

**Tim LeMaster / Stir Trek / May 5th 2023**

# Leet Code Hot Seat

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# The Mystery of the Increasing AWS Bill

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# Mystery Ingredients The Detective

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A cartoon illustration of a man with light brown hair, wearing dark-rimmed glasses, a mustache, and a brown scarf. He has a serious, slightly weary expression. The background behind him is black.

# Mystery Ingredients The Detective

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# Mystery Ingredients The Detective

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# Mystery Ingredients The Detective

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**WHO?**

# Mystery Ingredients

## The Mystery

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# Mystery Ingredients

## The Mystery

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# The Mystery Bills, Bills, Bills

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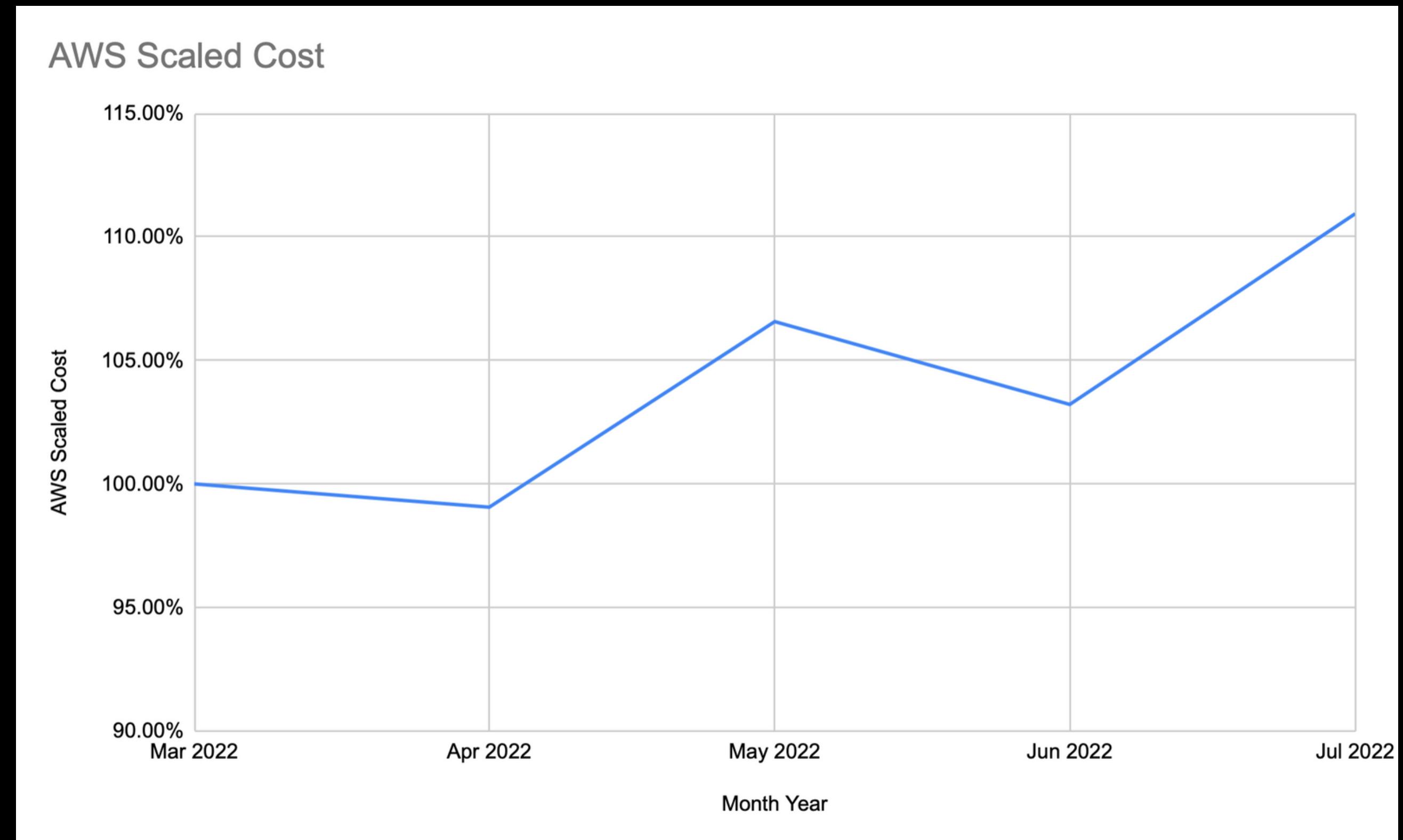
# The Mystery Bills, Bills, Bills

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# EC2 -> ECS

March 2022

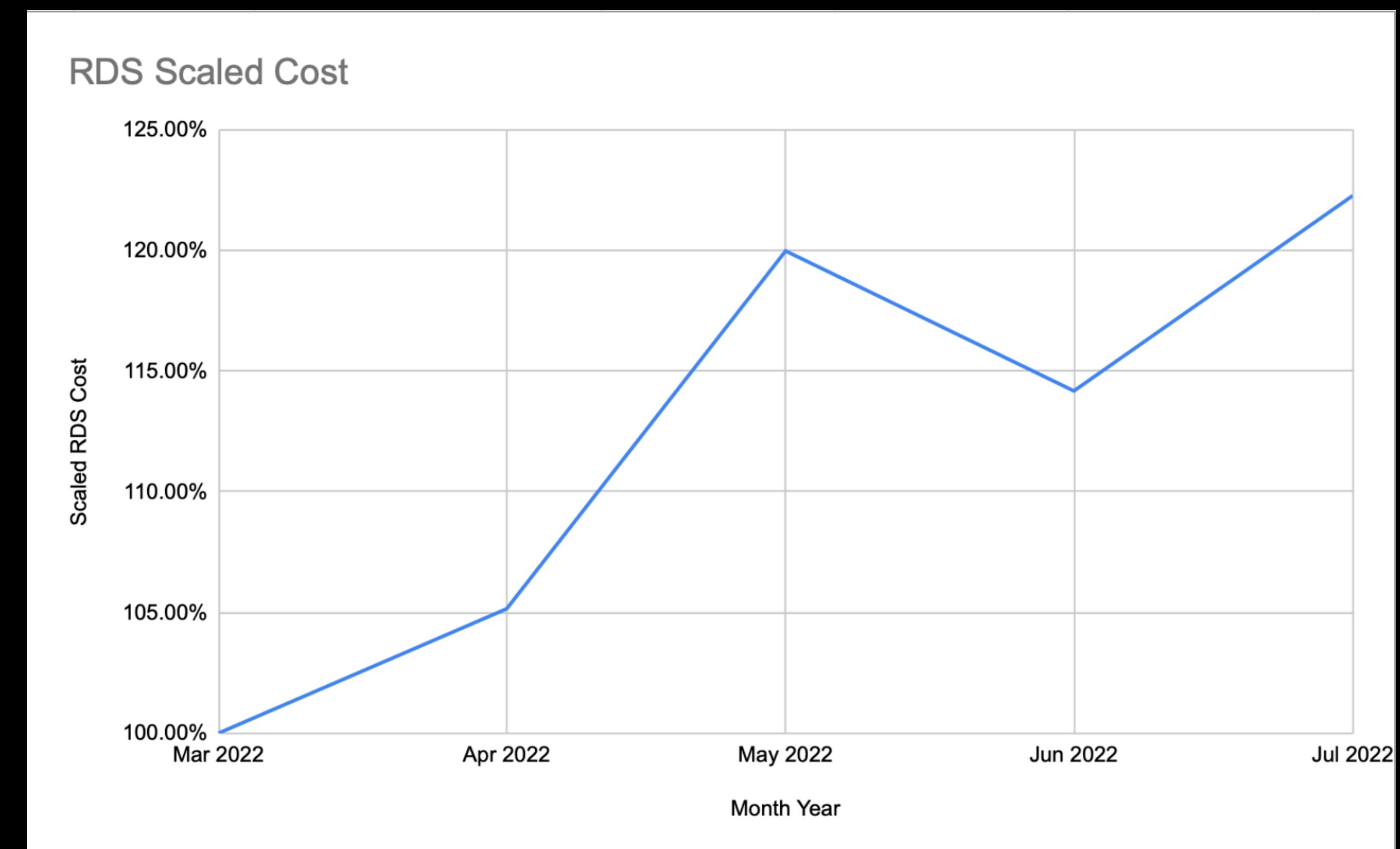
- Pangea moved our main application from EC2 to ECS in March of 2022
- In April 2022 we shutdown the EC2 servers entirely, our bill went down a little bit
- However was on an upward trend out pacing business growth from May 2022 forward



# RDS Costs

## Primary Cause of Increase

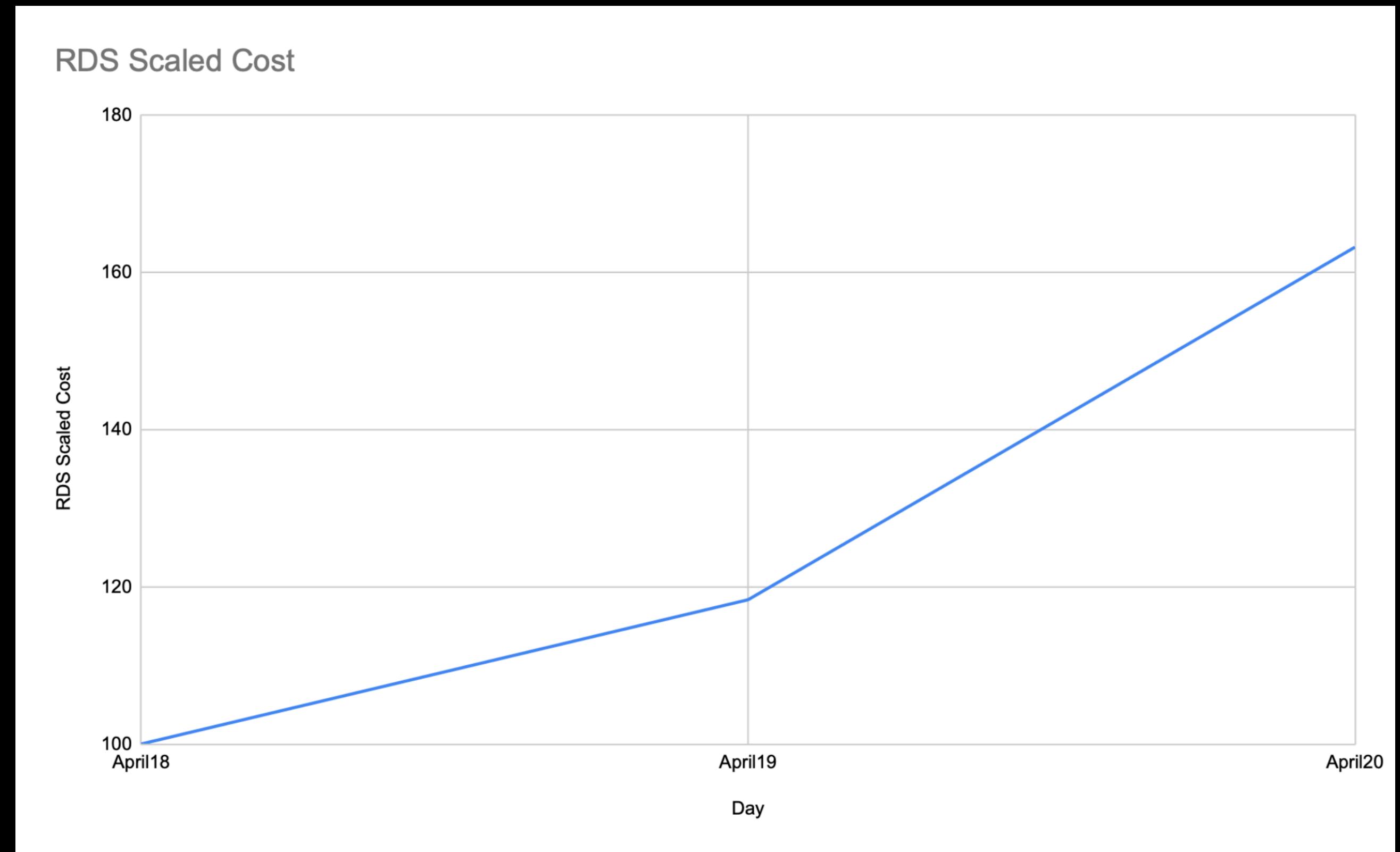
- Use Cost Explore to break down cost into categories
- RDS cost category was growing quickly
- All other categories had modest to no increases



# Daily RDS Cost

April 18, 2022 - April 20, 2022

- Charted Daily RDS for all of April
- RDS cost was 63% higher on April 20 vs April 18
- RDS cost was 18% higher on April 19 vs April 18
- What changed on April 19?



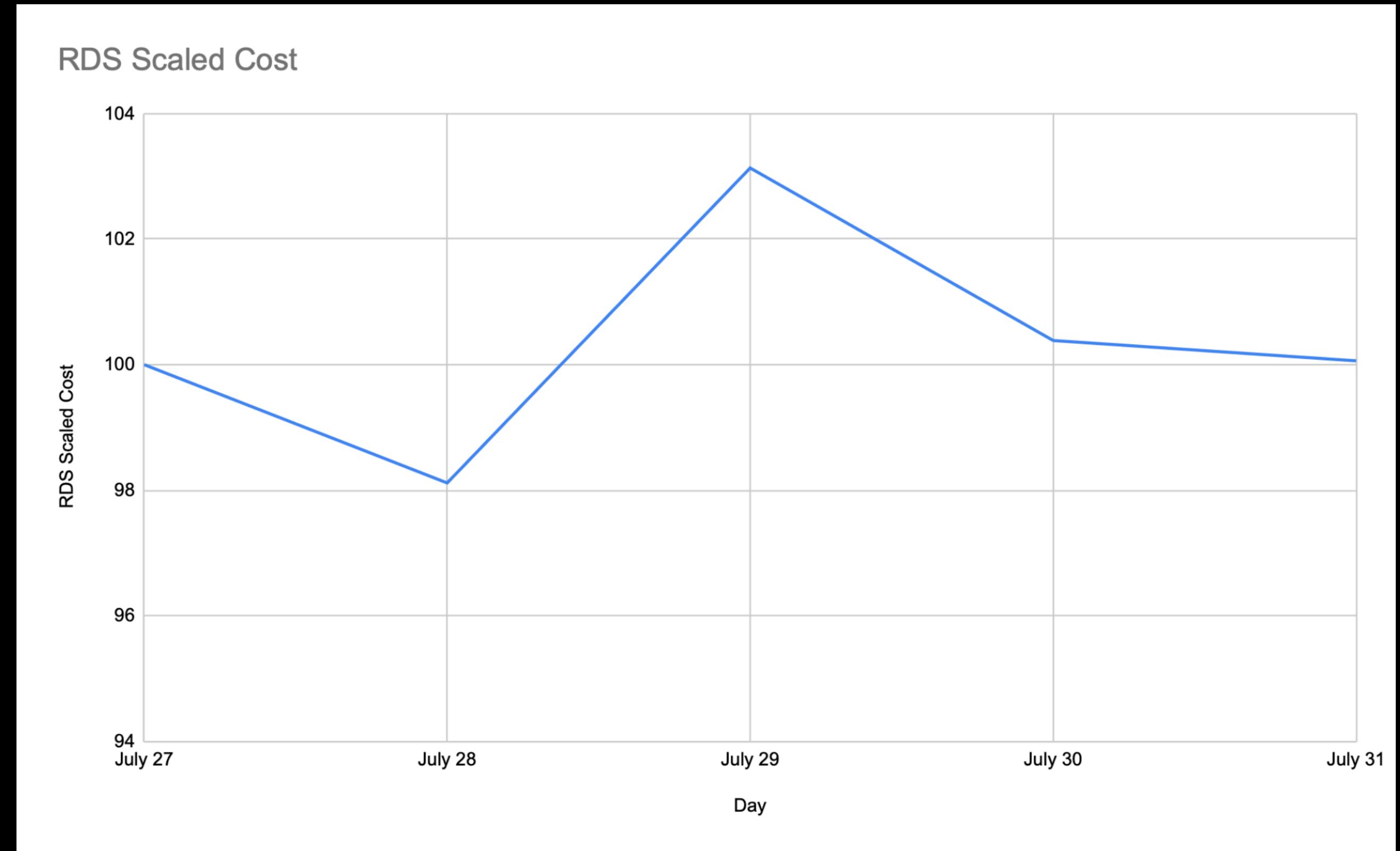
# Red Herring 1

## High Frequency Query

# Daily RDS Cost

July 27, 2022 - July 31, 2022

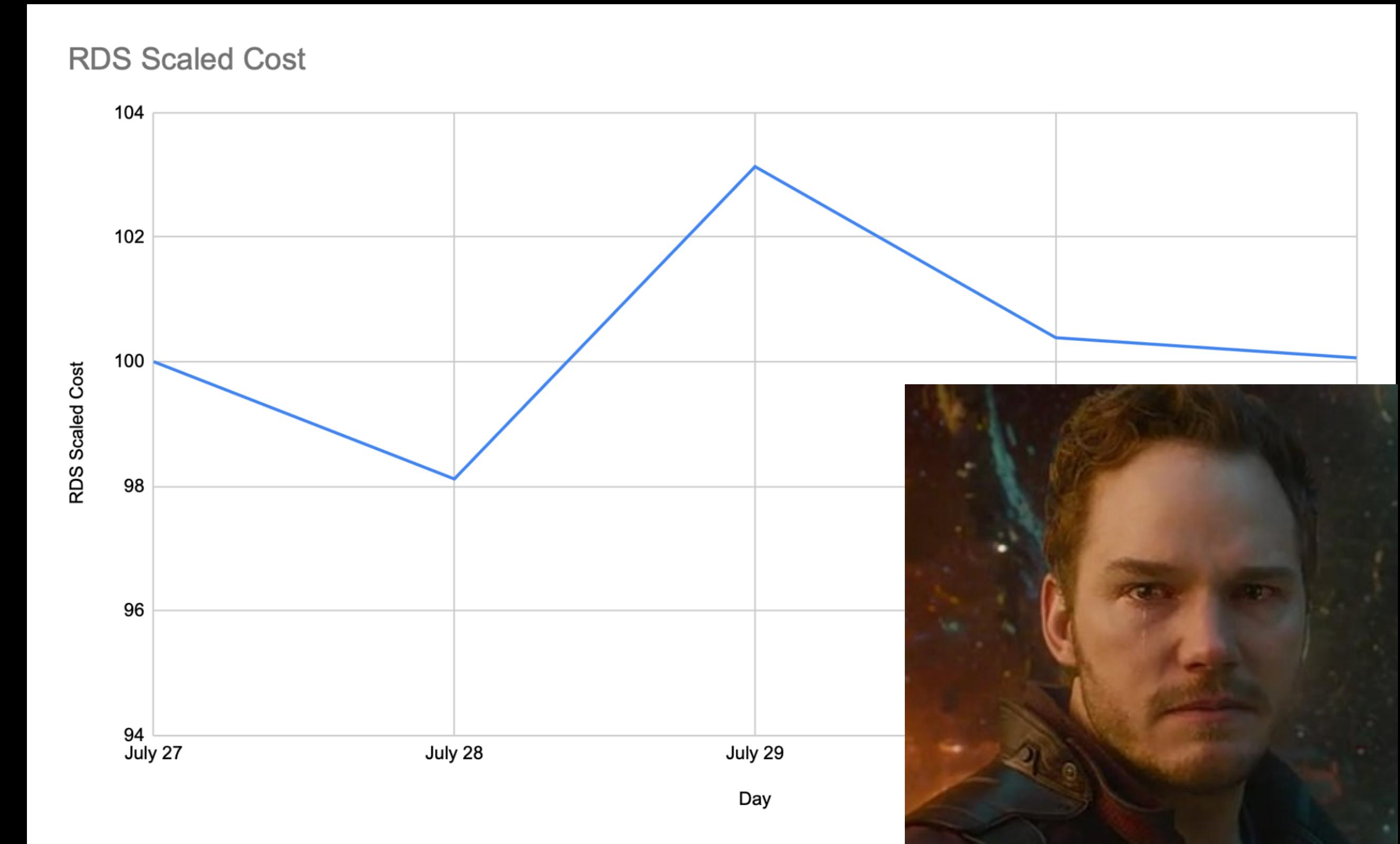
- Shutdown query on July 28, 2022
- Saw slight decline on RDS
- Slight increase on July 29, 2022
- Overall little to no impact



# Daily RDS Cost

July 27, 2022 - July 31, 2022

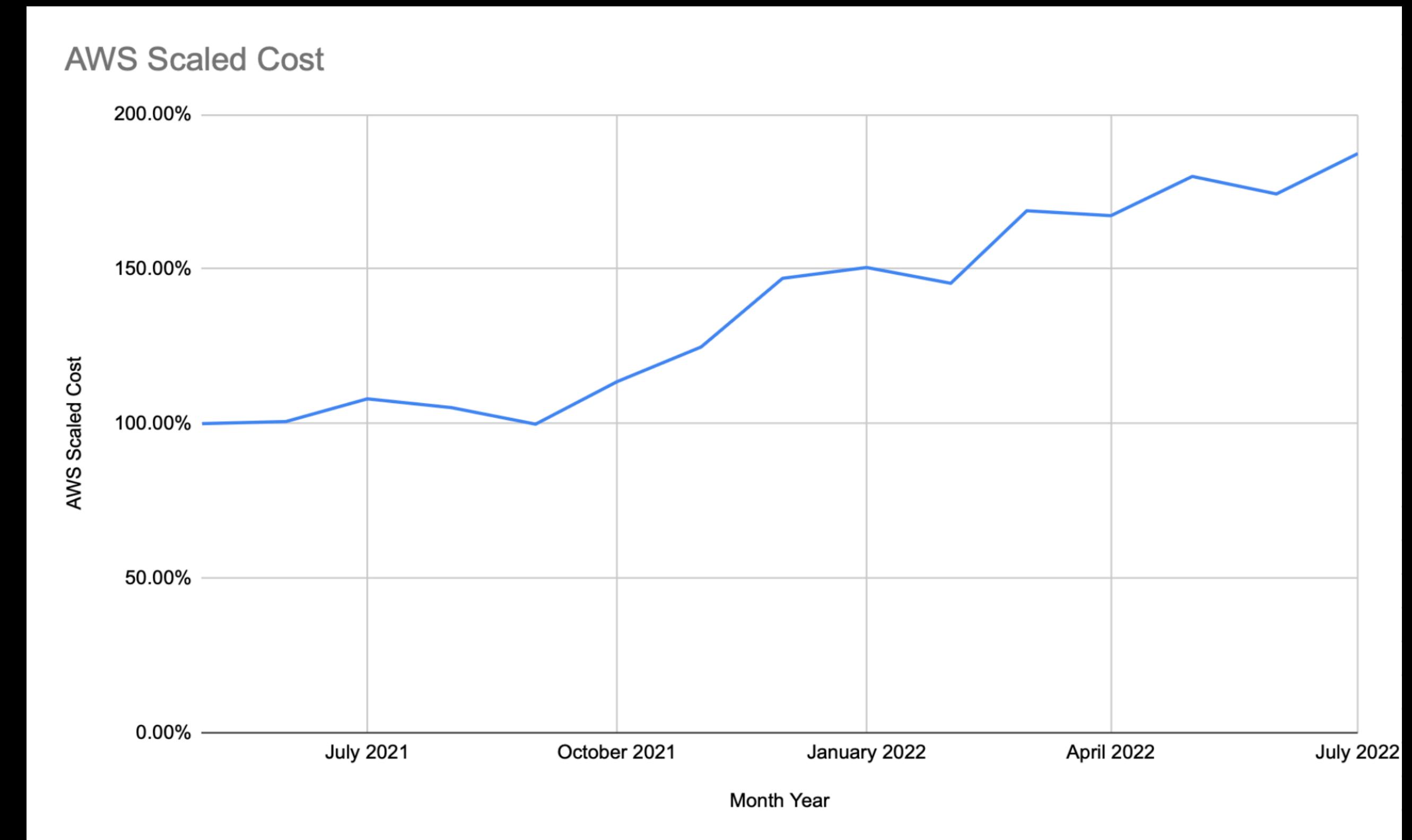
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# AWS Scaled Costs

May 2021 - July 2022

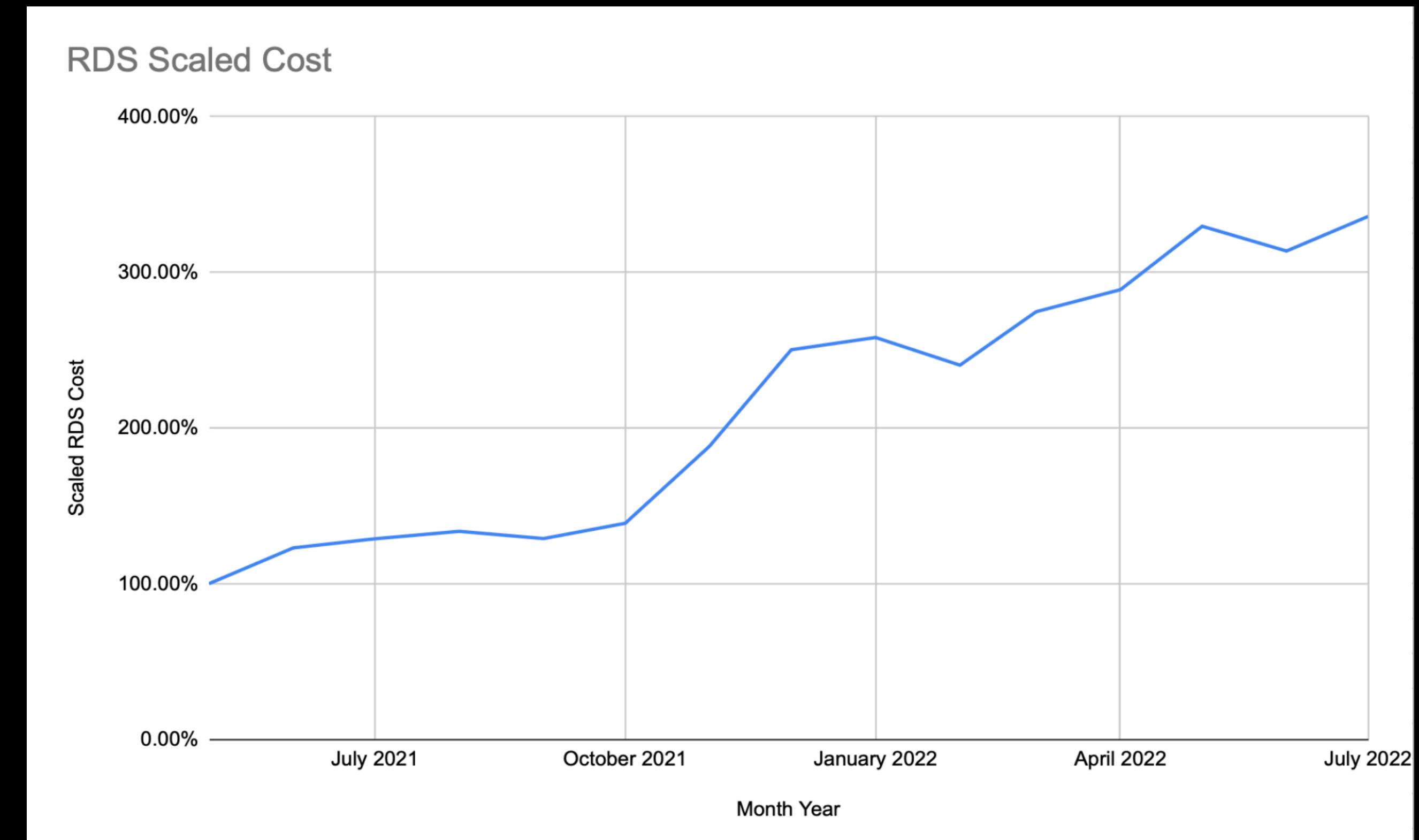
- Need to expand the search
- October - November 2021



# RDS Scaled Costs

May 2021 - July 2022

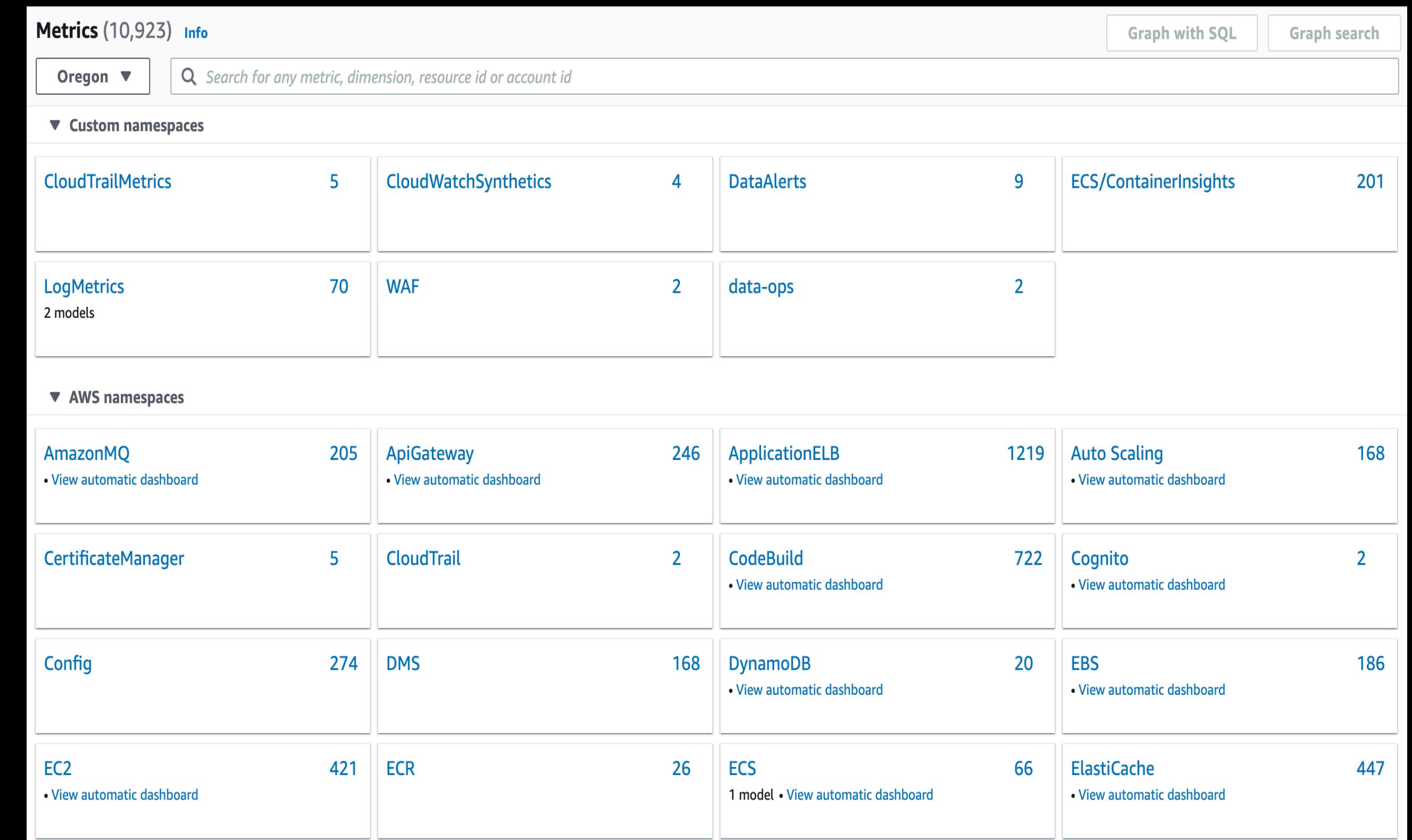
- Use Cost Explore to break down cost into categories
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# CloudWatch Metrics

## Many many metrics

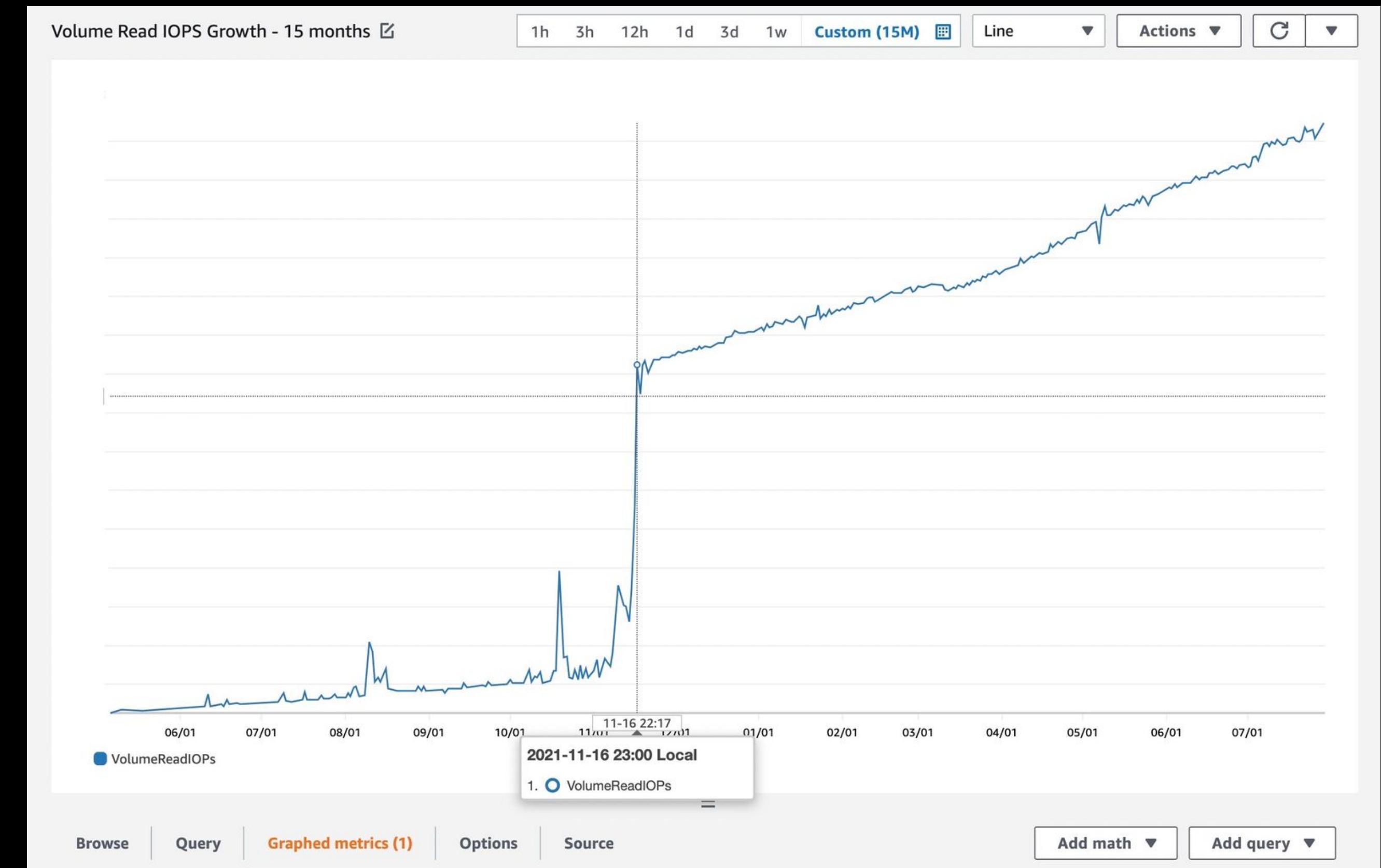
- Metrics on all sorts of AWS services
- 15 month data at 1 hour granularity
- Finer grains available for shorter periods of time



# Volume Read IOPS

## May 2021 - July 2022

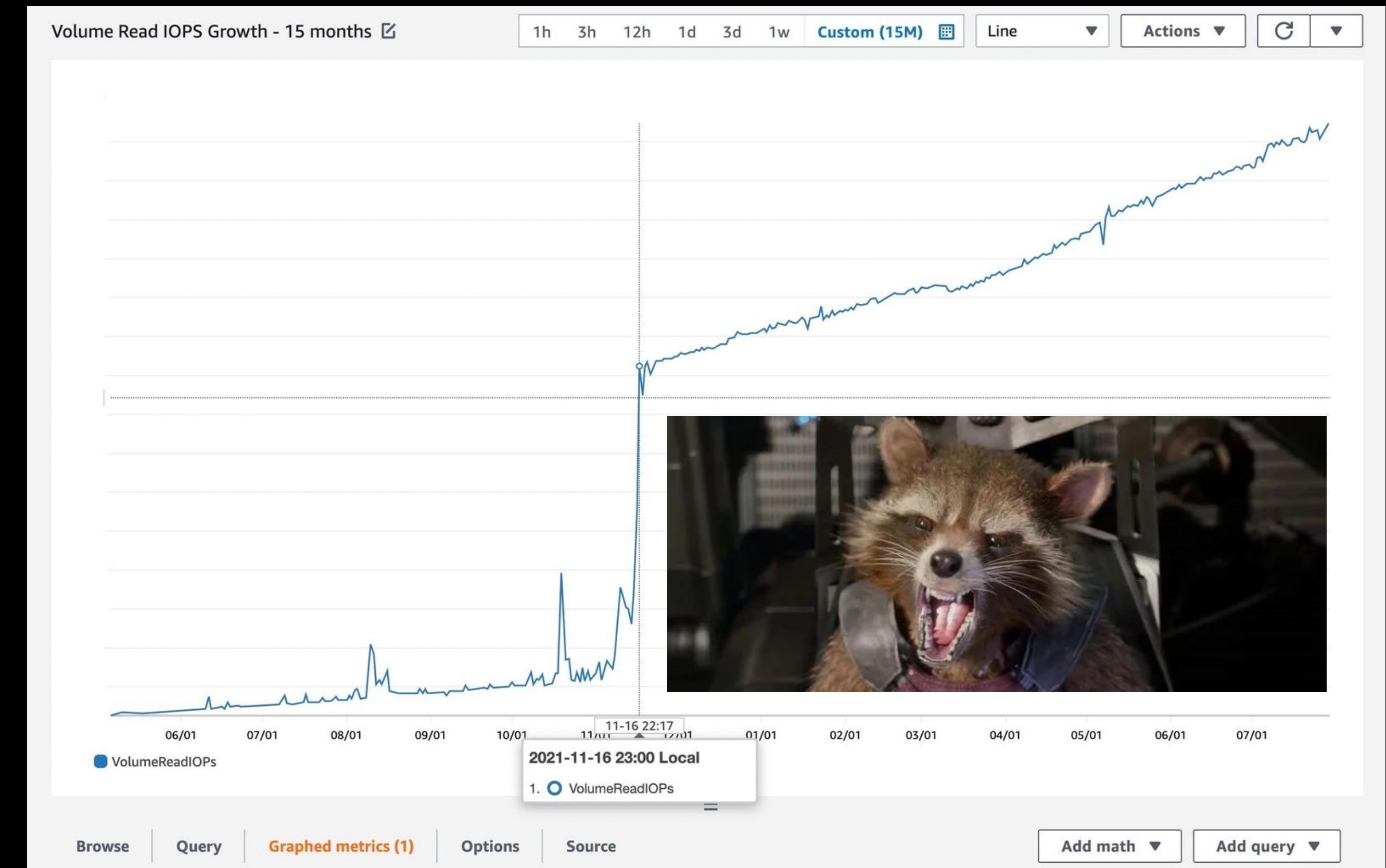
- Started to see Spikes in October 2021
- Major event on November 16, 2021
- Steeper growth curve after that event



# Volume Read IOPS

## May 2021 - July 2022

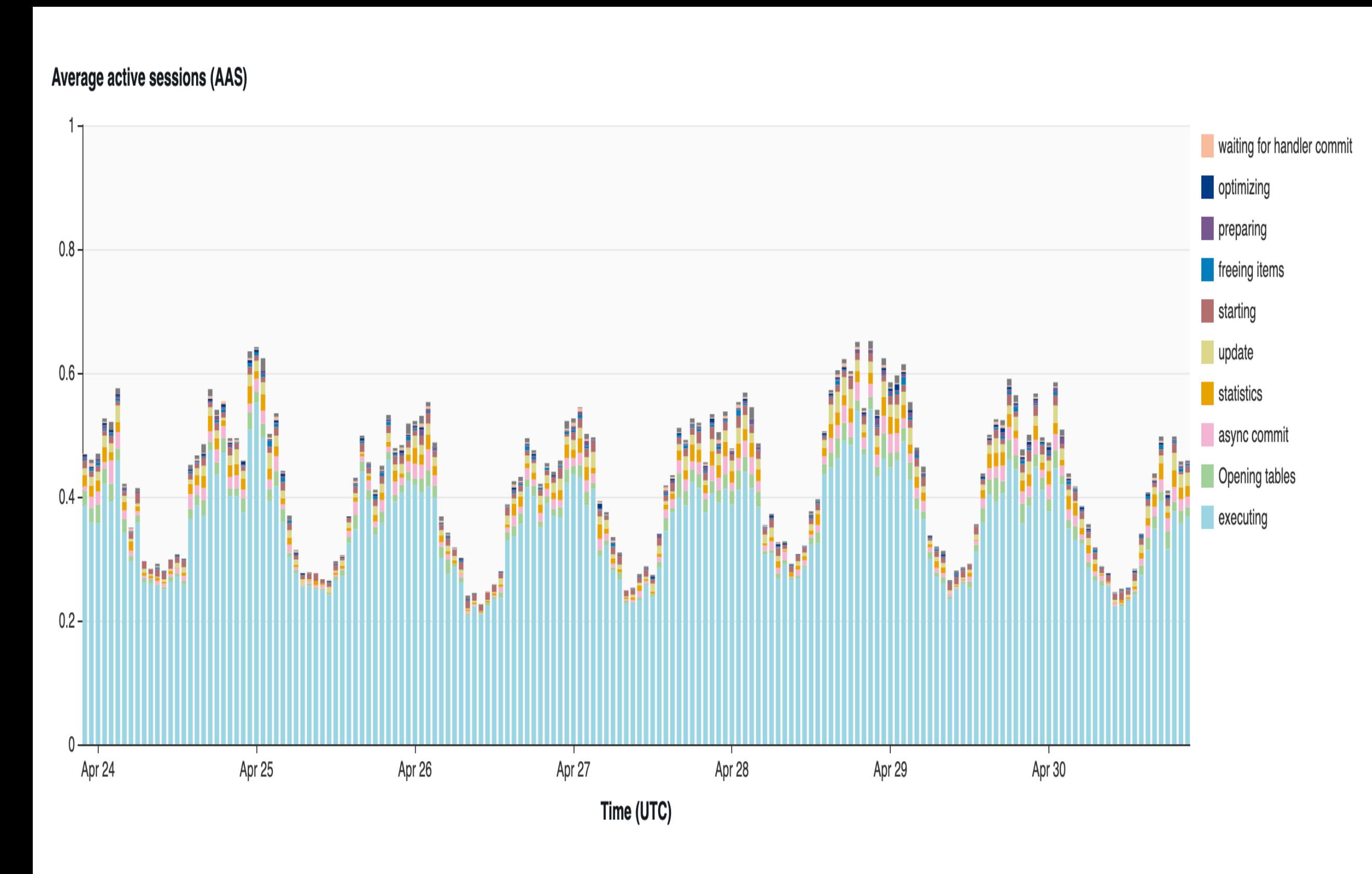
- Started to see Spikes in October 2021
- Major event on November 16, 2021
- Steeper growth curve after that event



# Performance Insights

## RDS Performance Tuning

- Show many counter metrics
- Shows database load sliced by different criteria
- Shows top 25 queries



# Red Herring 2

## Bad Indexes

Query	Rows Scanned Before	Rows Scanned After	Execution Time Before	Execution Time After
1	1,300,000		5.7s	
2	1,300,000		11.5s	
3	835,000		4.3s	
4	5,500,000		3.9s	
5	5,500,000		3.8s	
6	2,600,000		8.3s	

Query	Rows Scanned Before	Rows Scanned After	Execution Time Before	Execution Time After
1	1,300,000	23	5.7s	172ms
2	1,300,000		11.5s	
3	835,000		4.3s	
4	5,500,000		3.9s	
5	5,500,000		3.8s	
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Query	Rows Scanned Before	Rows Scanned After	Execution Time Before	Execution Time After
1	1,300,000	23	5.7s	172ms
2	1,300,000	23	11.5s	161ms
3	835,000	852	4.3s	469ms
4	5,500,000		3.9s	
5	5,500,000		3.8s	
6	2,600,000		8.3s	

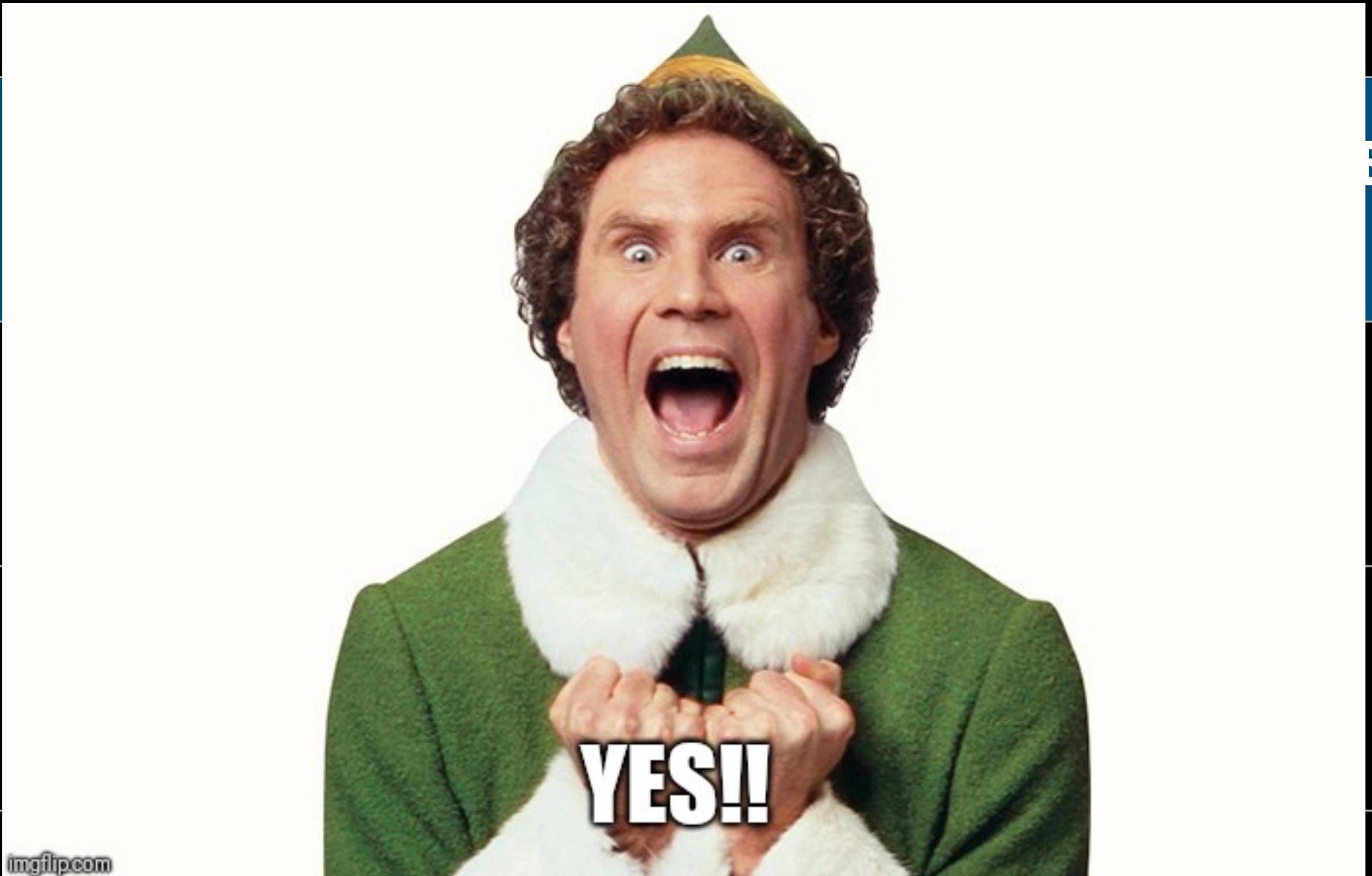
Query	Rows Scanned Before	Rows Scanned After	Execution Time Before	Execution Time After
1	1,300,000	23	5.7s	172ms
2	1,300,000	23	11.5s	161ms
3	835,000	852	4.3s	469ms
4	5,500,000	1	3.9s	250ms
5	5,500,000		3.8s	
6	2,600,000		8.3s	

Query	Rows Scanned Before	Rows Scanned After	Execution Time Before	Execution Time After
1	1,300,000	23	5.7s	172ms
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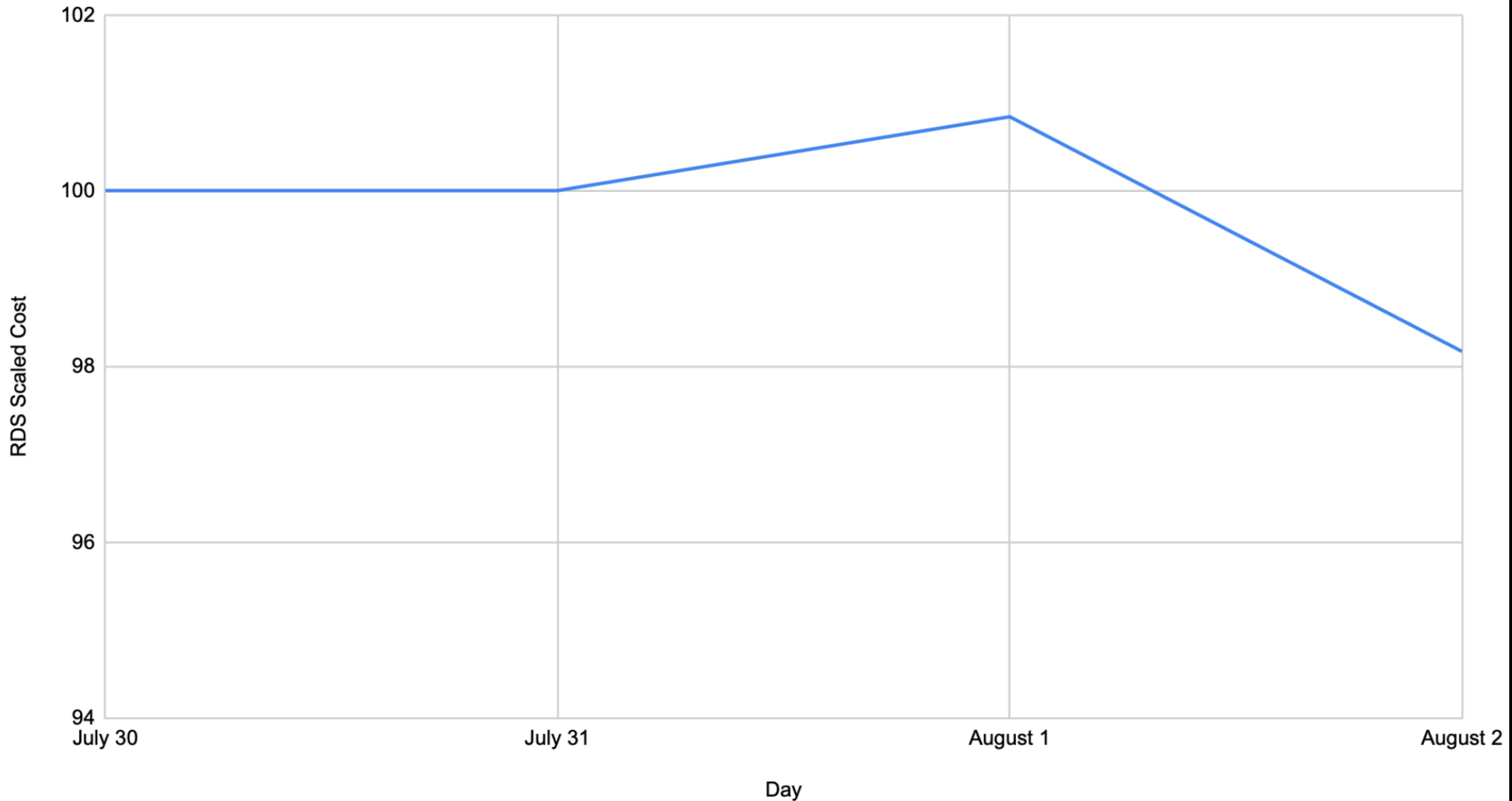
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## RDS Scaled Cost

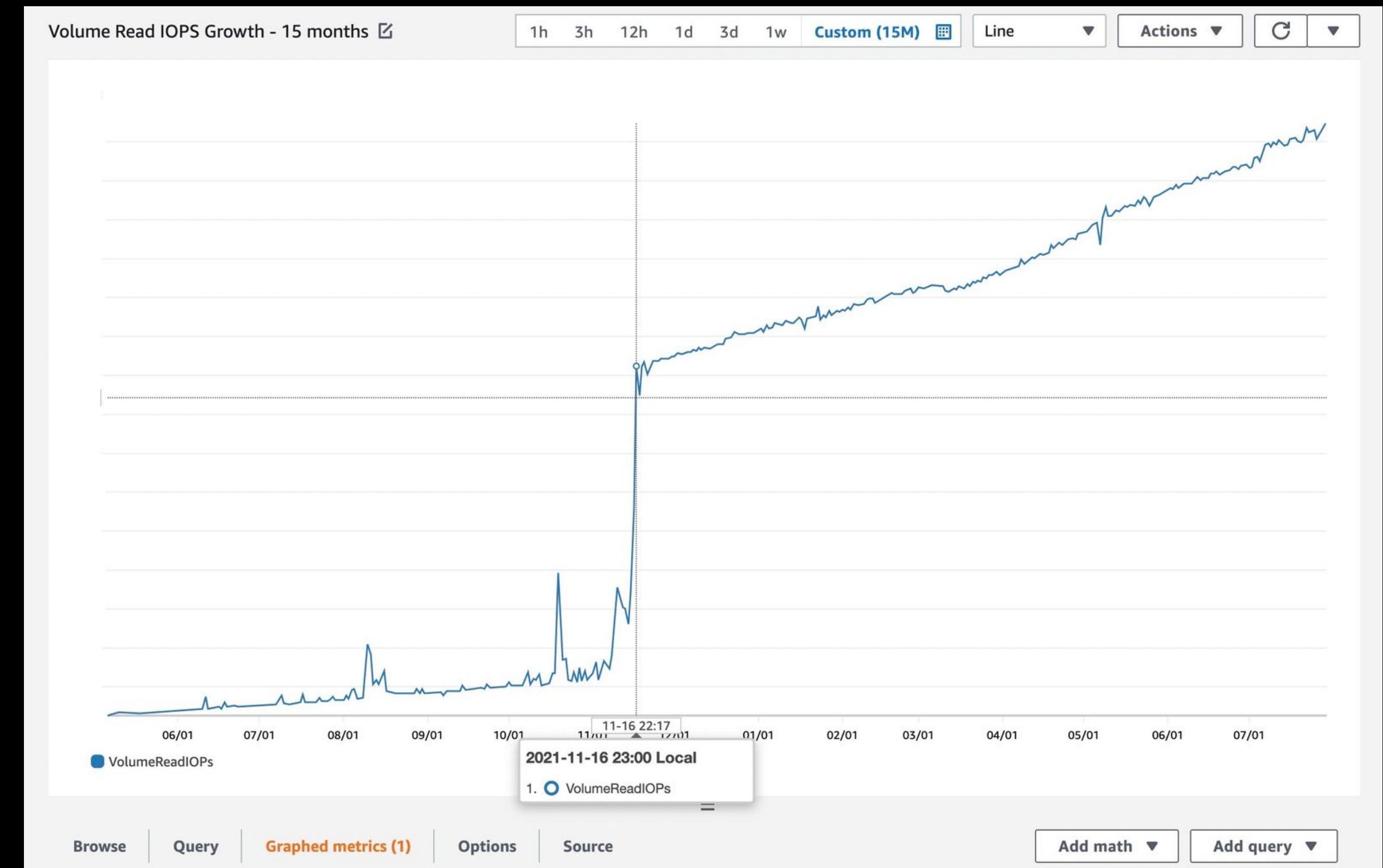


## RDS Scaled Cost



# Volume Read IOPS Revisited

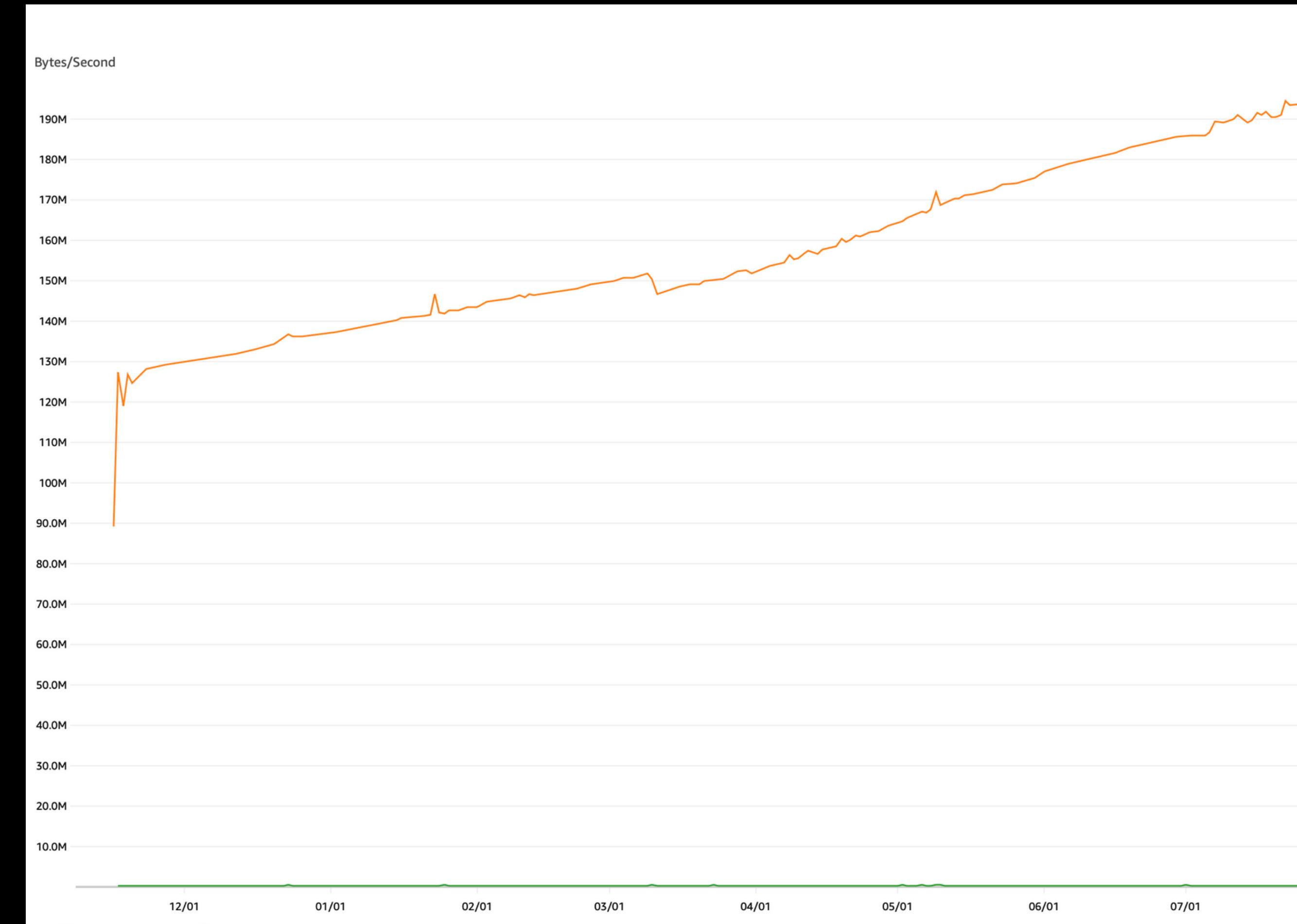
- Billed read I/O operations from a cluster volume
- Aggregated from all instances in the Aurora DB cluster



# Storage Network Throughput

## Write vs Read Instances

- Per Instance Metric
- Measure of Network traffic to/  
from storage not the client



# The Culprit

## Read Replica

## Query

1

2

3

## Total Rows Scanned

15 Million

114 Million

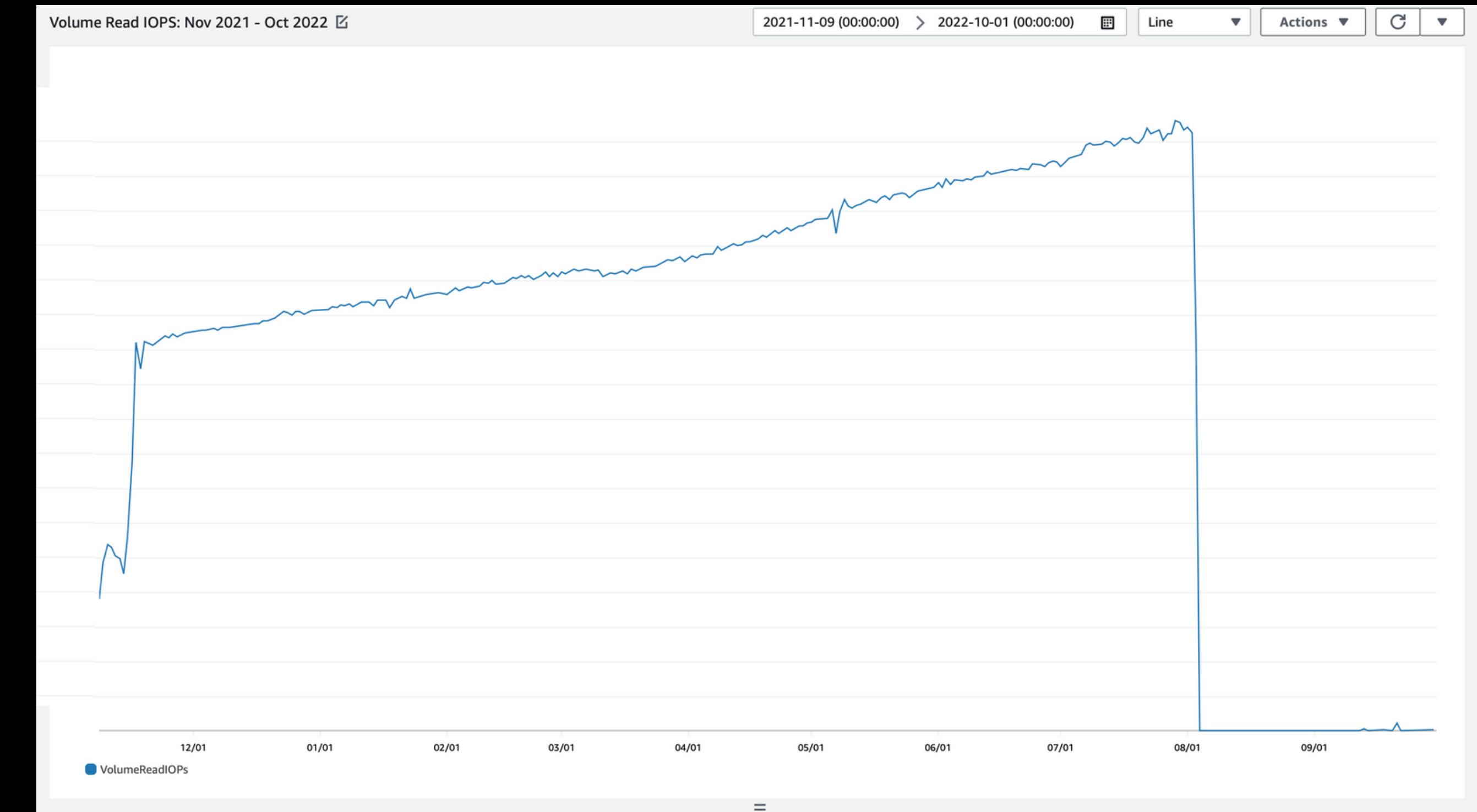
114 Million

# The Outcome

# Volume Read IOPS

## Nov 2021 - Oct 2022

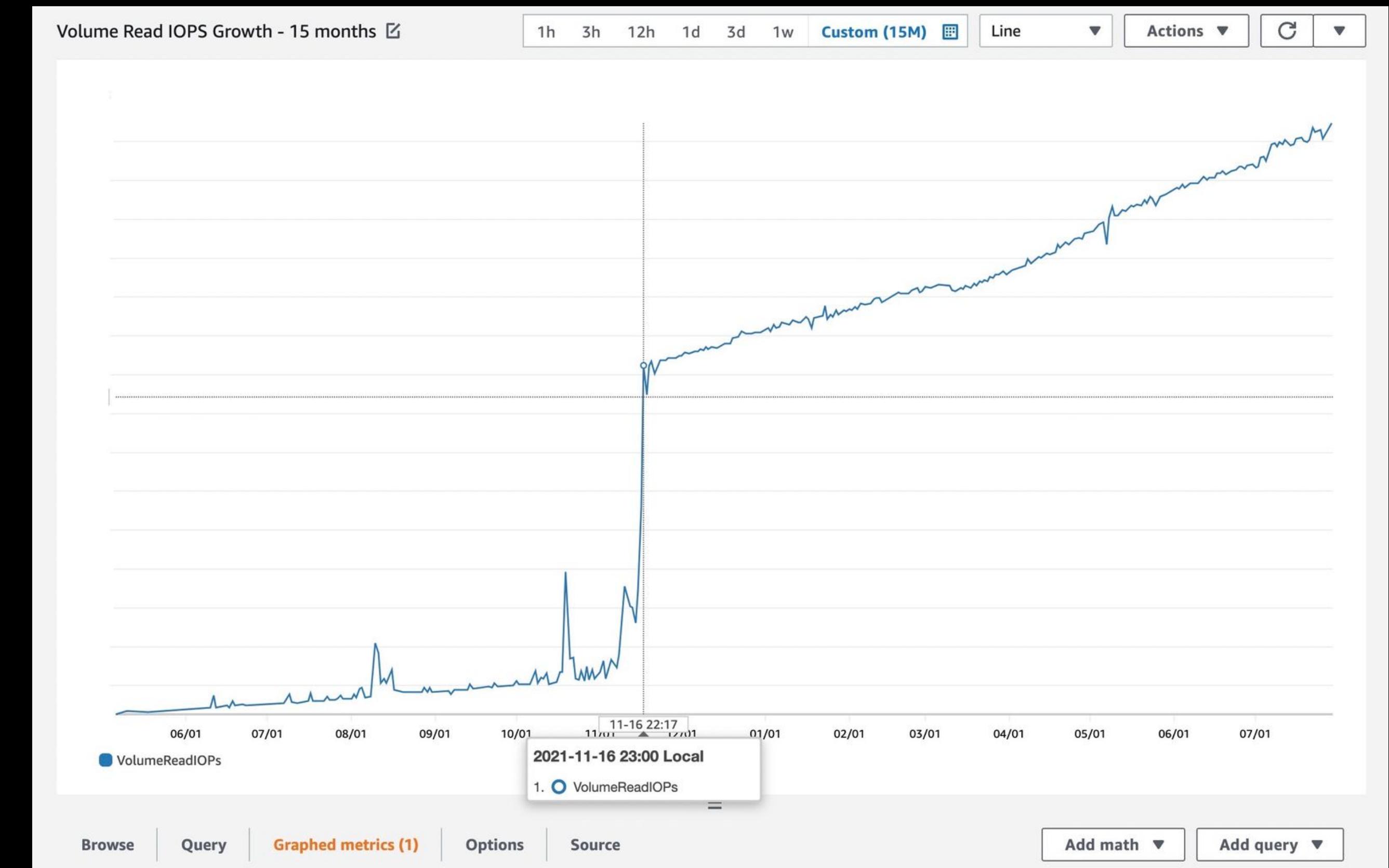
- On August 3rd we turned off the 3 Lambdas
- The Volume Read IOPS immediately dropped



# Volume Read IOPS

## That Spike

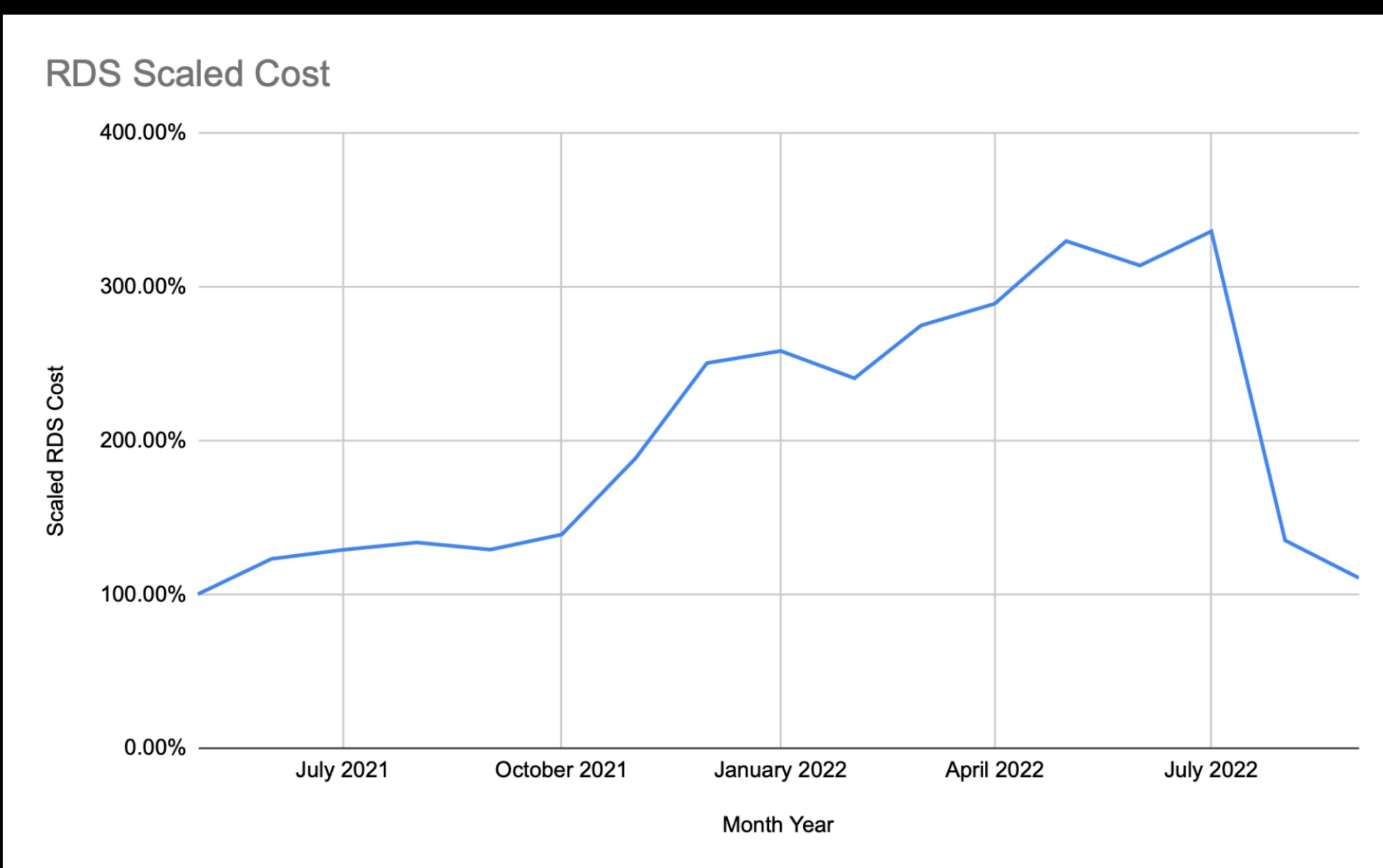
- What happened on Nov 11, 2021
- Unsolved but Theory
- Buffer Pool



# RDS Scaled Costs

## May 2021 - September 2022

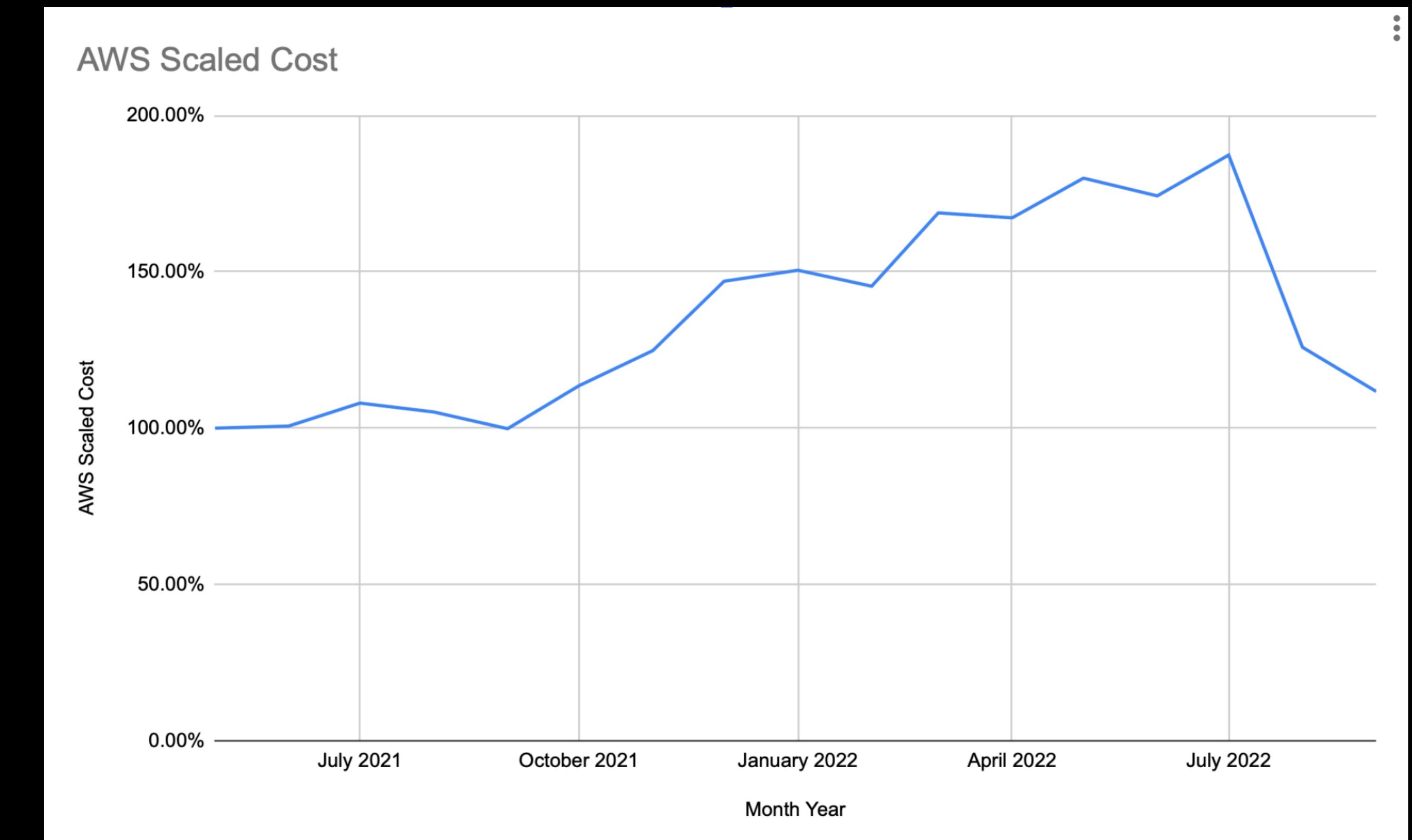
- RDS costs just 10% in September 2022 from May 2021



# AWS Scaled Costs

## May 2021 - September 2022

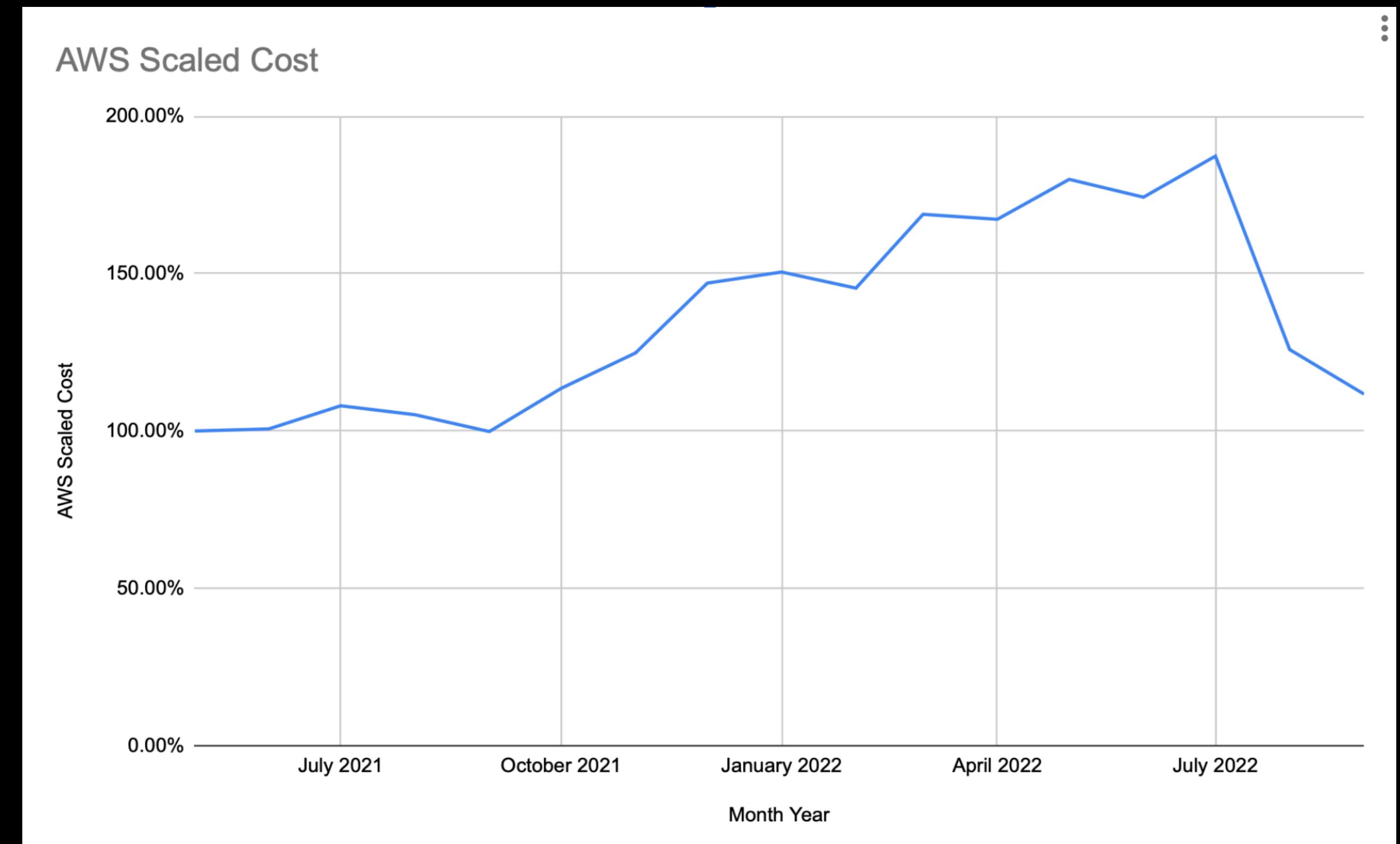
- AWS costs just 10% higher in September 2022 from May 2021





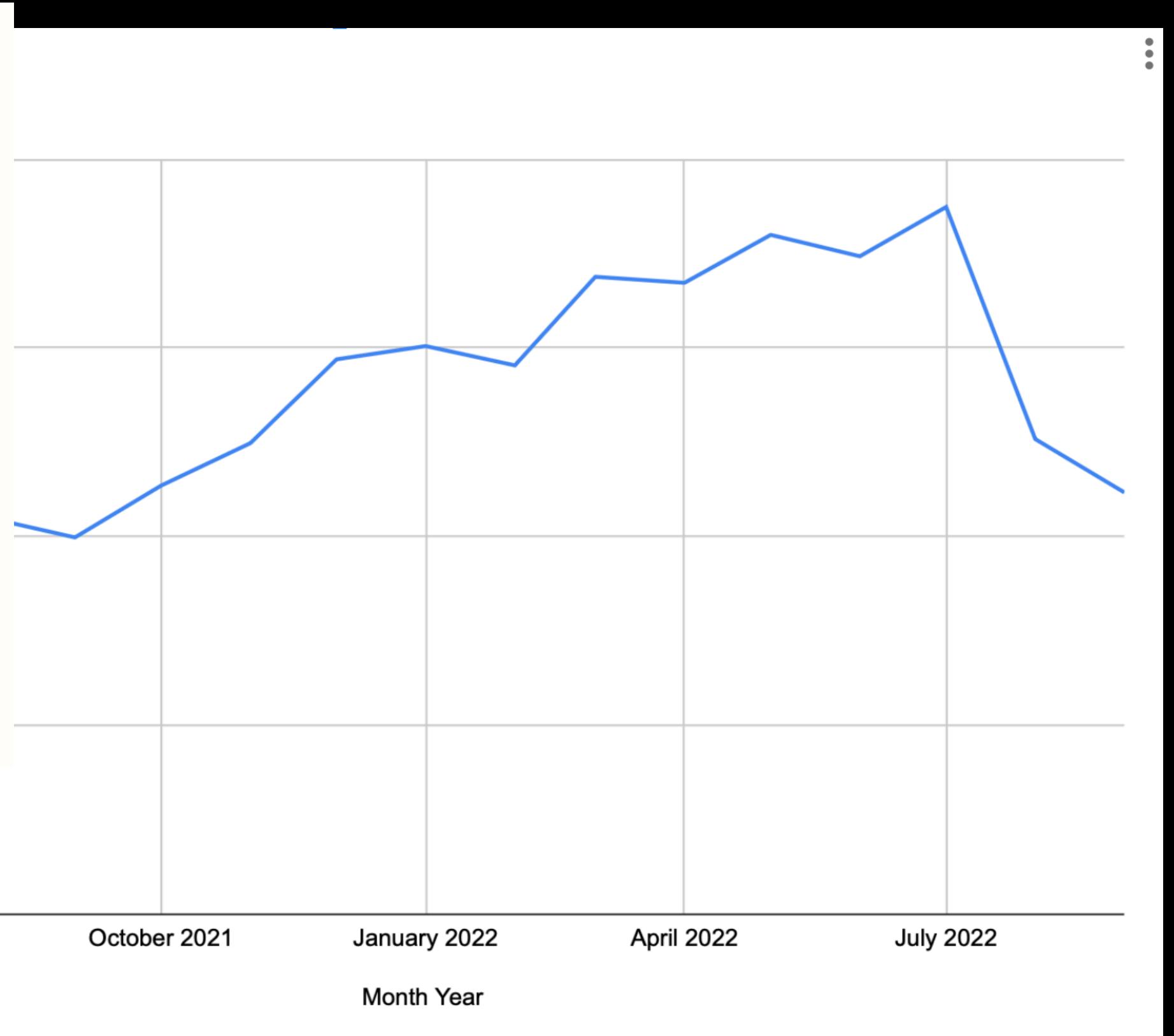
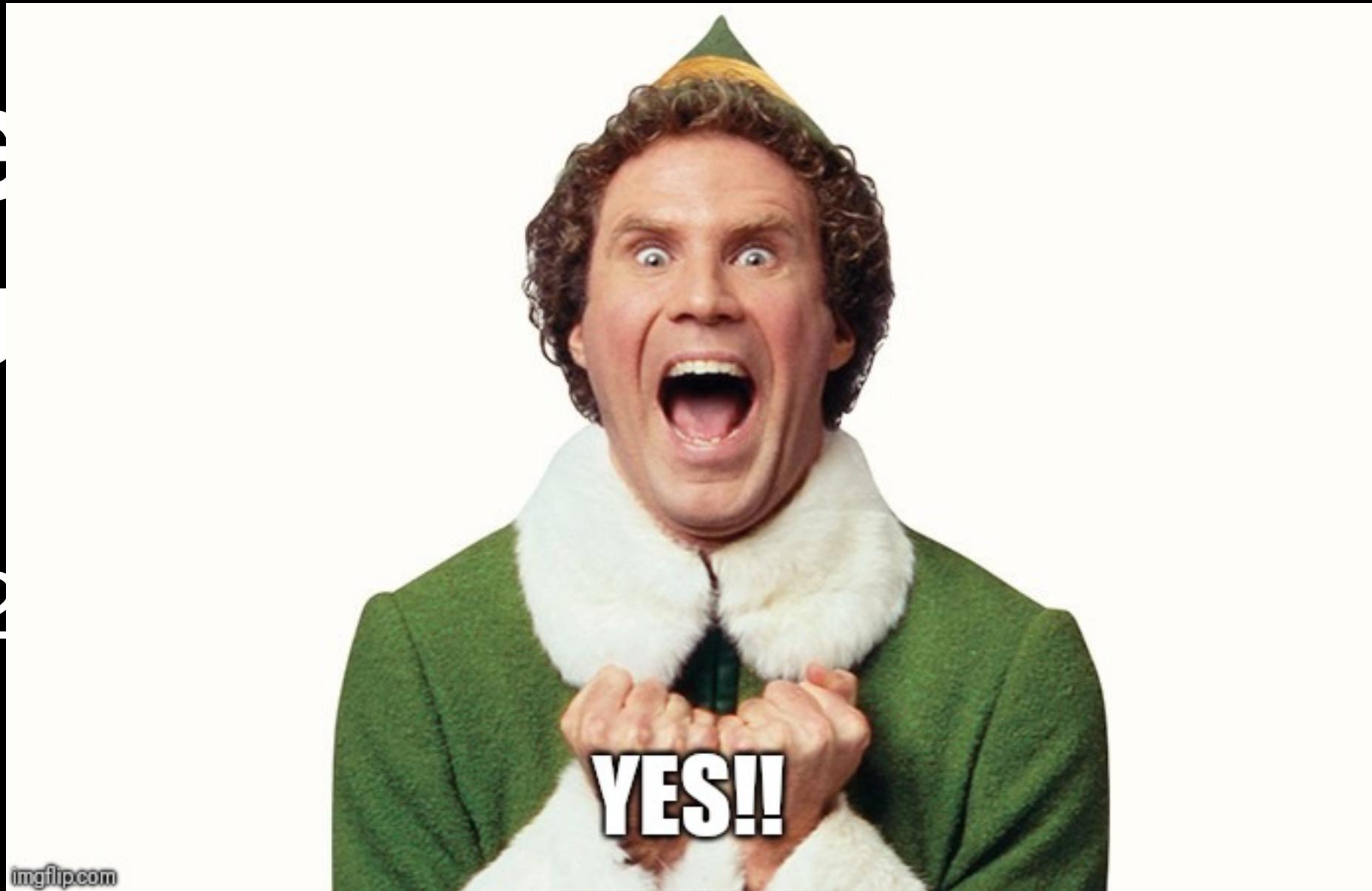
# ed Costs gust 2022

- September 2022 Bill just 10% higher than May 2021 Bill



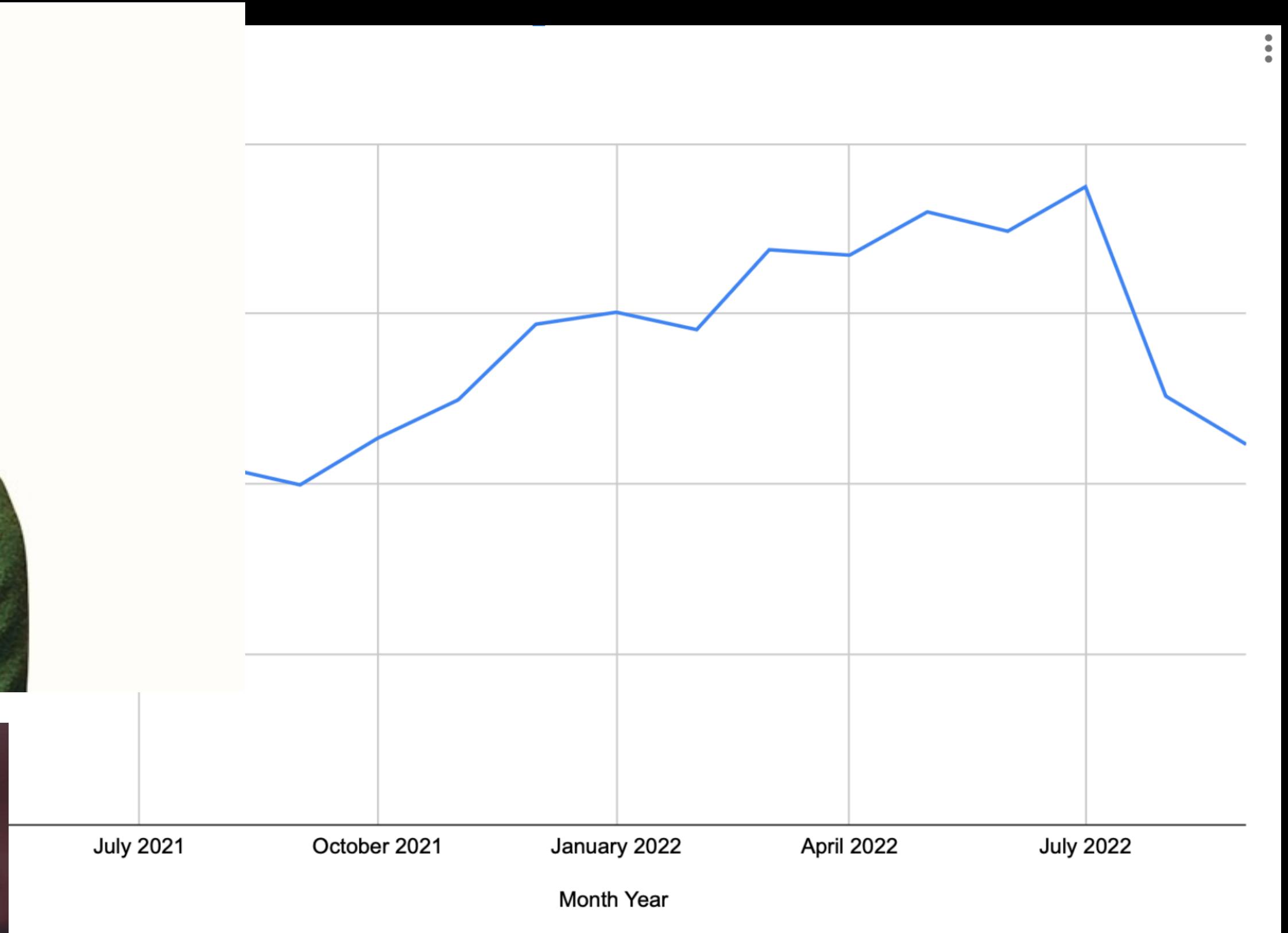


- September 2022 higher than May



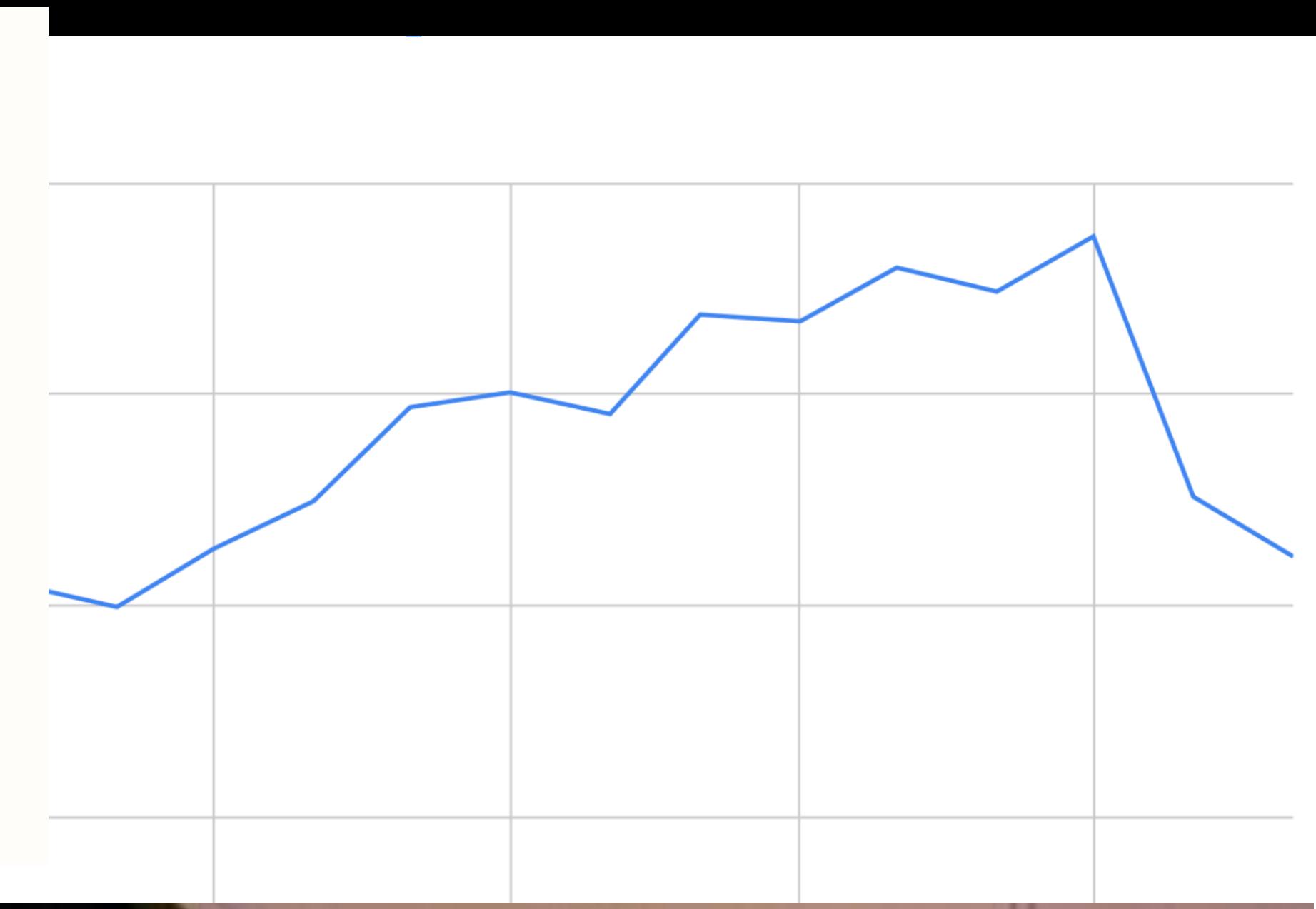


- September 2022 higher than May





- September 2022 higher than May



# Tool Review

## The Tools of the Trade

# Cost Explorer

## Explore AWS Costs

# **CloudWatch**

## **Metrics, Logs, and Alarms**

# Performance Insights

Performance Tool for RDS Databases



Thank You

The Twist

Why are we here?

# Lessons

M.C.U.?

# MONITOR

The Things You Care About

# CAST

A Wide Net

# UNDERSTAND

What You Do Not Know

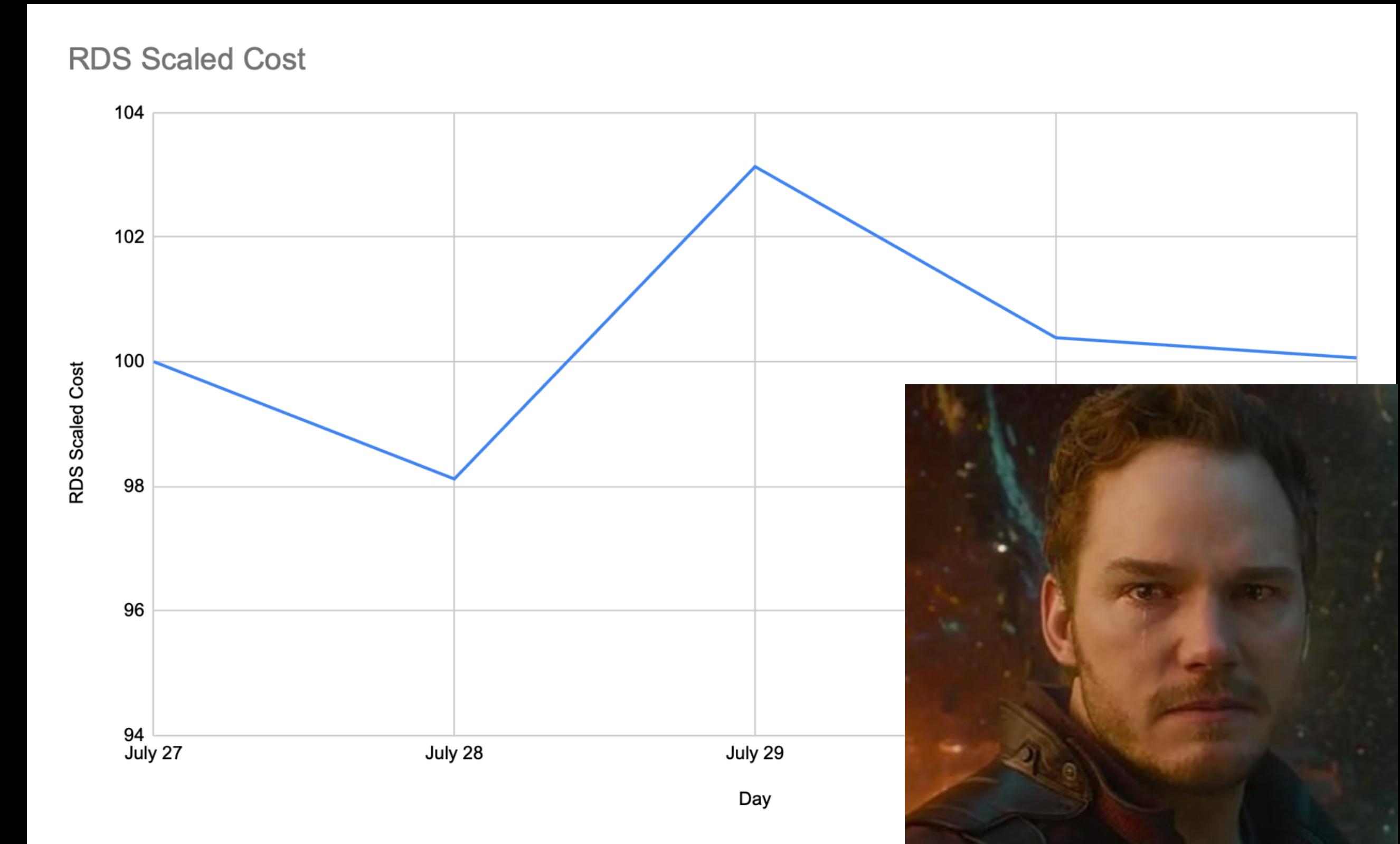
# THINK

About The Problem

# Daily RDS Cost

July 27, 2022 - July 31, 2022

- Shutdown query on July 28, 2022
- Saw slight decline on RDS
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- Overall little to no impact



## RDS Scaled Cost



“If I had an hour to solve a problem I'd spend 55 minutes thinking about the problem and 5 minutes thinking about solutions.”

- Albert Einstein

for more like this

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# Questions?

**Thank You!**  
**THINK, You!**