AWS Secure Migrations Framework: Mobilizing security and compliance

AWS Prescriptive Guidance

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Table of Contents

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Enterprise cloud migrations can be complex, resulting in challenges and risks if they're not planned adequately from a business and a technical standpoint. Security and compliance require detailed planning during a migration and modernization journey. Many organizations perceive security and compliance as an obstacle to cloud adoption. Chief Information Security Officers (CISOs) and security teams often cite the following common challenges when making cloud adoption decisions: uncertainty of the cloud security capabilities, adherence to compliance requirements, security policy mapping difficulties, lack of cloud security skillset, and low risk appetite.

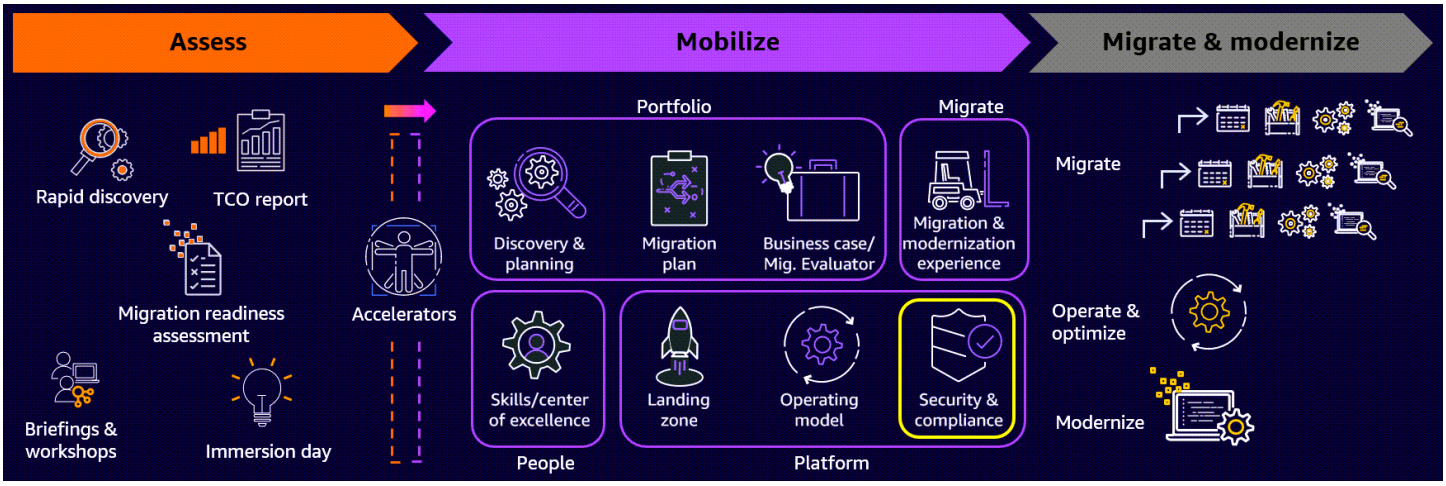
To address those challenges, the AWS Secure Migrations Framework highlights the key activities that you should plan and manage during the mobilize phase of a migration project. This guide helps you align your migration processes, methodology, and approach to include these best practices.

Intended audience

This framework is intended for those who are performing migrations and modernizations to the AWS Cloud, and it also intended for third parties who are supporting their clients' migrations.

Security and compliance workstream and team structure

AWS offers the AWS Migration Acceleration Program. This program separates the migration process into three phases: assess, mobilize, and migrate and modernize. As part of the mobilize phase, you create a migration plan and refine your business case. You address gaps in your organization's readiness that were uncovered in the assess phase. You also focus on building your landing zone, driving operational readiness, and developing cloud skills. A key part of the mobilize phase is create a *security and compliance workstream* that plans and addresses security, risk, and compliance requirements for the migration. As shown in the following image, the security and compliance workstream is part of the platform perspective of this migration methodology.



During the mobilize phase, it's important to discover and plan your security and compliance requirements. Evaluate your requirements through the lenses of tools, people, and process. There are five key domains for the security and compliance workstream during the mobilize phase:

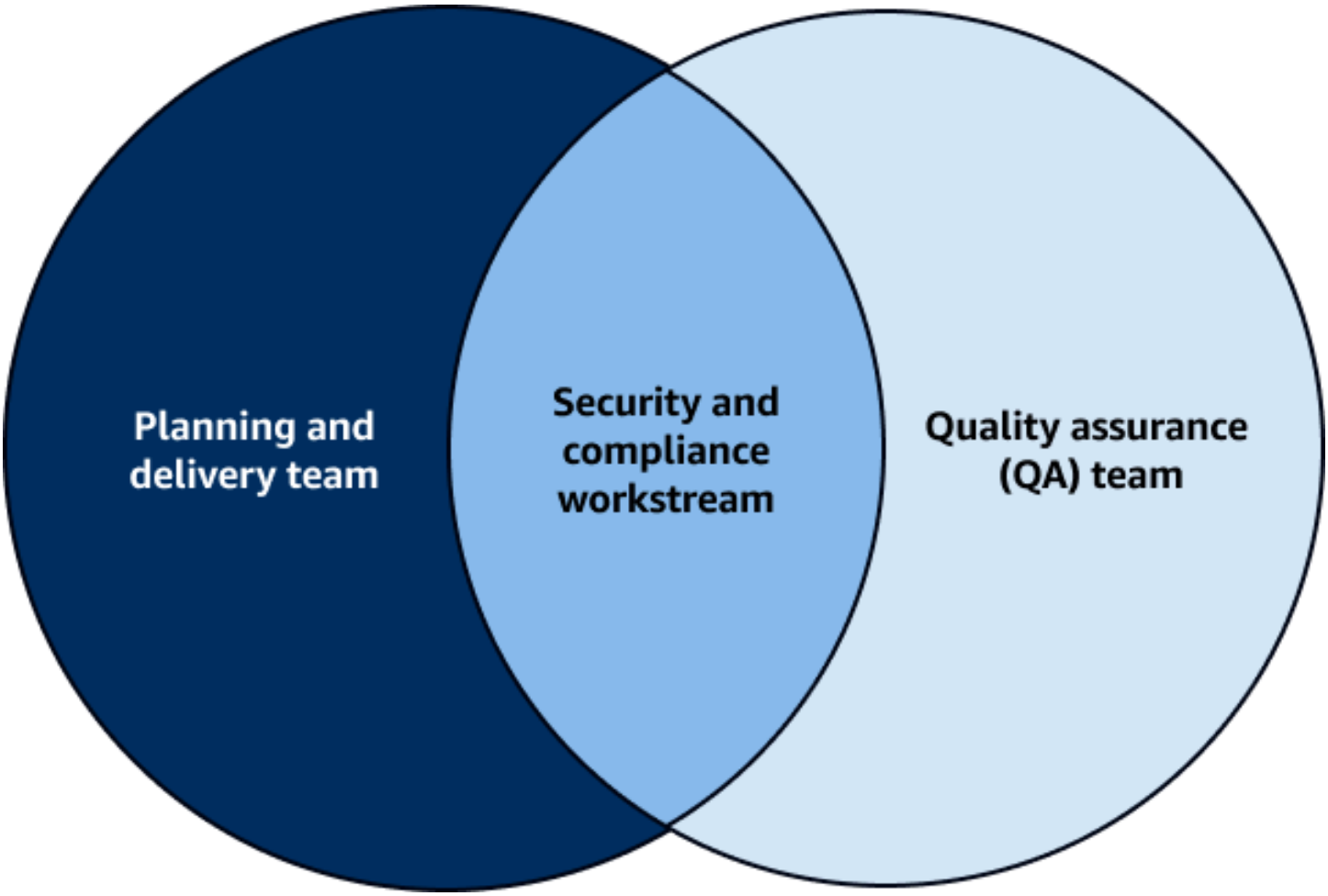
- Security discovery and alignment
- Security framework mapping
- Security implementation, integration, validation
- Security documentation
- Security and compliance cloud operations

These activities are discussed in detail in the Domains of the security and compliance workstream chapter of this guide. First, it's important to understand the composition and structure of the

teams that support the security and compliance workstream. These teams perform or facilitate the activities in the security and compliance workstream.

Security and compliance team structure

The first step for effective security and compliance mobilization is to set up or form two teams that can support, complete, and govern the five key activities in the framework. The following image shows the recommended team structure and resource requirements. The security and compliance workstream is primarily composed of individuals from the quality assurance (QA) team and the planning and delivery team.



The planning and delivery team is responsible for the following in the security and compliance workstream:

- Understanding the AWS shared responsibility model
- Understanding AWS security and compliance services at the 300–400 level

- Understanding compliance architectures design and setup on AWS
- Collecting security and compliance requirements by using defined tooling or mechanisms in place
- Mapping security requirements, policies, configurations, controls, and guardrails to service configurations on AWS (This is known as *security framework mapping*)
- Providing at least two individuals who are certified in AWS security
- Creating security documentation

The QA team is responsible for the following in the security and compliance workstream:

- Providing a total of 3–5 individuals, and at least two of them must have AWS security certifications
- Understanding compliance architecture design and setup on AWS
- Understanding and experience completing five or more AWS Well-Architected reviews
- Validating that the AWS infrastructure and resources comply with AWS security and compliance best practices
- Creating and presenting a security validation report

The requirements for each team vary depending on the migration size and security and compliance complexity. It is also important to note that the team structure and requirements are limited to the following scope:

- Operation of the security and compliance workstream in the mobilize phase
- Security and compliance validation of the migration and modernization

After the migration, we recommend that you establish a dedicated Security Operations Center (SOC) to continuously monitor and govern security and compliance in the AWS Cloud.

Domains of the security and compliance workstream

This section describes, in detail, the domains that the security and compliance workstream is responsible for. During the mobilize phase of your migration project, these domains help accelerate the planning and implementation of security and compliance on AWS:

- Security discovery and alignment
- Security framework mapping
- Security implementation, integration, and validation
- Security documentation
- Security and compliance cloud operations

It is important to address these domains during the mobilize phase in order to secure migration activities during the subsequent migration and modernize phase.

Security discovery and alignment

When mobilizing a migration project, the first domain for the security and compliance workstream is *security discovery and alignment*. This domain is intended to help your organization achieve the following goals:

- Train the security and compliance workstream about the AWS security services, capabilities, and compliance adherence
- Discover your security and compliance requirements and current practices. Consider these requirements from an infrastructure and operations standpoint, including:
  - Security challenges and drivers for the target end state
  - Cloud security team skillset
  - Security risk and compliance policies, configurations, controls, and guardrails
  - Security risk appetite and baseline
  - Existing and prospective security tooling

Immersion day workshops

To align on these goals, use security and compliance immersion days. *Immersion days* are workshops that cover a range of security-related topics, such as:

- AWS shared responsibility model
- AWS security services
- AWS Security Reference Architecture (AWS SRA)
- AWS compliance
- Security Pillar of the AWS Well-Architected Framework

The immersion day workshops help establish a knowledge baseline for your security team. It trains them about AWS security services and security and compliance best practices. AWS Solution Architects, AWS Professional Services, and AWS Partners can help you perform these interactive workshops. They use standard presentation decks, AWS labs, and whiteboard activities to help prepare your teams.

Discovery workshops

After the immersion day workshops, you perform multiple deep-dive security and compliance discovery workshops. These help your teams discover the current security, risk, and compliance (SRC) requirements of the infrastructure, applications, and operations. You analyze these requirements through the following perspectives: people, process, and technology. The following are the areas of discovery for each perspective.

People perspective

- **Organizational structure** – Understand the current security and compliance workstream structure and responsibilities.
- **Capabilities and skillsets** – Have practical knowledge and skillsets for AWS services and for cloud security and compliance capabilities. This includes discovery, planning, implementation, and operations.
- **Responsible, accountable, consulted, informed (RACI) matrix** – Define the roles and responsibilities for current security and compliance activities within the organization.

- **Culture** – Understand the current security and compliance culture. Prioritize security and compliance as part of build, design, implementation, and operation phases. Introduce Development Security Operations (DevSecOps) into the cloud security and compliance culture.

Process perspective

- **Practices** – Define and document the current security and compliance processes to build, design, implement, and operate. Processes include:
  - Identity access and management
  - Incident detection controls and response
  - Infrastructure and network security
  - Data protection
  - Compliance
  - Business continuity and recovery
- **Implementation documentation** – Document security and compliance policies, control configurations, tooling documentation, and architecture documentation. These documents are required to cover security and compliance from the infrastructure, network, applications, databases, and deployment areas.
- **Risk documentation** – Create information security risk documentation that outlines the risk appetite and threshold.
- **Validations** – Create internal and external security validation and audit requirements.
- **Runbooks** – Develop operational runbooks that cover the current, standard implementation and governance processes for security and compliance.

Technology perspective

- **Services and tools** – Use tools to validate your security and compliance posture and to enforce and govern the current IT landscape. Establish tooling for the following categories:
  - Identity access and management
  - Incident detection controls and response
  - Infrastructure and network security
  - Data protection
  - Compliance

- Business continuity and recovery

During the AWS security discovery workshop, you use standardized data collection templates and questionnaires to collect data. In scenarios where you are unable to provide the information due to lack of data clarity or obsolete data, you can use a migration discovery tool to collect application and infrastructure-level security information. For a list of discovery tools that you can use, see Discovery, planning, and recommendation migration tools on AWS Prescriptive Guidance. The list provides details about each tool's discovery capabilities and usage. It also compares tools to help you choose the best tool to meet your IT landscape requirements and constraints.

During the initial security assessment, we highly recommend that you start with threat modeling. This helps you identify possible threats and existing measures that are in place. There might also be predefined and documented requirements for security, compliance and risk. For more information, see the Threat modeling for builders workshop (AWS training) and see How to approach threat modeling (AWS blog post). This This approach helps you reconsider your security and compliance strategies for deployment, implementation, and governance in the AWS Cloud.

Security framework mapping

After completing the security discovery and alignment domain, the next step is to complete the *security framework mapping domain*. This domain is a workshop process that maps the discovered security and compliance requirements to AWS Cloud security services. It also aligns your architecture and operations to AWS security and compliance best practices. The workshop maps all requirements from the people, process and technology perspective in order to cover the following:

- AWS infrastructure
  - AWS account, infrastructure, and network protection
  - Data protection
  - Compliance
  - Incident detection and response
  - Identity and access management
  - Business continuity and recovery
- Application on AWS
  - Following best practices for AWS services to help protect your application
  - Access control for applications, databases, operating systems, and data

- Operating system protection
- Application, database and data protection
- Incident detection and response
- Compliance
- Application business continuity and recovery

As you complete the security framework mapping domain, consider the defined risk appetite, team structure, team skillset and capability, security processes, security policies, security controls, tooling, security operations, and other security requirements and constraints. Overall, security framework mapping provides organizations with a systematic approach to managing security risks, maintaining compliance, and continuously improving their security posture, according to industry standards and best practices.

The security framework mapping process uses the AWS Security Reference Architecture (AWS SRA), the Security Pillar of the AWS Well-Architected Framework, the Migration Lens of the AWS Well-Architected Framework, and the Introduction to AWS Security whitepaper. These documents act as guiding references to help you follow AWS best practices for cloud security and compliance.

By using standardized mapping templates in the workshop, you map the requirement to the target end state. You highlight the tools, AWS services, processes, policies, controls, and changes that are required to achieve the target end state.

When running the security framework mapping workshop, you can use AWS Professional Services, AWS Security Solution Architects, or AWS Partners. These resources can help you accelerate and facilitate the workshop. Security framework mapping workshops can be included as part of an Experience-Based Acceleration (EBA) party, which is led by AWS Solution Architects, AWS Customer Solution Managers, or AWS Partners. The EBA party acts as an accelerator to help you build a strong AWS Cloud foundation that follows AWS migration and modernization best practices.

You can use AWS Migration Hub Journeys to plan, perform, and track migrations to AWS. AWS Migration Hub Journeys introduces the concept of a *migration journey*. AWS Migration Hub Journeys converts a migration into a pipeline of migration-related tasks. You can create a journey from scratch or from one of the templates that Migration Hub Journeys provides. You can configure access and invite internal and external collaborators to work on migrations together. As a result, migration practitioners can collaborate, work on tasks, perform migrations, and track progress, all in one place. AWS Migration Hub Journeys offers templates that cover common

migration scenarios, such as rehost (lift and shift) migration, Windows migration, database migration, mainframe modernization, and many more.

Security implementation, integration, and validation

After mapping out your security, risk, and compliance requirements, the next domain is *security implementation, integration, and validation*. Based on the identified requirements, choose appropriate security controls and measures to mitigate risks effectively. This might include encryption, access controls, intrusion detection systems, or firewalls. Integrate security solutions, such as intrusion detection and prevention systems, endpoint protection, and identity management, into the existing IT infrastructure in order to provide comprehensive security coverage. Conduct regular security assessments, including vulnerability scanning, penetration testing, and code reviews, to validate the effectiveness of security controls and identify weaknesses or gaps. By focusing on security implementation, integration, and validation, organizations can strengthen their security posture, reduce the likelihood of security breaches, and demonstrate compliance with regulatory requirements and industry standards.

Implementation

First, update the documentation for your current security, risk and compliance threshold or appetite. This allows you to implement the planned security and compliance requirements, controls, policies, and tooling in the cloud. This step is needed only if you have an existing risk register and appetite defined, which would have been identified during the discovery workshops.

Next, you implement the planned security and compliance requirements, controls, policies, and tooling in the cloud. We recommend that you implement these in the following order: infrastructure, AWS services, operating system, and then application or database. Use the information in the following table to make sure that you've addressed all required areas of security and compliance.

Area	Security and compliance requirements
Infrastructure	• AWS account • Landing zone • Preventative controls

	• Detective controls • Network segmentation • Access control • Encryption • Logging, monitoring, and alerting

AWS services	• AWS service configuration
	• Instances
	  • Storage
	  • Network
	• Access control
	• Encryption
	• Updates and patches
	• Logging, monitoring, and alerting

Operating system	• Antivirus • Malware and worm protection • Configuration • Network protection • Access control • Encryption • Updates and patches • Logging, monitoring, and alerting
Application or database	• Configuration • Code and schema • Access control • Encryption • Updates and patches • Logging, monitoring, and alerting

Integration

Security implementation often requires integration with the following:

- **Networking** – Networking within and external to the AWS Cloud
- **Hybrid IT landscape** – IT environments other than the AWS Cloud, such as on premises, public clouds, private clouds, and colocations
- **External software or services** – Software and services that are managed by independent software vendors (ISVs) and are not hosted in your environment.
- **Cloud operating model services** – AWS cloud operating model services that provide DevSecOps capabilities.

During the assess phase of your migration project, use discovery tools, existing documentation, or application interview workshops to identify and confirm these security integration points. When designing and implementing the workloads in the AWS Cloud, establish these integrations according to the security and compliance policies and processes that you defined during the mapping workshops.

Validation

After implementation and integration, the next activity is to validate the implementation. You make sure that the setup is aligned to AWS best practices for security and compliance. We recommend that you validate security from two coverage areas:

- **Workload-specific vulnerability assessment and penetration testing** - Validate the operating system, application, database or network security of workloads that run on AWS services. In order to conduct these validations, use existing tools and test scripts. It is important to comply to the AWS penetration testing customer support policy when carrying out these assessments.
- **AWS security best practice validation** - Validate whether your AWS implementation complies to the AWS Well Architected Framework and other selected benchmarks, such as the Center for Internet Security (CIS). For this validation, you can use tools and services such as AWS Trusted Advisor, Prowler (GitHub), AWS Service Screener (GitHub), or AWS Self-Service Security Assessment (GitHub).

It is important to document and communicate all security and compliance findings to the security team and leaders. Standardize reporting templates and use them to facilitate the communication to the respective security stakeholder. Document all exceptions made during finding remediation and make sure that the respective security stakeholders sign off.

Security documentation

When mobilizing security and compliance during a migration, it is essential to define and document how you implement security and compliance in the cloud. The documentation should include the following:

- **Security and compliance implementation documentation** – Create one or more documents that detail your security and compliance definition, process, policies, controls, configurations, and tools. Make sure these documents address these aspects from an AWS Cloud perspective. Include the following in this documentation:
  - Identity access and management
  - Incident detection controls and response
  - Infrastructure and network security
  - Data protection
  - Compliance
  - Business continuity and recovery
- **Security and compliance runbooks** – Create a security and compliance operational runbooks that guide the cloud operations team. They should detail how to complete security and compliance tasks, activities, and changes in the cloud as part of operational requirements. This includes security and compliance monitoring, incident management, validation, and continuous improvement. Make sure that your runbooks address the requirements that you identified during the security discovery and alignment domain.
- **Cloud security RACI matrix** – Create a responsible, accountable, consulted, informed (RACI) matrix that defines security and compliance responsibilities and stakeholders for the following areas:
  - Design and development
  - Deployment and implementation
  - Operations

Security and compliance cloud operations

The final domain is *security and compliance cloud operations*. This is a continuous activity where you use the defined security and compliance operational runbooks to govern cloud operations. You also

build a security cloud operating model to determine responsibilities for security and compliance in your organization.

Security and compliance cloud operating model

In this domain, you define a cloud operating model for security. Your cloud operating model should address the requirements you identified during the discovery workshops and later defined as runbooks. You can design the security and compliance cloud operating model in one of three ways:

- **Centralized** – A more traditional model, where SecOps is responsible for identifying and remediating security events across the business. This can include reviewing general security posture findings for the business, such as patching and security configuration issues.
- **Decentralized** – Responsibility for responding to and remediating security events across the business has been delegated to the application owners and individual business units, and there is no central operations function. Typically, there is still an overarching security governance function that defines policies and principles.
- **Hybrid** – A mix of both approaches, where SecOps still has a level of responsibility and ownership for identifying and orchestrating the response to security events and the responsibility for remediation is owned by the application owners and individual business units.

It is important to select the right operating model based on your security and compliance requirements, organization maturity, and constraints. The security and compliance requirements and constraints were identified during the discovery workshop. Organization maturity, on the other hand, defines the level of operational security practices. The following is an example of a maturity range:

- **Low** – Logging is local, and some or sporadic actions are taken.
- **Intermediate** – Logs from different sources are correlated, and automated alerting is established.
- **High** – Detailed playbooks exist and contain details about standardized process responses. Operationally and technically, the majority of the alert responses are automated.

To further understand the security and compliance cloud operating model and assist in the selection of an appropriate design, see Considerations for security operations in the cloud (AWS blog post). In scenarios where there are no predefined requirements, we recommend that you set up a Security Operations Center (SOC) as part of the cloud operating model. This is typically a centralized operating model practice. With this approach, you can direct events from multiple

sources to a centralized team, which can then trigger actions and responses. This standardizes security governance through cloud operations. AWS and AWS Partners have the capability can help you build an SOC and define and implement Security Orchestration, Automation, and Response (SOAR). AWS and AWS Partners use professional services consultations, defined templates, AWS services, and third-party tools from AWS Partners.

Ongoing security operations

In this domain, perform the following tasks on an ongoing basis by using your defined security and compliance operations runbooks:

- **Security and compliance monitoring** – Perform centralized monitoring of security events and threats by using your defined AWS services, tools, metrics, criteria, and frequency. The operations team or the SOC administer this continuous monitoring, depending on your organization's structure. Security monitoring involves analysis and correlation of large amounts of logs and data. Log data comes from endpoints, networks, AWS services, infrastructure, and applications and is stored in a centralized repository, such as Amazon Security Lake or a security information and event management (SIEM) system. It is important to configure alerts so that you can manually or automatically respond to events in a timely fashion.
- **Incidents management** – Define your baseline security posture. When a deviation from a preset baseline occurs, either through misconfiguration or external factors, record an incident. Make sure that an assigned team responds to these incidents. The foundation of a successful incident response program in the cloud is to have people, process and tooling integrated into each stage of the incident response program (preparation, operations, and post-incident activity). Education, training, and experience are vital to a successful cloud incident response program. Ideally, these are implemented well in advance of having to handle a possible security incident. For more information about setting up an effective security incident response program, see the AWS Security Incident Response Guide. You can also use the AWS Incident Manager - Automate incident response to security events workshop to help document and train your teams about AWS services that can improve incident management, increase visibility, and reduce the recovery time.
- **Security validation** – Security validation involves running vulnerability assessment, penetration testing, and chaos security simulated event testing. Security validation should continue to be run periodically, especially for the following scenarios:
  - Software updates and releases
  - Newly identified threats, such as malware, viruses, or worms

- Internal and external audit requirements
- Security breaches

It is important to document the security validation process and highlight the people, process, schedule, tooling, and templates for data collection and reporting. This standardizes security validations. Continue to comply to the AWS customer support policy for penetration testing when running security validations in the cloud.

- **Internal and external audits** – Conduct internal and external audits to validate that security and compliance configurations meet regulatory or internal policy requirements. Perform audits periodically based on a predefined schedule. Internal audits are normally conducted by an internal security and risk team. External audits are conducted by relevant agencies or standard officials. You can use AWS services, such as AWS Audit Manager and AWS Artifact, to facilitate the audit process. These services can provide relevant evidence rfor security IT audit reports. They can also simplify risk and compliance management with regulatory and industry standards by automating evidence collection. This helps you assess whether the policies, procedures, and activities known as *controls* are operating effectively. It is also important to align audit requirements with your managed service partners to ensure compliance.

Security architecture review – Complete a periodic review and update of your AWS architecture from a security and compliance standpoint. Review the architecture on a quarterly basis or when there are architecture changes. AWS continues to release updates and improvements to the security and compliance features and services. Use the AWS Security Reference Architecture and AWS Well Architected Tool to facilitate these architecture reviews. It is important to document your security and compliance implementation and recommended changes after the review process.

AWS security services for operations

You share responsibility with AWS for security and compliance in the AWS Cloud. This relationship is described in detail in the AWS shared responsibility model. While AWS manages security *of* the cloud, you are responsible for security *in* the cloud. You are responsible for protecting your own content, infrastructure, applications, systems, and networks, no differently than you would for an on-premises data center. Your responsibilities for security and compliance in the AWS Cloud vary depending on the services you use, how you integrate those services into your IT environment, and applicable laws and regulations.

An advantage of the AWS Cloud is that it allows you to scale and innovate by using AWS best practices and security and compliance services. This helps you maintain a secure environment

while paying only for the services you use. You also have access to the same AWS security and compliance services that highly secured enterprise organizations use to secure their cloud environments.

Building a cloud architecture on a sound and secure foundation is the first and the best step to ensure cloud security and compliance. However, your AWS resources are only as secure as you configure them to be. An effective security and compliance posture is achieved only through continuous, strict adherence at an operational level. Security and compliance operations can be broadly grouped into five categories:

- Data protection
- Identity access and management
- Network and application protection
- Threat detection and continuous monitoring
- Compliance and data privacy

AWS security and compliance services map to these categories to help you meet a comprehensive set of requirements. Grouped into these categories, the following are the AWS security and compliance core services and their capabilities. These services can help you build and enforce cloud security governance.

Data protection

AWS provides the following services that can help you protect your data, accounts, and workloads from unauthorized access:

- AWS Certificate Manager – Provision, manage, and deploy SSL/TLS certificates for use with AWS services.
- AWS CloudHSM – Manage your hardware security modules (HSMs) in the AWS Cloud.
- AWS Key Management Service (AWS KMS) – Create and control the keys used to encrypt your data.
- Amazon Macie – Discover, classify, and help protect sensitive data with machine learning-powered security features.
- AWS Secrets Manager – Rotate, manage, and retrieve database credentials, API keys, and other secrets through their lifecycle.

Identity and access management

The following AWS identity services help you to securely manage identities, resources, and permissions at scale:

- Amazon Cognito – Add user sign-up, sign-in, and access control to your web and mobile applications.
- AWS Directory Service – Use managed Microsoft Active Directory in the AWS Cloud.
- AWS IAM Identity Center – Centrally manage single sign-on (SSO) access to multiple AWS accounts and business applications.
- AWS Identity and Access Management (IAM) – Securely control access to AWS services and resources.
- AWS Organizations – Implement policy-based management for multiple AWS accounts.
- AWS Resource Access Manager (AWS RAM) – Share AWS resources across your accounts.

Network and application protection

This category of services helps you to enforce fine-grained security policy at network control points across your organization. The following AWS services help you inspect and filter traffic to help prevent unauthorized resource access at the host-level, network-level, and application-level boundaries:

- AWS Firewall Manager – Configure and manage AWS WAF rules across AWS accounts and applications from a central location.
- AWS Network Firewall – Deploy essential network protections for your virtual private clouds (VPCs).
- Amazon Route 53 Resolver DNS Firewall – Help protect your outbound DNS requests from your VPCs.
- AWS Shield – Safeguard your web applications with managed DDoS protection.
- AWS Systems Manager – Configure and manage Amazon Elastic Compute Cloud (Amazon EC2) and on-premises systems to apply OS patches, create secure system images, and configure operating systems.
- Amazon Virtual Private Cloud (Amazon VPC) – Provision a logically isolated section of AWS where you can launch AWS resources in a virtual network that you define.
- AWS WAF – Help protect your web applications from common web exploits.

Threat detection and continuous monitoring

The following AWS monitoring and detection services help you identify potential security incidents within your AWS environment:

- AWS CloudTrail – Track user activity and API usage to enable governance and operational and risk auditing of your AWS account.
- AWS Config – Record and evaluate the configurations of your AWS resources to help you audit compliance, track resource changes, and analyze resource security.
- AWS Config rules – Create rules that automatically act in response to changes in your environment, such as isolating resources, enriching events with additional data, or restoring a configuration to a known-good state.
- Amazon Detective – Analyze and visualize security data to rapidly get to the root cause of potential security issues.
- Amazon GuardDuty – Help protect your AWS accounts and workloads with intelligent threat detection and continuous monitoring.
- Amazon Inspector – Automate security assessments to help improve the security and compliance of your applications that are deployed on AWS.
- AWS Lambda – Run code without provisioning or managing servers so that you can scale your programmed, automated response to incidents.
- AWS Security Hub – View and manage security alerts and automate compliance checks from a central location.

Compliance and data privacy

The following AWS services provide a comprehensive view of your compliance status. They continuously monitor your environment by using automated compliance checks that are based on AWS best practices and industry standards:

- AWS Artifact – Get on-demand access to AWS security and compliance reports and select online agreements.
- AWS Audit Manager – Continuously audit your AWS usage to simplify how you manage risk and maintain compliance with regulations and industry standards.

Conclusion

Cloud security and compliance are critical to the success and growth of an organization's cloud adoption journey. The security and compliance requirements must be gathered and analyzed. From a cloud readiness perspective, it's critical to identify the gaps early in your migration journey. The AWS Migration Acceleration Program mobilize phase recommends that you create a security and compliance workstream for this purpose. When this workstream performs effectively, it creates a strong and secure cloud foundation for a successful cloud migration and modernization journey. We recommend that you refer and incorporate the approach and processes detailed in this framework into your migration and modernization practice in order to adequately plan and implement secure cloud foundations.

Resources

AWS documentation

- AWS Security Incident Response Guide (AWS whitepaper)
- AWS Security Reference Architecture (AWS SRA) (AWS Prescriptive Guidance)
- Introduction to AWS Security (AWS whitepaper)
- Migration Lens (AWS Well-Architected Framework)
- Mobilize your organization to accelerate large-scale migrations (AWS Prescriptive Guidance)
- Security Pillar (AWS Well-Architected Framework)

Other AWS resources

- AWS Customer Support Policy for Penetration Testing
- AWS Incident Manager - Automate incident response to security events (AWS workshop)
- AWS Shared Responsibility Model
- Considerations for security operations in the cloud (AWS blog post)

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Document history

The following table describes significant changes to this guide. If you want to be notified about future updates, you can subscribe to an RSS feed.

Change	Description	Date
Initial publication	—	March 11, 2024

AWS Prescriptive Guidance glossary

The following are commonly used terms in strategies, guides, and patterns provided by AWS Prescriptive Guidance. To suggest entries, please use the **Provide feedback** link at the end of the glossary.

Numbers

7 Rs

Seven common migration strategies for moving applications to the cloud. These strategies build upon the 5 Rs that Gartner identified in 2011 and consist of the following:

- Refactor/re-architect – Move an application and modify its architecture by taking full advantage of cloud-native features to improve agility, performance, and scalability. This typically involves porting the operating system and database. Example: Migrate your on-premises Oracle database to the Amazon Aurora PostgreSQL-Compatible Edition.
- Replatform (lift and reshape) – Move an application to the cloud, and introduce some level of optimization to take advantage of cloud capabilities. Example: Migrate your on-premises Oracle database to Amazon Relational Database Service (Amazon RDS) for Oracle in the AWS Cloud.
- Repurchase (drop and shop) – Switch to a different product, typically by moving from a traditional license to a SaaS model. Example: Migrate your customer relationship management (CRM) system to Salesforce.com.
- Rehost (lift and shift) – Move an application to the cloud without making any changes to take advantage of cloud capabilities. Example: Migrate your on-premises Oracle database to Oracle on an EC2 instance in the AWS Cloud.
- Relocate (hypervisor-level lift and shift) – Move infrastructure to the cloud without purchasing new hardware, rewriting applications, or modifying your existing operations. You migrate servers from an on-premises platform to a cloud service for the same platform. Example: Migrate a Microsoft Hyper-V application to AWS.
- Retain (revisit) – Keep applications in your source environment. These might include applications that require major refactoring, and you want to postpone that work until a later time, and legacy applications that you want to retain, because there's no business justification for migrating them.

- Retire – Decommission or remove applications that are no longer needed in your source environment.

A

ABAC

See attribute-based access control.

abstracted services

See managed services.

ACID

See atomicity, consistency, isolation, durability.

active-active migration

A database migration method in which the source and target databases are kept in sync (by using a bidirectional replication tool or dual write operations), and both databases handle transactions from connecting applications during migration. This method supports migration in small, controlled batches instead of requiring a one-time cutover. It's more flexible but requires more work than active-passive migration.

active-passive migration

A database migration method in which in which the source and target databases are kept in sync, but only the source database handles transactions from connecting applications while data is replicated to the target database. The target database doesn't accept any transactions during migration.

aggregate function

A SQL function that operates on a group of rows and calculates a single return value for the group. Examples of aggregate functions include `SUM` and `MAX`.

AI

See artificial intelligence.

AIOps

See artificial intelligence operations.

anonymization

The process of permanently deleting personal information in a dataset. Anonymization can help protect personal privacy. Anonymized data is no longer considered to be personal data.

anti-pattern

A frequently used solution for a recurring issue where the solution is counter-productive, ineffective, or less effective than an alternative.

application control

A security approach that allows the use of only approved applications in order to help protect a system from malware.

application portfolio

A collection of detailed information about each application used by an organization, including the cost to build and maintain the application, and its business value. This information is key to the portfolio discovery and analysis process and helps identify and prioritize the applications to be migrated, modernized, and optimized.

artificial intelligence (AI)

The field of computer science that is dedicated to using computing technologies to perform cognitive functions that are typically associated with humans, such as learning, solving problems, and recognizing patterns. For more information, see What is Artificial Intelligence?

artificial intelligence operations (AIOps)

The process of using machine learning techniques to solve operational problems, reduce operational incidents and human intervention, and increase service quality. For more information about how AIOps is used in the AWS migration strategy, see the operations integration guide.

asymmetric encryption

An encryption algorithm that uses a pair of keys, a public key for encryption and a private key for decryption. You can share the public key because it isn't used for decryption, but access to the private key should be highly restricted.

atomicity, consistency, isolation, durability (ACID)

A set of software properties that guarantee the data validity and operational reliability of a database, even in the case of errors, power failures, or other problems.

attribute-based access control (ABAC)

The practice of creating fine-grained permissions based on user attributes, such as department, job role, and team name. For more information, see ABAC for AWS in the AWS Identity and Access Management (IAM) documentation.

authoritative data source

A location where you store the primary version of data, which is considered to be the most reliable source of information. You can copy data from the authoritative data source to other locations for the purposes of processing or modifying the data, such as anonymizing, redacting, or pseudonymizing it.

Availability Zone

A distinct location within an AWS Region that is insulated from failures in other Availability Zones and provides inexpensive, low-latency network connectivity to other Availability Zones in the same Region.

AWS Cloud Adoption Framework (AWS CAF)

A framework of guidelines and best practices from AWS to help organizations develop an efficient and effective plan to move successfully to the cloud. AWS CAF organizes guidance into six focus areas called perspectives: business, people, governance, platform, security, and operations. The business, people, and governance perspectives focus on business skills and processes; the platform, security, and operations perspectives focus on technical skills and processes. For example, the people perspective targets stakeholders who handle human resources (HR), staffing functions, and people management. For this perspective, AWS CAF provides guidance for people development, training, and communications to help ready the organization for successful cloud adoption. For more information, see the AWS CAF website and the AWS CAF whitepaper.

AWS Workload Qualification Framework (AWS WQF)

A tool that evaluates database migration workloads, recommends migration strategies, and provides work estimates. AWS WQF is included with AWS Schema Conversion Tool (AWS SCT). It analyzes database schemas and code objects, application code, dependencies, and performance characteristics, and provides assessment reports.

B

bad bot

A bot that is intended to disrupt or cause harm to individuals or organizations.

BCP

See business continuity planning.

behavior graph

A unified, interactive view of resource behavior and interactions over time. You can use a behavior graph with Amazon Detective to examine failed logon attempts, suspicious API calls, and similar actions. For more information, see Data in a behavior graph in the Detective documentation.

big-endian system

A system that stores the most significant byte first. See also endianness.

binary classification

A process that predicts a binary outcome (one of two possible classes). For example, your ML model might need to predict problems such as “Is this email spam or not spam?" or "Is this product a book or a car?"

bloom filter

A probabilistic, memory-efficient data structure that is used to test whether an element is a member of a set.

blue/green deployment

A deployment strategy where you create two separate but identical environments. You run the current application version in one environment (blue) and the new application version in the other environment (green). This strategy helps you quickly roll back with minimal impact.

bot

A software application that runs automated tasks over the internet and simulates human activity or interaction. Some bots are useful or beneficial, such as web crawlers that index information on the internet. Some other bots, known as *bad bots*, are intended to disrupt or cause harm to individuals or organizations.

botnet

Networks of bots that are infected by malware and are under the control of a single party, known as a *bot herder* or *bot operator*. Botnets are the best-known mechanism to scale bots and their impact.

branch

A contained area of a code repository. The first branch created in a repository is the *main branch*. You can create a new branch from an existing branch, and you can then develop features or fix bugs in the new branch. A branch you create to build a feature is commonly referred to as a *feature branch*. When the feature is ready for release, you merge the feature branch back into the main branch. For more information, see About branches (GitHub documentation).

break-glass access

In exceptional circumstances and through an approved process, a quick means for a user to gain access to an AWS account that they don't typically have permissions to access. For more information, see the Implement break-glass procedures indicator in the AWS Well-Architected guidance.

brownfield strategy

The existing infrastructure in your environment. When adopting a brownfield strategy for a system architecture, you design the architecture around the constraints of the current systems and infrastructure. If you are expanding the existing infrastructure, you might blend brownfield and greenfield strategies.

buffer cache

The memory area where the most frequently accessed data is stored.

business capability

What a business does to generate value (for example, sales, customer service, or marketing). Microservices architectures and development decisions can be driven by business capabilities. For more information, see the Organized around business capabilities section of the Running containerized microservices on AWS whitepaper.

business continuity planning (BCP)

A plan that addresses the potential impact of a disruptive event, such as a large-scale migration, on operations and enables a business to resume operations quickly.

C

CAF

See AWS Cloud Adoption Framework.

canary deployment

The slow and incremental release of a version to end users. When you are confident, you deploy the new version and replace the current version in its entirety.

CCoE

See Cloud Center of Excellence.

CDC

See change data capture.

change data capture (CDC)

The process of tracking changes to a data source, such as a database table, and recording metadata about the change. You can use CDC for various purposes, such as auditing or replicating changes in a target system to maintain synchronization.

chaos engineering

Intentionally introducing failures or disruptive events to test a system's resilience. You can use AWS Fault Injection Service (AWS FIS) to perform experiments that stress your AWS workloads and evaluate their response.

CI/CD

See continuous integration and continuous delivery.

classification

A categorization process that helps generate predictions. ML models for classification problems predict a discrete value. Discrete values are always distinct from one another. For example, a model might need to evaluate whether or not there is a car in an image.

client-side encryption

Encryption of data locally, before the target AWS service receives it.

Cloud Center of Excellence (CCoE)

A multi-disciplinary team that drives cloud adoption efforts across an organization, including developing cloud best practices, mobilizing resources, establishing migration timelines, and leading the organization through large-scale transformations. For more information, see the CCoE posts on the AWS Cloud Enterprise Strategy Blog.

cloud computing

The cloud technology that is typically used for remote data storage and IoT device management. Cloud computing is commonly connected to edge computing technology.

cloud operating model

In an IT organization, the operating model that is used to build, mature, and optimize one or more cloud environments. For more information, see Building your Cloud Operating Model.

cloud stages of adoption

The four phases that organizations typically go through when they migrate to the AWS Cloud:

- Project – Running a few cloud-related projects for proof of concept and learning purposes
- Foundation – Making foundational investments to scale your cloud adoption (e.g., creating a landing zone, defining a CCoE, establishing an operations model)
- Migration – Migrating individual applications
- Re-invention – Optimizing products and services, and innovating in the cloud

These stages were defined by Stephen Orban in the blog post The Journey Toward Cloud-First & the Stages of Adoption on the AWS Cloud Enterprise Strategy blog. For information about how they relate to the AWS migration strategy, see the migration readiness guide.

CMDB

See configuration management database.

code repository

A location where source code and other assets, such as documentation, samples, and scripts, are stored and updated through version control processes. Common cloud repositories include GitHub or AWS CodeCommit. Each version of the code is called a *branch*. In a microservice structure, each repository is devoted to a single piece of functionality. A single CI/CD pipeline can use multiple repositories.

cold cache

A buffer cache that is empty, not well populated, or contains stale or irrelevant data. This affects performance because the database instance must read from the main memory or disk, which is slower than reading from the buffer cache.

cold data

Data that is rarely accessed and is typically historical. When querying this kind of data, slow queries are typically acceptable. Moving this data to lower-performing and less expensive storage tiers or classes can reduce costs.

computer vision (CV)

A field of AI that uses machine learning to analyze and extract information from visual formats such as digital images and videos. For example, AWS Panorama offers devices that add CV to on-premises camera networks, and Amazon SageMaker provides image processing algorithms for CV.

configuration drift

For a workload, a configuration change from the expected state. It might cause the workload to become noncompliant, and it's typically gradual and unintentional.

configuration management database (CMDB)

A repository that stores and manages information about a database and its IT environment, including both hardware and software components and their configurations. You typically use data from a CMDB in the portfolio discovery and analysis stage of migration.

conformance pack

A collection of AWS Config rules and remediation actions that you can assemble to customize your compliance and security checks. You can deploy a conformance pack as a single entity in an AWS account and Region, or across an organization, by using a YAML template. For more information, see Conformance packs in the AWS Config documentation.

continuous integration and continuous delivery (CI/CD)

The process of automating the source, build, test, staging, and production stages of the software release process. CI/CD is commonly described as a pipeline. CI/CD can help you automate processes, improve productivity, improve code quality, and deliver faster. For more information, see Benefits of continuous delivery. CD can also stand for *continuous deployment*. For more information, see Continuous Delivery vs. Continuous Deployment.

CV

See computer vision.

D

data at rest

Data that is stationary in your network, such as data that is in storage.

data classification

A process for identifying and categorizing the data in your network based on its criticality and sensitivity. It is a critical component of any cybersecurity risk management strategy because it helps you determine the appropriate protection and retention controls for the data. Data classification is a component of the security pillar in the AWS Well-Architected Framework. For more information, see Data classification.

data drift

A meaningful variation between the production data and the data that was used to train an ML model, or a meaningful change in the input data over time. Data drift can reduce the overall quality, accuracy, and fairness in ML model predictions.

data in transit

Data that is actively moving through your network, such as between network resources.

data mesh

An architectural framework that provides distributed, decentralized data ownership with centralized management and governance.

data minimization

The principle of collecting and processing only the data that is strictly necessary. Practicing data minimization in the AWS Cloud can reduce privacy risks, costs, and your analytics carbon footprint.

data perimeter

A set of preventive guardrails in your AWS environment that help make sure that only trusted identities are accessing trusted resources from expected networks. For more information, see Building a data perimeter on AWS.

data preprocessing

To transform raw data into a format that is easily parsed by your ML model. Preprocessing data can mean removing certain columns or rows and addressing missing, inconsistent, or duplicate values.

data provenance

The process of tracking the origin and history of data throughout its lifecycle, such as how the data was generated, transmitted, and stored.

data subject

An individual whose data is being collected and processed.

data warehouse

A data management system that supports business intelligence, such as analytics. Data warehouses commonly contain large amounts of historical data, and they are typically used for queries and analysis.

database definition language (DDL)

Statements or commands for creating or modifying the structure of tables and objects in a database.

database manipulation language (DML)

Statements or commands for modifying (inserting, updating, and deleting) information in a database.

DDL

See database definition language.

deep ensemble

To combine multiple deep learning models for prediction. You can use deep ensembles to obtain a more accurate prediction or for estimating uncertainty in predictions.

deep learning

An ML subfield that uses multiple layers of artificial neural networks to identify mapping between input data and target variables of interest.

defense-in-depth

An information security approach in which a series of security mechanisms and controls are thoughtfully layered throughout a computer network to protect the confidentiality, integrity, and availability of the network and the data within. When you adopt this strategy on AWS, you add multiple controls at different layers of the AWS Organizations structure to help secure resources. For example, a defense-in-depth approach might combine multi-factor authentication, network segmentation, and encryption.

delegated administrator

In AWS Organizations, a compatible service can register an AWS member account to administer the organization's accounts and manage permissions for that service. This account is called the *delegated administrator* for that service. For more information and a list of compatible services, see Services that work with AWS Organizations in the AWS Organizations documentation.

deployment

The process of making an application, new features, or code fixes available in the target environment. Deployment involves implementing changes in a code base and then building and running that code base in the application's environments.

development environment

See environment.

detective control

A security control that is designed to detect, log, and alert after an event has occurred. These controls are a second line of defense, alerting you to security events that bypassed the preventative controls in place. For more information, see Detective controls in *Implementing security controls on AWS*.

development value stream mapping (DVSM)

A process used to identify and prioritize constraints that adversely affect speed and quality in a software development lifecycle. DVSM extends the value stream mapping process originally designed for lean manufacturing practices. It focuses on the steps and teams required to create and move value through the software development process.

digital twin

A virtual representation of a real-world system, such as a building, factory, industrial equipment, or production line. Digital twins support predictive maintenance, remote monitoring, and production optimization.

dimension table

In a star schema, a smaller table that contains data attributes about quantitative data in a fact table. Dimension table attributes are typically text fields or discrete numbers that behave like text. These attributes are commonly used for query constraining, filtering, and result set labeling.

disaster

An event that prevents a workload or system from fulfilling its business objectives in its primary deployed location. These events can be natural disasters, technical failures, or the result of human actions, such as unintentional misconfiguration or a malware attack.

disaster recovery (DR)

The strategy and process you use to minimize downtime and data loss caused by a disaster. For more information, see Disaster Recovery of Workloads on AWS: Recovery in the Cloud in the AWS Well-Architected Framework.

DML

See database manipulation language.

domain-driven design

An approach to developing a complex software system by connecting its components to evolving domains, or core business goals, that each component serves. This concept was introduced by Eric Evans in his book, *Domain-Driven Design: Tackling Complexity in the Heart of Software* (Boston: Addison-Wesley Professional, 2003). For information about how you can use domain-driven design with the strangler fig pattern, see Modernizing legacy Microsoft ASP.NET (ASMX) web services incrementally by using containers and Amazon API Gateway.

DR

See disaster recovery.

drift detection

Tracking deviations from a baselined configuration. For example, you can use AWS CloudFormation to detect drift in system resources, or you can use AWS Control Tower to detect changes in your landing zone that might affect compliance with governance requirements.

DVSM

See development value stream mapping.

E

EDA

See exploratory data analysis.

edge computing

The technology that increases the computing power for smart devices at the edges of an IoT network. When compared with cloud computing, edge computing can reduce communication latency and improve response time.

encryption

A computing process that transforms plaintext data, which is human-readable, into ciphertext.

encryption key

A cryptographic string of randomized bits that is generated by an encryption algorithm. Keys can vary in length, and each key is designed to be unpredictable and unique.

endianness

The order in which bytes are stored in computer memory. Big-endian systems store the most significant byte first. Little-endian systems store the least significant byte first.

endpoint

See service endpoint.

endpoint service

A service that you can host in a virtual private cloud (VPC) to share with other users. You can create an endpoint service with AWS PrivateLink and grant permissions to other AWS accounts

or to AWS Identity and Access Management (IAM) principals. These accounts or principals can connect to your endpoint service privately by creating interface VPC endpoints. For more information, see Create an endpoint service in the Amazon Virtual Private Cloud (Amazon VPC) documentation.

enterprise resource planning (ERP)

A system that automates and manages key business processes (such as accounting, MES, and project management) for an enterprise.

envelope encryption

The process of encrypting an encryption key with another encryption key. For more information, see Envelope encryption in the AWS Key Management Service (AWS KMS) documentation.

environment

An instance of a running application. The following are common types of environments in cloud computing:

- development environment – An instance of a running application that is available only to the core team responsible for maintaining the application. Development environments are used to test changes before promoting them to upper environments. This type of environment is sometimes referred to as a *test environment*.
- lower environments – All development environments for an application, such as those used for initial builds and tests.
- production environment – An instance of a running application that end users can access. In a CI/CD pipeline, the production environment is the last deployment environment.
- upper environments – All environments that can be accessed by users other than the core development team. This can include a production environment, preproduction environments, and environments for user acceptance testing.

epic

In agile methodologies, functional categories that help organize and prioritize your work. Epics provide a high-level description of requirements and implementation tasks. For example, AWS CAF security epics include identity and access management, detective controls, infrastructure security, data protection, and incident response. For more information about epics in the AWS migration strategy, see the program implementation guide.

ERP

See enterprise resource planning.

exploratory data analysis (EDA)

The process of analyzing a dataset to understand its main characteristics. You collect or aggregate data and then perform initial investigations to find patterns, detect anomalies, and check assumptions. EDA is performed by calculating summary statistics and creating data visualizations.

F

fact table

The central table in a star schema. It stores quantitative data about business operations. Typically, a fact table contains two types of columns: those that contain measures and those that contain a foreign key to a dimension table.

fail fast

A philosophy that uses frequent and incremental testing to reduce the development lifecycle. It is a critical part of an agile approach.

fault isolation boundary

In the AWS Cloud, a boundary such as an Availability Zone, AWS Region, control plane, or data plane that limits the effect of a failure and helps improve the resilience of workloads. For more information, see AWS Fault Isolation Boundaries.

feature branch

See branch.

features

The input data that you use to make a prediction. For example, in a manufacturing context, features could be images that are periodically captured from the manufacturing line.

feature importance

How significant a feature is for a model's predictions. This is usually expressed as a numerical score that can be calculated through various techniques, such as Shapley Additive Explanations

(SHAP) and integrated gradients. For more information, see Machine learning model interpretability with :AWS.

feature transformation

To optimize data for the ML process, including enriching data with additional sources, scaling values, or extracting multiple sets of information from a single data field. This enables the ML model to benefit from the data. For example, if you break down the “2021-05-27 00:15:37” date into “2021”, “May”, “Thu”, and “15”, you can help the learning algorithm learn nuanced patterns associated with different data components.

FGAC

See fine-grained access control.

fine-grained access control (FGAC)

The use of multiple conditions to allow or deny an access request.

flash-cut migration

A database migration method that uses continuous data replication through change data capture to migrate data in the shortest time possible, instead of using a phased approach. The objective is to keep downtime to a minimum.

G

geo blocking

See geographic restrictions.

geographic restrictions (geo blocking)

In Amazon CloudFront, an option to prevent users in specific countries from accessing content distributions. You can use an allow list or block list to specify approved and banned countries. For more information, see Restricting the geographic distribution of your content in the CloudFront documentation.

Gitflow workflow

An approach in which lower and upper environments use different branches in a source code repository. The Gitflow workflow is considered legacy, and the trunk-based workflow is the modern, preferred approach.

greenfield strategy

The absence of existing infrastructure in a new environment. When adopting a greenfield strategy for a system architecture, you can select all new technologies without the restriction of compatibility with existing infrastructure, also known as brownfield. If you are expanding the existing infrastructure, you might blend brownfield and greenfield strategies.

guardrail

A high-level rule that helps govern resources, policies, and compliance across organizational units (OUs). *Preventive guardrails* enforce policies to ensure alignment to compliance standards. They are implemented by using service control policies and IAM permissions boundaries. *Detective guardrails* detect policy violations and compliance issues, and generate alerts for remediation. They are implemented by using AWS Config, AWS Security Hub, Amazon GuardDuty, AWS Trusted Advisor, Amazon Inspector, and custom AWS Lambda checks.

H

HA

See high availability.

heterogeneous database migration

Migrating your source database to a target database that uses a different database engine (for example, Oracle to Amazon Aurora). Heterogeneous migration is typically part of a re-architecting effort, and converting the schema can be a complex task. AWS provides AWS SCT that helps with schema conversions.

high availability (HA)

The ability of a workload to operate continuously, without intervention, in the event of challenges or disasters. HA systems are designed to automatically fail over, consistently deliver high-quality performance, and handle different loads and failures with minimal performance impact.

historian modernization

An approach used to modernize and upgrade operational technology (OT) systems to better serve the needs of the manufacturing industry. A *historian* is a type of database that is used to collect and store data from various sources in a factory.

homogeneous database migration

Migrating your source database to a target database that shares the same database engine (for example, Microsoft SQL Server to Amazon RDS for SQL Server). Homogeneous migration is typically part of a rehosting or replatforming effort. You can use native database utilities to migrate the schema.

hot data

Data that is frequently accessed, such as real-time data or recent translational data. This data typically requires a high-performance storage tier or class to provide fast query responses.

hotfix

An urgent fix for a critical issue in a production environment. Due to its urgency, a hotfix is usually made outside of the typical DevOps release workflow.

hypercare period

Immediately following cutover, the period of time when a migration team manages and monitors the migrated applications in the cloud in order to address any issues. Typically, this period is 1–4 days in length. At the end of the hypercare period, the migration team typically transfers responsibility for the applications to the cloud operations team.

I

IaC

See infrastructure as code.

identity-based policy

A policy attached to one or more IAM principals that defines their permissions within the AWS Cloud environment.

idle application

An application that has an average CPU and memory usage between 5 and 20 percent over a period of 90 days. In a migration project, it is common to retire these applications or retain them on premises.

IIoT

See industrial Internet of Things.

immutable infrastructure

A model that deploys new infrastructure for production workloads instead of updating, patching, or modifying the existing infrastructure. Immutable infrastructures are inherently more consistent, reliable, and predictable than mutable infrastructure. For more information, see the Deploy using immutable infrastructure best practice in the AWS Well-Architected Framework.

inbound (ingress) VPC

In an AWS multi-account architecture, a VPC that accepts, inspects, and routes network connections from outside an application. The AWS Security Reference Architecture recommends setting up your Network account with inbound, outbound, and inspection VPCs to protect the two-way interface between your application and the broader internet.

incremental migration

A cutover strategy in which you migrate your application in small parts instead of performing a single, full cutover. For example, you might move only a few microservices or users to the new system initially. After you verify that everything is working properly, you can incrementally move additional microservices or users until you can decommission your legacy system. This strategy reduces the risks associated with large migrations.

Industry 4.0

A term that was introduced by Klaus Schwab in 2016 to refer to the modernization of manufacturing processes through advances in connectivity, real-time data, automation, analytics, and AI/ML.

infrastructure

All of the resources and assets contained within an application's environment.

infrastructure as code (IaC)

The process of provisioning and managing an application's infrastructure through a set of configuration files. IaC is designed to help you centralize infrastructure management, standardize resources, and scale quickly so that new environments are repeatable, reliable, and consistent.

industrial Internet of Things (IIoT)

The use of internet-connected sensors and devices in the industrial sectors, such as manufacturing, energy, automotive, healthcare, life sciences, and agriculture. For more information, see Building an industrial Internet of Things (IIoT) digital transformation strategy.

inspection VPC

In an AWS multi-account architecture, a centralized VPC that manages inspections of network traffic between VPCs (in the same or different AWS Regions), the internet, and on-premises networks. The AWS Security Reference Architecture recommends setting up your Network account with inbound, outbound, and inspection VPCs to protect the two-way interface between your application and the broader internet.

Internet of Things (IoT)

The network of connected physical objects with embedded sensors or processors that communicate with other devices and systems through the internet or over a local communication network. For more information, see What is IoT?

interpretability

A characteristic of a machine learning model that describes the degree to which a human can understand how the model's predictions depend on its inputs. For more information, see Machine learning model interpretability with AWS.

IoT

See Internet of Things.

IT information library (ITIL)

A set of best practices for delivering IT services and aligning these services with business requirements. ITIL provides the foundation for ITSM.

IT service management (ITSM)

Activities associated with designing, implementing, managing, and supporting IT services for an organization. For information about integrating cloud operations with ITSM tools, see the operations integration guide.

ITIL

See IT information library.

ITSM

See IT service management.

L

label-based access control (LBAC)

An implementation of mandatory access control (MAC) where the users and the data itself are each explicitly assigned a security label value. The intersection between the user security label and data security label determines which rows and columns can be seen by the user.

landing zone

A landing zone is a well-architected, multi-account AWS environment that is scalable and secure. This is a starting point from which your organizations can quickly launch and deploy workloads and applications with confidence in their security and infrastructure environment. For more information about landing zones, see Setting up a secure and scalable multi-account AWS environment.

large migration

A migration of 300 or more servers.

LBAC

See label-based access control.

least privilege

The security best practice of granting the minimum permissions required to perform a task. For more information, see Apply least-privilege permissions in the IAM documentation.

lift and shift

See 7 Rs.

little-endian system

A system that stores the least significant byte first. See also endianness.

lower environments

See environment.

M

machine learning (ML)

A type of artificial intelligence that uses algorithms and techniques for pattern recognition and learning. ML analyzes and learns from recorded data, such as Internet of Things (IoT) data, to generate a statistical model based on patterns. For more information, see Machine Learning.

main branch

See branch.

malware

Software that is designed to compromise computer security or privacy. Malware might disrupt computer systems, leak sensitive information, or gain unauthorized access. Examples of malware include viruses, worms, ransomware, Trojan horses, spyware, and keyloggers.

managed services

AWS services for which AWS operates the infrastructure layer, the operating system, and platforms, and you access the endpoints to store and retrieve data. Amazon Simple Storage Service (Amazon S3) and Amazon DynamoDB are examples of managed services. These are also known as *abstracted services*.

manufacturing execution system (MES)

A software system for tracking, monitoring, documenting, and controlling production processes that convert raw materials to finished products on the shop floor.

MAP

See Migration Acceleration Program.

mechanism

A complete process in which you create a tool, drive adoption of the tool, and then inspect the results in order to make adjustments. A mechanism is a cycle that reinforces and improves itself as it operates. For more information, see Building mechanisms in the AWS Well-Architected Framework.

member account

All AWS accounts other than the management account that are part of an organization in AWS Organizations. An account can be a member of only one organization at a time.

MES

See manufacturing execution system.

Message Queuing Telemetry Transport (MQTT)

A lightweight, machine-to-machine (M2M) communication protocol, based on the publish/subscribe pattern, for resource-constrained IoT devices.

microservice

A small, independent service that communicates over well-defined APIs and is typically owned by small, self-contained teams. For example, an insurance system might include microservices that map to business capabilities, such as sales or marketing, or subdomains, such as purchasing, claims, or analytics. The benefits of microservices include agility, flexible scaling, easy deployment, reusable code, and resilience. For more information, see Integrating microservices by using AWS serverless services.

microservices architecture

An approach to building an application with independent components that run each application process as a microservice. These microservices communicate through a well-defined interface by using lightweight APIs. Each microservice in this architecture can be updated, deployed, and scaled to meet demand for specific functions of an application. For more information, see Implementing microservices on AWS.

Migration Acceleration Program (MAP)

An AWS program that provides consulting support, training, and services to help organizations build a strong operational foundation for moving to the cloud, and to help offset the initial cost of migrations. MAP includes a migration methodology for executing legacy migrations in a methodical way and a set of tools to automate and accelerate common migration scenarios.

migration at scale

The process of moving the majority of the application portfolio to the cloud in waves, with more applications moved at a faster rate in each wave. This phase uses the best practices and lessons learned from the earlier phases to implement a *migration factory* of teams, tools, and processes to streamline the migration of workloads through automation and agile delivery. This is the third phase of the AWS migration strategy.

migration factory

Cross-functional teams that streamline the migration of workloads through automated, agile approaches. Migration factory teams typically include operations, business analysts and owners, migration engineers, developers, and DevOps professionals working in sprints. Between 20 and 50 percent of an enterprise application portfolio consists of repeated patterns that can be optimized by a factory approach. For more information, see the discussion of migration factories and the Cloud Migration Factory guide in this content set.

migration metadata

The information about the application and server that is needed to complete the migration. Each migration pattern requires a different set of migration metadata. Examples of migration metadata include the target subnet, security group, and AWS account.

migration pattern

A repeatable migration task that details the migration strategy, the migration destination, and the migration application or service used. Example: Rehost migration to Amazon EC2 with AWS Application Migration Service.

Migration Portfolio Assessment (MPA)

An online tool that provides information for validating the business case for migrating to the AWS Cloud. MPA provides detailed portfolio assessment (server right-sizing, pricing, TCO comparisons, migration cost analysis) as well as migration planning (application data analysis and data collection, application grouping, migration prioritization, and wave planning). The MPA tool (requires login) is available free of charge to all AWS consultants and APN Partner consultants.

Migration Readiness Assessment (MRA)

The process of gaining insights about an organization's cloud readiness status, identifying strengths and weaknesses, and building an action plan to close identified gaps, using the AWS CAF. For more information, see the migration readiness guide. MRA is the first phase of the AWS migration strategy.

migration strategy

The approach used to migrate a workload to the AWS Cloud. For more information, see the 7 Rs entry in this glossary and see Mobilize your organization to accelerate large-scale migrations.

ML

See machine learning.

modernization

Transforming an outdated (legacy or monolithic) application and its infrastructure into an agile, elastic, and highly available system in the cloud to reduce costs, gain efficiencies, and take advantage of innovations. For more information, see Strategy for modernizing applications in the AWS Cloud.

modernization readiness assessment

An evaluation that helps determine the modernization readiness of an organization's applications; identifies benefits, risks, and dependencies; and determines how well the organization can support the future state of those applications. The outcome of the assessment is a blueprint of the target architecture, a roadmap that details development phases and milestones for the modernization process, and an action plan for addressing identified gaps. For more information, see Evaluating modernization readiness for applications in the AWS Cloud.

monolithic applications (monoliths)

Applications that run as a single service with tightly coupled processes. Monolithic applications have several drawbacks. If one application feature experiences a spike in demand, the entire architecture must be scaled. Adding or improving a monolithic application's features also becomes more complex when the code base grows. To address these issues, you can use a microservices architecture. For more information, see Decomposing monoliths into microservices.

MPA

See Migration Portfolio Assessment.

MQTT

See Message Queuing Telemetry Transport.

multiclass classification

A process that helps generate predictions for multiple classes (predicting one of more than two outcomes). For example, an ML model might ask "Is this product a book, car, or phone?" or "Which product category is most interesting to this customer?"

mutable infrastructure

A model that updates and modifies the existing infrastructure for production workloads. For improved consistency, reliability, and predictability, the AWS Well-Architected Framework recommends the use of immutable infrastructure as a best practice.

O

OAC

See origin access control.

OAI

See origin access identity.

OCM

See organizational change management.

offline migration

A migration method in which the source workload is taken down during the migration process. This method involves extended downtime and is typically used for small, non-critical workloads.

OI

See operations integration.

OLA

See operational-level agreement.

online migration

A migration method in which the source workload is copied to the target system without being taken offline. Applications that are connected to the workload can continue to function during the migration. This method involves zero to minimal downtime and is typically used for critical production workloads.

OPC-UA

See Open Process Communications - Unified Architecture.

Open Process Communications - Unified Architecture (OPC-UA)

A machine-to-machine (M2M) communication protocol for industrial automation. OPC-UA provides an interoperability standard with data encryption, authentication, and authorization schemes.

operational-level agreement (OLA)

An agreement that clarifies what functional IT groups promise to deliver to each other, to support a service-level agreement (SLA).

operational readiness review (ORR)

A checklist of questions and associated best practices that help you understand, evaluate, prevent, or reduce the scope of incidents and possible failures. For more information, see Operational Readiness Reviews (ORR) in the AWS Well-Architected Framework.

operational technology (OT)

Hardware and software systems that work with the physical environment to control industrial operations, equipment, and infrastructure. In manufacturing, the integration of OT and information technology (IT) systems is a key focus for Industry 4.0 transformations.

operations integration (OI)

The process of modernizing operations in the cloud, which involves readiness planning, automation, and integration. For more information, see the operations integration guide.

organization trail

A trail that's created by AWS CloudTrail that logs all events for all AWS accounts in an organization in AWS Organizations. This trail is created in each AWS account that's part of the organization and tracks the activity in each account. For more information, see Creating a trail for an organization in the CloudTrail documentation.

organizational change management (OCM)

A framework for managing major, disruptive business transformations from a people, culture, and leadership perspective. OCM helps organizations prepare for, and transition to, new systems and strategies by accelerating change adoption, addressing transitional issues, and driving cultural and organizational changes. In the AWS migration strategy, this framework is called *people acceleration*, because of the speed of change required in cloud adoption projects. For more information, see the OCM guide.

origin access control (OAC)

In CloudFront, an enhanced option for restricting access to secure your Amazon Simple Storage Service (Amazon S3) content. OAC supports all S3 buckets in all AWS Regions, server-side encryption with AWS KMS (SSE-KMS), and dynamic PUT and DELETE requests to the S3 bucket.

origin access identity (OAI)

In CloudFront, an option for restricting access to secure your Amazon S3 content. When you use OAI, CloudFront creates a principal that Amazon S3 can authenticate with. Authenticated principals can access content in an S3 bucket only through a specific CloudFront distribution. See also OAC, which provides more granular and enhanced access control.

ORR

See operational readiness review.

OT

See operational technology.

outbound (egress) VPC

In an AWS multi-account architecture, a VPC that handles network connections that are initiated from within an application. The AWS Security Reference Architecture recommends setting up your Network account with inbound, outbound, and inspection VPCs to protect the two-way interface between your application and the broader internet.

P

permissions boundary

An IAM management policy that is attached to IAM principals to set the maximum permissions that the user or role can have. For more information, see Permissions boundaries in the IAM documentation.

personally identifiable information (PII)

Information that, when viewed directly or paired with other related data, can be used to reasonably infer the identity of an individual. Examples of PII include names, addresses, and contact information.

PII

See personally identifiable information.

playbook

A set of predefined steps that capture the work associated with migrations, such as delivering core operations functions in the cloud. A playbook can take the form of scripts, automated runbooks, or a summary of processes or steps required to operate your modernized environment.

PLC

See programmable logic controller.

PLM

See product lifecycle management.

policy

An object that can define permissions (see identity-based policy), specify access conditions (see resource-based policy), or define the maximum permissions for all accounts in an organization in AWS Organizations (see service control policy).

polyglot persistence

Independently choosing a microservice's data storage technology based on data access patterns and other requirements. If your microservices have the same data storage technology, they can encounter implementation challenges or experience poor performance. Microservices are more easily implemented and achieve better performance and scalability if they use the data store best adapted to their requirements. For more information, see Enabling data persistence in microservices.

portfolio assessment

A process of discovering, analyzing, and prioritizing the application portfolio in order to plan the migration. For more information, see Evaluating migration readiness.

predicate

A query condition that returns `true` or `false`, commonly located in a `WHERE` clause.

predicate pushdown

A database query optimization technique that filters the data in the query before transfer. This reduces the amount of data that must be retrieved and processed from the relational database, and it improves query performance.

preventative control

A security control that is designed to prevent an event from occurring. These controls are a first line of defense to help prevent unauthorized access or unwanted changes to your network. For more information, see Preventative controls in *Implementing security controls on AWS*.

principal

An entity in AWS that can perform actions and access resources. This entity is typically a root user for an AWS account, an IAM role, or a user. For more information, see *Principal* in Roles terms and concepts in the IAM documentation.

Privacy by Design

An approach in system engineering that takes privacy into account throughout the whole engineering process.

private hosted zones

A container that holds information about how you want Amazon Route 53 to respond to DNS queries for a domain and its subdomains within one or more VPCs. For more information, see Working with private hosted zones in the Route 53 documentation.

proactive control

A security control designed to prevent the deployment of noncompliant resources. These controls scan resources before they are provisioned. If the resource is not compliant with the control, then it isn't provisioned. For more information, see the Controls reference guide in the AWS Control Tower documentation and see Proactive controls in *Implementing security controls on AWS*.

product lifecycle management (PLM)

The management of data and processes for a product throughout its entire lifecycle, from design, development, and launch, through growth and maturity, to decline and removal.

production environment

See environment.

programmable logic controller (PLC)

In manufacturing, a highly reliable, adaptable computer that monitors machines and automates manufacturing processes.

pseudonymization

The process of replacing personal identifiers in a dataset with placeholder values. Pseudonymization can help protect personal privacy. Pseudonymized data is still considered to be personal data.

publish/subscribe (pub/sub)

A pattern that enables asynchronous communications among microservices to improve scalability and responsiveness. For example, in a microservices-based MES, a microservice can publish event messages to a channel that other microservices can subscribe to. The system can add new microservices without changing the publishing service.

Q

query plan

A series of steps, like instructions, that are used to access the data in a SQL relational database system.

query plan regression

When a database service optimizer chooses a less optimal plan than it did before a given change to the database environment. This can be caused by changes to statistics, constraints, environment settings, query parameter bindings, and updates to the database engine.

R

RACI matrix

See responsible, accountable, consulted, informed (RACI).

ransomware

A malicious software that is designed to block access to a computer system or data until a payment is made.

RASCI matrix

See responsible, accountable, consulted, informed (RACI).

RCAC

See row and column access control.

read replica

A copy of a database that's used for read-only purposes. You can route queries to the read replica to reduce the load on your primary database.

re-architect

See 7 Rs.

recovery point objective (RPO)

The maximum acceptable amount of time since the last data recovery point. This determines what is considered an acceptable loss of data between the last recovery point and the interruption of service.

recovery time objective (RTO)

The maximum acceptable delay between the interruption of service and restoration of service.

refactor

See 7 Rs.

Region

A collection of AWS resources in a geographic area. Each AWS Region is isolated and independent of the others to provide fault tolerance, stability, and resilience. For more information, see Specify which AWS Regions your account can use.

regression

An ML technique that predicts a numeric value. For example, to solve the problem of "What price will this house sell for?" an ML model could use a linear regression model to predict a house's sale price based on known facts about the house (for example, the square footage).

rehost

See 7 Rs.

release

In a deployment process, the act of promoting changes to a production environment.

relocate

See 7 Rs.

replatform

See 7 Rs.

repurchase

See 7 Rs.

resiliency

An application's ability to resist or recover from disruptions. High availability and disaster recovery are common considerations when planning for resiliency in the AWS Cloud. For more information, see AWS Cloud Resilience.

resource-based policy

A policy attached to a resource, such as an Amazon S3 bucket, an endpoint, or an encryption key. This type of policy specifies which principals are allowed access, supported actions, and any other conditions that must be met.

responsible, accountable, consulted, informed (RACI) matrix

A matrix that defines the roles and responsibilities for all parties involved in migration activities and cloud operations. The matrix name is derived from the responsibility types defined in the matrix: responsible (R), accountable (A), consulted (C), and informed (I). The support (S) type is optional. If you include support, the matrix is called a *RASCI matrix*, and if you exclude it, it's called a *RACI matrix*.

responsive control

A security control that is designed to drive remediation of adverse events or deviations from your security baseline. For more information, see Responsive controls in *Implementing security controls on AWS*.

retain

See 7 Rs.

retire

See 7 Rs.

rotation

The process of periodically updating a secret to make it more difficult for an attacker to access the credentials.

row and column access control (RCAC)

The use of basic, flexible SQL expressions that have defined access rules. RCAC consists of row permissions and column masks.

RPO

See recovery point objective.

RTO

See recovery time objective.

runbook

A set of manual or automated procedures required to perform a specific task. These are typically built to streamline repetitive operations or procedures with high error rates.

S

SAML 2.0

An open standard that many identity providers (IdPs) use. This feature enables federated single sign-on (SSO), so users can log into the AWS Management Console or call the AWS API operations without you having to create user in IAM for everyone in your organization. For more information about SAML 2.0-based federation, see About SAML 2.0-based federation in the IAM documentation.

SCADA

See supervisory control and data acquisition.

SCP

See service control policy.

secret

In AWS Secrets Manager, confidential or restricted information, such as a password or user credentials, that you store in encrypted form. It consists of the secret value and its metadata. The secret value can be binary, a single string, or multiple strings. For more information, see What's in a Secrets Manager secret? in the Secrets Manager documentation.

security control

A technical or administrative guardrail that prevents, detects, or reduces the ability of a threat actor to exploit a security vulnerability. There are four primary types of security controls: preventative, detective, responsive, and proactive.

security hardening

The process of reducing the attack surface to make it more resistant to attacks. This can include actions such as removing resources that are no longer needed, implementing the security best practice of granting least privilege, or deactivating unnecessary features in configuration files.

security information and event management (SIEM) system

Tools and services that combine security information management (SIM) and security event management (SEM) systems. A SIEM system collects, monitors, and analyzes data from servers, networks, devices, and other sources to detect threats and security breaches, and to generate alerts.

security response automation

A predefined and programmed action that is designed to automatically respond to or remediate a security event. These automations serve as detective or responsive security controls that help you implement AWS security best practices. Examples of automated response actions include modifying a VPC security group, patching an Amazon EC2 instance, or rotating credentials.

server-side encryption

Encryption of data at its destination, by the AWS service that receives it.

service control policy (SCP)

A policy that provides centralized control over permissions for all accounts in an organization in AWS Organizations. SCPs define guardrails or set limits on actions that an administrator can delegate to users or roles. You can use SCPs as allow lists or deny lists, to specify which services or actions are permitted or prohibited. For more information, see Service control policies in the AWS Organizations documentation.

service endpoint

The URL of the entry point for an AWS service. You can use the endpoint to connect programmatically to the target service. For more information, see AWS service endpoints in *AWS General Reference*.

service-level agreement (SLA)

An agreement that clarifies what an IT team promises to deliver to their customers, such as service uptime and performance.

service-level indicator (SLI)

A measurement of a performance aspect of a service, such as its error rate, availability, or throughput.

service-level objective (SLO)

A target metric that represents the health of a service, as measured by a service-level indicator.

shared responsibility model

A model describing the responsibility you share with AWS for cloud security and compliance. AWS is responsible for security *of* the cloud, whereas you are responsible for security *in* the cloud. For more information, see Shared responsibility model.

SIEM

See security information and event management system.

single point of failure (SPOF)

A failure in a single, critical component of an application that can disrupt the system.

SLA

See service-level agreement.

SLI

See service-level indicator.

SLO

See service-level objective.

split-and-seed model

A pattern for scaling and accelerating modernization projects. As new features and product releases are defined, the core team splits up to create new product teams. This helps scale your organization's capabilities and services, improves developer productivity, and supports rapid innovation. For more information, see Phased approach to modernizing applications in the AWS Cloud.

SPOF

See single point of failure.

star schema

A database organizational structure that uses one large fact table to store transactional or measured data and uses one or more smaller dimensional tables to store data attributes. This structure is designed for use in a data warehouse or for business intelligence purposes.

strangler fig pattern

An approach to modernizing monolithic systems by incrementally rewriting and replacing system functionality until the legacy system can be decommissioned. This pattern uses the analogy of a fig vine that grows into an established tree and eventually overcomes and replaces its host. The pattern was introduced by Martin Fowler as a way to manage risk when rewriting monolithic systems. For an example of how to apply this pattern, see Modernizing legacy Microsoft ASP.NET (ASMX) web services incrementally by using containers and Amazon API Gateway.

subnet

A range of IP addresses in your VPC. A subnet must reside in a single Availability Zone.

supervisory control and data acquisition (SCADA)

In manufacturing, a system that uses hardware and software to monitor physical assets and production operations.

symmetric encryption

An encryption algorithm that uses the same key to encrypt and decrypt the data.

synthetic testing

Testing a system in a way that simulates user interactions to detect potential issues or to monitor performance. You can use Amazon CloudWatch Synthetics to create these tests.

T

tags

Key-value pairs that act as metadata for organizing your AWS resources. Tags can help you manage, identify, organize, search for, and filter resources. For more information, see Tagging your AWS resources.

target variable

The value that you are trying to predict in supervised ML. This is also referred to as an *outcome variable*. For example, in a manufacturing setting the target variable could be a product defect.

task list

A tool that is used to track progress through a runbook. A task list contains an overview of the runbook and a list of general tasks to be completed. For each general task, it includes the estimated amount of time required, the owner, and the progress.

test environment

See environment.

training

To provide data for your ML model to learn from. The training data must contain the correct answer. The learning algorithm finds patterns in the training data that map the input data attributes to the target (the answer that you want to predict). It outputs an ML model that captures these patterns. You can then use the ML model to make predictions on new data for which you don't know the target.

transit gateway

A network transit hub that you can use to interconnect your VPCs and on-premises networks. For more information, see What is a transit gateway in the AWS Transit Gateway documentation.

trunk-based workflow

An approach in which developers build and test features locally in a feature branch and then merge those changes into the main branch. The main branch is then built to the development, preproduction, and production environments, sequentially.

trusted access

Granting permissions to a service that you specify to perform tasks in your organization in AWS Organizations and in its accounts on your behalf. The trusted service creates a service-linked role in each account, when that role is needed, to perform management tasks for you. For more information, see Using AWS Organizations with other AWS services in the AWS Organizations documentation.

tuning

To change aspects of your training process to improve the ML model's accuracy. For example, you can train the ML model by generating a labeling set, adding labels, and then repeating these steps several times under different settings to optimize the model.

two-pizza team

A small DevOps team that you can feed with two pizzas. A two-pizza team size ensures the best possible opportunity for collaboration in software development.

U

uncertainty

A concept that refers to imprecise, incomplete, or unknown information that can undermine the reliability of predictive ML models. There are two types of uncertainty: *Epistemic uncertainty* is caused by limited, incomplete data, whereas *aleatoric uncertainty* is caused by the noise and randomness inherent in the data. For more information, see the Quantifying uncertainty in deep learning systems guide.

undifferentiated tasks

Also known as *heavy lifting*, work that is necessary to create and operate an application but that doesn't provide direct value to the end user or provide competitive advantage. Examples of undifferentiated tasks include procurement, maintenance, and capacity planning.

upper environments

See environment.

V

vacuuming

A database maintenance operation that involves cleaning up after incremental updates to reclaim storage and improve performance.

version control

Processes and tools that track changes, such as changes to source code in a repository.

VPC peering

A connection between two VPCs that allows you to route traffic by using private IP addresses. For more information, see What is VPC peering in the Amazon VPC documentation.

vulnerability

A software or hardware flaw that compromises the security of the system.

W

warm cache

A buffer cache that contains current, relevant data that is frequently accessed. The database instance can read from the buffer cache, which is faster than reading from the main memory or disk.

warm data

Data that is infrequently accessed. When querying this kind of data, moderately slow queries are typically acceptable.

window function

A SQL function that performs a calculation on a group of rows that relate in some way to the current record. Window functions are useful for processing tasks, such as calculating a moving average or accessing the value of rows based on the relative position of the current row.

workload

A collection of resources and code that delivers business value, such as a customer-facing application or backend process.

workstream

Functional groups in a migration project that are responsible for a specific set of tasks. Each workstream is independent but supports the other workstreams in the project. For example, the portfolio workstream is responsible for prioritizing applications, wave planning, and collecting migration metadata. The portfolio workstream delivers these assets to the migration workstream, which then migrates the servers and applications.

WORM

See write once, read many.

WQF

See AWS Workload Qualification Framework.

write once, read many (WORM)

A storage model that writes data a single time and prevents the data from being deleted or modified. Authorized users can read the data as many times as needed, but they cannot change it. This data storage infrastructure is considered immutable.

Z

zero-day exploit

An attack, typically malware, that takes advantage of a zero-day vulnerability.

zero-day vulnerability

An unmitigated flaw or vulnerability in a production system. Threat actors can use this type of vulnerability to attack the system. Developers frequently become aware of the vulnerability as a result of the attack.

zombie application

An application that has an average CPU and memory usage below 5 percent. In a migration project, it is common to retire these applications.