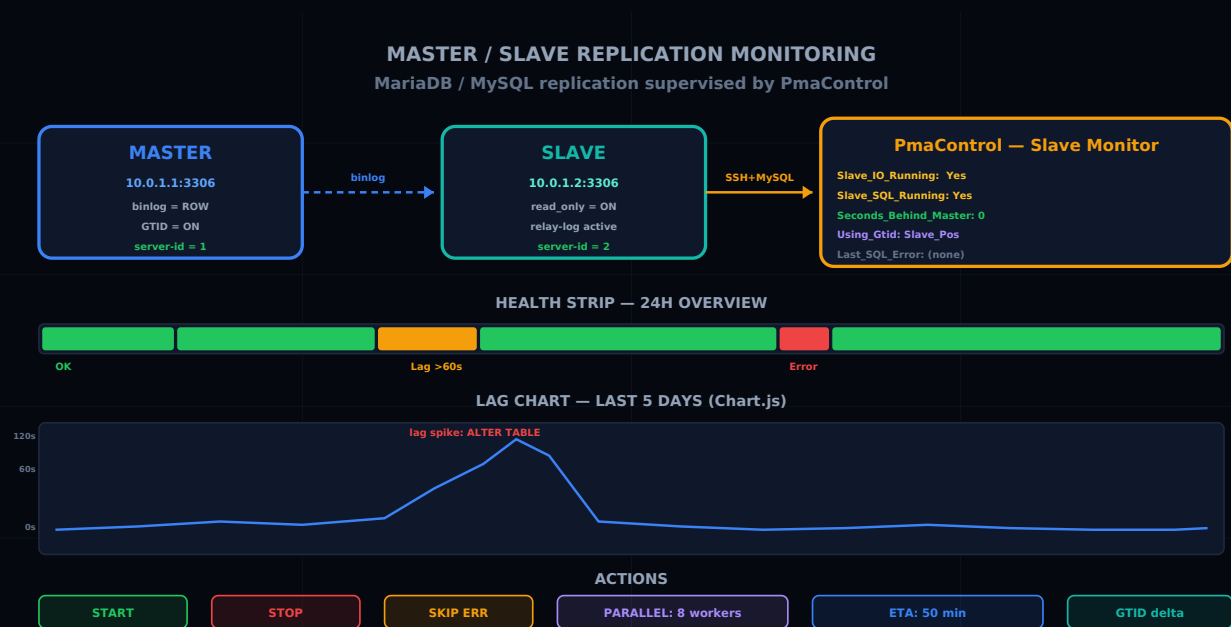


Deploy Master/Slave and Monitor Replication in PmaControl

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MARIADB MYSQL REPLICATION MASTER-SLAVE MONITORING PMACONTROL



Replication in 2026: Still the Foundation

Master/slave replication remains the fundamental building block of any production MariaDB / MySQL infrastructure. High availability, read distribution, hot backups — everything relies on it. And yet, most serious database incidents involve broken replication or undetected lag.

This article covers both sides of replication: how to set it up properly, then how to monitor it in PmaControl so you are never caught off guard.

Configuring Replication

Master Prerequisites

The master must have binlog enabled and a unique `server-id` :

```
[mysqld]
server-id = 1
log-bin = /var/log/mysql/mysql-bin
binlog-format = ROW
gtid_strict_mode = ON          # MariaDB
# enforce_gtid_consistency = ON # MySQL
# gtid_mode = ON              # MySQL
```

Create the replication user:

```
CREATE USER 'repl'@'10.0.1.%' IDENTIFIED BY 'secret_replication_password';
GRANT REPLICATION SLAVE ON *.* TO 'repl'@'10.0.1.%';
```

Slave Prerequisites

The slave needs its own `server-id` and relay log:

```
[mysqld]
server-id = 2
relay-log = /var/log/mysql/relay-bin
read-only = ON
log-slave-updates = ON
```

`log-slave-updates` is essential if you plan to chain slaves (slave of a slave) or use Galera.

Starting Replication

With GTID (Recommended)

On MariaDB:

```
CHANGE MASTER TO
  MASTER_HOST = '10.0.1.1',
  MASTER_USER = 'repl',
  MASTER_PASSWORD = 'secret_replication_password',
  MASTER_USE_GTID = slave_pos;

START SLAVE;
```

On MySQL 8.0+:

```
CHANGE REPLICATION SOURCE TO
  SOURCE_HOST = '10.0.1.1',
  SOURCE_USER = 'repl',
  SOURCE_PASSWORD = 'secret_replication_password',
  SOURCE_AUTO_POSITION = 1;

START REPLICA;
```

Without GTID (Classic Mode)

If GTID is not enabled, you need to note the master's binlog position:

```
-- On the master
SHOW MASTER STATUS;
-- File: mysql-bin.000042, Position: 154

-- On the slave
CHANGE MASTER TO
  MASTER_HOST = '10.0.1.1',
  MASTER_USER = 'repl',
  MASTER_PASSWORD = 'secret_replication_password',
  MASTER_LOG_FILE = 'mysql-bin.000042',
  MASTER_LOG_POS = 154;

START SLAVE;
```

Verifying It Works

```
SHOW SLAVE STATUS\G
```

The two key indicators:

```
Slave_IO_Running: Yes
Slave_SQL_Running: Yes
Seconds_Behind_Master: 0
```

If `Slave_IO_Running` is `No`, the slave cannot connect to the master (network, credentials, firewall).

If `Slave_SQL_Running` is `No`, the slave cannot apply events (SQL error, constraint violation).

Adding Servers to PmaControl

Via the Web Interface

1. Go to **Servers -> Add a server**
2. Enter the IP, port (3306), SSH and MySQL credentials
3. PmaControl automatically detects the role (master or slave) after the first collection cycle

Via the REST API

```
# Add the master
curl -X POST -H "Authorization: Bearer $TOKEN" \
  -H "Content-Type: application/json" \
  -d '{"ip": "10.0.1.1", "port": 3306, "name": "db-prod-master", "ssh_key_id": 1}' \
  https://pmacontrol.example.com/api/v1/servers

# Add the slave
curl -X POST -H "Authorization: Bearer $TOKEN" \
  -H "Content-Type: application/json" \
  -d '{"ip": "10.0.1.2", "port": 3306, "name": "db-prod-slave-01", "ssh_key_id": 1}' \
  https://pmacontrol.example.com/api/v1/servers
```

PmaControl launches a collection cycle within a minute. The slave then appears with a "Slave" badge in the dashboard.

The Slave Page in PmaControl

Replication monitoring is accessible via the route:

```
{lang}/slave/show/{id}/{name}/
```

For example: `/en/slave/show/42/db-prod-slave-01/`

The `slave.php` controller exposes two main actions:

- `show()` : the main page with current status and lag chart
- `showGraphDay()` : AJAX data to load an additional day of chart data

Monitored Variables

PmaControl collects all variables from `SHOW SLAVE STATUS` and stores them in time series tables.

The most critical:

Variable	Meaning
<code>Slave_IO_Running</code>	Is the IO thread active (master connection)
<code>Slave_SQL_Running</code>	Is the SQL thread active (event application)
<code>Seconds_Behind_Master</code>	Lag in seconds
<code>Using_Gtid</code>	GTID mode used (MariaDB)
<code>Auto_Position</code>	GTID auto-position (MySQL)
<code>Last_SQL_Error</code>	Last SQL error encountered
<code>Relay_Log_Space</code>	Current relay log size

For MySQL 8.0+, PmaControl also handles the renamed equivalents:

Old Variable	New Variable (MySQL 8.0+)
<code>Slave_IO_Running</code>	<code>Replica_IO_Running</code>
<code>Slave_SQL_Running</code>	<code>Replica_SQL_Running</code>
<code>Seconds_Behind_Master</code>	<code>Seconds_Behind_Source</code>

PmaControl automatically normalizes both names internally.

The Lag Chart

The lag chart is the heart of the slave page. It displays the **last 5 days** of `Seconds_Behind_Master` as a Chart.js curve.

Features:

- **Resolution:** one point per minute (1440 points per day)
- **Progressive loading:** the current day loads immediately, previous days via AJAX "Load previous day"
- **Auto-scaling:** the Y axis adapts to the maximum observed lag
- **Green zone:** < 10 seconds, normal operation

- **Amber zone:** 10-60 seconds, moderate lag
- **Red zone:** > 60 seconds, critical lag

The Health Strip

Above the chart, a horizontal strip summarizes the status of each minute over 24 hours with a color code:

Color	Condition
Green	IO Running + SQL Running + lag < 60s
Amber	IO Running + SQL Running + lag > 60s
Red	IO or SQL stopped, or critical error

This is an instant visual indicator: a single glance tells you whether the last 24 hours have been stable or chaotic.

Corrective Actions from PmaControl

The slave page is not limited to observation. PmaControl lets you act directly on replication.

START / STOP SLAVE

Two buttons to start or stop replication. STOP SLAVE is useful for:

- Performing maintenance on the slave (heavy ALTER TABLE)
- Taking a consistent backup (snapshot with replication stopped)
- Diagnosing a lag issue (stop to examine the binlog)

SKIP Error

When replication stops on a SQL error (duplicate constraint, missing table), PmaControl offers to **skip the event:**

```
SET GLOBAL sql_slave_skip_counter = 1;  
START SLAVE;
```

Warning: this action requires explicit confirmation. Skipping an event means accepting a divergence between master and slave. PmaControl logs the action with the user, date, and

skipped error for traceability.

Parallel Workers

PmaControl provides a **slider** to adjust the number of parallel replication workers:

- **Minimum:** 1 (classic sequential replication)
- **Maximum:** 50 or CPU x 2 (whichever is smaller)

```
STOP SLAVE;  
SET GLOBAL slave_parallel_workers = 8;  
START SLAVE;
```

Increasing workers allows catching up on lag faster, as multiple transactions are applied in parallel. But be careful: this only works well with parallel replication by LOGICAL_CLOCK (MariaDB) or WRITESET (MySQL 8.0+).

Catch-Up ETA Algorithm

When a slave has lag, the immediate question is: **how long to catch up?**

PmaControl calculates an estimate (ETA) based on:

1. Current lag in seconds
2. Observed catch-up speed (lag variation over the last 10 minutes)
3. Linear extrapolation

```
If lag goes from 3600s to 3000s in 10 minutes:  
Speed = 600s caught up / 10min = 60s/min  
ETA = 3000s / 60s/min = 50 minutes
```

The ETA is displayed at the top of the slave page with a progress bar. If the catch-up speed is zero or negative (lag is increasing), PmaControl displays "ETA: divergent" in red — a sign that intervention is needed.

GTID Support

PmaControl automatically detects the GTID mode:

- **MariaDB:** reads `Using_Gtid` from `SHOW SLAVE STATUS`. Possible values: `No`, `Slave_Pos`, `Current_Pos`
- **MySQL:** reads `Auto_Position` from `SHOW SLAVE STATUS`. Possible values: `0`, `1`

When GTID is active, PmaControl displays additional information:

- The master's GTID set (`Gtid_Slave_Pos` or `Executed_Gtid_Set`)
- The slave's GTID set
- The delta between the two (number of transactions behind)

The GTID delta is often more meaningful than `Seconds_Behind_Master`: it gives the exact number of transactions to catch up, regardless of each transaction's duration.

Best Practices

1. Always Use GTID

Binlog position mode (file + position) is fragile: a file purged too early, a failover, and replication breaks. GTID is idempotent and survives failovers.

2. Enable `read_only` on Slaves

```
SET GLOBAL read_only = ON;  
SET GLOBAL super_read_only = ON; -- MySQL 5.7.8+ / MariaDB 10.3.16+
```

Without `read_only`, an accidental write on the slave causes a silent divergence.

3. Monitor Lag, Not Just Status

`Slave_IO_Running: Yes` and `Slave_SQL_Running: Yes` are not enough. A slave can be "running" but with 2 hours of lag. PmaControl monitors both: status AND lag.

4. Configure Alerts

In PmaControl, set up alert thresholds:

- **Warning:** lag > 60 seconds for 5 minutes
- **Critical:** lag > 300 seconds OR IO/SQL stopped

Alerts are sent via Telegram with the server name, current lag, and a direct link to the slave page.

5. Plan Heavy Operations

`ALTER TABLE` on large tables generates a temporary lag spike. Use `pt-online-schema-change` or `gh-ost` for DDL in production, and put the slave in maintenance mode in PmaControl to avoid false positives.

Conclusion

MariaDB / MySQL replication is simple to configure but hard to maintain over time. PmaControl bridges the gap between "replication is running" and "replication is healthy" by providing:

- A real-time lag view with 5-day history
- Integrated corrective actions (start/stop, skip, parallel workers)
- A catch-up estimate (ETA) for anticipation
- Automatic GTID detection
- Proactive Telegram alerts

The goal is not to replace the DBA — it is to give them the tools to react in minutes instead of hours.