CS319 – Object-Oriented Software Engineering

D4 Report

CAMPUS CONNECT®

Section 3

Team 4 – FACID

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1. Introduction

CampusConnect is a website designed to make the lives of Bilkent University members easier. CampusConnect has attributes like second-hand sales for both textbooks for courses in Bilkent University and other belongings, It also provides communication services for Bilkent Members. This paper focuses on the design issues of the CampusConnect.

1.1 Purpose of the System

CampusConnect aims to create an inclusive and cohesive digital community within Bilkent University. It strives to facilitate the exchange of knowledge, resources, and experiences among students. The platform is dedicated to making the process of buying and selling second-hand books and furniture easy and cost-effective, reducing financial burdens on students. Additionally, we aspire to enhance transparency and communication between students and professors through the Questions and Suggestions section, ultimately improving the academic experience. Lastly, our Forum section fosters open dialogue on various university-related topics. Overall, our goals revolve around creating a thriving digital hub that addresses the diverse needs of our university community.

1.2 Design Goals

Campus Connect focuses on various goals, and the non-functional requirements show these goals:

1.2.1 Performance

Performance is the heartbeat of CampusConnect, with every aspect meticulously tuned to ensure lightning-fast interactions. Our login and logout processes are designed to take less than 2 seconds, allowing users to access their accounts swiftly. Navigating between pages is a seamless experience, taking less than 2 seconds to transition effortlessly. Whether you're uploading a post or entry with images, we prioritize speed – pictures from our database to your screen in under 5 seconds and post creation in less than 2 seconds, even with photographs. In the background, the entire system data is dynamically backed up to ensure data integrity and reliability. The importance of such performance measures cannot be overstated. A rapid, responsive system enhances user satisfaction, engagement, and the overall success of our platform. With CampusConnect, every second counts in making your online campus experience exceptional. These performance measures are vital to ensure that users have a smooth and efficient experience when using the CampusConnect platform. The speed of these actions directly impacts user engagement and the overall functionality of the website. Rapid performance is key to user satisfaction and success in providing an exceptional online campus experience.

1.2.2 Safety/Security

At CampusConnect, security and safety are paramount. We've implemented stringent measures to safeguard user data, ensuring that personal information is encrypted and stored

securely within our database. In CampusConnect passwords of users are stored in the database as a hashed form, so even admins cannot access the passwords of users. Additionally, the app boasts robust authentication and authorization mechanisms, limiting access exclusively to individuals within the Bilkent University community. The account verification feature of our app provides the chance to create an on-campus community in the CampusConnect app. The importance of these security measures cannot be overstated. They are the foundation of user trust and confidence in our platform. As guardians of sensitive data, we prioritize the protection of personal information and access controls to ensure that CampusConnect remains a safe and secure digital space for our users, fostering trust, peace of mind, and a thriving online community.

1.2.3 Usability

Usability is a cornerstone of CampusConnect's design philosophy, and it holds immense importance in delivering an exceptional user experience. Our user interface is meticulously crafted to be intuitive, accessible, and responsive, catering to users of different abilities. We have focused on creating an easy-to-use and simple user interface that ensures a seamless experience. Places of all buttons are on the top menu and easy to find and use for all users. Also, while adding a post, entry, borrowing, and donation, blanks that must be filled are located at the right of the page. The app's compatibility with popular web browsers, including Chrome, Safari, and Opera, guarantees that users can access CampusConnect with ease using any web browser. Additionally, we've chosen color tones (orange and white) that are easy on the human eye to prevent visual fatigue and ensure a pleasant reading experience. Our buttons are designed to be clear and user-friendly, streamlining interactions. By prioritizing usability, we aim to provide an accessible, enjoyable, and efficient platform for all users, promoting engagement and making CampusConnect a user's first choice.

1.2.4 Reliability

Reliability is at the core of CampusConnect, and its significance cannot be overstated. Our commitment to offering a dependable platform means that the CampusConnect app will be available 24/7, with minimal downtime reserved exclusively for essential maintenance. Furthermore, we've taken measures to ensure the system can recover gracefully from any unforeseen system failures, all without the loss of any critical data. We understand that reliability is the linchpin of user trust and satisfaction. It's the assurance of uninterrupted service, data integrity, and a seamless experience for our users. By prioritizing reliability, we aim to provide a platform that users can depend on day in and day out, fostering a strong sense of trust and loyalty within our digital community.

2. High-level Software Architecture

2.1 Subsystem Decomposition

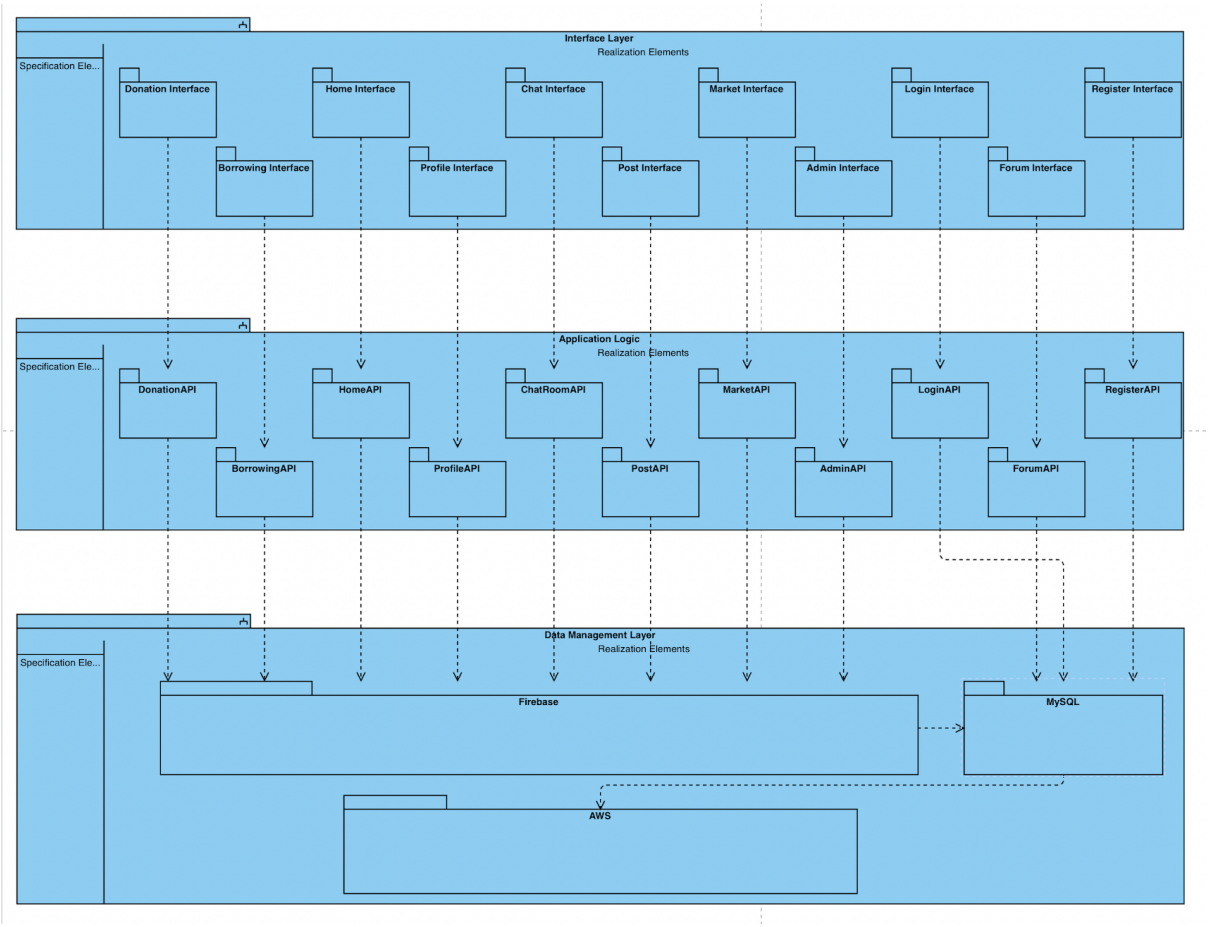

Figure 2.1: 3 Layer Architecture

We decided to use a 3 Layered Architecture, which contains an Interface Layer, Application Logic Layer, and Data Management Layer. Interface Layer contains the user interfaces used in the system as the boundary objects. Each interface has its own management package to handle the requests and communicate with the user. Application Logic Layer contains the backend APIs that correspond to the operations in the Interface Layer, executing the necessary logic and processing to fulfill user requests and application functions. This separation allows for a clean architecture where the user interface can evolve independently from the underlying business logic. It also facilitates scalability, as each layer can be scaled or modified without affecting the others.

The Data Management Layer is the core part of our system that takes care of safely storing, getting, and handling data. It uses Firebase, MySQL and AWS to store data. Firebase is utilized for storing images uploaded by users. It offers quick retrieval for the application and serves as an intermediary storage solution. MySQL acts as the primary database for storing links to the images in Firebase, user data, content, and other structured data required by the application. AWS is used for persistent storage, ensuring that data is available 24/7 with high reliability. This may be used in conjunction with other AWS services to enhance data management and scalability. Data Management Layer makes sure that all the information in

the app is correct and consistent. By keeping data management separate, we can easily change how we store data or make it handle more information if we need to. This setup also makes it easier to fix and improve the system since we can work on each layer by itself without making things too complicated or risky. In short, having this layer helps our app grow and change over time.

2.2 Hardware/Software Mapping

CampusConnect is a web-based project that will be accessed by search engines with both computers and smartphones. Therefore, it does not require any hardware to use. It will be deployed with Amazon Web Services EC2 so that anyone with the link can access and use the website. Django is a wide-support framework, and the whole back-end is developed with Django and Django-Rest Framework. It allows all modern search engines can use the webpage. On the other hand, CampusConnect is designed as a responsive website that uses the Bootstrap framework on its front-end part and consists of HTML, CSS, and JavaScript. Bootstrap helps the application be more relative and responsive to enhance usability. Therefore, Bootstrap and HTML5-supported devices can access the webpage.

2.3 Persistent Data Management

CampusConnect works in such a way that serves different types of users' data which they uploaded to CampusConnect to the other users of CampusConnect. These data are borrowings, donations, posts, and entries. Managing and categorizing this much data is vital for CampusConnect. For this reason, we preferred to use MySQL database because it has cross-platform compatibility, which means can run on various operating systems such as Windows, Linux, macOS, and more; it has scalability, which means it can efficiently handle growing datasets and number of users and it provides various security features including user authentication, access control, and encryption to ensure the safety of stored data. Also, we preferred Google Firebase for storing images of CampusConnects' data (borrowings, donations, posts, entries) because it provides simple API for file uploads and downloads, which makes it easy to integrate into the CampusConnect website, it automatically handles data traffic and delivers images efficiently even during periods of high demand, and it allows for real-time synchronization of data across clients. In addition, due to AWS RDS (Amazon Web Services Relational Database Service) provides real-time web-based remote database service to CampusConnect.

2.4 Access Control and Security

CampusConnect has an access control system in order to provide security for the app and prevent misuse of users. A user's access range is determined by his/her role. A user can either be a **user** or an **admin.** Users enter the app with an ordinary user interface and only execute certain actions that are restricted by the user interface. Our app determines the user's role according to the data that comes from the database during the login process. After determining that, the user can only see restricted interfaces and interface paths

designed for the user role and cannot intervene with other users' items.
Admins enter the app just like common users. After the login process admin user sees a similar page with users, but there are small changes, such as the lack of an "add interface," which is used for sharing posts and entries. Since admins exist to provide good and safe service, they do not share anything. They just check shared items, profiles, and reported items. If there is any offensive or abusive usage of the app, they are allowed to intervene and edit or delete items and ban users. Therefore, admins can be considered as the police of the app environment.

Access Control Matrix

	User	Admin
Login	**X**	**X**
Register	**X**	**X**
Renew Password	**X**	**X**
Share Post	**X**	
Share Entry	**X**	
Search for Post	**X**	**X**
Edit Own Post	**X**	
Edit Any Post		**X**
See Market	**X**	**X**
Filter Market	**X**	**X**
See Forum	**X**	**X**
See Detailed Post	**X**	**X**
See Detailed Entry	**X**	**X**
Comment to Entry	**X**	
Delete Own Post	**X**	
Delete Own Entry	**X**	
Delete Any Post		**X**
Delete Any Entry		**X**
View Own Profile	**X**	**X**

View Others Profile	**X**	**X**
Edit Own Profile	**X**	**X**
Edit Others Profile		**X**
Send Message	**X**	**X**
Report a Shared Item	**X**	
Report a Profile	**X**	
Ban a User		**X**

2.5 Boundary Conditions

2.5.1 Initialization

No installation is required to run the CampusConnect application; all necessary source files are fetched from the server when a user visits the CampusConnect domain. To use the application, the user should already have an account created in the database. The account creation phase is done through the registration process. After successful registration, users can log into the system through the login interface and access the features of CampusConnect.

2.5.2 Termination

CampusConnect operates on web servers and cloud-based services, ensuring continuous availability. The termination of the application would involve server maintenance or updates, which will typically be scheduled during low-usage periods. In case of any planned termination, users will be notified in advance through appropriate communication channels to minimize disruptions.

2.5.3 Failure

When a server failure or unexpected system issues occur, CampusConnect is designed to provide a seamless experience once the issues are resolved. Continuous monitoring and automated notifications are in place to alert administrators to any potential failures. Regular backups of the database are conducted to ensure data integrity and for being able to recover from unexpected events. In such scenarios, users of the application will be informed of the situation, and the development team will work punctually to restore normal operation.