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SESSION ID:

CSV-W14 - BUILDING AND ADOPTING A CLOUD-NATIVE SECURITY PROGRAM

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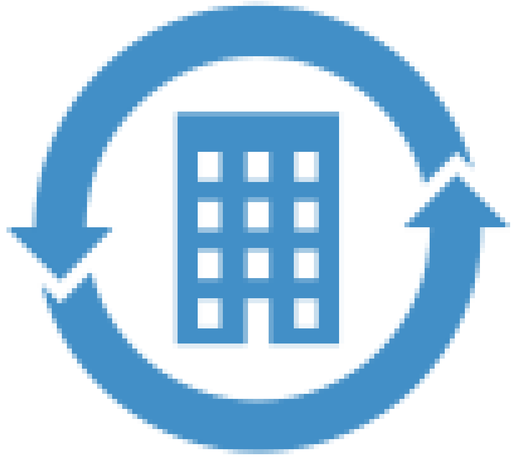
Our Plan

- Show you how to build your program from scratch
  - And bridge existing capabilities
- Highlight fundamental differences of cloud
- Show you what's real
  - We've done this… all of it. None of this is theory
- From architecture and strategy to key controls areas

STRATEGY

Cloud Native == NOT.Legacy

OR



You build it from scratch

Redesign without compromise

Building the cloud-native mindset

Cloud is:

- Developer Driven
- Volatile
- Abstracted
- Ephemeral
- Automated
- Massively Scalable

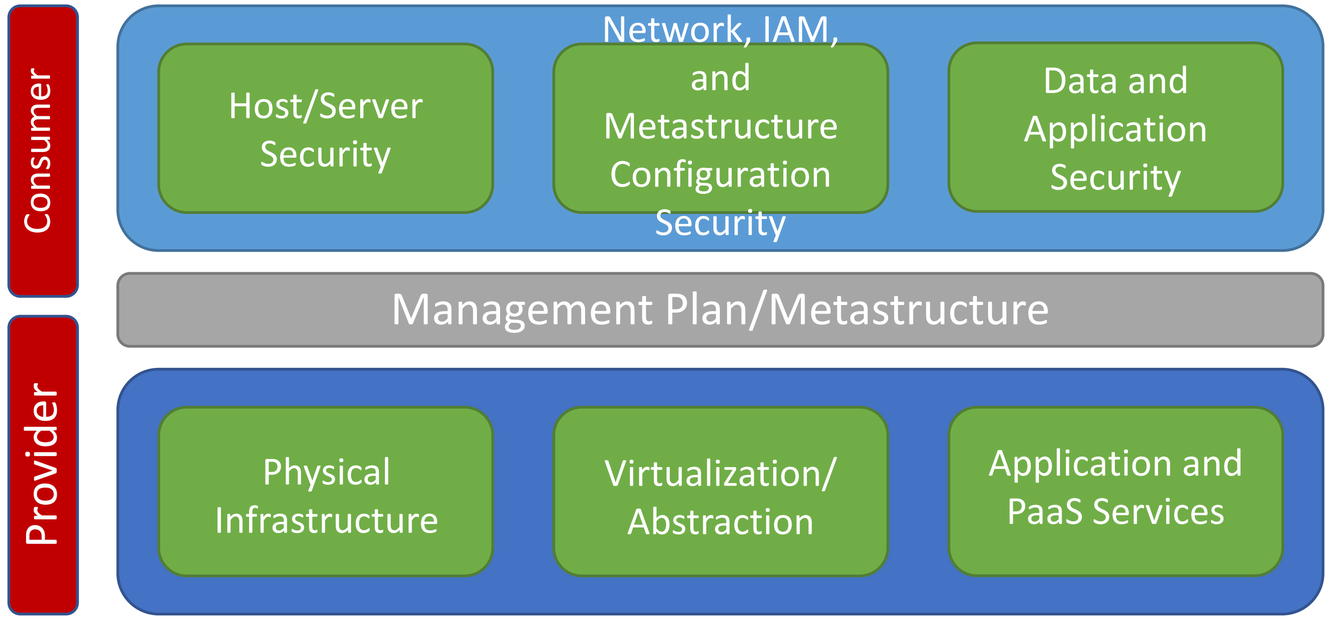
You should:

- Embrace Automation
- Embrace Failure
- Think Like a Developer
- Kill the Past
- Isolate by Default

Know the Lines, Use Them for Advantage

- Your customers and competitors are already getting comfortable with this

- Risk & Compliance
  - Declare and understand the shared responsibilities model
    - What you are responsible for, what the provider is responsible for.
  - Critical cloud provider security capabilities
    - You interact via APIs, not projects
  - *Use the model to change attack surface*



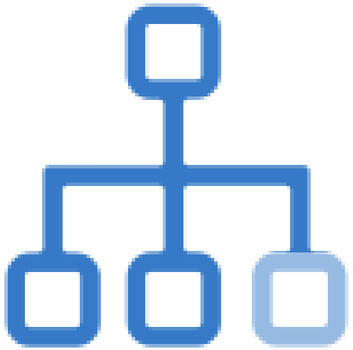
Critical cloud provider security capabilities

- API/admin activity logging
- Elasticity and autoscaling
- APIs for all security features
- Granular entitlements
- Good SAML support
- Multiple accounts/subscriptions/projects per customer
- Software defined networking
- Region/location control

Cloud Native Security Program Principles

APIs

Automation

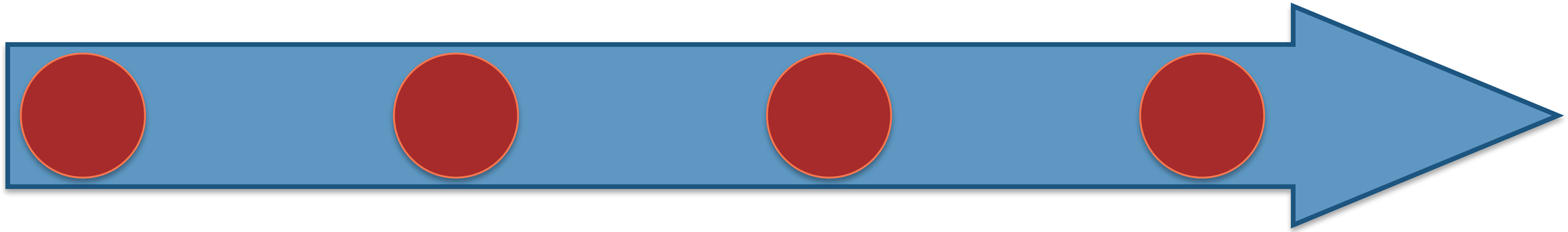


Immutability & Isolation

APPLICATION SECURITY

App security before infrastructure

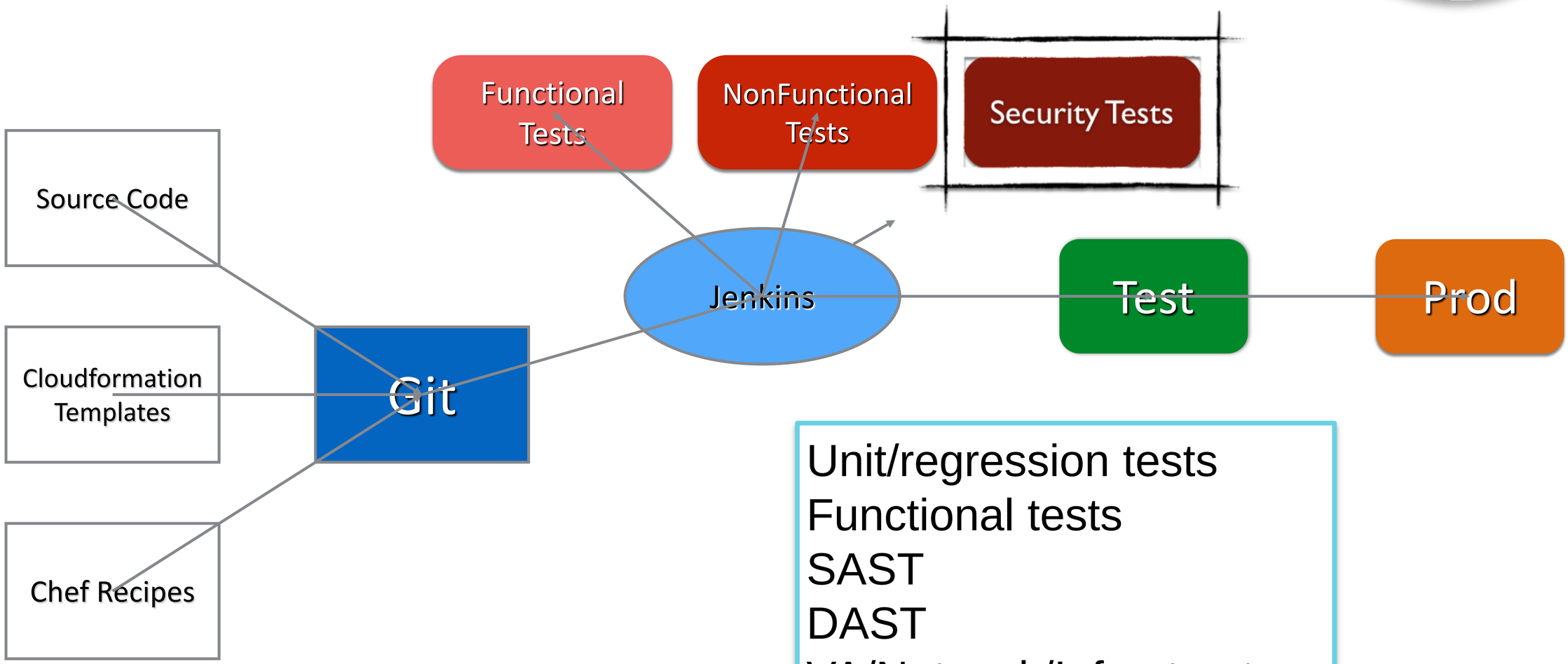
Cloud Application Security Process



Even infrastructure security starts with application design

- Fit the infrastructure to the application
- Leverage architecture for security
- Automate deployment and management with DevOps
  - Required for immutable, cloud disaster recovery, and portability anyway
- Good design can eliminate common traditional security issues
  - Network attack paths, patch management

Secure Application Development/ Deployment (Example)



Unit/regression tests
Functional tests
SAST
DAST
VA/Network/Infrastructure

Architecture + DevOps *is* cloud security

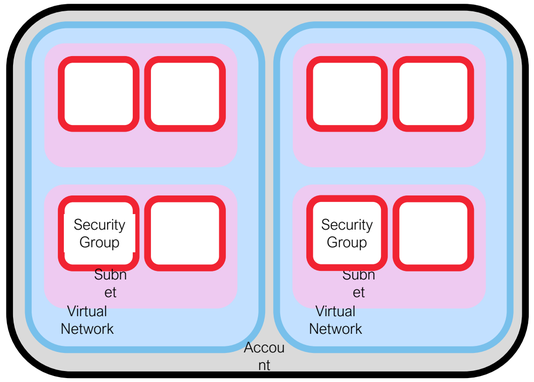
- Architecture allows you to leverage the shared responsibilities model to reduce your *security management surface* and push them onto a cloud provider that has stronger economic incentives to avoid incidents.
  - You are paying for it anyway, might as well take advantage.
- DevOps provides a **consistency** and **control** impossible with manual application deployments.
- Security can easily **embed** and **automate** into the same toolchains as development and operations.
- Security can steal DevOps techniques to improve security operations.

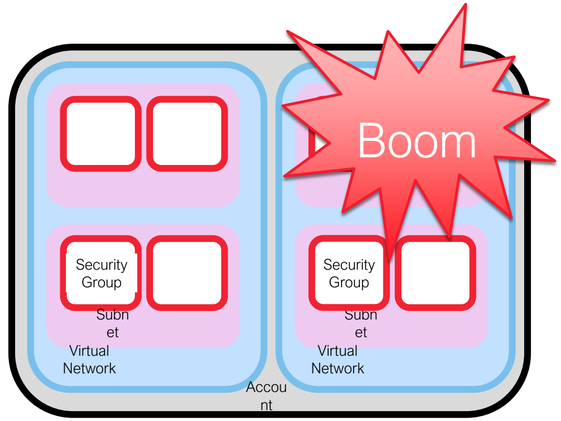
INFRASTRUCTURE

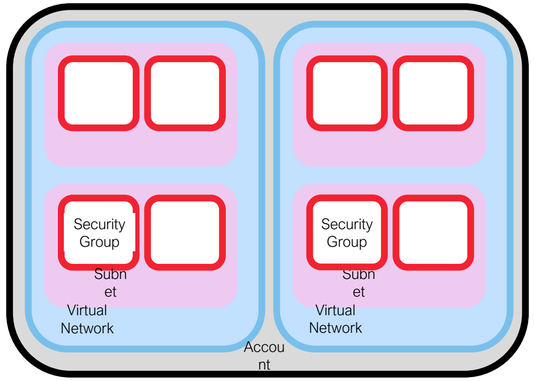
Building your cloud infrastructure security

Start with Architecture

- Architecture == security; it's a primary control not something to eval after the fact
  - Intrinsically tied to applications: These are general principles and cross-project design patterns.
  - Segregate with Accounts/Subscriptions/Projects first, virtual networks second
  - Minimize blast radius
  - Leverage immutable infrastructure
  - Cut off network attack paths
  - Wipe out classes of traditional security issues

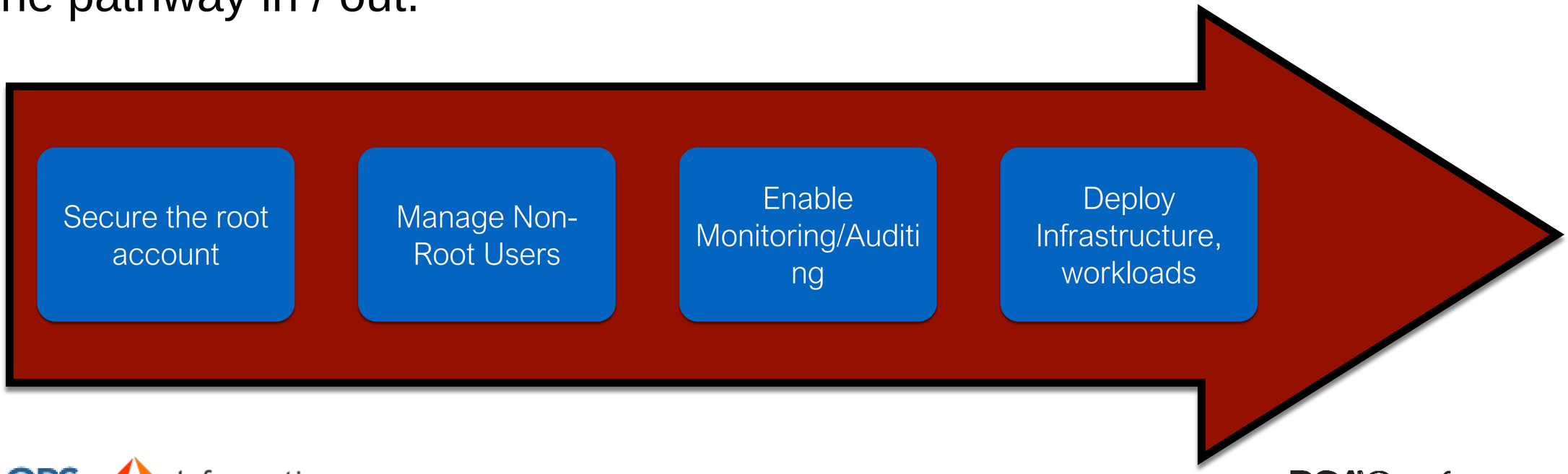






Own the Management Plane, Own the Cloud

- Baseline shared services / management plane
  - Use to enforce guardrails - let the cloud move fast but detect and respond quickly to things that stray too far
  - Make this “more secure approach” the “easier approach” to adopt. Enforce as the pathway in / out.



Define infrastructure in code

Containers

Servers (Instances)

Full Stack (Networks/IAM/etc)

```
{
  "AWSTemplateFormatVersion": "2010-09-09",

    "Parameters" : {
      "KeyName" : {
        "Description" : "The EC2 Key Pair to allow SSH access to the instance",
        "Type" : "String"
      }
    },
  "Resources": {
    "LabVPC": {
      "Type": "AWS::EC2::VPC",
      "Properties": {
        "CidrBlock": "10.0.0.0/16",
        "InstanceTenancy": "default",
        "EnableDnsSupport": "true",
        "EnableDnsHostnames": "true",
        "Tags": [
          {
            "Key": "Name",
            "Value": "CloudSec Lab"
          },
          {
            "Key": "Group",
            "Value": "Vpclab"
          }
        ]
      }
    },
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      "Type": "AWS::EC2::Subnet",
      "Properties": {
        "CidrBlock": "10.0.0.0/24",
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        "VpcId": {
          "Ref": "LabVPC"
        },
        "Tags": [
          {
```
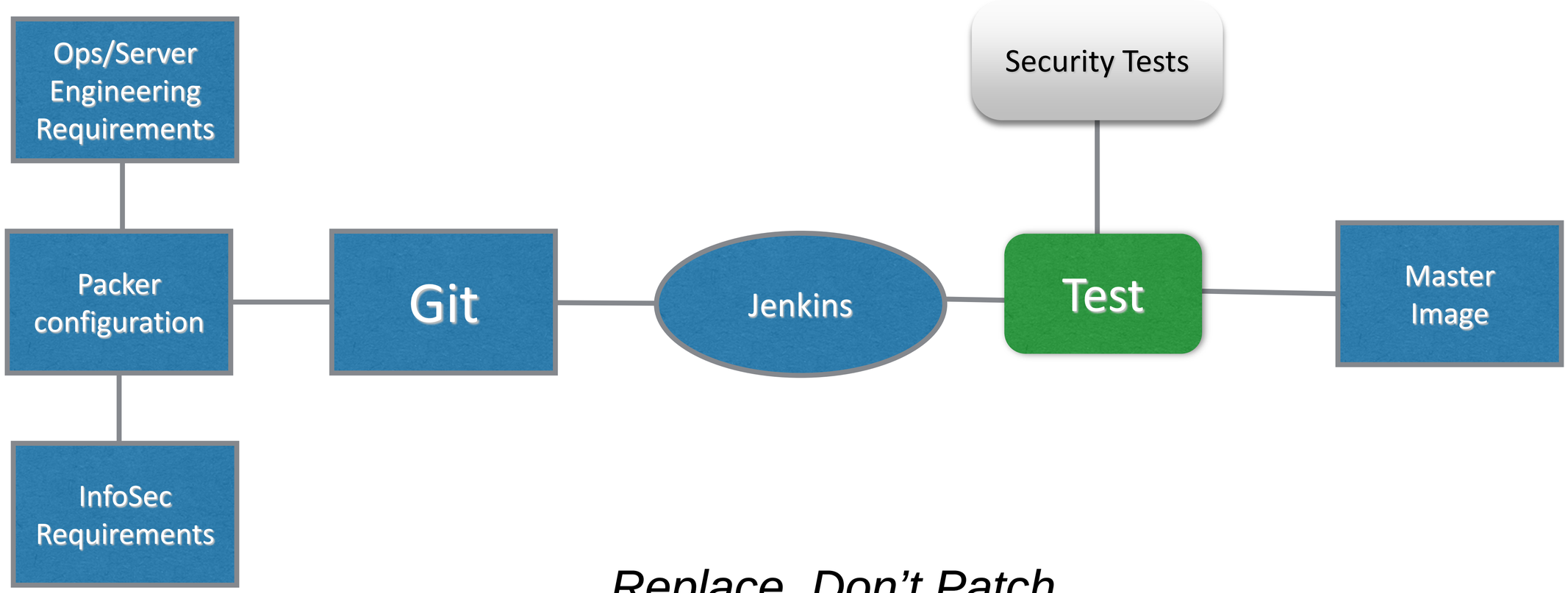
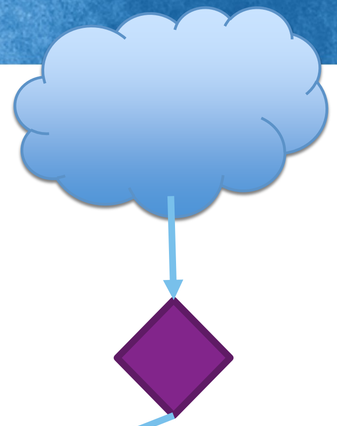

Infrastructure As Code - Master Image Bakery

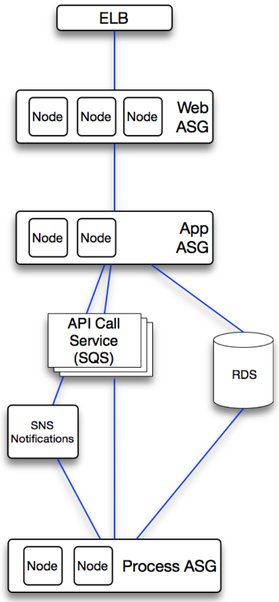


Replace, Don't Patch

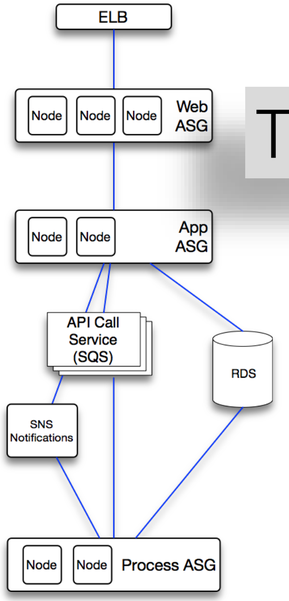
Immutable Infrastructure



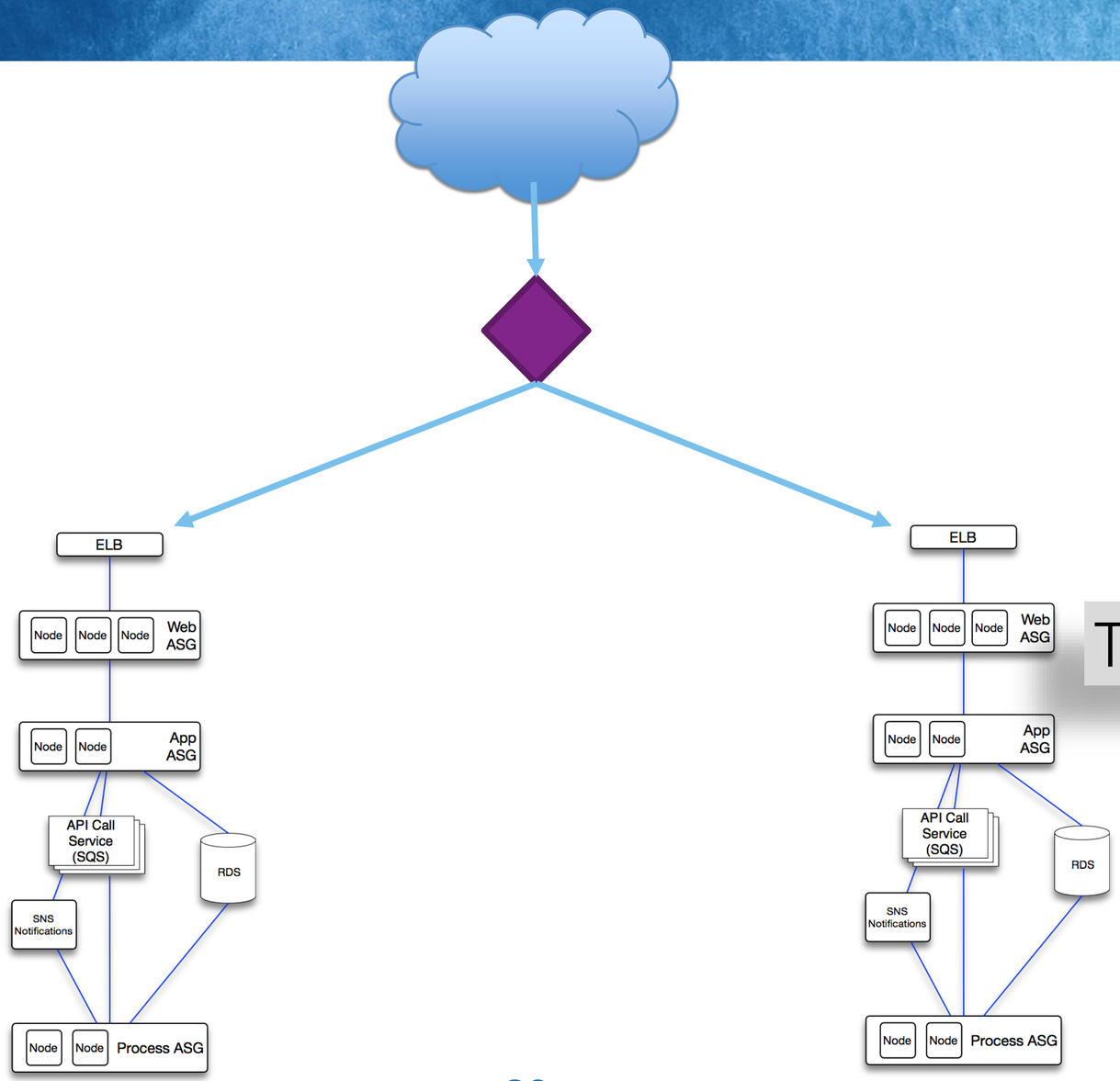
Template A:



Template B:



Immutable Infrastructure

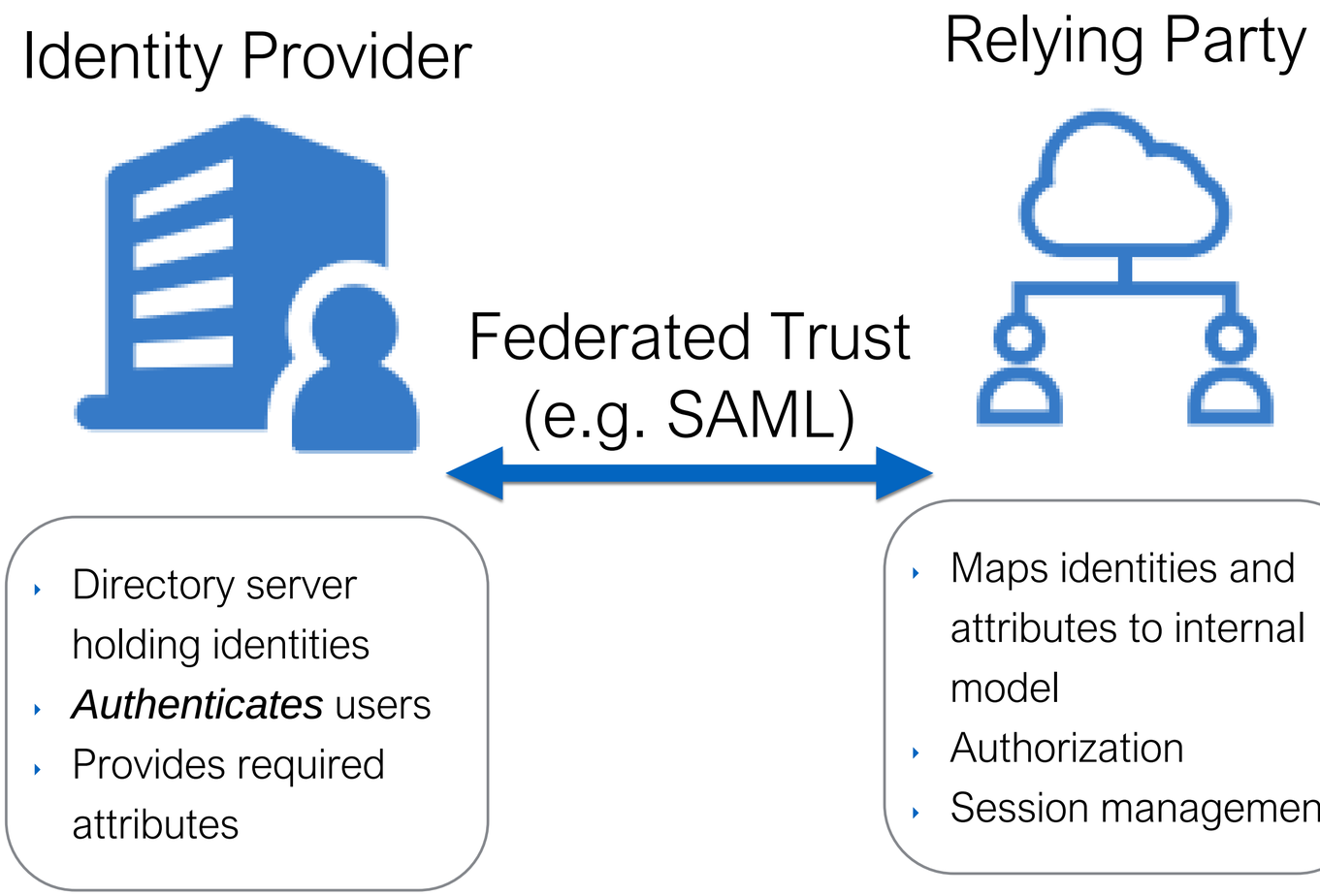


Template B:

Baseline Shared Services

IAM

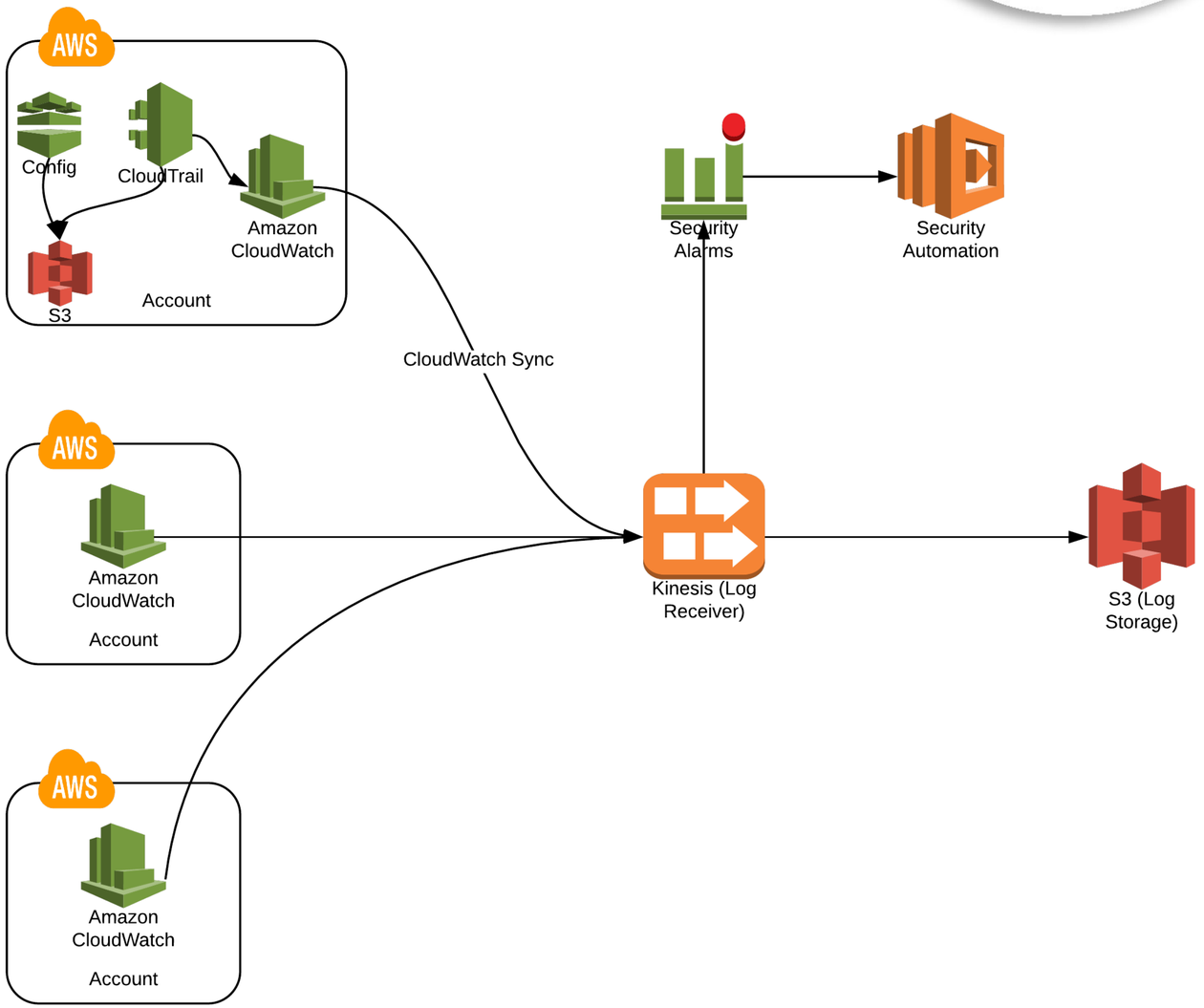
- Federated Identity Broker
- ABAC
- Security Access
  - Multiple authorities



Baseline Shared Services

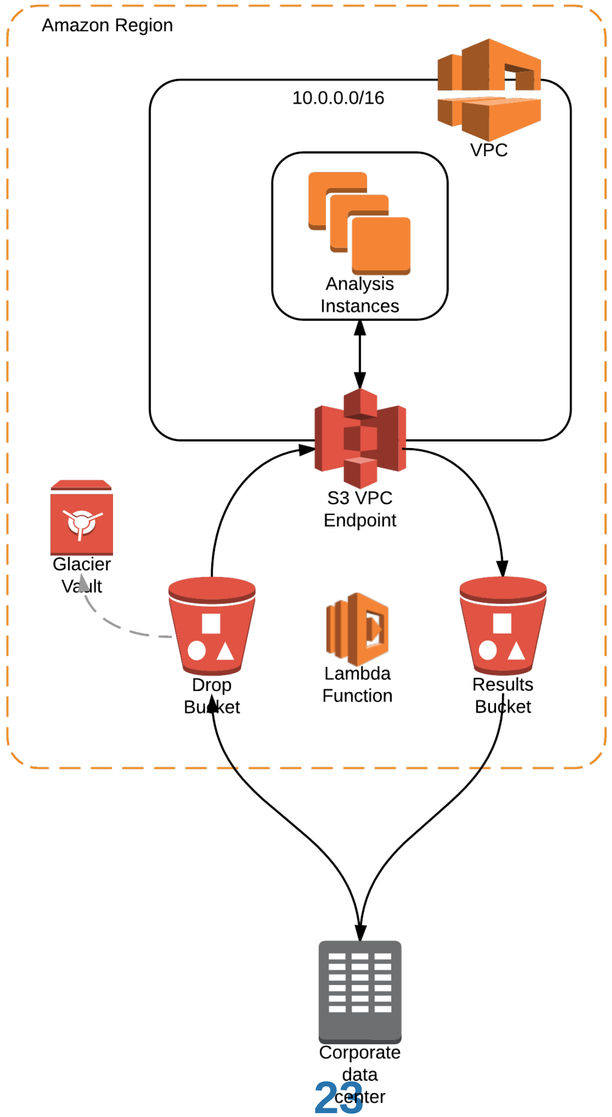
Monitoring/Alerting

- Centralize
  - But allow local access
- Leverage cloud events for real time alerts
  - Use to trigger guardrails
- Cascade and filter to manage costs



Example: Data Analytics Pattern

Attack surface?

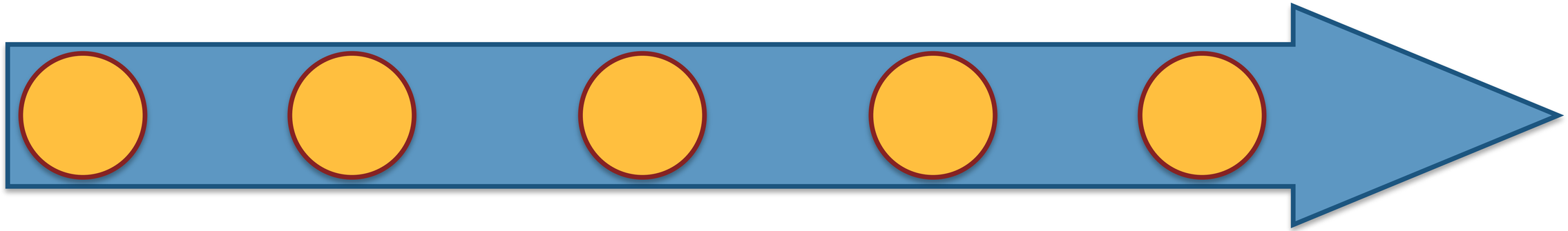


Network attack paths?

Cloud Network Security

Insulate with load balancers, ASG, PaaS

Supplement gaps

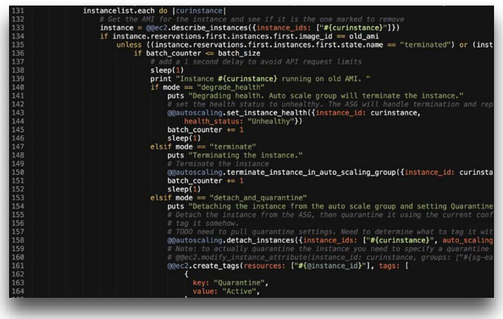
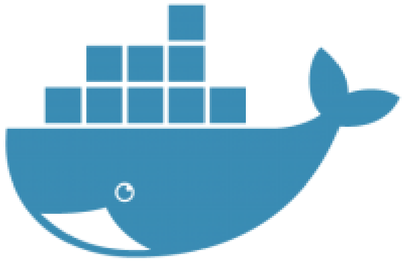


Fit to the app

Architect with native security group and route patterns

Automate + guardrails

Cloud Workload Security

Function as a Service (Lambda)	Instances/VMs	Containers
		

Security Focus:	Code and config	Trad or Immutable	Code + Hardening

Workload Security Wins

- Availability - embrace chaos engineering & immutability
  - Abolish fragile points in the architecture; design auto-scale groups for all critical services
  - Immutable and micro services
  - Serverless and FaaS

Instance (and container) security issues

Vulnerability and Patch Management

- Limitations on scanning due to provider terms of service
  - Or use a cloud-compatible host agent
- Can scan in deployment pipelines with immutable
- Patching on running instances only really used with standard/traditional instances
  - Weakest security option
- Can't rely on scans reflecting the actual system if they are IP based

Logs and Security Tools

- Logs can't rely on hostnames or IP addresses
  - More on logging later, but you need to build a cloud-native architecture
- Security tools also can't rely on normal addresses due to the high rate of change in cloud
  - Also they need to be lightweight since processors == cash
  - Ideally deployable with CI/CD
  - Need to auto-self-configure and connect to management systems
- EPP/AV often not needed

Other

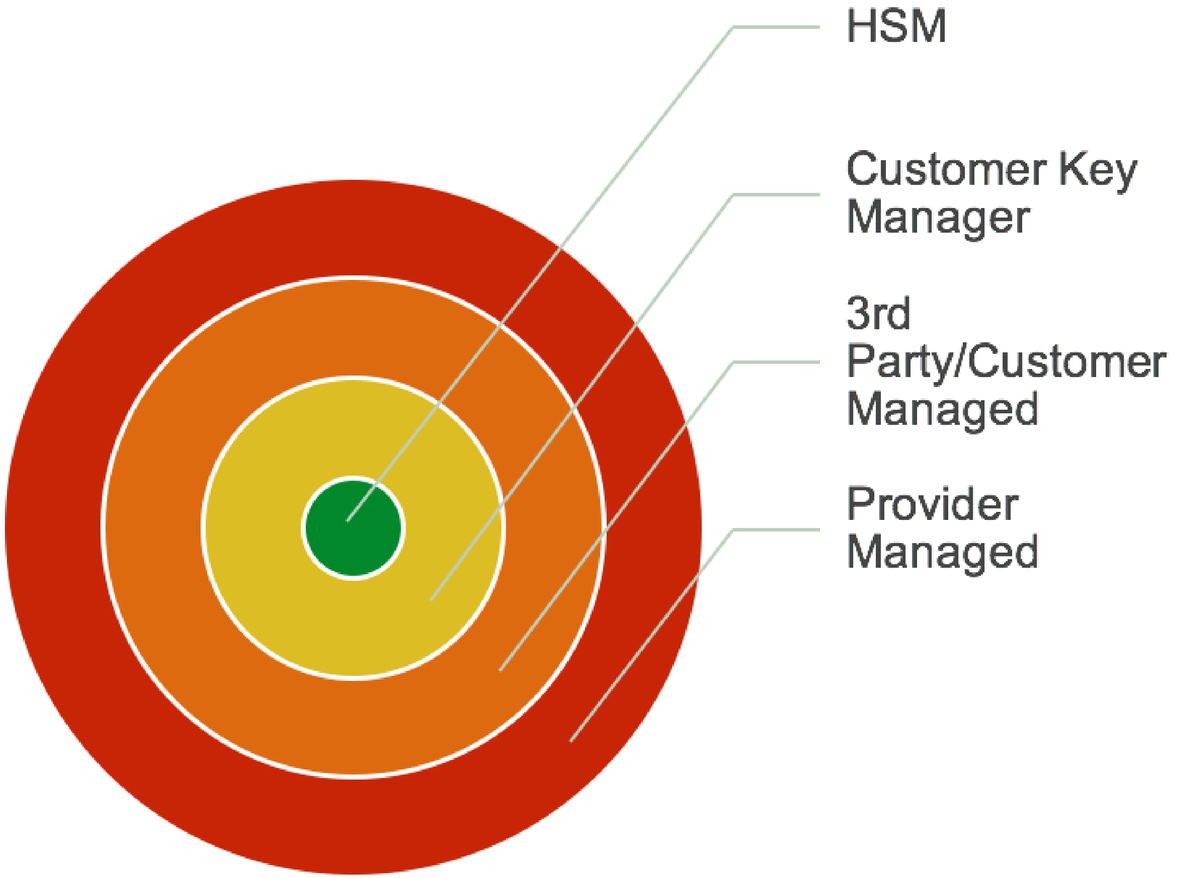
- Images can expose data if they aren't created properly
  - This is really easy to mess up
- Snapshots are ideal for data exfiltration
  - Encryption knocks down this problem
  - Encryption options generally built into the cloud platform, don't need external tools
- Instances can access metadata on themselves which can be used for attacks if not properly managed

Cloud Encryption

Encryption is the default. Focus on key management.

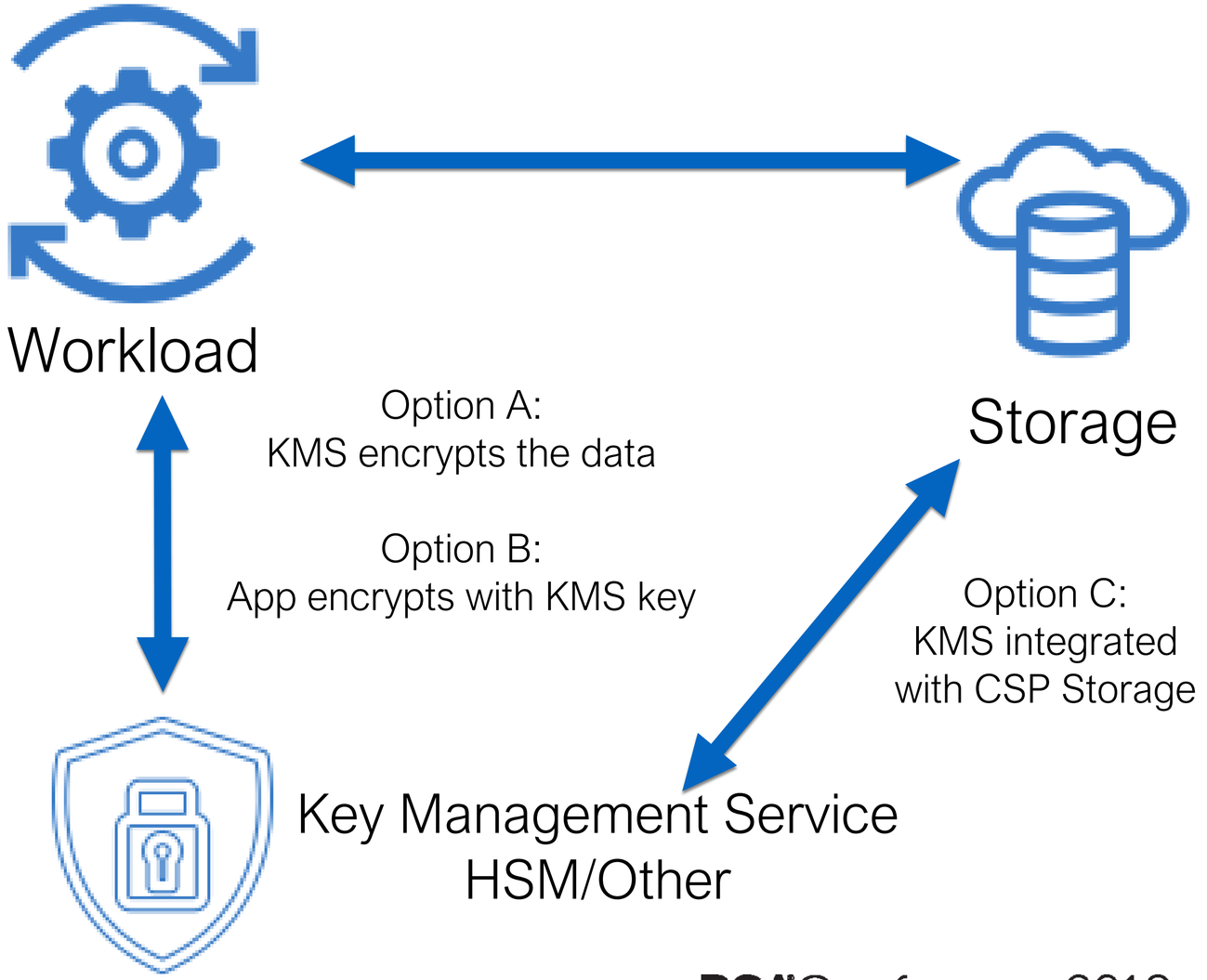
Cloud encryption

- Encryption is easy … key management is Hard
  - Do NOT do this yourself or roll your own
- Focus on ***BYOK*** for integrated encryption
- Cloud HSMs and KSMs - your cloud keys can be more secure than in most data centers



Encryption: App-Layer

- For regulated data, app-level encryption is your friend
- Integrate with IAM and automation
- Know the lines where data is potentially exposed and if it matters
- Cloud HSMs and KSMs - your cloud keys can be more secure than in most data centers



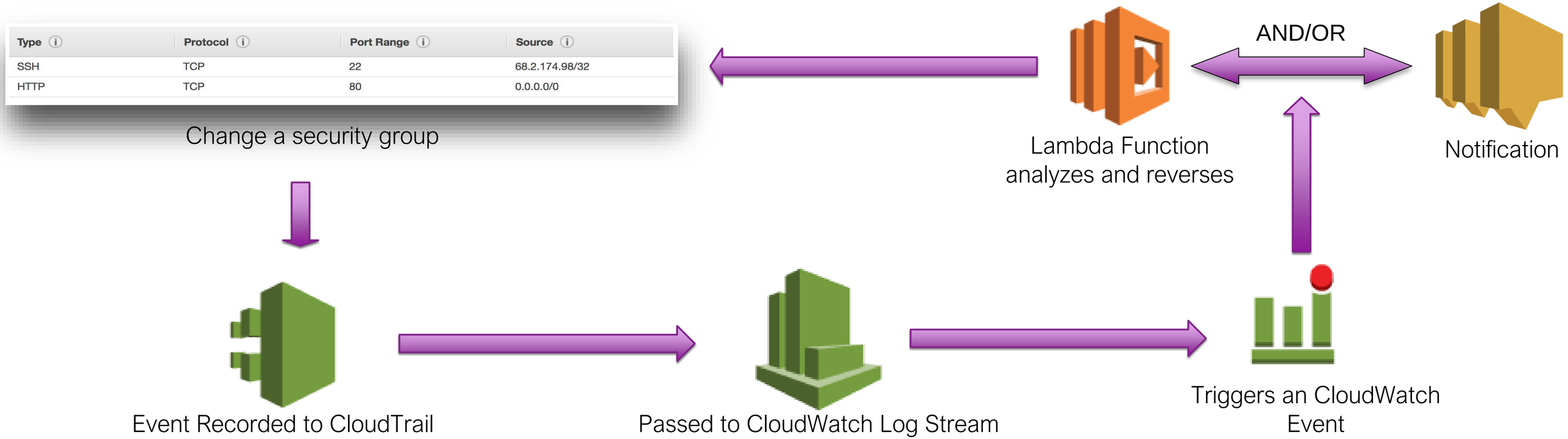
SECURITY OPERATIONS

Monitoring/alerting, incident response, assessment, management

Alerting tips

- If your cloud provider offers a security threat service… use it!
  - They see things you can't, such as failed API calls
- In-cloud event-based alerts are fastest
  - But also need to be configured and managed in each cloud deployment
  - Use automation to build/support
- Feed alerts to central feed, or alert off a central feed
  - We discussed earlier

Alerting++


Type
Protocol
Port Range
Source
SSH
TCP
22
68.2.174.98/32
HTTP
TCP
80
0.0.0.0/0
Change a security group
Lambda Function
analyzes and reverses
AND/OR
Notification
Event Recorded to CloudTrail
Passed to CloudWatch Log Stream
Triggers an CloudWatch
Event

Assessment

Cloud Configuration

- Some providers have built-in tools
- Third-party
- Manual assessments for context

Instances/Containers

- With immutable assess in the pipeline
- Prefer agent over network based

Application

- Push most testing to CI/CD
- Full web testing may require permission
- Choose pen testers with cloud experience

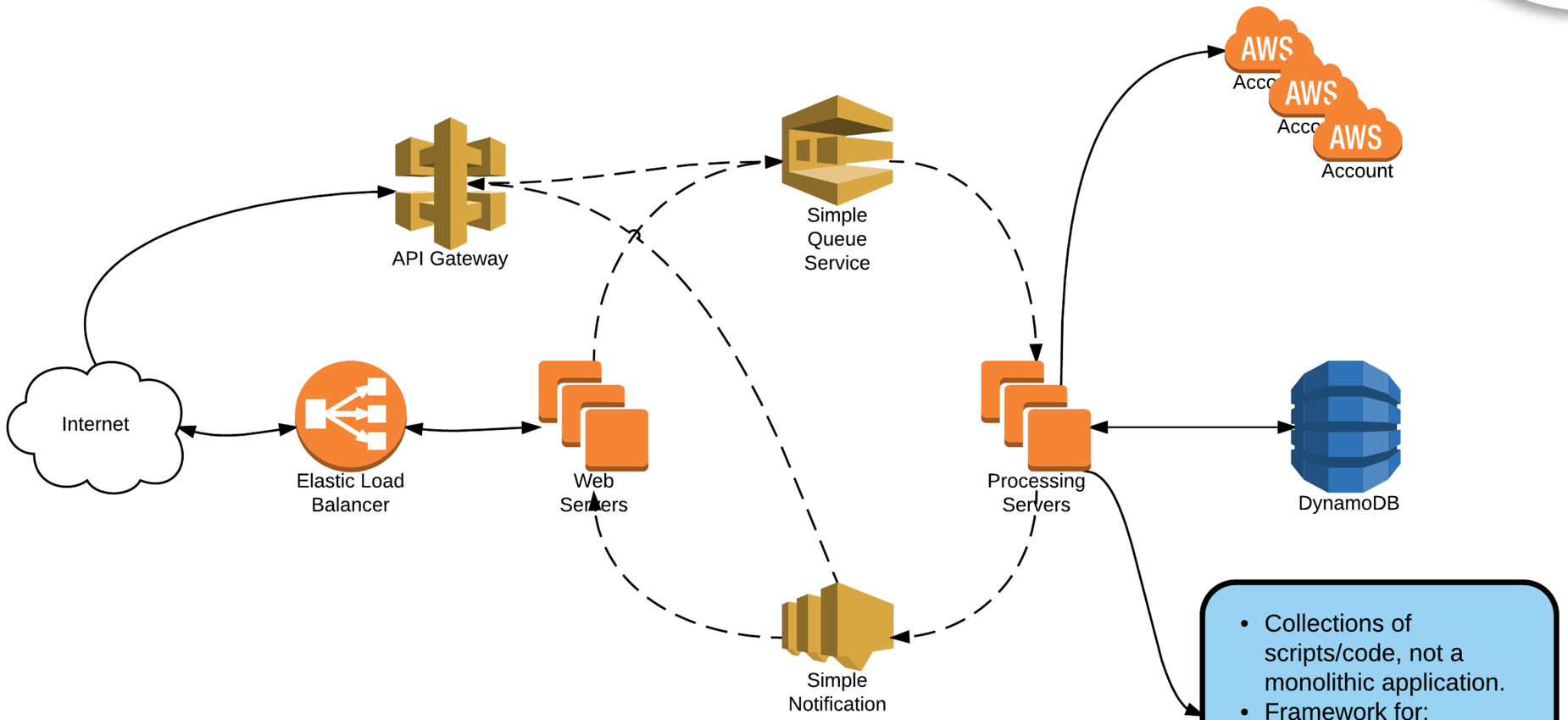
Incident Response

- Cloud registry
- Who to call and out of band authentication
- Cloud IR jump kit centralized automation is ESSENTIAL!
- Attack and response are all over API
- Focus on the management plane first
- Lock down IAM before anything else
- Multiple accounts dramatically improve IR success rates
- Did I mention automation? Quarantine environments?

Automate security management

- Infrastructure templating should include security
  - This is how you handle new account provisioning
- Use the hierarchical controls of your cloud provider
  - Set a security role to gain account access
- Use automation for cross-account and multi-cloud management
  - Guardrails
  - Workflows
  - Orchestrations (integrating 3rd party tools to operations)

Automate security management



Adopting and adapting to cloud security

- First 30 days
  - Find your cloud controller - Take owner to lunch; pain points
  - Get a read-only account. Get comfortable with APIs for cloud inventory, drift detection, attack surface changes, image configs.
- Within 2 months
  - Create a master image bakery
  - Get good at pushing new images on demand, work with app teams to rely on your images for push
- Within 3 months
  - Create guardrails to detect and alert on cloud config drift/violations
  - Automate remediation for simple failure cases, more complex checks over time