CS 4037
Introduction to Cloud Computing
Lecture 22

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AWS Cloud Economics and Billing

Lecture's Agenda

- **Fundamentals of Pricing**

- Total Cost of Ownership

- AWS Organizations

- AWS Billing and Cost Management

- Technical Support

AWS Pricing Model

- **Three fundamental drivers of cost with AWS**

Compute	**Storage**	**Data transfer**
• Charged per hour/second* • Varies by instance type *Linux only	• Charged typically per GB	• Outbound is aggregated and charged • Inbound has no charge (with some exceptions) • Charged typically per GB

How Do Customer Pay for AWS?


Pay for what you use

Pay less when you reserve
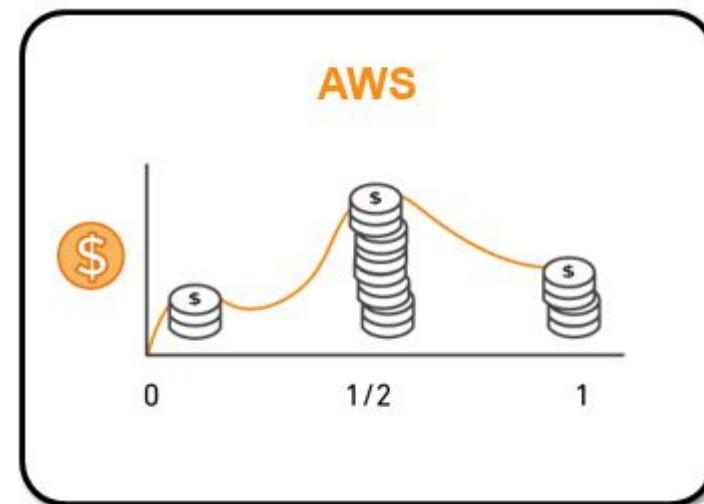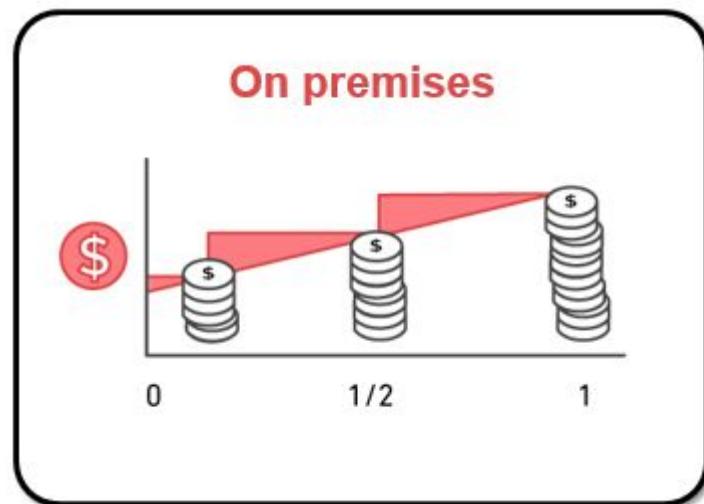
Pay less when you use more and as AWS grows

Pay for What You use

- **Pay only for the services that customer consume, with no large upfront expenses**
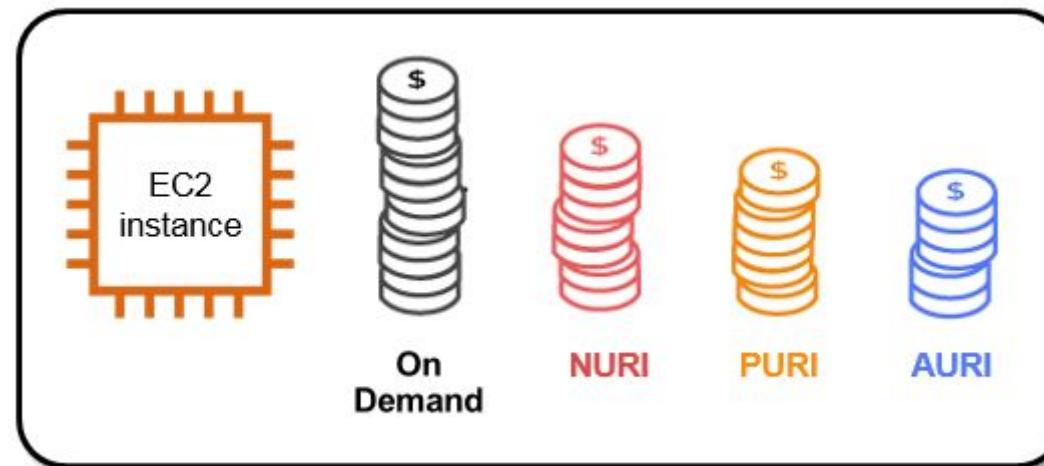
Pay Less when You Reserve

- **Invest in Reserved Instances (RIs):**
 - **Save up to 75 percent**
    - ✔ **All Upfront Reserved Instance (AURI) - largest discount**
    - ✔ **Partial Upfront Reserved Instance (PURI) - lower discounts**
    - ✔ **No Upfront Payments Reserved Instance (NURI) - smaller discount**
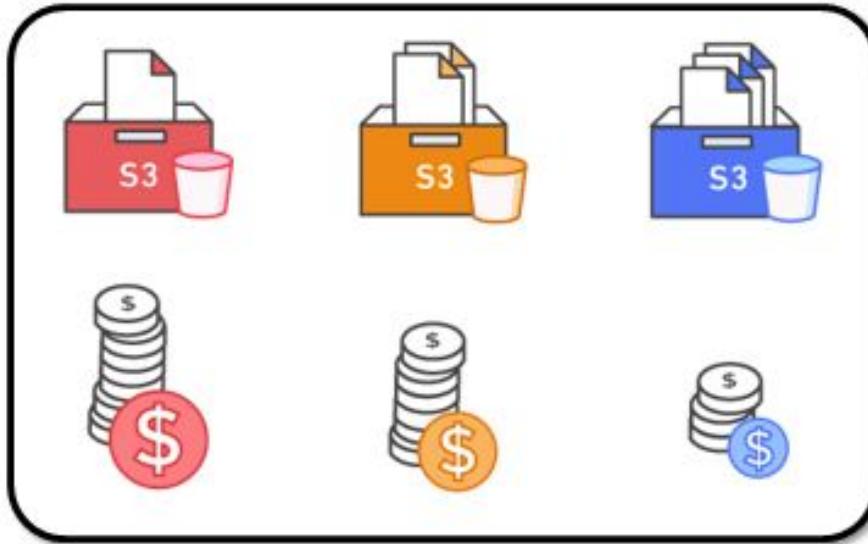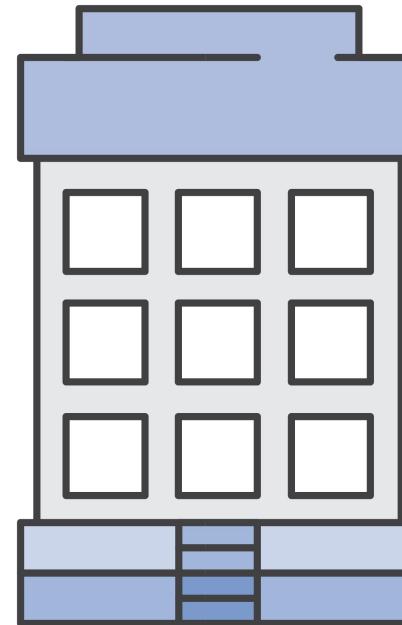
Pay Less by Using More

- **Realize volume-based discounts**
  - Savings as **usage** increases
  - Tiered pricing for services like Amazon S3, Amazon EBS, or Amazon EFS

- **Multiple storage services deliver lower storage costs based on needs**

Custom Pricing

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

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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 vs. on AWS**

- **To budget and build the business case for moving to the cloud**

TCO Considerations

|			Facilities cost		
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)		
			Space	Power	Cooling
			Facilities cost		
2	**Storage Costs**	Hardware: Storage disks, storage area network (SAN) or Fibre Channel (FC) switches	Storage administration costs		
			Space	Power	Cooling
			Facilities cost		
3	**Network Costs**	Network hardware: Local area network (LAN) switches, load balancer bandwidth costs	Network administration costs		
			Space	Power	Cooling
4	**IT Labor Costs**	Server administration costs			
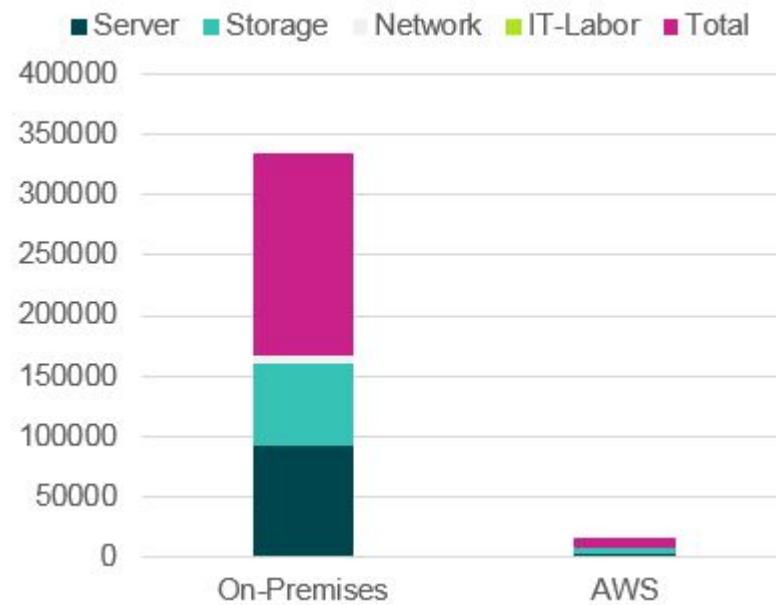
Sample Cost Comparison (On-Premises vs. All-in-Cloud)

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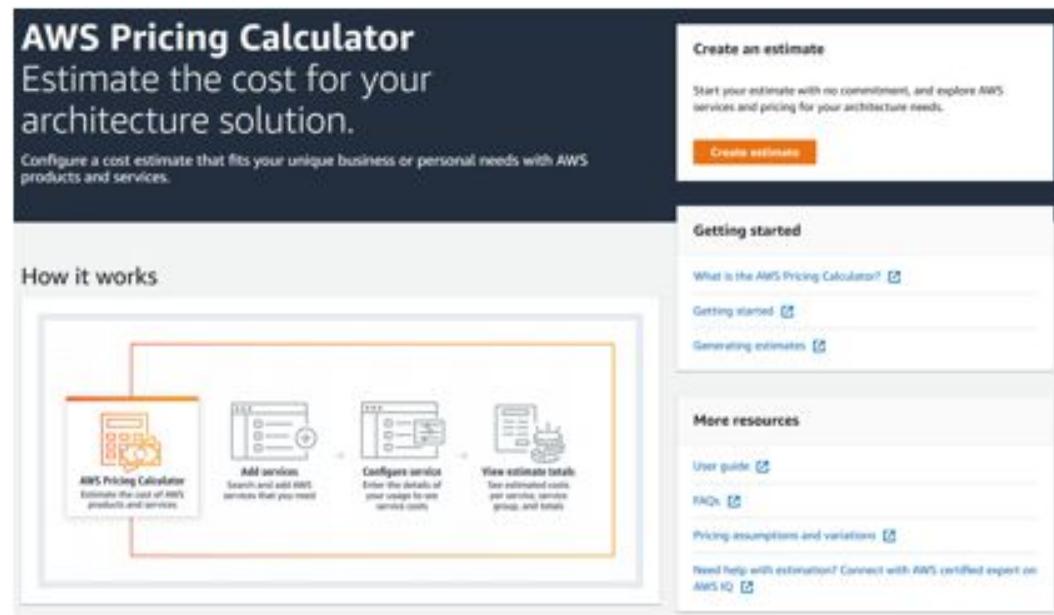
AWS cost includes business-level support and a 3-year PURI EC2 instance

AWS Pricing Calculator

- **Use the AWS Pricing Calculator to:**
  - Estimate monthly costs
  - Identify opportunities to reduce monthly costs
  - Model solutions before building them
  - Find the available instance types and contract terms that meet customers' needs
  - Activity: AWS Pricing Calculator
    - ✔ https://calculator.aws/#/

Reading an 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
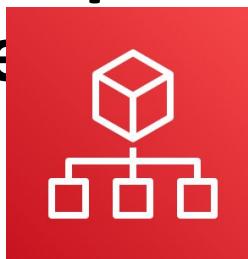
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- **AWS Organizations**

- AWS Billing and Cost Management

- Technical Support
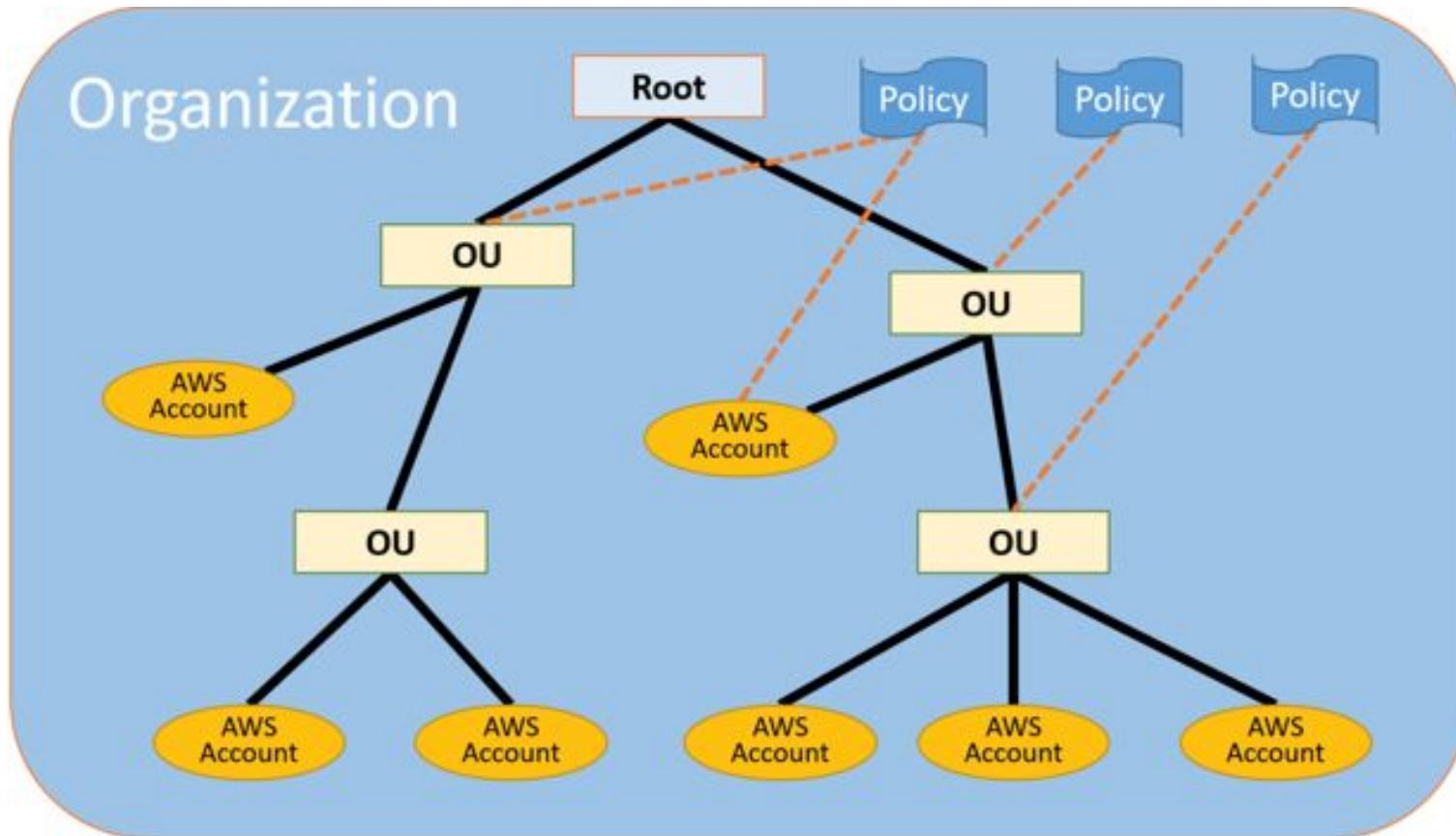
AWS Organizations

- AWS Organizations is a **free account management service** that enables user to consolidate multiple AWS accounts into an organization that user create and centrally manage.

- AWS Organizations **include** consolidated billing and account management capabilities that help user to better meet the budgetary, se   and compliance needs of the business.

AWS Organizations

AWS Organizations Terminology

*Organizational Units (OUs)
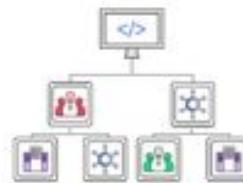
Key Features and Benefits
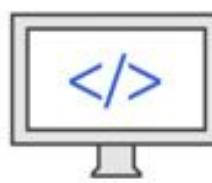

AWS
Organizations

Policy-based account management

Group based account management
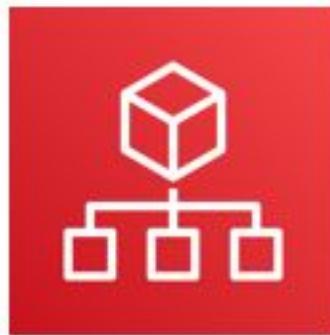
Application programming interfaces (APIs) that automate account management

Consolidated billing
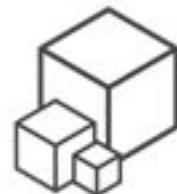
Accessing AWS Organizations
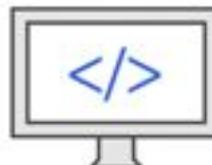
AWS Management Console

AWS Command Line Interface (AWS CLI) tools

Software development kits (SDKs)

HTTPS Query application programming interfaces (API)

AWS Organizations

Security with AWS Organizations
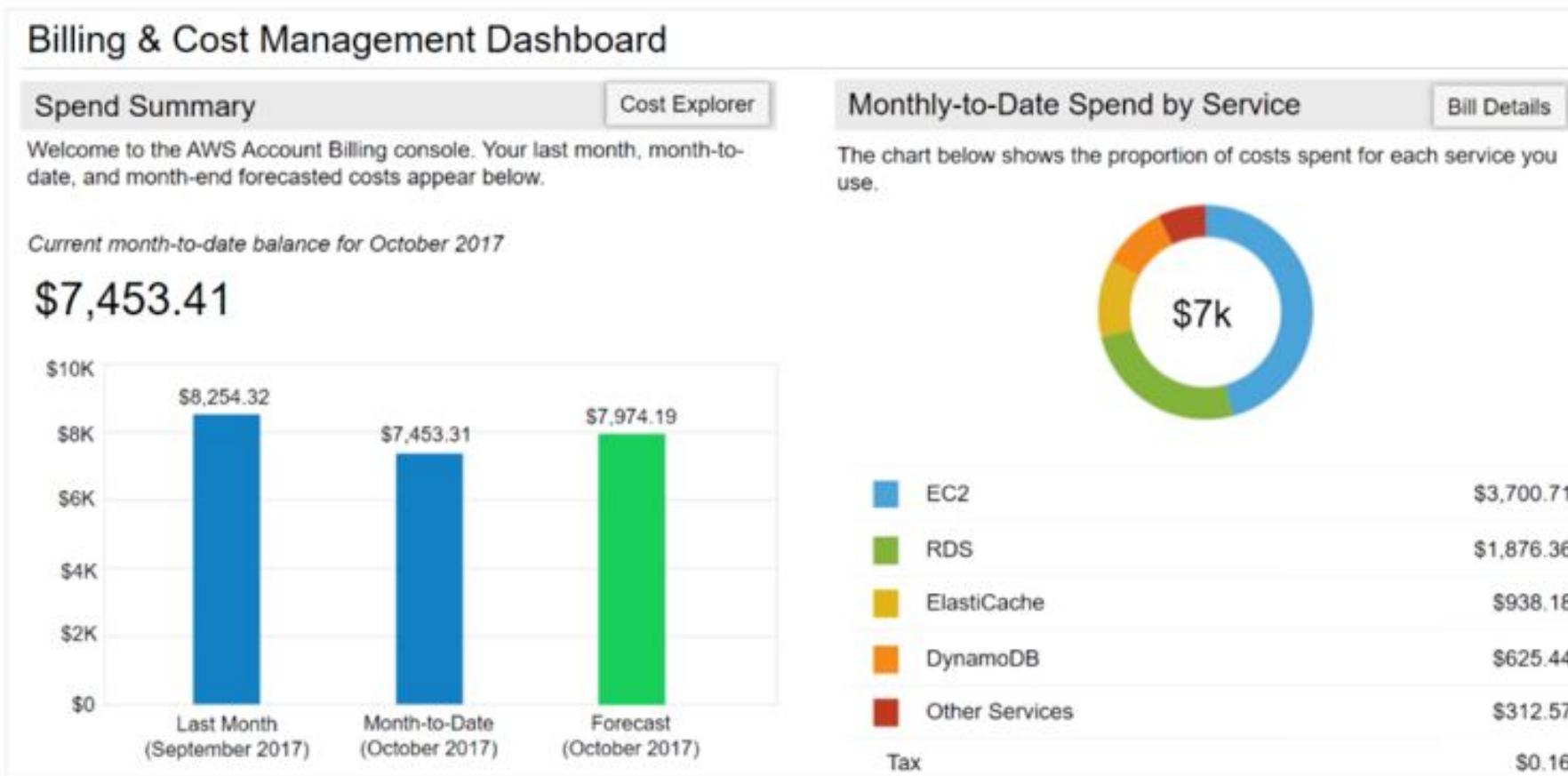
- **Service control policies** (SCPs) enable customer to allow or deny access to AWS services for individuals or group accounts in an **organizational unit** (OU).
  - Example: Different Views for different users

- **IAM policies** enable customer to allow or deny access to AWS services for **users, groups, and roles**.
  - Example: Different Permissions for different users

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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

Bar chart:
- Last Month (September 2017): $8,254.32
- Month-to-Date (October 2017): $7,453.31
- Forecast (October 2017): $7,974.19

Y-axis: $0, $2K, $4K, $6K, $8K, $10K

Monthly-to-Date Spend by Service | Bill Details

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

Donut chart center: $7k

Service	Amount
EC2	$3,700.71
RDS	$1,876.36
ElastiCache	$938.18
DynamoDB	$625.44
Other Services	$312.57
Tax	$0.16

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

AWS Budgets - Forecast and Track Costs

BILLS | COST EXPLORER | BUDGETS | REPORTS

| Create budget | Copy | Edit | Delete | | ⬇ Download CSV ⚙ |

▼ Filter by budget name

		Budget name	Current	Forecasted	Budgeted	Current vs. budgeted	Forecasted vs. budgeted
☐	▶	Total Monthly Cost	$760.27	$787.44	$1,000.00		
☐	▼	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 Report

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
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- **Technical Support**

AWS Support

- **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

- **Proactive guidance:**
  - Technical Account Manager (TAM)

- **Best practices**
  - AWS Trusted Advisor

Support Plans

AWS Support offers **four support plans:**

- **Basic Support (Free)**
  - Resource Center access, **Service Health Dashboard**, product FAQs, discussion forums, and support for health checks

- **Developer Support (Paid)**
  - Support for **early development** on AWS

- **Business Support (Paid)**
  - Customers that run **production** workloads

- **Enterprise Support (Paid)**
  - 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

- You have an assignment to deploy a "Windows with SQL Enterprise" instance in the UAE region.
- The instance type "m5.metal" has 96 vCPUs, 384 GB Ram, EBS attached storage and upto 26 Gbps network throughput.
- The on-demand hourly rate of the instance is $46.066.
- The on-demand per second rate of the instance is $0.015.
- This rate includes machine's virtual resources along with windows and SQL Enterprise subscriptions.
- Calculate the Annual Cost for the instance when you deploy it as a reserve instance.
  - Hourly rate based All Upfront Reserve Instance with 70% Discount:

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/**

Questions?