# Deploy Master/Slave and Monitor Replication in PmaControl

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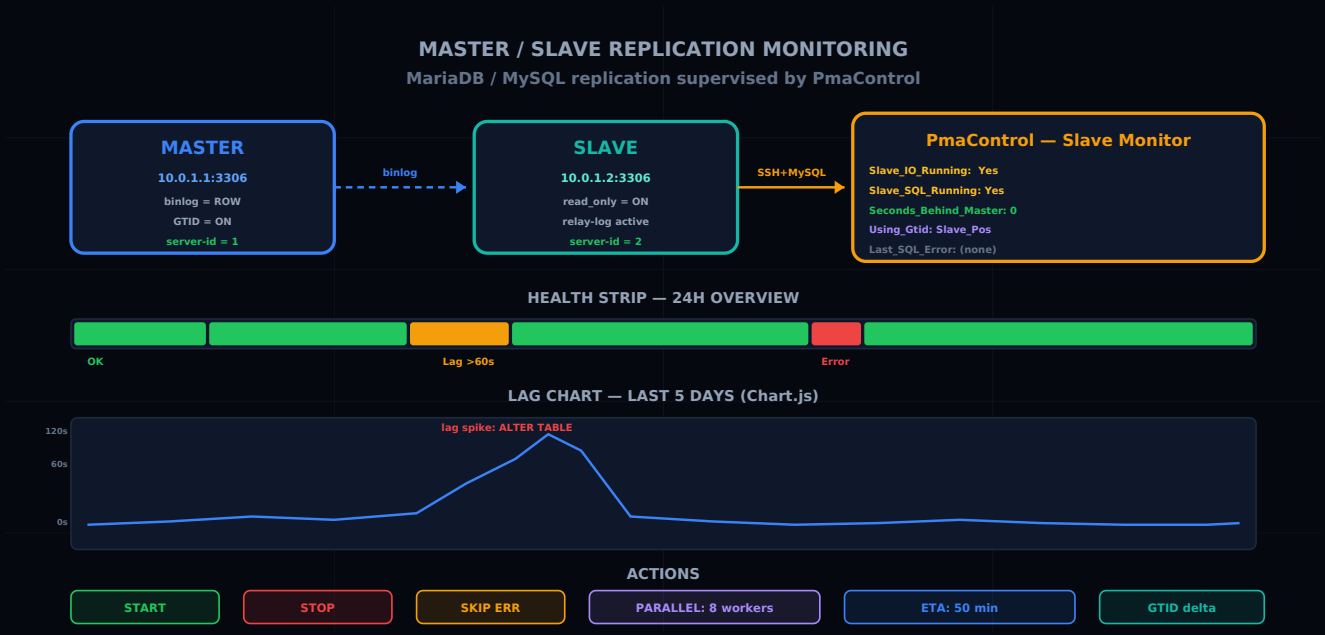
MARIADB MYSQL REPLICATION MASTER-SLAVE MONITORING PMACONTROL




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

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

| Old Variable | New Variable (MySQL 8.0+) |
|---|---|
| `Slave_IO_Running` | `Replica_IO_Running` |
| `Slave_SQL_Running` | `Replica_SQL_Running` |
| `Seconds_Behind_Master` | `Seconds_Behind_Source` |

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.