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Democratizing Cloud Security
Our Journey To Secure The Public Cloud

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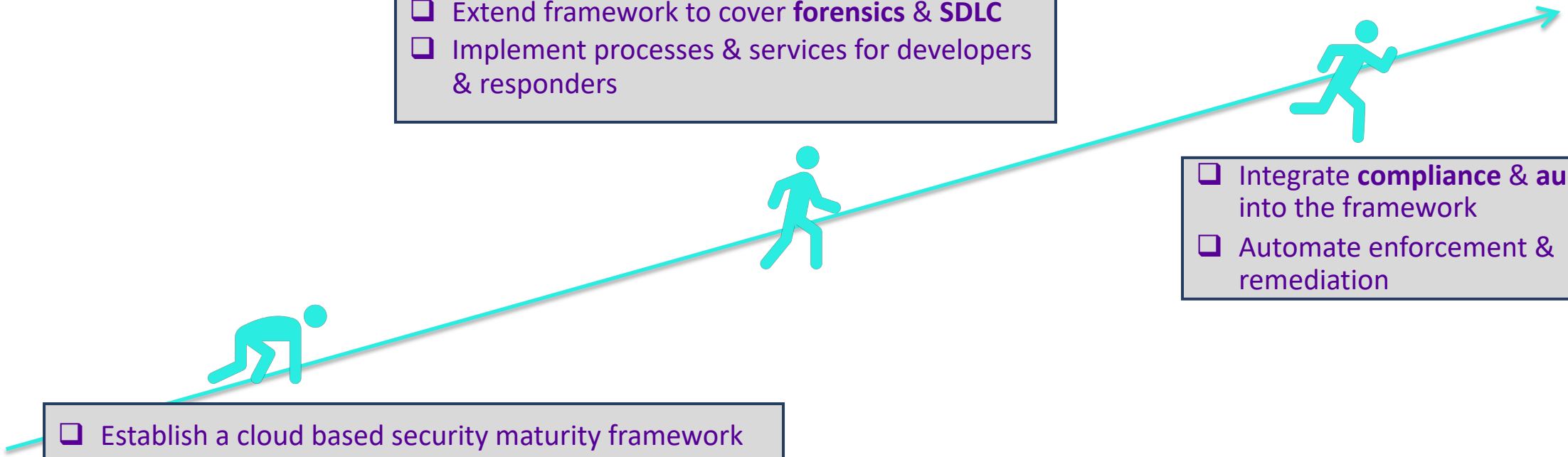
Why The Need To Democratize Security?

Centralized, Process Driven	Decentralized, agile adhocracy
On Premise – Private, limited resources, defined vectors	Public Cloud – Unlimited resources, unrestricted vectors
Strict separation of duties	DevOps wear many hats
Centralized SOC –Policies evolved on private data centers	

Journey To Secure The Public Cloud Environment



- ❑ Establish a cloud based security maturity framework
- ❑ Identify security controls for **environment**
- ❑ Implement processes & services for operators

- ❑ Extend framework to cover **forensics** & **SDLC**
- ❑ Implement processes & services for developers & responders

- ❑ Integrate **compliance** & **audits** into the framework
- ❑ Automate enforcement & remediation

Security Maturity Framework

Established a working group of security practitioners from all BU's

- Identified **ownership** at all levels
- Built consensus
- Identified account onboarding process
- Identified time lines for compliance

Defined security maturity polices

- **Observable, actionable** & **enforceable** polices only
- Started with baseline CIS AWS recommendations
- Extended to identify insecure resources
- Enhanced to cover internal polices, SDLC, forensics & compliance

Enforced compliance

- Established an exception process
- Created detailed reports on non compliance
- Automated enforcement
- **Created services to help operators, developers & responders in implementing security policies**

Security Maturity Policies

Cloud Environment

- Optimize IAM users & policies
- All audit logs centralized
- Restrict public access to resources
- Encrypt all storage resources
- Define a mandatory tagging policy
- Facilitate Incident responders (reactive)

SDLC

- Golden Image - scans in build cycle
- TVM- Response to new CVE's
- Threat Modeling of all services
- Secret & credentials management
- Pen testing, game days, bug bounties
- Auditable processes

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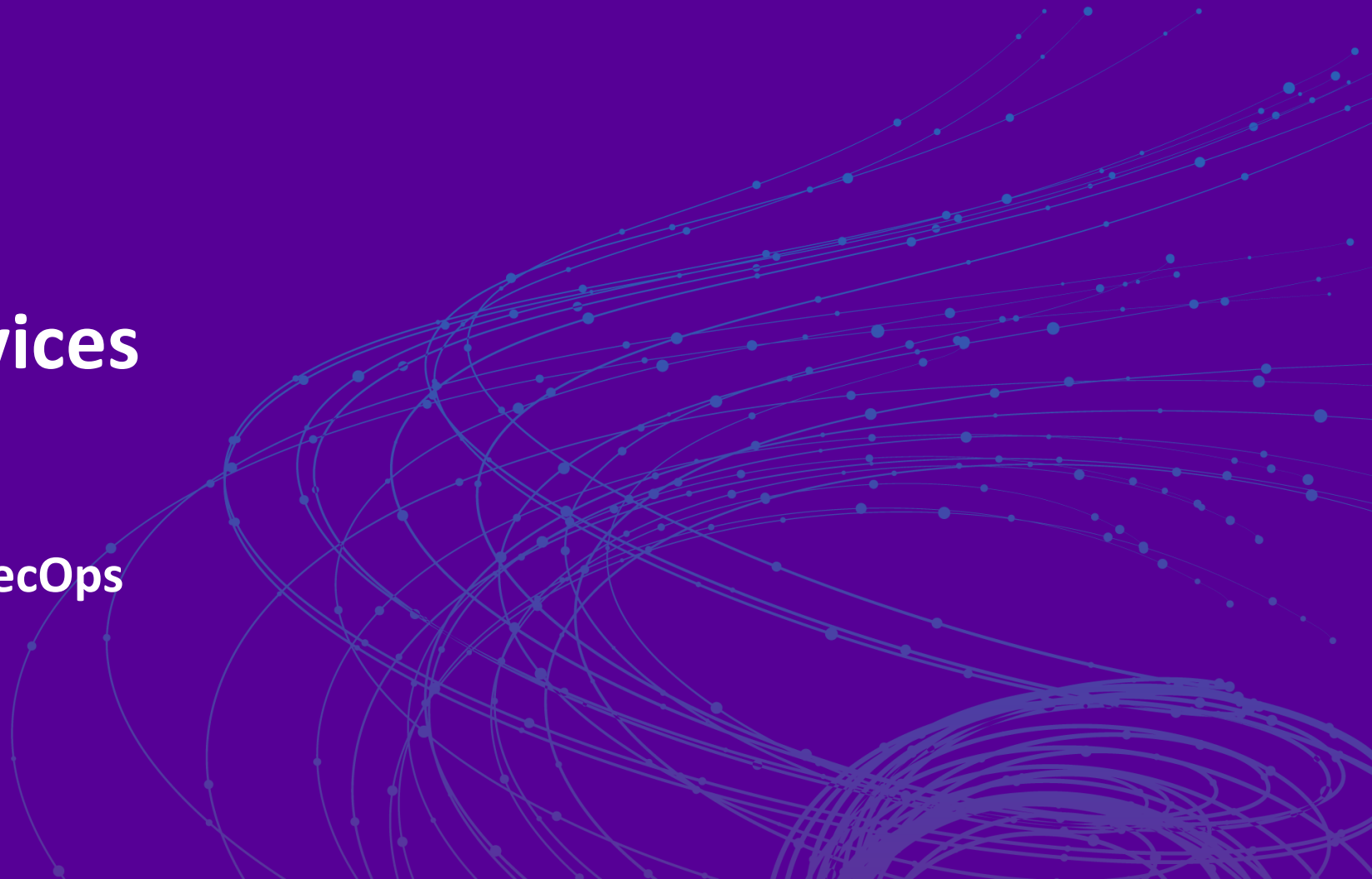
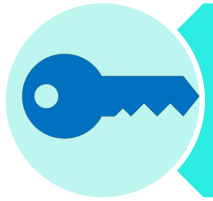
Security Services

Put the Sec in DevSecOps



Key Areas Of Focus For Security Services



Access Control

Inventory & Monitoring

SDLC

Forensics

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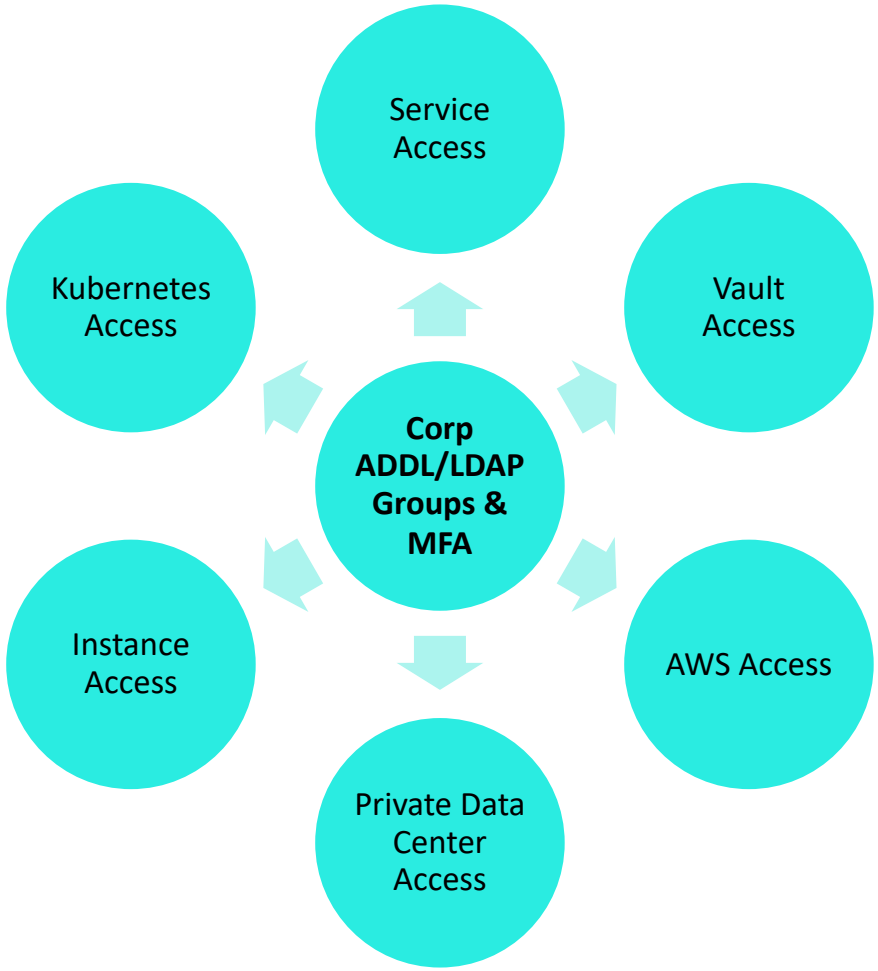
Access Control

Authentication & Authorization

Common Access Control To Rule Them All

- Federated Broker for AWS API & Console
- X509 certs for SSH, Kubernetes & Vault
- OpenID Connect for services
- LDAP Groups and Directory Lists for Roles
- MFA on authentication



Comprehensive Access Control Services

Authentication

- **Corporate authentication boundary extended to the cloud**
- SSO with MFA on all environments
- Ephemeral key for operators
- Long lived credentials only for services (stored in vault)

Authorization

- **Corporate authorization boundary extended to cloud**
- Integrated with corporate directory lists and LDAP groups
- Centralized privilege management
- Decentralized delegation
- Process to allow incident response team access

Environment

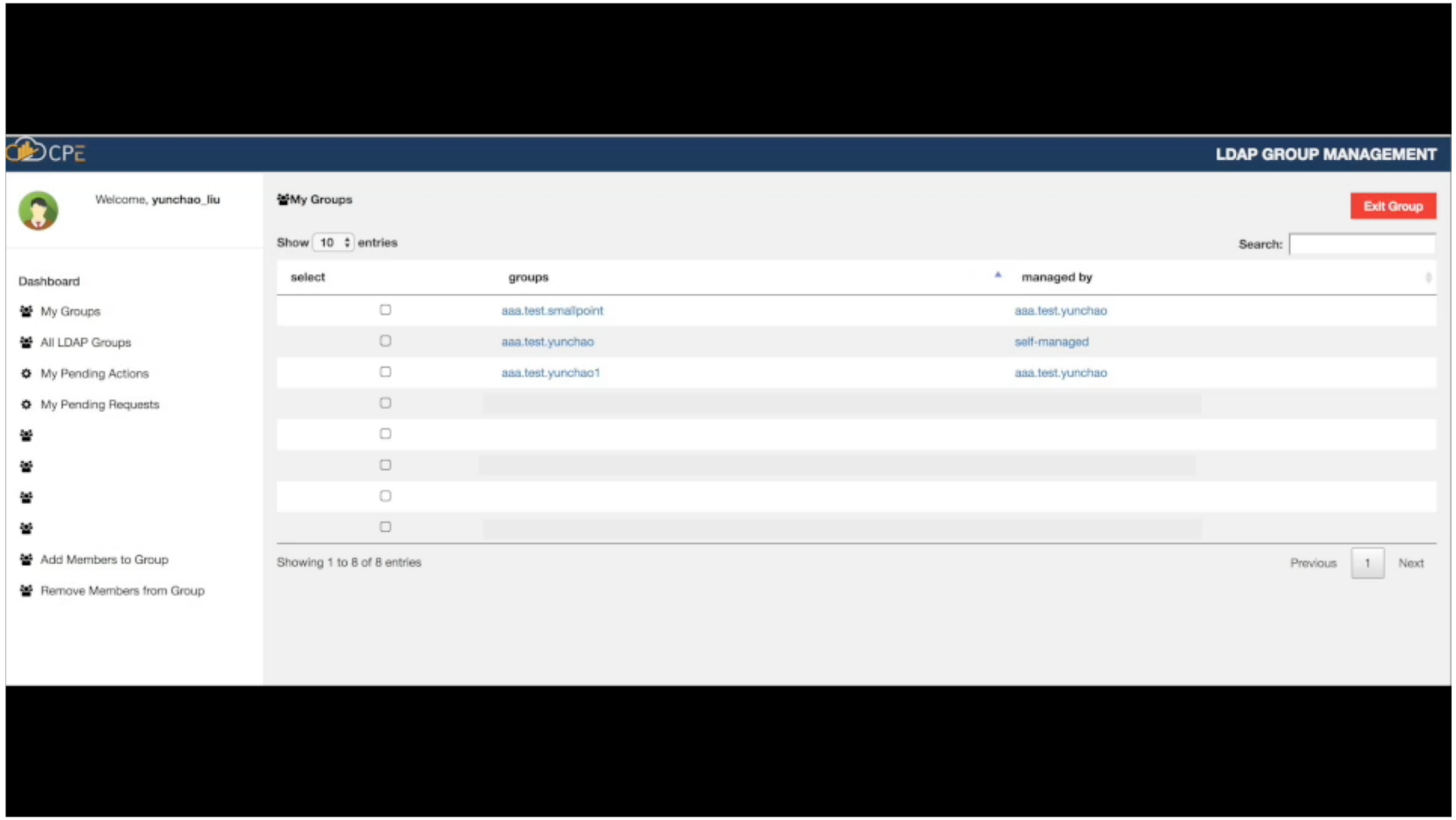
- AWS Console
- AWS API
- EC2 Instance
- On-Prem/Private Data Center VM's
- Kubernetes cluster
- Secrets Vault
- Data Stores
- Other Services

Authentication Service For DevOps- Keymaster

- Generates Ephemeral X509 Certs for authentication
  - SSH to EC2 instance & on premise VM's
  - Kerberos compatible (pkinit)
  - Kubernetes compatible
- Integrated with corporate active directory
- Provides 2FA via VIP and/or YubiKey
- Provides OpenID Connect support for web services
- Embeds LDAP groups into certificate for Kubernetes authorization
  - Embeds IP range from where certificate is valid

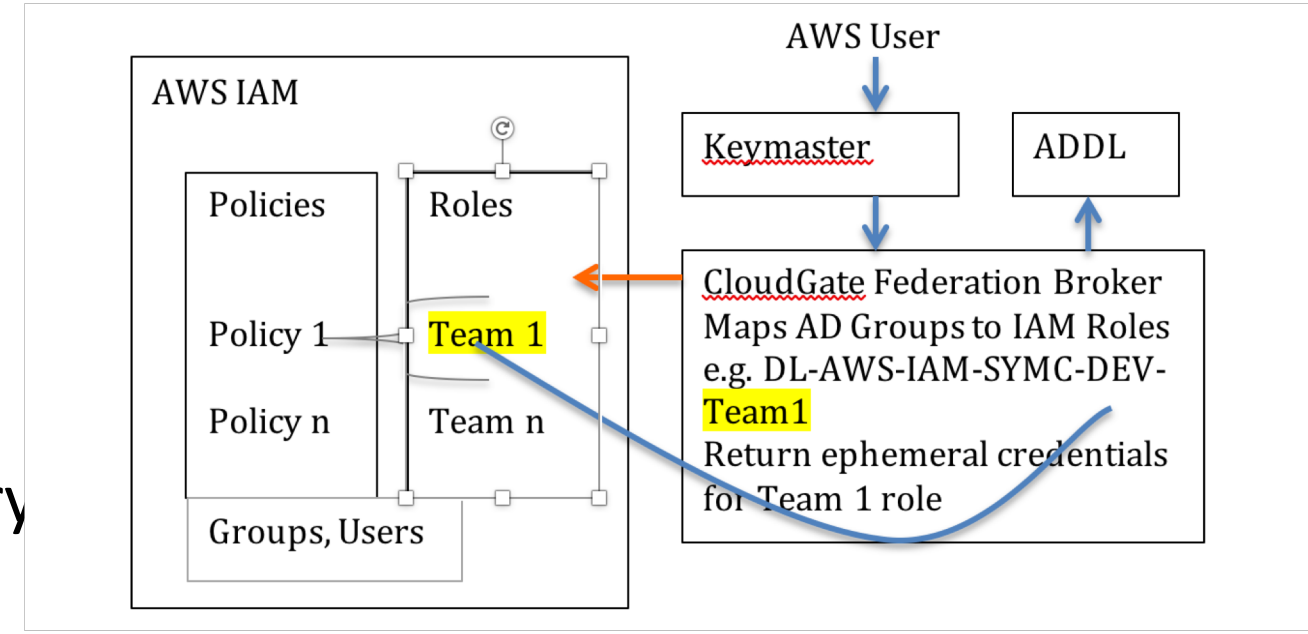
Authorization via LDAP groups- Smallpoint

- LDAP group management tool
- Integrated with corporate active directory
  - Authenticated by Keymaster
- Groups can mange other groups
- Service accounts can be managed like user accounts
- Light-weight
  - ~5K LOC



Authorization Service For AWS - Cloud-Gate

- Federated Broker for AWS API access for DevOPs
  - Maps Corp DL to AWS Roles & Polices
  - Assumes the mapped AWS roles on users behalf
- Generates ephemeral AWS API credentials for DevOps
- Integrated with Corp Active Directory
  - Authentication via Keymaster
- Enables DL owners control of membership



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Inventory

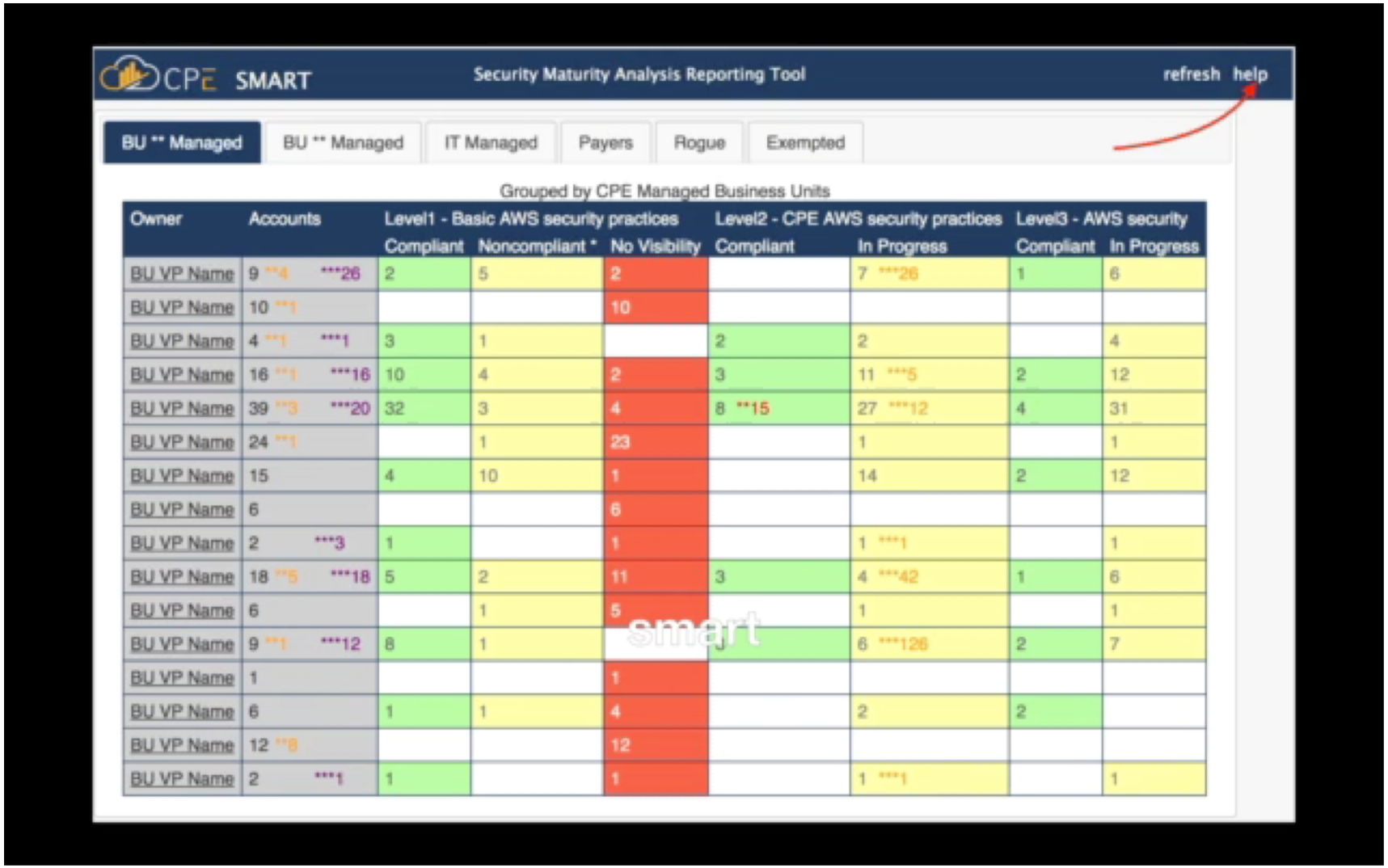
Feeds Reporting, Enforcement, Forensics & TVM Services

Centralized Inventory Of All Resources

- Service to catalog assets in all AWS accounts in the fleet
- Extends catalog to on premise resources
- Retain state & configuration history of every resource
- Source of truth for security & governance reports
- API access for other services
- Common view across otherwise siloed environment
- Enables operators & incident responders to track resources

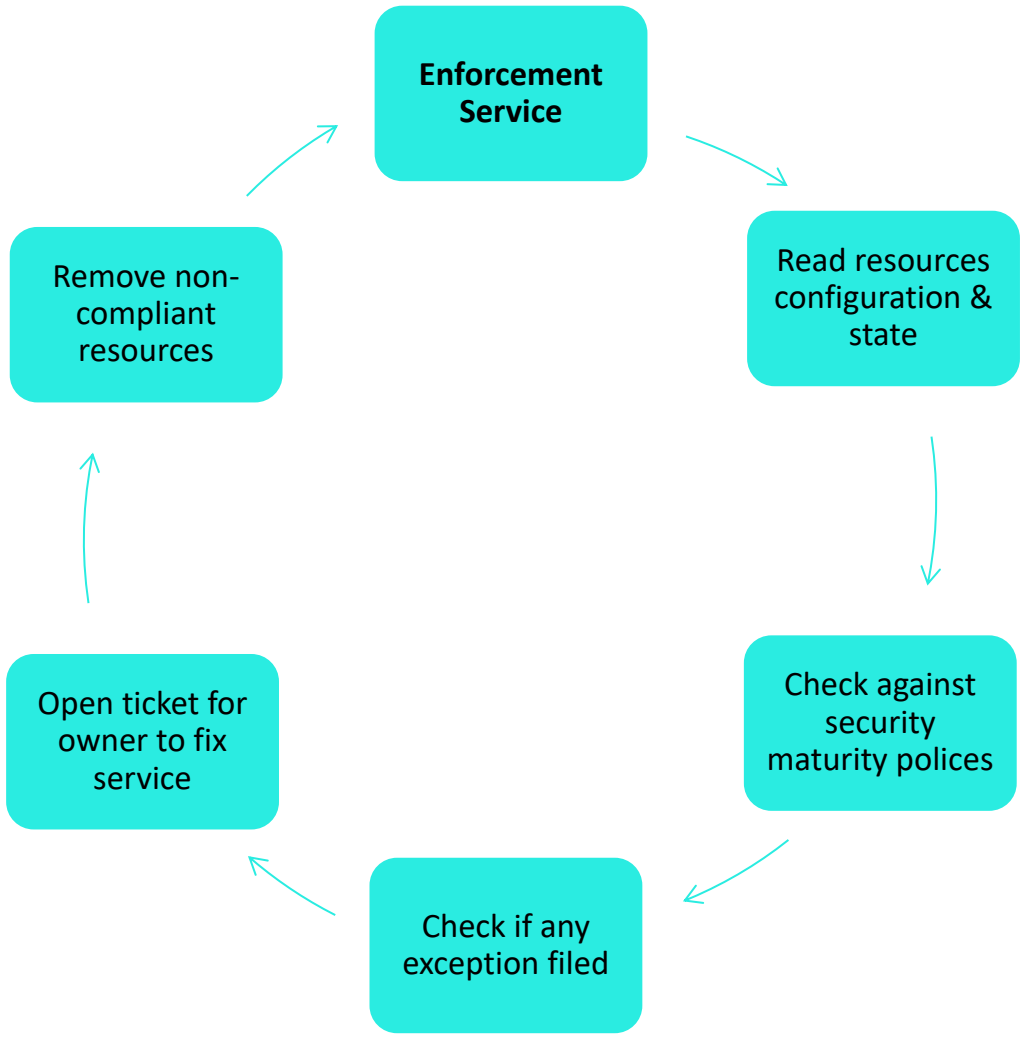
Compliance Monitoring & Reporting

- Security Maturity Analysis And Reporting Tool
- Monitors accounts for compliance to security maturity polices
- Aggregates non compliance by business unit, VP, payer accounts
- Identify on individual resource owners and send alerts
- Implements an exception process



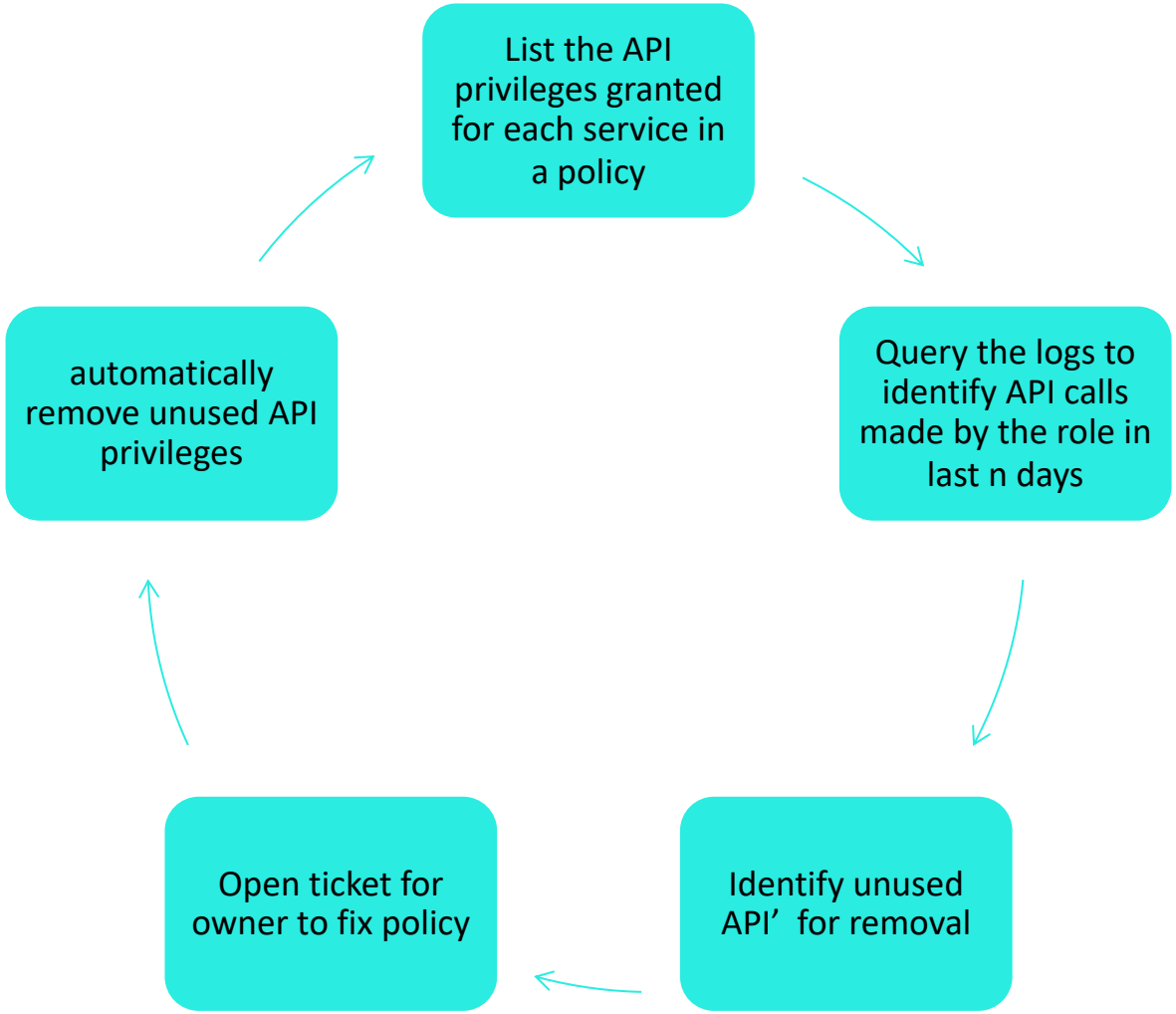
Compliance Enforcement Services

- Cloud Custodian & CWA
  - Security maturity compliance
- Reaper
  - IAM User cleanup
- RIP
  - IAM Policy Optimizer
- CWP
  - Endpoint protection



RIP - Remove Irrelevant Polices

- Access advisor limited
  - Lists services used
  - Does not identify API's
- Cloudtrail logs API calls
  - Query logs associated with IAM Role/User/Group
  - Cloudtrail does not log all API actions
- Enforce explicit API listing in policy



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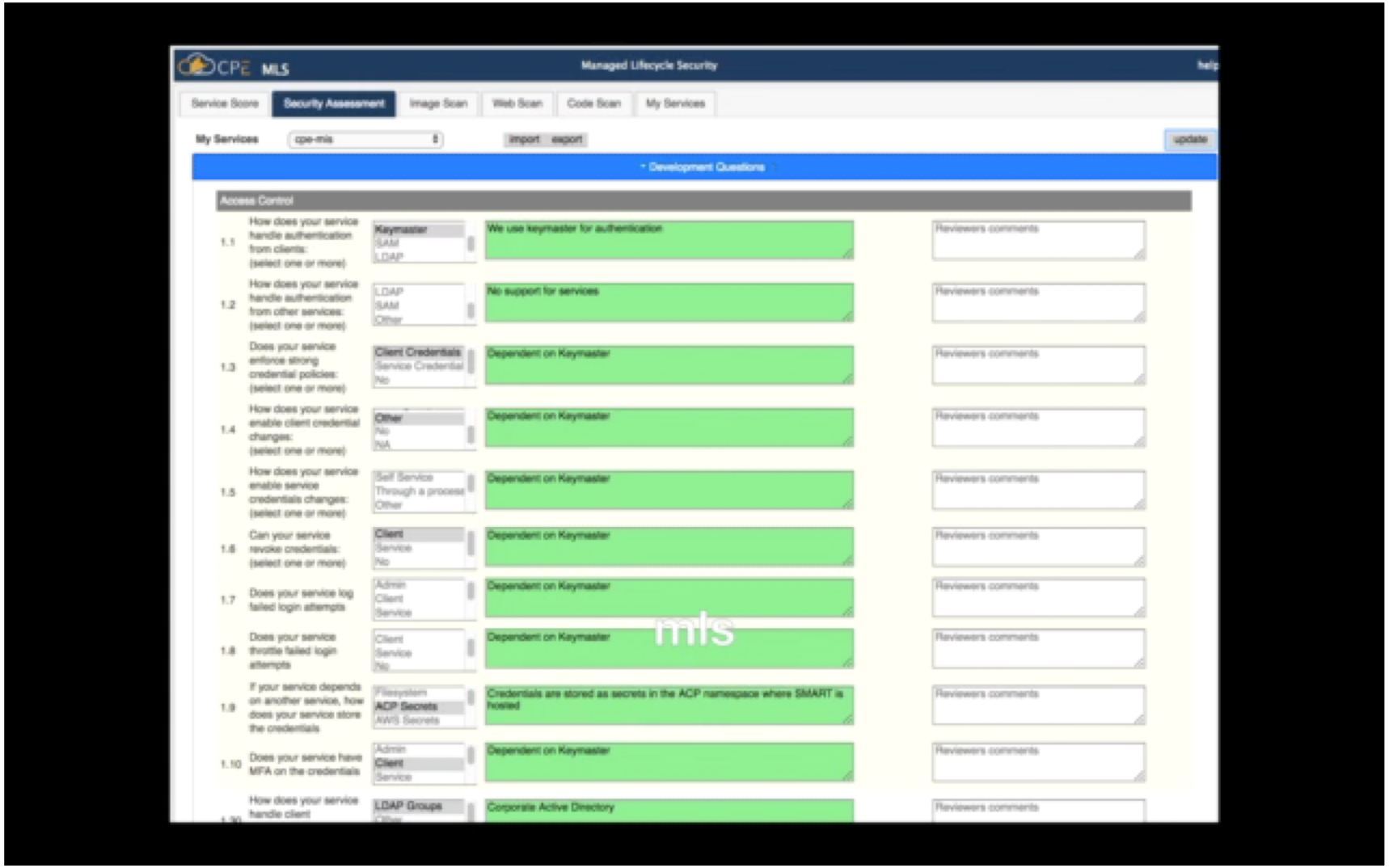
SDLC

TVM & Service Security Assessment

Service Security Assessment

- Catalog each services security posture
- Scanning – Static, Dynamic & Image
- Audit readiness
- Track Inventory
- Security score across all services



Service Secrets Storage - Vault

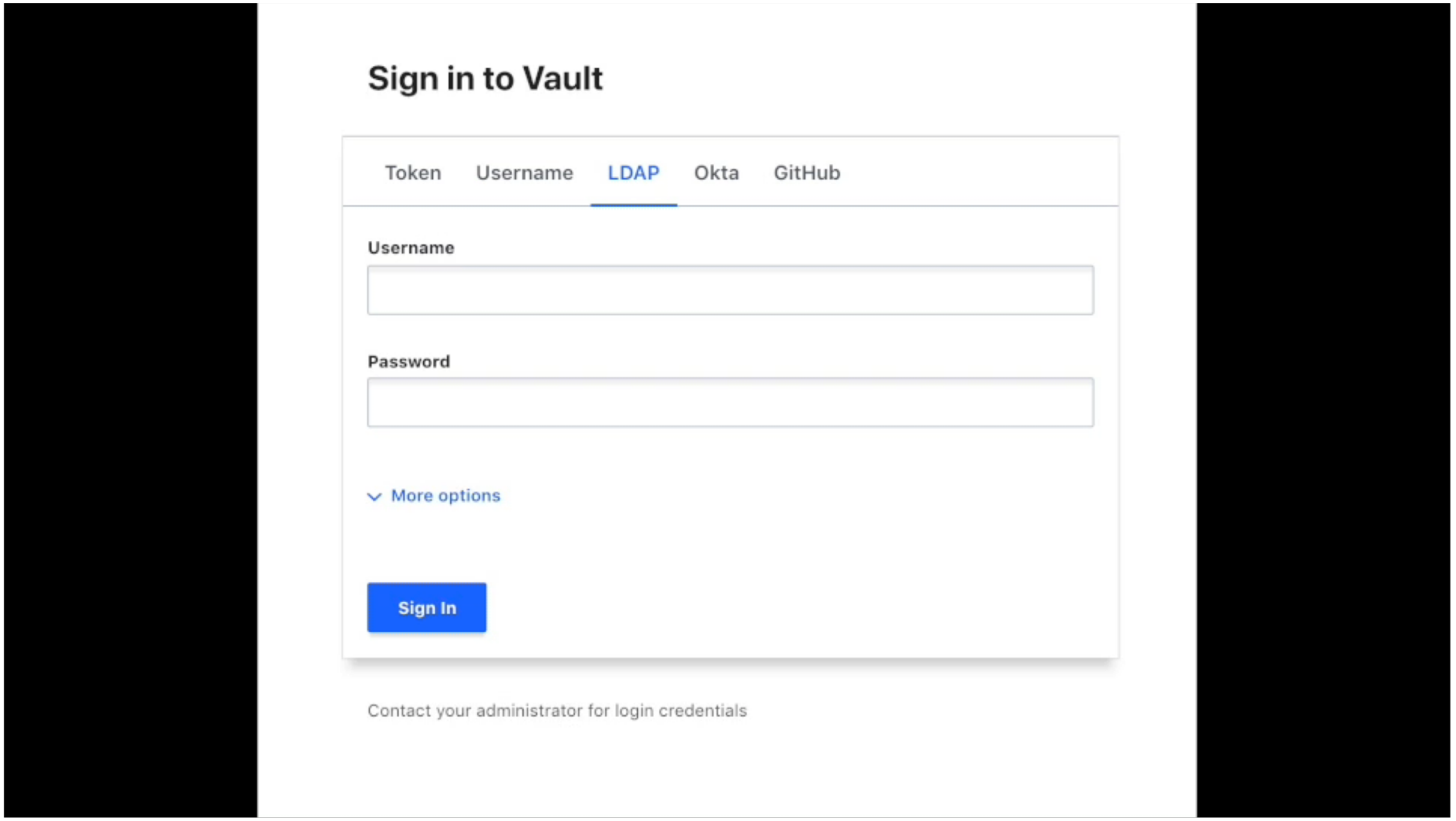
- Inventory of all secrets
  - All secrets stored in vault
  - All services read from vault
- All secrets rotated randomly
  - All secrets considered ephemeral
  - Monitor vault to ensure rotation

Target service or environment for this secret	Description (usage) of each secret in the service	Where is the secret saved at runtime	Who has access to the secret	Where is the secret stored for deployment	Who has access to the secret	What can you do with the secret	When was it last modified	What is the process for rotating the secret
AWS	AWS CIS Role Credentials	ACP Secrets	Operator	ACP Secrets	Admin	Assume CIS role in AWS accounts	Thu Oct 11 2018	Generate new credentials in AWS and update ACP secret
JIRA	JIRA credentials	ACP Secrets	Operator	ACP Secrets	Admin	Read, Write to JIRA SMART project	Thu Feb 01 2018	Open a ticket to get new credentials from IT and update ACP secret

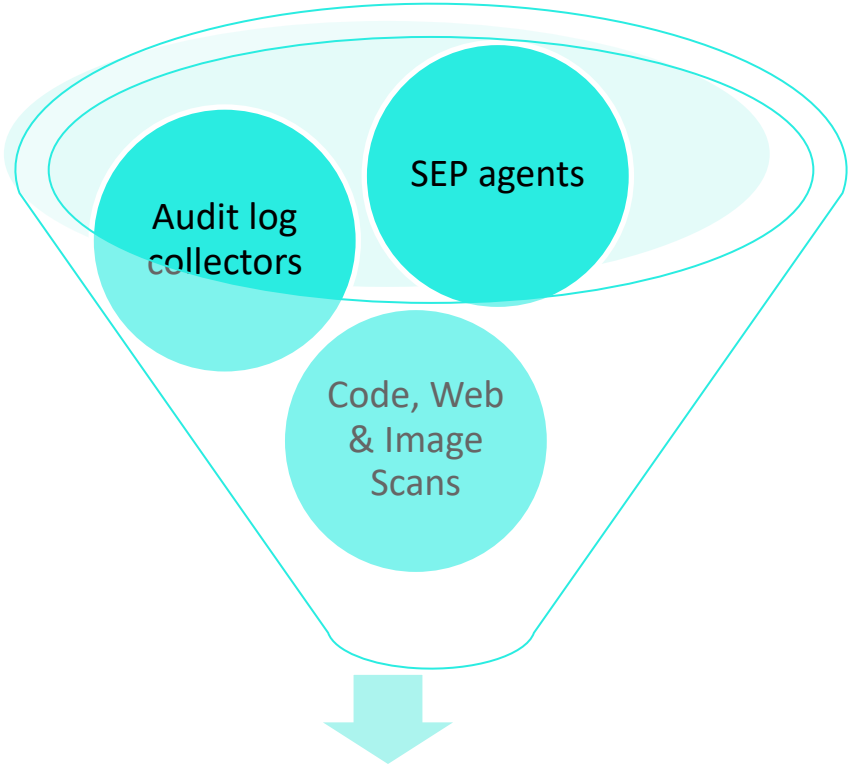
- Curl
  - curl --header "X-Vault-Token:$VAULT_TOKEN" $VAULT_ADDR/v1/secret/data/path_to_secret
- NodeJS
  - request.get({ url: https://volturl/v1/path_to_secret, headers: ,{"X-Vault-Token": vault_process.env.VAULT_TOKEN,"Content-Type": "application/json" }, method:'GET'}, function(…
- Python

```
client = hvac.Client(url = url)

client.auth.ldap.login(
    username=username,
    password=passwd,
    mount_point='ldap'
)

secret_version_response = client.secrets.kv.v2.read_secret_version(
    path=path,
)

print secret_version_response
```

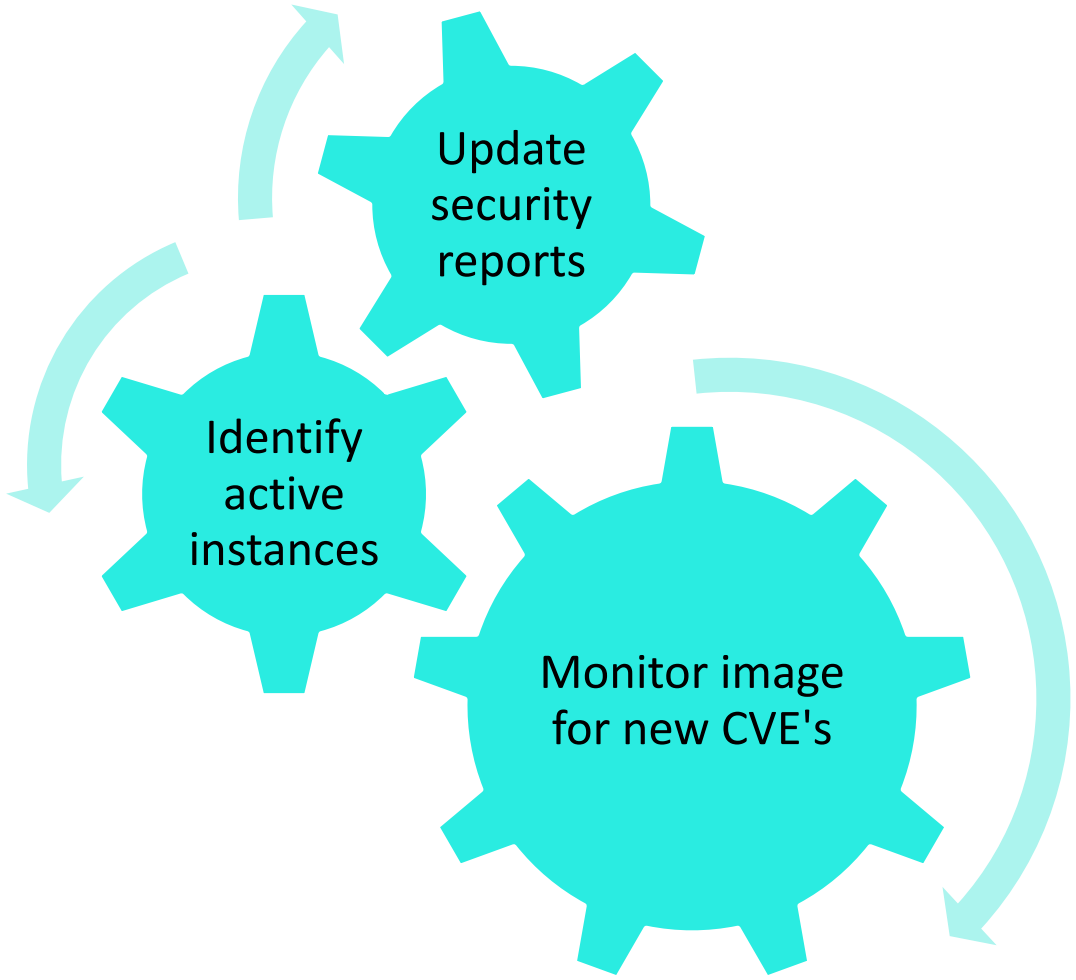
Demo for Vault



Integrate TVM With The Build Process

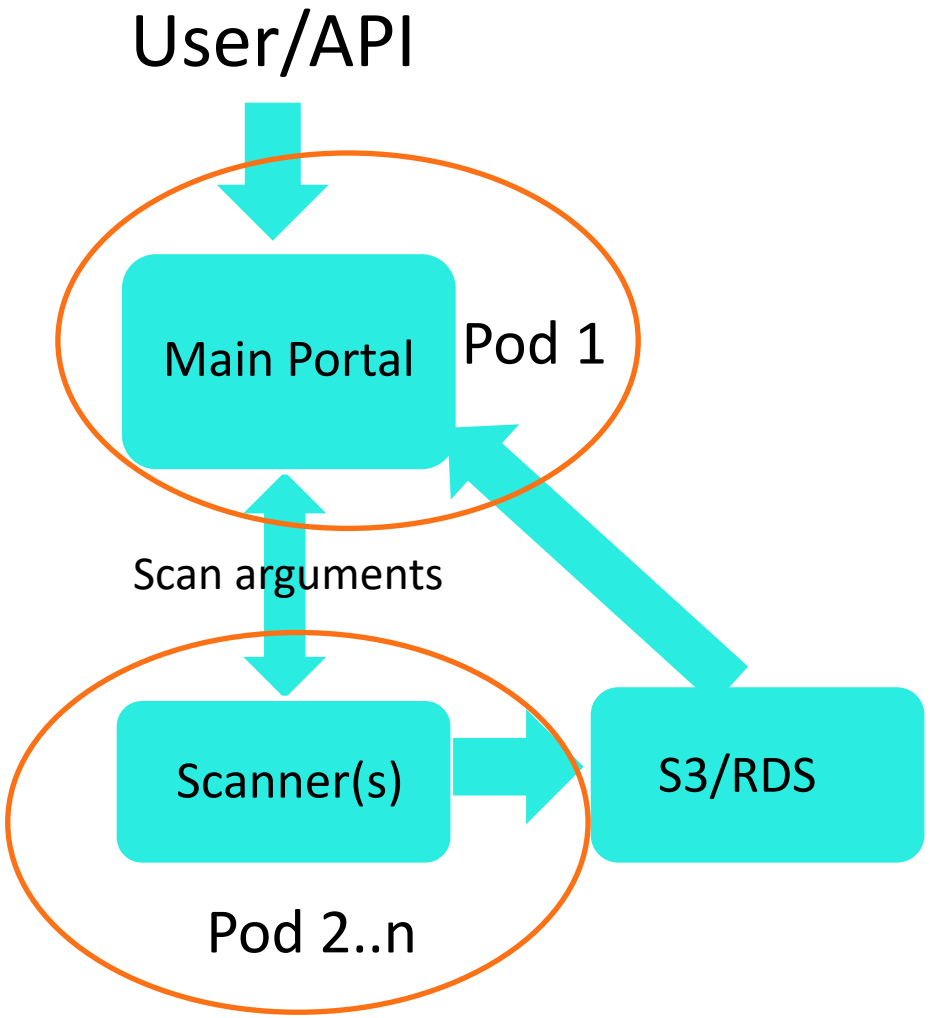


Secure Image



Scanning Services

- Scanning micro services that can integrate with CI/CD
- One or more containers per scan type
- Asynchronous (SQS)
- Results stored in S3 & RDS



Static Code Scanning Service

- SonarQube a self service
  - Install SonarQube server and scanner in containers.
  - Install plugins for more programming languages
    - SonarQube has some major languages plugins as default.
  - Configure scan
    - Scan parameters

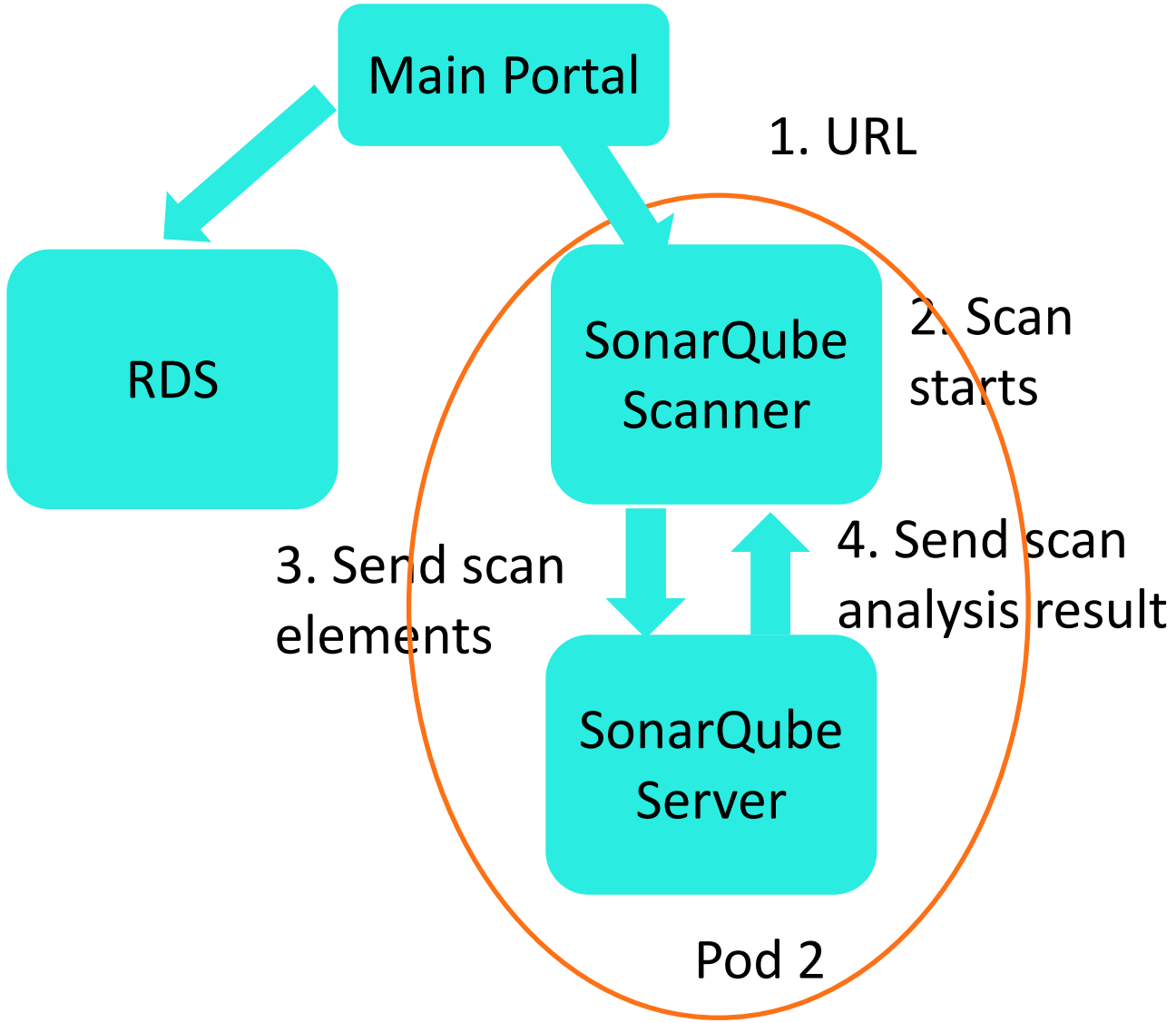
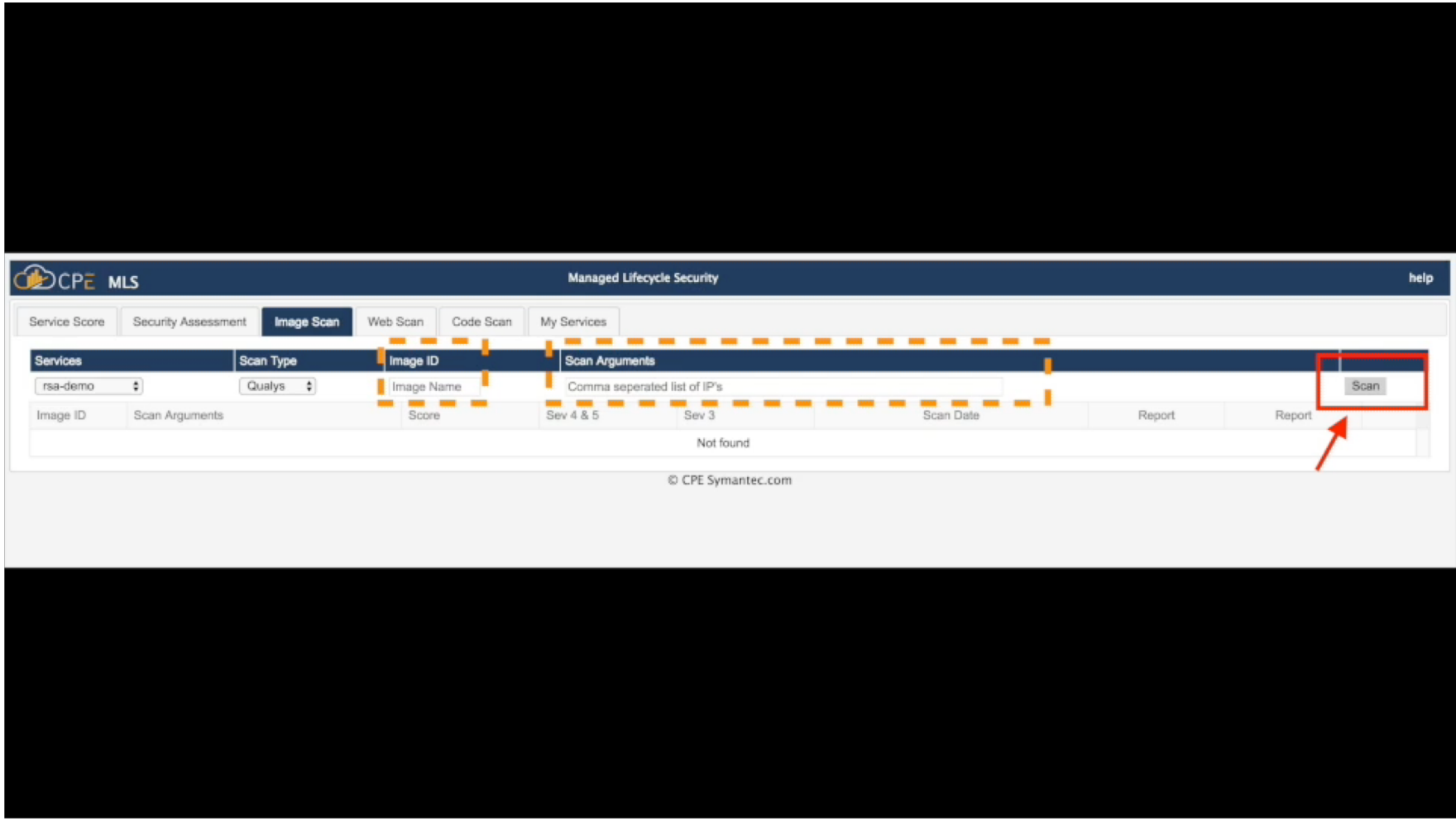


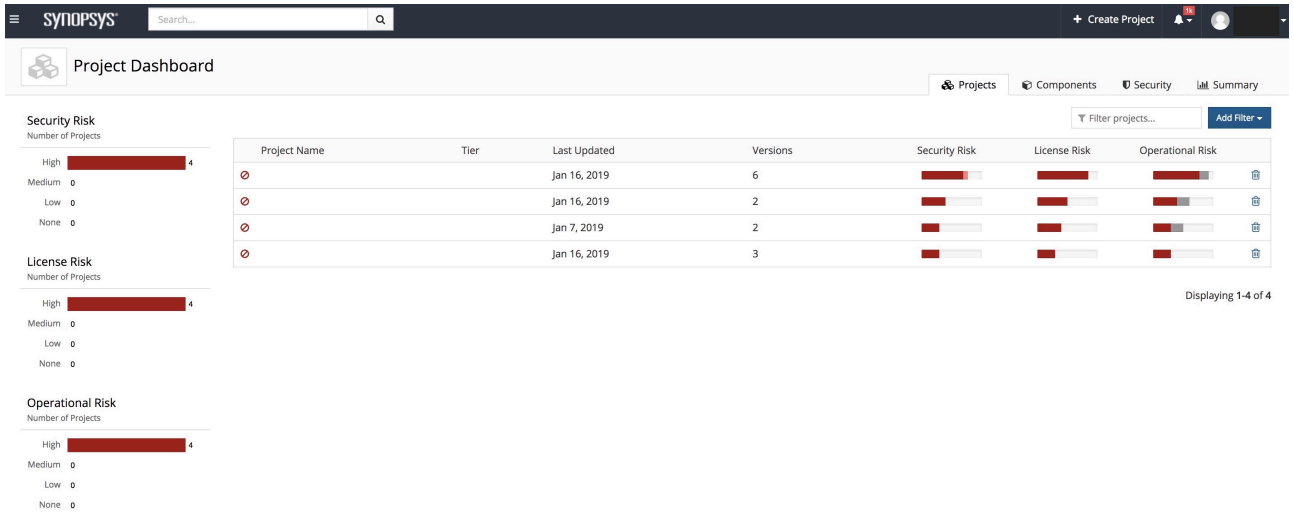
Image Scanning Service

- Qualys scan
  - Asynchronous flow
  - Launch & wait for scan result
  - Parse result to get scores
  - Store result & scores in repo
  - Track remediation



Container Scanning Service

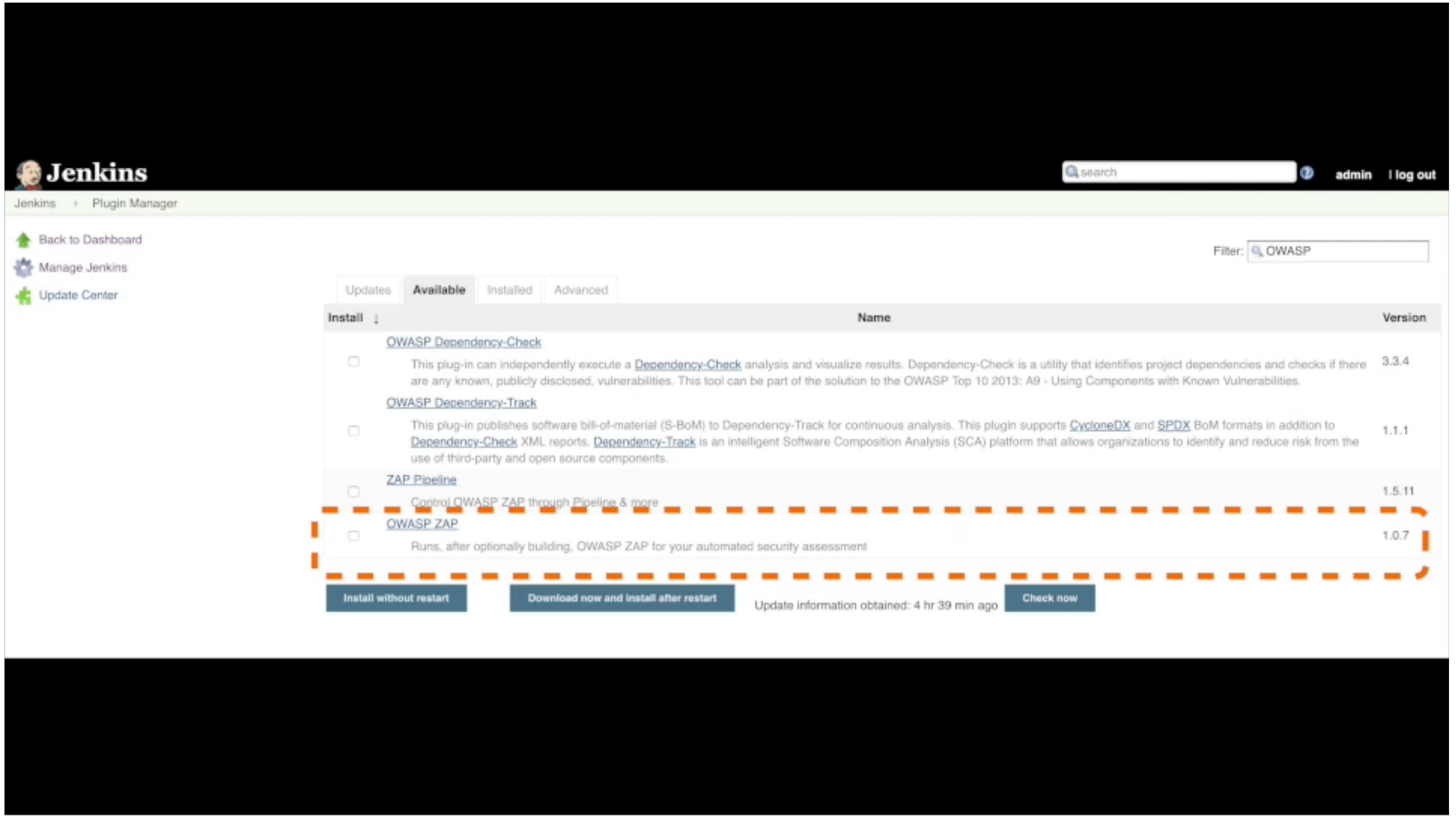
- Black Duck
  - Install Black Duck scanner on the machine where your code is placed
  - Configure scan settings
  - Parse result to get scores
  - Store result & scores in repo
  - Track remediation




```
function get_remote_file() {
  readonly REQUEST_URL=$1
  readonly TEMP_FILE="${THISDIR}/tmp.file"
  local command_output
  if [ -n "$(which wget)" ]; then
    execute_remote_request command_output "wget -O"  "$REQUEST_URL" "$2"
    if [[ $? -eq 0 ]]; then
      tr -d "\r" <"${TEMP_FILE}" >"$2"
      rm "${TEMP_FILE}"
      chmod 755 "$2"
      return 0
    else
      if [[  "${command_output}" == "${command_output#*Resolving blackducksoftware.github.io}" ]]; then
        using_proxy_instructions
      fi
    fi
    return 1
  else
    if [ -n "$(which curl)" ]; then
      execute_remote_request command_output "curl -s --netrc-optional -I $REQUEST_URL" ""
      status_code=$(echo $command_output | cut -d $'\r' -f1 | cut -d $' ' -f2)
      server_name=$(echo $command_output | cut -d $'\r' -f2 | cut -d $' ' -f3)
      if [ "$status_code" == "200" ]; then
        execute_remote_request command_output "curl --netrc-optional -s -o" "$REQUEST_URL" "$2"
        if [[ $? -eq 0 ]]; then
          tr -d "\r" <"${TEMP_FILE}" >"$2"
          rm "${TEMP_FILE}"
          chmod 755 "$2"
          return $?
        fi
      else
        if [[ "$server_name" != "GitHub.com" ]]; then
          using_proxy_instructions
        fi
      fi
    fi
    return 2
  fi
}
```

Dynamic Web Scanning Service - Zed Attack Proxy (ZAP)

- MITM proxy
  - Passive/Active scans
- Integrate with CI/CD
  - ZAP plugin for Jenkins
  - Configure plugin
  - Configure project
  - Configure session
  - Configure attack mode



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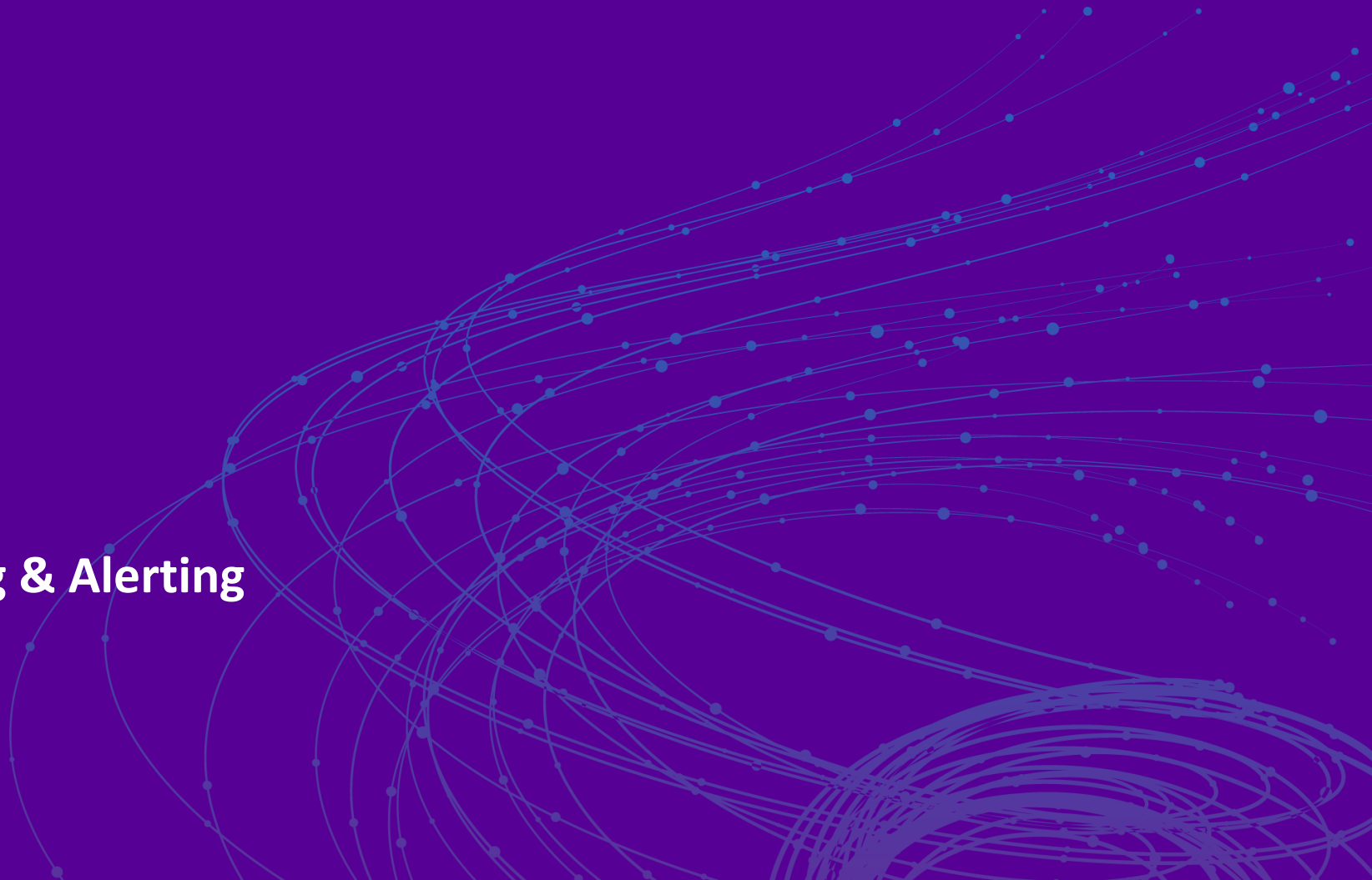
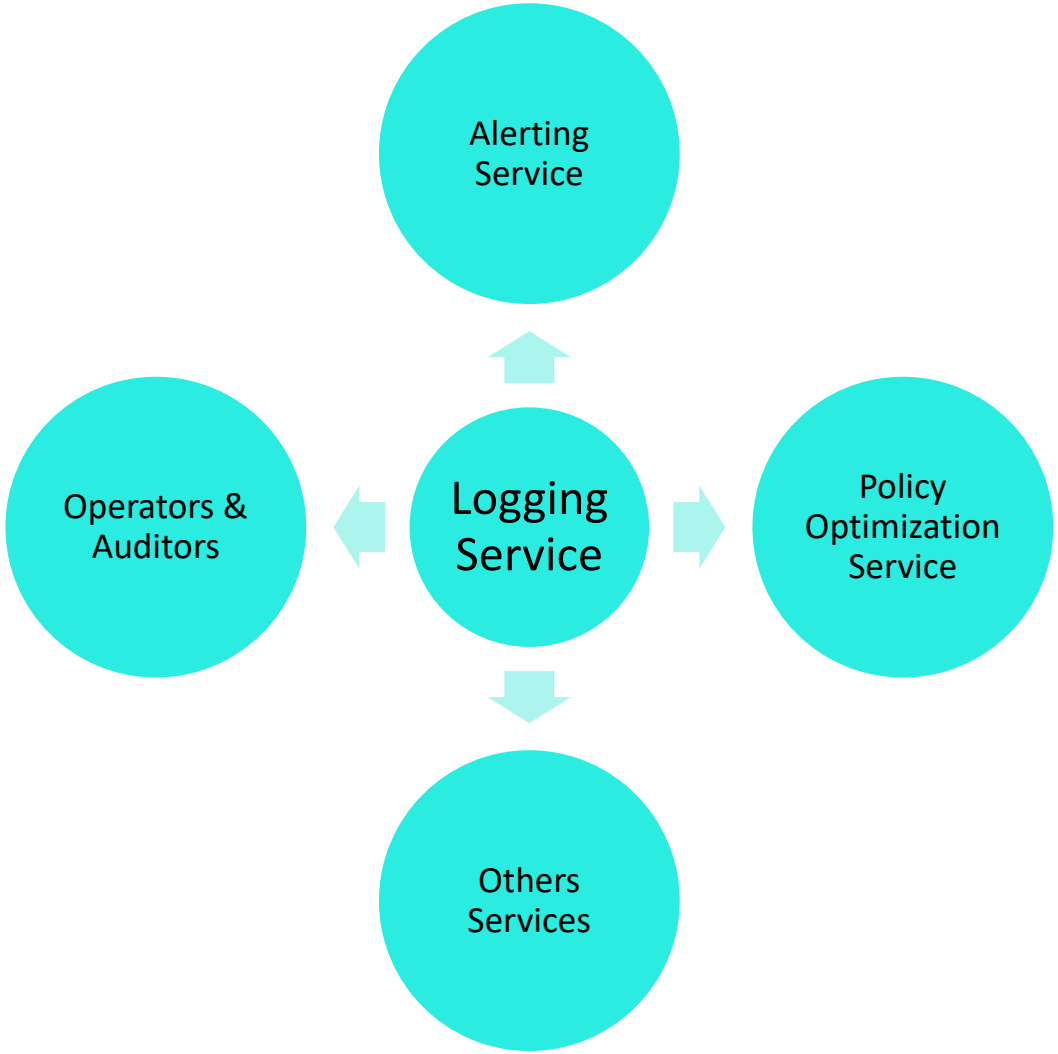
Forensics

Logging, Monitoring & Alerting



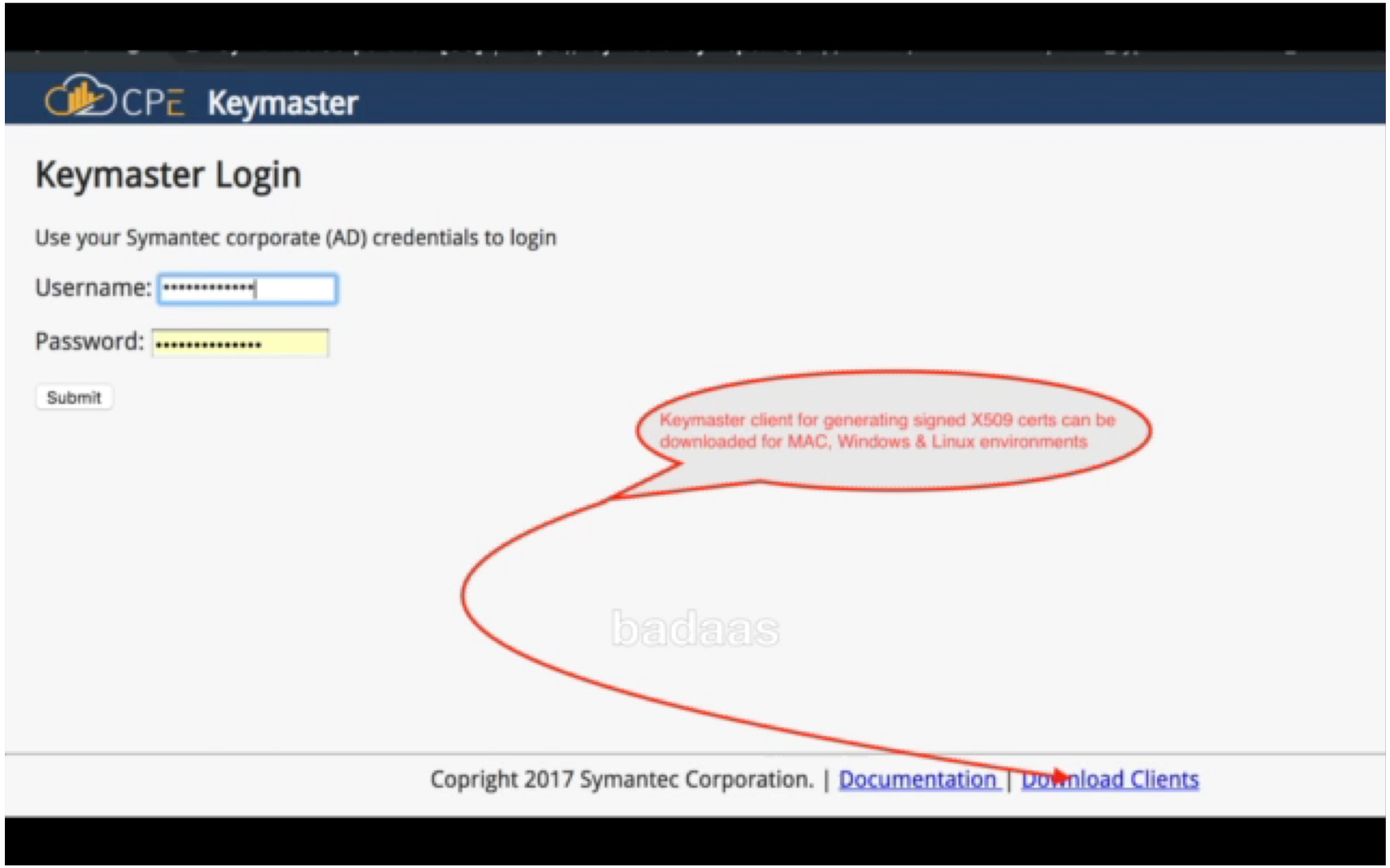
Logging Services

- Consolidate all logs into a central service
  - System/Auth, Cloudtrail, VPC Flow, Kubernetes Audit, DNS, Application
- Monitor heartbeat to ensure that logs are being collected
- Provide API access to logs
- Predefined views
- Long-term storage for compliance
- GDPR sensitive



Behavior Anomaly Detection And Alerting Service

- Allow operators to create security alerts on their logs
  - Reduces false positives
  - Democratizes security alerting
- Build baseline alerts for common vectors
  - Well defined vectors
  - Low false positives
- Alerts on behavior changes in credential usage
  - Change in source or target
  - Change in API called and/or API parameters



Incident Response Services (Reactive)

- Incident response process documented and distributed
- Help responders identify ownership and involve the owners during forensics
- Build services to enable responders to quickly take over effected resources
- Create a consolidated view of all relevant logs for the effected assets/service
- Review process and feedback into security maturity framework

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Summary

Summary

- Evolve security by democratizing it
- Create a Security Maturity Framework
- Build services to help DevOps achieve security maturity
- Decentralize security monitoring & alerting
- Integrate TVM in the SDLC
- Revisit every quarter to identify what works & what doesn't

Links

- CIS https://d0.awsstatic.com/whitepapers/compliance/AWS_CIS_Foundations_Benchmark.pdf
- Keymaster https://github.com/Symantec/keymaster
- Cloudgate https://github.com/Symantec/cloud-gate
- Cloud Custodian https://github.com/cloud-custodian/cloud-custodian
- SonarQube https://github.com/SonarSource/sonarqube
- ZAP https://github.com/zaproxy/zaproxy
- Clair https://github.com/coreos/clair
- Smallpoint https://github.com/Symantec/ldap-group-management
- Blackduck https://www.blackducksoftware.com/black-duck-home
- Security Scans Wrappers: https://github.com/Symantec/security-scan-wrappers
- CWP https://www.symantec.com/products/cloud-workload-protection
- Vault Self Service https://github.com/hardeep-s/vault-exchange