CS3700 Assignment-1 (Database Design): Part 1

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05/09/21
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Database Requirements Description:

The domain that we chose to model was an employee database of a software firm containing personal and official details of the employees.

An employee ID identifies each employee. Other information associated with each employee is their name which consists of both their first, middle and last names separately, their phone number, personal email, their date of birth, all the education degrees that they have achieved so far, along with the respective disciplines, year of study and the institutions at which they studied, the date on which they joined the firm, their salary, and their present residential address. The company email id of an employee is just the employee id followed by the company domain. The model includes any number of dependants that the employees and their details registered. These details have their name, relation to the employee, date of birth, phone number, and the dependant number, which uniquely identifies each dependant among those registered by a particular employee.

This firm has multiple branches, which are identified by the branch name and the address. Each employee works at precisely one of the branches while there can be numerous or no employees working in a single branch (We assume that a location could be unused and so no employees work there).

The firm also consists of various departments identified by department name. Each department has a department head and a domain. Each employee works in precisely one department at a given time, whereas there may be one or more employees in a single department. An empty department is not possible as at least there will be one person who is the head.

This company has various job titles, each identified by a job id and characterized by the job description and permissions. (Each permission is a string indicating a particular set of authorizations that an employee inherits from his Job title). Every employee is associated with one specific job title at any given time. There may be many employees with the same job title. It is also possible for no employee to have a particular job title.

The employees of this firm work on various projects. A project ID identifies a project. The project could be any possible stage of development that is given by its status. The other details of a project include the project head and the client's name. Each project has one or more employees assigned to it at any time. The employees are given a project with a timeline with start and end dates.

Every employee has a supervisor that they report to who is also an employee in that firm. Employees at the top-level report to each other. Each supervisor can mentor several employees and help them build their careers.

Considering that the firm works on diverse projects, the employees will need access to various software solutions to work productively. This software may be confidential or maybe subscription-based. Hence, access to the software is provided to employees based on the project they work on. Each software is characterized by its name, version, developer contact, and contact helpline. A project could require any number of software. The software can be identified uniquely using its name and version. Access to the software is attributed to the job title as well as the project assigned. Any number of software could be assigned. It is also possible that software is not assigned to any job title in any project. A job title may have access to no software for a project. A project may also have no access to software for any of the involved job titles. (The software accesses given to an intern/vice-president for the same project differ)

Entities and Attributes:

- Employee: Entity capturing the details of an employee in the firm
  - Name: The name of the employee (Composite)
    - First_Name: The first name of the employee
    - Middle_Name: The middle names of the employee (Multi-valued)
    - Last_Name: The last name of the employee
  - Phone_No: Mobile number of the employee
  - Email: Work email of the employee (Derived from Employee_ID)
  - Personal_Mail: Non-work email of the employee
  - Joining_Date: The first working day for the employee
  - Employee_ID: Unique identifier for each employee (Primary Key)
  - Salary: Annual salary of the employee
  - Education: Academic qualifications of the employee (Composite Multi-valued)
    - Branch: Discipline in which the Degree was obtained
    - Degree: Bachelors, Masters, etc.
    - Institute: Institute where Degree is obtained
    - Year: Year of completion of Degree
  - Address: Residential Address of the employee (Composite)
    - House_No: Door number
    - Street_Name: Name of the street
    - Locality: Name of the region/landmark
    - City: City name
    - State: State name
    - Pin_Code: Postal code for the residential address

- Dependant: Entity capturing the dependants of an employee
  - Name: Name of the dependant
  - Relation: Relationship to the employee
  - Phone_No: Phone number of the dependant
  - DOB: Date of birth of the dependant
  - Dependant_No: Index of the dependant among the dependants of the employee (Partial key)

- Branch: Entity capturing the working location/branch
  - Branch_Name: Name of the Branch (Primary key)
  - Address: Address of the branch

- Department: Entity capturing the teams in which the employees work
    - Dept_Name: Name of the team/department (Primary key)
    - Dept_Head: Employee_ID of the head of the department
    - Domain: Domain of the team

- Job_Title: Entity capturing the role in which an employee works
    - Job_ID: Identifier of the job role (Primary key)
    - Job_Name: Name of the job
    - Permissions: List of permissions that the employee is entitled to (Multi-valued)

- Project: Entity capturing the ongoing projects in the firm
    - Project_ID: Identifier of an ongoing project (Primary key)
    - Project_Name: Name of the project
    - Project_Lead: Employee_ID of the head of the project
    - Client_ID: ID of the client from the client database
    - Status: Status of the project

- Software: Entity capturing the various software available
    - Software_Name: Name of the software
    - Version: Version of the software
    - Dev_Contact: Developer contact for the software
    - Admin_User: Point of contact for access issues to the software

- Duration: Attribute capturing timeline of employees' involvement with a project (Composite attribute) (Attribute of Works_In relationship)
    - From_Date: Date from which the employee works on the project
    - To_Date: Date to which the employee works on the project

Relationships:

- Reports_To: It is a binary recursive relationship from Employee to itself and describes who (supervisor-employee) each employee (mentee-employee) reports to. Each employee may have any number of mentees whereas a mentee has exactly one supervisor. Thus mentees are of total participation and supervisors of partial participation.

- Has_Access: This is a ternary relationship between Job_Title, Project, and Software and it implies that a tuple (j, p, s) in this relationship means that any employee of Job_Title j working on a Project p has access to the Software s. Here a Job_Title could have access to any number of software across all projects and a project could have access to any number of software across all Job_Titles. It is also possible that access to a software is given any number of times across all Job_Titles and Projects. All three entities are of partial participation.

- Has_Job_Title: It is a binary relationship from Employee to Job_Title that gives the information regarding the job title of each employee. There may be multiple employees with the same job title, but each employee has only one job title. Employee entity is of total participation and Job_Title is of partial participation.

- Works_In: It is a binary relationship between Employee and Project which tells about the employees working on a project. A project has one or more employees working on it. An employee could be working on any number of projects. Employee entity is of partial participation and project is of total participation. This relationship has the following attribute:
    - Duration: This is a composite attribute representing the timeline during which the employee worked on that project. Its components are:
        - From_Date: Date on which employee started working on the project.
        - To_Date: Last date until which employee will work on the project.

- Is_Dependent: It is a binary relationship between Employee and Dependent, representing all dependants of an employee. Each employee is associated with any number of dependants but each dependant is related to exactly one employee. Here Dependent entity is of total participation and employee is of partial participation.

- Works_At: This is a binary relationship from Employee to Branch and tells the branch at which each employee works. A branch could have any number of employees but an employee works at exactly one branch. Here the employee entity is of total participation and the Branch entity is of partial participation.

- Belongs_To: This is a binary relationship from Employee to Department and represents the department in which each employee works. A department has at least one employee working in it but an employee works in exactly one department at a time. Here the employee entity is of total participation and the Department entity is of partial participation.

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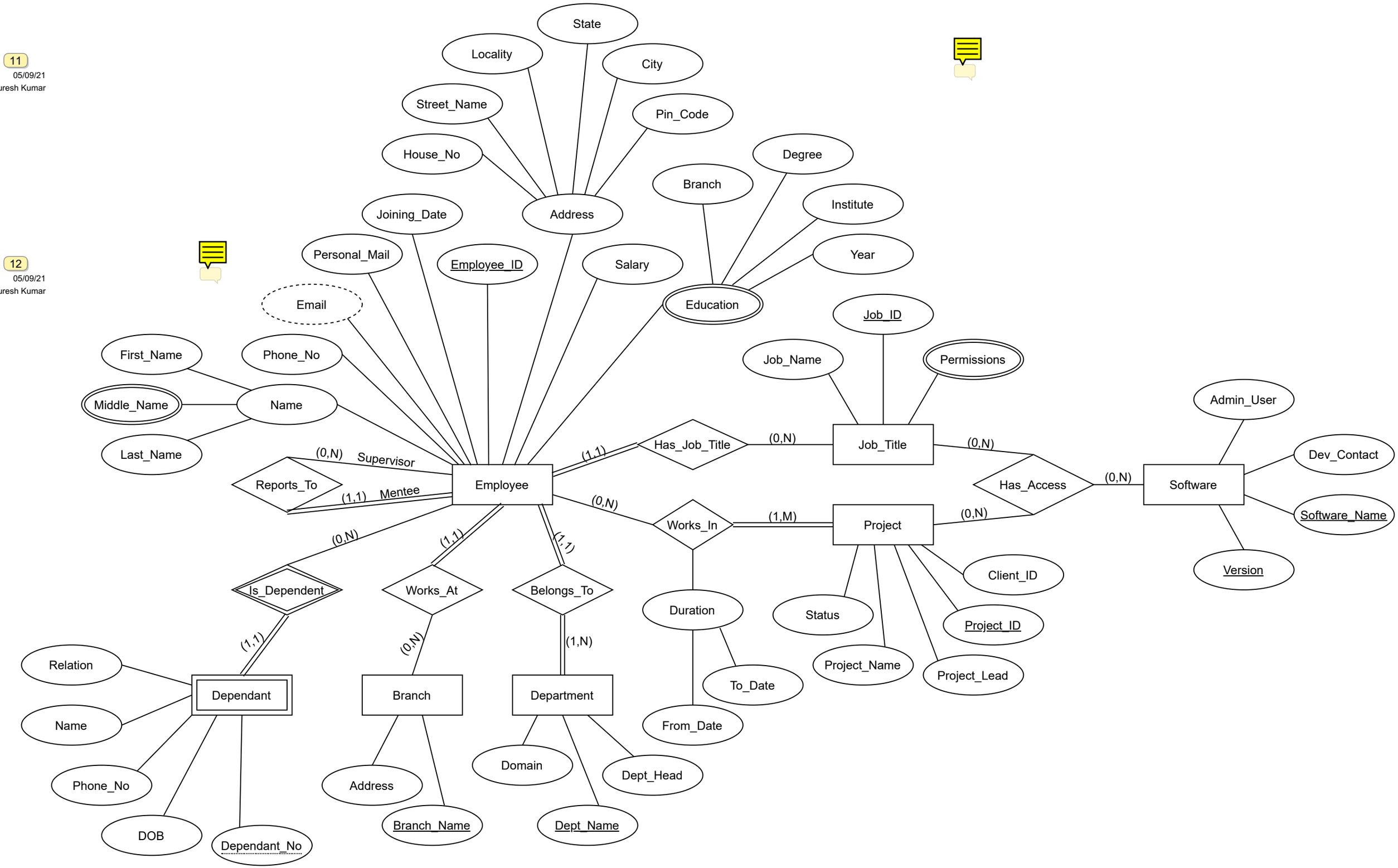

CS3700 Assignment-1 (Database Design): Part 1

Gorre, G; Satya, Venkata

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please write the domain name clearly..somewhere near to the heading part...

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please write the purpose of this modeling in clear words...

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each employee essenatially has a first name, possibly 0 or more middle names, and a last name.

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write intuitive definitions, do not use keywords such as- composite, multivalued, etc.

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please refer to the definition of derived attribute..

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we should not use terms such as- binary recursive relationship, ternary relationship, etc, at this level of the design. Instead, write an intuitive explanation regarding the uses of these relationships...

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please identidfy all other attributes which can uniquely identify a tuple in a relation, other than Employee-ID, Project-ID, etc.

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can we derive email from something?, why dashed ellipse?