
AWS Compute Optimizer

User Guide



AWS Compute Optimizer: User Guide

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What is AWS Compute Optimizer?

AWS Compute Optimizer is a service that analyzes the configuration and utilization metrics of your AWS resources. 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

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 \(p. 3\)](#).

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 \(p. 5\)](#).

Metrics analyzed

After you opt in, Compute Optimizer begins analyzing the specifications and the utilization metrics of your resources from Amazon CloudWatch. For example, for Amazon EC2 instances, it begins analyzing the vCPUs, memory, storage, and other specifications of currently running instances. For more information, see [Metrics analyzed by AWS Compute Optimizer \(p. 20\)](#).

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 \(p. 25\)](#).

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 \(p. 29\)](#).

Export your optimization recommendations to record them over time, and share the data with others. For more information, see [Exporting recommendations \(p. 51\)](#).

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 Amazon Elastic Compute Cloud (Amazon EC2) instances, Amazon EC2 Auto Scaling groups, Amazon Elastic Block Store (Amazon EBS) volumes, AWS Lambda functions that meet the following Amazon CloudWatch (CloudWatch) metric and resource-specific requirements.

Contents

- [CloudWatch metric requirements \(p. 3\)](#)
- [Amazon EC2 instance requirements \(p. 3\)](#)
- [Auto Scaling group requirements \(p. 4\)](#)
- [Amazon EBS volume requirements \(p. 4\)](#)
- [Lambda function requirements \(p. 4\)](#)

CloudWatch metric requirements

To generate recommendations, Compute Optimizer requires at least 30 *consecutive* hours of CloudWatch metric data from your resource. For more information about the metrics that are analyzed, see [Metrics analyzed by AWS Compute Optimizer \(p. 20\)](#). If your resources have not accumulated sufficient metric data, then allow more time for resource recommendations to begin appearing in the Compute Optimizer console.

Note

Lambda functions don't require 30 consecutive hours of metric data. For more information about the Lambda function requirements, see [Lambda function requirements \(p. 4\)](#).

If your resources have accumulated sufficient metric data, but recommendations are not yet showing up in the Compute Optimizer console, then the service might still be performing its analysis. It could take up to 12 hours to complete the analysis, after which time resource recommendations will begin appearing in the Compute Optimizer console.

Amazon EC2 instance requirements

Compute Optimizer generates recommendations for instance types in the C, D, H, I, M, R, T, X, and z instance families, in AWS Regions where Compute Optimizer and these instance families are available. Compute Optimizer also generates recommendations for storage optimized instances (-d), network optimized instances (-n), and Graviton2 instances (-g).

If you're running unsupported instance types, in addition to those supported by Compute Optimizer, the service generates recommendations only for the supported instances. 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*.

Auto Scaling group requirements

Compute Optimizer generates recommendations for Auto Scaling groups that run instance types from the supported instance families, which are listed in the [Amazon EC2 instance requirements \(p. 3\)](#) section of this guide.

The Auto Scaling groups must also be configured to run a single instance type (i.e., no mixed instance types), must not have a scaling policy attached to them, and have the same values for desired, minimum, and maximum capacity (i.e., an Auto Scaling group with a fixed number of instances). 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 General Purpose SSD (gp2 and gp3), and Provisioned IOPS SSD (io1 and io2) EBS volume types that are attached to an instance. It also generates recommendations from General Purpose SSD (gp2) volumes to General Purpose SSD (gp3) volumes from the aforementioned volume types.

Data is only reported to CloudWatch when the volume is attached to an instance. Therefore, the volume must be attached to an instance for at least 30 consecutive hours to meet the 30 consecutive hour metric data requirement described earlier in this guide.

Lambda function requirements

Compute Optimizer generates memory size recommendations only for Lambda functions that have configured memory less than or equal to 1,792 MB, and that have been invoked at least 50 times in the last 14 days. Functions that don't match these requirements are given a finding of **Unavailable**, with a reason code of **Inconclusive** for functions that have configured memory greater than 1,792 MB, and **Insufficient data** for functions that have been invoked less than 50 times in the last 14 days.

Functions with a finding of **Unavailable** are not listed in the Compute Optimizer console, and Compute Optimizer does not generate recommendations for them.

Getting started with AWS Compute Optimizer

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

By opting in, you are authorizing Compute Optimizer to analyze the specifications and utilization metrics of your AWS resources, such as 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 does not have AWS Organizations enabled. If you opt in to Compute Optimizer while signed in to a standalone account, the service analyzes resources that are in the account, and generates optimization recommendations for those resources.
- **Member account of an organization** - An AWS account that is a member of an organization. If you opt in to Compute Optimizer while signed in to a member account of an organization, the service analyzes resources that are in the member account only, 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, the service gives you the option to opt in only the management account, or the management account and all member accounts of the organization.

Important

To successfully opt in all member accounts of an organization, the organization must have all features enabled. For more information, see [Enabling All Features in Your Organization](#) in the *AWS Organizations User Guide*.

Trusted access for Compute Optimizer is automatically enabled in your organization account when you opt in using your organization's management account and include all member accounts within the organization. For more information, see [Compute Optimizer and AWS Organizations trusted access \(p. 8\)](#).

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 \(p. 8\)](#).

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 \(p. 11\)](#).

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, then you must use the AWS CLI to opt in. Specify the `--include-member-accounts` parameter when opting in with the `update-enrollment-status` command. You can also enable trusted access using the AWS Organizations console, its 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 a management account of an 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.
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 are redirected to the dashboard in the Compute Optimizer console, and the service begins analyzing the configuration and utilization metrics of your AWS resources. For more information, see [Metrics analyzed by AWS Compute Optimizer \(p. 20\)](#).

CLI

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 one of the following commands depending on whether you want to opt in your individual account or the management account of an 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 \(p. 20\)](#).

Note

To improve the recommendation quality of Compute Optimizer, AWS may use your CloudWatch metrics and configuration data, such as memory utilization. If you want to opt out of this experience and request that AWS does not use your CloudWatch metrics or configuration data to improve recommendation quality of Compute Optimizer, contact AWS Support.

Findings and optimization recommendations could take up to 12 hours to be generated after you opt in, and sufficient metric data must be accumulated. For more information, see [CloudWatch metric requirements \(p. 3\)](#). Findings and recommendations are displayed in the dashboard and recommendation pages of the Compute Optimizer console. For more information, see [Viewing the AWS Compute Optimizer dashboard \(p. 25\)](#) and [Viewing resource recommendations \(p. 29\)](#).

Opting out your account

Use the following procedure to opt out your account from Compute Optimizer using the AWS CLI, and delete 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 cannot 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 cannot specify the `--include-member-accounts` parameter when opting out with the `update-enrollment-status` command; you will receive an error message

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

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 then give those identities permissions to access the AWS Compute Optimizer console and APIs.

By default, IAM users do not 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 must have `ec2:DescribeInstances` permission. To view recommendations for EBS volumes, an IAM user must have `ec2:DescribeVolumes` permission. To view recommendations for Auto Scaling groups, an IAM user must have `autoscaling:DescribeAutoScalingGroups` permission. To view recommendations for Lambda functions, an IAM user must have `lambda:ListFunctions` and `lambda:ListProvisionedConcurrencyConfigs` permission. To view current CloudWatch metrics data in the Compute Optimizer console, an IAM user must have `cloudwatch:GetMetricData` permissions.

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.

Compute Optimizer and AWS Organizations trusted access

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

Compute Optimizer verifies that trusted access is enabled in your organization account every time you access recommendations for member accounts. If you disable Compute Optimizer trusted access after you opt in, Compute Optimizer will deny access to recommendations for your organization's member accounts, and the member accounts within the organization will not be 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 member accounts within the organization. For more information, see [Opting in your account \(p. 6\)](#). 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, which is required to opt in. For more information, see [Using Service-Linked Roles for AWS Compute Optimizer \(p. 11\)](#). 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.

```
{  
  "Version": "2012-10-17",  
  "Statement": [  
    {  
      "Effect": "Allow",  
      "Action": [  
        "compute-optimizer:*",  
        "ec2:DescribeInstances",  
        "ec2:DescribeVolumes",  
        "autoscaling:DescribeAutoScalingGroups",  
        "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:GetRecommendationSummaries",  
        "compute-optimizer:GetEC2InstanceRecommendations",  
        "compute-optimizer:GetEC2RecommendationProjectedMetrics",  
        "compute-optimizer:GetAutoScalingGroupRecommendations",  
        "compute-optimizer:UpdateEnrollmentStatus"  
      ]  
    }  
  ]  
}
```

```
        "compute-optimizer:GetEBSVolumeRecommendations",
        "compute-optimizer:GetLambdaFunctionRecommendations",
        "compute-optimizer:DescribeRecommendationExportJobs",
        "ec2:DescribeInstances",
        "ec2:DescribeVolumes",
        "autoscaling:DescribeAutoScalingGroups",
        "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 an organization.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "compute-optimizer:*",
        "ec2:DescribeInstances",
        "ec2:DescribeVolumes",
        "autoscaling:DescribeAutoScalingGroups",
        "lambda:ListFunctions",
        "lambda:ListProvisionedConcurrencyConfigs",
        "cloudwatch:GetMetricData",
        "organizations:ListAccounts",
        "organizations:DescribeOrganization",
        "organizations:DescribeAccount",
        "organizations:EnableAWSServiceAccess",
      ],
      "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:GetRecommendationSummaries",
        "compute-optimizer:GetEC2InstanceRecommendations",
        "compute-optimizer:GetEC2RecommendationProjectedMetrics",
        "compute-optimizer:GetAutoScalingGroupRecommendations",
        "compute-optimizer:GetEBSVolumeRecommendations",
        "compute-optimizer:GetLambdaFunctionRecommendations",
      ],
    }
  ]
}
```

```
        "ec2:DescribeInstances",
        "ec2:DescribeVolumes",
        "autoscaling:DescribeAutoScalingGroups",
        "lambda:ListFunctions",
        "lambda:ListProvisionedConcurrencyConfigs",
        "cloudwatch:GetMetricData",
        "organizations:ListAccounts",
        "organizations:DescribeOrganization",
        "organizations:DescribeAccount"
    ],
    "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 is 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 AWS services on your behalf.

A service-linked role makes setting up Compute Optimizer easier because you don't have to manually add 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 named **AWSServiceRoleForComputeOptimizer** – Role 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.

Service-Linked Role permissions

You must configure permissions to allow an IAM entity (such as a user, group, or role) to create a service-linked role for Compute Optimizer. 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

This service-linked role can appear in your account if you completed an action in another service that uses the features supported by this role. 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 does not allow you to edit the `AWSServiceRoleForComputeOptimizer` service-linked role. After you create a service-linked role, you cannot 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 you delete the `AWSServiceRoleForComputeOptimizer` service-linked role if you no longer need to use Compute Optimizer. That way you don't have an unused entity that is not actively monitored or maintained. However, you must opt out of Compute Optimizer before you can manually delete the service-linked role.

To opt out of Compute Optimizer

For information about opting out of Compute Optimizer, see [Opting out your account \(p. 7\)](#).

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, it is easier to use AWS managed policies than to write policies yourself. 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 our 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 do not remove permissions from an AWS managed policy, so policy updates won't break your existing permissions.

Additionally, AWS supports managed policies for job functions that span multiple services. For example, the **ReadOnlyAccess** AWS managed policy provides read-only access to all AWS services 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

You can't attach `ComputeOptimizerServiceRolePolicy` to your IAM entities. This 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 \(p. 11\)](#).

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.

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

```
        "Sid": "CloudWatchAccess",
        "Effect": "Allow",
        "Action": [
            "cloudwatch:GetMetricData"
        ],
        "Resource": "*"
    }
}
```

AWS managed policy: ComputeOptimizerReadOnlyAccess

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

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

Permissions details

This policy includes the following permissions.

- `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 supported by Compute Optimizer.
- `organizations` – Grants read-only access to member accounts of an AWS organization.

```
{
  "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",
        "ec2:DescribeInstances",
        "ec2:DescribeVolumes",
        "autoscaling:DescribeAutoScalingGroups",
        "lambda:ListFunctions",
        "lambda:ListProvisionedConcurrencyConfigs",
        "cloudwatch:GetMetricData",
        "organizations:ListAccounts",
        "organizations:DescribeOrganization",
        "organizations:DescribeAccount"
      ],
      "Resource": "*"
    }
  ]
}
```

}

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 <code>GetEnrollmentStatusesForOrganization</code> 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 in a comma-separated values (.csv) file, and its metadata in a JavaScript Object Notation (.json) file, to an Amazon Simple Storage Service (Amazon S3) bucket. For more information, see [Exporting recommendations \(p. 51\)](#).

You must create the destination S3 bucket for your recommendations export before you create the export job. Compute Optimizer does not create the S3 bucket for you. The S3 bucket that you specify for your recommendations export files cannot be publicly accessible, and cannot be configured as a [Requester Pays](#) bucket.

As a 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*. After you create the S3 bucket, ensure that it has the required permission policy to allow Compute Optimizer to write the export files to it. For more information, see [Specifying an existing bucket for your recommendations export \(p. 18\)](#).

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-Managed Keys (SSE-S3) or Customer Master Keys (CMKs) stored in the AWS Key Management Service (AWS KMS).

You must create a symmetric CMK to use an S3 bucket with AWS KMS encryption enabled. Symmetric CMKs are the only CMKs supported by Amazon S3. For more information, see [Creating keys](#) in the *AWS KMS Developer Guide*. After you create the CMK, you must 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 CMK to encrypt 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**.
4. Choose the name of the CMK that you chose 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 and paste one of the following policies into the statements section of the key policy. Replace the placeholders in italics with the source AWS Region, and the account number of the requester of the export job.

The statement (for the GenerateDataKey action) allows Compute Optimizer to call the AWS KMS API to obtain the data key for encrypting the recommendation files. In this way, the uploaded data format can accommodate the bucket encryption setting. Otherwise, Amazon S3 will reject the export request.

Note

If the existing CMK already has one or more policies attached, add the statements for Compute Optimizer access to those policies. Evaluate the resulting set of permissions to be sure that they are appropriate for the users who will access the CMK.

- Use the following policy if you *have not enabled* 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 *have 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:*"
      }
    }
  }
```

Specifying an existing bucket for your recommendations export

Use the following procedure to add a policy to your 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 the following policy, and paste it into the **Bucket Policy Editor** text box.

Replace the placeholders in *italics* with the name of your bucket, the optional object prefix, the source AWS Region, and the account number of the requester of the export job. If you plan to specify an object prefix when you create your recommendations export, include it in the policy. The object prefix is an optional addition to the S3 object key that organizes your export files in your S3 bucket.

You must copy and paste this policy to include all three statements. The first statement (for the `GetBucketAcl` action) allows Compute Optimizer to get the access control list (ACL) of your bucket. The second statement (for the `GetBucketPolicyStatus` action) allows Compute Optimizer to get the policy status of your bucket, indicating whether the bucket is public. The third statement (for the `PutObject` action) gives Compute Optimizer full control to put the export file in your bucket. Your export request will fail if any of these statements is missing, or if the bucket name and optional object prefix in the policy don't match what you specify in your export request, or 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 be sure that they are appropriate for the users who will access the bucket.

```
{
  "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/[optional prefix]/compute-optimizer/myAccountID/*",
        "Condition": { "StringEquals": {
            "s3:x-amz-acl": "bucket-owner-full-control",
            "aws:SourceAccount": "myAccountID",
            "aws:SourceArn": "arn:aws:compute-optimizer:myRegion:myAccountID:*"
        } }
    }
}
```

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

```
{
  "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:*"
      } }
    }
  ]
}
```

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 \(p. 5\)](#), AWS Compute Optimizer begins analyzing the specifications (vCPUs, memory, storage, and so on) and the CloudWatch metrics of your running resources from a period of the last 14 days. Compute Optimizer requires at least 30 *consecutive* hours of metrics data from your resource to generate recommendations. After the analysis is completed, which could take up to 12 hours, Compute Optimizer presents its findings on the dashboard page. For more information, see [Viewing the AWS Compute Optimizer dashboard \(p. 25\)](#).

Contents

- [EC2 instance metrics \(p. 20\)](#)
- [EBS volume metrics \(p. 21\)](#)
- [Lambda function metrics \(p. 22\)](#)

EC2 instance metrics

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 required to run an application on an instance.
Memory utilization	<p>The amount of memory that has been used in some way during the sample period. This metric identifies the memory required to run an application on an instance.</p> <p>Memory utilization is analyzed only for resources that have the unified CloudWatch agent installed on them. For more information, see Enabling memory utilization with the CloudWatch Agent (p. 21).</p>
NetworkIn	The number of bytes 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 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 received by the instance.
NetworkPacketsOut	The number of packets sent out by the instance.
DiskReadOps	The read operations per second of the instance store volume of the instance.

Metric	Description
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 KiB/seconds in the console.
VolumeWriteBytes	The write bytes per second of EBS volumes attached to the instance. Displayed as KiB/seconds in the console.
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

Install the CloudWatch agent on your instances to have Compute Optimizer analyze the memory utilization of your instances. Enabling Compute Optimizer to analyze memory utilization data for your instances provides an additional measurement of data that further improves the recommendations provided by the service. 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 `Memory % Committed Bytes In Use` metric in the `CWAgent` namespace. Additionally, the namespace must contain the `InstanceId` dimension. Compute Optimizer will not be able to collect memory utilization data for your instance if the `InstanceId` dimension is missing, or if you overwrite it with your own custom dimension name. 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*.

EBS volume metrics

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

Metric	Description
VolumeReadBytes	The read bytes per second of the EBS volume.

Metric	Description
VolumeWriteBytes	The write bytes per second of the EBS volume.
VolumeReadOps	The read operations per second of the EBS volume.
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*.

Viewing the accounts opted in to AWS Compute Optimizer

Management accounts of organizations can [enroll \(opt in\)](#) (p. 5) member accounts of the organization to AWS Compute Optimizer. When member accounts are opted in, all supported resources within those member accounts are analyzed for optimization opportunities by Compute Optimizer. If your account is the management account of an organization, you can view member accounts of the organization that are opted in to Compute Optimizer. View these accounts on the **Accounts** page in the Compute Optimizer console. The **Accounts** page is visible only to management accounts of an organization.

Viewing opted in accounts

Use the following procedure to view accounts that are opted in to Compute Optimizer using the console or the AWS Command Line Interface (AWS CLI).

Console

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

The **Accounts** 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 listed. To troubleshoot account opt-in failures, see [the section called "Troubleshooting account opt-in"](#) (p. 24).

CLI

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 to get the enrollment statuses for member accounts of an organization if your account is the management account of the organization.

```
aws compute-optimizer get-enrollment-statuses-for-organization
```

The response lists the member accounts of the organization, and their current Compute Optimizer opt-in status. The `status` and `statusReason` parameters describe the status of each account ID listed. To troubleshoot account opt-in failures, see [the section called "Troubleshooting account opt-in"](#) (p. 24).

Note

The response is paginated if the organization account contains more than 100 member accounts. In this case, the response includes a `nextPage` parameter, which you can specify in a subsequent `get-enrollment-statuses-for-organization` to advance to the next page of account enrollment statuses.

Troubleshooting account opt-in

Following are the reasons that accounts can fail to opt in to Compute Optimizer, and what you can do to mitigate the problem.

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, which 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 (such as 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 will perform the Compute Optimizer opt in. For more information, see [the section called "Service-Linked Role permissions" \(p. 12\)](#).

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*. Trusted access for Compute Optimizer is automatically enabled in your organization account when you opt in using your organization's management account and include all member accounts within the organization. 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 will 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" \(p. 6\)](#).

Viewing the AWS Compute Optimizer dashboard

The dashboard in the AWS Compute Optimizer console displays an overview of optimization findings for your AWS resources. Your resources are organized into findings classifications, and are separated into service-specific sections. For example, the dashboard shows the findings for your EC2 instances, Auto Scaling groups, EBS volumes, and AWS Lambda functions separately. Use the dashboard to identify the optimization opportunities for each resource type that is supported by Compute Optimizer.

The findings and recommendations are refreshed daily. They're generated by analyzing your resource's specifications and utilization metrics over a period of the last 14 days. For more information, see [Metrics analyzed by AWS Compute Optimizer \(p. 20\)](#). Keep in mind that findings and recommendations could take up to 12 hours to be generated, and sufficient metric data must be accumulated. For more information, see [CloudWatch metric requirements \(p. 3\)](#).

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. A percentage, and a count of your resources that are in each classification, are shown on the dashboard. The classifications differ based on the resource type. The following classifications apply to services and resources supported by Compute Optimizer.

EC2 instances

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.

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 \(p. 30\)](#) in the [Viewing EC2 instance recommendations \(p. 29\)](#) topic.

Auto Scaling groups

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 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 \(p. 30\)](#) in the [Viewing EC2 instance recommendations \(p. 29\)](#) topic.

EBS volumes

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

Lambda functions

The following findings classifications apply to Lambda functions.

Classification	Description
Not optimized	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-

Classification	Description
	<p>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 Memory under-provisioned or Memory over-provisioned.</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 requirements of Compute Optimizer for Lambda functions (p. 4), 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">• Insufficient data when the function does not have sufficient metric data for Compute Optimizer to generate a recommendation.• Inconclusive 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. <p>Note Functions with a finding of Unavailable are not listed in the Compute Optimizer console.</p>

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 are 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 are 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 \(p. 5\)](#) and [Compute Optimizer and AWS Organizations trusted access \(p. 8\)](#).

- 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 \(p. 29\)](#).

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, which you can access from the recommendations page, lists the top three recommendation options for a specific resource, along with utilization metric graphs for the resource.

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

- **Amazon EC2 instances** - For more information, see [Viewing EC2 instance recommendations \(p. 29\)](#).
- **Auto Scaling groups** - For more information, see [Viewing Auto Scaling group recommendations \(p. 40\)](#).
- **Amazon EBS volumes** - For more information, see [Viewing Amazon EBS volume recommendations \(p. 44\)](#).
- **AWS Lambda functions** - For more information, see [Viewing Lambda function recommendations \(p. 47\)](#).

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 \(p. 30\)](#), [finding reasons \(p. 30\)](#), [platform differences \(p. 33\)](#), current instance type, and current hourly price for the selected [purchasing option \(p. 35\)](#). The top recommendation from Compute Optimizer is listed next to each of your instances, 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 your current instances with their top recommendation, which can help you to decide if you should up-size or down-size your instances.
- The **EC2 instance details** page, which you can access from the EC2 instances recommendations page, lists up to three optimization recommendations for a specific instance. It lists the specifications for each recommendation, their [performance risk \(p. 36\)](#), 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. They're generated by analyzing the specifications and utilization metrics of the current instance over a period of the last 14 days. For more information, see [Metrics analyzed by AWS Compute Optimizer \(p. 20\)](#).

Keep in mind that Compute Optimizer generates recommendations for EC2 instances that meet a specific set of requirements, recommendations could take up to 12 hours to be generated, and sufficient metric data must be accumulated. For more information, see [Supported resources and requirements \(p. 3\)](#).

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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 while still meeting the performance requirements of your workload. This is identified by analyzing the <code>CPUtilization</code> metric of the current instance during the look-back period.

Finding reason	Description
CPU under-provisioned	<p>The instance's CPU configuration doesn't meet the performance requirements of your workload and there is 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.</p>
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> <p>Note Memory utilization is analyzed only for resources that have the unified CloudWatch agent installed on them. For more information, see Enabling memory utilization with the Amazon CloudWatch Agent in the <i>AWS Compute Optimizer User Guide</i>. On Linux instances, Compute Optimizer analyzes the <code>mem_used_percent</code> metric in the <code>CWAgent</code> namespace, or the legacy <code>MemoryUtilization</code> metric in the <code>System/Linux</code> namespace. On Windows instances, Compute Optimizer analyzes the <code>Memory % Committed Bytes In Use</code> metric in the <code>CWAgent</code> namespace.</p>
Memory under-provisioned	<p>The instance's memory configuration doesn't meet the performance requirements of your workload and there is 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.</p> <p>Note Memory utilization is analyzed only for resources that have the unified CloudWatch agent installed on them. For more information, see Enabling memory utilization with the Amazon CloudWatch Agent in the <i>AWS Compute Optimizer User Guide</i>. On Linux instances, Compute Optimizer analyzes the <code>mem_used_percent</code> metric in the <code>CWAgent</code> namespace, or the legacy <code>MemoryUtilization</code> metric in the <code>System/Linux</code> namespace. On Windows instances, Compute Optimizer analyzes the <code>Memory % Committed Bytes In Use</code> metric in the <code>CWAgent</code> namespace.</p>
EBS throughput over-provisioned	<p>The instance's EBS throughput configuration can be sized down while still meeting 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 is 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 attached to the current instance during the look-back period.</p>

Finding reason	Description
EBS IOPS over-provisioned	The instance's EBS IOPS configuration can be sized down while still meeting 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.
EBS IOPS under-provisioned	The instance's EBS IOPS configuration doesn't meet the performance requirements of your workload and there is 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 is 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 while still meeting 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 is 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.
Disk IOPS over-provisioned	The instance's disk IOPS configuration can be sized down while still meeting 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 is 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.

Finding reason	Description
Disk throughput under-provisioned	The instance's disk throughput configuration doesn't meet the performance requirements of your workload and there is 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.

Platform differences

The **Platform differences** column on the **EC2 instance details** page describes the differences between the current instance and the recommended instance type. You should 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	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, you should consider recompiling the software on your instance for the new architecture. Alternatively, you might switch to an Amazon Machine Image (AMI) that supports

Platform difference	Description
	the new architecture. For more information about the CPU architecture for each instance type, see Amazon EC2 Instance Types .
Hypervisor	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 should consider between these hypervisors, see Nitro Hypervisor section of the Amazon EC2 FAQs. For more information, see Instances built on the Nitro System in the <i>Amazon EC2 User Guide for Linux</i> , or Instances built on the Nitro System in the <i>Amazon EC2 User Guide for Windows</i> .
Instance store availability	The recommended instance type does not 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 How do I back up an instance store volume on my Amazon EC2 instance to Amazon EBS? in the <i>AWS Premium Support Knowledge Base</i> . For more information, see Networking and storage features and Amazon EC2 instance store in the <i>Amazon EC2 User Guide for Linux</i> , or see Networking and storage features and Amazon EC2 instance store in the <i>Amazon EC2 User Guide for Windows</i> .
Network interface	The network interface of the recommended instance type is different than that of the current instance. For example, the recommended instance type might use enhanced networking and the current instance might not. To enable enhanced networking for the recommended instance type, you need to install the Elastic Network Adapter (ENA) driver or the Intel 82599 Virtual Function driver. For more information, see Networking and storage features and Enhanced networking on Linux in the <i>Amazon EC2 User Guide for Linux</i> , or Networking and storage features and Enhanced networking on Windows in the <i>Amazon EC2 User Guide for Windows</i> .
Storage interface	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 does not. To access NVMe volumes for the recommended instance type, you will need to install or upgrade the NVMe driver. For more information, see Networking and storage features and Amazon EBS and NVMe on Linux instances in the <i>Amazon EC2 User Guide for Linux</i> , or Networking and storage features and Amazon EBS and NVMe on Windows instances in the <i>Amazon EC2 User Guide for Windows</i> .
Virtualization type	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 Linux AMI virtualization types in the <i>Amazon EC2 User Guide for Linux</i> , or Windows AMI virtualization types in the <i>Amazon EC2 User Guide for Windows</i> .

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 ▾
t2.micro	\$0.0072 per hour	t3.micro	\$0.0065 per hour	- \$0.0007 per hour
t2.micro	\$0.0072 per hour	t3.micro	\$0.0065 per hour	- \$0.0007 per hour
t2.micro	\$0.0672 per hour	t3.micro	\$0.0665 per hour	- \$0.0007 per hour
t2.micro	\$0.0672 per hour	t3.micro	\$0.0665 per hour	- \$0.0007 per hour

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

The **EC2 instances recommendations** page also lists the **On-Demand hours**, **Reserved Instance (RI) hours**, and **Savings Plans hours** for each of your running instances. These data columns represent the subset of the total running hours that each instance was On-Demand, was covered by an AWS reservation, and was covered by Savings Plans over the look-back period (up to the last 14 days). That data is used to calculate an **Estimated monthly saving** for each of your recommendations, which is also displayed on the recommendations page.

Estimated monthly saving ▾	Reserved instance hours ▾	On demand hours ▾	Saving plan hours ▾
\$0.31	0.0	119.0	0.0
\$0.87	0.0	332.0	0.0
\$0.87	0.0	332.0	0.0
\$0.87	0.0	332.0	0.0

To calculate the estimated monthly savings, we first examine the instance running in the look-back period to identify if it was partially or fully covered by an RI or running On-Demand. Another factor is whether the RI is size-flexible. The cost to run the instance is calculated based on the On-Demand hours and the rate of the instance type.

For each recommendation, we calculate the cost to operate a new instance. We assume that a size-flexible RI will cover the new instance in the same way as the previous instance. Savings are calculated based on the number of On-Demand running hours and the difference in On-Demand rates. If the RI isn't size-flexible, the savings calculation is based on if the instance hours during the look-back period are operated as On-Demand.

Recommendations are provided regardless of estimated monthly savings. Even if the estimated savings is less than zero, you might be able to convert your existing Convertible RIs to cover the recommended instance types.

Note

Recommendations don't capture second-order effects of rightsizing, such as the resulting RI hour's availability and how they will apply to other instances. Potential savings based on reallocation of the RI hours aren't included in the calculation.

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, 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 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

Utilization graphs

The **EC2 instance details** page displays utilization metric graphs for your current instance. The graphs display data for the analyzed period (up to 14 days). 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
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 would have been if you had used 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>
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 memory utilization would have been if you had used 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> <p>Note</p> <p>The memory utilization graph is populated only for instances that have the unified CloudWatch agent installed on them. For more information, see Collecting Metrics and Logs from Amazon</p>

Graph name	Description
	EC2 Instances and On-Premises Servers with the CloudWatch Agent in the <i>Amazon CloudWatch User Guide</i> .
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.
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, along with 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:
 - 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.
 - To filter recommendations 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 view recommendations for instances in another account, choose **Account**, and then select a different account ID.

Note

The ability to view recommendations for resources in other accounts is available only if you are signed in to a management account of an organization, and trusted access with Compute Optimizer is enabled. For more information, see [Accounts supported by Compute Optimizer \(p. 5\)](#) and [Compute Optimizer and AWS Organizations trusted access \(p. 8\)](#).

- To clear the selected filters, choose **Clear filters** next to the filter.
- 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**.
- To access the **EC2 instance details** page for a specific instance, choose the finding classification listed next to the desired instance.

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 for which you wish to view detailed information.

The details page lists up to three optimization recommendations for the instance that you chose. It 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.
 - 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, displayed in the CPU utilization and memory utilization graphs, is the projected utilization of the selected recommended instance if you had used that instance during the analyzed 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 instance 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 instance usage of your workload over time.

- 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 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 \(p. 41\)](#), current instance type, current hourly price for the selected [purchasing option \(p. 41\)](#), 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 up-size or down-size 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 \(p. 42\)](#), 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. For more information, see [Metrics analyzed by AWS Compute Optimizer \(p. 20\)](#).

Keep in mind that Compute Optimizer generates recommendations for Auto Scaling groups that meet a specific set of requirements, recommendations could take up to 12 hours to be generated, and sufficient metric data must be accumulated. For more information, see [Supported resources and requirements \(p. 3\)](#).

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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 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.

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.

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 ▾
t2.micro	\$0.0072 per hour	t3.micro	\$0.0065 per hour	- \$0.0007 per hour
t2.micro	\$0.0072 per hour	t3.micro	\$0.0065 per hour	- \$0.0007 per hour
t2.micro	\$0.0672 per hour	t3.micro	\$0.0665 per hour	- \$0.0007 per hour
t2.micro	\$0.0672 per hour	t3.micro	\$0.0665 per hour	- \$0.0007 per hour

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*.

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

Utilization graphs

The **Auto Scaling group details** page displays utilization metric graphs for current instances in the group. The graphs display data for the analyzed period (up to 14 days). 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
Average CPU utilization (percent)	The average percentage of allocated EC2 compute units used by instances in the Auto Scaling group.
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:
 - 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.
 - To filter recommendations 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 view recommendations for instances in another account, choose **Account**, and then select a different account ID.

Note

The ability to view recommendations for resources in other accounts is available only if you are signed in to a management account of an organization, and trusted access with Compute Optimizer is enabled. For more information, see [Accounts supported by Compute Optimizer \(p. 5\)](#) and [Compute Optimizer and AWS Organizations trusted access \(p. 8\)](#).

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

- To access the **Auto Scaling group details** page for a specific Auto Scaling group, 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.
 - 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**.

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](#) (p. 45), 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](#) (p. 45), 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 \(p. 20\)](#).

Keep in mind that Compute Optimizer generates recommendations for EBS volumes that meet a specific set of requirements, recommendations could take up to 12 hours to be generated, and sufficient metric data must be accumulated. For more information, see [Supported resources and requirements \(p. 3\)](#).

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

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*.

Utilization graphs

The **EBS volume details** page displays utilization metric graphs for your current volume. The graphs display data for the analyzed period (up to 14 days). 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)	The completed read operations per second for the current EBS volume. For Xen instances, data is reported only when there is read activity on the volume.
Write operations (per second)	The completed write operations per second to the current EBS volume. For Xen instances, data is reported only when there is write activity on the volume.
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)	The percentage of I/O credits remaining in the burst bucket for the current EBS volume. This metric is displayed only for General Purpose SSD (gp2) volumes in the Compute Optimizer console.

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:
 - To filter recommendations 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 view recommendations for volumes in another account, choose **Account**, and then select a different account ID.

Note

The ability to view recommendations for resources in other accounts is available only if you are signed in to a management account of an organization, and trusted access with Compute Optimizer is enabled. For more information, see [Accounts supported by Compute Optimizer \(p. 5\)](#) and [Compute Optimizer and AWS Organizations trusted access \(p. 8\)](#).

- To clear the selected filters, choose **Clear filters** next to the filter.
- To access the **EBS volume details** page for a specific volume, 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 \(p. 48\)](#), 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 \(p. 20\)](#).

Keep in mind that Compute Optimizer generates recommendations for Lambda functions that meet a specific set of requirements, recommendations could take up to 12 hours to be generated, and sufficient metric data must be accumulated. For more information, see [Supported resources and requirements \(p. 3\)](#).

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 Memory under-provisioned or Memory over-provisioned.</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 requirements of Compute Optimizer for Lambda functions (p. 4), 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"> • Insufficient data when the function does not have sufficient metric data for Compute Optimizer to generate a recommendation. • Inconclusive 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.

Classification	Description
	Note Functions with a finding of Unavailable are not listed in the Compute Optimizer console.

Utilization graphs

The **Lambda function details** page displays utilization metric graphs for your current function. The graphs display data for the analyzed period (up to 14 days). 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:
 - To filter recommendations 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 view recommendations for functions in another account, choose **Account**, and then select a different account ID.

Note

The ability to view recommendations for resources in other accounts is available only if you are signed in to a management account of an organization, and trusted access with Compute Optimizer is enabled. For more information, see [Accounts supported](#)

by [Compute Optimizer \(p. 5\)](#) and [Compute Optimizer and AWS Organizations trusted access \(p. 8\)](#).

- To clear the selected filters, choose **Clear filters** next to the filter.
- To access the **Lambda function details** page for a specific function, choose the finding classification listed next to the desired function.

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*.

Exporting recommendations

You can export your recommendations to record them over time, and share the data with others. Recommendations are exported in a comma-separated values (.csv) file, and its metadata in a JavaScript Object Notation (.json) file, to an existing Amazon Simple Storage Service (Amazon S3) bucket that you specify.

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- [Restrictions \(p. 51\)](#)
- [Amazon S3 bucket permission requirements \(p. 51\)](#)
- [Exporting your recommendations \(p. 51\)](#)
- [Viewing your export jobs \(p. 53\)](#)
- [Exported files \(p. 53\)](#)
- [Troubleshooting failed export jobs \(p. 89\)](#)

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. Confirm that all previous export jobs are completed before creating a new export job. For more information about viewing your export jobs, including those that are in progress, see [Viewing your export jobs \(p. 53\)](#).
- Recommendations for each resource type, and in each AWS Region are exported in separate .csv files. You cannot export recommendations from multiple resource types and Regions into a single file.
- Large export jobs can take a while to complete. 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

You must create the destination S3 bucket for your recommendations export before you create the export job. Compute Optimizer does not create the S3 bucket for you. The S3 bucket that you specify for your recommendations export files cannot be publicly accessible, and cannot be configured as a [Requester Pays](#) bucket. After you create the S3 bucket, ensure that it has the required permission 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, you must 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 \(p. 16\)](#).

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**, or **Lambda function**.
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 specified Region.
 - c. (Optional) Choose **Add Region** to export the recommendations for another AWS Region.
 - d. (Optional) Choose **Remove** next to a specified 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. For example, you can specify a date prefix (e.g., 2020/april), a resource type prefix (e.g., ec2-instances), or a combination of both (e.g., 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 \(p. 53\)](#).
7. Choose **Export** after you confirm that the export job is configured correctly, or choose **Cancel** to return to the **Recommendations** page without creating the export job. The export job configuration is deleted if you cancel it.

Note

If you export recommendations for multiple AWS Regions at one time, they are treated as separate export jobs and Compute Optimizer will try to start all of them at once. The **Export Recommendations** page will display an error if an export job fails to start. Export jobs that successfully start will continue to process, but you must resolve the errors for the failed jobs before trying to start them again.

Your recommendations export job will take a while to complete. Check the status of your export jobs by viewing the **Exports** page. For more information, see [Viewing your export jobs \(p. 53\)](#). Your recommendations export file, and its associated metadata file, are saved to the specified S3 bucket when the export job is completed. 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 \(p. 53\)](#).

```
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

Use the following procedure 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 has not yet started. You can have only one recommendations export job in progress for each resource type, and for each AWS Region.
 - **In progress** - The export job has started but has not yet completed. Export jobs can take from a few minutes to a few hours to complete depending on the number of recommendations and fields included in the export job.
 - **Complete** - The export job was completed successfully. A link to the export .csv file in the destination Amazon S3 bucket is displayed for each successfully completed export job under the export destination column.
 - **Failed** - The export job failed to start or complete. The message displayed under the failure reason column for the export job provides additional information about why the export job was not completed. For example, the export might have failed because the destination Amazon S3 bucket didn't have the required permissions. Try to export your recommendations again after resolving the issue. For more information, see [Troubleshooting failed export jobs \(p. 89\)](#).
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. Export jobs that are in progress, or that have failed display a dash.
 - Scroll right to view the failure reason for failed export jobs. Use the failure reason to determine why your export job was not completed.

Exported files

Recommendations are exported in a.csv file, and its 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 lists 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, and 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

All export files include the following columns by default:

- **recommendations_count** - The number of recommendations included in the export file.
- **errorCode** - The error code for when a recommendation was not 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 AWS account ID in which the current instance was created.</p> <p>This field is displayed as the Account ID column in the EC2 instances recommendations and instance details pages of the Compute Optimizer console. This field is labeled Account ID on the Export recommendations page of the Compute Optimizer console, and as accountId in the export .csv file.</p>
CurrentInstanceType	<p>The instance type of the current instance.</p> <p>This field is displayed as the Current instance type column in the EC2 instances recommendations and instance details pages of the Compute Optimizer console. This field is labeled Current instance type on the Export recommendations page of the Compute Optimizer console, and as currentInstanceType in the export .csv file.</p>
CurrentMemory	<p>The memory of the current instance.</p> <p>This field is displayed as the Memory column in the EC2 instance details page of the Compute Optimizer console. This field is labeled Current memory on the Export recommendations page of the Compute Optimizer console, and as current_memory in the export .csv file.</p>
CurrentNetwork	<p>The network performance, or rate of data transfer, of the current instance.</p> <p>This field is displayed as the Network column in the EC2 instance details page of the Compute Optimizer console. This field is labeled Current network on the Export recommendations page</p>

API field name	Description
	of the Compute Optimizer console, and as current_network in the export .csv file.
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 Current On-Demand price column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled Current On-Demand price on the Export recommendations page of the Compute Optimizer console, and as current_onDemandPrice 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 Current 1-year RI price column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled Current 1-year RI price on the Export recommendations page of the Compute Optimizer console, and as current_standardOneYearNoUpfrontReservedPrice in the export .csv file.</p>
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 Current 3-year RI price column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled Current 3-year RI price on the Export recommendations page of the Compute Optimizer console, and as current_standardThreeYearNoUpfrontReservedPrice in the export .csv file.</p>
CurrentStorage	<p>The local storage volume of the current instance.</p> <p>This field is displayed as the Storage column in the EC2 instance details page of the Compute Optimizer console. This field is labeled Current storage on the Export recommendations page of the Compute Optimizer console, and as current_storage in the export .csv file.</p>

API field name	Description
CurrentVCpus	<p>The number of vCPUs of the current instance.</p> <p>This field is displayed as the vCPUs column in the EC2 instance details page of the Compute Optimizer console. This field is labeled Current vCPUs on the Export recommendations page of the Compute Optimizer console, and as current_vcpus in the export .csv file.</p>
Finding	<p>The finding classification for the current instance. Instances can be classified as under-provisioned, over-provisioned, or optimized. For more information, see Instance finding classifications (p. 30).</p> <p>This field is displayed as the Finding column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled Finding on the Export recommendations page of the Compute Optimizer console, and as finding in the export .csv file.</p>
FindingReasonCodes	<p>The finding reasons describe which specifications (e.g., CPU, memory, local disk throughput, local disk IOPS, EBS volume throughput, EBS volume IOPS, network bandwidth, and network packets-per-second) of the current instance were under-provisioned or over-provisioned.</p> <p>This field is displayed as the Finding reasons column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled Finding reason codes on the Export recommendations page of the Compute Optimizer console, and as findingReasonCodes_<code> in the export .csv file. The <code> portion of the label identifies the instance specifications (CPU, memory, network, etc.) that are over-provisioned or under-provisioned.</p>
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 Instance ARN on the Export recommendations page of the Compute Optimizer console, and as instanceArn in the export .csv file.</p>

API field name	Description
InstanceName	<p>The name of the current instance.</p> <p>This field is displayed as the Instance name column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled Instance name on the Export recommendations page of the Compute Optimizer console, and as instanceName in the export .csv file.</p>
LastRefreshTimestamp	<p>The timestamp of when the instance recommendation was last refreshed.</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled Last refresh timestamp on the Export recommendations page of the Compute Optimizer console, and as lastRefreshTimestamp_UTC 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 is not displayed in the Compute Optimizer console. This field is labeled Lookback period in days on the Export recommendations page of the Compute Optimizer console, and as lookBackPeriodInDays in the export .csv file.</p>
RecommendationOptionsInstanceType	<p>The instance type of the instance recommendation.</p> <p>This field is displayed as the Recommended instance type column in the EC2 instances recommendations page of the Compute Optimizer console. This field is labeled Recommendation options Instance type on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_instanceType in the export .csv file.</p>
RecommendationOptionsMemory	<p>The memory of the instance recommendation.</p> <p>This field is displayed as the Memory column in the EC2 instance details page of the Compute Optimizer console. This field is labeled Recommendation options memory on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_memory in the export .csv file.</p>

API field name	Description
RecommendationOptionsNetwork	<p>The network performance, or rate of data transfer, of the instance recommendation.</p> <p>This field is displayed as the Network column in the EC2 instance details page of the Compute Optimizer console. This field is labeled Recommendation options network on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_network in the export .csv file.</p>
RecommendationOptionsOnDemandPrice	<p>The On-Demand price of the instance recommendation.</p> <p>This field is displayed as the Recommended On-Demand price column in the EC2 instance recommendations page of the Compute Optimizer console. This field is labeled Recommendation options On-Demand price on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_onDemandPrice in the export .csv file.</p>
RecommendationOptionsPerformanceRisk	<p>The performance risk of the instance recommendation.</p> <p>This field is displayed as the Performance risk column in the EC2 instance details page of the Compute Optimizer console. This field is labeled Recommendation options performance risk on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_performanceRisk 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 Platform differences column in the EC2 instance details page of the Compute Optimizer console. This field is labeled Recommendation options platform differences on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_platformDifferences_<difference> in the export .csv file. The <difference> portion of the label identifies the configuration that is 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 had used the recommended instance type during the look-back period.</p> <p>This field is displayed as an overlay on the CPU utilization (percent) metric graph in the EC2 instance details page of the Compute Optimizer console. This field is labeled Recommendation options projected utilization metrics CPU maximum on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_projectedUtilizationMetricsCPUMaximum in the export .csv file.</p>
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 had used the recommended instance type during the look-back period.</p> <p>This field is displayed as an overlay on the Memory utilization (percent) metric graph in the EC2 instance details page of the Compute Optimizer console. This field is labeled Recommendation options projected utilization metrics memory maximum on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_projectedUtilizationMetricsMemoryMaximum in the export .csv file.</p>
RecommendationOptionsStandardOneYearNoUpfrontPrice	<p>The Reserved instances, standard 1-year no upfront price for the instance recommendation.</p> <p>This field is displayed as the Recommended 1-year RI price column in the EC2 instance recommendations page of the Compute Optimizer console. This field is labeled Recommended options 1-year RI price on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_standardOneYearNoUpfrontPrice in the export .csv file.</p>

API field name	Description
RecommendationOptionsStandardThreeYearNoUpfrontPrice	<p>The Reserved Instance price for the instance recommendation.</p> <p>This field is displayed as the Recommended 3-year RI price column in the EC2 instance recommendations page of the Compute Optimizer console. This field is labeled Recommended options 3-year RI price on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_standardThreeYearNoUpfrontPrice in the export .csv file.</p>
RecommendationOptionsStorage	<p>The local storage volume of the instance recommendation.</p> <p>This field is displayed as the Storage column in the EC2 instance details page of the Compute Optimizer console. This field is labeled Recommendation options storage on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_storage in the export .csv file.</p>
RecommendationOptionsVcpus	<p>The vCPUs of the instance recommendation.</p> <p>This field is displayed as the vCPUs column in the EC2 instance details page of the Compute Optimizer console. This field is labeled Recommendation options vCPUs on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_vcpus 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 Recommendation source ARN on the Export recommendations page of the Compute Optimizer console, and as recommendationsSources_<rank>_recommendationSourceArn in the export .csv file.</p>

API field name	Description
RecommendationsSourcesRecommendationSourceType	<p>The resource type of the current resource (i.e., instance).</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled Recommendation source type on the Export recommendations page of the Compute Optimizer console, and as recommendationsSources_<rank>_recommendationSourceType in the export .csv file.</p>
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 CPU utilization (percent) graph in the EC2 instance details page. This field is labeled Utilization metrics CPU maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_CPU_MAXIMUM 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 Disk read (MiB/second) graph in the EC2 instance details page. This field is labeled Utilization metrics disk read bytes per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_DISK_READ_BYTES_PER_SECOND_MAXIMUM 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 Disk read (operations/second) graph in the EC2 instance details page. This field is labeled Utilization metrics disk read operations per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_DISK_READ_OPS_PER_SECOND_MAXIMUM 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 Disk write (MiB/second) graph in the EC2 instance details page. This field is labeled Utilization metrics disk write bytes per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_DISK_WRITE_BYTES_PER_SECOND_MAXIMUM 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 Disk write (operations/second) graph in the EC2 instance details page. This field is labeled Utilization metrics disk write operations per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_DISK_WRITE_OPS_PER_SECOND_MAXIMUM 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 EBS read bandwidth (MiB/second) graph in the EC2 instance details page. This field is labeled Utilization metrics EBS read bandwidth bytes per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_EBS_READ_BYTES_PER_SECOND_MAXIMUM in the export .csv file.</p>
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 EBS read operations (per second) graph in the EC2 instance details page. This field is labeled Utilization metrics EBS read throughput operations per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_EBS_READ_OPS_PER_SECOND_MAXIMUM in the export .csv file.</p>

API field name	Description
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 EBS write bandwidth (MiB/second) graph in the EC2 instance details page. This field is labeled Utilization metrics EBS write bandwidth bytes per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_EBS_WRITE_BYTES_PER_SECOND_MAXIMUM in the export .csv file.</p>
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 EBS write operations (per second) graph in the EC2 instance details page. This field is labeled Utilization metrics EBS write throughput operations per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_EBS_WRITE_OPS_PER_SECOND_MAXIMUM 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 Memory utilization (percent) graph in the EC2 instance details page. This field is labeled Utilization metrics memory maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_MEMORY_MAXIMUM 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 Network in (MiB/second) graph in the EC2 instance details page. This field is labeled Utilization metrics network in bytes per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_NETWORK_IN_BYTES_PER_SECOND_MAXIMUM 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 Network out (MiB/second) graph in the EC2 instance details page. This field is labeled Utilization metrics network out bytes per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_NETWORK_OUT_BYTES_PER_SECOND_MAX 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 Network packets in (per second) graph in the EC2 instance details page. This field is labeled Utilization metrics network packets in per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_NETWORK_PACKETS_IN_PER_SECOND_MAX 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 Network packets out (per second) graph in the EC2 instance details page. This field is labeled Utilization metrics network packets out per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_NETWORK_PACKETS_OUT_PER_SECOND_M in the export .csv file.</p>

Auto Scaling group recommendation fields

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

API field name	Description
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 Auto Scaling group ARN on the Export recommendations page of the Compute Optimizer console, and as autoScalingGroupArn in the export .csv file.</p>
AutoScalingGroupName	<p>The name of the Auto Scaling group.</p> <p>This field is displayed as the Auto Scaling group name column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled Auto Scaling group name on the Export recommendations page of the Compute Optimizer console, and as autoScalingGroupName in the export .csv file.</p>
CurrentConfigurationDesiredCapacity	<p>The desired capacity of the current Auto Scaling group.</p> <p>This field is displayed as the Desired number of instances column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled Current desired capacity on the Export recommendations page of the Compute Optimizer console, and as currentConfiguration_desiredCapacity 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 Current instance type column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled Current instance type on the Export recommendations page of the Compute Optimizer console, and as currentConfiguration_instanceType 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 Current maximum size column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled Current maximum size on the Export recommendations page of the Compute Optimizer console, and as currentConfiguration_maxSize 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 Current minimum size column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled Current minimum size on the Export recommendations page of the Compute Optimizer console, and as currentConfiguration_minSize 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 Memory column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Current memory on the Export recommendations page of the Compute Optimizer console, and as current_memory 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 Network column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Current network on the Export recommendations page of the Compute Optimizer console, and as current_network in the export .csv file.</p>
CurrentOnDemandPrice	<p>The On-Demand 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 Current On-Demand price column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled Current On-Demand price on the Export recommendations page of the Compute Optimizer console, and as current_onDemandPrice in the export .csv file.</p>

API field name	Description
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 Current 1-year RI price column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled Current 1-year RI price on the Export recommendations page of the Compute Optimizer console, and as current_standardOneYearNoUpfrontReservedPrice in the export .csv file.</p>
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 Current 3-year RI price column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled Current 3-year RI price on the Export recommendations page of the Compute Optimizer console, and as current_standardThreeYearNoUpfrontReservedPrice 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 Storage column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Current storage on the Export recommendations page of the Compute Optimizer console, and as current_storage in the export .csv file.</p>
CurrentVCpus	<p>The number of vCPUs of instances in the current Auto Scaling group.</p> <p>This field is displayed as the vCPUs column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Current vCPUs on the Export recommendations page of the Compute Optimizer console, and as current_vcpus in the export .csv file.</p>

API field name	Description
Finding	The finding classification for the current Auto Scaling group. Auto Scaling groups can be classified as not optimized, or optimized. For more information, see Auto Scaling group finding classifications (p. 41) . This field is displayed as the Finding column in the Auto Scaling groups recommendations apge of the Compute Optimizer console. This field is labeled Finding on the Export recommendations page of the Compute Optimizer console, and as finding in the export .csv file.
LastRefreshTimestamp	The timestamp of when the Auto Scaling group recommendation was last refreshed. This field is not displayed in the Compute Optimizer console. This field is labeled Last refresh timestamp on the Export recommendations page of the Compute Optimizer console, and as lastRefreshTimestamp in the export .csv file.
LookbackPeriodInDays	The number of preceding days for which Compute Optimizer analyzed metric data from the current Auto Scaling group to generate the recommendation. This field is not displayed in the Compute Optimizer console. This field is labeled Lookback period in days on the Export recommendations page of the Compute Optimizer console, and as lookBackPeriodInDays in the export .csv file.
RecommendationOptionsConfigurationDesiredCapacity	The desired capacity of the Auto Scaling group recommendation. This field is displayed as the Desired number of instances column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Recommendation options desired capacity on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_configuration_desiredCapacity in the export .csv file.

API field name	Description
RecommendationOptionsConfigurationInstanceType	<p>The instance type of the Auto Scaling group recommendation.</p> <p>This field is displayed as the Recommendation instance type column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled Recommendation options Instance type on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_configuration_instanceType 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 Maximum number of instances column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Recommendation options maximum size on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_configuration_maxSize in the export .csv file.</p>
RecommendationOptionsConfigurationMinSize	<p>The minimum size of the Auto Scaling group recommendation.</p> <p>This field is displayed as the Minimum number of instances column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Recommendation options minimum size on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_configuration_minSize in the export .csv file.</p>
RecommendationOptionsMemory	<p>The memory of the Auto Scaling group recommendation.</p> <p>This field is displayed as the Memory column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Recommendation options memory on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_memory 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 Network column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Recommendation options network on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_network 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 Recommended On-Demand price column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled Recommendation options On-Demand price on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_onDemandPrice in the export .csv file.</p>
RecommendationOptionsPerformanceRisk	<p>The performance risk of the Auto Scaling group recommendation.</p> <p>This field is displayed as the Performance risk column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Recommendation options performance risk on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_performanceRisk in the export .csv file.</p>
RecommendationOptionsProjectedUtilizationMetrics	<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 had used the recommended instance type during the look-back period.</p> <p>This field is displayed as an overlay on the CPU utilization (percent) metric graph in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Recommendation options projected utilization metrics CPU maximum on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_projectedUtilizationMetrics 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 had used the recommended instance type during the look-back period.</p> <p>This field is displayed as an overlay on the Memory utilization (percent) metric graph in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Recommendation options projected utilization metrics memory maximum on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_projectedUtilizationMetrics in the export .csv file.</p>
RecommendationOptionsStandardOneYearNoUpfrontPrice	<p>The Reserved Instances, standard 1-year no upfront price for the Auto Scaling group recommendation.</p> <p>This field is displayed as the Recommended 1-year RI price column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled Recommended options 1-year RI price on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_standardOneYearNoUpfront in the export .csv file.</p>
RecommendationOptionsStandardThreeYearNoUpfrontPrice	<p>The Reserved Instances, standard 3-year no upfront price for the Auto Scaling group recommendation.</p> <p>This field is displayed as the Recommended 3-year RI price column in the Auto Scaling groups recommendations page of the Compute Optimizer console. This field is labeled Recommended options 3-year RI price on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_standardThreeYearNoUpfront in the export .csv file.</p>

API field name	Description
RecommendationOptionsStorage	<p>The local storage volume of the Auto Scaling group recommendation.</p> <p>This field is displayed as the Storage column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Recommendation options storage on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_storage in the export .csv file.</p>
RecommendationOptionsVcpus	<p>The vCPUs of the Auto Scaling group recommendation.</p> <p>This field is displayed as the vCPUs column in the Auto Scaling group details page of the Compute Optimizer console. This field is labeled Recommendation options vCPUs on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_vcpus 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 CPU utilization (percent) graph in the Auto Scaling group details page. This field is labeled Utilization metrics CPU maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_CPU_MAXIMUM 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 Disk read (MiB/second) graph in the EC2 instance details page. This field is labeled Utilization metrics disk read bytes per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_DISK_READ_BYTES_PER_SECOND_MAXIMUM 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 Disk read (operations/second) graph in the EC2 instance details page. This field is labeled Utilization metrics disk read operations per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_DISK_READ_OPS_PER_SECOND_MAXIMUM 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 Disk write (MiB/second) graph in the EC2 instance details page. This field is labeled Utilization metrics disk write bytes per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_DISK_WRITE_BYTES_PER_SECOND_MAXIMUM 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 Disk write (operations/second) graph in the EC2 instance details page. This field is labeled Utilization metrics disk write operations per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_DISK_WRITE_OPS_PER_SECOND_MAXIMUM in the export .csv file.</p>
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 EBS read bandwidth (MiB/second) graph in the Auto Scaling group details page. This field is labeled Utilization metrics EBS read bandwidth bytes per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_EBS_READ_BYTES_PER_SECOND_MAXIMUM in the export .csv file.</p>

API field name	Description
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 EBS read operations (per second) graph in the Auto Scaling group details page. This field is labeled Utilization metrics EBS read throughput operations per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_EBS_READ_OPS_PER_SECOND_MAXIMUM in the export .csv file.</p>
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 EBS write bandwidth (MiB/second) graph in the Auto Scaling group details page. This field is labeled Utilization metrics EBS write bandwidth bytes per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_EBS_WRITE_BYTES_PER_SECOND_MAXIMUM 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 EBS write operations (per second) graph in the Auto Scaling group details page. This field is labeled Utilization metrics EBS write throughput operations per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_EBS_WRITE_OPS_PER_SECOND_MAXIMUM 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 Memory utilization (percent) graph in the Auto Scaling group details page. This field is labeled Utilization metrics memory maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_MEMORY_MAXIMUM 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 Network in (MiB/second) graph in the EC2 instance details page. This field is labeled Utilization metrics network in bytes per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_NETWORK_IN_BYTES_PER_SECOND_MAXIMUM 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 Network out (MiB/second) graph in the EC2 instance details page. This field is labeled Utilization metrics network out bytes per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_NETWORK_OUT_BYTES_PER_SECOND_MAXIMUM 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 Network packets in (per second) graph in the EC2 instance details page. This field is labeled Utilization metrics network packets in per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_NETWORK_PACKETS_IN_PER_SECOND_MAXIMUM 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 Network packets out (per second) graph in the EC2 instance details page. This field is labeled Utilization metrics network packets out per second maximum on the Export recommendations page of the Compute Optimizer console, and as utilizationMetrics_NETWORK_PACKETS_OUT_PER_SECOND_M in the export .csv file.</p>

EBS volume recommendation fields

API field name	Description
AccountId	<p>The AWS account ID in which the current EBS volume was created.</p> <p>This field is displayed as the Account ID column in the Amazon EBS volumes recommendations and volume details pages of the Compute Optimizer console. This field is labeled Account ID on the Export recommendations page of the Compute Optimizer console, and as accountId 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 Current IOPS column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled Current baseline IOPS on the Export recommendations page of the Compute Optimizer console, and as CurrentConfigurationVolumeBaselineIOPS in the export .csv file.</p>
CurrentConfigurationVolumeBaselineThroughput	<p>The baseline throughput of the current EBS volume.</p> <p>This field is displayed as the Current throughput column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled Current baseline throughput on the Export recommendations page of the Compute Optimizer console, and as CurrentConfigurationVolumeBaselineThroughput in the export .csv file.</p>
CurrentConfigurationVolumeBurstIOPS	<p>The burst input/output operations per second (IOPS) of the current EBS volume.</p>

API field name	Description
	<p>This field is displayed as the Burst IOPS column in the Amazon EBS volume details page of the Compute Optimizer console. This field is labeled Current burst IOPS on the Export recommendations page of the Compute Optimizer console, and as CurrentConfigurationVolumeBurstIOPS 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 Burst throughput column in the Amazon EBS volume details page of the Compute Optimizer console. This field is labeled Current burst throughput on the Export recommendations page of the Compute Optimizer console, and as CurrentConfigurationVolumeBurstThroughput 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 Current size column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled Current volume size on the Export recommendations page of the Compute Optimizer console, and as CurrentConfigurationVolumeSize in the export .csv file.</p>
CurrentConfigurationVolumeType	<p>The volume type of the current EBS volume.</p> <p>This field is displayed as the Current volume type column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled Current volume type on the Export recommendations page of the Compute Optimizer console, and as CurrentConfigurationVolumeType 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 Current monthly price column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled Current monthly price on the Export recommendations page of the Compute Optimizer console, and as currentMonthlyPrice in the export .csv file.</p>

API field name	Description
Finding	<p>The finding classification for the current EBS volume. EBS volumes can be classified as optimized, or not optimized. For more information, see EBS volume finding classifications (p. 45).</p> <p>This field is displayed as the Finding column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled Finding on the Export recommendations page of the Compute Optimizer console, and as finding in the export .csv file.</p>
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 Last refresh timestamp on the Export recommendations page of the Compute Optimizer console, and as lastRefreshTimestamp 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 Look-back period in days on the Export recommendations page of the Compute Optimizer console, and as lookBackPeriodInDays 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 Recommended IOPS column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled Recommended baseline IOPS on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_ConfigurationVolumeBaselineIOPS 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 Recommended throughput column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled Recommended baseline throughput on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_ConfigurationVolumeBaselineThroughput 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 Burst IOPS column in the Amazon EBS volume details page of the Compute Optimizer console. This field is labeled Recommended burst IOPS on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_ConfigurationVolumeBurstIOPS in the export .csv file.</p>
RecommendationOptionsConfigurationVolumeBurstThroughput	<p>The volume burst throughput of the EBS volume recommendation.</p> <p>This field is displayed as the Burst throughput column in the Amazon EBS volume details page of the Compute Optimizer console. This field is labeled Recommended burst throughput on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_ConfigurationVolumeBurstThroughput 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 Recommended size column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled Recommended volume size on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_ConfigurationVolumeSize 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 Recommended volume type in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled Recommended volume type on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_ConfigurationVolumeType in the export .csv file.</p>
RecommendationOptionsMonthlyPrice	<p>The monthly price of the EBS volume recommendation.</p> <p>This field is displayed as the Recommended monthly price column in the Amazon EBS volumes recommendations page of the Compute Optimizer console. This field is labeled Recommended monthly price on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_MonthlyPrice in the export .csv file.</p>
RecommendationOptionsPerformanceRisk	<p>The performance risk of the EBS volume recommendation.</p> <p>This field is displayed as the Performance risk column in the Amazon EBS volume details page of the Compute Optimizer console. This field is labeled Performance risk on the Export recommendations page of the Compute Optimizer console, and as recommendationOptions_<rank>_performanceRisk 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 Read bandwidth (KiB/second) graph in the Amazon EBS volume details page. This field is labeled Utilization metrics EBS read bytes per second (maximum) on the Export recommendations page of the Compute Optimizer console, and as UtilizationMetricsVolumeReadBytesPerSecondMaximum 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 Read operations (per second) graph in the Amazon EBS volume details page. This field is labeled Utilization metrics EBS read operations per second (maximum) on the Export recommendations page of the Compute Optimizer console, and as UtilizationMetricsVolumeReadOpsPerSecondMaximum 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 Write bandwidth (KiB/second) graph in the Amazon EBS volume details page. This field is labeled Utilization metrics EBS write bytes per second (maximum) on the Export recommendations page of the Compute Optimizer console, and as UtilizationMetricsVolumeWriteBytesPerSecondMaximum in the export .csv file.</p>
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 Write operations (per second) graph in the Amazon EBS volume details page. This field is labeled Utilization metrics EBS write operations per second (maximum) on the Export recommendations page of the Compute Optimizer console, and as UtilizationMetricsVolumeWriteOpsPerSecondMaximum in the export .csv file.</p>
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 EBS volume ARN on the Export recommendations page of the Compute Optimizer console, and as VolumeArn in the export .csv file.</p>

Lambda function recommendation fields

API field name	Description
AccountId	The AWS account ID in which the current Lambda function was created.

API field name	Description
	This field is displayed as the Account ID column in the Lambda functions recommendations and function details pages of the Compute Optimizer console. This field is labeled Account ID on the Export recommendations page of the Compute Optimizer console, and as accountId 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 Current configured memory column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled Current configured memory on the Export recommendations page of the Compute Optimizer console, and as CurrentConfigurationMemorySize in the export .csv file.</p>
CurrentConfigurationTimeout	<p>The execution time (timeout) currently configured on the current Lambda function.</p> <p>This field is displayed as the Timeout column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled Timeout on the Export recommendations page of the Compute Optimizer console, and as CurrentConfigurationTimeout in the export .csv file.</p>
CurrentCostAverage	<p>The average current cost of the current Lambda function.</p> <p>This field is displayed listed as the Current cost (average) column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled Current cost (average) on the Export recommendations page of the Compute Optimizer console, and as CurrentCostAverage 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 Current cost column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled Current cost (total) on the Export recommendations page of the Compute Optimizer console, and as CurrentCostTotal in the export .csv file.</p>

API field name	Description
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 Lambda function finding classifications (p. 48).</p> <p>This field is listed as the Finding column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled Finding on the Export recommendations page of the Compute Optimizer console, and as finding in the export .csv file.</p>
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 Lambda finding classifications (p. 48).</p> <p>This field is listed as the Finding reason column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled Finding reason on the Export recommendations page of the Compute Optimizer console, and as FindingReasonCodes 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 Function ARN on the Export recommendations page of the Compute Optimizer console, and as FunctionArn in the export .csv file.</p>
FunctionVersion	<p>The version of the current Lambda function.</p> <p>This field is listed as the Function version column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled Function version on the Export recommendations page of the Compute Optimizer console, and as FunctionVersion in the export .csv file.</p>
LastRefreshTimestamp	<p>The timestamp of when the Lambda function recommendation was last refreshed.</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled Last refresh timestamp on the Export recommendations page of the Compute Optimizer console, and as lastRefreshTimestamp 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 Lambda function to generate the recommendation.</p> <p>This field is not displayed in the Compute Optimizer console. This field is labeled Look-back period in days on the Export recommendations page of the Compute Optimizer console, and as lookBackPeriodInDays 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 Invocations (count) graph in the Lambda function details page. This field is labeled Number of invocations on the Export recommendations page of the Compute Optimizer console, and as NumberOfInvocations in the export .csv file.</p>
RecommendationOptionsConfigurationMemorySize	<p>The amount of memory (in MB) of the Lambda function recommendation.</p> <p>This field is listed as the Recommended configured memory in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled Recommended configured memory on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_ConfigurationMemorySize 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 Recommended cost (high) column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled Recommended cost (high) on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_CostHigh 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 Recommended cost (low) column in the Lambda functions recommendations page of the Compute Optimizer console. This field is labeled Recommended cost (low) on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_CostLow in the export .csv file.</p>
RecommendationOptionsProjectedUtilizationMetricsDurationExpected	<p>The projected duration of the Lambda function recommendation.</p> <p>This field is listed as the Projected duration (expected) column in the Lambda functions details page of the Compute Optimizer console. This field is labeled Utilization metrics Lambda duration milliseconds expected on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_ProjectedUtilizationMetricsDurationExpected in the export .csv file.</p>
RecommendationOptionsProjectedUtilizationMetricsDurationLowerBound	<p>The projected lower bound amount of time that the recommended Lambda function would have spent processing events if the recommended Lambda function had been 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 Projected duration (low) column in the Lambda functions details page of the Compute Optimizer console. This field is labeled Utilization metrics Lambda duration milliseconds (lower bound) on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_ProjectedUtilizationMetricsDurationLowerBound in the export .csv file.</p>

API field name	Description
RecommendationOptionsProjectedUtilizationMetricsDurationUpperBound	<p>The projected maximum amount of time that the recommended Lambda function would have spent processing events if the recommended Lambda function had been 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 Projected duration (high) column in the Lambda functions details page of the Compute Optimizer console. This field is labeled Utilization metrics Lambda duration milliseconds (upper bound) on the Export recommendations page of the Compute Optimizer console, and as RecommendationOptions_<rank>_ProjectedUtilizationMetrics 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 Duration (average) column in the Lambda function details page of the Compute Optimizer console. This field is labeled Utilization metrics Lambda duration milliseconds (average) on the Export recommendations page of the Compute Optimizer console, and as UtilizationMetricsDurationAverage in the export .csv file.</p>
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 Duration (maximum) column in the Lambda function details page of the Compute Optimizer console. This field is labeled Utilization metrics Lambda duration milliseconds (maximum) on the Export recommendations page of the Compute Optimizer console, and as UtilizationMetricsDurationMaximum in the export .csv file.</p>

API field name	Description
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 Used memory (average) column in the Lambda function details page of the Compute Optimizer console. This field is labeled Utilization metrics Lambda memory used MB (average) on the Export recommendations page of the Compute Optimizer console, and as UtilizationMetricsMemoryAverage in the export .csv file.</p>
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 Memory (maximum) column in the Lambda function details page of the Compute Optimizer console. This field is labeled Utilization metrics Lambda memory used MB (maximum) on the Export recommendations page of the Compute Optimizer console, and as UtilizationMetricsMemoryMaximum in the export .csv file.</p>

Metadata file

A metadata .json file is output with every export job. It includes the schema information for the associated recommendations file, such as the dialect of the data, column definitions, column descriptions, and more. 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 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

You might experience one of the following error messages when trying to export your resource recommendations. 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 \(p. 16\)](#).

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*.

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:** May 24, 2021

The following table describes the documentation for this release of Compute Optimizer.

update-history-change	update-history-description	update-history-date
AWS Graviton-based instance recommendations (p. 90)	Compute Optimizer now gives you the price and performance impact of running your workload on AWS Graviton-based instances. For more information, see AWS Graviton-based instance recommendations . You can also now view the member accounts of an organization that are opted in to Compute Optimizer if your account is the management account of the organization. For more information, see Viewing the accounts opted in to AWS Compute Optimizer .	August 26, 2021
Amazon EC2 instance recommendations enhancements (p. 90)	Compute Optimizer now supports a wider range of Amazon EC2 instance types, it evaluates a wider range of instance metrics to generate recommendations, it provides finding reasons for instance recommendations, and it 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 (p. 90)	Recommendations for Amazon EBS volumes and Lambda functions can now be exported to Amazon S3. For more	May 18, 2021

	information, see Exporting recommendations .	
Adding documentation for AWS managed policies (p. 90)	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 (p. 90)	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 (p. 90)	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 (p. 90)	Compute Optimizer now analyzes the read/write operations per second, and the read/write bytes per second of Amazon Elastic Block Store (Amazon EBS) volumes attached to an instance. The data is used to generate recommendations. You can also view EBS read/write bandwidth (operations/second), and EBS read/write throughput (KiB/second) 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 (p. 90)	Recommendations can be exported to Amazon Simple Storage Service (Amazon S3). For more information, see Exporting recommendations .	June 10, 2020
Self-service opt out (p. 90)	Self-service opt out is now supported by using the AWS Command Line Interface. For more information, see Opting out your account .	April 6, 2020
Service release (p. 90)	Compute Optimizer released.	December 2, 2019