Securing Infrastructure as Code

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About the speakers

Alex Bauert has been working on App Sec for over 15 years in various roles. He has participated in OWASP for 10 yrs and spoken at several OWASP events.

Zoa Buske was a Software Engineer for over 20 years, during which she was a Security advocate in all things. She moved to InfoSec and AppSec a year and a half ago. She has been a local OWASP member since 2013 and has recently joined the leadership team.

Nathan Larson wrote bug-ridden, vulnerable software for two decades before wandering into an OWASP talk and catching the cyber security bug. For the last ten years he's held himself up as an example to developers of what not to do. His favorite AppSec defect is still SQLi.

Agenda

- Immutable infrastructure
- Testing and Validation for IaC
- Fitting IaC into the AppSec Pipeline
- Threats, Vulnerabilities, Remediation
- IaC best practices
- Is it Security Architecture or Secure Coding?

Ground Rules and Expectations

- Interactive
- Share the knowledge/experience
- Presenting base info and Topics
- Did we mention Interactive?
- No Silver Bullets in the presentation

“A computer lets you make more mistakes faster than any other invention with the possible exceptions of handguns and Tequila.”

— Mitch Ratcliffe

Immutable Infrastructure

Mutable Architecture

- Mutable architecture came from time of hardware servers
  - Each server is an individual
  - Difficult and expensive to reproduce and replace
  - All configuration is manual
  - Configuration drift
  - Poorly understood configuration

Immutable Architecture

- Immutable Architecture came with virtualization
  - Simple, Reliable, Consistent
  - All changes to an environment are made in the code
  - Validated and version-controlled images
  - Designed to be unchanged after deployment

Testing and Validation for IaC

Testing and Validation

- Continuously test and monitor your deployments
- Automated Tests checked in with code
- Use Threat Modeling to inform test
- Automate monitoring and alerts

Fitting IaC into the AppSec Pipeline

The Flow

- Infrastructure Design
- Configuration Management
  - Coding
- Change Management
  - Test & Validate
- Deploy infrastructure
- Maintenance
  - Patch

IaC SDLC

Engineers

Repository

CI/CD

Cloud

IaC SDLC with security

Engineers

Repository

CI/CD

Cloud

Security IDE plugin

Template scanner

Cloud Security Posture Management

Ticketing and notification

IaC Best Practices

Best Practices

- Codify everything
- Document nothing
- Use version control
- Test, deploy, monitor
- Embrace Modularity

Codify Everything

- Environment
- Components
- Configuration

Document Nothing

- Code is:
  - Authoritative record
  - Complete
  - Explicit
- No other documentation needed

Use Version Control

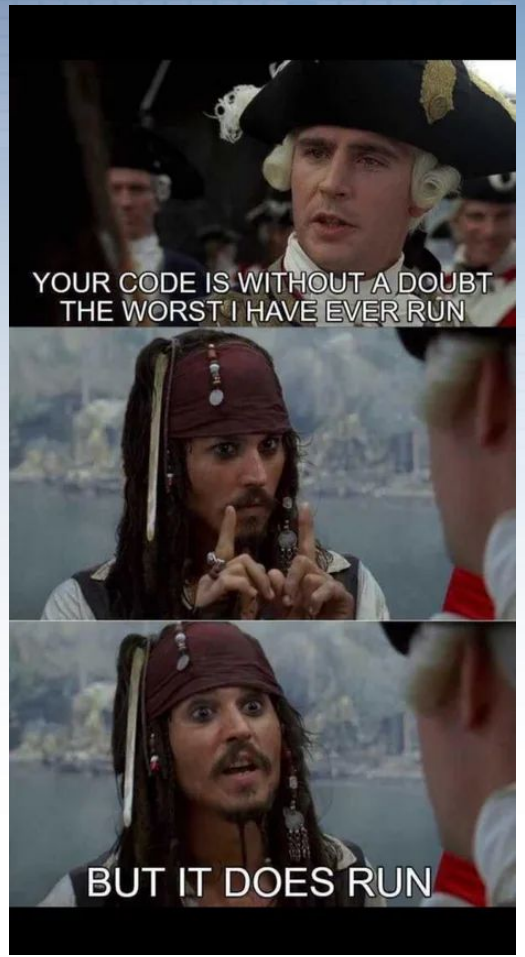
- Protects the code
  - Management
  - Logging
  - Merging
  - Auditable

Test, Deploy, Monitor

- Use the SDLC
  - Test
  - Deploy
  - Monitor
  - Repeat

Embrace Modularity

- Small modules
- Minimize dependencies
- Cohesive
- Better access controls
- Improved debugging



Threats, Vulnerabilities and Remediation, Oh My

OWASP
Open Web Application Security Project

Threats

- The Insider
  - Access to everything
  - Across scale
    - Configuration Management
    - Coding
  - Deploy infrastructure
- Configuration Management
  - Templates - 200k misconfigured with vulnerabilities
    - Palo Alto Paper on Cloud Threats
  - Managing Secrets

Part of Supply Chain

- Configuration Management
  - Coding
- Deploys infrastructure
- Validate before deployment
  - Code Review/Testing
  - Check in
  - Validate configuration items

Perspectives

- Tool chain
  - Configuration Management
  - Coding
  - Deployment
- Process
  - Pipeline
  - Logical Access Management
  - Maintaining/Validating the Configuration Templates

Top 10 Findings in CloudFormation

Policy Name	Misconfigured %
Amazon RDS event subscription disabled for DB security groups	99.00%
AWS Access logging not enabled on S3 buckets	55.33%
AWS S3 buckets do not have server-side encryption	48.46%
AWS security group allows traffic from blocked ports	16.96%
AWS (virtual private cloud) VPC subnets should not allow automatic public IP assignment	6.74%
Amazon RDS instance with Multi-Availability Zone disabled	43.56%
AWS S3 buckets are accessible to the public	13.22%
Amazon RDS instance is not encrypted	41.66%
Amazon RDS instance with copy tags to snapshots disabled	41.11%
AWS ECS task definition readonlyRootFilesystem not enabled	86.39%

**From the Palo Alto Cloud Threat Report - Spring 2020*

Top 10 Findings in Terraform

Policy Name	Misconfigured %
AWS Security Groups allow internet traffic to SSH port (22)	26.61%
AWS EC2 instance have SSH port open to the internet	26.61%
AWS Security Group allows traffic from blocked ports	26.38%
AWS Security Groups with Inbound rule overly permissive to All Traffic	17.92%
AWS Access logging not enabled on S3 buckets	66.58%
AWS S3 object versioning is disabled	51.60%
Amazon RDS event subscription disabled for DB security groups	99.57%
Storage Accounts without Secure transfer enabled	97.56%
Amazon RDS snapshots are accessible to the public	79.16%
AWS ECS task definition execution IAM role not found	70.57%

**From the Palo Alto Cloud Threat Report - Spring 2020*

Flow

- Configuration Management
- Coding
- Change Management - Approval
- Test & Validate
- Deploy infrastructure
- Maintenance
  - Patch
  - Update configuration

Prevent-Detect

Having a process

- Design is a prerequisite
  - Contextualized Requirements
- Coding & Templates
  - Adding the testing to the cycle
- Test & Validate
  - Code
  - Configuration values

Is it Security Architecture or Secure Coding?

Discussion

References

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