Πανεπιστήμιο Δυτικής Αττικής

Βάσεις Δεδομένων Μεταπτυχιακού Κύκλου Σπουδών (MSCICT101)

Ενότητα 5: Ερωτήματα σε γλώσσα SQL

JOIN πινάκων

Π. Ανδρίτσος - Α. Τσολακίδης

Καρτεσιανό γινόμενο και συνδέσεις

Παράδειγμα σχεσιακής βάσης δεδομένων προσωπικού εταιρείας

dept (πίνακας τμημάτων)

Deptno	Dname	Loc
10	ACCOUNTING	ATHENS
20	SALES	LONDON
30	RESEARCH	ATHENS
40	PAYROLL	LONDON

emp (πίνακας υπαλλήλων)

Empno	Ename	Job	Hiredate	Mgr	Sal	Comm	Deptno
10	CODD	ANALYST	1989-01-01	15	3000		10
15	ELMASRI	ANALYST	1995-05-02	15	1200	150	10
20	NAVATHE	SALESMAN	1977-07-07	20	2000		20
30	DATE	PROGRAMMER	2004-05-04	15	1800	200	10

Καρτεσιανό γινόμενο

```
mysql> SELECT *
    -> FROM dept, emp;
+--------+------------+----------+-------+--------+-----------+------------+------+---------+---------+--------+
| DEPTNO | DNAME      | LOC      | EMPNO | ENAME  | JOB       | HIREDATE   | MGR  | SAL     | COMM    | DEPTNO |
+--------+------------+----------+-------+--------+-----------+------------+------+---------+---------+--------+
|     10 | ACCOUNTING | NEW YORK |    10 | CODD   | ANALYST   | 1989-01-01 |   15 | 3000.00 |    NULL |     10 |
|     20 | RESEARCH   | DALLAS   |    10 | CODD   | ANALYST   | 1989-01-01 |   15 | 3000.00 |    NULL |     10 |
|     30 | SALES      | CHICAGO  |    10 | CODD   | ANALYST   | 1989-01-01 |   15 | 3000.00 |    NULL |     10 |
|     40 | OPERATIONS | BOSTON   |    10 | CODD   | ANALYST   | 1989-01-01 |   15 | 3000.00 |    NULL |     10 |
|     10 | ACCOUNTING | NEW YORK |    15 | ELMASRI | ANALYST   | 1995-05-02 |   15 | 1200.00 |  150.00 |     10 |
|     20 | RESEARCH   | DALLAS   |    15 | ELMASRI | ANALYST   | 1995-05-02 |   15 | 1200.00 |  150.00 |     10 |
|     30 | SALES      | CHICAGO  |    15 | ELMASRI | ANALYST   | 1995-05-02 |   15 | 1200.00 |  150.00 |     10 |
|     40 | OPERATIONS | BOSTON   |    15 | ELMASRI | ANALYST   | 1995-05-02 |   15 | 1200.00 |  150.00 |     10 |
|     10 | ACCOUNTING | NEW YORK |    20 | NAVATHE | SALESMAN  | 1977-07-07 |   20 | 2000.00 |    NULL |     20 |
|     20 | RESEARCH   | DALLAS   |    20 | NAVATHE | SALESMAN  | 1977-07-07 |   20 | 2000.00 |    NULL |     20 |
|     30 | SALES      | CHICAGO  |    20 | NAVATHE | SALESMAN  | 1977-07-07 |   20 | 2000.00 |    NULL |     20 |
|     40 | OPERATIONS | BOSTON   |    20 | NAVATHE | SALESMAN  | 1977-07-07 |   20 | 2000.00 |    NULL |     20 |
|     10 | ACCOUNTING | NEW YORK |    30 | DATE   | PROGRAMMER | 2004-05-04 |   15 | 1800.00 |  200.00 |     10 |
|     20 | RESEARCH   | DALLAS   |    30 | DATE   | PROGRAMMER | 2004-05-04 |   15 | 1800.00 |  200.00 |     10 |
|     30 | SALES      | CHICAGO  |    30 | DATE   | PROGRAMMER | 2004-05-04 |   15 | 1800.00 |  200.00 |     10 |
|     40 | OPERATIONS | BOSTON   |    30 | DATE   | PROGRAMMER | 2004-05-04 |   15 | 1800.00 |  200.00 |     10 |
+--------+------------+----------+-------+--------+-----------+------------+------+---------+---------+--------+
16 rows in set (0.03 sec)
```

```
SELECT *
FROM dept, emp;
```

Σύνδεση - join

```
mysql> SELECT *
    -> FROM dept, emp
    -> WHERE dept.deptno=emp.deptno;
+--------+------------+----------+-------+---------+-----------+------------+------+---------+---------+--------+
| DEPTNO | DNAME      | LOC      | EMPNO | ENAME   | JOB       | HIREDATE   | MGR  | SAL     | COMM    | DEPTNO |
+--------+------------+----------+-------+---------+-----------+------------+------+---------+---------+--------+
|     10 | ACCOUNTING | NEW YORK |    10 | CODD    | ANALYST   | 1989-01-01 |   15 | 3000.00 |    NULL |     10 |
|     10 | ACCOUNTING | NEW YORK |    15 | ELMASRI | ANALYST   | 1995-05-02 |   15 | 1200.00 | 150.00  |     10 |
|     20 | RESEARCH   | DALLAS   |    20 | NAVATHE | SALESMAN  | 1977-07-07 |   20 | 2000.00 |    NULL |     20 |
|     10 | ACCOUNTING | NEW YORK |    30 | DATE    | PROGRAMMER| 2004-05-04 |   15 | 1800.00 | 200.00  |     10 |
+--------+------------+----------+-------+---------+-----------+------------+------+---------+---------+--------+
4 rows in set (0.02 sec)
```

SELECT *

FROM dept, emp

WHERE dept.deptno=emp.deptno;

Σύνδεση - join

```
mysql>
mysql> SELECT empno, ename, emp.deptno, dname
    -> FROM dept, emp
    -> WHERE dept.deptno=emp.deptno;
+-------+---------+--------+------------+
| empno | ename   | deptno | dname      |
+-------+---------+--------+------------+
|    10 | CODD    |     10 | ACCOUNTING |
|    15 | ELMASRI |     10 | ACCOUNTING |
|    20 | NAVATHE |     20 | RESEARCH   |
|    30 | DATE    |     10 | ACCOUNTING |
+-------+---------+--------+------------+
4 rows in set (0.01 sec)

mysql> SELECT empno, ename, emp.deptno, dname
    -> FROM dept
    -> JOIN emp ON dept.deptno=emp.deptno;
+-------+---------+--------+------------+
| empno | ename   | deptno | dname      |
+-------+---------+--------+------------+
|    10 | CODD    |     10 | ACCOUNTING |
|    15 | ELMASRI |     10 | ACCOUNTING |
|    20 | NAVATHE |     20 | RESEARCH   |
|    30 | DATE    |     10 | ACCOUNTING |
+-------+---------+--------+------------+
4 rows in set (0.00 sec)
```

SELECT που βασίζονται σε περισσότερους από έναν πίνακες

Στην υποπρόταση WHERE γράφουμε συνθήκη σύνδεσης (join) των πινάκων:

SELECT … FROM emp, dept
WHERE empno.deptno=dept.deptno;

Έστω βάση Διοίκησης Προσωπικού αποτελούμενη από τους παρακάτω πίνακες

```
SELECT * FROM emp;
```

Empno	Ename	Job	Mgr	Hiredate	Sal	Comm.	Deptno
7369	SMITH	CLERK	7902	17/12/00	800		20
7499	ALLEN	SALESMAN	7698	20/02/01	1600	300	30
7521	WARD	SALESMAN	7698	22/02/01	1250	500	30
7566	JONES	MANAGER	7839	02/04/01	2975		20
7654	MARTIN	SALESMAN	7698	28/09/01	1250	1400	30
7698	BLAKE	MANAGER	7839	01/05/01	2850		30
7782	CLARK	MANAGER	7839	09/06/01	2450		10
7788	SCOTT	ANALYST	7566	19/04/07	3000		20
7839	KING	PRESIDENT		17/11/01	5000		10
7844	TURNER	SALESMAN	7698	08/09/01	1500	0	30
7876	ADAMS	CLERK	7788	23/05/07	1100		20
7900	JAMES	CLERK	7698	03/12/01	950		30
7902	FORD	ANALYST	7566	03/12/01	3000		20
7934	MILLER	CLERK	7782	23/01/02	1300		10
7998	BATES	ANALYST	7566	17/11/07	1000		

```
SELECT * FROM dept;
```

Deptno	Dname	Loc
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

Σε λογικό επίπεδο γίνεται σύνδεση των δύο πινάκων: **Αντί της στήλης Deptno του σχήματος στην πραγματικότητα έχουμε δύο στήλες, τις στήλες Emp.deptno, Dept.deptno, όπου Emp.deptno=Dept.deptno**

Empno	Ename	Job	Mgr	Hiredate	Sal	Comm	Deptno	Dname	Loc
7369	SMITH	CLERK	7902	17/12/00	800		20	RESEARCH	DALLAS
7499	ALLEN	SALESMAN	7698	20/02/01	1600	300	30	SALES	CHICAGO
7521	WARD	SALESMAN	7698	22/02/01	1250	500	30	SALES	CHICAGO
7566	JONES	MANAGER	7839	02/04/01	2975		20	RESEARCH	DALLAS
7654	MARTIN	SALESMAN	7698	28/09/01	1250	1400	30	SALES	CHICAGO
7698	BLAKE	MANAGER	7839	01/05/01	2850		30	SALES	CHICAGO
7782	CLARK	MANAGER	7839	09/06/01	2450		10	ACCOUNTING	NEW YORK
7788	SCOTT	**ANALYST**	7566	19/04/07	3000		20	RESEARCH	DALLAS
7839	KING	PRESIDENT		17/11/01	5000		10	ACCOUNTING	NEW YORK
7844	TURNER	SALESMAN	7698	08/09/01	1500	0	30	SALES	CHICAGO
7876	ADAMS	CLERK	7788	23/05/07	1100		20	RESEARCH	DALLAS
7900	JAMES	CLERK	7698	03/12/01	950		30	SALES	CHICAGO
7902	FORD	**ANALYST**	7566	03/12/01	3000		20	RESEARCH	DALLAS
7934	MILLER	CLERK	7782	23/01/02	1300		10	ACCOUNTING	NEW YORK
7998	BATES	ANALYST	7566	17/11/07	1000				

SELECT * FROM dept, emp WHERE dept.deptno=emp.deptno;
SELECT * FROM emp, dept WHERE emp.deptno=dept.deptno;
Προσοχή η υπάλληλος 7998 δεν συμπεριλαμβάνεται στη σύνδεση.

```
mysql> SELECT * FROM dept, emp WHERE emp.deptno=dept.deptno;
+--------+------------+----------+-------+--------+-----------+------+------------+---------+---------+--------+
| DEPTNO | DNAME      | LOC      | EMPNO | ENAME  | JOB       | MGR  | HIREDATE   | SAL     | COMM    | DEPTNO |
+--------+------------+----------+-------+--------+-----------+------+------------+---------+---------+--------+
|     10 | ACCOUNTING | NEW YORK |  7782 | CLARK  | MANAGER   | 7839 | 1981-11-27 | 2450.00 |    NULL |     10 |
|     10 | ACCOUNTING | NEW YORK |  7839 | KING   | PRESIDENT | NULL | 1987-11-12 | 5000.00 |    NULL |     10 |
|     10 | ACCOUNTING | NEW YORK |  7934 | MILLER | CLERK     | 7782 | 2003-01-19 | 1300.00 |    NULL |     10 |
|     20 | RESEARCH   | DALLAS   |  7369 | SMITH  | CLERK     | 7902 | 1980-12-17 |  800.00 |    NULL |     20 |
|     20 | RESEARCH   | DALLAS   |  7566 | JONES  | MANAGER   | 7839 | 1981-12-24 | 2975.00 |    NULL |     20 |
|     20 | RESEARCH   | DALLAS   |  7788 | SCOTT  | ANALYST   | 7566 | 1987-04-29 | 3000.00 |    NULL |     20 |
|     20 | RESEARCH   | DALLAS   |  7876 | ADAMS  | CLERK     | 7788 | 2003-05-07 | 1100.00 |    NULL |     20 |
|     20 | RESEARCH   | DALLAS   |  7902 | FORD   | ANALYST   | 7566 | 2003-12-19 | 3000.00 |    NULL |     20 |
|     30 | SALES      | CHICAGO  |  7499 | ALLEN  | SALESMAN  | 7698 | 1981-02-20 | 1600.00 |  300.00 |     30 |
|     30 | SALES      | CHICAGO  |  7521 | WARD   | SALESMAN  | 7698 | 2002-02-01 | 1250.00 |  500.00 |     30 |
|     30 | SALES      | CHICAGO  |  7654 | MARTIN | SALESMAN  | 7698 | 1981-10-28 | 1250.00 | 1400.00 |     30 |
|     30 | SALES      | CHICAGO  |  7698 | BLAKE  | MANAGER   | 7839 | 2001-05-02 | 2850.00 |    NULL |     30 |
|     30 | SALES      | CHICAGO  |  7844 | TURNER | SALESMAN  | 7698 | 2007-10-19 | 1500.00 |    0.00 |     30 |
|     30 | SALES      | CHICAGO  |  7900 | JAMES  | CLERK     | 7698 | 2003-12-12 |  950.00 |    NULL |     30 |
+--------+------------+----------+-------+--------+-----------+------+------------+---------+---------+--------+
14 rows in set (0.00 sec)

mysql> SELECT * FROM emp, dept WHERE emp.deptno=dept.deptno;
+-------+--------+-----------+------+------------+---------+---------+--------+--------+------------+----------+
| EMPNO | ENAME  | JOB       | MGR  | HIREDATE   | SAL     | COMM    | DEPTNO | DEPTNO | DNAME      | LOC      |
+-------+--------+-----------+------+------------+---------+---------+--------+--------+------------+----------+
|  7782 | CLARK  | MANAGER   | 7839 | 1981-11-27 | 2450.00 |    NULL |     10 |     10 | ACCOUNTING | NEW YORK |
|  7839 | KING   | PRESIDENT | NULL | 1987-11-12 | 5000.00 |    NULL |     10 |     10 | ACCOUNTING | NEW YORK |
|  7934 | MILLER | CLERK     | 7782 | 2003-01-19 | 1300.00 |    NULL |     10 |     10 | ACCOUNTING | NEW YORK |
|  7369 | SMITH  | CLERK     | 7902 | 1980-12-17 |  800.00 |    NULL |     20 |     20 | RESEARCH   | DALLAS   |
|  7566 | JONES  | MANAGER   | 7839 | 1981-12-24 | 2975.00 |    NULL |     20 |     20 | RESEARCH   | DALLAS   |
|  7788 | SCOTT  | ANALYST   | 7566 | 1987-04-29 | 3000.00 |    NULL |     20 |     20 | RESEARCH   | DALLAS   |
|  7876 | ADAMS  | CLERK     | 7788 | 2003-05-07 | 1100.00 |    NULL |     20 |     20 | RESEARCH   | DALLAS   |
|  7902 | FORD   | ANALYST   | 7566 | 2003-12-19 | 3000.00 |    NULL |     20 |     20 | RESEARCH   | DALLAS   |
|  7499 | ALLEN  | SALESMAN  | 7698 | 1981-02-20 | 1600.00 |  300.00 |     30 |     30 | SALES      | CHICAGO  |
|  7521 | WARD   | SALESMAN  | 7698 | 2002-02-01 | 1250.00 |  500.00 |     30 |     30 | SALES      | CHICAGO  |
|  7654 | MARTIN | SALESMAN  | 7698 | 1981-10-28 | 1250.00 | 1400.00 |     30 |     30 | SALES      | CHICAGO  |
|  7698 | BLAKE  | MANAGER   | 7839 | 2001-05-02 | 2850.00 |    NULL |     30 |     30 | SALES      | CHICAGO  |
|  7844 | TURNER | SALESMAN  | 7698 | 2007-10-19 | 1500.00 |    0.00 |     30 |     30 | SALES      | CHICAGO  |
|  7900 | JAMES  | CLERK     | 7698 | 2003-12-12 |  950.00 |    NULL |     30 |     30 | SALES      | CHICAGO  |
+-------+--------+-----------+------+------------+---------+---------+--------+--------+------------+----------+
14 rows in set (0.00 sec)
```

Επιλογή στηλών (ή πράξεων μεταξύ των στηλών) για προβολή

Empno	Ename	Job	Sal	Sal+IFNULL(Comm,0)	Emp.Deptno	Dname
7902	FORD	**ANALYST**	3000	3000	20	RESEARCH
7788	SCOTT	**ANALYST**	3000	3000	20	RESEARCH

Να και μία παραλλαγή της προηγούμενης δήλωσης.

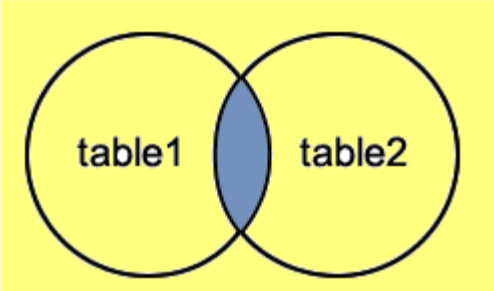
```
SELECT empno, ename, job, sal, sal+IFNULL(comm,0),
emp.deptno, dname
FROM dept , emp
WHERE dept.deptno= emp.deptno
AND job IN ('ANALYST', 'PROGRAMMER')
ORDER BY ename;
```

MySQL: IFNULL, ORACLE: NVL-Null VaLue

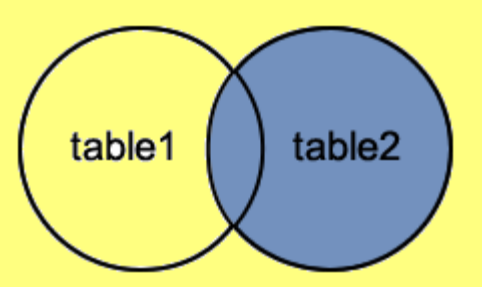
```
mysql> SELECT * FROM dept, emp WHERE dept.deptno=emp.deptno;
+--------+------------+----------+-------+--------+-----------+------+------------+---------+---------+--------+
| DEPTNO | DNAME      | LOC      | EMPNO | ENAME  | JOB       | MGR  | HIREDATE   | SAL     | COMM    | DEPTNO |
+--------+------------+----------+-------+--------+-----------+------+------------+---------+---------+--------+
|     10 | ACCOUNTING | NEW YORK |  7782 | CLARK  | MANAGER   | 7839 | 1981-11-27 | 2450.00 |    NULL |     10 |
|     10 | ACCOUNTING | NEW YORK |  7839 | KING   | PRESIDENT | NULL | 1987-11-12 | 5000.00 |    NULL |     10 |
|     10 | ACCOUNTING | NEW YORK |  7934 | MILLER | CLERK     | 7782 | 2003-01-19 | 1300.00 |    NULL |     10 |
|     20 | RESEARCH   | DALLAS   |  7369 | SMITH  | CLERK     | 7902 | 1980-12-17 |  800.00 |    NULL |     20 |
|     20 | RESEARCH   | DALLAS   |  7566 | JONES  | MANAGER   | 7839 | 1981-12-24 | 2975.00 |    NULL |     20 |
|     20 | RESEARCH   | DALLAS   |  7788 | SCOTT  | ANALYST   | 7566 | 1987-04-29 | 3000.00 |    NULL |     20 |
|     20 | RESEARCH   | DALLAS   |  7876 | ADAMS  | CLERK     | 7788 | 2003-05-07 | 1100.00 |    NULL |     20 |
|     20 | RESEARCH   | DALLAS   |  7902 | FORD   | ANALYST   | 7566 | 2003-12-19 | 3000.00 |    NULL |     20 |
|     30 | SALES      | CHICAGO  |  7499 | ALLEN  | SALESMAN  | 7698 | 1981-02-20 | 1600.00 |  300.00 |     30 |
|     30 | SALES      | CHICAGO  |  7521 | WARD   | SALESMAN  | 7698 | 2002-02-01 | 1250.00 |  500.00 |     30 |
|     30 | SALES      | CHICAGO  |  7654 | MARTIN | SALESMAN  | 7698 | 1981-10-28 | 1250.00 | 1400.00 |     30 |
|     30 | SALES      | CHICAGO  |  7698 | BLAKE  | MANAGER   | 7839 | 2001-05-02 | 2850.00 |    NULL |     30 |
|     30 | SALES      | CHICAGO  |  7844 | TURNER | SALESMAN  | 7698 | 2007-10-19 | 1500.00 |    0.00 |     30 |
|     30 | SALES      | CHICAGO  |  7900 | JAMES  | CLERK     | 7698 | 2003-12-12 |  950.00 |    NULL |     30 |
+--------+------------+----------+-------+--------+-----------+------+------------+---------+---------+--------+
14 rows in set (0.00 sec)

mysql>
mysql>
mysql> SELECT empno, ename, job, sal, sal+IFNULL(comm,0), emp.deptno, dname
    -> FROM dept , emp
    -> WHERE dept.deptno= emp.deptno
    -> AND job IN ('ANALYST', 'PROGRAMMER')
    -> ORDER BY ename;
+-------+-------+---------+---------+--------------------+--------+----------+
| empno | ename | job     | sal     | sal+IFNULL(comm,0) | deptno | dname    |
+-------+-------+---------+---------+--------------------+--------+----------+
|  7902 | FORD  | ANALYST | 3000.00 |            3000.00 |     20 | RESEARCH |
|  7788 | SCOTT | ANALYST | 3000.00 |            3000.00 |     20 | RESEARCH |
+-------+-------+---------+---------+--------------------+--------+----------+
2 rows in set (0.00 sec)
```

SELECT που περιλαμβάνουν σύνδεση πινάκων. Τελεστής JOIN

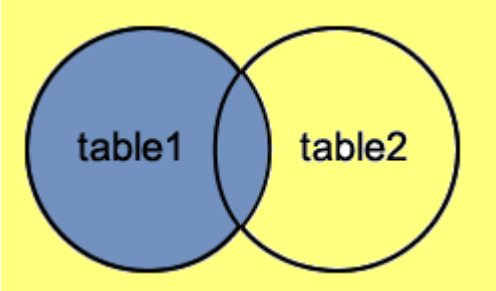
JOIN:



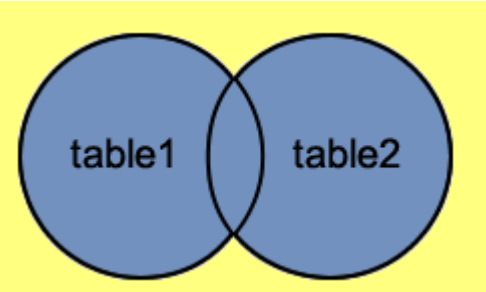
RIGHT JOIN:



LEFT JOIN:



FULL JOIN:



JOIN

Χρήση τελεστή join

```
SELECT empno, ename, job, emp.deptno, dname
FROM dept, emp
WHERE dept.deptno=emp.deptno;

SELECT empno, ename, job, emp.deptno, dname
FROM dept
INNER JOIN emp ON dept.deptno=emp.deptno;

SELECT empno, ename, job, emp.deptno, dname
FROM dept
JOIN emp ON dept.deptno=emp.deptno;
```

```
mysql> SELECT empno, ename, job, emp.deptno, dname
    -> FROM dept
    -> JOIN emp ON dept.deptno=emp.deptno;
+-------+--------+-----------+--------+------------+
| empno | ename  | job       | deptno | dname      |
+-------+--------+-----------+--------+------------+
|  7782 | CLARK  | MANAGER   |     10 | ACCOUNTING |
|  7839 | KING   | PRESIDENT |     10 | ACCOUNTING |
|  7934 | MILLER | CLERK     |     10 | ACCOUNTING |
|  7369 | SMITH  | CLERK     |     20 | RESEARCH   |
|  7566 | JONES  | MANAGER   |     20 | RESEARCH   |
|  7788 | SCOTT  | ANALYST   |     20 | RESEARCH   |
|  7876 | ADAMS  | CLERK     |     20 | RESEARCH   |
|  7902 | FORD   | ANALYST   |     20 | RESEARCH   |
|  7499 | ALLEN  | SALESMAN  |     30 | SALES      |
|  7521 | WARD   | SALESMAN  |     30 | SALES      |
|  7654 | MARTIN | SALESMAN  |     30 | SALES      |
|  7698 | BLAKE  | MANAGER   |     30 | SALES      |
|  7844 | TURNER | SALESMAN  |     30 | SALES      |
|  7900 | JAMES  | CLERK     |     30 | SALES      |
+-------+--------+-----------+--------+------------+
14 rows in set (0.00 sec)

mysql>
```

SELECT … SELECT vs JOIN

```
SELECT empno, ename, job, sal, deptno
FROM EMP
WHERE deptno IN (SELECT deptno FROM DEPT
        WHERE dname='SALES')
ORDER BY deptno, ename;
```

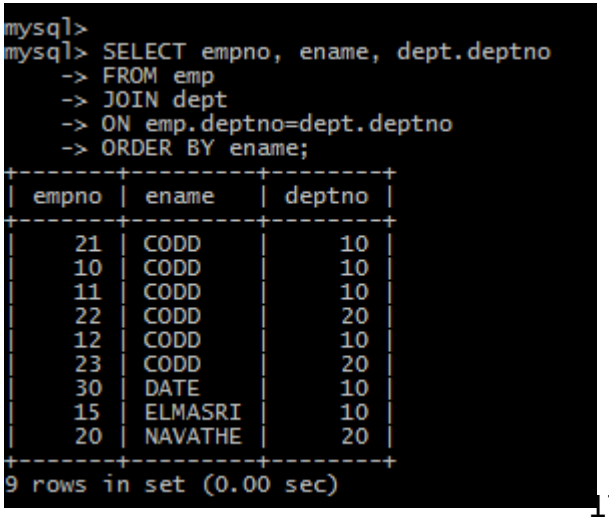
```
SELECT empno, ename, job, sal, emp.deptno
FROM EMP
JOIN DEPT ON EMP.DEPTNO=DEPT.DEPTNO
WHERE dname='SALES'
ORDER BY emp.deptno, ename;
```

```
SELECT EMPNO, ENAME, EMP.DEPTNO, DEPT.DNAME, SAL, COMM
        FROM emp
       INNER JOIN dept ON emp.deptno=dept.deptno
       ORDER BY ename;
```

```
mysql> SELECT EMPNO, ENAME, EMP.DEPTNO, DEPT.DNAME, SAL, COMM
    -> FROM emp
    -> INNER JOIN dept
    -> ON emp.deptno=dept.deptno
    -> ORDER BY ename;
+-------+---------+--------+------------+---------+---------+
| EMPNO | ENAME   | DEPTNO | DNAME      | SAL     | COMM    |
+-------+---------+--------+------------+---------+---------+
|    11 | CODD    |     10 | ACCOUNTING | 2900.00 |    NULL |
|    21 | CODD    |     10 | ACCOUNTING | 2000.00 |    NULL |
|    22 | CODD    |     20 | RESEARCH   | 1200.00 |  150.00 |
|    12 | CODD    |     10 | ACCOUNTING | 1200.00 |  150.00 |
|    23 | CODD    |     20 | RESEARCH   | 2000.00 |    NULL |
|    10 | CODD    |     10 | ACCOUNTING | 3000.00 |    NULL |
|    30 | DATE    |     10 | ACCOUNTING | 1800.00 |  200.00 |
|    15 | ELMASRI |     10 | ACCOUNTING | 1200.00 |  150.00 |
|    20 | NAVATHE |     20 | RESEARCH   | 2000.00 |    NULL |
+-------+---------+--------+------------+---------+---------+
9 rows in set (0.00 sec)
```

```
SELECT empno, ename, dept.deptno
FROM emp
INNER JOIN dept ON emp.deptno=dept.deptno
ORDER BY ename;
```

```
SELECT empno, ename, dept.deptno
FROM emp
JOIN dept ON emp.deptno=dept.deptno
ORDER BY ename;
```



```
mysql>
mysql> SELECT empno, ename, dept.deptno
    -> FROM emp
    -> JOIN dept
    -> ON emp.deptno=dept.deptno
    -> ORDER BY ename;
+-------+---------+--------+
| empno | ename   | deptno |
+-------+---------+--------+
|    21 | CODD    |     10 |
|    10 | CODD    |     10 |
|    11 | CODD    |     10 |
|    22 | CODD    |     20 |
|    12 | CODD    |     10 |
|    23 | CODD    |     20 |
|    30 | DATE    |     10 |
|    15 | ELMASRI |     10 |
|    20 | NAVATHE |     20 |
+-------+---------+--------+
9 rows in set (0.00 sec)
```

```
SELECT EMPNO, ENAME, EMP.DEPTNO, DEPT.DNAME, SAL, COMM
    FROM emp
INNER JOIN dept
ON emp.deptno=dept.deptno
ORDER BY ename;
```

```
mysql> SELECT EMPNO, ENAME, EMP.DEPTNO, DEPT.DNAME, SAL, COMM
    -> FROM emp
    -> INNER JOIN dept
    -> ON emp.deptno=dept.deptno
    -> ORDER BY ename;
+-------+---------+--------+------------+---------+--------+
| EMPNO | ENAME   | DEPTNO | DNAME      | SAL     | COMM   |
+-------+---------+--------+------------+---------+--------+
|    11 | CODD    |     10 | ACCOUNTING | 2900.00 |   NULL |
|    21 | CODD    |     10 | ACCOUNTING | 2000.00 |   NULL |
|    22 | CODD    |     20 | RESEARCH   | 1200.00 | 150.00 |
|    12 | CODD    |     10 | ACCOUNTING | 1200.00 | 150.00 |
|    23 | CODD    |     20 | RESEARCH   | 2000.00 |   NULL |
|    10 | CODD    |     10 | ACCOUNTING | 3000.00 |   NULL |
|    30 | DATE    |     10 | ACCOUNTING | 1800.00 | 200.00 |
|    15 | ELMASRI |     10 | ACCOUNTING | 1200.00 | 150.00 |
|    20 | NAVATHE |     20 | RESEARCH   | 2000.00 |   NULL |
+-------+---------+--------+------------+---------+--------+
9 rows in set (0.00 sec)
```

```
SELECT empno, ename, dept.deptno
FROM emp
LEFT JOIN dept
ON emp.deptno=dept.deptno
ORDER BY ename;
```

```
mysql> SELECT empno, ename, dept.deptno
    -> FROM emp
    -> LEFT JOIN dept
    -> ON emp.deptno=dept.deptno
    -> ORDER BY ename;
+-------+---------+--------+
| empno | ename   | deptno |
+-------+---------+--------+
|    77 | BATES   |   NULL |
|    23 | CODD    |     20 |
|    22 | CODD    |     20 |
|    21 | CODD    |     10 |
|    12 | CODD    |     10 |
|    11 | CODD    |     10 |
|    10 | CODD    |     10 |
|    30 | DATE    |     10 |
|    15 | ELMASRI |     10 |
|    20 | NAVATHE |     20 |
+-------+---------+--------+
10 rows in set (0.00 sec)
```

```
SELECT empno, ename, dept.deptno
FROM emp
RIGHT JOIN dept
ON emp.deptno=dept.deptno
ORDER BY ename;
```

```
mysql> SELECT empno, ename, dept.deptno
    -> FROM emp
    -> RIGHT JOIN dept
    -> ON emp.deptno=dept.deptno
    -> ORDER BY ename;
+-------+---------+--------+
| empno | ename   | deptno |
+-------+---------+--------+
|  NULL | NULL    |     30 |
|  NULL | NULL    |     40 |
|    12 | CODD    |     10 |
|    21 | CODD    |     10 |
|    22 | CODD    |     20 |
|    23 | CODD    |     20 |
|    10 | CODD    |     10 |
|    11 | CODD    |     10 |
|    30 | DATE    |     10 |
|    15 | ELMASRI |     10 |
|    20 | NAVATHE |     20 |
+-------+---------+--------+
11 rows in set (0.00 sec)
```

```
SELECT column_names
FROM table1
FULL JOIN table2
ON table1.column_name=table2.column_name;
```

Δεν υποστηρίζεται ο τελεστής στο προϊόν mySQL.

```
mysql> SELECT empno, ename, dept.deptno
    -> FROM emp
    -> LEFT JOIN dept
    -> ON emp.deptno=dept.deptno
    -> UNION
    -> SELECT empno, ename, dept.deptno
    -> FROM emp
    -> RIGHT JOIN dept
    -> ON emp.deptno=dept.deptno
    -> ORDER BY ename;
+-------+---------+--------+
| empno | ename   | deptno |
+-------+---------+--------+
|  NULL | NULL    |     30 |
|  NULL | NULL    |     40 |
|    77 | BATES   |   NULL |
|    21 | CODD    |     10 |
|    10 | CODD    |     10 |
|    22 | CODD    |     20 |
|    11 | CODD    |     10 |
|    23 | CODD    |     20 |
|    12 | CODD    |     10 |
|    30 | DATE    |     10 |
|    15 | ELMASRI |     10 |
|    20 | NAVATHE |     20 |
+-------+---------+--------+
12 rows in set (0.04 sec)
```

```
SELECT empno, ename, dept.deptno
FROM emp
LEFT JOIN dept
ON emp.deptno=dept.deptno
UNION
SELECT empno, ename, dept.deptno
FROM emp
RIGHT JOIN dept
ON emp.deptno=dept.deptno
ORDER BY ename;
```

Σχεσιακή βάση δεδομένων προσωπικού

Θα χρησιμοποιήσουμε μία βάση τεσσάρων (4) πινάκων:

- emp–πίνακας με στοιχεία υπαλλήλων,
- dept- πίνακας με στοιχεία τμημάτων,
- project-πίνακας με στοιχεία έργων,
- assign-πίνακας που δείχνει σε ποια έργα εργάζονται οι υπάλληλοι.

Δημιουργία της βάσης με mySQL

Οι πίνακες δημιουργούνται με κύρια και ξένα κλειδιά

```
DROP DATABASE IF EXISTS new_personnel;
CREATE DATABASE new_personnel;
USE new_personnel;

CREATE TABLE DEPT(DEPTNO INT(2) NOT NULL,
                  DNAME VARCHAR(14), LOC VARCHAR(14),
                  PRIMARY KEY(DEPTNO));
CREATE TABLE EMP(EMPNO INT(4) NOT NULL,
      ENAME VARCHAR(10), JOB VARCHAR(25),
      HIREDATE DATE, MGR INT(4),  SAL FLOAT(7,2), COMM FLOAT(7,2),
      DEPTNO INT(2),
      PRIMARY KEY(EMPNO),
      FOREIGN KEY(DEPTNO) REFERENCES DEPT(DEPTNO));
CREATE TABLE PROJ (projno INT(3) NOT NULL,
                   pname VARCHAR(15),
                   budget FLOAT(12,2),
     PRIMARY KEY(projno));
CREATE TABLE ASSIGN(
 EMPNO INT(4) NOT NULL, PROJNO INT(3) NOT NULL, PTIME INT(3),
PRIMARY KEY(EMPNO,PROJNO),
FOREIGN KEY(EMPNO) REFERENCES EMP(EMPNO),
FOREIGN KEY(PROJNO) REFERENCES PROJ(PROJNO));

SHOW TABLES;
```

```
INSERT INTO DEPT(DEPTNO, DNAME, LOC)
        VALUES (10, 'ACCOUNTING', 'NEW YORK');
INSERT INTO DEPT(DEPTNO, DNAME, LOC)
        VALUES (20, 'RESEARCH', 'DALLAS');
INSERT INTO DEPT(DEPTNO, DNAME, LOC)
        VALUES (30, 'SALES', 'CHICAGO');
INSERT INTO DEPT(DEPTNO, DNAME, LOC)
        VALUES (40, 'OPERATIONS', 'BOSTON');

INSERT INTO EMP
  VALUES (10, 'CODD', 'ANALYST', '1989/01/01', 15, 3000, NULL, 10);
INSERT INTO EMP
  VALUES (15, 'ELMASRI', 'ANALYST', '1995/05/02', 15, 1200, 150, 10);
INSERT INTO EMP
  VALUES (20, 'NAVATHE', 'SALESMAN', '1977/07/07', 20, 2000, NULL, 20);
INSERT INTO EMP
  VALUES (30, 'DATE', 'PROGRAMMER', '2004/05/04', 15, 1800, 200, 10);

INSERT INTO proj(projno, pname, budget)
        VALUES(100, 'PAYROLL', 100000);
INSERT INTO proj(projno, pname, budget)
        VALUES(200, 'PERSONNEL',200000 );
INSERT INTO proj(projno, pname, budget)
        VALUES(300, 'SALES', 150000);

INSERT INTO assign(empno, projno, ptime)
            VALUES(10,100, 40);
INSERT INTO assign(empno, projno, ptime)
            VALUES(10, 200, 60);
INSERT INTO assign(empno, projno, ptime)
            VALUES(15, 100, 100);
INSERT INTO assign(empno, projno, ptime)
            VALUES(20, 200, 100);
INSERT INTO assign(empno, projno, ptime)
            VALUES(30, 100, 100);
```

MySQL 8.0 Command Line Client - Unicode

```
mysql> DESCRIBE DEPT;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| DEPTNO | int         | NO   | PRI | NULL    |       |
| DNAME  | varchar(14) | YES  |     | NULL    |       |
| LOC    | varchar(14) | YES  |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
3 rows in set (0.01 sec)

mysql> DESCRIBE EMP;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| EMPNO    | int         | NO   | PRI | NULL    |       |
| ENAME    | varchar(10) | YES  |     | NULL    |       |
| JOB      | varchar(25) | YES  |     | NULL    |       |
| HIREDATE | date        | YES  |     | NULL    |       |
| MGR      | int         | YES  |     | NULL    |       |
| SAL      | float(7,2)  | YES  |     | NULL    |       |
| COMM     | float(7,2)  | YES  |     | NULL    |       |
| DEPTNO   | int         | YES  | MUL | NULL    |       |
+----------+-------------+------+-----+---------+-------+
8 rows in set (0.00 sec)

mysql> DESCRIBE PROJ;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| projno | int         | NO   | PRI | NULL    |       |
| pname  | varchar(15) | YES  |     | NULL    |       |
| budget | float(12,2) | YES  |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
3 rows in set (0.00 sec)

mysql> DESCRIBE ASSIGN;
+--------+------+------+-----+---------+-------+
| Field  | Type | Null | Key | Default | Extra |
+--------+------+------+-----+---------+-------+
| EMPNO  | int  | NO   | PRI | NULL    |       |
| PROJNO | int  | NO   | PRI | NULL    |       |
| PTIME  | int  | YES  |     | NULL    |       |
+--------+------+------+-----+---------+-------+
3 rows in set (0.00 sec)
```

Πως βλέπουμε τα δεδομένα

```
SELECT * FROM DEPT;
SELECT * FROM EMP;
SELECT * FROM PROJ;
SELECT * FROM ASSIGN;

# Διαγραφή πινάκων
DROP TABLE assign;
DROP TABLE emp;
DROP TABLE proj;
DROP TABLE dept;

# Η διαγραφή της βάσης γίνεται με τη δήλωση:
DROP DATABASE NEW_PERSONNEL;
```

Σχεσιακή βάση δεδομένων προσωπικού

assign (πίνακας που καταχωρεί ποιοί υπάλληλοι απασχολούνται σε ποιά έργα)

Empno	Projno	ptime
10	100	40
10	200	60
15	100	100
20	200	100
30	100	100

project (πίνακας έργων)

PROJNO	PNAME	BUDGET
100	PAYROLL	100000
200	PERSONNEL	200000
300	SALES	150000

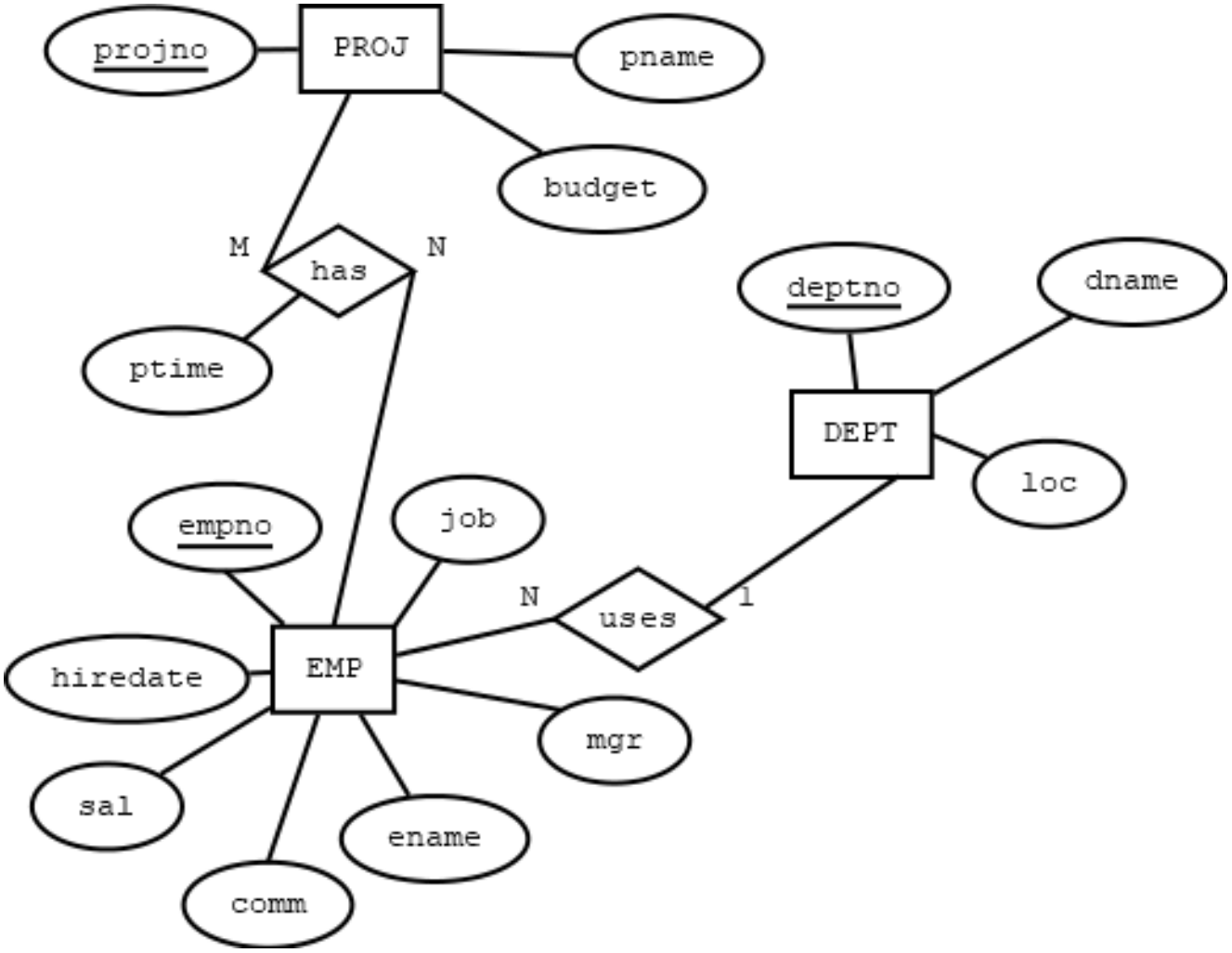
emp (πίνακας υπαλλήλων)

Empno	Ename	Job	Hiredate	Mgr	Sal	Comm	Deptno
10	Codd	ANALYST	1/1/89	15	3000		10
15	Elmasri	ANALYST	2/5/95	15	1200	150	10
20	Navathe	SALESMAN	7/7/77	20	2000		20
30	Date	PROGRAMMER	4/5/04	15	1800	200	10

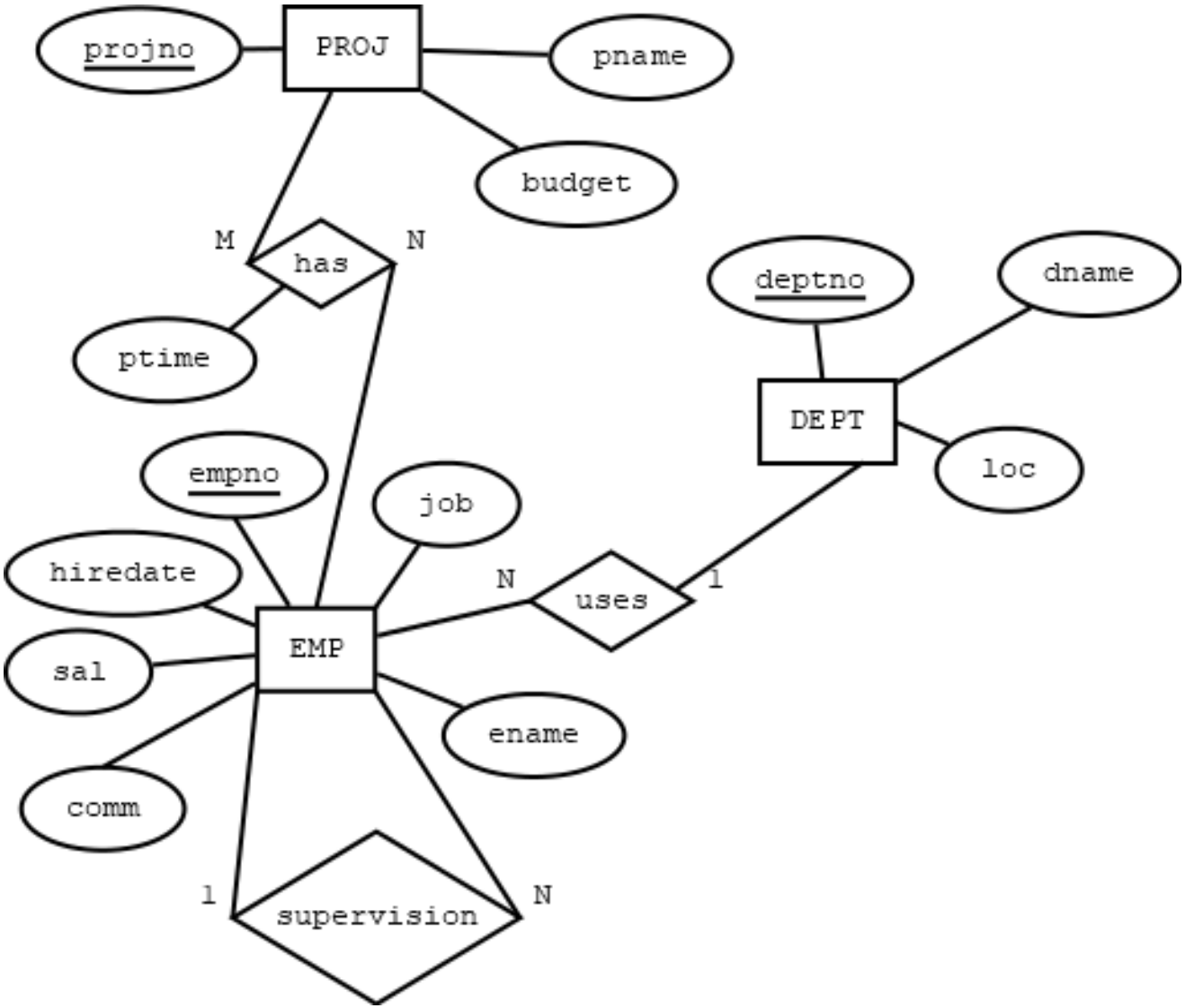
dept (πίνακας τμημάτων)

Deptno	Dname	Loc
10	ACCOUNTING	ATHENS
20	SALES	LONDON
30	RESEARCH	ATHENS
40	PAYROLL	LONDON

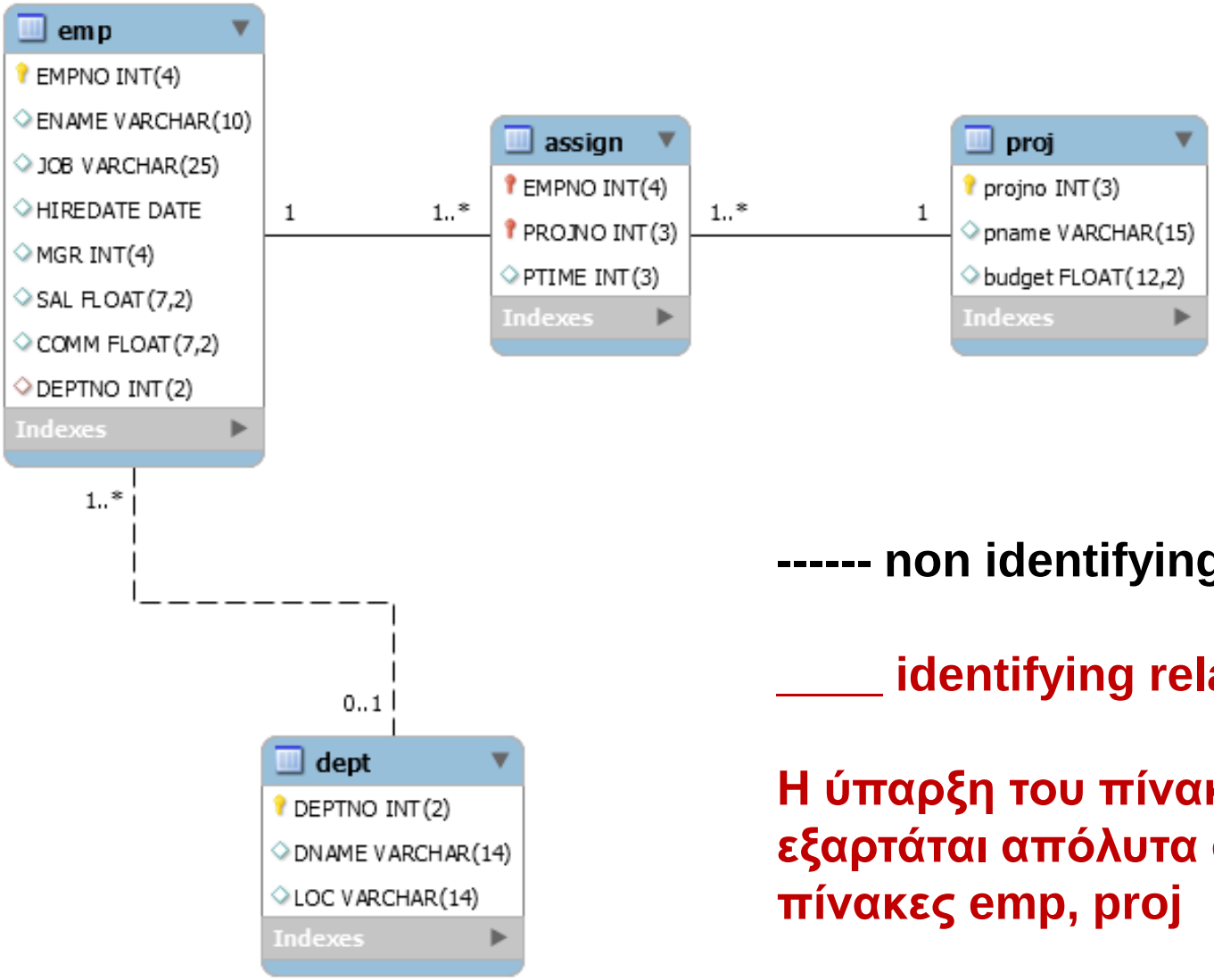
Μοντέλο οντοτήτων συσχετίσεων με συμβολισμό Chen, Navathe-Elmasri κ.λπ.



Μοντέλο οντοτήτων συσχετίσεων με συμβολισμό Chen, Navathe-Elmasri



UML



------ non identifying relationship

____ identifying relationships

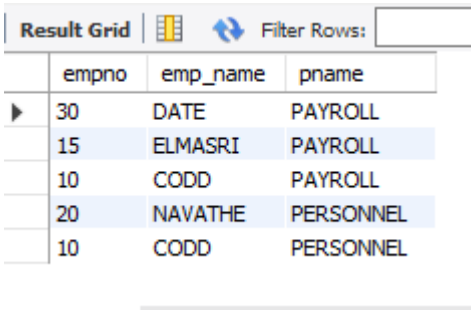
Η ύπαρξη του πίνακα assign εξαρτάται απόλυτα από τους πίνακες emp, proj

Παράδειγμα με 3 πίνακες

Query

```
select
    emp.empno,
    emp.emp_name,
    proj.pname
from
    emp,
    proj,
    assign
where
    emp.empno=assign.empno and
    assign.projno=proj.projno
;
```

Result



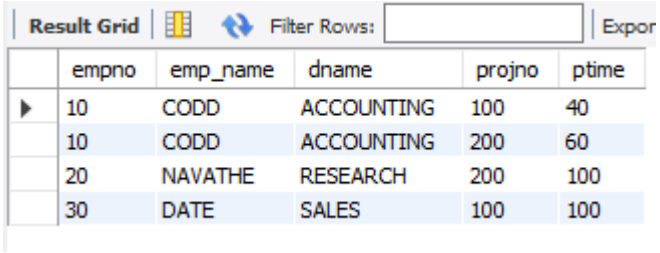
empno	emp_name	pname
30	DATE	PAYROLL
15	ELMASRI	PAYROLL
10	CODD	PAYROLL
20	NAVATHE	PERSONNEL
10	CODD	PERSONNEL

Παράδειγμα με 3 πίνακες

Query

```
SELECT
    assign.empno,
    emp_name,
    dname,
    assign.projno,
    ptime
FROM dept
INNER JOIN emp ON dept.deptno=emp.empno
JOIN assign ON emp.empno=assign.empno
JOIN proj ON assign.projno=proj.projno;
```

Result



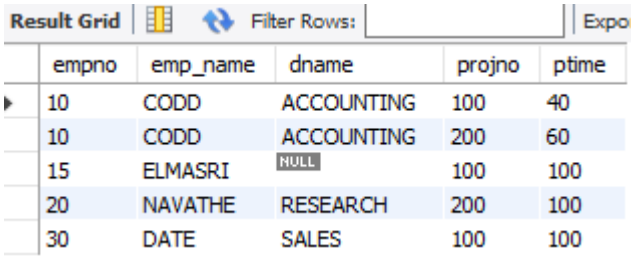
empno	emp_name	dname	projno	ptime
10	CODD	ACCOUNTING	100	40
10	CODD	ACCOUNTING	200	60
20	NAVATHE	RESEARCH	200	100
30	DATE	SALES	100	100

Παράδειγμα με 3 πίνακες

Query

```
SELECT
    assign.empno,
    emp_name,
    dname,
    assign.projno,
    ptime
FROM dept
right JOIN emp ON dept.deptno=emp.empno
JOIN assign ON emp.empno=assign.empno
JOIN proj ON assign.projno=proj.projno;
```

Result



Result Grid | Filter Rows: | Expo

empno	emp_name	dname	projno	ptime
10	CODD	ACCOUNTING	100	40
10	CODD	ACCOUNTING	200	60
15	ELMASRI	NULL	100	100
20	NAVATHE	RESEARCH	200	100
30	DATE	SALES	100	100

Τέλος Ενότητας

Ερωτήσεις;