

Other Query Interfaces and Languages

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Database Explorer - sa...

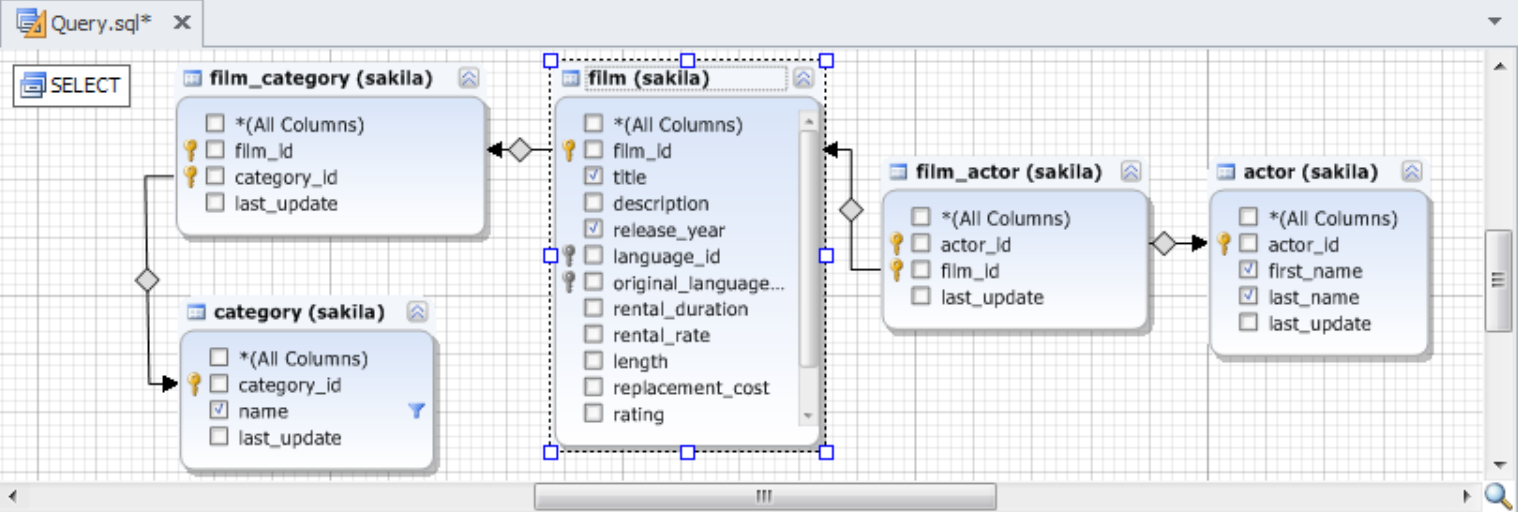
sakila.Prod

- Tables
 - actor
 - address
 - category
 - city
 - country
 - customer
 - film
 - film_actor
 - film_category
 - film_text
 - inventory
 - language
 - payment
 - rental
 - staff
 - store
- Views
 - actor_info
 - customer_list

Properties

sakila.film Table

(Name)	film
Charset	utf8
Collation	utf8_general_ci
Comment	
Owner	sakila
Table Type	INNODB



Selection Joins Where Group By Having Order By

And

- film.film_id not between 410 and 470
- category.name = 'comedy'

Or

sakila.film.release_year = <enter a value>

Table

<All Tables>

- name (sakila.category)
- original_language_id (sakila.film)
- rating (sakila.film)
- release_year (sakila.film)
- rental_duration (sakila.film)
- rental_rate (sakila.film)
- replacement_cost (sakila.film)
- special_features (sakila.film)
- title (sakila.film)

Function

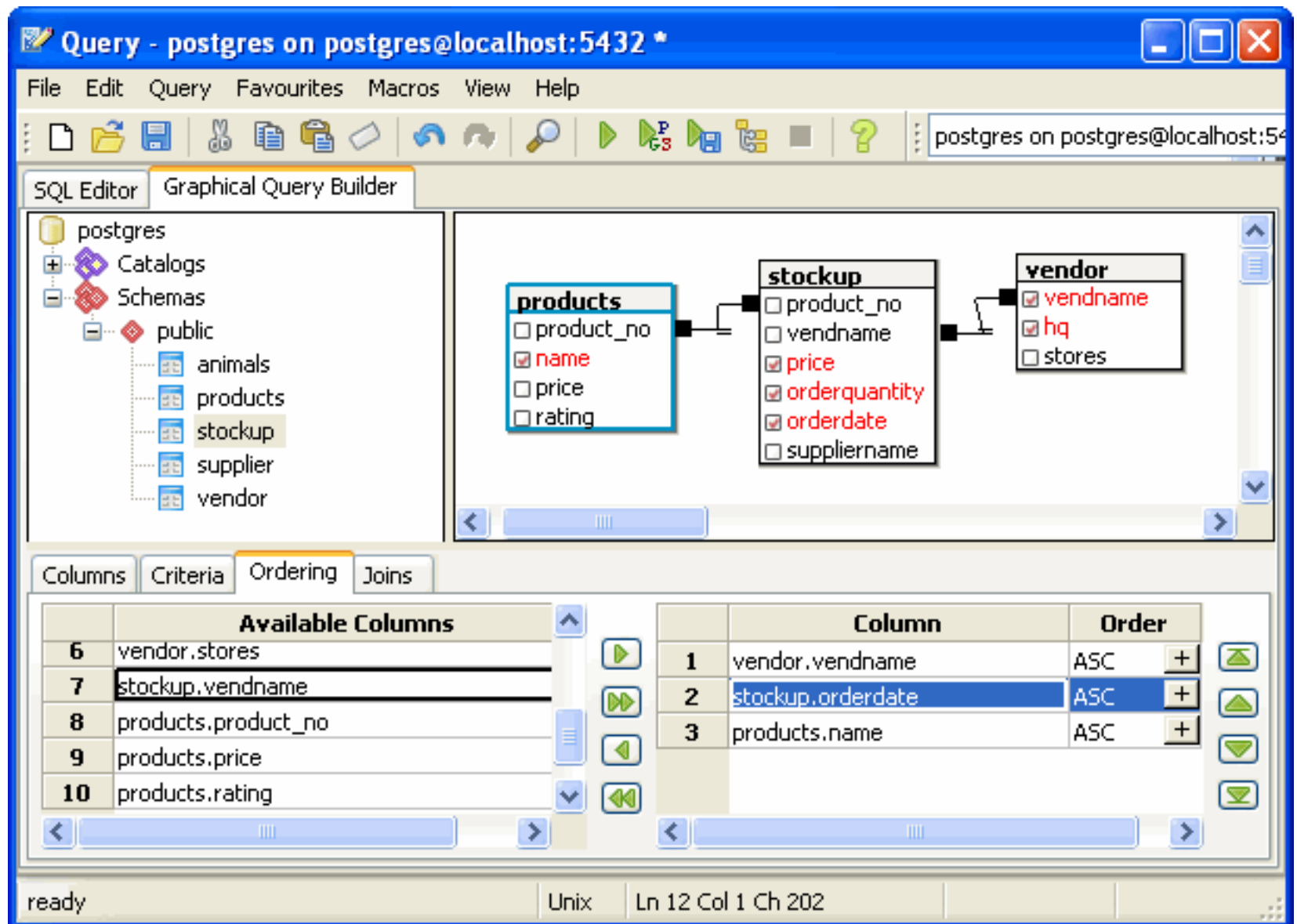
<All Functions>

- abs (x)
- acos (x)
- adddate (expr, days)
- adddate (date, interval, expr)
- addtime (expr1, expr2)
- release_year (sakila.film)
- asbinary (g)

Double-click a column to add it to the expression

() + - * / mod ~ & | ^

Close



dbForge Studio for Oracle - Query.sql*

File Edit View Database Comparison Query Layout SQL Debug Tools Window Help

Connection: HUMAN_RESOURCE@O...

89%

Execute Change Type

Database Explorer - HUMA...

HUMAN_RESOURCE@ORCL1

- Tables
 - COUNTRIES
 - DEPARTMENTS
 - EMPLOYEES
 - JOB_HISTORY
 - JOBS
 - LOCATIONS
 - REGIONS
- Columns
 - REGION_ID
 - REGION_NAME

Document Outline

Root Query

- Selection
 - Continents
 - Country
 - State Province
 - City
 - Postal Code
 - Street Address
 - LOCATIONS."Deapment"
 - LOCATIONS."Manager Na"
- Joins
 - From
 - Where
 - Group By
 - Order By

Query.sql* Start Page

Root Query LOCATIONS SubQuery

SELECT

REGIONS

- *(All Columns)
- REGION_ID
- REGION_NAME

COUNTRIES

- *(All Columns)
- COUNTRY_ID
- COUNTRY_NAME
- REGION_ID

LOCATIONS

- *(All Columns)
- STREET_ADDRESS
- POSTAL_CODE
- CITY
- STATE_PROVINCE
- COUNTRY_ID
- Deapment
- Manager Name

Selection Joins Where Group By Having Order By

Unique records

Column	Alias	Table	Aggregate	Sort	Filter
REGION_NAME	Continents	REGIONS		Ascending	
COUNTRY_NAME	Country	COUNTRIES			
STATE_PROVINCE	State Province	LOCATIONS			is not null
CITY	City	LOCATIONS			
POSTAL_CODE	Postal Code	LOCATIONS		Descending	

```
SELECT
  REGIONS.REGION_NAME AS "Continents", COUNTRIES.COUNTRY_NAME AS "Country", LOCATIONS.STATE_PROVINCE AS "State Province",
  LOCATIONS.CITY AS "City", LOCATIONS.POSTAL_CODE AS "Postal Code", LOCATIONS.STREET_ADDRESS AS "Street Address",
  LOCATIONS."Deapment" AS "Deapment", LOCATIONS."Manager Name" AS "Manager Name"
FROM
  COUNTRIES
INNER JOIN REGIONS ON
  COUNTRIES.REGION_ID = REGIONS.REGION_ID
INNER JOIN LOCATIONS ON
  COUNTRIES.COUNTRY_ID = LOCATIONS.COUNTRY_ID
```

Query Builder Text Data Profiler

Graphical Query Interfaces

- Oracle SQL query builder
- MySQL query builder
- SQL Server visual query builder
- Postgress query builder
- SQLite query builder
- Microsoft Access query interface

Roots

- Based on relational calculus
 - So is SQL
- Declarative
- Known as Query by Example (QBE)
- Limited expressive power

QBE: Query by Example

- Declarative query language, like SQL
- Developed in 1970s at IBM
- Based on DRC
- Visual
- Other visual query languages (MS Access, Paradox) are just incremental improvements

QBE - Examples

Q1. Print all professors' names in the Math department

Professor	<i>Id</i>	<i>Name</i>	<i>DeptId</i>
		P.	Math

Q2. Print all professors' names who taught c291 in Fall 2002.

Professor	<i>Id</i>	<i>Name</i>	<i>DeptId</i>
	_123	P.	

Teaching	<i>ProfId</i>	<i>CrsCode</i>	<i>Semester</i>
	_123	C291	F2002

Condition Boxes

- Some conditions are too complex to be placed directly in table columns

Transcript	<i>StudId</i>	<i>CrsCode</i>	<i>Semester</i>	<i>Grade</i>
	P.	CS532		_Gr

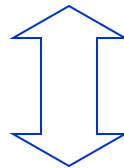
Conditions
_Gr = 'A' OR _Gr = 'B'

- Students who took CS532 & got A or B

Connection to Rel. Calculus

- A graphical representation of DRC

Transcript	<i>StudId</i>	<i>CrsCode</i>	<i>Semester</i>	<i>Grade</i>
	_123	_CS532	F2002	A



DRC:

Transcript($x, y, \text{'F2002'}, \text{'A'}$)

TRC: Transcript(t) AND $t.\text{Semester} = \text{'F2002'}$ AND $t.\text{Grade} = \text{'A'}$

Relational Calculus

- Two flavors
 - Tuple Relational Calculus (TRC)
 - Variables range over tuples (e.g. SQL)
 - Domain Relational Calculus (DRC)
 - Variables range over domains (e.g. QBE)
- Query \sim formula
- Answer \sim an assignment that makes the formula true

Examples

TRC:

$\{t \mid \text{Transcript}(t) \text{ AND } t.\text{Semester} = \text{'F2002'} \text{ AND } t.\text{Grade} = \text{'A'}\}$

$\{s \mid \text{Students}(s) \text{ AND } \exists e \in \text{Enroll} (s.\text{sid} = e.\text{sid} \text{ AND } e.\text{cid} = \text{'291'})\}$

$\{s \mid \text{Students}(s) \text{ AND } \exists c \in \text{Courses} (c.\text{instructor} = \text{'John Smith'} \\ \implies \exists e \in \text{Enroll} (e.\text{sid} = s.\text{sid} \text{ AND } e.\text{cid} = c.\text{cid}))\}$

DRC:

$\{x, y \mid \text{Transcript}(x, y, \text{'F2002'}, \text{'A'})\}$

Relational Calculus

a base for other query languages

Relation Between TRC and SQL

- List the names of all professors who have taught MGT123

– In TRC:

$$\{p.Name \mid \text{Professor}(p) \text{ AND } \exists t \in \text{Teaching} \\ (p.Id = t.ProfId \text{ AND } t.CrsCode = \text{'MGT123'}) \}$$

– In SQL:

```
SELECT  p.Name
FROM    Professor p, Teaching t
WHERE   p.Id = t.ProfId AND t.CrsCode = 'MGT123'
```

Core of SQL is merely a syntactic sugar on top of TRC

What Happened to Quantifiers in SQL?

- SQL has no quantifiers: how come? It uses conventions:
 - *Convention 1.* Universal quantifiers are not allowed (but SQL:1999 introduced a limited form of explicit \forall)
 - *Convention 2.* Make existential quantifiers *implicit*: Any tuple variable that does not occur in SELECT is assumed to be implicitly quantified with \exists

- Compare:

$\{p.Name \mid \text{Professor}(p) \text{ AND } \exists t \in \text{Teaching} \dots \}$

and

```
SELECT  P.Name
FROM    Professor p, Teaching t
... ..
```

Implicit

\exists

Relation Between TRC and SQL (cont'd)

- SQL uses a subset of TRC with simplifying conventions for quantification
- Restricts the use of quantification and negation (so TRC is more general in this respect)
- SQL uses aggregates, which are absent in TRC (and relational algebra, for that matter). But aggregates can be added
- SQL is extended with relational algebra operators (MINUS, UNION, JOIN, etc.)
 - This is just more syntactic sugar, but it makes queries easier to write

Graphical Interfaces

Of PC Databases

Microsoft Access

The screenshot displays the Microsoft Access interface. At the top, two tables are shown in design view:

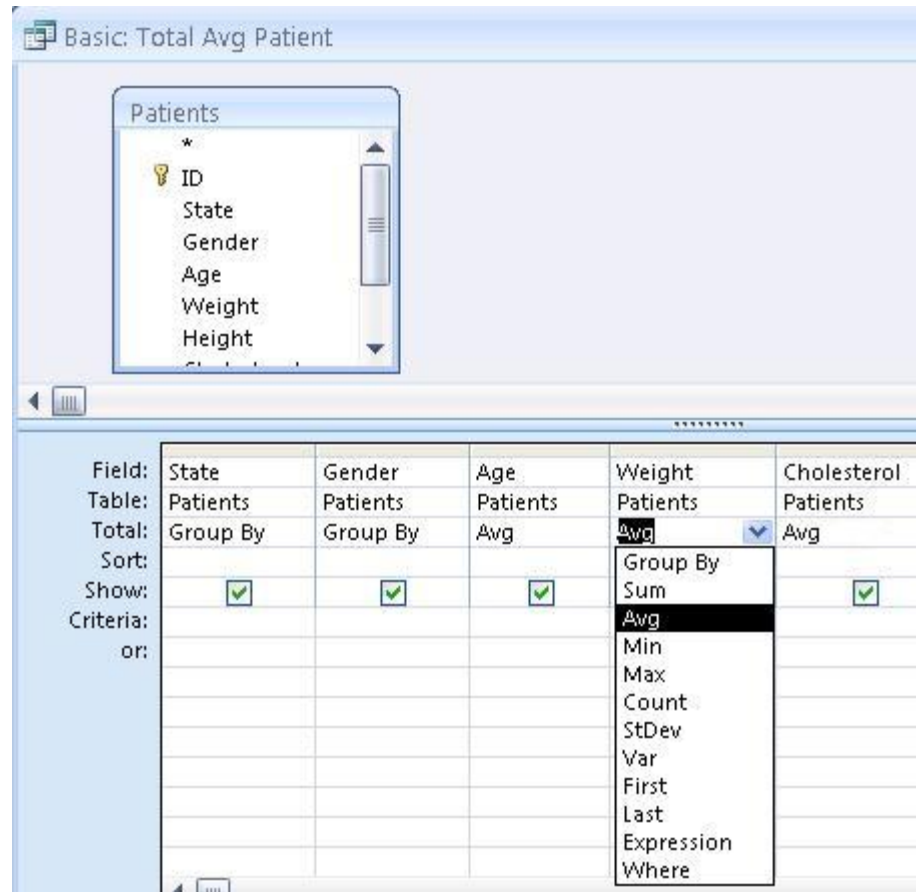
- account**:
 - * **account-number**
 - branch-name
 - balance
- depositor**:
 - * customer-name
 - account-number

A line connects the **account-number** field in the **account** table to the **account-number** field in the **depositor** table, indicating a relationship.

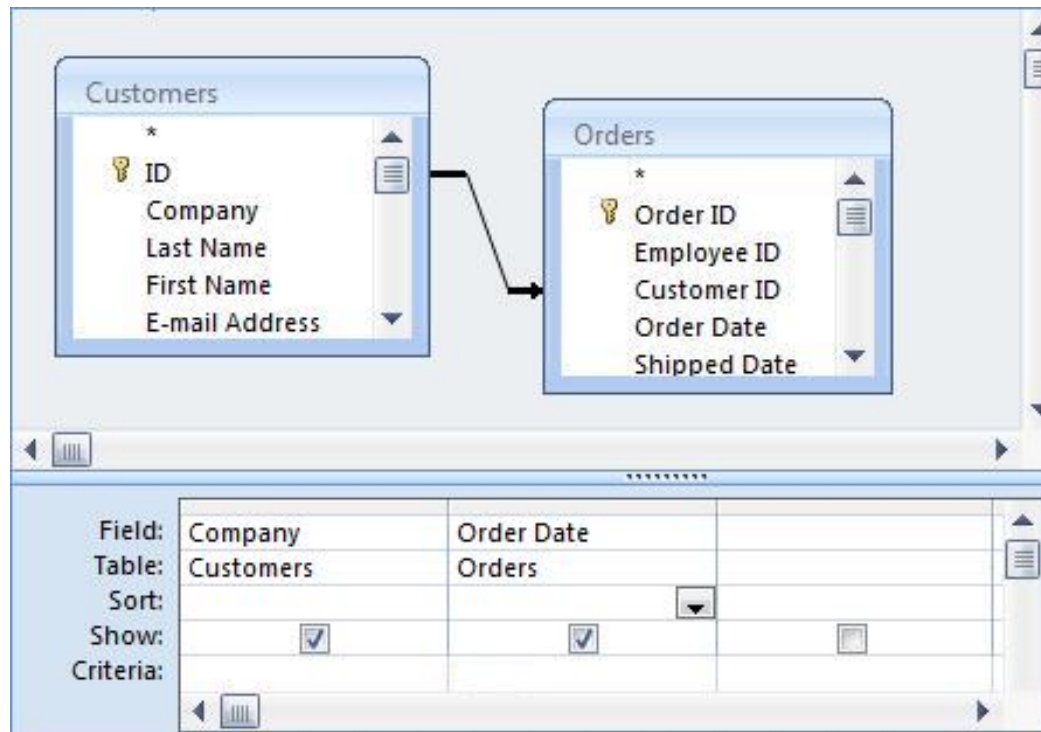
Below the tables is a query design view. The fields are arranged in a grid:

	customer-name	account-number	balance	branch-name
Field:	customer-name	account-number	balance	branch-name
Table:	depositor	account	account	account
Sort:				
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Criteria:				"Perryridge"
or:				

Microsoft Access (Cont)



Microsoft Access (Cont)



Microsoft Access (Cont)

Field: Entries.*

Table: Entries

Sort:

Show: ☒

Criteria: Like "*" & [forms]![Entries]![txtcriteria] & "*" or:

PC Databases

- A spruced up version of QBE (better interface)
- Be aware of implicit quantification
- Beware of negation pitfalls
 - Sec. 13.4 gives some of the pitfalls under the heading “the price of free lunch”