AWS State, Local, and Education Learning Days

Salt Lake City, UT

aws Learning Days
State, Local, and Education

Large-Scale Migration and Modernization with AWS

Best Practices and Lessons Learned

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aws Learning Days
State, Local, and Education

Migrations are more than just shifting technology

Making the case for migration

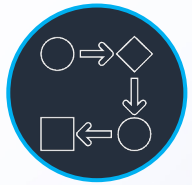
WHAT'S IN THE WAY?

Blockers for cloud value realization

Lack of visible & active sponsorship

Siloed Workflows between orgs

Architectural Entanglement



Undefined operating model

Analysis Paralysis

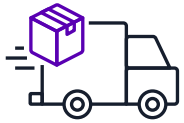
Talent and skills gaps

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

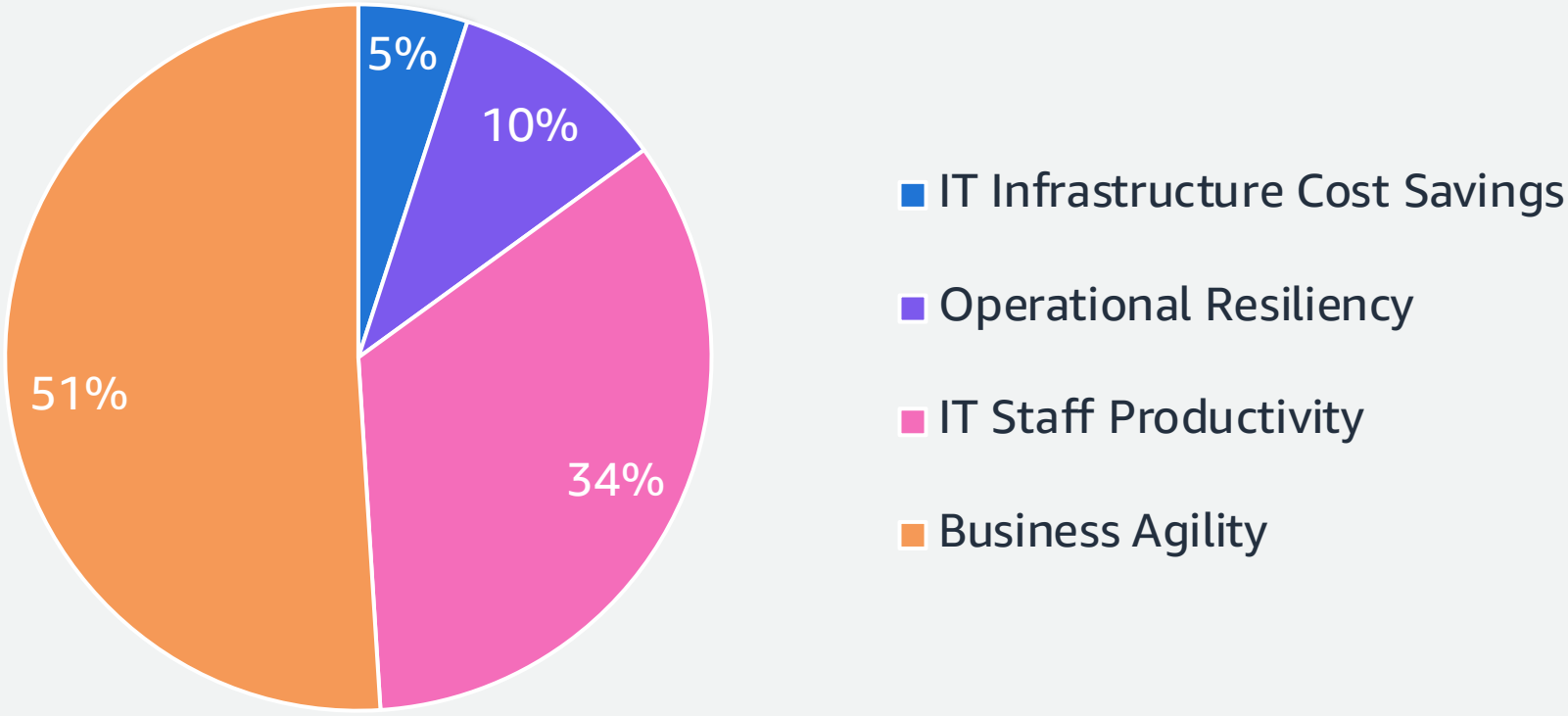

Scalability improvements


All of the above!!

Where does cloud business value come from?

IDC: NON-TCO DRIVERS CONSTITUTE OVER 90% OF ECONOMIC BUSINESS VALUE

Distribution of economic benefits from moving to AWS



The Business Value of Amazon Web Services, IDC Research, Inc., June 2022

Leadership support

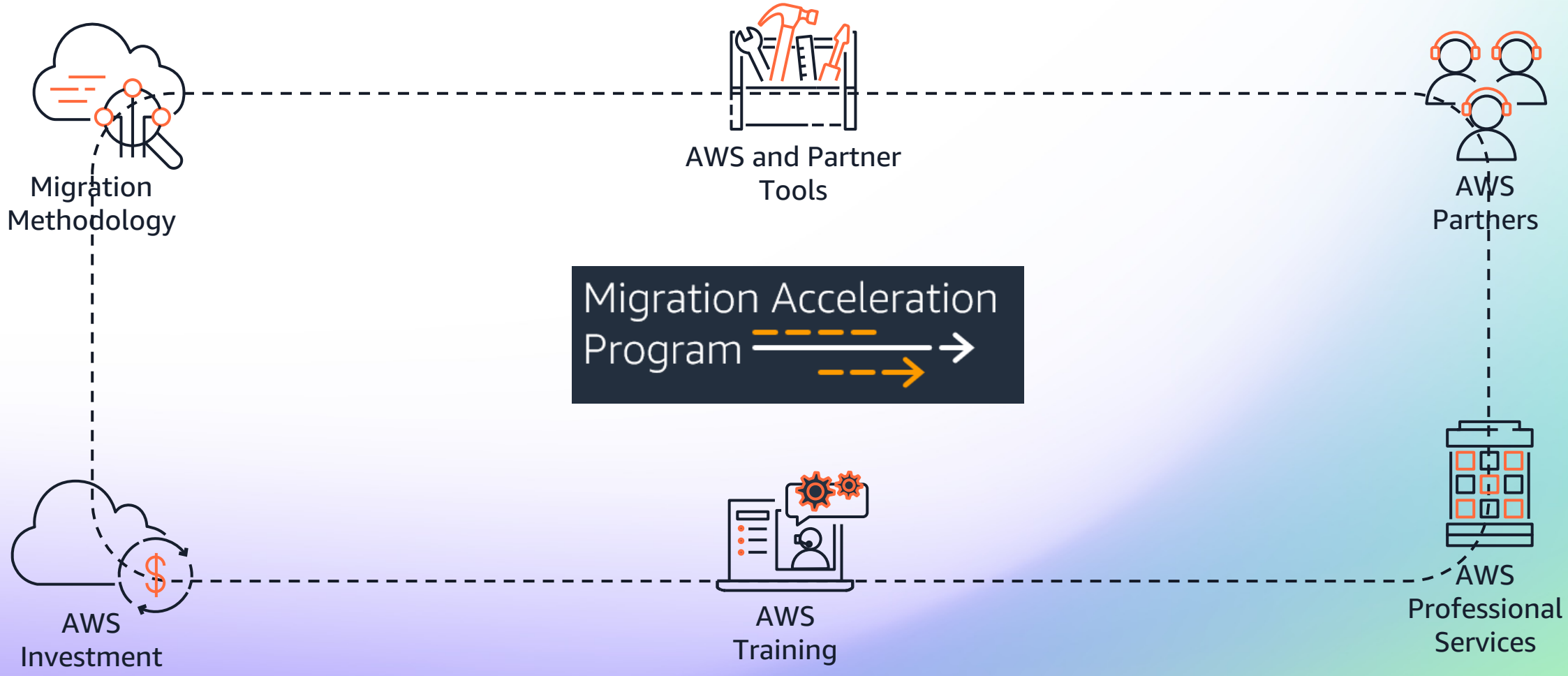
KEY FOR ORGANIZATION SUCCESS

- 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

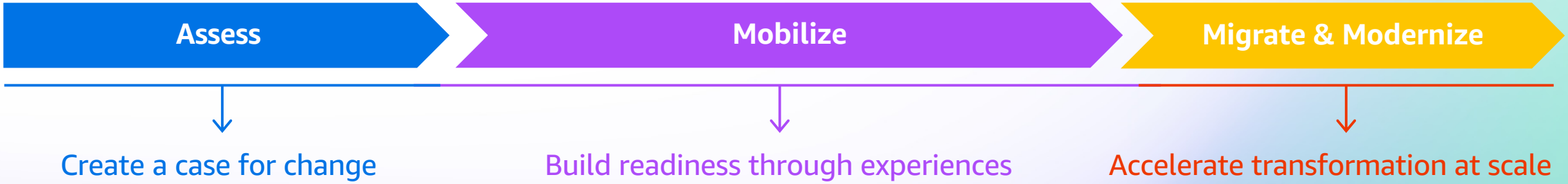
The Migration Acceleration Program (MAP) is the AWS best practice framework built from the experience of migrating hundreds of enterprise customers to get customers to quickly realize the benefits of the cloud.

Migration Acceleration Program (MAP)

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



Our simple three phase approach



Using a proven framework greatly increases your odds of success

ASSESS

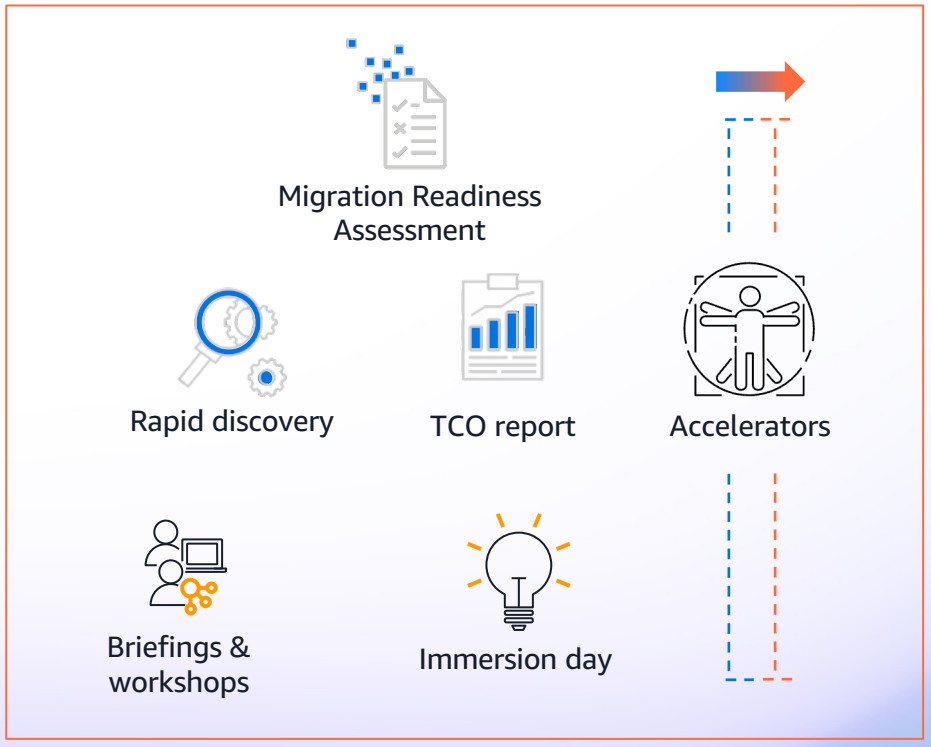
The goal of the Assess phase is to create a case for change by understanding a customer's business drivers and the high level cost in migrating to the cloud. This often includes initial gathering of high-level scope and conducting a licensing assessment (OLA), which results in a detailed presentation of on prem vs cloud costs (business case). This phase can include other items like a Migration Readiness Assessment (MRA).

Assess overview

Goals

- Have an understanding of high-level migration scope
- Create an estimate for right-sized cost on AWS
- Introduce team members to AWS products and services though hands-on learning
- Understand where an organization is in its cloud journey, identify strengths and weaknesses from a cloud-readiness perspective

Assess



Outcomes

Assess

- Migration Readiness Assessment (MRA)
- Optimization and Licensing Assessment (OLA)

Cost

- Total Cost of Ownership (TCO) report or business case

People

- Immersion days
- Workshops

Creating the case for change

Available Assessment Tools

AWS Services and Tools

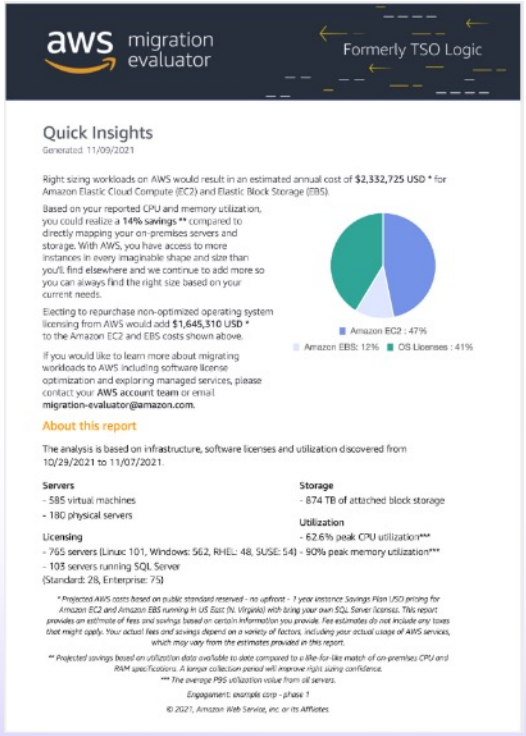
- Migration Evaluator
- AWS Migration Hub
- AWS Application Discovery Service
- AWS DataSync
- Cloud Adoption Readiness Tool (CART)
- Migration Readiness Assessment (MRA)
- CloudOptimizer
- Migration Portfolio Assessment (MPA)

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)

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.

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

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.

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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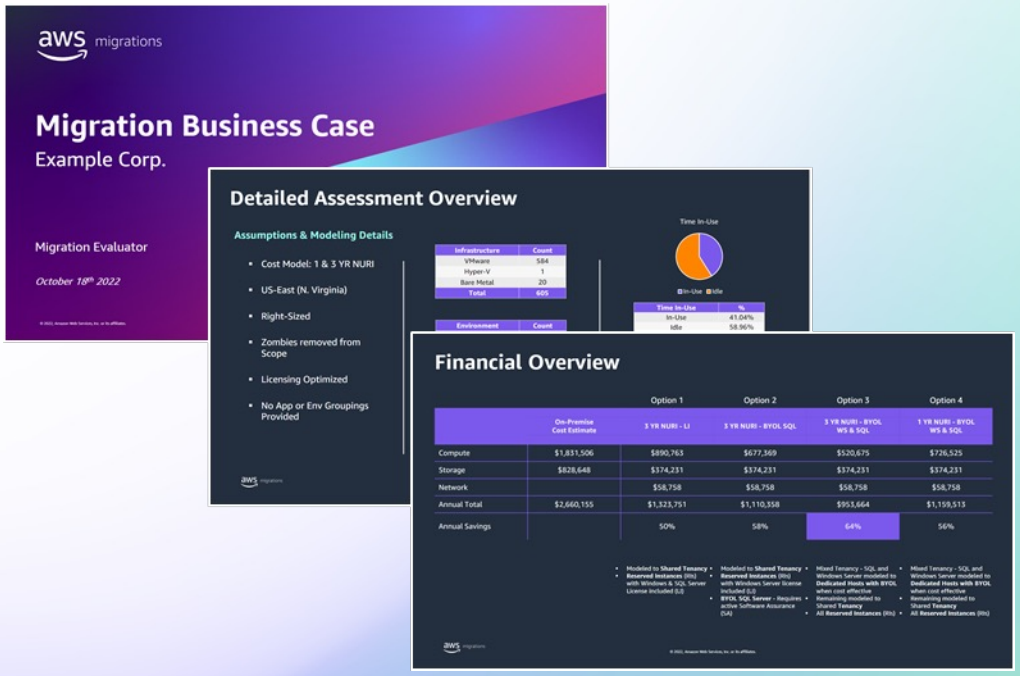
Directional business case



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%

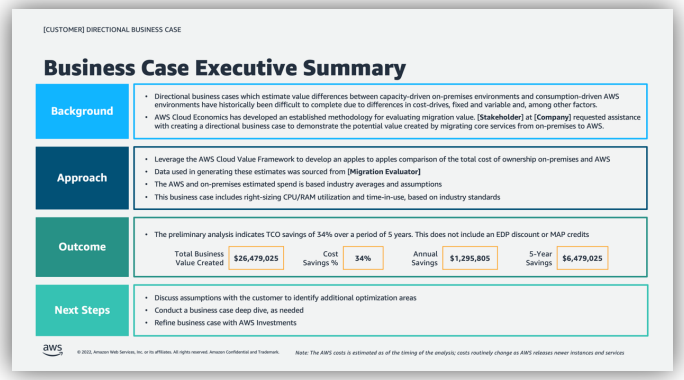
Financial Overview

	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%

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

Available 5 days after data collection ends (upon request)

The AWS Cloud Economics team can help

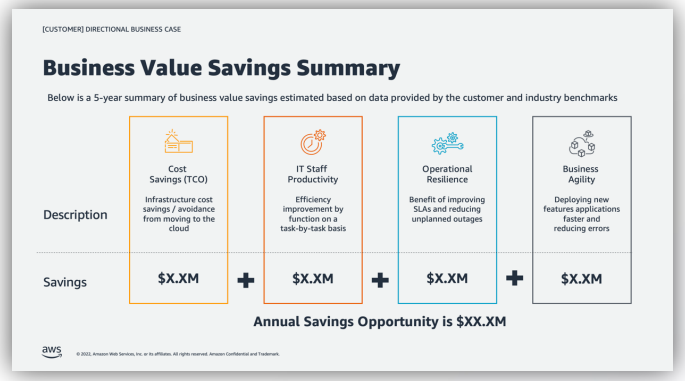

[CUSTOMER] DIRECTIONAL BUSINESS CASE

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

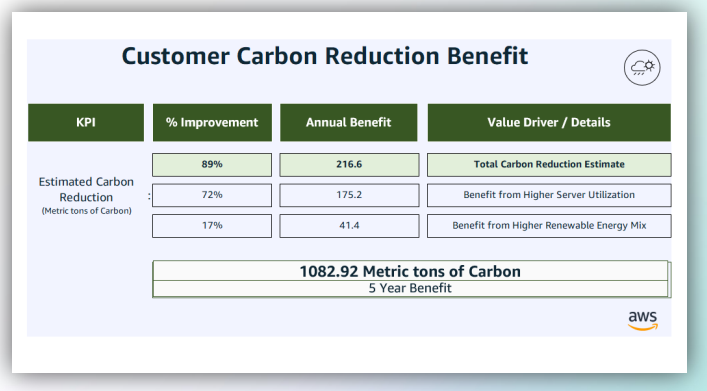
Business Value Savings Summary

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

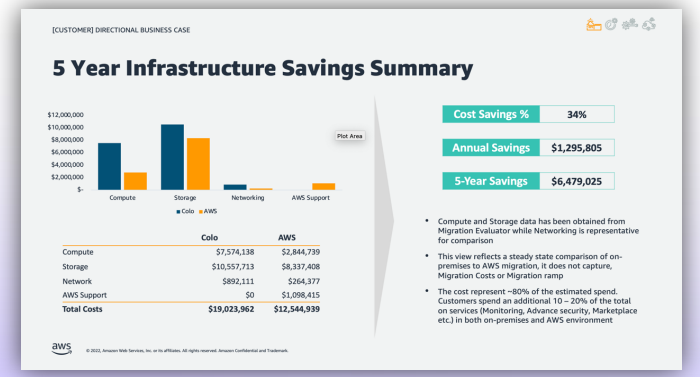
Financial Impact Results


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

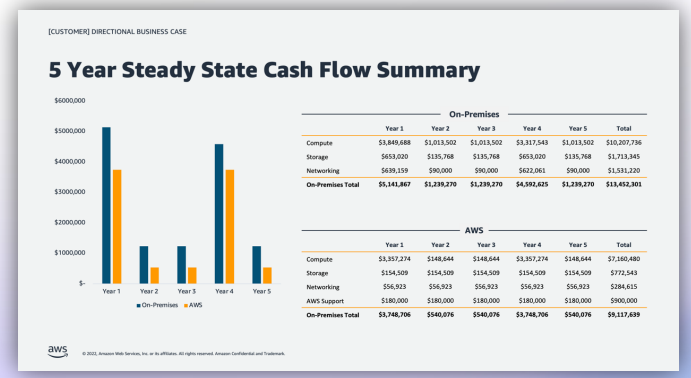
5 Year Infrastructure Savings Summary

	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

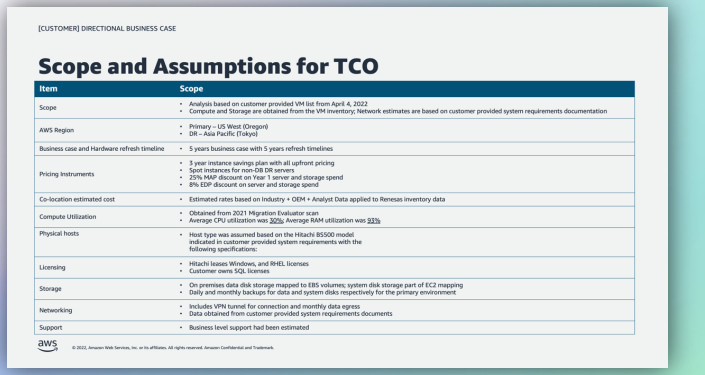
On-Premises

	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

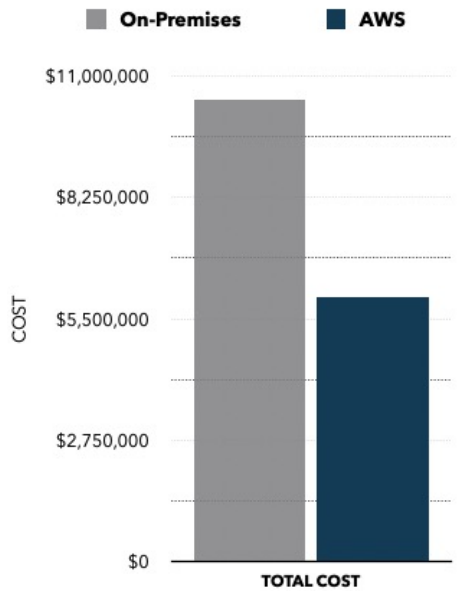
Scope and Assumptions for TCO

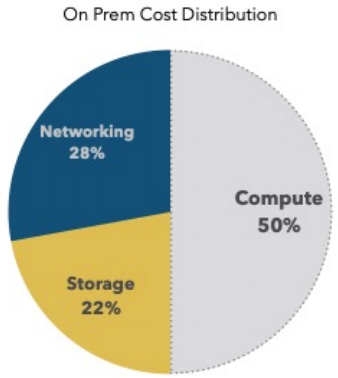
Item	Scope
Scope	• Analysis based on customer provided VM list from April 4, 2022 • Compute and Storage are obtained from the VM inventory; Network estimates are based on customer provided system requirements documentation
AWS Region	• Primary – US West (Oregon) • DR – Asia Pacific (Tokyo)
Business case 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

SUMMARY – ON PREM VS AWS (ME/CLOUD ECONOMICS TEAMS)





	On-Premises	AWS	SAVINGS	%
COMPUTE *(3 Yrs Reserved Inst.)*	$6,766,642	$2,992,184	$3,774,458	55.8%
STORAGE	$2,178,855.00	$1,701,449.00	$477,406.00	21.9%
NETWORKING	$1,499,579.00	$404,214.00	$1,095,365.00	73.0%
AWS ENT SUPPORT	$0	$900,000	-$900,000	0.0%
TOTAL COST	**$10,445,076**	**$5,997,847**	**$4,447,229**	**42.6%**

Fig. Example of Total Cost (5 Years)

**Labor Cost Not Included |*Windows SQL Included | *SQL BYOL | *3 Yrs Reserved Instance Pricing*

On-Prem cost analysis is done based on the customer environment

Tips

LOOK AT THE BIG PICTURE

Assess server and storage together to get a full picture of costs even if not all will be migrated right away

Licensing options to optimize both cost and maintenance

Partner fit: assess partners to find the right fit to meet your transformation needs

Preparing the organization to migrate

IS THE FOUNDATION READY?

MOBILIZE

The goal of the Mobilize phase is to design the future state architecture, refine the applications in scope, qualify cost estimates, conduct application rationalization, create a migration execution plan, build a landing zone and migrate a single workload to the cloud. This phase can also include a cloud maturity assessment (CMA) in order to optimize operational effectiveness across people, process, technology, and security to clearly define transformation scope.

Mobilize overview

Goals

- Design future state network and security architecture
- Build AWS foundational environment
- Define application strategy and identify migration dependencies, application integrations, pain points and timing considerations
- Define team model and agile work streams
- Develop cost and resource model for the migration of a defined portfolio
- Evaluate cloud operations and maturity goals, conduct optional learning needs analysis (LNA)

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

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

People

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

Enable readiness for migration and modernization

Migration and modernization strategies

Current IT snapshot

Asset inventories

App configuration data

Performance Information

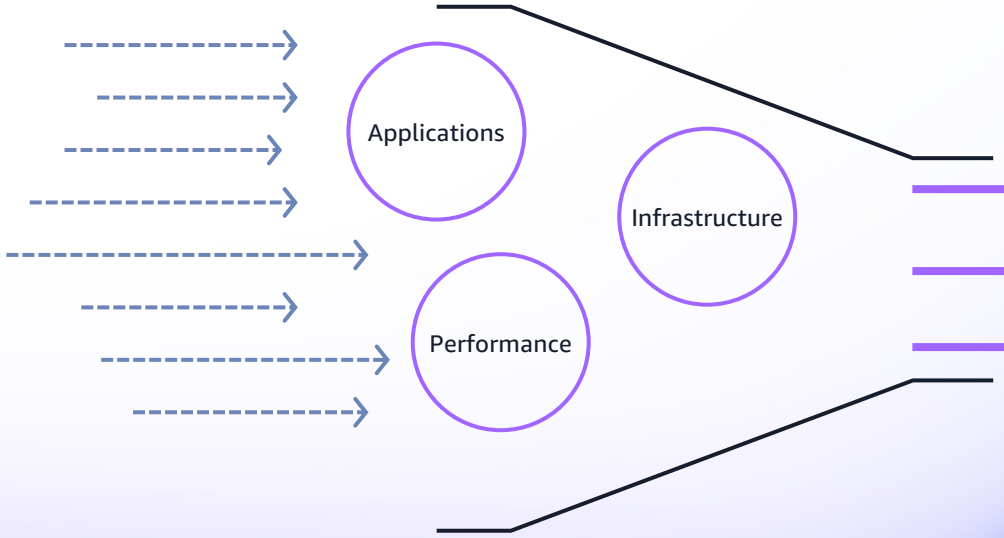
CMDB

SLA/OLA

Architecture

Tribal knowledge

Discover & organize data



Strategies for each workload (7Rs)

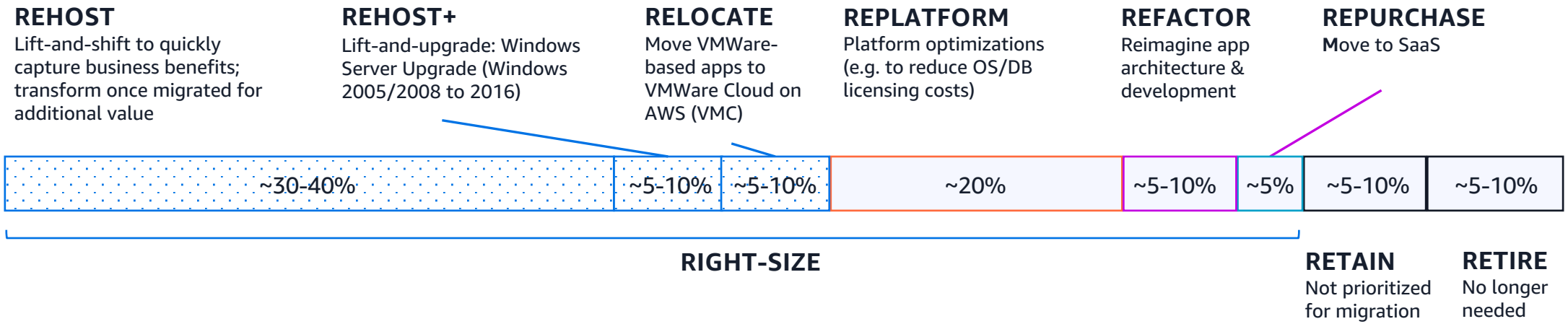
- Refactor
- Re-platform
- Repurchase
- Rehost
- Relocate
- Retain
- Retire

Level of effort

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

Migration and modernization patterns

Typical IT environment by migration pattern:



Migration (rehost/relocate) helps you quickly realize cloud benefits; ***Modernization*** (replatform/refactor) helps you maximize those benefits; ***Focus on both***, and periodic 'right sizing', to fully realize cloud benefits

Cloud operating model

Cloud foundation team
(0-6 months)

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

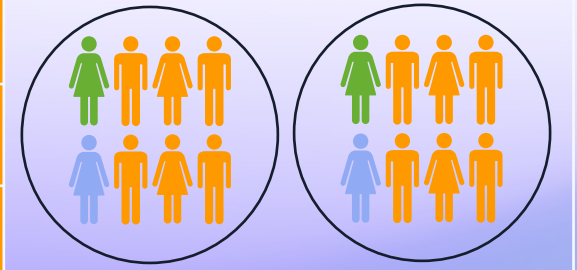
Initial cloud enablement engine
(6-12 months)

Cloud Business Office

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

Cloud Platform Engineering

- Platform
- Operations
- Security



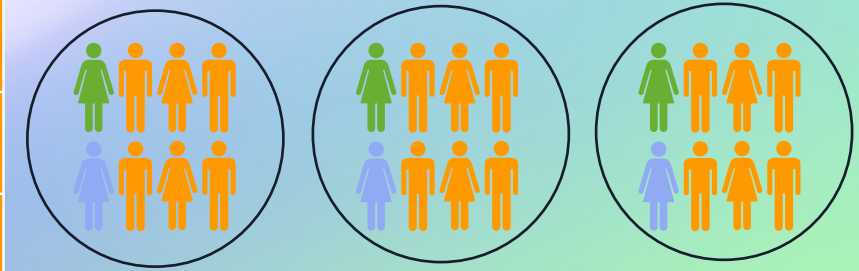
Cloud enablement engine @ scale
(12+ months)

Cloud Business Office

Product	Architecture	On-Boarding	OCM
Financial	Delivery		Training

Cloud Platform Engineering

- Platform
- Operations
- Security



Quick wins

ESTABLISH “LIGHTHOUSE” WORKLOAD

High value: focus on relatively small but important workload

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

Measurable: use metrics to show measurable results of outcomes

Our comprehensive approach to enablement

In-Person Immersion Days

- Workshops tailored to team needs or project objectives
- Taught by AWS Solution Architects and subject matter experts
- Access to regional higher ed learning days + seminars

Personalized Plans

- Learning Needs Analysis for data driven plan creation
- Customized for each staff member based on role and team requirements
- Incorporates individual career goals

Skill Builder + Lab Access

- Self-Paced courses, Labs, and Digital Classroom access
- Gamified learning with AWS Cloud Quest and Jams
- Full-length AWS certification practice exams

Accelerating your migration

HOW CAN WE HELP YOU REALIZE RESULTS?

MIGRATE AND MODERNIZE

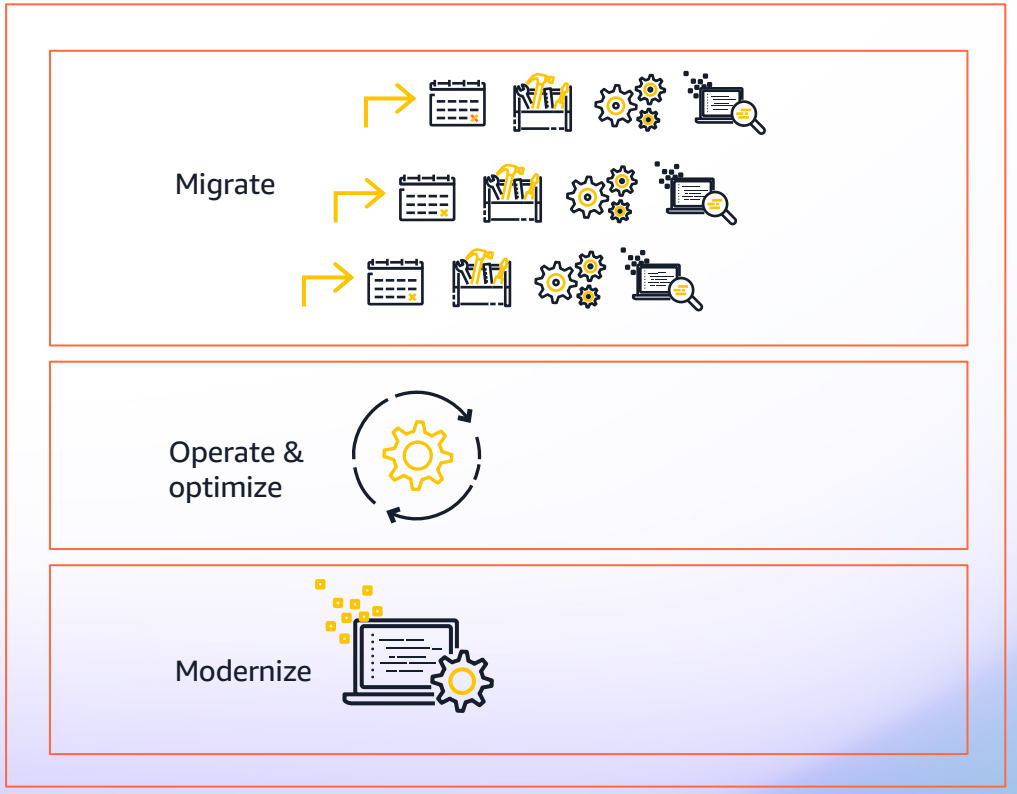
The goal of this phase is to execute the migration wave plan and build the design as defined in the Mobilize phase. For any applications This can also include any transformation activities to define the future state operating model on the cloud and ready the enterprise for Day 1.

Migrate & Modernize Overview

Goals

- Execute the migration wave plan as defined in the Mobilize phase
- Leverage tools like the Cloud Migration Factory to accelerate and automate migrations at scale
- Continue design for appl that will undergo modernization
- Adapt processes for operating in the cloud
- Train team

Migrate and Modernize



Outcomes

Technology

- Migrated apps in the cloud

People

- Team trained to use new tools such as Cloud Migration Factory (CMF) or Database Migration Service (DMS)

Process

- Migration Governance Framework
- Documented standard migration patterns and artifacts in operating runbooks

Accelerate transformation at scale

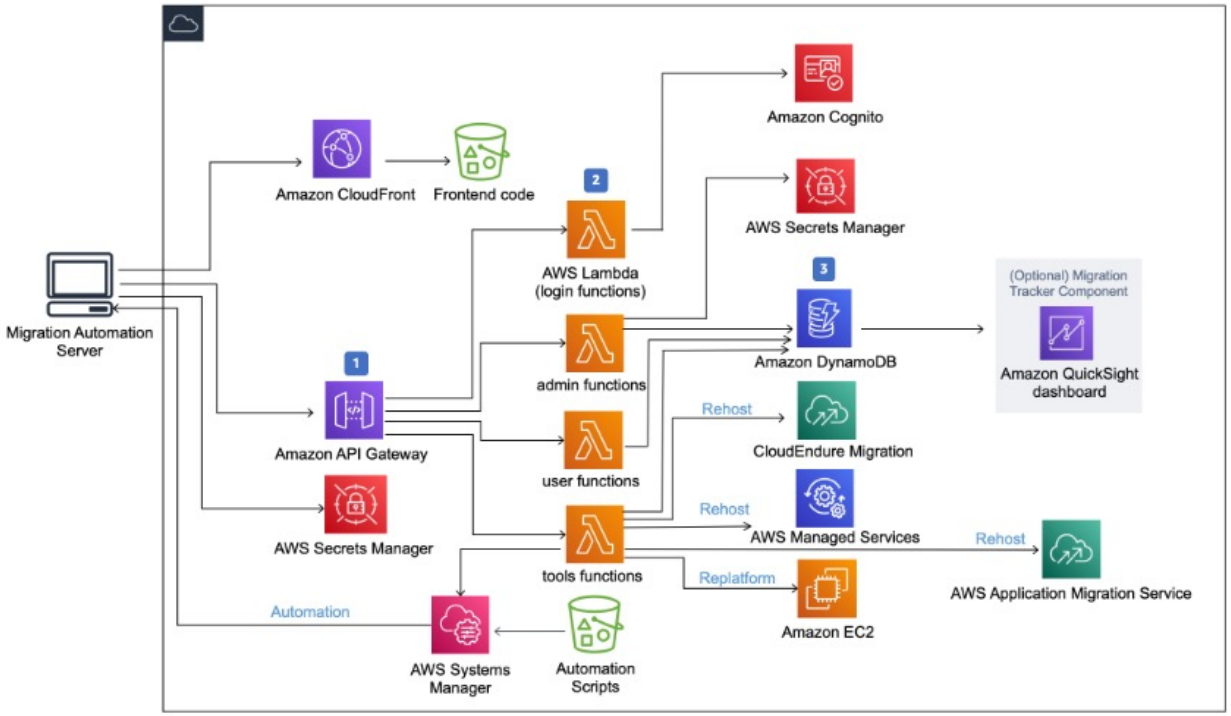
Cloud Migration Factory

Coordinate and Automate

Cloud Migration Factory (CMF) simplifies, expedites, and reduces the cost of cloud migration by offering a highly automated lift-and-shift solution.

It helps customers with their medium-scale to large-scale migrations by automating manual processes, which are often slow or complex to scale.

Thousands of servers have been migrated to AWS using CMF to date. For example, AWS customers have used CMF to migrate 1,300 servers in 5 months, and were able to cutover more than 600 servers in a single cutover window.



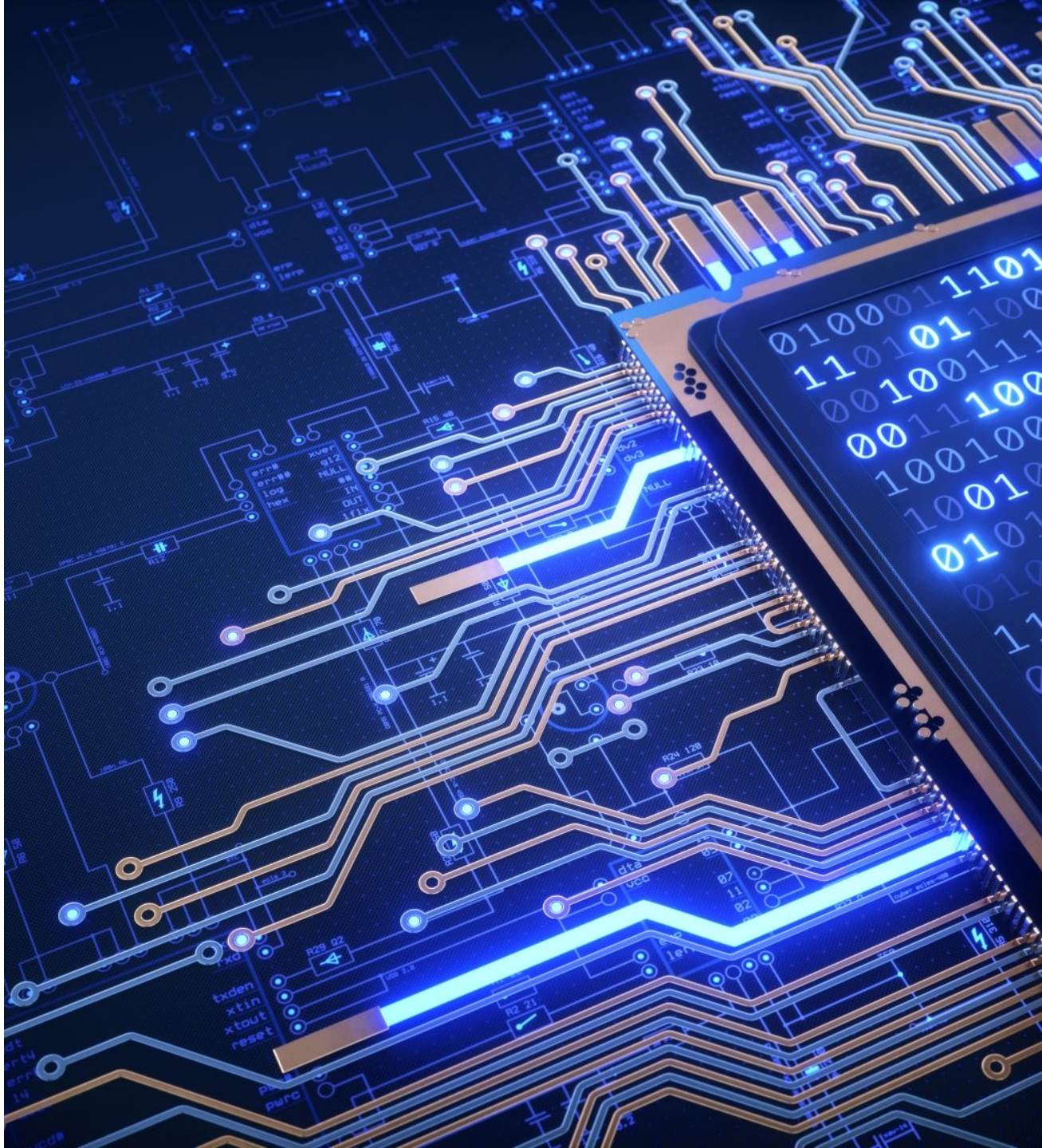
Learn more:
https://aws.amazon.com/solutions/implementations/aws-cloudendure-migration-factory-solution/

Leadership support

KEY FOR ORGANIZATION SUCCESS

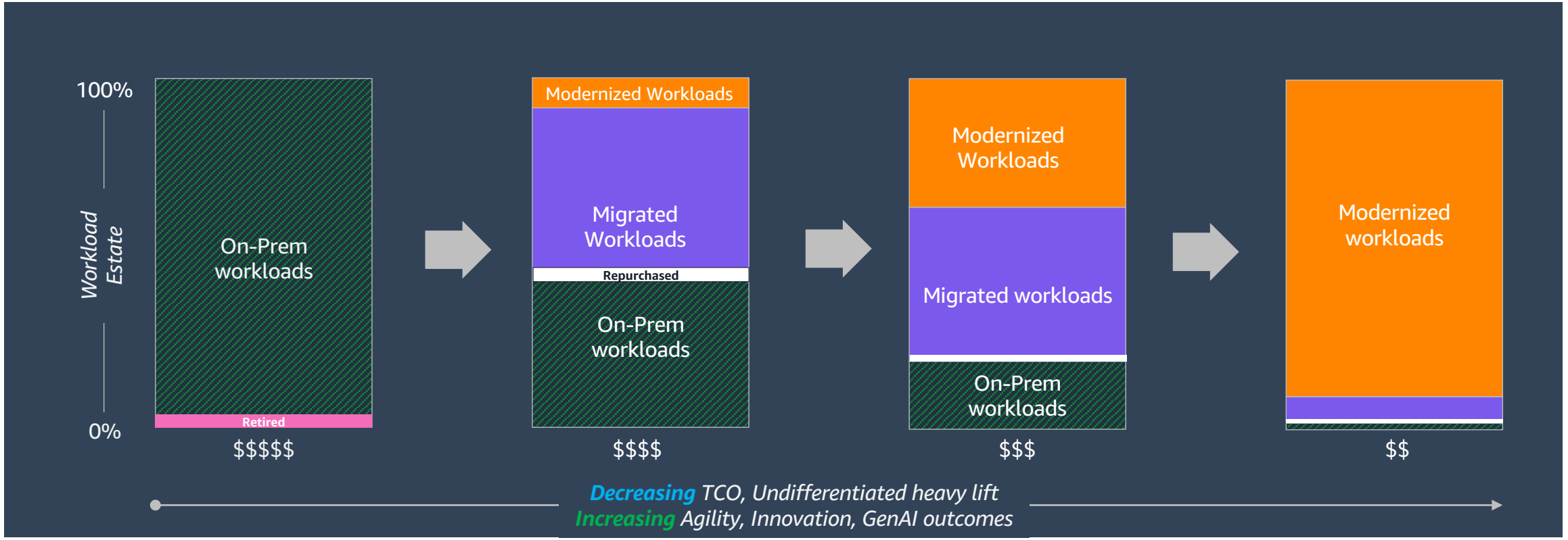
- Identify a **single-threaded leader** empowered to make decisions, help avoid silos and streamline workstreams by maintaining consistent priorities
- Align the senior leadership team to migration success criteria. Their support is critical during escalations and obstacles that may arise during the migration

Modernize the results



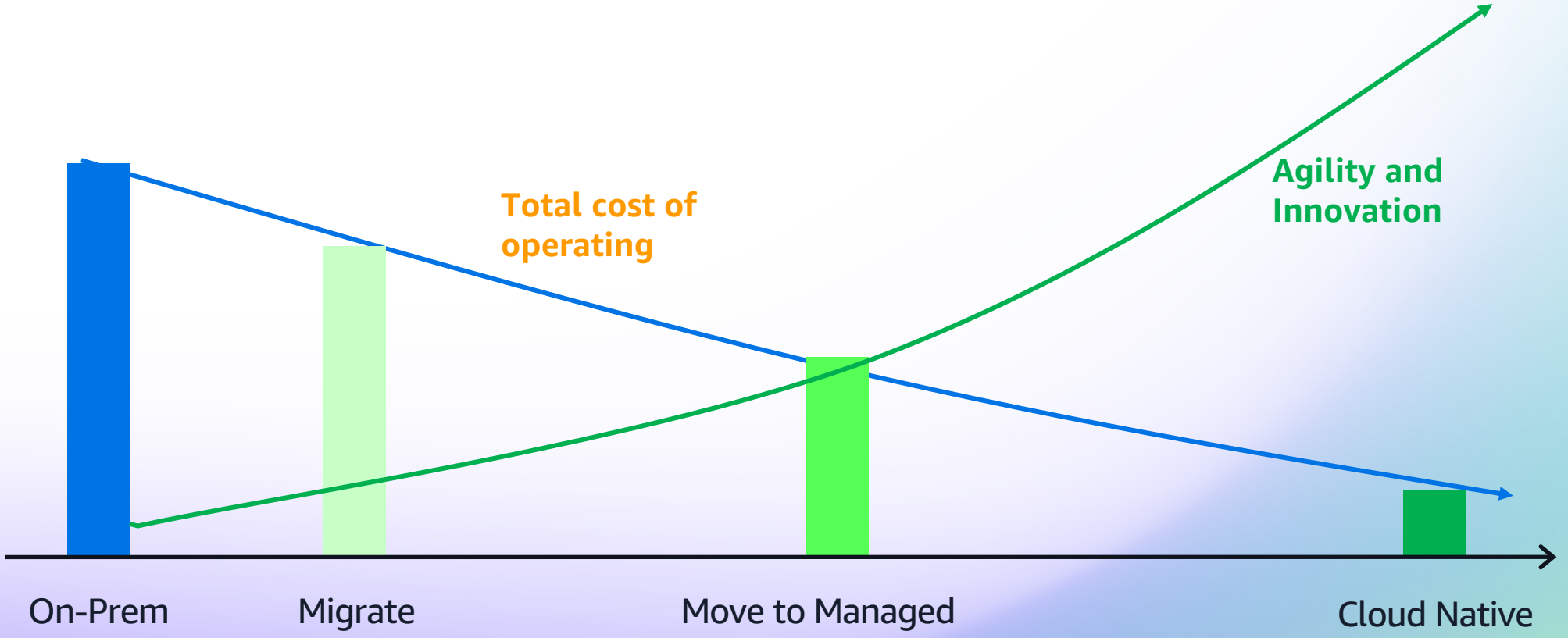
When to modernize? A representative cloud journey

Modernization begins with migration; migrate quickly and then modernize



1. Conduct assessment; Plan your journey
2. Migrate quickly to unlock benefits; modernize specialized workload(s) or a strategic App to build muscle for future
3. Continue to move on-prem workloads to cloud, and, scale modernization of migrated workloads
4. Cloud-Native transformation milestone, optimization continues

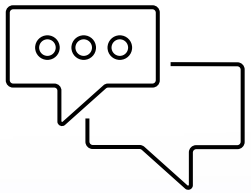
Both migrating and modernizing are important to fully realize the benefit of cloud



Leverage AI tools to accelerate your migration

Assess

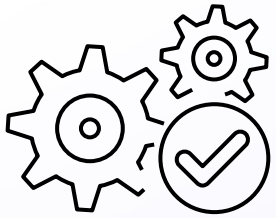
PLANNING & ANALYSIS



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

Mobilize

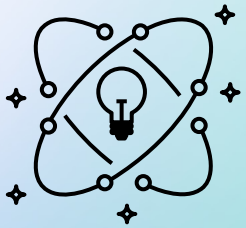
AIDED MODERNIZATION



- ✓ 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

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

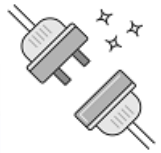
Change Management

Access Management

Security Management

Incident Management

Patch Management



ITSM Integration

Provisioning Management

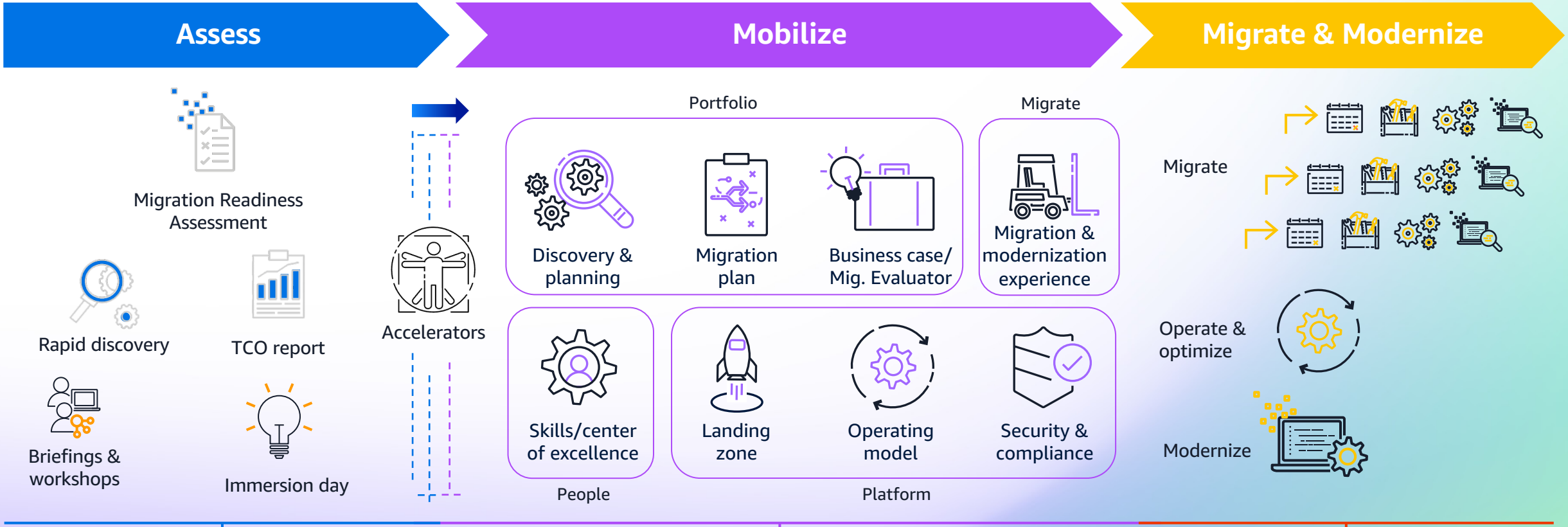
Continuity Management

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,

Our simple three phase approach



Thank you!

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Track Name

Large Migrations and Modernizations

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