

Live Migration Guide: Amazon Aurora to HeatWave MySQL on Oracle Cloud Infrastructure (OCI)

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Before you start:

- You must have an account on Oracle Cloud Infrastructure (OCI) and Amazon Web Services (AWS).
- Some OCI knowledge is preferred.
- This live migration guide only covers how to migrate your database from Amazon Aurora MySQL to HeatWave MySQL on OCI. Before performing the migration, you should have considered downtime (even though this is a live migration, some/minimal downtime will be required to make sure your database application points to the new HeatWave MySQL database once migrated), 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 live 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.
 - o 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.
- This live migration method requires binary logs to be present on the Aurora instance. To enable Aurora binary logs you must modify the parameter group used by Aurora and set the binlog_format variable to ROW. Any other values besides ROW will not work as HeatWave MySQL on OCI only uses row-based binary logging. For more information on how to set the Aurora binary logging, see <u>Configuring Aurora MySQL</u> binary logging.
- This live migration can be performed using two replication methods using binary log position or GTIDs. As HeatWave MySQL only supports GTIDs on OCI, once you migrate your Aurora instance to HeatWave MySQL you cannot go back to using the binary log position for replication.
- If you have Aurora replication configured in your current AWS environment, you can perform the migration steps shown in this guide from either your writer or reader instance. Although it is recommended to use the reader instance for the migration when applicable. This is because if you have a high concurrency for your Aurora instance performing the migration using the writer instance could negatively impact the database application performance.
- The Overview section of this live migration guide contains all the steps that are needed to finish the database migration from Amazon Aurora MySQL to HeatWave MySQL on OCI.
- In the Walkthrough section of this live migration guide, we will apply the information provided in the Overview section and give you a simple step-by-step guide. In this step-by-step guide, we will have an Amazon Aurora MySQL instance with some sample data pre-loaded and will migrate it over to HeatWave MySQL on OCI. This will help you follow and better visualize the process/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 environments accordingly or as required. Since each user following the step-by-step guide will have their environments configured differently, we cannot provide an ideal example that works for everyone.

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Overview:

Following are the required steps to migrate data from Amazon Aurora MySQL to HeatWave MySQL on OCI using live migration (with zero or minimal downtime):

I) Have an Oracle Cloud Infrastructure (OCI) account 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) Set up a VPN connection from OCI to AWS.

[A VPN connection will allow you to bridge your AWS network with the OCI VCN. The VPN connection will allow your Amazon Aurora MySQL to connect to HeatWave MySQL on OCI and it also ensures that your data in transit is encrypted while it is being migrated.]

VPN Connection to AWS: https://docs.oracle.com/en-us/iaas/Content/Network/Tasks/vpn_to_aws.htm

III) On OCI, create a standalone HeatWave MySQL instance.

[If you require High Availability for your HeatWave MySQL instance, you must enable it after completing section **VIII**) of this guide.]

Provision HeatWave MySQL on OCI: <u>https://docs.oracle.com/en-us/iaas/mysql-database/doc/creating-db-system1.html</u>

IV) Install MySQL Shell 8.2 or above on an EC2 instance that can connect to Amazon Aurora MySQL.

[MySQL Shell on the EC2 instance will be used to copy DDL and data from Amazon Aurora MySQL to HeatWave MySQL on OCI. You must download MySQL Shell 8.2 or above.] Download MySQL Shell: <u>https://dev.mysql.com/downloads/shell/</u> Install MySQL Shell: <u>https://dev.mysql.com/doc/mysql-shell/8.2/en/mysql-shell-install.html</u>

V) For your Amazon Aurora MySQL, ensure log_bin is set to 1, ensure binlog_format is set to ROW, and execute the mysql.rds_set_configuration stored procedure to retain binary logs.

[The Aurora binary logs are needed to set up replication from Aurora to HeatWave MySQL for data synchronization. The Aurora binary logs need to be retained until replication is set up from Aurora to HeatWave MySQL and all the pending transactions from Aurora have been replicated to HeatWave MySQL.] Aurora Binary Logs Stored Procedure:

https://docs.aws.amazon.com/AmazonRDS/latest/AuroraUserGuide/USER_LogAccess.MySQL.Binarylog.html

VI) Connect to Amazon Aurora MySQL using MySQL Shell and create a replication user. Afterwards, execute the MySQL Shell util.copyInstance() utility to export all schemas (including users, indexes, routines, triggers) from Amazon Aurora MySQL to HeatWave MySQL on OCI. After the util.copyInstance() utility finishes, save the MySQL Shell Dump_metadata values.

[The dump created by MySQL Shell's instance copy utility comprises DDL files specifying the schema structure, and tab-separated .tsv files containing the data. MySQL Shell's Dump_metadata values will let the HeatWave MySQL instance on OCI know where to start the replication from for data synchronization.] MySQL Shell Copy Utilities: <u>https://dev.mysql.com/doc/mysql-shell/8.2/en/mysql-shell-utils-copy.html</u>

VII) On OCI, create a replication channel to set up replication from Amazon Aurora MySQL to HeatWave MySQL on OCI. During the channel creation process, if the Aurora instance is using binary log positioning - under the replication positioning section, select Source cannot use GTID auto-positioning and provide the binlogFile and binlogPosition values. If the Aurora instance is using GTIDs - select Source can use GTID auto-positioning (recommended). Create the replication channel afterwards.

[Setting up this replication channel will propagate all the pending data changes to HeatWave MySQL that had occurred on the Aurora instance after the execution of MySQL Shell util.copyInstance() utility.] Create OCI Replication Channel: <u>https://docs.oracle.com/en-us/iaas/mysql-database/doc/creating-replication-channel.html#GUID-521ECA6C-4528-4DE9-8928-D9620893872A</u>

VIII) After the replication channel is up, connect to HeatWave MySQL and execute the SHOW REPLICA STATUS\G command. From the query output, look for the seconds_behind_source and Replica_SQL_Running_State fields. If the seconds_behind_source field displays a value of 0 and the Replica_SQL_Running_State field displays a message of Replica has read all relay log; waiting for more updates - this indicates that the HeatWave MySQL instance has fully caught up with the Amazon Aurora MySQL changes and the replication channel can now be disabled.

[During this step, it is recommended to stop the database application for ~5 minutes to ensure that no writes are happening to the Aurora instance before the replication channel between HeatWave MySQL and Aurora is disabled. After the replication channel has been disabled, you may turn on High Availability for your HeatWave MySQL instance.]

MySQL Replica Replication Status: <u>https://dev.mysql.com/doc/refman/8.0/en/show-replica-status.html</u> Disabling OCI Replication Channel: <u>https://docs.oracle.com/en-us/iaas/mysql-database/doc/managing-replication-channel.html#GUID-4CD38EFA-7463-4175-8838-0EE40C0FABC9</u>

IX) At this point, the live migration process for the database is complete. The database applications can now point to HeatWave MySQL on OCI.

X) (Optional) On OCI, if the HeatWave option was enabled during HeatWave MySQL DB creation, add the HW Cluster and load data from the MySQL InnoDB storage into the HW Cluster using automation.

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

Add a HeatWave Cluster: <u>https://docs.oracle.com/en-us/iaas/mysql-database/doc/adding-heatwave-cluster.html#GUID-2335AC1F-FB01-4701-9EFD-810A3489A850</u>

Load Data into HeatWave: https://dev.mysql.com/doc/heatwave/en/mys-hw-auto-parallel-load.html

Walkthrough:

I) Have an Oracle Cloud Infrastructure (OCI) account 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) Set up a VPN connection from OCI to AWS.

Resource map Info

 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.



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:

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	rtb-02410f795e8f94ebf	MySQL-igw
	MySQL-subnet-public1-us-east-2a	MySQL-rtb-private2-us-east-2b	
	MySQL-subnet-private1-us-east-2a	MySQL-rtb-private1-us-east-2a	
	us-east-2b	MySQL-rtb-public	
	MySQL-subnet-public2-us-east-2b		
	MySQL-subnet-private2-us-east-2b		

- 3. Log in to <u>OCI</u> and create a VCN. Open the OCI navigation menu, click **Networking**, and click **Virtual cloud networks**.
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4. Ensure you are in your desired compartment - we have chosen the root compartment. Click **Start VCN Wizard**.

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Networking	Virtual Clou A Virtual Cloud Netwo gateways that you car	Id Networks rk is a virtual private netw n choose to use.	in (root) rork that you set up in Oracle of	Compar	tment sely resembles a traditional ne	twork, with firewall rules and spe	cific types	of commu	inication	,
Virtual cloud networks										
Web Application Acceleration	Create VCN S	tart VCN Wizard								
Load balancers	Name	State	IPv4 CIDR Block	IPv6 Prefix	Default Route Table	DNS Domain Name	Create	ed		
DNS management				No item	is found.					
Customer connectivity							Showing 0	items <	(1 of 1	>
IP management										
Network Command Center										

5. Select Create VCN with Internet Connectivity and click Start VCN Wizard.

CICRACLE Cloud	Search resources, services, documentation, and Marketplace	US East (Ashburn) 🗸 🗔 🏠 🕜 🌐 😣
Networking Overview	Virtual Clo A Virtual Clo gateways th	Helo ith firewall rules and specific types of communication
Virtual cloud networks Web Application Acceleration Load balancers DNS management Customer connectivity IP management Network Command Center List scope Compartment I (root)	Create VCN with Internet Connectivity Add Internet Connectivity and Site- to-Site VPN to a VCN Add Internet Connectivity and Site- to-Site VPN to a VCN Create Services Network. Create Services Network. Internet classes a VCN, public subnet, private subnet, internet gateway (IG), NAT gateway (NAT), service gateway (SG).	NS Domain Name Created
Filters State Terminating Service logs <u>Manage</u>	Start VCN Wizard Cancel	
Resources: 2 (2 total logs) () Terms of Use and Privacy Cookie Prefet	Yrdices	Copyright © 2023. Oracle and/or its affiliates. All rights reserved.



6. Enter a VCN name and configure your VCN's IPv4 CIDR block - including the public and the private subnet. The guide uses the default values for all. Make sure that the OCI VCN IPv4 CIDR block does not overlap with your AWS VPC IPv4 CIDR.

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Create a VCN wit	h internet connectivity	Help
Configuration Review and create	Configuration	
	Resource availability checked successfully. Ck	vcN with internet connectivity
	Basic information VCN name ① MySQL-VCN	
	Compartment ① Compartment ① Cont	VCN Grade services network VCN Grade services network Includes: • Virtual cloud network (VCN)
	Configure VCN VCN IPv4 CIDR block ① 10.0.0.0/16	Private subnet Internet gateway (IG) NAT gateway (NAT) Service gateway (SG)
	If you plan to peer this VCN with another VCN, the VCNs must not have overlapping CIDR blocks. Learn more. IPv6 prefixes Optional IPv6 prefixes IPv6 in this VCN DNS resolution	
Next <u>Cancel</u>		·
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7. Click **Next** after the configuration for your VCN is completed.

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Create a VCN with i	nternet connectivity		Help
Configuration Review and create	DNS resolution Use DNS hostnames in this VCN Required for instance hostname assignment if you plan to use VCN (IS or a third-party DNS. This choice cannot be changed after the VCN is oreafed. Learn more.	
	Configure public subnet		
	IP address type	IPv4 CIDR block	
	IPv4 CIDR block	≎ 10.0.0.0/24 ×	
		Example: 172.16.0.0/16.	
		(Maximum number of items added) + Another IP address type	
	Configure private subnet		
	IP address type	IPv4 CIDR block	
	IPv4 CIDR block	≎ 10.0.1.0/24 ×	
		Example: 172.16.0.0/16.	
		(Maximum number of items added) + Another IP address type	A
	Show tagging options		
Next Cancel			
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8. On the Review and create page, validate the information for your VCN and click **Create**.

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Create a VCN wit	h internet connectivity					Help
 <u>Configuration</u> Review and create 	Review and create					
	(i) Resource availability checked successfully.	Close				
	Oracle VCN					
	Name: MySQL-VCN					
	Compartment: (root)					
	Tags: VCN: VCN-2023-05-15T14:57:35					
	IPv4 CIDR block: 10.0.0/16					
	DNS label: MySQLVCN					
	DNS domain name: MySQLVCN.oraclevcn.com					
	Subnets					
	Public subnet					
	Subnet name: public subnet-MySQL-VCN					
	IPv4 CIDR block: 10.0.0.0/24					
	Security list name: default security list for MySQL-VCN					
	Route table name: default route table for MySQL-VCN					
Previous Create <u>Cancel</u>						
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9. Click View VCN after your VCN creation has been completed.

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Create a VCN with	internet connectivity						He	lΩ
 <u>Configuration</u> Review and create 	Created VCN							
	Creating resources							
	VCN creation complete							
	Create VCN (1 resolved)	Done 🥑						
ORACLE Cloud S Create a VCN with Configuration Review and create	Create subnets (2 resolved)	Done 🥑						
	Create internet gateway (1 resolved)	Done 🥑						
	Create NAT gateway (1 resolved)	Done 🥑						
	Create service gateway (1 resolved)	Done 🥑						
	Greate route table for private subnet (1 resolved)	Done 🥑						
	Create security list for private subnet (1 resolved)	Done 🥑						
	Update route tables (2 resolved)	Done 🥑					F	<u>م</u>
	Update private subnet (1 resolved)	Done 🥑						
View VCN Terms of Use and Privacy Cookie Preferen	ces		Copyright @ 2023. Oracle a	nd/or its	affiliates	All right	s reserv	uerd.

10. On the Virtual Cloud Network Details page under Resources, click **Subnets** section. Click on **private subnet-**<vcn-name>.

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Networking > Virtual cloud networks	» Virtual Cloud Network Details								
	MySQL-VCN								
	Move resource Add tags	Delete							
VUN	VCN Information Tags								
	Compartment: root)			OCID:qsiv	ya <u>Show</u> <u>Copy</u>				
	Created: Tue, Sep 19, 2023, 16	:17:24 UTC		DNS Resolve	er: MySQL-VCN				
AVAILABLE	IPv4 CIDR Block: 10.0.0.0/16			Default Rout	te Table: default route table f	or MySQL-VCN			
	IPv6 Prefix: -			DNS Domair	n Name: mysqlvcn.oraclevcn	.com			
Resources	Subnets in r	(root) Co	mpartment						
Subnets (2)	Create Subnet								
CIDR Blocks/Prefixes (1)	Name	State	IPv4 CIDR Block	IPv6 Prefixes	Subnet Access	Created		•	
Route Tables (2)	private subnet-MvSQL-VCN	Available	10.0.1.0/24	-	Private (Regional)	Tue, Sep 19, 202	3. 16:17:26 UTC	G	-
Internet Gateways (1)								Q	3
Dynamic Routing Gateways	public subnet-MySQL-VCN	Available	10.0.0/24	-	Public (Regional)	Tue, Sep 19, 202	3, 16:17:26 UTC	Ŀ	
Attachments (0)						SI	howing 2 items	< 1 of 1	>
Network Security Groups (0)									
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11. Click on **security list for private subnet-<vcn-name>** to add an Ingress Rule which will allow HeatWave MySQL to access the Aurora instance on AWS and the Compute instance on OCI.

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Networking > Virtual cloud networks > M	ySQL-VCN > Subnet Details							
	private subnet-MySQL-	VCN						
	Edit Move resource Add tags Cre	ate path analysis 👻						
5	Subnet Information Tags							
	OCID:6xni2a Show Copy		Compartment (root)					
	IPv4 CIDR Block: 10.0.1.0/24		DNS Domain Name: sub0919	1617221 Show Copy				
AVAILABLE	IPv6 Prefix: -		Subnet Access: Private Subnet	et				
	Virtual Router MAC Address: 00:00:17:2D:	:45:1A	DHCP Options: Default DHCP	Options for MySQL-VCN				
	Subnet Type: Regional		Route Table: route table for pr	ivate subnet-MySQL-VCN				
Resources	Security Lists							
Security Lists (1)	Add Security List						(
Logs	Name	State	Compartment	Created				
IPv6 Prefixes (-)	security list for private subnet-MySQL-VCN	Available	(root)	Tue, Sep 19, 202	3, 16:17:	26 UTC		:
Tag filters add clear					Showing	1 item	< 1 of 1	1>
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12. Click Add Ingress Rules.

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Networking > Virtual cloud networks > My	SQL-VCN	» Security List D	etails	77.11,11			D)) IIII					57
	sec	urity list	for private s	subnet-M	ySQL-VCI	٧						
	Instanc	e traffic is contro	lled by firewall rules or	n each Instance in a	addition to this Secu	rrity List						
(SL)	Move	e resource Ad	ld tags Terminate									
	See	curity List Infor	rmation Tags									
AVAILABLE	OC Cre	I D: 653adq <u>Sh</u> ated: Tue, Sep 1	10W Copy 9, 2023, 16:17:26 UTC			Compartme	nt: (root)					
Resources	Ingi	ress Rule	es									
Ingress Rules (3)	Add	Ingress Rules	Edit Remove									
Egress Rules (1)		Stateless -	Source	IP Protocol	Source Port Range	Destination Port Range	Type and Code	Allows	Descri	iption		
		No	10.0.0.0/16	TCP	All	22		TCP traffic for ports: 22 SSH Remote Login Prot ocol			:	D ::
		No	0.0.0.0/0	ICMP			3, 4	ICMP traffic for: 3, 4 De stination Unreachable: F ragmentation Needed a				:
Terms of Use and Privacy Cookie Preference:	s							Copyright © 2023, Oracle a	and/or its at	ffiliates. All r	ights rese	rved.

13. For **Source CIDR** type **0.0.0/0** (you can be more restrictive here and enter only the AWS and OCI VPC and VCN IPv4 CIDR). For **Destination Port Range**, enter **3306,33060**. Click **Add Ingress Rules**.

	Search resources, services, documental	ion, and Marketplace		US East (Ashbu	m) 🗸 🕐	₩ 9
Networking > Virtual cloud networks	MySQL-VCN > Security List Details	Add Ingress Rules	3			
	security list for pr					
	Instance traffic is controlled by fire	Allows TCP traffic 3306,33060				
K SL	Move resource Add tags	Stateless (i)				
		Source Type	Source CIDR		IP Protocol (i)	
	Security List Information	CIDR \$	0.0.0/0		TCP	\$
			Specified IP addresses: 0.0.0.0-255.255.255	5.255 (4,294,967,296 IP addresses)		
AVAILABLE	OCID:653adq Show Copy	Source Port Range Optional (i)		Destination Port Range Optional)	
	Created: Tue, Sep 19, 2023, 1	All		3306,33060		
HURAL HURINGS STREET		Examples: 80, 20-22		Examples: 80, 20-22		
	L D L	Description Optional				
Resources	Ingress Rules	MySQL Ports				
Ingress Rules (3) Earess Rules (1)	Add Ingress Rules Edit	Maximum 255 characters			+ Another Ingres	ss Rule
	Stateless - Source					
	No 10.0.0.0					
	No 0.0.0.0/0	Add Ingress Rules Cancel				
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14. Open the OCI navigation menu, click **Networking** and click **Dynamic routing gateway** under Customer Connectivity.



15. Click Create Dynamic Routing Gateway.

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Networking > Customer connectivity >	Dynamic routing gateways									
Customer connectivity Overview Site-to-Site VPN	Dynamic routing ga Dynamic routing gateways (DRGs) are Create dynamic routing gateway	ateways e optional virtual routers that you can add to your VCN. The	ey provide a path for private network traffic between	your VCN and o	n-premis	ses netw	ork.			
FastConnect	Name	Lifecycle state	Oracle redundancy status (i)	c	reated					
Dynamic routing gateway		No items in the selected compartment.								
Customer-premises equipment	Showing 0 items < 1 of									

16. Enter a DRG name. Under Create in compartment - choose the compartment where your VCN resides. Click Create Dynamic Routing Gateway.

= ORACLE Cloud Sear	ch resources, services, documentatio	n, and Marketplace	US East (Ashburn) 🗸		¢ ()	• •
Networking > Customer connectivity > Dyn	namic routing gateways	Create dynamic routing gateway				Help
Customer connectivity Overview Site-to-Site VPN FastConnect Dynamic routing gateway	Dynamic routing Dynamic routing gateways (DRGs) Create dynamic routing gatewa Name	Name MySQL-DRG Create in compartment (root) Create in compartment Create in compartment Create in compartment				\$
Customer-premises equipment List scope Compartment (froot) C Tag filters add clear						
no tag filters applied						
		Create dynamic routing gateway Cancel				
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17. You will be taken to the DRG Details page. Once your DRG changes its state from Provisioning to **Available**, under Resources, click **Virtual Cloud Network Attachment**. Click **Create Virtual Cloud Network**

Attachment.								
	Search resources, services, docu	mentation, and Market	blace		US East (As	shburn) 🗸 🗔	\$?	• •
Networking » Customer connectivity »	 Dynamic routing gateways > MyS 	QL-DRG		5				
	MySQL-DRG							
	Edit Add tags Mo	ve resource Termina	ate					
DRG	Dynamic routing gat	eway information	Tags					
	Compartment:	(root)		OCID:fx4nt5ypqq	Show Copy			
	Oracle redundancy sta	itus: —		Created: Tue, Sep 1	9, 2023, 16:28:53 UTC			
AVAILABLE								
Resources	VCNs are connected to a D	ents in		ment	ita tabla. Learn more			
VCN attachments (0)		nd by an attachment w	an ale voir type. Tou can conligue		ite table. <u>Learn more</u> .			
Virtual circuit attachments (0)	Create virtual cloud net	work attachment						
IPSec tunnel attachments (0)	Attachment name	Lifecycle state	Virtual cloud network	DRG route table	VCN route type	Created		
Remote peering connection				No items found.				
Loopback attachments (0)						Showing	0 items <	(1 of 1)
Cross-tenancy attachments (0)								
DBG route tables (2)								
Import route distributions (2)								
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18. Enter a Virtual Cloud Network Attachment name and select the appropriate VCN from the drop-down list. Click Create Virtual Cloud Network Attachment.

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Networking > Customer connectivity >	Dynamic routing gateways > MySQL-DR	Create VCN attachment				ŀ	Help
DRG	MySQL-DRG Edit Add tags Move resc Dynamic routing gateway Compartment: root Oracle redundancy status:	Attachment name Optiona/ MySQL-VCN-Attachment Virtual cloud network in froot (Change compartment) MySQL-VCN Show Advanced options					¢
VCN attachments (0) Virtual circuit attachments (0) IPSec tunnel attachments (0) Remote peering connection attachments (0)	VCN attachments VCNs are connected to a DRG by Create virtual cloud network at Attachment name						
Loopback attachments (0) Cross-tenancy attachments (0) DRG route tables (2)							
Import route distributions (2)	2008	Create VCN attachment Cancel	Convicient @ 2022 Crossie o	ndlor ite of	filiatos All	righte roo	anyed
L COOKIE Preferer	1003		copyright @ 2025, Ofacle a	noyor its al	mates. All	ngins res	erveu.



19. Wait for your VCN Attachment to be in an **Attached** state.

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Networking > Customer connectivity	v > Dynamic routing gateways > MySQL	-DRG	The state of the second second					50
	MySQL-DRG							
	Edit Add tags Move	resource Terminat	e					
DRG	Dynamic routing gatew	vay information	Tags					
	Compartment:	ot)		OCID:fx4nt5ypqq Show	<u>Copy</u>			
	Oracle redundancy status	s: —		Created: Tue, Sep 19, 2023	3, 16:28:53 UTC			
Resources	VCN attachmer	nts in by an attachment wit	(root) Compartm	nent all VCNs to use the same route table	e. <u>Learn more</u> .			
VCN attachments (1)	Create virtual cloud netwo	'k attachment						
IPSec tunnel attachments (0)	Attachment name	Lifecycle state	Virtual cloud network	DRG route table	VCN route type	Created		
Remote peering connection attachments (0)	MySQL-VCN-Attachment	Attached	MySQL-VCN	Autogenerated Drg Route Ta ble for VCN attachments	Subnet CIDR blocks	Tue, Sep 19 UTC), 2023, 16:33:4	⁵ :
Loopback attachments (0)						Showing	1 item < 1 o	
Cross-tenancy attachments (0)								
DRG route tables (2)								
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- 20. Open the OCI navigation menu, click **Networking** and click on **Virtual cloud networks**. After landing on the Virtual Cloud Networks page, click on **the name of your VCN**.
- 21. On the Virtual Cloud Network Details page, under Resources, click on **Route Tables**.

ORACLE Cloud					U	6 East (Ashburn) 🗸 [
Networking > Virtual cloud network	s » Virtual Cloud Network Details » Subnets							
	MySQL-VCN							
	Move resource Add tags	Delete						
VUN	VCN Information Tags							
	Compartment: r (root)			OCID:qsiv	ya <u>Show</u> <u>Copy</u>			
	Created: Tue, Sep 19, 2023, 16	:17:24 UTC		DNS Resolv	er: MySQL-VCN			
AVAILABLE	IPv4 CIDR Block: 10.0.0/16			Default Rout	te Table: default route table f	or MySQL-VCN		
	IPv6 Prefix: -			DNS Domair	n Name: mysqlvcn.oraclevcn	.com		
Resources	Subnets in	(root) Co	ompartment					
Subnets (2)	Create Subnet							
CIDR Blocks/Prefixes (1)	Name	State	IPv4 CIDR Block	IPv6 Prefixes	Subnet Access	Created		•
Route Tables (2)	private subnet-MySQL-VCN	Available	10.0.1.0/24	-	Private (Regional)	Tue, Sep 19, 2023,	16:17:26 UTC	ā
Internet Gateways (1)	public subpet-MySQL-VCN		10.0.0.0/24		Public (Regional)	Tue Sen 19 2023	16-17-26 LITC	Q
Dynamic Routing Gateways Attachments (1)		•				Shov	ving 2 items	< 1 of 1 >
Network Security Groups (0)								
Terms of Use and Privacy Cookie Prefe	erences				c	opyright © 2023, Oracle and/c	or its affiliates. All	l rights reserve



22. You should see two Route Tables, one for your private subnet and the other for your public subnet. Click on **route table for private subnet-<vcn-name>**.

Resources	Route Tables in	(root) Compartment					
Subnets (2)	Create Route Table						
CIDR Blocks/Prefixes (1)	Name	State	Number of Rules	Created •			
Route Tables (2)	route table for private subnet-MySQL-VCN	Available	2	Tue, Sep 19, 2023, 16:17:26 UTC			
Dynamic Routing Gateways	default route table for MySQL-VCN	Available	1	Tue, Sep 19, 2023, 16:17:24 UTC			
Attachments (1)				Showing 2 items < 1 of 1 >			
Network Security Groups (0)							

23. On the private subnet route table page, click **Add Route Rules**.

E ORACLE Cloud				US East (Ashburn) 🗸	
Networking > Virtual cloud networks	MySQL-VCN Route Table Details				
	route table for private subnet-	MySQL-VCN			
	Move resource Add tags Terminate				
(RI	Route Table Information Tags				
	OCID:2ffena <u>Show Copy</u> Created: Tue, Sep 19, 2023, 16:17:26 UTC		Compartment 4 (root)		
AVAILABLE					
Resources	Route Rules				
Route Rules (2)	Traffic within the VCN is handled by the VCN's local routing <u>Network Path Analyzer</u> to check your connections.	by default. Intra-VCN routing all	ows you more control over routing betwe	en subnets. <u>Learn more.</u> I	f you're having problems, use
	Add Route Rules Edit Remove				
	Destination	▲ Target Type	Target	Route Type	Description
	0.0.0.0/0	NAT Gateway	NAT gateway-MySQL-VCN	Static	
	All IAD Services In Oracle Services Network	Service Gateway	Service gateway-MySQL-VCN	Static	
	0 selected				Showing 2 items < 1 of 1 >
Terms of Use and Privacy Cookie Prefer	ences			Copyright © 2023, Oracle	and/or its affiliates. All rights reserved.



24. Under Target Type, select Dynamic Routing Gateway from the drop-down list. For Destination Type, select CIDR Block and for Destination CIDR Block - enter your AWS VPC IPv4 CIDR block that you will be using to connect to OCI. The AWS VPC CIDR block that will be used for this guide is 10.1.0.0/16. Click Add Route Rules afterwards.

	Search resources, services, documentatio	n, and Marketplace US East (Ashburn) V 🕢 🎊 🤅	⊕ <mark>0</mark>
Networking > Virtual cloud networks	» MySQL-VCN » Route Table Details	Add Route Rules	Help
	route table for pri		
RT	Move resource Add tags	Important: For a route rule that targets a Private IP, you must first enable "Skip Source/Destination Check" on the VNIC that the Private IP is assign to.	ned
	Route Table Information	Route Rule	
	OCID:2ffena Show Copy	Target Type	
	Created: Tue, Sep 19, 2023, 16	Dynamic Routing Gateway	\$
AVAILABLE		Destination Type	
Resources	Route Bules	CIDR Block	0
	Traffic within the VCN is handled h	Destination CIDR Block	
Boute Bules (2)	Network Path Analyzer to check yo	10.1.0.0/16	
		Example: 10.0.0.0/24	
	Add Route Rules Edit	Target Dynamic Routing Gateway	
	Destination	Name: MySQL-DRG	
WHIE SWITTER	Destination	Compartment: (root)	
	0.0.0/0	Description Optional	
	All IAD Services In Oracle		
	0 selected	Maximum 255 characters	
		Add Route Rules Cancel	
Terms of Use and Privacy Cookie Prefer	rences	Copyright @ 2023, Oracle and/or its affiliates. All rights	reserved.

25. Now, repeat the same process for the other route table. Go back to Virtual Cloud Network Details page, click **Route Tables**, and click on **default route table for <vcn-name>**.

ORACLE Cloud	Search resources, services, documentation, and Ma	arketplace		US East (Ashburn) 🗸 🚺	⊘ ⊕
Networking » Virtual cloud network	s » Virtual Cloud Network Details » Route Tables				
	MySQL-VCN				
	Move resource Add tags Delete				
VGN	VCN Information Tags				
	Compartment: root)		OCID:qsivya Show Copy		
	Created: Tue, Sep 19, 2023, 16:17:24 UTC	>	DNS Resolver: MySQL-VCN		
AVAILABLE	IPv4 CIDR Block: 10.0.0.0/16		Default Route Table: default	route table for MySQL-VCN	
	IPv6 Prefix: -		DNS Domain Name: mysqlvo	on.oraclevcn.com	
Resources	Route Tables in	(root) Compar	tment		
Subnets (2)	Create Route Table				
CIDR Blocks/Prefixes (1)	Name	State	Number of Rules	Created	÷
Route Tables (2)	route table for private subnet-MySQL-VCN	Available	3	Tue, Sep 19, 2023, 16:17:26 UT	rc 🗲
Internet Gateways (1)	default route table for MySQL VCN		1	Tuo Son 10, 2022, 16:17:24 LT	TC U
Dynamic Routing Gateways Attachments (1)		Available	1	Showing 2 item	ns < 1 of 1
Network Security Groups (0)					
Terms of Lise and Drivecy Cookie Brefs	arences			Convicient @ 2022. Oracle and/or its officiate	e All righte recor



26. On the default route table page, click **Add Route Rules**.

E ORACLE Cloud	Search resources, services, document	ation, and Marketplace		US East (Ashb	urn) 🗸 🚺 🎝 🤇	2 🌐 9
Networking > Virtual cloud networks	* MySQL-VCN * Route Table Details					
	default route tab	le for MySQL-V	CN			
рт	Move resource Add tags	Terminate				
	Route Table Information	Tags				
	OCID:u6nmca Show Con Created: Tue, Sep 19, 2023,	Ω <u>γ</u> . 16:17:24 UTC	Compartment:	(root)		
Resources Route Rules (1)	Route Rules Traffic within the VCN is handled Network Path Analyzer to check	by the VCN's local routing by de your connections.	efault. Intra-VCN routing allows you more control	over routing between subnets. Learn	more. If you're having pro	blems, use
	Add Route Rules Edit	Remove				
	Destination 0.0.0.0/0	Target Type Internet Gateway	Target Internet.gateway-MySQL-VCN	Route Type Static	Description	
	0 selected				Showing 1 item	< 10
Terms of Use and Privacy Cookie Prefe	rences			Copyright @ 202	3, Oracle and/or its affiliates. Al	ll rights reserved.

27. Under Target Type, select Dynamic Routing Gateway from the drop-down list. For Destination Type, select CIDR Block and for Destination CIDR Block - enter your AWS VPC IPv4 CIDR block that you will be using to connect to OCI. The AWS VPC CIDR block that will be used for this guide is 10.1.0.0/16. Click Add Route Rules afterwards.

ORACLE Cloud	Search resources, services, documentation	n, and Marketplace	US East (Ashburn) 🗸		୭ 🌐	0
Networking > Virtual cloud network	ks > MySQL-VCN > Route Table Details	Add Route Rules			Н	lelp
	default route tabl					
DT	Move resource Add tags	Important: For a route rule that targets a Private IP, you must first enable "Ski to.	p Source/Destination Check" on the VNIC that	the Private IP is	assigned	
	Route Table Information	Route Rule				
	OCID:u6nmca Show Copy	Target Type				
	Created: Tue, Sep 19, 2023, 16	Dynamic Routing Gateway			\$	
AVAILABLE		Destination Type				
Resources	Route Rules	CIDR Block			¢	
	Traffic within the VCN is handled h	Destination CIDR Block				
Route Rules (1)	Network Path Analyzer to check yo	10.1.0.0/16				
	Add Bauta Bulas Edit	Example: 10.0.0.0/24				
In the second		Target Dynamic Routing Gateway				
MANNESS MANNESS	Destination	Compartment: (root)				
	0.0.0/0	Description Ontional			_	
	0 selected					
	0.30100100	Maximum 255 characters			-	
		Add Route Rules Cancel				
Terms of Use and Privacy Cookie Pret	ferences		Copyright @ 2023, Oracle ar	ıd/or its affiliates. A	III rights rese	erved.



28. Login to <u>AWS</u> to modify the VPC security groups for the Aurora MySQL instance which will allow Aurora to access the HeatWave MySQL instance on OCI and the EC2 instance on AWS. From the main AWS portal, expand the Services menu at the top left of the screen, click **Databases**, click **RDS**, and **select your Aurora instance**. Click **Connectivity & security**, under the **Security** section, look for **VPC security groups** and click on **the security group**. For this guide, our Aurora instance only uses one security group - **default**.

aws Services Q Search		[Option+S]		۵ ¢	00	Ohio 🔻
Amazon RDS ×	RDS > Databases > database-1 > da database-1-instance-	tabase-1-instance-1 1		C	Modify	Actions T
Databases Query Editor Performance insights	Related Q. Filter by databases				<	1 > @
Snapshots Exports in Amazon 53 Automated backups Reserved instances Proxies	DB identifier DB identifier database-1 database-1-instance-1	Status ▼ Role ▼ ⊘ Available Regional cluster ⊙ Available Writer instance	Engine ▼ Regio Aurora MySQL us-eas Aurora MySQL us-eas	n & AZ V Size V t-2 1 instance tt-2 db.t3.small	 Actions ▼ - 	CPU ▼ -
Subnet groups Parameter groups Option groups Custom engine versions	Connectivity & security Connectivity & security	ng Logs & events Configurat	ion Maintenance & bac	kups Tags		
Zero-ETL integrations New	Endpoint & port	Networking	Security			
Events Event subscriptions	database-1-instance- 1 us-east- 2.rds.amazonaws.com	variability zone us-east-2a VPC	default (sg-011bc99fa4	17f7af11)		
Recommendations	Port 3306	MySQL-vpc (vpc- 0682f94981a1e9f01)	No			

29. On the Security Groups page, select your Aurora security group. From **Actions**, choose **Edit inbound rules**.

aws Services Q Search	h [Option+S]]		D 4 0	Ohio ▼
🙋 EC2 🛛 VPC 🔯 RDS 💽	\$ \$3				
EC2 Dashboard X	Security Groups (1/1) Info	C	Actions 🔺 Export secu	urity groups to CSV 🛛 🔻	Create security group
EC2 Global View	Q Find resources by attribute or tag		View details		
Events			Edit inbound rules		
▼ Instances	sg-011bc99fa47f7af11 X Clear filters		Edit outbound rules		< 1 > 💿
Instances		TT Secur	Manage tags		T Description
Instance Types	Name Security group ID	v ∣ Secur	Manage stale rules	V VPC ID	
Launch Templates	✓ – sg-011bc99fa47f7af11	defau	Copy to new security group	vpc-0682f94981a1e9f01	default VP(
Spot Requests			Delete security groups		



30. Click Add rule. Under Type, select MySQL/Aurora. For Source, input the AWS VPC IPv4 CIDR. Click Add rule. Under Type, select MySQL/Aurora. For Source, input the OCI VCN IPv4 CIDR block. Click Save rules.

aws Services Q Search			[Option+S]			D 4 0	Ohio ▼	
🛃 EC2 🛛 VPC 🔯 RDS 🕞 S3								
EC2 > Security Groups > sg-011b Edit inbound rules of Inbound rules control the incoming tra	c99fa47f7af11 > Edit inbound r nfo ffic that's allowed to reach the inst	ules ance.						٩
Inbound rules Info								
Security group rule ID	Type Info	Protocol Info	Port range	Source Info		Description - optional Info		
sgr-06d0dca2b6d096922	All traffic 🛛 🔻	All	All	Custom 🔻	Q		Delete	
-	MYSQL/Aurora 💌	ТСР	3306	Custom 🔻	Q 10.1.0.0/16 X	AWS VPC	Delete	
					10.1.0.0/16 ×			
-	MYSQL/Aurora 🔻	ТСР	3306	Custom 🔻	Q 10.0.0/16 X	OCI VCN	Delete	
Add rule								
						Cancel Preview chang	Jes Save rules	

31. From the main AWS Services menu, navigate to **Networking & Content Delivery** and click **VPC**. From the left-hand AWS menu, scroll down and click **Customer Gateways** under Virtual private network (VPN). Click **Create customer gateway** once you have landed on the appropriate page.

aws Services Q Search	h [Option+S]	▶ 🕹 🕐 Ohio 🕶 🖡
🛃 EC2 🌀 VPC 🔯 RDS 🧕	I IAM 🔁 S3	· · · · · · · · · · · · · · · · · · ·
 Virtual private network (VPN) 	Customer gateways Info	C Actions Create customer gateway
Customer gateways	Q Filter customer gateways	< 1 > ©
Virtual private gateways Site-to-Site VPN	Name マ Customer gateway ID マ State マ BGP ASN	
connections		No customer gateways found
Client VPN endpoints		



32. Enter a **temporary customer gateway name**. For **BGP ASN** input **31898** and for **IP address** enter **1.1.1.1**. Leave the rest as-is and click **Create Customer Gateway**.

aws	Services Q Search	[Option+S]		🗘 🕐 Ohio	•
EC2 آن	: 🕝 VPC 🥳 RDS 🔠 IAM 🔁 S3				
VPC	> Customer gateways > Create customer gateway				٥
Cr	eate customer gateway Info				
A cu: netw	stomer gateway is a resource that you create in AWS that represents the customer gat vork.	eway device in your on-premises			
C	Details				
N	lame tag - optional reates a tag with a key of 'Name' and a value that you specify.	_			
	Temp-Gateway				
B	alue must be 256 characters or less in length. IGP ASN Info he ASN of your customer gateway device.				
	31898				
Vi IF SI	alue must be in 1 - 2147483647 range. P address info pecify the IP address for your customer gateway device's external interface.				
	1.1.1.1				
C TI	ertificate ARN he ARN of a private certificate provisioned in AWS Certificate Manager (ACM).	_			
	Select certificate ARN				
D	vevice - optional nter a name for the customer gateway device.				
	Enter device name				
> Cloud	IShell Feedback Language		© 2023, Amazon Web Services, Inc. or its affil	iates. Privacy Term	is Cookie preferences

33. From the Customer gateways page, scroll down on the left-hand AWS menu. Under Virtual private network click **Virtual private gateways**. Click **Create virtual private gateway**.

aws Services Q Searc	h [Option+S]	D
🙋 EC2 🏾 🏠 VPC 🔯 RDS 🧕	IAM 🔁 S3	
 Virtual private network (VPN) 	Virtual private gateways Info	C Actions Create virtual private gateway
Customer gateways	Q Filter virtual private gateways	< 1 > ©
Virtual private gateways Site-to-Site VPN	Name \triangledown Virtual private gateway ID \triangledown State \triangledown Type	∀ VPC √ Amazon Amazon
connections	No virtual private gateways fo	und
Client VPN endpoints		



34. Enter a virtual private gateway name. Leave everything as-is and click Create virtual private gateway.

aws	s	Services Q Search				[C	ption+S]				Þ.	¢	0	Ohio 🔻	
<i>©</i> E	c2 🕝	VPC 🔯 RDS 📴	IAM 🗗 S3												
VF	ic > Vi	/irtual private gateway	/s > Create	virtual private gateway	у										(1)
6	roate	o virtual pr	ivata ar	toway											
C	reate	e virtuat pr	ivate ga												
A	virtual pri	rivate gateway is the V	PN concentrat	or on the Amazon side	e of the site-to-si	te VPN co	nnection.								
	Details	ls													
	Name ta Creates a	ag - <i>optional</i> a tag with a key of 'Name'	and a value that	/ou specify.											
	MySQL	L-VPG													
	Value mus	ust be 256 characters or le	ss in length.												
	Autonon	mous System Number	(ASN)												
	O Ama:	azon default ASN													
	O Custo	tom ASN													
	Tags														
	A tag is a	a label that you assign to a	an AWS resource.	Each tag consists of a key	and an optional va	lue. You cai	use tags to search and filter								
	your resor	surces of track your Aws c	osts. Hume tag n	sips you track your resour	ces more cashy. we	recommer	a dualing hame tag.								
	Key			Value - optional											
	Q Na	ame	×	Q MySQL-VPG		×	Remove								
	Add	new tag													
	rou can a	add 49 more tags.													
					Consol	6									
S de	udSholl	Feedback Language			Cancel	Crea	te virtual private gatew	y	Ø 2023	7 Amazon Web Servic	er inc or its affi	liator	Privacy	Torms	Cookie preferences
	ausneu	recaback callyuage								o, ranazon web servic	co, inc. or its all	marces.	Hivacy	Terms	cookie preferences

35. While still on the Virtual Private Gateway page, select the **virtual private gateway** that we just created. Click on the **Actions** menu and select **Attach to VPC**.

aws Services Q Searc	h [Option+S]		D 4 0 0	Ohio 🔻
🙋 EC2 🛛 VPC 🔯 RDS 🗗	3 53			
VPC dashboard	⊘ You successfully created vgw-028f2331f39704da5 / MySQL-VPG.			× (i)
EC2 Global View 🔀	Virtual private gateways (1/1) info	C	Actions Create virtual	l private gateway
Filter by VPC:	Q Find resource by attribute or tag]	Attach to VPC	
Select a VPC 🔹	Virtual private gateway ID = vgw-028f2331f39704da5 X Clear filters		Detach from VPC	< 1 > @
Virtual private cloud			Manage tags	
Your VPCs	Name 🖉 🛛 🔻 Virtual private gateway ID 🛛 🗸 State	Туре	Delete virtual private gateway	
Subnets	● MySQL-VPG vgw-028f2331f39704da5 ⊖ Detached	ipsec.1	-	64512

36. From the drop-down list, select **your VPC**. Click **Attach to VPC** once completed.

aws III services Q Search Image: C2 C4 VPC C5 RDS C5 S3	[Option+S]	Ð	\$ Ø	٢	Ohio 🔻	_
VPC > Virtual private gateways > vgw-028f2331f39704da5 > Attach to VPC						(i)
Attach to VPC Info						
Details						
Virtual private gateway ID						
D vgw-028f2331f39704da5						
Available VPCs						
Attach the virtual private gateway to this VPC.						
vpc-0682f94981a1e9f01 / MySQL-vpc	•					
	Cancel Attach to VPC					



37. Wait until your Virtual private gateway changes its state to **Attached**. It is now time to update the AWS route tables - similar to what we did on OCI. From the Virtual private gateways page, scroll up on the left-hand AWS menu. Under Virtual private cloud, select **Route tables**.

aws Services Q Search	[Option+S]	E & ⑦ @ Ohio ▼
🗗 EC2 😚 VPC 🌼 RDS 🖻	53	
VPC dashboard X	Route tables (4) Info	C Actions ▼ Create route table ③
EC2 Global View 🔀	Q Find resources by attribute or tag	
Filter by VPC:	VPC = vpc-0682f94981a1e9f01 X Clear filters	
Select a VPC 🔹		
	Name ▼ Route table ID ▼ Explicit subnet asso	ciati Edge associations Main ▼ VPC
Virtual private cloud	- rtb-02410f795e8f94ebf -	- Yes <u>vpc-0682f94981a1e9f01</u>
Your VPCs	MySQL-rtb-private2-us-east-2b rtb-0b06f8eeccaccfd02 subnet-0f592879e3	9a5d – No <u>vpc-0682f94981a1e9f01</u>
Subnets	MySQL-rtb-private1-us-east-2a rtb-0d8e73ad681b4c320 subnet-0f08e03783	8f1fb No <u>vpc-0682f94981a1e9f01</u>
Route tables	MySQL-rtb-public rtb-048c2e3219a57980b 2 subnets	- No <u>vpc-0682f94981a1e9f01</u>

38. For this guide, the main route table (rtb-02410f795e8f94ebf - the one with no name) is not being used, although we will use the public route table (to deploy an EC2 later) and both private route tables (for Aurora). For each of the route tables that you wish to use, you will need to add an additional route rule. Select the appropriate route table one-by-one and from the **Actions** menu, click **Edit routes**.

aws Services Q Search	[Option+S]		Q Q Ohio ▼
🙋 EC2 🕜 VPC 🔯 RDS 💽	\$3		
VPC dashboard 🗙	Route tables (1/4) Info	C	Actions A Create route table
EC2 Global View 🗹	Q, Find resources by attribute or tag		View details
Filter by VPC:	VPC = vpc-0682f94981a1e9f01 X Clear filters		Set main route table
Select a VPC 🛛 🔻			Edit subnet associations
	■ Name ▼ Route table ID ▼ E	xplicit subnet associati Edge associations	Edit edge associations
 Virtual private cloud 	□ - rtb-02410f795e8f94ebf -	-	Edit route propagation 2f94981a1e9f01
Your VPCs	MySQL-rtb-private2-us-east-2b rtb-0b06f8eeccaccfd02	<u>ubnet-0f592879e39a5d</u> –	Edit routes 2f94981a1e9f01
Subnets	MySQL-rtb-private1-us-east-2a rtb-0d8e73ad681b4c320 s	<u>ibnet-0f08e037838f1fb</u> –	Manage tags 2f94981a1e9f01
Route tables	MySQL-rtb-public rtb-048c2e3219a57980b 2	subnets –	Delete route table

39. Click Add route and under the Destination, input your OCI VCN CIDR block that you are using when you created your OCI VCN (the guide uses OCI VCN CIDR block of 10.0.0/16). Afterwards, for Target, click Virtual Private Gateway from the drop-down list and select your Virtual Private Gateway. Once your route has been added as shown in the below image, click Save changes.

aws Services Q Search	[Option+S]		D & 0 0	Ohio 🔻
📴 EC2 🌀 VPC 🔯 RDS 🔁 S3				
VPC > Route tables > rtb-0b06f8eeccaccfd02 > Edit routes				
Edit routes				
Lait routes				
Destination	Target	Status	Propagated	
10.1.0.0/16	local	⊘ Active	No	
	Q local X			
Q 10.0.0.0/16 X	Virtual Private Gateway	-	No Rem	ove
	Q vgw-028f2331f39704da5 X			
Add route				
Add Toute				
			Cancel Preview	Save changes

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40. Repeat the same process for the remaining route tables that you will use.

aws Services Q Searc	ch	[Option+S]	D	🗘 🕜 🙆 Ohio	•
EC2 🕝 VPC 🔯 RDS 👩	∃ 53				
VPC dashboard X	Route tables (1/4) Info		C	Actions Create	route table
EC2 Global View 🔀	Q Find resources by attribute or tag			View details	
Filter by VPC:	VPC = vpc-0682f94981a1e9f01 X	Clear filters		Set main route table	
Select a VPC 🔹				Edit subnet associations	· > ©
	Name		subnet associati Edge associations	Edit edge associations	
 Virtual private cloud 	□ -	rtb-02410f795e8f94ebf –	-	Edit route propagation	2f94981a1e9f01
Your VPCs	MySQL-rtb-private2-us-east-2b	rtb-0b06f8eeccaccfd02 subnet-)f592879e39a5d –	Edit routes	2f94981a1e9f01
Subnets	MySQL-rtb-private1-us-east-2a	rtb-0d8e73ad681b4c320 subnet-	0f08e037838f1fb	Manage tags	2f94981a1e9f01
Route tables	MySQL-rtb-public	rtb-048c2e3219a57980b 2 subne		Delete route table	2f94981a1e9f01
Internet gateways					

aws Services Q Search	[Option+S]		d de la constante de la consta	⑦ Ø Ohio ▼
🙋 EC2 🏾 🖓 VPC 🔯 RDS 📑 S3				
VPC > Route tables > rtb-0d8e73ad681b4c320	> Edit routes			
Edit routos				
Edit Toutes				
Destination	Target	Status	Propagated	
10.1.0.0/16	local	▼ ⊘ Active	No	
	Q local	×		
Q 10.0.0/16	X Virtual Private Gateway	v -	No	Remove
	Q vgw-028f2331f39704da5	×		
Add route				
			Cancel	Preview Save changes

aws Services Q Searc	:h		[Option+S]		Ð	🗘 🕐 🎯 Ohi	
🗗 EC2 🛛 VPC 🔯 RDS 🗗	5 S3						
VPC dashboard	Rout	te tables (1/4) Info			C	Actions Create	route table
EC2 Global View 🔀	QI	Find resources by attribute or tag				View details	
Filter by VPC:	VPC	C = vpc-0682f94981a1e9f01 X	Clear filters			Set main route table	
Select a VPC 🔹						Edit subnet associations	
		Name	▼ Route table ID	▼ Explicit sul	onet associati Edge associations	Edit edge associations	
Virtual private cloud		-	rtb-02410f795e8f94ebf	-	-	Edit route propagation	2f94981a1e9f01
Your VPCs		MySQL-rtb-private2-us-east-2b	rtb-0b06f8eeccaccfd02	subnet-0f5	92879e39a5d –	Edit routes	2f94981a1e9f01
Subnets		MySQL-rtb-private1-us-east-2a	rtb-0d8e73ad681b4c320	subnet-0f0	<u>8e037838f1fb</u> –	Manage tags	2f94981a1e9f01
Route tables		MySQL-rtb-public	rtb-048c2e3219a57980b	2 subnets	-	Delete route table	2f94981a1e9f01
Internet gateways							

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🗗 EC2 🌀 VPC 🔯 RDS 🕞 S3				
VPC > Route tables > rtb-048c2e3219a57980b > Edit route: Edit routes	i			
Destination	Target	Status	Propagated	
10.1.0.0/16	local 🔻	⊘ Active	No	
	Q local X]		
Q 0.0.0.0/0 X	Internet Gateway 🔻	⊘ Active	No	Remove
	Q igw-0b2846c0b393f710b ×]		
Q 10.0.0/16 X	Virtual Private Gateway] –	No	Remove
	Q vgw-028f2331f39704da5 X	j		

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41. After you have updated all your route tables on AWS, from the left-hand menu, scroll down and click **Site-to-Site VPN Connections** under Virtual Private Network (VPN). Once on the appropriate page, click **Create VPN**

Connection.					
aws Services Q Sear	rch		[Option+S]	D 4	Ohio •
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 Virtual private network (VPN) 	VPN connections	Info		C Actions Download configuration	Create VPN connection
Customer gateways Virtual private gateways	Q Filter VPN connecti	ons			< 1 > 💿
Site-to-Site VPN connections	Name	VPN ID	⊽ State	▽ Virtual private gateway ▽ Transit gateway	♥ Customer gate
Client VPN endpoints					

42. Give a VPN connection name, for Target gateway type select Virtual private gateway. Under Virtual private gateway drop-down - select the VPG that we had created earlier. For Customer gateway select Existing and under the Customer gateway ID drop-down - select the temporary Customer Gateway that we had created earlier. Under Routing options select Dynamic (requires BGP). Leave the Local and Remote IPv4 network CIDR fields blank.

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🙋 EC2 🛛 🖓 VPC	805 RDS 📴 S3						
VPC > VPN conne	ctions > Create VPN connection						٩
Croate V/P	N connection						
		1. 1/DA					
Select the resources	and additional configuration options that you want to use for the si	te-to-site VPN connection.					
Details							
Name tag - option Creates a tag with a	nal key of 'Name' and a value that you specify.						
MySQL-VPN							
Value must be 256 d	characters or less in length.						
Target gateway t	ype Info						
O Virtual private	e gateway						
 Transit gatew 	ay						
O Not associated	d						
Virtual private ga	ateway						
vgw-028f2331f	39704da5	•					
Customer gatewa	ay Info						
Existing							
O New							
Customer gatewa	ay ID						
cgw-07454b149	9dc5fc4fd	•					



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- 43. While still on the Create VPN Connection page, expand the **Tunnel 1 options**. Choose a /30 CIDR from within the link local 169.254.0.0/16 range. Input the full CIDR in the Inside IPv4 CIDR for Tunnel 1 field. The guide uses the CIDR block of 169.254.6.0/30. Ensure that OCI supports the chosen /30 address for the inside tunnel IPs. OCI does not allow you to use the following IP ranges for inside tunnel IPs:
 - 169.254.10.0-169.254.19.255
 - 169.254.100.0-169.254.109.255
 - 169.254.192.0-169.254.201.255

Under Advanced options for tunnel 1, click the radio button for Edit tunnel 1 options.

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EC2 🌀 VPC 🔯 RDS 🛅 IAM 🔂 S3			
▼ Tunnel 1 options - optional Info			
Inside IPv4 CIDR for tunnel 1			
169.254.6.0/30			
A size /30 IPv4 CIDR block from the 169.254.0.0/16 range.			
Pre-shared key for tunnel 1 The pre-shared key (PSK) to establish initial authentication between the	virtual private gateway and customer gateway.		
Generated by Amazon			
The pre-shared key must have 8-64 characters. Valid characters: A-Z, a-z,	0-9, _ and . The key cannot begin with a zero.		
Advanced options for tunnel 1			
Use default options			
Edit tunnel 1 options			
Phase 1 encryption algorithms			
Select encryption algorithms	negotiations.		
AES128 X AES256 X AES128-GCM-16 X AES	256-GCM-16 ×		
Phase 2 encryption algorithms The permitted encryption algorithms for the VPN tunnel for phase 2 IKE	negotiations.		
Select encryption algorithms	▼		
AES128 X AES256 X AES128-GCM-16 X AES	256-GCM-16 ×		
Phase 1 integrity algorithms	antiations		
Select integrity algorithms	generous.		
seese magney agonamia			
udShell Feedback Language		© 2023, Amazon Web Services, Inc. or its affiliates.	Privacy Terms Cookie prefere

44. Once the tunnel 1 options expand, scroll down and look for **IKE Version**. Click the **X** and remove the **ikev1** field.



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45. After you have finished the configuration, click **Create VPN connection**.

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	 Start 								(i)
	VPN logging	nfo							
	Tunnel activity lo	og							
	Tunnel activity log	captures log messages for IPsec	activity and DPD protocol messages.						
	Enable								
	Tunnel mainte	enance							
	Tunnel endpoint	lifecycle control Info							
	Tunnel endpoint lif	ecycle control provides control o	ver the schedule of endpoint replacements						
_									
	Tunnel 2 d	ontions - ontional Info							
		options standard							
	Tags		For the two second states of the law second second states and		and the second second Place				
	your resources or tr	rack your AWS costs. Name tag h	elps you track your resources more easily. V	/e recommen	n use tags to search and filter nd adding Name tag.				
	Key		Value - optional						
	Q Name	X	Q MySQL-VPN	×	Remove				
	Add new tag	3							
	You can add 49 mo	ore tags.							
_									
			c	ancel	Create VPN connection				
-									
ک. Clo	udShell Feedbac	ck Language				© 2023, Amazon Web Services, Inc.	or its affiliates. Privacy	Terms Cookie pref	erences

46. On the VPN Connections page, make sure that your VPN connection is selected and click the **Download configuration** button.

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🙋 EC2 🛛 VPC 🔯 RDS 🧗	3 s3	
 Virtual private network (VPN) 	⊘ You successfully created vpn-0196b4b6647a3eb8c / MySQL-VPN.	× G
Customer gateways	VPN connections (1/1) info	C Actions Download configuration Create VPN connection
Virtual private gateways	Q. Find resource by attribute or tag	
Site-to-Site VPN connections	VPN ID = vpn-0196b4b6647a3eb8c X Clear filters	< 1 > @
Client VPN endpoints	Name 🟒 🛛 🗸 VPN ID 🗸 State	∇ I Virtual private gateway ∇ Transit gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway ∇ Customer gateway Customer gateway
AWS Verified Access	• MySQL-VPN vpn-0196b4b6647a3eb8c • Pending	vgw-028f2331f39704da5 – cgw-07454b149



47. For Vendor and Platform, select Generic. For IKE version, select ikev2. Click Download afterwards.

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🙋 EC2 🛛 VPC 🔯 RDS 💽	53						
 Virtual private network (VPN) 	VPN connections (1/1) Info		C Actions Download	configurati	on	Create VPN co	onnection
Customer gateways							
Virtual private gateways							
Site-to-Site VPN connections		Download configuration		× it gat			
Client VPN endpoints		Choose the sample configuration you wi gateway. Please note these are samples,	sh to download based on your customer and will need modification to use Advanced				
AWS Verified Access		Algorithms, Certificates, and/or IPv6.					
Verified Access instances		Vendor The manufacturer of the customer gateway de	vice (for example, Cisco Systems, Inc).				
Verified Access trust		Generic		•			
providers New		Platform					
Verified Access groups New		The class of the customer gateway device (for	example, J-Series).	_			
Verified Access endpoints		Generic		•			
New		Software					
Transit gateways		The operating system running on the custome	gateway device (for example, ScreenOS).	-			
Transit gateways		Vendor Agnostic		·			
Transit gateway		IKE version The IKE version you are using for your VPN con	nection.				
attachments		ikev2		▼ Lusto			
transit gateway policy tables				gw-0			
Transit gateway route			Cancel Downloa	d Jateg			

48. Open the downloaded configuration file in your text editor of choice. Look under **IPSec Tunnel #1**, section #1 Internet Key Exchange Configuration. Here you find your automatically generated Pre-Shared Key for

your tunnel. Save this value.

< > VI	pn-088ae880a93d15855.txt ×	
19 20	IPSec Tunnel #1	no tana Katalan ang katalan ang katalan Katalan katalan ang katalan Katalan katalan katalan Katalan katalan Katalan katalan katalan Katalan katalan
21 22	#1: Internet Key Exchange Configuration	North State
23	Configure the IKE SA as follows:	States and a second
24	Please note, these sample configurations are for the minimum requirement of AES128, SHA1, and DH Group 2.	Real versions
25	Category "VPN" connections in the GovCloud region have a minimum requirement of AES128, SHA2, and DH Group 14.	Bar Total State Total State Total State Total State S
26	You will need to modify these sample configuration files to take advantage of AES256, SHA256, or other DH groups like 2, 14-18, 22, 23, and 24.	Distance assess
27	NOTE: If you customized tunnel options when creating or modifying your VPN connection, you may need to modify these sample configurations to match the custom settings for your tunnels.	Missing and
28		and a second s
29	Higher parameters are only available for VPNs of category "VPN," and not for "VPN–Classic".	PLATE RELEASED OF THE PROPERTY
30	The address of the external interface for your customer gateway must be a static address.	JAM
31	Your customer gateway may reside behind a device performing network address translation (NAT).	PROTECTION CONTRACTOR
32	To ensure that NAT traversal (NAT-T) can function, you must adjust your firewall !rules to unblock UDP port 4500.	ACCULATION AND A CONTRACT OF A
33	If not behind NAT, and you are not using an Accelerated VPN, we recommend disabling NAT–T. If you are using an Accelerated VPN, make sure that NAT–T is enabled.	
34	– IKE version : IKEv2	
35	Authentication Method : Pre-Shared Key	
36	– Pre–Shared Key : Psd	
37	- Authentication Algorithm : sha1	
38	- Encryption Algorithm : aes-128-cbc	
39	- Lifetime : 28800 Seconds	
40	- Phase I Negotiation mode : main	
41	- Diffe-nettman : Group 2	
42	#2. IPSec Configuration	
45		
14 ct	harsclers selected Spaces: 2	Plain Text

Note: AWS might generate a pre-shared key using the period or underscore characters (. or _). OCI does not support using those characters in a pre-shared key. A key that includes these values must be changed. To change your pre-shared key in AWS for a tunnel, select your VPN connection, click the Actions button, then

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Modify VPN Tunnel Options. Select the **IPSec Tunnel #1 Virtual Private Gateway outisde IP address** from the drop-down (you can find this in the AWS downloaded configuration file). Remove the period or underscore characters from your pre-shared key and click **Save changes**.

aws Services Q Searc	n [Option+S]	i i		D 4	Ohio •	
🛃 EC2 🕝 VPC 🔯 RDS 📴	IAM 🔁 S3					
 Virtual private network (VPN) 	VPN connections (1/1) Info	C	Actions Download con	figuration	Create VPN connecti	on
Customer gateways	Q Filter VPN connections		Edit static routes		< 1 >	0
Virtual private gateways			Modify VPN connection			
Site-to-Site VPN	Name \triangledown VPN ID \triangledown State	\bigtriangledown	Modify VPN tunnel certificate	ansit gateway		mer gate
connections	● MySQL-VPN vpn-0d2671318be47c28e		Modify VPN connection options		cgw-0	d4728ff9
Client VPN endpoints			Modify VPN tunnel options			
AWS Verified Access			Replace VPN tunnel			

aws 2 EC2	III Services Q Search ᢙ VPC 100 配 IAM 135 S3	[Option+S]	D 4 (Ohio 🔻 🛛
VPC	VPN connections > vpn-0d2671318be47c28e > Modify VPN tunnel options			١
Мо	dify VPN tunnel options Info			
Select	a VPN tunnel based on the tunnels outside IP address to modify its ipsec options.			
De	tails			
VPI D	V connection ID vpn-0d2671318be47c28e			
VPI	N tunnel outside IP address			
SI	elect tunnel outside IP address			
3	own lpsec is down	Cancel Save changes		
1 D	own Ipsec is down			

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🙋 EC2 🛛 🏠	VPC 🔯 RDS 🛅 IAM 🔂 S	3				
VPC > V	VPN connections > vpn-0d26713	18be47c28e > Modify VPN tunnel options				١
Modi	fy VPN tunnel opt	ions Info				
Select a VF	PN tunnel based on the tunnels out	side IP address to modify its ipsec options.				
Detai	ls					
VPN con	nnection ID -0d2671318be47c28e					
VPN tur 3.	nnel outside IP address	▼				
Inside II A size /3 Q, 16	Pv4 CIDR 50 IPv4 CIDR block from the 169.254.0.0/	16 range.				
Pre-sha The pre-	ared key shared key must have 8-64 characters. Va	lid characters: A-Z, a-z, 0-9, _ and . The key cannot begin	with a zero.			

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49. While still under Tunnel 1 in the downloaded configuration, scroll down to section **#3 Tunnel Interface Configuration**. Here, note down all the values for **Outside IP Addresses** and **Inside IP Addresses**.

Scroll down to section **#4: Border Gateway Protocol (BGP) Configuration** and note down the **Virtual Private Gateway ASN** value.

85 86 87	The Customer Gateway outside IP address was provided when the Customer Gateway was created. Changing the IP address requires the creation of a new Customer Gateway.
88 89 90 91	The Customer Gateway inside IP address should be configured on your tunnel interface.
92 93 94 95	Outside IP Addresses: – Customer Gateway : 1.1.1.1 – Virtual Private Gateway : 3
96 97 98 99	Inside IP Addresses – Customer Gateway : 169. – Virtual Private Gateway : 169.
100 101 102	Configure your tunnel to fragment at the optimal size: — Tunnel interface MTU : 1436 bytes
103 104	<pre>#4: Border Gateway Protocol (BGP) Configuration:</pre>
105 106 107 108 109	The Border Gateway Protocol (BGPv4) is used within the tunnel, between the inside IP addresses, to exchange routes from the VPC to your home network. Each BGP router has an Autonomous System Number (ASN). Your ASN was provided to AWS when the Customer Gateway was created.
110 111 112 113 114	BGP Configuration Options: - Customer Gateway ASN : 31898 - Virtual Private Gateway ASN : 64512 - Neighbor IP Address : 16 - Neighbor Hold Time : 30

50. Log back in to <u>OCI</u>. From the OCI Navigation menu, navigate to **Networking**, click **Customer connectivity**, and click on **Customer-premises equipment**.

51. Click Create CPE.

ORACLE Cloud	Search resources, services, docum	nentation, and Marketplace		US East (Ashburn) 🗸	\bigcirc	4 0	0 @	9 0				
Networking > Customer connectivity	 Customer-premises equipment 											
Customer connectivity	Customer-pre	mises equipment in	(root) Compartmen	t								
Overview	Configure your on-premises network (VCN).	device (the customer-premises equipment, or CPE) a	t your end of the Site-to-Site VPN so traffic can fl	ow between your on-premise	es netwo	ork and vir	tual clou	bı				
Site-to-Site VPN	Create CPE											
FastConnect	Name	IP address	Created									
Dynamic routing gateway Customer-premises equipment			No items found.									
		Showing 0 items < 1 of 1 >										
List scope												
Compartment												
(root)	\$											

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52. Enter a **CPE name**. For the **Public IP address**, input the **Outside IP Address of the Virtual Private Gateway** - you can find this in the configuration file downloaded from AWS. For **CPE Vendor**, select **Other** from the dropdown. Click **Create CPE**.

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	Create CPE								Hel	<u>0</u>
	Name									
	MySQL-CPE									
	Create in compartment									
	(root)								¢	
	Allow IPSec over FastConnect	t								
	IP address									
	3.									
	This IP address will be used as your CPE IP	KE identifier.								
	Cpe vendor informa	tion (i)								
	Vender (i)									
	Other								\$	
	Add tags to organize your resourc	es. What can I do with tagging?								
	Tag namespace		Tag key	Tag value						
	None (add a free-form tag)	\$								5
								Add tag	g	
	Create CPE Save as stack	Cancel								
	Terms of Use and Privacy Cookie Prefe	erences			Copyright © 2023, Oracle a	and/or its	affiliates.	All rights	reserve	ed.

- 53. From the OCI Navigation menu, navigate to **Networking** and click on **Site-to-Site VPN**.
- 54. Click Create IPSec connection.

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Networking > Customer connectivity >	Site-to-Site VPN												
Customer connectivity	Site-to-	-Site VPN in	(root) Compartmen)t									
Overview	If your users h	fyour users have client devices that need offsite access to Oracle Cloud resources, you can also create an OpenVPN access server. See their marketplace solution.											
Site-to-Site VPN	Create IPS	ec connection Start VPN wiz	tard										
Dynamic routing gateway	Name	Lifecycle state	Customer-premises equipment	Dynamic routing gateway	Cre	ated							
Customer-premises equipment			No items found	d.									
List scope					Showing	0 items	< 1 of 1	>					
Compartment (root)													



55. Enter a **IPSec connection name**. Under **Customer-premises equipment** dropdown, select the CPE we previously created. For **Dynamic routing gateway compartment** select the DRG we created. For **Routes to your on-premises network**, enter **0.0.0.0/0**.

ORACLE Cloud Search resources, services, docu	entation, and Marketplace US East (Ashburn) 🗸 🕢 💮 🌐 🧕
Networking > Customer connectivity > Site-to-Site VPN	Create IPSec connection
Customer connectivity Site-to-Site V Site-to-Site VPN securely of Overview If your users have client de	N Name MySQL-VPN
Site-to-Site VPN FastConnect	Create in compartment (root) Customer compare acuiment image (root) Customer compare acuiment image (root)
Dynamic routing gateway Name Life Customer-premises equipment	Le st Customer-premises equipment in (OU) (<u>Change compartment</u>) MySQL-CPE (3. Image: Compartment in the compartment in
List scope Compartment root)	Dynamic routing gateway compartment root (Change compartment) MySQL-DRG This will create an attachment to the DRG for each IPSec tunnel. The attachment has the type IPSEC_TUNNEL, and uses the default route
Filters	table for that attachment type. To use static routing instead of BGP dynamic routing, provide at least one static route (an IPv4 CIDR block and optionally an IPv6 prefix). Otherwise, see the tunnel-specific options below to configure BGP or policy-based routing. You can also enter a unique local address (ULA) in place of an IPv6 prefix.
(root) (<u>Change compartment</u>) Any DRG	Routes to your on-premises network 0.0.0.00 × Notes an IPv4 CIDR block or IPv6 prefix. Press enter after typing each one. Example: 10.0.0.0/24 or 2001:db2:6/126 Notes and the second s
Customer-premises equipment in oot) (Change compartment) Tarme of Use and Palace, Cashie Balanceses	Create IPSec connection Cancel

56. While on the Create IPSec connection page, configure your **Tunnel 1**. Enter a **tunnel name**, check the **Provide custom shared secret** box, and input the **Pre-Shared Key** from the AWS VPN configuration file. For **IKE version**, select **IKEv2** and under **Routing type** - make sure **BGP dynamic routing** is selected.

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Networking > Customer connectivity > Si	ite-to-Site VPN		Create IPSec connection	Create IPSec connection							
Customer connectivity	Site-to-	Site VPN	✓ Tunnel 1								
Overview	Site-to-Site VPN securely connect		Name Optional Tunnel-1	Name Optional Tunnel-1							
FastConnect	Create IPSe	ec connection	Provide custom shared secret (i)								
Dynamic routing gateway Customer-premises equipment	Name	Lifecycle st	Shared secret								
List scope		2892MII/A	IKE version ① IKEv2				\$				
Compartment (root)			Routing type ④	Static routing	Policy based	routing					
Filters			The available routes are learned dy- namically through BGP. The Oracle router learns the routes from your on- premises network, and advertises your	Routes are static and not learned dy- namically. Here you provide routes to your on-premises network that you want the Oracle router to know about.	Use this option for device or if you red tion domains.	a policy based CF quire multiple encry	′Ε /p-				
Dynamic routing gateway in r (root) (<u>Change compartment</u>)			VCN's subnets to your on premises network.	Your network engineer must also con- figure your CPE device with static routes to the VCN's subnets.			6	ച			
Any DRG			BGP ASN					-) 			
Customer-premises equipment in r. (root) (Change compartment)			Create IPSec connection Gancel								
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57. Under **BGP ASN**, input the **BGP Virtual Private Gateway ASN** from the AWS VPN configuration file. The default AWS BGP ASN is **64512**. For **IPv4 inside tunnel interface - CPE**, enter the **Inside IP Address of the Virtual Private Gateway**. For **IPv4 inside tunnel interface - Oracle**, enter the **Inside IP Address of the Customer Gateway**. You can find all this information from the AWS VPN configuration file.

Networking > Customer connectivity	Site-to-Site VPN		Create IPSec connection				
Customer connectivity Overview Site-to-Site VPN FastConnect Dynamic routing gateway Customer-premises equipment List scope Compartment (root) Filters Dynamic routing gateway in root) (Change compartment) Any DRG	Site-to- Site-to-Site VP If your users ha Create IPSd Name	Site VPN N securely connect ave client devices th c connection	Routing type () BGP dynamic routing The available routes are learned dy- namically through BGP. The Oracle router learns the routes from your on- provises network, and advertises your VCN's subnets to your on premises network. BGP ASN 64512 IPV4 inside tunnel interface - CPE () 169	Static routing Routes are static and not learned dy- namically. Here you provide routes to your on-premises network that you want the Oracle router to know about. Your network engineer must also con- figure your CPE device with static routes to the VCN's subnets.	Policy based routing Use this option for a policy based CPE device or if you require multiple encryp- tion domains.		
Customer-premises equipment in (root)			Create IPSec connection Cancel				

58. Configure your **Tunnel 2** by copying and pasting the same values from Tunnel 1 into Tunnel 2. Click **Create IPSec connection**.

		rvices, documentatio	n, and Marketplace		US East (Ashburn) 🗸 👩 🎊	•
Networking > Customer connectivity > S	Site-to-Site VPN		Create IPSec connection			Help
Customer connectivity Overview Site-to-Site VPN FastConnect	Site-to- Site-to-Site VP If your users ha	Site VPN N securely connect ave client devices the ec connection	Tunnel 2 Name Optional Tunnel-2 Provide custom shared secret ①			
Dynamic routing gateway Customer-premises equipment List scope Compartment	Name	Lifecycle st	Shared secret Only numbers, letters, and spaces are allowed. IKE version ① IKEv2			•
Filtors Dynamic routing gateway in (coat) (Change compartment)			Routing type ① BGP dynamic routing The available routes are learned dy- namically through BGP. The Oracle router learns the routes from your on- premises network, and advertises your VCN's subnets to your on premises network.	Static routing Routes are static and not learned dy- namically. Here you provide routes to your on-premises network that you want the Oracle router to know about. Your network engineer must also con- figure your CPE device with static routes to the VCN's subnets.	Policy based routing Use this option for a policy based CPE device or if you require multiple encryp- tion domains.	
Any DRG Customer-premises equipment in root) (Change compartment)			BGP ASN 64512 Create IPSec connection Cancel			

Note: only Tunnel 1 will be used for this VPN connection and migration. We need to configure Tunnel 2 otherwise we cannot click Create IPSec connection.

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59. After your IPSec connection is provisioned, make note of the **Oracle VPN IP Address** of **Tunnel-1**. This address will be used to create a new customer gateway in the AWS portal.

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Networking > Customer connectivity	> Site-to-Site VPN >	MySQL-VPN								
	(i) Afte	r creating an IPSec connec	tion, your configuration i	information will be available und	der the CPE & tunnels informatic	n tab under IPSec connection	าร.		Close	
	MySQ	L-VPN								
IPC	Edit Ch	oose new compartment	Add tags Open CP	PE configuration helper Terr	ninate					
	IPSec co	onnection information	CPE & tunnels in	formation Tags						
AVAILABLE	Static rou	Ite CIDR block: Not in use	(all tunnels use BGP) <u>SI</u>	i) won	OCID:hgydda Show Copy					
	Created: Site-to-S	Wed, Sep 20, 2023, 13:22: ite VPN version: v2 (i)	29 UTC		CPE: MySOL-CPE					
Resources	Tunnel	s in r	oot) Compar	tment						
Tunnels (2)	Name	Lifecycle state (i)	IPSec status (i)	Oracle VPN IP address	IPv4 BGP status (i)	IPv6 BGP status (i)	Routing	g type		
Dynamic routing gateway attachments (2)	Tunnel-1	Available	Down	150.1			BGP dy	namic routin	9	:
Logs	Tunnel-2	Available	Down	150.1			BGP dy	namic routin		
								Showin	a 2 10	

60. Log back in to <u>AWS</u>. Expand the Services menu at the top left of the screen. Navigate to **Networking & Content Delivery** and select **VPC**. From the left-hand menu, scroll down and click **Customer Gateways** under Virtual private network (VPN). Click **Create customer gateway** once you have landed on the appropriate page.

aws Services Q Searc	[Option+S]	Σ & ⑦ @ Ohio ▼
🙋 EC2 🛛 VPC 🔯 RDS 🦻	\$3	
 Virtual private network (VPN) 	Customer gateways (1) info	C Actions ▼ Create customer gateway ⓒ
Customer gateways	Q Find resource by attribute or tag	< 1 > @
Virtual private gateways	Name ∠ Customer gateway ID	▼ BGP ASN ▼ IP address ▼ Type
Site-to-Site VPN	○ Temp-Gateway cgw-07454b149dc5fc4fd	31898 1.1.1.1 ipsec.1
connections		



61. Enter a customer gateway name. For BGP ASN, enter 31898 and for IP address, enter the Oracle VPN IP address for tunnel 1. Leave everything as-is and click Create customer gateway.

aws 🗰 Serv	ices Q Search		[Option+S]		Σ	\$	Ohio	• I	
🙋 EC2 🛛 🖓 VP	C 🔯 RDS 🛅 IAM	53							
VPC > Custo	omer gateways > Crea	ite customer gateway							٩
A customer ga network.	teway is a resource that y	you create in AWS that represents the customer gatew	ay device in your on-premises						
Details									
Name tag - Creates a tag	optional with a key of 'Name' and a va	alue that you specify.							
MySQL-C	G								
BGP ASN I The ASN of ye	e 256 characters or less in len nfo our customer gateway device.	ngth.							
31898									
Value must be IP address Specify the IP 150.	e in 1 - 2147483647 range. Info 2 address for your customer g	ateway device's external interface.							
Certificate A The ARN of a	ARN private certificate provisione	d in AWS Certificate Manager (ACM).							
Select cert	ificate ARN	•							
Device - opt Enter a name	tional for the customer gateway de	evice.							
Enter devi	ice name			@ 2023. Amazon Web Services. Inc.	or its affili	ates Pr	ivacy Term	s Cookie preferen	ces

62. From the left-hand AWS menu, scroll down and click **Site-to-Site VPN Connections** under Virtual Private Network (VPN). Select your VPN connection and click the **Actions** button, then **Modify VPN connection**.

aws Services Q Search	[Option+S]	⊡ 🗘 🕐 🞯 Ohio 🕶
🗗 EC2 🛛 VPC 🔯 RDS 🕞	53	
 Virtual private network (VPN) 	VPN connections (1/1) info	Actions Download configuration Create VPN connection
Customer gateways	Q Find resource by attribute or tag	Edit static routes < 1 > 🞯
Virtual private gateways	Name X VPN ID V State V	Modify VPN connection
Site to Site VPN		Modify VPN tunnel certificate
connections	● MySQL-VPN vpn-0196b4b6647a3eb8c ⊘Available	Modify VPN connection options cgw-07454b149
Client VPN endpoints		Modify VPN tunnel options



63. You will land on the Modify VPN connection page. Under **Target type**, select **Customer gateway** and for **Target customer gateway**, select the **new Customer Gateway** (not the Temp). Click **Save changes**.

aws	Services Q. Search	[Option+S]	D 4	⑦ ③ Ohio •	
6 EC2	🌀 VPC 🔯 RDS 😈 S3				
VPC >	<u>VPN connections</u> > <u>vpn-0196b4b6647a3eb8c</u> > Modify VPN connection				١
Mo	dify VPN connection 📷				
Select	a target type and the resource you would like to use.				
De	tails				
VPN	I connection ID				
ð	vpn-0196b4b6647a3eb8c				
Cur	rent VPN gateway				
đ	vgw-028f2331f39704da5				
Cur	rent customer gateway				
đ	cgw-07454b149dc5fc4fd				
Ch	ange target				
Targ	jet type				
Cu	stomer gateway 🔻]			
Targ	jet customer gateway				
cg	w-0988e7d6250c6020d 🔻]			
		Cancel Cancel			
		Save changes			
▶ Cloud	Shell Feedback		© 2023, Amazon Web Services, Inc. or its affil	iates. Privacy Terms	Cookie preferences

64. After a few minutes, your modified VPN connection should change its **State** from Modifying to **Available**.

aws Services Q Search	h [Option+S]	D 4 0	Ohio ▼
🙋 EC2 🛛 VPC 🔯 RDS 💽	\$ \$3		
 Virtual private network 			× 🛽
Customer gateways	VPN connections (1) info	C Actions Download configuration	Create VPN connection
Virtual private gateways	Q Find resource by attribute or tag		< 1 > ©
Site-to-Site VPN connections	Name 🟒 🛛 🔻 VPN ID 🗸	State $ abla \ \ Virtual private gateway \ abla \ \ Transit gateway$	マ Customer gatev
Client VPN endpoints	O MySQL-VPN vpn-0196b4b6647a3eb8c	⊘ Available vgw-028f2331f39704da5 –	cgw-0988e7d62



65. The VPN connection from OCI to AWS is now setup. To verify if your VPN tunnel is up, select your VPN connection and go to the **Tunnel details** tab which can be found on the same page. You should see a **Status** of **Up** (this will take a few minutes).

aws Services Q Sear	h [Option+S]	E & Ø Ø	Ohio 🔻
🙋 EC2 🛛 🖓 VPC 🔯 RDS 🧗	3 s3		
 Virtual private network (VPN) 	⊘ You successfully updated vpn-0196b4b6647a3eb8c / MySQL-VPN.		×
Customer gateways	VPN connections (1/1) info	C Actions Creation Creation	te VPN connection
Virtual private gateways	Q Find resource by attribute or tag		< 1 > 💿
Site-to-Site VPN connections	Name 🛃 🗢 VPN ID 🗢 State	▽ Virtual private gateway ▽ Transit gateway	
Client VPN endpoints	● MySQL-VPN vpn-0196b4b6647a3eb8c ⊘ Available	vgw-028f2331f39704da5 –	cgw-0988e7d62
AWS Verified Access			
Verified Access instances			
New			
Verified Access trust providers <u>New</u>			
Verified Access groups New	VPN connection vpn-0196b4b6647a3eb8c / MySQL-VPN	=	⊚ ×
Verified Access endpoints	Details Tunnel details Tags		
Transit gateways	A This VDN connection is not using both tunnels. This made of an available is not highly available.	single and us should use an figure your second turned	×
Transit gateways		stable and we strongly recommend you configure your second turnet.	^
Transit gateway attachments	Tunnel state		
Transit gateway policy	Tunnel number ▼ Outside IP address ▼ Inside IPv4 CIDR ▼ Inside IPv6 C	IDR	Details 🗢 🛛
tables	Tunnel 1 -	O Up November 28, 2023, 15:49:03 (UTC-05:00)	2 BGP ROUTES
Transit gateway route tables	Tunnel 2	8 Down November 28, 2023, 15:47:09 (UTC-05:00)	IPSEC IS DOWN

66. You can verify the same on the OCI side. Select your Site-to-Site VPN and under the Resources, click **Tunnels** (the page where you got the Oracle VPN IP address). You should see an **Up** status for **IPSec status** and **IPv4**

	Search resources, s	services, documentation,	and Marketplace			US East (Ashburn) v	~ @ L ()	Ð
letworking > Customer connectivit	ty » Site-to-Site VPN »	MySQL-VPN						
	MySQ	L-VPN						
	Edit Cr	noose new compartment	Add tags Open C	PE configuration helper Term	inate			
IPC	IPSec c	onnection information	CPE & tunnels i	nformation Tags				
	Static ro	ute CIDR block: Not in us	e (all tunnels use BGP) §	Show (i)	OCID:ryuoqa Show Copy			
	Created:	Tue, Nov 28, 2023, 18:00:	29 UTC	1	DRG: MySQL-DRG			
AVAILABLE	Site-to-S	iite VPN version: v2 (i)			CPE: MySQL-CPE			
lesources	Tunnel	ls <i>in</i> ravish6 (i	root) Compa	rtment				
Tunnels (2)	Name	Lifecycle state (i)	IPSec status (i)	Oracle VPN IP address	IPv4 BGP status (i)	IPv6 BGP status (i)	Routing type	
Dynamic routing gateway attachments (2)	Tunnel-1	Available	• Up		• Up	Down	BGP dynamic routing	
Logs	Tunnel-2	Available	Down		Down	Down	BGP dynamic routing	
							Showing) 2 ite

- 67. We are now ready to perform the migration.
- **35** Live Migration Guide: Amazon Aurora to HeatWave MySQL on Oracle Cloud Infrastructure (OCI) Copyright © 2024, Oracle and/or its affiliates. Public

III) On OCI, create a standalone HeatWave MySQL instance.

68. From the OCI Console, click on the navigation menu, click **Databases**, and click **HeatWave MySQL**. Click

Create DB System	I.									
= ORACLE Cloud	Search resour	ces, service	s, documentation, and M	arketplace			US East	t (Ashburn) 🗸 🗔	\$ ⑦	• •
MySQL DB Systems	DB	Syster	ms in	(root)	Compartmen	ht.				
Backups	Cre	ate DB Syste	em Actions -							
Channels		Name	DB System State	Crash Recovery	Delete Protected	High Availability	HeatWave Cluster	HeatWave State	Created	
Configurations				No DB s	vstems were found using	the selected compartm	ent and filters			
	0 sele	ected						Showing	0 items <	1 of 1 >
List scope										

69. Pick **Production** or **Development or testing** and enter **a MySQL DB system name**.

ORACLE Cloud Search resources, services, documentation, and Marketplace Create DB system	US East (Ashburn) ∨ ⊡ 🗘 ⑦ ⊕
Production Sets up a high availability DB system with recommended defaults for a production environment.	Development or testing Sets up a standalone DB system with recommended defaults for a development or testing environment.
Provide DB system information Create in compartment (root)	•
Name MySQL-HW	
The user-friendly name for the DB system. It does not have to be unique. Description Optional	
User-provided data about the DB system.	



70. Select Standalone, do not choose High Availability (HA) here as replicating to a MySQL HA instance on OCI for this migration may create some complications. You may enable HA after you have completed section VIII) of this live migration guide. Information on how to enable HA later can be found <u>here</u>. Turn ON the button for HeatWave MySQL - if you want to run OLTP, OLAP, and ML workloads. Afterwards, create your Administrator credentials that will be used to manage the HeatWave MySQL database.

Create DB System Standalone Jingle-instance DB system Jingh availability Run a DB system with 3 MySQL instances providing automatic failover and zero data loss						
Standalone High availability Single-instance DB system Image: Wight and						
Configure MySQL HeatWave MySQL HeatWave Show shares and configurations that support HeatWave Show shares and						
Create administrator credentials						
Username () admin Passwort						
Password						
Configure networking	Collapse					

71. For **Configuring Networking** - choose the earlier created VCN and make sure the **Private Subnet** is selected under **Subnet in <compartment-name>**. For **Configure Placement** leave it as-is.

				US East (Ashburn) V		
reate DB system						
Configure networking						Coll
The VCN and subnet where the DB system endpoin VCN, create a VCN.	t will be attached. The D	B system endpoint uses a private IP address and is not	directly accessible from the internet. \underline{H}	ow do I connect to a DB syst	tem? If you	do not hav
Virtual cloud network in (Change compartr	<u>nent)</u>					
MySQL-VCN						
Subnet in (Change compartment)						
private subnet-MySQL-VCN (Regional)						
Configure placement The availability domain/fault domain in which the DB	3 system endpoint will b	e physically placed. It is recommended to allow Oracle t	o choose the best placement for the fa	ult domain.		Coll
Configure placement The <u>availability domain/fault domain</u> in which the Da Availability domain	3 system endpoint will b	e physically placed. It is recommended to allow Oracle t	o choose the best placement for the fai	ult domain.		Coll
Configure placement The <u>availability domain/fault domain</u> in which the DR Availability domain AD-1	3 system endpoint will b	e physically placed. It is recommended to allow Oracle to	o choose the best placement for the fa	ult domain.		Coll
Configure placement The availability domain/fault domain in which the Di Availability domain AD-1 QDfL:US-ASHBURN-AD-1	3 system endpoint will b	e physically placed. It is recommended to allow Oracle t AD-2 QDfL:US-ASHBURN-AD-2	o choose the best placement for the fa	uit domain. IRN-AD-3		Coll
Configure placement The availability domain/fault domain in which the Di Availability domain AD-1 QDfL:US-ASHBURN-AD-1 Choose a fault domain If you do not select a fault domain, Oracle will choose the be	3 system endpoint will b	e physically placed. It is recommended to allow Oracle t AD-2 QDfL:US-ASHBURN-AD-2	o choose the best placement for the far AD-3 QDfL:US-ASHBU	ult domain. IRN-AD-3		Coll
Configure placement The availability domain/fault domain in which the Di Availability domain AD-1 ODfL:US-ASHBURN-AD-1 Choose a fault domain If you do not select a fault domain, Oracle will choose the be reate Save as stack Cancel	3 system endpoint will b	e physically placed. It is recommended to allow Oracle t AD-2 QDfL:US-ASHBURN-AD-2	o choose the best placement for the fa	ult domain. IRN-AD-3		Coll



72. **Configure hardware** (OCPU and Memory) for MySQL by choosing an appropriate DB Shape. For this guide, we will use the default HeatWave shape. For the **Data Storage Size** be sure to make the size large enough for future growth.

ORACLE Cloud Search resources, services, documentation, and Marketplace	US East (Ashburn) 🗸		Ĵ (?)	0
Create DB system					
Configure hardware				Collapse	
MySQL.HeatWave.VM.Standard CPU core count: 16 Memory size: 512 GB Max network bandwidth: 16Gbps		Char	nge shat	be	
A shape determines the number of OCPUs, memory, and other resources allocated to a MySOL instance of a DB system. The performance of a DB system depends on the shape you select. A shape has associated config advanced options. See supported shares. Data storage size (GB)	gurations, which you can select in	the Configur	ition tab u	nder Show	
1024 Storage allocated for data and log files. Storage size impacts IOPS and throughput. Data storage size must be an integer between 50 and 131,072. Total IDPS: 76800 Total throughput: 600 MB					
Create Save as stack Cancel					
Terms of Use and Privacy Cookie Preferences	Copyright © 2023, Oracle	ind/or its affi	iates. All	rights rese	erved.

73. **Configure a backup plan** according to what suits your needs. Lastly, scroll down until you see **Show advanced options**. Click on it to expand.

ORACLE Cloud	Search resources, services, documentation, and Marketplace US East (Ashbu	m) 🗸 🗔	L 🗘	?	٢	0
Create DB System	n					
1024						
Storage allocated for data and log	files. Storage size impacts IOPS and throughput. Data storage size must be an integer between 50 and 131,072.					
Total IOPS: 76800						
Total throughput: 600 MB						
						_
Configure backup pla						
 Enable automatic backups Enables automatic backups. You mill Backup retention period Optional 	ust also specify a retention period, and select a backup window. al ①					
7						
The retention period defines how long to	store the backups, in days.					
Enable point in time restore	0					
Enables you to restore from a DB sy	rstem at a point in time.					
Select backup window						
The backup window start time defin	es the start of the time period during which your DB system is backed up.					
Show advanced options						9
Kasta Sava sa stask Cas						
Save as slack						



es Hide advanced options								
Deletion plan Configuration Connections Crash recovery Maintenance	Data import Tags							
 Delete protected Protects the DB system against delete operations. To delete the DB system, this option must be disabled. By default, DB systems are Retain automatic backups after the DB system is deleted. By default, automatic backups are deleted if the DB system is deleted. 	 Delete protected Protects the DB system against delete operations. To delete the DB system, this option must be disabled. By default, DB systems are not delete protected. Retain automatic backups Retain automatic backups after the DB system is deleted. By default, automatic backups are deleted if the DB system is deleted. 							
Require final backup Require a final backup before deleting the DB system. By default, skip final backup.								
Create Save as stack Cancel								
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74. From the advanced options screen, go to the **Configuration** tab. If you have a custom configuration that you would like to apply to your HeatWave MySQL instance - you can do so by clicking **Select configuration**. Custom configurations allow you to tweak MySQL variables (i.e., max connections, binary log expire seconds, etc.) rather than using the default values. You must create a custom configuration in advance before applying. For more information regarding custom configurations, see <u>Configuration of a DB System</u>. For this guide, we have chosen the default configuration.

Hide advanced options								
Deletion plan Configuration	Connections	Crash recovery	Maintenance	Data import	Tags			
Select a configuration Optional								
Using default configuration	on for selected sha	pe MySQL.VM.Sta	ndard.E4.4.64GE	3		Select configuration	Reset configuration	
MySQL version								
Select a MySQL version								
Create Save as stack Cancel								
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75. For **MySQL version**, choose either **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 <u>Introducing MySQL Innovation and Bug fix versions</u>. For this guide, we have chosen **8.0.35 - Bug fix**.

Hide advanced o	ptions								
Deletion plan	Configuration	Connections	Crash recovery	Maintenance	Data import	Tags			
Select a configural	ion Optional								
Using defa	ault configuration	for selected shap	be "MySQL.VM.Sta	andard.E4.4.64G	В"		Select configuration	Reset configuration	
MySQL version Select a MySQL	version								ן בי
8.2.0 - Innovatio	n								
8.1.0 - Innovatio	n (Deprecated)								
8.0.35 - Bug fix								[
8.0.34 - Bug fix								l	:::
8.0.33 - Bug fix									
Create Save as	stack Cancel								
ierms of Use and Privacy	Cookie Preferences						Copyright © 2023, Oracle	and/or its affiliates. All rights re	serve

76. Click **Create** to finish the HeatWave MySQL DB system creation process.

Be Hide advanced	options								
Deletion plan	Configuration	Connections	Crash recovery	Maintenance	Data import	Tags			
Select a configura	tion Optional								
Using def	ault configuration	for selected shap	be "MySQL.VM.Sta	andard.E4.4.64G	В"		Select configuration	Reset configuration	
MySQL version									
8.0.35 - Bug fix									
Create Save as	stack Cancel								
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77. Your HeatWave MySQL DB system will start **CREATING**.

	earch resources, services, documentation, and Marketplace		US East (Ashburn) 🗸	\bigcirc	\Diamond	?	٢	0
MySQL HeatWave » DB systems » DB s	system details							
	MySQL-HW							
DPC	Edit Performance Hub Start Stop More actions -							
DD2	DB system information Connections Tags							
	General information	Associated services						
CREATING	OCID:6flau7wqcq Show Copy Description: -	Database Management: Disabled (D					

78. Within a few minutes, HeatWave MySQL DB system will change its state from CREATING to **ACTIVE** once the instance is ready.

	resources, services, documentat	tion, and Marke	place		US East (Ashburn) 🗸	ি	\bigtriangleup	?	• •
MySQL HeatWave » DB systems » DB system	n details								
	MySQL-HW								
DDC	Edit Performance Hub St	Start Stop	More actions 👻						
DBS	DB system information	Connection	s Tags						
	General informatio	on		Associated serv	vices				
ACTIVE	OCID:6flau7wqcq Show C	<u>Loby</u>		Database Management: 🗋	Details Disable (i)				

79. On the same DB system details page, click **Connections** to grab the **private IP address** for HeatWave MySQL. Save the private IP Address for later use.

E ORACLE Cloud	Search resources, services, documentation, and Marketplace	US East (Ashburn) ✓ 🔯 🇘 ⑦ 🜐 😧
MySQL HeatWave > DB systems >	DB system details	
	MySQL-HW	
	Edit Performance Hub Start Stop More actions	
DB2	DB system information Connections Tags	
	Networking	Endpoint
ACTIVE	Virtual cloud network: MySQL-VCN	Connect to the DB system using a MySQL client/connector via the endpoint below. How do Lconnect?
AUTIL	Subnet: private subnet-MySQL-VCN Subnet type: Regional	Private IP address: 10.0.1.220 Copy.
	outries types negloritar	Internal FQDN: -
		MySQL port: 3306
		MySQL X protocol port: 33060

Note: you can navigate to the **DB System Details** page by going to the Navigation menu in OCI. Click **Databases** and click **HeatWave MySQL**. Click on the name of your MySQL DB System to open the **DB System Details** page.

IV) Install MySQL Shell 8.2 or above on an EC2 instance that can connect to Amazon Aurora MySQL.

- 80. Login to <u>AWS</u>. From the Services menu, go to **Compute** and select **EC2**.
- 81. Click Launch instance.

aws Services Q Searc	ch [Option+S]	D 🗘 🧿 🞯 Ohio 🕶 🗸
🙋 EC2 🖓 VPC 🔯 RDS 🚦	ам 🕞 S3	
▼ Instances	Instances Info	C Connect Instance state ▼ Actions ▼ Launch instances ▼
Instances	Q. Find instance by attribute or tag (case-sensitive)	
Instance Types	Instance state = running X Clear filters	
Launch Templates		< 1 > @
Spot Requests	Name v Instance ID Instance state	
Savings Plans		No matching instances found
Reserved Instances		No matching instances found
Dedicated Hosts		
Capacity Reservations		

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

llowing the sim	ws you to create ple steps below	virtual machine	es, or instances, i	that run on the	e AWS Cloud. Q	Quickly get started by	▼ Summary		
Name and	tags info						Number of instances Info		
Name MySQL-EC2					A	Add additional tags	Software Image (AMI) Provided by Red Hat, Inc. ami-02b8554ff4b424959		
 Applicat 	ion and OS	lmages (Am	iazon Machir	ne Image)	Info		Virtual server type (instance type) t2.micro Firewall (security group)		
							New security group		
An AMI is a ten applications) re below	mplate that con equired to laun	tains the softwa	are configuration e. Search or Brow	(operating system of the syste	stem, applicatio you don't see w	on server, and vhat you are looking for	Storage (volumes) 1 volume(s) - 10 GiB		
An AMI is a ten applications) re below Q. Search ou Quick Start	mplate that con required to laun Ir full catalog in t	tains the softwa ch your instance cluding 1000s o	are configuration a. Search or Brow <i>f application and</i>	(operating sys se for AMIs if 1 OS images	stem, applicati you don't see w	on server, and vhat you are looking for	Storage (volumes) 1 volume(s) - 10 GiB Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free		
An AMI is a ten applications) re below Q Search ou Quick Start Amazon Linux aWS	mplate that con required to laun rr full catalog in t macOS	tains the softwa ch your instance cluding 1000s o Ubuntu ubuntu®	are configuration e. Search or Brow of application and Windows Microsoft	(operating sys se for AMIs if 1 OS images Red Hat	SUSE Lii	On server, and what you are looking for Q Browse more AMIs Including AMIs from AWS, Marketplace and the Community	Storage (volumes) 1 volume(s) - 10 GiB Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 30 GiB of EBS storage, 2 million IOs, 1 GB of snapshots, and 100 GB of bandwidth to the internet.		



83. 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.

aws	Services Q. Search	[Option+S]		2	¢	0	۲	Ohio 🔻	
ල් EC:	2 🌀 VPC 😥 RDS 📴 IAM 🔁 S3								
=	▼ Instance type Info		▼ Summary						٩
	Instance type t2.micro Free tier eligit Family: t2 1 VCPU 1 GiB Memory Current generation: true On-Demand Linux base pricing: 0.0116 USD per Hour	All generations	Number of instances Info 1						
	On-Demand SUSE base pricing: 0.0116 USD per Hour On-Demand Windows base pricing: 0.0102 USD per Hour On-Demand RHEL base pricing: 0.0716 USD per Hour Additional costs apply for AMIs with pre-installed software	Compare instance types	Software Image (AMI) Provided by Red Hat, Inc. ami-02b8534ff4b424939						
			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. Ensure that you h before you launch the instance.	ave access to the selected key pair	Storage (volumes) 1 volume(s) - 10 GiB						
	Key pair name - required								
	MySQL-Key	 C Create new key pair 	Free tier: In your first year includes X 750 hours of 12 micro (or 13 micro in						

84. 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 allows SSH from anywhere.

Services Q Search		[Option+S]	D 🕹 Ø	🙆 Ohio 🔻
🏠 VPC 🔯 RDS 🛅 IAM	🔁 S3			
Network settings in	ıfo		▼ Summary	
VPC - required Info				
vpc-0e70c2c402d3ceb74 (M 10.1.0.0/16	lySQL-vpc)	▼ C	1	
Subnet Info				
subnet-0e8e28c5ae0c364d4 VPC: vpc-0e70c2c402d3ceb74 IP addresses available: 4090 C	B MySQL-subnet-public1-us-eas Owner: 528770944777 Availability Zone: us-east-2 IDR: 10.1.0.0/20)	t-2a 2a ▼ C Create new subnet [2]	Software Image (AMI) Provided by Red Hat, Inc. ami-02b8534ff4b424939	
Auto-assign public IP Info			Virtual server type (instance type)	
Enable		•	t2.micro	
Firewall (security groups) In A security group is a set of firewall instance.	fo I rules that control the traffic for your instance. Add ru	les to allow specific traffic to reach your	Firewall (security group) New security group	
• Create security group	○ Select existing security g	roup	Storage (volumes)	
			1 volume(s) - 10 GiB	
Security group name - require	ed			
Launch-wizard-2 This security group will be added f	to all network interfaces. The name can't be edited aft	er the security group is created. Max length is	Free tier: In your first year includes	
Inbound Security Group Rules Security group rule 1 (TCP,	s 22, 0.0.0/0)	Remove	Software Image (AMI) Provided by Red Hat Inc	
			ami-02b8534ff4b424939	
Type Info	Protocol Info	Port range Info	Virtual server type (instance type)	
ssn		22	t2.micro	
Source type Info	Source Info	Description - optional Info	Firewall (security group)	
Anywhere	▼ Q Add CIDR, prefix list or security	e.g. SSH for admin desktop	New security group	
	0.0.0.0/0 ×		Storage (volumes) 1 volume(s) - 10 GiB	
Rules with source of 0. security group rules to	0.0.0/0 allow all IP addresses to access your in allow access from known IP addresses only.	istance. We recommend setting $ imes$	Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in	
Add security group rule			the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 30 GiB of EBS	
Advanced network config	guration		storage, 2 million IOs, 1 GB of snapshots, and 100 GB of bandwidth	

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

▼ Configure storage Info	Advanced	New security group	
1x 10 GiB gp2 Root volume (Not encrypted) ③ Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic store Add new volume	nge X	1 volume(s) - 10 GiB Free tier: In your first year includes 750 × hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 30 GiB of EBS storage, 2 million 10s, 1 GB of snapshots, and 100 GB of bandwidth to the internet.	
0 x File systems	Edit	dit	
► Advanced details Info		Cancel Launch instance Review commands	
CloudShell Feedback Language		© 2023, Amazon Web Services, Inc. or Its affiliates. Privacy Terms Cookie preferenc	es

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

S 7		Servic	es	Q Se	arch		[Option+S]			D	\$	0	٢	Ohio 🔻	
EC2	ි <u>EC2</u>	VPC	çoş nstanc	RDS	🛅 IAM 🕞 S3 Launch an instance										
	0) Suc	cess	lv initi	iated launch of instance (i.C	8d07ab77e1ee2513)									
	,	► Lau	nch lo	g		<u>000700776162213</u>) -									
	M	Vext	Step	s											
		QИ	/hat w	ould y	ou like to do next with this i	nstance, for example "create ala	rrm" or "create backup"				<	12	34	56	>
	C a T u t	Creat alerts To mai up emai ier usa	e bil S nage c ail not age th	ling a osts a ificatio reshol	and free tier usage nd avoid surprise bills, set ons for billing and free ds.	Connect to your in Once your instance is n from your local compu Connect to instance	nstance unning, log into it ter.	Connect an RD Configure the conr instance and a data between them.	DS database nection between an EC2 abase to allow traffic flow	Creat creat reten	e a policy tion, and reate EB	snapsl y that au deletion 5 snapsh	hot po tomates n of EBS not polic	licy s the creat snapshots cy [2]	ion, s
		Cre	ate bi	lling	alerts 🖸	Learn more 🗹		Create a new RDS of Learn more	database 🚺						

87. If you are using the SSH client to connect to your EC2 instance, copy the **Example** SSH command and login to your EC2 instance.

aws	Services Q Search [Option+S]	D	¢	0	٢	Ohio 🔻	
EC2	2 🕝 VPC 💀 RDS 🧧 IAM 😼 S3						
=	EC2 > Instances > i-08d07ab77e1ee2513 > Connect to instance						
	Connect to instance Info Connect to your instance i-08d07ab77e1ee2513 (MySQL-EC2) using any of these options						
	EC2 Instance Connect Session Manager SSH client EC2 serial console						
	Instance ID D: -08d07ab77e1ee2513 (MySQL-EC2) 1. Open an SSH client.						
	2. Locate your private key file. The key used to launch this instance is MySQL-Key.pem						
	 Run this command, if necessary, to ensure your key is not publicly viewable. chmod 400 MySQL-Key.pem 						
	4. Connect to your instance using its Public DNS:						
	⊘ Command copied						



88. 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.

- 89. We are now successfully connected to the EC2 instance.
- 90. After making a connection to the EC2 instance, go to the below website and download MySQL Shell 8.2 on your EC2 instance. From the MySQL Shell download page, ensure 8.2.x Innovation or higher is selected under Select Version. MySQL Shell 8.2 is fully compatible with MySQL 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.

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

MySQL Community Downloads			
MySQL Shell			
General Availability (GA) Releases Archives 🖓			
MySQL Shell 8.2.1 Innovation			
Select Version:			
8.2.1 Innovation	~		
Select Operating System:			
Red Hat Enterprise Linux / Oracle Linux	~		
Select OS Version:			
Red Hat Enterprise Linux 9 / Oracle Linux 9 (x86, 64-bit) ~		
	8.2.1	24.4M	Download
крм Раскаде			
(mysql-shell-8.2.1-1.el9.x86_64.rpm)		MD5: 5244a35845c7e5f	e78847132d43338
(mysql-shell-8.2.1-1.el9.x86_64.rpm) RPM Package, Debug Information	8.2.1	MD5: 5244a35845c7e51	e78847132d43338 Download

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>.

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



92. 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-8.2.1-

1.el9.x86 64.rpm

[ec2-user@ip-~]\$ wget https://dev.mysql.com/get/Downloads/MySQL-Shel l/mysql-shell-8.2.1-1.el9.x86_64.rpm --2023-11-22 00:00:51-- https://dev.mysql.com/get/Downloads/MySQL-Shell/mysqlshell-8.2.1-1.el9.x86 64.rpm Resolving dev.mysql.com (dev.mysql.com)... 23.61.160.86, 2600:1408:ec00:884::2e 31, 2600:1408:ec00:88e::2e31 Connecting to dev.mysgl.com (dev.mysgl.com) 23.61.160.86 :443... connected. HTTP request sent, awaiting response... 302 Moved Temporarily Location: https://cdn.mysql.com//Downloads/MySQL-Shell/mysql-shell-8.2.1-1.el9. x86_64.rpm [following] --2023-11-22 00:00:51-- https://cdn.mysgl.com//Downloads/MySQL-Shell/mysgl-she 11-8.2.1-1.el9.x86_64.rpm Resolving cdn.mysql.com (cdn.mysql.com)... 23.61.188.8, 2600:1408:ec00:888::1d6 8, 2600:1408:ec00:88f::1d68 Connecting to cdn.mysgl.com (cdn.mysgl.com) 23.61.188.8 :443... connected. HTTP request sent, awaiting response... 200 OK Length: 25586249 (24M) [application/x-redhat-package-manager] Saving to: 'mysql-shell-8.2.1-1.el9.x86_64.rpm'

Note: to install wget on the EC2, execute:

\$ sudo yum install wget

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

\$ sudo yum localinstall mysql-shell*

/	~]\$ sudo	yum localinstall	mysql-shell-8.2.1-1.	el9.x86_6					
4.rpm									
Updating Subscription Management repositories.									
Unable to read consumer identity									
This system is not registered with an entitlement server. You can use subscrip ion-manager to register.									
Last metadata expi	ration check: 0	:00:57 ago on We	d 22 Nov 2023 12:00:0	4 AM UTC.					
Dependencies resolved.									
Dependencies resor									
Package	Architecture	Version	Repository	Size					
Package Installing: mysgl-shell	Architecture x86 64	Version 8.2.1-1.el9	Repository 	Size ====================================					
Package Installing: mysql-shell	Architecture ====================================	Version 8.2.1–1.el9	Repository 	Size 24 M					
Package Installing: mysql-shell	Architecture Architecture x86_64	Version 8.2.1–1.el9	Repository 	Size 24 M					

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

\$ mysqlsh -	vers	ion											
[[ec2-user(0ip−			~]\$ m	ysq]	lshv	ers	sion					
mysqlsh er (GPL))	Ver	8.2.1	for	Linux	on	x86_64	_	for	MySQL	8.2.0	(MySQL	Community	Serv
[ec2-user(0ip−1		- ^ í	~]\$									

95. To login to your Amazon Aurora MySQL using MySQL Shell, use the below commands:

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

-OR-

```
$ mysqlsh -u <user> -p -h <hostname> -P <port-number>
[ec2-user@ip-
                      ~]$ mysqlsh admin@database-1-instance-1.
                                                                           .us
-east-2.rds.amazonaws.com
Please provide the password for 'admin@database-1-instance-1.
                                                                        i.us-ea
st-2.rds.amazonaws.com': *******
Save password for 'admin@database-1-instance-1.
                                                          .us-east-2.rds.amazo
naws.com'? [Y]es/[N]o/Ne[v]er (default No): Y
MySQL Shell 8.2.1
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.a
mazonaws.com'
Fetching schema names for auto-completion... Press ^C to stop.
Your MySQL connection id is 5104
Server version: 5.7.12-log MySQL Community Server (GPL)
No default schema selected; type \use <schema> to set one.
MySQL database-1-instance-1. .us-east-2 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.

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V) For your Amazon Aurora MySQL, ensure log_bin is set to 1, ensure binlog_format is set to ROW, and execute the mysql.rds_set_configuration stored procedure to retain binary logs.

96. Stay connected to your Aurora instance and execute the below commands to ensure your Aurora is configured correctly for the live migration.

MySQL JS> \sql		
MySQL SQL> SELECT @@log bin;		
MvSOL SOL> SELECT @@binlog for	mat;	
MySQL database-1-instance-1.		.us-east-2 JS > \sql
Switching to SQL mode Comma	ands end with	h ;
Fetching global names for auto	-completion	Press <u>C to stop</u> .
MySQL database-1-instance-1.		.us-east-2 SQL > SELECT @@log_bin;
++		
@@log_bin		
++		
↓		
1 row in set (0.0005 sec)		
MySQL database-1-instance-1.		.us-east-2 SQL > SELECT @@binlog_format;
++		
@@binlog_format		
++		
ROW		
++		
MySOL database_1_instance_1		US-02ST-2 SOL S SHOW BINARY LOGS.
		+
Log_name	File_size	Í
+		÷
mysql-bin-changelog.000003	154	
mysql-bin-changelog.000004	692708	
+		+
2 rows in set (0.0006 sec)		
MySQL database-1-instance-1.		.us-east-2 SQL >

Note: you must have a value of 1 for log_bin and a value of ROW for binlog_format.

97. After confirming you have binary logs on Aurora, execute the below stored procedure to retain the binary logs - as <u>Amazon Aurora normally purges a binary log as soon as possible</u>. For us to perform the live database migration - we will need to retain the current binary log that is in use/will be used during the data export of Aurora and the binary logs that will be generated afterwards. The binary logs will be needed until the replication setup is completed on OCI. Since the sample database 'world' (the one that will be migrated to HeatWave MySQL on OCI for the purposes of this step-by-step guide) is fairly small, we will set the binary log retention hours to 24. Set the binlog retention hours required depending on the data that you are migrating, high volumes of data will require a longer retention period; monitor the usage of your Aurora system afterwards.

MySQL SQL> call mysql.rds set configuration('binlog retention hours', 24);

MySQL database-1-instance-1.	.us-east-2.rds SQL > call mysql.rds_set_config
<pre>uration('binlog retention hours', 24);</pre>	
Query OK, 0 rows affected (0.0114 sec)	
MySQL database-1-instance-1.	.us-east-2.rds <mark>SQL</mark> >

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VI) Connect to Amazon Aurora MySQL using MySQL Shell and create a replication user. Afterwards, execute the MySQL Shell util.copyInstance() utility to export all schemas (including users, indexes, routines, triggers) from Amazon Aurora MySQL to HeatWave MySQL on OCI. After the util.copyInstance() utility finishes, save the MySQL Shell Dump metadata values.

- 98. Before 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.copyInstance(). 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 &
- 99. 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-
                            ~]$ tmux
                            ~]$ mysqlsh admin@database-1-instance-1.
                                                                                 1.us-east-2.1
   [ec2-user@ip-
   ds.amazonaws.com
   MySQL Shell 8.2.1
   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 5133
   Server version: 5.7.12-log MySQL Community Server (GPL)
   No default schema selected; type \use <schema> to set one.
   MySQL database-1-instance-1.
                                      .us-east-2.rds JS >
100.
         Change to the SQL mode of MySQL Shell and create a replication user, we will use this user to
   establish a replication connection from Aurora MySQL to HeatWave MySQL on OCI.
   MySQL SQL> CREATE USER 'repl'@'%' IDENTIFIED BY '<password>';
   MySOL SOL> GRANT REPLICATION SLAVE ON *.* TO 'repl'@'%';
```

MySQL database-1-instance-1.	.us-east-2.rds SQL > CREATE USER 'repl'@'%' ID
ENTIFIED BY 'MySQL8.0';	
Query OK, 0 rows affected (0.0160 sec)	
MySQL database-1-instance-1.	.us-east-2.rds SQL > GRANT REPLICATION SLAVE O
N *.* TO 'repl'@'%';	
Query OK, 0 rows affected (0.0052 sec)	
MySQL database-1-instance-1.	.us-east-2.rds SQL >

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101. Change to the JavaScript mode of MySQL Shell and run the util.copyInstance() utility to export all Amazon Aurora MySQL data into HeatWave MySQL on OCI.

```
MySQL JS> \js
MySQL JS> util.copyInstance('mysql://admin@10.0.1.220', {"compatibility":
["force_innodb", "skip_invalid_accounts", "strip_definers",
"strip_restricted_grants", "strip_tablespaces", "ignore_wildcard_grants",
"strip_invalid_grants", "create_invisible_pks"], updateGtidSet: "append", users:
"true", threads: 4, dryRun:"true"})
```

Note: replace the username (admin) and IP address (10.0.1.220) with your HeatWave MySQL username and IP address (not the Amazon Aurora MySQL username and IP address).

MySQL database-1-instance-1. .us-east-2.rds JS > util.copyInstance('mysql:/ /admin@10.0.1.220', {"compatibility": ["force_innodb", "skip_invalid_accounts", "strip_d efiners", "strip_restricted_grants", "strip_tablespaces", "ignore_wildcard_grants", "str ip_invalid_grants", "create_invisible_pks"], updateGtidSet: "append", users: <u>"true", thr</u> eads: 4, dryRun:"true<u>"</u>}) Please provide the password for 'admin@10.0.1.220': ******** Save password for 'admin@10.0.1.220'? [Y]es/[N]o/Ne[v]er (default No): Y Copying DDL, Data and Users from in-memory FS, source: ip-:3306, target: fw5e rxp3afmvjpsu:3306. SRC: dryRun enabled, no locks will be acquired and no files will be created. NOTE: SRC: 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. SRC: Acquiring global read lock WARNING: SRC: The current user lacks privileges to acquire a global read lock using 'FLU SH TABLES WITH READ LOCK'. Falling back to LOCK TABLES... SRC: Table locks acquired Initializing - done SRC: 1 out of 5 schemas will be dumped and within them 3 tables, 0 views. SRC: 3 out of 4 users will be dumped. Gathering information - done SRC: All transactions have been started SRC: Global read lock has been released NOTE: SRC: When migrating to MySQL HeatWave Service, please always use the latest availa ble version of MySQL Shell.

[... output truncated]

TGT: Starting data load
?% (0 bytes / ?), 0.00 B/s, 0 / 3 tables done
TGT: Executing common postamble SQL
Recreating indexes - done
TGT: Appending dumped gtid set to GTID_PURGED
TGT: No data loaded.
TGT: 0 accounts were loaded
TGT: 0 warnings were reported during the load.
--Dump_metadata:
 Binlog_file: mysql-bin-changelog.000004
Binlog_position: 693142
 Executed_GTID_set: 1 .1-13
MySQL database-1-instance-1. .us-east-2.rds JS >



102. Running the above step 101 command may generate **Errors** regarding **table locks** (see image

below).
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.
SRC: Global read lock has been released
Initializing – done
Util.copyInstance: While 'Initializing': Unable to lock tables: Consistency check has failed.
(MYSQLSH 52002)

103. If you do encounter the table lock problem (if and only if) run the same command as in step 101 but this time add an additional option: consistent: "false" and re-run the command. MySQL JS> util.copyInstance('mysql://admin@10.0.1.220', {"compatibility": ["force_innodb", "skip_invalid_accounts", "strip_definers", "strip_restricted_grants", "strip_tablespaces", "ignore_wildcard_grants", "strip_invalid_grants", "create_invisible_pks"], updateGtidSet: "append", users: "true", threads: 4, dryRun:"true", consistent: "false"})

Note:

- util.copyInstance(connectionData[, options]): MySQL instance copy utility enables copying of an entire instance to another server. By default, this utility includes all schemas, users, indexes, routines, and triggers. See <u>Copy Utilities</u>.
 - connectionData: Defines the connection details for the destination server you want to copy to.
- 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_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.
 - 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.
- updateGtidSet: append: If your Aurora MySQL is using GTIDs, for inbound replication, add the transaction IDs from the source gtid_executed GTID set to the replica gtid_purged GTID set. This lets you begin replication from the source without re-executing every past transaction from the source. Adding the GTIDs to gtid_purged tells the replica that those transactions have already been executed, although they are not present in the source binary log. This must be set to append during a live migration.
- users: Include (true) or exclude (false) users and their roles and grants in the dump.
- threads: (Optional) The number of parallel threads to use to copy chunks of data from the MySQL instance. Each thread has its own connection to the MySQL instance. The default is 4. The copy utilities require twice the number of threads, one thread to copy and one thread to write. If threads is set to N, 2N threads are used.
- consistent: Enable (true) or disable (false) consistent data dumps by locking the instance for backup during the dump.
- 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.

104. Once you have run the command in step 101/103 and did not see any errors in the output (warnings are okay), run the same step 101/103 command but this time change the dryRun option to false. MySQL JS> util.copyInstance('mysql://admin@10.0.1.220', {"compatibility": ["force_innodb", "skip_invalid_accounts", "strip_definers", "strip_restricted_grants", "strip_tablespaces", "ignore_wildcard_grants", "strip_invalid_grants", "create_invisible_pks"], updateGtidSet: "append", users: "true", threads: 4, dryRun:"false"})

Note: replace the username (admin) and IP address (10.0.1.220) with your HeatWave MySQL username and IP address (not the Amazon Aurora MySQL username and IP address). Add consistent: "false" to your step 104 command if you had encountered the table lock issue.

<pre>MySQL database=1=instance=1.</pre>
Copying DDL, Data and Users from in-memory FS, source: ip3306, target: fw5e
rxp3afmvjpsu:3306.
NOTE: SRC: 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. SRC: Acquiring global read lock
WARNING: SRC: The current user lacks privileges to acquire a global read lock using 'FLU SH TABLES WITH READ LOCK'. Falling back to LOCK TABLES SRC: Table locks acquired
SRC: 1 out of 5 schemas will be dumped and within them 3 tables, 0 views. SRC: 3 out of 4 users will be dumped.
[output truncated]
100% (194.61 KB / 194.61 KB), 0.00 B/S, 3 / 3 tables done
100% (194.61 KB / 194.61 KB), 0.00 B/s, 3 / 3 tables done Recreating indexes - done
Recreating indexes – done TGT: 3 chunks (5.30K rows, 194.61 KB) for 3 tables in 1 schemas were loaded in 1 sec (av
Recreating indexes - done TGT: 3 chunks (5.30K rows, 194.61 KB) for 3 tables in 1 schemas were loaded in 1 sec (av g throughput 194.61 KB/s)
Recreating indexes - done TGT: 3 chunks (5.30K rows, 194.61 KB) for 3 tables in 1 schemas were loaded in 1 sec (av g throughput 194.61 KB/s) TGT: 2 accounts were loaded TGT: 0 warnings were reported during the load.
Recreating indexes - done TGT: 3 chunks (5.30K rows, 194.61 KB) for 3 tables in 1 schemas were loaded in 1 sec (av g throughput 194.61 KB/s) TGT: 2 accounts were loaded TGT: 0 warnings were reported during the load.
Recreating indexes - done TGT: 3 chunks (5.30K rows, 194.61 KB) for 3 tables in 1 schemas were loaded in 1 sec (av g throughput 194.61 KB/s) TGT: 2 accounts were loaded TGT: 0 warnings were reported during the load. Dump_metadata:
<pre>100% (194.61 KB / 194.61 KB), 0.00 B/S, 3 / 3 tables done Recreating indexes - done TGT: 3 chunks (5.30K rows, 194.61 KB) for 3 tables in 1 schemas were loaded in 1 sec (av g throughput 194.61 KB/s) TGT: 2 accounts were loaded TGT: 0 warnings were reported during the load. Dump_metadata: Binlog_file: mysql-bin-changelog.000004</pre>
<pre>100% (194.61 KB / 194.61 KB), 0.00 B/S, 3 / 3 tables done Recreating indexes - done TGT: 3 chunks (5.30K rows, 194.61 KB) for 3 tables in 1 schemas were loaded in 1 sec (av g throughput 194.61 KB/s) TGT: 2 accounts were loaded TGT: 0 warnings were reported during the load. Dump_metadata: Binlog_file: mysql-bin-changelog.000004 Binlog_position: 693142</pre>
<pre>100% (194.61 KB / 194.61 KB), 0.00 B/S, 3 / 3 tables done Recreating indexes - done TGT: 3 chunks (5.30K rows, 194.61 KB) for 3 tables in 1 schemas were loaded in 1 sec (av g throughput 194.61 KB/s) TGT: 2 accounts were loaded TGT: 0 warnings were reported during the load. Dump_metadata: Binlog_file: mysql-bin-changelog.000004 Binlog_position: 693142 Executed_GTID_set: :1-13</pre>

105. Once the copy utility finishes, if your Aurora MySQL uses binary log positioning - save the Binlog_file and Binlog_position values from the MySQL Shell latest Dump_metadata for later use. This will let the HeatWave MySQL instance on OCI know where to start the replication from for data synchronization. If your Aurora MySQL uses GTIDs, you don't need to save any of the MySQL Shell Dump_metadata values. The initial data transfer from Aurora MySQL to HeatWave MySQL on OCI is now complete, you can end your tmux session.

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VII) On OCI, create a replication channel to set up replication from Amazon Aurora MySQL to HeatWave MySQL on OCI. During the channel creation process, if the Aurora instance is using binary log positioning - under the replication positioning section, select Source cannot use GTID auto-positioning and provide the binlogFile and binlogPosition values. If the Aurora instance is using GTIDs - select Source can use GTID auto-positioning (recommended). Create the replication channel afterwards.

- 106. After your data has successfully imported into HeatWave MySQL, from the OCI Console, click on the navigation menu again, go to **Databases**, and click **Channels**.
- 107. Click **Create channel** to set up replication between Aurora MySQL and HeatWave MySQL on OCI.

/ySQL	Channels in	(rc	oot) Compartme	ent			
DB Systems	Create channel Ac	tions -					
Backups	□ Name	Source	Target	State	Enabled	Created	
Channels			No channels were foun	d using the selected com	partment and filters		
Configurations	0 selected					Showing 0 it	ems < 1 of 1

108. Ensure you are in the right compartment and enter a **replication channel name**. Ensure that the **Enabled automatically upon creation** box is checked.

ORACLE Cloud Search resources, services, documentation, and Marketplace	US East (Ashburn) 🗸 👩 🏠 😲
Create channel	
Create in compartment	
root)	\$
Name Optional	
aws-oci-channel	
Enabled automatically upon creation	
Description Optional	
Write a channel description	
	l.
Source connection	
Configure connection to the MySQL source	
Hostname	
Define the MySQL source hostname	
MySQL port Optional	
3306	
Username 🛈	
Define the username	
Paceword	
Create channel Save as stack Cancel	
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109. Under Source connection, for Hostname input your Aurora Endpoint. For Port, specify the port number the Aurora listens on - the default is 3306. For Username and Password - specify the replication **username and password** for the account that you created on the Aurora instance.

ORACLE Cloud Search resources, services, documentation, and Marketplace	US East (Ashburn) 🗸 🕢 💮 💭 🧕
Create channel	
Source connection	
Configure connection to the MySQL source	
Hostname	
database-1-instance-1. us-east-2.rds.amazonaws.com	
MySQL port Optional	
3306	
Username (i)	
repl	
Password	
Confirm password	

For **SSL mode** select the one that meets your need. For this guide, we have chosen **Required** 110. (REQUIRED).

Disabled (DISABLED)	Required (REQUIRED)	Verify certificate authority	Verify identity
· · · · · ·		(VERIEX CA)	
stablish an unencrypted connection.	Establish an encrypted connection.		
		Like REQUIRED, but additionally verify the CA	Like VERIFY_CA, but additionally verify the
		certificate configured on the source against	source's hostname, defined in the source's
		the Certificate Authority (CA) certificate (X509	SSL certificate, against the hostname defined
		PEM file). This option requires you to upload	in the Hostname field. This option requires you
		your Certificate Authority's X509 certificate in	to upload your Certificate Authority's X509 ce

For **Replication positioning**, if your Aurora MySQL uses binary log positioning – select **Source** 111. cannot use GTID auto-positioning. Keep the UUID field as-is, for Binary log file name and Binary log offset, input the Binlog_file and Binlog_position values respectively from the MySQL Shell's Dump metadata that you had saved from step 104.

E ORACLE Cloud	Search resources, services,	documentation, and Marketplace		US East (Ashburn) 🗸	0 ¢	?	•
Create channel							
Replication posit Source GTID settings Source can use GTID a System variable gtid_mode-d Anonymous transactions i you need the name of the	ioning uto-positioning (recommended) ^{3N set on source.} vill be assigned a GTID on the ta binary log file and the offset whe	 Source cannot use GTID auto-positioning System variable glid_mode=OFF, OFF_PERMISSIVE or ON, rget DB system. Choose what UUID to use in the G re replication should start from. 	.PERMISSIVE. iTID for the transactions. You can use the g	generated UUID below. When you are not usi	ng auto-posit	ioning	
Manually specify Define or generate a ne	r a UUID w UUID.	~	Same UUID as target DB sy Use the same UUID as the target DB sy	rstem istem.			
UUID	iour own.					C	,
Binary log file name mysql-bin-changelog.00	0004						
Binary log offset 693142							
ation Guide: Amazon A	urora to HeatWave M	vSOL on Oracle Cloud Infrastructu	ire (OCI)	OR	ACLE	Ξ	

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112. For **Replication positioning**, if your Aurora MySQL uses GTIDs – select **Source can use GTID autopositioning (recommended)**.

≡	ORACLE Cloud	Search resources, services,	documentation, and Mark	ketplace				US East (Ashburn) 🗸	$\mathbf{\hat{s}}$	۵	?	٢	0
С	reate channel												
	Replication position Source GTID settings Source can use GTID aut System variable gtid_mode=ON	oning o-positioning (recommended) Liset on source.	Source cannot use GT	ID auto-positioning =0FF, OFF_PERMISSIVE	or ON_PERMISSIVE	E.							

113.

. Scroll down until you see **Tables without primary key**. If you plan on using the High Availability or HeatWave option, select **Generate primary key** since these options require primary keys on every table. If you don't plan on using High Availability or HeatWave – you can either select **Raise an error** or **Allow**. For this guide, we have chosen **Allow**.

ORACLE Cloud Search resources, services, documentation		US East (Ashburn) 🗸 👩 🏠 🕧 🌘
Create channel		
Target DB system Configure the target DB system. Applier username Optional Define the username for the replication applier on the target DB system Channel name Optional replication_channel		
 Tables without primary key ⁽²⁾ Raise an error (RAISE_ERROR) Raises an error when replicating a CREATE TABLE or ALTER TABLE transaction with no primary keys 	Allow (ALLOW) Allow replicating a CREATE TABLE or ALTER TABLE transaction with no primary keys.	Generate primary key (GENERATE_IMPLICIT_PRIMARY_KEY) Allow replicating a CREATE TABLE or ALTER TABLE transaction with no primary keys and automatically generate a new primary key when adding data to such tables.
Replication delay Optional ③ Set the amount of time, in seconds, that the channel waits before applying	a transaction received from the source.	
Create channel Save as stack <u>Cancel</u>		
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reate channel		
าสมเหตุการและ		
$^{\vee}$ Tables without primary key (i)		
Raise an error (RAISE_ERROR) Raises an error when replicating a CREATE TABLE or ALTER TABLE transaction with no primary keys	Allow (ALLOW) Allow replicating a CREATE TABLE or ALTER TABLE transaction with no primary keys.	Generate primary key (GENERATE_IMPLICIT_PRIMARY_KEY) Allow replicating a CREATE TABLE or ALTER TABLE transaction with no primary keys and automatically generate a new primary key when adding data to such tables.
Replication delay Optional ① Set the amount of time, in seconds, that the channel waits before ap	olving a transaction received from the source.	
Replication delay Optional ① Set the amount of time, in seconds, that the channel waits before app Target DB system	olying a transaction received from the source.	
Replication delay Optional ③ Set the amount of time, in seconds, that the channel waits before app Target DB system	olying a transaction received from the source.	Select DB sy
Replication delay <i>Optional</i> ③ Set the amount of time, in seconds, that the channel waits before app Target DB system	olying a transaction received from the source.	Select DB sy

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115. A list of your MySQL DB systems will open after completing the previous step. Select the HeatWave MySQL system that you created earlier and click Select DB system.

	RACLE Cloud Search resources, services, documentation	in, and M					US East (Ashburn) 🗸	\Diamond	۵	?	٢	0
Crea	ite channel	Sel	ect a D	B sys	tem							
~	Tables without primary key (i)		Name		Id	Status	Created					
	Raise an error (RAISE_ERROR)		MySQL-HW	,	lau7wqcq Show Copy	Active	Tue, Nov 28, 2023, 20:5	4:03 UT	0			
	Haises an error when replicating a CHEATE TABLE or ALTER TABLE transaction with no primary keys	1 se	lected				s	ihowing	1 item	< 1	of 1 🕽	>
Replie	cation delay Optional (i)											
Set	the amount of time, in seconds, that the channel waits before applyir											
Targe	t DB system											
00	Show channel filter options											
											F	3
응한 <u>Sho</u>	w advanced options											
Create	channel Save as stack Cancel	Sele	ct DB system	Cancel								
Terms of U	to and Brivey. Cashie Breferences	Ocic	or D D oyotom				Conversite @ 2022. Oraclo	nd/or ite	offiliatos	All right	to rocor	und
remis of U	as and Finacy Cookie Fieldences						copyright @ 2023, Ofacle a	major its	annates.	- ningh	ra Lepel	100.



116. Click Show channel filter options. ORACLE Cloud
 Search resources, services, documentation, and Marketplace US East (Ashburn) 🗸 🖸 🏠 🕐 🌐 Create channel Raise an error (RAISE_ERROR) Allow (ALLOW) Generate primary key (GENERATE_IMPLICIT_PRIMARY_KEY) Raises an error when replicating a CREATE TABLE or ALTER TABLE transaction with no primary keys Allow replicating a CREATE TABLE or ALTER TABLE transaction with no primary keys. Allow replicating a CREATE TABLE or ALTER TABLE transaction with no primary keys and automatically generate a new primary key when adding data to such tables. Replication delay Optional (i) Set the amount of time, in seconds, that the channel waits before applying a transaction received from the source. Target DB system Name: MySQL-HW Change DB system OCID: ...6flau7wqcq Show Copy Show channel filter options

117.

7. For **Channel filter**, under **Common filter templates** choose the appropriate **Aurora instance**

version you are using from the dropdown menu:

Channel filter	
Filter templates are provided for items that are typically filtered out in replication. Pick a filter template to match your source. You can also add your own filters manually. Some combinations of filters might cause unexpected results. If you want to add your own filters, make sure you check the MySQL documentation.	
Common filter templates	
Select filter template	

Note: for this step-by-step guide, we are using Aurora MySQL v5.7.12 (Aurora_version 2.11.2), thus no channel filter is required.

	US East (Ashburn) 🗸 🕢 💮 🌐 Q
Create channel	
Channel filter	
Filter templates are provided for items that are typically filtered out in replication. Pick a filter template to match your source. You can also add your own filters manually. Some combinations of filters might cause unexpected results. If you want to add your own fill	rs, make sure you check the <u>MySQL documentation</u> .
Common filter templates	
 ✓ Select filter template AWS Aurora MySQL v1 (5.6) (no filters required) AWS Aurora MySQL v2 (5.7) (Aurora_version < 2.0.4.0) (no filters required) AWS Aurora MySQL v3 (5.7) (Aurora_version >= 2.0.4.0) (no filters required) AWS Aurora MySQL v3 (8.0) (no filters required) AWS RDS MySQL 5.6 (no filters required) AWS RDS MySQL 5.7 AURS RDS MySQL 5.7 AURS RDS MySQL 5.7 AWS RDS MySQL 5.7 AURS RDS MySQL 5.7 AURS RDS MySQL 5.7 	¢
Azure MySQL Flexible server (8.0) Azure MySQL Single Server (8.0) Google Cloud SQL MySQL (5.7) Google Cloud SQL MySQL (5.7) AlibabaCloud ApsaraDB RDS for MySQL (5.7) AlibabaCloud ApsaraDB RDS for MySQL (8.0) Create stratment in the strategy services	
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118. We need to provide the appropriate replication filter depending on the database and the database version that we are using. Since there are some tables in Aurora that will cause the replication to fail - hence we are filtering those tables out. Click **Create channel** after you have applied the channel filter – if the Aurora version you are using requires one.

reate channel			4
Channel filter			
(i) Filter templates are provided for items that are typical You can also add your own filters manually. Some con	/ filtered out in replication. Pick a filter template to match you ibinations of filters might cause unexpected results. If you wa	ur source. ant to add your own filters, make sure you check the <u>MySQL documentation</u> .	
Common filter templates			
Select filter template			Ŷ
Туре	Value		
Select a filter type	Select a filter val	alue	
		Add another filter	
Show advanced options			
eate channel Save as stack Cancel			
of Lise and Drivary Conkie Preferences		Convrict @ 2023. Oracle and/or its affiliates. All rid	hte

119.

The replication channel from your Aurora MySQL to HeatWave MySQL on OCI will now start CREATING so that we can propagate all the pending data changes to HeatWave MySQL that had occurred on

the Aurora MySQL after the execution of MySQL Shell util.copyInstance() utility. Your channel should change its status to **ACTIVE** shortly if everything was done correctly.

		US East (Ashburn) 🗸 👩 🗍	90
MySQL HeatWave » Channels » Chann	iel details		
	aws-oci-channel		
	Edit Disable Reset Resume More actions -		
	Channel information Source Target Tags		
	OCID:pq6vuegetq Show Copy.	Compartment:	
CREATING	Description: -	Created: Fri, Dec 1, 2023, 22:29:21 UTC	
	Search resources, services, documentation, and Marketplace	US East (Ashburn) ∨ ⊡ 🗘 ⑦ 🤅	₿ 8
MySQL HeatWave > Channels > Channels	aws-oci-channel		
	Edit Disable Reset Resume More actions 👻		
	Channel information Source Target Tags		
	OCID:pq6vuegetq Show Copy	Compartment:	
	Description: -	Created: Fri, Dec 1, 2023, 22:29:21 UTC	
ACTIVE	Enabled: Yes	Last updated: Fri Dec 1, 2023, 22:30:51 UTC	

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VIII) After the replication channel is up, connect to HeatWave MySQL and execute the SHOW REPLICA STATUS\G command. From the query output, look for the seconds_behind_source and Replica_SQL_Running_State fields. If the seconds_behind_source field displays a value of 0 and the Replica_SQL_Running_State field displays a message of Replica has read all relay log; waiting for more updates - this indicates that the HeatWave MySQL instance has fully caught up with the Amazon Aurora MySQL changes and the replication channel can now be disabled.

Note: During this step, it is recommended to stop the database application for ~5 minutes to ensure that no writes are happening to the Aurora MySQL instance before the replication channel between HeatWave MySQL and Aurora MySQL is disabled.

120. Connect to your HeatWave MySQL on OCI instance using MySQL Shell which is installed on your EC2.

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

-OR-

\$ mysqlsh -u <user> -p -h <hostname> -P <port-number> [ec2-user@ip- ~]\$ mysqlsh admin@10.0.1.220 MySQL Shell 8.2.1 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@10.0.1.220' Fetching schema names for auto-completion... Press ^C to stop. Your MySQL connection id is 5378 (X protocol) Server version: 8.0.35-u1-cloud MySQL Enterprise - Cloud No default schema selected; type \use <schema> to set one. MySQL 10.0.1.220:33060+ ssl JS >

121. Switch to the SQL mode of MySQL Shell and run the below statement:

MySQL JS> \sql	
MySQL SQL> SHOW REPLICA STATUS	G
MySQL 10.0.1.220:33060+ ssl	SQL > SHOW REPLICA STATUS\G
***************************************	IOW **********************
Replica_IO_State:	Waiting for source to send event
Source_Host:	database-1-instance-1us-east-2.rds.amazonaw
s.com	
Source_User:	repl
Source_Port:	3306
Connect_Retry:	60
Source_Log_File:	mysql-bin-changelog.000004
Read_Source_Log_Pos:	693142
Relay_Log_File:	relay-log-replication_channel.000002
Relay_Log_Pos:	447
Relay_Source_Log_File:	mysql-bin-changelog.000004
Replica_IO_Running:	Yes
Replica_SQL_Running:	Yes

122. If the replication is successfully ongoing from Aurora MySQL to HeatWave MySQL, you should see the status of Replica_IO_Running and Replica_SQL_Running as Yes. If one or the other shows an output different than Yes, your replication has failed or encountered an error.

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123. When executing the above SQL statement SHOW REPLICA STATUS\G, also look for Seconds_Behind_Source and Replica_SQL_Running_State fields. If you see a value of 0 for Seconds_Behind_Source and a value string of Replica has read all relay log; waiting for more updates for Replica_SQL_Running_State - this suggests that HeatWave MySQL instance has fully caught up with the Aurora MySQL instance and there are no pending transactions/changes on Aurora MySQL that needs to be replicated to HeatWave MySQL.

,	
Seconds_Behind_Source:	0
Source_SSL_Verify_Server_Cert:	No
Last_IO_Errno:	0
Last_IO_Error:	
Last_SQL_Errno:	0
Last_SQL_Error:	
Replicate_Ignore_Server_Ids:	
Source_Server_Id:	1
Source_UUID:	
Source_Info_File:	mysql.slave_master_info
SQL_Delay:	0
SQL_Remaining_Delay:	NULL
Replica_SQL_Running_State:	Replica has read all relay log; waiting for more updates

124.

You can go back to the OCI MySQL Channels page and **Disable** the Channel.

earch resources, services, documentation, and Marketplace	US East (Ashburn) 🗸 👩 🧲
iel details	
aws-oci-channel	
Edit Disable Reset Resume More actions -	
Channel information Source Target Tags	
OCID:pq6vuegetq Show Copy	Compartment:
Description: -	Created: Fri, Dec 1, 2023, 22:29:21 UTC
Enabled: Yes	Created: Fri, Dec 1, 2023, 22:29:21 UTC Last updated: Fri, Dec 1, 2023, 22:30:51 UTC
earch resources, services, documentation, and Marketplace	US East (Ashburn) 🗸 🕜 🥰
el details	
	Search resources, services, documentation, and Marketplace editetails edit Disable Reset Resume More actions Channel information Source Target Tags OCID:pq6vuegetq Show Copy. Description: - Enabled: Yes Search resources, services, documentation, and Marketplace nel details

	Channe Disable <u>Cancel</u>	
	OCID:pq6vuegetq Show Copy	Compartment:
	Description: -	Created: Fri, Dec 1, 2023, 22:29:21 UTC
ACTIVE	Enabled: Yes	Last updated: Fri, Dec 1, 2023, 22:30:51 UTC



Are you sure you want to disable the channel aws-oci-channel?

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IX) At this point, the live migration process for the database is complete. The database applications can now point to HeatWave MySQL on OCI.

X) (Optional) On OCI, if the HeatWave option was enabled during HeatWave MySQL DB creation, add the HW Cluster and load data from MySQL InnoDB storage into the HW Cluster using automation.

Login to OCI. Click on the navigation menu, go to Databases, and click HeatWave MySQL.

126.

127. Click on the name of your HeatWave MySQL instance to go to the **DB System Details** page. ORACLE Cloud Search resources, services, documentation, and Marketplace US East (Ashburn) 🗸 🕢 🕜 🌐 🚺 DB systems in (root) Compartment MySQL HeatWave Create DB system Actions 👻 DB systems Backups Name DB system state Crash recovery Delete protected High availability HeatWave cluster HeatWave state Created Channels MySQL-HW Active Enabled Disabled Disabled Disabled Tue, Nov 21, 2023, 23:39:05 UTC Configurations Showing 1 item < 1 of 1 > 0 selected ORACLE Cloud
 Search resources, services, documentation, and Marketplace US East (Ashburn) 🗸 🖸 🌐 MySQL HeatWave » DB systems » DB system details MvSQL-HW Edit Performance Hub Start Stop More actions -DB system information Connections Tags General information Associated services OCID: ...6flau7wqcq Show Copy Database Management: Details Disable (i) ACTIVE Description: - Edit 128. Click More actions and click Add HeatWave cluster. US East (Ashburn) 🗸 ORACLE Cloud Search resources, services, documentation, and Marketplace MySQL HeatWave » DB systems » DB system details MySQL-HW Edit Performance Hub Start Stop More actions -Restart DB system information Connection Restore to a new DB system Edit backup plan General information Associated services Database Management: Details Disable (i) OCID: ...6flau7wqcq Show Copy Create manual backup ACTIVE Description: - Edit Disable Database Management High availability Compartment: Enable high availability Created: Tue, Nov 28, 2023, 20:54:03 UTC High availability: Disabled Enable (i) Last updated: Fri. Dec 1, 2023, 22:39:07 UTC Disable crash recovery **HeatWave** Add HeatWave cluster DB system configuration



CRACLE Cloud Search resources, services, documentation, and Marketplace US East (A Add HeatWave cluster Add a HeatWave cluster to the DB system MySQL-HW with shape MySQL.HeatWave.VM.Standard. What shapes support HeatWave? The current MySQL version 8.0.35 of the DB system MySQL-HW does not support real-time elasticity. Real-time elasticity is supported on MySQL version 8.2.0 or higher. What is real-time elasticity. Real-time elasticity is supported on MySQL version 8.2.0 or higher. What is real-time elasticity.	ushburn) ✓ □	\$ ⑦ €	•
Add HeatWave cluster Add a HeatWave cluster to the DB system MySQL-HW with shape MySQL.HeatWave.VM.Standard. What shapes support HeatWave? The current MySQL version 8.0.35 of the DB system MySQL-HW does not support real-time elasticity. Real-time elasticity is supported on MySQL version 8.2.0 or higher. What is real-time elasticity.	I-time elasticity?		
Add a HeatWave cluster to the DB system MySQL-HW with shape MySQL.HeatWave.VM.Standard. <u>What shapes support HeatWave?</u> The current MySQL version 8.0.35 of the DB system MySQL-HW does not support real-time elasticity. Real-time elasticity is supported on MySQL version 8.2.0 or higher. <u>What is real</u>	al-time elasticity?		
The current MySQL version 8.0.35 of the DB system MySQL-HW does not support real-time elasticity. Real-time elasticity is supported on MySQL version 8.2.0 or higher. What is real-time	al-time elasticity?		
Configure HeatWave cluster			
Select a shape			
MySQL.HeatWave.VM.Standard			
CPU core count: 16			
Memory size: 512 GB	С	hange shape	
Max network bandwidth: 16Gbps			
You must reload your data after changing the shape.			
Node			
1			
Specify a number between 1 and 64.			
MySQL HeatWave Lakehouse ①			
Enables query processing on data residing in Object Storage.			
Memory: 512 GB			
Estimate node			
This operation can take several minutes to complete.			
Add HeatWave cluster Cance			
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130. Click **Generate estimate**. This step will estimate the number of HeatWave nodes required by selecting the schemas or tables you want to analyze with HeatWave.

ORACLE Cloud Search resources, services, documentatio	n, and Marketplace	US East (Ashburn) 🗸 🐼] △ ⑦ €	90
Add HeatWave cluster	Estimate node			
Add a HeatWave cluster to the DB system MySQL-HW with shape N	Estimate number of required nodes by selecting the schemas or tables you	want to analyze with HeatWave. This operation tak	es few minutes to	
① The current MySQL version 8.0.35 of the DB system MySQL-HW do	complete. (i) Generate estimate			
Configure HeatWave cluster	No schema information available.			
Select a shape				
MySQL.HeatWave.VM.Standard				
CPU core count: 16				
Memory size: 512 GB				
Max network bandwidth: 16Gbps				
You must reload your data after changing the shape.				
Node				
1				
Specify a number between 1 and 64.				
MySQL HeatWave Lakehouse (i)				
Enables query processing on data residing in Object Storage.			ſ	
Memory: 512 GB				$\mathbf{\Theta}$
Estimate node			l	
Add HeatWave cluster Cancel	Apply estimated node Cancel			
Terms of Use and Privacy Cookie Preferences		Copyright © 2023, Oracle and/or i	its affiliates. All rights re	served.



131. Within a few minutes, the list of your schemas that are in the MySQL InnoDB storage engine will be listed. **Check the box** next to the schema or table name that you wish to load in HeatWave for query acceleration and to run OLAP and ML workloads - alongside OLTP.

	on, and Marketplace		US East (Ashl	burn) 🗸 🖸] 🗘	? (₽ 9
Add HeatWave cluster	Estimate nod	e					
(i) Add a HeatWave cluster to the DB system MySQL-HW with shape N	Estimate number of requir	ad nodes by selecting the schemas o	r tables you want to analyze with HeatWaye. Th	is operation tal	ree few m	inutes to	
The current MySQL version 8.0.35 of the DB system MySQL-HW do	complete. (i) Regenerate estimate	su nodes by selecting the schemas o	rables you wan to analyze with neatwave. In	is operation ta	les lew m	indies to	
Configure HeatWave cluster	Last estimate was generated on I	Aon, Oct 30, 2023, 22:46:31 UTC.					
Select a share	Name	Memory estimate	Information			~	·
Select a snape	mysql_audit	3 MB	Number of tables: 2 Number of tables with error comment:	1		~	,
CPU core count: 16	world	15 MB	Number of tables: 5			\sim	,
Memory size: 512 GB	Total memory selected: 0	Bytes					
Max network bandwidth: 16Gbps	MySQL.HeatWave.VM.St	andard					\$
You must reload your data after changing the shape.	Summary						
Node 1 Specify a number between 1 and 64.	No schema or table se Select the schemas an	ected. d tables to use for the node estimate.					
MySQL HeatWave Lakehouse (i)							
Enables query processing on data residing in Object Storage.							
Memory: 512 GB							
Estimate node							
This operation can take several minutes to complete.							
Add HeatWave cluster Cancel	Apply estimated node	Cancel					
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132.

After selecting the schemas or tables, scroll down on that page until you see the Show load

command.

	rch resources, services, documentation	, and Mai	rketplace					US East (Ashburn) 🗸	\Diamond	\Diamond	?	٢	0
Add HeatWave clust	ter	Esti	mate no	ode									
(i) Add a HeatWave cluster to the I	DB system MySQL-HW with shape N	Estimat						with the entropy. This are set		- (
() The current MySQL version 8.0.	.35 of the DB system MySQL-HW do	comple	te. (i)	quirea nodes	s by selecting the schem	las or tables yo	ou want to analyze	e with Heatwave. This opera	иоп таке	s tew r	ninutes	10	
		Reger	nerate estimate										
Configure HeatWave clus	ster	Last estim	nate was generated o	on Mon, Oct 30	0, 2023, 22:46:31 UTC.								
e e e e e e e e e e e e e e e e e e e	0101		Name		Memory estimate	h	formation					\sim	
Select a shape			mysql_audit		3 MB	N	umber of tables: umber of tables v	2 vith error comment: 1				~	
MySQL.HeatWave.VM.St	landard		world		15 MB	N	umber of tables:	5				\sim	
CPU core count: 16 Memory size: 512 GB		Total me	emory selected:	: 15 MB									
Max network bandwidth: 16Gb	DDS												
		MySQ	L.HeatWave.VM	A.Standard									-
You must reload your data after changing the sh	hape.	Summa	ry										
Node													
1		My:	SQL.HeatWa	ave.VM.St	tandard								
Specify a number between 1 and 64.		CPU	J core count: 16	6									
MySQL HeatWave Lakehouse (i))	Men	nory size: 512 (GB	hos								
Enables query processing on data residing	g in Object Storage.	wax	network band	width: 16G	bps							ſ	3
Memory: 512 GB		Nod	le: 1 (i)										2
Estimate node		Tota	I memory requi	uired: 15 MB	3							<u> </u>	-
This operation can take several minutes to com	iplete.	Toto	momone 519										
Add HeatWave cluster Cancel		Apply	estimated node	e <u>Cance</u>	1								
Terms of Use and Privacy Cookie Preferences								Copyright © 2023, Oracle	and/or its	affiliate	s. All rigi	nts reser	ved.



133. Click Show load command, copy the CALL sys.heatwave load command, and save it. Click



Node	On completion
1	All currently loaded tables remain loaded during and after the edit operation. The following command is only necessary when loading additional tables or schemas. (
Specify a number between 1 and 64.	3€ Hide load command
MySQL HeatWave Lakehouse (i)	
Enables query processing on data residing in Object Storage.	CALL sys.heatwave_load(JSON_ARRAY('world'), NULL);
Memory: 512 GB	Copy
Estimate node	
This operation can take several minutes to complete.	
Add HeatWave cluster Cancel	Apply estimated node Cancel
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\$

134. Executing the previous step will change the HeatWave node count depending on the data you have selected to load into the HeatWave in-memory engine. Click **Add HeatWave cluster** to finish adding the HeatWave cluster creation process.

	.∈ Cloud	Search resources, services, documentation, and Marketplace	US East (Ashburn) 🗸	\bigcirc	4) €	90
Add Heat	Wave cl	uster					
(i) Add a Hea	atWave cluster t	o the DB system MySQL-HW with shape MySQL.HeatWave.VM.Standard. What shapes support HeatWave?					
① The current	nt MySQL versio	n 8.0.35 of the DB system MySQL-HW does not support real-time elasticity. Real-time elasticity is supported on MySQL version	8.2.0 or higher. What is real-time elastic	<u>sity?</u>			
Configure	HeatWave	cluster					
Select a shape							
MySQL.	.HeatWave.V	M.Standard					
CPU core	count: 16						
Memory s	size: 512 GB			CI	nange sha	pe	
Max netw	ork bandwidth	16Gbps					
You must reload you	ur data after changir	g the shape.					
Node							
1							
Specify a number b	between 1 and 64.						
MySQL Hea	atWave Lakehou	se (i)					
Enables query	processing on data	residing in Object Storage.					
Memory: 512 0	GB						
Estimate node	e						
This operation can t	take several minutes	to complete.					
Add HeatWave cl	luster <u>Cance</u>	4					
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135. The HeatWave cluster will be ready within a few minutes. You should see the HeatWave state change from Creating to **Active**

from Creating to A	ctive.					
E ORACLE Cloud	Search resources, services, documentation, and Marketplace	US East (Ashbu	ım) 🗸 🖸	?	۲	0
MySQL HeatWave > DB systems >	DB system details					
	MySQL-HW					
DDC	Edit Performance Hub Start Stop More actions -					
DB2	DB system information Connections Tags					
	General information	Associated services				
11/1	OCID:6flau7wqcq Show Copy	Database Management: Details Disable (i)				
ACTIVE	Description: - Edit					
	Compartment:	High availability				
	Created: Tue, Nov 28, 2023, 20:54:03 UTC	High availability: Disabled Enable (i)				
	Last updated: Fri, Dec 1, 2023, 22:41:56 UTC					
		HeatWave				
	DB system configuration	HeatWave cluster: Details (i)				
	Shape: MySQL.HeatWave.VM.Standard Edit (i)	State: Creating				
	OCPU Count: 16 (<i>i</i>)	Lakehouse: Disabled (i)			6	3



	Search resources, services, documentation, and Marketplace	US East (Ashburn) 🗸 👩 🌐	9 0
MySQL HeatWave > DB systems > DE	system details		
	MySQL-HW		
	Edit Performance Hub Start Stop More actions 👻		
DBS	DB system information Connections Tags		
	General information	Associated services	
	OCID:6flau7wqcq Show Copy	Database Management: Details Disable (i)	
ACTIVE	Description: - Edit Compartment:	High availability	
	Created: Tue, Nov 28, 2023, 20:54:03 UTC	High availability: Disabled Enable (i)	
	Last updated: Fri, Dec 1, 2023, 22:41:56 UTC	HeatWave	
	DB system configuration	HeatWave cluster: Details Edit (1)	
	Shape: MySQL.HeatWave.VM.Standard Edit (i)	State: Active	
	OCPU Count: 16 (i)	Lakehouse: Disabled Enable (i)	1

136. Connect to your HeatWave MySQL on OCI instance using MySQL Shell which is installed on your EC2 instance.

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

-OR-

```
$ mysqlsh -u <user> -p -h <hostname> -P <port-number>
[ec2-user@ip-______~]$ mysqlsh admin@10.0.1.220
MySQL Shell 8.2.1
Copyright (c) 2016, 2023, Oracle and/or its affiliates.
Oracle is a registered trademark of Oracle Corporation and/or its affiliates.
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Type '\help' or '\?' for help; '\quit' to exit.
Creating a session to 'admin@10.0.1.220'
Fetching schema names for auto-completion... Press ^C to stop.
Your MySQL connection id is 5378 (X protocol)
Server version: 8.0.35-u1-cloud MySQL Enterprise - Cloud
No default schema selected; type \use <schema> to set one.
MySQL 10.0.1.220:33060+ ssl JS >
```

137. Switch to the SQL mode of MySQL Shell and execute the Load command that we had copied earlier to load data into HeatWave from the MySQL InnoDB storage engine.

```
MySQL JS> \sql
MySQL SQL> CALL sys.heatwave load(JSON ARRAY('world'), NULL);
```

Note: replace the sys.heatwave_load command with what you have.

My <mark>SQL</mark> 10.0.1.220:33060+ ssl	SQL > CALL sy:	s.heatwave_loa	ad(JSON_ARRAY	<pre>('world'),</pre>	NULL
INITIALIZING HEATWAVE AUTO F	PARALLEL LOAD				
Version: 2.20					
Load Mode: normal					
Output Mode: normal					
	ו ++				
				.	
OFFLOAD ANALYSIS					
Verifying input schemas: 1 User excluded items: 0					
SCHEMA NAME	OFFLOADABLE TABLES	OFFLOADABLE COLUMNS	SUMMARY ISSUES	OF	
`world`	3	24			
.output truncated]					-
LOAD SUMMARY					
SCHEMA	TABLES	TABLES	COLUMNS	LOAD	
NAME	LOADED	FAILED	LOADED	DURATION	
`world`	3	0	24	1.13 s	
rows in set (1 2705 see)				·	-
Jery OK, 0 rows affected (1.2	2705 sec)				



You now have a complete HeatWave MySQL cluster.

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

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