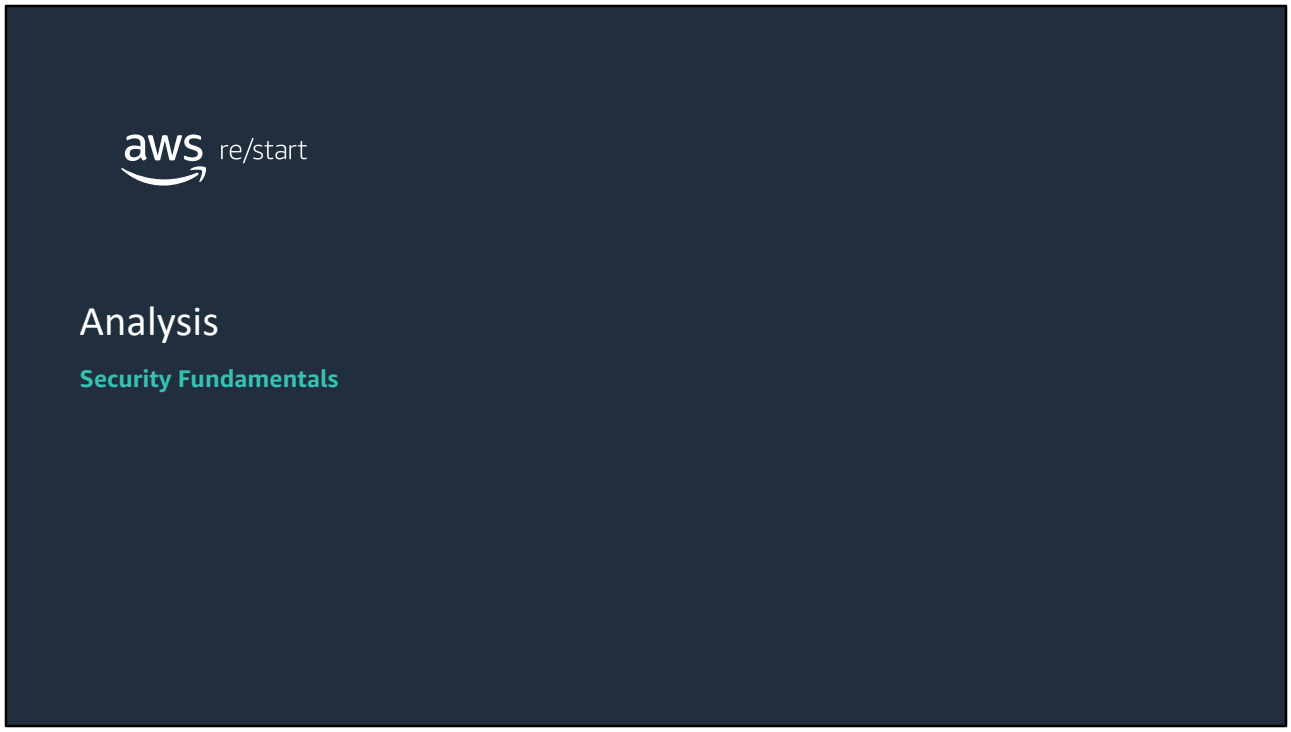

Welcome to Security Lifecycle – Analysis.

What you will learn

At the core of the lesson

You will learn how to:

- Define security analysis and why it is necessary
- Identify tools and processes for security analysis
- Describe how different types of testing, monitoring, and logging support security analysis

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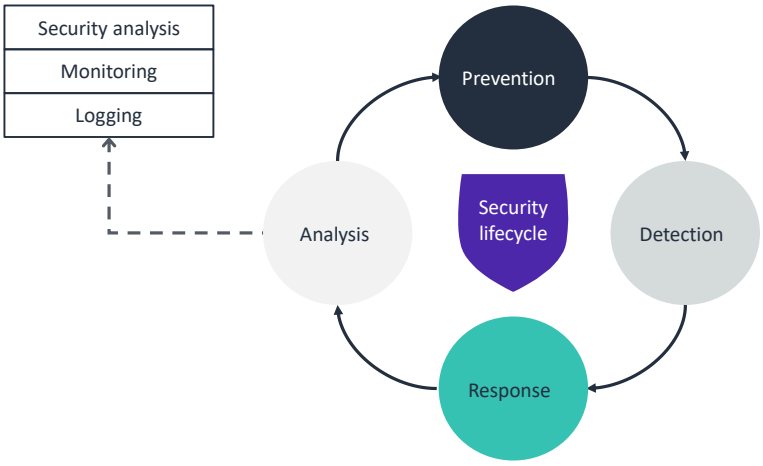
In this lesson, you will learn how to:

- Define security analysis and why it is necessary
- Identify tools and processes for security analysis
- Describe how different types of testing, monitoring, and logging support security analysis

Security lifecycle: Analysis



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As a review, the phases of the security lifecycle consist of:

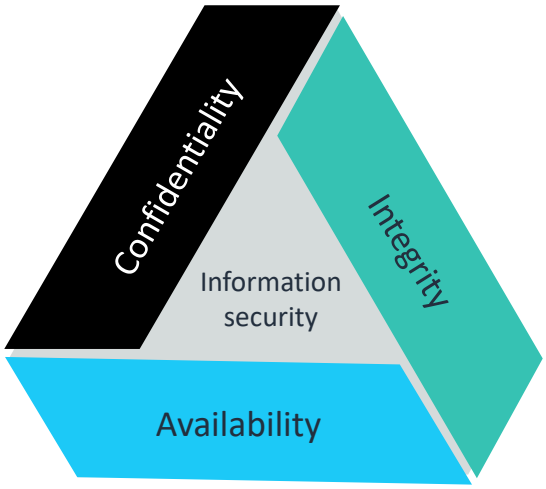
- **Prevention** – Is the first line of defense
- **Detection** – Occurs when prevention fails
- **Response** – Describes what you do when you detect a security threat
- **Analysis** – Completes the cycle as you identify lessons learned and implement new measures to prevent the issue from occurring again in the future

In this lesson, you will learn about the analysis phase of the security lifecycle. Specifically, you will discover tools and techniques for doing security monitoring, logging, and analysis.

Confidentiality, integrity, and availability (CIA)

Information must be protected to ensure its confidentiality, integrity, and availability.

- **Confidentiality**: Is private data protected to prevent unauthorized access?
- **Integrity**: Are measures in place to ensure that data has not been tampered with and is correct and authentic?
- **Availability**: Are authorized users able to access the data when they need it?



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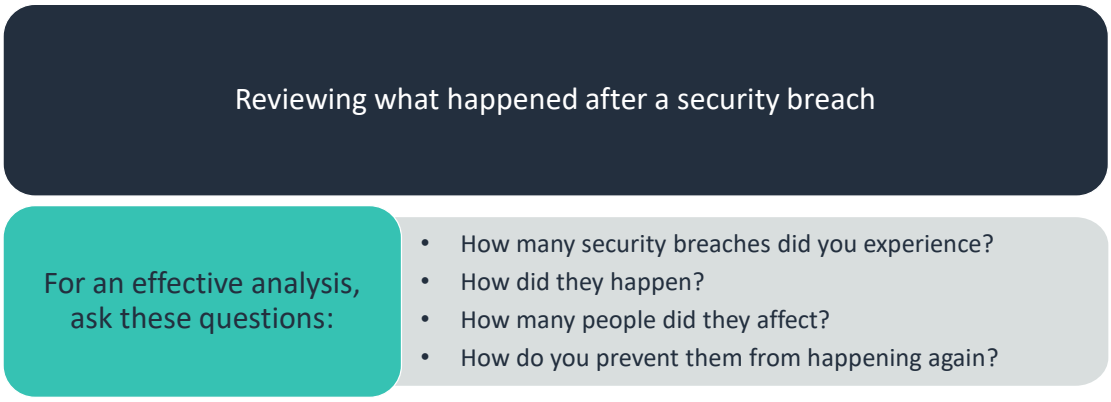
Recall that the CIA triad—confidentiality, integrity, and availability—is a concept that drives data security in enterprises. Confidentiality aims at keeping personal data safe and hidden from non-authorized people. Integrity consists of ensuring that data is not modified or altered throughout the process in which it is used. Finally, availability ensures that data stays available when needed for the right person.

All three of these concepts can be covered during analysis.

Security analysis

Next, you'll discuss why analysis is an important part of your security outlook.

What is analysis?



Analysis is the final phase of the security lifecycle. In the analysis phase, you review the cause of security incidents and analyze current security controls to determine weaknesses. The objective is to improve and strengthen those controls to better protect your network, facilities, and organization.

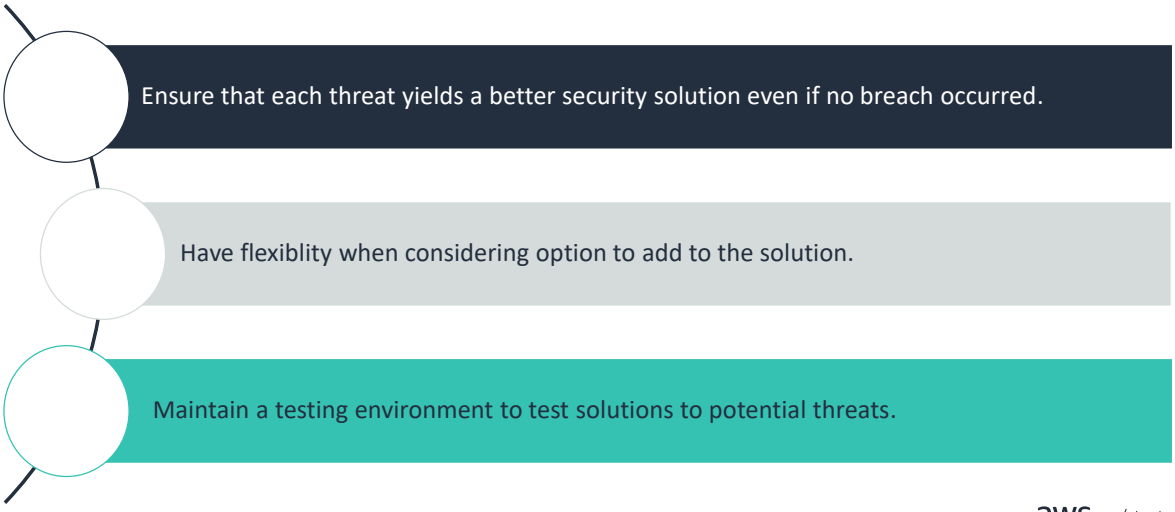
For example, when your car has a flat tire, you need to find the origin of the problem. It can be because of a nail or because it is deflated. For both cases, you would not act the same way to fix the issue and prevent it from happening again.

Questions that you might ask during analysis include the following:

- How many security breaches did you experience?
- How did they happen?
- Was the data breach accidental?
- How many people did they affect?
- How could you prevent them from happening again?

The next topic describes some guidelines and techniques that you can apply during the analysis phase to answer these questions.

General guidelines for analysis



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The main goal of analysis is to improve and strengthen the existing security of your environment.

When you test to simulate attacks, do so in a separate test environment that is representative of your production environment. However, be aware that you will probably not be able to do everything to protect your system. Each action that you take to protect your system (for example, limiting access to resources or reducing points of failure) will have impact (for example, slowing the network or increasing costs). You might want to find the right balance for your business instead of implementing everything that is possible.

Types of security tests

External vulnerability assessment

External penetration test

Internal review of applications and platforms

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You can conduct security testing during the analysis phase. Doing security tests in the analysis phase is useful in order to mimic what could happen if your system were under attack. Conducting security tests gives you an opportunity to implement solutions to better prepare against these attacks.

The types of testing include the following:

- **External vulnerability assessment** – A third party evaluates system vulnerabilities with little knowledge of the infrastructure and components.
- **External penetration test** – A third party with little knowledge of the system actively tries to break into the system in a controlled manner.
- **Internal review of applications and platforms** – A tester with some or full knowledge of the system validates the effectiveness of the following for known susceptibilities:
    - Controls in place
    - Applications and platforms

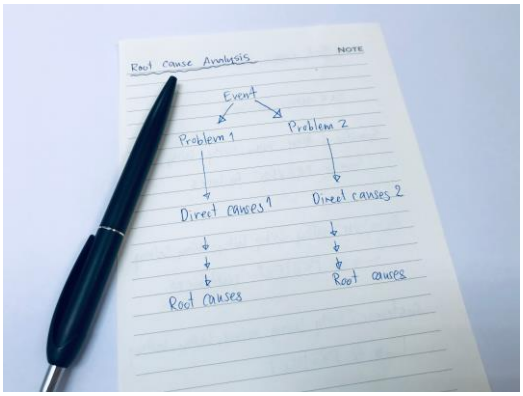
In the AWS Cloud, Amazon Web Services (AWS) customers are encouraged to conduct security assessments or penetration tests against their AWS infrastructure.

Root cause analysis (RCA)

RCA is used to identify the origin of security breaches.

Steps to conduct an RCA

1. Describe the issue that happened and what it led to. How did it happen? Where? What are the consequences?
2. Go back to the baseline situation, and analyze each event leading up to the issue.
3. Analyze events to understand the links between them, and identify which event most likely caused the issue. This mechanism is called **event correlation**.
4. Create a visual representation (for example, a diagram or graph) of the sequence of events from the origin to the final problem.



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Root cause analysis (RCA) can be used to provide a clear and accurate answer to the following question: How did the breach happen?

You usually perform root cause analysis when your network underwent an attack, for example, or when you perform penetration testing to test your network's security. As a result of that analysis, you can take actions to prevent that issue from happening again in the future.

Consider the example of a folder in which you are storing important data. One day, you realize that part of this data has disappeared. After performing a root cause analysis, you conclude that the wrong permissions were applied to this folder and that unauthorized users could access it. You must take action and modify the rules to restrict the access to the folder to prevent this from happening again.

Risk assessment

Risk is the likelihood of a threat occurring against a particular asset and the possible impact to that asset if the threat occurs.

A risk assessment helps to identify and rank risk.

Five basic steps:

1. Identify threats
2. Identify vulnerabilities
3. Determine likelihood
4. Determine impact
5. Determine risk

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During a risk assessment, ask “What are the most critical assets or critical business processes that need the most protection?”

Risk response strategies

Risk avoidance	Risk transference	Risk mitigation	Risk acceptance
• Stop doing the risky activity.	• Assign the responsibility for the risk to another party.	• Implement a control to reduce the risk.	• Do nothing to reduce the risk, but monitor and plan a response.

aws re/start

Based on the results of the risk assessment, decide which security response strategy to use for a particular asset or activity.

Monitoring and logging benefits

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Monitoring and logging also are tools that help in security analysis because they provide the data that is used to identify and resolve security problems.

The following are the benefits of monitoring and logging:

- Monitoring and logging can provide an effective way to govern IT.
- Monitoring and logging can aid in ensuring regulatory compliance by adhering to laws, regulations, and specifications relevant to its operations.
- Monitoring and logging can assist service level agreement (SLA) performance validation and help ensure compliance.
- Monitoring and logging can contribute to management oversight and control.

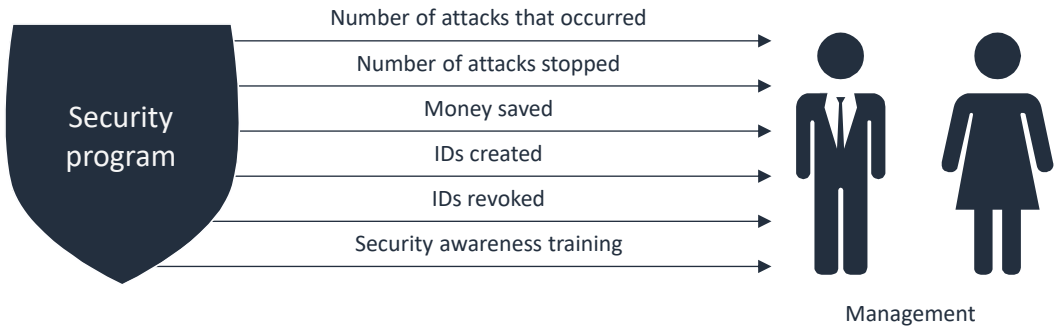
Monitoring and logging

- Logs
  - Provide data that is used to examine IT systems and processes
  - Can be both inputs and outputs of monitoring
- Monitor logs for
  - Changes
  - Exceptions
  - Other significant events
- Records produced from monitoring become logs for further analysis.

Monitoring and logging complement each other. Log significant events that are monitored in the environment.

Use metrics

- Metrics measure the success of the security program.
- For a security program, metrics can be both positive and negative.



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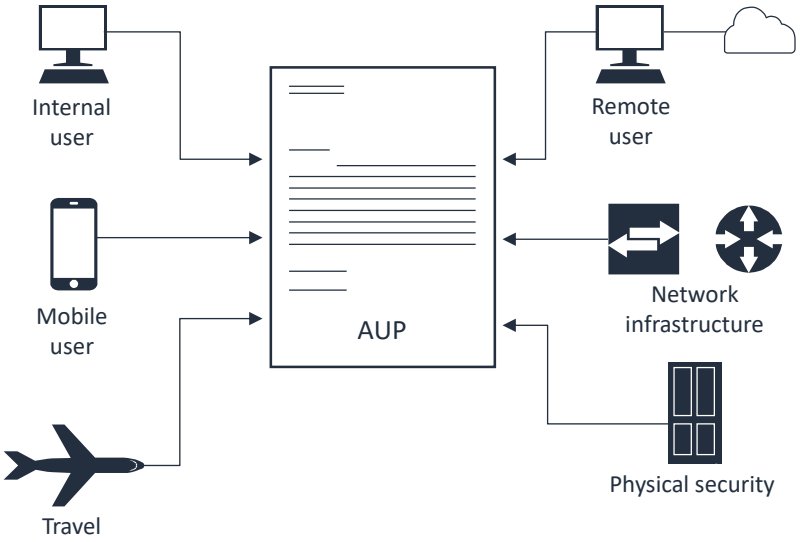
Use metrics to assess and demonstrate the success of your security solution.

Environment monitoring

This section discusses monitoring and logging in more detail.

Monitoring

- A company's Acceptable Use Policy (AUP) defines how employees or users can be monitored on a company's network:
  - At work
  - Remotely
  - On mobile devices



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A company can define a set of rules that determine what or who is monitored by creating an Acceptable Use Policy (AUP) document.

Types of monitoring

Location

- Onsite
- Remote
- Internal or external
- Outsourced

Resource

- System
- Network
- Database
- Physical
- Employee

Usage

- Usage or consumption
- Location
- Access restrictions

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The types of monitoring can vary based on where the monitoring occurs and what type of resource or usage is being monitored.

AWS monitoring services

AWS provides services for monitoring.

- Amazon CloudWatch monitors resources and applications in the AWS Cloud and on-premises.
- AWS Config records and evaluates configurations of your AWS resources.
- Amazon Managed Service for Prometheus provides highly available, secure, and managed monitoring for your containers.
- Amazon GuardDuty protects your AWS accounts with intelligent threat detection.
- Amazon Macie is a fully managed data security and data privacy service that uses machine learning and pattern matching to discover and protect your sensitive data in AWS.

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- Amazon CloudWatch is a monitoring and observability service built for DevOps engineers, developers, site reliability engineers (SREs), IT managers, and product owners. CloudWatch provides you with data and actionable insights to monitor your applications, respond to system-wide performance changes, and optimize resource utilization.
- AWS Config is a service that you can use to assess, audit, and evaluate the configurations of your AWS resources.
- Amazon Managed Service for Prometheus is a Prometheus-compatible monitoring and alerting service that makes it easy to monitor containerized applications and infrastructure at scale.
- Amazon GuardDuty is a threat detection service that continuously monitors your AWS accounts and workloads for malicious activity. It also delivers detailed security findings for visibility and remediation.

Monitoring as a service (MaaS)

- Amazon CloudWatch is a cloud-based monitoring infrastructure in the AWS Cloud.
- The entire infrastructure of CloudWatch is deployed in the cloud.
- CloudWatch provides anytime, anywhere access to monitoring information.

Amazon CloudWatch

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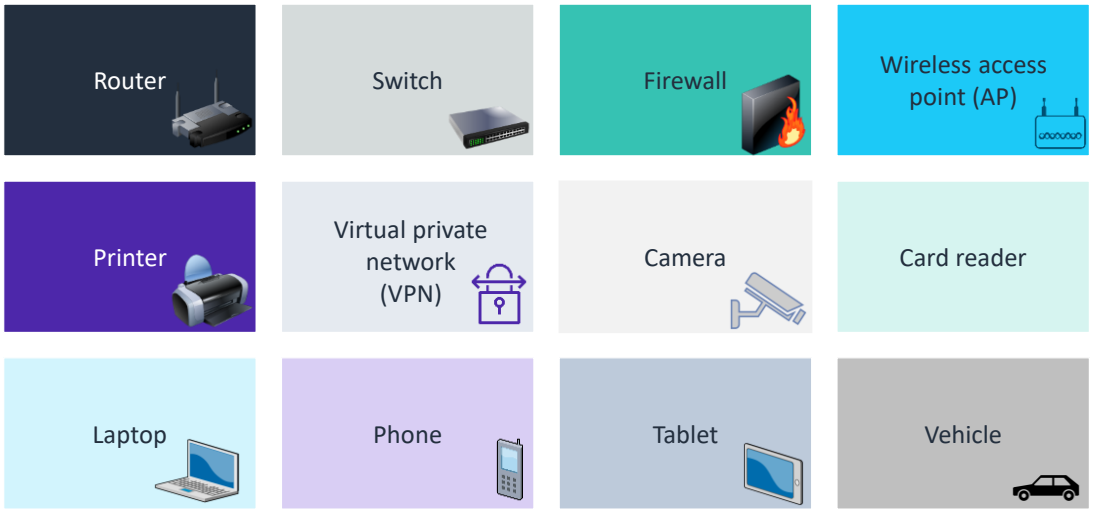
In the AWS Cloud, the Amazon CloudWatch service provides monitoring for AWS Cloud resources and the applications that you run on AWS. CloudWatch Logs is capable of monitoring and storing your logs to help you better understand and operate your systems and applications.

A benefit of monitoring as a service (MaaS) is that these types of services can provide real-time application and system monitoring. For example, CloudWatch Logs can track the number of errors that occur in your application logs. It can then send you a notification whenever the rate of errors exceeds a threshold that you specify.

Devices that might be monitored



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You can monitor almost any type of device that you can connect to a network.

Monitoring policy

When you develop a monitoring policy, ask the following questions:

- What should you monitor?
- How closely should you monitor?
- How often should you monitor?
- Who does the monitoring?
- Do you outsource monitoring?
  - Data retention monitoring
  - Access to monitoring tools
  - Remote monitoring
- Who watches the watchers?
  - Policy
  - Regulations

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Consider these factors when you create a monitoring policy.

Retention policy for monitoring

The retention policy identifies how long different types of data are maintained:

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A monitoring policy should also specify how long different types of data are retained.

Monitoring your data with Amazon Macie

- When your company grows, it becomes more and more difficult to be sure that your sensitive data is secure.
- Amazon Macie uses machine learning to help ensure that no sensitive data is at risk.

Amazon Macie

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Amazon Macie is a fully managed data security and data privacy service. It uses machine learning and pattern matching to discover and protect your sensitive data in AWS.

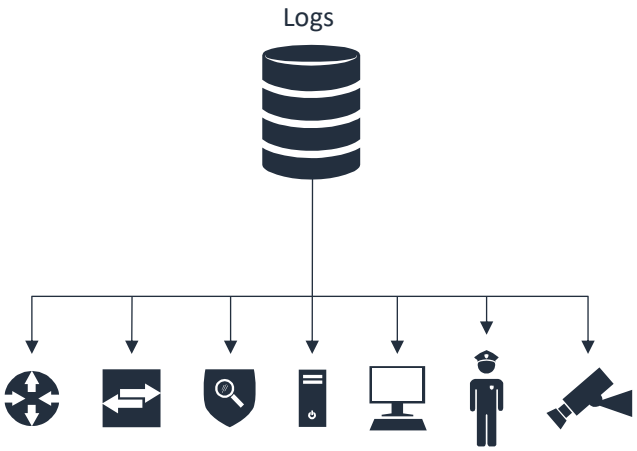
As organizations manage growing volumes of data, identifying and protecting their sensitive data at scale can become increasingly complex, expensive, and time-consuming. Amazon Macie automates the discovery of sensitive data at scale and lowers the cost of protecting your data.

Logging

Next, you'll discuss logging.

Logging policy

- Define a logging policy to identify what will be logged and how logs are managed.
- Ensure that both the *logging policy* and *infrastructure* support a cohesive and integrated enterprise solution.



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Identify which resources and activities in your enterprise must be logged. Capture this information in a logging policy. Also, define how logs are managed.

Protection of log information

- Keep logs on the original device, a log server, or both.
- Control physical and logical access to a log server.
- Log backup and recovery processes.
- Follow a retention policy.
- Check timestamps.

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It is important to protect log information from unauthorized access and to back up logs regularly. To ensure that analysis results are correct, keep the clocks on all log servers accurate and synchronized.

AWS logging services

- AWS CloudTrail tracks user activity and API usage.
- AWS Config records and evaluates configurations of your AWS resources.
- Amazon Virtual Private Cloud (Amazon VPC) Flow Logs capture information about IP traffic.

aws re/start

- AWS CloudTrail monitors and records account activity across your AWS infrastructure, which gives you control over storage, analysis, and remediation actions.
- AWS Config is a service that you can use to assess, audit, and evaluate the configurations of your AWS resources.
- Amazon Virtual Private Cloud (Amazon VPC) Flow Logs is a feature that you can use to capture information about the IP traffic to and from network interfaces in your VPC.

Key takeaways

- The goal of **security analysis** is **to strengthen security controls** to **better protect your network**, **facilities, and organization**.
- **Testing**, **monitoring**, and **logging** are key activities that support security analysis.
- A **monitoring policy** defines all the details of **what**, **who**, **when**, and **how** monitoring is to be performed.
- A **logging policy** identifies **what** should be logged and **how** to manage logs.

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This lesson includes the following key takeaways:

- The goal of security analysis is to strengthen security controls to better protect your network, facilities, and organization.
- Testing, monitoring, and logging are key activities that support security analysis.
- A monitoring policy defines all the details of what, who, when, and how monitoring is to be performed.
- A logging policy identifies what should be logged and how to manage logs.

Thank you

Thank you for completing this module.