

Module 3: Building in the cloud

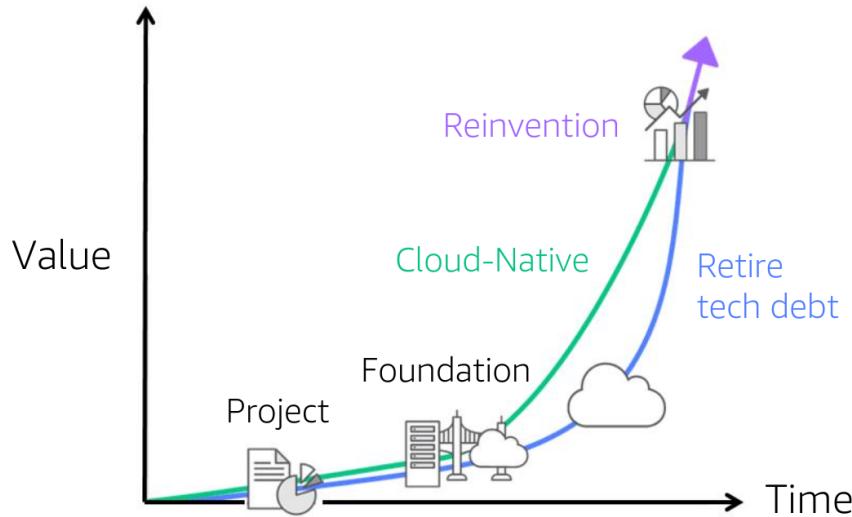
Navjot Singh
Technical Trainer
AWS



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Go beyond servers and storage

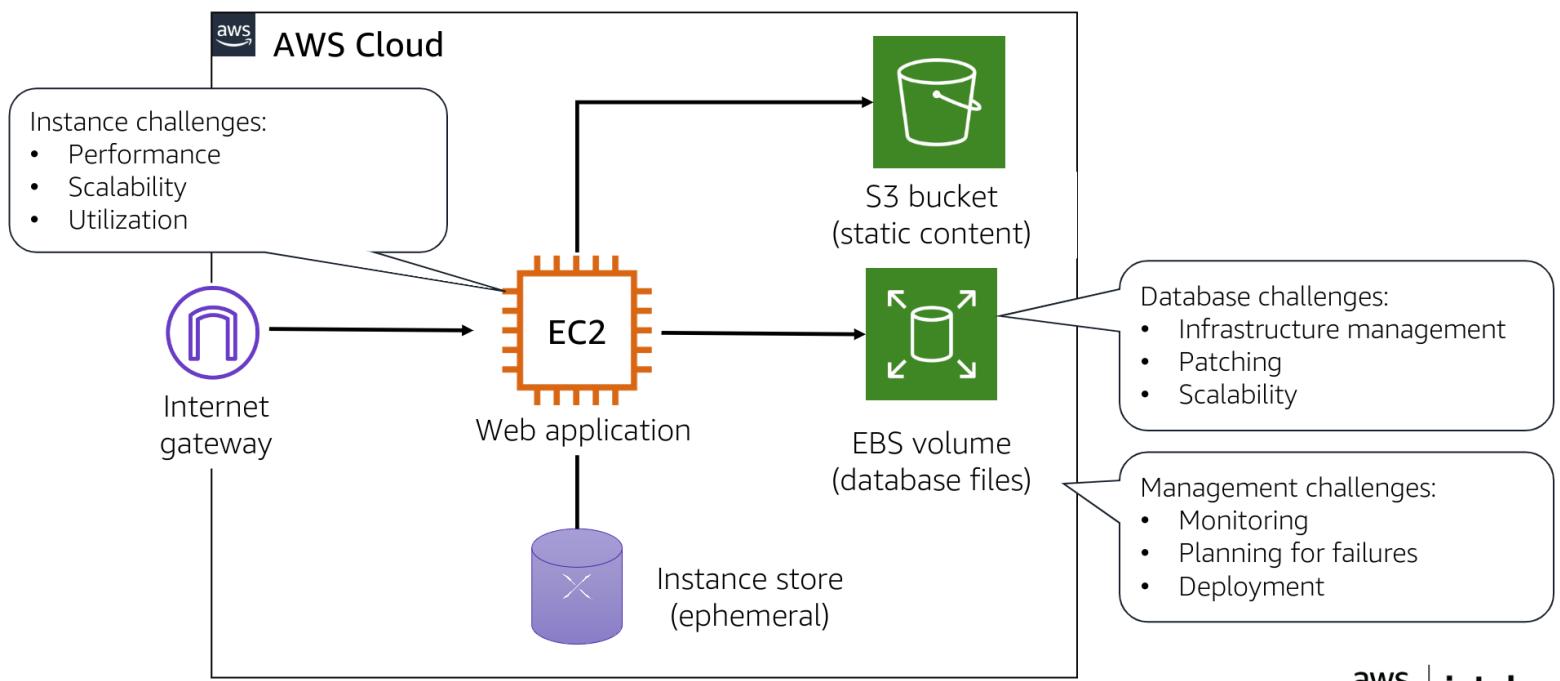
Migration and reinvention



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Improving your initial project

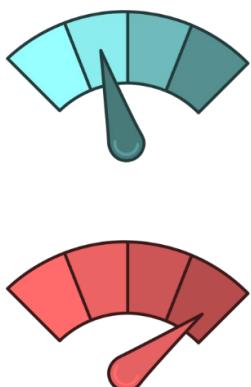


Monitor AWS resources

AWSOME DAY
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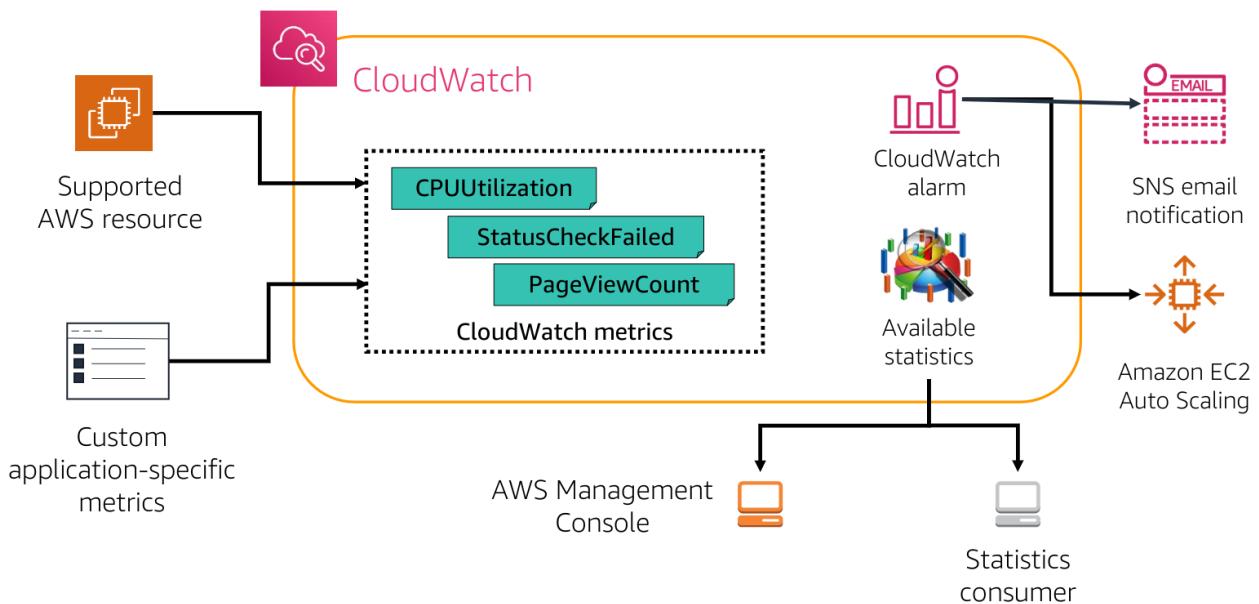
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What is Amazon CloudWatch?



- Monitors:
 - AWS resources
 - Applications running on AWS
- Collects and tracks:
 - Standard metrics
 - Custom metrics
- Alarms:
 - Send notifications
 - Automatically make changes based on rules you define

How CloudWatch works

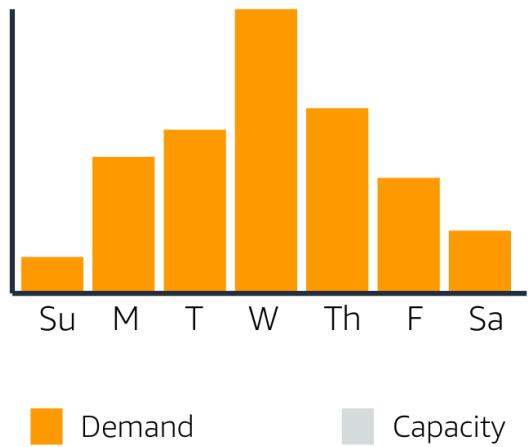


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Manage demand efficiently

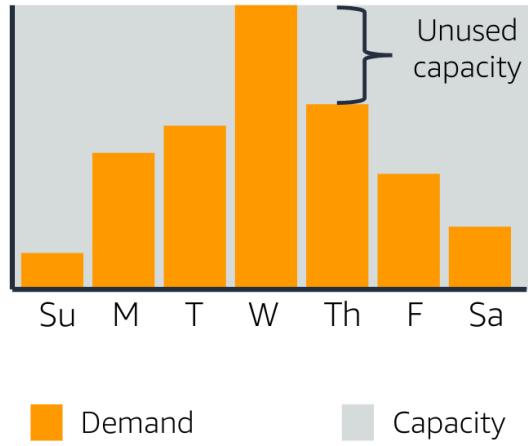
Why scaling matters



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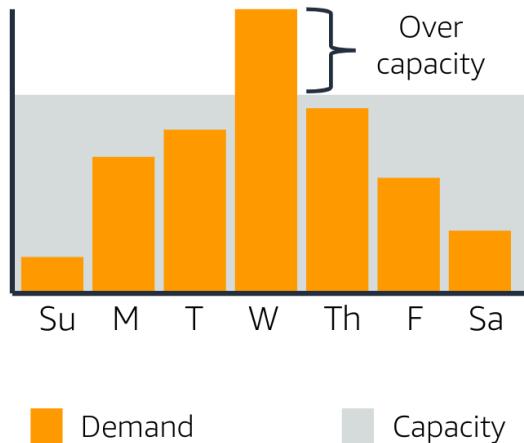
Why scaling matters



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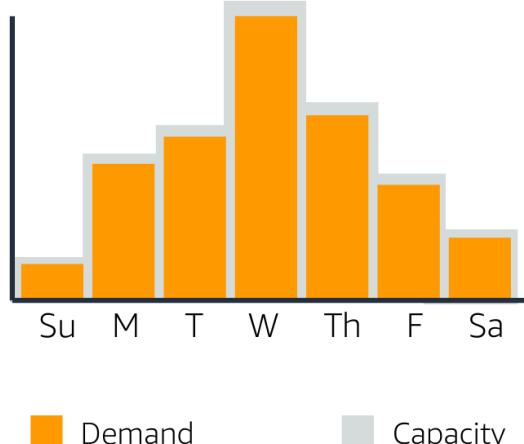
Why scaling matters



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Why scaling matters



Amazon EC2 Auto Scaling adjusts capacity as needed

- Scale out for spikes
- Scale in during off-peak
- Replace unhealthy instances
- Pay only for what you use

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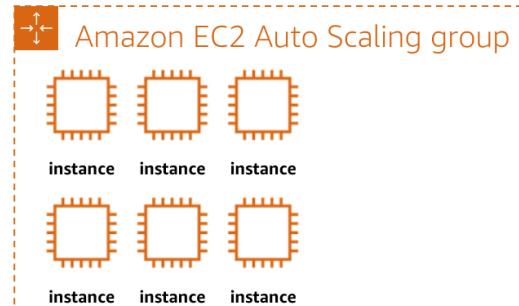


Dynamic scaling with Amazon EC2 Auto Scaling

Follow the demand curve for your applications

- Select a load metric for your application
- Set as conditional and/or scheduled
- Use with CloudWatch, optionally

Max	10
Min	2
Desired	6



Average Demand

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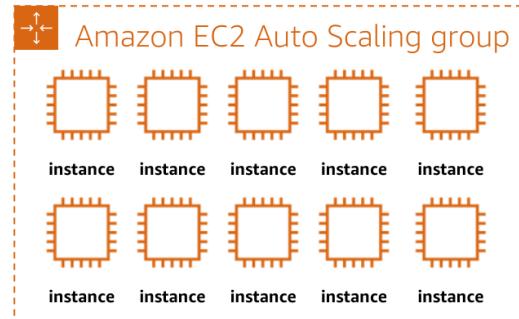


Dynamic scaling with Amazon EC2 Auto Scaling

Follow the demand curve for your applications

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Max	10
Min	2
Desired	10



High demand

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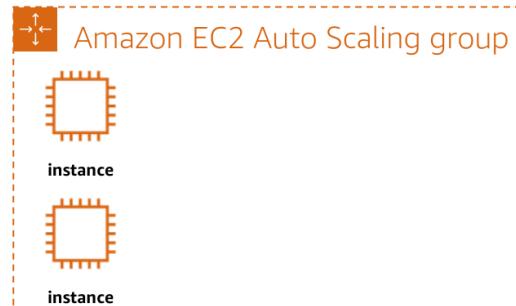


Dynamic scaling with Amazon EC2 Auto Scaling

Follow the demand curve for your applications

- Select a load metric for your application
- Set as conditional and/or scheduled
- Use with CloudWatch, optionally

Max	10
Min	2
Desired	2



Low demand

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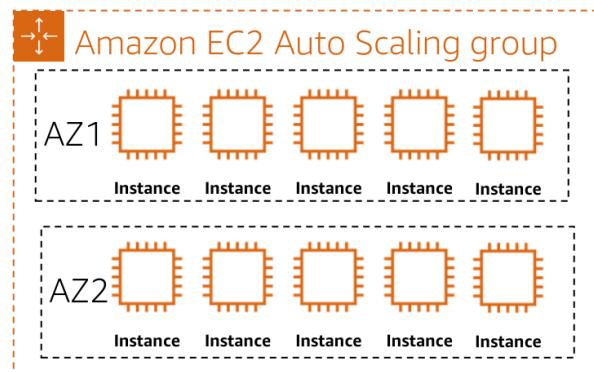


Fleet management with Amazon EC2 Auto Scaling

Replace impaired Amazon EC2 instances without intervention

- Monitor the health of running instances
- Replace impaired instances automatically
- Balance capacity across Availability Zones

Max	10
Min	2
Desired	10



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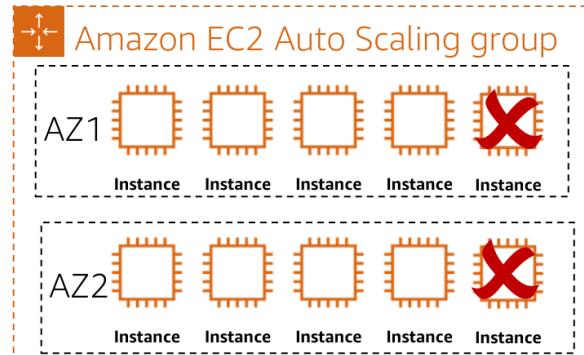


Fleet management with Amazon EC2 Auto Scaling

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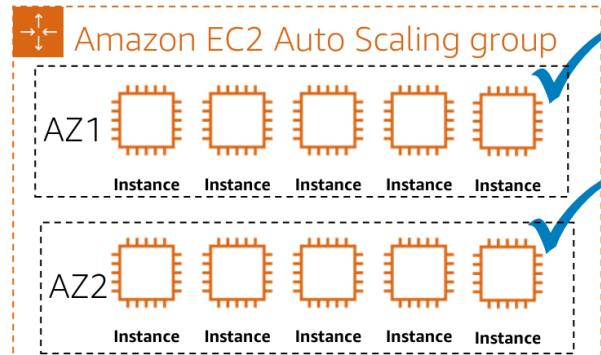


Fleet management with Amazon EC2 Auto Scaling

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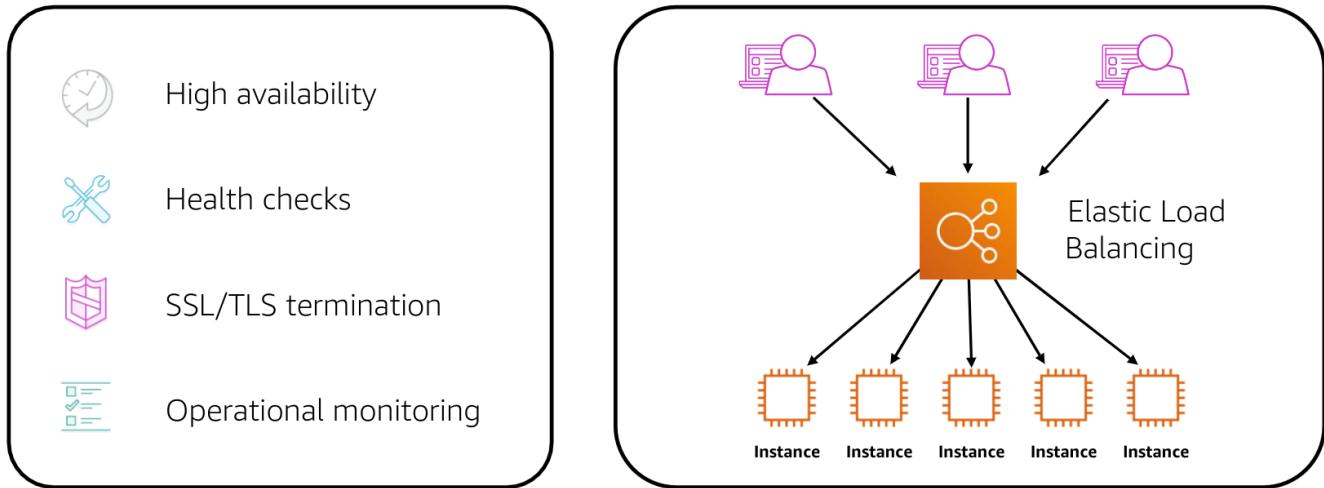


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Elastic Load Balancing

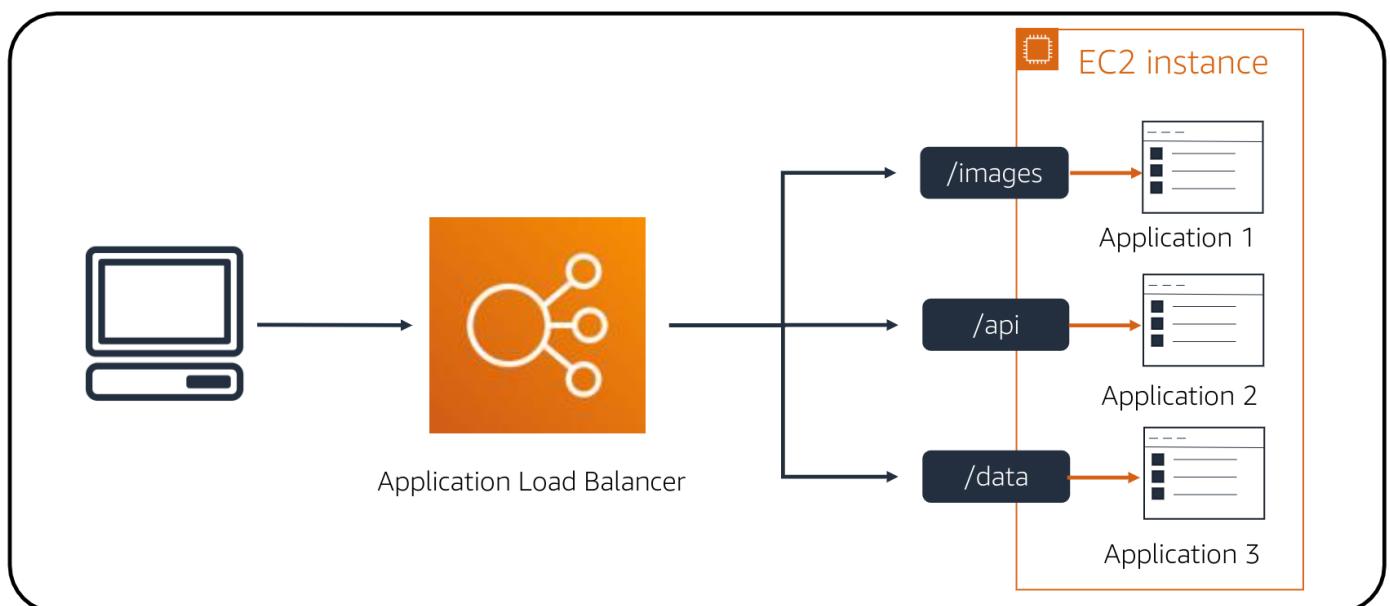
Automatically distribute traffic across multiple targets



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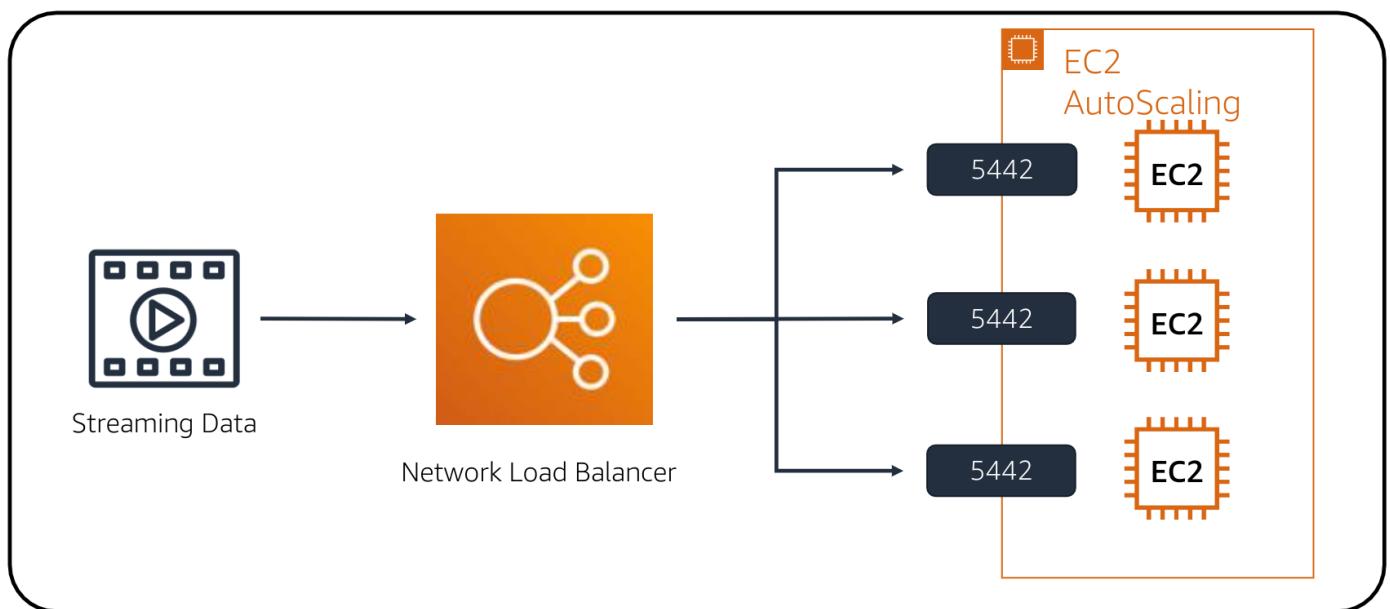
Application Load Balancer example



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Network Load Balancer example



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Deploy database services

DIY vs. AWS database services



Databases on Amazon EC2

- Operating system access
- Need features of specific application



AWS Database Services

- Easy to set up, manage, maintain
- Push-button high availability
- Focus on performance
- Managed infrastructure

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What is Amazon Relational Database Service?

A database service that makes it easy to set up, operate, and scale a relational database in the cloud

Amazon RDS Engines



ORACLE



- Easily scalable
- Automatic software patching
- Automated backups
- Database snapshots
- Multi-AZ deployments
- Automatic host replacement
- Encryption at rest and in transit

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What is Amazon Aurora?

- Enterprise-class relational database
- MySQL- or PostgreSQL-compatible
- Up to 5X faster than standard MySQL databases
- Up to 3X faster than standard PostgreSQL databases
- Continuous backup to Amazon S3
- Up to 15 low-latency read replicas



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Relational vs key-value databases

	Relational (SQL)				Key-value (NoSQL)												
Data storage	Rows and columns				Key-value, document, graph												
Schemas	Fixed				Dynamic												
Querying	Using SQL				Focused on collection of documents												
Scalability	Vertical				Horizontal												
Example	<table border="1"><thead><tr><th>ISBN</th><th>Title</th><th>Author</th><th>Format</th></tr></thead><tbody><tr><td>3111111223439</td><td>Withering Depths</td><td>Tark, Frank</td><td>Paperback</td></tr><tr><td>312222223439</td><td>Wily Willy</td><td>Felton, Maria</td><td>eBook</td></tr></tbody></table>				ISBN	Title	Author	Format	3111111223439	Withering Depths	Tark, Frank	Paperback	312222223439	Wily Willy	Felton, Maria	eBook	{ ISBN: 3111111223439, Title: "Withering Depths", Author: "Tark, Frank", Format: "Paperback" }
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What is Amazon DynamoDB?

Fast and flexible NoSQL database service for any scale

- Fully managed
- Low-latency queries
- Fine-grained access control
- Regional and global options



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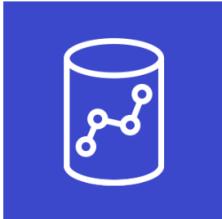
Amazon DynamoDB use cases

- Serverless web applications
- Microservices data store
- Mobile backends
- Ad tech
- Gaming
- Internet of Things (IoT)

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Other purpose-built database services



Amazon Redshift



Amazon DocumentDB



Amazon Neptune

Fast, scalable
data warehouse

MongoDB-compatible
database

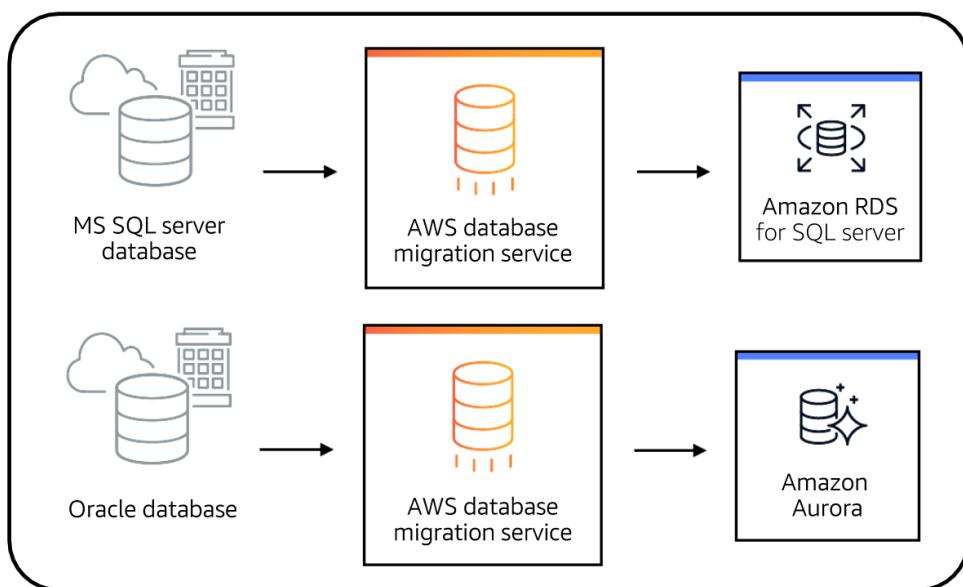
Graph database

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What is AWS Database Migration Service?

Migrate databases to AWS quickly and securely



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The right tool for the right job

What are my requirements?	
Enterprise class relational database	Amazon Relational Database Service (Amazon RDS)
Fast and flexible NoSQL database service for any scale	Amazon DynamoDB
Operating system access or application features not supported by AWS database services	Databases on EC2
Specific case-driven requirements (Machine learning, data warehouse, graphs)	AWS purpose-built database services

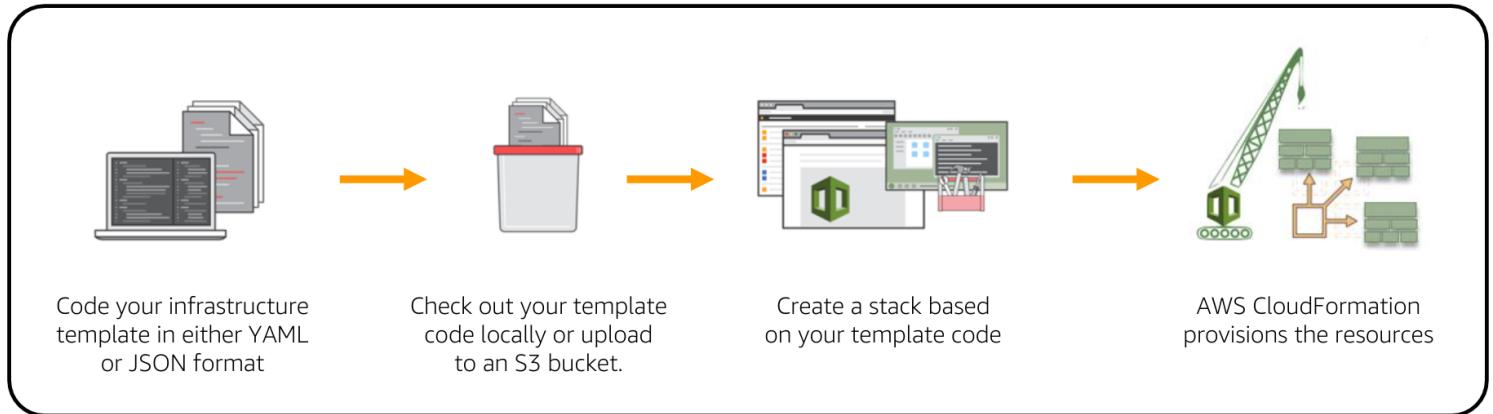
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Automate deployment

What is AWS CloudFormation?

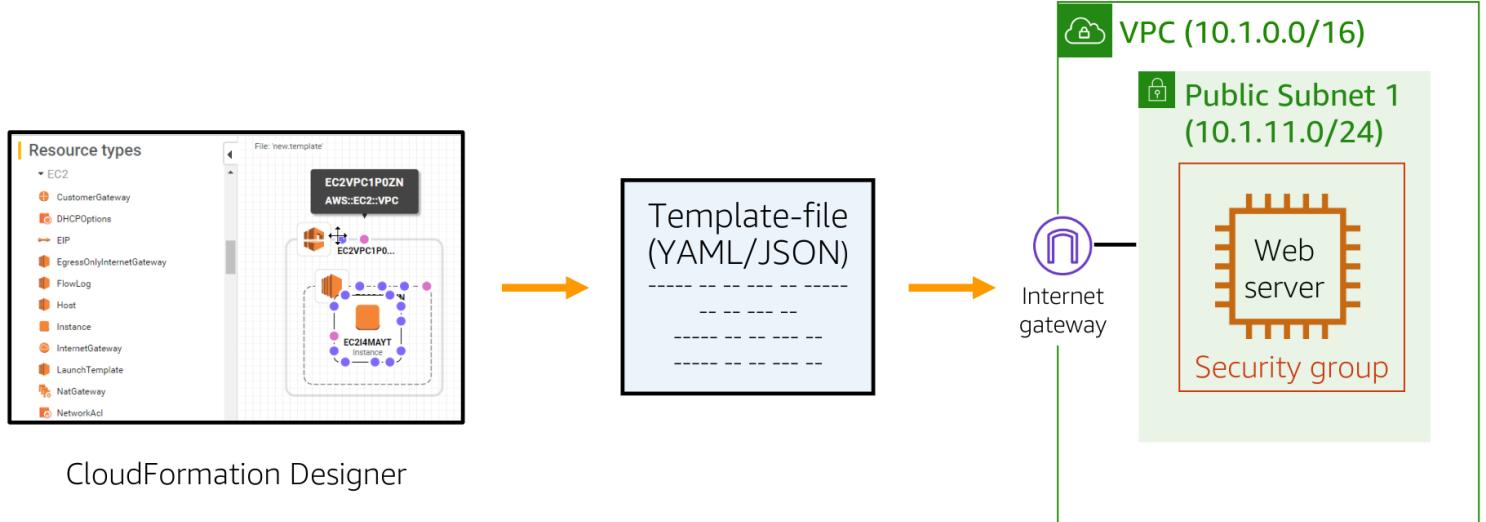
Model and provision all your cloud infrastructure resources



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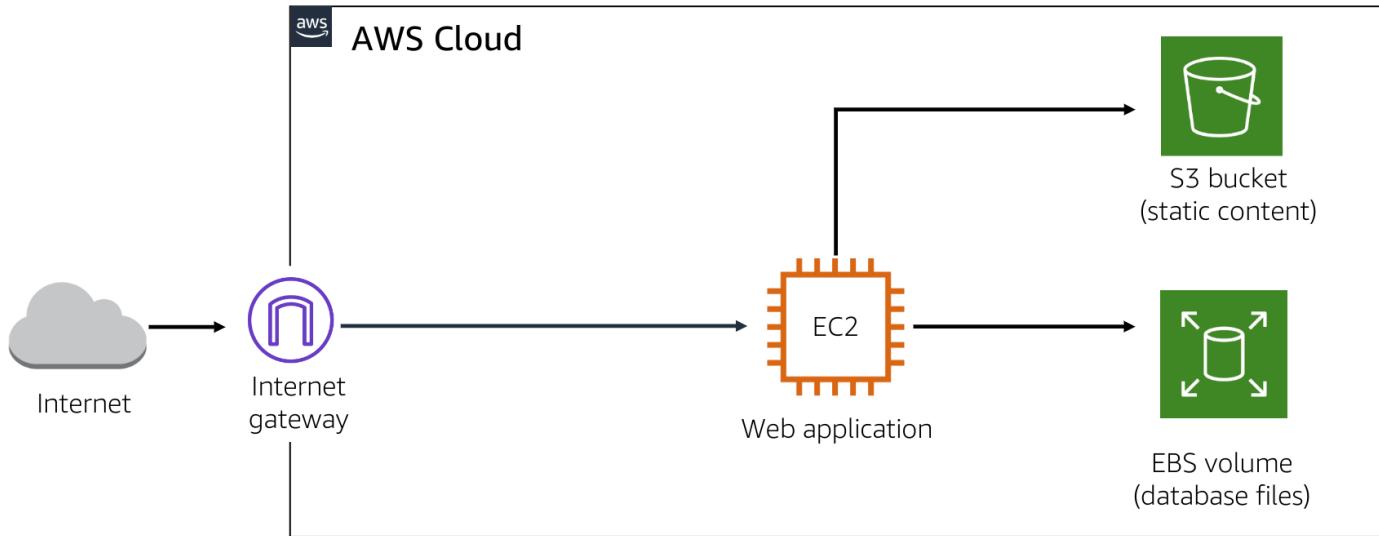
AWS CloudFormation example



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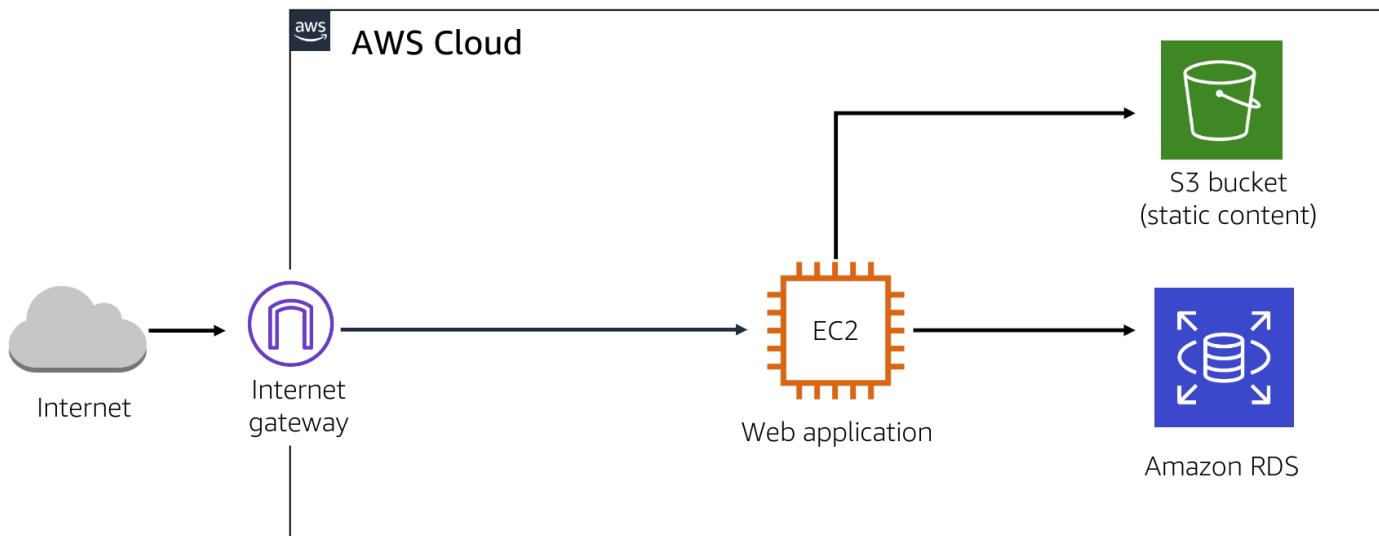
Putting it all together (1 of 4)



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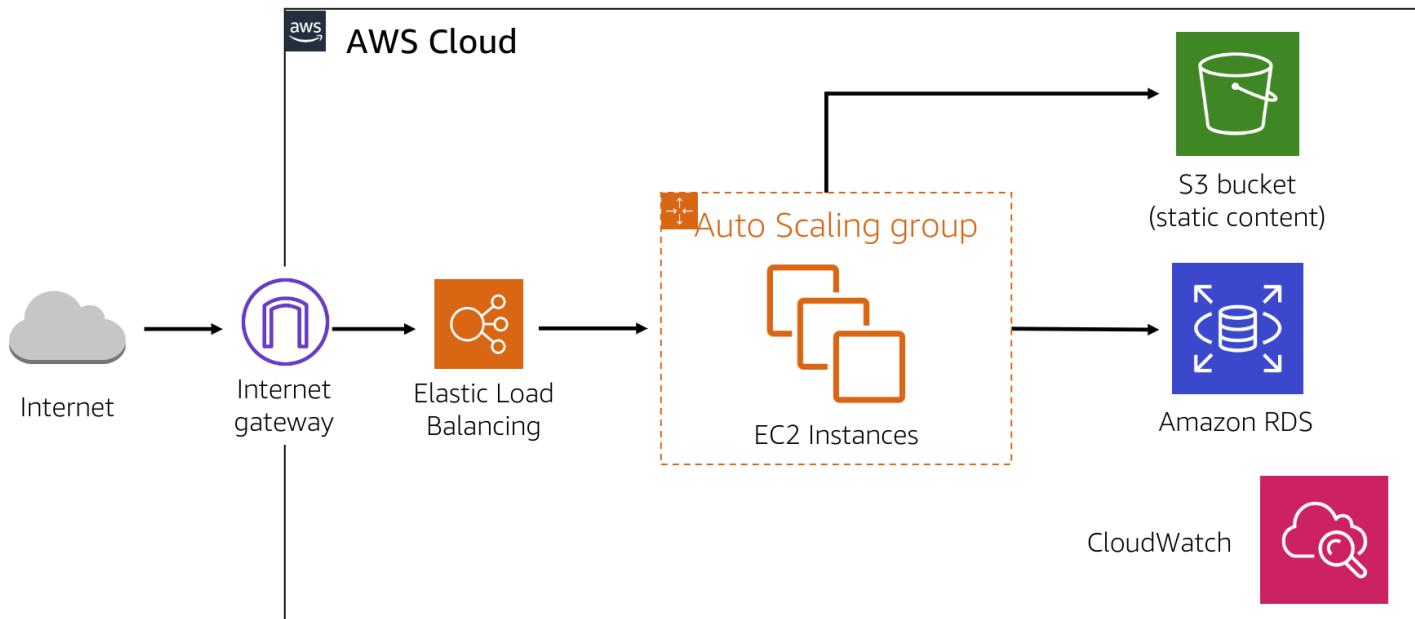
Putting it all together (2 of 4)



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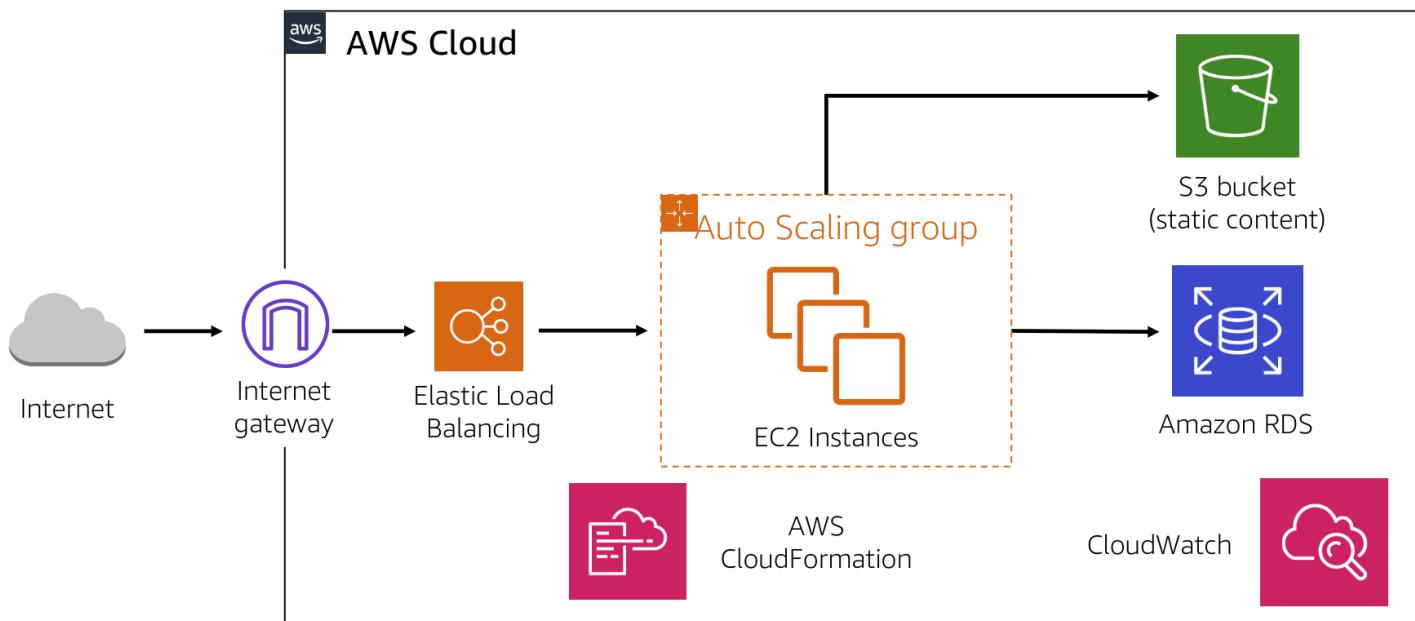
Putting it all together (3 of 4)



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Putting it all together (4 of 4)



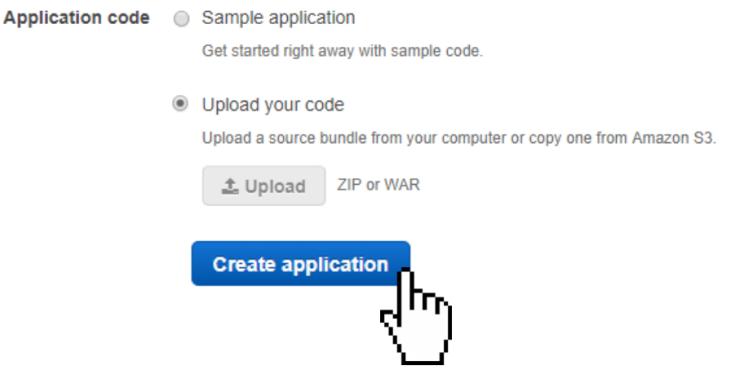
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How can I deploy without managing infrastructure?

Quickly deploy and manage applications with AWS Elastic Beanstalk

- Upload your application code
- The service handles:
 - ✓ Resource provisioning
 - ✓ Load balancing
 - ✓ Automatic scaling
 - ✓ Monitoring
- Support applications that scale to serve millions of users

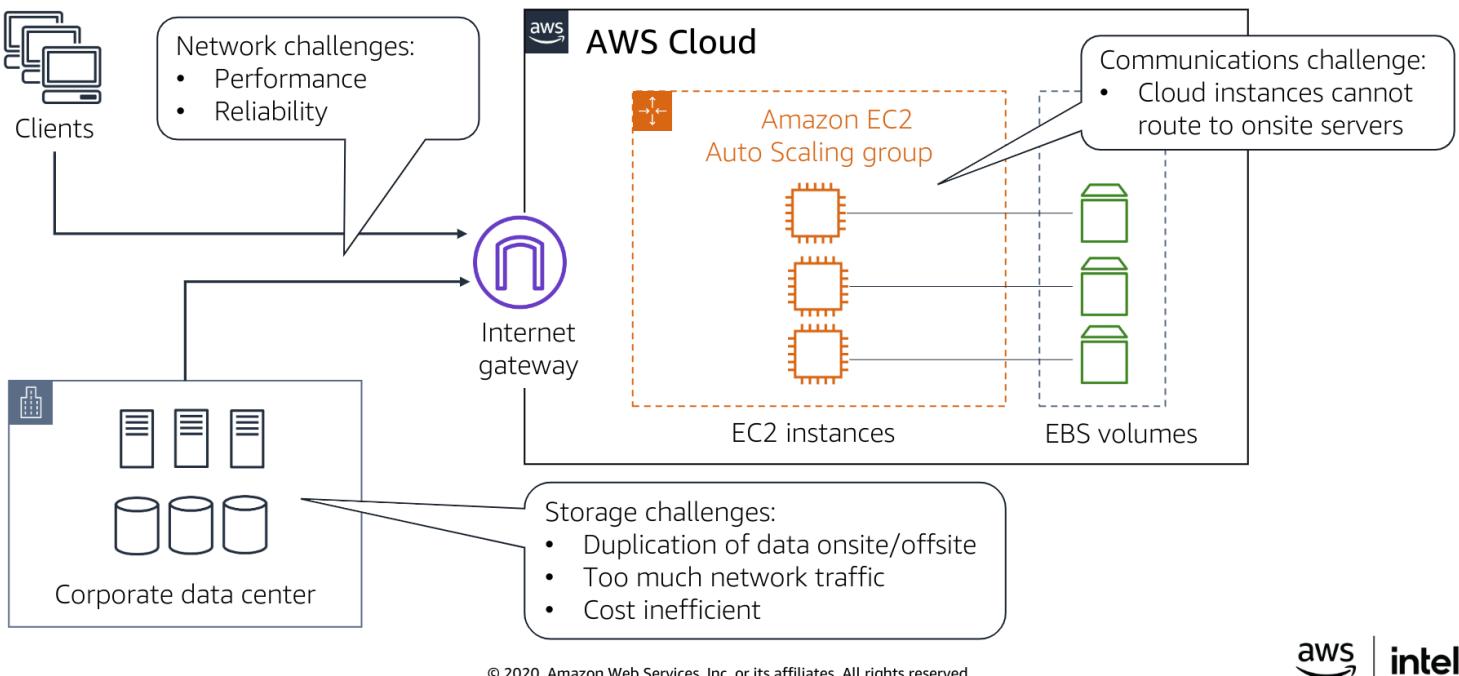


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Connect and share data

Challenge: hybrid cloud

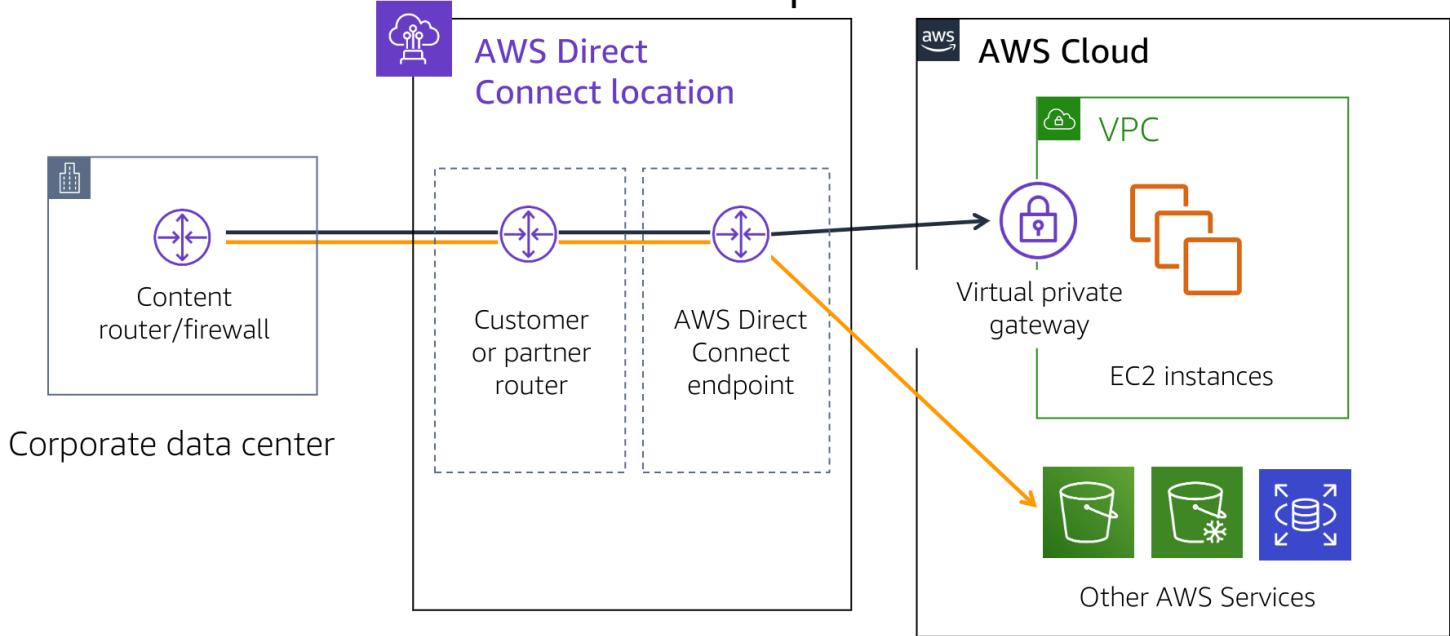


What is AWS Direct Connect?

A dedicated network connection from your premises to AWS

- Reduces network costs
- Creates consistent network performance
- Provides private connectivity to your Amazon VPC
- Scales easily

AWS Direct Connect example

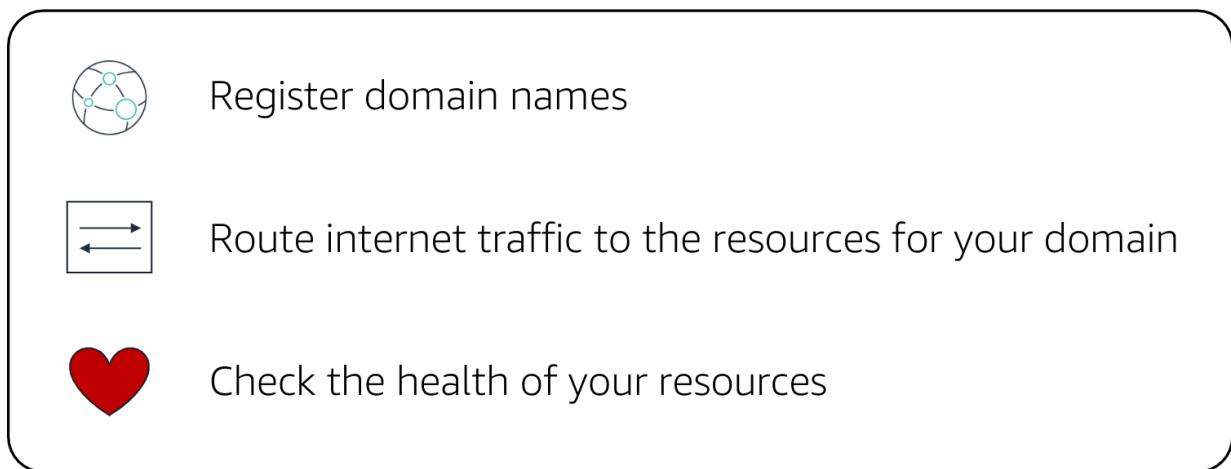


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What is Amazon Route 53?

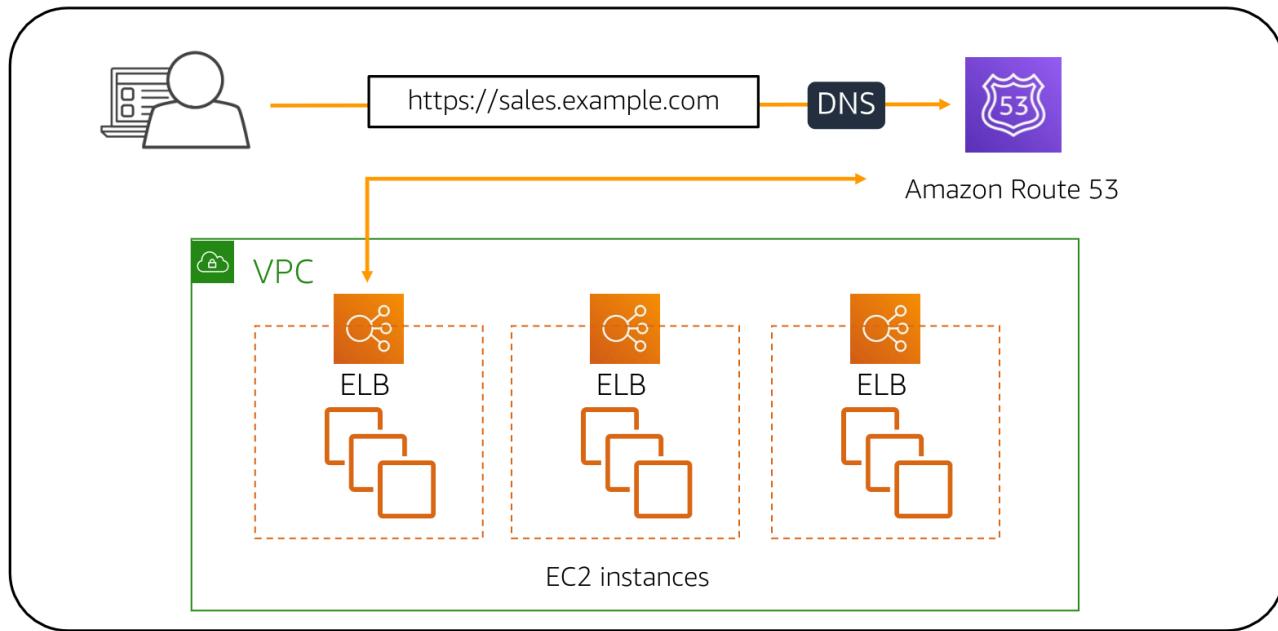
A highly available and scalable Domain Name System (DNS) web service



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Routing traffic



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What is Amazon Elastic File System (Amazon EFS)?

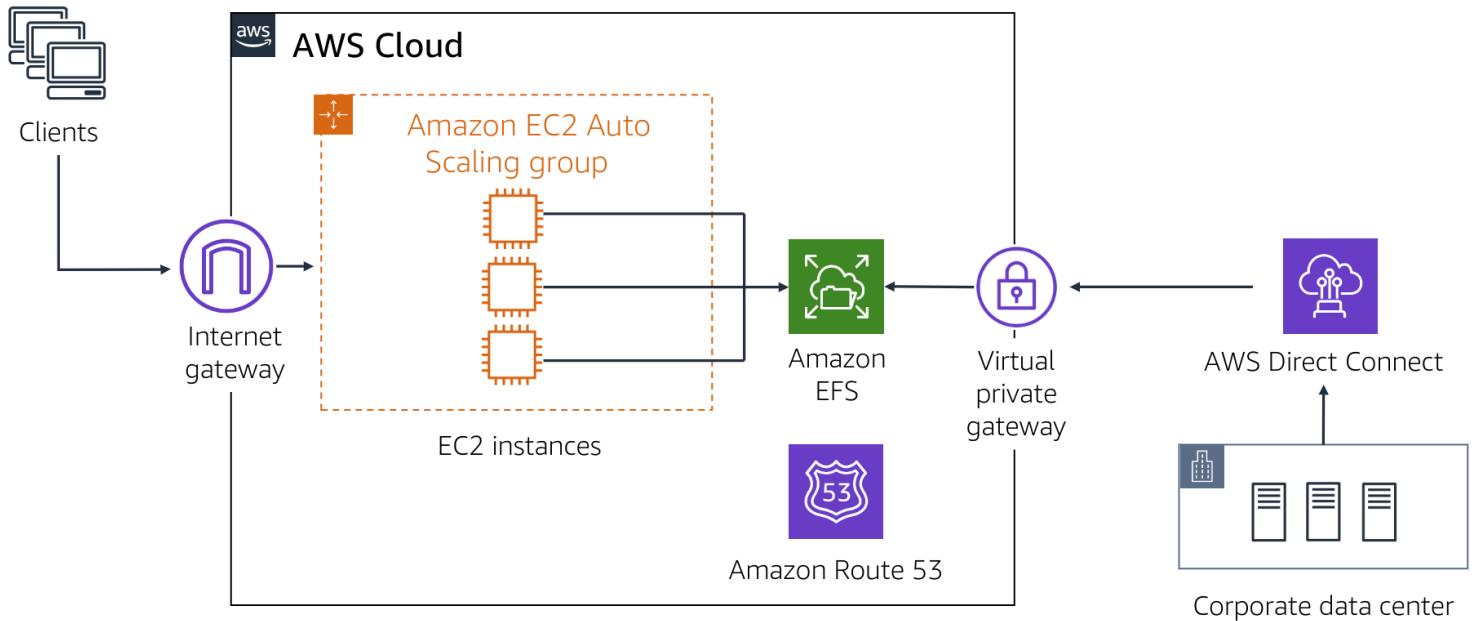
A scalable, elastic, cloud-native file system for Linux

-  Dynamic elasticity
-  Scalable performance
-  Shared file storage
-  Fully managed
-  Cost-effective

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Putting it all together

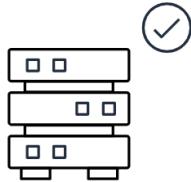


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Bringing AWS on premises

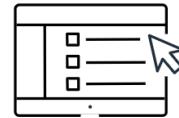
AWS Outposts: Bringing AWS on premises



Same AWS-designed infrastructure as in AWS data centers (built on AWS Nitro System)



Fully managed, monitored, and operated by AWS as if in AWS Regions



Single pane of management in the cloud providing the same APIs and tools as in AWS Regions

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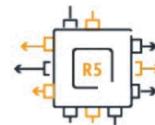
Build on the same Amazon EC2 instances & Amazon EBS volumes



For general-purpose applications



For compute-intensive applications (media transcoding, gaming servers, machine learning inference)



For memory-intensive applications (databases, in-memory caches, real-time data analytics)



For machine learning inference and graphics workstations



For I/O-intensive applications (NoSQL databases, in-memory or transactional databases, distributed file systems)



Local instance storage and EBS gp2 volumes for temporary and persistent storage

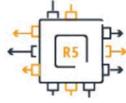
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Amazon EC2 Instances On Premises Powered by Intel Technologies

Consistent Infrastructure

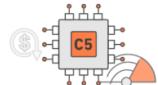
Build on the same EC2 instances [featuring Intel Xeon Scalable processors](#), on premises as in the cloud



2.5 GHz Intel Xeon Scalable Processors (Skylake)

Consistent Application Performance

Leverage the same [workload performance enhancements](#) on Outposts as instances running in the cloud.



2nd Generation Intel Xeon Scalable processors (Cascade Lake)

Ease of Application Migration

Seamlessly migrate your applications on Outposts to AWS



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AWS Local Zones

- New type of AWS infrastructure deployment
- Places compute, storage, database, and other services closer to customers
- For demanding applications that require single-digit latencies



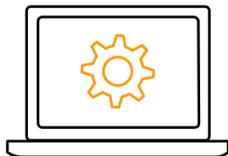
AWS infrastructure at the edge



Local Intel-powered EC2 compute, storage, database, and other services



Connect to services in AWS Regions



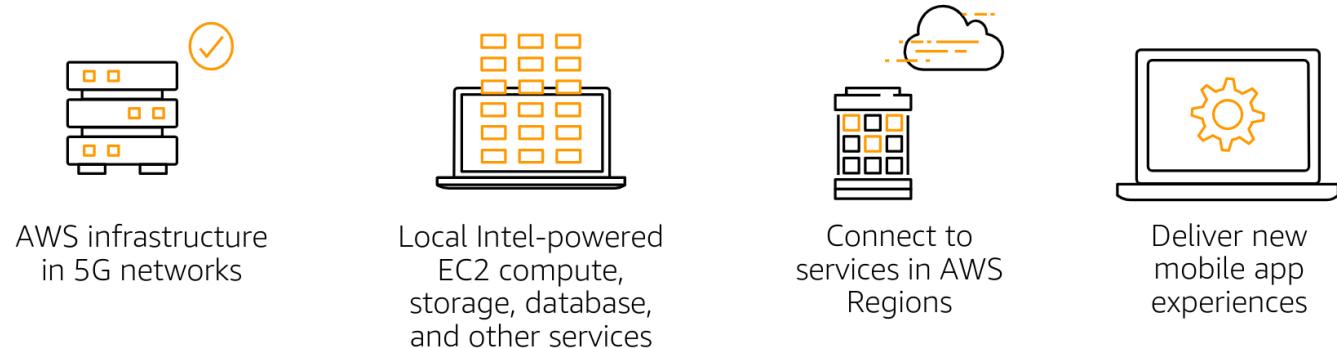
Deliver new low latency apps

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AWS Wavelength

- Extends AWS infrastructure to 5G networks
- Run latency-sensitive portions of applications in Wavelength Zones and seamlessly connect to your applications and services in AWS Regions
- Same AWS APIs, tools, and functionality
- Global partner network

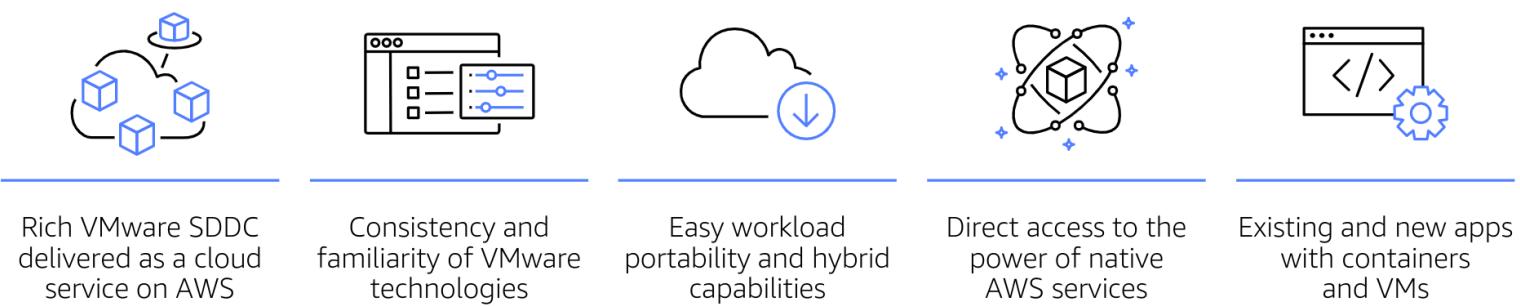


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VMware Cloud on AWS

VMware software-defined data center (SDDC) technologies you know and trust, delivered as a service on the world's most popular public cloud



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AWS Bare-metal Host Instance Types available

	i3.metal vSAN	r5.metal Elastic vSAN
Typical Use Case	General Purpose Clusters	
Suitable for	Workloads with high transaction rates <ul style="list-style-type: none"> Databases used in OLTP High-speed analytics 	Workloads with high storage capacity needs and lower transaction rates <ul style="list-style-type: none"> Data Warehousing Batch processing Disaster Recovery
Compute		
CPU Type	Intel Xeon E5-2686	Intel Xeon Scalable (Skylake)
CPU Cores	36 Cores @ 2.3Ghz	48 Cores @ 2.5Ghz
Memory		
RAM	512 GiB	768 GiB
Storage		
Type	vSAN with Local NVMe Flash	Elastic vSAN with Amazon EBS Only
Capacity Tier	~10,600 GiB	15,000 GiB to 35,000 GiB
Network		
Physical Speed	25 Gbps	25 Gbps

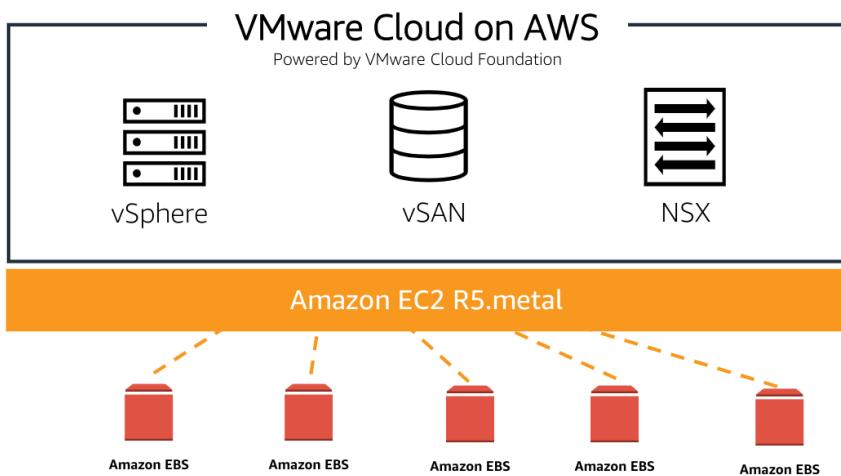
For identifying the right host types for specific scenarios, please use the [VMware Cloud on AWS Sizer](#)

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VMware vSAN utilizing Amazon Elastic Block Store with VMware Cloud on AWS running on new Amazon EC2 elastic, bare-metal instance

Augment existing SDDCs for storage-dense workloads to cost-effectively scale storage



Amazon EC2 R5.metal: R5.metal instances are based on 2.5 GHz Intel Platinum 8000 series (Skylake-SP) processors. Each host has 2 sockets, 48 cores, 96 hyper-threads, 768 GiB RAM, and 25 Gbps network bandwidth.

- VMware Cloud on AWS new Amazon EC2 R5.metal instance type with flexible storage
- VMware vSAN delivers enterprise class storage utilizing Amazon Elastic Block Storage (EBS) storage
- Storage per host range from 15 to 35 TB in increments of 5 TB
- User chooses amount of storage desired and used on all hosts within the cluster
- R5.metal clusters can be added to an existing SDDC with at least one existing provisioned cluster

* Preview: Feature released in preview to gather feedback – may not be available to all applicable customers or in all AWS regions . The information in this presentation is for informational purposes only and may not be incorporated into any contract. There is no commitment or obligation that items in 'Preview' will become 'Available'.

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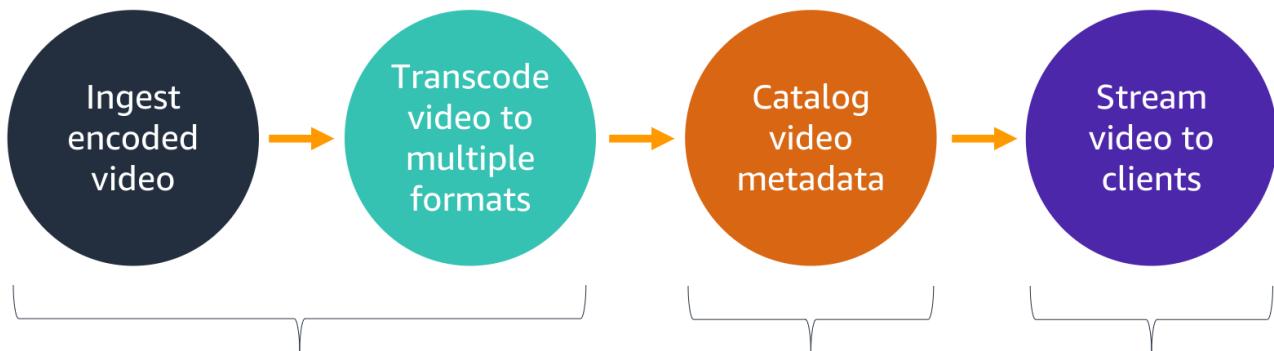
Deliver content faster

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Challenge: media streaming service

The architecture must meet the following requirements:

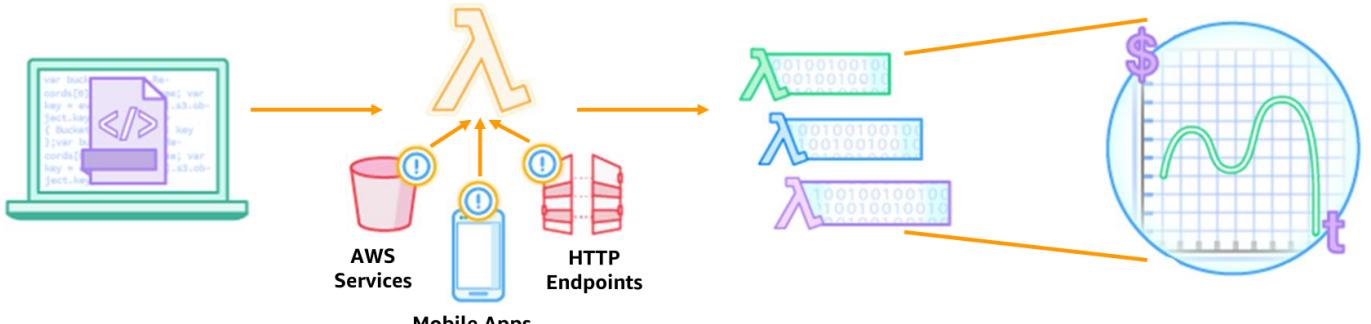


Efficient, scalable
compute resources

Fast data
access

Low latency

AWS Lambda: run code without servers



Upload your code
to AWS Lambda

Set your code to trigger
from an event source

Lambda runs your code
only when triggered

Pay only for the
compute time you use

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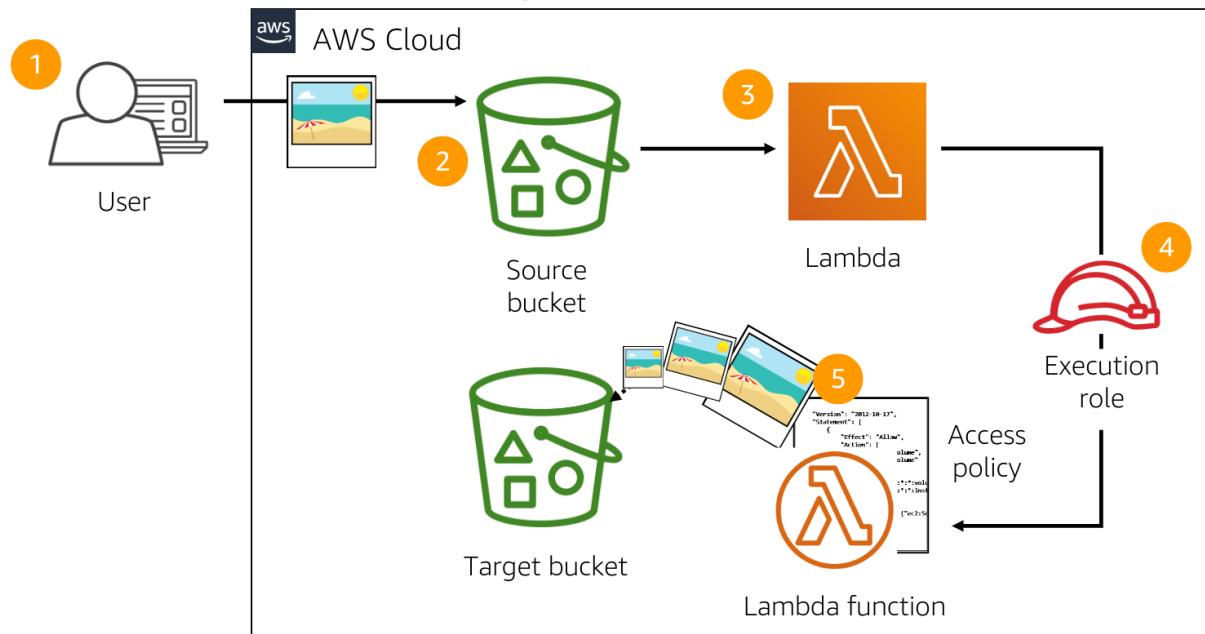
Benefits of AWS Lambda

-  Supports multiple programming languages
-  Completely automated administration
-  Built-in fault tolerance
-  Supports orchestration of multiple functions
-  Pay per use pricing

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AWS Lambda example: create thumbnails



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What is Amazon Simple Notification Service (Amazon SNS)?

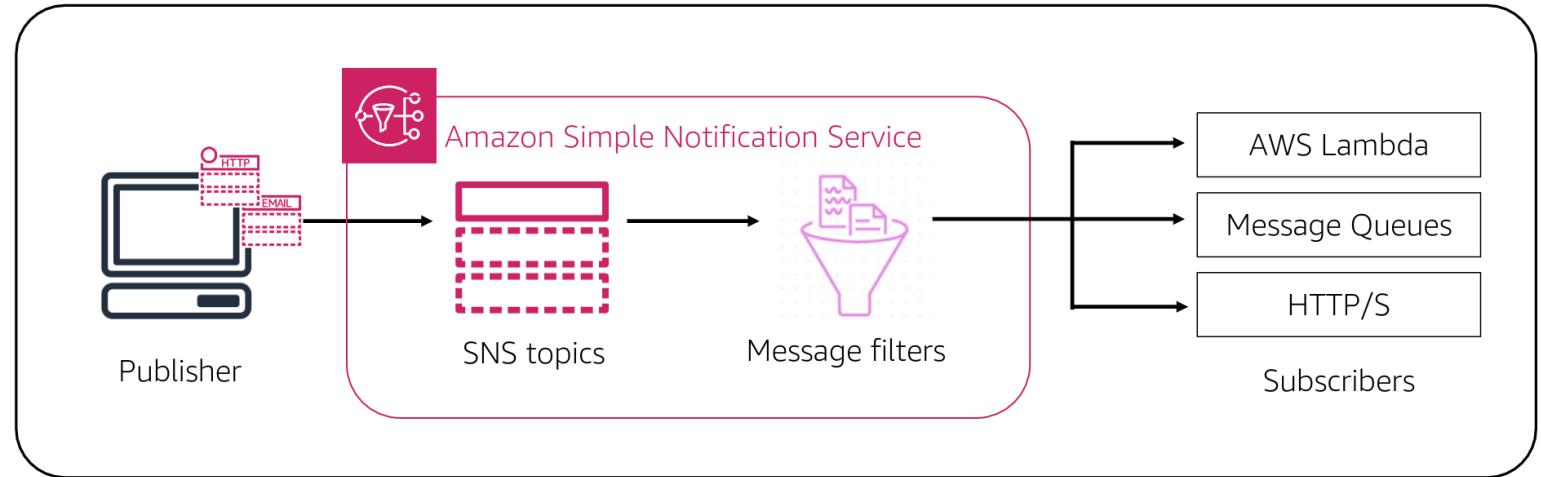
Fully managed pub/sub messaging for distributed or serverless applications



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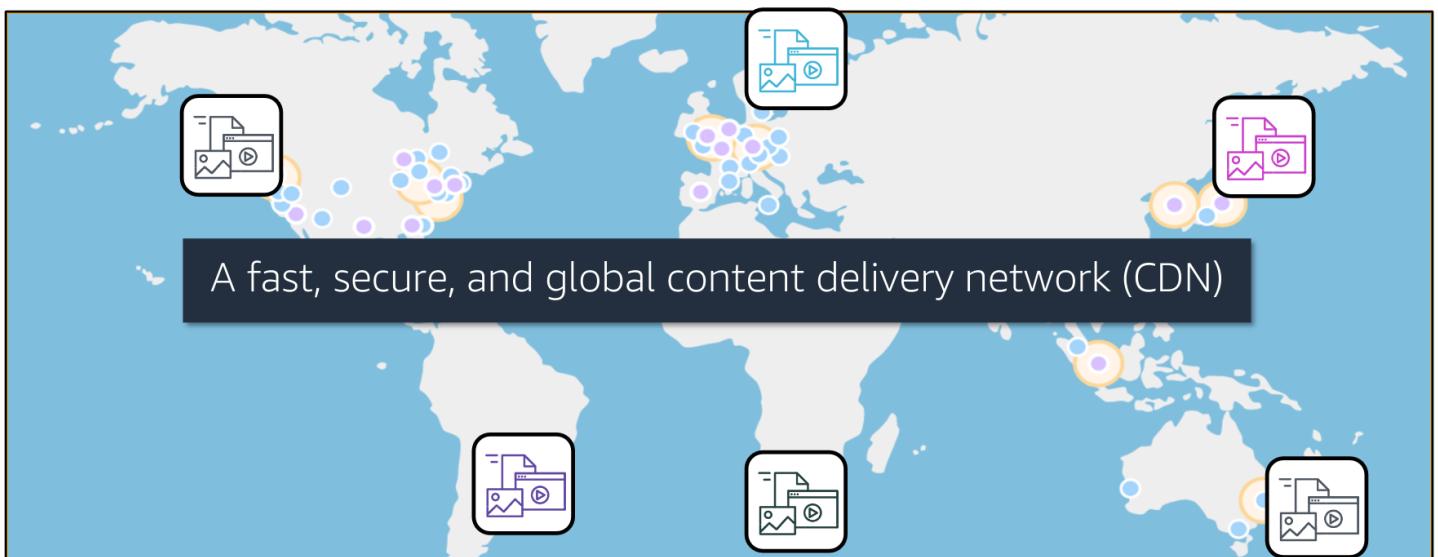
Amazon SNS overview



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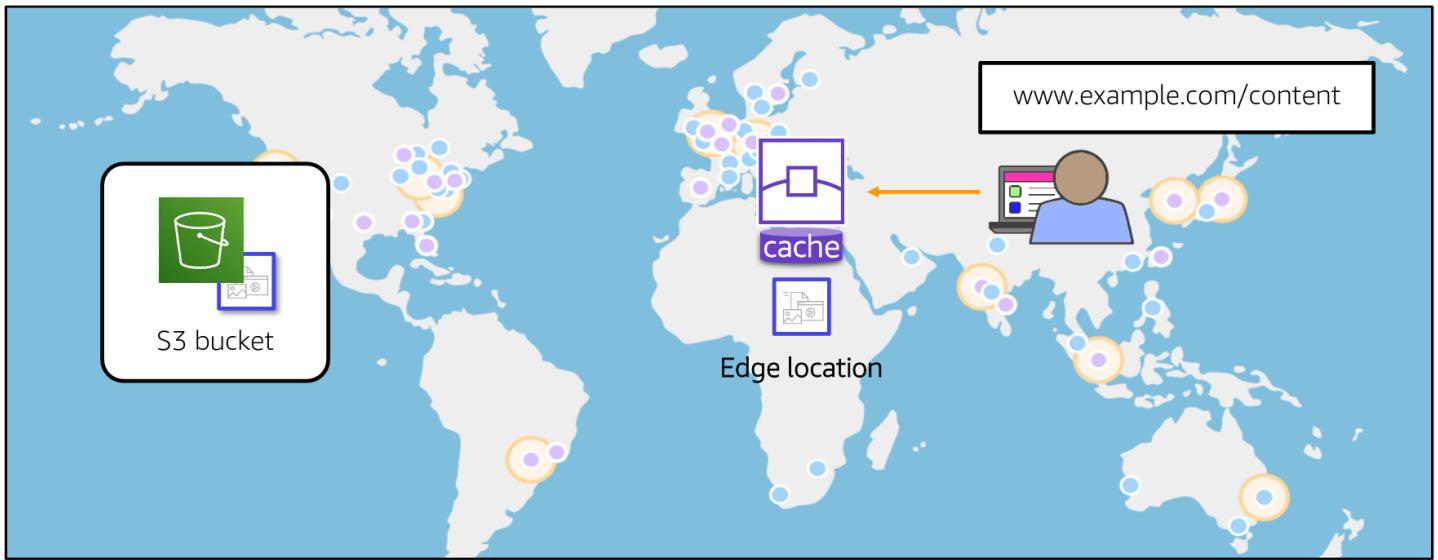
What is Amazon CloudFront?



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How CloudFront delivers content to users



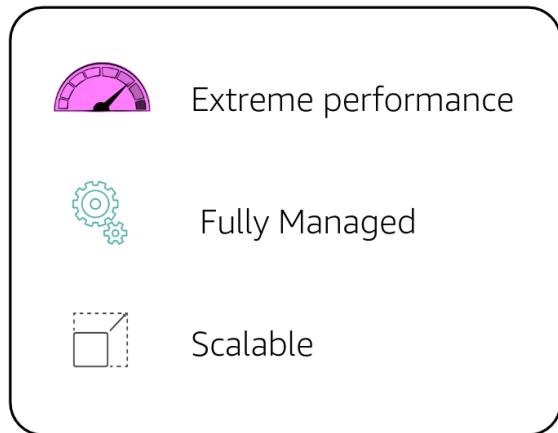
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Demo

What is Amazon ElastiCache?

Fully managed Redis or Memcached-compatible in-memory data store



**Amazon ElastiCache
for Redis**

Versatile in-memory data store



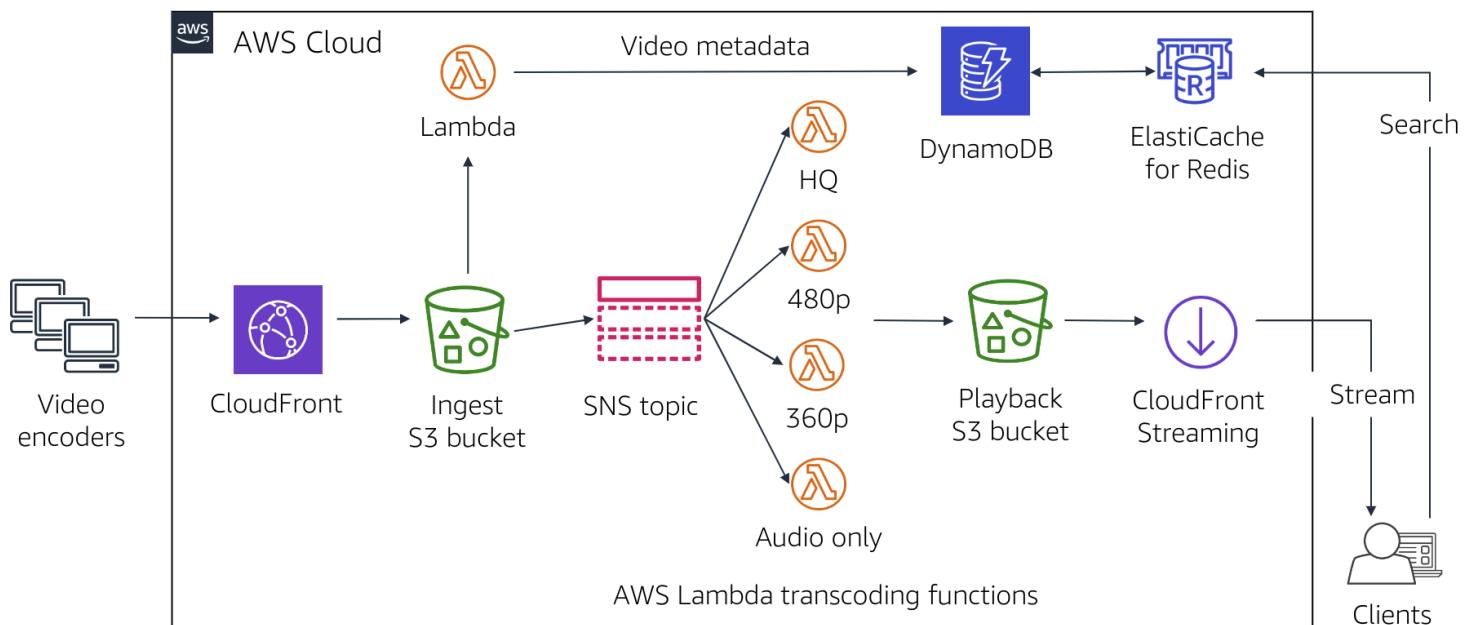
**Amazon ElastiCache
for Memcached**

Scalable caching tier
for data-intensive apps

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Challenge: Media streaming service



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Key Takeaways

Amazon CloudWatch	Have complete visibility of your cloud resources and applications
Elastic Load Balancing Application Auto Scaling	Deploy highly available applications that scale with demand
AWS Database Services	Run SQL or NoSQL databases without the management overhead
AWS CloudFormation	Programmatically deploy repeatable infrastructure
AWS Elastic Beanstalk	Deploy your application in the simplest way possible
AWS Direct Connect	Provision a dedicated network connection from your premises to AWS
Amazon Route 53	Run a highly available and scalable Domain Name System (DNS) web service
AWS Lambda	Run code without managing servers
Amazon CloudFront	Deliver your content across a massively scaled and globally available network

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End of Module 3 Test Your Knowledge

Access the quizzes with the "test your knowledge" button at the bottom of the page.