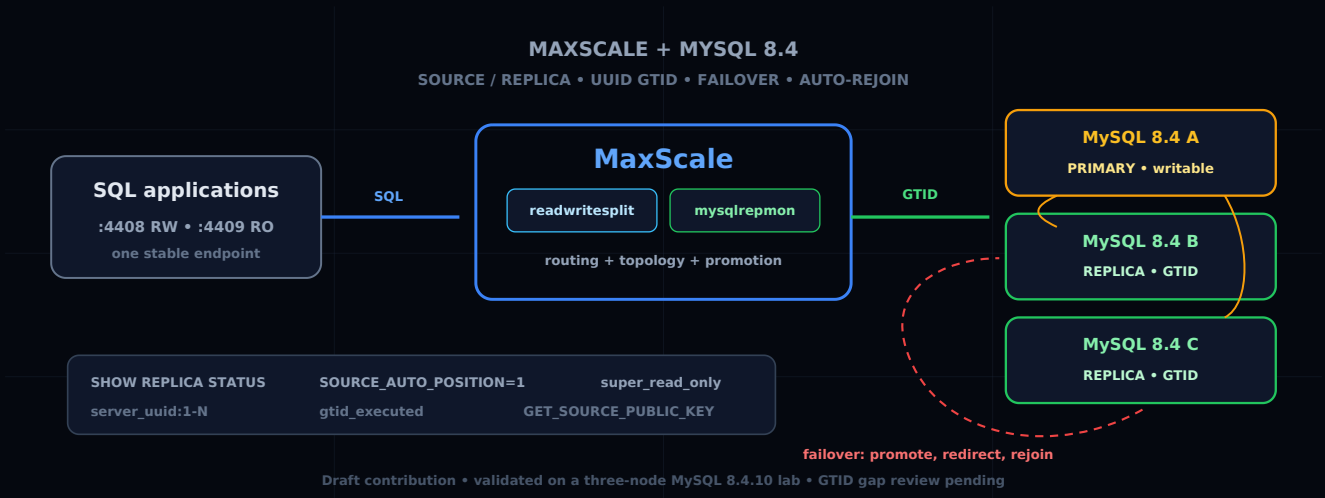
MaxScale and MySQL 8.4: Building Source/Replica-Compatible GTID Failover

Aurélien LEQUOY · July 27, 2026

MAXSCALE MYSQL MYSQL-8.4 REPLICATION GTID FAILOVER HIGH-AVAILABILITY PROXY



> ***Project status — July 27, 2026.*** *Upstream PR #421 proposes the* `mysqlrepmon` *module described in this article for MaxScale. The PR is intentionally a draft: the code has been built and tested on a MySQL 8.4.10 lab, but it is not yet included in an official MaxScale release. Do not present it as a vendor-supported production feature.*

The Problem in One Sentence

MaxScale has historically monitored MariaDB / MySQL replication topologies with `mariadbmon`. But MySQL 8.4 removed the old `SLAVE` / `MASTER` commands, uses UUID-based GTIDs, and requires a different grammar to reconfigure replication.

The outcome is deceptive: a proxy can keep accepting SQL connections while its monitor can no longer read the topology correctly, promote a replica, or attach the former primary.

Three separate functions must be considered:

1. **observe** the topology and replication thread state;
2. **change** the topology during a switchover, failover, or rejoin;

3. **route** application sessions to the current primary and available replicas.

MySQL 8.4 compatibility must be correct in all three areas. Replacing only `SHOW SLAVE STATUS` with `SHOW REPLICA STATUS` is not enough.

Why MySQL 8.4 Breaks the Historical Assumption

MySQL 8.0.22 introduced Source/Replica terminology while keeping several historical aliases. MySQL 8.4 completes that transition: deprecated commands have been removed.

Operation	MariaDB / old dialect	MySQL 8.4
Read replica state	`SHOW SLAVE STATUS`	`SHOW REPLICA STATUS`
Configure the source	`CHANGE MASTER TO`	`CHANGE REPLICATION SOURCE TO`
Start replication	`START SLAVE`	`START REPLICA`
Stop replication	`STOP SLAVE`	`STOP REPLICA`
Clear the configuration	`RESET SLAVE`	`RESET REPLICA`
Read binary log status	`SHOW MASTER STATUS`	`SHOW BINARY LOG STATUS`
Reset GTIDs	`RESET MASTER`	`RESET BINARY LOGS AND GTIDS`

Returned column names also change:

Old name	MySQL 8.4 name
`Master_Host`	`Source_Host`
`Master_Port`	`Source_Port`
`Master_Server_Id`	`Source_Server_Id`
`Slave_IO_Running`	`Replica_IO_Running`
`Slave_SQL_Running`	`Replica_SQL_Running`
`Seconds_Behind_Master`	`Seconds_Behind_Source`
`Master_Log_File`	`Source_Log_File`
`Read_Master_Log_Pos`	`Read_Source_Log_Pos`

Old name	MySQL 8.4 name
`Exec_Master_Log_Pos`	`Exec_Source_Log_Pos`
`Channel_Name`	`Channel_Name`

A monitor that still sends `SHOW SLAVE STATUS` immediately fails with a syntax error. A monitor that sends the correct query but still looks for `Slave_IO_Running` incorrectly concludes that replication is not running.

The Real Difference: The GTID Model

SQL vocabulary is not the most structural difference. Transaction representation is.

MariaDB GTIDs

MariaDB represents a GTID as:

```
domain_id-server_id-sequence
```

Example:

```
0-101-7842
```

The domain is part of the model. The MariaDB monitor knows how to compare those positions and uses `MASTER_USE_GTID`, among other mechanisms.

MySQL GTIDs

MySQL represents a GTID set using server UUIDs and intervals:

```
155fa720-7623-11f1-9a78-bc241174cab8:1-76
```

A history can contain multiple UUIDs and discontinuous intervals:

```
155fa720-7623-11f1-9a78-bc241174cab8:1-10:20-30,
7fd8c42a-7630-11f1-99af-bc241174cab8:1-8
```

MySQL exposes, among other values:

- `@@global.server_uuid` to identify the origin;

- `@@global.gtid_executed` for applied transactions;
- `@@global.gtid_purged` for GTIDs whose binary logs have been purged;
- `Retrieved_Gtid_Set` in `SHOW REPLICA STATUS` for received transactions.

Changing source uses automatic positioning:

```
CHANGE REPLICATION SOURCE TO
    SOURCE_HOST = '10.0.0.12',
    SOURCE_PORT = 3306,
    SOURCE_USER = 'repl',
    SOURCE_PASSWORD = 'secret',
    SOURCE_AUTO_POSITION = 1,
    GET_SOURCE_PUBLIC_KEY = 1
FOR CHANNEL '';
```

The server then selects the correct restart point from GTID sets without receiving a binary log file and position.

Why a `mysqlrepmon` Module

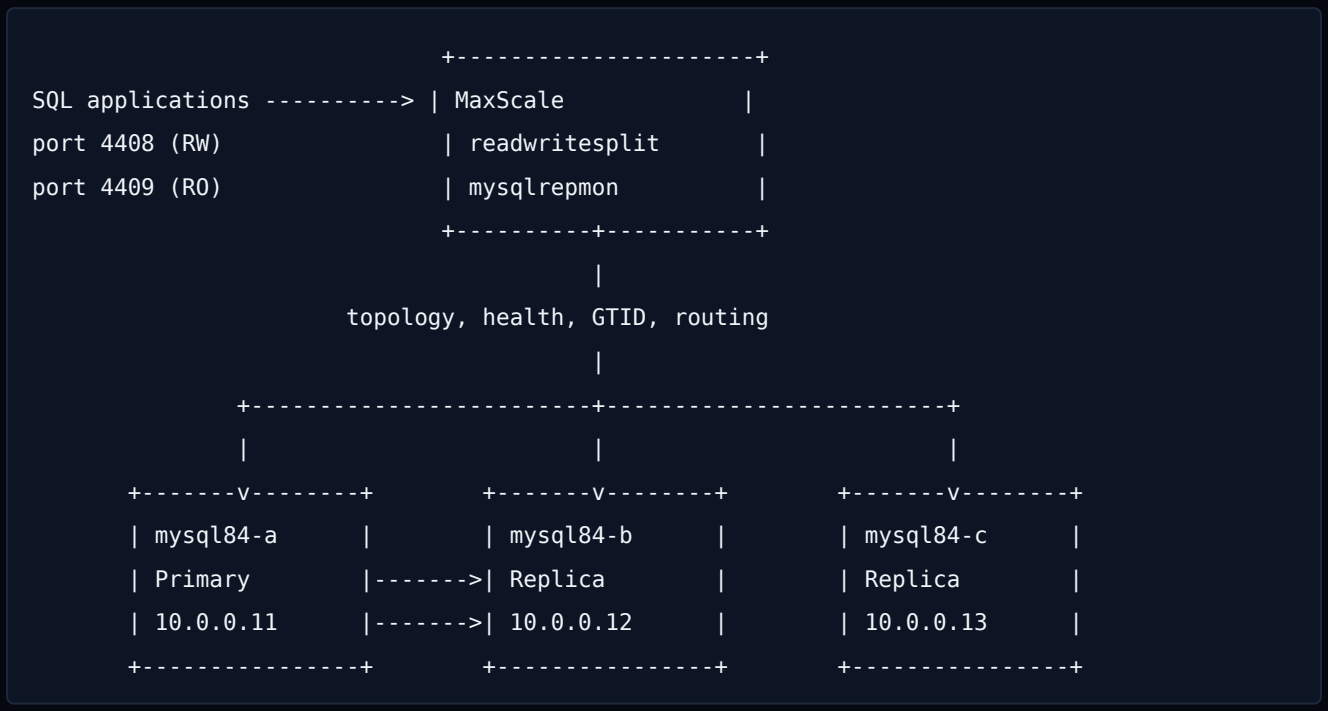
Next to `mariadbmon`, the contribution adds a monitor dedicated to MySQL. It reuses the proven cluster decision and manipulation engine while replacing server-specific leaves:

- reading `SHOW REPLICA STATUS` and `Source_*` / `Replica_*` columns;
- reading `server_uuid`, `gtid_executed`, and `gtid_purged`;
- using `CHANGE REPLICATION SOURCE TO ... SOURCE_AUTO_POSITION=1`;
- issuing `START`, `STOP`, and `RESET REPLICA ... FOR CHANNEL`;
- enabling `super_read_only=1` when demoting a server;
- using `RESET BINARY LOGS AND GTIDS` for the manual reset command;
- checking `enforce_gtid_consistency` and `log_replica_updates`.

The module retains the operational parameters known from `mariadbmon`: `auto_failover`, `auto_rejoin`, `enforce_read_only_slaves`, and switchover, failover, and rejoin commands.

Reference Architecture

The tested architecture uses three MySQL 8.4 servers and one MaxScale node:



Applications never know the primary address. They use a MaxScale listener. The monitor decides which server carries MaxScale's internal `Master` role; `readwritesplit` sends writes to that server and distributes reads.

> *MaxScale itself must be redundant. Perfect database failover is of no use if the only SQL proxy is a single point of failure. In production, plan at least two active/passive MaxScale nodes, a VIP or load balancer, and the appropriate cooperative locking mechanism.*

1. Prepare Every MySQL 8.4 Server

Every server that may be promoted must be able to produce its own binary logs and relay received transactions.

Baseline configuration:

```
[mysqld]
server_id=101
log_bin=mysql-bin
binlog_format=ROW

gtid_mode=ON
enforce_gtid_consistency=ON
```

```
log_replica_updates=ON

relay_log_recovery=ON
```

Use a different `server_id` on each node: `101`, `102`, and `103`, for example.

The `server_uuid` must also be unique. It is stored in the datadir's `auto.cnf` file. If you clone a machine or datadir, never deploy multiple servers with the same `server_uuid`.

On replicas:

```
read_only=ON
super_read_only=ON
```

On the primary:

```
read_only=OFF
super_read_only=OFF
```

After restarting, check the invariants:

```
SELECT
    @@hostname,
    @@server_id,
    @@server_uuid,
    @@gtid_mode,
    @@enforce_gtid_consistency,
    @@log_bin,
    @@log_replica_updates,
    @@read_only,
    @@super_read_only\G

SELECT @@global.gtid_executed\G
SHOW BINARY LOG STATUS\G
SHOW REPLICA STATUS\G
```

A promotable replica must have `log_bin=1`, `log_replica_updates=1`, both replication threads running, and controlled lag.

2. Create Separate Accounts

At a minimum, separate:

- the topology monitoring and manipulation account;
- the account replicas use to read binary logs;
- application accounts that go through the proxy.

Monitor Account

For observation only:

```
CREATE USER 'maxscale_mon'@'10.0.0.10'
    IDENTIFIED BY 'a-long-random-password';

GRANT REPLICATION CLIENT
    ON *.* TO 'maxscale_mon'@'10.0.0.10';
```

For failover, switchover, and rejoin, the monitor must also be able to stop and reconfigure replication, change read-only variables, and control connections:

```
GRANT REPLICATION SLAVE,
      REPLICATION CLIENT,
      PROCESS,
      SUPER,
      SYSTEM_VARIABLES_ADMIN,
      REPLICATION_SLAVE_ADMIN,
      CONNECTION_ADMIN
    ON *.* TO 'maxscale_mon'@'10.0.0.10';
```

The historical `SUPER` privilege is still requested by some compatibility paths. On a finalized module version, reassess the exact list and remove any privilege that is no longer required.

Replication Account

```
CREATE USER 'repl'@'10.0.0.%'
    IDENTIFIED BY 'another-long-random-password'
    REQUIRE SSL;

GRANT REPLICATION SLAVE
    ON *.* TO 'repl'@'10.0.0.%';
```

Prefer TLS. With MySQL 8.4's default `caching_sha2_password` authentication over an unencrypted connection, the source change command must supply `GET_SOURCE_PUBLIC_KEY=1` or a path to the RSA public key. The module adds this option when TLS is not enabled.

Service Account for Client Authentication

A MaxScale service's `user` is not the account under which every application query runs. It allows MaxScale's User Account Manager to load accounts and privileges from the backends:

```
CREATE USER 'maxscale_route'@'10.0.0.10'
    IDENTIFIED BY 'route-password';

GRANT SELECT ON mysql.user
    TO 'maxscale_route'@'10.0.0.10';
GRANT SELECT ON mysql.db
    TO 'maxscale_route'@'10.0.0.10';
GRANT SELECT ON mysql.tables_priv
    TO 'maxscale_route'@'10.0.0.10';
GRANT SELECT ON mysql.columns_priv
    TO 'maxscale_route'@'10.0.0.10';
GRANT SELECT ON mysql.procs_priv
    TO 'maxscale_route'@'10.0.0.10';
GRANT SELECT ON mysql.proxies_priv
    TO 'maxscale_route'@'10.0.0.10';
GRANT SHOW DATABASES ON *.*
    TO 'maxscale_route'@'10.0.0.10';
```

Application accounts must still exist on the MySQL servers with the same secret and consistent grants. Since the backends see connections arrive from MaxScale, their `@host` part must allow the proxy address.

3. Build the Contribution at a Reproducible SHA

Because the PR is still a draft, the standard MaxScale package does not contain `mysqlrepmon`. For a lab only, build the exact public SHA:

```
git clone https://github.com/mariadb-corporation/MaxScale.git
cd MaxScale

git fetch https://github.com/Esysteme/MaxScale.git \
```

```
  aurelien/mysql-8.4-replication-support
git checkout --detach f61776a5b19cf295636c94a8a3dea6d81fcd61fb

cmake -S . -B build \
  -DCMAKE_BUILD_TYPE=Release \
  -DCMAKE_INSTALL_PREFIX=/usr/local/maxscale-mysql84

cmake --build build --target mariadbmon mysqlrepmon test_cycle_find -j2
ctest --test-dir build --output-on-failure \
  -R '^test_mariadbmon_cycle_find$'

cmake --build build -j2
sudo cmake --install build
```

The targeted build must produce `libmysqlrepmon.so`. The contribution's CMake fix explicitly reuses `LIBSSH_LIBRARY` and `LIBSSH_INCLUDE_DIR` detected by MaxScale instead of assuming an internal `libssh` target exists.

Start the Isolated Build

The `/usr/local/maxscale-mysql84` prefix avoids overwriting the installed package. In return, the package's `maxscale.service` still starts `/usr/bin/maxscale` and will not load the new module. For the lab, create `/etc/systemd/system/maxscale-mysql84.service`:

```
[Unit]
Description=MaxScale MySQL 8.4 compiled build
After=network-online.target
Wants=network-online.target

[Service]
Type=simple
User=maxscale
Group=maxscale
RuntimeDirectory=maxscale
RuntimeDirectoryMode=0755
ExecStart=/usr/local/maxscale-mysql84/bin/maxscale --nodaemon --config=/etc/maxscale.cnf --
logdir=/var/log/maxscale --datadir=/var/lib/maxscale --cachedir=/var/cache/maxscale --
libdir=/usr/local/maxscale-mysql84/lib/maxscale --piddir=/run/maxscale
Restart=on-failure
RestartSec=5s
LimitNOFILE=65535
```

```
[Install]
WantedBy=multi-user.target
```

The `maxscale` system account and data directories must exist; they are normally created by the installed MaxScale package that provides the runtime environment. Then reload systemd:

```
sudo install -d -o maxscale -g maxscale -m 0755 \
  /var/lib/maxscale /var/cache/maxscale /var/log/maxscale
sudo systemctl daemon-reload
```

4. Configure MaxScale

Complete minimal example:

```
[maxscale]
threads=auto
admin_host=127.0.0.1
admin_port=8989

[mysql84-a]
type=server
address=10.0.0.11
port=3306
protocol=MariaDBBackend

[mysql84-b]
type=server
address=10.0.0.12
port=3306
protocol=MariaDBBackend

[mysql84-c]
type=server
address=10.0.0.13
port=3306
protocol=MariaDBBackend

[MySQL84-Monitor]
type=monitor
```

```
module=mysqlrepmon
servers=mysql84-a,mysql84-b,mysql84-c
user=maxscale_mon
password=a-long-random-password
monitor_interval=2000ms

assume_unique_hostnames=true
auto_failover=safe
auto_rejoin=true
enforce_read_only_slaves=true

replication_user=repl
replication_password=another-long-random-password
replication_master_ssl=true

[MySQL84-RW-Service]
type=service
router=readwritesplit
servers=mysql84-a,mysql84-b,mysql84-c
user=maxscale_route
password=route-password

master_reconnection=true
master_failure_mode=fail_on_write

[MySQL84-RW-Listener]
type=listener
service=MySQL84-RW-Service
protocol=MariaDBClient
port=4408

[MySQL84-RO-Service]
type=service
router=readconnroute
servers=mysql84-a,mysql84-b,mysql84-c
user=maxscale_route
password=route-password
router_options=slave

[MySQL84-RO-Listener]
type=listener
service=MySQL84-RO-Service
```

```
protocol=MariaDBClient
port=4409
```

Passwords are left in clear text here only to keep the example readable. In operations, use MaxScale's secret encryption, strict permissions on the configuration file, and a documented rotation process.

`assume_unique_hostnames=true` is required to enable `auto_failover` and `auto_rejoin`. Each backend must therefore expose a unique, stable address or hostname matching the source recorded by the replicas; use `private_address` when the replication network uses a different address.

Why start with `auto_failover=safe`? This mode refuses the operation when the monitor detects that promotion would clearly lose transactions. It does not turn asynchronous replication into synchronous replication, but it adds a useful barrier during evaluation.

Why `master_reconnection=true` and `master_failure_mode=fail_on_write`? A `readwritesplit` session can preserve its context and reconnect to the new primary as long as no write arrives during the no-primary window and no transaction is open. Without those settings, database failover can succeed while every application session is still disconnected.

5. Verify Before the First Test

Validate the configuration and start MaxScale:

```
sudo /usr/local/maxscale-mysql84/bin/maxscale \
  --config=/etc/maxscale.cnf \
  --libdir=/usr/local/maxscale-mysql84/lib/maxscale \
  --config-check

sudo systemctl disable --now maxscale.service 2>/dev/null || true
sudo systemctl enable --now maxscale-mysql84.service
systemctl --no-pager --full status maxscale-mysql84.service
```

Check that the module and topology are visible:

```
maxctrl list modules | grep -E 'mariadbmon|mysqlrepmon'
maxctrl list servers
maxctrl list monitors
```

```
maxctrl show monitor MySQL84-Monitor
```

Expected state:

- one `Master, Running` server;
- two `Slave, Running` servers;
- no `Down` server;
- an active monitor;
- open listeners on `4408` and `4409`.

Also check MySQL directly:

```
mysql -h 10.0.0.12 -e "SHOW REPLICA STATUS\\G"
mysql -h 10.0.0.13 -e "SHOW REPLICA STATUS\\G"
```

The essential fields are:

```
Replica_IO_Running: Yes
Replica_SQL_Running: Yes
Seconds_Behind_Source: 0
Auto_Position: 1
```

6. Understand the Failover Sequence

When the primary disappears, the monitor does more than change a label:

1. it waits for the number of cycles defined by `failcount` and verifies the failure as far as possible;
2. it compares replica state and selects a promotable candidate;
3. it stops replication on the candidate;
4. it disables `read_only` on the new primary;
5. it redirects the other replicas using `CHANGE REPLICATION SOURCE TO ... SOURCE_AUTO_POSITION=1`;
6. it restarts their replication threads;
7. `readwritesplit` detects the new role and routes subsequent writes to the new primary.

To demote a primary, `mysqlrepmon` uses:

```
SET GLOBAL super_read_only = 1;
```

This is stronger than `read_only=1`: even an account with administrative privileges must not accidentally keep writing to the former primary.

7. Test a Controlled Switchover

Before simulating a hard failure, validate a switchover:

```
maxctrl call command mysqlrepmon switchover \
  MySQL84-Monitor mysql84-b mysql84-a
```

Then check:

```
maxctrl list servers

mysql -h 10.0.0.11 -e \
  "SELECT @@hostname, @@read_only, @@super_read_only, @@global.gtid_executed\\G"
mysql -h 10.0.0.12 -e \
  "SELECT @@hostname, @@read_only, @@super_read_only, @@global.gtid_executed\\G"
mysql -h 10.0.0.13 -e \
  "SELECT @@hostname, @@read_only, @@super_read_only, @@global.gtid_executed\\G"
```

The new primary must be writable. Both other nodes must have `super_read_only=1` and replicate from it.

8. Test a Real Failure Without Cheating

First create data through MaxScale:

```
CREATE DATABASE maxscale_ha_test;
CREATE TABLE maxscale_ha_test.events (
    id BIGINT UNSIGNED NOT NULL AUTO_INCREMENT,
    source_hostname VARCHAR(255) NOT NULL,
    created_at TIMESTAMP(6) NOT NULL DEFAULT CURRENT_TIMESTAMP(6),
    PRIMARY KEY (id)
) ENGINE=InnoDB;

INSERT INTO maxscale_ha_test.events(source_hostname)
```

```
VALUES (@@hostname);
```

Verify that it exists on the replicas, then stop the primary at the service or machine level. Do not merely place the server in maintenance mode in MaxScale: that tests an administrative decision, not failure detection.

During the test:

```
watch -n 1 'maxctrl list servers'
```

In another terminal:

```
journalctl -u maxscale -f
```

Success criteria:

- exactly one new primary is elected;
- the other replicas point to it;
- a write through listener `4408` succeeds after promotion;
- reads through `4409` remain consistent;
- the former primary rejoins as a replica after it returns;
- `gtid_executed` sets converge.

What the MySQL 8.4.10 Lab Validated

The scenario was executed on three MySQL 8.4.10 nodes:

- initial detection of the primary and two replicas;
- primary shutdown;
- promotion of one replica;
- redirection of the remaining replica to the new source;
- return of the former primary and automatic rejoin as a replica;
- a second failover in the opposite direction;
- final convergence to the same `gtid_executed` set on all three servers;
- valid read/write routing through MaxScale;
- writes rejected on the read-only listener.

This test validates the functional path on contiguous GTID histories. It does not yet prove every edge case required for upstream integration.

Authentication: Do Not Confuse Two Failures

The MaxScale build deployed in the lab rejected application accounts using MySQL 8.4's `caching_sha2_password` hash:

```
Stored password hash length is 70 when 40 was expected
```

This message comes from the MaxScale protocol authenticator used in that build, not from the replication monitor. Replication and routing can be healthy while client authentication fails.

In the lab, an explicitly dedicated `mysql_native_password` probe account isolated the issue. This is not a general recommendation: MySQL 8.4 disables that historical plugin by default. In production, use a MaxScale build and authenticator compatible with `caching_sha2_password`, or an officially supported authentication method, rather than globally weakening the MySQL configuration.

The same rule applies to:

```
401 Unauthorized
```

on the REST port: it means `maxctrl` does not have the correct administrative credentials. It is not evidence that the monitor or SQL routing is down.

Diagnostic Table

Symptom	Likely cause	Check
Syntax error on `SHOW SLAVE STATUS`	old module or MariaDB dialect used against MySQL 8.4	MaxScale log, query actually sent
Server shown without replica role	`Replica_*` columns not mapped	direct `SHOW REPLICA STATUS\G`
Replica cannot be promoted	`log_bin`, `log_replica_updates`, or GTID disabled	global variables and monitor log

Symptom	Likely cause	Check
Rejoin refused	errant transactions or incompatible history	compare `gtid_executed` / `gtid_purged`
`Stored password hash length is 70...`	authenticator incompatible with `caching_sha2_password`	MaxScale log, account plugin
`401 Unauthorized` with `maxctrl`	incorrect REST credentials	MaxScale admin configuration
Session disconnected despite promotion	router cannot reconnect, open transaction, or exhausted session-command history	`master_reconnection`, `master_failure_mode`, router log
Two writable primaries	insufficient fencing/read-only enforcement or concurrent monitors	`super_read_only`, cooperative locks, network state

Known Limitation: Gaps in GTID Sets

To reuse the internal `mariadbmon` engine, the proposal maps each MySQL UUID to a synthetic domain and converts its intervals to the existing internal representation.

In its current state, it keeps the highest transaction number for each UUID. Therefore:

```
uuid:1-10:20-30
```

is summarized as though the position reached `30`. The information that transactions 11 through 19 are absent is not represented faithfully.

Lab histories were contiguous. On infrastructure with injected, filtered, purged, or errant GTIDs, this approximation can distort candidate comparison.

This is the main reason the PR remains a draft. Before the module can be considered production-ready, it needs:

- correct representation or comparison of discontinuous intervals;
- unit tests with multiple UUIDs and gaps;
- coverage for errant GTIDs and purged histories;
- the complete upstream CI;

- review by MaxScale maintainers.

What Failover Does Not Guarantee

A monitor does not abolish the properties of asynchronous replication.

- **Zero RPO is not guaranteed**: a transaction acknowledged by the former primary might not have reached a replica.
- **Open transactions**: an in-transaction session cannot always be moved without an error.
- **Split brain**: if the former primary remains reachable by some applications, real network or system fencing is required.
- **Complex topologies**: multi-source, circular replication, and relays need a specific strategy.
- **Divergent data**: `auto_rejoin` must not silently overwrite errant transactions.
- **Single proxy**: MaxScale must be made redundant separately.

A proper high-availability test therefore measures four separate things: detection, promotion, data convergence, and application continuity.

Pre-Production Checklist

- [ ] a tested, restorable backup;
- [ ] three unique `server_id` and `server_uuid` values;
- [ ] GTID and `log_replica_updates` enabled everywhere;
- [ ] TLS between MaxScale and backends;
- [ ] separate monitor, replication, and application accounts;
- [ ] `super_read_only=1` verified on every replica;
- [ ] controlled switchover validated before a hard failover;
- [ ] write test through MaxScale after promotion;
- [ ] former-primary rejoin test;
- [ ] final comparison of `gtid_executed` sets;
- [ ] documented behavior for application transactions;
- [ ] tested fencing and MaxScale redundancy;

- [ ] alerting on every promotion and GTID divergence;
- [ ] upstream module finalized, reviewed, and supported before production.

Why Publish This Contribution

MySQL 8.4 is an LTS release. Historical commands are not coming back. Keeping aliases indefinitely in monitoring tools does not solve the GTID model difference or the reconfiguration grammar.

A dedicated module makes the boundary explicit:

- `mariadbmon` stays native to the MariaDB dialect and GTIDs;
- `mysqlrepmon` carries MySQL 8.x-specific rules;
- the common failover engine remains shared;
- tests can verify each family without multiplying scattered conditions.

MaxScale PR #421 contains the code, documentation, validation commands, lab results, and the known GTID limitation. The purpose of the draft is precisely to obtain review of this representation before claiming that every MySQL history is safe.

Further Reading

- MySQL 8.4 — new features and removed replication commands
- MySQL 8.4 — replication configuration
- MySQL 8.4 — changing source and `GET_SOURCE_PUBLIC_KEY`
- MaxScale — MariaDB Monitor parameters
- MaxScale — readwritesplit router
- Install MySQL 8.4 on Debian 13
- Understand the move from Master/Slave to Source/Replica

Want to See This Support in MaxScale?

If this MySQL 8.4 compatibility would be useful to you, read the proposal, test the branch, and show your support directly on the PR. Field feedback, complex GTID cases, and technical reviews will help turn this draft into a contribution that can genuinely be integrated:

Support MaxScale PR #421