

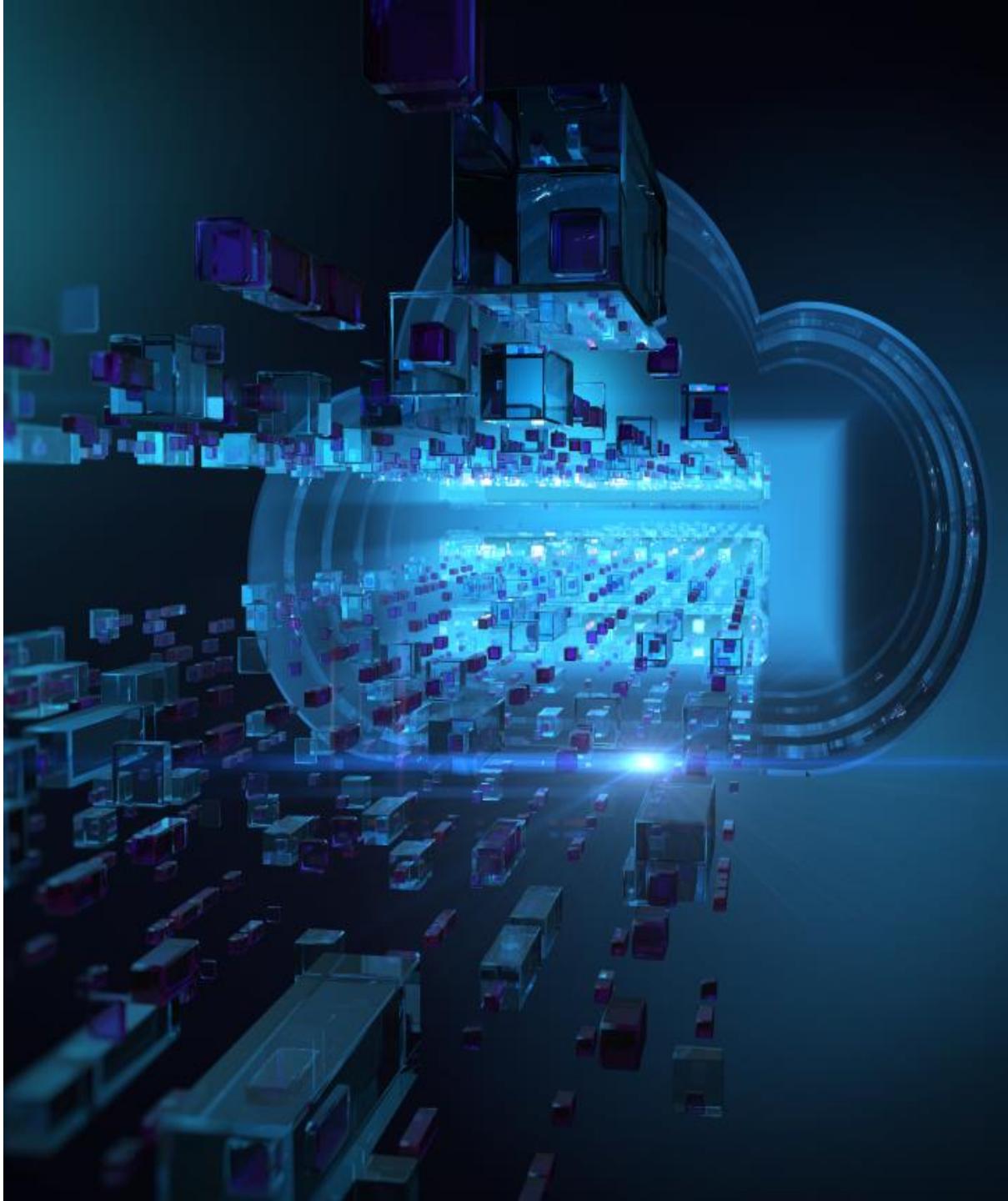


Amazon CloudWatch

- Amazon CloudWatch is used for management and governance
- It is a monitoring and management service designed for developers, system operators, site reliability engineers (SRE), and managers
- CloudWatch offers data, meaningful metrics, and actionable insights to:
 - Monitor applications
 - Recognize and respond to system-wide performance changes
 - Optimize resource utilization
 - Gain a unified view of operational health

CloudWatch Use Cases

- Monitor critical metrics and logs, visualize application and infrastructure stacks, generate alarms, and correlate metrics and logs to recognize and resolve the root cause of performance issues
- Monitor applications and trigger automated CloudWatch alarms and Lambda workflows to enhance the customer experience
- Explore, analyze, and visualize logs instantly to optimize resources, leverage CloudWatch alarms to automate capacity, and do resource planning for Auto Scaling



Amazon CloudWatch Dashboards

AWS Services

CloudWatch Dashboards MyDashboard Alarms ALARM INSUFFICIENT OK Billing Events Rules Event Buses Logs Insights Metrics Favorites + Add a dashboard

Add to this dashboard

Select a widget type to configure and add to this dashboard.

Line Stacked area Number Text Query results

Compare metrics over time Compare the total over time Instantly see the latest value for a metric Free text with markdown formatting Explore results from Logs Insights

Cancel Configure

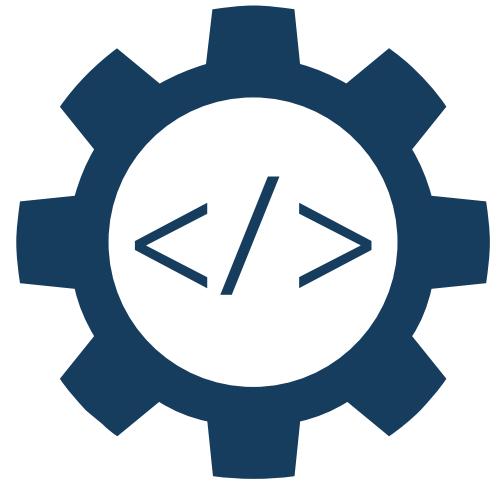
The screenshot shows the AWS CloudWatch Dashboards interface. On the left, there's a sidebar with various CloudWatch services like CloudWatch Metrics, CloudWatch Logs, and CloudWatch Events. The 'Dashboards' section is currently selected. A modal window titled 'Add to this dashboard' is open in the center. It contains five options for adding widgets: 'Line' (represented by a line chart icon), 'Stacked area' (represented by a stacked area chart icon), 'Number' (represented by a large number '11' icon), 'Text' (represented by a large letter 'Aa' icon), and 'Query results' (represented by a grid icon). Each option has a brief description below it. At the bottom right of the modal are 'Cancel' and 'Configure' buttons.

AWS CloudTrail

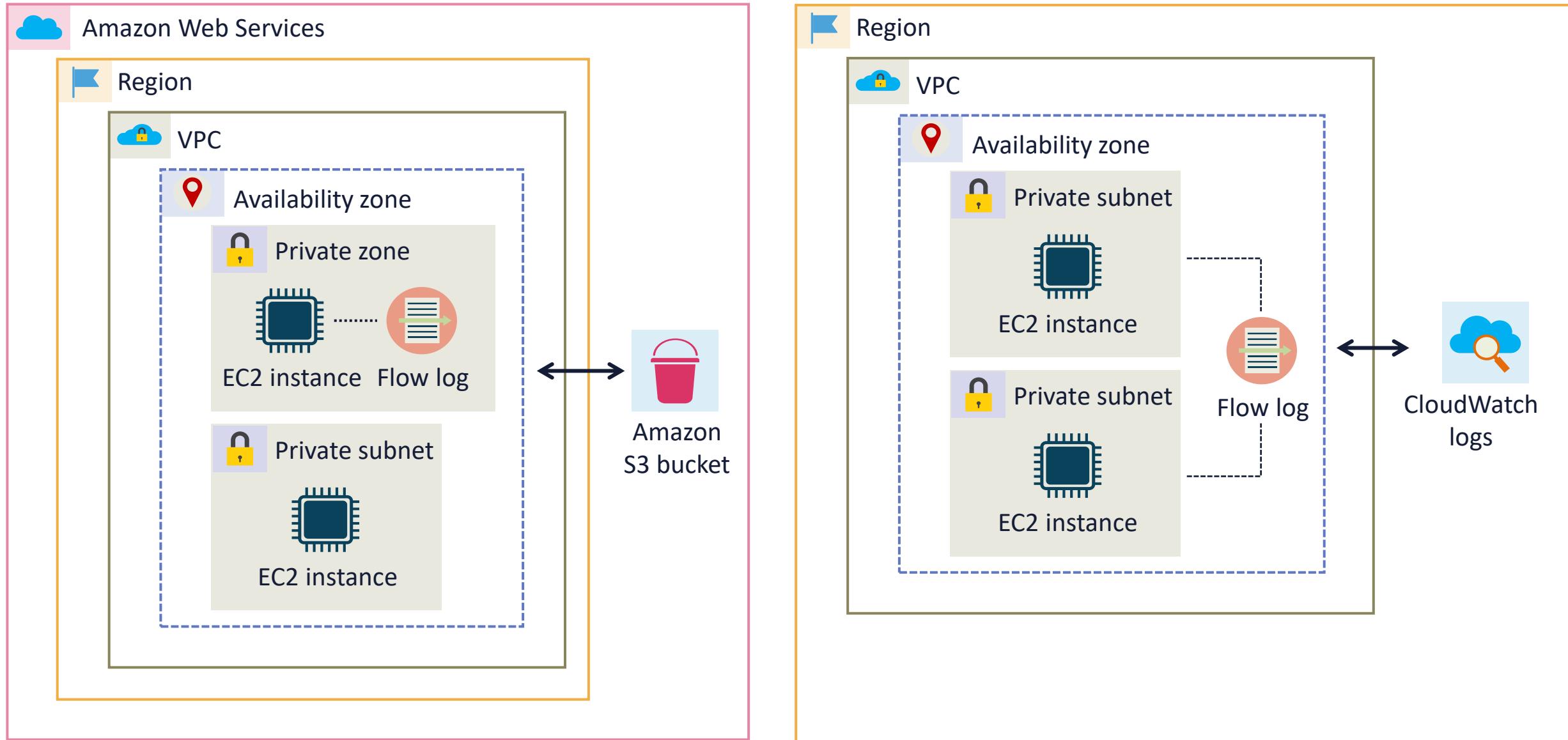
- With CloudTrail, customers can log, continuously monitor, and retain account activity related to all API calls across the AWS infrastructure
- Within CloudTrail, CloudTrail Insights can be enabled to automatically detect unusual API activities in AWS accounts
- Example: CloudTrail Insights could detect that a higher number of Amazon EC2 instances than usual have recently launched in an account or abnormal account activity has occurred, then review the full event details to determine which actions need to be taken next

AWS CloudTrail Use Cases

- Detect that a higher number of Amazon EC2 instances than usual have recently launched
- Identify which users and accounts called AWS, the source IP address from which the calls were made, and when the calls occurred
- Create a workflow to add a specific policy to an Amazon S3 bucket when CloudTrail logs an API call that makes that bucket public
- Connect your VPC to CloudTrail by defining an interface VPC endpoint for CloudTrail
- **Exam: CloudTrail is one of the most common tools for getting insights into security events at AWS**



AWS Flow Logs



In this demo...

examine AWS Security Hub

<https://aws.amazon.com/security-hub/>

Examining AWS Security Hub

A photograph showing two scientists in white lab coats and safety goggles looking at a computer monitor. The monitor displays several data tables with numerical values. One scientist's hand is visible, pointing at the screen. The background is a laboratory setting with glassware on a bench.

Amazon Inspector

- Inspector is an automated vulnerability management service that continually scans AWS workloads for weaknesses and inadvertent network exposures
- It automatically finds and scans running Elastic Compute Cloud (EC2) instances, container images in Amazon Elastic Container Registry (ECR) and AWS Lambda functions for known vulnerabilities and unintended exposure

Amazon Inspector

- Amazon Inspector creates a finding when it discovers a software vulnerability or network configuration issue
- A finding describes the vulnerability, identifies the affected resource, rates the severity of the vulnerability, and provides remediation guidance
- Customers can analyze results using the Amazon Inspector console or visualize and process discoveries through other associated AWS services





AWS Shield Standard and Advanced

- Standard provides DDoS protection provided at no extra cost
- Basic protection against common DoS floods and exploits
- Most common DDoS comes from botnet servers
- Combined with GuardDuty, NACLs, SGs, and WAF for layered defense
- Additional protection from known DDoS attacks with Shield Advanced
 - Advanced must also have a Business or Enterprise support plan for 24/7 DRT

AWS GuardDuty

- GuardDuty is a managed threat detection service that constantly monitors for malevolent and unauthorized behavior
- Watches out for unusual application programming interface (API) calls or potentially unauthorized deployments that indicate a possible account compromise (zero-day)
- Detects potentially compromised instances or reconnaissance by advanced persistent threat actors



AWS GuardDuty

- The finding details include information about what occurred, what AWS resources were involved in the suspicious activity, when this activity took place, and other data
- The finding type provides a description of the potential security issue:
Recon:EC2/PortProbeUnprotectedPort
- GuardDuty now uses AI to conduct "pre-crime" identification of bad actors 7-10 days in advance of malware release





Amazon Detective

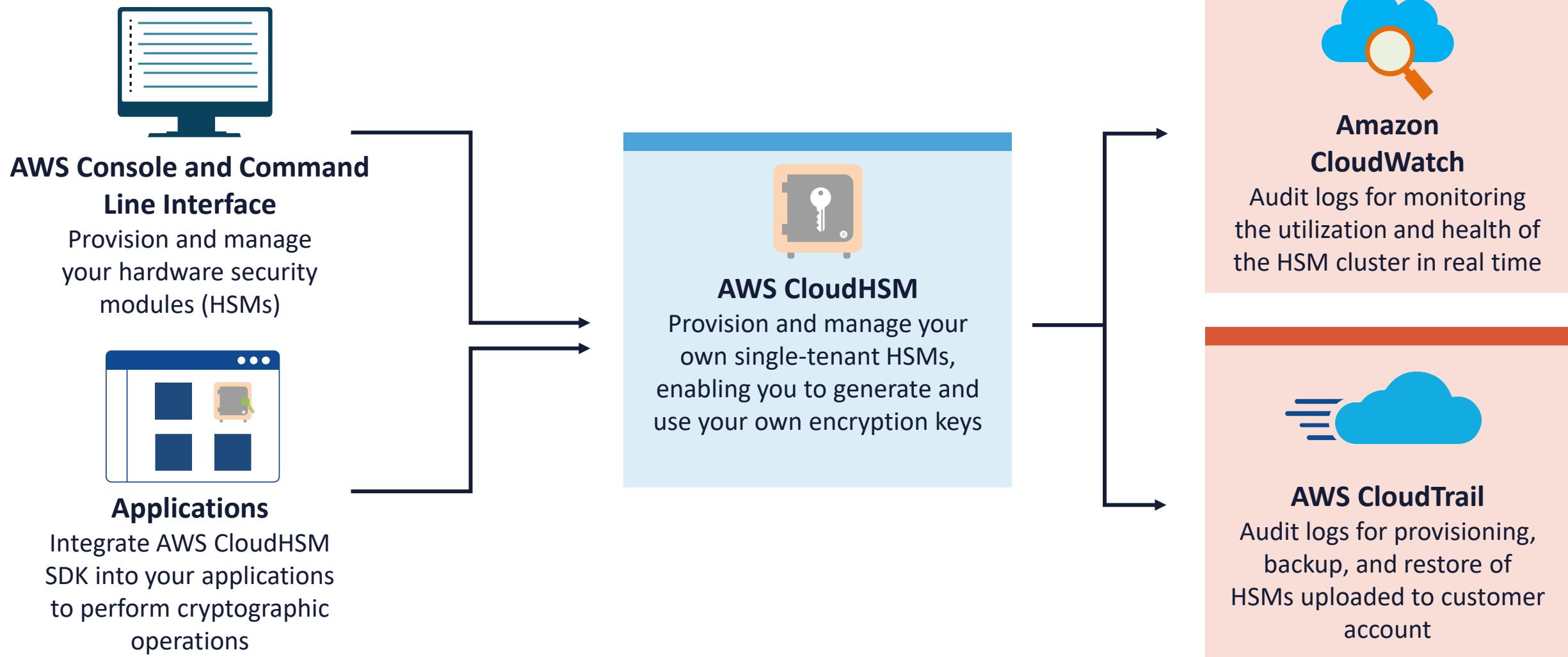
- Amazon Detective streamlines the investigative process and assists security teams in performing rapid and efficient eDiscovery initiatives
- Customers can quickly analyze and determine the nature and extent of possible security issues with Amazon Detective prebuilt data aggregations, summaries, and context
- Detective automatically gathers log data from AWS resources and uses machine learning, statistical analysis, and graph theory to generate a linked dataset to drive more efficient security inquiries

Amazon Macie

- Amazon Macie is a data security service that uses machine learning and pattern matching to discover and help protect the customer's sensitive data
- Macie discovers sensitive data and provides visibility into data security risks, allowing automated protection against those risks
- It is also commonly deployed behind an API gateway with serverless technologies



AWS CloudHSM



AWS Security Center



Prevent

Define user permissions and identities, infrastructure protection, and data protection measures for a smooth and planned AWS adoption strategy



Detect

Gain visibility into your organization's security posture with logging and monitoring services

Ingest this information into a scalable platform for event management, testing, and auditing



Respond

Automated incident response and recovery to help shift the primary focus of security teams from response to analyzing root cause



Remediate

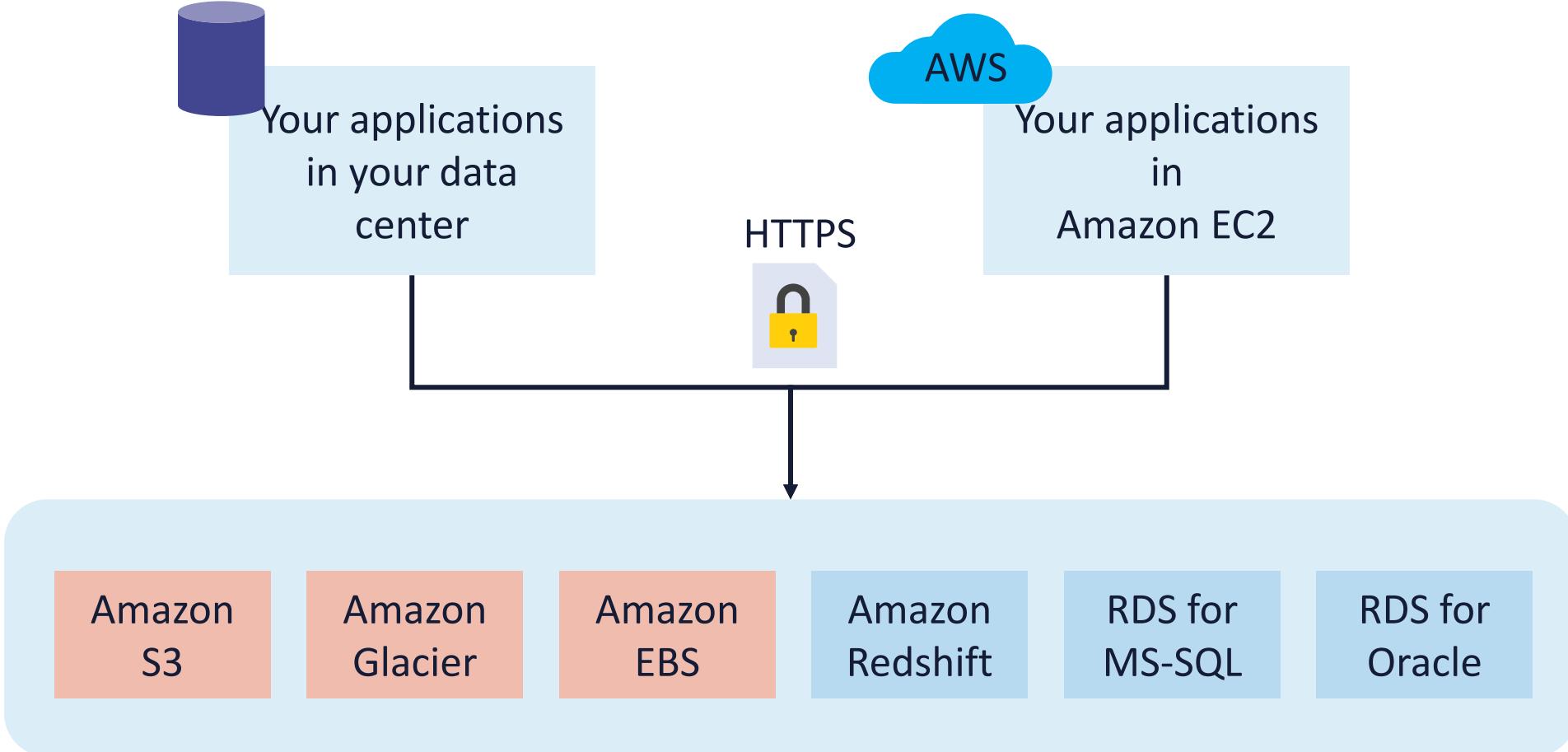
Leverage event driven automation to quickly remediate and secure your AWS environment in near real-time

A photograph showing a person's hands typing on a silver laptop keyboard. The laptop screen displays a blog post from the AWS Security Blog. The background shows a kitchen counter with a blue mug, a notebook, and some fruit. The overall scene suggests a casual work or study environment.

AWS Security Blog

- The AWS Security Blog features regular posts by AWS experts and other industry professionals
- The blog articles are an excellent research and information-gathering source for all things AWS
- Customers can search based on categories, topics, keywords, products, solutions, industries, and even learning levels

Client vs. Server-Side Encryption



AWS Key Management Service (KMS)

- AWS Key Management Service lets customers create, manage, and control cryptographic keys across most applications and services
- AWS KMS can encrypt data across AWS workloads, digitally sign data, encrypt within applications using the AWS Encryption SDK, and generate and verify message authentication codes (MACs)
- The customer managed keys (CMKs) never leave the AWS FIPS 140-validated HSMs unencrypted
- Customers have complete control over permissions, administration, and usage across AWS services



KMS

Volume Type <i>i</i>	Device <i>i</i>	Snapshot <i>i</i>	Size (GiB) <i>i</i>	Volume Type <i>i</i>	IOPS <i>i</i>	Throughput (MB/s) <i>i</i>	Delete on Termination <i>i</i>	Encryption <i>i</i>
Root	/dev/xvda	snap-04a92f3aceecdabef	8	General Purpose SSD (gp2)	100 / 3000	N/A	<input checked="" type="checkbox"/>	Not Encrypted
EBS	/dev/sdb	Search (case-insensit	8	General Purpose SSD (gp2)	100 / 3000	N/A	<input type="checkbox"/>	Not Encrypted

Add New Volume

Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage. [Learn more](#) about free usage tier eligibility and usage restrictions.

Filter by attributes

KMS Key Aliases	KMS Key ID
Not Encrypted	
(default) aws/ebs	alias/aws/ebs

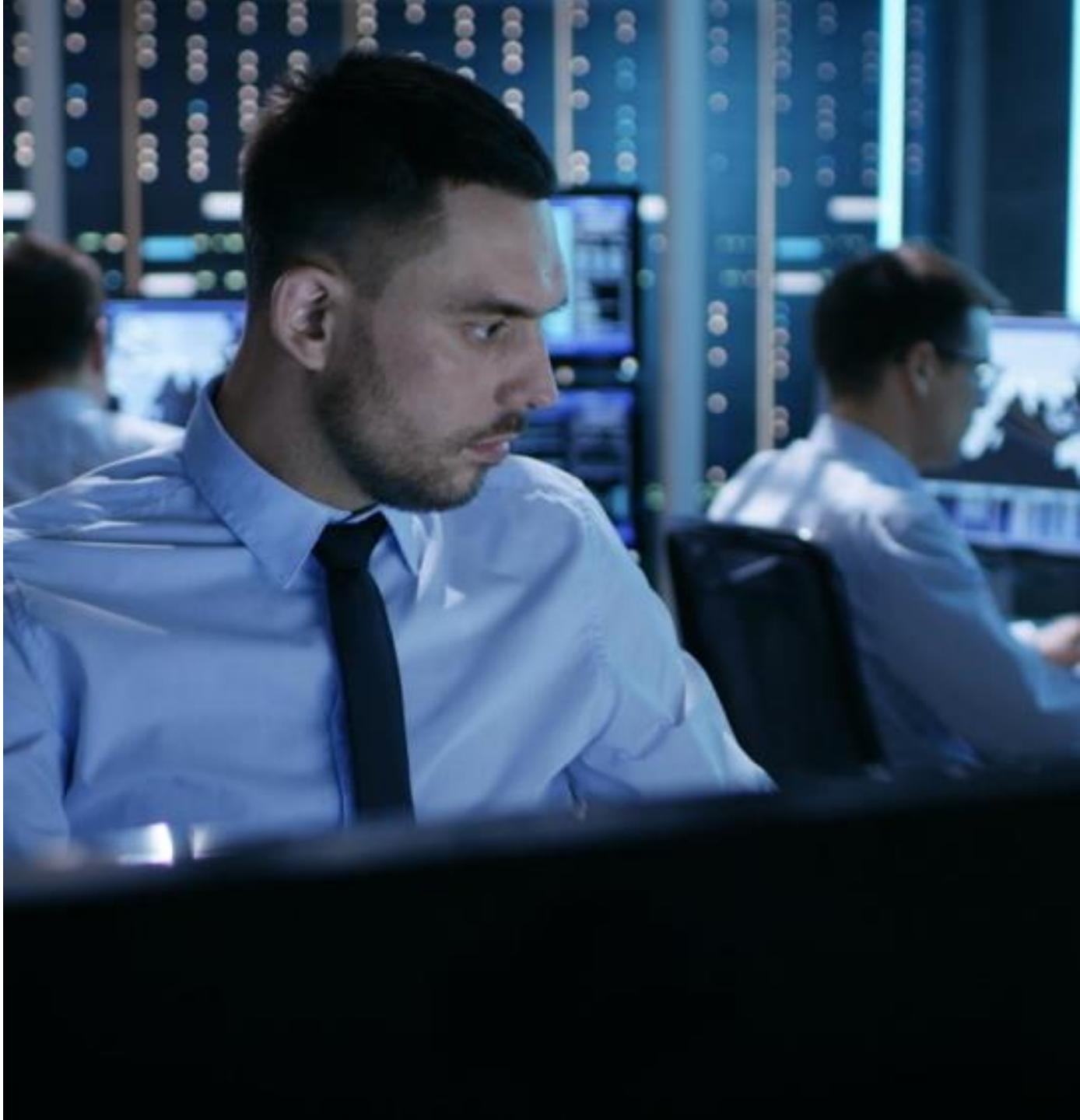


One-Time Operations

- Run ad hoc serverless workloads such as Bastion (jump) services
- Automate extract, transform, and load (ETL) processes to ensure that multiple long-running ETL jobs run in order and complete successfully, without the need for manual orchestration
- Combine multiple AWS Lambda functions into a one-time responsive serverless application and microservice
- Use code to process data on demand with large-scale parallel workflows

Repeatable Operations

- Application orchestration of web applications
- Machine learning collection and processing of image data to detect objects within a video stream or to provide visual and metadata information for data cataloging
- Security automation of scheduled analysis or security incident response initiated by managed resource events
- Media processing by extracting data from PDF documents or images for processing





AWS Batch

- AWS Batch lets developers, scientists, and engineers powerfully run hundreds of thousands of batch and ML computing jobs while optimizing compute resources
- Customers can focus on analyzing results and solving problems
 - Financial services
 - Life sciences
 - Digital media

AWS CloudFormation

- AWS CloudFormation empowers customers to model, deploy, and manage AWS and third-party resources by handling infrastructure as code
- The cloud template language comes in either JSON or YAML formats
- Customers can automate, test, and deploy infrastructure templates with continuous integration and delivery (CI/CD) automations

AWS Instance Families (types)

In this demo...

- You will explore AWS EC2, Instance Types
- <https://aws.amazon.com/ec2/instance-types/>

Reserved Instance Behavior and Flexibility

- Amazon EC2 Reserved Instances (RIs) offer a substantial discount (up to 72%) when compared to On-Demand pricing
- RIs can deliver a capacity reservation, offering extra confidence in the ability to launch the number of instances reserved when needed
- Customers have the flexibility to change families, OS types, and tenancies while benefitting from RI pricing when they use **Convertible RIs**





Amazon EC2 RI Instance Types

- **Standard RIs** provide the most significant discount (up to 72% off On-Demand) for regular usage
- **Convertible RIs** provide a discount (up to 54% off On-Demand) and the capability to change the attributes of the RI if the exchange leads to the creation of Reserved Instances of equal or greater value
- **Scheduled RIs** are available to launch within the time windows you reserve

Instance Type Comparisons

Characteristic	Standard	Convertible
Terms (avg. discount off On-Demand)	1Yr (40%), 3yr (60%)	1yr (31%) 3yr (54%)
Change Availability Zone, instance size (for Linux OS), networking type	Yes (using ModifyReservedInstances API and console)	Yes (using ExchangeReservedInstances API and console)
Change instance families, operating system, tenancy, and payment option		Yes
Benefit from price reductions		Yes



Spot Instances

- EC2 Spot Instances leverage unused EC2 capacity in the AWS cloud
- They are available at up to a 90% discount compared to On-Demand prices
- Spot Instances for various stateless, fault-tolerant, or flexible applications such as big data, containerized workloads, CI/CD, web servers, high-performance computing (HPC), and test & development workloads

Savings Plans

- Savings Plans provides low prices in exchange for commitment and the commitment cannot be changed after purchase
- **Compute** Savings Plans offer the most flexibility and prices that are up to 66 percent off On-Demand rates
- **EC2 Instance** Savings Plans provide savings up to 72 percent off On-Demand
- **SageMaker** Savings Plans provide savings up to 64 percent off On-Demand rates



Dedicated Hosts and Instances



- An important difference between a Dedicated Host and a Dedicated Instance is that a Dedicated Host gives the customer additional visibility and control over how instances are placed on a physical server
- Customers can consistently deploy their instances to the same physical server over time

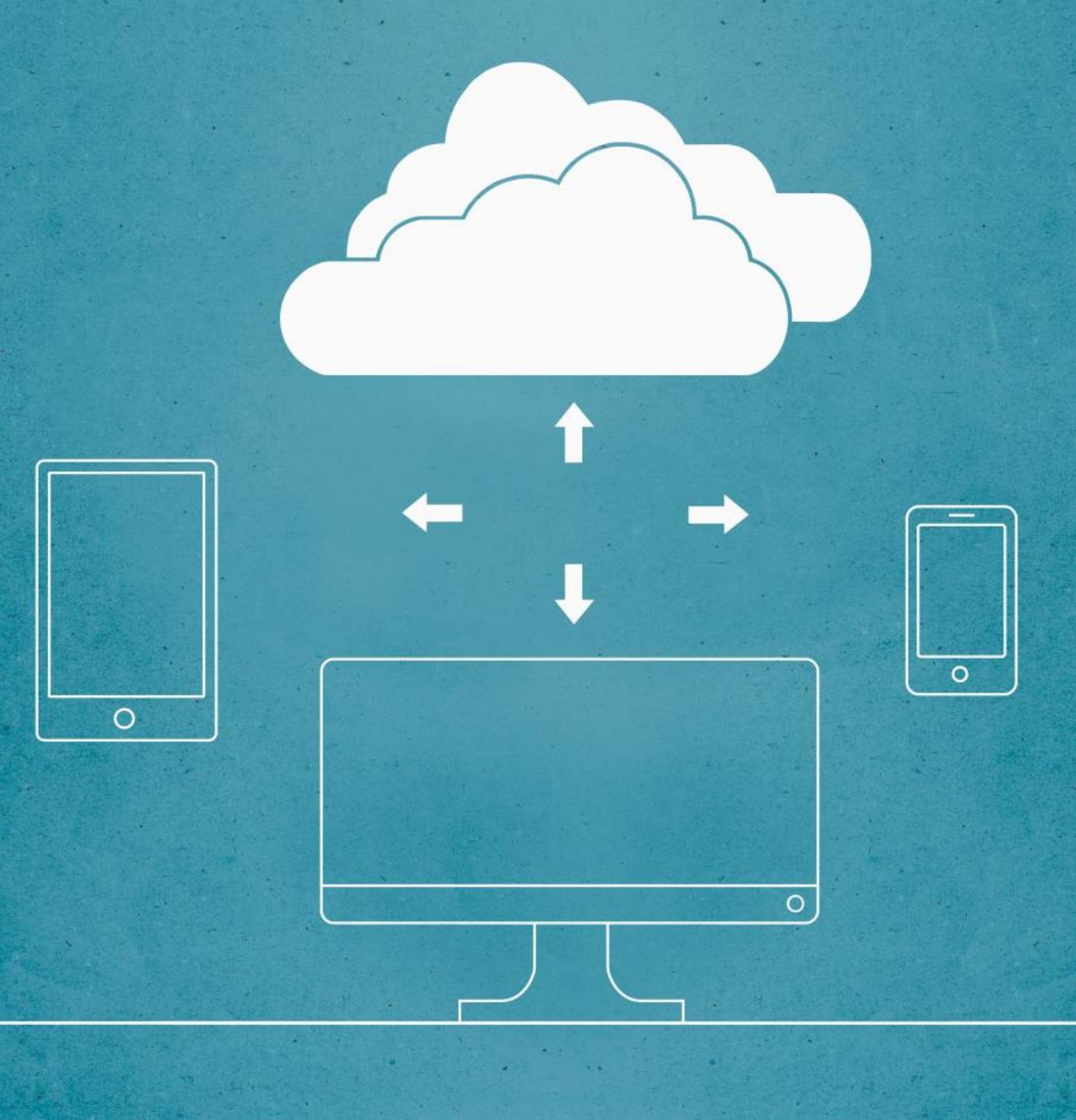
AWS Placement Groups

- A placement group is a configuration option that AWS offers that lets customers house a group of interdependent EC2 instances in a certain way across the underlying hardware on which those instances reside
- The instances could be placed close together, spread through different racks, or spread through different AZs



Containers Defined

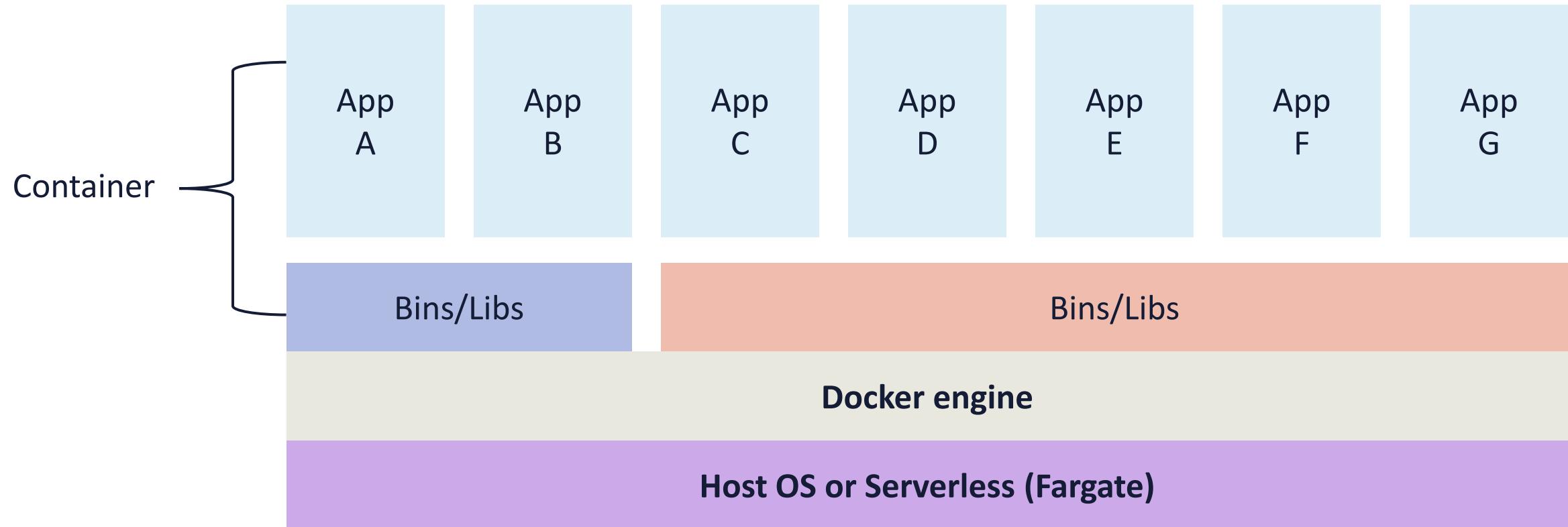
- A container is a discrete environment within an operating system (or a serverless architecture) where one or more applications can run that is typically assigned all the resources and dependencies needed to function
- It is a modular and portable environment that includes the application binaries, software dependencies, and hardware requirements wrapped up into an independent, self-contained unit



Containers

- Containers are commonly used for processes and workflows in which there are important requirements for security, reliability, and scalability
- All cloud providers offer managed container development, automation, and orchestration services
- Containers can be server-based or serverless (AWS Fargate)
- While a VM is a full abstraction of an operating system, a container is a constrained place to run segregated processes while still utilizing the kernel and other capabilities of the base OS

Application Containers





Microservices

- Microservices are specific service-oriented application components made up of small independent services that communicate over well-defined APIs for notification and process queueing
- Microservices make applications and apps faster to develop and easier to scale by small, self-contained teams of developers
 - Microservices are about the design of software
 - Containers are about packaging software for deployment

Lightsail

- Lightsail allows companies to build small business applications such as file storage and sharing, backups, financial and accounting software, and more
- Customers can build a website in just a few clicks, with pre-configured applications like WordPress, Magento, Prestashop, and Joomla
- Some customers can easily create and delete development sandboxes and test environments risk free



AWS Elastic Beanstalk



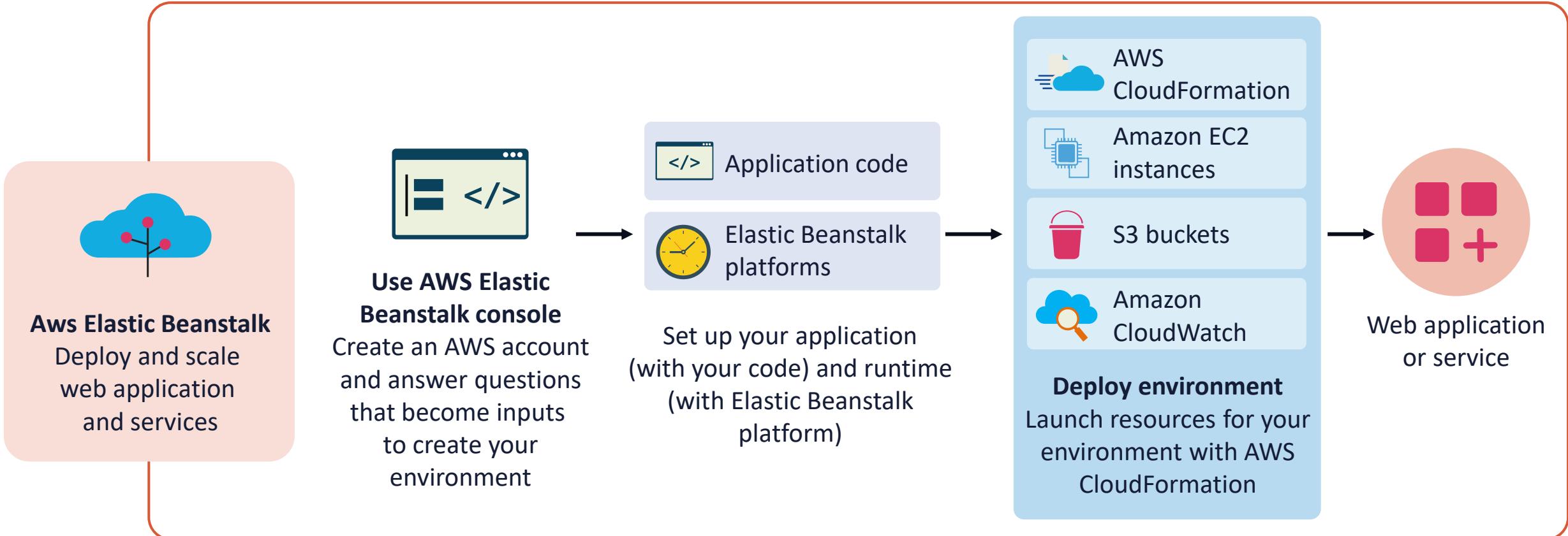
- Elastic Beanstalk is an AWS service for deploying and scaling web applications and services
- Customers can upload their code and let Elastic Beanstalk automatically handle the deployment
- Beanstalk does everything from capacity provisioning, load balancing, and auto scaling to application health monitoring

AWS Elastic Beanstalk

- Rapidly launch web applications
 - Deploy scalable web applications in minutes without the overhead of provisioning and handling the underlying infrastructure
- Create mobile API backends for the applications
 - Use the desired programming language to build mobile API backends
- Replatform critical business applications
 - Customers can migrate stateful applications based on legacy infrastructure to Elastic Beanstalk and then connect securely to private networks if desired



AWS Elastic Beanstalk

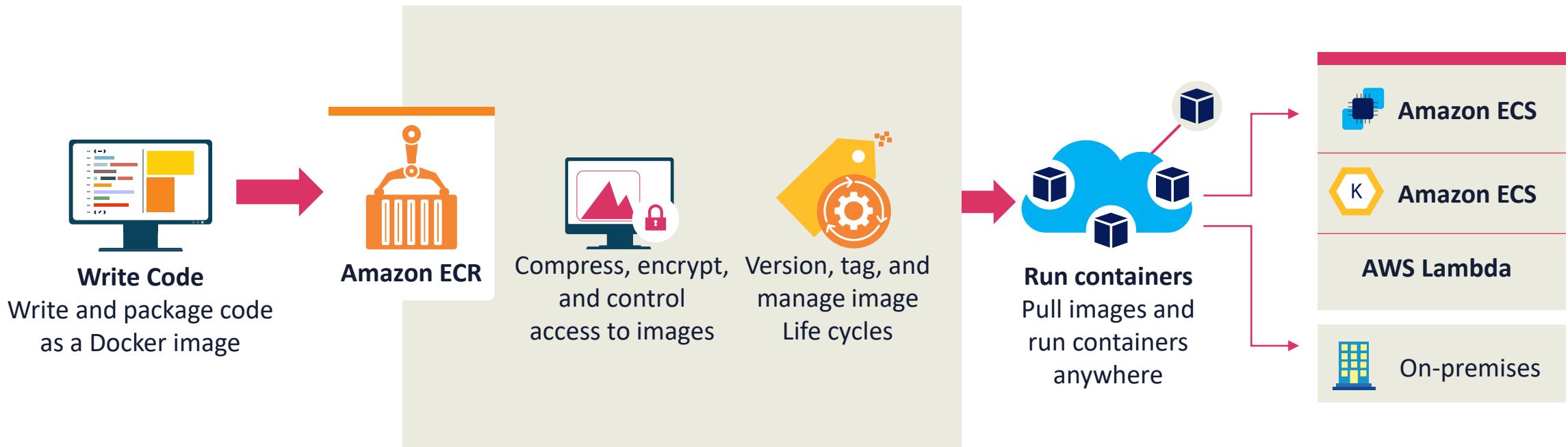


A close-up photograph of a young man's face, looking directly at the viewer with a neutral expression. The background is heavily blurred, creating a bokeh effect with various shades of blue, green, and white. Interspersed throughout this blur are snippets of what appears to be computer code or data, suggesting a theme of technology, data science, or software development.

Amazon Elastic Container Registry (Amazon ECR)

- Amazon Elastic Container Registry is a fully-managed container registry offering high-performance hosting
- Customers can dependably deploy application images and artifacts anywhere
- Developers can manage software vulnerabilities, streamline deployment workloads, and manage image life cycle policies

Amazon Elastic Container Registry



Amazon Elastic Kubernetes Service (Amazon EKS)

- Amazon EKS is a managed Kubernetes service that makes it easy to run Kubernetes on AWS and on-premises
- EKS automatically manages the availability and scalability of the Kubernetes control plane nodes responsible for scheduling containers, managing application availability, storing cluster data, and more
- EKS offers all the performance, scalability, reliability, and availability of the AWS infrastructure





Serverless Compute Options

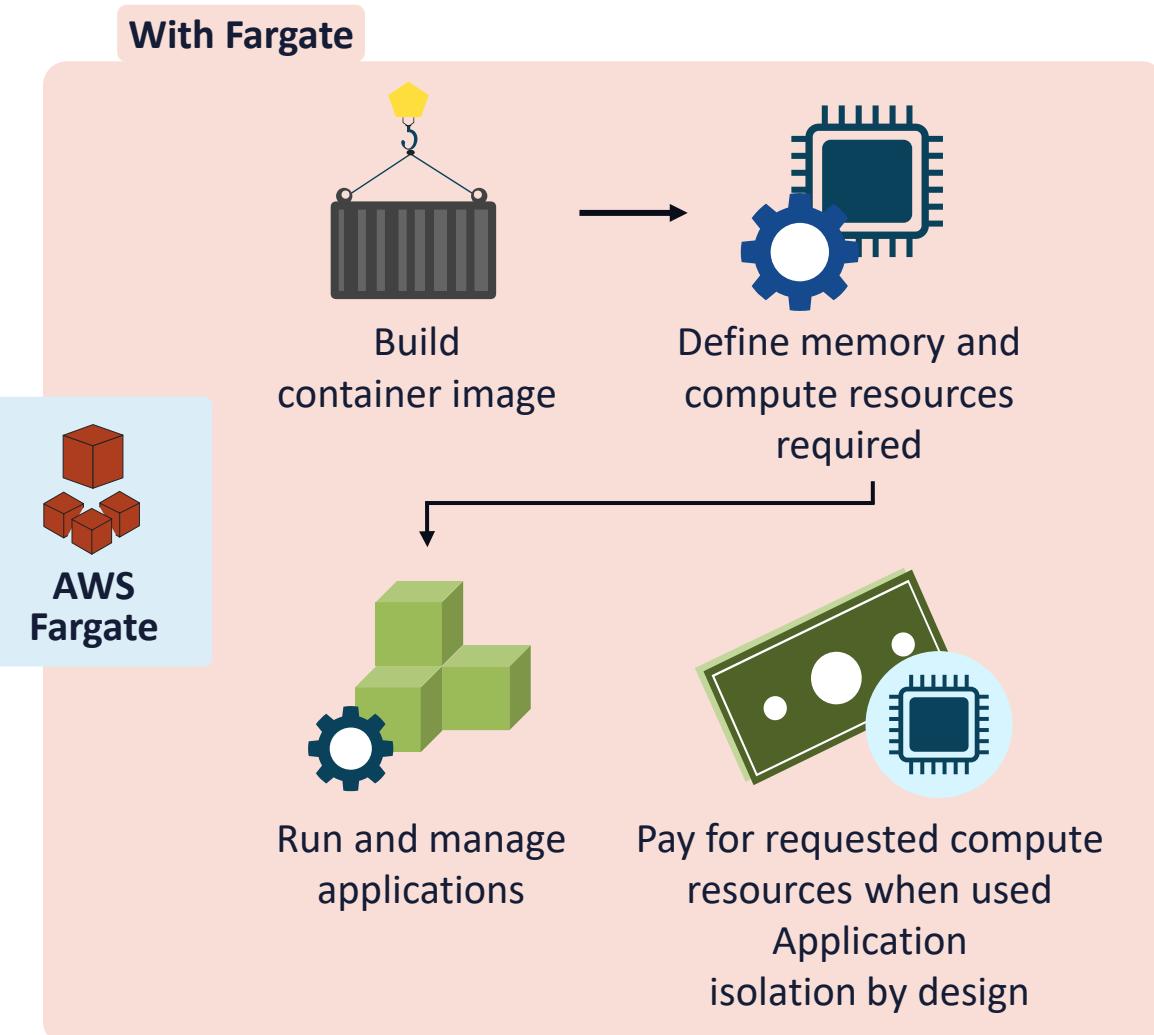
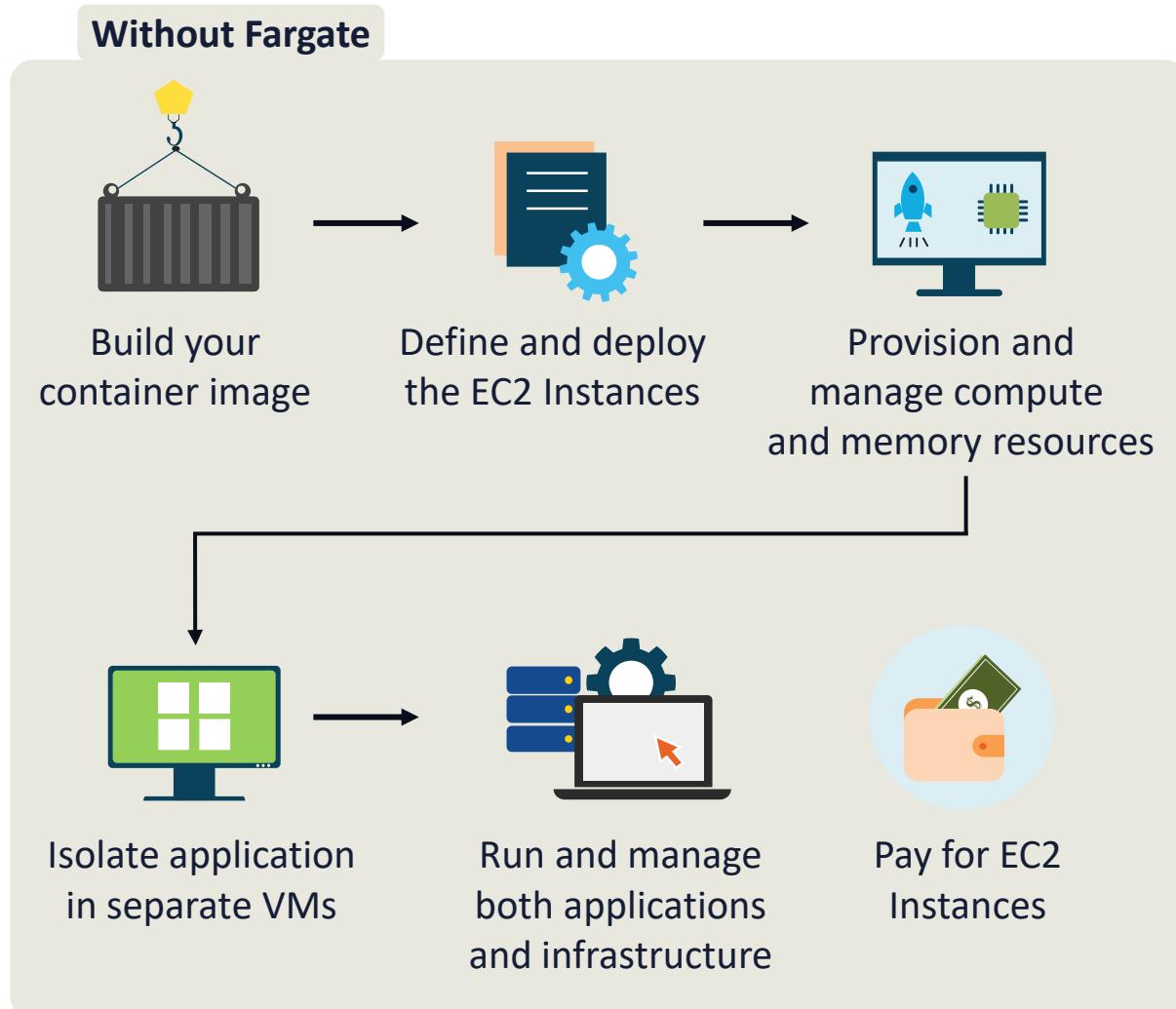
- Modern serverless solutions often leverage modern cloud infrastructures that emulate the network operating system environment without the need for a Windows or Linux-based server
- These are technologies for running code, managing data, and integrating applications, all without managing servers
- Serverless technologies feature automatic scaling, built-in high availability, and a pay-for-use billing model to increase agility and optimize costs

AWS Fargate

- AWS Fargate is a serverless, pay-as-you-go compute engine that lets customers construct applications without servers
- Fargate is attuned with Amazon ECS and Amazon EKS
- Tasks include choosing an Open Container Initiative (OCI)-compliant container image, defining memory and compute resources, and running the container with serverless compute
- Multiple CPU architectures and operating systems are supported



AWS Fargate

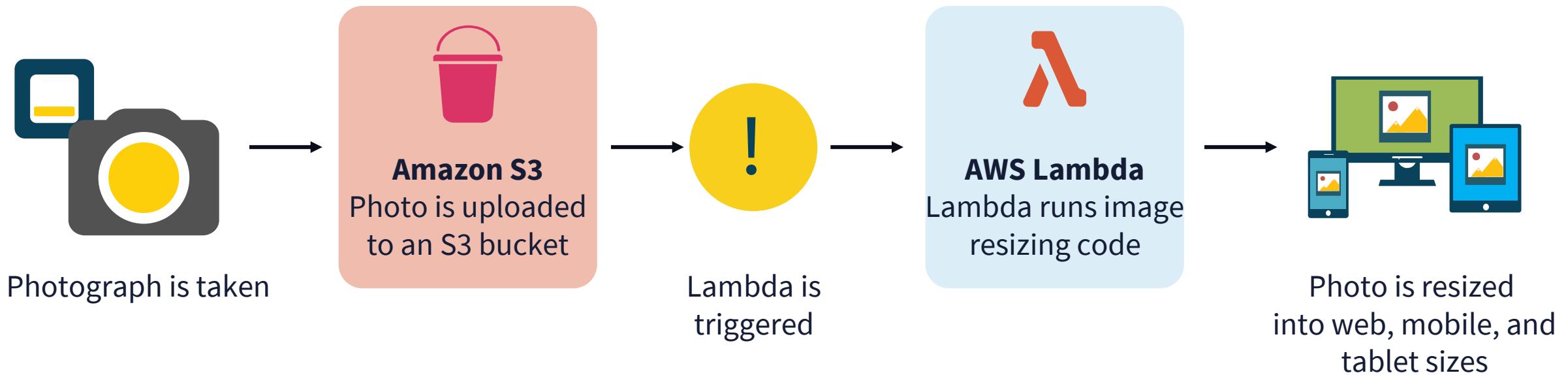




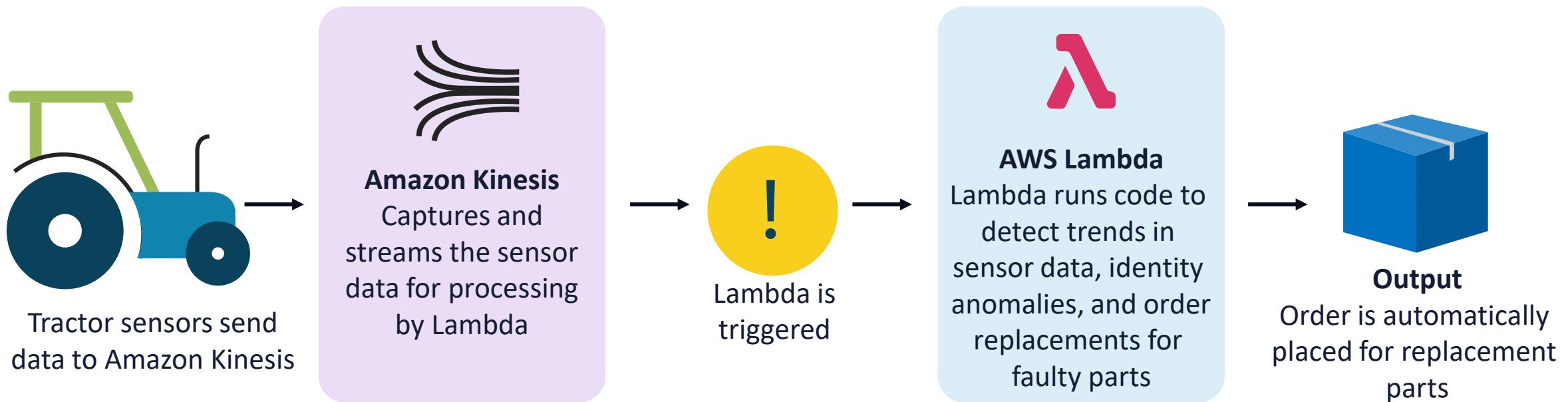
AWS Lambda

- AWS Lambda is a serverless, event-driven compute service that enables customers to run code for practically any application or backend service without deploying or managing servers
- Customers can trigger Lambda from over 200 AWS services and Software as a Service (SaaS) applications
- It uses the pay-as-you-go model

AWS Lambda for File Processing



AWS Lambda for Internet of Things (IoT) Backends





Auto Scaling Services

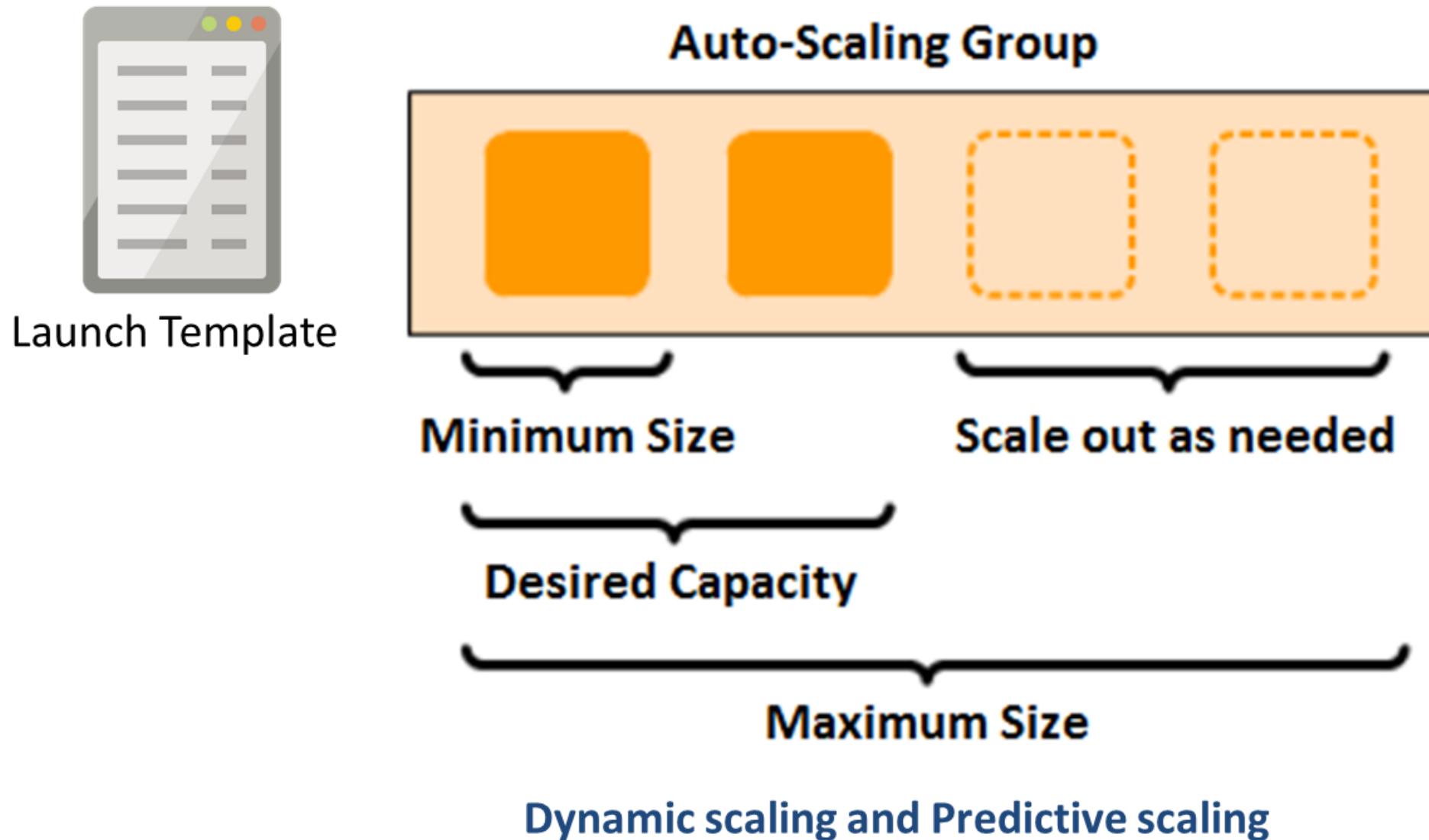
- AWS Auto Scaling monitors client applications and routinely regulates capacity to maintain stable, predictable performance at the lowest probable cost
- It is simple to set up application scaling for multiple resources across multiple services in a matter of minutes
- This service offers an efficient graphical user interface (GUI) to construct scaling plans and launch templates for resources, including EC2 instances, Spot Fleets, ECS tasks, DynamoDB tables, indexes, and even Amazon Aurora (RDS) Replicas

AWS Auto Scaling

- AWS Auto Scaling makes scaling easy with common suggestions that let customers optimize performance, costs, or balance between them
- Customers often combine existing EC2 instances with AWS Auto Scaling to scale out extra resources for other AWS services
- Applications always have the proper resources at the right time with AWS



AWS Auto Scaling



A 3D grid of binary code blocks, represented by a 4x4x4 cube of binary digits (0s and 1s) in a dark blue space with glowing nodes at the intersections. The blocks are translucent, showing the binary code inside.

Block Storage

- There are three types of cloud storage: object, file, and block – each having specific use cases and storage needs
- Block storage is a classic technology that manages data storage and storage devices
- It takes any data, like a file or database entry, and distributes it into equal size blocks (512-bit is legacy, 4K is common)



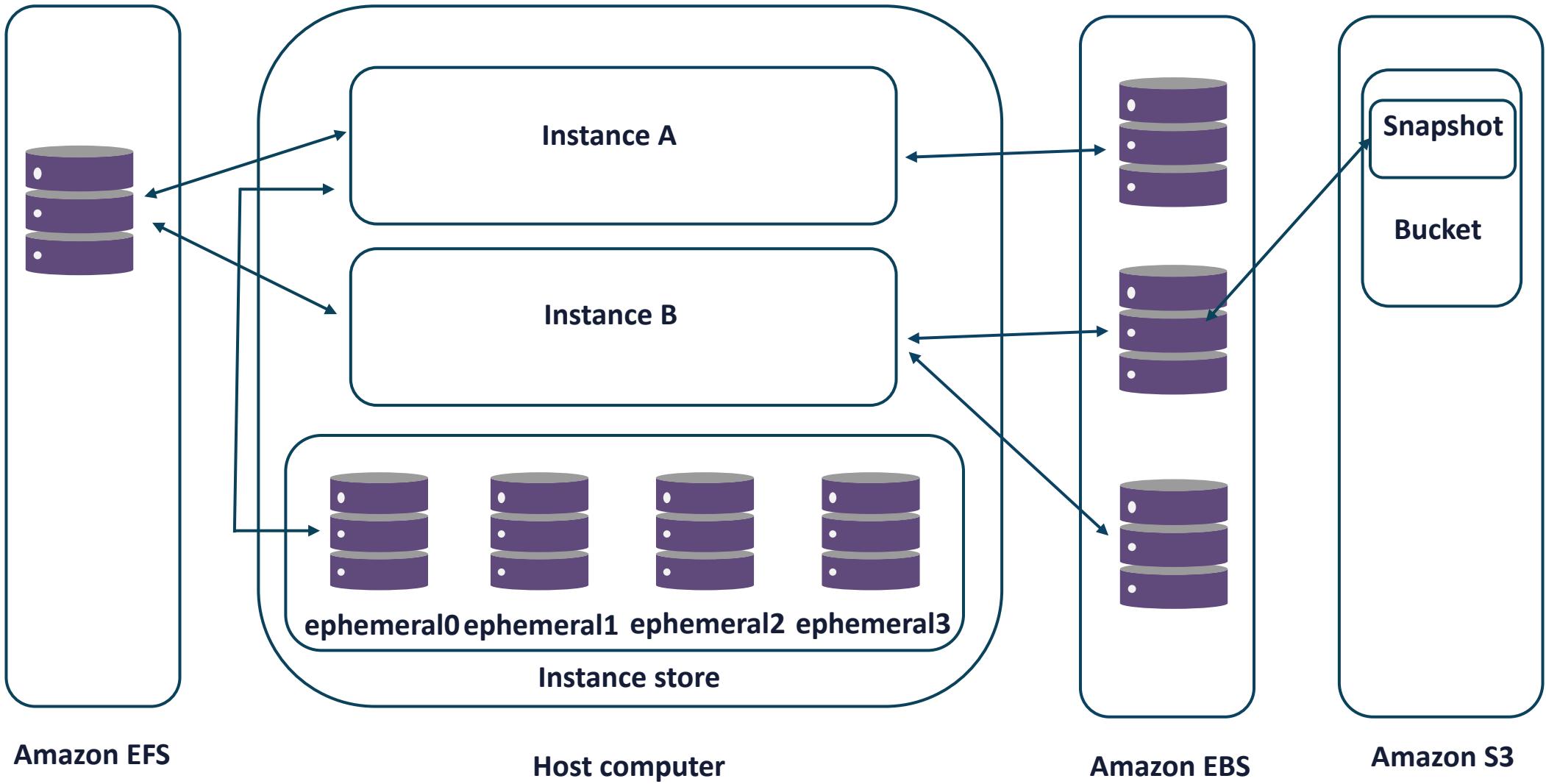
Block Storage

- The block storage system stores the data block on supporting physical storage in a manner that is optimized for fast access and retrieval (RAID arrays)
- Developers prefer block storage for applications that require efficient, fast, and reliable data access
- Block storage offers a more direct pipeline to the data
- By comparison, file storage has an extra layer consisting of a file system (NFS, SMB, CIFS) to process before accessing the data

- Storage area networks (SANs)
- Containerized applications
- Transactional workloads
- Analytics and data warehousing
- Virtual machines

Block Storage Use Cases

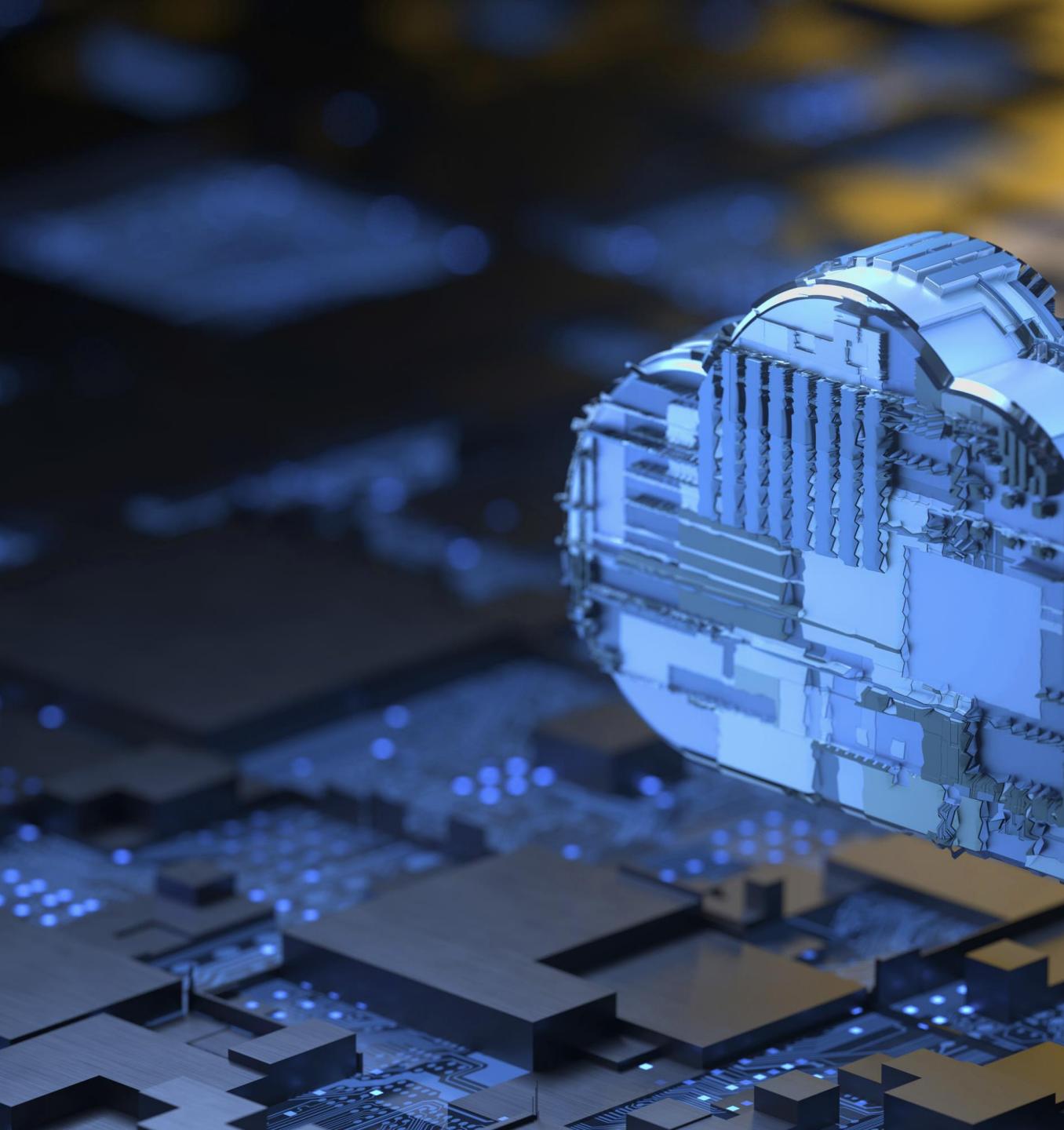
Block, File, and Object Storage at AWS



Exploring Block Storage Solutions

In this demo...

Explore block storage solutions like Amazon Elastic Block Store (EBS)



Object Storage

- Object storage is a technology that stores and controls data in an unstructured format called objects
- Modern enterprises generate and analyze large amounts of unstructured data such as photos, graphics, audio files, videos, email, web pages, and sensor data
- This solution creates a flat structure instead of a hierarchical or tiered storage

Object Storage

- Metadata is critical to object storage technology, and objects are kept in a bucket instead of files in folders
- Object storage combines the chunks of data that make up a file, adds all the user-created metadata to that file, and assigns a custom identifier
- Users can get and analyze any object in the bucket, no matter the file type, based on its function and attributes





Object Storage Use Cases

- **Analytics** – collect and store virtually unlimited data of any type in cloud object storage
- **Data lakes** – use cloud object storage as its core since it has virtually unlimited scalability and high durability
- **Data archiving** – cloud object storage is exceptional for long-term data retention
- **Rich media** – speed up applications and lower the cost of storing media files like videos, digital images, and music

Object Storage Use Cases

- **Cloud-native applications** – use technologies like containerization and serverless to address customer needs in a rapid and flexible way
- **Machine learning** – requires object storage because of the scale and cost efficiency to "teach" a computer system to make predictions or inferences
- **Backup and recovery** – deploy object storage systems to duplicate content in case a physical device fails



Comparing S3 Storage Classes

In this demo...

- Compare S3 storage classes
- <https://aws.amazon.com/s3/storage-classes/>

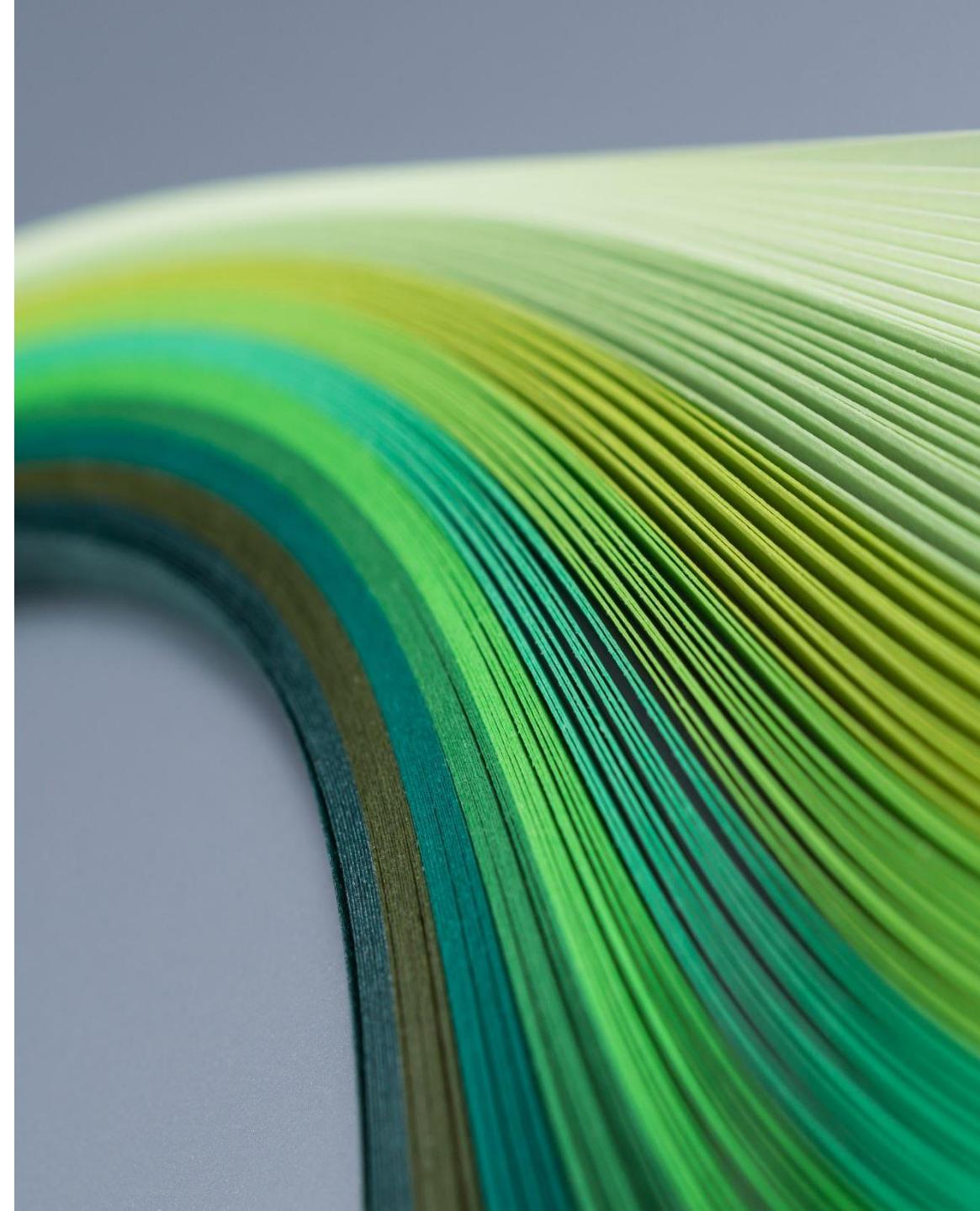


AWS Elastic File System (EFS)

- Amazon Elastic File System offers a simple, scalable, elastic file system for workloads using AWS Cloud services and on-premises resources
- EFS automatically grows and shrinks as files are added or removed with no need for management or provisioning
- It is built to scale on demand to petabytes without disrupting applications, growing and shrinking automatically as you add and remove files
- It is a fully managed service that requires no changes to existing applications

Amazon FSx

- Amazon FSx makes it easy and cost effective to launch, run, and scale feature-rich, high-performance file systems in the cloud supporting a wide range of workloads with its reliability, security, scalability, and broad set of capabilities
- Amazon FSx is built on the latest AWS compute, networking, and disk technologies to provide high performance and lower TCO
- Customers can choose between four widely-used file systems: NetApp ONTAP, OpenZFS, Windows File Server, and Lustre

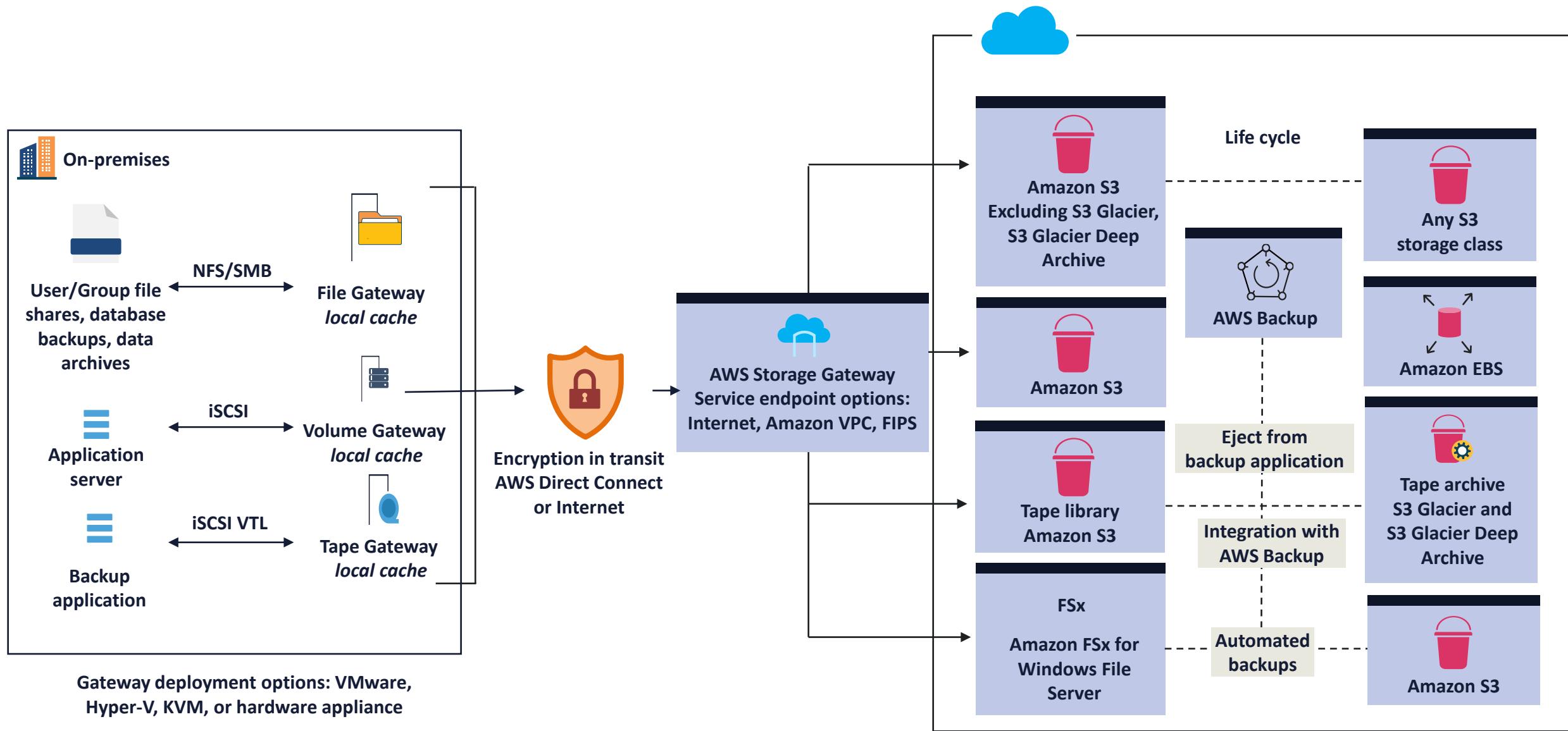


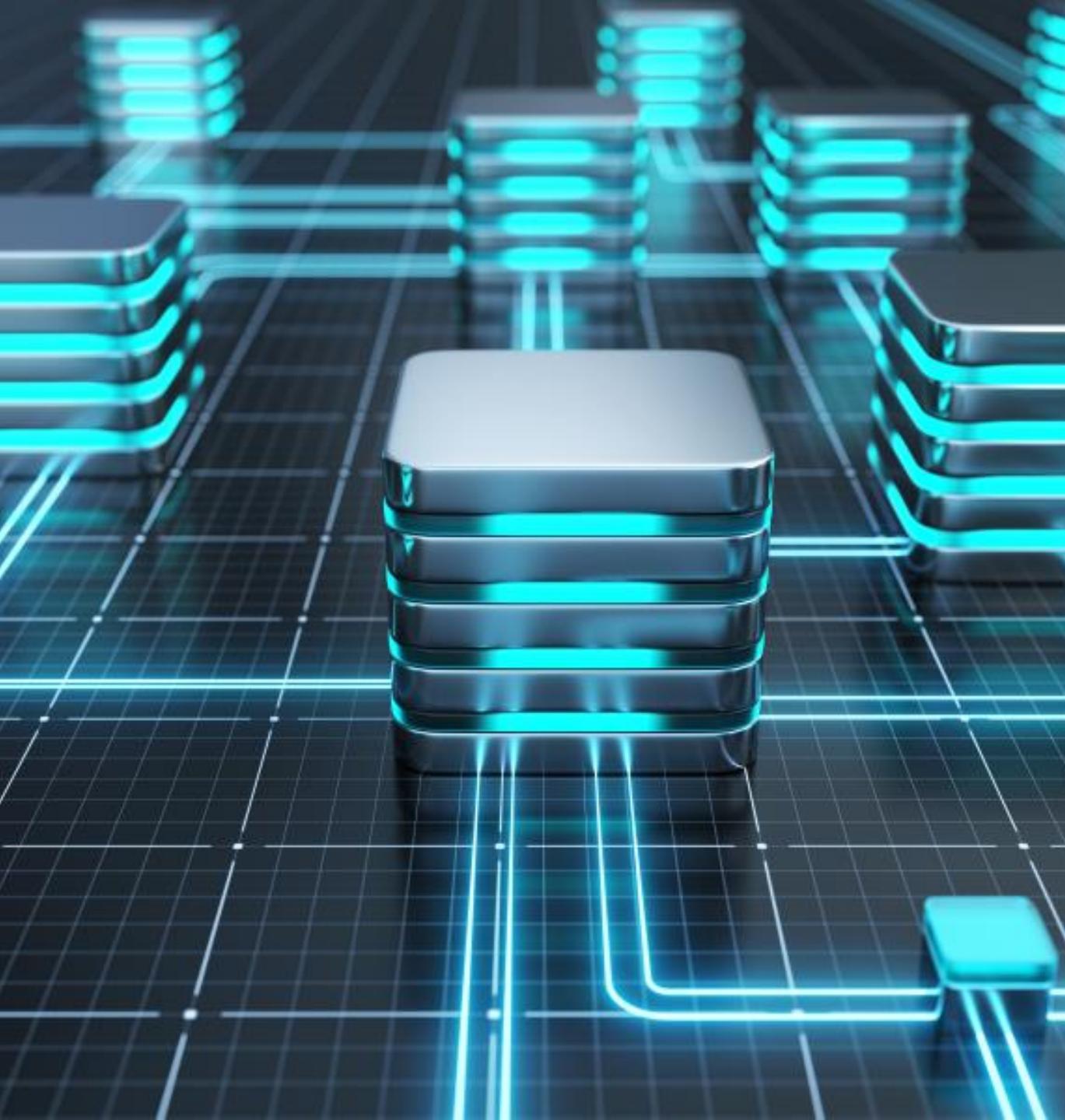
AWS Storage Gateway



- AWS Storage Gateway is a hybrid storage service that enables your on-premises applications to seamlessly use AWS cloud storage
- You can use the service for backup and archiving, disaster recovery, cloud data processing, storage tiering, and migration
- Can be appliance-based or in a hypervisor
- Often used in conjunction with AWS Direct Connect 10 or 100 Gbps connections

AWS Storage Gateway





Relational Databases

- A relational database is a collection of structured data items with pre-defined relationships between them
- These items are ordered as a set of tables with associated columns and rows
- Tables are used to hold information about the objects to be represented in the database
- Each column in a table holds a specific format of data, and a field stores the actual value of an attribute

Non-Relational (NoSQL) Databases

- Are purpose-built for designated data models
- Have elastic schemas for constructing modern applications
- Are commonly known for their simplicity of development, functionality, and scalable performance



A photograph of a young man with dark hair, wearing a light grey button-down shirt. He is shown from the side and slightly from behind, looking off to his left with a thoughtful expression. His right hand is resting against his chin, supporting his head. In the background, there is a large, glowing, translucent blue and white network diagram, resembling a complex web or a digital interface. The overall atmosphere is one of deep concentration or innovation.

Non-Relational Databases

- NoSQL databases use a diversity of data models for accessing and controlling data
- These database types are optimized explicitly for applications that demand large data volume, low latency, and flexible data models
- This is accomplished by bypassing some of the data consistency restrictions of other databases, such as the relational type

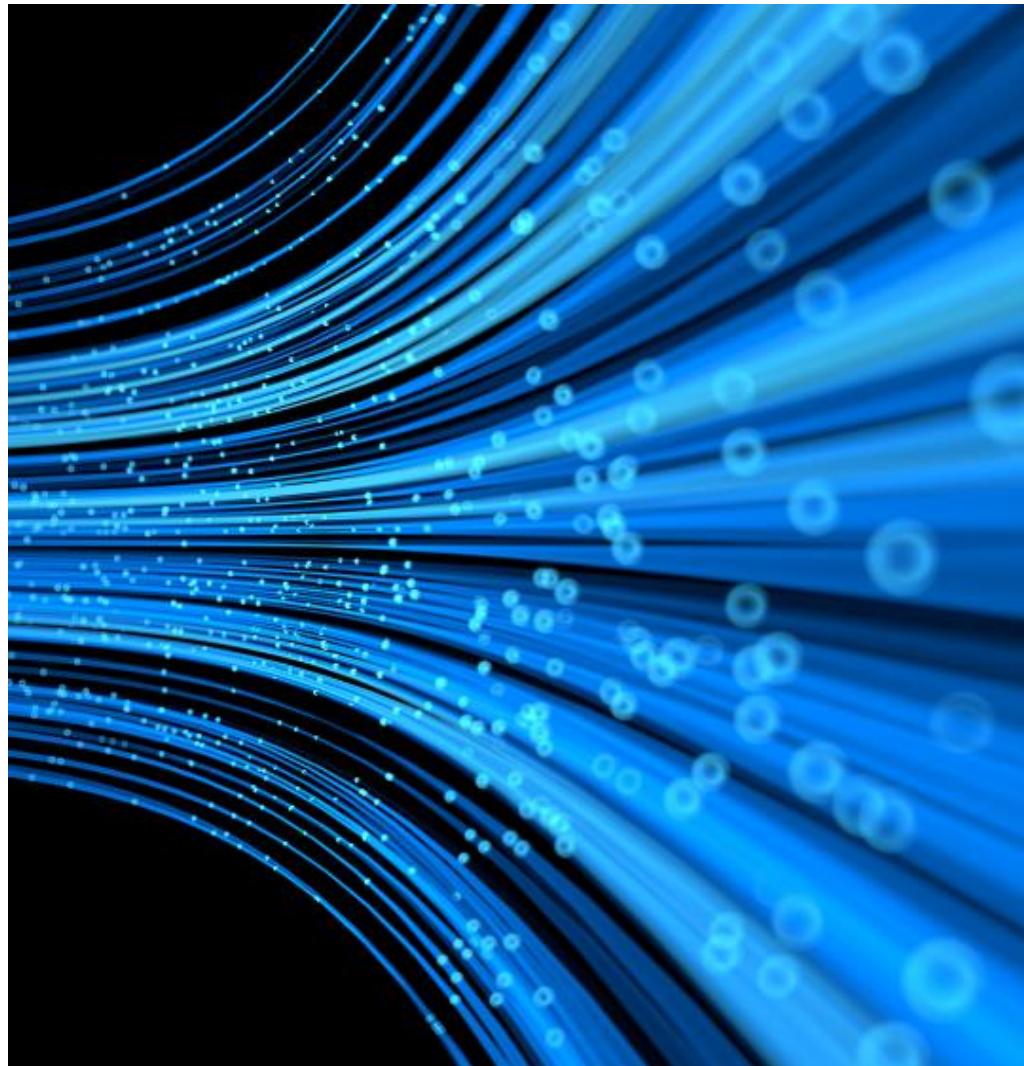
Using RDS Services

In this demo...

- Evaluate RDS Services and Aurora
- Explore Amazon Redshift and Amazon Neptune

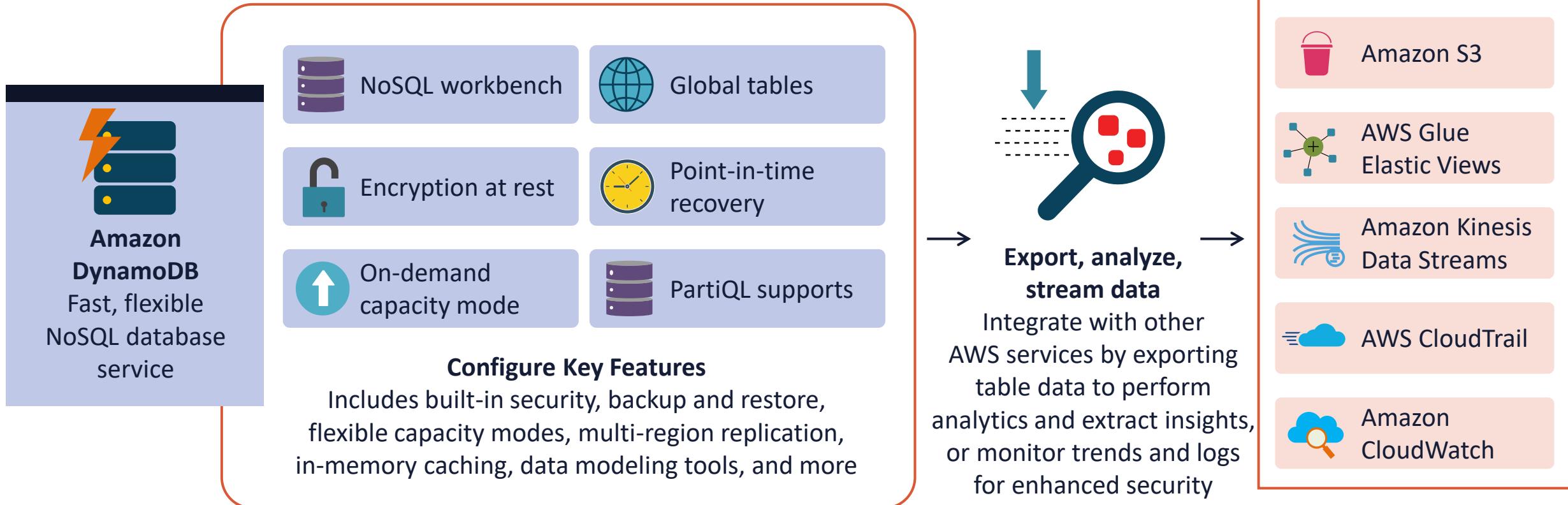
<https://aws.amazon.com/free/database/>

Amazon DynamoDB



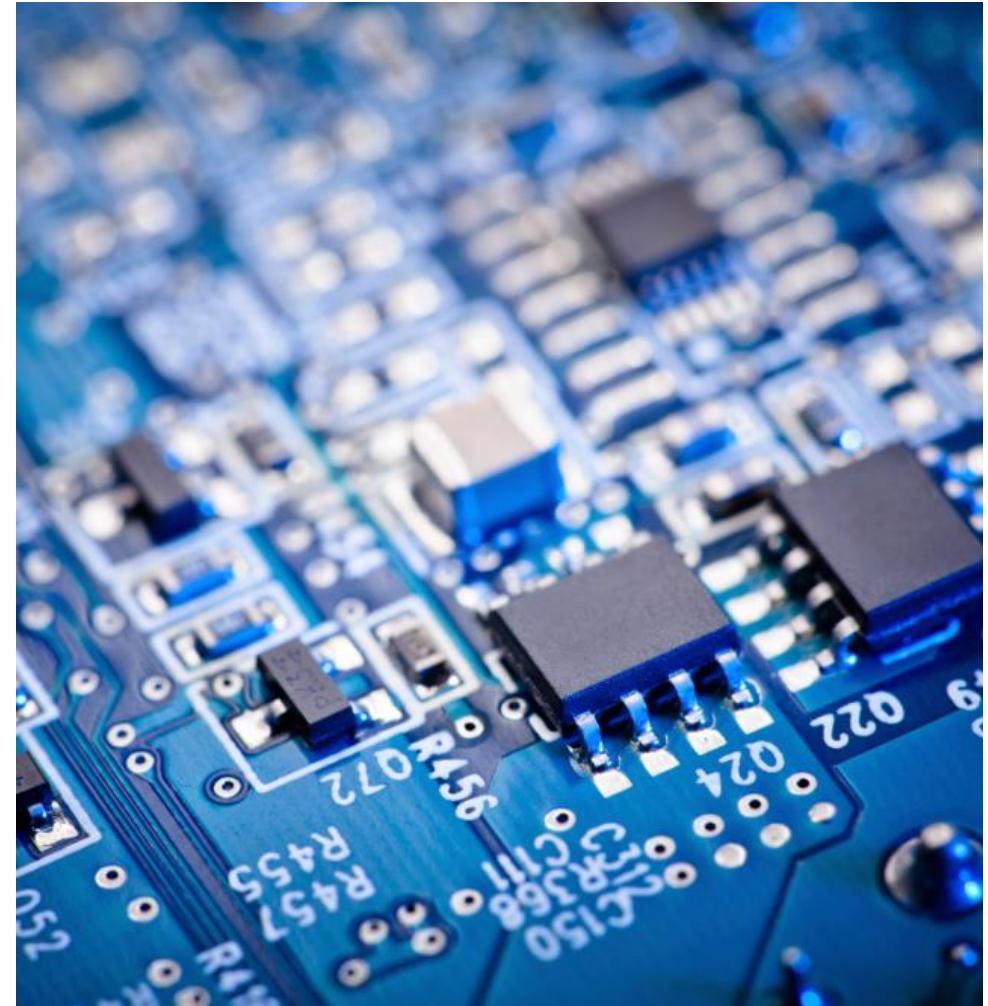
- Is a fast, malleable NoSQL database service for single-digit millisecond performance at any scale
- Is a fully managed, serverless, key-value NoSQL database designed to run high-performance applications
- Delivers built-in security, nonstop backups, automated multi-region replication, in-memory caching, and powerful data import and export tools

Amazon DynamoDB



Memory-Based Databases

- In-memory databases are purpose-built databases that typically depend on high-speed memory chip clusters for data storage, **as opposed to** databases that store data on disk or solid-state drives (SSDs)
- In-memory data storage is intended to allow for nominal response times by abolishing the need to access physical disks
- In-memory databases can persist data on disks by storing each operation in a log or in a snapshot

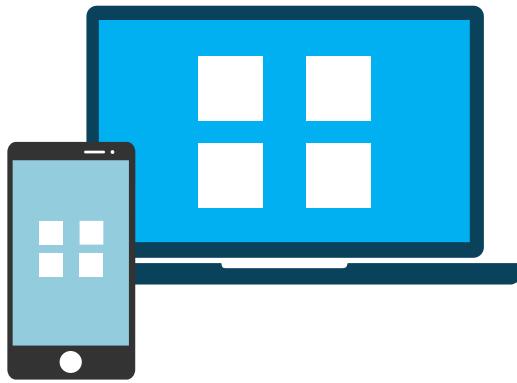




Amazon ElastiCache for Redis

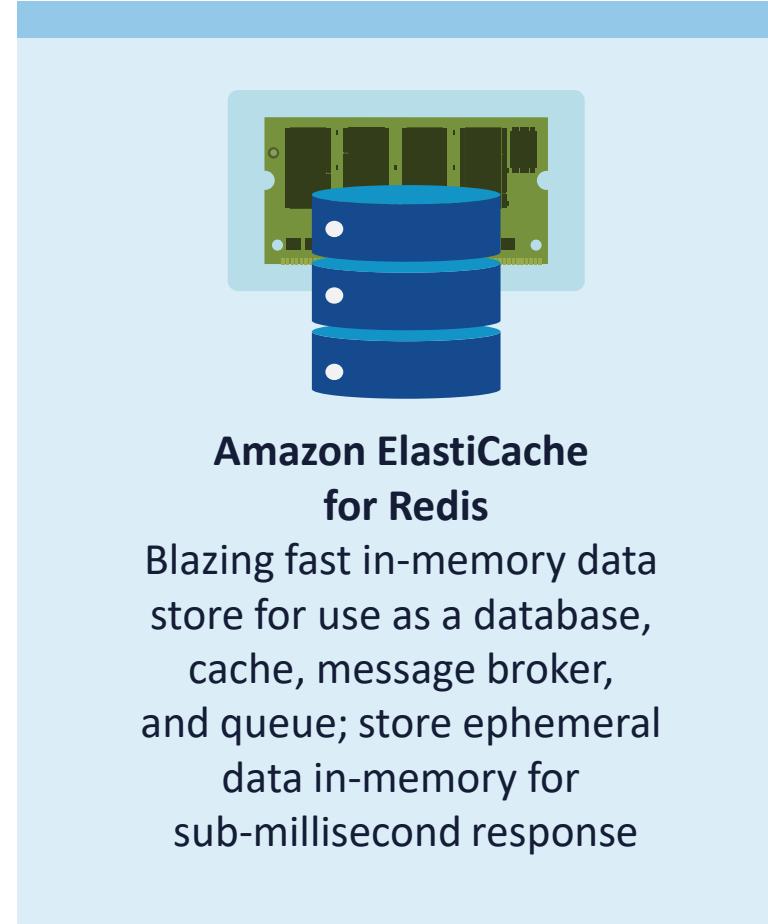
- ElastiCache is an extremely fast in-memory data store that provides sub-millisecond latency to enable Internet-scale real-time applications
- It is constructed on open-source Redis and compatible with the Redis APIs
- Self-managed Redis applications can function effortlessly with Redis ElastiCache without any code changes
- It joins the speed, ease, and flexibility of open-source Redis with manageability, security, and scalability from AWS

Amazon ElastiCache for Redis



Internet-scale applications

Real-time apps in gaming,
ride-hailing, media streaming,
dating, and social media
need fast data access



Use cases

Real-time transactions,
chat, BI and analytics,
session store, gaming
leaderboards, and cache

Appropriate Migration Strategies: Database Replication

- Database replication refers to the process of copying data from a primary database to one or more replica databases to improve data availability and system fault-tolerance and reliability
- Database replication is usually a continual process occurring in real-time as data is created, modified, or deleted in the primary database
 - It can also occur as one-time or scheduled batch projects





Database Replication Use Cases

- Customers can create tasks for ongoing replication using AWS Database Migration Service (DMS)
- Data can be migrated to S3 storage to match the organizational data life cycle
- A newer solution would be to use Amazon Elastic File System (EFS) replication to create a replica of their EFS file system in the AWS Region of their choosing
- AWS customers may decide to innovate and build new database applications with Amazon Relational Database Service (RDS)

AWS Appropriate Migration Strategies: AWS Snowball

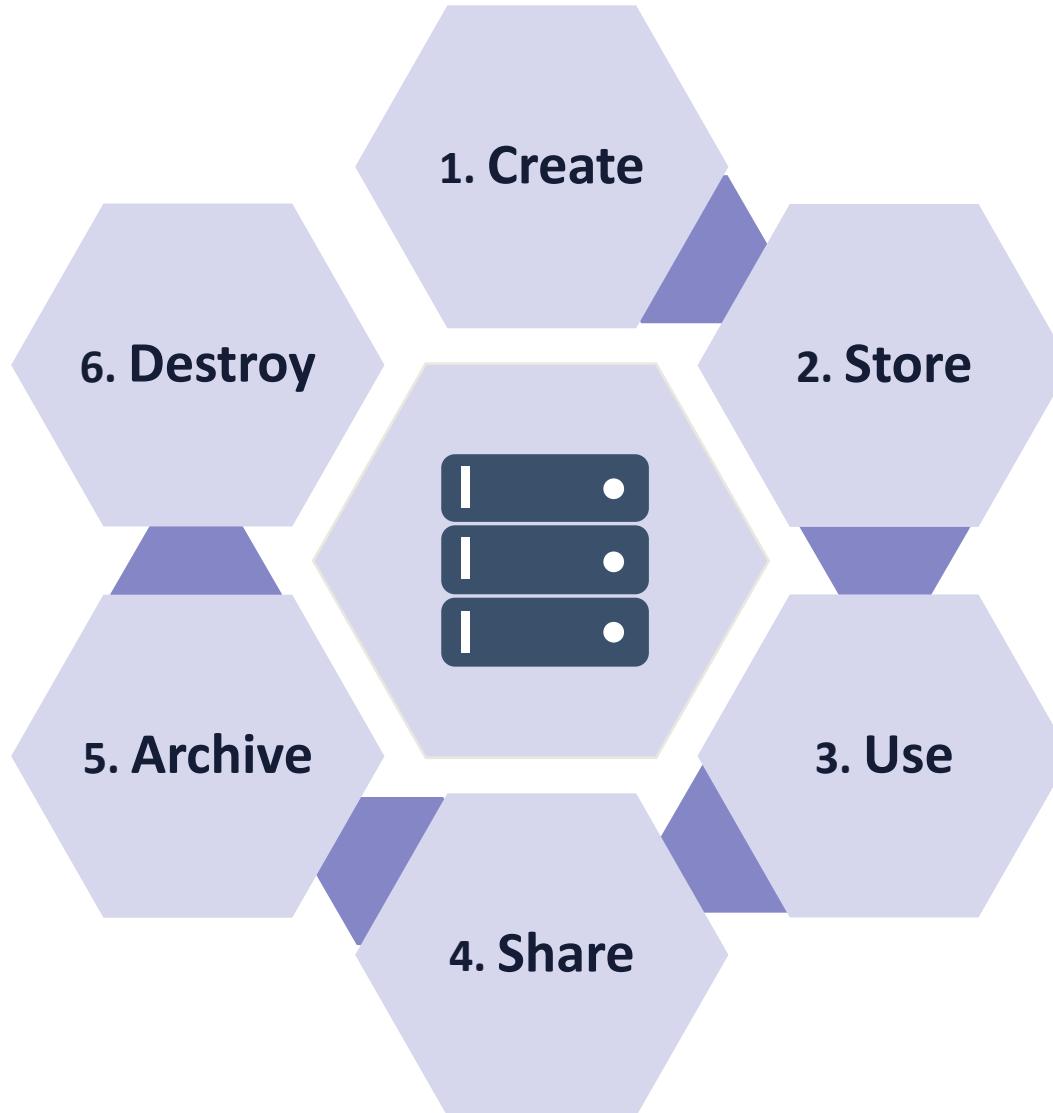


Database Migration Tools

- **AWS Database Migration Service (AWS DMS)** is a managed migration and replication service that helps move databases and analytics workloads to AWS quickly, securely, and with minimal downtime and zero data loss
- **AWS Schema Conversion Tool (AWS SCT)**
AWS offers two schema conversion solutions to make heterogeneous database migrations predictable, fast, secure, and simple



Cloud Data Life Cycle



Data Life Cycle Policies

- Customers can formulate a data life cycle initiative for several areas:
 - Block storage using levels of SSD/HDD
 - Object storage using S3 storage tiers
 - S3 Glacier archiving retrieval plans
 - Manage EBS snapshots and EBS-backed Amazon Machine Images (AMIs)
 - Moving data to AWS with AWS Snow services
 - Supporting enterprise backup and restore policies
 - Enabling cloud disaster recovery
 - Database replication plans

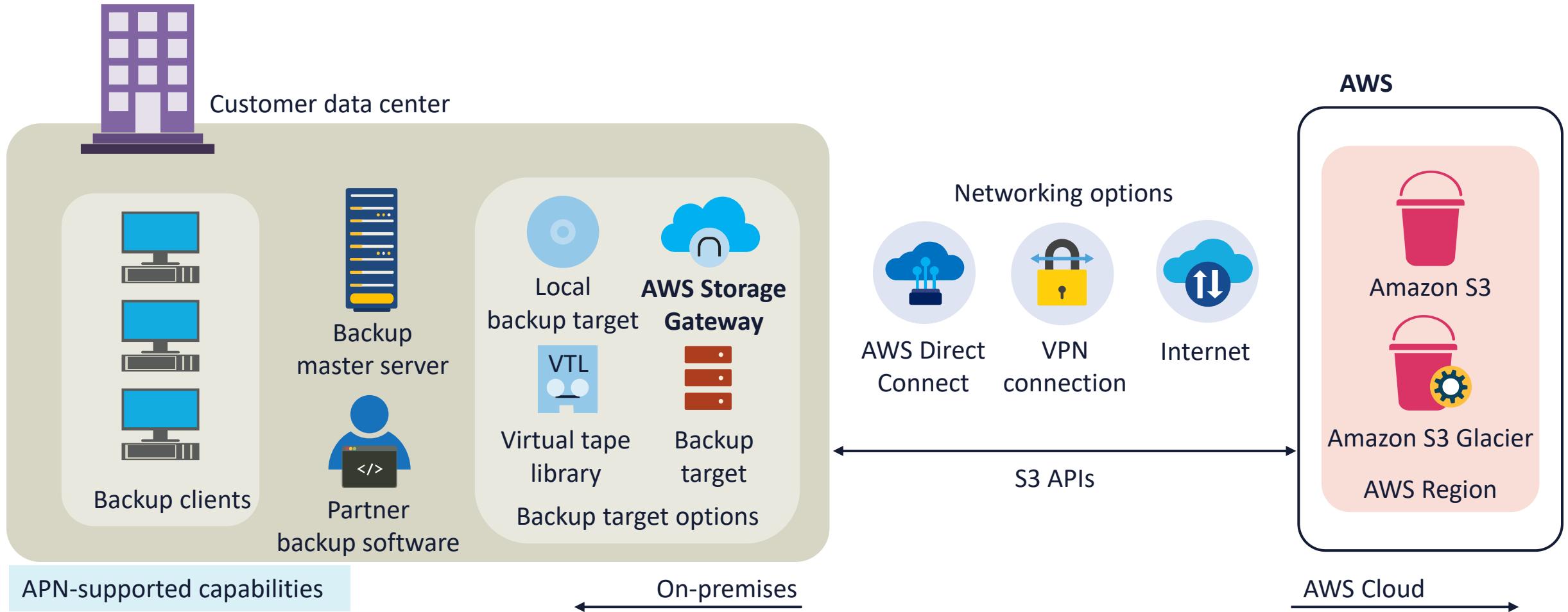


Hybrid Cloud Backup

- Many third-party backup services have built-in cloud connectors that can be used to send data backups to AWS smoothly
- During a restoration, backup data is brought back to the on-premises environment and reinstated for production
- Backups are generated on-premises where the backup master server is hosted and sent to AWS to be stored in Amazon S3, S3 Glacier, and S3 Glacier Deep Archive



Hybrid Cloud Backup

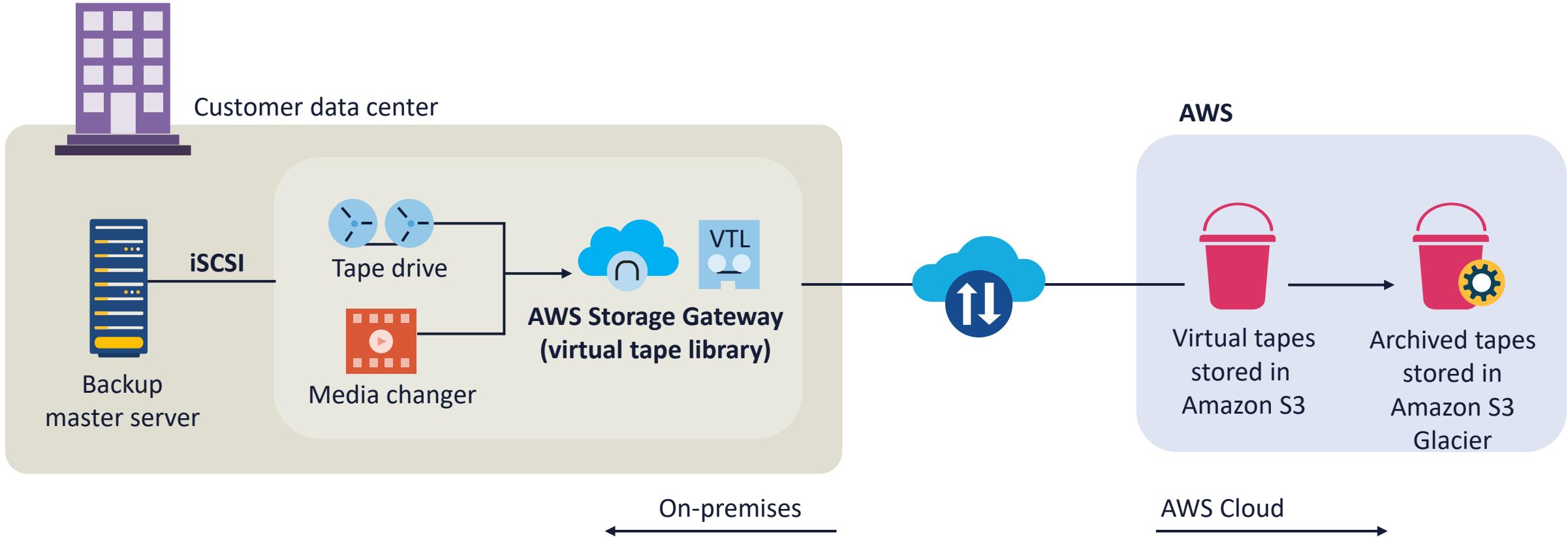




Tape Replacement

- With Storage Gateway, customers can retire physical tape libraries and replace them with sturdy and secure cloud-enabled storage solutions
 - This enables IT groups to transfer backup jobs from on-premises tape or virtual tape library systems to AWS without disrupting existing on-premises workflows
- The Storage Gateway's virtual tape library interface can help customers update their backup infrastructure, lower the need to transport storage media to and from offsite facilities, and remove upfront capital investments of maintaining old tape media

Tape Replacement



Database Backup

- AWS provides the widest array of database services to support virtually any use case
- Services such as Amazon Relational Database Service (Amazon RDS) and Amazon DynamoDB have built-in backup functionalities to protect data and related applications
- Customers can also use EBS snapshots to backup Amazon EBS volumes that support other database services running on Amazon EC2



Database Backup



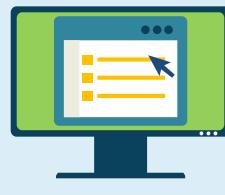
Apply S3 storage class analysis

S3 storage class analysis can be configured to monitor objects by S3 bucket, prefix, or object tag



Identify data sets to transfer

Use reports from S3 storage class analysis to identify data sets for transition to other storage class or expiration



Configure an S3 life cycle policy

An S3 life cycle policy is a set of rules that define actions for a data set – by S3 bucket, prefix, or object tag



Specify the policy type

There are two policy types: *transitions* that move objects to other storage classes and *expirations* that delete objects



Realize storage efficiencies

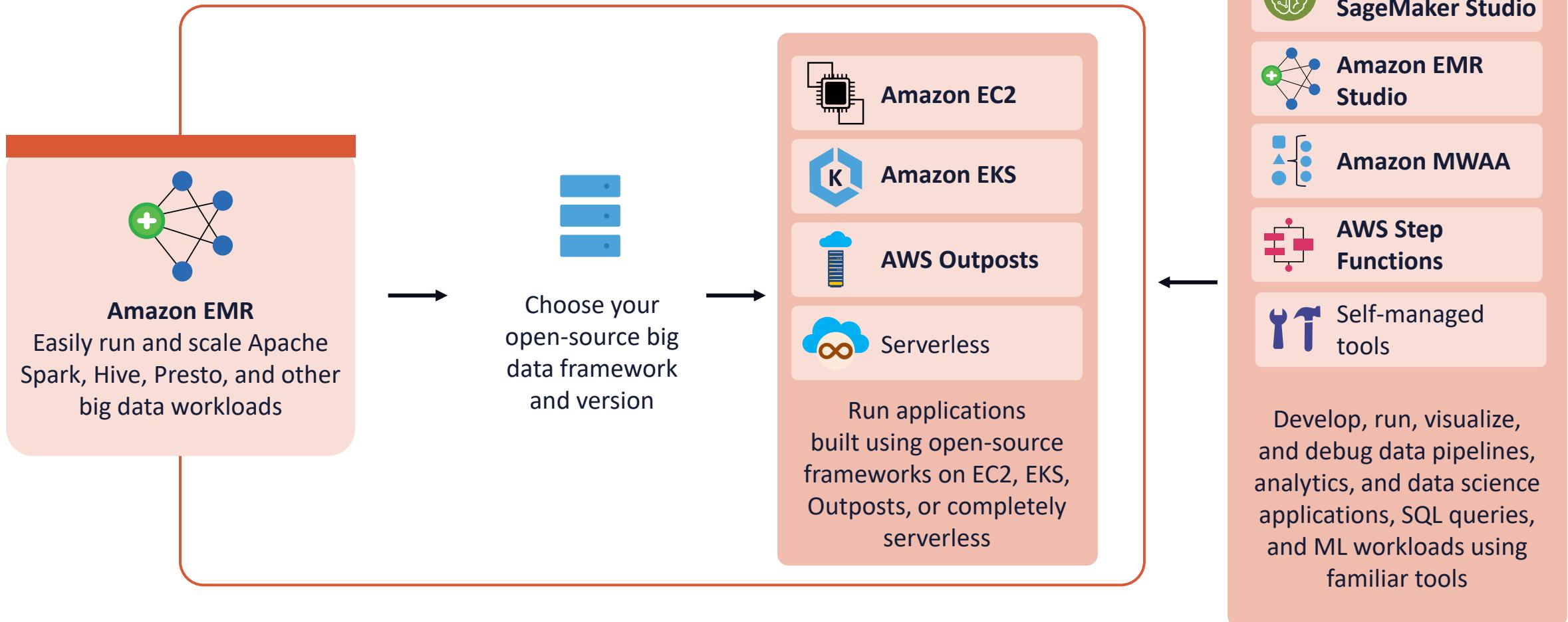
After configured, S3 life cycle policies automate tiering and expiration of data sets for cost saving and resource optimization

Amazon EMR

- Amazon EMR (Formerly Amazon Elastic MapReduce) is the industry-leading cloud big data solution for petabyte-scale data processing, interactive analytics, and machine learning
- It utilizes open-source frameworks such as Apache Spark, Apache Hive, and Presto
- **EMR Serverless is a new option in EMR**
 - It makes it simple and cost-effective for engineers and analysts to run applications built using open-source big data frameworks like Apache Spark, Hive, or Presto
 - There is no need to tune, operate, optimize, secure, or manage clusters



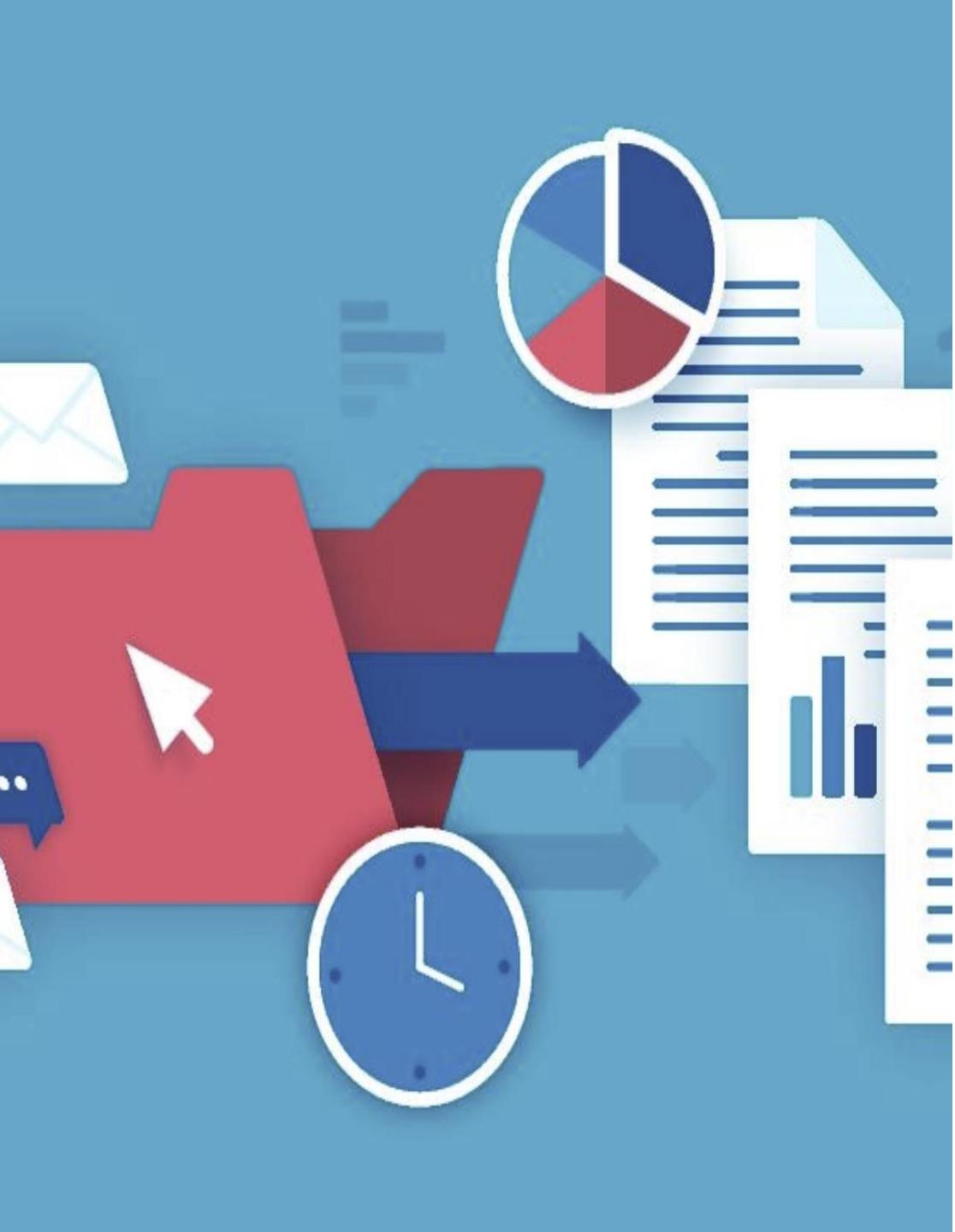
Amazon EMR



Amazon EventBridge

- Amazon EventBridge is a serverless event bus to assist customers in constructing event-driven or SaaS applications at scale
- The event bus delivers streams of real-time data from event sources such as Shopify to targets like AWS Lambda and other SaaS applications
- Customers can accelerate modernizing and re-orchestrating their architecture with decoupled services and applications
- Leverage AWS AI/ML services and get valuable insights

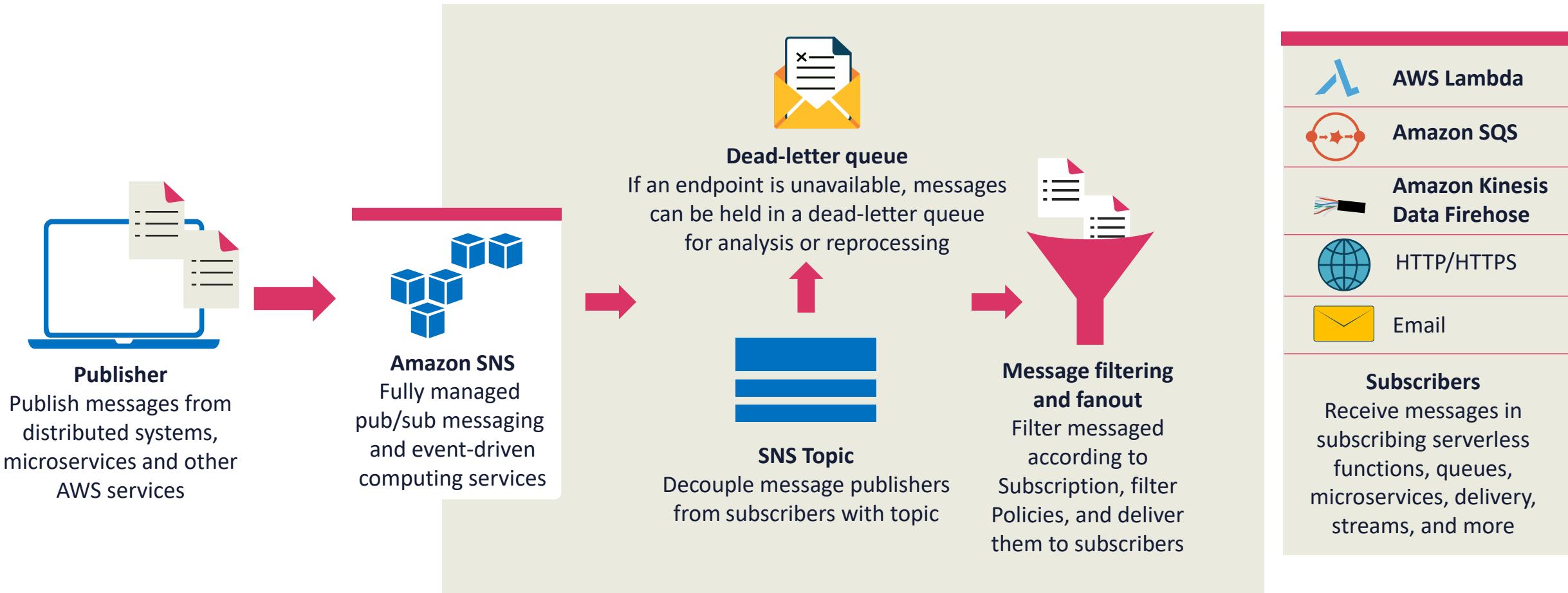




Amazon Simple Notification Service (Amazon SNS)

- Amazon Simple Notification Service (Amazon SNS) sends notifications two ways, A2A and A2P
- A2A offers high-throughput, push-based, many-to-many messaging between distributed systems, microservices, and event-driven serverless applications
 - Applications include Amazon Simple Queue Service (SQS), Amazon Kinesis Data Firehose, AWS Lambda, and other HTTPS endpoints
- A2P functionality lets you send messages to customers with SMS texts, push notifications, and email

Amazon Simple Notification Service

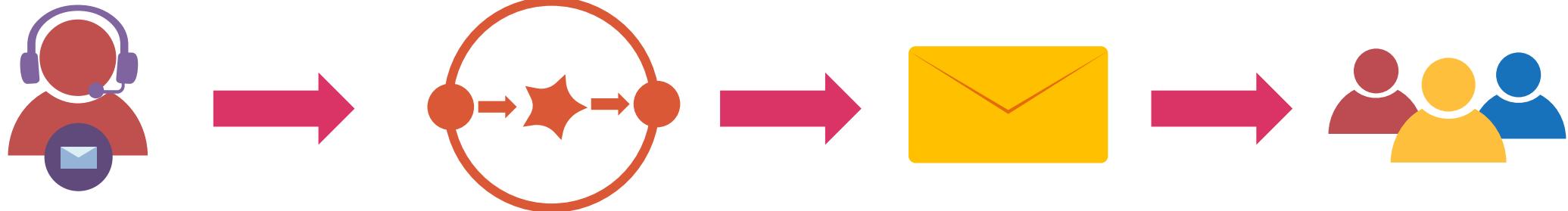


Amazon Simple Queue Service (Amazon SQS)

- Amazon Simple Queue Service is a fully managed message queuing for microservices, distributed systems, and serverless applications
- SQS lets customers send, store, and receive messages between application components at any volume, without losing messages or requiring other services
- Sensitive data can be securely sent between applications and the keys managed with KMS



Amazon Simple Queue Service



Producer

Sends messages to Amazon SQS

Amazon SQS

Fully-managed message queuing service to reliably and continually exchange any volume of messages from anywhere

Encryption

Messages are encrypted at rest (AWS KMS) and in flight with HTTPS/TLS

Consumers

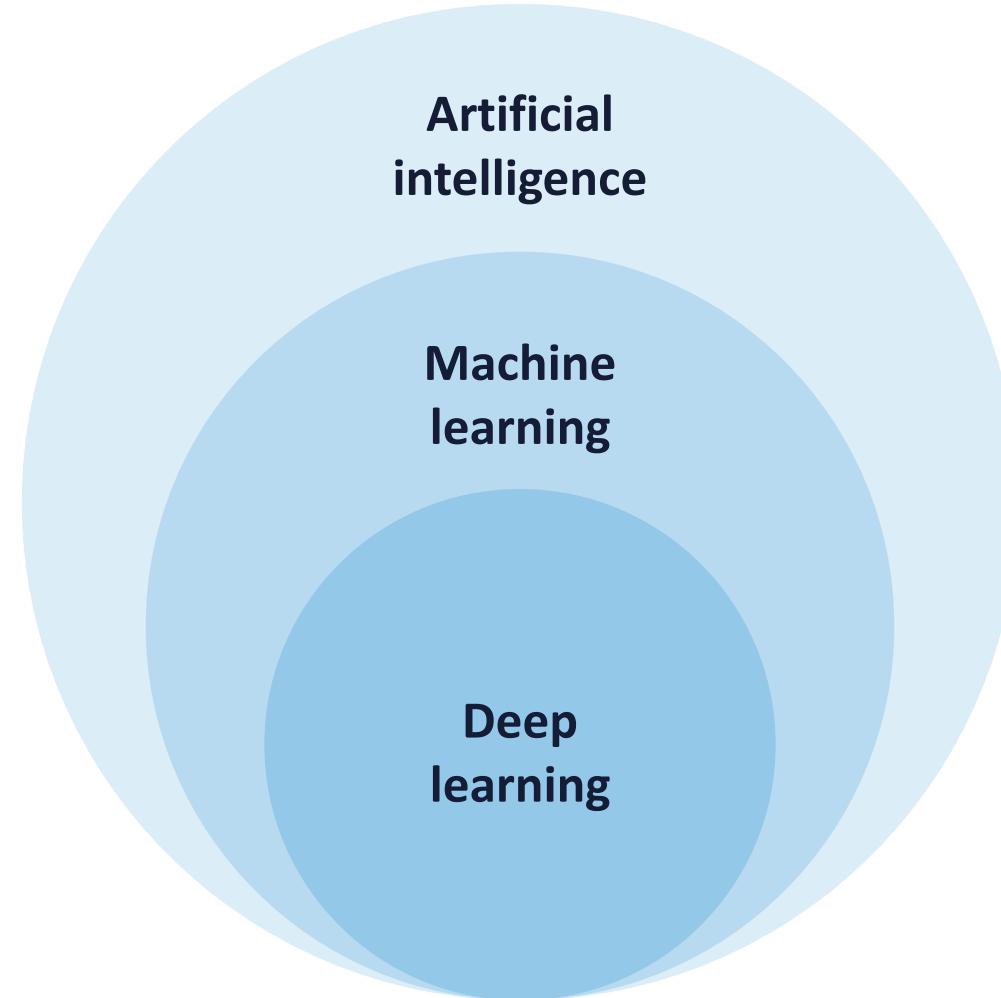
Nearly infinite scalability and ability to increase message throughput to consumer without the need to pre-provision capacity



Artificial Intelligence in a Nutshell

- According to Amazon Web Services (AWS), artificial intelligence (AI) is a technology that simulates human intelligence to solve problems
- AI can make data-based predictions and recognize images, and write text
- This is a domain of computer science focused on solving cognitive problems universally associated with human intelligence:
 - Learning
 - Problem solving
 - Pattern recognition

Artificial Intelligence (AI)





Machine Learning in a Nutshell

- Machine learning assists organizations in generating growth, discovering new revenue streams, and fixing challenging issues
- Data is a critical success factor (CSF) in business decision-making, and companies have typically leveraged data from various sources, such as customer feedback, employees, finance, and consultants:
 - ML research automates and optimizes this process
 - Businesses can get results quicker by using code that analyzes very large data sets at high speeds

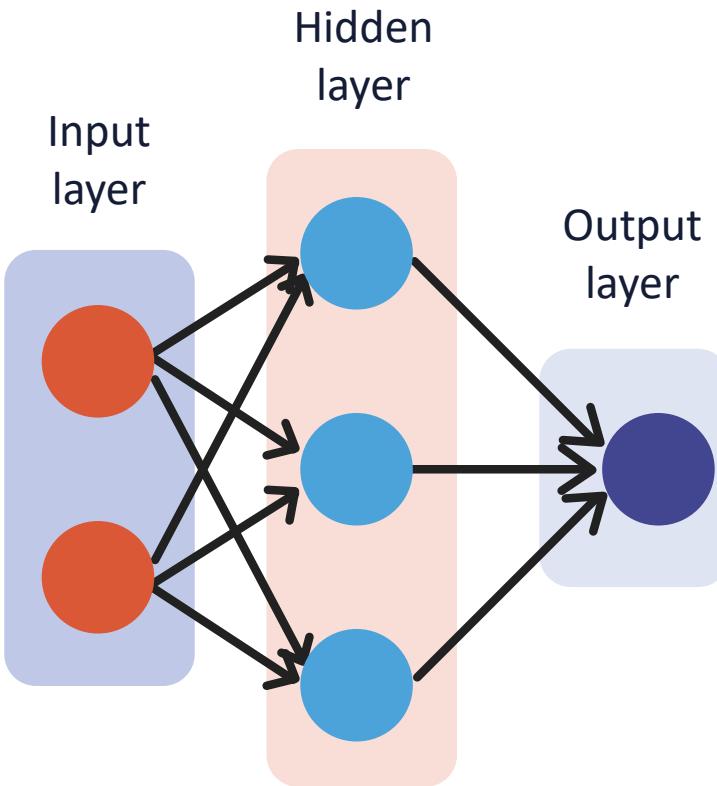
Neural Networks

- **Neural networks** are a technique in artificial intelligence that teaches computers to process data in a way that is motivated by the activities of the human brain
- It is a type of ML process, called deep learning, that uses interconnected nodes or neurons in a layered structure that resembles the human brain

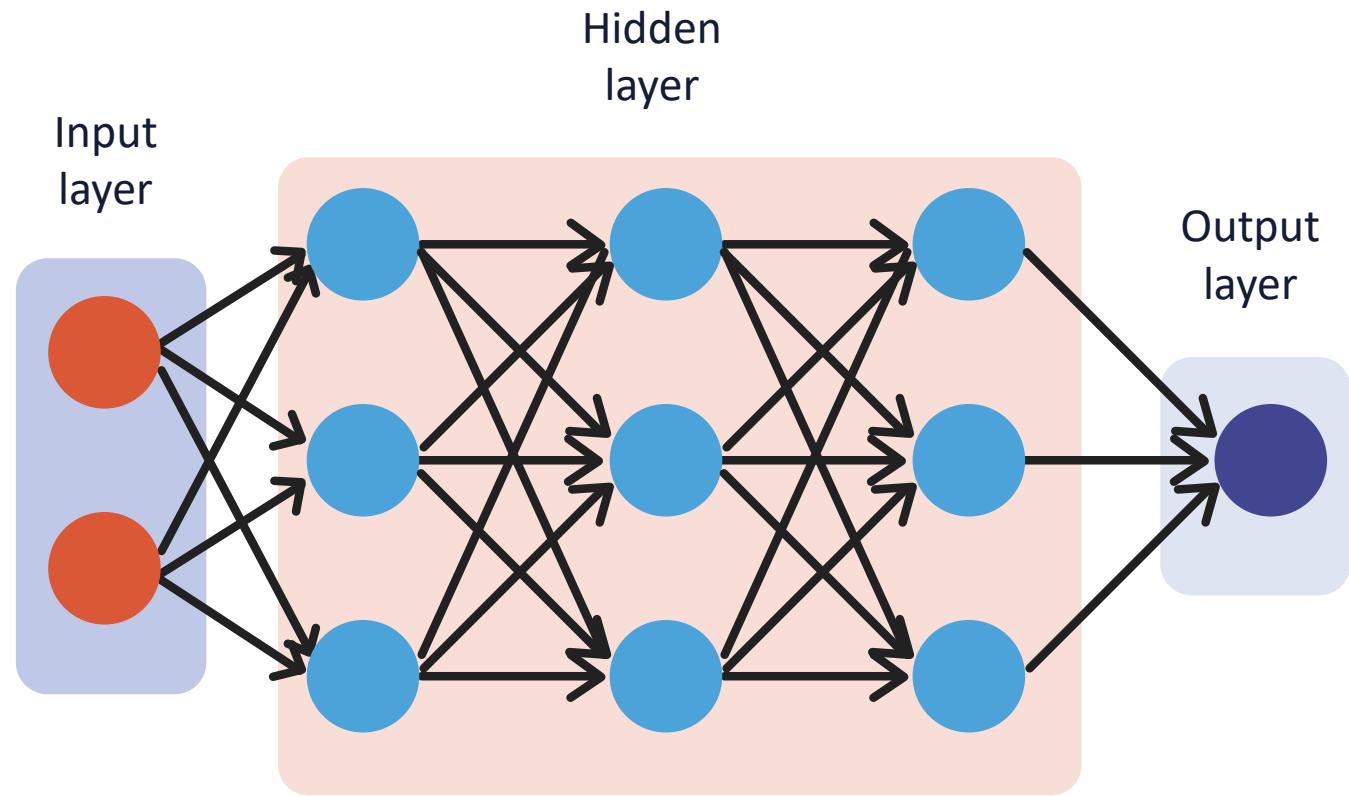


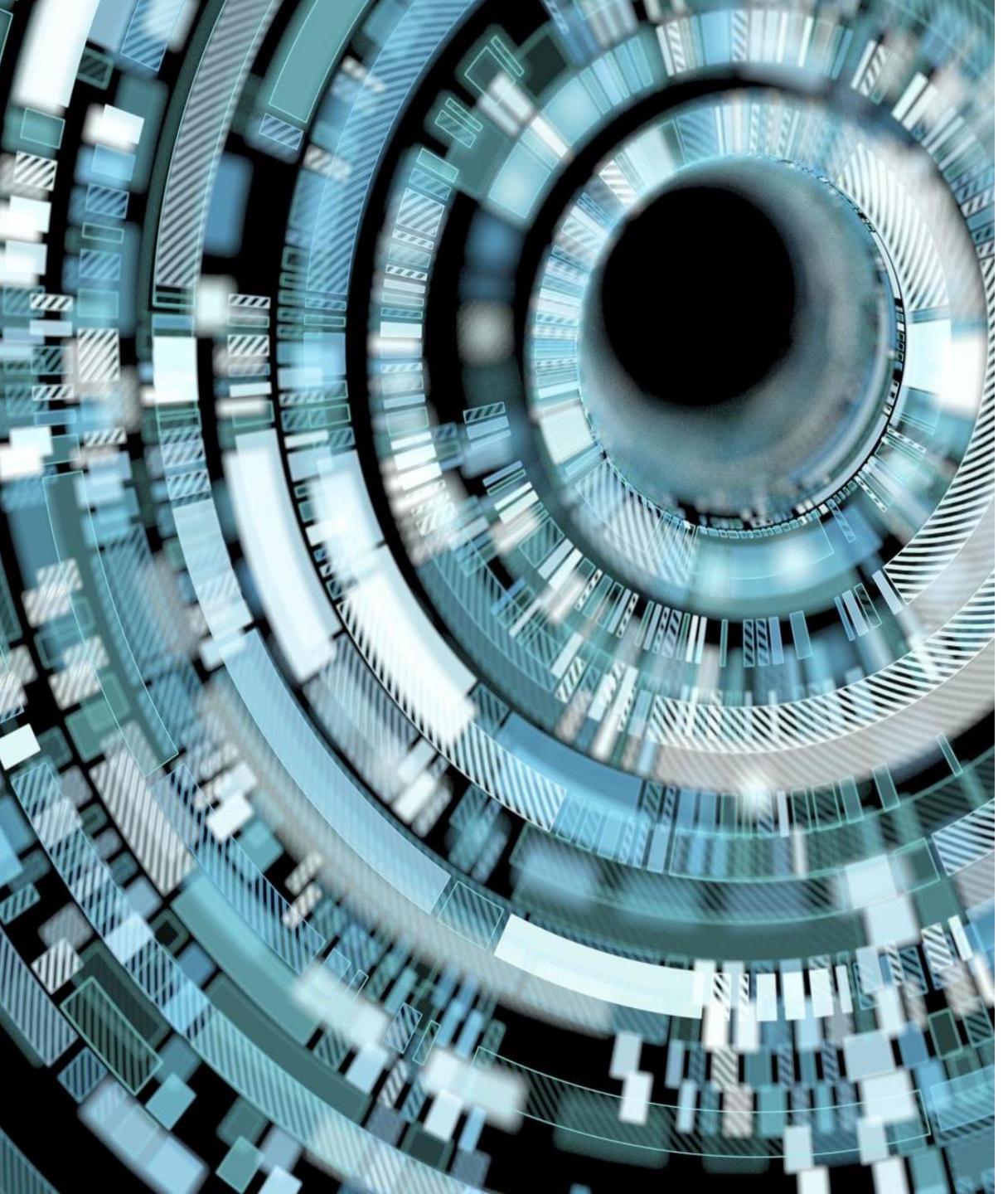
Neural Networks

Neural network



Deep neural network



A complex, abstract circular pattern composed of numerous overlapping and nested concentric circles. The colors are primarily shades of blue, ranging from light cyan to dark slate. The pattern has a high-tech, futuristic, and slightly blurred aesthetic, resembling a digital interface or a microscopic view of a complex system.

Amazon SageMaker

- SageMaker empowers AWS customers to build, train, and deploy machine learning models for any use case with fully managed infrastructure, tools, and workflows
- Amazon SageMaker JumpStart offers a set of solutions for common use cases that can be deployed with just a few clicks to make it easier to get started
- The solutions are fully customizable and support one-click deployment and fine-tuning of more than 150 popular open-source models such as natural language processing, object detection, and image classification



Amazon Bedrock

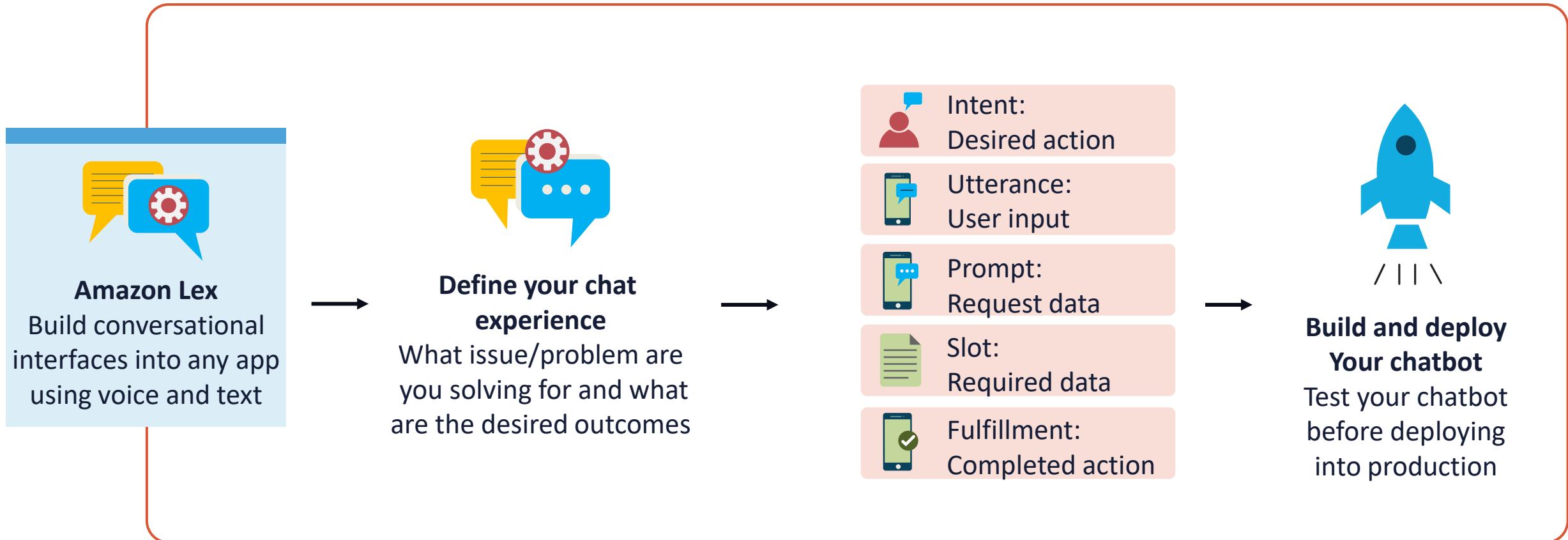
- Generative AI is a type of AI that can create new content and ideas, including conversations, stories, images, videos, and music
- Amazon Bedrock is a fully managed service that provides access to high-performing foundation models (FMs) from leading AI companies and Amazon through a single API, enabling users to build and scale generative AI applications with security, privacy, and responsible AI
- It allows users to experiment with, customize, and deploy FMs without managing infrastructure

Amazon Lex

- Amazon Lex is a fully managed artificial intelligence service with cutting-edge natural language models for designing, constructing, testing, and releasing conversational interfaces in applications and mobile apps:
 - Virtual agents and voice assistants
 - Informational response automation
 - Application bots for enhancing productivity
 - Chatbots using existing contact center transcripts

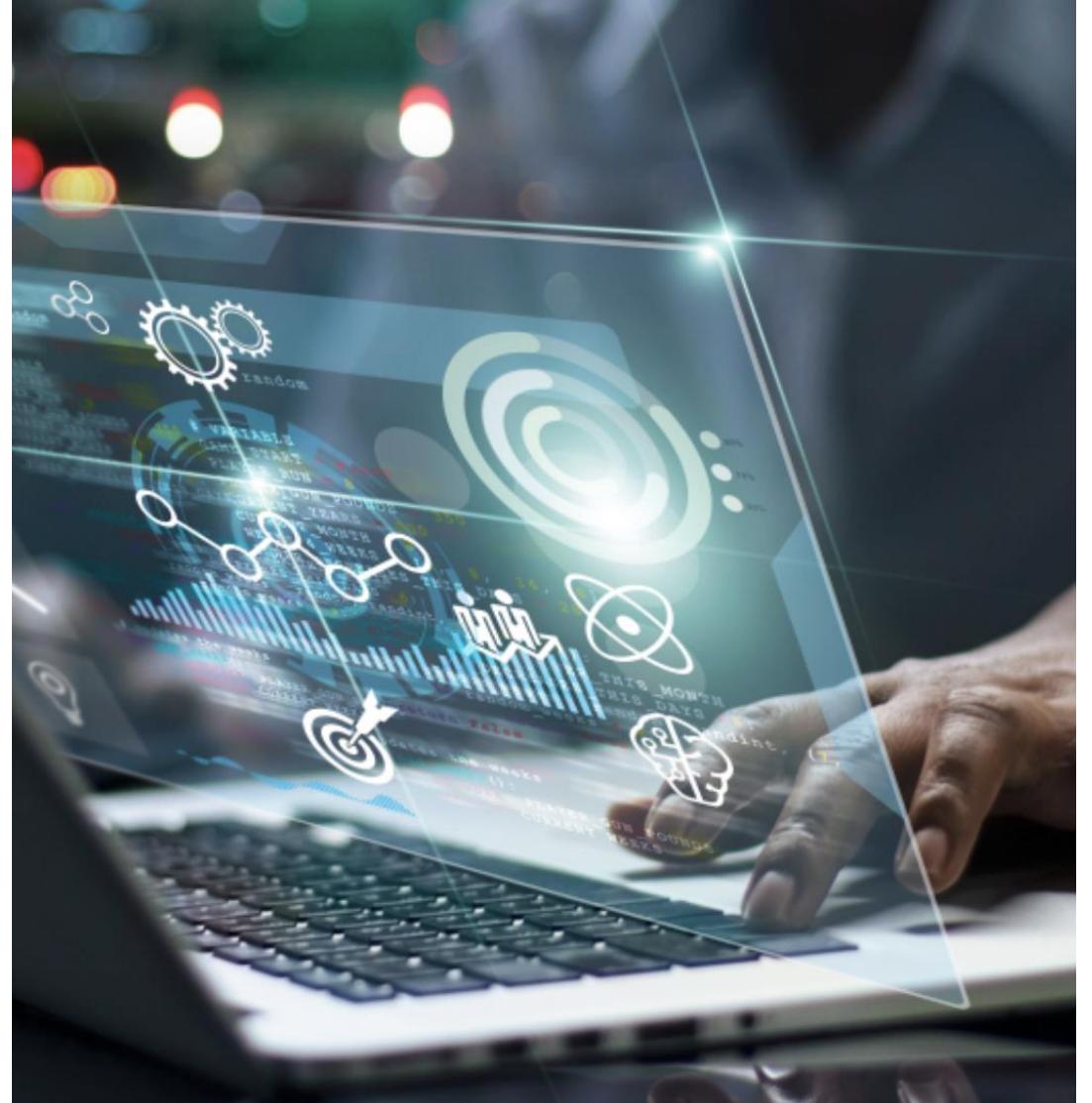


Amazon Lex

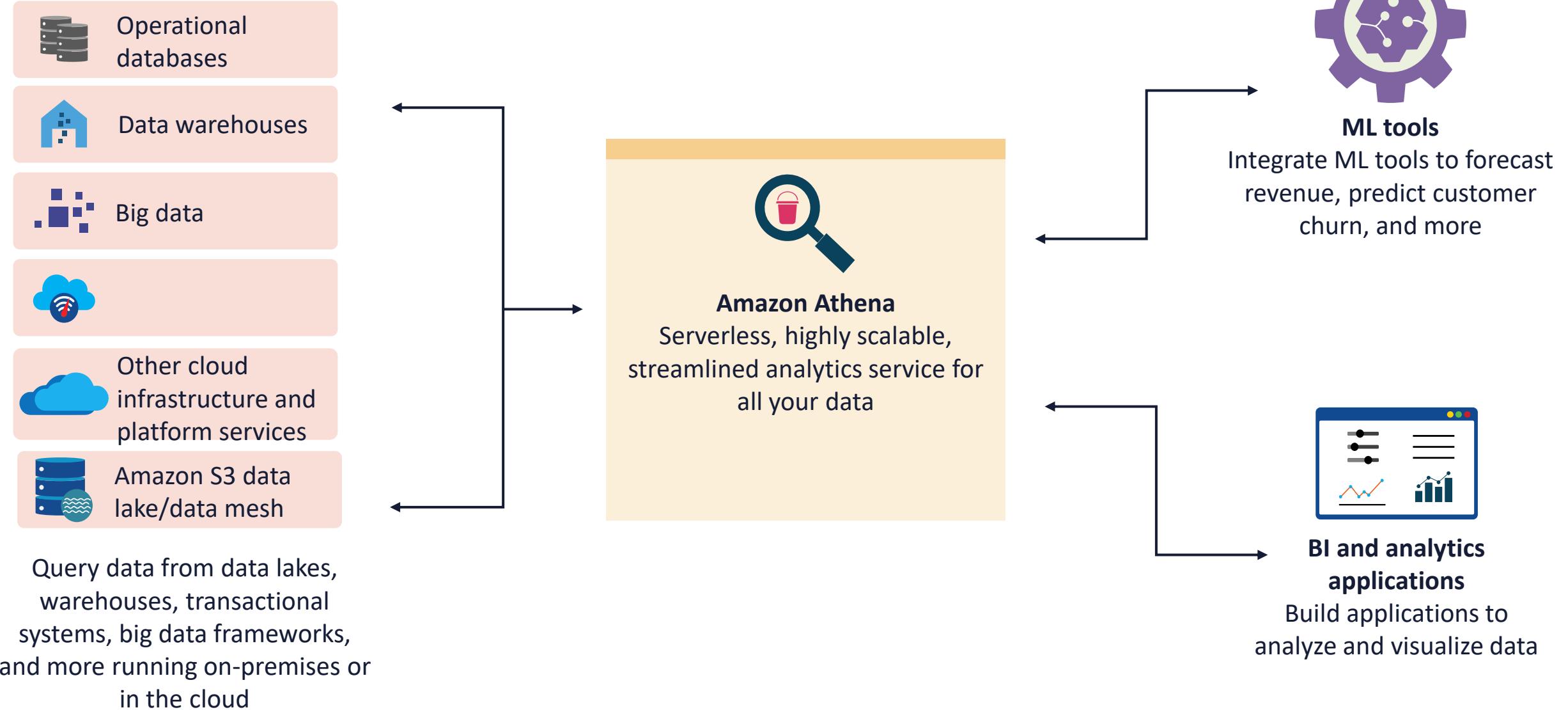


Amazon Athena

- Amazon Athena is a serverless, interactive analytics solution built on open-source frameworks
- Customers use Athena to analyze data or build applications from an Amazon S3 data lake and 30 data sources, including on-premises data sources or other cloud solutions using SQL or Python
- Athena is built on open-source Trino and Presto engines and Apache Spark frameworks



Amazon Athena





Amazon Kinesis

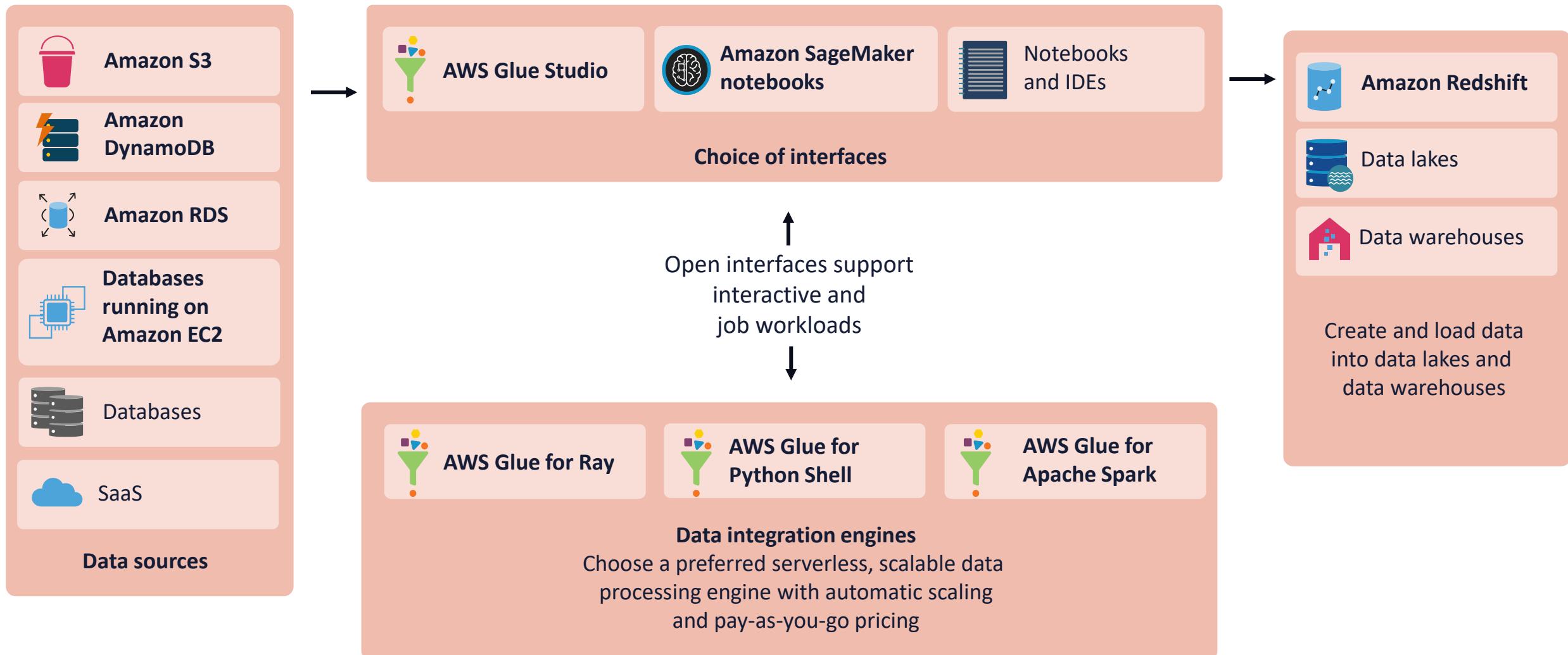
- With Amazon Kinesis customers can collect, process, and analyze real-time, streaming data to gain timely insights and react quickly to new information
- Customers can ingest real-time data such as video, audio, application logs, website clickstreams, and IoT telemetry data for machine learning, analytics, and other applications
- They can process and analyze data as it arrives and respond instantly instead of having to wait until all the data is collected before the processing can begin

AWS Glue

- AWS Glue is a serverless data integration service that makes it easier to discover, prepare, move, and integrate data from multiple sources
- Glue is used for analytics, ML, and application development
- AWS customers can use Glue to
 - Discover and connect to over 70 varied data sources
 - Manage data in a centralized data catalog
 - Visually create, run, and monitor ETL pipelines to load data into data lakes



AWS Glue



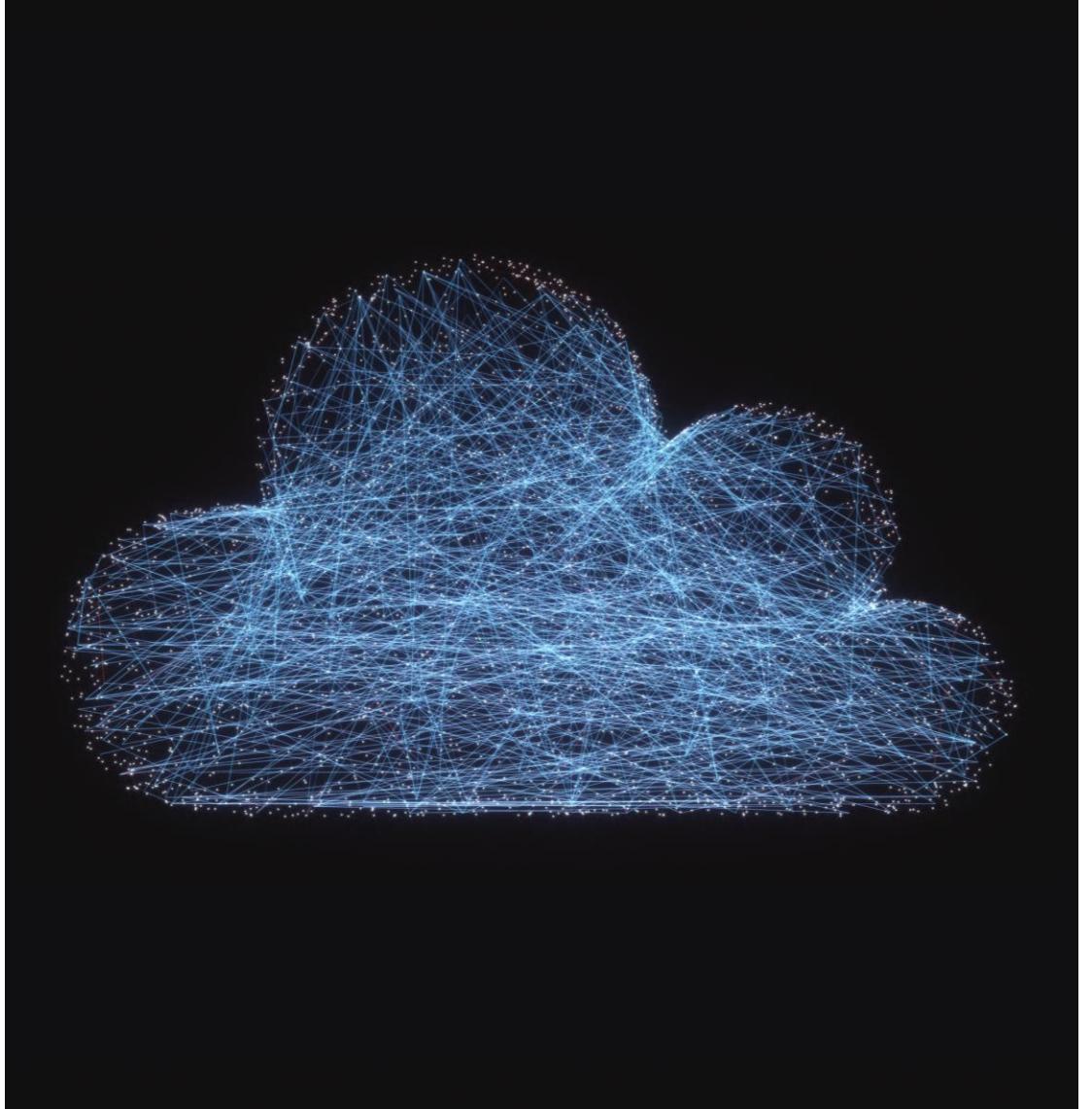
A photograph of several lightbulbs hanging from wires against a dark background. One lightbulb in the center is brightly lit, while the others are dark and out of focus.

Amazon QuickSight

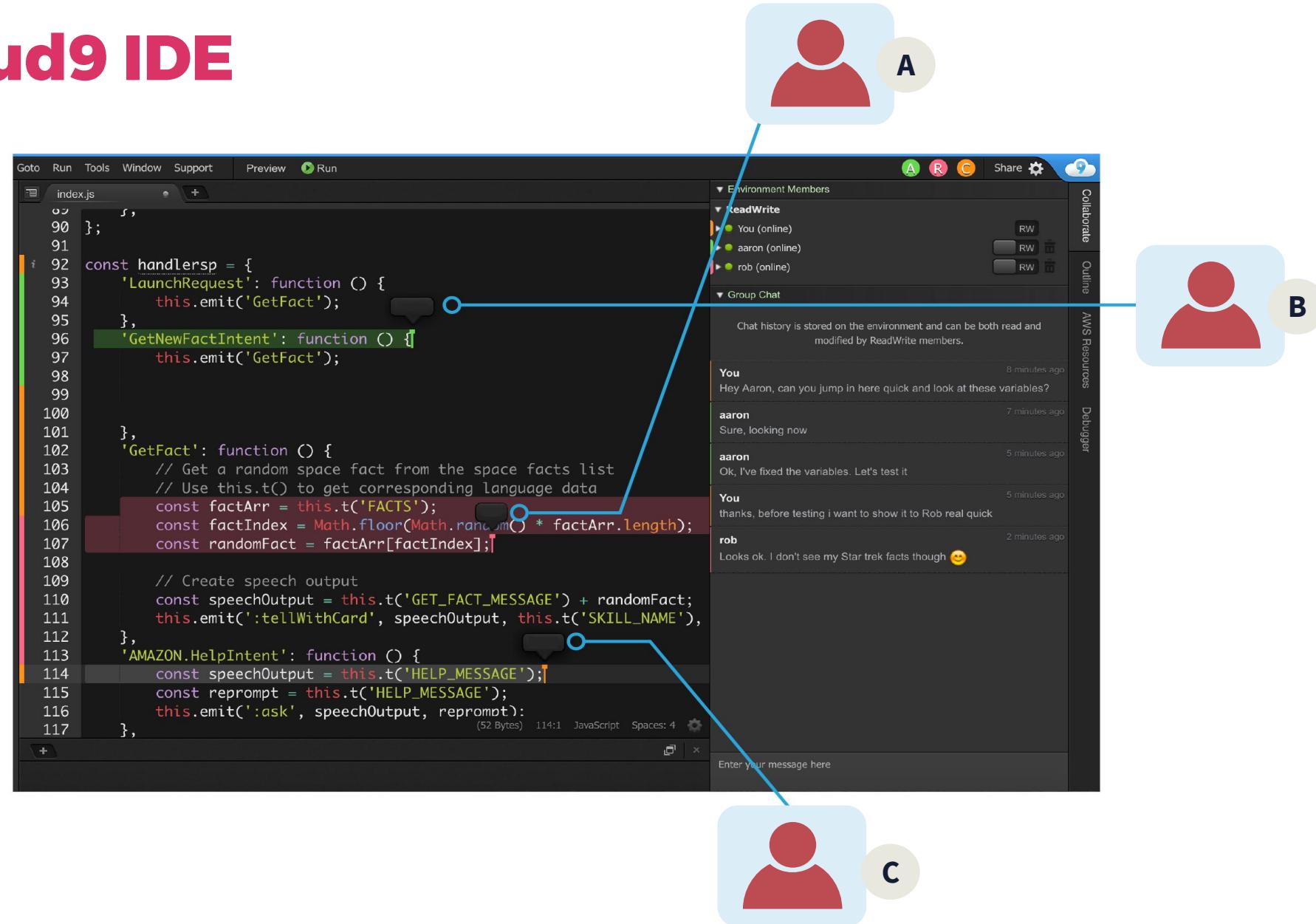
- QuickSight is a popular cloud-native, serverless Business Intelligence (BI) service
- Customers can easily embed analytics to differentiate their applications in a scalable way
- End-users can ask questions in their natural language and receive answers with pertinent visualizations
- Business analysts can generate and share pixel-perfect dashboards and visualizations without needing any client software or a server infrastructure

AWS Cloud9

- AWS Cloud9 is a cloud-based integrated development environment (IDE) that enables DevOps professionals to construct, run, and debug the code with only a browser
 - It includes a code editor, debugger, and terminal
- Cloud9 comes prepackaged with vital tools for popular programming languages, including JavaScript, Python, and PHP
- There is no need to install files or configure the development machine for new projects



AWS Cloud9 IDE



AWS CloudShell



AWS CloudShell
CloudShell provides command line access to AWS resources and tools directly from a browser



CloudShell comes with popular development tools preinstalled as well as common AWS CLIs and other tools



Store up to 1 GB of data per region in a persistent home directory that will be available the next time you launch CloudShell in the same region



AWS AppConfig

- **AWS AppConfig is a feature of AWS Systems Manager** that enables customers to generate, manage, and rapidly install application configurations
 - A configuration is a pool of settings that impact the functionality of applications
 - AppConfig is used with applications hosted on EC2 instances, AWS Lambda, containers, mobile applications, or Internet of Things (IoT) devices

Survey of Developer Services

AWS CodeArtifact

A managed artifact **repository** service that lets you securely store, publish, and share software packages



AWS CodeBuild

A fully-managed continuous integration service that **compiles** source code, runs tests, and produces ready-to-deploy software



AWS CodeCommit

A managed source control service that makes it easier to securely host highly scalable private **Git repositories**



AWS CodeDeploy

A fully-managed deployment service that **automates software deployments** to various compute services, such as EC2

Survey of Developer Services

AWS CodePipeline

a fully managed **continuous delivery** service that automates release pipelines for fast and reliable application and infrastructure updates



AWS CodeStar*

Enables rapid developing, building, and deploying applications with a unified user interface

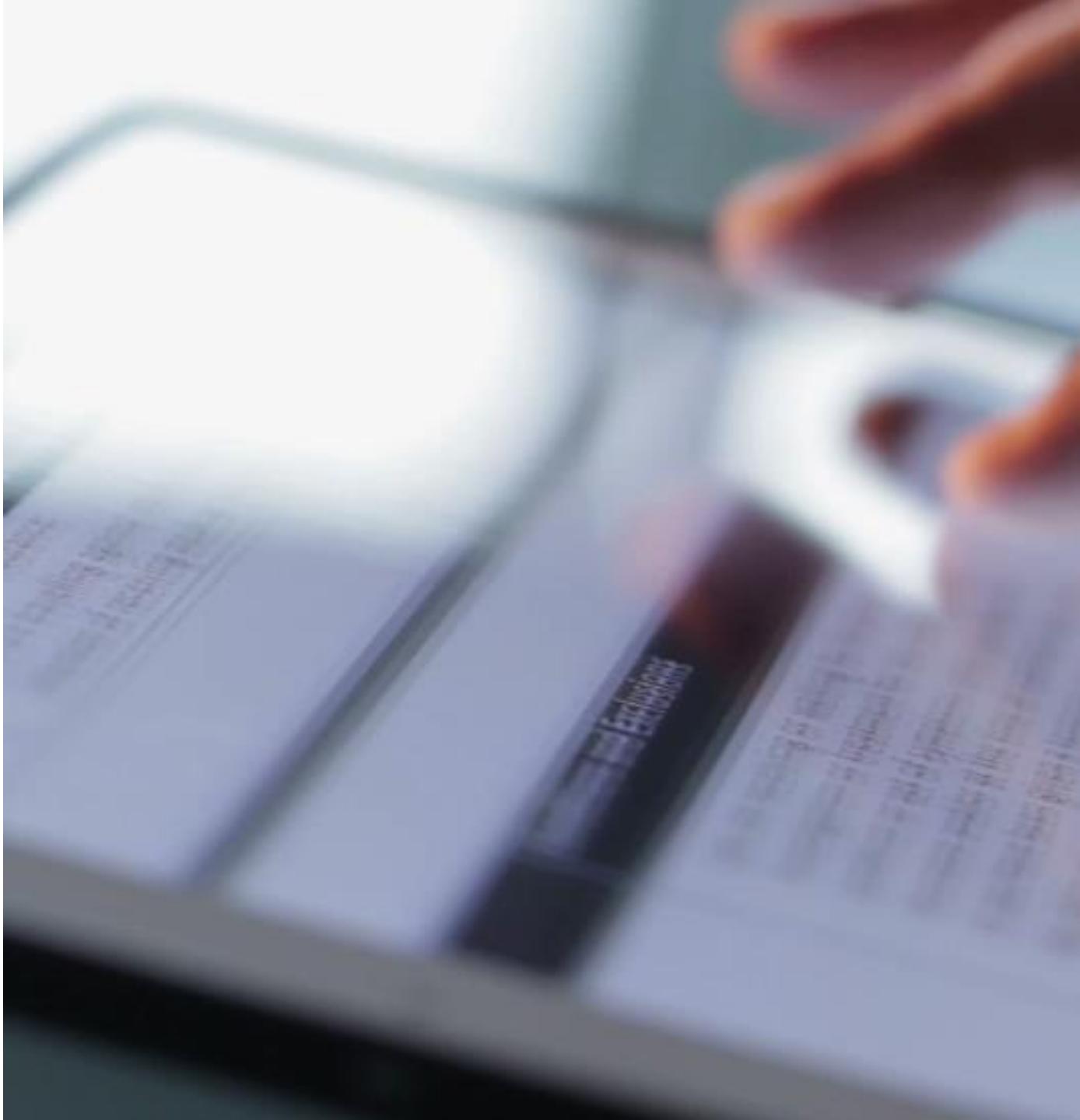


AWS X-Ray

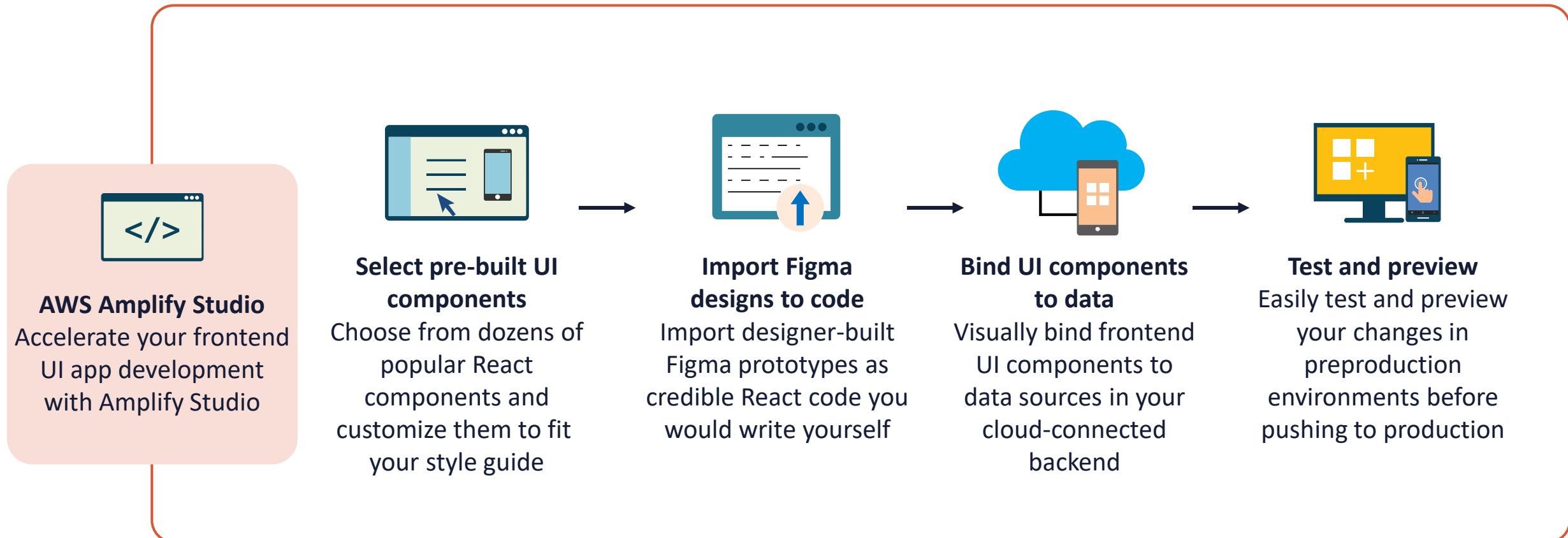
Offers a complete **view of requests** as they travel through the application and filters visual data across payloads, functions, traces, services, APIs, and more

AWS Amplify

- AWS Amplify is a total solution that enables frontend web and mobile developers to rapidly and seamlessly build, deploy, and host full stack applications on AWS
- It has the flexibility to leverage the range of AWS services as use cases introduce themselves without any necessary cloud expertise
- **Although one can make a free-tier static website with S3 buckets, AWS recommends Amplify**



Create a Frontend UI With AWS Amplify

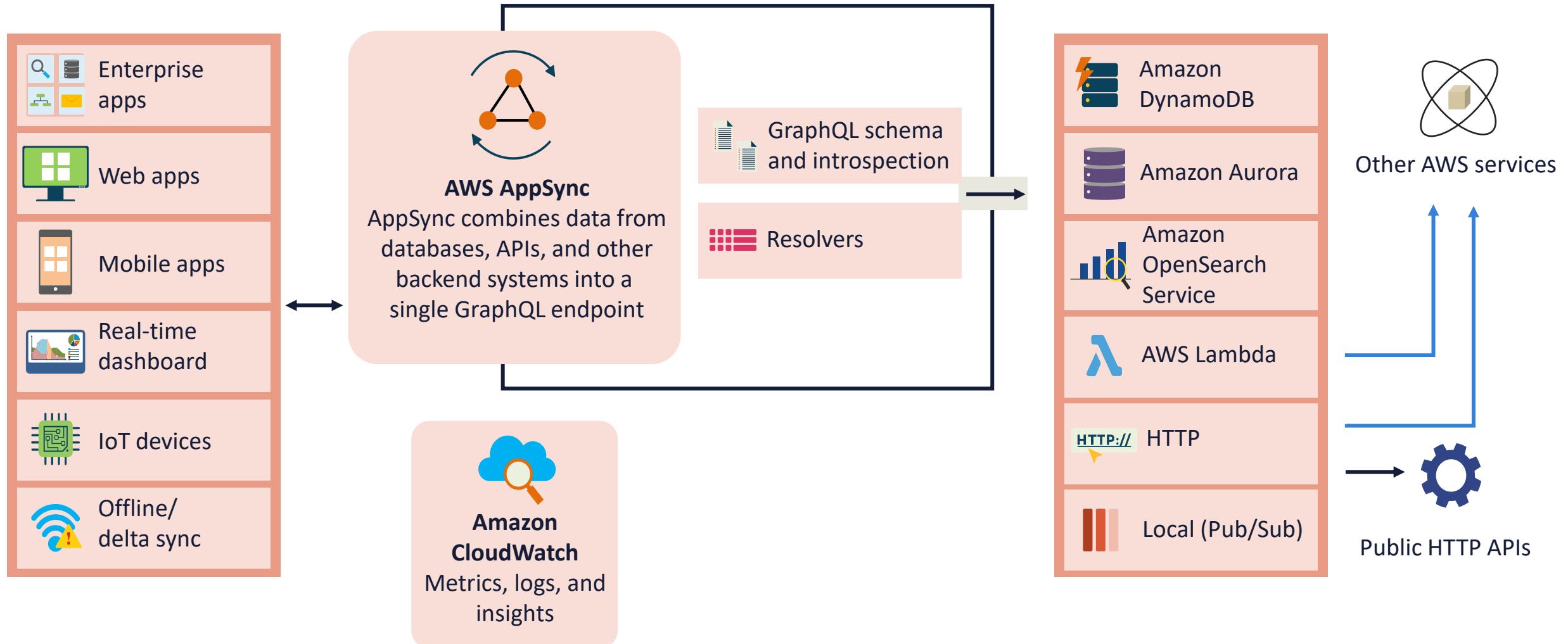




AWS AppSync

- AWS AppSync generates serverless **GraphQL** and pub/sub APIs that make application development easy
- It offers a single endpoint to securely query, update, or publish data
- Customers can connect apps to data and events with secure, serverless, and high-performing APIs

AWS AppSync



End User Computing (EUC) Services

- **Amazon AppStream 2.0** is a fully-managed non-persistent desktop and application service for remotely accessing work
- **Amazon WorkDocs & WorkSpaces** bundle is a managed, content creation, file collaboration, secure cloud desktop service
- **Amazon WorkSpaces Web** is a low cost, fully-managed, Linux-based service, designed to facilitate secure browser access to internal websites and SaaS applications from existing web browsers, without appliances, infrastructure, special client software, or VPN connections





Amazon Connect

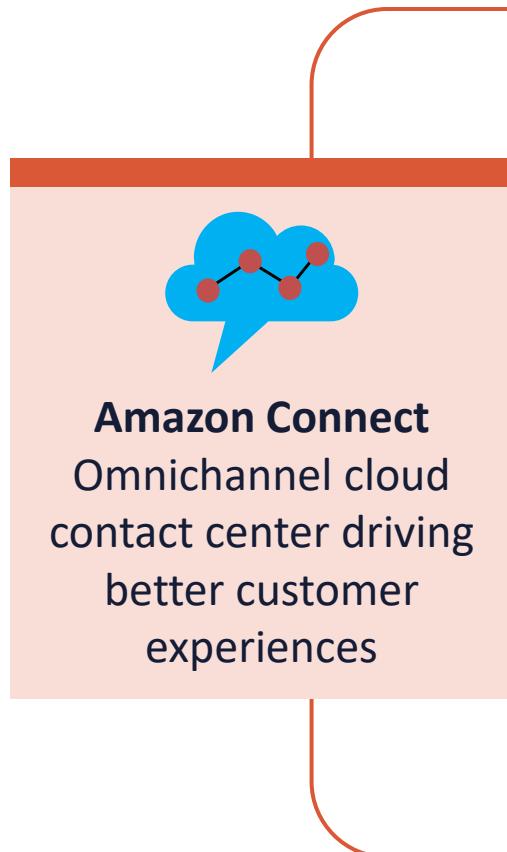
- Connect allows customers to roll out a scalable contact center in minutes
- Amazon Connect offers powerful analytics, insights, and optimization
- Customers can use a few clicks and onboard agents to assist customers immediately
- Expand agent productivity and customer experience over voice and digital channels with the AI/ML-powered contact center

Amazon Connect



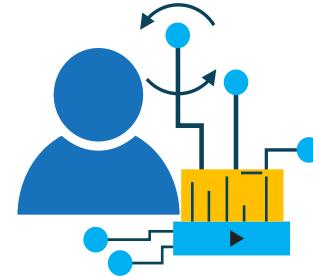
Customers

Fast, secure, high-quality, personalized customer service



Agents

Efficient tools in one UI to deliver productive customer conversations and improve CSAT



Managers

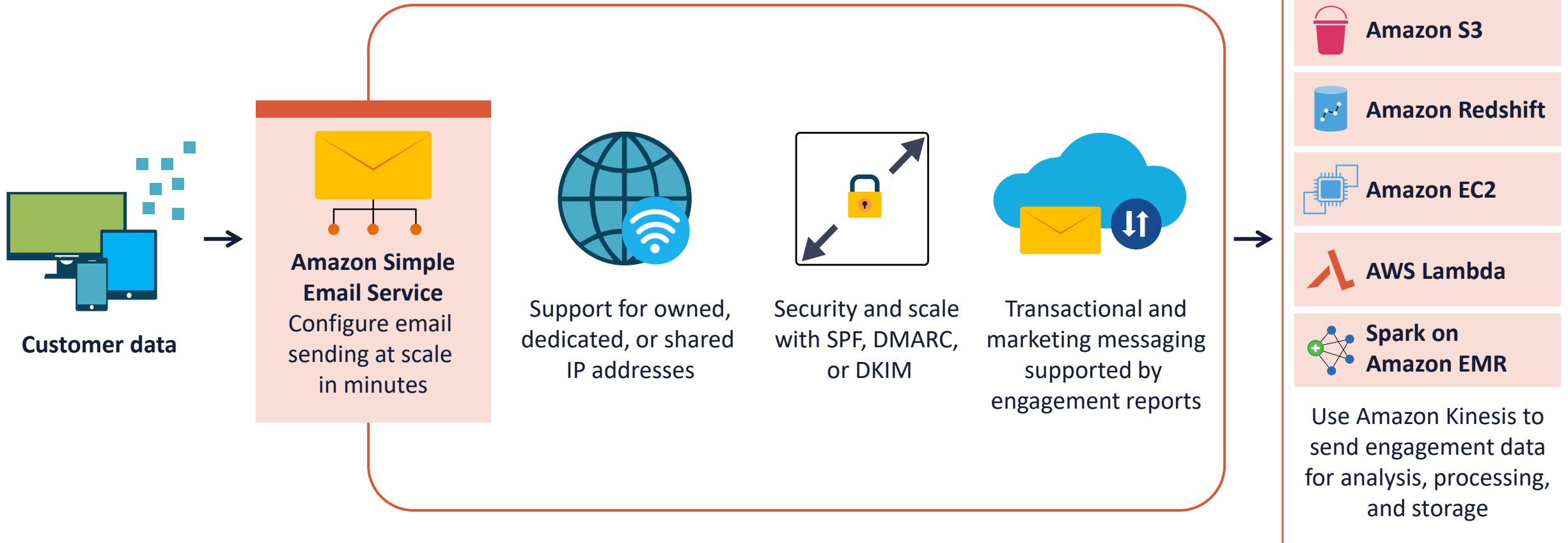
An ML-powered contact center you can set up quickly and make changes in minutes, not months

Amazon Simple Email Service (Amazon SES)

- Amazon Simple Email Service lets AWS customers reach *their* customers assertively without an on-premises Simple Mail Transfer Protocol (SMTP) email server
- It can use the Amazon SES API or SMTP interface



Amazon Simple Email Service





IoT Core

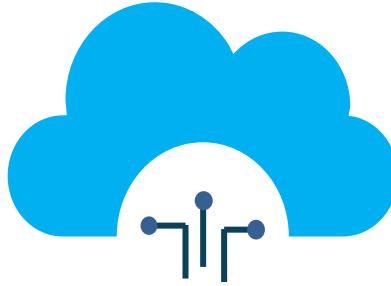
- AWS IoT Core lets customers potentially connect billions of IoT devices and route trillions of messages to AWS services without managing an infrastructure
- Provides secure device connections and data with mutual authentication and end-to-end encryption
- Customers can choose among several communication protocols including MQTT, HTTPS, MQTT over WSS, and LoRaWAN

AWS IoT Core



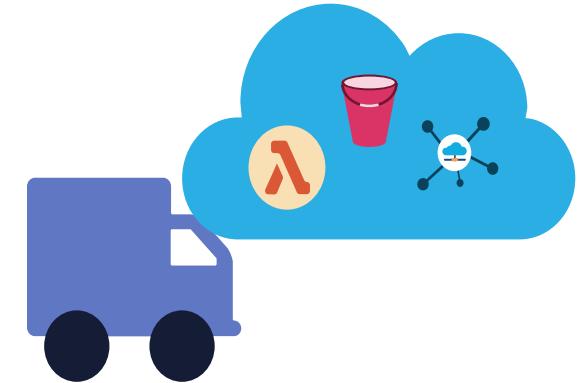
Devices publish & subscribe

Billions of devices can publish and subscribe to messages



AWS IoT Core

Messages are transmitted and received using the MQTT protocol which minimizes the code footprint on the device and reduces network bandwidth requirements



Devices communicate

AWS IoT Core enables devices to communicate with AWS services and each other

IoT Greengrass

- AWS IoT Greengrass is an open-source edge runtime and cloud service for building, deploying, and managing device software
- Greengrass makes it easy to bring intelligence to edge devices, such as for anomaly detection in precision agriculture or powering autonomous devices
- Collect, aggregate, filter, and send data locally or manage and control which data goes to the cloud for optimized analytics and storage



AWS Activate for Startups



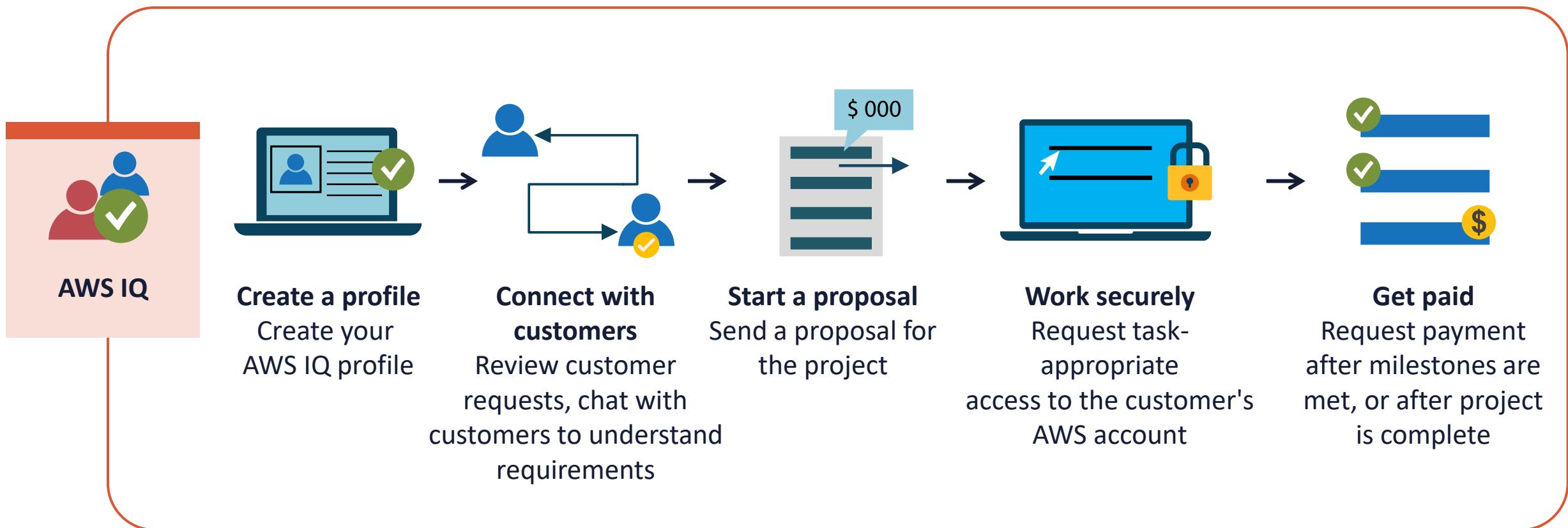
- AWS Activate offers eligible* startup organizations free tools, resources, and content meant to streamline every phase of the startup initiative
- New members get benefits such as:
 - AWS curated expert advice on business and technical needs
 - Training and support
 - Pre-built infrastructure templates
- Startups can apply for AWS Activate credits to offset their AWS bill and build a new scalable, dependable, secure, and efficient infrastructure

AWS IQ

- AWS IQ enables customers to quickly find, engage, and pay AWS Certified third-party experts for on-demand project work
- AWS IQ also makes it easy for you to use your AWS Certifications to help AWS customers
- With AWS IQ, you have a secure collaborative workspace for project consultations and an easy way to get paid



AWS IQ





AWS Managed Services (AMS)

- AWS AMS with the adoption of AWS at scale to operate more efficiently and securely
- Enables customers to leverage standard AWS services and offers guidance and execution of operational best practices with specialized automation, skills, and experience for:
 - Monitoring
 - Incident management
 - AWS Incident Detection and Response
 - Security
 - Patch and backup
 - Cost optimization

AWS Managed Services

