

Amazon WorkSpaces Cost Optimizer

AWS Implementation Guide

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About This Guide

This implementation guide discusses architectural considerations and configuration steps for deploying the Amazon WorkSpaces Cost Optimizer on the Amazon Web Services (AWS) Cloud. It includes links to [AWS CloudFormation](#) templates that launch, configure, and run the AWS compute, management, storage, and other services required to deploy this solution on AWS, using AWS best practices for security and availability.

The guide is intended for IT infrastructure architects, administrators, and DevOps professionals who have a working knowledge of Amazon WorkSpaces and architecting on the AWS Cloud.

Overview

Amazon WorkSpaces, a fully managed, secure virtual desktop computing service on the AWS Cloud, eliminates the need for customers to procure, deploy, and manage complex virtual desktop environments. Amazon WorkSpaces provides a complete cloud-based virtual desktop service, including compute, persistent storage, and applications.

Amazon WorkSpaces offers the flexibility to pay hourly or monthly without any up-front commitment. With hourly billing, you pay a small fixed monthly fee per Workspace and a low hourly rate for each hour the Workspace is used during the month. With monthly billing, you pay a fixed monthly fee for unlimited usage during the month. This is initially set up when you launch the Workspace and can be changed at any time.

To help customers monitor their Workspace usage and optimize costs, AWS offers the Amazon WorkSpaces Cost Optimizer, a solution that analyzes all of your Amazon WorkSpaces usage data and automatically converts the Workspace to the most cost-effective billing option (hourly or monthly) depending on a user's individual usage. This solution is easy to deploy and uses AWS CloudFormation to automatically provision and configure the necessary AWS services to convert individual WorkSpaces.

This guide assumes basic knowledge of virtual desktops and Amazon WorkSpaces. It is also helpful to have working knowledge of Amazon Simple Storage Service (Amazon S3), AWS Lambda, and Amazon CloudWatch.

Cost

You are responsible for the cost of the AWS services used while running this solution. The total cost for running this solution depends on the number of WorkSpaces this solution monitors. As of the date of publication, the cost for running this solution with default settings in the US East (N. Virginia) Region is approximately **\$0.005 per day** for a deployment with 25 WorkSpaces. This does not include the cost of the individual WorkSpaces. This reflects AWS Lambda and Amazon CloudWatch charges. You will also incur variable charges from Amazon S3.

Prices are subject to change. For full details, see the pricing webpage for each AWS service you will be using in this solution.

Architecture Overview

Deploying this solution with the **default parameters** builds the following environment in the AWS Cloud.

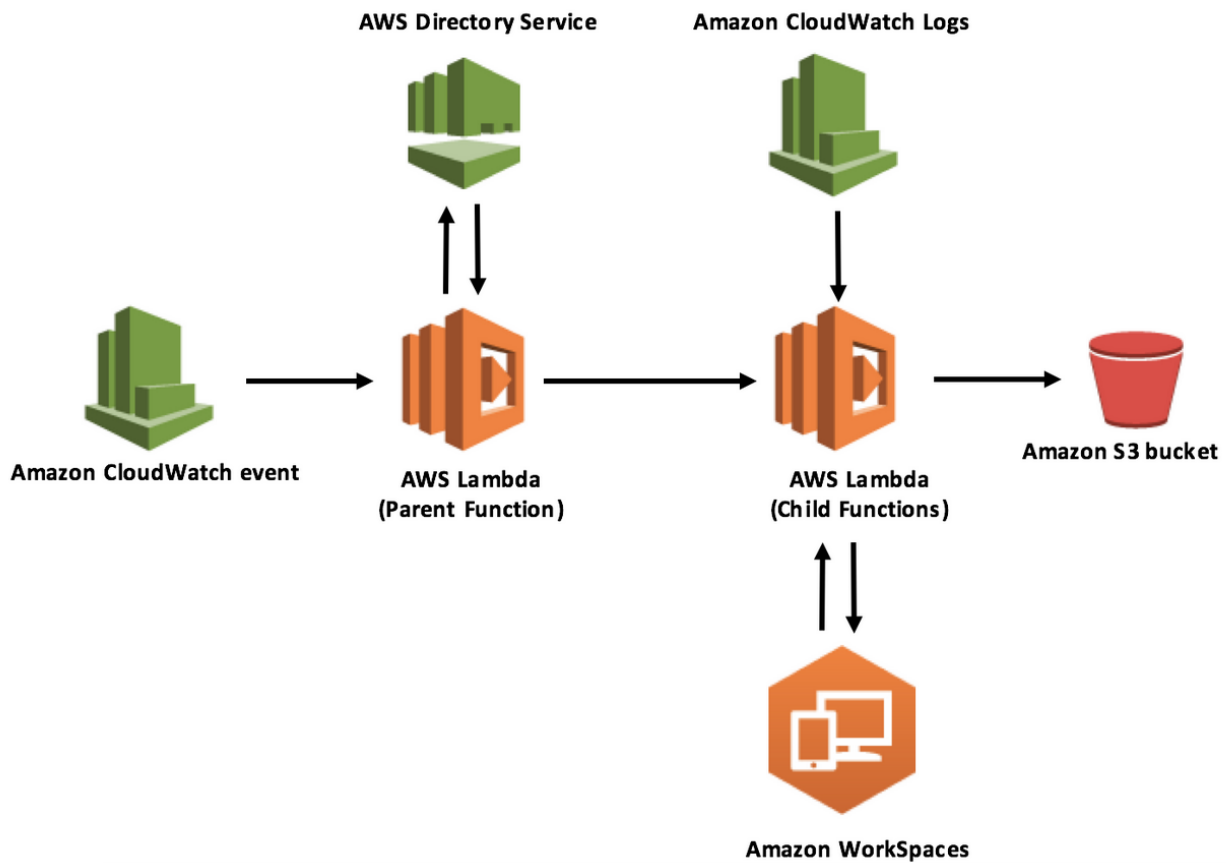


Figure 1: WorkSpaces Cost Optimizer architecture

The AWS CloudFormation template creates an Amazon CloudWatch event that invokes the Amazon WorkSpaces Cost Optimizer AWS Lambda parent function every 24 hours. The parent Lambda function polls the AWS Directory Service to gather a list of all directories registered for Amazon WorkSpaces in a specific AWS Region.

The child Lambda function checks the total usage for each WorkSpace that is on an hourly billing model. If the monthly usage threshold has been met, the solution will convert the individual WorkSpace to monthly billing. Note that a new child Lambda function will be invoked for every 25 WorkSpaces in your account.

Note: If a WorkSpace starts in monthly billing or the solution converts a WorkSpace from hourly to monthly billing, the solution will not convert the WorkSpace to hourly billing until the beginning of the next month, if usage was below the threshold. However, you can manually change the billing model at any time using the Amazon WorkSpaces console. Also, you can change the threshold for when each WorkSpace converts from hourly to monthly billing. For more information, see [Billing Model Conversion](#).

At the end of the month, the child Lambda function checks the total usage for each Workspace that is on a monthly billing model. If the monthly usage threshold has not been met, the solution will convert the individual Workspace from monthly to hourly billing at the start of the next month.

The AWS CloudFormation template also creates an Amazon S3 bucket to log the conversions at the end of each execution.

Note: Customers should check their Amazon S3 bucket frequently to track the optimizer's activity, and to view logs with error messages.

Implementation Considerations

Billing Model Conversion

This solution can convert individual WorkSpaces from an hourly billing model to a monthly billing model on any day once the threshold is met. If the solution converts a Workspace from hourly billing to monthly billing, the solution will not convert the Workspace to hourly billing until the beginning of the next month, if the usage was below the threshold. However, you can manually change the billing model at any time using the AWS Management Console. For customers who want to change the threshold for when each Workspace converts from hourly to monthly billing, the solution's AWS CloudFormation template includes parameters that will execute these conversions.

This solution will only convert a Workspace from a monthly to hourly billing model when the next billing period begins at the beginning of the month. To prevent Amazon WorkSpaces from being converted multiple times in a month, usage for monthly WorkSpaces is calculated at the end of the month. For customers who want to convert WorkSpaces from monthly billing to hourly billing immediately, the solution's AWS CloudFormation template includes a parameter (**Simulate End of Month**) that will execute these conversions at the time of deployment.

Opting Out with Tags

To prevent the solution from converting a Workspace between billing models, you can apply a resource tag to the Workspace using the tag key `Skip_Convert` and any tag value. This solution will log tagged WorkSpaces, but it will not convert the tagged WorkSpaces. Remove the tag at any time to resume automatic conversion for that Workspace.

Regional Deployment

You must launch the Amazon WorkSpaces Cost Optimizer solution in an AWS Region that supports both the AWS Lambda and Amazon WorkSpaces services. However, once deployed, the Lambda function will monitor the Workspaces in any AWS Region. ¹

AWS CloudFormation Template

This solution uses AWS CloudFormation to automate the deployment of the Amazon WorkSpaces Cost Optimizer on the AWS Cloud. It includes the following AWS CloudFormation template, which you can download before deployment:

[View template](#)

workspaces-cost-optimizer.template: Use this template to launch the Amazon WorkSpaces Cost Optimizer and all associated components. The default configuration deploys AWS Lambda functions, an Amazon CloudWatch event, and an Amazon S3 bucket, but you can also customize the template based on your specific needs.

Automated Deployment

Before you launch the automated deployment, please review the architecture, configuration, and other considerations discussed in this guide. Follow the step-by-step instructions in this section to configure and deploy the Amazon WorkSpaces Cost Optimizer into your account.

Time to deploy: Approximately five minutes

Launch the Stack

This automated AWS CloudFormation template deploys the Amazon WorkSpaces Cost Optimizer on the AWS Cloud.

Note: You are responsible for the cost of the AWS services used while running this solution. See the [Cost](#) section for more details. For full details, see the pricing webpage for each AWS service you will be using in this solution.

1. Sign in to the AWS Management Console and choose the button to the right to launch the *workspaces-cost-optimizer* AWS CloudFormation template.
You can also [download the template](#) as a starting point for your own implementation.

**Launch
Solution**

¹ For the most current AWS Lambda availability by region, see <https://aws.amazon.com/about-aws/global-infrastructure/regional-product-services/>

- The template is launched in the US East (N. Virginia) Region by default. To launch the Amazon WorkSpaces Cost Optimizer in a different AWS Region, use the region selector in the console navigation bar.

Note: This solution uses AWS Lambda and Amazon WorkSpaces, which are currently available in specific AWS Regions only. Therefore, you must launch this solution in an AWS Region where both of these services are available.²

- On the **Select Template** page, verify that you selected the correct template and choose **Next**.
- Under **Parameters**, review the parameters for the template and modify them as necessary. This solution uses the following default values.

Parameter	Default	Description
Launch in Dry Run Mode?	Yes	Generates a change log, but does not execute any changes
Simulate End of Month	No	Overrides date and forces the solution to run as if it is the end of the month
Log Level	INFO	Sets the log level for the Lambda function logs in CloudWatch
Value Limit	81	The number of hours a Value instance can run in a month before being converted to ALWAYS_ON
Standard Limit	85	The number of hours a Standard instance can run in a month before being converted to ALWAYS_ON
Performance Limit	83	The number of hours a Performance instance can run in a month before being converted to ALWAYS_ON
Power Limit	83	The number of hours a Power instance can run in a month before being converted to ALWAYS_ON

² For the most current AWS Lambda availability by region, see <https://aws.amazon.com/about-aws/global-infrastructure/regional-product-services/>

Parameter	Default	Description
Graphics Limit	217	The number of hours a Graphics instance can run in a month before being converted to ALWAYS_ON

5. Choose **Next**.
6. On the **Options** page, choose **Next**.
7. On the **Review** page, review and confirm the settings. Be sure to check the box acknowledging that the template will create AWS Identity and Access Management (IAM) resources.
8. Choose **Create** to deploy the stack.

You can view the status of the stack in the AWS CloudFormation console in the **Status** column. You should see a status of **CREATE_COMPLETE** in approximately five minutes.

Note: In addition to the `workspaces-cost-optimizer-parent` and `workspaces-cost-optimizer-child` AWS Lambda functions, this solution includes the `solution-helper` Lambda function, which runs only during initial configuration or when resources are updated or deleted. When running this solution, you will see all AWS Lambda functions in the AWS console, but only the `workspaces-cost-optimizer` function is regularly active. However, do not delete the `solution-helper` function as it is necessary to manage associated resources.

Security

When you build systems on AWS infrastructure, security responsibilities are shared between you and AWS. This shared model can reduce your operational burden as AWS operates, manages, and controls the components from the host operating system and virtualization layer down to the physical security of the facilities in which the services operate. For more information about security on AWS, visit the [AWS Security Center](#).

IAM Roles

This solution creates AWS Identity and Access Management (IAM) roles to control and isolate permissions for the AWS Lambda functions, following the best practice of least privilege. The Lambda functions are granted the following permissions:

Workspaces-cost-optimizer-parent function:

- Read-only permissions to AWS Directory Services and Amazon WorkSpaces
- Write permissions to Amazon S3
- Execute permissions to AWS Lambda

Workspaces-cost-optimizer-child function(s):

- Read only permissions to AWS Directory Services
- Read-only permissions to Amazon CloudWatch
- Read/Write permissions to Amazon WorkSpaces

Additional Resources

AWS services

- [Amazon WorkSpaces](#)
- [AWS CloudFormation](#)
- [AWS Lambda](#)
- [Amazon CloudWatch](#)

Appendix: Collection of Anonymous Data

This solution includes an option to send anonymous usage data to AWS. We use this data to better understand how customers use this solution and related services and products. When enabled, the following information is collected and sent to AWS:

- **Solution ID:** The AWS solution identifier
- **Unique ID (UUID):** Randomly generated, unique identifier for each Amazon WorkSpaces Cost Optimizer deployment
- **Timestamp:** Data-collection timestamp
- **WorkSpaces Data:** The number and billing model of WorkSpaces that the Amazon WorkSpaces Cost Optimizer manages in each AWS Region

Example data:

```
{
  noChange: 103
  error: 0
  toHourly: 0
}
```

```
    toMonthly: 17
  }
```

Note that AWS will own the data gathered via this survey. Data collection will be subject to the [AWS Privacy Policy](#). To opt out of this feature, modify the AWS CloudFormation template mapping section as follows:

```
Mappings:
  Solution:
    Data:
      SendAnonymousUsageData: True
```

to

```
Mappings:
  Solution:
    Data:
      SendAnonymousUsageData: False
```

Send Us Feedback

We welcome your questions and comments. Please post your feedback on the [AWS Solutions Discussion Forum](#).

You can visit our [GitHub repository](#) to download the templates and scripts for this solution, and to share your customizations with others.

Document Revisions

Date	Change	In sections
January 2017	Initial Release	--
March 2017	Added a function to the child AWS Lambda function and updated the parameters	Overview ; Architecture Overview ; Implementation Considerations ; Automated Deployment
February 2018	Added a Power instance parameter and updated the anonymous data collection configuration	Automated Deployment ; Appendix

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