snapshots:** Allows you to create backups of your EBS volumes, stored in Amazon S3.

**EBS Use Cases:** Operating system drives, Databases,Applications requiring persistent storage.

2.Instance Store: Ephemeral storage tied to the instance.

* Data is lost when an instance is terminated or stopped.
* Useful when you need fast I/O operation.
* High-speed local storage for caching, temporary data, or swap space,Buffers.
* ***No additional charges*** for the storage (included in the instance price).

3.Amazon S3: Object storage for backups and logs.

4.Amazon EFS: Managed file system for multiple instances.

Provides a scalable, fully managed network file system that can be shared by multiple EC2 instances.

**EFS Use Cases:** Web servers. Content management systems. Shared data repositories.

5.FSx for Windows/Linux: Specialized file storage.

**EC2 Security & Networking in EC2:**

* Security Groups: Firewall rules.Control inbound and outbound traffic.Stateless(Only allow rule)
* Key Pairs: Secure SSH or RDP access.
* Virtual Private Cloud (VPC): Isolated network environment.
* Subnets: Divide VPC into smaller networks.
* Network ACLs: Control traffic at the subnet level. Stateful(Both allow and deny needs to be defined)
* Elastic Load Balancer (ELB): Distributes traffic across instances.
* AWS Shield & WAF: Protection against DDoS attacks.

**AMI - Amazon machine image [AWS AMI](https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/AMIs.html)**

**AMI is a pre-configured template that provides the information required to launch an EC2 instance in AWS.**

**Key Characteristics:**

* Templates: AMIs are templates, not running instances.
* Region-Specific: AMIs are specific to an AWS Region.
* Customizable: You can create your own AMIs or use pre-built ones from AWS Marketplace or the AWS community.
* Multiple Options: AMIs are available with various operating systems (Linux, Windows, etc.) and software packages.

**Key points about AMIs:**

* Base OS: An AMI includes the operating system (e.g., Linux, Windows, etc.).
* Software Packages: You can include specific applications, web servers, databases, or any other software pre-installed in the AMI.
* Configuration: The AMI contains configurations, settings, and permissions that define how the instance behaves.
* Processor architecture
* [Launch permissions](https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ComponentsAMIs.html#launch-permissions)(public/explicit/implicit)
* Root device type( *Amazon EBS* or  *instance store)*
* Virtualization type(paravirtual (PV) or hardware virtual machine (HVM).)
* Instance Launching: When you launch an EC2 (Elastic Compute Cloud) instance in AWS, you select an AMI as the base template for the instance.
* Customizable: You can create your own custom AMI or use public AMIs offered by AWS, third parties, or the community.

**EC2 Image Builder:**

* A fully managed service provided by Amazon Web Services (AWS)
* Simplifies the process of building, testing, and maintaining custom Amazon Machine Images (AMIs) for EC2 instances.
* It automates the creation, validation, and distribution of AMIs, reducing the complexity and time required to manage custom AMIs in your environment.
* ***Free service*** (only pay for the underlying resources)

**EC2 image builder Key Features:**

* *Pipelines*:Image Builder uses pipelines to define the steps involved in building and testing your images.
* *Recipes*:Recipes define the components and configurations that are included in your images.There are recipe components for operating system updates, application installations, and security configurations.
* *Components*:Components are the building blocks of recipes. They are used to perform specific tasks, such as installing software or applying security patches.
* *Testing*:Image Builder allows you to automate testing of your images to ensure they meet your requirements.
* *Distribution*:You can distribute your images to multiple AWS Regions and accounts.
* *Security*:Integrates with AWS security services, such as IAM and AWS Security Hub.
* *Versioning*: Image builder keeps track of image versions

**EC2 image builder benefits:**

* *Improved Security*:Helps you create secure images by automating security patching and configuration.
* Reduced Operational Overhead:
* Automates image creation and management, reducing the manual effort required.
* Increased Consistency:Ensures consistency across your EC2 instances by using standardized images.
* Faster Image Creation:Automates the image creation process, reducing the time required to build images.
* Simplified Compliance:Helps you meet compliance requirements by creating secure and consistent images.

