

Architecture Design Document

PART I

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1. OVERVIEW

This document presents the conceptual and information architectures of the proposed Student Aid solution. Each section has been tailored to present a viewpoint relevant to non-technical or semi-technical stakeholders involved in the project.

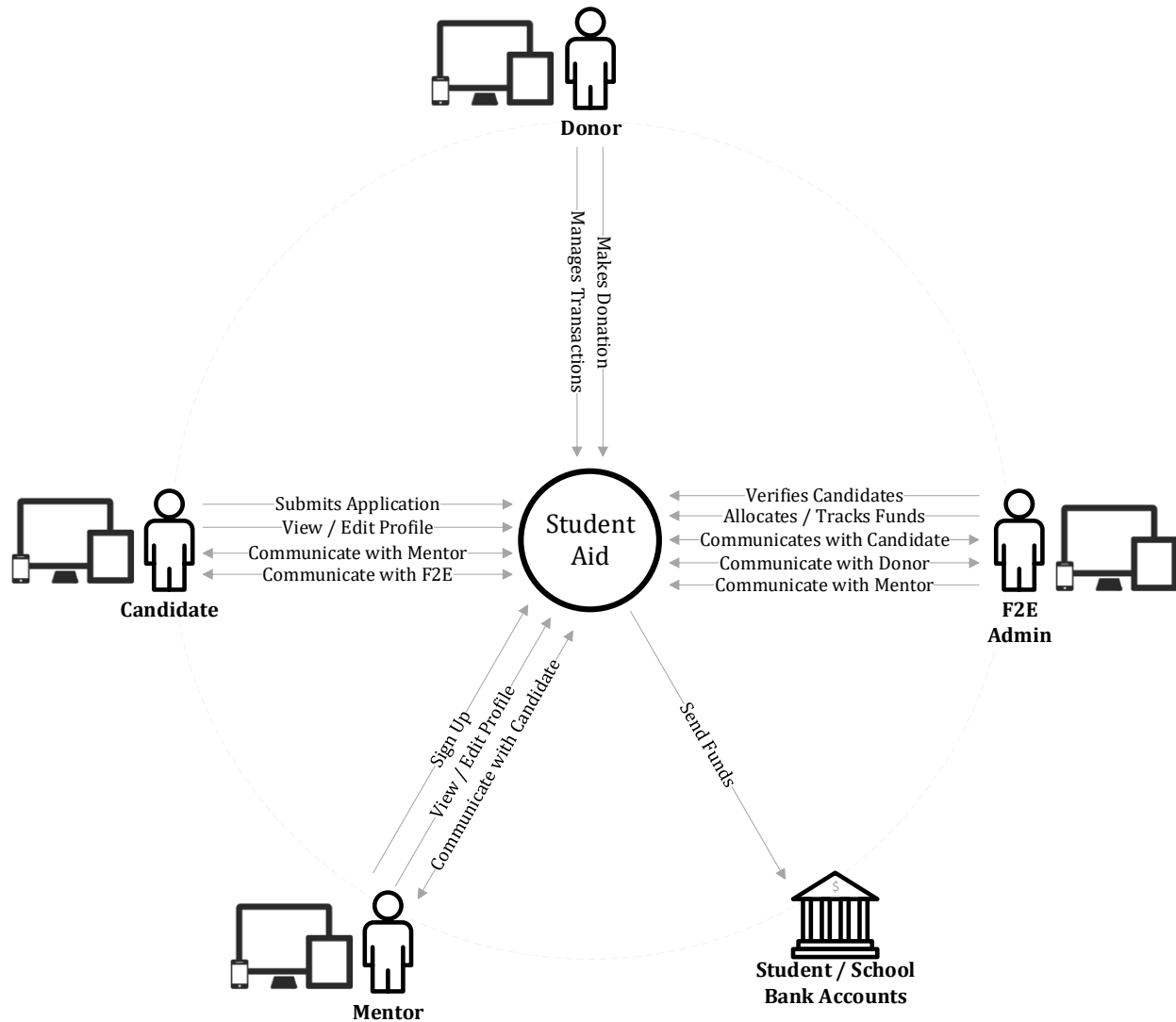
What makes F2E unique is the financial educational support for students of various grades including high school through Ph.D., student sponsorship making it more personal, and the availability of career-oriented mentorship. These unique features were deciding factors for what we chose to build instead of buy.

F2E also has set a target of capping its overhead ratio to 0.12 while increasing the number of students served from 200 to 20,000 in 3 years. Capabilities that differentiates F2E from other scholarship and career management services shall be fulfilled by customized solutions. Capabilities that could be considered as industry standard shall be sourced via best of the breed solutions, preferably with cloud and mobile capabilities. Being a not-for-profit organization, to take advantage of special pricing toward 501(c)(3) organizations, the solution & technology architecture may be sub-optimized toward a specific supplier. Some of the conceptual and logical parts described in this document have taken into account these objectives.

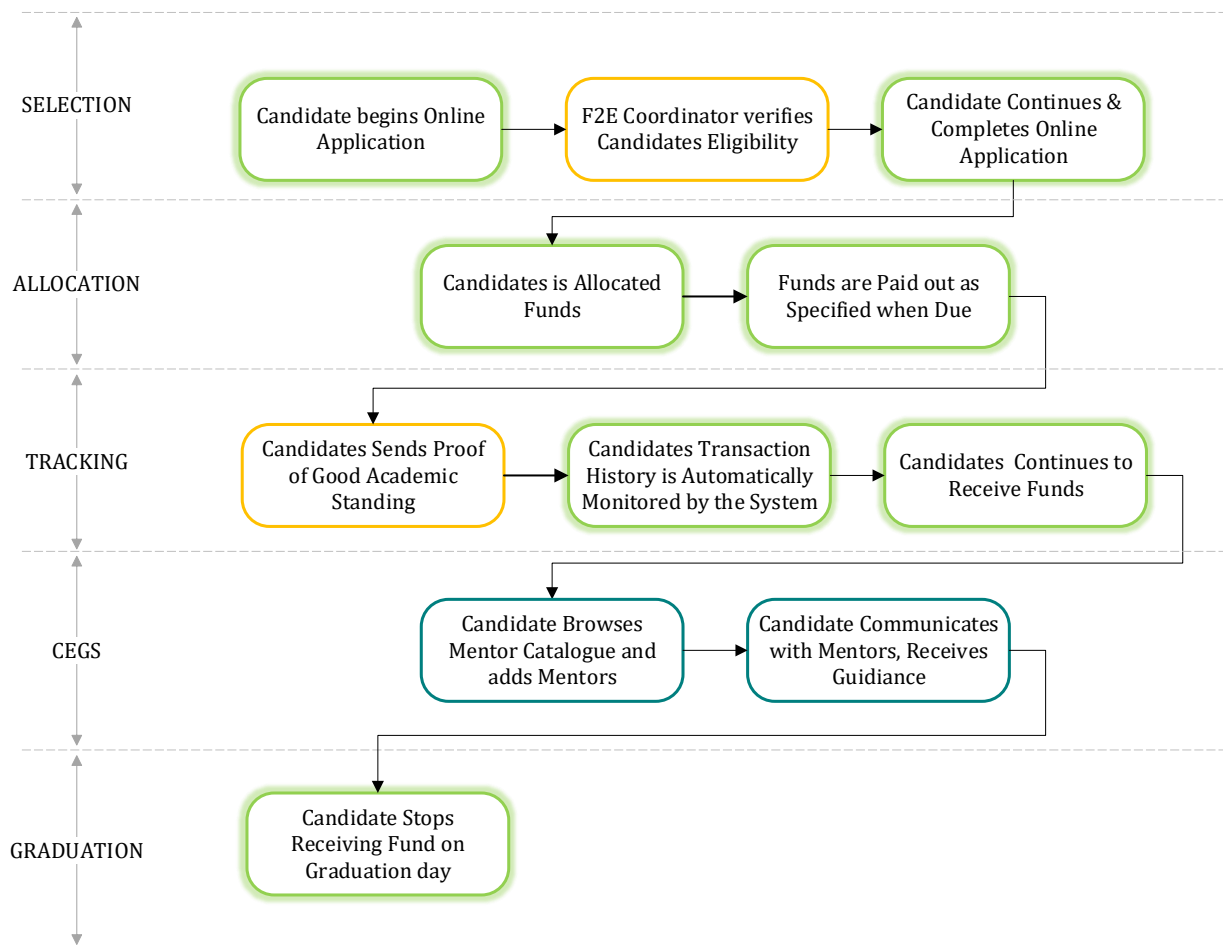
To get a full understanding of this conceptual architecture refer to the objectives and needs in the [business requirements](#) document (Deliverable 1).

2. CONCEPTUAL ARCHITECTURE

2.1 Context Diagram & Its Components



This view has been shown in the business requirement document. It portrays Student Aid's relationships with actors from the general business process perspective of F2E. In this document, we will delve deeper into the Student Aid system to provide complete understanding of the solution from different viewpoints.



Process Model showing Activities for a Candidate who completes the F2E Lifecycle using System Aid



This Process Model above displays the processes that will be automated, added, or unchanged in F2E. An online application will reduce the cost of paper and make it faster for more students to apply. This is why we will build a website. The allocation of funds is made possible through the Matching System that will be built-in. Suggested commercial solutions to be bought include: a Scheduling System to allow the coordination of meetings between students, coordinators, and mentors; a Payment System to send and receive funding; Corporate Donation Matching system to allow gift matching; an Identity Management system to secure information; a Messaging System to make communication easier; and Analytics System to monitor website and mobile app.

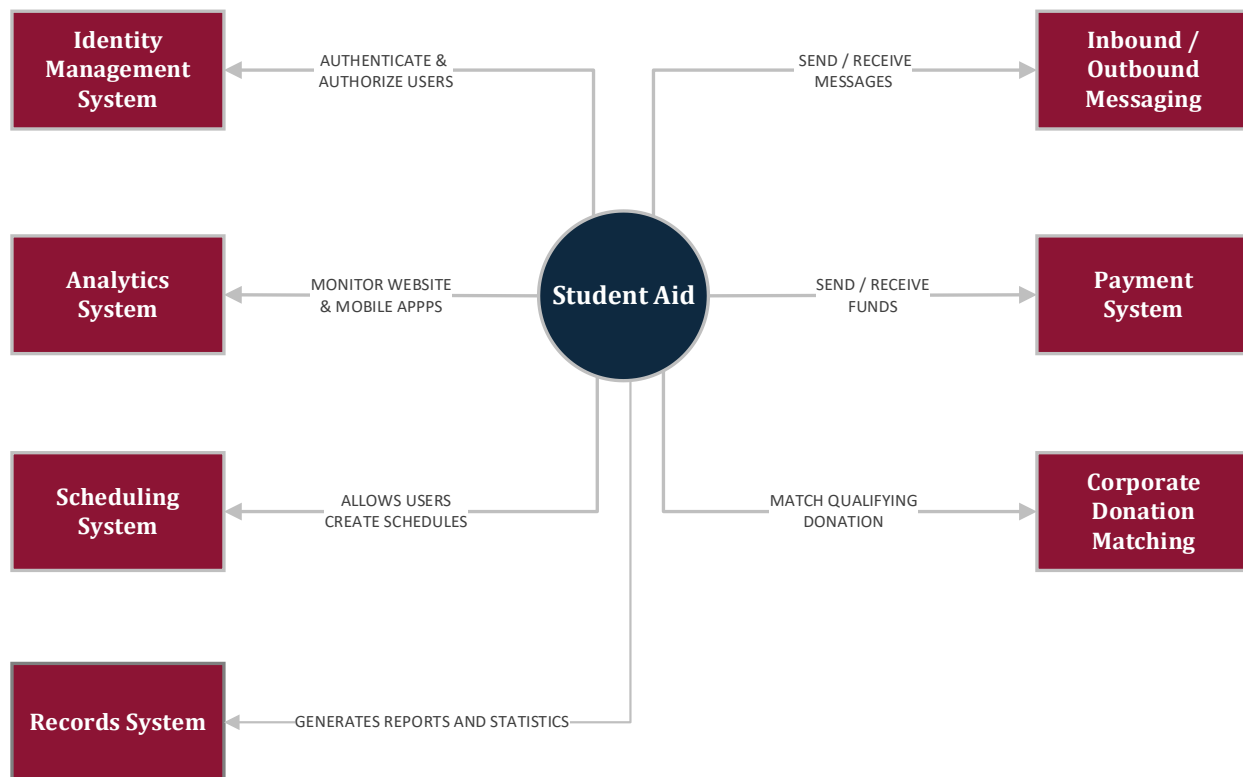
Legend for all diagrams below:



Components / Systems that will be bought and Integrated



Components / Systems that will be built by the development team



This is a view of the external systems that communicate with Student Aid. These systems provide, receive or manipulate data from the solution, however, the development team will not be tasked with building them. To save cost and redeem development time, tried and tested systems will be purchased and integrated with the solution either as SaaS, hosted or on-premise software.

2.1.1.1 Identity Management System:

This system will interface with the user management system to handle the management of identities for all the users interacting with the solution. It will be responsible for authentication and authorization as well as managing roles and privileges for various kinds of users, to ensure security. The solution will leverage the abilities of the identity management system to provide

third party user data which will be useful in the development of the Career and Education Guidance Service (CEGS).

Rationale: We would like to use the most common identity management solutions our users are comfortable with (eg: LinkedIn, FacebookId, AppleID, etc.)

2.1.1.2 Analytics System:

The Analytics system will be used to monitor, measure, collect, and analyze website and mobile app data. Insights from this data can be used by F2E to optimize its operations enabling it to reach more donors and students. It will also prove useful for generating statistics about the F2E program.

Rationale: Highly efficient commercial applications are available to provide insights and perform fraud analysis. (eg: Omniture, Google Analytics)

2.1.1.3 Inbound/Outbound Messaging System

This system provides the solution with a flexible avenue for communication with all external actor's interacting with Student Aid. This includes the functionality for dispatching information individually or in bulk to many users at the same time. E.g. Sending reports to donors or students or sending information about F2E to various schools.

Rationale: Be available where the users are; Use most common solutions that are easy to integrate (eg., GSuite, O365, Slack)

External: This system is external as it may be accessed outside of the system

2.1.1.4 Payment System:

The payment system will handle all electronic money transfer in and out of the system. This includes receiving funds from donors as well as sending out funds to student and school bank accounts.

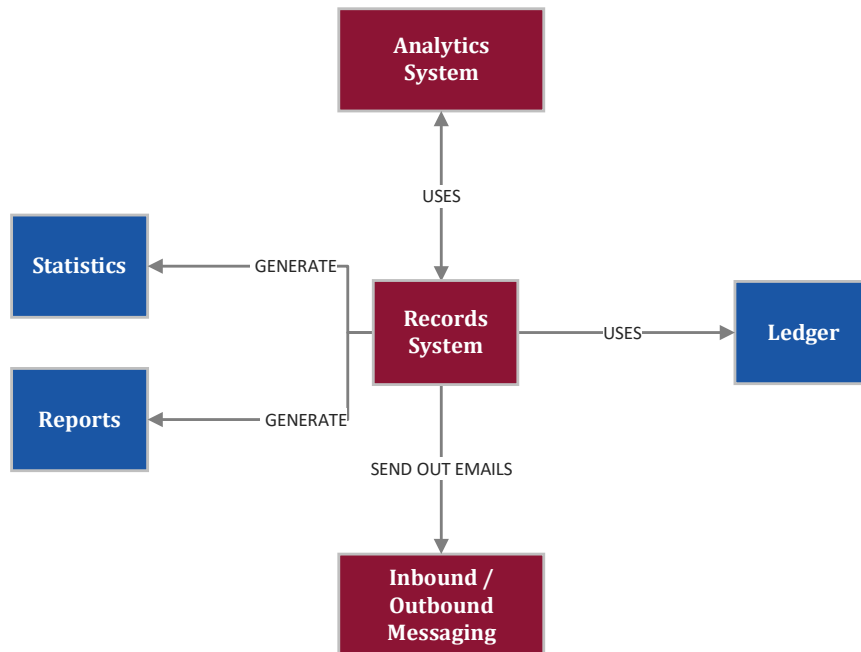
Rationale: Secure solutions from banks and payment management agencies are robust and secure. It also simplifies the audit needs to meet PCI-DSS requirements. (eg., CheckFree, Paypal)

2.1.1.5 Corporate Donation Matching System

This system is responsible for identifying donations that qualify for corporate gift matching. It captures financial data from Student Aid when donations are made and sends it out to the relevant institutions that provide gift matching.

Rationale: There are agencies that specialize in marketing, matching and collecting funds for very little commission. This reduces the need for human oversight, audit, and collection costs. (eg: Benevity)

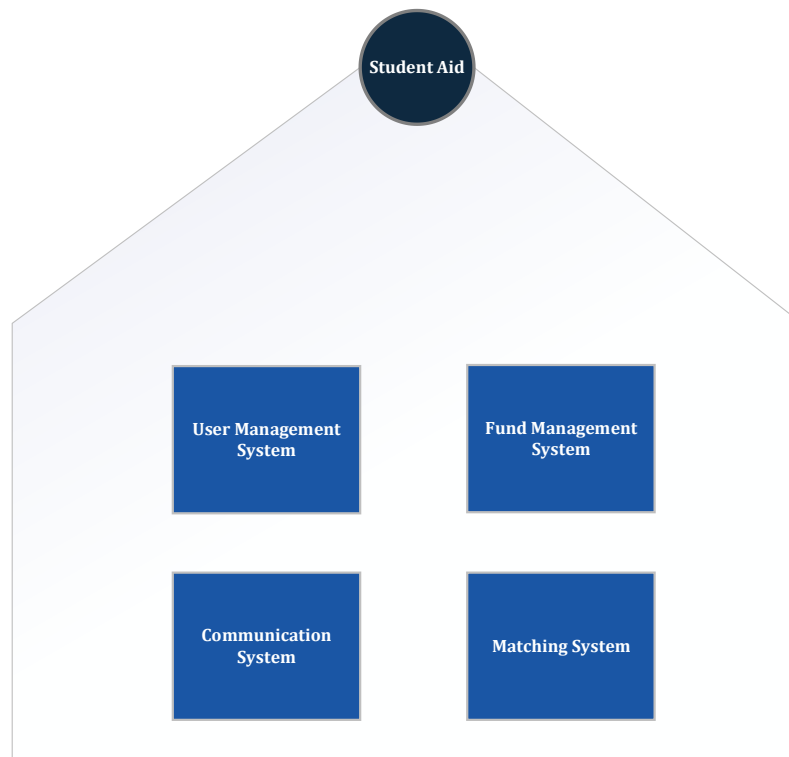
2.1.1.6 Records System



The records system is primarily responsible for generating reports and statistics about the F2E program. It collects financial data using the Ledger, provides context for that data, then serves relevant information to the various users as the need arises using the inbound / outbound messaging system. Reports about the program are sent to potential donors, donors and students who have completed the program. The records system also employs the services of the analytics system to generate statistics that can be useful to F2E's business.

Rationale: It automates the generation of reports and statistics lowering the cost of production making it more scalable.

2.2 Components of Student Aid

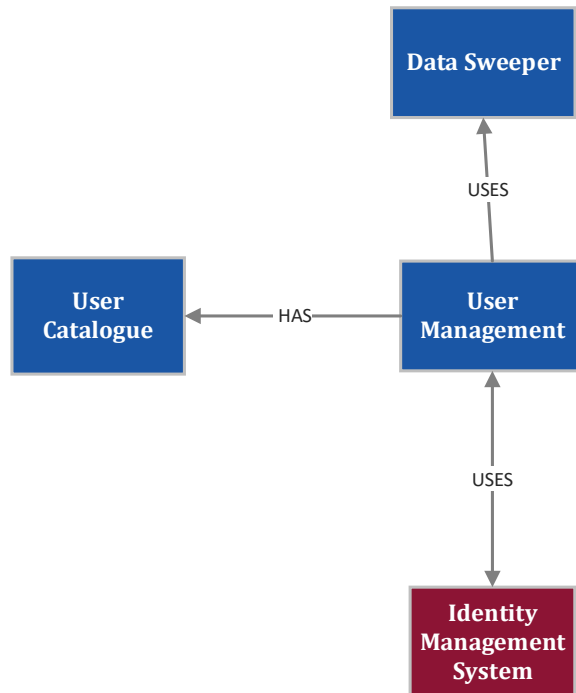


This view shows all systems that will be developed entirely by the development teams. Some of these systems are unique to F2E's business process and thus will contain features that offer key business differentiators for F2E. Therefore, it is pertinent that they be developed in entirety regardless of cost. Others are just too intricately connected with the functionality of the solution that they cannot be implemented as external systems. Details of these systems are explained in the component diagrams that follow, the component views still show how these systems interact with some of the external systems.

2.2.0 User Interface

Even though it is a common component for across functionalities, the non-functional needs demand that it be called out specifically. The solution shall meet the supportability, modularity, agility and user experience needs. Through the use of modern technology, the solution will be supported by desktop and mobile applications.

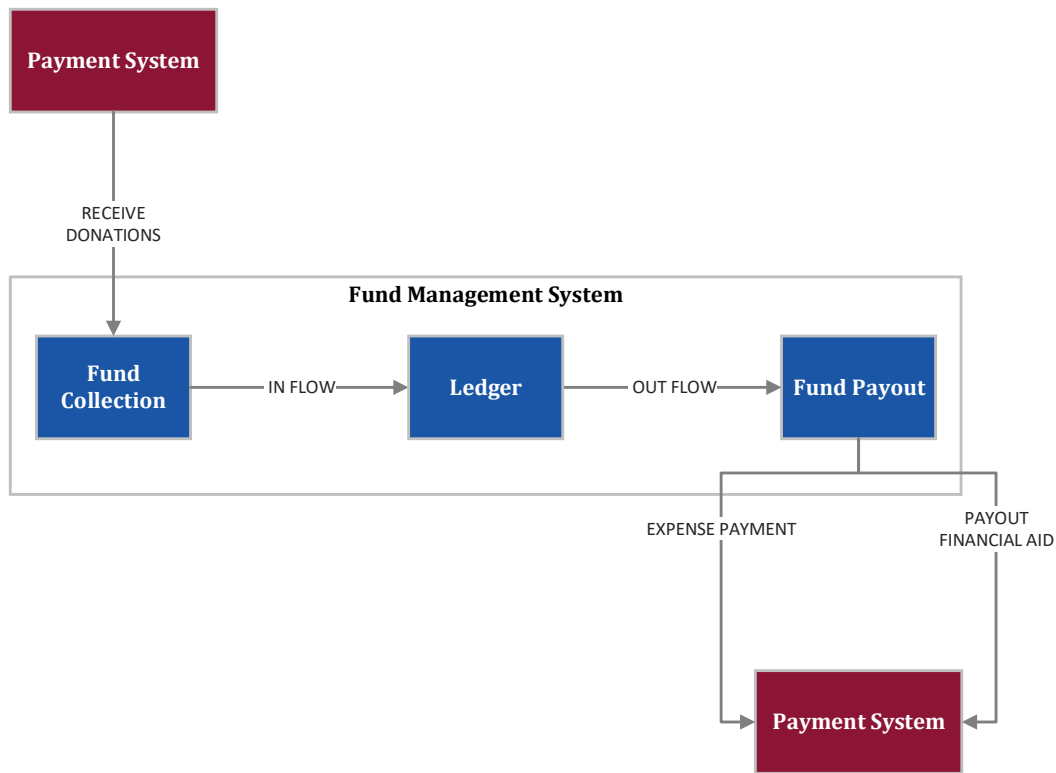
2.2.2 User Management System



The user management system is made up of a catalogue of users, including external users and F2E employees. It employs the abilities of the identity management system for authenticating and authorizing users as well as providing role-based access to F2E employee users. The Data Sweeper removes sensitive user information from users who are no longer parts of the F2E program to follow the HIPAA and FinCEN standards.

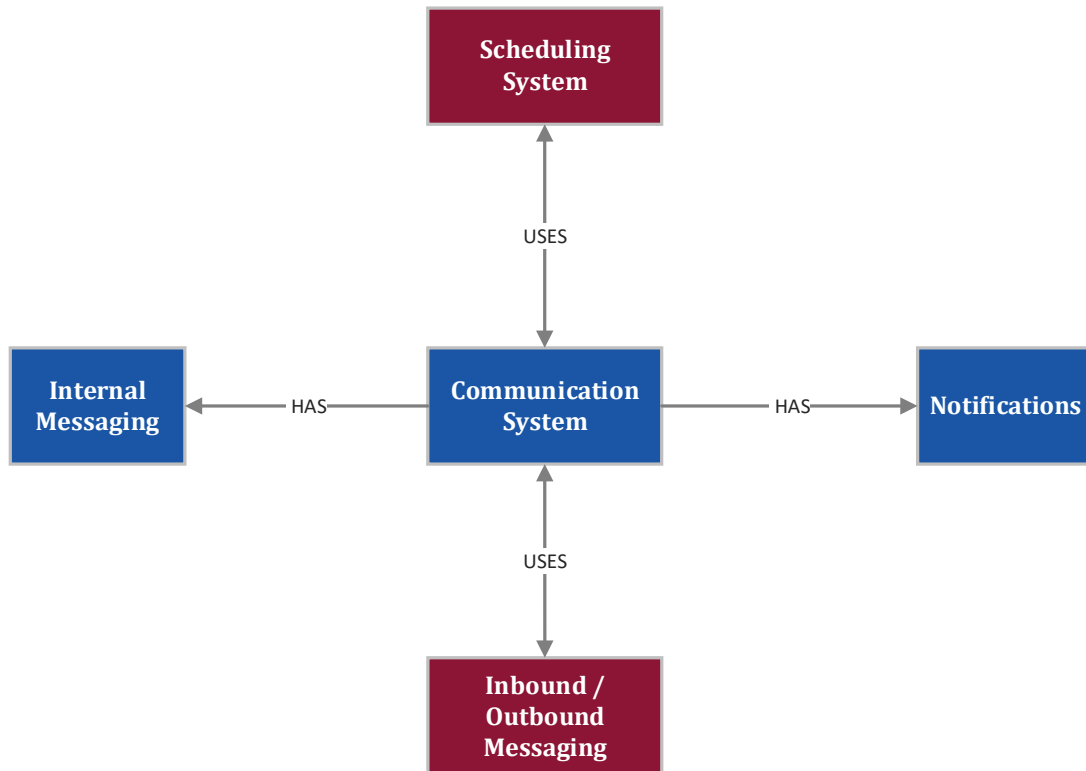
Note: The document reflects only business and end users. Technology users are not reflected to keep the flow of the document and the content simple.

2.2.3 Fund Management System



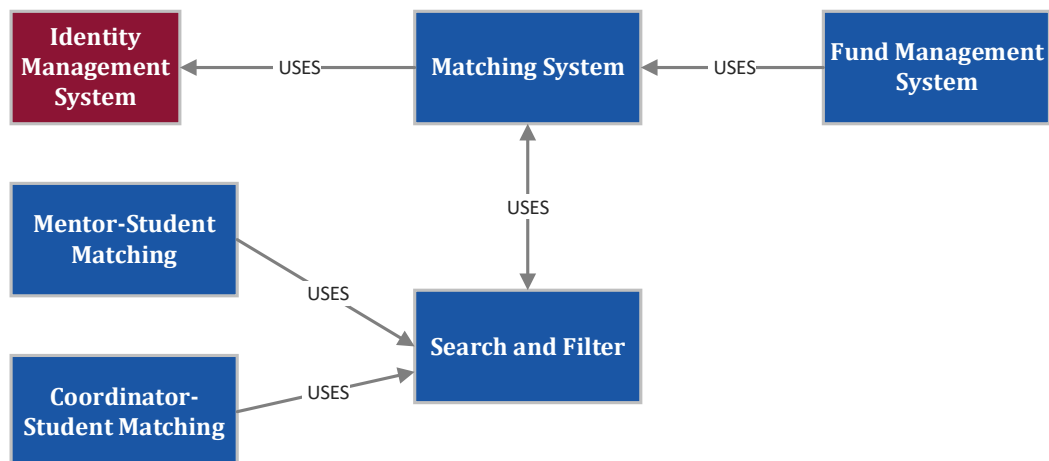
The Fund Management System keeps track of all financial transactions flowing in or out of the solution. The receiving of funds from donors as well as payout to student or school bank accounts is handled by an external payment system integrated into the fund management system. A ledger system is also integrated to record and balance the transactions and to provide proof of payments. Funds are paid out to support students financially and to F2E to cover other expenses to keep the system running.

2.2.4 Communication System



The internal communication system allows communication between users within the scope of the solution through the option of messages and notifications. These messages and notifications can be viewed within the website and mobile app. The Inbound/Outbound messaging system is employed for communication with external actors and systems to allow for email messaging.

2.2.5 Matching System

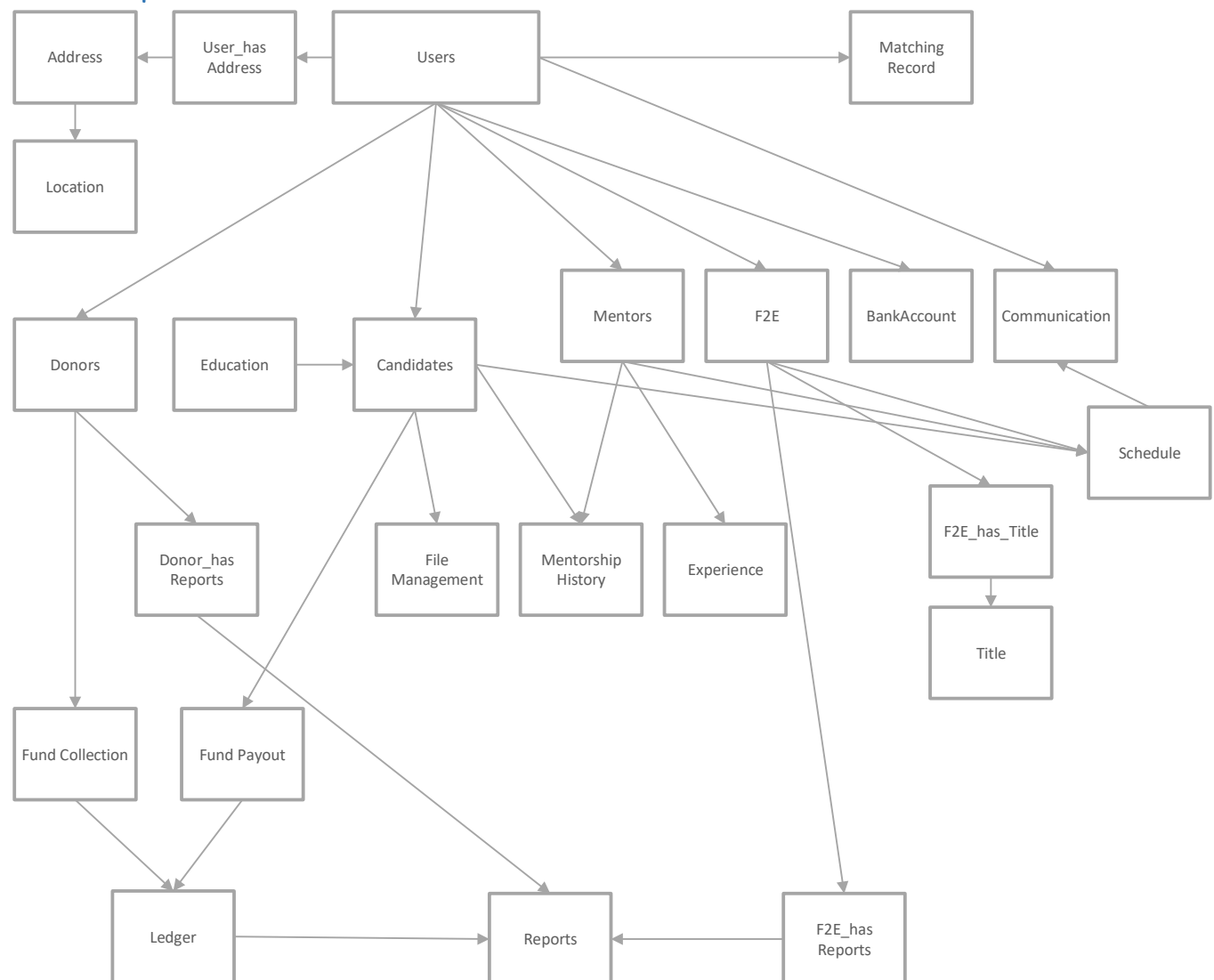


The matching system employs advanced search and filter functionality to match coordinators to students based on their location. It suggests mentors to students based on field of study / career interests. The matching system uses third party data supplied by the identity management system for matching mentors to students. Finally, the matching system enables the allocation of funds to student or student groups based on student need, region or level of education. We will explore the possibility of buying a Search and Filter System.

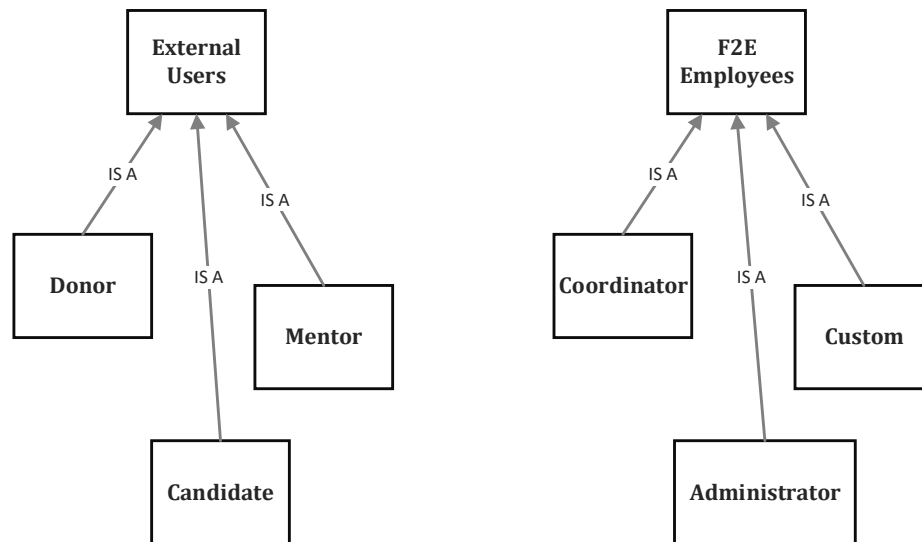
3. INFORMATION ARCHITECTURE

Note: We have shown conceptual information architecture for the components that will be built by F2E. For interactions with external solutions, the information architecture will be finalized based on the API signatures (integration architecture), specific to solutions selected.

3.1 Conceptual Data Model

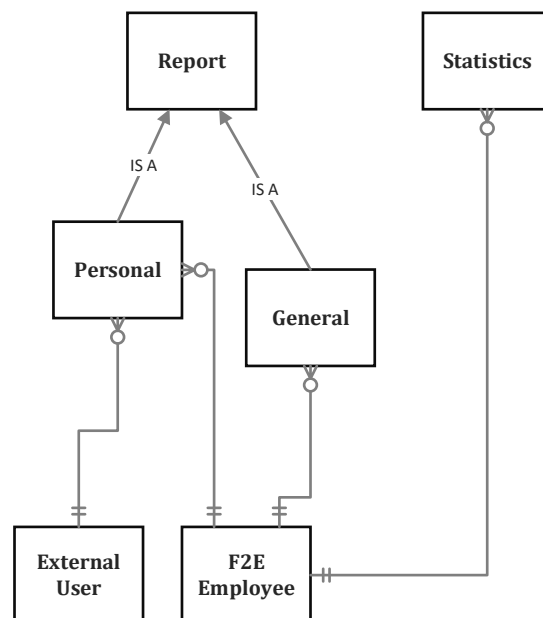


3.1.1 User Data Model



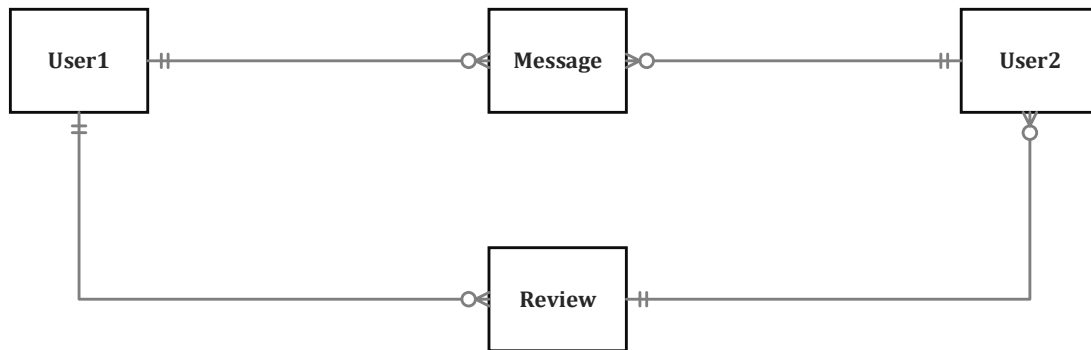
External users are logically separated from F2E Employee users for security reasons. External Users include Donors, Candidates, and Mentors. F2E Employees require different level of privileges in the system, therefore role bases access will be used to categorize backend user groups. A new F2E Employee user group with custom privileges can be created by the executive F2E user.

3.1.2 Records Data Model



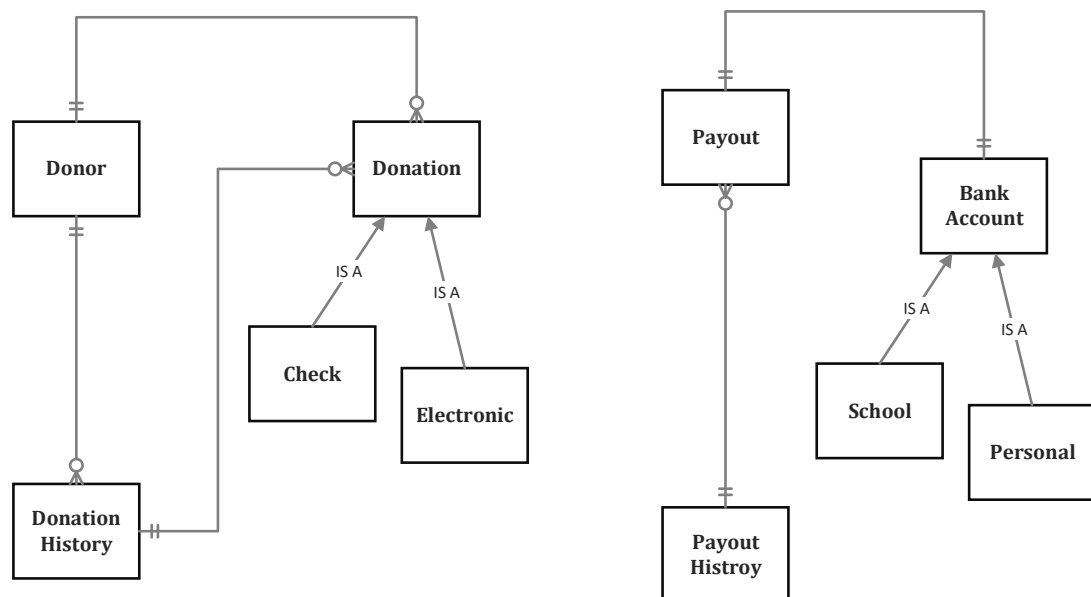
General reports are generated for public consumption and can be displayed on the website. Personal reports are user targeted e.g. report for a donor showing his donation history, or a report for a student showing history of financial aid received. F2E employees can generate reports or statistics at any time they wish. Reports and statistics can also be generated automatically a specified date and time.

3.1.3 Communication Data Model



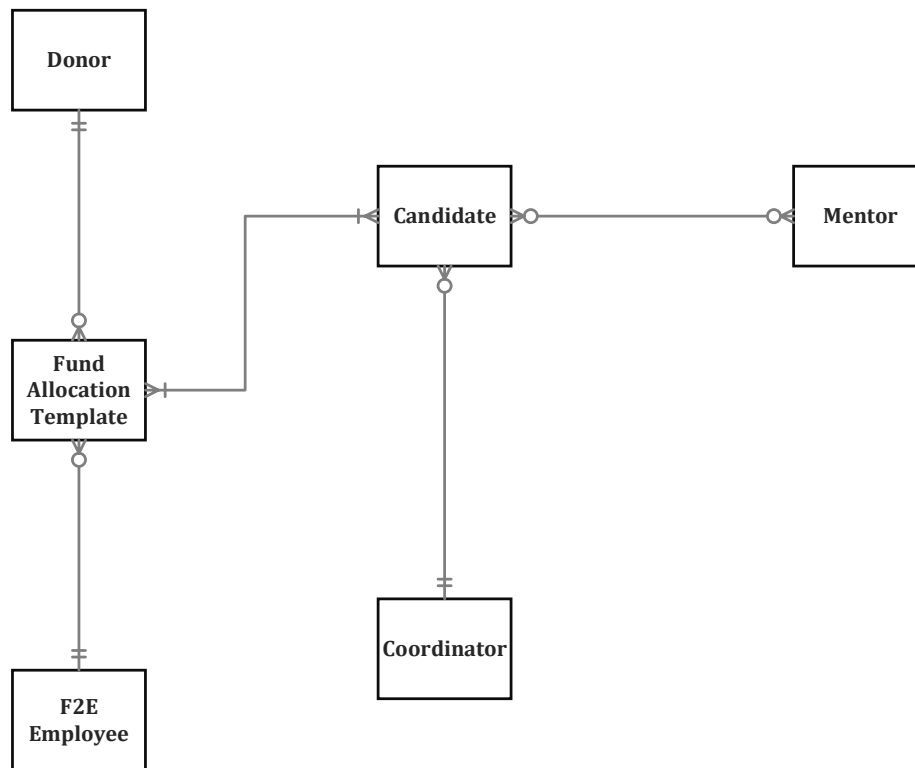
Mentors, F2E employees, and Candidates may send and receive messages from each other through Student Aid. A Candidate may create Reviews based on a 5-star system to rate their Mentor. Since a candidate can have more than one mentor, they can create one review for each mentor, this means each mentor may have reviews from different students.

3.1.4 Fund Data Model



Donors give Donations, and they have a Donation History containing Donation information including Check and Electronic donations. Payouts can be made to a Bank Account which either belongs to the student or the students' academic institution. Payout History is kept for records.

3.1.5 Matching Data Model



An F2E Employee User may create a Fund Allocation Template. Donors also create new fund allocation templates when they make donations directed towards specific students. Fund allocation templates indicate the designation of funds for different academic or personal needs. Different fund allocation templates can be assigned to different candidates; if more than one fund allocation template is assigned to a candidate, the sum of allocated funds is computed and assigned to the candidate. Candidates are assigned to coordinators in their geographic region; one coordinator can have more than one candidate assigned to him. Students can also be matched with mentors.

3.2 Logical Data Model

3.2.1 User

3.2.1.1 Relation:

	Entity & Attributes	Relation
1	Users: User Id(PK), Name, password, Email, Phone number	Users as a super type mainly has four subtypes, including donors, candidates, mentors, F2E.
2	Address: Address id(PK), Address Type, Address, Zip, location id (FK) Location: location id, State, City	-One user can have 1 to many addresses, such as company address, home address, school address and so on -One address may be related to 1 to many users and to one location. -One location may be related to 1 to many addresses.

3	Bank Account: Bank Account id(PK), Bank Name, Bank ABA number(optional), Bank account, Address of Bank, Bank phone number, Recipient's Name, Recipient's Address, User id(FK)	-One user can have 0 to many bank account, such as school account, and personal account. -One bank account may be related to one user.
4	F2E Employees: User id(PK&FK), Hire Date, Supervisor (User id) (FK) Title: Title id(PK), Title Name, User id(FK)	-One F2E staff can be in 1 to many titles. For example, a F2E administrate can also be a coordinator.
5	Candidates: User id(PK&FK), #Year From, #Year To ¹ , Progress ² , Fund allocated, Education id(FK), Guardian name, Guardian relationship, Guardian contact number -Education: Education id(PK), School Name, Field of Study(optional) -File Management: File id(PK), Date, File Type, Expense Date(optional), Expense Amount(optional), File Name, File Link, Candidate user id (FK)	-One Candidate can have one latest education record, one education record may be related to 0 to many candidates. -One candidate may have 0 to many files; one file may be related to only one candidate -File can be receipts, transcript or other files.
6	-Mentors: User id(PK&FK), LinkedIn -Experience: Experience id(PK), industry, Company Name, #Year From, #Year To, Title, Mentor user id(FK) -Mentorship History: Mentorship history id(PK), Date from, Date to, Candidate Rating, Candidate Comment, Mentor Comment, Mentor user id(FK), Candidate user id(FK)	-One mentor may have 1 to many working experiences -One candidate may be related to 0 to many mentorship history, and One mentor can have 0 to many mentorship histories.
7	-Donors: User id(PK&FK), Company Name	

3.2.2 Matching

	Entity & Attributes	Relation
1	-Matching record: User id(PK&FK), User id(PK&FK), Matching type, Matching Date, Matching purpose	-One user can have 0 to many matching records, but one record may be related to two users.

3.2.3 Communication

	Entity & Attributes	Relation
1	-Communication: From: User id(PK&FK), To: User id(PK&FK), Send Date, Communication Method ³ , Content, Schedule id(optional)	-One user can have 0 to many Communication records.

¹ #Year From & #Year To: these two attributes indicate the funding period.

² Progress: it indicates whether the candidates are funded or at the end of program.

³ Communication Method: the method for users to communicate with each other, such as message and notification.

2	-Schedule: Schedule id(PK), Schedule Date, Schedule Type, Engagement Method, Description, F2E user id(FK), Mentor user id(FK), Candidate user id(FK)	<p>-The Schedule is for the F2E, Candidate, or mentor to make an appointment. F2E user id(FK), Mentor user id(FK), or Candidate user id(FK) can be null.</p> <p>-One F2E employer, Candidate, or mentor may have 0 to many appointments.</p> <p>-One Schedule can be related to 1 to many communication, but one communication can be related to 0 to 1 schedule.</p>
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3.2.4 Fund

	Entity & Attributes	Relation
1	-Fund Collection: Donation id(PK), Donation Date, Amount, Payment method, Donor user id(FK), Ledger id(FK)	-One donor can make 1 to many donations, but one donation can be related to one donor.
2	-Fund Payout: Fund id(PK), Amount, Send Date, Fund Type, Candidate user id(FK), Ledger id(FK)	-One candidate may have 0 to many fund payouts but one history can be related to only one candidate.
3	-Ledger: ledger id(PK), Update Date, Balance, Ledger Report(FK)	<p>-Ledger is to list the balance between donation and funding.</p> <p>-One Ledger can be related to different fund collection and fund payout.</p>

3.2.5 Record/Statistic

	Entity & Attributes	Relation
1	-Report: Report id(PK), Report Date, Remaining Fund, Number of Student without fund, Number of Student having fund	<p>-One report may be related to 0 to many ledgers.</p> <p>-One report may be sent to 0 to many donors or F2E.</p> <p>-One donor/F2E employer may have 0 to many reports.</p>

