AWS State, Local, and Education Learning Days

Washington DC

aws Learning Days
State, Local, and Education

Large-Scale Migration and Modernization with AWS

Lessons Learned and Best Practices

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aws Learning Days
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Migrations are more than just shifting technology

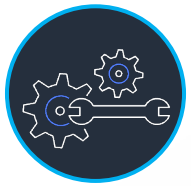
Making the case for migration

WHAT'S IN THE WAY?

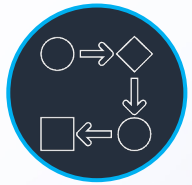
Blockers for cloud value realization

Lack of visible & active sponsorship

Siloed Workflows between orgs



Architectural Entanglement



Undefined operating model

Analysis Paralysis

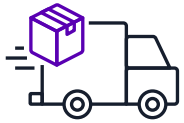
Talent and skills gaps

Misaligned teams

Unrealistic goals

AWS deploys proven mechanisms, developed over hundreds of customer engagements, to unblock and accelerate cloud journey

Understand your compelling “why?”


Delivery speed improvement


Time-driven data center exit


Acquisition of another business


Divestiture of a line of business


Reduce technical debt


Cost reduction


Moving to multi-tenancy SaaS


Licensing cost reduction


Enabling gen AI solutions


Removing undifferentiated lifting


Security improvements


Availability improvements


Moving to data-driven business


Changing contact center technology


Moving to data as a product


Durability improvements


Sustainability improvements


Move to compete globally

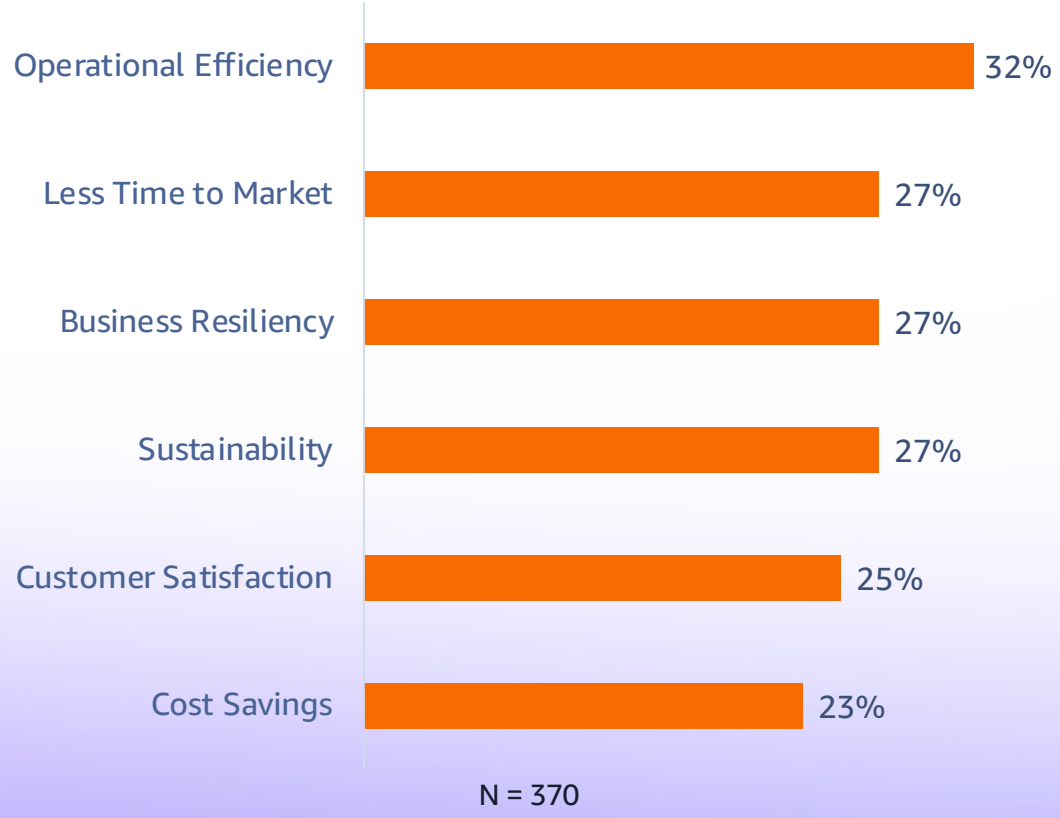

Scalability improvements


All of the above!!


“To get insights,
you need to experiment.”

Migration and Modernization with AWS deliver key business priorities

Customer Priorities



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Source: IDC Future Enterprise Resiliency and Spending Survey, Wave 8, September, 2022

Post-Migration KPI Improvements

- **66%** **increase** in VMs managed per admin
- **43%** **reduction** in time to market
- **69%** **reduction** in unplanned downtime
- **88%** **reduction** in workload carbon footprint
- **18%** **increase** in CSAT ratings*
- **20%** **reduction** in IT Infra. Cost as % of Revenue

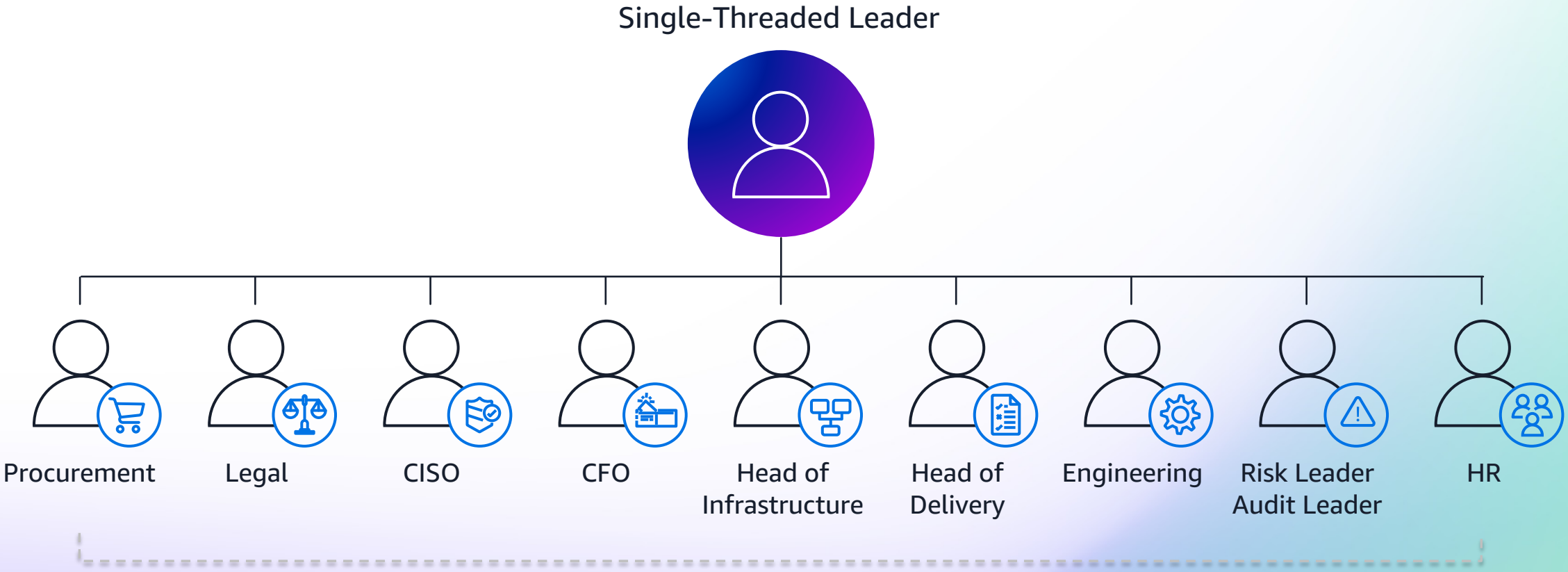
Source: The Hackett Group, 2022

Leadership support

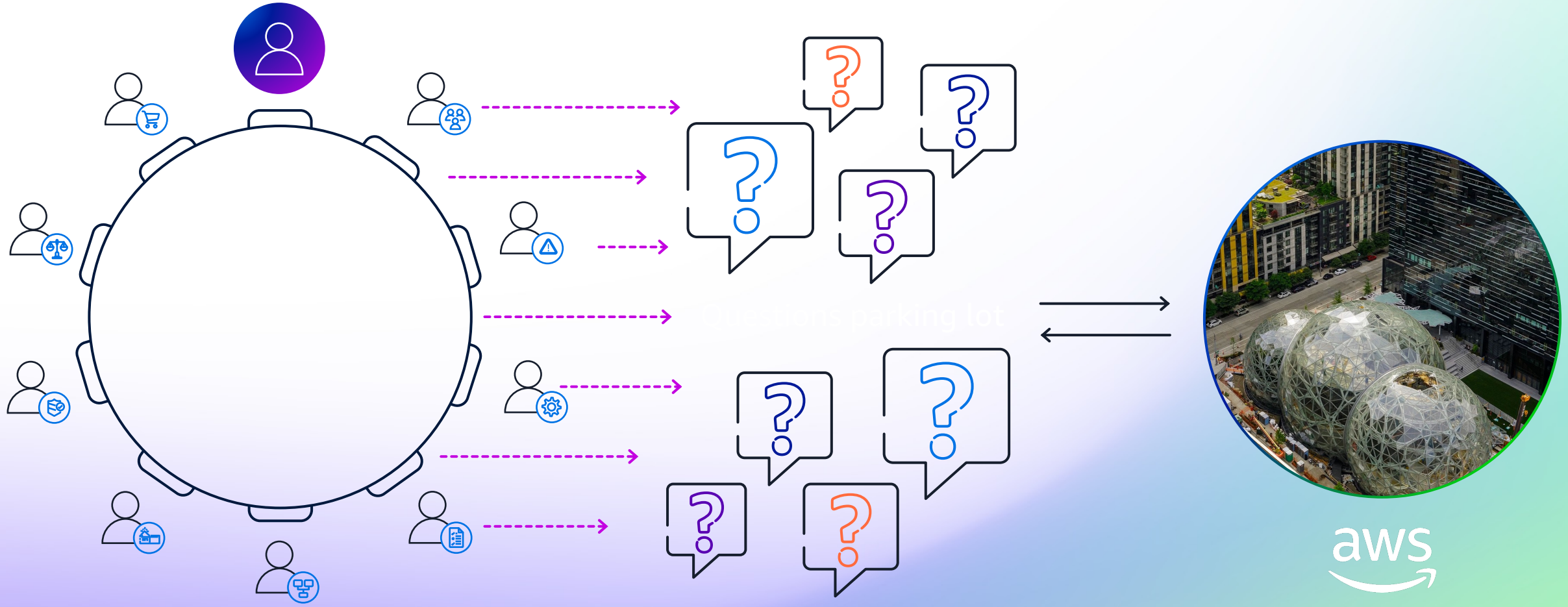
KEY FOR ORGANIZATION SUCCESS

- Define and communicate **vision** and business strategy
- Be aggressive with goal setting and drive **top down**
- Mandate the move to **cloud-native** architectures org wide

Leadership team



Be prepared to answer questions



Create and amend your principles as you go!

We believe that...

the business case will continually be reviewed

we will limit complexity by using a primary cloud partner

security is job zero

this group can remove all blockers

If you build it, You support it

Engineers are trusted, But we verify their actions

...unless you have better ones

Quick wins

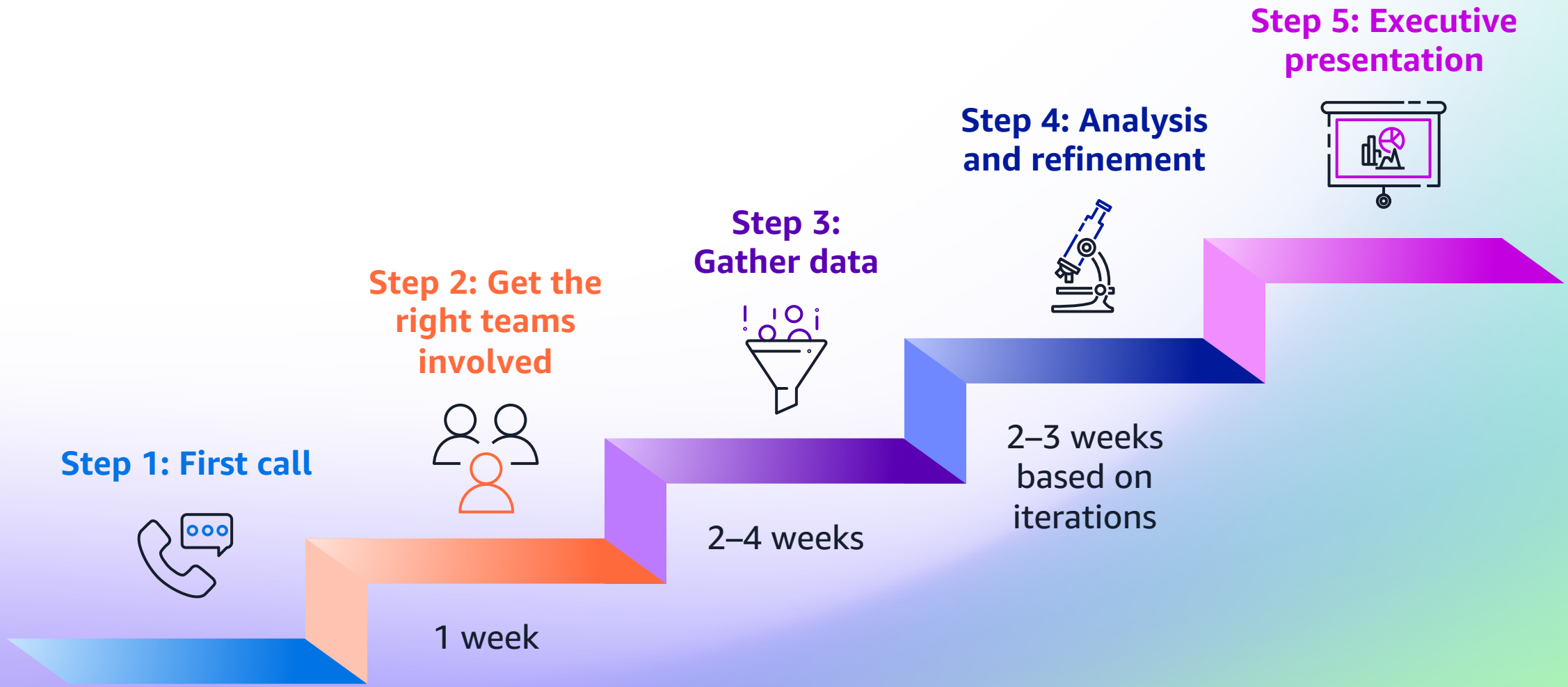
ESTABLISH “LIGHTHOUSE” WORKLOAD

High value: focus on relatively small but important project

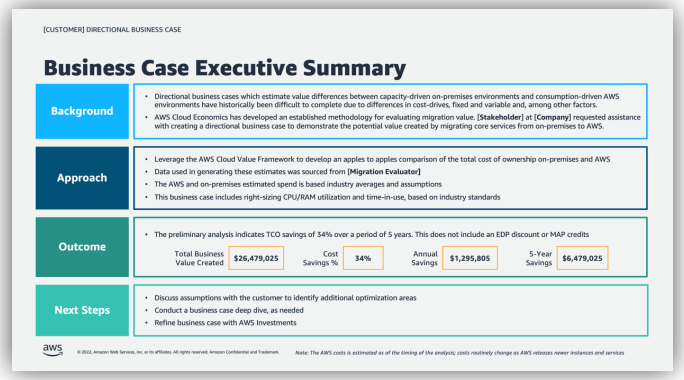
Representative: avoid ”one-off” projects so results will resonate across the organization

Measurable: use metrics to show measurable results of outcomes

The AWS Cloud Economics team can help



The AWS Cloud Economics team can help

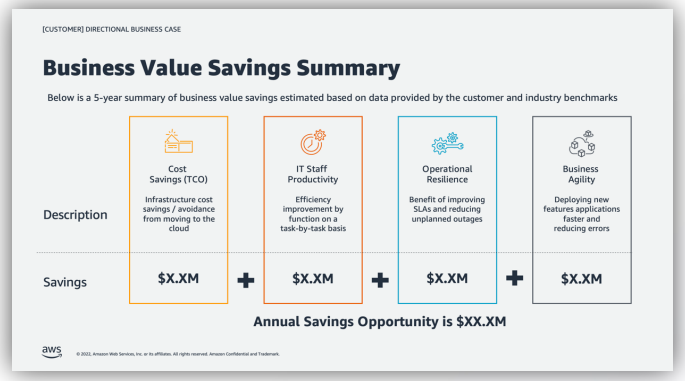

[CUSTOMER] DIRECTIONAL BUSINESS CASE

Business Case Executive Summary

Background	• Directional business cases which estimate value differences between capacity-driven on-premises environments and consumption-driven AWS environments have historically been difficult to complete due to differences in cost-drives, fixed and variable and, among other factors. • AWS Cloud Economics has developed an established methodology for evaluating migration value. [Stakeholder] at [Company] requested assistance with creating a directional business case to demonstrate the potential value created by migrating core services from on-premises to AWS.
Approach	• Leverage the AWS Cloud Value Framework to develop an apples to apples comparison of the total cost of ownership on-premises and AWS • Data used in generating these estimates was sourced from [Migration Evaluator] • The AWS and on-premises estimated spend is based industry averages and assumptions • This business case includes right-sizing CPU/RAM utilization and time-in-use, based on industry standards
Outcome	• The preliminary analysis indicates TCO savings of 34% over a period of 5 years. This does not include an EDP discount or MAP credits Total Business Value Created $26,479,025 · Cost Savings % 34% · Annual Savings $1,295,805 · 5-Year Savings $6,479,025
Next Steps	• Discuss assumptions with the customer to identify additional optimization areas • Conduct a business case deep dive, as needed • Refine business case with AWS Investments

Note: The AWS costs is estimated as of the timing of the analysis; costs routinely change as AWS releases newer instances and services

Executive Summary


[CUSTOMER] DIRECTIONAL BUSINESS CASE

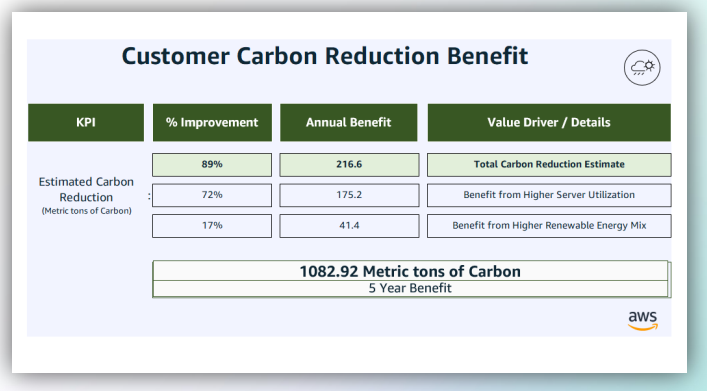
Business Value Savings Summary

Below is a 5-year summary of business value savings estimated based on data provided by the customer and industry benchmarks

Description	Cost Savings (TCO)	IT Staff Productivity	Operational Resilience	Business Agility
	Infrastructure cost savings / avoidance from moving to the cloud	Efficiency improvement by function on a task-by-task basis	Benefit of improving SLAs and reducing unplanned outages	Deploying new features applications faster and reducing errors
Savings	$X.XM	$X.XM	$X.XM	$X.XM

Annual Savings Opportunity is $XX.XM

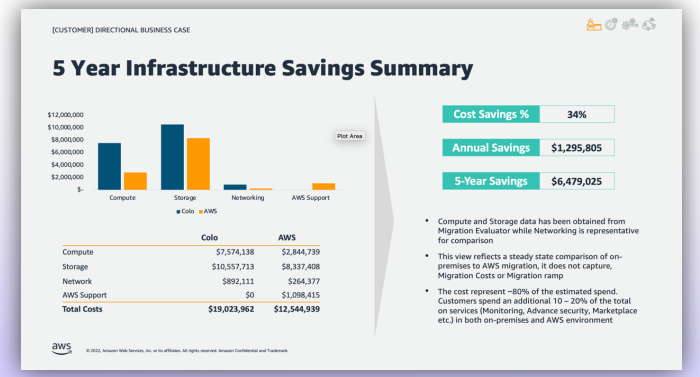
Financial Impact Results


Customer Carbon Reduction Benefit

KPI	% Improvement	Annual Benefit	Value Driver / Details
Estimated Carbon Reduction (Metric tons of Carbon)	89%	216.6	Total Carbon Reduction Estimate
	72%	175.2	Benefit from Higher Server Utilization
	17%	41.4	Benefit from Higher Renewable Energy Mix

1082.92 Metric tons of Carbon
5 Year Benefit

Carbon Reduction Benefit Results


[CUSTOMER] DIRECTIONAL BUSINESS CASE

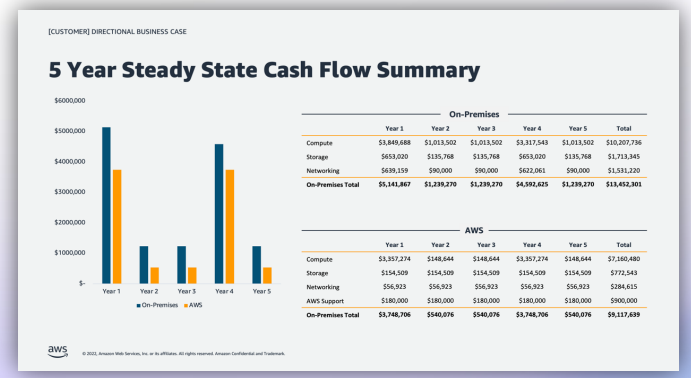
5 Year Infrastructure Savings Summary

	Colo	AWS
Compute	$7,574,138	$2,844,739
Storage	$10,557,713	$8,337,408
Network	$892,111	$264,377
AWS Support	$0	$1,098,415
Total Costs	**$19,023,962**	**$12,544,939**

Cost Savings %	34%
Annual Savings	$1,295,805
5-Year Savings	$6,479,025

- Compute and Storage data has been obtained from Migration Evaluator while Networking is representative for comparison
- This view reflects a steady state comparison of on-premises to AWS migration, it does not capture, Migration Costs or Migration ramp
- The cost represent ~80% of the estimated spend. Customers spend an additional 10 – 20% of the total on services (Monitoring, Advance security, Marketplace etc.) in both on-premises and AWS environment

Infrastructure Savings Summary


[CUSTOMER] DIRECTIONAL BUSINESS CASE

5 Year Steady State Cash Flow Summary

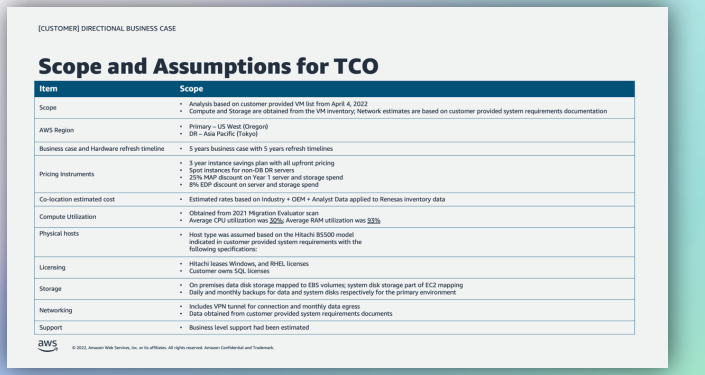
On-Premises

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Compute	$3,849,688	$1,013,502	$1,013,502	$3,317,543	$1,013,502	$10,207,736
Storage	$653,020	$135,768	$135,768	$653,020	$135,768	$1,713,345
Networking	$639,159	$90,000	$90,000	$622,061	$90,000	$1,531,220
On-Premises Total	**$5,141,867**	**$1,239,270**	**$1,239,270**	**$4,592,625**	**$1,239,270**	**$13,452,301**

AWS

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Compute	$3,357,274	$148,644	$148,644	$3,357,274	$148,644	$7,160,480
Storage	$154,509	$154,509	$154,509	$154,509	$154,509	$772,543
Networking	$56,923	$56,923	$56,923	$56,923	$56,923	$284,615
AWS Support	$180,000	$180,000	$180,000	$180,000	$180,000	$900,000
On-Premises Total	**$3,748,706**	**$540,076**	**$540,076**	**$3,748,706**	**$540,076**	**$9,117,639**

Cashflow Summary


[CUSTOMER] DIRECTIONAL BUSINESS CASE

Scope and Assumptions for TCO

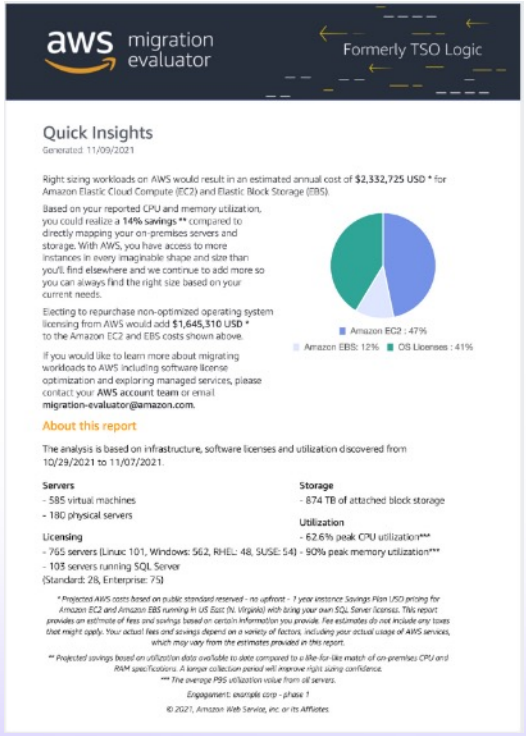
Item	Scope
Scope	• Analysis based on customer provided VM list from April 4, 2022 • Compute and Storage are obtained from the VM inventory; Network estimates are based on customer provided system requirements documentation
AWS Region	• Primary – US West (Oregon) • DR – Asia Pacific (Tokyo)
Business case and Hardware refresh timeline	• 5 years business case with 5 years refresh timelines
Pricing Instruments	• 3 year instance savings plan with all upfront pricing • Spot instances for non-DB DR servers • 25% MAP discount on Year 1 server and storage spend • 8% EDP discount on server and storage spend
Co-location estimated cost	• Estimated rates based on Industry + OEM + Analyst Data applied to Renesas inventory data
Compute Utilization	• Obtained from 2021 Migration Evaluator scan • Average CPU utilization was 30%; Average RAM utilization was 93%
Physical hosts	• Host type was assumed based on the Hitachi BS500 model indicated in customer provided system requirements with the following specifications:
Licensing	• Hitachi leases Windows, and RHEL licenses • Customer owns SQL licenses
Storage	• On premises data disk storage mapped to EBS volumes; system disk storage part of EC2 mapping • Daily and monthly backups for data and system disks respectively for the primary environment
Networking	• Includes VPN tunnel for connection and monthly data egress • Data obtained from customer provided system requirements documents
Support	• Business level support had been estimated

All Assumptions Used

Examples are not exclusive, all business cases contain custom content

Business case with Migration Evaluator

Quick Insights report



aws migration evaluator — Formerly TSO Logic

Quick Insights

Generated: 11/09/2021

Right sizing workloads on AWS would result in an estimated annual cost of **$2,332,725 USD** * for Amazon Elastic Cloud Compute (EC2) and Elastic Block Storage (EBS).

Based on your reported CPU and memory utilization, you could realize a **14% savings** ** compared to directly mapping your on-premises servers and storage. With AWS, you have access to more instances in every imaginable shape and size than you'll find elsewhere and we continue to add more so you can always find the right size based on your current needs.

Electing to repurchase non-optimized operating system licensing from AWS would add **$1,645,310 USD** * to the Amazon EC2 and EBS costs shown above.

If you would like to learn more about migrating workloads to AWS including software license optimization and exploring managed services, please contact your AWS account team or email migration-evaluator@amazon.com.

Amazon EC2 : 47% · Amazon EBS: 12% · OS Licenses : 41%

About this report

The analysis is based on infrastructure, software licenses and utilization discovered from 10/29/2021 to 11/07/2021.

Servers
- 585 virtual machines
- 180 physical servers

Storage
- 874 TB of attached block storage

Utilization
- 62.6% peak CPU utilization***
- 90% peak memory utilization***

Licensing
- 765 servers (Linux: 101, Windows: 562, RHEL: 48, SUSE: 54)
- 103 servers running SQL Server (Standard: 28, Enterprise: 75)

* Projected AWS costs based on public standard reserved - no upfront - 1 year instance Savings Plan USD pricing for Amazon EC2 and Amazon EBS running in US East (N. Virginia) with bring your own SQL Server licenses. This report provides an estimate of fees and savings based on certain information you provide. Fee estimates do not include any taxes that might apply. Your actual fees and savings depend on a variety of factors, including your actual usage of AWS services, which may vary from the estimates provided in this report.

** Projected savings based on utilization data available to date compared to a like-for-like match of on-premises CPU and RAM specifications. A longer collection period will improve right sizing confidence.

*** The average P95 utilization value from all servers.

Engagement: example corp - phase 1

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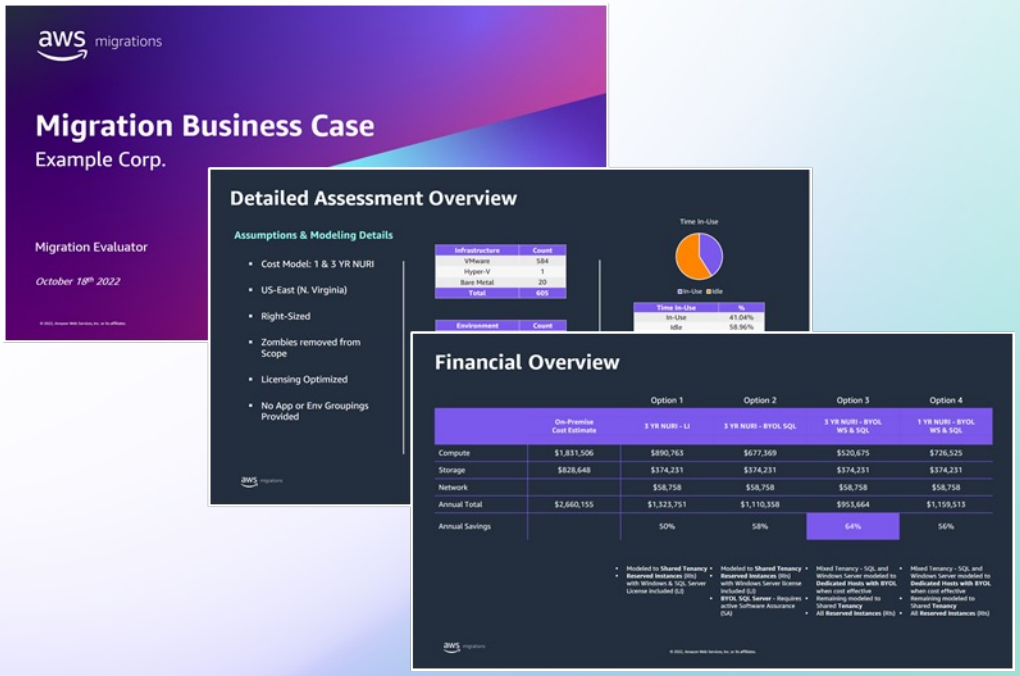
Automated PDF & Excel export
Available within 48 hours of data collection

Directional business case



aws migrations

Migration Business Case

Example Corp.

Migration Evaluator

October 18th 2022

Detailed Assessment Overview

Assumptions & Modeling Details

- Cost Model: 1 & 3 YR NURI
- US-East (N. Virginia)
- Right-Sized
- Zombies removed from Scope
- Licensing Optimized
- No App or Env Groupings Provided

Infrastructure	Count
VMware	584
Hyper-V	1
Bare Metal	20
Total	605

Time In-Use

Time In-Use	%
In-Use	41.04%
Idle	58.96%

Financial Overview

	On-Premise Cost Estimate	Option 1: 3 YR NURI - LI	Option 2: 3 YR NURI - BYOL SQL	Option 3: 3 YR NURI - BYOL WS & SQL	Option 4: 1 YR NURI - BYOL WS & SQL
Compute	$1,831,506	$890,763	$677,369	$520,675	$726,525
Storage	$828,648	$374,231	$374,231	$374,231	$374,231
Network		$58,758	$58,758	$58,758	$58,758
Annual Total	$2,660,155	$1,323,751	$1,110,358	$953,664	$1,159,513
Annual Savings		50%	58%	64%	56%

Available 5 days after data collection ends (upon request)

Accelerating your migration

Migration & modernization projects can be challenging

THESE PROJECTS CAN BE COMPLEX

- Deconstruct the on-premises technical environment
- Performance and relationship of migrating applications
- Understand the current operational processes
- Policy issues and business rules
- Security policies
- Embedded local knowledge
- People/culture issues
- Regulations

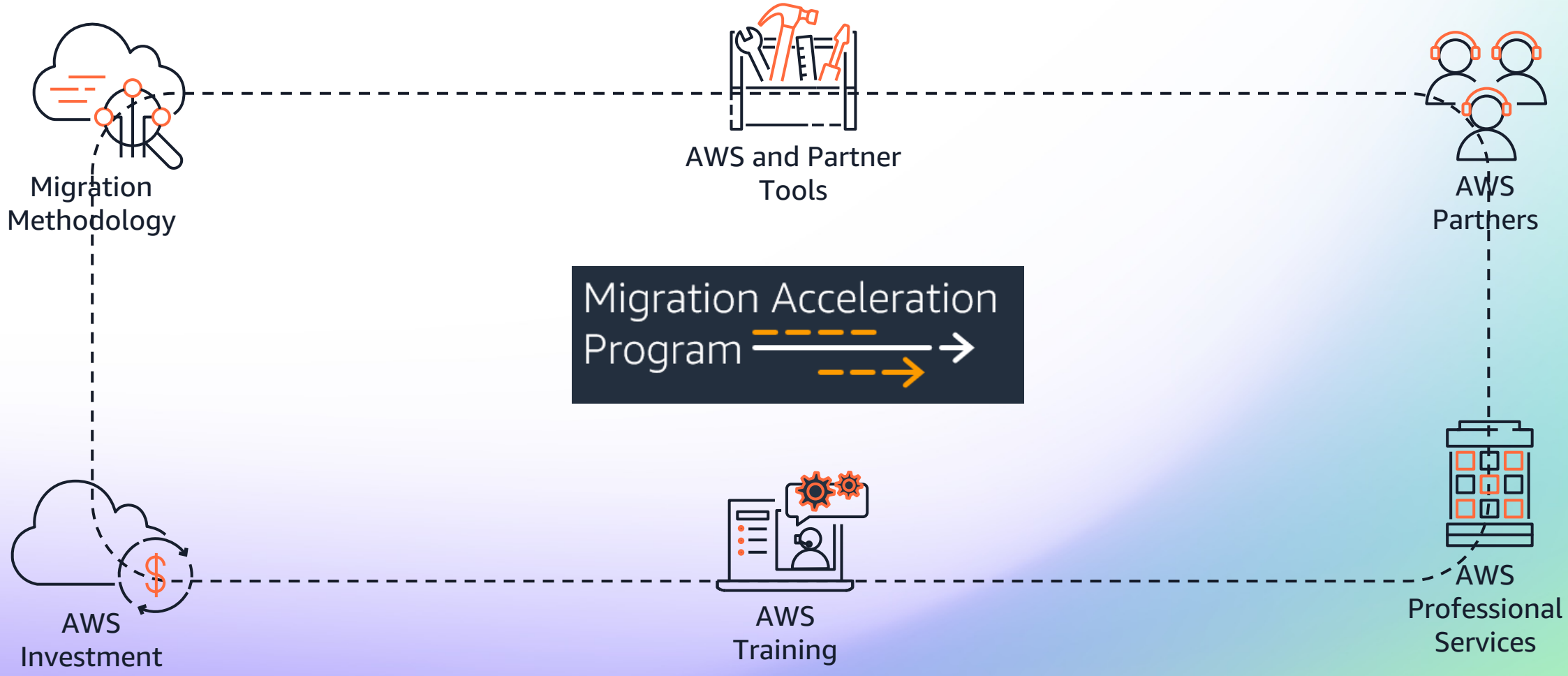
Best Practices

- ✓ **Demonstrated leadership**
- ✓ **Set clear business goals**
- ✓ **Develop cloud skills / address gaps**

The highest risk has been in a stalled project or a false start
….. these can set a cloud program back by months, even years

Migration Acceleration Program (MAP)

Flagship AWS program to help customers migrate and modernize to AWS using a proven approach



Simple three-step approach

Assess

Migration Readiness Assessment

Rapid discovery

TCO report

Briefings & workshops

Immersion day

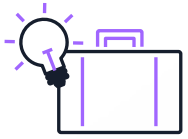
Accelerators

Mobilize

Portfolio

Discovery & planning

Migration plan



Business case/ Mig. Evaluator

Migrate

Migration & modernization experience

Skills/center of excellence

People

Landing zone

Operating model

Security & compliance

Platform

Migrate & Modernize

Migrate

Operate & optimize

Modernize

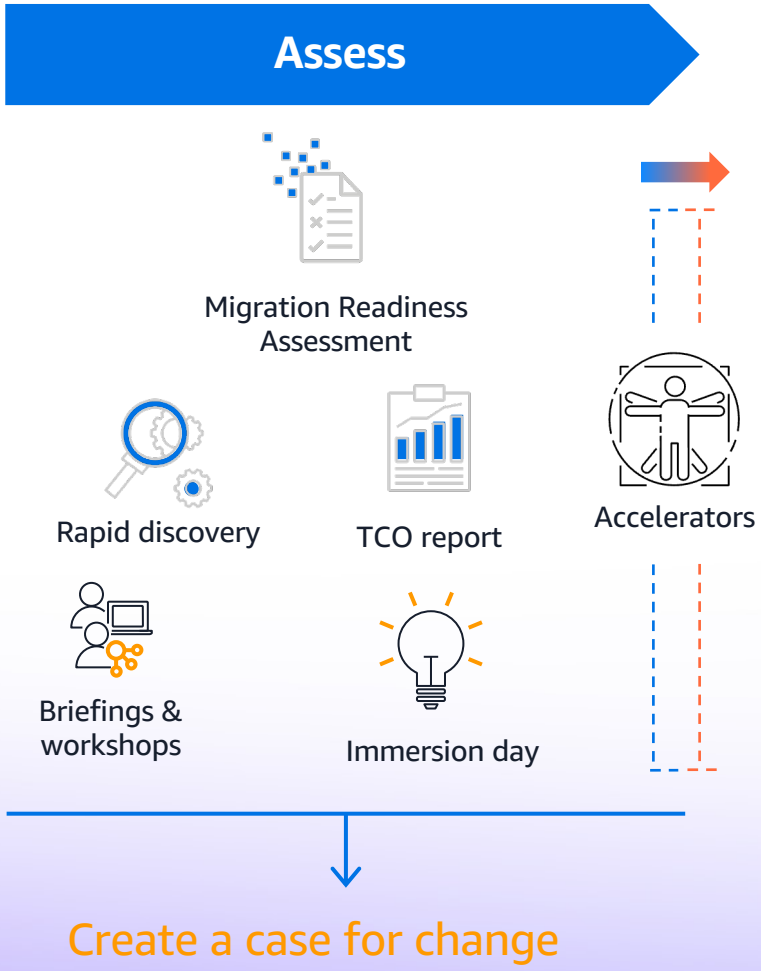
Create a case for change

Build readiness through experiences

Accelerate transformation at scale

Using a proven framework greatly increases your odds of success and speed to market

AWS Migration Framework



Creating a Case For Change

- Establishing Data Requirements and Collecting Data
- Evaluating potential third-party license cost savings
- Developing a compelling business Case
- Aligning on an understanding of the capabilities required
- Establishing a Roadmap for the activities to come
- Agreeing to a Prioritized List of Actions
- Gaining organizational commitment to the journey ahead
- Taking the first step

AWS Migration Evaluator
AWS Migration Readiness Assessment
AWS Optimization and License Assessment

Using a proven framework greatly increases your odds of success and speed to market

Available Assessment Tools

AWS Services and Tools

- Migration Evaluator
- AWS Migration Hub
- AWS Application Discovery Service
- AWS DataSync
- Cloud Adoption Readiness Tool (CART)
- Migration Readiness Assessment (MRA)
- CloudOptimizer
- Migration Portfolio Assessment (MPA)

Partner tools – Discovery, Planning, Recommendation

Cloudamize, CAST (Software Intelligence for Digital Leaders), dynatrace, Flexera, CloudHealth Technologies, New Relic, CloudChomp, modelizeIT, DATADOG, turbonomic, DEVICE42, MICRO FOCUS, APPDYNAMICS, bmc, ATADATA, CloudSphere, wanclouds, matilda cloud, Corent, tidal, tds (Accelerating IT Transformation)

Mobilize overview

Goals

- Build AWS foundational environment
- Establish governance and security posture
- Scale enterprise operations to AWS
- Identify migration patterns
- Define team model and agile work streams
- Develop cost and resource model for the migration of a defined portfolio

Mobilize

Outcomes

Platform

- Landing Zone with security controls
- Operational tools and procedures

Portfolio

- 7R disposition and decision criteria
- App discovery and migration Wave Plan

Migration

- 3–5 applications migrated to AWS
- Hands-on migration experience and patterns
- Migration proposal

People

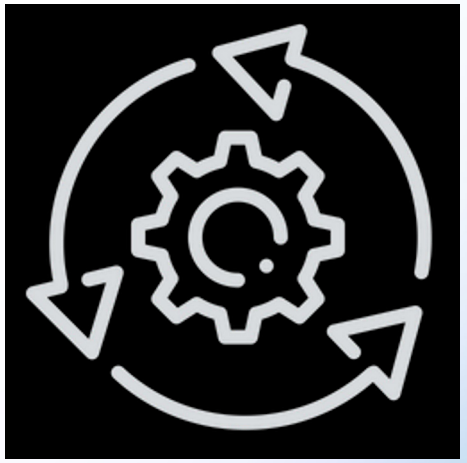
- Cloud Leadership functional optimization
- Organization Change Acceleration plan(s)
- Cloud skills assessment and role ramp-up plans

Enable readiness for a mass migration, modernization, or greenfield

You need a cloud foundation

Landing Zone

+



Operating model(s)

Cloud foundation

What is a landing zone?

- As a concept, “landing zone” represents a starting point for a customer’s cloud migration journey. In this context, landing zone refers to a cloud environment that can be used to deploy initial customer workloads. – AWS

- “Landing zone” can be defined as an environment where applications can “land” and just work, without having to worry about ecosystem dependencies such as network routing, AD integration, access to file storage systems, compliance with established company standards, etc.

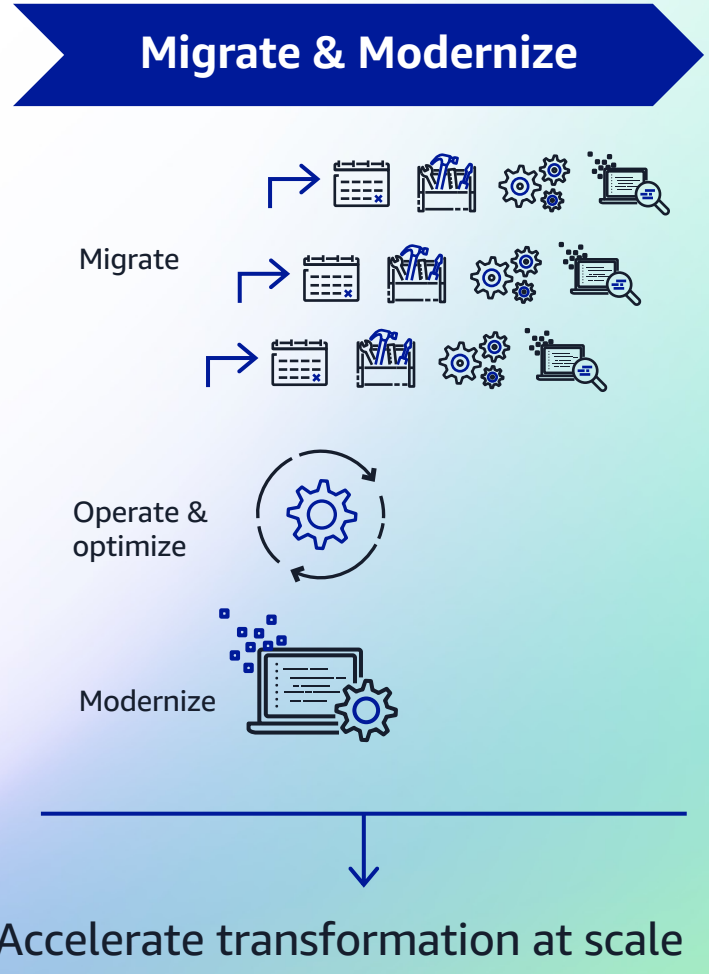
- An ideal landing zone offers features and functionalities that cover capabilities under all three technical pillars of CAF - namely Platform, Operations and Security

Compliance requirements

- ✓ Personnel
- ✓ Incident response
- ✓ Boundary protection
- ✓ Identity and access control
- ✓ Disaster recovery
- ✓ Configuration management
- ✓ Highly available architecture
- ✓ System management & monitoring
- ✓ Log management & monitoring
- ✓ Compute and storage
- ✓ Networking
- ✓ Virtualization
- ✓ Data center

AWS Migration Framework

- Cloud Migration Factory
- AWS End-of-Support Migration Program (EMP) for Windows Server
- Application Modernization (Assessment, Lab)
- SaaS Transformation



Using a proven framework greatly increases your odds of success and speed to market

Migration and modernization strategies

Current IT snapshot

Asset inventories

App configuration data

Performance Information

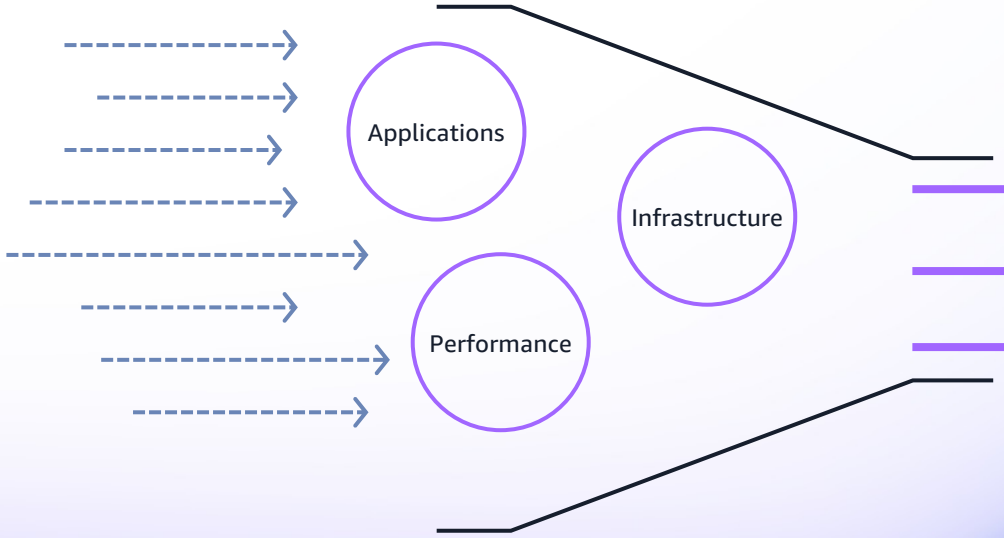
CMDB

SLA/OLA

Architecture

Tribal knowledge

Discover & organize data



Strategies for each workload (7Rs)

- Refactor
- Re-platform
- Repurchase
- Rehost
- Relocate
- Retain
- Retire

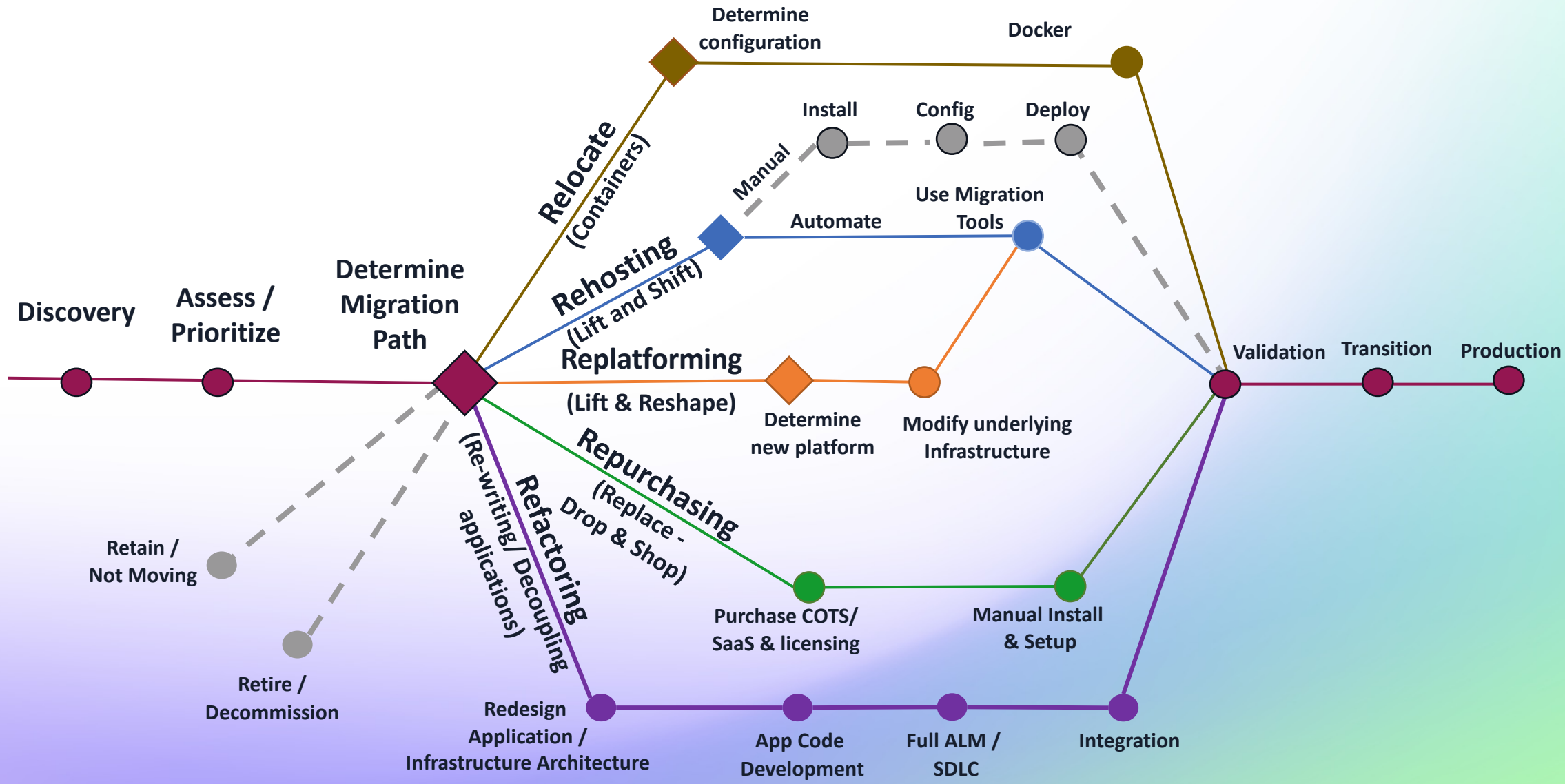
Level of effort

Strategy decision criteria should be based on both business and technical needs

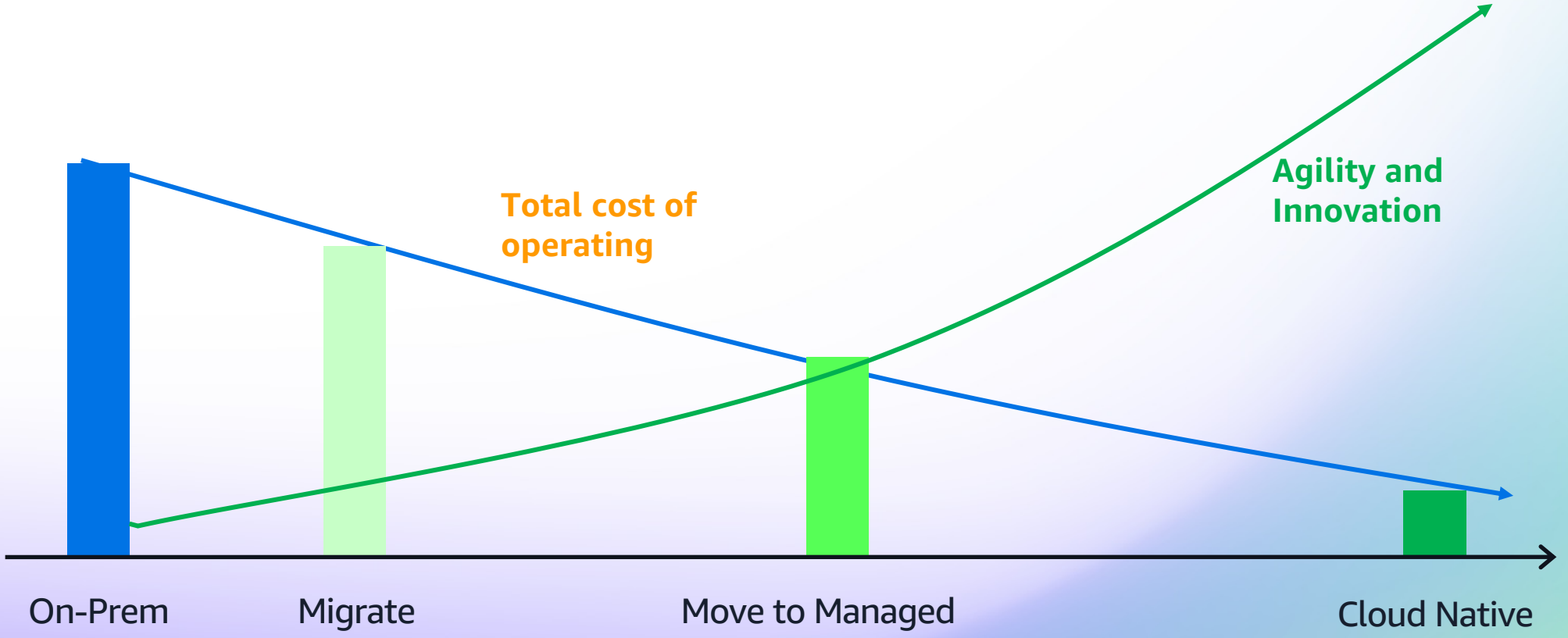
Georgia Department of Community Health

- Challenge - Complex migration of legacy Medicaid system to AWS cloud while maintaining CMS compliance and continuous service for 2.4M citizens
- Partnered with GTRI to build modular AWS cloud services, replacing monolithic on-premises infrastructure with flexible, scalable solutions
- Cut modernization timeline by 2 years, reduced 15 COTS licenses to 3 AWS services, and achieved 99.99% uptime using AWS Availability Zones

Application Migration Strategies



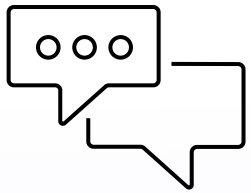
Both migrating and modernizing are important to fully realize the benefit of cloud



Adopt GenAI in your existing Migration & Modernization

Assess

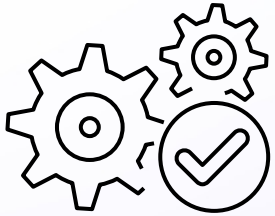
PLANNING & ANALYSIS



- ✓ Improved decision making
- ✓ Wave planning
- ✓ Early Insights from GenAI like Anti-patterns
- ✓ Building Business Case

Mobilize

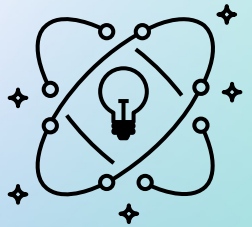
AIDED MODERNIZATION



- ✓ Automated Code Documentation
- ✓ Automated Test cases and Test Data generation
- ✓ Landing Zone build & IAC

Migrate & Modernize

FORTIFY OPERATIONS



- ✓ Code build & Generation
- ✓ Version and Framework Upgrades
- ✓ Performance Optimization
- ✓ Troubleshooting & Debugging
- ✓ Cloud Native Build
- ✓ Code refactoring & Tech Debt reduction

Cloud operating model

Cloud foundation team
(0-6 months)

- Cloud Leader
- Product Owner
- Financial Analyst
- OCM/Training Specialist
- Cloud Architect
- Platform Engineers

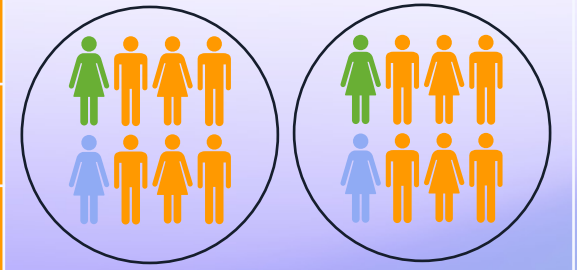
Initial cloud enablement engine
(6-12 months)

Cloud Business Office

Architecture Alignment	Product Management
On-Boarding	Financial Management
Training	Org Change Management
Delivery Management	

Cloud Platform Engineering

- Platform
- Operations
- Security



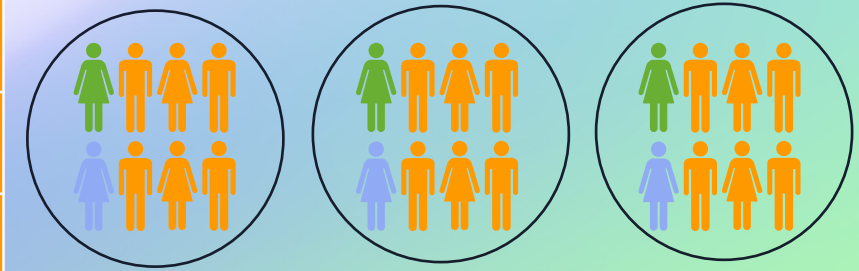
Cloud enablement engine @ scale
(12+ months)

Cloud Business Office

Product	Architecture	On-Boarding	OCM
Financial	Delivery		Training

Cloud Platform Engineering

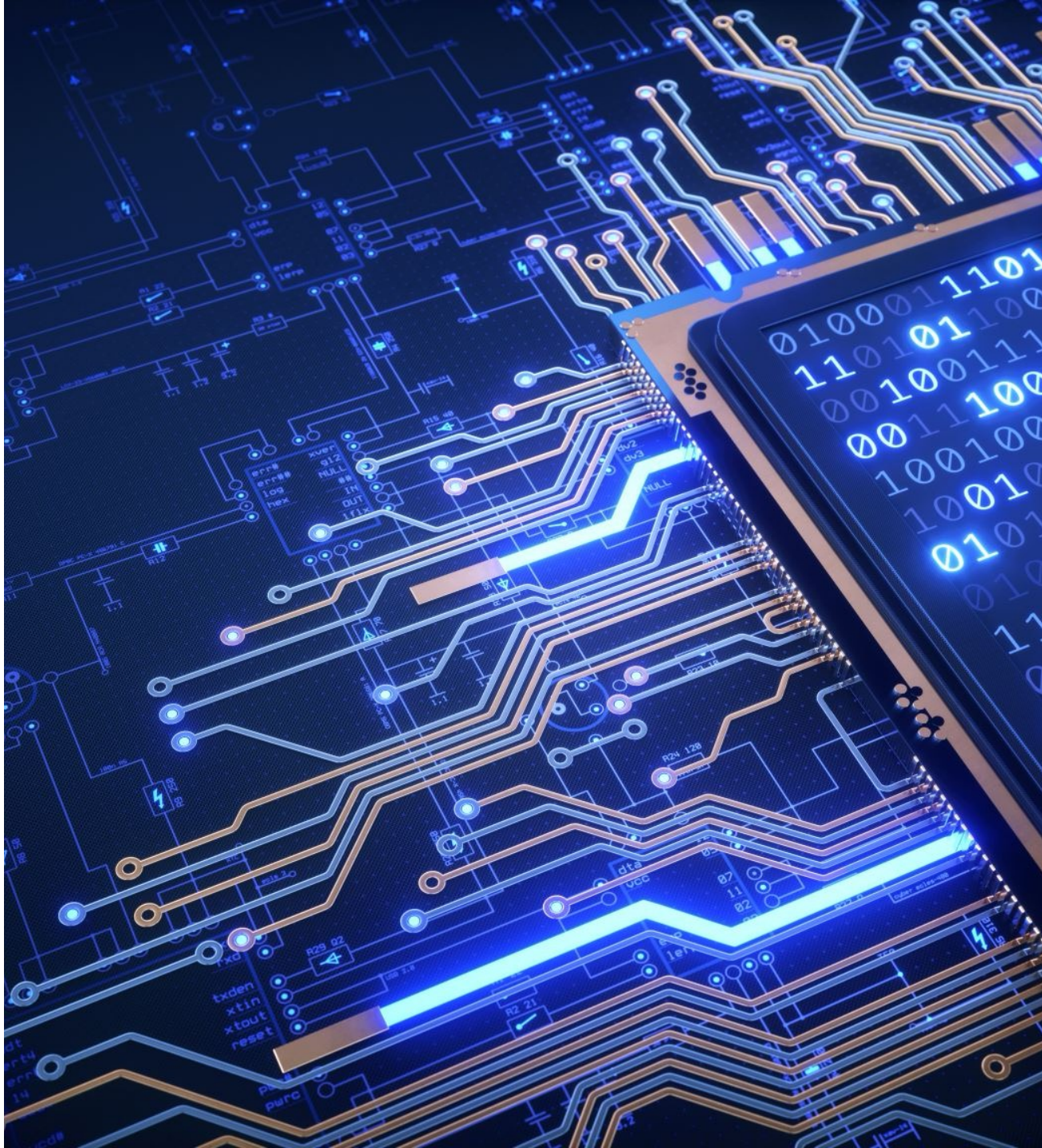
- Platform
- Operations
- Security



Keys to Success

- Create a clear vision and strategy
- Build strong foundations
- Invest in people and processes
- Demonstrate that the success aligns with the strategy

Modernize the results



Replatform: 6 modernization pathways

AWS Application Migration Service

01

Configure disaster recovery after migration

02

Convert CentOS to Rocky Linux

03

Convert SUSE BYOS to AWS license

MORE TO COME

Upgrading the operating system

Get to latest OS Version

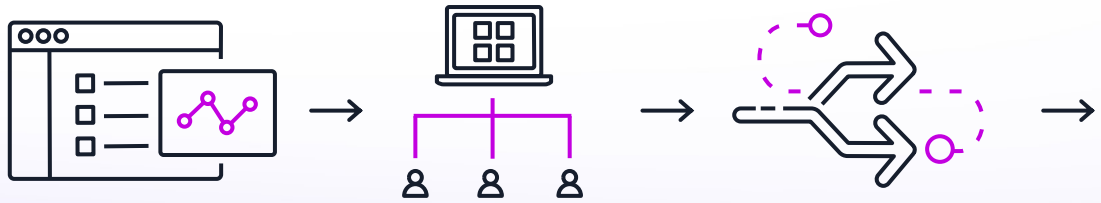
Rehydratable AMIs

Packaged Software Installs

Load Balanced Across AZs

Replatform: 6 modernization pathways

App2Container helps customers to transform their applications running in virtual machines into containers and easily deploy them to Amazon ECS or EKS with minimal effort



Discover and analyze
Create application inventory and analyze runtime dependencies

Extract and containerize
Extract application with dependencies and create a docker image

Create deployment artifacts
Generate the ECS task and Kubernetes pod definitions and create CI/CD pipelines

Deploy to AWS Cloud
Store image in Amazon ECR and deploy to Amazon ECS and Amazon EKS

Upgrading the operating system

Move to Containers

Legacy app containerization with minimal efforts

Containerization at scale

Best practices for containerization

Opinionated AWS Deployment artifacts

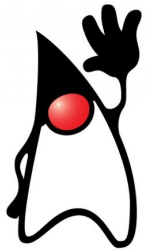
Replatform: 6 modernization pathways

Porting Assistant for .NET

Insight and assistance for porting from .NET Framework to .NET Core

Get started with Porting Assistant for .NET

Download Porting Assistant for .NET



Upgrading the operating system

Move to Containers

Move to Open Source

Quickly prioritize and reduce manual effort for .NET with Porting Assistant to .NET Core

Moving to Open Source databases

(i.e., SQL Server -> Aurora PostgreSQL)

Moving to Linux

(i.e., Windows→ Linux)

Replatform: 6 modernization pathways


AWS Lambda

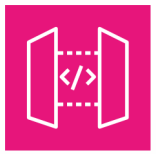

AWS Fargate


Amazon EventBridge


AWS Step Functions


Amazon Neptune Serverless


Amazon OpenSearch Serverless


Amazon API Gateway


AWS AppSync


Amazon Simple Storage Service (Amazon S3)


Amazon Elastic File System (Amazon EFS)


Amazon Simple Notification Service (Amazon SNS)


Amazon DynamoDB


Amazon RDS Proxy


Amazon Aurora Serverless


Amazon Redshift Serverless


Amazon Simple Queue Service (Amazon SQS)

Upgrading the operating system

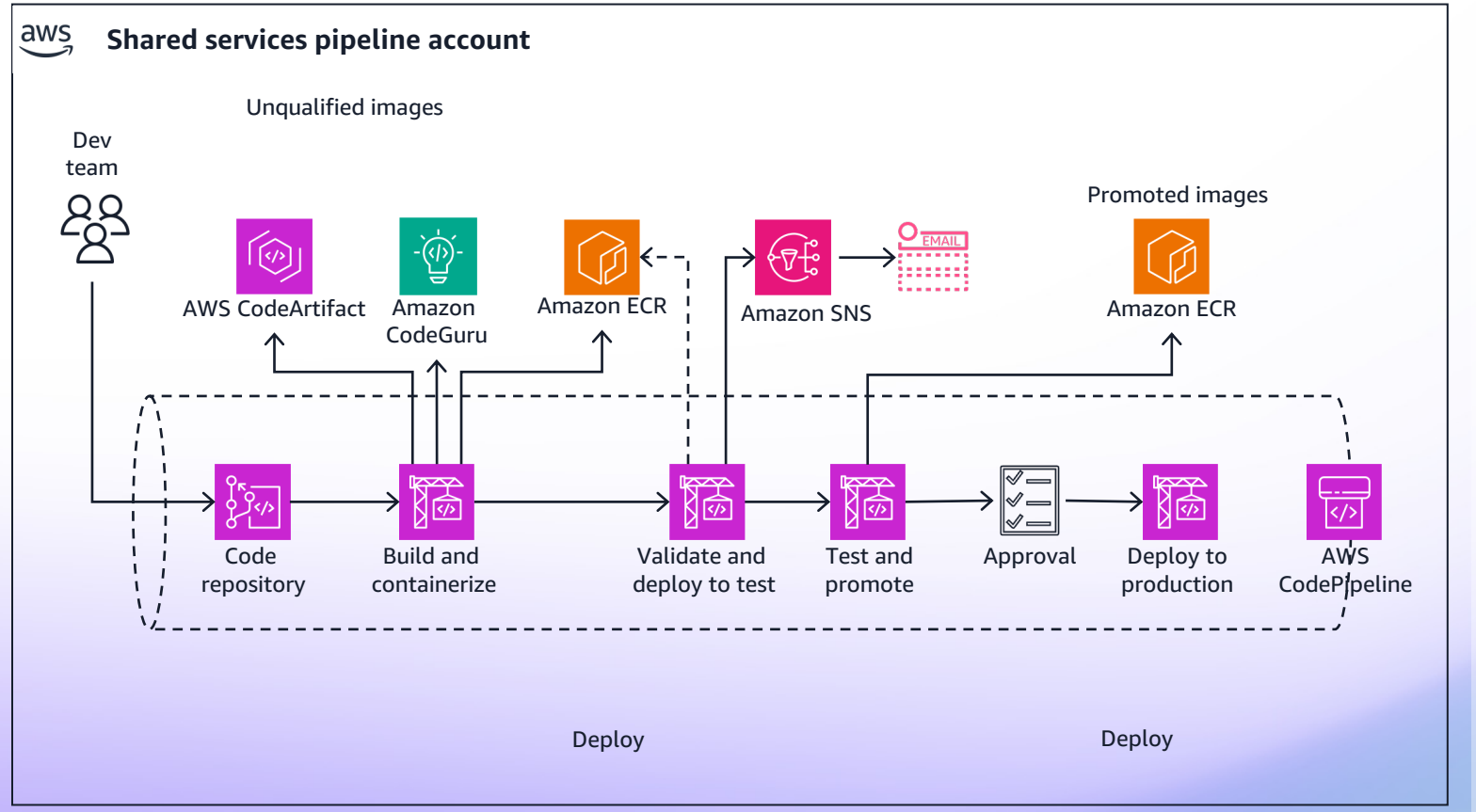
Move to Containers

Move to Open Source

Move to Serverless

Multiple services now offer serverless offerings

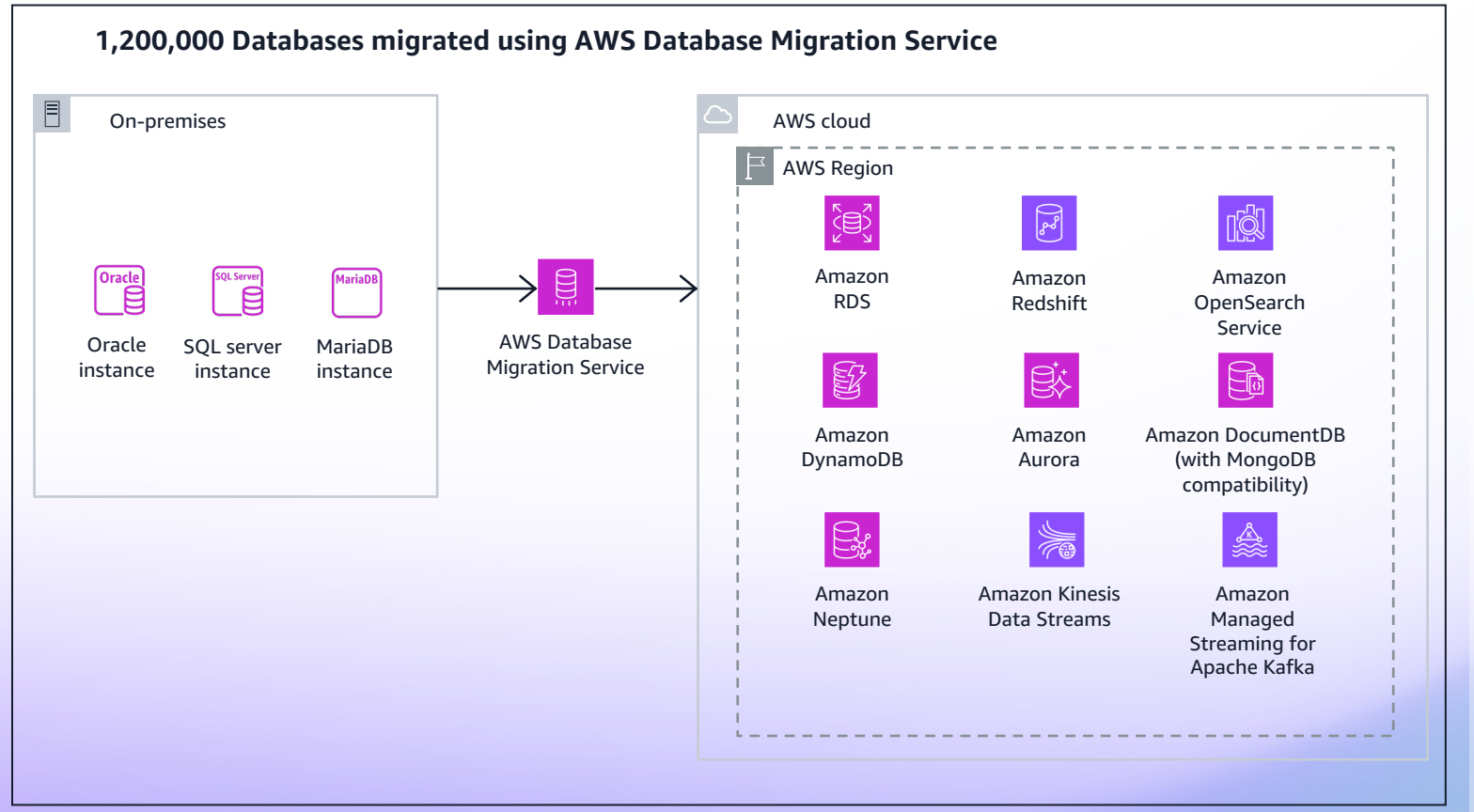
Replatform: 6 modernization pathways



- Upgrading the operating system
- Move to Containers
- Move to Open Source
- Move to Serverless

Move to DevOps

Replatform modernization pathways



Upgrading the operating system

Move to Containers

Move to Open Source

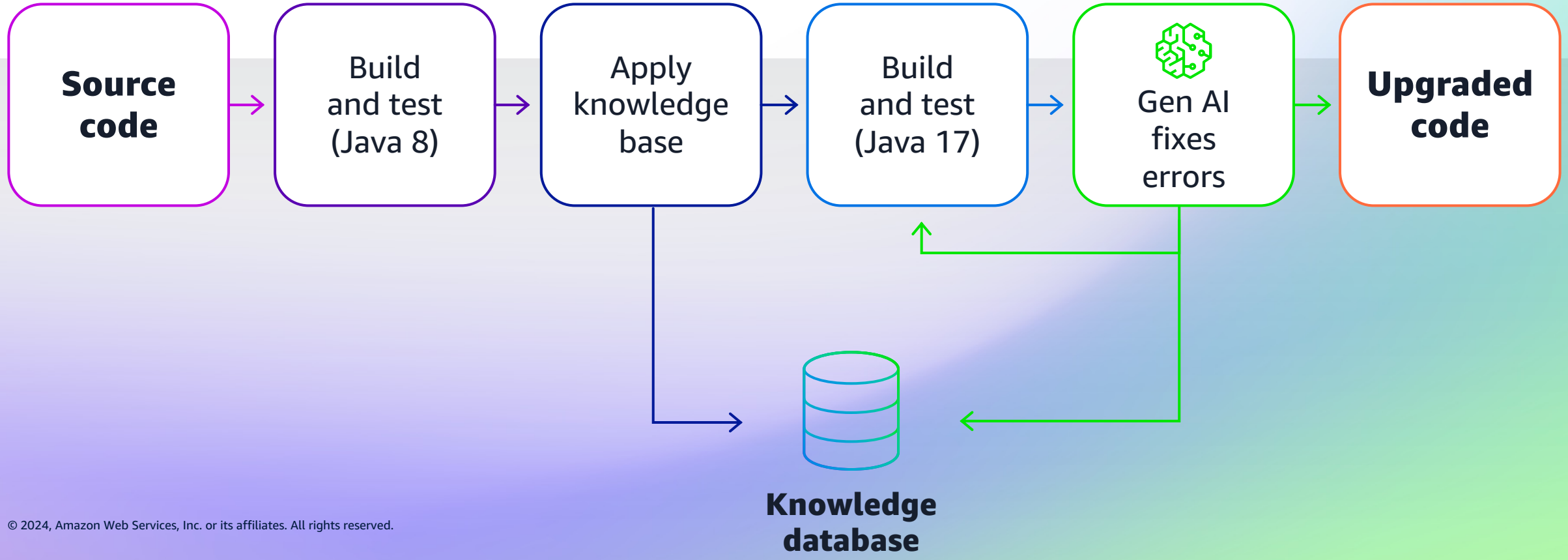
Move to Serverless

Move to DevOps

Move to Manage Databases

Amazon Q Developer agent for code transformation

MODERNIZE LANGUAGE VERSIONS IN A FRACTION OF THE TIME



University of Newcastle

- Emergency migration of 139 applications to AWS in 9 months due to data center demolition, requiring partnership with AWS, Deloitte, and CSA
- Leveraged AWS services to replatform 72% and refactor 23% of applications, including NUSTAR student management system serving 39,000 users
- Achieved rapid infrastructure deployment through AWS (from 8 weeks to 6 minutes), implemented high availability with Amazon RDS Multi-AZ, and reduced infrastructure costs by 20%

Are you well-architected?

Build and deploy faster

- Lower or mitigate risks

- Make informed decisions

Learn AWS best practices

Cost optimization

- Implement Cloud Financial Management (CFM)
- Adopt a consumption model
- Measure overall efficiency
- Stop spending money on undifferentiated heavy lifting
- Analyze and attribute expenditure

Operational excellence

- Organize teams around business outcomes
- Implement observability for actionable insights
- Safely automate where possible
- Make frequent, small, reversible changes
- Refine operations procedures frequently
- Anticipate failure
- Learn from all operational events and metrics
- Use managed services

Operating your cloud

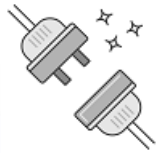
Change Management

Access Management

Security Management

Incident Management

Patch Management



ITSM Integration

Provisioning Management

Continuity Management

Reporting

Self-Managed	**Full control simplified with AWS tools** • AWS Service Catalog • AWS Systems Manager • AWS Management Tools & Services ○ Modeling and Provisioning; Automation and Operations; Monitoring and Logging • 3rd Party Tools
AWS Managed Services (AMS)	**We operate your cloud with AWS best practices and compliance standards so you can focus on your business priorities** • Addresses Security & Compliance • Managed AWS Landing Zone • Self-service automation • 7x24 Worldwide AWS Operations Support Engineers • “Month-to-Month” terms: you can take back control any time
Partner Managed	**Leverage AWS certified Managed Service Partners to help operate your cloud** • 100+ Managed Service Partners (MSP) • Certification Program • Third-Party Audit • Full Lifecycle Services

2023,

Emory University

- Build high-performance computing environment in AWS cloud to support AI.Humanity initiative and large-scale machine learning research
- Deployed AWS HPC cluster in 6 weeks using CloudFormation, enabling seamless integration with existing workflows and supporting complex ML workloads with A100 GPUs
- Reduced genome sequencing time from 3 days to 3 hours on AWS, trained 21,000-image ML model, and expanded research capabilities

Thank you!

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Please complete the survey for this session

Cloud Fundementals

Large-Scale Migration and Modernization with AWS

aws Learning Days
State, Local, and Education