MySQL Security
Past and Present

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Agenda

- Introduction to MySQL Security
- What’s New in MySQL 5.6 ?

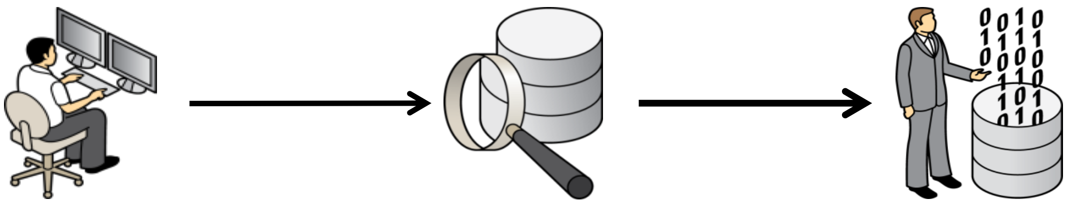
MySQL Security
Logical Model

User Accounts

- Two parts : ‘user name’@’host name’.
- Can use wildcards in host names: empty (‘’), ‘%’ and ‘_’.
- Host part can be IP addresses/net masks too.
- Authentication methods are pluggable.
- No passwords are stored in tables, only hashes.
- GRANT commands can create users too.
- Account can “inherit” other, more general accounts.

“Logged in” and “Current” User IDs

- Joe connects from the data entry department
- MySQL finds a record *”@’%.dataentry’* and authenticates Joe to it
- Joe can use all privileges granted to *”@’%.dataentry’*



user()

Users table

current_user()

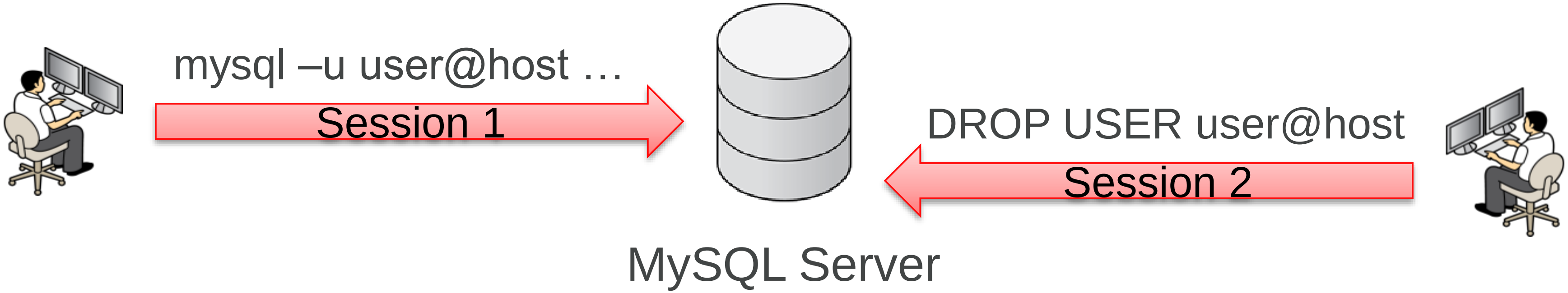
joe@p1.dataentry

”@%.dataentry

Inheriting rights from “less specific” accounts

- Setup
  - CREATE USER user@localhost;
  - GRANT SELECT ON mysql.user to user@’%’;
- Login as **user@localhost** and:
  - “SELECT * FROM mysql.user” works !
  - But “SHOW GRANTS” doesn’t show the SELECT privilege inherited from user@’%’
  - Observe two distinct users defined: user@localhost and user@%

QUIZ : How Does “DROP USER” Work ?



mysql –u user@host …

Session 1

DROP USER user@host

Session 2

MySQL Server

What Happens ?

A. DROP USER fails with an “active session” error

B. Session 1 is terminated

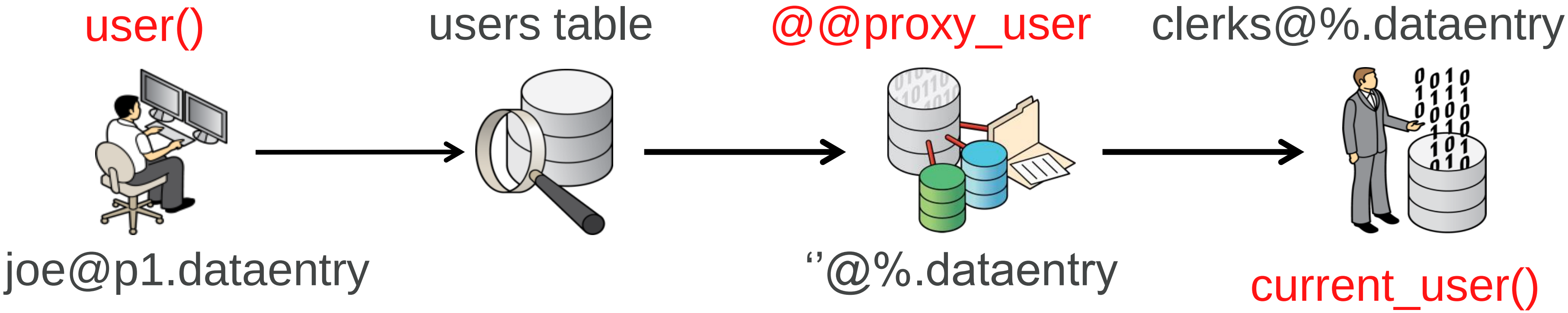
C. Session 1 is unaffected by DROP USER

Using Plugins to Authenticate

- All MySQL users authenticate via plugins
- Plugins come in pairs: client + server
- The server picks the plugin pair
- Built-in plugins
- Backward compatible
- Plugins can “re-route” (proxy) to other MySQL user ids

Proxy Users

- Joe connects and gets resolved to ’’@’%.dataentry’
- ’’@’%.dataentry’ uses a plugin to authenticate Joe
- The plugin “re-routes” Joe to ’clerks’@’%.dataentry’



user()

users table

@@proxy_user

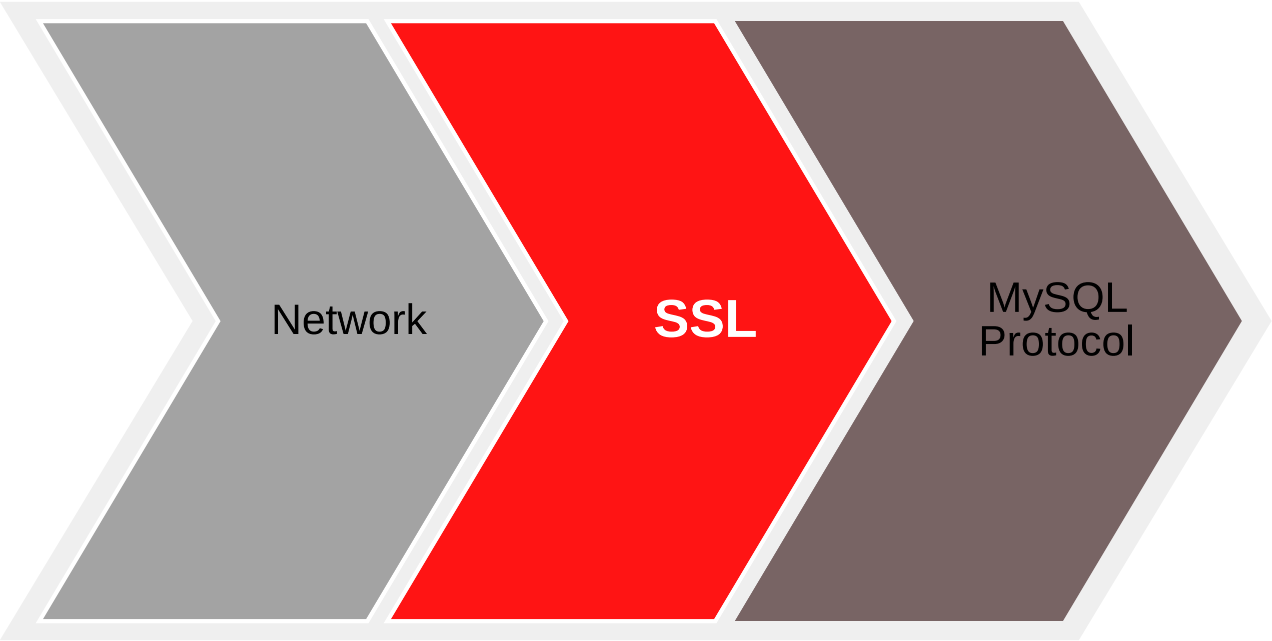
clerks@%.dataentry

joe@p1.dataentry

‘’@%.dataentry

current_user()

SSL is a Separate Layer



Privileges available in MySQL

- **Server** : *USAGE, SHUTDOWN, SUPER, CREATE …*
- **Database** : *CREATE, DROP, EXECUTE, SELECT*, …
- **Table** : *INSERT, SELECT*, …
- **Column** : *INSERT, SELECT, UPDATE*
- **Stored routine** : *EXECUTE, CREATE ROUTINE, ALTER ROUTINE*
- **User** : *PROXY*

Granting Privileges

- Always granted to a user+host combination
- Only *DROP USER* is guaranteed to clean up properly !
- *INSERT* can be granted on a column subset
- Privileges are checked against *current_user()*

MySQL Security
Physical Model

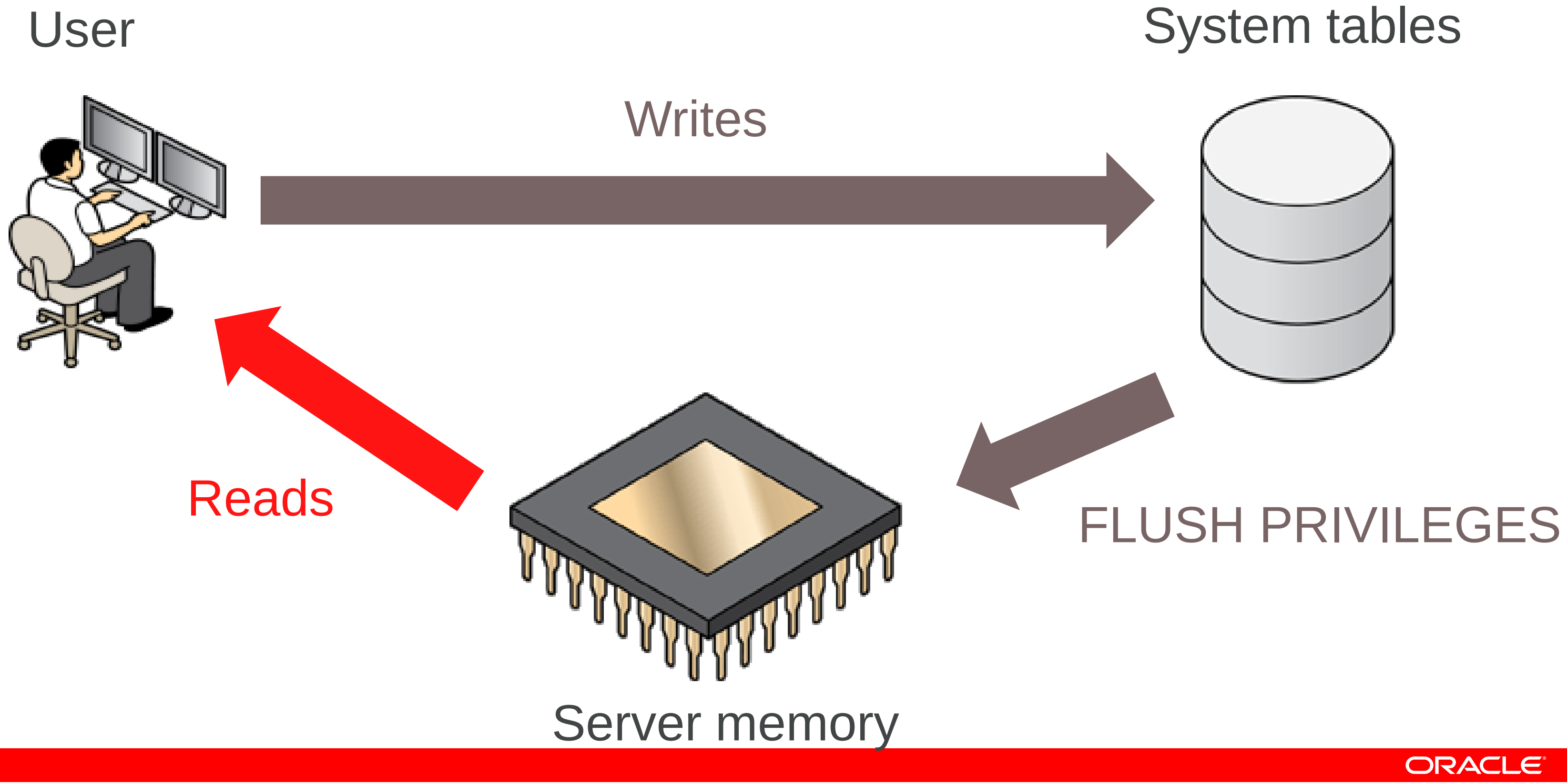
Authentication Tables

Table	Usage
user	User accounts definitions
plugin	Definitions for authentication plugins

Authorization Tables

Table	Applicable to
user	Users
db	Databases
tables_priv	Tables
columns_priv	Table columns
procs_priv	Stored procedures and functions
proxies_priv	User proxying by plugins

Memory Cache for User Data


User

System tables

Writes

Reads

FLUSH PRIVILEGES

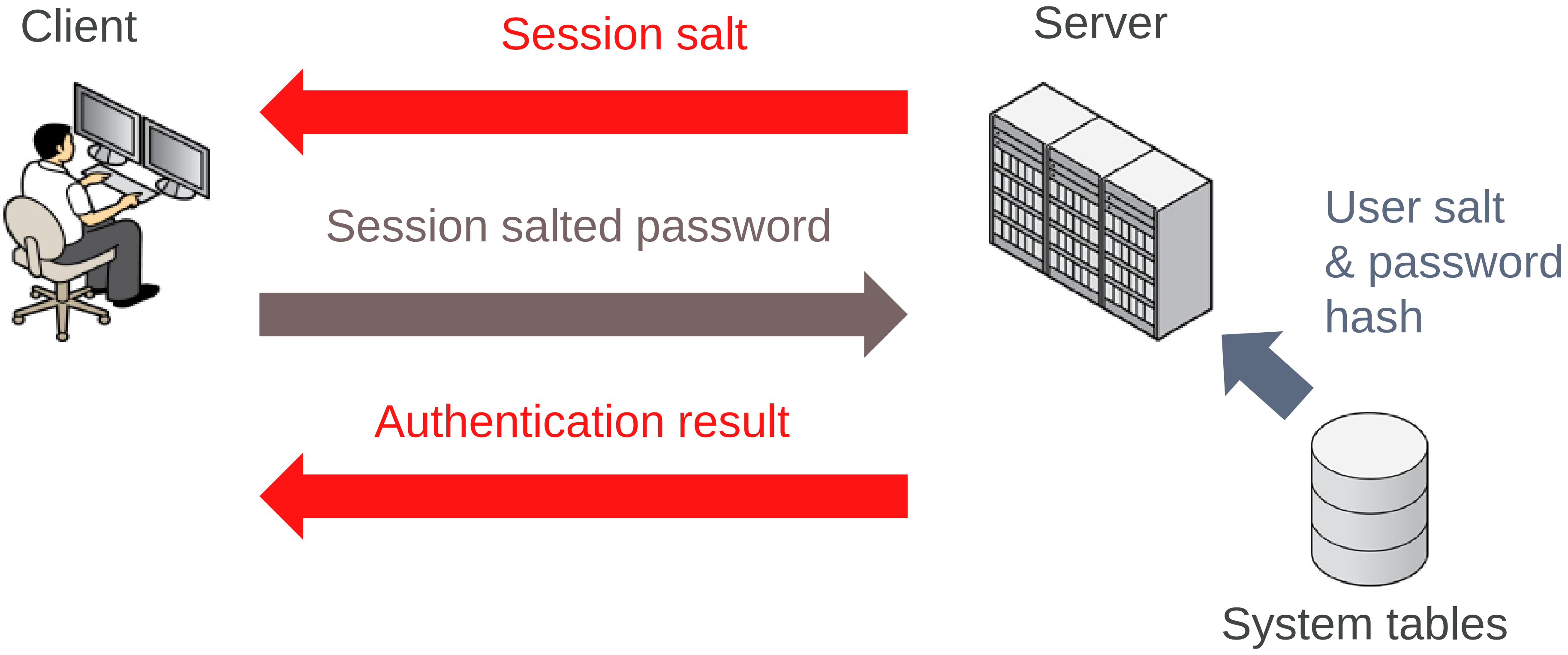
Server memory

WHAT'S NEW IN MYSQL 5.6 ?

New Authentication Method

- Adds per-user password salt
- Modern hash algorithms (SHA256) for an extensible format
- Makes use of hardware acceleration for cryptography calculations
- Falls back to RSA to encrypt the password when no SSL

How does SHA256 work



Client

Session salt

Server

Session salted password

User salt
& password
hash

Authentication result

System tables

Change Password at Next Login

- Safe way to force password reset
- Introduces *ALTER USER … EXPIRE*
- New field in *mysql.user*

Auditing Password Security

- New plugin API
- Works for *PASSWORD(), CREATE USER* etc
- Strength evaluation aid for GUIs : *validate_password_strength()*

Policy	Length	Mixed case + digits + special chars	Dictionary
Low	✓		
Medium	✓	✓	
High	✓	✓	✓

Enterprise Auditing

- Versatile standards based output (XML)
- Designed for minimum impact (Flexible disk flushing/buffering)
- Supports log file rotation
- Part of the MySQL Enterprise offering
- Supported by MySQL Workbench GUI tool
- Works with Oracle Audit Vault

Alternative to Passwords on the Command Line

- Wallet type of design
- Named “login paths” : user/password/host combos
- An alternative to passwords in scripts
- Use encryption to make it harder to abuse the password files
- Designated configuration editor command line tool

Connect Strings Support

- Arbitrary strings sent by clients at login time
- Some MySQL clients send client PIDs, command lines, platforms, versions, program names, OSes, etc.
- Client programs can supply more via mysql_options4()
- PERFORMANCE_SCHEMA tables to read the data

Refactoring

- Obfuscate passwords from slow query log (WL#5706)
- Use the C++ Standard Template Library (WL#5825)
- Use standard random generator (WL#5605)
- Replace custom encryption code with approved packages (WL#6008)
- Support SSL certificate revocation lists (Bug#31224)
- Support SSL keys with pass phrases (Bug#44559)

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