dstny Engage

DEMO#3

Security : Mariam Osama

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SPRINT 2

Recap

Scanning Tool

Where are we so far:

The Kubernetes Cluster Scanner Tool is a utility designed to perform security scans on Kubernetes deployments using various security tools. This tool automates the scanning process across different namespaces, identifying vulnerabilities and security risks in your Kubernetes environment.

```bash
#!/bin/sh

# Function to print a message with timestamp
print_with_timestamp() {
    echo "$(date -u +"%Y-%m-%dT%H:%M:%SZ") $1"
}

# Install kubectl if not present
if ! command -v kubectl &> /dev/null; then
    print_with_timestamp "kubectl not found, installing..."
    wget -O /usr/local/bin/kubectl https://storage.googleapis.com/kubernetes-release/release/v1.22.2/bin/linux/amd64/kubectl
    chmod +x /usr/local/bin/kubectl
fi

print_with_timestamp "Cluster scan started."

# Iterate through all namespaces
for ns in $(kubectl get namespaces -o=jsonpath='{.items[*].metadata.name}'); do
    print_with_timestamp "Scanning namespace: $ns"

    # Iterate through deployments in the namespace
    for deployment in $(kubectl get deployments -n $ns -o=jsonpath='{.items[*].metadata.name}'); do
        print_with_timestamp "Scanning deployment: $deployment"

        # Run vulnerability scan using Trivy
        trivy_image=$(kubectl get deployment $deployment -n $ns -o=jsonpath='{.spec.template.spec.containers[0].image}')
        trivy_results="/app/scan-results/${ns}_${deployment}_$(date -u +"%Y%m%d%H%M%S")_trivy-results.json"
        trivy image --cache-dir /tmp/trivy --format json -o $trivy_results $trivy_image

        # Run kube-bench
        kube_bench_results="/app/scan-results/${ns}_${deployment}_$(date -u +"%Y%m%d%H%M%S")_kube-bench-results.json"
        ./kube-bench > $kube_bench_results

        # Run kube-hunter
        kube_hunter_results="/app/scan-results/${ns}_${deployment}_$(date -u +"%Y%m%d%H%M%S")_kube-hunter-results.json"
        ./kube-hunter --remote > $kube_hunter_results

        # Run kubescape
        kubescape_results="/app/scan-results/${ns}_${deployment}_$(date -u +"%Y%m%d%H%M%S")_kubescape-results.json"
        ./kubescape scan framework nsa -o $kubescape_results

        print_with_timestamp "Scanning completed for deployment: $deployment"
    done
done

print_with_timestamp "Cluster scan completed."
```

```
/app/scan-results # ls
default_cluster-scanner_20230824160124_trivy-results.json
default_cluster-scanner_20230824160418_kube-bench-results.json
default_cluster-scanner_20230824160418_kube-hunter-results.json
default_python-deployment_20230824160418_trivy-results.json
default_python-deployment_20230824160749_kube-bench-results.json
default_python-deployment_20230824160749_kube-hunter-results.json
hello_hello-world-deployment_20230824160750_trivy-results.json
hello_hello-world-deployment_20230824160846_kube-bench-results.json
hello_hello-world-deployment_20230824160846_kube-hunter-results.json
kube-system_coredns_20230824160846_trivy-results.json
kube-system_coredns_20230824160916_kube-bench-results.json
kube-system_coredns_20230824160916_kube-hunter-results.json
kubernetes-dashboard_dashboard-metrics-scraper_20230824160916_trivy-results.json
kubernetes-dashboard_dashboard-metrics-scraper_20230824161020_kube-bench-results.json
kubernetes-dashboard_dashboard-metrics-scraper_20230824161020_kube-hunter-results.json
```


```
        {
          "VulnerabilityID": "CVE-2022-40897",
          "PkgName": "setuptools",
          "PkgPath": "usr/local/lib/python3.9/site-packages/setuptools-58.1.0.dist-info/METADATA",
          "InstalledVersion": "58.1.0",
          "FixedVersion": "65.5.1",
          "Status": "fixed",
          "Layer": {
            "Digest": "sha256:d271c014c3a0adbd37dae2ce6245711e2876ace65aa5c9b7859a6c515063c45f",
            "DiffID": "sha256:ddab61a14989358634f27d99fed2910a51c05aba9f83ec630386edcf80c8bb53"
          },
          "SeveritySource": "nvd",
          "PrimaryURL": "https://avd.aquasec.com/nvd/cve-2022-40897",
          "DataSource": {
            "ID": "osv",
            "Name": "Python Packaging Advisory Database",
            "URL": "https://github.com/pypa/advisory-db"
          },
          "Title": "Regular Expression Denial of Service (ReDoS) in package_index.py",
          "Description": "Python Packaging Authority (PyPA) setuptools before 65.5.1 allows remote attackers to cause a denial of service via HTML in a crafted package
or custom PackageIndex page. There is a Regular Expression Denial of Service (ReDoS) in package_index.py.",
          "Severity": "MEDIUM",
          "CweIDs": [
            "CWE-1333"
          ],
          "CVSS": {
            "ghsa": {
              "V3Vector": "CVSS:3.1/AV:N/AC:L/PR:N/UI:N/S:U/C:N/I:N/A:H",
              "V3Score": 7.5
            },
            "nvd": {
```

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SPRINT 3

What is done

1.Presitent Volume

Initially

I used static provisioning

Open

pv.yaml
~/Desktop/cluster-scanner

```yaml
apiVersion: v1
kind: PersistentVolume
metadata:
  name: scan-results-pv
spec:
  capacity:
    storage: 5Gi
  accessModes:
    - ReadWriteOnce
  persistentVolumeReclaimPolicy: Retain
  hostPath:
    path: /app/scan-results
```

Open

pvc.yaml
~/Desktop/cluster-scanner

```yaml
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: scan-results-pvc
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 5Gi
```

Currently

Using dynamic provisioning

```yaml
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: scan-results-pvc
spec:
  accessModes:
    - ReadWriteMany
  storageClassName: longhorn
  resources:
    requests:
      storage: 1Gi
```

2.Deploying In Cluster

```
satrtingg
Scanning namespace: cattle-fleet-clusters-system
Scanning namespace: cattle-fleet-system
Scanning deployment: fleet-controller
2023-09-08T16:21:58.506Z        INFO    Vulnerability scanning is enabled
2023-09-08T16:21:58.506Z        INFO    Secret scanning is enabled
2023-09-08T16:21:58.506Z        INFO    If your scanning is slow, please try '--scanners vuln' to disable secret scanning
2023-09-08T16:21:58.506Z        INFO    Please see also https://aquasecurity.github.io/trivy/v0.44/docs/scanner/secret/#recommendation for faster secret detection
2023-09-08T16:21:58.730Z        INFO    Detected OS: suse linux enterprise server
2023-09-08T16:21:58.732Z        INFO    Detecting SUSE vulnerabilities...
2023-09-08T16:21:58.737Z        INFO    Number of language-specific files: 1
2023-09-08T16:21:58.738Z        INFO    Detecting gobinary vulnerabilities...
Scanning completed for deployment: fleet-controller
Scanning deployment: gitjob
2023-09-08T16:22:00.942Z        INFO    Vulnerability scanning is enabled
2023-09-08T16:22:00.943Z        INFO    Secret scanning is enabled
2023-09-08T16:22:00.943Z        INFO    If your scanning is slow, please try '--scanners vuln' to disable secret scanning
2023-09-08T16:22:00.943Z        INFO    Please see also https://aquasecurity.github.io/trivy/v0.44/docs/scanner/secret/#recommendation for faster secret detection
2023-09-08T16:22:01.205Z        INFO    Detected OS: suse linux enterprise server
2023-09-08T16:22:01.206Z        INFO    Detecting SUSE vulnerabilities...
2023-09-08T16:22:01.210Z        INFO    Number of language-specific files: 1
2023-09-08T16:22:01.210Z        INFO    Detecting gobinary vulnerabilities...
Scanning completed for deployment: gitjob
Scanning namespace: cattle-global-data
Scanning namespace: cattle-global-nt
Scanning namespace: cattle-impersonation-system
Scanning namespace: cattle-system
Scanning deployment: rancher
2023-09-08T16:22:04.006Z        INFO    Vulnerability scanning is enabled
2023-09-08T16:22:04.006Z        INFO    Secret scanning is enabled
2023-09-08T16:22:04.006Z        INFO    If your scanning is slow, please try '--scanners vuln' to disable secret scanning
2023-09-08T16:22:04.006Z        INFO    Please see also https://aquasecurity.github.io/trivy/v0.44/docs/scanner/secret/#recommendation for faster secret detection
2023-09-08T16:22:04.376Z        INFO    Detected OS: suse linux enterprise server
2023-09-08T16:22:04.378Z        INFO    Detecting SUSE vulnerabilities...
2023-09-08T16:22:04.383Z        INFO    Number of language-specific files: 16
2023-09-08T16:22:04.383Z        INFO    Detecting gomod vulnerabilities...
```

Tool running inside the cluster

```
/app/scan-results # ls
cattle-fleet-system_fleet-controller_20230908162101_trivy-results.json
cattle-fleet-system_fleet-controller_20230908162158_kube-bench-results.json
cattle-fleet-system_fleet-controller_20230908162158_kube-hunter-results.json
cattle-fleet-system_gitjob_20230908162158_trivy-results.json
cattle-fleet-system_gitjob_20230908162201_kube-bench-results.json
cattle-fleet-system_gitjob_20230908162201_kube-hunter-results.json
cattle-system_rancher-webhook_20230908162204_trivy-results.json
cattle-system_rancher-webhook_20230908162206_kube-bench-results.json
cattle-system_rancher-webhook_20230908162206_kube-hunter-results.json
cattle-system_rancher_20230908162201_trivy-results.json
cattle-system_rancher_20230908162204_kube-bench-results.json
cattle-system_rancher_20230908162204_kube-hunter-results.json
cert-manager_cert-manager-cainjector_20230908162209_trivy-results.json
cert-manager_cert-manager-cainjector_20230908162210_kube-bench-results.json
cert-manager_cert-manager-cainjector_20230908162210_kube-hunter-results.json
cert-manager_cert-manager-webhook_20230908162210_trivy-results.json
cert-manager_cert-manager-webhook_20230908162212_kube-bench-results.json
cert-manager_cert-manager-webhook_20230908162212_kube-hunter-results.json
cert-manager_cert-manager_20230908162206_trivy-results.json
cert-manager_cert-manager_20230908162209_kube-bench-results.json
cert-manager_cert-manager_20230908162209_kube-hunter-results.json
kube-system_calico-kube-controllers_20230908162213_trivy-results.json
kube-system_calico-kube-controllers_20230908162215_kube-bench-results.json
kube-system_calico-kube-controllers_20230908162215_kube-hunter-results.json
kube-system_coredns-autoscaler_20230908162218_trivy-results.json
kube-system_coredns-autoscaler_20230908162220_kube-bench-results.json
kube-system_coredns-autoscaler_20230908162220_kube-hunter-results.json
kube-system_coredns_20230908162215_trivy-results.json
kube-system_coredns_20230908162218_kube-bench-results.json
kube-system_coredns_20230908162218_kube-hunter-results.json
kube-system_metrics-server_20230908162221_trivy-results.json
kube-system_metrics-server_20230908162223_kube-bench-results.json
kube-system_metrics-server_20230908162223_kube-hunter-results.json
longhorn-system_csi-attacher_20230908162224_trivy-results.json
longhorn-system_csi-attacher_20230908162226_kube-bench-results.json
longhorn-system_csi-attacher_20230908162226_kube-hunter-results.json
longhorn-system_csi-provisioner_20230908162226_trivy-results.json
longhorn-system_csi-provisioner_20230908162229_kube-bench-results.json
longhorn-system_csi-provisioner_20230908162229_kube-hunter-results.json
longhorn-system_csi-resizer_20230908162229_trivy-results.json
longhorn-system_csi-resizer_20230908162232_kube-bench-results.json
longhorn-system_csi-resizer_20230908162232_kube-hunter-results.json
longhorn-system_csi-snapshotter_20230908162232_trivy-results.json
longhorn-system_csi-snapshotter_20230908162242_kube-bench-results.json
longhorn-system_csi-snapshotter_20230908162242_kube-hunter-results.json
longhorn-system_longhorn-driver-deployer_20230908162243_trivy-results.json
longhorn-system_longhorn-driver-deployer_20230908162308_kube-bench-results.json
longhorn-system_longhorn-driver-deployer_20230908162308_kube-hunter-results.json
longhorn-system_longhorn-ui_20230908162309_trivy-results.json
longhorn-system_longhorn-ui_20230908162311_kube-bench-results.json
longhorn-system_longhorn-ui_20230908162311_kube-hunter-results.json
lost+found
metallb-system_metallb-controller_20230908162311_trivy-results.json
metallb-system_metallb-controller_20230908162323_kube-bench-results.json
metallb-system_metallb-controller_20230908162323_kube-hunter-results.json
monitoring_monitoring-grafana_20230908162324_trivy-results.json
monitoring_monitoring-grafana_20230908162326_kube-bench-results.json
monitoring_monitoring-grafana_20230908162326_kube-hunter-results.json
monitoring_monitoring-kube-prometheus-operator_20230908162326_trivy-results.json
monitoring_monitoring-kube-prometheus-operator_20230908162328_kube-bench-results.json
monitoring_monitoring-kube-prometheus-operator_20230908162328_kube-hunter-results.json
monitoring_monitoring-kube-state-metrics_20230908162329_trivy-results.json
monitoring_monitoring-kube-state-metrics_20230908162330_kube-bench-results.json
monitoring_monitoring-kube-state-metrics_20230908162330_kube-hunter-results.json
/app/scan-results #
```

Files saved in persistent volume

```
        {
          "VulnerabilityID": "SUSE-SU-2023:2224-1",
          "PkgID": "libcurl4@7.79.1-150400.5.18.1.x86_64",
          "PkgName": "libcurl4",
          "InstalledVersion": "7.79.1-150400.5.18.1",
          "FixedVersion": "8.0.1-150400.5.23.1",
          "Status": "fixed",
          "Layer": {
            "Digest": "sha256:a044828fb7b83c49cc759dbfac3542c94fc2c2a65ca8b222bb8d0bb8a9f2ce63",
            "DiffID": "sha256:52d58f02f883a2c3687215b71f7679b48d75f52564c248ade22d8ebfc0514b91"
          },
          "SeveritySource": "suse-cvrf",
          "DataSource": {
            "ID": "suse-cvrf",
            "Name": "SUSE CVRF",
            "URL": "https://ftp.suse.com/pub/projects/security/cvrf/"
          },
          "Title": "Security update for curl",
          "Description": "This update for curl adds the following feature:\n\nUpdate to version 8.0.1 (jsc#PED-2580)\n\n- CVE-2023-28319: use-after-free in SSH sha256 fingerprint check (bsc#1
23-28320: siglongjmp race condition (bsc#1211231).\n- CVE-2023-28321: IDN wildcard matching (bsc#1211232).\n- CVE-2023-28322: POST-after-PUT confusion (bsc#1211233).\n",
          "Severity": "HIGH",
          "References": [
            "https://bugzilla.suse.com/1211230",
            "https://bugzilla.suse.com/1211231",
            "https://bugzilla.suse.com/1211232",
            "https://bugzilla.suse.com/1211233",
            "https://lists.suse.com/pipermail/sle-security-updates/2023-May/014913.html",
            "https://www.suse.com/security/cve/CVE-2023-28319/",
            "https://www.suse.com/security/cve/CVE-2023-28320/",
            "https://www.suse.com/security/cve/CVE-2023-28321/",
            "https://www.suse.com/security/cve/CVE-2023-28322/",
            "https://www.suse.com/support/security/rating/",
            "https://www.suse.com/support/update/announcement/2023/suse-su-20232224-1/"
          ]
        },
        {
          "VulnerabilityID": "SUSE-SU-2023:2891-1",
          "PkgID": "libcurl4@7.79.1-150400.5.18.1.x86_64",
          "PkgName": "libcurl4",
          "InstalledVersion": "7.79.1-150400.5.18.1",
          "FixedVersion": "8.0.1-150400.5.26.1",
          "Status": "fixed",
          "Layer": {
            "Digest": "sha256:a044828fb7b83c49cc759dbfac3542c94fc2c2a65ca8b222bb8d0bb8a9f2ce63",
            "DiffID": "sha256:52d58f02f883a2c3687215b71f7679b48d75f52564c248ade22d8ebfc0514b91"
          },
          "SeveritySource": "suse-cvrf",
          "DataSource": {
            "ID": "suse-cvrf",
            "Name": "SUSE CVRF",
            "URL": "https://ftp.suse.com/pub/projects/security/cvrf/"
          },
          "Title": "Security update for curl",
```

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SPRINT 4

In the progress

1.Analyzing and Patching

Analyze the results from the scanning tool filtering and prioritizing the vulnerabilities to be patched then recommending the patch management.

```python

import json

# Load Trivy results from JSON file
with open('default_cluster-scanner_20230905175015_trivy-results.json', 'r') as f:
    trivy_data = json.load(f)

# Extract vulnerabilities
vulnerabilities = trivy_data.get("Results", [])

# Filter high-severity vulnerabilities
high_severity_vulnerabilities = []

for result in vulnerabilities:
    if "Vulnerabilities" in result:
        for vulnerability in result["Vulnerabilities"]:
            if vulnerability.get("Severity") == "HIGH":
                high_severity_vulnerabilities.append(vulnerability)

# Print the number of high severity vulnerabilities
print(f"Total High Severity Vulnerabilities: {len(high_severity_vulnerabilities)}")

# Print details of high severity vulnerabilities
for idx, vulnerability in enumerate(high_severity_vulnerabilities, start=1):
    print(f"\nHigh Severity Vulnerability {idx}:")
    print(f"Vulnerability ID: {vulnerability.get('VulnerabilityID')}")
    print(f"Package Name: {vulnerability.get('PkgName')}")
    print(f"Installed Version: {vulnerability.get('InstalledVersion')}")
    print(f"Fixed Version: {vulnerability.get('FixedVersion')}")
    print(f"Description: {vulnerability.get('Description')}")
    print(f"CVSS Score: {vulnerability['CVSS']['bitnami']['V3Score']}")
    print(f"More Info: {vulnerability.get('PrimaryURL')}\n")

```

Making a script that will automate this process

2.ZAP OWASP

Studying the tool to test API's
Currently training on dvwa and other sample vulnerable web applications.

THANK YOU

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