CS3431: Project Description
B-term, 2011
Building a Database Application
Phase 4: Complete Functioning Application

Due Date: Dec. 6, 2011 (8:00AM).

Description:

In this phase, you will complete the database application in Oracle (Full design and Full functionality). You will use triggers (code inside the database) to enforce business constraints and derived attributes.

Step 1 (Derived Attributes):

Derived attributes are the ones that can be computed from other attributes. In your database, you are required to have **at least three derived attributes**. If you do not already have enough derived attributes, then extend your model and add new ones to the design. Examples of derived attributes can be:

"Age attribute that is automatically computed from DoB attribute",

"NumCourses attribute in a STUDENT table that is automatically computed by counting the courses a student takes",

"GPA in a STUDENT table that can be automatically computed from the individual grades of each course"

Theoretically, any derived attribute is redundant but they can be added to the database if they are frequently queried.

Step 2 (Business Constraints):

As stated in the previous phases, you should have identified several business constraints that cannot be captured by ERD or relational model. In this phase you are required to have **at least three of these constraints** that can be enforced using database triggers. If your design does not have enough of such constraints, then extend the design to add more of them.

Step 3 (Create Database Triggers) [30 Points]:

a) **[15 Points]** Create a set of database triggers that automatically maintain the consistency of the derived attributes. That is these triggers should re-compute the derived attributes whenever the base values/records change. Even if you try to manually insert wrong values in these derived attributes (or update them), the triggers should compute the correct values.
b) **[15 Points]** Create a set of database triggers that automatically enforce the business constraints you defined.

Step 4 (Create Views) [10 Points]:

Select 4 of the queries you have and create views for them (so you will have 4 views, one for each query). The purpose of the view is that queries are now register and stored in the database. Once they exist, you can now issue queries on top of these views. So your task in Step 4 is to create 4 of these views.

Step 5 (Querying The Views) [10 Points]:

For each view you defined in Step 4, add one query that references the view (4 queries). You can think of the view as table without data. So your new queries can reference one view, multiple views, or mix of actual tables and views in the same query (This is left up to you).

Step 5 (Checklist of Final Complete Design):

Before you submit your final application, It is good to go over this checklist to make sure you have everything in place and functioning in Oracle:

a) All tables are created.
b) All Primary keys and foreign keys are defined.
c) All other additional constraints you want to capture, e.g., domain constraints, NOT NULL constraints, etc.
d) Sample date already inserted into the tables.
e) Queries are running and returning the correct results.
f) The required database triggers are created. They automatically compute the derived attributes and they enforce the business constraints. Try to break these constraints by inserting invalid values or records, and make sure the triggers will prevent that.
g) Make data updates to change values in the database that affect derived attributes, and make sure the triggers will automatically re-compute these derived values.
h) Issue some queries over the views you created in Step 4, and make sure they return the correct results.

What To Deliver

Each group should deliver a report (.doc or .pdf) and a script (text file .sql) with the following details:

Report (username.doc or username.pdf):

1- Description of the application
2- ER Diagram of the application (The final one including any modifications)
3- Relational model (The final one including any modifications)
4- List of derived attributes and how to compute each one from other existing attributes. For each derived attribute, list the triggers you created to enforce that the attribute is always up-to-date.
5- List the business constraints you have. For each constraint, list the triggers you created to always enforce this constraint.
6- List the 4 views you created in Step 4, and the queries that reference these views (Step5).

Script (username.sql):

The script should contain all the commands needed to create your database. It should have commands for (follow the order given below):

1- Creating all tables and defining the constraints
2- Creating all needed triggers
3- Inserting sample data
4- Creating the 4 views you defined in Step 4
5- Querying the views as you defined in Step 5

Similar to Phase 3, your TA will run the script you submit using the following command inside SQL, so make sure your script is working fine without generating errors:

SQL > @<username>.sql;

Grading of Phase 4 (How to lose points !!!)

- Phase 4 is of maximum 50 points distributed as shown in Steps 3, 4, and 5 above. Missing any of the above requirements will make you lose some points.
- Additionally, your TA will try to break your derived attributes and business constraints that you defined. That is, using database operations, e.g., inserting or deleting some records, or updating some values, he will try to make the derived values inconsistent. And the same for business constraints. Your database triggers should prevent that. Given **three** derived attributes and **three** business constraints, each broken one will cost you **4 points** (with maximum lose of **24 points** even if you introduce more derived attributes or business constraints).

Max Points:
The maximum grade is 50 Points. Late submissions follow the rules stated on the website.

Deliverables:
Each team should deliver ONE zip or tar file containing the report and the script.

Submission:
Submit a hardcopy in the beginning of the class (8:00AM), or submit electronically via blackboard.wpi.edu website.