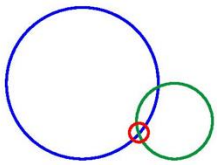

STUDENT IT ARCHITECTURE COMPETITION - III

RECOGNIZING AND PROMOTING THE ART AND SCIENCE OF IT ARCHITECTURE

Architecture Design Document

Part I

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REVISION HISTORY

Version Number	Changes	Date
1.0	Initial version	January 30, 2018
1.1	Wording, diagrams	January 27, 2018
1.2	Major changes to diagrams	February 5, 2018

1 OVERVIEW

Finance to Education (F2E) is a non-profit organization that supports the financial needs of students in their pursuit of education. Currently, F2E's activities are all managed manually. Therefore, an IT system would benefit F2E by streamlining all processes and creating a system that can adapt to the company's anticipated growth. This document provides the proposed conceptual and informational architectures of the F2E IT system.

2 CONCEPTUAL ARCHITECTURE

This section contains the conceptual architecture of F2E. It consists of a context diagram and a layered viewpoint, each with descriptions of the components. The purpose of conceptual architecture is to provide a high-level view of key structures and relationships of the F2E IT system.

2.1 Assumptions

2.1.1 Donors will be directed to a third-party payment system when making donations.

2.1.2 Database and application administration roles will be assigned to F2E staff, paid consultants, or volunteers, depending on F2E's budget constraints and in-house expertise.

2.1.3 Currently, interactions between F2E and the banking systems are managed manually, i.e., The banking system is not a part of the streamlined IT solution for F2E.[1]

2.1.4 Currently, interactions between F2E and the educational institutions are managed manually, i.e., The educational system is not a part of the streamlined IT solution for F2E.[2]

2.2 Context Diagram & Its Components

The Context diagram is a part of the conceptual architecture. It depicts the relationships between the IT solution components and its relationships with user groups and institutional stakeholders. The purpose of the context diagram is to provide an overview of the F2E IT system and its relationships with entities.

[1] It is possible that future development of F2E IT solution might automate such job.
[2] It is possible that future development of F2E IT solution might automate such job.

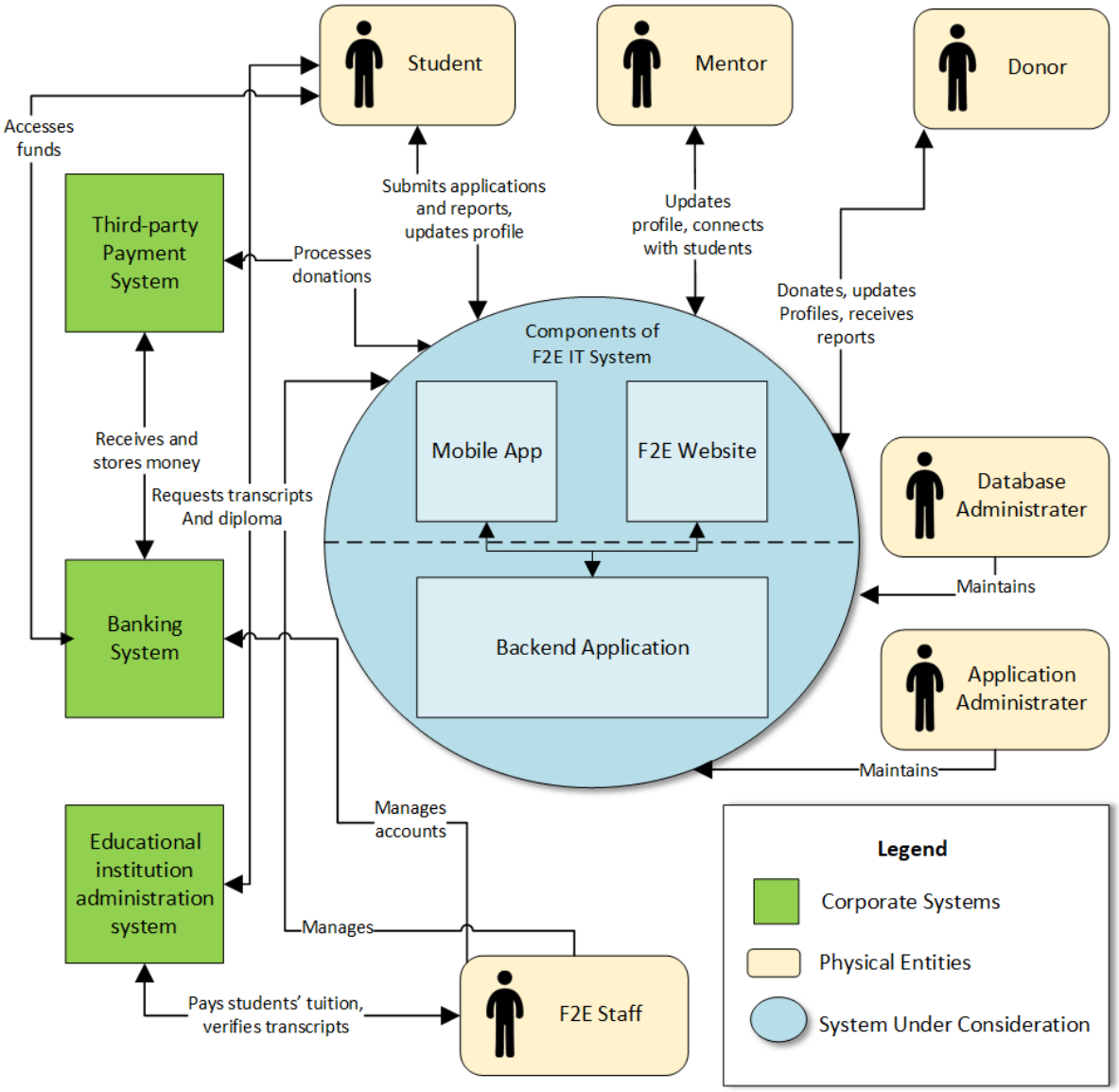

Figure 1: Context Diagram

2.2.1 F2E IT System:

The F2E IT System is the proposed IT solution for F2E's shift from a manual to an online management system. The solution contains a mobile app, website, and backend application.

2.2.2 Third-Party Payment System:

The third-party payment system is the service that will be used when a donor makes an online donation. F2E's mobile application and website will direct users to the third-party payment system. Funds from the third-party payment system will go to the banking system.

2.2.3 Banking System

The banking system will hold funds related to F2E business. That is, funds from donors will be deposited in the banking system. In addition, students who receive sponsorship funds for anything besides tuition, will access their funds directly from the banking system. Lastly, F2E staff are responsible for manually managing the banking accounts.

2.2.4 Educational Institution Administration System

The Educational Institution Administration System will interact with students and F2E staff. Students who attend the educational institution, will request transcripts, diplomas and, reports to send as deliverables to maintain membership in F2E. F2E staff will interact with the educational administration to handle transactions regarding tuition payments and to verify students' transcript validity.

2.2.5 Student:

A student must create and maintain his or her user account and can submit applications through the student portal. In addition, a sponsored student, may send and receive emails and receive auto reminders from F2E. A sponsored student will have direct access to the education system that he or she is attending. If the sponsored student is being sponsored for room, board, or other financial obligations besides tuition, the student will also have direct access to the banking system.

2.2.6 Mentor:

A mentor is an individual who advises one or more sponsored students. A prospective mentor will be able to apply and register as a mentor through the website or mobile app. Once registered, he or she can be assigned to mentor one or more students. The mentor will use the mentor portal to communicate with students and F2E staff.

2.2.7 Donor:

A donor is an individual who gives funds to support F2E's sponsored students. The donor will have access to the website and mobile app through the donor portal. When donating, the website and mobile app will use a third-party payment system to complete the donation transaction. In addition, donors will receive yearly reports from F2E about student progress.

2.2.8 Database Administrator:

A database administrator is in charge of maintaining and updating the database. The database administrator will have direct access to the database for maintenance purposes and to add or modify fields, tables, or relationships when necessary.

2.2.9 Application Administrator

An application administrator is in charge of maintaining the IT system's daily functions. The application administrator will have direct access to the backend of the system for maintenance purposes and to add or modify functionalities when necessary.

2.2.10 F2E Staff:

F2E staff are in charge of business responsibilities for F2E. In addition, F2E staff will have access to the website through the management portal and direct access to the financial system to complete financial business transactions.

2.3 F2E IT System Components Diagram

The IT solution uses a client-server model to divide tasks between the service provider and the client. The service provider is the nonprofit, F2E and the clients are F2E's website and mobile app. A user, such as a member of the general public, a sponsored student, a mentor, or a donor, can visit a client in order to access a service function from the server. Service functions may include turning in an application, submitting grades and financial reports, communicating with F2E staff or mentors, browsing F2E's website, and more. The solution utilizes a client-server architecture to allow for reduced costs and scalability. That is, a client-server architecture reduces costs because fewer support staff are needed to manage the centralized server, reducing management costs. In addition, it can more easily handle new resources, which will allow for convenient adjustments in times of company growth. The IT System is composed of a mobile application, website and backend application.

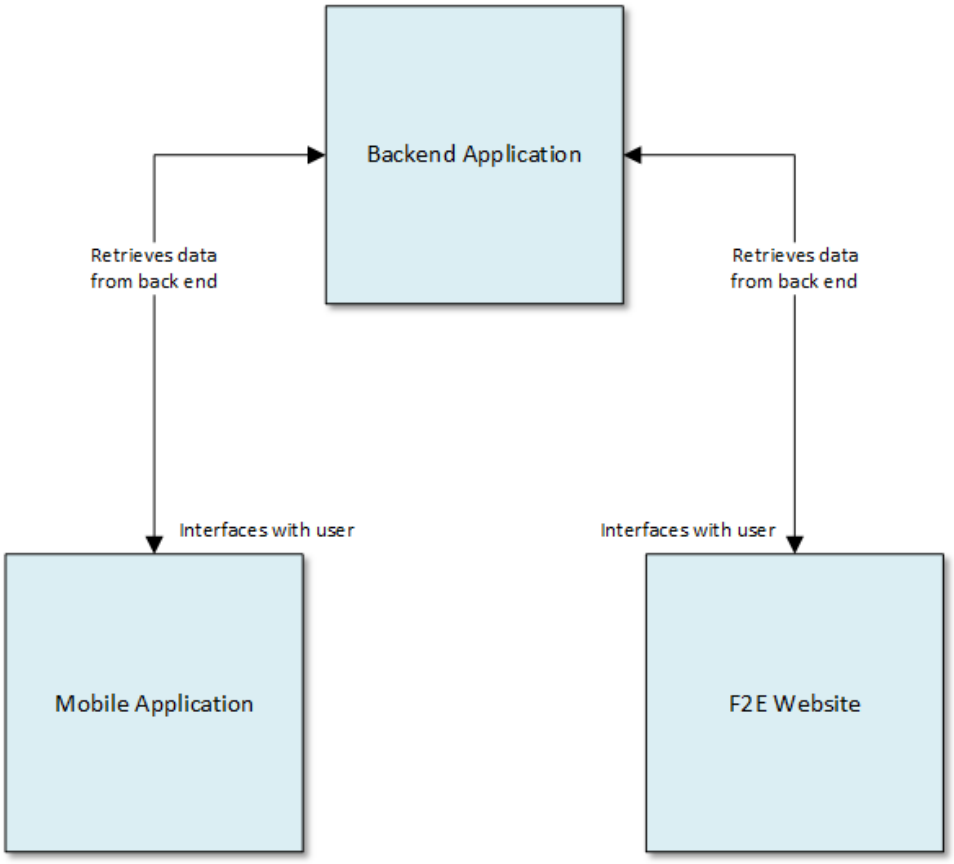

Figure 2: Components Diagram

2.3.1 Mobile Application

Users will use the mobile application to view information regarding F2E on one's mobile device. The type of portal access is determined by the role of the user. For example, F2E staff will access the management portal, donors will access the donor portal, mentors will access the mentor portal, etc. In addition, a user may register and log in to his or her account, edit the account, and take actions

depending on his or her role. This component is a client that a user interacts with to request service functions from the server.

2.3.2 Website

Users will use the website to view information about F2E on a web browser. The functions and purpose of the website are the same as the mobile application above.

2.3.3 Backend Application

F2E's data will be organized, managed and updated in the database. The backend application system is a software application for administration, documentation, tracking, and reporting.

2.4 Layered Viewpoint of F2E IT System & Its Components

In contrast to the Context and Components Diagram which show relationships between entities, the Layered Viewpoint shows the multiple layers of the system. In addition, each layer depicts the individual components that belong to that layer. The layers for the IT System include: External Roles and Actors, Access, Application, Data and Security. The Security layer is one that runs throughout the entirety of the stack and has features on each of the other four layers.

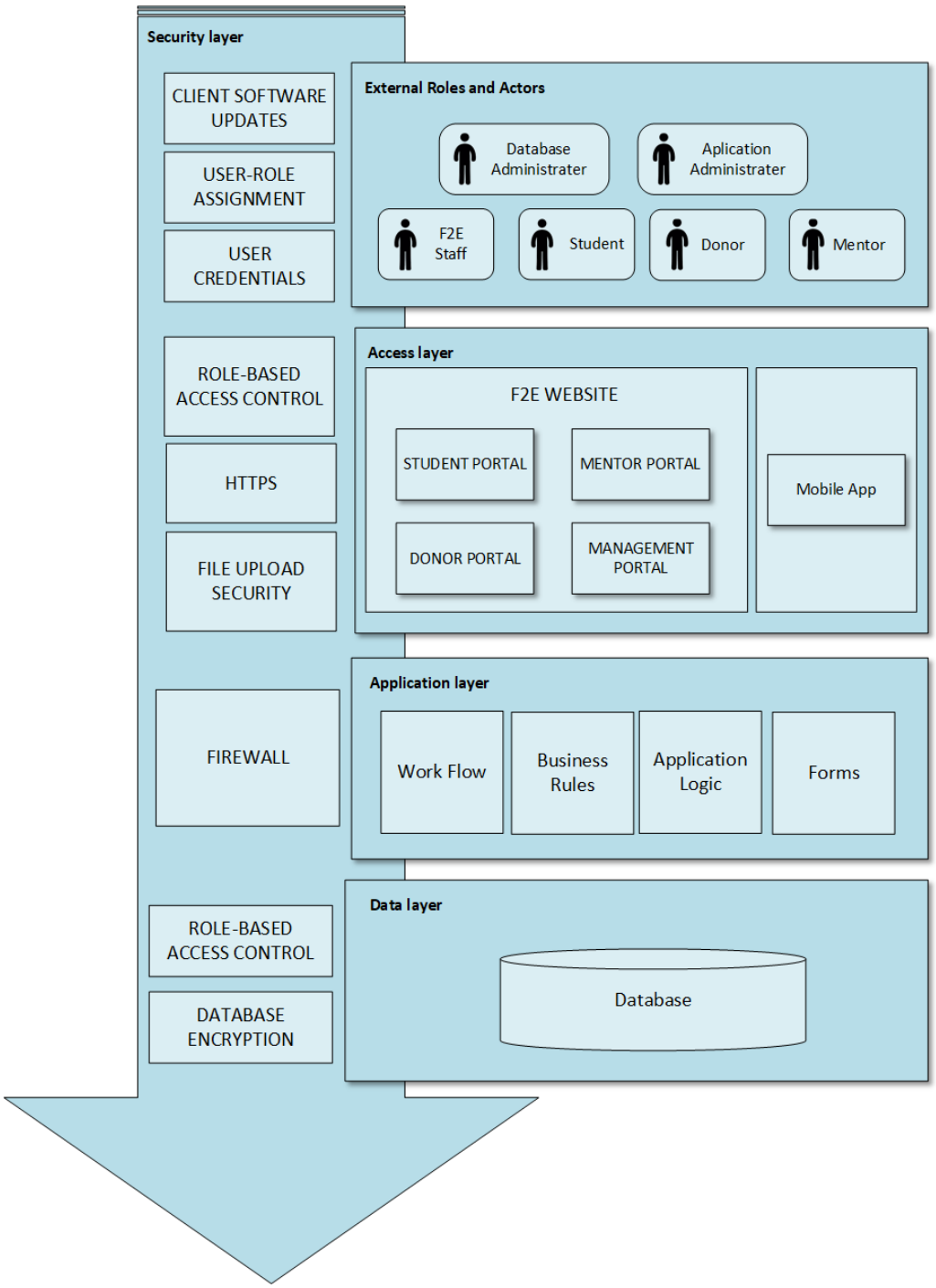

Figure 3: Layered Viewpoint

2.4.1 External Roles and Actors

The External Roles and Actors layer describes all human user groups that interact with the IT system. User groups includes students, mentors, donors, F2E staff, database administrator and application administrator. A "visitor" is a user group that is not included in the viewpoint, but is considered an "anonymous" user, or a member of the general public that can view public information on the website or mobile application.

2.4.2 Access Layer

The Access Layer describes the clients that user groups interface with. That is, user groups will interface with the website and mobile application. The website and application both contain access portals, but the portals are only depicted for the website, for simplicity's sake. User portals include portals for students, mentors, donors, and management.

2.4.3 Application Layer

The Application Layer refers to the server and its components. The Application Layer contains the mobile application logic and website logic, business rules, forms, and workflow.

2.4.4 Data Layer

The Data Layer refers to the database. All of F2E's data will be organized, managed and updated in the database.

2.4.5 Security Layer

The Security Layer runs through each layer in the system. For this reason, the security layer is represented as a vertical arrow that runs throughout the entire stack. The goal of the security layer is to protect all aspects of the system.

In the External Roles and Actors layer, security features include client software updates, user-role assignment, and user credentials. F2E staff are responsible for updating client software to ensure that security updates are up to date in the website and mobile application. User-role assignment will assign users' specific roles based on their role with F2E when users register and log in to clients. User credentials refer to a user's username and password, which will be used to authenticate users.

In the Access Layer, the security components include role-based access control, HTTPS and, file upload security. Role-based access control ensures that user groups are directed to their respective portal based on their user-role assignment. HTTPS is a protocol used to protect the privacy of exchanged data, to guard against attacks, and to ensure secure communication between users. Lastly, file upload security ensures that files uploaded through the website and mobile app, such as deliverables and applications, are not harmful.

In the Application Layer, security exists in the form of a firewall. The firewall controls what services are exposed to the network, by blocking ports that should not be publicly available, protecting sensitive data and filtering out malware.

In the Data Layer, there is role-based access control and database encryption. The role-based access control ensures that only authorized users, such as the database administrator, have access to the

database. Database encryption is a process that transforms data into cipher text to protect data stored in the database.

3 INFORMATION ARCHITECTURE

This section consists of the conceptual data model and logical data model. Each model describes significant entities and their relationships. We have chosen not to include a physical data model at this stage of project development.

3.1 Assumptions for Conceptual Data Model

The following assumptions describe the relationships between various entities in the conceptual data model below.

3.1.1 An F2E staff can manage many students.

3.1.2 A mentor can advise many students, but a student can only be advised by one mentor at any given point in time.

3.1.3 A student can be accepted into F2E's program multiple times for multiple degrees.

3.1.4 A donor can sponsor many students, one student can be sponsored by many donors.

3.2 Conceptual Data Model

The conceptual data model diagram provides a top-down approach to the data model for F2E IT System. It depicts the main entities of the system, high level information exchange and relationship among different entities. As depicted in the diagram, a student submits an application and F2E staff reviews it.

If the student is accepted into the program, he/she is assigned a sponsorship case. F2E staff coordinates the case and as a result, sponsored students receive funds, have access to mentors, and may submit reports.

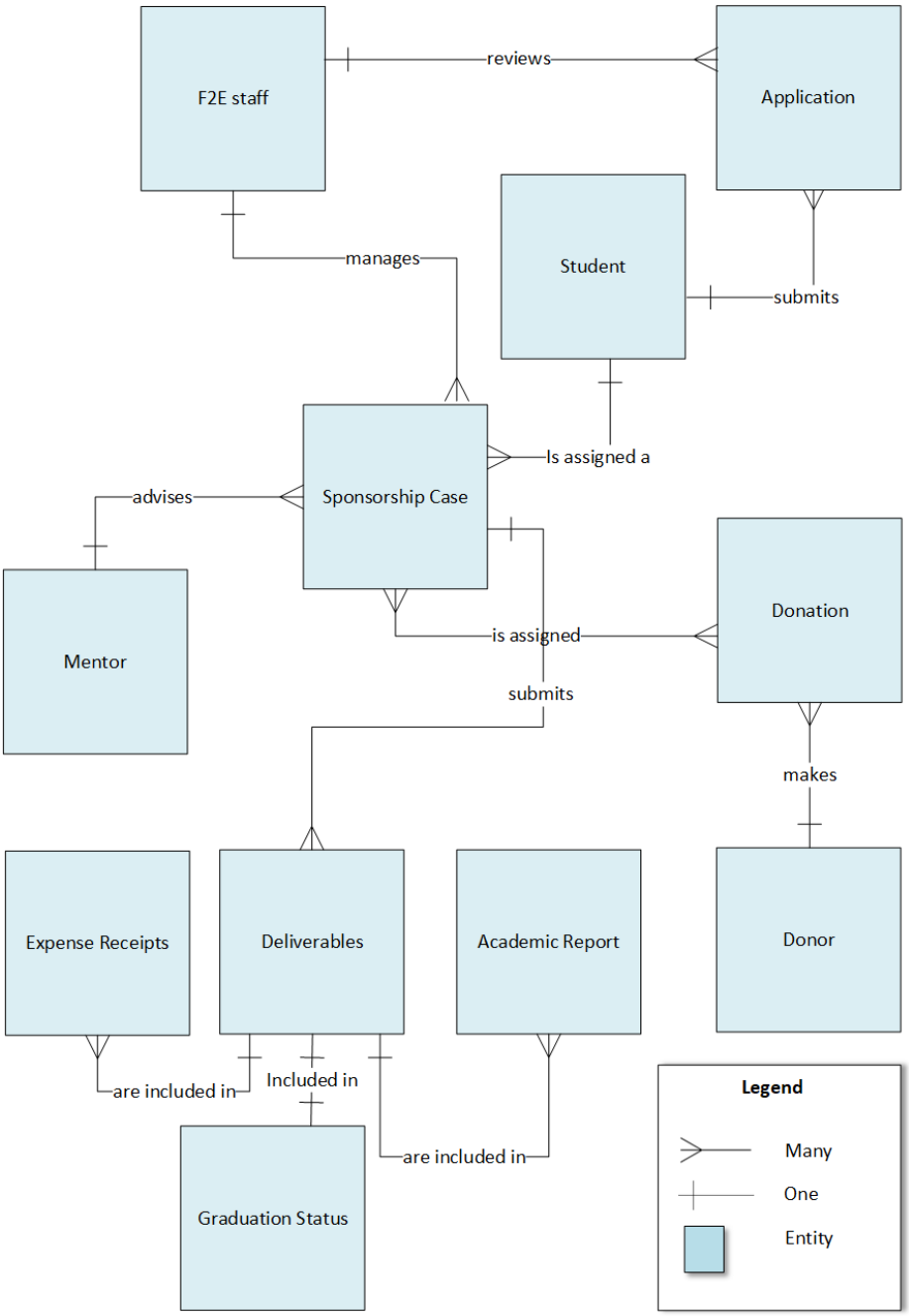

Figure 4: Conceptual Data Model

3.2.1 Sponsorship Case:

Sponsorship Case is at the center of the F2E database. It represents a case of a student getting sponsored by F2E. A student may only have one sponsorship case at any given point in time, but throughout his/her lifetime, a student may have one or more separate sponsorship cases. For example, a student may potentially get admitted to the program on two separate occasions (i.e. have two distinct sponsorship cases): first, for an undergraduate degree and, second, for a master's degree. The Sponsorship Case entity stores information such as when the sponsorship case was approved, expected graduation date, and degree sought.

3.2.2 Student:

Student refers to all students who have applied to the program, regardless if they were admitted. This entity stores basic information about students' name, address, contact information, etc.

3.2.3 Deliverable:

Deliverable includes all the reports that students submit to F2E. Deliverable items may include expense receipts, academic reports, and graduation status information.

3.2.4 Application form:

Application refers to both pre-verification application and full application forms. This entity stores information about a student's application.

3.2.5 Expense receipt:

An expense receipt includes data related to students' expenses. Students who are being sponsored for tuition only will not need to turn in expense receipts, as their finances are handled directly between F2E and the Educational Institution. However, students who are receiving any kind of sponsorship unrelated to tuition must keep expense receipts to turn them in as deliverables. This entity stores information such as date of expense, description, and price.

3.2.6 Academic Report:

Academic report includes data related to students' grades. This entity stores information such as when the sponsorship case was approved, expected graduation date, degree sought, Grade Point Average, name of classes taken, and grades for the specific classes.

3.2.7 Graduation status:

Graduation status includes data related to students' graduation status. This entity stores information such as expected graduation date and whether all requirements of the major have been fulfilled.

3.2.8 F2E staff:

F2E staff includes data related to both F2E coordinators and managers. This entity stores information such as date hired, name, and employee title.

3.2.9 Donor:

Donor includes data related to people who contribute financially to F2E's mission. A donor can make zero to many donations. A donor that has zero donations is a potential donor. This entity stores information such as name, address, and contact information.

3.2.10 Donation:

Donation includes information related to any funds donors provide to F2E. A many-to-many relationship exists between donation and sponsorship case. A donation may be associated with many sponsorship cases (for example, if it is a big donation that is able to help several students). A sponsorship case can be associated with many donations (I.e. having several smaller donations contribute towards one student). This entity stores information such donation date, donation amount, and donor identification.

3.2.11 Mentor:

Mentor includes data related to mentors who provide guidance and advice to sponsored students. This entity stores information such as mentor name and mentor contact information.

3.3 Logical Data Model

The following diagram offers a logical data model with details about all entities, primary and foreign keys, and relationships. Please refer to the conceptual data model's entity description above for more detailed descriptions of each entity. The logical data model makes the following assertions:

- An application has two subtypes: pre-verification application and a full application.
- A sponsorship case represents a case of a student whose application was approved for a particular degree. When the student acquires that degree, it would denote the end of the lifecycle of that sponsorship case.
- Deliverables include different types of reports, including grade status, fund usage, and graduation status reports.
- F2E Employee includes coordinators, managers, and all other F2E staff roles.
- Donors includes current donors, past donors, and potential donor information.
- Donation Allocation keeps all records of the financial resources that are being allocated to specific sponsorship cases.

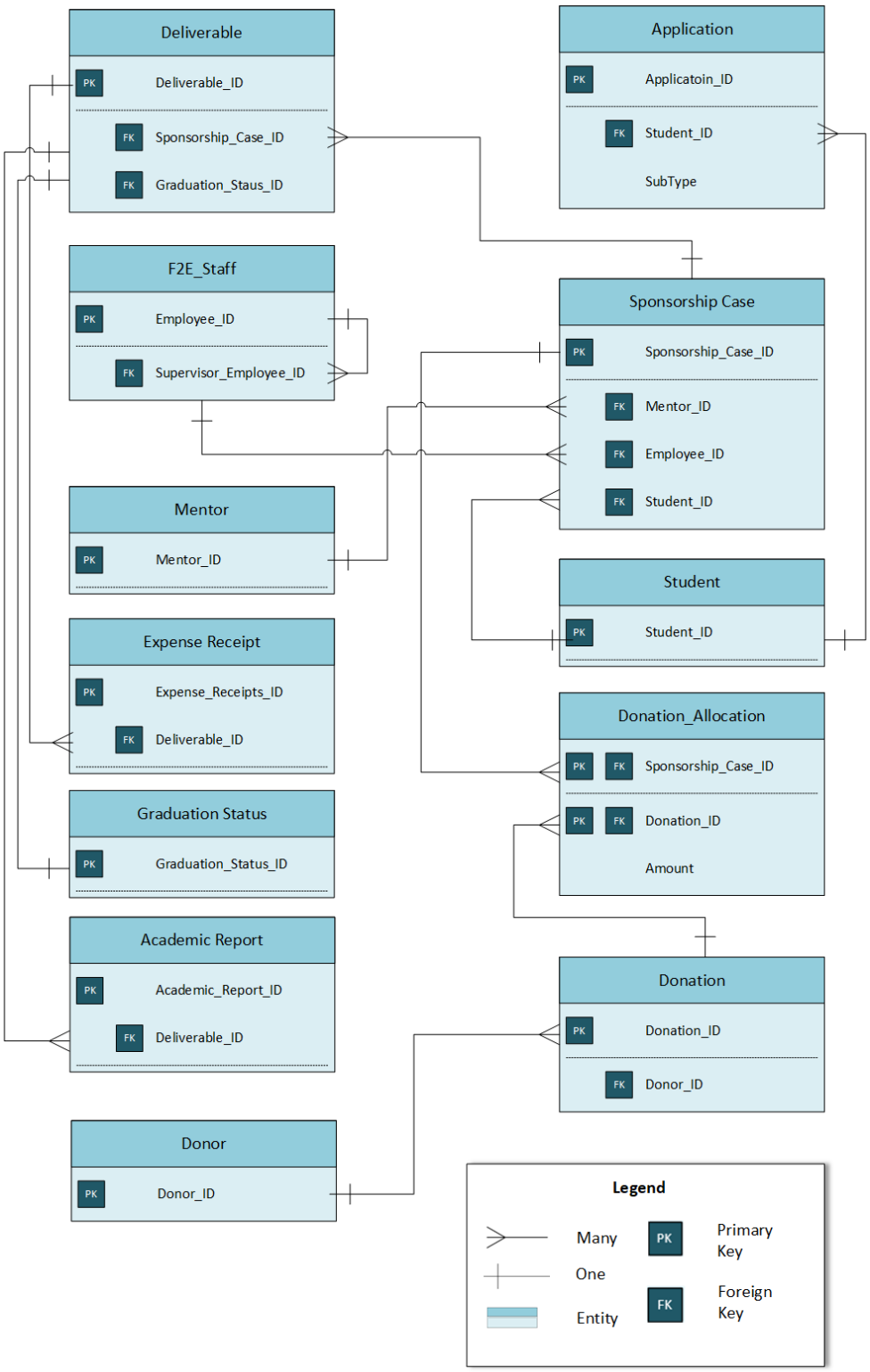

Figure 5: Logical Data Model

4 GLOSSARY

Term	Description
NFR	Non-Functional Requirement
F2E	Finance to Education
ERD	Entity relationship diagram

5 REFERENCES

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