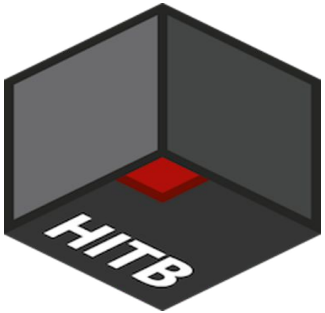
AWSGoat : A Damn Vulnerable AWS Infrastructure

About Me

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, HITB AMS, GSEC NZ OWASP day, Rootcon 13

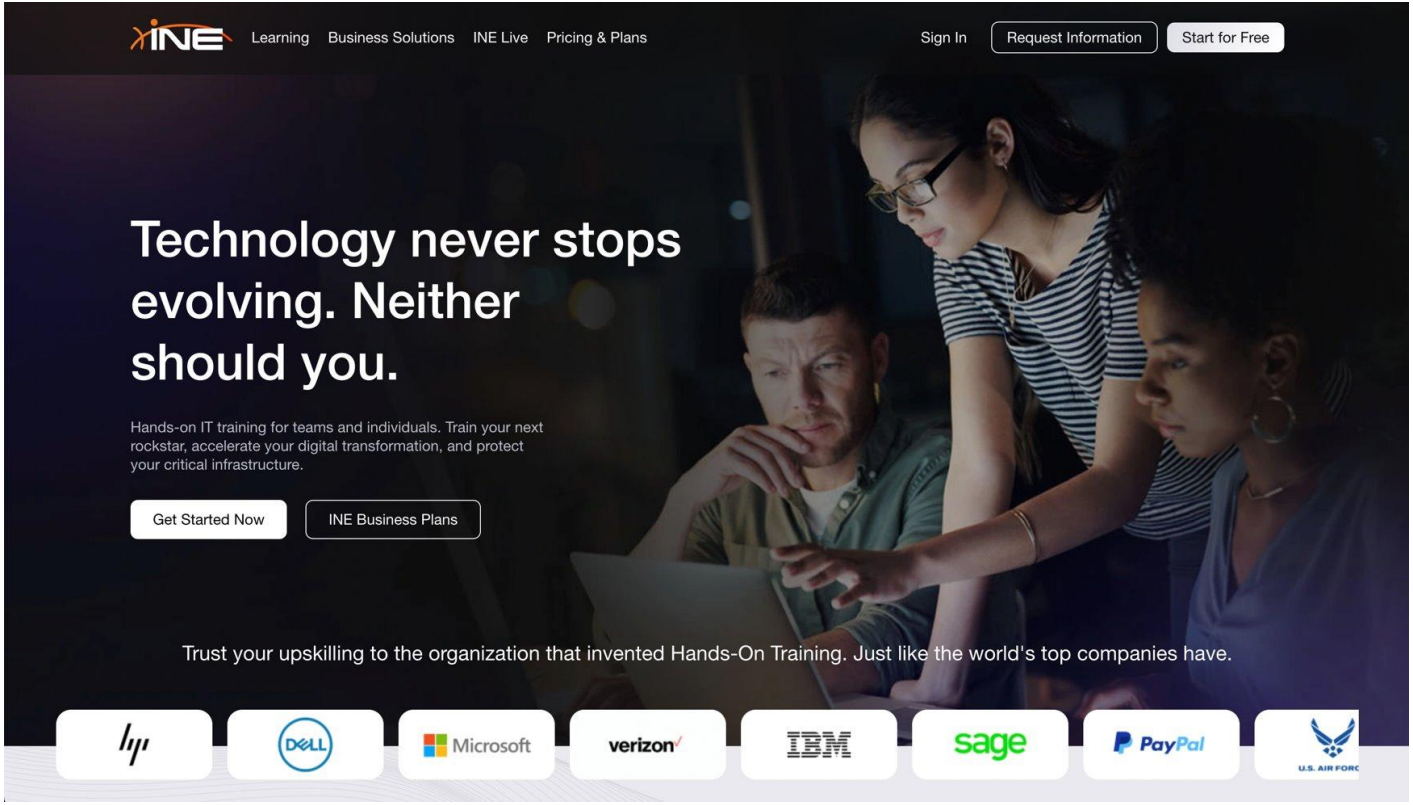
Conferences



Team Members

- **Nishant Sharma,** Director, Lab Platform
- **Sanjeev Mahunta**, Software Engineer (Cloud)
- **Shantanu Kale**, Software Engineer (Cloud)

About INE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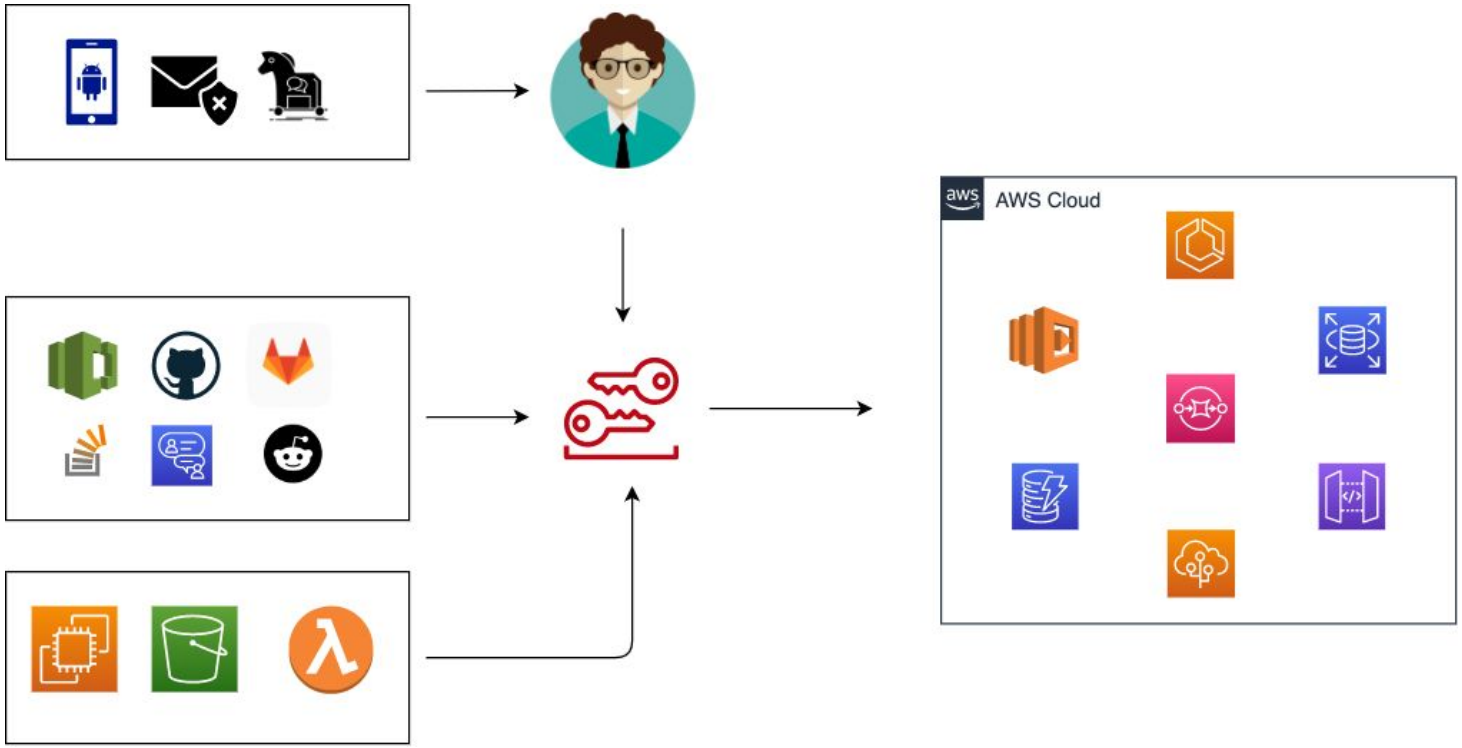
Threatscape

Threatscape



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

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Introducing AWSGoat!

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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 (Will be released post BlackHat US)
- Co-exist with other projects

AWSGoat

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OWASP Top 2021

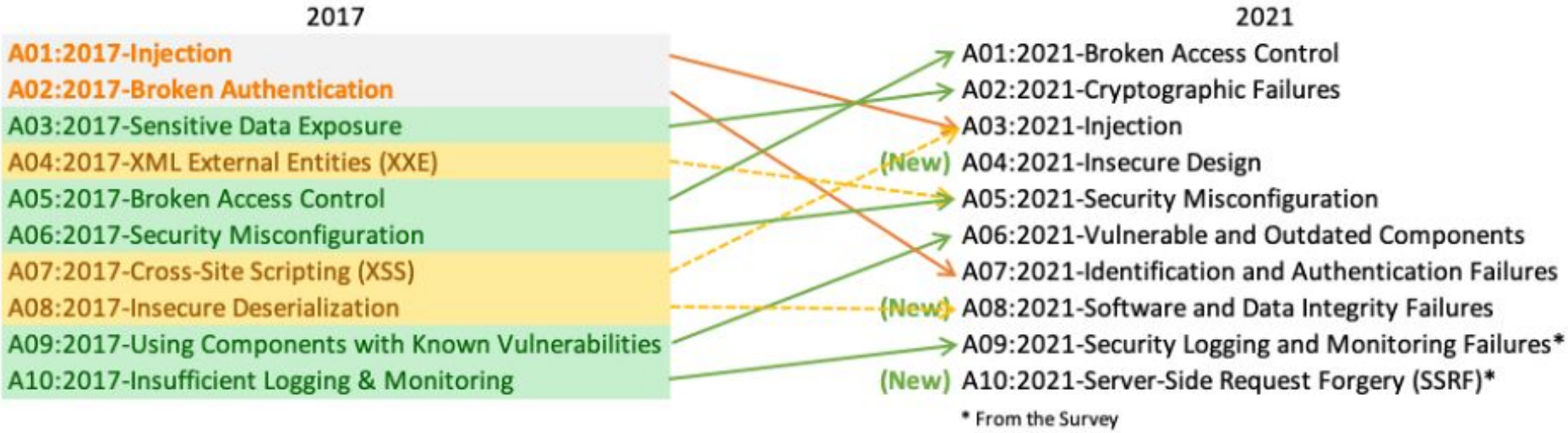
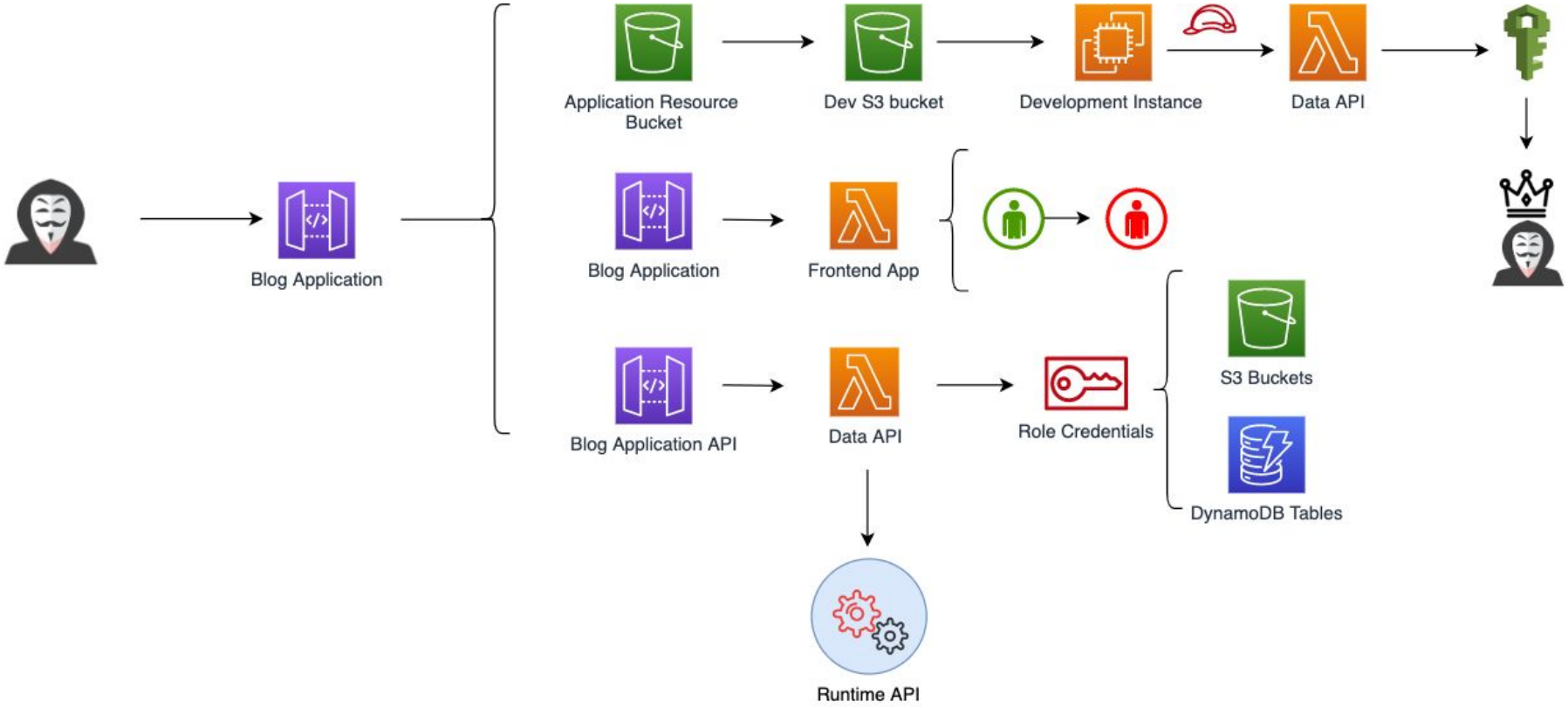


Image Reference: https://owasp.org/www-project-top-ten/

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)



Building Realistic Insecure Application : Challenges

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

Project Family

Installation

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

- Using GitHub Actions
  - Configure Credentials in GitHub Secrets
  - Run the “deploy” 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

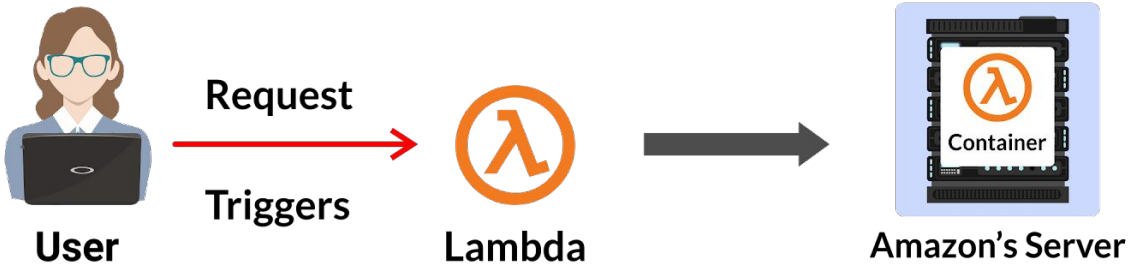
Exploring AWSGoat

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 : Overview

- Function Code
- Highly Scalable
- Underlying servers are managed by AWS



Lambda Environment : Overview

Lambda Environment : Role

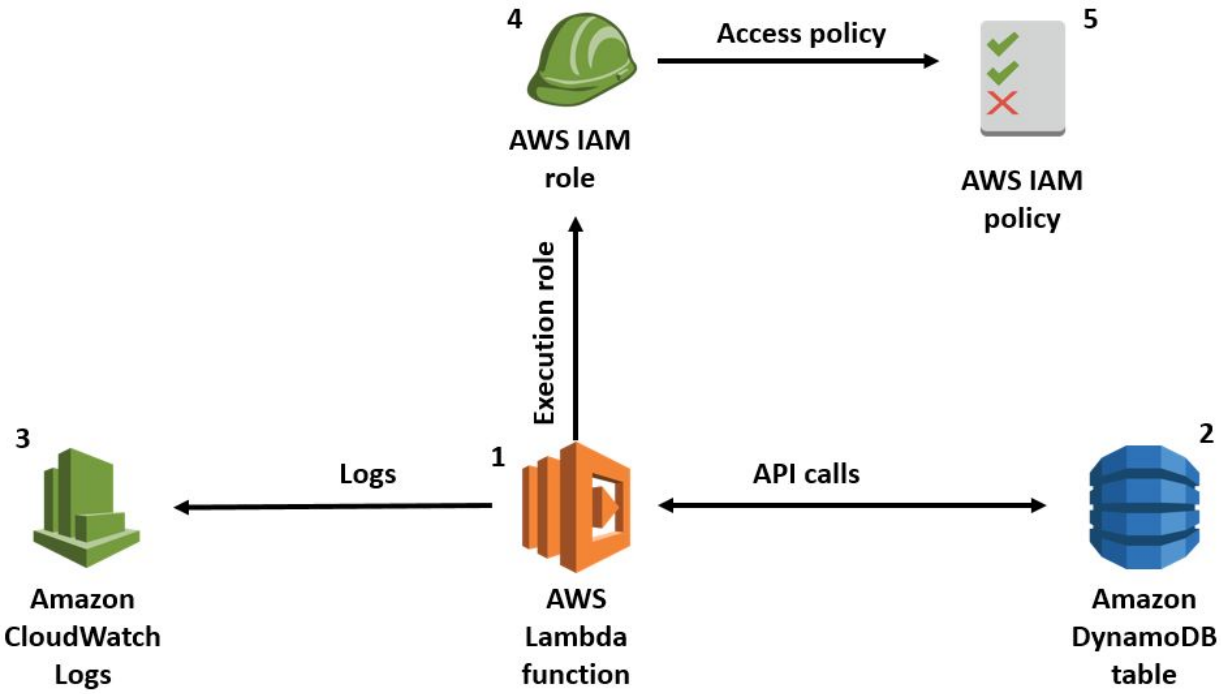


Image Source: https://aws.amazon.com/blogs/security/how-to-create-an-aws-iam-policy-to-grant-aws-lambda-access-to-an-amazon-dynamodb-table/

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

API Gateway

- Service Endpoints
  - protocol://service-code.region-code.amazonaws.com
  - e.g: https://dynamodb.us-west-2.amazonaws.com/

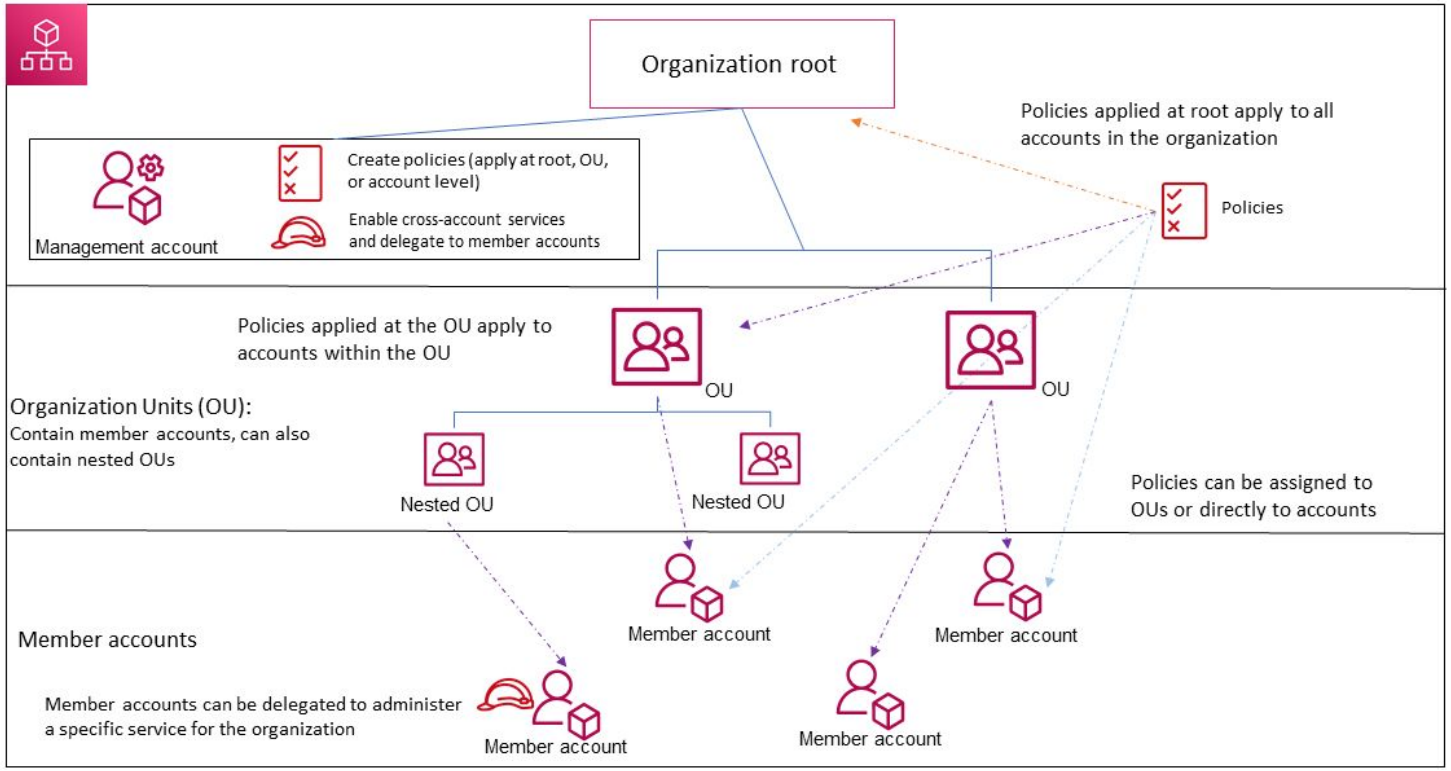
- https://{restapi_id}.execute-api.{region}.amazonaws.com/{stage_name}/
  - https://0od87ivnul.execute-api.us-east-1.amazonaws.com/dev/

- https://{restapi_id}.execute-api.{region}.amazonaws.com/{stage_name}/{resource_name}/
  - https://0od87ivnul.execute-api.us-east-1.amazonaws.com/dev/list

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

Future Plans: Multiple Applications across Multiple Accounts



Future Plans

- More modules: EC2, EKS and Elastic Beanstalk
- Multi account infrastructure
- Working with the community
- IaC Misconfigurations
- Secure coding/deployment practices

Thank you!

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