

A dark, out-of-focus photograph of a person from the chest up. They are wearing a dark-colored button-down shirt. Their hands are clasped in front of them, holding a smartphone horizontally. The background is dark and indistinct.

Business Continuity

Concepts

From Routine Maintenance...



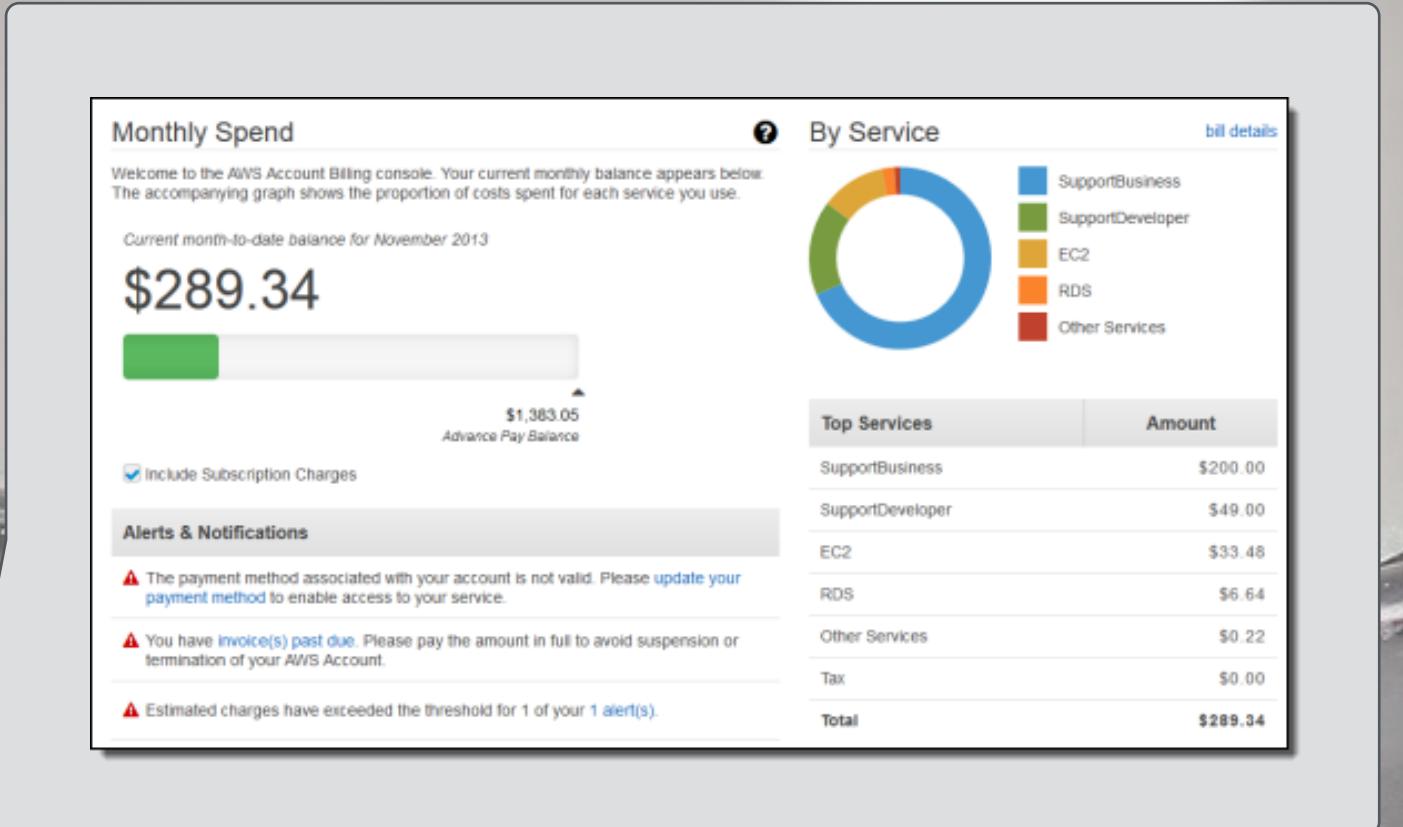
A CLOUD GURU



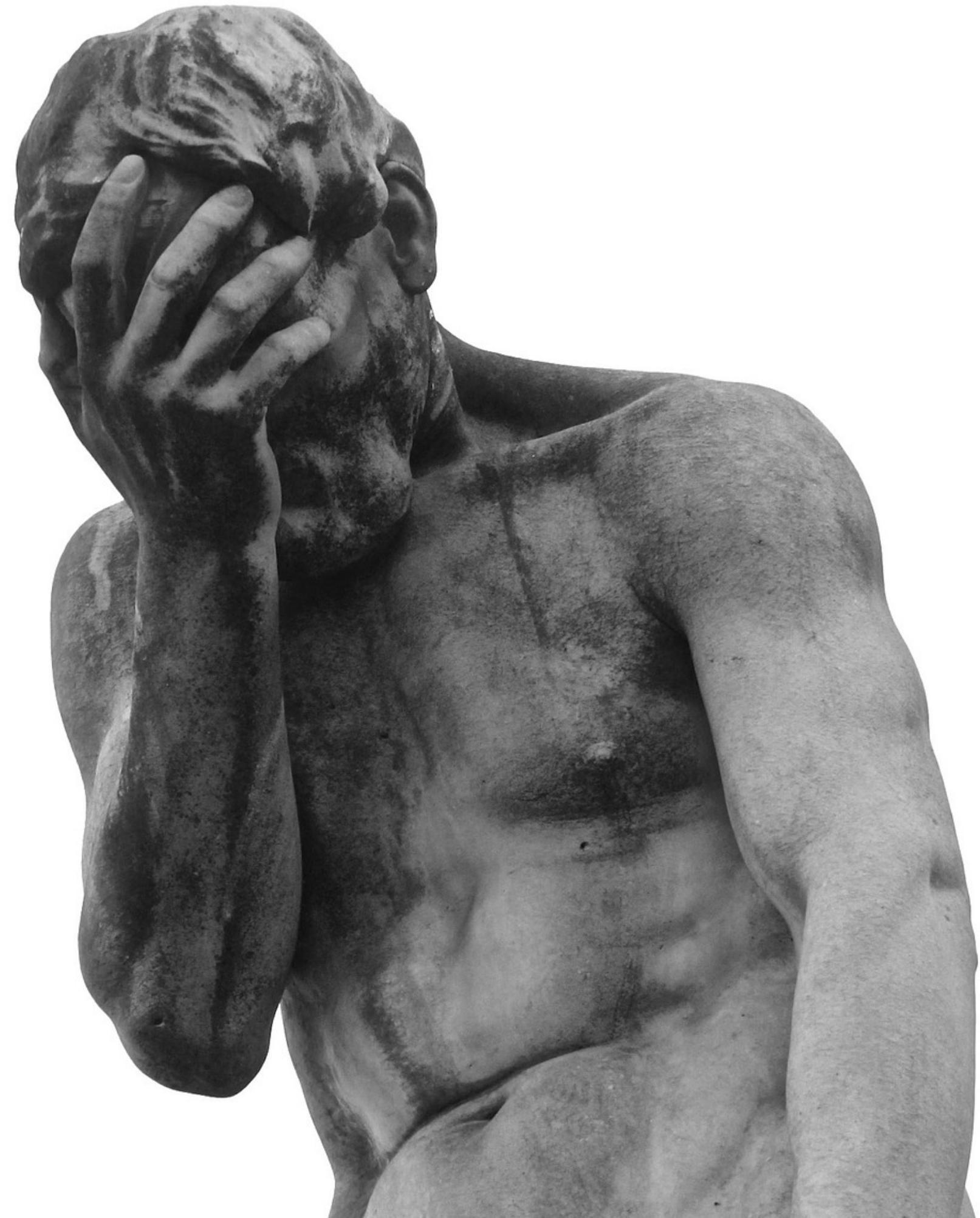
From Routine Maintenance...



A CLOUD GURU



To Total Chaos!



"Unfortunately one of the inputs of the command was entered incorrectly and a larger set of servers was removed than intended."

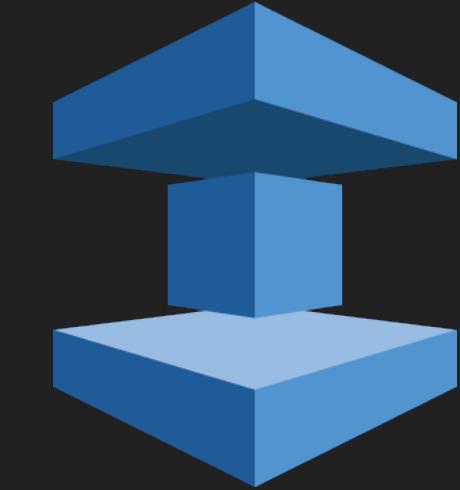


GET, LIST, PUT and DELETE
requests for S3 in US-EAST-1

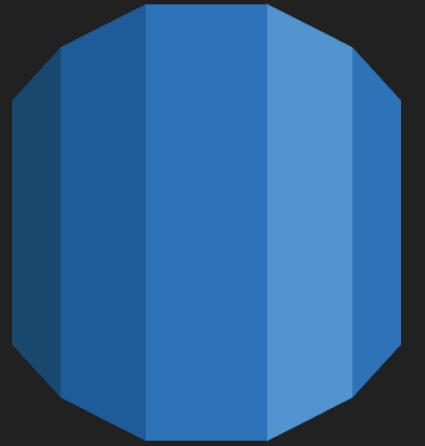


Placement subsystem for S3 in US-
EAST-1

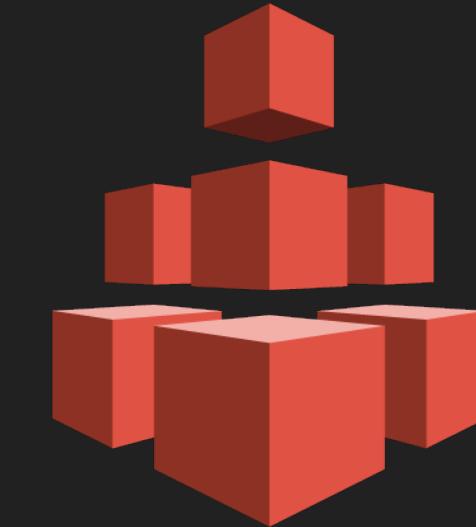
To Total Chaos!



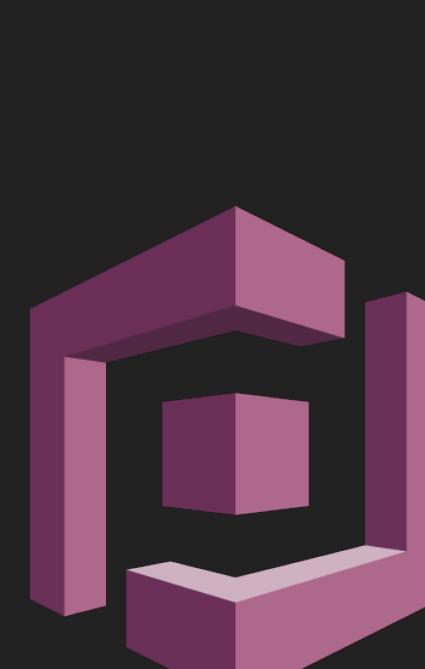
Amazon
ElastiCache



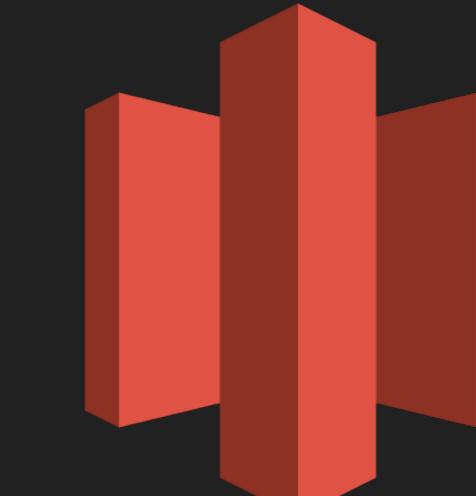
Amazon
RDS



Amazon
EFS



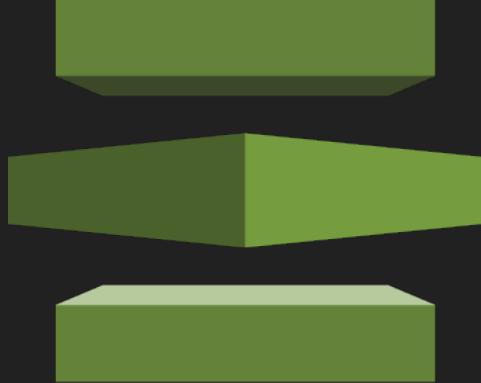
Amazon
Cognito



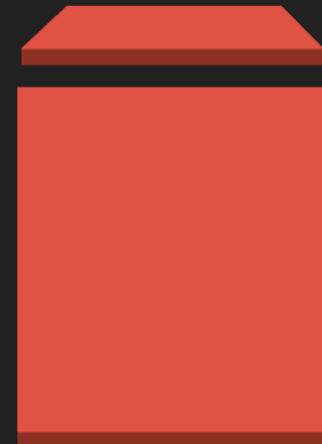
Amazon
Glacier



AWS Kinesis



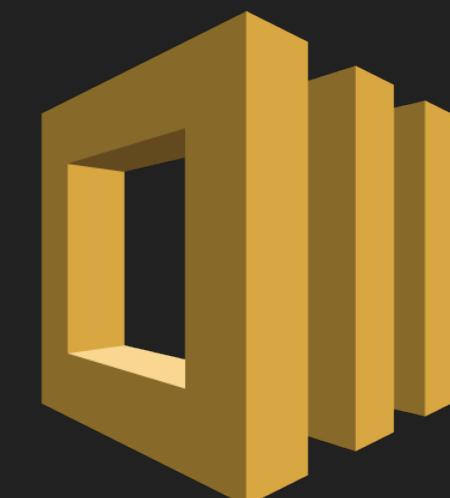
AWS
Certificate Manager



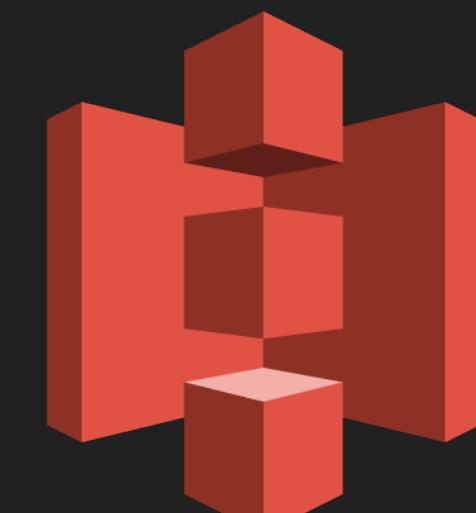
Amazon
EBS



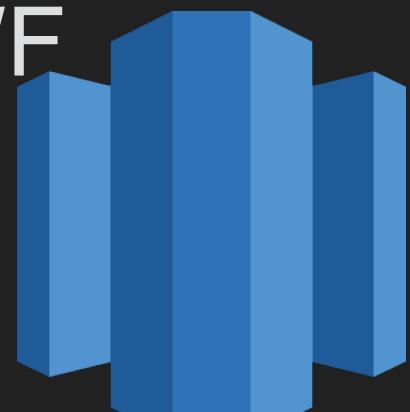
AWS
Elastic Beanstalk



AWS SWF



Amazon
S3



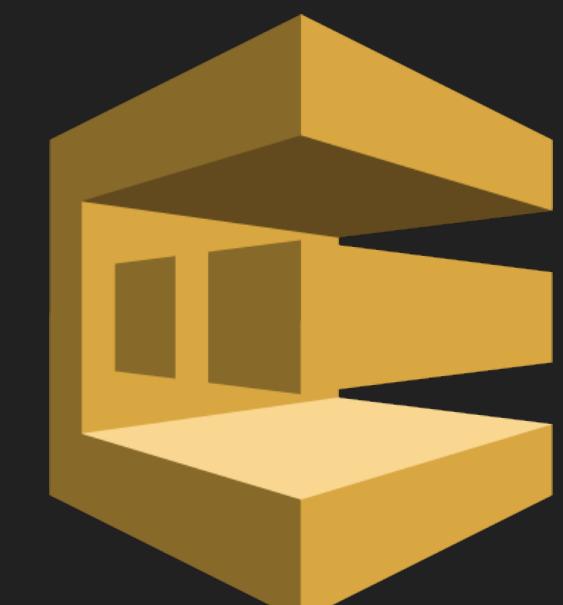
Amazon
Redshift



AWS
KMS



AWS Lambda



AW

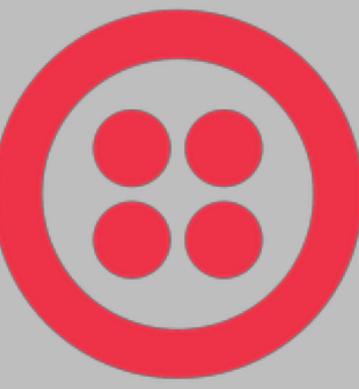


AWS
EMR

To Total Chaos!



A CLOUD GURU



twilio™

News Corp

GitHub



NETFLIX

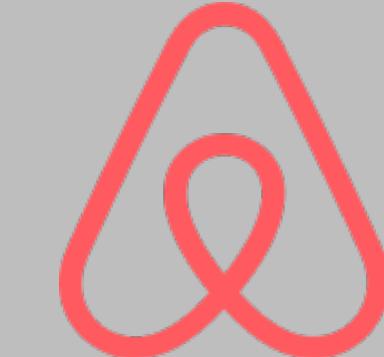


Expedia®

Time Inc.



zendesk



airbnb

ATLASSIAN



reddit

MailChimp

Trello



Pinterest



slack

To Total Chaos!



A CLOUD GURU

Amazon Web Services 
@awscloud

The dashboard not changing color is related to S3 issue. See the banner at the top of the dashboard for updates.

3:17 PM - Feb 28, 2017

2,315 1,975 people are talking about this



Adobe



SLACK



Pinterest

So You're Telling Me There's A Chance!



AWS S3 Availability Goal

99.99%

Minutes Disruption Per Year

52

Minutes of S3 Outage on
February 28, 2017

252

Wise Words

“Everything
fails all the
time.”

Werner Vogels, Amazon CTO



A CLOUD GURU



Blah, Blah, Blah



Business Continuity (BC)

Seeks to minimize business activity disruption when something unexpected happens.

Disaster Recovery (DR)

Act of responding to an event that threatens business continuity.

Blah, Blah, Blah



High Availability (HA)

Designing in **redundancies** to reduce the chance of impacting service levels.

Fault Tolerance

Designing in the ability to **absorb problems** without impacting service levels.

Blah, Blah, Blah



Service Level Agreement (SLA)

An agreed **goal** or **target** for a given service on its performance or availability.

Service Credits

Service Credits are calculated as a percentage of the total charges paid by you for Amazon S3 for the billing cycle in which the error occurred in accordance with the schedule below.

For all requests not otherwise specified below:

Monthly Uptime Percentage	Service Credit Percentage
Equal to or greater than 99.0% but less than 99.9%	10%
Less than 99.0%	25%

For requests to Amazon S3 Standard – Infrequent Access (Standard-IA) and Amazon S3 One Zone – Infrequent Access (OneZone-IA):

Monthly Uptime Percentage	Service Credit Percentage
Equal to or greater than 98.0% but less than 99.0%	10%
Less than 98.0%	25%

Blah, Blah, Blah



Recovery Time Objective (RTO)

Time that it takes after a disruption to restore business processes to their service levels.

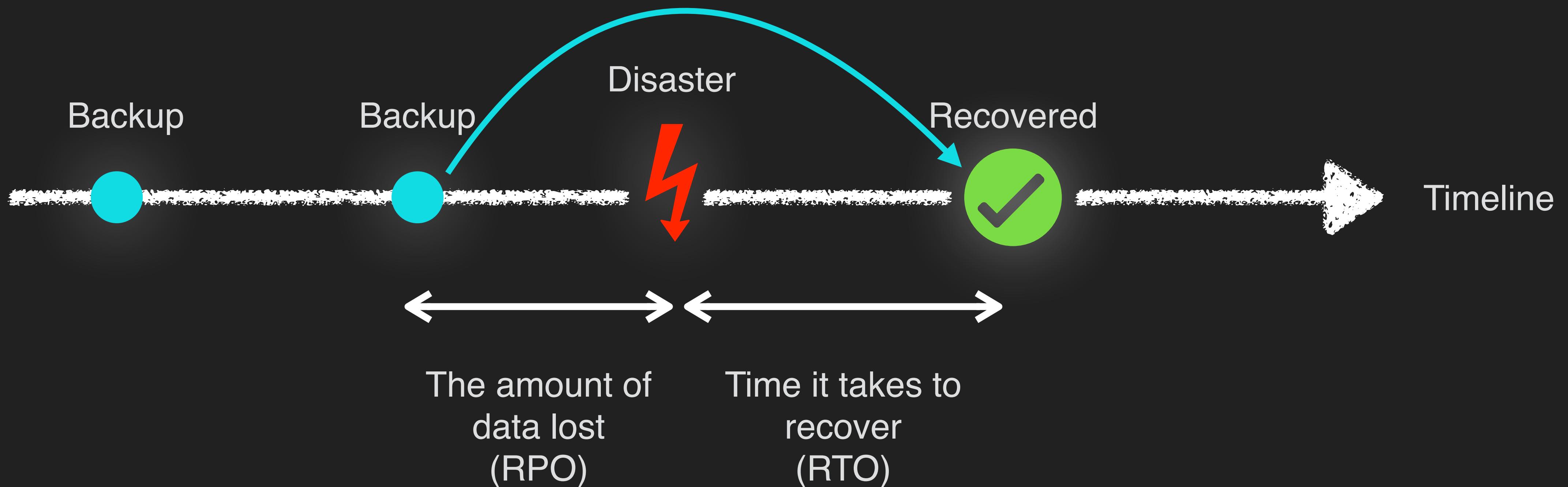
(T is for Time)

Recovery Point Objective (RPO)

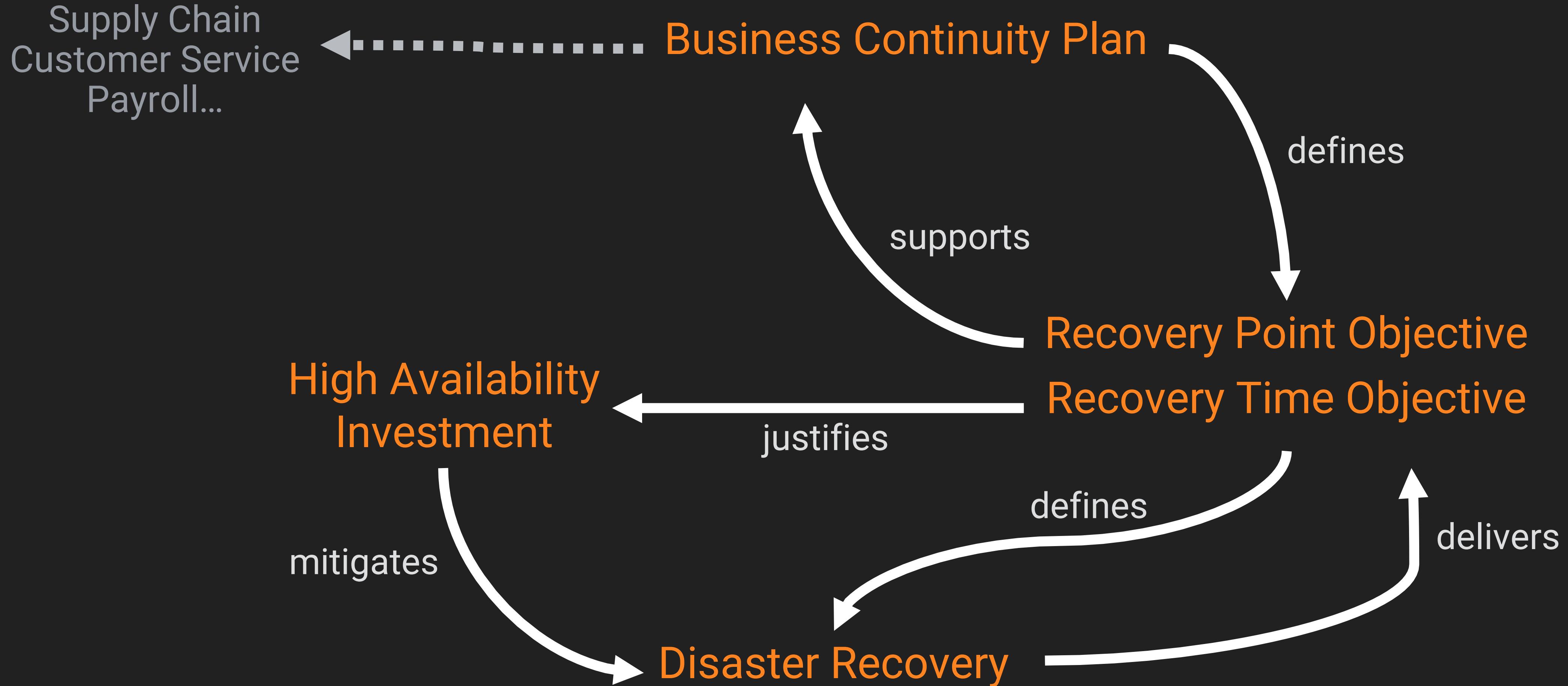
Acceptable amount of data loss measured in time.

(P is for data that goes “poof”.)

RTO and RPO



HA, DR, RPO, Oh My!





Disaster Categories

Category	Example
Hardware Failure	Network switch power supply fails and brings down LAN.
Deployment Failure	Deploying a patch that breaks a key ERP business process.
Load Induced	Distributed Denial of Service attack on your website.
Data Induced	Ariane 5 rocket explosion on June 4, 1996
Credential Expiration	An SSL/TLS certificate expires on your eCommerce site.
Dependency	S3 subsystem failure cause numerous other AWS service failures
Infrastructure	A construction crew accidentally cuts a fiber optic data line.
Identifier Exhaustion	“We currently do not have sufficient capacity in the AZ you requested”

Disaster Categories



Human Error

“I thought I was in the QA system!”

```
sudo rm -rf /
```

```
truncate table 'invoices';
```

High Availability and Business Continuity

Disaster Recovery Architectures

Disaster Recovery Architectures



Backup and Restore

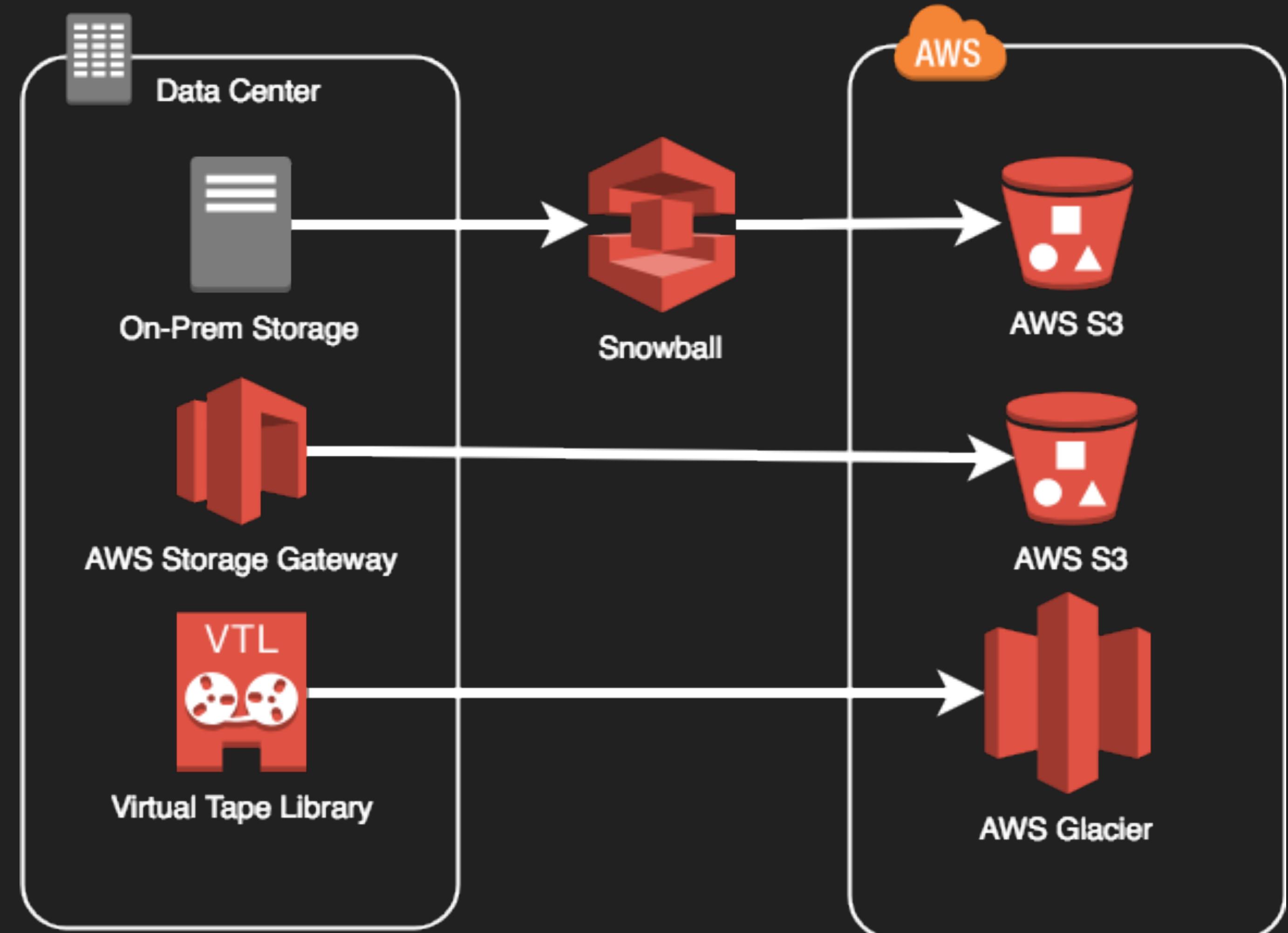


Pros:

- Very common entry point into AWS
- Minimal effort to configure

Cons:

- Least flexibility
- Analogous to off-site backup storage



Pilot Light

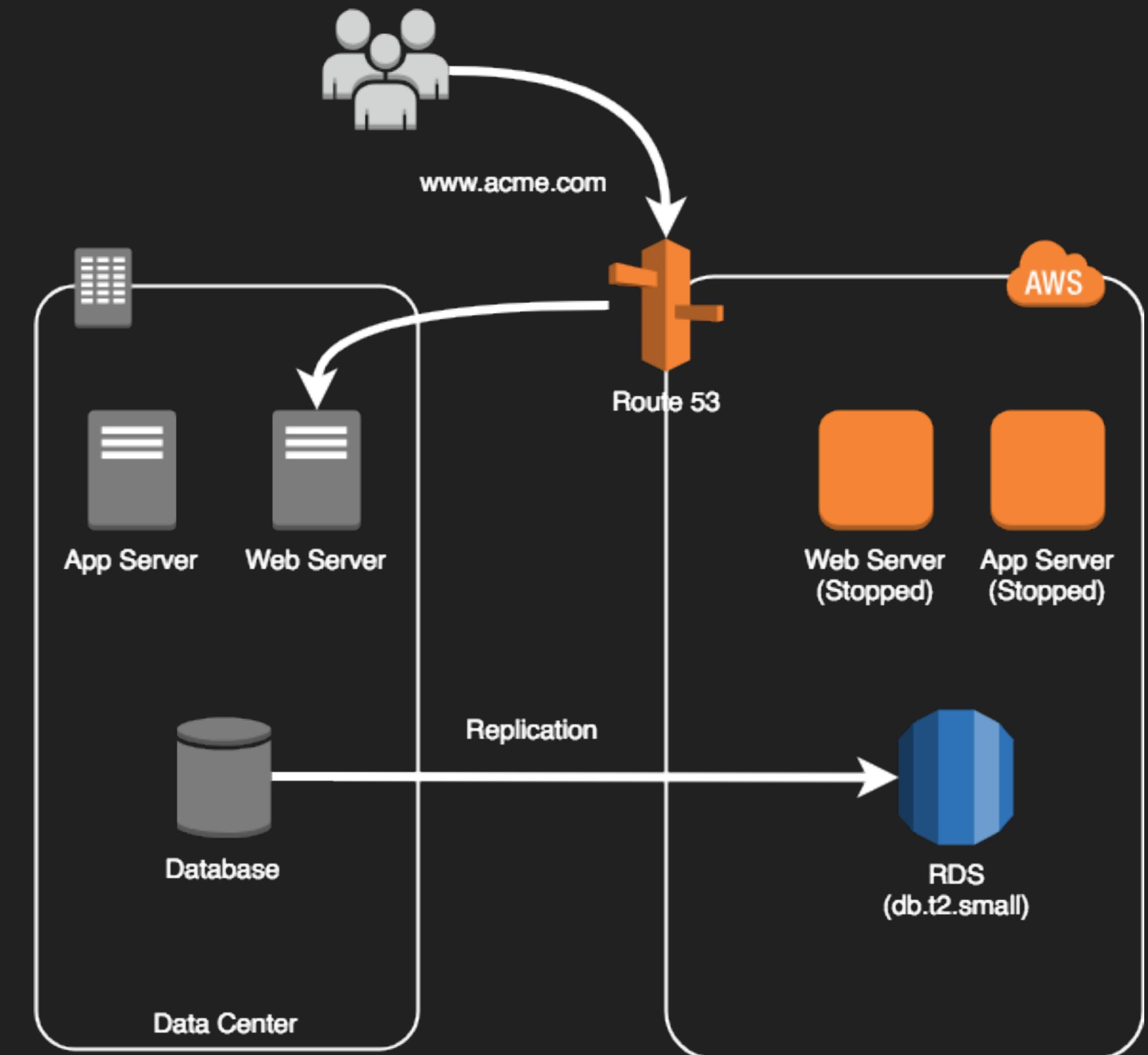


Pros:

- Cost effective way to maintain a “hot site” concept
- Suitable for a variety of landscapes and applications

Cons:

- Usually requires manual intervention for failover
- Spinning up cloud environments will take minutes or hours
- Must keep AMIs up-to-date with on-prem counterparts



Pilot Light

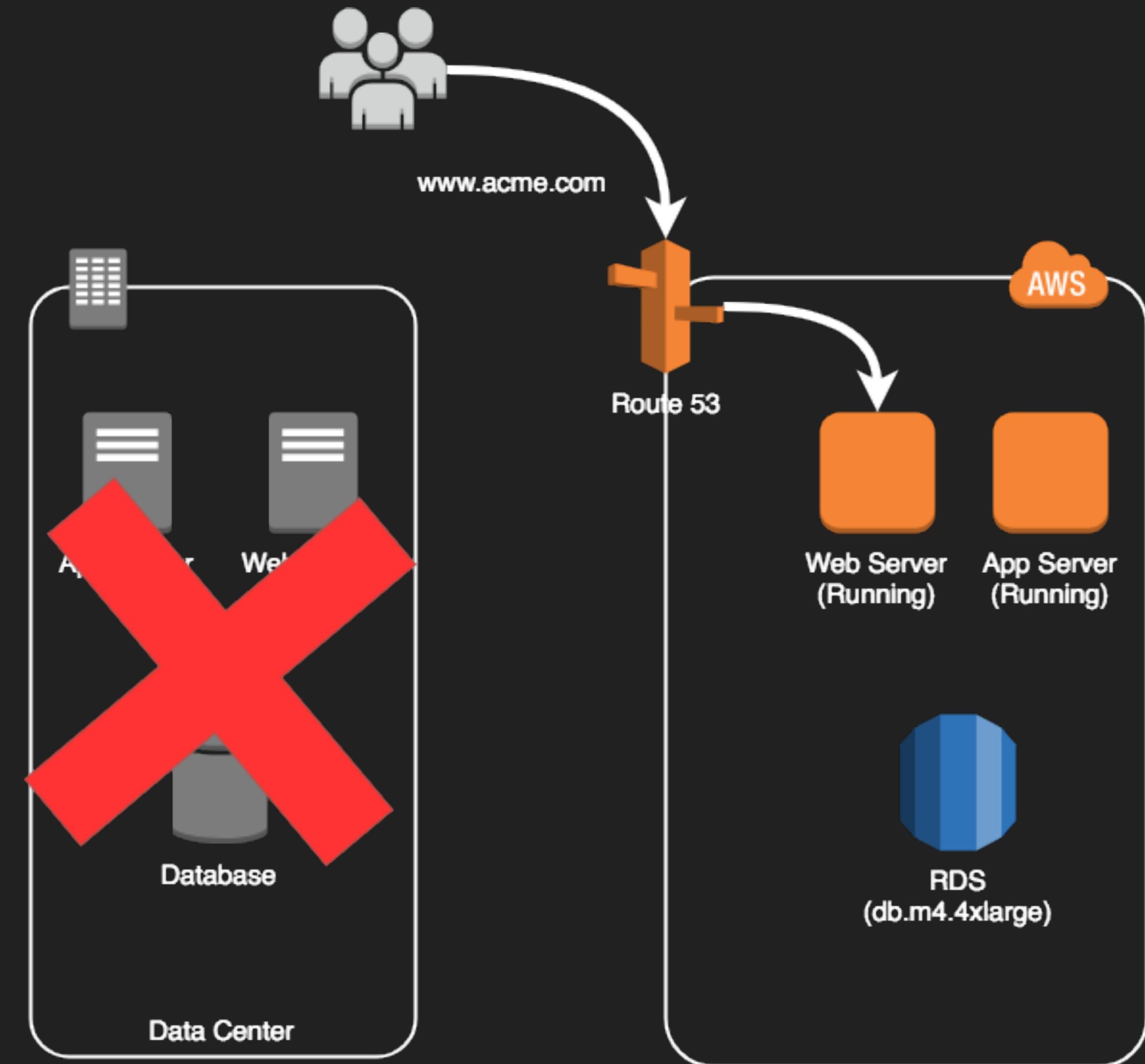


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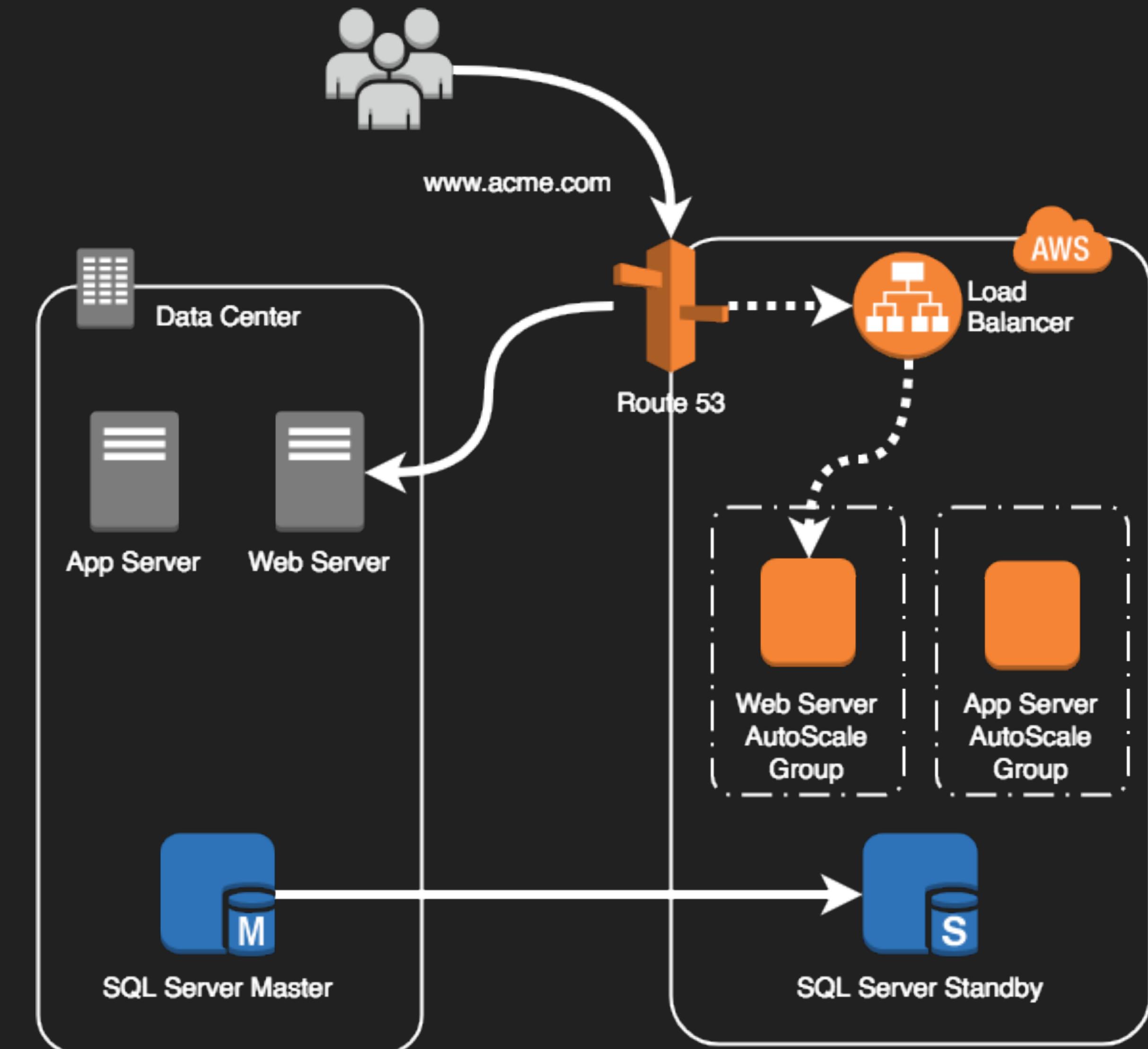
Warm Standby

Pros:

- All services are up and ready to accept a failover faster within minutes or seconds
- Can be used as a “shadow environment” for testing or production staging

Cons:

- Resources would need to be scaled to accept production load
- Still requires some environment adjustments but could be scripted



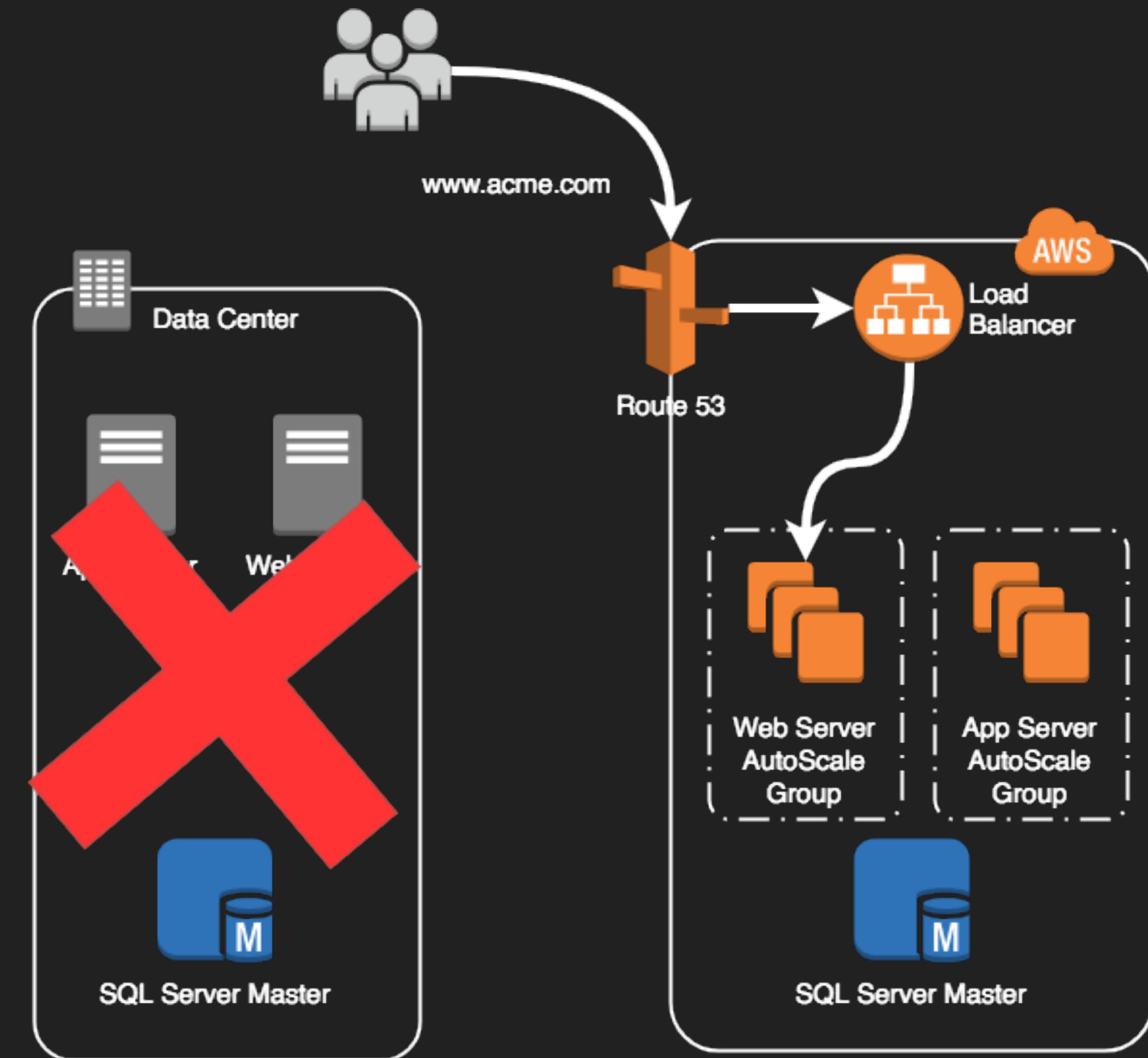
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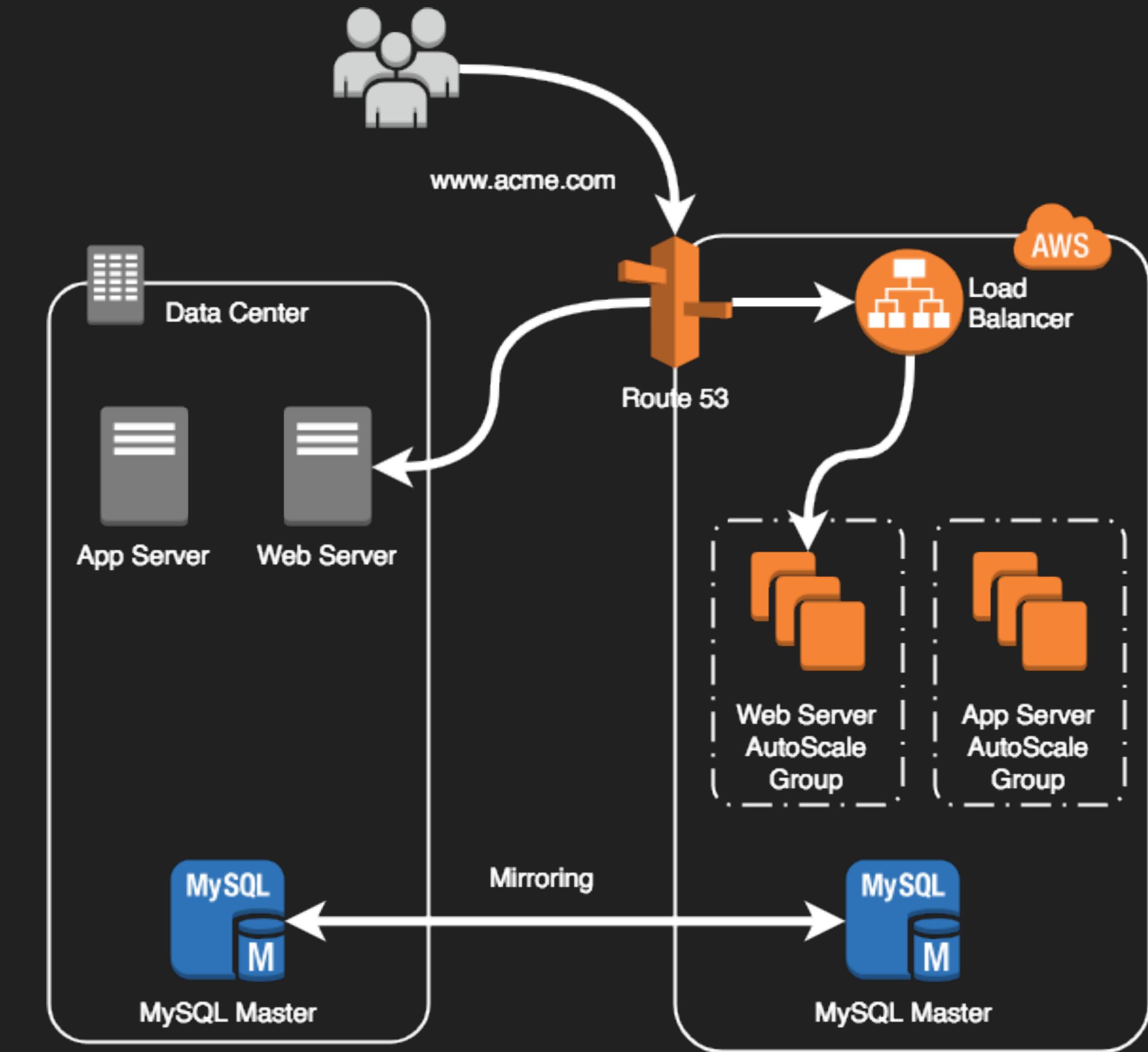
Multi-Site

Pros:

- Ready all the time to take full production load—effectively a mirrored data center
- Fails over in seconds or less
- No or little intervention required to fail over

Cons:

- Most expensive DR option
- Can be perceived as wasteful as you have resources just standing around waiting for the primary to fail



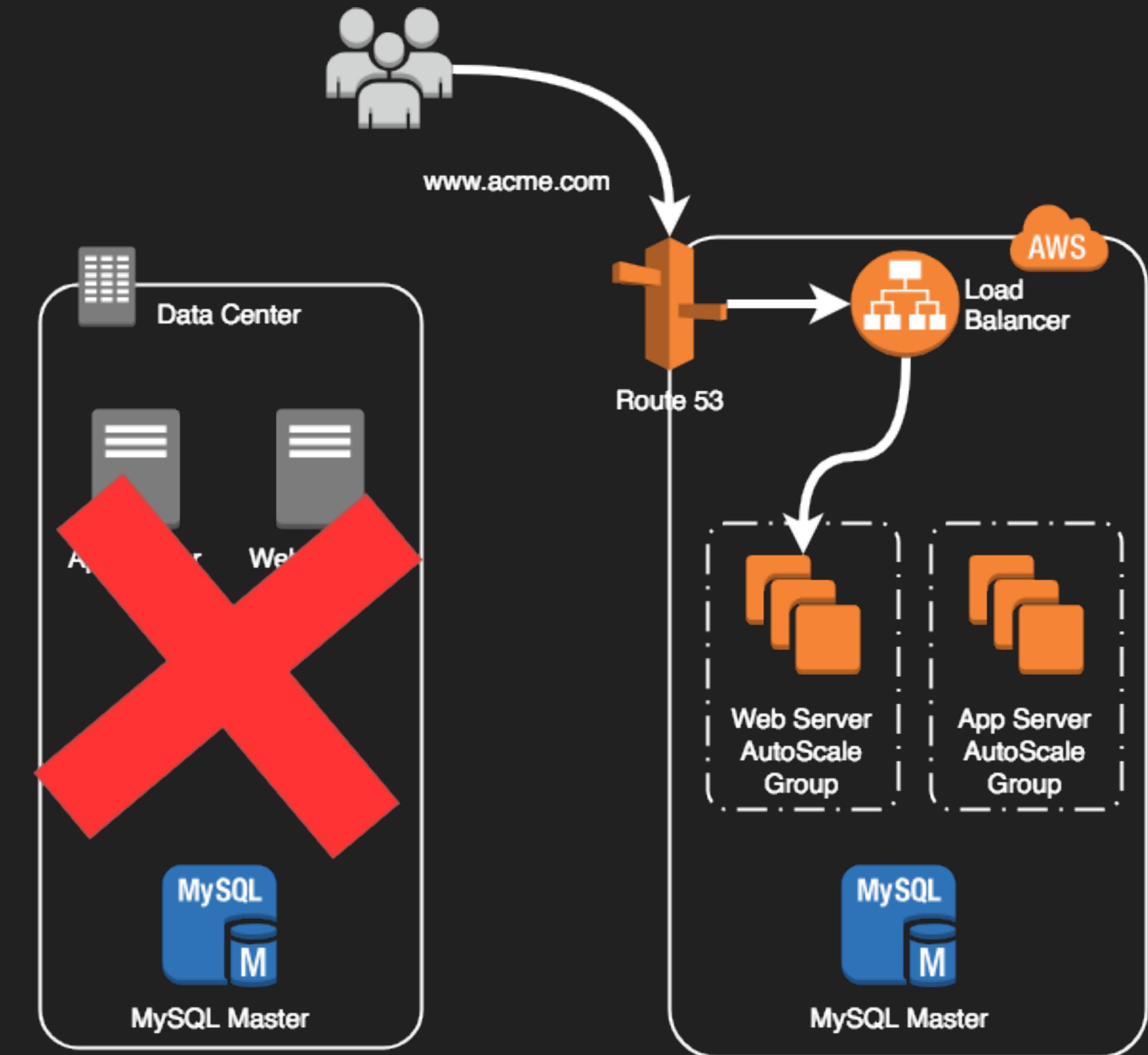
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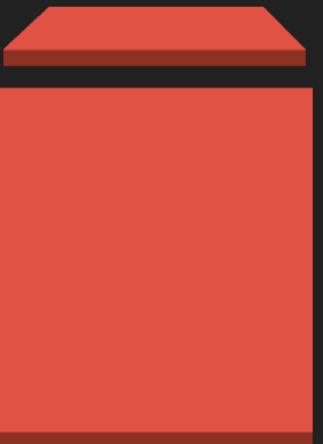
High Availability and Business Continuity

Storage Options

EBS Volumes



- Annual Failure Rate less than 0.2% compared to commodity hard drive at 4%. (Given 1000 EBS volumes, expect around 2 to fail per year.)
- Availability target of 99.999%.
- Replicated automatically **within a single AZ**.
- **Vulnerable to AZ failure. Plan accordingly.**
- Easy to snapshot, which is stored on S3 and multi-AZ durable.
- You can copy snapshots to other regions as well.
- Supports RAID configurations.





RAID Configurations

	RAID0	RAID1	RAID5	RAID6
Redundancy	None	1 drive can fail	1 drive can fail	2 drives can fail
Reads	★★★★★	★★★★	★★★★★	★★★★★
Writes	★★★★★	★★★★	★★	★
Capacity	100%	50%	(n-1)/n	(n-2)/n
Disk Layout	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> A1 A3 A5 A7 </div> <div style="text-align: center;"> A2 A4 A6 A8 </div> </div>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> A1 A2 A3 A4 </div> <div style="text-align: center;"> A1 A2 A3 A4 </div> </div>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> A1 B1 Cp D1 </div> <div style="text-align: center;"> A2 Bp C1 D2 </div> <div style="text-align: center;"> Ap B2 C2 Dp </div> </div>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> A1 B1 Cp1 Dp2 </div> <div style="text-align: center;"> A2 Bp1 Cp2 D1 </div> <div style="text-align: center;"> Ap1 Bp2 C1 D2 </div> <div style="text-align: center;"> Ap2 B2 C2 Dp1 </div> </div>



RAID Configurations

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RAID IOPS and Throughput



A CLOUD GURU

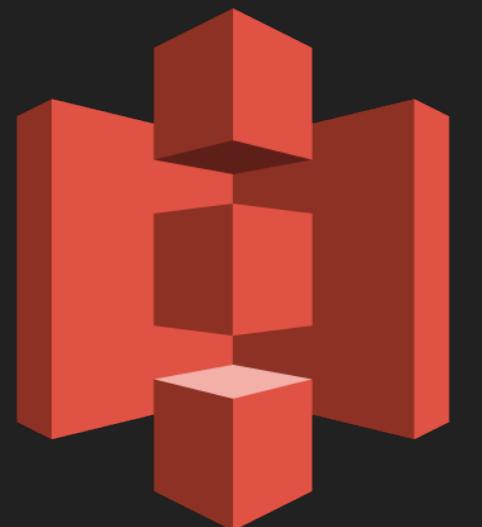
Volume Type: ESB Provisioned IOPS SSD (lo1)

	Volume Size	Provisioned IOPS	Total Volume IOPS	Usable Space	Throughput
No RAID	(1) 1000 GB	4000	4000	1000 GB	500 MB/s
RAID0	(2) 500 GB	4000	8000	1000 GB	1000 MB/s
RAID1	(2) 500 GB	4000	4000	500 GB	500 MB/s

S3 Storage



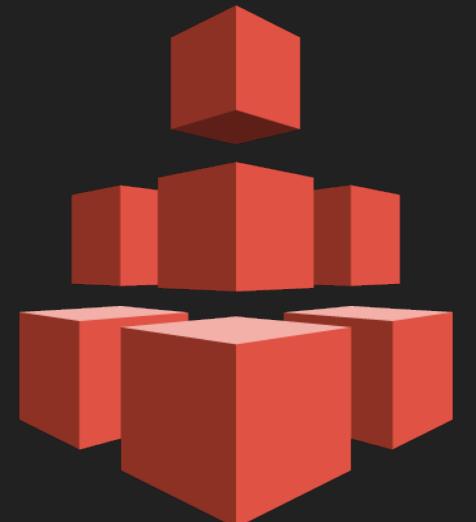
- Standard Storage Class (99.99% availability = 52.6 minutes / year).
- Standard Infrequent Access (99.9% availability = 8.76 hours / year).
- One-zone Infrequent Access (99.5% availability = 1.83 days / year).
- Eleven 9s of durability (99.999999999%).
- Standard & Standard-IA have multi-AZ durability; One-zone only as single AZ durability.
- Backing service for EBS snapshots and many other AWS services.



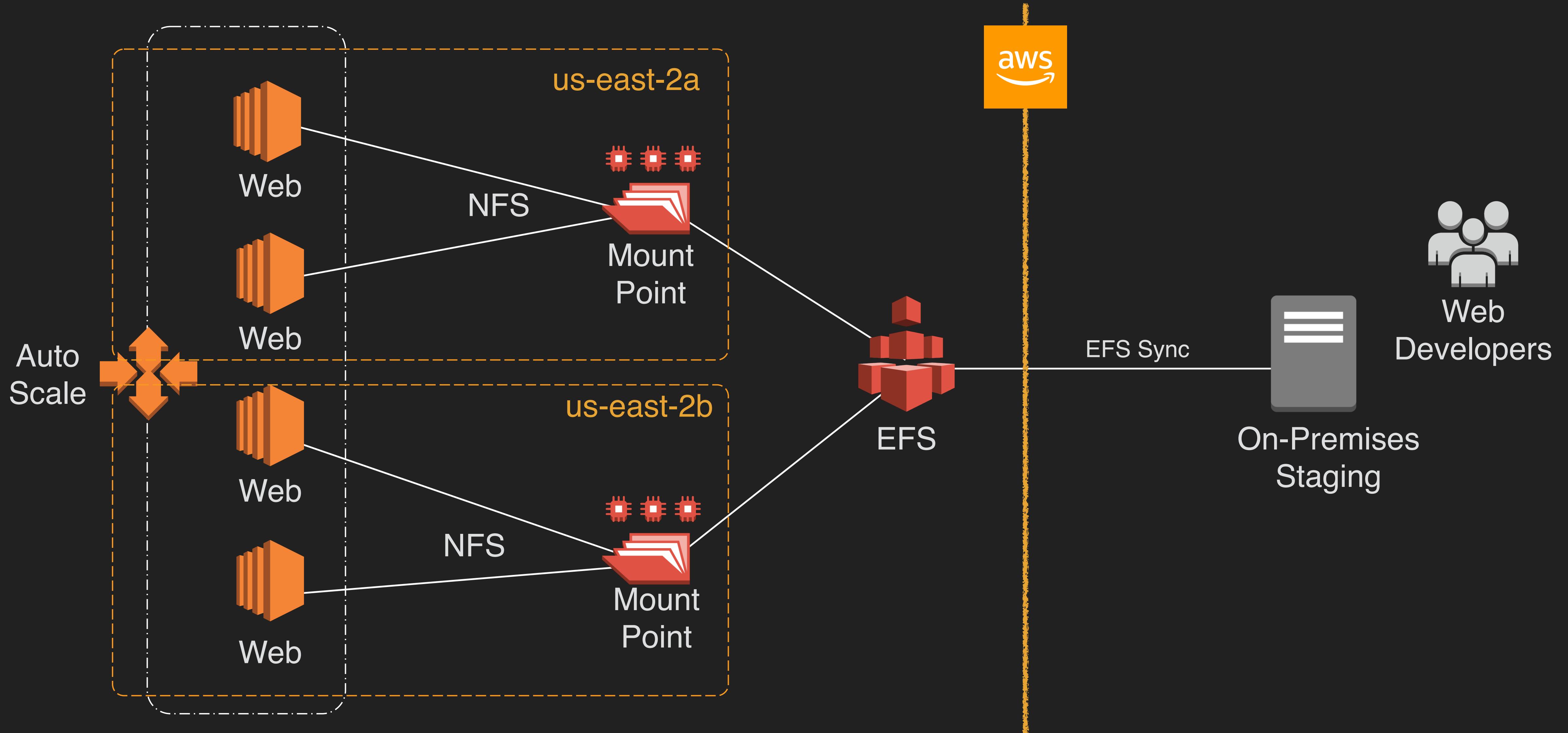
Amazon EFS



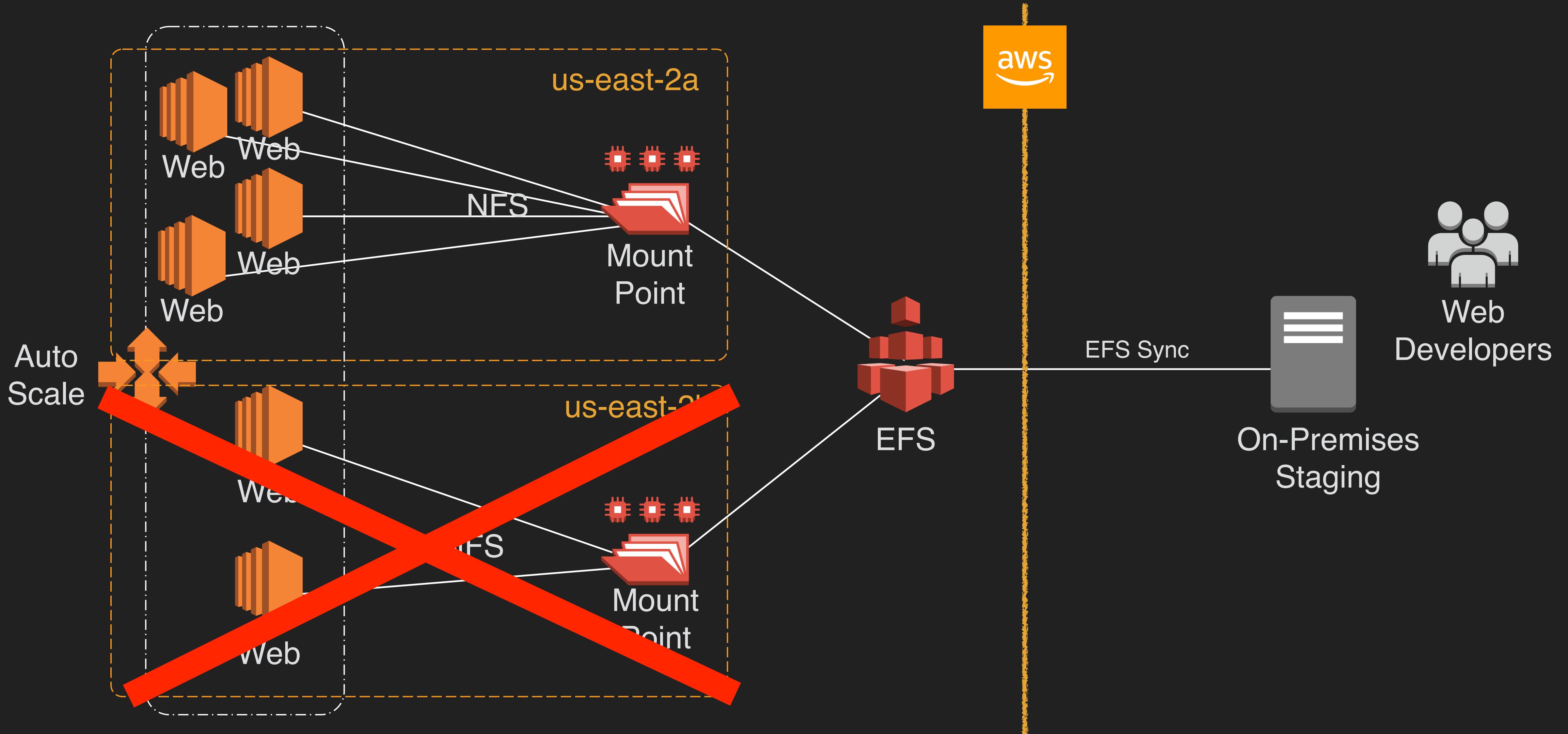
- Implementation of the NFS file system.
- True file system as opposed to block storage (EBS) or object storage (S3).
- File locking, strong consistency, concurrently accessible.
- Each file object and metadata is stored across multiple AZs.
- Can be accessed from all AZs concurrently.
- Mount targets are highly available.



Amazon EFS



Amazon EFS



Other Options



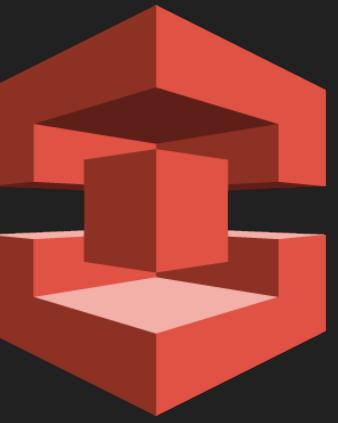
Amazon Storage Gateway

- Good way to migrate on-prem data to AWS for offsite backup.
- Best for continuous sync needs.

AWS Storage
Gateway

Snowball

- Various options for migrating data to AWS based on volume.
- Only for batch transfers of data.

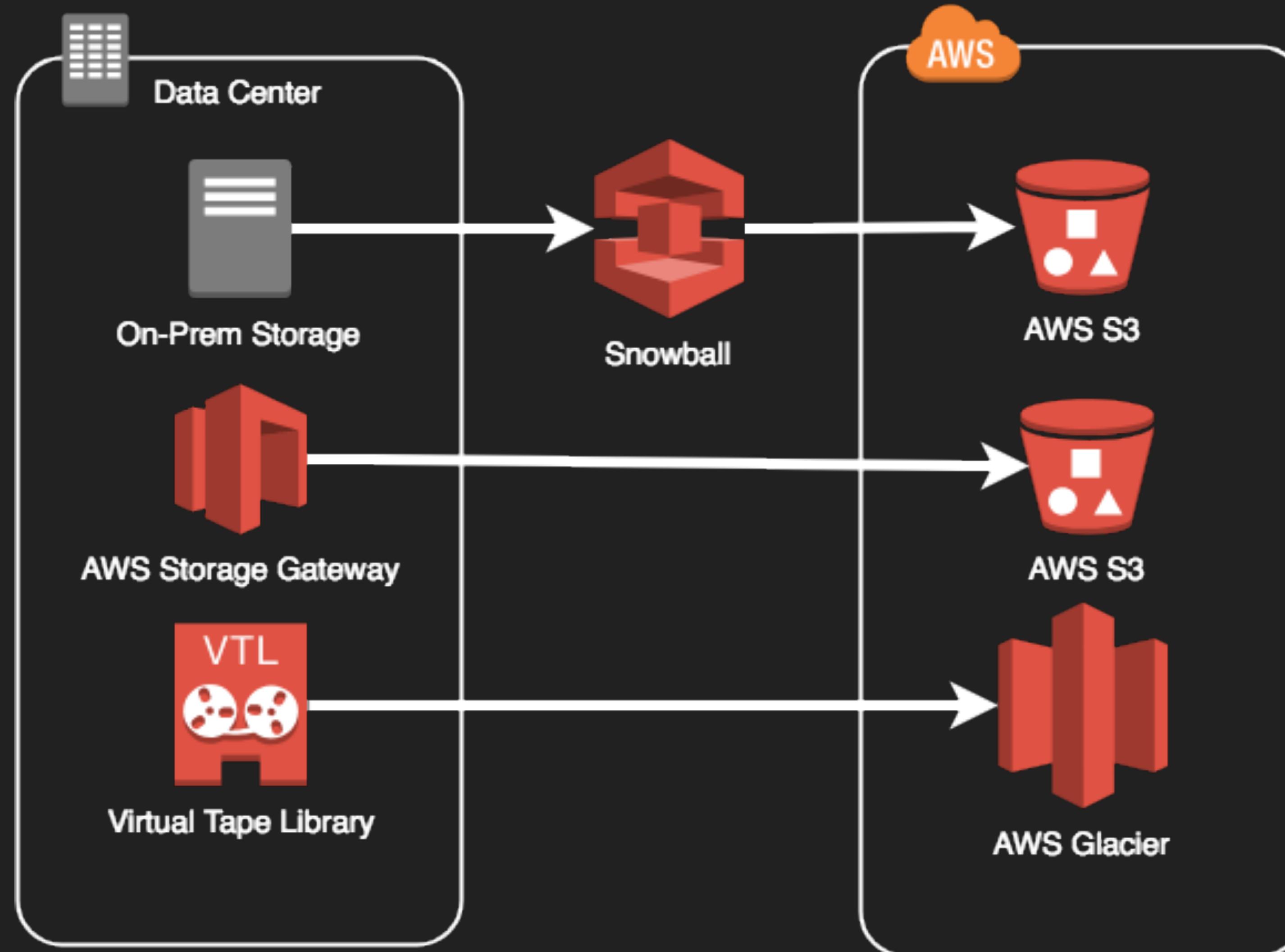
AWS Snowball
Family

Glacier

- Safe offsite archive storage.
- Long-term storage with rare retrieval needs.

Amazon
Glacier

Amazon Storage Gateway



High Availability and Business Continuity

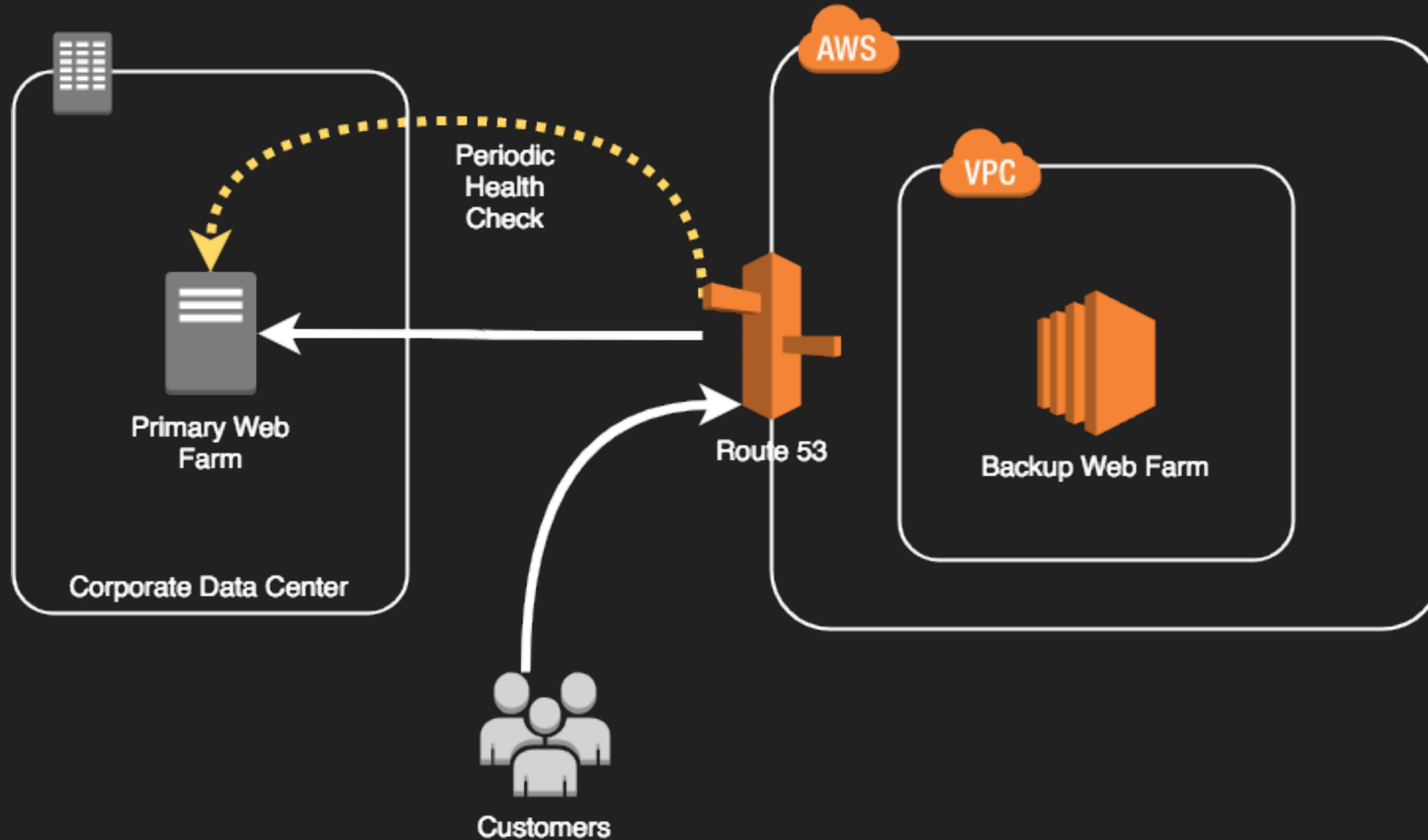
Compute Options

HA Approaches for Compute

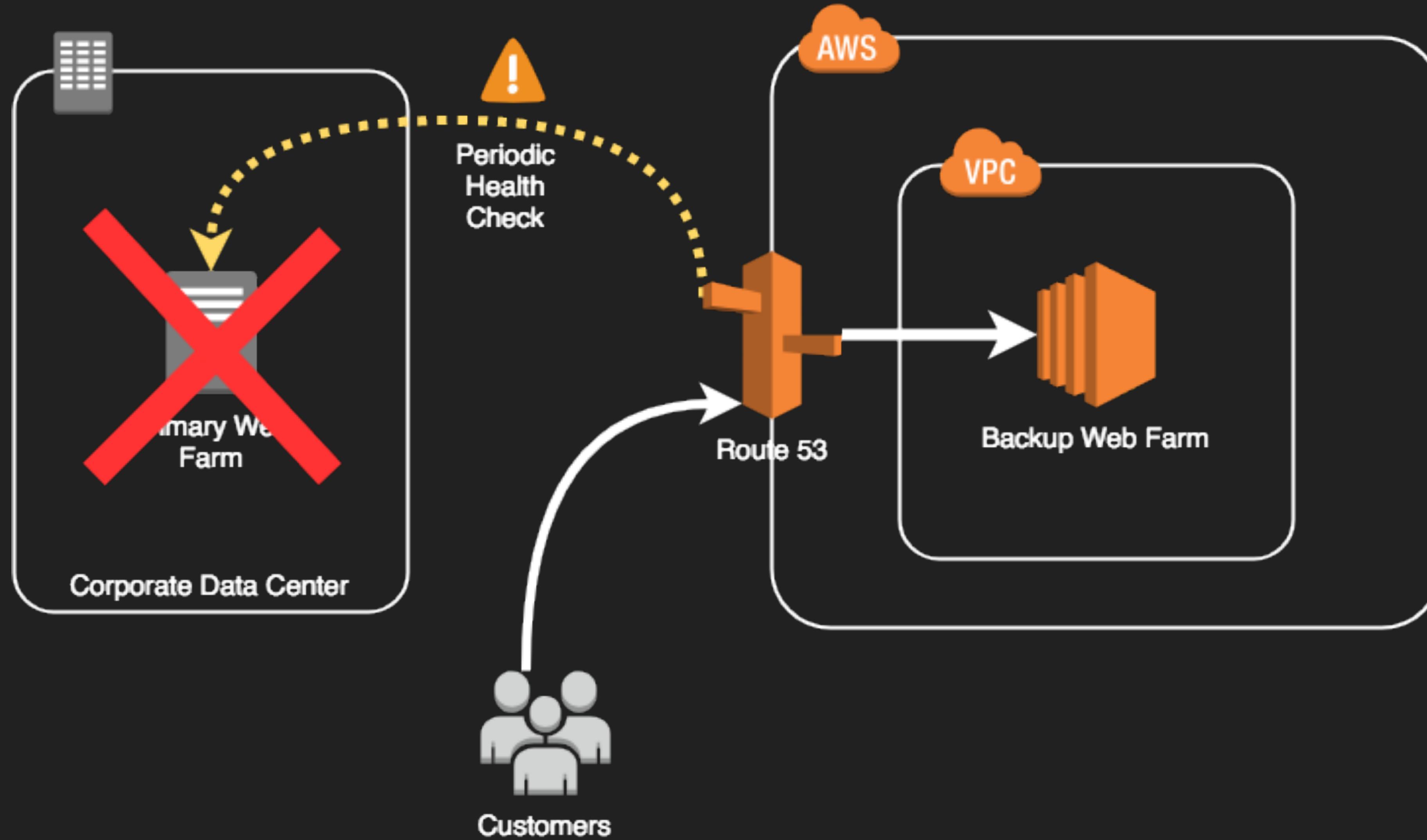


- Up-to-Date AMIs are critical for rapid fail-over.
- AMIs can be copied to other regions for safety or DR staging.
- Horizontally scalable architectures are preferred because risk can be spread across multiple smaller machines versus one large machine.
- Reserved Instances is the only way to guarantee that resources will be available when needed.
- Auto Scaling and Elastic Load Balancing work together to provide automated recovery by maintaining minimum instances.
- Route 53 Health Checks also provide “self-healing” redirection of traffic.

Route 53 Health Checks



Route 53 Health Checks



High Availability and Business Continuity

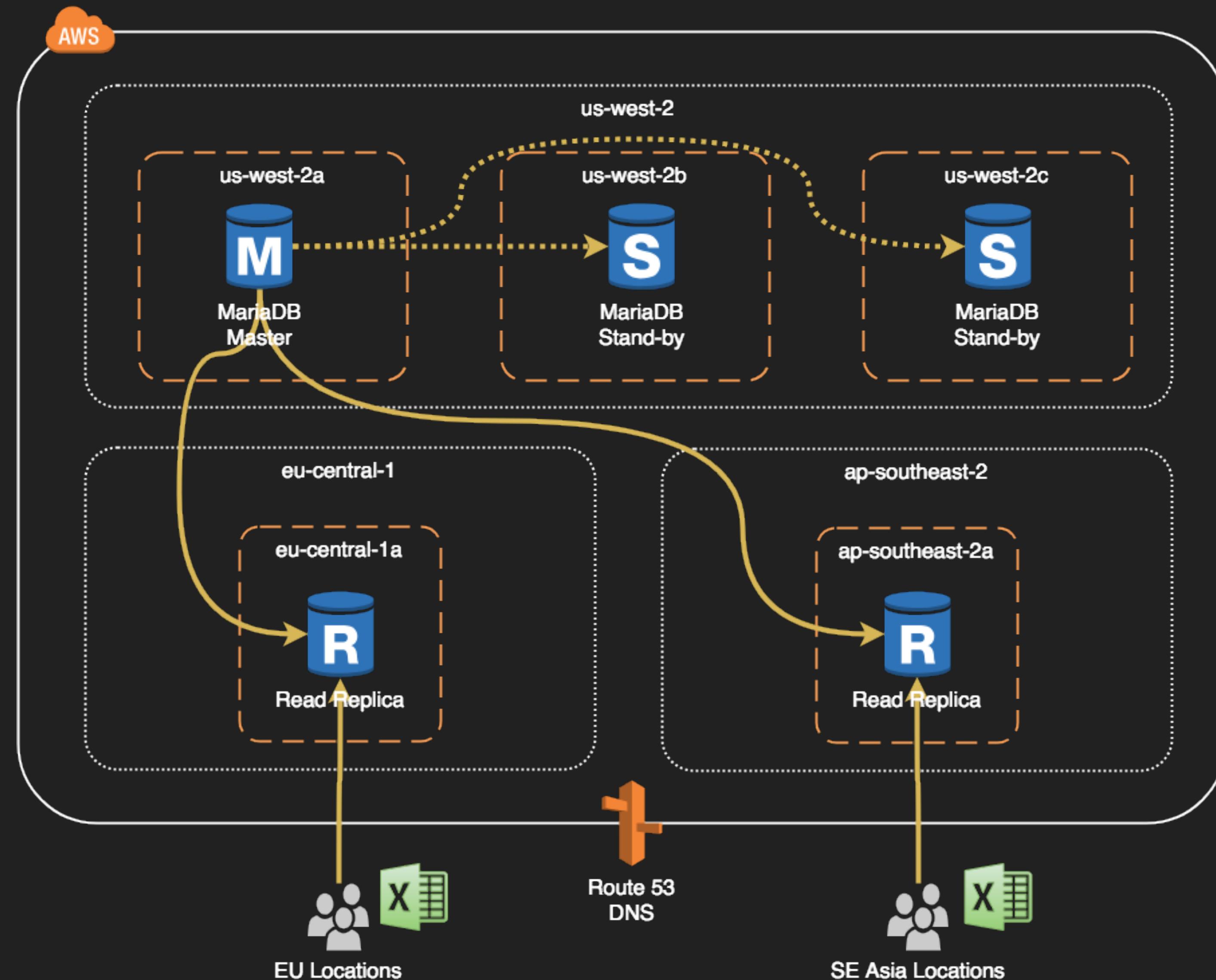
Database Options

HA Approaches for Databases



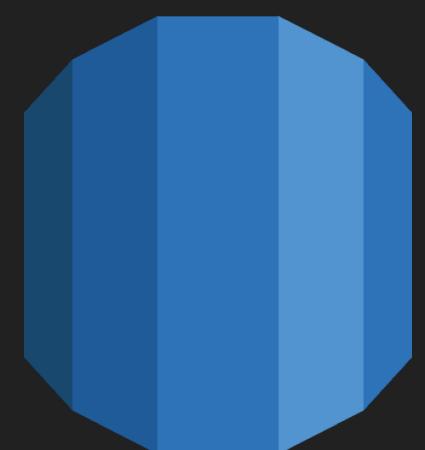
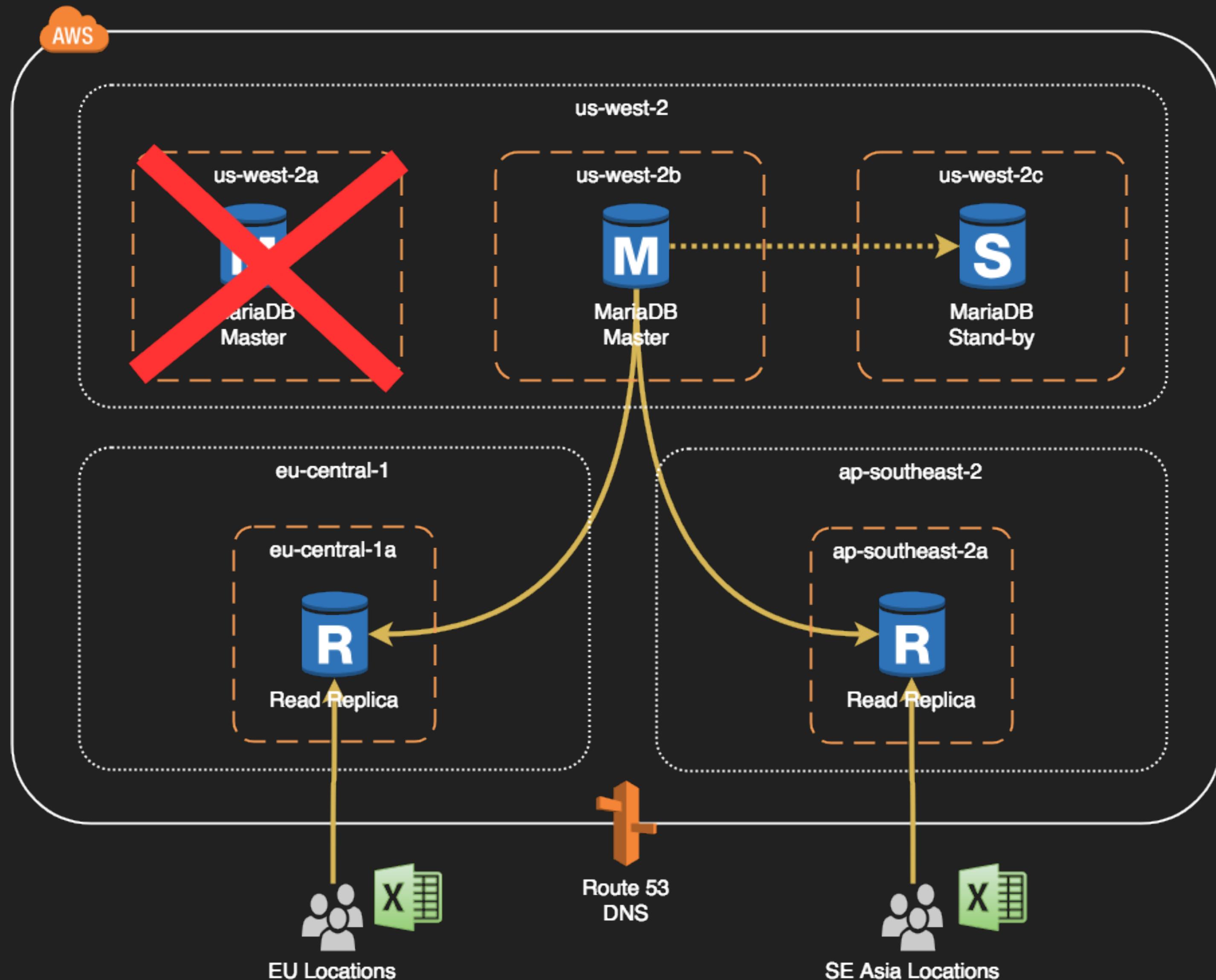
- If possible, choose DynamoDB over RDS because of inherent fault tolerance.
- If DynamoDB can't be used, choose Aurora because of redundancy and automatic recovery features.
- If Aurora can't be used, choose Multi-AZ RDS.
- Frequent RDS snapshots can protect against data corruption or failure—and they won't impact performance of multi-AZ deployment.
- Regional replication is also an option, but will not be strongly consistent.
- If Database on EC2, you'll have to design HA yourself.

Amazon RDS



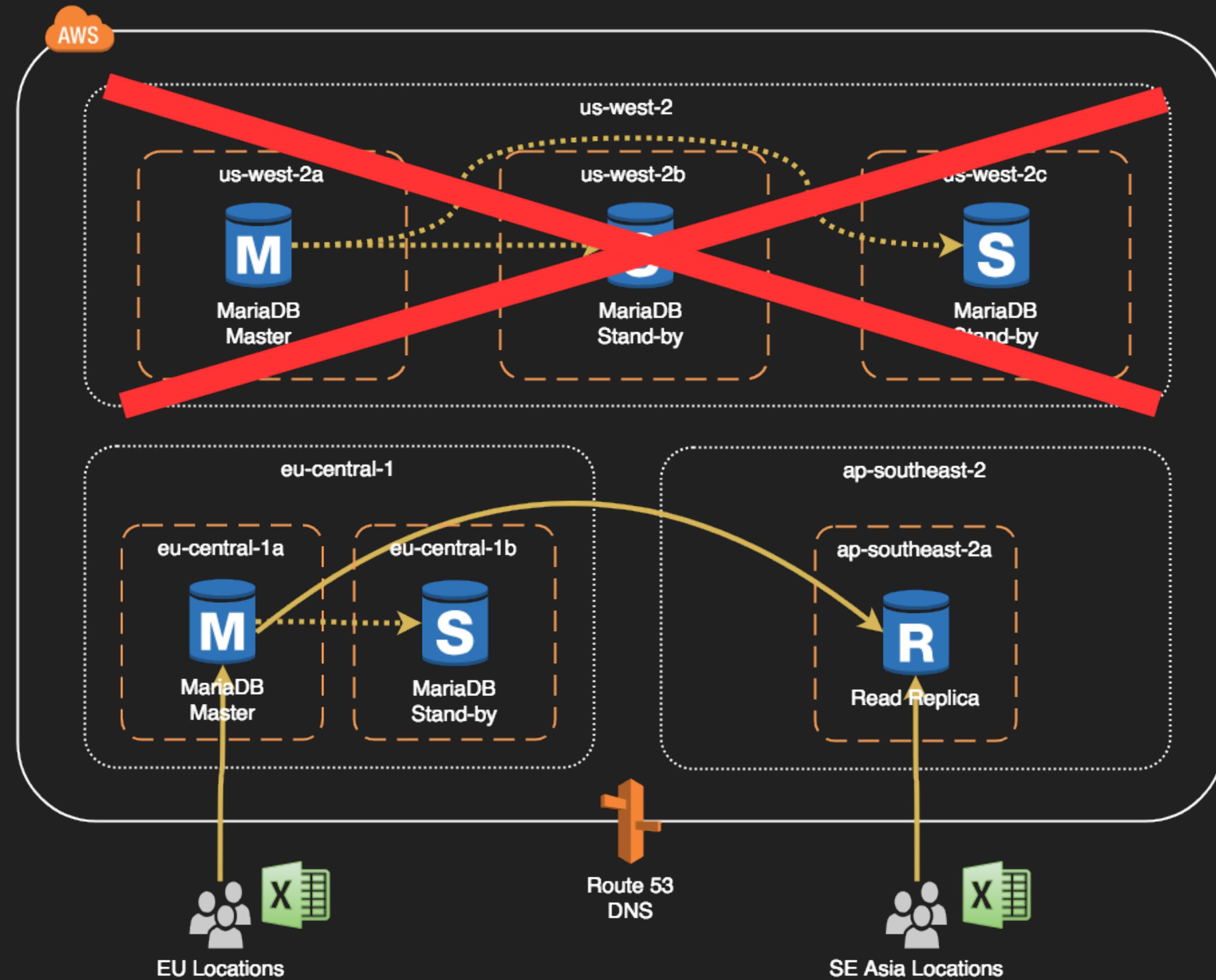
Amazon
RDS

Amazon RDS



Amazon
RDS

Amazon RDS



HA Notes for Redshift



- Currently, Redshift does not support multi-AZ deployments.
- Best HA option is to use a multi-node cluster which support data replication and node recovery.
- A single node Redshift cluster does not support data replication. and you'll have to restore from a snapshot on S3 if a drive fails.



HA Notes for ElastiCache

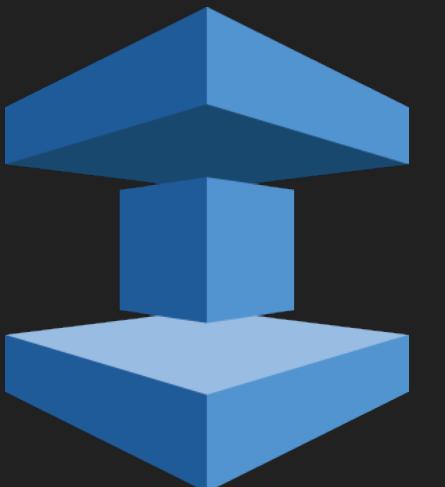


Memcached

- Because Memcached does not support replication, a node failure will result in data loss.
- Use multiple nodes in each shard to minimize data loss on node failure.
- Launch multiple nodes across available AZs to minimize data loss on AZ failure.

Redis

- Use multiple nodes in each shard and distribute the nodes across multiple AZs.
- Enable multi-AZ on the replication group to permit automatic failover if the primary node fails.
- Schedule regular backups of your Redis cluster.



High Availability and Business Continuity

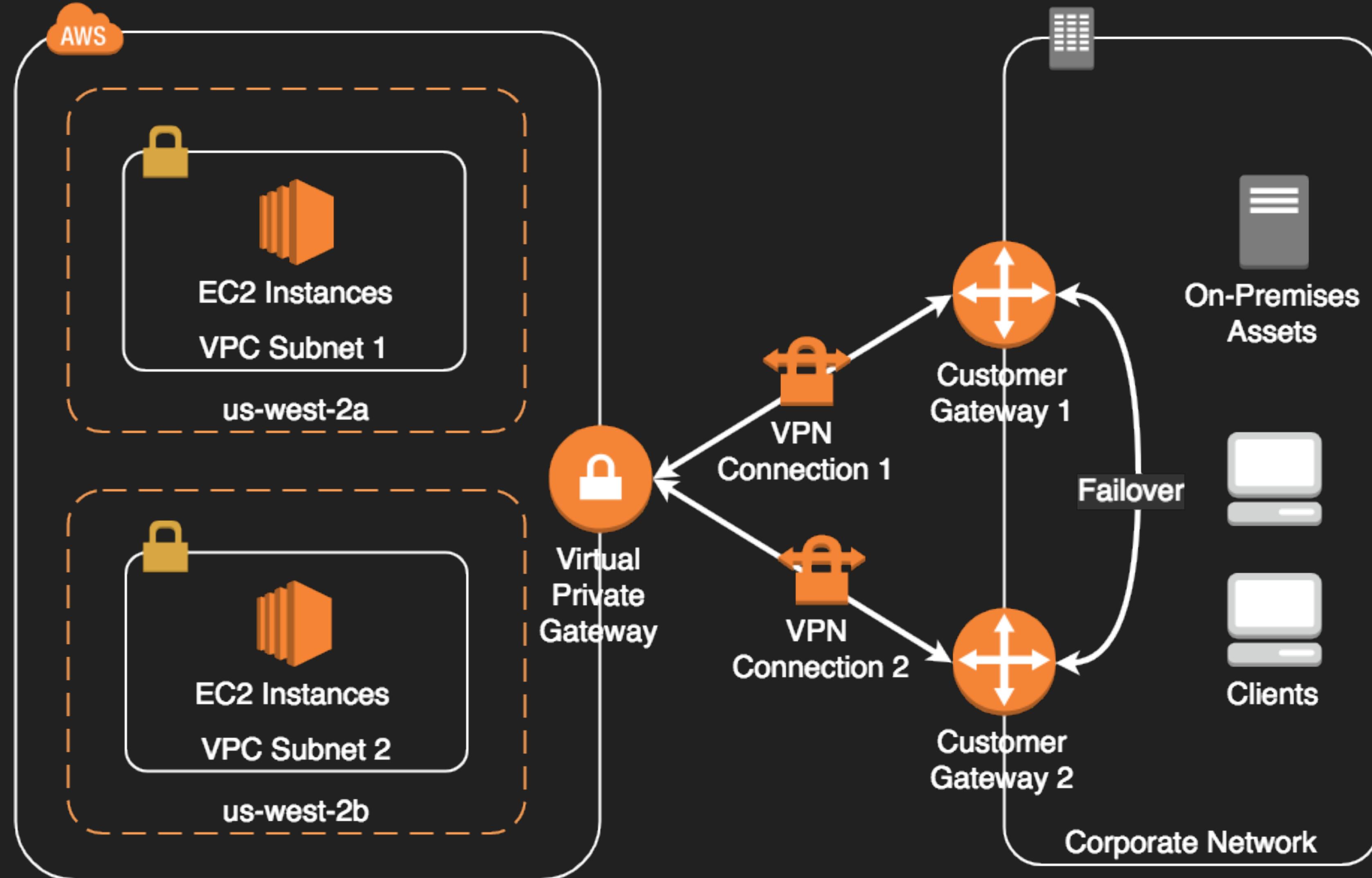
Network Options



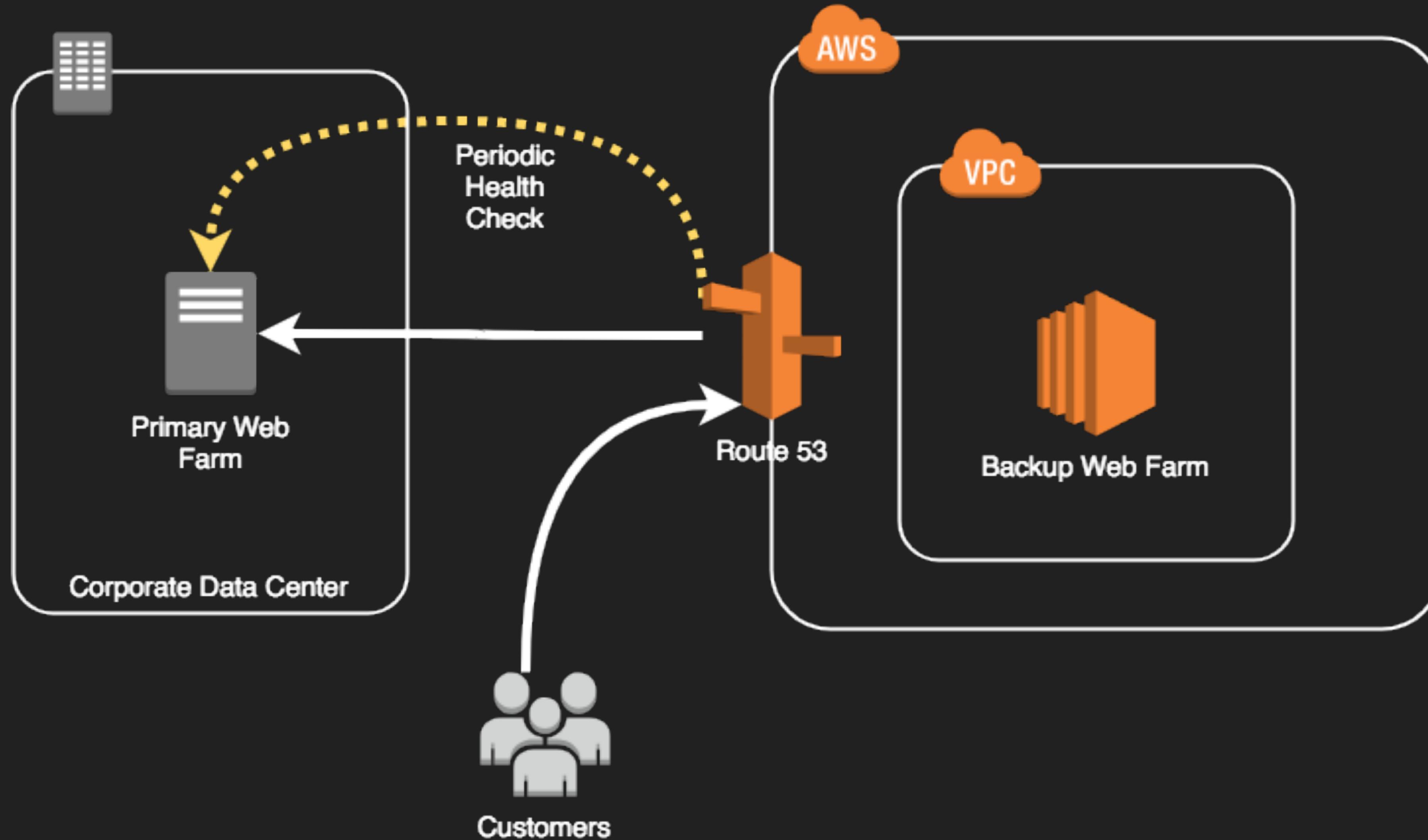
HA Approaches for Networking

- By creating subnets in the available AZs, you create multi-AZ presence for your VPC.
- Best practice is to create at least two VPN tunnels into your Virtual Private Gateway.
- Direct Connect is not HA by default, so you need to establish a secondary connection via another Direct Connect (ideally with another provider) or use a VPN.
- Route 53's Health Checks provide basic level of redirecting DNS resolutions.
- Elastic IPs allow you flexibility to change out backing assets without impacting name resolution.
- For multi-AZ redundancy of NAT Gateways, create gateways in each AZ with routes for private subnets to use the local Gateway.

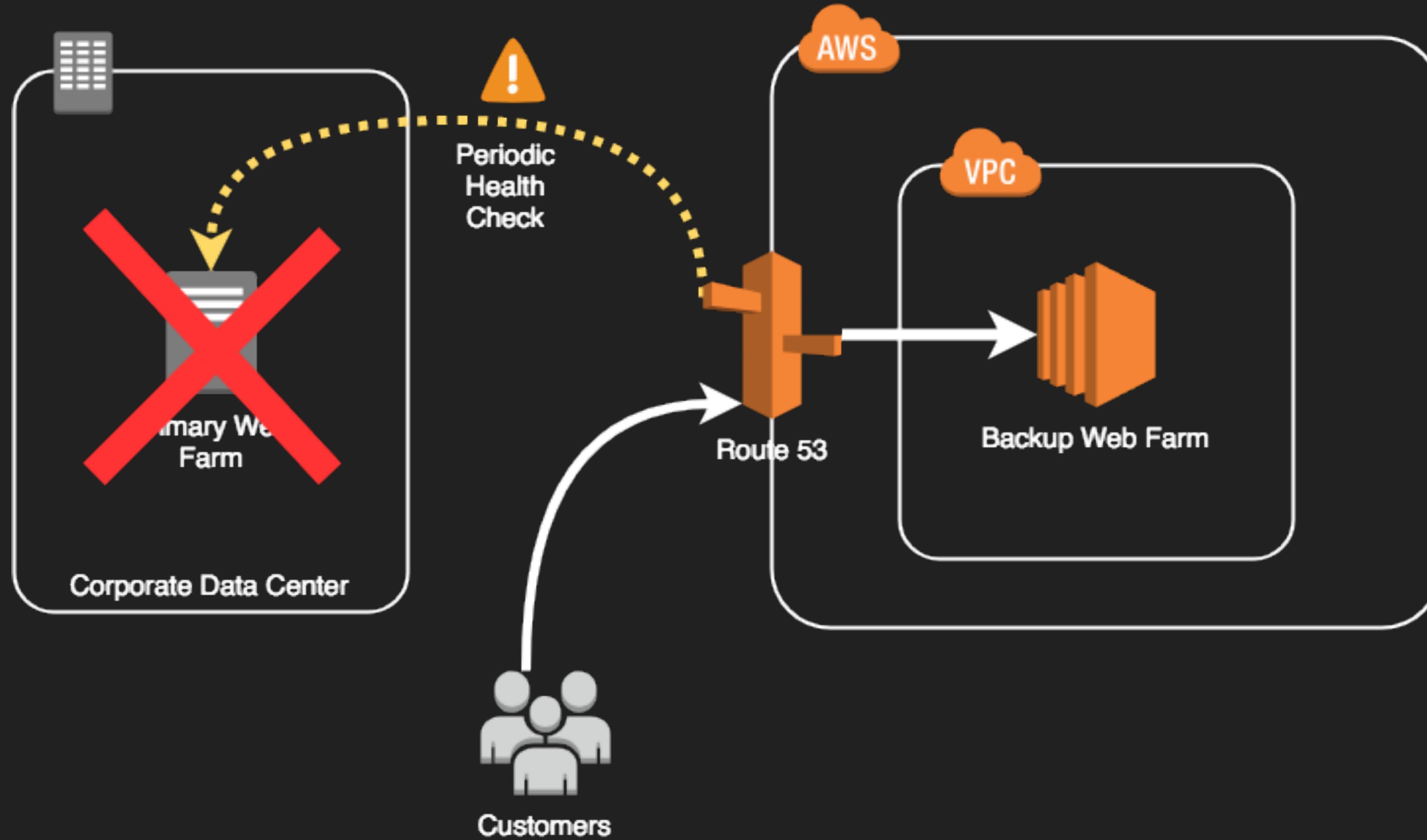
AWS Managed VPN - Redundant

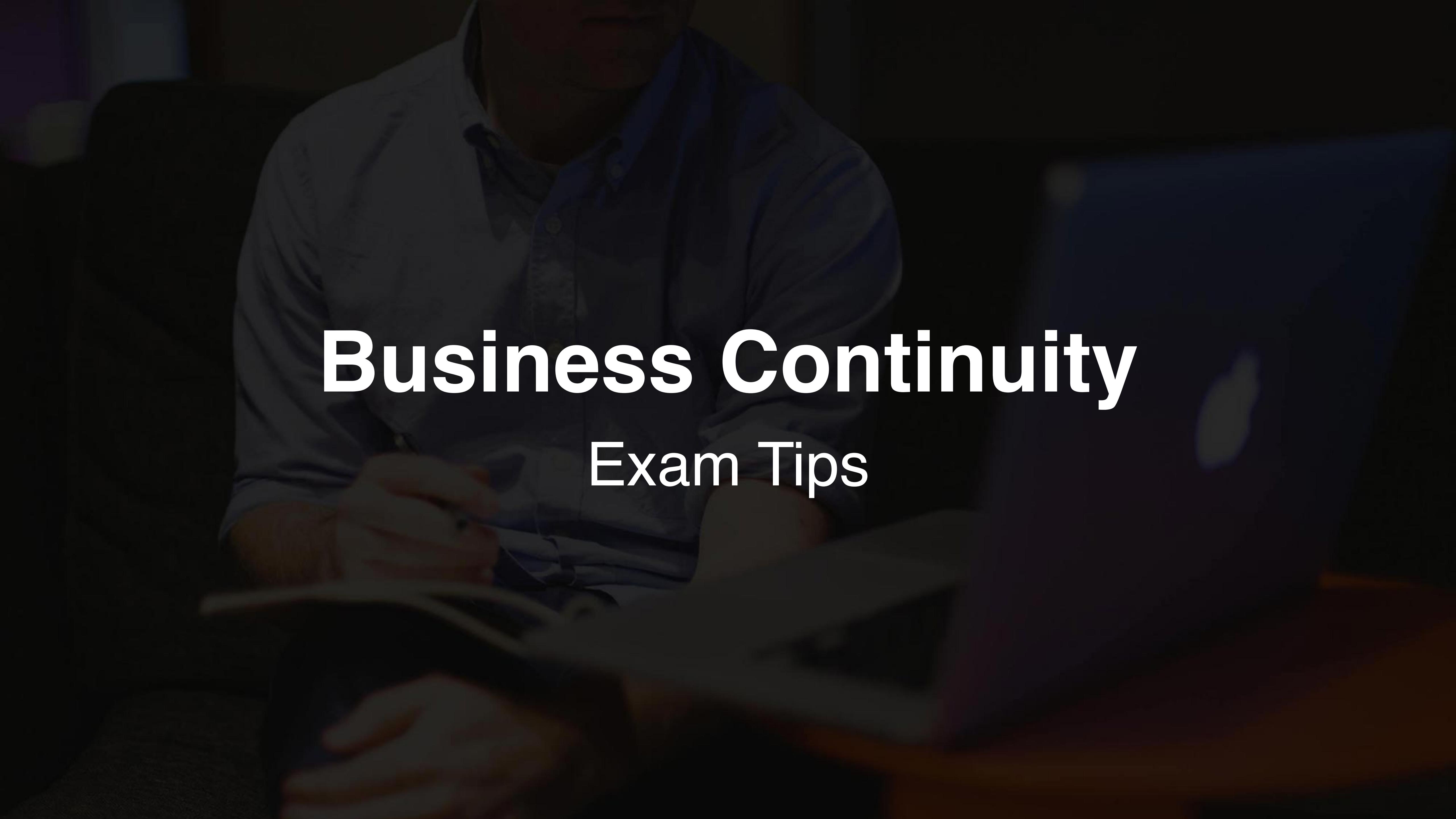


Route 53 Health Checks



Route 53 Health Checks





Business Continuity

Exam Tips

Exam Tips



General Concepts

- Know the difference between Business Continuity, Disaster Recovery, and Service Levels.
- Know the difference between High Availability and Fault Tolerance.
- Understand the inter-relationships and how AWS uses the terms.
- Know the difference between RTO and RPO.
- Know the four general types of DR architectures and trade-offs of each.

Exam Tips



Storage Options

- Understand the HA capabilities and limitations of AWS storage options.
- Know when to use each storage option to achieve the required level of recovery capability.
- Understand RAID and the potential benefits and limitations.

Compute Options

- Understand why horizontal scaling is preferred from an HA perspective.
- Know that compute resources are finite in an AZ and know how to guarantee their availability.
- Understand how Auto Scaling and ELB can contribute to HA.

Exam Tips



Database Options

- Know the HA attributes of the various Database services.
- Understand the different HA approaches and risks for Memcached and Redis.
- Know which RDS options require manual failover and which are automatic.

Network Options

- Know which networking components are not redundant across AZs and how to architect for them to be redundant.
- Understand the capabilities of Route 53 and Elastic IP in context of HA.

A dark, moody photograph of a person from the chest up. They are wearing a dark, button-down shirt and are looking down at a smartphone held in their hands. The lighting is low, creating strong shadows and highlights on their face and hands.

Business Continuity

Pro Tips



Failure Mode and Effects Analysis (FMEA)

A systematic process to examine:

1. What could go wrong
2. What impact it might have
3. What is the likelihood of it occurring
4. What is our ability to detect and react

Failure Mode and Effects Analysis



Severity * Probability * Detection = Risk Priority Number

Severity * Probability + Detection = Risk Priority Number



Step 1 - Round up Possible Failures

	Failure Mode	Cause	Current Controls
Invoicing	Pricing Unavailable	Retail price incorrect in ERP system	Master data maintenance audit report
	Pricing Incorrect	Retail price not assigned in ERP system	None
	Slow to build Invoice	Invoicing System is slow	None
	Unable to Build Invoice	Invoicing System is offline	Uptime monitor



Step 2 - Assign Scores

	Failure Mode	Customer Impact	Likelihood	Detect and React	Risk Priority Number
Invoicing	Pricing Unavailable	7	3	2	42
	Pricing Incorrect	8	3	9	216
	Slow to build Invoice	5	2	9	90
	Unable to Build Invoice	8	3	2	48



Step 3 - Prioritize on Risk

	Failure Mode	Customer Impact	Likelihood	Detect and React	Risk Priority Number
Invoicing	Pricing Unavailable	7	3	2	42
	Pricing Incorrect	8	3	9	216
	Slow to build Invoice	5	2	9	90
	Unable to Build Invoice	8	3	2	48

Sample FMEA Sheet



A CLOUD GURU

					1 = no impact, 10 = worst customer impact		1 = least likely, 10 = most likely		1 = always detected before customer impact; 10 = no possible way to detect					
Macro Process	Process	Function	Failure Mode	Effects	Severity Rating	Causes	Occurrence Rating	Current Controls	Detection Rating	Risk Priority Number	Interface	Recommended Actions	Responsibility and Target Comp.	Action Taken
Sales and Service	Finalizing Invoice	Invoice Built	Sales tax unavailable	Sales tax calculation missing on invoice	1	Tax rates were not loaded	1	Data load monitoring	3	3				
					1	New jurisdiction code doesn't exist in tax tables	3		5	15	IM.051, IM.032			
					1	Tax rate missing for jurisdiction code	5		7	35				
			Sales tax incorrect	Sales tax calculation incorrect on invoice	5	Tax rates were not transferred properly	2		5	50				
					5	Incorrect tax rate for a jurisdiction	3		7	105	IM.051, IM.032			
					5	Temporary tax holiday not reflected in tax tables	3		6	90				
			Pricing unavailable	Cannot calculate price of invoice	7	Retail price not assigned to article in SAP ECC	3	Master data maintenance processes	2	42	IM.095	Assuming retail price load is part of the master data maintenance processes and price changes never remove price		
					7	Retail price not loaded into hybris	2		5	70	IM.095	Implement control to only activate articles with retail prices in ECC		
					7	Retail price not loaded into OVC	2		5	70		Assuming OVC gets retail price from hybris, measure to prevent article to be active without price in hybris upstream.		
			Pricing incorrect	Purchase price of invoice incorrect	8	Retail price incorrect for article in SAP ECC	3	Master data maintenance processes	9	216		Implement a process to validate price adjustments in SAP ECC		
					8	Retail price incorrect for article in hybris	3		7	168				
					8	Retail price incorrect for article in OVC	3		7	168				
			Unable to build invoice	Cannot complete invoice systematically	8	Tablet unavailable or damaged	5		2	80				
					8	OVC Client has error	3	Rigorous testing and change control process in place	5	120		Build reaction plans to various client errors for triage, troubleshooting and rapid resolution		
					8	OVC back-end is unavailable	2	OVC Client designed to work in offline mode for a period of time	1	16				
					8	Wireless Network in Local Store Unavailable	2	OVC Client designed to work in offline mode for a period of time	1	16				
					8	Wide Area Network to Data Center Unavailable	2	OVC Client designed to work in offline mode for a period of time	1	16				
			Slow to build invoice	Invoice takes longer than usual to build	5	OneView Commerce Back-end Slow	2		4	40				
					5	OneView Commerce Front-end Slow	2		4	40				
					5	Tablet Slow	2		6	60				
					5	Wireless Network in Local Store Slow	2		2	20				
					5	Wide Area Network to Data Center Slow	2		2	20				
			Customer Reviews Invoice with Salesperson	Unable to show invoice	9	Tablet unavailable or damaged	5		2	90				
					9	No tablet or terminals available in store	2		1	18				
			Customer Tenders Payment	Unable to run payment card	7	Payment device unavailable or damaged	3	Phone auth backup	2	42				
					7	Payment device cannot communicate with processor	3	Phone auth backup	5	105	IT.116			
					7	Authorization token not received by POS	3	Phone auth backup	5	105	IT.116			
				Unable to authorize personal check	7	Authorization service unavailable	3		7	147		Perform phone authorization		
					7	Check reader unavailable	1	Check readers are being phased out	3	21				
				Unable to complete credit check for AR Customers	7	Credit check service unavailable	3		3	63				
			Invoice Finalized	Unable to finalize invoice systematically	4	Tablet unavailable or damaged	5		2	40				
					4	OVC Client has error	3		5	60				
					4	OVC back-end is unavailable	2	OVC Client designed to work in offline mode for a period of time	1	8				
					4	Wireless Network in Local Store Unavailable	2	OVC Client designed to work in offline mode for a period of time	1	8				
					4	Wide Area Network to Data Center Unavailable	2	OVC Client designed to work in offline mode for a period of time	1	8				
			Receipt Output	Unable to output receipt	6	Cannot send receipt output to mail service	2		3	36	IT.117, IT.107			
					6	Mail service down	2		7	84				
					6	Mail is undeliverable	4	Only detectable via bounce-back	8	192		Implement email address validation during email address collection		
					6	Printer unavailable	4		4	96				
					6	Print server unavailable	2		2	24				

					Q1	Stakeholder analysis report	3		3	34				
					Q1	Stakeholder analysis report	4		4	88				
					Q1	Stakeholder analysis report	4	Only detectable via bounce-back	8	192		Only detectable via bounce-back		
					Q1	Print server down	2		3	34	IT.117, IT.107			
					Q1	Print server down	2		3	34				



Sample FMEA Sheet

Macro Process	Process	Function	Failure Mode	Effects
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Sample FMEA Sheet

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Customer Severity Rating	Causes	Occurrence Rating	Current Controls	Detection Rating
1	Tax rates were not loaded	1	Data load monitoring	3
1	New jurisdiction code doesn't exist in tax tables	3		5
1	Tax rate missing for jurisdiction code	5		7
5	Tax rates were not transferred properly	2		5
5	Incorrect tax rate for a jurisdiction	3		7
5	Temporary tax holiday not reflected in tax tables	3		6
2	Temporary tax holiday not reflected in tax tables	3		6
2	Incorrect tax rate for a jurisdiction	3		5

Sample FMEA Sheet

Risk Priority Number	Interface	Recommended Actions	Responsibility and Target Completion Date	Action Taken
3	IM.051, IM.032			
15				
35				
50				
105				
90				
42	IM.095	Assuming retail price load is part of the master data maintenance processes and price changes never remove price		
	IM.062	price price changes never remove		

FMEA Across Disaster Categories



A CLOUD GURU

	Category	Customer Impact	Likelihood	Detect and React	Risk Priority Number
eCommerce System	Hardware Failure	9	5	2	90
	Deployment Failure	9	1	2	18
	Load Induced	5	5	2	50
	Data Induced	6	1	6	36
	Credential Expiration	7	6	7	294
	Dependency	7	7	2	98
	Infrastructure	8	5	9	360
	Identifier Exhaustion	2	2	2	8

A dark, low-light photograph of a person from the chest up. They are wearing a dark-colored button-down shirt over a blue t-shirt. Their hands are clasped in front of them, holding a smartphone horizontally.

Business Continuity

Challenge 1



Challenge 1

Company X supports all store transactions out of their Global Data Center. Their homegrown Point of Sales (POS) system is comprised a store client application and a central 2-tier processing engine. Periodically, sales transactions are uploaded from the stores to the data center and processed by one of 3 app servers and inserted into a 2TB MySQL database. The raw transaction files are then stored on SAN space as encrypted text files for 5 years. They currently have about 10TB worth of archived files on their SAN.

The POS client in the stores can run for no more than 4 hours in offline mode so the RTO must be less than 4 hours. The POS clients also cache the past 12 hours worth of data locally and can retransmit if needed so the RPO must be less than 12 hours. A cron job is scheduled monthly to purge out the raw text files that are older than 5 years.

What preparation steps will ensure the RTO/RPO requirements can be met most cost-effectively?

- A. Use Snowball to pre-load the SAN data into AWS S3 buckets, then setup Storage Gateway File Gateway to keep the SAN in sync. Provision a single-AZ RDS instance and setup replication between MySQL RDS and on-premise MySQL database. Import images of the App servers into EC2 as AMIs.
- B. Setup a cron job that uses rsync to replicate the SAN data to EFS volumes mounted on an EC2 instance. Configure lifecycle rules on EFS to purge anything over 5 years. Provision an RDS MySQL Read Replica and setup mirroring to the on-premise database Import images of the App servers into EC2 as AMIs.
- C. Use Snowball to pre-load the SAN data into AWS S3 buckets, then schedule daily Snowball deliveries to batch sync SAN data. Provision a single-AZ Amazon Aurora instance and setup replication between Aurora and on-premise MySQL database. Import images of the App servers into EC2 as AMIs.
- D. Create a RAID5 array using EBS and EC2, then use rsync to keep the SAN data in sync with the AWS versions. Perform regular backups to tape using Virtual Tape Library. Create CloudFormation scripts to provision the MySQL and App Servers, restoring them from VTL as needed.



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Business Continuity

Challenge 2



Challenge 2

You are conducting a technical evaluation of a company's disaster recovery plan. As part of the Business Continuity Plan, you notice that several key business processes running on the company's ERP system have been defined to allow only 10 minutes of unplanned downtime with no permitted data lost because extreme financial and commercial impact would be realized after 10 minutes.

As part of the audit, you also review the architecture of the landscape as well as their Disaster Recovery plan. The landscape consists of a multi-AZ MySQL RDS and a fleet of app servers behind an ELB in the us-east-2 region across three AZs. Additionally, a read replica of the MySQL RDS has been created in us-west-2.

You notice that there are several aspects of the existing architecture documentation which are concerning. Which of the following statements in the DR documentation would be concerning to you if you were conducting the audit?

Pick all that apply.

- A. "In the case of an AZ failure, the database will auto-failover to one of the read replicas."
- B. "The app servers are defined in an auto-scaling group to keep a minimum of 6 instances equally distributed across multiple AZs."
- C. "The ELB is has cross-zone load balancing enabled so traffic is distributed equally across all app servers."
- D. "The app servers are configured for RAID0 to provide both performance and redundancy for local data."
- E. "We use Route 53 health checks to detect and remove routes to unhealthy app servers in under a minute."
- F. "A minimum of 2 reserved instances have been purchased in each of three AZs to be used by our app servers."
- G. "To provide the best read performance, we have chosen to use the MyISAM storage engine for our MySQL database."

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Deployment and Operations Management

Introduction



A CLOUD GURU



Exam Blueprint

Domain 1: Design for Organizational Complexity

- 1.1. Determine cross-account authentication and access strategy for complex organizations (for example, an organization with varying compliance requirements, multiple business units, and varying scalability requirements).
- 1.2. Determine how to design networks for complex organizations (for example, an organization with varying compliance requirements, multiple business units, and varying scalability requirements).
- 1.3. Determine how to design a multi-account AWS environment for complex organizations (for example, an organization with varying compliance requirements, multiple business units, and varying scalability requirements).

Domain 2: Design for New Solutions

- 2.1. Determine security requirements and controls when designing and implementing a solution.
- 2.2. Determine a solution design and implementation strategy to meet reliability requirements.
- 2.3. Determine a solution design to ensure business continuity.
- 2.4. Determine a solution design to meet performance objectives.
- 2.5. Determine a deployment strategy to meet business requirements when designing and implementing a solution.



Exam Blueprint

Domain 3: Migration Planning

- 3.1. Select existing workloads and processes for potential migration to the cloud.
- 3.2. Select migration tools and/or services for new and migrated solutions based on detailed AWS knowledge.
- 3.3. Determine a new cloud architecture for an existing solution.
- 3.4. Determine a strategy for migrating existing on-premises workloads to the cloud.

Domain 4: Cost Control

- 4.1. Select a cost-effective pricing model for a solution.
- 4.2. Determine which controls to design and implement that will ensure cost optimization.
- 4.3. Identify opportunities to reduce cost in an existing solution.

Domain 5: Continuous Improvement for Existing Solutions

- 5.1. Troubleshoot solution architectures.
- 5.2. Determine a strategy to improve an existing solution for operational excellence.
- 5.3. Determine a strategy to improve the reliability of an existing solution.
- 5.4. Determine a strategy to improve the performance of an existing solution.
- 5.5. Determine a strategy to improve the security of an existing solution.
- 5.6. Determine how to improve the deployment of an existing solution.

Deployment Management

Types of Deployments



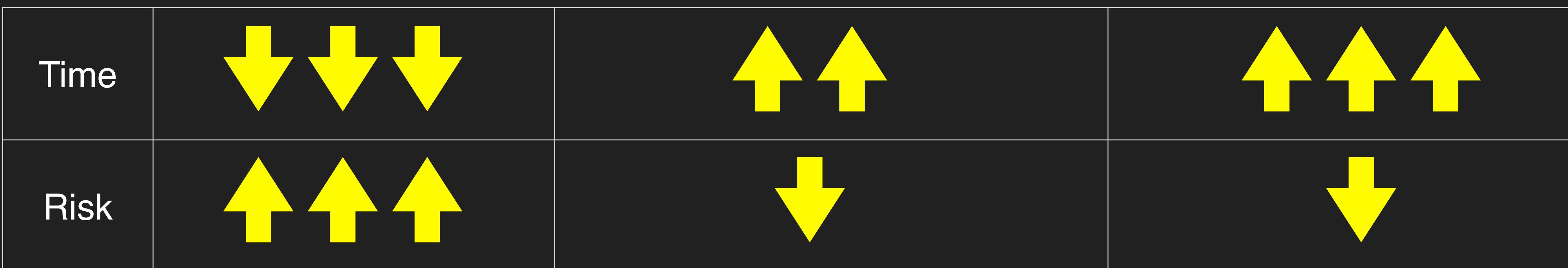
Types of Deployments

Software Deployments

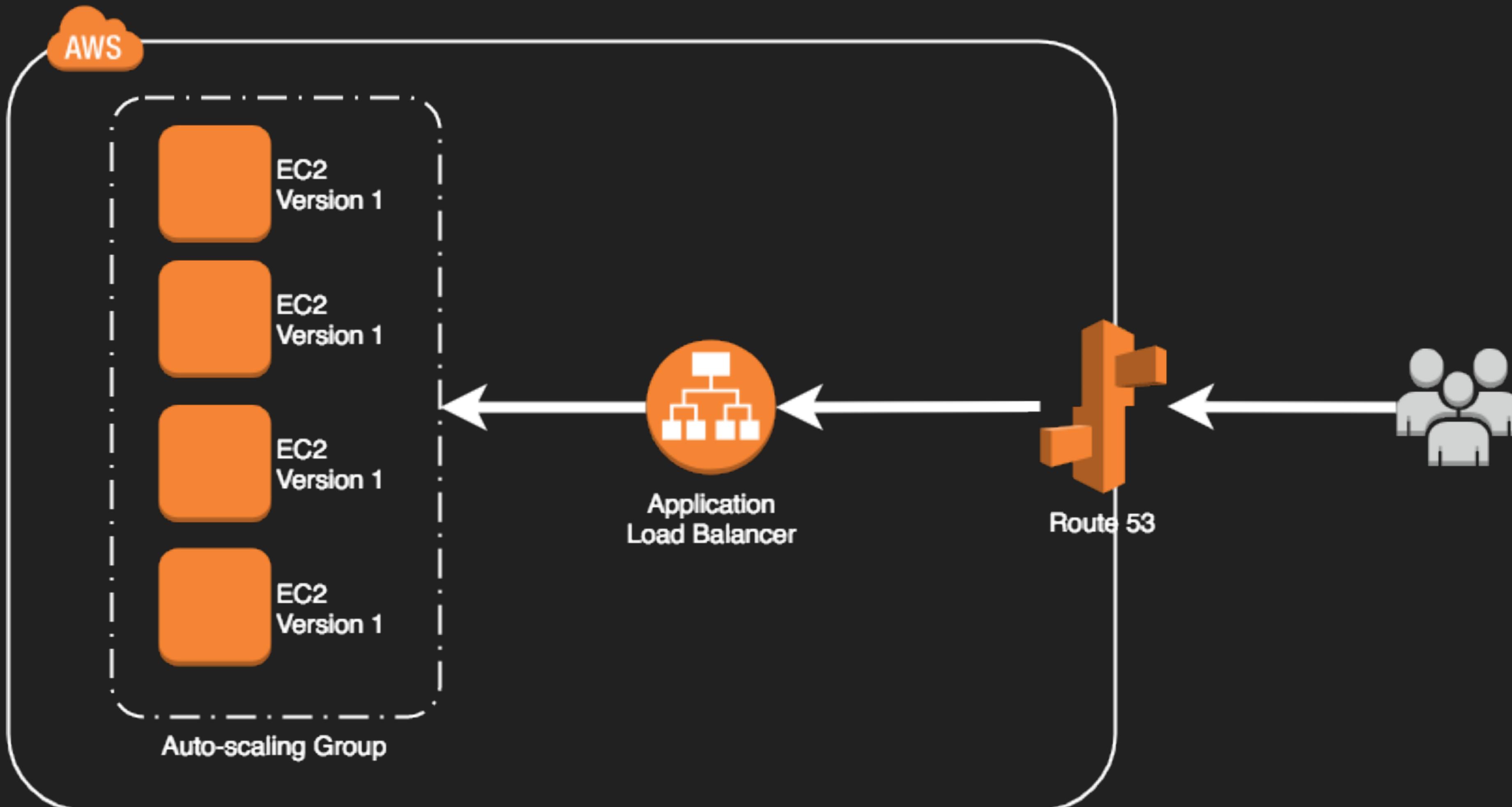
“Big Bang”

Phased Rollout

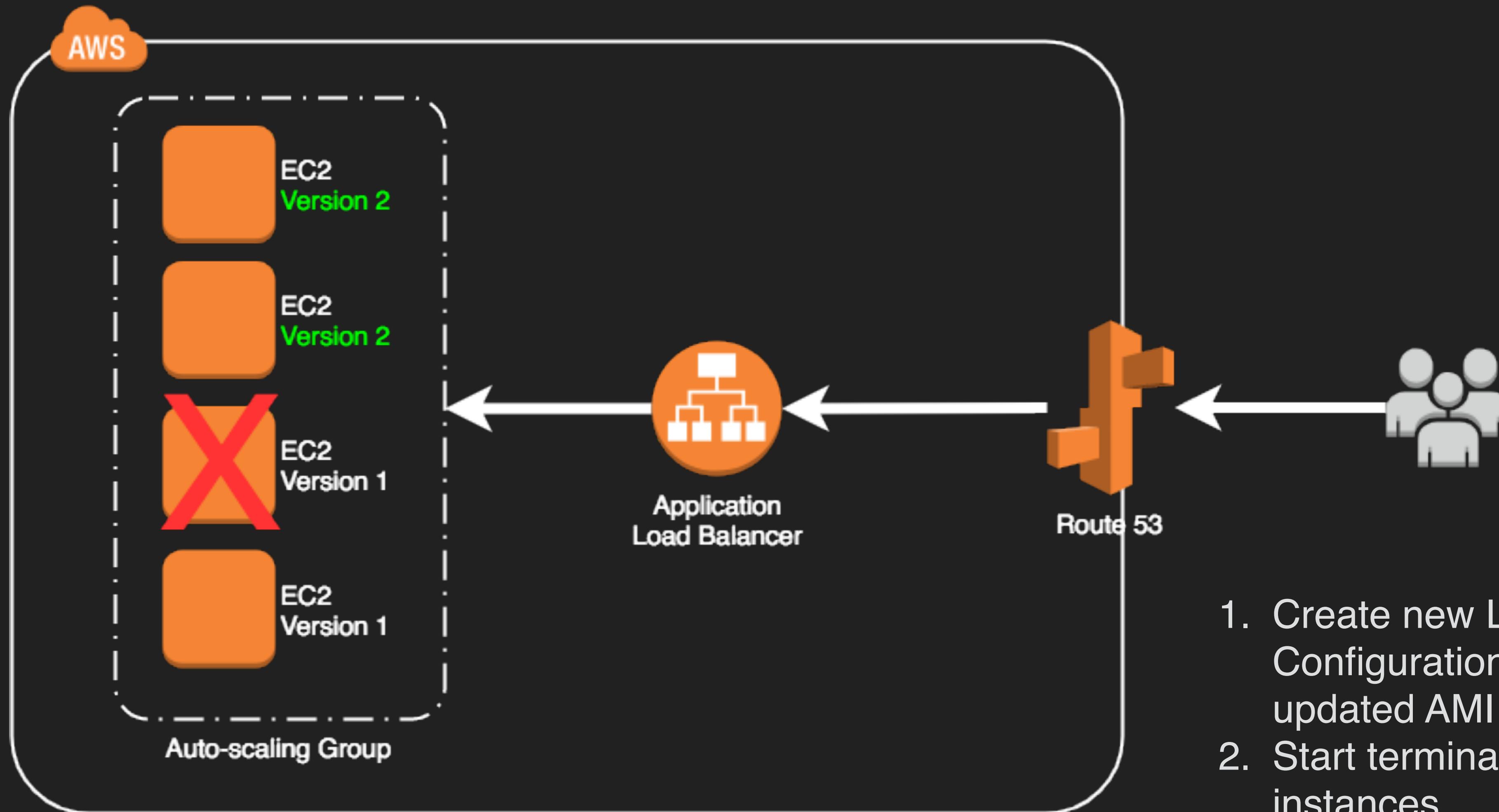
Parallel Adoption



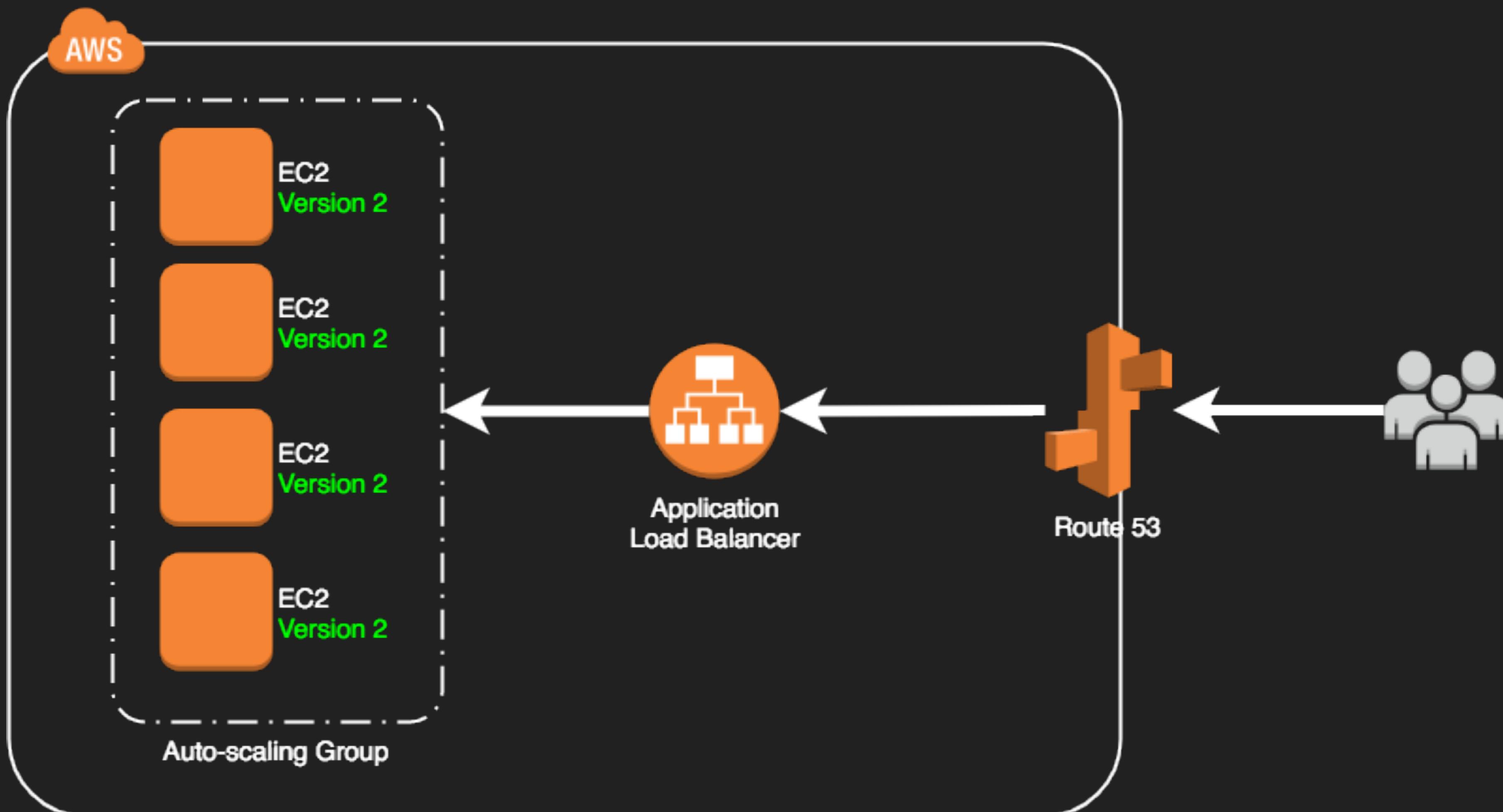
Rolling Deployment



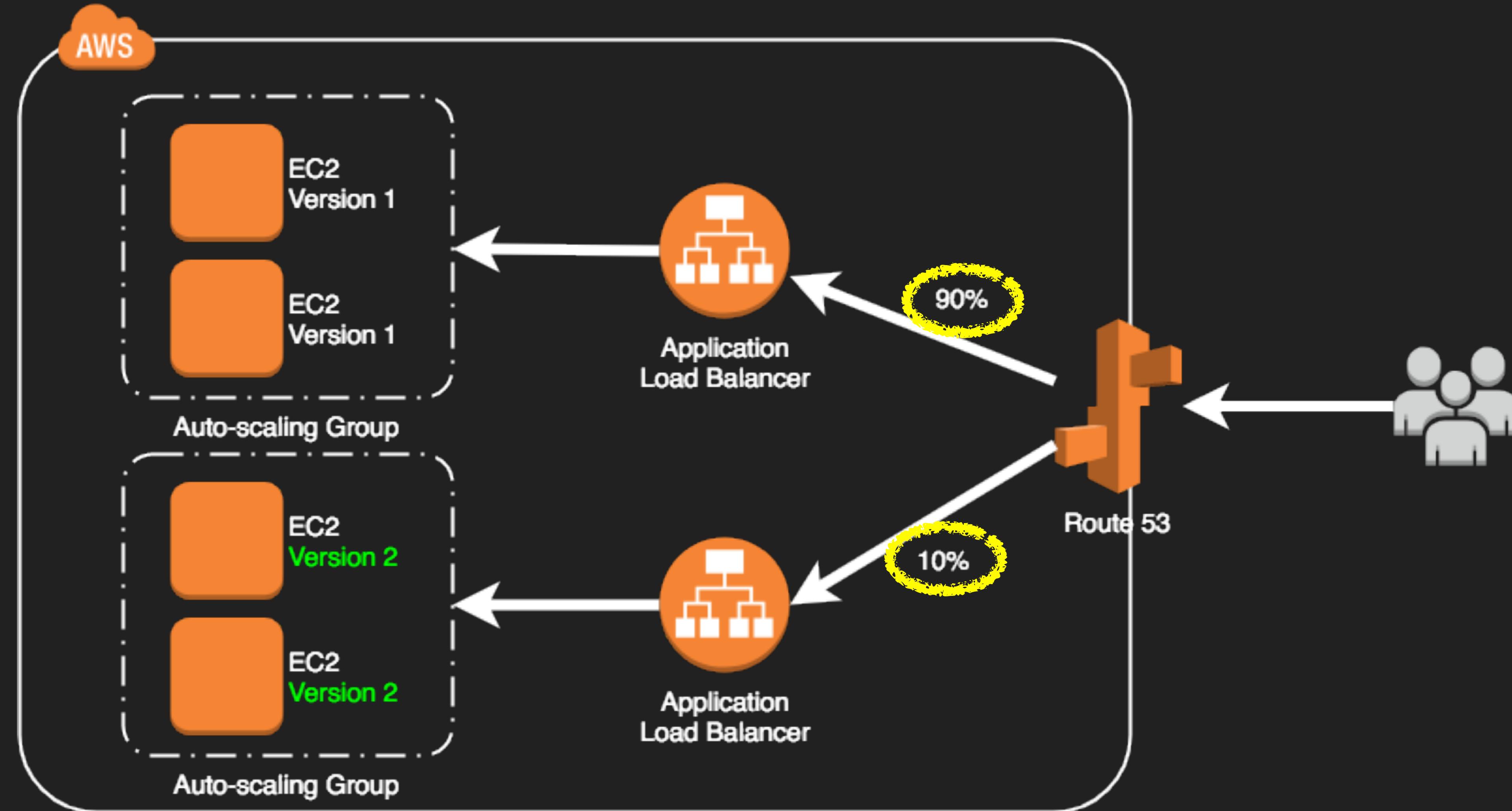
Rolling Deployment



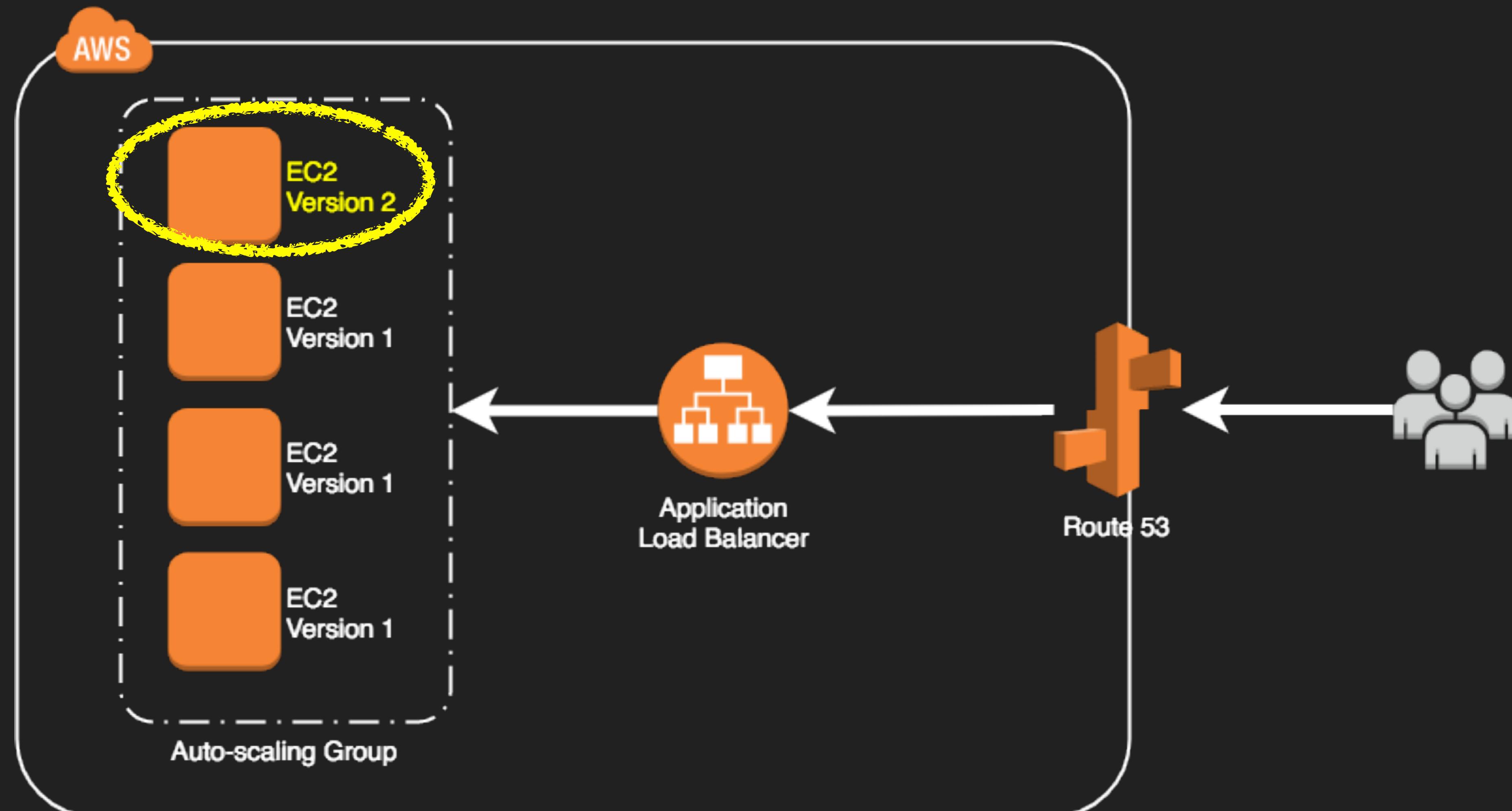
Rolling Deployment



A/B Testing

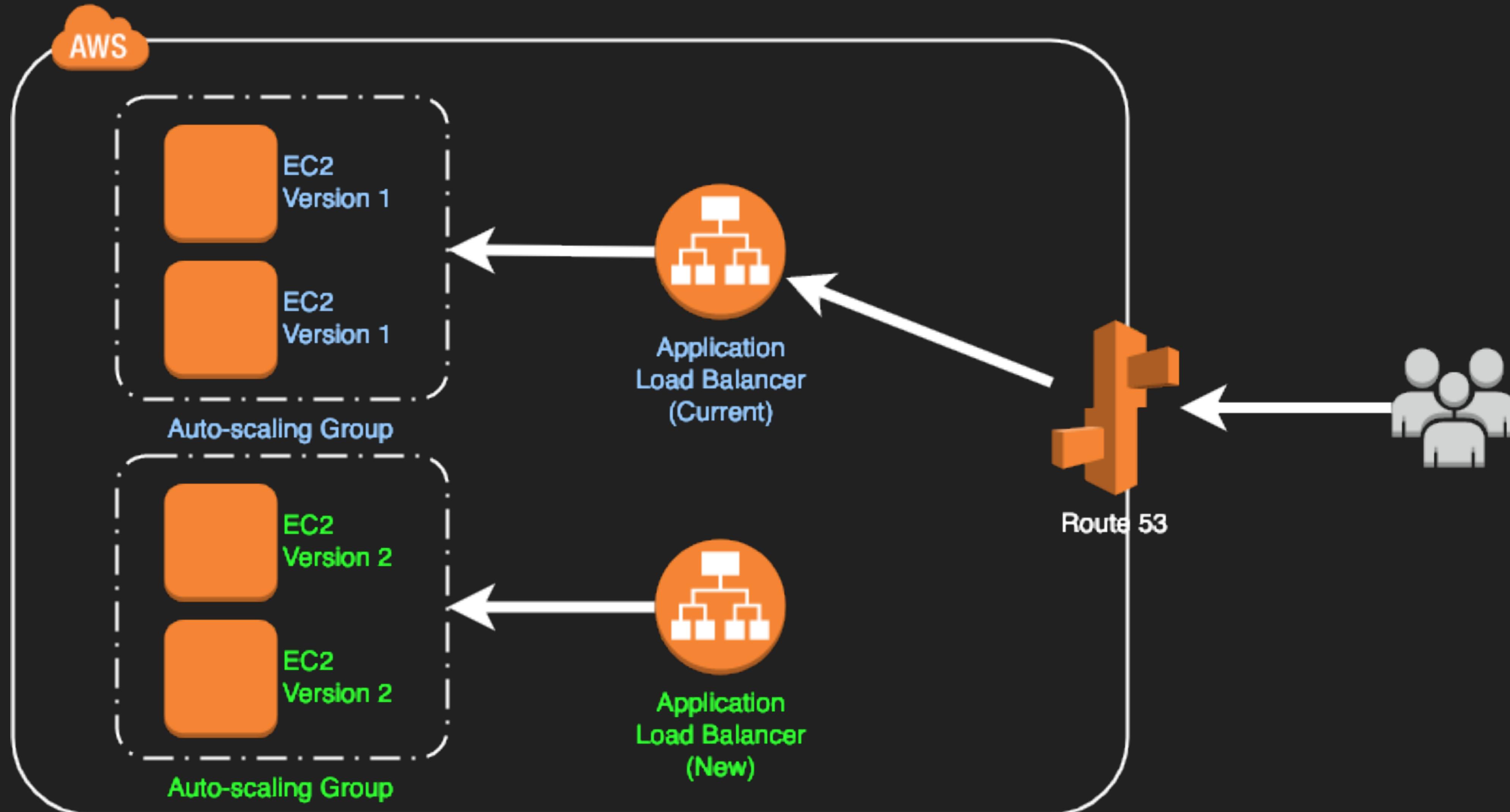


Canary Release

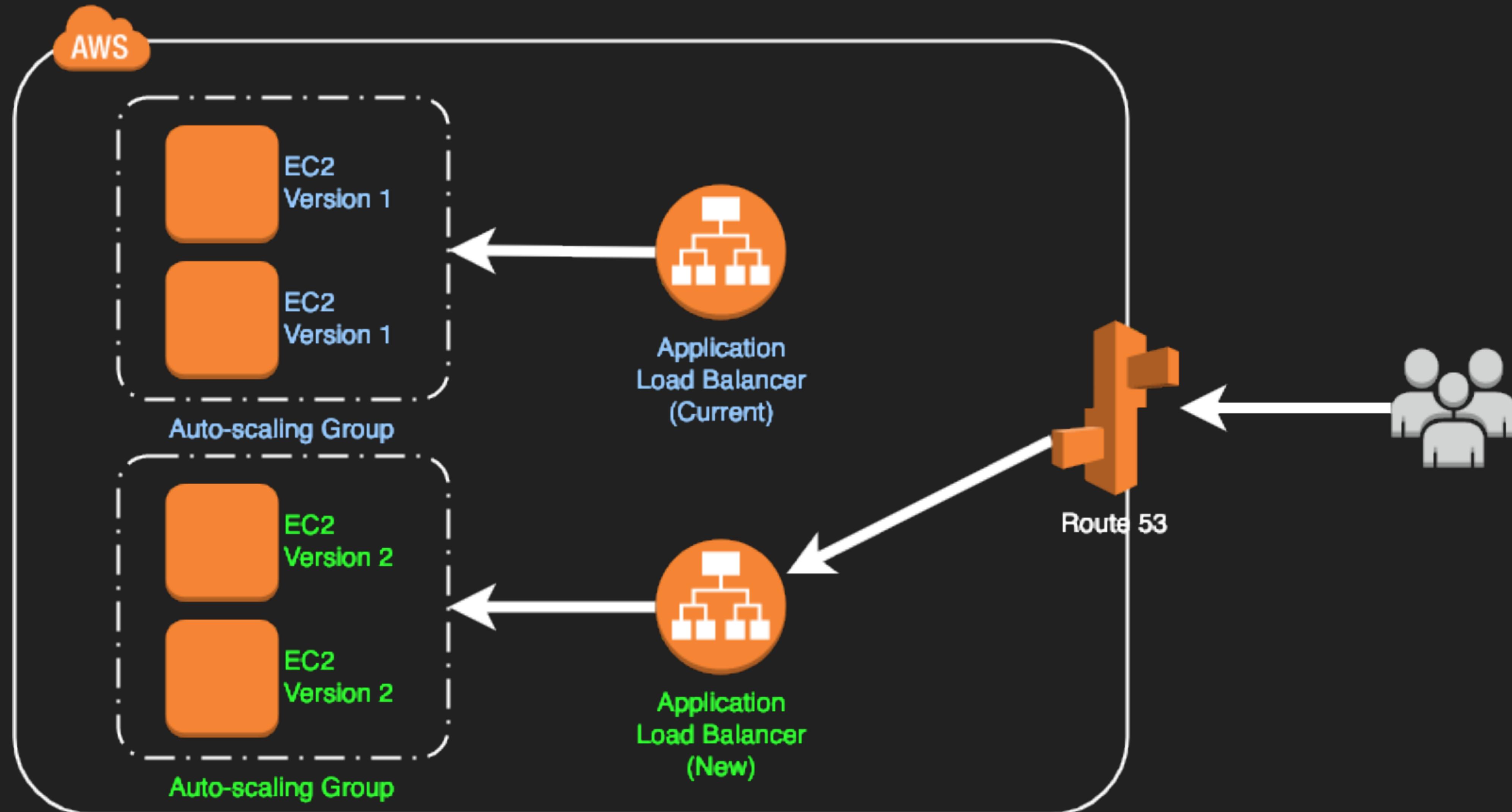




Blue-Green Deployment



Blue-Green Deployment



Blue Green Deployments



“The goal of blue/green deployments is to achieve immutable infrastructure, where you don’t make changes to your application after it’s deployed, but redeploy altogether.”



Blue Green Methods

- Update DNS with Route 53 to point to a new ELB or instance.
- Swap Auto-scaling Group already primed with new version instances behind the ELB.
- Change Auto-Scaling Group Launch Configuration to use new AMI version and terminate old instances.
- Swap environment URL of Elastic Beanstalk.
- Clone stack in AWS OpsWorks and update DNS.



Blue Green Contraindication

- Data store schema is too tightly coupled to the code changes.
- The upgrade requires special upgrade routines to be run during deployment.
- Off-the-shelf products might not be blue-green friendly.

Deployment Management

Continuous Integration and
Continuous Deployment

Meet Grandma COBOL



A CLOUD GURU



By Lynn Gilbert, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=57587522>

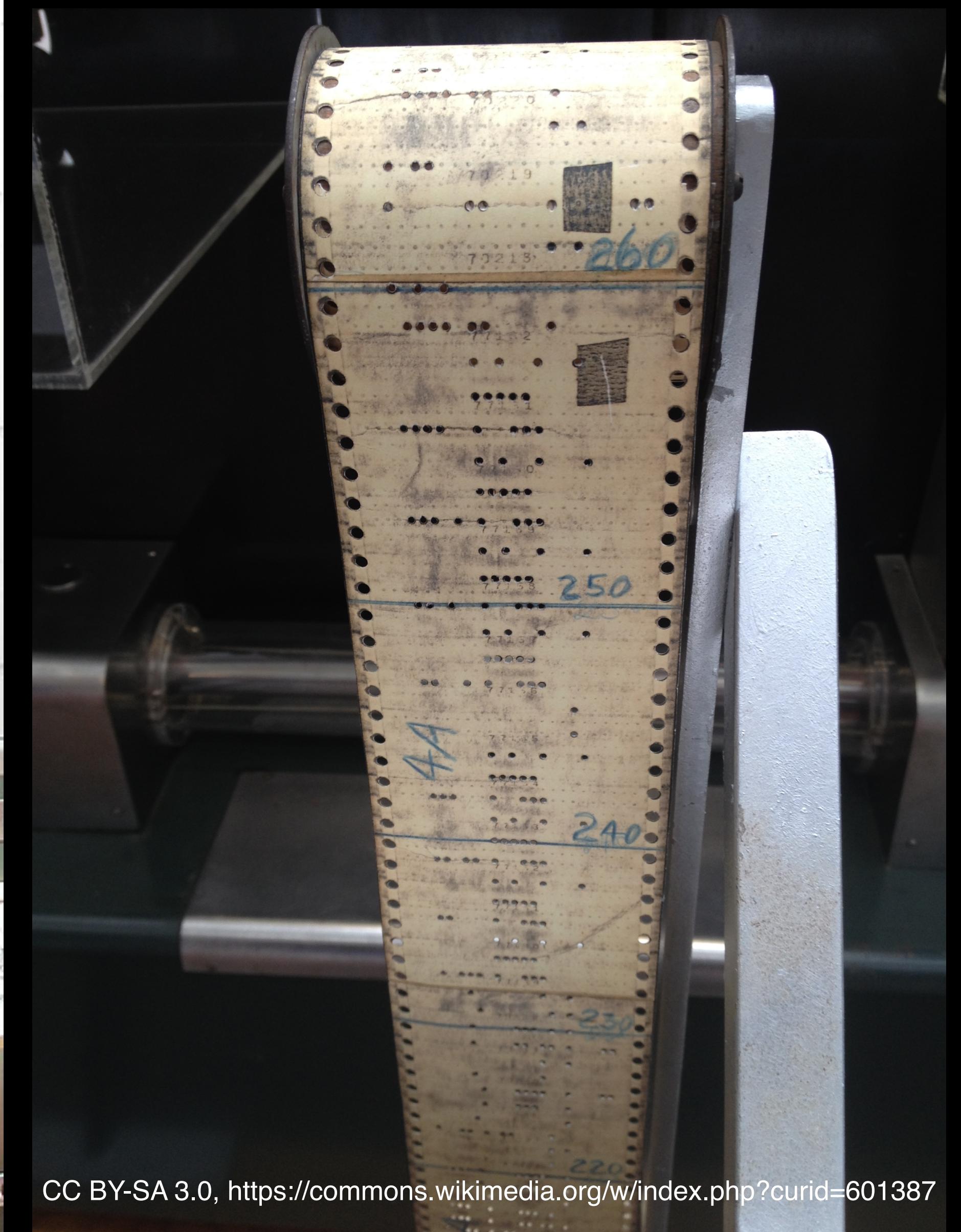
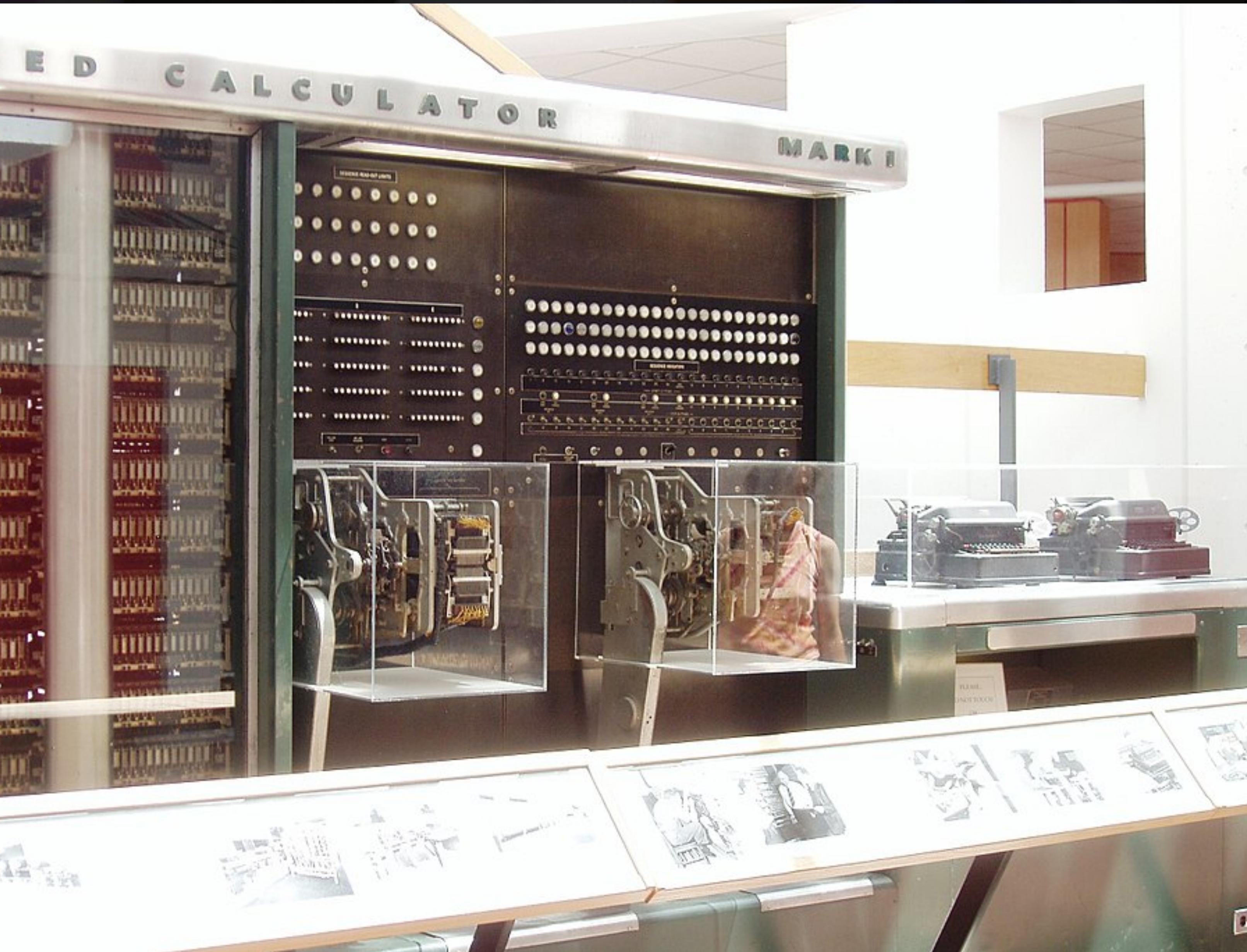


By Unknown (Smithsonian Institution) - Flickr: Grace Hopper and UNIVAC, CC BY 2.0, <https://commons.wikimedia.org/w/index.php?curid=19763543>

Harvard Mark I



A CLOUD GURU



Literal Computer Bug



A CLOUD GURU

9/9

0800 arctan started
1000 " stopped - arctan ✓
13"src (032) MP - MC
(033) PRO 2 2. 130476415
 correct 2. 130676415

{ 1.2700 9.037847025
 9.037846795 correct
~~1.982147000~~
~~2.130476715~~ 4.615925059(-2)

Relays 6-2 in 033 failed special speed test
in Relay " 10.000 test .

Relay
2145
Relay 3370

1700 Started Cosine Tape (Sine check)
1525 Started Mult+Adder Test.

1545



Relay #70 Panel F
(moth) in relay.

First actual case of bug being found.
1630 arctangent started.

1700 closed down .

Yes, that's
a bug. ➔

USS Hopper



A CLOUD GURU



By Official Navy Page from United States of AmericaMC2 (AW/SW) Jon Dasbach/U.S. Navy - USS Hopper leaves Joint Base Pearl Harbor-Hickam., Public Domain, <https://commons.wikimedia.org/w/index.php?curid=22705907>

CI, CD and CD too



Continuous Integration

Merge code changes back to main branch as frequently as possible with automated testing as you go.

Continuous Delivery

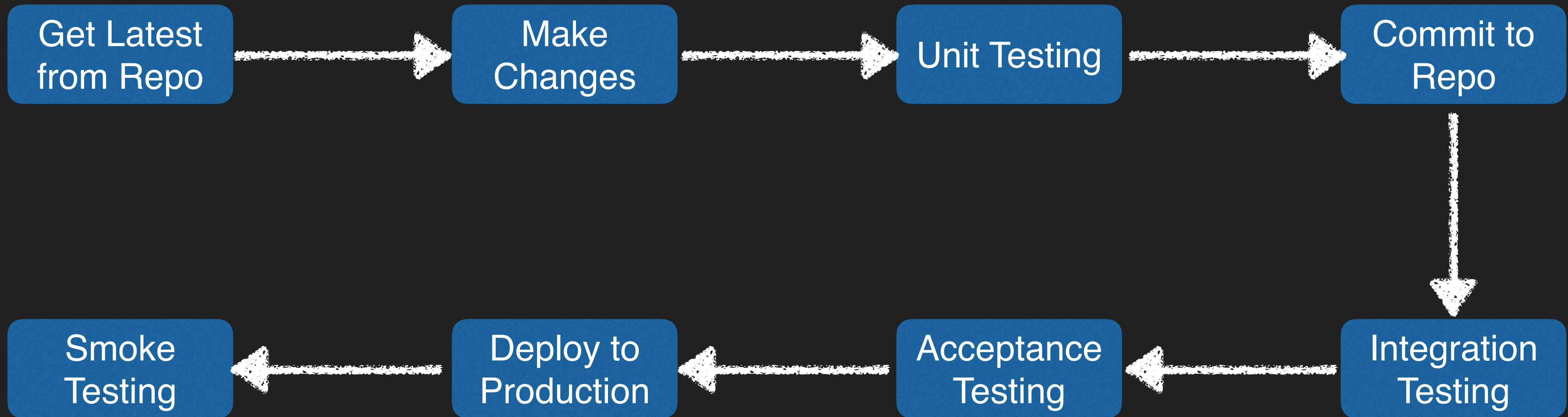
You have automated your release process to the point you can deploy at the click of a button.

Continuous Deployment

Each code change that passes all stages of the release process is released to production with no human intervention required.

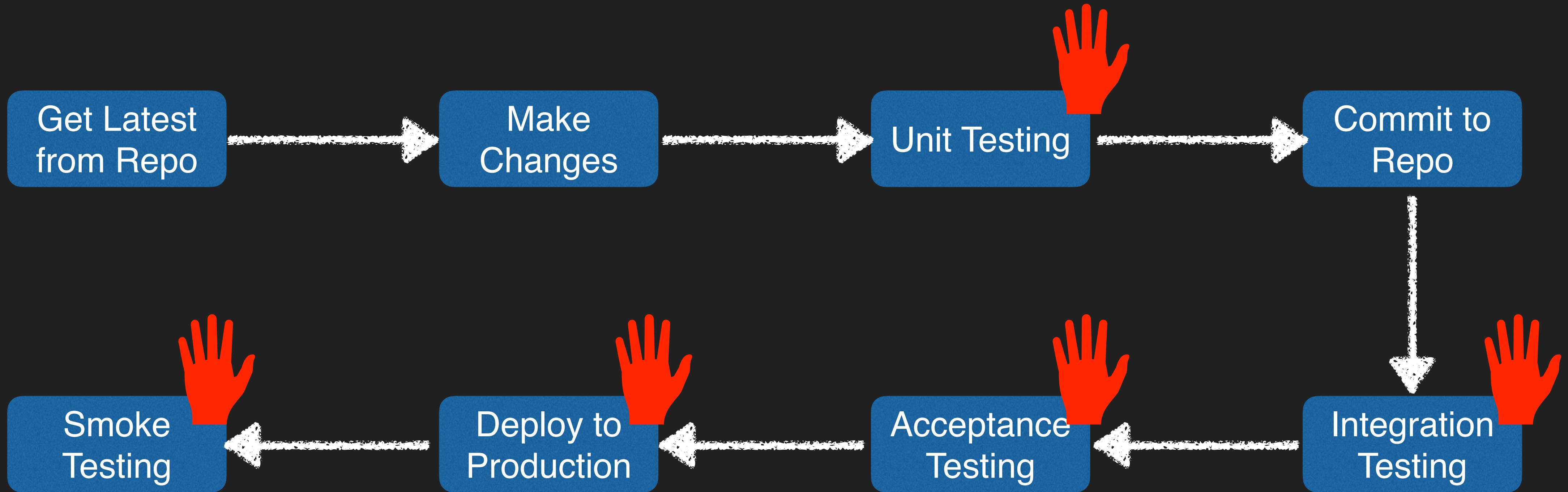


Typical Development Lifecycle

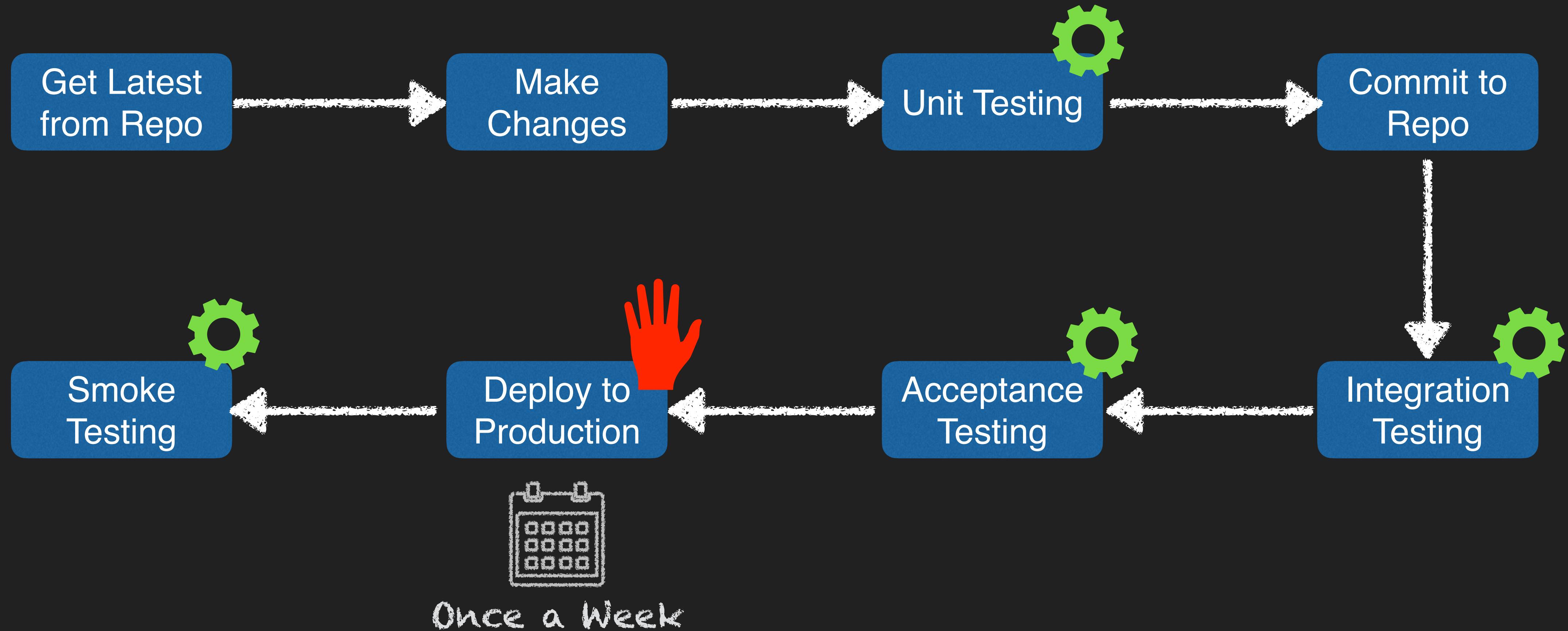




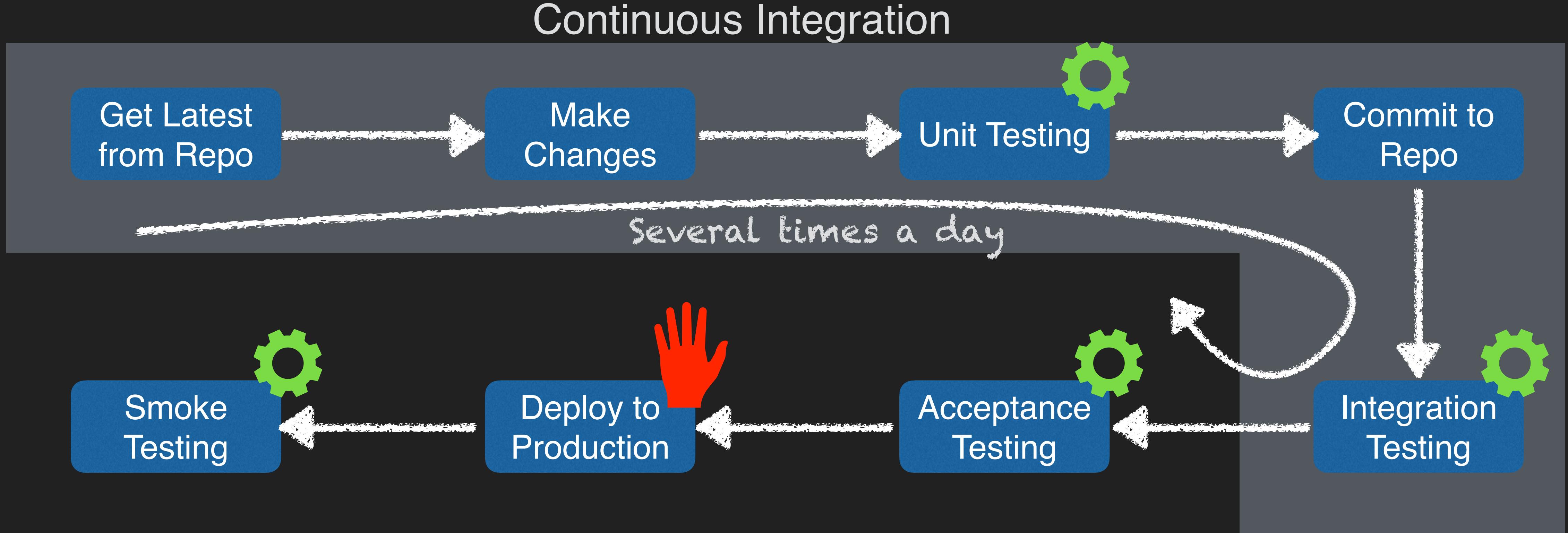
Typical Development Lifecycle



Test Automation



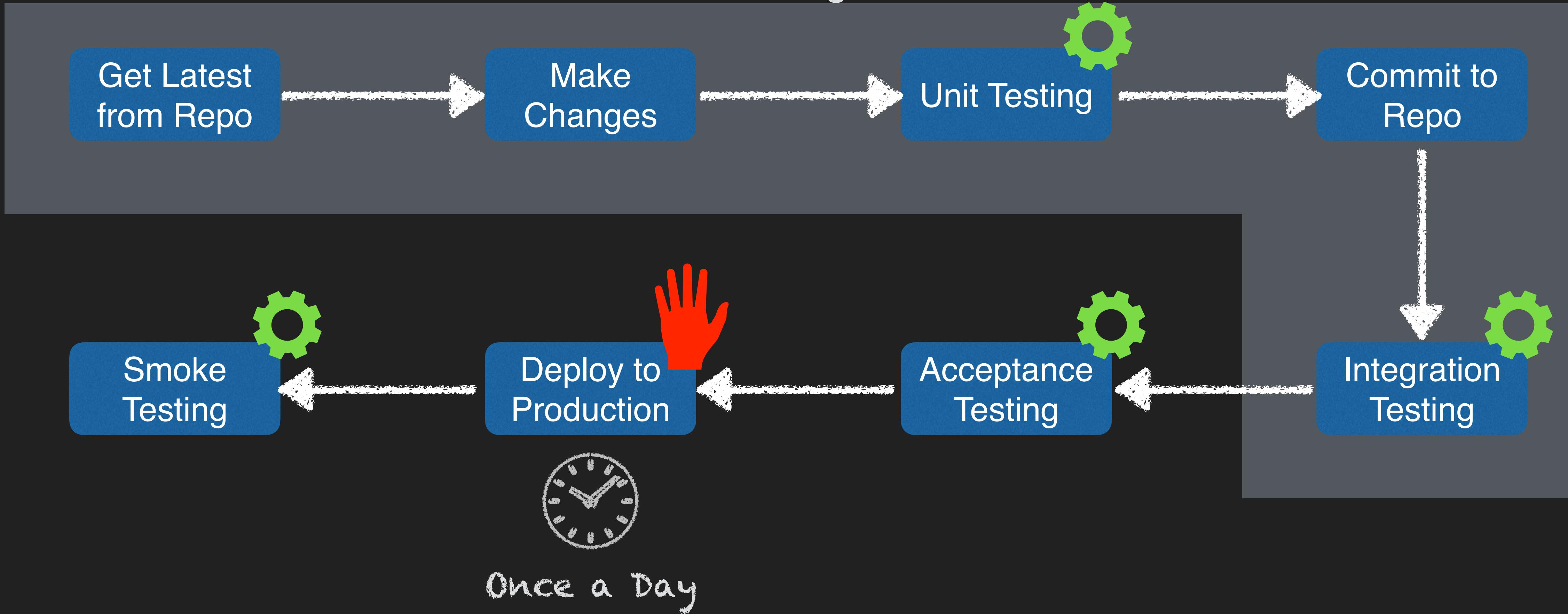
Continuous Integration



Continuous Delivery



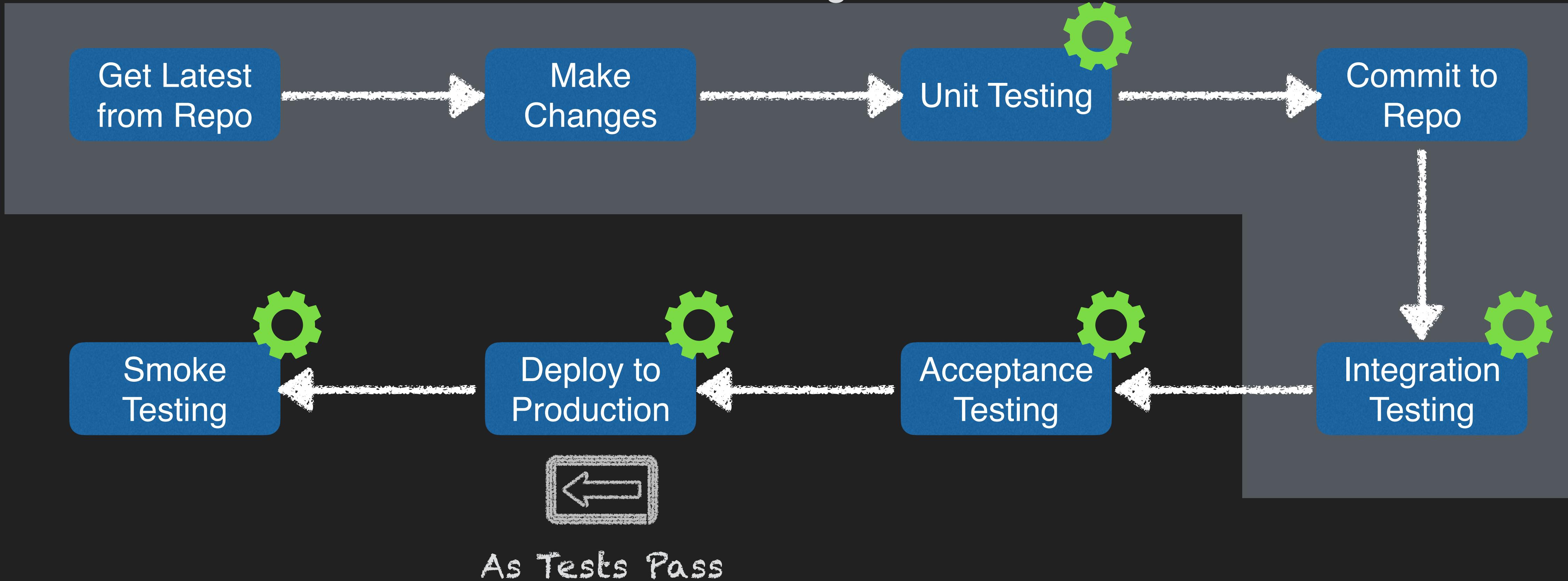
Continuous Integration



Continuous Deployment



Continuous Integration



CI/CD Considerations



- Objective is to create smaller, incremental compartmentalized improvements and features.
- Lowers deployment risk and tries to limit negative impact.
- Test Automation game must be STRONG.
- Feature toggle patterns useful for dealing with in-progress features not ready for release (versus more traditional branching strategies).
- Microservice architectures lend themselves well to CI/CD practices.

AWS Development Lifecycle Tools



AWS CodeCommit



AWS CodeBuild



AWS CodeDeploy



AWS CodePipeline



AWS X-Ray



AWS CodeStar

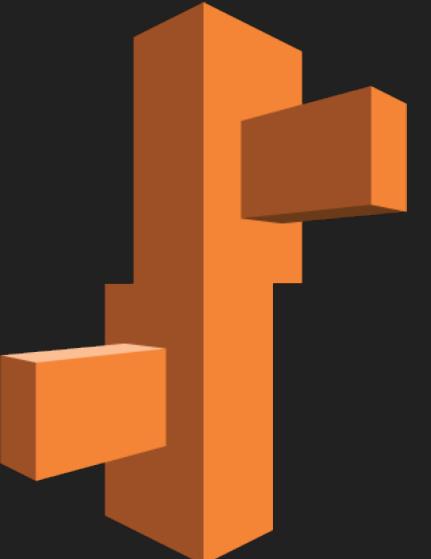
Deployment Management

Elastic Beanstalk

Elastic Beanstalk



- Orchestration service to make it push-button easy to deploy scalable web landscapes.
- Wide range of supported platforms — from Docker to PHP to Java to Node.js.
- Multiple Environments within Application (DEV, QA, PRD, etc.)
- Great for ease of deployment, but not great if you need lots of control and flexibility.



Elastic Beanstalk



Your Application Code

V1

V2

Application Versions

DEV

QA

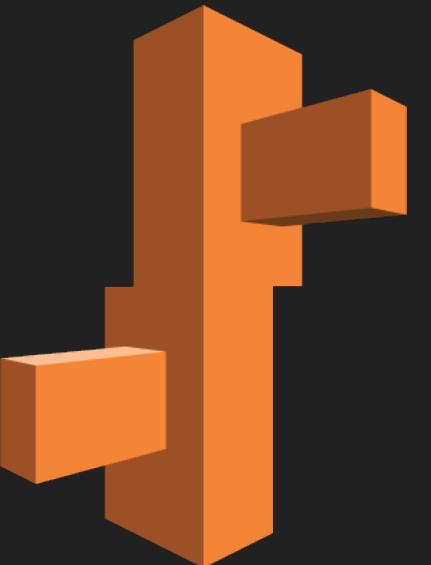
PRD

Environment

Instances, Web Server, Engines,
Monitoring, Scaling

Management Layer

Application



AWS
Elastic Beanstalk



Elastic Beanstalk Deployment Options

Deployment Option	What	Deployment Time	Downtime?	Rollback Process
All At Once	All old version instances are terminated and new version instances are spun up.		Yes	Manual
Rolling	One by one, terminates old version instances and replaces with new instances.		No	Manual
Rolling with Additional Batch	Launch new version instances prior to taking any old version instances out of service.		No	Manual
Immutable	Launch a full set of new version instances in separate auto-scaling group and only cuts over when health check is passed.		No	Terminate New Instances
Blue/Green	CNAME DNS entry changed when new version is fully up, leaving old version in place until new is fully verified.		No	Swap URL



Blue/Green Deployments

docs > green (Environment ID: e-8xkn8mgya9, URL: staging-env.us-west-2.elasticbeanstalk.com)

Actions ▾

- Load Configuration
- Save Configuration
- Swap Environment URLs** (highlighted)
- Clone Environment
- Clone with Latest Platform
- Abort Current Operation
- Restart App Server(s)
- Rebuild Environment
- Terminate Environment

64bit Amazon Linux 2016.03
v2.1.2 running PHP 5.6

Change

Overview

Health

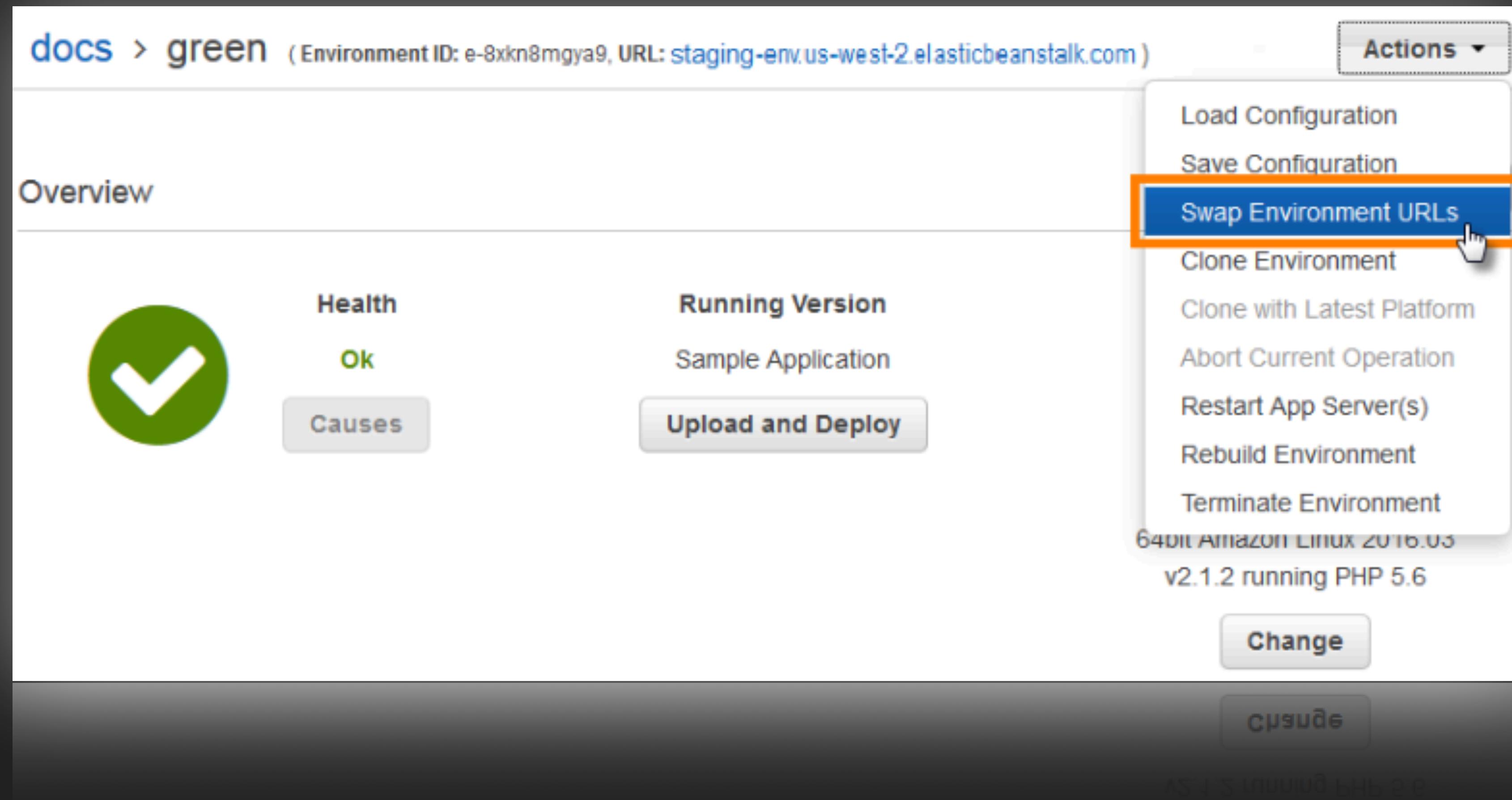
Ok

Causes

Running Version

Sample Application

Upload and Deploy



Deployment Management

CloudFormation

CloudFormation



- Infrastructure as Code!
- Using JSON or YAML, you can model and provision entire landscapes.
- Repeatable, automatic deployments and rollbacks.
- Nest common components for reusability.
- Supports over 300 Resource Types (components of AWS Services).
- Want more? Supports custom resources via SNS or Lambda.

Introduction to CloudFormation - 2 hours of video
AWS Advanced CloudFormation - 12 hours of video



Resource Types

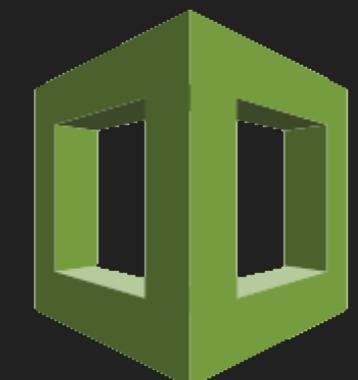


AWS::AmazonMQ::Broker	AWS::CloudFront::StreamingDistribution	AWS::EC2::NetworkInterface	AWS::ElasticLoadBalancingV2::LoadBalancer	AWS::KinesisFirehose::DeliveryStream	AWS::SDB::Domain
AWS::AmazonMQ::Configuration	AWS::CloudTrail::Trail	AWS::EC2::NetworkInterfaceAttachment	AWS::ElasticLoadBalancingV2::TargetGroup	AWS::KMS::Alias	AWS::ServiceCatalog::AcceptedPortfolioShare
AWS::ApiGateway::Account	AWS::CloudWatch::Alarm	AWS::EC2::NetworkInterfacePermission	AWS::Elasticsearch::Domain	AWS::KMS::Key	AWS::ServiceCatalog::CloudFormationProduct
AWS::ApiGateway::ApiKey	AWS::CloudWatch::Dashboard	AWS::EC2::PlacementGroup	AWS::EMR::Cluster	AWS::Lambda::EventSourceMapping	AWS::ServiceCatalog::CloudFormationProvisionedProduct
AWS::ApiGateway::Authorizer	AWS::CodeBuild::Project	AWS::EC2::Route	AWS::EMR::InstanceFleetConfig	AWS::Lambda::Alias	AWS::ServiceCatalog::LaunchNotificationConstraint
AWS::ApiGateway::BasePathMapping	AWS::CodeCommit::Repository	AWS::EC2::RouteTable	AWS::EMR::InstanceGroupConfig	AWS::Lambda::Function	AWS::ServiceCatalog::LaunchRoleConstraint
AWS::ApiGateway::ClientCertificate	AWS::CodeDeploy::Application	AWS::EC2::SecurityGroup	AWS::EMR::SecurityConfiguration	AWS::Lambda::Permission	AWS::ServiceCatalog::LaunchTemplateConstraint
AWS::ApiGateway::Deployment	AWS::CodeDeploy::DeploymentConfig	AWS::EC2::SecurityGroupEgress	AWS::EMR::Step	AWS::Lambda::Version	AWS::ServiceCatalog::Portfolio
AWS::ApiGateway::DocumentationPart	AWS::CodeDeploy::DeploymentGroup	AWS::EC2::SecurityGroupIngress	AWS::Events::Rule	AWS::Logs::Destination	AWS::ServiceCatalog::PortfolioPrincipalAssociation
AWS::ApiGateway::DocumentationVersion	AWS::CodePipeline::CustomActionType	AWS::EC2::SpotFleet	AWS::GameLift::Alias	AWS::Logs::LogGroup	AWS::ServiceCatalog::PortfolioProductAssociation
AWS::ApiGateway::DomainName	AWS::CodePipeline::Pipeline	AWS::EC2::Subnet	AWS::GameLift::Build	AWS::Logs::LogStream	AWS::ServiceCatalog::PortfolioShare
AWS::ApiGateway::GatewayResponse	AWS::CodePipeline::Webhook	AWS::EC2::SubnetCidrBlock	AWS::GameLift::Fleet	AWS::Logs::MetricFilter	AWS::ServiceCatalog::TagOption
AWS::ApiGateway::Method	AWS::Cognito::IdentityPool	AWS::EC2::SubnetNetworkAclAssociation	AWS::Glue::Classifier	AWS::Logs::SubscriptionFilter	AWS::ServiceCatalog::TagOptionAssociation
AWS::ApiGateway::Model	AWS::Cognito::IdentityPoolRoleAttachment	AWS::EC2::SubnetRouteTableAssociation	AWS::Glue::Connection	AWS::Neptune::DBCluster	AWS::ServiceDiscovery::Instance
AWS::ApiGateway::RequestValidator	AWS::Cognito::UserPool	AWS::EC2::Volume	AWS::Glue::Crawler	AWS::Neptune::DBClusterParameterGroup	AWS::ServiceDiscovery::PrivateDnsNamespace
AWS::ApiGateway::Resource	AWS::Cognito::UserPoolClient	AWS::EC2::VolumeAttachment	AWS::Glue::Database	AWS::Neptune::DBInstanceState	AWS::ServiceDiscovery::PublicDnsNamespace
AWS::ApiGateway::RestApi	AWS::Cognito::UserPoolGroup	AWS::EC2::VPC	AWS::Glue::DevEndpoint	AWS::Neptune::DBParameterGroup	AWS::ServiceDiscovery::Service
AWS::ApiGateway::Stage	AWS::Cognito::UserPoolUser	AWS::EC2::VPCCidrBlock	AWS::Glue::Job	AWS::Neptune::DBSubnetGroup	AWS::SES::ConfigurationSet
AWS::ApiGateway::UsagePlan	AWS::Cognito::UserPoolUserToGroupAttachment	AWS::EC2::VPCDHCOptionsAssociation	AWS::Glue::Partition	AWS::OpsWorks::App	AWS::SES::ConfigurationSetEventDestination
AWS::ApiGateway::UsagePlanKey	AWS::Config::AggregationAuthorization	AWS::EC2::VPCEndpoint	AWS::Glue::Table	AWS::OpsWorks::ElasticLoadBalancerAttachment	AWS::SES::ReceiptFilter
AWS::ApiGateway::VpcLink	AWS::Config::ConfigRule	AWS::EC2::VPCEndpointConnectionNotification	AWS::Glue::Trigger	AWS::OpsWorks::Instance	AWS::SES::ReceiptRule
AWS::ApplicationAutoScaling::ScalableTarget	AWS::Config::ConfigurationAggregator	AWS::EC2::VPCEndpointService	AWS::GuardDuty::Detector	AWS::OpsWorks::Layer	AWS::SES::ReceiptRuleSet
AWS::ApplicationAutoScaling::ScalingPolicy	AWS::Config::ConfigurationRecorder	AWS::EC2::VPCEndpointServicePermissions	AWS::GuardDuty::Filter	AWS::OpsWorks::Stack	AWS::SES::Template
AWS::AppSync::ApiKey	AWS::Config::DeliveryChannel	AWS::EC2::VPCGatewayAttachment	AWS::GuardDuty::Master	AWS::OpsWorks::UserProfile	AWS::SNS::Subscription
AWS::AppSync::DataSource	AWS::DataPipeline::Pipeline	AWS::EC2::VPCPeeringConnection	AWS::GuardDuty::Member	AWS::OpsWorks::Volume	AWS::SNS::Topic
AWS::AppSync::GraphQLApi	AWS::DAX::Cluster	AWS::EC2::VPNConnection	AWS::GuardDuty::IPSet	AWS::RDS::DBCluster	AWS::SNS::TopicPolicy
AWS::AppSync::GraphQLSchema	AWS::DAX::ParameterGroup	AWS::EC2::VPNConnectionRoute	AWS::GuardDuty::ThreatIntelSet	AWS::RDS::DBClusterParameterGroup	AWS::SQS::Queue
AWS::AppSync::Resolver	AWS::DAX::SubnetGroup	AWS::EC2::VPNGateway	AWS::IAM::AccessKey	AWS::RDS::DBInstanceState	AWS::SQS::QueuePolicy
AWS::Athena::NamedQuery	AWS::DirectoryService::MicrosoftAD	AWS::EC2::VPNGatewayRoutePropagation	AWS::IAM::Group	AWS::RDS::DBParameterGroup	AWS::SSM::Association
AWS::AutoScaling::AutoScalingGroup	AWS::DirectoryService::SimpleAD	AWS::ECR::Repository	AWS::IAM::InstanceProfile	AWS::RDS::DBSecurityGroup	AWS::SSM::Document
AWS::AutoScaling::LaunchConfiguration	AWS::DMS::Certificate	AWS::ECS::Cluster	AWS::IAM::ManagedPolicy	AWS::RDS::DBSecurityGroupIngress	AWS::SSM::MaintenanceWindow
AWS::AutoScaling::LifecycleHook	AWS::DMS::Endpoint	AWS::ECS::Service	AWS::IAM::Policy	AWS::RDS::DBSubnetGroup	AWS::SSM::MaintenanceWindowTarget
AWS::AutoScaling::ScalingPolicy	AWS::DMS::EventSubscription	AWS::ECS::TaskDefinition	AWS::IAM::Role	AWS::RDS::EventSubscription	AWS::SSM::MaintenanceWindowTask
AWS::AutoScaling::ScheduledAction	AWS::DMS::ReplicationInstance	AWS::EFS::FileSystem	AWS::IAM::ServiceLinkedRole	AWS::RDS::OptionGroup	AWS::SSM::Parameter
AWS::AutoScalingPlans::ScalingPlan	AWS::DMS::ReplicationSubnetGroup	AWS::EFS::MountTarget	AWS::IAM::User	AWS::Redshift::Cluster	AWS::SSM::PatchBaseline
AWS::Batch::ComputeEnvironment	AWS::DMS::ReplicationTask	AWS::EKS::Cluster	AWS::IAM::UserToGroupAddition	AWS::Redshift::ClusterParameterGroup	AWS::SSM::ResourceDataSync
AWS::Batch::JobDefinition	AWS::DynamoDB::Table	AWS::ElastiCache::CacheCluster	AWS::Inspector::AssessmentTarget	AWS::Redshift::ClusterSecurityGroup	AWS::StepFunctions::Activity
AWS::Batch::JobQueue	AWS::EC2::CustomerGateway	AWS::ElastiCache::ParameterGroup	AWS::Inspector::AssessmentTemplate	AWS::Redshift::ClusterSecurityGroupIngress	AWS::StepFunctions::StateMachine
AWS::Budgets::Budget	AWS::EC2::DHCOptions	AWS::ElastiCache::ReplicationGroup	AWS::Inspector::ResourceGroup	AWS::Redshift::ClusterSubnetGroup	AWS::WAF::ByteMatchSet
AWS::CertificateManager::Certificate	AWS::EC2::EgressOnlyInternetGateway	AWS::ElastiCache::SecurityGroup	AWS::IoT::Certificate	AWS::Route53::HealthCheck	AWS::WAF::IPSet
AWS::Cloud9::EnvironmentEC2	AWS::EC2::EIP	AWS::ElastiCache::SecurityGroupIngress	AWS::IoT::Policy	AWS::Route53::HostedZone	AWS::WAF::Rule
AWS::CloudFormation::Authentication	AWS::EC2::EIPAssociation	AWS::ElastiCache::SubnetGroup	AWS::IoT::PolicyPrincipalAttachment	AWS::Route53::RecordSet	AWS::WAF::SizeConstraintSet
AWS::CloudFormation::CustomResource	AWS::EC2::FlowLog	AWS::ElasticBeanstalk::Application	AWS::IoT::Thing	AWS::Route53::RecordSetGroup	AWS::WAF::SqlInjectionMatchSet
AWS::CloudFormation::Init	AWS::EC2::Host	AWS::ElasticBeanstalk::ApplicationVersion	AWS::IoT::ThingPrincipalAttachment	AWS::S3::Bucket	AWS::WAF::WebACL
AWS::CloudFormation::Interface	AWS::EC2::Instance	AWS::ElasticBeanstalk::ConfigurationTemplate	AWS::IoT::TopicRule	AWS::S3::BucketPolicy	AWS::WAF::XssMatchSet
AWS::CloudFormation::Stack	AWS::EC2::InternetGateway	AWS::ElasticBeanstalk::Environment	AWS::Kinesis::Stream	AWS::SageMaker::Endpoint	AWS::WAFRegional::ByteMatchSet
AWS::CloudFormation::WaitCondition	AWS::EC2::LaunchTemplate	AWS::ElasticLoadBalancing::LoadBalancer	AWS::KinesisAnalytics::Application	AWS::SageMaker::EndpointConfig	AWS::WAFRegional::IPSet
AWS::CloudFormation::WaitConditionHandle	AWS::EC2::NatGateway	AWS::ElasticLoadBalancingV2::Listener	AWS::KinesisAnalytics::ApplicationOutput	AWS::SageMaker::Model	AWS::WAFRegional::Rule
AWS::CloudFront::Distribution	AWS::EC2::NetworkAcl	AWS::ElasticLoadBalancingV2::ListenerCertificate	AWS::KinesisAnalytics::ApplicationReferenceDataSource	AWS::SageMaker::NotebookInstance	AWS::WAFRegional::SizeConstraintSet
AWS::CloudFront::CloudFrontOriginAccessIdentity	AWS::EC2::NetworkAclEntry	AWS::ElasticLoadBalancingV2::ListenerRule		AWS::SageMaker::NotebookInstanceLifecycleConfig	AWS::WAFRegional::SqlInjectionMatchSet
					AWS::WAFRegional::WebACL
					AWS::WAFRegional::WebACLAffiliation
					AWS::WAFRegional::XssMatchSet
					AWS::WorkSpaces::Workspace

CloudFormation Concepts



Templates	The JSON or YAML text file that contains the instructions for building-out the AWS environment.
Stacks	The entire environment described by the template and created, updated, and deleted as a single unit.
Change Sets	A summary of proposed changes to your stack that will allow you to see how those changes might impact your existing resources before implementing them



Sample Template



JSON

```
{  
  "AWSTemplateFormatVersion" : "2010-09-09",  
  "Description" : "A sample template",  
  "Resources" : {  
    "MyEC2Instance" : {  
      "Type" : "AWS::EC2::Instance",  
      "Properties" : {  
        "ImageId" : "ami-2f726546",  
        "InstanceType" : "t1.micro",  
        "KeyName" : "testkey",  
        "BlockDeviceMappings" : [  
          {  
            "DeviceName" : "/dev/sdm",  
            "Ebs" : {  
              "VolumeType" : "io1",  
              "Iops" : "200",  
              "DeleteOnTermination" : "false",  
              "VolumeSize" : "20"  
            }  
          }  
        ]  
      }  
    }  
  }  
}
```

YAML

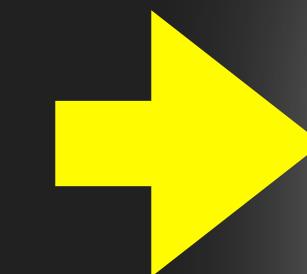
```
AWSTemplateFormatVersion: "2010-09-09"  
Description: A sample template  
Resources:  
  MyEC2Instance:  
    Type: "AWS::EC2::Instance"  
    Properties:  
      ImageId: "ami-2f726546"  
      InstanceType: t1.micro  
      KeyName: testkey  
      BlockDeviceMappings:  
        -  
          DeviceName: /dev/sdm  
          Ebs:  
            VolumeType: io1  
            Iops: 200  
            DeleteOnTermination: false  
            VolumeSize: 20  
          DeleteOnTermination: false  
          VolumeSize: 50
```



Resources - Only Section that's Required

JSON

```
{  
    "AWSTemplateFormatVersion" : "2010-09-09",  
    "Description" : "A sample template",  
    "Resources" : {  
        "MyEC2Instance" : {  
            "Type" : "AWS::EC2::Instance",  
            "Properties" : {  
                "ImageId" : "ami-2f726546",  
                "InstanceType" : "t1.micro",  
                "KeyName" : "testkey",  
                "BlockDeviceMappings" : [  
                    {  
                        "DeviceName" : "/dev/sdm",  
                        "Ebs" : {  
                            "VolumeType" : "io1",  
                            "Iops" : "200",  
                            "DeleteOnTermination" : "false",  
                            "VolumeSize" : "20"  
                        }  
                    }  
                ]  
            }  
        }  
    }  
}
```



YAML

```
AWSTemplateFormatVersion: "2010-09-09"  
Description: A sample template  
Resources:  
  MyEC2Instance:  
    Type: "AWS::EC2::Instance"  
    Properties:  
      ImageId: "ami-2f726546"  
      InstanceType: t1.micro  
      KeyName: testkey  
      BlockDeviceMappings:  
        -  
          DeviceName: /dev/sdm  
          Ebs:  
            VolumeType: io1  
            Iops: 200  
            DeleteOnTermination: false  
            VolumeSize: 20  
          DeleteOnTermination: false  
          Iops: 200
```



Sample Template

JSON

```
{  
    "AWSTemplateFormatVersion" : "2010-09-09",  
    "Description" : "A sample template",  
    "Resources" : {  
        "MyEC2Instance" : {  
            "Type" : "AWS::EC2::Instance",  
            "Properties" : {  
                "ImageId" : "ami-2f726546",  
                "InstanceType" : "t1.micro",  
                "KeyName" : "testkey",  
                "BlockDeviceMappings" : [  
                    {  
                        "DeviceName" : "/dev/sdm",  
                        "Ebs" : {  
                            "VolumeType" : "io1",  
                            "Iops" : "200",  
                            "DeleteOnTermination" : "false",  
                            "VolumeSize" : "20"  
                        }  
                    }  
                ]  
            }  
        }  
    }  
}
```

YAML

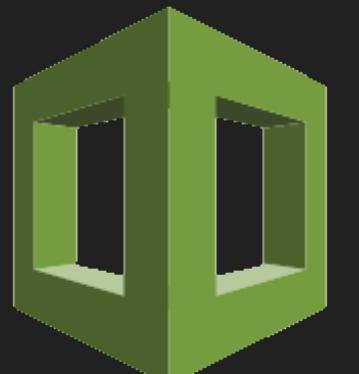
```
AWS::TemplateFormatVersion: "2010-09-09"  
Description: A sample template  
Resources:  
  MyEC2Instance:  
    Type: "AWS::EC2::Instance"  
    Properties:  
      ImageId: "ami-2f726546"  
      InstanceType: t1.micro  
      KeyName: testkey  
      BlockDeviceMappings:  
        -  
          DeviceName: /dev/sdm  
          Ebs:  
            VolumeType: io1  
            Iops: 200  
            DeleteOnTermination: false  
            VolumeSize: 20  
          DeleteOnTermination: false  
          Iops: 300
```

Stack Policies



- Protect specific resources within your stack from being unintentionally deleted or updated.
- Add a Stack Policy via the console or CLI when creating a stack.
- Adding a Stack Policy to an existing stack can only be done via CLI.
- Once applied, a Stack Policy cannot be removed — but it can be modified via CLI.

```
{  
  "Statement": [  
    {  
      "Effect": "Allow",  
      "Action": "Update:*",  
      "Principal": "*",  
      "Resource": "*"  
    },  
    {  
      "Effect": "Deny",  
      "Action": "Update:*",  
      "Principal": "*",  
      "Resource": "LogicalResourceId/ProductionDatabase"  
    }  
  ]  
}
```





Example Template Snippet

Scaling
Policy
Adjustment

CloudWatch
Alarm

```
ScaleUpPolicy:  
  Type: AWS::AutoScaling::ScalingPolicy  
  Properties:  
    AdjustmentType: ChangeInCapacity  
    AutoScalingGroupName:  
      Ref: asGroup  
    Cooldown: '1'  
    ScalingAdjustment: '1'  
CPUAlarmHigh:  
  Type: AWS::CloudWatch::Alarm  
  Properties:  
    EvaluationPeriods: '1'  
    Statistic: Average  
    Threshold: '10'  
    AlarmDescription: Alarm if CPU too high or metric disappears indicating instance  
      is down  
    Period: '60'  
    AlarmActions:  
      - Ref: ScaleUpPolicy  
    Namespace: AWS/EC2  
    Dimensions:  
      - Name: AutoScalingGroupName  
        Value:  
          Ref: asGroup  
    ComparisonOperator: GreaterThanThreshold  
    MetricName: CPUUtilization  
    MetricsName: CPUUtilization  
    ComparisonOperator: GreaterThanThreshold  
    MetricName: CPUUtilization  
    Key: asGroup
```



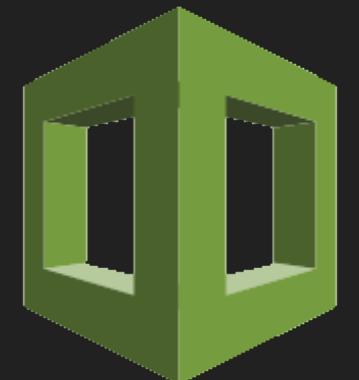
Example Template Snippet

```
ScaleUpPolicy:  
  Type: AWS::AutoScaling::ScalingPolicy  
  Properties:  
    AdjustmentType: ChangeInCapacity  
    AutoScalingGroupName:  
      Ref: asGroup  
    Cooldown: '1'  
    ScalingAdjustment: '1'  
CPUAlarmHigh:  
  Type: AWS::CloudWatch::Alarm  
  Properties:  
    EvaluationPeriods: '1'  
    Statistic: Average  
    Threshold: '10'  
    AlarmDescription: Alarm if CPU too high or metric disappears indicating instance  
      is down  
    Period: '60'  
    AlarmActions:  
      - Ref: ScaleUpPolicy  
    Namespace: AWS/EC2  
    Dimensions:  
      - Name: AutoScalingGroupName  
        Value:  
          Ref: asGroup  
    ComparisonOperator: GreaterThanThreshold  
    MetricName: CPUUtilization  
    MetricsName: CPUUtilization  
    ComparisonOperator: GreaterThanThreshold  
    MetricName: CPUUtilization  
    Key: asGroup
```

CloudFormation Best Practices



- AWS provides Python “helper scripts” which can help you install software and start services on your EC2 instances.
- Use CloudFormation to make changes to your landscape rather than going directly into the resources.
- Make use of Change Sets to identify potential trouble spots in your updates.
- Use Stack Policies to explicitly protect sensitive portions of your stack.
- Use a version control system such as CodeCommit or GitHub to track changes to templates.



Deployment Management

Elastic Container Service

Elastic Container Service

Amazon
ECSAmazon
EKS

Managed, highly available, highly scalable container platform.	
AWS-specific platform that supports Docker containers.	Compatible with upstream K8s so its easy to lift and shift from other K8s.
Considered simpler to learn and use.	Considered more feature-rich and complex with a steep learning curve
Leverages AWS services like Route 53, ALB and CloudWatch.	A hosted K8s platform than handles many things internally.
“Tasks” are instances of containers that are run on underlying compute but more or less isolated.	“Pods” are containers collocated with one another and can have shared access to each other.
Limited extensibility.	Extensible via a wide variety of third-party and community add-ons.

Launch Types



Amazon EC2
Launch Type



Amazon Fargate
Launch Type

You explicitly provision EC2 instances.	The control plane asked for resources and Fargate automatically provisions.
You're responsible for upgrading, patching, care of EC2 pool.	Fargate provisions compute as needed.
You must handle cluster optimization.	Fargate handles cluster optimization.
More granular control over infrastructure.	Limited control, as infrastructure is automated.



Deployment Management

API Gateway

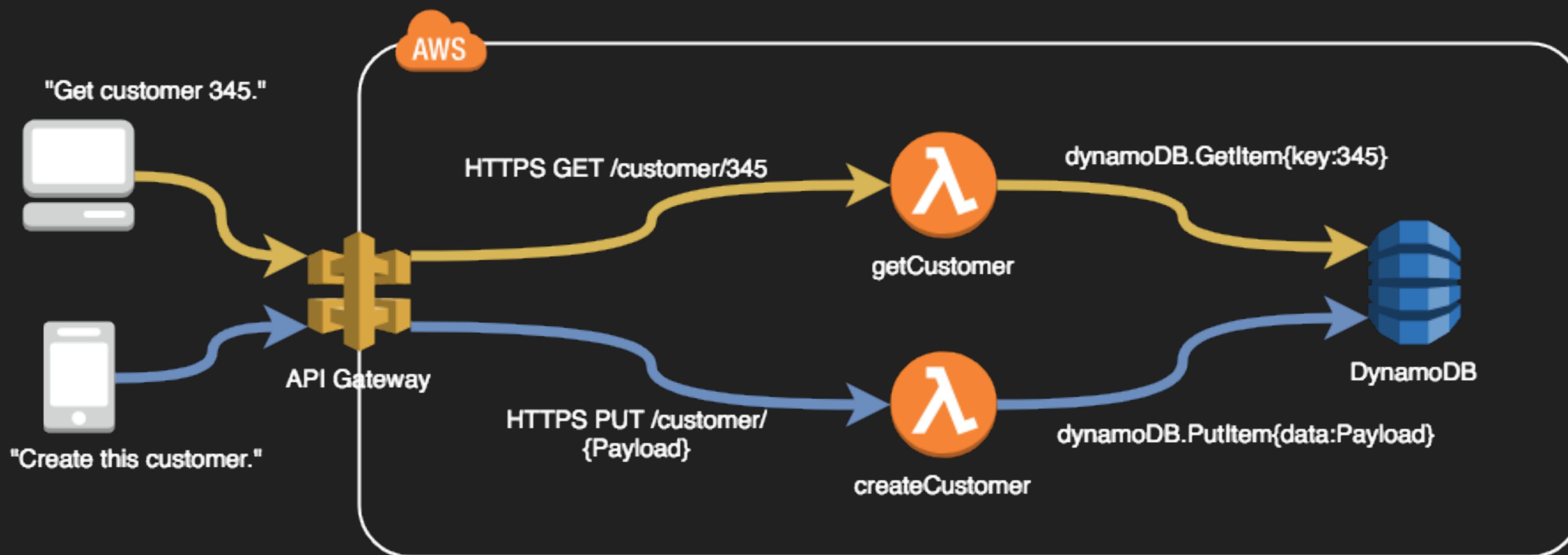
API Gateway



- Managed, high availability service to front-end REST APIs.
- Backed with custom code via Lambda, as a proxy for another AWS Service or any other HTTP API on AWS or elsewhere.
- Regionally based, private or edge optimized (deployed via CloudFront).
- Support API Keys and Usage Plans for user identification, throttling or quota management.
- Using CloudFront behind the scenes and custom domains and SNI are supported.
- Can be published as products and monetized on AWS Marketplace.



API Gateway



API Gateway



A dark, low-light photograph of a person from the chest up. The person is wearing a dark-colored button-down shirt. Their hands are clasped in front of them, holding a smartphone horizontally. The screen of the phone is visible but appears mostly black or very dimly lit.

AWS System Manager

AWS System Manager



A CLOUD GURU

- Centralized console and toolset for a wide variety of system management tasks
- Designed for managing a large fleet of systems—tens or hundreds
- SSM Agent enables System Manager features and support all OSs supported by OS as well as back to Windows Server 2003 and Raspbian (Raspberry Pi deployment of Debian)
- SSM Agent installed by default on recent AWS-provided base AMIs for Linux and Windows
- Manages AWS-based and on-premises based systems via the agent



AWS
Systems Manager

AWS Systems Manager



A CLOUD GURU

Screenshot of the AWS Systems Manager console.

Left Sidebar:

- Resource Groups:** Find Resources, Saved Resource Groups
- Insights:** Built-In Insights, Dashboard by CloudWatch, Inventory, Compliance
- Actions:** Automation, Run Command, Session Manager, Patch Manager, Maintenance Windows, State Manager
- Shared Resources:** Managed Instances, Activations, Documents, Parameter Store

Main Content Area:

MANAGEMENT TOOLS

AWS Systems Manager

Gain Operational Insight and Take Action on AWS Resources.

View operational data for groups of resources, so you can quickly identify and act on any issues that might impact applications that use those resources.

How it works

Group your resources	View insights	Take action
Group your resources	View insights	Take action
Group your AWS resources and save them into resource groups	See relevant operational data and dashboards about your	Mitigate issues by performing operations directly on groups

Bottom Navigation:

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- Feedback English (US)
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AWS System Manager



A CLOUD GURU

Service	Description	Example
Inventory	Collect OS, application and instances metadata about instances.	Which instances have Apache HTTP Server 2.2.x or earlier?
State Manager	Create states that represent a certain configuration is applied to instances.	Keep track of which instances have been updated to the current stable version of Apache HTTP Server.
Logging	CloudWatch Log agent and stream logs directly to CloudWatch from instances.	Stream logs of our web servers directly to CloudWatch for monitoring and notification.
Parameter Store	Shared secure storage for config data, connection strings, passwords, etc.	Store and retrieve RDS credentials to append to a config file upon boot.
Insight Dashboards	Account-level view of Cloudtrail, Config, Trust Advisor.	Single viewport for any exceptions on config compliance.

AWS System Manager



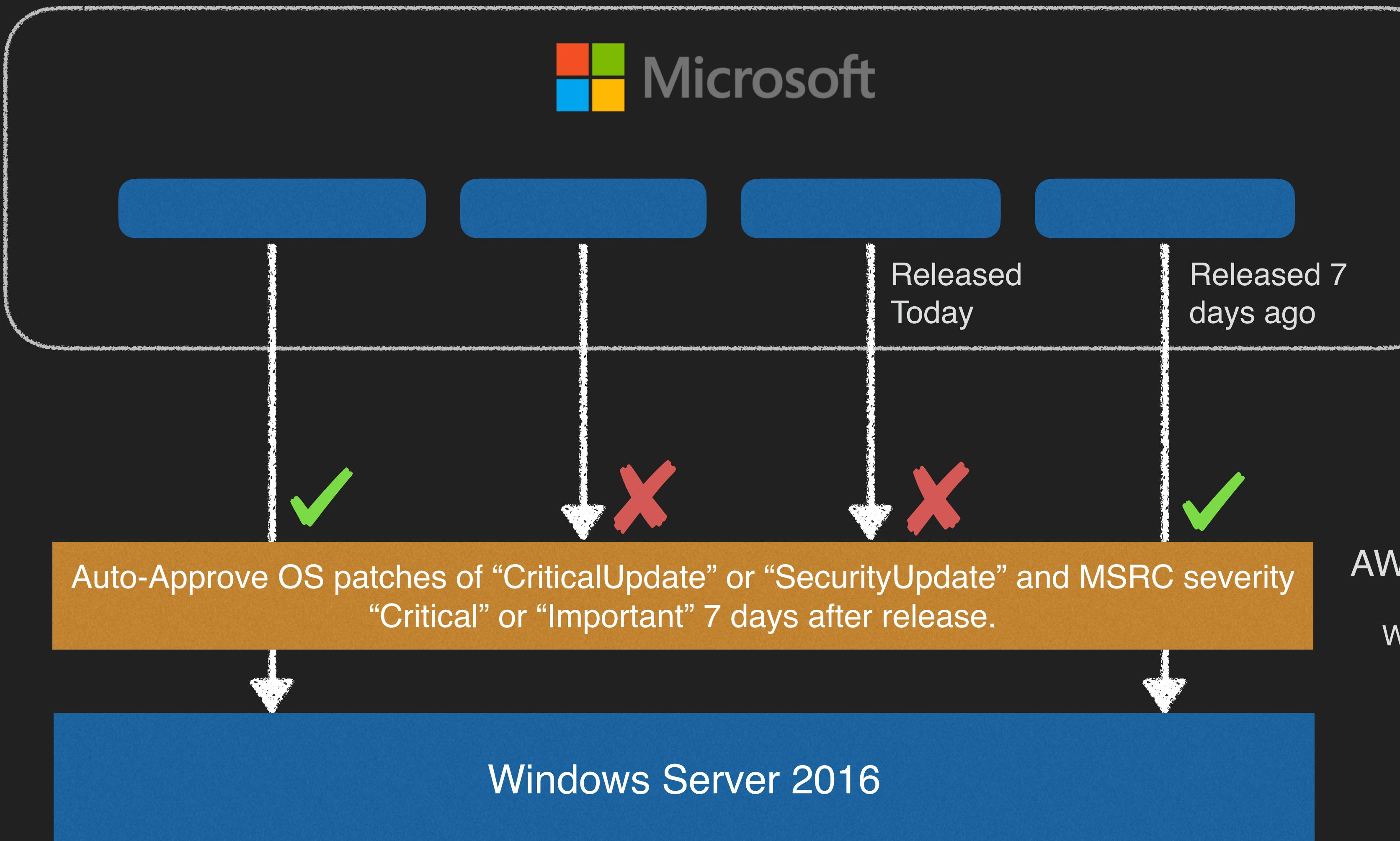
A CLOUD GURU

Service	Description	Example
Resource Groups	Group resource through tagging for organization.	Create a dashboard for all assets belonging to our Production ERP landscape.
Maintenance Windows	Define schedules for instances to patch, update apps, run scripts and more.	Define hours of 00:00 to 02:00 as maintenance windows for Patch Manager
Automation	Automating routine maintenance tasks and scripts.	Stop DEV and QA instances every Friday and restart Monday morning.
Run Command	Run commands and scripts without logging in via SSH or RDP.	Run a shell script on 53 different instances at the same time.
Patch Manager	Automates process of patching instances for updates.	Keep a fleet at the same patch level by applying new security patches during next Maintenance Window.

Patch Manager Baselines



A CLOUD GURU



AWS System Manager Documents



A CLOUD GURU

Type	Used With	Purpose
Command Document	Run Command State Manager	Run Command uses command documents to execute commands. State Manager uses command documents to apply a configuration. These actions can be run on one or more targets at any point during the lifecycle of an instance.
Policy Document	State Manager	Policy documents enforce a policy on your targets. If the policy document is removed, the policy action (for example, collecting inventory) no longer happens.
Automation Document	Automation	Use automation documents when performing common maintenance and deployment tasks such as creating or updating an Amazon Machine Image (AMI).

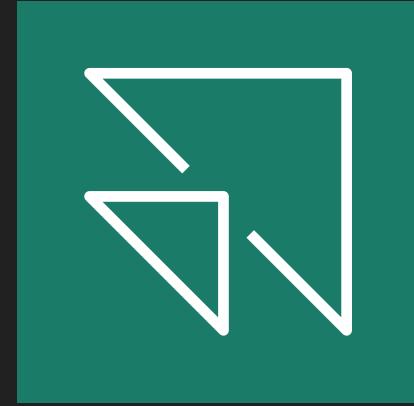
A dark, low-light photograph of a person from the back. The person is wearing a dark button-down shirt and has their hands clasped behind their back. They appear to be seated at a desk.

Business Applications and End-User Computing

Business Applications and End-User Computing



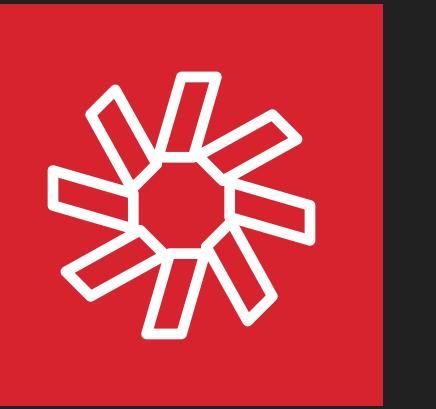
A CLOUD GURU



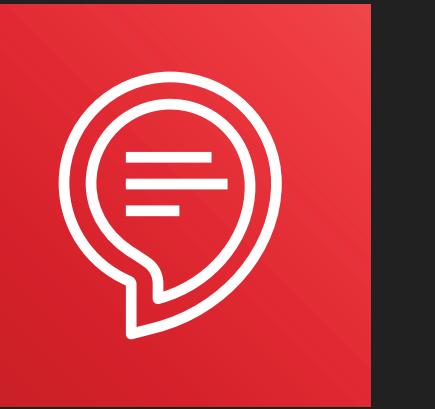
Amazon AppStream



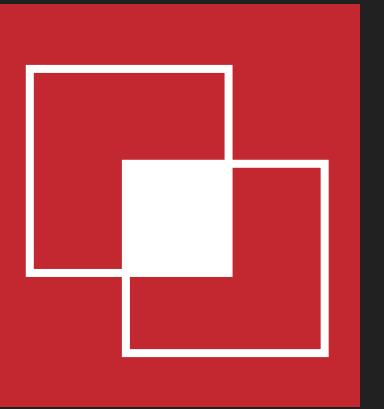
AWS Client VPN



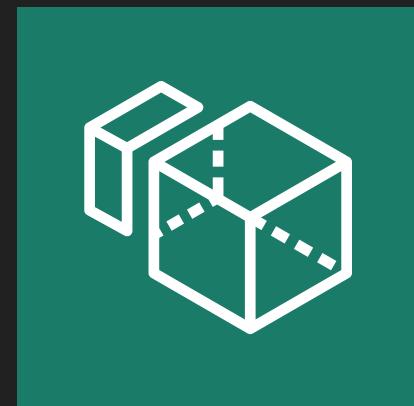
Amazon Chime



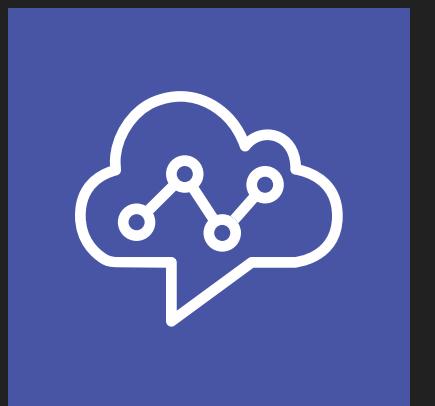
Alexa for Business



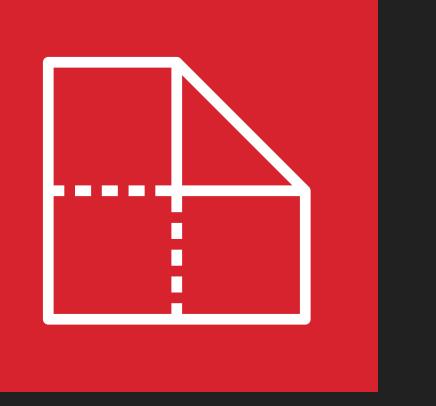
Amazon WorkLink



Amazon WorkSpaces



AWS Connect



Amazon WorkDocs



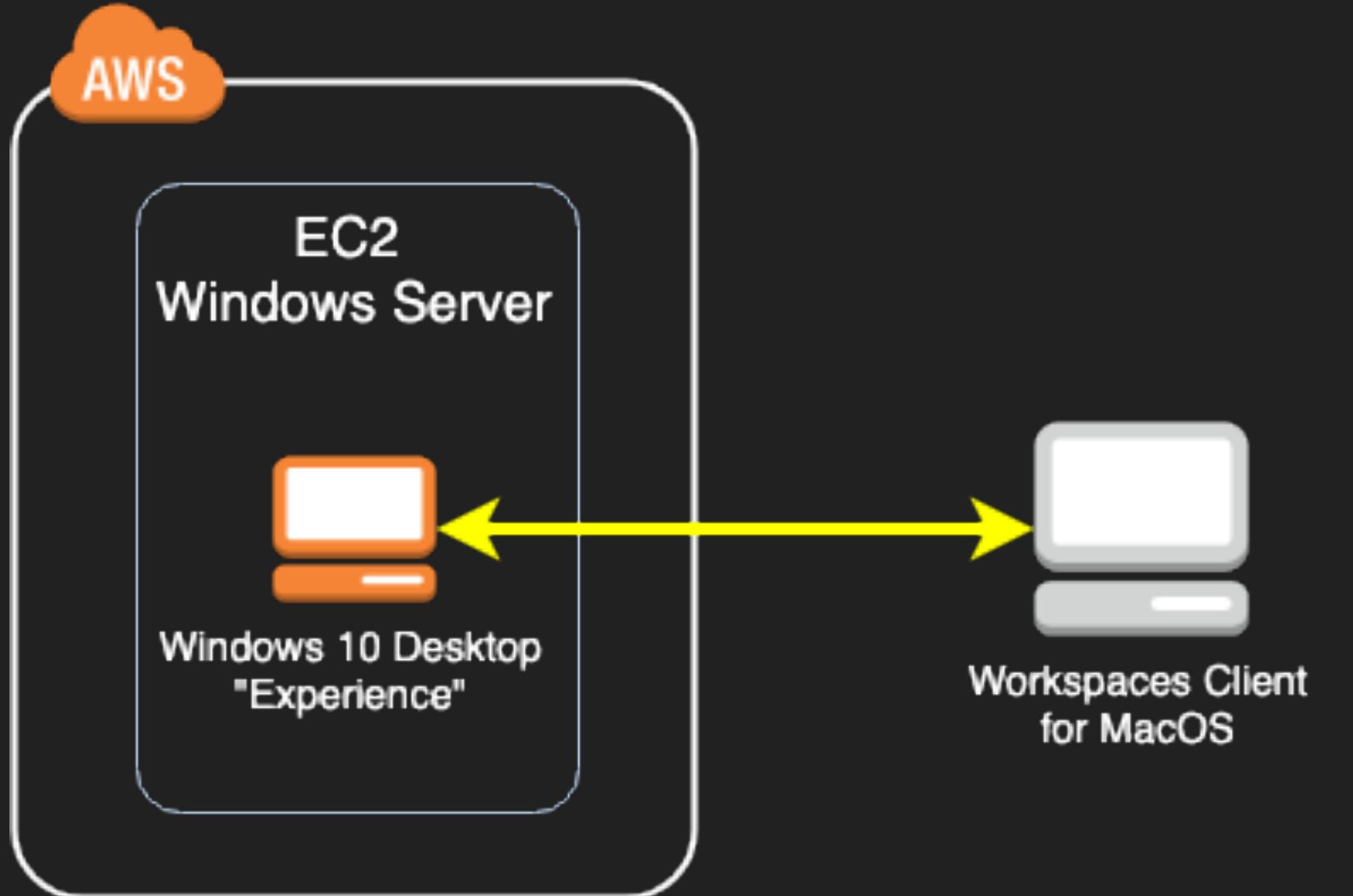
Amazon WorkMail

Amazon WorkSpaces and AppStream



A CLOUD GURU

Amazon Workspaces

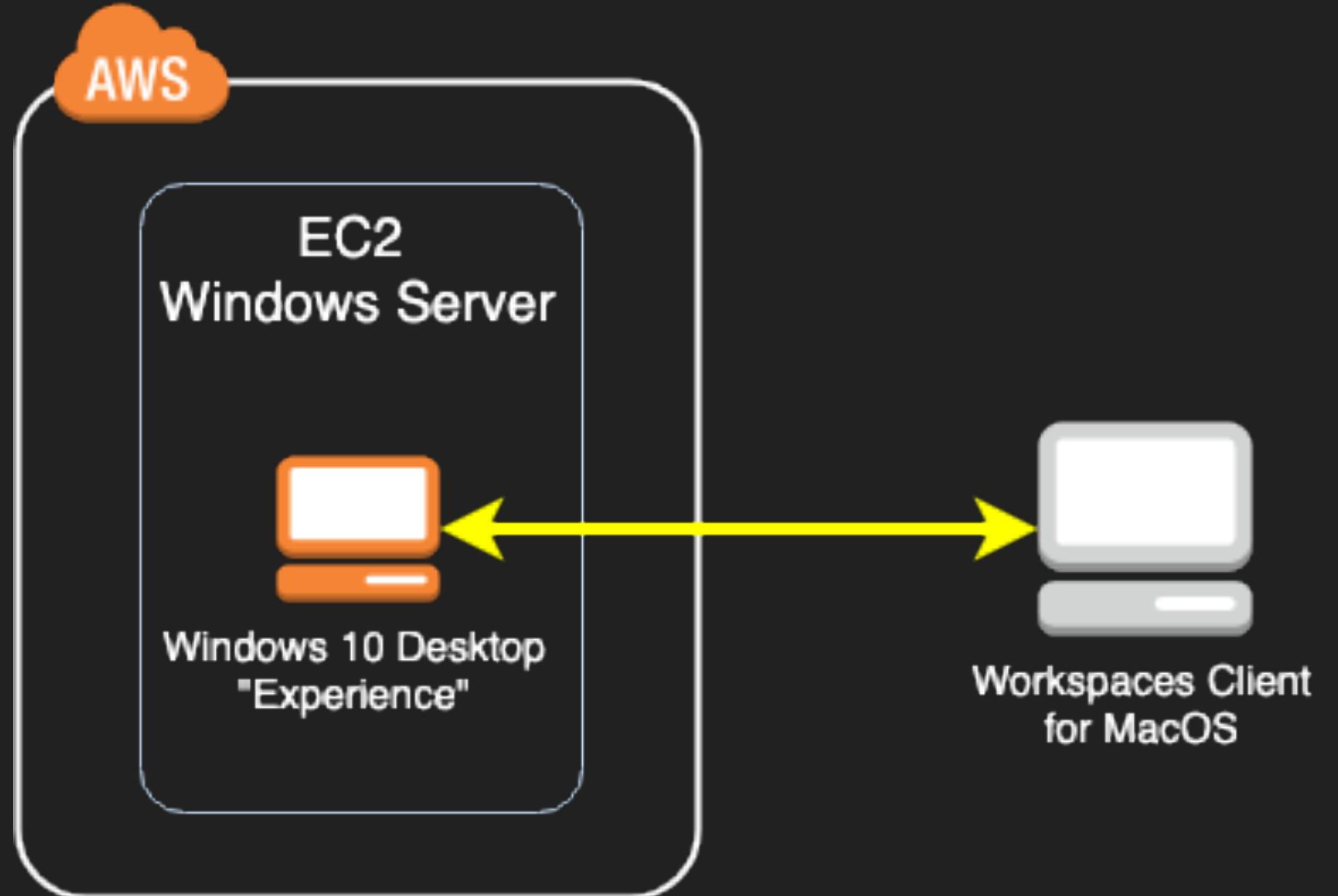


Amazon WorkSpaces and AppStream

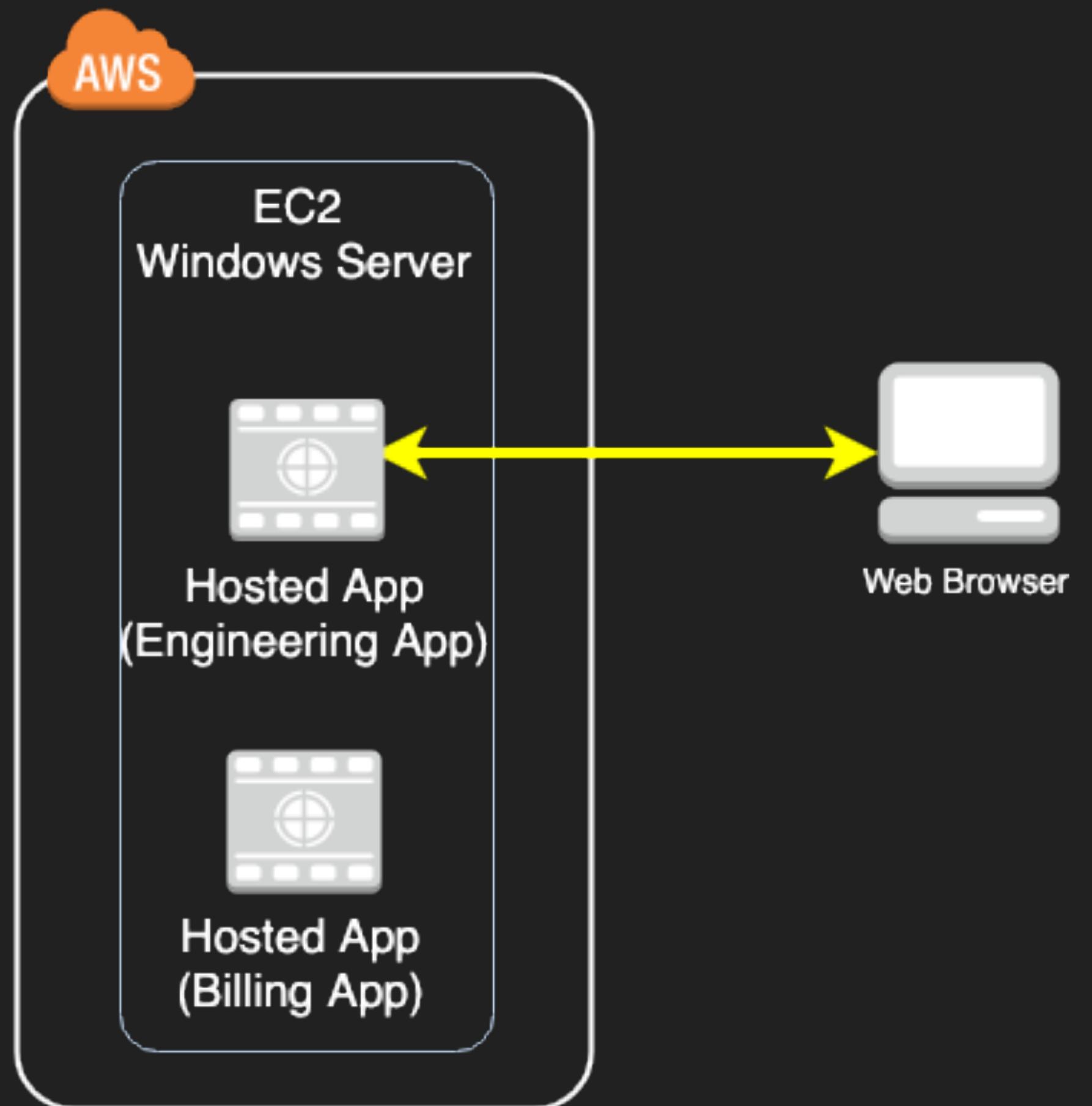


A CLOUD GURU

Amazon Workspaces



Amazon AppStream



Amazon AppStream and WorkSpaces



A CLOUD GURU

- Fully managed desktop-as-a-service (WorkSpaces) and application hosting (AppStream)
- Everything lives on AWS infrastructure and can be tightly managed and controlled
- Use Case: Highly regulated industries where security and confidentiality is a concern. Can be used to keep all data in a protected VPC and off local PCs.
- Use Case: Remote or seasonal workers such as a distributed call center. Given remote workers virtual desktops or hosted applications and let them use their own PCs.
- Use Case: Allow customers to demo your product without them having to download and install it locally.

Amazon Connect and Amazon Chime

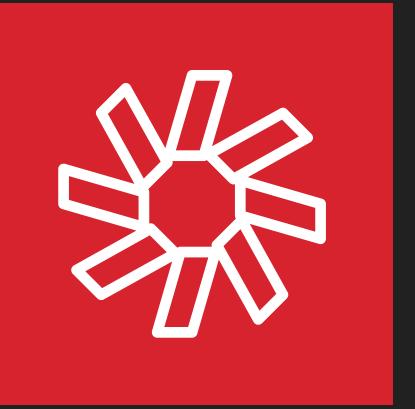


A CLOUD GURU



AWS Connect

- Fully managed cloud-based contact center solution with configurable call handing, inbound and outbound telephony, interactive voice response, chatbot technology and analytics
- Can integrate with other enterprise applications like Customer Relationship Management (CRM) systems



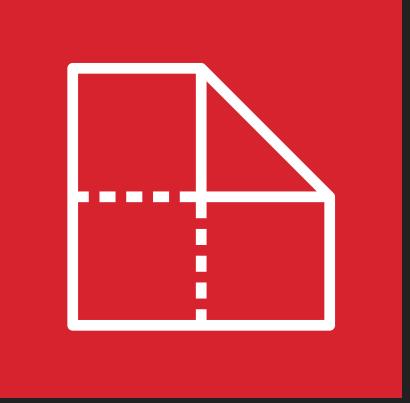
Amazon Chime

- Online meeting and video conferencing service
- Supports usual conferencing features like desktop sharing, group chat and session recording

Amazon WorkDocs and Amazon WorkMail



A CLOUD GURU



Amazon WorkDocs

- Online document storage and collaboration platform
- Supports version management, sharing documents and collaborative edits



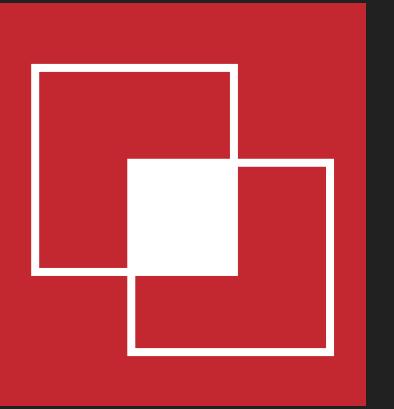
Amazon WorkMail

- Fully managed email and calendar as-a-service
- Compatible with Microsoft Exchange (Outlook), IMAP, Android and iOS mail clients

Amazon WorkLink and Alexa for Business

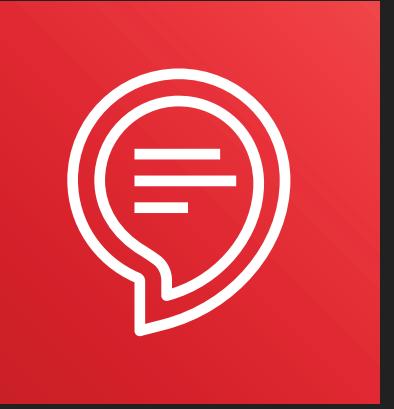


A CLOUD GURU



Amazon WorkLink

- Provide secure access to internal web applications for mobile devices
- When mobile user requests an app, it's rendered on a secure machine then the image is sent to the mobile client.



Alexa for Business

- Deploy Alexa functionality and skills internally in your enterprise
- Management functionality more appropriate for an enterprise organization than buying and provisioning individual Alexa devices

A dark, low-light photograph of a person from the chest up. The person is wearing a dark-colored button-down shirt. Their hands are clasped in front of them, holding a smartphone horizontally. The screen of the phone is visible but mostly black.

AWS Machine Learning Landscape

AWS Machine Learning Landscape



A CLOUD GURU

AI Services

App Developers, no ML experience required



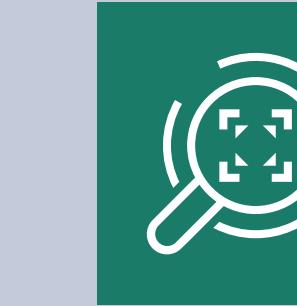
Amazon Comprehend



Amazon Lex



Amazon Polly



Amazon Rekognition



Amazon Translate



Amazon Transcribe



Amazon Personalize

ML Services

ML Developers and Data Scientists



Amazon SageMaker

Ground Truth

Notebooks

Training

Hosting

Algorithms

Marketplace

ML Frameworks & Infrastructure

ML Researchers and Academics

Frameworks



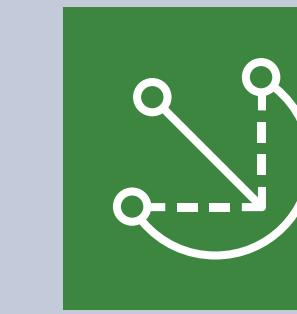
Interfaces



GUON



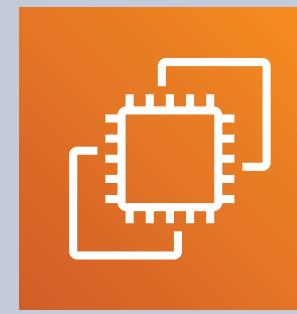
Keras



Amazon Greengrass



Amazon EC2



AWS Deep Learning AMIs

AWS Machine Learning Landscape



A CLOUD GURU

AI Services

App Developers, no ML experience required



Amazon Comprehend



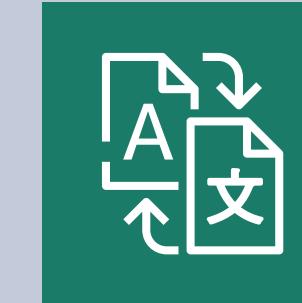
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Amazon Polly



Amazon Rekognition



Amazon Translate



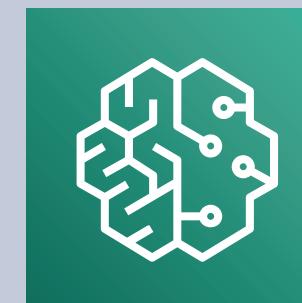
Amazon Transcribe



Amazon Personalize

ML Services

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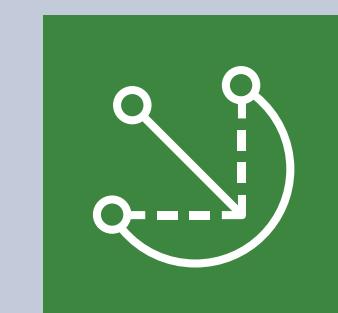
Interfaces



GLUON



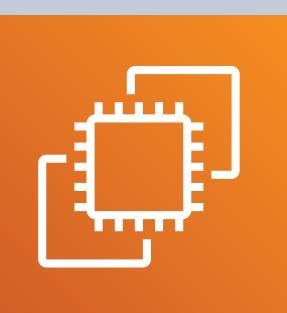
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AWS Deep Learning AMIs

AWS Machine Learning Landscape



A CLOUD GURU

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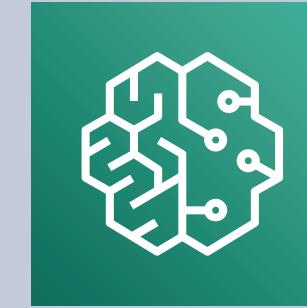
Amazon Transcribe



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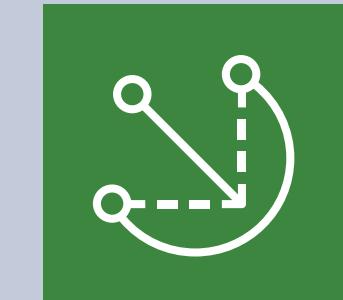


Interfaces

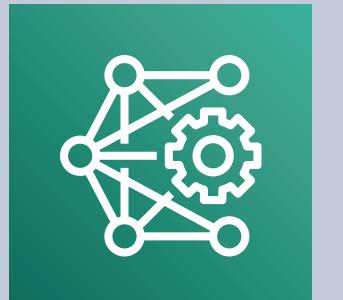


GLUON

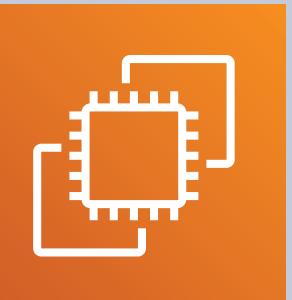
Keras



Amazon Greengrass



Amazon EC2



AWS Deep Learning AMIs

AWS Machine Learning Landscape



A CLOUD GURU

AI Services

App Developers, no ML experience required



Amazon Comprehend



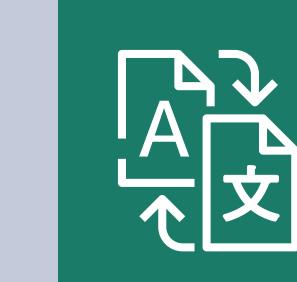
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Amazon Rekognition



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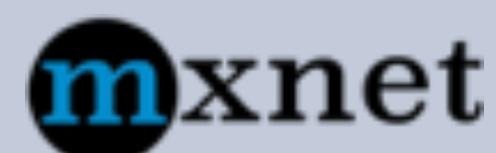
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GUON



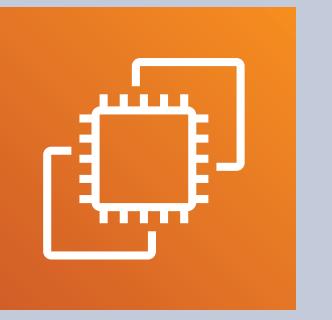
Keras



Amazon Greengrass



Amazon EC2



AWS Deep Learning AMIs



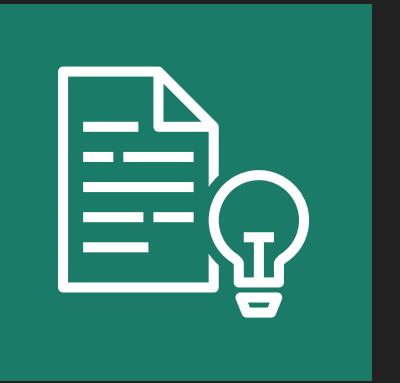
AI Developer Services

- Easy to use with no ML knowledge required
- Scalable and Robust
- Redundant and Fault Tolerant
- Pay per Use
- REST API and SDK

AWS Machine Learning Landscape



A CLOUD GURU



Amazon
Comprehend

What

Natural Language Processing (NLP)
service that finds insight and
relationships within text.

When

Sentiment analysis of social media
posts

AWS Machine Learning Landscape



A CLOUD GURU



Amazon
Comprehend



Amazon
Forecast

What

Natural Language Processing (NLP) service that finds insight and relationships within text.

When

Sentiment analysis of social media posts

Combines time-series data with other variables to deliver highly accurate forecasts.

Forecast seasonal demand for a specific color of shirt.

AWS Machine Learning Landscape



A CLOUD GURU



Amazon
Lex

What

Build conversational interfaces that can understand the intent and context of natural speech.

When

Create a customer service chatbot to automatically handle routine requests.

AWS Machine Learning Landscape



A CLOUD GURU



Amazon
Lex



Amazon
Personalize

What

Build conversational interfaces that can understand the intent and context of natural speech.

When

Create a customer service chatbot to automatically handle routine requests.

Recommendation engine as a service based on demographic and behavioral data.

Provide potential upsell products at checkout during a web transaction.

AWS Machine Learning Landscape



A CLOUD GURU



Amazon
Polly

What

Text-to-Speech service supporting multiple languages, accents and voices.

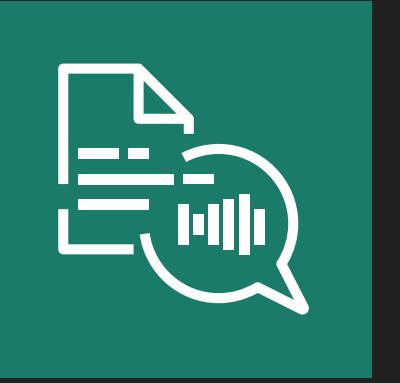
When

Provide dynamically generated personalized voice response for inbound callers.

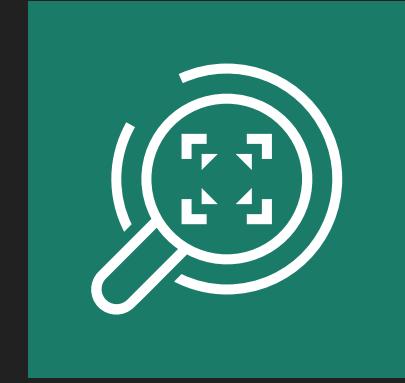
AWS Machine Learning Landscape



A CLOUD GURU



Amazon
Polly



Amazon
Rekognition

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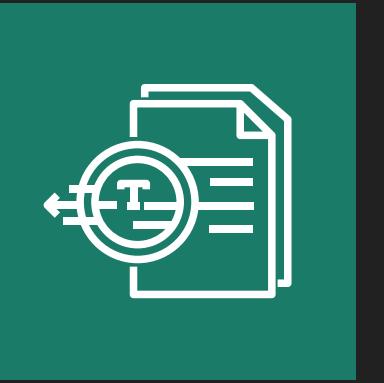
Image and video analysis to parse and recognize objects, people, activities and facial expressions.

Provide an additional form of employee authentication through facial recognition as they scan an access badge.

AWS Machine Learning Landscape



A CLOUD GURU



Amazon
Textract

What

Extract text, context and metadata
from scanned documents

When

Automatically digitize and process
physical paper forms

AWS Machine Learning Landscape



A CLOUD GURU



Amazon
Textract



Amazon
Transcribe

What

Extract text, context and metadata
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When

Automatically digitize and process
physical paper forms

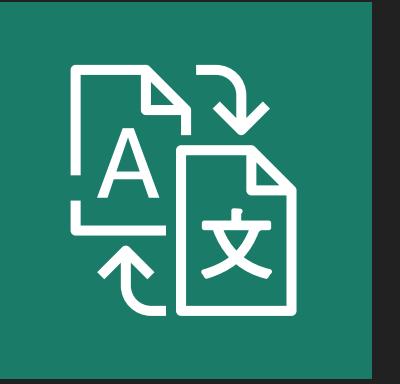
Speech-to-Text as a service

Automatically create transcripts of
recorded presentations.

AWS Machine Learning Landscape



A CLOUD GURU



Amazon
Translate

What

Translate text to and from many
different languages

When

Dynamically create localized web
content for users based on their
geography.

AWS Machine Learning Landscape



A CLOUD GURU

Screenshot of the AWS Amazon Comprehend service interface.

Left Sidebar:

- Amazon Comprehend**
- Real-time analysis**
- Job management
- Customization**
 - Custom classification
 - Custom entity recognition
- Comprehend Medical**
 - Real-time analysis

Top Bar:

- aws
- Services ▾
- Resource Groups ▾
- Amazon SageMaker
- bell icon
- Oregon ▾
- Support ▾

Insights View:

Entities (highlighted) | Key phrases | Language | Sentiment | Syntax

Analyzed text:

Amazon.com, Inc. is located in Seattle, WA and was founded July 5th, 1994 by Jeff Bezos, allowing customers to buy everything from books to blenders. Seattle is north of Portland and south of Vancouver, BC. Other notable Seattle-based companies are Starbucks and Boeing.

Results:

Entity	Category	Confidence
Amazon.com, Inc	Organization	0.90
Seattle, WA	Location	0.89
July 5th, 1994	Date	0.99+
Jeff Bezos	Person	0.99+

AWS Machine Learning Landscape



A CLOUD GURU

aws Services Resource Groups Amazon SageMaker Oregon Support

Amazon Rekognition

- Metrics
- Demos
- Object and scene detection**
- Image moderation
- Facial analysis
- Celebrity recognition
- Face comparison
- Text in image
- Video Demos
- Video analysis

Object and scene detection

Rekognition automatically labels objects, concepts and scenes in your images, and provides a confidence score.

Done with the demo? [Learn more](#)

Results

Transportation	98.8 %
Automobile	98.8 %
Car	98.8 %
Vehicle	98.8 %
Human	98.3 %
Person	98.3 %

Choose a sample image

Use your own image
Image must be .jpeg or .png format and no larger than 5MB. Your image isn't stored.

Upload or drag and drop

Use image URL [Go](#)

► Request

► Response

AWS Machine Learning Specialty



A CLOUD GURU



A CLOUD GURU

Dashboard

Courses

Discussions

Manage your team

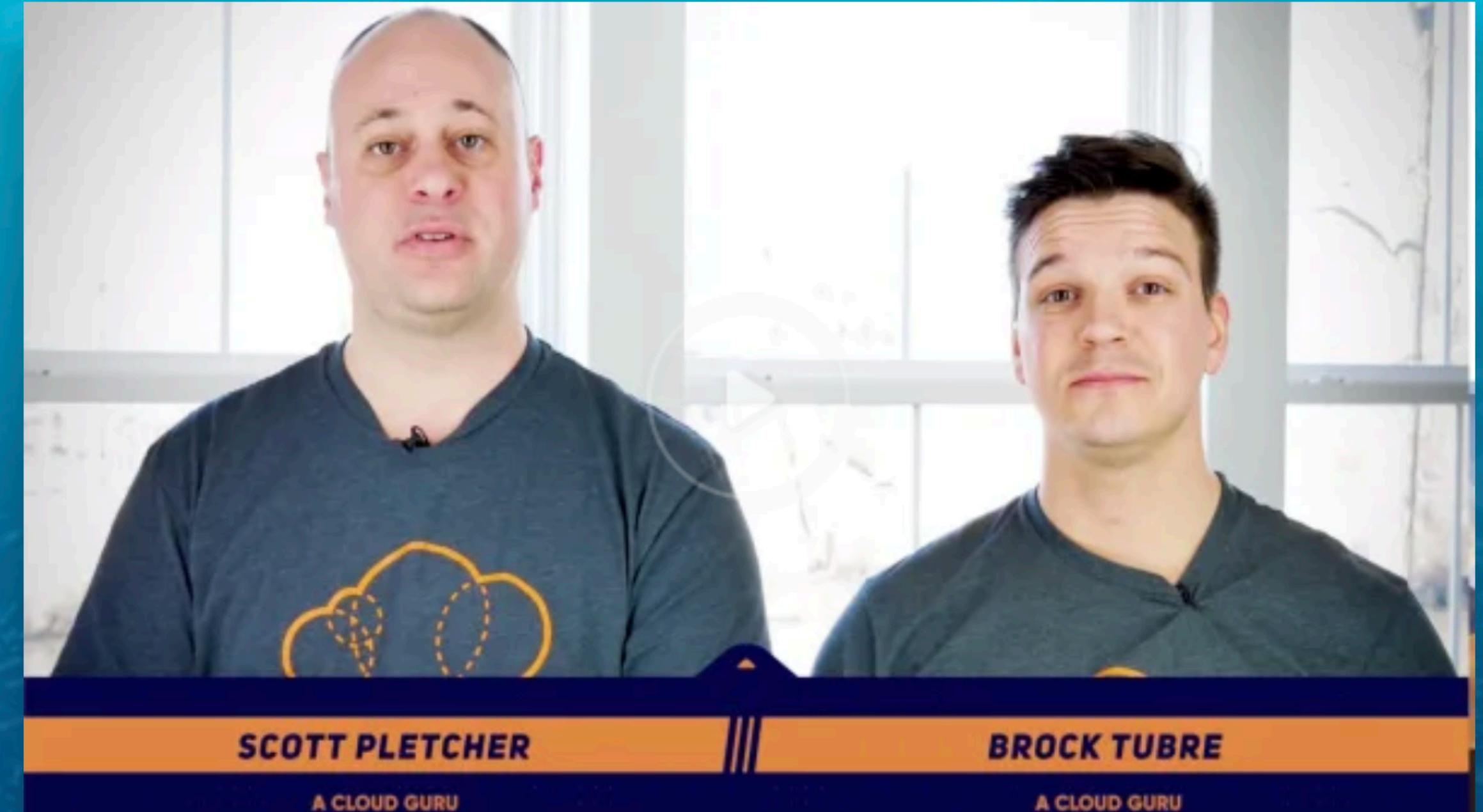


Scott Pletcher ▾

AWS Certified Machine Learning - Specialty 2019

Ace the AWS Machine Learning Specialty Certification exam with ACG - no PhD in Mathematics needed!

CONTINUE THIS COURSE ➔



A dark, moody photograph of a person from the chest up. They are wearing a dark button-down shirt over a patterned tie. Their hands are clasped together in front of them, resting on what appears to be a table or desk. The lighting is low, creating deep shadows and highlights on the fabric.

Deployment Management

Management Tools



AWS Config

- Allows you to assess, audit and evaluate configurations of your AWS resources.
- Very useful for Configuration Management as part of an ITIL program.
- Creates a baseline of various configuration settings and files then can track variations against that baseline.
- AWS Config Rules can check resources for certain desired conditions and if violations are found, the resources is flagged as “noncompliant”.

Examples of Config Rules:

Is Backup enabled on RDS?

Is CloudTrail enabled on the AWS account?

Are EBS volumes encrypted?



AWS Config

AWS OpsWorks



- Managed instance of Chef and Puppet—two very popular automation platforms.
- Provide configuration management to deploy code, automate tasks, configure instances, perform upgrades, etc.
- Has three offerings: **OpsWorks for Chef Automate**, **OpsWorks for Puppet Enterprise** and **OpsWorks Stacks**.
- OpsWorks for Chef Automate and Puppet Enterprise are fully managed implementation of each respective platform.
- OpsWorks Stacks is an AWS creation and uses an embedded Chef solo client installed on EC2 instances to run Chef recipes.
- OpsWorks Stacks support EC2 instances and on-prem servers as well with an agent.



AWS OpsWorks Stacks



A CLOUD GURU

- Stacks are collections of resources needed to support a service or application.
- Layers represent different components of the application delivery hierarchy.
- EC2 instances, RDS instances, and ELBs are examples of Layers.
- Stacks can be cloned – but only within the same region.
- OpsWorks is a global service. But when you create a stack, you must specify a region and that stack can only control resources in that region.

(For example, you can't manage an EC2 instance created in EU-CENTRAL-1 from OpsWorks stack created for US-EAST-2.)



AWS
OpsWorks

A dark, out-of-focus photograph of a person from the chest up. The person is wearing a dark button-down shirt over a patterned tie. Their hands are clasped together in their lap. The background is dark and indistinct.

Deployment Management

Wrap-Up

Exam Blueprint



- 3 Domain 3.0: Deployment Management**
- 3.1 Ability to manage the lifecycle of an application on AWS
 - 3.2 Demonstrate ability to implement the right architecture for development, testing, and staging environments
 - 3.3 Position and select most appropriate AWS deployment mechanism based on scenario

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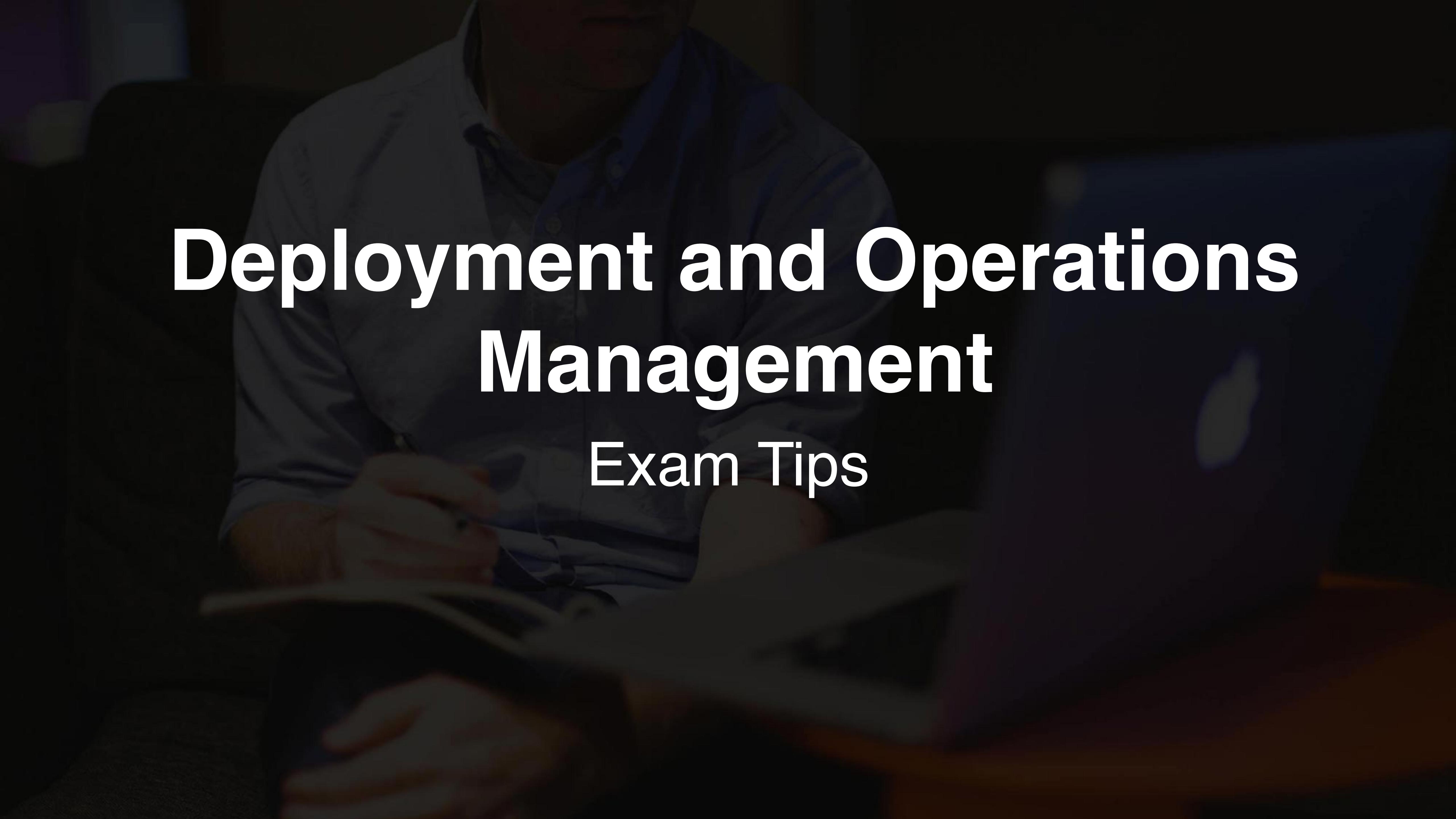
For Further Study

AWS Whitepapers

- “Infrastructure as Code”
- “Practicing Continuous Integration and Continuous Delivery on AWS”
- “Overview of Deployment Options on AWS”

2017 re:Invent Videos

- Deep Dive on AWS CloudFormation (DEV317)
- Moving to Containers: Building with Docker and Amazon ECS (CON310)
- Continuous Integration Best Practices for Software Development Teams (DEV322)



Deployment and Operations Management

Exam Tips

Exam Tips



Types of Deployments:

- Understand the types of deployments and when each might be preferred in a given situation.
- Know the various ways AWS can support Blue/Green deployments and when Blue/Green is *not* recommended.

Continuous Integration and Continuous Deployment:

- Understand conceptually Continuous Integration, Continuous Delivery, and Continuous Deployment and their considerations.
- Know what AWS tools can be used to facilitate these methods of deployment.

Exam Tips



Elastic Beanstalk:

- Know the components of Elastic Beanstalk and the platforms supported.
- Understand the deployment options with Elastic Beanstalk and the tradeoffs for each.

CloudFormation:

- Understand how CloudFormation delivers Infrastructure as Code and the benefits of that.
- Strongly recommend hands-on work with CloudFormation via one of our more in-depth courses if you haven't worked with it before.

Exam Tips



Elastic Container Service:

- Know the difference between ECS and EKS – as well as the uniqueness of each.
- Understand the difference between EC2 Launch Types and Fargate Launch Types.

API Gateway:

- Understand what (and how) you would deploy an API on API Gateway.
- Remember that API Gateway is designed to serve up REST APIs.



Exam Tips

Management Tools:

- Know when and what you can expect when using AWS Config. Understand the purpose of a Config Rule.
- Know the different flavors of AWS OpsWorks and, conceptually, what Chef and Puppet offer.
- Understand the difference between AWS OpsWorks Stacks and AWS OpWorks for Chef Automate.
- Remember that OpsWorks is a global service, but you can only manage resources in the region you created the OpsWorks stack.



Exam Tips

System Manager:

- Know the various services under the System Manager heading and how they help simplify management of large landscapes
- Can manage both AWS-based and on-prem systems so long as they are supported OSs (No IBM AIX for example.)
- Understand Patch Manager pre-defined baselines and that they act as a pre-approval gatekeeper
- Understand the various SSM document types and their purposes.

Deployment and Operations Management

Pro Tips

Pro Tips



A CLOUD GURU

- The Cloud will open a whole new world of possibilities to landscape management and project deployment.
- Blue/Green is not just for nimble web apps in the cloud.
- It will be a hard transition to move to Infrastructure as Code. Training is key.
- API Gateway + Lambda create loads of opportunity for agility and efficiency in the way of serverless platforms. (You're using one right now!)

Deployment and Operations Management

Challenge 1

Challenge 1



You are documenting the steps for a Blue/Green deployment of your Production web application. You have chosen a Blue/Green deployment because the application must remain 100% constantly available for customers, even during new deployments. Additionally, you want the upgrade to be as fast as possible to limit the time when you'll have multiple versions in production. You also want the ability to quickly rollback if the upgrade fails.

The blue stack is running the current version of the application and the green stack is the new version.

First, you prepare the new version of the application as a new AMI. Then, you configure an auto-scaling group to use that new AMI. You then start up a green Elastic Load Balancer and attach it to the green auto-scaling group.

What should you document as the next step in the deployment? (Choose One)

- A. Remove the blue ELB from the blue stack then wait until the TTL expires on the DNS record. Then change the Route 53 entry to point to the green ELB.
- B. Once the green ELB and auto-scaling pool are healthy, use Route 53's weighted routing feature to route traffic to the green ELB by setting the weight to a number higher than the current weight of 10 for blue ELB.
- C. Update the route table in the VPC to route all inbound traffic to the new green ELB's IP address. Using CloudWatch, monitor traffic until there are no more requests going to the blue ELB's IP address then remove it.
- D. Once the green ELB and auto-scaling pool are healthy, use Route 53's weighted routing feature to route traffic to the green ELB setting the weight to 1 and set the blue ELB to zero.
- E. Change the current launch configuration for the blue auto-scaling group to use the new green AMI then manually terminate all the instances running the old blue AMI one-by-one so they restart with the green AMI.
- F. Reassign the EIP from the Blue instances to the Green instances.

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- C. Update the route table in the VPC to route all inbound traffic to the new green ELB's IP address. Using CloudWatch, monitor traffic until there are no more requests going to the blue ELB's IP address then remove it.
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Challenge 1



You are documenting the steps for a Blue/Green deployment of your Production web application. You have chosen a Blue/Green deployment because the application must remain 100% constantly available for customers, even during new deployments. Additionally, you want the upgrade to be as fast as possible to limit the time when you'll have multiple versions in production. You also want the ability to quickly rollback if the upgrade fails.

The blue stack is running the current version of the application and the green stack is the new version.

First, you prepare the new version of the application as a new AMI. Then, you configure an auto-scaling group to use that new AMI. You then start up a green Elastic Load Balancer and attach it to the green auto-scaling group.

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Deployment and Operations Management

Challenge 2

Challenge 2



A colleague has come to you for some help on CloudFormation. He has created his stack template and validated it successfully. Then, because he wants to protect the production database from accidentally being re-initialized, he's added the Stack Policy below:

```
{
  "Statement" : [
    {
      "Effect" : "Deny",
      "Action" : "Update:*",
      "Principal": "*",
      "Resource" : "LogicalResourceId/ProductionDatabase"
    }
  ]
}
```

What are your analysis and recommended actions, if any?

- A. The Stack Policy is fine the way it is.
- B. The Stack Policy parameter syntax is incorrect.
- C. The Stack Policy is lacking a necessary component.
- D. Do nothing to the Stack Policy.
- E. Remove the faulty policy using the CLI.
- F. Remove the faulty policy using the Console
- G. Update the faulty policy using the CLI.
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Challenge 2



```
{  
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    {  
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      "Action": "Update:*",  
      "Principal": "*",  
      "Resource": "*"  
    },  
    {  
      "Effect": "Deny",  
      "Action": "Update:*",  
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Deployment and Operations Management

Lab

Zero-Downtime Deployment

Zero Downtime Deployment



After years of R&D and millions of venture capital spending, your small start-up company has finally released version 1.0 of its long-anticipated API:

The Shakespeare Insult Engine

This API can be called at anytime to generate a hardy dose of Shakespearian insults.

After incorporating customer feedback, you are preparing to release version 2.

But, given the widespread use, you cannot tolerate any downtime at all during a deployment.



Zero Downtime Deployment



Sequence	Task	Hint
1	Choose a deployment method.	
2	Get both versions setup and running.	
3	Cut over and test. Roll back and test.	

Zero Downtime Deployment



Expert Level

Pause now and go give it a try without hints.

Zero Downtime Deployment

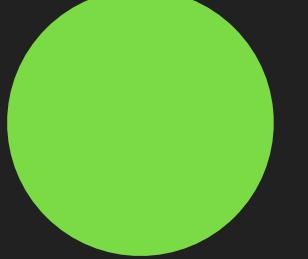


Intermediate Level

Keep going for some hints to get you started.



Zero Downtime Deployment

Sequence	Task	Hint
1	Choose a deployment method.	 
2	Get both application versions setup and running.	git clone npm install node app.js
3	Cut over and test. Roll back and test.	flip/flop

Zero Downtime Deployment



Intermediate Level

Pause now and go give it a try.
Keep going to see how I did it.

Zero Downtime Deployment



Walkthrough

Cost Management

Introduction



A CLOUD GURU



Exam Blueprint

Domain 1: Design for Organizational Complexity

- 1.1. Determine cross-account authentication and access strategy for complex organizations (for example, an organization with varying compliance requirements, multiple business units, and varying scalability requirements).
- 1.2. Determine how to design networks for complex organizations (for example, an organization with varying compliance requirements, multiple business units, and varying scalability requirements).
- 1.3. Determine how to design a multi-account AWS environment for complex organizations (for example, an organization with varying compliance requirements, multiple business units, and varying scalability requirements).

Domain 2: Design for New Solutions

- 2.1. Determine security requirements and controls when designing and implementing a solution.
- 2.2. Determine a solution design and implementation strategy to meet reliability requirements.
- 2.3. Determine a solution design to ensure business continuity.
- 2.4. Determine a solution design to meet performance objectives.
- 2.5. Determine a deployment strategy to meet business requirements when designing and implementing a solution.

olutions.

- 2.6. Determine a deployment strategy to meet business requirements when designing and implementing a solution.



Exam Blueprint

Domain 3: Migration Planning

- 3.1. Select existing workloads and processes for potential migration to the cloud.
- 3.2. Select migration tools and/or services for new and migrated solutions based on detailed AWS knowledge.
- 3.3. Determine a new cloud architecture for an existing solution.
- 3.4. Determine a strategy for migrating existing on-premises workloads to the cloud.

Domain 4: Cost Control

- 4.1. Select a cost-effective pricing model for a solution.
- 4.2. Determine which controls to design and implement that will ensure cost optimization.
- 4.3. Identify opportunities to reduce cost in an existing solution.

Domain 5: Continuous Improvement for Existing Solutions

- 5.1. Troubleshoot solution architectures.
- 5.2. Determine a strategy to improve an existing solution for operational excellence.
- 5.3. Determine a strategy to improve the reliability of an existing solution.
- 5.4. Determine a strategy to improve the performance of an existing solution.
- 5.5. Determine a strategy to improve the security of an existing solution.
- 5.6. Determine how to improve the deployment of an existing solution.

A dark, out-of-focus photograph of a person from the chest up. The person is wearing a dark-colored button-down shirt. Their hands are clasped in front of them, holding a smartphone horizontally. The background is dark and indistinct.

Cost Management

Concepts



Capital Expenses (CapEx)

Money spent on long-term assets like property, buildings and equipment.

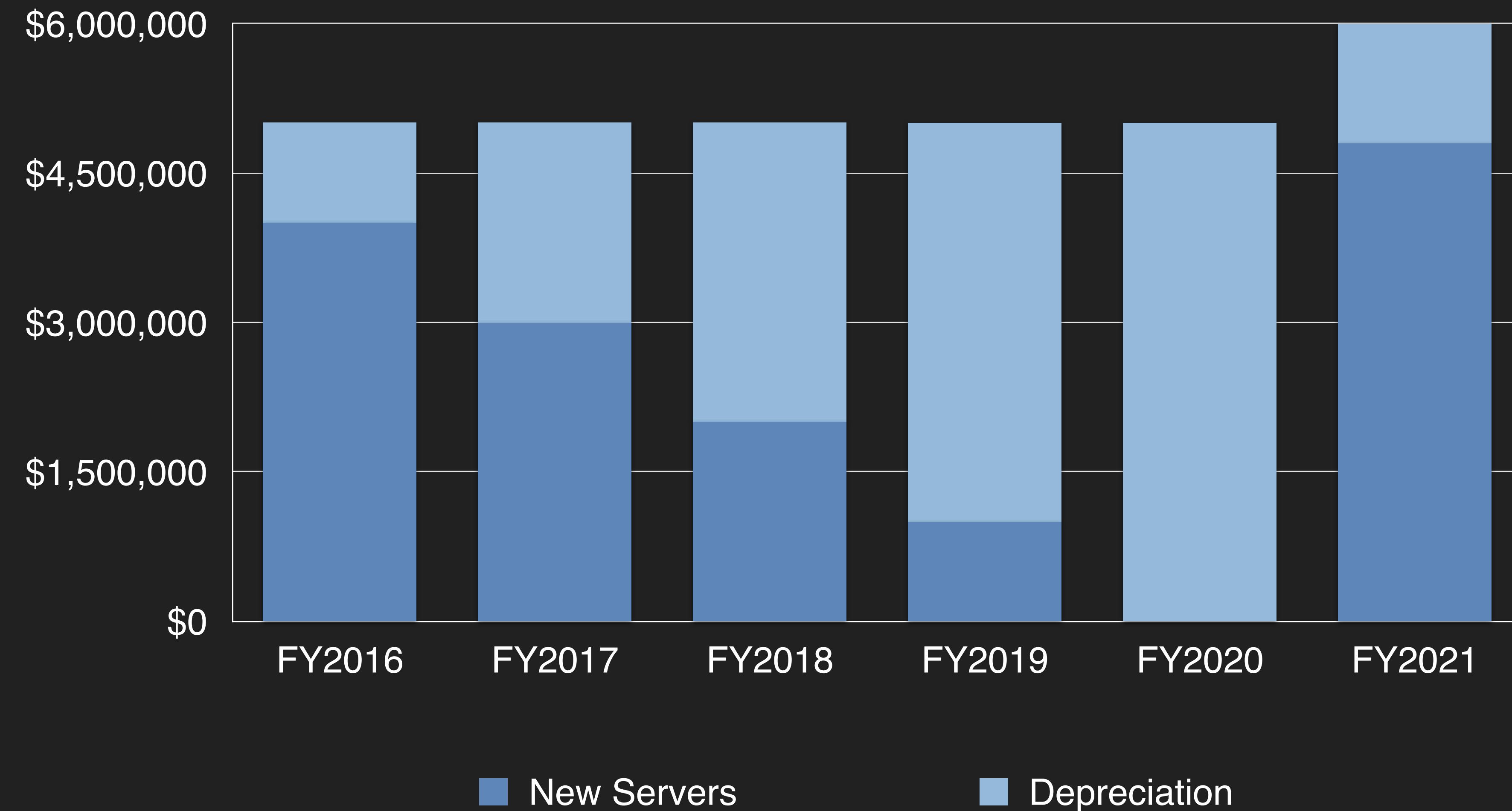
Operational Expenses (OpEx)

Money spent for on-going costs for running the business.
Usually considered variable expenses.

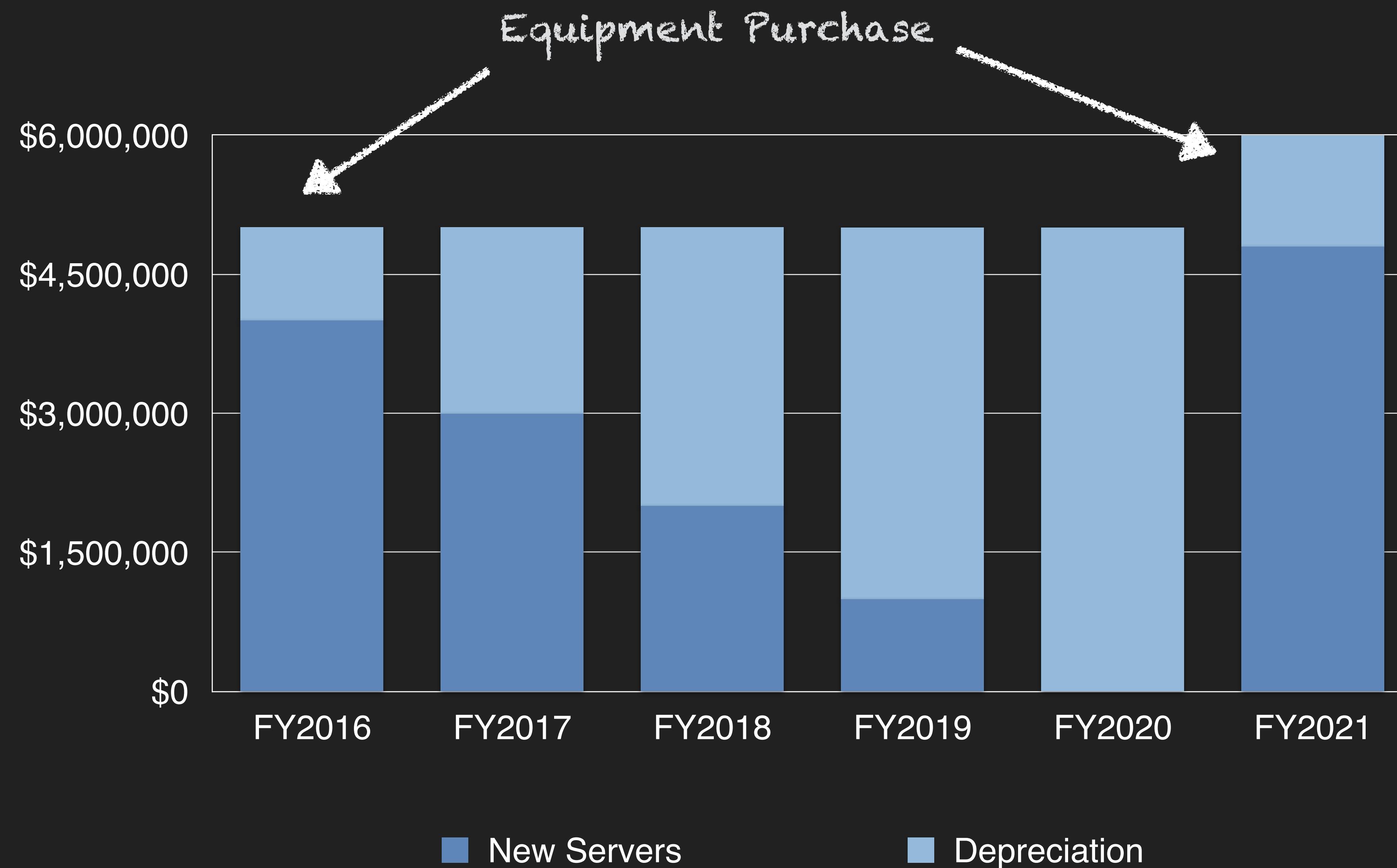
CapEx Budgeting



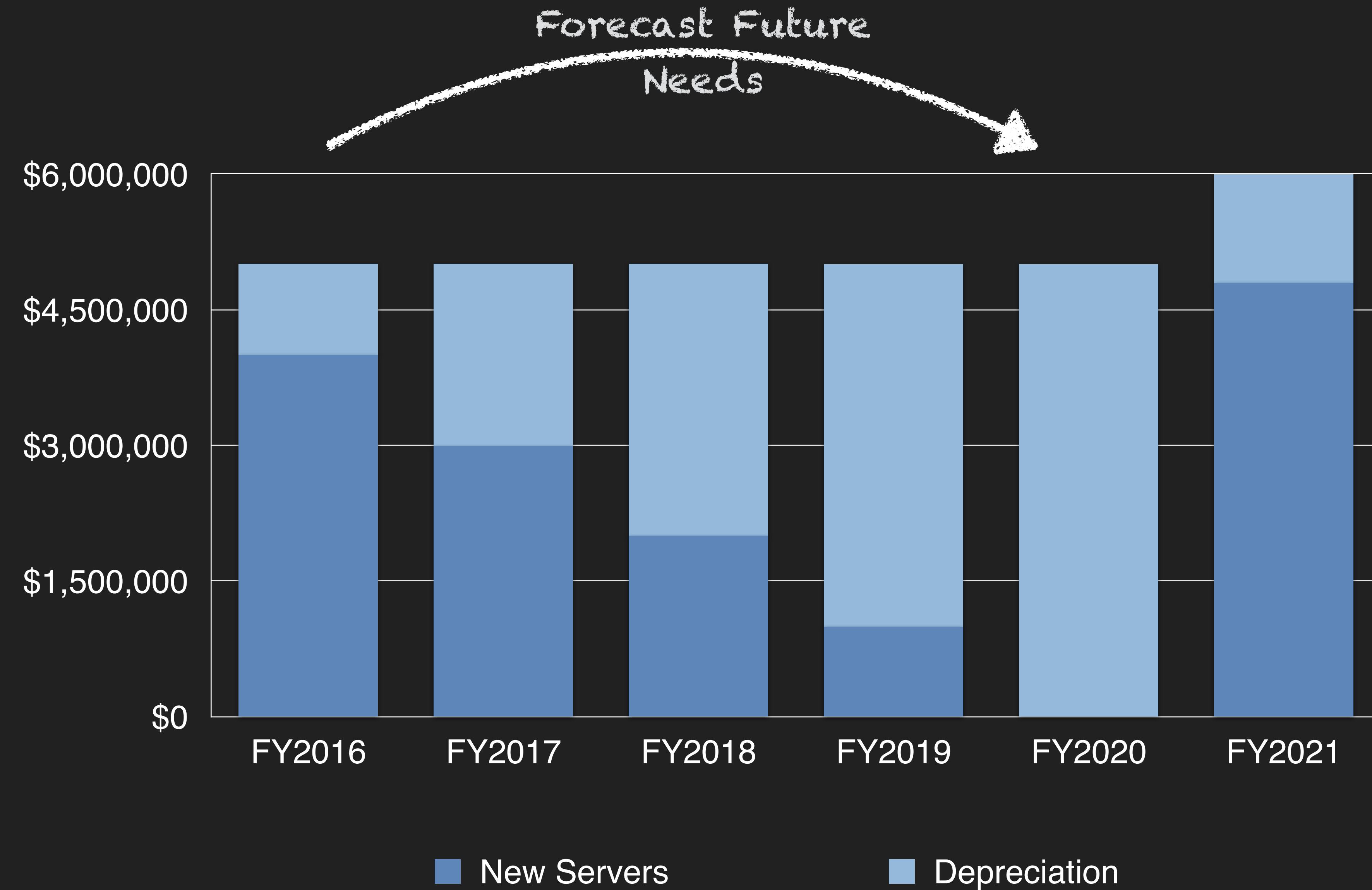
A CLOUD GURU



CapEx Budgeting



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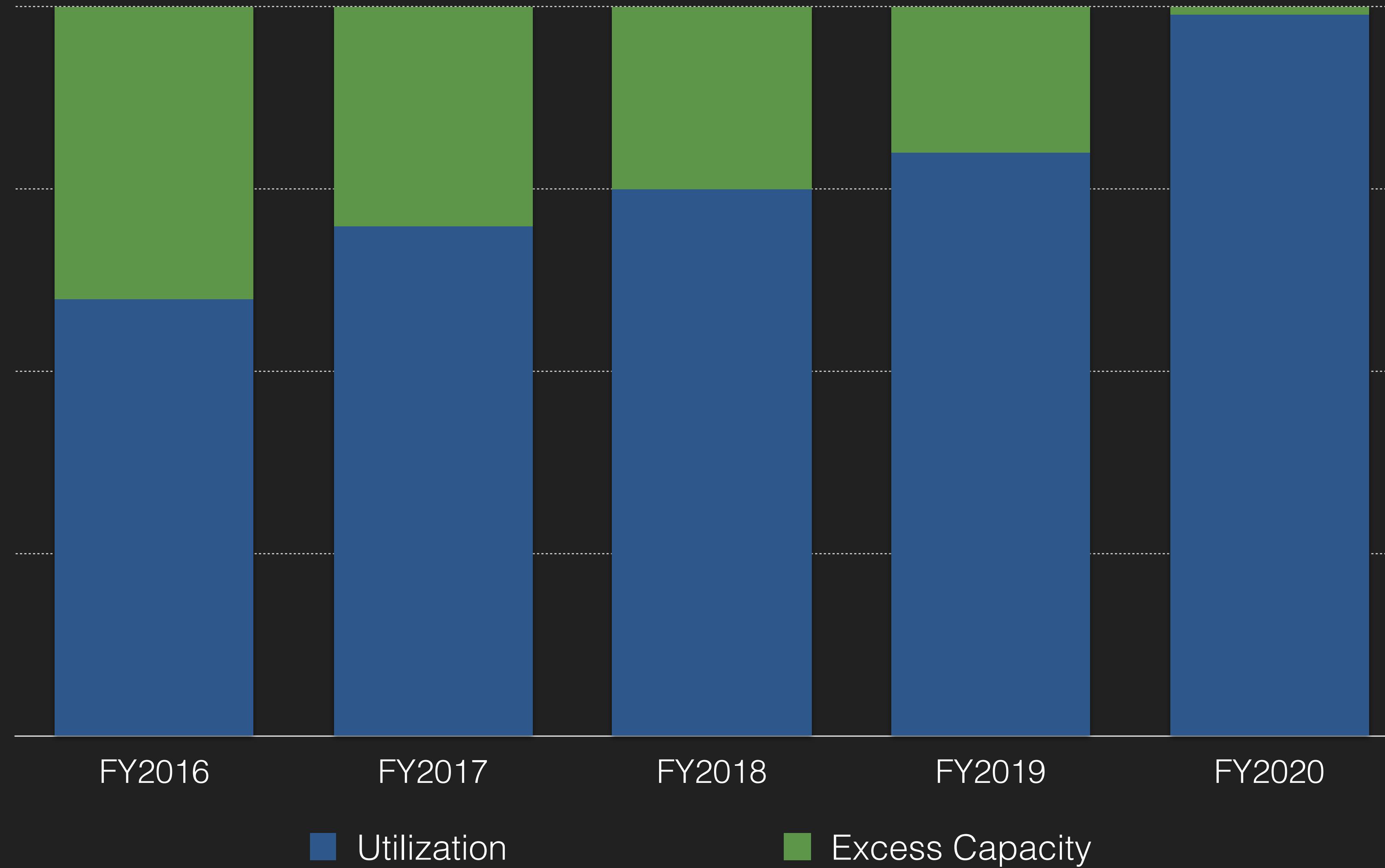
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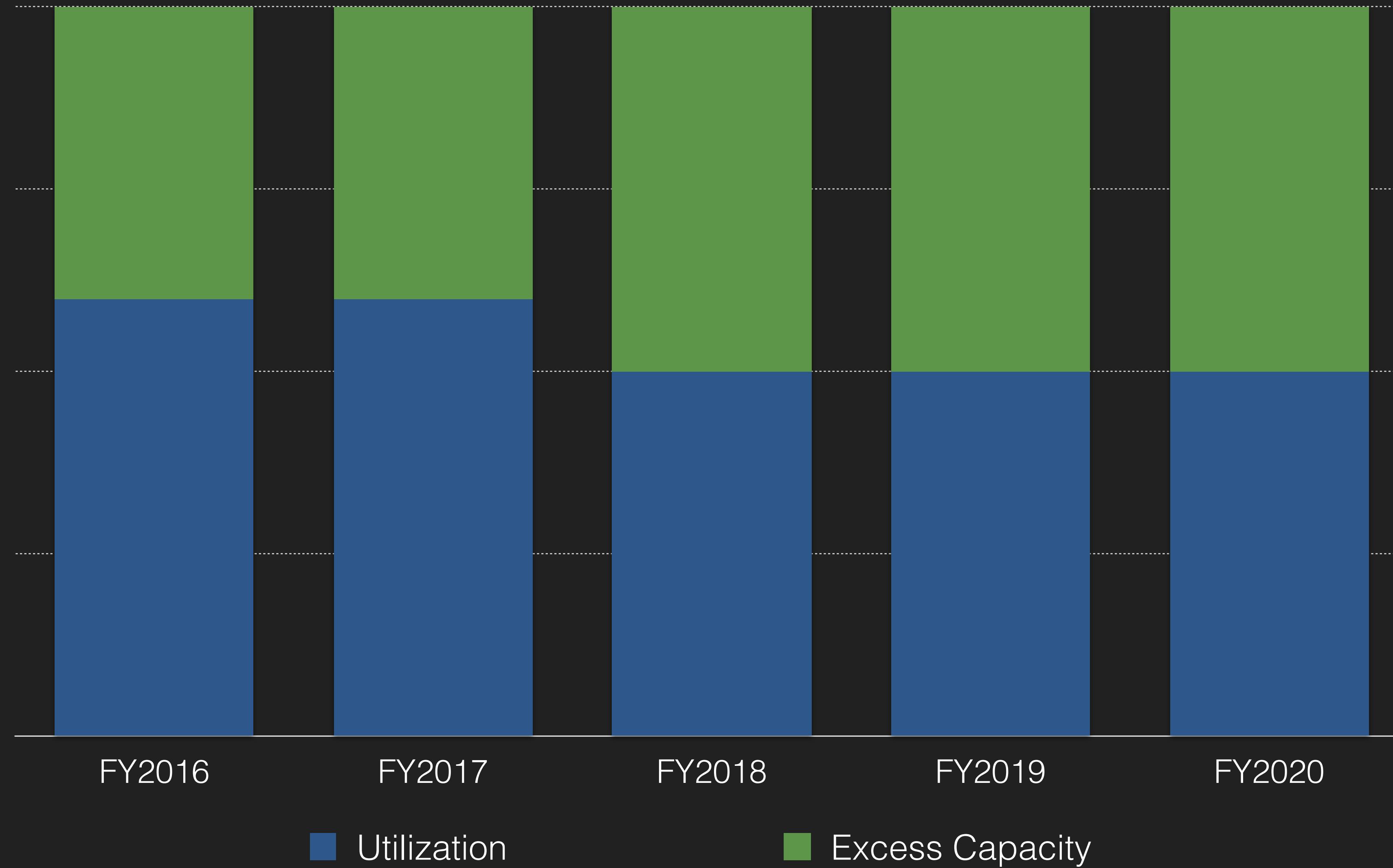
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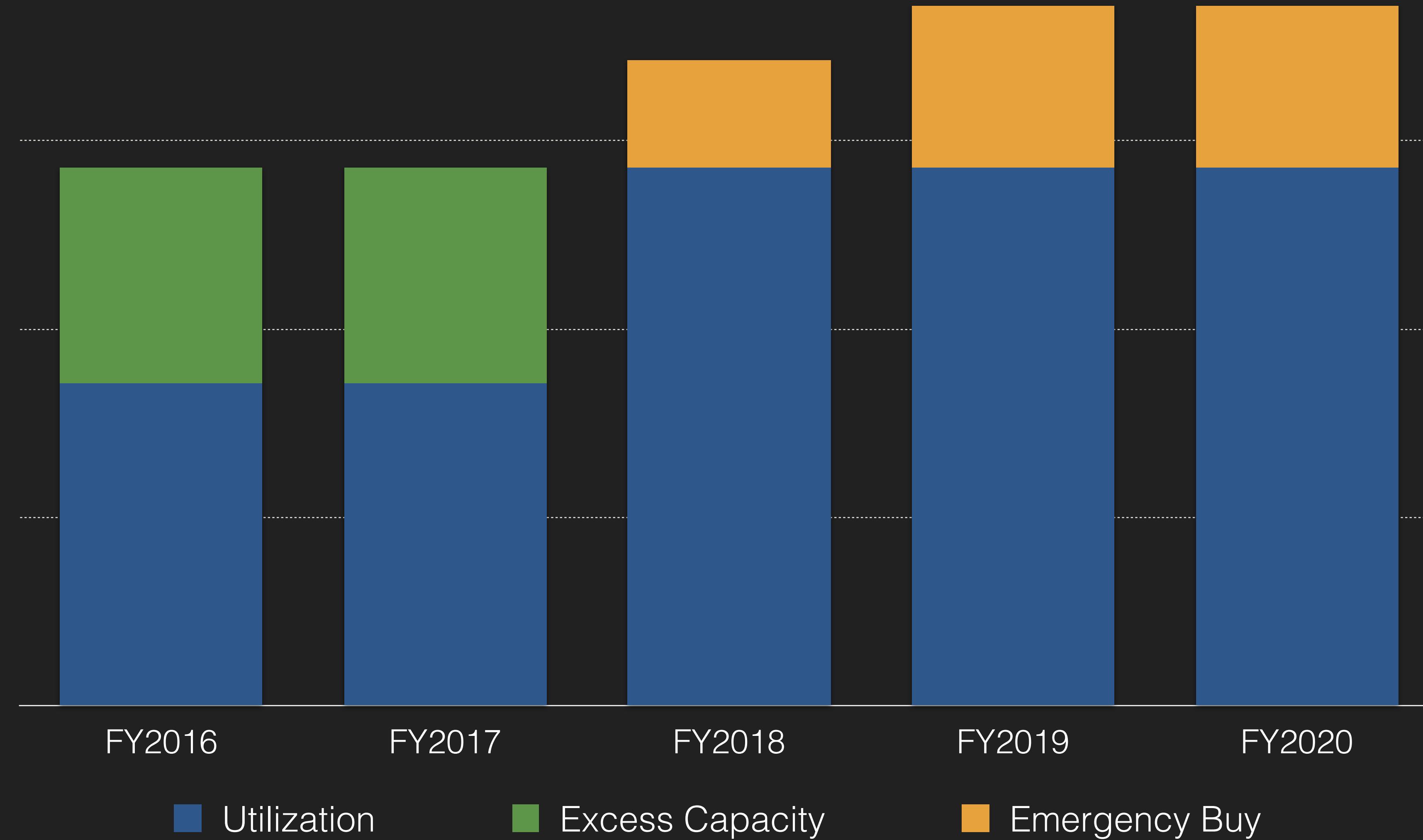
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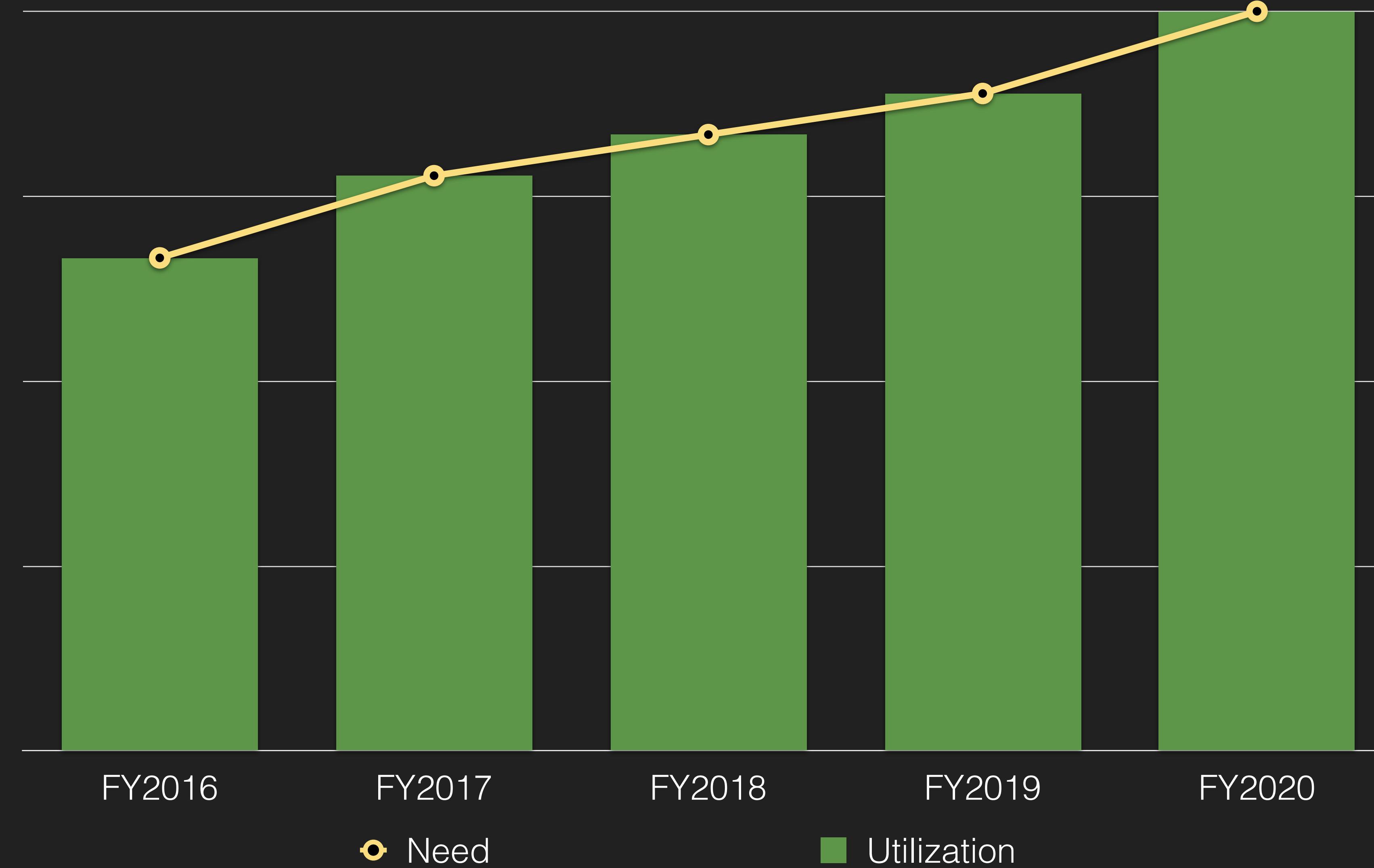
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OpEx Cost Model



A CLOUD GURU





Total Cost of Ownership (TCO)

A comprehensive look at the entire cost model of a given decision or option, often including both hard costs and soft costs.

Return on Investment (ROI)

The amount an entity can expect to receive back within a certain amount of time given an investment.



“It’s a TRAP!”

- General Ackbar



- Many times, organizations don't have a good handle on their full on-prem data center costs (power, cooling, fire suppression, etc.)
- Soft costs are rarely tracked or even understood as a tangible expense.
- Learning curve will be very different from person to person.
- Business Plans usually include many assumptions which in turn require support organizations to create derivative assumptions—sometimes layers deep.

Don't go it alone!
Get help....make friends with your Finance department.

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Costing

Cost Optimization Strategies

Cost Optimization Strategies



- Appropriate Provisioning
- Right-Sizing
- Purchase Options
- Geographic Selection
- Managed Services
- Optimized Data Transfer



Appropriate Provisioning

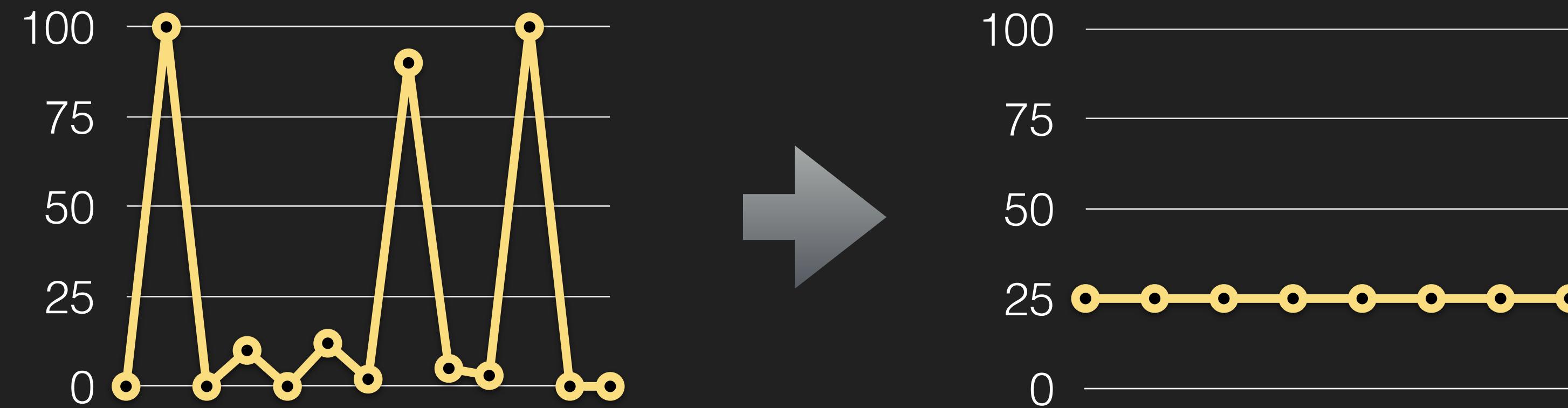
- Provision the resources you need and nothing more
- Consolidate where possible for greater density and lower complexity (multi-database RDS, containers)
- CloudWatch can help by monitoring utilization



Right-Sizing



- Using lowest-cost resource that still meets the technical specifications.
- Architecting for most consistent use of resources is best versus spikes and valleys.
- Loosely coupled architectures using SNS, SQS, Lambda and DynamoDB can smooth demand and create more predictability and consistency.



Purchase Options



- For permanent applications or needs, Reserved Instances provide the best cost advantage.
- Spot instances are best for temporary horizontal scaling.
- EC2 Fleet lets you define target mix of On-Demand, Reserved and Spot instances.

Instance	On Demand	Reserved 1 Year All Upfront	Spot Instance (Sept. 2, 2018 us-east-2)
m5.2xlarge	\$0.384	\$0.229 (40% less)	\$0.0798 (79% less)

Geographic Selection



- AWS Pricing can vary from region to region.
- Consider potential savings by locating resources in a remote region if local access is not required.
- Route 53 and CloudFront can be used to reduce potential latency of a remote region.

Region	S3 Standard Storage First 50TB
us-west-2	\$0.023 per GB
us-west-1	\$0.026 per GB
ap-northeast-1	\$0.025 per GB
sa-east-1	\$0.0405 per GB

Managed Services



- Leverage managed services such as MySQL RDS over self-managed options such as MySQL on EC2.
- Cost savings gained through lower complexity and manual intervention.
- RDS, RedShift, Fargate, and EMR are great examples of fully-managed services that replace traditionally complex and difficult installations with push-button ease.

Optimized Data Transfer



- Data going out and between AWS regions can become a significant cost component.
- Direct Connect can be a more cost-effective option given data volume and speed.



Costing

Tagging and Resource Groups



AWS Tagging

- **THE NUMBER ONE BEST THING** you can do to help manage your AWS assets!
- Tags are just arbitrary name/value pairs that you can assign to virtually all AWS assets to serve as metadata.
- Tagging strategies can be used for Cost Allocation, Security, Automation, and many other uses.

For example, we can use a tag in an IAM policy to implement access controls to certain resources.

- Enforcing standardized tagging can be done via AWS Config Rules or custom scripts.
For example, EC2 instances not properly tagged are stopped or terminated nightly.
- Most resources can have up to 50 tags.

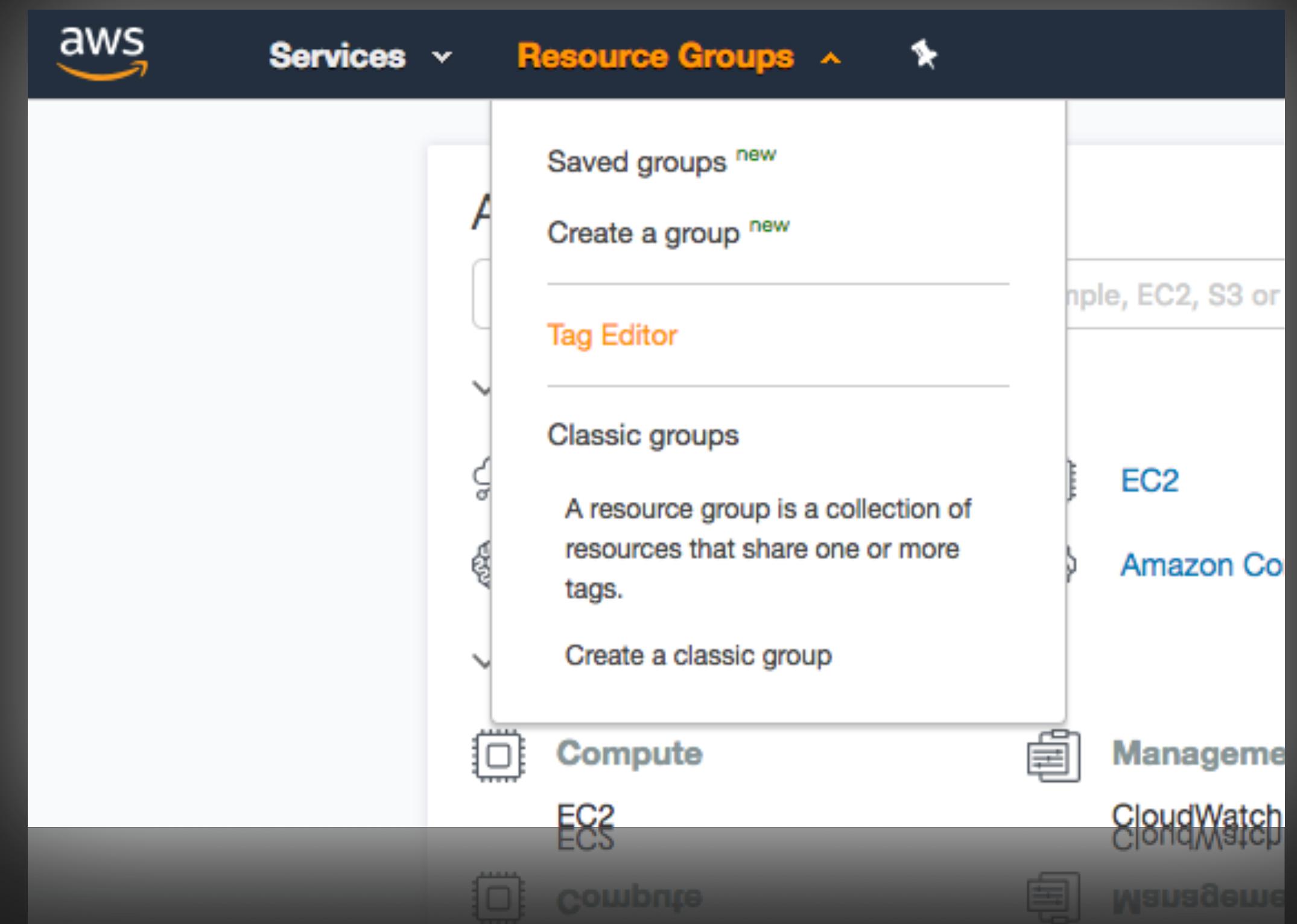


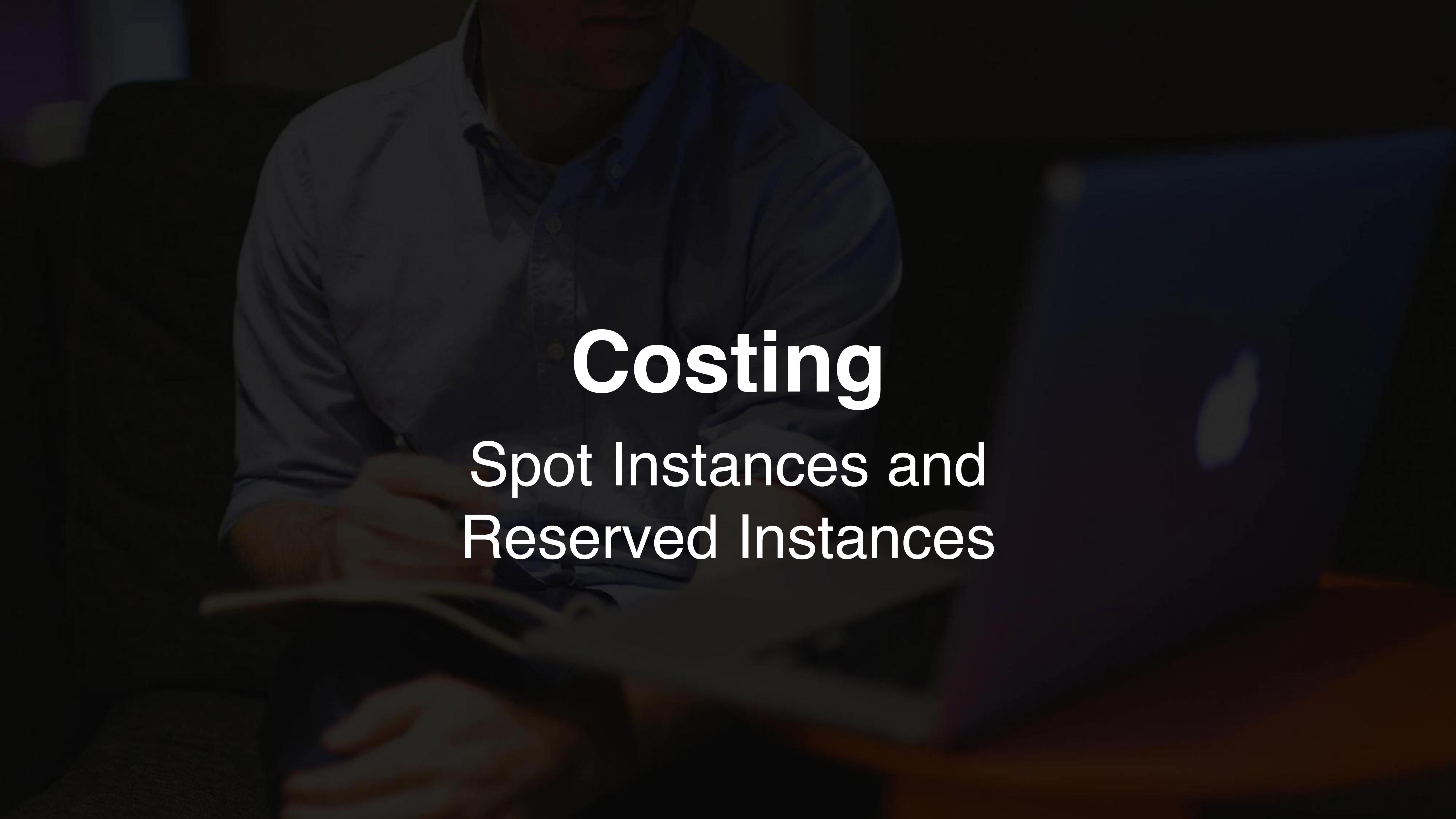
AWS Resource Groups

- Resource Groups are groupings of AWS assets defined by tags.
- Create custom consoles to consolidate metrics, alarms and config details around given tags.

Common Resource Groupings:

- Environments (DEV, QA, PRD)
- Project Resources
- Collection of resources supporting key business processes
- Resources allocated to various departments or cost centers



A dark, out-of-focus photograph of a person's torso and hands. The person is wearing a dark button-down shirt over a blue collared shirt and a dark tie. Their hands are clasped in front of them, resting on what appears to be a laptop keyboard. The background is dark and indistinct.

Costing

Spot Instances and Reserved Instances



Reserved Instances

- Purchase (or agree to purchase) usage of EC2 instances in advance for a significant discount over On-Demand pricing
- Provides capacity reservation when used in a specific AZ.
- AWS Billing automatically applies discounted rates when you launch an instance that matches your purchased RI.
- EC2 has three RI types: Standard, Convertible, and Scheduled.
- Can be shared across multiple accounts within Consolidated Billing
- If you find you don't need your RI's, you can try to sell them on the Reserved Instance Marketplace.



Reserved Instances

	Standard	Convertible
Terms	1 year, 3 year	1 year, 3 year
Average Discount off On-Demand	40% - 60%	31% - 54%
Change AZ, Instances Size, Networking Type	Yes via API or console	Yes via API or console
Change instance family, OS, Tenancy, Payment Options	No	Yes
Benefit from Price Reductions	No	Yes
Sellable on Reserved Instances Marketplace	Yes (Sale proceeds must be deposited in US bank account)	Coming Soon

RI Attributes



- Instance Type - designates CPU, memory, networking capability
- Platform - Linux, SUSE Linux, RHEL, Microsoft Windows, Microsoft SQL Server
- Tenancy - Default (shared) tenancy or Dedicated tenancy
- Availability Zone (optional) - If AZ is selected, RI is reserved and discount applies to that AZ (Zonal RI). **If no AZ is specified, no reservation is created** but the discount is applied to any instance in the family in any AZ in the region (Regional RI).

You can change a Zonal RI to Regional RI via the console or `ModifyReservedInstance` API.

Zonal RI



Zonal RI

m4.2xlarge
Linux
Default Tenancy
us-west-2b

us-west-2a	us-west-2b	us-west-2c
	<p>m4.2xlarge Linux Reserved Discounted</p>	

Regional RI



Regional RI

m4.2xlarge
Linux
Default Tenancy
No AZ specified

us-west-2a	us-west-2b	us-west-2c
		<p>m4.2xlarge Linux Discounted</p>



RI Size Flexibility

Regional RI

m4.2xlarge
Linux

Default Tenancy
No AZ specified

us-west-2a	us-west-2b	us-west-2c
	<p>m4.xlarge Linux Discounted</p>	
	<p>m4.xlarge Linux Discounted</p>	

NOTE: This instances size flexibility is only available for Linux/Unix Regional RIs with default tenancy.
Not available for Windows, RHEL or SLES.

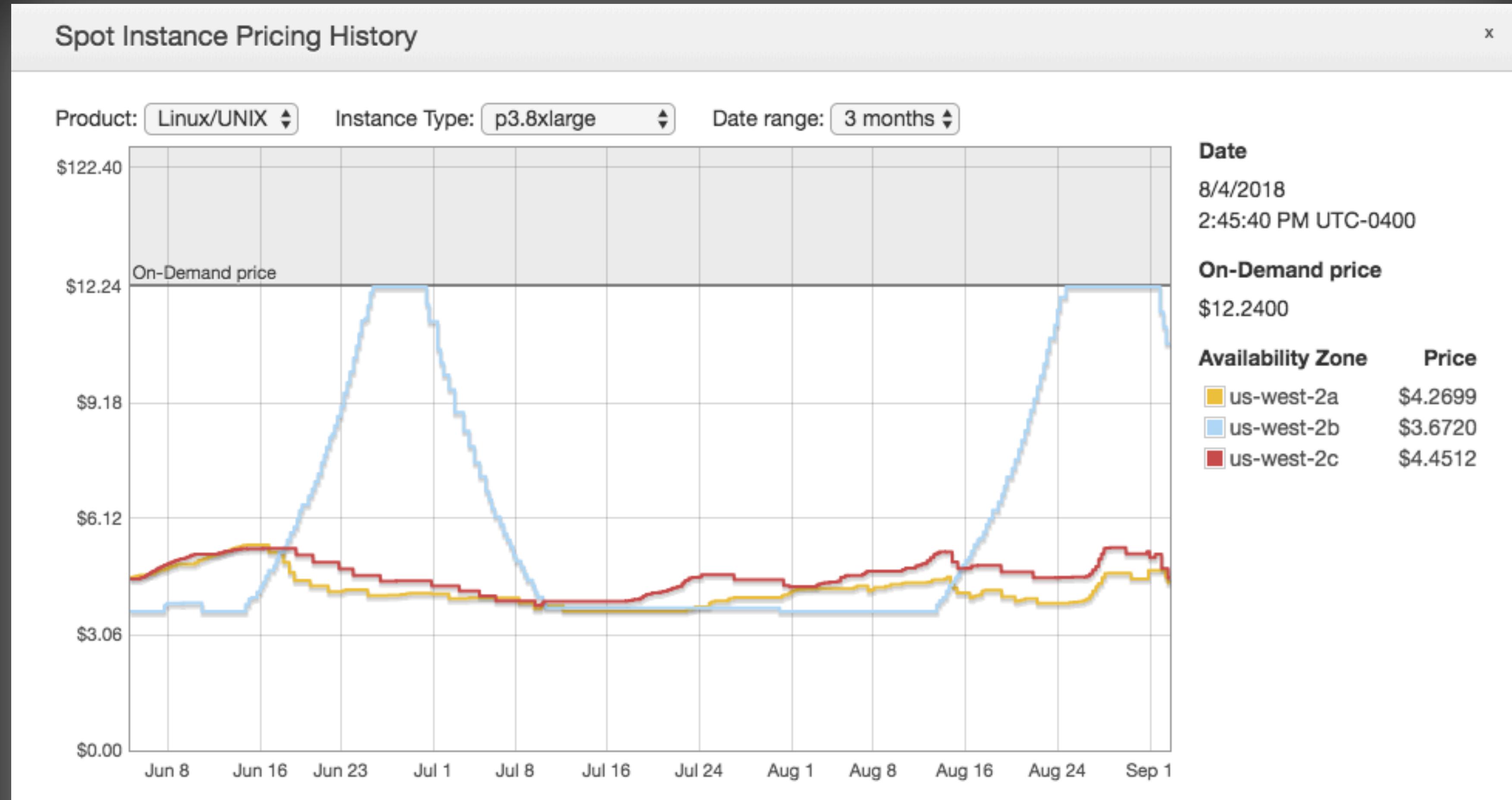
Spot Instances



- Excess EC2 capacity that AWS tries to sell on an market exchange basis
- Customer creates a Spot Request and specifies AMI, desired instance types, and other key information.
- Customer defines highest price willing to pay for instance. If capacity is constrained and others are willing to pay more, your instance might get terminated or stopped.
- Spot request can be a “fill and kill”, “maintain”, or “duration-based”.
- For “One-Time Request”, instance is **terminated and ephemeral data lost**.
- For “Request and Maintain”, instance can be configured to Terminate, Stop or Hibernate until price point can be met again.



Spot Instances

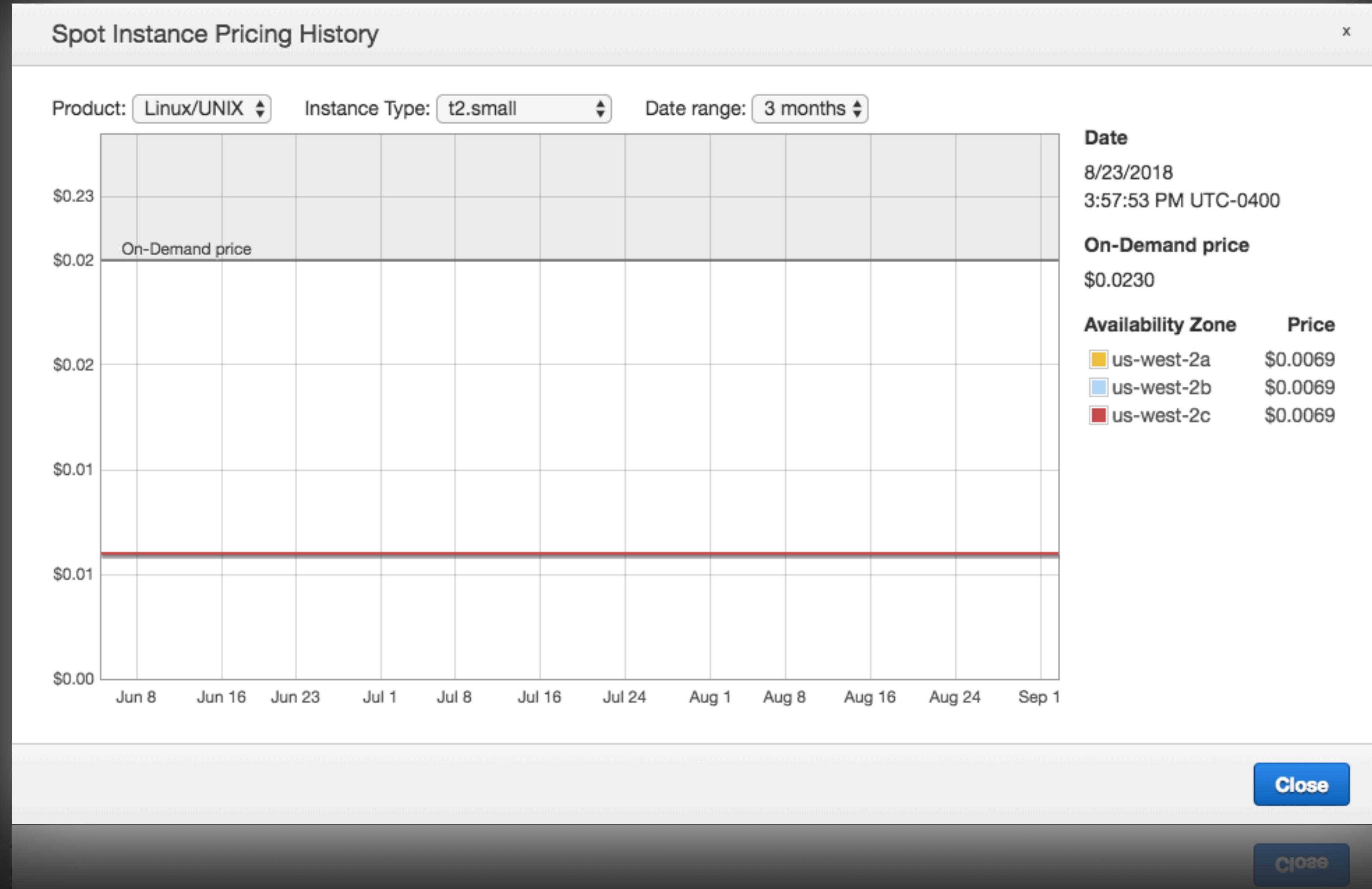


Close

Close



Spot Instances



Dedicated Instances and Hosts



Dedicated Instance

- Virtualized instances on hardware just for you.
- May share hardware with other non-dedicated instances in the same account.
- Available as On-Demand, Reserved Instances, and Spot Instances
- Cost additional \$2 per hour per region

Dedicated Host

- Physical servers dedicated to just your use
- You then have control over which instances are deployed on that host.
- Available as On-Demand or with Dedicated Host Reservation
- Useful if you have server-bound software licenses that use metrics like per-core, per-socket or per-VM
- Each dedicated host can only run one EC2 instances size and type.

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Costing

Cost Management Tools

AWS Budgets



- Allow you to set pre-defined limits and notifications if nearing a budget or exceeding the budget
- Can be based on Cost, Usage, Reserved Instance Utilization or Reserved Instance Coverage
- Useful as a method to distribute cost and usage awareness and responsibility to platform users.

AWS Budgets

AWS Budgets lets you quickly create custom budgets that will automatically alert you when your AWS costs or usage exceed, or are forecasted to exceed, the thresholds you set.

[Create budget](#)

Getting started with AWS Budgets



Create and manage budgets

Set custom cost and usage budgets to more easily manage your AWS spend. Monitor budget status from the Budgets Dashboard.



Refine your budget using filters

Track your cost or usage across multiple dimensions by adding filters related to Service, Linked Account(s), Availability Zone, and more.



Add notifications to a budget

Ensure that the right people know a threshold has been exceeded by sending notifications via email or publishing notifications to your SNS topic.

For more information about managing your AWS Budgets, refer to [Managing Your Costs With Budgets](#) in the Billing & Cost Management User Guide.

Consolidated Billing



- Enable a single Payer account that's locked down to only those who need access.
- Economies of scale by bringing together resource consumption across accounts.

	Account A	Account B	Account C	Billed Individually	Consolidated Billing
S3 Storage	50 TB	50 TB	50 TB	\$3,450	\$3,350

us-east-2 S3 Pricing

First 50 TB: \$0.023 per GB
Next 450 TB: \$0.022 per GB

Trusted Advisor

- Runs a series of checks on your resources and proposes suggested improvements
- Can help recommend cost optimization adjustments like reserved instances or scaling adjustments
- Core checks are available to all customers
- Full Trusted Advisor benefits require a Business or Enterprise support plan



The Trusted Advisor Dashboard provides a quick overview of resource health across five categories: Cost Optimization, Performance, Security, Fault Tolerance, and Service Limits.

Category	Status	Count
Cost Optimization	Green (✓)	0 ✓ 0 ▲ 0 !
Performance	Green (✓)	0 ✓ 0 ▲ 0 !
Security	Yellow (⚠)	5 ✓ 1 ▲ 0 !
Fault Tolerance	Green (✓)	0 ✓ 0 ▲ 0 !
Service Limits	Green (✓)	41 ✓ 0 ▲ 0 !

Recommended Actions:

- Security Groups - Specific Ports Unrestricted** (Refreshed: a few seconds ago)
Checks security groups for rules that allow unrestricted access (0.0.0.0/0) to specific ports.
1 of 1 security group rules allow unrestricted access to a specific port.
- EBS Cold HDD (sc1) Volume Storage** (Refreshed: a few seconds ago)
Checks for usage that is more than 80% of the EBS Cold HDD (sc1) Volume Storage Limit.
0 of 15 items have usage that is more than 80% of the service limit.
- Amazon S3 Bucket Permissions** (Refreshed: a few seconds ago)
Checks buckets in Amazon Simple Storage Service (Amazon S3) that have open access permissions or allow access to any authenticated AWS user.
0 of 0 buckets have permission properties that grant global access.

A dark, out-of-focus photograph of a person from the chest up. The person is wearing a dark-colored button-down shirt. Their hands are clasped in front of them, holding a smartphone horizontally. The background is dark and indistinct.

Cost Management

Wrap-Up

Exam Blueprint



2

Domain 2.0: Costing

- 2.1 Demonstrate ability to make architectural decisions that minimize and optimize infrastructure cost
 - 2.2 Apply the appropriate AWS account and billing set-up options based on scenario
 - 2.3 Ability to compare and contrast the cost implications of different architectures
- 2.5 Ability to compare and contrast the cost implications of different architectures

For Further Study



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AWS Whitepapers

- “Cost Optimization Pillar: AWS Well-Architected Framework”
- “Maximizing Value with AWS”
- “Introduction to AWS Economics: Reducing Costs and Complexity”

2017 re:Invent Videos

- Building a Solid Business Case for Cloud Migration (ENT203)
- Running Lean Architectures: How to Optimize for Cost Efficiency (ARC303)
- How Hess Has Continued to Optimize the AWS Cloud After Migrating (ENT218)

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Cost Management

Exam Tips

Exam Tips



Costing in General:

- Understand the difference between CapEx and OpEx models.
- Understand TCO, ROI, and the challenges faced in these activities.

Cost Optimization Strategies:

- Know conceptually the variety of ways customers can approach cost optimization on AWS.
- Fully understand the Cost Optimization Pillar whitepaper.

Exam Tips



Tagging and Resource Groups:

- Understand the various common uses for tagging and ways you can implement/enforce a tagging strategy.
- Know when and how to create Resource Groups, and don't be tricked into thinking they are anything more than a logical grouping.

Spot and Reserved Instances:

- Know the differences and limitations for the different types of Reserved Instances, including Zonal and Regional.
- Understand how Spot instances work and when they are best used.
- Understand Dedicated Instances and Dedicated Hosts.

Exam Tips



Cost Management Tools

- Know how and when you would use AWS Budgets.
- Understand the benefits of consolidated billing.
- Know how Trusted Advisor can help customers optimize and improve their AWS landscapes.

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Cost Management

Pro Tips

Pro Tips



- Be extra careful around the TCO and ROI minefield.
- The real benefit of a Cloud Migration is in **Agility and Flexibility**. Cost alone is typically not the strongest business case.
- Think of cost optimization as a long-term effort — don't spend too much time on trying to micro-manage it up-front.
- Implement a Tagging Strategy out of the gate!
- Be aggressive in formulating a pilot project: large-scale benefits make for dramatic business cases, where small-scale wins can easily be ignored.

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Cost Management

Challenge 1

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Your CFO has issued a decree that all budgets must be reduced by 40% for next year due to a declining economy.

You've been tasked with brainstorming some ideas you can reduce costs for your existing AWS landscape. But, your CIO has said that you absolutely cannot compromise durability of the data or integrity of the applications and services running on AWS.

Which of these would be reasonable ideas to implement?

- A. Setup CloudTrail to collect usage logs to determine which instances can be scaled back.
- B. Configure your web site's Auto-scaling group to use spot instances rather than on-demand instances.
- C. Migrate an EC2-based DB2 Database to RDS.
- D. Create a EBS snapshot lifecycle process to delete outdated snapshots.
- E. Use S3 Lifecycle feature to transition infrequently accessed data to different storage classes.
- F. Consolidate many smaller RDS instances into a single larger RDS instance.
- G. Purchase Dedicated Instances for those applications that will continue as part of the roadmap for the next year.



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Cost Management

Challenge 2

Challenge 2

Your eCommerce production landscape is hosted in us-west-2 and makes use of all three AZs. Using a performance monitoring method that uses synthetic transactions, you occasionally notice that performance falls below acceptable levels.

At first look, we think it might be a scaling issue. What are some things you might consider to address the issue in the most cost-effective manner?



- A. Enabled cross-zone load balancing on your ELB.
- B. Purchase a Dedicated Host in us-west-2 and ensure that instances spun up in the auto-scaling groups get assigned Dedicated Hosts.
- C. Purchase some Scheduled Instances for the most common poor performance times.
- D. Submit a Reserved Instance Modification Request to move RIs from us-east-2 to us-west-2.
- E. Make sure your VPC subnets have sufficient IP address range available for scale-out.
- F. Purchase Reserved Instances without selecting a specific availability zone so the reserved capacity can cover all AZs.

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Conclusion

Good Luck!



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Blueprint Coverage

Domain 1: Design for Organizational Complexity

- 1.1. Determine cross-account authentication and access strategy for complex organizations (for example, an organization with varying compliance requirements, multiple business units, and varying scalability requirements).
- 1.2. Determine how to design networks for complex organizations (for example, an organization with varying compliance requirements, multiple business units, and varying scalability requirements).
- 1.3. Determine how to design a multi-account AWS environment for complex organizations (for example, an organization with varying compliance requirements, multiple business units, and varying scalability requirements).

Domain 2: Design for New Solutions

- 2.1. Determine security requirements and controls when designing and implementing a solution.
- 2.2. Determine a solution design and implementation strategy to meet reliability requirements.
- 2.3. Determine a solution design to ensure business continuity.
- 2.4. Determine a solution design to meet performance objectives.
- 2.5. Determine a deployment strategy to meet business requirements when designing and implementing a solution.

Domain 3: Migration Planning

- 3.1. Select existing workloads and processes for potential migration to the cloud.
- 3.2. Select migration tools and/or services for new and migrated solutions based on detailed AWS knowledge.
- 3.3. Determine a new cloud architecture for an existing solution.
- 3.4. Determine a strategy for migrating existing on-premises workloads to the cloud.

Domain 4: Cost Control

- 4.1. Select a cost-effective pricing model for a solution.
- 4.2. Determine which controls to design and implement that will ensure cost optimization.
- 4.3. Identify opportunities to reduce cost in an existing solution.

Domain 5: Continuous Improvement for Existing Solutions

- 5.1. Troubleshoot solution architectures.
- 5.2. Determine a strategy to improve an existing solution for operational excellence.
- 5.3. Determine a strategy to improve the reliability of an existing solution.
- 5.4. Determine a strategy to improve the performance of an existing solution.
- 5.5. Determine a strategy to improve the security of an existing solution.
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2.1. Determining how to improve the deployment of an existing solution.

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Blueprint Coverage

- Chapter 2 - Data Stores

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Blueprint Coverage

- Chapter 2 - Data Stores
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Blueprint Coverage

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Blueprint Coverage

- Chapter 2 - Data Stores
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- Chapter 4 - Security
- Chapter 5 - Migrations

Domain 1: Design for Organizational Complexity

- 1.1. Determine cross-account authentication and access strategy for complex organizations (for example, an organization with varying compliance requirements, multiple business units, and varying scalability requirements).
- 1.2. Determine how to design networks for complex organizations (for example, an organization with varying compliance requirements, multiple business units, and varying scalability requirements).
- 1.3. Determine how to design a multi-account AWS environment for complex organizations (for example, an organization with varying compliance requirements, multiple business units, and varying scalability requirements).

Domain 2: Design for New Solutions

- 2.1. Determine security requirements and controls when designing and implementing a solution.
- 2.2. Determine a solution design and implementation strategy to meet reliability requirements.
- 2.3. Determine a solution design to ensure business continuity.
- 2.4. Determine a solution design to meet performance objectives.
- 2.5. Determine a deployment strategy to meet business requirements when designing and implementing a solution.

Domain 3: Migration Planning

- 3.1. Select existing workloads and processes for potential migration to the cloud.
- 3.2. Select migration tools and/or services for new and migrated solutions based on detailed AWS knowledge.
- 3.3. Determine a new cloud architecture for an existing solution.
- 3.4. Determine a strategy for migrating existing on-premises workloads to the cloud.

Domain 4: Cost Control

- 4.1. Select a cost-effective pricing model for a solution.
- 4.2. Determine which controls to design and implement that will ensure cost optimization.
- 4.3. Identify opportunities to reduce cost in an existing solution.

Domain 5: Continuous Improvement for Existing Solutions

- 5.1. Troubleshoot solution architectures.
- 5.2. Determine a strategy to improve an existing solution for operational excellence.
- 5.3. Determine a strategy to improve the reliability of an existing solution.
- 5.4. Determine a strategy to improve the performance of an existing solution.
- 5.5. Determine a strategy to improve the security of an existing solution.
- 5.6. Determine how to improve the deployment of an existing solution.



Blueprint Coverage

- Chapter 2 - Data Stores
- Chapter 3 - Networking
- Chapter 4 - Security
- Chapter 5 - Migrations
- Chapter 6 - Architecting to Scale

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- 6.2. Determining a strategy to improve the security of an existing solution.



Blueprint Coverage

- Chapter 2 - Data Stores
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- Chapter 4 - Security
- Chapter 5 - Migrations
- Chapter 6 - Architecting to Scale
- Chapter 7 - Business Continuity

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- Chapter 7 - Business Continuity
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- Chapter 9 - Cost Management

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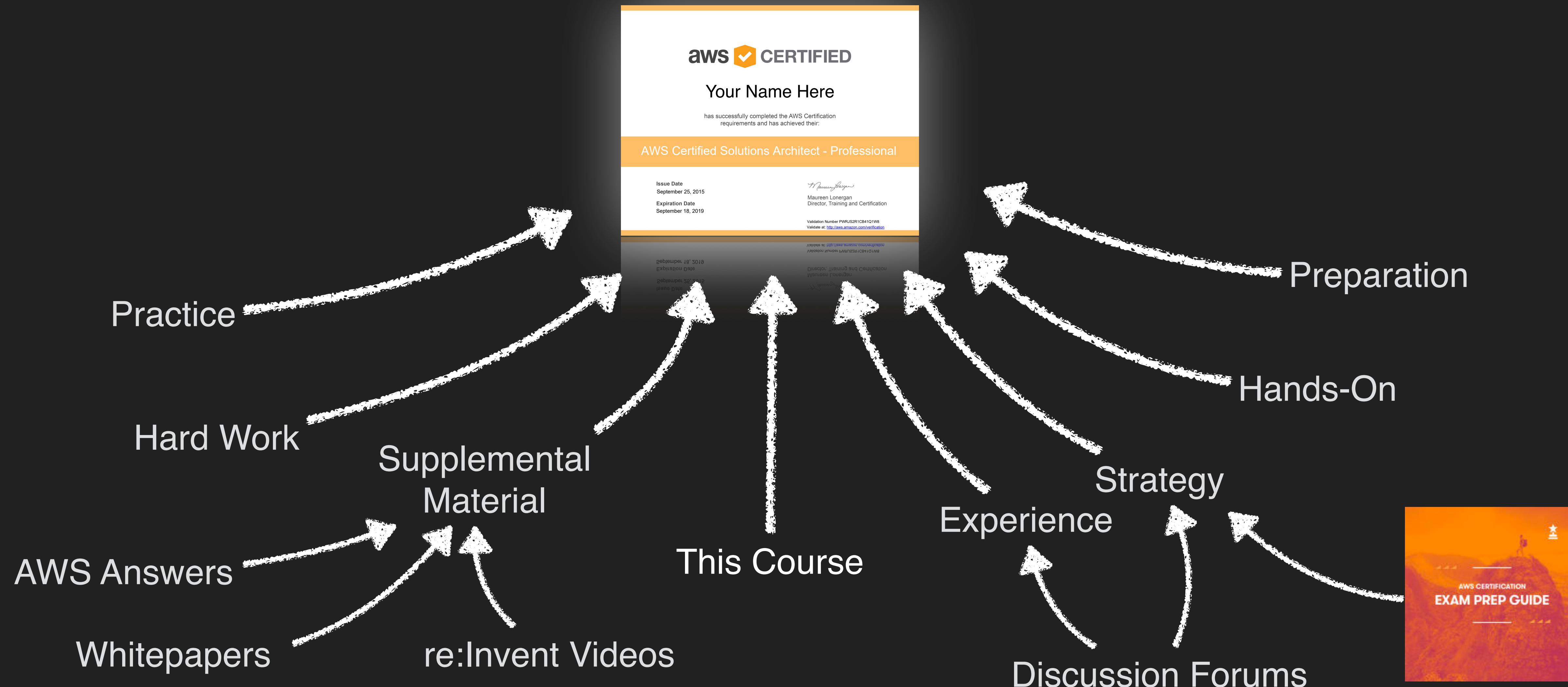
2.2. Determining a strategy to improve the security of an existing solution.

GOOD LUCK!

Holistic Preparation Plan



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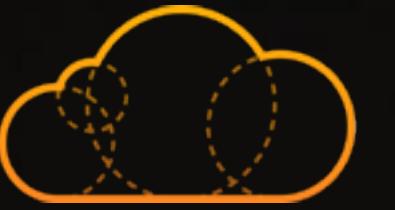




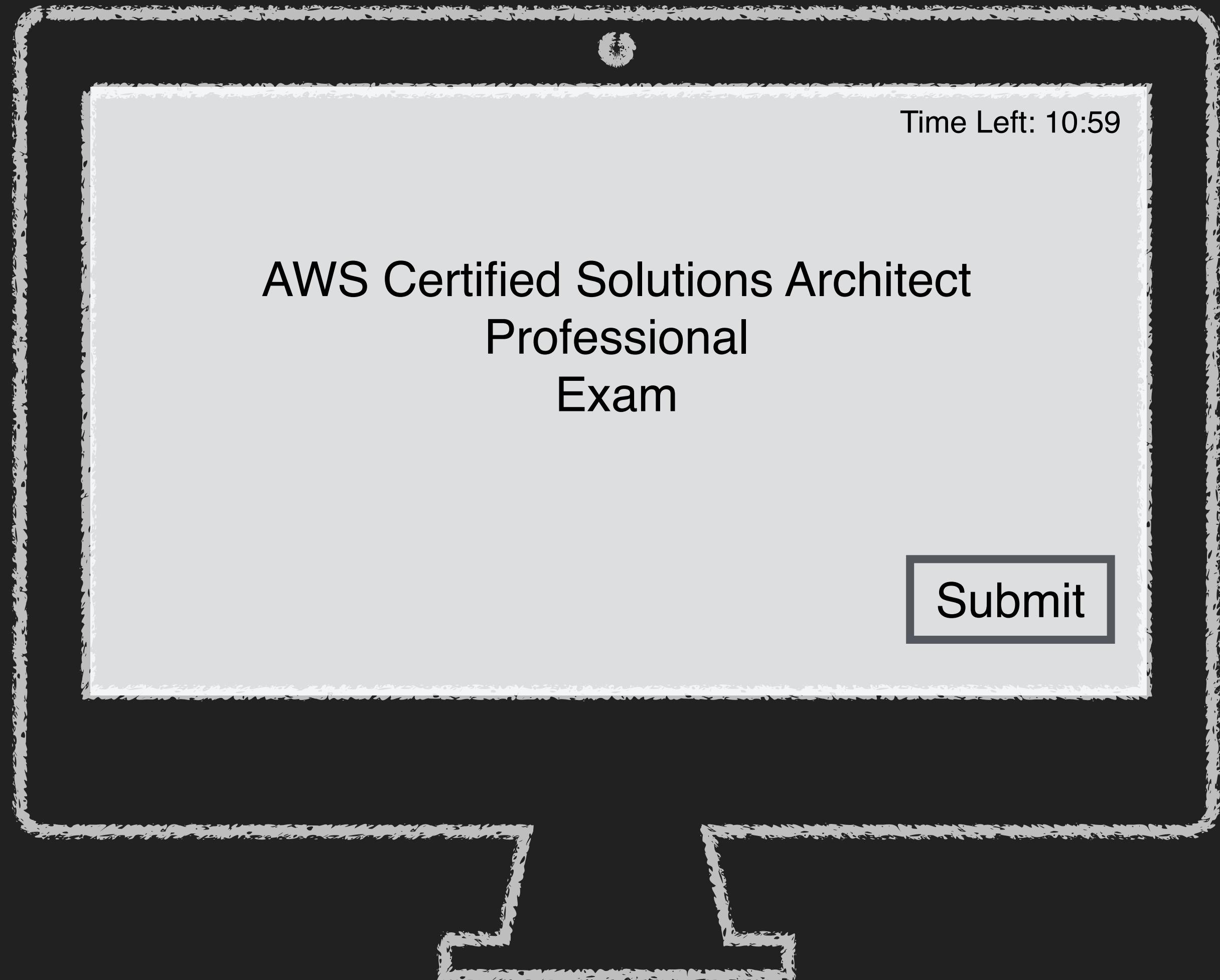
Overall Exam Tips

- Study to become an expert, not to pass an exam.
- Start by eliminating what will not work and only then assess what is left.
- Avoid the trap of the 'Practitioner's Curse'.
- Dig deep enough to understand the **why** of AWS, not just the **what**.
- Understanding is reinforced by application.
- Make sure you're solid on all the fundamentals by repeating the Associate-level ACG course practice exams
- Understand, Eliminate, Evaluate, Choose and Validate

Visualize



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Visualize



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Congratulations!

You have successfully passed the AWS Certified Solutions Architect Professional exam. You will receive an email once your detailed results are available in your AWS Certification Account.

GOOD LUCK!

You Can Do It!



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Hello

Congratulations! You have successfully completed the AWS Certified Solutions Architect – Professional exam and you are now AWS Certified. You can now use the AWS Certified Solutions Architect – Professional credential to gain recognition and visibility for your proven experience with AWS services.

Attached to your test completion email, you will find your certificate, logo file and certification guidelines.

Please note that use of the logos are subject to the [AWS Certification Program Agreement](#).

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amazon
web services

Certified

Solutions Architect - Professional

Solutions Architect - Professional



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GOOD LUCK!

A dark, low-light photograph of a person from the chest up. The person is wearing a dark button-down shirt over a blue collared shirt and a dark tie. Their hands are clasped in front of them. They appear to be looking down at their hands or the floor.

Conclusion
Stay Engaged

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Our forums are a hive of activity, full of engineers helping each other learn Cloud and prepare for exams.

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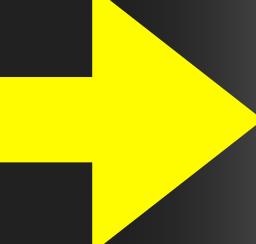
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Recent Activity

[Why do we need to add 0.0.0.0/0 nat-gateway-id to a routing table for a private subnet we are trying to route to a NAT gateway?](#)

 MandyPandax3 - a minute ago

1 answers 0 votes

In answer to: Why do we need to add 0.0.0.0/0 ...
"When you are using a NAT Gateway attached to your private subnet route table you are allowing your private subnet" ...

A Cloud Guru Discussion Groups



RECENT **POPULAR** **NEW** **UNSOLVED**

Elastic Load Balancing: Application Load Balancers now support multiple SSL certificates
Elastic Load Balancing: Application Load Balancers now support multiple SSL certificates <https://aws.amazon.com/about-aws/whats-new/2017>

2 Answers ✓ 1 Accepted Answer Last post an hour ago

New Book on AWS Professional certification
It seems there is a new study guide released on AWS Solutions Architect Professional certification. <https://www.amazon.in/Aws>

7 Answers 2 Votes ✓ 1 Accepted Answer Last post 7 hours ago

Do you need a reverse proxy in AWS?
We are in the process from moving from a bricks-and-mortar datacentre where we colocated to AWS. I am

1 Answer Last post 19 hours ago

Passed SA Pro today
Left it a bit late to do the pro or renew my associate, but I put in some long hours

1 Answer ✓ 1 Accepted Answer Last post a day ago

One particular sample question for CSAP on security
Below is a sample question in AWS . Japanese version of the site reveals the answer as "D". Only reason "D"

1 Answer ✓ 1 Accepted Answer Last post 2 days ago

ACG Regular Content



AWS This Week

OG (Original Guru) Ryan Kroonenburg and ACG Technical Instructor Faye Ellis bring you the latest news from Amazon Web Services.



AWS THIS WEEK #165 • 09 SEP 2018
This week: AWS WAF has new logging functionality, you can...

AWS THIS WEEK #164 • 02 SEP 2018
This Week: RDS to be supported on VMware, new...

AWS THIS WEEK #163 • 26 AUG 2018
This Week: there's a new T3 EC2 Instance Type as well as...

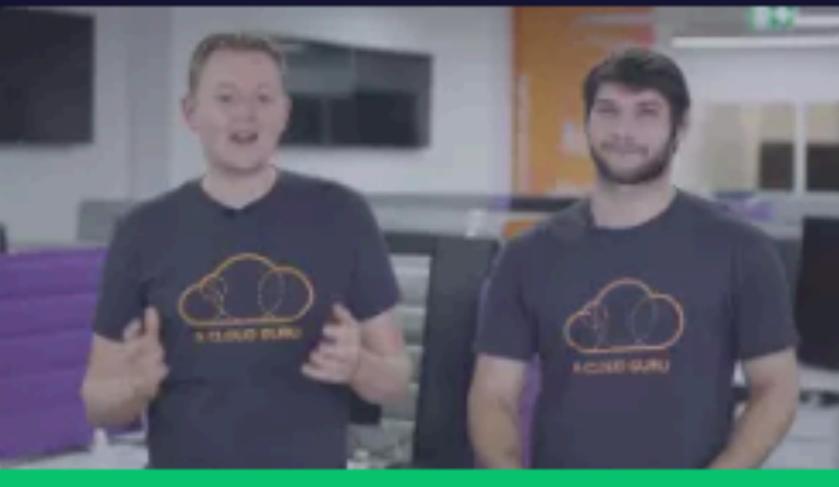
AWS THIS WEEK #162 • 19 AUG 2018
This Week: DAX adds encryption at rest, Direct...

ACG Regular Content



Release Review

A Cloud Guru Co-Founder/CEO Sam Kroonenburg and ACG Technical Instructor Julian Pittas take a hard look at newly released AWS services, using detailed technical demo walkthroughs to reach a verdict as to whether you should invest in, dabble with, or hold on implementing each service as part of your production systems.



#108 - AMAZON CONNECT • 13 JUL ...

In this episode we build our own contact centre using...



#107 - AMAZON GUARDDUTY • 26 A...

In this episode, we look at Amazon GuardDuty, one of ...



#106 - AMAZON SAGEMAKER • 07 M...

In this episode, we'll go through some of the benefits of...



#105 - AWS CLOUD9 • 01 FEB 2018

In this episode we look at AWS Cloud9, a fully fledged...

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