Introduction to Database Systems

CSC365
Spring 2019

What is a database?

A collection of information (data) that exists over a period of time.

Managed by software called Database Management System (DBMS)

Database Management System

Supports

- Creation of databases and logical structure of the data (schemas)
- Querying and modifying data
- Storing large amount of data over a long period of time
- Durability & Fault tolerance - Recovery of the database
- Control of access to data from many users at once (concurrency)

Examples of DBMS

Do you know any?

How would you organize information?

Would you organize your address book as a graph or a table?

Relational Database Systems

- Conceived by Tedd Codd in 1970s.
- Presents a view of data organized as tables called relations.
- Provides an access using a language called SQL.

An example

Name	Phone	Email
Jon Snow	805-123-4567	jsnow@calpoly.edu
		jsnow@gmail.com
Arya Stark	805-111-1234	astark@calpoly.edu
Tyrion Lannister	805-222-3344	tyrion@calpoly.edu
	203-111-2222	tlannister@gmail.com

Normalized Relations (Tables)

pid	name
1	Jon Snow
2	Arya Stark
3	Tyrion Lannister

key

pid	number
1	805-123-4567
2	805-111-1234
3	805-222-3344
3	203-111-2222

Foreign Key

pid	address
1	jsnow@calpoly.edu
1	jsnow@gmail.com
2	astark@calpoly.edu
3	tyrion@calpoly.edu
3	tlannister@gmail.com

Foreign Key
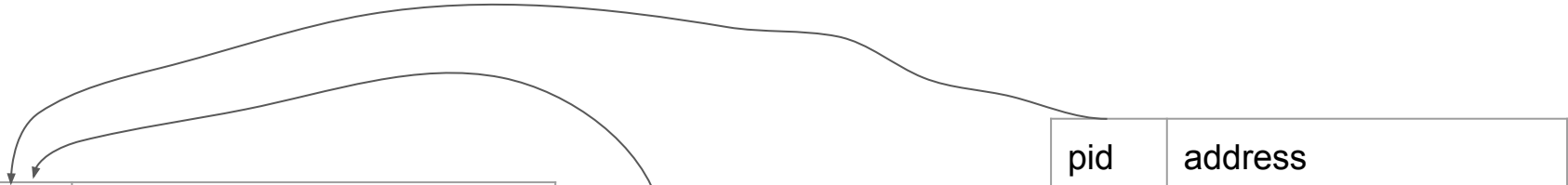
Querying

Person

pid	name
1	Jon Snow
2	Arya Stark
3	Tyrion Lannister

- select pid, name from Person;
  - Returns everything in the table
- select name from Person where pid = 1;
  - Returns "Jon Snow"
- select pid from Person where name = 'Arya Stark';
  - Returns 2

Querying

Phone

pid	number
1	805-123-4567
2	805-111-1234
3	805-222-3344
3	203-111-2222

- select pid, number from Phone;
  - Returns everything in the table
- select number from Phone where pid = 1;
  - Returns "805-123-4567"
- select number from Phone where pid = 3;
  - Returns "805-222-3344" and "203-111-2222"

Querying

Email

pid	address
1	jsnow@calpoly.edu
1	jsnow@gmail.com
2	astark@calpoly.edu
3	tyrion@calpoly.edu
3	tlannister@gmail.com

- select pid, address from Email;
  - Returns everything in the table
- select address from Email where pid = 1;
  - Returns "jsnow@calpoly.edu" and "jsnow@gmail.com"
- select pid from Email where address = 'astark@calpoly.edu';
  - Returns 2

SELECT Person.pid, Person.name, Phone.number, Email.address FROM Person JOIN Phone ON Phone.pid = Person.pid JOIN Email ON Email.pid = Person.pid;

pid	name
1	Jon Snow
2	Arya Stark
3	Tyrion Lannister

pid	number
1	805-123-4567
2	805-111-1234
3	805-222-3344
3	203-111-2222

pid	address
1	jsnow@calpoly.edu
1	jsnow@gmail.com
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3	tyrion@calpoly.edu
3	tlannister@gmail.com

pid	name	number	address
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3	Tyrion Lannister	203-111-2222	tlannister@gmail.com

Lab 1 Entities

Customer

id	ssn	name	address	phone number
1	123456789	Bob Smith	1 Grand Ave.	8051234567
2	...	...	...	...

CreditCard

number	type	limit	balance	active
1	Visa	1000	500	1
2	...	...	...	...

Ownership

c_id	c_number	current
1	1	1
2	...	...

Lab 1 Entities

Vendor

id	name	address
1	Campus Bookstore	1 Grand Ave.
2	...	...

Transaction

c_id	c_number	v_id	amount	date
1	1	1	654.23	04/01/19
2	...	...	...	...

Payment

c_id	c_number	amount	date
1	1	500	04/02/19
2	...	...	