AWS re:Invent

NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

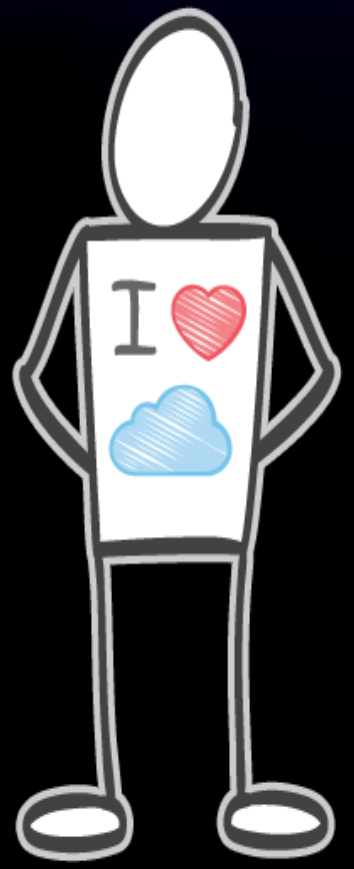
COP203

Cost control and governance at scale

Bina Khimani (she/her)
Global Business Leader, AWS Insights
Product Management and GTM
Amazon Web Services

Katelyn Decraene (she/her)
Senior Cloud Finance Manager
Morningstar

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A little bit about *yourself*

- Cloud financial management (CFM) or financial operations (FinOps)
- Finance and procurement teams
- Tech team or application owner
- Cloud center of excellence

aws

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Where we're headed

WHAT DOES COST CONTROL AND GOVERNANCE AT SCALE LOOK LIKE?



- Establishing guardrails
- Reporting and monitoring
- Control in practice

Adapting traditional processes to be *cloud-ready*

DYNAMIC CLOUD USAGE DESERVES AGILE, DYNAMIC CONTROL MECHANISMS



Forecasting

Mapping to AWS

Dynamic, rolling forecast

Cross-functional alignment



Control

Consolidated billing

Governance and agility

Simplified procure-to-pay



Traceability

Clean account structure

Meaningful cost reporting

Charge/showback ready



Oversight

Cost-aware architecture

Match demand with supply

Various purchase options

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Enable

Provision

Operate

Secure and compliant

Operations and spend management

Experiment

Be productive

Empower distributed teams

Self-service access

Respond quickly to change

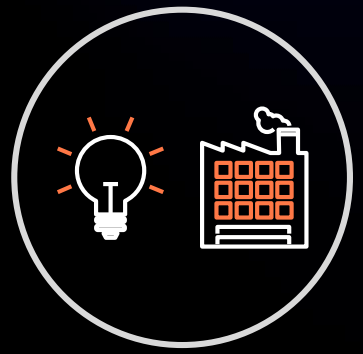


With AWS, you don’t have to choose between agility or control

You can have both for your level of maturity, complexity, and scale

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Finding the right balance



Business profile

Startup

vs

Global enterprise

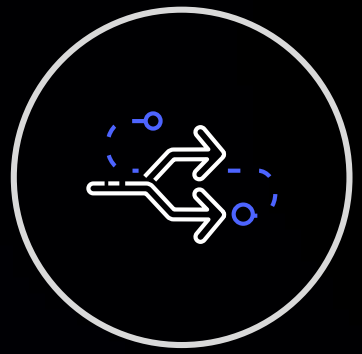


Cloud maturity

New to cloud

vs

Experienced with cloud

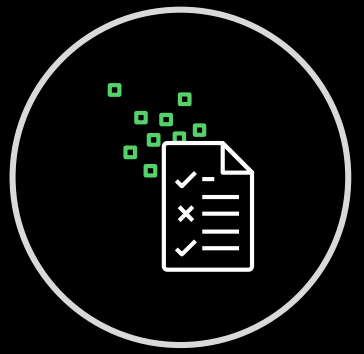


Process

Augment

vs

Create



Type of control

Proactive

vs

Reactive

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Evolving cost control to be *cloud-native*

Govern

Monitor

Automate

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Govern and control

Establishing guardrails without slowing innovation

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Establishing guardrails and policies for your organization

STRATEGY FOR ALLOCATION, AND PERMISSIONS AND POLICIES TO CONTROL RESOURCE USAGE



Who has access to which resources?



How do I scale compliance?



How to logically group accounts and policies?

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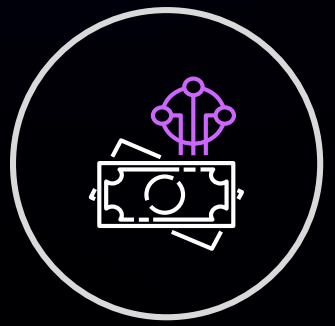
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Govern and control through process

AUGMENT OR EVOLVE EXISTING PROCESSES



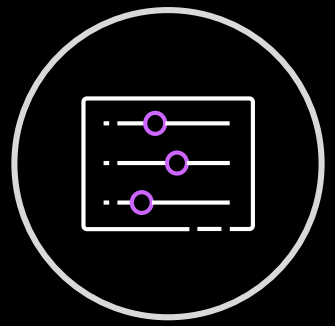
New cloud workload onboarding



Architecture cost reviews



Service readiness reviews



Change management



Incident management

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Control as you scale

ESTABLISH CENTRAL POLICIES TO DRIVE GOVERNANCE AT SCALE



AWS Identity and Access Management (IAM)

- Create and manage users and groups, and use permissions to allow and deny access to AWS resources
- Control what operations can be performed by an entity or AWS services
- Set permissions to control which operations a user or role can perform on AWS resources



AWS Organizations

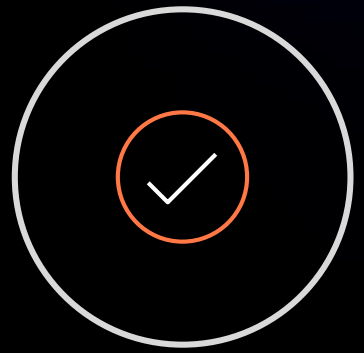
- AWS Organizations provides a management framework for AWS accounts
- Organizational units (OU) are sets of AWS accounts logically grouped within an organization
- Use service control policies to apply policies to OU and accounts for guardrails

aws

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AWS Control Tower

SELF-SERVICE SOLUTION TO AUTOMATE THE SETUP OF NEW AWS MULTI-ACCOUNT ENVIRONMENTS



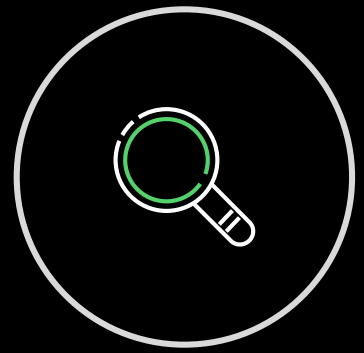
An AWS service offering account creation based on AWS best practices



Deployment of AWS best practice blueprints and guardrails



Baseline fundamental accounts to provide standardization of best practices



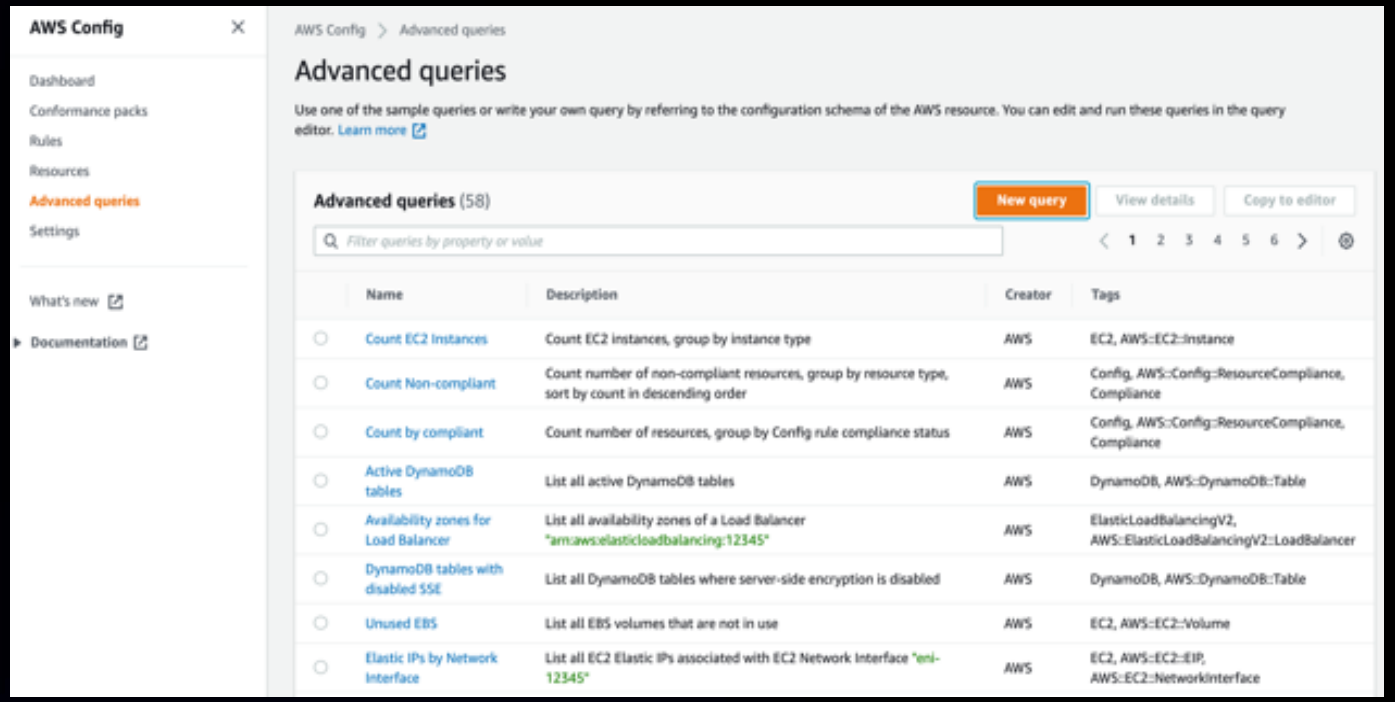
Single pane of glass for monitoring compliance to guardrails

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AWS Config

SIMPLIFY COMPLIANCE AUDITING, CHANGE MANAGEMENT, AND OPERATIONAL TROUBLESHOOTING

- Continuously monitor and record your AWS resource configurations
- Evaluate recorded configurations against desired configurations
- Tracks configuration changes (up to 7 years of history)
- Provides an aggregated view of resource configuration and compliance status across accounts and regions
- Integrates with your own CMDBs (such as ServiceNow)



Example: Query resource state metadata without performing AWS service-specific API calls

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Report and monitor

Ensuring innovation is consistent with organizational objectives

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Establishing visibility and predictability

ALLOCATION STRATEGY, PERMISSIONS, AND POLICIES TO CONTROL RESOURCE USAGE



How do we logically group resources?



How do we avoid cost surprises?



How do we create hard spending limits?

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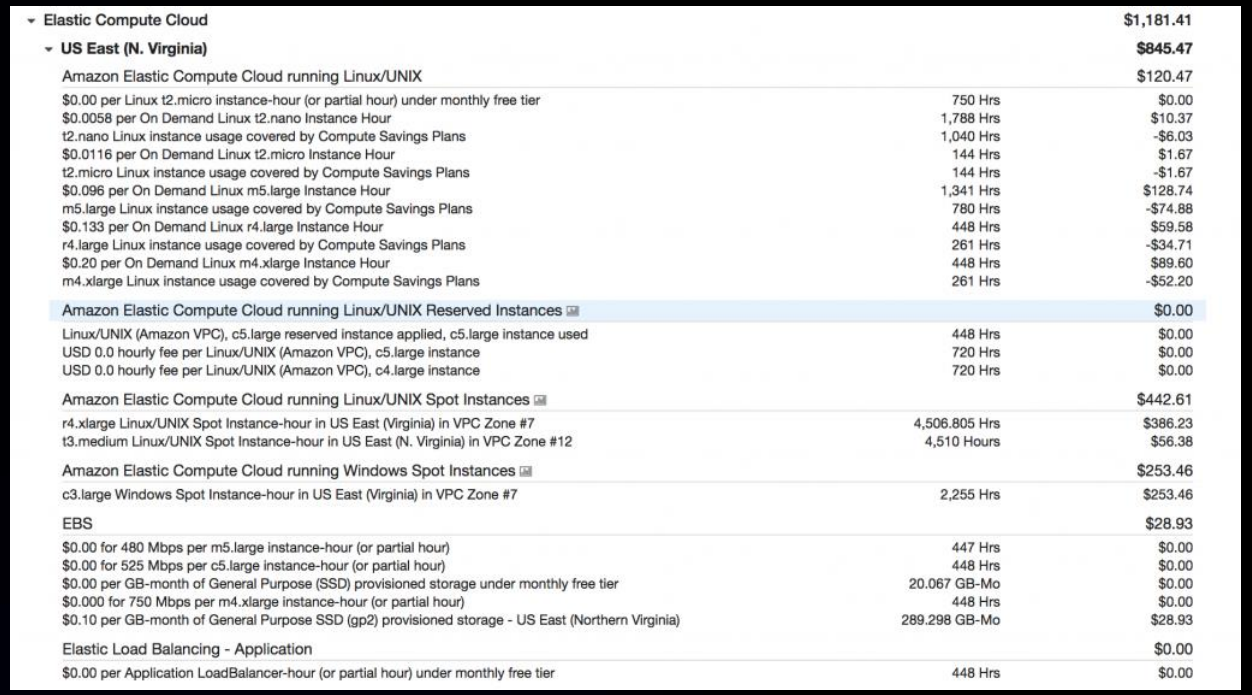
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Billing at scale

BILLING, PAYMENTS, AND COST MANAGEMENT

AWS Billing and Cost Management

- Review usage and month-to-date spend
- Configure billing and payment preferences
- Establish cost category rules to group and multilevel hierarchies to manage spend
- Set rules for sharing discounts
- Go!



Elastic Compute Cloud		**$1,181.41**
US East (N. Virginia)		**$845.47**
Amazon Elastic Compute Cloud running Linux/UNIX		$120.47
$0.00 per Linux t2.micro instance-hour (or partial hour) under monthly free tier	750 Hrs	$0.00
$0.0058 per On Demand Linux t2.nano Instance Hour	1,788 Hrs	$10.37
t2.nano Linux instance usage covered by Compute Savings Plans	1,040 Hrs	-$6.03
$0.0116 per On Demand Linux t2.micro Instance Hour	144 Hrs	$1.67
t2.micro Linux instance usage covered by Compute Savings Plans	144 Hrs	-$1.67
$0.096 per On Demand Linux m5.large Instance Hour	1,341 Hrs	$128.74
m5.large Linux instance usage covered by Compute Savings Plans	780 Hrs	-$74.88
$0.133 per On Demand Linux r4.large Instance Hour	448 Hrs	$59.58
r4.large Linux instance usage covered by Compute Savings Plans	261 Hrs	-$34.71
$0.20 per On Demand Linux m4.xlarge Instance Hour	448 Hrs	$89.60
m4.xlarge Linux instance usage covered by Compute Savings Plans	261 Hrs	-$52.20
Amazon Elastic Compute Cloud running Linux/UNIX Reserved Instances		$0.00
Linux/UNIX (Amazon VPC), c5.large reserved instance applied, c5.large instance used	448 Hrs	$0.00
USD 0.0 hourly fee per Linux/UNIX (Amazon VPC), c5.large instance	720 Hrs	$0.00
USD 0.0 hourly fee per Linux/UNIX (Amazon VPC), c4.large instance	720 Hrs	$0.00
Amazon Elastic Compute Cloud running Linux/UNIX Spot Instances		$442.61
r4.xlarge Linux/UNIX Spot Instance-hour in US East (Virginia) in VPC Zone #7	4,506.805 Hrs	$386.23
t3.medium Linux/UNIX Spot Instance-hour in US East (N. Virginia) in VPC Zone #12	4,510 Hours	$56.38
Amazon Elastic Compute Cloud running Windows Spot Instances		$253.46
c3.large Windows Spot Instance-hour in US East (Virginia) in VPC Zone #7	2,255 Hrs	$253.46
EBS		$28.93
$0.00 for 480 Mbps per m5.large instance-hour (or partial hour)	447 Hrs	$0.00
$0.00 for 525 Mbps per c5.large instance-hour (or partial hour)	448 Hrs	$0.00
$0.00 per GB-month of General Purpose (SSD) provisioned storage under monthly free tier	20.067 GB-Mo	$0.00
$0.000 for 750 Mbps per m4.xlarge instance-hour (or partial hour)	448 Hrs	$0.00
$0.10 per GB-month of General Purpose SSD (gp2) provisioned storage - US East (Northern Virginia)	289.298 GB-Mo	$28.93
Elastic Load Balancing - Application		$0.00
$0.00 per Application LoadBalancer-hour (or partial hour) under monthly free tier	448 Hrs	$0.00

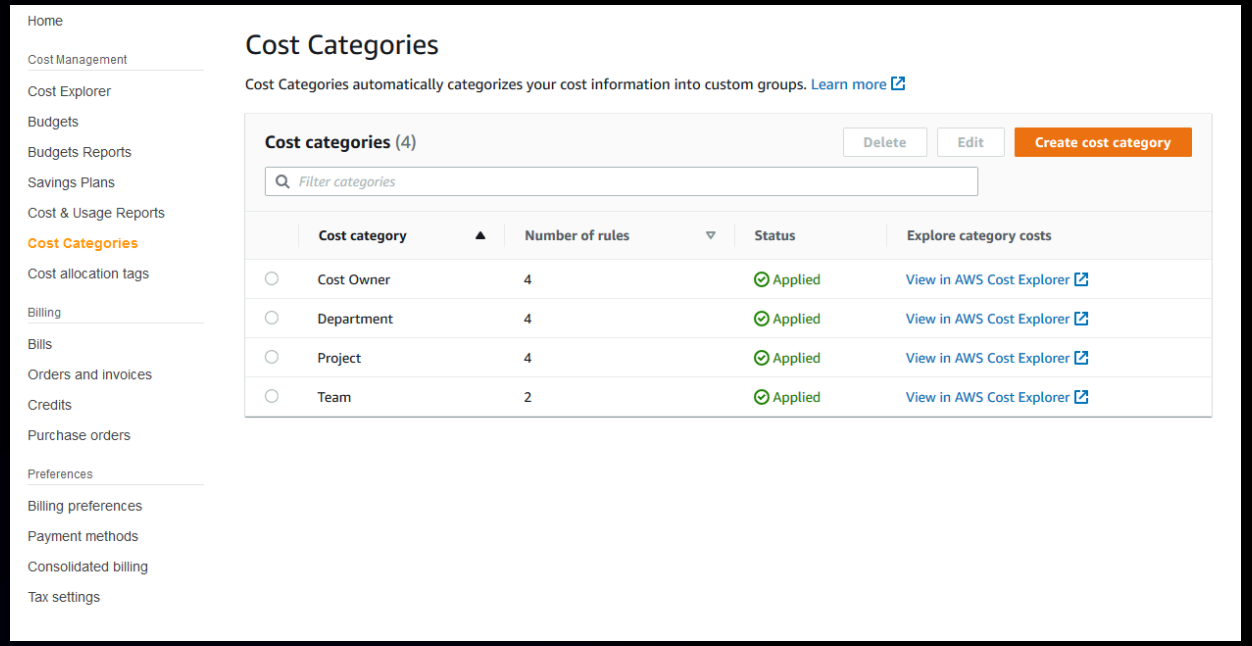
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Establishing a uniform view of your business

DEFINE ALLOCATION RULES AND ORGANIZATIONAL MAPPING

AWS Cost Categories

- Map cost and usage back to teams, organizations, or products
- Group cost and usage based on account, tag, service, charge type, or other cost categories
- Define split charges for shared costs

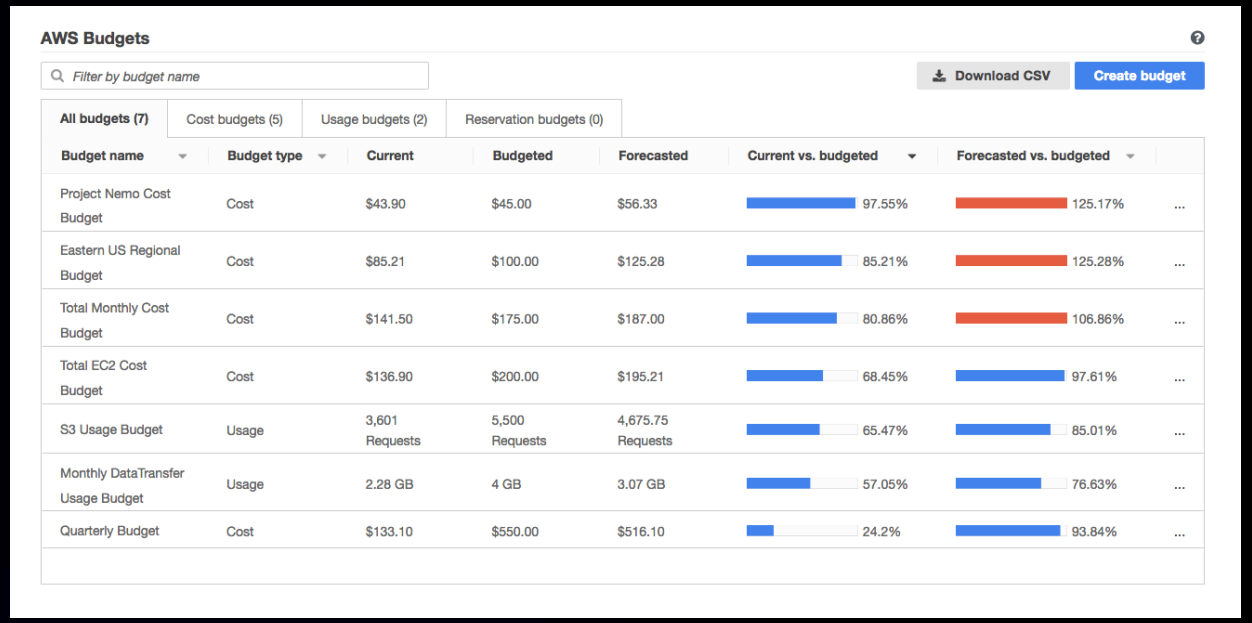


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AWS Budgets

SET CUSTOM BUDGETS TO ALERT YOU WHEN YOU EXCEED YOUR BUDGET THRESHOLD

- Create custom budgets to track cost, usage, or savings plan/RI coverage and utilization
- Track daily, monthly, quarterly, or annual granularity
- Track across multiple dimensions, such as, service, linked account(s), cost category, region, tag, and more
- Receive alerts when your cost and usage exceeds (or is forecast to exceed) predefined thresholds
- Get summary notifications daily, weekly, or monthly



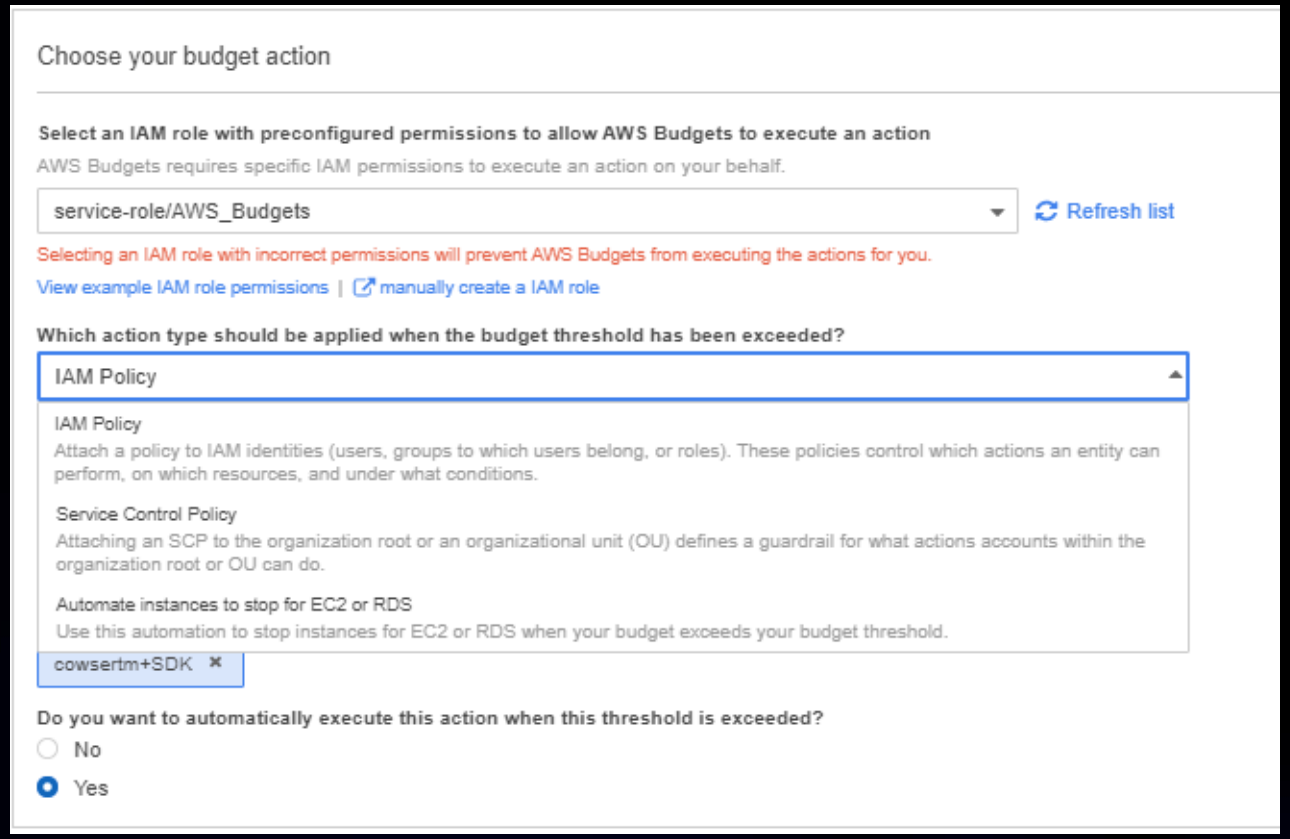
Budget name	Budget type	Current	Budgeted	Forecasted	Current vs. budgeted	Forecasted vs. budgeted
Project Nemo Cost Budget	Cost	$43.90	$45.00	$56.33	97.55%	125.17%
Eastern US Regional Budget	Cost	$85.21	$100.00	$125.28	85.21%	125.28%
Total Monthly Cost Budget	Cost	$141.50	$175.00	$187.00	80.86%	106.86%
Total EC2 Cost Budget	Cost	$136.90	$200.00	$195.21	68.45%	97.61%
S3 Usage Budget	Usage	3,601 Requests	5,500 Requests	4,675.75 Requests	65.47%	85.01%
Monthly DataTransfer Usage Budget	Usage	2.28 GB	4 GB	3.07 GB	57.05%	76.63%
Quarterly Budget	Cost	$133.10	$550.00	$516.10	24.2%	93.84%

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AWS Budgets actions

AUTOMATED RESPONSES TO STOP OR APPROVE WHEN YOU REACH OR EXCEED BUDGET THRESHOLDS

- Apply IAM and service control policies
- Stop running resources
- Workflow approval or automated

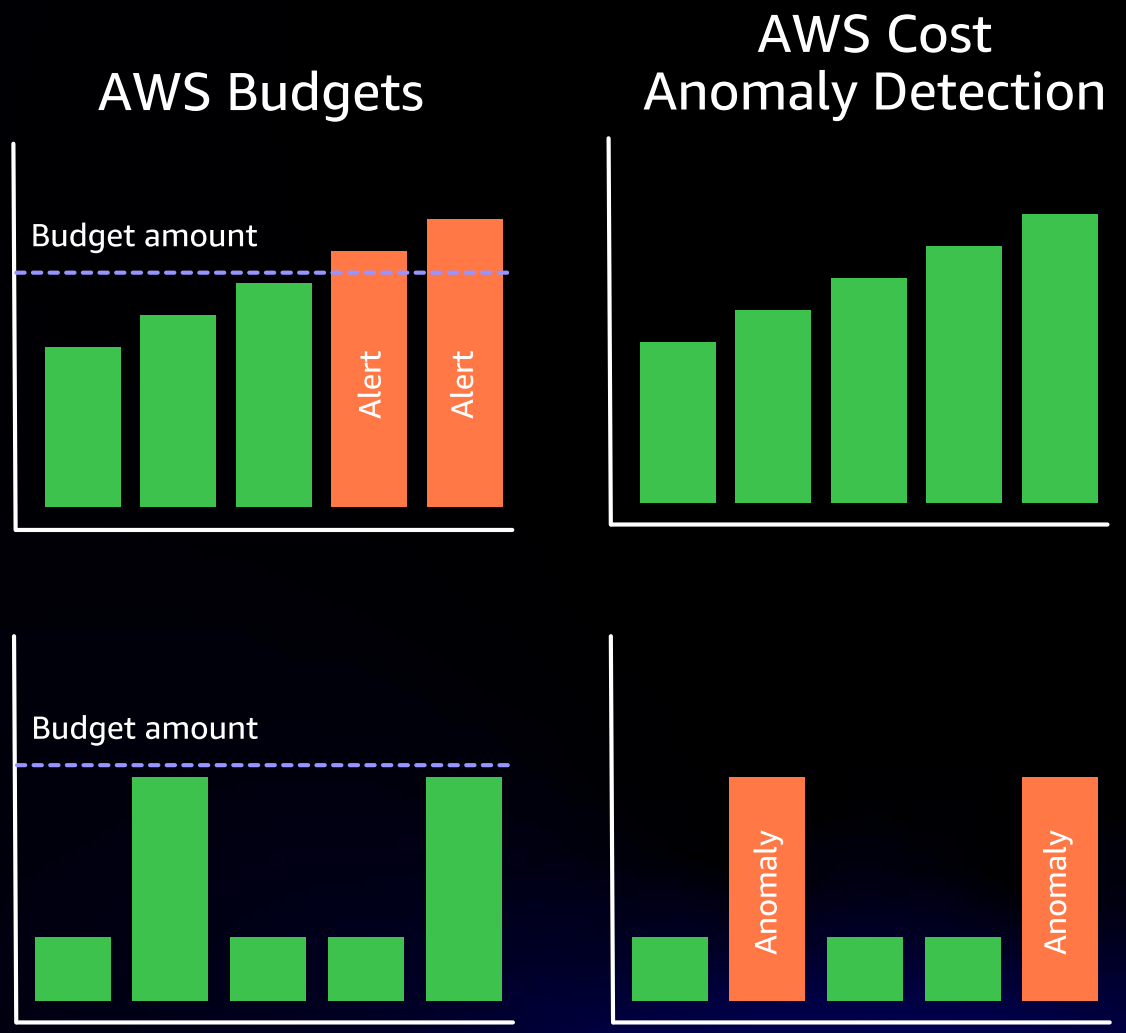


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AWS Cost Anomaly Detection

MULTI-LAYERED, ML-BASED SERVICE TO PROACTIVELY DETECT COST AND USAGE ANOMALIES

- Automated contextualized, ML-backed cost anomaly detection
- Root-cause analysis
- Receive individual, daily, or weekly summary alerts via email or Amazon SNS topic
- Get started in 3 clicks
- (Bonus: it's free!)



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MORNINGSTAR®

Cost control in practice

Putting cost control and governance into practice at Morningstar

Katelyn Decraene (she/her)

Senior Cloud Finance Manager
Morningstar

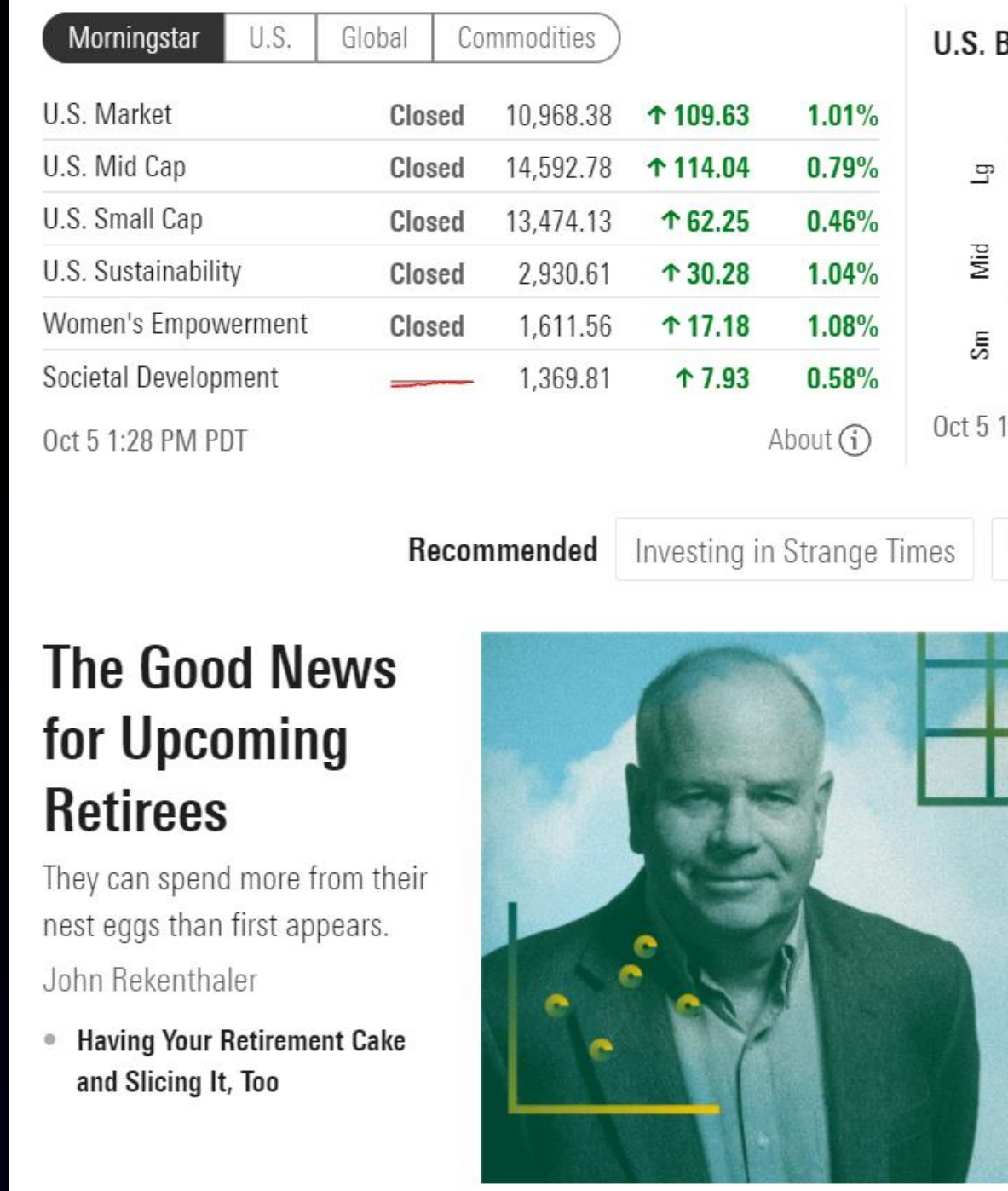
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- Extensive line of products and services for individual investors, financial advisors, asset managers, retirement plan providers and sponsors, and institutional investors in the private capital markets
- 7,900+ employees, 29 countries

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Public cloud journey

HOW IT STARTED



Own and operate minimum infrastructure

Increase our speed to market

Support quick entry into emerging markets

Support maximum client uptime and availability

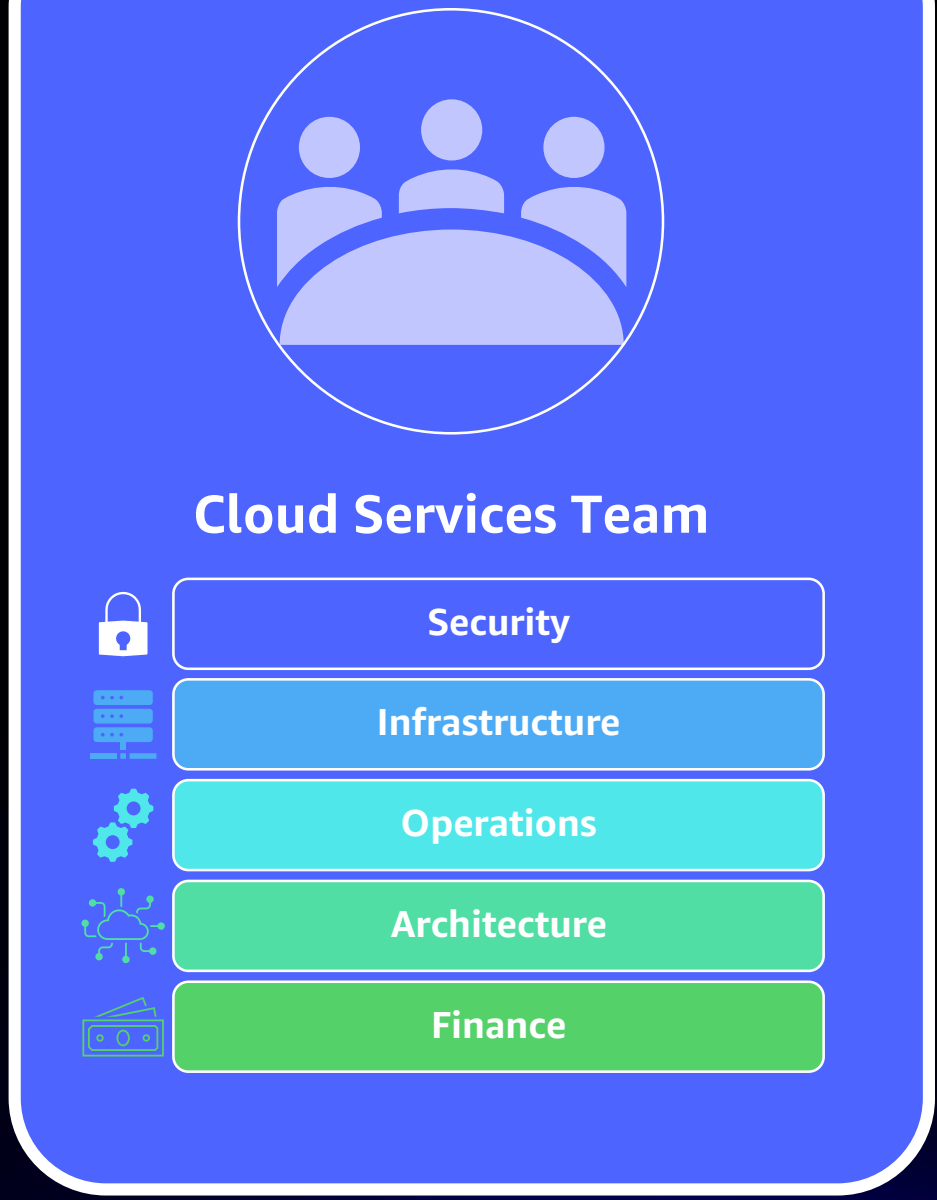
Efficient and transparent cost structure

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Public cloud journey

PROGRESS TO DATE

- 9 data center migrations
- 5.5K+ on-premises server retirement
- 1,000+ accounts in AWS
- Dedicated Cloud Services Team



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Challenges



Increased onboarding and adoption

+

Limited visibility into team spend

Innovation > Cost governance

Bad at estimating costs

Cost awareness and continuous monitoring

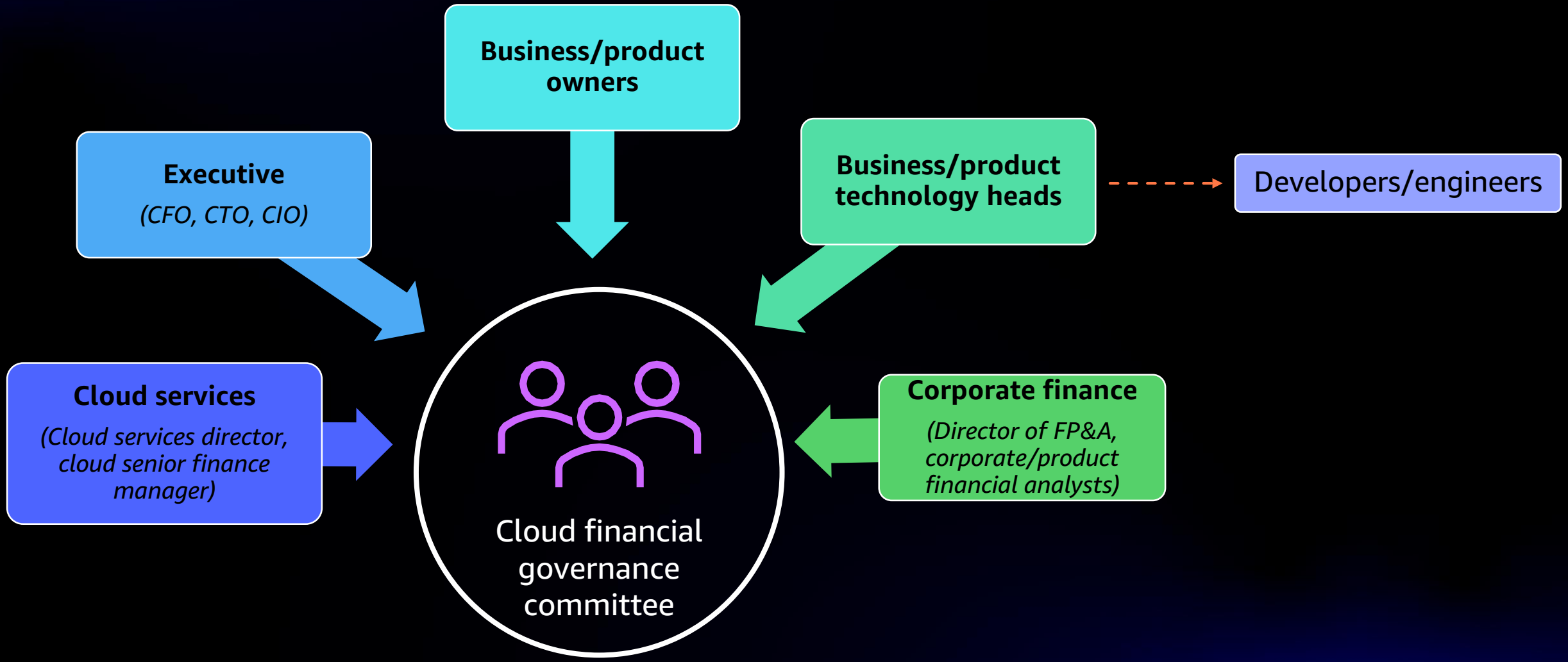
On-premises mindset

= $$$

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FinOps at Morningstar

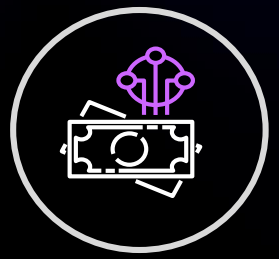
PEOPLE



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FinOps at Morningstar

HOW WE OPERATE



Agile budgeting and forecasting



Standardized business case



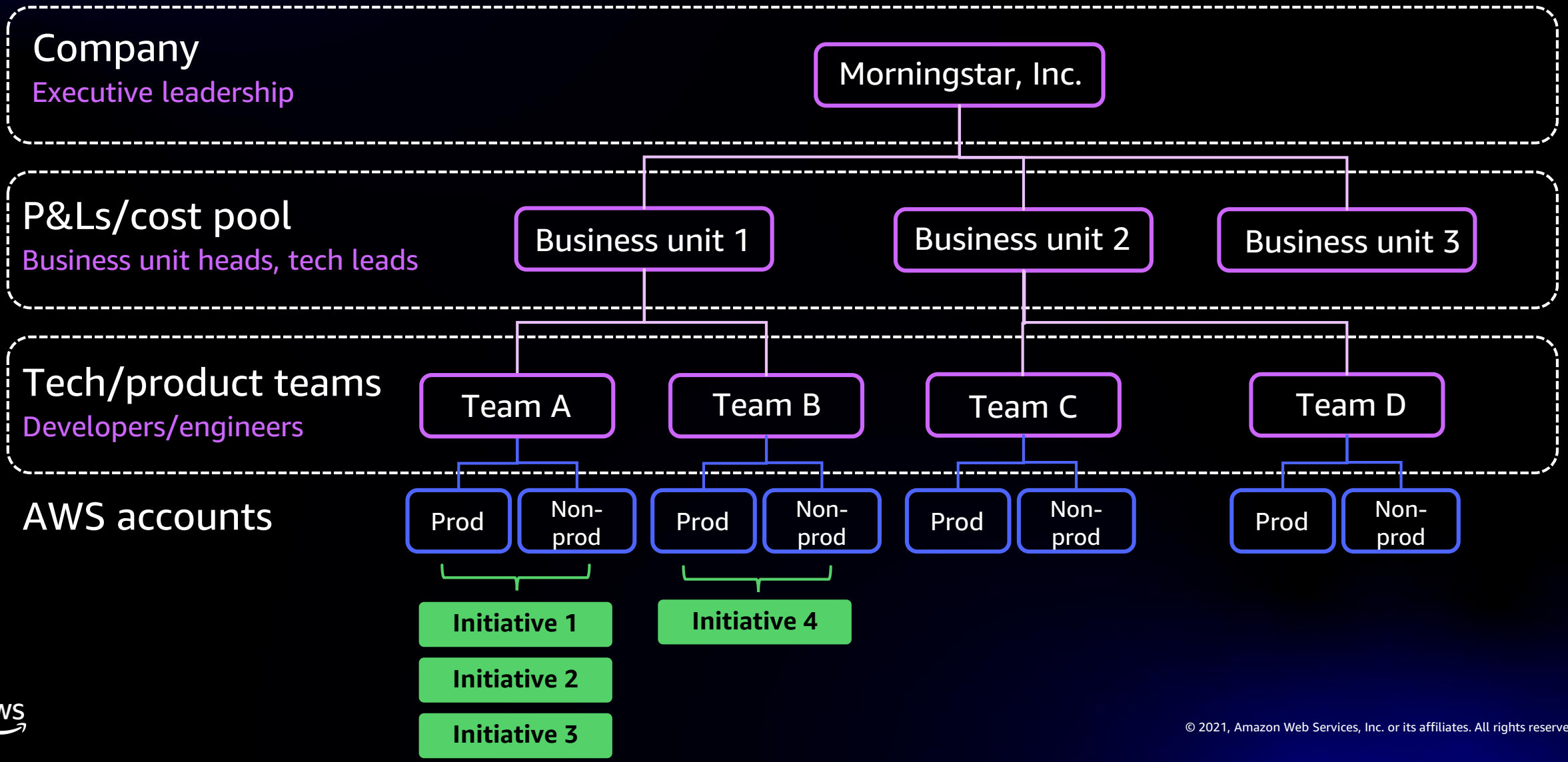
Finance and architecture review

- Centrally managed budget, reserve pool, and showback
- Business value and strategic alignment
- Documented cost drivers and assumptions (AWS Pricing Calculator)
- Proactive cost optimization
- Team initiative granularity and inventory
- Baseline to manage and track spend

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FinOps at Morningstar

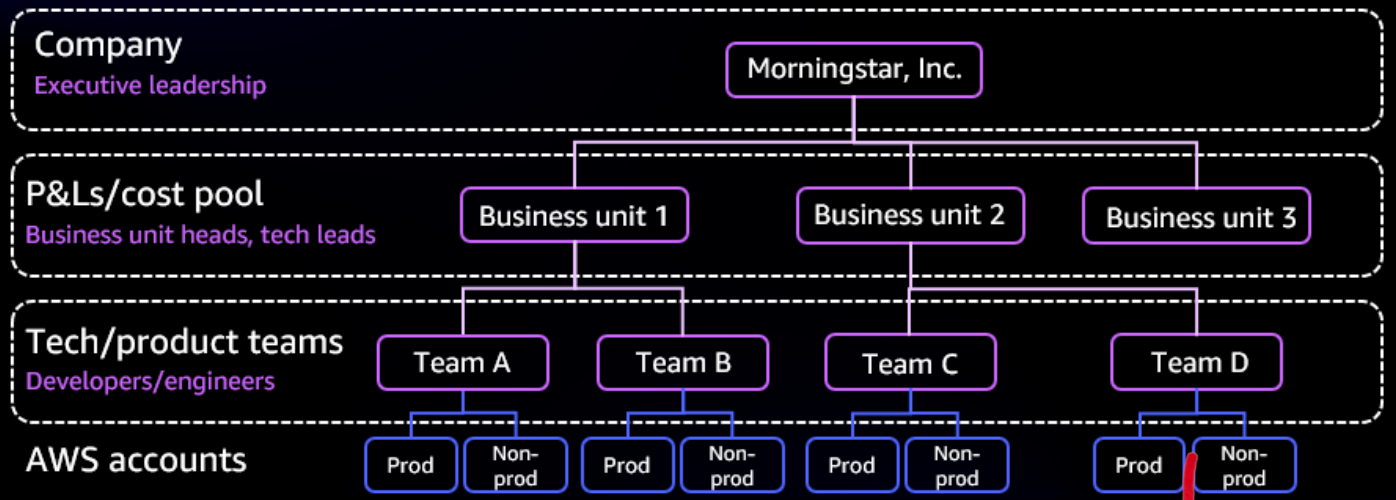
ACCOUNT STRUCTURE



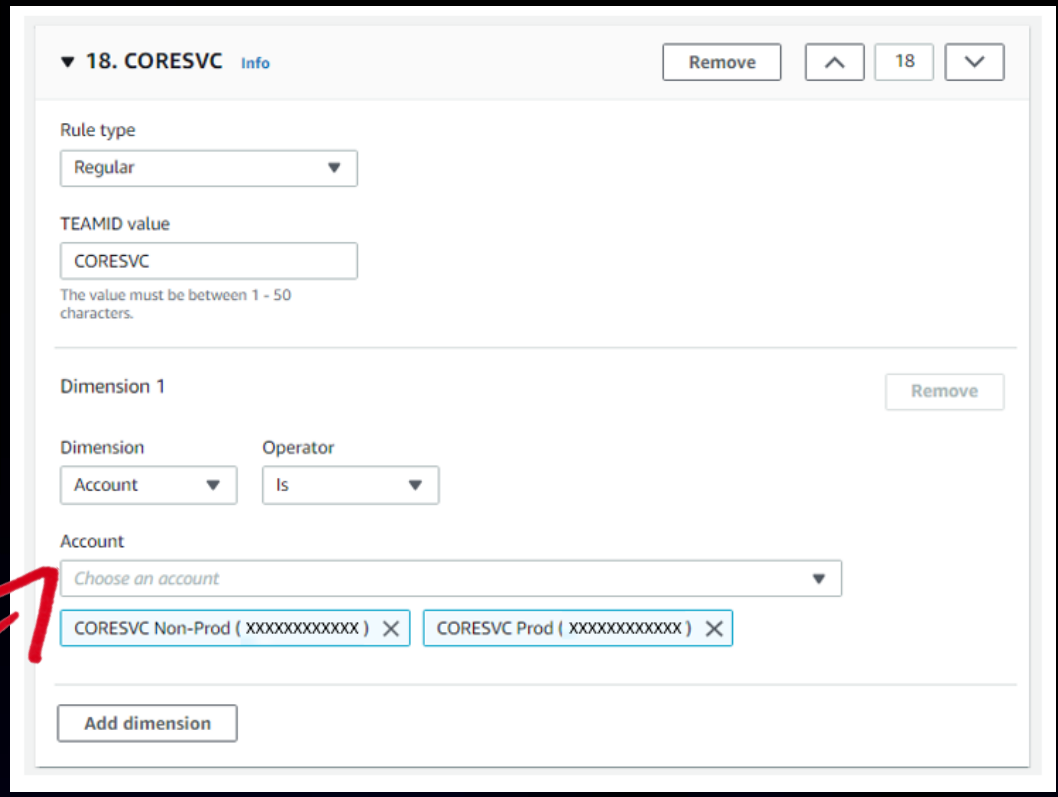
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Cost allocation

AWS COST CATEGORIES



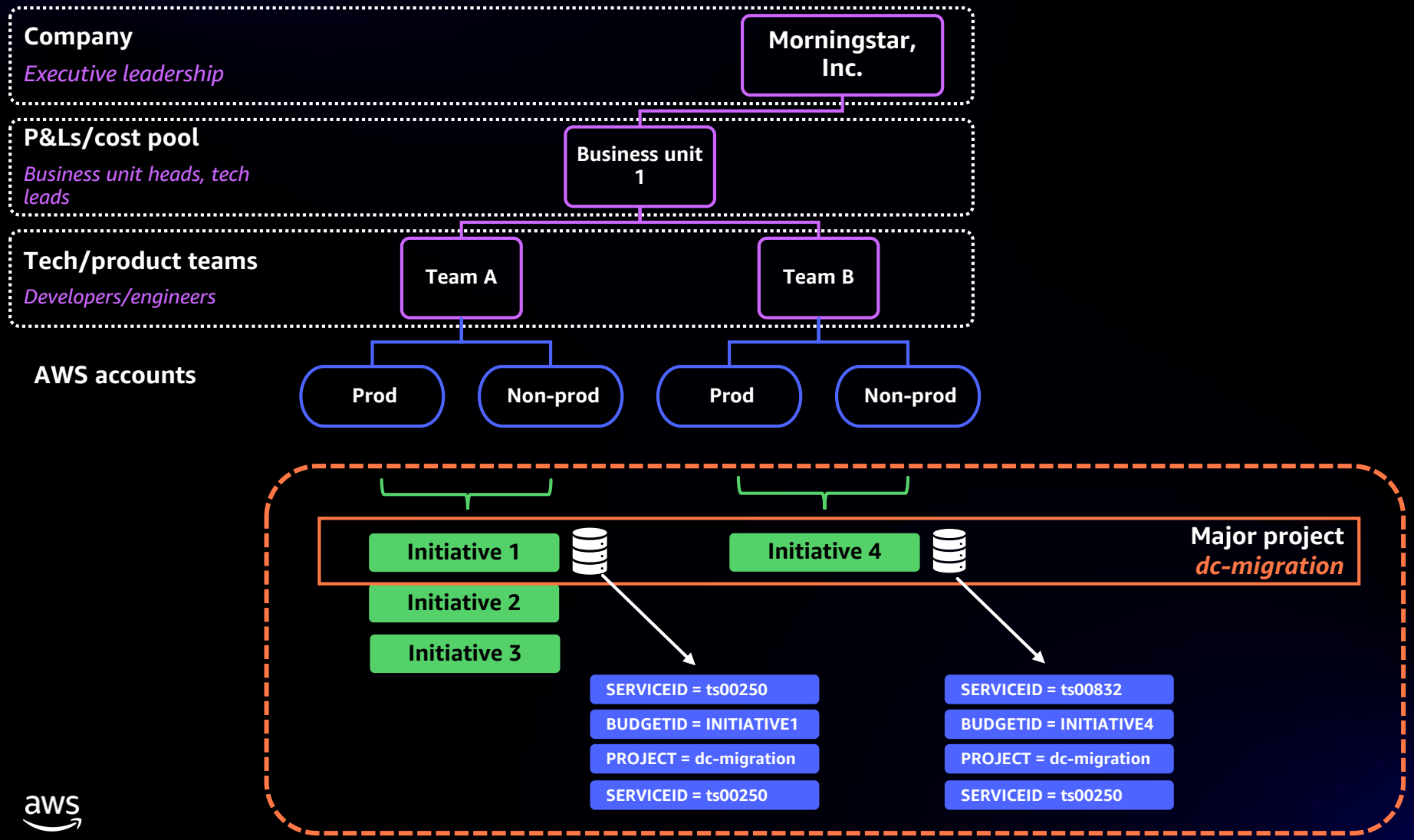
AWS
Cost Categories



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Cost allocation

COST ALLOCATION TAGS

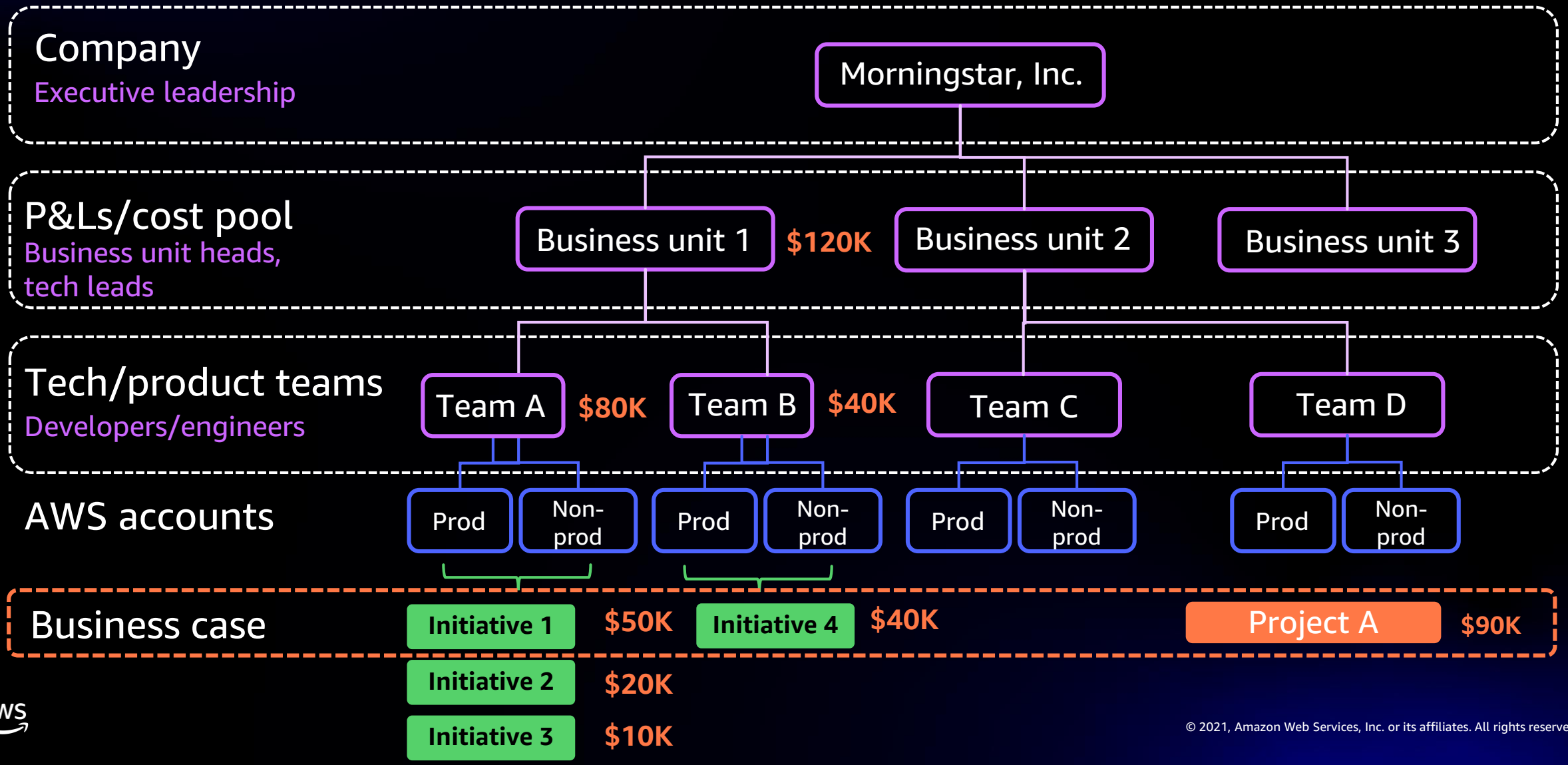


Cost allocation tags

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FinOps at Morningstar

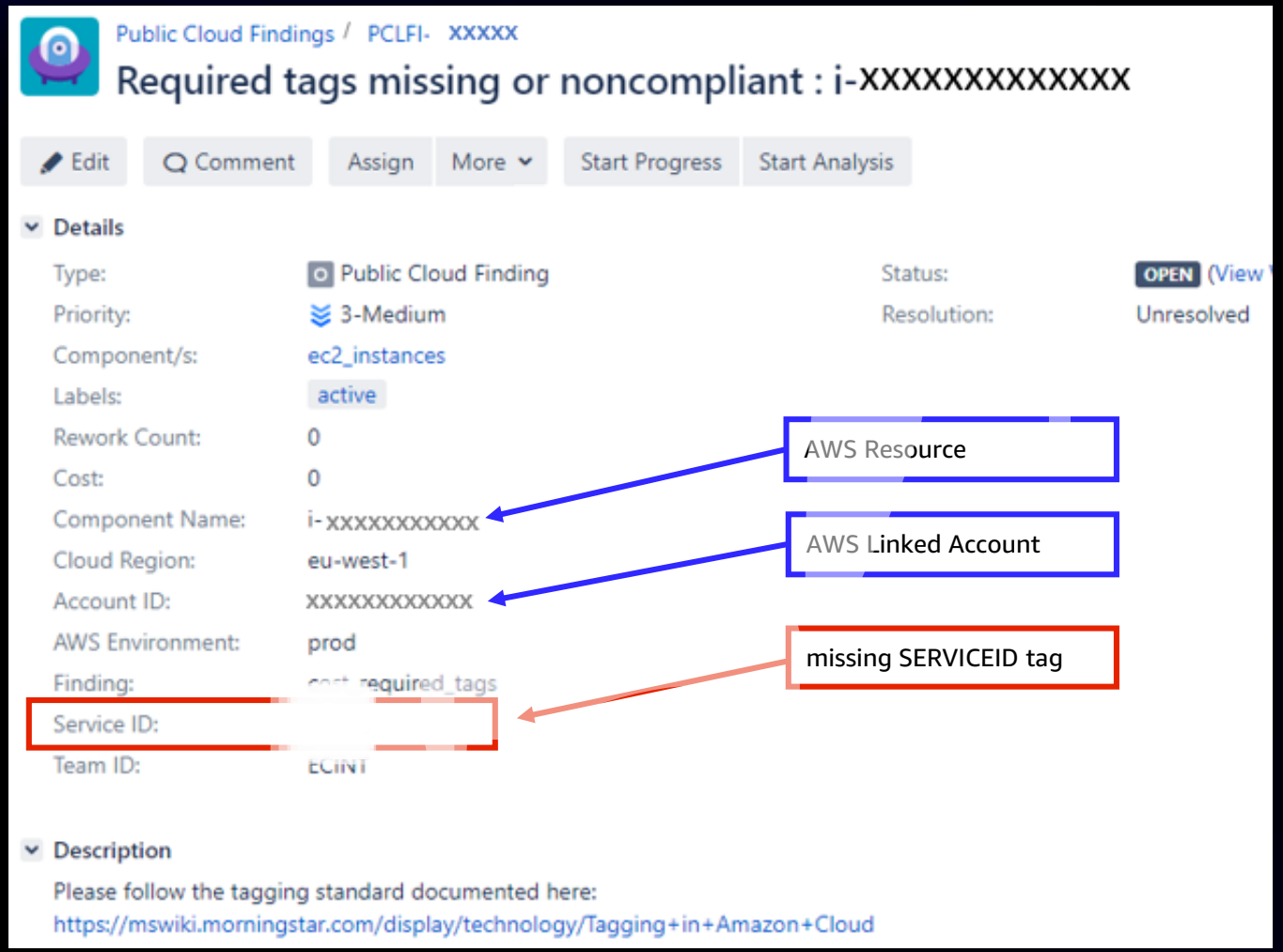
ACCOUNT STRUCTURE



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Cost allocation

COST ALLOCATION TAG ENFORCEMENT



Percentage of Amazon EC2 instance spend coverage with the SERVICEID cost allocation tag increased 7% within the first 3 months

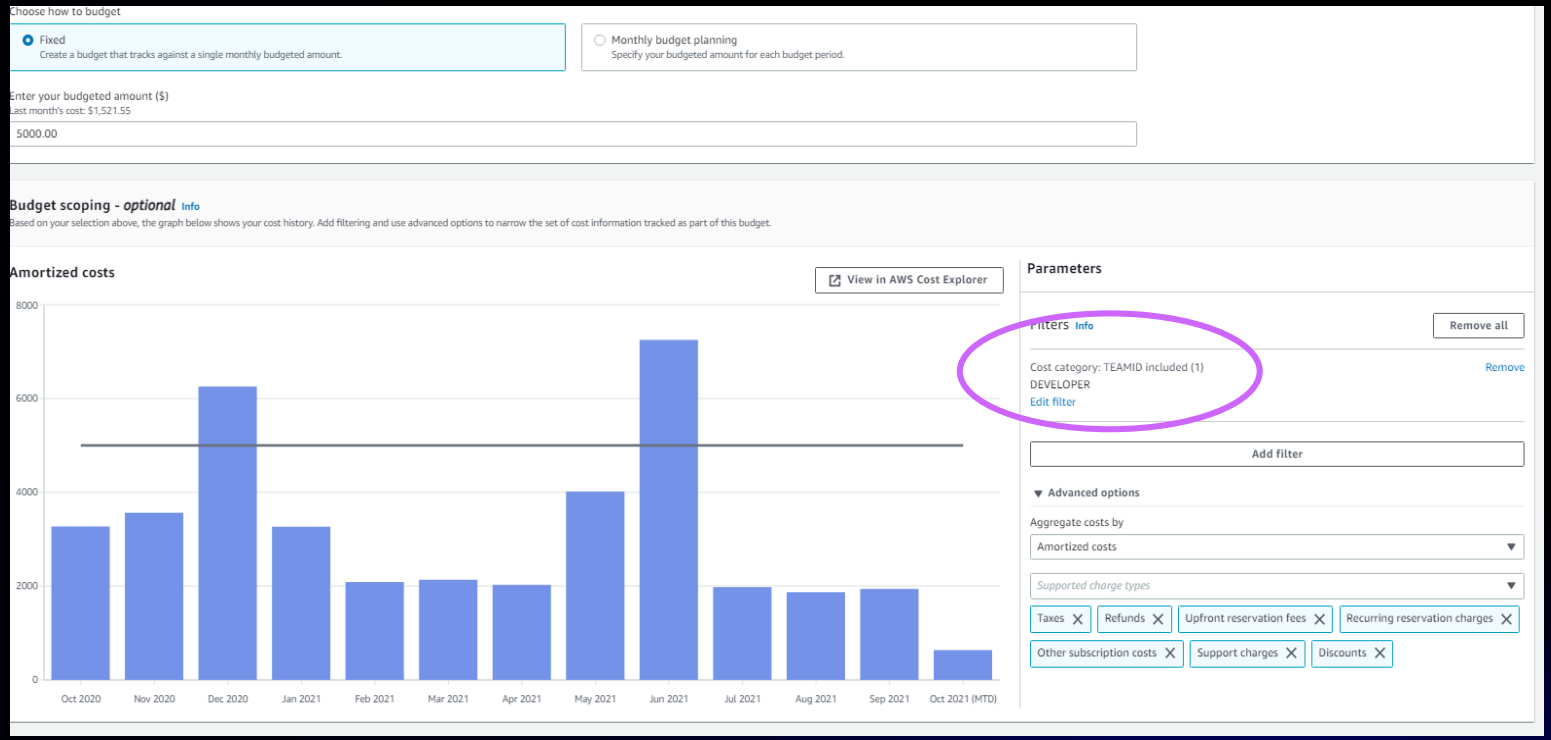
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Monitor, report, and respond

AWS Budgets and budget reports

- Budgets created and managed centrally by Cloud Services Finance
- AWS Cost Categories and cost allocation tag strategy enables multidimensional report
- Weekly budget report emails
- Layered budget alerts
  - Alert threshold 1: Actuals > 80% of budget
  - Alert threshold 2: Forecast > 95% of budget

Report dimension	Stakeholders/recipients
Team	Engineers/developers
Business unit	Technology head(s)
Major project	Engineers/developers, technology head(s), project management head(s)



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Monitor, report, and respond

AWS COST ANOMALY DETECTION

- New lens on cost monitoring for Morningstar
- Uncovering anomalous spend masked by the dynamic nature of cloud and growth driven by increased adoption

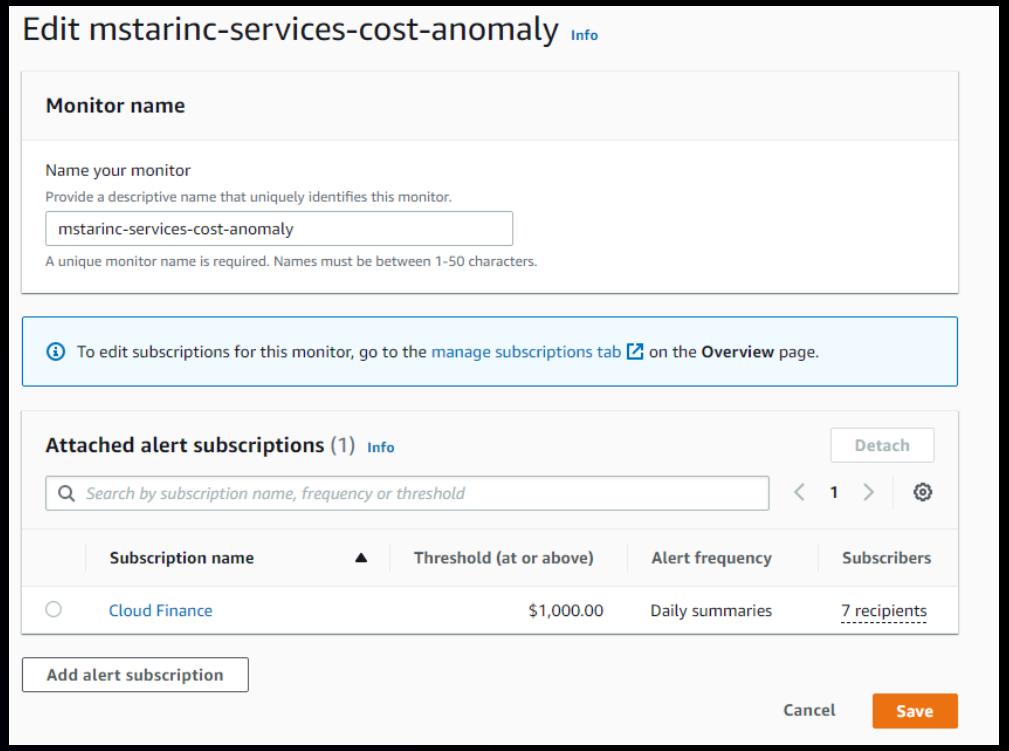


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Monitor, report, and respond

AWS COST ANOMALY DETECTION

- AWS services cost monitor rollout for all linked accounts across Morningstar in progress
- Cloud Services POC done to understand and provide guidance on using AWS Cost Anomaly Detection before rollout
- AWS services cost monitor in primary payer account at defined threshold POC approach



Alert threshold triggered → Email sent to cloud services team → Cloud finance review → Developer/ engineer review → Cloud finance submits assessment in console

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Monitor, report & respond

AWS COST ANOMALY DETECTION

Case study: Amazon EFS cleanup job failed to execute, leading to steady increase in Amazon EFS costs



1. Alert

2. Investigate

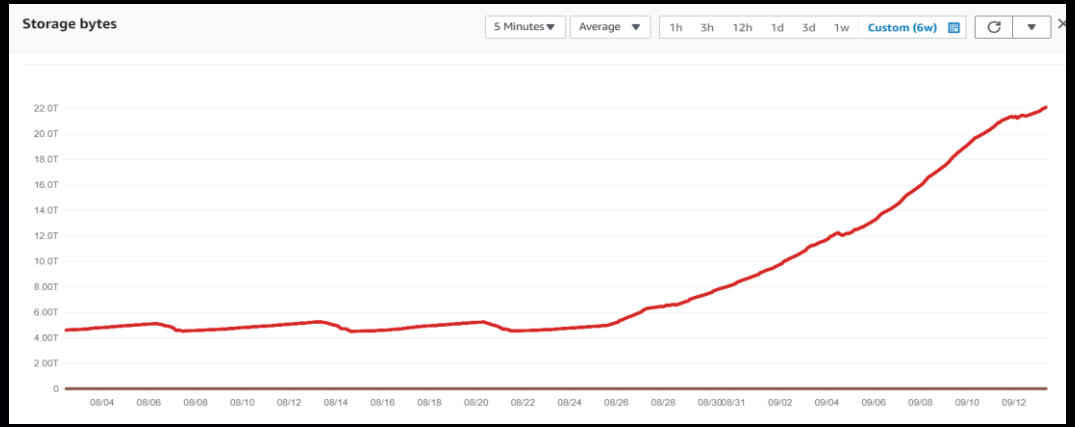
3. Respond

AWS Cost Management: Anomaly Detection
AWS Account XXXXXXXXXX

Dear AWS Customer,

You are receiving this alert because you asked us to provide you with a summary of unusual AWS usage patterns for accounts in your AWS organization with payer account id number above. Below is a list of anomalies that have been detected with corresponding root cause(s).

Name	Severity	Cost Impact	Root Cause	Next Steps
Amazon Elastic File System	LOW	Max Daily Impact: 168.99 Total Impact: 1362.52	Member Account: XXXXXXXXXXX Region: us-east-1 AWS Service: Amazon Elastic File System Usage Type: USE1-TimedStorage-ByteHrs	View In Anomaly Detection





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The results

- Established cost-aware culture
- Enhanced communication and transparency across business units
- Average architecture/finance review sessions down from 3 to 1 per business case initiative since implementation
- Budget vs. actual cloud spend variance has gone from 36% favorable to 13% favorable in 2020 vs. 2018

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Things I wish I knew

- Embrace agile
- Implement and enforce tagging early
- Automate, automate, automate

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Before you go

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Before you go

RESOURCES TO LEARN, CONNECT, AND ROLL UP YOUR SLEEVES

Connect!

Peer Connect

aws.amazon.com/aws-cost-management/cfm-peer-connect/

CFM Kiosk

Expo Hall

CFM blog

aws.amazon.com/blogs/aws-cloud-financial-management/

Learn!

Strategic IT planning and evaluation

ENT214

Unit metrics in practice

ENT216

8 ways to control and manage AWS costs

COP204 (chalk talk)

Quantify and maximize your cloud business value

ENT213 (chalk talk)

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Thank you!

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