GETTING STARTED WITH AWS CLOUD FUNDAMENTALS

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AWS Community Builder/AWS Technical Trainer

KIRA HUB

CLOUD TECHNOLOGY

Agenda

1. What is Cloud Computing?
2. Cloud deployment Models
3. Benefits & Characteristics of Cloud Computing
4. Cloud Service Models
5. AWS Global Infrastructure

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Agenda

Cloud Computing Analogy

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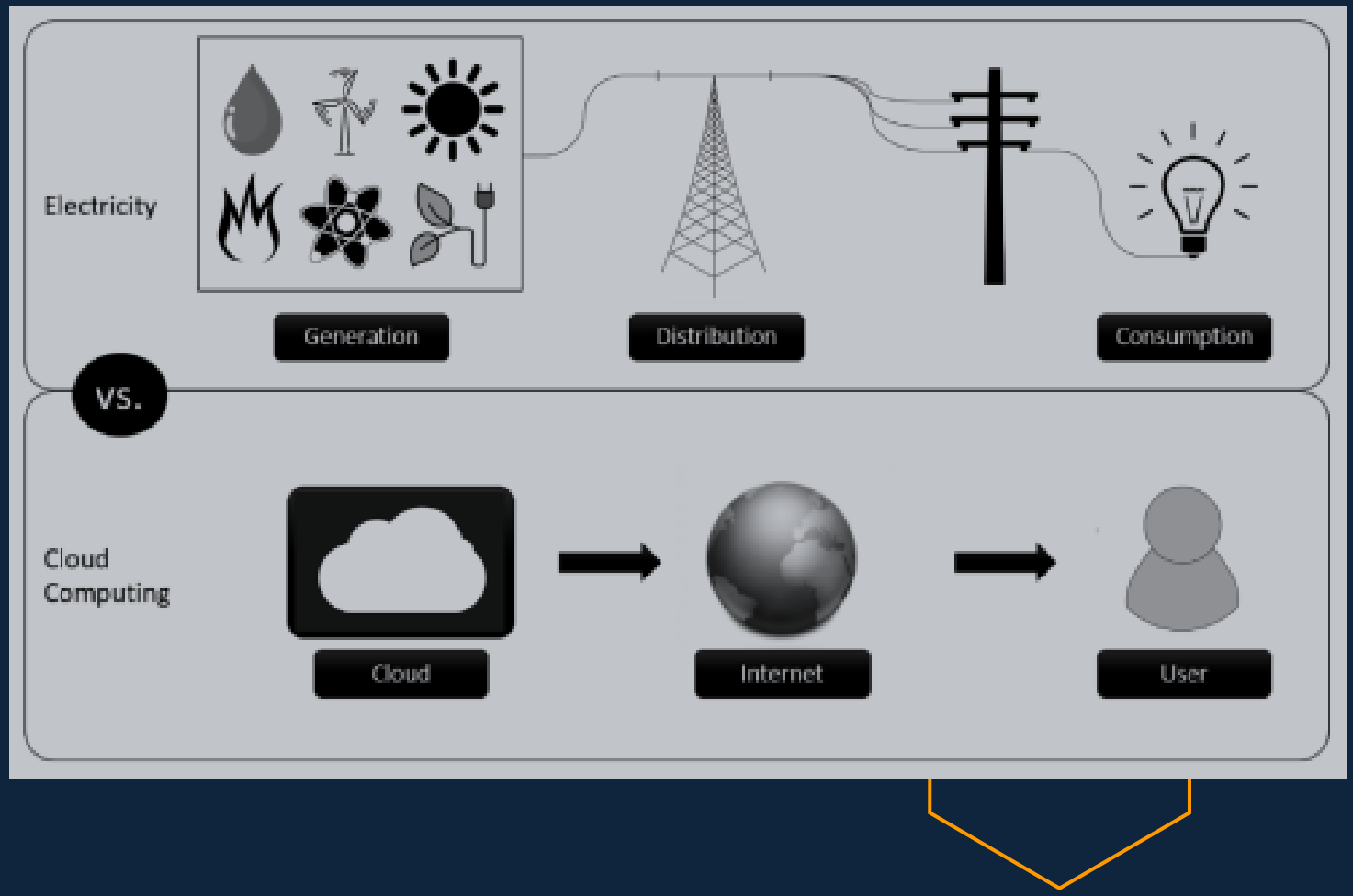
Analogy Credit: **Ashish Prajapati**, from **AWS Cloud Computing Concepts and Tech Analogies book**

Cloud Computing Analogy



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Traditional Infrastructure

- Pay for physical space (renting a data center or using your own office/garage).
- Maintenance (servers, power supplies, cooling systems)
- Scaling up means ordering new hardware, waiting for it to arrive, installing it—time-consuming and expensive.
- Your team is on 24/7 alert to monitor, fix, and optimize everything, from network crashes to power outages.
- Disasters like power failures or fires could put all your equipment at risk, adding complexity and cost for recovery plans.

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Cloud Computing

- No more physical space or hardware hassles. Everything is managed by cloud providers like AWS.
- You can scale instantly, from one server to hundreds, with a few clicks—no waiting for deliveries or installations.
- You pay only for the resources you use, saving money on overprovisioning.
- Disaster recovery and maintenance are handled by the provider, giving you peace of mind.

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CLOUD SERVICES PROVIDERS

Amazon Web Services (AWS)

Leader in Cloud Services: Offers a wide range of cloud solutions including compute, storage, and databases.

Microsoft Azure

Appealing to enterprises, hybrid cloud embracers, and companies that mainly use Microsoft products, including Office 365..

Google Cloud Platform (GCP)

Has carved a niche for itself through innovations across Artificial Intelligence (AI), Machine Learning (ML), Data Analytics, and Kubernetes

IBM Cloud

Help businesses that would like to stick to a familiar, on-premises environment transition to digital brands without much hassle.

Oracle Cloud Infrastructure (OCI)

Enterprise Cloud: Focuses on delivering high-performance computing for enterprise workloads.

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Popular Platforms Running on the Cloud

Spotify

Spotify has unlocked greater performance efficiency in its workloads running on Google Cloud.

Skype

Skype found the perfect fit in Azure Cosmos DB, the globally distributed NoSQL database service from Microsoft.

Pinterest

Pinterest's exabyte data platform runs entirely on AWS

Netflix

Netflix uses AWS for nearly all its computing and storage needs, including databases, recommendation engines, video transcoding, and more

AirBnB

To support demand, the company uses Amazon EC2 instances for its application, memcache, and search servers.

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Cloud Deployment Models

Private Cloud: The Exclusive Club

- ✓ For a Single Organization: Cloud services used exclusively by one organization.
- ✓ Complete Control: Full management and customization.
- ✓ Security: Ideal for sensitive applications.
- ✓ Specific Needs: Tailored to meet unique business requirements.

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Public Cloud: The Open Marketplace

- ✓ Third-Party Provider: Cloud resources managed and delivered by a third-party over the Internet.
- ✓ Accessibility: Available to anyone who subscribes.
- ✓ Scalability: Easy to scale resources up or down.
- ✓ Cost-Effective: Pay-as-you-go pricing.

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Hybrid Cloud: The Best of Both Worlds

- ✓ Mixed Environment: Combines on-premises servers with cloud capabilities.
- ✓ Control: Manage sensitive data on-premises.
- ✓ Flexibility: Extend capabilities to the cloud for scalability.
- ✓ Cost Efficiency: Optimize costs by balancing in-house and cloud resources.

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The Five Key Characteristics of Cloud Computing

On-Demand Self Service

- Provision resources independently
- Flexibility

Broad Network Access

- Accessible anywhere
- Versatility

Multi-Tenancy and Resource Pooling

- Shared Infrastructure
- Efficient Use

Rapid Elasticity and Scalability

- Dynamic Resources
- Flexibility

Measured Service

- Pay-as-You-Go
- Cost Efficiency

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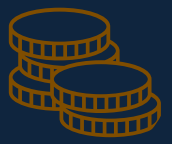
BENEFITS OF CLOUD COMPUTING

Variable expenses

- With cloud computing, you can trade upfront expenses for variable expenses.

Economies of scale

- You can benefit from massive economies of scale



Cost optimization

- No longer needing to spend money on running and maintaining data centers.

Capacity

- you don't have to predict how much infrastructure capacity you will need before deploying an application.

Speed and agility

- The flexibility of cloud computing makes it easier for you to develop and deploy applications

Global in minutes

- The global footprint of the AWS Cloud enables you to deploy applications to customers around the world quickly

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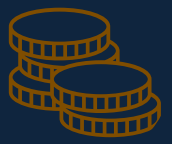

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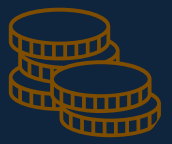

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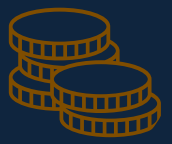

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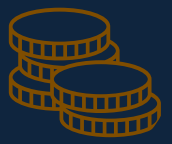

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Different ways of eating Pizza

Make at Home

Take and Bake

Pizza Delivery

Eat Out

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Cloud Service Models

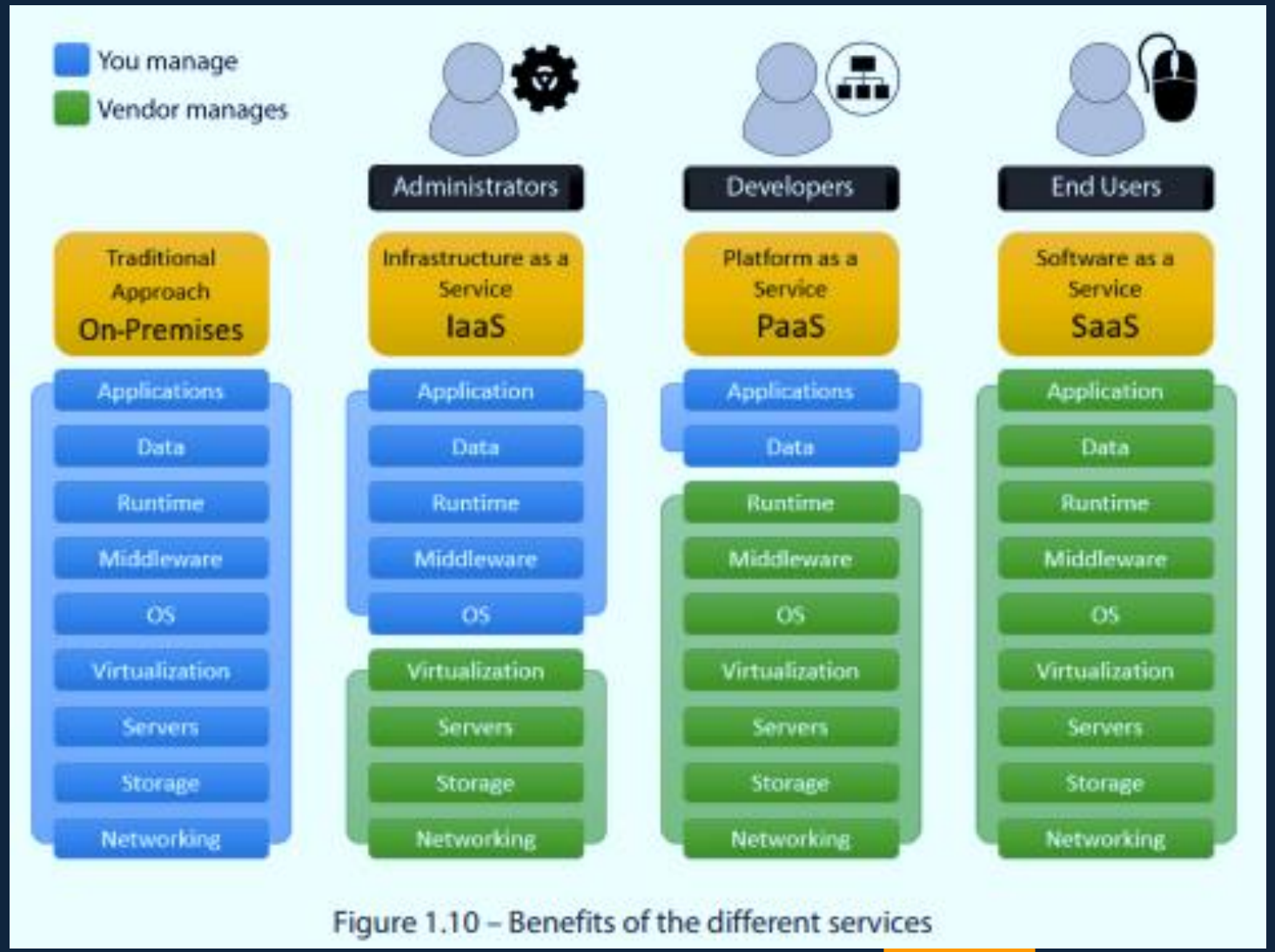

Figure 1.10 – Benefits of the different services

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Cloud Service Models

Infrastructure as a Service (IaaS)

- ✓ Building Blocks for Cloud IT: Offers networking, computing power, and storage resources.
- ✓ Flexibility: Provides the highest level of control and customization, akin to traditional on-premises IT.
- ✓ Example Providers: AWS EC2, Google Compute Engine, Microsoft Azure Virtual Machines.

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Platform as a Service (PaaS)

- ✓ Managed Infrastructure: Removes the need to manage the underlying hardware and software.
- ✓ Focus on Applications: You focus on deployment and managing your applications, while the platform handles the infrastructure.
- ✓ Example Providers: AWS Elastic Beanstalk, Google App Engine, Microsoft Azure App Service.

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Software as a Service (SaaS)

- ✓ Completed Product: The service provider runs and manages the entire application
- ✓ No Management Required: You simply use the software as a customer, with everything handled by the provider.
- ✓ Example Providers: Gmail, Salesforce, Microsoft 365.

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What is AWS?

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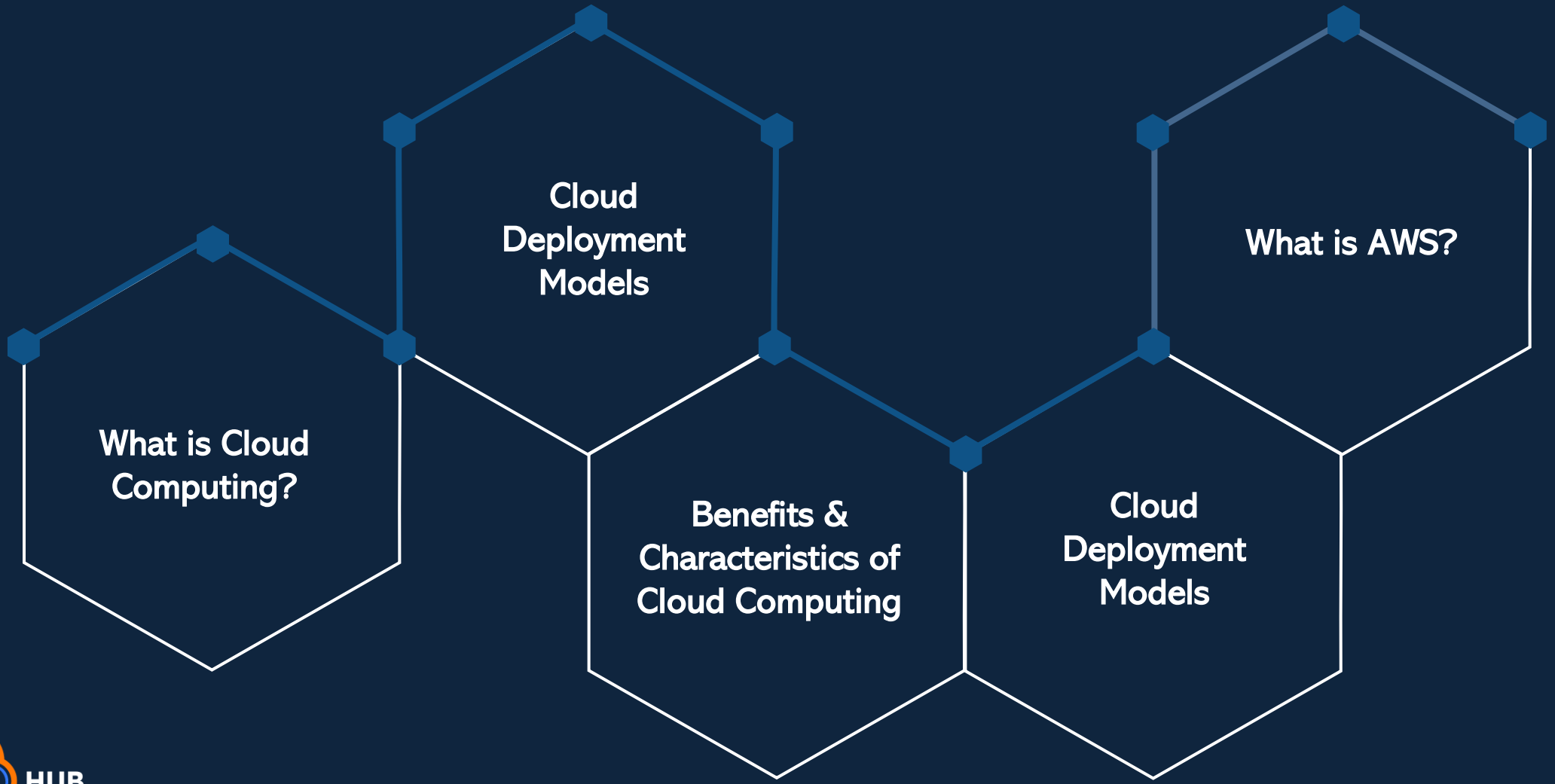
SUMMARY



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Cloud Atlas:
AWS GLOBAL INFRASTRUCTURE

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AWS infrastructure

- Data centers
- Availability Zones
- Regions
- AWS Local Zones
- Edge locations/POPs

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Data Centers

- AWS services operate within AWS-managed data centers.

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- Each location is equipped with AWS's own network hardware.

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Data Centers

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- These data centers contain thousands of servers working together.
- Each location is equipped with AWS's own network hardware.
- Data centers are grouped into Availability Zones for redundancy and high availability.

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AZs

- Availability Zones (AZs) are multiple isolated data centers within an AWS Region

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- Each AWS Region typically contains 2 to 6 Availability Zones

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- Independently powered and have redundant networking

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AZs

- Availability Zones (AZs) are multiple isolated data centers within an AWS Region
- Each AWS Region typically contains 2 to 6 Availability Zones
- Independently powered and have redundant networking
- AZs are connected through high-bandwidth, low-latency private links.

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REGIONS

- Each AWS Region is completely independent and uses AWS's own network infrastructure.

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- AWS has Regions located globally, with names like us-east-1 and eu-west-3.

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REGIONS

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- Regions are clusters of data centers and typically contain multiple Availability Zones (AZs)
- AWS has Regions located globally, with names like us-east-1 and eu-west-3.
- Most AWS services are scoped to specific Regions, ensuring data and resources stay within the chosen geographical area.

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Key factors to consider when selecting an AWS Region:

GOVERNANCE

LATENCY

SERVICE AVAILABILITY

COST

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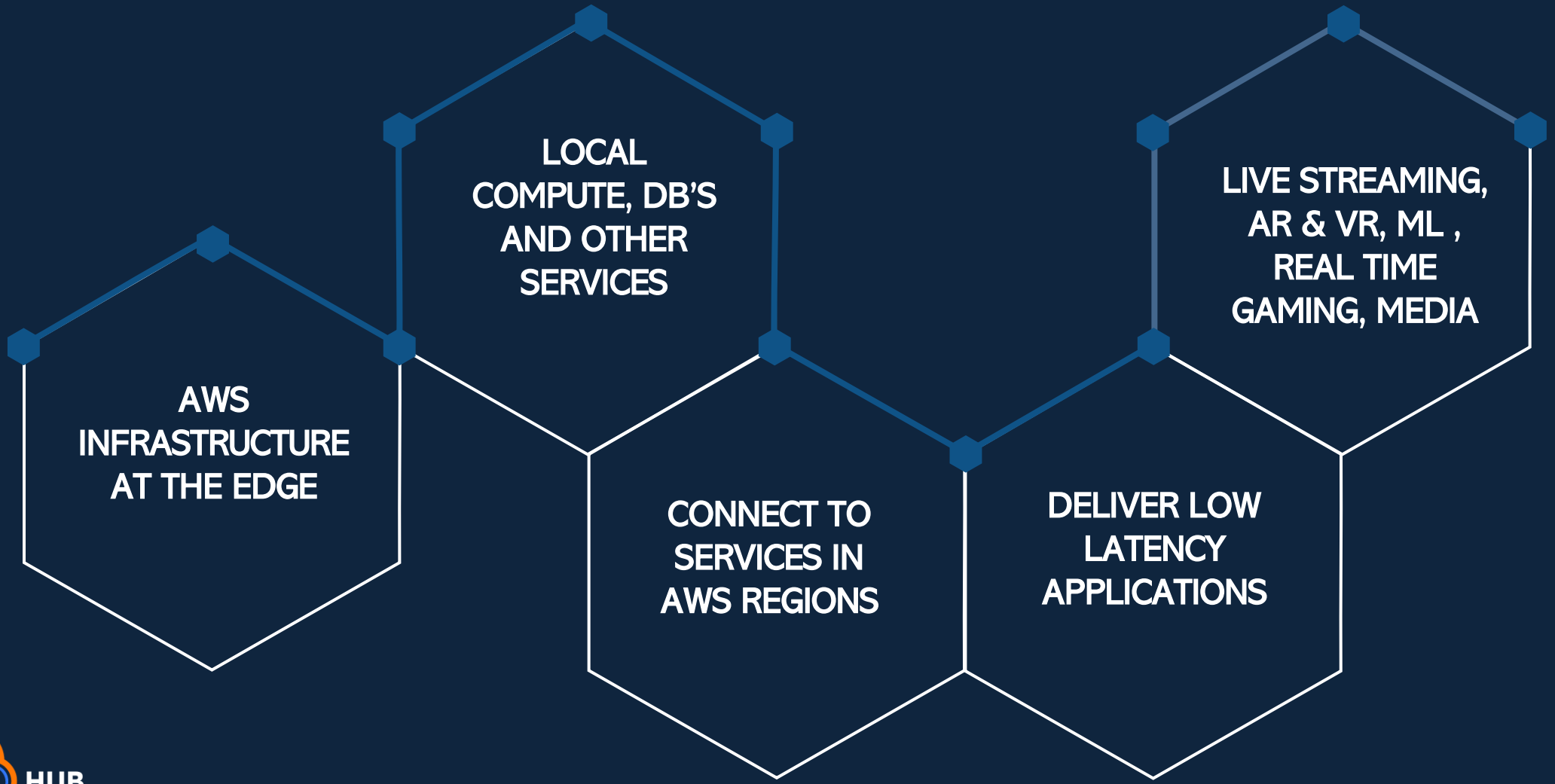
AWS LOCAL ZONES



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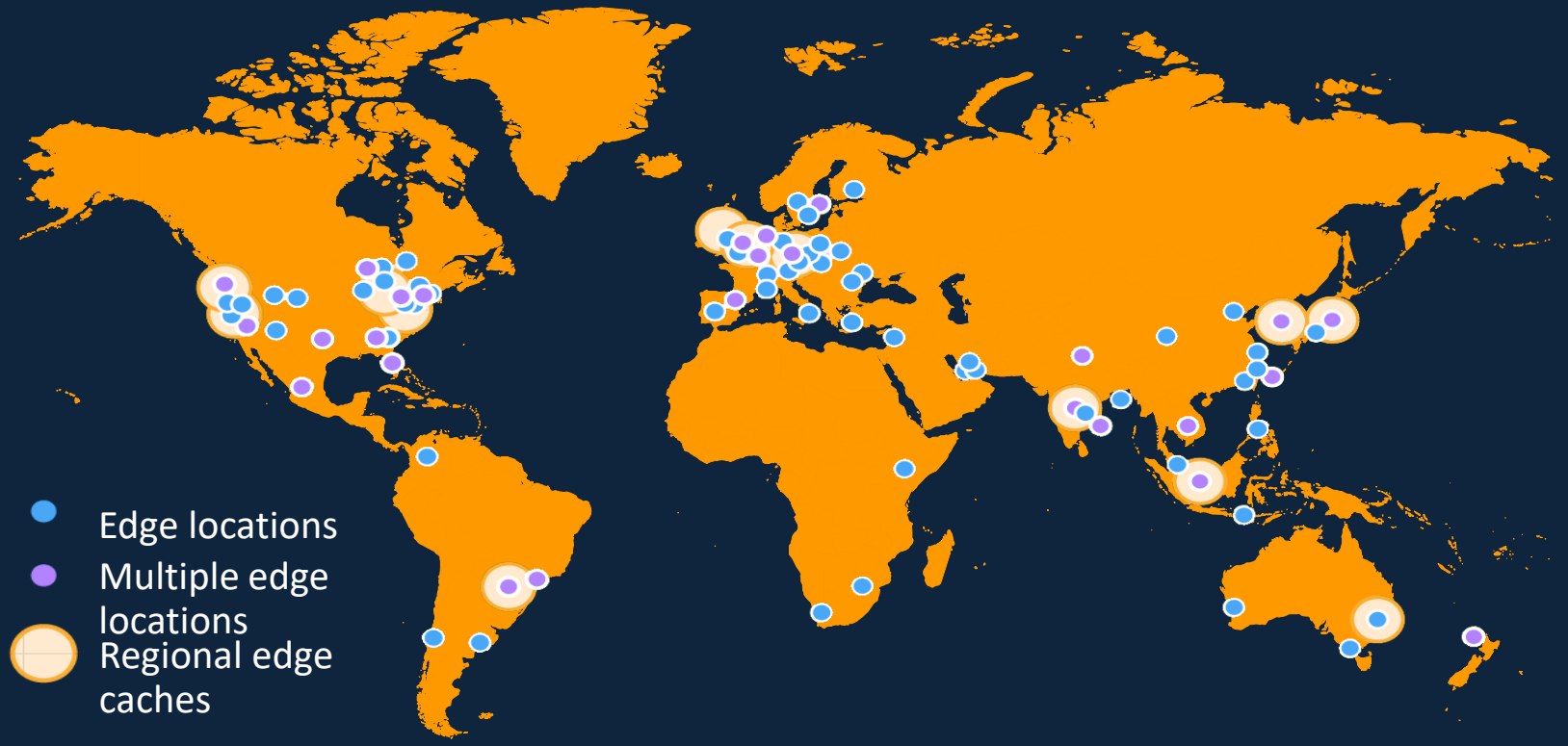
Edge locations

- Operate in major cities worldwide, ensuring broad geographic coverage.
- Supports AWS services such as Amazon Route 53 and Amazon CloudFront for content delivery and DNS management.
- Delivers content to end users with reduced latency for faster performance.



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LOCAL ZONE & EDGE LOCATION FEATURES

AWS LOCAL ZONES

- Local data Processing
- Low latency
- Consistent AWS experience

EDGE LOCATIONS

- Fast Delivery of content
- Caching of data
- Better User Experience

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AWS REGION VIBES!!

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I AM WHO I SAY I AM:
AWS IAM

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Namwakira

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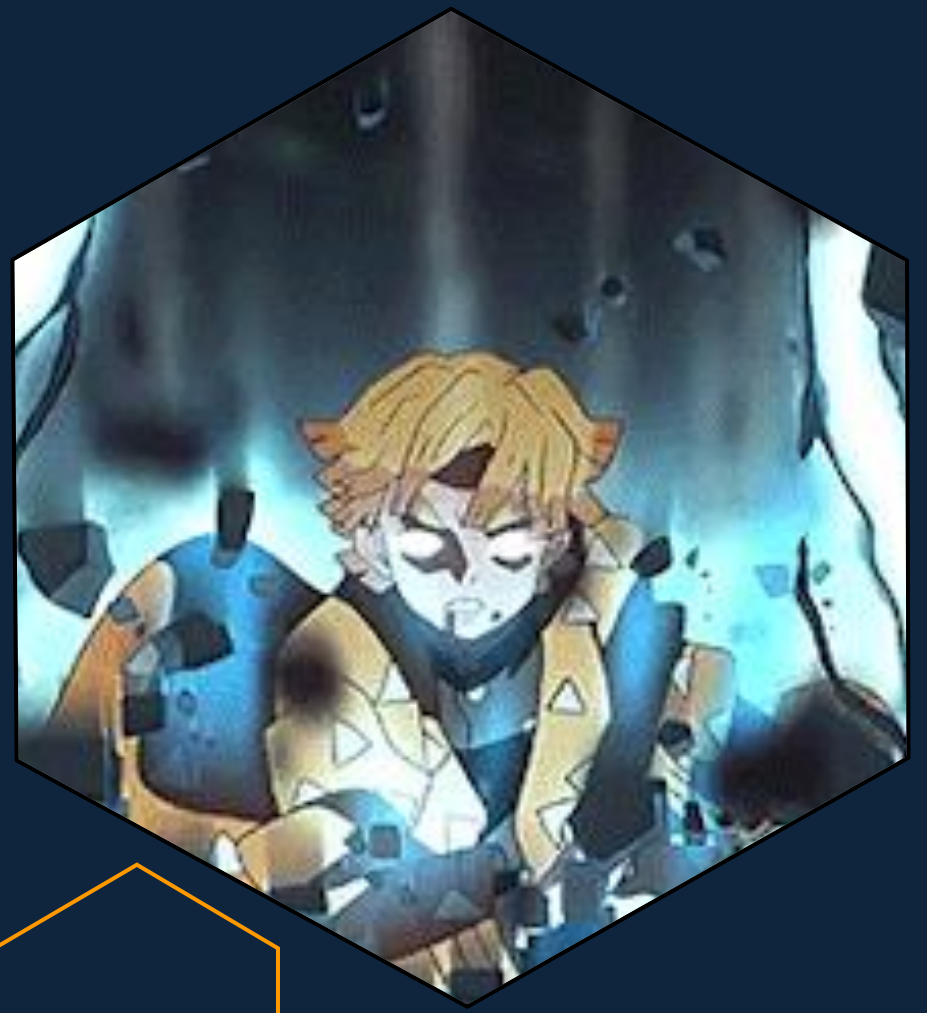
ROOT USER

- AWS accounts start with a root user that has full access to all services.
- AWS strongly advises against using the root user for daily operations
- Create Admin User: Set up an administrator user for managing the account instead of using the root user.
- Protect the root account with Multi-Factor Authentication (MFA) for enhanced security.



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AWS Identity and Access Management (IAM)

IAM Overview

allows secure control over access to AWS resources by managing who can sign in and what they can do.

Granular Access

IAM provides fine-grained control over permissions, helping you define who can perform specific actions on AWS resources.

Security Policies

Access is managed through security policies applied to IAM users, groups, and roles.

Centralized Management

Use IAM to centrally manage permissions for launching, configuring, and managing AWS resources.

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PRINCIPALS

AWS PRINCIPALS

A principal is an entity that can request actions or operations on AWS resources. The most common principals are IAM users and IAM roles, but AWS services, SAML 2.0 providers, or external identity providers (such as Login with Amazon, Facebook, or Google) can also act as principals.

FEDERATED USERS

These are external identities that are not directly managed by IAM. Through identity federation, you can allow these external users to access AWS resources using external identity providers.

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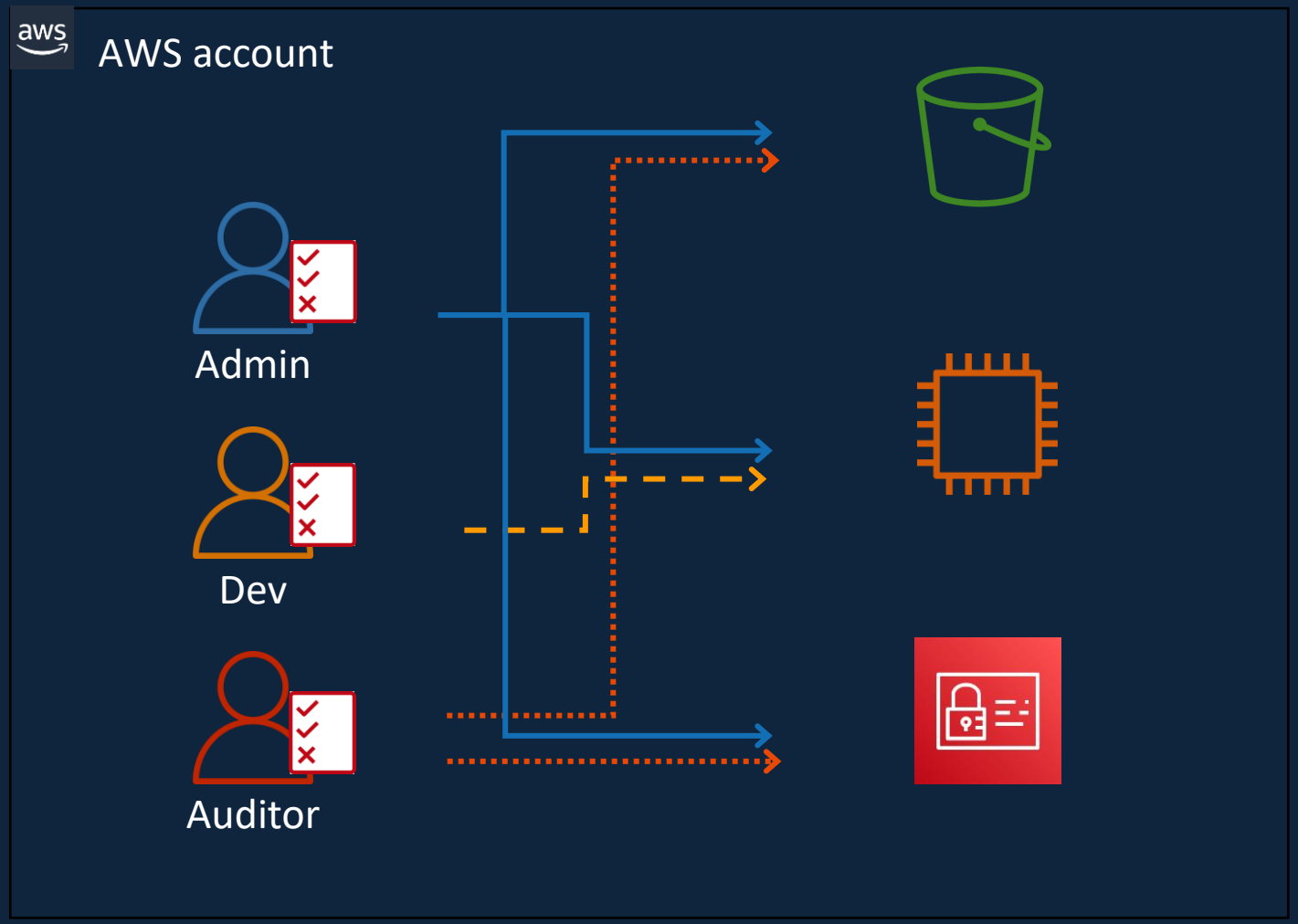
Users

- ✓ IAM users are individual users within an AWS account.
- ✓ Each user has their own unique credentials and permissions to access specific AWS resources.
- ✓ By default, new IAM users have
- ✓ It is a best practice to enable multi-factor authentication (MFA) for IAM users
- ✓ Implement an IAM password policy to enhance security within your AWS account.



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How users access AWS

Three Methods to Access AWS:

- AWS Management Console: Access via password and optional Multi-Factor Authentication (MFA).
- AWS CLI (Command Line Interface): Programmatic access using access key (Access Key ID + Secret Access Key).
- AWS SDK (Software Developer Kit): For coding access, also protected by access keys.

Access Key Details:

- Access keys are generated in the AWS Management Console.
- Access Key ID = Username, Secret Access Key = Password.
- Important: Never share access keys; they are confidential like passwords.

Best Practices:

- Apply the principle of least privilege: Only give users the credentials they need (e.g., don't generate access keys if a user only needs console access).
- Enforce MFA and strong password policies for added security.

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Setting permissions with IAM policies

IAM policy

Select	Policy name
	AdministratorAccess
	AmazonEC2ReadOnlyAccess
✓	AmazonS3FullAccess
	AmazonS3ReadOnlyAccess

Amazon S3 administrator

Select	Policy name
	AdministratorAccess
✓	AmazonEC2ReadOnlyAccess
	AmazonS3FullAccess
✓	AmazonS3ReadOnlyAccess

Auditor

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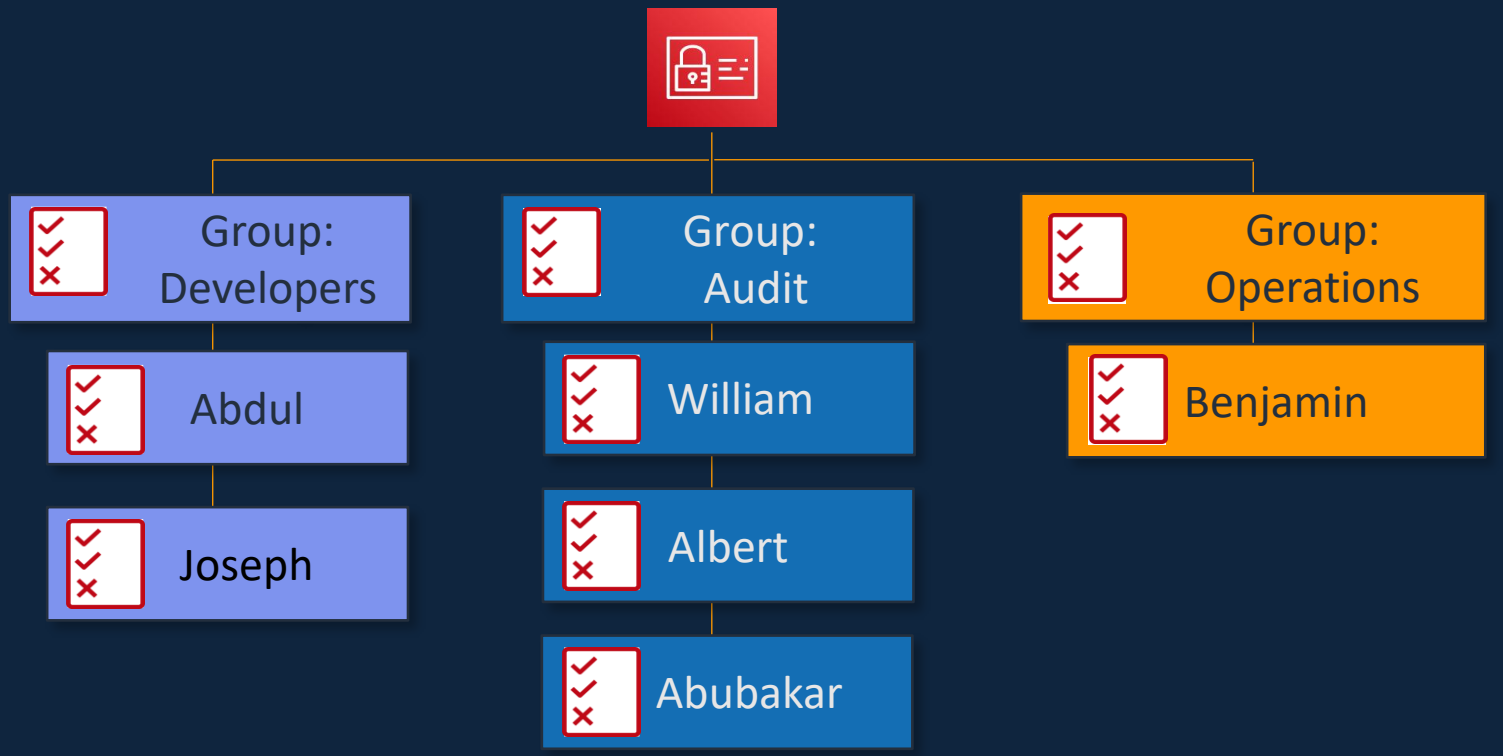
IAM groups

- An IAM user group is a collection of IAM users that share the same permissions. It simplifies managing permissions for multiple users.
- A user can belong to multiple groups.
- Groups cannot contain other groups, and users are not required to be part of a group, but they can belong to more than one.



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IAM Roles

Temporary Credentials:

- IAM roles provide temporary AWS credentials that can be assumed by users or services, facilitating secure access without long-term credentials.
- Roles simplify permission management as multiple users and applications can share the same role, promoting efficiency.

Use Cases:

- Cross-Account Access: Allow users to access resources across different AWS accounts.
- Grant contractors or third-party services limited-time access to resources.
- Assign only the permissions necessary for specific actions, enhancing security.

Common Service Roles:

- EC2 Instance Roles: Allow EC2 instances to access AWS resources securely.
- Lambda Function Roles: Grant Lambda functions permissions to interact with other AWS services.

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AWS Policy Types Overview

Grant Permissions

Identity-based Policies - Attach policies (managed or inline) to IAM identities (users, groups, or roles).Examples: Users' policies and group policies.

Resource-based Policies - Attach inline policies to AWS resources (e.g., Amazon S3 bucket policies, IAM role trust policies).

Set Maximum Boundaries

AWS Organizations Service Control Policies (SCPs) - Define maximum permissions for accounts in an organization or organizational unit (OU).

IAM Permissions Boundaries- Set the maximum permissions an IAM entity (user or role) can receive.

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Identity-based policy example

```
A "Version": "2012-10-17",
    "Statement": [
      {
B      "Effect": "Allow",
       "Action": [
C        "ec2:StartInstances",
         "ec2:StopInstances"
       ],
D      "Resource": "arn:aws:ec2:*:*:instance/*",
       "Condition": {
E        "StringEquals": {
"ec2:ResourceTag/Owner": "${aws:username}"
          }
        }
      }
    ]
}
```

A. specifies the language syntax rules that are to be used to process a policy.

B. Use Allow or Deny to indicate whether the policy allows or denies access.

C. List of actions that the policy allows or denies.

D. You must specify a list of resources to which the actions apply.

E. Specify the circumstances under which the policy grants permission.

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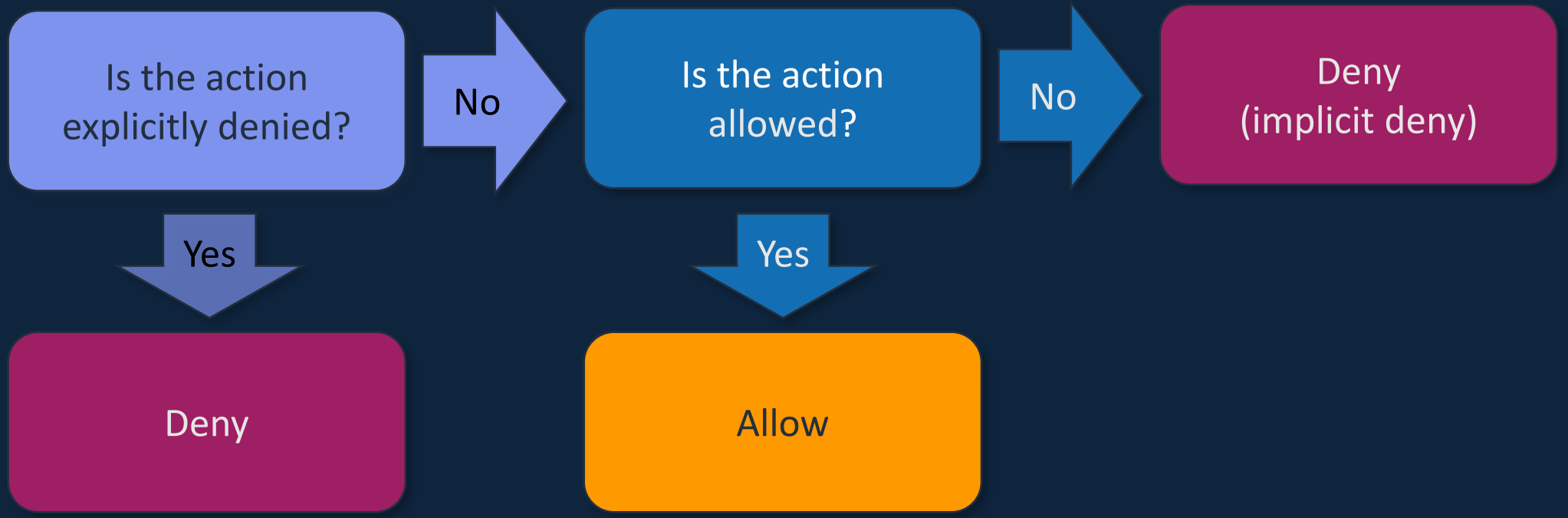
How IAM policies are evaluated



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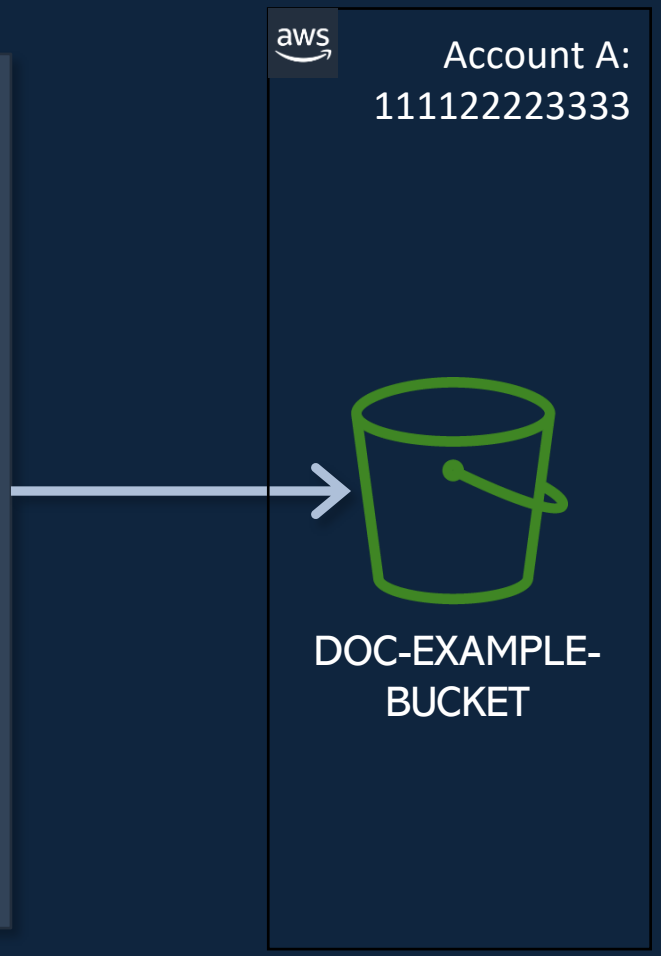
Using a resource-based policy

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "AccountBAccess",
      "Effect": "Allow",
      "Principal": {"AWS": "444455556666"},
      "Action": "s3:PutObject",
      "Resource": [
        "arn:aws:s3:::DOC-EXAMPLE-BUCKET/folder123/*"
      ]
    }
  ]
}
```



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