MySQL security best practices

A 101 webinar presented by Dimitri Vanoverbeke
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MySQL Security 101 overview

• Having a security mindset.
  • Infrastructure
  • Operating system
  • Applications
• MySQL privileges
• SSL communication
• Handling ransomware
• Encryption options
Have the correct mindset

- Applications should be written with **security** from the ground up.
- Work together with your **sysadmins** and **devteam** to make the correct choices.
- Disable and restrict remote access
- Understand the **cloud** means working on other people's computers.
- **Restrictive** mindset
Infrastructure: Network

- **Segregate** your network
  - Only **application servers** should be able to connect to the DB **remotely**.
  - Dev **access/general access** should be **limited** by using a bastion/jumphost
  - **DO NOT OPEN IT UP TO THE INTERNET!!!** (or use strict firewall rules)
  - **Example** on https://www.shodan.io/search?query=mysql
  - **IPS/IDS** appliance/software can be handy
    - Snort, Bro Network Security monitor, OSSEC
Be friends with your network engineer
Operating system security

• Deploy security patches as soon as possible.
• Make sure permissions are correct:
  • mysql should be the owner
  • Don’t use chmod 777 :-)
  • 0750 dirs, 0640 files
  • selinux setenforce 1
• If PCI compliant?
  • ecryptfs, luks, EBS encryption (starting at medium sizes)
• Use trusted package sources!
• Establishing a patching policy!
Applications

• Perform penetration tests on staging environments.
• Validate user inputs
• Watch out for SQL injections.
Use configuration management

• Use your favourite configuration management solution. Tools like puppet, chef, ansible and salt are excellent tools to ensure compliancy:

```bash
$users = {
    'dim0@localhost' => {
        ensure => 'present',
        max_connections_per_hour => '0',
        max_queries_per_hour => '0',
        max_updates_per_hour => '0',
        max_user_connections => '0',
        password_hash => '*T5D3A5831A93829BE2468926B4132313728C250DBF',
    },
}
```
(Again) use configuration management (enforcement)

- Configuration management will help you with:
  - Consistent and effective rollout of your configuration files
  - Compliancy
  - MySQL database version (security patches, feature updates, etc)
  - OS security updates
  - User management
  - Resource limitations
  - Documents environments
  - Ensures the correct packages are installed
  - Less manual work
MySQL privileges

- Limit your user privileges to key application servers.
- Be restrictive for your users!
- Use complex passwords
  - Use the password validation plugin!
Password validation plugin

```sql
mysql> 
[root@master ~]# mysql_secure_installation

 Securing the MySQL server deployment.

 Enter password for user root:
 Error: Can't connect to local MySQL server through socket '/var/lib/mysql/mysql.sock' (2)
[root@master ~]# mysql_secure_installation

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 Enter password for user root:
 Error: Can't connect to local MySQL server through socket '/var/lib/mysql/mysql.sock' (2)
[root@master ~]# mysql_secure_installation

 ERROD 2002 (HY000): Can't connect to local MySQL server through socket '/var/lib/mysql/mysql.sock' (2)
[root@master ~]# service mysql start

 Redirecting to /bin/systemctl start mysql.service
[root@master ~]# mysql_secure_installation

 Securing the MySQL server deployment.

 Connecting to MySQL using a blank password.

 VALIDATE PASSWORD Plugin can be used to test passwords
 and improve security. It checks the strength of password
 and allows the users to set only those passwords which are
 secure enough. Would you like to setup VALIDATE PASSWORD plugin?

 Press y|Y for Yes, any other key for No: y

 There are three levels of password validation policy:

 LOW    Length >= 8
 MEDIUM Length >= 8, numeric, mixed case, and special characters
 STRONG Length >= 8, numeric, mixed case, special characters and dictionary

 Please enter 0 = LOW, 1 = MEDIUM and 2 = STRONG: 2
 Please set the password for root here.

 New password:

 Re-enter new password:

 Estimated strength of the password: 100
 Do you wish to continue with the password provided?(Press y|Y for Yes, any other key for No) : y
```
Password requirement

• Use a strict policy along your organisation
• Make sure it’s not a dictionary word
• Give limitations!
• Don’t use root as a standard access user to your database!
MySQL Grants

• Identify users based on: user@host
  • user: username
  • host: hostname/ip/network of the client that connects
  • different host, different user, different ‘grants’
  • use of wildcards could be BAAAAD :)

• Examples:

‘dim0’@‘localhost’,  ‘root’@‘localhost’
‘tommeketoch’@‘app0001’,  ‘kenju’@‘192.168.%’
‘ledijkske’@‘192.168.1.212’, ‘fredjen’@‘app.fq.dn’

• Creating A User:
  > CREATE USER 'dim0'@'app0001';
  • Drop user: change CREATE into DROP
  > DROP USER [IF EXISTS] ‘dim0’@‘app0001’;
MySQL Grants (2)

- Grant the user some kind of privilege
- Grant ... to: server, database, table, column, trigger, stored procedure, view, index

- Example: INSERT, SELECT, UPDATE, DELETE
- SQL Command:
  > GRANT SELECT ON db.* TO ‘dim0’@‘app0001’;
  > GRANT INSERT ON *.* TO ‘dim0’@‘app0001’;
- Revoking privileges: change GRANT into REVOKE
MySQL grants (3)

• Password Expiration Policy
• Watch out for granting all privileges, the grant option or even super!

• User Account Locking

MySQL supports locking and unlocking user accounts using the ACCOUNT LOCK and ACCOUNT UNLOCK clauses
Grants (Limit your resources)

- For every user: `max_user_connections`

```sql
mysql> GRANT USAGE ON db.* TO 'dim0'@'localhost'
  WITH MAX_QUERIES_PER_HOUR 1000
  MAX_UPDATES_PER_HOUR 999
  MAX_CONNECTIONS_PER_HOUR 100
  MAX_USER_CONNECTIONS 5;
FLUSH USER_RESOURCES;
```

It’s however not really popular… :-D
SSL connection

- SSL encryption to ensure in transit encryption.
- Requirement for PCI and other security compliance.
- Can give a slight performance penalty.
- AWS/RDS users should definitely have a look at this.
Handling ransomware

- Apply all updates!
- When is the last time you rebooted?
- Again limit access to trusted services and users.
- Make sure you have backups locally and offsite
- TEST
Encryption

• Encrypting your filesystem is still the most popular option.
• Since MySQL 5.7 table level encryption is included.
Audit plugin

• Example of output

```xml
<AUDIT_RECORD
  "NAME"="Query"
  "RECORD"="23_2014-04-29T09:29:40"
  "TIMESTAMP"="2014-04-29T10:20:10 UTC"
  "COMMAND_CLASS"="select"
  "CONNECTION_ID"="49"
  "STATUS"="0"
  "SQLTEXT"="SELECT * from mysql.user"
  "USER"="root[root] @ localhost []"
  "HOST"="localhost"
  "OS_USER"=""
  "IP"=""
/>
```

• Output to syslog possible
Closing remarks

• Disable the use of the “LOAD DATA LOCAL INFILE”
• Maybe use the pam plugin!

Remember be restrictive!!!
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