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## DevOps Shack

# 100 Real Time DevOps Security Errors, Solutions and Root Cause Analysis

### Trivy Errors

1. **Error:** `FATAL: unable to authenticate to Docker Hub`
  - **Cause:** Docker Hub authentication credentials are not provided or expired.
  - **Solution:** Log in to Docker Hub using `docker login`.
  - **RCA:** Trivy requires Docker Hub authentication for private images.
2. **Error:** `Error: failed to scan image: timeout while fetching layers`
  - **Cause:** Network latency or connectivity issues.
  - **Solution:** Increase the scan timeout using `--timeout` flag.
  - **RCA:** Slow network connections or server-side delays.
3. **Error:** `Failed to scan image: unsupported media type`
  - **Cause:** The image format is not supported by Trivy.
  - **Solution:** Use `docker save` to convert the image into a supported tar format.
  - **RCA:** Trivy works only with specific media types (e.g., Docker layers).
4. **Error:** `Trivy scan results show "UNKNOWN" severity`
  - **Cause:** Missing or outdated vulnerability database.
  - **Solution:** Update the database using `trivy --update`.
  - **RCA:** Trivy relies on an up-to-date database for accurate vulnerability severity classification.



## 5. Error: **Error: insufficient permissions to scan directories**

- **Cause:** Lack of read permissions for files or directories.
- **Solution:** Ensure the user running Trivy has sufficient file permissions.
- **RCA:** Scanning restricted files without proper permissions results in errors.

## OWASP ZAP Errors

### 6. Error: **ZAP unable to start proxy server**

- **Cause:** Port conflict with another service using the same proxy port.
- **Solution:** Change the proxy port in ZAP settings.
- **RCA:** Default port (8080) is often used by other services.

### 7. Error: **ZAP crashes during large-scale scan**

- **Cause:** Insufficient memory allocated to the JVM.
- **Solution:** Increase JVM heap size.
- **RCA:** Large scans consume significant memory.

### 8. Error: **ZapProxy Timeout on Selenium Integration**

- **Cause:** Selenium WebDriver fails to communicate with ZAP proxy.
- **Solution:** Increase the timeout in WebDriver settings.
- **RCA:** Slow network conditions or misconfigured proxy settings disrupt communication.

### 9. Error: **Active scan hangs at 0% progress**

- **Cause:** Server-side protections blocking ZAP's requests.
- **Solution:** Add headers or user-agent strings to mimic legitimate traffic.
- **RCA:** Web servers identify and block ZAP traffic as potentially malicious.

### 10. Error: **ZAP reports incorrect vulnerabilities**

- **Cause:** False positives due to misconfigured contexts or baselines.
- **Solution:** Adjust scan rules and verify results manually.
- **RCA:** Misconfigured baselines may flag benign issues.



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## Prowler Errors

### 11. Error: Access Denied on AWS API calls

- **Cause:** Insufficient IAM permissions.
- **Solution:** Attach the **SecurityAudit** AWS managed policy.
- **RCA:** Prowler needs extensive permissions to perform checks.

### 12. Error: Check skipped: Missing AWS CLI or credentials

- **Cause:** AWS CLI is not installed or credentials are not configured.
- **Solution:** Install AWS CLI and configure credentials using **aws configure**.
- **RCA:** Prowler relies on AWS CLI to interact with AWS services.

### 13. Error: Failed to execute check: invalid region

- **Cause:** AWS region is not valid or not specified.
- **Solution:** Use **--region** to specify a valid region.
- **RCA:** Incorrect region values lead to API errors.

### 14. Error: S3 Bucket encryption check reports incorrect status

- **Cause:** Prowler uses cached data from AWS CLI.
- **Solution:** Clear cache and re-run the check.
- **RCA:** AWS CLI caching can return stale information.

### 15. Error: Prowler scan takes too long

- **Cause:** Large AWS environments with numerous services.
- **Solution:** Use **--check** to limit checks to specific services.
- **RCA:** Checking all resources in large environments is time-consuming.

## HashiCorp Vault Errors

### 16. Error: Error initializing Vault: connection refused

- **Cause:** Vault service is not running or incorrectly configured.



- **Solution:** Start the Vault server and verify the configuration.
- **RCA:** Vault initialization requires a running service.

**17. Error:** `Permission denied for secret access`

- **Cause:** The token does not have appropriate policies attached.
- **Solution:** Update the policy using `vault policy write`.
- **RCA:** Vault enforces strict access controls.

**18. Error:** `Vault unseal operation failed`

- **Cause:** Incorrect unseal keys provided.
- **Solution:** Use valid unseal keys generated during initialization.
- **RCA:** Incorrect keys prevent access to Vault.

**19. Error:** `Unable to renew token: permission denied`

- **Cause:** Token lacks `renew-self` capability.
- **Solution:** Attach a policy with `renew-self` permissions.
- **RCA:** Restricted token capabilities prevent renewal.

**20. Error:** `Audit logs not being generated`

- **Cause:** Audit device not enabled or configured incorrectly.
- **Solution:** Enable audit devices using `vault audit enable`.
- **RCA:** Audit devices must be explicitly enabled in Vault.

## OWASP ZAP Errors

**21. Error:** `API scan fails with "Invalid JSON Response"`

- **Cause:** API endpoints return non-standard responses.
- **Solution:** Validate and format JSON responses before scanning.
- **RCA:** ZAP expects JSON-compliant data for API scans.



## 22. Error: Unable to authenticate via API key

- **Cause:** Incorrect API key provided in ZAP configuration.
- **Solution:** Update the API key in the ZAP settings.
- **RCA:** API access requires matching keys for authentication.

## 23. Error: Passive scan results are incomplete

- **Cause:** ZAP is not properly intercepting traffic.
- **Solution:** Verify proxy settings and ensure traffic passes through ZAP.
- **RCA:** Misconfigured proxies prevent passive scans.

## Trivy Errors

### 24. Error: Error parsing image manifest: unsupported schema version

- **Cause:** Trivy encountered an image manifest with a schema version it does not support.
- **Solution:**
  1. Ensure the Docker image uses a supported schema (e.g., Schema 2).
  2. Rebuild the image using `docker build` and push it again to the registry.
- **RCA:** Trivy requires images to adhere to specific standards, and outdated or incompatible manifests result in parsing errors.

### 25. Error: Cannot scan local files: no vulnerabilities detected, but warnings present

- **Cause:** The directory being scanned lacks sufficient permissions, or critical libraries are missing.
- **Solution:**
  1. Run the scan as a user with read access to all files in the directory.
  2. Ensure that critical files such as `package.json` (for Node.js) or `requirements.txt` (for Python) exist.
- **RCA:** Trivy depends on specific metadata and library files to detect vulnerabilities in local projects. Missing files lead to incomplete scans.

## 26. Error: Error fetching vulnerability database: failed to update database

- **Cause:** Network restrictions or a failure in the Trivy update mechanism.
- **Solution:**
  1. Ensure you have internet access.
  2. Use a proxy by setting the `HTTP_PROXY` or `HTTPS_PROXY` environment variable if behind a firewall.
  3. Manually update the database with `trivy db update`.
- **RCA:** Trivy uses an online database to identify vulnerabilities. Network connectivity issues or proxy misconfigurations block access.

## 27. Error: High CPU usage during Trivy scan

- **Cause:** Trivy processes large Docker images or extensive file directories, consuming significant CPU resources.
- **Solution:**
  1. Limit resource usage with container tools like Docker's `--cpus` or `--memory` flags.
  2. Break down scans into smaller parts or exclude unnecessary directories.
- **RCA:** Trivy scans large files comprehensively, which can overwhelm system resources, especially on underpowered machines.

## 28. Error: Empty results despite confirmed vulnerabilities

- **Cause:** The vulnerability database is outdated or the wrong scan mode is used.
- **Solution:**
  1. Update the database using `trivy --update`.
  2. Use the correct scan mode, such as `trivy fs` for file systems or `trivy image` for Docker images.
- **RCA:** Incorrect configurations or database sync issues lead to incomplete or inaccurate results.



## OWASP ZAP Errors

### 29. Error: Authentication script not working

- **Cause:** Incorrect scripting format or unsupported scripting language used for authentication scripts.
- **Solution:**
  1. Use ZAP's Script Console to debug the authentication script.
  2. Refer to ZAP documentation to use supported languages (e.g., JavaScript or Python).
- **RCA:** ZAP's authentication module depends on properly configured scripts. Errors in syntax or unsupported features cause authentication failures.

### 30. Error: ZAP returns empty scan reports

- **Cause:** Incorrect inclusion/exclusion rules or missing context configuration.
- **Solution:**
  1. Add proper inclusion rules to target the application domain.
  2. Ensure the target application is within ZAP's active scan context.
- **RCA:** ZAP scans only the URLs within its configured context. Misconfigurations lead to empty or incomplete reports.

### 31. Error: ZAP proxy requests blocked by firewall

- **Cause:** The target application or network has firewall rules blocking ZAP's IP or requests.
- **Solution:**
  1. Whitelist ZAP's IP address or configure the firewall to allow its requests.
  2. Use stealth techniques, such as modifying headers or using a different user-agent string.
- **RCA:** Security mechanisms often block automated scanners to prevent penetration testing.

### 32. Error: Persistent XSS checks not detected during scan

- **Cause:** ZAP is not configured to detect persistent vulnerabilities by default.
- **Solution:**
  1. Enable ZAP's advanced passive scan rules.
  2. Use ZAP extensions like "Retest Add-On" to enhance XSS detection.
- **RCA:** Persistent vulnerabilities require deeper inspection and tailored scan rules to detect effectively.

## Prowler Errors

### 33. Error: Multiple failed checks: "KMS keys are not rotated"

- **Cause:** Customer-managed KMS keys have exceeded the recommended rotation period.
- **Solution:**
  1. Manually rotate KMS keys using the AWS Management Console or CLI.
  2. Set automatic rotation policies for future compliance.
- **RCA:** AWS recommends rotating KMS keys every 365 days. Failure to comply leads to non-compliance alerts in tools like Prowler.

### 34. Error: Root user access detected

- **Cause:** Root credentials have been used for AWS actions.
- **Solution:**
  1. Create and use IAM users with specific permissions.
  2. Lock down root user access and enable MFA (Multi-Factor Authentication).
- **RCA:** AWS advises against using the root account for day-to-day operations. Detection tools flag such usage as a security risk.

### 35. Error: IAM policy with "FullAccess" found

- **Cause:** Overly permissive policies attached to users or roles.
- **Solution:**
  1. Review and update the IAM policies to follow the principle of least privilege.



2. Replace **FullAccess** policies with more granular permissions.
- **RCA:** Overly broad permissions increase the attack surface, violating security best practices.

### 36. Error: **S3 bucket publicly accessible**

- **Cause:** Bucket policies or ACLs (Access Control Lists) allow public read/write access.
- **Solution:**
  1. Use the AWS S3 Block Public Access feature to restrict public access.
  2. Review and update bucket policies to ensure access is limited to required entities.
- **RCA:** Misconfigured bucket policies expose sensitive data, a common vulnerability in cloud environments.

### 37. Error: **Prowler reports "Unencrypted EBS volumes"**

- **Cause:** EBS volumes are created without specifying encryption.
- **Solution:**
  1. Enable encryption during volume creation or re-enable encryption for existing volumes.
  2. Use AWS Config rules to enforce encryption by default.
- **RCA:** AWS does not encrypt volumes by default unless explicitly configured, leading to compliance issues.

## HashiCorp Vault Errors

### 38. Error: **Vault login failed: "invalid token"**

- **Cause:** The token used is expired or revoked.
- **Solution:**
  1. Generate a new token using a valid root or admin token.
  2. Configure a longer TTL for tokens that require extended usage.
- **RCA:** Vault tokens are time-sensitive and must be refreshed regularly.



### 39. Error: Vault performance backend unreachable

- **Cause:** The configured backend (e.g., Consul, DynamoDB) is not reachable due to network issues or misconfiguration.
- **Solution:**
  1. Verify the backend service's health and network connectivity.
  2. Update Vault's configuration with the correct backend address.
- **RCA:** Vault relies on external storage backends for persistence. Disruptions in these services affect Vault's performance.

### 40. Error: TLS handshake failed

- **Cause:** SSL/TLS certificates are invalid or misconfigured.
- **Solution:**
  1. Verify and replace expired or incorrect certificates.
  2. Use a valid CA-signed certificate or configure self-signed certificates correctly.
- **RCA:** Secure communication between Vault and clients depends on valid SSL/TLS configurations.

## HashiCorp Vault Errors

### 41. Error: Vault cluster nodes fail to join

- **Cause:** Incorrect cluster configuration or network connectivity issues between nodes.
- **Solution:**
  1. Verify the `api_addr` and `cluster_addr` settings in the Vault configuration file.
  2. Ensure that all nodes can communicate over the specified ports (e.g., 8200 and 8201 by default).
- **RCA:** Vault uses specific addresses and ports for cluster communication. Misconfigurations or blocked ports prevent nodes from joining the cluster.



#### 42. Error: Vault high availability mode not working

- **Cause:** Incorrect backend configuration for HA (e.g., Consul or DynamoDB not properly set up).
- **Solution:**
  1. Confirm that the storage backend supports high availability.
  2. Verify the backend health and network settings.
- **RCA:** HA in Vault depends on the storage backend's ability to manage leader elections and state synchronization.

#### 43. Error: Seal/Unseal keys lost

- **Cause:** The original keys from the initialization process are not securely stored or have been misplaced.
- **Solution:**
  1. Restore the keys from a secure backup, if available.
  2. Reinitialize Vault and restore secrets if the keys cannot be recovered.
- **RCA:** Vault relies on these keys for secure access. Loss of these keys renders the Vault inaccessible.

#### 44. Error: Error: "max\_lease\_ttl exceeded"

- **Cause:** A lease duration exceeds the maximum TTL configured for Vault.
- **Solution:**
  1. Update the `max_lease_ttl` configuration in Vault's settings.
  2. Ensure requested leases comply with the maximum allowed TTL.
- **RCA:** Lease TTL restrictions are set to enforce security policies. Requests exceeding these limits are rejected.

#### 45. Error: Error: "no route to backend"

- **Cause:** The backend storage service is unavailable or unreachable.
- **Solution:**
  1. Restart the backend storage service (e.g., Consul, DynamoDB).
  2. Verify the network settings and DNS resolution for the backend's address.
- **RCA:** Vault depends on the backend storage for persistence. Backend downtime directly affects Vault's availability.



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## OWASP ZAP Errors

### 46. Error: Unable to detect CSRF vulnerabilities

- **Cause:** Anti-CSRF tokens or incorrect scanner configuration.
- **Solution:**
  1. Add the appropriate anti-CSRF token configuration in ZAP.
  2. Use ZAP's Anti-CSRF add-on to improve detection.
- **RCA:** Applications with CSRF protection mechanisms require specific configurations for ZAP to detect vulnerabilities effectively.

### 47. Error: Scan results include duplicate vulnerabilities

- **Cause:** Multiple similar endpoints or payloads return the same vulnerability.
- **Solution:**
  1. Consolidate the results manually or use deduplication scripts.
  2. Limit the scan scope to unique endpoints.
- **RCA:** ZAP scans every endpoint individually, which can result in duplicate findings for similar payloads.

### 48. Error: AJAX Spider fails to discover all endpoints

- **Cause:** Dynamic JavaScript rendering or client-side routing not handled by ZAP.
- **Solution:**
  1. Use ZAP's Headless Browser or Selenium integration for enhanced endpoint discovery.
  2. Enable debugging to identify skipped endpoints.
- **RCA:** AJAX-based applications rely heavily on client-side rendering, requiring advanced tools for full coverage.

### 49. Error: Invalid SSL certificate error during scan

- **Cause:** ZAP's self-signed certificate is not trusted by the browser or application.
- **Solution:**
  1. Import ZAP's certificate into the browser or application.

2. Use `zap.sh` to generate and trust a custom certificate.
- **RCA:** Applications require trusted certificates to accept HTTPS traffic. ZAP's default self-signed certificate is flagged as untrusted.

#### 50. Error: Scan results missing key vulnerabilities

- **Cause:** Incorrect scan rule set or insufficient privileges to access endpoints.
- **Solution:**
  1. Enable all scan rules in the Scan Policy Manager.
  2. Ensure proper authentication is configured to access protected endpoints.
- **RCA:** Restricted endpoints or disabled scan rules can lead to incomplete vulnerability detection.

## Prowler Errors

#### 51. Error: No MFA enabled for IAM users

- **Cause:** IAM users are created without enabling MFA.
- **Solution:**
  1. Enable MFA for all IAM users via the AWS Management Console or CLI.
  2. Use a policy to enforce MFA requirements.
- **RCA:** MFA adds an extra layer of security for IAM users, and lack of it violates AWS best practices.

#### 52. Error: VPC Flow Logs not enabled

- **Cause:** VPC Flow Logs are not configured for monitoring network traffic.
- **Solution:**
  1. Enable Flow Logs for all VPCs using the AWS Management Console or CLI.
  2. Store the logs in an S3 bucket or CloudWatch for analysis.
- **RCA:** VPC Flow Logs provide essential data for network monitoring and troubleshooting. Their absence leads to blind spots in security audits.

### 53. Error: Unrestricted inbound traffic on security groups

- **Cause:** Security groups allow unrestricted inbound traffic on critical ports (e.g., 22, 3389).
- **Solution:**
  1. Restrict inbound traffic to specific IPs or CIDR blocks.
  2. Use AWS Config rules to enforce stricter security group settings.
- **RCA:** Open ports increase the risk of unauthorized access and potential attacks.

### 54. Error: CloudTrail not enabled in all regions

- **Cause:** CloudTrail is not configured for logging activity in specific AWS regions.
- **Solution:**
  1. Enable CloudTrail in all AWS regions.
  2. Configure centralized logging for improved visibility.
- **RCA:** CloudTrail monitors API activity across regions. Disabling it leads to gaps in activity logs.

### 55. Error: AWS Config rules non-compliant

- **Cause:** Misconfigured or missing AWS Config rules for resource compliance.
- **Solution:**
  1. Review and correct non-compliant rules in AWS Config.
  2. Use Prowler's recommendations to implement compliant configurations.
- **RCA:** AWS Config enforces compliance. Misconfigured rules result in failed checks during audits.

## Trivy Errors

### 56. Error: Container image scan fails due to missing manifest.json

- **Cause:** The image does not include a valid `manifest.json` file.
- **Solution:**
  1. Rebuild the Docker image to ensure it includes the manifest.
  2. Use `docker save` to create a tarball that includes all necessary metadata.



- **RCA:** Trivy requires `manifest.json` to understand image layers and dependencies.

#### 57. Error: `Error: scan limit exceeded`

- **Cause:** Trivy exceeds the API rate limit of the Docker registry.
- **Solution:**
  1. Authenticate with Docker Hub using `docker login`.
  2. Increase API limits for enterprise-grade accounts if using a private registry.
- **RCA:** Trivy makes multiple API calls to retrieve image metadata, which can hit rate limits on free-tier accounts.

#### 58. Error: `Outdated CVE information in scan results`

- **Cause:** Trivy's vulnerability database is not updated regularly.
- **Solution:** Run `trivy db update` before each scan to ensure up-to-date CVE data.
- **RCA:** Trivy relies on the latest CVE database to identify vulnerabilities accurately.

## HashiCorp Vault Errors

#### 59. Error: `Vault replication issues in performance standby mode`

- **Cause:** Network latency or misconfigured replication settings between primary and secondary Vault instances.
- **Solution:**
  1. Check the `primary_cluster_addr` and `cluster_addr` settings in the Vault configuration.
  2. Verify network connectivity and ensure required ports (e.g., 8201) are open.
- **RCA:** Replication in Vault requires low latency and properly synchronized configuration. Network interruptions or incorrect settings disrupt data synchronization.



#### 60. Error: Vault transit secret engine encryption failure

- **Cause:** Missing encryption keys or invalid key settings in the transit engine.
- **Solution:**
  1. Ensure encryption keys are created and properly initialized using `vault write transit/keys/<key-name>`.
  2. Verify that the key name matches the one used during encryption operations.
- **RCA:** The transit engine relies on properly initialized keys for encryption/decryption. Missing or misconfigured keys result in failures.

#### 61. Error: Error: "invalid backend configuration"

- **Cause:** Incorrect storage backend settings in the Vault configuration file.
- **Solution:**
  1. Review the backend block in the Vault configuration file.
  2. Correct any typos or missing parameters.
- **RCA:** Vault depends on correctly configured storage backends (e.g., Consul, DynamoDB). Misconfigurations prevent it from operating correctly.

#### 62. Error: Error enabling dynamic secrets: "plugin not found"

- **Cause:** The specified plugin for dynamic secrets is not installed or registered.
- **Solution:**
  1. Verify that the plugin binary exists in the plugin directory.
  2. Register the plugin using `vault write sys/plugins/catalog/....`
- **RCA:** Vault requires plugins to be registered and accessible. Missing or unregistered plugins prevent dynamic secret generation.

#### 63. Error: Vault failed to authenticate with Kubernetes

- **Cause:** Incorrect Kubernetes service account configuration or missing JWT tokens.
- **Solution:**
  1. Verify the service account's role binding and ensure it has the necessary permissions.



2. Check the JWT token used for authentication.
- **RCA:** Vault uses Kubernetes tokens for authentication. Misconfigured service accounts or invalid tokens disrupt this process.

## OWASP ZAP Errors

### 64. Error: Active scan detects fewer vulnerabilities than expected

- **Cause:** Default scan rules do not cover all potential vulnerabilities.
- **Solution:**
  1. Add additional scan rules or use third-party plugins to enhance ZAP's detection capabilities.
  2. Review the Scan Policy Manager to ensure all rules are enabled.
- **RCA:** The default ZAP configuration may not cover specialized or rare vulnerabilities.

### 65. Error: Error while importing HAR file

- **Cause:** HAR file is corrupted or generated in an unsupported format.
- **Solution:**
  1. Regenerate the HAR file using a supported browser or tool.
  2. Verify that the file adheres to the HAR specification.
- **RCA:** ZAP requires HAR files to conform to standards. Corruption or unsupported formats lead to import failures.

### 66. Error: Context import failed: "Invalid configuration"

- **Cause:** The imported context file contains incorrect or outdated settings.
- **Solution:**
  1. Export a fresh context from a working ZAP instance.
  2. Verify and correct any invalid parameters in the configuration file.
- **RCA:** Contexts store scan parameters and settings. Misconfigured contexts disrupt the scanning process.

#### 67. Error: ZAP's Fuzzer fails to test endpoints

- **Cause:** Incorrect fuzz payloads or improperly configured attack settings.
- **Solution:**
  1. Use valid payloads and configure the fuzzer's settings for the target endpoint.
  2. Test with smaller payload sets to identify issues incrementally.
- **RCA:** Fuzzers depend on well-formed payloads to interact with endpoints effectively. Incorrect configurations cause failures.

#### 68. Error: Spidering fails to crawl certain pages

- **Cause:** Pages are dynamically loaded via JavaScript or hidden behind authentication.
- **Solution:**
  1. Use ZAP's AJAX Spider for better coverage of JavaScript-heavy sites.
  2. Authenticate using ZAP's session management features before crawling.
- **RCA:** Traditional crawlers struggle with dynamic content, requiring advanced techniques to discover all pages.

#### 69. Error: Unrestricted outbound traffic detected

- **Cause:** Security groups allow unrestricted outbound traffic.
- **Solution:**
  1. Restrict outbound traffic to specific IPs, CIDR blocks, or ports.
  2. Use AWS Config rules to enforce stricter security group policies.
- **RCA:** Unrestricted outbound traffic can be exploited by malicious actors to exfiltrate data.

#### 70. Error: Unused IAM roles detected

- **Cause:** IAM roles have not been used in over 90 days.
- **Solution:**
  1. Identify unused roles using AWS IAM Access Analyzer.
  2. Delete or deactivate roles that are no longer needed.
- **RCA:** Unused IAM roles increase the attack surface and violate AWS best practices.

#### 71. Error: ECS task definition not encrypted

- **Cause:** The ECS task definition does not specify encryption for sensitive environment variables.
- **Solution:**
  1. Use AWS KMS to encrypt sensitive variables in the task definition.
  2. Update the task definition and redeploy affected services.
- **RCA:** Unencrypted environment variables expose sensitive data to potential leaks.

#### 72. Error: RDS instance not using multi-AZ deployment

- **Cause:** RDS instance is deployed in a single availability zone.
- **Solution:**
  1. Enable multi-AZ deployment for all critical databases.
  2. Configure backups and replication for high availability.
- **RCA:** Multi-AZ deployments ensure availability during outages. Single-zone setups are less resilient.

#### 73. Error: AWS Lambda function without logging enabled

- **Cause:** The function does not have logging enabled via CloudWatch.
- **Solution:**
  1. Enable logging in the Lambda function's configuration.
  2. Use AWS Config to ensure all Lambda functions are compliant.
- **RCA:** Logging is critical for monitoring and debugging. Missing logs hinder operational visibility.

#### 74. Error: Scan excludes certain vulnerabilities

- **Cause:** Default scanning policies exclude low-severity vulnerabilities.
- **Solution:**
  1. Use `--severity` to include low, medium, and high vulnerabilities in scans.
  2. Update the Trivy configuration file to include all severities.
- **RCA:** Default settings often exclude low-priority vulnerabilities to reduce noise.

#### 75. Error: **Filesystem scan fails due to symbolic links**

- **Cause:** Trivy cannot resolve broken or recursive symbolic links.
- **Solution:**
  1. Identify and fix broken symbolic links in the scanned directory.
  2. Use the `--skip-dirs` option to exclude problematic directories.
- **RCA:** Symbolic link resolution is critical for file scans. Broken links disrupt the process.

#### 76. Error: **Vault HTTP status 500: Internal Server Error**

- **Cause:** Misconfigured backend storage or server-side issue.
- **Solution:**
  1. Check Vault server logs for detailed error messages.
  2. Verify the backend storage configuration (e.g., Consul, DynamoDB) and its availability.
  3. Restart the Vault server after resolving backend issues.
- **RCA:** Vault depends on a stable backend storage system. Server-side issues like misconfiguration or storage unavailability cause internal errors.

#### 77. Error: **Vault does not respond after leader election**

- **Cause:** The leader node is unable to communicate with standby nodes due to network issues or incorrect cluster settings.
- **Solution:**
  1. Check and correct `cluster_addr` and `api_addr` configurations.
  2. Ensure firewall rules allow cluster communication on required ports (8200 and 8201 by default).
- **RCA:** Leader election requires seamless communication among cluster nodes. Network disruptions or misconfigurations lead to failure.

#### 78. Error: **Dynamic secrets are not rotated automatically**

- **Cause:** Rotation policies for dynamic secrets are not configured.
- **Solution:**
  1. Set up a lease with the desired TTL and auto-renewal for dynamic secrets.



2. Use `vault renew` for manual renewal if needed.

- **RCA:** Vault does not rotate secrets automatically unless explicitly configured. Dynamic secrets must adhere to lease policies.

#### 79. Error: Access denied to AWS secrets in Vault

- **Cause:** IAM role or user does not have sufficient permissions in AWS.
- **Solution:**
  1. Update the IAM policy to include necessary permissions (e.g., `secretsmanager:GetSecretValue`).
  2. Reauthenticate Vault with AWS using a role with the correct permissions.
- **RCA:** Vault integrates with AWS using IAM roles. Incorrect permissions prevent access to secrets.

#### 80. Error: Vault policies not enforced

- **Cause:** Incorrectly defined or applied policies in the Vault configuration.
- **Solution:**
  1. Verify and correct policy definitions using `vault policy read <policy_name>`.
  2. Reattach policies to tokens or roles that require them.
- **RCA:** Vault policies enforce access control. Misconfigured or missing policies result in unexpected behavior.

#### 81. Error: ZAP does not detect SQL Injection vulnerabilities

- **Cause:** The application uses non-standard SQL queries or parameterized queries that bypass traditional detection methods.
- **Solution:**
  1. Enable advanced SQL Injection rules in the Scan Policy Manager.
  2. Use manual testing with crafted payloads for complex scenarios.
- **RCA:** ZAP relies on generic SQL payloads for detection. Advanced techniques or parameterized queries require custom testing.

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## 82. Error: ZAP AJAX Spider does not load all JavaScript resources

- **Cause:** The target website blocks requests from untrusted user agents or scripts are dynamically loaded after specific user actions.
- **Solution:**
  1. Change the user-agent string in ZAP to mimic a real browser.
  2. Use ZAP's browser-based crawler for better coverage.
- **RCA:** AJAX Spider relies on fetching JavaScript resources. Security mechanisms like bot detection prevent this.

## 83. Error: High false positive rate in ZAP scan results

- **Cause:** Overly aggressive scan rules or lack of application context.
- **Solution:**
  1. Review and refine the scan rules to reduce noise.
  2. Configure proper contexts and exclusions for the target application.
- **RCA:** Default scan configurations may flag benign issues as vulnerabilities without proper context.

## 84. Error: Unable to intercept HTTPS traffic

- **Cause:** ZAP's SSL/TLS certificate is not trusted by the browser or application.
- **Solution:**
  1. Import ZAP's root certificate into the browser or application.
  2. Verify that ZAP is listening on the correct proxy port.
- **RCA:** HTTPS interception requires trusted certificates. Untrusted certificates are rejected by secure applications.

## 85. Error: Scan stops unexpectedly

- **Cause:** Resource exhaustion (e.g., memory or disk space) on the system running ZAP.
- **Solution:**
  1. Increase the system's available memory or disk space.
  2. Limit the scan scope to smaller target areas or use pagination.

- **RCA:** Large-scale scans can overwhelm system resources, leading to abrupt terminations.

#### 86. Error: AWS account missing root account MFA

- **Cause:** MFA is not enabled for the AWS root account.
- **Solution:**
  1. Enable MFA for the root account in the AWS Management Console.
  2. Use a hardware or virtual MFA device to enhance security.
- **RCA:** AWS strongly recommends MFA for the root account. Lack of MFA increases the risk of unauthorized access.

#### 87. Error: IAM access keys are active for over 90 days

- **Cause:** Access keys have not been rotated or disabled after the recommended period.
- **Solution:**
  1. Rotate the access keys regularly and update applications using them.
  2. Use IAM Access Analyzer to monitor and enforce key rotation.
- **RCA:** Stale access keys are a security risk and often flagged during compliance checks.

#### 88. Error: Default VPC is not deleted

- **Cause:** The default VPC still exists and is unused.
- **Solution:**
  1. Delete the default VPC if not in use.
  2. Use custom VPCs with stricter security configurations for workloads.
- **RCA:** Default VPCs often have broad permissions and lack custom security configurations, making them less secure.

#### 89. Error: Elastic IPs found unattached

- **Cause:** Elastic IPs are allocated but not associated with any instance.



- **Solution:**
  1. Release unused Elastic IPs to avoid unnecessary charges.
  2. Regularly audit the account for unattached resources.
- **RCA:** Unused Elastic IPs incur costs and are often overlooked in resource management.

#### 90. **Error:** Unencrypted AMIs detected

- **Cause:** AMIs are not encrypted during creation.
- **Solution:**
  1. Enable encryption for all AMIs using KMS keys.
  2. Enforce encryption policies via AWS Config rules.
- **RCA:** Unencrypted AMIs expose sensitive data, violating AWS security best practices.

#### 91. **Error:** Image scan shows missing OS packages

- **Cause:** The image uses a base layer not supported by Trivy's database.
- **Solution:**
  1. Rebuild the image with a supported base layer.
  2. Ensure that Trivy's vulnerability database is up-to-date.
- **RCA:** Trivy relies on known vulnerabilities for specific OS packages. Unsupported layers lead to incomplete scans.

#### 92. **Error:** Error analyzing Dockerfile: syntax error detected

- **Cause:** The Dockerfile contains invalid syntax or unsupported commands.
- **Solution:**
  1. Validate the Dockerfile using `docker build` or linters.
  2. Correct any syntax errors or deprecated commands.
- **RCA:** Trivy's Dockerfile analysis expects proper syntax. Invalid files cannot be processed.

#### 93. **Error:** No vulnerabilities detected, but outdated dependencies present



- **Cause:** Trivy does not flag outdated dependencies as vulnerabilities.
- **Solution:**
  1. Use dependency management tools to update to the latest versions.
  2. Combine Trivy with tools like `npm audit` or `pip-audit` for dependency checks.
- **RCA:** Outdated dependencies may not have CVEs but pose a security risk nonetheless.

#### 94. Error: Trivy scan fails for multi-stage builds

- **Cause:** Trivy scans only the final stage of multi-stage builds by default.
- **Solution:**
  1. Use `docker save` to extract all stages and scan each stage individually.
  2. Build a comprehensive image that includes intermediate layers if necessary.
- **RCA:** Trivy focuses on the final image, potentially missing vulnerabilities in intermediate stages.

#### 95. Error: Trivy reports vulnerabilities for patched CVEs

- **Cause:** Trivy's database is outdated, or the scanned software uses backported patches that do not update the reported version.
- **Solution:**
  1. Update Trivy's database using `trivy db update`.
  2. Verify manually if the CVE is fixed through backported patches in the software.
  3. Exclude the specific CVE from the scan results using the `--ignore-unfixed` flag.
- **RCA:** Backported fixes can cause false positives, as the patched version does not always increment its release number.

#### 96. Error: Trivy fails to scan filesystems with special characters

- **Cause:** Special characters or non-standard filenames in the target directory cause parsing errors.
- **Solution:**
  1. Rename files to standard ASCII characters.
  2. Use `--skip-dirs` or `--skip-files` options to exclude problematic files.
- **RCA:** File parsing issues occur due to non-standard naming conventions or unsupported encoding.

#### 97. Error: Scan of large images crashes with "out of memory"

- **Cause:** Trivy requires more memory than available on the host system.
- **Solution:**
  1. Increase available memory for the Trivy process by closing unnecessary applications or running it on a system with higher RAM.
  2. Use the `--cache-dir` option to store intermediate scan data on disk instead of memory.
- **RCA:** Trivy's analysis of large images involves loading all image layers into memory, which overwhelms systems with limited resources.

#### 98. Error: Trivy Docker image scan fails: "Cannot connect to Docker daemon"

- **Cause:** Docker is not running or the user does not have permission to access the Docker socket.
- **Solution:**
  1. Start the Docker daemon using `sudo systemctl start docker`.
  2. Add the current user to the Docker group using `sudo usermod -aG docker $USER`.
  3. Use `sudo` for commands if permissions are not configured.
- **RCA:** Trivy interacts directly with the Docker daemon, requiring it to be running and accessible.

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#### 99. **Error:** Trivy cannot parse SPDX license data

- **Cause:** The scanned image or project includes malformed SPDX license information.
- **Solution:**
  1. Correct the SPDX license format in the project metadata (e.g., `package.json` or `requirements.txt`).
  2. Rebuild the image or regenerate the metadata.
- **RCA:** SPDX license data needs to adhere to specific formatting standards. Any deviation results in parsing errors.

#### 100. **Error:** Trivy fails to scan OCI-compliant images

- **Cause:** The image uses a newer OCI format not fully supported by Trivy.
- **Solution:**
  1. Convert the image to a Docker-compatible format using tools like `docker save`.
  2. Ensure Trivy is updated to the latest version with OCI format support.
- **RCA:** OCI-compliant images introduce features that may not be fully integrated into Trivy's scanning mechanisms.

