AWS Security & Cloud Fundamentals

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Agenda

1. Intro
2. Cloud Fundamentals
3. Design Patterns
4. Additional References, Resources and/or Questions

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Intro

- Bill Ohlson
- ~2.5 years at AWS
- ~10 Information Security experience
- ~24 years IT experience
  - Including startups, investment banking, and payments

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Cloud Fundamentals

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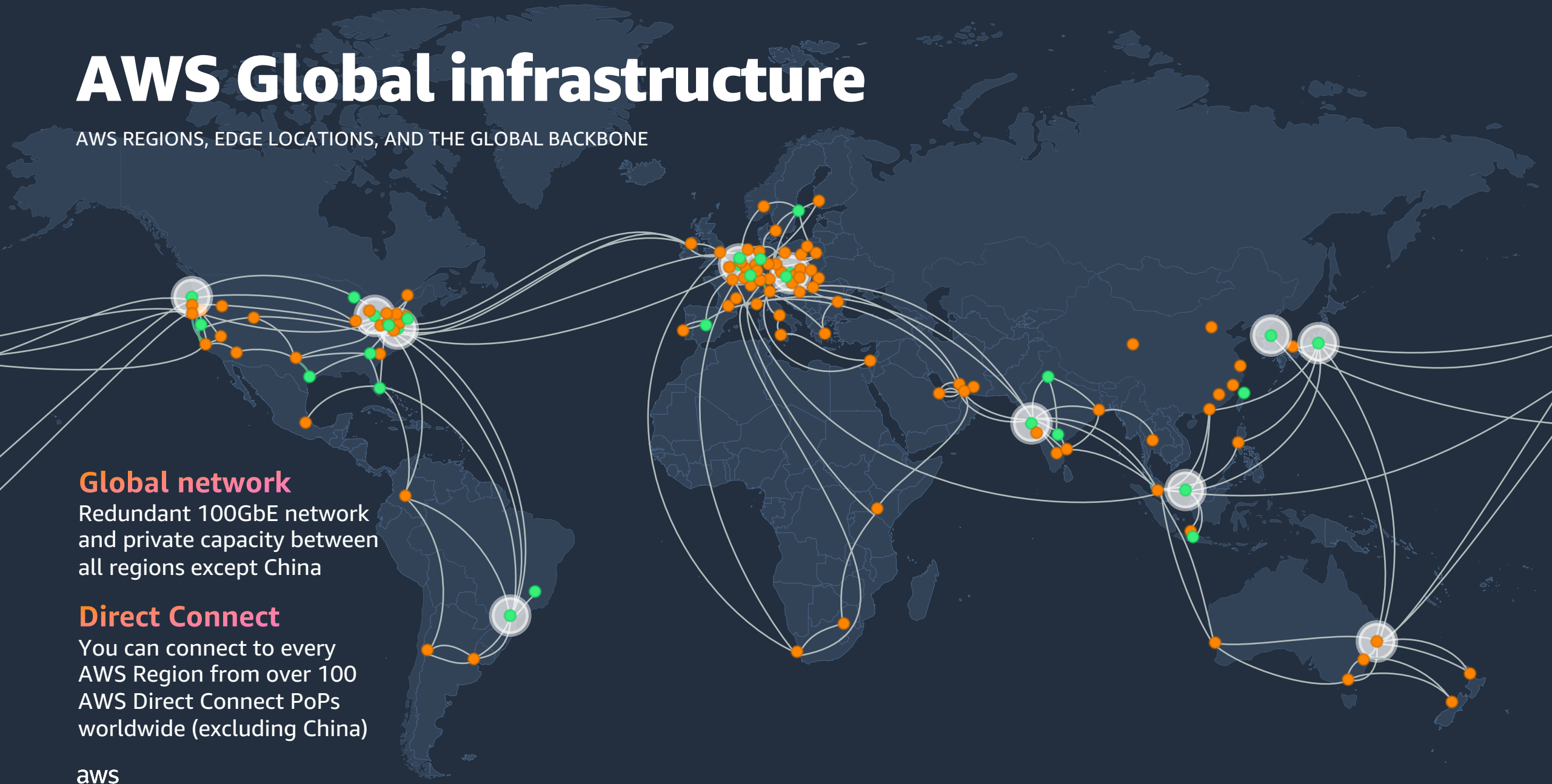
AWS Global infrastructure

AWS REGIONS, EDGE LOCATIONS, AND THE GLOBAL BACKBONE



Global network

Redundant 100GbE network and private capacity between all regions except China

Direct Connect

You can connect to every AWS Region from over 100 AWS Direct Connect PoPs worldwide (excluding China)

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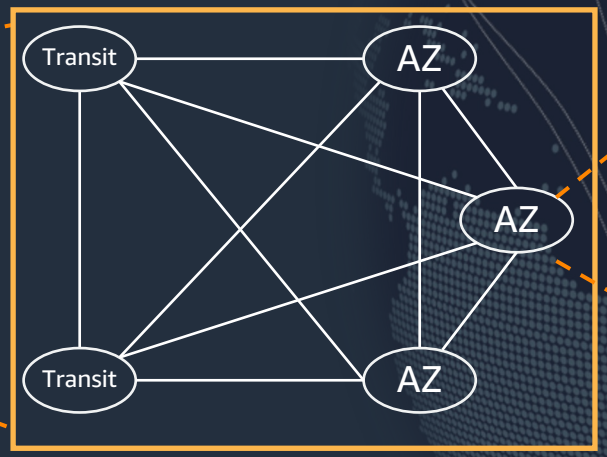
AWS Region design

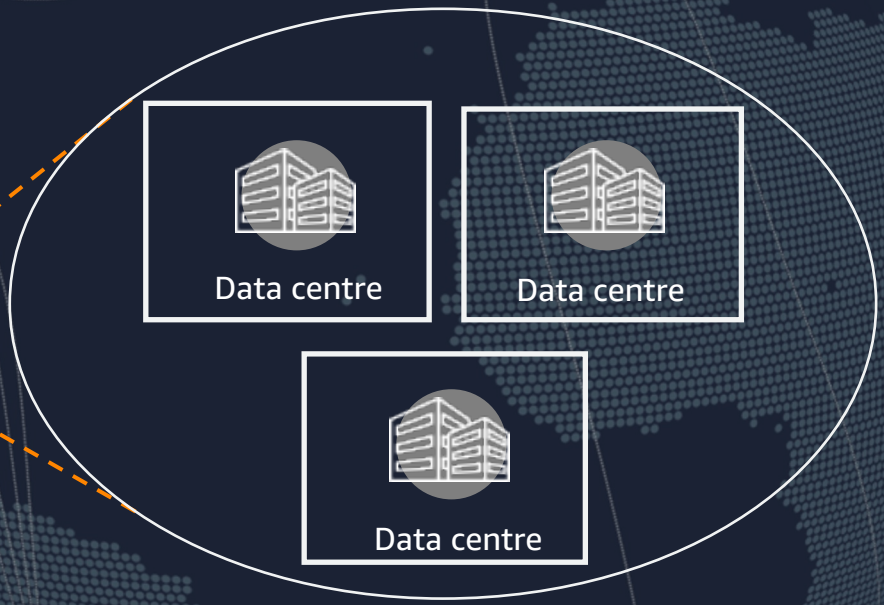
AWS Regions are comprised of multiple Availability Zones (AZs) for high availability, high scalability, and high fault tolerance. Applications and data are replicated in real time and consistent in the different AZs.

AWS Canada Region



A **Region** is a physical location in the world where we have multiple **AZs.**

AWS AZ



AZs consist of one or more discrete data centres, each with redundant power, networking, and connectivity, housed in separate facilities.

32 geographic Regions

102 AZs

600+ points of presence

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Calgary Region – On track for Q4 2023/Q1 2024

FULL REGION – 3 AVAILABILITY ZONES

CA$21 billion
data centre investment in Canada by 2037

CA$39 billion
increase in GDP due to construction and operation of our data centres by 2037

5,195
full-time equivalent (FTE) jobs supported through construction and operation of data centres by 2037

AWS locations in Canada

Amazon Offices
Vancouver, Winnipeg, and Toronto

AWS Regions
Montreal
Calgary (Coming Soon)

Amazon CloudFront Edge Locations
Vancouver, Toronto, and Montreal

Amazon Solar Farms
Newell, AB
Vulcan, AB

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Why customers choose AWS

Most experience

16

years helping millions of customers

Global reach & high availability

102

availability zones spanning 32 geographic regions

Security & compliance

300+

security features

Customer obsession & innovation

200+

service offerings

AWS's Infrastructure is

3x **More Energy Efficient**

than the median of surveyed U.S. enterprise data centers

Improve TCO

111

price reductions since 2006

Machine learning

81%

of all deep learning is running on AWS[1]

Ecosystem

4,500

software listings from 1,400 ISVs

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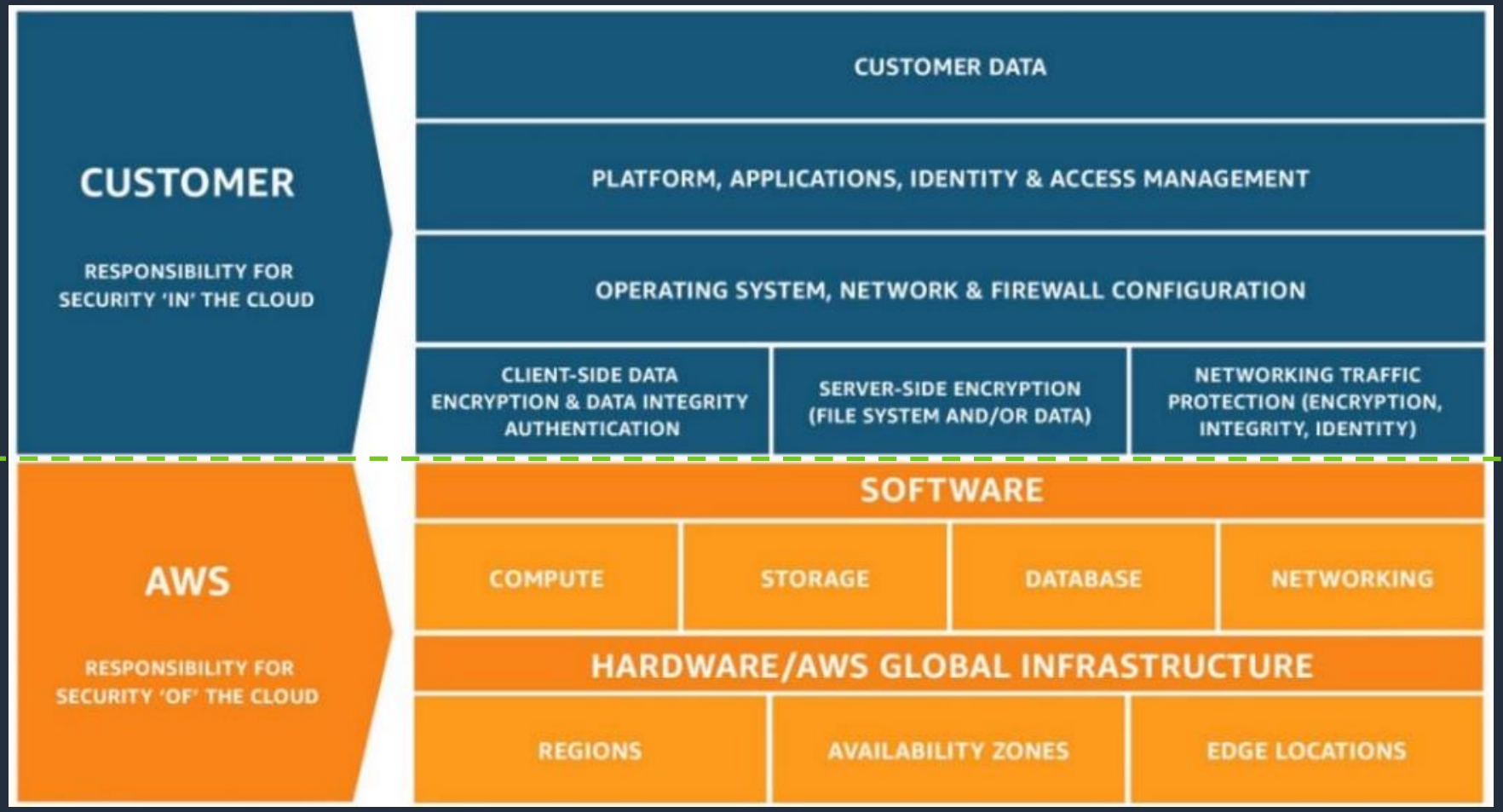
Source: AWS Approved Public Stats

Understand the AWS Shared Responsibility Model



Security **IN** the Cloud

Managed by **customers**

Security **OF** the Cloud

Managed by **AWS**

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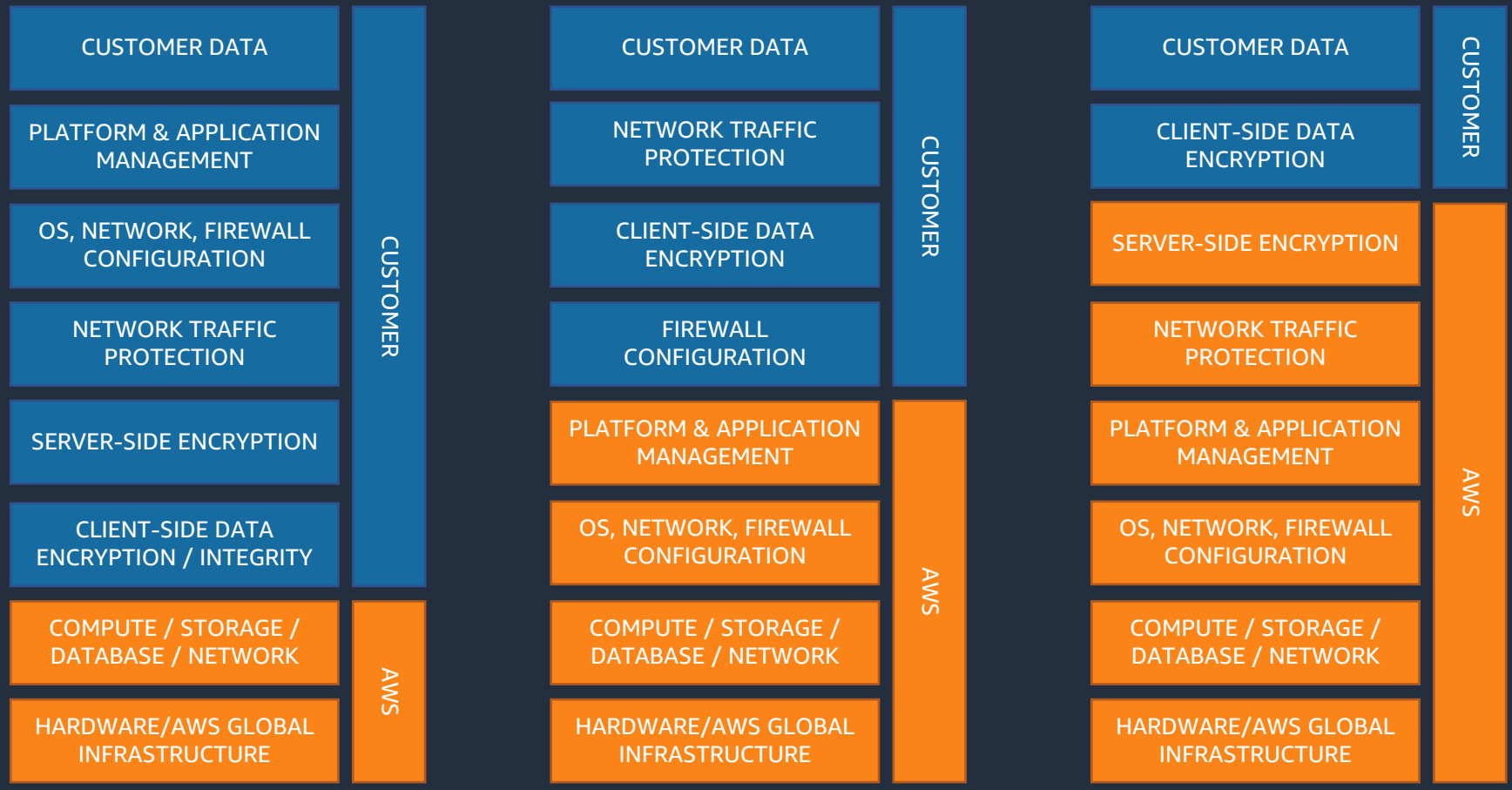
Shared Responsibility Model is NOT static



More Customizable
+
More Customer Responsibility

Less Customizable
+
Less Customer Responsibility
+
More Best Practices built-in

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Third Party Validation

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Global security and compliance standards

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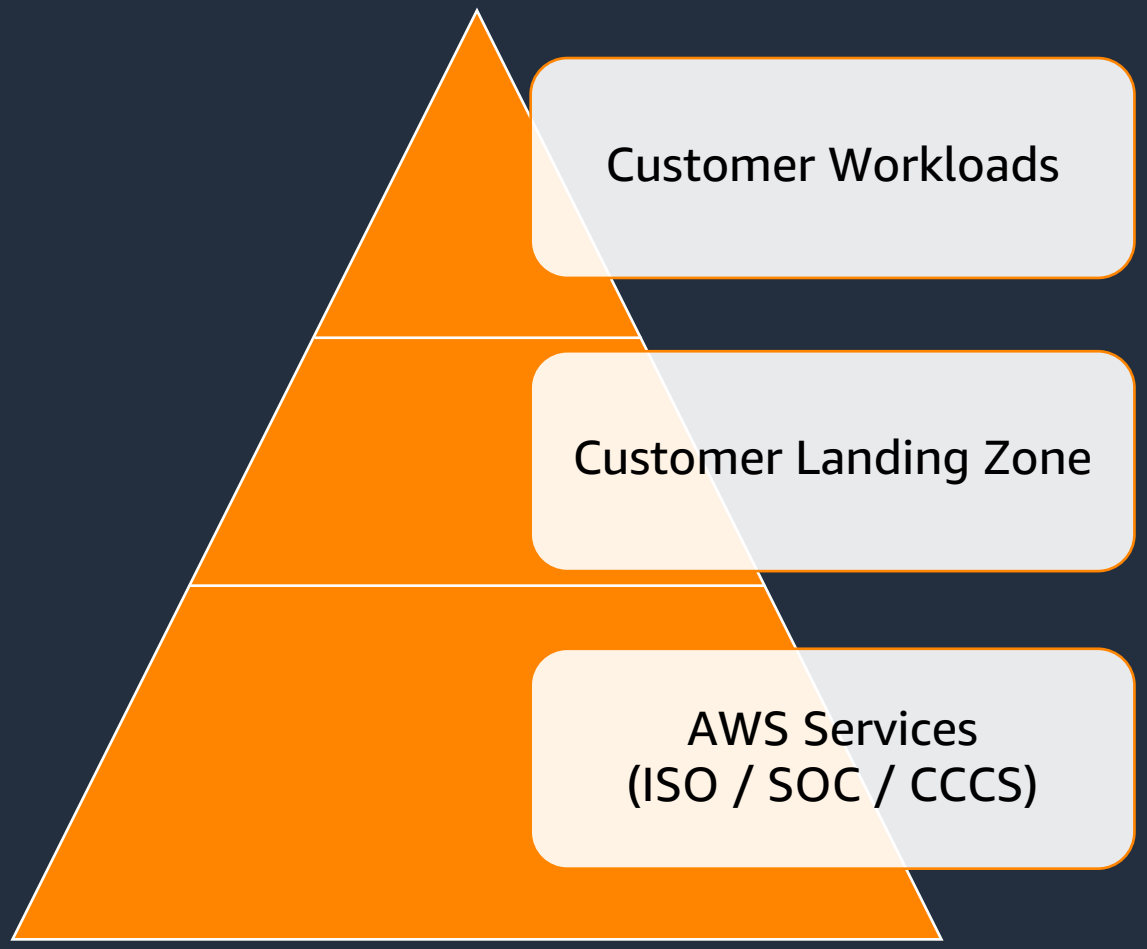
Stacked Assessment

- Controls can be inherited from underlying layers
- Landing zone provides organization-wide controls
- Many AWS services assessed by ISO, SOC, and CCCS



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AWS Resources

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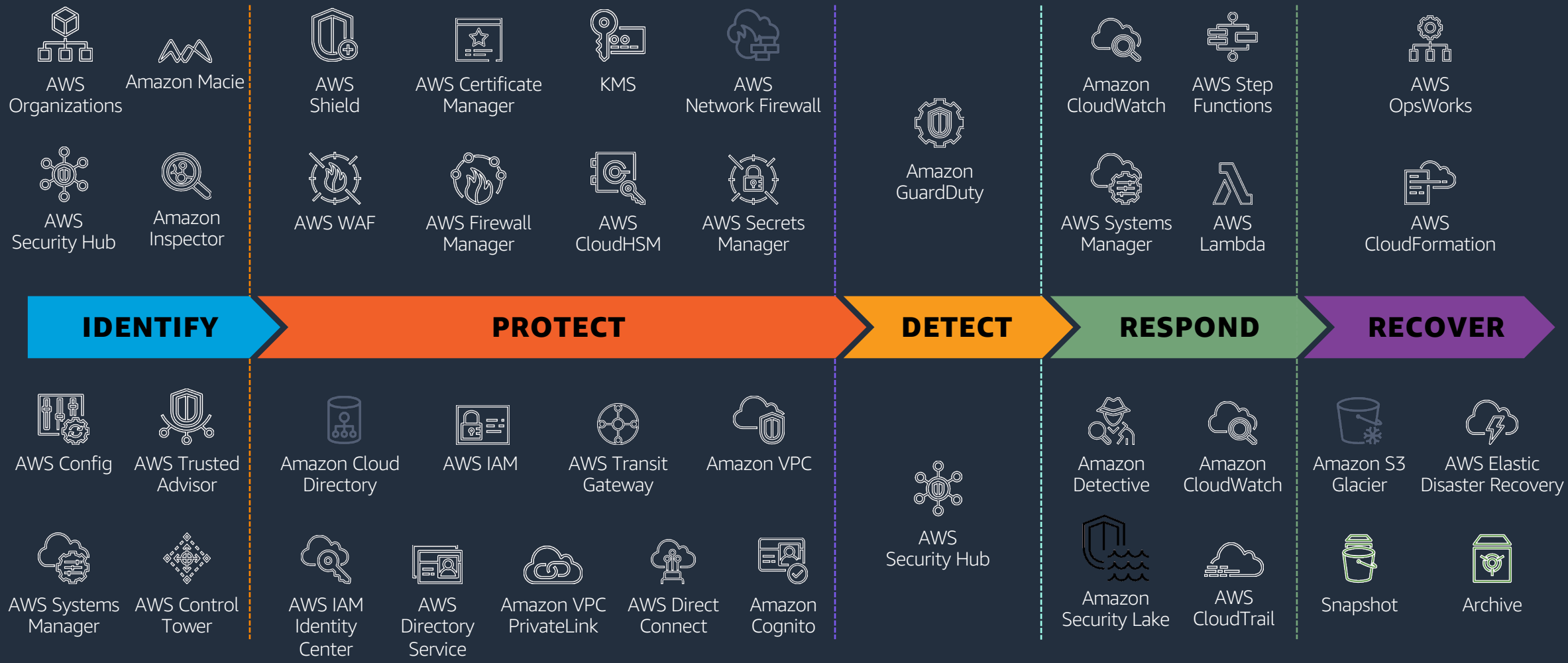
Use AWS services to mitigate threats



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Perception?

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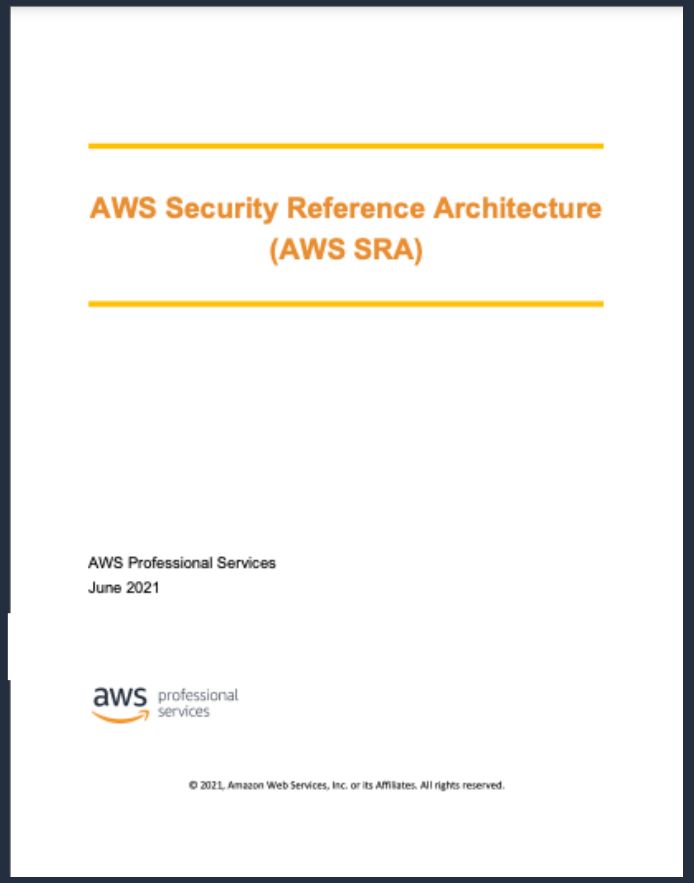
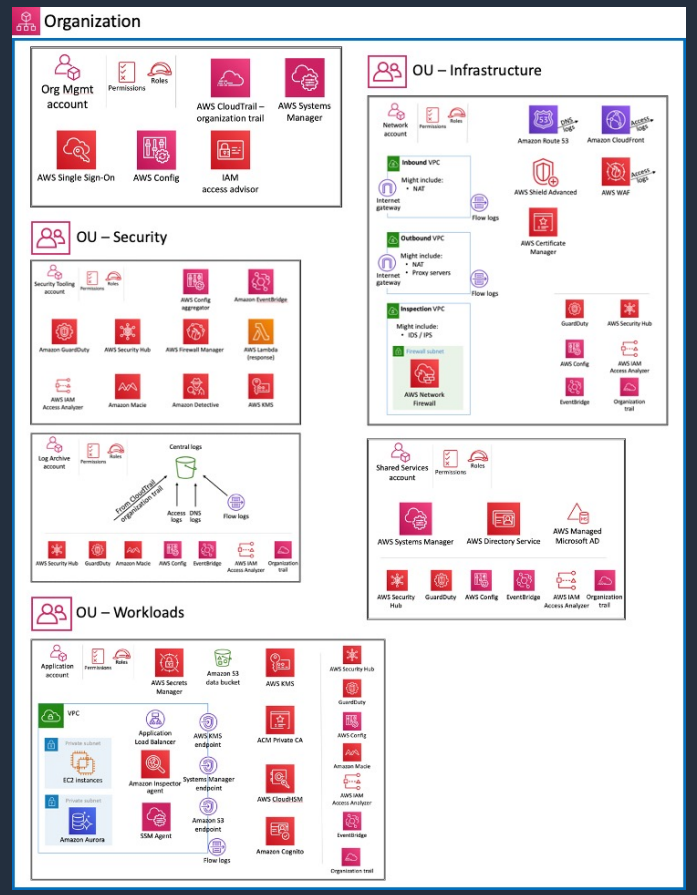
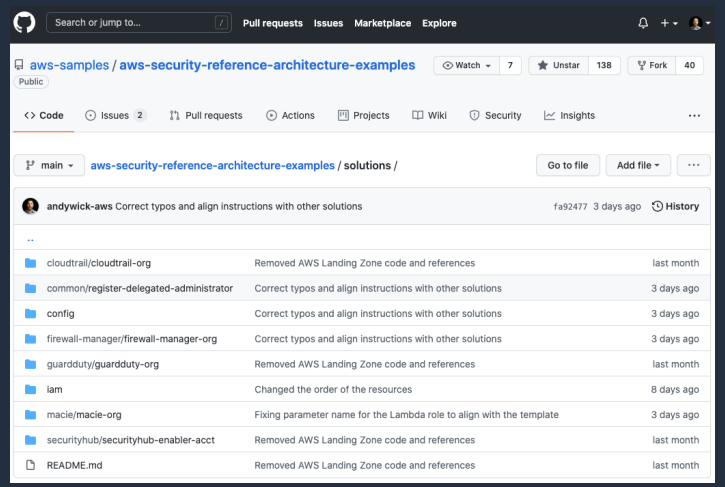
AWS Security Reference Architecture (AWS SRA)







aws-samples/aws-security-reference-architecture-examples
https://github.com/aws-samples/aws-security-reference-architecture-examples

https://docs.aws.amazon.com/prescriptive-guidance/latest/security-reference-architecture/welcome.html

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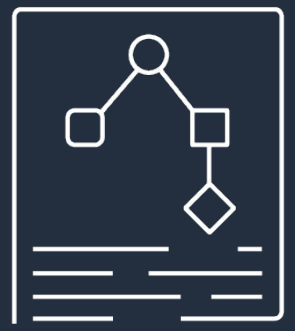
Landing Zone Accelerator (LZA) on AWS

The Landing Zone Accelerator on AWS (LZA) is an open-source solution that accelerates the implementation of a customer's technical security controls and infrastructure foundation on AWS.

Automation



Data Security

Compliance

Support

Learn more about the LZA and Deployment Guide in the [AWS Solutions Library]

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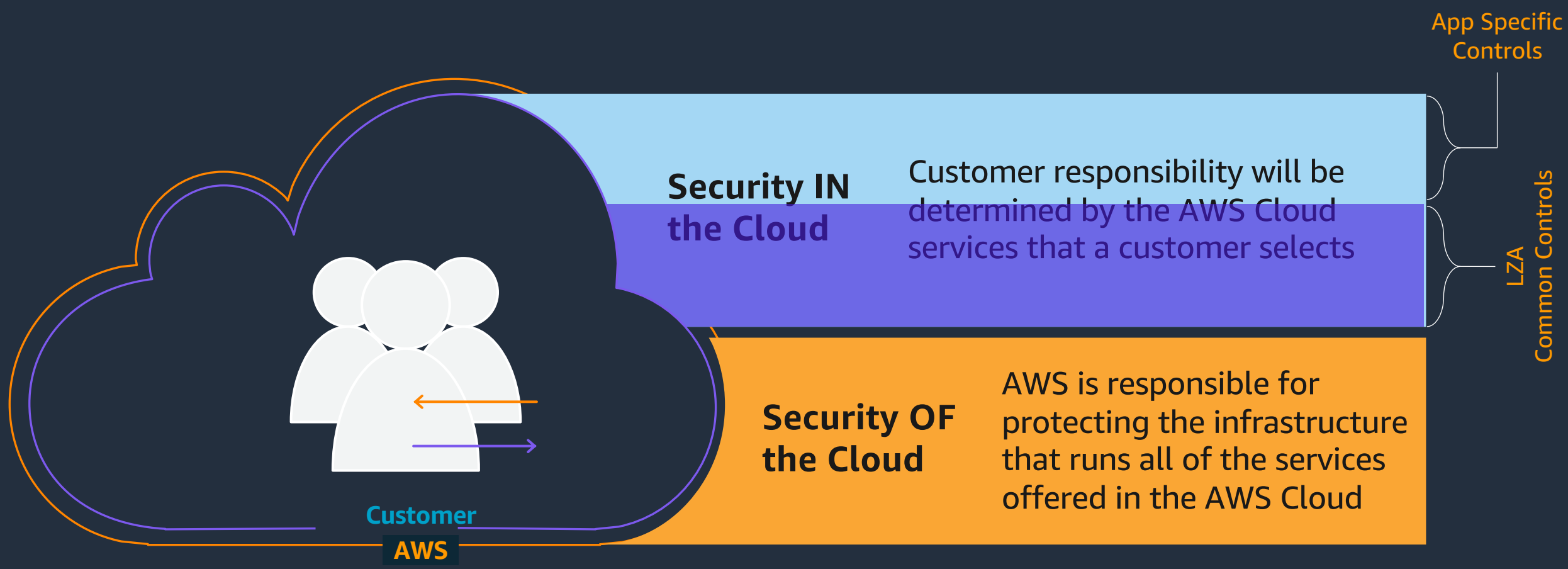
Shared Responsibility Model



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Design Patterns

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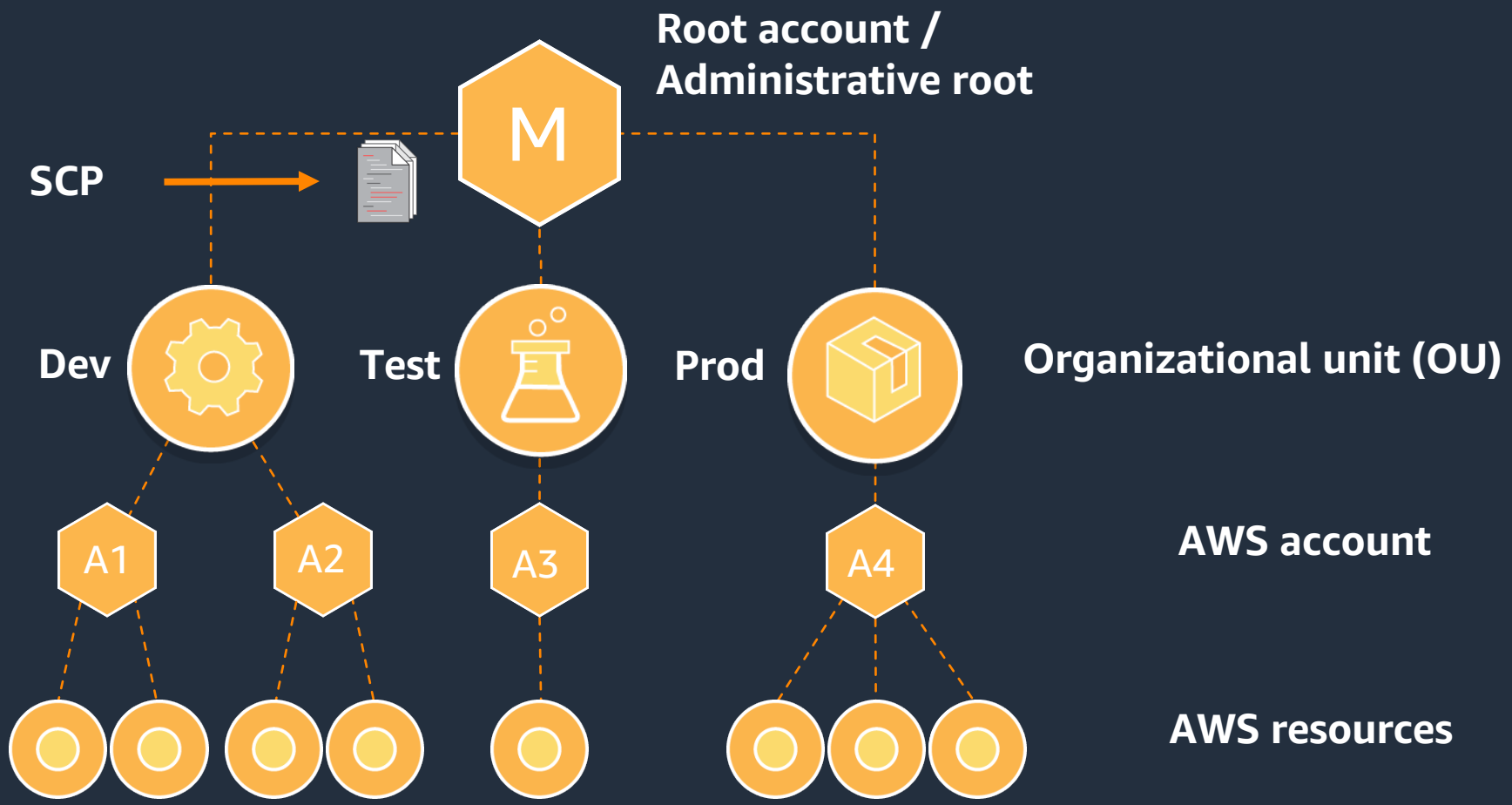
Use a multi-account strategy and network segmentation



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“Everything starts with a threat model”

- Characterizes what can (be made to) go wrong
    - Who causes it and how
- Is used in conjunction with a risk register
    - Characterizes probabilities and consequences
    - Material risks require compensating controls
    - Residual risks are accepted and signed off as part of “the risk of doing business”
- Informs controls (normally in a framework)
    - Which turn material risks into residual risks

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Why use a threat model

Identify security issues **early**

+

Understand security needs **early**

=

Build securely

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Threat model developments

There are now threat analysis documents specifically focusing on ML from standards and advisory bodies and academia:

- Securing Artificial Intelligence (SAI)

- AI Accidents: An Emerging Threat

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Shifting security left

Developer Workstations

Deployment Pipeline

Assessment and Authorization

Monitoring

Address security sooner

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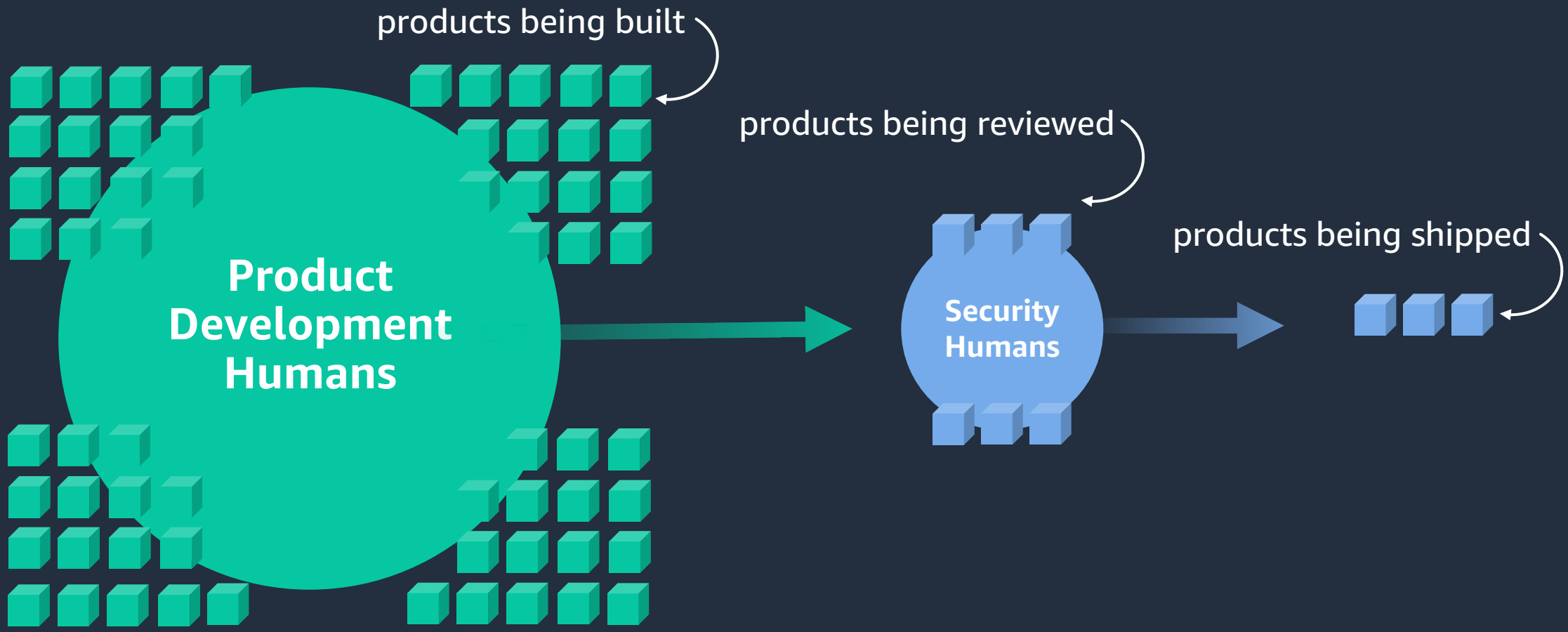
How to build capability?



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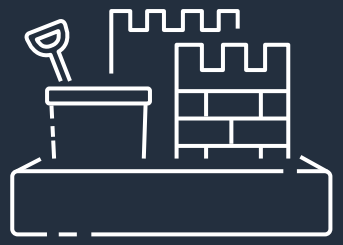
Security Guardians

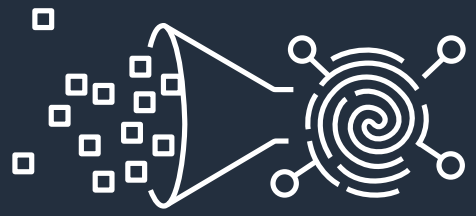
A human mechanism to scale security at AWS

Guardians are trained, security-minded Amazonians who volunteer to be a consistent champion for security on their team



They partner with their fellow builders make informed security decisions that lead to more secure, on-time launches

They serve as an extension to the application security function, scaling security awareness and providing a strong feedback mechanism



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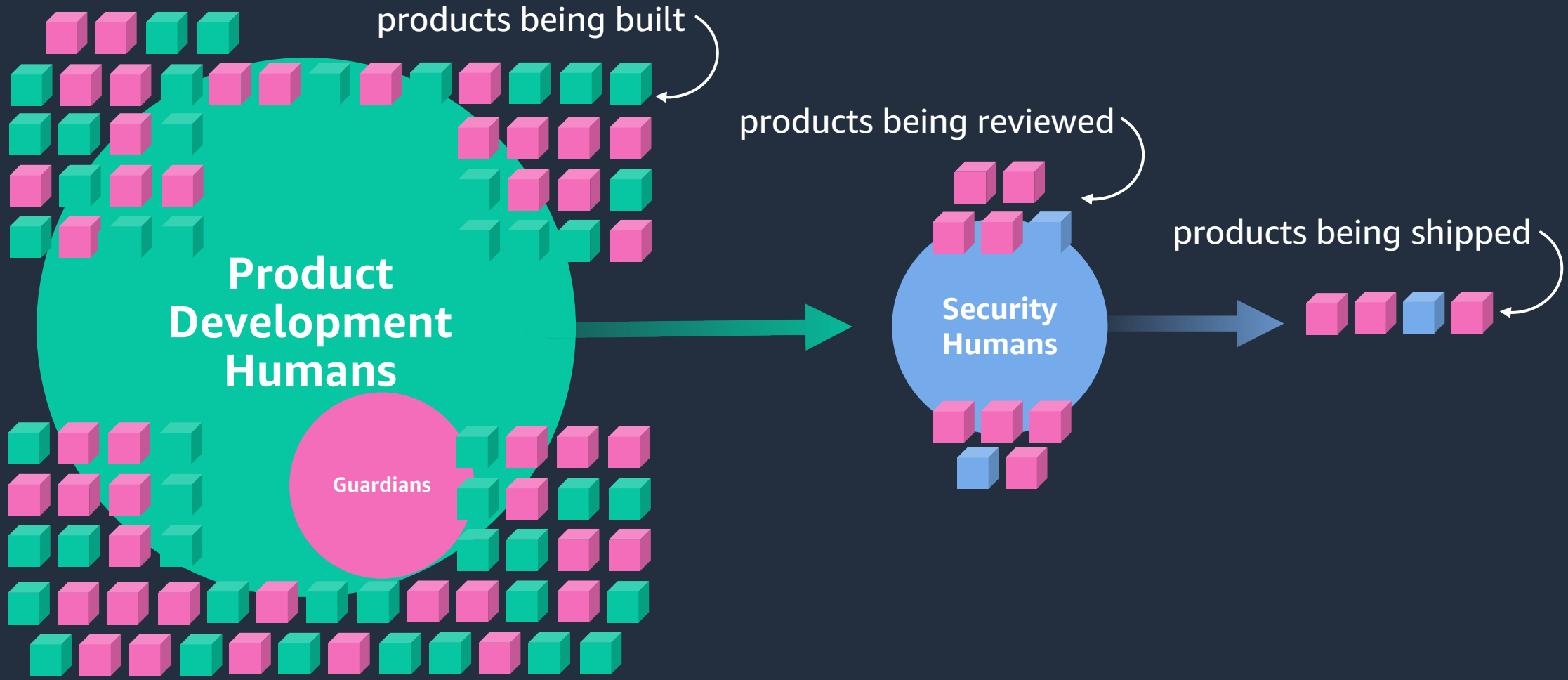
Security embedded into builder teams



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Security Guardian results

18.4% fewer launch-blocking findings

16.2% less time to complete a security review

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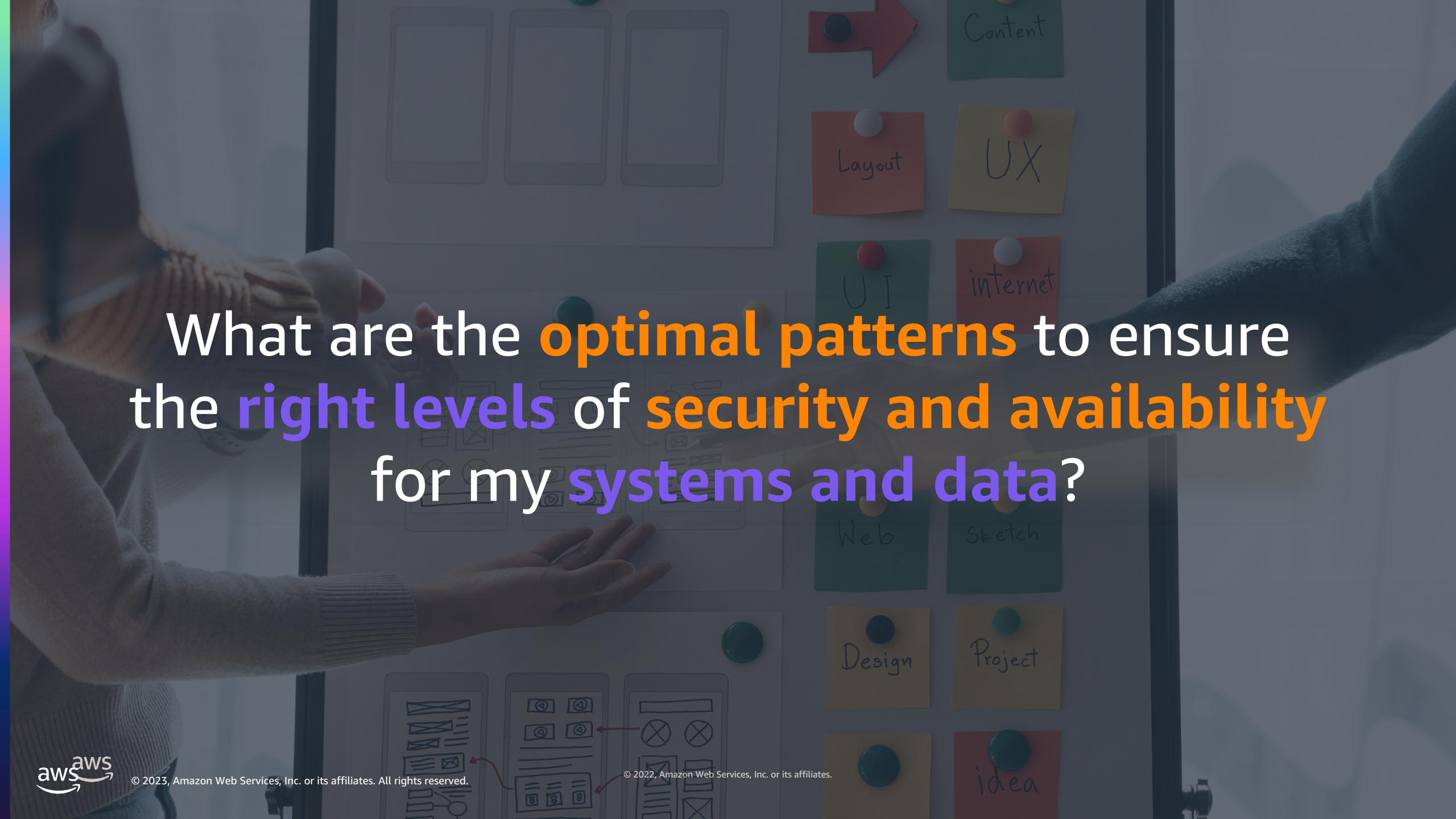

What are the **optimal patterns** to ensure the **right levels** of **security and availability** for my **systems and data**?

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Zero Trust defined

A conceptual **security model** and associated set of **mechanisms** that focus on providing security controls around digital assets that **do not solely or fundamentally depend on** traditional network controls or network perimeters

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Guiding principles for Zero Trust

01

Avoid a binary choice

02

Work backwards from your use cases

03

One size doesn't fit all

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What is a data perimeter?

Trusted identities

principals within your AWS accounts, or AWS services acting on your behalf

Trusted resources

resources owned by your AWS accounts or by AWS services acting on your behalf

Expected networks

your on-premises data centers and virtual private clouds (VPCs), or networks of AWS services acting on your behalf

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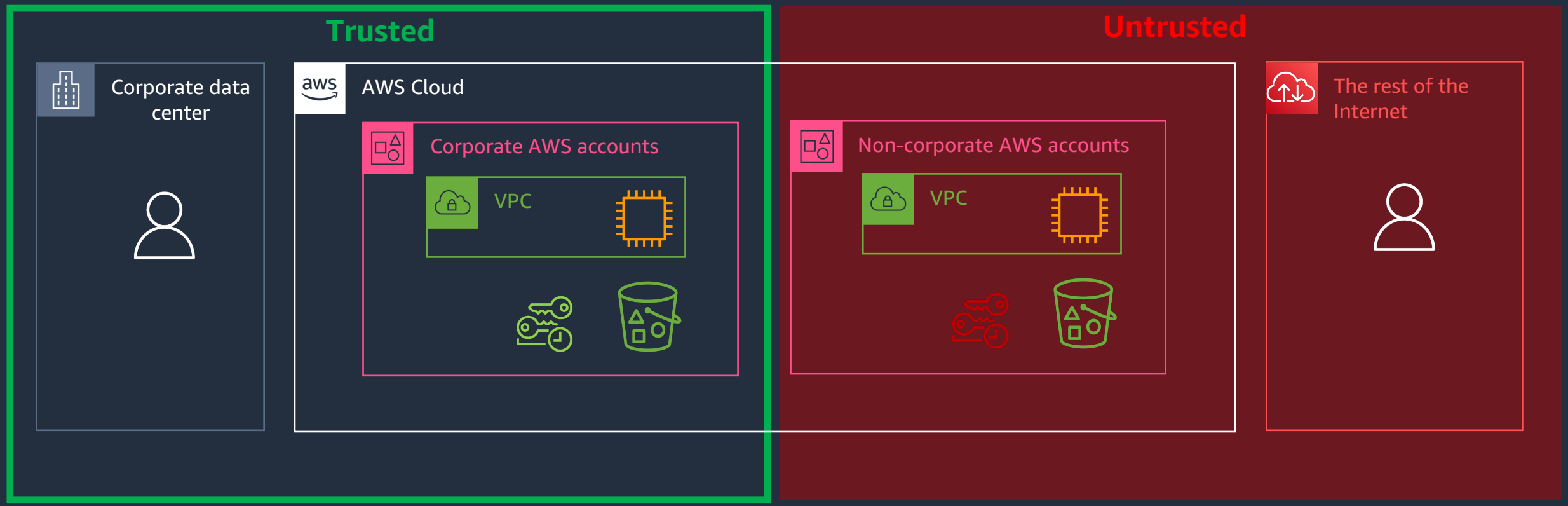
What is a data perimeter?

A set of **preventive guardrails**

- only your trusted identities
- are accessing trusted resources
- from expected networks



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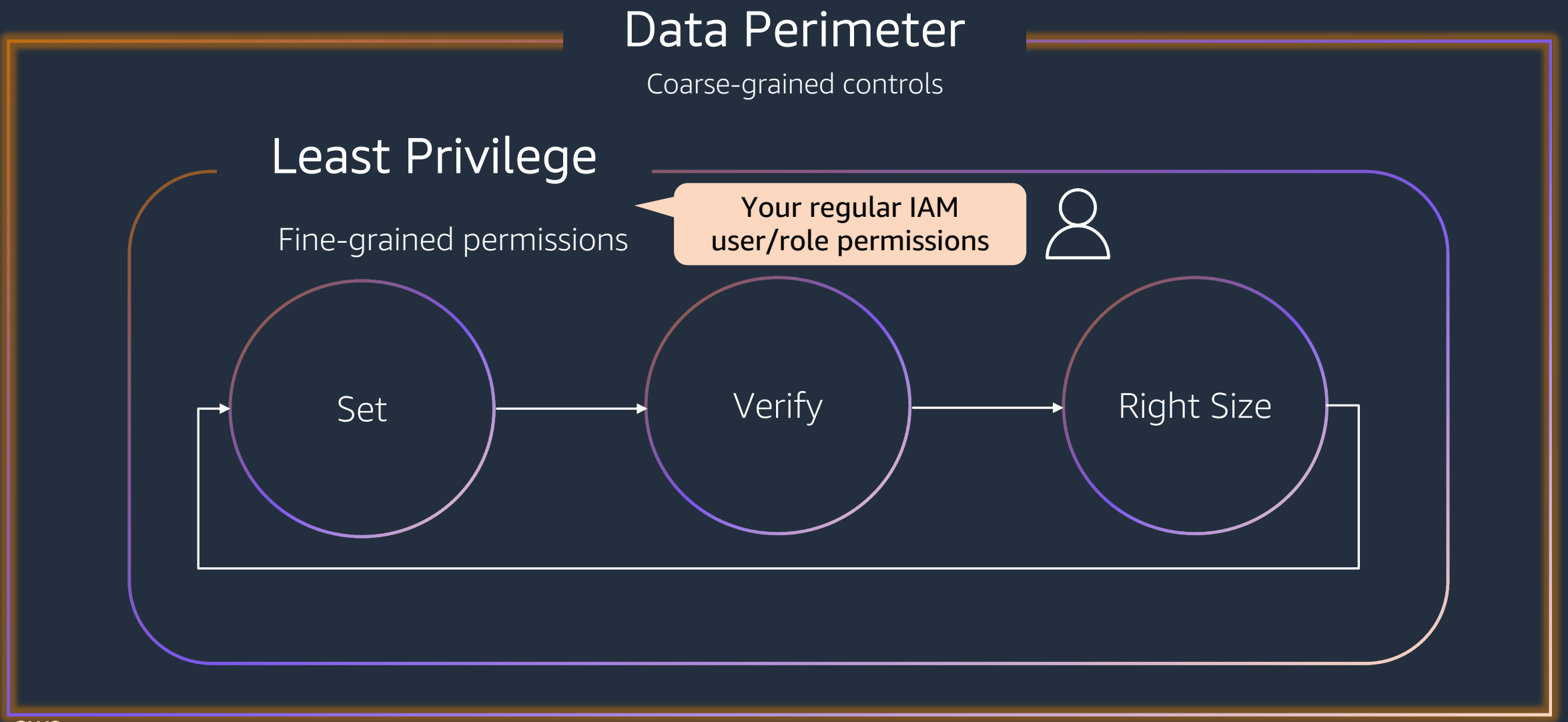
Access Management



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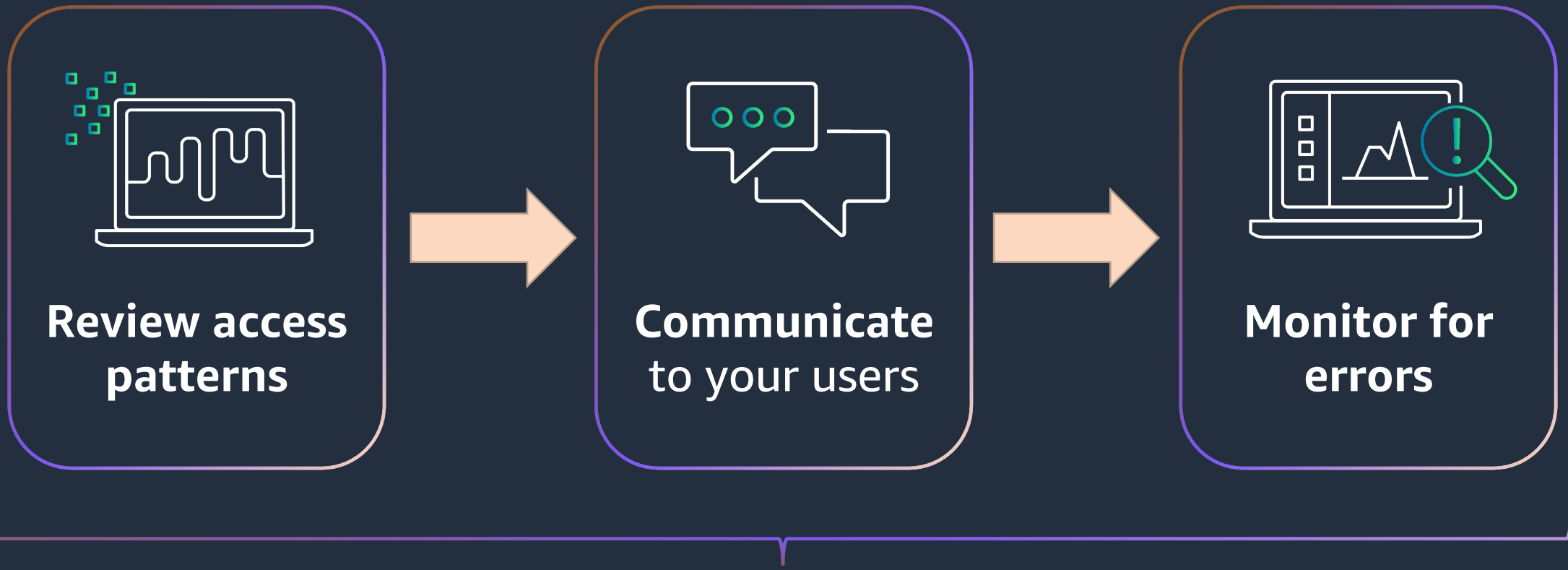
Tips on implementation



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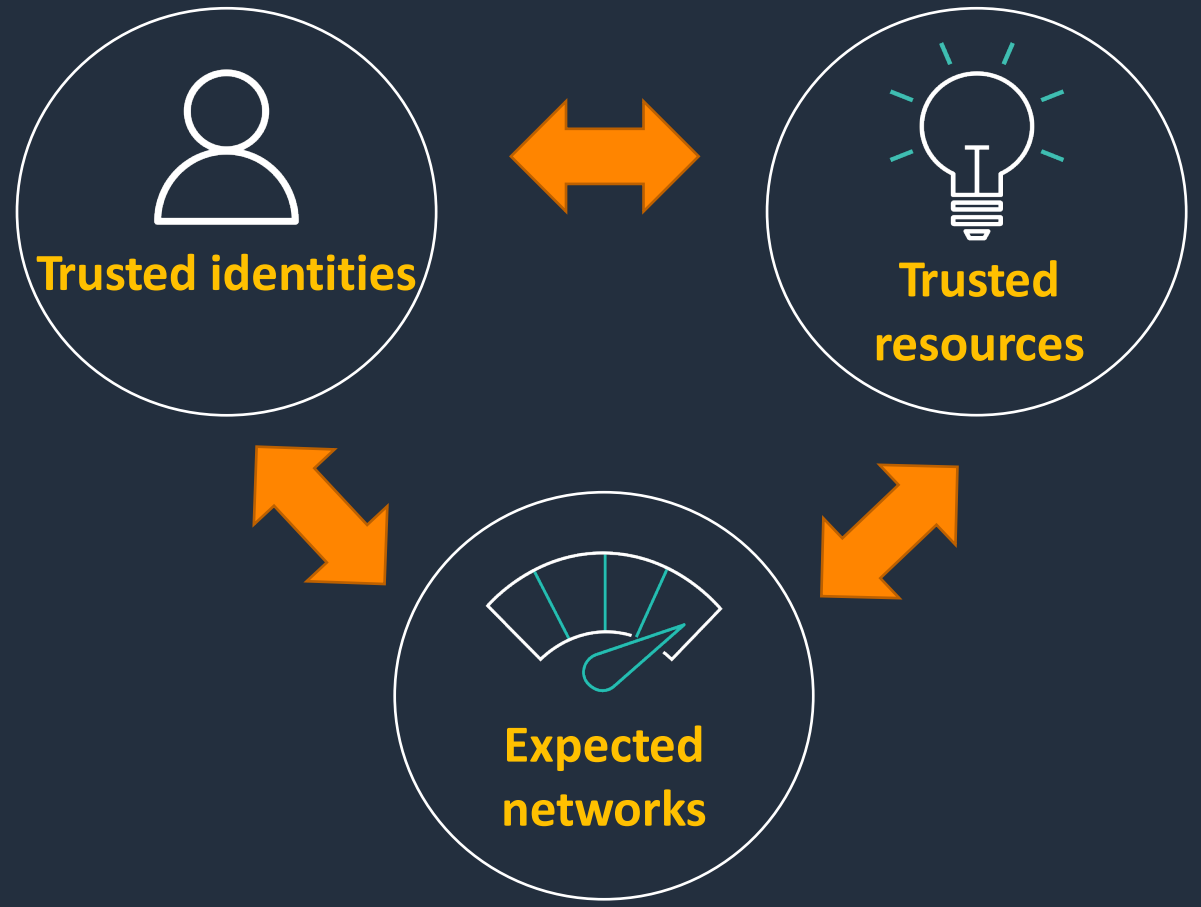
Key Takeaways

- Data perimeter provides **coarse-grained controls** to protect your organization as a whole

- How to implement
  - Service control policies
  - VPC endpoint policies
  - Resource-based policies

- Risk-based approach

- Always test before implementation



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Top 4 customer needs from data protection services

Data at rest

Storage encryption

Easily encrypt the data where it resides

Data in transit

Network encryption

Encrypt the data as it moves between networks – enforce data sovereignty

Application Credentials

Managed secrets

Encrypted secrets without the management overhead

Lifecycle Management

Automation

Make security easy and reduce human error

Customers don’t want to day-to-day management for cryptography or preventative controls

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How does AWS help customers with data protection?

"How do we move our data to AWS securely?"

Client-side encryption to encrypt inbound data

AWS Certificate Manager for SSL/TLS certificates

"How do we keep data on AWS confidential?"

Server-side encryption to encrypt data at-rest

AWS KMS and CloudHSM for enterprise key management and FIPS 140 validated HSMs

"How do we securely share data and resources within the cloud?"

AWS Identity and Access Management – Cross-Account Access

"How do we manage authentication and authorization?"

AWS IAM and Secrets Manager for identity and credentials management

"How do I prove security and compliance to auditors?"

AWS Management & Governance integrations

"How do we optimize cost and performance?"

"How do we architect for availability?"

"How do we scale?"

- Well-Architected Guidance
- Available in all Regions
- Our services are used by all other AWS services
- Cryptographic SDKs for application encryption
- Multi-Region Keys for Disaster Recovery

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Security assurance and provable data protection

Notify me if my desired encryption settings are modified

AWS Config

Utilize AWS Config Managed Rules to monitor encryption configuration changes in your AWS environment

Examples:

- s3-bucket-server-side-encryption-enabled
- s3-bucket-ssl-requests-only
- cloud-trail-encryption-enabled

Monitor usage of ACM certificates and KMS keys

AWS CloudTrail

Use AWS CloudTrail to create detailed logs of API calls to the KMS and ACM services for audit purposes

A KMS API action was called:

- by who (user, account, IP)
- when (timestamp)
- where, why (KMS key, AWS resource)

Audit important lifecycle events for certificates and KMS keys

Amazon CloudWatch

Use Amazon CloudWatch Metrics and Events to monitor important events and API calls in your AWS accounts

Examples:

- Metrics: time until key/certificate expiration
- Events: key rotation, key deletion, imported key expiration, certificate renewal

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Start with requirements

Identify applications to protect

Business impact analysis

Define RPO and RTO requirements

($ investment)

Compliance considerations

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Objectives and impacts

How much data can you afford to recreate or lose?

How quickly must you recover? What is the cost of downtime?

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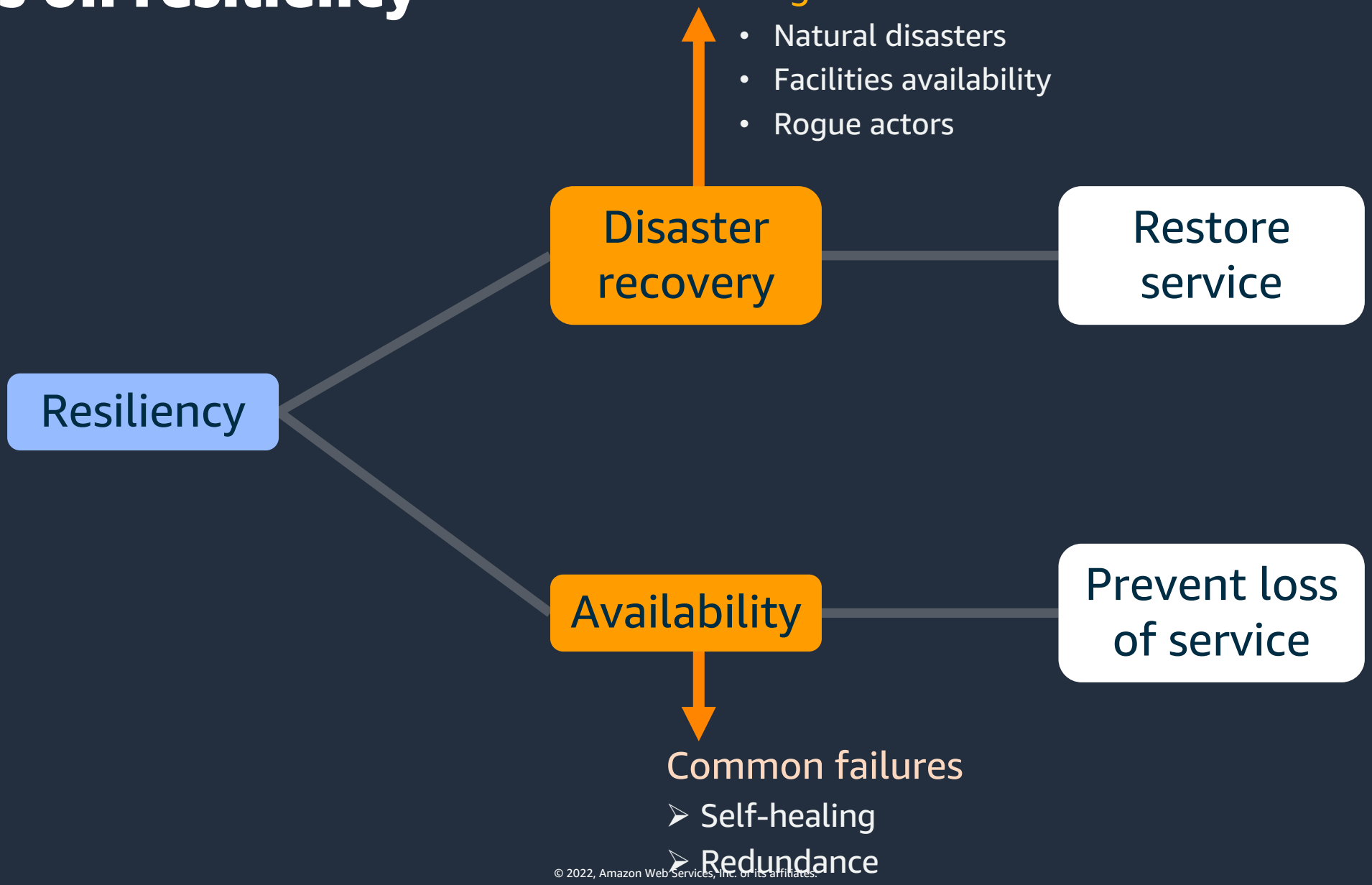
Focus on resiliency



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Categories of failures

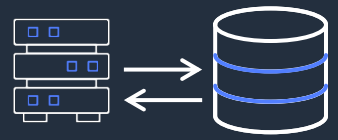
WHEN TO CHOOSE SINGLE REGION VS. MULTI-REGION

Code deployments and configuration

(e.g., bad deployment, cred expiration)

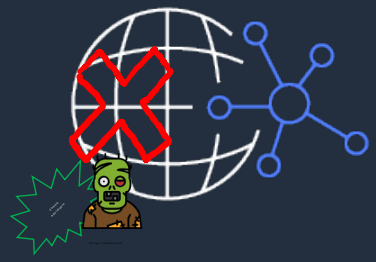
Core infrastructure

(e.g., data centre failure, host failure)



Data and state

(e.g., data corruption)



Highly unlikely scenarios

(e.g., all of internet failures, environmental disasters, supplier failures)

Likelihood

Probable — Rare

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AWS DR strategies (factors: complexity & time)

RPO/RTO: hours

- Lower priority use cases
- Solutions: Amazon S3, AWS Storage Gateway
- Cost: $

RPO/RTO: 10s of minutes

- Meeting lower RTO & RPO requirements
- Core services
- Scale AWS resources in response to a DR event
- Cost: $$

RPO/RTO: minutes

- Solutions that require RTO & RPO in minutes
- Business-critical services
- Cost: $$$

RPO/RTO: real time

- Auto-failover of your environment in AWS
- Cost: $$$$

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Resiliency patterns and trade-offs

	P1	P2	P3	P4	P5
	Multi-AZ Deployment	Static Stability in Region	Application Portfolio Distribution	Multi-AZ Deployment [Regional DR]	Multi-Region Active-Active Deployment
Design Complexity	Low	Medium	Medium	High	Very High
Cost to Implement	Low	High	Medium	High	High
Operational Effort	Low	Medium	Medium	Medium	Very High
Effort to Secure	Low	Medium	Medium	High	High
Environmental Impact	Low	Medium	Medium	High	High

Lowest — Availability — Highest

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Security resources

Developer information, articles and tutorials, security products, and whitepapers

http://aws.amazon.com/security/security-resources/

Security blog

Subscribe to the blog – it's a great way to stay up to date on AWS security and compliance

http://blogs.aws.amazon.com/security/

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billohl@amazon.com

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