



User Guide

# AWS Compute Optimizer



# AWS Compute Optimizer: User Guide

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# What is AWS Compute Optimizer?

AWS Compute Optimizer is a service that analyzes your AWS resources' configuration and utilization metrics to provide you with rightsizing recommendations. It reports whether your resources are optimal, and generates optimization recommendations to reduce the cost and improve the performance of your workloads. Compute Optimizer also provides graphs showing recent utilization metric history data, as well as projected utilization for recommendations, which you can use to evaluate which recommendation provides the best price-performance trade-off. The analysis and visualization of your usage patterns can help you decide when to move or resize your running resources, and still meet your performance and capacity requirements.

Compute Optimizer provides a [console experience](#), and a [set of APIs](#) that allows you to view the findings of the analysis and recommendations for your resources across multiple AWS Regions. You can also view findings and recommendations across multiple accounts, if you opt in the management account of an organization. The findings from the service are also reported in the consoles of the supported services, such as the Amazon EC2 console.

## Supported resources and requirements

Compute Optimizer generates recommendations for the following resources:

- Amazon Elastic Compute Cloud (Amazon EC2) instances
- Amazon EC2 Auto Scaling groups
- Amazon Elastic Block Store (Amazon EBS) volumes
- AWS Lambda functions
- Amazon Elastic Container Service (Amazon ECS) services on AWS Fargate
- Commercial software licenses

For Compute Optimizer to generate recommendations for these resources, they must meet a specific set of requirements, and must have accumulated sufficient metric data. For more information, see [Supported resources and requirements](#).

## Opting in

You must opt in to have Compute Optimizer analyze your AWS resources. The service supports standalone AWS accounts, member accounts of an organization, and the management account of an organization. For more information, see [Getting started with AWS Compute Optimizer](#).

## Analyzing metrics

After you opt in, Compute Optimizer begins analyzing the specifications and the utilization metrics of your resources from Amazon CloudWatch for the last 14 days. For example, for Amazon EC2 instances, Compute Optimizer analyzes the vCPUs, memory, storage, and other specifications. It also analyzes the CPU utilization, network in and out, disk read and write, and other utilization metrics of currently running instances. For more information, see [Metrics analyzed by AWS Compute Optimizer](#).

## Enhancing recommendations

After you opt in, you can enhance your recommendations by activating recommendation preferences, such as the enhanced infrastructure metrics paid feature. It extends the metrics analysis look-back period for EC2 instances, including instances in Auto Scaling groups, to three months (compared to the 14-day default). For more information, see [Recommendation preferences](#).

## Viewing findings and recommendations

Optimization findings for your resources are displayed on the Compute Optimizer dashboard. For more information, see [Viewing the AWS Compute Optimizer dashboard](#).

The top optimization recommendations for each of your resources are listed on the recommendations page. The top 3 optimization recommendations and utilization graphs for a specific resource are listed on the resource details page. For more information, see [Viewing resource recommendations](#).

Export your optimization recommendations to record them over time, and share the data with others. For more information, see [Exporting recommendations](#).

# Availability

To view the currently supported AWS Regions and endpoints for Compute Optimizer, see [Compute Optimizer Endpoints and Quotas](#) in the *AWS General Reference*.

# Supported resources and requirements

AWS Compute Optimizer generates recommendations for the following resources:

- Amazon Elastic Compute Cloud (Amazon EC2) instances
- Amazon EC2 Auto Scaling groups
- Amazon Elastic Block Store (Amazon EBS) volumes
- AWS Lambda functions
- Amazon Elastic Container Service (Amazon ECS) services on AWS Fargate
- Commercial software licenses

To receive recommendations, the resources must meet the following Amazon CloudWatch (CloudWatch) metric and resource-specific requirements.

## CloudWatch metric requirements

To generate recommendations, Compute Optimizer has different CloudWatch metric data requirements for each resource type. The CloudWatch metric data requirements for each resource type are the following:

- **Amazon EC2 instances** require at least 30 hours of metric data in the past 14 days. If you enabled the enhanced infrastructure metrics feature, EC2 instances require at least 30 hours of metric data over the past 93 days. For more information, see [Enhanced infrastructure metrics](#).
- **Auto Scaling groups** require at least 30 *consecutive* hours of metric data.
- **Amazon EBS volumes** require at least 30 *consecutive* hours of metric data.
- **Amazon ECS services on Fargate** require at least 24 hours of metric data.
- **Lambda functions** don't require CloudWatch metric data.
- **Commercial software licenses** require at least 30 *consecutive* hours of metric data.

If your resources don't have enough metric data, allow for more time before the recommendations start appearing in the Compute Optimizer console. For more information about the metrics that Compute Optimizer analyzes, see [Metrics analyzed by AWS Compute Optimizer](#).

Suppose that your resources have enough metric data, but the recommendations aren't showing up. This probably means that Compute Optimizer is still analyzing your resources. It can take up to 24 hours to complete the analysis. After the analysis is complete, resource recommendations appear in the Compute Optimizer console.

## Amazon EC2 instance requirements

Compute Optimizer generates recommendations for several instance types. You can run unsupported instance types in addition to supported types. However, Compute Optimizer only generates recommendations for supported instances. Not all instance types are available in every [AWS Region that Compute Optimizer is available in](#). To determine the supported Regions for each of these instance types, see [Finding an Amazon EC2 instance type](#) in the *Amazon EC2 User Guide for Linux Instances*.

The following table lists the EC2 instance types that are supported by Compute Optimizer.

Instance family	Type
<b>C</b>	C1   C3   C4   C5   C5a   C5ad   C5d   C5n   C6a   C6g   C6gd   C6gn   C6i   C6in   C7a   C7g   C7gd   C7gn   C7i
<b>D</b>	D2   D3   D3en
<b>G</b>	G4dn
<b>Hpc</b>	H1   Hpc6a   Hpc6id   Hpc7a   Hpc7g
<b>I</b>	I2   I3   I3en   I4g   I4i   I4gn   I4gen
<b>M</b>	M1   M2   M3   M4   M5   M5a   M5ad   M5d   M5dn   M5n   M5zn   M6a   M6g   M6gd   M6i   M6id   M6idn   M6in   M7a   M7g   M7gd   M7i   M7i-flex
<b>P</b>	P3
<b>R</b>	R3   R4   R5   R5a   R5ad   R5b   R5d   R5dn   R5n   R6a   R6g   R6gd   R6i   R6id   R6idn   R6in   R7a   R7g   R7gd   R7i   R8g
<b>T</b>	T1   T2   T3   T3a   T4g

Instance family	Type
X	X1   X1e   X2gd   X2idn   X2iedn   X2iezn
z	z1d

### Note

- If an EC2 instance isn't listed, then it isn't supported by Compute Optimizer.
- Compute Optimizer doesn't generate recommendations for Spot instances.

## Auto Scaling group requirements

Compute Optimizer generates recommendations for Auto Scaling groups that run supported instance types. The supported instance types are listed in the preceding [Amazon EC2 instance requirements](#) section.

Additionally, the Auto Scaling groups must meet the following requirements:

- Run only a single instance type (no mixed instance types).
- The values for desired, minimum, and maximum capacity are all the same (for example, an Auto Scaling group with a fixed number of instances).
- No scaling policy is attached.
- No overrides are configured.

Compute Optimizer generates recommendations for instances in Auto Scaling groups that meet *all* of these configuration requirements.

## Amazon EBS volume requirements

Compute Optimizer generates recommendations for the following EBS volume types that are attached to an instance:

- HDD st1 and sc1

- General Purpose SSD gp2 and gp3
- Provisioned IOPS SSD io1, io2, and io2 Block Express

Compute Optimizer also generates recommendations to move your data out from previous generation HDD Magnetic volumes. For more information, see [Amazon EBS previous generation volumes](#).

Data is only reported to CloudWatch when the volume is attached to an instance. The volume must be attached to an instance for at least 30 consecutive hours.

## Lambda function requirements

Compute Optimizer generates memory size recommendations only for Lambda functions that meet the following requirements:

- The configured memory is less than or equal to 1,792 MB.
- The functions were invoked at least 50 times in the last 14 days.

Functions that don't meet these requirements are given a finding of **Unavailable**. The reason code of **Inconclusive** applies to functions that have configured memory greater than 1,792 MB. **Insufficient data** applies to functions that have been invoked fewer than 50 times in the last 14 days.

Functions with a finding of **Unavailable** don't appear in the Compute Optimizer console and don't receive recommendations.

## Requirements for Amazon ECS services on Fargate

To generate recommendations for Amazon ECS services on Fargate, Compute Optimizer requires the following:

- Your services have at least 24 hours of CloudWatch and Amazon ECS utilization metrics in the past 14 days.
- No step scaling policy is attached.
- No target scaling policy is attached to CPU and memory.

**Note**

If a target tracking policy is attached to the service's CPU only, Compute Optimizer only generates memory size recommendations. Or, if a target tracking policy is attached to the service's memory only, Compute Optimizer only generates CPU size recommendations.

- The service run status is **SteadyState** or **MoreWork**.

For more information about the metrics analyzed, see [Metrics for Amazon ECS services on Fargate](#).

## Commercial software license requirements

**Note**

Compute Optimizer only generates license recommendations for Microsoft SQL Server on Amazon EC2.

To generate recommendations for commercial software licenses, Compute Optimizer requires the following:

- Enable CloudWatch Application Insights using your Microsoft SQL Server database credentials.

For more information about how to enable CloudWatch Application Insights, see [Get started with Amazon CloudWatch Application Insights](#) in the *Amazon CloudWatch User Guide*.

- Attach the required instance role and policy for CloudWatch Application Insights. For more information, see [Policies to enable commercial software license recommendations](#).

For more information about the metrics analyzed, see [Metrics for commercial software licenses](#).

# Getting started with AWS Compute Optimizer

When you access the AWS Compute Optimizer console for the first time, you're asked to opt in using the account that you're signed in with. Before you can use the service, you must opt in or out. In addition, you can also opt in or opt out using the Compute Optimizer API, AWS Command Line Interface (AWS CLI), or SDKs.

By opting in, you're authorizing Compute Optimizer to analyze the specifications and utilization metrics of your AWS resources. Examples include EC2 instances and Auto Scaling groups.

## Accounts supported by Compute Optimizer

The following AWS account types can opt in to Compute Optimizer:

- **Standalone AWS account**

A standalone AWS account that doesn't have AWS Organizations enabled. For example, suppose that you opt in to Compute Optimizer while signed in to a standalone account. Then, Compute Optimizer analyzes the resources in the account and generates optimization recommendations for those resources.

- **Member account of an organization**

An AWS account that's a member of an organization. If you opt in to Compute Optimizer while signed in to a member account of an organization. Then, Compute Optimizer only analyzes the resources in the member account and generates optimization recommendations for those resources.

- **Management account of an organization**

An AWS account that administers an organization. If you opt in to Compute Optimizer while signed in to a management account of an organization. Then, Compute Optimizer gives you the option to opt in the management account only, or the management account and all member accounts of the organization.

### **Important**

To opt in all member accounts for an organization, make sure that the organization has all features enabled. For more information, see [Enabling All Features in Your Organization](#) in the *AWS Organizations User Guide*.

When you opt in using your organization's management account and include all member accounts within the organization, trusted access for Compute Optimizer is enabled in your organization account. For more information, see [Compute Optimizer and AWS Organizations trusted access](#).

## Required permissions

You must have the appropriate permissions to opt in to Compute Optimizer, to view its recommendations, and to opt out. For more information, see [Controlling access with AWS Identity and Access Management](#).

When you opt in, Compute Optimizer automatically creates a Service-Linked Role in your account to access its data. For more information, see [Using Service-Linked Roles for AWS Compute Optimizer](#).

## Opting in your account

Use the following procedure to opt in your account using the Compute Optimizer console or the AWS CLI.

### Note

If your account is already opted in, but you want to opt in again to re-enable trusted access for Compute Optimizer in your organization. You can opt in again, but this must be done using the AWS CLI. When you opt in using the AWS CLI, run the `update-enrollment-status` command and specify the `--include-member-accounts` parameter. Alternatively, you can enable trusted access directly in the AWS Organizations console or by using AWS CLI or API. For more information, see [Using AWS Organizations with other AWS services](#) in the *AWS Organizations User Guide*.

### Console

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.

If this is your first time using the Compute Optimizer console, the **Compute Optimizer landing page** is displayed.

2. Choose **Get started**.
3. On the **Account setup** page, review the **Getting started** and **Setting up your account** sections.
4. The following options are displayed if the account that you're signed in to is the management account of your organization. Choose one before continuing to the next step.
  - **Only this account** - Choose this option to opt in only the account that you're currently signed in to. If you choose this option, Compute Optimizer analyzes resources that are in the individual account, and generates optimization recommendations for those resources.
  - **All accounts within this organization** - Choose this option to opt in the account you're currently signed in to, and all of its member accounts. If you choose this option, Compute Optimizer analyzes resources that are in all accounts in the organization, and generates optimization recommendations for those resources.

 **Note**

If you add any new member accounts to your organization after you opt in, Compute Optimizer automatically opts in those accounts.

5. Choose **Opt in**. By opting in, you indicate that you agree to and understand the requirements to opt in to Compute Optimizer.

After you opt in, you're redirected to the dashboard in the Compute Optimizer console. At the same time, the service immediately starts analyzing the configuration and utilization metrics of your AWS resources. For more information, see [Metrics analyzed by AWS Compute Optimizer](#).

 **Note**

When you complete the opt in process, it can up to 24 hours for the opted-in accounts to appear in the Compute Optimizer console.

## CLI

1. Open a terminal or command prompt window.

If you didn't already install the AWS CLI already, install and configure it to work with Compute Optimizer. For more information, see [Installing the AWS CLI](#) and [Quickly Configuring the AWS CLI](#) in the *AWS Command Line Interface User Guide*.

2. Enter one of the following commands. Choose if you want to opt in your individual account or the management account of your organization and all its member accounts.

- To opt in your individual account:

```
aws compute-optimizer update-enrollment-status --status Active
```

- To opt in the management account of an organization and include all member accounts within the organization:

```
aws compute-optimizer update-enrollment-status --status Active --include-member-accounts
```

After you opt in to Compute Optimizer using the previous command, the service begins analyzing the configuration and utilization metrics of your AWS resources. For more information, see [Metrics analyzed by AWS Compute Optimizer](#).

Consider the following after opting in:

- After you opt in, findings and optimization recommendations can take up to 24 hours to be generated. Moreover, for optimization recommendations can be generated, sufficient metric data must be accumulated. For more information, see [CloudWatch metric requirements](#).
- Findings and recommendations are displayed in the dashboard and the recommendation pages of the Compute Optimizer console. For more information, see [Viewing the AWS Compute Optimizer dashboard](#) and [Viewing resource recommendations](#).
- Some recommendation preferences such as the enhanced infrastructure metrics is paid feature. This feature extends the metrics analysis look-back period of EC2 instances, including instances in Auto Scaling groups, to up to three months. By default, the look-back period is 14 days. For more information, see [Recommendation preferences](#).

- Using the management account of your organization, you can delegate a member account as an administrator for Compute Optimizer. A delegated administrator can access and manage Compute Optimizer recommendations. A delegated administrator can also set recommendation preferences for your entire organization without needing to access the management account. For more information, see [Delegate an administrator account](#).

### Note

To improve the recommendation quality of Compute Optimizer, Amazon Web Services might use your CloudWatch metrics and configuration data. This includes up to three months (93 days) of metrics analysis when you activate the enhanced infrastructure metrics feature. Contact [AWS Support](#) to request that AWS stop using your CloudWatch metrics and configuration data to improve the recommendation quality of Compute Optimizer.

## Opting out your account

Use the following procedure to opt out your account from Compute Optimizer using the AWS CLI. The same procedure also deletes your account's recommendations and related metrics data from Compute Optimizer. For more information, see [update-enrollment-status](#) in the *AWS CLI Command Reference*. You can't opt out using the Compute Optimizer console.

### To opt out an account

1. Open a terminal or command prompt window.

If you haven't already, install the AWS CLI and configure it to work with Compute Optimizer. For more information, see [Installing the AWS CLI](#) and [Quickly Configuring the AWS CLI](#) in the *AWS Command Line Interface User Guide*.

2. Enter the following command.

```
aws compute-optimizer update-enrollment-status --status Inactive
```

**Note**

You can't specify the `--include-member-accounts` parameter when opting out with the `update-enrollment-status` command. If you specify this parameter when opting out with this command, an error occurs.

Your account is opted out of Compute Optimizer after running the previous command. At the same time, your account's recommendations and related metrics data are deleted from Compute Optimizer. If you access the Compute Optimizer console, the option to opt in again should be displayed.

## Controlling access with AWS Identity and Access Management

You can use AWS Identity and Access Management (IAM) to create identities (users, groups, or roles), and give those identities permissions to access the AWS Compute Optimizer console and APIs.

By default, IAM users don't have access to the Compute Optimizer console and APIs. You give users access by attaching IAM policies to a single user, a group of users, or a role. For more information, see [Identities \(Users, Groups, and Roles\)](#) and [Overview of IAM Policies in the IAM User Guide](#).

After you create IAM users, you can give those users individual passwords. Then, they can sign in to your account and view Compute Optimizer information by using an account-specific sign-in page. For more information, see [How Users Sign In to Your Account](#).

**Important**

- To view recommendations for EC2 instances, an IAM user requires the `ec2:DescribeInstances` permission.
- To view recommendations for EBS volumes, an IAM user requires the `ec2:DescribeVolumes` permission.
- To view recommendations for Auto Scaling groups, an IAM user requires the `autoscaling:DescribeAutoScalingGroups` and `autoscaling:DescribeAutoScalingInstances` permissions.

- To view recommendations for Lambda functions, an IAM user requires the `lambda:ListFunctions` and `lambda:ListProvisionedConcurrencyConfigs` permissions.
- To view recommendations for Amazon ECS services on Fargate, an IAM user requires the `ecs:ListServices` and `ecs:ListClusters` permissions.
- To view current CloudWatch metrics data in the Compute Optimizer console, an IAM user requires the `cloudwatch:GetMetricData` permission.
- To view recommendations commercial software licenses, certain Amazon EC2 instance roles and IAM user permissions are required. For more information see, [Policies to enable commercial software license recommendations](#).

If the user or group that you want to give permissions to already has a policy, you can add one of the Compute Optimizer specific policy statements illustrated here to that policy.

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- [Compute Optimizer and AWS Organizations trusted access](#)
- [Policy to opt in to Compute Optimizer](#)
- [Policies to grant access to Compute Optimizer for standalone AWS accounts](#)
- [Policies to grant access to Compute Optimizer for a management account of an organization](#)
- [Policies to grant access to manage Compute Optimizer recommendation preferences](#)
- [Policies to enable commercial software license recommendations](#)
- [Policy to deny access to Compute Optimizer](#)

## Compute Optimizer and AWS Organizations trusted access

When you opt in using your organization's management account and include all member accounts within the organization, trusted access for Compute Optimizer is automatically enabled in your organization account. This allows Compute Optimizer to analyze compute resources in those member accounts, and generate recommendations for them.

Every time that you access recommendations for member accounts, Compute Optimizer verifies that trusted access is enabled in your organization account. If you disable Compute Optimizer trusted access after you opt in, Compute Optimizer denies access to recommendations for your organization's member accounts. Moreover, the member accounts within the organization aren't

opted in to Compute Optimizer. To re-enable trusted access, opt in to Compute Optimizer again using your organization's management account and include all the member accounts within the organization. For more information, see [Opting in your account](#). For more information about AWS Organizations trusted access, see [Using AWS Organizations with other AWS services](#) in the *AWS Organizations User Guide*.

## Policy to opt in to Compute Optimizer

The following policy statement grants access to opt in to Compute Optimizer. It grants access to create a service-linked role for Compute Optimizer. This role is required to opt in. For more information, see [Using Service-Linked Roles for AWS Compute Optimizer](#). It also grants access to update the enrollment status to the Compute Optimizer service.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "iam:CreateServiceLinkedRole",
      "Resource": "arn:aws:iam::*:role/aws-service-role/compute-optimizer.amazonaws.com/AWSServiceRoleForComputeOptimizer*",
      "Condition": {"StringLike": {"iam:AWSServiceName": "compute-optimizer.amazonaws.com"}}
    },
    {
      "Effect": "Allow",
      "Action": "iam:PutRolePolicy",
      "Resource": "arn:aws:iam::*:role/aws-service-role/compute-optimizer.amazonaws.com/AWSServiceRoleForComputeOptimizer"
    },
    {
      "Effect": "Allow",
      "Action": "compute-optimizer:UpdateEnrollmentStatus",
      "Resource": "*"
    }
  ]
}
```

## Policies to grant access to Compute Optimizer for standalone AWS accounts

The following policy statement grants full access to Compute Optimizer for standalone AWS accounts. For the policy statements to manage recommendation preferences, see [Policies to grant access to manage Compute Optimizer recommendation preferences](#).

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "compute-optimizer:*",
        "ec2:DescribeInstances",
        "ec2:DescribeVolumes",
        "ecs:ListServices",
        "ecs:ListClusters",
        "autoscaling:DescribeAutoScalingGroups",
        "autoscaling:DescribeAutoScalingInstances",
        "lambda:ListFunctions",
        "lambda:ListProvisionedConcurrencyConfigs",
        "cloudwatch:GetMetricData"
      ],
      "Resource": "*"
    }
  ]
}
```

The following policy statement grants read-only access to Compute Optimizer for standalone AWS accounts.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "compute-optimizer:GetEnrollmentStatus",
        "compute-optimizer:GetEffectiveRecommendationPreferences",
        "compute-optimizer:GetRecommendationPreferences",
        "compute-optimizer:GetRecommendationSummaries",

```

```

        "compute-optimizer:GetEC2InstanceRecommendations",
        "compute-optimizer:GetEC2RecommendationProjectedMetrics",
        "compute-optimizer:GetAutoScalingGroupRecommendations",
        "compute-optimizer:GetEBSVolumeRecommendations",
        "compute-optimizer:GetLambdaFunctionRecommendations",
        "compute-optimizer:DescribeRecommendationExportJobs",
        "compute-optimizer:GetEffectiveRecommendationPreferences",
        "compute-optimizer:GetRecommendationPreferences",
        "compute-optimizer:GetECSServiceRecommendations",
        "compute-optimizer:GetECSServiceRecommendationProjectedMetrics",
        "ec2:DescribeInstances",
        "ec2:DescribeVolumes",
        "ecs:ListServices",
        "ecs:ListClusters",
        "autoscaling:DescribeAutoScalingGroups",
        "autoscaling:DescribeAutoScalingInstances",
        "lambda:ListFunctions",
        "lambda:ListProvisionedConcurrencyConfigs",
        "cloudwatch:GetMetricData"
    ],
    "Resource": "*"
}
]
}

```

## Policies to grant access to Compute Optimizer for a management account of an organization

The following policy statement grants full access to Compute Optimizer for a management account of your organization. For the policy statements to manage recommendation preferences, see [Policies to grant access to manage Compute Optimizer recommendation preferences](#).

```

{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "compute-optimizer:*",
        "ec2:DescribeInstances",
        "ec2:DescribeVolumes",
        "ecs:ListServices",

```

```

        "ecs:ListClusters",
        "autoscaling:DescribeAutoScalingGroups",
        "autoscaling:DescribeAutoScalingInstances",
        "lambda:ListFunctions",
        "lambda:ListProvisionedConcurrencyConfigs",
        "cloudwatch:GetMetricData",
        "organizations:ListAccounts",
        "organizations:DescribeOrganization",
        "organizations:DescribeAccount",
        "organizations:EnableAWSServiceAccess",
        "organizations:ListDelegatedAdministrators",
        "organizations:RegisterDelegatedAdministrator",
        "organizations:DeregisterDelegatedAdministrator"
    ],
    "Resource": "*"
}
]
}

```

The following policy statement grants read-only access to Compute Optimizer for a management account of an organization.

```

{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "compute-optimizer:GetEnrollmentStatus",
        "compute-optimizer:GetEnrollmentStatusesForOrganization",
        "compute-optimizer:GetRecommendationSummaries",
        "compute-optimizer:GetEC2InstanceRecommendations",
        "compute-optimizer:GetEC2RecommendationProjectedMetrics",
        "compute-optimizer:GetAutoScalingGroupRecommendations",
        "compute-optimizer:GetEBSVolumeRecommendations",
        "compute-optimizer:GetLambdaFunctionRecommendations",
        "compute-optimizer:GetEffectiveRecommendationPreferences",
        "compute-optimizer:GetRecommendationPreferences",
        "compute-optimizer:GetECSServiceRecommendations",
        "compute-optimizer:GetECSServiceRecommendationProjectedMetrics",
        "ec2:DescribeInstances",
        "ec2:DescribeVolumes",
        "ecs:ListServices",

```

```

        "ecs:ListClusters",
        "autoscaling:DescribeAutoScalingGroups",
        "autoscaling:DescribeAutoScalingInstances",
        "lambda:ListFunctions",
        "lambda:ListProvisionedConcurrencyConfigs",
        "cloudwatch:GetMetricData",
        "organizations:ListAccounts",
        "organizations:DescribeOrganization",
        "organizations:DescribeAccount",
        "organizations:ListDelegatedAdministrators"
    ],
    "Resource": "*"
}
]
}

```

## Policies to grant access to manage Compute Optimizer recommendation preferences

The following policy statements grant access to view and edit recommendation preferences, such as the enhanced infrastructure metrics paid feature. For more information, see [Recommendation preferences](#).

### Grant access to manage recommendation preferences for EC2 instances only

```

{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "compute-optimizer:DeleteRecommendationPreferences",
        "compute-optimizer:GetEffectiveRecommendationPreferences",
        "compute-optimizer:GetRecommendationPreferences",
        "compute-optimizer:PutRecommendationPreferences"
      ],
      "Resource": "*",
      "Condition": {
        "StringEquals": {
          "compute-optimizer:ResourceType": "Ec2Instance"
        }
      }
    }
  ]
}

```

```

    }
  ]
}

```

## Grant access to manage recommendation preferences for Auto Scaling groups only

```

{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "compute-optimizer:DeleteRecommendationPreferences",
        "compute-optimizer:GetEffectiveRecommendationPreferences",
        "compute-optimizer:GetRecommendationPreferences",
        "compute-optimizer:PutRecommendationPreferences"
      ],
      "Resource": "*",
      "Condition": {
        "StringEquals": {
          "compute-optimizer:ResourceType": "AutoScalingGroup"
        }
      }
    }
  ]
}

```

## Policies to enable commercial software license recommendations

For Compute Optimizer to generate license recommendations, attach the following Amazon EC2 instance roles and policies.

- The `AmazonSSMManagedInstanceCore` role to enable Systems Manager. For more information, see [AWS Systems Manager identity-based policy examples](#) in the *AWS Systems Manager User Guide*.
- The `CloudWatchAgentServerPolicy` policy to enable the release of instance metrics and logs to CloudWatch. For more information, see [Create IAM roles and users for use with the CloudWatch agent](#) in the *Amazon CloudWatch User Guide*.

- The following IAM inline policy statement to read the secret Microsoft SQL Server connection string stored in AWS Systems Manager. For more information about inline policies, see [Managed policies and inline policies](#) in the *AWS Identity and Access Management User Guide*.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "secretsmanager:GetSecretValue*"
      ],
      "Resource": "arn:aws:secretsmanager:*:*:secret:ApplicationInsights-*"
    }
  ]
}
```

Additionally, to enable and receive license recommendations, attach the following IAM policy to your user, group or role. For more information, [IAM policy](#) in the *Amazon CloudWatch User Guide*.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Action": [
        "applicationinsights:*",
        "iam:CreateServiceLinkedRole",
        "iam:ListRoles",
        "resource-groups:ListGroup"
      ],
      "Effect": "Allow",
      "Resource": "*"
    }
  ]
}
```

## Policy to deny access to Compute Optimizer

The following policy statement denies access to Compute Optimizer.

```
{
```

```
"Version": "2012-10-17",
"Statement": [
  {
    "Effect": "Deny",
    "Action": "compute-optimizer:*",
    "Resource": "*"
  }
]
```

## Using Service-Linked Roles for AWS Compute Optimizer

AWS Compute Optimizer uses AWS Identity and Access Management (IAM) [service-linked roles](#). A service-linked role is a unique type of IAM role that's linked directly to Compute Optimizer. Service-linked roles are predefined by Compute Optimizer and include all of the permissions that the service requires to call other on your behalf.

With a service-linked role, setting up Compute Optimizer doesn't require manually adding the necessary permissions. Compute Optimizer defines the permissions of its service-linked roles, and unless defined otherwise, only Compute Optimizer can assume its roles. The defined permissions include the trust policy and the permissions policy, and that permissions policy cannot be attached to any other IAM entity.

For information about other services that support service-linked roles, see [AWS Services That Work with IAM](#) and look for the services that have **Yes** in the **Service-Linked Role** column. Choose a **Yes** with a link to view the service-linked role documentation for that service.

### Service-Linked Role permissions for Compute Optimizer

Compute Optimizer uses the service-linked role that's named **AWSServiceRoleForComputeOptimizer** to access Amazon CloudWatch metrics for AWS resources in the account.

The **AWSServiceRoleForComputeOptimizer** service-linked role trusts the following services to assume the role:

- `compute-optimizer.amazonaws.com`

The role permissions policy allows Compute Optimizer to complete the following actions on the specified resources:

- Action: `cloudwatch:GetMetricData` on all AWS resources.
- Action: `organizations:DescribeOrganization` on all AWS resources.
- Action: `organizations:ListAccounts` on all AWS resources.
- Action: `organizations:ListAWSServiceAccessForOrganization` on all AWS resources.
- Action: `organizations:ListDelegatedAdministrators` on all AWS resources.

## Service-Linked Role permissions

To create a service-linked role for Compute Optimizer, configure permissions to allow an IAM entity (such as a user, group, or role) to create the service-linked role. For more information, see [Service-Linked Role Permissions](#) in the *IAM User Guide*.

### To allow an IAM entity to create a specific service-linked role for Compute Optimizer

Add the following policy to the IAM entity that needs to create the service-linked role.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "iam:CreateServiceLinkedRole",
      "Resource": "arn:aws:iam::*:role/aws-service-role/compute-optimizer.amazonaws.com/AWSServiceRoleForComputeOptimizer*",
      "Condition": {"StringLike": {"iam:AWSServiceName": "compute-optimizer.amazonaws.com"}}
    },
    {
      "Effect": "Allow",
      "Action": "iam:PutRolePolicy",
      "Resource": "arn:aws:iam::*:role/aws-service-role/compute-optimizer.amazonaws.com/AWSServiceRoleForComputeOptimizer"
    },
    {
      "Effect": "Allow",
      "Action": "compute-optimizer:UpdateEnrollmentStatus",
      "Resource": "*"
    }
  ]
}
```

## To allow an IAM entity to create any service-linked role

Add the following statement to the permissions policy for the IAM entity that needs to create a service-linked role, or any service role that includes the needed policies. This policy attaches a policy to the role.

```
{
  "Effect": "Allow",
  "Action": "iam:CreateServiceLinkedRole",
  "Resource": "arn:aws:iam::*:role/aws-service-role/*"
}
```

## Creating a Service-Linked Role for Compute Optimizer

You don't need to manually create a service-linked role. When you opt in to the Compute Optimizer service in the AWS Management Console, the AWS CLI, or the AWS API, Compute Optimizer creates the service-linked role for you.

### Important

If you completed an action in another service that uses the features supported by the service-linked role, the role can appear in your account. For more information, see [A New Role Appeared in My IAM Account](#).

If you delete this service-linked role, and then need to create it again, you can use the same process to recreate the role in your account. When you opt in to the Compute Optimizer service, Compute Optimizer creates the service-linked role for you again.

## Editing a Service-Linked Role for Compute Optimizer

Compute Optimizer doesn't allow you to edit the `AWSServiceRoleForComputeOptimizer` service-linked role. After you create a service-linked role, you can't change the name of the role because various entities might reference the role. However, you can edit the description of the role using IAM. For more information, see [Editing a Service-Linked Role](#) in the *IAM User Guide*.

## Deleting a Service-Linked Role for Compute Optimizer

We recommend that, if you no longer need to use Compute Optimizer, you delete the `AWSServiceRoleForComputeOptimizer` service-linked role. That way you don't have an unused

entity that's not actively monitored or maintained. However, before you can manually delete the service-linked role, you must opt out of Compute Optimizer.

### To opt out of Compute Optimizer

For information about opting out of Compute Optimizer, see [Opting out your account](#).

### To manually delete the service-linked role using IAM

Use the IAM console, the AWS CLI, or the AWS API to delete the `AWSServiceRoleForComputeOptimizer` service-linked role. For more information, see [Deleting a Service-Linked Role](#) in the *IAM User Guide*.

## Supported Regions for Compute Optimizer Service-Linked Roles

Compute Optimizer supports using service-linked roles in all of the Regions where the service is available. To view the currently supported AWS Regions and endpoints for Compute Optimizer, see [Compute Optimizer Endpoints and Quotas](#) in the *AWS General Reference*.

## AWS managed policies for AWS Compute Optimizer

To add permissions to users, groups, and roles, consider using AWS managed policies rather than to writing your own policies. It takes time and expertise to [create IAM customer managed policies](#) that provide your team with only the permissions they need. To get started quickly, you can use AWS managed policies. These policies cover common use cases and are available in your AWS account. For more information about AWS managed policies, see [AWS managed policies](#) in the *IAM User Guide*.

AWS services maintain and update AWS managed policies. You can't change the permissions in AWS managed policies. Services occasionally add additional permissions to an AWS managed policy to support new features. This type of update affects all identities (users, groups, and roles) where the policy is attached. Services are most likely to update an AWS managed policy when a new feature is launched or when new operations become available. Services don't remove permissions from an AWS managed policy, so policy updates won't break your existing permissions.

Additionally, Amazon Web Services supports managed policies for job functions that span multiple services. For example, the **ReadOnlyAccess** AWS managed policy provides read-only access to all and resources. When a service launches a new feature, AWS adds read-only permissions for new operations and resources. For a list and descriptions of job function policies, see [AWS managed policies for job functions](#) in the *IAM User Guide*.

## AWS managed policy: ComputeOptimizerServiceRolePolicy

The ComputeOptimizerServiceRolePolicy managed policy is attached to a service-linked role that allows Compute Optimizer to perform actions on your behalf. For more information, see [Using Service-Linked Roles for AWS Compute Optimizer](#).

### Note

You can't attach ComputeOptimizerServiceRolePolicy to your IAM entities.

### Permissions details

This policy includes the following permissions.

- `compute-optimizer` – Grants full administrative permissions to all resources in Compute Optimizer.
- `organizations` – Allows the management account of an AWS organization to opt in member accounts of the organization to Compute Optimizer.
- `cloudwatch` – Grants access to CloudWatch resource metrics for the purpose of analyzing them and generating Compute Optimizer resource recommendations.
- `autoscaling` – Grants access to Auto Scaling groups and the instances in Auto Scaling groups for validation purposes.
- `Ec2` – Grants access to Amazon EC2 instances and volumes.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "ComputeOptimizerFullAccess",
      "Effect": "Allow",
      "Action": [
        "compute-optimizer:*"
      ],
      "Resource": "*"
    },
    {
      "Sid": "AwsOrgsAccess",
```

```

    "Effect": "Allow",
    "Action": [
      "organizations:DescribeOrganization",
      "organizations:ListAccounts",
      "organizations:ListAWSServiceAccessForOrganization",
      "organizations:ListDelegatedAdministrators"
    ],
    "Resource": [
      "*"
    ]
  },
  {
    "Sid": "CloudWatchAccess",
    "Effect": "Allow",
    "Action": [
      "cloudwatch:GetMetricData"
    ],
    "Resource": "*"
  },
  {
    "Sid": "AutoScalingAccess",
    "Effect": "Allow",
    "Action": [
      "autoscaling:DescribeAutoScalingInstances",
      "autoscaling:DescribeAutoScalingGroups"
    ],
    "Resource": "*"
  },
  {
    "Sid": "Ec2Access",
    "Effect": "Allow",
    "Action": [
      "ec2:DescribeInstances",
      "ec2:DescribeVolumes"
    ],
    "Resource": "*"
  }
]
}

```

## AWS managed policy: ComputeOptimizerReadOnlyAccess

You can attach the `ComputeOptimizerReadOnlyAccess` policy to your IAM identities.

This policy grants read-only permissions that allow IAM users to view Compute Optimizer resource recommendations.

## Permissions details

This policy includes the following:

- `compute-optimizer` – Grants read-only access to Compute Optimizer resource recommendations.
- `ec2` – Grants read-only access to Amazon EC2 instances and Amazon EBS volumes.
- `autoscaling` – Grants read-only access to Auto Scaling groups.
- `lambda` – Grants read-only access to AWS Lambda functions and their configurations.
- `cloudwatch` – Grants read-only access to Amazon CloudWatch metric data for resource types that are supported by Compute Optimizer.
- `organizations` – Grants read-only access to member accounts of an AWS organization.
- `ecs` – Grants access to Amazon ECS services on Fargate.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "compute-optimizer:DescribeRecommendationExportJobs",
        "compute-optimizer:GetEnrollmentStatus",
        "compute-optimizer:GetEnrollmentStatusesForOrganization",
        "compute-optimizer:GetRecommendationSummaries",
        "compute-optimizer:GetEC2InstanceRecommendations",
        "compute-optimizer:GetEC2RecommendationProjectedMetrics",
        "compute-optimizer:GetAutoScalingGroupRecommendations",
        "compute-optimizer:GetEBSVolumeRecommendations",
        "compute-optimizer:GetLambdaFunctionRecommendations",
        "compute-optimizer:GetRecommendationPreferences",
        "compute-optimizer:GetEffectiveRecommendationPreferences",
        "compute-optimizer:GetECSServiceRecommendations",
        "compute-optimizer:GetECSServiceRecommendationProjectedMetrics",
        "compute-optimizer:GetLicenseRecommendations",
        "ec2:DescribeInstances",
        "ec2:DescribeVolumes",
```

```

    "ecs:ListServices",
    "ecs:ListClusters",
    "autoscaling:DescribeAutoScalingGroups",
    "autoscaling:DescribeAutoScalingInstances",
    "lambda:ListFunctions",
    "lambda:ListProvisionedConcurrencyConfigs",
    "cloudwatch:GetMetricData",
    "organizations:ListAccounts",
    "organizations:DescribeOrganization",
    "organizations:DescribeAccount"
  ],
  "Resource": "*"
}
]
}

```

### Note

The following policy statement only grants read-only access to Compute Optimizer for a management account of an organization to view org-level recommendations. If you're the delegated administrator and you want to view org-level recommendations, see [Policies to grant access to Compute Optimizer for a management account of an organization](#).

## Compute Optimizer updates to AWS managed policies

View details about updates to AWS managed policies for Compute Optimizer since this service began tracking these changes. For automatic alerts about changes to this page, subscribe to the RSS feed for this guide.

Change	Description	Date
Edit to the ComputeOptimizerReadOnlyAccess managed policy	Added the compute-optimizer:GetLicenseRecommendations actions to the ComputeOptimizerReadOnlyAccess managed policy.	July 26, 2023

Change	Description	Date
Edit to the ComputeOptimizerReadOnlyAccess managed policy	Added the <code>compute-optimizer:GetECSServiceRecommendations</code> , <code>compute-optimizer:GetECSServiceRecommendationProjectedMetrics</code> , <code>ecs:ListServices</code> , and <code>ecs:ListClusters</code> actions to the <code>ComputeOptimizerReadOnlyAccess</code> managed policy.	December 22, 2022
Edit to the ComputeOptimizerServiceRolePolicy managed policy	Added the <code>ec2:DescribeInstances</code> , <code>ec2:DescribeVolumes</code> , and <code>organizations:ListDelegatedAdministrators</code> actions to the <code>ComputeOptimizerServiceRolePolicy</code> managed policy.	July 25, 2022
Edit to the ComputeOptimizerServiceRolePolicy managed policy	Added the <code>autoscaling:DescribeAutoScalingInstances</code> and <code>autoscaling:DescribeAutoScalingGroups</code> actions to the <code>ComputeOptimizerServiceRolePolicy</code> managed policy.	November 29, 2021

Change	Description	Date
Edit to the ComputeOptimizerReadOnlyAccess managed policy	Added the compute-optimizer:GetRecommendationPreferences , compute-optimizer:GetEffectiveRecommendationPreferences , and autoscaling:DescribeAutoScalingInstances actions to the ComputeOptimizerReadOnlyAccess managed policy.	November 29, 2021
Edit to the ComputeOptimizerReadOnlyAccess managed policy	Added the GetEnrollmentStatusesForOrganization action to the ComputeOptimizerReadOnlyAccess managed policy.	August 26, 2021
Compute Optimizer started tracking changes	Compute Optimizer started tracking changes for its AWS managed policies.	May 18, 2021

## Amazon S3 bucket policy for AWS Compute Optimizer

You can export your Compute Optimizer recommendations to an Amazon Simple Storage Service (Amazon S3) bucket. Your recommendations are exported as CSV file and the metadata is exported as a JSON file. For more information, see [Exporting recommendations](#).

Before you create the export job, you must first create the destination S3 bucket for your recommendations export. Compute Optimizer doesn't create the S3 bucket for you. The S3 bucket that you specify for your recommendations export files must not be publicly accessible, and can't be configured as a [Requester Pays](#) bucket. As a security best practice, create a dedicated S3 bucket

for Compute Optimizer export files. For more information, see [How Do I Create an S3 Bucket?](#) in the *Amazon S3 Console User Guide*.

## Specifying an existing bucket for your recommendations export

After you create your S3 bucket, follow these steps to add a policy to the S3 bucket that allows Compute Optimizer to write recommendations export files to your bucket.

1. Open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.
2. Choose the bucket where you want Compute Optimizer to deliver your export files.
3. Choose **Permissions**.
4. Choose **Bucket Policy**.
5. Copy one of the following policies, and paste it into the **Bucket Policy Editor** text box.
6. Replace the following placeholder text in the policy:
  - Replace *myBucketName* with the name of your bucket.
  - Replace *optionalPrefix* with the optional object prefix.
  - Replace *myRegion* with the source AWS Region.
  - Replace *myAccountID* with the account number of the requester of the export job.
7. Include all three of the following statements in the policy:
  1. The first statement (for the `GetBucketAcl` action) allows Compute Optimizer to get the access control list (ACL) of your bucket.
  2. The second statement (for the `GetBucketPolicyStatus` action) allows Compute Optimizer to get the policy status of your bucket, indicating whether the bucket is public.
  3. The third statement (for the `PutObject` action) gives Compute Optimizer full control to put the export file in your bucket.

Your export request fails if any of these statements are missing or if the bucket name and optional object prefix in the policy don't match what you specify in your export request. Your export also fails if the account number in the policy doesn't match the account number of the requester of the export job.

**Note**

If the existing bucket already has one or more policies attached, add the statements for Compute Optimizer access to that policy or policies. Evaluate the resulting set of permissions to ensure that they're appropriate for the users who access the bucket.

**Policy option 1: Using an optional prefix**

The object prefix is an optional addition to the S3 object key that organizes your export files in your S3 bucket. If you want to specify an object prefix when you create your recommendations export, use the following policy.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {"Service": "compute-optimizer.amazonaws.com"},
      "Action": "s3:GetBucketAcl",
      "Resource": "arn:aws:s3:::myBucketName"
    },
    {
      "Effect": "Allow",
      "Principal": {"Service": "compute-optimizer.amazonaws.com"},
      "Action": "s3:GetBucketPolicyStatus",
      "Resource": "arn:aws:s3:::myBucketName"
    },
    {
      "Effect": "Allow",
      "Principal": {"Service": "compute-optimizer.amazonaws.com"},
      "Action": "s3:PutObject",
      "Resource": "arn:aws:s3:::myBucketName/optionalPrefix/compute-optimizer/myAccountID/*",
      "Condition": {"StringEquals": {
        "s3:x-amz-acl": "bucket-owner-full-control",
        "aws:SourceAccount": "myAccountID",
        "aws:SourceArn": "arn:aws:compute-optimizer:myRegion:myAccountID:*"
      }}
    }
  ]
}
```

```
]
}
```

### Note

The *compute-optimizer/myAccountID/* component isn't part of the optional prefix. Compute Optimizer creates the *optimizer/myAccountID/* part of the bucket path for you that's added to the prefix that you specify.

## Policy option 2: No object prefix

If you don't want to specify an object prefix, use the following policy.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {"Service": "compute-optimizer.amazonaws.com"},
      "Action": "s3:GetBucketAcl",
      "Resource": "arn:aws:s3:::myBucketName"
    },
    {
      "Effect": "Allow",
      "Principal": {"Service": "compute-optimizer.amazonaws.com"},
      "Action": "s3:GetBucketPolicyStatus",
      "Resource": "arn:aws:s3:::myBucketName"
    },
    {
      "Effect": "Allow",
      "Principal": {"Service": "compute-optimizer.amazonaws.com"},
      "Action": "s3:PutObject",
      "Resource": "arn:aws:s3:::myBucketName/compute-optimizer/myAccountID/*",
      "Condition": {"StringEquals": {
        "s3:x-amz-acl": "bucket-owner-full-control",
        "aws:SourceAccount": "myAccountID",
        "aws:SourceArn": "arn:aws:compute-optimizer:myRegion:myAccountID:*"
      }}
    }
  ]
}
```

```
}
```

## Using encrypted S3 buckets for your recommendations export

For the destination of your Compute Optimizer recommendations exports, you can specify S3 buckets that are encrypted with either Amazon S3 customer managed keys or AWS Key Management Service (KMS) keys.

To use an S3 bucket with AWS KMS encryption enabled, you must create a symmetric KMS key. Symmetric KMS keys are the only KMS keys that Amazon S3 supports. For instructions, see [Creating keys](#) in the *AWS KMS Developer Guide*. After you create the KMS key, apply it to the S3 bucket that you plan to use for your recommendations export. For more information, see [Enabling Amazon S3 default bucket encryption](#) in the *Amazon Simple Storage Service User Guide*.

Use the following procedure to grant Compute Optimizer the required permission to use your KMS key. This permission is specific for encrypting your recommendations export file when saving it to your encrypted S3 bucket.

1. Open the AWS KMS console at <https://console.aws.amazon.com/kms>.
2. To change the AWS Region, use the Region selector in the upper-right corner of the page.
3. In the left navigation menu, choose **Customer-managed keys**.

### Note

Compute Optimizer recommendation exports aren't permitted for S3 buckets encrypted with **AWS managed keys**.

4. Choose the name of the KMS key that you used to encrypt the export S3 bucket.
5. Choose the **Key policy** tab, then choose **Switch to policy view**.
6. Choose **Edit** to edit the key policy.
7. Copy one of the following policies, and paste it into the statements section of the key policy.
8. Replace the following placeholder text in the policy:
  - Replace *myRegion* with the source AWS Region.
  - Replace *myAccountID* with the account number of the export requester.

The `GenerateDataKey` statement allows Compute Optimizer to call the AWS KMS API to obtain the data key for encrypting the recommendation files. This way, the uploaded data format can accommodate the bucket encryption setting. Otherwise, Amazon S3 rejects the export request.

**Note**

If the existing KMS key already has one or more policies attached, add the statements for Compute Optimizer access to those policies. Evaluate the resulting set of permissions to ensure that they're appropriate for the users who access the KMS key.

Use the following policy if you *didn't enable* Amazon S3 bucket keys.

```
{
  "Sid": "Allow use of the key to Compute Optimizer",
  "Effect": "Allow",
  "Principal": {
    "Service": "compute-optimizer.amazonaws.com"
  },
  "Action": "kms:GenerateDataKey",
  "Resource": "*",
  "Condition": {
    "StringEquals": {
      "aws:SourceAccount": "myAccountID",
      "aws:SourceArn": "arn:aws:compute-optimizer:myRegion:myAccountID:*"
    }
  }
}
```

Use the following policy if you *enabled* Amazon S3 bucket keys. For more information, see [Reducing the cost of SSE-KMS with Amazon S3 Bucket Keys](#) in the *Amazon Simple Storage Service User Guide*.

```
{
  "Sid": "Allow use of the key to Compute Optimizer",
  "Effect": "Allow",
  "Principal": {
    "Service": "compute-optimizer.amazonaws.com"
  }
}
```

```
    },
    "Action": [
      "kms:GenerateDataKey",
      "kms:Decrypt"
    ],
    "Resource": "*",
    "Condition": {
      "StringEquals": {
        "aws:SourceAccount": "myAccountID",
        "aws:SourceArn": "arn:aws:compute-optimizer:myRegion:myAccountID:*"
      }
    }
  }
}
```

## Additional resources

For more information about S3 buckets and policies, see the [Amazon Simple Storage Service User Guide](#).

# Metrics analyzed by AWS Compute Optimizer

After you [opt in](#), AWS Compute Optimizer analyzes the specifications, such as vCPUs, memory, or storage, and the CloudWatch metrics of your running resources from a period over the last 14 days. If you activate the [enhanced infrastructure metrics recommendation preference](#), AWS Compute Optimizer analyzes your resources for up to 93 days.

The analysis can take up to 24 hours to complete. When the analysis is complete, the findings are displayed on the dashboard page of the Compute Optimizer console. For more information, see [Viewing the AWS Compute Optimizer dashboard](#).

## Note

- To generate recommendations for Amazon EC2 instances, Auto Scaling groups, Amazon EBS volumes, Lambda functions, and commercial software licenses, Compute Optimizer uses the maximum utilization point within each five-minute time interval over the lookback period. For ECS services on Fargate recommendations, Compute Optimizer uses the maximum utilization point within each one-minute time interval.
- AWS might use your utilization data to help improve the overall quality of Compute Optimizer's recommendations. To stop AWS using your utilization data, contact [AWS Support](#).

## Contents

- [EC2 instance metrics](#)
- [EBS volume metrics](#)
- [Lambda function metrics](#)
- [Metrics for Amazon ECS services on Fargate](#)
- [Metrics for commercial software licenses](#)

## EC2 instance metrics

### Topics

- [Metrics analyzed for EC2 instances](#)

- [Enabling memory utilization with the CloudWatch agent](#)
- [Enabling NVIDIA GPU utilization with the CloudWatch agent](#)
- [Configure external metrics ingestion](#)

## Metrics analyzed for EC2 instances

Compute Optimizer analyzes the following CloudWatch metrics of your EC2 instances, including instances that are part of Auto Scaling groups.

Metric	Description
CPUUtilization	The percentage of allocated EC2 compute units that are in use on the instance. This metric identifies the processing power that's required to run an application on an instance.
MemoryUtilization	<p>The percentage of memory that's used during the sample period. This metric identifies the memory that's required to run an application on an instance.</p> <p>Memory utilization metrics are analyzed for the following resources:</p> <ul style="list-style-type: none"> <li>• EC2 instances with the CloudWatch agent that's installed on them. For more information, see <a href="#">Enabling memory utilization with the CloudWatch agent</a>.</li> <li>• External EC2 instances from one of the four observability products: Datadog, Dynatrace, Instana, and New Relic. For more information, see <a href="#">External metrics ingestion</a>.</li> </ul>
GPUUtilization	<p>The percentage of allocated GPUs that are currently in use on the instance.</p> <div data-bbox="591 1650 1510 1885" style="border: 1px solid #00a0e3; border-radius: 10px; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>To allow Compute Optimizer analyze the GPU utilization metric of your instances, install the CloudWatch agent on your instances. For more information, see</p> </div>

Metric	Description
	<p><a href="#">Enabling NVIDIA GPU utilization with the CloudWatch agent.</a></p>
GPUMemoryUtilization	The percentage of total GPU memory that's currently in use on the instance.
NetworkIn	The number of bytes that's received on all network interfaces by the instance. This metric identifies the volume of incoming network traffic to an instance.
NetworkOut	The number of bytes that are sent out on all network interfaces by the instance. This metric identifies the volume of outgoing network traffic from an instance.
NetworkPacketsIn	The number of packets that are received by the instance.
NetworkPacketsOut	The number of packets that are sent out by the instance.
DiskReadOps	The read operations per second of the instance store volume of the instance.
DiskWriteOps	The write operations per second of the instance store volume of the instance.
DiskReadBytes	The read bytes per second of the instance store volume of the instance.
DiskWriteBytes	The write bytes per second of the instance store volume of the instance.
VolumeReadBytes	The read bytes per second of EBS volumes attached to the instance. Displayed as KiBs in the console.
VolumeWriteBytes	The write bytes per second of EBS volumes attached to the instance. Displayed as KiBs in the console.

Metric	Description
VolumeReadOps	The read operations per second of EBS volumes attached to the instance.
VolumeWriteOps	The write operations per second of EBS volumes attached to the instance.

For more information about instance metrics, see [List the available CloudWatch metrics for your instances](#) in the *Amazon Elastic Compute Cloud User Guide*. For more information about EBS volume metrics, see [Amazon CloudWatch metrics for Amazon EBS](#) in the *Amazon Elastic Compute Cloud User Guide*.

## Enabling memory utilization with the CloudWatch agent

To have Compute Optimizer analyze the memory utilization metric of your instances, install the CloudWatch agent on your instances. Enabling Compute Optimizer to analyze memory utilization data for your instances provides an additional measurement of data that further improves Compute Optimizer's recommendations. For more information about installing the CloudWatch agent, see [Collecting Metrics and Logs from Amazon EC2 Instances and On-Premises Servers with the CloudWatch agent](#) in the *Amazon CloudWatch User Guide*.

On Linux instances, Compute Optimizer analyses the `mem_used_percent` metric in the `CWAgent` namespace, or the legacy `MemoryUtilization` metric in the `System/Linux` namespace. On Windows instances, Compute Optimizer analyses the `Available MBytes` metric in the `CWAgent` namespace. If both the `Available MBytes` and `Memory % Committed Bytes In Use` metrics are configured in the `CWAgent` namespace, Compute Optimizer chooses `Available MBytes` as the primary memory metric to generate recommendations.

### Note

- We recommend that you configure the `CWAgent` namespace to use `Available MBytes` as your memory metric for Windows instances.
- Compute Optimizer also supports the `Available KBytes` and `Available Bytes` metrics, and prioritizes both over the `Memory % Committed Bytes In Use` metric when generating recommendations for Windows instances.

Additionally, the namespace must contain the InstanceId dimension. If the InstanceId dimension is missing or you overwrite it with a custom dimension name, Compute Optimizer can't collect memory utilization data for your instance. Namespaces and dimensions are defined in the CloudWatch agent configuration file. For more information, see [Create the CloudWatch agent Configuration File](#) in the *Amazon CloudWatch User Guide*.

### Example: CloudWatch agent configuration for memory collection

```
{
  "agent": {
    "metrics_collection_interval": 60,
    "run_as_user": "root"
  },
  "metrics": {
    "namespace": "CWAgent",
    "append_dimensions": {
      "InstanceId": "${aws:InstanceId}"
    },
    "metrics_collected": {
      "mem": {
        "measurement": [
          "mem_used_percent"
        ],
        "metrics_collection_interval": 60
      }
    }
  }
}
```

## Enabling NVIDIA GPU utilization with the CloudWatch agent

To allow Compute Optimizer to analyze the NVIDIA GPU utilization metric of your instances, do the following:

1. Install the CloudWatch agent on your instances. For more information, see [Installing the CloudWatch agent](#) in the *Amazon CloudWatch User Guide*.
2. Allow the CloudWatch agent to collect NVIDIA GPU metrics. For more information, see [Collect NVIDIA GPU metrics](#) in the *Amazon CloudWatch User Guide*.

Compute Optimizer analyzes the following NVIDIA GPU metrics:

- `nvidia_smi_utilization_gpu`
- `nvidia_smi_memory_used`
- `nvidia_smi_encoder_stats_session_count`
- `nvidia_smi_encoder_stats_average_fps`
- `nvidia_smi_encoder_stats_average_latency`
- `nvidia_smi_temperature_gpu`

The namespace must contain the `InstanceId` dimension and `index` dimensions. If the dimensions are missing or you overwrite them with a custom dimension name, Compute Optimizer can't collect GPU utilization data for your instance. Namespaces and dimensions are defined in the CloudWatch agent configuration file. For more information, see [Create the CloudWatch agent Configuration File](#) in the *Amazon CloudWatch User Guide*.

## Configure external metrics ingestion

You can use the external metrics ingestion feature to configure AWS Compute Optimizer to ingest EC2 memory utilization metrics from one of the four observability products: Datadog, Dynatrace, Instana, and New Relic. When you enable external metrics ingestion, Compute Optimizer analyzes your external EC2 memory utilization metrics in addition to your CPU, disk, network, IO, and throughput data to generate EC2 rightsizing recommendations. These recommendations can provide you with additional savings and enhanced performance. For more information, see [External metrics ingestion](#).

## EBS volume metrics

Compute Optimizer analyzes the following CloudWatch metrics of your EBS volumes.

Metric	Description
<code>VolumeReadBytes</code>	The read bytes per second of the EBS volume.
<code>VolumeWriteBytes</code>	The write bytes per second of the EBS volume.
<code>VolumeReadOps</code>	The read operations per second of the EBS volume.

Metric	Description
VolumeWriteOps	The write operations per second of the EBS volume.

For more information about these metrics, see [Amazon CloudWatch metrics for Amazon EBS](#) in the *Amazon Elastic Compute Cloud User Guide*.

## Lambda function metrics

Compute Optimizer analyzes the following CloudWatch metrics of your Lambda functions.

Metric	Description
Invocations	The number of times your function code is executed, including successful executions and executions that result in a function error.
Duration	The amount of time that your function code spends processing an event.
Errors	The number of invocations that result in a function error. Function errors include exceptions thrown by your code and exceptions thrown by the Lambda runtime. The runtime returns errors for issues such as timeouts and configuration errors.
Throttles	The number of invocation requests that are throttled.

For more information about these metrics, see [Working with AWS Lambda function metrics](#) in the *AWS Lambda Developer Guide*.

In addition to these metrics, Compute Optimizer analyzes the memory utilization of your function during the look-back period. For more information about memory utilization for Lambda functions, see [Understanding AWS Lambda behavior using Amazon CloudWatch Logs Insights](#) in the *AWS Management & Governance Blog* and [Using Lambda Insights in CloudWatch](#) in the *AWS Lambda Developer Guide*.

## Metrics for Amazon ECS services on Fargate

Compute Optimizer analyzes the following CloudWatch and Amazon ECS utilization metrics of your Amazon ECS services on Fargate.

Metric	Description
CPUUtilization	The percentage of CPU capacity that's used in the service.
MemoryUtilization	The percentage of memory that's used in the service.

For more information about these metrics, see [Amazon ECS CloudWatch metrics](#) in the *Amazon ECS User Guide for AWS Fargate*.

## Metrics for commercial software licenses

Compute Optimizer analyzes the following metric to generate recommendations for commercial software licenses.

**mssql\_enterprise\_features\_used** — the number of Microsoft SQL Server Enterprise edition features in use. The features are as follows:

- More than 128GB of memory for the buffer pool extension
- More than 48 vCPUs
- Always On availability groups with more than 1 database
- Asynchronous commit replicas
- Read-only replicas
- Asynchronous database mirroring
- tempdb memory-optimized metadata is enabled
- R or Python extensions
- Peer-to-peer replication
- Resource Governor

# Recommendation preferences

Recommendation preferences are features that you can activate so that Compute Optimizer generates resources recommendations that align more with your workload requirements. Following are the features that are currently available as recommendation preferences in Compute Optimizer.

- [Rightsizing recommendation preferences](#)
- [Enhanced infrastructure metrics](#)
- [External metrics ingestion](#)
- [Inferred workload type](#)
- [Savings estimation mode](#)
- [AWS Graviton-based instance recommendations](#)

## Rightsizing recommendation preferences

The rightsizing recommendation preferences feature allows you to customize the settings you want Compute Optimizer to consider when generating your Amazon EC2 and Auto Scaling group instance recommendations. This feature allows you to do the following:

- Adjust both the headroom and threshold of your CPU utilization
- Adjust the headroom of your memory utilization
- Configure a specific lookback period option
- Set instance family preferences at the organization, account, or regional level.

This provides you with greater transparency on how your recommendations are generated, and the ability for you to configure EC2 rightsizing recommendations for higher savings and performance sensitivity.

If you're the account manager or the delegated administrator of an AWS Organization, you can choose the account or organization you want the rightsizing recommendation preferences to be applied to. If you're an individual AWS account holder (not within an organization), the rightsizing recommendation preferences you set only apply to your recommendations.

**Note**

- The preferred EC2 instances and lookback period features of rightsizing recommendation preferences are only available for Amazon EC2 and Auto Scaling group instances.
- The rightsizing preferences for CPU and memory utilization are only available for Amazon EC2 instances.

The following sections outline the details of each feature and how to set your rightsizing recommendation preferences in AWS Compute Optimizer.

**Topics**

- [Step 1: Preference level \(Organizations only\)](#)
- [Step 2: Regional scope](#)
- [Step 3: Preferred EC2 instances](#)
- [Step 4: Lookback period and metrics](#)

## Step 1: Preference level (Organizations only)

If you're the account manager or the delegated administrator of your organization, you can choose all the accounts in an organization or specific accounts to which you want to apply rightsizing recommendation preferences.

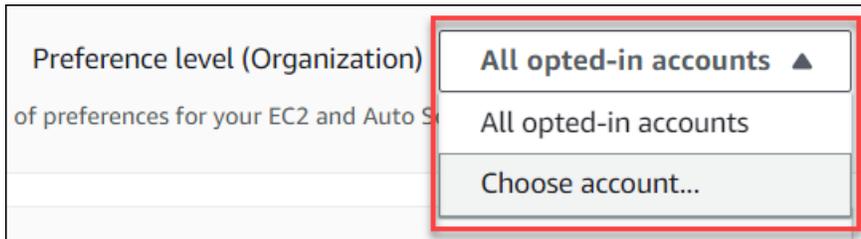
**Note**

If you're an individual AWS account holder, skip to [Step2: Regional scope](#).

**To set the preference level for your rightsizing recommendation preferences**

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **Rightsizing** in the navigation pane.
3. In the **EC2 and Auto Scaling groups** section, choose the **All opted-in accounts** dropdown menu.

- To opt in all member accounts, choose **All opted-in accounts** from the Preference level dropdown.
- To opt in an individual member account, choose **Choose account** from the Preference level dropdown. In the prompt that appears, select the account you want to opt in for rightsizing preferences. Then, choose **Set account level**.



## Step 2: Regional scope

In this step you can specify the AWS Regions where you want Compute Optimizer to apply your rightsizing recommendation preferences. For example, if you select the US East (N. Virginia) Region and US East (Ohio) Region, we only apply the preferences to those Regions.

### To set the regional scope of your rightsizing recommendation preferences

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **Rightsizing** in the navigation pane.
3. On the **Rightsizing preferences** page, choose **Edit**.
4. Choose either **Any Region** or **Custom Regions** based on your requirements.
5. If you choose **Custom Regions**, select the AWS Regions where you want Compute Optimizer to apply your preferences. Then, choose **Next**.

**Any region**  
 Compute Optimizer applies rightsizing recommendation preferences to all available Regions.

**Custom regions**  
 Compute Optimizer only applies the rightsizing recommendation preferences for the Regions you specify.

### Regions

Select all enabled regions for this account

---

<input type="checkbox"/> US East (N. Virginia)	<input checked="" type="checkbox"/> US East (Ohio)	<input type="checkbox"/> US West (Oregon)	<input checked="" type="checkbox"/> US West (N. California)
<input type="checkbox"/> Africa (Cape Town)	<input type="checkbox"/> Asia Pacific (Hong Kong)	<input type="checkbox"/> Asia Pacific (Hyderabad)	<input type="checkbox"/> Asia Pacific (Jakarta)
<input type="checkbox"/> Asia Pacific (Melbourne)	<input type="checkbox"/> Asia Pacific (Mumbai)	<input type="checkbox"/> Asia Pacific (Osaka-Local)	<input checked="" type="checkbox"/> Asia Pacific (Seoul)
<input checked="" type="checkbox"/> Asia Pacific (Singapore)	<input type="checkbox"/> Asia Pacific (Sydney)	<input type="checkbox"/> Asia Pacific (Tokyo)	<input checked="" type="checkbox"/> Canada (Central)
<input checked="" type="checkbox"/> EU (Frankfurt)	<input checked="" type="checkbox"/> EU (Ireland)	<input checked="" type="checkbox"/> EU (London)	<input type="checkbox"/> EU (Milan)
<input checked="" type="checkbox"/> EU (Paris)	<input checked="" type="checkbox"/> EU (Stockholm)	<input type="checkbox"/> Europe (Spain)	<input type="checkbox"/> Europe (Zurich)
<input type="checkbox"/> Israel (Tel Aviv)	<input type="checkbox"/> Middle East (Bahrain)	<input type="checkbox"/> Middle East (UAE)	<input checked="" type="checkbox"/> South America (Sao Paulo)

## Step 3: Preferred EC2 instances

Rightsizing recommendation preferences allows you to specify the EC2 instances you want in your recommendation output. You can define a custom instance consideration set which controls the instance types and families recommended by Compute Optimizer for migration. This preference ensures that Compute Optimizer only recommends instances that are aligned with your specific requirements. This doesn't prevent Compute Optimizer from generating recommendations for any of your workloads.

You can customize your instance type selection based on your organizational guidelines or requirements. For example, if you have purchased Savings Plans and Reserved Instances, you can specify instances only covered by those pricing models. Or, if you only want to use instances equipped with certain processors or non-burstable instances due to your application design, you can specify those instances for your recommendation output.

This feature also gives you the option to automatically consider future variations of your chosen instance families. This ensures that your preferences are using the latest version of your preferred instance families which can provide the best price-to-performance ratio.

### Note

We recommend that you avoid limiting instance candidates too much. This can reduce your potential savings and rightsizing opportunities.

## Specify preferred instances

Use the following procedure to specify your preferred instance types and sizes for member accounts of an organization or an individual AWS account holder.

### To set the instances you want in your recommendation output

1. Follow the steps outlined in [Step2: Regional scope](#).
2. On the **Preferred EC2 instances** page, choose either **Any instance type** (default) or **Limit to specific instance types and sizes** based on your requirements.
3. If you choose **Limit to specific instance types and sizes**, select the instance types you want in your recommendation output.
  - Use the **Search by instance families** dropdown menu. When you select any of the instance families, the list only displays the available instance types within those families that you selected.
  - Use the **Find instance types** search bar to enter the specific instance types you want.

**Any instance type**  
 Compute Optimizer considers all instance types and sizes when generating recommendations.

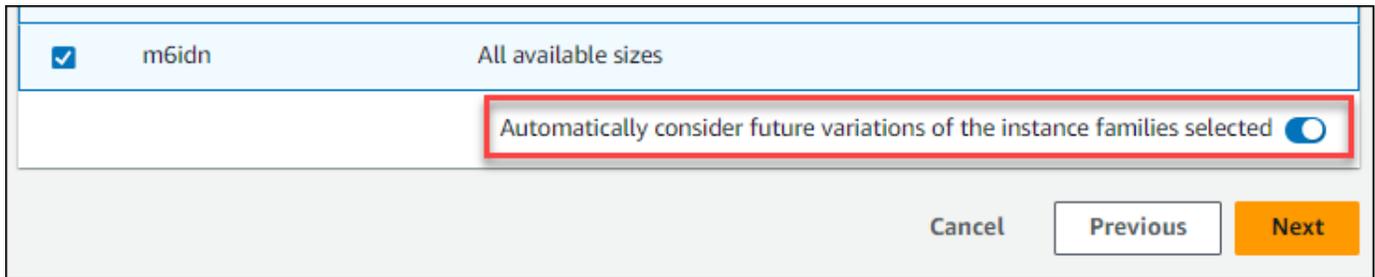
**Limit to specific instance types and sizes**  
 Choose the EC2 instances you want in your recommendation output.

### Preferred instance types and sizes (651/651)

< 1 2 >

<input checked="" type="checkbox"/>	Instance type ▲	Instance size ✎
<input checked="" type="checkbox"/>	c1	All available sizes
<input checked="" type="checkbox"/>	c3	All available sizes
<input checked="" type="checkbox"/>	c4	All available sizes
<input checked="" type="checkbox"/>	c5	All available sizes
<input checked="" type="checkbox"/>	c5a	All available sizes
<input checked="" type="checkbox"/>	c5ad	All available sizes
<input checked="" type="checkbox"/>	c5d	All available sizes

4. (Optional) To specify the sizes of each instance type, do the following:
  1. Choose the edit icon on the instance type you want.
  2. Select **X** on the instance sizes that you don't want.
  3. Select **✓** to confirm your selections.
5. (Optional) If you don't want Compute Optimizer to automatically consider future variations of your chosen instance families, turn off **Automatically consider future variations of the instance families selected**.



6. Choose **Next**.

## Step 4: Lookback period and metrics

Rightsizing recommendation preferences allows you to specify the lookback period, and the CPU and memory utilization preferences you want Compute Optimizer to use when generating your custom recommendations.

### Topics

- [Lookback period](#)
- [CPU and memory utilization](#)
- [Specify lookback period and metrics](#)

### Lookback period

Choose a metric analysis lookback period for your rightsizing recommendation preferences. Compute Optimizer analyzes your utilization preference settings for the number of days that you specify. We recommend that you set a lookback period that captures critical signals from your workload utilization history which can allow Compute Optimizer to identify rightsizing opportunities with higher savings and lower performance risk.

In Compute Optimizer, you can choose from the following lookback period options: 14 days (default), 32 days, or 93 days. The 14-day and 32-day lookback periods require no additional payments. If you have monthly cycles, the 32-day lookback period can capture monthly workload patterns. The 93-day lookback period requires additional payment. To use the 93-day option, you need to enable the enhanced infrastructure metrics preference. For more information, see [Enhanced infrastructure metrics](#).

## CPU and memory utilization

The rightsizing recommendation preferences feature allows you to customize your utilization settings: CPU threshold, CPU headroom, and memory headroom so your instance recommendations meet your specific workload requirements. Depending on the utilization settings you choose, your recommendations can be tailored to increased savings opportunities, more performance headroom, or have a higher tolerance for performance risks.

### CPU utilization threshold

Threshold is the percentile value that Compute Optimizer uses to process utilization data before generating recommendations. If you set a CPU threshold preference, Compute Optimizer removes the peak usage data points above this threshold. A lower percentile value removes more peak usage from the data.

Compute Optimizer offers three options for CPU utilization threshold: P90, P95, and P99.5. By default, Compute Optimizer uses a P99.5 threshold for its rightsizing recommendations. This means that Compute Optimizer only ignores the top 0.5% of the highest utilization data points from your utilization history. The P99.5 threshold might be more suited for highly sensitive production workloads where peak utilization significantly affects application performance. If you set the utilization threshold to P90, Compute Optimizer ignores the top 10% of your highest data points from your utilization history. P90 might be a suitable threshold for workloads less sensitive to peak utilization, such as non-production environments.

### CPU utilization headroom

Utilization headroom is added CPU capacity within Compute Optimizer's recommendation to account for any future increases in CPU usage requirements. It represents the gap between the instance's current usage and its maximum capabilities.

Compute Optimizer provides three options for CPU utilization headroom: 30%, 20%, and 0%. By default, Compute Optimizer uses a 20% headroom for its rightsizing recommendations. If you need additional capacity to account for any unexpected future increases in CPU utilization, you can set the headroom to 30%. Or, suppose that your utilization is expected to remain constant with a low chance of future increases, then you can reduce the headroom. This generates recommendations with less added CPU capacity and increased cost savings.

### Memory utilization headroom

Memory utilization headroom is added memory capacity within Compute Optimizer's recommendation to account for any future increases in memory usage. It represents the gap

between the instance's current usage and its maximum capabilities. Compute Optimizer provides three options for memory utilization headroom: 30%, 20%, and 10%. By default, Compute Optimizer uses a 20% headroom for its rightsizing recommendations. If you need additional capacity to account for any unexpected future increases in memory utilization, you can set the headroom to 30%. Or, suppose that your usage is expected to remain constant with a low chance of future increases, then you can reduce the headroom. This generates recommendations with less added memory capacity and increased cost savings.

### Note

To receive EC2 instance recommendations that consider the memory utilization metric, you need to enable memory utilization with the CloudWatch agent. You can also configure Compute Optimizer to ingest EC2 memory utilization metrics from your preferred observability product. For more information, see [Enabling memory utilization with the CloudWatch agent](#) and [Configure external metrics ingestion](#).

## Utilization presets

Compute Optimizer provides four preset options for CPU and memory utilization:

- **Maximum savings** - CPU threshold is set to **P90**, CPU headroom is set to **0%**, and memory headroom is set to **10%**. This provides recommendations with no added CPU capacity and reserves the lowest added memory capacity for future usage growth. It also removes the top 10% of the highest data points from your CPU utilization history. As a result, this preset might generate recommendations with a higher latency or greater degradation risk.
- **Balanced** - CPU threshold is set to **P95**, CPU headroom is set to **30%**, and memory headroom is set to **30%**. The recommendations target CPU utilization to remain below 70% for more than 95% of the time, and target memory utilization to remain below 70%. This is suitable for most workloads and can identify more savings opportunities than the default settings. If your workloads aren't particularly sensitive to CPU or memory utilization spikes, this is a good alternative to the default settings.
- **Default** - Compute Optimizer uses a **P99.5** CPU threshold, a **20%** CPU headroom, and a **20%** memory headroom to generate recommendations for all EC2 instances. These settings aim to ensure that CPU utilization remains below 80% for more than 99.5% of the time, and target memory utilization to remain below 80%. This provides a very low risk of performance issues but potentially limits savings opportunities.

- **Maximum performance** - CPU threshold is set to **P99.5**, CPU headroom is set to **30%**, and memory headroom is set to **30%**. This provides recommendations with high performance sensitivity and added capacity for future increases in CPU and memory usage.

 **Note**

Compute Optimizer might update these threshold and headroom values to reflect the latest technological updates and maintain recommendation quality. Compute Optimizer might adjust your chosen parameters based on your workload characteristics to ensure suitable instance recommendations for you.

You can use the simulated graphs in the console to get a representation of how your CPU and memory usage interacts with the threshold and headroom settings across the lookback period. The graph displays how the threshold and headroom values you set are applied to utilization data of the example workload before Compute Optimizer uses the data to generate recommendations. As you adjust the headroom and threshold, the graph updates to show how Compute Optimizer generates recommendations based on your custom preferences.

## CPU usage

### Threshold [Info](#)

Utilization threshold corresponds to the percentage of time that your workload should run under your utilization headroom.

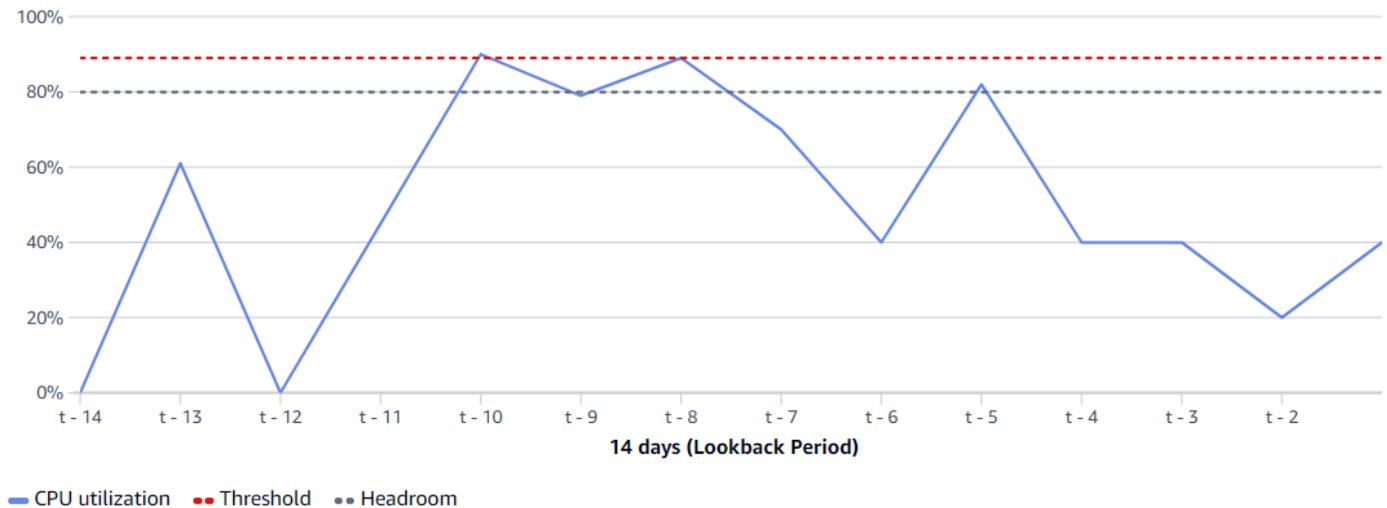
P90 (least sensitive)
  P95
  P99.5 (default: most conservative)

### Headroom [Info](#)

Utilization headroom is added processing capacity beyond historical usage.

0% (no added capacity)
  20% (default)
  30% (high added capacity)

### CPU utilization (simulated)



Data shown is representative and for illustrative purpose only.

In this example scenario, Compute Optimizer would provide upsizing recommendations.

In an actual deployment, given the threshold and utilization values you selected, Compute Optimizer would only generate recommendations that allow CPU usage to remain **80%** for up to **0.5%** of the time.

### **⚠ Important**

The data shown in the simulated graph is representative and for illustrative purposes only. The graph isn't based on your utilization data.

## Specify lookback period and metrics

Use the following procedure to specify the lookback period, and the CPU and memory utilization preferences you want Compute Optimizer to use when generating your custom recommendations.

### To set the lookback period, and CPU and memory preferences

1. Follow the steps outlined in [Step 4: Preferred EC2 instances](#).

2. On the **Lookback period and metrics** page, choose a lookback period option based on your requirements.
  - If you want to use the 93-day lookback period (paid feature), you need to enable the enhanced infrastructure metrics preference. To do this, choose **Enable enhanced infrastructure metrics**. Then, in the prompt that appears, choose **Enable enhanced infrastructure metrics**.
  - If the enhanced infrastructure metrics preference is already enabled and you want to choose a 14-day or 32-day lookback period, you need to disable the enhanced infrastructure metrics preference. To do this, choose **Disable enhanced infrastructure metrics**. Then, in the prompt that appears, choose **Disable enhanced infrastructure metrics**.
3. Choose a utilization preset: **Max savings**, **Balanced**, **Default**, or **Max performance**.

Alternatively, you can customize your own specific CPU and memory utilization preferences.

**Utilization presets**  
Choose a preset to configure your CPU and memory usage preferences.

Max savings
  Balanced
  Default
  Max performance

---

**CPU usage**

**Threshold** [Info](#)  
Utilization threshold corresponds to the percentage of time that your workload should run under your utilization headroom.

P90 (least sensitive)
  P95
  P99.5 (default: most conservative)

**Headroom** [Info](#)  
Utilization headroom is added processing capacity beyond historical usage.

0% (no added capacity)
  20% (default)
  30% (high added capacity)

4. Choose **Next**.
5. On the **Review and save** page, review all the preferences you have set. Then, choose **Save preferences**.

Within 24 hours your new recommendations start to appear with the rightsizing preferences that you set.

## Enhanced infrastructure metrics

Enhanced infrastructure metrics is a paid feature of Compute Optimizer that applies to Amazon EC2 instances and instances that are part of Auto Scaling groups. This recommendation preference

extends the utilization metrics analysis look-back period to up to 93 days, compared to the default 14-day 2-week period. This gives Compute Optimizer a longer history of utilization metrics data to analyze. You need to activate the enhanced infrastructure metrics preference. For more information, see [Organization, account, and resource level](#).

## Contents

- [Required permissions](#)
- [Organization, account, and resource level](#)
- [Activate enhanced infrastructure metrics at the resource level](#)
- [Activate enhanced infrastructure metrics at the organization or account level](#)
- [Confirming the status of enhanced infrastructure metrics](#)
- [Troubleshooting enhanced infrastructure metrics](#)

## Required permissions

You must have the appropriate permissions to activate and deactivate enhanced infrastructure metrics. For more information, see [Policies to grant access to manage Compute Optimizer recommendation preferences](#).

## Organization, account, and resource level

You can activate enhanced infrastructure metrics using the Compute Optimizer console, AWS Command Line Interface (AWS CLI), and AWS SDKs. In the console, you can activate the feature in the following three areas, with each providing a different level of activation.

- At the resource level, you can activate enhanced infrastructure metrics for the individual resource that you're viewing. For example, the **Instance details** page for an individual EC2 instance provides the option to activate the enhanced infrastructure metrics feature only for that EC2 instance. For more information, see [Activate enhanced infrastructure metrics at the resource level](#) later in this guide.

### Note

Resource-level preferences override account-level preferences, and account-level preferences override organization-level preferences. For an EC2 instance that is part of an

Auto Scaling group, the Auto Scaling group recommendation preference overrides that of the individual instance.

- For an individual AWS account holder, you can activate the enhanced infrastructure metrics feature for all EC2 instances in the account that meet your resource type and AWS Region criteria. EC2 instance preferences at the account level apply to standalone instances and instances that are part of Auto Scaling groups. For more information, see [Activate enhanced infrastructure metrics at the organization or account level](#) later in this guide.
- The account manager or the delegated administrator of an AWS Organization can activate the enhanced infrastructure metrics feature for all resources in all member accounts of the organization that meet your resource type and AWS Region criteria. EC2 instance preferences at the organization level apply to standalone instances and instances that are part of Auto Scaling groups in all member accounts. For more information, see [Activate enhanced infrastructure metrics at the organization or account level](#) later in this guide.

After you activate the enhanced infrastructure metrics feature, Compute Optimizer applies the preference the next time recommendations are refreshed. This can take up to 24 hours. To confirm that your resource recommendations have enhanced infrastructure metrics enabled, see [Confirming the status of enhanced infrastructure metrics](#).

Compute Optimizer considers updated preferences the next time that it generates recommendations. Until then, a **pending** status is affixed to your update preference (for example, **Active-pending** or **Inactive-pending**). To confirm if your resource recommendations are taking enhanced infrastructure metrics into consideration, see [Confirming the status of enhanced infrastructure metrics](#).

## Activate enhanced infrastructure metrics at the resource level

Follow these steps to activate or deactivate enhanced infrastructure metrics at the resource level. Recommendation preferences activated at the resource level apply only to the individual resource.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. On the **Dashboard** page of the Compute Optimizer console, complete one of the following steps based on the resource type that you want to activate or deactivate enhanced infrastructure metrics for.

- If you want to activate the feature for an individual Amazon EC2 instance, choose **View recommendations** for EC2 instances.
- If you want to activate the feature for an individual Auto Scaling group, choose **View recommendations** for Auto Scaling groups.

 **Note**

For an EC2 instance that's part of an Auto Scaling group, the Auto Scaling group recommendation preference overrides the preference of the individual instance.

3. In the **Resource recommendations** page, select the resource for which you want to activate or deactivate enhanced infrastructure metrics. Then, choose **View details**.
4. In the **Recommendation preferences** section of the **Resource details** page, choose **Enhanced infrastructure metrics**.
5. In the prompt that appears, select the **Enhanced infrastructure metrics - paid feature** checkbox. Then, choose **Save** to activate enhanced infrastructure metrics for the resource.
6. (Optional) If you want to deactivate the the enhanced infrastructure metrics, unselect the **Enhanced infrastructure metrics - paid feature** checkbox. Then, choose **Save**.

 **Note**

Saving the preference initiates metering for enhanced infrastructure metrics for the individual resource. For more information about pricing for this feature, see [Compute Optimizer pricing](#).

Compute Optimizer considers updated preferences the next time that it generates recommendations. Until then, a **pending** status is affixed to your updated preference (for example, **Active-pending** or **Inactive-pending**). To confirm if your resource recommendations are taking enhanced infrastructure metrics into consideration, see [Confirming the status of enhanced infrastructure metrics](#).

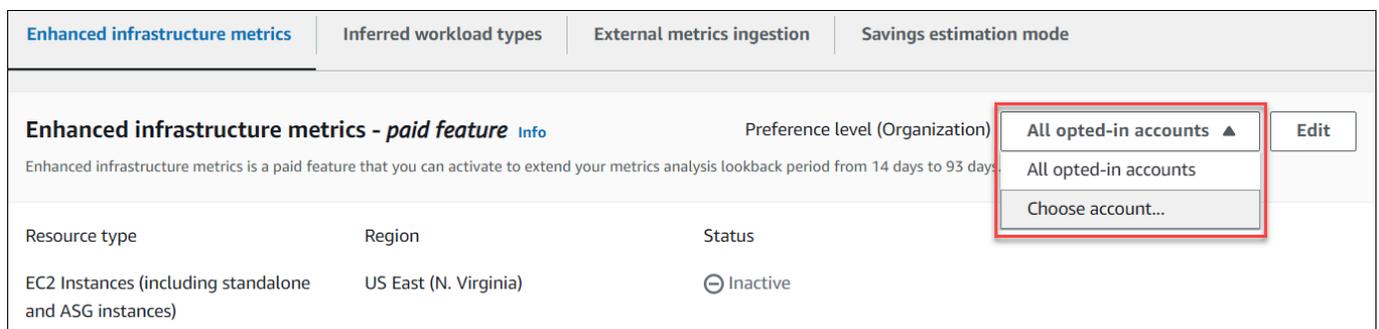
## Activate enhanced infrastructure metrics at the organization or account level

Use the following procedure to activate or deactivate enhanced infrastructure metrics for member accounts of an AWS Organization or an individual AWS account holder.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **General** in the navigation pane. Then, choose the **Enhanced infrastructure metrics** tab.
3. If you're an individual AWS account holder, skip to step 4.

If you're the account manager or delegated administrator of your organization, you can manage all member accounts or an individual member account for enhanced infrastructure metrics.

- To opt in all member accounts, choose **All opted-in accounts** from the Preference level dropdown.
- To opt in an individual member account, choose **Choose account** from the Preference level dropdown. In the prompt that appears, select the account you want to opt in for rightsizing preferences. Then, choose **Set account level**.



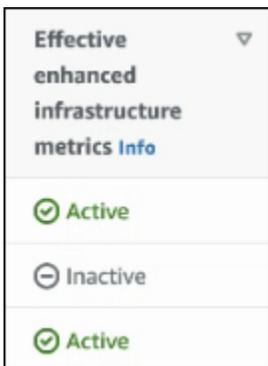
Enhanced infrastructure metrics	Inferred workload types	External metrics ingestion	Savings estimation mode
<b>Enhanced infrastructure metrics - paid feature</b> <a href="#">Info</a> Preference level (Organization)			<input type="button" value="Edit"/>
Enhanced infrastructure metrics is a paid feature that you can activate to extend your metrics analysis lookback period from 14 days to 93 days.			
Resource type	Region	Status	
EC2 Instances (including standalone and ASG instances)	US East (N. Virginia)	<input type="checkbox"/> Inactive	

4. Choose **Edit**.
5. In the prompt that appears, choose **Add a preference**.
6. Select a **Resource type**, **Region**, and the **Activate** checkbox. Then, choose **Save**.
7. (Optional) If you want to deactivate enhanced infrastructure metrics, unselect the **Activate** checkbox. Then, choose **Save**.

Compute Optimizer considers updated preferences the next time that it generates recommendations. Until then, a **pending** status is affixed to your update preference (for example, **Active-pending** or **Inactive-pending**). To confirm that your resource recommendations are taking enhanced infrastructure metrics into consideration, see [Confirming the status of enhanced infrastructure metrics](#).

## Confirming the status of enhanced infrastructure metrics

After you activate the enhanced infrastructure metrics recommendation preference, Compute Optimizer applies the preference the next time that recommendations are refreshed. This can take up to 24 hours. The **Effective enhanced infrastructure metrics** column in the Resource Recommendations page confirms that the recommendations listed are taking the three-month look-back period into consideration. An **Active** status confirms the recommendation listed is considering the longer look-back period. An **Inactive** status confirms that the recommendation isn't yet considering the longer look-back period.



## Troubleshooting enhanced infrastructure metrics

Following sections cover the issues that you might experience with enhanced infrastructure metrics recommendation preferences. These sections also cover what you can do to mitigate these issues.

### Failed to get or update enhanced infrastructure metrics recommendation preferences

#### Description

A banner is displayed that indicates that the Compute Optimizer console could not get or update enhanced infrastructure metrics recommendation preferences.

#### Cause

You might not have the permissions required to view or update recommendation preferences.

## Solution

Add the required permissions to the user who will view or edit recommendation preferences. For more information, see [Policies to grant access to manage Compute Optimizer recommendation preferences](#).

## External metrics ingestion

You can use the external metrics ingestion feature to configure AWS Compute Optimizer to ingest EC2 memory utilization metrics from one of the four observability products: Datadog, Dynatrace, Instana, and New Relic. When you enable external metrics ingestion, Compute Optimizer analyzes your external EC2 memory utilization metrics in addition to your CPU, disk, network, IO, and throughput data to generate EC2 rightsizing recommendations. These recommendations can provide you with additional savings and enhanced performance. For more information, see [Configure external metrics ingestion](#).

### Note

External metrics ingestion doesn't support EC2 instances that are part of Auto Scaling groups.

## Metric requirements

To generate EC2 rightsizing recommendations with external memory utilization metrics, Compute Optimizer requires at least 30 consecutive hours of memory utilization metrics from your observability product. If you don't have enough hours of external memory utilization metrics, Compute Optimizer analyzes and generates recommendations from your CloudWatch metrics until you reach the external memory metric requirements.

### Note

When external metrics ingestion is enabled, Compute Optimizer prioritizes your external memory utilization metrics over your CloudWatch memory data. If you opt out of external metrics ingestion, Compute Optimizer defaults back to analyze and generate recommendations based on your CloudWatch metrics.

## Organization and account level

You can configure external metric ingestion at both the organization and account level. If you're a member account of an AWS organization that configured external metrics ingestion, you can opt out of this feature. For more information, see [Opt out of external metrics ingestion](#).

Suppose that you're a new member of an AWS organization that already configured external metrics ingestion. Then, you must configure external metrics ingestion for your AWS account manually. For more information, see [Configure external metrics ingestion](#).

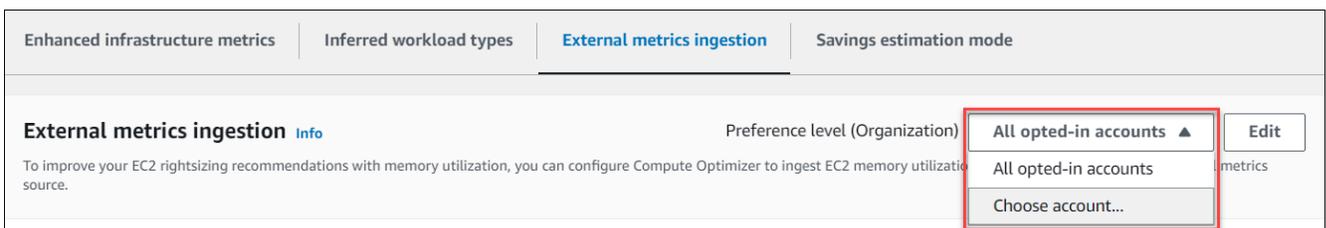
## Configure external metrics ingestion

### Console

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **General** in the navigation pane. Then, choose the **External metrics ingestion** tab.
3. If you're an individual AWS account holder, skip to step 4.

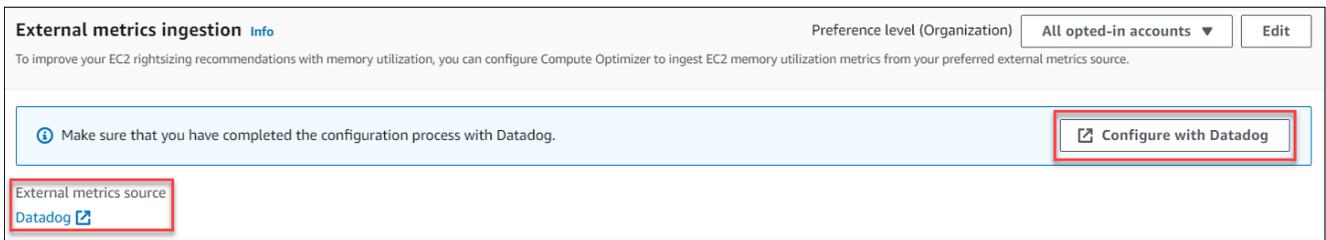
If you're the account manager or delegated administrator of your organization, you can opt-in all member accounts or an individual member account for external metrics ingestion.

- To opt-in all member accounts, choose **All opted-in accounts** from the Preference level dropdown.
- To opt-in an individual member account, choose **Choose account** from the Preference level dropdown. In the prompt that appears, select the account you want to opt-in. Then, choose **Set account level**.



4. Choose **Edit**.
5. In the prompt that appears, select your external metrics provider for EC2 instances. Then, choose **Enable**.

- Navigate to your external metrics provider's website. To do this, choose **Configure with provider** or the external metrics source link.



- Complete the configuration process on your external metrics provider's website.

### **⚠ Important**

If you don't complete the configuration process with your external metrics provider, Compute Optimizer can't receive your external metrics.

## CLI

- Open a terminal or command prompt window.
- Call the following API operation.
  - Replace *myRegion* with the source AWS Region.
  - Replace *123456789012* with your account ID.
  - Replace *ExternalMetricsProvider* with your external metrics provider.

```
aws compute-optimizer put-recommendation-preferences --region myRegion --
resource-type=Ec2Instance --scope='{"name":"AccountId", "value":"123456789012"}'
--external-metrics-preference='{"source":"ExternalMetricsProvider"}
```

- Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
- Choose **Accounts** in the navigation pane.
- In the **Organization-level preferences for external metrics ingestion** or the **Account-level preferences for external metrics ingestion** section, navigate to your external metrics provider's website. To do this, choose **Configure with provider** or the external metrics source link.

**External metrics ingestion** [Info](#) Preference level (Organization) **All opted-in accounts** ▼ Edit

To improve your EC2 rightsizing recommendations with memory utilization, you can configure Compute Optimizer to ingest EC2 memory utilization metrics from your preferred external metrics source.

Make sure that you have completed the configuration process with Datadog. Configure with Datadog

External metrics source  
Datadog [↗](#)

- Complete the configuration process on your external metrics provider's website.

### **⚠ Important**

If you don't complete the configuration process with your external metrics provider, Compute Optimizer can't receive your external metrics.

## Opt out of external metrics ingestion

### Console

- Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
- Choose **General** in the navigation pane. Then, choose the **External metrics ingestion** tab.
- If you're an individual AWS account holder, skip to step 4.

If you're the account manager or delegated administrator of your organization, you can opt out all member accounts or an individual member account for external metrics ingestion.

- To opt out all member accounts, choose **All opted-in accounts** from the Preference level dropdown.
  - To opt out an individual member account, choose **Choose account** from the Preference level dropdown. In the prompt that appears, select the account you want to opt out. Then, choose **Set account level**.
- Choose **Edit**.
  - In the prompt that appears, select **No external metrics provider**. Then, choose **Confirm**.

### CLI

- Open a terminal or command prompt window.

2. Call the following API operation.
  - Replace *myRegion* with the source AWS Region.
  - Replace *123456789012* with your account ID.

```
aws compute-optimizer delete-recommendation-preferences --  
region myRegion --resource-type=Ec2Instance --recommendation-preference-  
names='["ExternalMetricsPreference"]' --scope='{ "name": "AccountId",  
"value": "123456789012" }'
```

## Inferred workload type

Inferred workload type is a feature that's included with AWS Compute Optimizer that infers the applications that might be running on your AWS resources, such as EC2 instances and Auto Scaling groups. Inferred workload type does this by analyzing the attributes of your resources. These resources include resource names, tags, and configuration. Compute Optimizer currently can infer if your instances are running Amazon EMR, Apache Cassandra, Apache Hadoop, Memcached, NGINX, PostgreSQL, Redis, Kafka, or SQLServer. By inferring the applications that are running on your instances, Compute Optimizer can identify the effort to migrate your workloads from x86-based instance types to Arm-based AWS Graviton instances types. By default, the inferred workload type feature is activated. But, you can create a recommendation preference to deactivate the feature.

### Note

You can't infer the SQLServer application in the Middle East (Bahrain), Africa (Cape Town), Asia Pacific (Hong Kong), Europe (Milan), and Asia Pacific (Jakarta) Regions.

The inferred workload types and migration effort are listed in the **Inferred workload types** and **Migration effort** columns of the EC2 instances and Auto Scaling groups recommendations pages. For more information, see [Viewing EC2 instance recommendations](#) and [Viewing Auto Scaling group recommendations](#).

### Contents

- [Required permissions](#)
- [Organization and account level](#)

- [Manage the status of inferred workload type](#)

## Required permissions

You must have the appropriate permissions to manage the status of the inferred workload type feature. For more information, see [Policies to grant access to manage Compute Optimizer recommendation preferences](#).

## Organization and account level

By default, inferred workload type is activated. However, you can create a recommendation preference to deactivate the feature. You can deactivate inferred workload type using the Compute Optimizer console, AWS Command Line Interface (AWS CLI), or AWS SDKs. In the console, you can deactivate the feature in the following areas. Deactivating in each area provides a different level of deactivation.

- For an individual AWS account holder, you can deactivate the inferred workload type feature for all AWS resources in the account that meet your AWS Region criteria. For more information, see [Manage the status of inferred workload type](#)
- The account manager or the delegated administrator of an AWS Organization can deactivate the inferred workload type feature for all resources in all member accounts of the organization that meet your AWS Region criteria. For more information, see [Manage the status of inferred workload type](#).

After you deactivate the inferred workload type feature, Compute Optimizer stops inferring workload types the next time that recommendations are refreshed. This can take up to 24 hours to take effect.

## Manage the status of inferred workload type

Use the following procedure to manage the status of the inferred workload type feature for member accounts of an AWS Organization or an individual AWS account holder.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **General** in the navigation pane. Then, choose the **Inferred workload type** tab.
3. If you're an individual AWS account holder, skip to step 4.

If you're the account manager or delegated administrator of your organization, you can manage all member accounts or an individual member account for inferred workload type.

- To opt in all member accounts, choose **All opted-in accounts** from the Preference level dropdown.
- To opt in an individual member account, choose **Choose account** from the Preference level dropdown. In the prompt that appears, select the account you want to opt in for rightsizing preferences. Then, choose **Set account level**.

The screenshot shows the AWS Compute Optimizer console interface. At the top, there are four tabs: 'Enhanced infrastructure metrics', 'Inferred workload types' (which is selected), 'External metrics ingestion', and 'Savings estimation mode'. Below the tabs, the 'Inferred workload type' section is visible, with a sub-section for 'Preference level (Organization)'. A dropdown menu is open, showing three options: 'All opted-in accounts' (with an upward arrow), 'All opted-in accounts', and 'Choose account...'. The 'All opted-in accounts' option is highlighted with a red box. To the right of the dropdown is an 'Edit' button. Below the dropdown, there is a table with two columns: 'Region' and 'Status'. The table contains two rows: 'US East (N. Virginia)' with a green checkmark and the word 'Active', and 'US East (Ohio)' with a grey circle and the word 'Inactive'.

4. Choose **Edit**.
5. To deactivate the inferred workload type preference in an AWS Region, unselect the **Activate** checkbox. Then, choose **Save**.
6. (Optional) If you want to activate the inferred workload type preference in an AWS Region select the **Activate** checkbox. Then, choose **Save**.
7. (Optional) To add a new inferred workload type preference in an AWS Region, choose **Add a preference**. Then, select a **Region** and the **Activate** checkbox. Finally, choose **Save**.

## Savings estimation mode

The savings estimation mode preference allows Compute Optimizer to analyze specific pricing discounts when generating the estimated cost savings of rightsizing recommendations. Compute Optimizer offers the savings estimation mode for the following pricing discounts per AWS resource:

- Amazon EC2 and Auto Scaling group instances - Savings Plans and Reserved Instances pricing discounts.
- AWS Lambda functions and Amazon ECS services - Saving Plans pricing discounts.
- Amazon EBS volumes - other specific pricing discounts.

**Note**

The savings estimation mode preference is only available for accounts within AWS Organizations that enable Cost Optimization Hub in AWS Cost Explorer. For more information, see [Cost Optimization Hub](#) in the *AWS Cost Management User Guide*.

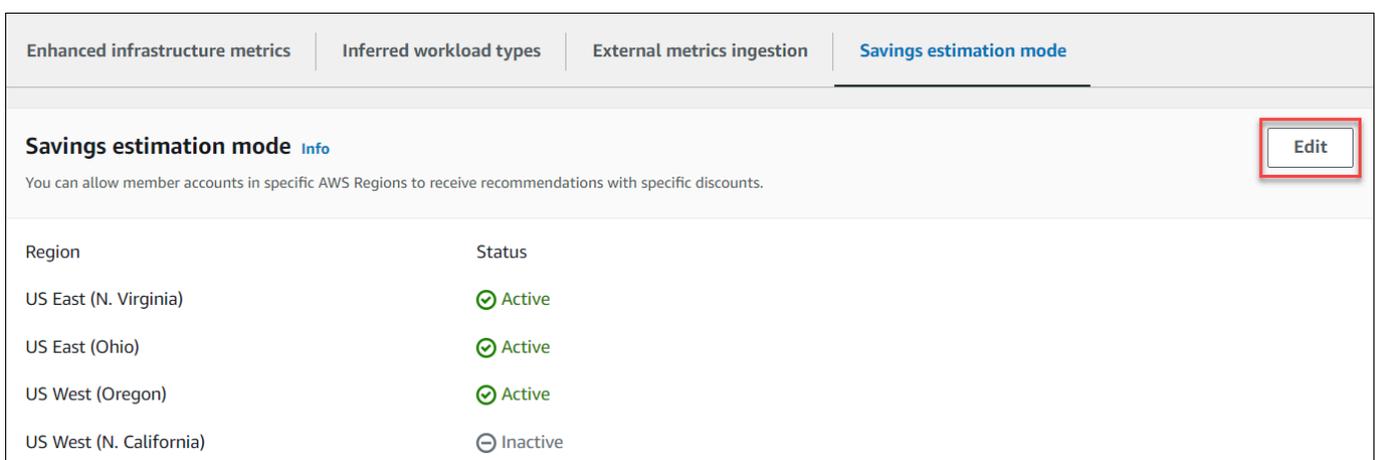
Only the account manager or delegated administrator of your organization can activate member accounts in specific AWS Regions to receive recommendations with pricing discounts. For the account manager and the delegated administrator, the savings estimation mode preference is activated by default.

If the savings estimation mode preference isn't activated, Compute Optimizer only uses the default On-Demand pricing information.

## Activate savings estimation mode

Use the following procedure to activate or deactivate the savings estimation mode preference for member accounts within specific AWS Regions.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **General** in the navigation pane.
3. Choose the **Savings estimation mode** tab. Then, choose **Edit**.



Region	Status
US East (N. Virginia)	Active
US East (Ohio)	Active
US West (Oregon)	Active
US West (N. California)	Inactive

4. In the pop-up window that appears, select the AWS Regions where you want to activate the savings estimation mode preference. Then, choose **Save**.

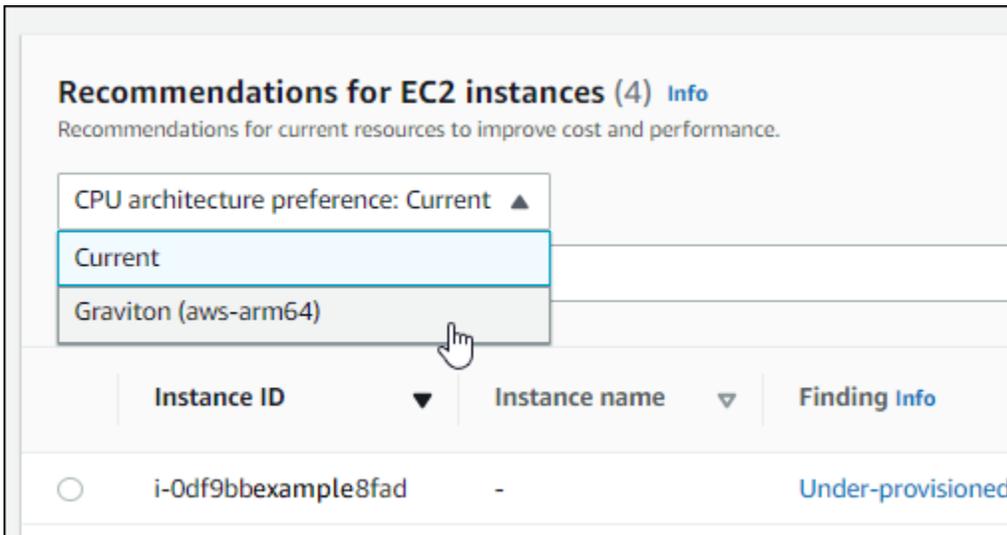
Savings estimation mode	
Region	Activate
US East (N. Virginia)	<input checked="" type="checkbox"/>
US East (Ohio)	<input checked="" type="checkbox"/>
US West (Oregon)	<input checked="" type="checkbox"/>
US West (N. California)	<input type="checkbox"/>
Asia Pacific (Mumbai)	<input type="checkbox"/>
Asia Pacific (Osaka-Local)	<input checked="" type="checkbox"/>
Asia Pacific (Seoul)	<input checked="" type="checkbox"/>

- (Optional) Unselect the AWS Regions where you want to deactivate the savings estimation mode preference.

When you activate the savings estimation mode preference, it can take up to 24 hours for your new recommendations with specific discounts to appear. You can view your specific discount recommendations in the **Estimated monthly savings (after discounts)** column of a given AWS resource. For more information, see [Estimated monthly savings and savings opportunity](#).

## AWS Graviton-based instance recommendations

When viewing Amazon EC2 instance and Auto Scaling group recommendations, you can view the price and performance impact of running your workload on AWS Graviton-based instances. To do so, choose **Graviton (aws-arm64)** in the **CPU architecture preference** dropdown. Otherwise, choose **Current** to view recommendations that are based on the same CPU vendor and architecture as the current instance. For more information about viewing Amazon EC2 instance and Auto Scaling group recommendations, see [Viewing EC2 instance recommendations](#) and [Viewing Auto Scaling group recommendations](#).



**Recommendations for EC2 instances (4)** [Info](#)  
Recommendations for current resources to improve cost and performance.

CPU architecture preference: Current ▲

- Current
- Graviton (aws-arm64)

Instance ID	Instance name	Finding Info
i-0df9bbexample8fad	-	<a href="#">Under-provisioned</a>

### Note

The **Current price**, **Recommended price**, **Price difference**, **Price difference (%)**, and **Estimated monthly savings** columns are updated to provide a price comparison between the current instance type and the instance type of the selected CPU architecture preference. For example, if you choose **Graviton (aws-arm64)**, prices are compared between the current instance type and the recommended Graviton-based instance type.

# Managing accounts and preferences

The Accounts page of the Compute Optimizer console lists the recommendation preferences that are activated for the account or organization, such as [enhanced infrastructure metrics](#).

For the management account of an organization, the Accounts page also lists your organization's member accounts and their opt-in status to Compute Optimizer. Management accounts can [opt in](#) member accounts of the organization to AWS Compute Optimizer. When a member account is opted in, Compute Optimizer analyzes the member account's supported resources for potential optimization.

On the Accounts page of the Compute Optimizer console, you can do the following:

- [View account opt-in and preferences](#).
- [Delegate an administrator account](#).
- [Troubleshoot account opt-in and preferences](#).

## Viewing the opt-in status of member accounts of an organization

Use the following procedure to view member accounts of an organization that are opted in to Compute Optimizer.

### Note

This option is only available to the management account or delegated administrator of an organization who opted in member accounts to Compute Optimizer.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **Account management** in the navigation pane.

The **Account management** page lists the member accounts of the organization and their current Compute Optimizer opt-in status. The **Opt-in status** and **Status description** columns

describe the status of each account ID that are listed. To delegate an administrator account, see [the section called “Delegate an administrator account”](#).

Organization opt-in by account (3/3) <small>Info</small>			
<input type="text" value="Search by account ID"/>		<span>Delegate ▾</span>	<span>Opt-in status: All statuses ▾</span>
Account ID ▾	Opt-in status ▾	Status description ▾	Last modified ▾
<input type="radio"/> 734862158247 <span>management account</span>	<span>✔ Active</span>	Opted in	18/10/2023, 03:56:54
<input type="radio"/> 698808747014 <span>delegated administrator</span>	<span>✔ Active</span>	Opted in	18/10/2023, 03:58:04
<input type="radio"/> 464447557341	<span>✔ Active</span>	Opted in	18/10/2023, 03:56:43

## Delegate an administrator account

You can delegate a member account in your organization as an administrator for Compute Optimizer. A delegated administrator can access and manage Compute Optimizer recommendations. A delegated administrator can also set recommendation preferences for your entire organization without the need to access the management account. The management account controls the delegated administrator option for its organization. Each organization can only have one delegated administrator for Compute Optimizer at a time.

The delegated administrator can get and export recommendations, set recommendation preferences, set member account opt-in status, and get projected utilization metrics.

### Note

- You can limit your delegated administrator’s access to Compute Optimizer actions by setting up appropriate IAM permissions in your IAM policy. For more information, see [Policies and permissions in IAM](#).
- If you're the delegated administrator and you want to view org-level recommendations, see [Policies to grant access to Compute Optimizer for a management account of an organization](#).

To register or update an account as a delegated administrator:

## Console

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **Account management** in the navigation pane.
3. In the **Organization opt-in by account** section, choose the account ID that you want to add as the delegated administrator.
4. For **Delegate**, choose **Register as delegated administrator**.
5. In the prompt that appears, choose **Confirm** if you agree to the change and to add the delegated administrator.

## CLI

1. Log in as the management account of your organization.
2. Open a terminal or command prompt window.
3. Call the following API operation. Replace *123456789012* with your account ID.

```
aws organizations register-delegated-administrator \
    --account-id 123456789012 \
    --service-principal compute-optimizer.amazonaws.com
```

To remove a member account as a delegated administrator:

## Console

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **Account management** in the navigation pane.
3. In the **Organization opt-in by account** section, choose the current delegated administrator's account ID.
4. For **Delegate**, choose **Deregister as delegated administrator**.
5. In the prompt that appears, choose **Confirm** if you agree to the change and to remove the delegated administrator.

## CLI

1. Log in as the management account of your organization.
2. Open a terminal or command prompt window.
3. Call the following API operation. Replace `123456789012` with your account ID.

```
aws organizations deregister-delegated-administrator \
    --account-id 123456789012 \
    --service-principal compute-optimizer.amazonaws.com
```

## Troubleshooting account opt-in and recommendation preferences

This section covers troubleshooting why accounts might fail to opt in to Compute Optimizer and why recommendation preferences might fail to display or save. The solutions provided in this section show how you can mitigate these problems.

### Failed to create service-linked role

#### Description

Accounts show a **Failed** opt-in status, and a description of **Failed to create service-linked role**.

#### Cause

Compute Optimizer uses AWS Identity and Access Management (IAM) service-linked roles. These roles include all of the permissions that the service requires to call other AWS services on your behalf. You must configure permissions to allow an IAM entity (a user, group, or role) to create a service-linked role for Compute Optimizer. The user who tried to opt in to Compute Optimizer might not have the permissions required to have the service-linked role created.

#### Solution

Add the required permissions to the user who performs the Compute Optimizer opt-in. For more information, see [the section called "Service-Linked Role permissions"](#).

### Failed to enable trusted access

#### Description

Accounts show a **Failed** opt-in status, and a description of **Failed to enable trusted access**.

### Cause

You can use *trusted access* to enable Compute Optimizer to perform tasks in your organization and its accounts on your behalf. For more information about AWS Organizations trusted access, see [Using AWS Organizations with other AWS services](#) in the *AWS Organizations User Guide*. When you opt in using your organization's management account and include all member accounts within the organization, trusted access for Compute Optimizer is automatically enabled in your organization account. The user who tried to opt in to Compute Optimizer might not have the permissions required to have trusted access enabled.

### Solution

Add the required permissions to the user who perform the Compute Optimizer opt-in. For more information, see [Permissions required to enable trusted access](#) in the *AWS Organizations User Guide*. After you add the required permissions, opt in to Compute Optimizer again using your organization's management account and include all member accounts within the organization. For more information, see [the section called "Opting in your account"](#).

## Failed to get or update enhanced infrastructure metrics recommendation preferences

### Description

A banner is displayed that indicates that the Compute Optimizer console could not get or update enhanced infrastructure metrics recommendation preferences.

### Cause

You might not have the permissions required to view or update recommendation preferences.

### Solution

Add the required permissions to the user who will view or edit recommendation preferences. For more information, see [Policies to grant access to manage Compute Optimizer recommendation preferences](#).

# Viewing the AWS Compute Optimizer dashboard

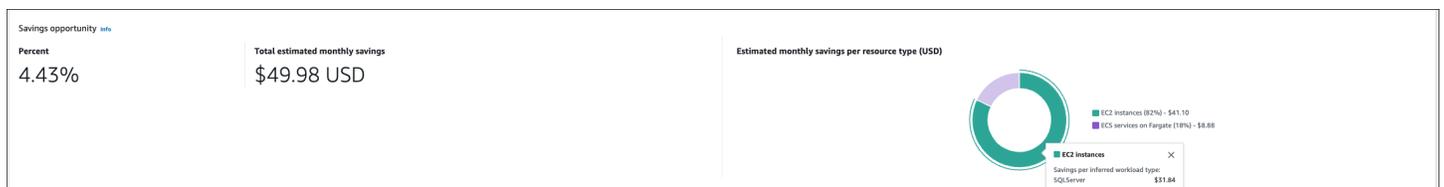
Use the dashboard in the Compute Optimizer console to evaluate and prioritize the optimization opportunities for the supported resource types in your account. The dashboard displays the following information, which is refreshed daily and generated by analyzing the specifications and utilization metrics of your resources.

## Savings opportunity

The savings opportunity section displays the total estimated monthly USD amount and percentage that you could save (based on On-Demand Instance pricing) if you implement the Compute Optimizer recommendations for resources in your account. It also displays the estimated monthly savings for each resource type. If you prefer to evaluate your resources for cost savings, then prioritize the resource type that has the greatest savings opportunity.

### Important

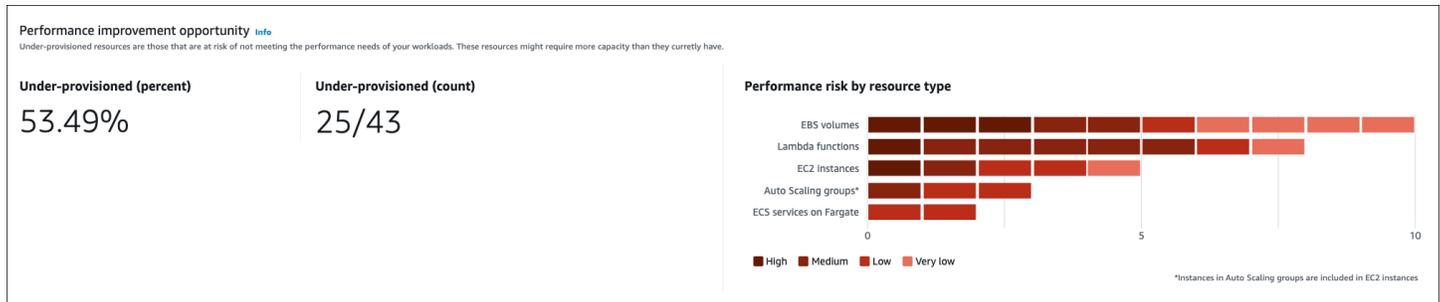
If you enable Cost Optimization Hub in AWS Cost Explorer, Compute Optimizer uses Cost Optimization Hub data, which includes your specific pricing discounts, to generate your recommendations. If Cost Optimization Hub isn't enabled, Compute Optimizer uses Cost Explorer data and On-Demand pricing information to generate your recommendations. For more information, see [Enabling Cost Explorer](#) and [Cost Optimization Hub](#) in the *AWS Cost Management User Guide*.



The estimated monthly savings and savings opportunity for individual EC2 instances are listed in the EC2 instances recommendations page under the **Estimated monthly savings (after discounts)**, **Estimated monthly savings (On-Demand)**, and **Savings opportunity (%)** columns. For more information, including how estimated monthly savings is calculated, see [Estimated monthly savings and savings opportunity](#).

## Performance improvement opportunity

The performance improvement opportunity section displays a count and percentage of the resources in your account that Compute Optimizer found to be at risk of not meeting your workload performance needs. It also displays the performance risk classifications per resource type. Resources can have a performance risk of high, medium, and very low. If you prefer to evaluate your resources for performance improvements, then prioritize the resource types that have a high performance risk.



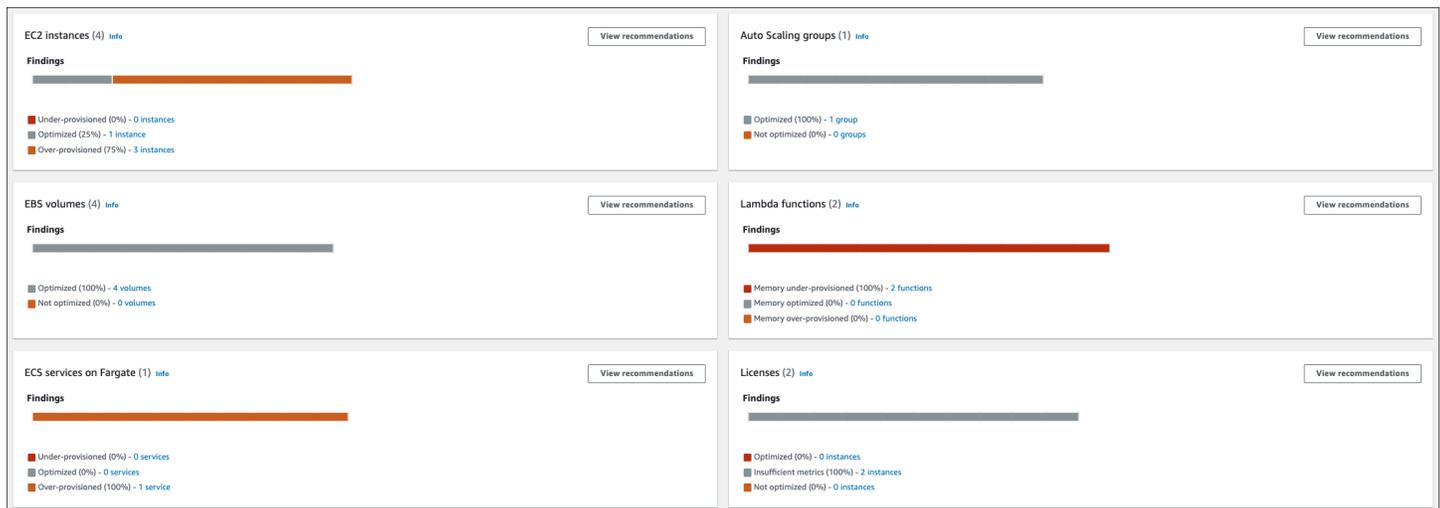
The current performance risk for individual EC2 instances and Auto Scaling groups is listed in the EC2 instance details page under the **Current performance risk** column. For more information, see [Current performance risk for EC2 instances](#).

## Findings

The findings section displays the findings classifications count and percentage for different resources types in your account. Compute Optimizer classifies resource findings in the following ways:

- Amazon EC2 instances, Auto Scaling groups, Lambda functions, and Amazon ECS services on Fargate are classified as under-provisioned, over-provisioned, or optimized.
- Amazon EBS volumes are classified as not optimized or optimized.
- Commercial software licenses are classified as optimized, not optimized, and insufficient metrics.

For more information, see [Findings classifications](#).



## Findings classifications

The findings classifications in the Compute Optimizer console provide an at-a-glance view of how your resources performed during the analyzed period. The findings classifications differ based on the resource type. The following classifications apply to services and resources supported by Compute Optimizer.

### EC2 instance finding classifications

Classification	Description
Under-provisioned	An EC2 instance is considered under-provisioned when at least one specification of your instance, such as CPU, memory, or network, does not meet the performance requirements of your workload. Under-provisioned EC2 instances might lead to poor application performance.
Over-provisioned	An EC2 instance is considered over-provisioned when at least one specification of your instance, such as CPU, memory, or network, can be sized down while still meeting the performance requirements of your workload, and when no specification is under-provisioned. Over-provisioned EC2 instances might lead to unnecessary infrastructure cost.

Classification	Description
Optimized	An EC2 instance is considered optimized when all specifications of your instance, such as CPU, memory, and network, meet the performance requirements of your workload, and the instance is not over-provisioned. For optimized instances, Compute Optimizer might sometimes recommend a new generation instance type.

### Note

For instances, Compute Optimizer generates finding reasons that provide a greater level of detail into why an instance was found to be under-provisioned, or over-provisioned. For more information, see [Finding reasons](#) in the [Viewing EC2 instance recommendations](#) topic.

## Auto Scaling group finding classifications

Classification	Description
Not optimized	An Auto Scaling group is considered not optimized when Compute Optimizer has identified a recommendation that can provide better performance or cost for your workload.
Optimized	An Auto Scaling group is considered optimized when Compute Optimizer determines that the group is correctly provisioned to run your workload, based on the chosen instance type. For optimized Auto Scaling groups, Compute Optimizer might sometimes recommend a new generation instance type.

### Note

For instances in Auto Scaling groups, Compute Optimizer generates finding reasons that provide a greater level of detail into why an Auto Scaling group was found to be

not optimized. For more information, see [Finding reasons](#) in the [Viewing EC2 instance recommendations](#) topic.

## EBS volume finding classifications

Classification	Description
Not optimized	An EBS volume is considered not optimized when Compute Optimizer has identified a volume type, volume size, or IOPS specification that can provide better performance or cost for your workload.
Optimized	An EBS volume is considered optimized when Compute Optimizer determines that the volume is correctly provisioned to run your workload, based on the chosen volume type, volume size, and IOPS specification. For optimized resources, Compute Optimizer might sometimes recommend a new generation volume type.

## Lambda function finding classifications

Classification	Description
Not optimized	<p>A Lambda function is considered not optimized when Compute Optimizer has identified that its configured memory or CPU power (which is proportional to the configured memory) is under-provisioned or over-provisioned. In this case, Compute Optimizer generates a recommendation that can provide better performance or cost for your workload.</p> <p>When a function is not optimized, Compute Optimizer displays a finding reason of either <b>Memory under-provisioned</b> or <b>Memory over-provisioned</b>.</p>

Classification	Description
Optimized	A Lambda function is considered optimized when Compute Optimizer determines that its configured memory or CPU power (which is proportional to the configured memory) is correctly provisioned to run your workload.
Unavailable	<p>Compute Optimizer was unable to generate a recommendation for the function. This could be because the function has not met the <a href="#">requirements of Compute Optimizer for Lambda functions</a>, or the function does not qualify for a recommendation.</p> <p>For this finding classification, Compute Optimizer displays one of the following finding reasons:</p> <ul style="list-style-type: none"><li>• <b>Insufficient data</b> when the function does not have sufficient metric data for Compute Optimizer to generate a recommendation.</li><li>• <b>Inconclusive</b> when the function does not qualify for a recommendation because the function has configured memory greater than 1,792 MB, or Compute Optimizer cannot generate a recommendation with a high degree of confidence.</li></ul> <div data-bbox="592 1297 1507 1522"><p> <b>Note</b></p><p>Functions with a finding of <b>Unavailable</b> are not listed in the Compute Optimizer console.</p></div>

## Finding classifications for Amazon ECS services on Fargate

Classification	Description
Under-provisioned	When Compute Optimizer detects that there's not enough memory or CPU, an Amazon ECS service is considered under-provisioned. Compute Optimizer displays a finding reason of <b>CPU under-provisioned</b> or <b>Memory under-provisioned</b> . An under-provisioned Amazon ECS service might result in poor application performance.
Over-provisioned	When Compute Optimizer detects that there's excessive memory or CPU, an Amazon ECS service is considered over-provisioned. Compute Optimizer displays a finding reason of <b>CPU over-provisioned</b> or <b>Memory over-provisioned</b> . An over-provisioned Amazon ECS service might result in additional infrastructure costs.
Optimized	When both the CPU and memory of your Amazon ECS service meet the performance requirements of your workload, the service is considered optimized.

For more information about an under and over provisioned Amazon ECS services on Fargate, see [Finding reasons](#) in the [Viewing recommendations for Amazon ECS services on Fargate](#) topic.

## Finding classifications for commercial software license

Classification	Description
Insufficient metrics	When Compute Optimizer detects that your CloudWatch Application Insights isn't enabled or is enabled with insufficient permissions. Compute Optimizer displays a finding reason of <code>InvalidCloudwatchApplicationInsights</code> or <code>CloudwatchApplicationInsightsError</code> .
Not optimized	When Compute Optimizer detects that your EC2 infrastructure isn't using any of the Microsoft SQL server license

Classification	Description
	features you're paying for, a license is considered not optimized . Compute Optimizer displays a finding reason of LicenseOverprovisioned . A license that isn't optimized might result in unnecessary additional costs.
Optimized	When the license for your SQL server database meets your performance requirements, the license is considered optimized.

For more information about these finding classifications, see [Finding reasons](#) in the [Viewing commercial software license recommendations](#) topic.

## Viewing the dashboard

Use the following procedure to view the dashboard and the optimization findings for your resources.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **Dashboard** in the navigation pane.

By default, the dashboard displays an overview of optimization findings for AWS resources across all AWS Regions in the account that you're currently signed in to.

3. You can perform the following actions on the dashboard:
  - To view the optimization findings for resources in another account, choose **Account**, and then select a different account ID.

### Note

The ability to view optimization findings for resources in other accounts is available only if you're signed in to a management account of an organization, you opted in all member accounts of the organization, and trusted access with Compute Optimizer is enabled. For more information, see [Accounts supported by Compute Optimizer](#) and [Compute Optimizer and AWS Organizations trusted access](#).

- To show or hide the savings opportunity and performance improvement opportunity sections of the dashboard, choose the gear icon, choose the sections that you want to show or hide, and choose **Apply**.
- To filter findings on the dashboard to one or more AWS Regions, enter the name of the Region in the **Filter by one or more Regions** text box, or choose one or more Regions in the drop-down list that appears.
- To clear the selected filters, choose **Clear filters** next to the filter.
- To view optimization recommendations, choose the **View recommendations** link for one of the resource types displayed, or choose the number of resources listed next to a findings classification to view the resources for that classification. For more information, see [Viewing resource recommendations](#).

# Viewing resource recommendations

Recommendations for your AWS resources are displayed in the following pages of the AWS Compute Optimizer console.

- The **resources recommendations** page lists each of your running resources, along with their top recommendation generated by Compute Optimizer.
- The **resource details** page lists the top recommendation options for a specific resource, along with utilization metric graphs for the resource. You can access this page from the recommendations page.

The recommendations and resource details pages are available for each of the following AWS resources that are supported by Compute Optimizer:

- [Amazon EC2 instances](#)
- [Auto Scaling groups](#)
- [Amazon EBS volumes](#)
- [AWS Lambda functions](#)
- [Amazon ECS services on Fargate](#)
- [Commercial software licenses](#)

## Viewing EC2 instance recommendations

AWS Compute Optimizer generates instance type recommendations for Amazon Elastic Compute Cloud (Amazon EC2) instances. Recommendations for your Amazon EC2 instances are displayed on the following pages of the Compute Optimizer console:

- The **EC2 instances recommendations** page lists each of your current instances, their [finding classifications](#), [finding reasons](#), [platform differences](#), current instance type, and current hourly price for the selected [purchasing option](#). The top recommendation from Compute Optimizer is listed next to each of your instances. This recommendation includes the recommended instance type, the hourly price for the selected purchasing option, and the price difference between your current instance. Use the recommendations page to compare your current instances with their top recommendation. Doing this can help you to decide if you want to up-size or down-size your instances.

- The **EC2 instance details** page lists up to three optimization recommendations for a specific instance. You can access this page from the EC2 instances recommendations page. The page specifically lists the specifications for each recommendation, their [performance risk](#), and their hourly prices for the selected purchasing option. The details page also displays utilization metric graphs for the current instance, overlaid with the projected utilization metrics for the recommendation options.

The recommendations are refreshed daily. These recommendations are generated by analyzing the specifications and utilization metrics of the current instance over a period of the last 14 days. Or, if you activate the [enhanced infrastructure metrics paid feature](#), the recommendations are generated by analyzing a longer period of time. For more information, see [Metrics analyzed by AWS Compute Optimizer](#).

Keep in mind that Compute Optimizer generates recommendations for EC2 instances that meet a specific set of requirements. Recommendations can take up to 24 hours to be generated. Moreover, sufficient metric data must be accumulated for recommendations to be generated. For more information, see [Supported resources and requirements](#).

## Contents

- [Finding classifications](#)
- [Finding reasons](#)
- [AWS Graviton-based instance recommendations](#)
- [Inferred workload types](#)
- [Migration effort](#)
- [Platform differences](#)
- [Prices and purchasing options](#)
- [Estimated monthly savings and savings opportunity](#)
- [Performance risk](#)
- [Current performance risk](#)
- [Utilization graphs](#)
- [Viewing EC2 instances recommendations](#)
- [Viewing EC2 instance details](#)

## Finding classifications

The **Finding** column on the **EC2 instances recommendations** page provides a summary of how each of your instances performed during the analyzed period.

The following findings classifications apply to EC2 instances.

Classification	Description
Under-provisioned	An EC2 instance is considered under-provisioned when at least one specification of your instance, such as CPU, memory, or network, does not meet the performance requirements of your workload. Under-provisioned EC2 instances might lead to poor application performance.
Over-provisioned	An EC2 instance is considered over-provisioned when at least one specification of your instance, such as CPU, memory, or network, can be sized down while still meeting the performance requirements of your workload, and when no specification is under-provisioned. Over-provisioned EC2 instances might lead to unnecessary infrastructure cost.
Optimized	An EC2 instance is considered optimized when all specifications of your instance, such as CPU, memory, and network, meet the performance requirements of your workload, and the instance is not over-provisioned. For optimized instances, Compute Optimizer might sometimes recommend a new generation instance type.

## Finding reasons

The **Finding reasons** column on the **EC2 instances recommendations** and **EC2 instance details** pages shows which specification of an instance is under-provisioned or over-provisioned.

The following finding reasons apply to instances:

Finding reason	Description
CPU over-provisioned	The instance's CPU configuration can be sized down and also meet the performance requirements of your workload. This is identified by analyzing the <code>CPUUtilization</code> metric of the current instance during the look-back period.
CPU under-provisioned	The instance's CPU configuration doesn't meet the performance requirements of your workload and there's an alternative instance type that provides better CPU performance. This is identified by analyzing the <code>CPUUtilization</code> metric of the current instance during the look-back period.
Memory over-provisioned	<p>The instance's memory configuration can be sized down while still meeting the performance requirements of your workload. This is identified by analyzing the memory utilization metric of the current instance during the look-back period.</p> <div data-bbox="594 968 1507 1283" style="border: 1px solid #0070C0; border-radius: 10px; padding: 10px; background-color: #E6F2FF;"> <p><b>Note</b></p> <p>Memory utilization is analyzed only for resources with the unified CloudWatch agent installed. For more information, see <a href="#">Enabling memory utilization with the Amazon CloudWatch Agent</a>.</p> </div>
Memory under-provisioned	The instance's memory configuration doesn't meet the performance requirements of your workload and there's an alternative instance type that provides better memory performance. This is identified by analyzing the memory utilization metric of the current instance during the look-back period.
GPU over-provisioned	The instance's GPU and GPU memory configurations can be sized down while still meeting the performance requirements of your workload. This is identified by analyzing the <code>GPUUtilization</code> and <code>GPUMemoryUtilization</code> metrics of the current instance during the look-back period.

Finding reason	Description
	<p><b>Note</b></p> <p>The GPU utilization and GPU memory utilization metrics are analyzed only for resources with the unified CloudWatch agent installed. For more information, see <a href="#">Enabling NVIDIA GPU utilization with the CloudWatch agent</a>.</p>
GPU under-provisioned	<p>The instance's GPU and GPU memory configurations don't meet the performance requirements of your workload and there's an alternative instance type that provides better memory performance. This is identified by analyzing the <code>GPUUtilization</code> and <code>GPUMemoryUtilization</code> metrics of the current instance during the look-back period.</p>
EBS throughput over-provisioned	<p>The instance's EBS throughput configuration can be sized down and also meet the performance requirements of your workload. This is identified by analyzing the <code>VolumeReadBytes</code> and <code>VolumeWriteBytes</code> metric of EBS volumes attached to the current instance during the look-back period.</p>
EBS throughput under-provisioned	<p>The instance's EBS throughput configuration doesn't meet the performance requirements of your workload. And, there's an alternative instance type that provides better EBS throughput performance. This is identified by analyzing the <code>VolumeReadBytes</code> and <code>VolumeWriteBytes</code> metric of EBS volumes that are attached to the current instance during the look-back period.</p>
EBS IOPS over-provisioned	<p>The instance's EBS IOPS configuration can be sized down and also meet the performance requirements of your workload. This is identified by analyzing the <code>VolumeReadOps</code> and <code>VolumeWriteOps</code> metrics of EBS volumes attached to the current instance during the look-back period.</p>

Finding reason	Description
EBS IOPS under-provisioned	The instance's EBS IOPS configuration doesn't meet the performance requirements of your workload. And, there's an alternative instance type that provides better EBS IOPS performance. This is identified by analyzing the <code>VolumeReadOps</code> and <code>VolumeWriteOps</code> metrics of EBS volumes attached to the current instance during the look-back period.
Network bandwidth over-provisioned	The instance's network bandwidth configuration can be sized down while still meeting the performance requirements of your workload. This is identified by analyzing the <code>NetworkIn</code> and <code>NetworkOut</code> metrics of the current instance during the look-back period.
Network bandwidth under-provisioned	The instance's network bandwidth configuration doesn't meet the performance requirements of your workload. And, there's an alternative instance type that provides better network bandwidth performance. This is identified by analyzing the <code>NetworkIn</code> and <code>NetworkOut</code> metrics of the current instance during the look-back period. This finding reason happens when the <code>NetworkIn</code> or <code>NetworkOut</code> performance of an instance is impacted.
Network PPS over-provisioned	The instance's network PPS (packets per second) configuration can be sized down and also meet the performance requirements of your workload. This is identified by analyzing the <code>NetworkPacketsIn</code> and <code>NetworkPacketsOut</code> metrics of the current instance during the look-back period.
Network PPS under-provisioned	The instance's network PPS (packets per second) configuration doesn't meet the performance requirements of your workload. And, there's an alternative instance type that provides better network PPS performance. This is identified by analyzing the <code>NetworkPacketsIn</code> and <code>NetworkPacketsOut</code> metrics of the current instance during the look-back period.

Finding reason	Description
Disk IOPS over-provisioned	The instance's disk IOPS configuration can be sized down and also meet the performance requirements of your workload. This is identified by analyzing the <code>DiskReadOps</code> and <code>DiskWriteOps</code> metrics of the current instance during the look-back period.
Disk IOPS under-provisioned	The instance's disk IOPS configuration doesn't meet the performance requirements of your workload. And, there's an alternative instance type that provides better disk IOPS performance. This is identified by analyzing the <code>DiskReadOps</code> and <code>DiskWriteOps</code> metrics of the current instance during the look-back period.
Disk throughput over-provisioned	The instance's disk throughput configuration can be sized down while still meeting the performance requirements of your workload. This is identified by analyzing the <code>DiskReadBytes</code> and <code>DiskWriteBytes</code> metrics of the current instance during the look-back period.
Disk throughput under-provisioned	The instance's disk throughput configuration doesn't meet the performance requirements of your workload. And, there's an alternative instance type that provides better disk throughput performance. This is identified by analyzing the <code>DiskReadBytes</code> and <code>DiskWriteBytes</code> metrics of the current instance during the look-back period.

**Note**

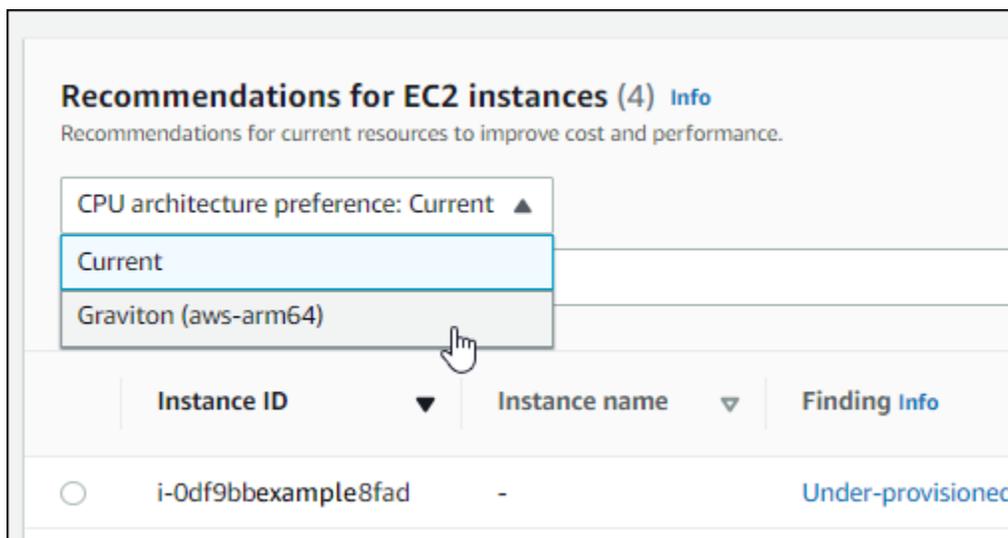
For more information about instance metrics, see [List the available CloudWatch metrics for your instances](#) in the *Amazon Elastic Compute Cloud User Guide*. For more information about EBS volume metrics, see [Amazon CloudWatch metrics for Amazon EBS](#) in the *Amazon Elastic Compute Cloud User Guide*.

You can change an instance's CPU, local disk, memory, or network specifications by changing the type of the instance. For example, you can change the instance type from C5 to C5n to help improve network performance. For more information, see [Change the instance type guide for Linux](#) and [Change the instance type guide for Windows](#) in the *EC2 User Guides*.

You can change an EBS volume's IOPS or throughput specifications by using Amazon EBS Elastic Volumes. For more information, see [Amazon EBS Elastic Volumes](#) in the *Amazon Elastic Compute Cloud User Guide*.

## AWS Graviton-based instance recommendations

When viewing Amazon EC2 instance recommendations, you can view the price and performance impact of running your workload on AWS Graviton-based instances. To do so, choose **Graviton (aws-arm64)** in the **CPU architecture preference** dropdown. Otherwise, choose **Current** to view recommendations that are based on the same CPU vendor and architecture as the current instance.



### Note

The **Current price**, **Recommended price**, **Price difference**, **Price difference (%)**, and **Estimated monthly savings** columns are updated to provide a price comparison between the current instance type and the instance type of the selected CPU architecture preference. For example, if you choose **Graviton (aws-arm64)**, prices are compared between the current instance type and the recommended Graviton-based instance type.

## Inferred workload types

The **Inferred workload types** column on the **EC2 instances recommendations** page lists the applications that might be running on the instance as inferred by Compute Optimizer. This column does this by analyzing the attributes of your instances. These attributes include the instance name, tags, and configuration. Compute Optimizer can currently infer if your instances are running Amazon EMR, Apache Cassandra, Apache Hadoop, Memcached, NGINX, PostgreSQL, Redis, Kafka, or SQLServer. By inferring the applications that run on your instances, Compute Optimizer can identify the effort to migrate your workloads from x86-based instance types to Arm-based AWS Graviton instances types. For more information, see [Migration effort](#) in the next section of this guide.

### Note

You can't infer the SQLServer application in the Middle East (Bahrain), Africa (Cape Town), Asia Pacific (Hong Kong), Europe (Milan), and Asia Pacific (Jakarta) Regions.

## Migration effort

The **Migration effort** column on the **EC2 instances recommendations** and **EC2 instances details** pages lists the level of effort that might be required to migrate from the current instance type to the recommended instance type. For example, the migration effort is **Medium** if a workload type can't be inferred but an AWS Graviton instance type is recommended. The migration effort is **Low** if Amazon EMR is the inferred workload type and an AWS Graviton instance type is recommended. The migration effort is **Very low** if both the current and recommended instance types are of the same CPU architecture. For more information about migrating from x86-based instance types to Arm-based AWS Graviton instances type, see [Considerations when transitioning workloads to AWSGraviton2 based Amazon EC2 instances](#) in the *AWS Graviton Getting Started GitHub*.

## Platform differences

The **Platform differences** column on the **EC2 instance details** page describes the differences between the current instance and the recommended instance type. Consider the configuration differences before migrating your workloads from the current instance to the recommended instance type.

The following platform differences apply to EC2 instances:

Platform difference	Description
Architecture	<p>The CPU architecture of the recommended instance type is different than that of the current instance type. For example, the recommended instance type might use an Arm CPU architecture and the current instance type might use a different one, such as x86. Before migrating, consider recompiling the software on your instance for the new architecture. Alternatively, you might switch to an Amazon Machine Image (AMI) that supports the new architecture. For more information about the CPU architecture for each instance type, see <a href="#">Amazon EC2 Instance Types</a>.</p>
Hypervisor	<p>The hypervisor of the recommended instance type is different than that of the current instance. For example, the recommended instance type might use a Nitro hypervisor and the current instance might use a Xen hypervisor. For information about the differences that you can consider between these hypervisors, see <a href="#">Nitro Hypervisor</a> section of the Amazon EC2 FAQs. For more information, see <a href="#">Instances built on the Nitro System</a> in the <i>Amazon EC2 User Guide for Linux</i>, or <a href="#">Instances built on the Nitro System</a> in the <i>Amazon EC2 User Guide for Windows</i>.</p>
Instance store availability	<p>The recommended instance type doesn't support instance store volumes, but the current instance does. Before migrating, you might need to back up the data on your instance store volumes if you want to preserve them. For more information, see <a href="#">How do I back up an instance store volume on my Amazon EC2 instance to Amazon EBS?</a> in the <i>AWS Premium Support Knowledge Base</i>. For more information, see <a href="#">Networking and storage features</a> and <a href="#">Amazon EC2 instance store</a> in the <i>Amazon EC2 User Guide for Linux</i>, or see <a href="#">Networking and storage features</a> and <a href="#">Amazon EC2 instance store</a> in the <i>Amazon EC2 User Guide for Windows</i>.</p>
Network interface	<p>The network interface of the recommended instance type is different than that of the current instance. For example, the</p>

Platform difference	Description
	<p>recommended instance type might use enhanced networking and the current instance might not. To enable enhanced networking for the recommended instance type, install the Elastic Network Adapter (ENA) driver or the Intel 82599 Virtual Function driver. For more information, see <a href="#">Networking and storage features</a> and <a href="#">Enhanced networking on Linux</a> in the <i>Amazon EC2 User Guide for Linux</i>, or <a href="#">Networking and storage features</a> and <a href="#">Enhanced networking on Windows</a> in the <i>Amazon EC2 User Guide for Windows</i>.</p>
Storage interface	<p>The storage interface of the recommended instance type is different than that of the current instance. For example, the recommended instance type uses an NVMe storage interface and the current instance doesn't such this interface. To access NVMe volumes for the recommended instance type, install or upgrade the NVMe driver. For more information, see <a href="#">Networking and storage features</a> and <a href="#">Amazon EBS and NVMe on Linux instances</a> in the <i>Amazon EC2 User Guide for Linux</i>, or <a href="#">Networking and storage features</a> and <a href="#">Amazon EBS and NVMe on Windows instances</a> in the <i>Amazon EC2 User Guide for Windows</i>.</p>
Virtualization type	<p>The recommended instance type uses the hardware virtual machine (HVM) virtualization type and the current instance uses the paravirtual (PV) virtualization type. For more information about the differences between these virtualization types, see <a href="#">Linux AMI virtualization types</a> in the <i>Amazon EC2 User Guide for Linux</i>, or <a href="#">Windows AMI virtualization types</a> in the <i>Amazon EC2 User Guide for Windows</i>.</p>

## Prices and purchasing options

On the **EC2 instances recommendations** and **EC2 instance details** pages, you can choose to view the hourly prices for your current instances and the recommended instances under different Amazon EC2 purchasing options. For example, you can view the price of your current instance and

the recommended instance under the Reserve Instances, standard one-year no upfront purchasing option. Use the pricing information to get an idea of the price difference between your current instance and the recommended instance.

Current instance type ▾	Current 1-year RI price ▾	Recommended instance type ▾	Recommended 1-year RI price ▾	Price difference ▾	Price difference (%) ▾
t2.micro	\$0.0072 per hour	t3.micro	\$0.0065 per hour	-\$0.0007 per hour	-9.7%
t2.micro	\$0.0072 per hour	t3.micro	\$0.0065 per hour	-\$0.0007 per hour	-9.7%
t2.micro	\$0.0672 per hour	t3.micro	\$0.0665 per hour	-\$0.0007 per hour	-1.0%
t2.micro	\$0.0672 per hour	t3.micro	\$0.0665 per hour	-\$0.0007 per hour	-1.0%

### Important

The prices that are listed on the recommendations page might not reflect the actual prices that you pay for your instances. For more information about finding the actual price of your current instances, see [Amazon EC2 Usage Reports](#) in the *Amazon Elastic Compute Cloud User Guide*.

The following purchasing options can be selected on the recommendations page:

- **On-Demand Instances** - An On-Demand Instance is an instance that you use on demand. You have full control over its lifecycle. That is, you decide when to launch, stop, hibernate, start, reboot, and terminate it. No longer-term commitments or upfront payments are needed. For more information about On-Demand Instances, see [On-Demand Instances](#) in the *Amazon Elastic Compute Cloud User Guide*. For more information about pricing, see [Amazon EC2 On-Demand Instance Pricing](#).
- **Reserved Instances (standard one-year or three-year commitment, no upfront)** - Reserved Instances provide you with significant savings on your Amazon EC2 costs compared to On-Demand Instance pricing. Reserved Instances aren't physical instances, but rather a billing discount applied to the use of On-Demand Instances in your account. For more information about Reserved Instances, see [Reserved Instances](#) in the *Amazon Elastic Compute Cloud User Guide*. For more information about pricing, see [Amazon EC2 Reserved Instance Pricing](#).

For more information about purchasing options, see [Instance Purchasing Options](#) in the *Amazon Elastic Compute Cloud User Guide*.

## Estimated monthly savings and savings opportunity

### Estimated monthly savings (after discounts)

This column lists the approximate monthly cost savings that you experience by migrating your workloads from the current instance type to the recommended instance type under the Savings Plans and Reserved Instances pricing models. To receive recommendations with Savings Plans and Reserved Instances discounts, the savings estimation mode preference needs to be activated. For more information, see [Savings estimation mode](#).

#### Note

If you don't activate the savings estimation mode preference, this column displays the default On-Demand pricing discount information.

### Estimated monthly savings (On-Demand)

This column lists the approximate monthly cost savings that you experience by migrating your workloads from the current instance type to the recommended instance type under the On-Demand pricing model.

### Savings opportunity (%)

This column lists the percentage difference between the price of the current instance and the price of the recommended instance type. If savings estimation mode is activated, Compute Optimizer analyzes the Savings Plans and Reserved Instances pricing discounts to generate the savings opportunity percentage. If savings estimation mode isn't activated, Compute Optimizer only uses On-Demand pricing information. For more information, see [Savings estimation mode](#).

#### Important

If you enable Cost Optimization Hub in AWS Cost Explorer, Compute Optimizer uses Cost Optimization Hub data, which includes your specific pricing discounts, to generate your recommendations. If Cost Optimization Hub isn't enabled, Compute Optimizer uses Cost Explorer data and On-Demand pricing information to generate your recommendations. For more information, see [Enabling Cost Explorer](#) and [Cost Optimization Hub](#) in the *AWS Cost Management User Guide*.

## Estimated monthly savings calculation

For each recommendation, the cost to operate a new instance using the recommended instance type is calculated. Estimated monthly savings are calculated based on the number of running hours for the current instance and the difference in rates between the current instance type and the recommended instance type. The estimated monthly savings for instances that are displayed on the Compute Optimizer dashboard is a sum of the estimated monthly savings for all over-provisioned instances in the account.

## Performance risk

The **Performance risk** column on the **EC2 instance details** page defines the likelihood of each recommended instance type not meeting the resource needs of your workload. Compute Optimizer calculates an individual performance risk score for each specification of the recommended instance. This includes specifications such as CPU, memory, EBS throughput, EBS IOPS, disk throughput, disk IOPS, network throughput, and network PPS. The performance risk of the recommended instance is calculated as the maximum performance risk score across the analyzed resource specifications.

The values range from very low, low, medium, high, and very high. A very low performance risk means that the instance type recommendation is predicted to always provide enough capability. The higher the performance risk is, the more highly we recommend that you validate whether the recommendation meets the performance requirements of your workload before migrating your resource. Decide whether to optimize for performance improvement, for cost reduction, or for a combination of these two. For more information, see [Changing the Instance Type](#) in the *Amazon Elastic Compute Cloud User Guide*.

### Note

In the Compute Optimizer API, the AWS Command Line Interface (AWS CLI), and the AWS SDKs, performance risk is measured on a scale of 0 (very low) to 4 (very high).

Price difference (%)	Performance risk	Estimated monthly saving
-	-	-
-10.3%	Very low	\$0.31
0.0%	Very low	\$0.00

## Current performance risk

The **Current performance risk** column on the **EC2 instances recommendations** page defines the likelihood of each current instance not meeting the resource needs of its workload. The current performance risk values range from very low, low, medium, and high. A very low performance risk means that the current instance is predicted to always provide enough capability. The higher the performance risk is, the more likely you should consider the recommendation generated by Compute Optimizer.

## Utilization graphs

The **EC2 instance details** page displays utilization metric graphs for your current instance. The graphs display data for the analyzed period. Compute Optimizer uses the maximum utilization point within each 5 minute time interval to generate EC2 instance recommendations.

You can change the graphs to display data for the last 24 hours, 3 days, 1 week, or 2 weeks. If you activate the [enhanced infrastructure metrics paid feature](#), you can view 3 months. You can also change the statistic of the graphs between average and maximum.

### Note

For periods of time when your instances are in a stopped state, the utilization graphs show a value of 0.

The following utilization graphs are displayed on the details page:

Graph name	Description
CPU utilization (percent)	<p>The percentage of allocated EC2 compute units used by the instance.</p> <p>The CPU utilization graph includes a comparison of the CPU utilization data of your current instance type against that of the selected recommended instance type. The comparison shows you what the CPU utilization is if you use the selected recommended instance type during the analyzed period. This comparison can help you to identify if the recommended instance type is within your workload's performance threshold.</p> <div data-bbox="829 884 1507 1486"><p> <b>Note</b></p><p>The <b>Burstable baseline</b> only displays for T-instances. You can use this baseline performance to learn how your CPU utilization relates to the baseline utilization of the specific T-instance. For more information, see <a href="#">Key concepts and definitions for burstable performance instances</a> in the <i>Amazon EC2 User Guide for Linux Instances</i>.</p></div>
Memory utilization (percent)	<p>The percentage of memory allocated by applications and the operating system as used.</p> <p>The memory utilization graph includes a comparison of the memory utilization data of your current instance type against that of the selected recommended instance type. The comparison shows you what the</p>

Graph name	Description
	<p>memory utilization is if you use the selected recommended instance type during the analyzed period. This comparison can help you to identify if the recommended instance type is within your workload's performance threshold.</p> <div data-bbox="829 527 1507 1079" style="border: 1px solid #add8e6; border-radius: 10px; padding: 10px;"> <p><b>Note</b></p> <p>The memory utilization graph is populated only for instances that have the unified CloudWatch agent installed on them. For more information, see <a href="#">Collecting Metrics and Logs from Amazon EC2 Instances and On-Premises Servers with the CloudWatch Agent</a> in the <i>Amazon CloudWatch User Guide</i>.</p> </div>
Network in (MiB/second)	The number of mebibytes (MiB) per second received on all network interfaces by the instance.
Network out (MiB/second)	The number of mebibytes (MiB) per second sent out on all network interfaces by the instance.
Network packets in (per second)	The number of packets received by the instance on all network interfaces.
Network packets out (per second)	The number of packets sent out by the instance on all network interfaces.
Disk read operations (per second)	The completed read operations per second from the instance store volumes of the instance.

Graph name	Description
Disk write operations (per second)	The completed write operations per second from the instance store volumes of the instance.
Disk read bandwidth (MiB/second)	The read mebibytes (MiB) per second from the instance store volumes of the instance.
Disk write bandwidth (MiB/second)	The write mebibytes (MiB) per second from the instance store volumes of the instance.
EBS read operations (per second)	The completed read operations per second from all EBS volumes attached to the instance.  For Xen instances, data is reported only when there is read activity on the volume.
EBS write operations (per second)	The completed write operations per second to all EBS volumes attached to the instance.  For Xen instances, data is reported only when there is write activity on the volume.
EBS read bandwidth (MiB/second)	The read mebibytes (MiB) per second from all EBS volumes attached to the instance.
EBS write bandwidth (MiB/second)	The written mebibytes (MiB) per second to all EBS volumes attached to the instance.

## Viewing EC2 instances recommendations

Use the following procedure to access the **EC2 instances recommendations** page, and view recommendations for your current instances.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **EC2 instances** in the navigation pane.

The recommendations page lists the specifications and finding classifications of your current instances and the specifications of the recommended instances. The current instances listed are from the AWS Region that is currently selected, in the selected account.

3. You can perform the following actions on the recommendations page:

- View the price and performance impact of running your workload on AWS Graviton-based instances. To do this, choose **Graviton (aws-arm64)** in the **CPU architecture preference** dropdown list. Otherwise, the **Current** (default) option displays recommendations that are based on the same CPU vendor and architecture as the current instance.
- Filter recommendations by AWS Regions, Findings, Finding reasons, or Inferred Workload Type. To do this, first select the **Filter by one or more properties** text box. Then, choose the property and a value in the dropdown list that appears.
- Filter your recommendations by tags. To do this, first select the **Tag key** or **Tag value** text box. Then, enter the key or value that you want to filter your EC2 instance recommendations by.

For example, to find all the recommendations that have a tag with the key of `Owner` and the value of `TeamA`, specify `tag:Owner` for the filter name and `TeamA` for the filter value.

- View recommendations for instances in another account. To do this, choose **Account**, and then select a different account ID.

 **Note**

If you're signed in to a management account of an organization and trusted access with Compute Optimizer is enabled, you can view recommendations for resources in other accounts. For more information, see [Accounts supported by Compute Optimizer](#) and [Compute Optimizer and AWS Organizations trusted access](#).

- Clear the selected filters. To do this, choose **Clear filters** next to the filter.
- Change the purchasing option that is displayed. To do this, choose **Settings** (the gear icon), then choose **On-Demand Instances**, **Reserved Instances, standard 1-year no upfront**, or **Reserved Instances, standard 3-year no upfront**.
- Access the **EC2 instance details** page for a specific instance. To do this, choose the finding classification listed next to the instance that you want to access.

## Viewing EC2 instance details

Use the following procedure to access the **EC2 instance details** page, and view details of a specific instance and its recommendations.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **EC2 instances** in the navigation pane.
3. Choose the finding classification listed next to the instance that you want to view detailed information for.

The details page lists up to three optimization recommendations for the instance that you chose. The page lists the specifications of your current instance, the specifications and performance risks of the recommended instances, and utilization metric graphs.

4. You can perform the following actions on the details page:
  - To view the price and performance impact of running your workload on AWS Graviton-based instances, choose **Graviton (aws-arm64)** in the **CPU architecture preference** dropdown. Otherwise, the **Current** (default) option displays recommendations that are based on the same CPU vendor and architecture as the current instance.
  - Activate the enhanced infrastructure metrics paid feature to extend the metrics analysis look-back period for the EC2 instance you're viewing up to three months (compared to the 14-day default). For more information, see [Enhanced infrastructure metrics](#).
  - Choose a recommendation option to view the utilization comparison between your current instance and a recommended instance.

The utilization metric graphs for your current instance are displayed at the bottom of the page. The solid blue line is the utilization of your current instance. The dotted orange line is the projected utilization of the selected recommended instance if you use that instance during the analyzed period. The dotted orange line is displayed in the CPU utilization and memory utilization graphs.

- To change the time range of the graphs, choose **Time Range**, and then choose **Last 24 hours**, **Last 3 days**, **Last week**, or **Last 2 weeks**. If you activate the [enhanced infrastructure metrics recommendation preference](#), you can also choose **Last 3 months**.

Choosing a shorter time range displays the data points at a higher granularity, which provides a higher level of detail.

- To change the statistic value of the graphs, choose **Statistics**, and then choose **Average** or **Maximum**.

You can use this option to determine the typical instance utilization of your workload over time. To view the highest value observed during the specified period, change the selection to **Maximum**. This way, you can determine the peak instance usage of your workload over time.

- To change the purchasing option that's displayed, choose **Settings** (the gear icon), then choose **On-Demand Instances**, **Reserved Instances, standard 1-year no upfront**, or **Reserved Instances, standard 3-year no upfront**.

## Viewing Auto Scaling group recommendations

AWS Compute Optimizer generates instance type recommendations for Amazon EC2 Auto Scaling (Auto Scaling) groups. Recommendations for your Auto Scaling groups are displayed on the following pages of the AWS Compute Optimizer console:

- The **Auto Scaling groups recommendations** page lists each of your current Auto Scaling groups, their [finding classifications](#), current instance type, current hourly price for the selected [purchasing option](#), and current configuration. The top recommendation from Compute Optimizer is listed next to each of your Auto Scaling groups, and it includes the recommended instance type, the hourly price for the selected purchasing option, and the price difference between your current instance and the recommendation. Use the recommendations page to compare the current instances of your Auto Scaling groups with their top recommendation, which can help you to decide if you should upsize or downsize your instances.
- The **Auto Scaling group details** page, which you can access from the Auto Scaling groups recommendations page, lists up to three optimization recommendations for a specific Auto Scaling group. It lists the specifications for each recommendation, their [performance risk](#), and their hourly prices for the selected purchasing option. The details page also displays utilization metric graphs for the current Auto Scaling group.

The recommendations are refreshed daily. They're generated by analyzing the specifications and utilization metrics of the current Auto Scaling group over a period of the last 14 days, or longer if you activate the [enhanced infrastructure metrics paid feature](#). For more information, see [Metrics analyzed by AWS Compute Optimizer](#).

Keep in mind that Compute Optimizer generates recommendations for Auto Scaling groups that meet a specific set of requirements, recommendations could take up to 24 hours to be generated, and sufficient metric data must be accumulated. For more information, see [Supported resources and requirements](#).

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## Finding classifications

The **Finding** column on the **Auto Scaling groups recommendations** page provides a summary of how each of your Auto Scaling groups performed during the analyzed period.

The following findings classifications apply to Auto Scaling groups.

Classification	Description
Not optimized	An Auto Scaling group is considered not optimized when Compute Optimizer has identified a recommendation that can provide better performance or cost for your workload.
Optimized	An Auto Scaling group is considered optimized when Compute Optimizer determines that the group is correctly provisioned to run your workload, based on the chosen instance type. For

Classification	Description
	optimized Auto Scaling groups, Compute Optimizer might sometimes recommend a new generation instance type.

## AWS Graviton-based instance recommendations

When viewing Auto Scaling group recommendations, you can view the price and performance impact of running your workload on AWS Graviton-based instances. To do so, choose **Graviton (aws-arm64)** in the **CPU architecture preference** dropdown. Otherwise, choose **Current** to view recommendations that are based on the same CPU vendor and architecture as the current instance.

**Recommendations for Auto Scaling groups (1)** [Info](#)  
 Recommendations for current resources to improve cost and performance.

CPU architecture preference: Current ▲

- Current
- Graviton (aws-arm64)

Auto Scaling group name	Finding Info	Current instance type
MyAutoScalingGroup	Not optimized	t2.nano

### Note

The **Current price**, **Recommended price**, **Price difference**, **Price difference (%)**, and **Estimated monthly savings** columns are updated to provide a price comparison between the current instance type and the instance type of the selected CPU architecture preference. For example, if you choose **Graviton (aws-arm64)**, prices are compared between the current instance type and the recommended Graviton-based instance type.

## Inferred workload types

The **Inferred workload types** column on the **Auto Scaling groups recommendations** page lists the applications that might be running on instances in the Auto Scaling group as inferred by Compute Optimizer. It does this by analyzing the attributes of instances in the Auto Scaling group, such as the instance name, tags, and configuration. Compute Optimizer can currently infer if your instances are running Amazon EMR, Apache Cassandra, Apache Hadoop, Memcached, NGINX, PostgreSQL, Redis, Kafka, or SQLServer. By inferring the applications running on your instances, Compute Optimizer is able to identify the effort to migrate your workloads from x86-based instance types to Arm-based AWS Graviton instances types. For more information, see [Migration effort](#).

### Note

You can't infer the SQLServer application in the Middle East (Bahrain), Africa (Cape Town), Asia Pacific (Hong Kong), Europe (Milan), and Asia Pacific (Jakarta) Regions.

## Migration effort

The **Migration effort** column on the **Auto Scaling groups recommendations** and **Auto Scaling groups details** pages lists the level of effort that might be required to migrate from the current instance type to the recommended instance type. For example, the migration effort is **Medium** if a workload type can't be inferred but an AWS Graviton instance type is recommended. The migration effort is **Low** if Amazon EMR is the inferred workload type and an AWS Graviton instance type is recommended. The migration effort is **Very low** if both the current and recommended instance types are of the same CPU architecture. For more information about migrating from x86-based instance types to Arm-based AWS Graviton instances type, see [Considerations when transitioning workloads to AWS Graviton2 based Amazon EC2 instances](#) in the *AWS Graviton Getting Started GitHub*.

## Prices and purchasing options

On the **Auto Scaling groups recommendations** and **Auto Scaling group details** pages, you can choose to view the hourly prices for current EC2 instances in your Auto Scaling groups and the recommended instances under different Amazon EC2 purchasing options. For example, you can view the price of your current instance and the recommended instance under the Reserve Instances, standard one-year no upfront purchasing option. Use the pricing information to get an idea of the price difference between your current instance and the recommended instance.

Current instance type ▾	Current 1-year RI price ▾	Recommended instance type ▾	Recommended 1-year RI price ▾	Price difference ▾	Price difference (%) ▾
t2.micro	\$0.0072 per hour	t3.micro	\$0.0065 per hour	-\$0.0007 per hour	-9.7%
t2.micro	\$0.0072 per hour	t3.micro	\$0.0065 per hour	-\$0.0007 per hour	-9.7%
t2.micro	\$0.0672 per hour	t3.micro	\$0.0665 per hour	-\$0.0007 per hour	-1.0%
t2.micro	\$0.0672 per hour	t3.micro	\$0.0665 per hour	-\$0.0007 per hour	-1.0%

### Important

The prices listed on the recommendations page might not reflect the actual prices you pay for your instances. For more information about finding the actual price of your current instances, see [Amazon EC2 Usage Reports](#) in the *Amazon Elastic Compute Cloud User Guide*.

The following purchasing options can be selected on the recommendations page:

- **On-Demand Instances** - An On-Demand Instance is an instance that you use on demand. You have full control over its lifecycle—you decide when to launch, stop, hibernate, start, reboot, and terminate it. No longer-term commitments or upfront payments are needed. For more information about On-Demand Instances, see [On-Demand Instances](#) in the *Amazon Elastic Compute Cloud User Guide*. For more information about pricing, see [Amazon EC2 On-Demand Instance Pricing](#).
- **Reserved Instances (standard one-year or three-year commitment, no upfront)** - Reserved Instances provide you with significant savings on your Amazon EC2 costs compared to On-Demand Instance pricing. Reserved Instances are not physical instances, but rather a billing discount applied to the use of On-Demand Instances in your account. For more information about Reserved Instances, see [Reserved Instances](#) in the *Amazon Elastic Compute Cloud User Guide*. For more information about pricing, see [Amazon EC2 Reserved Instance Pricing](#).

For more information about purchasing options, see [Instance Purchasing Options](#) in the *Amazon Elastic Compute Cloud User Guide*.

## Estimated monthly savings and savings opportunity

### Estimated monthly savings (after discounts)

This column lists the approximate monthly cost savings that you experience by migrating your workloads from the current instance type to the recommended instance type under the Savings Plans and Reserved Instances pricing models. To receive recommendations with Savings Plans and Reserved Instances discounts, the savings estimation mode preference needs to be activated. For more information, see [Savings estimation mode](#).

**Note**

If you don't activate the savings estimation mode preference, this column displays the default On-Demand pricing discount information.

**Estimated monthly savings (On-Demand)**

This column lists the approximate monthly cost savings that you experience by migrating your workloads from the current instance type to the recommended instance type under the On-Demand pricing model.

**Savings opportunity (%)**

This column lists the percentage difference between the price of the current instance and the price of the recommended instance type. If savings estimation mode is activated, Compute Optimizer analyzes the Savings Plans and Reserved Instances pricing discounts to generate the savings opportunity percentage. If savings estimation mode isn't activated, Compute Optimizer only uses On-Demand pricing information. For more information, see [Savings estimation mode](#).

**Important**

If you enable Cost Optimization Hub in AWS Cost Explorer, Compute Optimizer uses Cost Optimization Hub data, which includes your specific pricing discounts, to generate your recommendations. If Cost Optimization Hub isn't enabled, Compute Optimizer uses Cost Explorer data and On-Demand pricing information to generate your recommendations. For more information, see [Enabling Cost Explorer](#) and [Cost Optimization Hub](#) in the *AWS Cost Management User Guide*.

## Estimated monthly savings calculation

For each recommendation, we calculate the cost to operate a new instance using the recommended instance type. Estimated monthly savings are calculated based on the number of running hours for current instances in the Auto Scaling group and the difference in rates between the current instance type and the recommended instance type. The estimated monthly savings for Auto Scaling groups displayed on the Compute Optimizer dashboard is a sum of the estimated monthly savings for all over-provisioned instances in Auto Scaling groups, in the account.

## Performance risk

The **Performance risk** column on the **Auto Scaling group details** page defines the likelihood of each recommended instance type not meeting the resource needs of your workload. Compute Optimizer calculates an individual performance risk score for each specification of the recommended instance, including CPU, memory, EBS throughput, EBS IOPS, disk throughput, disk IOPS, network throughput, and network PPS. The performance risk of the recommended instance is calculated as the maximum performance risk score across the analyzed resource specifications.

The values range from very low, low, medium, high, and very high. A very low performance risk means that the instance type recommendation is predicted to always provide enough capability. The higher the performance risk is, the more likely you should validate whether the recommendation will meet the performance requirements of your workload before migrating your resource. Decide whether to optimize for performance improvement, for cost reduction, or for a combination of these two. For more information, see [Changing the Instance Type](#) in the *Amazon Elastic Compute Cloud User Guide*.

### Note

In the Compute Optimizer API, the AWS Command Line Interface (AWS CLI), and AWS SDKs, performance risk is measured on a scale of 0 (very low) to 4 (very high).

Price difference	Performance risk	Desired number of instances
-	-	2
- \$0.0007 per hour	Very low	2
\$0.0000 per hour	Very low	2

## Current performance risk

The **Current performance risk** column on the **Auto Scaling groups recommendations** page defines the likelihood of each current Auto Scaling group not meeting the resource needs of its workload. The current performance risk values range from very low, low, medium, and high. A very low performance risk means that the current Auto Scaling group is predicted to always provide enough capability. The higher the performance risk is, the more likely you should consider the recommendation generated by Compute Optimizer.

## Utilization graphs

The **Auto Scaling group details** page displays utilization metric graphs for current instances in the group. The graphs display data for the analysis period. Compute Optimizer uses the maximum utilization point within each five-minute time interval to generate Auto Scaling group recommendations.

You can change the graphs to display data for the last 24 hours, three days, one week, or two weeks. If you activate the [enhanced infrastructure metrics paid feature](#), you can view data from the last three months.

The following utilization graphs are displayed on the details page:

Graph name	Description
Average CPU utilization (percent)	The average percentage of allocated EC2 compute units used by instances in the Auto Scaling group.

Graph name	Description
Average Network in (MiB/second)	The number of mebibytes (MiB) per second received on all network interfaces by instances in the Auto Scaling group.
Average Network out (MiB/second)	The number of mebibytes (MiB) per second sent out on all network interfaces by instances in the Auto Scaling group.

## Viewing Auto Scaling groups recommendations

Use the following procedure to access the **Auto Scaling groups recommendations** page, and view recommendations for your current Auto Scaling groups.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **Auto Scaling groups** in the navigation pane.

The recommendations page lists the specifications and finding classifications of your Auto Scaling groups, along with the specifications of the recommended groups. The current Auto Scaling groups listed are from the AWS Region that is currently selected, in the selected account.

3. You can perform the following actions on the recommendations page:
  - View the price and performance impact of running your workload on AWS Graviton-based instances. To do this, choose **Graviton (aws-arm64)** in the **CPU architecture preference** dropdown list. Otherwise, the **Current** (default) option displays recommendations that are based on the same CPU vendor and architecture as the current instance.
  - Filter recommendations by AWS Regions, Findings, or Finding reasons. To do this, first select the **Filter by one or more properties** text box. Then, choose the property and a value in the dropdown list that appears.
  - View recommendations for instances in another account. To do this, choose **Account**, and then select a different account ID.

**Note**

If you're signed in to a management account of an organization and trusted access with Compute Optimizer is enabled, you can view recommendations for resources in other accounts. For more information, see [Accounts supported by Compute Optimizer](#) and [Compute Optimizer and AWS Organizations trusted access](#).

- Clear the selected filters. To do this, choose **Clear filters** next to the filter.
- Change the purchasing option that is displayed. To do this, first choose **Settings** (the gear icon), then choose **On-Demand Instances, Reserved Instances, standard 1-year no upfront, or Reserved Instances, standard 3-year no upfront**.
- Access the **Auto Scaling group details** page for a specific Auto Scaling group. To do this, choose the finding classification listed next to the desired group.

## Viewing Auto Scaling group details

Use the following procedure to access the **Auto Scaling group details** page, and view details of a specific group and its recommendations.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **Auto Scaling groups** in the navigation pane.
3. Choose the finding classification listed next to the Auto Scaling group for which you wish to view detailed information.

The details page lists up to three optimization recommendations for the Auto Scaling group that you chose. It lists the specifications of current instances in the Auto Scaling group, the specifications and performance risks of the recommended instances, and utilization metric graphs.

4. You can perform the following actions on the details page:
  - To view the price and performance impact of running your workload on AWS Graviton-based instances, choose **Graviton (aws-arm64)** in the **CPU architecture preference** dropdown. Otherwise, the **Current** (default) option displays recommendations that are based on the same CPU vendor and architecture as the current instance.

- Activate the enhanced infrastructure metrics paid feature to extend the metrics analysis look-back period for the Auto Scaling group you're viewing up to three months (compared to the 14-day default). For more information, see [Enhanced infrastructure metrics](#).
- The utilization metric graphs for your current instance are displayed at the bottom of the page. The solid blue line is the utilization of current instances in the Auto Scaling group.
- To change the time range of the graphs, choose **Time Range**, and then choose **Last 24 hours**, **Last 3 days**, **Last week**, or **Last 2 weeks**. If you activate the [enhanced infrastructure metrics recommendation preference](#), you can also choose **Last 3 months**.

Choosing a shorter time range displays the data points at a higher granularity, which provides a higher level of detail.

- To change the purchasing option that is displayed, choose **Settings** (the gear icon), then choose **On-Demand Instances**, **Reserved Instances, standard 1-year no upfront**, or **Reserved Instances, standard 3-year no upfront**.

## Viewing Amazon EBS volume recommendations

AWS Compute Optimizer generates volume type, volume size, IOPS, and throughput recommendations for Amazon Elastic Block Store (Amazon EBS) volumes. Recommendations for your EBS volumes are displayed in the following pages of the AWS Compute Optimizer console:

- The **EBS volumes recommendations** page lists each of your current volumes, their [finding classifications](#), their current volume type, and their current hourly price. The top recommendation from Compute Optimizer is listed next to each of your volumes, and it includes the recommended volume type, recommended volume size, recommended IOPS, the monthly price of the recommendation, and the price difference between your current volume and the recommendation. Use the recommendations page to compare your current volumes with their top recommendation, which can help you to decide if you should up-size or down-size your volume.
- The **EBS volume details** page, which you can access from the EBS volume recommendations page, lists up to three optimization recommendations for a specific volume. It lists the specifications for each recommendation, their [performance risk](#), and their monthly prices. The details page also displays utilization metric graphs for the current volume.

The recommendations are refreshed daily. They're generated by analyzing the specifications and utilization metrics of the current volume over a period of the last 14 days. For more information, see [Metrics analyzed by AWS Compute Optimizer](#).

Keep in mind that Compute Optimizer generates recommendations for EBS volumes that meet a specific set of requirements, recommendations could take up to 24 hours to be generated, and sufficient metric data must be accumulated. For more information, see [Supported resources and requirements](#).

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## Finding classifications

The **Finding** column on the **EBS volumes recommendations** page provides a summary of how each of your volumes performed during the analyzed period.

The following findings classifications apply to EBS volumes.

Classification	Description
Not optimized	An EBS volume is considered not optimized when Compute Optimizer has identified a volume type, volume size, or IOPS specification that can provide better performance or cost for your workload.
Optimized	An EBS volume is considered optimized when Compute Optimizer determines that the volume is correctly provisioned to run your workload, based on the chosen volume type, volume size, and IOPS specification. For optimized resources

Classification	Description
	, Compute Optimizer might sometimes recommend a new generation volume type.

## Estimated monthly savings and savings opportunity

### Estimated monthly savings (after discounts)

This column lists the approximate monthly cost savings that you experience by migrating your EBS volumes from the current specifications to the recommended specifications under specific discounts. To receive recommendations with specific discounts, the savings estimation mode preference needs to be activated. For more information, see [Savings estimation mode](#).

#### Note

If you don't activate the savings estimation mode preference, this column displays the default On-Demand pricing discount information.

### Estimated monthly savings (On-Demand)

This column lists the approximate monthly cost savings that you will experience by migrating your EBS volumes from the current specifications to the recommended specifications.

### Savings opportunity (%)

This column lists the percentage difference between the price of the current EBS volume specification and the price of the recommended volume specification. If savings estimation mode is activated, Compute Optimizer analyzes specific discounts to generate the savings opportunity percentage. If savings estimation mode isn't activated, Compute Optimizer only uses On-Demand pricing information. For more information, see [Savings estimation mode](#).

#### Important

If you enable Cost Optimization Hub in AWS Cost Explorer, Compute Optimizer uses Cost Optimization Hub data, which includes your specific pricing discounts, to generate your recommendations. If Cost Optimization Hub isn't enabled, Compute Optimizer uses Cost Explorer data and On-Demand pricing information to generate your recommendations. For

more information, see [Enabling Cost Explorer](#) and [Cost Optimization Hub](#) in the *AWS Cost Management User Guide*.

## Estimated monthly savings calculation

For each recommendation, we calculate the cost to operate a new EBS volume using the recommended volume specifications. Estimated monthly savings are calculated based on the number of running hours for the current volume and the difference in rates between the current volume specifications and the recommended volume specifications. The estimated monthly savings for EBS volumes displayed on the Compute Optimizer dashboard is a sum of the estimated monthly savings for all EBS volumes in the account with a finding classification of *Not optimized*.

## Performance risk

The **Performance risk** column on the **EBS volume details** page defines the likelihood of each EBS volume recommendation not meeting the resource needs of your workload. Compute Optimizer calculates an individual performance risk score for each specification of the EBS volume recommendation, including volume type, volume size, baseline IOPS, burst IOPS, baseline throughput, and burst throughput. The performance risk of the EBS volume recommendation is calculated as the maximum performance risk score across the analyzed resource specifications.

The values range from very low, low, medium, high, and very high. A performance risk of very low means that the EBS volume recommendation is predicted to always provide enough capability. The higher the performance risk is, the more likely you should validate whether the recommendation will meet the performance requirements of your workload before migrating your resource. Decide whether to optimize for performance improvement, for cost reduction, or for a combination of these two. For more information, see [Requesting modifications to your EBS Volumes](#) in the *Amazon Elastic Compute Cloud User Guide*.

## Current performance risk

The **Current performance risk** column on the **EBS volumes recommendations** page defines the likelihood of each current EBS volume not meeting the resource needs of its workload. The current performance risk values range from very low, low, medium, and high. A very low performance risk means that the current volume is predicted to always provide enough capability. The higher the performance risk is, the more likely you should consider the recommendation generated by Compute Optimizer.

## Utilization graphs

The **EBS volume details** page displays utilization metric graphs for your current volume. The graphs display data for the analysis period. Compute Optimizer uses the maximum utilization point within each five-minute time interval to generate EBS volume recommendations.

You can change the graphs to display data for the last 24 hours, three days, one week, or two weeks. You can also change the statistic of the graphs between average and maximum.

The following utilization graphs are displayed on the details page:

Graph name	Description
Read operations (per second)	<p>The completed read operations per second for the current EBS volume.</p> <p>For Xen instances, data is reported only when there is read activity on the volume.</p>
Write operations (per second)	<p>The completed write operations per second to the current EBS volume.</p> <p>For Xen instances, data is reported only when there is write activity on the volume.</p>
Read bandwidth (KiB/second)	The read kibibytes (KiB) per second from the current EBS volume.
Write bandwidth (KiB/second)	The written kibibytes (KiB) per second to the current EBS volume.
Burst balance (percent)	<p>The percentage of I/O credits remaining in the burst bucket for the current EBS volume.</p> <p>This metric is displayed only for General Purpose SSD (gp2) volumes in the Compute Optimizer console.</p>

## Viewing EBS volumes recommendations

Use the following procedure to access the **EBS volumes recommendations** page, and view recommendations for your current volumes.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **EBS volumes** in the navigation pane.

The recommendations page lists the specifications and finding classifications of your volumes, along with the specifications of the recommended volumes. The current volumes listed are from the AWS Region that is currently selected, in the selected account.

3. You can perform the following actions on the recommendations page:
  - Filter recommendations by AWS Regions, Findings, or Finding reasons. To do this, first select the **Filter by one or more properties** text box. Then, choose the property and a value in the drop-down list that appears.
  - Filter your recommendations by tags. To do this, select the **Tag key** or **Tag value** text box. Then, enter the key or value you want to filter your EBS volume recommendations by.

For example, to find all recommendations that have a tag with the key of `Owner` and the value of `TeamA`, specify `tag:Owner` for the filter name and `TeamA` for the filter value.

- View recommendations for volumes in another account. To do this, choose **Account**, and then select a different account ID.

### Note

If you're signed in to a management account of an organization and trusted access with Compute Optimizer is enabled, you can view recommendations for resources in other accounts. For more information, see [Accounts supported by Compute Optimizer](#) and [Compute Optimizer and AWS Organizations trusted access](#).

- Clear the selected filters. To do this, choose **Clear filters** next to the filter.
- Access the **EBS volume details** page for a specific volume. To do this, choose the finding classification listed next to the desired volume.

When you're ready, use Amazon EBS Elastic Volumes to modify the configuration of your volumes. For more information, see [Amazon EBS Elastic Volumes](#) in the *Amazon Elastic Compute Cloud User Guide*.

## Viewing EBS volume details

Use the following procedure to access the **EBS volume details** page, and view details of a specific volume and its recommendations.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **EBS volumes** in the navigation pane.
3. Choose the finding classification listed next to the volume for which you wish to view detailed information.

The details page lists up to three optimization recommendations for the volume that you chose. It lists the specifications of your current volume, the specifications and performance risks of the recommended volumes, and utilization metric graphs.

4. You can perform the following actions on the details page:
  - Choose a recommendation option to view the utilization comparison between your current volume and a recommended volume.

The utilization metric graphs for your current volume are displayed at the bottom of the page.

- To change the time range of the graphs, choose **Time Range**, and then choose **Last 24 hours**, **Last 3 days**, **Last week**, or **Last 2 weeks**.

Choosing a shorter time range displays the data points at a higher granularity, which provides a higher level of detail.

- To change the statistic value of the graphs, choose **Statistics**, and then choose **Average** or **Maximum**.

You can use this option to determine the typical volume utilization of your workload over time. To view the highest value observed during the specified period, change the selection

to **Maximum**. This allows you to determine the peak volume usage of your workload over time.

When you're ready, use Amazon EBS Elastic Volumes to modify the configuration of your volumes. For more information, see [Amazon EBS Elastic Volumes](#) in the *Amazon Elastic Compute Cloud User Guide*.

## Viewing Lambda function recommendations

AWS Compute Optimizer generates memory size recommendations for AWS Lambda functions. Recommendations for your functions are displayed in the following pages of the Compute Optimizer console:

- The **Lambda functions recommendations** page lists each of your current functions, their [finding classifications](#), finding reasons, current configured memory, current usage, and current cost. The top recommendation from Compute Optimizer is listed next to each of your functions, and it includes the recommended configured memory, recommended cost, and the price difference between your current function and the recommendation. Note that the recommended cost is a range that is displayed under the **Recommended cost (high)** and **Recommended cost (low)** columns in the console. Use the recommendations page to compare your current functions with their top recommendation, which can help you to decide if you should up-size or down-size the configured memory of your function.
- The **Lambda function details** page, which you can access from the Lambda function recommendations page, lists the top optimization recommendation for a function. It lists the configuration for your current function and the recommendation option. The details page also displays utilization metric graphs for the current function.

The recommendations are refreshed daily. They're generated by analyzing the specifications and utilization metrics of the current function over a period of the last 14 days. For more information, see [Metrics analyzed by AWS Compute Optimizer](#).

Keep in mind that Compute Optimizer generates recommendations for Lambda functions that meet a specific set of requirements, recommendations could take up to 24 hours to be generated, and sufficient metric data must be accumulated. For more information, see [Supported resources and requirements](#).

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## Finding classifications

The **Finding** column on the **Lambda functions recommendations** page provides a summary of how each of your functions performed during the analyzed period.

The following findings classifications apply to Lambda functions.

Classification	Description
Not optimized	<p>A Lambda function is considered not optimized when Compute Optimizer has identified that its configured memory or CPU power (which is proportional to the configured memory) is under-provisioned or over-provisioned. In this case, Compute Optimizer generates a recommendation that can provide better performance or cost for your workload.</p> <p>When a function is not optimized, Compute Optimizer displays a finding reason of either <b>Memory under-provisioned</b> or <b>Memory over-provisioned</b>.</p>
Optimized	<p>A Lambda function is considered optimized when Compute Optimizer determines that its configured memory or CPU power (which is proportional to the configured memory) is correctly provisioned to run your workload.</p>
Unavailable	<p>Compute Optimizer was unable to generate a recommendation for the function. This could be because the function has not met the <a href="#">requirements of Compute Optimizer for Lambda</a></p>

Classification	Description
	<p><a href="#">functions</a>, or the function does not qualify for a recommendation.</p> <p>For this finding classification, Compute Optimizer displays one of the following finding reasons:</p> <ul style="list-style-type: none"><li>• <b>Insufficient data</b> when the function does not have sufficient metric data for Compute Optimizer to generate a recommendation.</li><li>• <b>Inconclusive</b> when the function does not qualify for a recommendation because the function has configured memory greater than 1,792 MB, or Compute Optimizer cannot generate a recommendation with a high degree of confidence.</li></ul> <div data-bbox="592 919 1507 1136"><p> <b>Note</b></p><p>Functions with a finding of <b>Unavailable</b> are not listed in the Compute Optimizer console.</p></div>

## Estimated monthly savings and savings opportunity

### Estimated monthly savings (after discounts)

This column lists the approximate monthly cost savings that you experience by migrating your workloads from the current Lambda function memory specification to the recommended memory specification under the Savings Plans pricing model. To receive recommendations with Savings Plans discounts, the savings estimation mode preference needs to be activated. For more information, see [Savings estimation mode](#).

#### Note

If you don't activate the savings estimation mode preference, this column displays the default On-Demand pricing discount information.

## Estimated monthly savings (On-Demand)

This column lists the approximate monthly cost savings that you experience by migrating your workloads from the current Lambda function memory specification to the recommended memory specification under the On-Demand pricing model.

## Savings opportunity (%)

This column lists the percentage difference between the price of the current Lambda function memory specification and the price of the recommended specification. If savings estimation mode is activated, Compute Optimizer analyzes the Savings Plans pricing discounts to generate the savings opportunity percentage. If savings estimation mode isn't activated, Compute Optimizer only uses On-Demand pricing information. For more information, see [Savings estimation mode](#).

### Important

If you enable Cost Optimization Hub in AWS Cost Explorer, Compute Optimizer uses Cost Optimization Hub data, which includes your specific pricing discounts, to generate your recommendations. If Cost Optimization Hub isn't enabled, Compute Optimizer uses Cost Explorer data and On-Demand pricing information to generate your recommendations. For more information, see [Enabling Cost Explorer](#) and [Cost Optimization Hub](#) in the *AWS Cost Management User Guide*.

## Estimated monthly savings calculation

For each recommendation, we calculate the cost to operate a new Lambda function using the recommended memory specification. Estimated monthly savings are calculated based on the number of running hours for the current Lambda function and the difference in rates between the current memory specification and the recommended memory specification. The estimated monthly savings for Lambda functions displayed on the Compute Optimizer dashboard is a sum of the estimated monthly savings for all Lambda functions in the account with a finding classification of *Not optimized*.

## Current performance risk

The **Current performance risk** column on the **Lambda functions recommendations** page defines the likelihood of each current Lambda function not meeting the resource needs of its workload. The current performance risk values range from very low, low, medium, and high. A

very low performance risk means that the current Lambda function is predicted to always provide enough capability. The higher the performance risk is, the more likely you should consider the recommendation generated by Compute Optimizer.

## Utilization graphs

The **Lambda function details** page displays utilization metric graphs for your current function. The graphs display data for the analysis period. Compute Optimizer uses the maximum utilization point within each five-minute time interval to generate Lambda function recommendations.

You can change the graphs to display data for the last 24 hours, three days, one week, or two weeks.

The following utilization graphs are displayed on the details page:

Graph name	Description
Duration (milliseconds)	The amount of time that your function code spends processing an event.
Errors (count)	The number of invocations that result in a function error. Function errors include exceptions thrown by your code and exceptions thrown by the Lambda runtime. The runtime returns errors for issues such as timeouts and configuration errors.
Invocations (count)	The number of times your function code is executed, including successful executions and executions that result in a function error.

## Viewing Lambda function recommendations

Use the following procedure to access the **Lambda functions recommendations** page, and view recommendations for your current functions.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.

## 2. Choose **Lambda functions** in the navigation pane.

The recommendations page lists the specifications and finding classifications of your functions, along with the specifications of the recommended functions. The current functions listed are from the AWS Region that is currently selected, in the selected account.

## 3. You can perform the following actions on the recommendations page:

- Filter recommendations by AWS Regions, Findings, or Finding reasons. To do this, first select the **Filter by one or more properties** text box. Then, choose the property and a value in the dropdown list that appears.
- Filter your recommendations by tags. To do this, select the **Tag key** or **Tag value** text box. Then, enter the key or value you want to filter your Lambda function recommendations by.

For example, to find all recommendations that have a tag with the key of `Owner` and the value of `TeamA`, specify `tag:Owner` for the filter name and `TeamA` for the filter value.

- View recommendations for functions in another account. To do this, choose **Account**, and then select a different account ID.

### **Note**

If you're signed in to a management account of an organization and trusted access with Compute Optimizer is enabled, you can view recommendations for resources in other accounts. For more information, see [Accounts supported by Compute Optimizer](#) and [Compute Optimizer and AWS Organizations trusted access](#).

- Clear the selected filters. To do this, choose **Clear filters** next to the filter.
- Access the **Lambda function details** page for a specific function. To do this, choose the finding classification listed next to the function that you want to access.

Modify the configured memory of your Lambda function when you're ready. For more information, see [Configuring Lambda function memory](#) in the *AWS Lambda Developer Guide*.

## Viewing Lambda function details

Use the following procedure to access the **Lambda function details** page, and view details of a specific function and its recommendations.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **Lambda functions** in the navigation pane.
3. Choose the finding classification listed next to the function for which you wish to view detailed information.

The details page lists the top optimization recommendation for the function that you chose. It lists the specifications of your current function, the recommended function configuration, and utilization metric graphs.

4. You can perform the following actions on the details page:
  - Choose a recommendation option to view the utilization comparison between your current function and a recommended function.

The utilization metric graphs for your current function are displayed at the bottom of the page.

- To change the time range of the graphs, choose **Time Range**, and then choose **Last 24 hours**, **Last 3 days**, **Last week**, or **Last 2 weeks**.

Choosing a shorter time range displays the data points at a higher granularity, which provides a higher level of detail.

Modify the configured memory of your Lambda function when you're ready. For more information, see [Configuring Lambda function memory](#) in the *AWS Lambda Developer Guide*.

## Viewing recommendations for Amazon ECS services on Fargate

AWS Compute Optimizer generates recommendations for Amazon ECS services on Fargate. These recommendations are displayed on the following pages of the Compute Optimizer console.

The **Recommendations for Amazon ECS services on Fargate** page lists the following information for each of your ECS services:

- Finding classifications
- Finding reasons
- Estimated monthly savings
- Savings opportunity

- Current performance risk

The recommendations from Compute Optimizer are listed next to each of your Amazon ECS services. The information that's provided includes the recommended CPU and memory size within an Amazon ECS service, the hourly price for the selected purchasing option, and the price difference between your current Amazon ECS service and the service with Compute Optimizer's recommended configurations. This information can help you decide if you up-size or down-size your Amazon ECS services on Fargate. For more information about how to view your recommendations for Amazon ECS services on Fargate, see [Viewing recommendations for Amazon ECS services on Fargate](#).

#### Note

The recommendations are refreshed daily and they can take up to 24 hours to generate. Keep in mind that Compute Optimizer requires 24 hours of metrics in the past 14 days to generate recommendations for Amazon ECS service on Fargate. For more information, see [Requirements for Amazon ECS services on Fargate](#).

The **Amazon ECS service details** page provides the following information for your Amazon ECS service:

- Your current Amazon ECS service task size settings and Compute Optimizer's recommended task size settings. Use the table to compare your current task settings, such as CPU size, memory size, and pricing details, with Compute Optimizer recommendations.
- Your current container size settings and Compute Optimizer's recommended container size settings. Use the table to compare your current container settings, such as CPU size, memory size, and memory reserved, with Compute Optimizer recommendations.
- Use the utilization graphs to compare your current Amazon ECS service CPU and memory utilization metrics with Compute Optimizer's recommendation. The graphs show visually the impact of these recommendations.

For more information about how to view the details for your Amazon ECS service on Fargate, see [Viewing details of an Amazon ECS service recommendation](#).

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## Finding classifications

The **Findings** column on the **Recommendations for Amazon ECS services on Fargate** page provides a summary of how each of your services performed during the analysis period.

The following findings classifications apply to Amazon ECS services on Fargate.

Classification	Description
Under-provisioned	When Compute Optimizer detects that there's not enough memory or CPU, an Amazon ECS service is considered under-provisioned. Compute Optimizer displays a finding reason of <b>CPU under-provisioned</b> or <b>Memory under-provisioned</b> . An under-provisioned Amazon ECS service might result in poor application performance.
Over-provisioned	When Compute Optimizer detects that there's excessive memory or CPU, an Amazon ECS service is considered over-provisioned. Compute Optimizer displays a finding reason of <b>CPU over-provisioned</b> or <b>Memory over-provisioned</b> . An over-provisioned Amazon ECS service might result in additional infrastructure costs.
Optimized	When both the CPU and memory of your Amazon ECS service meet the performance requirements of your workload, the service is considered optimized.

For more information about under-provisioned and over-provisioned Amazon ECS services on Fargate, see [Finding reasons](#) in the [Viewing recommendations for Amazon ECS services on Fargate](#) topic.

## Finding reasons

The **Finding reasons** column on the **Recommendations for Amazon ECS services on Fargate** page shows which specification of an Amazon ECS service on Fargate is under-provisioned or over-provisioned.

The following finding reasons apply to Amazon ECS services on Fargate.

Finding reason	Description
CPU over-provisioned	The ECS service CPU configuration can be sized down while still meeting the performance requirements of your workload. This is identified by analyzing the <code>CPUUtilization</code> metric of the current service during the look-back period.
CPU under-provisioned	The ECS service CPU configuration can be sized up to enhance the performance of your workload. This is identified by analyzing the <code>CPUUtilization</code> metric of the current service during the look-back period.
Memory over-provisioned	The ECS service memory configuration can be sized down while still meeting the performance requirements of your workload. This is identified by analyzing the <code>MemoryUtilization</code> metric of the current service during the look-back period.
Memory under-provisioned	The ECS service memory configuration can be sized up to enhance the performance of your workload. This is identified by analyzing the <code>MemoryUtilization</code> metric of the current service during the look-back period.

For more information about these metrics, see [Amazon ECS CloudWatch metrics](#) in the *Amazon ECS User Guide for AWS Fargate*.

## Estimated monthly savings and savings opportunity

### Estimated monthly savings (after discounts)

This column lists the approximate monthly cost savings that you experience after you adjust the configurations of your Amazon ECS service on Fargate to the recommended configurations under the Savings Plans pricing model. To receive recommendations with Savings Plans discounts, the savings estimation mode preference needs to be activated. For more information, see [Savings estimation mode](#).

#### Note

If you don't activate the savings estimation mode preference, this column displays the default On-Demand pricing discount information.

### Estimated monthly savings (On-Demand)

This column lists the approximate monthly cost savings that you experience after you adjust the configurations of your Amazon ECS service on Fargate to the recommended configurations under the On-Demand pricing model.

### Savings opportunity (%)

This column lists the percentage difference between the price of the current ECS service on Fargate and the price of the service with the recommended configurations. If savings estimation mode is activated, Compute Optimizer analyzes the Savings Plans pricing discounts to generate the savings opportunity percentage. If savings estimation mode isn't activated, Compute Optimizer only uses On-Demand pricing information. For more information, see [Savings estimation mode](#).

#### Important

If you enable Cost Optimization Hub in AWS Cost Explorer, Compute Optimizer uses Cost Optimization Hub data, which includes your specific pricing discounts, to generate your recommendations. If Cost Optimization Hub isn't enabled, Compute Optimizer uses Cost Explorer data and On-Demand pricing information to generate your recommendations. For more information, see [Enabling Cost Explorer](#) and [Cost Optimization Hub](#) in the *AWS Cost Management User Guide*.

## Estimated monthly savings calculation

For each recommendation, Compute Optimizer calculates the cost to operate a new Amazon ECS service on Fargate by using the recommended service specifications. Estimated monthly savings are calculated based on the estimated monthly running time of the current Amazon ECS service. The savings are also based on the difference in rates between the current Amazon ECS service and the service with the recommended configurations.

### Note

To calculate the estimated monthly running time of your Amazon ECS services on Fargate, Compute Optimizer analyzes your utilization data over the past 14 days. Then, Compute Optimizer uses the analysis results to estimate your monthly usage.

The estimated monthly savings for Amazon ECS services that are displayed on the Compute Optimizer dashboard is a sum of the estimated monthly savings for all over-provisioned services in the account.

## Current performance risk

The **Current performance risk** column on the **Recommendations for Amazon ECS services on Fargate** page defines how likely each current Amazon ECS service doesn't meet workload resource needs. The values for current performance risk are Very low, Low, Medium, and High.

A very low performance risk means that the current Amazon ECS service is predicted to consistently provide enough capability. A high performance risk is likely due to high CPU or memory utilization. If your Amazon ECS service is always running at capacity, it increases the chances of your service suffering from higher latency or lower performance. Compute Optimizer's recommendations provides you with enough capacity to run your workloads efficiently.

## Compare current settings with recommended task size

On the **Amazon ECS service details** page, compare the current Amazon ECS service task size with Compute Optimizer's recommended task size for your resources. Savings and performance risk information for your Amazon ECS service is also provided in the table. The following table provides a description for each column section in the console.

Column	Description
CPU size	The CPU size of the current Amazon ECS service tasks and Compute Optimizer's recommended CPU size configurations.
Memory size	The memory size of the current Amazon ECS service tasks and Compute Optimizer's recommended memory size configurations.
Pricing details	The On-Demand price of the current Amazon ECS service on Fargate and Compute Optimizer's recommended configurations. For more information, see <a href="#">AWS Fargate Pricing</a> .
Estimated monthly savings	The approximate monthly cost savings after you adjust the configurations of your Amazon ECS service to Compute Optimizer's recommended configurations. For more information, see <a href="#">Estimated monthly savings and savings opportunity</a> .
Savings opportunity (%)	The percentage difference between the price of your current Amazon ECS service and the price of the service with Compute Optimizer's recommended configurations. For more information, see <a href="#">Estimated monthly savings and savings opportunity</a> .
Price difference	The difference between the public pricing of the current Amazon ECS service on Fargate and the service with Compute Optimizer's recommended configurations. For more information, see <a href="#">AWS Fargate Pricing</a> .
Performance risk	This defines how likely your current Amazon ECS service and Compute Optimizer's recommendation doesn't meet workload

Column	Description
	<p>resource needs. The values for performance risk are Very low, Low, Medium, and High. For more information, see <a href="#">Current performance risk</a>.</p>
Auto Scaling configuration	<p>The Auto Scaling configuration of your current Amazon ECS service and Compute Optimizer's recommended task size. If your service has a step scaling policy or a target tracking policy on both CPU and memory, Compute Optimizer can't generate any Auto Scaling recommendations.</p> <p>If a target tracking policy is on the service's CPU only, Compute Optimizer only generates memory size recommendations. Or, if a target tracking policy is on the service's memory only, Compute Optimizer only generates CPU size recommendations.</p> <p>For more information about step scaling and target scaling policies, see <a href="#">Step scaling policies for Application Auto Scaling</a> and <a href="#">Target tracking scaling policies for Application Auto Scaling</a> in the <i>Application Auto Scaling User Guide</i>.</p>

## Compare current settings with recommended container size

On the **Amazon ECS service details** page, compare the current Amazon ECS service container size with the recommended container size options. The table provides your current and Compute Optimizer's recommended CPU size, memory size, and memory reserved configurations. Compute Optimizer generates container-level recommendations that are compatible with the recommended task size.

**Note**

Compute Optimizer only provides container size setting recommendations for when container size settings need to adjust to fit within an Amazon ECS service task. For example, suppose that Compute Optimizer recommends downsizing a task size. Then, Compute Optimizer provides container-level setting recommendations to make sure that the task size and container size settings are compatible with each other.

## Utilization graphs

The **Amazon ECS service details** page displays utilization metric graphs for your Amazon ECS services on Fargate and Compute Optimizer recommendations. The graphs display the current and recommended CPU and memory data for the analysis period. Compute Optimizer uses the maximum utilization point within each one-minute time interval to generate recommendations for ECS services on Fargate.

The solid blue line is the utilization of your current service. If you used the recommendations during the analysis period, the green line is the projected upper bound value and the grey line is the projected lower bound value.

**Note**

The utilization values of an Amazon ECS service can vary based on the infrastructure Fargate uses. Compute Optimizer provides a utilization range to help you consider all possible operating conditions.

You can change the graphs to display data for the last 24 hours, 3 days, 1 week, or 2 weeks. You can also change the statistic of the graphs between average and maximum.

The following utilization graphs are displayed on the details page.

Graph name	Description
CPU utilization (percent)	The percentage of CPU capacity that's used in the service.

Graph name	Description
	<p>The graph compares the CPU utilization data of your current Amazon ECS service with the service when the recommended configurations are applied. The comparison shows you what the CPU utilization is if you configured your CPU to the recommended settings during the analysis period. This comparison shows if the recommended Amazon ECS service settings are within your workload's performance threshold.</p>
Memory utilization (percent)	<p>The percentage of memory that's used in the service.</p> <p>The graph compares the memory utilization data of your current Amazon ECS service with the service when the recommended configurations are applied. The comparison shows you what the memory utilization is if you configured your memory to the recommended settings during the analysis period. This comparison shows if the recommended Amazon ECS service settings are within your workload's performance threshold.</p>

## Viewing recommendations for Amazon ECS services on Fargate

Use the following procedure to access the **Recommendations for Amazon ECS services on Fargate** page, and view recommendations for your current services.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. In the navigation pane, choose **ECS services on Fargate**.

**Note**

The current services listed are from the AWS Region that's currently selected in the selected account.

3. You can perform the following actions on the recommendations page:
  - Filter recommendations by AWS Regions, Findings, or Finding reasons. To do this, first select the **Filter by one or more properties** text box. Then, choose the property and a value in the dropdown list that appears.
  - Filter your recommendations by tags. To do this, select the **Tag key** or **Tag value** text box. Then, enter the key or value you want to filter your ECS service recommendations by.

For example, to find all recommendations that have a tag with the key of `Owner` and the value of `TeamA`, specify `tag:Owner` for the filter name and `TeamA` for the filter value.

- View recommendations for services in another account. To do this, choose **Account**, and then select a different account ID.

**Note**

If you're signed in to a management account of an organization and trusted access with Compute Optimizer is enabled, you can view recommendations for resources in other accounts. For more information, see [Accounts supported by Compute Optimizer](#) and [Compute Optimizer and AWS Organizations trusted access](#).

- Clear the selected filters. To do this, choose **Clear filters** next to the filter.

## Viewing details of an Amazon ECS service recommendation

Use the following procedure to access the **Amazon ECS service details** page, and view details of a specific service and its recommendations.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. In the navigation pane, choose **ECS services on Fargate**.
3. Select the service name you want to view detailed information for. Then, choose **View details**.

4. You can perform the following actions on the details page:
  - On the utilization graphs, you can hover over the graph to see exact values on specific dates over the analysis period.
  - To change the time range of the graphs, choose **Time Range**, and then choose **Last 24 hours**, **Last 3 days**, **Last week**, or **Last 2 weeks**.

Choosing a shorter time range displays the data points at a higher granularity, which provides a higher level of detail.

- To change the statistic value of the graphs, choose **Statistics**, and then choose **Average** or **Maximum**.

You can use this option to determine the typical Amazon ECS service utilization of your workload over time. To view the highest value observed during the specified period, change the selection to **Maximum**. This way, you can determine the peak service usage of your workload over time.

## Viewing commercial software license recommendations

AWS Compute Optimizer generates license recommendations for commercial software that run on Amazon EC2. These recommendations are displayed on the following pages of the Compute Optimizer console.

The **Recommendations for commercial software licenses** page lists the following information for each of your EC2 instances with licenses.

- Finding classifications
- Finding reasons
- Estimated monthly savings
- Savings opportunity
- On-Demand prices
- BYOL hourly license prices

The recommendations from Compute Optimizer are listed next to each of your EC2 instances with commercial software licenses. The information that's provided includes recommended saving opportunities, EC2 instance On-Demand prices, and hourly bring your own license (BYOL)

prices. This information can help you decide if you should down-size your license edition. For more information about how to view your license recommendations for commercial software, see [Viewing recommendations for commercial software licenses](#).

### Note

The recommendations are refreshed daily and they can take up to 24 hours to generate. Keep in mind that Compute Optimizer requires 24 hours of metrics in the past 14 days to generate license recommendations. For more information, see [Commercial software license requirements](#).

The **License details** page provides the following information for your license recommendation:

- Your current license settings and Compute Optimizer's recommended licence configurations. Use the table to compare your current license configurations, such as edition, model, and number of instance cores, with Compute Optimizer recommendations.
- Use the utilization graphs to access the utilization of the current license during the analysis period.

For more information about how to view the details for your license recommendation, see [Viewing details of a commercial software license recommendation](#).

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## Finding classifications

The **Findings** column on the **Commercial software license recommendations** page provides a summary of how each of your licenses performed during the analyzed period.

The following findings classifications apply to Microsoft SQL Server licenses.

Classification	Description
Insufficient metrics	When Compute Optimizer detects that your CloudWatch Application Insights isn't enabled or is enabled with insufficient permissions. Compute Optimizer displays a finding reason of <code>InvalidCloudwatchApplicationInsights</code> or <code>CloudwatchApplicationInsightsError</code> .
Not optimized	When Compute Optimizer detects that your EC2 infrastructure isn't using any of the Microsoft SQL server license features you're paying for, a license is considered not optimized. Compute Optimizer displays a finding reason of <code>LicenseOverprovisioned</code> . A license that isn't optimized might result in unnecessary additional costs.
Optimized	When the license for your SQL server database meets your performance requirements, the license is considered optimized.

For more information about these finding classifications, see [Finding reasons](#).

## Finding reasons

The **Finding reasons** column on the **EC2 instances recommendations** and **EC2 instance details** pages shows which specification of an instance is under-provisioned or over-provisioned.

The following finding reasons apply to Microsoft SQL server license recommendations.

Finding reason	Description
<code>LicenseOverprovisioned</code>	A license is considered over-provisioned when any of the current license features aren't in use. CloudWatch Application

Finding reason	Description
	<p>Insights analyzes the <code>mssql_enterprise_features_used</code> metric to identify this.</p> <p>If your license is over-provisioned, you can consider downgrading your Microsoft SQL Server license. If you meet certain eligibility requirements you can downgrade from SQL Server Enterprise edition to SQL Server Standard edition, or Developer edition if it is a non-production workload. For more information, see <a href="#">Downgrade your Microsoft SQL Server edition</a> in the <i>Microsoft SQL Server on Amazon EC2 User Guide</i>.</p>
InvalidCloudwatchApplicationInsights	<p>The backend exporter of your CloudWatch Application Insights isn't configured properly. For more information about how to configure CloudWatch Application Insights, see <a href="#">Get started with Amazon CloudWatch Application Insights</a> in the <i>Amazon CloudWatch User Guide</i>.</p>
CloudwatchApplicationInsightsError	<p>You have configured CloudWatch Application Insights but it hasn't identified the number of Enterprise edition features in use. It can take a few hours to identify the features. If the features aren't identified after a few hours, contact AWS Support.</p>

## Estimated monthly savings and savings opportunity

The **Estimated monthly savings (On-Demand)** column lists the approximate monthly cost savings after you downgrade your license edition based on Compute Optimizer's recommendations. To calculate this, Compute Optimizer multiplies the savings per hour by the estimated monthly running hours.

The **Savings opportunity (%)** column lists the percentage difference between your current Microsoft SQL server license and Compute Optimizer's recommended license. The Bring Your Own License (BYOL) savings calculation is based on the license price. The License Included savings calculation is based on the On-Demand pricing.

### Important

Savings opportunity data requires that you opt in to Cost Explorer, as well as activate **Receive Amazon EC2 resource recommendations** in the Cost Explorer preferences page. That creates a connection between Cost Explorer and Compute Optimizer. With this connection, Cost Explorer generates savings estimates considering the price of existing resources, the price of recommended resources, and historical usage data. Estimated monthly savings reflects the projected dollar savings associated with each of the recommendations generated. For more information, see [Enabling Cost Explorer](#) and [Optimizing your cost with Rightsizing Recommendations](#) in the *Cost Management User Guide*.

## Inferred workload types

The **Inferred workload types** column on the **EC2 instances recommendations** page lists the applications that might be running on the instance as inferred by Compute Optimizer. This column does this by analyzing the attributes of your instances. These attributes include the instance name, tags, and configuration. Compute Optimizer can currently infer if your instances are running Amazon EMR, Apache Cassandra, Apache Hadoop, Memcached, NGINX, PostgreSQL, Redis, Kafka, or SQLServer. By inferring the applications that run on your instances, Compute Optimizer can identify the effort to migrate your workloads from x86-based instance types to Arm-based AWS Graviton instances types. For more information, see [Migration effort](#) in the next section of this guide.

### Note

You can't infer the SQLServer application in the Middle East (Bahrain), Africa (Cape Town), Asia Pacific (Hong Kong), Europe (Milan), and Asia Pacific (Jakarta) Regions.

## Compare current license edition with recommended license edition

On the **License details** page, compare the configurations of your current license edition with Compute Optimizer's recommended license edition. The following table provides a description for each column section in the console.

Column	Description
License edition	The current license edition and the recommended license edition. For example, Enterprise, Standard, and Free.
Instance On-Demand price	The current and recommended On-Demand instance prices.
BYOL price (hourly)	The current and recommended Bring your own license (BYOL) hourly price.
Estimated monthly savings	The approximate monthly cost savings after you downgrade your license edition based on Compute Optimizer's recommendations. For more information, see <a href="#">Estimated monthly savings and savings opportunity</a> .
Savings opportunity (%)	The percentage difference between your current Microsoft SQL server license and Compute Optimizer's recommended license. For more information, see <a href="#">Estimated monthly savings and savings opportunity</a> .
Instance cores	The current and recommended number of physical cores for an instance. Number of instance cores are used in licensing calculations.

## Utilization graphs

The **License details** page displays current resource utilization of the current commercial software license. The graph only displays the number of Enterprise edition features that were used data over the analysis period.

You can change the graphs to display data for the last 24 hours, three days, one week, or two weeks.

## Viewing recommendations for commercial software licenses

Use the following procedure to access the **Recommendations for commercial software licenses** page.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **Licenses** in the navigation pane.
3. (Optional) You can also access the license recommendations from the EC2 instances page. To do this, first select the Filter by one or more properties. From the dropdown list that appears, choose the **Inferred workload type** property and then choose the **Inferred workload type = SQL Server value**.

### Note

The current licenses listed are from the AWS Region that is currently selected, in the selected account.

4. You can perform the following actions on the recommendations for commercial software licenses page:
  - Filter recommendations by AWS Regions, Findings, or Finding reasons. To do this, first select the **Filter by one or more properties** text box. Then, choose the property and a value in the dropdown list that appears.
  - Filter your recommendations by tags. To do this, select the **Tag key** or **Tag value** text box. Then, enter the key or value you want to filter your license recommendations by.

For example, to find all recommendations that have a tag with the key of `Owner` and the value of `TeamA`, specify `tag:Owner` for the filter name and `TeamA` for the filter value.

- View recommendations for functions in another account. To do this, choose **Account**, and then select a different account ID.

### Note

If you're signed in to a management account of an organization and trusted access with Compute Optimizer is enabled, you can view recommendations for resources

in other accounts. For more information, see [Accounts supported by Compute Optimizer](#) and [Compute Optimizer and AWS Organizations trusted access](#).

- Clear the selected filters. To do this, choose **Clear filters** next to the filter.

## Viewing details of a commercial software license recommendation

Use the following procedure to access the **License details** page, and view details of a specific license recommendation.

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **Licenses** in the navigation pane.
3. Choose the **Instance ID** you want to view detailed information.
4. You can perform the following actions on the details page:
  - On the utilization graphs, you can hover over the graph to see exact values on specific dates over the analysis period.
  - To change the time range of the graphs, choose **Time Range**, and then choose **Last 24 hours**, **Last 3 days**, **Last week**, or **Last 2 weeks**.

Choosing a shorter time range displays the data points at a higher granularity, which provides a higher level of detail.

- To change the statistic value of the graphs, choose **Statistics**, and then choose **Average** or **Maximum**.

# Exporting recommendations

You can export your recommendations to record them over time, and share the data with others. Recommendations are exported in a CSV file, and its metadata in a JSON file, to an existing Amazon Simple Storage Service (Amazon S3) bucket that you specify.

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- [Amazon S3 bucket permission requirements](#)
- [Exporting your recommendations](#)
- [Viewing your export jobs](#)
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## Restrictions

The following restrictions apply when exporting recommendations:

- You can have only one recommendations export job in progress for each resource type, and for each AWS Region. Before creating a new export job, confirm that all previous export jobs are complete. For more information about viewing your export jobs, including those that are in progress, see [Viewing your export jobs](#).
- Recommendations for each resource type and in each are exported in separate CSV files. You can't export recommendations from multiple resource types and Regions into a single file.
- Large export jobs can take up to a few hours to complete. To lower your wait time, consider limiting the recommendation columns that you include in your export job. Additionally, if your account is the management account of an organization, consider limiting the number of member accounts to include in your export job.

## Amazon S3 bucket permission requirements

Before you create an export job, you must create the destination S3 bucket for your recommendations to export to. Compute Optimizer doesn't create the S3 bucket for you. The S3

bucket that you specify for your recommendations to export to can't be publicly accessible, and can't be configured as a [Requester Pays](#) bucket. After you create the S3 bucket, confirm that the bucket has the required permissions policy to allow Compute Optimizer to write the export files to it. If you plan to specify an object prefix when you create your recommendations export job, include the object prefix in the policy that you add to the S3 bucket. For more information, see [Amazon S3 bucket policy for AWS Compute Optimizer](#).

## Exporting your recommendations

Use the following procedure to export your recommendations.

### To export your recommendations

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose a resource type in the navigation pane. For example, choose **EC2 instances**, **Auto Scaling groups**, **EBS volume**, **Lambda function**, or **ECS services on Fargate**.
3. On the **Recommendations** page, choose the **Action** dropdown menu, and choose **Export Recommendations**.
4. On the **Export Recommendations** page, under **Export destination settings**, specify the following:
  - a. For **Region**, specify an AWS Region for your export.
  - b. For **Destination S3 bucket name**, specify the name of an existing S3 bucket in the specific Region.
  - c. (Optional) Choose **Add Region** to export the recommendations for another AWS Region.
  - d. (Optional) Choose **Remove** next to a specific Region and S3 bucket name to remove the destination from the export job.
  - e. (Optional) For **Object prefix**, specify a prefix to use in the destination S3 bucket for all of the export files. The prefix is an optional addition to the S3 object key that organizes your export files in your S3 bucket. You can specify a date prefix (for example, `2020/april`), a resource type prefix (for example, `ec2-instances`), or a combination of both (for example, `2020/april/ec2-instances`).
5. Under **Export filters**, specify the following:
  - a. For **Resource type**, choose the resource type to include in your recommendations export.

- b. For **Accounts**, choose if you want to include recommendations for all member accounts of the organization. This option is available only if your account is the management account of an organization.
  - c. For **CPU architecture preference**, choose **Graviton (aws-arm64)** to export recommendations that are based on the 64-bit ARM architecture (AWS Graviton). Otherwise, choose **Current** to export recommendations that are based on the CPU architecture of your current instances.
6. Under **Columns to include**, choose the recommendations data to include in your recommendations export. For more information about the columns to include, see [Exported files](#).
7. After confirming that the export job is configured correctly, choose **Export**. Or, to return to the **Recommendations** page without creating the export job, choose **Cancel**. If you cancel the export job configuration, the configuration is deleted.

 **Note**

If you export recommendations for multiple AWS Regions at one time, they're treated as separate export jobs. Compute Optimizer tries to start all of them at once. If an export job fails to start, the **Export Recommendations** page displays an error. Export jobs that successfully start continue to process. But, before trying to start them again, you must resolve the errors for the failed jobs.

Your recommendations export job might take up to a few hours to complete. Check the status of your export jobs by viewing the **Exports** page. For more information, see [Viewing your export jobs](#). Your recommendations export file and its associated metadata file are saved to the specified S3 bucket when the export job is complete. The following are examples of the full Amazon S3 object key for the export file and its associated metadata file. The account ID in the object keys is the account of the requester of the export job. For more information, see [Exported files](#).

```
s3://<BucketName>/<OptionalPrefix>/compute-optimizer/<AccountId>/<AWSRegion>-<CreatedTimestamp>-<UniqueJobID>.csv
```

```
s3://<BucketName>/<OptionalPrefix>/compute-optimizer/<AccountId>/<AWSRegion>-<CreatedTimestamp>-<UniqueJobID>-metadata.json
```

## Example:

```
s3://compute-optimizer-exports/ec2-instance-recommendations/compute-optimizer/111122223333/us-west-2-2020-03-03T133027-3e496c549301c8a4dfcsdX.csv
```

```
s3://compute-optimizer-exports/ec2-instance-recommendations/compute-optimizer/111122223333/us-west-2-2020-03-03T133027-3e496c549301c8a4dfcsdX-metadata.json
```

## Viewing your export jobs

Follow these steps to view the export jobs created in the last seven days.

### To view your export jobs

1. Open the Compute Optimizer console at <https://console.aws.amazon.com/compute-optimizer/>.
2. Choose **Exports** in the navigation pane.

The **Exports** page displays the recommendation export jobs that were created in the last seven days.

Export jobs can have one of the following statuses.

- **Queued** - The export job didn't start yet. You can have only one recommendations export job in progress for each resource type, and for each AWS Region.
  - **In progress** - The export job started but isn't complete. Export jobs can take anywhere from a few minutes to a few hours to complete. This depends on the number of recommendations and fields that the export job includes.
  - **Complete** - The export job is complete. A link to the export CSV file in the destination Amazon S3 bucket is displayed for each complete export job under the export destination column.
  - **Failed** - The export job failed to start or complete. The message that's displayed under the failure reason column for the export job provides additional information about why the export job failed. For example, the export might have failed because the destination Amazon S3 bucket didn't have the required permissions. After resolving the issue, try to export your recommendations again. For more information, see [Troubleshooting failed export jobs](#).
3. You can perform the following actions on the page:

- Choose the export destination link for a completed job to access the destination S3 bucket. The export destination displays only for successful export jobs. A dash (-) displays for export jobs that are in progress or that failed.
- Scroll right to view the failure reason for failed export jobs. Use the failure reason to determine why your export job isn't complete.

## Exported files

Recommendations are exported in a CSV file, and the metadata in a JSON file, to the Amazon S3 bucket that you specified when you created the export job.

## Recommendations file

The recommendations file includes the recommendation data for the recommendation columns that you choose to include when you create the export job. The following tables list all of the recommendation columns that can be included in the export file for each resource type.

In the following tables, *API field name* column represents the fields that you can specify when requesting a recommendations export using the API. The *Description* column describes the data of each field, the name of the column as displayed in the Compute Optimizer console, and the name of the column as listed in the export CSV file. The recommendation data columns in the CSV file are numbered when multiple recommendations are generated for each resource. Ranked recommendation columns, in which *<rank>* is replaced with a ranking, correspond to each other. For example, `recommendationOptions_1_memory`, `recommendationOptions_1_network`, and `recommendationOptions_1_vcpus` correspond to each other, and are for the same recommendation.

### Note

By default, all export files include the following columns:

- **recommendations\_count** - The number of recommendations included in the export file.
- **errorCode** - The error code for when a recommendation wasn't generated for a resource.
- **errorMessage** - The error message that corresponds to the error in the `errorCode` column.

## EC2 instance recommendation fields

API field name	Description
AccountId	<p>The account ID that the current instance was created under.</p> <p>This field is displayed as the <b>Account ID</b> column in the EC2 instances recommendations and instance details pages of the Compute Optimizer console. This field is labeled <b>Account ID</b> on the Export recommendations page of the Compute Optimizer console, and as <b>accountId</b> in the export CSV file.</p>
CurrentInstanceType	<p>The instance type of the current instance.</p> <p>This field is displayed as the <b>Current instance type</b> column in the EC2 instances recommendations and instance details pages of the Compute Optimizer console. This field is labeled <b>Current instance type</b> on the Export recommendations page of the Compute Optimizer console, and as <b>currentInstanceType</b> in the export CSV file.</p>
CurrentMemory	<p>The memory of the current instance.</p> <p>This field is displayed as the <b>Memory</b> column in the EC2 instance details page of the Compute Optimizer console. This field is labeled <b>Current memory</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_memory</b> in the export CSV file.</p>
CurrentNetwork	<p>The network performance, or rate of data transfer, of the current instance.</p>

API field name	Description
	<p>This field is displayed as the <b>Network</b> column in the EC2 instance details page of the Compute Optimizer console. This field is labeled <b>Current network</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_network</b> in the export CSV file.</p>
CurrentOnDemandPrice	<p>The On-Demand price of the current instance. The price listed might not reflect the actual price you pay for the instance.</p> <p>This field is displayed as the <b>Current On-Demand price</b> column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled <b>Current On-Demand price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_onDemandPrice</b> in the export CSV file.</p>
CurrentStandardOneYearNoUpfrontReservedPrice	<p>The Reserved Instances, standard 1-year no upfront price of the current instance. The price listed might not reflect the actual price you pay for the instance.</p> <p>This field is displayed as the <b>Current 1-year RI price</b> column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled <b>Current 1-year RI price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_standardOneYearNoUpfrontReservedPrice</b> in the export CSV file.</p>

API field name	Description
CurrentStandardThreeYearNoUpfrontReservedPrice	<p>The Reserved Instances, standard 3-year no upfront price of the current instance. The price listed might not reflect the actual price you pay for the instance.</p> <p>This field is displayed as the <b>Current 3-year RI price</b> column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled <b>Current 3-year RI price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_standardThreeYearNoUpfrontReservedPrice</b> in the export CSV file.</p>
CurrentStorage	<p>The local storage volume of the current instance.</p> <p>This field is displayed as the <b>Storage</b> column in the EC2 instance details page of the Compute Optimizer console. This field is labeled <b>Current storage</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_storage</b> in the export CSV file.</p>
CurrentVCpus	<p>The number of vCPUs of the current instance.</p> <p>This field is displayed as the <b>vCPUs</b> column in the EC2 instance details page of the Compute Optimizer console. This field is labeled <b>Current vCPUs</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_vcpus</b> in the export CSV file.</p>

API field name	Description
Finding	<p>The finding classification for the current instance. Instances can be classified as under-provisioned, over-provisioned, or optimized . For more information, see <a href="#">Instance finding classifications</a>.</p> <p>This field is displayed as the <b>Finding</b> column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled <b>Finding</b> on the Export recommendations page of the Compute Optimizer console, and as <b>finding</b> in the export CSV file.</p>
FindingReasonCodes	<p>The finding reasons describe which specifications of the current instance were under-provisioned or over-provisioned. Specifications include CPU, memory, local disk throughput, local disk IOPS, EBS volume throughput, EBS volume IOPS, network bandwidth, or network packets-per-second.</p> <p>This field is displayed as the <b>Finding reasons</b> column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled <b>Finding reason codes</b> on the Export recommendations page of the Compute Optimizer console, and as <b>findingReasonCodes_&lt;code&gt;</b> in the export CSV file. The <i>&lt;code&gt;</i> portion of the label identifies the instance specifications (CPU, memory, network, etc.) that are over-provisioned or under-provisioned.</p>

API field name	Description
InstanceArn	<p>The Amazon Resource Name (ARN) of the current instance.</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled <b>Instance ARN</b> on the Export recommendations page of the Compute Optimizer console, and as <b>instanceArn</b> in the export CSV file.</p>
InstanceState	<p>The state of the instance when the recommendation was generated.</p> <p>This field is displayed as the <b>Recommendation instance state</b> column in the EC2 instance recommendation and detail pages of the Compute Optimizer console. This field is labeled <b>Recommendation instance state</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>instanceArn</b> in the export CSV file.</p>
InstanceName	<p>The name of the current instance.</p> <p>This field is displayed as the <b>Instance name</b> column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled <b>Instance name</b> on the Export recommendations page of the Compute Optimizer console, and as <b>instanceName</b> in the export CSV file.</p>

API field name	Description
LastRefreshTimestamp	<p>The timestamp of when the instance recommendation was last refreshed.</p> <p>This field isn't displayed in the Compute Optimizer console. This field is labeled <b>Last refresh timestamp</b> on the Export recommendations page of the Compute Optimizer console, and as <b>lastRefreshTimestamp_UTC</b> in the export CSV file.</p>
LookbackPeriodInDays	<p>The number of preceding days for which Compute Optimizer analyzed metric data from the current instance to generate the recommendation.</p> <p>This field isn't displayed in the Compute Optimizer console. This field is labeled <b>Lookback period in days</b> on the Export recommendations page of the Compute Optimizer console, and as <b>lookBackPeriodInDays</b> in the export CSV file.</p>
RecommendationOptionsInstanceType	<p>The instance type of the instance recommendation.</p> <p>This field is displayed as the <b>Recommended instance type</b> column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled <b>Recommendation options Instance type</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_instanceType</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsMemory	<p>The memory of the instance recommendation.</p> <p>This field is displayed as the <b>Memory</b> column in the EC2 instance details page of the Compute Optimizer console. This field is labeled <b>Recommendation options memory</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_memory</b> in the export CSV file.</p>
RecommendationOptionsNetwork	<p>The network performance or rate of data transfer of the instance recommendation.</p> <p>This field is displayed as the <b>Network</b> column in the EC2 instance details page of the Compute Optimizer console. This field is labeled <b>Recommendation options network</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_network</b> in the export CSV file.</p>
RecommendationOptionsOnDemandPrice	<p>The On-Demand price of the instance recommendation.</p> <p>This field is displayed as the <b>Recommended On-Demand price</b> column in the EC2 instance recommendations page of the Compute Optimizer console. This field is labeled <b>Recommendation options On-Demand price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_onDemandPrice</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsPerformanceRisk	<p>The performance risk of the instance recommendation.</p> <p>This field is displayed as the <b>Performance risk</b> column in the EC2 instance details page of the Compute Optimizer console. This field is labeled <b>Recommendation options performance risk</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_performanceRisk</b> in the export CSV file.</p>
RecommendationOptionsPlatformDifferences	<p>The platform differences column displays the configuration differences between the current instance and each recommended instance type option. The recommended instance type might use a different CPU architecture, hypervisor, instance store, network interface, storage interface, and virtualization type.</p> <p>This field is displayed as the <b>Platform differences</b> column in the EC2 instance details page of the Compute Optimizer console. This field is labeled <b>Recommendation options platform differences</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_platformDifferences_&lt;difference&gt;</b> in the export CSV file. The <b>&lt;difference&gt;</b> portion of the label identifies the configuration that's different between the current instance and recommended instance type.</p>

API field name	Description
RecommendationOptionsProjectedUtilizationMetricsCpuMaximum	<p>The projected maximum CPU utilization metric of the instance recommendation. This value defines the maximum CPU utilization of the recommended instance type if you used the recommended instance type during the look-back period.</p> <p>This field is displayed as an overlay on the <b>CPU utilization (percent)</b> metric graph in the EC2 instance details page of the Compute Optimizer console. This field is labeled <b>Recommendation options projected utilization metrics CPU maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_projectedUtilizationMetrics_CPU_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsProjectedUtilizationMetricsMemoryMaximum	<p>The projected maximum memory utilization metric of the instance recommendation. This value defines the maximum memory utilization of the recommended instance type if you used the recommended instance type during the look-back period.</p> <p>This field is displayed as an overlay on the <b>Memory utilization (percent)</b> metric graph in the EC2 instance details page of the Compute Optimizer console. This field is labeled <b>Recommendation options projected utilization metrics memory maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_projectedUtilizationMetrics_MEMORY_MAXIMUM</b> in the export CSV file.</p>
RecommendationOptionsStandardOneYearNoUpfrontReservedPrice	<p>The Reserved Instances, standard 1-year no upfront price for the instance recommendation.</p> <p>This field is displayed as the <b>Recommended 1-year RI price</b> column in the EC2 instance recommendations page of the Compute Optimizer console. This field is labeled <b>Recommended options 1-year RI price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_standardOneYearNoUpfrontReservedPrice</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsStandardThreeYearNoUpfrontReservedPrice	<p>The Reserved Instances, standard 3-year no upfront price for the instance recommendation.</p> <p>This field is displayed as the <b>Recommended 3-year RI price</b> column in the EC2 instance recommendations page of the Compute Optimizer console. This field is labeled <b>Recommended options 3-year RI price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_standard ThreeYearNoUpfrontReservedPrice</b> in the export CSV file.</p>
RecommendationOptionsStorage	<p>The local storage volume of the instance recommendation.</p> <p>This field is displayed as the <b>Storage</b> column in the EC2 instance details page of the Compute Optimizer console. This field is labeled <b>Recommendation options storage</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_storage</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsVcpus	<p>The vCPUs of the instance recommendation.</p> <p>This field is displayed as the <b>vCPUs</b> column in the EC2 instance details page of the Compute Optimizer console. This field is labeled <b>Recommendation options vCPUs</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_vcpus</b> in the export CSV file.</p>
RecommendationsSourcesRecommendationSourceArn	<p>The Amazon Resource Name (ARN) of the current resource.</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled <b>Recommendation source ARN</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationsSources_&lt;rank&gt;_recommendationSourceArn</b> in the export CSV file.</p>
RecommendationsSourcesRecommendationSourceType	<p>The resource type of the current resource (for example, instance).</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled <b>Recommendation source type</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationsSources_&lt;rank&gt;_recommendationSourceType</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsCpuMaximum	<p>The maximum CPU utilization metric of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>CPU utilization (percent)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics CPU maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_CPU_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsDiskReadBytesPerSecondMaximum	<p>The maximum disk read bytes per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Disk read (MiB/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics disk read bytes per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_DISK_READ_BYTES_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsDiskReadOpsPerSecondMaximum	<p>The maximum disk read operations per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Disk read (operations/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics disk read operations per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_DISK_READ_OPS_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsDiskWriteBytesPerSecondMaximum	<p>The maximum disk write bytes per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Disk write (MiB/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics disk write bytes per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_DISK_WRITE_BYTES_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsDiskWriteOpsPerSecondMaximum	<p>The maximum disk write operations per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Disk write (operations/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics disk write operations per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_DISK_WRITE_OPS_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsEbsReadBytesPerSecondMaximum	<p>The maximum bytes read per second for volumes attached to an instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>EBS read bandwidth (MiB/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics EBS read bandwidth bytes per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_EBS_READ_BYTES_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsEbsReadOpsPerSecondMaximum	<p>The maximum number of read operations per second for volumes attached to an instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>EBS read operations (per second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics EBS read throughput operations per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_EBS_READ_OPS_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsEbsWriteBytesPerSecondMaximum	<p>The maximum bytes written per second for volumes attached to an instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>EBS write bandwidth (MiB/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics EBS write bandwidth bytes per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_EBS_WRITE_BYTES_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsEbsWriteOpsPerSecondMaximum	<p>The maximum number of write operations per second for volumes attached to an instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>EBS write operations (per second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics EBS write throughput operations per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_EBS_WRITE_OPS_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsMemoryMaximum	<p>The maximum memory utilization metric of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Memory utilization (percent)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics memory maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_MEMORY_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsNetworkInBytesPerSecondMaximum	<p>The maximum network in bytes per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Network in (MiB/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics network in bytes per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_NETWORK_IN_BYTES_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsNetworkOutBytesPerSecondMaximum	<p>The maximum network out bytes per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Network out (MiB/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics network out bytes per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_NETWORK_OUT_BYTES_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsNetworkPacketsInPerSecondMaximum	<p>The maximum network packets in per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Network packets in (per second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics network packets in per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_NETWORK_PACKETS_IN_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsNetworkPacketsOutPerSecondMaximum	<p>The maximum network packets out per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Network packets out (per second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics network packets out per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_NETWORK_PACKETS_OUT_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
EffectiveRecommendationPreferencesEnhancedInfrastructureMetrics	<p>The status of the enhanced infrastructure metrics recommendation preference for the listed recommendation. An <b>Active</b> status confirms the recommendation listed is considering the longer three-month lookback period. An <b>Inactive</b> status confirms that the recommendation is not yet considering the longer lookback period. For more information, see <a href="#">Enhanced infrastructure metrics</a>.</p> <p>This field is displayed as the <b>Effective enhanced infrastructure metrics</b> column in the EC2 instance recommendations page of the Compute Optimizer console. On the Export recommendations page of the Compute Optimizer console, it's labeled as <b>Effective recommendation preferences enhanced infrastructure metrics</b>, and in the export CSV file, it's labeled as <b>EffectiveRecommendationPreferencesEnhancedInfrastructureMetrics</b>.</p>
EffectiveRecommendationPreferencesExternalMetricsSource	<p>The status of the external metrics recommendation preference for the listed recommendation. For more information, see <a href="#">External metrics ingestion</a>.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Effective recommendation preferences external metrics source</b>, and in the export CSV file format it's labeled as <b>EffectiveRecommendationPreferencesExternalMetricsSource</b>.</p>

API field name	Description
EffectiveRecommendationPreferencesCpuVendorArchitectures	<p>The CPU vendor and architecture for an EC2 instance recommendation.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Effective recommendation preferences CPU vendor architectures</b>, and in the export CSV file, it's labeled as <b>EffectiveRecommendationPreferencesCpuVendorArchitectures</b>.</p>
CurrentPerformanceRisk	<p>The performance risk rating for a current instance.</p> <p>This field is displayed as the <b>Current performance risk</b> column in the EC2 instances recommendations page of the Compute Optimizer console. On the Export recommendations page of the Compute Optimizer console, it's labeled as <b>Current performance risk</b>, and in the export CSV file, it's labeled as <b>CurrentPerformanceRisk</b>.</p>
RecommendationOptionsSavingsOpportunityPercentage	<p>The estimated monthly savings possible as a percentage of monthly cost by adopting Compute Optimizer recommendations for an instance.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options savings opportunity percentage</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsSavingsOpportunityPercentage</b>.</p>

API field name	Description
RecommendationOptionsEstimatedMonthlySavingsCurrency	<p>The currency of the estimated monthly savings.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options estimated monthly savings currency</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsEstimatedMonthlySavingsCurrency</b>.</p>
RecommendationOptionsEstimatedMonthlySavingsValue	<p>The value of the estimated monthly savings.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options estimated monthly savings value</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsEstimatedMonthlySavingsValue</b>.</p>
EffectiveRecommendationPreferencesInferredWorkloadTypes	<p>The status of the inferred workload type recommendation preference for the listed recommendation. For more information, see <a href="#">Inferred workload type</a>.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Effective recommendation preferences inferred workload types</b>, and in the export CSV file, it's labeled as <b>EffectiveRecommendationPreferencesInferredWorkloadTypes</b>.</p>

API field name	Description
InferredWorkloadTypes	<p>The application that might be running on the instance as detected by Compute Optimizer. For more information, see <a href="#">Inferred workload types</a>.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Inferred workload types</b>, and in the export CSV file, it's labeled as <b>InferredWorkloadTypes</b>.</p>
RecommendationOptionsMigrationEffort	<p>The level of effort that might be required to migrate from the current instance type to the recommended instance type. For more information, see <a href="#">Inferred workload types</a>.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options migration effort</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsMigrationEffort</b>.</p>

## Auto Scaling group recommendation fields

API field name	Description
AccountId	<p>The account ID in which the current Auto Scaling group was created.</p> <p>This field is displayed as the <b>Account ID</b> column in the Auto Scaling groups recommendations and group details pages of the Compute Optimizer console. This field is labeled <b>Account ID</b> on the Export</p>

API field name	Description
	recommendations page of the Compute Optimizer console, and as <b>accountId</b> in the export CSV file.
AutoScalingGroupArn	<p>The Amazon Resource Name (ARN) of the current Auto Scaling group.</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled <b>Auto Scaling group ARN</b> on the Export recommendations page of the Compute Optimizer console, and as <b>autoScalingGroupArn</b> in the export CSV file.</p>
AutoScalingGroupName	<p>The name of the Auto Scaling group.</p> <p>This field is displayed as the <b>Auto Scaling group name</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Auto Scaling group name</b> on the Export recommendations page of the Compute Optimizer console, and as <b>autoScalingGroupName</b> in the export CSV file.</p>

API field name	Description
CurrentConfigurationDesiredCapacity	<p>The desired capacity of the current Auto Scaling group.</p> <p>This field is displayed as the <b>Desired number of instances</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Current desired capacity</b> on the Export recommendations page of the Compute Optimizer console, and as <b>currentConfiguration_desiredCapacity</b> in the export CSV file.</p>
CurrentConfigurationInstanceType	<p>The instance type of instances in the current Auto Scaling group.</p> <p>This field is displayed as the <b>Current instance type</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Current instance type</b> on the Export recommendations page of the Compute Optimizer console, and as <b>currentConfiguration_instanceType</b> in the export CSV file.</p>
CurrentConfigurationMaxSize	<p>The maximum size of the current Auto Scaling group.</p> <p>This field is displayed as the <b>Current maximum size</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Current maximum size</b> on the Export recommendations page of the Compute Optimizer console, and as <b>currentConfiguration_maxSize</b> in the export CSV file.</p>

API field name	Description
CurrentConfigurationMinSize	<p>The minimum size of the current Auto Scaling group.</p> <p>This field is displayed as the <b>Current minimum size</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Current minimum size</b> on the Export recommendations page of the Compute Optimizer console, and as <b>currentConfiguration_minSize</b> in the export CSV file.</p>
CurrentMemory	<p>The memory of instances in the current Auto Scaling group.</p> <p>This field is displayed as the <b>Memory</b> column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Current memory</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_memory</b> in the export CSV file.</p>
CurrentNetwork	<p>The network performance, or rate of data transfer, of instances in the current Auto Scaling group.</p> <p>This field is displayed as the <b>Network</b> column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Current network</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_network</b> in the export CSV file.</p>

API field name	Description
CurrentOnDemandPrice	<p>The On-Demand price of instances in the current Auto Scaling group. The price that's listed might not reflect the actual price that you pay for the instance.</p> <p>This field is displayed as the <b>Current On-Demand price</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Current On-Demand price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_onDemandPrice</b> in the export CSV file.</p>
CurrentStandardOneYearNoUpfrontReservedPrice	<p>The Reserved Instances, standard 1-year no upfront price of instances in the current Auto Scaling group. The price listed might not reflect the actual price you pay for the instance.</p> <p>This field is displayed as the <b>Current 1-year RI price</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Current 1-year RI price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_standardOneYearNoUpfrontReservedPrice</b> in the export CSV file.</p>

API field name	Description
CurrentStandardThreeYearNoUpfrontReservedPrice	<p>The Reserved Instances, standard 3-year no upfront price of instances in the current Auto Scaling group. The price listed might not reflect the actual price you pay for the instance.</p> <p>This field is displayed as the <b>Current 3-year RI price</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Current 3-year RI price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_standardThreeYearNoUpfrontReservedPrice</b> in the export CSV file.</p>
CurrentStorage	<p>The local storage volume of instances in the current Auto Scaling group.</p> <p>This field is displayed as the <b>Storage</b> column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Current storage</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_storage</b> in the export CSV file.</p>

API field name	Description
CurrentVCpus	<p>The number of vCPUs of instances in the current Auto Scaling group.</p> <p>This field is displayed as the <b>vCPUs</b> column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Current vCPUs</b> on the Export recommendations page of the Compute Optimizer console, and as <b>current_vcpus</b> in the export CSV file.</p>
Finding	<p>The finding classification for the current Auto Scaling group. Auto Scaling groups can be classified as not optimized or optimized. For more information, see <a href="#">Auto Scaling group finding classifications</a>. This field is displayed as the <b>Finding</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Finding</b> on the Export recommendations page of the Compute Optimizer console, and as <b>finding</b> in the export CSV file.</p>
LastRefreshTimestamp	<p>The timestamp of when the Auto Scaling group recommendation was last refreshed.</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled <b>Last refresh timestamp</b> on the Export recommendations page of the Compute Optimizer console, and as <b>lastRefreshTimestamp</b> in the export CSV file.</p>

API field name	Description
LookbackPeriodInDays	<p>The number of preceding days for which Compute Optimizer analyzed metric data from the current Auto Scaling group to generate the recommendation.</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled <b>Lookback period in days</b> on the Export recommendations page of the Compute Optimizer console, and as <b>lookBackPeriodInDays</b> in the export CSV file.</p>
RecommendationOptionsConfigurationDesiredCapacity	<p>The desired capacity of the Auto Scaling group recommendation.</p> <p>This field is displayed as the <b>Desired number of instances</b> column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Recommendation options desired capacity</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_configuration_desiredCapacity</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsConfigurationInstanceType	<p>The instance type of the Auto Scaling group recommendation.</p> <p>This field is displayed as the <b>Recommendation instance type</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Recommendation options Instance type</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_configuration_instanceType</b> in the export CSV file.</p>
RecommendationOptionsConfigurationMaxSize	<p>The maximum size of the Auto Scaling group recommendation.</p> <p>This field is displayed as the <b>Maximum number of instances</b> column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Recommendation options maximum size</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_configuration_maxSize</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsConfigurationMinimumSize	<p>The minimum size of the Auto Scaling group recommendation.</p> <p>This field is displayed as the <b>Minimum number of instances</b> column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Recommendation options minimum size</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_configuration_minSize</b> in the export CSV file.</p>
RecommendationOptionsMemory	<p>The memory of the Auto Scaling group recommendation.</p> <p>This field is displayed as the <b>Memory</b> column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Recommendation options memory</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_memory</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsNetwork	<p>The network performance, or rate of data transfer, of the Auto Scaling group recommendation.</p> <p>This field is displayed as the <b>Network</b> column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Recommendation options network</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_network</b> in the export CSV file.</p>
RecommendationOptionsOnDemandPrice	<p>The On-Demand price of the Auto Scaling group recommendation.</p> <p>This field is displayed as the <b>Recommended On-Demand price</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Recommendation options On-Demand price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_onDemandPrice</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsPerformanceRisk	<p>The performance risk of the Auto Scaling group recommendation.</p> <p>This field is displayed as the <b>Performance risk</b> column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Recommendation options performance risk</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_performanceRisk</b> in the export CSV file.</p>
RecommendationOptionsProjectedUtilizationMetricsCpuMaximum	<p>The projected maximum CPU utilization metric of the Auto Scaling group recommendation. This value defines the maximum CPU utilization of the recommended instance type if you used the recommended instance type during the look-back period.</p> <p>This field is displayed as an overlay on the <b>CPU utilization (percent)</b> metric graph in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Recommendation options projected utilization metrics CPU maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_projectedUtilizationMetrics_CPU_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsProjectedUtilizationMetricsMemoryMaximum	<p>The projected maximum memory utilization metric of the Auto Scaling group recommendation. This value defines the maximum memory utilization of the recommended instance type if you used the recommended instance type during the look-back period.</p> <p>This field is displayed as an overlay on the <b>Memory utilization (percent)</b> metric graph in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Recommendation options projected utilization metrics memory maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_projectedUtilizationMetrics_MEMORY_MAXIMUM</b> in the export CSV file.</p>
RecommendationOptionsStandardOneYearNoUpfrontReservedPrice	<p>The Reserved Instances, standard 1-year no upfront price for the Auto Scaling group recommendation.</p> <p>This field is displayed as the <b>Recommended 1-year RI price</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Recommended options 1-year RI price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_standardOneYearNoUpfrontReservedPrice</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsStandardThreeYearNoUpfrontReservedPrice	<p>The Reserved Instances, standard 3-year no upfront price for the Auto Scaling group recommendation.</p> <p>This field is displayed as the <b>Recommended 3-year RI price</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled <b>Recommended options 3-year RI price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_standardThreeYearNoUpfrontReservedPrice</b> in the export CSV file.</p>
RecommendationOptionsStorage	<p>The local storage volume of the Auto Scaling group recommendation.</p> <p>This field is displayed as the <b>Storage</b> column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Recommendation options storage</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_storage</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsVcpus	<p>The vCPUs of the Auto Scaling group recommendation.</p> <p>This field is displayed as the <b>vCPUs</b> column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled <b>Recommendation options vCPUs</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_vcpus</b> in the export CSV file.</p>
UtilizationMetricsCpuMaximum	<p>The maximum CPU utilization metric of instances in the current Auto Scaling group observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>CPU utilization (percent)</b> graph in the Auto Scaling group details page. This field is labeled <b>Utilization metrics CPU maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_CPU_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsDiskReadBytesPerSecondMaximum	<p>The maximum disk read bytes per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Disk read (MiB/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics disk read bytes per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_DISK_READ_BYTES_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsDiskReadOpsPerSecondMaximum	<p>The maximum disk read operations per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Disk read (operations/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics disk read operations per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_DISK_READ_OPS_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsDiskWriteBytesPerSecondMaximum	<p>The maximum disk write bytes per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Disk write (MiB/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics disk write bytes per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_DISK_WRITE_BYTES_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsDiskWriteOpsPerSecondMaximum	<p>The maximum disk write operations per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Disk write (operations/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics disk write operations per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_DISK_WRITE_OPS_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsEbsReadBytesPerSecondMaximum	<p>The maximum bytes read per second for volumes attached to instances in the current Auto Scaling group observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>EBS read bandwidth (MiB/second)</b> graph in the Auto Scaling group details page. This field is labeled <b>Utilization metrics EBS read bandwidth bytes per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_EBS_READ_BYTES_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsEbsReadOpsPerSecondMaximum	<p>The maximum number of read operations per second for volumes attached to instances in the current Auto Scaling group observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>EBS read operations (per second)</b> graph in the Auto Scaling group details page. This field is labeled <b>Utilization metrics EBS read throughput operations per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_EBS_READ_OPS_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsEbsWriteBytesPerSecondMaximum	<p>The maximum bytes written per second for volumes attached to instances in the current Auto Scaling group observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>EBS write bandwidth (MiB/second)</b> graph in the Auto Scaling group details page. This field is labeled <b>Utilization metrics EBS write bandwidth bytes per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_EBS_WRITE_BYTES_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsEbsWriteOpsPerSecondMaximum	<p>The maximum number of write operations per second for volumes attached to instances in the current Auto Scaling group observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>EBS write operations (per second)</b> graph in the Auto Scaling group details page. This field is labeled <b>Utilization metrics EBS write throughput operations per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_EBS_WRITE_OPS_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsMemoryMaximum	<p>The maximum memory utilization metric of instances in the current Auto Scaling group observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Memory utilization (percent)</b> graph in the Auto Scaling group details page. This field is labeled <b>Utilization metrics memory maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_MEMORY_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsNetworkInBytesPerSecondMaximum	<p>The maximum network in bytes per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Network in (MiB/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics network in bytes per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_NETWORK_IN_BYTES_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsNetworkOutBytesPerSecondMaximum	<p>The maximum network out bytes per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Network out (MiB/second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics network out bytes per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_NETWORK_OUT_BYTES_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>
UtilizationMetricsNetworkPacketsInPerSecondMaximum	<p>The maximum network packets in per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Network packets in (per second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics network packets in per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_NETWORK_PACKETS_IN_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsNetworkPacketsOutPerSecondMaximum	<p>The maximum network packets out per second of the current instance observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Network packets out (per second)</b> graph in the EC2 instance details page. This field is labeled <b>Utilization metrics network packets out per second maximum</b> on the Export recommendations page of the Compute Optimizer console, and as <b>utilizationMetrics_NETWORK_PACKETS_OUT_PER_SECOND_MAXIMUM</b> in the export CSV file.</p>
EffectiveRecommendationPreferencesEnhancedInfrastructureMetrics	<p>The status of the enhanced infrastructure metrics recommendation preference for the listed recommendation. An <b>Active</b> status confirms the recommendation listed is considering the longer three-month lookback period. An <b>Inactive</b> status confirms that the recommendation isn't considering the longer lookback period. For more information, see <a href="#">Enhanced infrastructure metrics</a>.</p> <p>This field is displayed as the <b>Effective enhanced infrastructure metrics</b> column in the Auto Scaling group recommendations page of the Compute Optimizer console. On the Export recommendations page of the Compute Optimizer console, it's labeled as <b>Effective recommendation preferences enhanced infrastructure metrics</b>, and in the export CSV file, it's labeled as <b>EffectiveRecommendationPreferencesEnhancedInfrastructureMetrics</b>.</p>

API field name	Description
EffectiveRecommendationPreferencesCpuVendorArchitectures	<p>The CPU vendor and architecture for an Auto Scaling group recommendation.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Effective recommendation preferences CPU vendor architectures</b>, and in the export CSV file, it's labeled as <b>EffectiveRecommendationPreferencesCpuVendorArchitectures</b>.</p>
CurrentPerformanceRisk	<p>The performance risk rating for a current Auto Scaling group.</p> <p>This field is displayed as the <b>Current performance risk</b> column in the Auto Scaling groups recommendations page of the Compute Optimizer console. On the Export recommendations page of the Compute Optimizer console, it's labeled as <b>Current performance risk</b>, and in the export CSV file, it's labeled as <b>CurrentPerformanceRisk</b>.</p>
RecommendationOptionsSavingsOpportunityPercentage	<p>The estimated monthly savings possible as a percentage of monthly cost by adopting Compute Optimizer recommendations for an Auto Scaling group.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options savings opportunity percentage</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsSavingsOpportunityPercentage</b>.</p>

API field name	Description
RecommendationOptionsEstimatedMonthlySavingsCurrency	<p>The currency of the estimated monthly savings.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options estimated monthly savings currency</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsEstimatedMonthlySavingsCurrency</b>.</p>
RecommendationOptionsEstimatedMonthlySavingsValue	<p>The value of the estimated monthly savings.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options estimated monthly savings value</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsEstimatedMonthlySavingsValue</b>.</p>
EffectiveRecommendationPreferencesInferredWorkloadTypes	<p>The status of the inferred workload type recommendation preference for the listed recommendation. For more information, see <a href="#">Inferred workload type</a>.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Effective recommendation preferences inferred workload types</b>, and in the export CSV file, it's labeled as <b>EffectiveRecommendationPreferencesInferredWorkloadTypes</b>.</p>

API field name	Description
InferredWorkloadTypes	<p>The application that might be running on the instances in the Auto Scaling group as detected by Compute Optimizer. For more information, see <a href="#">Inferred workload types</a>.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Inferred workload types</b>, and in the export CSV file, it's labeled as <b>InferredWorkloadTypes</b>.</p>
RecommendationOptionsMigrationEffort	<p>The level of effort that might be required to migrate from the current instance type to the recommended instance type. For more information, see <a href="#">Inferred workload types</a>.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options migration effort</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsMigrationEffort</b>.</p>

## EBS volume recommendation fields

API field name	Description
AccountId	<p>The AWS account ID that the current EBS volume was created under.</p> <p>This field is displayed as the <b>Account ID</b> column in the Amazon EBS volumes recommendations and volume details pages of the Compute Optimizer console. This field is labeled <b>Account ID</b> on the Export</p>

API field name	Description
	<p>recommendations page of the Compute Optimizer console, and as <b>accountId</b> in the export CSV file.</p>
CurrentConfigurationVolumeBaselineIOPS	<p>The baseline input/output operations per second (IOPS) of the current EBS volume.</p> <p>This field is displayed as the <b>Current IOPS</b> column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled <b>Current baseline IOPS</b> on the Export recommendations page of the Compute Optimizer console, and as <b>CurrentConfigurationVolumeBaselineIOPS</b> in the export CSV file.</p>
CurrentConfigurationVolumeBaselineThroughput	<p>The baseline throughput of the current EBS volume.</p> <p>This field is displayed as the <b>Current throughput</b> column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled <b>Current baseline throughput</b> on the Export recommendations page of the Compute Optimizer console, and as <b>CurrentConfigurationVolumeBaselineThroughput</b> in the export CSV file.</p>

API field name	Description
CurrentConfigurationVolumeBurstIOPS	<p>The burst input/output operations per second (IOPS) of the current EBS volume.</p> <p>This field is displayed as the <b>Burst IOPS</b> column in the Amazon EBS volume details page of the Compute Optimizer console. This field is labeled <b>Current burst IOPS</b> on the Export recommendations page of the Compute Optimizer console, and as <b>CurrentConfigurationVolumeBurstIOPS</b> in the export CSV file.</p>
CurrentConfigurationVolumeBurstThroughput	<p>The volume burst throughput of the current EBS volume.</p> <p>This field is displayed as the <b>Burst throughput</b> column in the Amazon EBS volume details page of the Compute Optimizer console. This field is labeled <b>Current burst throughput</b> on the Export recommendations page of the Compute Optimizer console, and as <b>CurrentConfigurationVolumeBurstThroughput</b> in the export CSV file.</p>
CurrentConfigurationVolumeSize	<p>The current size (in GB) of the current EBS volume.</p> <p>This field is displayed as the <b>Current size</b> column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled <b>Current volume size</b> on the Export recommendations page of the Compute Optimizer console, and as <b>CurrentConfigurationVolumeSize</b> in the export CSV file.</p>

API field name	Description
CurrentConfigurationVolumeType	<p>The volume type of the current EBS volume.</p> <p>This field is displayed as the <b>Current volume type</b> column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled <b>Current volume type</b> on the Export recommendations page of the Compute Optimizer console, and as <b>CurrentConfigurationVolumeType</b> in the export CSV file.</p>
CurrentMonthlyPrice	<p>The current monthly price of the current EBS volume.</p> <p>This field is displayed as the <b>Current monthly price</b> column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled <b>Current monthly price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>currentMonthlyPrice</b> in the export CSV file.</p>
Finding	<p>The finding classification for the current EBS volume. EBS volumes can be classified as optimized, or not optimized. For more information, see <a href="#">EBS volume finding classifications</a>.</p> <p>This field is displayed as the <b>Finding</b> column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled <b>Finding</b> on the Export recommendations page of the Compute Optimizer console, and as <b>finding</b> in the export CSV file.</p>

API field name	Description
LastRefreshTimestamp	<p>The timestamp of when the EBS volume recommendation was last refreshed.</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled <b>Last refresh timestamp</b> on the Export recommendations page of the Compute Optimizer console, and as <b>lastRefreshTimestamp</b> in the export CSV file.</p>
LookbackPeriodInDays	<p>The number of preceding days for which Compute Optimizer analyzed metric data from the current EBS volume to generate the recommendation.</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled <b>Look-back period in days</b> on the Export recommendations page of the Compute Optimizer console, and as <b>lookBackPeriodInDays</b> in the export CSV file.</p>
RecommendationOptionsConfigurationVolumeBaselineIOPS	<p>The baseline input/output operations per second (IOPS) of the EBS volume recommendation.</p> <p>This field is displayed as the <b>Recommended IOPS</b> column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled <b>Recommended baseline IOPS</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;_ConfigurationVolumeBaselineIOPS</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsConfigurationVolumeBaselineThroughput	<p>The baseline throughput of the EBS volume recommendation.</p> <p>This field is displayed as the <b>Recommended throughput</b> column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled <b>Recommended baseline throughput</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;_ConfigurationVolumeBaselineThroughput</b> in the export CSV file.</p>
RecommendationOptionsConfigurationVolumeBurstIOPS	<p>The burst input/output operations per second (IOPS) of the EBS volume recommendation.</p> <p>This field is displayed as the <b>Burst IOPS</b> column in the Amazon EBS volume details page of the Compute Optimizer console. This field is labeled <b>Recommended burst IOPS</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;_ConfigurationVolumeBurstIOPS</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsConfigurationVolumeBurstThroughput	<p>The volume burst throughput of the EBS volume recommendation.</p> <p>This field is displayed as the <b>Burst throughput</b> column in the Amazon EBS volume details page of the Compute Optimizer console. This field is labeled <b>Recommended burst throughput</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;_ConfigurationVolumeBurstThroughput</b> in the export CSV file.</p>
RecommendationOptionsConfigurationVolumeSize	<p>The current size (in GB) of the EBS volume recommendation.</p> <p>This field is displayed as the <b>Recommended size</b> column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled <b>Recommended volume size</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;_ConfigurationVolumeSize</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsConfigurationVolumeType	<p>The volume type of the EBS volume recommendation.</p> <p>This field is displayed as the <b>Recommended volume type</b> in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled <b>Recommended volume type</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;_ConfigurationVolumeType</b> in the export CSV file.</p>
RecommendationOptionsMonthlyPrice	<p>The monthly price of the EBS volume recommendation.</p> <p>This field is displayed as the <b>Recommended monthly price</b> column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled <b>Recommended monthly price</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;_MonthlyPrice</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsPerformanceRisk	<p>The performance risk of the EBS volume recommendation.</p> <p>This field is displayed as the <b>Performance risk</b> column in the Amazon EBS volume details page of the Compute Optimizer console. This field is labeled <b>Performance risk</b> on the Export recommendations page of the Compute Optimizer console, and as <b>recommendationOptions_&lt;rank&gt;_performanceRisk</b> in the export CSV file.</p>
UtilizationMetricsVolumeReadBytesPerSecondMaximum	<p>The maximum read bytes per second metric of the current EBS volume observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Read bandwidth (KiB/second)</b> graph in the Amazon EBS volume details page. This field is labeled <b>Utilization metrics EBS read bytes per second (maximum)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>UtilizationMetricsVolumeReadBytesPerSecondMaximum</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsVolumeReadOpsPerSecondMaximum	<p>The maximum read operations per second metric of the current EBS volume observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Read operations (per second)</b> graph in the Amazon EBS volume details page. This field is labeled <b>Utilization metrics EBS read operations per second (maximum)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>UtilizationMetricsVolumeReadOpsPerSecondMaximum</b> in the export CSV file.</p>
UtilizationMetricsVolumeWriteBytesPerSecondMaximum	<p>The maximum write bytes per second metric of the current EBS volume observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Write bandwidth (KiB/second)</b> graph in the Amazon EBS volume details page. This field is labeled <b>Utilization metrics EBS write bytes per second (maximum)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>UtilizationMetricsVolumeWriteBytesPerSecondMaximum</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsVolumeWriteOpsPerSecondMaximum	<p>The maximum write operations per second metric of the current EBS volume observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Write operations (per second)</b> graph in the Amazon EBS volume details page. This field is labeled <b>Utilization metrics EBS write operations per second (maximum)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>UtilizationMetricsVolumeWriteOpsPerSecondMaximum</b> in the export CSV file.</p>
CurrentConfigurationRootVolume	<p>Contains the image used to boot the current instance during launch.</p> <p>This field is displayed as the <b>Root volume</b> column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled <b>Root volume</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>rootVolume</b> in the export CSV file.</p>
RootVolume	<p>Contains the image used to boot the instance during launch.</p> <p>This field is displayed as the <b>Root volume</b> column in the Amazon EBS volumes recommendations and volume details pages of the Compute Optimizer console. This field is labeled <b>Root volume</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>rootVolume</b> in the export CSV file.</p>

API field name	Description
VolumeArn	<p>The Amazon Resource Name (ARN) of the current EBS volume.</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled <b>EBS volume ARN</b> on the Export recommendations page of the Compute Optimizer console, and as <b>VolumeArn</b> in the export CSV file.</p>
CurrentPerformanceRisk	<p>The performance risk rating for a current EBS volume.</p> <p>This field is displayed as the <b>Current performance risk</b> column in the EBS volumes recommendations page of the Compute Optimizer console. On the Export recommendations page of the Compute Optimizer console, it's labeled as <b>Current performance risk</b>, and in the export CSV file, it's labeled as <b>CurrentPerformanceRisk</b>.</p>
RecommendationOptionsSavingsOpportunityPercentage	<p>The estimated monthly savings possible as a percentage of monthly cost by adopting Compute Optimizer recommendations for an EBS volume.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options savings opportunity percentage</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsSavingsOpportunityPercentage</b>.</p>

API field name	Description
RecommendationOptionsEstimatedMonthlySavingsCurrency	<p>The currency of the estimated monthly savings.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options estimated monthly savings currency</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsEstimatedMonthlySavingsCurrency</b>.</p>
RecommendationOptionsEstimatedMonthlySavingsValue	<p>The value of the estimated monthly savings.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options estimated monthly savings value</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsEstimatedMonthlySavingsValue</b>.</p>

### Lambda function recommendation fields

API field name	Description
AccountId	<p>The AWS account ID in which the current Lambda function was created.</p> <p>This field is displayed as the <b>Account ID</b> column in the Lambda functions recommendations and function details pages of the Compute Optimizer console. This field is labeled <b>Account ID</b> on the Export recommendations page of the Compute Optimizer</p>

API field name	Description
	console, and as <b>accountId</b> in the export CSV file.
CurrentConfigurationMemorySize	<p>The amount of memory (in MB) currently configured on the current Lambda function.</p> <p>This field is displayed as the <b>Current configured memory</b> column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled <b>Current configured memory</b> on the Export recommendations page of the Compute Optimizer console, and as <b>CurrentConfigurationMemorySize</b> in the export CSV file.</p>
CurrentConfigurationTimeout	<p>The timeout time currently configured on the current Lambda function.</p> <p>This field is displayed as the <b>Timeout</b> column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled <b>Timeout</b> on the Export recommendations page of the Compute Optimizer console, and as <b>CurrentConfigurationTimeout</b> in the export CSV file.</p>

API field name	Description
CurrentCostAverage	<p>The average current cost of the current Lambda function.</p> <p>This field is displayed listed as the <b>Current cost (average)</b> column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled <b>Current cost (average)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>CurrentCostAverage</b> in the export CSV file.</p>
CurrentCostTotal	<p>The total current cost of the current Lambda function.</p> <p>This field is listed as the <b>Current cost</b> column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled <b>Current cost (total)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>CurrentCostTotal</b> in the export CSV file.</p>
Finding	<p>The finding classification for the current Lambda function. Lambda functions can be classified as under-provisioned, over-provisioned, or optimized. For more information, see <a href="#">Lambda function finding classifications</a>.</p> <p>This field is listed as the <b>Finding</b> column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled <b>Finding</b> on the Export recommendations page of the Compute Optimizer console, and as <b>finding</b> in the export CSV file.</p>

API field name	Description
FindingReasonCodes	<p>The finding reason for the current Lambda function. Lambda functions can have a finding reason of memory under-provisioned, memory over-provisioned, insufficient data, or inconclusive. For more information, see <a href="#">Lambda finding classifications</a>.</p> <p>This field is listed as the <b>Finding reason</b> column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled <b>Finding reason</b> on the Export recommendations page of the Compute Optimizer console, and as <b>FindingReasonCodes</b> in the export CSV file.</p>
FunctionArn	<p>The Amazon Resource Name (ARN) of the current Lambda function.</p> <p>This field is not listed in the Compute Optimizer console. This field is labeled <b>Function ARN</b> on the Export recommendations page of the Compute Optimizer console, and as <b>FunctionArn</b> in the export CSV file.</p>
FunctionVersion	<p>The version of the current Lambda function.</p> <p>This field is listed as the <b>Function version</b> column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled <b>Function version</b> on the Export recommendations page of the Compute Optimizer console, and as <b>FunctionVersion</b> in the export CSV file.</p>

API field name	Description
LastRefreshTimestamp	<p>The timestamp of when the Lambda function recommendation was last refreshed.</p> <p>This field isn't displayed in the Compute Optimizer console. This field is labeled <b>Last refresh timestamp</b> on the Export recommendations page of the Compute Optimizer console, and as <b>lastRefreshTimestamp</b> in the export CSV file.</p>
LookbackPeriodInDays	<p>The number of preceding days for which Compute Optimizer analyzed metric data from the current Lambda function to generate the recommendation.</p> <p>This field isn't displayed in the Compute Optimizer console. This field is labeled <b>Look-back period in days</b> on the Export recommendations page of the Compute Optimizer console, and as <b>lookBackPeriodInDays</b> in the export CSV file.</p>
NumberOfInvocations	<p>The number of invocations for the current Lambda function during the look-back period.</p> <p>This field is displayed as the <b>Invocations (count)</b> graph in the Lambda function details page. This field is labeled <b>Number of invocations</b> on the Export recommendations page of the Compute Optimizer console, and as <b>NumberOfInvocations</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsConfigurationMemorySize	<p>The amount of memory (in MB) of the Lambda function recommendation.</p> <p>This field is listed as the <b>Recommended configured memory</b> in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled <b>Recommended configured memory</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;_ConfigurationMemorySize</b> in the export CSV file.</p>
RecommendationOptionsCostHigh	<p>The upper range cost of the Lambda function recommendation.</p> <p>This field is displayed as the <b>Recommended cost (high)</b> column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled <b>Recommended cost (high)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;_CostHigh</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsCostLow	<p>The lower range cost of the Lambda function recommendation.</p> <p>This field is displayed as the <b>Recommended cost (low)</b> column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled <b>Recommended cost (low)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;_CostLow</b> in the export CSV file.</p>
RecommendationOptionsProjectedUtilizationMetricsDurationExpected	<p>The projected duration of the Lambda function recommendation.</p> <p>This field is listed as the <b>Projected duration (expected)</b> column in the Lambda functions details page of the Compute Optimizer console. This field is labeled <b>Utilization metrics Lambda duration milliseconds expected</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;_ProjectedUtilizationMetricsDurationExpected</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsProjectedUtilizationMetricsDurationLowerBound	<p>The projected minimum amount of time that the recommended Lambda function spends processing events if the recommended Lambda function is used during the look-back period. The lower bound together with the upper bound form a range of time that the Lambda function recommendation option is projected to spend processing an event.</p> <p>This field is listed as the <b>Projected duration (low)</b> column in the Lambda functions details page of the Compute Optimizer console. This field is labeled <b>Utilization metrics Lambda duration milliseconds (lower bound)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;ProjectedUtilizationMetricsDurationLowerBound</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsProjectedUtilizationMetricsDurationUpperBound	<p>The projected maximum amount of time that the recommended Lambda function spends processing events if the recommended Lambda function is used during the look-back period. The lower bound together with the upper bound form a range of time that the Lambda function recommendation option is projected to spend processing an event.</p> <p>This field is listed as the <b>Projected duration (high)</b> column in the Lambda functions details page of the Compute Optimizer console. This field is labeled <b>Utilization metrics Lambda duration milliseconds (upper bound)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>RecommendationOptions_&lt;rank&gt;_ProjectedUtilizationMetricsDurationUpperBound</b> in the export CSV file.</p>
UtilizationMetricsDurationAverage	<p>The average duration metric of the current Lambda function observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Duration (average)</b> column in the Lambda function details page of the Compute Optimizer console. This field is labeled <b>Utilization metrics Lambda duration milliseconds (average)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>UtilizationMetricsDurationAverage</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsDurationMaximum	<p>The maximum duration metric of the current Lambda function observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Duration (maximum)</b> column in the Lambda function details page of the Compute Optimizer console. This field is labeled <b>Utilization metrics Lambda duration milliseconds (maximum)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>UtilizationMetricsDurationMaximum</b> in the export CSV file.</p>
UtilizationMetricsMemoryAverage	<p>The average memory utilization metric of the current Lambda function observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Used memory (average)</b> column in the Lambda function details page of the Compute Optimizer console. This field is labeled <b>Utilization metrics Lambda memory used MB (average)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>UtilizationMetricsMemoryAverage</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsMemoryMaximum	<p>The maximum memory utilization metric of the current Lambda function observed during the lookback period (up to 14 days).</p> <p>This field is displayed as the <b>Memory (maximum)</b> column in the Lambda function details page of the Compute Optimizer console. This field is labeled <b>Utilization metrics Lambda memory used MB (maximum)</b> on the Export recommendations page of the Compute Optimizer console, and as <b>UtilizationMetricsMemoryMaximum</b> in the export CSV file.</p>
CurrentPerformanceRisk	<p>The performance risk rating for a current Lambda function.</p> <p>This field is displayed as the <b>Current performance risk</b> column in the Lambda functions recommendations page of the Compute Optimizer console. On the Export recommendations page of the Compute Optimizer console, it's labeled as <b>Current performance risk</b>, and in the export CSV file, it's labeled as <b>CurrentPerformanceRisk</b>.</p>

API field name	Description
RecommendationOptionsSavingsOpportunityPercentage	<p>The estimated monthly savings possible as a percentage of monthly cost by adopting Compute Optimizer recommendations for a Lambda function.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options savings opportunity percentage</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsSavingsOpportunityPercentage</b>.</p>
RecommendationOptionsEstimatedMonthlySavingsCurrency	<p>The currency of the estimated monthly savings.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options estimated monthly savings currency</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsEstimatedMonthlySavingsCurrency</b>.</p>
RecommendationOptionsEstimatedMonthlySavingsValue	<p>The value of the estimated monthly savings.</p> <p>On the Export recommendations page of the Compute Optimizer console, this field is labeled as <b>Recommendation options estimated monthly savings value</b>, and in the export CSV file, it's labeled as <b>RecommendationOptionsEstimatedMonthlySavingsValue</b>.</p>

## Recommendation fields for Amazon ECS services on Fargate

API field name	Description
AccountId	<p>The AWS account ID that created the current Amazon ECS service on Fargate.</p> <p>This field is displayed as the <b>Account ID</b> column in the Amazon ECS services recommendations and details pages of the Compute Optimizer console. This field is labeled <b>Account ID</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>accountId</b> in the export CSV file.</p>
ServiceArn	<p>The Amazon Resource Name (ARN) of the current Amazon ECS service.</p> <p>This field isn't displayed in the Compute Optimizer console. This field is labeled <b>Service ARN</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>serviceArn</b> in the export CSV file.</p>
LookbackPeriodInDays	<p>The number of preceding days Compute Optimizer analyzed metric data from the current service to generate the recommendation.</p> <p>This field isn't displayed in the Compute Optimizer console. This field is labeled <b>Lookback period in days</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>lookBackPeriodInDays</b> in the export CSV file.</p>
LastRefreshTimestamp	<p>The timestamp of when the Amazon ECS service recommendation was last refreshed.</p>

API field name	Description
	<p>This field isn't displayed in the Compute Optimizer console. This field is labeled <b>Last refresh timestamp</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>lastRefreshTimestamp_UTC</b> in the export CSV file.</p>
LaunchType	<p>The capacity provider for the current Amazon ECS service.</p> <p>This field is displayed as the <b>Launch type</b> column in the Amazon ECS services recommendations page of the Compute Optimizer console. This field is labeled <b>Launch type</b> on the Export recommendations page of the Compute Optimizer console, and as <b>launchType</b> in the export CSV file.</p>
CurrentPerformanceRisk	<p>The performance risk rating for the current Amazon ECS service.</p> <p>This field is displayed as the <b>Current performance risk</b> column in the Amazon ECS services recommendations page of the Compute Optimizer console. This field is labeled <b>Current performance risk</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>CurrentPerformanceRisk</b> in the export CSV file.</p>

API field name	Description
CurrentServiceConfigurationMemory	<p>The memory size of the current Amazon ECS service tasks.</p> <p>This field is displayed as the <b>Current configured memory size</b> column in the Amazon ECS services recommendations page of the Compute Optimizer console. This field is labeled <b>Current configured memory</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>currentServiceConfiguration_memory</b> in the export CSV file.</p>
CurrentServiceConfigurationCpu	<p>The CPU size of the current Amazon ECS service tasks.</p> <p>This field is displayed as the <b>Current configured CPU size</b> column in the Amazon ECS services recommendations page of the Compute Optimizer console. This field is labeled <b>Current configured CPU</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>currentServiceConfiguration_cpu</b> in the export CSV file.</p>

API field name	Description
CurrentServiceConfigurationTaskDefinitionArn	<p>The task definition ARN of the current Amazon ECS service.</p> <p>This field is displayed as the <b>Task definition name</b> column in the Amazon ECS services recommendations page of the Compute Optimizer console. This field is labeled <b>Task definition name</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>currentServiceConfiguration_taskDefinitionArn</b> in the export CSV file.</p>
CurrentServiceConfigurationAutoScalingConfiguration	<p>The Auto Scaling configuration of your current Amazon ECS service.</p> <p>This field is displayed as the <b>Auto Scaling configuration</b> column in the Amazon ECS service details page of the Compute Optimizer console. This field is labeled <b>Auto Scaling configuration</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>currentServiceConfiguration_autoScalingConfiguration</b> in the export CSV file.</p>

API field name	Description
CurrentServiceContainerConfigurations	<p>The current container configurations of the current Amazon ECS service task.</p> <p>This field is displayed in the <b>Compare current settings with recommended container size</b> table of the Compute Optimizer console's service details page. This field is labeled <b>Container configurations</b> on the Export recommendations page of the Compute Optimizer console. In the export CSV file, the following labels are populated:</p> <ul style="list-style-type: none"> <li>• <b>currentServiceContainerConfiguration</b> <b><i>_container_number</i></b> <b>_containerName</b></li> <li>• <b>currentServiceContainerConfiguration</b> <b><i>_container_number</i></b> <b>_memory</b></li> <li>• <b>currentServiceContainerConfiguration</b> <b><i>_container_number</i></b> <b>_memoryRe</b> <b>servation</b></li> <li>• <b>currentServiceContainerConfiguration</b> <b><i>_container_number</i></b> <b>_cpu</b></li> </ul>
UtilizationMetricsCpuMaximum	<p>The maximum percentage of CPU capacity that's used in the Amazon ECS service.</p> <p>This field is displayed as the <b>CPU utilization (percent)</b> graph in the Amazon ECS service details page of the Compute Optimizer console. This field is labeled <b>Projected utilization max CPU metric</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>utilizationMetrics_CPU_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
UtilizationMetricsMemoryMaximum	<p>The maximum percentage of memory capacity that's used in the Amazon ECS service.</p> <p>This field is displayed as the <b>Memory utilization (percent)</b> graph in the Amazon ECS service details page of the Compute Optimizer console. This field is labeled <b>Projected utilization max memory metric</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>utilizationMetrics_MEMORY_MAXIMUM</b> in the export CSV file.</p>
Findings	<p>The finding classification for the Amazon ECS service. Amazon ECS services on Fargate can be classified as under-provisioned, over-provisioned, or optimized. For more information, see <a href="#">Finding classifications</a>.</p> <p>This field is displayed as the <b>Findings</b> column in the Amazon ECS services recommendations page of the Compute Optimizer console. This field is labeled <b>Findings</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>findings</b> in the export CSV file.</p>

API field name	Description
FindingReasonCodes	<p>The finding reasons column describes which specifications of the current Amazon ECS service were under-provisioned, over-provisioned, or optimized.</p> <p>This field is displayed as the <b>Finding reasons</b> column in the Amazon ECS services recommendations page of the Compute Optimizer console. This field is labeled <b>Finding reason codes</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>findingReasonCodes_&lt;code&gt;</b> in the export CSV file. The <i>&lt;code&gt;</i> portion of the label identifies the service specifications (CPU or memory) that are under-provisioned, over-provisioned, or optimized.</p>
RecommendationOptionsMemory	<p>The memory size of the Amazon ECS service recommendation.</p> <p>This field is displayed as the <b>Memory size</b> column in the Amazon ECS service details page of the Compute Optimizer console. This field is labeled <b>Recommendation options memory</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>recommendationOptions_&lt;rank&gt;_memory</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsCpu	<p>The CPU size of the Amazon ECS service recommendation.</p> <p>This field is displayed as the <b>CPU size</b> column in the Amazon ECS service details page of the Compute Optimizer console. This field is labeled <b>Recommendation options CPU</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>recommendationOptions_&lt;rank&gt;_cpu</b> in the export CSV file.</p>
RecommendationOptionsSavingsOpportunityPercentage	<p>The approximate monthly cost savings percentage after you adjust the configurations of your Amazon ECS service to Compute Optimizer's recommended configuration.</p> <p>This field is labeled <b>Recommendation options savings opportunity percentage</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>RecommendationOptionsSavingsOpportunityPercentage</b> in the export CSV file.</p>
RecommendationOptionsEstimatedMonthlySavingsCurrency	<p>The currency of the estimated monthly savings.</p> <p>This field is labeled <b>Recommendation options estimated monthly savings currency</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>RecommendationOptionsEstimatedMonthlySavingsCurrency</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsEstimatedMonthlySavingsValue	<p>The value of the estimated monthly savings.</p> <p>This field is labeled <b>Recommendation options estimated monthly savings value</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>RecommendationOptionsEstimatedMonthlySavingsValue</b> in the export CSV file.</p>
RecommendationOptionsContainerRecommendations	<p>The recommended memory and CPU size of the containers in the Amazon ECS service.</p> <p>This field is displayed in the <b>Compare current settings with recommended container size</b> table of the Compute Optimizer console's service details page. This field is labeled <b>Container recommendations</b> on the Export recommendations page of the Compute Optimizer console. In the export CSV file, the following labels are populated:</p> <ul style="list-style-type: none"> <li>• <b>recommendationOptions_&lt;index&gt;_containerName_&lt;index&gt;</b></li> <li>• <b>recommendationOptions_&lt;index&gt;_containerMemory_&lt;container_number&gt;</b></li> <li>• <b>recommendationOptions_&lt;index&gt;_containerMemoryReservation_&lt;container_number&gt;</b></li> <li>• <b>recommendationOptions_&lt;index&gt;_containerCpu_&lt;container_number&gt;</b></li> </ul>

API field name	Description
RecommendationOptionsProjectedUtilizationMetricsCpuMaximum	<p>The projected maximum CPU utilization metric of the Amazon ECS service recommendation. If you used the recommended Amazon ECS service during the look-back period, this value defines the maximum CPU utilization of the recommended Amazon ECS service.</p> <p>This field is displayed as an overlay on the <b>CPU utilization (percent)</b> metric graph in the Amazon ECS service details page of the Compute Optimizer console. This field is labeled <b>Recommendation options projected utilization metrics CPU maximum</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>recommendationOptions_&lt;rank&gt;_projectedUtilizationMetrics_CPU_MAXIMUM</b> in the export CSV file.</p>

API field name	Description
RecommendationOptionsProjectedUtilizationMetricsMemoryMaximum	<p>The projected maximum memory utilization metric of the Amazon ECS service recommendation. If you used the recommended Amazon ECS service during the look-back period, this value defines the maximum memory utilization of the recommended Amazon ECS service.</p> <p>This field is displayed as an overlay on the <b>Memory utilization (percent)</b> metric graph in the Amazon ECS service details page of the Compute Optimizer console. This field is labeled <b>Recommendation options projected utilization metrics memory maximum</b> on the Export recommendations page of the Compute Optimizer console, and labeled <b>recommendationOptions_&lt;rank&gt;_projectedUtilizationMetrics_MEMORY_MAXIMUM</b> in the export CSV file.</p>

### Recommendation fields for commercial software licenses

- **AccountId**
- **ResourceArn**
- **LookbackPeriodInDays**
- **LastRefreshTimestamp**
- **Findings**
- **FindingReasonCodes**
- **NumberOfCores**
- **CurrentLicenseConfigurationInstanceType**
- **CurrentLicenseConfigurationOperatingSystem**
- **CurrentLicenseConfigurationLicenseName**
- **CurrentLicenseConfigurationLicenseEdition**

- **CurrentLicenseConfigurationLicenseModel**
- **CurrentLicenseConfigurationLicenseVersion**
- **MetricsSource**
- **RecommendationOptionsOperatingSystem**
- **RecommendationOptionsLicenseEdition**
- **RecommendationOptionsLicenseModel**
- **RecommendationOptionsSavingsOpportunityPercentage**
- **RecommendationOptionsEstimatedMonthlySavingsCurrency**
- **RecommendationOptionsEstimatedMonthlySavingsValue**
- **Tags**

## Metadata file

A metadata JSON file is output with every export job. The file includes the schema information for the associated recommendations file, such as the dialect of the data, column definitions, and column descriptions. The file is meant to help parse the export file, and describe its contents. The metadata file is saved in the same S3 bucket and prefix that you specified for the export file.

The metadata file includes the following properties for each exported column or field:

- **Name** - The export field recommendations column name.
- **Titles** - The user-friendly recommendations column name.
- **Datatype** - The type of data for the column.
- **Null** - The string to expect if the column is null.
- **Required** - Indicates if the column data is required.

The following is an example of the information that's included in the metadata file.

```
{
  "@context": [
    "http://www.w3.org/ns/csvw"
  ],
  "url": "us-east-1-2020-05-18T001229Z-f264881a-bfb3-4676-9b14-8d1243599ebb.csv",
  "dc:title": "EC2 Instance Recommendations",
  "dialect": {
```

```
"encoding": "utf-8",
"lineTerminators": [
  "\n"
],
"doubleQuote": true,
"skipRows": 0,
"header": true,
"headerRowCount": 1,
"delimiter": ",",
"skipColumns": 0,
"skipBlankRows": false,
"trim": false
},
"dc:modified": {
  "@value": "2020-05-20",
  "@type": "xsd:date"
},
"tableSchema": {
  "columns": [
    {
      "name": "accountId",
      "titles": "Account ID",
      "datatype": "string",
      "null": "",
      "required": false
    },
    {
      "name": "instanceArn",
      "titles": "Instance Arn",
      "datatype": "string",
      "null": "",
      "required": false
    },
    {
      "name": "utilizationMetrics_CPU_MAXIMUM",
      "titles": "Cpu Maximum Utilization Metrics",
      "datatype": "double",
      "null": "",
      "required": false
    },
    {
      "name": "recommendations_count",
      "titles": "Number of recommendations",
      "datatype": "integer",
```

```
    "required": true
  },
  {
    "name": "recommendationOptions_1_instanceType",
    "titles": "Recommendation 1 Instance Type",
    "datatype": "integer",
    "null": "",
    "required": false
  },
  {
    "name": "lastRefreshTimestamp.UTC",
    "titles": "Last Resfreshed Timestamp UTC",
    "datatype": "datetime",
    "format": "yyyy-MM-dd HH:mm:ss",
    "null": "",
    "required": false
  },
  {
    "name": "errorCode",
    "titles": "Error Code",
    "datatype": "string",
    "required": true
  },
  {
    "name": "errorMessage",
    "titles": "Error Message",
    "datatype": "string",
    "required": true
  }
]
}
```

## Troubleshooting failed export jobs

When you try to export your resource recommendations, you might experience one of the following error messages or issues. Use the information provided to try to resolve the error before trying to export your recommendations again.

**You don't have permissions to the Amazon S3 bucket specified. Confirm the permissions of your S3 bucket and try again.**

Confirm that you have configured the required permissions on your Amazon S3 bucket. For more information, see [Amazon S3 bucket policy for AWS Compute Optimizer](#).

**The Amazon S3 bucket specified is public. Only private S3 buckets are supported.**

Your Amazon S3 bucket must be set to block public access. For more information, see [Blocking public access to your Amazon S3 storage](#) in the *Amazon Simple Storage Service User Guide*.

**You created a scripted or automatic export job but there is recommendation data missing from your Amazon S3 bucket.**

Call the `DescribeRecommendationExportJobs` API to verify the final status of the export job. If the export job failed, try to call the `ExportResourceRecommendations` API again. For more information, see [DescribeRecommendationExportJobs](#) in the *AWS Compute Optimizer API Reference*.

# Document history for AWS Compute Optimizer

The following table describes the documentation for this release of AWS Compute Optimizer.

- **API version:** 2019-11-30
- **Latest documentation update:** August 15, 2022

The following table describes the documentation for this release of Compute Optimizer.

Change	Description	Date
<a href="#">Compute Optimizer supports rightsizing preferences for memory utilization headroom</a>	In Compute Optimizer you can use rightsizing recommendation preferences to customize the memory utilization headroom settings you want Compute Optimizer to use when generating your Amazon EC2 instance recommendations. For more information, see <a href="#">Rightsizing recommendation preferences</a> .	March 28, 2024
<a href="#">Compute Optimizer supports new EC2 instance types</a>	Compute Optimizer now provides recommendations for 51 new EC2 instance types, including the C7i, r7i, r8g, x2idn, x2iedn, and hpc7a instances. For more information, see <a href="#">Amazon EC2 instance requirements</a> .	March 25, 2024
<a href="#">Compute Optimizer supports rightsizing recommendation preferences</a>	In Compute Optimizer you can use rightsizing recommendation preferences to customize the settings	November 26, 2023

you want Compute Optimizer to consider when generating your Amazon EC2 and Auto Scaling group instance recommendations. For more information, see [Rightsizing recommendation preferences](#).

[Compute Optimizer supports new specific discounts for rightsizing recommendations](#)

You can now allow Compute Optimizer to analyze specific pricing discounts, such as Saving Plans and Reserved Instances, when generating the estimated cost savings of rightsizing recommendations. For more information, see [Savings estimation mode](#).

November 26, 2023

[Compute Optimizer supports new EC2 instance types and EBS volumes](#)

Compute Optimizer now provides recommendations for 153 new Amazon EC2 instance types, including the M7a, M7i, M7i-flex, M6a, C7gn, R6a, R7g, X2iezn, I4g, I4i, Hpc7g, and Hpc6id instances. Additionally, Compute Optimizer now supports Provisioned IOPS Amazon EBS volumes that are attached to multiple EC2 instances. For more information, see [Amazon EC2 instance requirements](#).

September 28, 2023

[Compute Optimizer supports GPU-based EC2 instances](#)

Compute Optimizer now provides rightsizing recommendations for G4dn and P3 instances. For more information, see [Amazon EC2 instance requirements](#).

September 5, 2023

[Compute Optimizer generates commercial software license recommendations](#)

Compute Optimizer now generates license recommendations for commercial software that run on Amazon EC2. Compute Optimizer only provides Microsoft SQL Server license recommendations. For more information, see [Viewing commercial software license recommendations](#).

August 28, 2023

[Compute Optimizer supports tag filtering and inferred workload type filtering for recommendations](#)

In Compute Optimizer you can now filter your EC2 instance, EBS volume, Lambda function, and ECS service recommendations by tag key and tag value. Additionally, you can also filter your EC2 recommendations by inferred workload types. For more information, see [Viewing EC2 instances recommendations](#).

May 1, 2023

[Compute Optimizer supports new EC2 instance types](#)

Compute Optimizer now provides recommendations for 61 new EC2 instance types, including the C6in, R6in, R6idn, M6in, and M6idn instances. For more information, see [Amazon EC2 instance requirements](#).

March 30, 2023

[Compute Optimizer supports new EBS volume types](#)

Compute Optimizer now provides recommendations for three new EBS volume types: HDD st1 and sc1, and Provisioned IOPS SSD io2 Block Express. For more information, see [Amazon EBS volume requirements](#).

March 30, 2023

[Compute Optimizer supports EC2 suspension workloads](#)

Compute Optimizer can now combine utilization data from intermittent workloads to generate EC2 recommendations. For more information, see [Amazon EC2 instance requirements](#).

March 30, 2023

[Compute Optimizer generates recommendations for Amazon ECS services on Fargate](#)

Compute Optimizer now generates recommendations for Amazon ECS services on Fargate. For more information, see [Recommendations for Amazon ECS services on Fargate](#).

December 22, 2022

[Compute Optimizer launches external metrics ingestion feature](#)

Compute Optimizer can now ingest and analyze external EC2 memory utilization metrics from one of the four observability products to generate EC2 rightsizing recommendations that provide you with additional savings and enhanced performance. For more information, see [External metrics ingestion](#).

November 28, 2022

[Compute Optimizer supports new EC2 instance types and Windows memory metrics](#)

Compute Optimizer now provides recommendations for 37 new EC2 instance types, including the M6i.metal, C6i.metal, C7g, and Hpc6a instances. Additionally, Compute Optimizer now prioritizes the Available MBytes memory metric when generating recommendations for EC2 Windows instances. For more information, see [Amazon EC2 instance requirements](#) and [EC2 instance metrics](#).

October 7, 2022

[Compute Optimizer launches delegated administrator feature](#)

Now in Compute Optimizer, an organization's management accounts can delegate a member account as an administrator for their organization. The delegated administrator can access and manage Compute Optimizer recommendations. The delegated administrator can also set recommendation preferences for your entire organization without the need to access the management account. For more information, see [Delegate an administrator account](#).

August 15, 2022

[Updated an AWS managed policy for AWS Compute Optimizer](#)

The ComputeOptimizerServiceRolePolicy AWS managed policy for AWS Compute Optimizer was updated. For more information, see [AWS managed policies for AWS Compute Optimizer](#).

July 25, 2022

[Compute Optimizer adds support for additional Amazon EC2 instance types](#)

Compute Optimizer now supports C5d, C6a, C6i, I2, I4gn, I4gen, M5ad, M6a, M6i, and R6i Amazon EC2 instance types. These instance types are supported in all the AWS Regions where both these instance types and Compute Optimizer are available. This update doesn't apply in the China (Beijing) and China (Ningxia) Regions. For more information, see [Amazon EC2 instance requirements](#).

April 7, 2022

[Workload-aware recommendations and migration effort now available](#)

With the new inferred workload types feature, Compute Optimizer can infer the applications that might be running on your resources . Examples include EC2 instances and Auto Scaling groups. Compute Optimizer does this by analyzing the attributes of your resources , such as resource names, tags, and configuration. By inferring applications, Compute Optimizer can generate recommendations that take your applications into account. It can also identify the level of effort required to migrate from the current instance type to the recommended instance type. For more information, see [Inferred workload type](#).

January 10, 2022

[View savings and performance improvement opportunities for your resources, and activate enhanced infrastructure metrics](#)

Identify your biggest cost and performance improvement opportunities in the new **Savings opportunity** and **Performance improvement opportunity** sections of the dashboard. For more information, see [Viewing the AWS Compute Optimizer dashboard](#). You can also now extend the metrics analysis lookback period for EC2 instances and Auto Scaling groups up to three months. By default, the lookback period is 14 days. To do this, activate enhanced infrastructure metrics. The enhanced infrastructure metrics feature is a paid feature of Compute Optimizer. For more information, see [Activating enhanced infrastructure metrics](#).

November 29, 2021

[Updated AWS managed policies for AWS Compute Optimizer](#)

The `ComputeOptimizerServiceRolePolicy` and `ComputeOptimizerReadOnlyAccess` AWS managed policies for AWS Compute Optimizer were updated. For more information, see [AWS managed policies for AWS Compute Optimizer](#).

November 29, 2021

## [AWS Graviton based instance recommendations](#)

Compute Optimizer now provides the price and performance impact for running your workload on AWS Graviton based instances . For more information, see [AWS Graviton-based instance recommendations](#). If your account is your organization's management account, you can now also view the member accounts of an organization that are opted in to Compute Optimizer. For more information, see [Viewing the accounts opted in to AWS Compute Optimizer](#).

August 26, 2021

[Amazon EC2 instance recommendations enhancements](#)

Compute Optimizer now supports a wider range of Amazon EC2 instance types. Compute Optimizer evaluates a wider range of instance metrics to generate recommendations and provides finding instance recommendations reasons. Compute Optimizer also describes the platform differences between the current instance and the recommended instance type. For more information, see [Amazon EC2 instance requirements](#), [EC2 instance metrics](#), [Finding reasons](#), and [Platform differences](#).

May 24, 2021

[Recommendations export for Amazon EBS volumes and Lambda functions](#)

You can now export recommendations for Amazon EBS volumes and Lambda functions to Amazon S3. For more information, see [Exporting recommendations](#).

May 18, 2021

[Adding documentation for AWS managed policies](#)

Compute Optimizer now tracks changes for its AWS managed policies. For more information, see [AWS managed policies for AWS Compute Optimizer](#).

May 18, 2021

[AWS Lambda function recommendations](#)

Compute Optimizer now generates recommendations for AWS Lambda functions . For more information, see [Viewing AWS Lambda function recommendations](#).

December 23, 2020

[Amazon EBS volume recommendations](#)

Compute Optimizer now generates recommendations for Amazon Elastic Block Store (Amazon EBS) volumes. For more information, see [Viewing EBS volume recommendations](#).

December 3, 2020

### [Amazon EBS metrics and encrypted S3 buckets](#)

Compute Optimizer now analyzes the read/write operations per second (ops), and the read/write bytes per second (Bps) of the Amazon Elastic Block Store (Amazon EBS) volumes that are attached to an instance. The data is used to generate recommendations. You can also view EBS read/write bandwidth (operations per second), and EBS read/write throughput (KiBps) graphs in the Compute Optimizer console. For more information, see [Viewing EC2 instance recommendations](#). You can also now export recommendations to encrypted Amazon S3 buckets. For more information, see [Exporting recommendations](#).

October 7, 2020

### [Recommendations export](#)

Recommendations can be exported to Amazon Simple Storage Service (Amazon S3). For more information, see [Exporting recommendations](#).

June 10, 2020

### [Self-service opt-out](#)

AWS Command Line Interface now supports self-service opt-out. For more information, see [Opting out your account](#).

April 6, 2020

### [Service release](#)

Compute Optimizer released.

December 2, 2019