Advanced Database Systems Lab

Assignment 08

Distributed Database Systems

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Class : TY CSE

Title : Configuration of Distributed Database in a cluster using MYSQL InnoDB Cluster Management.

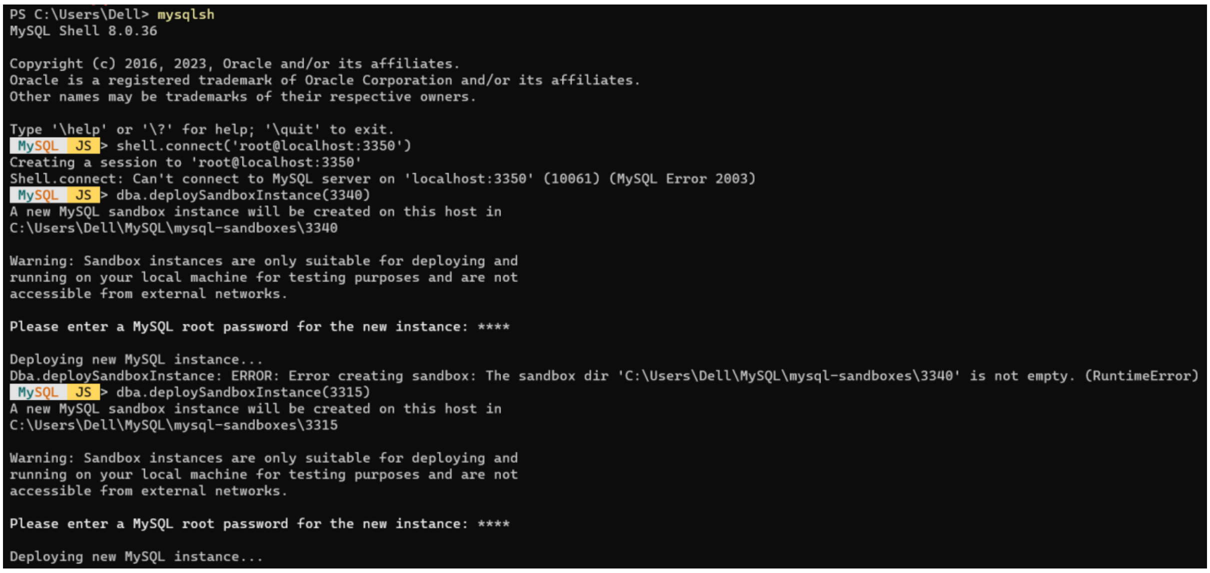
Theory :

InnoDB, MySQL's storage engine, embodies core theories ensuring robust database management. Central to its design are the ACID properties, guaranteeing Atomicity, Consistency, Isolation, and Durability of transactions. Leveraging multi-versioning concurrency control (MVCC), InnoDB enables concurrent access to data while maintaining consistency and isolation levels adjustable via transaction isolation settings. Its row-level locking mechanism minimizes contention by locking individual rows rather than entire tables, enhancing concurrency. The buffer pool caches frequently accessed data and indexes in memory, optimizing query performance. Transaction logs facilitate crash recovery, ensuring data durability by replaying changes after system failures. Supporting foreign key constraints and auto-increment columns, InnoDB enforces referential integrity and generates unique values automatically. Its clustered index organization enhances query performance by physically ordering data on disk. Understanding these principles is fundamental for effective database design, implementation, and management within InnoDB.

Steps followed for creating clusters and sandboxing the localhost:

1] The localhost is sandboxed to three instances having ports 3315 , 3325 , 3335.The name of the cluster is ‘devCluster’ .

Screenshots :



```
PS C:\Users\Dell> mysqlsh
MySQL Shell 8.0.36

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Type '\help' or '\?' for help; '\quit' to exit.
 MySQL  JS > shell.connect('root@localhost:3350')
Creating a session to 'root@localhost:3350'
Shell.connect: Can't connect to MySQL server on 'localhost:3350' (10061) (MySQL Error 2003)
 MySQL  JS > dba.deploySandboxInstance(3340)
A new MySQL sandbox instance will be created on this host in
C:\Users\Dell\MySQL\mysql-sandboxes\3340

Warning: Sandbox instances are only suitable for deploying and
running on your local machine for testing purposes and are not
accessible from external networks.

Please enter a MySQL root password for the new instance: ****

Deploying new MySQL instance...
Dba.deploySandboxInstance: ERROR: Error creating sandbox: The sandbox dir 'C:\Users\Dell\MySQL\mysql-sandboxes\3340' is not empty. (RuntimeError)
 MySQL  JS > dba.deploySandboxInstance(3315)
A new MySQL sandbox instance will be created on this host in
C:\Users\Dell\MySQL\mysql-sandboxes\3315

Warning: Sandbox instances are only suitable for deploying and
running on your local machine for testing purposes and are not
accessible from external networks.

Please enter a MySQL root password for the new instance: ****

Deploying new MySQL instance...
```
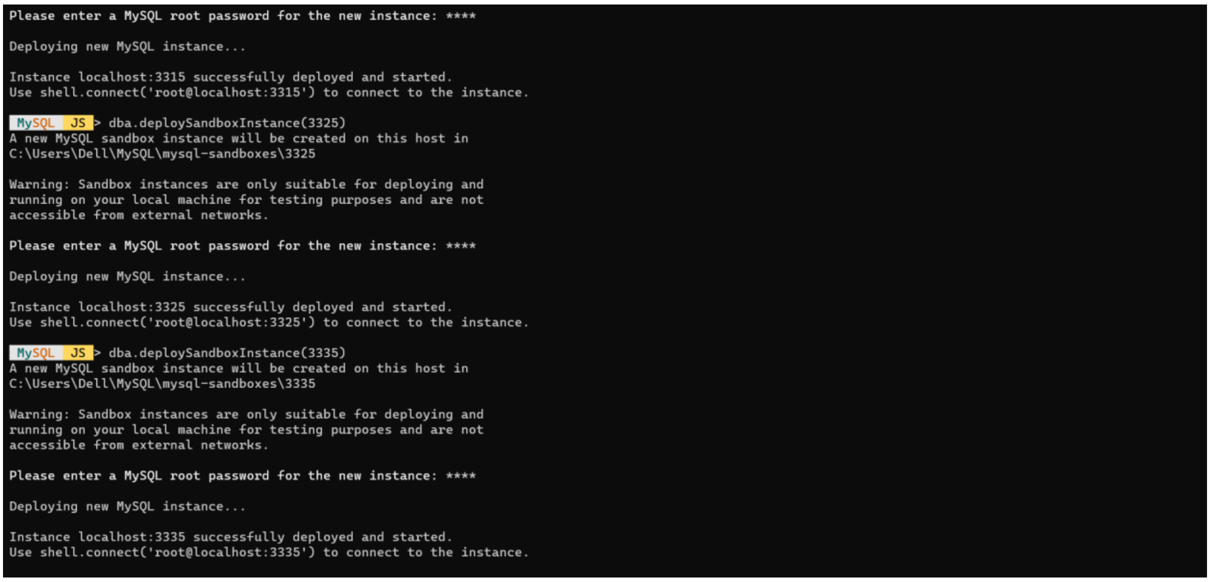
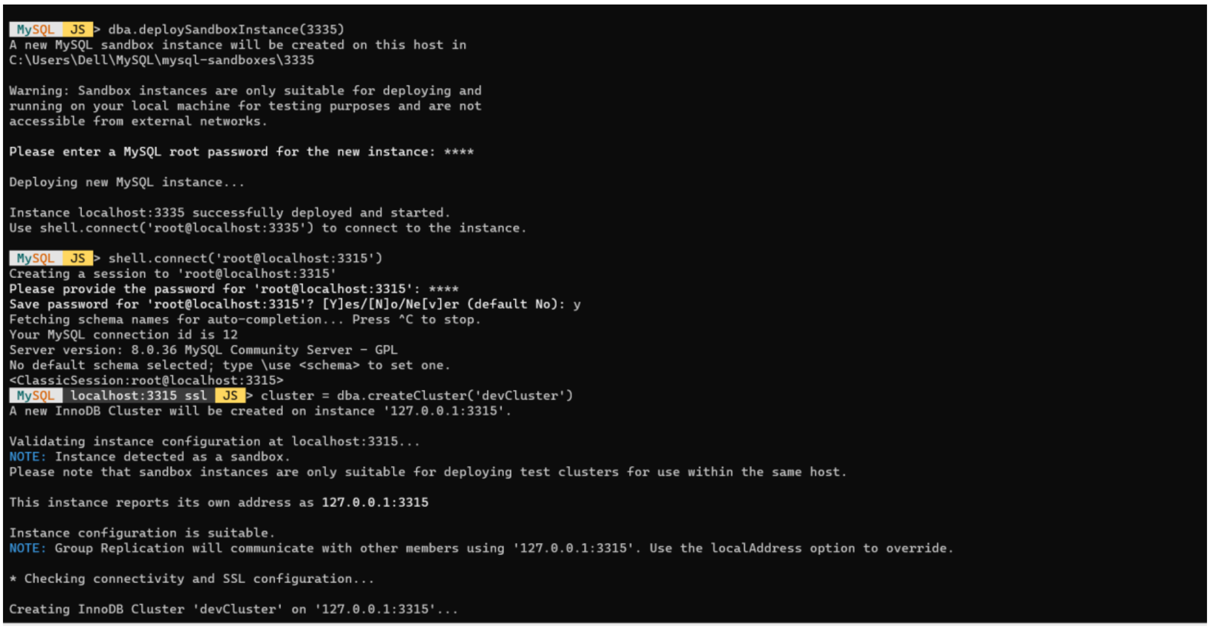
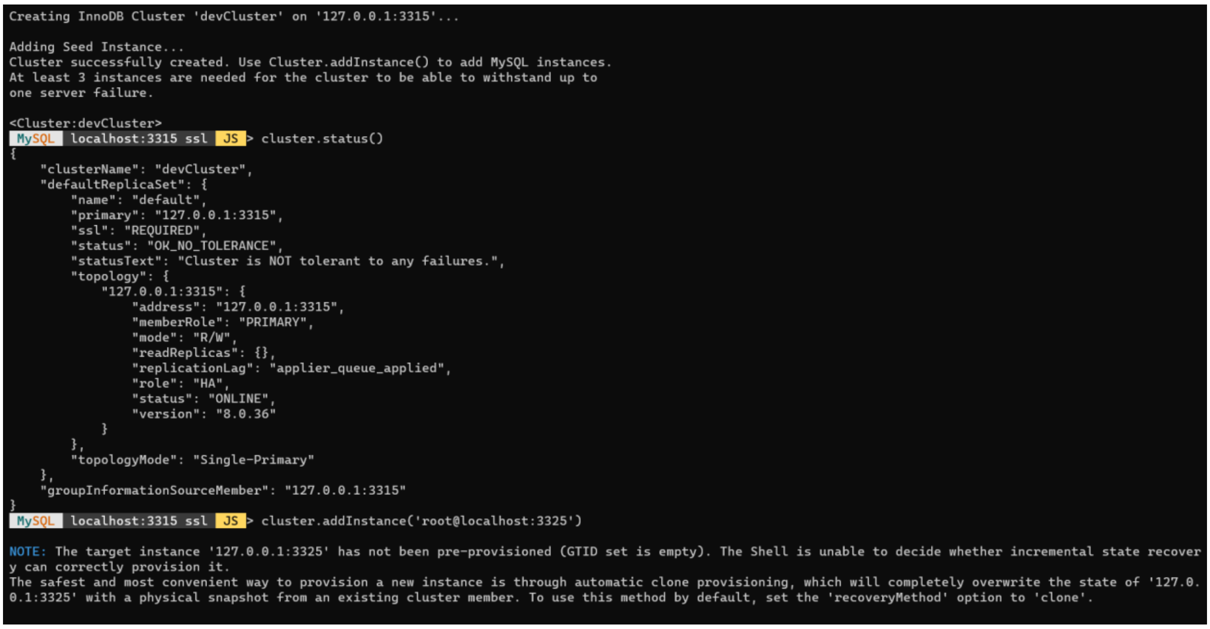



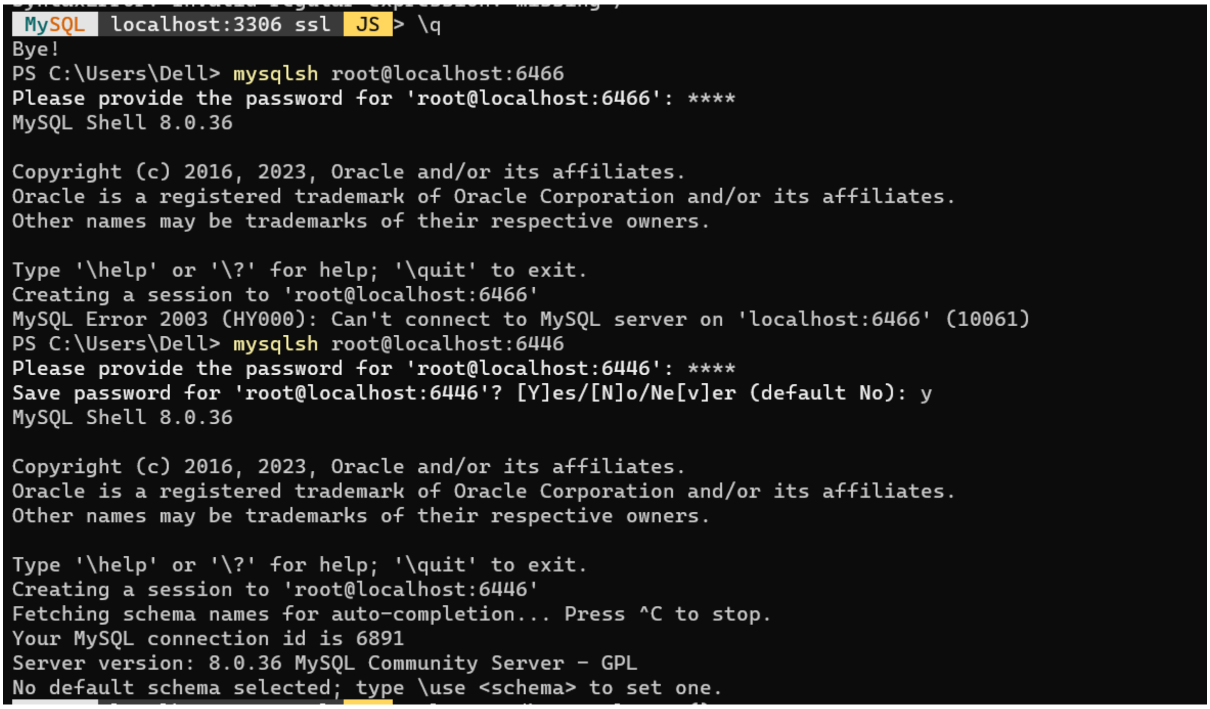
```
Please enter a MySQL root password for the new instance: ****

Deploying new MySQL instance...

Instance localhost:3315 successfully deployed and started.
Use shell.connect('root@localhost:3315') to connect to the instance.

 MySQL  JS > dba.deploySandboxInstance(3325)
A new MySQL sandbox instance will be created on this host in
C:\Users\Dell\MySQL\mysql-sandboxes\3325

Warning: Sandbox instances are only suitable for deploying and
running on your local machine for testing purposes and are not
accessible from external networks.

Please enter a MySQL root password for the new instance: ****

Deploying new MySQL instance...

Instance localhost:3325 successfully deployed and started.
Use shell.connect('root@localhost:3325') to connect to the instance.

 MySQL  JS > dba.deploySandboxInstance(3335)
A new MySQL sandbox instance will be created on this host in
C:\Users\Dell\MySQL\mysql-sandboxes\3335

Warning: Sandbox instances are only suitable for deploying and
running on your local machine for testing purposes and are not
accessible from external networks.

Please enter a MySQL root password for the new instance: ****

Deploying new MySQL instance...

Instance localhost:3335 successfully deployed and started.
Use shell.connect('root@localhost:3335') to connect to the instance.
```



```
 MySQL  JS > dba.deploySandboxInstance(3335)
A new MySQL sandbox instance will be created on this host in
C:\Users\Dell\MySQL\mysql-sandboxes\3335

Warning: Sandbox instances are only suitable for deploying and
running on your local machine for testing purposes and are not
accessible from external networks.

Please enter a MySQL root password for the new instance: ****

Deploying new MySQL instance...

Instance localhost:3335 successfully deployed and started.
Use shell.connect('root@localhost:3335') to connect to the instance.

 MySQL  JS > shell.connect('root@localhost:3315')
Creating a session to 'root@localhost:3315'
Please provide the password for 'root@localhost:3315': ****
Save password for 'root@localhost:3315'? [Y]es/[N]o/Ne[v]er (default No): y
Fetching schema names for auto-completion... Press ^C to stop.
Your MySQL connection id is 12
Server version: 8.0.36 MySQL Community Server - GPL
No default schema selected; type \use <schema> to set one.
<ClassicSession:root@localhost:3315>
 MySQL  localhost:3315 ssl  JS > cluster = dba.createCluster('devCluster')
A new InnoDB Cluster will be created on instance '127.0.0.1:3315'.

Validating instance configuration at localhost:3315...
NOTE: Instance detected as a sandbox.
Please note that sandbox instances are only suitable for deploying test clusters for use within the same host.

This instance reports its own address as 127.0.0.1:3315

Instance configuration is suitable.
NOTE: Group Replication will communicate with other members using '127.0.0.1:3315'. Use the localAddress option to override.

* Checking connectivity and SSL configuration...

Creating InnoDB Cluster 'devCluster' on '127.0.0.1:3315'...
```



```
Creating InnoDB Cluster 'devCluster' on '127.0.0.1:3315'...

Adding Seed Instance...
Cluster successfully created. Use Cluster.addInstance() to add MySQL instances.
At least 3 instances are needed for the cluster to be able to withstand up to
one server failure.

<Cluster:devCluster>
 MySQL  localhost:3315 ssl  JS > cluster.status()
{
    "clusterName": "devCluster",
    "defaultReplicaSet": {
        "name": "default",
        "primary": "127.0.0.1:3315",
        "ssl": "REQUIRED",
        "status": "OK_NO_TOLERANCE",
        "statusText": "Cluster is NOT tolerant to any failures.",
        "topology": {
            "127.0.0.1:3315": {
                "address": "127.0.0.1:3315",
                "memberRole": "PRIMARY",
                "mode": "R/W",
                "readReplicas": {},
                "replicationLag": "applier_queue_applied",
                "role": "HA",
                "status": "ONLINE",
                "version": "8.0.36"
            }
        },
        "topologyMode": "Single-Primary"
    },
    "groupInformationSourceMember": "127.0.0.1:3315"
}
 MySQL  localhost:3315 ssl  JS > cluster.addInstance('root@localhost:3325')

NOTE: The target instance '127.0.0.1:3325' has not been pre-provisioned (GTID set is empty). The Shell is unable to decide whether incremental state recover
y can correctly provision it.
The safest and most convenient way to provision a new instance is through automatic clone provisioning, which will completely overwrite the state of '127.0.
0.1:3325' with a physical snapshot from an existing cluster member. To use this method by default, set the 'recoveryMethod' option to 'clone'.
```



```
 MySQL  localhost:3306 ssl  JS > \q
Bye!
PS C:\Users\Dell> mysqlsh root@localhost:6466
Please provide the password for 'root@localhost:6466': ****
MySQL Shell 8.0.36

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Type '\help' or '\?' for help; '\quit' to exit.
Creating a session to 'root@localhost:6466'
MySQL Error 2003 (HY000): Can't connect to MySQL server on 'localhost:6466' (10061)
PS C:\Users\Dell> mysqlsh root@localhost:6446
Please provide the password for 'root@localhost:6446': ****
Save password for 'root@localhost:6446'? [Y]es/[N]o/Ne[v]er (default No): y
MySQL Shell 8.0.36

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Type '\help' or '\?' for help; '\quit' to exit.
Creating a session to 'root@localhost:6446'
Fetching schema names for auto-completion... Press ^C to stop.
Your MySQL connection id is 6891
Server version: 8.0.36 MySQL Community Server - GPL
No default schema selected; type \use <schema> to set one.
```
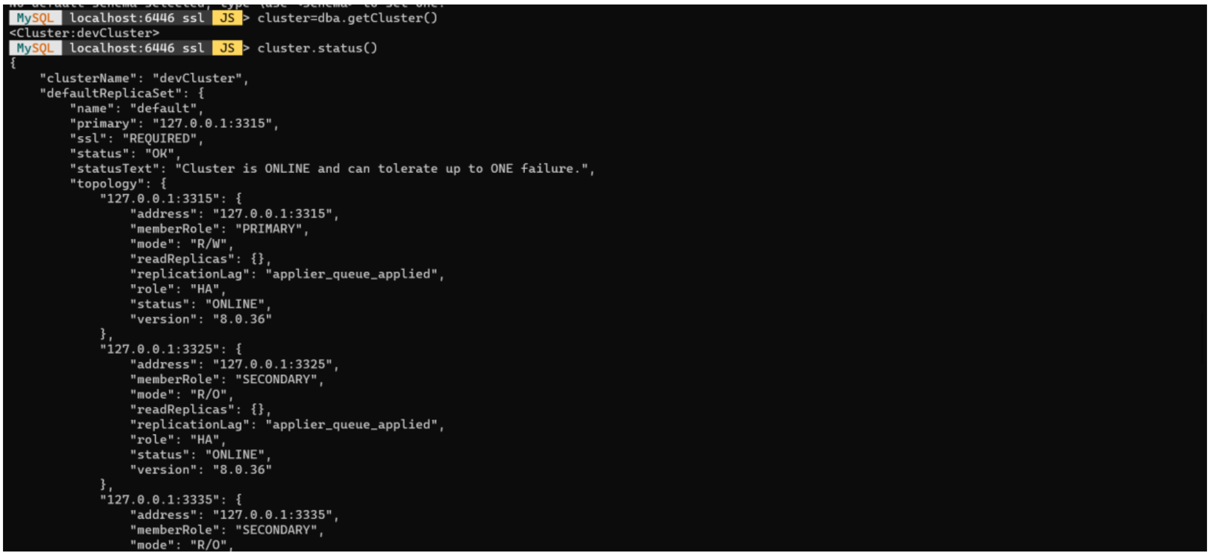
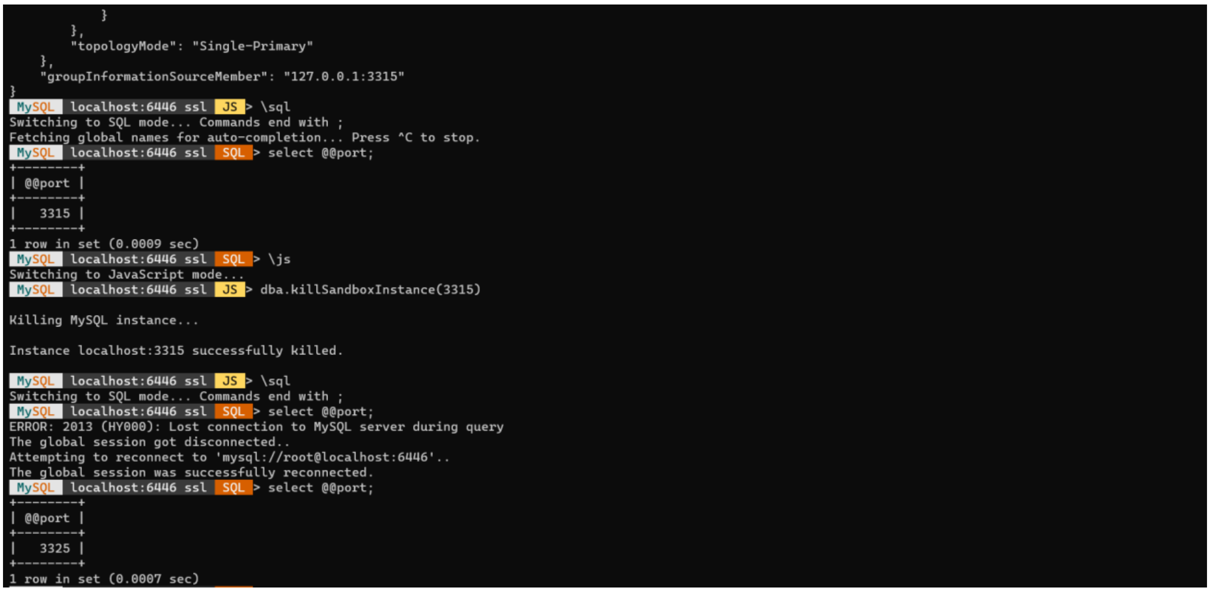
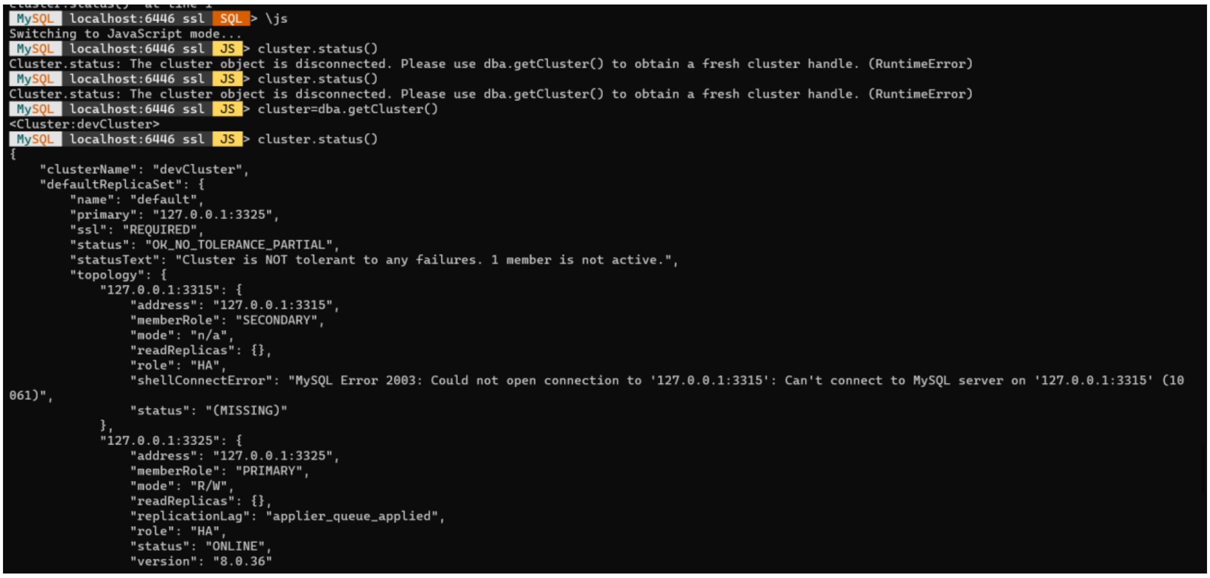



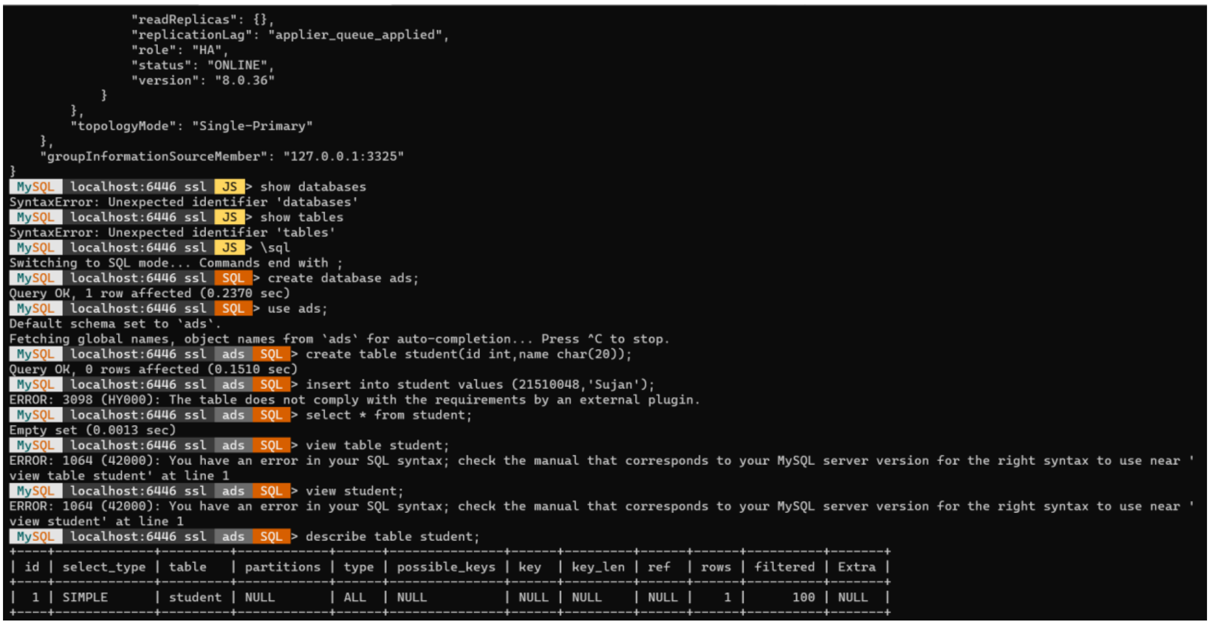
```
 MySQL  localhost:6446 ssl  JS > cluster=dba.getCluster()
<Cluster:devCluster>
 MySQL  localhost:6446 ssl  JS > cluster.status()
{
    "clusterName": "devCluster",
    "defaultReplicaSet": {
        "name": "default",
        "primary": "127.0.0.1:3315",
        "ssl": "REQUIRED",
        "status": "OK",
        "statusText": "Cluster is ONLINE and can tolerate up to ONE failure.",
        "topology": {
            "127.0.0.1:3315": {
                "address": "127.0.0.1:3315",
                "memberRole": "PRIMARY",
                "mode": "R/W",
                "readReplicas": {},
                "replicationLag": "applier_queue_applied",
                "role": "HA",
                "status": "ONLINE",
                "version": "8.0.36"
            },
            "127.0.0.1:3325": {
                "address": "127.0.0.1:3325",
                "memberRole": "SECONDARY",
                "mode": "R/O",
                "readReplicas": {},
                "replicationLag": "applier_queue_applied",
                "role": "HA",
                "status": "ONLINE",
                "version": "8.0.36"
            },
            "127.0.0.1:3335": {
                "address": "127.0.0.1:3335",
                "memberRole": "SECONDARY",
                "mode": "R/O",
```



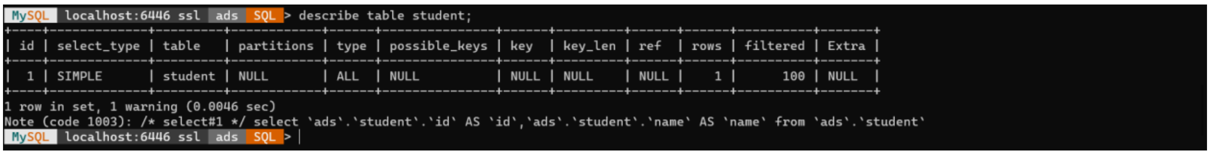
```
            }
        },
        "topologyMode": "Single-Primary"
    },
    "groupInformationSourceMember": "127.0.0.1:3315"
}
 MySQL  localhost:6446 ssl  JS > \sql
Switching to SQL mode... Commands end with ;
Fetching global names for auto-completion... Press ^C to stop.
 MySQL  localhost:6446 ssl  SQL > select @@port;
+--------+
| @@port |
+--------+
|   3315 |
+--------+
1 row in set (0.0009 sec)
 MySQL  localhost:6446 ssl  SQL > \js
Switching to JavaScript mode...
 MySQL  localhost:6446 ssl  JS > dba.killSandboxInstance(3315)

Killing MySQL instance...

Instance localhost:3315 successfully killed.

 MySQL  localhost:6446 ssl  JS > \sql
Switching to SQL mode... Commands end with ;
 MySQL  localhost:6446 ssl  SQL > select @@port;
ERROR: 2013 (HY000): Lost connection to MySQL server during query
The global session got disconnected..
Attempting to reconnect to 'mysql://root@localhost:6446'..
The global session was successfully reconnected.
 MySQL  localhost:6446 ssl  SQL > select @@port;
+--------+
| @@port |
+--------+
|   3325 |
+--------+
1 row in set (0.0007 sec)
```



```
 MySQL  localhost:6446 ssl  SQL > \js
Switching to JavaScript mode...
 MySQL  localhost:6446 ssl  JS > cluster.status()
Cluster.status: The cluster object is disconnected. Please use dba.getCluster() to obtain a fresh cluster handle. (RuntimeError)
 MySQL  localhost:6446 ssl  JS > cluster.status()
Cluster.status: The cluster object is disconnected. Please use dba.getCluster() to obtain a fresh cluster handle. (RuntimeError)
 MySQL  localhost:6446 ssl  JS > cluster=dba.getCluster()
<Cluster:devCluster>
 MySQL  localhost:6446 ssl  JS > cluster.status()
{
    "clusterName": "devCluster",
    "defaultReplicaSet": {
        "name": "default",
        "primary": "127.0.0.1:3325",
        "ssl": "REQUIRED",
        "status": "OK_NO_TOLERANCE_PARTIAL",
        "statusText": "Cluster is NOT tolerant to any failures. 1 member is not active.",
        "topology": {
            "127.0.0.1:3315": {
                "address": "127.0.0.1:3315",
                "memberRole": "SECONDARY",
                "mode": "n/a",
                "readReplicas": {},
                "role": "HA",
                "shellConnectError": "MySQL Error 2003: Could not open connection to '127.0.0.1:3315': Can't connect to MySQL server on '127.0.0.1:3315' (10
061)",
                "status": "(MISSING)"
            },
            "127.0.0.1:3325": {
                "address": "127.0.0.1:3325",
                "memberRole": "PRIMARY",
                "mode": "R/W",
                "readReplicas": {},
                "replicationLag": "applier_queue_applied",
                "role": "HA",
                "status": "ONLINE",
                "version": "8.0.36"
```



```
                "readReplicas": {},
                "replicationLag": "applier_queue_applied",
                "role": "HA",
                "status": "ONLINE",
                "version": "8.0.36"
            }
        },
        "topologyMode": "Single-Primary"
    },
    "groupInformationSourceMember": "127.0.0.1:3325"
}
 MySQL  localhost:6446 ssl  JS > show databases
SyntaxError: Unexpected identifier 'databases'
 MySQL  localhost:6446 ssl  JS > show tables
SyntaxError: Unexpected identifier 'tables'
 MySQL  localhost:6446 ssl  JS > \sql
Switching to SQL mode... Commands end with ;
 MySQL  localhost:6446 ssl  SQL > create database ads;
Query OK, 1 row affected (0.2370 sec)
 MySQL  localhost:6446 ssl  SQL > use ads;
Default schema set to `ads`.
Fetching global names, object names from `ads` for auto-completion... Press ^C to stop.
 MySQL  localhost:6446 ssl  ads  SQL > create table student(id int,name char(20));
Query OK, 0 rows affected (0.1510 sec)
 MySQL  localhost:6446 ssl  ads  SQL > insert into student values (21510048,'Sujan');
ERROR: 3098 (HY000): The table does not comply with the requirements by an external plugin.
 MySQL  localhost:6446 ssl  ads  SQL > select * from student;
Empty set (0.0013 sec)
 MySQL  localhost:6446 ssl  ads  SQL > view table student;
ERROR: 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near '
view table student' at line 1
 MySQL  localhost:6446 ssl  ads  SQL > view student;
ERROR: 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near '
view student' at line 1
 MySQL  localhost:6446 ssl  ads  SQL > describe table student;
+----+-------------+---------+------------+------+---------------+------+---------+------+------+----------+-------+
| id | select_type | table   | partitions | type | possible_keys | key  | key_len | ref  | rows | filtered | Extra |
+----+-------------+---------+------------+------+---------------+------+---------+------+------+----------+-------+
|  1 | SIMPLE      | student | NULL       | ALL  | NULL          | NULL | NULL    | NULL |    1 |      100 | NULL  |
+----+-------------+---------+------------+------+---------------+------+---------+------+------+----------+-------+
```



```
MySQL  localhost:6446 ssl  ads  SQL > describe table student;
+----+-------------+---------+------------+------+---------------+------+---------+------+------+----------+-------+
| id | select_type | table   | partitions | type | possible_keys | key  | key_len | ref  | rows | filtered | Extra |
+----+-------------+---------+------------+------+---------------+------+---------+------+------+----------+-------+
|  1 | SIMPLE      | student | NULL       | ALL  | NULL          | NULL | NULL    | NULL |    1 |      100 | NULL  |
+----+-------------+---------+------------+------+---------------+------+---------+------+------+----------+-------+
1 row in set, 1 warning (0.0046 sec)
Note (code 1003): /* select#1 */ select `ads`.`student`.`id` AS `id`,`ads`.`student`.`name` AS `name` from `ads`.`student`
MySQL  localhost:6446 ssl  ads  SQL > 
```

End of Assignment…