



Cloud Computing Service Models, Deployment Models, Advantages & Challenges

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Agenda

- Cloud Infrastructure
- High level business drivers for migration
- Setting yourself up for success
- AWS Migration Approaches

Questions to consider when evaluating cloud vendors

Global infrastructure: What is the underlying architecture and design of this to enable HA and synchronous replication?

Security: How many third-party attestations and security features do the vendors have? Do they have international customers that can attest to this?

Innovation: Is the vendor investing for the long term and have demonstrated capability with reference customers taking advantage of innovative services?

Cost: What is the philosophy of the company when it comes to cost? Is it economies of scale driven for long term or is it undercutting the market or credits for the short term? Have you evaluated price to features across vendors?

Performance: Have you tested the stability of the platform and see if it's working well? Have you reviewed performance benchmarks, price to performance and therefore impact to overall TCO?

Support and documentation: How many support personnel are trained for international cloud use? Have you sought feedback on the vendor's support and implementation success? (say from multiple partners?)

Track record: Are there well-known international customers using the cloud provider? What is the materiality of their workload?

Small business to Enterprise grade support as you grow: what is the support/ services offered by cloud vendor to support not just small workloads but also to large scale SAP type workloads as an example?

Benefits of the AWS Global Infrastructure



Security



Availability



Performance



Scalability



Flexibility

← Low cost →

AWS custom hardware



Routers



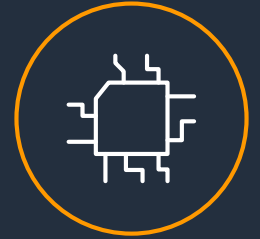
Load
balancers



Custom compute
servers and
semiconductors



Custom
software



Silicon

Inherit global security and compliance controls

Certifications / Attestations

C5	DE ✓
Cyber Essentials Plus	GB ✓
DoD SRG	US ✓
FedRAMP	US ✓
FIPS	US ✓
IRAP	AU ✓
ISO 9001	🌐 ✓
ISO 27001	🌐 ✓
ISO 27017	🌐 ✓
ISO 27018	🌐 ✓
K-ISMS	KR ✓
MTCS	SG ✓
PCI DSS Level 1	🌐 ✓
SEC Rule 17-a-4(f)	US ✓
SOC 1, SOC 2, SOC 3	🌐 ✓

Laws / Regulations / Privacy

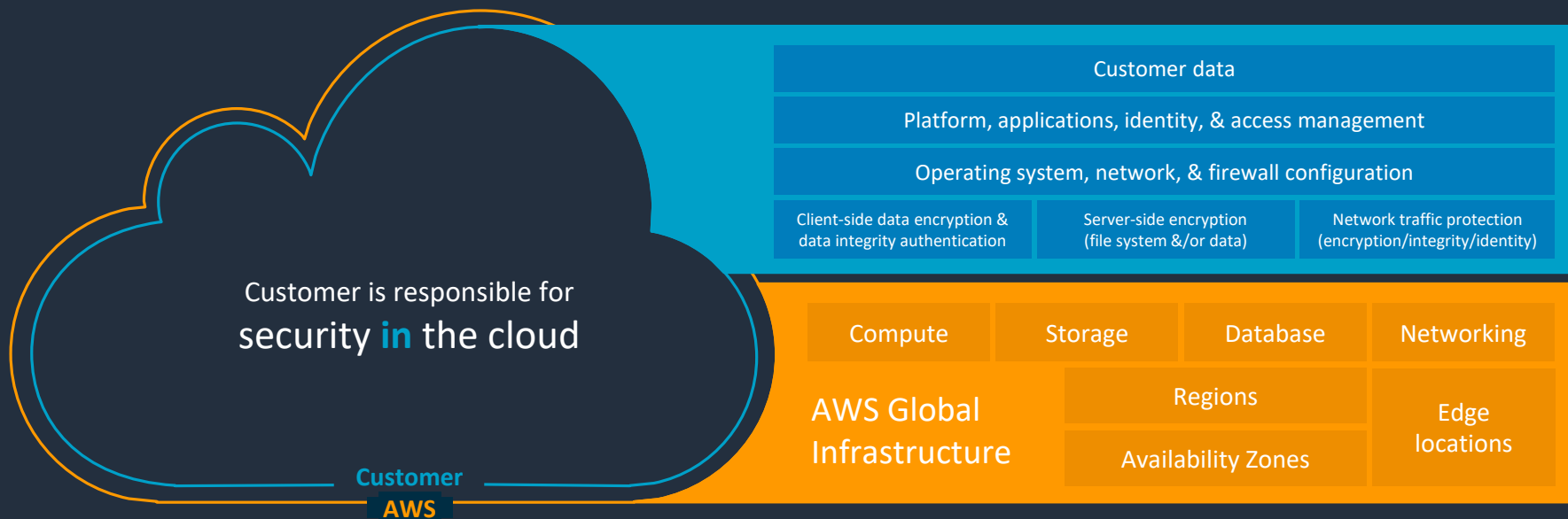
Argentina Data Privacy	✓
CISPE	EU ✓
EU Model Clauses	EU ✓
FERPA	US ✓
GDPR	EU ✓
GLBA	US ✓
HIPAA	US ✓
HITECH	🌐 ✓
IRS 1075	US ✓
ITAR	US ✓
My Number Act	JP ✓
UK DPA - 1988	GB ✓
VPAT/Section 508	US ✓
Data Protection Directive	EU ✓
Privacy Act [Australia]	AU ✓
Privacy Act [New Zealand]	NZ ✓
PDPA—2010 [Malaysia]	MY ✓
PDPA—2012 [Singapore]	SG ✓
PIPEDA [Canada]	CA ✓
Spanish DPA Authorization	ES ✓
Spanish DPA Authorization	ES ✓

Alignments / Frameworks

CIS (Center for Internet Security)	🌐 ✓
CJIS (US FBI)	US ✓
CSA (Cloud Security Alliance)	🌐 ✓
ENS High	ES ✓
EU-US Privacy Shield	EU ✓
FFIEC	US ✓
FISC	JP ✓
FISMA	US ✓
G-Cloud	GB ✓
GxP (US FDA CFR 21 Part 11)	US ✓
ICREA	🌐 ✓
IT Grundschutz	DE ✓
MITA 3.0 (US Medicaid)	US ✓
MPAA	US ✓
NIST	US ✓
PHR	US ✓
Uptime Institute Tiers	🌐 ✓
Cloud Security Principles	GB ✓

🌐 = industry or global standard

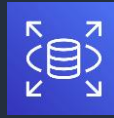
Share your security responsibility with AWS



The line varies...



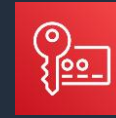
Amazon EC2



Amazon RDS



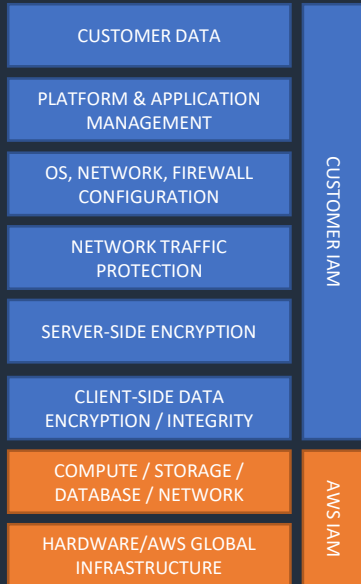
Amazon S3



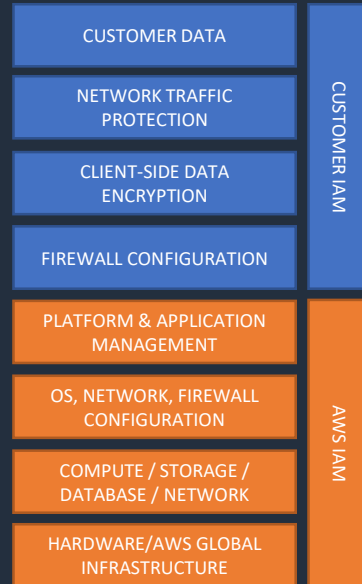
AWS KMS



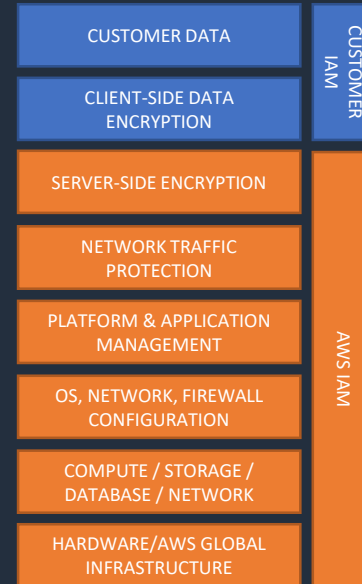
Amazon
DynamoDB



INFRASTRUCTURE SERVICES



CONTAINER SERVICES



ABSTRACTED SERVICES

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

More Customizable
+
More Customer Responsibility

AWS Global Infrastructure

31 geographical regions, 99 availability zones, 410+ POPs

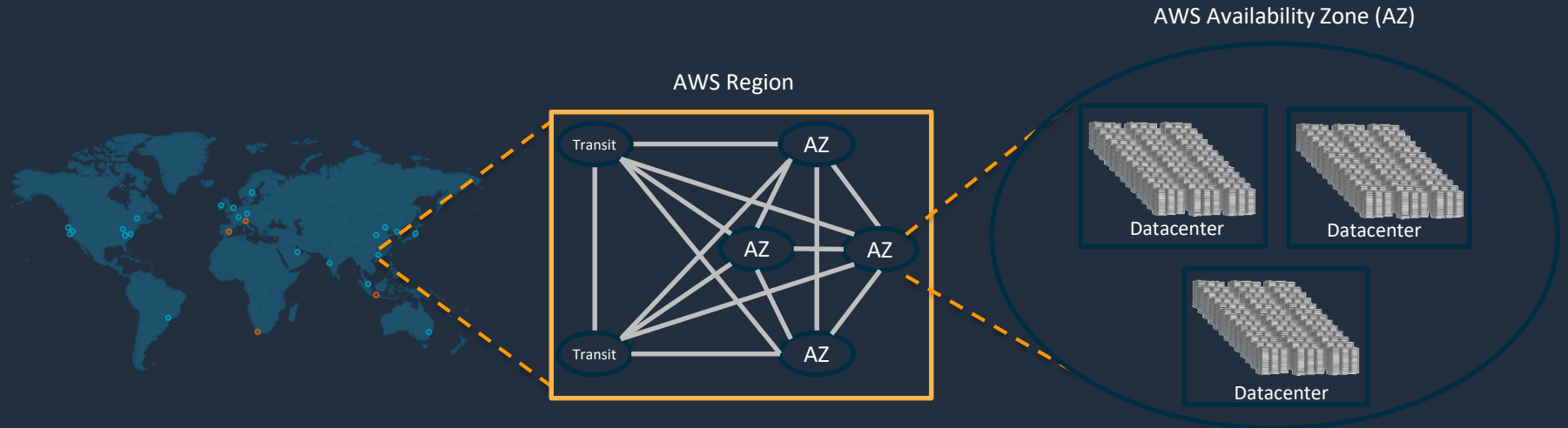
AWS Global Infrastructure Map

The AWS Cloud spans 99 Availability Zones within 31 geographic regions around the world, with announced plans for 12 more Availability Zones and 4 more AWS Regions in Canada, Israel, New Zealand, and Thailand.



AWS Region design

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



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

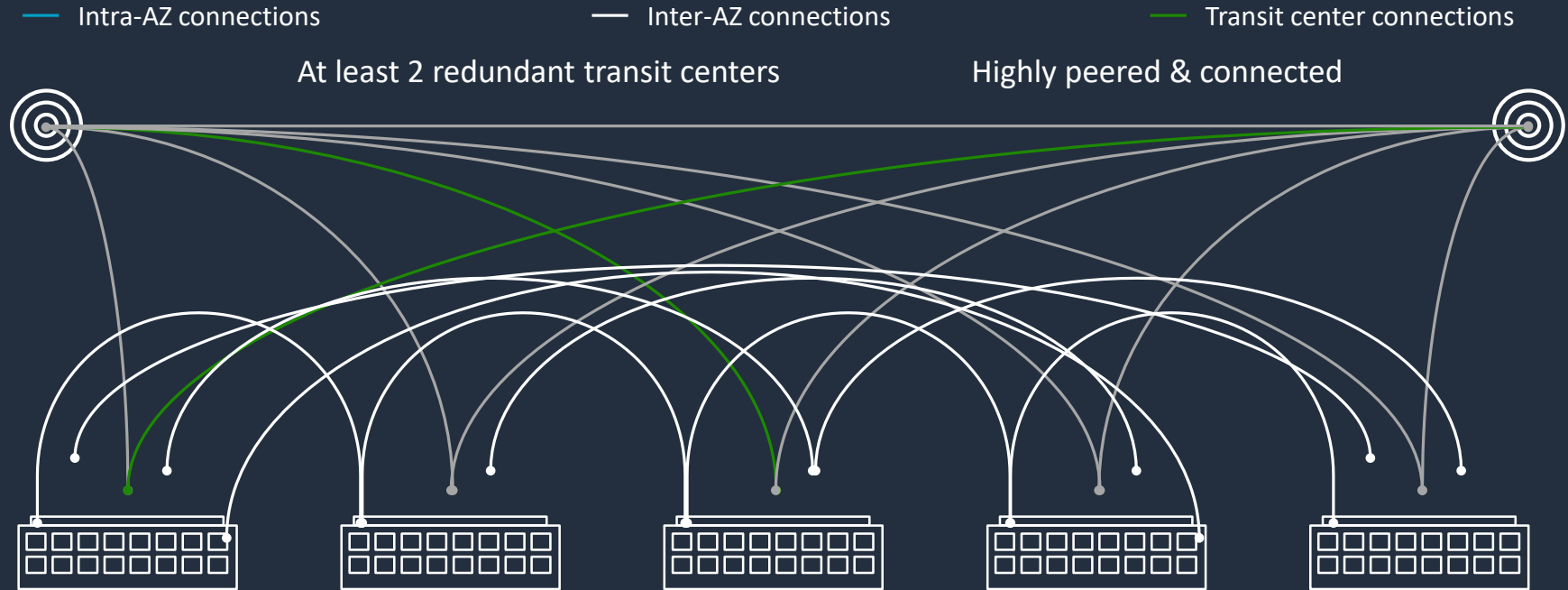
Availability Zones consist of one or more discrete data centers, each with redundant power, networking, and connectivity, housed in separate facilities.

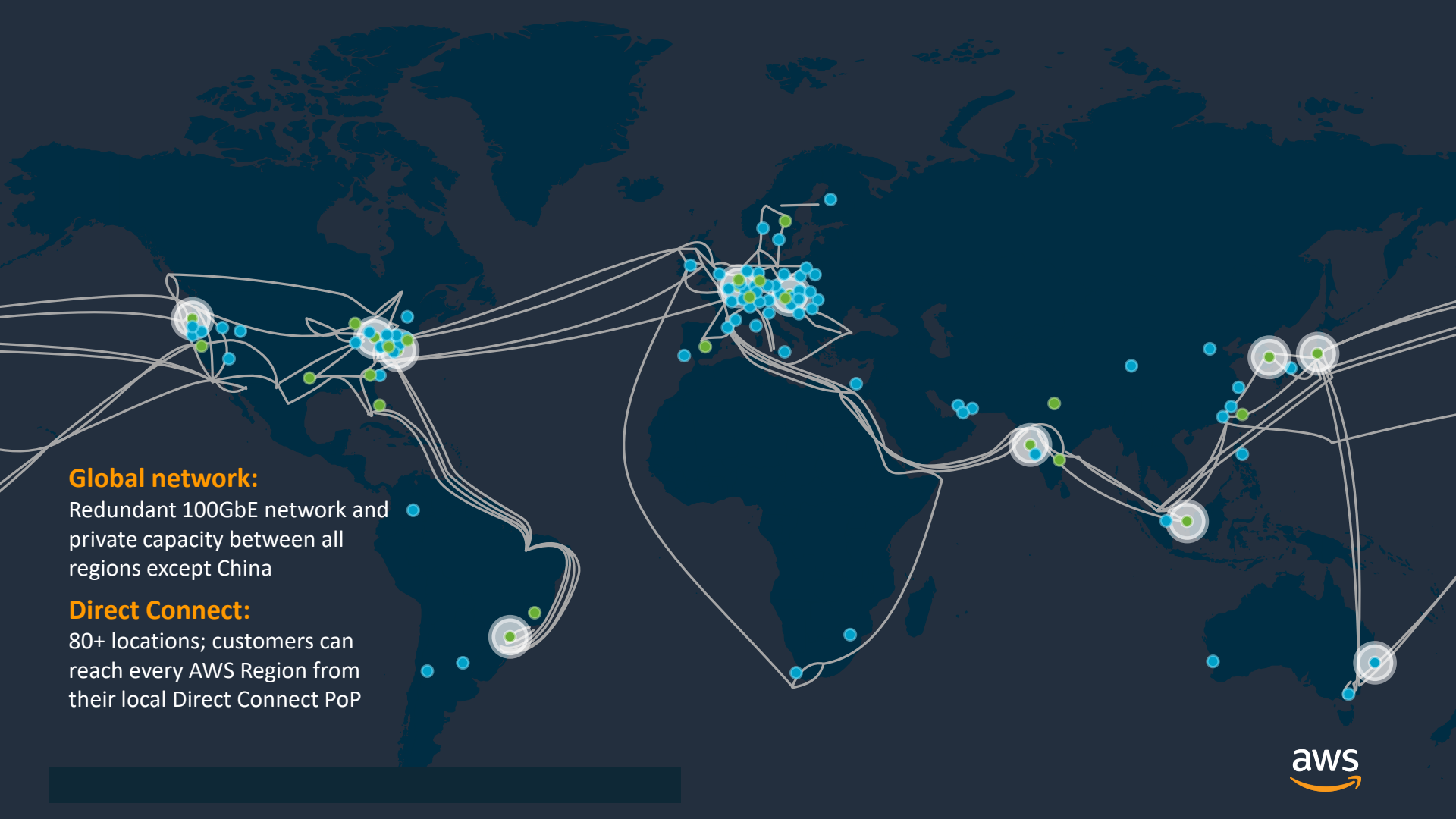
AWS Availability Zone (AZ) design

- Fully isolated infrastructure with one or more datacenters
- Meaningful distance of separation
- Unique power infrastructure
- Many 100Ks of servers at scale
- Datacenters connected via fully redundant and isolated metro fiber



AWS network design





Global network:

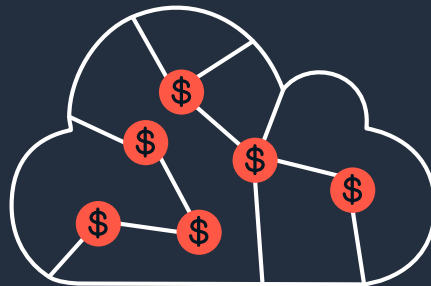
Redundant 100GbE network and private capacity between all regions except China

Direct Connect:

80+ locations; customers can reach every AWS Region from their local Direct Connect PoP

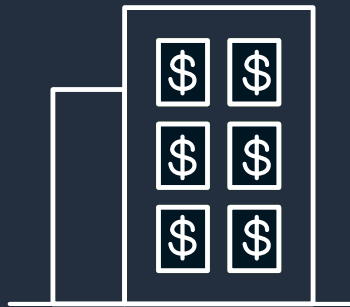
Business drivers for migration





Migrate

Unlock savings, position
for modernization



Customer experiences



Migrated over 1,200 instances (90+ apps) in 18 months, introduced an automated build and deployment pipeline, and sped up provisioning from weeks to 1–2 days for an entire application stack



Migrated over ~5,500 instances in 9 months, reduced storage costs by 50% and compute costs by 20%, and sped up provisioning 10X from 4 weeks to 2 days



Consolidating 56 datacenters down to 6, moving 75% of infrastructure to cloud, and re-allocating more than \$100M to key business drivers



Migrated over 600 workloads to AWS in under 14 months, including some Unix to Linux conversions, driving year over year cost reduction

Real customer business outcomes achieved



Cost Savings

“realized a 52 percent reduction in TCO”

General Electric

“avoided acquiring additional data center space, saving an estimated \$1M+ over three years”

Lionsgate

“reducing its data center footprint from eight to three by 2018”

Capital One



Staff Productivity

“we have enhanced software development by 20%”

Orbis

“without AWS, we would need the DevOps team to be at least twice the size”

Avizia

“with half the people normally required to build and operate sites”

Bustle



Operational Resilience

“15% increase in availability”

Conde Nast

“average response time was 500 ms, but by using AWS, the average is 80 ms”

Haven Power

“availability increased from 99.7 to of 99.999”

2C2P



Business Agility

“gone from deployments taking 6 weeks to 1 per week”

3M

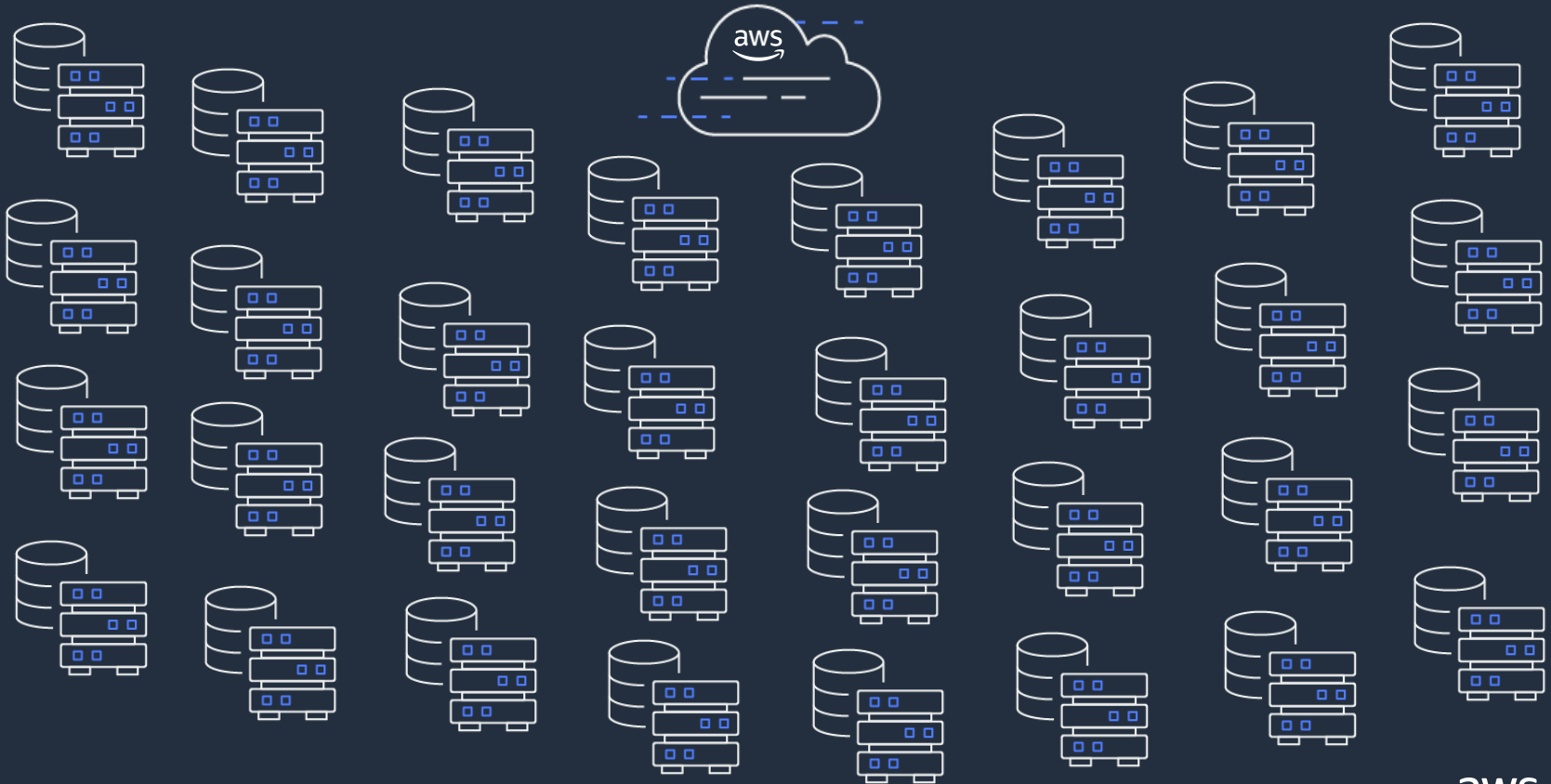
“set up in about 1/5 of the time it would taken to do a buildout and deployment”

Intuit

“our projects no longer last years, they last months”

Autodesk

Enterprise migration projects can be challenging



Enterprise migration projects can be challenging

? Challenges

People

- Many years of embedded tribal knowledge
- People/culture issues dealing with change

Technical

- Deconstruct your on-premises technical environment
- Need to understand performance and relationship of applications

Operational and Process

- Understand the current operational processes
- Determine policies and business rules
- Modify and adhere to security policies
- Comply with Industry Regulations

✓ Best Practices

Build Excitement

- Engage all stakeholders – Business, Technology, HR, Finance
- Establish clear savings opportunity
- Show path to innovation

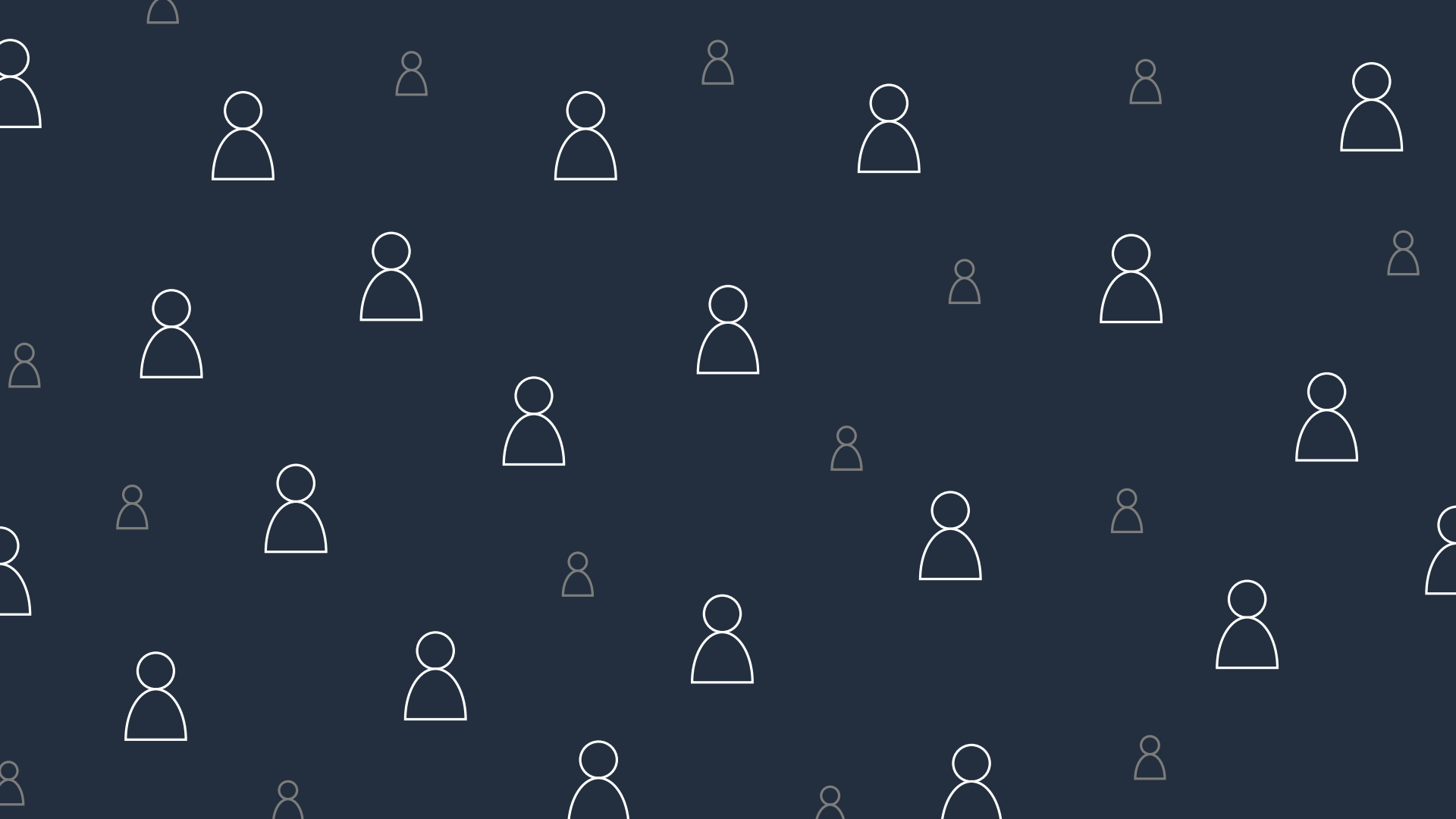
Build experience early and gain proof points

- Systematic discovery process and planning
- Use AWS best practices to build Landing Zone
- Migrate initial applications early
- Celebrate wins!!!

Become Outcome Driven

- Articulate the business goal, set deadlines (e.g. close data center)
- Define, measure, and achieve business outcomes

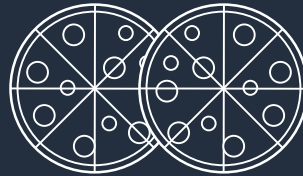
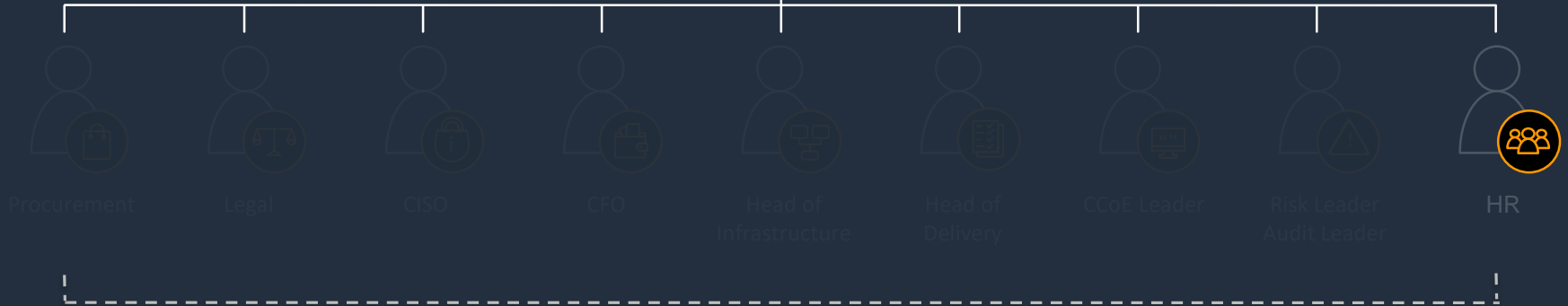
“With the benefit of hindsight how can we go really fast but safely?”





“Declare a **bold** cloud objective”

Executive steering group

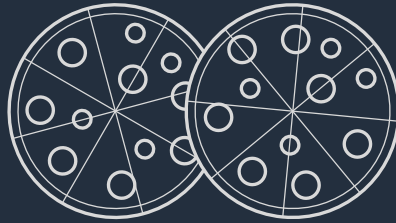




Create your questions parking lot



Establish your Cloud Enablement Engine



AWS Infrastructure
Engineers



Security
Engineers



Application
Engineers



Operations
Engineers



Lead
Architect

You need a "Landing Zone"

A configured, secure, scalable, multi-account AWS environment based on AWS best practices

A starting point for net new development and experimentation

A starting point for migrating applications

An environment that allows for iteration and extension over time



Option 1 – Landing Zones as code

Option 2 – Control Tower creates your Landing Zones

What you get with the AWS Landing Zone

Account management

Framework for creating and baselining a multi-account environment

Initial multi-account structure including security, audit, & shared service requirements

An account vending machine that enables automated deployment of additional accounts with a set of security baselines

Identity & access management

User account access managed through AWS SSO federation

Cross-account roles enable centralized management

Security & governance

Multiple accounts enable separation of duties

Initial account security and AWS Config rules baseline

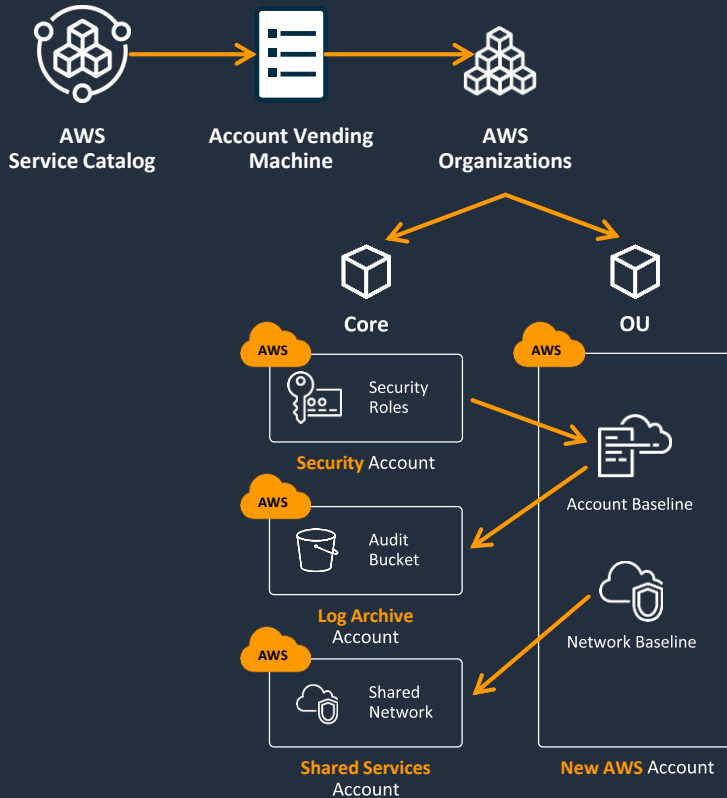
Network baseline

Sets up monitoring and intelligent threat detection (through Amazon GuardDuty)

Solution extensibility

Easily deploy optional Add-Ons to extend your AWS Landing Zone

Account Vending Machine



Account Vending Machine (AWS Service Catalog)

Account creation factory

User Interface to create new accounts

Account baseline versioning

Launch constraints

Creates/updates AWS account

Apply account baseline stack sets

Create network baseline

Apply account security control policy

AWS Control Tower

Consistent and simple multi-account management



Automated AWS setup

Launch an automated landing zone with best-practices blueprints



Policy enforcement

Pre-packaged guardrails to enforce policies or detect violations



Dashboard for oversight

Continuous visibility into workload compliance with controls

Key features and benefits

Account setup



Automated, secure, and scalable landing zone



Multi-account management using Organizations



Account provisioning wizard



Central logging and multi-account configuration consistency

Guardrails



Built-in best practices



Multi-account preventive and detective guardrails



Curated rules in plain English



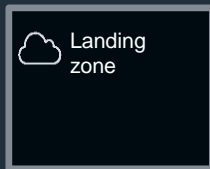
Easy-to-use dashboard and notifications

AWS Control Tower: Building blocks



AWS Control Tower

Account management



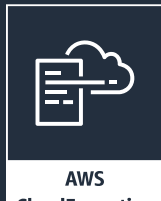
AWS Landing Zone



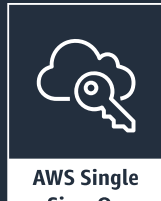
Organizations



Amazon VPC



AWS
CloudFormation

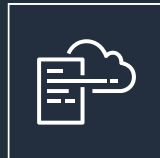


AWS Single
Sign-On



AWS Service
Catalog

Guardrail enforcement



AWS
CloudFormation



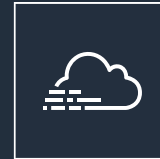
AWS Lambda



AWS Config



AWS Security Hub

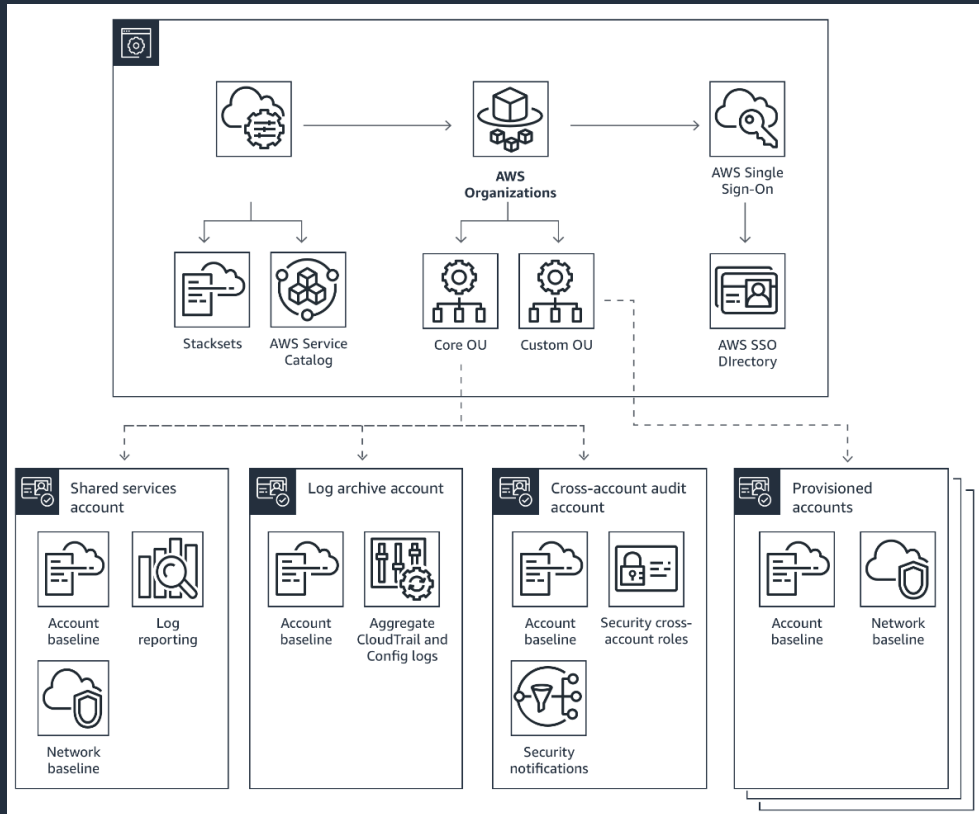


AWS
CloudTrail



Amazon
CloudWatch

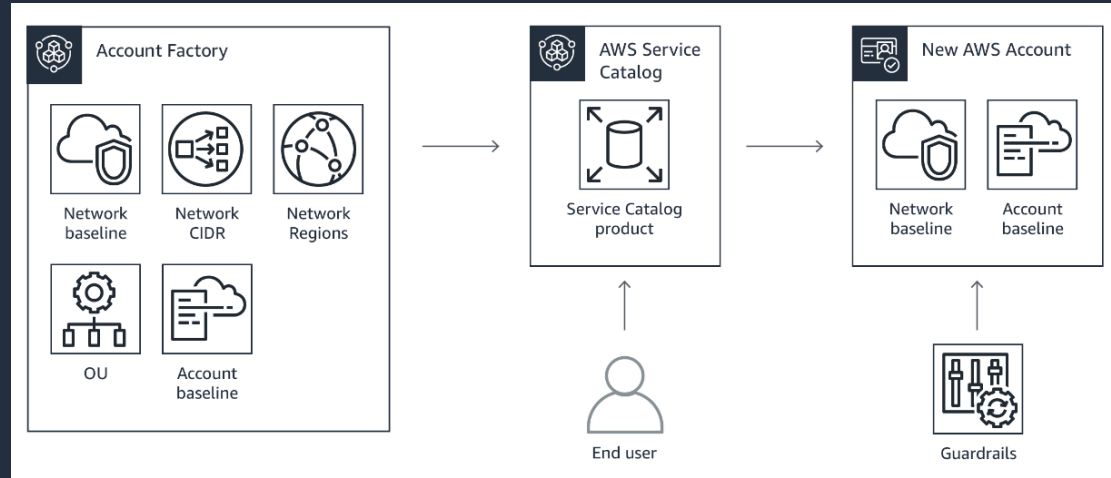
AWS Control Tower's automated landing zone



- ✓ AWS Organizations with master and pre-created accounts for central log archive, cross-account audit, and shared services
- ✓ Pre-configured directory and SSO using AWS SSO (with Active Directory custom option*)
- ✓ Centralized monitoring and alerts using AWS Config, CloudTrail, and Amazon CloudWatch

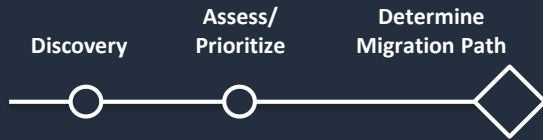
Account factory

- Account factory for controls on account provisioning
- Pre-approved account baselines with VPC options
- Pre-approved configuration options
- End-user configuration and provisioning through AWS Service Catalog
- Create and update AWS accounts under organizational units

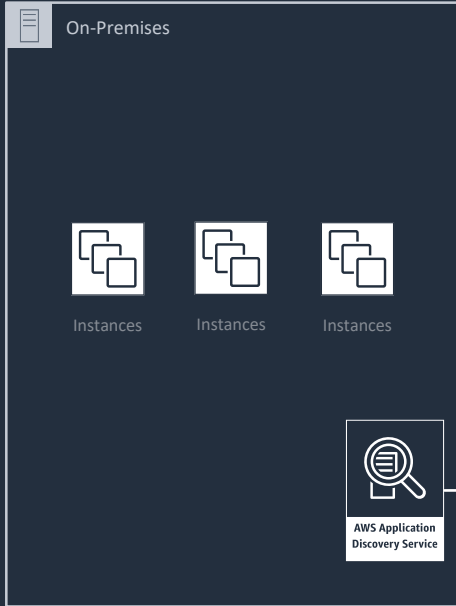


Application migration strategies

Docker / eMotion



Discover



AWS Application Discovery Service

AWS APPLICATION DISCOVERY AGENT

Linux

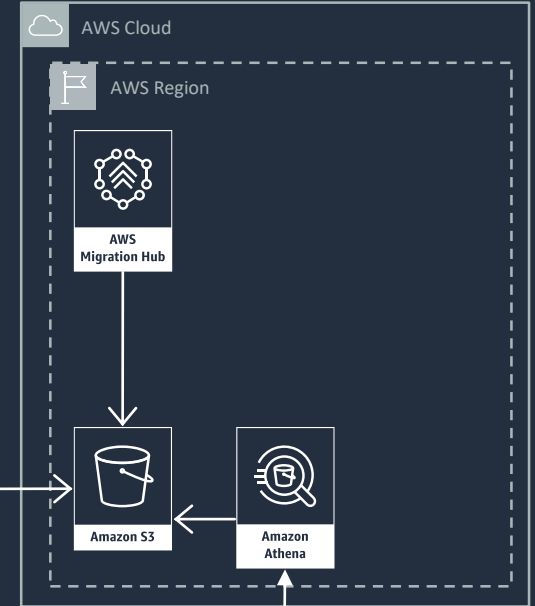
- Amazon Linux 2012.03, 2015.03
- Ubuntu 12.04, 14.04, 16.04
- Red Hat Enterprise Linux 5.11, 6.9, 7.3
- CentOS 5.11, 6.9, 7.3
- SUSE 11 SP4, 12 SP2

Windows

- Windows Server 2003 R2 SP2
- Windows Server 2008 R1 SP2, 2008 R2 SP1
- Windows Server 2012 R1, 2012 R2
- Windows Server 2016

AWS AGENTLESS DISCOVERY CONNECTOR

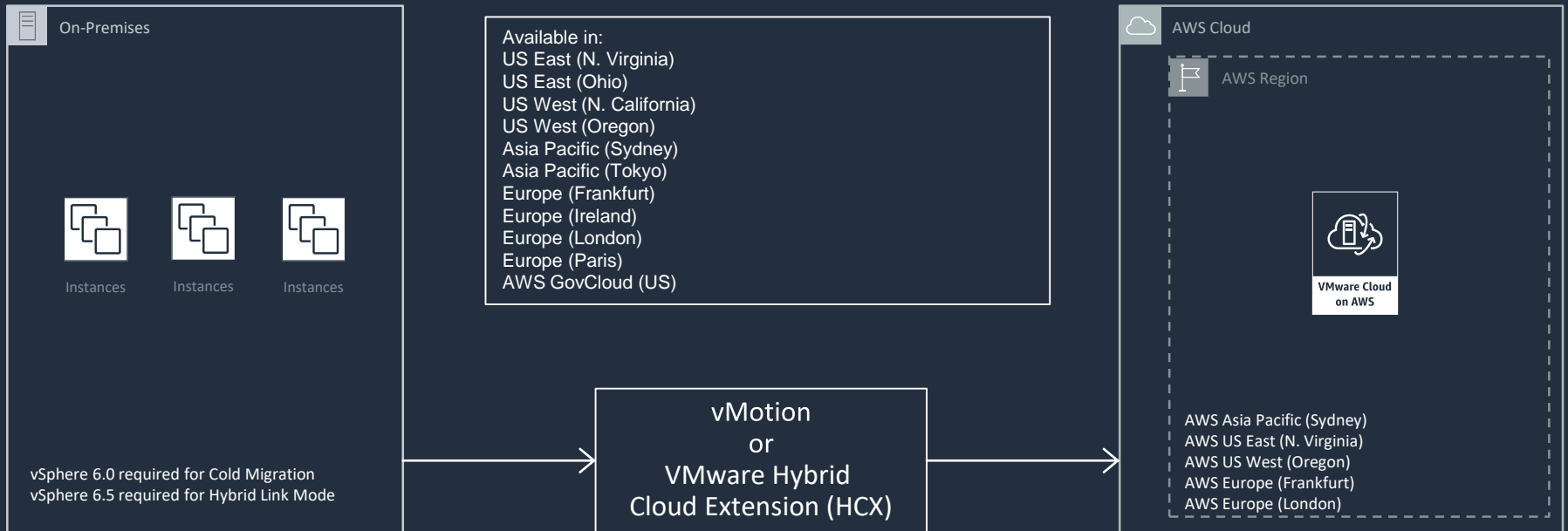
- VMware vCenter (V5.5, V6, & V6.5)



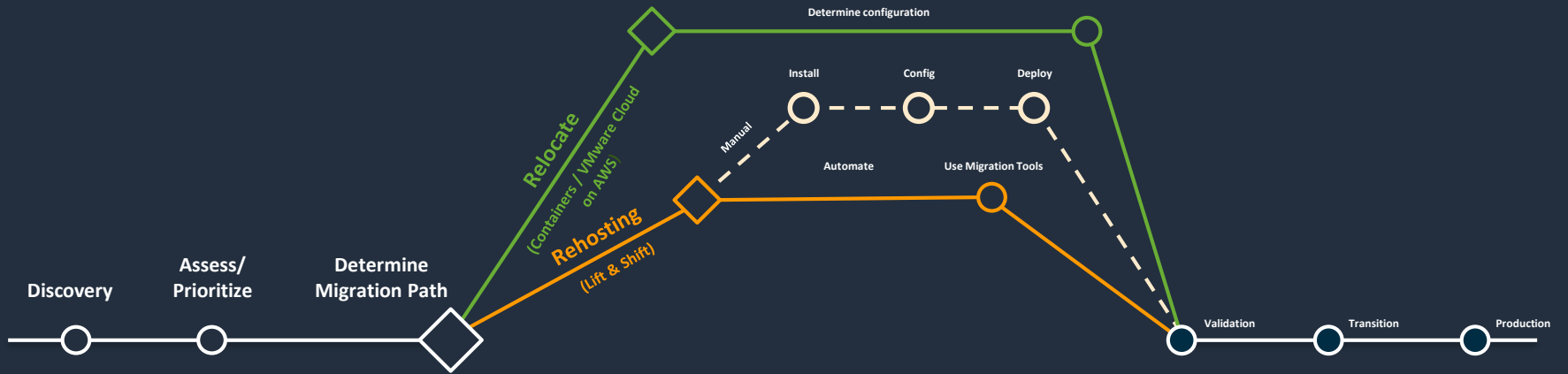
Application migration strategies



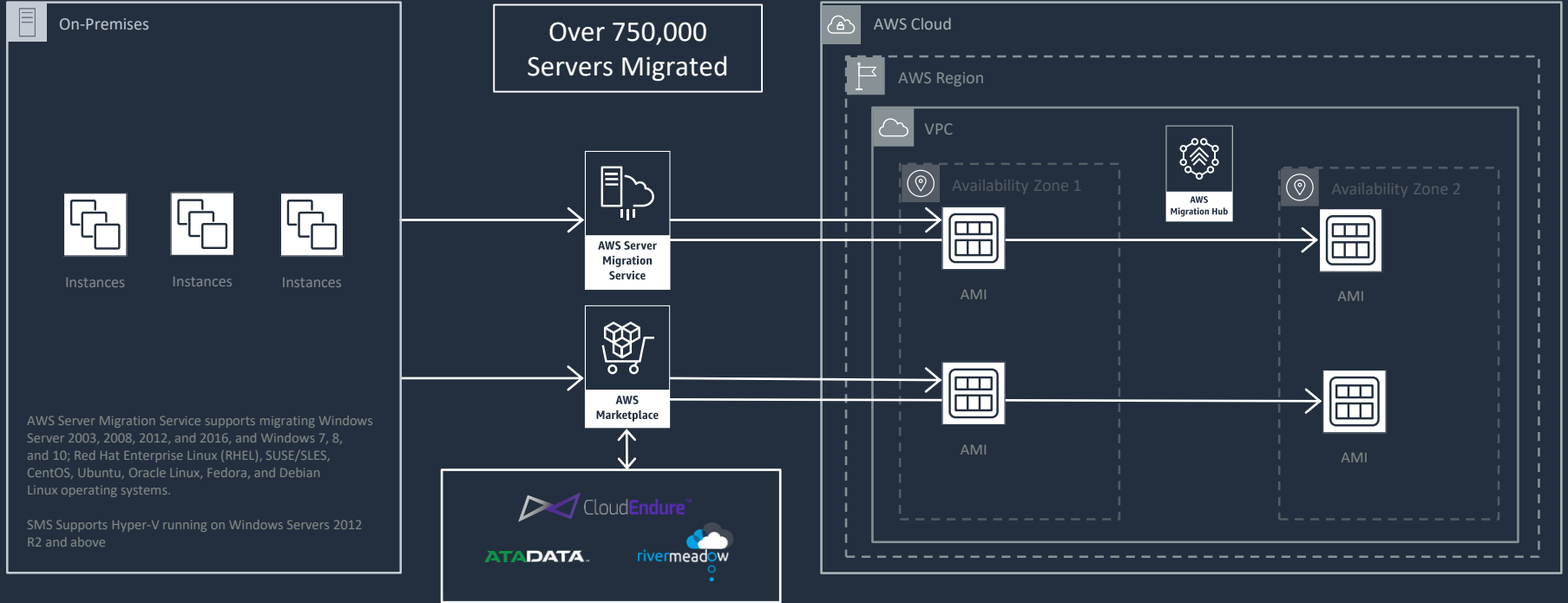
Relocate with VMware



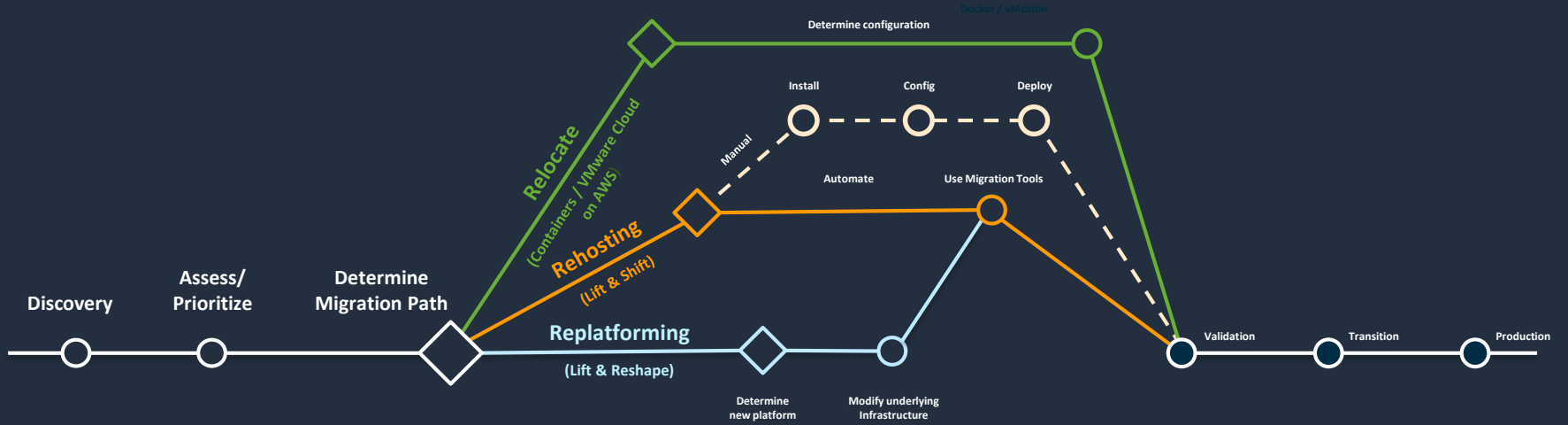
Application migration strategies



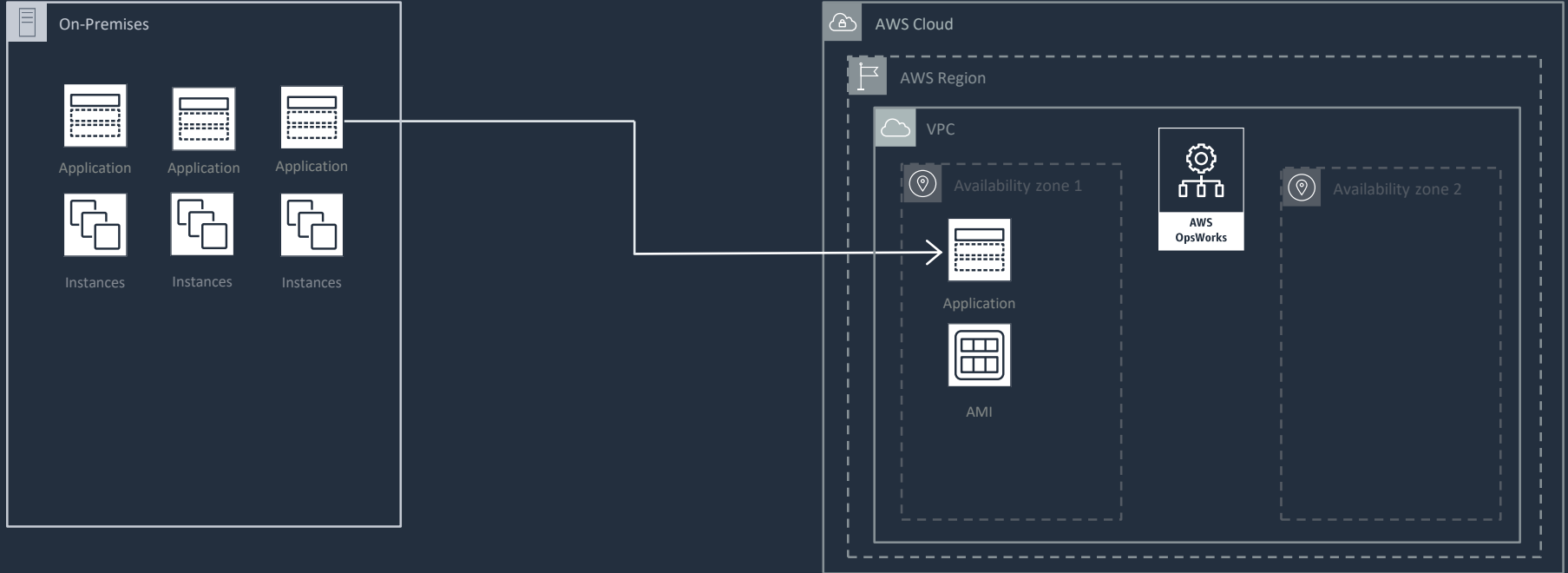
Re-host applications



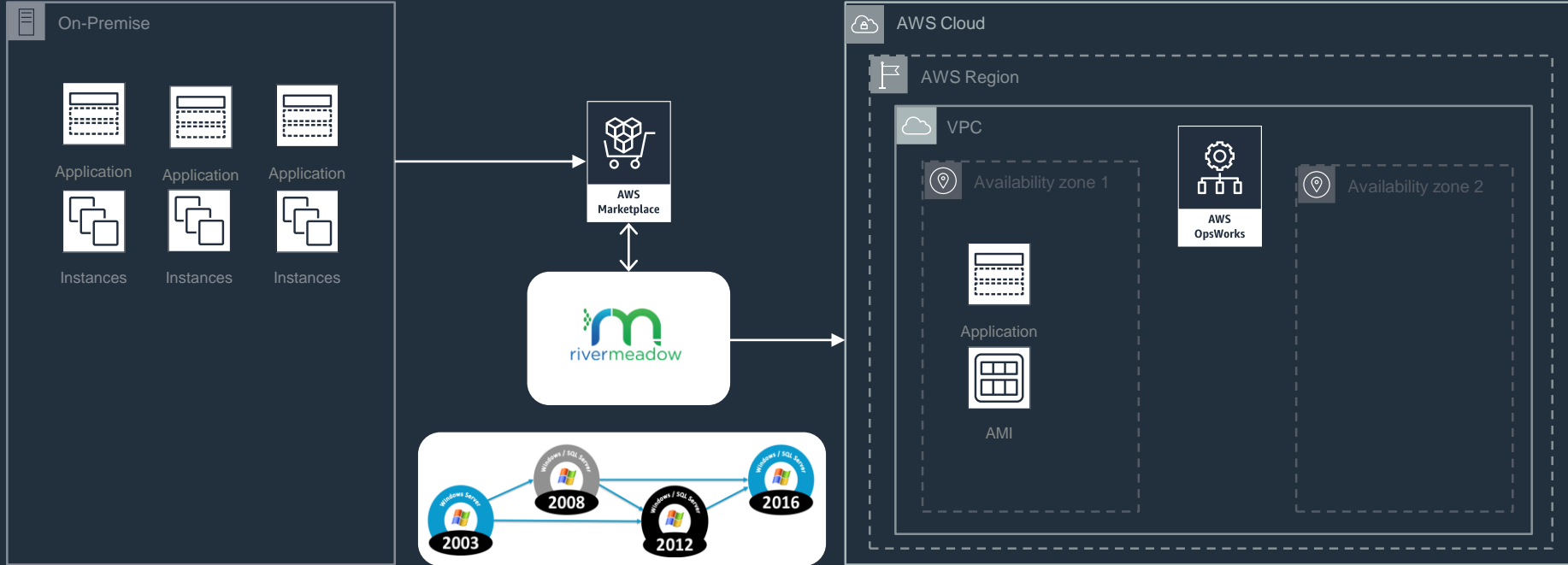
Application migration strategies



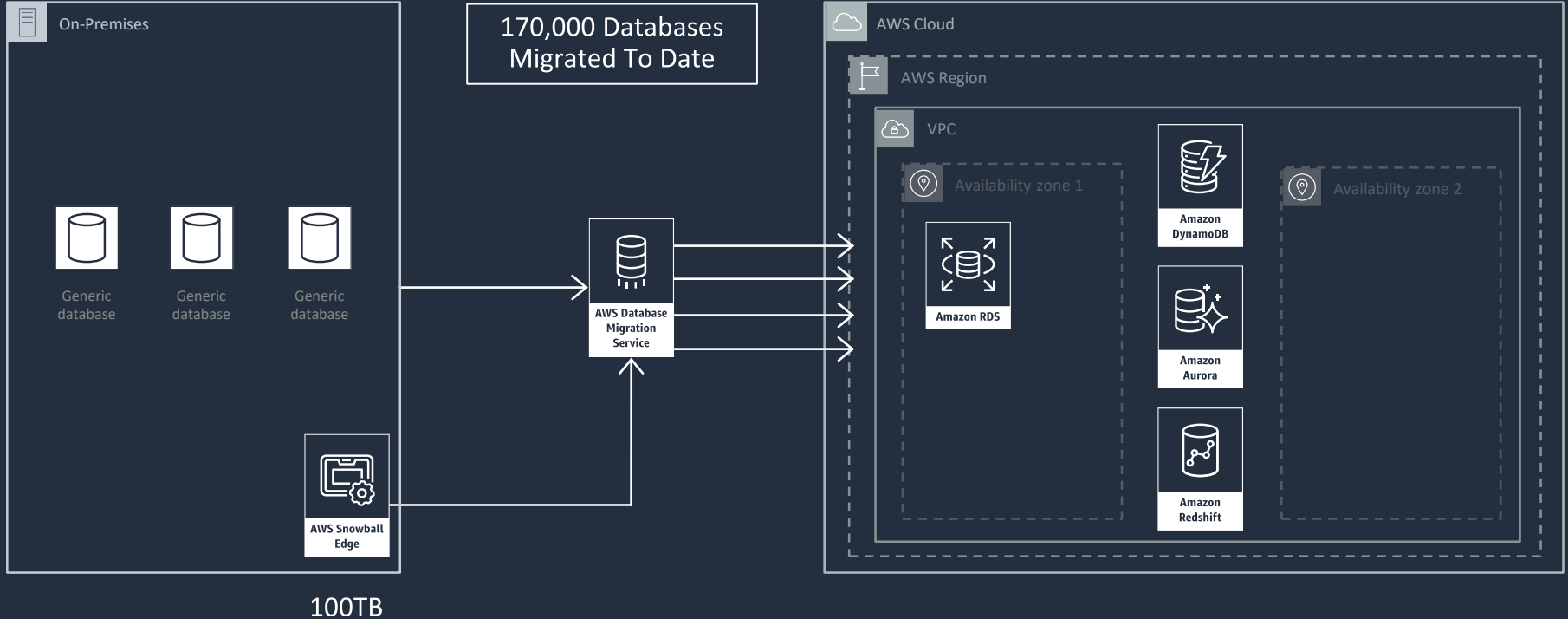
Re-platform



Re-platform Windows and Upgrade



Re-platform databases



Sources for AWS Data Migration Service



You can use the following data stores as source endpoints for data migration using AWS Database Migration Service.

On-premises and EC2 instance databases

- Oracle versions 10.2 and later, 11g, and up to 12.2, AND 18c for the Enterprise, Standard, Standard One, and Standard Two editions
- Microsoft SQL Server versions 2005, 2008, 2008R2, 2012, 2014, and 2016, for the Enterprise, Standard, Workgroup, and Developer editions. The Web and Express editions are not supported.
- MySQL versions 5.5, 5.6, and 5.7.
- MariaDB (supported as a MySQL-compatible data source) versions 10.0.24 to 10.0.28, 10.1, 10.2 and 10.3.
- PostgreSQL version 9.4 and later (for versions 9.x), 10.x, and 11.x.
- MongoDB versions 2.6.x and 3.x and later.
- SAP Adaptive Server Enterprise (ASE) versions 12.5, 15, 15.5, 15.7, 16 and later.
- Db2 LUW versions:
 - Version 9.7, all Fix Packs are supported.
 - Version 10.1, all Fix Packs are supported.
 - Version 10.5, all Fix Packs except for Fix Pack 5 are supported.

Microsoft Azure

- Azure SQL Database.

Amazon RDS instance databases, and Amazon Simple Storage Service (Amazon S3)

- Oracle versions 11g (versions 11.2.0.3.v1 and later) and 12c, for the Enterprise, Standard, Standard One, and Standard Two editions.
- Microsoft SQL Server versions 2008R2, 2012, 2014, and 2016 for the Enterprise, Standard, Workgroup, and Developer editions. The Web and Express editions are not supported.
- MySQL versions 5.5, 5.6, and 5.7.
- MariaDB (supported as a MySQL-compatible data source).
- PostgreSQL 9.4 and later. Change data capture (CDC) is only supported for versions 9.4.9 and higher and 9.5.4 and higher. The `rds.logical_replication` parameter, which is required for CDC, is supported only in these versions and later.
- Amazon Aurora (supported as a MySQL-compatible data source).
- Amazon S3.

Targets for AWS Database Migration Service



You can use the following data stores as target endpoints for data migration using AWS Database Migration Service.

On-premises and Amazon EC2 instance databases


- Oracle versions 10g, 11g, 12c, for the Enterprise, Standard, Standard One, and Standard Two editions
- Microsoft SQL Server versions 2005, 2008, 2008R2, 2012, 2014, and 2016, for the Enterprise, Standard, Workgroup, and Developer editions. The Web and Express editions are not supported.
- MySQL, versions 5.5, 5.6, and 5.7
- MariaDB (supported as a MySQL-compatible data target)
- PostgreSQL, versions 9.4 and later
- SAP Adaptive Server Enterprise (ASE) versions 15, 15.5, 15.7, 16 and later

Amazon RDS instance databases, Amazon Redshift, Amazon DynamoDB, Amazon S3, Amazon Elasticsearch Service, Amazon Kinesis Data Streams, and Amazon DocumentDB

- Oracle versions 11g (versions 11.2.0.3.v1 and later) and 12c, for the Enterprise, Standard, Standard One, and Standard Two editions
- Microsoft SQL Server versions 2008R2, 2012, and 2014, for the Enterprise, Standard, Workgroup, and Developer editions. The Web and Express editions are not supported.
- MySQL, versions 5.5, 5.6, and 5.7
- MariaDB (supported as a MySQL-compatible data target)
- PostgreSQL, versions 9.4 and later
- Amazon Aurora with MySQL compatibility
- Amazon Aurora with PostgreSQL compatibility
- Amazon Redshift
- Amazon S3
- Amazon DynamoDB
- Amazon Elasticsearch Service
- Amazon Kinesis Data Streams
- Amazon DocumentDB (with MongoDB compatibility)


Databases Schema Conversion Tool

On-Premises




Generic database Generic database Generic database

On-Premises



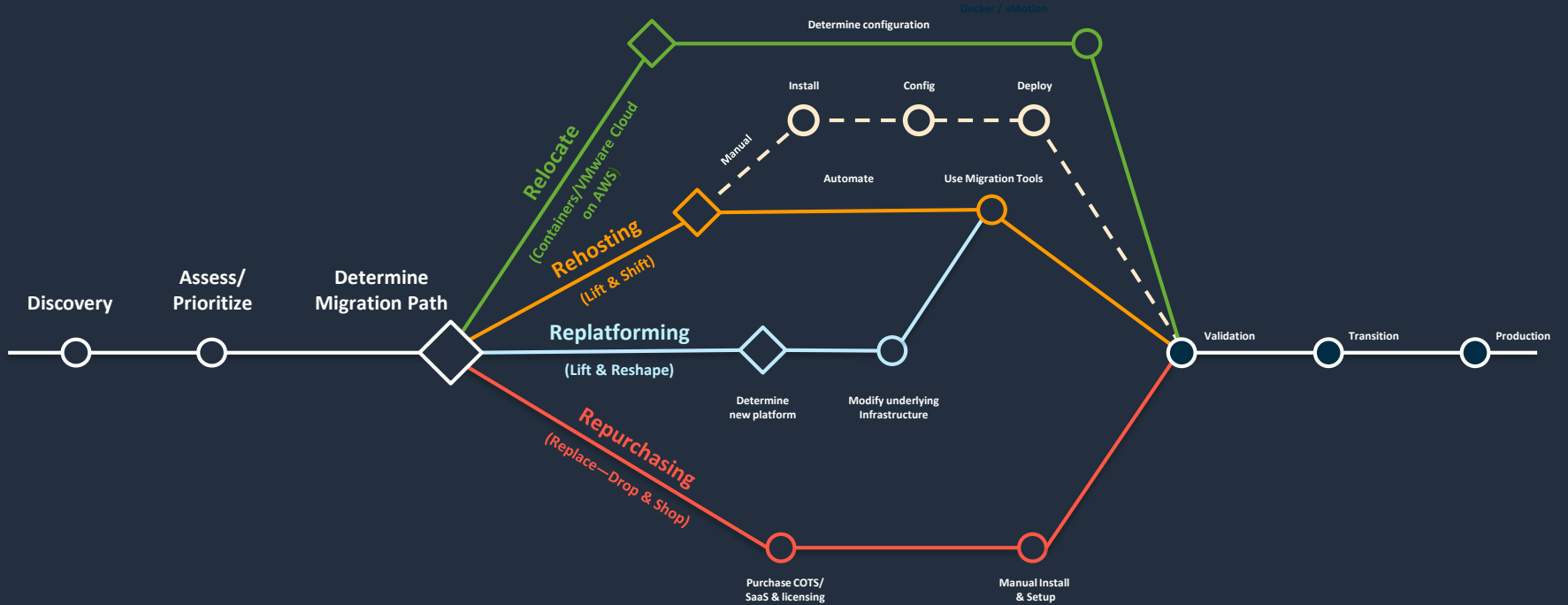
User



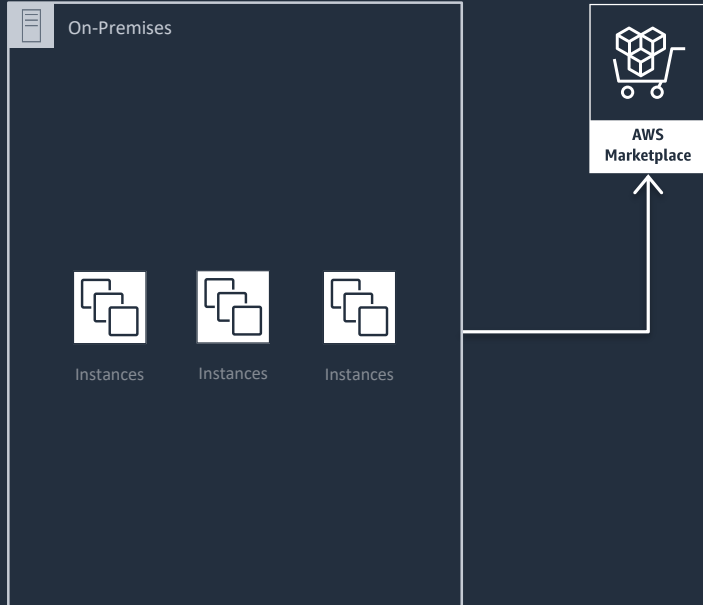
Microsoft Windows
Apple MAC
Fedora Linux (rpm)
Ubuntu Linux (deb)

Source Database	Target Database on AWS
Oracle Database	Amazon Aurora, MySQL, PostgreSQL, Oracle
Oracle Data Warehouse	Amazon Redshift
Azure SQL	Amazon Aurora, MySQL, PostgreSQL
Microsoft SQL Server	Amazon Aurora, Amazon Redshift, MySQL, PostgreSQL
Teradata	Amazon Redshift
IBM Netezza	Amazon Redshift
Greenplum	Amazon Redshift
HPE Vertica	Amazon Redshift
MySQL and MariaDB	PostgreSQL
PostgreSQL	Amazon Aurora, MySQL
Amazon Aurora	PostgreSQL
IBM DB2 LUW	Amazon Aurora, MySQL, PostgreSQL
Apache Cassandra	Amazon DynamoDB

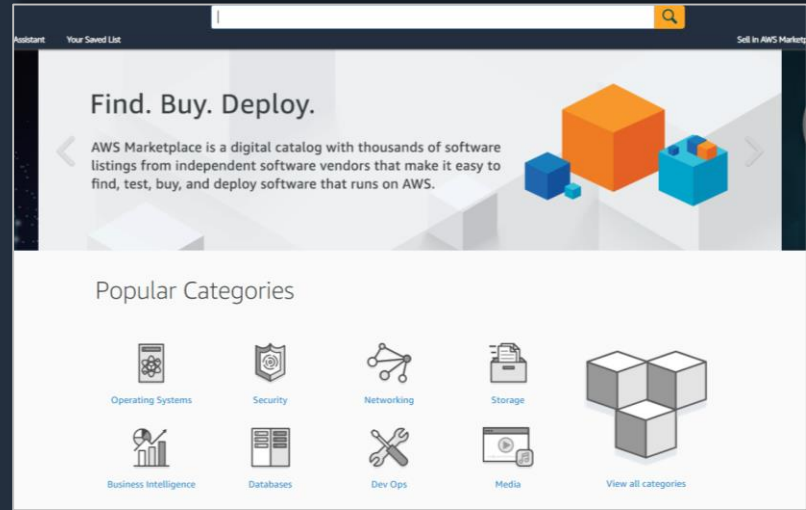
Application migration strategies



Repurchase



Simplifies software migration and provisioning



AWS Marketplace

Simplifies software migration and provisioning



Find, Test, Buy, and Deploy Software In the Cloud

Deploy software on demand

Procure new, BYOL or free Open Source

Tagged, trackable, and metered

1,400+ participating ISVs

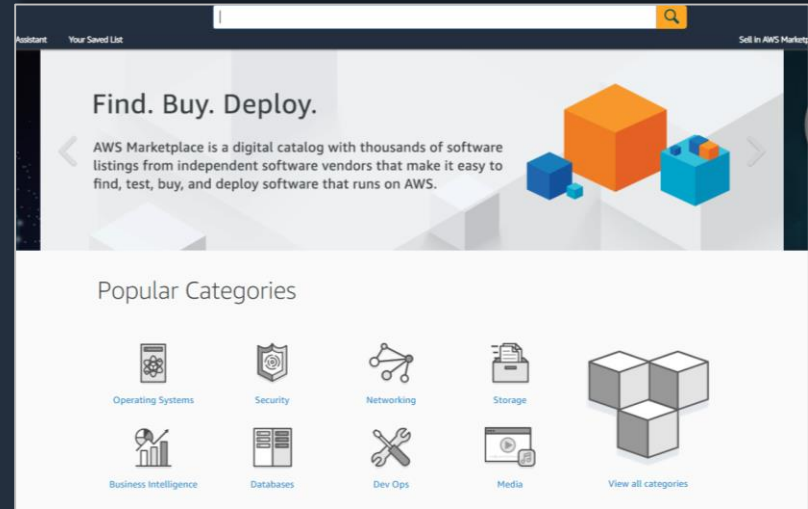
4,200+ product listings

190,000 active customers*

Deployed in 16 regions

Offers 35 categories

Over 570M hours of EC2 deployed monthly*



* as of 9/4/2018

8 Popular categories most often provisioned



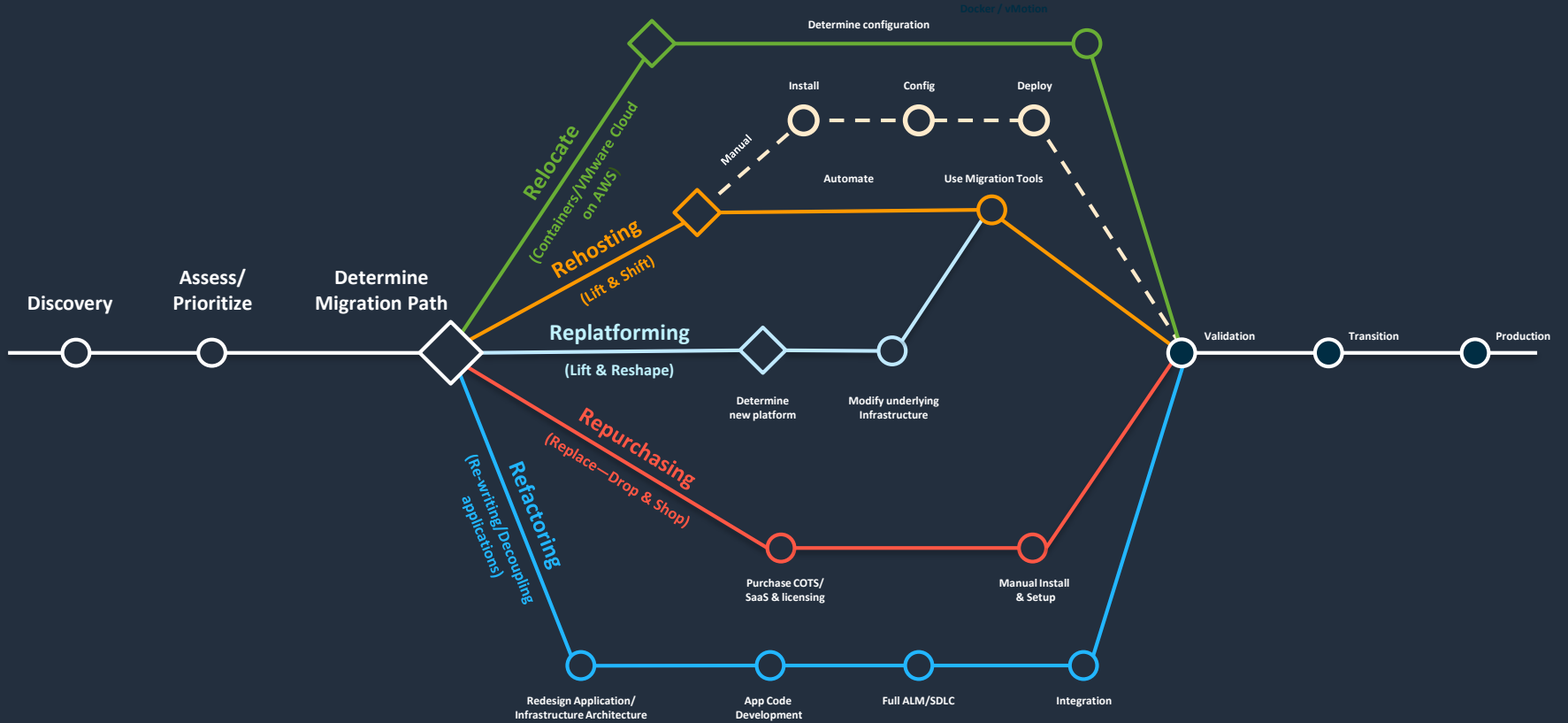
OS	Security	Storage	Networking	Database	SIEM	DevOps	BI
CentOS	TREND MICRO	NetApp	CISCO	TERADATA	splunk >	APPDYNAMICS	+ a b l e a u
ubuntu	paloalto NETWORKS	druva	F5	SAP	+ sumologic	ca technologies	TIBCO
debian	CROWDSTRIKE	N2WS a Veeam company	JUNIPER NETWORKS	snowflake	ArcSight An HP Company	New Relic.	Qlik
SUSE	Check Point SOFTWARE TECHNOLOGIES LTD.	SoftNAS	CITRIX	VERTICA	ALIEN VAULT	puppet	alteryx
ORACLE Linux	Barracuda	commvault	riverbed	Couchbase	MICRO FOCUS	CHEF	MATILLION
Windows	FORTINET.	DELL EMC	NGINX	mongoDB.	LogRhythm	Informatica	

* as of 9/4/2018

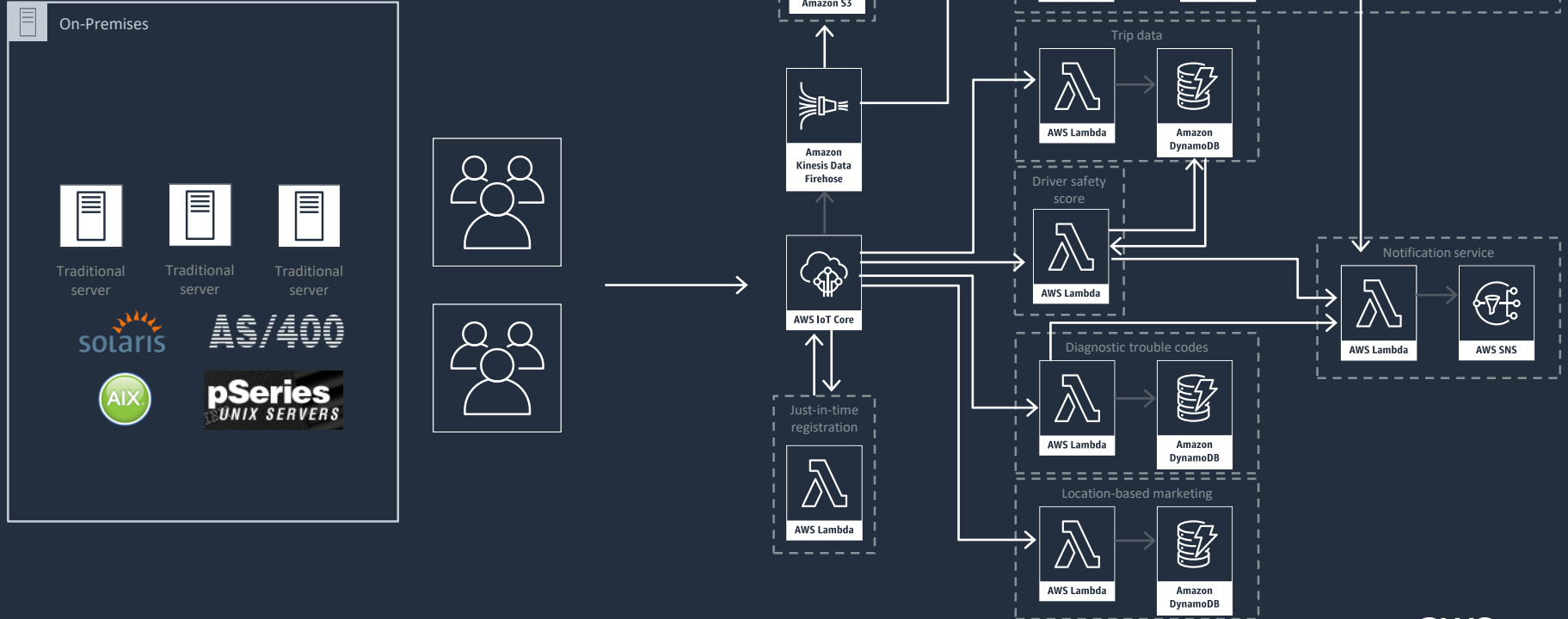
35 Categories, 4 Deployment Types (AMI, SAAS, Cloudformation, API), 3 Commerce Models - Free, BYOL, Paid



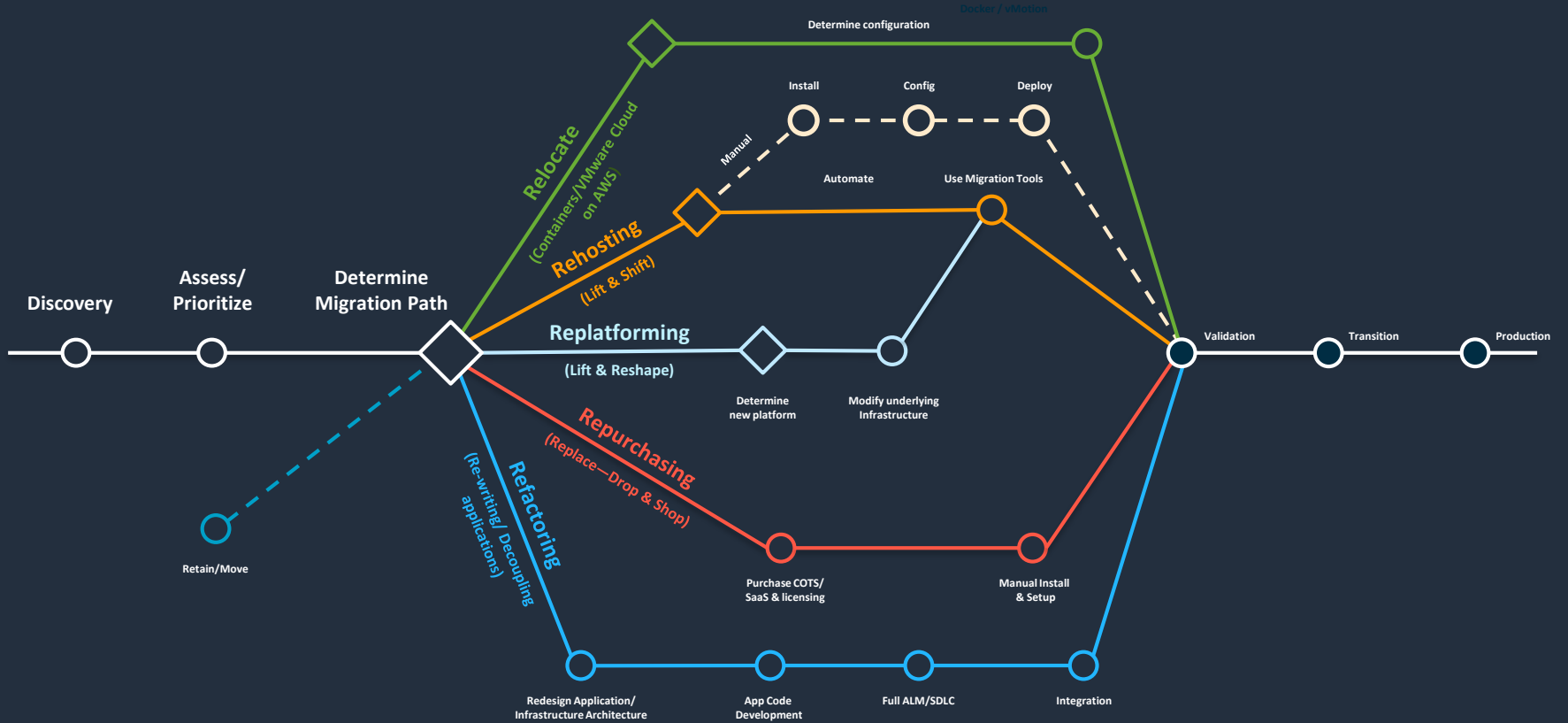
Application migration strategies



Refactoring



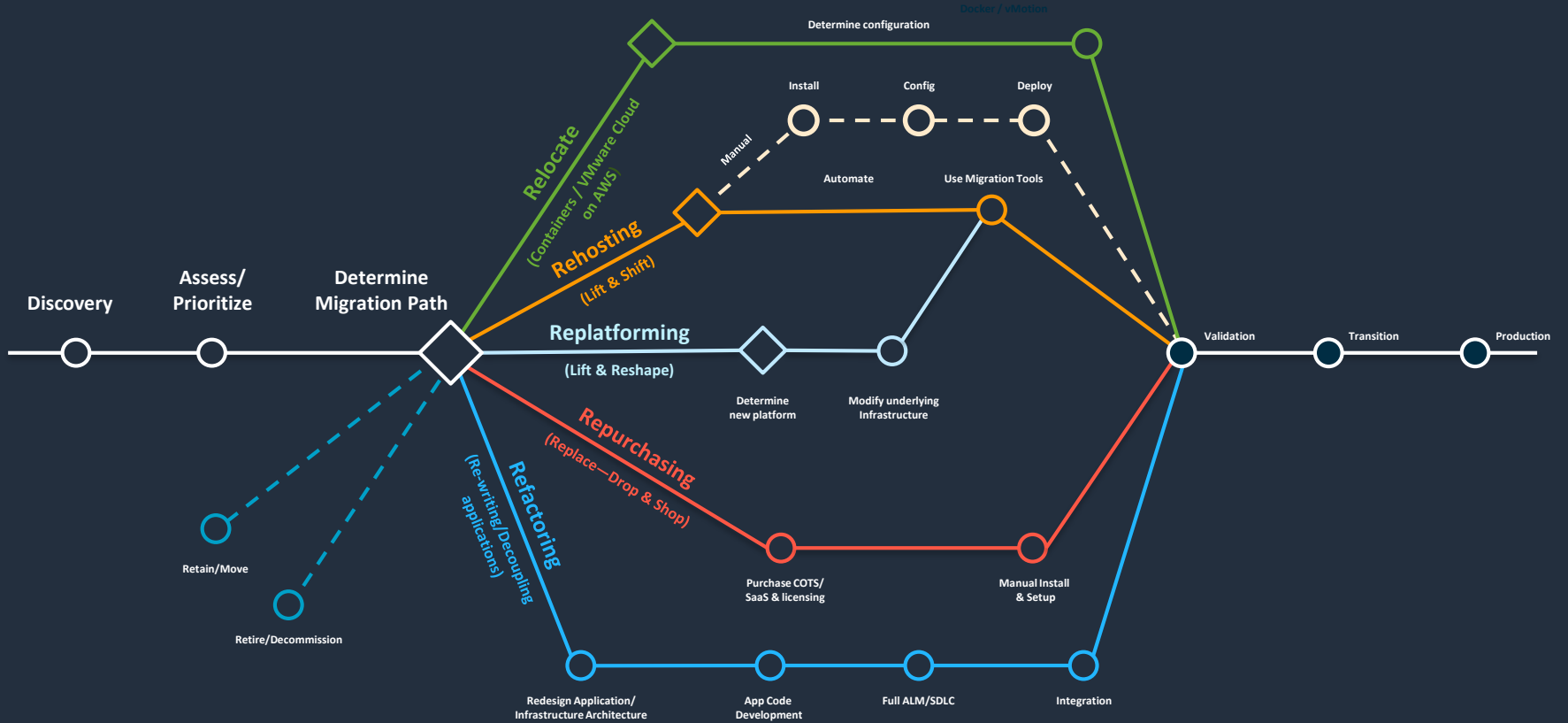
Application migration strategies



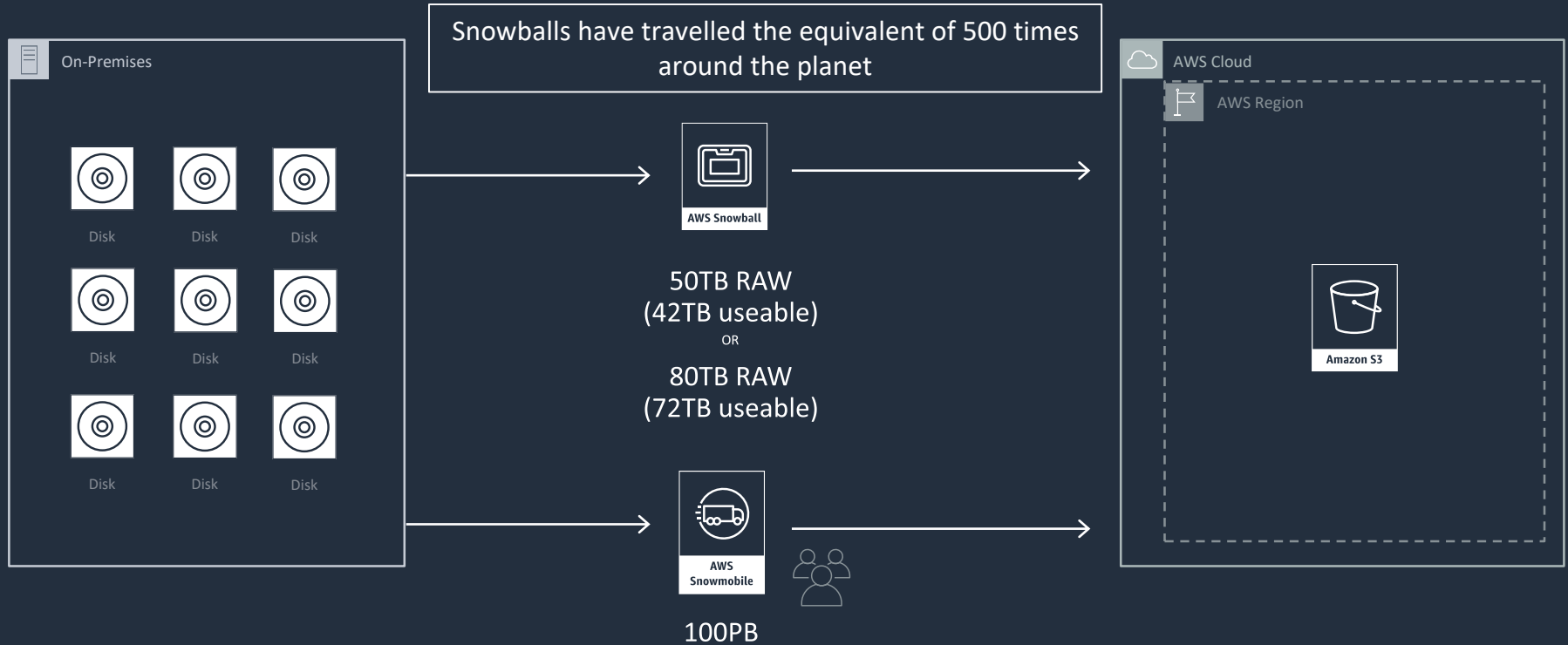
Retain



Application migration strategies



Moving vast amounts of data



	Pattern description	Percentage
Relocate	As appropriate	TBD
Retire	Application and host decommission on source	10%
Retain	Customer will keep application or move to secure shared facility	5%
Re-Host	Like for Like application migration to target cloud	40%
Re-Platform	Up-Version of the OS and/or Database	30%
Re-Factoring	Application architecture changes to Cloud Native	10%
Re-Purchase	Appropriately leveraging SaaS	5%

70%

**“Don’t let perfect be the enemy
of good enough.”**

– Voltaire

Migration business outcomes

Innovate

Build and operate your foundation for innovation





Retire
technical debt

Obtain substantial cost-savings, focus IT on what differentiates your business

Reduce risk

Migrate through a secure and proven approach, reducing IT risk moving to a more reliant IT model

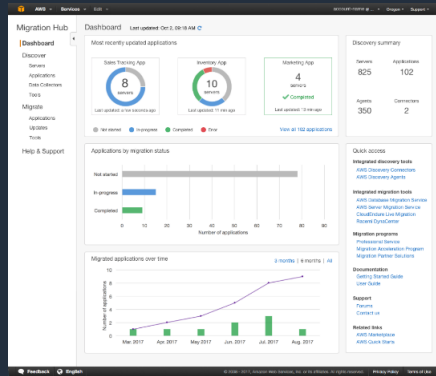
Holistic business case

 Cost savings	 Staff productivity	 Operational resilience	 Business agility
<p>“Realized a 52 percent reduction in TCO”</p> <p>General Electric</p>	<p>“We have enhanced software development by 20%”</p> <p>Orbis</p>	<p>“15% increase in availability”</p> <p>Conde Nast</p>	<p>“Gone from deployments taking 6 weeks to 1 per week”</p> <p>3M</p>
<p>“Avoided acquiring additional data center space, saving an estimated \$1M+ over three years”</p> <p>Lionsgate</p>	<p>“Without AWS, we would need the DevOps team to be at least twice the size”</p> <p>Avizia</p>	<p>“Average response time was 500 ms, but by using AWS, the average is 80 ms”</p> <p>Haven Power</p>	<p>“Set up in about 1/5 of the time it would taken to do a buildout and deployment”</p> <p>Intuit</p>
<p>“Reducing its data center footprint from eight to three by 2018”</p> <p>Capital One</p>	<p>“With half the people normally required to build and operate sites”</p> <p>Bustle</p>	<p>“Availability increased from 99.7 to of 99.999”</p> <p>2C2P</p>	<p>“Our projects no longer last years, they last months”</p> <p>Autodesk</p>

Tools to accelerate the journey



A single location to track the progress of application migrations across AWS and partner solutions



AWS migration services



AWS data transfer



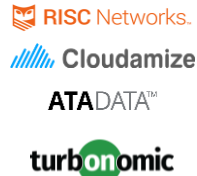
Inventory



Business case



Deep discovery & planning



App dependency mapping



Workload & data migration



Validation



Partners to help you migrate



- AWS Migration Competency Partners (40+)
- Established AWS migration practice
- Current Managed Services or DevOps Competency
- At least Advanced level AWS Consulting partner
- AWS certifications and certified consultants
- Audited annually against competencies

<https://aws.amazon.com/migration/partner-solutions/>

Thank-you!