Database Application Development Methodology

- an Example

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Assumptions

• Business process is well-designed
• Documents are known
• Tasks are known
• System boundary is known
• One database schema unifying all views can be designed
  – difficult: interests, goals, power, politics
  – problems with the methodology?
  – problems with the organization?
  – or-ga-ni-za-tion: “an entity created to pursue a shared set of goals”
The Software Process

- Business process (re-)design
  - Analysis
  - Specification
  - Design
  - Implementation
- Testing
- Operation
- Maintenance

Unique for Database
Methodology

Management
Overview of the Methodology
- data first!!

1. Analysis
2. Specification
3. Design
4. Implementation
Example Project Description

• The project description represents the customer:
  – Business process
  – Documents
  – Tasks
  – System boundary
GTOnline is a simple social networking application with a set of basic features similar to those found on sites like Facebook and LinkedIn. GTOnline users maintain a basic profile including their name, birth date, hometown, current city, schools they have attended, and places of employment. Users can connect to other users by sending friend requests. If a request is accepted, then a friendship link is established between the two users. In addition to maintaining basic profile information, users can let their friends know what they are currently doing by writing status updates. Users can also comment on their friends’ status updates as well as their own status updates. The GTOnline application also supports administrative users who maintain the list of schools and places of employment.
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Read the full example project description!

Screen shots and small requirement snippets are shown on the following slides. These are not sufficient to develop the application in this example.
These snippets of task requirements are taken from a comprehensive project description and are just part of what is used to design the IFD Diagram.

[Requirement]: ..... Logging In to GTOnline via the login screen. All users are uniquely identified by his or her Email Address. Providing a valid Email Address and Password combination will log the user into the system. Providing invalid login credentials should display an error message and return the user to the login screen.

[Requirement]: ..... Users who are new to GTOnline must register first. A Register button is provided directly on the login page. Clicking this button displays the new user registration form. After the user clicks Register, the system should verify that all fields are filled in, that the Email Address has not already been registered, and that the Password and Confirm Password fields are equal.

[Requirement]: ..... All GTOnline users (except administrative users) have a User Profiles containing basic information about them. After a new user registers with GTOnline, they should be taken immediately to the Edit Profile screen. The basic profile properties include the user’s Sex, Birthdate, Current City, Hometown, and any number of Interests.
[Requirement]: ..... Social networks are all about making connections. **GTOnline allows users to search for friends and connect to them.** There are several steps involved in making a connection with a new friend on GTOnline:
- The user searches for a friend based on several profile criteria including Name, Email Address, and Hometown.
- Then, the user submits a friend request to another user with whom they wish to connect.
- Finally, the other user receives the friend request and accepts it or rejects it.

[Requirement]: ..... There are a number of links on the View Profile screen:
- Clicking **View Friends** shows the list of friends for this user.
- Clicking **Log Out** signs the user out of the system and shows the login screen.

In addition, the currently logged in user can:
- Clicking **View Pending Requests** to see the list of friend requests that have not yet been accepted or rejected.
- Clicking **Edit Profile** shows the Edit Profile screen allowing the user to make changes to his or her own profile.

[Requirement]: ..... The profile also contains professional information. The user will select his or her **Employer** from the list and then provide a **Job Title**.

[Requirement]: ..... The profile also contains information about the user’s education. The set of available **Schools** and their **Types** is maintained by the GTOnline. A user can have any number of schools associated with his or her profile and can also provide a **Graduation Date** for each school.
Analysis – Information Flow Diagram

- information flow; **not** control flow
- **never** connect two documents
- **never** connect two tasks
Use document and task names from the project description in the IFD!
What goes into the database?
What comes out of the database?

- Everything in the database must come from somewhere
- Everything on the input documents must go somewhere
- Everything in the database must be used for something
- Everything on the output documents must come from somewhere
Specification

• EER Diagram
• Data Formats
• Constraints
• Task Decomposition

Learn about the Entity Relationship Model
[Requirement]: ..... All users are uniquely identified by his or her Email Address. Providing a valid Email Address and Password combination will log the user into the system ..... 

[Question]: Should Name be a composite attribute? Well, you decide, sort of ..... 

These snippets of task requirements are taken from a comprehensive project description and are just part of what is used to design the ER Diagram.
Use attribute names from the documents in the EER Diagram!
[Requirements]: ..... All GTOnline users (except administrative users) have a profile containing basic information about them. ..... 

[Requirements]: ..... Administrative users have some of the same information as regular users (Email Address, Password, First Name, and Last Name) ..... , but do not have a full profile and cannot request friends, etc. A user must be either an administrator or a regular user, but never both. GTOnline also tracks the last date and time that an admin user logged in to the system .....
[Requirements]: ... A list of **Schools**, from which the user can select, is maintained in the system. Assume that all **School Names** will be unique. A user can have any number of schools associated with him or her and can provide a **Graduation Date** for each school. ..... It is possible that the same school will appear multiple times with different graduation dates.
[Requirements]: ..... Each school must have a **School Type**. There are four possible types: College/University, High School, Middle School, and Elementary School. ..... It should be possible for the database administrator to add new school types from behind the scenes.
[Requirements]: ..... Administrators are responsible for managing the list of Employers. Assume that all Employers have a unique Name.

[Requirements]: ..... The Job Title field is not managed by the administrator and can be any value provided by the user. A profile can contain multiple Employers and the same Employer may even appear multiple times as long as the Job Title is different in each case.
[Requirements]: ..... friendship is not always reciprocal ..... just because Emily is friends with Sarah, this does not imply that Sarah is friends with Emily. ..... 

..... the **DateConnected** field is set when the friend request is accepted, *not* when the request is originally sent.
Data Formats
- *beg, steal, borrow*

User:
- Email: max 36 chars. Example: `leomark@cc.gt.edu`
- Password: max 20 chars. Example: `qwerty`
- Name: FirstName: max 25 chars; Last: max 40 chars
- Addresses (when needed) are very very difficult. E.g., look at the 208 page guideline at http://pe.usps.com/cpim/ftp/pubs/pub28/pub28.pdf

RegularUser:
- Birthdate: Date: 'YYYY-MM-DD'
- Sex: \{M, F\}
- CurrentCity, HomeTown: max 20 chars, each
- Interests: multi-value with 16 chars, each
Constraints

Examples:

• DateConnected is NULL until request is accepted.
• Cannot be Friend with yourself.
• Can only comment on Status of Friends.

Ignore:

• Data formatting constraints
• Constraints that can be expressed in the EER Diagram