Data and Applications

Requirement Analysis (Project Phase #1)

Submitted By:

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DfOEP : Database for Online Educational Platform

Introduction to the Mini World

The mini world chosen here is an application used as online platform for a college to be used to conduct academic activities online in response to the global pandemic caused of Covid-19.

The app offers a platform to conduct online classes through live video streaming and a platform for online quizzes. We can have a TEAM on the app to conduct activities related to a particular subject. Students and Instructors (TAs and professors) form accounts using their email ids on the app and join teams as per the requirement.

The teams are further divided into channels and channels conduct meetings. Meetings are presented by instructor accounts and attendance is recorded for each student. The app also has provision of conducting some quizzes online which follow a particular pattern. From a set of questions, each student is assigned a fixed number of random questions and the student submits the response of each question separately, the response is evaluated then by a TA on per question basis. So effectively all the responses of a particular student are usually checked by different TAs. As there is no chat question answers and doubt clearing are done through microphones.

Users and User views

1. Student User : A student user attends the meetings of the teams that are already assigned to him/her. He/she attemptsthe quizzes that are assigned. After the evaluations are complete the student will then get a view of his/her records like attendance and marks achieved in quizzes and sgpa.
2. Instructor User : An instructor has the right to create a team, add students to the team, create channels, conduct meetings and take quizzes. The instructor accounts also can get their information for the subject they are teaching. The instructors should be able to see the marks of all students, their attendance, the responses for the questions and the evaluated marks.

Data Requirements:

1. Each User is represented as an Account (ACCOUNT). Every Account has:
    - Name – A composite attribute made up of 2 parts:
        - First_name -a text of length up to 80.
        - Family_name - a text of length up to 80.
    - Email _id - text of length up to 80 and a valid email. This is unique for every user – a key.
    - Password - text 8 to 15 long
    - Mobile_number – a 10 digit integer. This is unique for every user – a key.
    - Sex – a single character ‘M’ or ‘F’ or ‘O’
    - Address - text of length up to 80 and a valid address(multivalued).
2. There are two types of accounts i.e. subclasses: INSTRUCTOR (Professor and Teaching Assistant) and STUDENT.
    - INSTRUCTOR has the following atttribute:
        - Degree - text of length up to 80 (multivalued). Degrees can be 0 for teaching assistants.
    - STUDENT has the following atttributes :
        - Roll_number – a 10 digit integer. This is unique for every STUDENT.

- Batch - text of length up to 10 signifying if student is undergraduate or post graduate or phd and in which year.
- cgpa - a decimal between 0-10 both inclusive as derived attribute.

3. We have a TEAM for every course offered. Each TEAM has the following atttributes :
   - Team_name - text of length up to 80. This is unique for every TEAM.
   - Course – A composite attribute made up of:
     - Course_name : text upto length 30, telling name of the course.
     - Course_details : text upto length 100 telling about the course.
     - Textbook : text upto length 30, the preferred textbooks for the course (multivalued).
4. Each TEAM has some channels(CHANNEL) depending upon the need of instructors. Every CHANNEL has the following attributes:
   - Channel_name - text of length up to 80. The channel name is the partial key for the entity CHANNEL.
5. Instructors (INSTRUCTOR) of a team can organize meetings (MEETING) in a CHANNEL of which they are part of. Each MEETING will have :
   - Start_time - a valid time in IST. It is also the partial key.
   - End_time - a valid time in IST.
   - Length - time length of meeting in hours, minutes, and seconds. This is a derived attribute.
   - It is a weak entity with its partial key being the Start_time.
6. Instructor (INSTRUCTOR) can organize quizzes (QUIZ) for the teams he is admin of. QUIZ has the following attributes :
   - Quiz_id : A composite key formed from combining Course_name and Quiz_no. This is unique for every QUIZ.
     - Course_name - text of length up to 80 denoting the course for which this quiz is being conducted.

    - Quiz_no – an integer representing what number of quiz is this in a particular course.

- No_of_qn – an integer representing the number of questions to be asked in the quiz.
- Max_marks – an integer representing the maximum obtainable marks. A derived attribute as all questions are of 10 marks. Max_marks = No_of_Qn * 10.

7. QUESTION is at random selected to be part of quizzes (QUIZ). It has the following attributes :

- Qn_text : text of length upto 1000. The question itself in text format.
- Course_name - text of length up to 80 denoting the course for which this QUESTION is relevant.
- Q_id – an integer. A unique identifier for each question.

Relationship Types:

- MEMBERSHIP : Between TEAM and ACCOUNT
  - Teams have members in it. Members are account users. Each team needs at least 2 members and can have at max 300 members. An account must be part of at least one and at max any number of teams.
- ADMIN : Between TEAM and INSTRUCTOR
  - Each team has only one instructor that can act as admin of the team. An instructor can be admin of multiple teams depending upon the number of courses he/she teaches.
- CONSISTS_OF : Between TEAM and CHANNEL
  - Teams are disributed into several channels for convenience. Channels are weak entities which are identified by team entity. A team may have multiple channels, but a channel is associated with only one team.
- ORGANIZE : Among CHANNEL, INSTRUCTOR and MEETING
  - Meetings are organized by instructor accounts and are weak entity in themselves, identified by the channel in which they are organized and the instructor that organizes them. There should be exactly one organizer. Thus, the identifying relationship of the meetings is a ternary relationship. A meeting can occur in only one channel. A channel can have multiple meetings.
- ATTENDS: Between MEETING and STUDENT
  - Students that are part of the team can attend any meeting in any channel of the team. A meeting can have multiple students attending it.
- RESPONSE: Among INSTRUCTOR,QUIZ,QUESTIONS and STUDENT
  - In quizzes we have multiple questions assigned randomly to one student from the set of all available questions, and student submits answers to each one of them separately and each answer is checked by a different evaluator. Thus, this relationship is of degree 4 and the participants are quiz, question, student, evaluator (an instructor). A student may or may not attempt a question. The relationship has the following attributes :
    - Answer – a text with length upto 1000, the answer of the student.
    - Marks – an integer, the marks awarded by evaluator out of 10.
- GIVES: Between STUDENT and QUIZ
  - A student can give several quizzes and a quiz can be given by several students. It has one derived attribute:

    - Percentage_marks – a decimal with precision upto 3 digits.
- SUPERVISES: Between INSTRUCTOR(professor) and INSTRUCTOR(teaching assistant)
    - The entity INSTRUCTOR takes part in this relationship in 2 roles – professors and teaching assistants. A professor supervises multiple teaching assistants, but a teaching assistant is supervised by only one professor.

Functional Requirements:

The database is nothing without the capability to provide data in multiple views and to do some operations and deduce results from the data. Thus, for our database we must be able to provide the following functionalities as part of itself.
Functions in the database can be broadly categorised in 2 types: Retrieval, Analysis and Modification.

Retrieval:

The database not only needs to store data but also display it in a meaningful way. We have retrieval functions for this. The retrieval functions present in our database are:

1. **Selection**
    I. The database has a function to display details of the course that is going on the team given the Team_name. It gives us all the Course_details and preferred Textbooks.
    II. The database has a function to display the list of all member participants that are part of a team given the Team_name as input.
    III. The database has a function to display the list of all participants, both students and instructors that are part of a given meeting given the Team_name, Channel_name and the instructor (Email_id) who organized it.
    IV. A student can find his/her own marks for each question given the Quiz_id and student Roll_number as input.
2. **Projection**
    I. The database has a function to display a list of all students and their personal details given a specific year (Batch) as input.
    II. The database displays the list of top 10 students for each semester by Sgpa for felicitation.
3. **Aggregate Function**
    I. Given a Course_name the database provides the average marks of all students per quiz.
    II. Given a student Roll_number and Team_name the database displays the attendance of the student in the meetings held in that team.

4. **Search Function**
    I. An instructor has the ability to find all information about a student by searching through student name (Name). If there are multiple results all of them will be displayed.

Analysis:

The database systems will need to analyse the data it has stored to guide the instructors on their teaching methodologies.
The functions provided by our database for analysis are:

1. Number of students in ranges of below 50%, 50% - 60% and so on till 90%-100%. This will show what percentage of students are more comfortable with the subject and are able to grasp the concepts. This will be a measure of how effective online teaching is.
2. The database creates a report card for a student given his Roll_number. The database displays his/her percentage for all the courses in that semester as well as his Sgpa.
3. For a given course(Course_name) display top 20 students with highest attendance, top 20 with lowest attendance, top 20 students with highest marks and top 20 with lowest marks to see if those who attend meetings more score higher or not.

Modification:

The database needs regular update and undergoes constant changes. To help users with this we have modification functions that are:

1. **Insertion**
    I. Create a new account (ACCOUNT) in the data base with all the necessary attributes. The account must satisfy all the previously stated constraints.
    II. Creating a new team (TEAM) and include members in them. The team must have at least 2 members and 1 admin. The team must satisfy all the previously stated constraints.
    III. Creating a new channel (CHANNEL) with a unique Channel_name for the given TEAM. The channel must satisfy all the previously stated constraints.
    IV. Creating a new meeting (MEETING) with Start_time. The End_time is stored only when meeting ends. The meeting must satisfy all the previously stated constraints.
    V. Creating a question (QUESTION) with a Qn_text. The Q_id is automatically generated and reported. The question must satisfy all the previously stated constraints.

VI. Creating a new quiz (QUIZ) for a given course(Course_name) with a Quiz_no. The quiz must satisfy all the previously stated constraints.

2. **Update**
   I. An operation to update the marks (Marks) obtained by student ion a question after rechecking. The operation automatically updates Percentage_marks in quiz and student grade.
   II. Any account (ACCOUNT) can update his/her Address or Mobile_number through the database.
3. **Deletion**
   I. The databse provides an operation to Delete an account (ACCOUNT) and all the associated details given its Email_id.

Note: We are removing account data only from app database not from institute database thus the data is still in institute database for future verifications.

THE END