

Migration Guide: MySQL Onpremises to HeatWave MySQL on Amazon Web Services (AWS)

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Before you start:

- You must have an account on Oracle Cloud Infrastructure (OCI) and Amazon Web Services (AWS).
- You must have enabled HeatWave MySQL on AWS from the OCI Console. For instructions on how to enable HeatWave MySQL on AWS from OCI, refer to the documentation: <u>https://dev.mysql.com/doc/heatwave-aws/en/heatwave-aws-getting-started.html</u>
- Some OCI and AWS knowledge is preferred.
- This migration guide only covers how to migrate your database from on-premises MySQL to HeatWave MySQL on AWS. Before performing the migration, you should have considered downtime (the length of the downtime will mostly depend on the size of your database and checks you may want to perform before bringing your database back online), application compatibility, current database metrics (CPU, storage size, RAM, max number of concurrent users, backups, binary logs expiration, number of replicas if any, etc.), desired database metrics, networking, security, user testing, etc.
- The migration method shown in this guide works for on-premises MySQL v5.7 and above. This can be a MySQL Community Edition, MySQL Standard Edition, MySQL Enterprise Edition, or Percona Server.
- When following the guide, you should always execute the commands/steps shown as an admin/root user wherever applicable.
 - On OCI and AWS you must have the ability to create and manage resources.
 - For your on-premises MySQL instance, use an admin/root user.
- You do not need to make any configuration changes to your on-premises MySQL for this migration.
- If you have MySQL replication configured in your current on-premises environment, you can perform the migration steps shown in this guide from either your source or replica instance.
- The Overview section of this migration guide contains all the steps that are needed to complete the database migration from on-premises MySQL to HeatWave MySQL on AWS.
- In the Walkthrough section, we will apply the information provided in the Overview section and give you a simple step-by-step guide. In this guide, we will use an on-premises MySQL instance with some sample data pre-loaded and will migrate it over to HeatWave MySQL on AWS. This will help you follow and better visualize the process and information provided in the Overview section.
- You can use the Walkthrough section's step-by-step guide as a reference for your migration from onpremises MySQL to HeatWave MySQL. When following the guide, make changes along the way to your onpremises, OCI, and AWS environment accordingly or as required. Since each user following the step-by-step guide will have their environments configured differently, we will not be able to provide an ideal example that works for everyone.

Overview:

Following are the required steps to migrate data from on-premises MySQL to HeatWave MySQL on AWS:

I) Have Oracle Cloud Infrastructure (OCI) and Amazon Web Services (AWS) accounts.

OCI Sign in/Sign up page: <u>https://cloud.oracle.com</u> AWS Sign in/Sign up page: <u>https://aws.amazon.com</u>

II) Ensure you can access the HeatWave MySQL on AWS Console after enabling the HeatWave MySQL on AWS service on OCI.

Enabling HeatWave MySQL on AWS service: <u>https://dev.mysql.com/doc/heatwave-aws/en/heatwave-aws-getting-started.html</u>

HeatWave MySQL on AWS Console: https://cloud.mysql.com/

III) On AWS, create an access key and an S3 bucket.

[The on-premises MySQL data will be exported to an S3 bucket, which will then be later imported into HeatWave MySQL on AWS. You must create the AWS S3 bucket in the same region where your HeatWave MySQL on AWS DB System will reside. An AWS access key is required to grant secure access to the AWS S3 bucket. The user creating the access key must have the AmazonS3FullAccess permissions policy.]

Creating access keys for the root user: <u>https://docs.aws.amazon.com/IAM/latest/UserGuide/id_root-</u>user_manage_add-key.html

AmazonS3FullAccess Policy: https://docs.aws.amazon.com/aws-managed-

policy/latest/reference/AmazonS3FullAccess.html

Creating a bucket: https://docs.aws.amazon.com/AmazonS3/latest/userguide/create-bucket-overview.html

IV) Install MySQL Shell 8.3 (or above) on an on-premises instance that can connect to on-premises MySQL and create a credentials file.

[MySQL Shell on the on-premises instance will be used to copy DDL and data from on-premises MySQL to the AWS S3 bucket. You must download MySQL Shell 8.3 or above. A credentials file needs to be created on the on-premises instance to store access keys. The credentials file will be used by MySQL Shell for authentication to export data from on-premises MySQL to the AWS S3 bucket.]

Download MySQL Shell: <u>https://dev.mysql.com/downloads/shell/</u>

Install MySQL Shell: <u>https://dev.mysql.com/doc/mysql-shell/8.0/en/mysql-shell-install.html</u> <u>AWS</u>

AWS Credentials File: <u>https://docs.aws.amazon.com/cli/latest/userguide/cli-authentication-user.html#cli-authentication-user-configure-csv.titlecli-authentication-user-configure-file</u>

V) Connect to on-premises MySQL using MySQL Shell. Afterwards, execute the MySQL Shell util.dumpInstance() utility to export all schemas (including users, indexes, routines, triggers) from onpremises MySQL to the AWS S3 bucket.

[The dump created by MySQL Shell's instance dump utility comprises DDL files specifying the schema structure, and tab-separated .tsv files containing the data.]

MySQL Shell Dump Utilities: <u>https://dev.mysql.com/doc/mysql-shell/8.3/en/mysql-shell-utilities-dump-instance-schema.html</u>

VI) Create a HeatWave MySQL on AWS DB System and a HeatWave Cluster.

[HeatWave MySQL on AWS is a fully-managed MySQL service, developed and supported by the MySQL team at Oracle.] Provision HeatWave MySQL on AWS: <u>https://dev.mysql.com/doc/heatwave-aws/en/heatwave-aws-dbsystem-</u>create.html

VII) Import data from the AWS S3 bucket to HeatWave MySQL on AWS.

[The data will be imported using the Data Import Feature. This feature allows you to import data in a variety of formats such as MySQL dump files and text files from an AWS S3 bucket to HeatWave MySQL on AWS in the same region.]

Importing Data Using the Data Import Feature: <u>https://dev.mysql.com/doc/heatwave-aws/en/heatwave-aws-importing-data-data-import.html</u>

VIII) (Optional) Use the Query Editor tab to verify whether the data was migrated successfully from onpremises MySQL to HeatWave MySQL on AWS.

[The Query Editor under the Workspaces page allows you to connect to the HeatWave MySQL on AWS DB System and run queries against it.]

HeatWave MySQL on AWS Console Overview: https://dev.mysql.com/doc/heatwave-aws/en/console-overview.html

IX) If the HeatWave option was enabled during the HeatWave MySQL on AWS DB System creation, load data from MySQL InnoDB storage into the HeatWave Cluster using automation.

[Loading data into the HeatWave in-memory Cluster combines transactions, analytics, and machine learning services into one MySQL Database.]

Loading Data into HeatWave: <u>https://dev.mysql.com/doc/heatwave-aws/en/heatwave-aws-loading-unloading-heatwave.html</u>



Walkthrough:

I) Have an Oracle Cloud Infrastructure (OCI) and Amazon Web Services (AWS) account.

OCI Sign in/Sign up page: <u>https://cloud.oracle.com</u> AWS Sign in/Sign up page: <u>https://aws.amazon.com</u>

II) Ensure you can access the HeatWave MySQL on AWS Console after enabling the HeatWave MySQL on AWS service on OCI.

Enabling the HeatWave MySQL on AWS service: <u>https://dev.mysql.com/doc/heatwave-aws/en/heatwave-aws-getting-started.html</u>

HeatWave MySQL on AWS Console: https://cloud.mysql.com/

III) On AWS, create an access key and an S3 bucket.

1. Below is the on-premises MySQL instance version and <u>the sample database ("world"</u>) that will be migrated for this guide. The sample world database consists of 3 tables.



2. Log in to <u>AWS</u> as a root user or another user that has the AmazonS3FullAccess permissions policy and create an access key. Click on your account name or number in the upper right corner of the Console and choose **Security Credentials**.

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3. Scroll down on the Security Credentials page until you see the Access Keys section. Click **Create access key**.

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4. Check the Continue to create access key box and click **Create access key**.



5. On the Retrieve access key page, **save the access key and secret access key values** for later use by **downloading the .csv file**. Choose **Done**.

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6. Expand the Services menu at the top left of the screen, click Storage, and choose S3.



7. Click Create bucket.



 Select the AWS Region where you want to create the bucket. The bucket must be in the same region as HeatWave MySQL on AWS. For this guide, we are going to deploy the bucket in US East (N. Virginia) as that is where we will deploy the HeatWave MySQL on AWS DB System later in this section. Choose the Bucket type as General purpose and give your Bucket a name.

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9. Leave everything else as-is and click **Create bucket**.

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IV) Install MySQL Shell 8.3 (or above) on an on-premises instance that can connect to on-premises MySQL and create a credentials file.

10. Have an on-premises instance that can connect to your on-premises MySQL. Go to the below website and download MySQL Shell 8.3 on your on-premises instance. For this guide, we have deployed our on-premises MySQL on a Linux instance. From the MySQL Shell download page, under Select Version, ensure 8.3.x Innovation or higher is selected. MySQL Shell 8.3 is fully compatible with MySQL 8.3, 8.2, 8.1, 8.0, and 5.7. For **Operating System** and **OS Version** - pick the appropriate option depending on the OS and the OS Version that you are running. Click **Download**. Do not download the Debug Information Package. ht

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Note: for this guide, we will show you how to install MySQL Shell on a Linux environment. For other environments, see Installing MySQL Shell on Windows, Installing MySQL Shell on Linux, and Installing MySQL Shell on macOS.

11. Right-click on **No thanks, just start my download** and click **Copy link address**.

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- 12. Go back to the on-premises instance that can connect to your on-premises MySQL and execute the below command to download MySQL Shell:
 - \$ wget <MySQL-Shell-Download-Link>

Replace the link with what you have.

<pre>\$ wget https://dev.mysql.com/get/Downloads/MySQL-Shell/mysql-shell-8.3.0-</pre>
1.el8.x86 64.rpm
[opc@linux-8 ~]\$ wget https://dev.mysql.com/get/Downloads/MySQL-Shell/mysql-shell-8
.3.0-1.el8.x86_64.rpm
2024-04-11 21:16:00 https://dev.mysql.com/get/Downloads/MySQL-Shell/mysql-shel
l-8.3.0-1.el8.x86_64.rpm
Resolving dev.mysql.com (dev.mysql.com) 104.70.58.222, 2600:1408:ec00:986::2e31, 2600:1408:ec00:98e::2e31
Connecting to dev.mysql.com (dev.mysql.com) 104.70.58.222 :443 connected.
HTTP request sent, awaiting response 302 Moved Temporarily
Location: https://cdn.mysql.com//Downloads/MySQL-Shell/mysql-shell-8.3.0-1.el8.x86_
64.rpm [following]
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Connecting to cdn.mysql.com (cdn.mysql.com) 104.70.53.38 :443 connected.
HTTP request sent, awaiting response 200 OK
Length: 32608996 (31M) [application/x-redhat-package-manager]
Saving to: 'mysql-shell-8.3.0-1.el8.x86_64.rpm.1'
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13. After downloading the MySQL Shell rpm, install MySQL Shell:



14. You can now verify if MySQL Shell has successfully installed on your on-premises instance by executing the below command:

```
$ mysqlsh --version
[opc@linux-8 ~]$ mysqlsh --version
mysqlsh Ver 8.3.0 for Linux on x86_64 - for MySQL 8.3.0 (MySQL Community Server (
GPL))
```

15. Next, log in to your on-premises MySQL using MySQL Shell by executing the below command:

```
$ mysqlsh <user>@<hostname>:<port-number>
-OR-
$ mysqlsh -u <user> -p -h <hostname> -P <port-number>
[opc@linux-8 ~]$ mysqlsh root@localhost
Please provide the password for 'root@localhost': *******
Save password for 'root@localhost'? [Y]es/[N]o/Ne[v]er (default No): Y
MySQL Shell 8.3.0
Copyright (c) 2016, 2023, Oracle and/or its affiliates.
Oracle is a registered trademark of Oracle Corporation and/or its affiliates.
Other names may be trademarks of their respective owners.
Type '\help' or '\?' for help; '\quit' to exit.
Creating a session to 'root@localhost'
Fetching schema names for auto-completion... Press ^C to stop.
Your MySQL connection id is 9 (X protocol)
Server version: 8.0.33 MySQL Community Server - GPL
No default schema selected; type \ \ schema> to set one.
MySQL localhost:33060+ ssl JS >
```

Note: you can interact with MySQL Shell using JavaScript, Python, or SQL mode. The default is JavaScript. To switch between the different modes, execute /js for JavaScript, /py for Python, and /sql for SQL mode inside MySQL Shell. To exit out of MySQL Shell, execute /q.

16. Exit out of MySQL Shell and create a . aws directory inside the home directory of your on-premises instance. Go inside the newly created directory and create a file called credentials using the text editor of your choice.



17. Inside the credentials file, paste the below contents and fill in the aws_access_key_id and



18. Save and close the file.

V) Connect to on-premises MySQL using MySQL Shell. Afterwards, execute the MySQL Shell util.dumpInstance() utility to export all schemas (including users, indexes, routines, triggers) from onpremises MySQL to the AWS S3 bucket.

- 19. Before connecting to on-premises MySQL using MySQL Shell and proceeding with the below steps, it is highly recommended that you use a command like screen or tmux. These commands will allow you to reconnect to a dropped session in case your connection drops in the middle of performing the MySQL Shell export using util.dumpInstance(). For small databases, the screen or tmux may not be necessary. For this guide, we will use tmux. To learn more about tmux, see <u>A beginner's guide to tmux</u>. Below are the basics of using the tmux command:
 - Install tmux on Linux: \$ sudo yum install tmux
 - Start a new tmux session, from your terminal execute: \$ tmux
 - List all the active tmux sessions: \$ tmux ls
 - Detach from a tmux session and leave it running in the background: \$ Ctrl+B d
 - Attach a tmux session running in the background: \$ tmux attach
 - End a tmux session: \$ Ctrl+B &
- 20. Start a tmux session and connect to your on-premises MySQL using MySQL Shell.

```
$ tmux
$ mysqlsh <user>@<hostname>:<port-number>
-OR-
$ mysqlsh -u <user> -p -h <hostname> -P <port-number>
[opc@linux-8 ~]$ tmux
[opc@linux-8 ~]$ mysqlsh root@localhost
MySQL Shell 8.3.0
Copyright (c) 2016, 2023, Oracle and/or its affiliates.
Oracle is a registered trademark of Oracle Corporation and/or its affiliates.
Other names may be trademarks of their respective owners.
Type '\help' or '\?' for help; '\quit' to exit.
Creating a session to 'root@localhost'
Fetching schema names for auto-completion... Press ^C to stop.
Your MySQL connection id is 10 (X protocol)
Server version: 8.0.33 MySQL Community Server - GPL
No default schema selected; type \use <schema> to set one.
 MySQL localhost:33060+ ssl JS >
```

21. Change to the JavaScript mode (if you are not in JS mode) of MySQL Shell and run the util.dumpInstance() utility to export all on-premises MySQL data into the S3 bucket. The data will be copied over from on-premises MySQL to S3 using HTTPS.

```
MySQL JS> \js
MySQL JS> util.dumpInstance("mysql-hw-dump",{s3bucketName: "mysql-hw-bucket",
"compatibility": ["force innodb", "skip invalid accounts", "strip definers",
"strip restricted grants", "strip tablespaces", "ignore wildcard grants",
"strip invalid grants", "create invisible pks"], users: "true", threads: 4,
targetVersion: "8.3.0", ocimds: "true", dryRun:"true"})
```

Note: replace the bucket name (mysql-hw-bucket) with your S3 bucket name and the target version (8.3.0) to the HeatWave MySQL on AWS version that you are planning to migrate to.

MySQL localhost:33060+ ssl JS > util.dumpInstance("mysql-hw-dump",{s3bucketName: "mysql-hw-bucket", "compatibility": ["force_innodb", "skip_invalid_accounts", "str ip_definers", "strip_restricted_grants", "strip_tablespaces", "ignore_wildcard_gran ts", "strip_invalid_grants", "create_invisible_pks"], users: "true", threads: 4, ta rgetVersion: "8.3.0", ocimds: "true", dryRun:"true"}) NOTE: The 'targetVersion' option is set to 8.3.0. This version supports the SET ANY _DEFINER privilege, using the 'strip_definers' compatibility option is unnecessary. dryRun enabled, no locks will be acquired and no files will be created. Acquiring global read lock Global read lock acquired Initializing - done 1 out of 5 schemas will be dumped and within them 3 tables, 0 views. 3 out of 6 users will be dumped.

[... output truncated]

Writing global DDL files Writing users DDL Writing DDL - done Starting data dump 0% (0 rows / ~5.26K rows), 0.00 rows/s, 0.00 B/s uncompressed, 0.00 B/s compressed MySQL localhost:33060+ ssl JS >

Note:

- util.dumpInstance(outputUrl[, options]): MySQL instance dump utility exports all • schemas or a selected schema from a MySOL instance into a set of local files or an OCI or AWS bucket. By default, this utility includes all schemas, users, indexes, routines, and triggers. You can use the excludeSchemas or includeSchemas and excludeTables or includeTables option to specify individual schemas or tables to be excluded or included in the dump files. For example: excludeSchemas: ["test", "world"]and excludeTables: ["test.table", ["world.city"]. See <u>Dump Utilities</u>.
- s3BucketName: The name of the S3 bucket to which the dump is to be written. •
- compatibility: Apply the specified requirements for compatibility with HeatWave MySQL for all tables in the dump output, altering the dump files as necessary.
 - o force innob: Change CREATE TABLE statements to use the InnoDB storage engine for any tables that do not already use it.
 - skip invalid accounts: You cannot export a user that has no password defined. This option skips any such users.

- strip_definers: Remove the DEFINER clause from views, routines, events, and triggers, so these objects are created with the default definer (the user invoking the schema) and change the SQL SECURITY clause for views and routines to specify INVOKER instead of DEFINER. HeatWave MySQL requires special privileges to create these objects with a definer other than the user loading the schema. If your security model requires that views and routines have more privileges than the account querying or calling them, you must manually modify the schema before loading it. If you plan to use HeatWave MySQL on AWS v8.3 or above, this option is not required.
- strip_restricted_grants: Certain privileges are restricted in HeatWave MySQL.
 Privileges such as RELOAD, FILE, SUPER, BINLOG_ADMIN, and SET_USER_ID. You cannot create users granting these privileges. This option strips these privileges from dumped GRANT statements.
- strip_tablespaces: Tablespaces have some restrictions in HeatWave MySQL. If you need tables created in their default tablespaces, this option strips the TABLESPACE= option from CREATE TABLE statements.
- ignore_wildcard_grants: If enabled, ignores errors from grants on schemas with wildcards, which are interpreted differently in systems where the partial_revokes system variable is enabled.
- strip_invalid_grants: If enabled, strips grant statements which would fail when users are copied, such as grants referring to a specific routine which does not exist.
- create_invisible_pks: Primary keys are required by High Availability and HeatWave. If you intend to export data for use in a highly available DB system or a HeatWave DB system, add primary keys as they are not defined on the tables. This compatibility flag adds invisible primary keys to each table that requires them.
- users: Include (true) or exclude (false) users and their roles and grants in the dump. You can use the excludeUsers or includeUsers option to specify individual user accounts to be excluded or included in the dump files. For example: excludeUsers: ["'test'@'%'", "'root'@'localhost'"].
- threads: (Optional) The number of parallel threads to use to dump chunks of data from the MySQL instance. Each thread has its own connection to the MySQL instance. The default is 4.
- targetVersion: Define the version of the target MySQL instance, in n.n.n format. Such as 8.3.0 or 8.0.36, for example. If the value is not set, the MySQL Shell version is used.
- ocimds: Setting this option to true enables checks and modifications for compatibility with the HeatWave MySQL Service.
- dryRun: Displays information about the copy with the specified set of options, and about the results of HeatWave MySQL Service compatibility checks but does not proceed with the copy. Setting this option enables you to list out all the compatibility issues before starting the copy.
- consistent: Enable (true) or disable (false) consistent data copies by locking the instance for backup during the copy.

22. Once you have run the command in step 21 and do not see any errors in the output (warnings are okay), run the same step 21 command but this time change the dryRun option to false.

```
MySQL JS> util.dumpInstance("mysql-hw-dump",{s3bucketName: "mysql-hw-bucket",
    "compatibility": ["force_innodb", "skip_invalid_accounts", "strip_definers",
    "strip_restricted_grants", "strip_tablespaces", "ignore_wildcard_grants",
    "strip_invalid_grants", "create_invisible_pks"], users: "true", threads: 4,
    targetVersion: "8.3.0", ocimds: "true", dryRun:"false"})
```

Note: replace the bucket name (mysql-hw-bucket) with your S3 bucket name and the target version (8.3.0) to the HeatWave MySQL on AWS version that you are planning to migrate to.

MySQL localhost:33060+ ssl JS > util.dumpInstance("mysql-hw-dump",{s3bucketName: "mysql-hw-bucket", "compatibility": ["force_innodb", "skip_invalid_accounts", "str ip_definers", "strip_restricted_grants", "strip_tablespaces", "ignore_wildcard_gran ts", "strip_invalid_grants", "create_invisible_pks"], users: "true", threads: 4, ta rgetVersion: "8.3.0", ocimds: "true", dryRun:"false"}) NOTE: The 'targetVersion' option is set to 8.3.0. This version supports the SET_ANY _DEFINER privilege, using the 'strip_definers' compatibility option is unnecessary. Acquiring global read lock Global read lock acquired Initializing - done 1 out of 5 schemas will be dumped and within them 3 tables, 0 views. 3 out of 6 users will be dumped.

[... output truncated]

100% (5.30K rows / ~5.26K rows), 0.00 rows/s, 0.00 B/s uncompressed, 0.00 B/s compr essed Dump duration: 00:00:00s Total duration: 00:00:01s Schemas dumped: 1 Tables dumped: 3 Uncompressed data size: 194.65 KB Compressed data size: 91.63 KB Compression ratio: 2.1 Rows written: 5303 Bytes written: 5303 Bytes written: 91.63 KB Average uncompressed throughput: 194.65 KB/s Average compressed throughput: 91.63 KB/s MySQL localhost:33060+ ssl JS > □

Note: once the MySQL Shell dump utility finishes, all your data will be exported over from on-premises MySQL to the AWS S3 bucket. You can end your tmux session by executing Ctrl+B &.

23. Open the AWS S3 Console and verify whether the dump was successful.



VI) Create a HeatWave MySQL on AWS DB System and a HeatWave Cluster.

- 24. Log in to the <u>HeatWave MySQL on AWS Console</u>.
- 25. After logging in, click on the **MySQL** tab.



26. On the **DB Systems** tab, choose **Create MySQL DB System**.

MySQL He	atWave		US East (N. Virgi	inia) 🔻	Ø
DB Systems Backups	Configurations Channels PrivateLinks				
Create MySQL DB Syst	Start Stop Restart Action	s •	Q State Any - Name 🛞		
Name 🗘	State	HeatWave Cluster	HeatWave State	Created ~	
		The provided filter options did not mate	h any resources		
Select a MySQL DB System	above to view details				
	tySQL 🗱 HeatWave Clusters 🖽 Workspa	ices 딸 HeatWave AutoML	<u>ម្មា</u> Performance		



27. The **Create MySQL DB System and HeatWave Cluster** dialog will open. Enter a MySQL **Display Name** and a **Description** (optional). Configure your **Administrator credentials** that will be used to manage HeatWave MySQL.

MySQL HeatWave	Create MySQL DB System and HeatWave Cluster
DB Systems Backups Configurations Channels PrivateLinks	(2) MySQL DB System HeatWave Cluster
Oreate MySQL DB System Start Stop Restart Actions ▼	Basic information
Name O State HeatWay	Display name MySQL-HW
N The provided filter o	Description
	Administrator credentials Username
Select a MySQL DB System above to view details	admin Password
	Confirm password
E Introduction 自MySQL 器 HeatWave Clusters III Workspaces 翌 HeatW	Cancel Next

28. Next, select your Hardware configuration by choosing the appropriate amount of vCPUs and Memory and configure your Data storage size. Leave the Availability zone and MySQL Configuration as-is. If you have a custom MySQL configuration that you would like to apply to your MySQL – you can do so by clicking Change. For more information regarding custom configurations, see <u>Configuration</u>.

		Create MySQL DB System	and HeatWave Cluster	r
DB Systems Backups Configurations Channels PrivateL	inks	1 MySQL DB System		② HeatWave Cluster
Create MySQL DB System Start Stop Restart	Actions 🔻	Hardware configuration MySQL.2.16GB	MySQL.4.32GB	
Name O State	HeatWave Clu	MySQL.8.64GB	MySQL.32.256GB	
	N The provided filter o	Data storage size (GiB) 32		~ ^
		Availability zone ① Select placement ④ Automatic 〇 Manual		
		MySQL Configuration Selected MySQL Configuration Default MySQL Configuration for MySQL 4	S 1.32GB (Supports HeatWave) Y	upports HeatWave Change
Select a MySQL DB System above to view details	III Workspaces 望 HeatW			Cancel Next



29. For MySQL version, choose the MySQL server version to deploy. You have two options, Innovation or Bug fix. With the new MySQL versioning model, you have the flexibility to select an innovation or a bug fix release. Both releases are production-grade quality. MySQL innovation releases allow you to access the latest features and improvements. Innovation releases are ideal for fast-paced development environments with high levels of automated tests and modern continuous integration techniques for faster upgrade cycles. MySQL bug fix releases (aka long-term support releases) allow you to reduce the risks associated with changes in the database software behavior, as these releases only contain necessary fixes (bugfix and security patches). For more information regarding MySQL innovation and bug fix releases, see Introducing MySQL Innovation and Bug fix versions. For this guide, we have chosen 8.3.0. Select the start time for the Maintenance Window.

	MySQL HeatWave			Create MySQL DB System a	nd HeatWave Cluster	
01	DB Systems Backups Configurations Cl	hannels PrivateLinks		MySQL DB System	(2) HeatWave Cluster	
	Create MySQL DB System Start	Stop Restart Actions 🔻		MySQL version		
0.0	Name 🗘	State	HeatWav	8.0.31	8.0.32	
1.001			N	8.2.0	8.3.0	
		The prov	vided filter o			
				Maintenance window ${}^{}$		
				Select start time Automatic O Manual		

30. For **Networking**, check the **Enable inbound connectivity from allowed public IP address ranges** if you would like your MySQL DB System to be accessible via the public internet and specify the **Allowed public IP address ranges**. For this guide, we have chosen not to do that. Configure your **Port**, **X Plugin Port**, and the **Backup policy**.

MySQL HeatWave	Create MySQL DB System and HeatWave Cluster
DB Systems Backups Configurations Channels PrivateLinks	(2) MySQL DB System HeatWave Cluster
	Networking Enable inbound connectivity from allowed public IP address ranges
Name © State HeatWi	 This DB System will not be accessible via the public internet. To enable private inbound connectivity, a PrivateLink must be configured to access this DB System once created. The DB System will remain accessible through the Workspaces tab. Port 3306 X Plugin Port
Select a MySQL DB System above to view details	Backup policy Enable automatic backups Backup retention period (days) 7 Select backup window Backup start time 00:00 UTC
🔄 🗐 Introduction 😝 MySQL 🎇 HeatWave Clusters 🗰 Workspaces 🖳 Heat	W Cancel Next

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31. For **IAM roles**, leave it as-is. Select **Next**.

MySQL HeatWave		Create MySQL DB System and HeatWave Cluster		
DB Systems Backups Confi	gurations Channels PrivateLinks		MySQL DB System	(2) HeatWave Cluster
Create MySQL DB System	Start Stop Restart Ac	tions 👻	Backup policy	
Name ©	State	HeatWav N The provided filter o		× ^
Select a MySQL DB System above	to view details		IAM roles ① Data Import role ARN Lakehouse role ARN	Cancel Next

32. Select whether to **provision a HeatWave Cluster**, which will allow you to run OLAP (analytics queries) and ML (machine learning) workloads alongside OLTP. Give your Cluster a **Display name** and **Description** (optional). Lastly, configure the **shape** and **Cluster size**. The HeatWave.16GB shape can process up to 25 GB of data and the HeatWave.256GB shape can process up to 400 GB of data. If you intend to use HeatWave AutoML and Lakehouse functionality, the HeatWave.256GB shape is required. Choose **Create**.

MySQL HeatWave		Create MySQL DB System and HeatWave Cluster			
DB Systems Backups	Configurations Channels PrivateLinks	7.77 777	① MySQL DB System	н	2 leatWave Cluster
Create MySQL DB Syste	em Stärt Stop Restart Action	ns 🔻	Provision HeatWave Cluster		
Name 🗘	State	HeatWav	Basic information		
			HW-Cluster		
		N The provided filter o	Description		
			HeatWave Cluster configuration Shape		
Select a MySQL DB System a	above to view details		Does not support Lakehouse	Heatwave.256GB Supports Lakehouse	
			Cluster size 1		~ ^
	ySQL 🎄 HeatWave Clusters 🖩 Worksp.	aces 😰 HeatW			Cancel Back Create



33. Your HeatWave MySQL DB system will start Creating.

MySQL Heat Oracle	Wave		US East (N.	Virginia) + ()
DB Systems Backups Cor	figurations Channels PrivateLinks	ns 🔹	Q State Any - Search Name	
Name ≎	State	HeatWave Cluster	HeatWave State	Page 1 (Items 1 - 5) < 4 > Created ~
MySQL-HW	Creating	HW-Cluster	Creating	Thu, 11 Apr 2024 21:51:50 GMT

34. After approximately 15-20 minutes, the HeatWave MySQL DB system will change its state from Creating to **Active**.

MySQL HeatWave ORACLE			US East (N. Vi	rginia) 🔻	0
DB Systems Backups Configurations Chanr • Create MySQL DB System Start Stoppen Start	nels PrivateLinks		Q State Any V Search Name		
				Page 1 (Items 1 - 5)	
Name 🗘	State	HeatWave Cluster	HeatWave State	Created ~	
MySQL-HW	Active	HW-Cluster	Active	Thu, 11 Apr 2024 21:51:50 GMT	

35. Click on the name of your MySQL DB System to open the **MySQL DB System Details** page. Here you can see information like **Hostname**, **Shape**, **Storage**, **MySQL version**, etc.

MySQL HeatWave Oracle	US East (N. Virginia) 👻 🕜
MySQL » DB Systems » Details MySQL-HW	
Start Stop Restart Edit MySQL D5 System Opdate Networking Actions * Summary State Network accessibility Active Oconsole only Hostname PrivateLink Hostname	Resource ID Shape
dbsystem.us-east-1.aws.c - loud.mysql.com DB System info Backups Events	MySQL.4.32GB
General information Description - Last updated	DB System configuration Storage size 32 GIB MySQL version
Thu, 11 Apr 2024 21:58:13 GMT Created Thu, 11 Apr 2024 21:51:50 GMT	8.3.0-u3-cloud MySQL Configuration Default MySQL Configuration for MySQL.4.32GB (Supports HeatWave)
目 Introduction 目 MySQL 総 HeatWave Clusters 田 Workspaces 空 HeatWave Aut	toML <u>w</u> Performance



VII) Import data from the AWS S3 bucket to HeatWave MySQL on AWS.

- 36. It is now time to import the on-premises MySQL data sitting in the S3 bucket to HeatWave MySQL on AWS using the Data Import feature.
- 37. In the HeatWave MySQL Console, click the Workspaces tab, and then click the Data Imports tab. Click
 - Connect to MySQL DB System. MySQL HeatWave US East (N. Virginia) 🔻 ORACLE Connect to MySQL DB Syst Manage Data in HeatWave **Ouerv** Editor Data Imports Autopilot Index Advisor 🕀 Import Data Cancel Nam State Description Created Connect to a MySQL DB System To import data into your DB System, you must be connected to an Active DB System. Introduction HysqL 28 HeatWave Clusters Workspaces 문 HeatWave AutoML /넨 Performance
- 38. In the **Connect to MySQL DB System** dialog, select the DB System to which you want to import data and enter the administrator credentials that you provided while creating the DB System. Click **Connect**.

MySQL HeatWave Oracle	US E	East (N. Virginia) 👻 💿
Query Editor Manage Data in HeatWave Data Imports	Connect to MySQL DB System	Connect to MySQL DB System
Import Data Cancel	MySQL-HW 👻	
Name	Username admin	
Connect to a MySQL DB System To import data into your DB System, you must be	Password	
	Cancel Connect	

39. Click Import Data.

MySQL HeatWave Oracle	US East (N. Virginia) 🔻	• @
Query Editor Manage Data in HeatWave Data Imports Autopilot Index Advisor	HeatWave Cluster Active MySQL-DB System MySQL-HW	Username admin Disconnect
Import Data Cancel		

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40. In the **Import data into DB System** dialog, enter a **Display name** and **Description** (optional) for the data import operation. Under **Source**, select **Bring your own data** and specify the **S3 URI** for the Object where your on-premises MySQL dump is located. See below:

aws Services Q Search	[Option+S]	Ъ Ҿ Ø Ø Global ▼	
🙋 EC2 🌀 VPC 🔯 RDS 🔁 S3	Billing and Cost Management 🔠 IAM		
Amazon S3 ×	Amazon S3 > Buckets > mysql-hw-bucket		(i)
Buckets	mysql-hw-bucket Info		0
Access Grants			
Access Points	Objects Properties Permissions Metrics	Management Access Points	
Object Lambda Access Points			
Multi-Region Access Points	S3 URI copied		
Batch Operations	Object:		
IAM Access Analyzer for S3	C Di Copy S3 URI D Copy URL D Do Objects are the fundamental entities stored in Amazon S3. You can use Am grant them permissions. Learn more [2]	wnload Open [2] Delete Actions ▼ Create folder H Upload iazon SS inventory [2] to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly	
Block Public Access settings for this account	Q Find objects by prefix	< 1 > ©	
Storage Lens	✓ Name ▲ Type		
Dashboards	Market Ma		
Charago Long groups			
Query Editor Manage Data in Hea	tWave Data Imports Autopilot Index Advisor State Description	Display name On-prem-MySQL-to-MySQL-HW Description	
Import data into	vour MvSOL DB System	Source	
Data stored in a variety of f	ormats can be imported into your DB System from An	Bring your own data O Import sample data	
		s3 URI s3://mysql-hw-bucket/mysql-hw-dump/	
	· · · · · · · · · · · · · · · · · · ·	uthentication method	
		IAM role O User access key	
		DB System does not have an IAM role configured for Data Import If you would like to import data into your DB System using an IAM role, first add the role to your DB System using the Edit I System menu action.	DB
		ile type	
			Income
Introduction MySQL	ஃ HeatWave Clusters	Cancel	Import



41. After specifying the S3 URI, choose User access key for the Authentication method. The recommended authentication method approach here is to use the IAM role, but for this guide, we will use the user access key that we created in step 5. For more information on how to use the IAM role, see <u>Data Import Feature</u>. The user using the access key must have the AmazonS3FullAccess permissions policy. Under File Type, specify MySQL dump files, for Character set, enter the character set of your dumped data, and for Update GTID set, select APPEND. Choose Import.

MySQL HeatWave	Import data into DB System
Query Editor Manage Data in HeatWave Data Imports Autopilot Index Advisor Import Data Cancel Name State Description Import data into your MySQL DB System Data stored in a variety of formats can be imported into your DB System from Am	Source Bring your own data Import sample data S3 URI s3//mysql-hw-bucket/mysql-hw-dump/ Authentication method IAM role User access key Authentication method IAM role User access key Access key ID File type MySQL dump files Text files File parsing settings Lharacter set utf8mb4 Update GTID set APPEND
🔄 🗐 Introduction 😑 MySQL 🗱 HeatWave Clusters 🖬 Workspaces 👳 HeatW	Cancel Import

42. Your data will now start importing from the S3 bucket to HeatWave MySQL on AWS and the status of the Data Import changes to **In Progress**. Once the operation is complete, the status will change to **Succeeded**. Click or select a Data Import operation to view more information like the import progress of the tables, potential warnings, and errors.

MySQL HeatWave ORACLE				US East (N. Virginia) 🔻	Ø
			व्यास स स सम्ब । 🗠 🖉		
 Query Editor Manage Data in HeatWave Data Imports	Autopilot Index Advi	sor		HeatWave Cluster MySQL DB System Active MySQL-HW	tem Username admin Disconnect
 Import Data Cancel					
Name	State	Progress (%)	Description	Created	
On-prem-MySQL-to-MySQL-HW	Succeeded		-	Thu, 11 Apr 2024 22:08:25 (SMT
Select a Data Import above to view details			-		



VIII) (Optional) Use the Query Editor tab to verify whether the data was migrated successfully from onpremises MySQL to HeatWave MySQL on AWS.

43. On the Workspaces page, click **Query Editor** and ensure you are connected to your HeatWave MySQL on AWS DB System. Once you are connected, you can see all your schemas and tables on the left panel, like below:

	MySQL HeatWave ORACLE	US East (N. Virginia) 🔻	0
6	a wa mana amin'ny fantsansa 🐧 🌒 🔊 Manana Alay 🗾 🖓 🖬 👘 👘		
	Query Editor Manage Data in HeatWave Data Imports Autopilot Index Advisor	HeatWave Cluster MySQL DB System Username Active MySQL-HW admin	Disconnect
	Database Objects 🛈 🗘 🕊 Run Query Stop		
	Schema/Table Name HeatWave 1		
	> world 0 of 3		

44. You can run the below query on every table that you have for your on-premises MySQL and HeatWave MySQL on AWS to ensure that the row count matches on both sides:

MySQL SQL> SELECT COUNT(*) FROM <schema-name>.<table-name>;

45. Here is our row count comparison for on-premises MySQL and HeatWave MySQL on AWS:

n-premises MySQL row count:	
MySQL localhost:33060+ ssl SQL > USE world;	
Default schema set to `world`.	
$^{ m c}$ etching global names, object names from `world` for auto-completion Press ^C to sto	bр
MySQL localhost:33060+ ssl world SQL > SELECT COUNT(*) FROM city;	
COUNT(*)	
4079 I	
+	
. row in set (0.0015 sec)	
MySQL localhost:33060+ ssl world SQL > SELECT COUNT(*) FROM country;	
+	
COUNT(*)	
* 239 *	
row in set (0,0008 sec)	
MySQL localhost:33060+ ssl world SQL > SELECT COUNT(*) FROM countrylanguage:	
+	
COUNT(*)	
+	
984	
MySQL localnost:33060+ ssl world SQL >	

HeatWave MySQL on AWS row count:

1 USE world; 2 SELECT COUNT(*) FROM city;	
Query Results	
Query completed on Thu, 11 Apr 2024 22:21:51 GMT (took 0.0010 seconds). Result set is limited to 1000 rows.	
Results JSON Job Information	
COUNT(*) 🗘	
4079	
1 USE world; 2 SELECT COUNT(*) FROM country;	
Query Results	
Query completed on Thu, 11 Apr 2024 22:22:16 GMT (took 0.0006 seconds). Result set is limited to 1000 rows.	
Results JSON Job Information	
COUNT(*) \$	
239	
1 USE world; 2 SELECT COUNT(*) FROM countrylanguage;	
Query Results	
Query completed on Thu, 11 Apr 2024 22:22:48 GMT (took 0.0005 seconds). Result set is limited to 1000 rows.	
Results JSON Job Information	
COUNT(4) A	

46. After validating, you can have your application(s) point to the new HeatWave MySQL on AWS DB System.

IX) If the HeatWave option was enabled during HeatWave MySQL on AWS DB System creation, load data from MySQL InnoDB storage into the HeatWave Cluster using automation.

47. On the Workspaces page, click **Manage Data in HeatWave** and ensure you are connected to your HeatWave MySQL on AWS DB System.

MySQL HeatWav	e		US East (N. Vir	rginia) 🔻	0
Query Editor Manage Data in HeatWa	ave Data Imports Autopilot Index Advisor		HeatWave Cluster Active	MySQL DB System MySQL-HW admin	e Disconnect
 Load into HeatWave Unload from	n HeatWave Create Lakehouse Mapping Refresh	Estimate Actions -	nings Rows Estimate	Estimate last refres	hed: a minute ago ①
□ → world	-	0 of 3 0	5,269	0.009	

48. Click the **check box present in front of the schema or table name** to select the schemas and tables you want to load into HeatWave for query acceleration and to run OLAP and ML workloads - alongside OLTP. After selecting, click **Load into HeatWave**.

ORACLE			54 1965 - March 19	
ery Editor Manage Data in HeatWave Data	Imports Autopilot Index Advisor		HeatWave Cluster Active 	MySQL DB System Username MySQL-HW admin Disconne
Load into HeatWave Unload from HeatWave	Create Lakehouse Mapping Refresh E	stimate Actions 👻		Estimate last refreshed: a few minutes ag
Name	Source	Loaded War	nings Rows Estimate	Memory Size Estimate (GiB)
✓ vorld	-	0 of 3 0	5,269	0.009
✓ III city	InnoDB	• -	4,046	0.003
country	InnoDB	• -	239	0.003
 Countrylanguage 	InnoDB	• -	984	0.003
0.0 %	16.0 GiB	C	.0 GiB	0.0 GiB
a	Free cluster memory @	Size of		Size of tables to unload ()



49. A dialog will appear which will provide a summary of the load operation. It shows information like DB System name, number of tables to load, estimated load size, and estimated load time. Click **Load Tables**.

MySQL HeatWave ORACLE					US East (N. Virg	ginia) 🔻		0
Query Editor Manage Data in HeatWave Data Imports	MySQL Auto	pilot Parallel Lo	oad tables to H	eatWave	luster	MySQL DB System MySQL-HW	Username admin	Disconnect
Load into HeatWave Unload from HeatWave Crea	DB System MySQL-HW	Tables to load 3	Estimated load size 0.009 GiB	Estimated load time 0.4 seconds	Estimato	Estimate last ref	reshed: less thar	n an hour ago ①
world ✓	Schemas and table	s to be loaded			_stinute	0.009	Jy Size Estimat	
en 🖬 city	Name	Memory Size Estin	nate (GiB)			0.003		
🗹 🖽 country	world	0.009				0.003		
Countrylanguage			Canc	el Load Tables		0.003		

50. Your data will begin loading into HeatWave from the MySQL InnoDB storage. You can verify the status of the load operation by looking at the **Loaded** column on the **Manage Data in HeatWave** tab.

MySQL HeatWave Oracle					US East (N. Virginia)	0	
Query Editor Manage Da	ata in HeatWave Data Imp	orts Autopilot Index Advisor		१९९९ २ 🦉	HeatWave Cluster My Active My	SQL DB System Username SQL-HW admin Disconnect	
Load into HeatWave	Unload from HeatWave	Create Lakehouse Mapping Refresh Est	imate Actions	•		Estimate last refreshed: less than an hour ago	
Name		Source	Loaded	Warnings	Rows Estimate	Memory Size Estimate (GiB)	
vorld		-	3 of 3	0	5,269	0.009	
🗹 🖩 city		InnoDB		-	4,046	0.003	
Country		InnoDB	1	-	239	0.003	
Countrylanguag	e	InnoDB	00		984	0.003	

51. You now have a complete HeatWave MySQL cluster.

To learn more about using HeatWave MySQL on AWS, please visit our documentation.



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