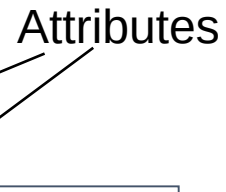
Relational Database

Install SQL Server on Windows

Relational Model

- Example of tabular data in the relational model



Customer-id	*customer-name*	*customer-street*	*customer-city*	*account-number*
192-83-7465	Johnson	Alma	Palo Alto	A-101
019-28-3746	Smith	North	Rye	A-215
192-83-7465	Johnson	Alma	Palo Alto	A-201
321-12-3123	Jones	Main	Harrison	A-217
019-28-3746	Smith	North	Rye	A-201

A Sample Relational Database

customer-id	*customer-name*	*customer-street*	*customer-city*
192-83-7465	Johnson	12 Alma St.	Palo Alto
019-28-3746	Smith	4 North St.	Rye
677-89-9011	Hayes	3 Main St.	Harrison
182-73-6091	Turner	123 Putnam Ave.	Stamford
321-12-3123	Jones	100 Main St.	Harrison
336-66-9999	Lindsay	175 Park Ave.	Pittsfield
019-28-3746	Smith	72 North St.	Rye

(a) The *customer* table

account-number	*balance*
A-101	500
A-215	700
A-102	400
A-305	350
A-201	900
A-217	750
A-222	700

(b) The *account* table

customer-id	*account-number*
192-83-7465	A-101
192-83-7465	A-201
019-28-3746	A-215
677-89-9011	A-102
182-73-6091	A-305
321-12-3123	A-217
336-66-9999	A-222
019-28-3746	A-201

(c) The *depositor* table

Create Table Construct

- An SQL relation is defined using the **create table** command:

  create table r (A_1 D_1, A_2 D_2, ..., A_n D_n,
  (integrity-constraint$_1$),
  ...,
  (integrity-constraint$_k$))

  - r is the name of the relation
  - each A_i is an attribute name in the schema of relation r
  - D_i is the data type of attribute A_i

- Example:

  create table *branch*
  (*branch_name* **char**(15),
  branch_city **char**(30),
  assets **integer**)

The select Clause

- The **select** clause list the attributes desired in the result of a query
  - corresponds to the projection operation of the relational algebra
- Example: find the names of all branches in the *loan* relation:

  select *branch_name*
  from *loan*

- In the relational algebra, the query would be:

$$\Pi_{branch\_name}(loan)$$

- NOTE: SQL names are case insensitive (i.e., you may use upper- or lower-case letters.)
  - E.g. *Branch_Name* ≡ *BRANCH_NAME* ≡ *branch_name*
  - Some people use upper case wherever we use bold font.

The select Clause (Cont.)

- SQL allows duplicates in relations as well as in query results.
- To force the elimination of duplicates, insert the keyword **distinct** after select.
- Find the names of all branches in the *loan* relations, and remove duplicates

```
select distinct branch_name
from loan
```

- The keyword **all** specifies that duplicates not be removed.

```
select all branch_name
from loan
```

The select Clause (Cont.)

- An asterisk in the select clause denotes "all attributes"

```
select *
from loan
```

- The **select** clause can contain arithmetic expressions involving the operation, +, –, *, and /, and operating on constants or attributes of tuples.
- E.g.:

```
select loan_number, branch_name, amount * 100
from loan
```

branch-name	account-number	balance
Downtown	A-101	500
Mianus	A-215	700
Perrryridge	A-102	400
Round Hill	A-305	350
Brighton	A-201	900
Redwood	A-222	700
Brighton	A-217	750

Account relation

branch-name	branch-city	balance
Downtown	Brooklyn	9000000
Redwood	Palo Alto	2100000
Perrryridge	Horseneck	1700000
Mianus	Horseneck	400000
Round Hill	Horseneck	8000000
Pownal	Bennington	3000000
Northton	Rye	3700000
Brighton	Brooklyn	7100000

Branch relation

Customer-name	Customer-street	Customer-city
Jones	Main	Harrison
Smith	North	Rye
Hayes	Main	Harrison
Curry	North	Rye
Lindsay	Park	Pittsfield
Turner	Putnam	Stamford
Williams	Nassau	Princeton
Adams	Spring	Pittsfield
Johnson	Alma	Palo Alto
Glenn	Sand Hill	Woodside
Brooks	Senator	Brooklyn
Green	Walnut	Stamford

customer relation

Customer-name	Account-Number
Jones	A-101
Smith	A-215
Hayes	A-102
Turner	A-305
Johnson	A-201
Jones	A-217
Lindsay	A-222

depositor relation

Customer-name	Loan-Number
Jones	L-17
Smith	L-23
Hayes	L-15
Jackson	L-14
Currry	L-93
Smith	L-11
Williams	L-17
Adams	L-16

borower relation

branch-name	Loan - number	amount
Downtown	L-17	1000
Redwood	L-23	2000
Perrryridge	L-15	1500
Downtown	L-14	1500
Mianus	L-93	500
Round Hill	L-11	900
Perrryridge	L-17	1300

Loan relation

Schema Diagram for the Banking Enterprise