



Relational Database Service (RDS)

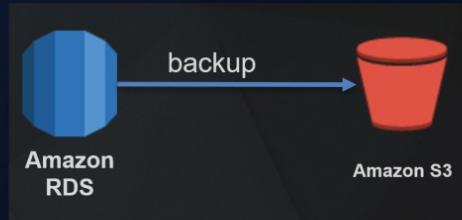
AWS Certification Preparation



© BackSpace Technology LLC



RDS Backup



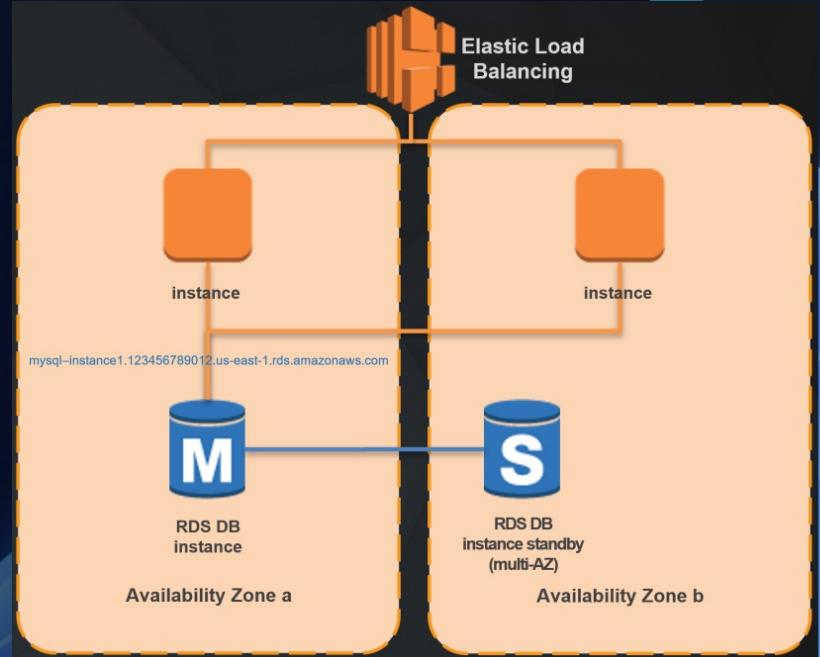
- **User initiated** DB Snapshots of instance
- **Automated** DB backups to S3
 - Deleted by default when instance terminated
 - Disable by setting backup retention period to 0
- **Encryption** of database and snapshots at rest available

© BackSpace Technology LLC



RDS Multi-AZ

- Multi-AZ recommended for **production** applications
- **Application** should also be located in multiple AZ's
- Available for **all database types**
- Allows **failover** to standby

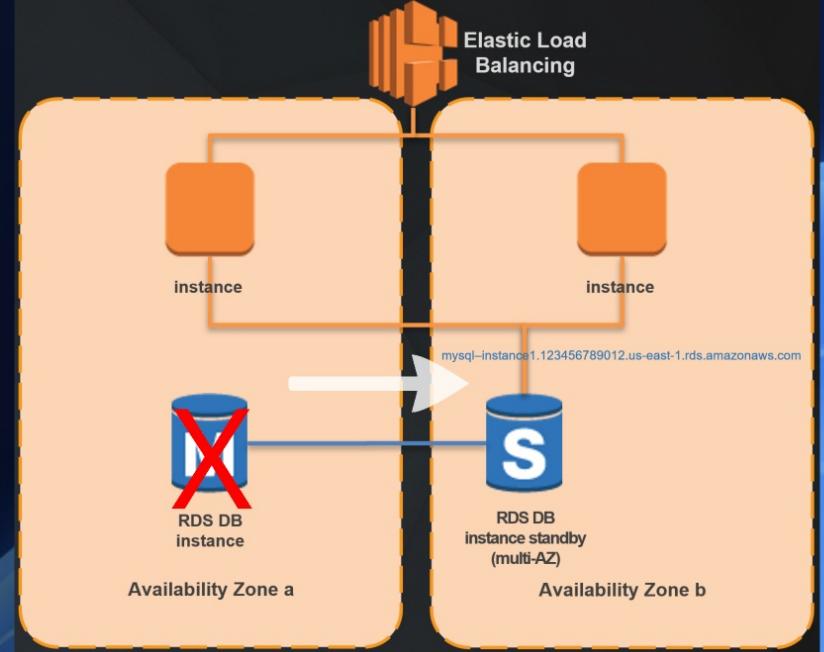


© BackSpace Technology LLC



RDS Multi-AZ

- Multi-AZ recommended for **production** applications
- **Application** should also be located in multiple AZ's
- Available for **all database types**
- Allows **failover** to standby



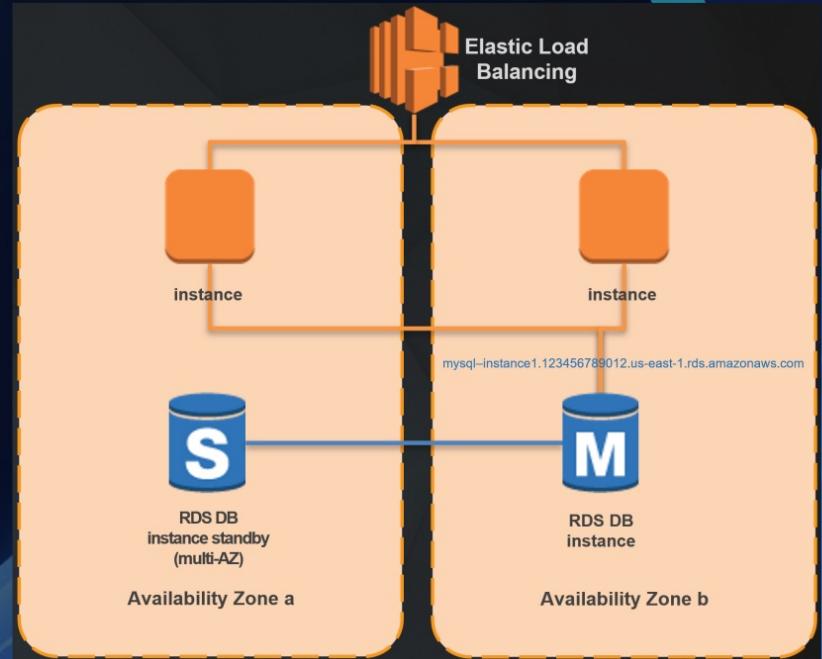
© BackSpace Technology LLC



RDS Multi-AZ



- Multi-AZ recommended for **production** applications
- **Application** should also be located in multiple AZ's
- Available for **all database types**
- Allows **failover** to standby

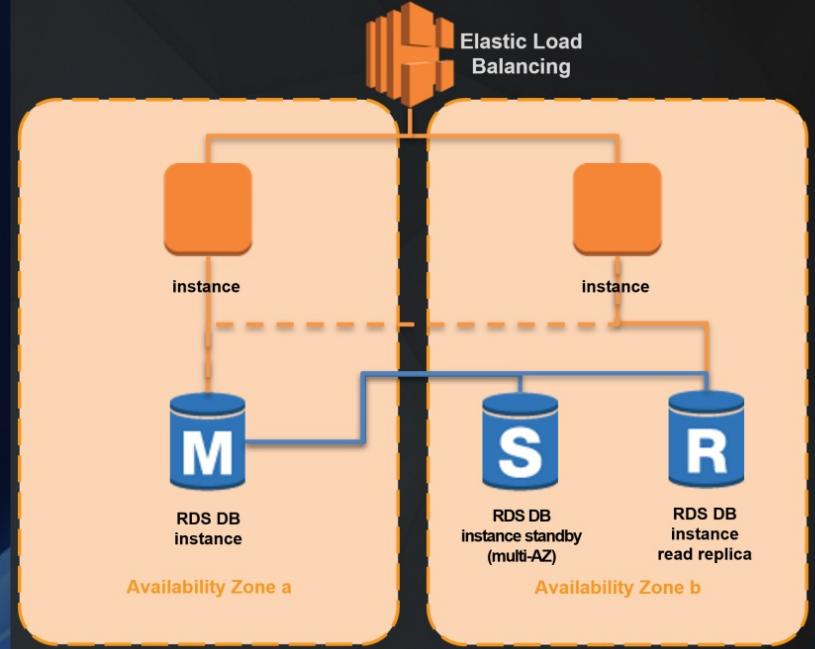


© BackSpace Technology LLC



RDS Read Replicas

- Supported for Aurora, PostgreSQL, MySQL, and MariaDB
- **Multiple** read replicas (up to 15 for Aurora)
- **Cannot** be put behind AWS **ELB**. (Use Aurora Cluster, software, Route 53 routing or HaProxy)



© BackSpace Technology LLC





Relational Database Service (RDS)

AWS Certification Preparation



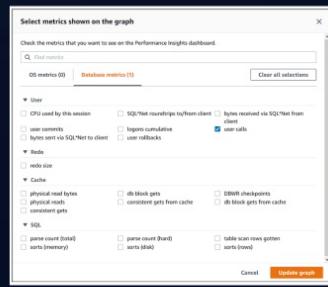
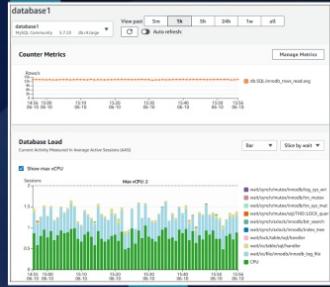
© BackSpace Technology LLC





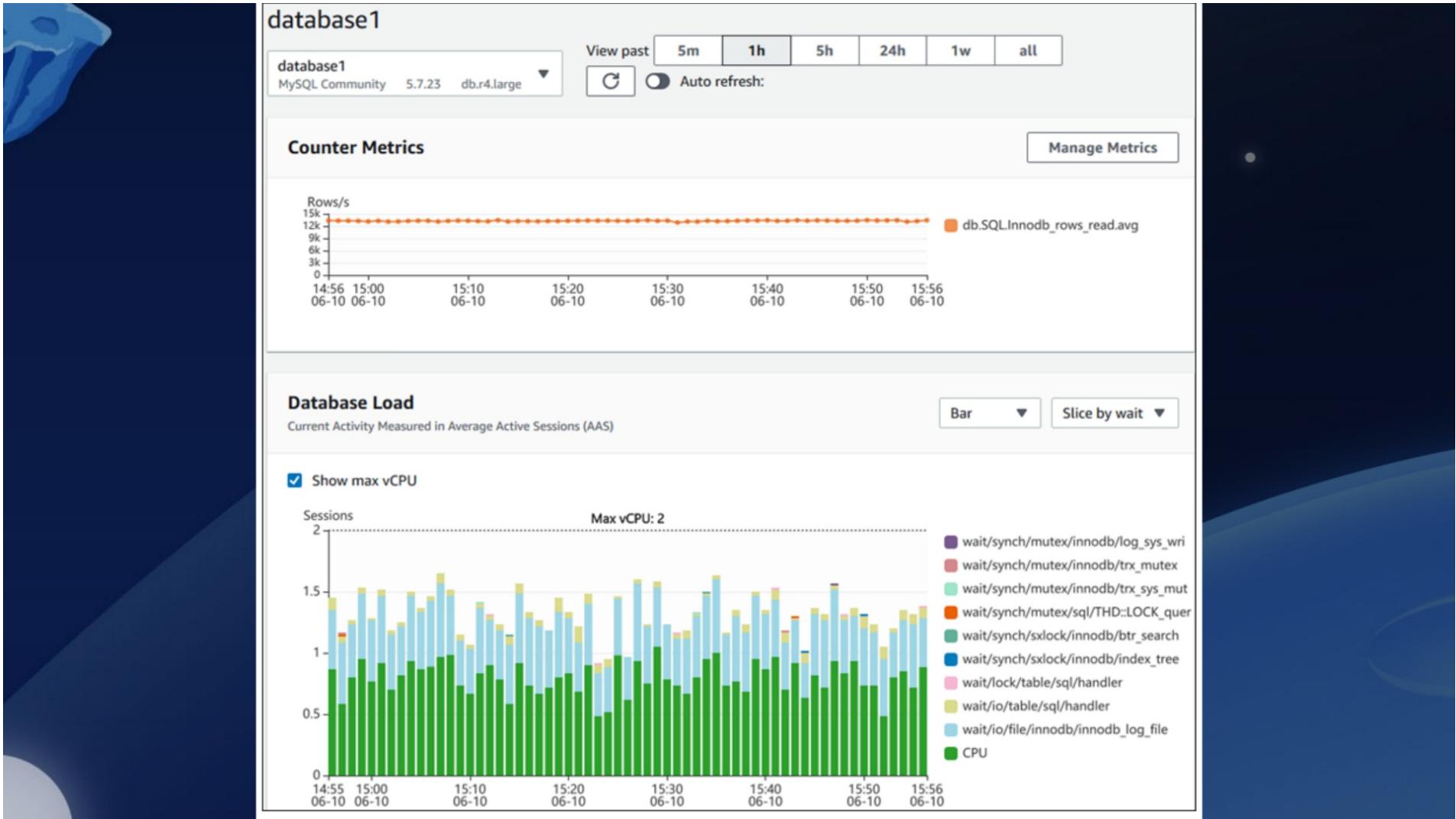
RDS Performance Insights (PI)

- Can be enabled when **creating** or **modifying** a database.
- Available through AWS Console and AWS API/SDK.
- Displays a moving 1 hr window of data updated every few seconds.
- **DB Load** is measured in average active sessions (**AAS**) waiting for response. **Counter metrics** can be customized.
- Metrics can trigger CloudWatch **alarms**.



© BackSpace Technology LLC





Select metrics shown on the graph

Check the metrics that you want to see on the Performance Insights dashboard.

Find metrics

OS metrics (0)

Database metrics (1)

[Clear all selections](#)

User

- CPU used by this session
- SQL*Net roundtrips to/from client
- bytes received via SQL*Net from client
- user commits
- logons cumulative
- user calls
- bytes sent via SQL*Net to client
- user rollbacks

redo

- redo size

Cache

- physical read bytes
- db block gets
- DBWR checkpoints
- physical reads
- consistent gets from cache
- db block gets from cache
- consistent gets

SQL

- parse count (total)
- parse count (hard)
- table scan rows gotten
- sorts (memory)
- sorts (disk)
- sorts (rows)

[Cancel](#)

[Update graph](#)



RDS Storage Auto Scaling

- Enable using console, RDS API/SDK/CLI
(CreateDBInstance -> SupportsStorageAutoscaling).
- You set the maximum storage **threshold**.
- Based on **FreeStorageSpace** metrics.
- Changes in increments of 5 GiB or 10% (whichever is greater)
- In most cases scaling doesn't affect performance.

© BackSpace Technology LLC





AWS Managed Microsoft AD Integration

- Centrally managed single sign-on (SSO) authentication using **Kerberos** protocol.
- Credentials stored in AWS Managed Microsoft Active Directory (AD) or on-premises AD.
- Instances can join AWS Managed Microsoft AD owned by different accounts.

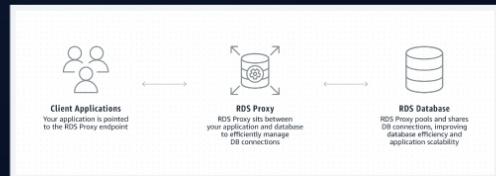
© BackSpace Technology LLC





RDS Proxy

- Maintains a pool of **established connections**.
- Reduces load on database for establishing new connections.
- Centrally manage database credentials using AWS **Secrets Manager**.
- Can enforce **IAM authentication** for access without excessive DB load.
- Single endpoint and deployed across **multi AZ**.
- Reduces **failover** time.



© BackSpace Technology LLC





Client Applications

Your application is pointed to the RDS Proxy endpoint



RDS Proxy

RDS Proxy sits between your application and database to efficiently manage DB connections



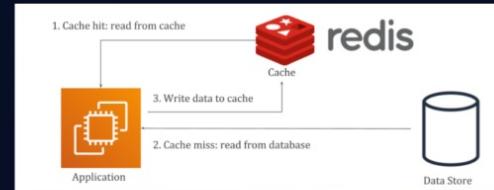
RDS Database

RDS Proxy pools and shares DB connections, improving database efficiency and application scalability

Amazon ElastiCache



- Fully managed, **in-memory** data store service.
- Low latency data access for popular content.
- **Redis** or **Memcached** engine.



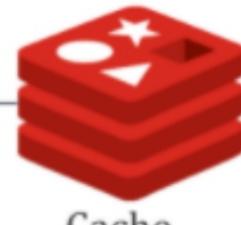
© BackSpace Technology LLC



1. Cache hit: read from cache



Application



Cache

redis

3. Write data to cache

2. Cache miss: read from database



Data Store



Relational Database Service (RDS)

AWS Certification Preparation



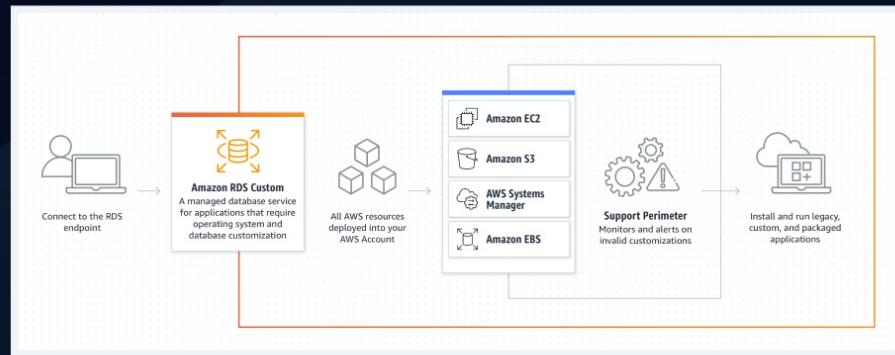
© BackSpace Technology LLC





RDS Custom

- For applications that require customization of the underlying **operating system** and **database environment**



© BackSpace Technology LLC







Relational Database Service (RDS)

AWS Certification Preparation



© BackSpace Technology LLC





DB Parameter Groups

- Associated to RDS **instances**.
- Specify how the database is **configured**.
- **Default** DB parameter group used when not defined.
- **Static** parameters require instance **reboot**.
- **Dynamic** parameter changes are implemented immediately.

The screenshot shows the AWS RDS console with the URL: [https://console.aws.amazon.com/rds/home?region=us-east-1#db-parameter-groups:group/mygroup](#). The page displays a table of parameters for the DB Parameter Group 'mygroup'. The columns include Name, Value, Allowed values, Health Status, Source, Apply type, Data type, and Description. Key parameters shown include 'allow_local_login' set to 'true', 'max_allowed_packet' set to '16384', and 'character_set_client' set to 'utf8'. The 'Apply type' column indicates that most parameters apply at the instance level, except for 'character_set_client' which applies at the connection level.

© BackSpace Technology LLC



mygroup

Parameters								Edit parameters
	Name	Values	Allowed values	Modifiable	Source	Apply type	Data type	Description
<input type="checkbox"/>	allow-suspicious-udfs		0, 1	false	engine-default	static	boolean	Controls whether user-defined functions that have only an xxx symbol for the main function can be loaded.
<input type="checkbox"/>	aurora_disable_hash_join		0, 1	true	engine-default	dynamic	boolean	A global user variable for user to disable hash join. When it is on, hash join is disabled by default, and customer can set it on per session.
<input type="checkbox"/>	aurora_lab_mode	0	0, 1	true	engine-default	static	boolean	Enables new features in the Aurora engine.
<input type="checkbox"/>	aurora_parallel_query	OFF	ON, OFF	true	system	dynamic	string	This parameter can be used to enable and disable Aurora Parallel Query. The parameter applies to Aurora release 2.09.0 and later.
<input type="checkbox"/>	autocommit		0, 1	true	engine-default	dynamic	boolean	Sets the autocommit mode
<input type="checkbox"/>	automatic_sp_privileges		0, 1	true	engine-default	dynamic	boolean	When this variable has a value of 1 (the default), the server automatically grants the EXECUTE and ALTER ROUTINE privileges to the creator of a stored routine, if the user cannot already execute and alter or drop the routine.
<input type="checkbox"/>	back_log		1-65535	true	engine-default	static	integer	The number of outstanding connection requests MySQL can have.
<input type="checkbox"/>	basedir	/rdsdbbin/oscar		false	system	static	string	The MySQL installation base directory.
<input type="checkbox"/>	binlog_cache_size	32768	4096-18446744073709547520	true	system	dynamic	integer	The size of the cache to hold the SQL statements for the binary log during a transaction.
<input type="checkbox"/>	binlog_max_flush_queue_time		0-100000	true	engine-default	dynamic	integer	How long in microseconds to keep reading transactions from the flush queue before proceeding with the group commit (and syncing the log to disk, if sync_binlog is greater than 0). If the value is 0 (the default), there is no timeout and the server keeps reading new transactions until the queue is empty.
<input type="checkbox"/>	binlog_order_commits		0, 1	true	engine-default	dynamic	boolean	If this variable is enabled (the default), transactions are committed in the same order they are written to the binary log.



Relational Database Service (RDS)

AWS Certification Preparation



© BackSpace Technology LLC





RDS Best Practices

- Monitor performance (PI, Enhanced Monitoring)
- Enable storage **auto scaling**
- Enable **automatic backups**, set **window** when demand is low
- Ensure adequate **I/O** and **RAM** capacity (instance class/type, PIOPS).
- Test **failover**

© BackSpace Technology LLC





RDS Security Best Practices

- Individual IAM users.
- Grant least privilege.
- Use IAM groups.
- Rotate IAM credentials regularly.
- Rotate credentials automatically with AWS Secrets Manager.

© BackSpace Technology LLC





Relational Database Service (RDS)

AWS Certification Preparation



© BackSpace Technology LLC





Auto Scaling with Aurora Replicas

- Dynamically adjusts the number of **replicas** for an Aurora DB **cluster**.
- **Scaling Policy** defines the min / max replicas and, **cooldown** period.
- Single master with read and write endpoints.

© BackSpace Technology LLC



Aurora Global Database



- Allows an Aurora cluster to span **multiple regions**.
 - Low latency.
 - Cross region disaster recovery.
- Replicates data with **no impact** on database performance.

© BackSpace Technology LLC





Aurora Parallel Query (MySQL)

- Query processing is pushed down to the Aurora **storage layer**.
- Aurora instance can continue serving transactions with minimal performance change.
- Available for Aurora **MySQL**.
- Enable when creating cluster.

© BackSpace Technology LLC



Query Editor for Aurora Serverless



- Run **SQL** queries in the RDS **console**.
- No need for client software.

The image shows two screenshots of the AWS RDS Query Editor. The left screenshot is a 'Connect to database' dialog box with fields for 'Database instance or cluster' (set to 'database-1'), 'Database username', 'Add new database credentials', 'Enter database password', and 'Enter the name of the database or schema (optional)'. The right screenshot shows the main Query Editor interface with a query editor pane containing the code 'select * from information_schema.tables; # Press run and see the current database tables below', and an output pane below it.

© BackSpace Technology LLC



Connect to database



You need to choose a database and enter the database credentials to use the query editor. We will be storing your credentials and the connection in the AWS Secrets Manager service. [Learn more](#)

Database instance or cluster

database-1

Database username

Add new database credentials

Enter database username

Enter database password

Enter the name of the database or schema (optional)

Enter the name for schemas collection

Enter database or schema name

Cancel

Connect to database

Editor

Recent

Saved queries

```
1 select * from information_schema.tables;
2 # Press run and see the current database tables below
```

Run

Save

Clear

Change database

Output

Export to csv

Search rows

< 1 >

Empty results

You haven't finished running any queries yet.

Data API for Aurora Serverless



- Invoke **SQL** commands through an HTTPS **API endpoint**.

© BackSpace Technology LLC





Relational Database Service (RDS)

AWS Certification Preparation



© BackSpace Technology LLC

