Introduction to Databases

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Foreword

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- Focus on the database, designs, interactions
- You may encounter databases in different ways
  - Backend, API's, Admin, Cloud, consulting
- If you are serious, then PRACTICE!
  - Employers want experience more than degrees
  - We will practice a variety of skills from software to live presentations
- Do your OWN WORK
  - Give results, not excuses

Software to set up

- XAMPP – control panel for Windows
  - Enables various servers like SQL and Apache
  - Can then use an SQL interface like Heidi or a browser
- Linux – usually has MariaDB built-in
  - Install as a VM or on dedicated hardware
  - Vmware is a little easier, can set up Kali in the process
  - Ubuntu requires a simple one-step installation
- SQL Server for Windows Server? Requires Azure subscription, so the above are the top 2 choices

MariaDB on Linux

- Pre-Installed on Kali Linux
- Can install on Ubuntu with:

  https://phoenixnap.com/kb/install-mysql-ubuntu-20-04

  (5 easy steps)

Check if pre-installed on later versions or other systems by typing:

```
mysql --version
```

Before we begin…Self-check

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- What do you imagine when you think of a software developer?
- What jobs would this class prepare you to do?
- What benefits does this class have over self-study?
- Can you be successful?

- Keep these ideas in mind throughout the course

Data

What is the Value of Data?

Data

- Describes real-world systems
- Characteristics of data
  - Scope – range of values
  - Format – commas, decimal
  - Access – who can get it
  - Type – numbers, letters
- Analog vs. digital – analog is ‘real world’, digital is on/off
- Qualitative, Quantitative – descriptive vs numerical
- https://www.youtube.com/watch?v=-S2EiPD4-W0

Discuss

Data vs. Information

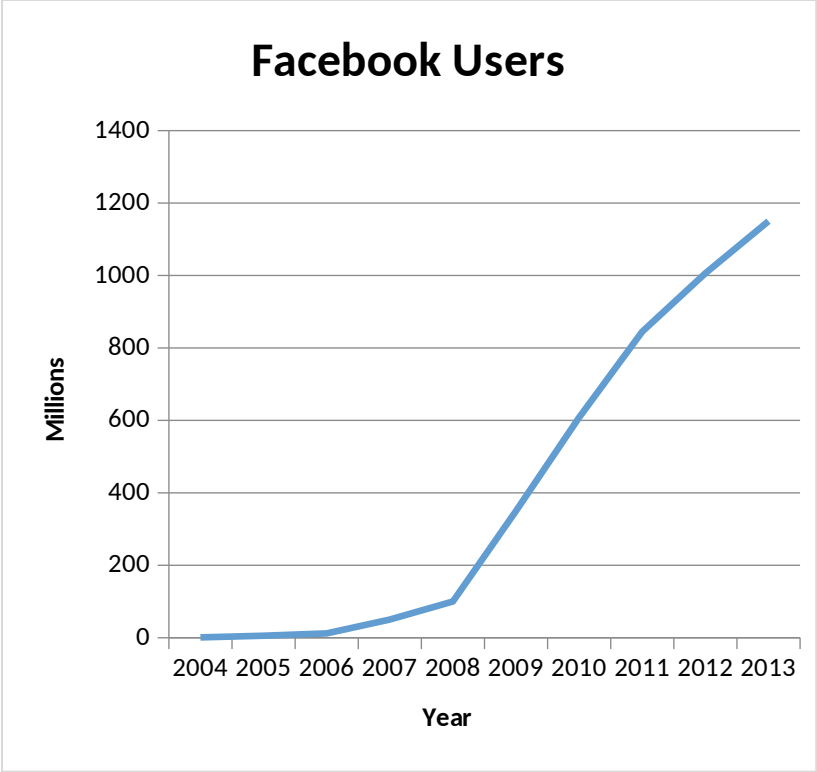
- Data
  - Raw facts
  - No context
  - Just numbers and/or text
- Information
  - Processed data
  - Has context
  - Value added to data
    - Summarized
    - Organized
    - Analyzed

Data vs. Information

Data

Data
1 5.5
12
50
100
350
608
845
1006
1150

Information



Information

- Why is information important?
  - Leads to knowledge
  - Fuels decision making
- Challenge – How do we organize data so that information can be produced?

Databases

- A **database** is a collection of data in a structured format.
- Output of a Database management system (DBMS)
- Interacts via Query language
- Often a Database application program is the interface

DBMS Requirements

- Performance - reasonably fast response
- Authorization - controls who has data access
- Security - protection of sensitive data
- Rules - predictable behavior
- Recovery - can be restored from a backup or serious fault

Examples of DBMS

- Microsoft Access
- MySQL
- Oracle
- Microsoft SQL Server
- Postgres
- SQLite
- MongoDB

DBMS Architecture

Query processor

Storage manager

Transaction manager

Logs

Data Dictionary

Query Languages

A **query** is a command for a database

A **query language** is a computer programming language for writing database queries.

SQL

- Structured Query Language contains commands to
  - Insert, update, retrieve and delete data
  - Create, modify and delete databases

Transactions

- A **transaction** is a group of queries that must be either completed or rejected as a whole.
- Manage concurrency
- DBMS must
  - Insure that transactions are processed completely or not at all
  - Prevent conflict between concurrent transactions
  - Ensure transactions are never lost
- DBMSs that do this are said to provide ACID guarantees (Atomicity, Consistency, Isolation, Durability)

https://www.mongodb.com/basics/acid-transactions

Questions?

SUMMARY

- MariaDB for Linux, XAMPP for others
- Data vs Information
- Files vs Database
- DBMS, Query Languages
- Transactions