Module 2: Cloud Economics and Billing

AWS Academy Cloud Foundations

Module overview

Topics

- Fundamentals of pricing
- Total Cost of Ownership
- AWS Organizations
- AWS Billing and Cost Management
- Technical Support

Activities

- AWS Pricing Calculator
- Support plans scavenger hunt

Demo

- Overview of the Billing Dashboard

Knowledge check

Module objectives

After completing this module, you should be able to:

- Explain the AWS pricing philosophy
- Recognize fundamental pricing characteristics
- Indicate the elements of total cost of ownership
- Discuss the results of the AWS Pricing Calculator
- Identify how to set up an organizational structure that simplifies billing and account visibility to review cost data.
- Identify the functionality in the AWS Billing Dashboard
- Describe how to use AWS Bills, AWS Cost Explorer, AWS Budgets, and AWS Cost and Usage Reports
- Identify the various AWS technical support plans and features

Section 1: Fundamentals of pricing

Module 2: Cloud Economics and Billing

AWS pricing model

Three fundamental drivers of cost with AWS

Compute

- Charged per hour/second*
- Varies by instance type

*Linux only

Storage

- Charged typically per GB

Data transfer

- Outbound is aggregated and charged
- Inbound has no charge (with some exceptions)
- Charged typically per GB

How do you pay for AWS?

Pay for what you use

Pay less when you reserve

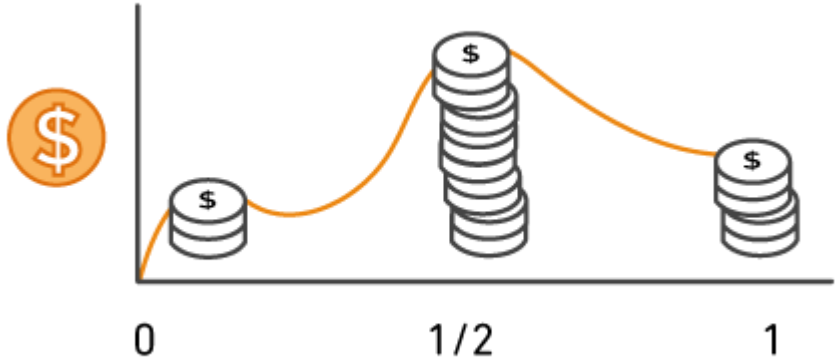
Pay less when you use more and as AWS grows

Pay for what you use

Pay only for the services that you consume, with no large upfront expenses.

On premises

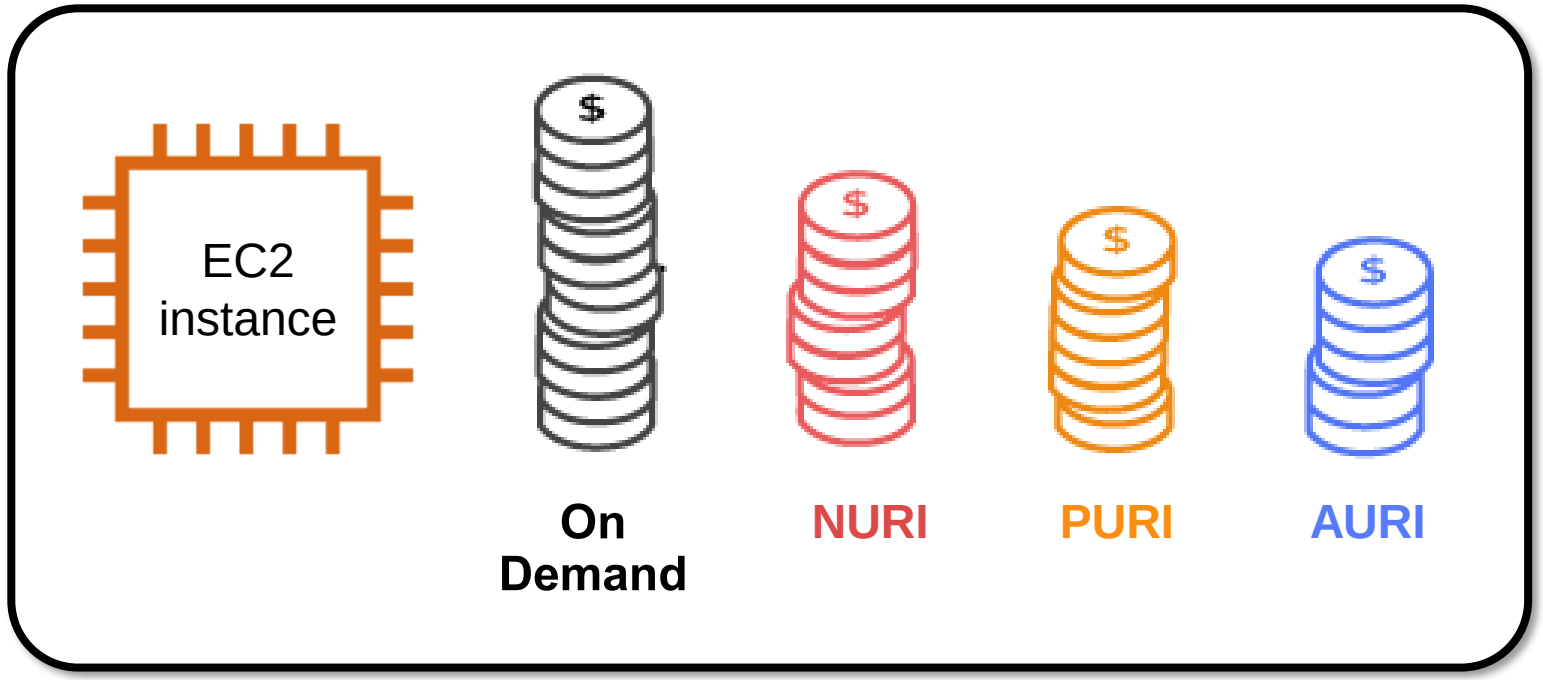
AWS



Pay less when you reserve

Invest in Reserved Instances (RIs):

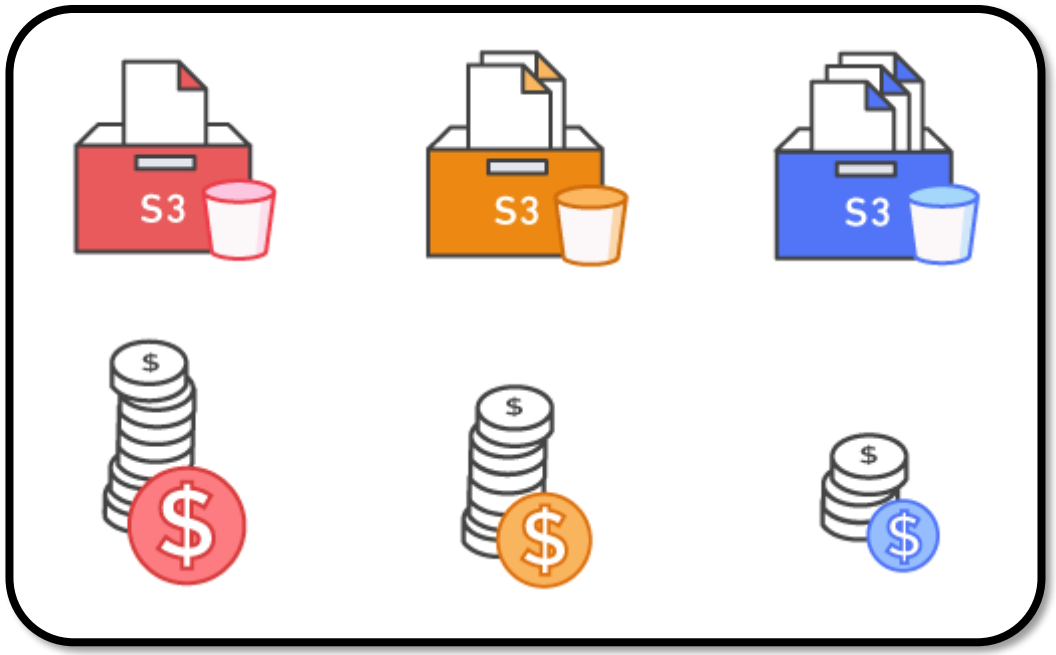
- Save up to 75 percent
- Options:
  - All Upfront Reserved Instance **(AURI)** → **largest discount**
  - Partial Upfront Reserved Instance **(PURI)** → **lower discounts**
  - No Upfront Payments Reserved Instance **(NURI)** → **smaller discount**



Pay less by using more

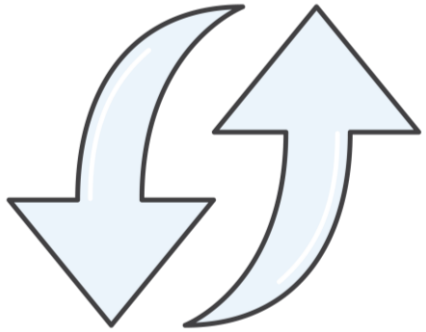
Realize volume-based discounts:

- **Savings** as usage increases.
- **Tiered pricing** for services like Amazon Simple Storage Service (Amazon S3), Amazon Elastic Block Store (Amazon EBS), or Amazon Elastic File System (Amazon EFS) → the more you use, the less you pay per GB.
- Multiple storage services deliver **lower** storage costs based on needs.



Pay even less as AWS grows

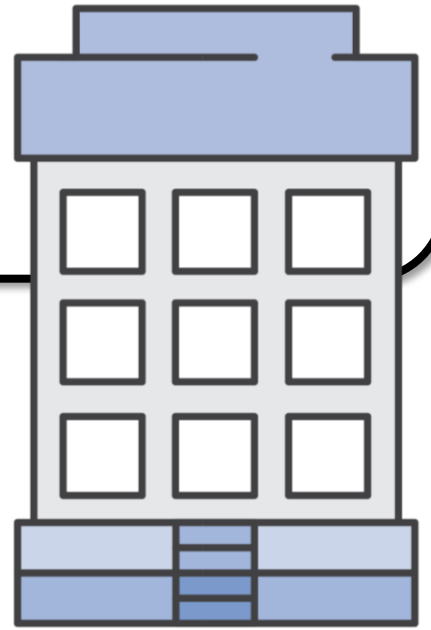
As AWS grows:



- AWS focuses on lowering cost of doing business.
- This practice results in AWS passing savings from economies of scale to you.
- Since 2006, AWS has **lowered pricing 75** times (as of September 2019).
- Future higher-performing resources replace current resources for no extra charge.

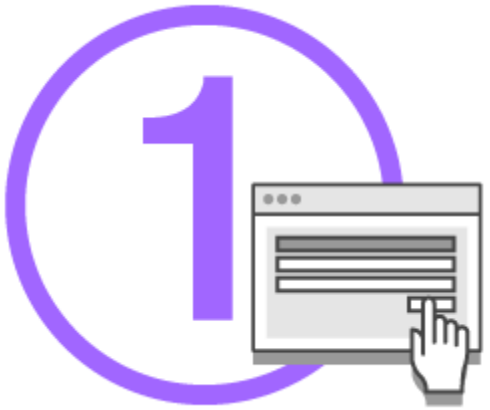
Custom pricing

- Meet varying needs through custom pricing.
- Available for high-volume projects with unique requirements.



AWS Free Tier

Enables you to gain free hands-on experience with the AWS platform, products, and services. Free for 1 year for new customers.

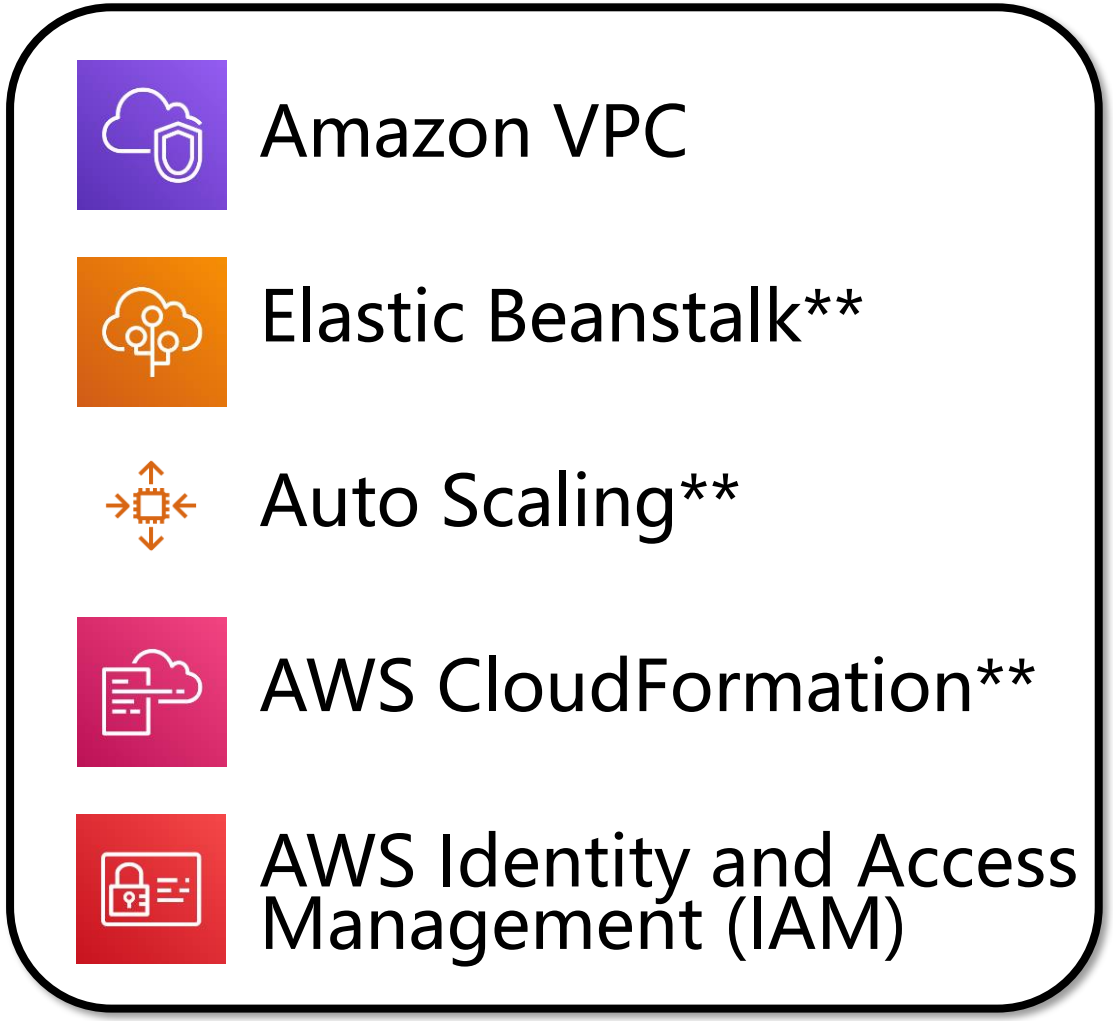


Sign up for an AWS account

Learn with 10-minute tutorials

Start building with AWS

Services with no charge



**Note: There might be charges associated with other AWS services that are used with these services.

Key takeaways

- There is no charge (with some exceptions) for:
  - Inbound data transfer.
  - Data transfer between services within the same AWS Region.
- Pay for what you use.
- Start and stop anytime.
- No long-term contracts are required.
- Some services are free, but the other AWS services that they provision might not be free.

Section 2: Total Cost of Ownership

Module 2: Cloud Economics and Billing

On-premises versus cloud

Traditional Infrastructure

Equipment

Resources and administration

Contracts

Cost

≠

AWS Cloud

No upfront expense—pay for what you use

Improve time to market and agility

Scale up and down

Self-service infrastructure

What is Total cost of Ownership (TCO)?

Total Cost of Ownership (TCO) is the financial estimate to help identify direct and indirect costs of a system.

Why use TCO?

- To compare the costs of running an **entire infrastructure environment or specific workload** on-premises versus on AWS
- To budget and **build the business case** for moving to the cloud

TCO considerations

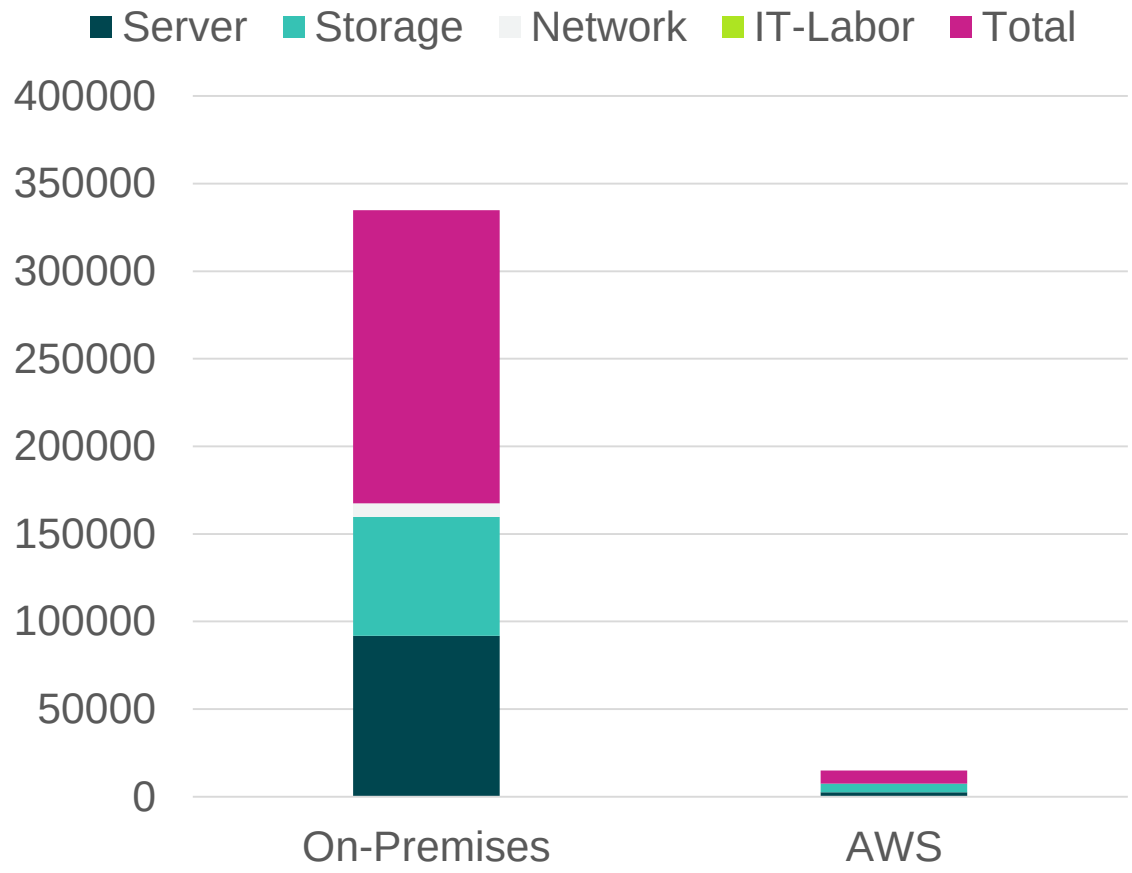
1 Server Costs	Hardware: Server, rack chassis power distribution units (PDUs), top-of-rack (TOR) switches (and maintenance)	Software: Operating system (OS), virtualization licenses (and maintenance)	Facilities cost	Space, Power, Cooling
2 Storage Costs	Hardware: Storage disks, storage area network (SAN) or Fibre Channel (FC) switches	Storage administration costs	Facilities cost	Space, Power, Cooling
3 Network Costs	Network hardware: Local area network (LAN) switches, load balancer bandwidth costs	Network administration costs	Facilities cost	Space, Power, Cooling
4 IT Labor Costs	Server administration costs			

On-premises versus all-in-cloud

You could save up to **96 percent** a year by moving your infrastructure to AWS.
Your 3-year total savings would be **$159,913**.

3-Year Total Cost of Ownership		
	On-Premises	AWS
Server	$91,922	$2,547
Storage	$67,840	$4,963
Network	$7,660	$-------
IT – Labor	$ -------- --	$-------
Total	$167, 422	$7,509

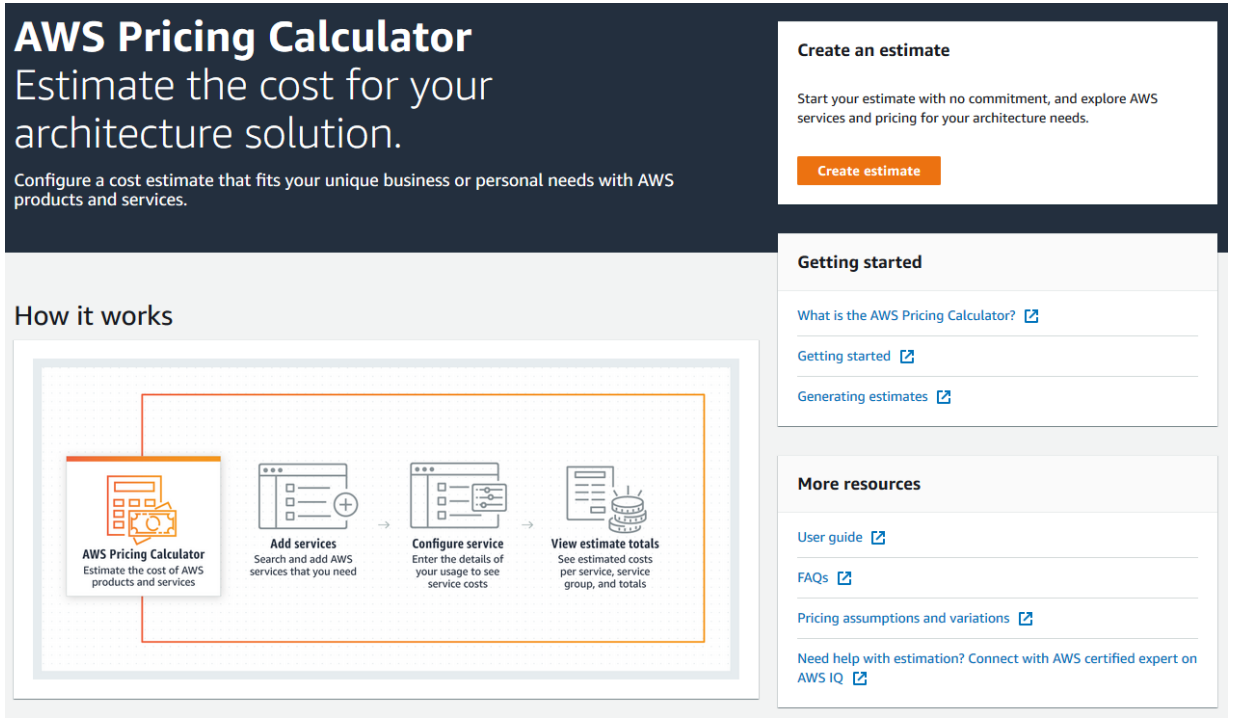
AWS cost includes business-level support and
a 3-year PURI EC2 instance



AWS Pricing Calculator

Use the AWS Pricing Calculator to:

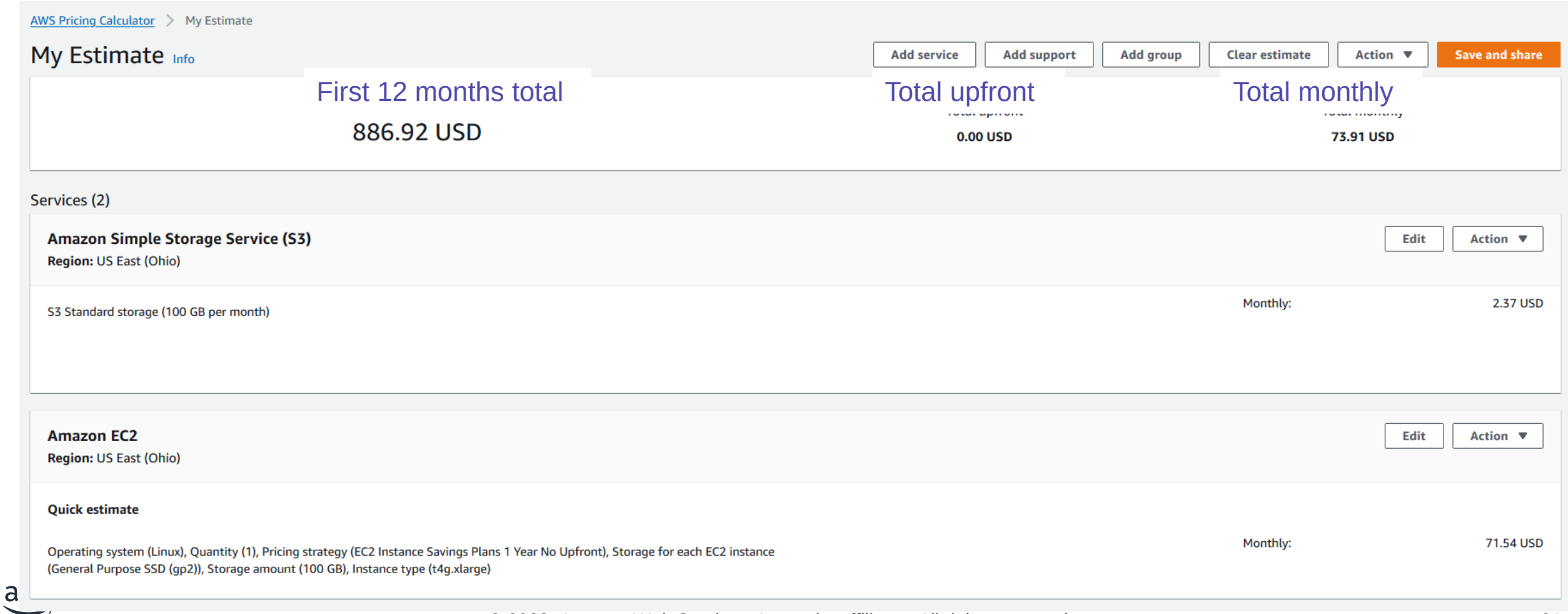
- Estimate monthly costs
- Identify opportunities to reduce monthly costs
- Model your solutions before building them
- Explore price points and calculations behind your estimate
- Find the available instance types and contract terms that meet your needs
- Name your estimate and create and name groups of services



Access the AWS Pricing Calculator

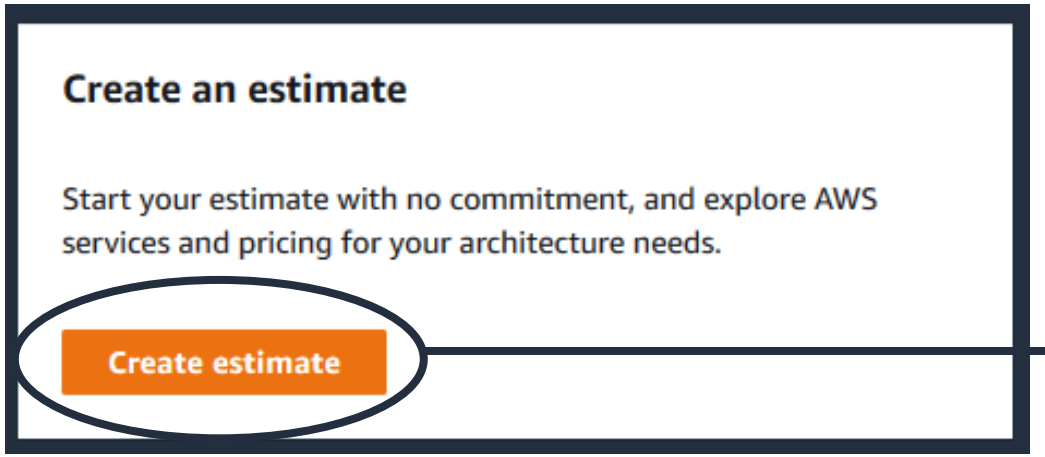
Reading an estimate

Your estimate is broken into: first 12 months total, total upfront, and total month

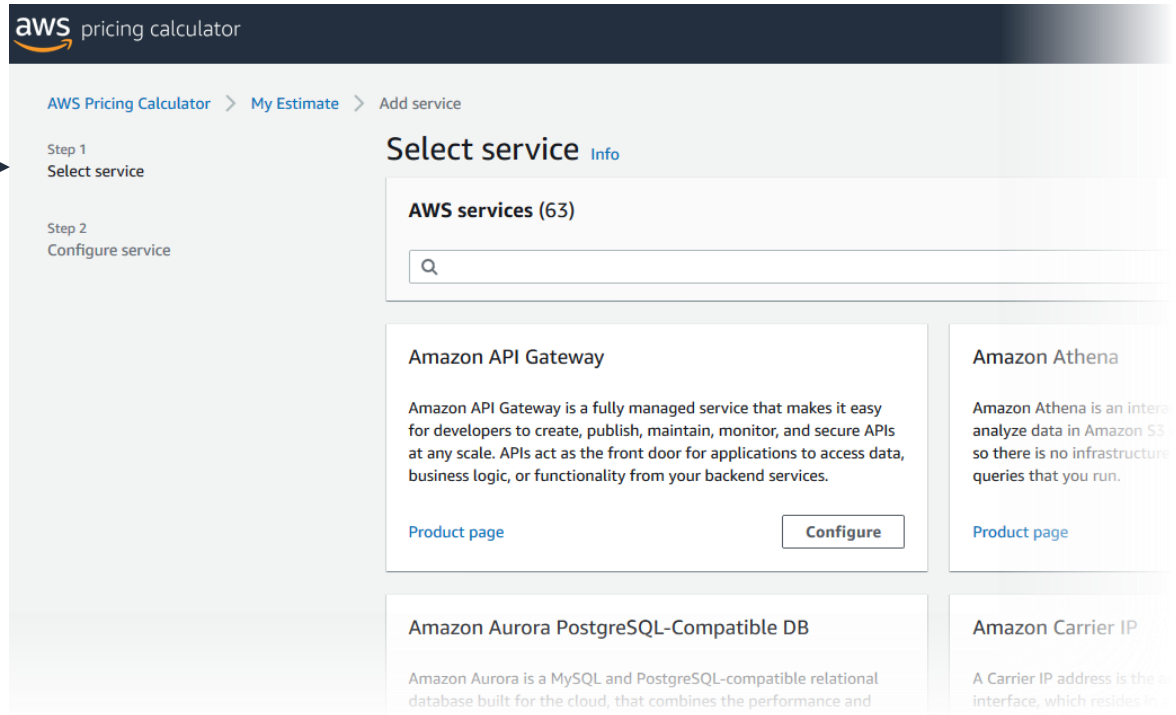


Activity: AWS Pricing Calculator activity

- Break up into groups of four or five and use the AWS Pricing Calculator and specifications provided to develop a cost estimate.
- Be prepared to report your findings back to the class.



AWS Pricing calculator website



Additional benefit considerations

Hard benefits

- Reduced spending on compute, storage, networking, security
- Reductions in hardware and software purchases (capex)
- Reductions in operational costs, backup, and disaster recovery
- Reduction in operations personnel

Soft Benefits

- Reuse of service and applications that enable you to define (and redefine solutions) by using the same cloud service
- Increased developer productivity
- Improved customer satisfaction
- Agile business processes that can quickly respond to new and emerging opportunities
- Increase in global reach

Case study: Total Cost Of Ownership (1 of 6)

Background:

- Growing global company with over 200 locations
- 500 million customers, $3 billion annual revenue

Case study: Total Cost of Ownership (2 of 6)

Background:

- Growing global company with over 200 locations
- 500 million customers, $3 billion annual revenue

Challenge:

- Meet demand to rapidly deploy new solutions
- Constantly upgrade aging equipment

Case study: Total Cost of Ownership (3 of 6)

Background:

- Growing global company with over 200 locations
- 500 million customers, $3 billion annual revenue

Challenge:

- Meet demand to rapidly deploy new solutions
- Constantly upgrade aging equipment

Criteria:

- Broad solution to handle all workloads
- Ability to modify processes to improve efficiency and lower costs
- Eliminate busy work (such as patching software)
- Achieve a positive return on investment (ROI)

Case study: Total Cost of Ownership (4 of 6)

Background:

- Is a growing global company with over 200 locations
- Have 500 million customers, $3 billion (USD) annual revenue

Challenge:

- Meet demand to rapidly deploy new solutions
- Constantly upgrade aging equipment

Criteria:

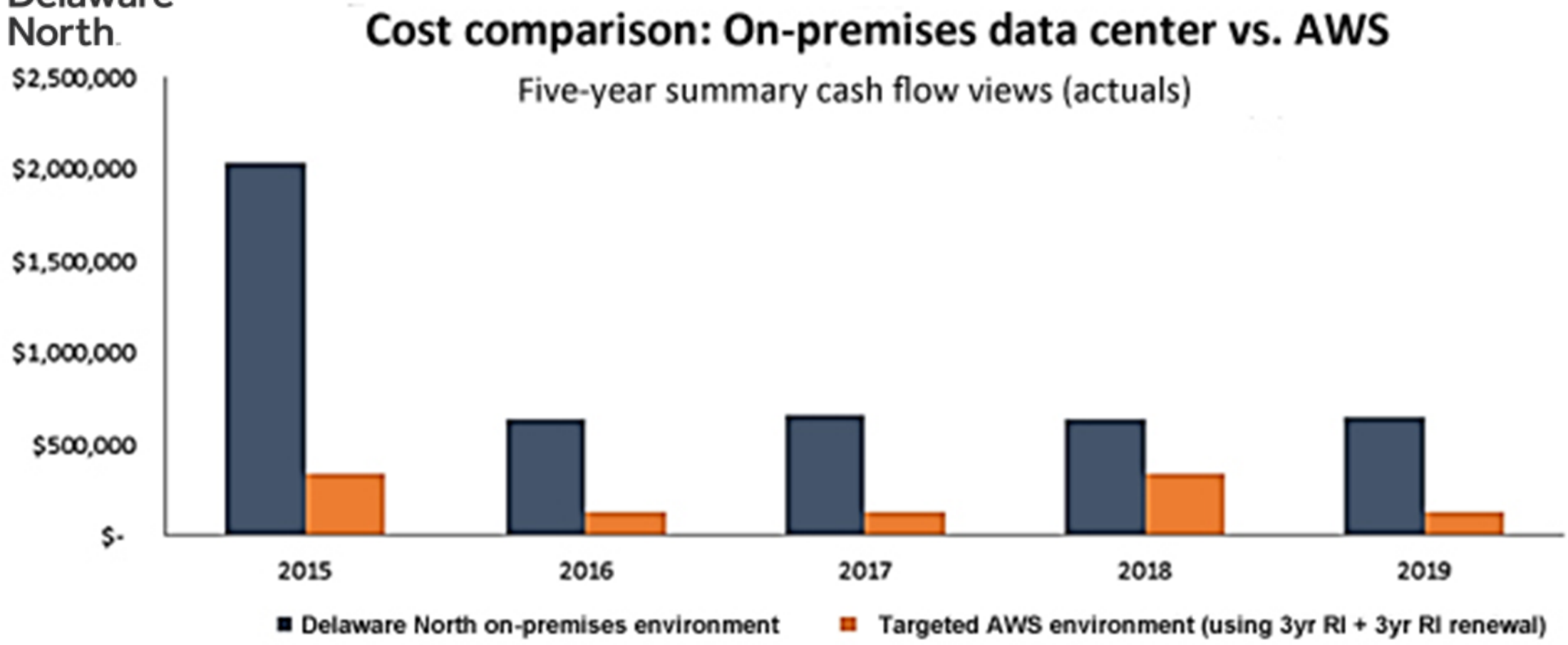
- Have a broad solution to handle all workloads
- Be able to modify processes to improve efficiency and lower costs
- Eliminate busy work (such as patching software)
- Achieve a positive return on investment (ROI)

Solution:

- Moved their on-premises data center to AWS
  - Eliminated 205 servers (90 percent)
  - Moved nearly all applications to AWS
- Used 3-year Amazon EC2 Reserved Instances

Case study: Total Cost of Ownership (5 of 6)

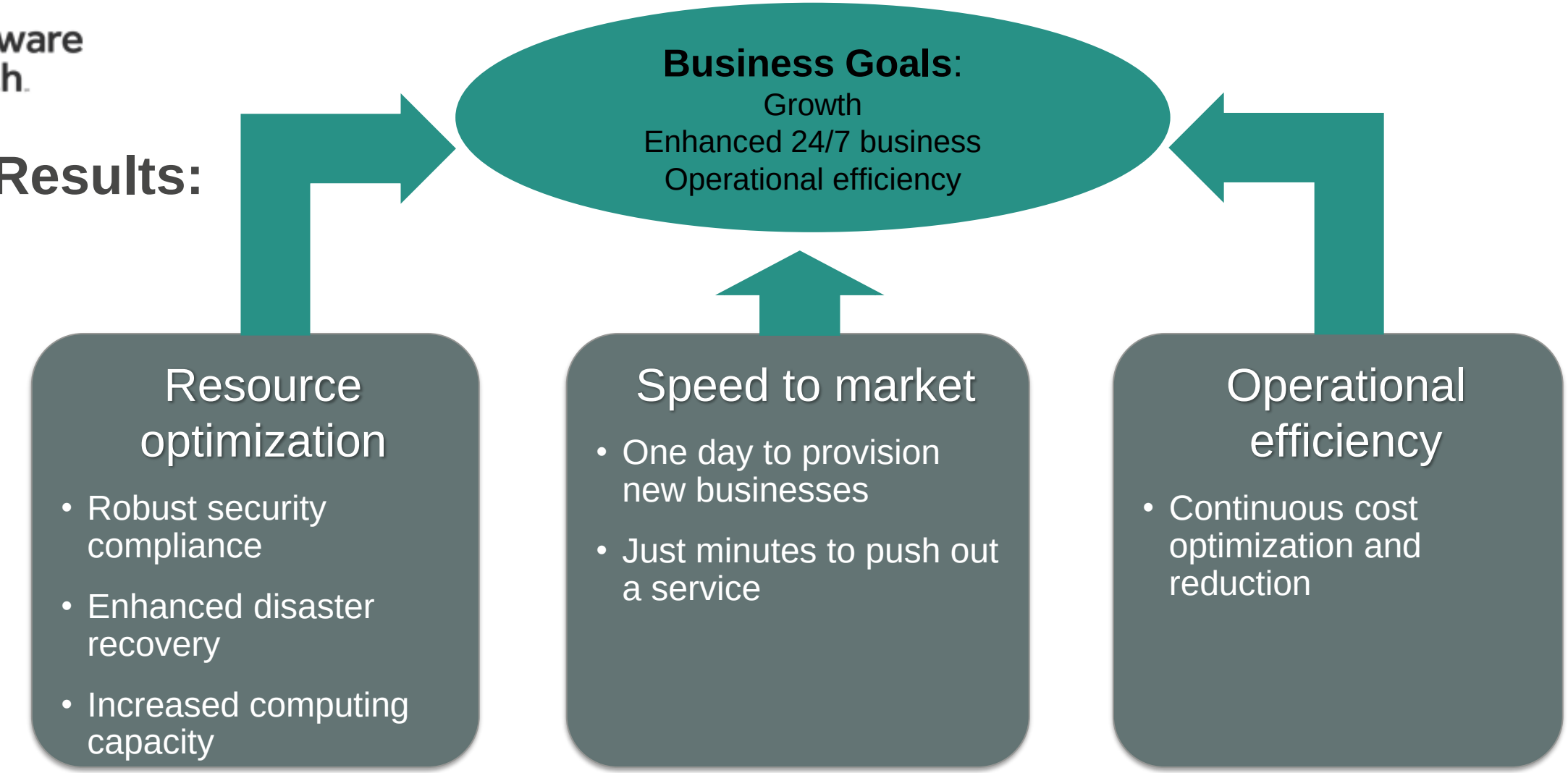
Delaware North



Case study: Total Cost of Ownership (6 of 6)

Delaware North

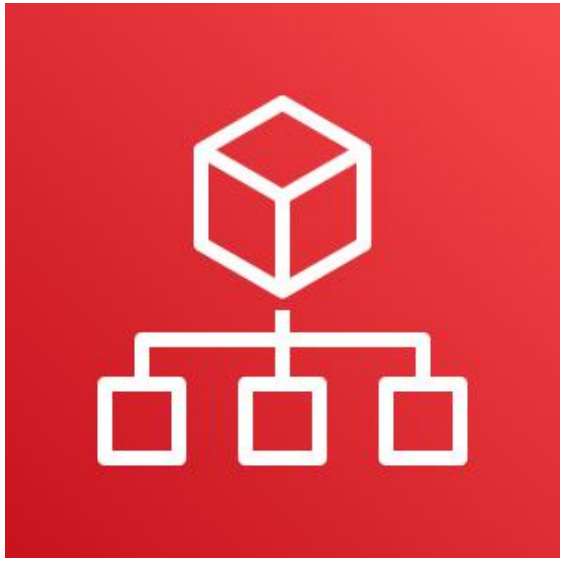
Results:



Section 3: AWS Organizations

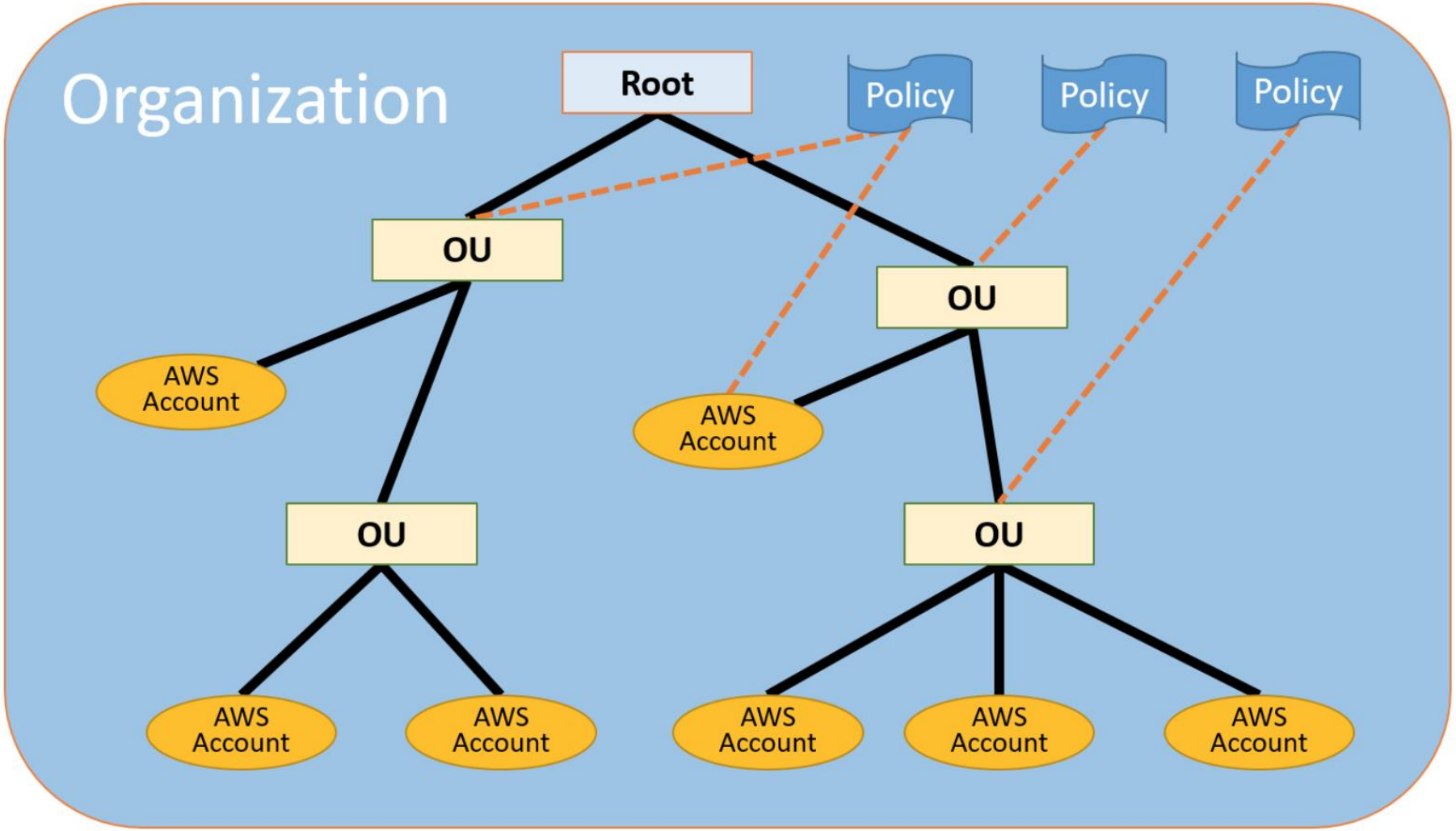
Module 2: Cloud Economics and Billing

Introduction to AWS Organizations



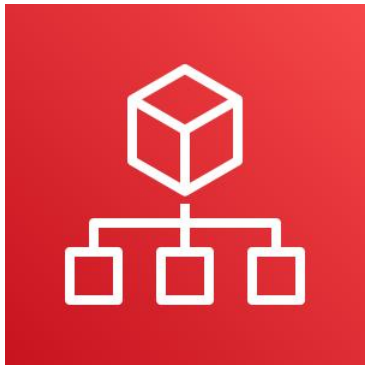
AWS Organizations

AWS Organizations terminology



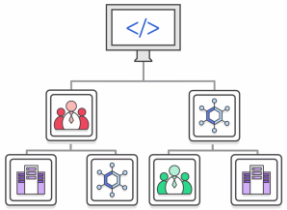
*Organizational Units (OUs)

Key features and benefits

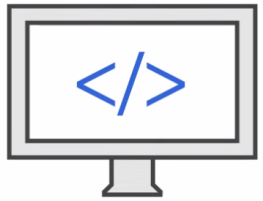


AWS Organizations

Policy-based account management



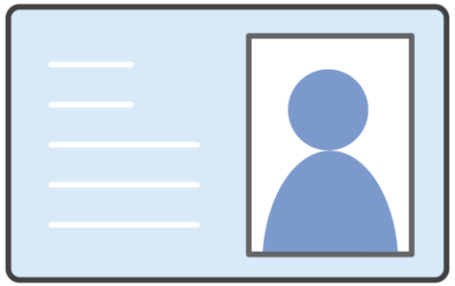
Group based account management



Application programming interfaces (APIs) that automate account management

Consolidated billing

Security with AWS Organizations

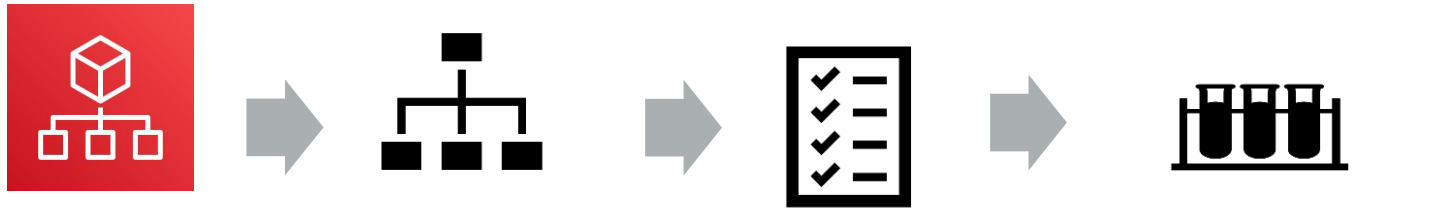


Control access with AWS Identity and Access Management (IAM).

IAM policies enable you to allow or deny access to AWS services for users, groups, and roles.

Service control policies (SCPs) enable you to allow or deny access to AWS services for individuals or group accounts in an organizational unit (OU).

Organizations setup



Step 1

Create Organization

Step 2

Create organizational units

Step 3

Create service control policies

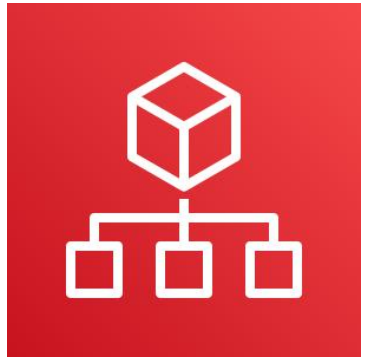
Step 4

Test restrictions

Limits of AWS Organizations

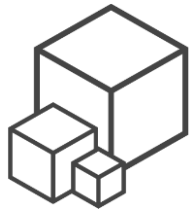
Limits		
Limits on Names	Names must be composed of Unicode characters.	
	Names must not exceed 250 characters in length.	
Maximum and Minimum Values	Number of AWS accounts	Varies. Note: An invitation sent to an account counts against this limit.
	Number of roots	1
	Number of OUs	1,000
	Number of policies	1,000
	Maximum size of a service control policy document	5,120 bytes
	Maximum nesting of OUs in a root	5 levels of OUs under a root
	Invitations sent per day	20
	Number of member accounts you can create concurrently	Only five can be in progress at one time
	Number of entities to which you can attach a policy	Unlimited

Accessing AWS Organizations



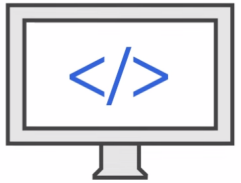
AWS Organizations

AWS Management Console



AWS Command Line Interface (AWS CLI) tools

Software development kits (SDKs)



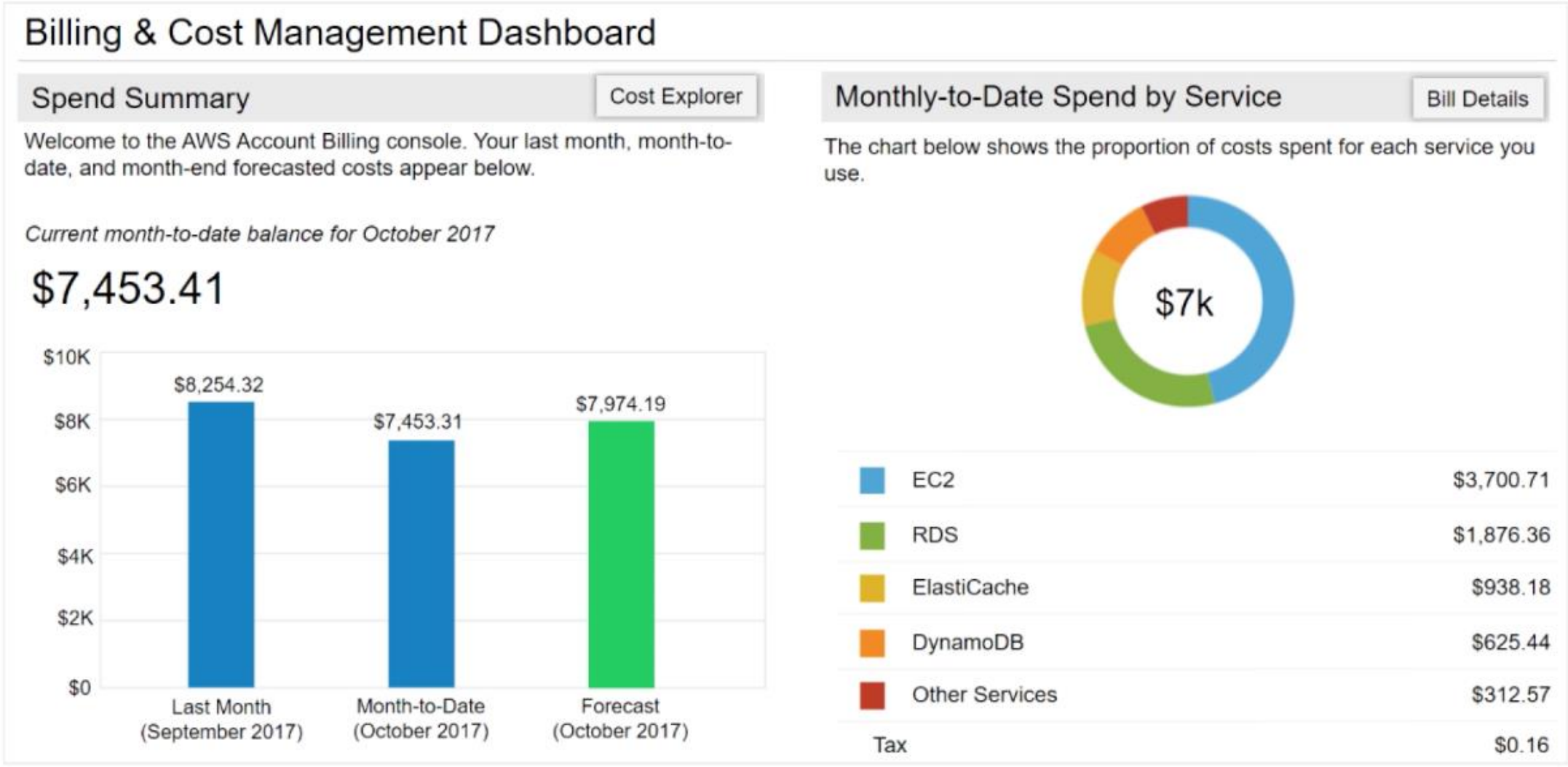
HTTPS Query application programming interfaces (API)

Section 4: AWS Billing and Cost Management

Module 2: Cloud Economics and Billing

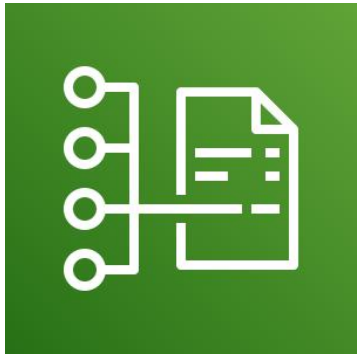
Introducing AWS Billing and Cost Management

AWS Billing Dashboard



Tools

AWS Budgets



AWS Cost and Usage Report

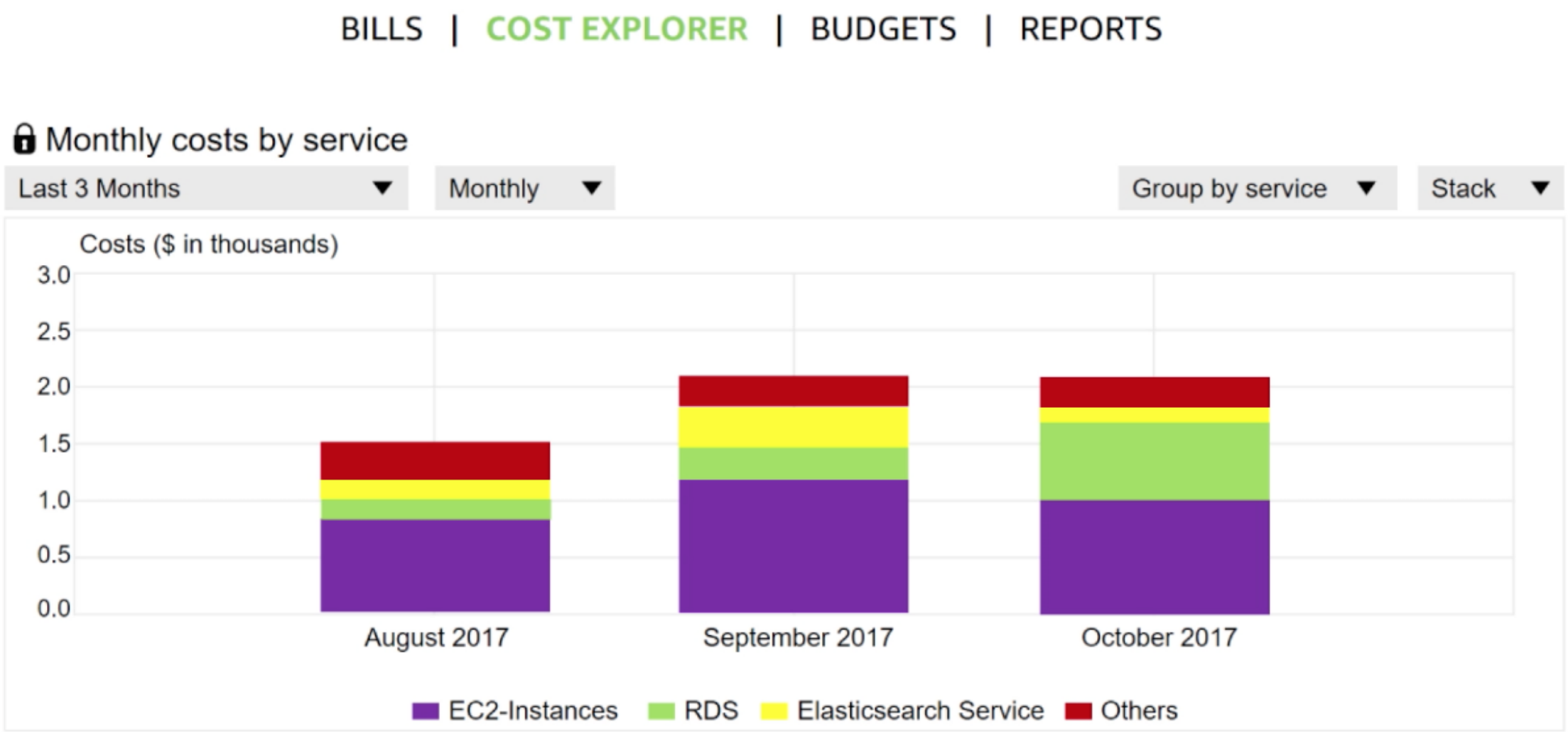
AWS Cost Explorer

Monthly bills

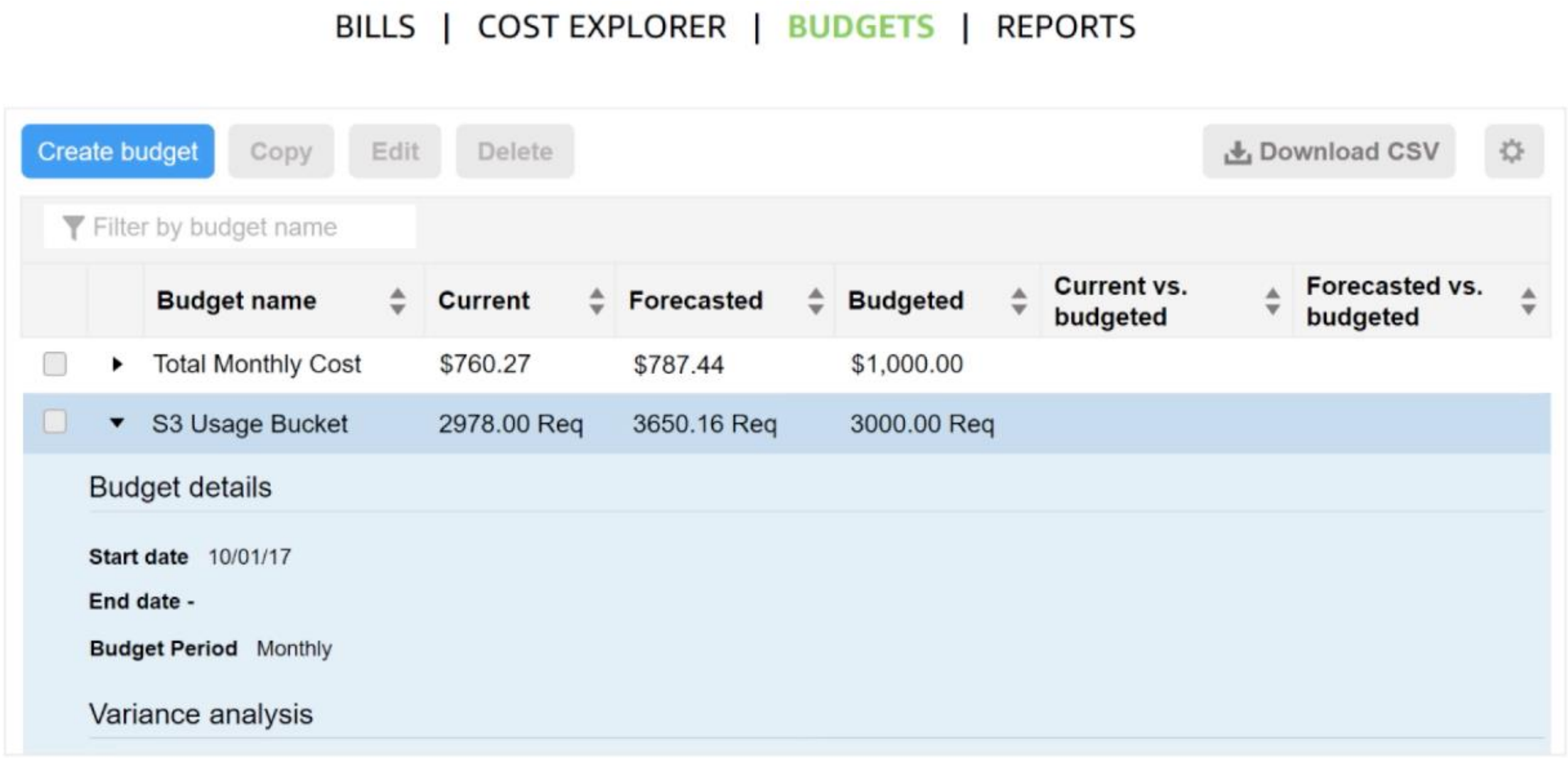
BILLS | COST EXPLORER | BUDGETS | REPORTS

Total		$7,453.41 USD
AWS Marketplace Charges		**$15.00**
▼ Usage Charges and Recurring Fees		$15.00
Invoice 32342548 – AWS Service Charges: Usage charge for this statement period	2017-10-10	$15.00
AWS Service Charges		**$7,438.41**
▼ Usage Charges and Recurring Fees		$7,414.41
Invoice 32342513 – AWS Service Charges: Usage charge for this statement period	2017-10-10	$7,414.41
▼ Usage Charges and Recurring Fees		$24.00
Invoice 32342507 – AWS Service Charges: Subscription charge	2017-10-10	$24.00

Cost Explorer



Forecast and track costs



Cost and usage reporting

BILLS | COST EXPLORER | BUDGETS | REPORTS

Product Code	Usage Type	Operation	Availability Zone	Usage Amount	Currency Code	Line Item Description
Amazon S3	Requests – Tier 1	ListAllMyBuckets		2	USD	$0.00 per request – PUT, COPY, POST, LIST under the global free tier
Amazon EC2	USW2-Boxusage:t2.micro	Runinstnaces:0002	us-west-2a	1	USD	$0.00 per Windows t2.micro instance-hour under monthly free tier
Amazon S3	Requests – Tier 1	ListAllMyBuckets		2	USD	$0.00 per request – PUT, COPY, POST, LIST under the global free tier
Amazon EC2	USW2-Boxusage:t2.micro	Runinstnaces:0002	us-west-2a	1	USD	$0.00 per Windows t2.micro instance-hour under monthly free tier
Amazon S3	Requests – Tier 1	ListAllMyBuckets		2	USD	$0.00 per request – PUT, COPY, POST, LIST under the global free tier
Amazon S3	Requests – Tier 1	ListAllMyBuckets		2	USD	$0.00 per request – PUT, COPY, POST, LIST under the global free tier

Recorded demo: Amazon Billing dashboard

Billing dashboard demonstration

Getting Started with AWS Billing & Cost Management

- Manage your costs and usage using AWS Budgets
- Visualize your cost drivers and usage trends via Cost Explorer
- Dive deeper into your costs using the Cost and Usage Reports with Athena integration
- **Learn more:** Check out the AWS What's New webpage

Do you have Reserved Instances (RIs)?

- Access the RI Utilization & Coverage reports—and RI purchase recommendations—via Cost Explorer.

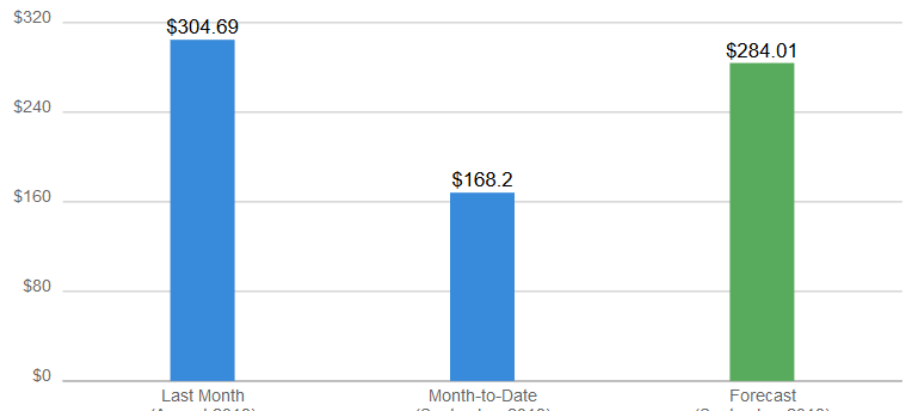
Spend Summary

Cost Explorer

Welcome to the AWS Billing & Cost Management console. Your last month, month-to-date, and month-end forecasted costs appear below.

Current month-to-date balance for September 2019

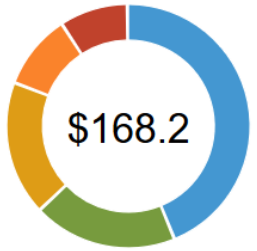
$168.20



Month-to-Date Spend by Service

Bill Details

The chart below shows the proportion of costs spent for each service you use.



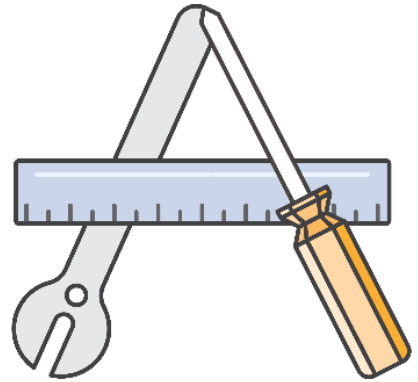
ES	$74.52
DatabaseMigrationSvc	$32.12
SageMaker	$29.99
EC2	$16.59
Other Services	$14.98
Tax	$0.00
Total	**$168.20**

Section 5: Technical support

Module 2: Cloud Economics and Billing

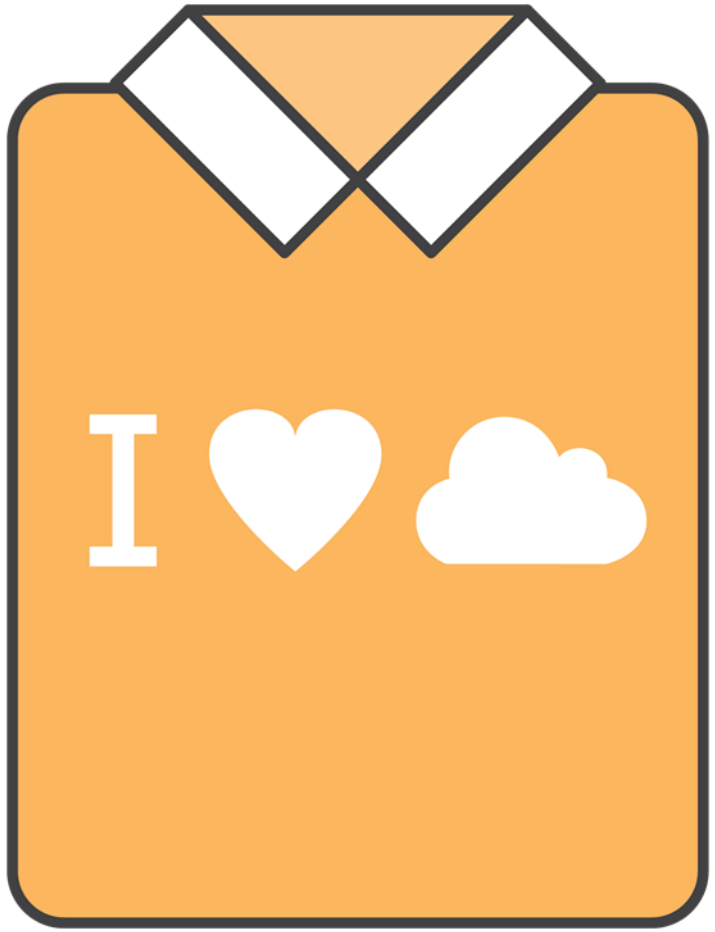
AWS support (1 of 2)

- Provide unique combination of tools and expertise:
  - AWS Support
  - AWS Support Plans
- Support is provided for:
  - Experimenting with AWS
  - Production use of AWS
  - Business-critical use of AWS



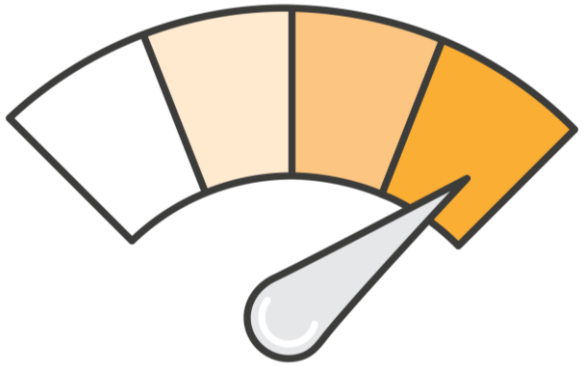
AWS support (2 of 2)

- Proactive guidance :
  - Technical Account Manager (TAM)
- Best practices :
  - AWS Trusted Advisor
- Account assistance :
  - AWS Support Concierge



Support plans

AWS Support offers four support plans:



- **Basic Support** – Resource Center access, Service Health Dashboard, product FAQs, discussion forums, and support for health checks
- **Developer Support**: Support for early development on AWS
- **Business Support**: Customers that run production workloads
- **Enterprise Support**: Customers that run business and mission-critical workloads

Case severity and response times

	Critical	Urgent	High	Normal	Low
Basic			No Case Support		
Developer Plan (Business hours)				12 hours or less	24 hours or less
Business Plan (24/7)		1 hour or less	4 hours or less	12 hours or less	24 hours or less
Enterprise Plan (24/7)	15 minutes or less	1 hour or less	4 hours or less	12 hours or less	24 hours or less

Activity: Support plan scavenger hunt

- Break up into groups of four or five and develop a recommendation for the best support plan for one of the business cases that are provided.

- Be prepared to report your findings back to the class.

Module wrap-up

Module 2: Cloud Economics and Billing

Module summary

- Explored the fundamental of AWS pricing
- Reviewed TCO concepts
- Reviewed an AWS Pricing Calculator estimate
- Reviewed the Billing dashboard
- Reviewed Technical Support options and costs

Complete the knowledge check

Sample exam question

Which AWS service provides infrastructure security optimization recommendations?

Choice	Response
A	AWS Price List Application Programming Interface (API)
B	Reserved Instances
C	AWS Trusted Advisor
D	Amazon Elastic Compute Cloud (Amazon EC2) Spot Fleet

Sample exam question answer

Which AWS service provides infrastructure security optimization recommendations?

The correct answer is C.

The keyword in the question is “recommendations”.

Additional resources

- AWS Economics Center: http://aws.amazon.com/economics/
- AWS Pricing Calculator: https://calculator.aws/#/
- Case studies and research: http://aws.amazon.com/economics/
- Additional pricing exercises: https://dx1572sre29wk.cloudfront.net/cost/

Thank you

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