What is a database?

What is a Database (DB)?

- Any collection of related information
  - Phone Book
  - Shopping list
  - Todo list
  - Your 5 best friends
  - Facebook’s User Base
- Databases can be stored in different ways
  - On paper
  - In your mind
  - On a computer
  - This powerpoint
  - Comments Section

Computers + Databases = <3

Amazon.com

- Keeps track of Products, Reviews, Purchase Orders, Credit Cards, Users, Media, etc
- Trillions of pieces of information need to be stored and readily available
- Information is extremely valuable and critical to Amazon.com's functioning
- Security is essential, Amazon stores peoples personal information
  - Credit card #, SSN, Address, phone
- Information is stored on a computer

vs

Shopping List

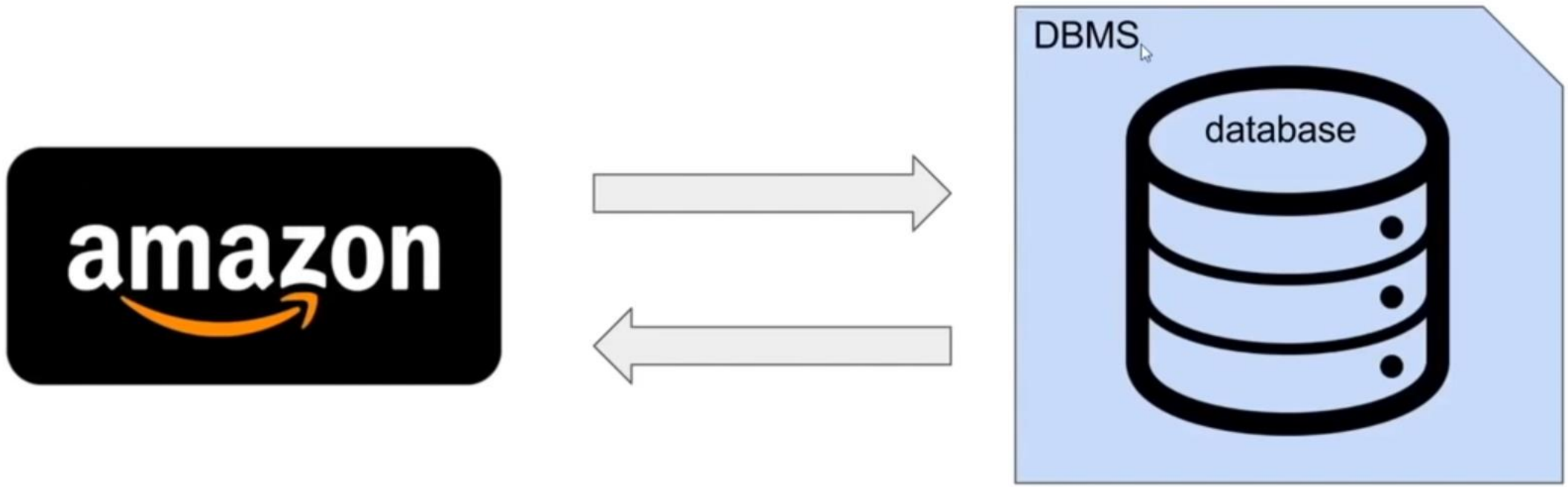
- Keeps track of consumer products that need to be purchased
- 10-20 pieces of information need to be stored and readily available
- Information is for convenience sake only and not necessary for shopping
- Security is not important
- Information is stored on a piece of paper, or even just in someone's memory

Computers are great at keeping track of large amounts of information

Database Management Systems (DBMS)

- A special software program that helps users create and maintain a database
  - Makes it easy to manage large amounts of information
  - Handles Security
  - Backups
  - Importing/exporting data
  - Concurrency
  - Interacts with software applications
    - Programming Languages

Amazon.com Database Diagram



Amazon.com will interact with the DBMS in order to create, read, update and delete information

C.R.U.D

Create Read Update Delete

Two Types of Databases

Relational Databases (SQL)

- Organize data into one or more tables
  - Each table has columns and rows
  - A unique key identifies each row

Non-Relational (noSQL / not just SQL)

- Organize data is anything but a traditional table
  - Key-value stores
  - Documents (JSON, XML, etc)
  - Graphs
  - Flexible Tables

Relational Databases (SQL)

Student Table

*ID #	Name	Major
1	Jack	Biology
2	Kate	Sociology
3	Claire	English
4	John	Chemistry

Users Table

*Username	Password	Email
jsmith22	wordpass	...
catlover45	apple223	...
gamerkid	...	...
giraffe	...	...

Relational Databases (SQL)

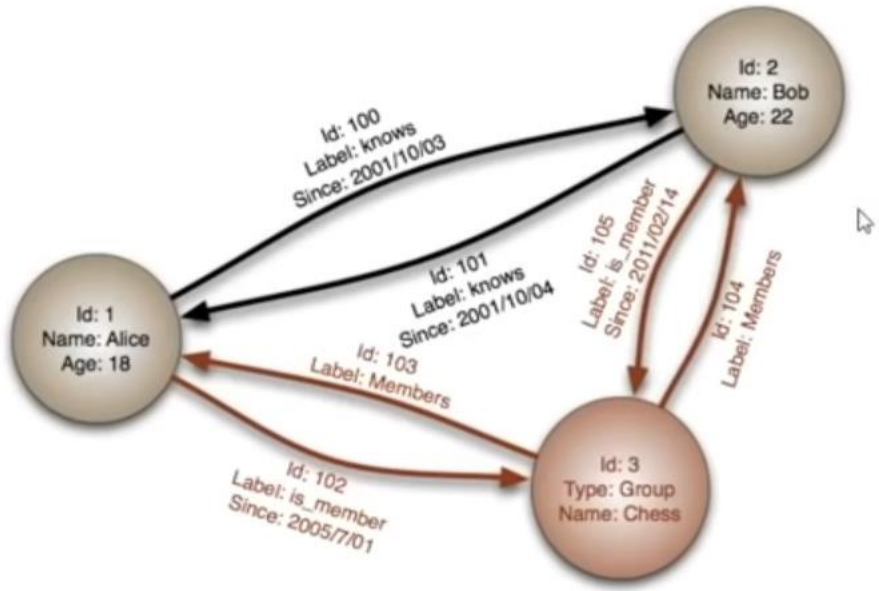
- Relational Database Management Systems (RDBMS)
  - Help users create and maintain a relational database
    - mySQL, Oracle, postgreSQL, mariaDB, etc.
- Structured Query Language (SQL)
  - Standardized language for interacting with RDBMS
  - Used to to perform C.R.U.D operations, as well as other administrative tasks (user management, security, backup, etc).
  - Used to define tables and structures
  - SQL code used on one RDBMS is not always portable to another without modification.

Non-Relational Databases (noSQL / not just SQL)

```
[{
     "_id": 1345,
     "name": "Jack",
     "major": "Biology"
}, {
     "_id": 2267,
     "name": "Kate",
     "major": "Sociology"
}, {
     "_id": 2453,
     "name": "Claire",
     "major": "English"
}, {
     "_id": 1957,
     "name": "John",
     "major": "Chemistry"
}]
```

Document

(JSON, BLOB, XML, etc..)



Graph

Relational nodes

Key	Value
“xyz”	*string*
“abc”	*JSON*
“pqr”	*BLOB*
“lmno”	*etc...*

Key-Value Hash

Keys are mapped to values (strings, json, blob, etc..)

Non-Relational Databases (noSQL / not just SQL)

- Non-Relational Database Management Systems (NRDBMS)
  - Help users create and maintain a non-relational database
    - mongoDB, dynamoDB, apache cassandra, firebase, etc

- Implementation Specific
  - Any non-relational database falls under this category, so there's no set language standard.
  - Most NRDBMS will implement their own language for performing C.R.U.D and administrative operations on the database.

Database Queries

Queries are requests made to the database management system for specific information

As the database's structure become more and more complex, it becomes more difficult to get the specific pieces of information we want.

A google search is a query

Wrap Up

- Database is any collection of related information
- Computer are great for storing databases
- Database Management Systems (DBMS) make it easy to create, maintain and secure a database.
- DBMS allow you to perform the C.R.U.D operations and other administrative tasks
- Two types of Databases, Relational & Non-Relational
- Relational databases use SQL and store data in tables with rows and columns
- Non-Relational data store data using other data structures