DOKUZ EYLÜL UNIVERSITY
DEPARTMENT OF STATISTICS
1993

BIL3203 – DATABASE MANAGEMENT

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SQL – Structured Query Language

Structured Query Language – SQL

- SQL – Structured Query Language
- A standart query language for Relational Databases (ANSI)
- Used to communicate with the DBMS to reach at the data.
  - Database and table creation, update and delete operations,
  - Data Entry, query, update and delete operations,
  - Authorization and authentication operations.

Structured Query Language - SQL

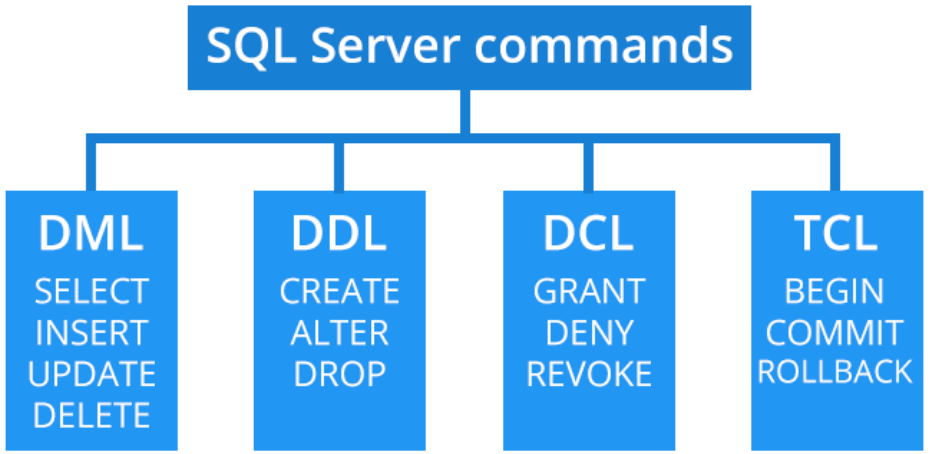
- History :
  - SEQUEL – System R (1974)
  - SQL – 87 (ANSI)
  - SQL – 89 (embedded SQL)
  - SQL – 92 or SQL2
  - SQL3 (1999)
  - SQL:2006
  - SQL:2008
  - SQL:2011
  - SQL:2016

SQL Extensions

Source	Common name	Full name
IBM DB2	SQL PL	SQL Procedural Language (implements SQL/PSM)
IBM Informix	SPL	Stored Procedural Language
IBM Netezza	NZPLSQL	(based on Postgres PL/pgSQL)
Microsoft / Sybase	T-SQL	Transact-SQL
MySQL	SQL/PSM	SQL/Persistent Stored Module (implements SQL/PSM)
MonetDB	SQL/PSM	SQL/Persistent Stored Module (implements SQL/PSM)
NuoDB	SSP	Starkey Stored Procedures
Oracle	PL/SQL	Procedural Language/SQL (based on Ada)
PostgreSQL	PL/pgSQL	Procedural Language/PostgreSQL Structured Query Language (implements SQL/PSM)
SAP R/3	ABAP	Advanced Business Application Programming
SAP HANA	SQLScript	SQLScript
Sybase	Watcom-SQL	SQL Anywhere Watcom-SQL Dialect
Teradata	SPL	Stored Procedural Language

Structured Query Language - SQL

- **DDL (Data Definition Language)**
  - Database and table creation, update and delete operations,
- **DML (Data Manipulation Language)**
  - Data Entry, query, update and delete operations,
- **DCL (Data Control Language)**
  - Authorization and authentication operations.



SQL – Targets

- Easy to learn
  - Tries to find “what”, but not “how”.
  - Uses standart English words, sentences.
- Portable
  - Common language for all relational databases,
  - Each user can use,
  - Can be executed inside other programming languages.

Structured Query Language - SQL

- Syntax
  - Written in statements,
  - "*Reserved word*"s,
  - Case insensitive (ALI, Ali, aLi)
  - Similar to English command sentences.
  - No loops,
  - No "IF – THEN" clauses.

SQL – SELECT

- SELECTion Query
- DML – Data Manipulation Language
- **SELECT [DISTINCT | ALL]**

  {* | [columnname [AS newname]] [,...] }

  FROM table_name [alias] [, ...]

  [WHERE condition(s)]

  [GROUP BY column(s)] [HAVING condition]

  [ORDER BY column(s)]

  On the browser, type the address:

http://alpervahaplar.com/db

SQL – SELECT

Employee Table

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

SELECT * FROM *Employee*

SQL – SELECT

- Column Selection
- SELECT *fName* FROM *Employee*

fName
John
Ann
David
Mary
Susan
Julie

SQL – SELECT

- Multiple Column Selection
- SELECT *fName, lName, position*
  FROM *Employee*

fName	lName	position
John	White	Manager
Ann	Beech	Assistant
David	Ford	Supervisor
Mary	Howe	Assistant
Susan	Brand	Manager
Julie	Lee	Assistant

SQL – SELECT

- SELECT *fName, lName, salary*
  FROM *Employee*

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

SQL – SELECT

- Row Selection – Filtering
- SELECT * FROM *Employee*
  WHERE *position = "Manager"*

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

SQL – SELECT

- Row Selection – Filtering
- SELECT *fName, lName* FROM *Employee*
  WHERE *position = "Manager"*

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

SQL – SELECT

- SELECT * FROM *Employee*
  WHERE *position = "Manager"*
  and *sex="M"*

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

SQL – SELECT

- Employees with salary less than 15000
- SELECT * FROM *Employee*
  WHERE *salary < 15000*

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

SQL – SELECT

- Employees working in B005 and B003
- SELECT * FROM *Employee*
  WHERE *branchNo = "B003"*
  or branchNo = "B005"

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

SQL – SELECT

- Row count
- SELECT count(*) FROM *Employee*
- Answer : 6

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

SQL – SELECT

- Number of employees working in B003
- SELECT count(*) FROM *Employee* WHERE branchNo="B003"
- Answer: 3

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

SQL – SELECT

- LIKE
- Joker Characters
- “%”
  - Represent 0, 1 or more characters.
  - Ex : Ali, Ahmet, Alper, Ayşe, Mehmet, Veli
  - “A%” = Ali, Ahmet, Alper, Ayşe
  - “Al%” = Ali, Alper

SQL – SELECT

- Employees with names beginning with 'J'
- SELECT * FROM *Employee*
  WHERE *fName* LIKE "J%"

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

SQL – SELECT

- Employees with last names ending with ‘e’
- SELECT * FROM *Employee*
  WHERE *lName* LIKE “%e”

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

SQL – SELECT

- Arithmetic operations
- SELECT 12*60
- SELECT 123*45/2+14
- SELECT 123*45/2+14 FROM Employee

SQL – SELECT

- Arithmetic operations
- Compute the salary by month
- SELECT fname, lname, salary / 12
  FROM Employee

fname	lname	Expr1002
Mary	Howe	750
David	Ford	1500
Ann	Beech	1000
Susan	Brand	2000
John	White	2500
Julie	Lee	750

SQL – SELECT

- Round
- SELECT ROUND(salary/7)
  FROM Employee

round(salary/7)
1286
2571
1714
3429
4286
1286

SQL – SELECT

- Round
- SELECT ROUND(salary/7,2)
  FROM Employee

round(salary/7)
1286
2571
1714
3429
4286
1286

round(salary/7, 2)
1285,71
2571,43
1714,29
3428,57
4285,71
1285,71

SQL – SELECT

- Minimum salary
- SELECT MIN(salary)
  FROM Employee

min(salary)
9000

SQL – SELECT

- Maximum salary
- SELECT MAX(salary)
  FROM Employee

max(salary)
30000

SQL – SELECT

- Sum of salaries
- SELECT SUM(salary)
  FROM Employee

sum(salary)
102000

SQL – SELECT

- Mean of salaries
- SELECT SUM(salary) / COUNT(salary)
  FROM Employee

sum(salary) / count(salary)
17000

SQL – SELECT

- Mean of salaries
- SELECT AVG(salary)
  FROM Employee

avg(salary)
17000

SQL – SELECT

- Standart Deviation of salaries
- SELECT STD(salary)
  FROM Employee

std(salary)
7874.0079

SQL – SELECT

- Variance of salaries
- SELECT POW(STD(salary) ,2)
  FROM Employee

POW(STD(salary) ,2)
61999999.99999

SQL – SELECT

- Variance of salaries
- SELECT VARIANCE(salary)
  FROM Employee

variance(salary)
62000000.0000

SQL – SELECT

- Mean of salaries of male employees
- SELECT AVG(salary)
  FROM Employee
  WHERE sex="M"

avg(salary)
24000

SQL – SELECT

- Range of salary
- SELECT MAX(salary) – MIN(salary)
  FROM Employee

max(salary) – min(salary)
21000