



*Database Security (ITMS428-528)*  
*Lesson 3*  
*Database Installation 1: MySQL*



# Objectives

- Identify the considerations that an administrator must take into account prior to installation
- Download and install the binary distribution of MySQL for the most common operating systems
- Configure a MySQL database for both Windows- and UNIX-based platforms
- In this class we will demo mysql installation on Windows and two UNIX-based platforms
- Secure the installation and configuration of MySQL server



# Preinstallation Preparation

- MySQL
  - Reliable open-source application
  - Most popular open-source database application used today
  - Can be customized to fit almost any business or personal environment
- Preinstallation considerations for the administrator
  - Distribution formats, MySQL versions, supporting platforms, and technical support lines



# Choosing a Distribution Format

- MySQL can be installed in different ways
  - Simple prepackaged executions
  - Custom downloads
- Two main installation formats
  - Source code installation
    - Allows users to download actual MySQL source code to change, customize, and compile as desired
    - Compiling can take up to 60 minutes
  - Binary code installation
    - Binary files ready for installation without compiling



# Choosing a Distribution Format (cont'd.)

- Considerations for using source code distribution format
  - Software programming expertise is necessary for customization
  - Removing unneeded default features of a specific version of MySQL can improve efficiency
  - Additional steps and long compiling times needed
  - Detailed documentation must be created for any customization



# Choosing a Distribution Format (cont'd.)

- Considerations for using binary distribution format
  - Easy to install, requires less time and expertise
  - Cannot be customized and compilers cannot be changed
- Consider alternatives before deciding to use source code distribution installations
  - Several different versions of MySQL exist
  - Third party vendors distribute their own versions with customized features for specific environments and operating systems



# Choosing a Version of MySQL

- Identifying most stable MySQL release available
  - Important to success of database application implementation
- Four main phases of maturity for a MySQL release
  - General availability
  - Release candidate
  - Beta
  - Alpha
- Milestone model: new approach to phase and release cycle introduced in 2008



# Choosing a Version of MySQL (cont'd.)

- Milestone model
  - Allows for more frequent releases with fewer changes in each
  - Version numbers use a specific naming scheme with a suffix after the version number
- Example: MySQL 5.5.0-m2
  - First 5 indicates the version number
  - Second 5 indicates the release level and indicates number of major changes added
  - Third number indicates number of smaller changes that have been tested and released



# Choosing a Version of MySQL (cont'd.)

- Suffix indicates how stable the application is

<b>Suffix</b>	<b>Meaning</b>	<b>Example</b>
m1, m2, m3, etc.	A suffix of m1, m2, m3, etc., indicates the number of milestones that have been achieved thus far  This stage is similar to the beta stage described earlier.	MySQL 5.5.0-m2  For this example, two milestones have been achieved; a milestone is a small focused change or feature added to an application that has been tested rigorously
rc	A suffix of rc indicates that an application is a release candidate	MySQL 5.5.0-RC  For this example, the application is considered to be somewhat stable, although it may have serious bugs that still exist but do not affect everyone; normally these bugs only affect unique and rare environments
None	If no suffix is provided at the end of a version of a MySQL application, then the application is considered to be of General Availability	MySQL 5.5.0  For this example, the application is ready for production; in this stage of maturity, there are very few known bugs and it is a stable application

**Table 3-1 Suffix types**

**Table 3-2**  
**Timeline of**  
**MySQL**  
**releases**

Year	Version	Notes
1994	Original development	
1996	Public release for Solaris	
1998	Windows version released for Windows 95 and NT	
2000	Version 3.23 beta release	BDB and InnoDB engines
2001	GA production release of version 3.23	
2002	Beta version 4.0 release	
2003	GA production release version 4.0 three months after Beta release version 4.01	Version
2004	Beta and production versions of 4.1 are released	Subqueries R-trees, B-trees, prepared statements
2005	Beta and production versions of 5.0 are released	Cursors, stored procedures, triggers, views, XA transaction Federated Storage Engine included as a default engine
2006	Beta release version 5.1	Partitioning, row-based replications, plug-in storage engine API, server log tables, and event scheduler
2007	6.0 Alpha version released	Falcon and Maria storage engines and online backup
2008	Sun Microsystems acquired MySQLAB version 5.1 production, version production release 5.4-m1	Version 6.0 withdrawn Version 5.4 upgraded features: improve scalability on multicore CPUs, I/O subsystem changes, enhanced Solaris support, diagnostic, and monitoring capabilities
2009	Version 6.0 cancelled Version 5.5.0-m2	Semisynchronous replication, key caching for index, two new users defined, enhanced XML functionality

# +

# Supported Platforms

- Compatible operating system platforms
  - AIX, BSDi, eComStation, FreeBSD, HPUX, i5/OS, Linux, Mac OS X, Microsoft Windows, NetBSD, Novell NetWare, OpenBSD, OpenSolaris, OS/2 Warp, QNX, IRIX, Solaris, Symbian, SunOS, SCO OpenServer, SCO, UNIXWare, Sanos, and Tru64
- More details available on MySQL's Web site
  - Community and enterprise edition information URLs found on Page 83 of the text



# Locating Help

- MySQLAB
  - Paid support service offered by Sun Microsystems
  - Connects users and administrators:
    - For questions, consultations, and training
- Most resources for MySQL can be found free online
  - MySQL manual, MySQL forums, mailing lists, bloggers, Twitter, bug alerts
  - <http://dev.mysql.com/doc>, <http://forums.mysql.com>,  
<https://lists.mysql.com>, <http://planet.mysql.com>,  
<http://twitter.com/MySQL>, <http://bugs.mysql.com>.



# Server Environment Setup

- Oracle VirtualBox
  - Windows 7
  - Ubuntu 15.04 Server
  - Red Hat 6.0 Server

# + Downloading MySQL

- Official download site: *<http://dev.mysql.com/downloads>*
  - Contains all available versions, editions, and distribution formats of MySQL
- Community Edition
  - Most popular open source edition
- Enterprise Edition
  - Provides additional assistance for monitoring and analyzing database server performance
  - Includes support, training, and consultation
  - Recommended for large organizations



# Downloading MySQL (cont'd.)

- Steps to verify file integrity after download and before installation
  - MD5 checksum
    - Match hexadecimal codes
  - GnuPG
    - Uses digital signatures



# Installation

- This section provides steps for installing MySQL
  - Windows- and UNIX-based machines
- Steps listed are for installing:
  - Binary distribution formation
  - MySQL 5.5 Community Edition

# +

# Installing on Windows

- MySQL is available for virtually all Windows Operating Systems active today
  - 32-bit and 64-bit versions are supported
- Installing MySQL on Windows using an installer package
  - Three different binary packages available
    - The Essentials Package
    - The Complete Package
    - The Noinstall Archive



# Adding a MySQL Port in Windows 7

1. Click Control Panel found in the Start menu of Microsoft Windows
2. Click System and Security
3. Click Windows Firewall
4. Click Advanced settings on the left pane
5. In the Windows Firewall with Advanced Security dialog box in the left pane, click Inbound Rules
  - In the far-right pane, click New Rule
6. Click Port from the New Inbound Rule Wizard dialog box and click Next



# Adding a MySQL Port in Windows 7 (cont'd.)

7. Apply the rule to TCP
8. Specify the port in the Port Number text field (the suggested port is 3306)
9. Click Next
10. Click Allow the connection it is secure
  - This is only compatible with Windows Vista and later versions of Windows
11. Click Next
12. Add the list of allowed user connections and exceptions (if applicable)



# Adding a MySQL Port in Windows 7 (cont'd.)

13. Add the list of allowed computer connections and exceptions (if applicable)
14. Click Next
15. Select whether computers will be connecting to the server from within the domain, a private location, public location, or all locations
  - Public setting not recommended unless necessary
16. Provide a descriptive name in the Name text field
17. Click Finish to confirm your choices and add the port

# +

# Installation Instructions

1. Locate the downloaded file. Unzip if necessary
2. Double-click Microsoft Windows Installer (MSI) file to execute

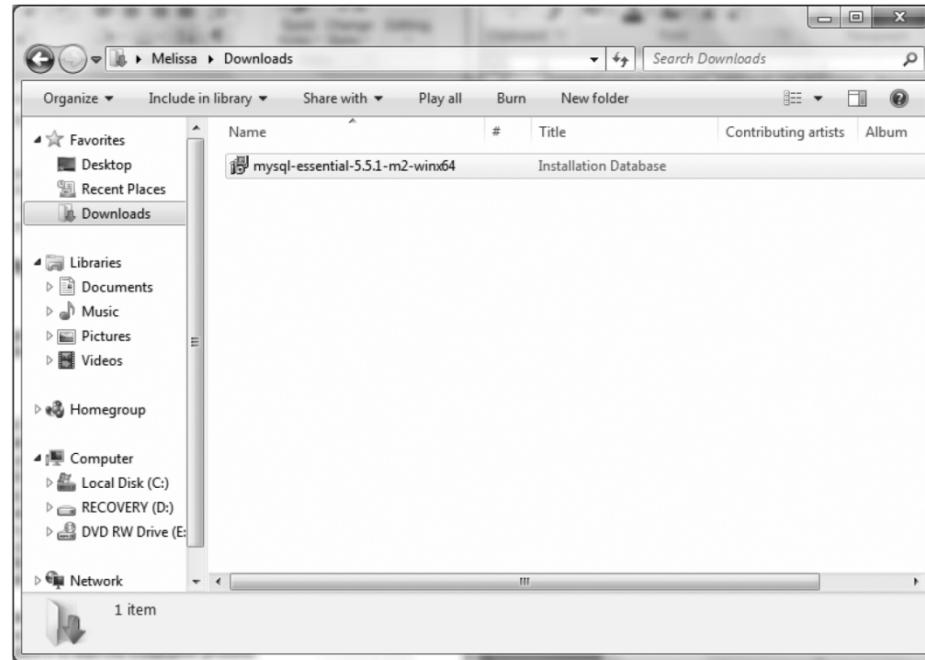


Figure 3-1 Locate the  
downloaded file  
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# Installation Instructions (cont'd.)

3. Security warning may appear to confirm system request is approved and intentional
4. Click Run to begin installation

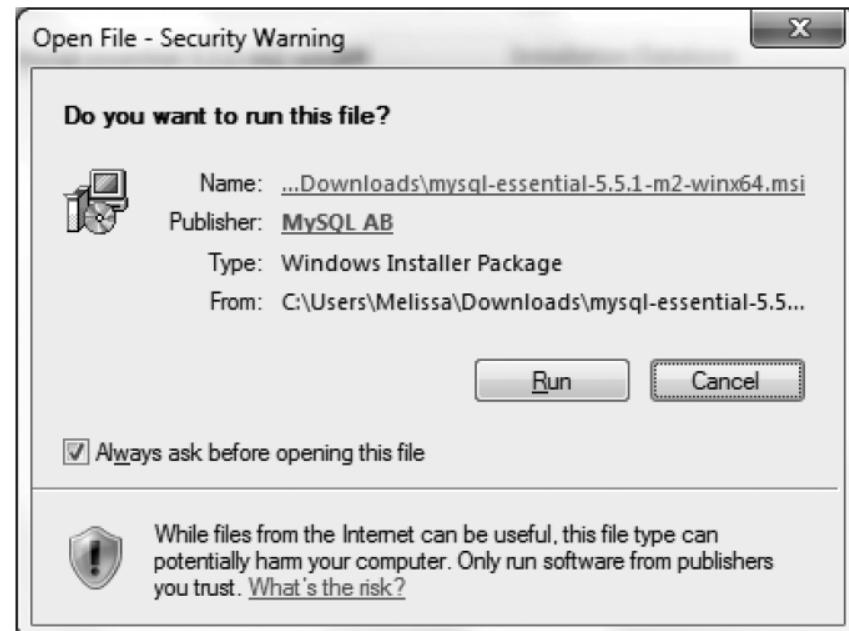


Figure 3-2 Security warning  
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# Installation Instructions (cont'd.)

5. First window encountered will provide a general overview of MySQL server release
6. Click Next to continue

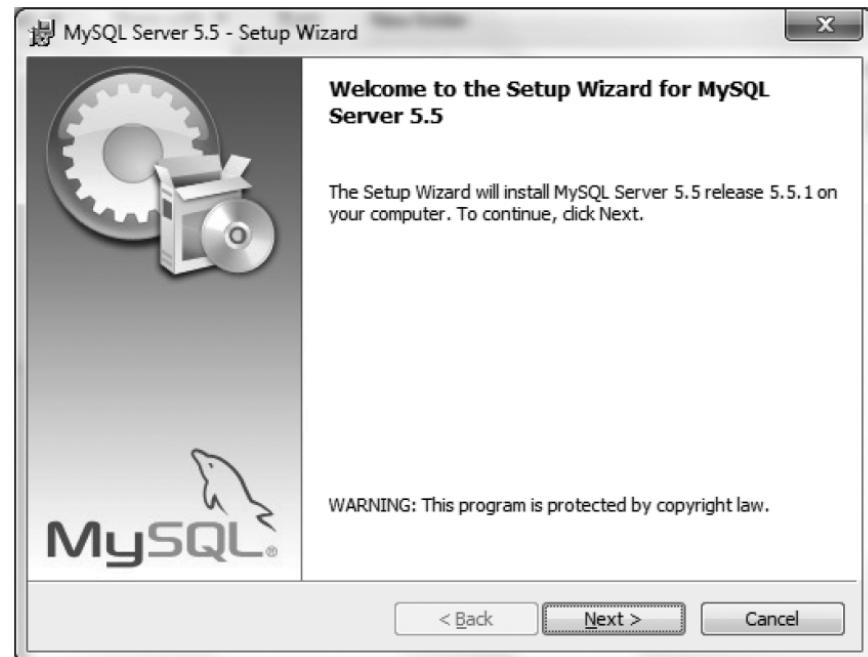


Figure 3-3 Setup welcome  
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# Installation Instructions (cont'd.)

7. Three installation types: typical, complete, and custom
8. Select Typical or Complete and click Next, then Install



Figure 3-4 Installation type  
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# Installation Instructions (cont'd.)

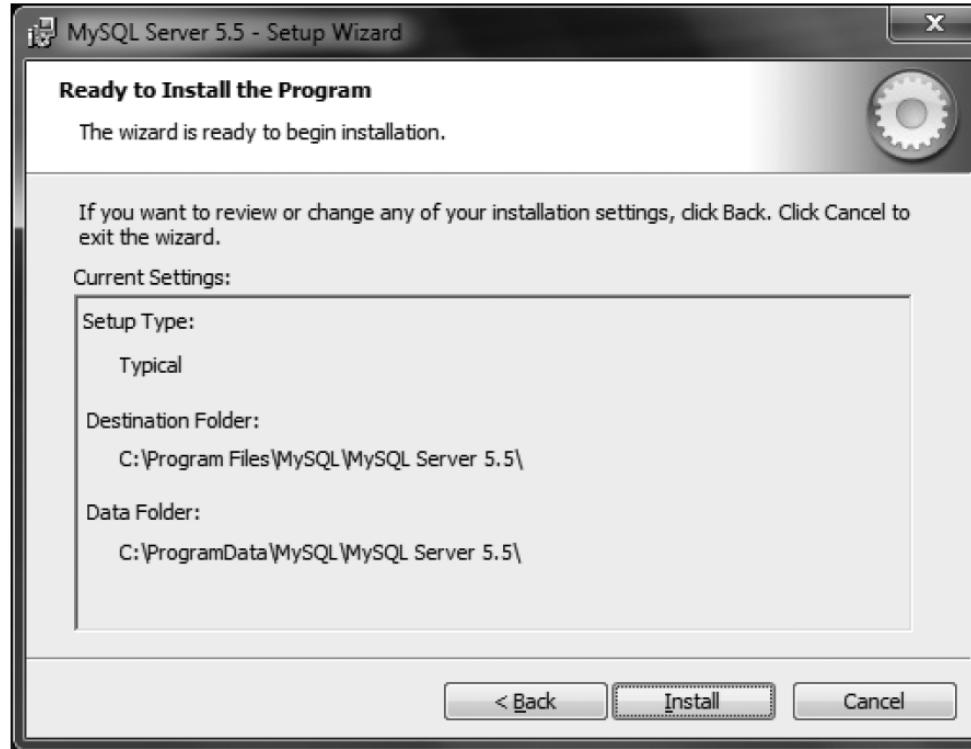


Figure 3-5 Verify installation  
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# Installation Instructions (cont'd.)

9. Custom installation screen lists components available for installation
10. Click icon to the left of the feature name to change the way features are installed
11. Highlight component name and click Change to change the directory to which client program is installed
  - Type new directory in Folder Name field
  - Or use Look In List arrow to choose from drop down menu
  - Click OK

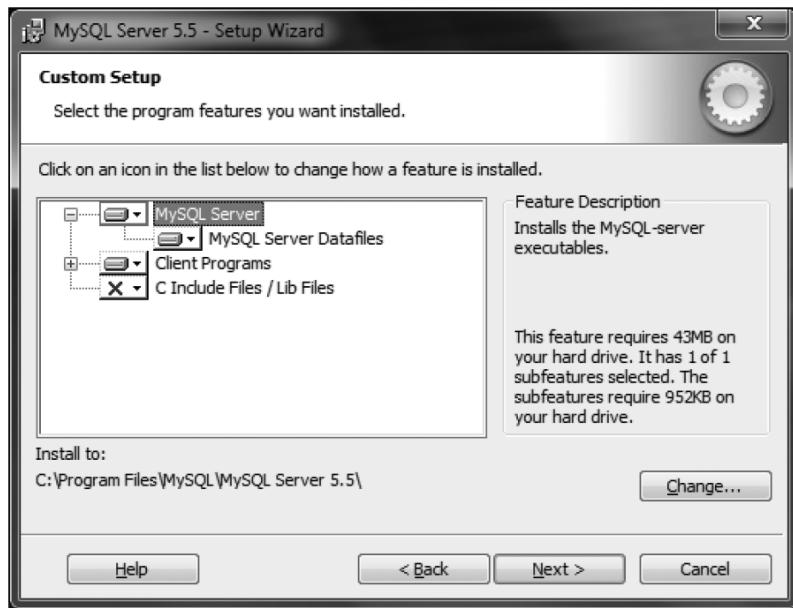


Figure 3-6 Custom installation  
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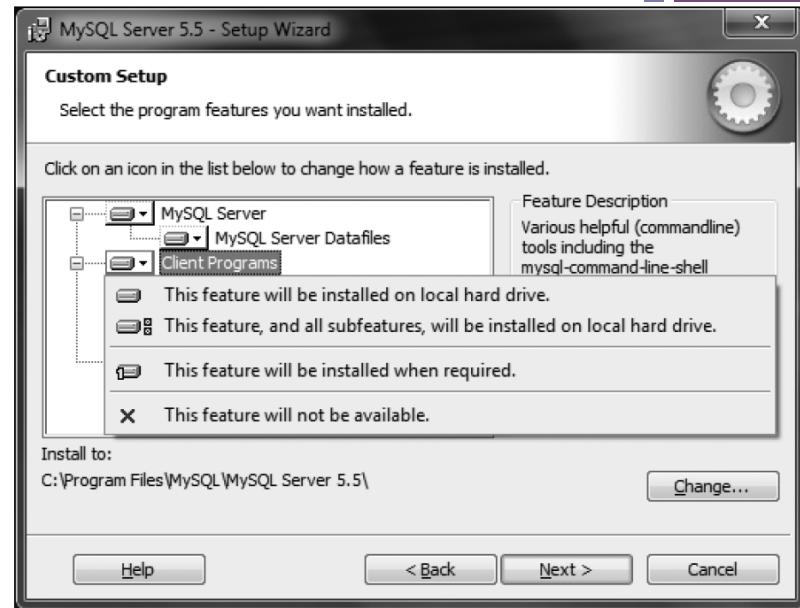


Figure 3-7 Select program features to be installed  
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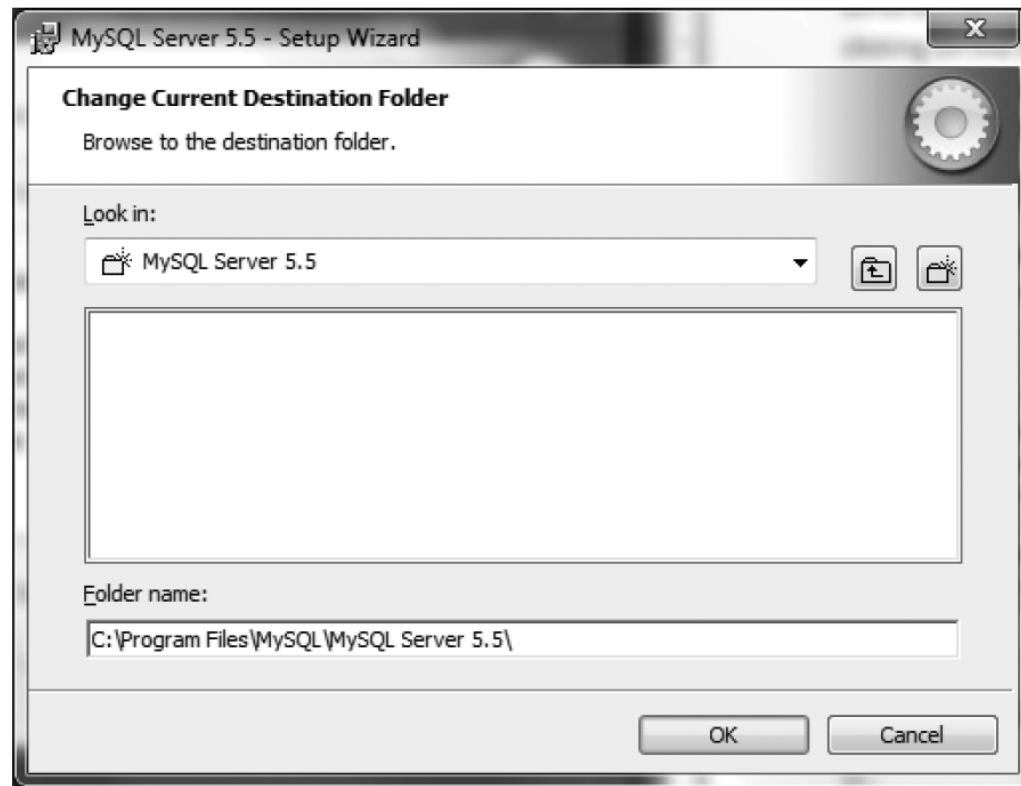


Figure 3-8 Change current destination folder  
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# Installation Instructions (cont'd.)

12. Click Next on the Setup Wizard
  - Advances to the verification screen
13. Click Install to begin the installation

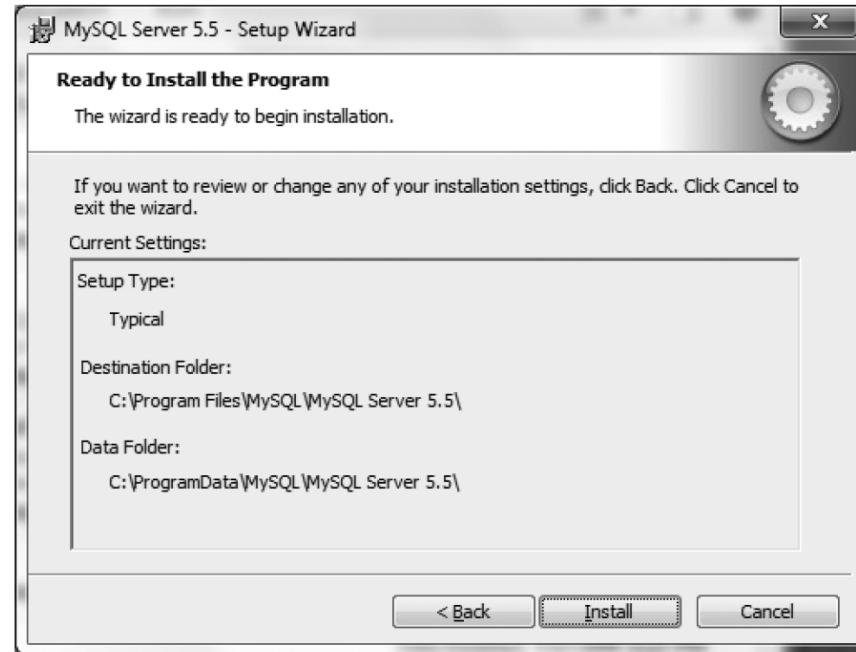


Figure 3-9 Ready to install  
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# Installing on UNIX

- Several different variations of UNIX-based server package formats
  - Instructions are essentially the same
  - Binary distribution should be used if possible
- Next section provides instructions for installing binary packages for UNIX-based systems



# Installing UNIX Binary Distributions

- MySQL downloads are often combined into platform-based formats
  - Especially true for UNIX-based operating systems
  - <http://dev.mysql.com/downloads/mysql/>



# Installing Linux Binary Distributions Using RPM (Red Hat Linux)

- MySQL using RPM packaging
  - Fast and simple way to install MySQL on a UNIX-based machine
  - Suggested for installing MySQL on Linux operating systems
- Two categories of RPM packages
  - Platform specific
  - Non-platform specific



# Installing Linux Binary Distributions Using YUM Repository

- MySQL using YUM Repository (Red Hat Linux)
  - <http://dev.mysql.com/doc/mysql-yum-repo-quick-guide/en/>
  - **Adding the MySQL Yum Repository**
    - Go to the download page for MySQL Yum repository at <http://dev.mysql.com/downloads/repo/yum/>.
    - Select and download the release package for your platform.
    - Install the downloaded release package with the following command, replacing *platform-and-version-specific-package-name* with the name of the downloaded package:
    - Shell> wget http://dev.mysql.com/get/mysql-community-release-el6-5.noarch.rpm
    - shell> sudo rpm -Uvh mysql-community-release-el6-5.noarch.rpm



# Installing Linux Binary Distributions Using YUM Repository

- MySQL using YUM Repository (Red Hat Linux)
  - **Installation**
    - `shell> sudo yum install mysql-community-server`
  - **Starting/Stopping mysql service**
    - `shell> sudo service mysqld status`
    - `Shell> sudo service mysqld start`
    - `Shell> sudo service mysqld stop`
  - **Securing mysql installation**
    - `Shell> mysql_secure_installation`



# Installing Linux Binary Distributions Using YUM Repository

- MySQL using YUM Repository (Red Hat Linux)
  - **Access mysql**
    - shell>Mysql --user:root –password:password
    - mysql>show databases;
    - Mysql>use [a database];
    - Mysql>select user, host, password from mysql.user;
    - Mysql>exit



# Installing Linux Binary Distributions Using APT (Ubuntu)

- MySQL using APT Repository (Ubuntu)
    - **First, add the MySQL APT repository to your system's software repository list**
      - Go to the download page for the MySQL APT repository at <http://dev.mysql.com/downloads/repo/apt/>
      - Select and download the release package for your platform
      - Install the downloaded package with the following command
- ```
shell> wget http://dev.mysql.com/get/mysql-apt-config_0.3.7-1ubuntu15.04_all.deb
```
- ```
shell> sudo dpkg -i mysql-apt-config_0.3.7-1ubuntu15.04_all.deb
```

<http://dev.mysql.com/doc/mysql-apt-repo-quick-guide/en/>



# Installing Linux Binary Distributions Using APT (Ubuntu)

- MySQL using APT Repository (Ubuntu)
  - During the installation of the package, you will be asked to choose the versions of the MySQL server and other components (for example, the MySQL Workbench) that you want to install. If you are not sure which version to choose, do not change the default options selected for you. You can also choose none if you do not want a particular component to be installed. After making the choices for all components, choose Apply to finish the configuration and installation of the release package.
  - Use the following command to get the most up-to-date package information from the MySQL APT repository

```
Shell> sudo apt-get update
```



# Installing Linux Binary Distributions Using APT (Ubuntu)

## ■ Installing MySQL with APT

- Shell> sudo apt-get install mysql-server
  - Supply a password for the root user
  - Choose “No” for the installation of the test database option

## ■ Starting the MySQL Server

- Shell> sudo service mysql status
- Shell> sudo service mysql stop
- Shell> sudo service mysql start

## ■ Securing mysql installation

- Shell> mysql\_secure\_installation



# Installing Linux Binary Distributions Using APT (Ubuntu)

## ■ Access mysql

- shell>Mysql --user:root –password:password
- mysql>show databases;
- Mysql>use [a database];
- Mysql>select user, host, password from mysql.user;
- Mysql>exit



# Configuration

- MySQL must be configured after installation
- Windows configuration aspects
  - Identify server type and role
  - Allocate resources for storage engines and server
  - Identify root password and set file ownership properties
- Central configuration file used to configure MySQL on startup



# Configuring MySQL on Windows

- MySQL Server Instance Configuration Wizard
  - Creates custom configuration file (my.ini) after installation
  - Wizard prompts user to begin initial server configuration
  - Run MySQLInstanceConfig file from the installation directory under “bin” folder
- First choice: configuration types
  - Detailed configuration
  - Standard configuration



# Standard Configuration Using the Windows Configuration Wizard

1. Check Configure the MySQL Server now on confirmation window at end of MySQL installation
2. Click Finish to complete installation
3. Select Standard Configuration and click Next
4. Configuration Wizard automatically creates a service called MySQL that launches with start of machine
  - Users can change service name or disable the service from starting up with the machine
  - Check Install as Windows Service and Launch the MySQL Server automatically, click Next

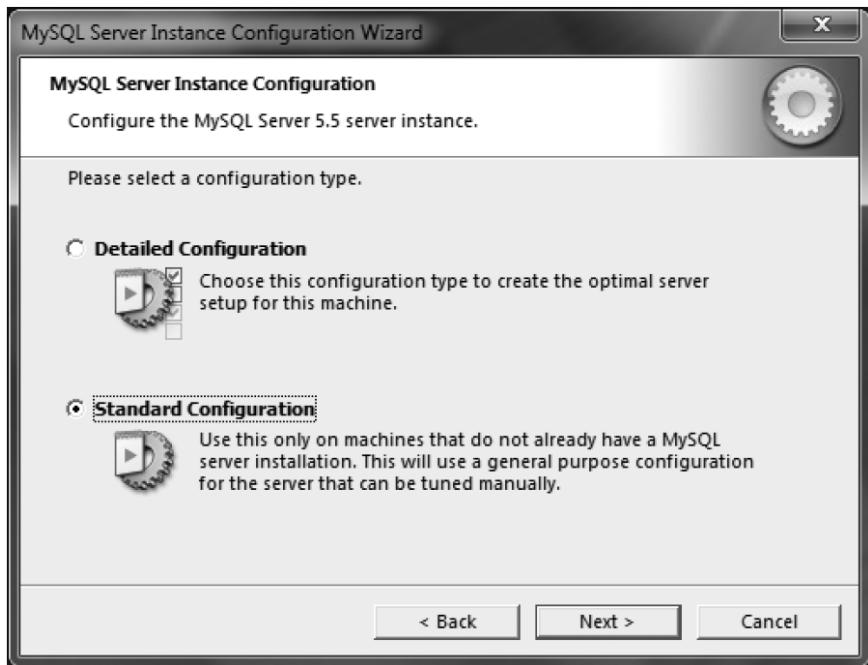


Figure 3-11 Select configuration type  
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Figure 3-12 Windows options  
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# + Standard Configuration Using the Windows Configuration Wizard (cont'd.)

5. Create user password for the root user, deny remote access, and disable anonymous accounts
  - Once security options are in place, click Next
6. Confirmation screen allows user to save options to the configuration file
7. Click Finish on the confirmation screen

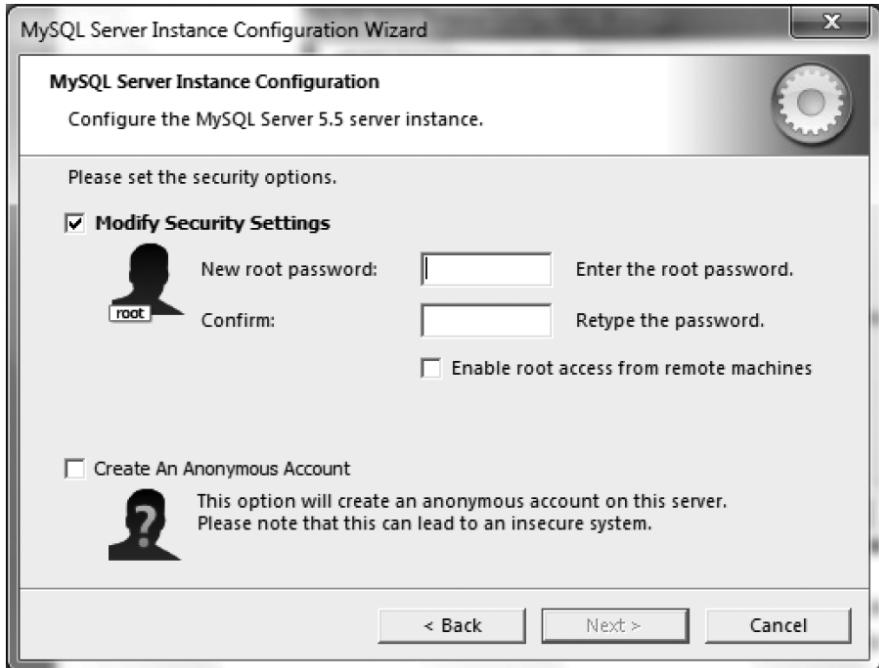


Figure 3-13 Instance configuration security options  
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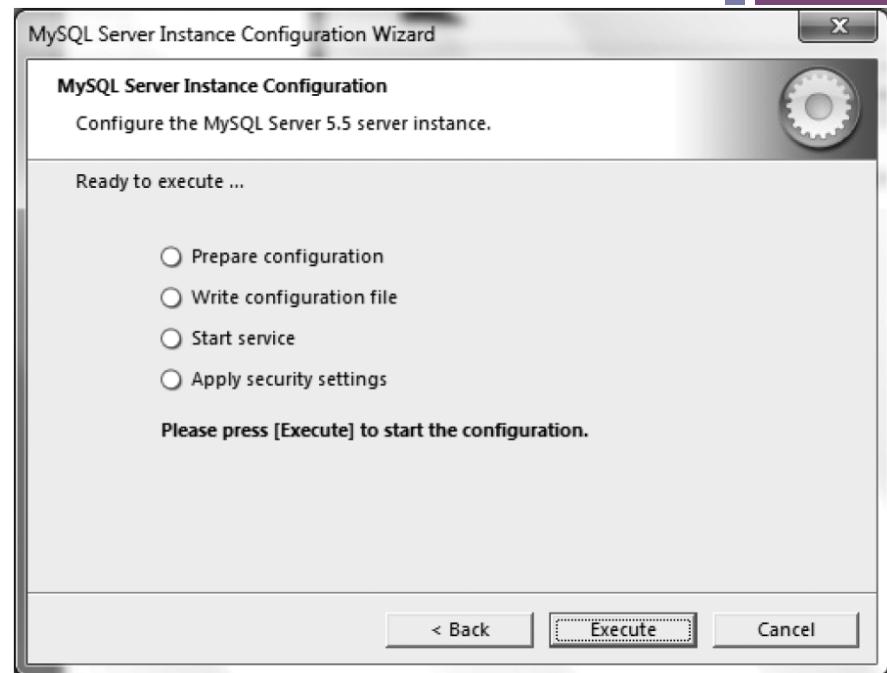


Figure 3-14 Execute instance configuration  
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# Detailed Configuration Using the Windows Configuration Wizard

1. Check Configure the MySQL Server now on the confirmation window at the end of the installation of MySQL
  - Click Finish to complete this installation
2. Select Detailed Configuration and click Next to continue
3. Choose one of three server configuration types
  - Developer, server, and dedicated
  - Choose Dedicated MySQL Server Machine and click Next

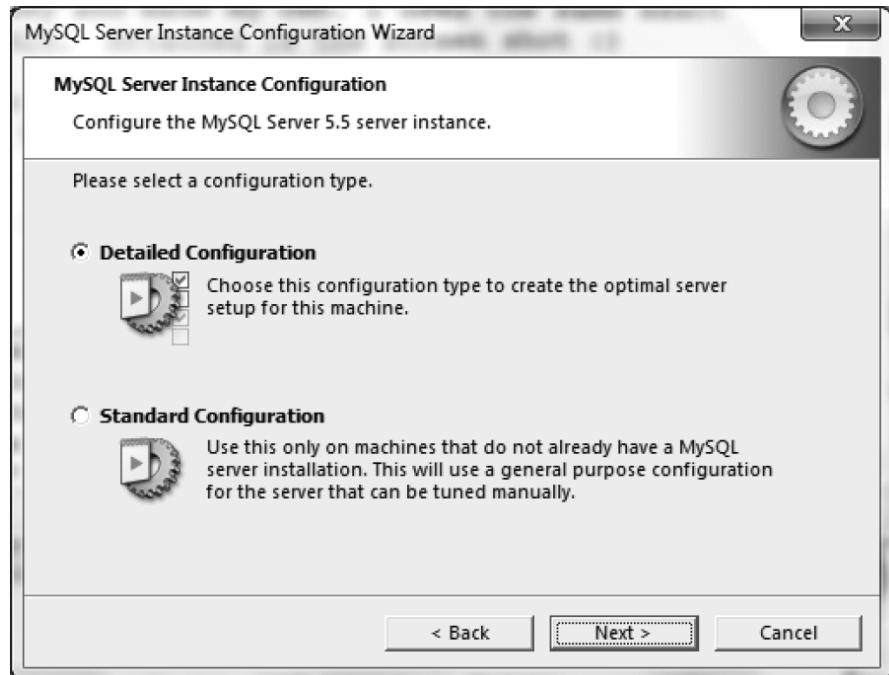


Figure 3-16 Select configuration type  
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Figure 3-17 Select server type  
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# +Detailed Configuration Using the Windows Configuration Wizard (cont'd.)

4. Choose the way the database will be used
  - Three options: multifunctional, transactional, and non-transactional
  - Select Transactional Database Only and click Next to continue
5. InnoDB tablespace information
  - Stored in a file called ibdata1
  - Screen allows user to move files to a different location
  - Leave default and click Next

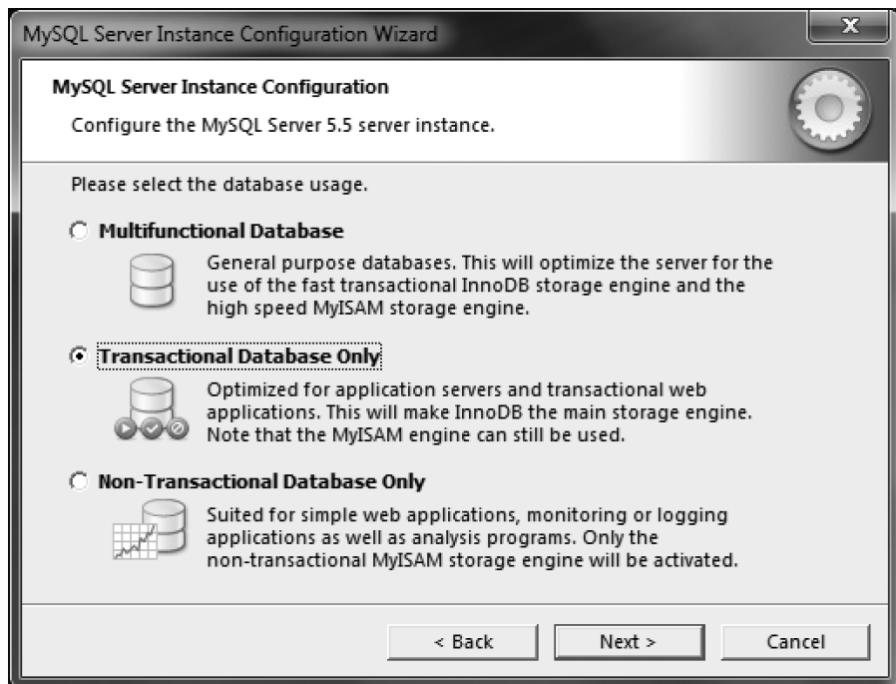


Figure 3-18 Database usage  
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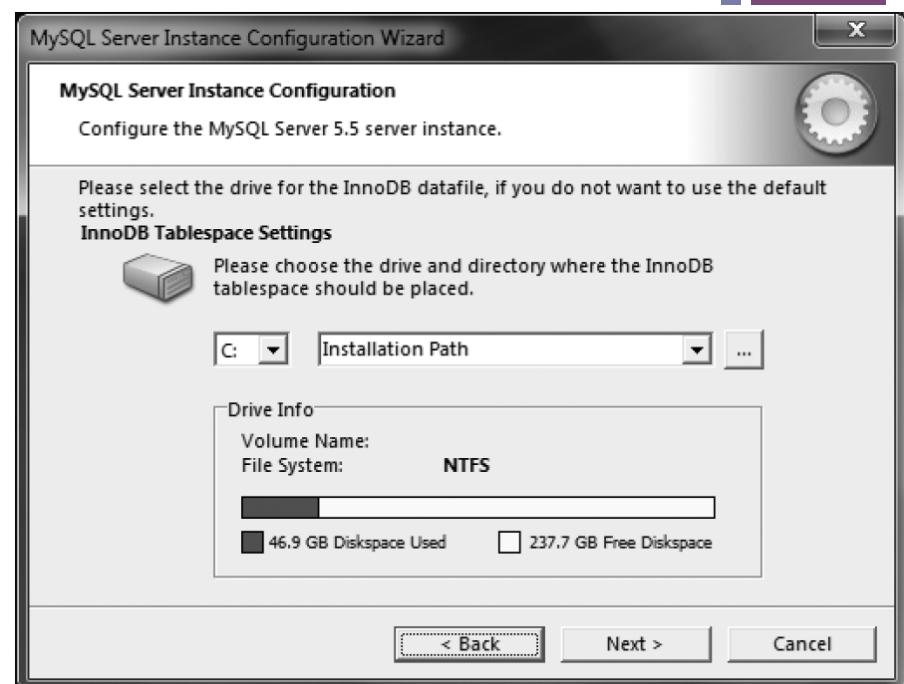


Figure 3-19 InnoDB tablespace settings  
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# +Detailed Configuration Using the Windows Configuration Wizard (cont'd.)

6. Set maximum number of concurrent connections in the msqid
  - Select Manual Setting and enter number of connections
  - Click Next
7. Change the port in which TCP/IP connects to MySQL
  - Click Strict Mode
  - Check Enable TCP/IP Networking
  - Click Next

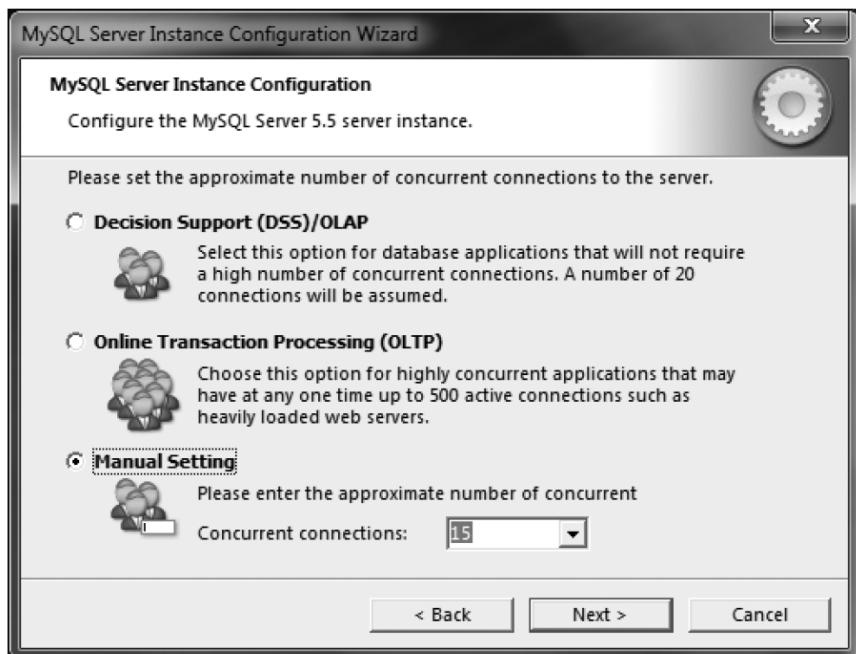


Figure 3-20 Concurrent connections  
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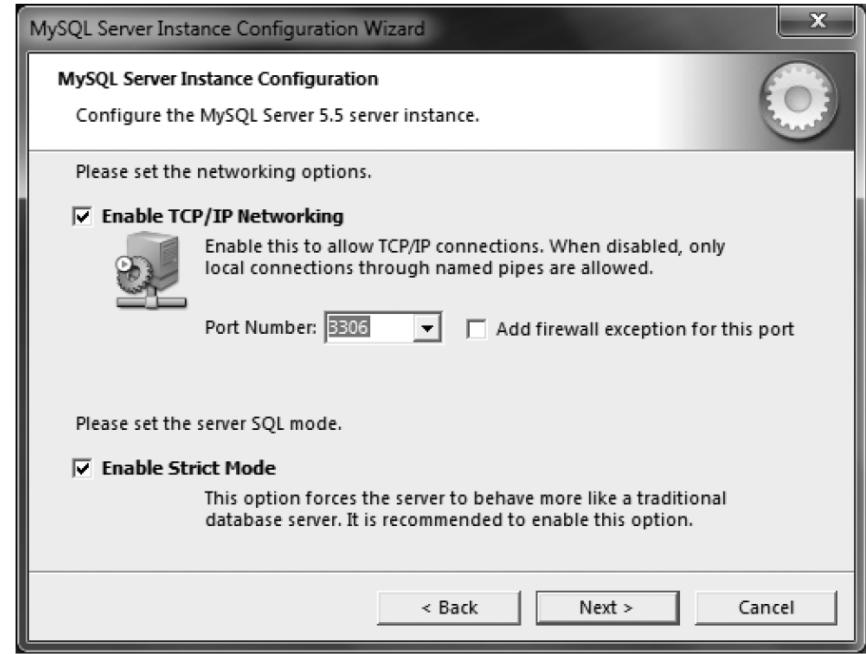


Figure 3-21 Networking options  
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# +Detailed Configuration Using the Windows Configuration Wizard (cont'd.)

8. Set default character set within MySQL
  - Determines type of characters used globally in databases and tables
  - Select Standard Character Set and click Next
9. Click Install as Windows Service and Launch MySQL Server automatically
  - Click Next
10. Put security options in place and click Next
11. Click Execute to save options to configurations
12. Click Finish

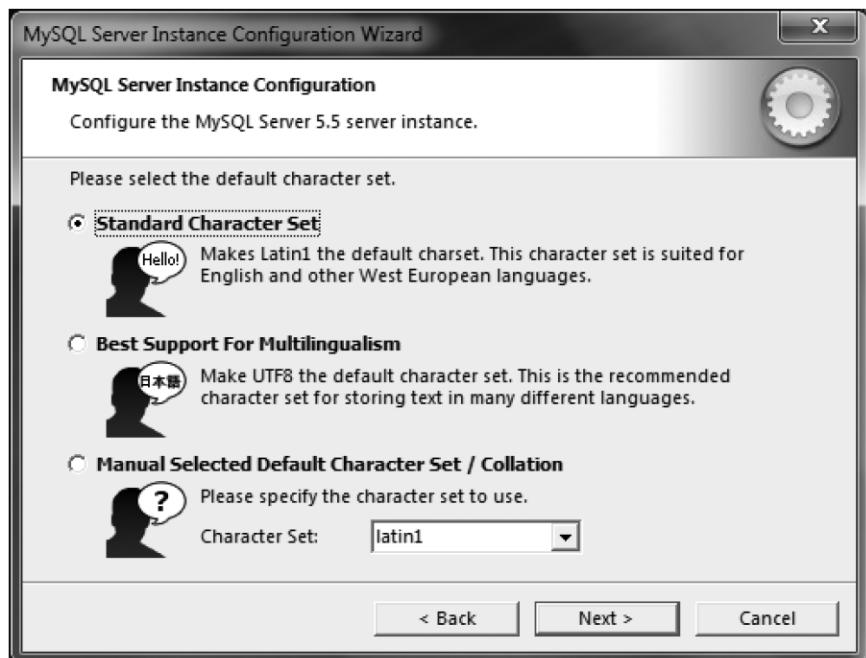


Figure 3-22 Default character set  
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Figure 3-23 Set Windows options  
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Figure 3-24 Set security options  
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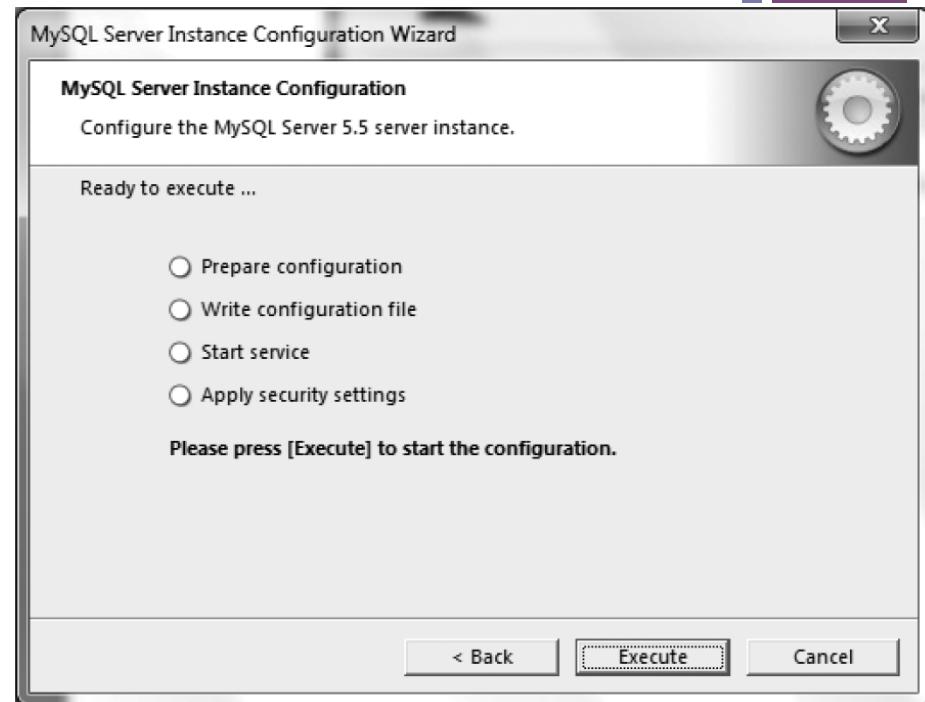


Figure 3-25 Ready to execute  
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# Configuring MySQL on UNIX

- Configuration file for UNIX-based machines
  - Named my.cnf under /etc/mysql
- Data directory and file permissions need to be created to prepare MySQL for startup



# Additional Security Suggestions

- Passwords
  - Left blank by default
  - Root passwords allow execution of every command available in MySQL
    - Should be changed and replaced with strong passwords
  - Never store passwords in plain text format
- Default root usernames can be easy to find online
  - Change usernames of root passwords to provide additional security



# Account Access and User Privileges

- Follow principle of least privileges:
  - To ensure protection of sensitive data
- Do not share root access
- Remove or disable all anonymous accounts on the system



# Network Connection Administration

- Database administrators often overlook network connections when creating security plan
- Best practices for protecting network connections
  - Disable remote access
  - Do not leave your ports wide open
  - Use IP addresses to restrict access to the database
  - Encrypt your connection to the server using SSH or SSL



# Summary

- Prior to installing MySQL, administrator must select distribution format, version, and edition of MySQL
- There are two different ways to install MySQL:
  - Using its prepackaged binary files
  - Installing and compiling the source code manually
- Help with MySQL comes in many different forms
  - MySQL's Web site
  - Forums, bloggers, Twitter, mailing lists
- Different versions of MySQL are available at different stages of its development



# Summary (cont'd.)

- Windows installation packages use wizards to install and configure MySQL
- UNIX-based servers offer several different platform-dependent installation packages
- MySQL can configure a machine to be either a developer machine, a server machine, or a dedicated MySQL server machine
- Database administrators should use best practices when protecting network connections