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DATABASE DESIGN II - 1DL400

Assignment 1 - Database Integrity:
Assertions, Triggers, and Stored Procedures

1 Database Integrity: Assertions, Triggers, and Stored Procedures

1.1 Objectives

The overall purpose of this assignment is to practice more advanced SQL features by extending a given relational database scenario with additional functionality. The objectives of this exercise is to give a good understanding of how to use SQL assertion checks, triggers, and stored procedures to maintain database integrity and to support applications. You will use the existing Jonson Brothers company database (also used in the course Database Design I - 1DL300). The student should become familiar with how to create assertion check conditions, triggers and stored procedures in SQL.

1.2 Preparation

If needed, install the DBMS MySQL on your PC (not necessary if you run the assignment at the university) and then set up the Jonson Brothers database. Instructions for installing MySQL and scripts for loading the database can be found at the assignment course webpage.

You should also prepare yourself reading about integrity constraints, triggers and stored procedures by studying relevant sections in the following reference material:

- Elmasri and Navathe [EN10]: Chapters 4, 5, 12 and 24.1.
- Padron-McCarthy and Risch [PMR05]: Chapters 12, 14 and 15.
- MySQL on-line manual.

Before starting your implementation, it is a good idea to write your solutions on paper before testing them out on the Jonson Brothers database. There is also an supervised introduction to the assignment in your schedule.

2 Assignment

2.1 The scenario - a company database

The Jonson Brothers is a retail company with department stores in many major US cities. The company has a large number of employees and sells a varied line of products. To manage all information about the company structure and products, a database system is used. The company consists of a number of stores that contain a number of departments. The company has a number of employees, who (among other things) sell items at the different stores. Sales are registered in the sale and debit tables. The sale and debit tables may be a bit tricky to understand. You can view a row in the debit table as representing the complete receipt you get when you pay for your items, while a row in the sale table represents a row on such a receipt.

The company has contracts with various suppliers, who supply items for sale and also parts for the companys computer equipment. Deliveries of computer parts are registered in the supply table. The basic state of the company database can be seen in the ER diagram given in Appendix A and the table definitions and contents in the file JohnsonSchema.sql and Appendix B.

Furthermore, the database have been extended to support a bonus system where managers can be given an extra bonus (e.g. if their departments have met their sale predictions) added to their salary. There is also support for customer cards associated with accounts. These additional extensions are not part of the basic ER-diagram so you have to interpret

that on your own but the corresponding scripts for those extensions are given in the `extension.sql` file.

The business is expanding and the database is continuously being extended with new information. The management of Jonson Brothers has hired you to help them to extend their database.

2.2 Exercises

1. First you need to set up your Jonson Brothers database by following the instructions on the course home page.

2. Start by analyzing the ER diagram in Appendix A, and the relational database in `JohnsonSchema.sql` and Appendix C.

3. Create a stored procedure for creating customers. Should take name, street address, and city as arguments. Demonstrate that your procedure works by adding a customer. Show the contents of the customer table before and after the procedure call.

4. Create a stored procedure that creates a customer account. Should take customer number and any credit limit as arguments. Set the balance to 0. Demonstrate that your procedure works by adding an account to the customer created in step 3 above. Show the contents of the account table before and after the procedure call.

5. Create a stored procedure for depositing money into a customers account. The procedure should take an account number and a positive amount as arguments. If amount is not positive the deposit should be aborted and an exception should be thrown.

6. Create a stored procedure that finalizes a sale given by its transaction number. The procedure should charge a customer account the total cost of the sale and reduce qoh of the sold items.

   Demonstrate that your procedure works by creating and finalizing a sale of several different items on the account you created in step 5 above. Show the contents of the sale, transaction, item and customer account tables before and after the procedure call.

Hint: Create some local variables to store intermediate values. You can define a view to calculate sale total values.

7. Create an update trigger that checks if a customer account exceeds its given credit limit. If the credit limit is exceeded by less than 10% the trigger stores the date, account number and the overdraft amount in a table (a new table created by you). If the credit limit is exceeded by more than 10%, and exception should be thrown, preventing any update to take place.

   Demonstrate that your trigger works according to the specification by withdrawing different amounts from a customer account. Attempt to withdraw within credit limit, $< 10\%$ overdraft and $> 10\%$ overdraft. Show the contents of the customer account and overdraft tables before and after the trigger was executed.

For further details, you can refer to the MySQL manual found on the assignment home page.

3 Examination

You should hand in an assignment report that include the following:

1. All SQL commands issued.
2. All command results from the database server.
3. Answers to questions, and explanations where appropriate.

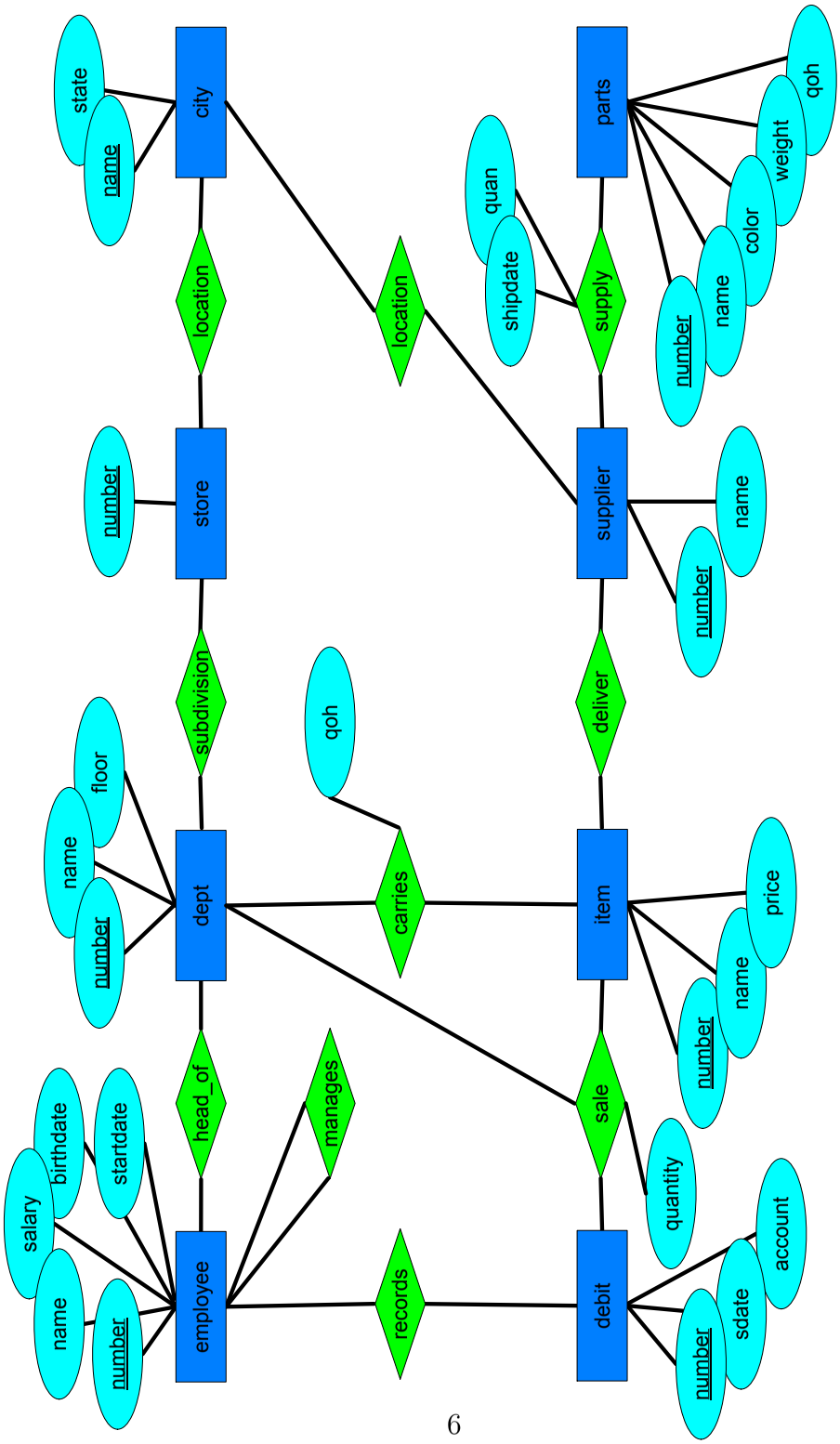
Note that you should hand in these solutions in one assignment report per group.

References

[EN10] Elmasri, R. and Navathe, S. B.: Fundamentals of Databases, 6th Edition, Addison-Wesley, 2010 (available e.g. at Akademibokhandeln).

[PMR05] Padron-McCarthy, T. and Risch, T.: Databasteknik, Studentlitteratur, 2005 (available e.g. at Akademibokhandeln).

Appendix A: Entity-relationship diagram of the Jonson Brothers company database



Appendix B: The contents of the existing company Jonson Brothers database

The tables of the existing company database are given below:

```
SELECT * FROM employee;
```

NUMBER	NAME	SALARY	MANAGER	BIRTHYEAR	STARTYEAR
10	Ross, Stanley	15908	199	1927	1945
11	Ross, Stuart	12067	-	1931	1932
13	Edwards, Peter	9000	199	1928	1958
26	Thompson, Bob	13000	199	1930	1970
32	Smythe, Carol	9050	199	1929	1967
33	Hayes, Evelyn	10100	199	1931	1963
35	Evans, Michael	5000	32	1952	1974
37	Raveen, Lemont	11985	26	1950	1974
55	James, Mary	12000	199	1920	1969
98	Williams, Judy	9000	199	1935	1969
129	Thomas, Tom	10000	199	1941	1962
157	Jones, Tim	12000	199	1940	1960
199	Bullock, J.D.	27000	-	1920	1920
215	Collins, Joanne	7000	10	1950	1971
430	Brunet, Paul C.	17674	129	1938	1959
843	Schmidt, Herman	11204	26	1936	1956
994	Iwano, Masahiro	15641	129	1944	1970
1110	Smith, Paul	6000	33	1952	1973
1330	Onstad, Richard	8779	13	1952	1971
1523	Zugnoni, Arthur A.	19868	129	1928	1949
1639	Choy, Wanda	11160	55	1947	1970
2398	Wallace, Maggie J.	7880	26	1940	1959
4901	Bailey, Chas M.	8377	32	1956	1975
5119	Bono, Sonny	13621	55	1939	1963
5219	Schwarz, Jason B.	13374	33	1944	1959

25 rows found

```
SELECT * FROM dept;
```

NUMBER	NAME	STORE	FLOOR	MANAGER
1	Bargain	5	0	37
10	Candy	5	1	13
14	Jewelry	8	1	33
19	Furniture	7	4	26
20	Major Appliances	7	4	26
26	Linens	7	3	157
28	Women's	8	2	32
34	Stationary	5	1	33
35	Book	5	1	55
43	Children's	8	2	32
47	Junior Miss	7	2	129
49	Toys	8	2	35
58	Men's	7	2	129
60	Sportswear	5	1	10
63	Women's	7	3	32
65	Junior's	7	3	37
70	Women's	5	1	10
73	Children's	5	1	10
99	Giftwrap	5	1	98

19 rows found

```
SELECT * FROM store;
     NUMBER CITY
========== ===============
          5 San Francisco
          7 Oakland
          8 El Cerrito
```

3 rows found

```
SELECT * FROM item;
     NUMBER NAME                      PRICE    SUPPLIER
========== ================== ========== ==========
         11 Wash Cloth                 75         213
         19 Bellbottoms               450          33
         21 ABC Blocks                198         125
         23 1 lb Box                  215          42
         25 2 lb Box, Mix             450          42
         26 Earrings                 1000         199
         43 Maze                      325          89
         52 Jacket                   3295          15
        101 Slacks                   1600          15
        106 Clock Book                198         125
        107 The 'Feel' Book           225          89
        115 Gold Ring                4995         199
        118 Towels, Bath              250         213
        119 Squeeze Ball              250          89
        120 Twin Sheet                800         213
        121 Queen Sheet              1375         213
        127 Ski Jumpsuit             4350          15
        165 Jean                      825          33
        258 Shirt                     650          33
        301 Boy's Jean Suit          1250          33
```

20 rows found

```
SELECT * FROM carries;
       ITEM        DEPT         QOH
========== =========== ===========
          1          14         220
         11           1         575
         19          43         600
         21           1         405
         21          49         120
         23          10         100
         25          10          75
         26          14          20
         43          49         200
         52          60         300
        101          63         325
        101          28         125
        101          70         225
        106          49         150
        106           1         175
        107          35         225
        115          14          10
        118          26        1000
        119          49         400
        120          26         750
        121          26         600
```

```
        127          65         125
        165          65         500
        258          58        1200
        301          43         500
        301          73         100

                23 rows found
```

```
SELECT * FROM parts;
     NUMBER NAME                 COLOR         WEIGHT          QOH
========== ==================== ======== ========== ==========
          1 central processor    pink             10           1
          2 memory               gray             20          32
          3 disk drive           black           685           2
          4 tape drive           black           450           4
          5 tapes                gray              1         250
          6 line printer         yellow          578           3
          7 l-p paper            white            15          95
          8 terminals            blue             19          15
          9 terminal paper       white             2         350
         10 byte-soap            clear             0         143
         11 card reader          gray            327           0
         12 card punch           gray            427           0
         13 paper tape reader    black           107           0
         14 paper tape punch     black           147           0

                14 rows found
```

```
SELECT * FROM sale;
    DEBIT        ITEM        DEPT    QUANTITY
========== ========== ========== ==========
   100581         118          26          5
   100581         120          26          1
   100582          26          14          1
   100586         106           1          2
   100586         127          65          3
   100592         258          58          1
   100593          23          10          2
   100594          52          60          1

              8 rows found
```

```
SELECT * FROM debit;
     NUMBER SDATE         EMPLOYEE     ACCOUNT
========== ========== ========== ==========
     100581 1995-01-15         157          -
     100582 1995-01-15        1110   14356540
     100586 1995-01-16          35   14096831
     100592 1995-01-17         129          -
     100593 1995-01-18          13   11652133
     100594 1995-01-18         215   12591815

               6 rows found
```

```
SELECT * FROM city;
NAME           STATE
============== ======
```

```
Amherst         Mass
Atlanta         Ga
Boston          Mass
Dallas          Tex
Denver          Colo
El Cerrito      Calif
Hickville       Okla
Los Angeles     Calif
Madison         Wisc
New York        NY
Oakland         Calif
Paxton          Ill
Salt Lake City  Utah
San Diego       Calif
San Francisco   Calif
Seattle         Wash
White Plains    Neb

                17 rows found


SELECT * FROM supply;
   SUPPLIER        PART SHIPDATE          QUAN
========== =========== ========== ===========
          5           4 1994-11-15           3
          5           4 1995-01-22           6
         20           5 1995-01-10          20
         20           5 1995-01-11          75
         62           3 1994-06-18           3
         67           4 1995-07-01           1
         89           3 1995-07-04        1000
         89           4 1995-07-04        1000
        122           7 1995-02-01         144
        122           7 1995-02-02          48
        122           9 1995-02-01         144
        241           1 1995-06-01           1
        241           2 1995-06-01          32
        241           3 1995-06-01           1
        241           4 1993-12-31           1
        241           8 1995-07-01           1
        241           9 1995-07-01         144
        440           6 1994-10-10           2
        475           1 1993-12-31           1
        475           1 1994-07-01           1
        475           2 1993-12-31          32
        475           2 1994-05-31          32
        475           3 1993-12-31           2
        475           4 1994-05-31           1
        999          10 1996-01-01         144

                25 rows found


SELECT * FROM supplier;
     NUMBER NAME                 CITY
========== ==================== ===============
          5 Amdahl               San Diego
         15 White Stag           White Plains
         20 Wormley              Hickville
         33 Levi-Strauss         San Francisco
         42 Whitman's            Denver
         62 Data General         Atlanta
         67 Edger                Salt Lake City
         89 Fisher-Price         Boston
```

```
122 White Paper          Seattle
125 Playskool            Dallas
199 Koret                Los Angeles
213 Cannon               Atlanta
241 IBM                  New York
440 Spooley              Paxton
475 DEC                  Amherst
999 A E Neumann          Madison

        16 rows found
```
