AWS - DevOps Cyber Attack Kill Chain with Automated Security Response & Visibility

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Australian Cyber Innovation Executive Lunch

26-Jul-18

Compliance, Protection & Business Confidence

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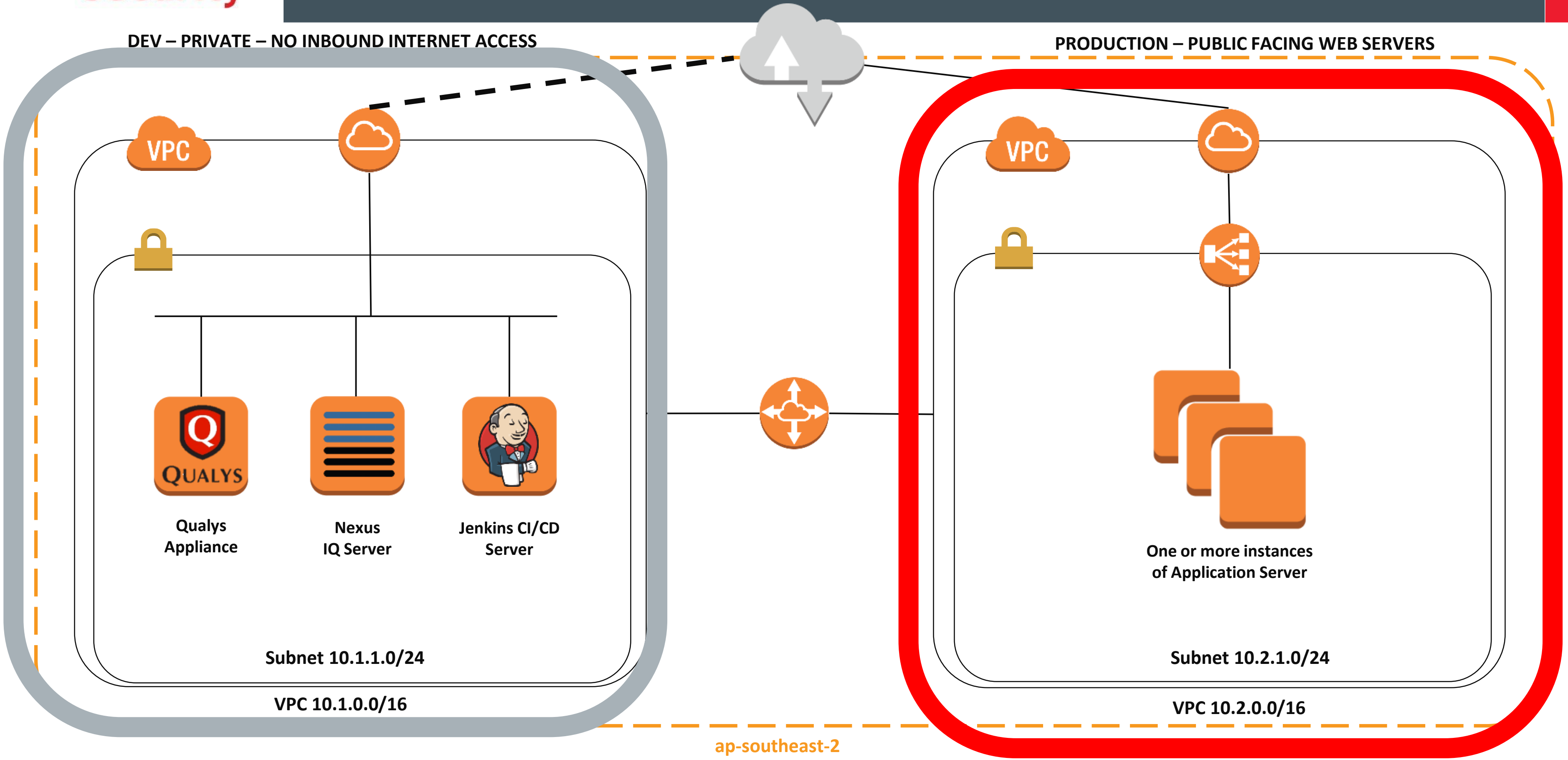
Sense of Security, DevSecOps AWS Kill Chain Demonstration

https://www.youtube.com/watch?v=fm4CqlxqQfs


DEV – PRIVATE – NO INBOUND INTERNET ACCESS
PRODUCTION – PUBLIC FACING WEB SERVERS
VPC
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Qualys Appliance
Nexus IQ Server
Jenkins CI/CD Server
One or more instances of Application Server
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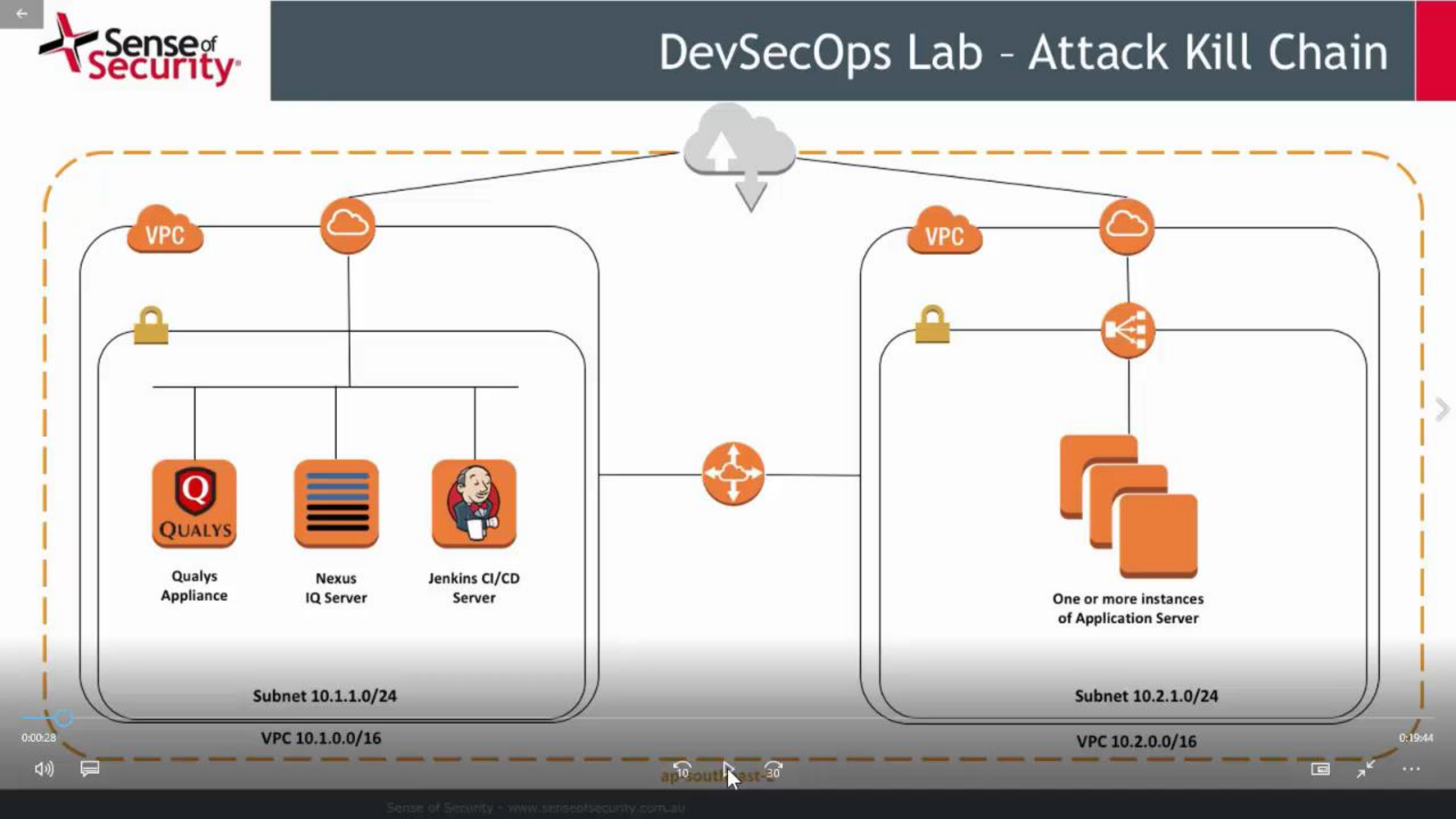
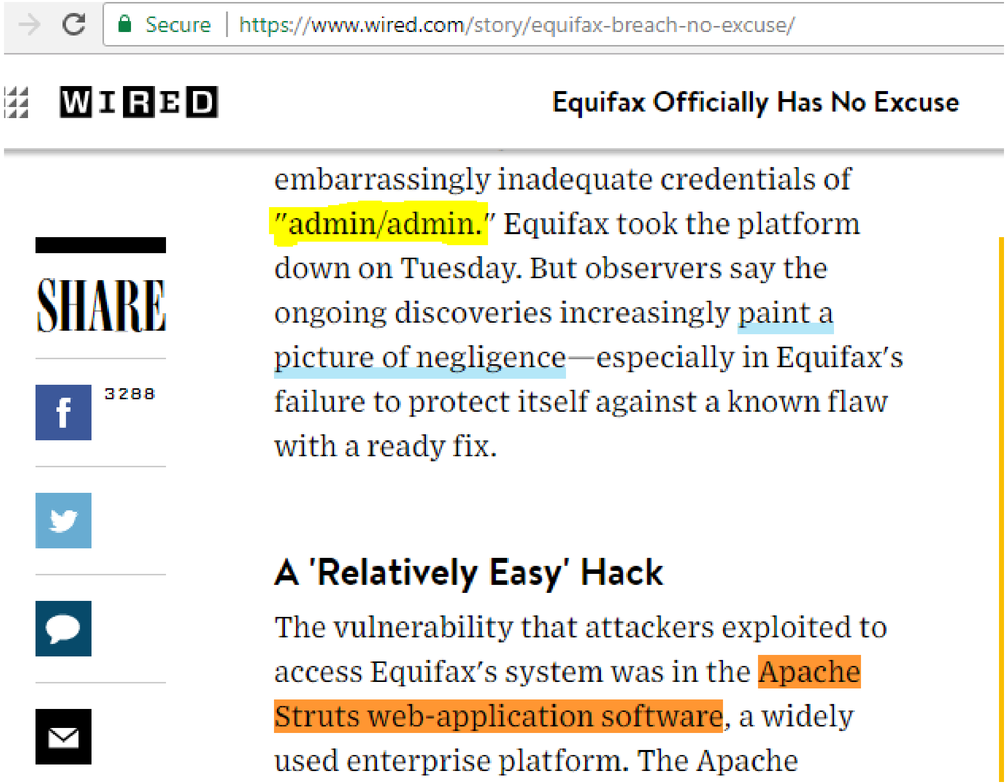
ap-southeast-2



DevSecOps Lab – Attack Kill Chain

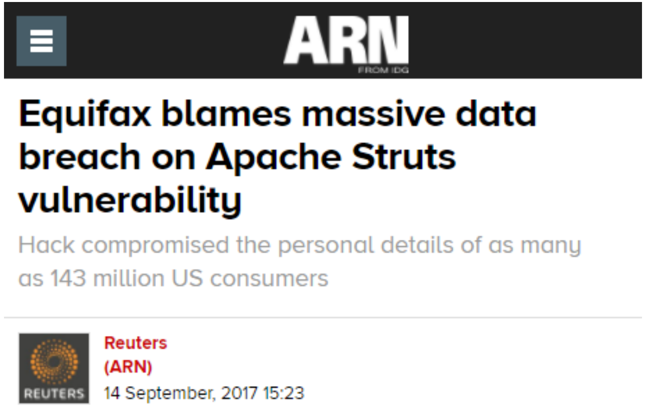


Equifax Officially Has No Excuse

embarrassingly inadequate credentials of "admin/admin." Equifax took the platform down on Tuesday. But observers say the ongoing discoveries increasingly paint a picture of negligence—especially in Equifax's failure to protect itself against a known flaw with a ready fix.

A 'Relatively Easy' Hack

The vulnerability that attackers exploited to access Equifax's system was in the Apache Struts web-application software, a widely used enterprise platform. The Apache



Equifax blames massive data breach on Apache Struts vulnerability

Hack compromised the personal details of as many as 143 million US consumers

Reuters
(ARN)
14 September, 2017 15:23

The defaults, including what would at face(palm) value appear to be innocuous settings, cause a litany of problems …

PREVENTION

through

CONFIGURATION MGT

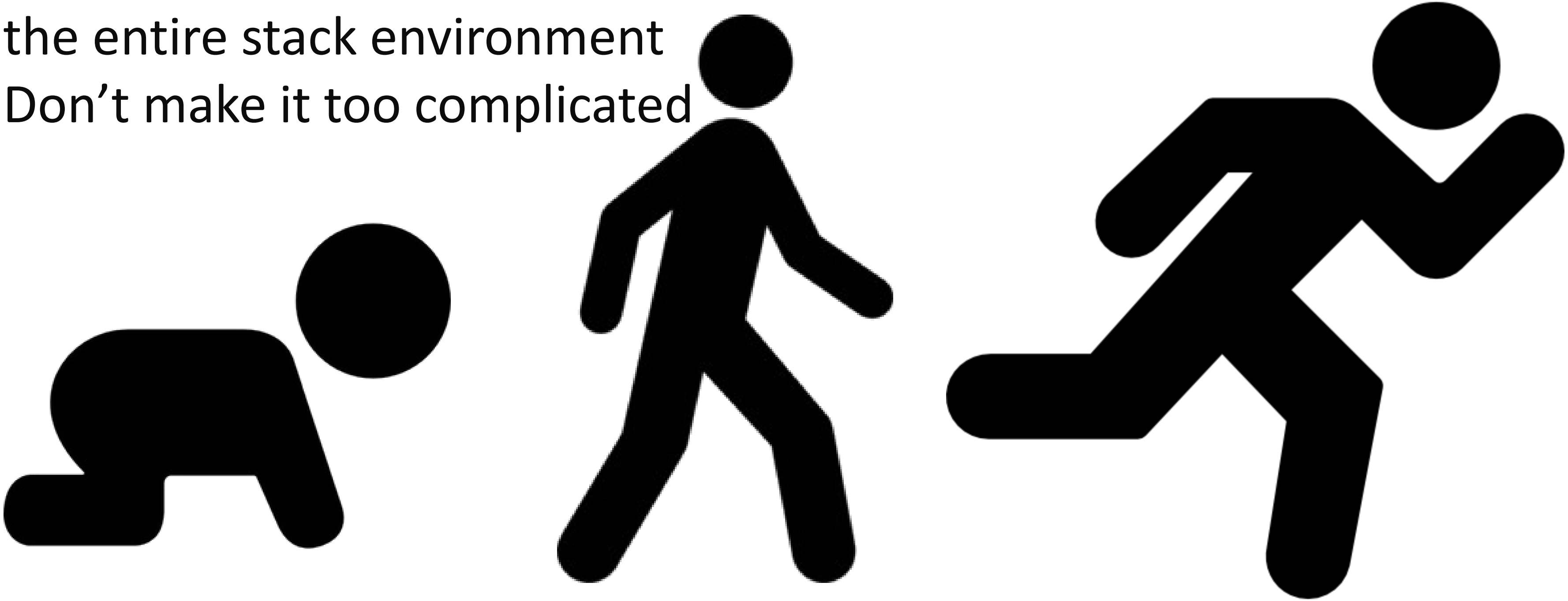
OPERATIONAL MGT (PATCH/VULN)

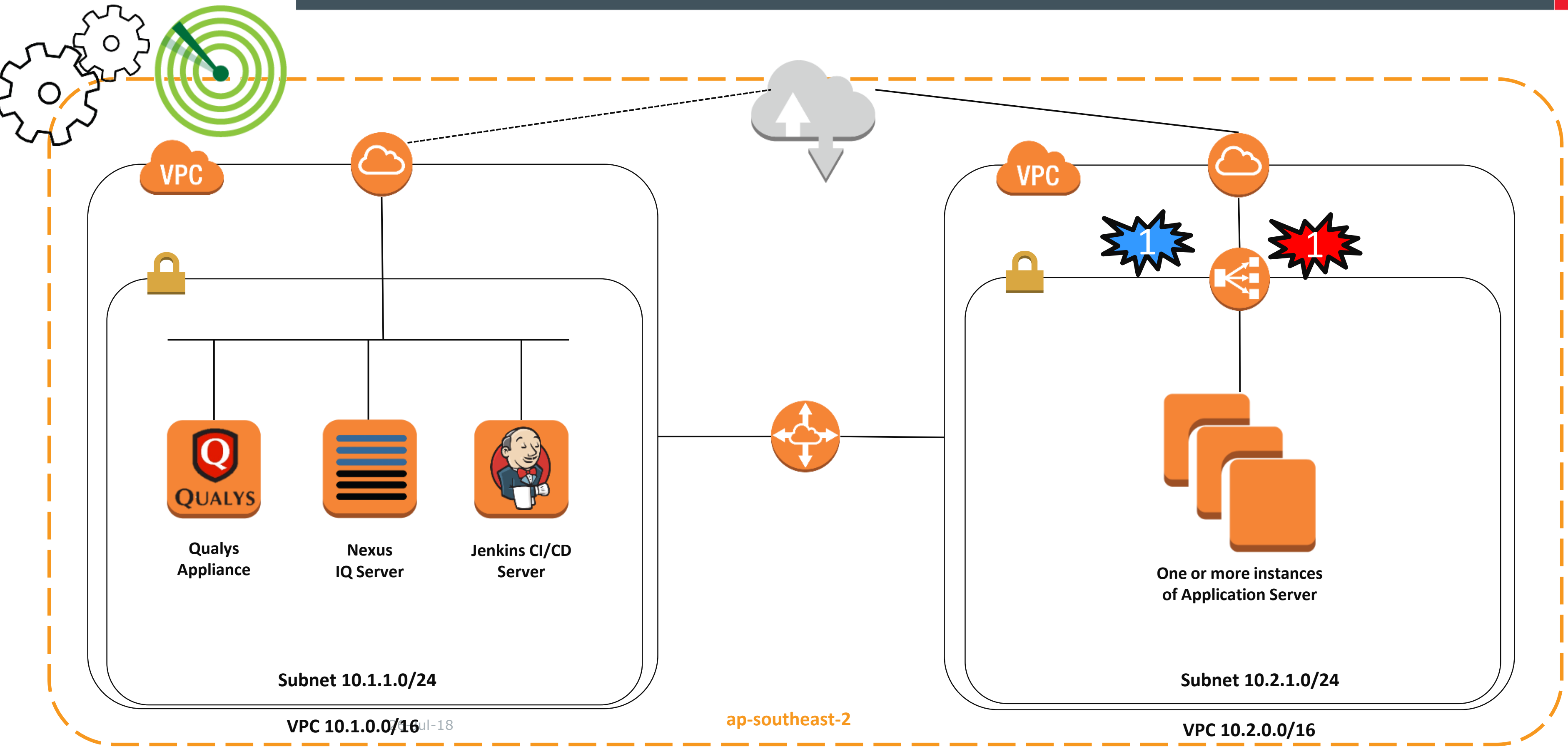
CONTINUOUS
MONITORING

SELF HEALING

AUTOMATION

- Automation can dramatically improve security
- Make the application build success rely on the security state of the entire stack environment
- Don’t make it too complicated

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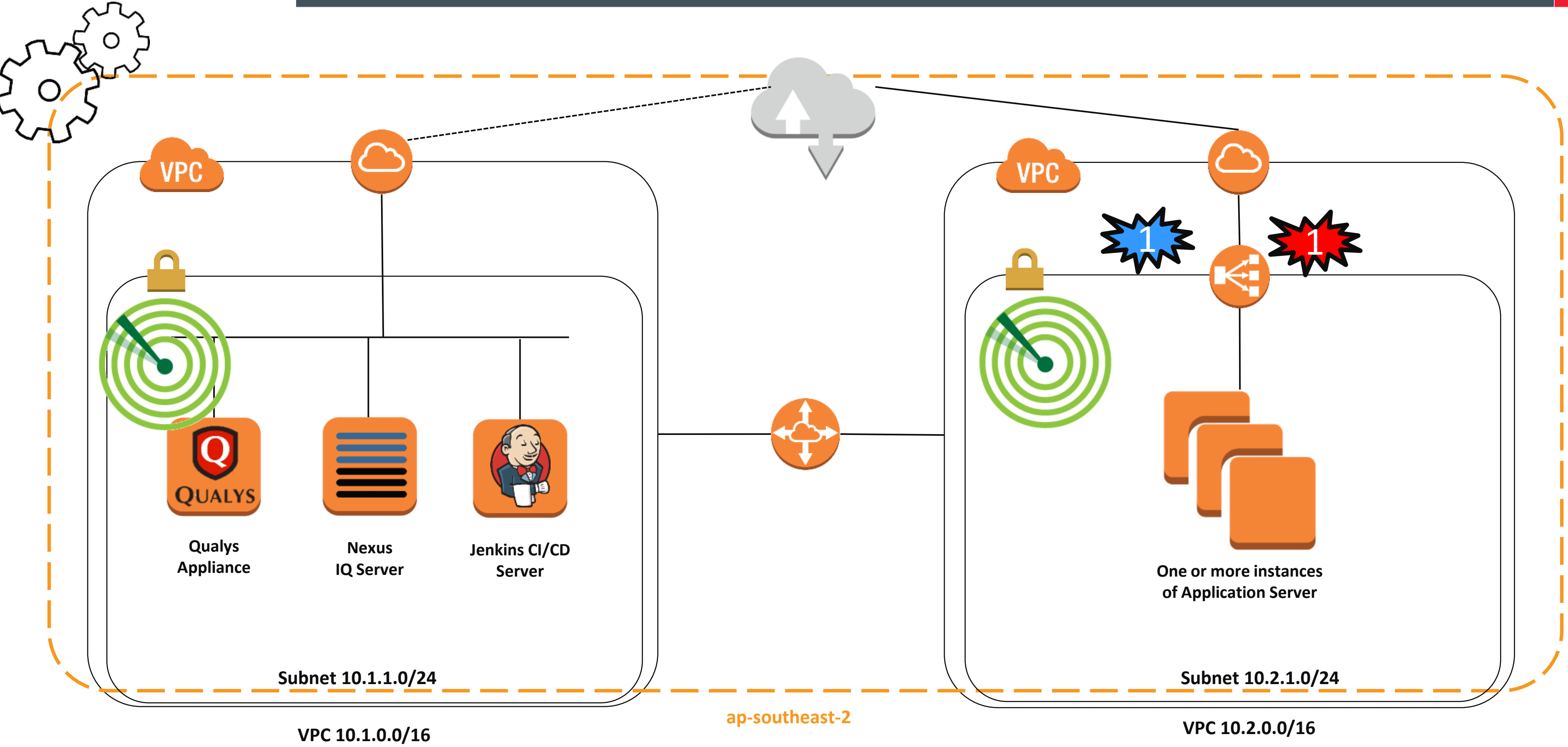
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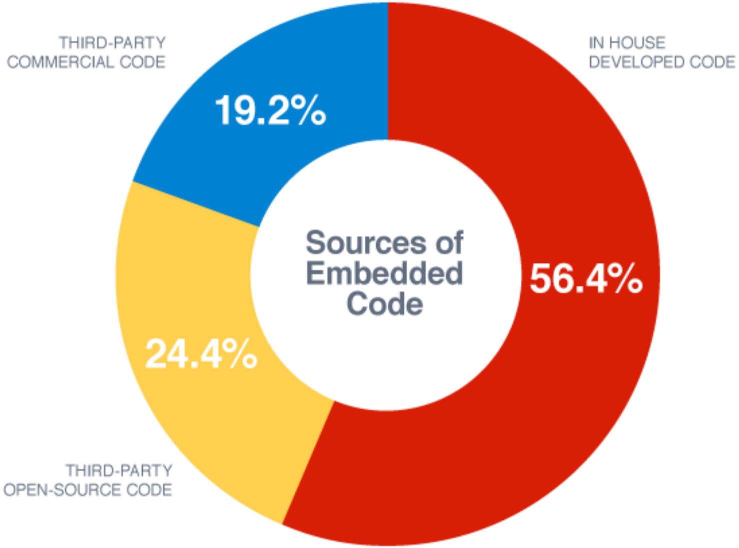
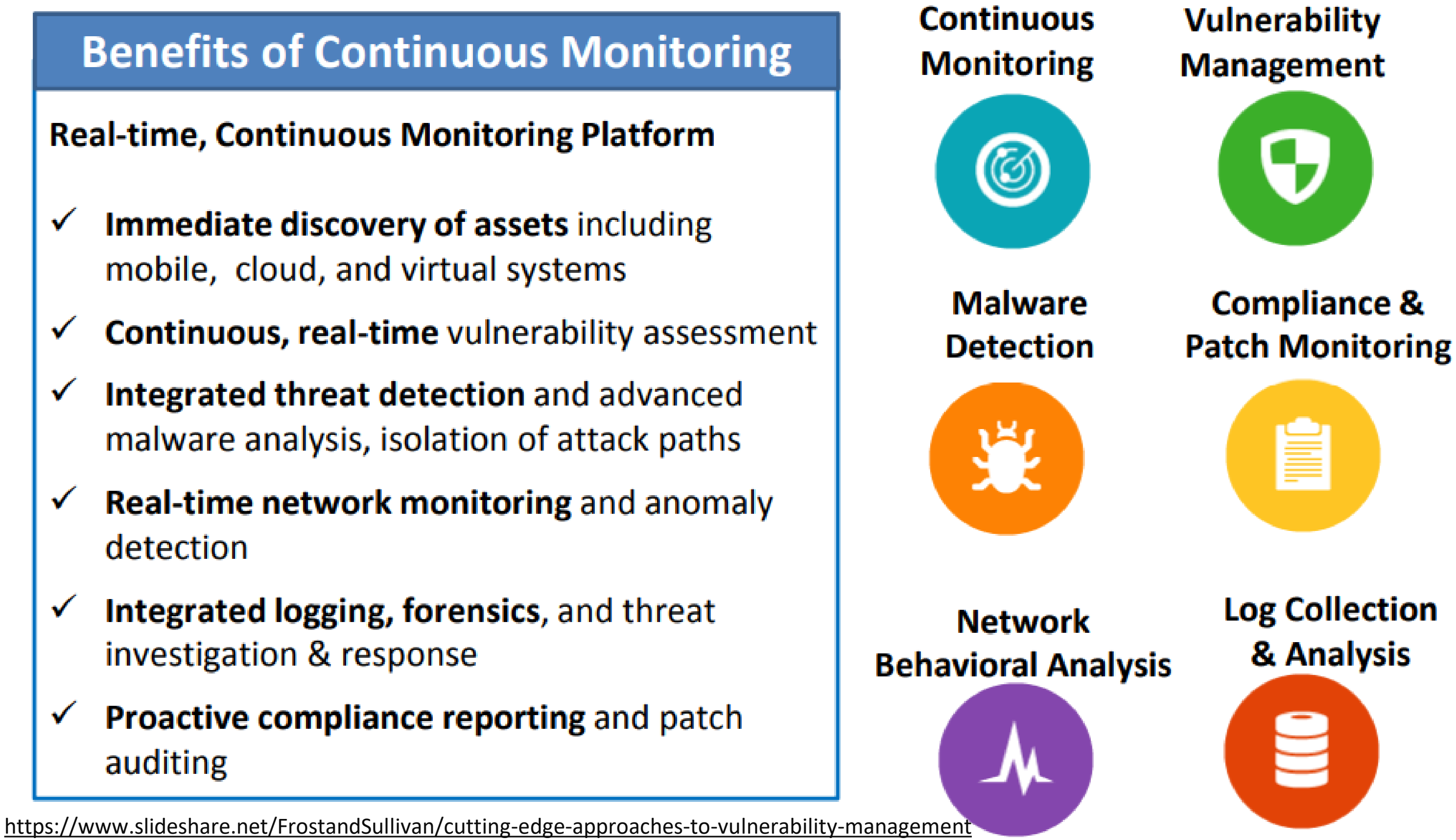
Supply Chain Security: Identify Vulnerable Third Party Components. Automatically strengthen and secure software supply chains everywhere, and at scale

Source: https://www.sonatype.com



Source: https://www.grammatech.com/



Benefits of Continuous Monitoring

Real-time, Continuous Monitoring Platform

- ✓ **Immediate discovery of assets** including mobile, cloud, and virtual systems
- ✓ **Continuous, real-time** vulnerability assessment
- ✓ **Integrated threat detection** and advanced malware analysis, isolation of attack paths
- ✓ **Real-time network monitoring** and anomaly detection
- ✓ **Integrated logging, forensics**, and threat investigation & response
- ✓ **Proactive compliance reporting** and patch auditing

Continuous Monitoring

Vulnerability Management

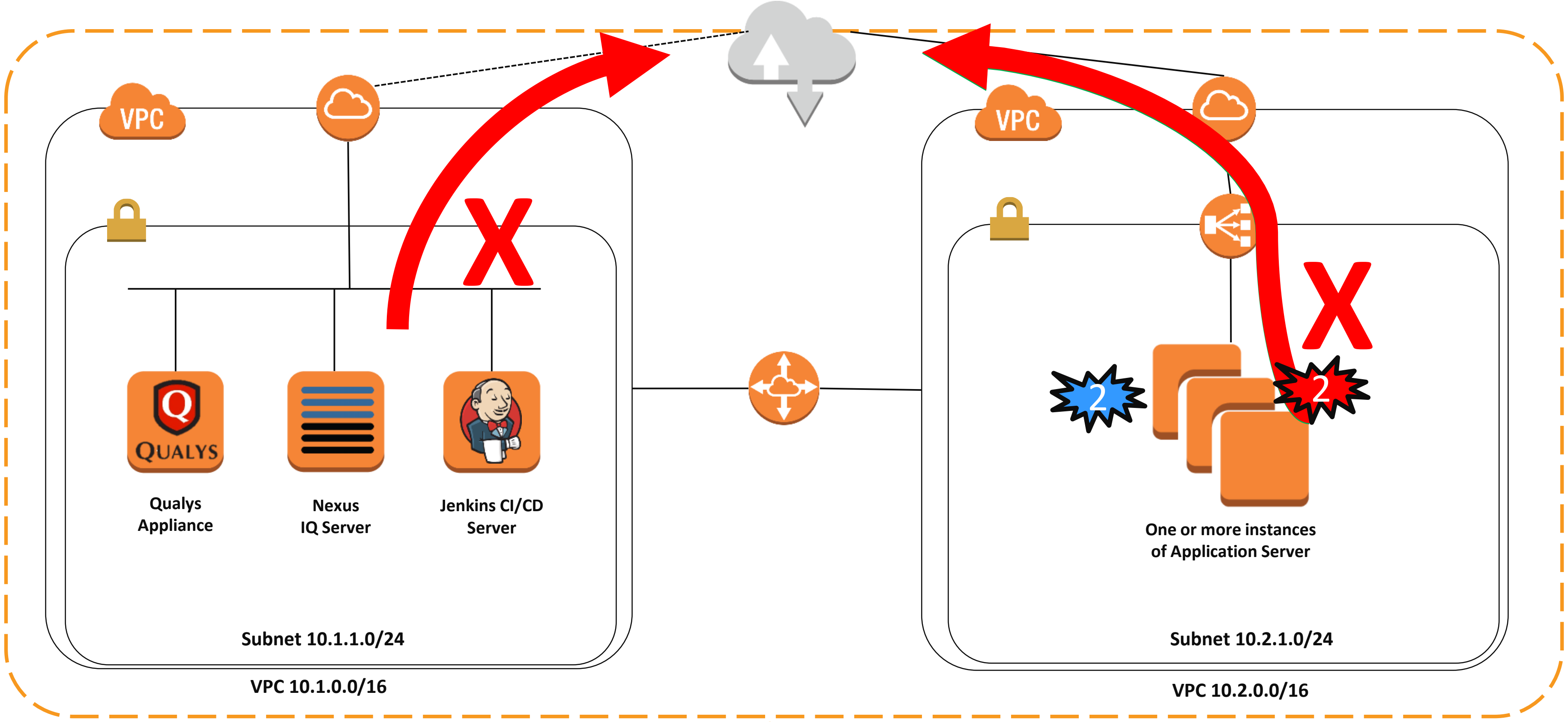
Malware Detection

Compliance & Patch Monitoring

Network Behavioral Analysis

Log Collection & Analysis

https://www.slideshare.net/FrostandSullivan/cutting-edge-approaches-to-vulnerability-management



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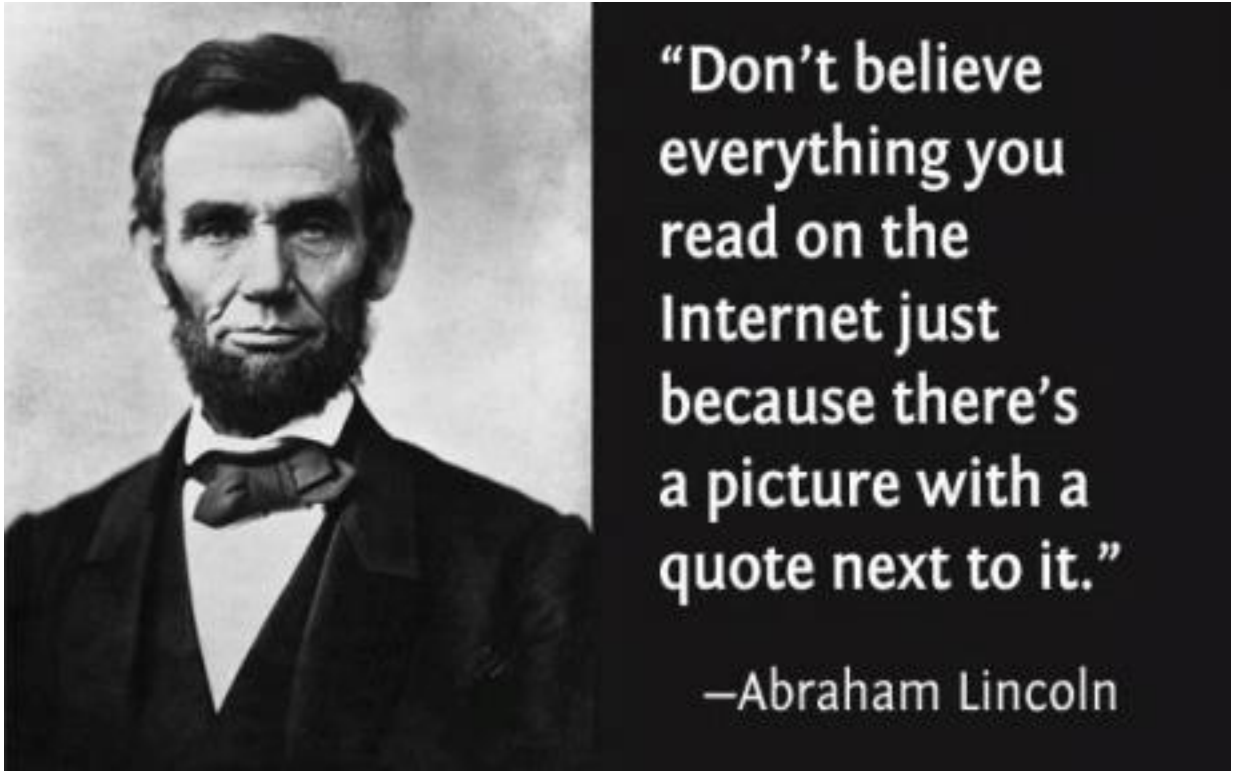
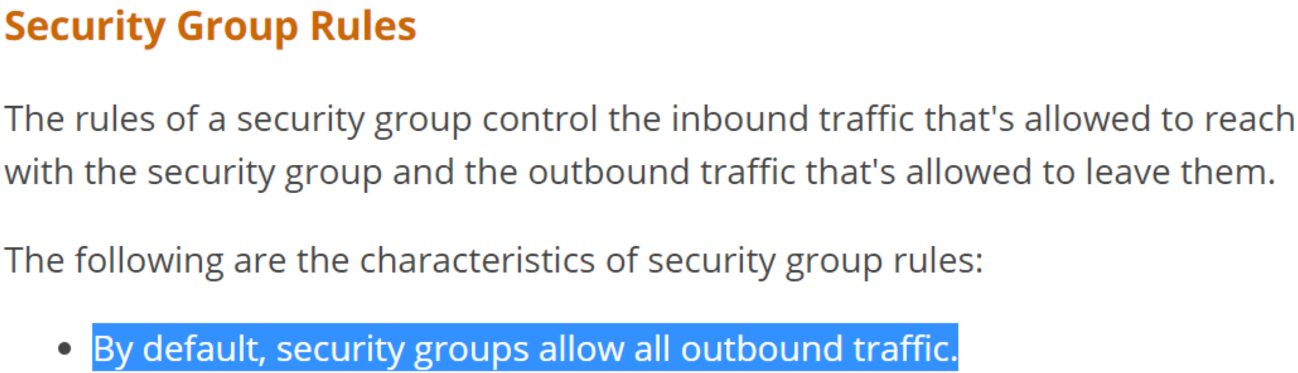


"Don't believe everything you read on the Internet just because there's a picture with a quote next to it."

–Abraham Lincoln

http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/using-network-security.html#vpc-security-groups



Security Group Rules

The rules of a security group control the inbound traffic that's allowed to reach the instances that are associated with the security group and the outbound traffic that's allowed to leave them.

The following are the characteristics of security group rules:

- By default, security groups allow all outbound traffic.

Self Healing

- Lambda Trigger on CloudWatch Event, Re-Set Security Group Rule.
  1. Setup your CloudWatch event
  2. Setup your Lambda function
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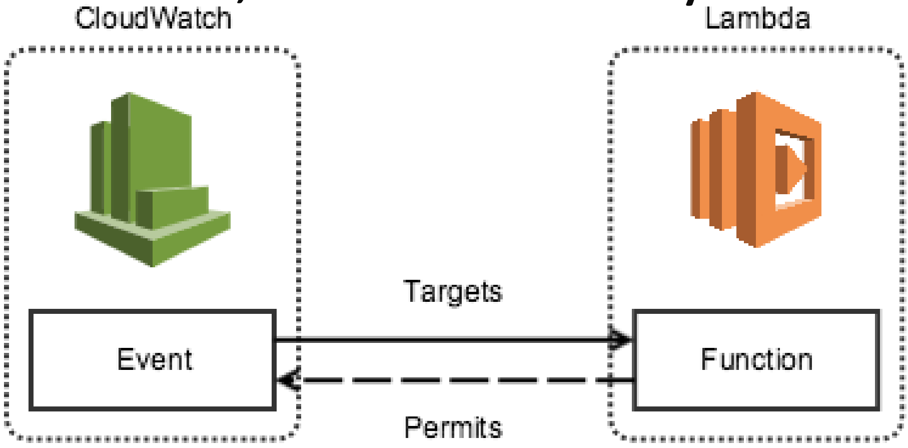


- Commercial Tools – e.g. Dome9, TamperProofing Security Groups.

https://dome9.com/wp-content/uploads/2015/08/Dome9-Securing-AWS-Network-Best-Practices-Webinar-Mar-2015.pdf

Run Time Defence - WAF

Capability	Requirements
WAF's "could" mitigate this attack through Whitelisting *	**But only IF** the rules are set to whitelist valid content types or blacklist Object Graph Navigation Library (OGNL) expressions.
WAF's "could" mitigate this attack through Custom Rules **	**BUT a Custom rule reqd** to block requests that contain invalid Content-Type header values for a specific URL that accepts multipart requests conditions: request.path EQUAL "/struts2-showcase/index.action" request.header "Content-Type" NOT.EQUAL "multipart/form-data"
More Advanced WAFs "could" mitigate this attack through Zero Day Protections ***	Payload analysis on form submissions & API calls.

Run Time Defence - WAF

Capability	Requirements
More Advanced Application Firewalling – RASP ****	• Runtime application self-protection (RASP) • Built into an application • Detect and prevent real-time application attacks • “self-protecting” or reconfiguring automatically without human intervention (on conditions of threats, faults, etc.)

* https://blog.blackducksoftware.com/cve-2017-5638-anatomy-apache-struts-vulnerability

** https://blog.qualys.com/technology/2017/03/09/qualys-waf-2-0-protects-against-critical-apache-struts2-vulnerability-cve-2017-5638

*** https://www.imperva.com/blog/2017/09/apache-struts-rce-and-managing-app-risk/

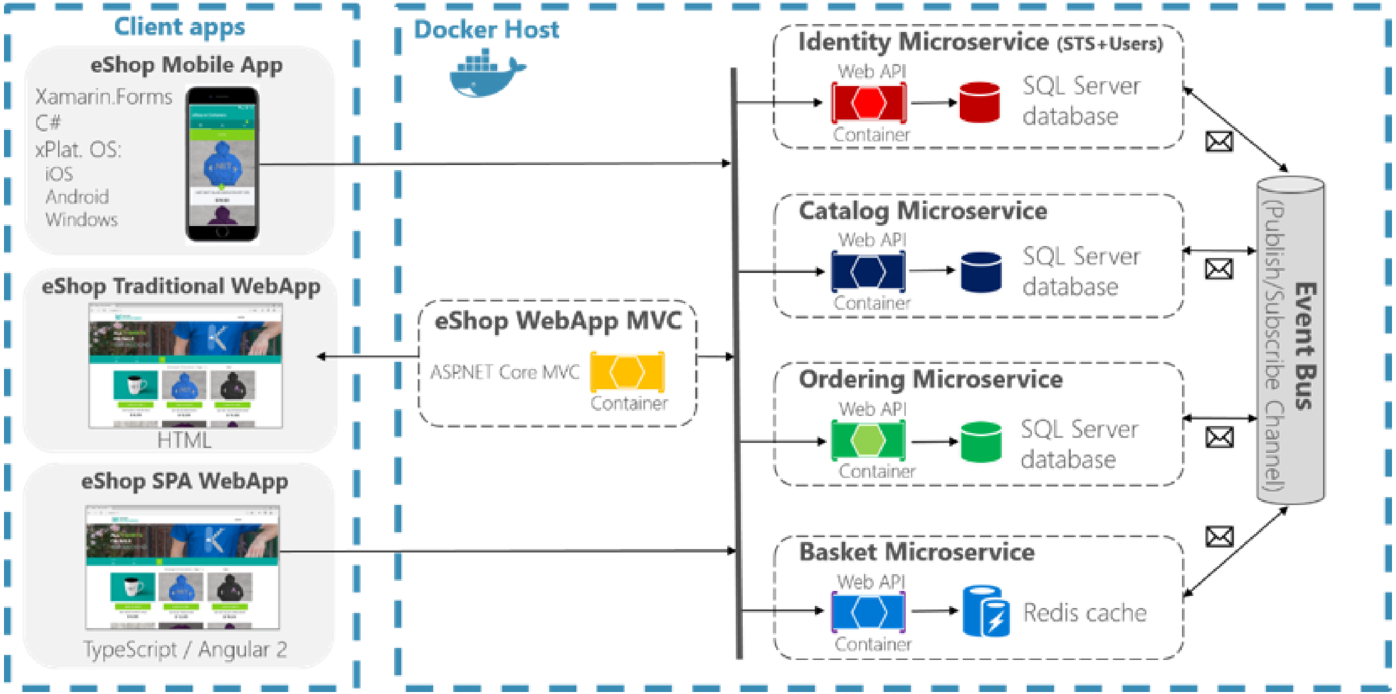
**** https://www.veracode.com/security/runtime-application-self-protection-rasp , https://www.waratek.com/runtime-application-self-protection-rasp/

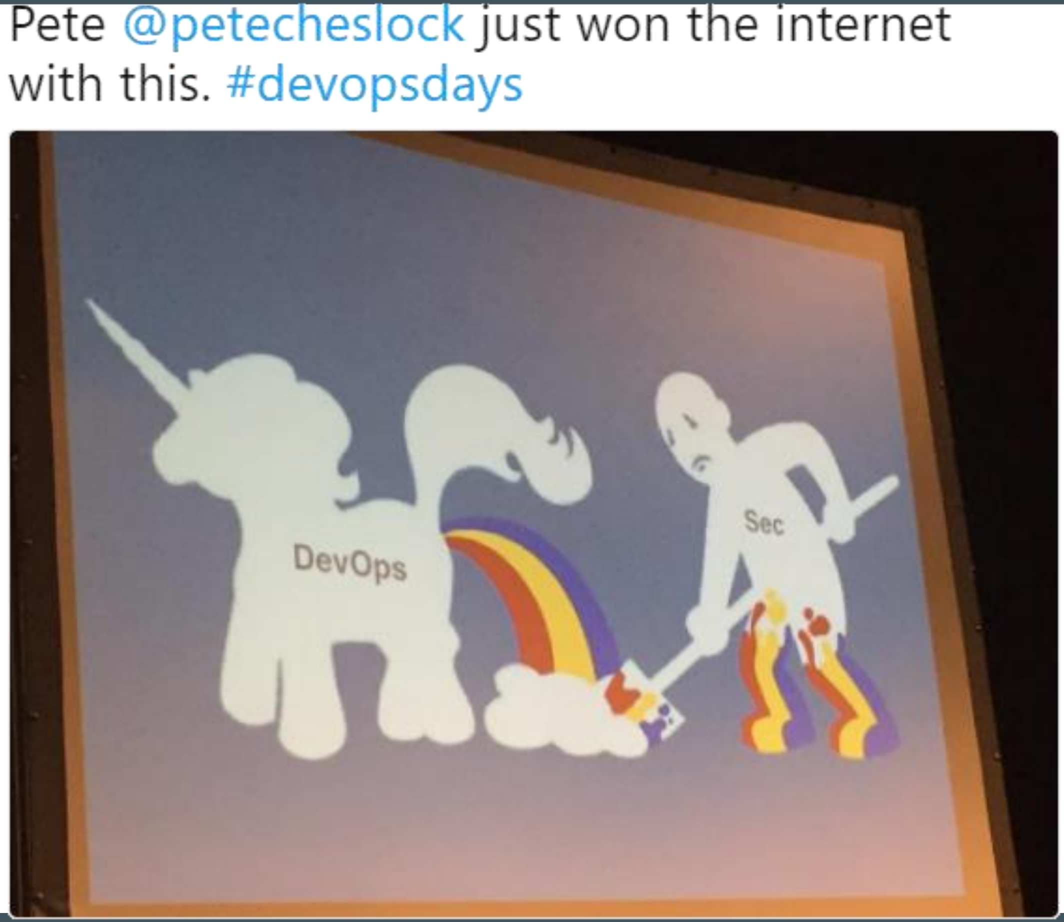
When attackers hack web apps/servers, they want to:

- Get access to sensitive data
- Remain persistent
- Access additional internal resources – Horizontal Attack

“eShopOnContainers” Reference Application

Microservices Architecture

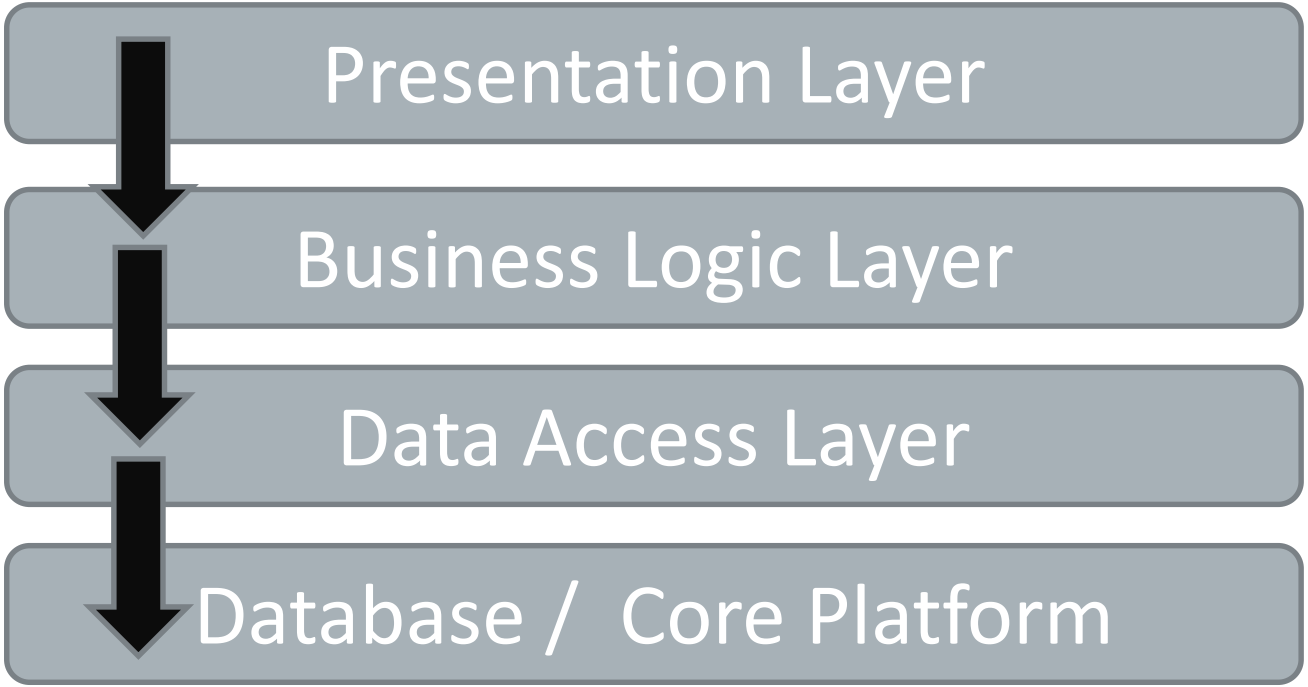




Pete @petecheslock just won the internet with this. #devopsdays

Pre Run Time Defence – Containers

Container Attribute	Defence in Depth
TTL - Containers Don't Live as Long as servers	Affects Persistence of Attack BUT – Permanent storage negates
Isolated from the underlying machine, and from other containers	Increasing difficulty for Pivot Attack BUT – need hardening
Fewer privileges than regular processes	Escape from a container usually involves kernel exploitation (difficult)
Container images can be scanned (before deployment) for known vulns	Quality at Source. *Prevent* images with a vulnerability from being deployed
Supports microservice architecture	Patch, update, redeploy



Presentation Layer

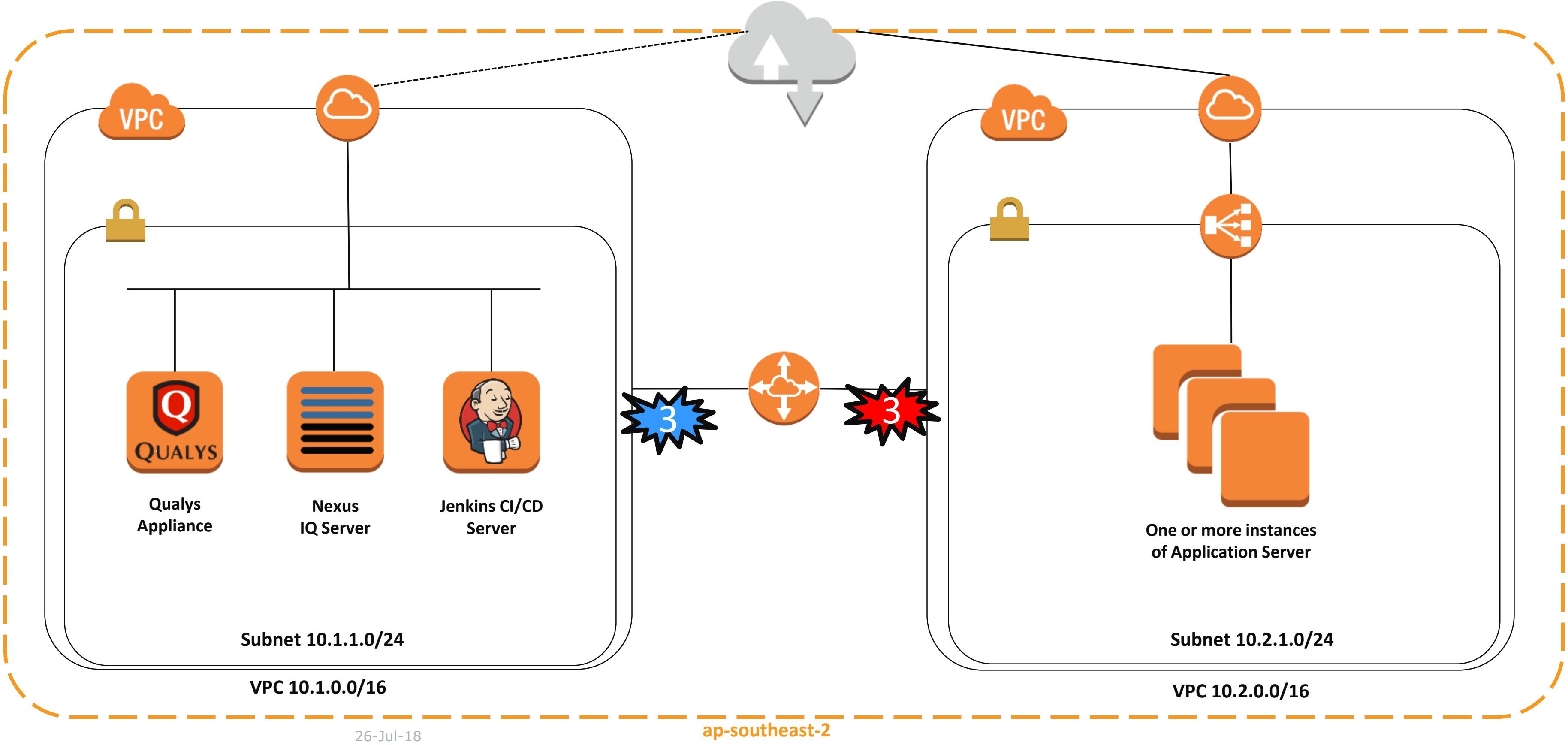
Business Logic Layer

Data Access Layer

Database / Core Platform

Run Time Defence – Container Firewalls

Attribute	Defence in Depth
Attack Window	- before a vulnerability is published - before a patched is available - before you can implement a corrective action
Additional Controls - Container Firewall	- application segmentation - whitelist of allowed container connections - policy for internal applications (web servers) prevent connections to external networks - prohibit direct connections to database/core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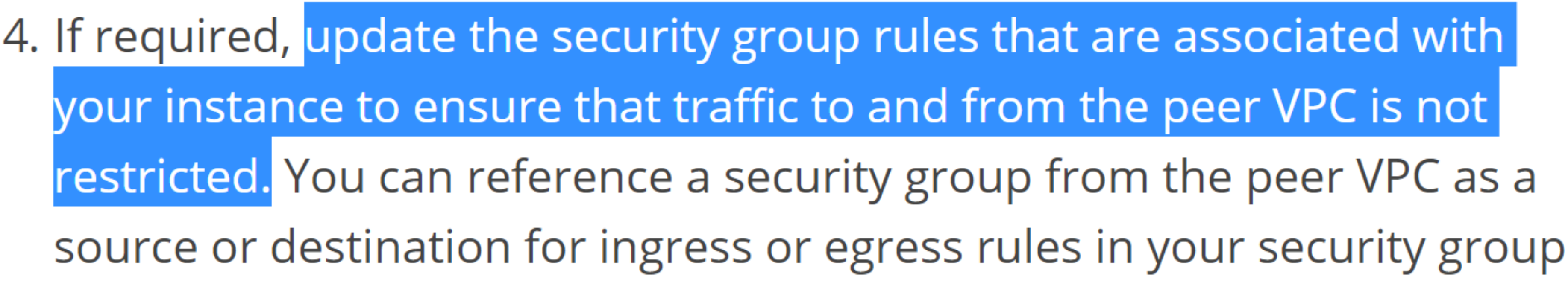
http://docs.aws.amazon.com/AmazonVPC/latest/PeeringGuide/vpc-peering-basics.html



4. If required, update the security group rules that are associated with your instance to ensure that traffic to and from the peer VPC is not restricted. You can reference a security group from the peer VPC as a source or destination for ingress or egress rules in your security group rules.

NO!

Self Healing

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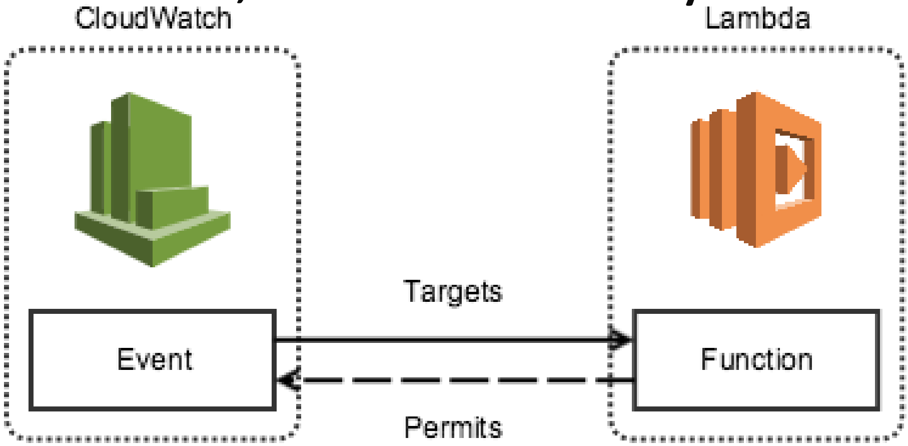

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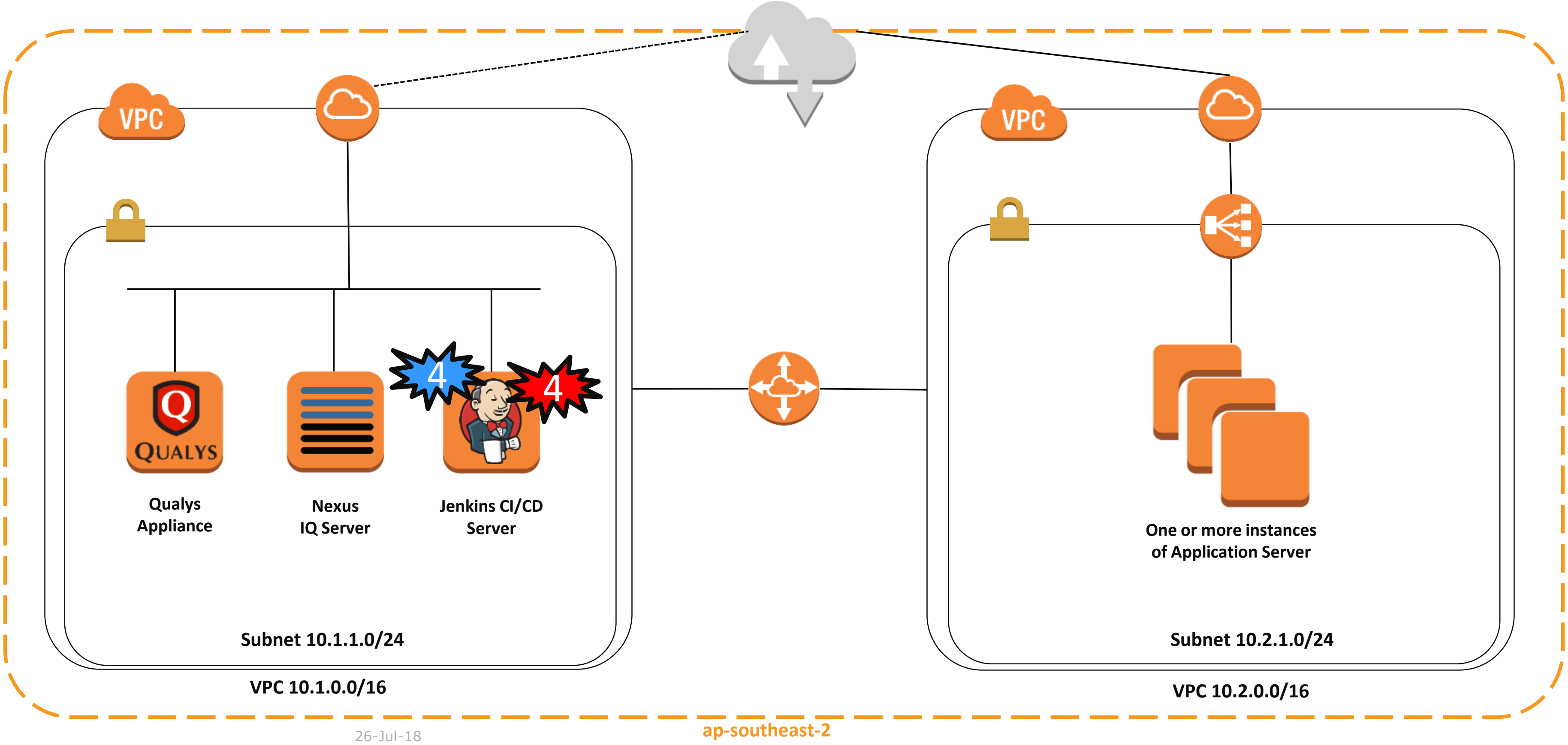
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Self Healing

- Lambda Trigger on CloudWatch Event, Revoke IAM Privileges.

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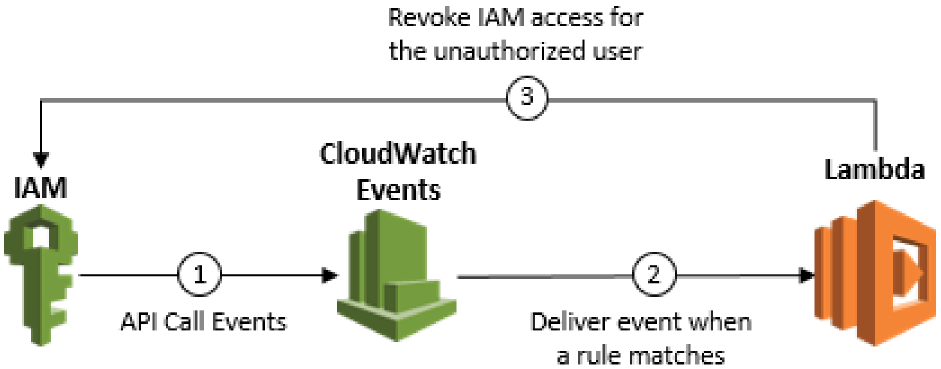
  4. Make the rule target the function


Revoke IAM access for the unauthorized user
3
IAM
CloudWatch Events
Lambda
1
API Call Events
2
Deliver event when a rule matches

https://aws.amazon.com/blogs/security/how-to-detect-and-automatically-revoke-unintended-iam-access-with-amazon-cloudwatch-events/

- Commercial Tools – e.g. Dome9, TamperProofing IAM.

https://go.dome9.com/Whitepaper_RichardStiennon.html

Improved DevOps Architecture Principles ….

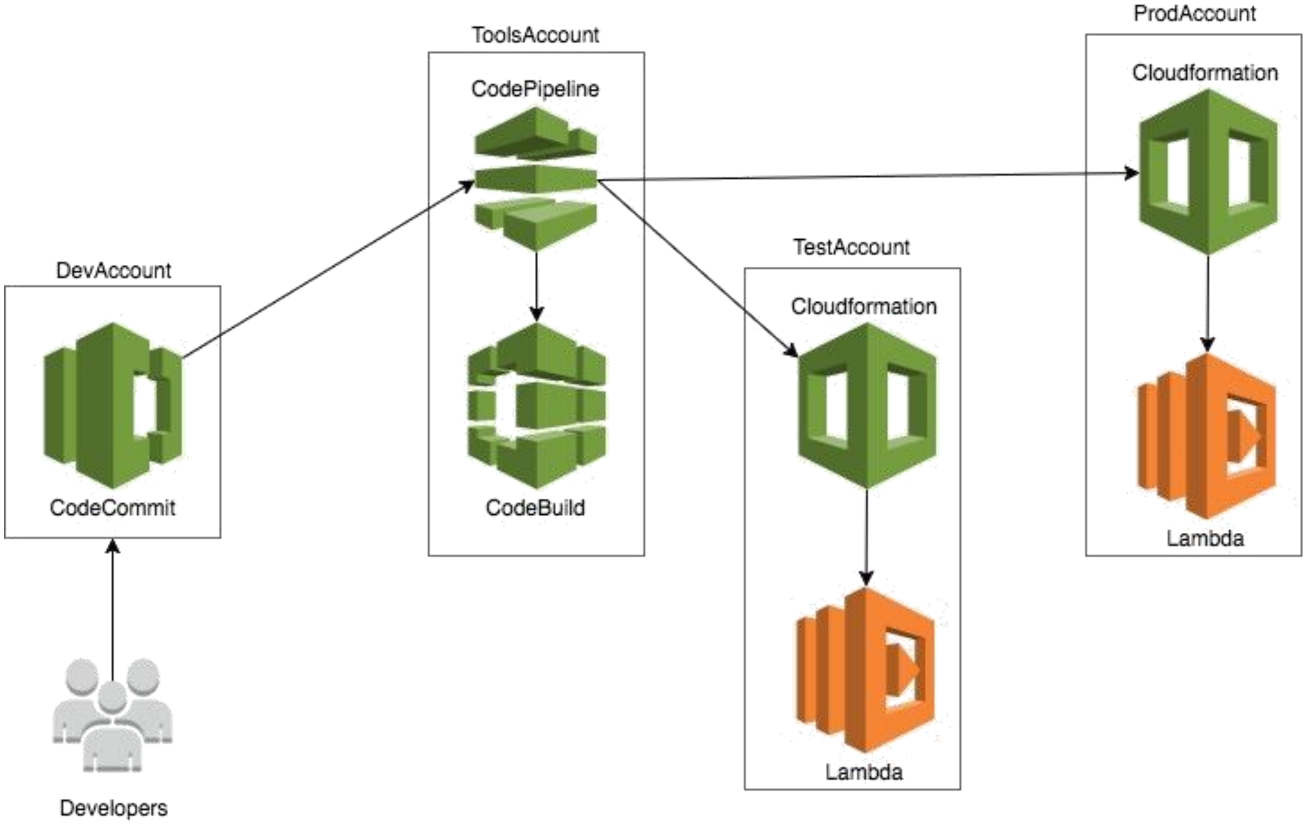
Isolation for Development,

Testing,

Deployment, etc

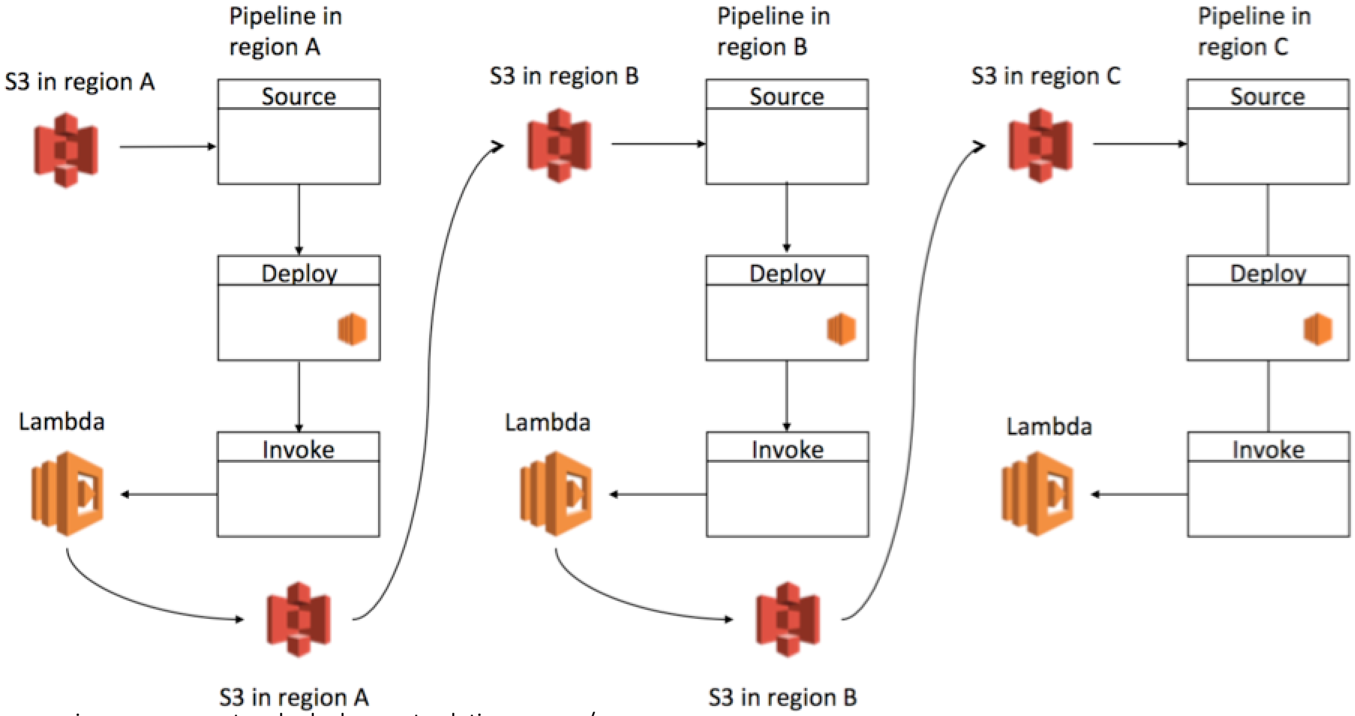
Use Multiple Accounts

Account	RBAC
DevAccount	• Developers check the code into repo • Store all the repositories as a single source of truth for application code. • Developers have full control over this account • Used as a sandbox for developers
ToolsAccount	• Central location for all the tools related to the org, incl CI/CD services • Developers have limited/read-only access in this account • Operations team has more control
TestAccount	• Applications using the CI/CD orchestration for test purposes deployed from this account • Developers & Ops team have limited/read-only access in this account
ProdAccount	• Applications using the CI/CD orchestration tested in the ToolsAccount deployed to production from this account • Developers & Ops team have limited/read-only access in this account



https://aws.amazon.com/blogs/devops/aws-building-a-secure-cross-account-continuous-delivery-pipeline/
https://d0.awsstatic.com/aws-answers/AWS_Multi_Account_Security_Strategy.pdf

A successful processing of source code in all of its AWS CodePipeline stages will invoke a Lambda function as a custom action, which will copy the source code into an S3 bucket in Region B. After the source code is copied into this bucket, it will trigger a similar chain of processes into the different AWS CodePipeline stages in Region B. See the following diagram.



https://aws.amazon.com/blogs/devops/building-a-cross-regioncross-account-code-deployment-solution-on-aws/

Conclusions

- Cloud introduces some (new) challenges
- Common Sense & Reasonable Security Measures Prevail!
- Active Defence and Self-Healing is possible
- Continuous Monitoring can be achieved thru automation
- Common attacks can be defeated with Low/No Cost!
- Crawl, Walk, Run
- Start with the basics, improve configurable settings
- Strive towards more advanced DevOps Deployments with integrated security

Thank You!

info@senseofsecurity.com.au

Security, it's all we do. Knowledge, Experience & Trust.

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