Control y Gestión de Costes

Posgrado Cloud Computing Architecture

UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH

Narratives

CAPEX vs. OPEX

- Story to change finantial 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/

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

Timeframe
5 Years

Region
West Europe

Licensing program
gram

Show Dev/Test Pricing

Azure suggests UK South

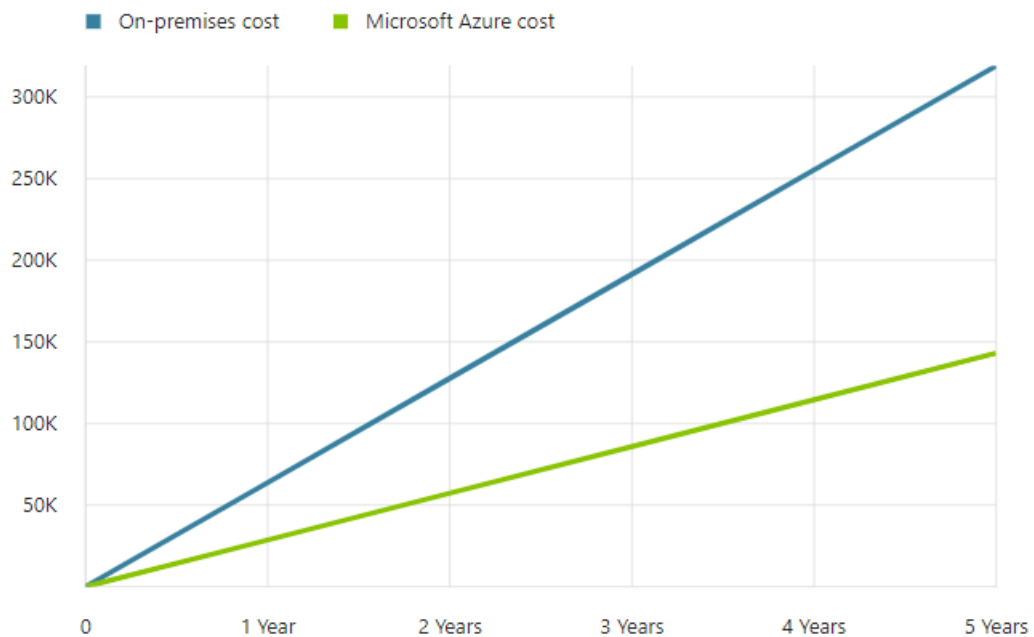
You may save money selecting UK South. The region you've selected may cost more for the same services

x

Over 5 year(s) with Microsoft savings could be as much as **$1,75,966**

Total on-premises vs. Azure cost over time

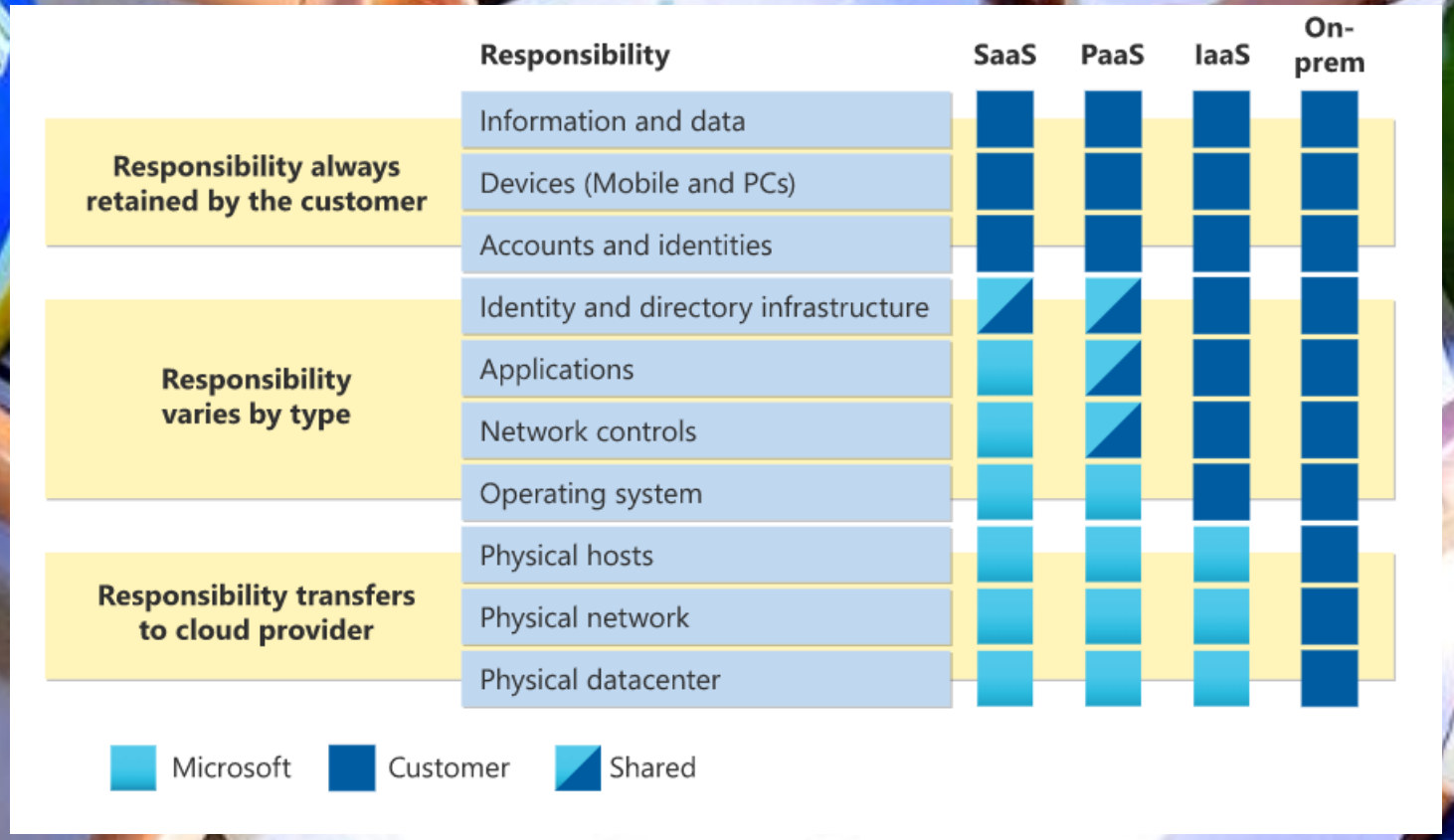
Savings from running workloads in Azure accrue over time. The following shows how those savings add up over years.



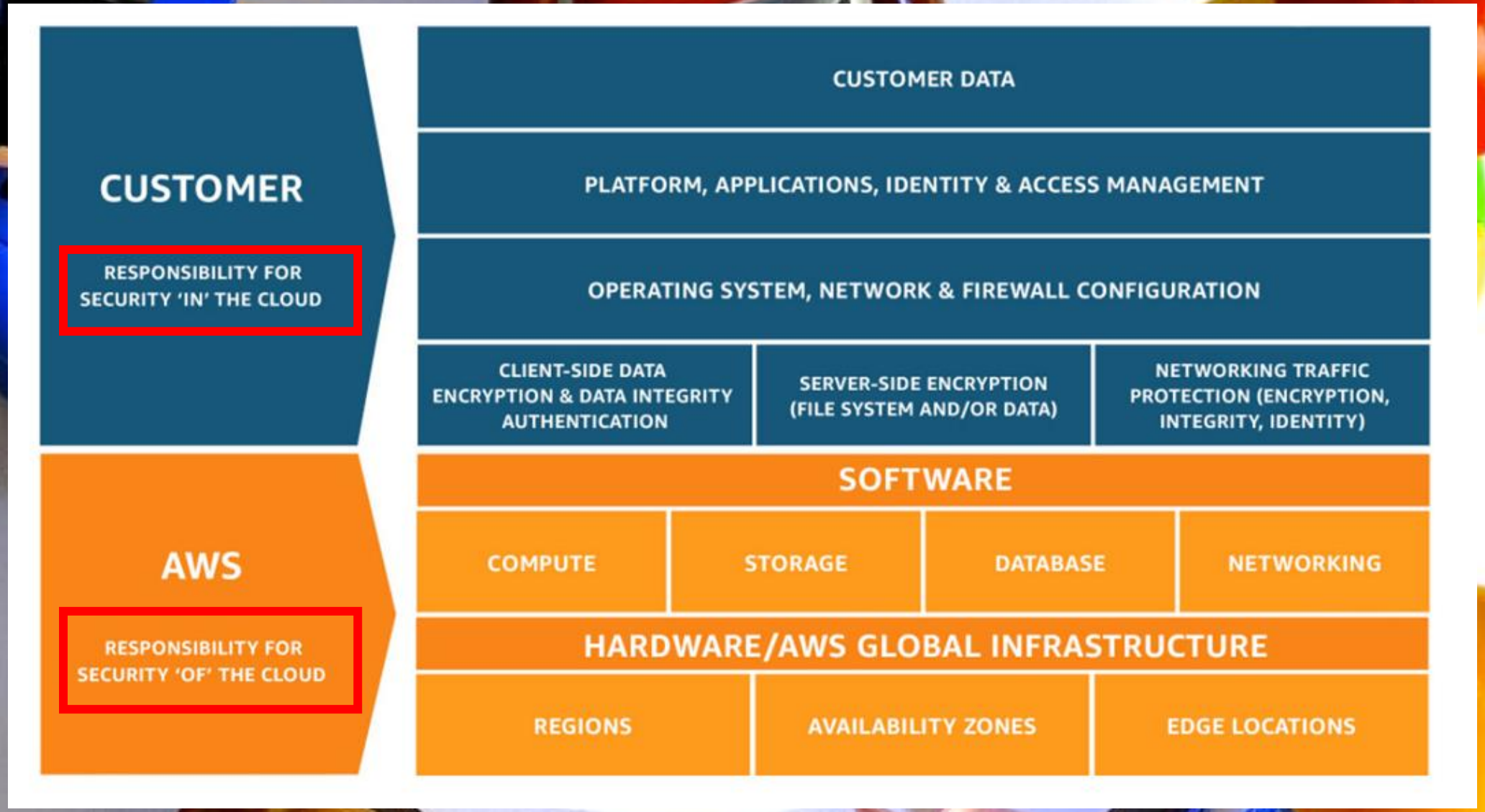
Common misunderstandings – Real Life

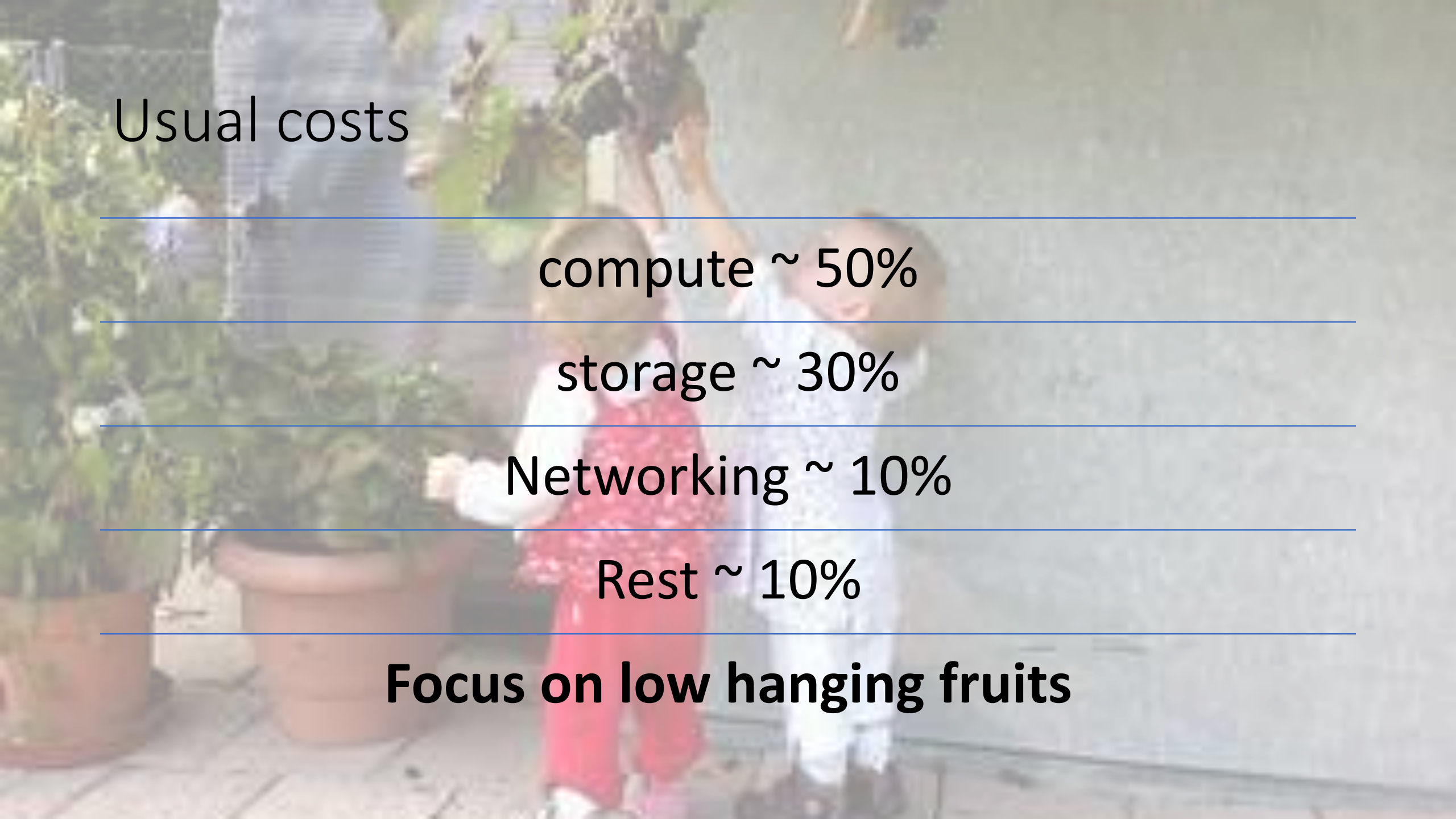
- “It’s free to create VMs on our VMWARE deployment”
- “Comparing 1-1 VM size it’s much more expensive”
- “We have done comparisons and it’s much more expensive”

Shared Responsibility model



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*

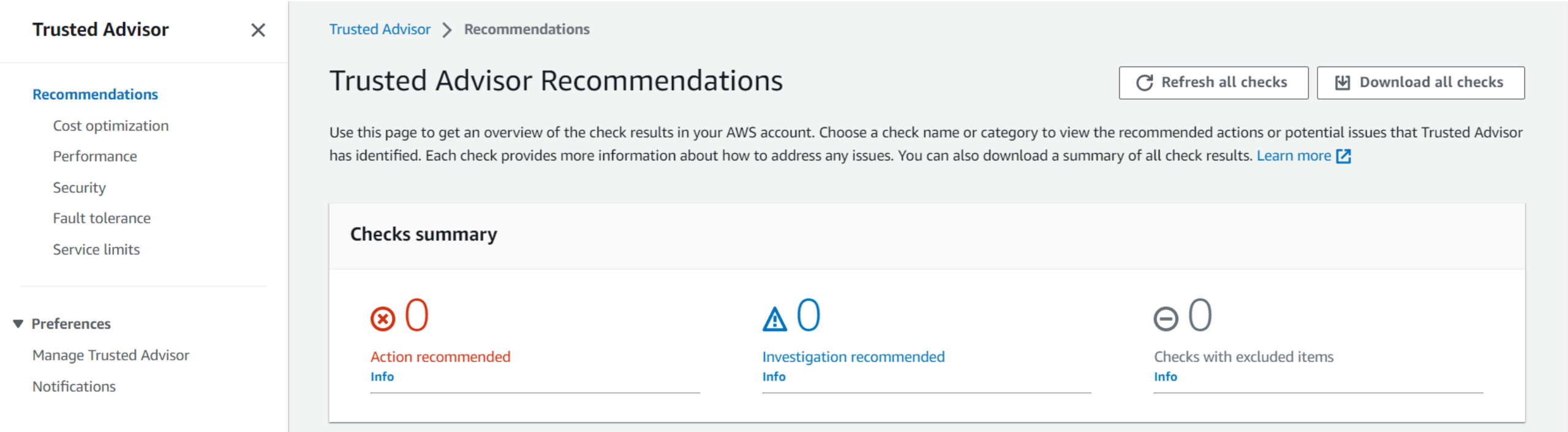
Tags

- 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

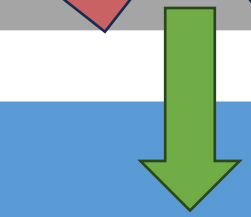


AWS Billing

Bills

Cost and Usage Reports

Cost Explorer



Data Exports

New!! reinvent 2023

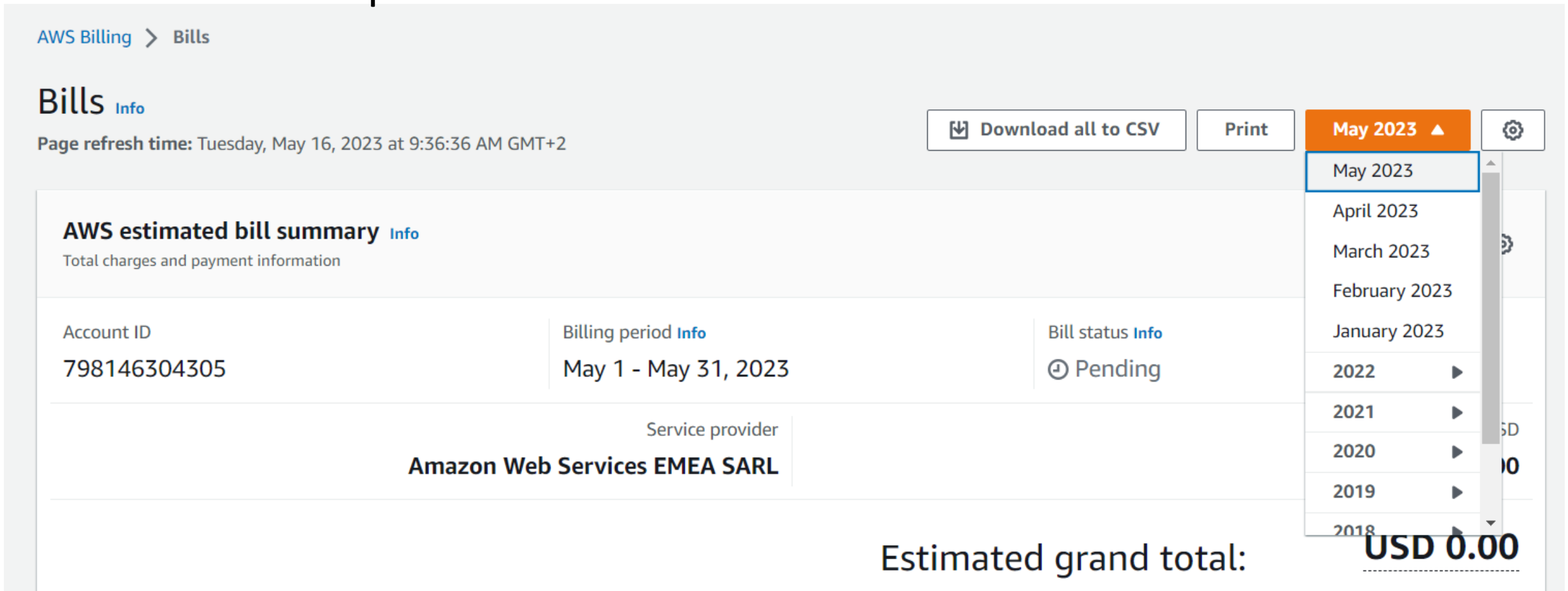
https://aws.amazon.com/blogs/aws-cloud-financial-management/introducing-data-exports-for-billing-and-cost-management/

AWS Billing

Bills

AWS Bills

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



Billing period	Account ID	Bill status	Date printed
May 1 - May 31, 2023	798146304305	Pending	May 16, 2023

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**

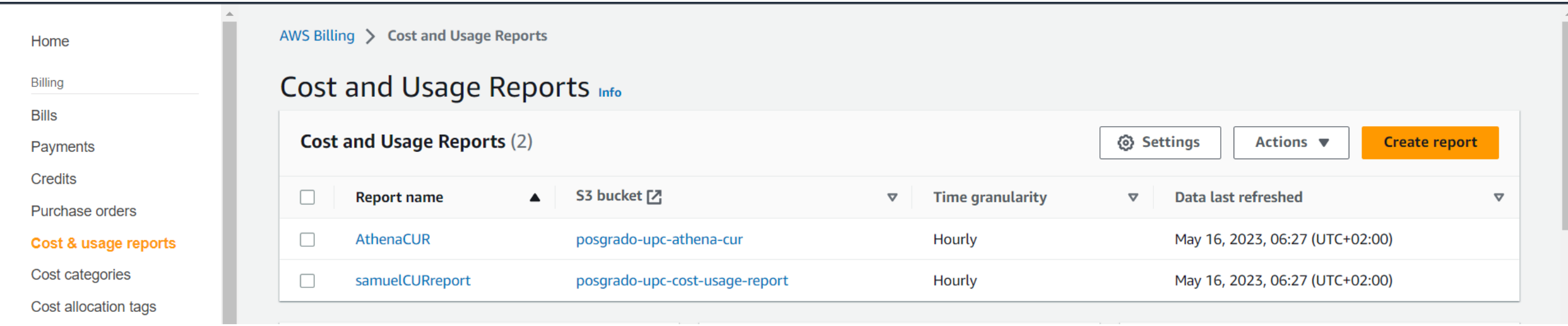
Description	Usage Quantity	Amount in USD
API Gateway		**USD 0.00**
No Region		**(USD 0.01)**
		(USD 0.01)
AAI_Vocareum, credit from account: 798146304305	Credit	(USD 0.01)
EU (Ireland)		**USD 0.01**
Amazon API Gateway ApiGatewayHttpApi		USD 0.01
$1.11/million requests - API Gateway HTTP API (first 300 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

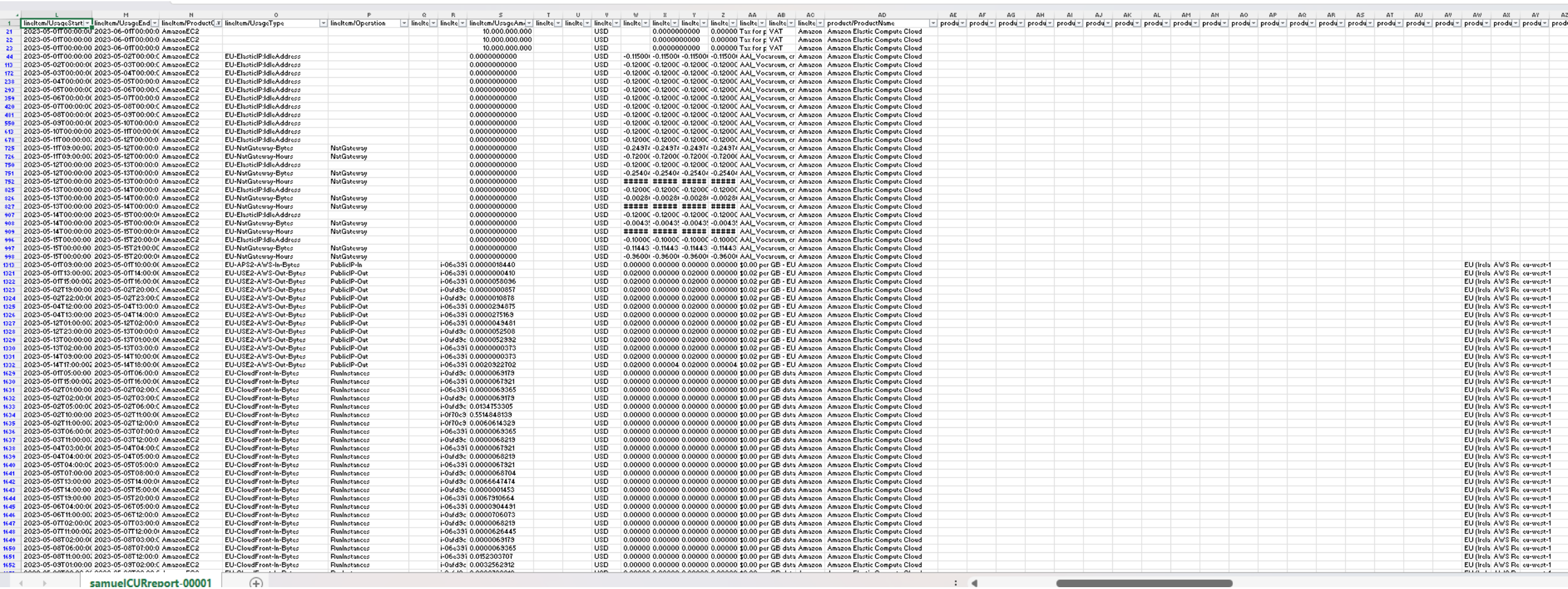
AWS Billing

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





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1633	2023-05-02T05:00:00	2023-05-02T06:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-0afd9c	0.0134753305			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1634	2023-05-02T10:00:00	2023-05-02T11:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-0f70c9	0.5514848139			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1635	2023-05-02T11:00:00	2023-05-02T12:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-0f70c9	0.0060614329			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1636	2023-05-03T06:00:00	2023-05-03T07:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-06e39	0.0000063365			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1637	2023-05-03T11:00:00	2023-05-03T12:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-0afd9c	0.0000068219			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1638	2023-05-04T03:00:00	2023-05-04T04:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-06e39	0.0000067321			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1639	2023-05-04T04:00:00	2023-05-04T05:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-0afd9c	0.0000068219			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1640	2023-05-05T04:00:00	2023-05-05T05:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-06e39	0.0000067321			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1641	2023-05-05T07:00:00	2023-05-05T08:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-0afd9c	0.0000068704			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1642	2023-05-05T13:00:00	2023-05-05T14:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-0afd9c	0.0066647474			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
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1644	2023-05-05T19:00:00	2023-05-05T20:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-06e39	0.0067910664			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1645	2023-05-06T04:00:00	2023-05-06T05:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-06e39	0.0000304431			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
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1647	2023-05-07T02:00:00	2023-05-07T03:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-0afd9c	0.0000068219			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1648	2023-05-07T11:00:00	2023-05-07T12:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-06e39	0.0000626445			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1649	2023-05-08T02:00:00	2023-05-08T03:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-0afd9c	0.0000063173			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
1650	2023-05-08T06:00:00	2023-05-08T07:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-06e39	0.0000063365			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1
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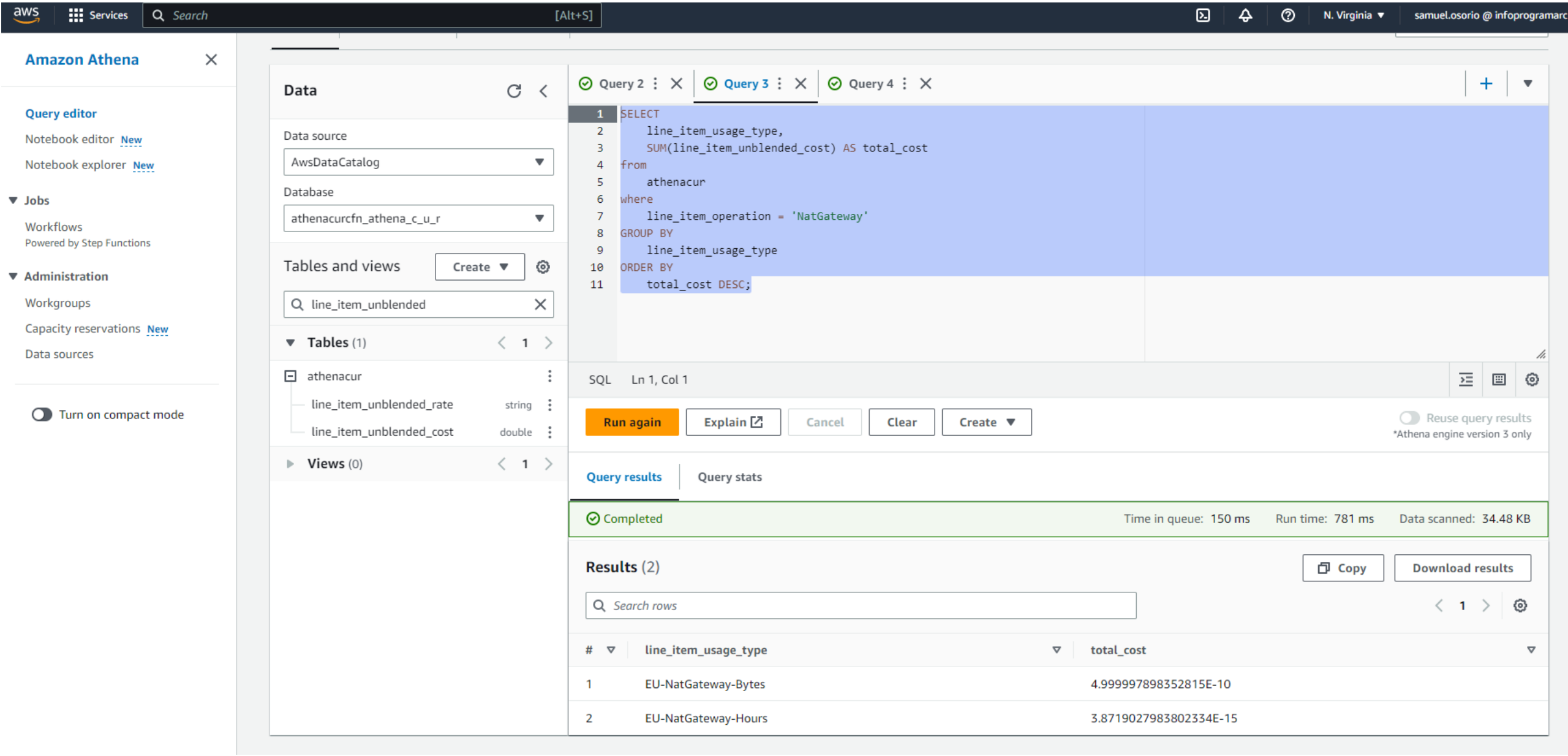
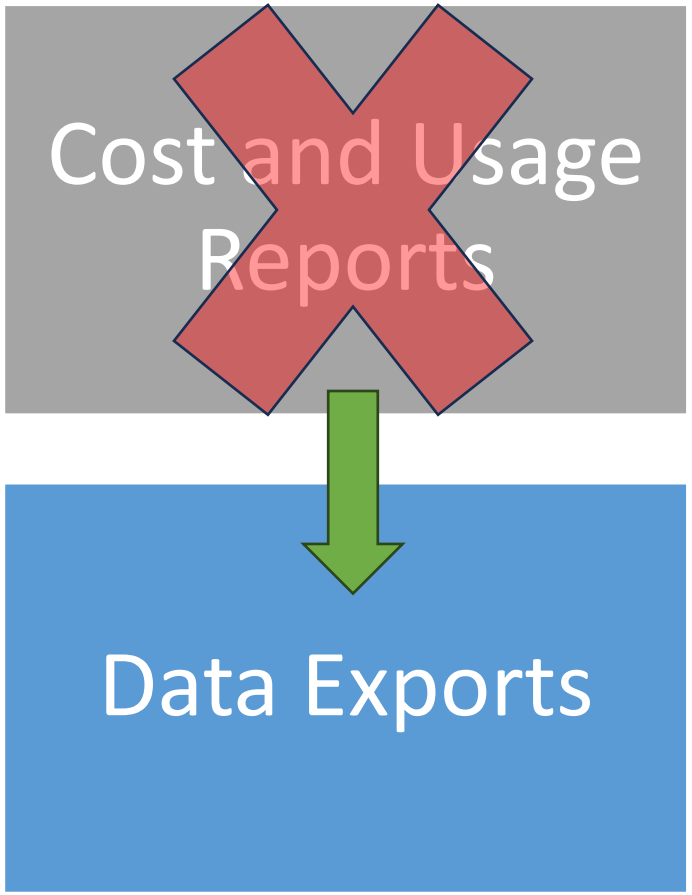
1652	2023-05-09T01:00:00	2023-05-09T02:00:0	AmazonEC2	EU-CloudFront-In-Bytes	RunInstances		i-0afd9c	0.0032562312			USD	0.00000	0.00000	0.00000	0.00000	$0.00 per GB data	Amazon	Amazon Elastic Compute Cloud																						EU (Irela	AWS Re	eu-west-1

samuelCURreport-00001


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
Data sources
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 SELECT
2 line_item_usage_type,
3 SUM(line_item_unblended_cost) AS total_cost
4 from
5 athenacur
6 where
7 line_item_operation = 'NatGateway'
8 GROUP BY
9 line_item_usage_type
10 ORDER BY
11 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 QuickSigth 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

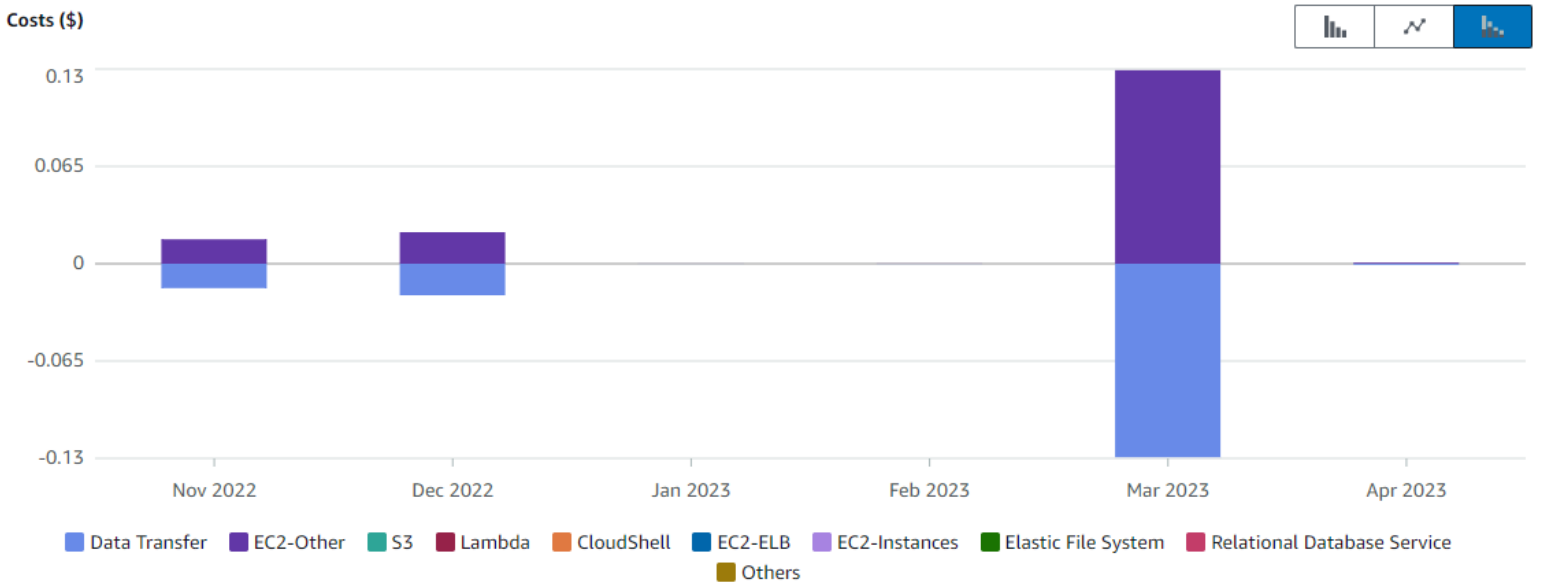
Savings Plans
Overview
Inventory
Recommendations
Purchase Savings Plans
Utilization report
Coverage report
Cart 0

Reservations
Overview
Recommendations
Utilization report
Coverage report

Preferences
Billing Console
Documentation

Cost and usage graph Info

Total cost	Average monthly cost	Service count
$0.00	$0.00	30



Cost and usage breakdown

Download as CSV

Find cost and usage data

1

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 Clear

Service

Filters Info

Applied filters (0) Clear all

Service Clear

Choose services

Linked account Clear

Choose linked accounts

Region Clear

Choose regions

Instance type Clear

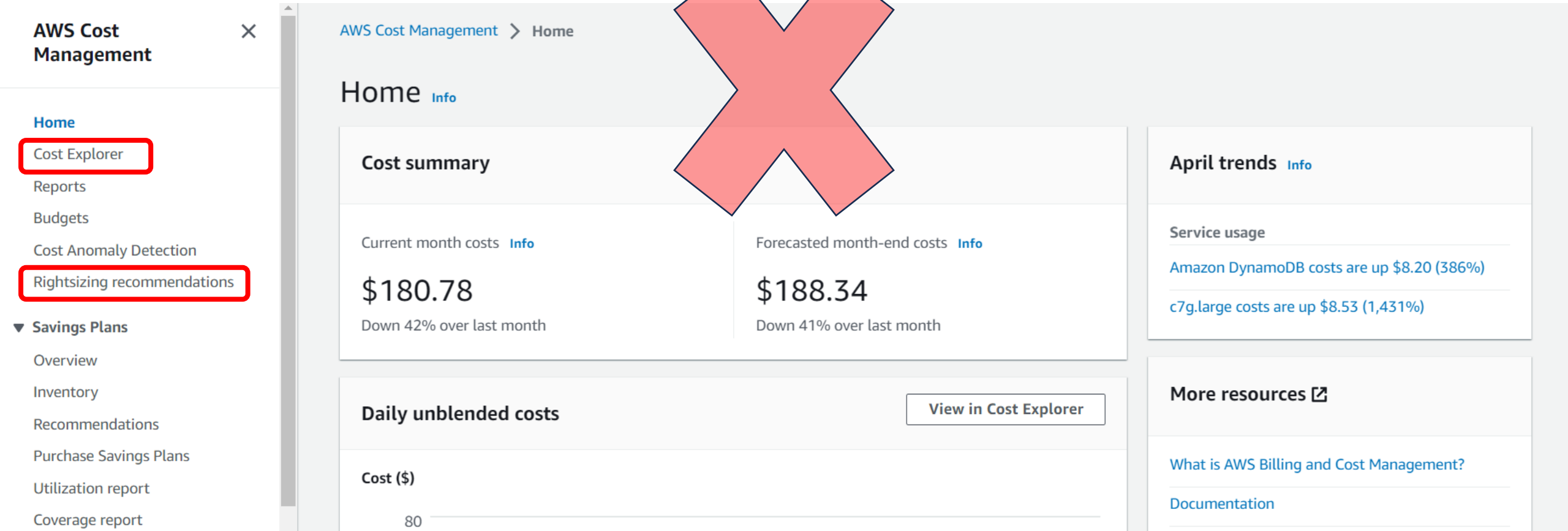
Choose instance types

Usage type Clear

Choose usage types

AWS cost tools: Cost Explorer

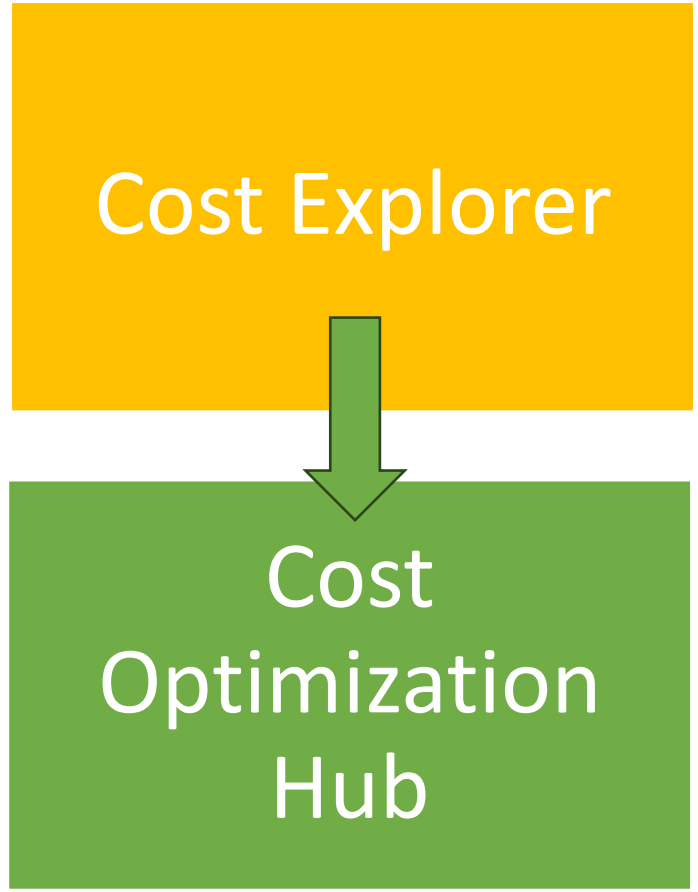
- Rightsizing recommendations
- Enabled at payer account ~ root account of your AWS Organizations



Cost Optimization Hub: reinvent 2023!!

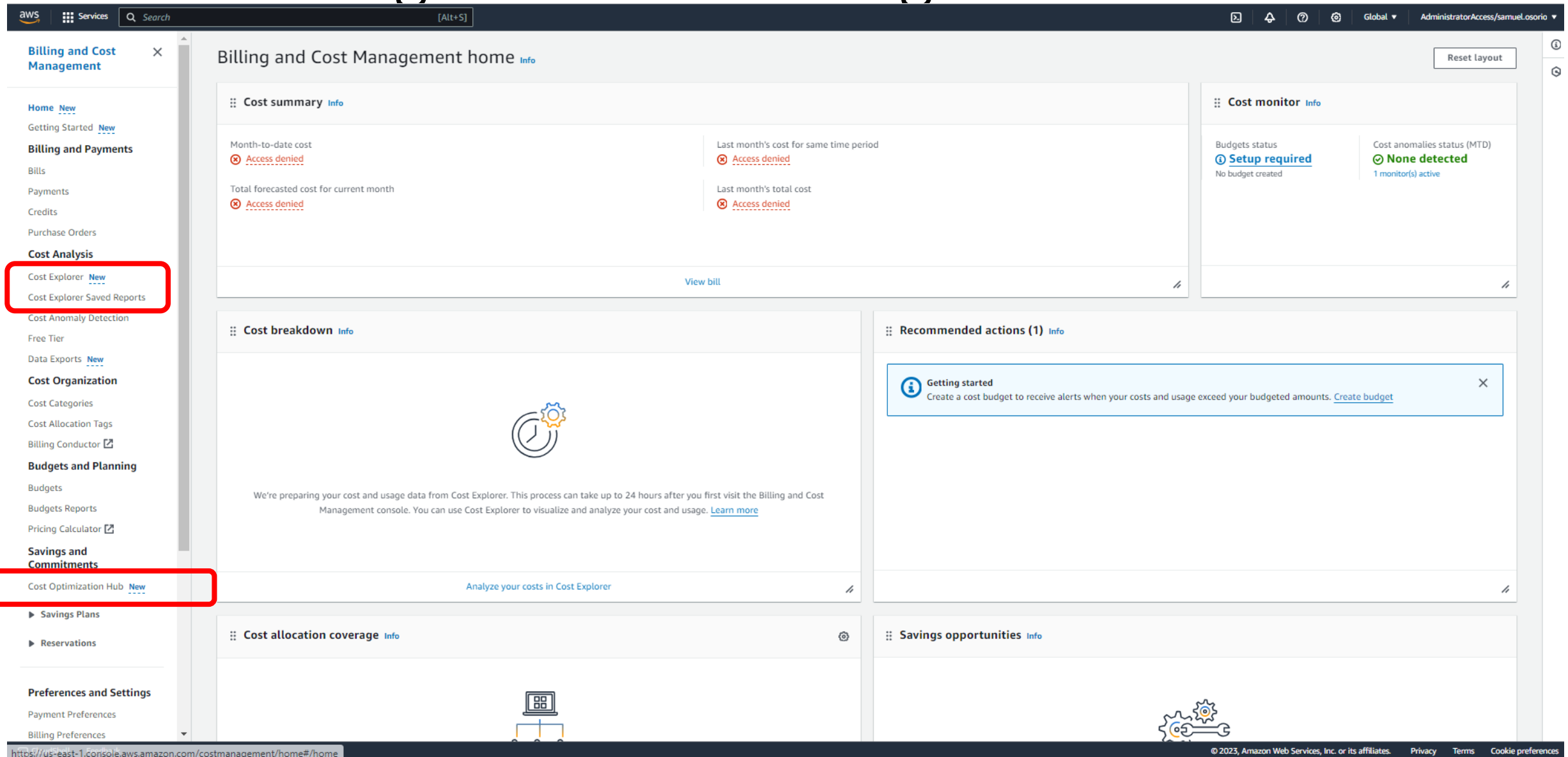
New!! reinvent 2023

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



New!! reinvent 2023

AWS Billing and Cost Management: New UI



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

Data Exports

Cost Explorer

Cost Optimization Hub

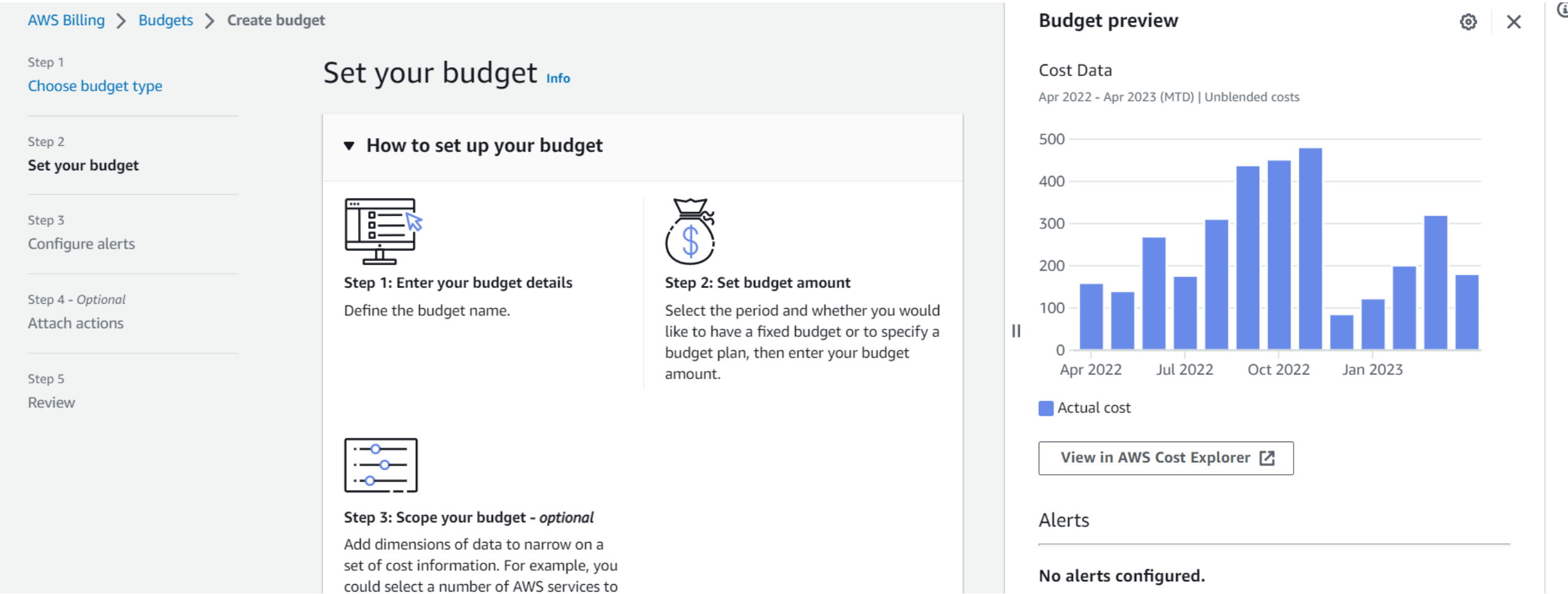
New!! reinvent 2023

Demo Time

- Let’s explore the AWS Console….

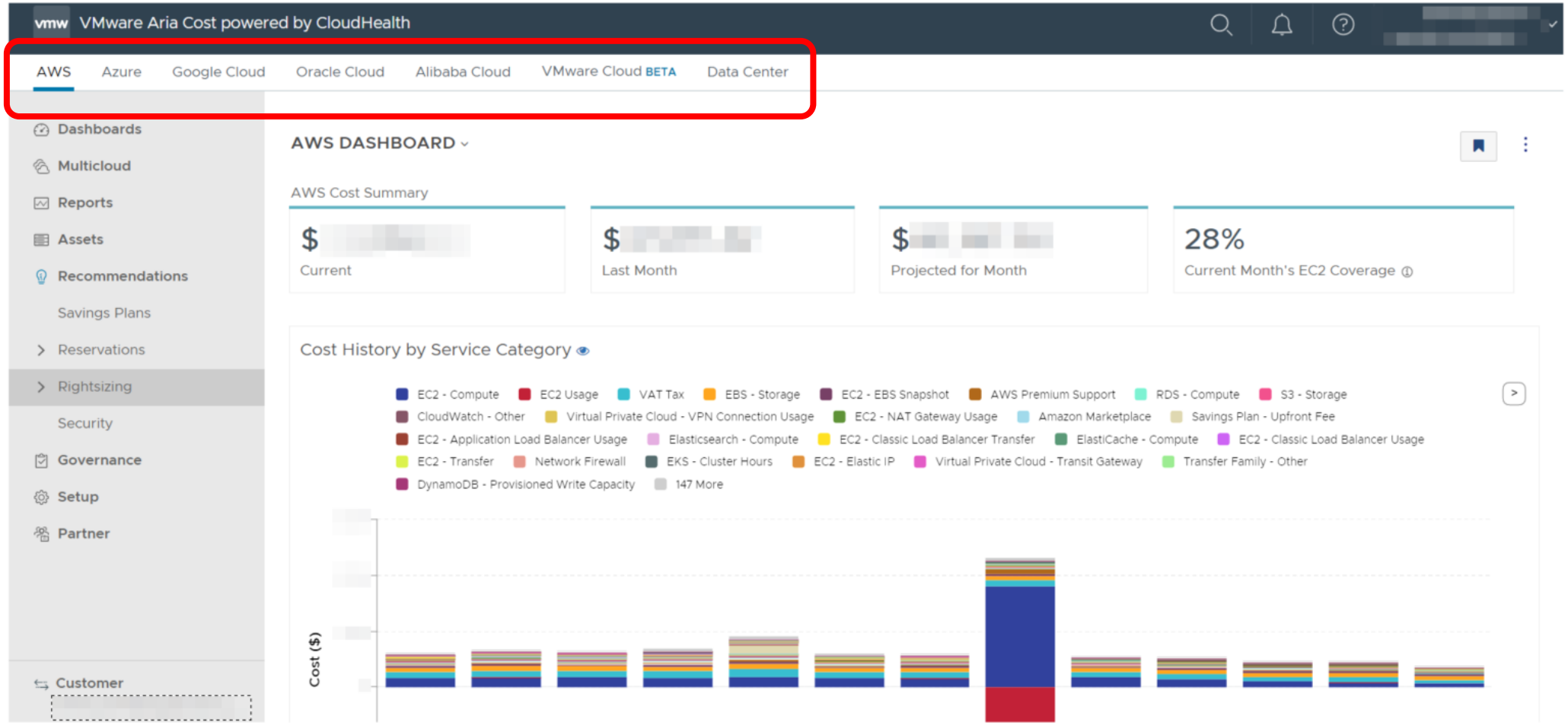
AWS cost tools: Budgets and alarms

- Able to get notification of preconfigured thresholds



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
  - NAT GW

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 Beneffit
    - https://azure.microsoft.com/en-gb/pricing/hybrid-benefit/#overview

Cost Optimization

Cost Optimization strategies

Payment Mode	**Resource Rightsizing**	**Remove Unused/orphan resources**	**Ligths 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

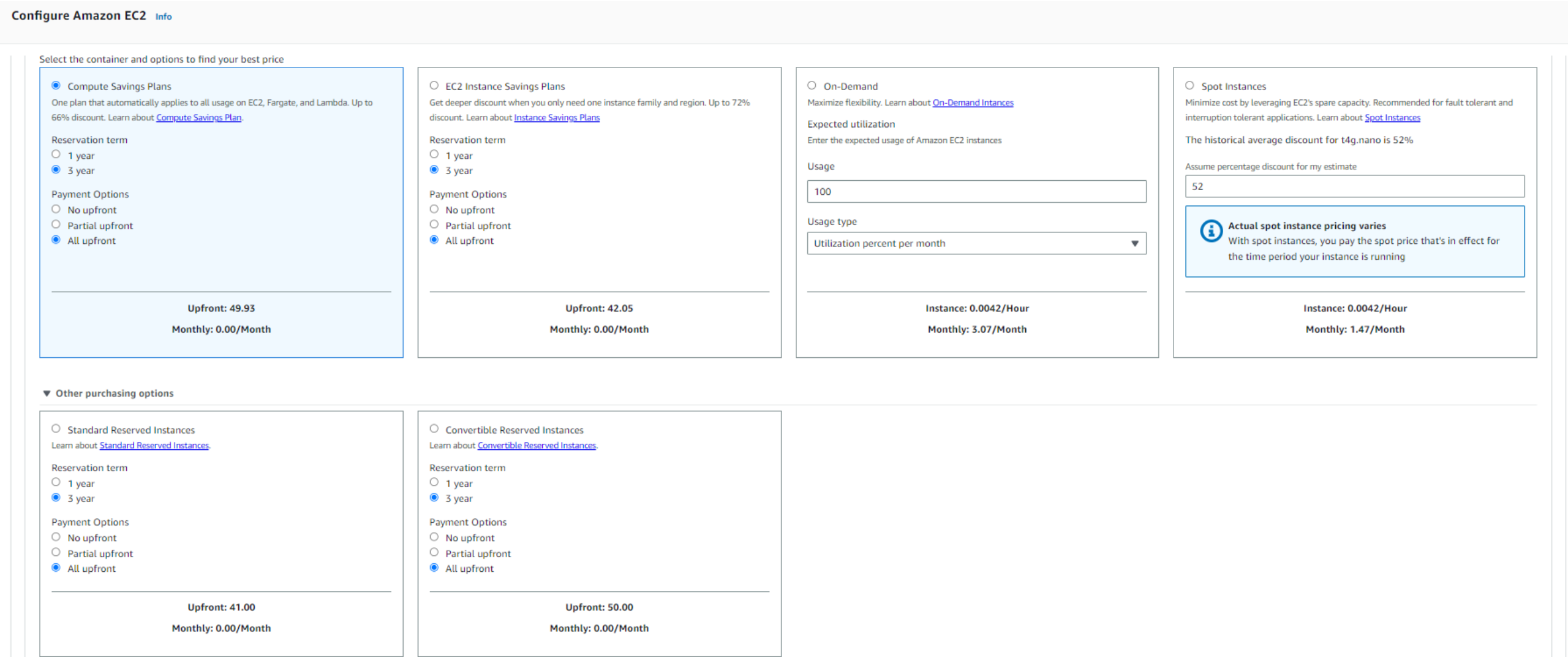
Saving Plans

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

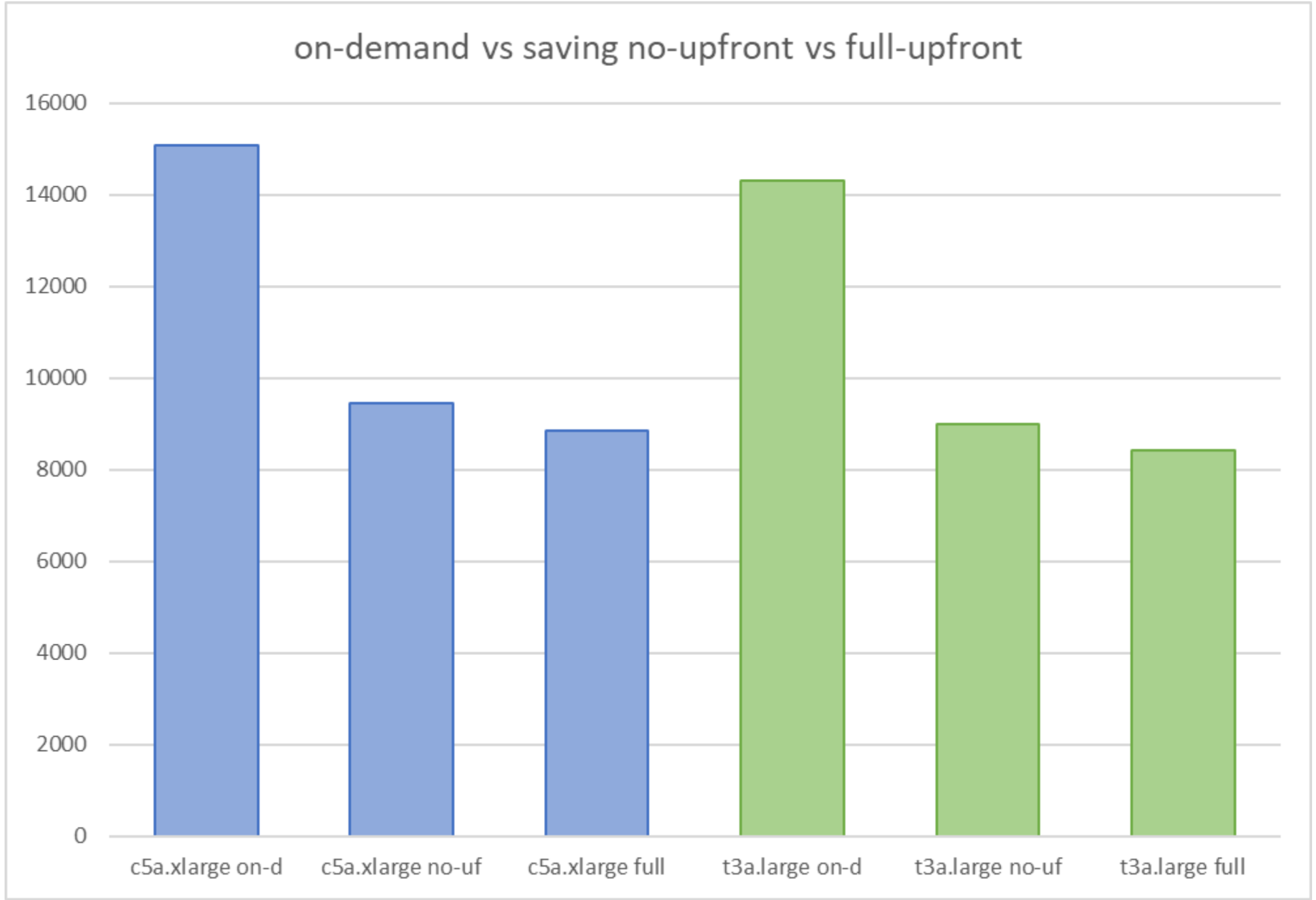
Spot

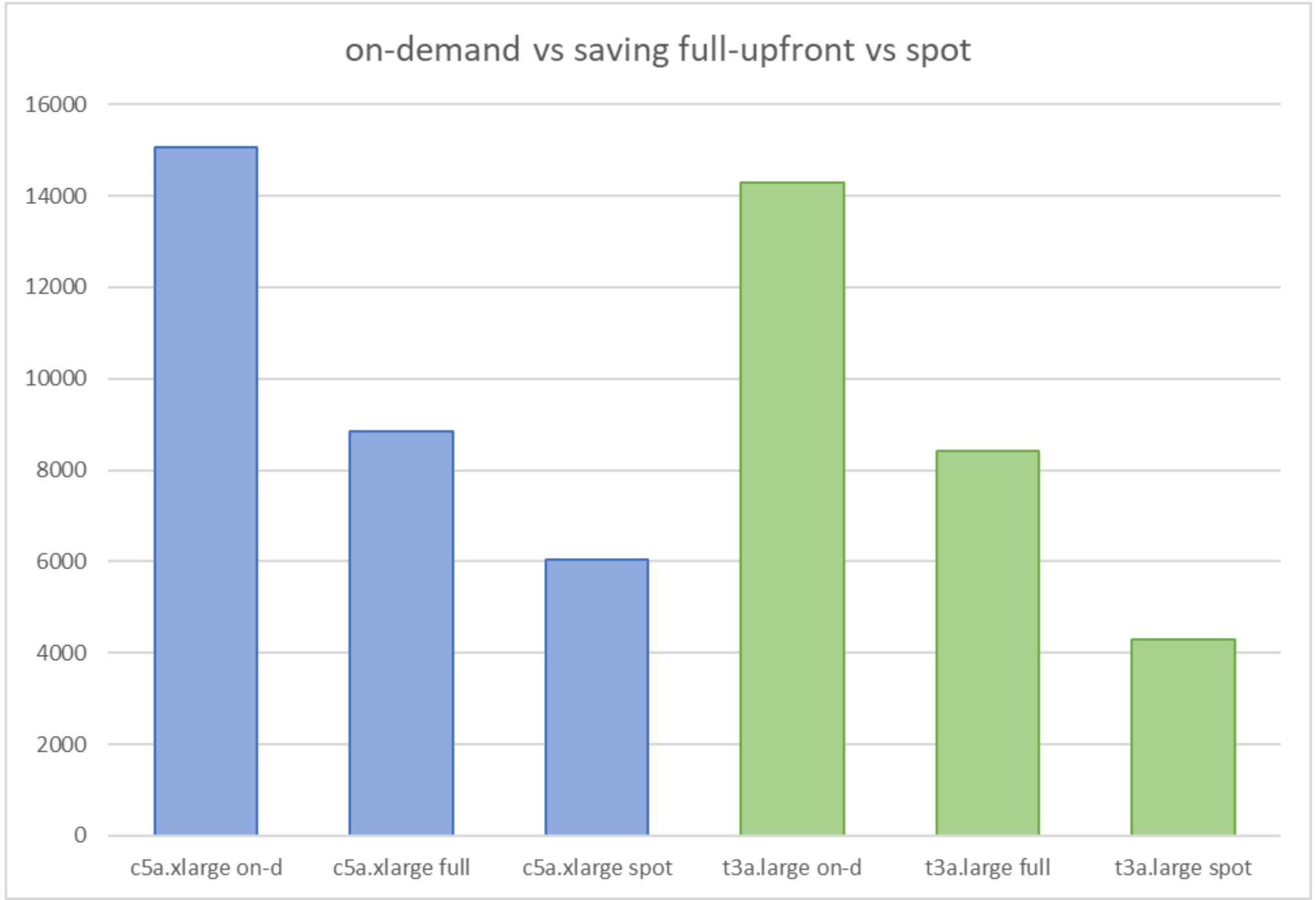
max discount at the cost of interruptions

EC2 linux US East (Ohio) t4g.nano

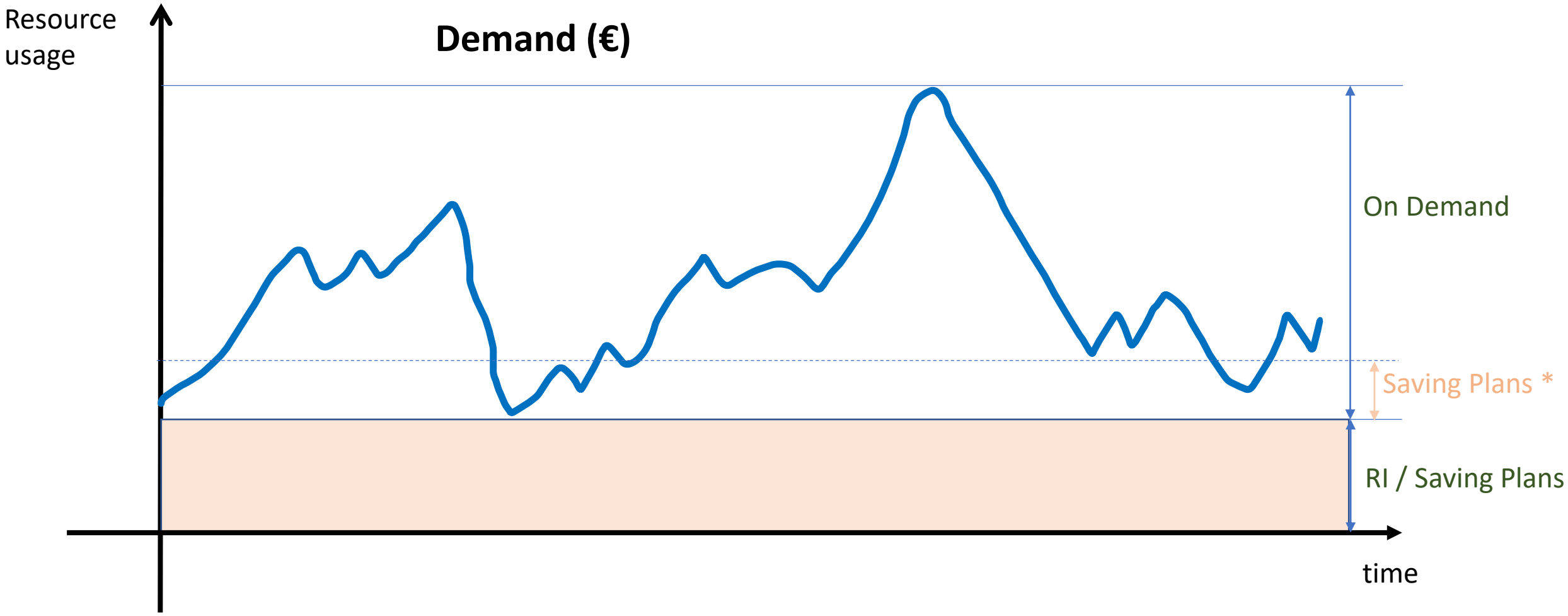



on-demand vs reservation vs saving plans
16000
14000
12000
10000
8000
6000
4000
2000
0
c5a.xlarge on-d
c5a.xlarge res
c5a.xlarge sav
t3a.large on-d
t3a.large res
t3a.large sav


on-demand vs saving no-upfront vs full-upfront
16000
14000
12000
10000
8000
6000
4000
2000
0
c5a.xlarge on-d
c5a.xlarge no-uf
c5a.xlarge full
t3a.large on-d
t3a.large no-uf
t3a.large full


on-demand vs saving full-upfront vs spot
16000
14000
12000
10000
8000
6000
4000
2000
0
c5a.xlarge on-d
c5a.xlarge full
c5a.xlarge spot
t3a.large on-d
t3a.large full
t3a.large 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

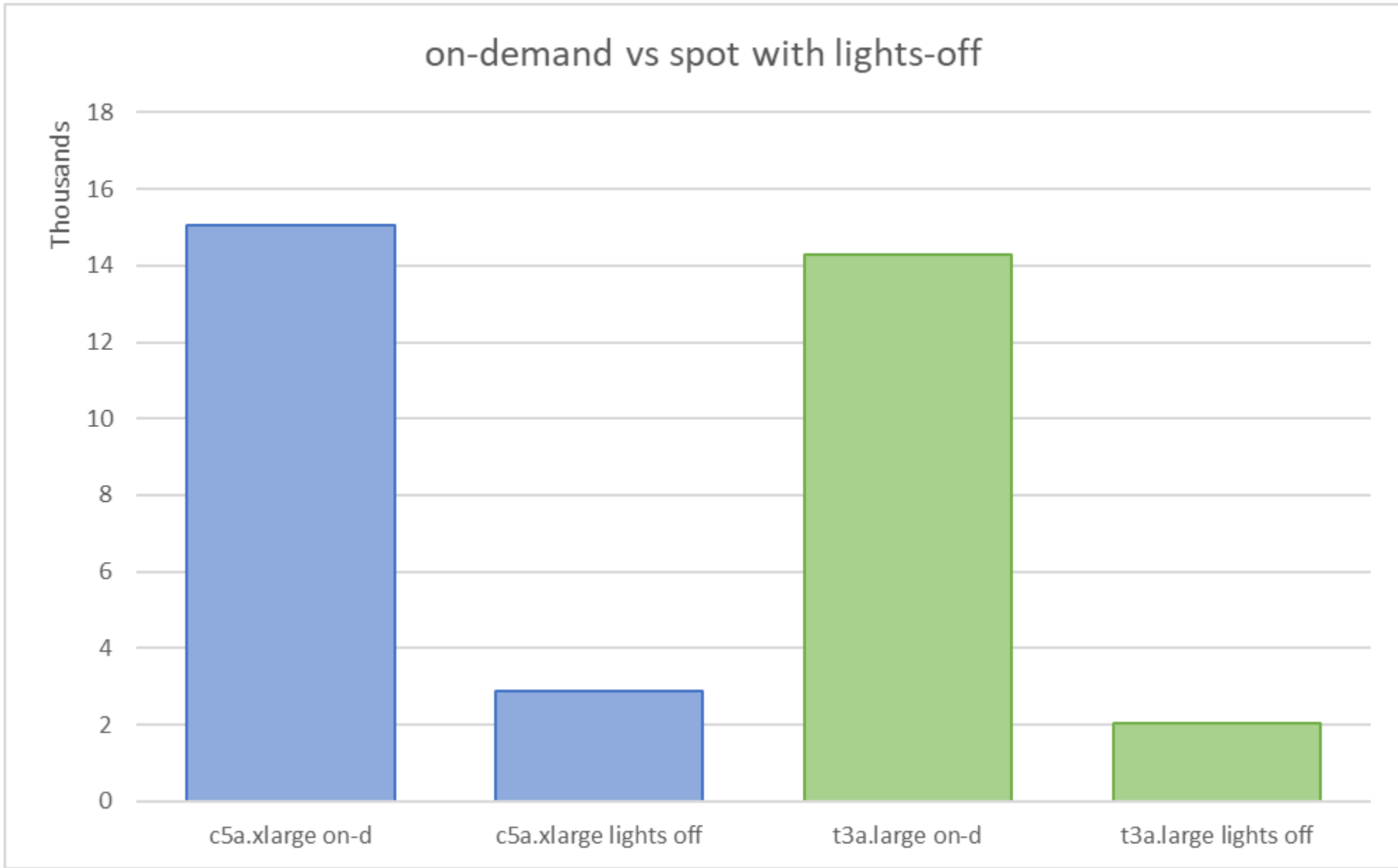
Cost Optimization strategies

Ligths
ON/OFF

Ligths 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%.**

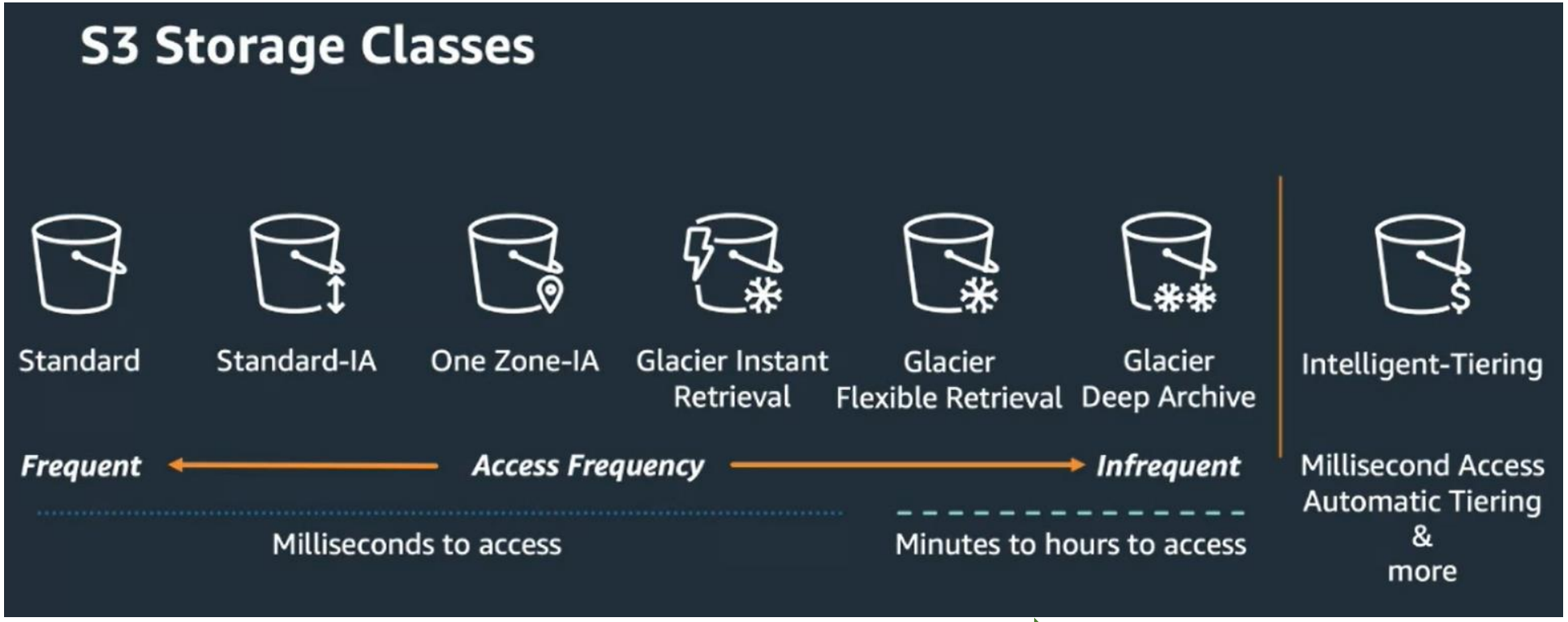

on-demand vs spot with lights-off
Thousands
18
16
14
12
10
8
6
4
2
0
c5a.xlarge on-d
c5a.xlarge lights off
t3a.large on-d
t3a.large lights off

Cost Optimization strategies

Storage tiers

Storage tiers

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



$0.023/GB → -95% → $0.00099/GB

Storage tiers

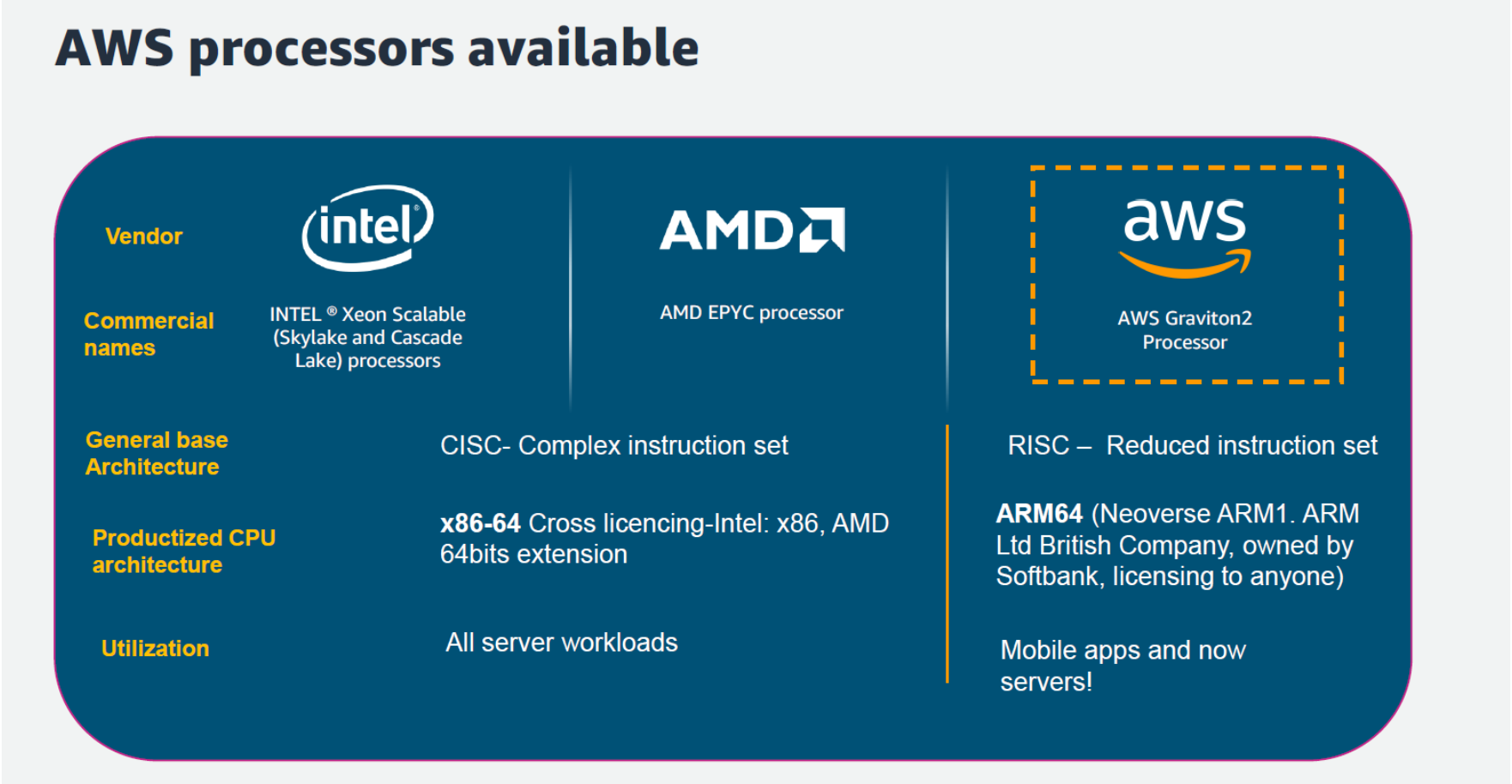
- EBS: General purpose, provisioned IOPS SSD, Cold HDD, Throughput optimized

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

Cost Optimization strategies

Processor type

Processor Type



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 servicesand for Linux if programming language is interpreted (Python, Java…) and more involved if it is compiled(C, C++..).

Cost Optimization strategies

Network topology

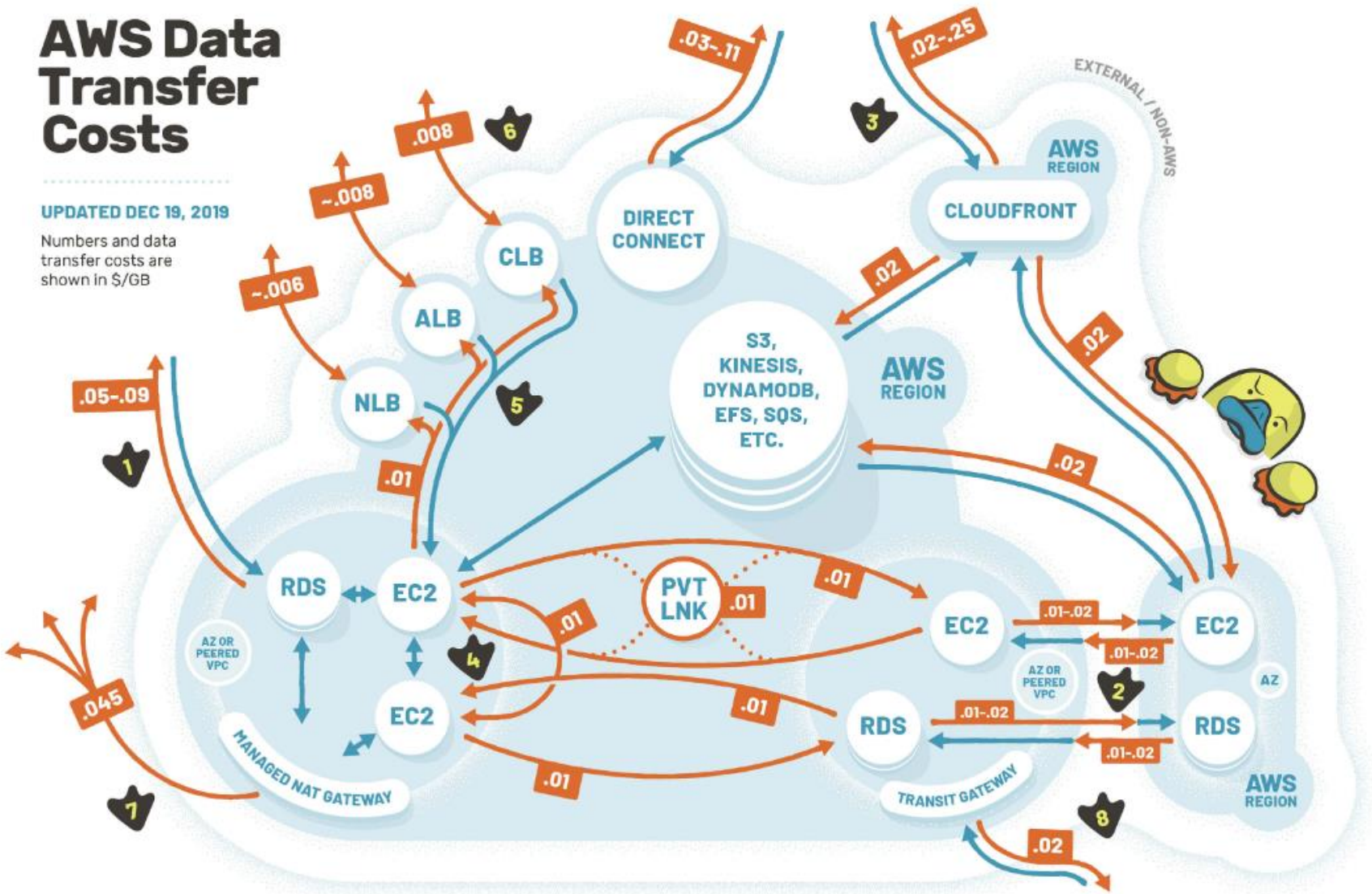
Network topology

- 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.**

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

Inspired by Open Guide to AWS's data transfer diagram
github.com/open-guides/og-aws

Cost Optimization strategies

Region

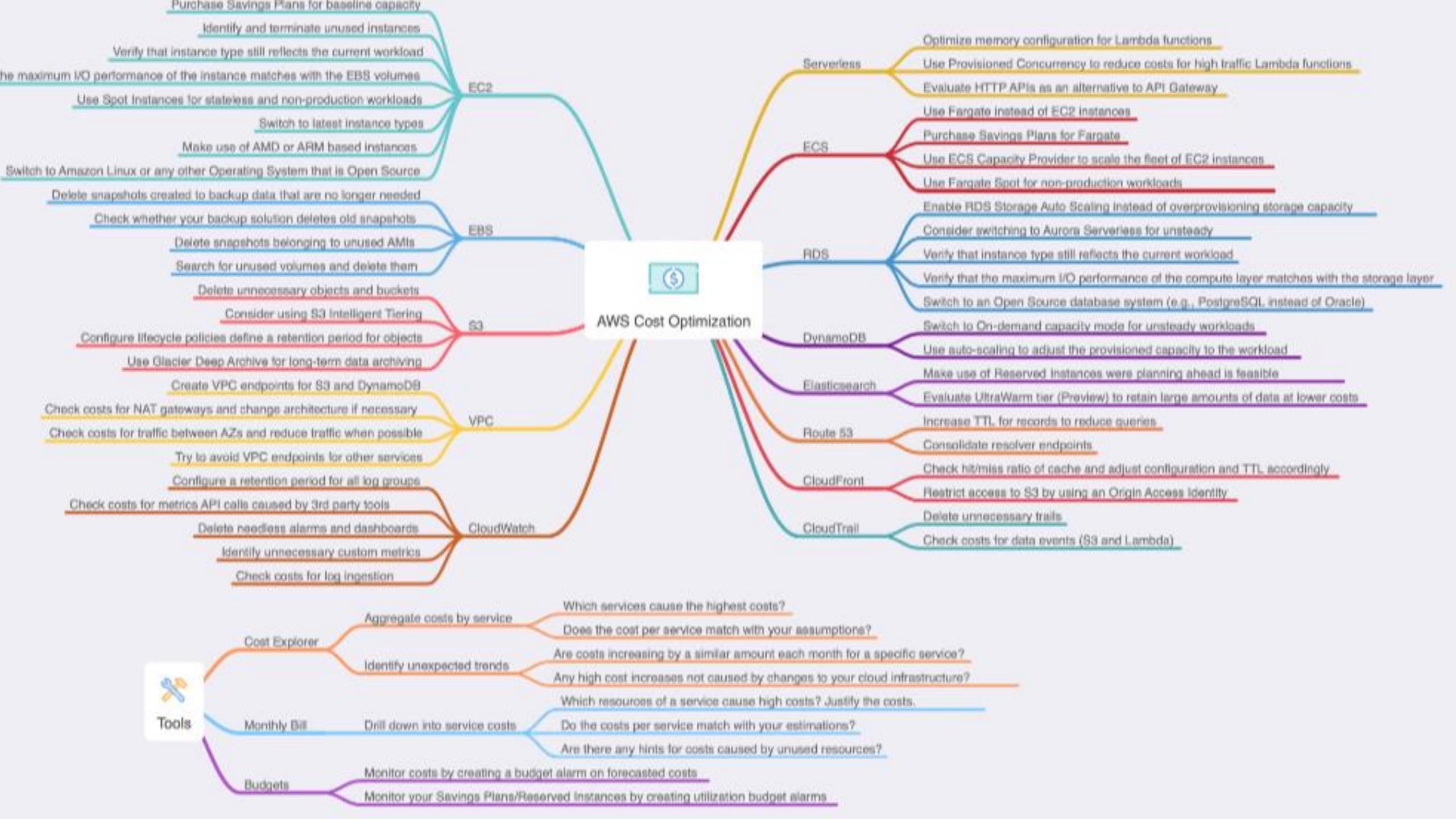
Region

- 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**	**Ligths ON/OFF**
Storage tiers	**Processor type**	**Network topology**	**Region**


AWS Cost Optimization
EC2
Purchase Savings Plans for baseline capacity
Identify and terminate unused instances
Verify that instance type still reflects the current workload
he maximum I/O performance of the instance matches with the EBS volumes
Use Spot Instances for stateless and non-production workloads
Switch to latest instance types
Make use of AMD or ARM based instances
Switch to Amazon Linux or any other Operating System that is Open Source
EBS
Delete snapshots created to backup data that are no longer needed
Check whether your backup solution deletes old snapshots
Delete snapshots belonging to unused AMIs
Search for unused volumes and delete them
S3
Delete unnecessary objects and buckets
Consider using S3 Intelligent Tiering
Configure lifecycle policies define a retention period for objects
Use Glacier Deep Archive for long-term data archiving
VPC
Create VPC endpoints for S3 and DynamoDB
Check costs for NAT gateways and change architecture if necessary
Check costs for traffic between AZs and reduce traffic when possible
Try to avoid VPC endpoints for other services
CloudWatch
Configure a retention period for all log groups
Check costs for metrics API calls caused by 3rd party tools
Delete needless alarms and dashboards
Identify unnecessary custom metrics
Check costs for log ingestion
Serverless
Optimize memory configuration for Lambda functions
Use Provisioned Concurrency to reduce costs for high traffic Lambda functions
Evaluate HTTP APIs as an alternative to API Gateway
ECS
Use Fargate instead of EC2 instances
Purchase Savings Plans for Fargate
Use ECS Capacity Provider to scale the fleet of EC2 instances
Use Fargate Spot for non-production workloads
RDS
Enable RDS Storage Auto Scaling instead of overprovisioning storage capacity
Consider switching to Aurora Serverless for unsteady
Verify that instance type still reflects the current workload
Verify that the maximum I/O performance of the compute layer matches with the storage layer
Switch to an Open Source database system (e.g., PostgreSQL instead of Oracle)
DynamoDB
Switch to On-demand capacity mode for unsteady workloads
Use auto-scaling to adjust the provisioned capacity to the workload
Elasticsearch
Make use of Reserved Instances were planning ahead is feasible
Evaluate UltraWarm tier (Preview) to retain large amounts of data at lower costs
Route 53
Increase TTL for records to reduce queries
Consolidate resolver endpoints
CloudFront
Check hit/miss ratio of cache and adjust configuration and TTL accordingly
Restrict access to S3 by using an Origin Access Identity
CloudTrail
Delete unnecessary trails
Check costs for data events (S3 and Lambda)
Tools
Cost Explorer
Aggregate costs by service
Which services cause the highest costs?
Does the cost per service match with your assumptions?
Identify unexpected trends
Are costs increasing by a similar amount each month for a specific service?
Any high cost increases not caused by changes to your cloud infrastructure?
Monthly Bill
Drill down into service costs
Which resources of a service cause high costs? Justify the costs.
Do the costs per service match with your estimations?
Are there any hints for costs caused by unused resources?
Budgets
Monitor costs by creating a budget alarm on forecasted costs
Monitor your Savings Plans/Reserved Instances by creating utilization budget alarms

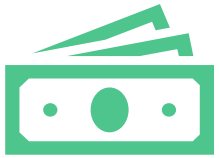
Open Ideas

- 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/videos/1816367124

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


شكراً جزيلاً
ngiyabonga
рахмат
danke
謝謝
teşekkür ederim
Баярлалаа
mersi
kia ora
barka
welalin
spas
tack
mahalo
tapadh leat
спасибо
faafetai lava
vinaka
спасибі
blagodaram
dank je
misaotra
matondo
paldies
grazzi
thank you
gracias
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nanni
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