

Using the integrated development environment in MySQL workbench to learn database design and SQL

利用MySQL workbench 整合開發環境
學習數據庫設計及 SQL 指令

Tsang Chi Wai

Hong Kong True Light College

MySQL Community Edition Server

- ▶ Open-source database system
- ▶ Popular RDBMS developed by Oracle
- ▶ Used by many famous IT company



MySQL Workbench



- ▶ MySQL IDE tool
- ▶ GUI/CLI SQL development
- ▶ Visual modelling
- ▶ Database/user administration

The screenshot displays the MySQL Workbench interface for a MySQL server. The main window shows the 'Administration - Server Status' view for a connection named 'MYSQL_server'. The server is running on host 'mysql' at port 3306. The version is 8.0.29 (MySQL Community Server - GPL), compiled for Win64 (x86_64). The server has been running since Tuesday, May 31, 2022, at 23:19.

Available Server Features:

Performance Schema:	<input checked="" type="radio"/> On	Windows Authentication:	<input type="radio"/> Off
Thread Pool:	<input type="radio"/> n/a	Password Validation:	<input type="radio"/> n/a
Memcached Plugin:	<input type="radio"/> n/a	Audit Log:	<input type="radio"/> n/a
Semisync Replication Plugin:	<input type="radio"/> n/a	Firewall:	<input type="radio"/> n/a
SSL Availability:	<input checked="" type="radio"/> On	Firewall Trace:	<input type="radio"/> n/a

Server Directories:

- Base Directory: C:\Program Files\MySQL\MySQL Server 8.0\
- Data Directory: C:\ProgramData\MySQL\MySQL Server 8.0\Data\
- Disk Space in Data Dir: unable to retrieve
- Plugins Directory: C:\Program Files\MySQL\MySQL Server 8.0\lib\plugin\
- Tmp Directory: C:\Windows\SERVIC~2\NETWORK~1\AppData\Local\Temp
- Error Log: On .\WIN-B9LEIHSKDK5K.err
- General Log: Off
- Slow Query Log: On WIN-B9LEIHSKDK5K-slow.log

Replica:

: this server is not a replica in a replication setup

Performance Metrics (Right Panel):

- Server Status: Running
- CPU Load: ---
- Connections: 10
- Traffic: 16.29 KB/s
- Key Efficiency: 0.0%
- Selects per Second: 0
- InnoDB Buffer Usage: 52.1%
- InnoDB Reads per Second: 0
- InnoDB Writes per Second: 0

The interface also includes a left-hand navigation pane with sections for MANAGEMENT, INSTANCE, and PERFORMANCE. The bottom of the window shows an 'Output' pane with 'Action Output' selected, and a 'Context Help' pane on the right side.

Installation environment

- ▶ Standalone

Windows, Linux, macOS etc

- ▶ Client-server

Dedicate/shared server: Windows Server, Linux etc

Client PC: Windows, Linux, macOS etc

- ▶ RMDBS Software: MySQL Installer 8.0.29 (latest version)

(Including MySQL Community Server, MySQL Workbench)

Download MySQL Installer

MySQL Community Downloads

MySQL Installer

General Availability (GA) Releases

Archives



MySQL Installer 8.0.29

Select Operating System:

Microsoft Windows

Looking for previous GA versions?

Windows (x86, 32-bit), MSI Installer

8.0.29

Online installer

2.3M

Download

(mysql-installer-web-community-8.0.29.0.msi)

MD5: 4f735569267527dec28d9e8d977f35a1 | Signature

Windows (x86, 32-bit), MSI Installer

8.0.29

Offline installer

439.6M

Download

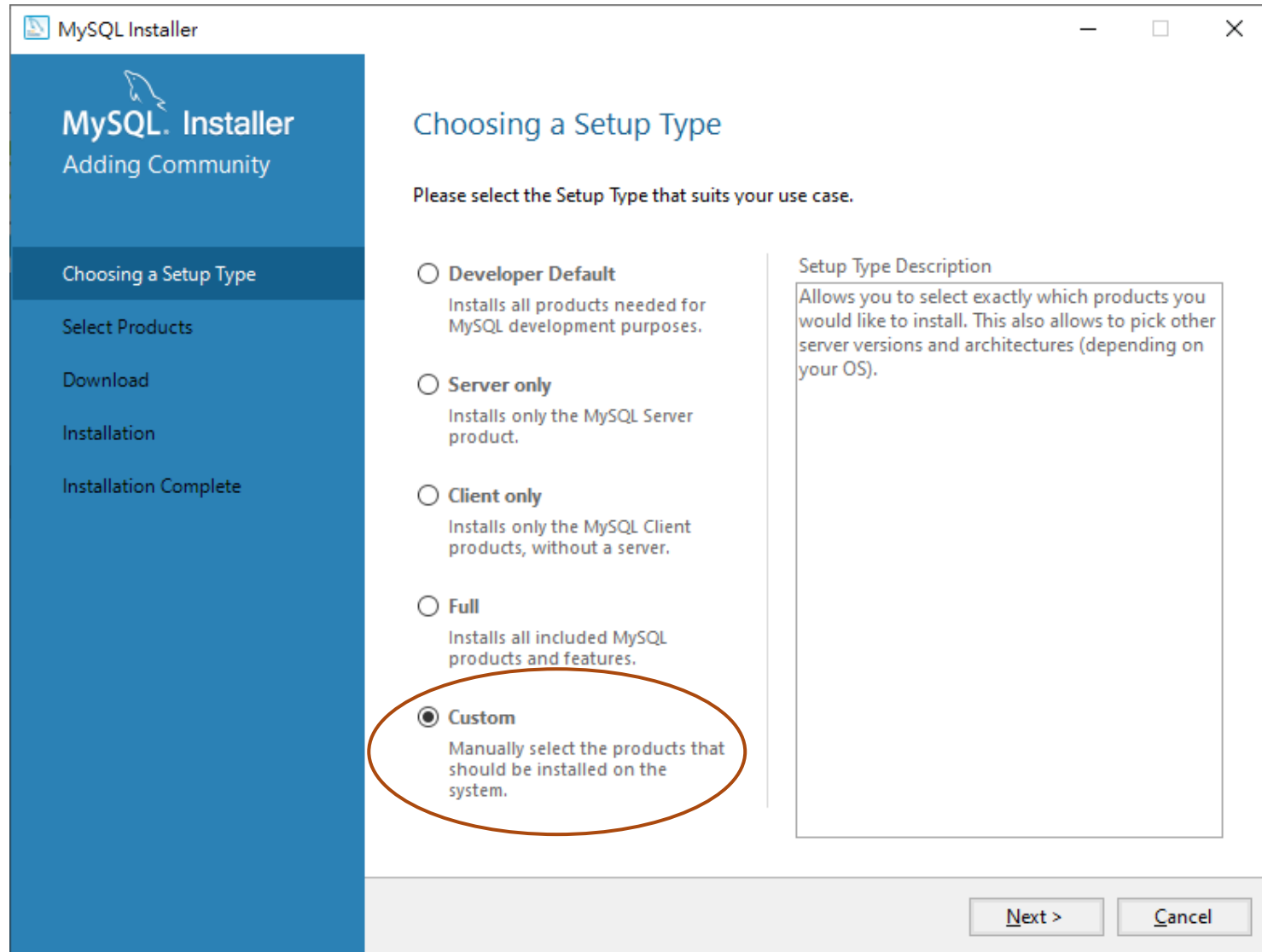
(mysql-installer-community-8.0.29.0.msi)

MD5: 3f4def7aef5e2e030e2dd62e784f246 | Signature



We suggest that you use the MD5 checksums and GnuPG signatures to verify the integrity of the packages you download.

Execute MySQL Installer



Standalone computer



MySQL Server
MySQL Workbench

MySQL Installer

MySQL. Installer
Adding Community

Choosing a Setup Type

Select Products

Download

Installation

Product Configuration

Installation Complete

Select Products

Please select the products you would like to install on this computer.

Filter: All Software, Current GA, Any Edit

Available Products:

- MySQL Servers
 - MySQL Server
 - MySQL Server 8.0
 - MySQL Server 5.7
 - MySQL Server 5.6
 - Applications
 - MySQL Workbench
 - MySQL Workbench 8.0
 - MySQL for Visual Studio
 - MySQL Shell
 - MySQL Router
 - MySQL Connectors
 - Documentation

Products To Be Installed:

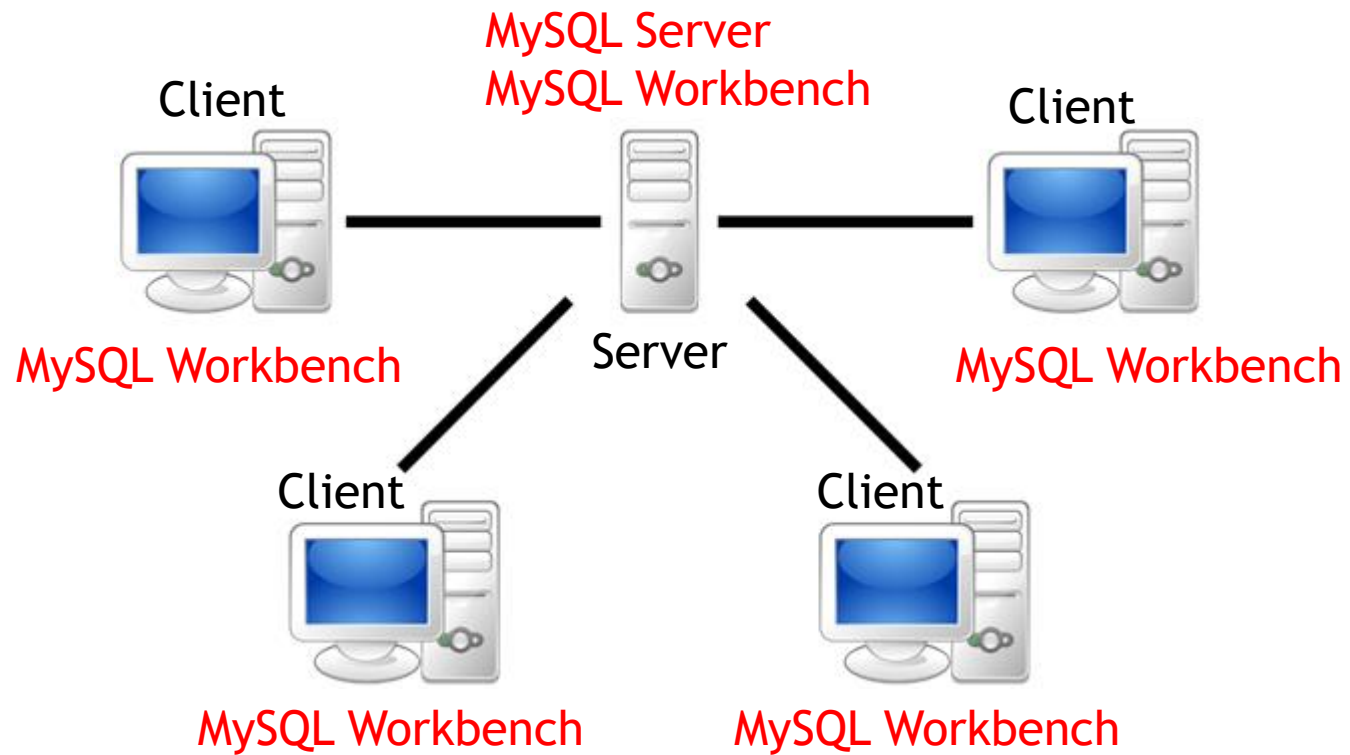
- MySQL Workbench 8.0.29 - X64
- MySQL Server 8.0.29 - X64

Enable the Select Features page to customize product features

Published: 2022年4月26日
Release Notes: <https://dev.mysql.com/doc/relnotes/mysql/8.0/en/news-8-0-29.html>

< Back Next > Cancel

Client-Server model



Client-Server model

MySQL Installer

Server

MySQL Installer
Adding Community

Choosing a Setup Type

Select Products

Download

Installation

Product Configuration

Installation Complete

Select Products

Please select the products you would like to install on this computer.

Filter: All Software, Current GA, Any Edit

Available Products:

- MySQL Workbench 8.0
- MySQL Workbench 8.0.29
- MySQL Workbench 8.0.28
- MySQL Workbench 8.0.27
- MySQL Workbench 8.0.26
- MySQL Workbench 8.0.25
- MySQL Workbench 8.0.24
- MySQL Workbench 8.0.23
- MySQL Workbench 8.0.22
- MySQL Workbench 8.0.21
- MySQL Workbench 8.0.20
- MySQL Workbench 8.0.19
- MySQL Workbench 8.0.18

Products To Be Installed:

- MySQL Server 8.0.29 - X64
- MySQL Workbench 8.0.29 - X64

Enable the Select Features page to customize product features

Published: 2022年4月26日
Release Notes: <https://dev.mysql.com/doc/relnotes/workbench/en/news-8-0-29.html>

< Back Next > Cancel

MySQL Installer

Client PC

MySQL Installer
Adding Community

Choosing a Setup Type

Select Products

Download

Installation

Installation Complete

Select Products

Please select the products you would like to install on this computer.

Filter: All Software, Current GA, Any Edit

Available Products:

- MySQL Workbench 8.0
- MySQL Workbench 8.0.29
- MySQL Workbench 8.0.28
- MySQL Workbench 8.0.27
- MySQL Workbench 8.0.26
- MySQL Workbench 8.0.25
- MySQL Workbench 8.0.24
- MySQL Workbench 8.0.23
- MySQL Workbench 8.0.22
- MySQL Workbench 8.0.21
- MySQL Workbench 8.0.20
- MySQL Workbench 8.0.19
- MySQL Workbench 8.0.18

Products To Be Installed:

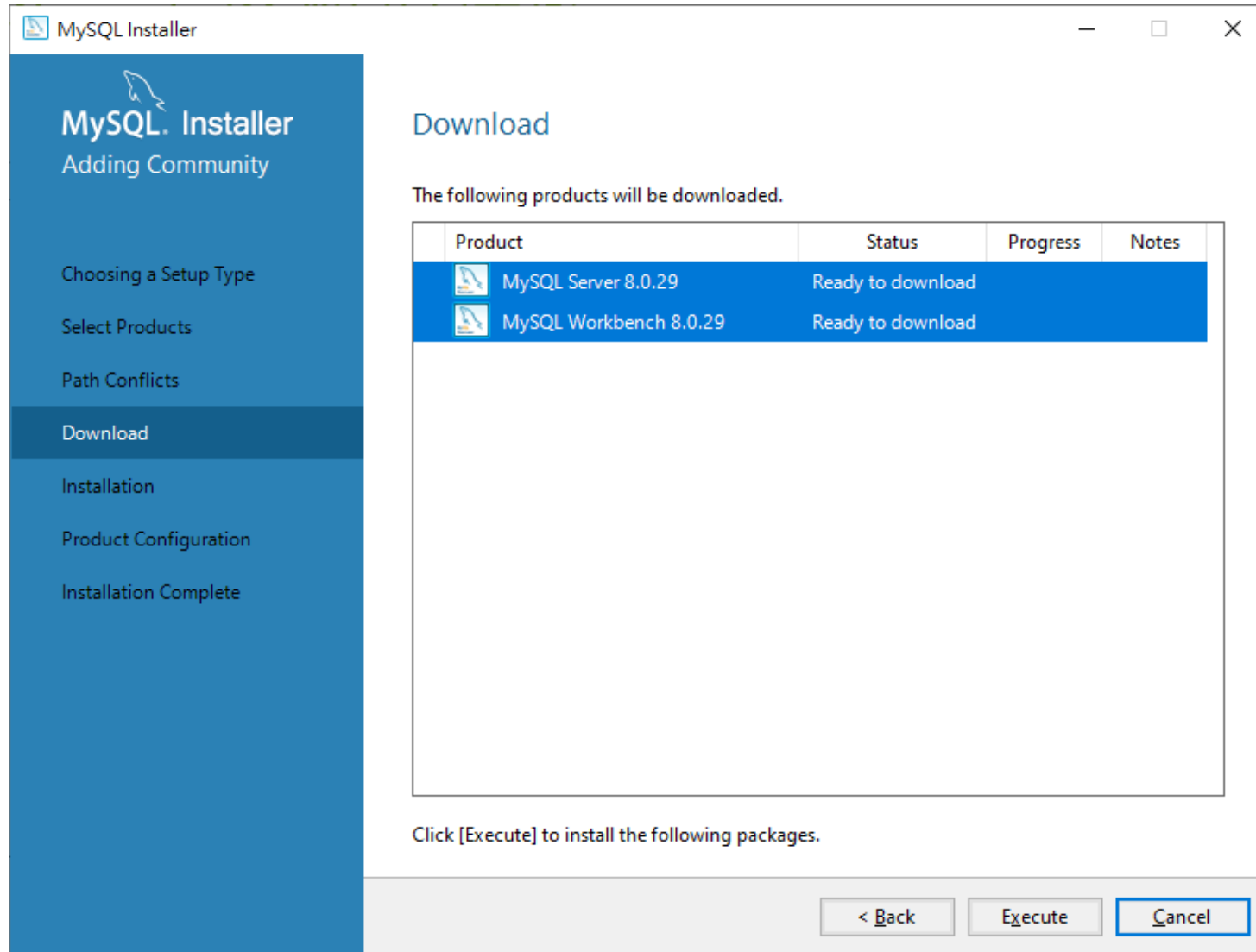
- MySQL Workbench 8.0.29 - X64

Enable the Select Features page to customize product features

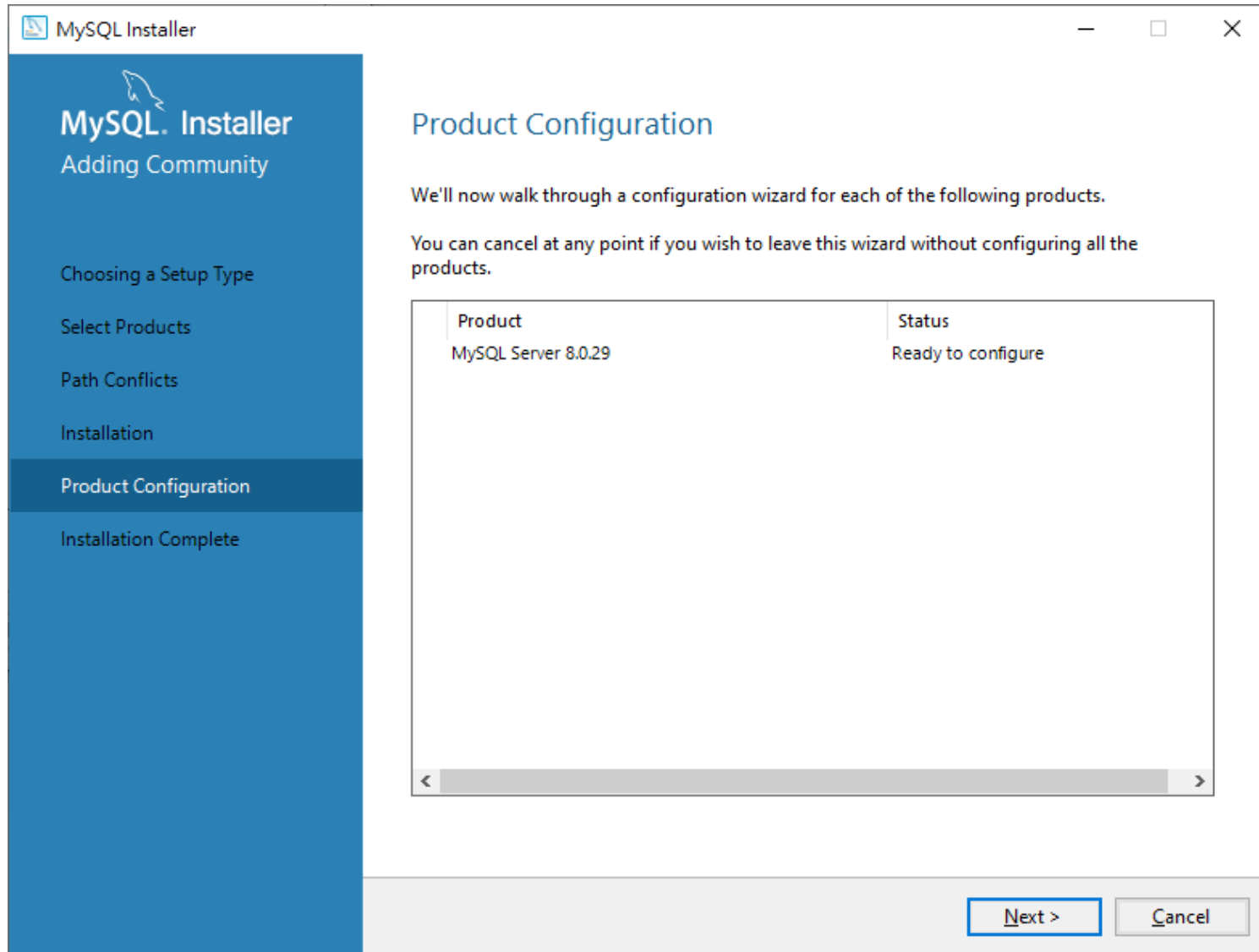
Published:
Release Notes:

< Back Next > Cancel

Download and ready to install



MySQL Server configuration



MySQL Server configuration

The screenshot shows the 'MySQL Installer' window for 'MySQL Server 8.0.29'. The 'Type and Networking' tab is selected in the left sidebar. The main area is titled 'Type and Networking' and contains the following sections:

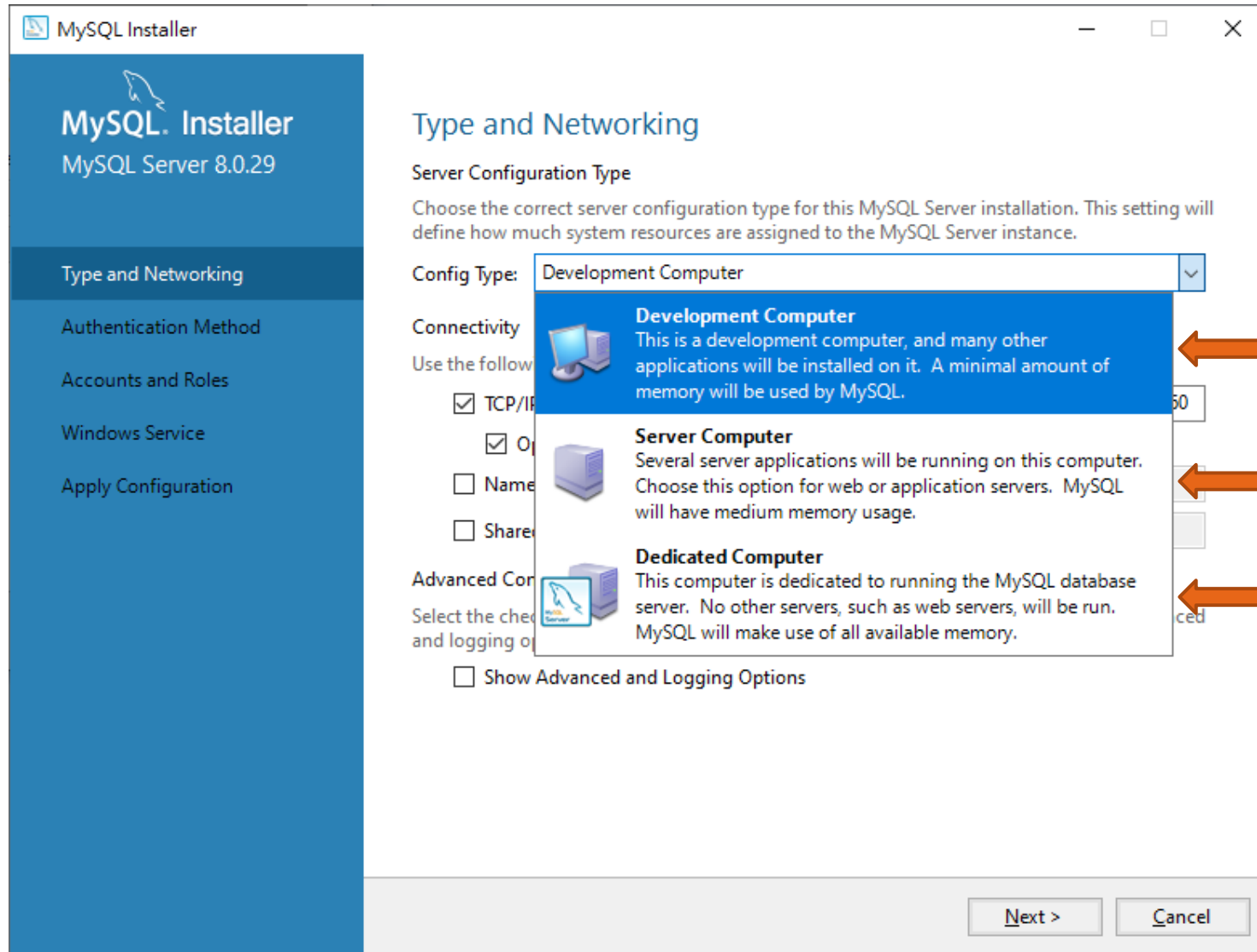
- Server Configuration Type:** A dropdown menu labeled 'Config Type:' is set to 'Development Computer'. This dropdown is circled in red.
- Connectivity:** A section with the instruction 'Use the following controls to select how you would like to connect to this server.' It includes:
 - TCP/IP: A text box for 'Port:' is set to '3306' and is circled in red. Next to it is a text box for 'X Protocol Port:' set to '33060'.
 - Open Windows Firewall ports for network access
 - Named Pipe: 'Pipe Name:' is 'MYSQL'.
 - Shared Memory: 'Memory Name:' is 'MYSQL'.
- Advanced Configuration:** A section with the instruction 'Select the check box below to get additional configuration pages where you can set advanced and logging options for this server instance.' It includes:
 - Show Advanced and Logging Options

At the bottom right, there are 'Next >' and 'Cancel' buttons.

← Environment type

← Default TCP Port

MySQL Server configuration



Standalone PC

Shared Server

Dedicated Server

MySQL Server configuration

MySQL Installer

MySQL Installer
MySQL Server 8.0.29

Type and Networking

Authentication Method

Accounts and Roles

Windows Service

Apply Configuration

Accounts and Roles

Root Account Password
Enter the password for the root account. Please remember to store this password in a secure place.

MySQL Root Password:

Repeat Password:

Password strength: **Weak**

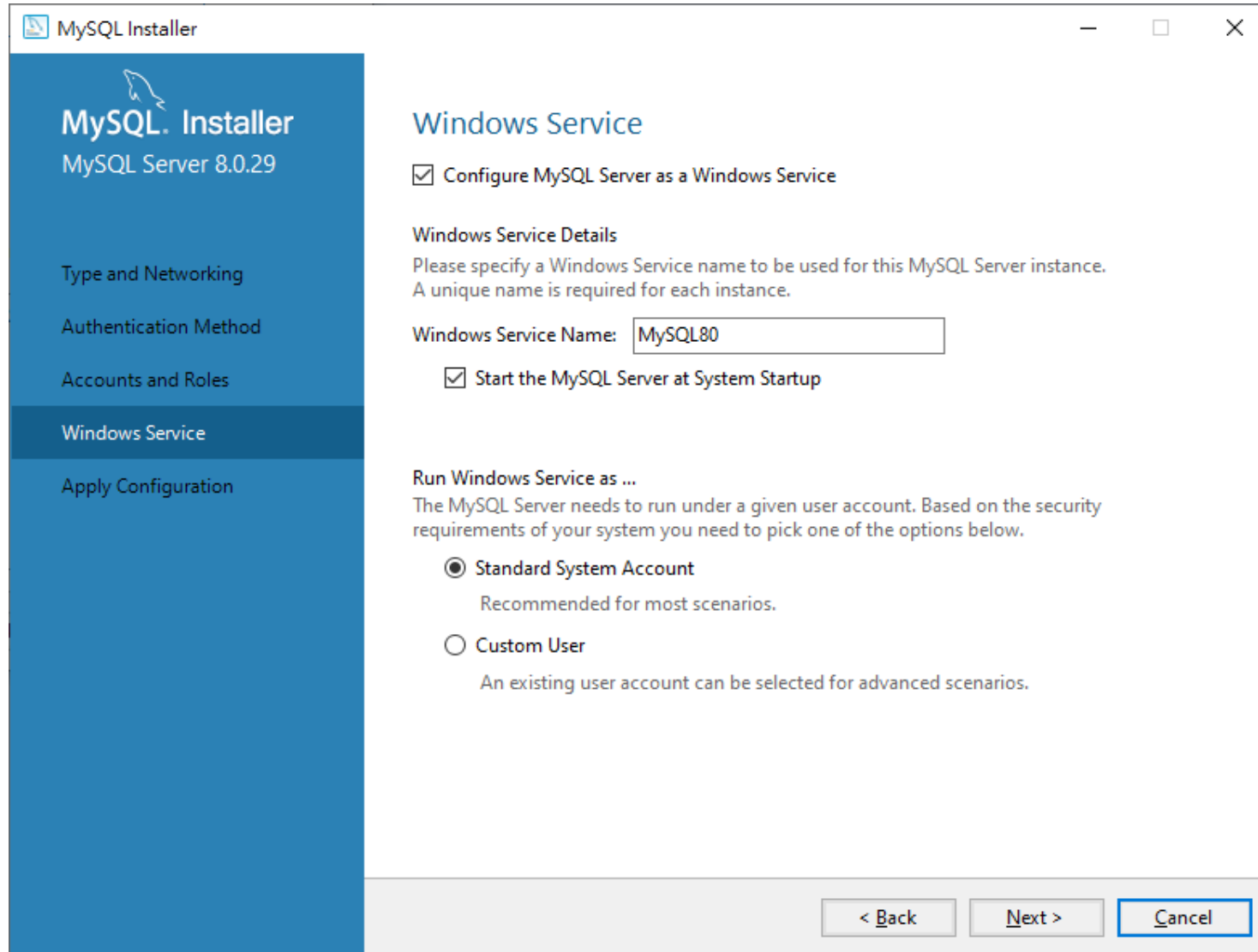
MySQL User Accounts

Create MySQL user accounts for your users and applications. Assign a role to the user that consists of a set of privileges.

MySQL User Name	Host	User Role
-----------------	------	-----------

< Back Next > Cancel

MySQL Server configuration

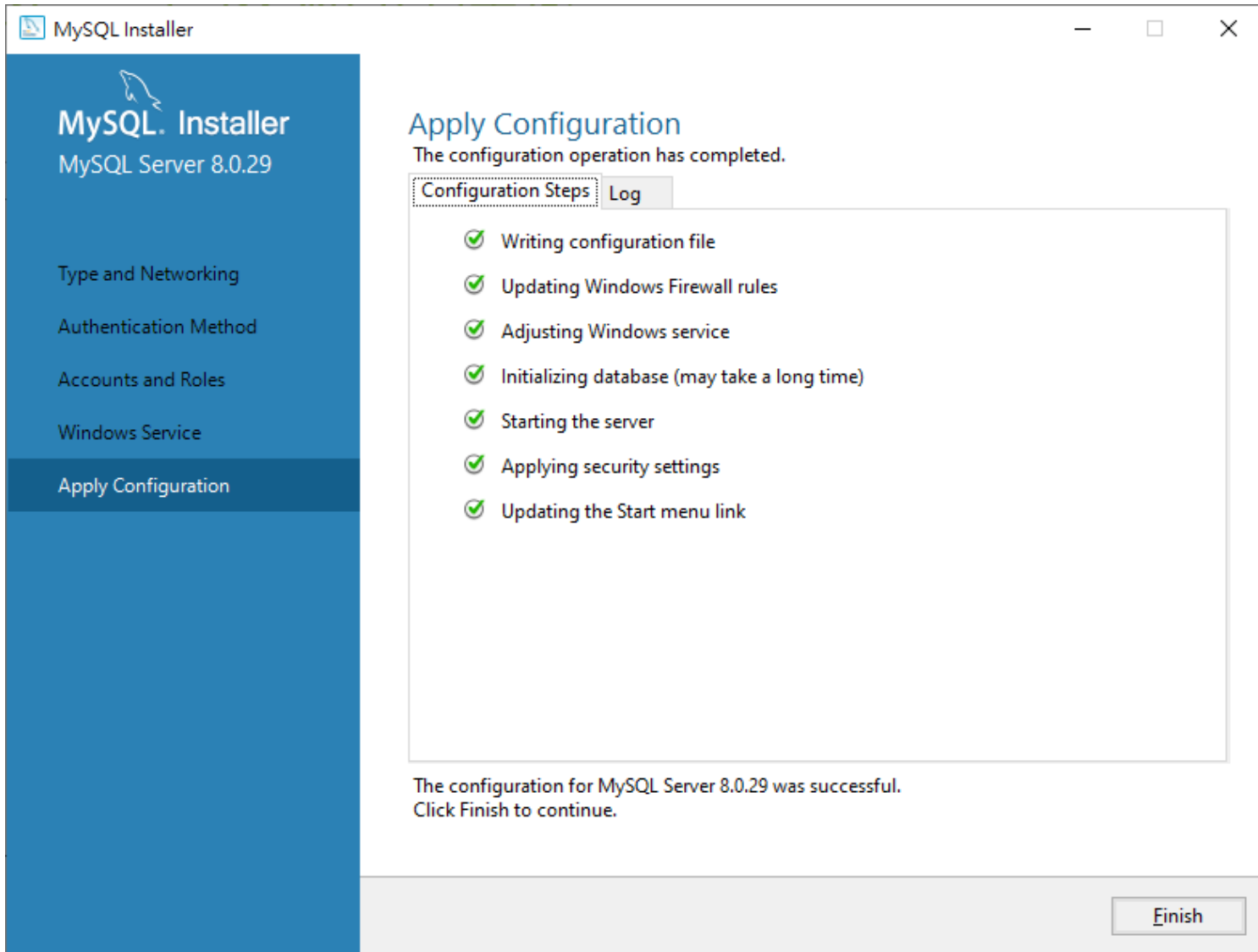


The screenshot shows the 'MySQL Installer' window for 'MySQL Server 8.0.29'. The left sidebar contains navigation options: 'Type and Networking', 'Authentication Method', 'Accounts and Roles', 'Windows Service' (selected), and 'Apply Configuration'. The main area is titled 'Windows Service' and contains the following configuration options:

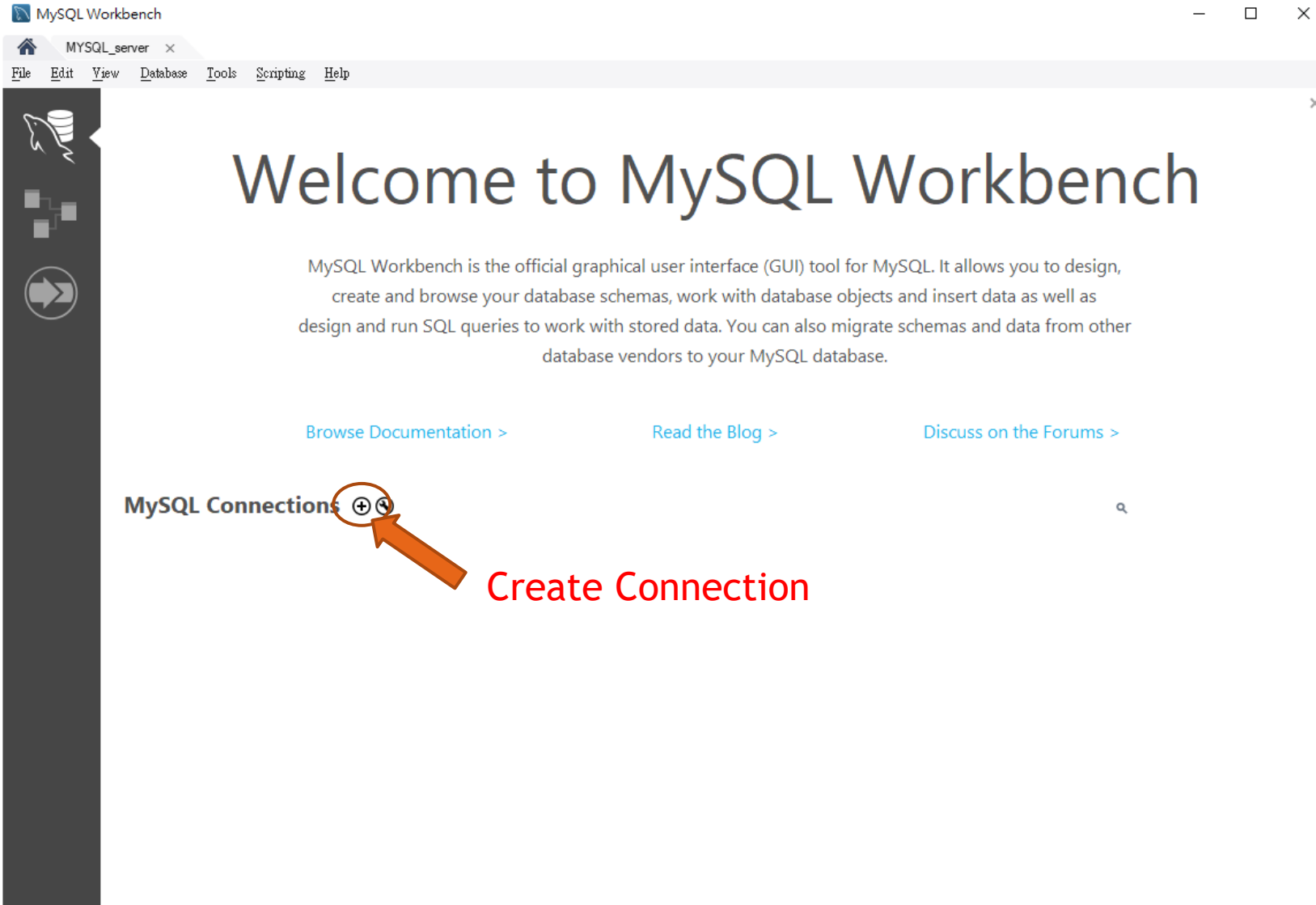
- Configure MySQL Server as a Windows Service
- Windows Service Details**
Please specify a Windows Service name to be used for this MySQL Server instance. A unique name is required for each instance.
Windows Service Name:
- Start the MySQL Server at System Startup
- Run Windows Service as ...**
The MySQL Server needs to run under a given user account. Based on the security requirements of your system you need to pick one of the options below.
 - Standard System Account
Recommended for most scenarios.
 - Custom User
An existing user account can be selected for advanced scenarios.

At the bottom of the window are three buttons: '< Back', 'Next >', and 'Cancel'.

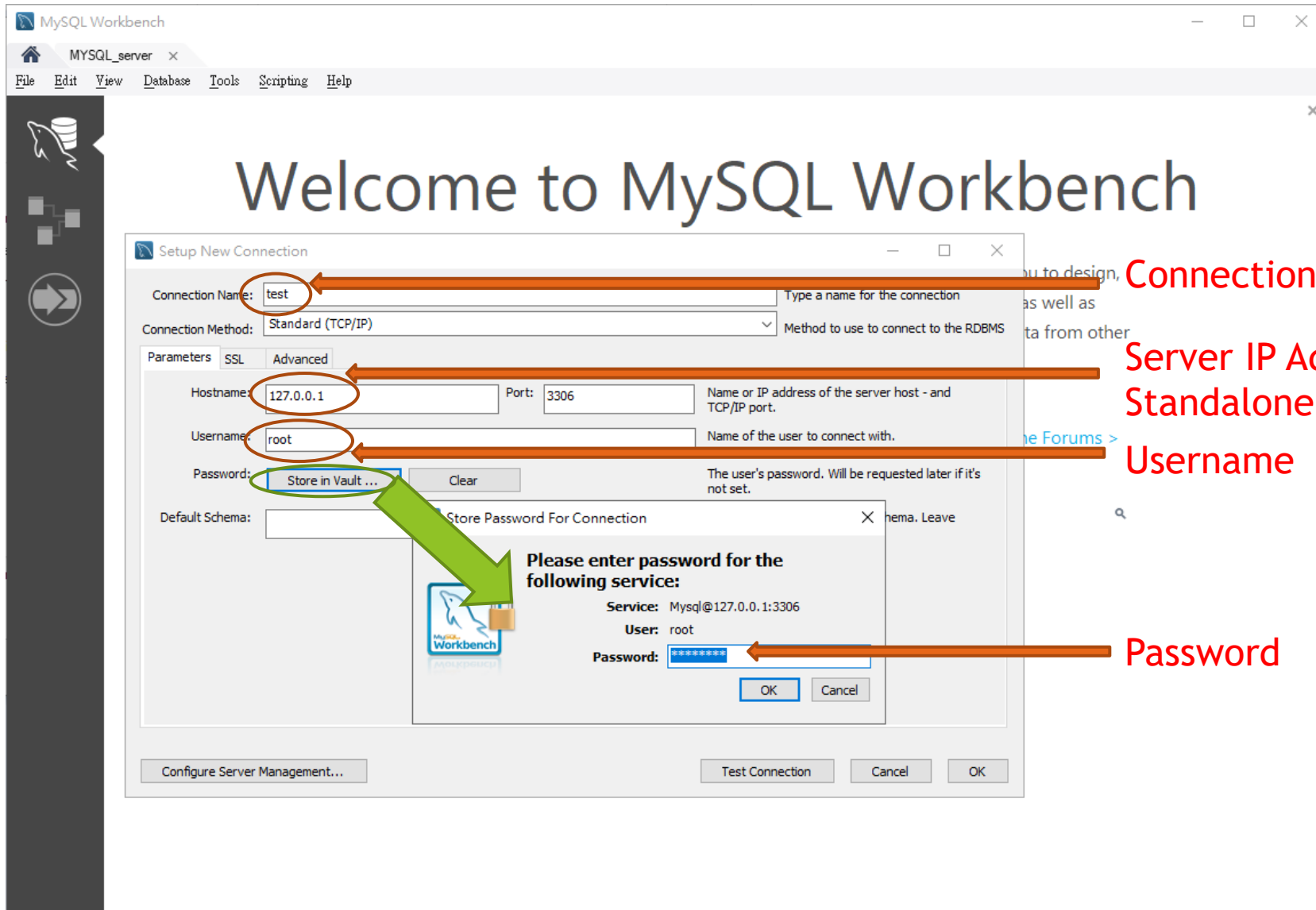
MySQL Server configuration



MySQL Workbench configuration



MySQL Workbench configuration



Connection Name

Server IP Address
Standalone: 127.0.0.1

Username

Password

MySQL Workbench configuration

The screenshot displays the MySQL Workbench interface. The main window shows a SQL editor with the following query:

```
1 • use sys;  
2 • Select * from sys_config
```

The query is highlighted with a red circle. Below the editor, the 'Result Grid' shows the following data:

variable	value	set_time	set_by
diagnostics.allow_i_s_tables	OFF	2022-06-02 10:30:44	NULL
diagnostics.include_raw	OFF	2022-06-02 10:30:44	NULL
ps_thread_trx_info.max_length	65535	2022-06-02 10:30:44	NULL
statement_performance_analyzer.limit	100	2022-06-02 10:30:44	NULL
statement_performance_analyzer.view	NULL	2022-06-02 10:30:44	NULL

The 'Output' pane at the bottom shows the execution log:

#	Time	Action	Message	Duration / Fetch
✖	1 11:28:10	Select * from sys_config LIMIT 0, 1000	Error Code: 1046. No database selected Select the default DB to b...	0.015 sec
✔	2 11:28:29	use sys	0 row(s) affected	0.000 sec
✔	3 11:28:29	Select * from sys_config LIMIT 0, 1000	6 row(s) returned	0.016 sec / 0.000 sec

The 'Table: sys_config' information is shown in the bottom left:

Columns:
variable varchar(128) PK
value varchar(128)
set_time timestamp
set_by varchar(128)

The 'SQLAdditions' pane on the right contains the text: "Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help."

MySQL Workbench configuration

The screenshot shows the MySQL Workbench application window. The 'Edit' menu is open, and the 'Preferences...' option is highlighted with a red circle. The main window displays a SQL query editor with the following code:

```
use sys;  
select * from sys_config
```

The 'Result Grid' shows the following data:

variable	value	set_time	set_by
diagnostics.allow_i_s_tables	OFF	2022-06-02 10:30:44	NULL
diagnostics.include_raw	OFF	2022-06-02 10:30:44	NULL
ps_thread_trx_info.max_length	65535	2022-06-02 10:30:44	NULL
statement_performance_analyzer.limit	100	2022-06-02 10:30:44	NULL
statement_performance_analyzer.view	NULL	2022-06-02 10:30:44	NULL

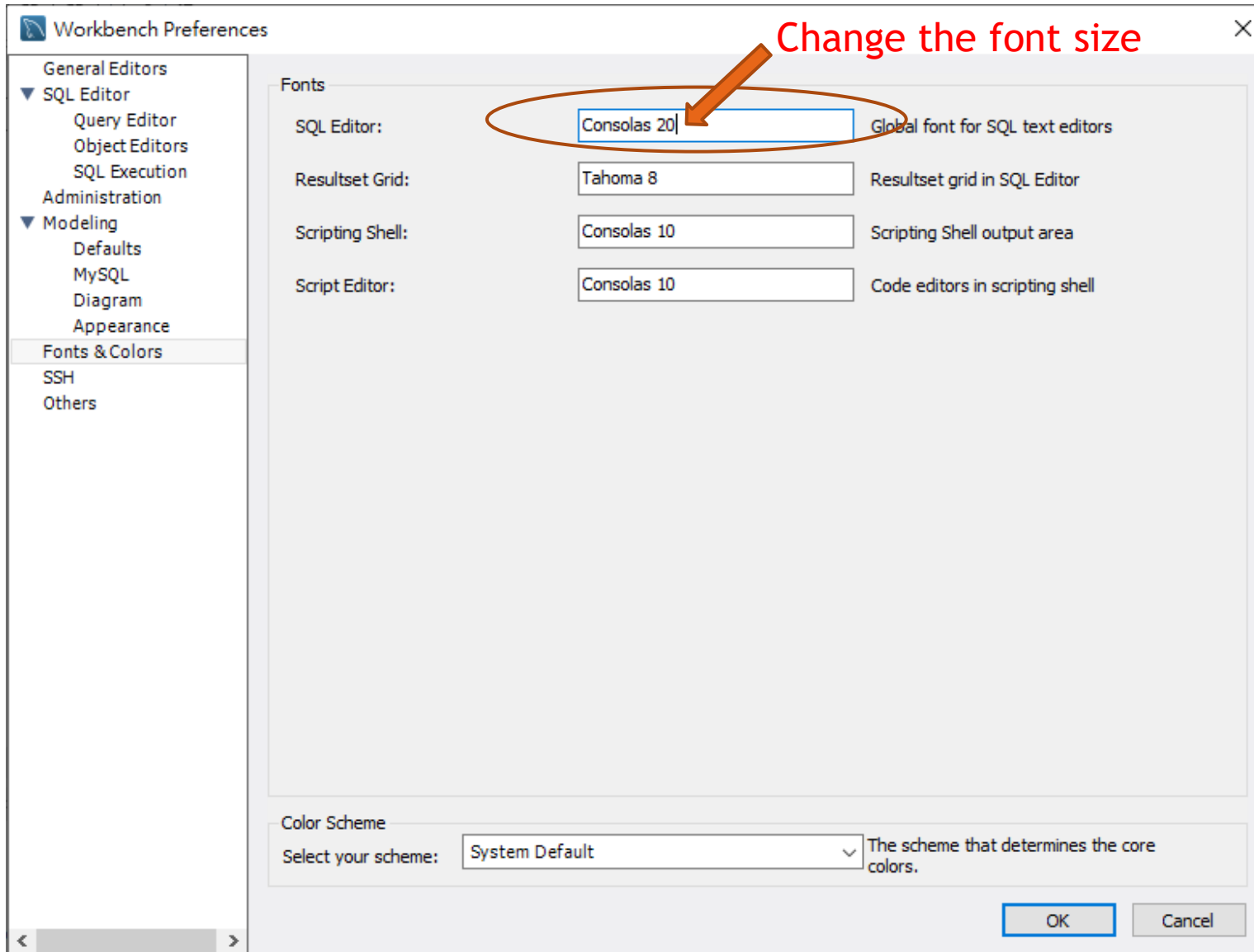
The 'Output' pane shows the following action output:

#	Time	Action	Message	Duration / Fetch
1	11:28:10	Select * from sys_config LIMIT 0, 1000	Error Code: 1046. No database selected Select the default DB to b...	0.015 sec
2	11:28:29	use sys	0 row(s) affected	0.000 sec
3	11:28:29	Select * from sys_config LIMIT 0, 1000	6 row(s) returned	0.016 sec / 0.000 sec

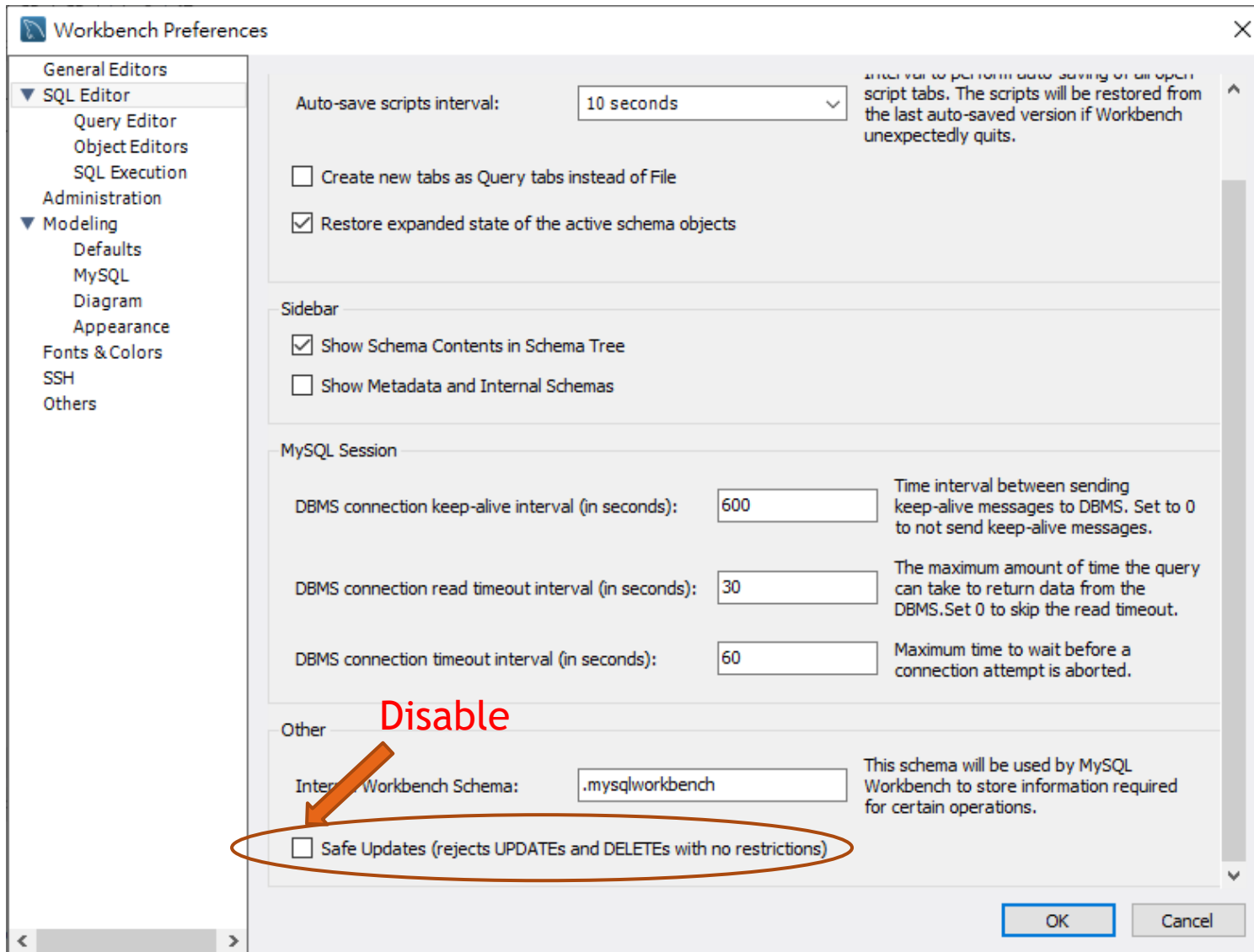
The 'Table: sys_config' information is displayed in the bottom left pane:

Columns:
variable varchar(128) PK
value varchar(128)
set_time timestamp
set_by varchar(128)

MySQL Workbench configuration



MySQL Workbench configuration



Create MySQL admin account

MySQL Workbench

Navigation: Administration - Users and Privileges

MANAGEMENT

- Server Status
- Client Connections
- Users and Privileges**
- Status and System Variables
- Data Export
- Data Import/Restore

INSTANCE

- Startup / Shutdown
- Server Logs
- Options File

PERFORMANCE

- Dashboard
- Performance Reports
- Performance Schema Setup

Administration Schemas

Information

Table: sys_config

Columns:

variable	varchar(128) PK
value	varchar(128)
set_time	timestamp
set_by	varchar(128)

Object Info Session

User Accounts

User	From Host
mysql.infoschema	localhost
mysql.session	localhost
mysql.sys	localhost
newuser	%
root	localhost

Details for account newuser@%

Login Account Limits Administrative Roles Schema Privileges

Login Name: user01

Authentication Type: Standard

Limit to Hosts Matching: %

Password: *****

Confirm Password: *****

Weak password.

Expire Password

Revert Apply

Output

#	Time	Action	Message	Duration / Fetch
1	11:28:10	Select * from sys_config LIMIT 0, 1000	Error Code: 1046. No database selected Select the default DB to b...	0.015 sec
2	11:28:29	use sys	0 row(s) affected	0.000 sec
3	11:28:29	Select * from sys_config LIMIT 0, 1000	6 row(s) returned	0.016 sec / 0.000 sec

Create MySQL admin account

MySQL Workbench

test
Users and Privileges

User Accounts

User	From Host
mysql.infoschema	localhost
mysql.session	localhost
mysql.sys	localhost
newuser	%
root	localhost

Details for account newuser@%

Administrative Roles

Role	Description
<input checked="" type="checkbox"/> DBA	grants the rights to perform all tasks
<input checked="" type="checkbox"/> MaintenanceAdmin	grants rights needed to maintain server
<input checked="" type="checkbox"/> ProcessAdmin	rights needed to assess, monitor, and k
<input checked="" type="checkbox"/> UserAdmin	grants rights to create users logins and
<input checked="" type="checkbox"/> SecurityAdmin	rights to manage logins and grant and r
<input checked="" type="checkbox"/> MonitorAdmin	minimum set of rights needed to monit
<input checked="" type="checkbox"/> DBManager	grants full rights on all databases
<input checked="" type="checkbox"/> DBDesigner	rights to create and reverse engineer an
<input checked="" type="checkbox"/> ReplicationAdmin	rights needed to setup and manage rep
<input checked="" type="checkbox"/> BackupAdmin	minimal rights needed to backup any da

Global Privileges

- ALTER
- ALTER ROUTINE
- CREATE
- CREATE ROUTINE
- CREATE TABLESPACE
- CREATE TEMPORARY TABLES
- CREATE USER
- CREATE VIEW
- DELETE
- DROP
- EVENT
- EXECUTE
- FILE
- GRANT OPTION
- INDEX
- INSERT
- LOCK TABLES
- PROCESS

Table: sys_config

Columns:

Column	Type
variable	varchar(128) PK
value	varchar(128)
set_time	timestamp
set_by	varchar(128)

Output

#	Time	Action	Message	Duration / Fetch
1	11:28:10	Select * from sys_config LIMIT 0, 1000	Error Code: 1046. No database selected Select the default DB to b...	0.015 sec
2	11:28:29	use sys	0 row(s) affected	0.000 sec
3	11:28:29	Select * from sys_config LIMIT 0, 1000	6 row(s) returned	0.016 sec / 0.000 sec

Create MySQL user/student account and database

- ▶ Create user

- ▶ `CREATE USER 'user_id'@'%' IDENTIFIED BY 'user_password';`

- ▶ Create database

- ▶ `CREATE DATABASE 'user_db';`

- ▶ Grant/remove rights on specific database

- ▶ `GRANT ALL PRIVILEGES ON user_db.* TO 'user_id'@'%';`

- ▶ `REVOKE DROP, ALTER ON user_db.* FROM 'user_id'@'%';`

SQL sample script

▶ Student username: S2022001, password: s2022001Stu

▶ Create user and database

```
▶ CREATE USER 's2022001'@'%' IDENTIFIED BY  
's2022001Stu';CREATE DATABASE `s2022001`;GRANT ALL  
PRIVILEGES ON s2022001.* TO 's2022001'@'%';REVOKE DROP,  
ALTER ON s2022001.* FROM 's2022001'@'%';
```

▶ Create second database

```
▶ CREATE DATABASE `s2022001_classwork`;GRANT ALL PRIVILEGES  
ON s2022001_classwork.* TO 's2022001'@'%';REVOKE DROP,  
ALTER ON s2022001_classwork.* FROM 's2022001'@'%';
```

Create Bulk Users Accounts and databases from Excel spreadsheet

The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H
1	reg	2122	name_e	name_c	MYSQL Login	Password	script_createdb_stdid	script_createdb_stdid_classwork
2	2022001	5A01	Chan Tai Man	陳大文	s2022001	s2022001Stu	CREATE USER 's2022001'	CREATE DATABASE `s2022001_classwork`; GRANT ALL PRIVILEGES ON s2022001_classwork TO 's2022001Stu'@'%' IDENTIFIED BY 's2022001Stu';
3	2022002	5A02	Chan Siu Ming	陳小明	s2022002	s2022002Stu	CREATE USER 's2022002'	CREATE DATABASE `s2022002_classwork`; GRANT ALL PRIVILEGES ON s2022002_classwork TO 's2022002Stu'@'%' IDENTIFIED BY 's2022002Stu';
4	2022003	5A03	Chan Siu Mei	陳小美	s2022003	s2022003Stu	CREATE USER 's2022003'	CREATE DATABASE `s2022003_classwork`; GRANT ALL PRIVILEGES ON s2022003_classwork TO 's2022003Stu'@'%' IDENTIFIED BY 's2022003Stu';
5	2022004	5A04	Li Ka Sing	李嘉誠	s2022004	s2022004Stu	CREATE USER 's2022004'	CREATE DATABASE `s2022004_classwork`; GRANT ALL PRIVILEGES ON s2022004_classwork TO 's2022004Stu'@'%' IDENTIFIED BY 's2022004Stu';
6	2022005	5A05	Li Chak Kai	李澤楷	s2022005	s2022005Stu	CREATE USER 's2022005'	CREATE DATABASE `s2022005_classwork`; GRANT ALL PRIVILEGES ON s2022005_classwork TO 's2022005Stu'@'%' IDENTIFIED BY 's2022005Stu';
7	2022006	5A06	Lau Mei Mei	劉美美	s2022006	s2022006Stu	CREATE USER 's2022006'	CREATE DATABASE `s2022006_classwork`; GRANT ALL PRIVILEGES ON s2022006_classwork TO 's2022006Stu'@'%' IDENTIFIED BY 's2022006Stu';
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								

The formula bar for cell G2 contains the following formula: `=CONCATENATE("CREATE USER 's",A2,"@"&"%' IDENTIFIED BY '",F2,"";`

https://docs.google.com/spreadsheets/d/17_3YhhdLP_tnUvkFw2gK-1eEjC2ifPRi/edit?usp=sharing&ouid=105970360885754566251&rtpof=true&sd=true

Create ER Diagram

The screenshot shows the MySQL Workbench interface. The 'Database' menu is open, and the 'Reverse Engineer...' option is highlighted with a red circle. The 'Server' menu is also circled in red. The 'Navigator' pane on the left shows a tree view of schemas, including 'music', 'mydb1', 'post', 's2022001', 'sets', 'staff', 'sys', and 'tcw'. The 'Information' pane at the bottom shows 'No object selected'. The 'Output' pane at the bottom right shows a table with the following data:

#	Time	Action	Message	Duration / Fetch
1	11:26:02	DROP TABLE `s2022001`.`artist`, `s2022001`.`assignment`, `s2022001`.`award`, `s202...	0 row(s) affected	0.375 sec

Create ER Diagram

Reverse Engineer Database

Connection Options

- Connect to DBMS
- Select Schemas
- Retrieve Objects
- Select Objects
- Reverse Engineer
- Results

Set Parameters for Connecting to a DBMS

Stored Connection: Select from saved connection settings

Connection Method: Method to use to connect to the RDBMS

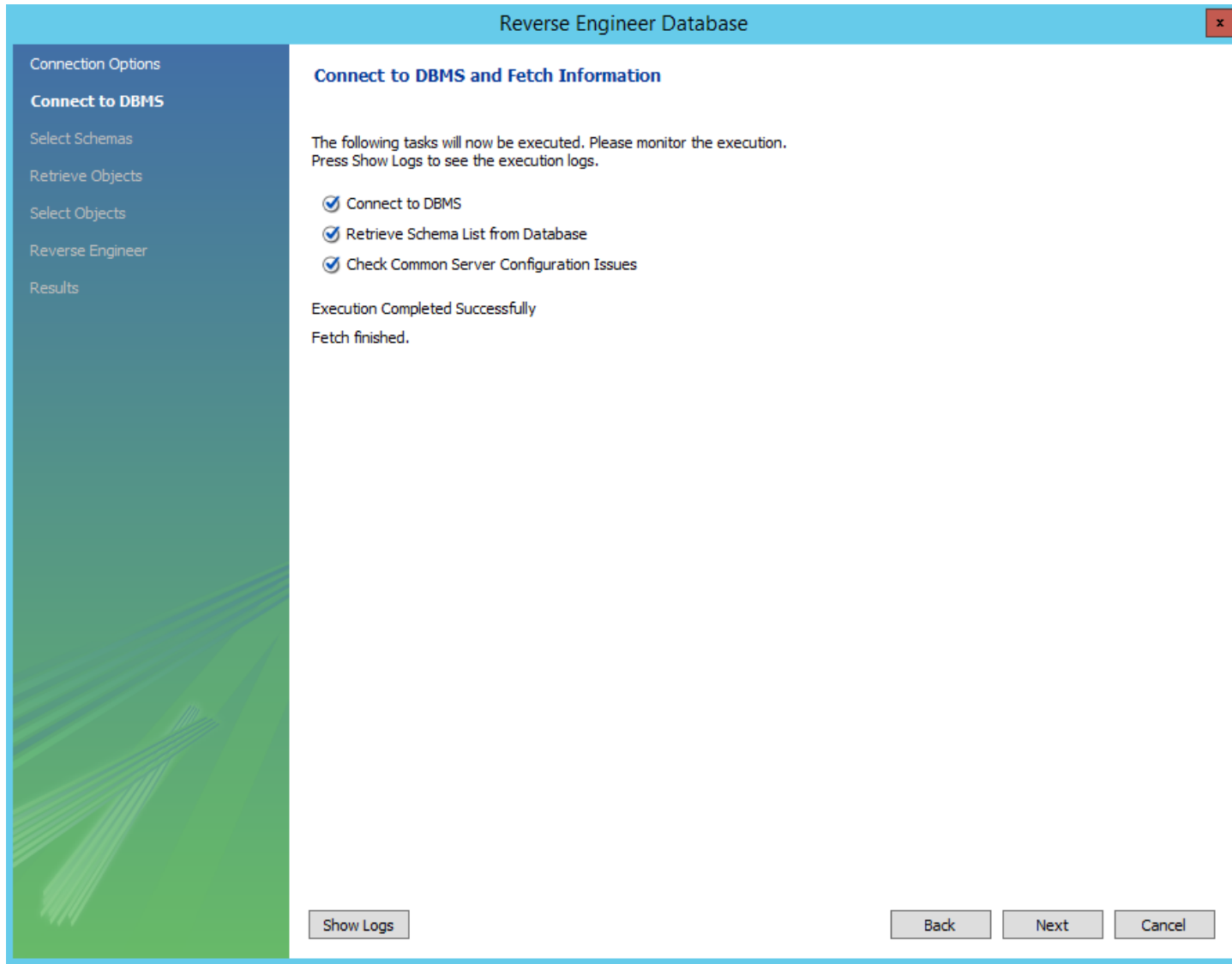
Parameters

Hostname: Port: Name or IP address of the server host - and TCP/IP port.

Username: Name of the user to connect with.

Password: The user's password. Will be requested later if it's not set.

Create ER Diagram



Create ER Diagram

Reverse Engineer Database

Connection Options

Connect to DBMS

Select Schemas


Retrieve Objects

Select Objects

Reverse Engineer

Results

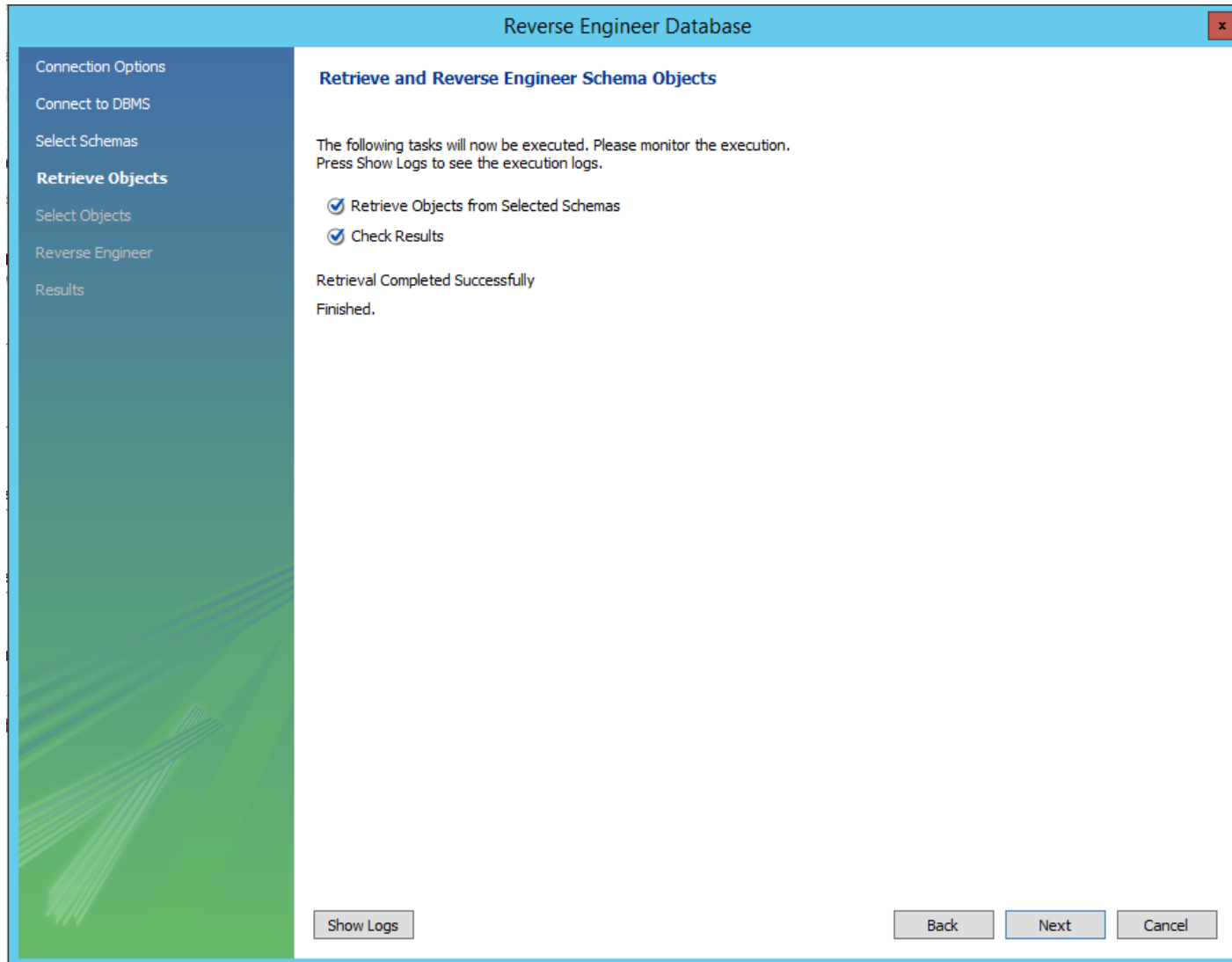
Select Schemas to Reverse Engineer

 **Select the schemas you want to include:**

- award
- bus
- customer
- invoice
- music
- mydb1
- post
- s2022001
- sets
- staff
- tcw
- vehicle

Back Next Cancel

Create ER Diagram



Create ER Diagram

Reverse Engineer Database

Connection Options
Connect to DBMS
Select Schemas
Retrieve Objects
Select Objects
Reverse Engineer
Results

Select Objects to Reverse Engineer

Import MySQL Table Objects
26 Total Objects, 3 Selected
Hide Filter

tcw.book	>	tcw.librarian
tcw.loanrecord	>	tcw.membership
tcw.student	>	tcw.post
	>	tcw.product
	>	tcw.project
	>	tcw.rental
	>	tcw.salorder
	>	tcw.salstaff
	>	tcw.seta
	>	tcw.setb
	>	tcw.song
	>	tcw.staffrec

Use the + button to exclude objects matching wildcards such as * and ?

Show

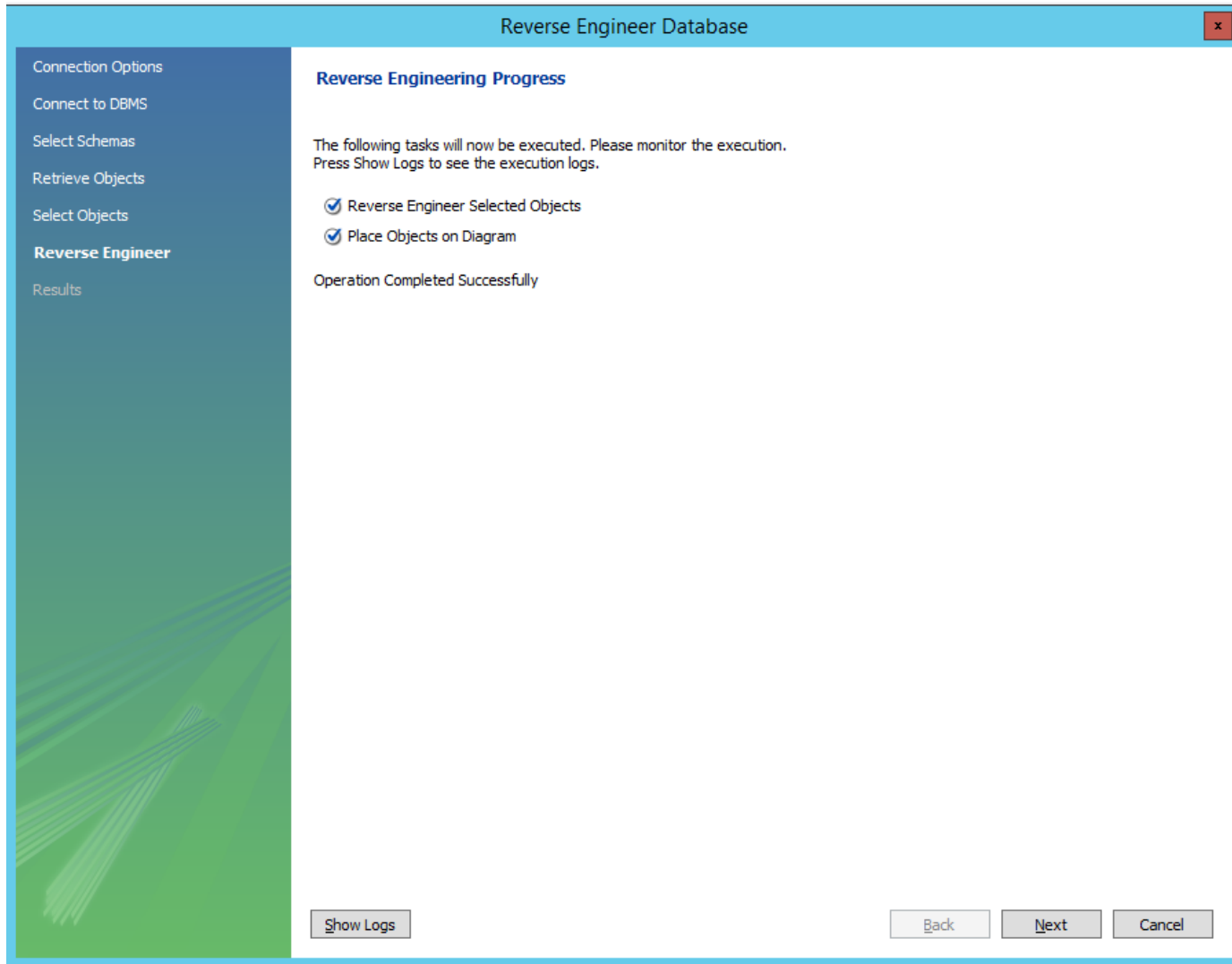
Hide

Import MySQL View Objects
6 Total Objects, 6 Selected
Show Filter

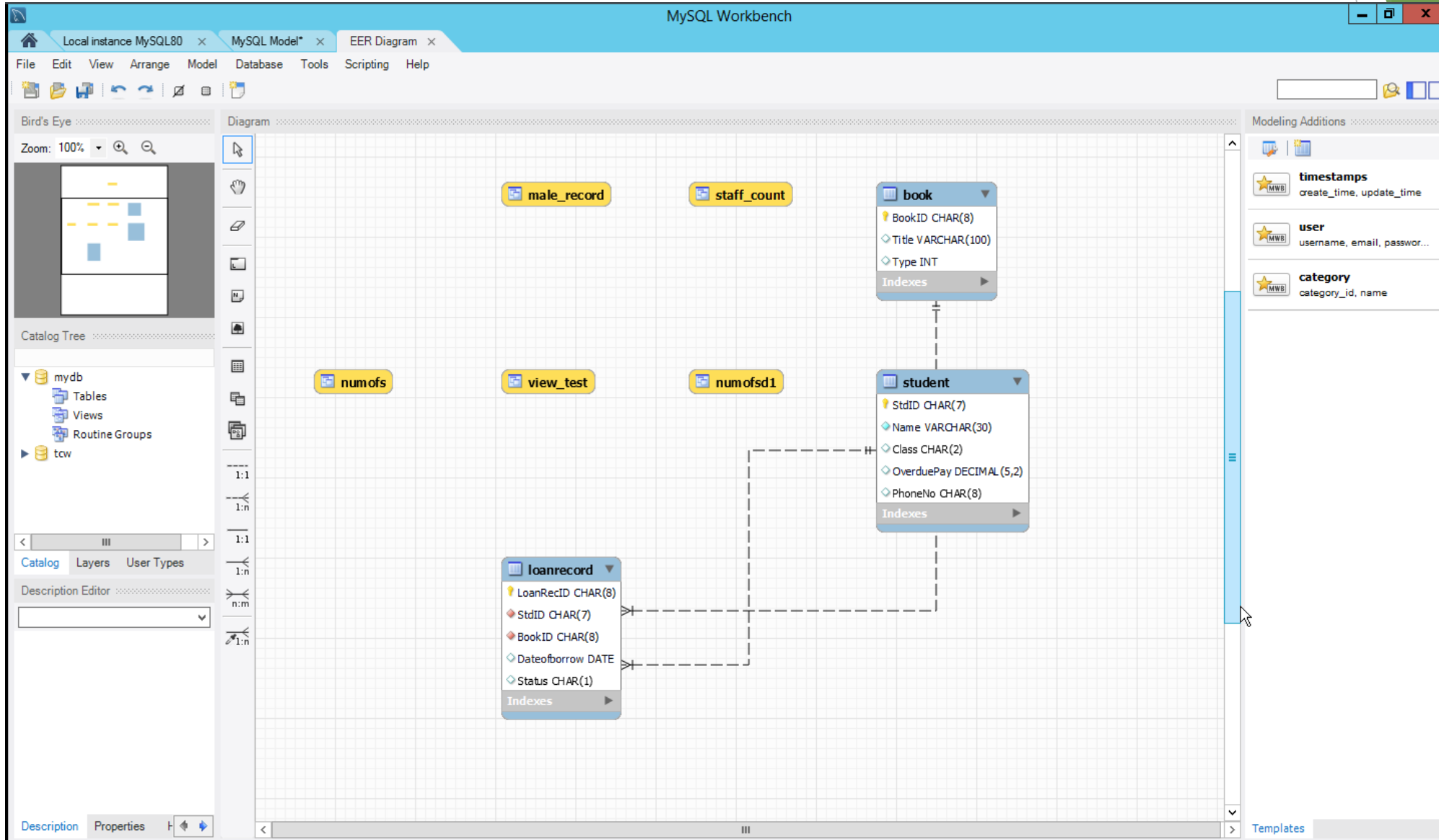
Place imported objects on a diagram

Back Execute > Cancel

Create ER Diagram



Create ER Diagram



Remote Connections to MySQL server

- ▶ Server/firewall/Router Setting
 - ▶ NAT
 - ▶ Port forwarding (Don't use default TCP 3306)
 - ▶ ACL on firewall
 - ▶ Restrict local access of root account
 - ▶ Change “%” to “localhost” on “Limit to Hosts Matching”
 - ▶ Use complex password
- ▶ MYSQL Workbench
 - ▶ Change IP address from private to public IP
 - ▶ Change TCP port