AWSGoat : A Damn Vulnerable AWS Infrastructure

About Us

Jeswin Mathai

- Chief Architect, Lab Platform @ INE
- Published Research at Black Hat US/Asia Arsenal, DEF CON USA/China Demolabs
- Gave research talk at DEF CON China and Rootcon Philippines
- Co-Trainer in Training:
    - Black Hat Asia, US
    - HITB AMS, GSEC
    - Rootcon 13,16
    - NZ OWASP day

About Us

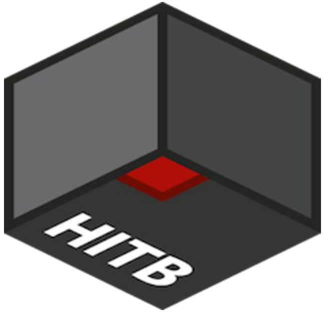
Shantanu Kale

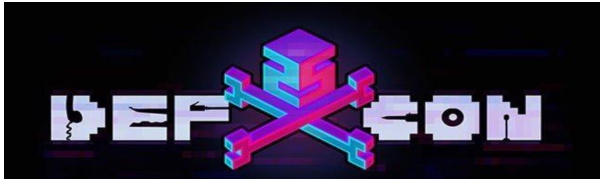
- Cloud Developer @ INE
- Published Research at Black Hat US/Asia Arsenal and DEFCON 30 DemoLabs
- Co-trainer in training at Seasides Goa, Rootcon 16
- Strong roots in cloud and network penetration testing, vulnerability scanning, and Open Source Intelligence Techniques

Sanjeev Mahunta

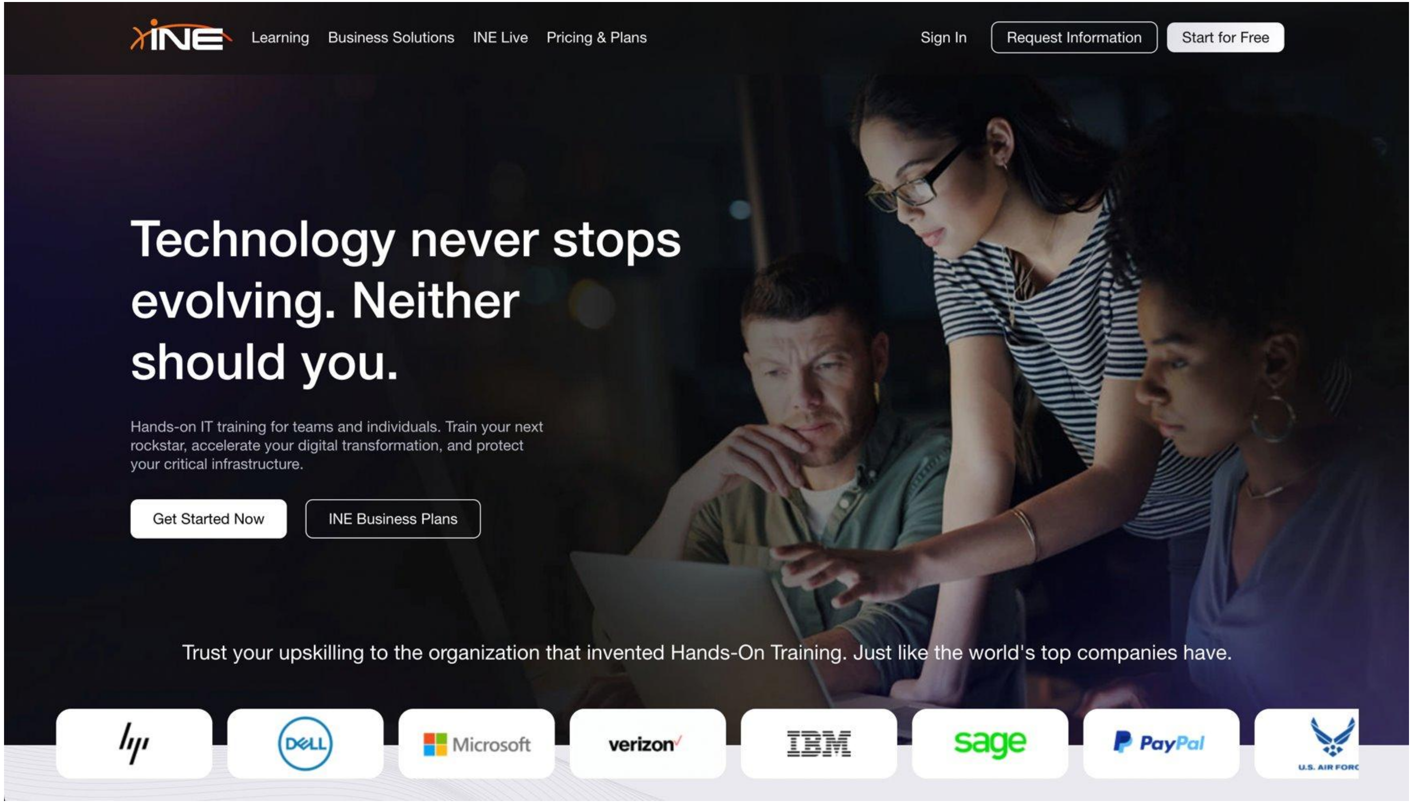
- Cloud Software Engineer @ INE
- Published research at Blackhat US Arsenal, DEF CON USA Demolabs.
- Co-trainer in training at Rootcon 16
- 2+ years of experience building front-end applications for the web and implementing ERP solutions
- Interned at Defence Research and Development Organisation (DRDO)

Conferences





About INE



Technology never stops evolving. Neither should you.

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The Motivation

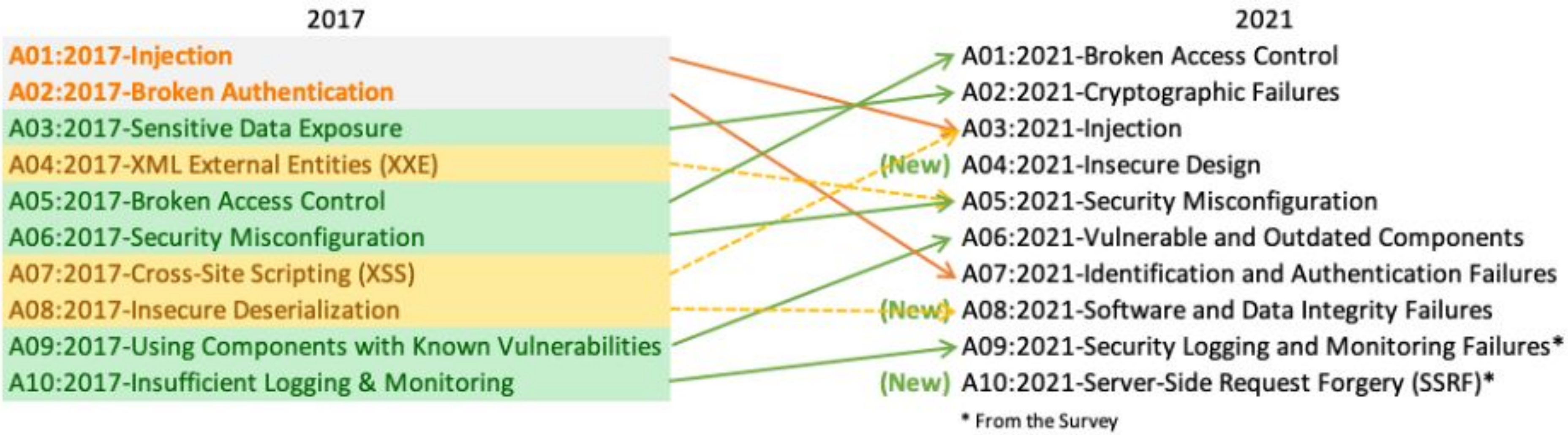
- Training Needs
  - Basics and Fundamentals
  - Enumeration techniques
  - Abusing IAM, S3, API Gateway Misconfigurations
  - Attack vectors on Lambda and EC2
  - What Next?
- Lack of Real World AWS Pentesting Environment
- Contribution from the open source community and security professionals
- Release of OWASP Top 10: 2021

Enter AWSGoat!

AWSGoat : A Damn Vulnerable AWS Infrastructure

- Mimics real-world infrastructure but with added vulnerabilities
- Multiple application stacks - Multiple exploitation/escalation paths
- Features OWASP Top 10: 2021
- Focused on Black-box approach
- Still in early stage
  - Module 1 : Blog Application
  - Module 2 : HR Application
- Co-exist with other projects

OWASP Top 2021



2017

- A01:2017-Injection
- A02:2017-Broken Authentication
- A03:2017-Sensitive Data Exposure
- A04:2017-XML External Entities (XXE)
- A05:2017-Broken Access Control
- A06:2017-Security Misconfiguration
- A07:2017-Cross-Site Scripting (XSS)
- A08:2017-Insecure Deserialization
- A09:2017-Using Components with Known Vulnerabilities
- A10:2017-Insufficient Logging & Monitoring

2021

- A01:2021-Broken Access Control
- A02:2021-Cryptographic Failures
- A03:2021-Injection
- (New) A04:2021-Insecure Design
- A05:2021-Security Misconfiguration
- A06:2021-Vulnerable and Outdated Components
- A07:2021-Identification and Authentication Failures
- (New) A08:2021-Software and Data Integrity Failures
- A09:2021-Security Logging and Monitoring Failures*
- (New) A10:2021-Server-Side Request Forgery (SSRF)*

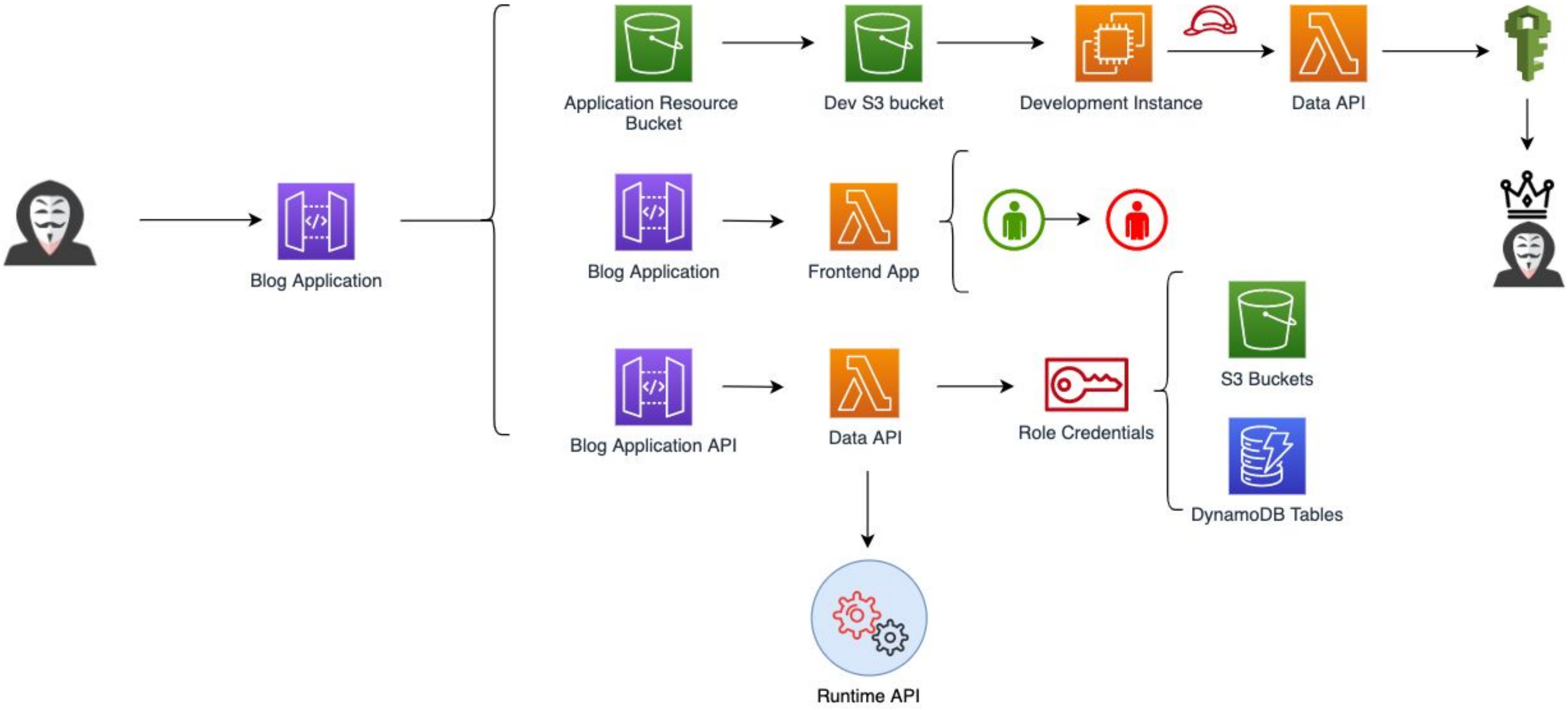
* From the Survey

Image Reference: https://owasp.org/www-project-top-ten/

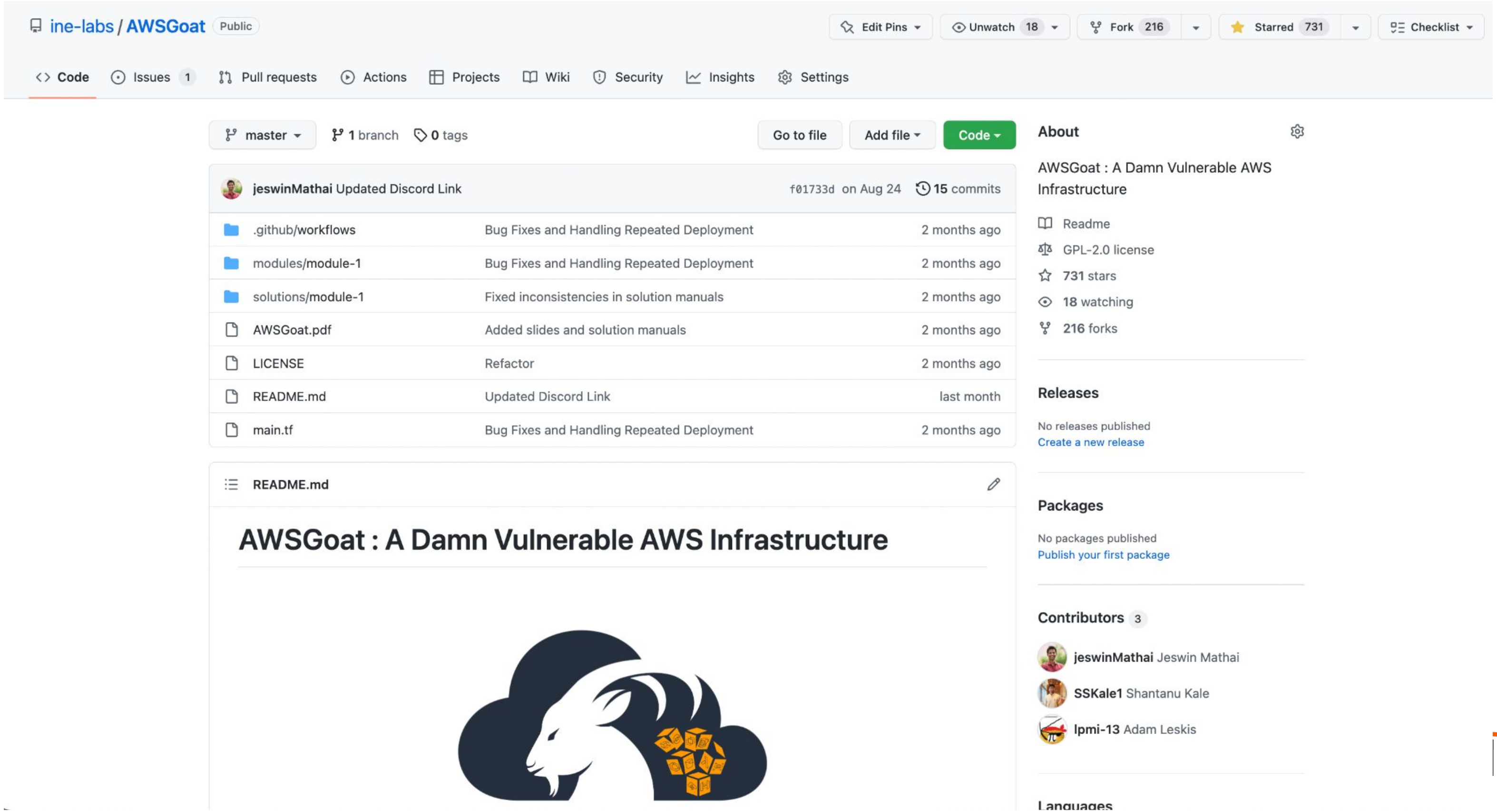
AWSGoat : Module 1 (Blog Application)

- A01: Broken Access Control
- A02: Cryptographic Failure
- A03: Injection
- A04: Insecure Design
- A05: Security Misconfiguration
- A07: Identification and Authentication Failures
- A10: Server Side Request Forgery

AWSGoat : Module 1 (Blog Application)



AWSGoat : Module 1 (Blog Application)



jeswinMathai Updated Discord Link f01733d on Aug 24 15 commits

.github/workflows	Bug Fixes and Handling Repeated Deployment	2 months ago
modules/module-1	Bug Fixes and Handling Repeated Deployment	2 months ago
solutions/module-1	Fixed inconsistencies in solution manuals	2 months ago
AWSGoat.pdf	Added slides and solution manuals	2 months ago
LICENSE	Refactor	2 months ago
README.md	Updated Discord Link	last month
main.tf	Bug Fixes and Handling Repeated Deployment	2 months ago

README.md

AWSGoat : A Damn Vulnerable AWS Infrastructure

About

AWSGoat : A Damn Vulnerable AWS Infrastructure

Readme

GPL-2.0 license

731 stars

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216 forks

Releases

No releases published

Create a new release

Packages

No packages published

Publish your first package

Contributors 3

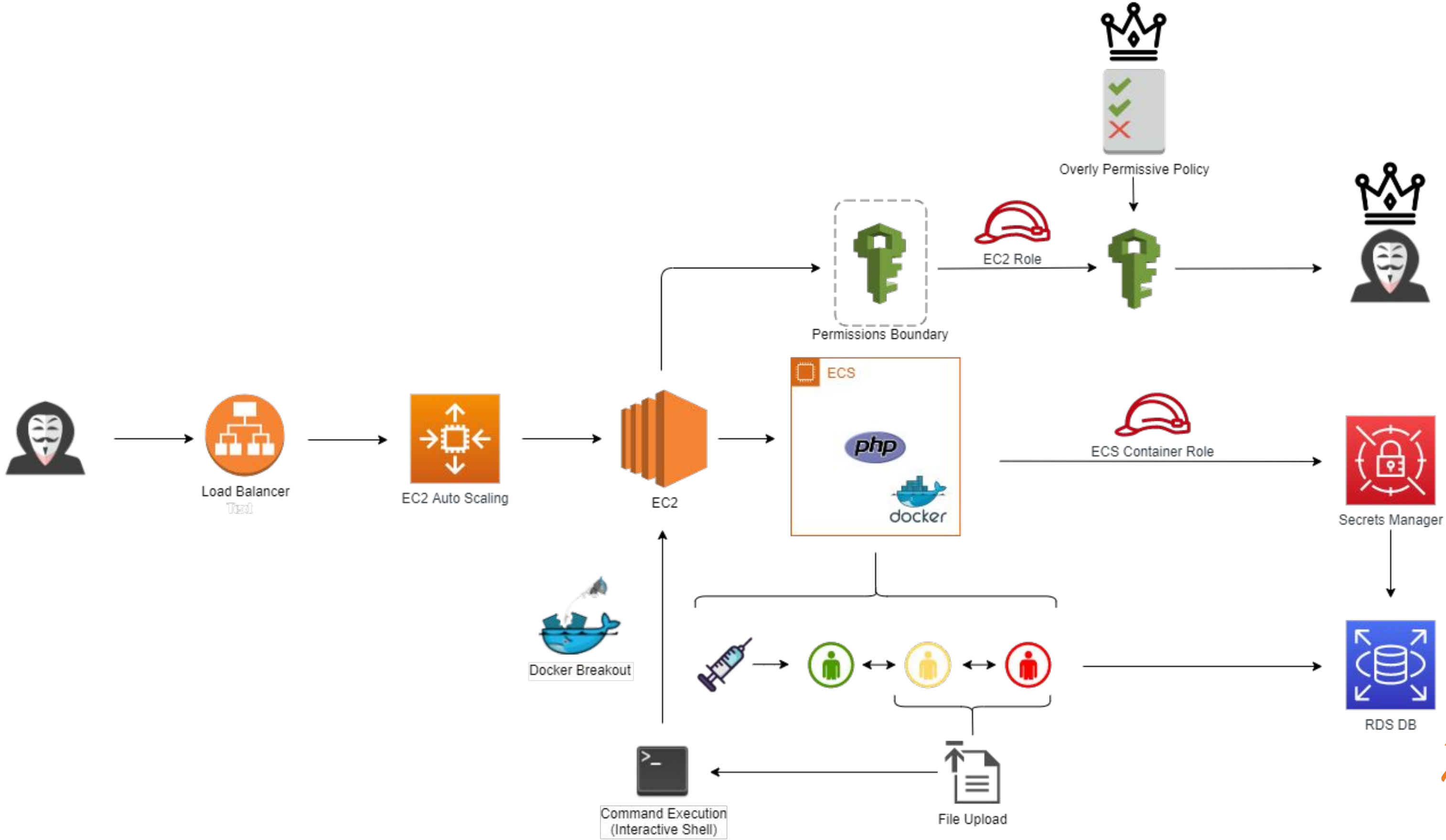
jeswinMathai Jeswin Mathai

SSKale1 Shantanu Kale

lpmi-13 Adam Leskis

Languages

AWSGoat : Module 2 (HR Application)



Building Realistic Insecure Application : Challenges

- Security Professional vs Seasoned Developers
- Mimicking Development Process
- Multiple Developer Environments
- Fast paced development.
- Lack of secure code practices

Goat Family

Installation

- Repository: https://github.com/ine-labs/AWSGoat

- Using GitHub Actions
  - Fork the repository
  - Configure Credentials in GitHub Secrets
  - Run the “terraform apply” workflow

- Manual Installation (Linux Machine)
  - Requirements
    - AWS CLI
    - Terraform
    - Python
    - Git
  - Commands:
    - aws configure
    - git clone https://github.com/ine-labs/AWSGoat
    - terraform init
    - terraform apply

Attacking the Application

- XSS
- SQL Injection
- Insecure Direct Object Reference
- Server Side Request Forgery
- Sensitive Data Exposure and Password Reset
- S3 Misconfiguration
- IAM Privilege Escalation

Lambda Environment : Role

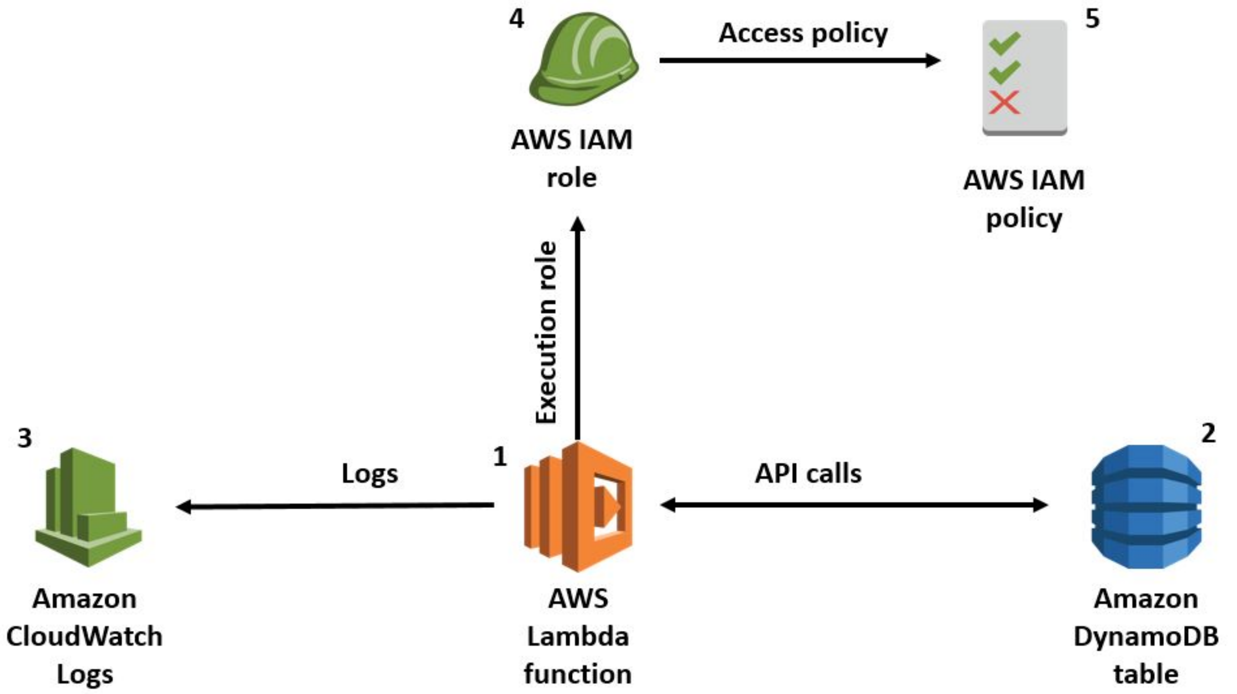
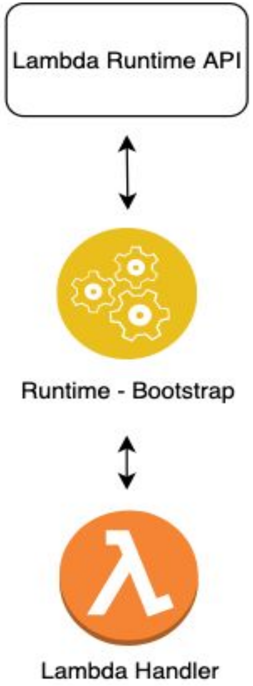


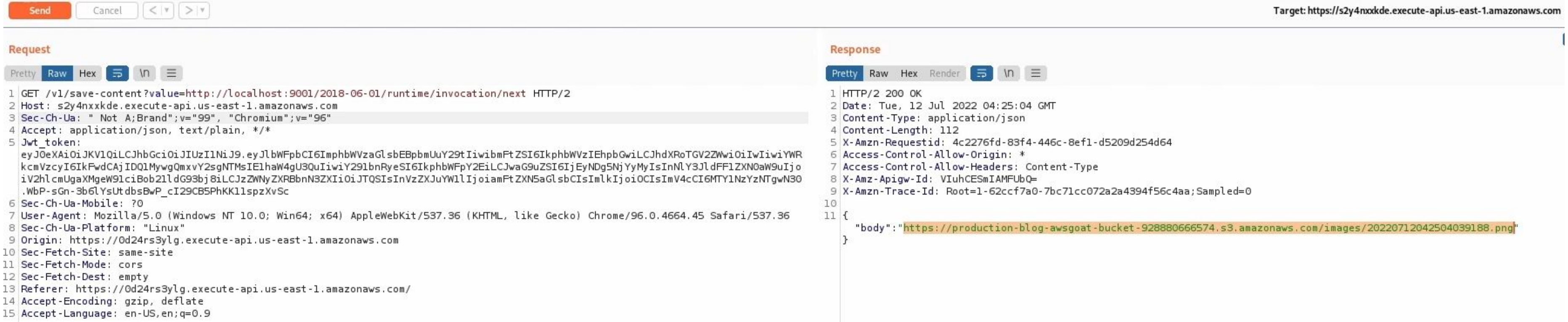
Image Source: https://aws.amazon.com/blogs/security/how-to-create-an-aws-iam-policy-to-grant-aws-lambda-access-to-an-amazon-dynamodb-table/

Server Side Request Forgery

- Interacting with the Lambda Runtime API
- Reading the source code of the application
- Reading the environment variables
    - Enumerate and attack other AWS Resources
    - Escalate Privileges
- Enumerate other applications/instances in the VPC



Server Side Request Forgery



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Host: s2y4nxxkde.execute-api.us-east-1.amazonaws.com
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Accept: application/json, text/plain, */*
Jwt_token:
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Sec-Fetch-Mode: cors
Sec-Fetch-Dest: empty
Referer: https://0d24rs3ylg.execute-api.us-east-1.amazonaws.com/
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Accept-Language: en-US,en;q=0.9
```

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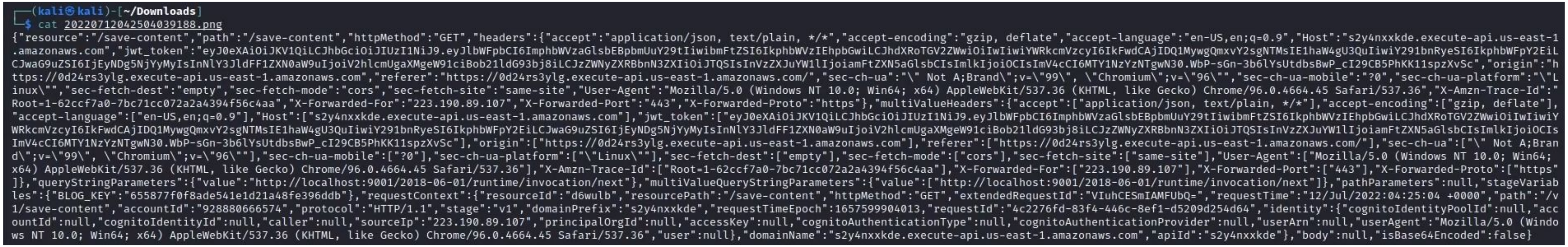

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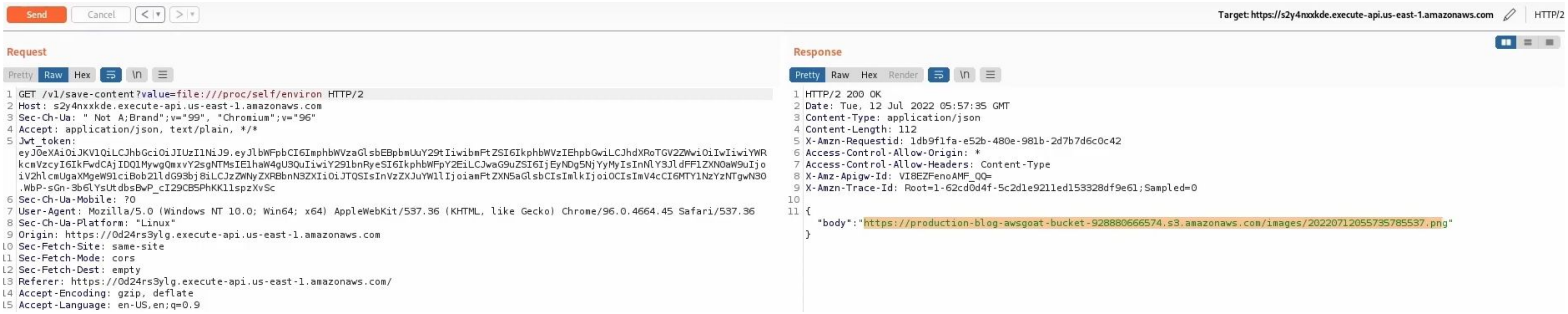
Server Side Request Forgery



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Sec-Ch-Ua: " Not A;Brand";v="99", "Chromium";v="96"
Accept: application/json, text/plain, */*
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Sec-Fetch-Mode: cors
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Referer: https://0d24rs3ylg.execute-api.us-east-1.amazonaws.com/
Accept-Encoding: gzip, deflate
Accept-Language: en-US,en;q=0.9
```

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Date: Tue, 12 Jul 2022 05:57:35 GMT
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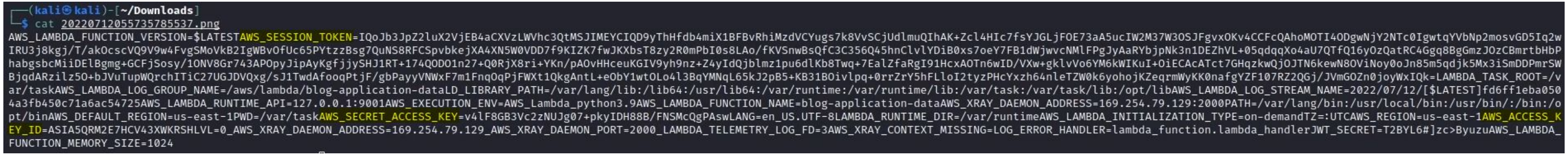

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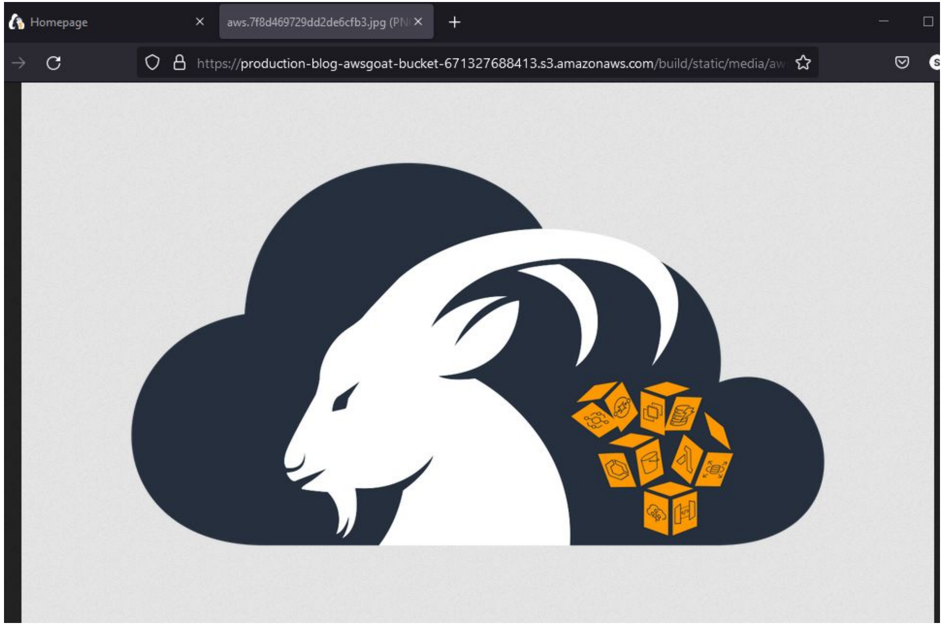
Hunting S3 buckets

- Globally unique
- Company-wide naming practices
- Predictable names - based on departments/applications
- Misconfigured Policy - plethora of information
- Tool: https://github.com/jordanpotti/AWSBucketDump

Image Source: https://threatpost.com/leaky-amazon-s3-buckets-expose-data-of-netflix-td-bank/146084/

Hunting S3 buckets



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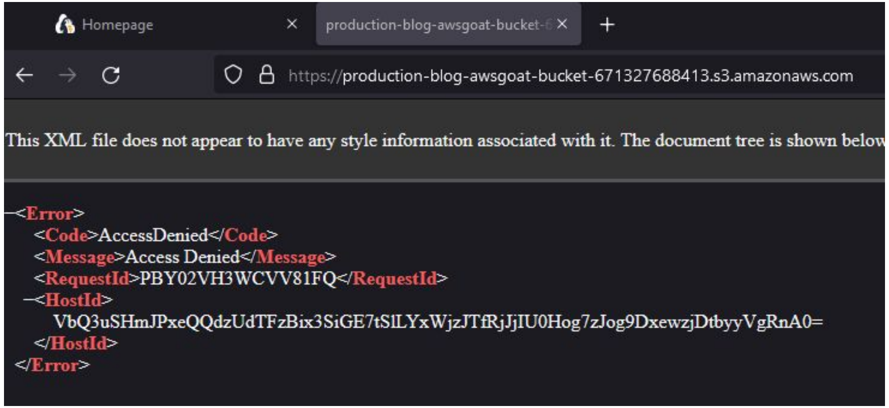
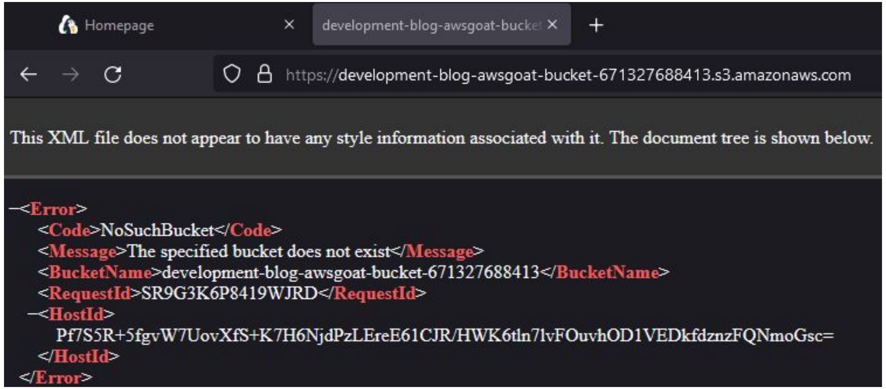


https://production-blog-awsgoat-bucket-671327688413.s3.amazonaws.com

This XML file does not appear to have any style information associated with it. The document tree is shown below

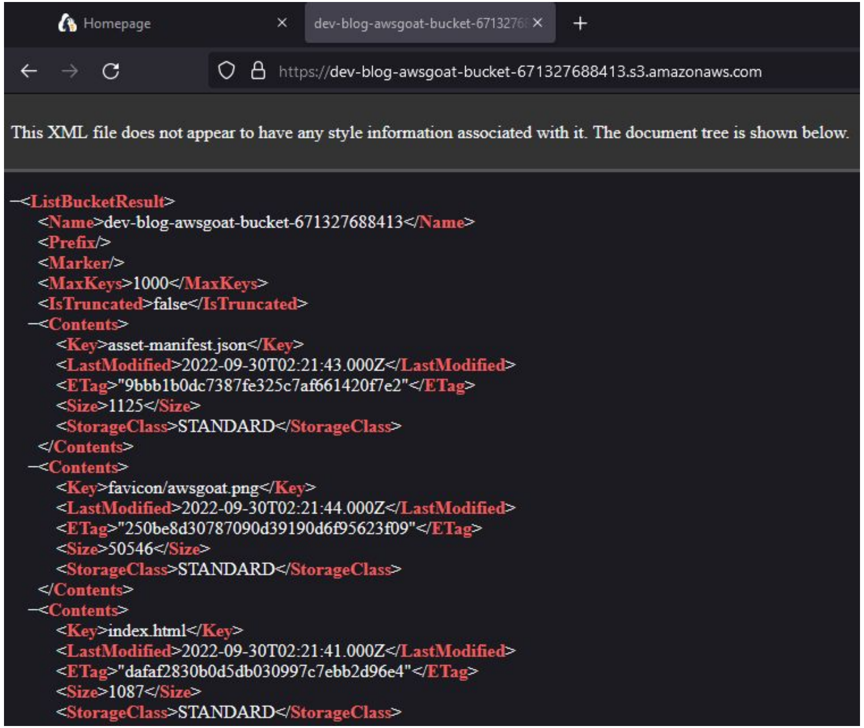
```
-<Error>
   <Code>AccessDenied</Code>
   <Message>Access Denied</Message>
   <RequestId>PBY02VH3WCVV81FQ</RequestId>
  -<HostId>
     VbQ3uSHmJPxeQQdzUdTFzBix3SiGE7tSlLYxWjzJTfRjJjIU0Hog7zJog9DxewzjDtbyyVgRnA0=
   </HostId>
 </Error>
```

Hunting S3 buckets


Homepage
development-blog-awsgoat-bucke
https://development-blog-awsgoat-bucket-671327688413.s3.amazonaws.com

This XML file does not appear to have any style information associated with it. The document tree is shown below.

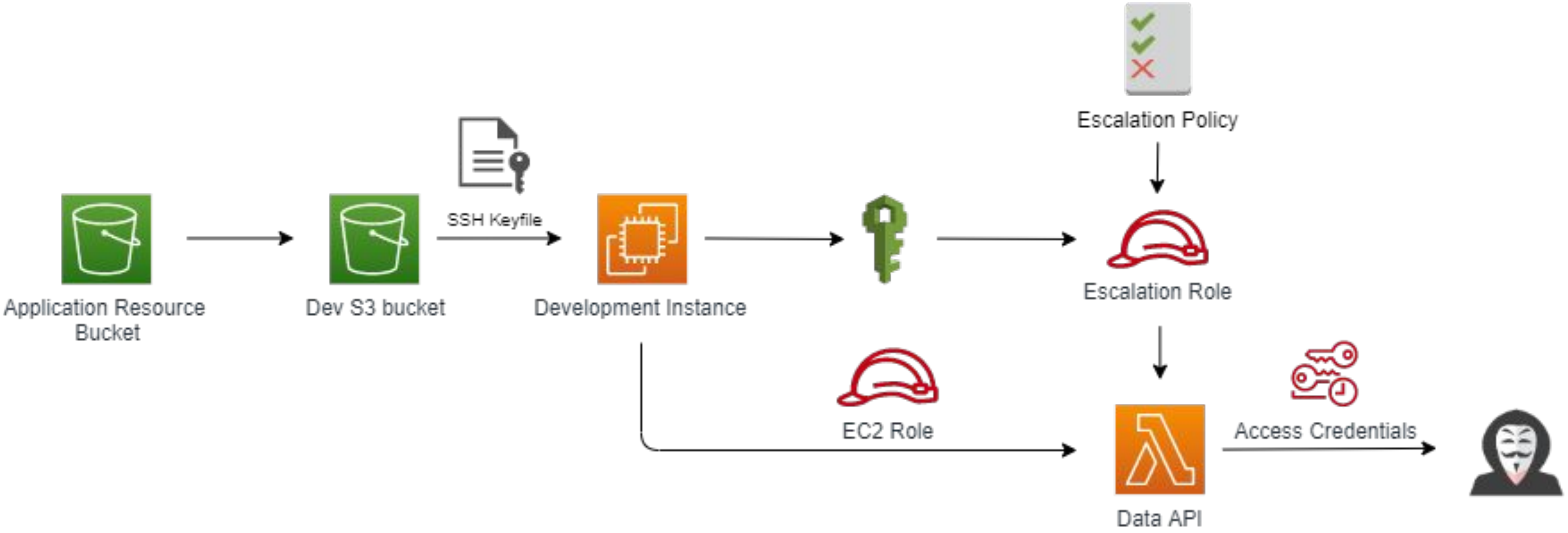
```
–<Error>
   <Code>NoSuchBucket</Code>
   <Message>The specified bucket does not exist</Message>
   <BucketName>development-blog-awsgoat-bucket-671327688413</BucketName>
   <RequestId>SR9G3K6P8419WJRD</RequestId>
  –<HostId>
     Pf7S5R+5fgvW7UovXfS+K7H6NjdPzLEreE61CJR/HWK6tln7lvFOuvhOD1VEDkfdznzFQNmoGsc=
   </HostId>
 </Error>
```


Homepage
dev-blog-awsgoat-bucket-6713276
https://dev-blog-awsgoat-bucket-671327688413.s3.amazonaws.com

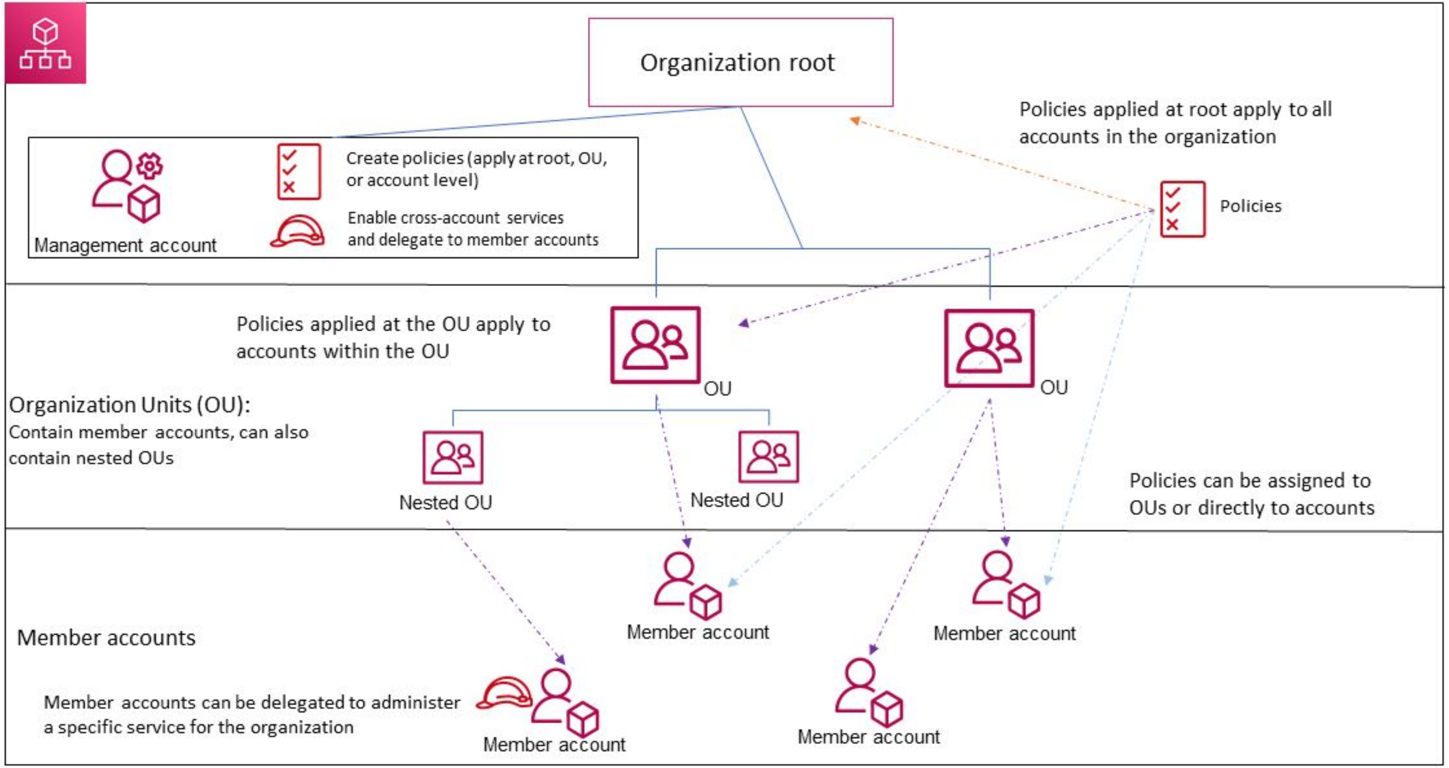
This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
–<ListBucketResult>
   <Name>dev-blog-awsgoat-bucket-671327688413</Name>
   <Prefix/>
   <Marker/>
   <MaxKeys>1000</MaxKeys>
   <IsTruncated>false</IsTruncated>
  –<Contents>
     <Key>asset-manifest.json</Key>
     <LastModified>2022-09-30T02:21:43.000Z</LastModified>
     <ETag>"9bbb1b0dc7387fe325c7af661420f7e2"</ETag>
     <Size>1125</Size>
     <StorageClass>STANDARD</StorageClass>
   </Contents>
  –<Contents>
     <Key>favicon/awsgoat.png</Key>
     <LastModified>2022-09-30T02:21:44.000Z</LastModified>
     <ETag>"250be8d30787090d39190d6f95623f09"</ETag>
     <Size>50546</Size>
     <StorageClass>STANDARD</StorageClass>
   </Contents>
  –<Contents>
     <Key>index.html</Key>
     <LastModified>2022-09-30T02:21:41.000Z</LastModified>
     <ETag>"dafaf2830b0d5db030997c7ebb2d96e4"</ETag>
     <Size>1087</Size>
     <StorageClass>STANDARD</StorageClass>
```

AWSGoat IAM Escalation



Future Plans: Multiple Applications across Multiple Accounts



Organization root

Management account

Create policies (apply at root, OU, or account level)

Enable cross-account services and delegate to member accounts

Policies applied at root apply to all accounts in the organization

Policies

Policies applied at the OU apply to accounts within the OU

Organization Units (OU):
Contain member accounts, can also contain nested OUs

Policies can be assigned to OUs or directly to accounts

Member accounts

Member accounts can be delegated to administer a specific service for the organization

Future Plans

- More modules: EKS and Elastic Beanstalk
- Multi account infrastructure
- Working with the community
- IaC Misconfigurations
- Secure coding/deployment practices

Elastic Container Kubernetes

Elastic Beanstalk

Config

GuardDuty

Cloudtrail

Macie

HashiCorp Terraform

INE

Thank you!

jmathai@ine.com