



AWS vs Azure vs Google



Module-3

Using Prominent Cloud Services

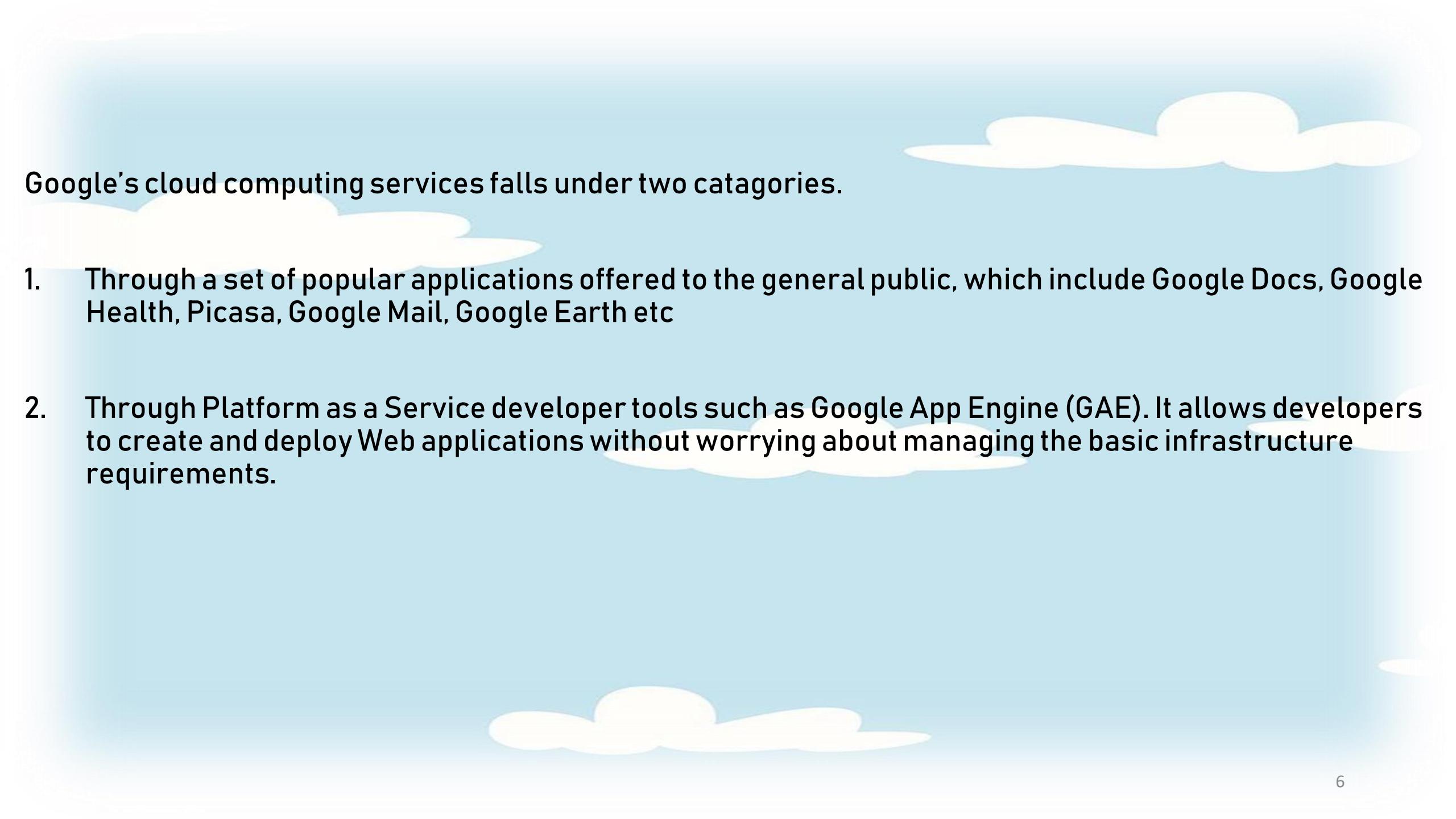


Google
Cloud Platform

Using Google Web Services

- Google; a cloud computing services company, supports some of the largest Web sites and services in the world.
- Its core business is the company's search technology. Google uses automated technology to index the Web.
- It makes its search service available to users as a standard search engine and to developers as a collection of special search tools limited to various areas of content.
- The prime commercial part of Google's activities is its targeting advertising business: AdWords and AdSense.

- Google has developed a range of services including Google Analytics that supports its targeted advertising business.
- Google applications are cloud-based applications which includes productivity applications, mobile applications, media delivery, social interactions etc.
- Google's major income comes from the sales of target advertising based on information collected from your Google account activities or through cookies placed on your system using its AdWords system.



Google's cloud computing services falls under two catagories.

1. Through a set of popular applications offered to the general public, which include Google Docs, Google Health, Picasa, Google Mail, Google Earth etc
2. Through Platform as a Service developer tools such as Google App Engine (GAE). It allows developers to create and deploy Web applications without worrying about managing the basic infrastructure requirements.

Google Application Portfolio

*Indexed search | The Dark Web | Productivity applications
and services*

*Enterprise offerings | AdWords
Google Analytics | Google Translate*

Indexed search

- Google's search technology is based on automated page indexing and information retrieval by Web crawlers, also called spiders or robots.
- Content on pages is scanned up to a certain number of words and placed into an index.
- Google also caches copies of certain Web pages and stores copies of documents such as DOC or PDF files in its cache.
- Its algorithm determine the importance of a particular page based on the number of quality links to that page from other sites, the use of keywords, how long the site has been available, and traffic to the site or page. That factor is called the PageRank.

- Google is always improving the algorithm to prevent Search Engine Optimization (SEO) strategies from gaming the system.
- Based on this algorithm, Google returns what is called a Search Engine Results Page (SERP) for a query that is parsed for its keywords.
- Any site can place directions in their ROBOTS.TXT file indicating whether the site can be searched or not, and if so what pages can be searched.
- Sitemaps protocol control how the Google robot can work with the site.
- There's a hidden part of the internet that is much larger than the parts of the web you use every day.

- When you're checking your email, shopping online, or Facebooking, you are using what is referred to as the "Surface Web" or "Visible Web."
- The Visible Web consists of websites that are indexed by normal search engines, like Google or Yahoo.
- While this seems huge, a much larger part of the web lurks below the Surface Web and isn't indexed. This part of the web is called the "Deep Web."

The Deep Web

- The deep web refers to all the pages which are not indexed, which means that most search engines won't return them to you after a search. Their crawlers don't 'see' these pages, making them de facto invisible to these search engines.
- This means that in order to access one of these pages, you need to either know their exact address (link) or to click on another link once you get in the deep side of the web.
- Deep web refers to anything on the internet that is not indexed by and, therefore, accessible via a search engine like Google.

- Deep web content includes anything behind a paywall or requires sign-in credentials.
- It also includes any content that its owners have blocked web crawlers from indexing.
- Also, the deep web can include significant parts of the legitimate, mainstream web (like Netflix or Amazon pages), simply because they are personalized for users and not all URLs are meant to be indexed.

Dark Web

- The **dark web** refers to encrypted online content that is not indexed by conventional search engines. Sometimes, the **dark web** is also called the **dark net**. This hides the content on the World Wide Web.
- The terms “deep web” and “dark web” are sometimes used interchangeably, but they are not the same.
- Medical records, fee-based content, membership websites, and confidential corporate web pages are just a few examples of what makes up the deep web.

The Deep Web includes:

- Access to online databases
- Pages without links
- Password-protected websites with members-only access
- The internal sites of major companies, associations, and trade organizations
- Documents and files that aren't in a form that can be searched, which includes media files and information in non-standard file formats

Aggregation & Disintermediation

- Display of information from various sites for easy access.
- Even though a great user service, it sometimes violates copyright laws and damages content providers.
- Disintermediation is the removal of intermediaries such as a distributor, agent, broker, or some similar functionary from a supply chain.
- This connects producers directly with consumers, which in many cases is a very good thing.
- But it impacted organizations such as news collection agencies, publishers, retail outlets, and many other businesses, which played a positive role in the transactions they were involved in.

Productivity Applications and Services

- These products store your information online in a form that Google can use to build a profile of your activities.
- Company uses these informations it stores to deliver personalises services and products.
- Eg: Maps, web search, Web email, Calender

Enterprise Offerings

The following are among Google's products aimed at the enterprise market:

- *Google Commerce Search:* A search service for online retailers that markets their products in their site searches with a number of navigation, filtering, promotion, and analytical functions.
- *Google Site Search:* Customized search engine for enterprises under the Google Site Search service banner. The user enters a search string in the site's search, and Google returns the results from that site.
- For business and other organizations such as governmental agencies, the company has a branded Google Apps Premier Edition, which is a paid service. The different versions offer Gmail, Docs, and Calendar as core applications.

- ***Google Search Appliance(GSA)***:This server can be deployed within an organization to speed up both Intranet and Internet searching. These appliances have document management features, perform custom searches, cache content, and give local support to Google Analytics and Google Sitemaps.
- ***Google Mini***:A smaller version of the GSA.
- Google uses different names for the different bundles(such as governments, schools, non-profits, and ISPs) under a branded program called Google Apps for Business.

AdWords

- AdWords is a targeted ad service based on matching advertisers and their keywords to users and their search profiles.
- Responsible for the majority of Google's revenue stream.
- Ads are displayed as text, banners, or media and can be tailored based on geographical location, frequency, IP addresses, and other factors.
- AdWords ads can appear in Google.com, AOL search, Ask.com, and Netscape etc and Other partners belonging to the Google Display Network.
- In all these cases, the AdWords system determines which ads to match to the user searches.

- Advertisers bid on keywords that are used to match a user to their product or service. Google gets paid for the ad whenever a user clicks it.
- The system is referred to as pay-per-click advertising, and the success of the ad is measured by **click-through rate (CTR)**.
- Google calculates a quality score for ads based on the CTR, the strength of the connection between the ad and the keywords, and the advertiser's history with Google.
- This quality score is used to price the minimum bid of a keyword

Google Analytics

- A statistical tool that measures the number and types of visitors to a Web site and how the Web site is used.
- Analytics works by using a JavaScript snippet called the Google Analytics Tracking Code (GATC) on individual pages to implement a page tag.
- When the page loads, the JavaScript runs and creates a browser cookie that can be used to manage return visitors, perform tracking, test browser characteristics, and request tracking code that identifies the location of the visitor.

- GATC requests and stores information from the user's account and it sends back to GA servers for processing.
- GA aggregates the data and presents the information in a visual form. GA also is connected to the AdWords system so it can track the performance of particular ads in different contexts.
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Google Translate

- Google Translate was introduced in 2007.
- Google Translate performs machine translation of language as a cloud service to several languages.
- Translate uses a corpus linguistics approach to translation.
- The text-corpus method is a digestive approach that derives a set of abstract rules that govern a natural language from texts in that language, and explores how that language relates to other languages.

- Google Translate can be used in the following ways:
 - Enter text directly into the text box, and click the Translate button to have the text translated.
 - Enter a URL for a Web page to have Google display a copy of the translated Web page.
 - Upload a document to the page to have it translated.
- Translate parses the document into words and phrases and applies its statistical algorithm to make the translation

GT and GAE

- *Google Toolkit*
- *Google APIs*
- *Google App Engine*

Exploring the Google Toolkit

- Google has an extensive program that supports developers who want to leverage Google's cloudbased applications and services.
- Google has a number of areas in which it offers development services, including the following:
 - **AJAX APIs:** used to build widgets and other applets commonly found in places like iGoogle. AJAX provides access to dynamic information using JavaScript and HTML.
 - **Android:** is a phone operating system development.
 - **Google Apps Marketplace:** offers application development tools and a distribution channel for cloud-based applications.
 - **Google App Engine:** is Google's Platform as a Service (PaaS) development and deployment system for cloud computing applications.

- **Google Gears:** is a service that provides offline access to online data. It includes a database engine installed on the client that caches data and synchronizes it.
- **Google Web Toolkit:** is a set of development tools for browser-based applications. Open-source platform. Allows developers to create AJAX applications using Java or with the GWT compiler using JavaScript.
- **Project Hosting:** is a project management tool for managing source code.

Google APIs

- Google's APIs can be categorized as belonging to the following categories:
 - Ads and AdSense: These APIs allow Google's advertising services to be integrated into Web applications. Eg: AdWords, AdSense, and Google Analytics.
 - AJAX: Provide a means to add content such as RSS feeds, maps, search boxes, and other information sources by including a snippet of JavaScript into your code.
 - Browser: Related to building browser-based applications. Eg: Google Cloud Print API, Installable Web Apps API(for creating installation packages), the Google Web Toolkit (for building AJAX applications using Java), V8 (a high-performance JavaScript engine).

- Geo: Give location-specific information hooking into maps and geo-specific databases. Eg: Google Earth, Directions, JavaScripts Maps, Maps API for Flash, and Static Maps.
- Search: The search APIs leverage Google's core competency and its central service. Eg: APIs such as Google AJAX Search, Book Search, Code Search, Custom Search, and Webmaster Tools Data APIs allow developers to include Google searches in their applications and websites.

- Social: For information exchange and communication tools. Eg: Gmail, Calendar, and others, and they provide a set of foundation services. The popular social APIs are Blogger Data, Calendar, Contacts, OpenSocial, Picasa, and YouTube.
- Data: The Data APIs exchange data with a variety of Google services. Eg: Google Apps, Google Analytics, Blogger, Calendar, Code Search, Google Earth, Google Spreadsheets, PicasaWeb Albums.

Google App Engine (GAE)

- Google App Engine (GAE) is a Platform as a Service (PaaS) cloud-based Web hosting service on Google's infrastructure.
- This service allows developers to build and deploy Web applications and have Google manage all the infrastructure needs, such as monitoring, failover, clustering, machine instance management etc.
- For an application to run on GAE, it must comply with Google's platform standards.

GAE supports the following major features:

- Dynamic Web services based on common standards
- Automatic scaling and load balancing
- Authentication using Google's Accounts API
- Persistent storage, with query access sorting and transaction management features
- Task queues and task scheduling
- A client-side development environment for simulating GAE on your local system
- One of either two runtime environments: Java or Python

- Google allows for free application development and deployment up to a certain level of resource consumption; beyond the free limit is generally on a pay-as-you-go basis.
- Applications running in GAE are isolated from the underlying operating system, which Google describes as running in a sandbox. This allows GAE to optimize the system so Web requests can be matched to the current traffic load.
- It also allows applications to be more secure because applications can connect only to computers using the specified URLs and fetch services using HTTP or HTTPS over the standard well-known ports.

- Applications can only read files; they cannot write to the file system directly.
- To access data, an application must use data stored in the memcache (memory cache). Memcache is a fast in-memory key-value cache that can be used between application instances.
- An application responds only to a specific HTTP request—in real-time, part of a queue, or scheduled

- GAE has a distributed datastore system that supports queries and transactions.
- The datastore uses an optimistic concurrency control and maintains strong consistency.
- To support the distributed nature of the datastore, the concept of an entity group is employed.
- Transactions manage entities as a single group, and entity groups are stored together in the system so operations can be performed faster.
- The App Engine relies on the Google Accounts API for user authentication



Using Amazon Web Services

- Amazon Web Services (AWS) is a complete and evolving cloud computing platform provided by Amazon that offers a mix of packaged software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS).
- Amazon Web Services offers a broad set of global cloud-based products including compute, storage, databases, analytics, networking, mobile, developer tools, management tools, IoT, security and enterprise applications.
- Amazon Web Services is based on SOA standards, including HTTP, REST and SOAP transfer protocols, open source and commercial operating systems, application servers, and browser-based access.



Analytics



Application Integration



Compute



Containers



AWS Cost Management



Database



End User Computing



Developer Tools



Game Tech



Internet of Things



Machine Learning



Management Tools



Media Services



Migration



Networking & Content
Delivery



Security, Identity &
Compliance



Storage

Compute

- **Amazon EC2** → Virtual Servers in the Cloud
- **Amazon EC2 Auto Scaling** → Add or remove compute capacity to meet changes in demand
- **AWS Lambda** → Run Code Without Thinking About Servers
- **Amazon Virtual Private Cloud (VPC)** → Isolated Cloud Resources
- **AWS Elastic Beanstalk** → AWS Application Container
- **AWS Batch** → Fully managed batch processing at any scale.
- **AWS Serverless Application Repository** → Discover, deploy, publish and share serverless applications

Storage

- **Amazon S3** → Scalable Storage in the Cloud
- **Amazon Elastic Block Store (EBS)** → Scalable Storage in the Cloud
- **Amazon Glacier** → Low Cost Archive Storage in the Cloud
- **AWS Snowball** → Move petabyte-scale data sets
- **AWS Storage Gateway** → Integrates on-premises IT environments with Cloud storage
- **Amazon Elastic File System** → Full managed file system for EC2
- **AWS Backup** → Centralized backup across AWS services

Networking & Content Delivery

- **Amazon CloudFront** → Global Content Delivery Network
- **Elastic Load Balancing** → Distribute incoming traffic across multiple targets
- **AWS Direct Connect** → Dedicated Network Connection to AWS
- **Amazon Route 53** → A reliable and cost-effective way to route end users to Internet applications
- **AWS Transit Gateway** → Easily scale VPC and account connections
- **AWS PrivateLink** → Access services hosted on AWS easily and securely by keeping your network traffic within the AWS network

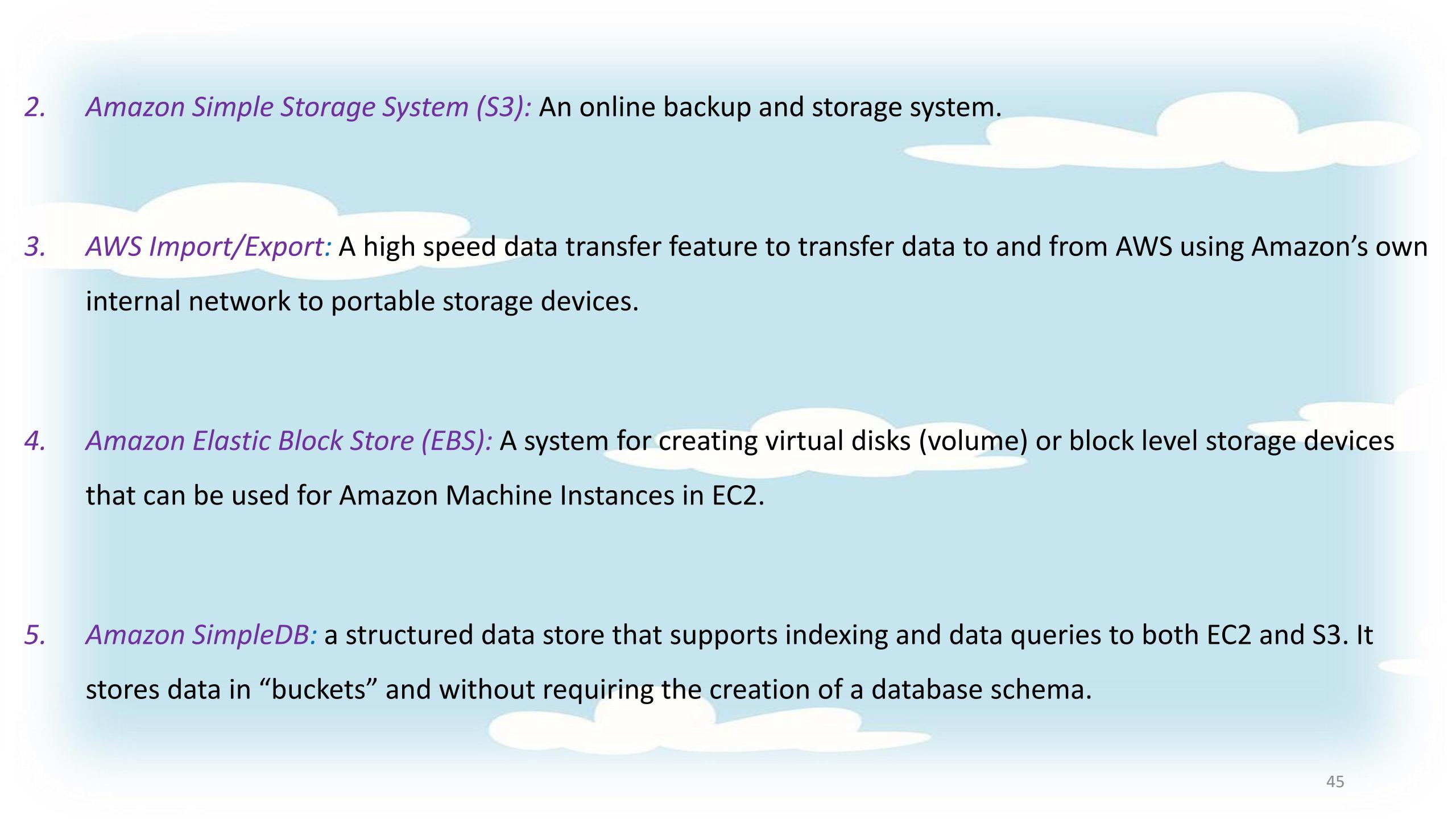
Database

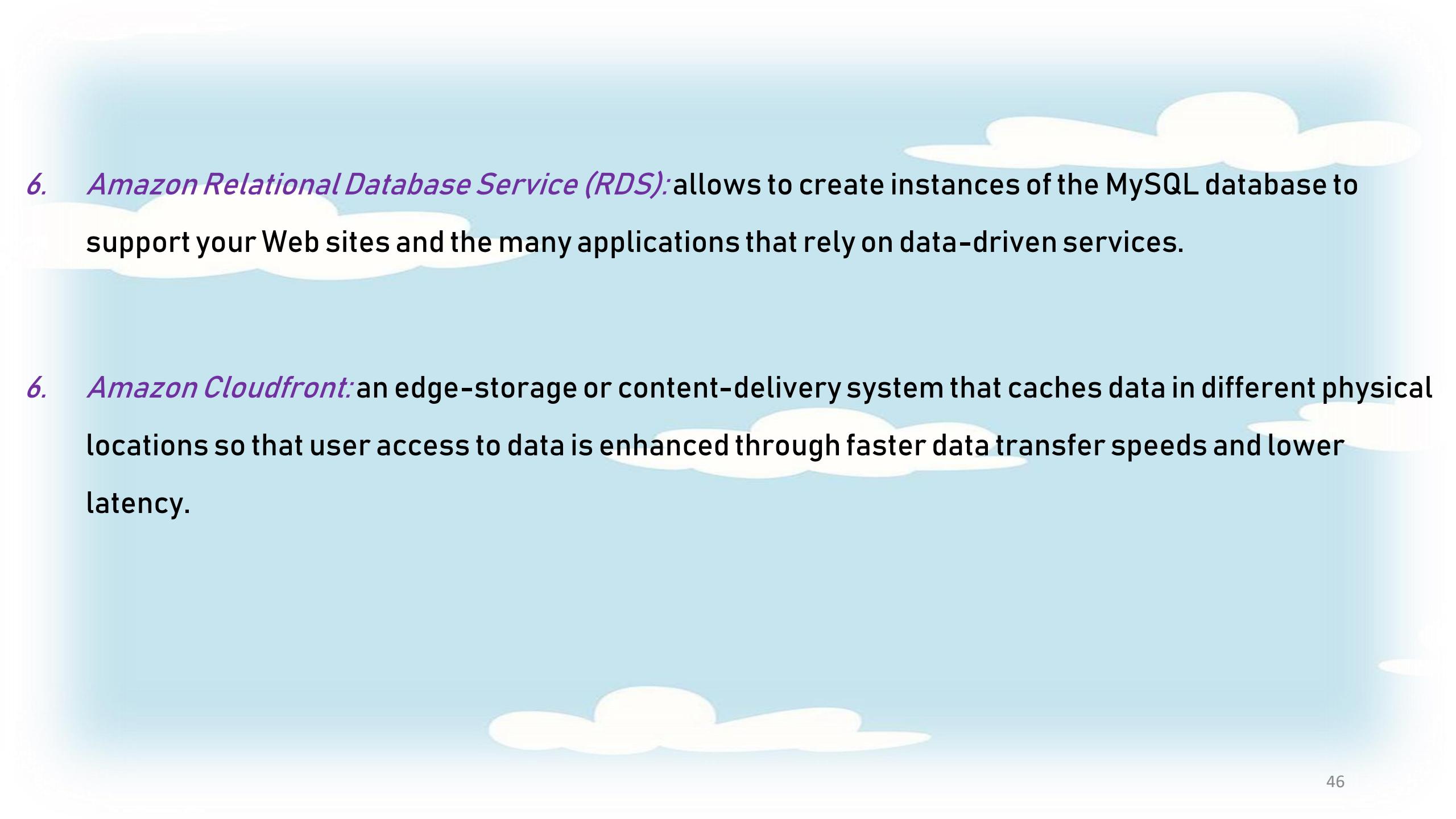
- **Amazon Relational Database Service (RDS)** → Managed Relational Database Service
- **Amazon DynamoDB** → Dynamic Databases in the Cloud
- **Amazon Aurora** → MySQL and PostgreSQL Compatible Relational Database Built for the Cloud
- **Amazon ElastiCache** → In-Memory Caching Service
- **Amazon Neptune** → Fast, reliable graph database built for the cloud
- **Amazon Keyspaces (for Apache Cassandra)** → Managed Cassandra-compatible database
- **AWS Database Migration Service** → Migrate your databases to AWS with minimal downtime

Amazon Web Service Components and Services

1. *Amazon Elastic Compute Cloud (EC2)*: enables the creation, use, and management of virtual private servers running the Linux or Windows operating system over a Xen hypervisor.
 - **Amazon Simple Queue Service (SQS)**: is a message queue or transaction system for distributed Internet-based applications.
 - **Amazon Simple Notification Service (SNS)**: a Web service that can publish messages from an application and deliver them to other applications or to subscribers.

- **Amazon CloudWatch:** To monitor EC2. Provides a view of resource utilization, performance metrics and operational indicators for processor demand, disk utilization, and network I/O.
- **Auto Scaling:** Automatically scale an EC2 site based on a set of rules that you create. The metrics are obtained by CloudWatch.
- **Elastic Load Balancing feature:** To load balance Amazon Machine Instances (AMIs) in EC2.

- 
2. *Amazon Simple Storage System (S3)*: An online backup and storage system.
 3. *AWS Import/Export*: A high speed data transfer feature to transfer data to and from AWS using Amazon's own internal network to portable storage devices.
 4. *Amazon Elastic Block Store (EBS)*: A system for creating virtual disks (volume) or block level storage devices that can be used for Amazon Machine Instances in EC2.
 5. *Amazon SimpleDB*: a structured data store that supports indexing and data queries to both EC2 and S3. It stores data in “buckets” and without requiring the creation of a database schema.

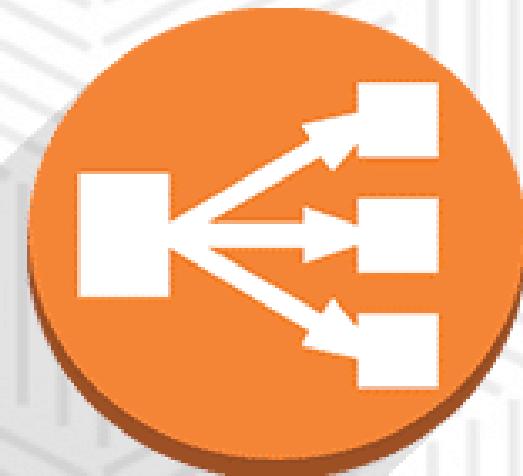
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6. *Amazon Relational Database Service (RDS)*: allows to create instances of the MySQL database to support your Web sites and the many applications that rely on data-driven services.

 6. *Amazon Cloudfront*: an edge-storage or content-delivery system that caches data in different physical locations so that user access to data is enhanced through faster data transfer speeds and lower latency.

AMAZON COMPUTE



Amazon
EC2



Elastic Load
Balancer

Elastic Compute Cloud (EC2)

- Amazon EC2 is a virtual server platform that allows users to create and run virtual machines on Amazon's server farm.
- Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed to make web-scale computing easier for developers.
- Amazon EC2's simple web service interface allows you to obtain and configure capacity with minimal friction.
- It provides you with complete control of your computing resources and lets you run on Amazon's proven computing environment.

- It reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity, both up and down, as your computing requirements change. It changes the economics of computing by allowing you to pay only for capacity that you actually use.
- Amazon EC2 provides developers the tools to build failure resilient applications and isolate themselves from common failure scenarios.

- The term elastic refers to the ability to size your capacity quickly as needed.

Instance and a machine image

- An instance is the emulation of a hardware platform such as X86, IA64, and so on running on the Xen hypervisor.
- A machine image is the software and OS running on top of the instance. It is something that you could package up with a program to create a single file containing the exact contents of a volume.
- A machine image should be composed of a hardened OS with as few features and capabilities as possible and locked down as much as possible.

Amazon Machine Images

- AMIs are operating systems running on the Xen virtualization hypervisor.
- Each virtual private server is accorded a size rating called its EC2 Compute Unit.
 1. **Standard Instances:** They are deemed to be suitable for standard server applications.
 2. **High Memory Instances:** Useful for large data throughput applications such as SQL Server databases and data caching and retrieval.
 3. **High CPU Instances:** Used for applications that are processor- or compute-intensive. Applications of this type include rendering, encoding, data analysis, and others.

Pricing models

- The pricing of the different AMI types depends on the operating system used, which data center the AMI is located in (you can select its location), and the amount of time that the AMI runs.
- **On-Demand Instance:** This is the hourly rate with no long-term commitment.
- **Reserved Instances:** This is a purchase of a contract for each instance you use with a significantly lower hourly usage charge after you have paid for the reservation. users are expected to reserve the instance well in advance in the range of one to three years.
- **Spot Instance:** This is a method for bidding on unused EC2 capacity based on the current spot price. This feature offers a significantly lower price, but it varies over time or may not be available when there is no excess capacity. Lets users bid on compute instances that are not used. Spot prices differ based on usage, time of day, week or month.

System images and software

- You can choose to use a template AMI system image with the operating system of your choice or create your own system image that contains your custom applications, code libraries, settings, and data.
Security can be set through passwords, Kerberos tickets, or certificates.
- These operating systems are offered:
- Red Hat Enterprise Linux
- OpenSuse Linux
- Ubuntu Linux
- Oracle Enterprise Linux
- Windows Server 2003/2008 32-bit and 64-bit up to Data Center Edition
- Debian
- Most of the system image templates that Amazon AWS offers are based on from the list above.

Creating an account and instance on EC2

- The process for signing up for AWS, creating an AMI, and provisioning the image with software requires following steps:
- For signing up for AWS:
 - Sign Up to AWS.
 - Name your account, provide a password and select a payment option.
 - Sign into the Amazon EC2 Management Console.

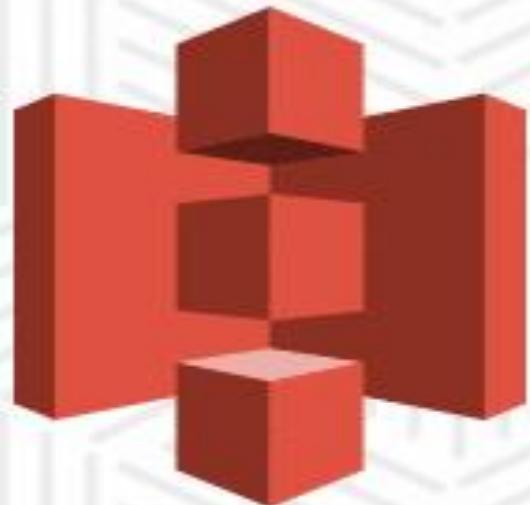
- To create an AMI instance:
 - Click the Launch Instance button.
 - Select the type of system image you want.
 - Specify the Number of Instance(s), the Availability Zone and the Instance type.
 - Enter Kernel ID and enable CloudWatch.
 - Create a Key Pair.
 - Configure Firewall.
 - Review the settings.
 - Run and connect to the instance.

Elastic load balancing

- Elastic Load Balancing automatically distributes incoming application traffic across multiple targets, such as Amazon EC2 instances, containers, IP addresses etc.
- It can handle the varying load of your application traffic in a single Availability Zone or across multiple Availability Zones.
- Elastic Load Balancing offers three types of load balancers that all feature the high availability, automatic scaling, and robust security necessary to make your applications fault tolerant.

- ❖ Application Load Balancer
- ❖ Network Load Balancer
- ❖ Classic Load Balancer

AMAZON STORAGE



Amazon
S3



Amazon
EBS

Working with Amazon Storage Systems

- When you create an AMI the storage allocated is temporal; it only exists for as long as your instance is running.
- All of the data contained in that storage is lost when the instance is suspended or terminated, as the storage is reassigned to other AWS users to use.
- So, you need to have access to persistent storage.

Amazon Simple Storage System (S3)

- AWS cloud provides various options for storing, accessing, and backing up web application data and assets.
- The Amazon S3 (Simple Storage Service) provides a simple web-services interface that can be used to store and retrieve any amount of data, at any time, from anywhere on the web.
- Amazon S3 stores data as objects within resources called **buckets**. The user can store as many objects as per requirement within the bucket, and can read, write and delete objects from the bucket.
- It is important that you do not associate the concept of a filesystem with S3, because files are not supported; only objects are stored.

- The Infrequent Access storage tier and Amazon Glacier are services of S3 that can be used as long-term cold storage at an affordable cost.
- The S3 system allows you to assign a name to a bucket, but that name must be unique in the S3 namespace across all AWS customers.
- Access to an S3 bucket is through the S3 Web API (either with SOAP or REST).
- S3's performance limits its use to non-operational functions such as data archiving and retrieval or disk backup.

- You can do the following with S3 buckets through the APIs:

- Create, edit, or delete existing buckets
- Upload new objects to a bucket and download them
- Search for and find objects and buckets
- Find metadata associate with objects and buckets
- Specify where a bucket should be stored
- Make buckets and objects available for public access

- Versioning option is available for Amazon S3.
- With versioning feature is enabled, every version of an object stored in an S3 bucket is retained.
- Versioning is used for preserving data and for archiving purposes.
- Amazon S3 provides large quantities of reliable storage that is highly protected but to which you have low bandwidth access.

Amazon Elastic Block Store (EBS)

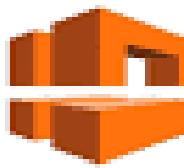
- Amazon Elastic Block Store (EBS) provides block level storage volumes for use with Amazon EC2 instances.
- EBS creates virtual drives that can be used with your machine instances in the same way that you would use a hard drive with a physical system.
- EBS tends to be used in transactional systems where high-speed data access is required.
- A persistent storage service with a high operational performance. It can store file system information and its performance is higher and much more reliable than Amazon S3.

- The cost of creating an EBS volume is greater than creating a similarly sized S3 bucket.
- An EBS volume can be used as an instance boot partition.
- The advantages of an EBS boot partition:
 - Can have a volume up to 1TB.
 - Retain your boot partition separately from your EC2 instance.
 - Use a boot partition volume as a means for bundling an AMI into a single package.
 - EBS boot partitions can be stopped and started.
 - They offer fast AMI boot times.

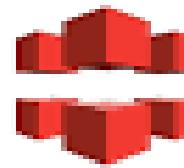
- EBS creates block storage volumes varying in size from 1GB to 1TB and makes those volumes available to your machine instances.
- The created volumes must be formatted for use.
- A volume is mounted on a particular instance and is available only to that instance; i.e., volumes may not be shared between instances.
- Volumes appear as if they are physical drives attached to an instance.
- Multiple volumes can be mounted on a single instance and create striped RAID volumes for faster performance.
- You can make an instance image or snapshot of your AMI, and these point-in-time snapshots are then copied out to Amazon S3.

- You can use these snapshots as system images to create new AMIs or to restore a volume to that point-in-time snapshot when needed.
- Snapshots can be shared with authorized users using Snapshot Permissions command.
- When you create a new volume from an S3 snapshot, the data is slowly copied to the new volume.
- As you start working on the new volume, any missing data is downloaded preferentially as needed.
- Amazon EBS is particularly suited for applications that require a database, file system, or access to raw block level storage

Networking & Content Delivery



Amazon
VPC



Amazon
CloudFront



Amazon
Direct
Connect



Amazon
Route 53

CloudFront

- Amazon CloudFront is a fast global content delivery network (CDN) service that securely delivers data, videos, applications, and APIs to customers globally with low latency, high transfer speeds, all within a developer-friendly environment.
- Amazon CloudFront is referred to as a Content Delivery Network (CDN) or Edge Computing.
- In edge computing, content is pushed out geographically so the data is more readily available to network clients and has a lower latency when requested.

- CloudFront ensures that content is closer to the users and improves the user experience by delivering the content faster by serving the content from the AWS region closer to the end user.
- CDN is like a distributed caching system.
- CloudFront servers are located throughout the world.
- A user requesting data from a CloudFront site is referred to the nearest geographical location.

- CloudFront supports “geo-caching” data by performing static data transfers and streaming content from one CloudFront location to another.
- A CloudFront domain name is registered for your domain name in the form <domainname>.cloudfront.net.
- Objects in the CloudFront domain can be mapped to your own domain.
- Source files on CloudNet servers are stored in Amazon S3 buckets and then use the CloudFront API to register the S3 bucket with the CloudNet distribution.
- Then in your applications, Web pages, and links, you reference the distribution location.

Amazon Route 53

- Amazon Route 53 is a highly available and scalable cloud Domain Name System (DNS) web service.
- It is designed to give developers and businesses an extremely reliable and cost effective way to route end users to Internet applications by translating names like `www.example.com` into the numeric IP addresses like `192.0.2.1` that computers use to connect to each other.
- Amazon Route 53 is fully compliant with IPv6 as well.

- Amazon Route 53 effectively connects user requests to infrastructure running in AWS – such as Amazon EC2 instances, Elastic Load Balancing load balancers– and can also be used to route users to infrastructure outside of AWS.
- You can use Amazon Route 53 to configure DNS health checks to route traffic to healthy endpoints or to independently monitor the health of your application and its endpoints.
- Amazon Route 53 enables you to manage traffic within China or globally through a variety of routing types, including Latency Based Routing, and Weighted Round Robin—all of which can be combined with DNS Failover in order to enable a variety of low-latency, fault-tolerant architectures.



Amazon Database Services

- Amazon offers two different types of database services:
 - Amazon SimpleDB (non-relational)
 - Amazon Relational Database Service (Amazon RDS)

Amazon SimpleDB

- Amazon SimpleDB is an attempt to create a high performance data store with many database features.
- The service is meant to be low touch, in that it abstracts many of the common concerns of database administrators for hardware requirements, software maintenance, indexing, and performance optimization
- To create a high performance “simple” database, the data store is non-relational and joins are not supported
- Data stored in SimpleDB domains are easily scalable and highly available.

- Transactions are performed as a set of conditional PUTS and DELETES, and you can INSERT, REPLACE, or DELETE values for item attributes.
- Features like ROLLBACK are not supported.
- Optimistic concurrency control is maintained using the value of a counter or timestamp.
- Capacity of SimpleDB database can be increased by scaling out and creating additional data domains.
- SimpleDB integrates with EC2 instances and S3 storage.

- Data in SimpleDB is automatically indexed and may be queried as needed.
- A data domain may be located geographically in any of AWS's regions.
- Featured uses of SimpleDB are data logging, online gaming, and metadata indexing.
- SimpleDB would not be the best choice for a high-volume transaction system.

Amazon Relational Database Service (RDS)

- Amazon Relational Database Service (Amazon RDS) makes it easy to set up, operate, and scale a relational database in the cloud
- Amazon RDS gives you access to several familiar database engines, including Amazon Aurora, MySQL, PostgreSQL, MariaDB, Oracle, and SQL Server. This means that the code, applications, and tools you already use with your existing databases can be used with Amazon RDS.
- RDS automatically performs functions such as backups and is deployable throughout AWS zones using the AWS infrastructure.
- RDS is started by launching a DB instance in the AWS Management Console and assigning the DB Instance class and size of the data store.

- The DB Instance is then connected to your MySQL database.
- Additionally, you can monitor your database usage as part of Amazon CloudWatch as it monitors your Amazon Web Services (AWS) resources and the applications you run on AWS in real time.
- You can use CloudWatch to collect and track metrics, which are variables you can measure for your resources and applications.
- Important features of RDS is the automated point-in-time backup system for data in the DB as well as for the MySQL transaction logs.
- RDS supports database snapshots. A DB Snapshot is stored as a full DB backup and is retained until you delete it from your storage container.

Choosing a database for AWS

- *Choose SimpleDB*

- ✓ When index and query functions do not require relational database support.
- ✓ For the lowest administrative overhead.
- ✓ If you want a solution that auto scales on demand.
- ✓ For a solution that has a very high availability.

- *Use RDS*

- ✓ When you have an existing MySQL database that could be ported
- ✓ When you want to minimize the amount of infrastructure and administrative management required.
- ✓ When your DB queries require relation between data objects.
- ✓ When you want a DB that scales based on an API call and has a pay-as-you-use-it pricing model.



Using Microsoft Cloud Services

- **Microsoft Azure**, commonly referred to as **Azure** is a cloud computing service created by Microsoft for building, testing, deploying, and managing applications and services through Microsoft-managed data centers.
- It provides software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS) and supports many different programming languages, tools, and frameworks, including both Microsoft-specific and third-party software and systems.

- Azure is a combination of virtualized infrastructure to which the .NET Framework has been added as a set of .NET Services.
- The Windows Azure service itself is a hosted environment of virtual machines enabled by a fabric called Windows Azure AppFabric.
- Applications can be hosted on Azure and provision it with storage, growing it as you need it.
- Windows Azure service is an Infrastructure-as-a-Service(IaaS) offering.

- Azure and its related services were built to allow developers to extend their applications into the cloud.
- Azure is a virtualized infrastructure to which a set of additional enterprise services has been layered on top, including:
 - *Azure AppFabric*: A virtualization service that creates an application hosting environment. Formerly known as .NET Services. It is a cloud-enabled version of the .NET Framework.
 - *Storage*: A high capacity non-relational storage facility.
 - *Compute*: A set of virtual machine instances.

- *SQL Azure Database*: A cloud-enabled version of SQL Server.
- *Dallas*: A database marketplace based on SQL Azure DB.
- *Dynamics CRM*: An xRM (Anything Relations Management) service based on Microsoft Dynamics.
- *SharePoint Services*: A document and collaboration service based on SharePoint.
- *Windows Live Services*: A collection of services that runs on Windows Live, which can be used in applications that run in the Azure cloud.

Defining Windows Azure Platform

Software plus Services approach

Azure Platform | Windows Azure service

Windows Azure AppFabric

Azure Content Delivery Network

SQL Azure | Windows Azure pricing

Windows Live services

Defining Windows Azure Platform

- Windows Azure is both IaaS and PaaS service offering.
- Azure is IaaS and Azure Platform is PaaS.
- A developer creates an Azure application by logging onto the Azure portal and creating a Windows Live ID, a hosted account, and a storage account.
- The completed application can then be made available to users as a hosted application or service.

Software plus Services approach

- Microsoft sees the cloud as being a complimentary platform to its other platforms.
- Microsoft developer can extend his application's availability to the cloud.
- The application runs on a server, desktop, or mobile device running some form of Windows.
- Microsoft calls this approach software plus services.

- The approach provides benefits of both traditional physical-based software and Web-based software-as-a-service (SaaS) delivery methods.
- The Windows Azure Platform allows a developer to modify his application so it can run in the cloud on virtual machines hosted in Microsoft datacenters.
- Windows Azure serves as a cloud OS and the application can be hosted on Azure as a runtime application where it can make use of the various Azure Services.

The Azure Platform

- With Azure's architecture, an application can run locally, run in the cloud, or some combination of both.
- Applications on Azure can be run as applications, as background processes or services, or as both.
- The Windows Azure service is a cloud-based OS with a fabric infrastructure of virtual machines hosted in Microsoft datacenters.
- The Azure Windows Services Platform API uses the industry standard REST, HTTP, and XML protocols.

- Developers can install a client-side managed class library that contains functions that can make calls to the Azure Windows Services Platform API as part of their applications.
- These API functions have been added to Microsoft Visual Studio as part of Microsoft's Integrated Development Environment (IDE).
- The Azure Service Platform hosts runtime versions of .NET Framework applications

- Azure can deploy Web-based applications built with ASP.NET, the Windows Communication Foundation (WCF), and PHP, and it supports Microsoft's automated deployment technologies.
- Microsoft also has released software development kit for both Java and Ruby to place calls to the Azure Service Platform API to the AppFabric Service.

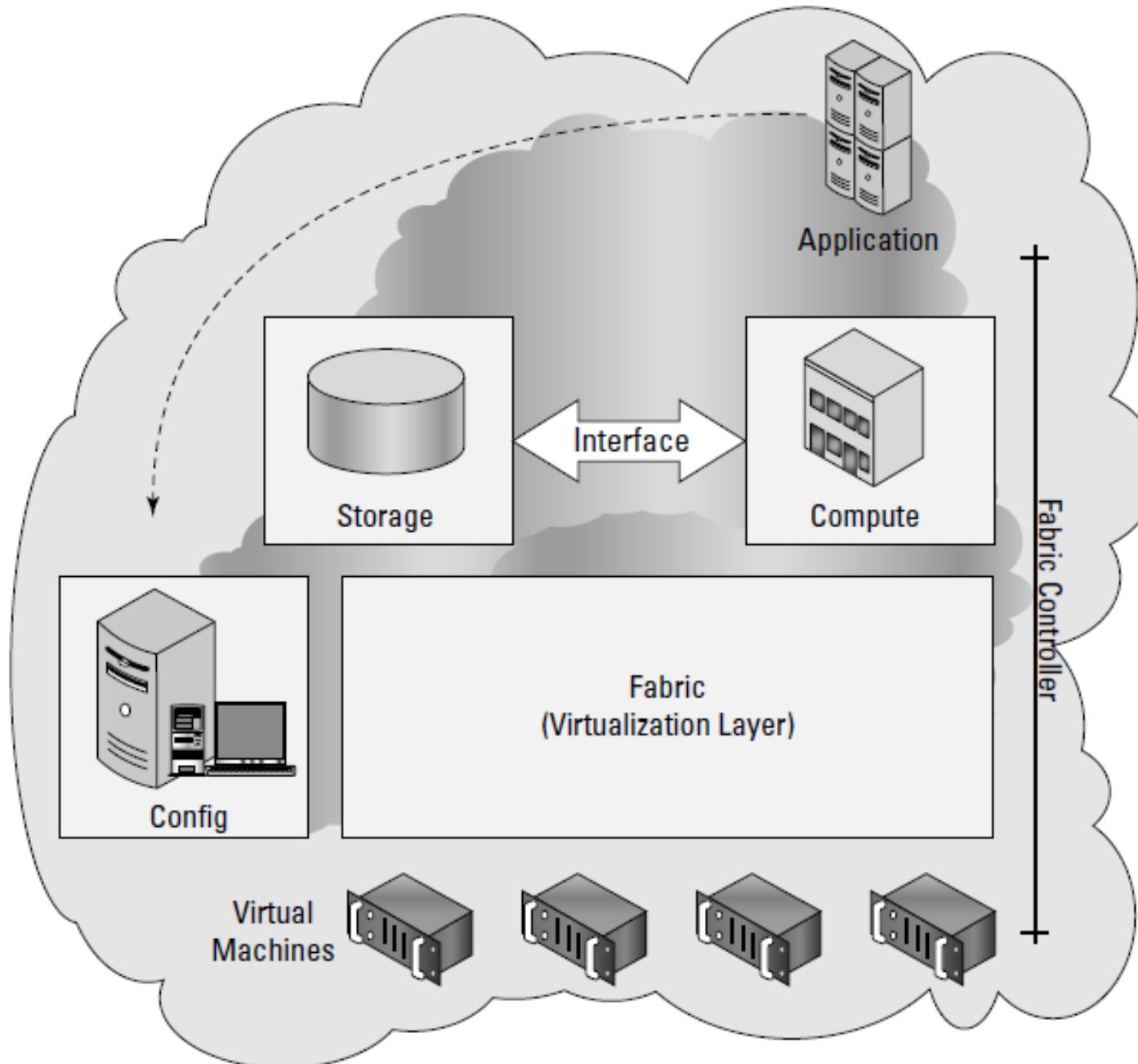
The Windows Azure Service

- Six main elements are part of Windows Azure:

- ***Application***: This is the runtime of the application that is running in the cloud.
- ***Compute***: This is the load-balanced Windows server computation and policy engine that allows you to create and manage virtual machines that serve either in a Web role and a Worker role.
- ***Storage***: This is a non-relational storage system for large-scale storage.
- ***Fabric***: This is the Windows Azure Hypervisor, which is a version of Hyper-V that runs on Windows Server 2008.

- *Config*: This is a management service.
 - *Virtual machines*: These are instances of Windows that run the applications and services that are part of a particular deployment.
-
- The portion of the Azure environment that creates and manages a virtual resource pool is called the Fabric Controller.
 - Applications that run on Azure are memory-managed, load-balanced, replicated, and backed up through snapshots automatically by the Fabric Controller.

Windows Azure is a virtualized infrastructure that provides configurable virtual machines, independent storage, and a configuration interface.

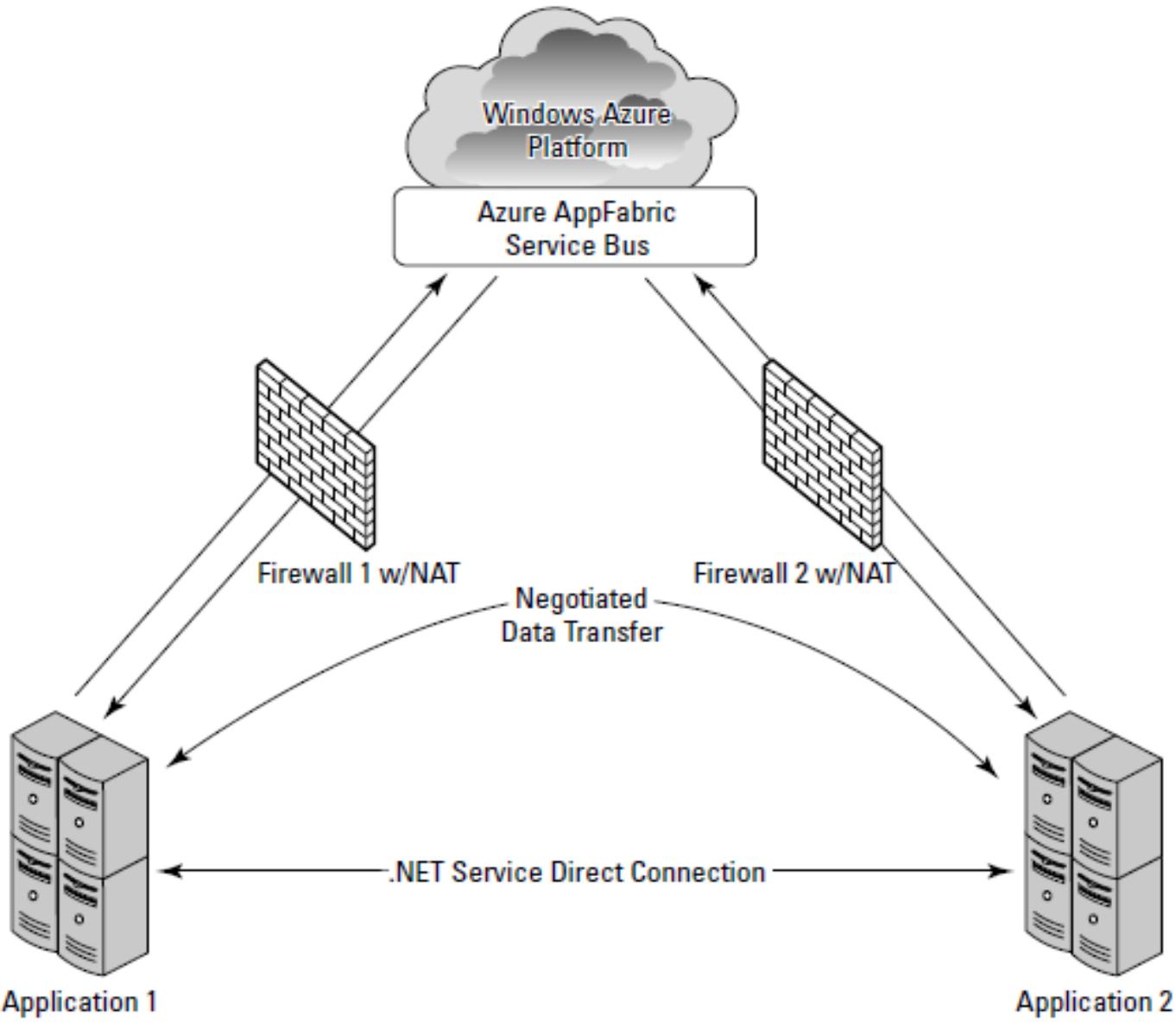


Windows Azure AppFabric

- It is a *Service Bus* and *Access Control facility* based on .NET technology for client requests to Web services on Azure. Previously, known as Microsoft .NET Services.
- Supports the standard SOA protocols such as REST and SOAP and the WS- protocols.
- Microsoft refer Azure AppFabric as an “Internet Service Bus”.
- AppFabric has components such as service orchestration, federated identity, access control, a namespace, service registry, and a messaging fabric, but it locates these components in the cloud.

- The function of a service bus is to expose distributed services as an endpoint with a specific Uniform Resource Identifier (URI) that clients can request services from.
- A particular set of endpoints and its associated Access Control rules for an application is referred to as the service namespace.
- Each namespace is assigned a management key that is part of the security mechanism.
- Azure AppFabric manages requests by locating the service, communicating the request, and making the necessary connection possible by performing network address translation, opening appropriate ports in any intervening firewalls.

Azure AppFabric service pathways

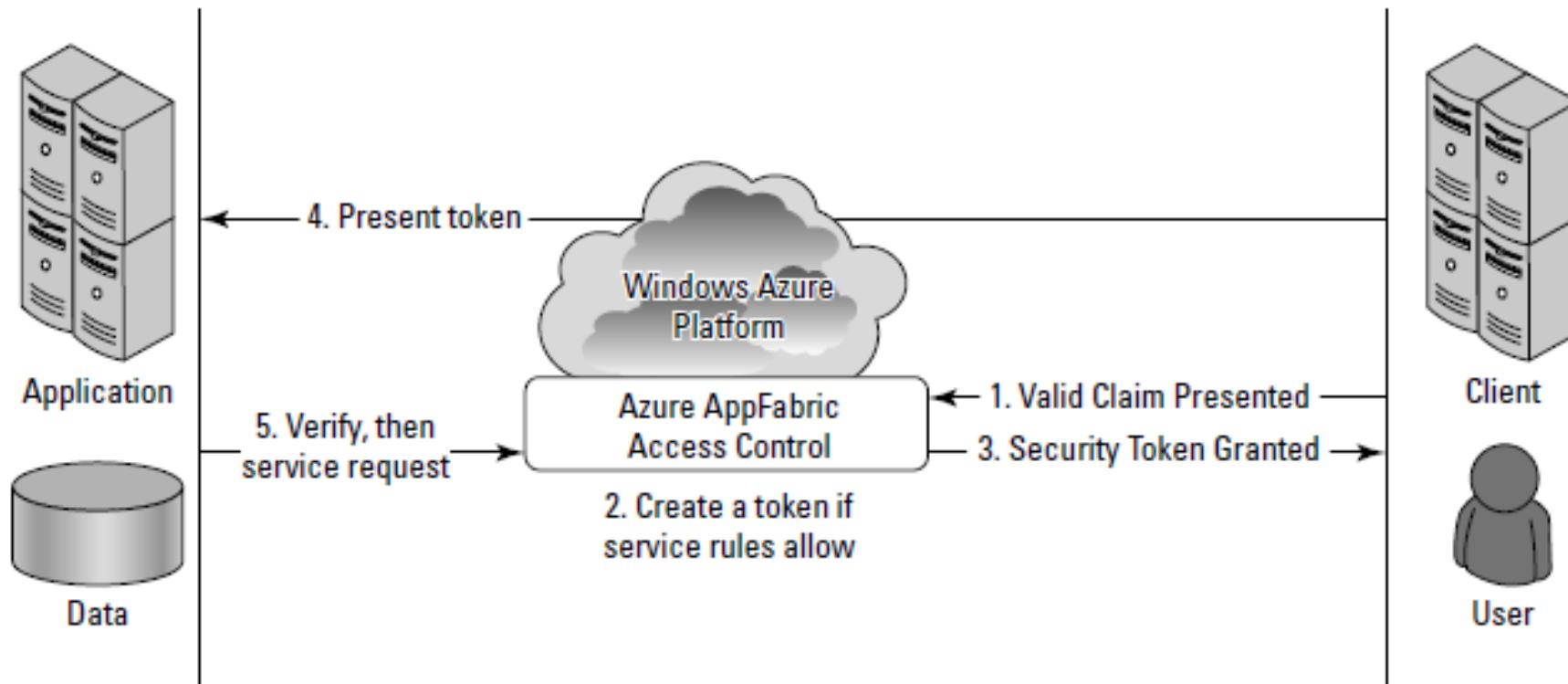


- AppFabric manages the transaction to ensure that it is completed and that a response is sent to the client.
 - A service bus also negotiate the exchange of information between a client and the service.
 - AppFabric can provide a negotiated traversal of services through firewalls and NATs (Network Address Traversal).
-
- The Access Control portion of Azure AppFabric provides a token-based trust mechanism for identity management. An application or user, presents a claim for a service from an application.
 - The Access Control examines the request, and if it finds it to be valid, it grants a security token to the client.

Steps in access control:

- Client requests authentication from Access control.
- Access control creates a token based on the stored rules for server application.
- A token is signed and returned to the client application.
- The client presents the token to the service application.
- Server application verifies the signature and uses the token to decide what the client application is allowed to do.

Azure AppFabric Access Control enables secure application requests through a token mechanism.



Azure Content Delivery Network

- It is a worldwide content caching and delivery system for Windows Azure blob content.
- CDN is an edge network service that lowers latency and maximizes bandwidth by delivering content to users who are nearby.
- Any storage account can be enabled for CDN.
- In order to share information stored in an Azure blob, it has to be placed in a public blob container that is accessible to anyone using an anonymous sign-in.

- When the Blob service URL is used, the request is redirected to the closest CDN endpoint to the client.
- The CDN service searches that location and serves the content.
- If the content isn't found, the CDN retrieves the Blob from the Blob service, caches the content, and then serves it to the user.

Azure Blob storage is a service that stores unstructured data in the cloud as objects/blobs. Blob storage can store any type of text or binary data, such as a document, media file, or application installer. Blob storage is also referred to as object storage.

SQL Azure

- SQL Azure is a cloud-based relational database service that is based on Microsoft SQL Server.
- Initially, this service was called SQL Server Data Service.
- An application that uses SQL Azure Database can run locally on a server, PC, or mobile device, in a datacenter, or on Windows Azure.
- Data stored in an SQL Azure database is accessed using the Tabular Data Stream (TDS) protocol, the same protocol used for a local SQL Server database.
- SQL Azure Database supports Transact-SQL statements.

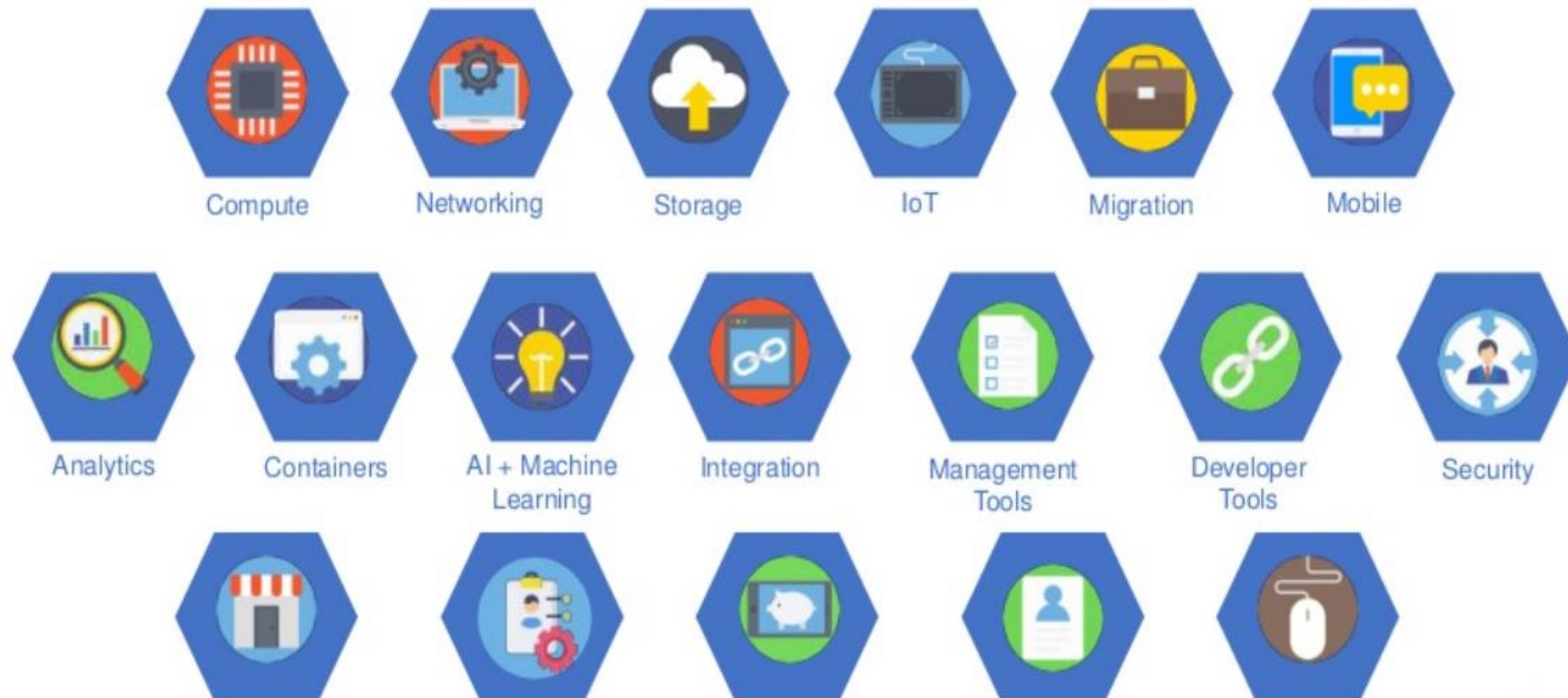
- Azure data is replicated three times for data protection and writes are checked for consistency.
- SQL Azure eventually will support the Microsoft Sync Framework providing a facility for SQL Azure DB to synchronize their data with local DB.
- Current limit of each SQL Azure Database is 10GB.
- If the storage size exceeds the limit, then data must be partitioned into logical sets and queries need to be structured to account for this partitioning.
- SQL Azure Database is a shared database environment, and limitations are placed on how long a query can run or how many resources a query can use.

Windows Azure pricing

- Prices for working with the Windows Azure Platform are based either on a “consumption” (pay-as-you-go) model or through various contracts for levels of monthly service that Microsoft calls “commitments.”
- When you exceed the subscription level of your commitment, the additional usage is charged on the consumption model.

Azure Services

Azure services are divided into 18 categories and contains more than 200 services



Compute

Linux Virtual Machines	Functions	Azure Batch AI	Azure Kubernetes Service (AKS)
Windows Virtual Machines	Batch	Service Fabric	Cloud Services
SAP HANA on Azure Large Instances	Container Instances	Virtual Machine Scale Sets	SQL Server on Virtual Machines

Networking

Content Delivery Network	Virtual Network	VPN Gateway	Network Watcher
ExpressRoute	Traffic Manager	Application Gateway	Azure Firewall
Azure DNS	Load Balancer	Azure DDoS Protection	Virtual WAN

Containers

App Service	Azure Container Registry	Service Fabric	Web App for Containers
Batch	Container Instances	Azure Kubernetes Service (AKS)	Azure Dev Spaces

Storage			
StorSimple	Blob Storage	Queue Storage	Archive Storage
Data Lake Storage Gen2	Disk Storage	File Storage	Azure NetApp Files
Data Lake Storage Gen1	Managed Disks	Storage Explorer	

Databases			
Azure SQL Database	Data Factory	SQL Server on Virtual Machines	Azure Database for MySQL
Azure Cosmos DB	Redis Cache	Table Storage	Azure Database Migration Service
SQL Data Warehouse	SQL Server Stretch Database	Azure Database for PostgreSQL	

Application Services



Software Services

Microsoft®
Exchange Online

Microsoft®
SharePoint Online

Microsoft®
Office Communications Online

Microsoft
Dynamics CRM Online

Platform Services

Microsoft®
SQL Azure™

Microsoft®
.NET Services

Live Services

Microsoft®
SharePoint Services

Microsoft
Dynamics CRM Services

Windows® Azure™

Infrastructure Services

Windows Live services

- **Windows Live** is a discontinued brand-name for a set of web services and software products from Microsoft as part of its software plus services platform.
- Windows Live is a collection of cloud-based applications and services, some of which can be used inside applications that run on Windows Azure Platform.
- Some of them run as standalone applications and are available to users directly through a browser.
- Others are services that add capabilities to the Windows Azure Platform as part of Microsoft's software plus services strategy.

- Windows Live applications including Windows Mail, Windows Photo Gallery, and Windows Movie Maker were rolled into a downloadable software suite called Windows Live Essentials.
- Some parts of the Windows Live portfolio are shared applications and services that are accessible to developers.
- Developers access the services for Windows Live Services through a collection of APIs and controls called Windows Live Messenger Connect.
- Using these APIs and controls, developers can add Windows Live Services capabilities and data to their application.

Using Windows Live

- Windows Live includes several popular cloud-based services.
- The two best known and most widely used are Windows Live Hotmail and Windows Live Messenger.
- Windows Live is based around five core services:
 - E-mail
 - Instant Messaging
 - Photos
 - Social Networking
 - Online Storage

- A user or application can consume Windows Live in a number of ways.

- ✓ Some are entirely cloud-based Web services which are accessed using a browser.
- ✓ Some are aimed at mobile devices and are referred to as Windows Live for Mobile, and are accessed using mobile devices.
- ✓ Some are client-side applications that are download from Windows Live for use on your desktop.

Windows Live Essentials

- A collection of client-side applications that must be downloaded and installed on a desktop.
- Live Essentials rely on cloud-based services for their data storage and retrieval, and in some cases for their processing.
- All the Windows Essentials are downloaded as a single file.
- Live Essentials currently includes the following:
 - Family Safety
 - Windows Live Messenger
 - Photo Gallery
 - Mail
 - Movie Maker

Windows Live Home

- Windows Live Home is the central access page or portal for the Windows Live suite.
- The page provides navigation, lists activities, provides access to e-mail, shows your RSS feeds, and lists your account name and some related information.
- This page is customizable and depends on the services to which you are subscribed.

- These are the most commonly used features on Windows Live Home:

- ✓ Launching other Windows Live services
- ✓ Viewing e-mail headers from Hotmail and private messages from other users
- ✓ Viewing activity of people you follow
- ✓ Displaying weather information and RSS feed updates
- ✓ Managing calendars and events
- ✓ Viewing photos
- ✓ Modifying profile and relationships

Windows Live for Mobile

- Windows Live services that are specifically meant to be run on mobile devices or cell phones.
- Some of these services run on the Windows Mobile platform, some are Web-based applications that conform to the lightweight Wireless Application Protocol (WAP) or on GPRS (General Packet Radio Service) browser, and some support SMS (Simple Message Service) systems.

- Services includes:

- Live Mesh Mobile
- Windows Live Calendar Mobile
- Windows Live Contacts Mobile
- Windows Live Groups Mobile
- Windows Live Home Mobile
- Windows Live Messenger Mobile
- Windows Live Office Mobile
- Windows Live Profile Mobile
- Windows Live SkyDrive Mobile
- Windows Live Spaces Mobile