

Migration Guide: Amazon Aurora MySQL 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 Amazon Aurora 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 Amazon Aurora MySQL v5.7 and above.
- 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 Amazon Aurora MySQL instance, use an admin/root user.
- You do not need to make any configuration changes to your Amazon Aurora MySQL for this migration.
- If you have MySQL replication configured in your current Amazon Aurora MySQL 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 finish the database migration from Amazon Aurora 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 Amazon Aurora 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 Amazon Aurora MySQL to HeatWave MySQL. When following the guide, make changes along the way to your AWS and OCI 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 Amazon Aurora MySQL to HeatWave MySQL on AWS:

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

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

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

[The Amazon Aurora 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: <u>https://docs.aws.amazon.com/AmazonS3/latest/userguide/create-bucket-overview.html</u>

IV) Install MySQL Shell 8.3 (or above) on an EC2 instance that can connect to Amazon Aurora MySQL and create a credentials file.

[MySQL Shell on EC2 will be used to copy DDL and data from Amazon Aurora MySQL to the AWS S3 bucket. You must download MySQL Shell 8.3 or above. A credentials file needs to be created on the EC2 instance to store access keys. The credentials file will be used by MySQL Shell for authentication to export data from Amazon Aurora MySQL to the AWS S3 bucket.]

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

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 Amazon Aurora MySQL using MySQL Shell on EC2. Afterwards, execute the MySQL Shell util.dumpInstance() utility to export all schemas (including users, indexes, routines, triggers) from Amazon Aurora 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 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 Amazon Aurora 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 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 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 Amazon Aurora 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. The Amazon Aurora MySQL instance used for this does not have public access and is deployed in the US East (Ohio) region.

MySQL database-1-instance-1.	.us-east-2 world SQL > SELECT @@VERSION;
++	
@@VERSION	
++ 5.7.12	
++	
<u>1 row i</u> n set (0.0011 sec)	
My <mark>SQL</mark> database-1-instance-1.	.us-east-2 world SQL > SHOW SCHEMAS;
++ Database	
information_schema	
mysql	
performance_schema	
sys world	
++	
<u>5 rows</u> in set (0.0020 sec)	
MySQL database-1-instance-1.	.us-east-2 world SQL > SHOW TABLES IN world;
++ Tables_in_world	
'abies_iii_worid	
city	
country	
countrylanguage	
+ 3 rows in set (0.0019 sec)	
0 1003 IN 3CC (0.001/ 3CC)	

2. The AWS VPC associated with the above Amazon Aurora MySQL instance uses an IPv4 CIDR: 10.1.0.0/16. You can view the VPC resource map below:

Resource map Info			
VPC Show details Your AWS virtual network	Subnets (4) Subnets within this VPC	Route tables (4) Route network traffic to resources	Network connections (1) Connections to other networks
MySQL-vpc	us-east-2a	MySQL-rtb-private1-us-east-2a	MySQL-igw
	MySQL-subnet-public1-us-east-2a	rtb-027b6f0a9c4be9523	
	MySQL-subnet-private1-us-east-2a	MySQL-rtb-public	
	us-east-2b	MySQL-rtb-private2-us-east-2b	
	MySQL-subnet-public2-us-east-2b		
	MySQL-subnet-private2-us-east-2b		

3. 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**.

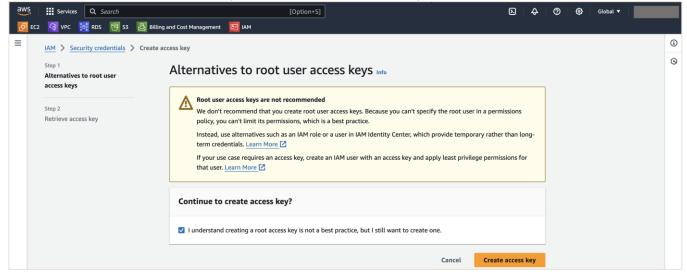
aws Image: Services Q Search Image: Open Control of the services Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search	[Option+S]	
E Console Home Info		Account ID: (Reset to default la Account
:: Recently visited Info	÷	Image: Service Quotas Organization
<u>ළ</u> EC2 ල 53	AWS Compute Optimizer AWS Private Certificate Authority	Billing and Cost Management Us-east-2 (Current Region)
Billing and Cost Management Support	Service CatalogEC2 Image Builder	Name Description Region V
RDS IAM	🔊 Lightsail 🕻	No applications Get started by creating an application to view your application cost, security findings, and
Co VPC		metrics all in one place. Create application
View a	all services	Go to myApplications
: Welcome to AWS :	# AWS Health Info :	E Cost and usage Info
Getting started with AWS [가	Open issues	Current month costs Total costs per month © 2024, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

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

aws Services Q Search	[Option+S]		D 4 0 ©	Global 🔻
📴 EC2 🔏 VPC 🔯 RDS 🕞 S3	Billing and Cost Management 📴 IAM			
Identity and Access × Management (IAM)	Access keys (0) Use access keys to send programmatic calls to AWS from the AWS C at a time. Learn more	LI, AWS Tools for PowerShell, AWS SDKs, or direct AWS API calls. Y		e access key ctive or inactive)
Q Search IAM	Access key ID Created on	Access key last used Region last used	Service last used	Status
Dashboard	As a best exaction pupid using long terms	No access keys redentials like access keys. Instead, use tools which provic	la chart term cradentiale Learn more 🗗	
Access management User groups Users	As a best practice, avoid using long-term of	Create access key	ae snort term credentials. <u>Learn more (z</u>	*

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

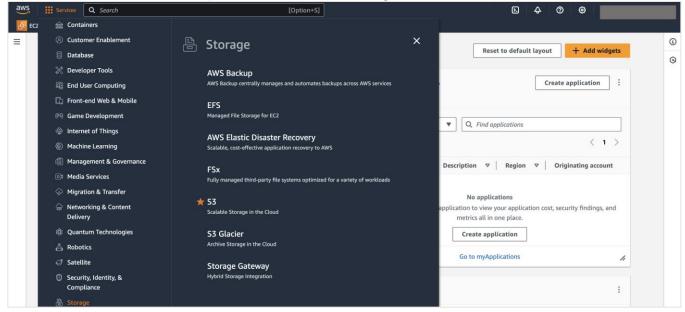


6. On the Retrieve access key page, **save the access key and secret access key values** for later use by **downloading the .csv file**. Choose **Done**.

aws	Services	Q Search		[Option-	-s]		Þ	\$	0	0	Global 🔻	
ලි	EC2 🕝 VPC	🔯 RDS 📑 S3	Billing and Cost Management									
=	Access key cr	eated										(
	This is the on	ly time that the se	cret access key can be viewed or	downloaded. You cannot recove	r it later. However, you can create a n	ew access key any time.						G
- 1	IAM > Sec	urity credentials	> Create access key									Ť
	Step 1 Alternatives keys		Retrieve a	ccess key Info								
	Step 2 Retrieve acc	ess key	Access key If you lose or forge	: your secret access key, you cannot r	etrieve it. Instead, create a new access key a	ind make the old key inactive.						
			Access key	S	ecret access key							
					Show							
			Access key b	est practices								
			Never store y	our access key in plain text, in a	code repository, or in code.							
			Disable or de	ete access key when no longer	needed.							
				privilege permissions.								
			Rotate access									
			For more details	about managing access keys, se	ee the best practices for managing AV	vs access keys.						
						Download .csv file	Do	ne				
D. Cla	oudShell Feedba	ck				© 2024, Amazon Web Ser	vices, Inc. o	or its affil	iates.	Privacy	Terms	Cookie preferences



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



8. Click Create bucket.



9. 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 HeatWave MySQL on AWS DB System later in this section. Choose the Bucket type as General purpose and give your Bucket a name.

S	Services	Q Sea	arch					[Optic	on+S]				2	¢	0	٢	Global 🔻	
EC2	C VPC	os RDS	🔁 S3 🙎	Billing and O	Cost Management	t 🔠	IAM											
	Amazon S3	> Bucket	ts > Creat	e bucket														
	Create	buck	cet unio															
	Buckets are o			red in S3. Lea	arn more 🖸													
	General	l configi	uration															
	AWS Regio	on																
	US East ((N. Virginia	a) us-east-1					•										
	Bucket typ	pe Info																
	Reco Gene They	eral purpose / allow a mix	for most use c e buckets are t x of storage cl	ases and acces the original S3 asses that redu Availability Zon	bucket type. Indantly	С		ed for low-la S3 Express C ter processing	One Zone stor	ses. These bucke age class, which nin a single								
	Bucket na	me Info																
	mysql-hv	w-bucket																



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

aws	Services	Q Search					[Opti	ion+S]						D	¢	0	٢	Global 🔻		
EC2	🕝 VPC	😥 RDS 📑 S3	i 🛃 Billin	ig and Cost Man	agement [
Ξ	Bucket Ke Using an S3 KMS. Learn O Disabl O Enable	3 Bucket Key for SSE- more 🖸	E-KMS reduces	encryption cos	ts by lowering	calls to AWS KI	MS. S3 Bucket	Keys aren't si	upporte	ed for DSSE-										6
	▼ Adva	anced settings	s																	
		ts using a write-once time or indefinitely. (eted or overw	vritten f	for a fixed										
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	(i) Ob	bject Lock works o	only in versi	oned buckets	. Enabling O	bject Lock au	utomatically	enables Ver	rsionin	ıg.										
	(i) After	creating the buck	ket, you can	upload files a	and folders t	o the bucket,	, and configu	ire addition	nal buc	ket settings.										
								Cancel	C	Create bucket										
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IV) Install MySQL Shell 8.3 (or above) on an EC2 instance that can connect to Amazon Aurora MySQL and create a credentials file.

- 11. From the AWS Services menu, go to **Compute** and select **EC2**.
- 12. Click Launch instance. We are creating this instance in the same region as our Amazon Aurora MySQL

ir	nstance.					
	aws Services Q	Search	[Op	otion+S]	E & Ø @	
	🙋 EC2 🏾 🏠 VPC 🔯 RE	os 🔁 S3	Billing and Cost Management 🛛 🔠 IAM			
	EC2 Dashboard EC2 Global View Events	×	Launch instance To get started, launch an Amazon EC2 instance, which is a virtual server in the cloud.	Service health AWS Health Dashboard C	Offer usage (monthly) Linux EC2 Instances	0
,	 Instances Instance Types 		Launch instance ▼ Migrate a server □	Region US East (Ohio) Status	661 hours remaining Storage space on EBS 28.81 GB remaining 4%	

13. Enter an EC2 name. For Application and OS Images, select Red Hat Enterprise Linux 9.

	Services Q. Search [Option+S] Image: VPC Image: Services Image: Service	
Ξ	Name and tags Info	▼ Summary ©
	Name	Number of instances Info
	mysql-ec2 Add additional tags	1
	Application and OS Images (Amazon Machine Image) Info	Software Image (AMI) Provided by Red Hat, Inc. ami-0d77c9d87c7e619f9
	An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below	Virtual server type (instance type) t2.micro Firewall (security group)
	Q Search our full catalog including 1000s of application and OS images Quick Start	New security group Storage (volumes) 1 volume(s) - 10 GiB
	Amazon Linux macOS Ubuntu Windows Red Hat SUSE Li Q aWS image ubuntu® image image image image image image	Cancel Launch instance Review commands
	Amazon Machine Image (AMI)	
	Red Hat Enterprise Linux 9 (HVM), SSD Volume Type Free tier eligible ami-0d77c9d87c7e619f9 (64-bit (x86)) / ami-0e8b346cd048835d4 (64-bit (Arm)) Image: Control of the state	
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14. For **Instance type**, choose an instance type you think is appropriate. If you have large amounts of data - provisioning an EC2 with more vCPUs and Memory will speed up the migration process. For the **Key pair** section, you can use your existing keys or create a new pair. For this guide, we will use an existing key pair.

Services Q Search	[Option+S]	ы <u></u>	©
🛛 EC2 🌀 VPC 😥 RDS 🕞 S3 🛃 Billing and Cost Management 🛽	ам		
Instance type Info Get advice		Summary	© 9
Instance type t2.micro Family: 12 1 VCPU 1 GiB Memory Current generation: true On-Demand SUSE base pricing: 0.0116 USD per Hour On-Demand Windows base pricing: 0.0116 USD per Hour On-Demand Windows base pricing: 0.0121 USD per Hour On-Demand RHEL base pricing: 0.0716 USD per Hour Additional costs apply for AMIs with pre-installed software	Tree tier eligible All generations Compare instance types	Number of instances Info Info Software Image (AMI) Provided by Red Hat, Inc. ami-0d7729897c7e619f9 Virtual server type (instance type) t2.micro	
▼ Key pair (login) Info		Firewall (security group) New security group	
You can use a key pair to securely connect to your instance. Ensu- before you launch the instance.	re that you have access to the selected key pair	Storage (volumes) 1 volume(s) - 10 GiB	
Key pair name - <i>required</i> MySQL-Key	Create new key pair	Cancel Launch instance Review commands	

15. Under Network settings, ensure that the correct VPC (the VPC that is associated with your Aurora instance) and Subnet are selected. For this guide - we have decided to deploy the EC2 instance inside a public subnet. For Auto-assign public IP select Enable. Under the Firewall (security groups), choose Create security group and have an Inbound security group rules like the below one which only allows SSH from your IP.

1	group			Jund security group rules like u	The Delow one, which only allows 5511 in	JIII your IF.
	aws	Services	Q Search	[Option+S]	D A	0 0

 Network settings Info 		▼ Summary	
VPC - required Info		Nuclear distance is a	
-		Number of instances Info	
vpc-0682f94981a1e9f01 (MySQL-vpc) 10.1.0.0/16	▲ G	1	
Subnet Info		Software Image (AMI)	
subnet-09014a1d1db54bb80 MySQL-sul VPC: vpc-0682f94981a1e9f01 Owner: 528770944777 Ava IP addresses available: 4091 CIDR: 10.1.0.0/20) CIDR: 10.1.0.0/20)	bnet-public1-us-east-2a ilability Zone: us-east-2a ▼ C Create new subnet [2]	Provided by Red Hat, Inc. ami-0d77c9d87c7e619f9	
Auto-assign public IP Info		Virtual server type (instance type)	
Enable	•	t2.micro	
		Firewall (security group)	
Additional charges apply when outside of free tier allowan	Le Ce	New security group	
Firewall (security groups) Info A security group is a set of firewall rules that control the traffic for	or your instance. Add rules to allow specific traffic to reach your	Storage (volumes)	
instance.		1 volume(s) - 10 GiB	
• Create security group • Select	ct existing security group		
Security group name - required		Cancel Launch instance	
launch-wizard-6		Review commands	
This security group will be added to all network interfaces. The n. 255 characters. Valid characters: a-z, A-Z, 0-9, spaces, and:/()#	ame can't be edited after the security group is created. Max length is		_
200 characters, valid characters, and joint of spaces, and i_ i/ (iii			
Inbound Security Group Rules			
Security group rule 1 (TCP, 22, 4/32)	Remove	Firewall (security group)	
		New security group	
Type Info Protocol Info	Port range Info	Storage (volumes)	
ssh TCP	22	1 volume(s) - 10 GiB	
Source type Info Name Info	Description - optional Info		-
My IP Add CIDR, p	e.g. SSH for admin desktop	Cancel Launch instance	
right v v Add Clob, p			

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16. Leave everything as-is and click **Launch instance**.

▼ Configure storage Info	Advanced		New security group Storage (volumes)					
1x 10 GiB gp2 v Root volume (Not encrypted)			1 volume(s) - 10 GiB G Free tier: In your first yea	ar includes 750 🗙				
Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storag Add new volume	je X		hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tire AMIs per month, 30 GiB of EBS storage, 2 million IOs, 1 GB of snapshots, and 100 GB of bandwidth to the internet.					
0 x File systems	Edit	-	Sundwidth to the internet		-			
Advanced details Info			Cancel	Launch instance Review commands				
ک CloudShell Feedback Language			© 2023, Amazon Web	b Services, Inc. or its affiliates.	Privacy	Terms	Cookie preference	s

17. You will be brought to a Next Steps page. Here, click **Connect to instance**.

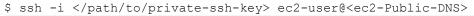
Services Q Search	[Option+S]		₽ \$ @ @
🛛 🏠 VPC 🔯 RDS 📑 S3 🛃 Billing and Cost I	fanagement 🛅 IAM		
EC2 > Instances > Launch an instance			
 Success Successfully initiated launch of instance (i-048 	34d96f21e845b2)		
Launch log			
P Lounch tog			
Next Steps			
•	ance, for example "create alarm" or "create backup"		< 1 2 3 4 5 6 >
			· · · · · · · ·
Create billing and free tier usage	Connect to your instance	Connect an RDS database	Create EBS snapshot policy
alerts			
To manage costs and avoid surprise bills, set	Once your instance is running, log into it from your local computer.	Configure the connection between an EC2 instance and a database to allow traffic flow	Create a policy that automates the creation, retention, and deletion of EBS snapshots
up email notifications for billing and free		between them.	
tier usage thresholds.	Connect to instance	Connect an RDS database	Create EBS snapshot policy 🖸
Create billing alerts 🔼	Learn more 🖸		
		Create a new RDS database	
		Learn more 🖸	

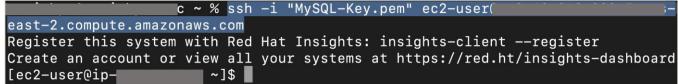
18. If you are using the SSH client to connect to EC2, copy the **Example** SSH command and log in to your EC2 instance.

aws	Services	Q Search			[Opti	m+S]		D	¢	0	۲	T
EC2	2 🕝 VPC 💈	🔯 RDS 📑 S	53 🛃 Billing and Cost	t Management	IAM							
=	EC2 > Insta	ances > <u>i-048</u>	334d96f21e845b2 >	Connect to instan	e							0
	Conne	ct to ins	stance Info									
	Connect to yo	our instance i-0	4834d96f21e845b2 (n	mysql-ec2) using an	y of these options							
	EC2 Insta	ance Connect	Session Manager	SSH client	EC2 serial console							
	Instance II											
	D i-0483	34d96f21e845b	2 (mysql-ec2)									
	1. Ope	en an SSH client	t.									
	2. Loca	ate your private	e key file. The key used	I to launch this insta	nce is MySQL-Key.pen							
			, if necessary, to ensure lySQL-Key.pem"	e your key is not pu	blicly viewable.							
		nnect to your ins	stance using its Public	DNS: ute.amazonaws.com								
	⊘ Comm	mand copied										
	🗇 ssh -i	i "MySQL-Key.pe	m" ec2-user@	st	-2.compute.amazonav	s.com						



19. You can SSH into EC2 using the below command:





Note: after running the above SSH command, if prompted **Are you sure you want to continue connecting** (yes/no/[fingerprint])?, type yes.

- 20. We are now successfully connected to the EC2 instance.
- 21. After making a connection to the EC2 instance, go to the below website and download MySQL Shell 8.3 on your EC2 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.

https://dev.mysql.com/downloads/shell/

MySQL Shell				
General Availability (GA) Releases Archives	Ð			
MySQL Shell 8.3.0 Innovation				
8.3.0 Innovation	~			
Select Operating System:				
Red Hat Enterprise Linux / Oracle Linux	~			
Select OS Version:				
Red Hat Enterprise Linux 9 / Oracle Linux 9 (x86, 64	4-bit) ~			
RPM Package	8.3.0	25.0M	Download	
(mysql-shell-8.3.0-1.el9.x86_64.rpm)		MD5: 552300962797b8	39f7c224ad1feb9ed0b	
RPM Package, Debug Information	8.3.0	325.9M	Download	
(mysql-shell-debuginfo-8.3.0-1.el9.x86_64.rpm)		MD5: 4945535ae9def2	2fb4e7e9737e12d9c7b	
We suggest that you use the MD5 checksums and				

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

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



- 23. Go back to the EC2 instance that can connect to your Amazon Aurora MySQL and execute the below command to download MySQL Shell:
 - \$ wget <MySQL-Shell-Download-Link>

Replace the link with what you have.

\$ wget https://dev.mysql.com/get/Downloads/MySQL-Shell/mysql-shell-8.3.0-



Note: to install wget on the EC2, execute:

\$ sudo yum install wget

14 Migration Guide: Amazon Aurora MySQL to HeatWave MySQL on Amazon Web Services (AWS) Copyright © 2024, Oracle and/or its affiliates. Public

24. After downloading the MySQL Shell rpm, install MySQL Shell:

[ec2-user@ip-10-1	nstall mysql-shell* -7-186 ~]\$ <mark>sudo yum</mark> tion Management rep nsumer identity		ql-shell*				
This system is not registered with an entitlement server. You can use subscription-manag er to register.							
Last metadata exp Dependencies reso ====================================		:13 ago on Mon 18	Mar 2024 03:23:34 PM UTC.				
Package	Architecture	Version	Repository	Size			
Installing: mysql-shell	x86_64	8.3.0-1.el9	@commandline	25 M			
	rv						
Transaction Summa	± y 						

25. You can now verify if MySQL Shell has successfully installed on your EC2 instance by executing the below command:

\$ mysqlsh												
[[ec2-user(0ip-10-1-7-	-186	~]\$ my	/sqlsh	vei	sion						
mysqlsh	Ver 8.3.0	for	Linux	on x8	6_64 -	- for	MySQL	8.3.0	(MySQL	Community	Server	(GPL))

26. Go back to the AWS EC2 Instances page and **select your EC2 instance**. Choose **Actions**, then **Networking**, and **click Connect RDS database**.

aws Services Q Searc	h [Opti	۵n+S] ک	♦ Ø Ø
🙋 EC2 🛛 VPC 🔯 RDS 📑	ਤੋਂ S3 🖉 Billing and Cost Management 📴 IAM		
EC2 Dashboard 🗙	Instances (1/1) Info	C Connect Instance state 🔻	Actions A Launch instances
EC2 Global View	Q Find Instance by attribute or tag (case-sensitive)	Running 🔻	Connect > @
Events	✓ Name ∠ ▼ Instance ID In	stance state v Instance type v Status check Alarm s	View details tatu Public IPv4 DN
▼ Instances	✓ mysql-ec2 i-04834d96f21e845b2	Running @ @ t2.micro ② 2/2 checks passed View ala	Manage instance state
Instances			Instance settings
		Attach network interface	Networking 🕨
Instance Types		Detach network interface	Security
Launch Templates			
Spot Requests		Connect RDS database	Image and templates
Savings Plans		Disaster recovery for your instances	Monitor and troubleshoot



27. On the Connect RDS database page, pick your Aurora Cluster and select Connect.

aws	Services Q Search	[Option+S]	Ð	\$ Ø	0
ල් EC2	: 😚 VPC 🧑 RDS 🔁 S3 🛃 Billing and Cost Management	IAM			
=	EC2 > Instances > Connect RDS database				٤
	Connect RDS database Info				
	Connecting an RDS database to your EC2 instance automati the database and the EC2 instance.	cally creates and adds security groups to allow traffic between			
	EC2 Instance ID i-04834d96f21e845b2				
	Instance VPC ID vpc-0682f94981a1e9f01				
	Select the RDS database to connect to your EC2 instance.				
	Cluster Apply security groups to all database instances within a cluster (Only regional clusters supported)	Instance Apply security groups to individual database instances that are not part of a cluster			
	RDS database A security group is added to the EC2 instance. A security group is also to access the database port.	added to the cluster with an inbound rule that allows the EC2 instance			
	database-1 Engine: Aurora MySQL Availability Zones: us-east-2b, us-east-2c,	us-east-2a 🔻 C Create RDS database 🗹			
		Cancel Connect			

28. Next, log in to your Amazon Aurora MySQL using MySQL Shell by executing the below command:

\$ mysqlsh <user>@<hostname>:<port-number>

-OR-\$ mysqlsh -u <user> -p -h <hostname> -P <port-number> [ec2-user@ip-10-1-7-186 ~]\$ mysqlsh admin@database-1-instance-1. .us-east-2.r ds.amazonaws.com Please provide the password for 'admin@database-1-instance-1. .us-east-2.rds. amazonaws.com': ******* Save password for 'admin@database-1-instance-1. .us-east-2.rds.amazonaws.com' ? [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 'admin@database-1-instance-1. .us-east-2.rds.amazonaws. com' Fetching schema names for auto-completion... Press ^C to stop. Your MySQL connection id is 137 Server version: 5.7.12 MySQL Community Server (GPL) No default schema selected; type \use <schema> to set one. MySQL database-1-instance-1. .us-east-2.rds 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.

29. Exit out of MySQL Shell and **create a**. aws **directory** inside the home directory of your EC2 instance. Go inside the newly created directory and **create a file called** credentials using the text editor of your choice.



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

aws_secret_access_key values using the .csv file you downloaded in step 6.



31. Save and close the file.

V) Connect to Amazon Aurora MySQL using MySQL Shell on EC2. Afterwards, execute the MySQL Shell util.dumpInstance() utility to export all schemas (including users, indexes, routines, triggers) from Amazon Aurora MySQL to the AWS S3 bucket.

- 32. Before connecting to Amazon Aurora 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 &
- 33. Start a tmux session and connect to your Amazon Aurora MySQL using MySQL Shell on EC2.

```
$ tmux
$ mysqlsh <user>@<hostname>:<port-number>
-OR-
$ mysqlsh -u <user> -p -h <hostname> -P <port-number>
[ec2-user@ip-10-1-7-186 ~]$ tmux
[ec2-user@ip-10-1-7-186 ~]$ mysqlsh admin@database-1-instance-1.
                                                                              .us-east-2.r
ds.ama<u>zonaws.com</u>
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 'admin@database-1-instance-1.
                                                                 us-east-2.rds.amazonaws.
com'
Fetching schema names for auto-completion... Press ^C to stop.
Your MySQL connection id is 152
Server version: 5.7.12 MySQL Community Server (GPL)
No default schema selected; type \ \ schema\ to set one.
 MySQL database-1-instance-1.
                                           us-east-2.rds JS >
```

34. Change to the JavaScript mode (if you are not in JS mode) of MySQL Shell and run the util.dumpInstance() utility to export all Amazon Aurora MySQL data into the S3 bucket. The data will be copied over from Amazon Aurora 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 database-1-instance-1. ql-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, targetVer sion: "8.3.0", ocimds: "true", dryRun:"true"}) NOTE: The 'targetVersion' option is set to 8.3.0. This version supports the SET_ANY_DEFINER pr ivilege, using the 'strip_definers' compatibility option is unnecessary. dryRun enabled, no locks will be acquired and no files will be created. NOTE: Backup lock is not supported in MySQL 5.7 and DDL changes will not be blocked. The dump may fail with an error if schema changes are made while dumping. Acquiring global read lock WARNING: The current user lacks privileges to acquire a global read lock using 'FLUSH TABLES W ITH READ LOCK'. Falling back to LOCK TABLES... ERROR: The current user does not have required privileges to execute FLUSH TABLES WITH READ LO CK. Backup lock is not supported in MySQL 5.7 and DDL changes cannot be blocked. The gtid mode system variable is set to OFF or OFF PERMISSIVE. The log_bin system variable is set to OFF or the current user does not have required privi leges to execute SHOW MASTER STATUS. The consistency of the dump cannot be guaranteed. ERROR: Unable to acquire global read lock neither table read locks. Global read lock has been released Initializing - done Util.dumpInstance: While 'Initializing': Unable to lock tables: Consistency check has failed. (MYSQLSH 52002)

Note:

- util.dumpInstance(outputUrl[, options]): MySQL instance dump utility exports all schemas or a selected schema from a MySQL 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 Dump Utilities.
- 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.
 - force_innodb: 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.

35. Running the above step 34 command may generate **Errors** regarding **table locks** (see image below). If you do encounter such a problem (if and only if) run the same command as in step 34 but this time add an additional option: consistent: "false" and re-run the command.

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", consistent: "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.

WARNING: SRC: The current user lacks privileges to acquire a global read lock using 'FLUSH TAB LES WITH READ LOCK'. Falling back to LOCK TABLES... ERROR: SRC: The current user does not have required privileges to execute FLUSH TABLES WITH RE AD LOCK. Backup lock is not supported in MySQL 5.7 and DDL changes cannot be blocked. The gtid_mode system variable is set to OFF or OFF_PERMISSIVE. The log_bin system variable is set to OFF or the current user does not have required privi leges to execute SHOW MASTER STATUS. The consistency of the dump cannot be guaranteed. ERROR: SRC: Unable to acquire global read lock neither table read locks.

MySQL database-1-instance-1. .us-east-2.rds.amazonaws JS > util.dumpInstance("mys ql-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, targetVer sion: "8.3.0", ocimds: "true", dryRun:"true", consistent: "false"}) NOTE: The 'targetVersion' option is set to 8.3.0. This version supports the SET_ANY_DEFINER pr ivilege, using the 'strip_definers' compatibility option is unnecessary. dryRun enabled, no locks will be acquired and no files will be created. Initializing - done 1 out of 5 schemas will be dumped and within them 3 tables, 0 views. 2 out of 3 users will be dumped.

[... output truncated]

Errors: a Warnings: 1 Notices: 0 NOTE: No fatal errors were found that would prevent an upgrade, but some potential issues were detected. Please ensure that the reported issues are not significant before upgrading. NOTE: User 'admin'@'%' had restricted privileges (INVOKE COMPREHEND, INVOKE LAMBDA, INVOKE SAG EMAKER, LOAD FROM S3, RELOAD, SELECT INTO S3) removed NOTE: User 'rdsadmin'@'localhost' had restricted privileges (CREATE TABLESPACE, FILE, RELOAD, SHUTDOWN, SUPER) removed Compatibility issues with MySQL HeatWave Service 8.3.0 were found and repaired. Please review the changes made before loading them. Validating MySQL HeatWave Service compatibility - done Writing global DDL files Writing users DDL Writing DDL - done Starting data dump 0% (0 rows / ~5.30K rows), 0.00 rows/s, 0.00 B/s uncompressed, 0.00 B/s compressed MySQL database-1-instance-1. .us-east-2.rds.amazonaws JS >

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36. Once you have run the command in step 34/35 and do not see any errors in the output (warnings are okay), run the same step 34 (or step 35 if required) 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. Add the consistent: "false" option if you have encountered the table lock error.

MySQL database-1-instance-1. .us-east-2.rds.amazonaws JS > util.dumpInstance("mys ql-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, targetVer sion: "8.3.0", ocimds: "true", dryRun:"false", consistent: "false"}) NOTE: The 'targetVersion' option is set to 8.3.0. This version supports the SET_ANY_DEFINER pr ivilege, using the 'strip_definers' compatibility option is unnecessary. Initializing - done 1 out of 5 schemas will be dumped and within them 3 tables, 0 views. 2 out of 3 users will be dumped. Gathering information - done [... output truncated]

Writing schema metadata – done Writing DDL - done Writing table metadata – done Starting data dump 1 thds dumping - 98% (5.22K rows / ~5.30K rows), 0.00 rows/s, 0.00 B/s uncompressed, 0.00 B/s 1 thds dumping \ 100% (5.30K rows / ~5.30K rows), 0.00 rows/s, 0.00 B/s uncompressed, 0.00 B/s compressed Dump duration: 00:00:00s Total duration: 00:00:01s Schemas dumped: 1 Tables dumped: 3 Uncompressed data size: 194.61 KB Compressed data size: 91.66 KB Compression ratio: 2.1 Rows written: 5302 Bytes written: 91.66 KB Average uncompressed throughput: 194.61 KB/s Average compressed throughput: 91.66 KB/s MySQL database-1-instance-1. .us-east-2.rds.amazonaws JS >

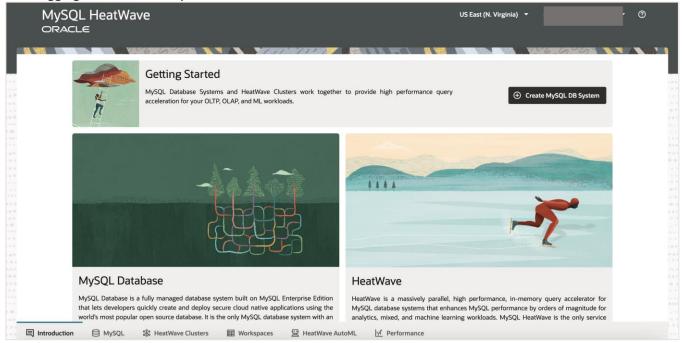
Note: once the MySQL Shell dump utility finishes, all your data will be exported over from Amazon Aurora MySQL to the AWS S3 bucket. You can end your tmux session by executing Ctrl+B &.

37. 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.

- 38. Log in to the HeatWave MySQL on AWS Console.
- 39. After logging in, click on the **MySQL** tab.



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

MySQL He Oracle	eatWave			US Eas	t (N. Virginia) 🔻	0
DB Systems Backups	Configurations Channels P	rivateLinks				
⊕ Create MySQL DB Sy	stem Start Stop R	estart Actions -		Q State Any - Name	8	
Name 🗘	Stat	e	HeatWave Cluster	HeatWave State	Crea	ited ~
		The prov	No items found vided filter options did not ma	tch any resources		
Select a MySQL DB Syste	m above to view details					
国 Introduction 日	MySQL 🗱 HeatWave Clusters	Workspaces	望 HeatWave AutoML	<u> </u>		



41. 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 Oracle	Create MySQL DB System and HeatWave Cluster
DB Systems Backups Configurations Channels PrivateLinks	(2) MySQL DB System HeatWave Cluster
	Basic information
Name State HeatWay	Display name MySQL-HW
N The provided filter o	Description
	Administrator credentials Username admin
Select a MySQL DB System above to view details	Password (
	Confirm password
티 Introduction B MySQL 챯 HeatWave Clusters 표 Workspaces 腔 HeatW	Cancel Next

42. 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, you can do so by clicking **Change**. For more information regarding custom configurations, see <u>Configuration</u>.

MySQL HeatWave	Create MySQL DB System and HeatWave Cluster					
DB Systems Backups Configurations Channels PrivateLinks	2 MySQL DB System HeatWave Cluster					
• Create MySQL DB System Start Stop Restart Actions Name	Hardware configuration MySQL2.16GB MySQL4.32GB					
	MySQL8.64GB MySQL32.256GB					
h The provided filter o	Data storage size (GiB) 52					
	Availability zone ① Select placement Automatic 〇 Manual					
Select a MySQL DB System above to view details	MySQL Configuration Supports HeatWave Change Default MySQL Configuration for MySQL.2.16GB (Supports HeatWave) Yes Change					
国 Introduction 自 MySQL 黎 HeatWave Clusters 囯 Workspaces 翌 HeatW	MuSOL version Cancel Next					



43. 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 and HeatWave Cluster				
	DB Systems Backups Configurations Chan	nels PrivateLinks	MySQL DB System	(2) HeatWave Cluster			
1 1 1 1 2 0	Create MySQL DB System Start Stop	p Restart Actions -	MySQL version				
	Name ¢	State HeatV	8.0.31 8.0.33	8.0.32			
1 (0 1 1 (0 1 1 (0 1))			8.0.55	8.3.0			
4 F 4 4 4 4		The provided filte	N er o				
			Maintenance window ^①				
			Select start time O Manual				
- 01							

44. 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			
DR Systems Backups Configurations Channels PrivateLinks	(2) MySQL DB System HeatWave Cluster			
⊕ Create MySQL DB System Start Stop Restart	Networking Enable inbound connectivity from allowed public IP address ranges			
Name C State HeatWav	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.			
Select a MySQL DB System above to view details	Backup policy			
回 Introduction O MySQL 総 HeatWave Clusters III Workspaces 翌 HeatW	Cancel Next			

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

	MySQL HeatW ORACLE	lave		Create MySQL DB System and Heat	Wave Cluster
		gurations Channels PrivateLinks		MySQL DB System	(2) HeatWave Cluster
2.0 4.4 0.0	Create MySQL DB System Name	Start Stop Restart A	Actions 👻 HeatWav	Backup policy	
			N The provided filter o	Enable automatic backups Backup retention period (days) 7 Select backup window Backup start time 00:00 UTC	× ^ •
	Select a MySQL DB System above	to view details		IAM roles ⁽¹⁾ Data Import role ARN Lakehouse role ARN	
	Introduction MySQL	- 🍀 HeatWave Clusters 🛛 🖽 Wo	orkspaces 🖳 HeatW		Cancel Next

46. 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 Hea	atWave		Create MySQL DB System	and HeatWave Clu	ıster
	Configurations Channels PrivateLinks		1 MySQL DB System		2 HeatWave Cluster
⊕ Create MySQL DB Syste	em Start Stop Restart Acti	ions 🔻	Provision HeatWave Cluster		
Name ≎	State	HeatWav	Basic information		
			Display name HW-Cluster		
		The provided filter o	Description HeatWave Cluster configuration		
			Shape HeatWave.16GB	HeatWave.256GB	
Select a MySQL DB System a	above to view details		Does not support Lakehouse	Supports Lakehouse	
			Cluster size 1		× •
Introduction	ySQL 🐉 HeatWave Clusters 🥅 Works	spaces 👳 HeatW			Cancel Back Create



47. Your HeatWave MySQL DB system will start Creating.

MySQL HeatWave			US East (N. Virginia	a) •
DB Systems Backups Configurations (channels PrivateLinks		Q State Creating - Search Name	
	Stop Restart Actions	·	Gaile Greating + Search Hame	Page 1 (Items 1 - 1) < • •
Name 🗘	State	HeatWave Cluster	HeatWave State	Created ~
MySQL-HW	Creating	HW-Cluster	Creating	Mon, 18 Mar 2024 16:03:38 GMT

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

MySQL HeatWave ORACLE			US East (N. Virginia)	•	0
DB Systems Backups Configurations Channel Create MySQL DB System Start Store			Q State Active V Name MySQL-HW @		
8 0 2 4 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0				Page 1 (Items 1 - 1)	
Name ≎	State	HeatWave Cluster	HeatWave State	Created ~	
MySQL-HW	Active	HW-Cluster	Active	Mon, 18 Mar 2024 16:03:38 GMT	

49. 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) 🔻
tySQL » DB Systems » Details MySQL-HW		
Start Stop Restart Edit My	SQL DB System Update Networking Actions •	
Summary		
State Active	Network accessibility © Console only	Resource ID
Hostname .d cloud.mysql.com	PrivateLink Hostname bsystem.us-east-1.aws	Shape MySQL:4.32GB
DB System info Backups Events		
General information	DB Sys	em configuration
Description -	Storage : 32 GiB	ize
Last updated Mon, 18 Mar 2024 16:10:30 GMT	MySQL v 8.3.0-u2	
Created Mon, 18 Mar 2024 16:03:38 GMT		onfiguration ySQL Configuration for MySQL.4.32GB (Supports HeatWave)
		ince window 00 UTC Φ
Introduction 🖨 MySQL 👯 Hea	atWave Clusters	년 Performance



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

- 50. It is now time to import the Amazon Aurora MySQL data sitting in the S3 bucket to HeatWave MySQL on AWS using the Data Import feature.
- 51. 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
- 52. 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	ast (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	

53. Click Import Data.

MySQL HeatWave ORACLE	US East	(N. Virginia) + ⑦
Query Editor Manage Data in HeatWave Data Imports Autopilot In	dex Advisor	MySQL-HW admin Disconnect
Import Data Cancel		

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54. In the **Import data into DB System** dialog, enter a **Display name** and **Description** (optional) for the data import operation. Under **Source**, specify the **S3 URI** for the Object where your Amazon Aurora MySQL dump is located. See below:

aws Services Q Search	[Option+S]	
🙋 EC2 🛛 VPC 🔯 RDS 🕞 S3	🛃 Billing and Cost Management 🔠 IAM	
Amazon S3 ×	Amazon S3 > Buckets > mysql-hw-bucket	٤
Buckets	mysql-hw-bucket 🗤	0
Access Grants Access Points	Objects Properties Permissions Metrics Management Access Points	
Object Lambda Access Points		
Multi-Region Access Points Batch Operations	Object:	
IAM Access Analyzer for S3	C D Copy S3 URI C Copy URL D Download Open [2] Delete Actions ▼ Create folder P Upload Objects are the fundamental entities stored in Amazon S3. You can use Amazon S3 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	grant them permissions. Learn more 💈 Q. Find objects by prefix < 1 > ③	
▼ Storage Lens	☑ Name ▲ Type ▼ Last modified ▼ Size ▼ Storage class ▼	
Dashboards	☑ 🗅 mysql-hw-dump/ Folder	

MySQL HeatWave Oracle	Import data into DB System
Query Editor Manage Data in HeatWave Data Imports Autopilot Index Advisor Import Data Cancel	Basic information Display name Aurora-to-MySQL-HW Description
Name State Des Import data into your MySQL DB System Data stored in a variety of formats can be imported into your DB System from An	Source
티 Introduction 은 MySQL 🗱 HeatWave Clusters 🖬 Workspaces 💯 HeatW	Cancel Import



55. 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 6. 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	
Getty Lation manage but interfinite • Import Data • Name State	Source S3 URI S3://mysql-hw-bucket/mysql-hw-dump/
Import data into your MySQL DB System Data stored in a variety of formats can be imported into your DB System from Am	Authentication method O IAM role O User access key Access key ID Secret access key File type O MySQL dump files O Text files
同 Introduction 〇 MySQL 黎 HeatWave Clusters 园 Workspaces 空 HeatW	File parsing settings Character set utf8mb4 Update GTID set APPEND Cancel Import

56. 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) 👻	0
63			EN REENT			
	Query Editor Manage Data in HeatWave Data Imports	Autopilot Index Advisor			HeatWave Cluster MySQL DB System Username Active MySQL-HW admin	Disconnect
	Import Data Cancel					
	Name	State	Progress (%)	Description	Created	
	Aurora-to-MySQL-HW	Succeeded	••	-	Mon, 18 Mar 2024 16:16:27 GMT	
	Select a Data Import above to view details		_			



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

57. 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
		HeatWave Cluster MySQL DB System Username	e Disconnect
Query Editor Manage Data in HeatWave Data	Imports Autopilot Index Advisor	Active MySQL-HW admin	
Database Objects ①	Run Query Stop Clear		
Schema/Table Name HeatWave	1		
► world 0 of 3			

58. You can run the below query on every table that you have for your Amazon Aurora 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>;

59. Here is our row count comparison for Amazon Aurora MySQL and HeatWave MySQL on AWS:

Amazon Aurora MySQL row count:					
MySQL database-1-instance-1.	-east-2.rds world	SQL > USE wor	rld;		
Default schema set to `world`.					
Fetching global names, object names from `wo					02-11-21
My <mark>SQL</mark> database-1-instance-1.	-east-2.rds world	SQL > SELECT	COUNT(*)	FROM	cit
у;					
++					
COUNT(*)					
+ 4079					
++					
1 row in set (0.0011 sec)					
MySQL database-1-instance-1.	-east-2.rds world	SQL > SELECT	COUNT(*)	FROM	coul
ntry;					
++					
COUNT(*)					
++					
239					
1 row in set (0.0011 sec)					
MySQL database-1-instance-1.	-east-2.rds world	SOL > SELECT	COUNT(*)	FROM	coul
ntrylanguage;	ouse 21140 horra	OUL POLLET	000111(1)		000
++					
COUNT(*)					
++					
984					
++					
1 row in set (0.0145 sec)					

HeatWave MySQL on AWS row count:

1 USE world; 2 SELECT COUNT(*) FROM city;	
Query Results	
Query completed on Mon, 18 Mar 2024 16:19:43 GMT (took 0.0011 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 Mon, 18 Mar 2024 16:20:26 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 Mon, 18 Mar 2024 16:21:11 GMT (took 0.0007 seconds). Result set is limited to 1000 rows.	
Results JSON Job Information	
COUNT(*) ≎	
984	

60. 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.

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

MySQL HeatWave ORACLE			US East (N. Virginia)	•
Query Editor Manage Data in HeatWave Data Im	ports Autopilot Index Advisor	and a line for the		/SQL DB System Username /SQL-HW admin Disconnect
Load into HeatWave Unload from HeatWave	Create Lakehouse Mapping Refresh Estimation	ate Actions -		Estimate last refreshed: a minute ago ${}^{}$
Name	Source	Loaded Warning	s Rows Estimate	Memory Size Estimate (GiB)
□ ▶ world	-	0 of 3 0	5,269	0.009

62. 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**.

Query Editor Manage Data in Heat	Ave Data Imports Autopilot Index Advisor		र सन्त । 🐖		QL DB System Username QL-HW admin Disconne
Load into HeatWave Unload fro	m HeatWave Create Lakehouse Mapping Refree	sh Estimate Action	ns 🕶		Estimate last refreshed: a few minutes ag
Name	Source	Loaded	Warnings	Rows Estimate	Memory Size Estimate (GiB)
🖌 🗕 world	-	0 of 3	0	5,269	0.009
City	InnoDB	0		4,046	0.003
country	InnoDB	0	-	239	0.003
Countrylanguage	InnoDB	0	÷	984	0.003
0.0 %	16.0 GiB		0.0 Gi	3	0.0 GiB
Cluster memory usage			Size of tables to		Size of tables to unload ①



63. 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. Virgir	nia) 🔻 🔤
Query Editor Manage Data in HeatWave Data Imports Load Into HeatWave Unload from HeatWave Created	MySQL Auto	pilot Parallel Lo	Dad tables to H	eatWave	luster	MySQL DB System Username MySQL-HW admin Disconnect Estimate last refreshed: less than an hour ago 0
	MySQL-HW	3	size 0.009 GiB	time 0.4 seconds	Estimate	Memory Size Estimate (GiB)
vorld	Schemas and table	es to be loaded				0.009
🗹 🖽 city	Name	Memory Size Estin	nate (GiB)			0.003
Country	world	0.009			-	0.003
Countrylanguage			Capit	el Load Tables		0.003
			Canc			

64. 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			US East (N. Virginia)	©
Query Editor Manage Data in HeatWave Data Imp	orts Autopilot Index Advisor			DL DB System Username DL-HW admin Disconnect
Load into HeatWave Unload from HeatWave	Create Lakehouse Mapping Refresh Es	stimate Actions 🔻	E	stimate last refreshed: less than an hour ago ${\mathbb C}$
Name	Source	Loaded Warnings	Rows Estimate	Memory Size Estimate (GiB)
vworld		3 of 3 0	5,269	0.009
🗹 🖩 city	InnoDB	· ·	4,046	0.003
Country	InnoDB		239	0.003
 countrylanguage 	InnoDB	· ·	984	0.003

65. 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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