MaxScale: Much More Than a Reverse SQL Proxy (Part 2)

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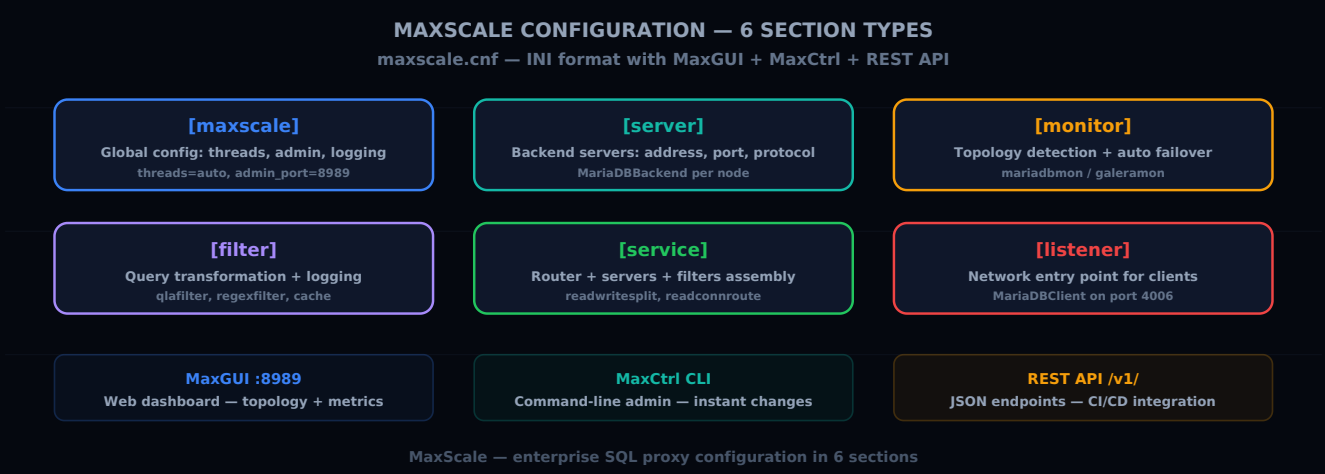
MAXSCALE MARIADB PROXY CONFIGURATION



From Theory to Practice

In Part 1, we explored MaxScale's architectural capabilities: its protocols, routers, monitors, and filters. This second part is a practical guide: how to install, configure, and administer MaxScale on a daily basis.

Installation

MaxScale is available via the official MariaDB repository. On Debian/Ubuntu:

```
curl -LsS https://r.mariadb.com/downloads/mariadb_repo_setup \
  | sudo bash -s -- --mariadb-maxscale-version=24.02

sudo apt-get install maxscale
```

The main configuration file is located at `/etc/maxscale.cnf`. It is an INI-format file, organized into clearly defined sections.

Anatomy of the Configuration File

The `maxscale.cnf` file is organized into six types of sections, each identified by a bracketed header.

[maxscale] Section — Global Configuration

```
[maxscale]
threads        = auto
log_info       = false
admin_host     = 0.0.0.0
admin_port     = 8989
admin_secure_gui = true
```

- **threads=auto**: MaxScale automatically detects the number of available CPU cores.
- **admin_host/admin_port**: Enables the MaxGUI web interface and REST API.
- **admin_secure_gui**: Enables HTTPS for the administration interface.

[server] Section — Server Definitions

Each MariaDB / MySQL backend server is declared individually:

```
[db-master]
type     = server
address  = 10.0.1.10
port     = 3306
protocol = MariaDBBackend

[db-slave1]
type     = server
address  = 10.0.1.11
port     = 3306
protocol = MariaDBBackend

[db-slave2]
type     = server
address  = 10.0.1.12
port     = 3306
protocol = MariaDBBackend
```

Each `[server]` section carries a logical name (here `db-master`, `db-slave1`, `db-slave2`) that will be referenced by monitors and services.

[monitor] Section — Topology Monitoring

The monitor is the component that automatically detects the replication topology and the state of each node:

```
[replication-monitor]
type            = monitor
module          = mariadbmon
servers         = db-master, db-slave1, db-slave2
user            = maxscale_monitor
password        = encrypted_password_here
monitor_interval = 2000
auto_failover    = true
auto_rejoin      = true
```

- **mariadbmon**: The standard monitor for MariaDB / MySQL master-slave topologies.
- **auto_failover**: If the master is lost, MaxScale automatically promotes a slave.
- **auto_rejoin**: A former master that comes back online is automatically reconfigured as a slave.

For Galera, you would use `galeramon` instead of `mariadbmon`.

[filter] Section — Query Transformation

Filters intercept and modify the SQL stream:

```
[query-log]
type   = filter
module = qlafilter
filebase = /var/log/maxscale/queries
flush   = true

[regex-rewrite]
type    = filter
module  = regexfilter
match   = SELECT.*FROM\s+legacy_table
replace = SELECT * FROM new_table
```

The `qlafilter` records all queries (useful for auditing). The `regexfilter` allows rewriting queries on the fly, without modifying the application.

[service] Section — Component Assembly

The service ties together servers, monitors, filters, and the router:

```
[rw-service]
type     = service
router   = readwritesplit
servers  = db-master, db-slave1, db-slave2
user     = maxscale_service
password = encrypted_password_here
filters  = query-log | regex-rewrite

max_slave_connections    = 100%
max_slave_replication_lag = 5s
```

- **readwritesplit**: Writes go to the master, reads are distributed across slaves.
- **max_slave_replication_lag**: A slave lagging more than 5 seconds is temporarily excluded from routing.
- **filters**: Filters are chained with the pipe `|` character.

[listener] Section — Network Entry Point

The listener exposes the service on a network port:

```
[rw-listener]
type     = listener
service  = rw-service
protocol = MariaDBClient
port     = 4006
address  = 0.0.0.0
```

The application connects to MaxScale on port 4006 as if it were a standard MariaDB / MySQL server. MaxScale is transparent from a protocol perspective.

MaxGUI: The Web Interface

Since MaxScale 2.5, the MaxGUI web interface provides a complete graphical view of the infrastructure. Accessible via `https://maxscale-host:8989`, it allows you to:

- Visualize the topology in real-time (master, slaves, connection state)
- View performance metrics (queries/second, latency, active connections)
- Manage servers (drain, maintenance, addition)
- Browse logs and alerts

MaxGUI is a monitoring tool, not a configuration tool. Configuration changes are made via the `maxscale.cnf` file or the REST API.

MaxCtrl: The Command Line Tool

MaxCtrl is MaxScale's official CLI. It communicates with the REST API and offers an intuitive syntax:

```
# List servers and their state
maxctrl list servers

# Put a server in maintenance
maxctrl set server db-slave1 maintenance

# Remove maintenance mode
maxctrl clear server db-slave1 maintenance

# List services and their statistics
maxctrl list services

# View replication topology
maxctrl show monitor replication-monitor

# Create a filter dynamically
maxctrl create filter my-filter regexfilter \
  match="SELECT 1" replace="SELECT 2"
```

The advantage of MaxCtrl over direct file editing is that changes take effect immediately, without restarting.

REST API: Automation

MaxScale's REST API is the foundation for automation. It exposes all functionality via HTTP/JSON endpoints:

```
# Get server list
curl -s -u admin:password https://maxscale:8989/v1/servers | jq

# Manual failover
curl -X POST -u admin:password \
  https://maxscale:8989/v1/monitors/replication-monitor/failover

# Get service metrics
curl -s -u admin:password \
  https://maxscale:8989/v1/services/rw-service | jq '.data.attributes.statistics'
```

The REST API enables integrating MaxScale into CI/CD pipelines, monitoring systems (Prometheus, Grafana), and orchestration tools (Ansible, Terraform).

Configuration Best Practices

Here are some recommendations from field experience:

1. **Always use encrypted passwords** in the configuration file. MaxScale provides the `maxkeys` tool to generate encryption keys.
2. **Enable automatic failover** with `auto_failover=true`, but test it regularly in pre-production environments.
3. **Size the threads** according to load. `threads=auto` is a good default, but for very high volumes (>50,000 queries/second), manual tuning may be necessary.
4. **Monitor replication lag** via `max_slave_replication_lag`. A value that is too permissive sends reads to lagging slaves. A value that is too restrictive concentrates all reads on the master.
5. **Use filters sparingly**. Each filter adds a processing layer. The `regexfilter` in particular can have a significant performance impact if the regular expressions are complex.

Complete Sample Configuration

To summarize, here is a sample configuration file for a master + 2 slaves topology:

```
[maxscale]
threads = auto
admin_host = 0.0.0.0
admin_port = 8989

[db-master]
type = server
address = 10.0.1.10
port = 3306
protocol = MariaDBBackend

[db-slave1]
type = server
address = 10.0.1.11
port = 3306
protocol = MariaDBBackend

[db-slave2]
type = server
address = 10.0.1.12
port = 3306
protocol = MariaDBBackend

[replication-monitor]
type = monitor
module = mariadbmon
servers = db-master, db-slave1, db-slave2
user = maxscale_monitor
password = <encrypted>
monitor_interval = 2000
auto_failover = true
auto_rejoin = true

[rw-service]
type = service
router = readwritesplit
servers = db-master, db-slave1, db-slave2
user = maxscale_service
password = <encrypted>
max_slave_replication_lag = 5s
```

```
[rw-listener]
type = listener
service = rw-service
protocol = MariaDBClient
port = 4006
```

Conclusion

MaxScale is configured with a clear, structured INI file. Six types of sections are enough to describe a complete infrastructure: global configuration, servers, the monitor, filters, the service, and the listener.

Day-to-day administration relies on three complementary tools: MaxGUI for visual monitoring, MaxCtrl for command-line operations, and the REST API for automation. Together, they form a complete ecosystem for managing an enterprise-grade SQL proxy.

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