Cybersec: MariaDB, Round 2

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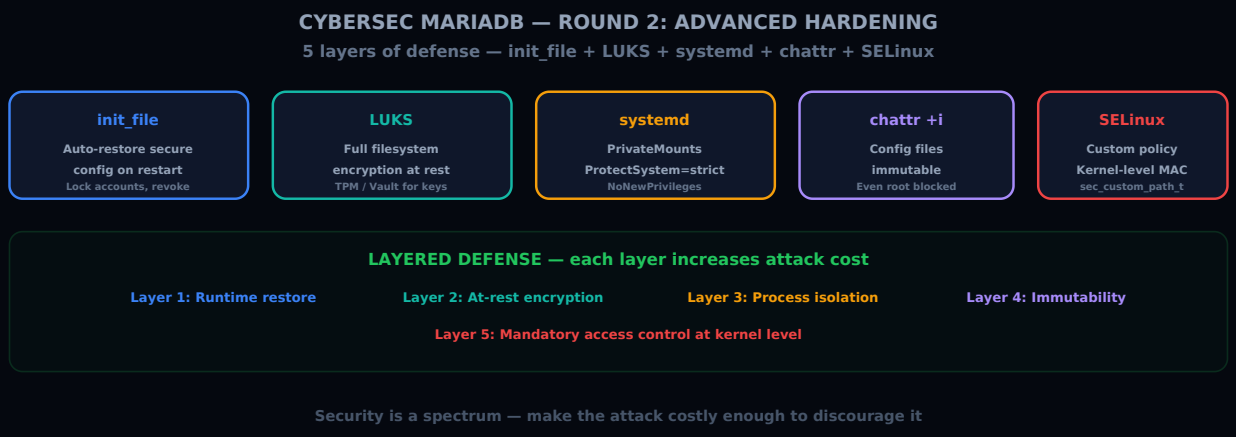
MARIADB SECURITY HARDENING SYSTEMD SELINUX



Beyond the Fundamentals

Round 1 of MariaDB / MySQL security covers the basics: strong passwords, minimal users, TLS enabled, firewall configured. Round 2 goes further. We are entering advanced hardening territory — techniques that few DBAs implement but that make the difference against a determined attacker.

init_file: The Silent Script

The MariaDB / MySQL `init_file` variable allows specifying a SQL file that will be executed automatically at server startup. It is a powerful hardening tool:

```
[mysqld]
init_file = /etc/mysql/conf.d/init_security.sql
```

The `init_security.sql` file can contain:

```
-- Disable default accounts
ALTER USER 'root'@'localhost' ACCOUNT LOCK;

-- Revoke excessive privileges
```

```
REVOKE ALL PRIVILEGES ON *.* FROM 'app_user'@'%';
GRANT SELECT, INSERT, UPDATE, DELETE ON app_db.* TO 'app_user'@'%';

-- Drop test databases
DROP DATABASE IF EXISTS test;

-- Enable auditing
INSTALL SONAME 'server_audit';
SET GLOBAL server_audit_logging = ON;
```

The advantage: even if an attacker modifies the database during an intrusion, restarting the server automatically restores the secure configuration.

LUKS: Filesystem Encryption

MariaDB data at rest must be encrypted. InnoDB supports native tablespace encryption, but LUKS (Linux Unified Key Setup) offers more complete protection: it encrypts the entire filesystem, including logs, temporary files, and configuration files.

```
# Create a LUKS encrypted volume for the datadir
cryptsetup luksFormat /dev/sdb1
cryptsetup luksOpen /dev/sdb1 mariadb_data
mkfs.ext4 /dev/mapper/mariadb_data
mount /dev/mapper/mariadb_data /var/lib/mysql
```

The LUKS key must never be stored on the same disk as the data. Use a TPM module, a USB token, or an external key management service (Vault, AWS KMS).

systemd: defaults-file and PrivateMounts

The MariaDB systemd unit file can be hardened in several ways:

Explicit --defaults-file

```
[Service]
ExecStart=/usr/sbin/mariadbd --defaults-file=/etc/mysql/mariadb.cnf
```

Specifying `--defaults-file` prevents MariaDB from reading other configuration files (such as a malicious `~/.my.cnf` dropped by an attacker).

PrivateMounts and namespaces

```
[Service]
PrivateMounts=yes
ProtectHome=yes
ProtectSystem=strict
ReadWritePaths=/var/lib/mysql /var/run/mysqld /tmp
NoNewPrivileges=yes
PrivateTmp=yes
```

- **PrivateMounts=yes**: MariaDB sees its own mount namespace. Mount changes made by other processes are not visible.
- **ProtectHome=yes**: The /home directory is inaccessible.
- **ProtectSystem=strict**: The filesystem is read-only except for explicitly allowed paths.
- **NoNewPrivileges=yes**: The MariaDB process cannot acquire new privileges (no setuid).
- **PrivateTmp=yes**: MariaDB has its own isolated /tmp.

chattr: Immutability

The ext4 filesystem `+i` (immutable) attribute prevents file modification, even by root:

```
# Make the configuration file immutable
chattr +i /etc/mysql/mariadb.cnf
chattr +i /etc/mysql/conf.d/init_security.sql

# Verify
lsattr /etc/mysql/mariadb.cnf
# ----i--------e-- /etc/mysql/mariadb.cnf
```

An attacker who gains root access cannot modify the MariaDB configuration without first removing the immutable attribute — which leaves traces in the audit logs.

To legitimately modify the file:

```
chattr -i /etc/mysql/mariadb.cnf
# ... modify the file ...
chattr +i /etc/mysql/mariadb.cnf
systemctl restart mariadb
```

SELinux: Custom Policies

SELinux in enforcing mode is the most powerful and most neglected security layer. MariaDB ships with a default SELinux policy, but a custom policy can go much further.

Create a custom SELinux type

```
# Define a type for sensitive configuration files
semanage fcontext -a -t sec_custom_path_t "/etc/mysql/conf.d(/.*)?"
restorecon -Rv /etc/mysql/conf.d/
```

Custom module policy

Create a `.te` (Type Enforcement) file that restricts MariaDB access:

```
# mariadb_custom.te
module mariadb_custom 1.0;

require {
    type mysqld_t;
    type sec_custom_path_t;
    class file { read open getattr };
}

# MariaDB can read configs but not modify them
allow mysqld_t sec_custom_path_t:file { read open getattr };
# No write access allowed on configs
```

Compile and install:

```
checkmodule -M -m -o mariadb_custom.mod mariadb_custom.te
semodule_package -o mariadb_custom.pp -m mariadb_custom.mod
semodule -i mariadb_custom.pp
```

With this policy, even if an attacker compromises the MariaDB process, they cannot modify the configuration files — SELinux blocks access at the kernel level.

Layered Defense

Each technique presented here is a layer of defense. None is sufficient on its own. Together, they form significant armor:

Layer	Protection	Against
init_file	Automatic restoration	Runtime config modifications
LUKS	At-rest encryption	Physical disk theft
systemd namespaces	Process isolation	Privilege escalation
chattr +i	Config immutability	Modification by compromised root
SELinux	Mandatory access control	MariaDB process exploitation

Conclusion

Advanced MariaDB hardening takes time and expertise. Each added layer makes attacks harder, slower, and more detectable.

Security is not a binary state — it is a spectrum. The goal is not to be invulnerable (that is impossible), but to make the attack costly enough that the attacker moves to an easier target.

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