

Lecture 12

Cost Metrics and Pricing Models

Disclaimer

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- All the AWS slides are taken from Amazon Web Services academy

Cost Metrics & Pricing Models

- Business Cost Metrics
- Cloud Usage Cost Metrics
- Cost Management Considerations

Business Cost Metrics

Up-Front and On-Going Costs

- **Up-front costs:** Initial investments that organizations need to make in order to fund the IT resources they intend to use.
 - Includes costs of obtaining, deploying, and administering these IT resources.
- **On-going costs:** Expenses required by an organization to run and maintain IT resources it uses.

Additional Costs

- **Cost of Capital** — Cost incurred by raising required funds.
- **Sunk Costs** — Prior investment that has been made in the on-premise IT resources.
- **Integration Costs** — Funds to carry out system integration etc.
- **Locked-in Costs** — Costs related to movement of consumers between cloud providers.

Cloud Usage Cost Metrics

Cloud Usage Cost Metrics

- **Network Usage:** Inbound and outbound network traffic, as well as intra-cloud network traffic.
- **Server Usage:** Virtual server allocation (and resource reservation)
- **Cloud Storage Device:** Storage capacity allocation
- **Cloud Service:** Subscription duration, number of nominated users, number of transactions (of cloud services and cloud-based applications)

Network Usage

| Usage Metric | Inbound Network | Outbound Network | Intra-Cloud WAN |
|-----------------------|---|---|---|
| <i>Description</i> | Inbound network traffic | Outbound network traffic | Network traffic between geographically diverse IT resources of same cloud |
| <i>Measurement</i> | Inbound traffic in bytes | Outbound traffic in bytes | Intra-cloud WAN traffic |
| <i>Frequency</i> | Continuous and cumulative | Continuous and cumulative | Continuous and cumulative |
| <i>Delivery Model</i> | IaaS, PaaS, SaaS | IaaS, PaaS, SaaS | IaaS, PaaS, SaaS |
| <i>Example</i> | Up to 1GB free, RM0.001/GB up to 10TB a month | Up to 1GB free, RM0.001/GB up to 10TB a month | Up to 500MB free daily and RM0.01/GB thereafter. |

Server Usage

| Usage Metric | On-Demand Virtual Machine Instance Allocation | Reserved Virtual Machine Instance Allocation |
|-----------------------|---|--|
| <i>Description</i> | Uptime of a virtual server instance | Up-front cost for reserving a virtual server instance |
| <i>Measurement</i> | Virtual server start date and stop date | Virtual server reservation start date to expiry date |
| <i>Frequency</i> | Continuous and cumulative | Daily, monthly, yearly |
| <i>Delivery Model</i> | IaaS, PaaS | IaaS, PaaS |
| <i>Example</i> | RM0.10/hour small instance, RM0.20/hour medium instance, RM0.90/hour large instance | RM55.10/small instance, RM99.90/medium instance, RM250.00/large instance |

Cloud Storage Device Usage

| Usage Metric | On-Demand Storage Space Allocation | I/O Data Transferred |
|-----------------------|--|--------------------------------|
| <i>Description</i> | duration and size of on-demand storage space allocation in bytes | amount of transferred I/O data |
| <i>Measurement</i> | Σ , date of storage release / reallocation to date of storage allocation (resets upon change in storage size) | Σ , I/O data in bytes |
| <i>Frequency</i> | Continuous | Continuous |
| <i>Delivery Model</i> | IaaS, PaaS, SaaS | IaaS, PaaS |
| <i>Example</i> | \$0.01 / GB per hour (typically expressed as GB/month) | \$0.10/TB |

Cloud Service Usage

| Usage Metric | Application Subscription Duration | Number of Nominated Users | Number of Transaction Users |
|-----------------------|--|---|---|
| <i>Description</i> | Duration of cloud service usage subscription | Number of registered users with legitimate access | Number of transactions served by the cloud service |
| <i>Measurement</i> | Subscription start date to expiry date | Number of users | Number of transactions (request-response message exchanges) |
| <i>Frequency</i> | Daily, monthly, yearly | Monthly, yearly | Continuos |
| <i>Delivery Model</i> | SaaS | SaaS | PaaS, SaaS |
| <i>Example</i> | RM69.90 per month | RM0.90 / additional user per month | RM0.05 per 1000 transactions |

Amazon Web Services

Cloud Economics and Billing

Fundamentals of pricing

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



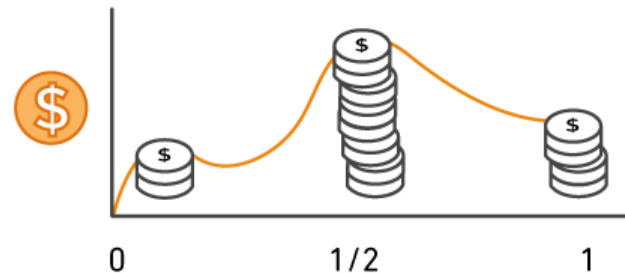
Pay for what you use

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

On premises



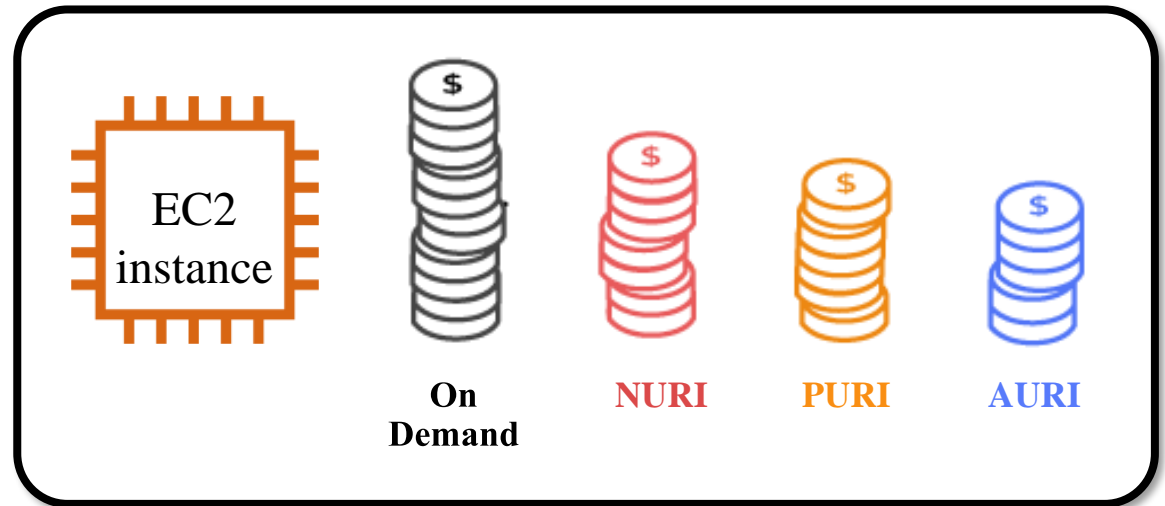
AWS



Pay less when you reserve

Invest in Reserved Instances (RIs):

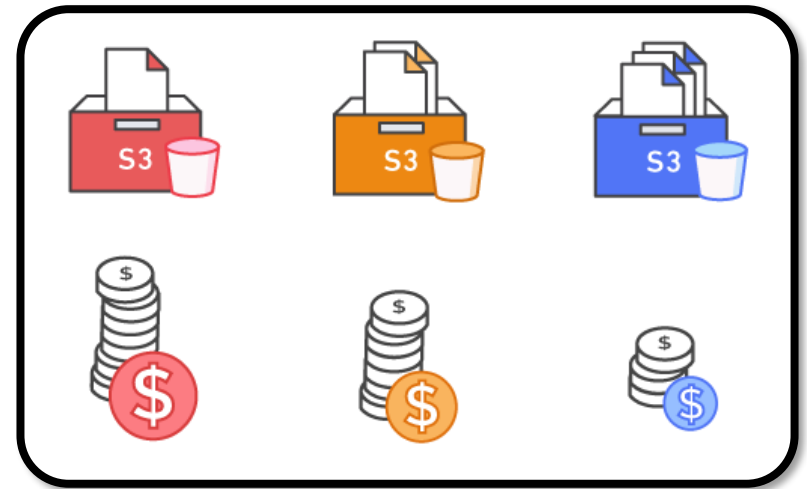
- Save up to 75 percent
- Options:
 - All Upfront Reserved Instance (**AURI**) → **largest discount**
 - Partial Upfront Reserved Instance (**PURI**) → **lower discounts**
 - No Upfront Payments Reserved Instance (**NURI**) → **smaller discount**



Pay less by using more

Realize volume-based discounts:

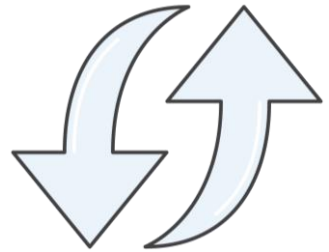
- **Savings** as usage increases.
- **Tiered pricing** for services like Amazon Simple Storage Service (Amazon S3), Amazon Elastic Block Store (Amazon EBS), or Amazon Elastic File System (Amazon EFS) → the more you use, the less you pay per GB.
- Multiple storage services deliver **lower** storage costs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



Pay even less as AWS grows

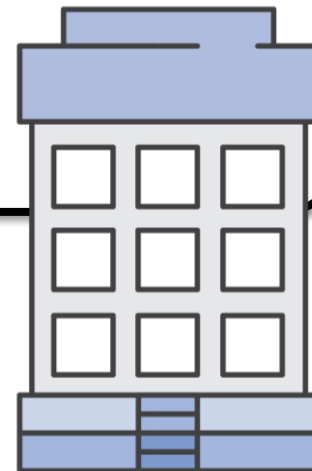
As AWS grows:

- 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.



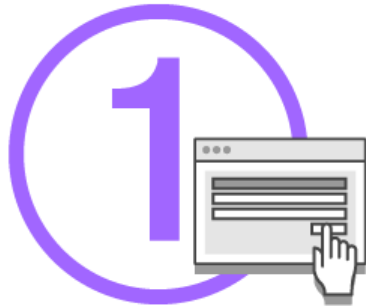
Custom pricing

- 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



Amazon VPC



Elastic Beanstalk**



Auto Scaling**



AWS CloudFormation**



AWS Identity and Access Management (IAM)

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

Total Cost of Ownership

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

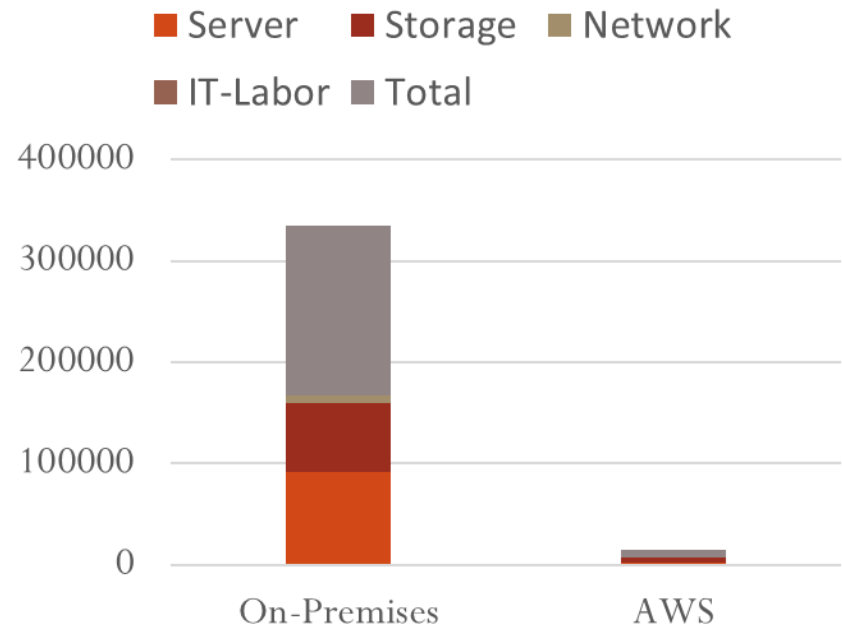
Server administration costs

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

The screenshot displays the AWS Pricing Calculator interface. At the top, a dark blue header contains the title 'AWS Pricing Calculator' and the subtitle 'Estimate the cost for your architecture solution.' Below this, a light gray section titled 'How it works' features a four-step process flow: 1. 'AWS Pricing Calculator' (Estimate the cost of AWS products and services), 2. 'Add services' (Search and add AWS services that you need), 3. 'Configure service' (Enter the details of your usage to see service costs), and 4. 'View estimate totals' (See estimated costs per service, service group, and totals). To the right of the flow, a white sidebar contains sections for 'Create an estimate' (with a 'Create estimate' button), 'Getting started' (with links for 'What is the AWS Pricing Calculator?', 'Getting started', and 'Generating estimates'), and 'More resources' (with links for 'User guide', 'FAQs', 'Pricing assumptions and variations', and 'Need help with estimation?').

Access the [AWS Pricing Calculator](#)

Reading an estimate

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

[AWS Pricing Calculator](#) > My Estimate

My Estimate [Info](#)

[Add service](#) [Add support](#) [Add group](#) [Clear estimate](#) [Action ▼](#) [Save and share](#)

| | First 12 months total | Total upfront | Total monthly |
|--|-----------------------|---------------|---------------|
| | 886.92 USD | 0.00 USD | 73.91 USD |

Services (2)

Amazon Simple Storage Service (S3)
Region: US East (Ohio)

[Edit](#) [Action ▼](#)

| | | |
|--|----------|----------|
| S3 Standard storage (100 GB per month) | Monthly: | 2.37 USD |
|--|----------|----------|

Amazon EC2
Region: US East (Ohio)

[Edit](#) [Action ▼](#)

Quick estimate

| | | |
|---|----------|-----------|
| Operating system (Linux), Quantity (1), Pricing strategy (EC2 Instance Savings Plans 1 Year No Upfront), Storage for each EC2 instance (General Purpose SSD (gp2)), Storage amount (100 GB), Instance type (t4g.xlarge) | Monthly: | 71.54 USD |
|---|----------|-----------|

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

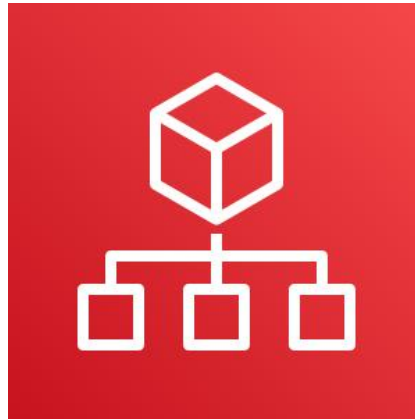


Soft Benefits

- 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

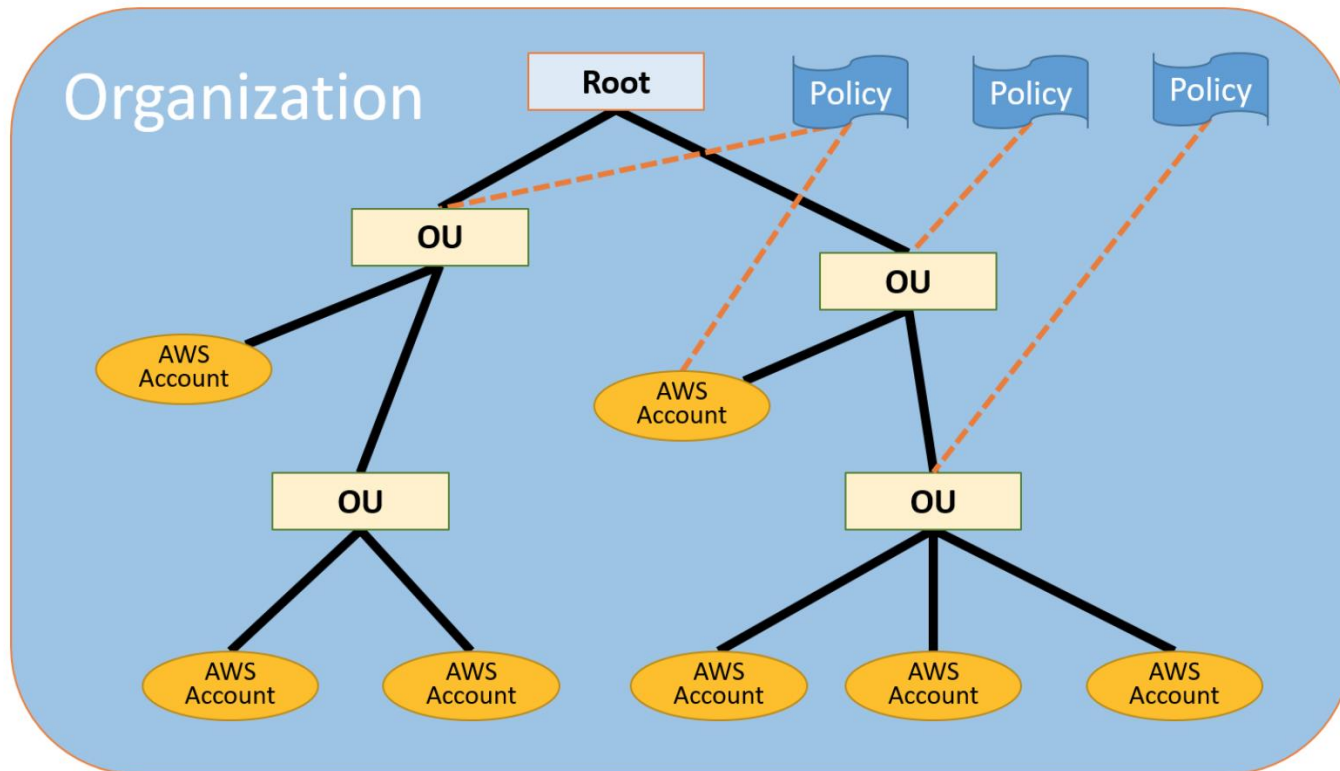
AWS Organizations

Introduction to AWS Organizations



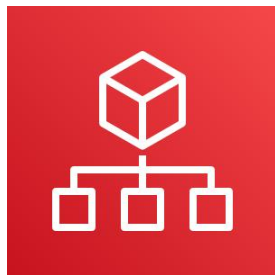
AWS Organizations

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.



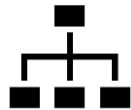
Service control policies (SCPs) enable you to allow or deny access to AWS services for individuals or group accounts in an organizational unit (OU).

Organizations setup



Step 1

Create
Organization



Step 2

Create
organizational
units



Step 3

Create
service
control
policies



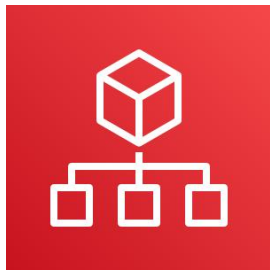
Step 4

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)

AWS Billing and Cost Management

Introducing AWS Billing and Cost Management



AWS Billing Dashboard

Billing & Cost Management Dashboard

Spend Summary

[Cost Explorer](#)

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

Current month-to-date balance for October 2017

\$7,453.41



Monthly-to-Date Spend by Service

[Bill Details](#)

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

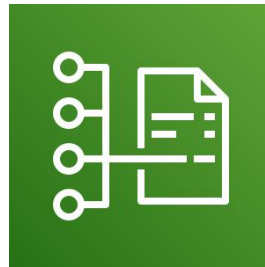


| | |
|----------------|------------|
| EC2 | \$3,700.71 |
| RDS | \$1,876.36 |
| ElastiCache | \$938.18 |
| DynamoDB | \$625.44 |
| Other Services | \$312.57 |
| Tax | \$0.16 |

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

BILLS | **COST EXPLORER** | BUDGETS | REPORTS

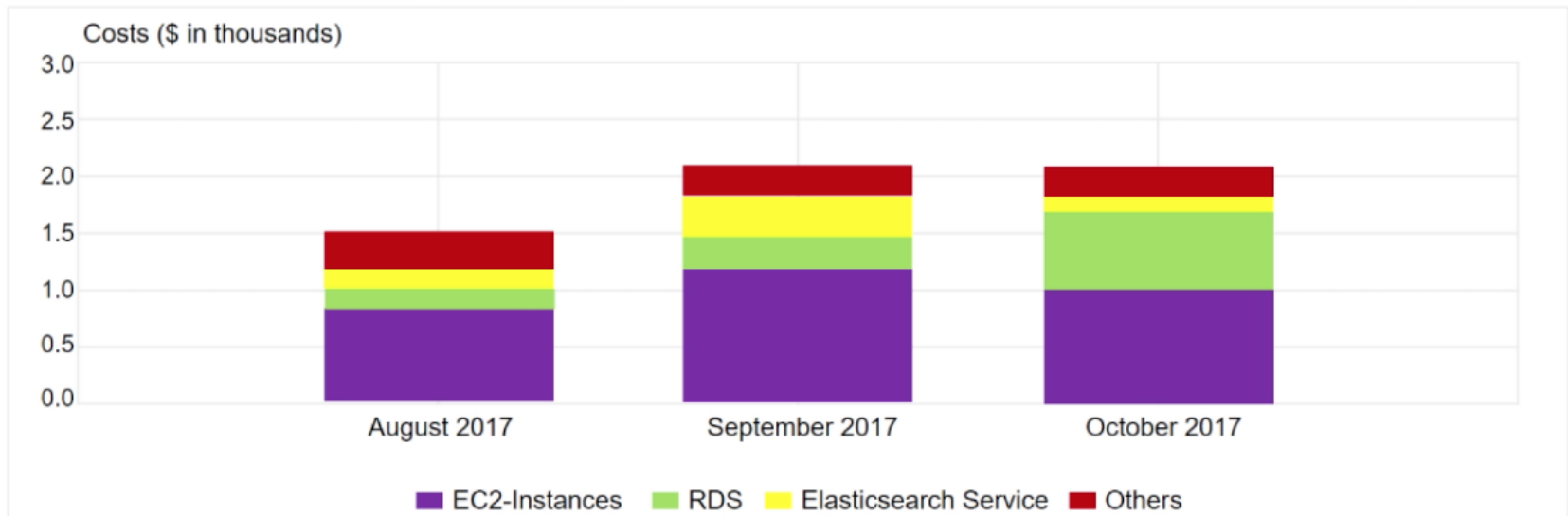
Monthly costs by service

Last 3 Months ▼

Monthly ▼


Group by service ▼

Stack ▼



Forecast and track costs

BILLS | COST EXPLORER | **BUDGETS** | REPORTS

[Create budget](#) [Copy](#) [Edit](#) [Delete](#) [Download CSV](#) 

| | Budget name | Current | Forecasted | Budgeted | Current vs. budgeted | Forecasted vs. budgeted |
|--------------------------|----------------------|-------------|-------------|-------------|----------------------|-------------------------|
| <input type="checkbox"/> | ▶ Total Monthly Cost | \$760.27 | \$787.44 | \$1,000.00 | | |
| <input type="checkbox"/> | ▼ S3 Usage Bucket | 2978.00 Req | 3650.16 Req | 3000.00 Req | | |

Budget details

Start date 10/01/17

End date -

Budget Period Monthly

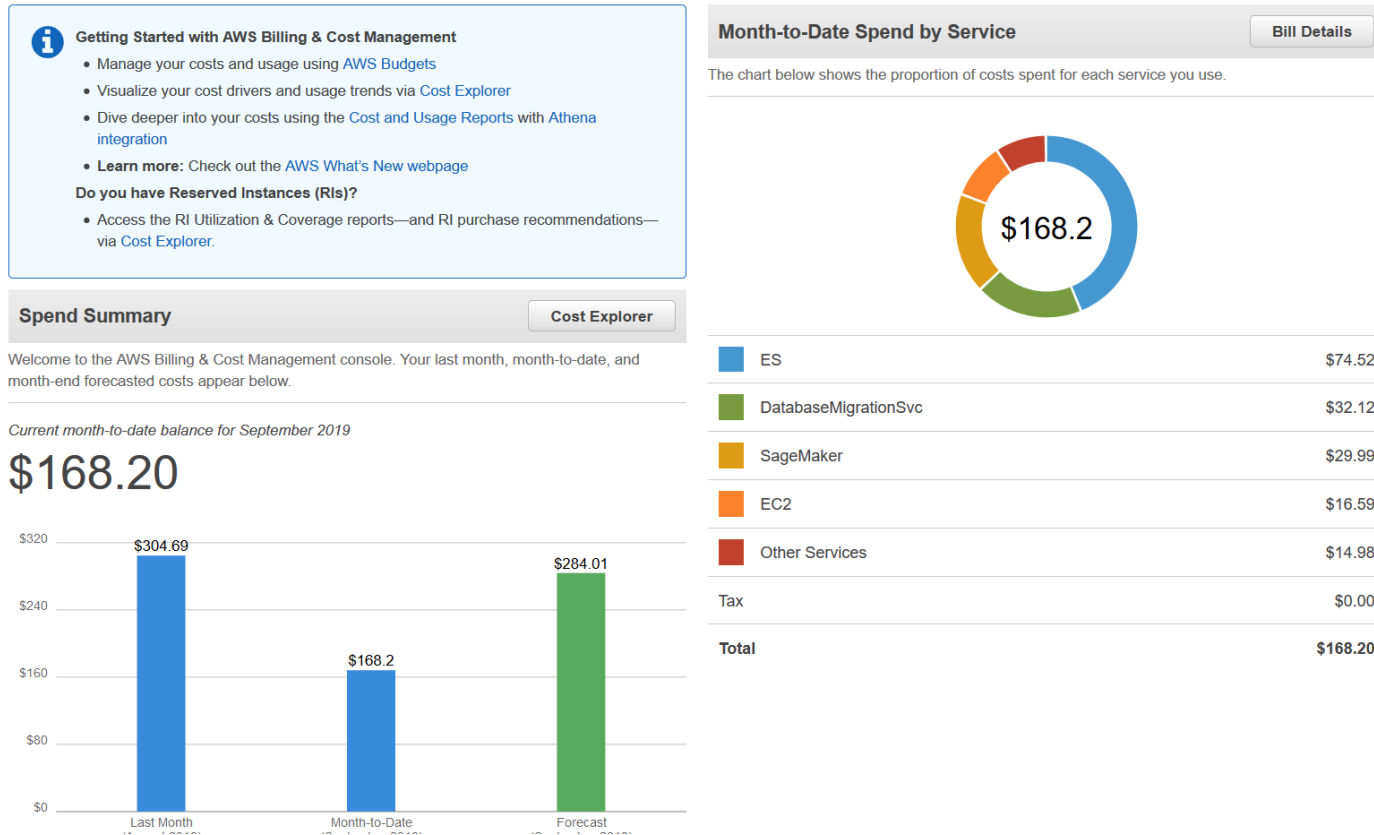
Variance analysis

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 |
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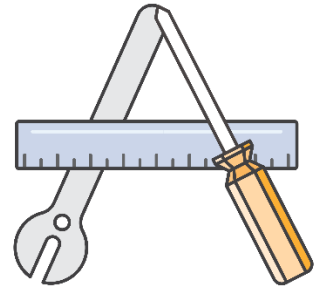
Billing dashboard demonstration



Technical support

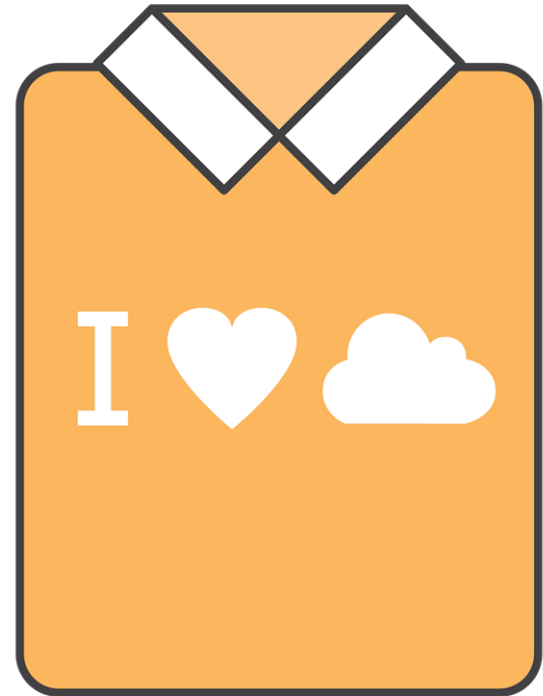
AWS support (1 of 2)

- 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)

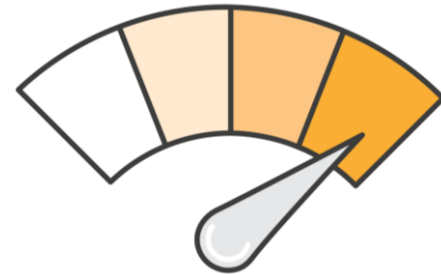
- Proactive guidance :
 - Technical Account Manager (TAM)
- Best practices :
 - AWS Trusted Advisor
- Account assistance :
 - AWS Support Concierge



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 |