How to be Cost-Efficient on AWS

Virtual Workshop Series: Well Architected, Episode 6

November 15th 2019

Arthur Basbaum, AWS Cloud Economics

aws | Pop-up Loft

What are we going to see today

Agenda

- Intro on AWS Cost Management
- Hands-on labs
    1. Governance
    2. Pricing Models
    3. Cost Analysis
    4. Cost Visualization
- Best Practices and Q&A

How to maximize this session

- Have your AWS account open and ready
- Present then Implement: A few slides on the topic + Hands on labs
- Dual streams for each topic: 100 (getting started) and 200 (more complex) labs
- Don't be shy ask questions to our moderators
- Labs are available online: Try to stay together but don't worry if you don't finish it

aws

Where do you sit today within your organization when it comes to AWS cost management?

Poll #1

aws

What is Cost Optimization?

The ability to run systems to deliver business value at the lowest possible price point

aws

How to measure success?
Link consumption with value created

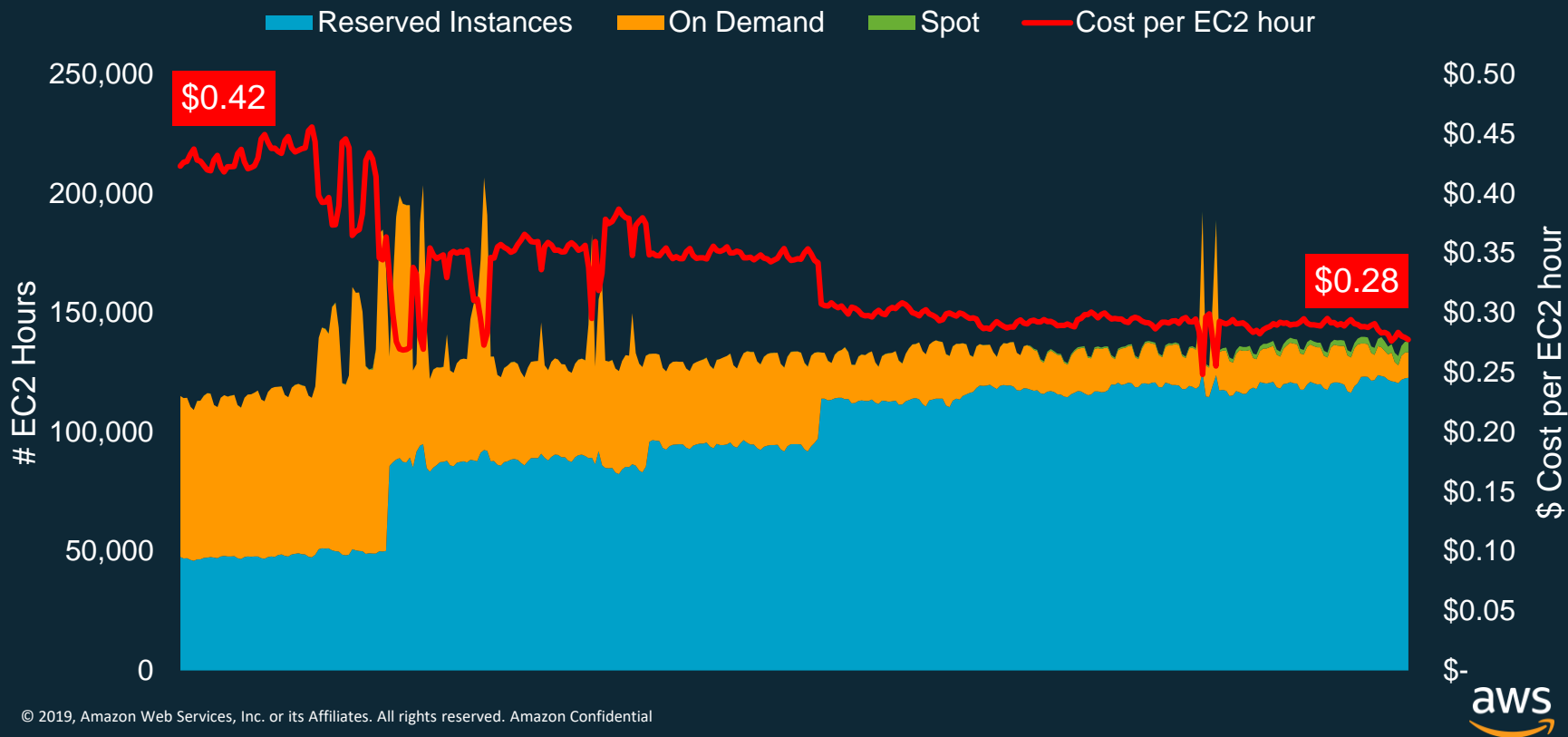## Cost based (efficiency)

% Turned off instances

% RI coverage and utilization

$ Saved

$ Untagged resources

$ Underutilized resources
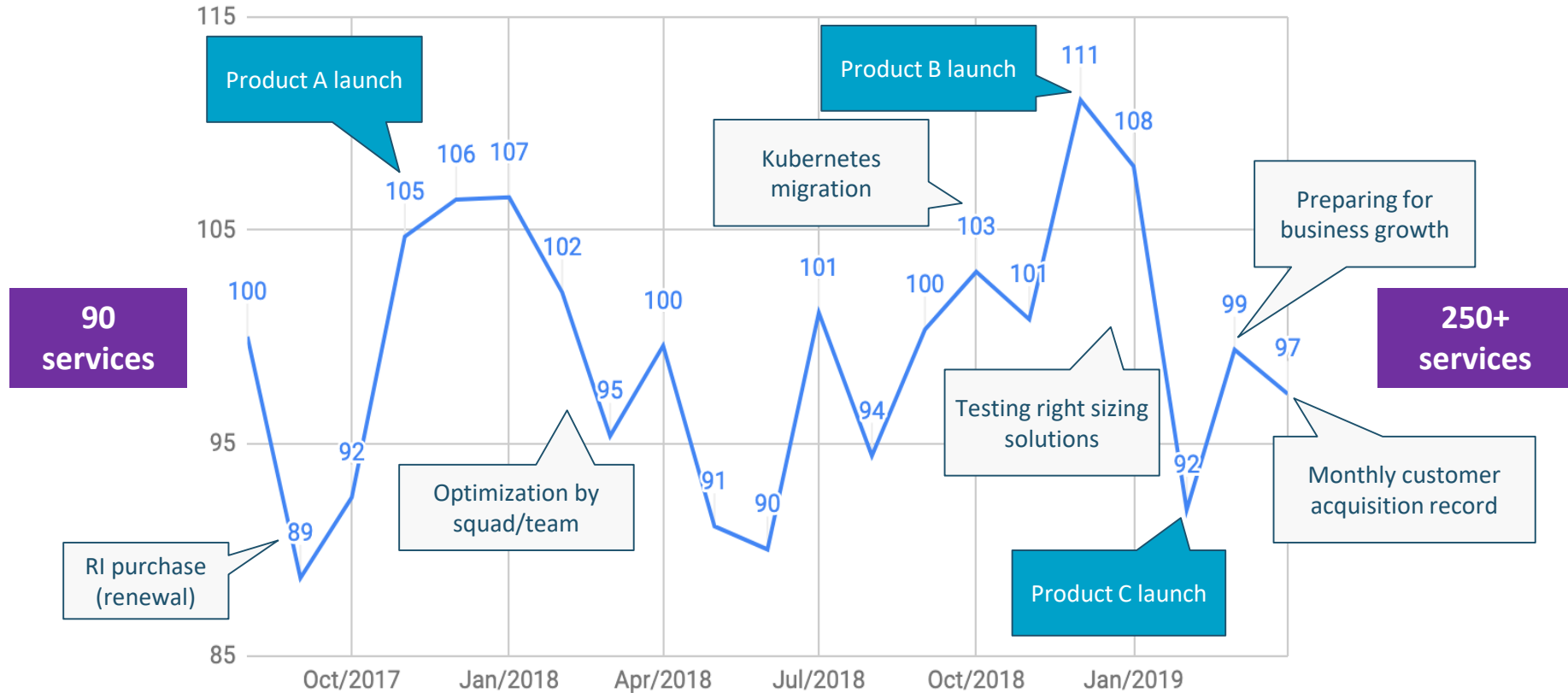
$ Average hourly spend

$ Monthly forecast vs actual

…

Value based (business outcomes)

$ per User or Transaction

$ per Impression or Click

$ per Request

$ per Application or Business Unit

$ per Revenue

$ Per Developer

hours per $ invested

…

aws

After leveraging RIs this customer decreased their Average Compute Cost by 33% in the last 12 months

Legend: Reserved Instances — On Demand — Spot — Cost per EC2 hour

$0.42

$0.28

EC2 Hours

$ Cost per EC2 hour

aws

This other customer managed to keep the cost per user stable after growing 3x userbase and launching +150 new features

90 services

250+ services

- Product A launch
- Product B launch
- Kubernetes migration
- Preparing for business growth
- Testing right sizing solutions
- Optimization by squad/team
- RI purchase (renewal)
- Product C launch
- Monthly customer acquisition record

Data points: 100, 89, 92, 105, 106, 107, 102, 95, 100, 91, 90, 101, 94, 100, 103, 101, 111, 108, 92, 99, 97

X-axis: Oct/2017, Jan/2018, Apr/2018, Jul/2018, Oct/2018, Jan/2019

Y-axis: 85, 95, 105, 115

Governance

aws

What about the upcoming AWS monthly bill, do you know how much that will be?
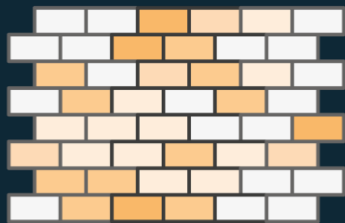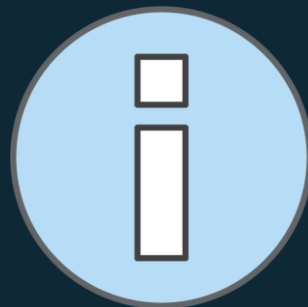

Poll #2

aws

Governance

Usage
Who can do what?

Safety
Broad, high level controls

Learn
Notifications and alerts

Manage
Implement controls

aws

Governance – Controls and Notifications

Notifications = AWS Budgets

- Soft approach (do not enforce)

- Set forecasted and actual budgets

- Cost, usage, Reserved Instance and Savings Plan Coverage

- Refine by: Accounts, tags, instances… (~10 billing columns)

Controls = Identity and Access Management (IAM)

- Enforce permissions based on business needs

- Put in place controls so excess usage does not happen

- Provide and manage access using IAM (users, groups, policies, etc)

aws

Exercise 100 #2 Governance – AWS Budgets
Exercise 200 #2 Governance – IAM Policies

https://wellarchitectedlabs.com/Cost/Fundamentals.html

100 – Implementing AWS Budgets
200 – Implementing IAM Policies for Usage Management

aws

AWS Budget Email Alerts Example

AWS Budget Notification

September 02, 2019

AWS Account ████ *0642*

Dear AWS Customer,

You requested that we alert you when the **cost** associated with your *Monthly EC2 Budget for Project Beta* budget **exceeds $31.50** for the current month. The **cost** associated with this budget is **$33.35**. You can find additional details below and by accessing the AWS Budgets dashboard.

Budget Name	Budget Type	Budgeted Amount	Alert Type	Alert Threshold	FORECASTED Amount
Monthly EC2 Budget for Project Beta	Cost	$35.00	FORECASTED	> $31.50	$33.35

Go to the AWS Budgets dashboard

aws

AWS Budget Email Alerts Example

Reserved Instance Alerts
AWS Account ███████ *0642*

Dear AWS Customer,

You requested that we alert you when the daily **RI Utilization** associated with your *EC2 RI Utilization* budget falls **below 90.0%**. On September 19, 2019, the daily utilization associated with your Amazon EC2 reservations was **9.524%**. You can find additional details below and by accessing the AWS Budgets dashboard.

Budget Name	Budget Type	Budgeted Amount %	Utilization Threshold %	Actual Utilization %
EC2 RI Utilization	RI Utilization	100.00%	90.0%	9.524%

Go to the AWS Budgets dashboard

Your 3 most under-utilized Amazon EC2 reservations, in terms of unused hours, are summarized below. You can find additional information in AWS Cost Explorer's RI Utilization reports.

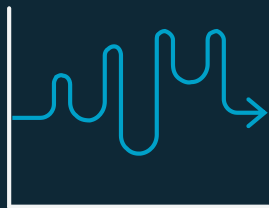| Subscription Id	Instance Type	Availability Zone	Current Utilization %	RI Hours Purchased	RI Hours Unused	Cost for Unused RI Hours
███████	t3.nano		5.26%	456.0	432.0	1.12
███████	t2.nano		0.00%	24.0	24.0	0.20
███████	t3.nano		100.00%	24.0	0.0	0.00

Go to AWS RI Utilization reports

aws

Pricing Models

aws

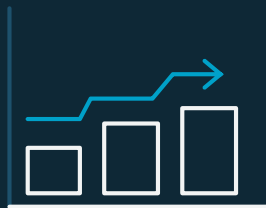# Amazon EC2 purchase options

On-Demand

Pay for compute capacity **the second** with no long-term commitments

Spiky workloads, to define needs

Reserved Instances

Make a 1 or 3-year commitment and receive a **significant discount** off On-Demand prices

Committed & steady-state usage

Spot Instances

Spare EC2 capacity at **savings of up to 90%** off On-Demand prices

Fault-tolerant, flexible, stateless workloads

aws

Introducing Savings Plans

What is it?

A new flexible pricing model which helps you save up to 72% on EC2 and Fargate usage. Customers simply commit to a consistent amount of usage (e.g. $10/hour) over 1 or 3 years, and in exchange they will receive a lower price for that usage.

How it works?

Every type of compute usage has an On Demand rate and a Savings Plans price. If a customer commits to $10/hour of compute usage, then they will get Savings Plans prices on all usage up to $10. Any usage beyond the commitment will be charged at regular On-Demand rates.
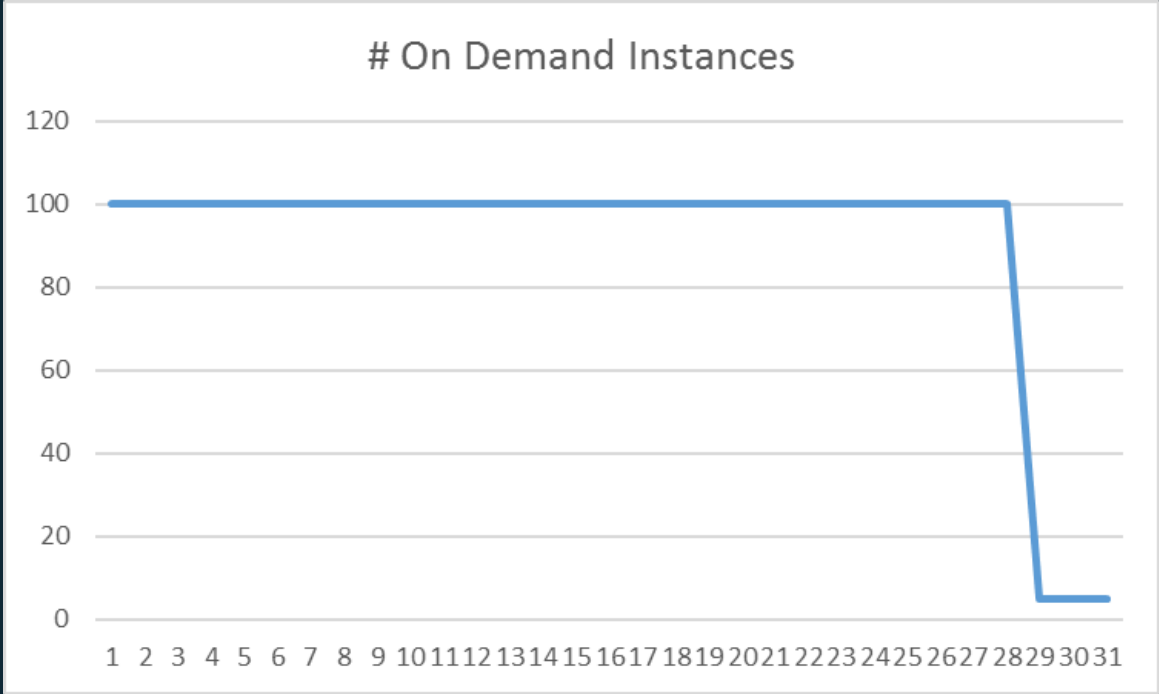
aws

Coverage vs. Utilization (RI)

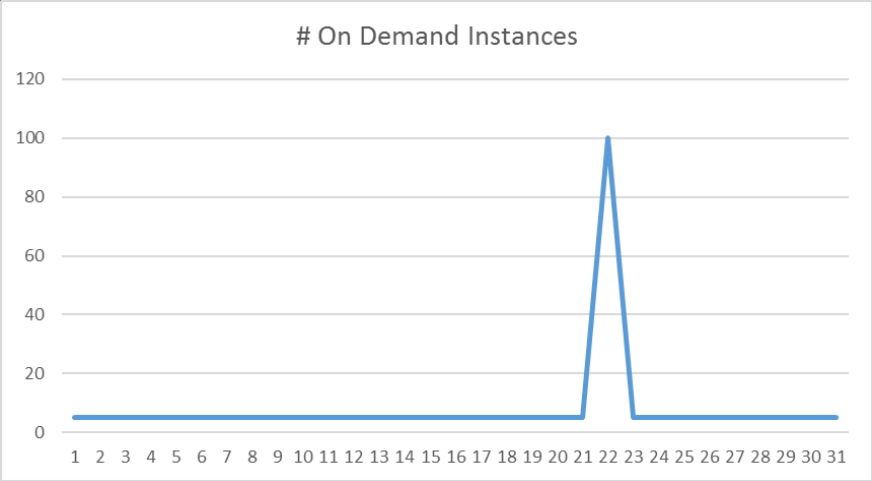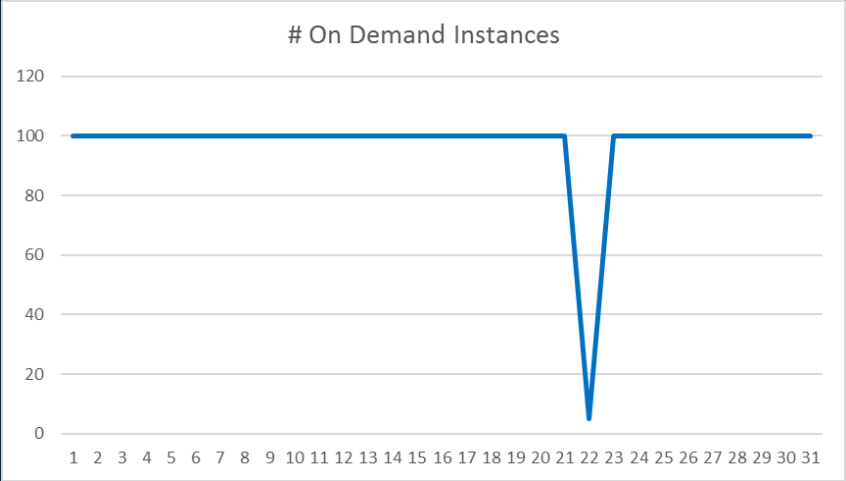100 m5.large instances, Linux, us-east-1 with a 1 year commit, no upfront

- On-Demand: $84,096

- RI Discount = 36%

- 50% Coverage (50 RI/50 OD): $68,766

- 25% Coverage (25 RI/75 OD): $76,431

- Purchase 128 RI's (need 100!): $68,398
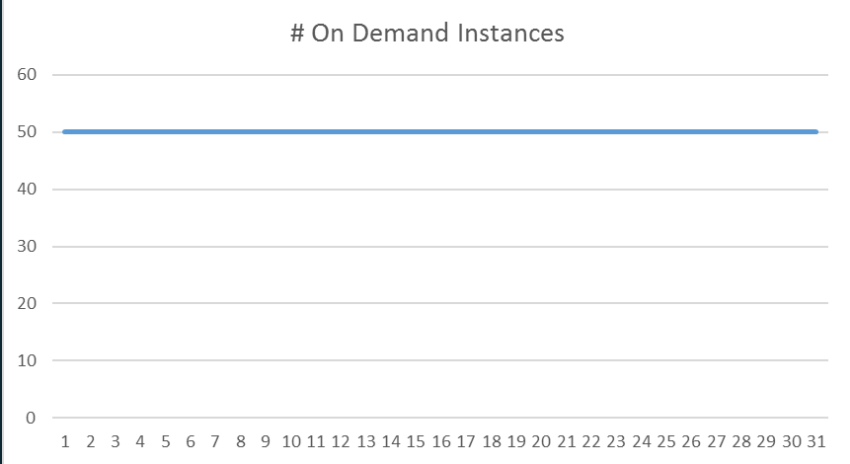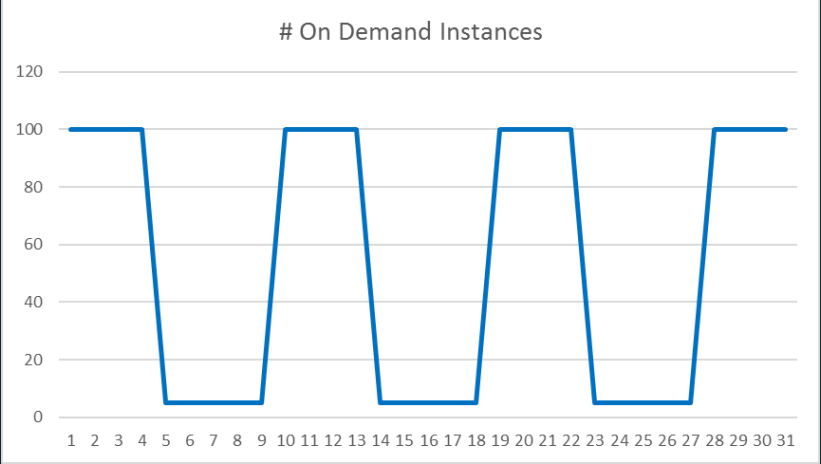
- Purchase 143 RI's (need 100!): $76,413

aws

Usage patterns: Upcoming Environment changes

Usage patterns: Minimum, Maximum and Average

Usage patterns: Predictable Demand

RI and Savings Plan best practices

- When purchasing RIs select the lower size when flexible (AWS Linux)

- Decide at speed and scale, look for repeatable processes

- Sort by Break Even (sooner = lower risk)

- Then sort by Monthly Savings (highest return)

aws

Exercise 200 #3 - Pricing Models

https://wellarchitectedlabs.com/Cost/Fundamentals.html

Both 100 & 200 do the same exercise

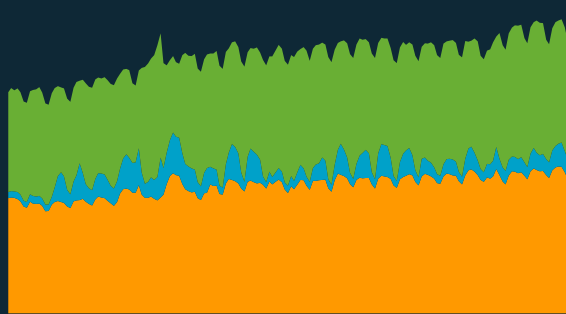If you don't have RI's – there are sample files

aws

What is the ideal mix of On Demand, RI and Spot?
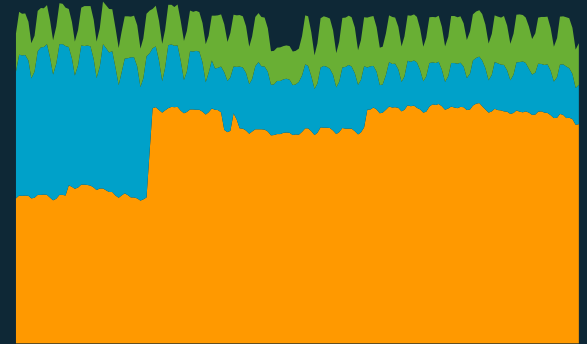

Traditional Enterprise

■ RI ■ OD ■ SP

Retail

■ RI ■ OD ■ Spot

Media

■ RI ■ OD ■ Spot

aws

Don't forget to evaluate Right Sizing efforts vs potential savings within your environment before committing to RIs or Savings Plan

AWS Online Tech Talks   LEVEL 300

Lower Costs with Amazon EC2 T3
General Purpose Burstable Instances

Alex Bestavros, Sr. Product Manager, AWS
October 3rd, 2019

aws

Lower Costs by Right Sizing
Your Instance with Amazon
EC2 T3 General Purpose
Burstable Instances

WIP

https://aws.amazon.com/about-aws/events/monthlywebinarseries/on-demand/

aws

Cost and Usage Analysis

aws

Are you using any 3rd party tools to manage AWS costs?

Poll #3

aws

Cost and Usage Analysis

- Where was your usage (and cost)?
- Who created the most usage (and cost)?
- What did you spend the most money on?

- It's all about learning how to find your answers!

aws

Monitor Cost: Billing Console vs Cost & Usage Reports

- Billing console (100 level)
    - Legal invoice
    - Higher level
    - Accounts, service, service line items

- Cost and Usage Report (200 level)
    - Detailed! (Up to Billions of Lines)
    - Data Source for Many 3rd Party Tools
    - Hourly Granularity, Resource IDs, Tags
    - Everything, Everyone, Anytime, Anywhere = 1 File

aws

Exercise 100 #3 - Cost and Usage Analysis
Exercise 200 #3 - Cost and Usage Analysis

https://wellarchitectedlabs.com/Cost/Fundamentals.html

100 – High level, billing console

200 – Use Athena to do deep analysis of the CUR

Pick the tool that provides the visibility you need

	Monthly AWS Invoice	**AWS Cost Explorer**	**Cost and Usage Report**
Data Field	AWS Account, Service, Usage Type (BoxUsage:t3.large, Operation (RunInstance), Item Description (OS & pricing, Usage Quantity, Cost, etc	All fields from Invoice file + User Defined Tags, API Operation, Region/AZ, Platform (OS), Purchase Option **and resource-id (EC2 only)**	All fields from Bills/Cost Explorer Resource-id (all services)
Period	Monthly	Monthly and Daily (last 12 months) **Hourly (last 14 days)**	Hourly
Output	PDF and CSV	Billing Dashboard and CSV export Cost Explorer API	S3 (JSON, GZIP, etc)
Used for	Simple finance reports	Regular cost tracking Leverage Cost Awareness Trend and Budget analysis	Hourly/Daily reporting Detailed Chargeback & Showback

Simple, Static, Small environment → Complex, Dynamic, Large environment

aws

Cost Visualization

aws

Cost Visualization: Insights and Trends

- A quicker and easier way to do your billing analysis

- AWS Cost Explorer
    - Free & console based
    - Pre-configured reports
    - Daily granularity
    - Tags & ~10 other billing fields

- Amazon QuickSight
    - Extend the CUR & Athena solution (previous exercise)
    - Hourly granularity
    - 120+ billing fields
    - Highly customizable

aws

Exercise 100 #4 - Cost Visualization
Exercise 200 #4 - Cost Visualization

https://wellarchitectedlabs.com/Cost/Fundamentals.html

100 – Cost Explorer, default & custom reports

200 – CUR & QuickSight

aws

Best practices to be cost efficient at AWS

Identify owners for cost management and optimization activities

Start with cost transparency (cost allocation tags), make sure teams who are using the platform are aware of how much they are spending

Improve cost predictability with AWS Budgets and forecasting

Leverage tools (AWS Cost Explorer, CUR) to analyze and execute cost optimization activities

Define what success looks for your organization (metrics) and build mechanisms to recognize good behavior

aws

aws | Pop-up Loft

# Thank you!
https://aws.amazon.com/well-architected

aws

Resources

- [Cost Optimization Pillar](#)
- [Analyzing Your Costs with Cost Explorer](#)
- [AWS Cloud Economics Center](#)
- [AWS Detailed Billing Reports](#)
- [AWS Total Cost of Ownership (TCO) Calculators](#)
- [AWS Simple Monthly Calculator](#)
- [Cost Optimization on AWS](#)

After SPOT adoption this customer increased the number of EC2 hours per $ spend on AWS by 8x
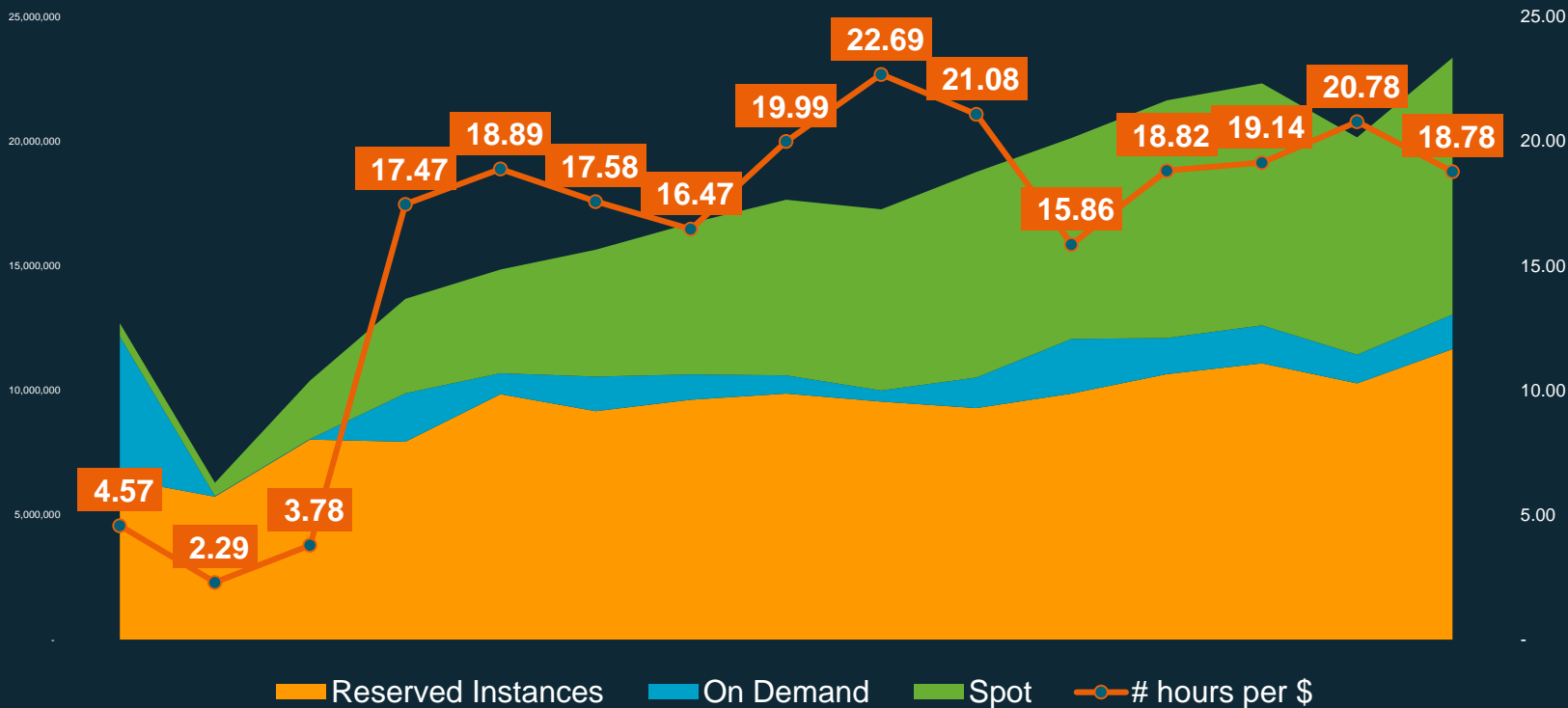
More compute options have led to the need for greater flexibility for customers...

Need an **easier way to manage commitments at scale** across different compute services and 200+ instance options across AWS 22+ Regions

Need a commitment option that **supports changes** to compute usage **without management overhead**

aws

Why Savings Plans?

Flexible purchase option that offers savings of up to 72% on Amazon EC2 and AWS Fargate usage

Easy to use
Receive lower rates automatically in exchange for a monetary commitment

Significant Savings
Select from two types of savings plans to access prices of up to 66% off on Compute Savings Plans and 72% off on EC2 Instance Plans

Flexible
Make a single commitment that applies across multiple AWS Compute Services, even as your requirements change

Significant savings just like EC2 RIs, with more flexibility

aws

Types of Savings Plans

Compute Savings Plans

Offer the greatest flexibility, up to 66% off (same prices as Convertible RIs)

FLEXIBLE ACROSS

- ✓ Instance family: E.g. Move from C5 to M5
- ✓ Region: E.g. change from EU (Ireland) to EU (London)
- ✓ OS: E.g. Windows to Linux
- ✓ Tenancy: E.g. switch Dedicated tenancy to Default tenancy
- ✓ Compute options: E.g. move from EC2 to Fargate

EC2 Instance Savings Plans

Provide the lowest prices, up to 72% off (same as Standard RIs) on the selected instance family (e.g. C5 or M5), in a specific AWS region

FLEXIBLE ACROSS

- ✓ Size: E.g. move from m5.xl to m5.4xl
- ✓ OS: E.g. change from m5.xl Windows to m5.xl Linux
- ✓ Tenancy: E.g. modify m5.xl Dedicated to m5.xl Default tenancy

aws

Comparing RIs and Savings Plans

Savings plans offer all the benefits of RI as well as improved flexibility and reduced management

	Compute Savings Plans	EC2 Instance Savings Plans	Convertible RIs*	Standard RIs
Savings over On Demand	Up to 66%	Up to 72%	Up to 66%	Up to 72%
Low price in exchange for monetary commitment	✓	✓	✗	✗
Pricing automatically applies to any instance families	✓	✗	✗	✗
Pricing automatically applies to any instance size	✓	✓	✗**	✗**
Pricing automatically applies to any Tenancy, or OS	✓	✓	✗	✗
Automatically apply to Fargate Usage	✓	✗	✗	✗
Pricing automatically applies to across any AWS Region	✓	✗	✗	✗
1- and 3-year Term length options	✓	✓	✓	✓

* Convertible RIs can be changed across instance families, sizes, OS and tenancy they require customers to manually perform exchanges.

** Regional Convertible RIs and Regional Standard RIs provide instance size flexibility

aws