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Duel: Automated Deck Creation Service Based on Video Content for Quizlet

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TEAM

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Frontend Engineer

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Backend Engineer

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Data Engineer

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Agenda

1. Wrap-up
2. Architecture
3. Demo
4. Usage & Cost Estimation

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Problems

1. User Experience

Over 60% of Quizlet Users find it **time-consuming** to generate flashcards manually.

Currently, it could take up to 2 hours to generate flashcards while reviewing a 1-hour lecture video.

"Do you spend a lot of time when you are transferring data to flashcards?" @reddit(n=115)

Problems

2. Quizlet

MAU has returned to pre-pandemic levels, with an **annual drop rate of about 41.5%** since the 2022 peak.

It's time to try new feature to stop the drop and bring in more users!

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Objective

Automatically generate flashcard decks from video content.

Reducing user’s time consuming by approximately 96% compared to manually.

Creating a Single Deck from a 1-Hour Video

Expected Outcome

1. Reaching 80% user engagement of this feature within six months of release.

2. Re-engage 7.5 million users, which is 50% of the 15 million users who left post-COVID.

3. More cost-effective compared to on-premises solutions.

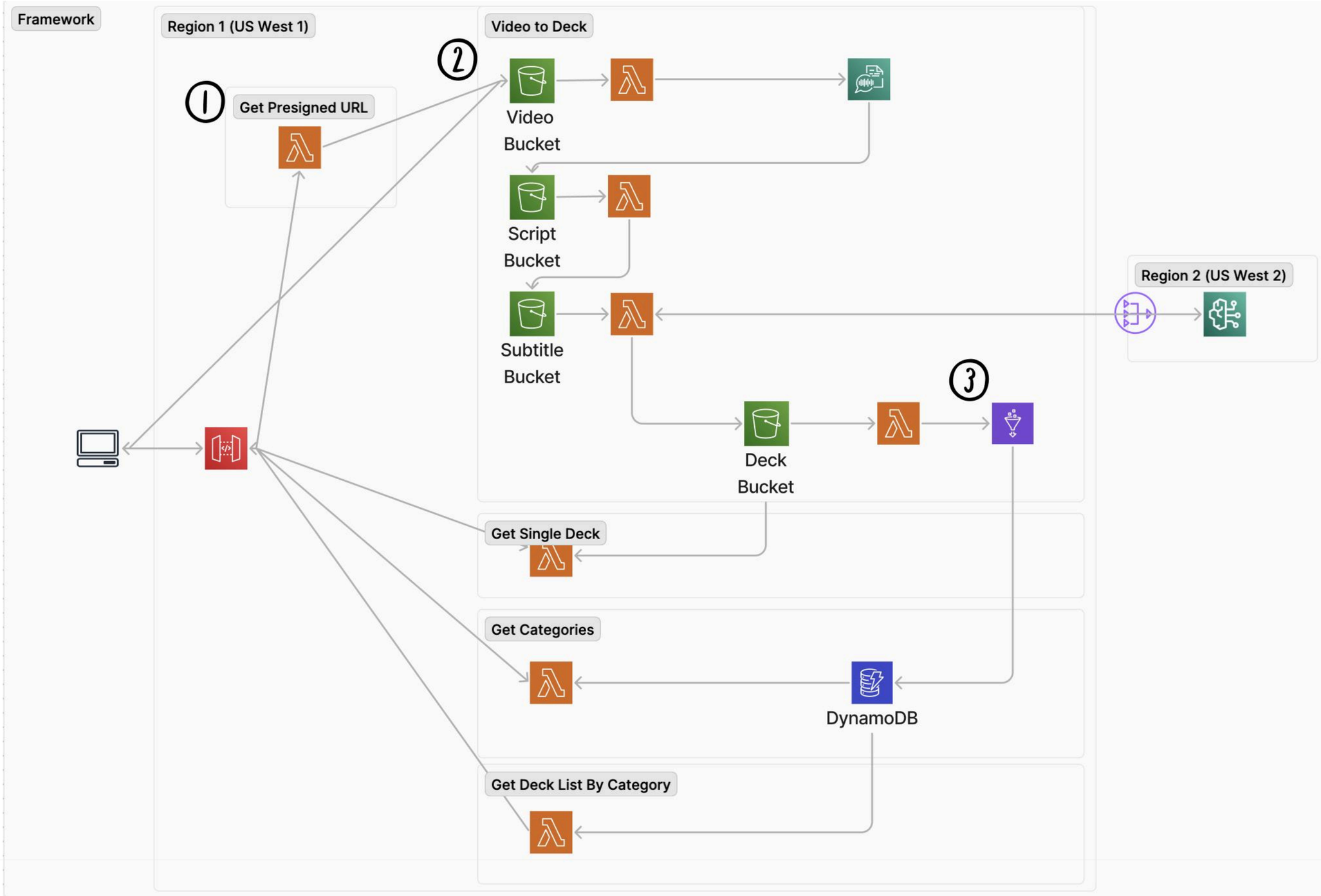
Solution

Current

1. Watching video/lecture
2. Make their own notes
3. Create Deck (manual effort!)

With AWS Duel

1. Direct Video Input
2. Automatic Deck Creation


Framework
Region 1 (US West 1)
Video to Deck
1
Get Presigned URL
2
Video
Bucket
Script
Bucket
Subtitle
Bucket
Region 2 (US West 2)
3
Deck
Bucket
Get Single Deck
Get Categories
DynamoDB
Get Deck List By Category

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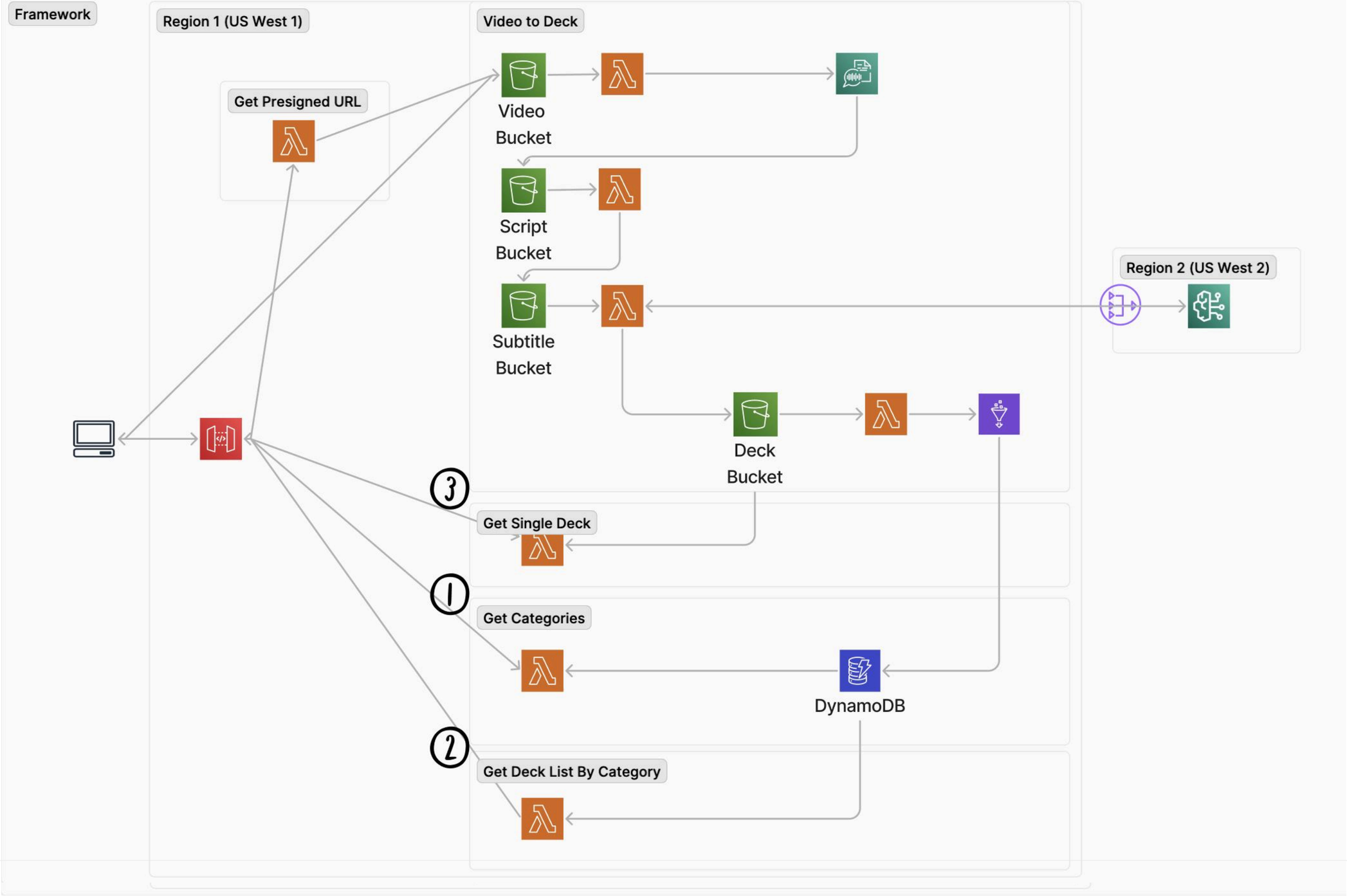

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Demo

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Estimated Monthly Usage

(avg. 40-min each)

General Months

1M Decks

40M video minutes

900% increase in traffic

Exam period

10M Decks

March, June, and December
40M video minutes

Estimated Monthly Cost

General Usage:
1M decks generated + 1M decks browsed(avg. 40-min each)

Service	Cost ($)	Portion
S3	$2,378.52	0.43%
Lambda	$32.26	0.01%
Transcribe	$532,050.00	95.91%
Bedrock(Sonnet v2)	$20,244.00	3.65%
Glue	$18.04	0.003%
DynamoDB	$11.04	0.002%
Networking	$1.00	0.0002%
Grand Total		**$554,735**
Current Monthly Revenue		**$13,292,014**
Portion		**4.17%**

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Estimated Monthly Cost

General Usage:
1M decks generated + 1M decks browsed(avg. 40-min each)

Generation (99.99%)

- Storage for Video to Deck >
- Audio to Text File >
- Text File to Q&A Deck >

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Browsing (0.01%)

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Grand Total		**$554,735**
Current Monthly Revenue		**$13,292,014**
Portion		**4.17%**

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Estimated Monthly Cost

High Traffic Usage(e.g. Exam Season):
10M decks generated + 10M decks browsed(avg. 40-min each)

Generation (99.99%)

Storage for Video to Deck >

Audio to Text File >

Text File to Q&A Deck >

Browsing (0.01%)

Service	Cost(USD)	Portion
S3	$23,785.20	0.43%
Lambda	$322.60	0.01%
Transcribe	$5,284,050.00	95.89%
Bedrock(Sonnet v2)	$202,300.00	3.67%
Glue	$180.04	0.003%
DynamoDB	$110.35	0.002%
Networking	$10.00	0.0002%
Grand Total(USD)		**$5,510,758**
Monthly Revenue(USD)		**$13,292,014**
Portion		**41.46%**

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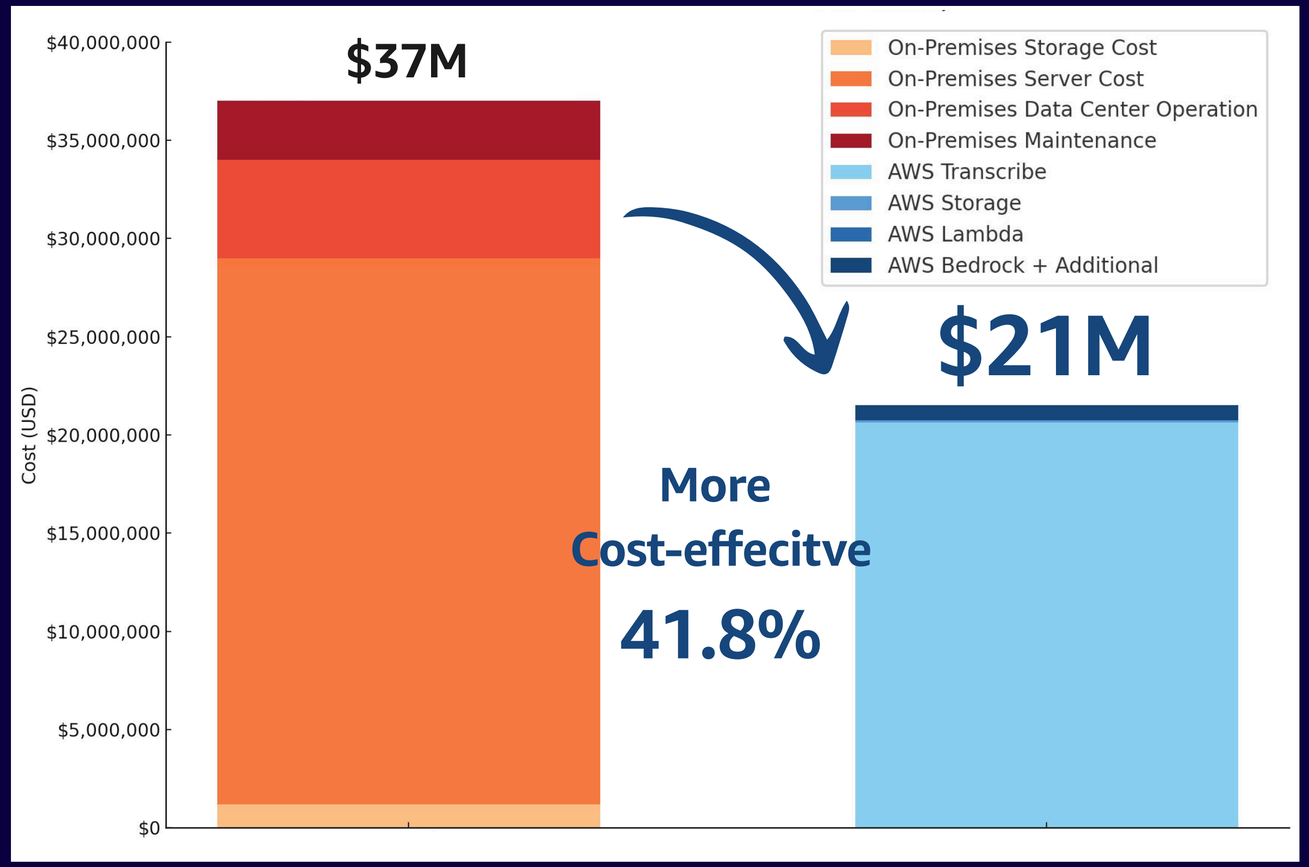
Estimated Annual Cost

Compared to on-premises solutions, AWS Duel is **almost 42% more cost-effective.**

Savings of **$1.5M annually.**

Portion:
13.17% of Current Annual Revenue

Annual Cost Comparison: On-Premises vs AWS Duel



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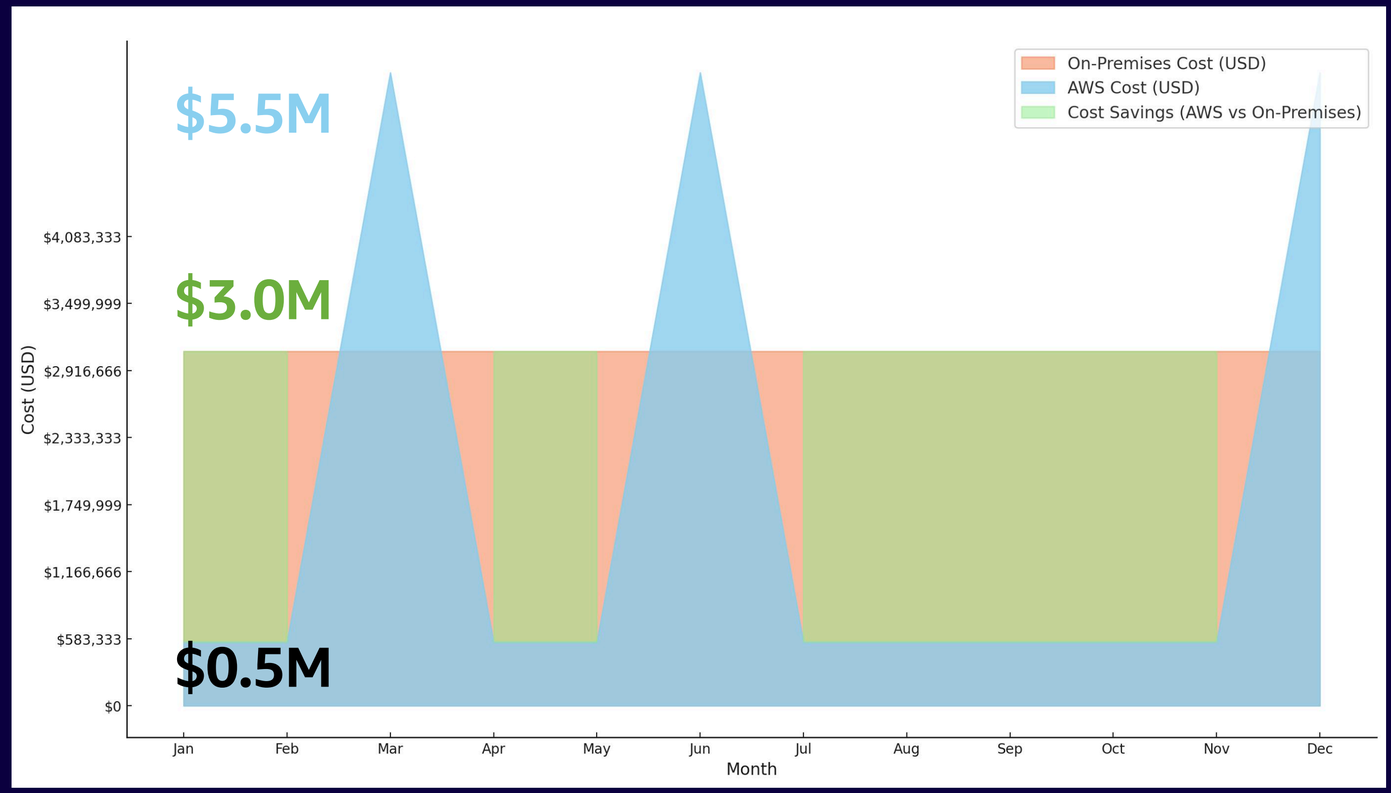
Why With AWS Duel

1. Flexibility

Efficient cost management during high-traffic periods such as midterms and finals.

Monthly Cost Comparison: On-Premises vs AWS Duel



Exam periods: (March, June, December)
Traffic: 1M(General) ~ 10M(High)

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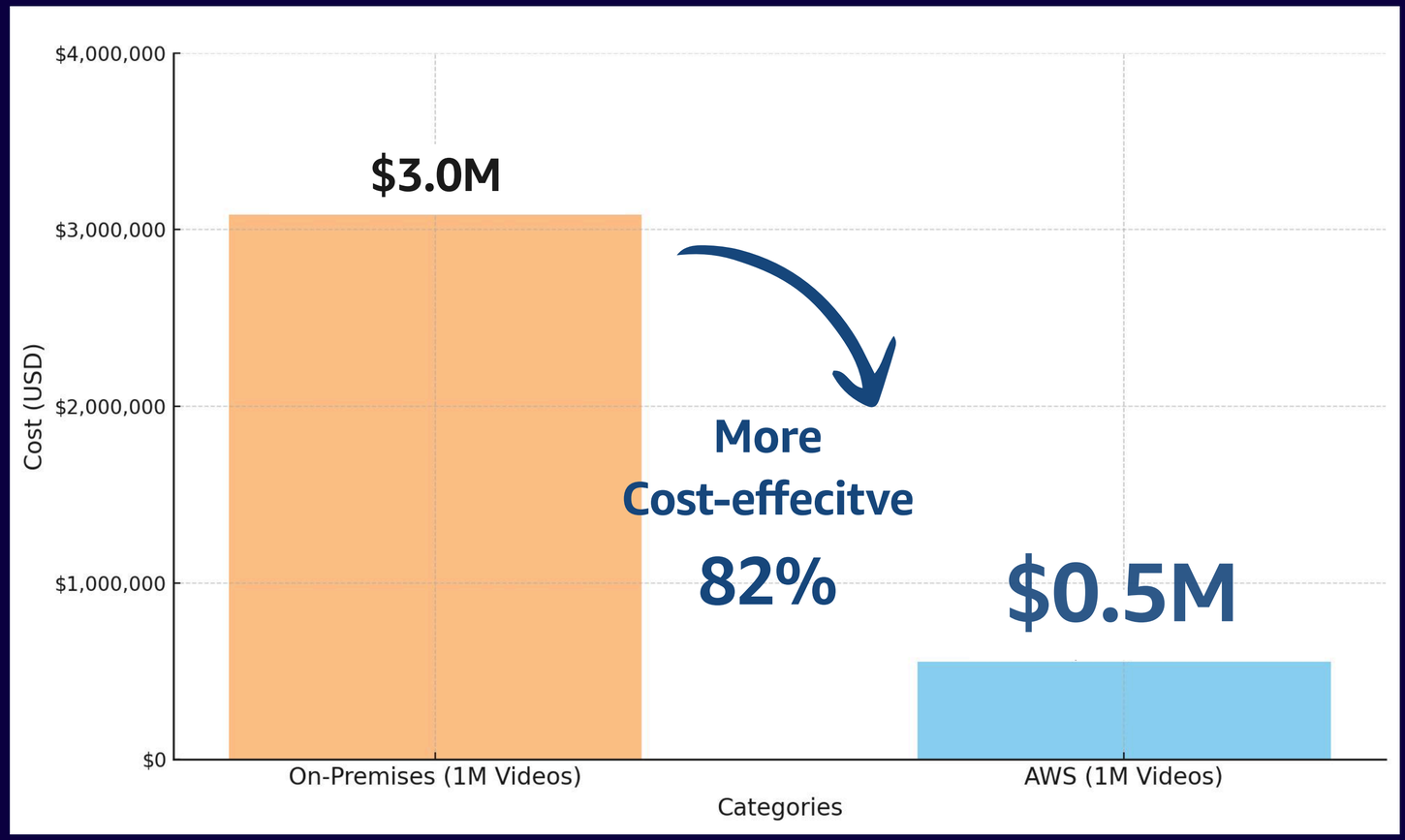
Why With AWS Duel

2. Scalability

Saving up to **82% during low-traffic months and in the early stages.**

Cost Comparison for 1 million videos: On-Premises vs AWS Duel



With AWS, you only pay for what you use, even during traffic spikes.

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E.O.D

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Appendix 1:
S3 - Storage for Video to Deck

Total(Storage + Request)

Storage Cost	**$2,356.92**
Request Cost	**$21.60**
S3 Total	**$2,378.52**

Storage

Bucket	Storage (GB)	Cost ($)
Video Bucket	101,318.36	$2,331.32
Script Bucket	1,074.22	$24.71
Text Bucket	34.14	$0.79
Deck Bucket	4	$0.10

Request

Bucket	PUT Requests	PUT Cost ($)	GET Requests	GET Cost ($)
Video Bucket	1,000,000	$5.00	1,000,000	$0.40
Script Bucket	1,000,000	$5.00	1,000,000	$0.40
Text Bucket	1,000,000	$5.00	1,000,000	$0.40
Deck Bucket	1,000,000	$5.00	1,000,000	$0.40

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Text Bucket	1,000,000	$5.00	1,000,000	$0.40
Deck Bucket	1,000,000	$5.00	1,000,000	$0.40

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Appendix 2:
Transcribe - Audio to Text File

~250,000 minutes
~1,000,000 minutes
Over 1,000,000 minutes

Pricing Tier	Minutes	Rate per Minute ($)	Cost ($)
Tier 1	250,000	$0.024	$6,000.00
Tier 2	750,000	$0.015	$11,250.00
Tier 3	39,000,000	$0.0132	$514,800.00
Minutes Total			**40M**
Transcribe Total			**$532,050**

*Total Minutes: 40,000,000(40 Mins * 1M)*

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Appendix 3:
Bedrock - Text File to Q&A Deck

Total(Input Token + Output Token)

Total Bedrock Cost	
Input Token Cost	$5,244.00
Output Token Cost	$15,000.00
Bedrock Total	**$20,244.00**

Token Detail

Token Pricing	
Input Tokens (1,000)	$0.003
Output Tokens (1,000)	$0.015
Usage Details	
Input Tokens per Video	1,748
Output Tokens per Video	1,000

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Appendix 4: Lambda

Function	Invocations	Memory (MB)	Execution (s)	GB-Seconds/Request	Total GB-Sec	Cost ($)
Video to Script	1,000,000	500	1.15	0.561	561,000	$9.36
Script to Text	1,000,000	300	1	0.293	293,000	$4.89
Text to Deck	1,000,000	128	3.5	0.438	438,000	$7.29
Certain Deck 1	1,000,000	128	1	0.125	125,000	$2.08
Certain Deck 2	1,000,000	128	1	0.125	125,000	$2.08
Category	1,000,000	128	1	0.125	125,000	$2.08
Deck Per Category	1,000,000	128	1	0.125	125,000	$2.08

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Appendix 5:

AWS Duel Estimated Cost

https://docs.google.com/spreadsheets/d/1Wac61axwoJm6_LwxFOZNLhS8alYYy3IP7YDrVlcoXsg/edit?usp=sharing

Estimaed Annual On-Premises Cost

Cateogry	Cost(USD)	비고
On-Premises Storage Cost	1,200,000	80PB RAID (2x) Configuration
On-Premises Server Cost	27,800,000	5,555 GPU Servers (Capacity for 10 million units)
On-Premises Data Center Operation	5,000,000	Power/Cooling/Space Requirements
On-Premises Maintenance	3,000,000	Hardware Replacement and Software Updates
Total	37,000,000	