Fireside Chat:
Best practices for cost optimizations for the AWS database portfolio

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AWS Database Cost Optimization

- Choosing the right infrastructure
- Optimizing your license structure
- In-Memory Caching
- Data lifecycle decisions
- Monitoring and tracking cost metrics
- Using pricing calculators and estimation tools

NEW! Improved price performance and price predictability with Amazon Aurora I/O-Optimized

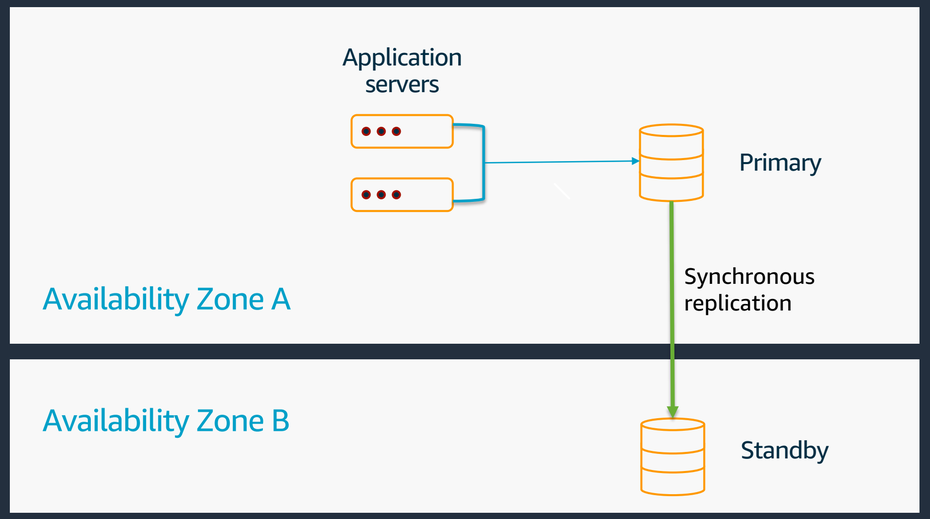
- Aurora cluster configuration with the option to pay for compute and storage only with <u>no charges for read and write I/O operations</u>
- Price predictability: no pay-per-request I/O charges making it easy to estimate database spend upfront
- For customers whose I/O spend exceeds 25% of total Aurora database spend, customers can save up to 40% cost savings
- Improved performance: increasing throughput and reducing latency for I/O-intensive applications
- Available for Aurora PostgreSQL-Compatible Edition and Aurora MySQL-Compatible Edition
- Supported on Aurora Serverless v2 and provisioned (on-demand and reserved) instances

*These price points are subject to change at our discretion.

Graviton based price / performance

- AWS designed processors for performance optimization of cloud workloads running on EC2
- Currently on third generation Graviton3 processors
- Databases available on Graviton2: Amazon Aurora, RDS, Neptune, DocumentDB, MemoryDB for Redis, ElastiCache
- Graviton2: 52% better price/performance on RDS and 35% better price/performance on Aurora
- Graviton3: 20% price/performance improvement vs. Graviton2 for Aurora and 27% for RDS open-source

Compute: cost optimization strategies



Cost

- DB Instance per hour cost (metered per second, min 10 minutes)

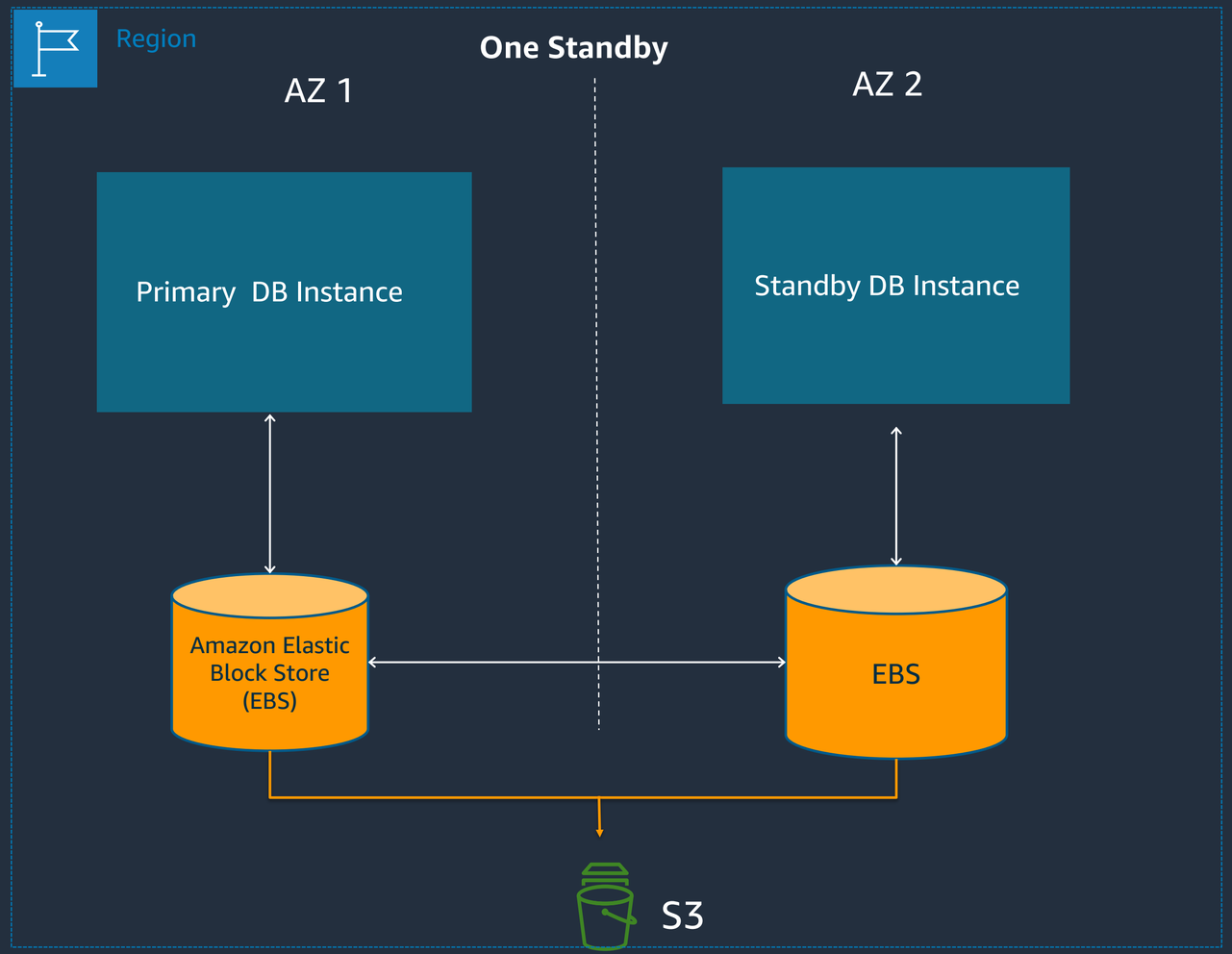
Cost Monitoring

- CloudWatch metrics: CPUUtilization , FreeableMemory, NetworkReceive/TransmitThroughput
- AWS Trusted Advisor: Idle DB instances.

Optimizations

- Right-scaling (CPU, memory, network)
- Use Reserved Instances (long commitment, constant workloads)
- Stop/start DB instance/cluster(intermittent load)
- Tune SQL queries to avoid additional rows processing and high resource utilization for SQL execution
- Use Aurora Serverless (variable/intermittent load)

RDS storage: cost optimization strategies



Cost

- Depending on the storage type provisioned - gp2, gp3, io1
- General Purpose (GP2) - Cost based on the amount of storage provisioned
- Provisioned IOPS – Cost based on the amount of storage provisioned and IOPS separately.

Cost Monitoring

- CloudWatch metrics: FreeStorageSpace, Read/Write IOPS, Read/Write Latency, DiskQueueDepth

Optimizations

- Avoid unused/unnecessary secondary indexes
- Implement data life cycle management polices by periodically archiving old data into Amazon S3
- Consider logical export and import using native tools into new RDS DB instance to reduce storage usage

Aurora storage: cost optimization strategies

- Applies for one copy of data only
- Storage consumption is billed in per GB-month increments
- Storage and I/O costs are decoupled and charged separately
- Storage grows and shrinks automatically*
- No pre-provisioning of storage, grows in 10 GB increments

GB-month calculation

Day 1 of month: 1000 GB

Day 2 of month: 20 GB

Day 3 of month: 20 GB

Total monthly Aurora storage usage : GB-month: (1,000 GB * 30 days + 20 GB * 29 days + 20 GB * 28 days + ... + 20 GB * 1 day) / 30 days = 1,290 GB-month.

Total monthly Aurora cost in USE1: 1,290 GB-month * $0.10 per GB-month = $129

Cost monitoring

[Billed] Volume Bytes Used (GiB)

Optimizing Aurora storage cost

- Partition the large tables
- Drop older partitions or unused table
- Analyze the need to storing data in Aurora
- Data archiving
- Purge duplicate, unused indexes
- Data type consideration
- Aurora storage automatic resize

Aurora Read I/O cost optimization

Cost

- Per-page Read I/O Cost: Number of physical pages read from Aurora storage
- Aurora MySQL page size: 16KB
- Aurora PostgreSQL: 8KB

Cost monitoring:

- CloudWatch Metrics: [Billed] Volume Read IOPS (Count)
- Use Performance Insights to identify I/O intensive queries

Optimizing Aurora Read I/O Cost

- Optimize queries to read from memory as much as possible
- Monitor CloudWatch metrics BufferCacheHitRatio (Percent)
- Optimize and right-size your DB instance
- Tune queries to avoid full table scans on large tables
- Use Aurora native backup and snapshots when possible. Logical backup will cause excessive reads.

Aurora Write I/O Cost

Cost

- Write I/O Unit: 4 KB unit
- Write I/O Cost : Per 1 million requests
- Example: For us-east-1 AWS region I/O rate: $0.20 per 1 million requests
- No cost for transaction log record streaming and page updates on all the read replica instances of the cluster

Cost monitoring

- CloudWatch Metrics: [Billed] Volume Write IOPS (Count)

Optimizing Aurora Write I/O Cost

- Aurora groups concurrent writes of 4KB against the same pages/segments
- Write IO usage is optimized is built-in process
- Remove un-used or duplicate indexes from tables
- Logical replication – Use when needed

Aurora: Features and cost

Aurora Global Database

- Billed for replicated write I/O between regions
- Instances, storage, backup storage and cross-region data transfer
- Optimize by choosing appropriate number of regions, replicas and headless cluster

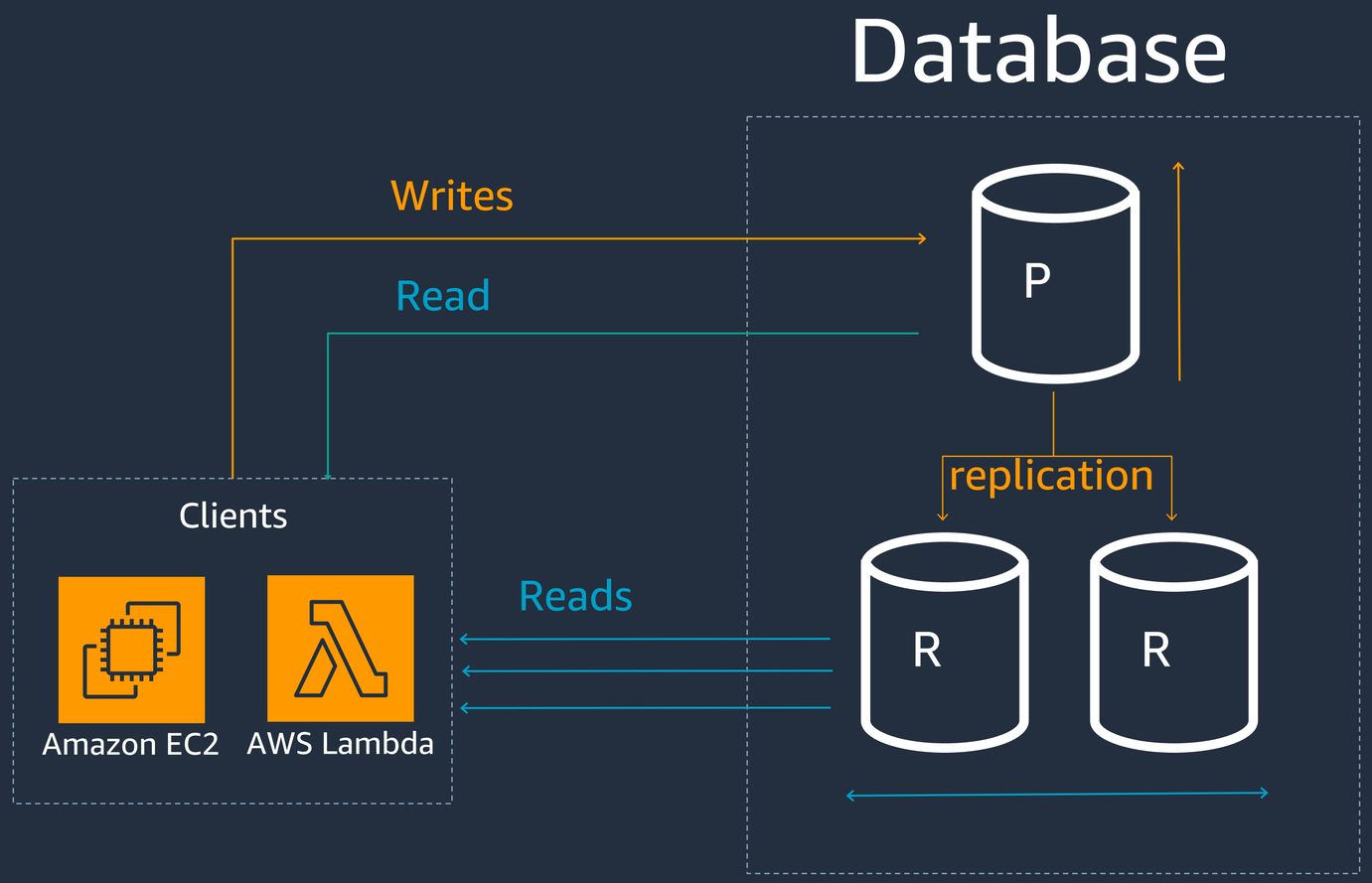
Aurora Fast Clones

- No additional storage cost initially
- Instances, backup storage, cost applies
- When not in use , drop the clone
- Aurora headless clone cluster

Snapshot Export to S3

- Every export of data from the same snapshot is billed at full snapshot size, even while exporting selective database or tables.
- Billed per GB of snapshot size ($.010 in US-EAST). Example: Export of 100GB snapshot will cost 100 X $ 0.01 = $1. Storage, encryption and PUT requests are charged by S3 separately.
- Optimize by dropping unneeded snapshots exports.

Relational database scaling



DB Scale Vertically

- Increased memory
- Increased CPU count
- Increased network capacity

DB Scale Horizontally

- Increased read capacity

Drawbacks

- Vertical scaling is limited
- Unnecessary data on replicas
- Impacted by disk-based latency
- Costly & limited in scope

Financial advantages of caching RDS/Aurora

"Save up to 55% in cost and gain up to 80x faster read performance using ElastiCache with RDS for MySQL (vs. RDS for MySQL alone)."

$

- Significantly cheaper than scaling RDS for the same workload
- Only pay a per instance fee and no separate IO charge
- It can scale independently from RDS at a lower cost
- With ElastiCache optimizations such as Enhanced IO multiplexing, obtain up to 72% better price/performance, and with data tiering, obtain up to 60% better price/capacity

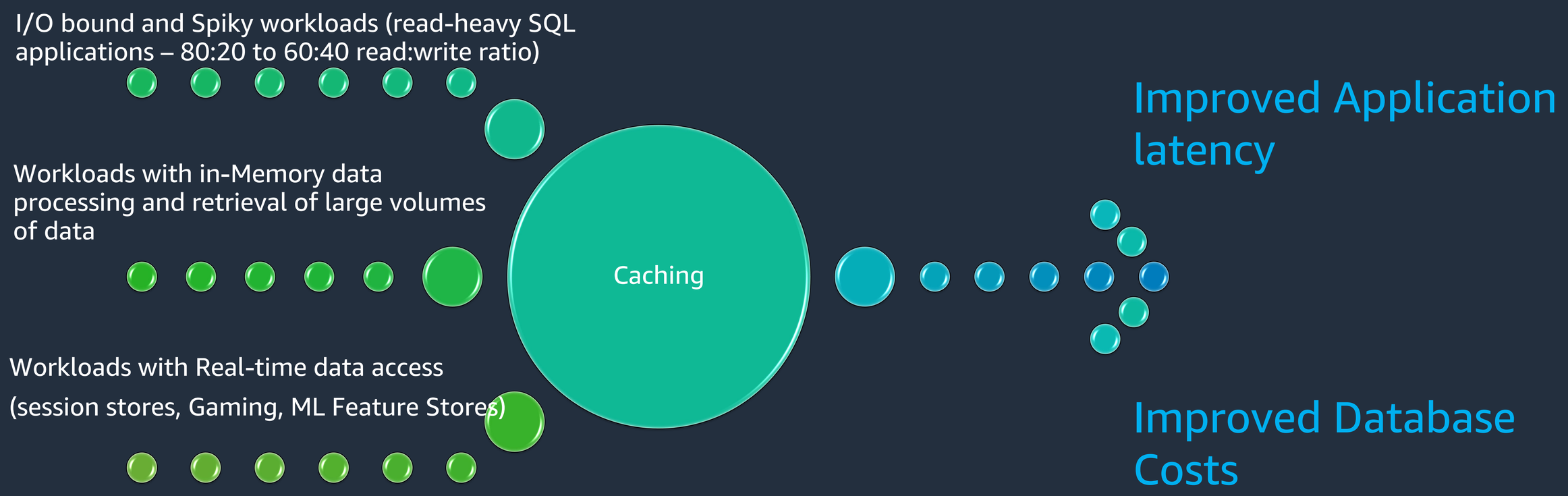
* Internal tests. Can share analysis and customize to customer workloads, instance types.

Recent In-Memory Price/Performance Optimizations

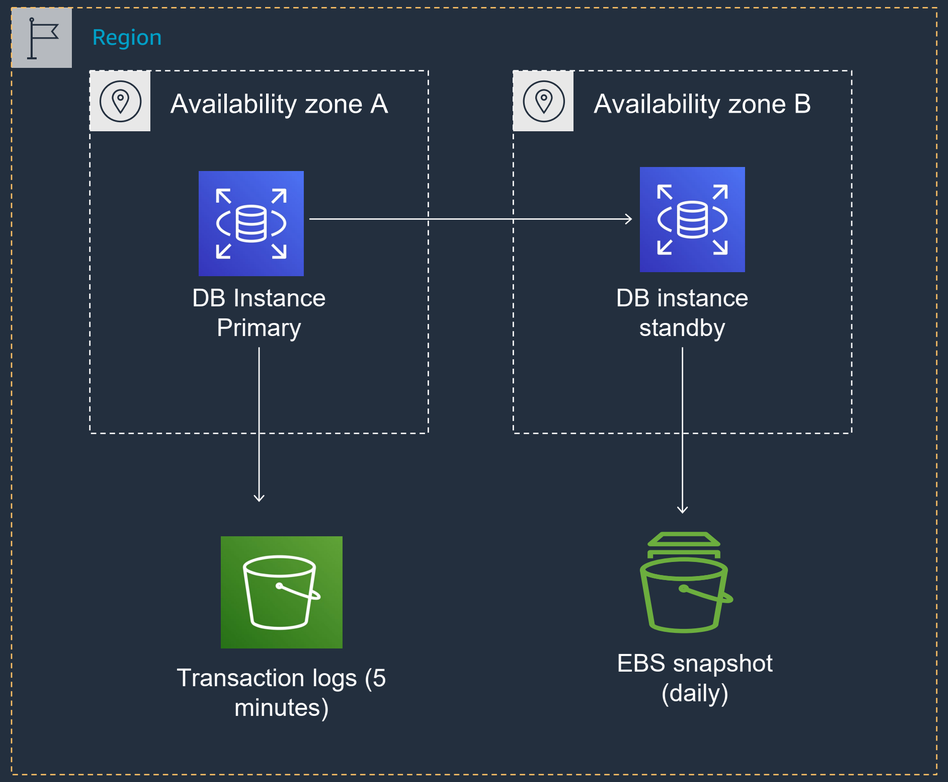
- Data tiering for ElastiCache and MemoryDB for Redis with up to 60% cost savings versus maximum utilization on R6g nodes
- ElastiCache for Redis 7 including enhanced I/O multiplexing with up to 72% increased throughput and up to 71% reduction in query latency
- MemoryDB enhanced I/O multiplexing with up to 46% increased throughput and up to 21% reduction in latency

* Internal tests. Can share analysis and customize to customer workloads, instance types.

What Workloads can be cost-optimized with Caching



Backup and Snapshots: cost optimization strategies



Cost

- RDS/Aurora Backup cost: Backup storage per GB-month

Notes

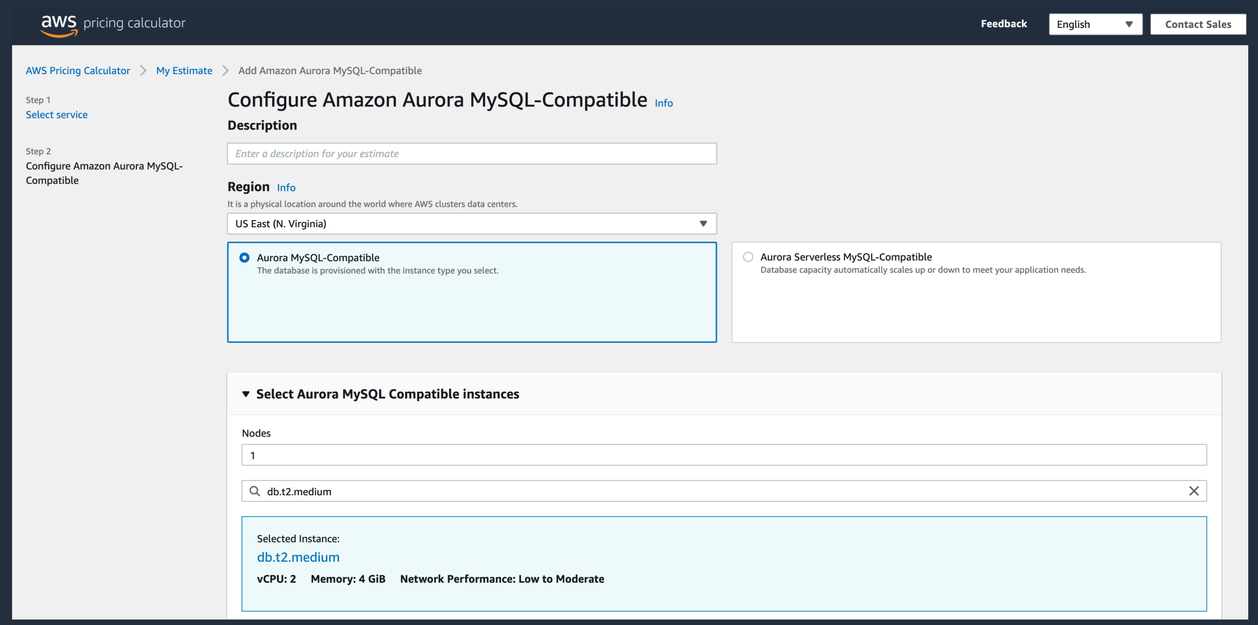
- No charges for backup up to 100% of total RDS/Aurora database storage for a region
- The first snapshot of a DB instance is full and subsequent snapshots are incremental
- Manual snapshots that fall within the retention period are not charged
- Manual snapshots retained more than retention period charged

Optimizations

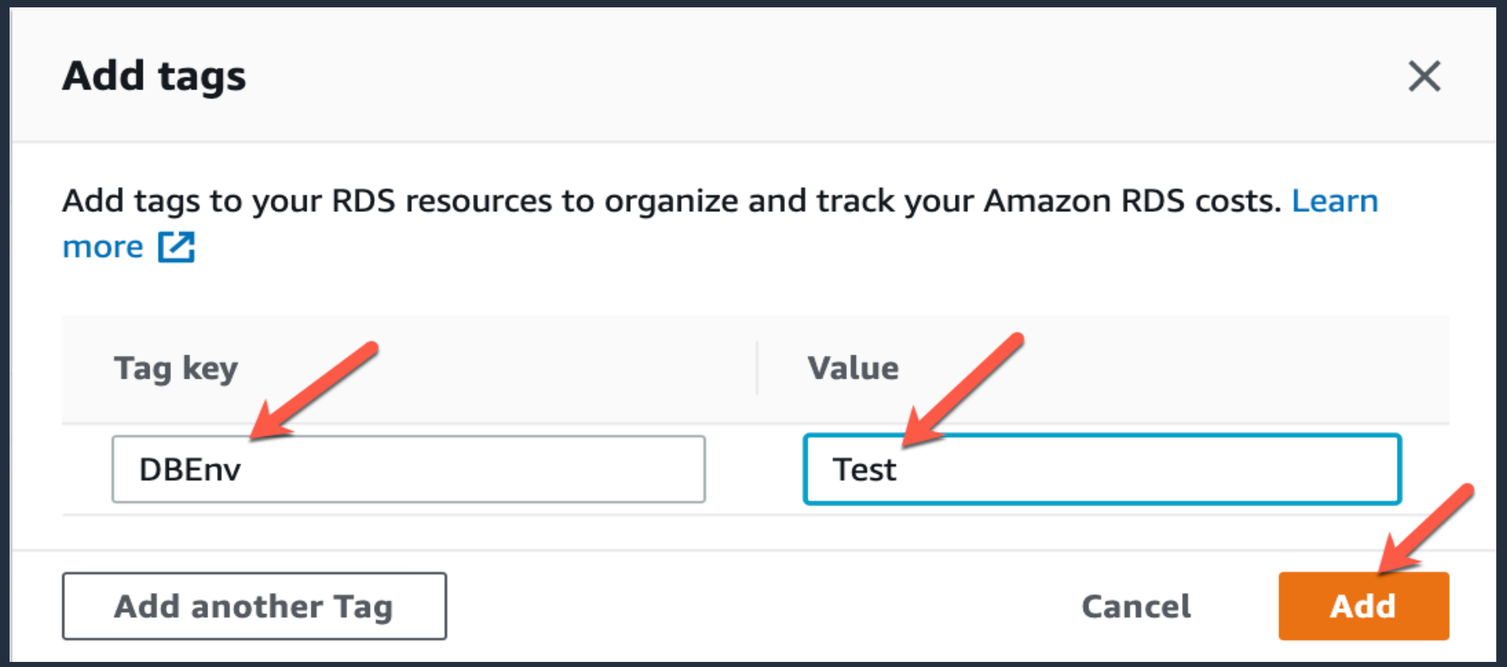
- Review and configure the backup retention period based on business SLAs
- Use and maintain the manual snapshots as needed
- Identify orphan snapshots with no provisioned instance

AWS Pricing Calculator

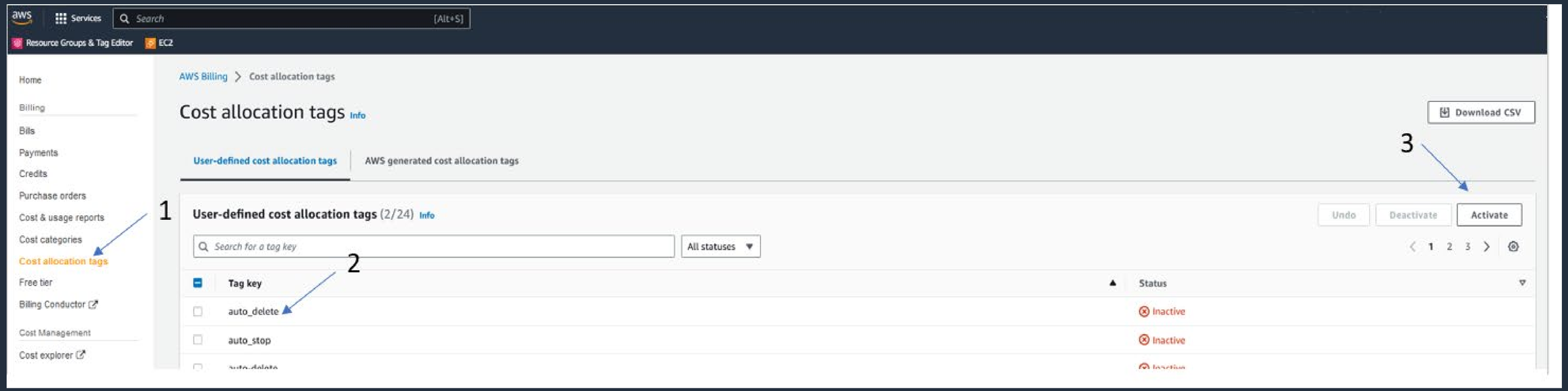
- https://calculator.aws/#/
- Web-based planning tool that can use to create estimates for your AWS use case
- Model your solutions before building them, explore the AWS service price point
- Review the calculations behind your estimates
- Plan how you spend, find cost saving opportunities



RDS: Tagging



Activate custom tags in the Billing console

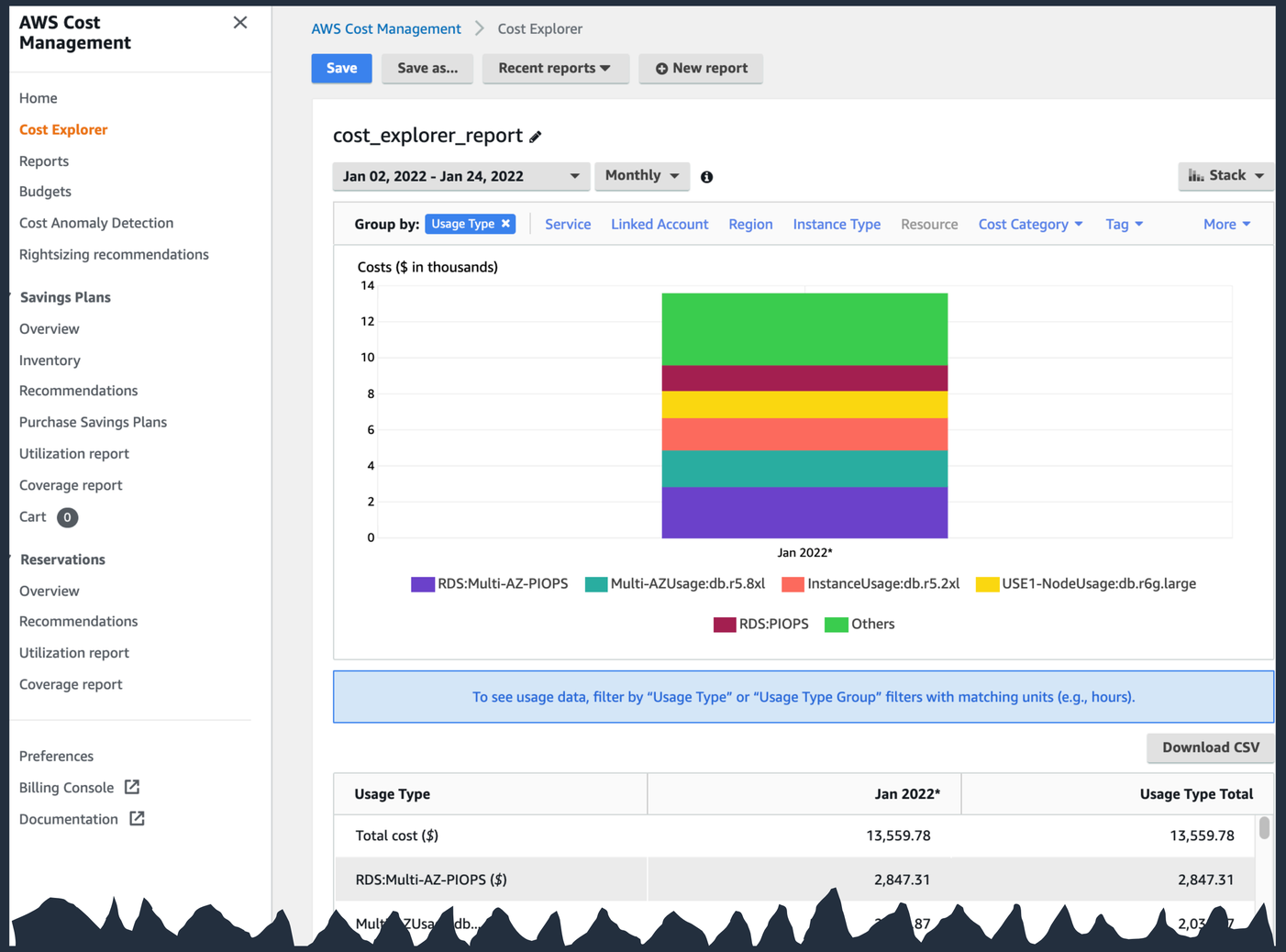


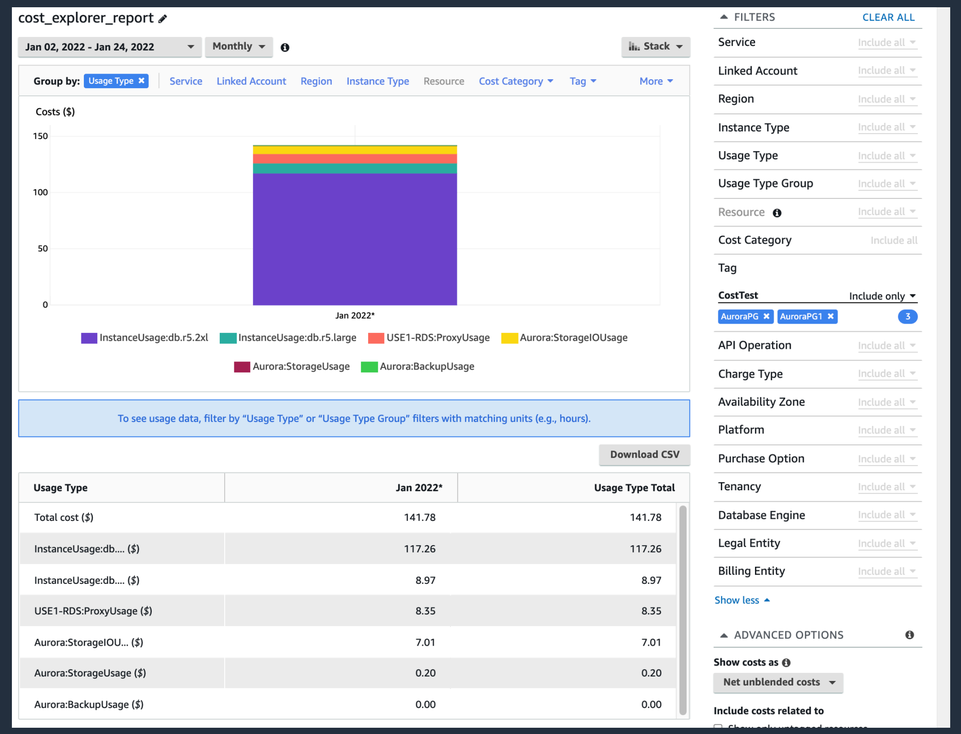
Cost allocation tags for Aurora storage

- Categorize resources such as storage, I/O, backups, snapshots, Aurora Backtrack, and Global Database replicated I/O
- Based on the purpose, owner, environment
- Usage categorization based on DB environments like production, test & dev etc
- Usage resources like storage, I/O, backups, snapshots, Aurora Backtrack, and Global Database replicated I/O etc

GuardDuty		$0.18
Key Management Service		$0.00
Pinpoint		$0.50
Relational Database Service		[illegible]
US East (N. Virginia)		[illegible]
Amazon Aurora Storage and I/O		$1.92
$0.10 per GB-month of consumed storage (Aurora)	0.671 GB-Mo	[illegible]
$0.20 per 1 million I/O requests (Aurora)	9,268,227.000 IOs	[illegible]
Amazon Relational Database Service for Aurora MySQL		[illegible]
$0.29 per RDS db.r4.large instance hour (or partial hour) running Amazon Aurora	164.190 Hrs	[illegible]
Secrets Manager		$1.20
Simple Notification Service		$0.00

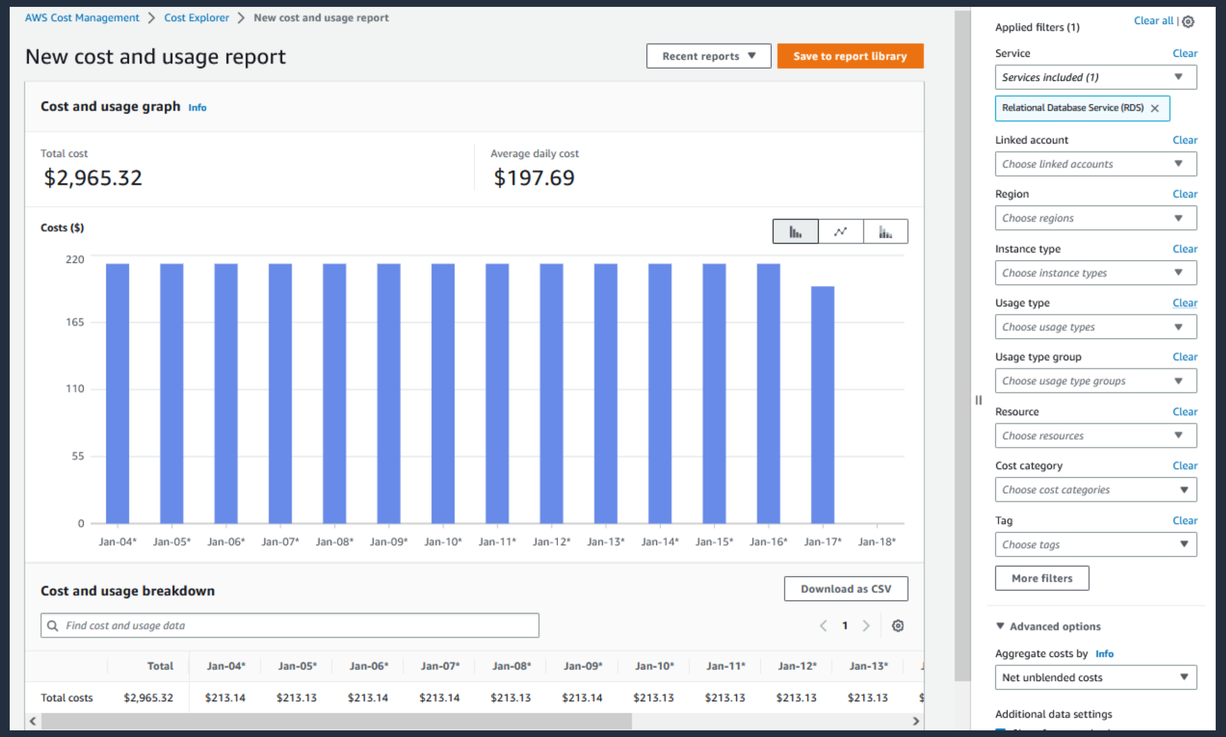
Cost Explorer





AWS Cost and Usage Report (CUR)

- Comprehensive set of cost and usage data, and estimated cost.
- Publish your AWS billing reports to an Amazon S3 bucket
- Break down your costs by the hour, day, or month, by product or product resource, or by tags
- Use Amazon Athena or Amazon QuickSight to analyze CUR data in S3
- Upload CUR reports to Amazon Redshift to analyze AWS cost and usage.



Call to action

- Understand key cost components: cost calculations, monitoring and optimization
- Setup an alert to monitor abnormal changes in critical cost components
- Analyze top 10 intensive read IO queries and tune to reduce query overhead
- Use Aurora/RDS tagging on RDS databases and Aurora clusters for cost categorization and usages analysis
- Frequently review the cost usage report and plan for optimization
- Reach out to Database Specialist TAM for additional help

More Questions?

Office Hours

Your questions answered: Best practices for AWS database cost optimizations.

Thursday, 07/27/23 | 8:00 AM–8:45 AM PT

Resources

Cost explorer

- https://aws.amazon.com/aws-cost-management/aws-cost-explorer/

AWS Pricing calculator

- https://calculator.aws/

Planning Aurora I/O cost

- https://aws.amazon.com/blogs/database/planning-i-o-in-amazon-aurora/

Planning Aurora I/O cost

- https://docs.aws.amazon.com/cur/latest/userguide/what-is-cur.html

Aurora pricing page

- https://aws.amazon.com/rds/aurora/pricing/

Thank You!