SM note 3:

Contents: This file has the following topic(s)/section(s)

I have installed Ubuntu Linux OS (Operating System) on windows computer as a dual boot --- both windows OS and Ubuntu OS can be loaded at start. Such installations of Linux are much more powerful for computation over virtual machine. I used Ubuntu Release 20.04. Typing command 'lsb_release -a' on Terminal displays this information. *Please, note that a) text after '#' is for human not computer, b) text I greyed out is the command that needs to be typed on or copied to Terminal or other as the case maybe and c) after typing or copying the command hit Return/Enter key for it to execute.*

lsb_release -a #Displays version of Ubuntu d) Clicking on Terminal window and pressing Ctrl+C or Cmd+C ends any code running on Terminal. e) # Ref is used as abbreviation for word Reference

What is MySQL? What do we use it for?

Ref: https://www.hostinger.com/tutorials/what-is-mysql

Data such as tables stored in a database and organized by linking them based on 'relations' or features common between the tables, is called 'relational database'. Now for the computer i.e. 'client', to access, compute, modify and add to this data i.e. 'query' on the web/cloud/server aka 'host' that has the database, we use a programming language called SQL (Standard Query Language) and its run in MySQL database management program. We can also store data locally on computer hard drive aka 'local host' as database and pretend its 'server', then we can also access this locally stored data using MySQL. MySQL is only one of many different database management systems specifically designed for relational databases, other such programs being Microsoft Access, SQL Server etc. SQL is a programming language, while MySQL like IDEs, makes coding and getting results in from the database being queried easy ---this is just for understanding the difference between SQL and MySQL, technically MySQL Workbench is the IDE.

MySQL allows the computer to obtain information from a database using SQL language. MySQL also integrates well with other languages such as Python i.e. MySQL can be accessed from within Python script with Python libraries Ref: https://www.askpython.com/python-modules/python-mysql-tutorial, so that users can crosstalk with database while doing coding project in Python.

MySQL is most popular relational database management system for SQL and relational databases. The three major database types are described below:

1. Relational Database: In this type of database, data is stored in the form of relations between tables (rows and columns). Relational databases have "primary keys" in a column that are unique to every row of a table, while "foreign keys" in a column are used to connect tables ---what is primary key for one table, can be foreign key for another table thus establishing a relation between tables. Foreign keys and primary keys are used to create SQL query statements (codes) to retrieve desired data and even calculations with the data. MySQL is one of the most popular Relational

Database Management Systems (RDMS) enabling users to send SQL query to the database, retrieve response and edit (add, modify and delete) data tables on the database. *Example*: MySQL databases are widely used in social media platforms and website blogs such as WordPress Ref:https://en.wikipedia.org/wiki/MySQL. *Positive*: It's the simplest form of database model, where data in form of tables are linked by common column(s) called "foreign keys". Especially, useful for storing structured data (e.g. text and numbers organized in different cells of table). *Negative*: As more data gets added, relations between tables become entangled and hard to find, slowing down response to query.

2. NoSQL Database: In this type of database, different types of data relations are stored in ways other than relations between tables used in relational databases. NoSQL Databases store information in the form of Key-value (key is unique using which we can retrieve some values), Document (nested key-value pairs), Columnar (in relational databases data is stored by row, while in columnar databases data is stored by column so can quickly retrieve data by column) and Graph (nodes-edges). MongoDB is a type of NoSQL Document type database. *Example*: MongoDB databases is useful for building mobile apps. "Walking Tour" mobile app, uses MongoDB to guide tourists Ref:https://www.mongodb.com/presentations/mobile-1-mobile-apps-with-mongodb. *Positive*: Allows data to be stored in form of different complex relations. Can quickly store both structured and unstructured (e.g. text and numbers mixed in same cell of table) data quickly. *Negative*: The query language for NoSQL databases vary so there is no standardization. It should be noted, NoSQL is sometimes called "not only SQL" to signify that based on data organization SQL queries are possible.
3. Object Database: In this type of database, data is stored as objects and "object-oriented programing" is performed on these objects. Different sets of computational operations i.e. functions/methods are available for each object type so its called "object-oriented programing". "Pointers" are used to establish relations between objects, serving the role of "keys" used in the other two types of databases described here. *Example*: There are not many real life popular applications of object databases as most developers use relational databases. *Positive*: This time of database is a great fit for object-oriented-programing. Thus its especially useful when the data is going to be used extensively for computational analysis, and not just simple math. *Negative*: This database type is not widely used and developed, when compared to the other two types of databases described here.

When it comes to databases and their management, my favourite is a combination of Node.JS and MongoDB. Node.JS can also interact with MySQL. However, Node.JS and MongoDB combination, though relatively new has a lot of promise cause it allows developers to use same programming language JavaScript for both front-end and back-end of development aka 'holy grail' for web developer ---this discussion is for another day and beyond the scope of this MySQL discussion.

Additional References:
Ref: Types of Databases: Written: https://phoenixnap.com/kb/database-types
Ref: Databases: Written: https://phoenixnap.com/kb/what-is-a-database
Ref: Types of Databases: Written: https://www.educba.com/types-of-dbms/
Ref: Full Stack Web Development: Written and Video: https://www.udemy.com/course/the-full-stack-web-development/

Ref: MongoDB and Node.JS: Written and Video:
https://university.mongodb.com/courses/M220JS/about

Do we need a MySQL IDE?
Ref: https://codingsight.com/10-best-mysql-gui-tools/

There are several IDEs for MySQL but I prefer 'MySQL workbench' as its made by the same folks who made MySQL and it works across all the Operating Systems, namely Ubuntu Linux OS, Windows OS and Mac OS. IDEs provide support by making suggestions while coding before executing code and have rich visual display, where codes and results are displayed on separate sections of the IDE window (Also see discussion about IDE and Text Editors in file "2.2_Install_Atom_Its_More_Than_Just_Text_Editor_9-19-21done.pdf"). This visual display is especially useful to visualize the different tables present in the database and figure out how to connect, rather what relations exist between the tables. The relations between tables in a database is called "schema", while the database itself that has relations between tables is called "relational database".

Here are the details of MySQL (language), SQL (Atom's package) and MySQL Workbench (IDE) installation

2.3.1 Install Language: MySQL on Ubuntu (linux OS), Windows OS or Apple Mac OS laptop/computer.

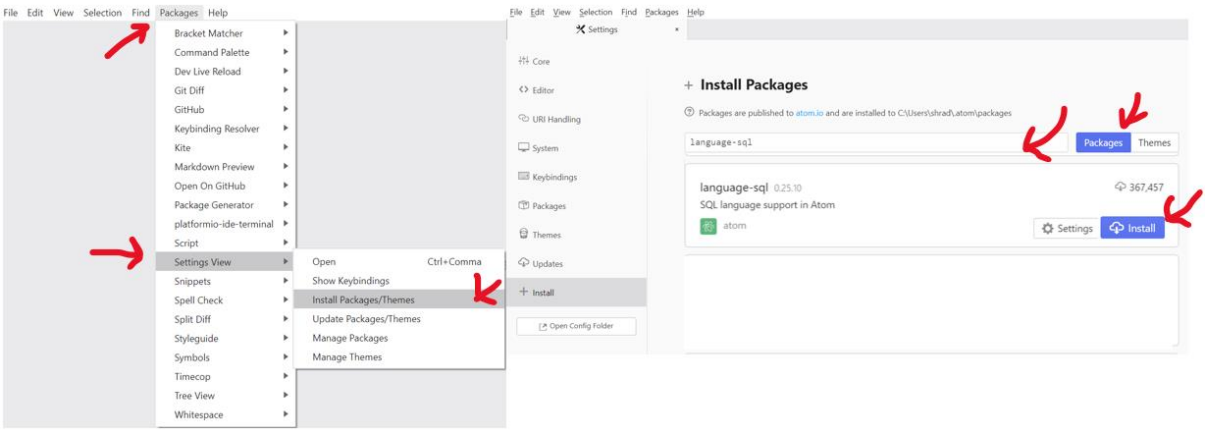
1. Install MySQL relational database management system On Ubuntu (linux OS), Windows OS or Apple Mac OS laptop/computer
2. Getting Started Tutorial(s) free Ref Written: https://www.digitalocean.com/community/tutorials/a-basic-mysql-tutorial and Video: http://www.newthinktank.com/2014/08/mysql-video-tutorial/
3. Install MySQL on Linux/Ubuntu: Video: https://youtu.be/3qD6zv7thdE
4. Install MySQL on Linux/Ubuntu: Written: https://readerstacks.com/how-to-install-mysql-in-ubuntu/
5. Install MySQL on Mac: Written https://www.imymac.com/mac-tips/install-mysql-mac.html and Written: https://www.thoughtco.com/installing-mysql-on-mac-2693866
6. Install MySQL on Windows: Written: https://www.educba.com/install-mysql/
7. Type following commands on Ubuntu Terminal to install MySQL
   ```
   sudo apt-get update
   sudo apt-get upgrade
   sudo apt-get install mysql-server
   #answer questions https://readerstacks.com/how-to-install-mysql-in-ubuntu/
   sudo mysql_secure_installation

   #check if connection is made
   sudo service mysql status
   #stop service as follows when done
   sudo service mysql stop
   #start service again when needed
   sudo service mysql start
   ```
8. To launch MySQL for use, type in Terminal command below
   ```
   mysql
   ```

#use as root user or own username
mysql -u root -p
#Alternatively, login using 'sudo' as root user or own username
sudo mysql -u root -p

9. To close MySQL, type in Terminal quit/exit

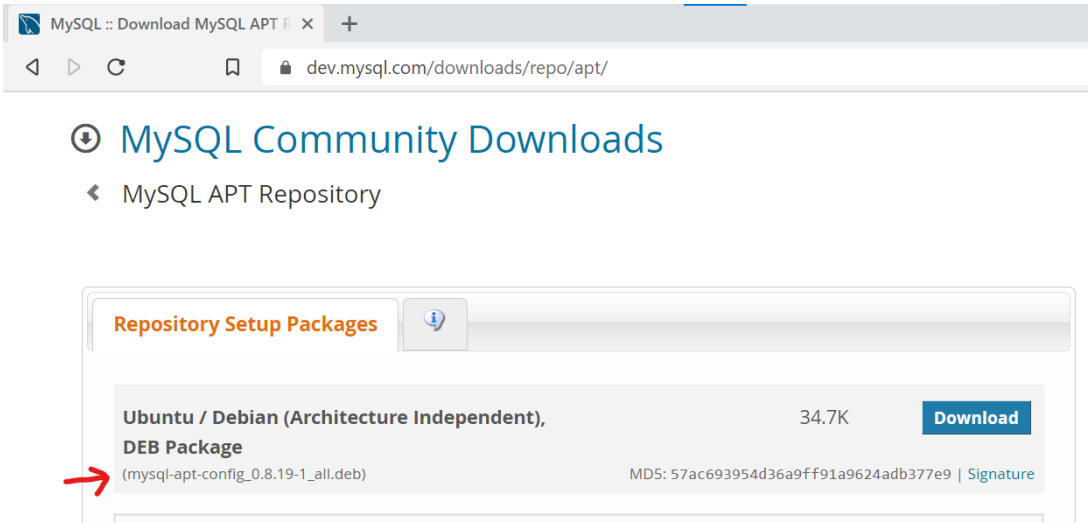
2.3.2 Install Package on Atom: SQL on Atom in Ubuntu (linux OS), Windows OS or Apple Mac OS laptop/computer.

1. SQL File Extention Ref: https://fileinfo.com/extension/sql
2. For SQL language on Atom install "language-sql" package https://atom.io/packages/language-sql from withing Atom using >Packages > Settings View > Install Packages/Themes > search package name "language-sql" > click install. This adds syntax highlighting i.e. color codes different pasrts of the code, and adds syntax understanding to Atom so that when we execute sql codes in Atom Atom points out mistakes if any in syntax.
3. From file extension atom automatically knows what language we are coding in for SQL language its .sql extension.

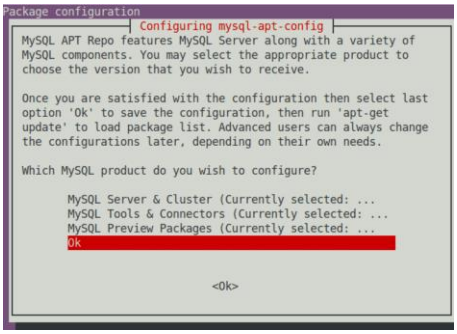


2.3.3 Install IDE: MySQL Workbench on Ubuntu (linux OS), Windows OS or Apple Mac OS laptop/computer.

1. Install MySQL Workbench on Ubuntu: Written: https://dev.mysql.com/doc/workbench/en/wb-installing-linux.html and Written: https://linuxhint.com/installing_mysql_workbench_ubuntu/
2. Install MySQL Workbench on Ubuntu: Video: https://youtu.be/2QbJlyawfuM
3. Install MySQL Workbench on Mac: Written: https://dev.mysql.com/doc/workbench/en/wb-installing-mac.html
4. Install MySQL Workbench on Mac: Video: https://youtu.be/WjpV6X9wvF4
5. Install MySQL Workbench on Windows: Written: https://dev.mysql.com/doc/workbench/en/wb-installing-windows.html
6. Install MySQL Workbench on Windows: Video: https://youtu.be/u96rVINbAUI
7. Obtain the filename of the latest version of mysql-apt-config file from https://dev.mysql.com/downloads/repo/apt/ to put after the wget (wget is a commandline method to quickly download some file without accessing browser and clicking) and sudo apt install command below.



8. Type following commands on Ubuntu Terminal to install MySQL Workbench, change version .deb file name if needed as described in point above. When pop-up window "Configure mysql-apt-config" opens asking about what version to install leave as default option hit enter to ok,
   wget https://dev.mysql.com/get/mysql-apt-config_0.8.19-1_all.deb
   sudo apt install ./mysql-apt-config_0.8.19-1_all.deb
   sudo apt-get update
   sudo apt-get install mysql-workbench-community
   #if above does not work then type next line to install with snap
   snap install mysql-workbench-community



9. To launch MySQL Workbench type on Terminal or launch it from the Ubuntu Applications menu, create Dock/Desktop shortcut.
   mysql-workbench-community
10. Note, normally to uninstall packages installed by 'apt-get' we use 'apt-get remove', likewise to uninstall packages installed by 'snap' we use 'snap remove' command.
    sudo apt-get remove mysql-workbench-community
    sudo snap remove mysql-workbench-community

2.3.4 (Optional) Learning typing SQL commands, MySQL and MySQL Workbench.

MySQL and SQL: Video: http://www.newthinktank.com/2014/08/mysql-video-tutorial/
MySQL and SQL: Video: https://youtu.be/p3qvj9hO_Bo
MySQL Workbench: Video: https://youtu.be/X_umYKqKaF0
MySQL Workbench: Video: https://youtu.be/chezeWdTHbo

end of SM note 3