Content Moderation System Proposal for ‘ANY Company’

AWS Technical Support Team

Team Members

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| Solution Architect
Business Model

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| Solution Architect
Architecture & Demo

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| Solution Architect
Demo & Cost Estimation

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Company Analysis

Company Overview

ANY Company

- **Type**: Streaming service provider
- **Industry**: Digital Media and Entertainment
- **Established**: 2020
- **Business Model**: Ad-supported and donation based video streaming platform
- **Main Contents**: Game streaming, daily vlogs, chatting(visible radio), eSports broadcasting etc.
- **User Demographic**: Originally focused on 1020 gens, now with a surge of 3040s users after Twitch’s exit.

Analysis Summary

User influx

- After ‘Twitch Korea’ ended the service, the number of streamers has doubled, and viewers have increased by 2.3 times, especially in the 3040 gens

Problems of the current moderation system

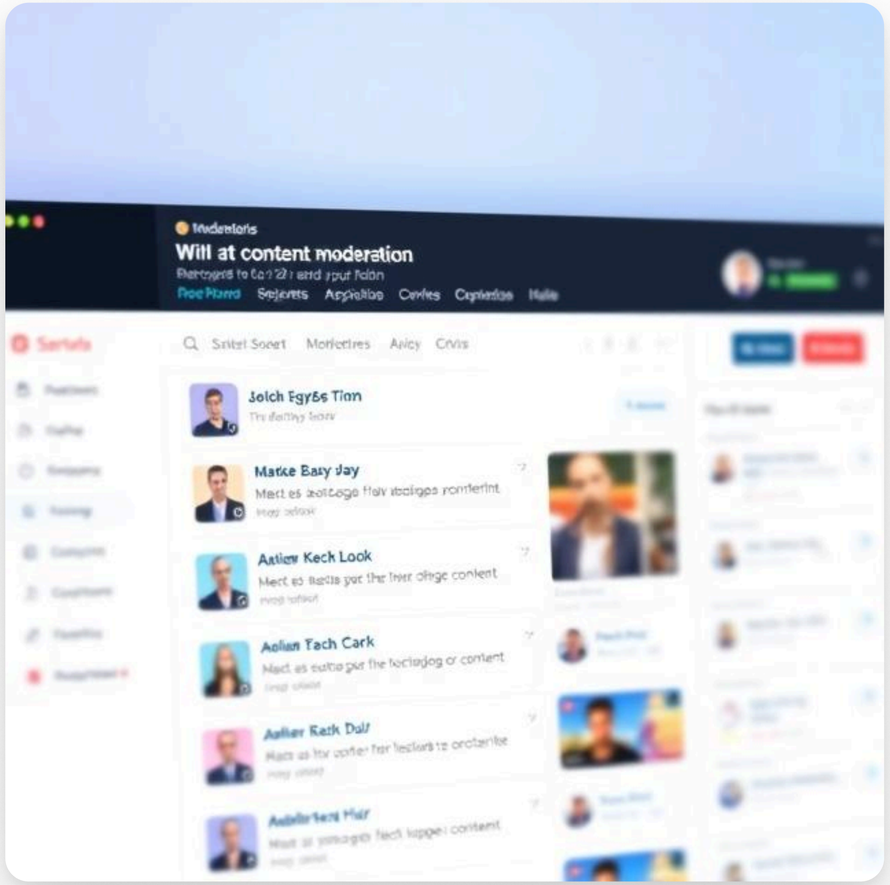
- The ‘Report-and-Review’ system has many weaknesses and is not suitable for managing the increasing user traffic

Challenges of the infrastructure

- Due to user influx, the on-premise servers are unable to handle the increased user traffic and cost, but the technical team lacks expertise in this area

Business Goals and Needs

1. Automated Content Moderation System
2. Real-time Moderation
3. Cost-effective Scaling of Infrastructure



Competitor Analysis

1. Company Overview

SOOP(Afreeca TV)

- A leading internet broadcasting platform of Korea
- Highly loyal viewer base
- Working on rebranding and platform innovation (→”SOOP”)
- 3040 gens (eSports and soccer broadcasts)

CHZZK

- A new platform launched by Naver
- Rapidly growing with a large influx of viewers from Twitch
- Competing with AfreecaTV for the top spots in MAU rankings
- 1020 gens (personal broadcasts, gaming, and eSports)

Competitor Analysis

2. Market Size Comparison

Category	AnyCompany	CHZZK	Soop(Afreeca TV)
MAU	2067K	2421K	2403K
Average Usage Time	478min	583min	1048min
Average Viewers	102K	117K	145K
Peak Viewers	422K	435K	471K
Q1’24 ARPU (KRW)	~11.3K	~8K	~23.5K

(Data Analytics Service ‘Viewership by Softcone’ 11.2024 Statistics)

Competitor Analysis

3. Moderation Method

- **‘TaekwonS’**: Own real-time explicit content filtering AI technology analyzes the appropriateness in real-time and automatically detect harmful material.
- **‘Cleaner-T’**: Operates a dedicated monitoring team to identify and address harmful content in real-time, 24/7.
- **User reporting system**: Users can report inappropriate content in real-time, and these reports are immediately forwarded to the monitoring team for swift action.

Competitor Analysis

3. Moderation Method

- **‘CLOVA GreenEye’**: Naver’s AI-based content filtering system detects inappropriate images and videos in real-time.
- **Strict content guidelines**: Non-compliant content is subject to actions such as being set to private, deletion, or user suspension.
- **24/7 Monitoring Implementation Plan**: Naver plans to introduce a 24/7 monitoring system for Chizijik to promptly detect and respond to harmful content.

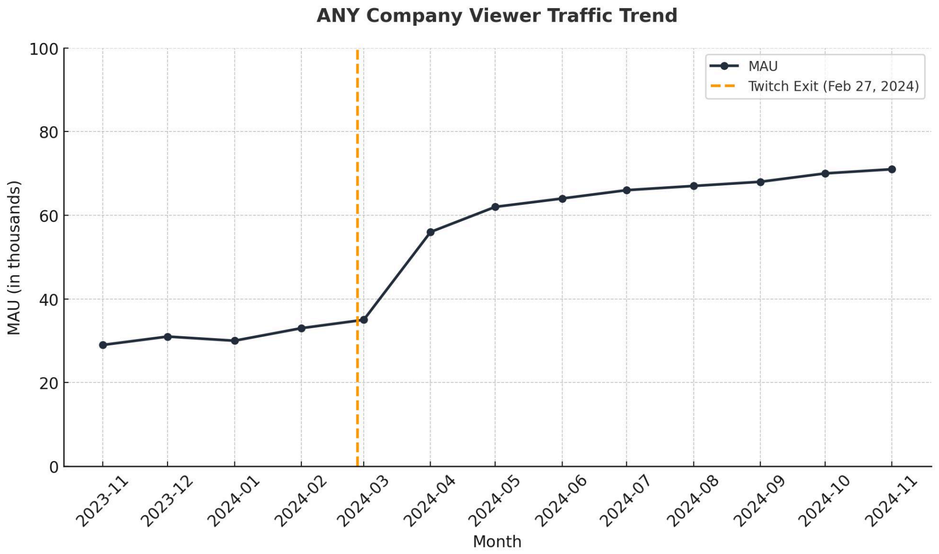
User Traffic

Viewers

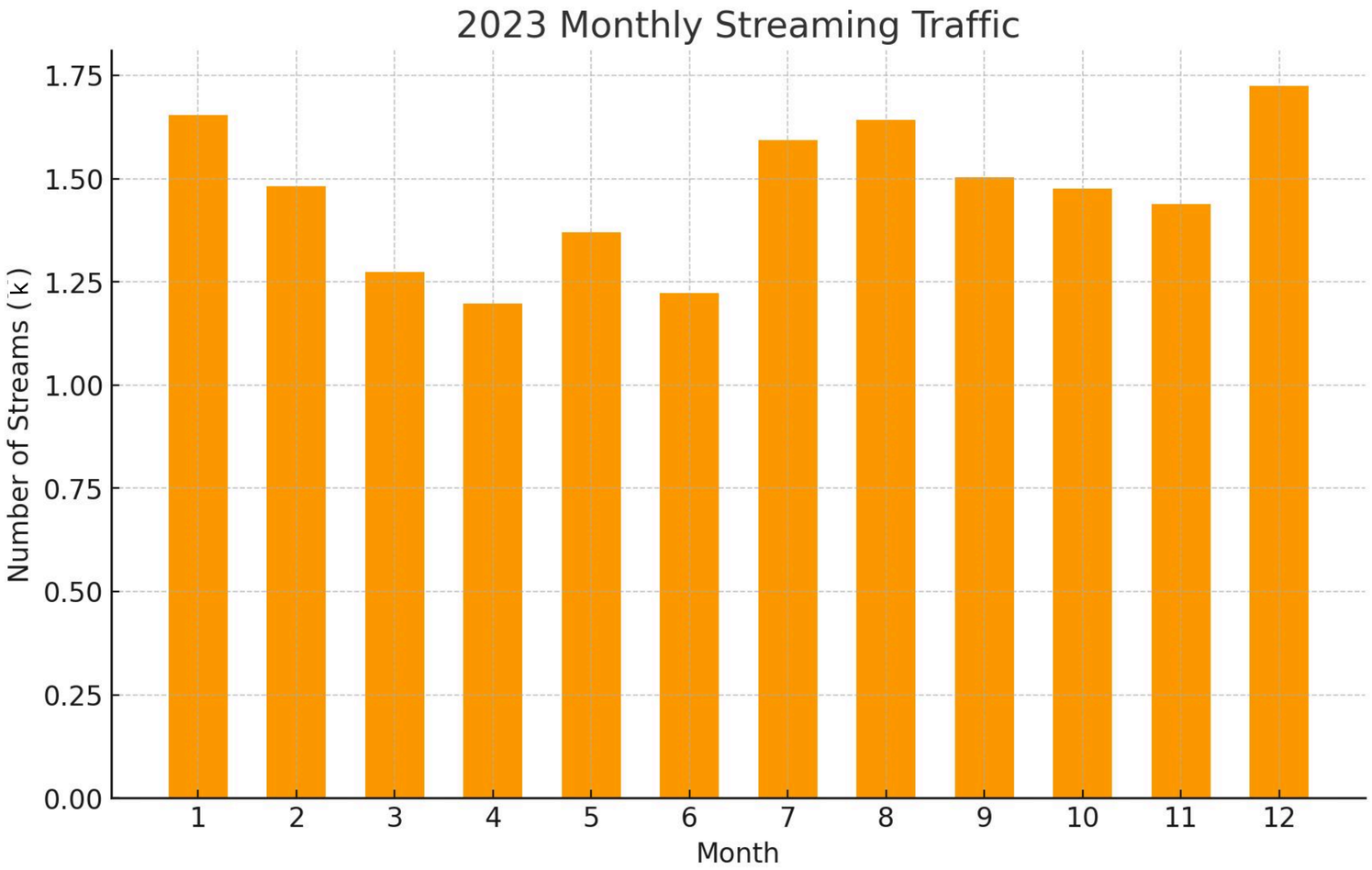
- MAU(Monthly Active Users): **2067K**
- Average Viewers: **102K** concurrent viewers
- Peak Traffic: **422K** concurrent viewers

Streamers

- Active streamers : **11K**
- Average Streamers Broadcasting: **1.5K**
- Average Streaming Time: **8**hours



Streaming Traffic



Streaming Traffic

Period	Expected Traffic Change	Reason
Summer/Winter Vacation	+17.7%	Increased leisure time for students
Weekends and Public Holidays	+10.0%	More free time for both students and workers
Popular Event Periods	+20.0% or more	Special broadcasts, large events, and game tournaments
Weekday Daytime	-26.0%	Limited streaming activity due to work or study
Exam Period	-10.0%	Reduced activity among student audiences

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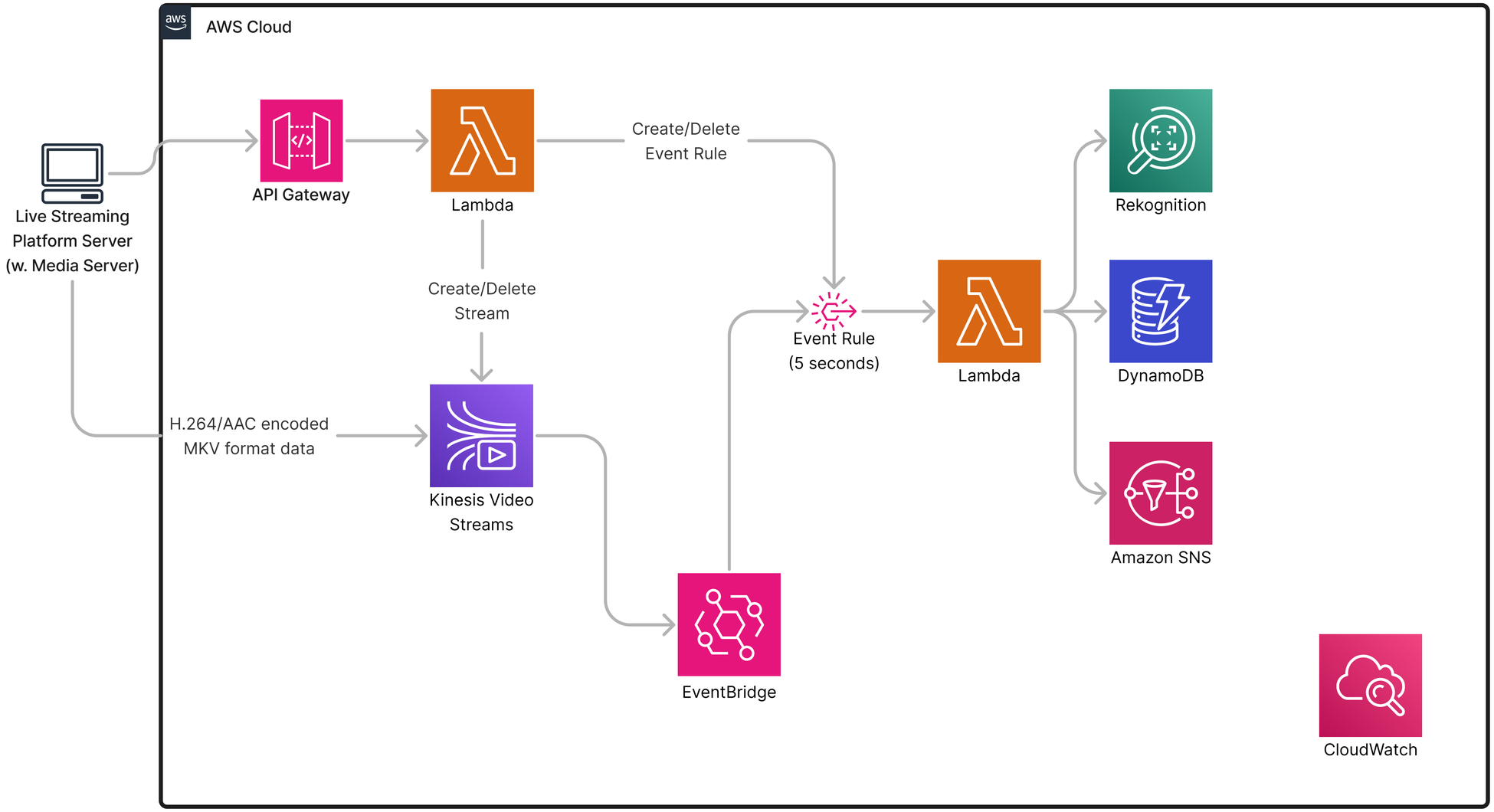
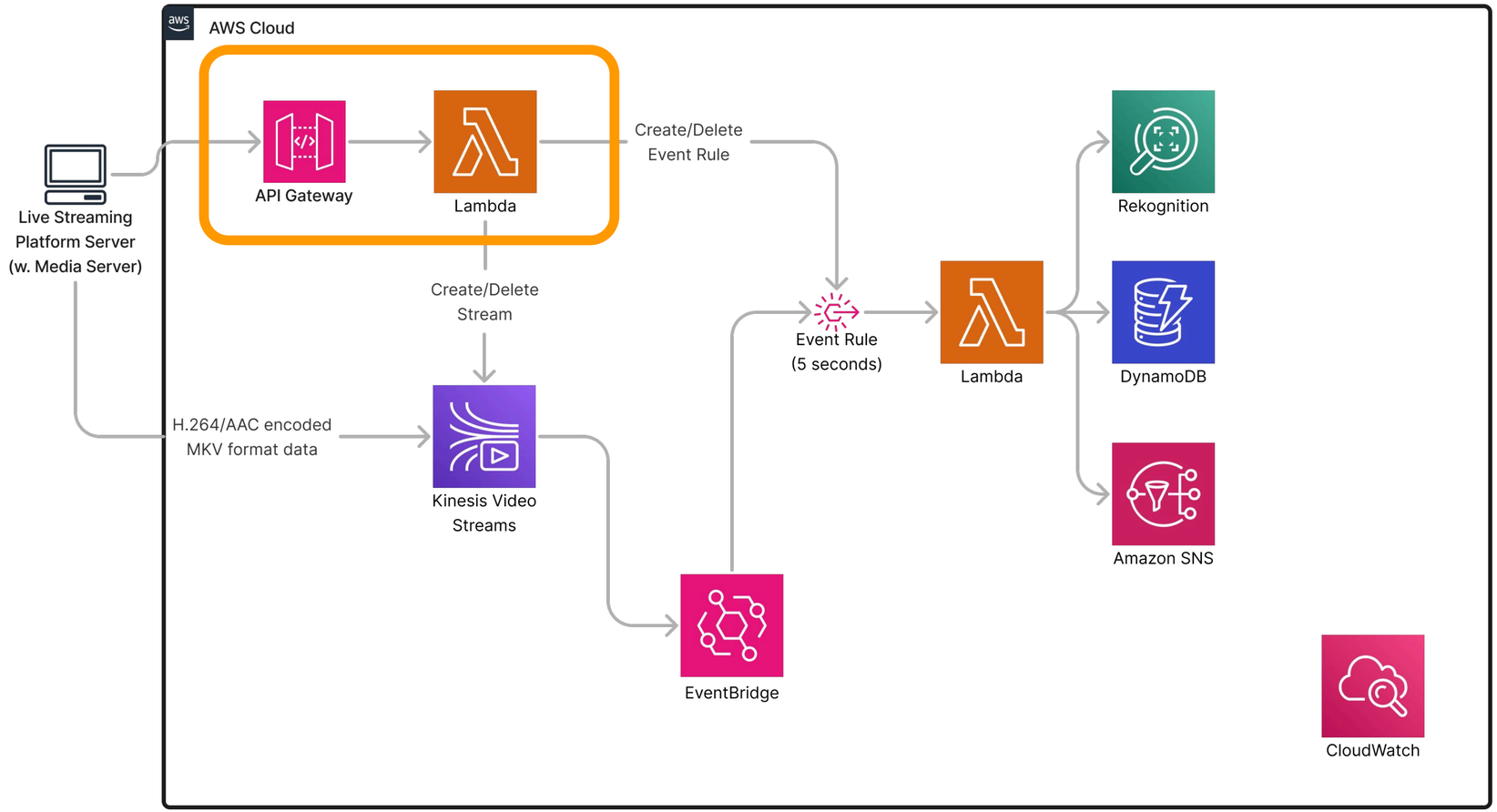
Architecture

Architecture Overview



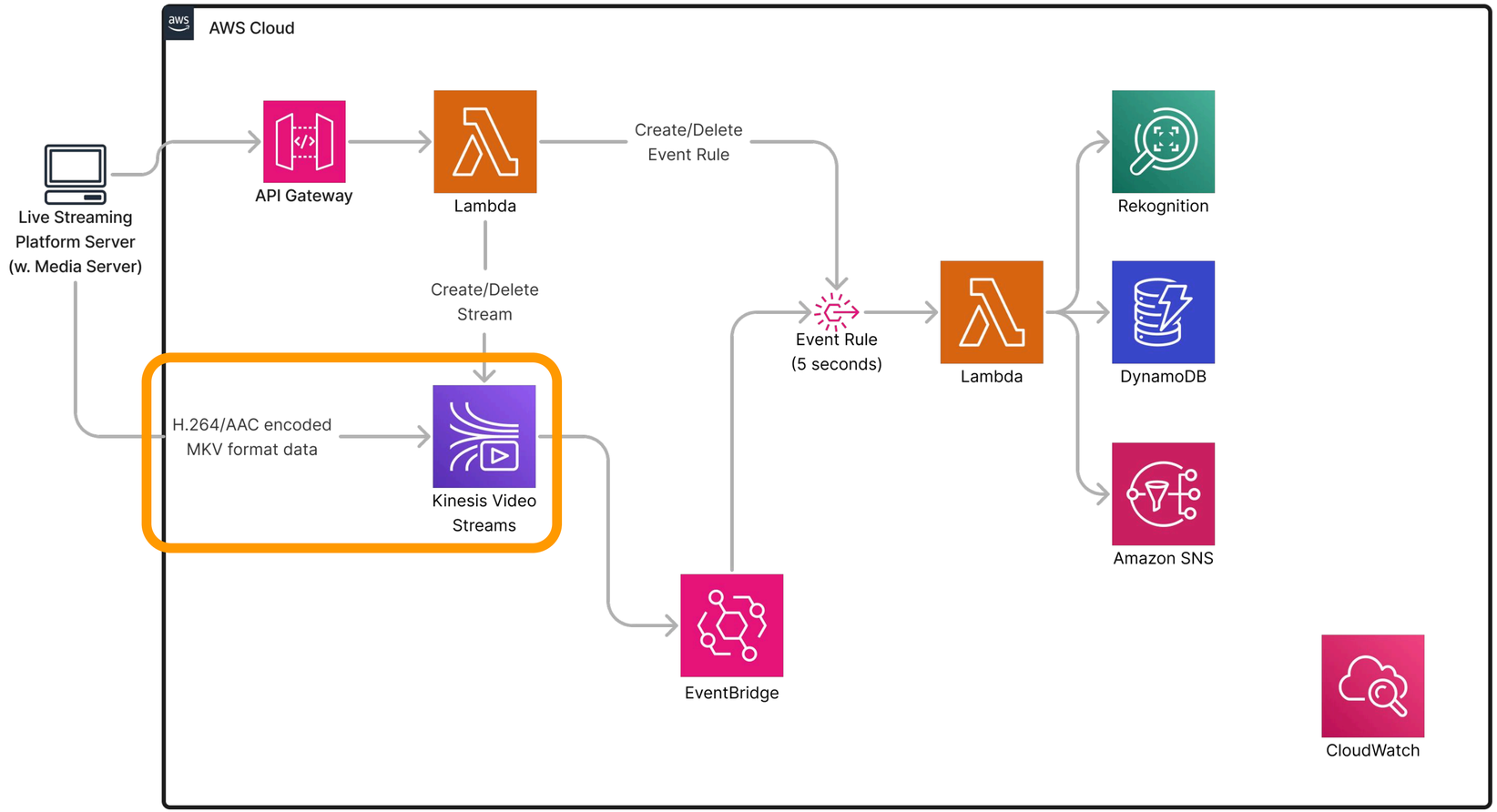
Architecture Overview

- When a stream starts, an API Gateway and Lambda function dynamically create a Kinesis Video Stream (KVS) and an EventBridge rule based on the requirements of the live streaming server.
- The process is scalable and automated.



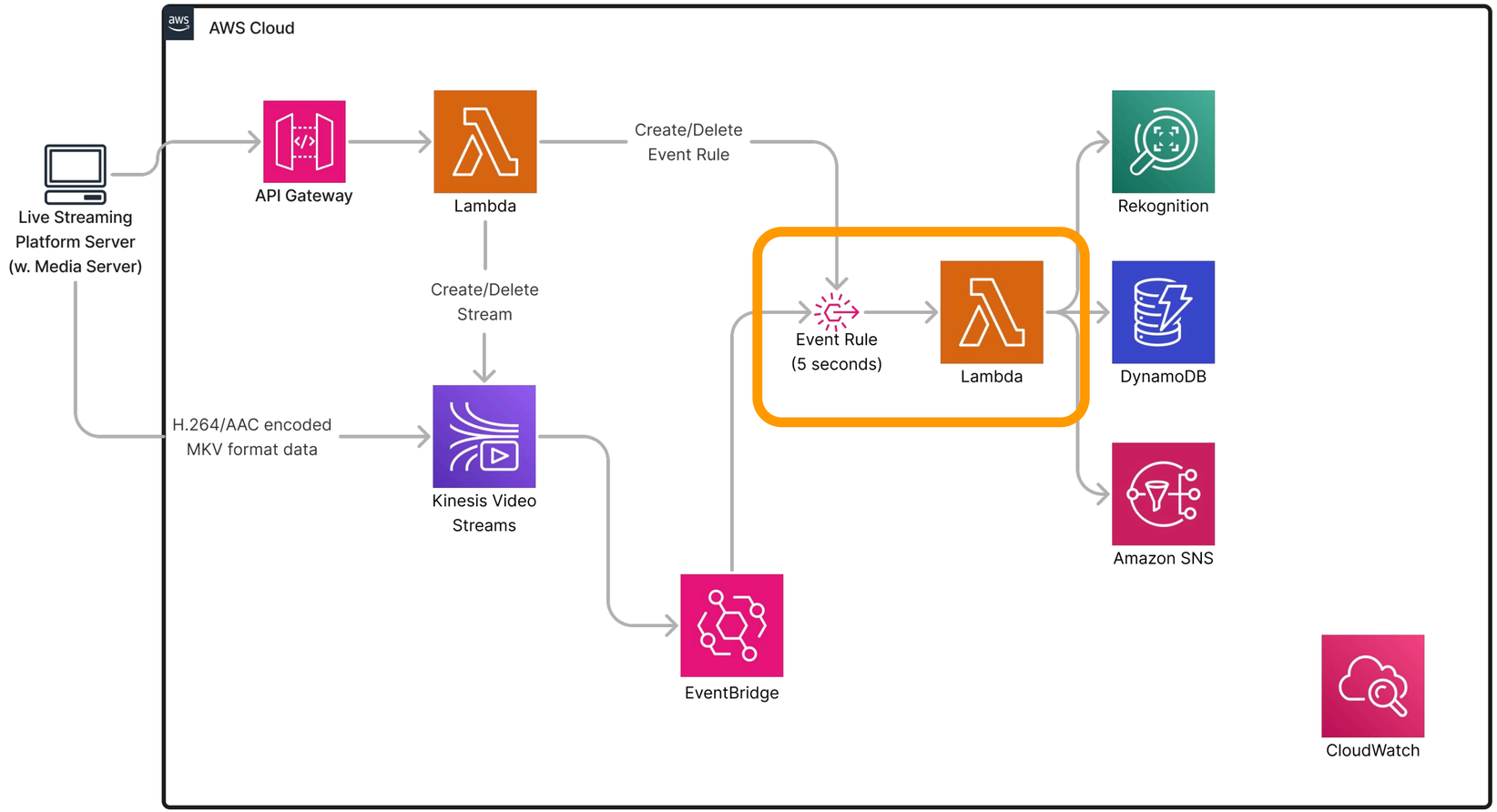
Architecture Overview

- Using the AWS SDK
- Kinesis Video Streams Producer Library
- WebRTC



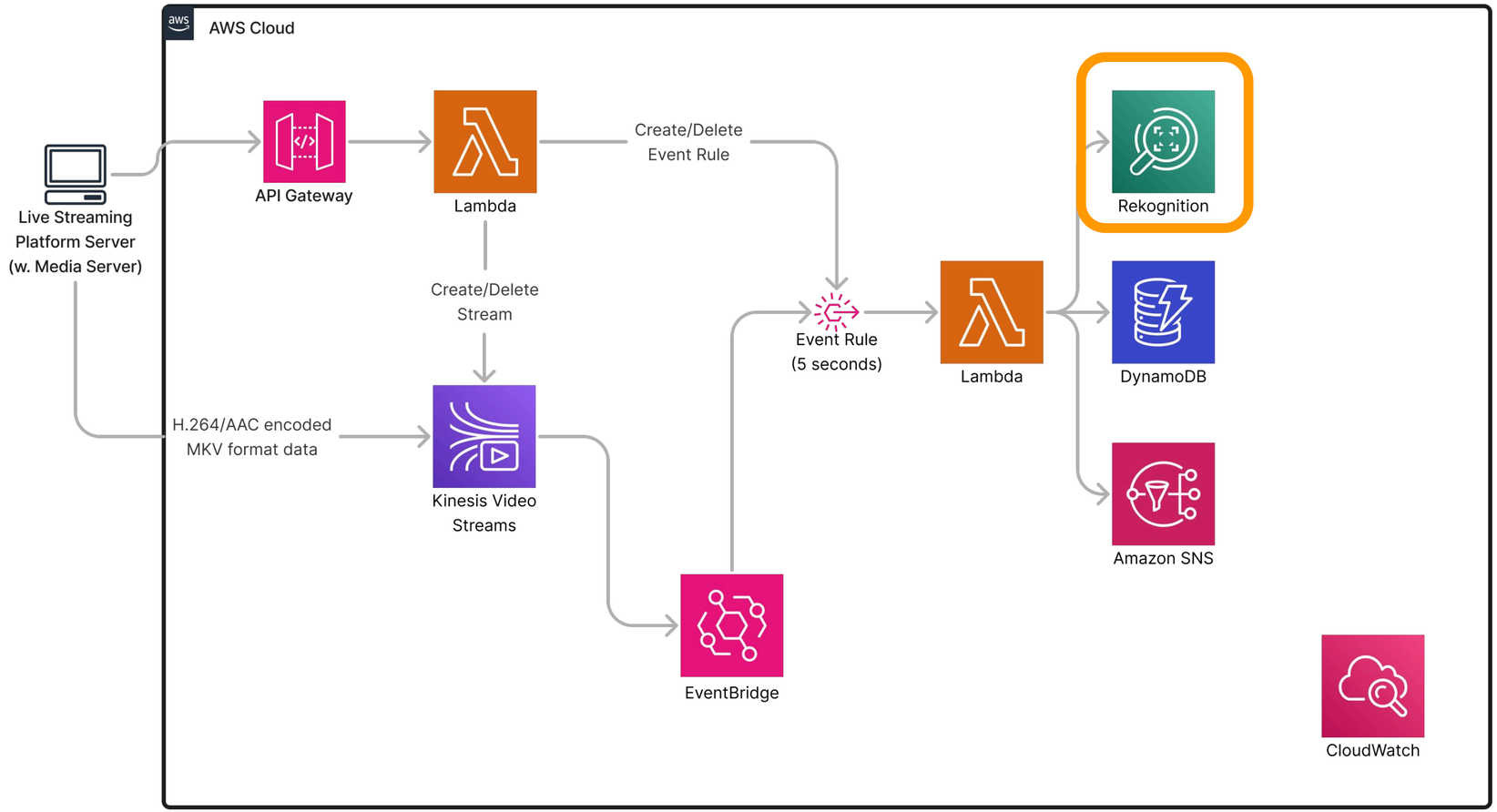
Architecture Overview

- EventBridge triggers a Lambda function every 5 seconds,
- sending a scheduled event to initiate the lambda process.



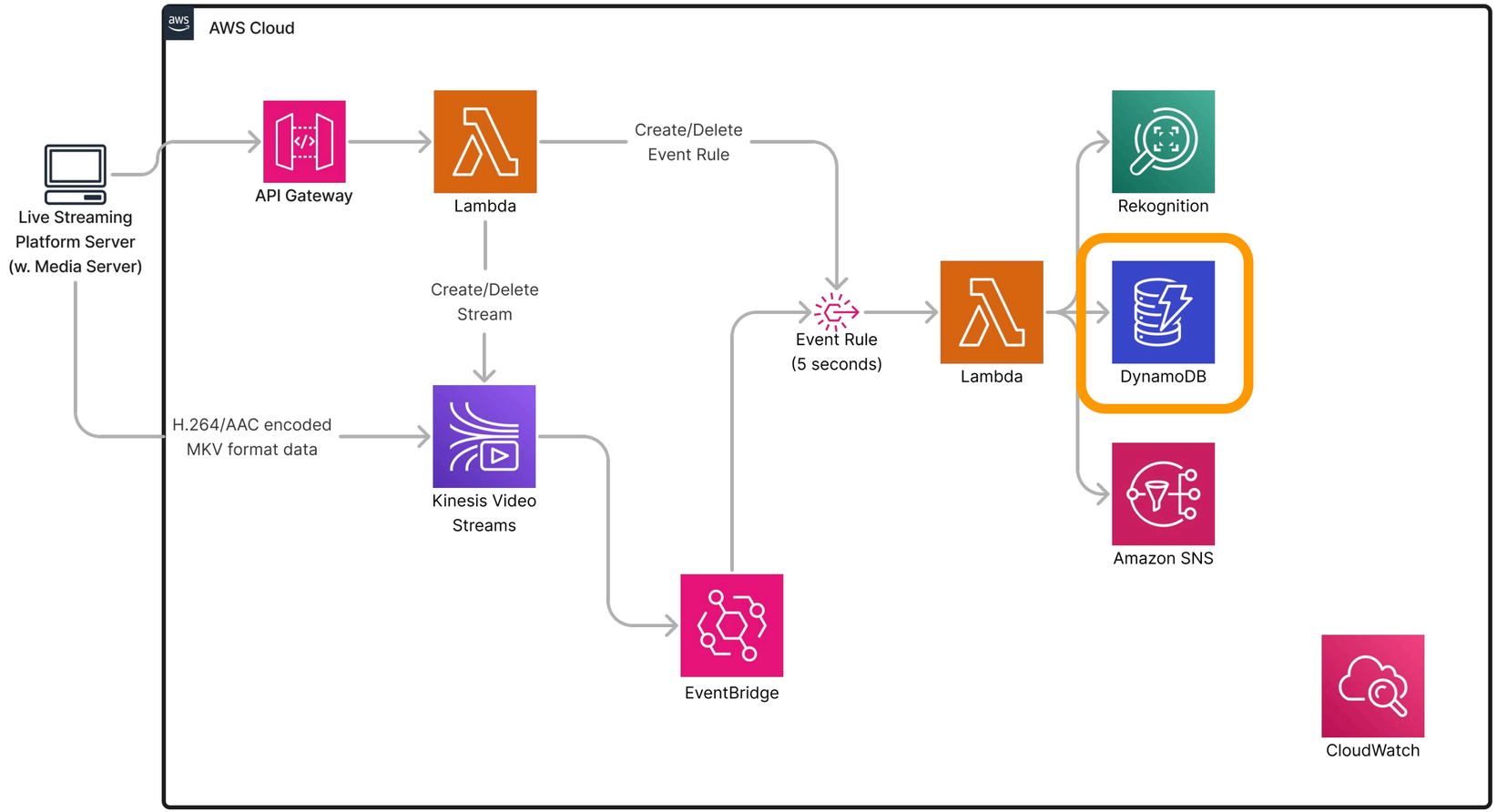
Architecture Overview

- The Lambda function extracts frames and sends them to AWS Rekognition via the DetectModerationLabels API.
- Rekognition returns moderation labels (e.g., "Explicit Nudity," "Violence") with confidence scores.



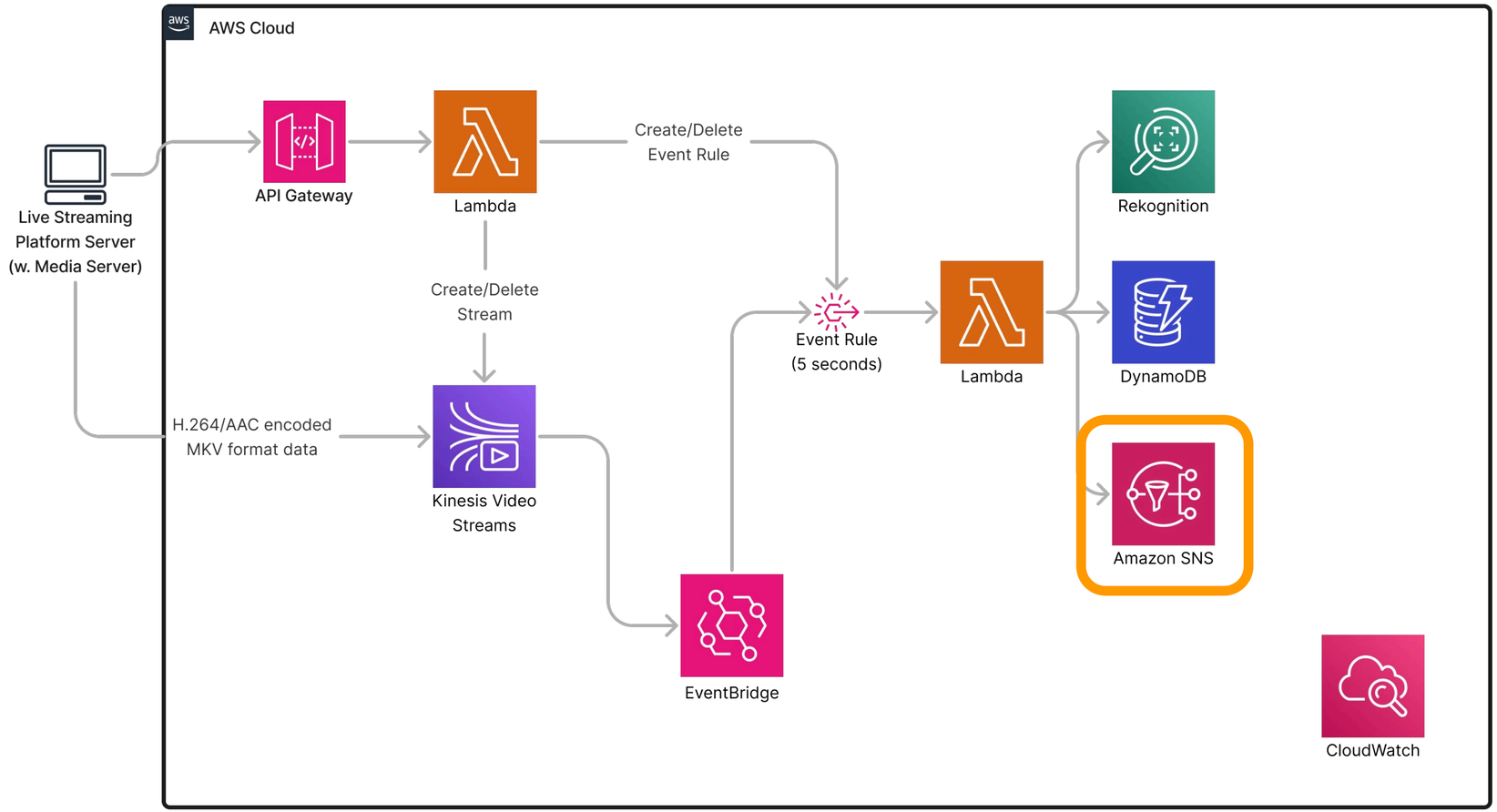
Architecture Overview

- The Lambda function writes the moderation results to DynamoDB
- DynamoDB serves as a storage solution that allows Any Company to query and audit flagged frames as needed.



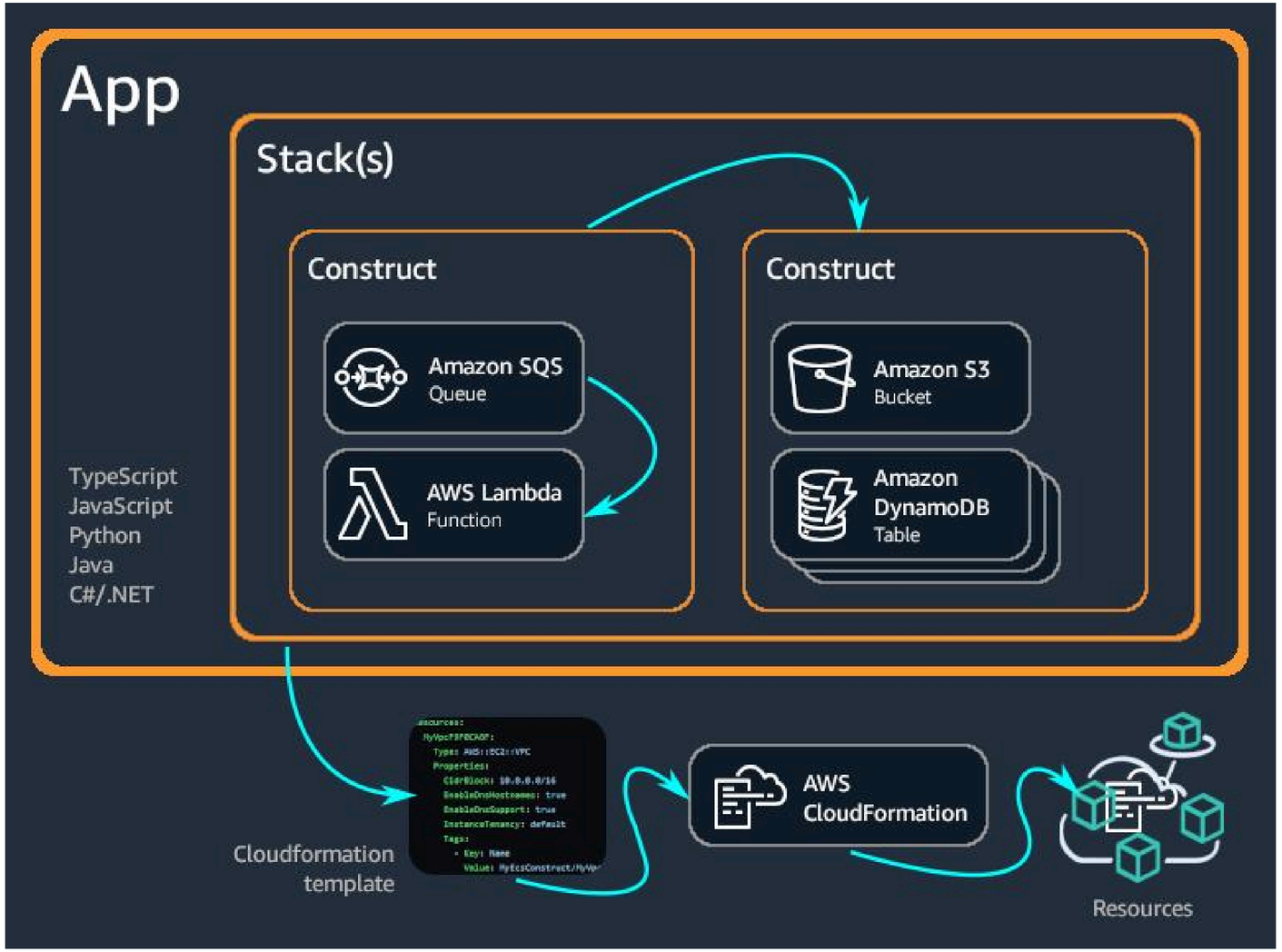
Architecture Overview

- If a frame is flagged, the Lambda function sends a notification to Amazon SNS



AWS CDK

CDK (Cloud Development Kit)

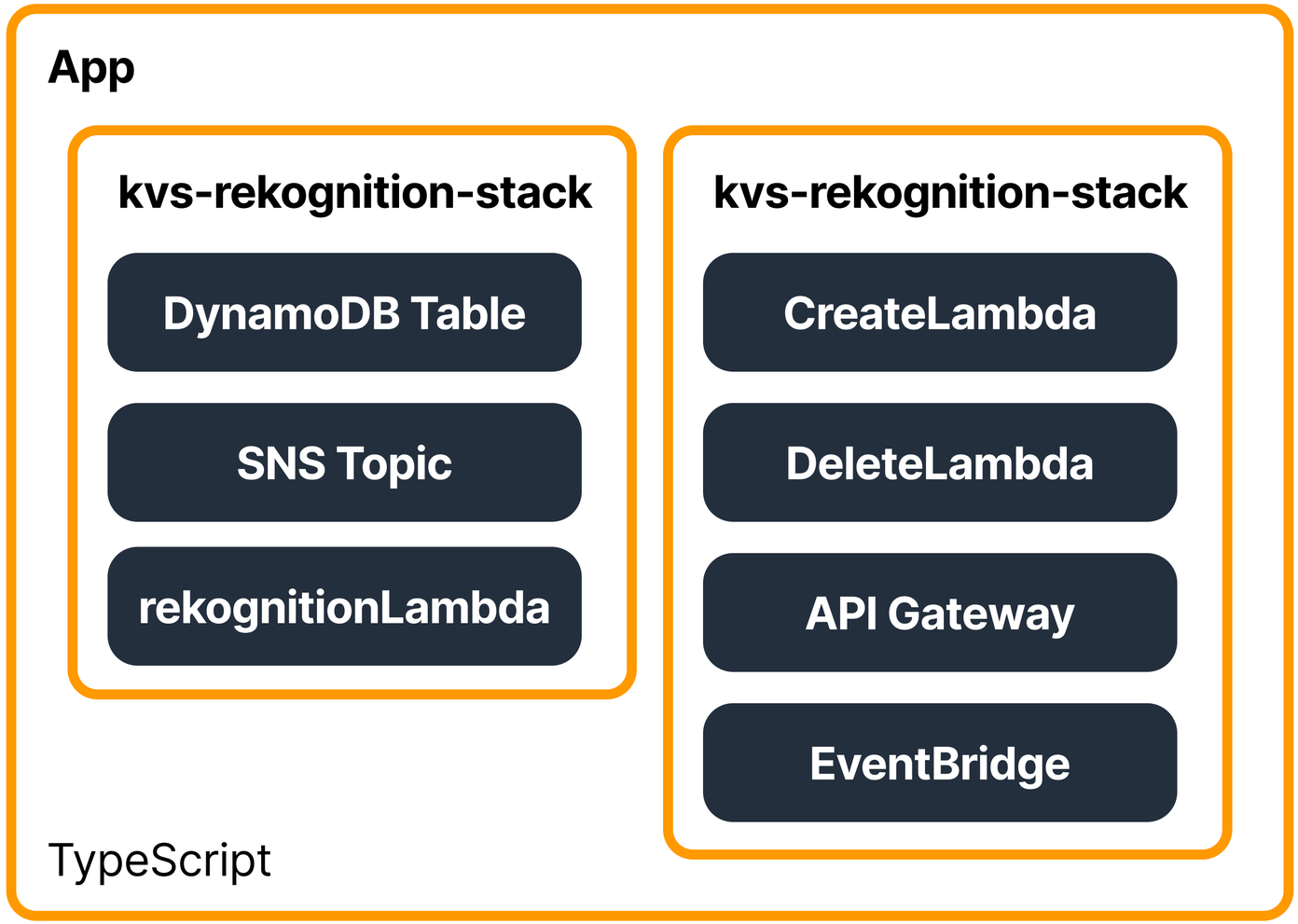


https://docs.aws.amazon.com/cdk/v2/guide/home.html

AWS CDK

cdk-app structure

```
my-cdk-app/
├── bin/
│   └── my-cdk-app.ts
├── lib/
│   ├── api-lambda-kvs-stack.ts
│   └── kvs-rekognition-stack.ts
├── lambda/
│   ├── create.ts
│   ├── delete.ts
│   └── rekognition.ts
├── package.json
├── tsconfig.json
└── cdk.json
```

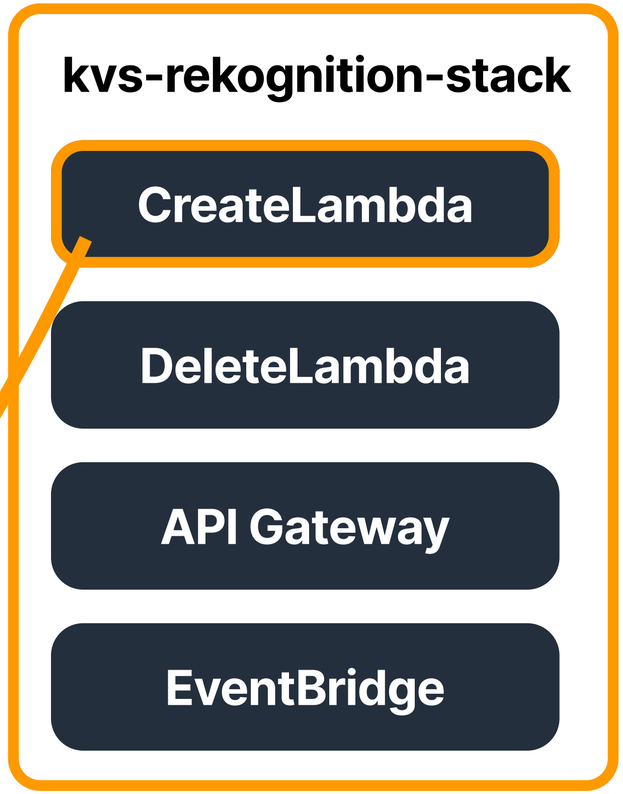


AWS CDK

cdk-app structure

```
await eventBridge
  .putRule({
    Name: ruleName,
    ScheduleExpression: "rate(5 seconds)", // Adjust as needed
    State: "ENABLED",
    EventBusName: EVENT_BUS_NAME,
  })
  .promise();

console.log(`EventBridge rule "${ruleName}" created.`);
```



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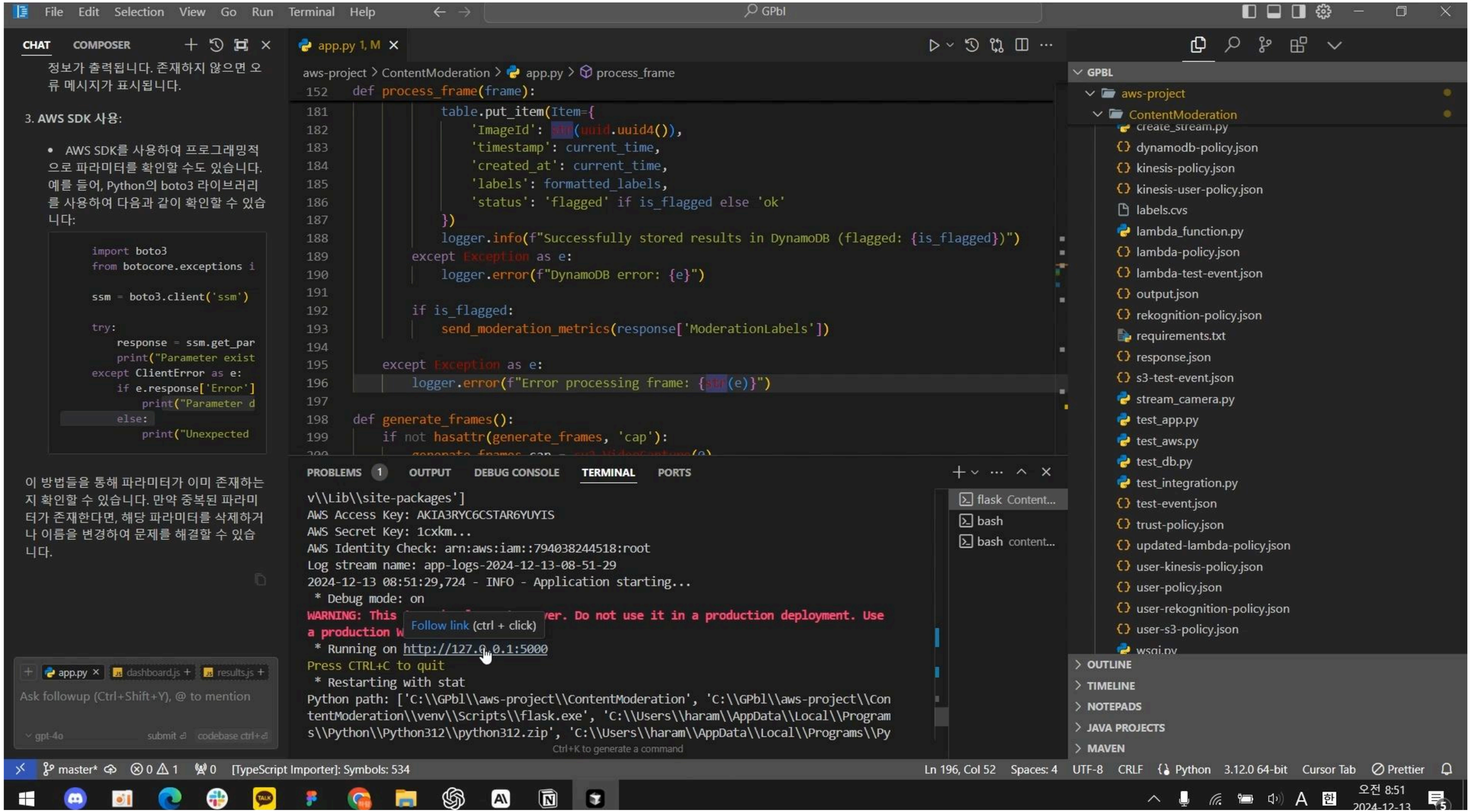
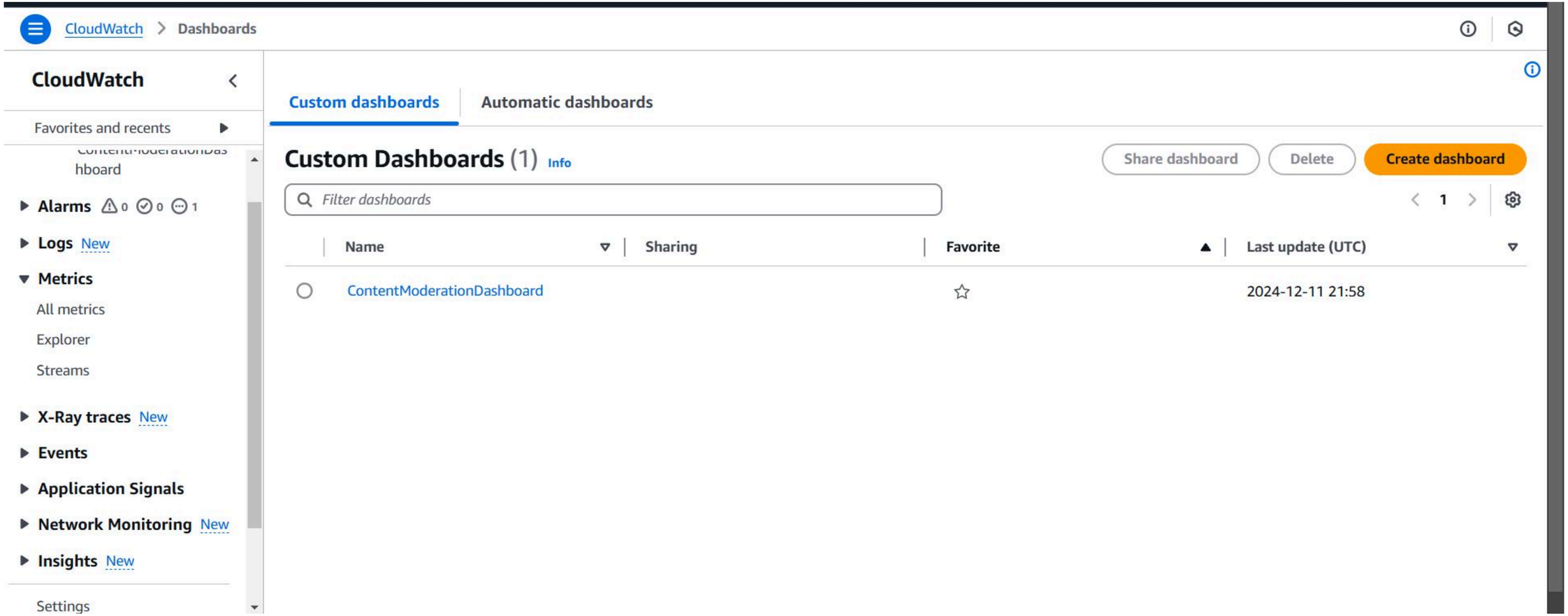
DEMO

DEMO - Service Solution Example

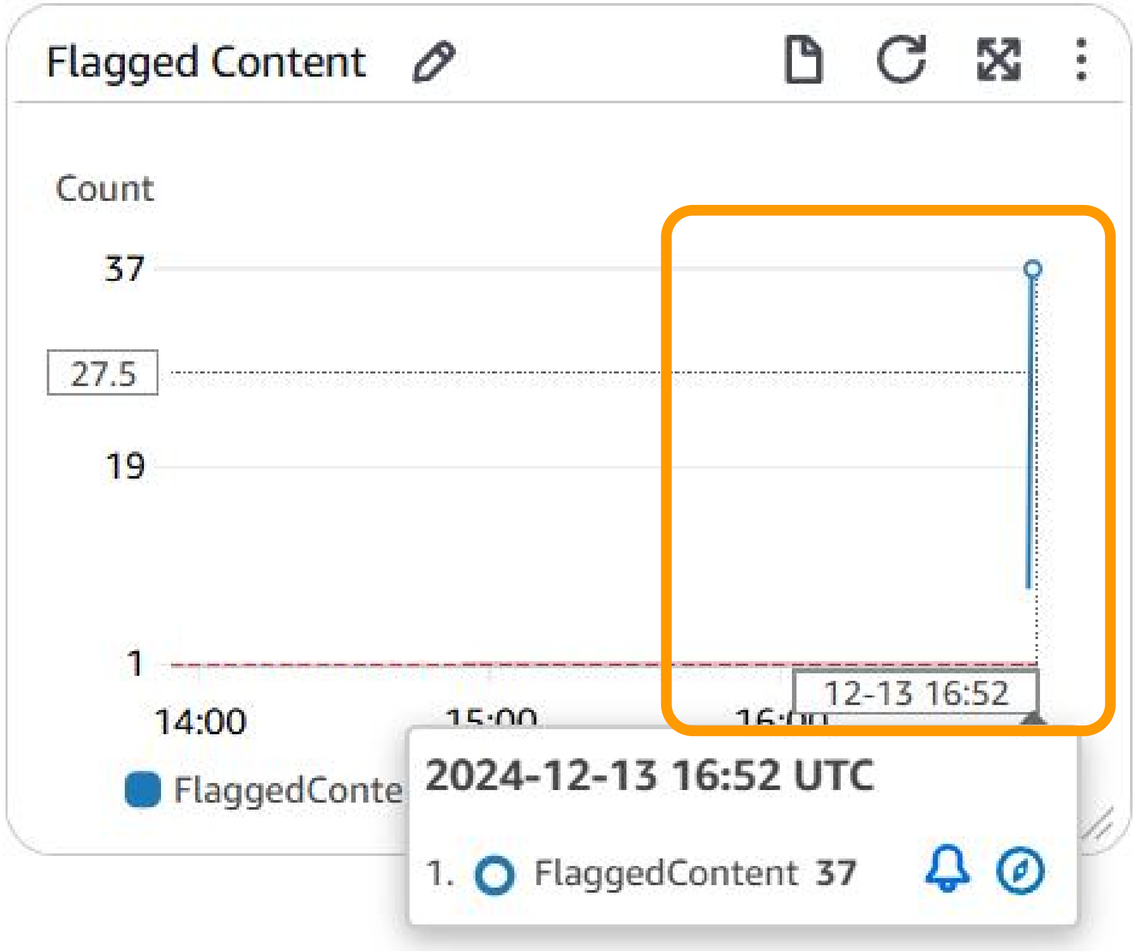


DEMO - Service Solution Example



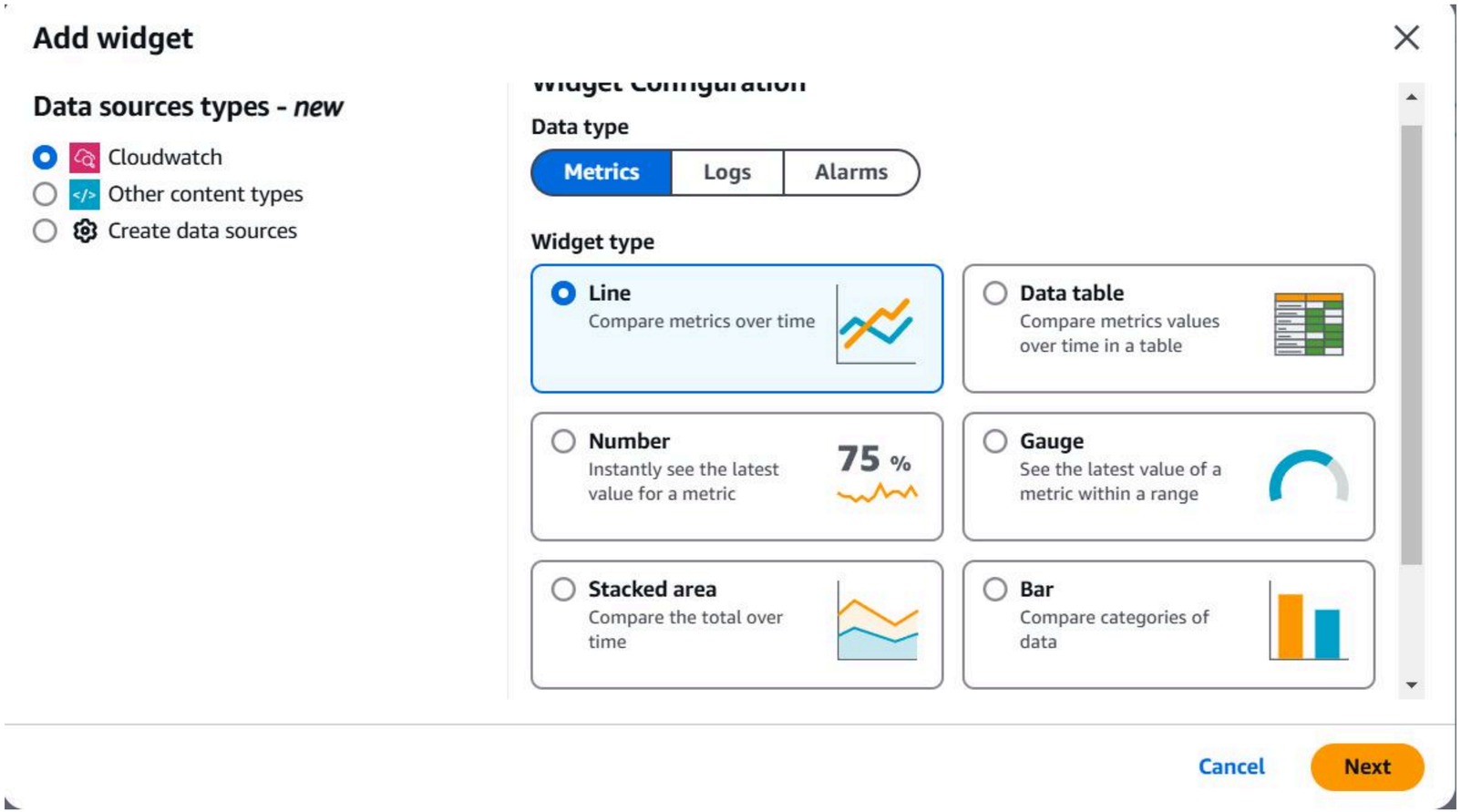
CloudWatch Dashboard

DEMO - Service Solution Example



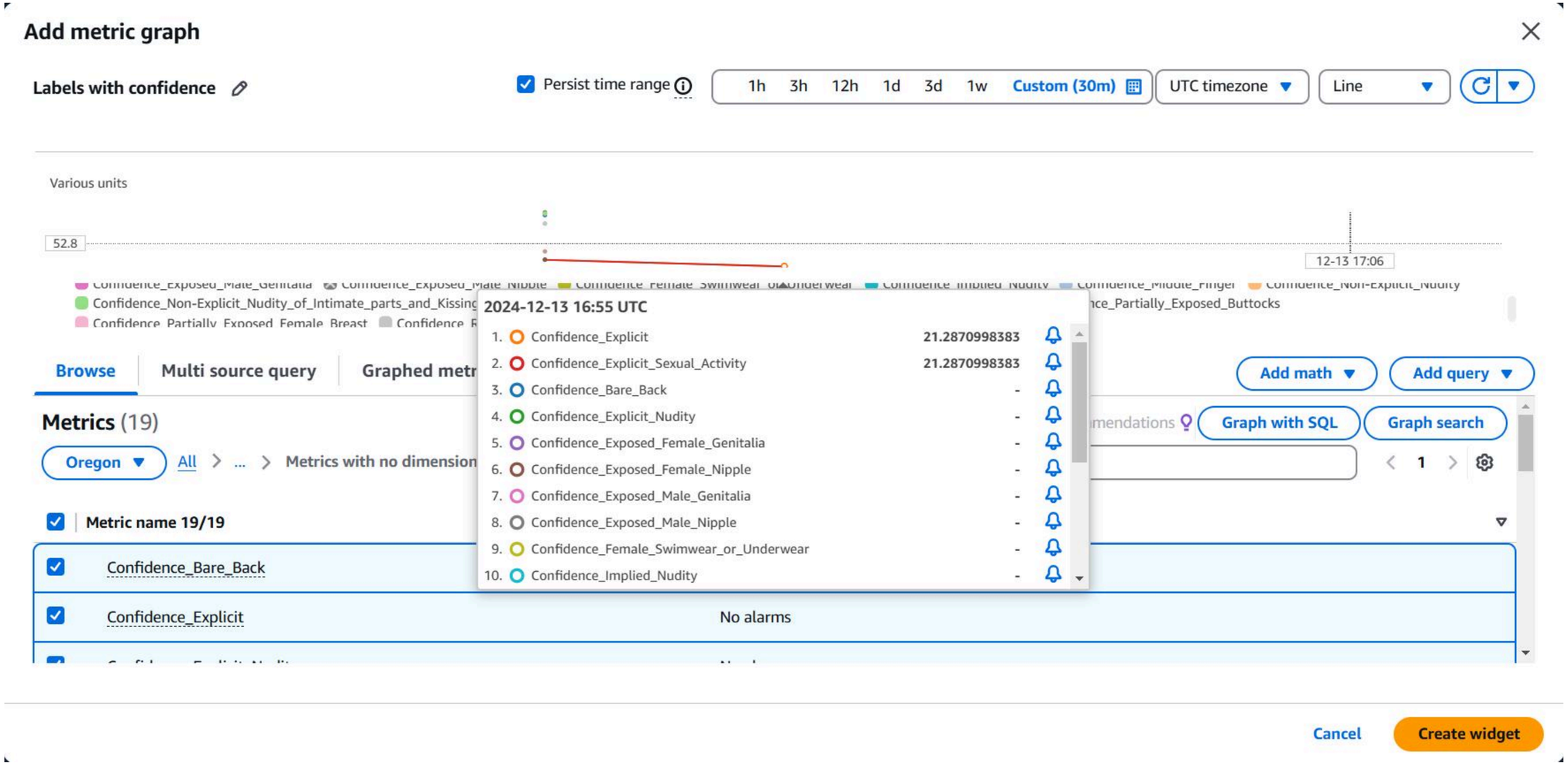
CloudWatch Dashboard

DEMO - Service Solution Example



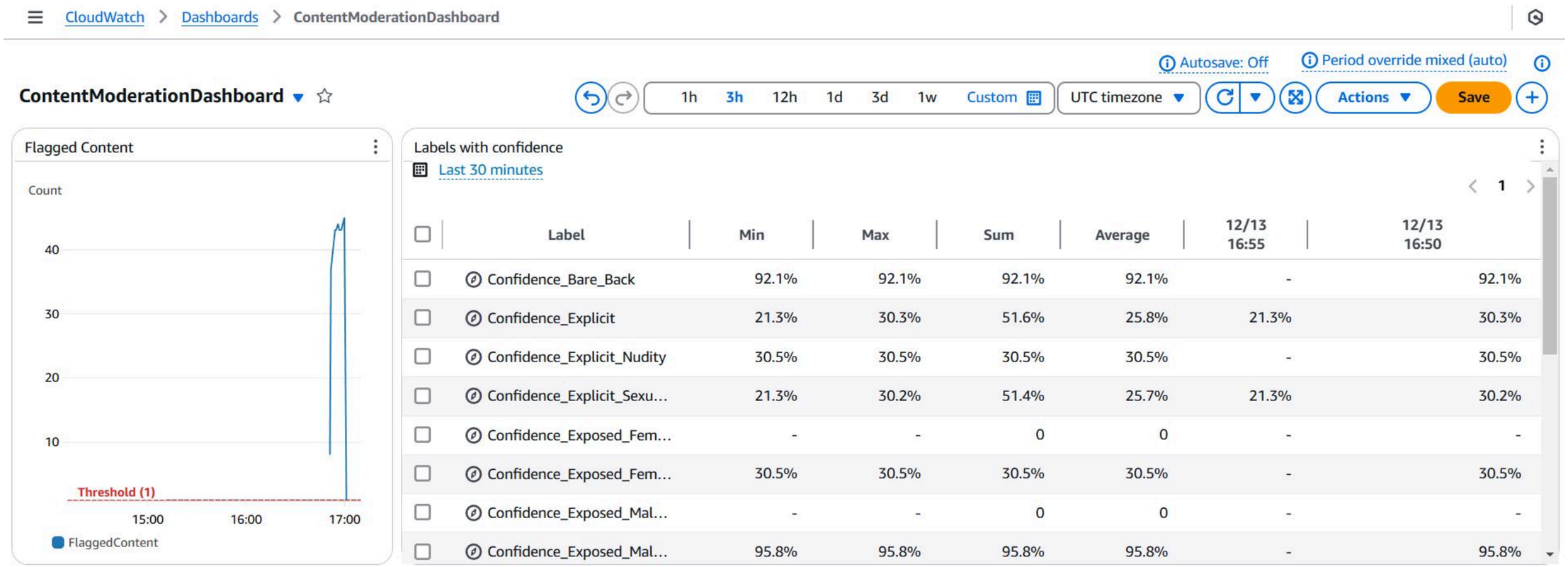
CloudWatch Dashboard - widget creation

DEMO - Service Solution Example



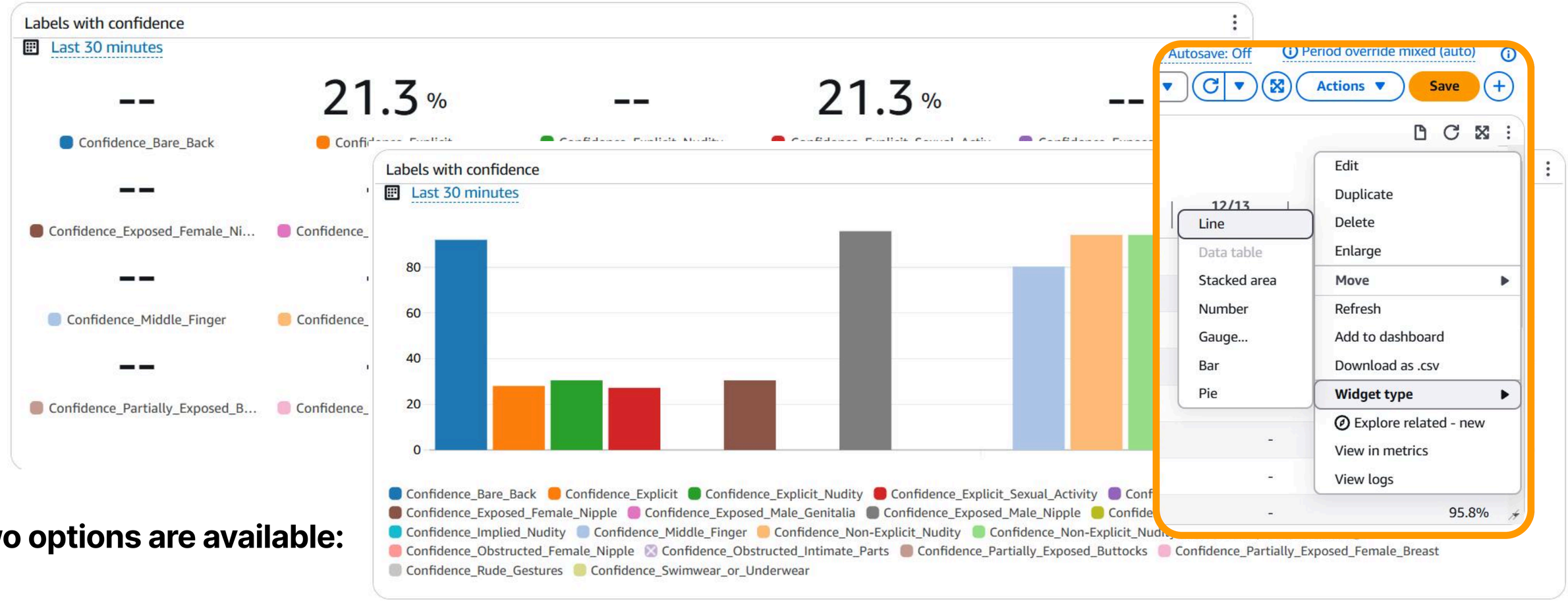
CloudWatch Dashboard - widget

DEMO - Service Solution Example



CloudWatch Dashboard - widget configuring

DEMO - Service Solution Example



Two options are available:

- Manual setup in the AWS console
- Automation with CDK code

CloudWatch Dashboard - widget configuring

Advanced Dashboard

Additional Metrics to Enhance Your System

Metric	Category	Description
Lambda Execution Time	Performance	Tracks how long Lambda functions take to execute
Lambda Error Rate	Performance	Monitors errors in Lambda function executions
DynamoDB Capacity Usage	Resource Utilization	Tracks read/write capacity units
SNS Delivery Success/Failure	Resource Utilization	Tracks SNS notification delivery
Total Flagged Content	Content Moderation	Counts flagged content items

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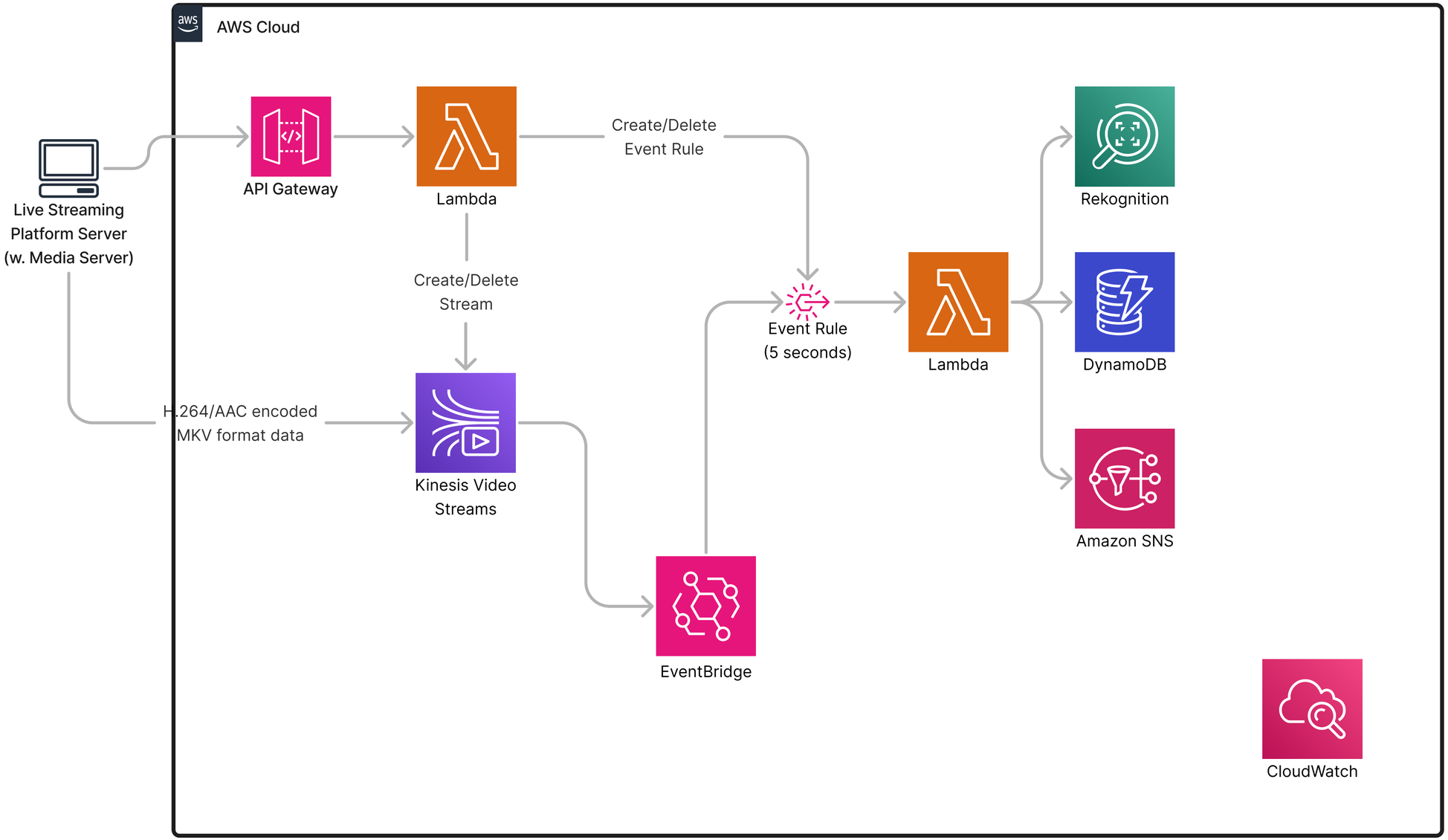
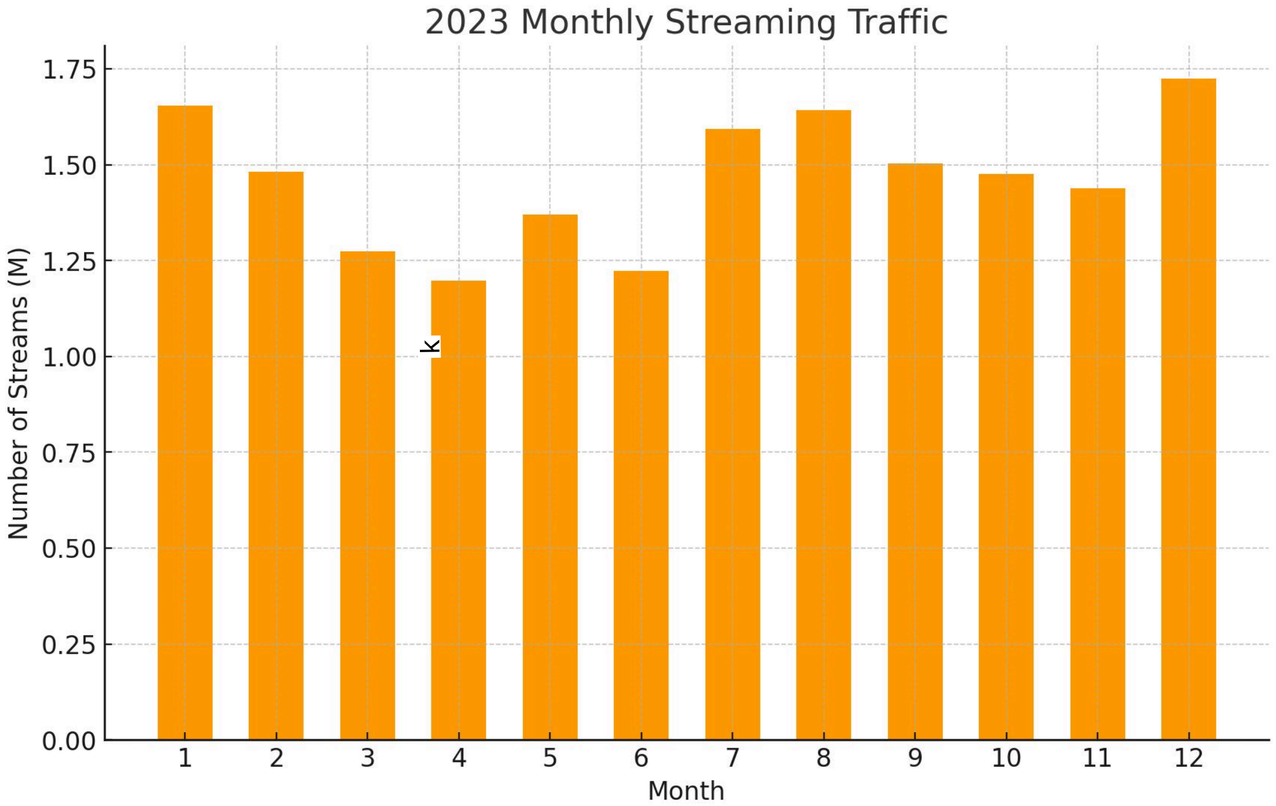
Cost Estimation

Real time content moderation Architecture Overview



Streaming Traffic

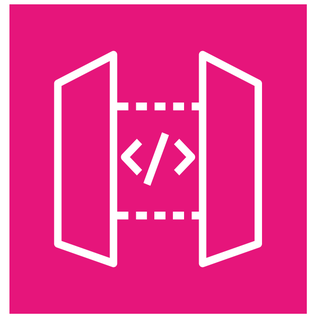


- **Cost estimation is critical for scaling efficiently in high- and low-traffic scenarios.**
- **Costs vary based on stream hours and service usage.**

207,360,000 requests per month.
Request Cost: $18.66
Data Transfer Cost: $23.64

1700 Streamers per day - HIGH TRAFFIC
1200 Streamers per day - LOW TRAFFIC

8 hours a day



API Gateway

$273.72
(includes requests + data transfer).

$0.011 per shard hour.
$0.0085 per GB ingested.
$0.01 per GB retrieved.

1700 Streamers per day - HIGH TRAFFIC
1200 Streamers per day - LOW TRAFFIC

8 hours a day

Kinesis Video Streams

$40,630 per month.

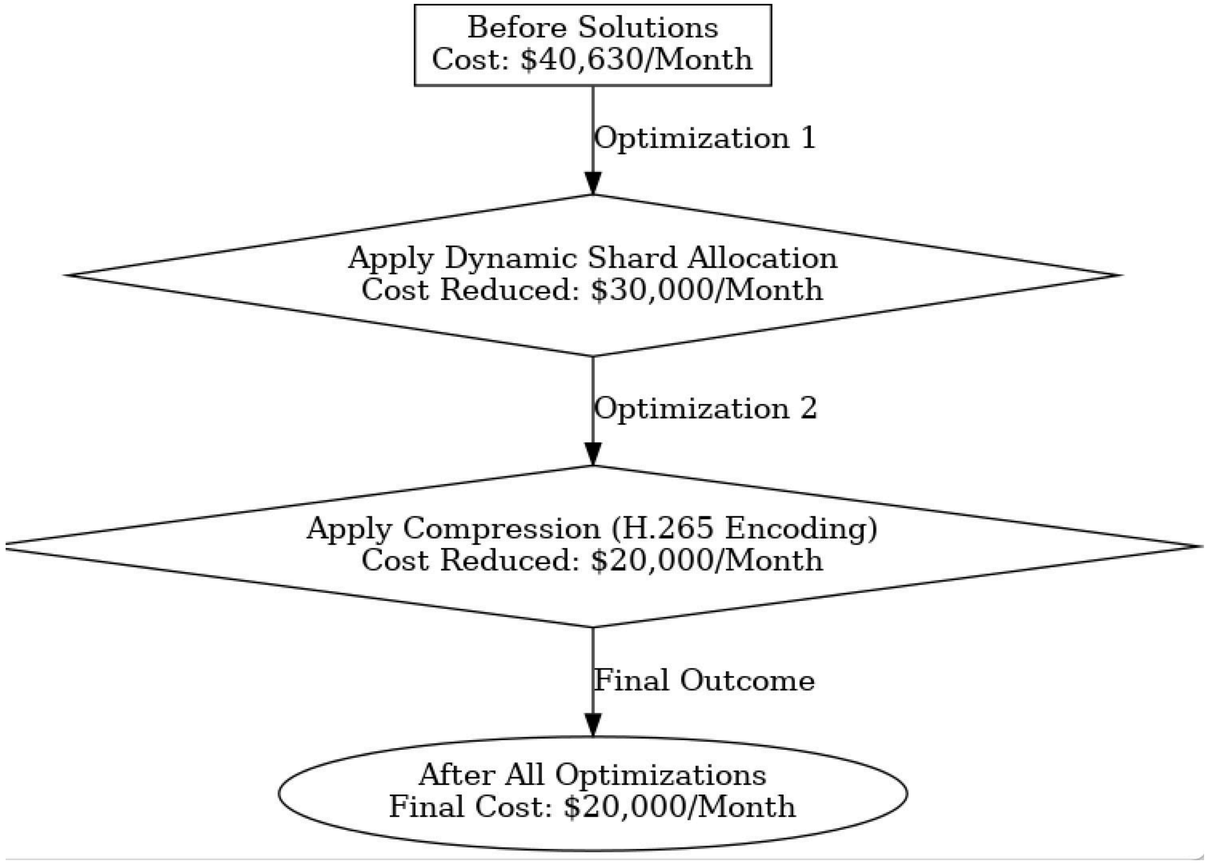
SOLUTIONS:

Dynamic Shard Allocation:

- Scale shards dynamically based on actual traffic rather than pre-allocating a fixed number.
- During off-peak hours, reduce the number of shards to lower costs.

Compression:

- Compress video data before ingestion to reduce the volume of data processed.
- Use H.265 encoding instead of H.264 to decrease the size of ingested video streams.



1. Start/Stop Lambda
2. 5-second Trigger Lambda
3. Rekognition Lambda

1700 Streamers per day - HIGH TRAFFIC
1200 Streamers per day - LOW TRAFFIC

8 hours a day

Lambda

$1,811 per month.

$1.00 per million events.
Events are triggered **every 5 seconds** per stream.

1700 Streamers per day - HIGH TRAFFIC
1200 Streamers per day - LOW TRAFFIC

8 hours a day

EventBridge

$207 per month.

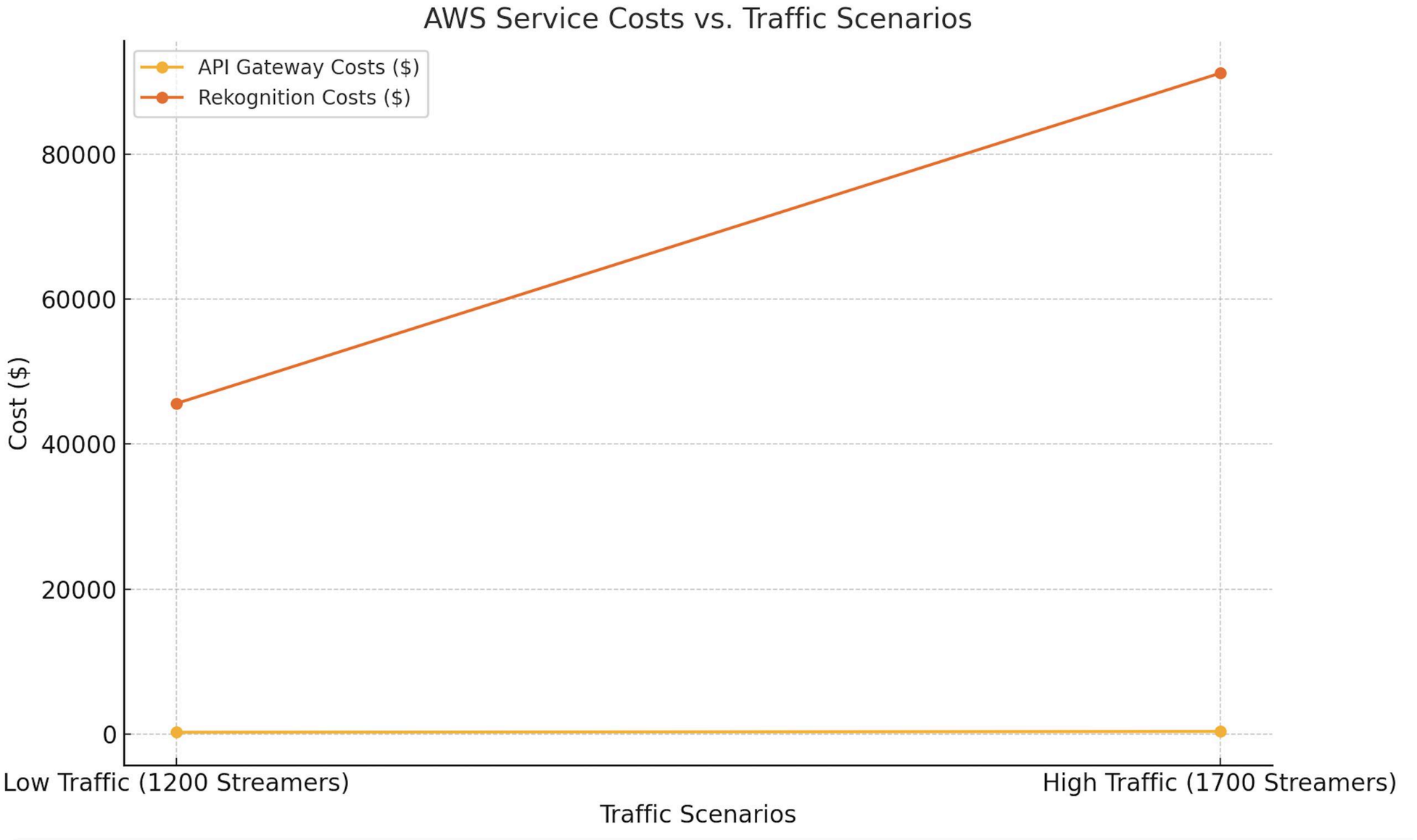
Frames per Month: 207,360,000
Calculated as frames processed per 5 seconds per stream.

1700 Streamers per day - HIGH TRAFFIC
1200 Streamers per day - LOW TRAFFIC

8 hours a day

Rekognition

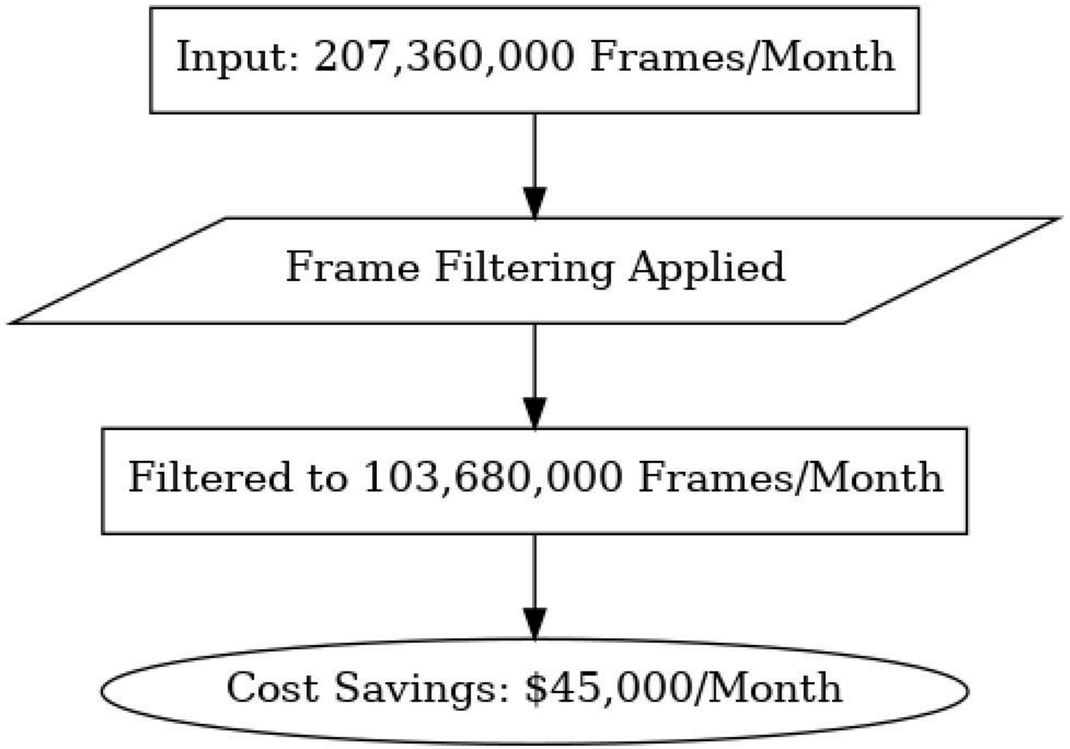
$91,144 per month.


AWS Service Costs vs. Traffic Scenarios
API Gateway Costs ($)
Rekognition Costs ($)
80000
60000
40000
20000
0
Cost ($)
Low Traffic (1200 Streamers)
High Traffic (1700 Streamers)
Traffic Scenarios

SOLUTIONS:

Batch Processing: every 10 seconds instead of 5 seconds.

Frame Filtering: Use Lambda functions or custom logic to filter unnecessary frames (e.g., process frames only when motion is detected).

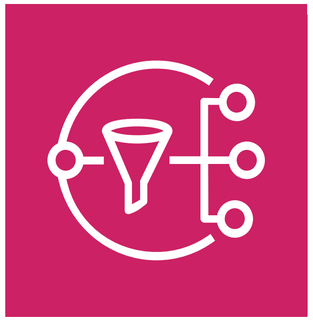


Write Cost: $323.48
Read Cost: $64.28
Storage Cost: $6.72

DynamoDB

$394 per month

Mobile Push Notifications:
Email/Email-JSON Notifications:



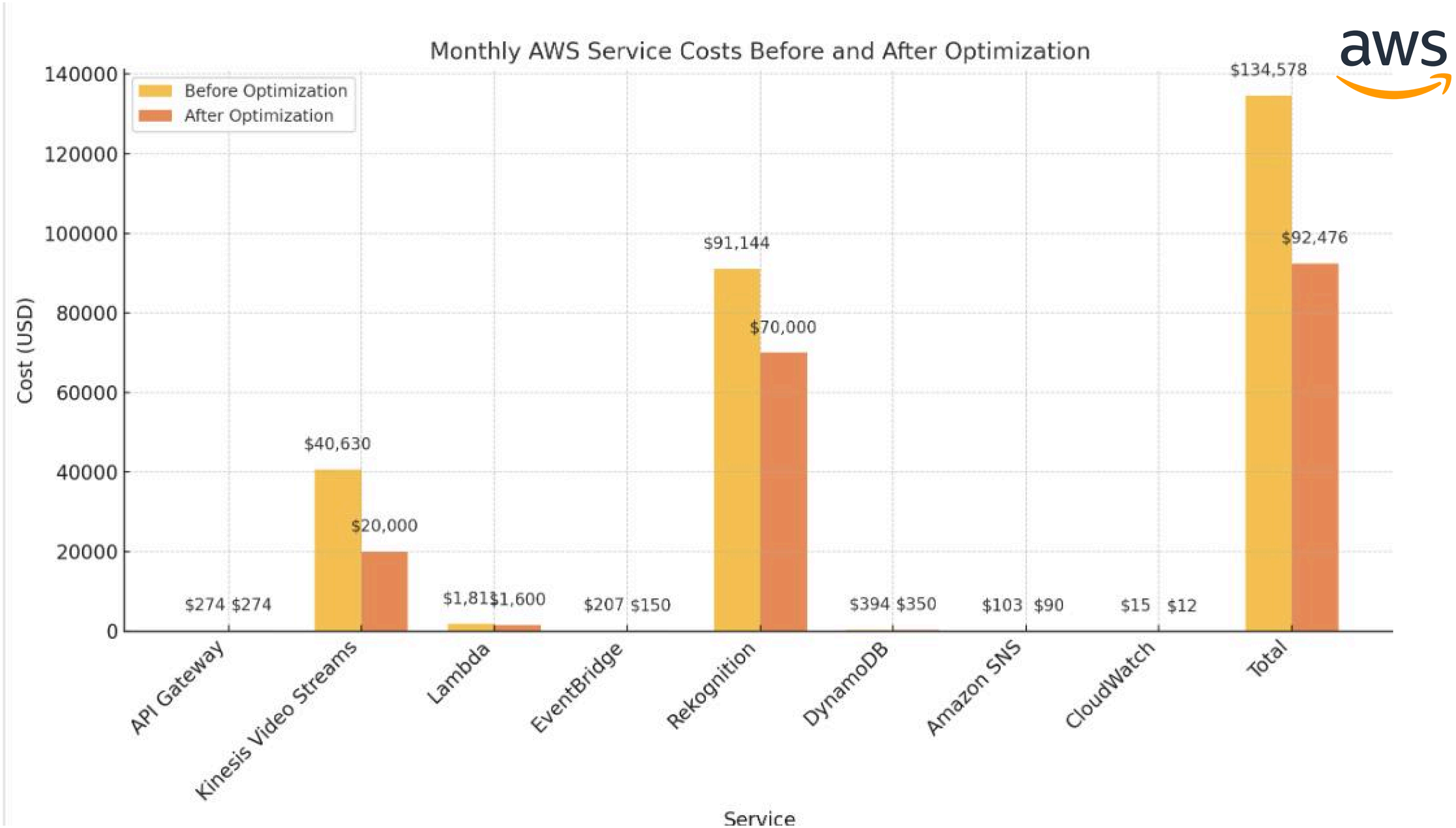
Amazon SNS

$103 per month.

Log Storage Cost: $6.22
Custom Metrics Cost: $3.00

CloudWatch

$15.44 per month


Monthly AWS Service Costs Before and After Optimization
Before Optimization
After Optimization
Cost (USD)
140000
120000
100000
80000
60000
40000
20000
0
$274
$274
$40,630
$20,000
$1,81
$1,600
$207
$150
$91,144
$70,000
$394
$350
$103
$90
$15
$12
$134,578
$92,476
API Gateway
Kinesis Video Streams
Lambda
EventBridge
Rekognition
DynamoDB
Amazon SNS
CloudWatch
Total
Service

Cost Comparison Before and After Solutions

	Service	Cost Per Month ($)_Before Solutions	Cost Per Month ($)_After Solutions
0	API Gateway	273.72	273.72
1	Kinesis Video Streams	40630.0	20000.0
2	Lambda	1811.0	1600.0
3	EventBridge	207.0	150.0
4	Rekognition	91144.0	70000.0
5	DynamoDB	394.0	350.0
6	Amazon SNS	103.0	90.0
7	CloudWatch	15.44	12.0
8	Total	134578.16	92475.72

Results and Benefits

- **Total monthly savings: ~$42,102.**
- **Increased scalability and efficiency.**
- **Enable handling 400–500% higher traffic levels without interruptions.**

StreamAMG

StreamAMG Scores Record Viewership and Uninterrupted Delivery

2020

In the OTT industry reputation is key and our ability to consistently deliver scalable and resilient platforms has afforded us such a dependable reputation."

Andrew De Bono
CTO, StreamAMG

StreamAMG to handle traffic levels 400-500% higher than normal, delivering 2.9 million streams without interruption. The project was completed in just 12 weeks, thanks to close collaboration between AWS and StreamAMG teams.

Next Steps:

- Schedule a consultation to identify cost-saving opportunities.
- Explore additional AWS tools for cost management.

Thank You

AWS Technical Support Team

Appendix

2024 Revenue (Q1~3)

Unit (KRW: Million)	Q1'24	Q2'24	Q3'24
Operating Revenue	60,894	64,950	71,052
Platform Services	50,845	50,635	55,028
- Core Services	48,091	48,447	53,004
- Items	1,549	1,667	1,847
- Others	395	522	377
Advertisement	8,383	12,912	14,458
- Search Ads	2,573	3,627	3,396
- Display Ads	4,791	8,623	9,510
- Others	1,318	1,663	1,689
Others	1,667	1,403	1,336
Operating Expenses	41,299	43,423	47,942
Operating Profit	19,595	21,527	23,110
Profit Before Tax	20,039	20,732	25,213
Total Comprehensive Income	**15,509**	**18,880**	**19,760**

Estimated Total Comprehensive Income (Q4'24)

: 19,830M (KRW)

Estimated Total Comprehensive Income (FY 2024)

: 73,979M (KRW)
= 56,906,923 (USD)

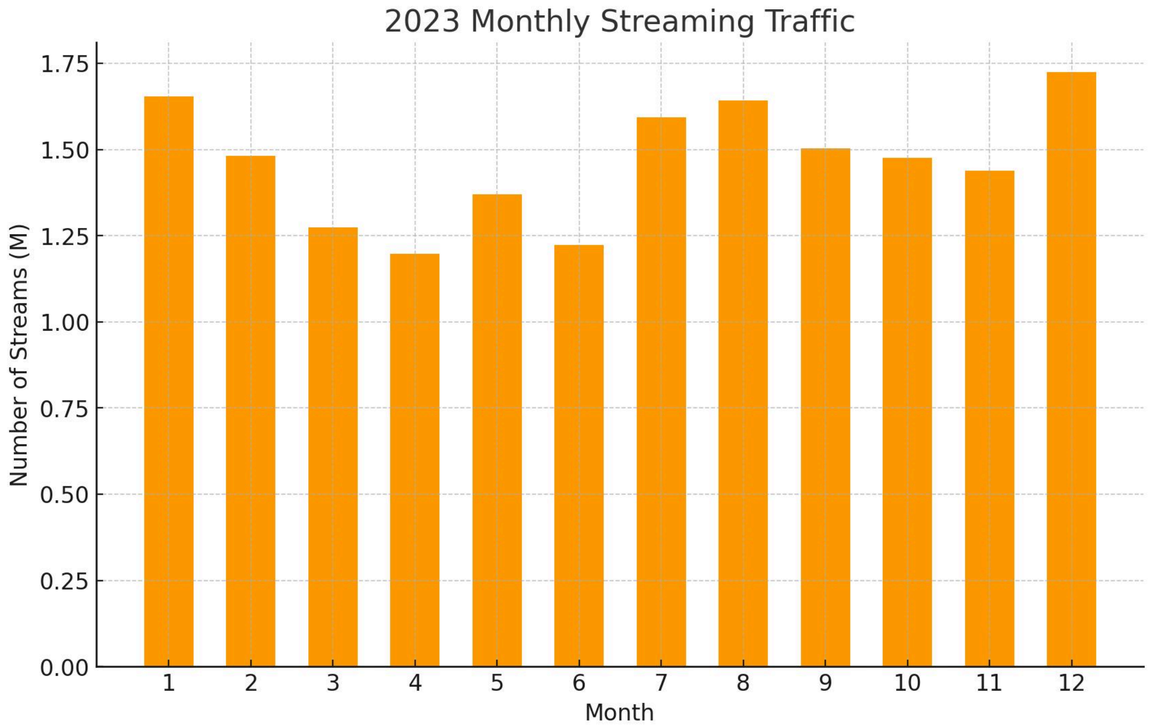
Appendix

2023 Revenue

Unit (KRW: Million)	Q1'23	Q2'23	Q3'23	Q4'23	FY 2023
Operating Revenue	41,126	45,067	50,073	60,300	196,566
Platform Services	34,524	39,078	41,483	44,797	159,882
- Core Services	29,378	30,903	33,832	36,148	29,378
- Items	7,033	4,210	13,382	7,306	7,306
- Others	2,392	1,686	1,556	1,671	146,153
Advertisement	8,257	10,935	14,070	17,152	50,414
- Search Ads	654	679	536	799	2,668
- Display Ads	1,929	1,066	4,047	5,546	47,535
- Others	1,004	1,250	1,552	1,876	5,682
Others	2,392	1,686	1,556	1,671	7,306
Operating Expenses	32,869	34,132	36,003	43,148	146,153
Operating Profit	6,981	12,680	13,969	13,905	37,851
Profit Before Tax	5,569	11,005	11,132	10,145	36,260
Total Comprehensive Income	**5,388**	**10,239**	**10,966**	**9,667**	**36,393**

Appendix

2023 Monthly Streaming Traffic



Month	Number of Streams (K)
January	1,653
February	1,482
March	1,273
April	1,198
May	1,369
June	1,223
July	1,594
August	1,642
September	1,503
October	1,476
November	1,439
December	1,724