

Control y Gestión de Costes

Posgrado Cloud Computing Architecture



UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH



Narratives

CAPEX vs. OPEX

- Story to change financial outcomes

CAPEX

Invest and be tied for several years

OPEX

Be **agile** and **adapt to changes**

Total Cost of Ownership (TCO)

- Visualize all costs concepts:
 - Energy
 - Space
 - Licenses
 - People
 - HW renovation
 - Network appliances, bandwidth, fibers, interconnections
 - Indirect costs (marketing, certifications,...)

Be aware of **shadow IT**

<https://azure.microsoft.com/en-in/pricing/tco/calculator/>

<https://calculator.aws/#/addService>

Counter narrative:

<https://dev.37signals.com/our-cloud-spend-in-2022/>

<https://world.hey.com/dhh/we-have-left-the-cloud-251760fb>

Storage costs

Storage procurement cost/GB for local disk/SAN-SSD ⓘ

3 USD

Storage procurement cost/GB for local disk/SAN-HDD ⓘ

2 USD

Storage procurement cost/GB for NAS/file storage ⓘ

2 USD

Storage procurement cost/GB for Blob storage ⓘ

2 USD

Annual enterprise storage software support cost ⓘ

10 %

Cost per tape drive ⓘ

4500 USD

IT labor costs

Number of physical servers that can be managed by a full time administrator

387

Number of virtual machines that can be managed by a full time administrator

516

Hourly rate for IT administrator ⓘ

50 USD

Other assumptions

The following assumptions also affect the TCO model, but typically require less adjustment by customers. You can come back to this section at any time and adjust the assumptions.

⌵ Hardware costs ⓘ

⌵ Software costs ⓘ

⌵ Electricity costs ⓘ

⌵ Virtualisation costs

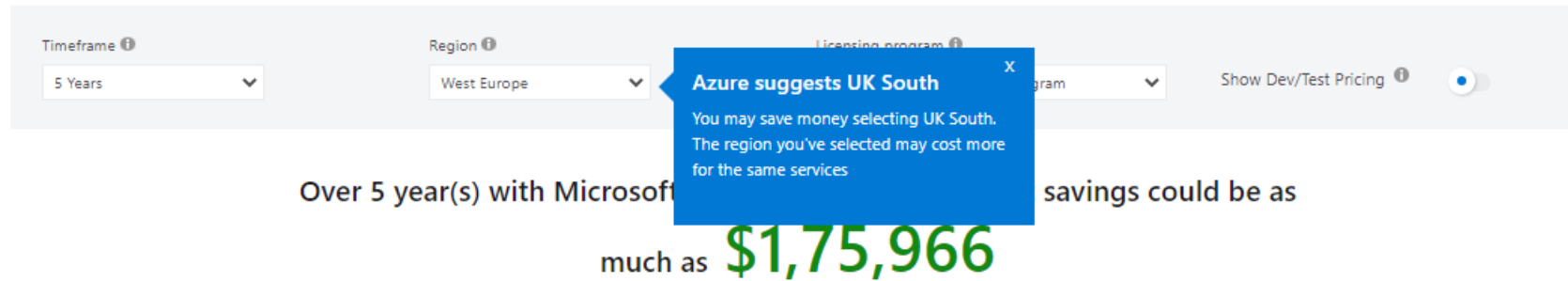
⌵ Data center costs

⌵ Networking costs

⌵ Database costs ⓘ

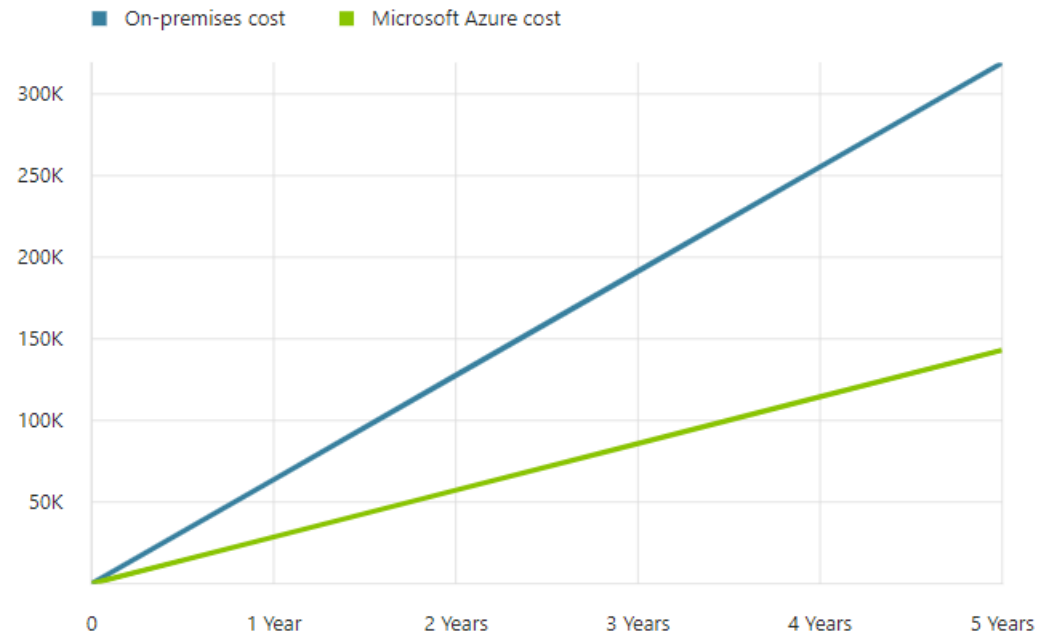
⌵ Data warehouse costs

View report



Total on-premises vs. Azure cost over time

Savings from running workloads in Azure accrue over time. The following shows how those savings add up over years.



Common misunderstandings – Real Life

- “It’s free to create VMs on our VMWARE deployment”
- “Comparing 1-1 VM size it’s much more expensive”
- “We have done comparisons and it’s much more expensive”

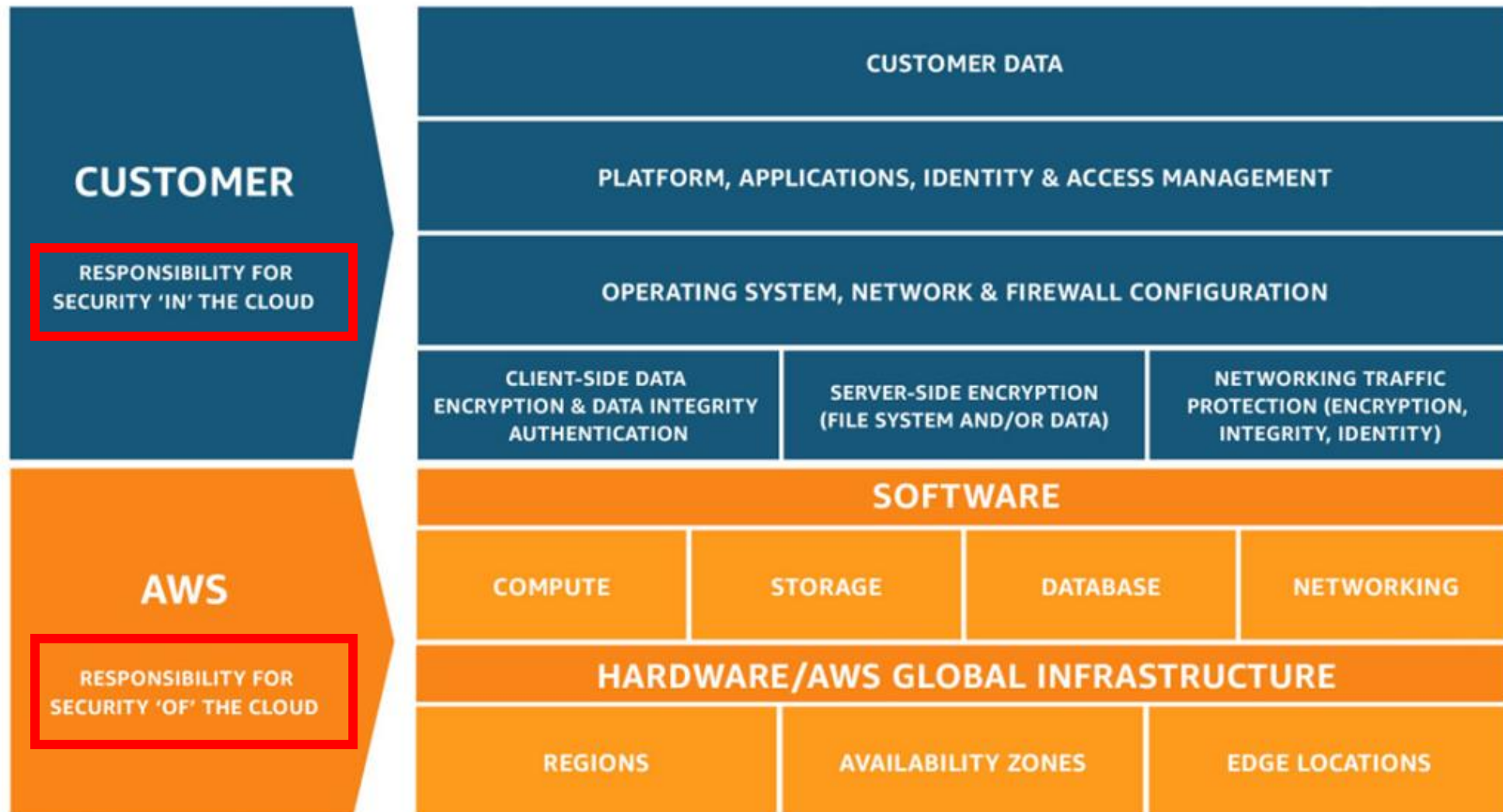
Shared Responsibility model

Responsibility		SaaS	PaaS	IaaS	On-prem
Responsibility always retained by the customer	Information and data	Customer	Customer	Customer	Customer
	Devices (Mobile and PCs)	Customer	Customer	Customer	Customer
	Accounts and identities	Customer	Customer	Customer	Customer
Responsibility varies by type	Identity and directory infrastructure	Shared	Shared	Customer	Customer
	Applications	Microsoft	Shared	Customer	Customer
	Network controls	Microsoft	Shared	Customer	Customer
	Operating system	Microsoft	Microsoft	Customer	Customer
Responsibility transfers to cloud provider	Physical hosts	Microsoft	Microsoft	Microsoft	Customer
	Physical network	Microsoft	Microsoft	Microsoft	Customer
	Physical datacenter	Microsoft	Microsoft	Microsoft	Customer

■ Microsoft ■ Customer ■ Shared

team work

AWS Shared Responsibility model





Usual costs

compute ~ 50%

storage ~ 30%

Networking ~ 10%

Rest ~ 10%

Focus on low hanging fruits



AWS Cost

AWS Aggregation costs

- Standard Aggregation:
 - Each **AWS Account has its own billing invoice**
 - New enterprise models, with the incorporation of AWS Organizations and Control Tower enable aggregating several AWS Accounts
- Flexible and custom cost aggregation: **Tags**
 - Used for other purposes (technical, ownership identification) but also for cost aggregation and integrated with AWS Billing services

Tags

- Main cost visualization tool: **Cost allocation tags**
 - Dynamic grouping of costs adapting to the company requirements
 - Managed at the payer account (AWS Organization root account) level
- Usual cost tags:
 - *Departments*
 - *Applications*
 - *Environments*
 - *Cost-center*
 - *Country*
 - *Product*



Tags

- Be aware that not all resources support tagging (~network traffic)
 - Might use “cost categories” to add transversal costs
<https://docs.aws.amazon.com/awsaccountbilling/latest/aboutv2/manage-cost-categories.html>
- Cost categories:
 - enable showback,
 - chargeback and
 - cost reconciliation

AWS Trusted Advisor

- Free recommendations
- Improved support plan->more recommendations

Trusted Advisor

Recommendations

Cost optimization

Performance

Security

Fault tolerance

Service limits

▼ Preferences

Manage Trusted Advisor

Notifications

Trusted Advisor > Recommendations

Trusted Advisor Recommendations

Refresh all checks

Download all checks

Use this page to get an overview of the check results in your AWS account. Choose a check name or category to view the recommended actions or potential issues that Trusted Advisor has identified. Each check provides more information about how to address any issues. You can also download a summary of all check results. [Learn more](#)

Checks summary

0

Action recommended

Info

0

Investigation recommended

Info

0

Checks with excluded items

Info

AWS Billing

Bills

Cost and Usage
Reports

Cost Explorer

Data Exports

New!! reinvent 2023

<https://aws.amazon.com/blogs/aws-cloud-financial-management/introducing-data-exports-for-billing-and-cost-management/>

AWS Billing

A solid orange rectangle with the word "Bills" centered inside it in white text.

Bills


AWS Bills

- Financial monthly payment data
- Received via post mail and available in the AWS Console

[AWS Billing](#) > [Bills](#)

Bills [Info](#)

Page refresh time: Tuesday, May 16, 2023 at 9:36:36 AM GMT+2

 Download all to CSV

Print

May 2023 ▲



May 2023

April 2023

March 2023

February 2023

January 2023

2022 ▶

2021 ▶

2020 ▶

2019 ▶

2018 ▶

AWS estimated bill summary [Info](#)

Total charges and payment information

Account ID

798146304305

Billing period [Info](#)

May 1 - May 31, 2023

Bill status [Info](#)

⌚ Pending

Service provider

Amazon Web Services EMEA SARL

Estimated grand total:

USD 0.00



AWS estimated bill summary

Service provider	Total in USD
Amazon Web Services EMEA SARL	USD 0.00
Estimated grand total:	USD 0.00

Payment information (0)

Total received payments USD 0.00

No data to display.

Highest estimated cost by service provider

Amazon Web Services EMEA SARL

Highest service spend	
Service name	Simple Notification Service
Highest service spend	USD 0.00
Trend compared to prior month	No data
Highest AWS Region spend	
Region name	EU (Ireland)
Highest AWS Region spend	USD 35.73
Trend compared to prior month	↑ 46.1%

Charges by service

Amazon Web Services EMEA SARL (20)

Total pre-tax USD 0.00

Description	Usage Quantity	Amount in USD
API Gateway		USD 0.00
No Region		(USD 0.01)
AAI_Vocareum, credit from account: 798146304305	Credit	(USD 0.01)
EU (Ireland)		USD 0.01
Amazon API Gateway ApiGatewayHttpApi		USD 0.01
\$1.11/million requests - API Gateway HTTP API (first 300 million)	6,418 Requests	USD 0.01
US East (N. Virginia)		USD 0.00
Amazon API Gateway ApiGatewayHttpApi		USD 0.00
\$1/million requests - API Gateway HTTP API (first 300 million)	3 Requests	USD 0.00
CloudFront		USD 0.00
Canada (Central)		USD 0.00
Amazon CloudFront CA-Requests-Tier1		USD 0.00
\$0.000 per request - HTTP or HTTPS under the global monthly free tier	1 Requests	USD 0.00
Amazon CloudFront CA-Requests-Tier2-HTTPS		USD 0.00
\$0.000 per request - HTTP or HTTPS under the global monthly free tier	1 Requests	USD 0.00
Bandwidth		USD 0.00
\$0.000 per GB - data transfer out under the global monthly free tier	0 GB	USD 0.00

AWS Billing

Cost and Usage
Reports

AWS Billing: Cost and Usage Reports

- Create a periodic report that is stored in S3
- Get a detailed .csv
 - Hard to consume via Excel
- Compatible with Athena and Quicksight

Home

Billing

Bills

Payments

Credits

Purchase orders

Cost & usage reports

Cost categories

Cost allocation tags

AWS Billing > Cost and Usage Reports


Cost and Usage Reports [Info](#)

Cost and Usage Reports (2)

 Settings

Actions ▼

Create report

<input type="checkbox"/>	Report name ▲	S3 bucket 	▼	Time granularity ▼	Data last refreshed ▼
<input type="checkbox"/>	AthenaCUR	posgrado-upc-athena-cur		Hourly	May 16, 2023, 06:27 (UTC+02:00)
<input type="checkbox"/>	samuelCURreport	posgrado-upc-cost-usage-report		Hourly	May 16, 2023, 06:27 (UTC+02:00)

	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	
	lineItem/UsageStart	lineItem/UsageEnd	lineItem/ProductCode	lineItem/UsageType	lineItem/Operation	lineItem	lineItem	lineItem/UsageAmount	lineItem	lineItem	lineItem	lineItem	lineItem	lineItem	lineItem	lineItem	lineItem	product/ProductName	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ	produ
21	2023-05-01T00:00:00	2023-06-01T00:00:00	AmazonEC2					10,000,000,000			USD	0.0000000000	0.0000000000	Tax for VAT	Amazon	Amazon Elastic Compute Cloud																										
22	2023-05-01T00:00:00	2023-06-01T00:00:00	AmazonEC2					10,000,000,000			USD	0.0000000000	0.0000000000	Tax for VAT	Amazon	Amazon Elastic Compute Cloud																										
23	2023-05-01T00:00:00	2023-06-01T00:00:00	AmazonEC2					10,000,000,000			USD	0.0000000000	0.0000000000	Tax for VAT	Amazon	Amazon Elastic Compute Cloud																										
24	2023-05-01T00:00:00	2023-05-02T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	-0.115000	-0.115000	-0.115000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
25	2023-05-02T00:00:00	2023-05-03T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	0.120000	0.120000	0.120000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
172	2023-05-03T00:00:00	2023-05-04T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	-0.120000	-0.120000	-0.120000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
238	2023-05-04T00:00:00	2023-05-05T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	-0.120000	-0.120000	-0.120000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
243	2023-05-05T00:00:00	2023-05-06T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	-0.120000	-0.120000	-0.120000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
389	2023-05-06T00:00:00	2023-05-07T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	-0.120000	-0.120000	-0.120000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
420	2023-05-07T00:00:00	2023-05-08T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	-0.120000	-0.120000	-0.120000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
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599	2023-05-09T00:00:00	2023-05-10T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	0.120000	0.120000	0.120000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
613	2023-05-10T00:00:00	2023-05-11T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	-0.120000	-0.120000	-0.120000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
678	2023-05-11T00:00:00	2023-05-12T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	-0.120000	-0.120000	-0.120000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
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750	2023-05-12T00:00:00	2023-05-13T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	-0.12000	-0.12000	-0.12000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
751	2023-05-12T00:00:00	2023-05-13T00:00:00	AmazonEC2	EU-NatGateway-Bytes	NatGateway			0.0000000000			USD	-0.25400	-0.25400	-0.25400	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
752	2023-05-12T00:00:00	2023-05-13T00:00:00	AmazonEC2	EU-NatGateway-Hours	NatGateway			0.0000000000			USD	0.0000000000	0.0000000000	0.0000000000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
825	2023-05-13T00:00:00	2023-05-14T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	-0.12000	-0.12000	-0.12000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
826	2023-05-13T00:00:00	2023-05-14T00:00:00	AmazonEC2	EU-NatGateway-Bytes	NatGateway			0.0000000000			USD	-0.00281	-0.00281	-0.00281	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
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907	2023-05-14T00:00:00	2023-05-15T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	-0.12000	-0.12000	-0.12000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
908	2023-05-14T00:00:00	2023-05-15T00:00:00	AmazonEC2	EU-NatGateway-Bytes	NatGateway			0.0000000000			USD	-0.00431	-0.00431	-0.00431	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
909	2023-05-14T00:00:00	2023-05-15T00:00:00	AmazonEC2	EU-NatGateway-Hours	NatGateway			0.0000000000			USD	*****	*****	*****	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
997	2023-05-15T00:00:00	2023-05-16T00:00:00	AmazonEC2	EU-ElasticPdbIdAddress				0.0000000000			USD	-0.12000	-0.12000	-0.12000	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
998	2023-05-15T00:00:00	2023-05-16T00:00:00	AmazonEC2	EU-NatGateway-Bytes	NatGateway			0.0000000000			USD	-0.11443	-0.11443	-0.11443	AAL_Vocareum, cr	Amazon	Amazon Elastic Compute Cloud																									
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1322	2023-05-01T15:00:00	2023-05-01T16:00:00	AmazonEC2	EU-USE2-AWS-Out-Bytes	PublicIP-Out			i-06e331 0.0000005896			USD	0.02000	0.00000	0.02000	0.00000	0.02	per GB	EU Amazon	Amazon Elastic Compute Cloud																							
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1324	2023-05-02T22:00:00	2023-05-02T23:00:00	AmazonEC2	EU-USE2-AWS-Out-Bytes	PublicIP-Out			i-04fd93c 0.0000000878			USD	0.02000	0.00000	0.02000	0.00000	0.02	per GB	EU Amazon	Amazon Elastic Compute Cloud																							
1325	2023-05-04T12:00:00	2023-05-04T13:00:00	AmazonEC2	EU-USE2-AWS-Out-Bytes	PublicIP-Out			i-06e331 0.00002934875			USD	0.02000	0.00000	0.02000	0.00000	0.02	per GB	EU Amazon	Amazon Elastic Compute Cloud																							
1326	2023-05-04T13:00:00	2023-05-04T14:00:00	AmazonEC2	EU-USE2-AWS-Out-Bytes	PublicIP-Out			i-06e331 0.0000275169			USD	0.02000	0.00000	0.02000	0.00000	0.02	per GB	EU Amazon	Amazon Elastic Compute Cloud																							
1327	2023-05-12T01:00:00	2023-05-12T02:00:00	AmazonEC2	EU-USE2-AWS-Out-Bytes	PublicIP-Out			i-06e331 0.0000043481			USD	0.02000	0.00000	0.02000	0.00000	0.02	per GB	EU Amazon	Amazon Elastic Compute Cloud																							
1328	2023-05-12T23:00:00	2023-05-13T00:00:00	AmazonEC2	EU-USE2-AWS-Out-Bytes	PublicIP-Out			i-04fd93c 0.00000052508			USD	0.02000	0.00000	0.02000	0.00000	0.02	per GB	EU Amazon	Amazon Elastic Compute Cloud																							
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1330	2023-05-13T02:00:00	2023-05-13T03:00:00	AmazonEC2	EU-USE2-AWS-Out-Bytes	PublicIP-Out			i-06e331 0.000000000373			USD	0.02000	0.00000	0.02000	0.00000	0.02	per GB	EU Amazon	Amazon Elastic Compute Cloud																							
1331	2023-05-14T09:00:00	2023-05-14T10:00:00	AmazonEC2	EU-USE2-AWS-Out-Bytes	PublicIP-Out			i-06e331 0.000000000078			USD	0.02000	0.00000	0.02000	0.00000	0.02	per GB	EU Amazon	Amazon Elastic Compute Cloud																							
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aws

Services

Search

[Alt+S]

N. Virginia

samuel.osorio @ infoprogramarc

Amazon Athena

Query editor

Notebook editor

New

Notebook explorer

New

Jobs

Workflows

Powered by Step Functions

Administration

Workgroups

Capacity reservations

New

Turn on compact mode

Data

Data source

AwsDataCatalog

Database

athenacurcfn_athena_c_u_r

Tables and views

Create

line_item_unblended

Tables (1)

athenacur

line_item_unblended_rate

string

line_item_unblended_cost

double

Views (0)

Query 2

Query 3

Query 4

1

2

3

4

5

6

7

8

9

10

11

SELECT

line_item_usage_type,

SUM(line_item_unblended_cost) AS total_cost

from

athenacur

where

line_item_operation = 'NatGateway'

GROUP BY

line_item_usage_type

ORDER BY

total_cost DESC;

SQL

Ln 1, Col 1

Run again

Explain

Cancel

Clear

Create

Reuse query results

Athena engine version 3 only

Query results

Query stats

Completed

Time in queue: 150 ms

Run time: 781 ms

Data scanned: 34.48 KB

Results (2)

Copy

Download results

Search rows

#

line_item_usage_type

total_cost

1

EU-NatGateway-Bytes

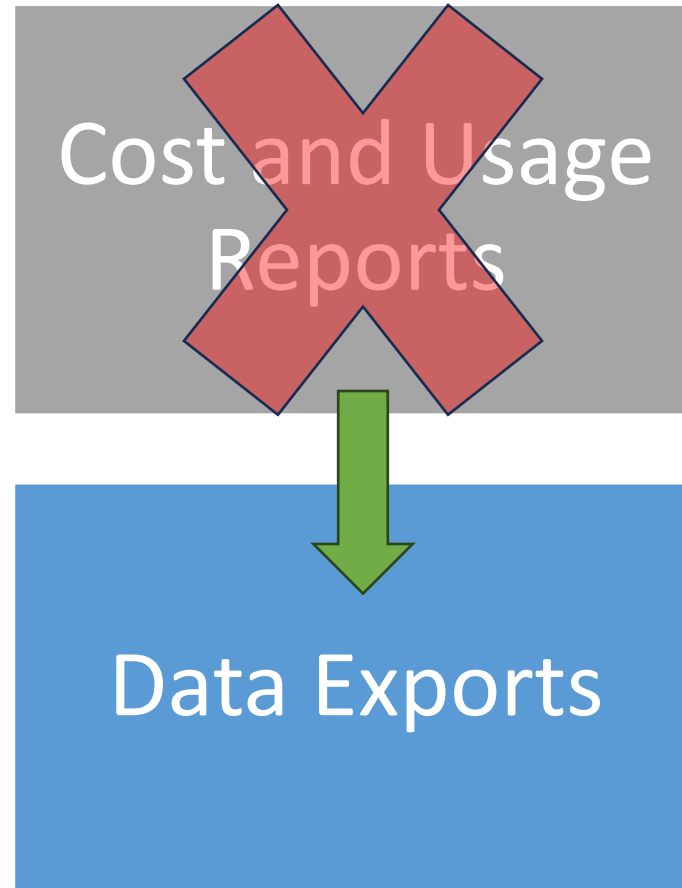
4.999997898352815E-10

2

EU-NatGateway-Hours

3.8719027983802334E-15

AWS Billing



New!! reinvent 2023

<https://aws.amazon.com/blogs/aws-cloud-financial-management/introducing-data-exports-for-billing-and-cost-management/>

Data Exports

- More granular and customizable fields (columns) exported into an S3 Bucket
- Integrated export to QuickSight dashboards
- Leverage SQL syntax to select data to be exported
- Custom data schema, not depending on AWS modifying CUR export set.
- Use cases:
 - Create specific exports, avoiding central discounts or access to other's BU expenses

Data Exports: limitations

- From (<https://docs.aws.amazon.com/cur/latest/userguide/dataexports-processing.html>):
 - **“Currently, Data Exports doesn't provide the SQL file for setting up Athena** to query your exports like Cost and Usage Reports (CUR) does. However, you can still manually set up Athena to query your exports. We recommend that you use the Apache Parquet file format and overwrite preference for Athena.”
 - **“Currently, Data Exports doesn't provide the SQL file for setting up Redshift** to query your exports like Cost and Usage Reports (CUR) does. However, you can still manually set up Redshift to query your exports. We recommend that you use the gzip/csv compression and file format for Redshift.”

AWS Billing

Cost Explorer

AWS Cost Management

- Home
- Cost Explorer
- Reports
- Budgets
- Cost Anomaly Detection
- Rightsizing recommendations

- Savings Plans
 - Overview
 - Inventory
 - Recommendations
 - Purchase Savings Plans
 - Utilization report
 - Coverage report
- Cart 0

- Reservations
 - Overview
 - Recommendations
 - Utilization report
 - Coverage report

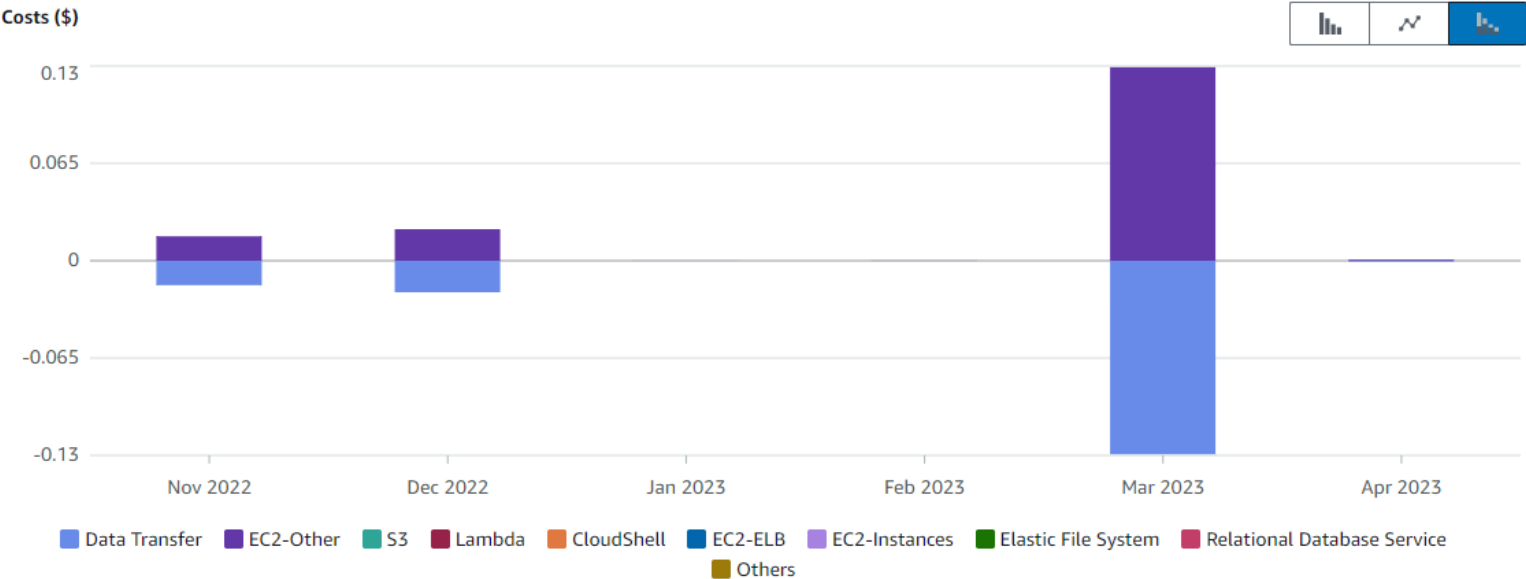
- Preferences
- Billing Console
- Documentation

Cost and usage graph

Total cost
\$0.00

Average monthly cost
\$0.00

Service count
30



Cost and usage breakdown

Find cost and usage data

Download as CSV

Service	Service total	November 2022	December 2022	January 2023	February 2023	March 2023	April 2023
Total costs	\$0.00	-\$0.00	\$0.00	\$0.00	-\$0.00	\$0.00	-\$0.00
EC2-Other	\$0.17	\$0.02	\$0.02	\$0.00	\$0.00	\$0.13	\$0.00

Report parameters

Time

Date Range

2022-11-01 — 2023-04-30

Displaying last 6 months

Granularity

Monthly

Group by

Dimension

Service

Filters

Applied filters (0)

Service

Choose services

Linked account

Choose linked accounts

Region

Choose regions

Instance type

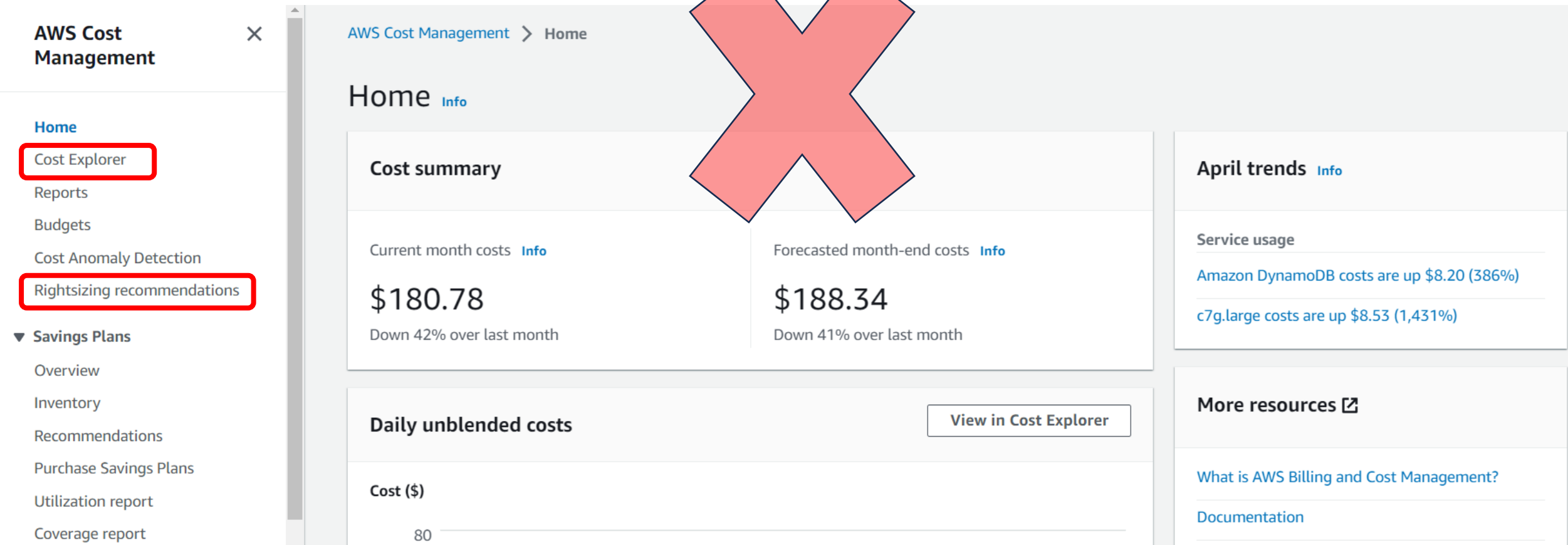
Choose instance types

Usage type

Choose usage types

AWS cost tools: Cost Explorer

- Rightsizing recommendations
- Enabled at payer account ~ root account of your AWS Organizations



The screenshot shows the AWS Cost Management console interface. A large red 'X' is overlaid on the main content area, indicating that the features shown are not available in the current account type.

AWS Cost Management [Close]

[AWS Cost Management](#) > [Home](#)

Home [Info](#)

Cost Explorer

Reports

Budgets

Cost Anomaly Detection

Rightsizing recommendations

Savings Plans

Overview

Inventory

Recommendations

Purchase Savings Plans

Utilization report

Coverage report

Cost summary

Current month costs [Info](#)

\$180.78
Down 42% over last month

Forecasted month-end costs [Info](#)

\$188.34
Down 41% over last month

Daily unblended costs

Cost (\$)

80

[View in Cost Explorer](#)

April trends [Info](#)

Service usage

Amazon DynamoDB costs are up \$8.20 (386%)

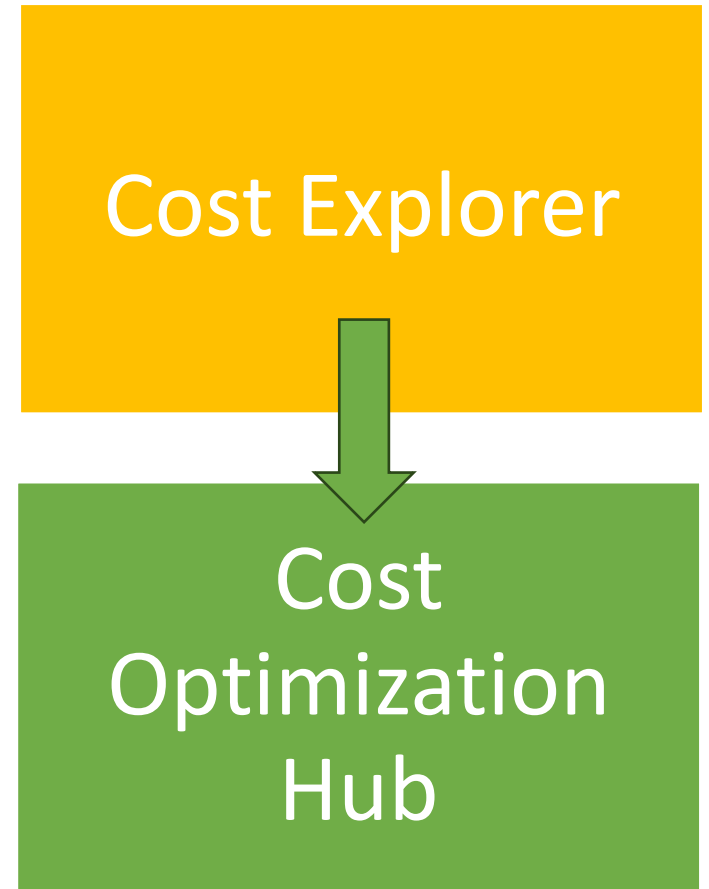
c7g.large costs are up \$8.53 (1,431%)

More resources [🔗](#)

[What is AWS Billing and Cost Management?](#)

[Documentation](#)

Cost Optimization Hub: reinvent 2023!!



New!! reinvent 2023

<https://aws.amazon.com/about-aws/whats-new/2023/11/cost-optimization-hub/>

New!! reinvent 2023

AWS Billing and Cost Management: New UI

The screenshot displays the AWS Billing and Cost Management console interface. The top navigation bar includes the AWS logo, a search bar, and user information. The left sidebar contains a navigation menu with categories like Billing and Payments, Cost Analysis, Cost Organization, Budgets and Planning, Savings and Commitments, and Preferences and Settings. The main content area is titled 'Billing and Cost Management home' and features several widgets: 'Cost summary' (showing month-to-date and forecasted costs), 'Cost monitor' (showing budget status and anomalies), 'Cost breakdown' (with a message about data preparation), 'Recommended actions' (with a 'Getting started' alert), 'Cost allocation coverage', and 'Savings opportunities'. Two items in the sidebar are highlighted with red boxes: 'Cost Explorer' under 'Cost Analysis' and 'Cost Optimization Hub' under 'Savings and Commitments'.

Billing and Cost Management

Home [New](#)

Getting Started [New](#)

Billing and Payments

Bills

Payments

Credits

Purchase Orders

Cost Analysis

Cost Explorer [New](#)

Cost Explorer Saved Reports

Cost Anomaly Detection

Free Tier

Data Exports [New](#)

Cost Organization

Cost Categories

Cost Allocation Tags

Billing Conductor [↗](#)

Budgets and Planning

Budgets

Budgets Reports

Pricing Calculator [↗](#)

Savings and Commitments

Cost Optimization Hub [New](#)

► Savings Plans

► Reservations

Preferences and Settings

Payment Preferences

Billing Preferences

Billing and Cost Management home [Info](#)

Cost summary [Info](#)

Month-to-date cost [Access denied](#)

Last month's cost for same time period [Access denied](#)

Total forecasted cost for current month [Access denied](#)

Last month's total cost [Access denied](#)

[View bill](#)

Cost monitor [Info](#)

Budgets status [Setup required](#)
No budget created

Cost anomalies status (MTD) [None detected](#)
1 monitor(s) active

Cost breakdown [Info](#)

We're preparing your cost and usage data from Cost Explorer. This process can take up to 24 hours after you first visit the Billing and Cost Management console. You can use Cost Explorer to visualize and analyze your cost and usage. [Learn more](#)

[Analyze your costs in Cost Explorer](#)

Recommended actions (1) [Info](#)

Getting started
Create a cost budget to receive alerts when your costs and usage exceed your budgeted amounts. [Create budget](#)

Cost allocation coverage [Info](#)

Savings opportunities [Info](#)

<https://us-east-1.console.aws.amazon.com/costmanagement/home#/home>

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AWS Cost Optimization Hub

- Centralize recommendation from
 - EC2 instance rightsizing recommendations
 - Graviton migration recommendations
 - Idle resource recommendations
 - Saving Plans recommendations
- Works across accounts and Regions.
- Before: different services offering recommendations
 - Difficult to centralize
 - Conflicting recommendations

AWS Billing

Bills

~~Cost and Usage
Reports~~

Cost Explorer

Data Exports

Cost
Optimization
Hub

New!! reinvent 2023



Demo Time

- Let's explore the AWS Console....

AWS cost tools: Budgets and alarms

- Able to get notification of preconfigured thresholds

[AWS Billing](#) > [Budgets](#) > Create budget

Step 1
[Choose budget type](#)

Step 2
Set your budget

Step 3
Configure alerts

Step 4 - *Optional*
Attach actions

Step 5
Review

Set your budget [Info](#)

▼ How to set up your budget



Step 1: Enter your budget details

Define the budget name.



Step 2: Set budget amount

Select the period and whether you would like to have a fixed budget or to specify a budget plan, then enter your budget amount.



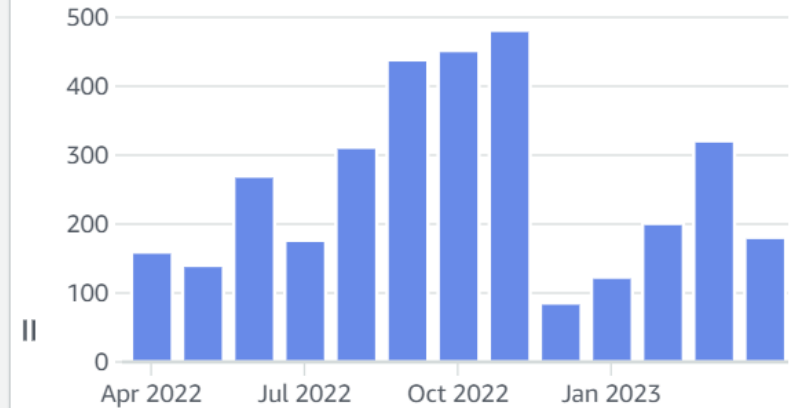
Step 3: Scope your budget - *optional*

Add dimensions of data to narrow on a set of cost information. For example, you could select a number of AWS services to

Budget preview

Cost Data

Apr 2022 - Apr 2023 (MTD) | Unblended costs



Actual cost

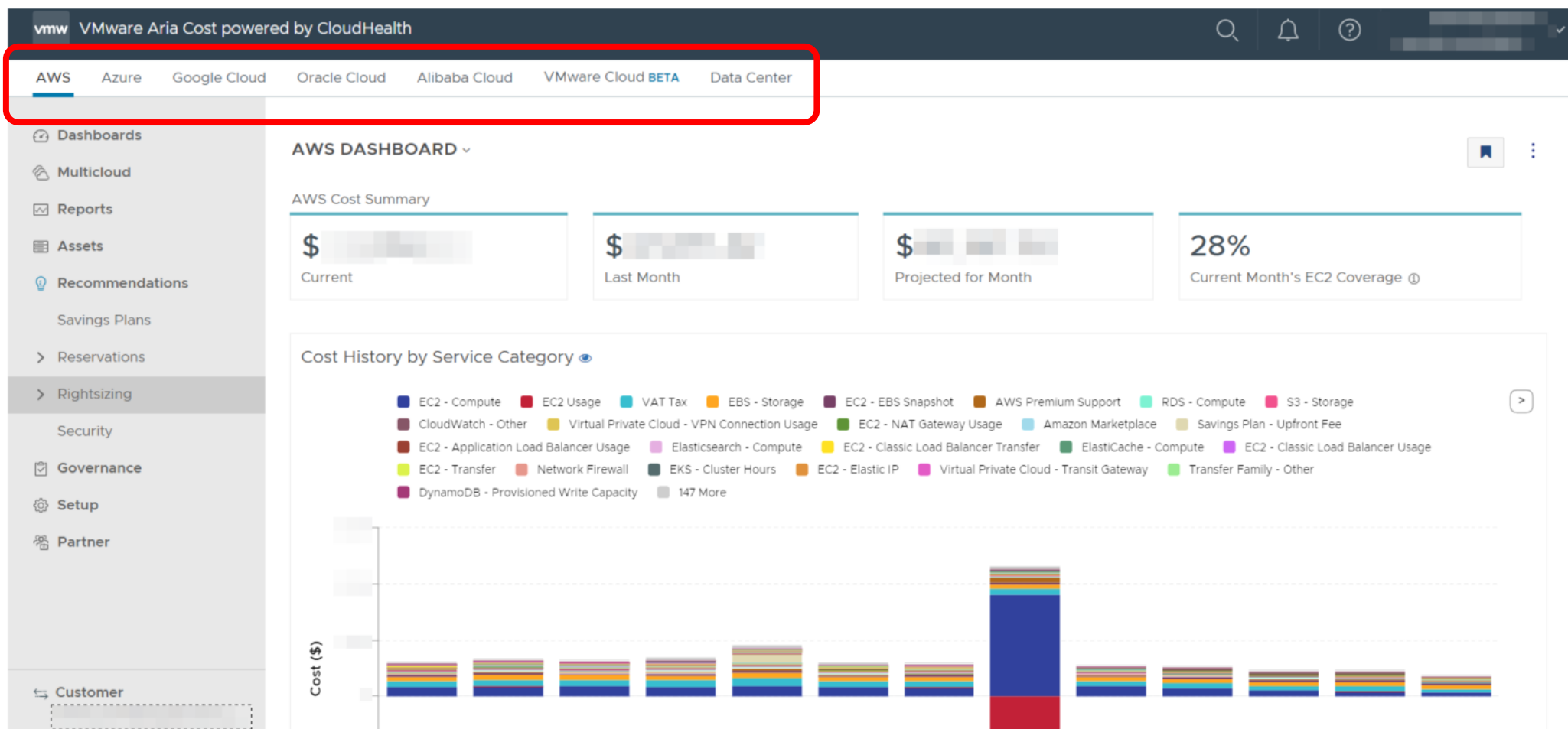
[View in AWS Cost Explorer](#)

Alerts

No alerts configured.

Multi cloud environments

Tools like CloudHealth or Cloudchecker might provide enhanced value



Lab Time

- Create and assign tags to AWS Resources
- Assign Cost Allocation Tags from above created tags
- Create budgets and alarms for your environment
 - Free Tier
 - Specific project with a Tag



Licensing

Licenses

- Native AWS services includes the required license
- Bring Your Own License (BYOL)
 - Use the current license that the Organization has
- Usually, **BYOL have lower costs** but must be managed by the Organization and renegotiated every expiration period.
- Programs optimize migration
 - Azure Hybrid Benefit
 - <https://azure.microsoft.com/en-gb/pricing/hybrid-benefit/#overview>



Cost Optimization

Cost Optimization strategies

Payment Mode

**Resource
Rightsizing**

**Remove
Unused/orphan
resources**

Lights ON/OFF

Storage tiers

Processor type

**Network
topology**

Region

Cost Optimization strategies

Payment Mode

Payment Modes

Select the most appropriate mode to the application lifecycle and features

On Demand

public price with the most flexibility

Reservations

commit for a given time (1,3 years) for reduced price

Saving Plans

like RI but simpler: committed price and not coupons (size/AZ/..)

Spot

max discount at the cost of interruptions

EC2 linux US East (Ohio) t4g.nano

Configure Amazon EC2 [Info](#)

Select the container and options to find your best price

☒ Compute Savings Plans

One plan that automatically applies to all usage on EC2, Fargate, and Lambda. Up to 66% discount. Learn about [Compute Savings Plan](#).

Reservation term

- ☐ 1 year
☒ 3 year

Payment Options

- ☐ No upfront
☐ Partial upfront
☒ All upfront

Upfront: 49.93

Monthly: 0.00/Month

☐ EC2 Instance Savings Plans

Get deeper discount when you only need one instance family and region. Up to 72% discount. Learn about [Instance Savings Plans](#)

Reservation term

- ☐ 1 year
☒ 3 year

Payment Options

- ☐ No upfront
☐ Partial upfront
☒ All upfront

Upfront: 42.05

Monthly: 0.00/Month

☐ On-Demand

Maximize flexibility. Learn about [On-Demand Instances](#)

Expected utilization

Enter the expected usage of Amazon EC2 instances

Usage

100

Usage type

Utilization percent per month

Instance: 0.0042/Hour

Monthly: 3.07/Month

☐ Spot Instances

Minimize cost by leveraging EC2's spare capacity. Recommended for fault tolerant and interruption tolerant applications. Learn about [Spot Instances](#)

The historical average discount for t4g.nano is 52%

Assume percentage discount for my estimate

52



Actual spot instance pricing varies

With spot instances, you pay the spot price that's in effect for the time period your instance is running

Instance: 0.0042/Hour

Monthly: 1.47/Month

▼ Other purchasing options

☐ Standard Reserved Instances

Learn about [Standard Reserved Instances](#).

Reservation term

- ☐ 1 year
☒ 3 year

Payment Options

- ☐ No upfront
☐ Partial upfront
☒ All upfront

Upfront: 41.00

Monthly: 0.00/Month

☐ Convertible Reserved Instances

Learn about [Convertible Reserved Instances](#).

Reservation term

- ☐ 1 year
☒ 3 year

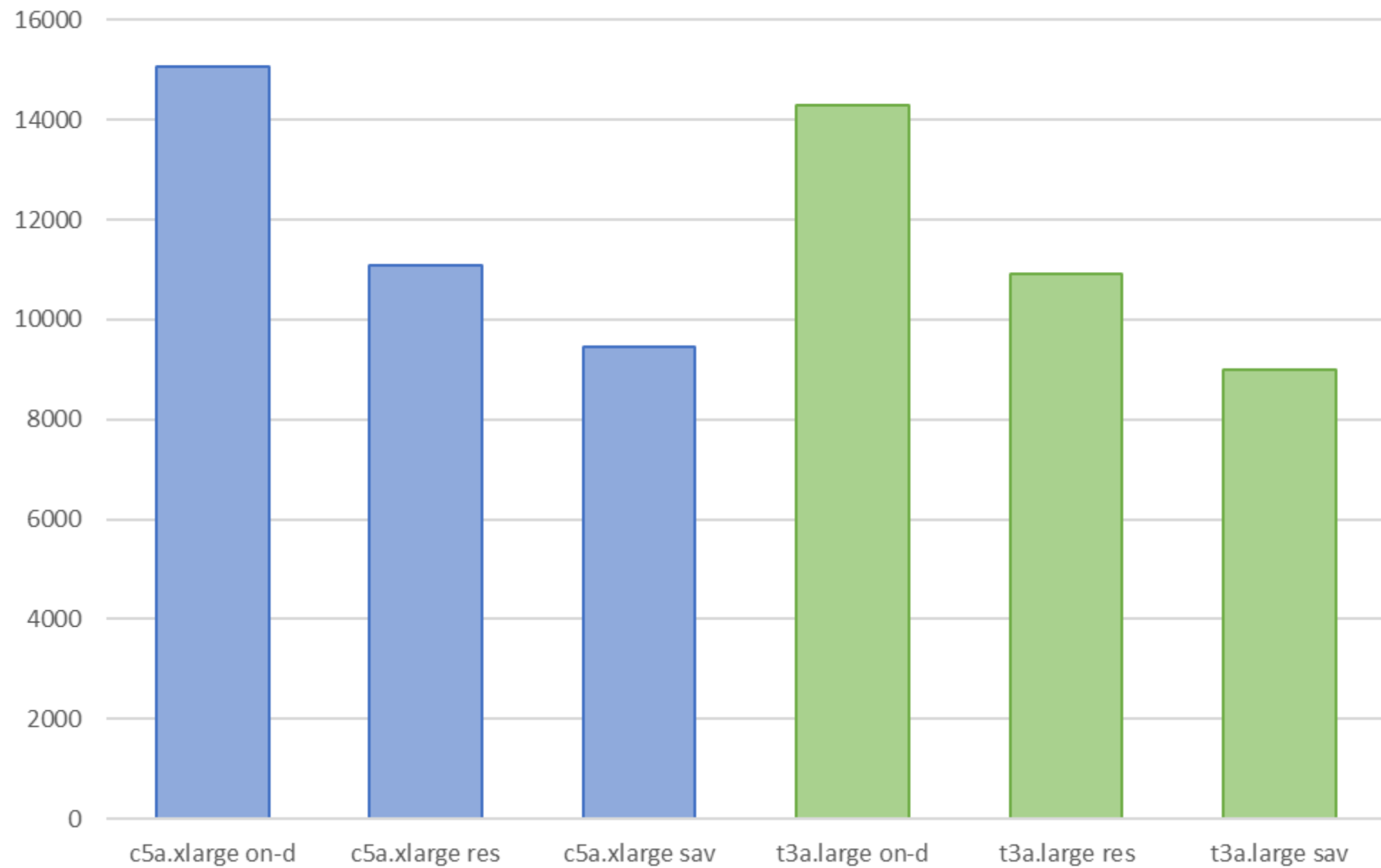
Payment Options

- ☐ No upfront
☐ Partial upfront
☒ All upfront

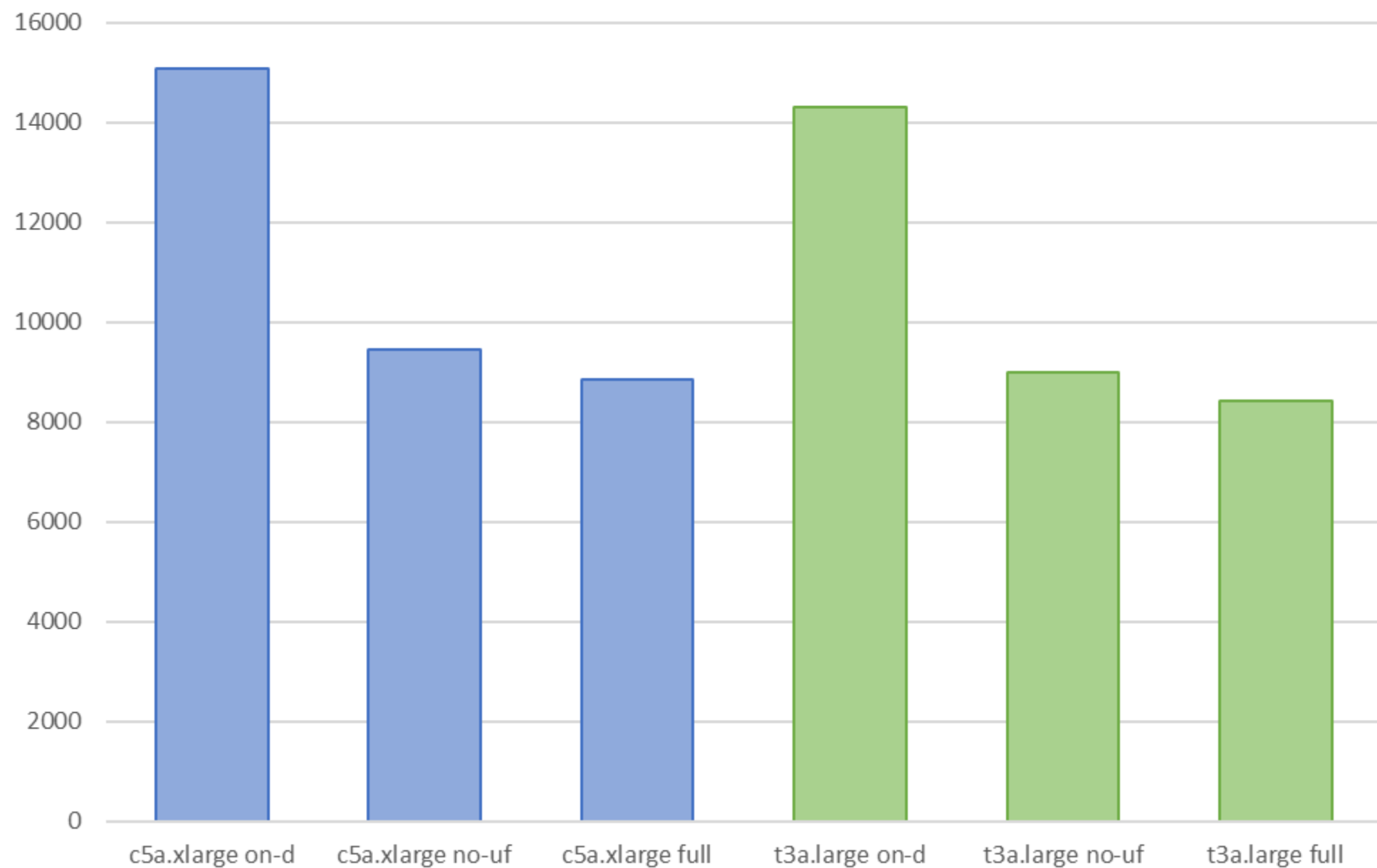
Upfront: 50.00

Monthly: 0.00/Month

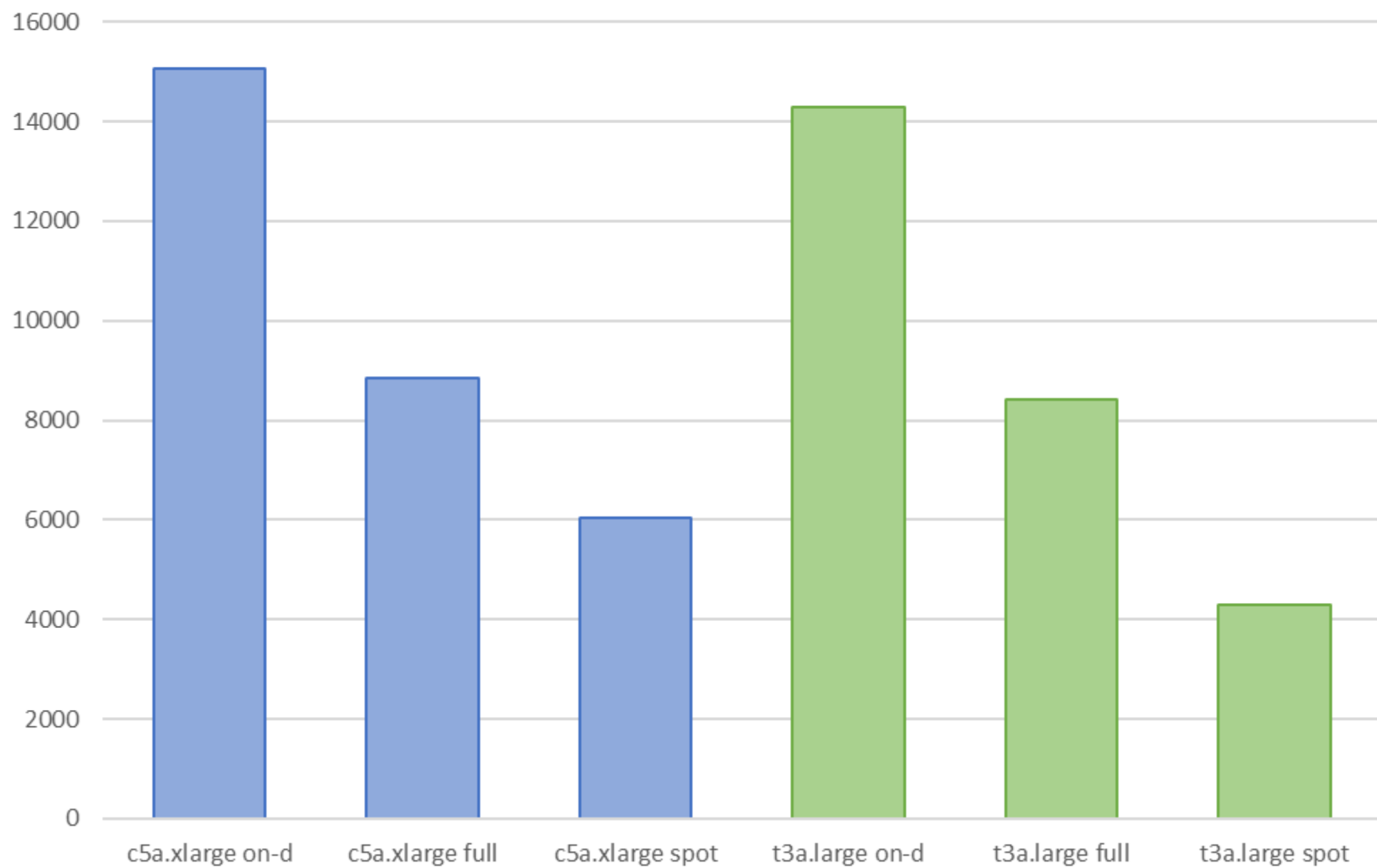
on-demand vs reservation vs saving plans



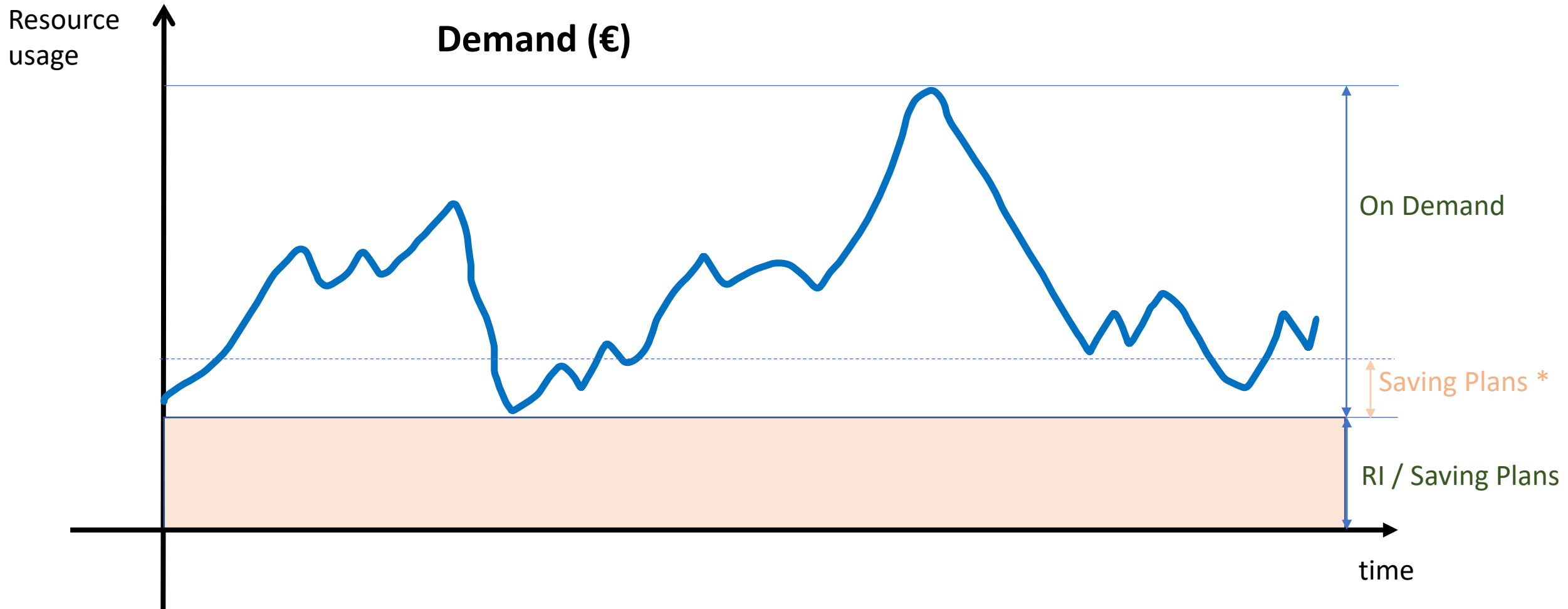
on-demand vs saving no-upfront vs full-upfront



on-demand vs saving full-upfront vs spot



Generic consumption split



Real Use Cases

- “How to align on sizes for Reservations in a multinational enterprise”
 - Multinational teams with different goals
- “Usually reserving appliances, like NVAs”
 - Static loads
- AWS Organizations, permissions and view - a hell
 - RIs at Account level can not be grouped at AWS Organizations
- Migrations
 - Analyze usage during the initial months before applying RIs or Saving Plans

Spot recommendations

- Historic shutdown of instance types per region:

<https://aws.amazon.com/ec2/spot/instance-advisor/>

“The average frequency of interruption across all Regions and instance types is <5%.”

- Be flexible in family/size and AZ:
 - Automated with [EC2 fleet](#) able to use both on-demand and spot
 - price-capacity-optimized (recommended)
 - capacity-optimized
 - diversified
 - lowest-price

Prices are going down...

- ...until inflation arrives:
 - <https://news.microsoft.com/europe/2023/01/05/consistent-global-pricing-for-the-microsoft-cloud/>

Cost Optimization strategies



**Resource
Rightsizing**

Resource Rightsizing

- Always design and later monitor that **resources are adapted to the demand**. Overprovision and under provision are wrong design choices and a Cloud Engineer must take this into account always.
 - Example: adapt resources to each environment requirements

DEV << UAT/INT < PRE = PRO

- AWS Trusted advisor and similar tools provide **automatic recommendations** for selecting the most appropriate size

Resource Rightsizing

- **Newer EC2 families:** better performance for same price=> cost optimization
- Low usage systems: **serverless alternatives**

Real Use Cases

- Vendors requiring specific sizes like SAP
- 10TB disks resized to 4TB=>annual savings of around \$ 80K

Cost Optimization strategies

**Remove
Unused/orphan
resources**

Remove Unused/orphan resources

Detect those resources that are not used

- First easy win when optimizing costs:
 - Follow recommendations from cost tools to detect forgotten resources and to remove them
- Snapshots and AMIs
- Non used public IPs
- Automate Data Life Cycles

Cost Optimization strategies

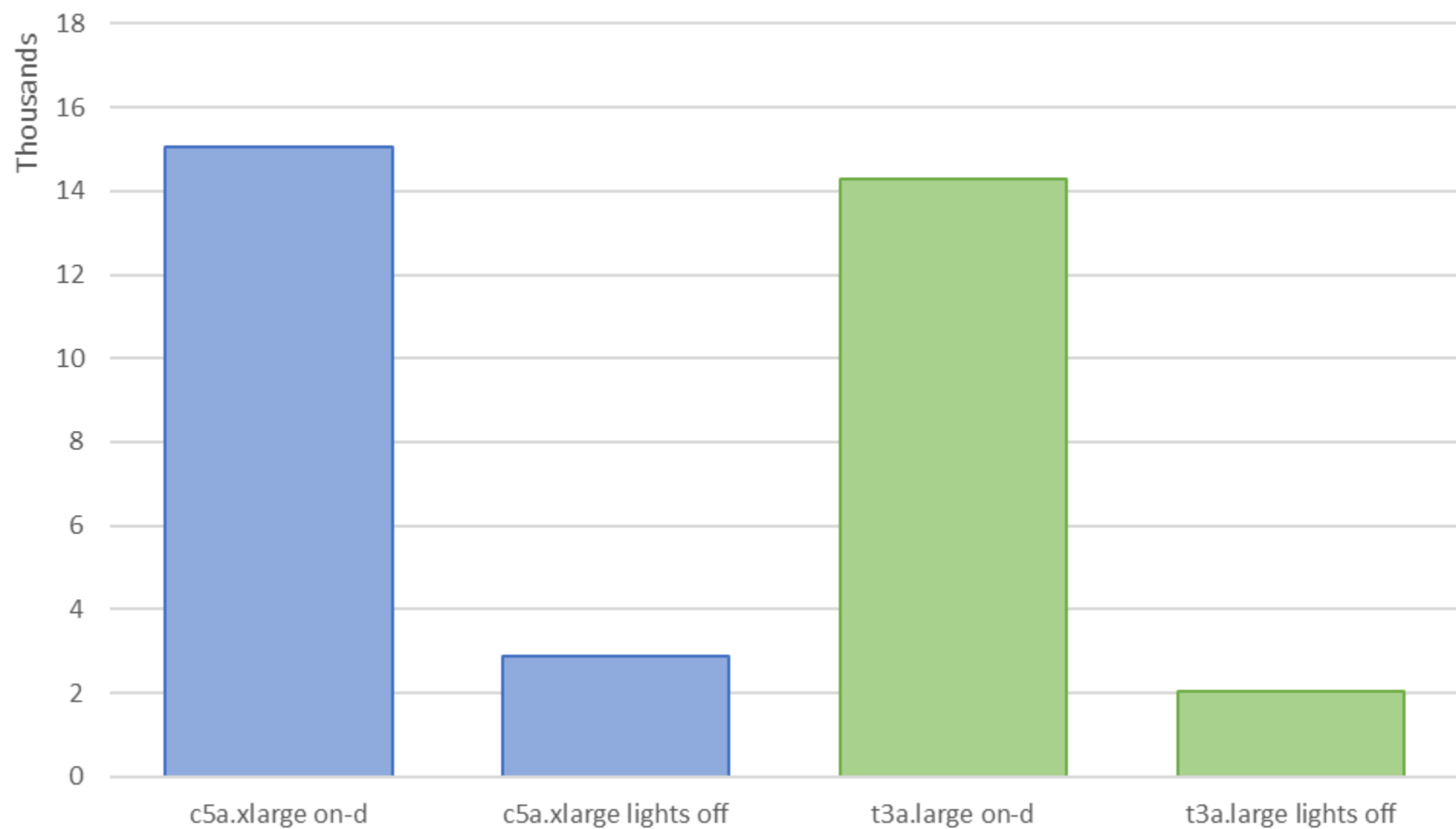
Lights
ON/OFF

Lights ON/OFF

Switching off resources when they are not needed provides huge cost reductions with minimal impact on processes

- Example:
 - Business hours 8 hours 20 days a month: 160
 - 24/7 hours a month: 744
 - By enabling services only when needed: **savings up to 80%.**

on-demand vs spot with lights-off

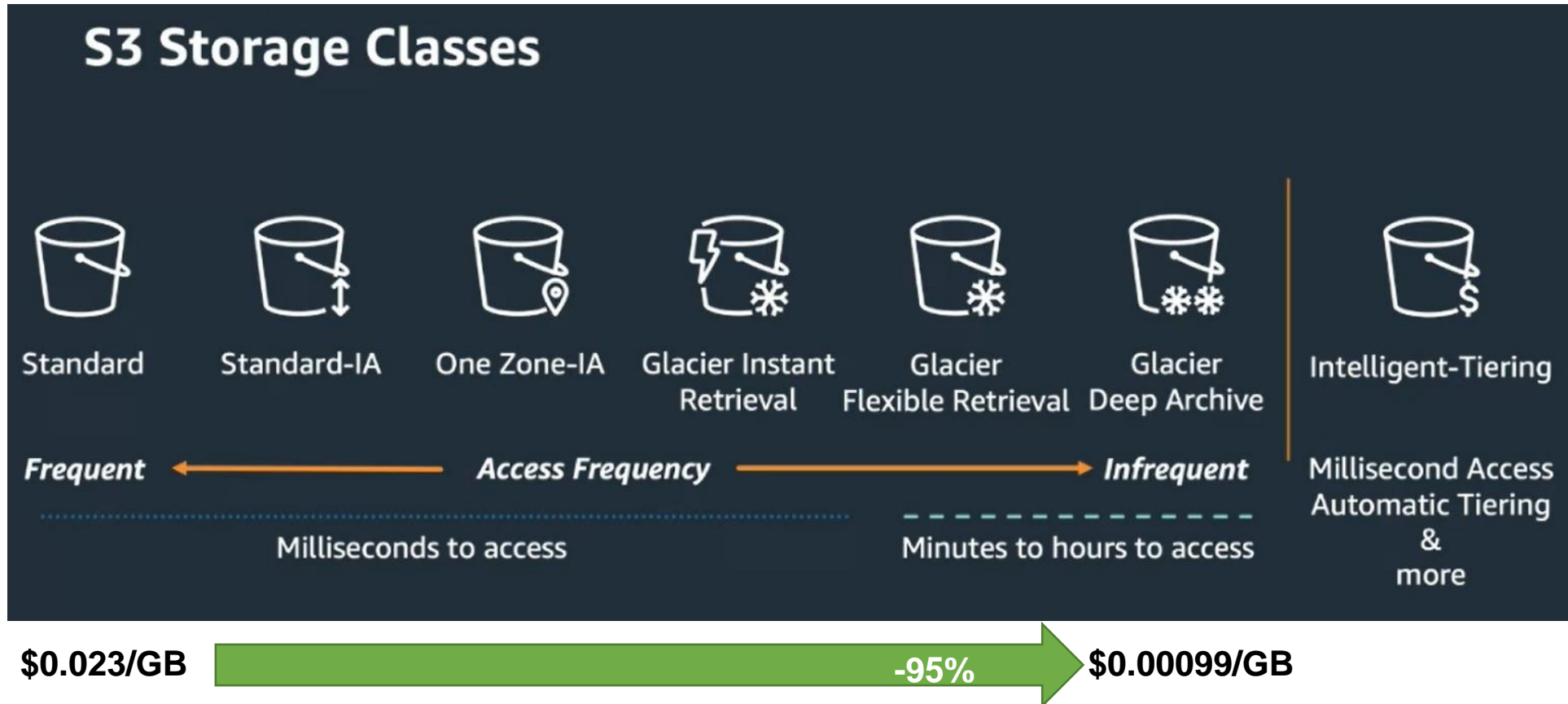


Cost Optimization strategies

Storage tiers

Storage tiers

- Design and later monitor the usage: access and reliability
- S3:



Storage tiers

- EBS: General purpose, provisioned IOPS SSD, Cold HDD, Throughput optimized

	General Purpose SSD volumes		Provisioned IOPS SSD volumes		
Volume type	gp3	gp2	io2 Block Express ‡	io2	io1




Cost Optimization strategies



Processor type

Processor Type

AWS processors available

Vendor			
Commercial names	INTEL® Xeon Scalable (Skylake and Cascade Lake) processors	AMD EPYC processor	AWS Graviton2 Processor
General base Architecture	CISC- Complex instruction set		RISC – Reduced instruction set
Productized CPU architecture	x86-64 Cross licencing-Intel: x86, AMD 64bits extension		ARM64 (Neoverse ARM1. ARM Ltd British Company, owned by Softbank, licensing to anyone)
Utilization	All server workloads		Mobile apps and now servers!

Processor Type

- Graviton are the new AWS processors, based on ARM. Graviton instances are always **20% cheaper** than corresponding x86 instances, and more performing for many workloads (up to **40% better price performance**).
- Graviton instances **are up to 60% more energy efficient** vs x86. They work with many managed services (RDS , Aurora, OpenSearch, ASG...) and with Linux workloads.
- Transition to Graviton is easy for managed services and for Linux if programming language is interpreted (Python, Java...) and more involved if it is compiled (C, C++..).

Cost Optimization strategies



**Network
topology**

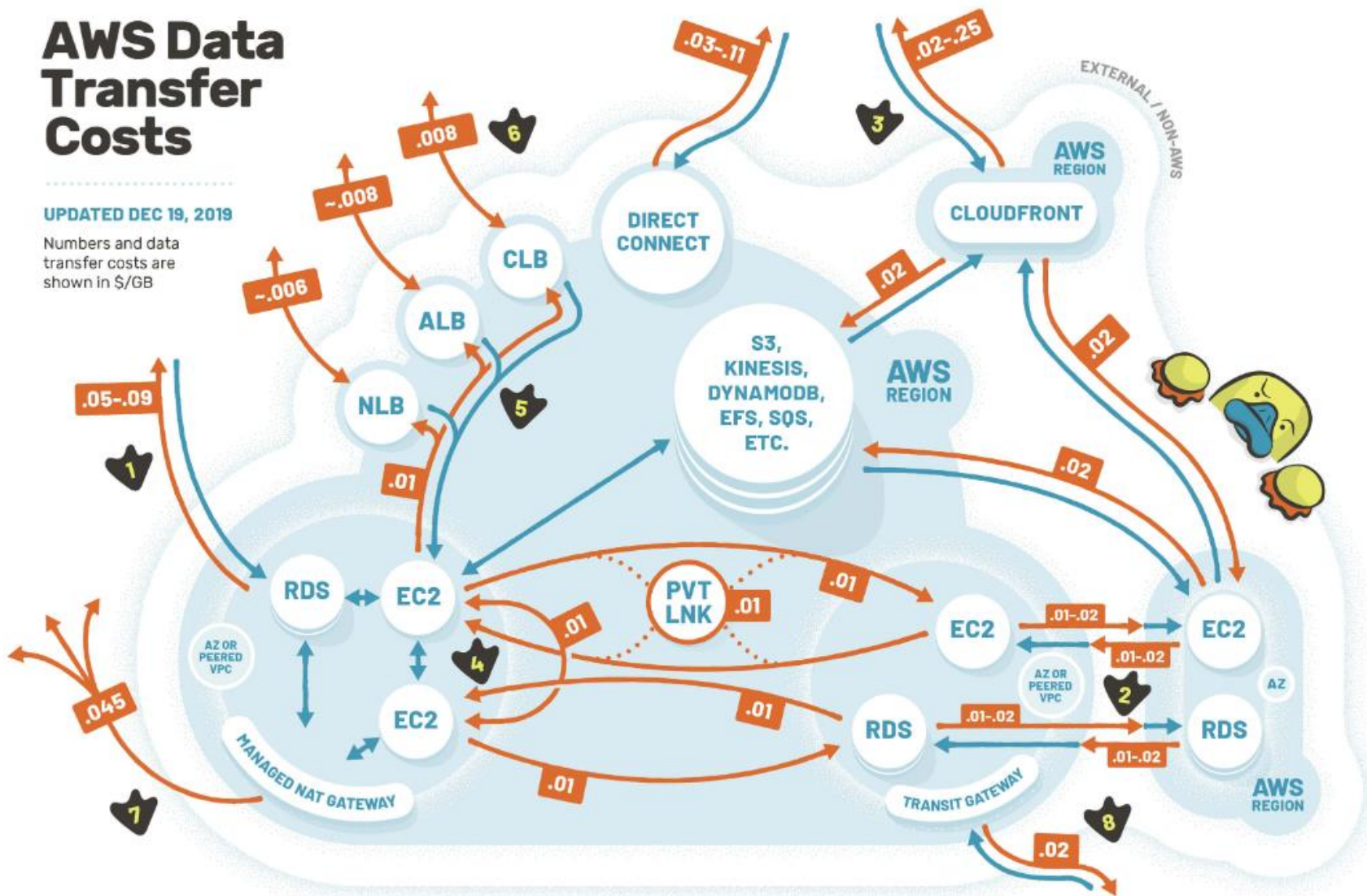
Network topology

- Data Transfer
 - Inter-Region replication
- NAT GWs
- Position of endpoints:
 - CloudFront
 - LB
 - AZs











AWS Data Transfer Costs

UPDATED DEC 19, 2019

Numbers and data transfer costs are shown in \$/GB



Still confused as hell? Get help at duckbillgroup.com

-  Inbound traffic is typically free – outbound is not. Some (but not all) internal traffic is **free**.
-  Outbound traffic costs are shown **per transmission**.
-  Direct outbound data starts at **\$.09/GB** for less than 10TB, and discounts with volume. **First 1GB is free**.
-  Region-to-region traffic is **\$.02/GB** when it exits a region for indicated services except between us-east-1 and us-east-2, where it's **\$.01/GB**. Even data wants to get out of Ohio.
-  Outbound CloudFront prices are highly variable by geography and regional edge cache and start at **\$.085/GB** in US/Canada.
-  Internal traffic via public or elastic IPs incurs **additional fees** in both directions.
-  Cross-AZ EC2 traffic within a region costs as much as region-to-region. ELB-EC2 traffic is **free** except outbound crossing AZs.
-  Elastic Load Balancing: Classic and Network LB is priced per GB. Application LB costs are in LCUs, not \$/GB.
-  Traffic via Managed NAT Gateway – regardless of destination – costs an additional **\$.045/GB** on top of other transfer, including internal transfer (S3, Kinesis, etc.).
-  Data processing charges apply for each gigabyte sent to the AWS Transit Gateway – whether from a VPC, Direct Connect or VPN.

Cost Optimization strategies



Region

Region

- Prices depends on region, with some surprises

Service	eu-north-1 (Stockholm)	eu-west-1 (Ireland)	eu-west-3 (Paris)	eu-south-1 (Milan)	eu-west-2 (London)	eu-central-1 (Frankfurt)	eu-central-2 (Zurich)
Amazon Aurora PostgreSQL-Compatible DB	\$449,55	\$478,78	\$500,68	\$502,76	\$506,93	\$523,48	\$575,83
Amazon CloudWatch	\$139,38	\$145,47	\$151,23	\$151,56	\$151,23	\$157,60	\$169,76
DynamoDB on-demand capacity	\$26,90	\$28,30	\$29,71	\$29,71	\$29,71	\$30,60	\$33,66
Amazon EC2	\$159,37	\$167,22	\$175,12	\$175,07	\$173,66	\$179,80	\$198,99
S3 Standard	\$23,00	\$23,00	\$24,00	\$24,00	\$24,00	\$24,50	\$26,95
Data Transfer	\$112,64	\$112,64	\$112,64	\$112,64	\$112,64	\$112,64	\$112,64
Network Address Translation (NAT) Gateway	\$114,54	\$119,52	\$124,50	\$124,50	\$124,50	\$129,48	\$142,44
Application Load Balancer	\$23,03	\$24,24	\$25,45	\$25,47	\$25,45	\$25,55	\$28,10
TOTAL	\$1.048,41	\$1.099,17	\$1.143,33	\$1.145,71	\$1.148,12	\$1.183,65	\$1.288,37

Cost Optimization strategies

Payment Mode

**Resource
Rightsizing**

**Remove
Unused/orphan
resources**

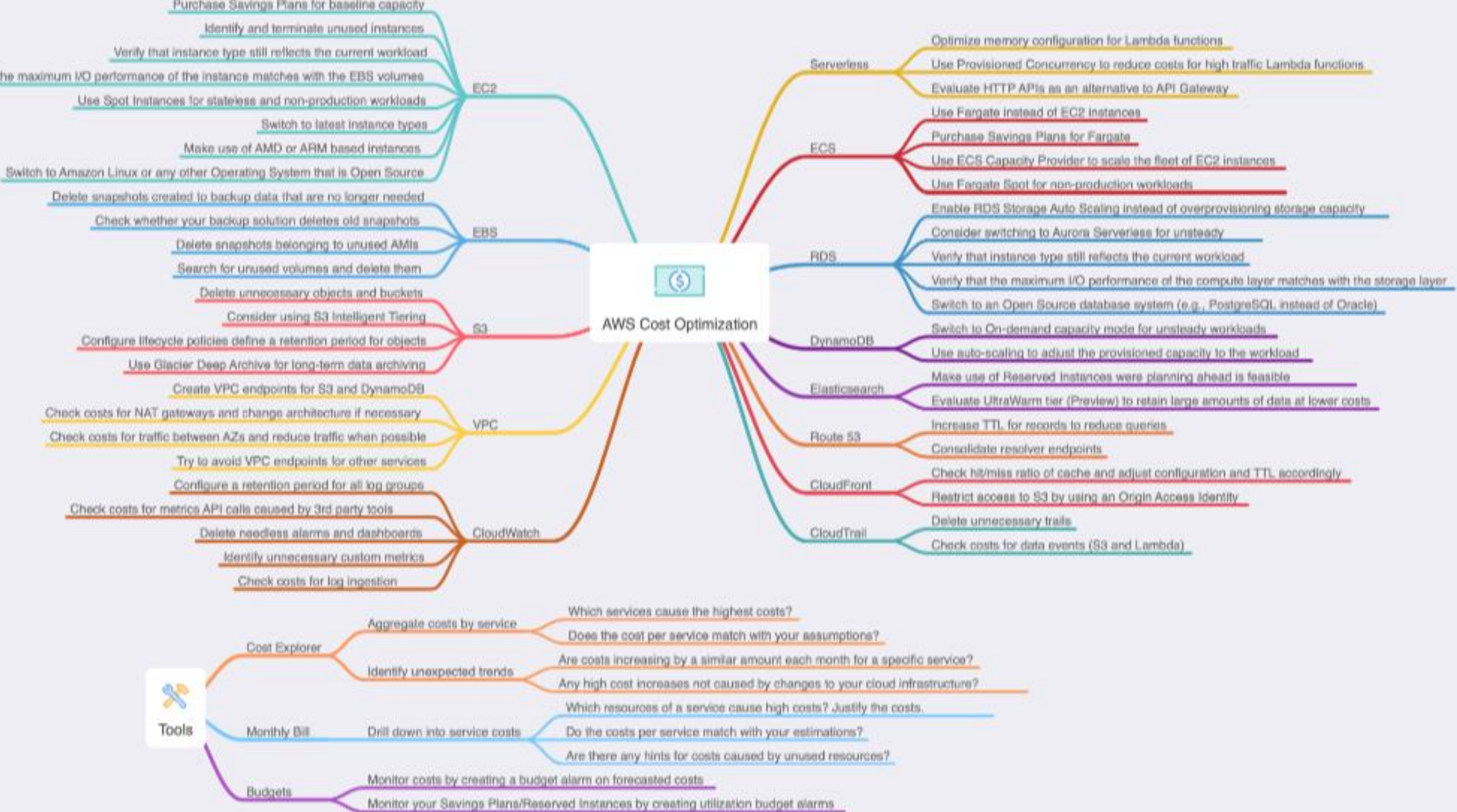
Lights ON/OFF

Storage tiers

Processor type

**Network
topology**

Region



Open Ideas

- What strategies are most applicable to your current environment?
- Other alternatives that you might share?
- **The AWS 24 Hours of Cost Optimization - Live Broadcast**
 - <https://www.twitch.tv/aws/video/1820839695>

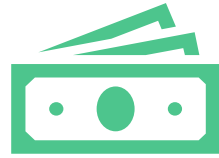


Key Takeaways

Key takeaway



Migrating to Public Cloud must not be done to reduce costs



Visibility and accountability costs

Cost allocation Tags

Continuous evaluation

Rightsizing

Purchase models



Cost is part of the engineering design

[illegible]