Blink ID

Software Design Document (SDD)

Version 3.0

Document Preparation

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Revision History

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| 04/12/2024 | 1.0 | The first draft. | Vysnavi Balabhadruni  Dheeraj Chiggurupati |
| 04/11/2024 | 2.0 | Added staff portal and entity relationship module and some changes in all the portals | Venkata Sai Ramya Padmasri Boggaram  Mounika Dubba |
| 04/22/2024 | 3.0 | Included all the project documents and the latest version numbers of the project documents.  Updated design Constraints in full form. Added latest design in user interface. | Sai charan Kammampally  Mounika Dubba |

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Software Design Document

# Introduction

## Purpose of the Document

This document's main goal is to provide an overview of the Blink ID project's software design specifications. It functions as an all-inclusive guide that describes the Blink ID application's architecture, features, and methods of implementation.

## Scope of the Document

This document's scope includes the Blink ID project's software design. It outlines a number of topics, including design choices, limitations, architecture, parts, modules/classes, user interfaces, and other relevant design features that were necessary for the creation of the Blink ID program.

## References

Following are the list of references:

* Spring Boot Microservice API- Refers to the official documentation for Spring Boot, a Java-based framework used for developing microservices-based APIs: [Spring Boot Documentation] **(**[**https://spring.io/projects/spring-boot**](https://spring.io/projects/spring-boot)**)**
* Project\_smart\_campus\_PPD\_version\_2**(** [**https://drive.google.com/file/d/1k0n1DCK70Ez\_OurQhA22LG9MwKlwD7so/view?usp=drive\_link**](https://drive.google.com/file/d/1k0n1DCK70Ez_OurQhA22LG9MwKlwD7so/view?usp=drive_link)**)**
* Project\_smart\_campus\_Project\_vision\_Document\_version\_2(<https://drive.google.com/file/d/1sNEibsJLEY_eJ1BWT9CaKe5C81u5NqAZ/view?usp=drive_link>)
* Project\_smart\_campus\_SDD\_version\_2(<https://drive.google.com/file/d/1VtA0Jfs0HiZzkVKC_BNsphXsSO37Zltw/view?usp=drive_link>)
* Project\_smart\_campus\_Software\_Test\_Document\_(STD)\_version\_2(<https://drive.google.com/file/d/1PrSeEJN5LjtrF04M8tCuSCU4CEn7TSg4/view?usp=drive_link>)
* Project\_smart\_campus\_SRS\_version\_2(<https://drive.google.com/file/d/1rkHd3ZsuzLRmns8lIaKHoTFJ3oYld3_4/view?usp=drive_link>)
* Face Recognition Flask API - Refers to resources and documentation for building APIs with Flask, a Python-based micro web framework, specifically for implementing face recognition functionality: [Flask Documentation] **(https://flask.palletsprojects.com/en/2.0.x/)**
* Image Store (AWS S3, Firebase Storage)- Resources related to storing and managing images using AWS S3 (Simple Storage Service) and Firebase Storage: [AWS S3 Documentation] **(https://docs.aws.amazon.com/s3/index.html)**, [Firebase Storage Documentation] **(https://firebase.google.com/docs/storage)**
* Android (Kotlin, Jetpack Compose) - Refers to the official documentation for Android app development using Kotlin programming language and Jetpack Compose UI toolkit: [Android Developers - Kotlin Documentation] **(https://developer.android.com/kotlin)** and [Android Developers - Jetpack Compose Documentation] **(https://developer.android.com/jetpack/compose)**
* Web (ReactJS)- Resources for building web applications using ReactJS, a JavaScript library for building user interfaces: [React Documentation] **(https://reactjs.org/docs/getting-started.html)**
* Deployment CI/CD (GitHub Actions)- Resources for setting up continuous integration and continuous deployment (CI/CD) pipelines using GitHub Actions: [GitHub Actions Documentation] **(https://docs.github.com/en/actions)**
* Hosting (AWS EC2, AWS Elastic Beanstalk)- Resources for hosting applications on AWS (Amazon Web Services) using services like EC2 (Elastic Compute Cloud) and Elastic Beanstalk: [AWS EC2 Documentation] **(https://docs.aws.amazon.com/ec2/index.html),** [AWS Elastic Beanstalk Documentation**](https://docs.aws.amazon.com/elasticbeanstalk/index.html)**

## Definitions, Acronyms, and Abbreviations

See Appendix A.

# Product Scope

The BlinkID project's product scope is to provide a user-friendly platform that uses facial recognition technology to enable safe access and recognition services in an academic setting on a college or university campus. The scope encompasses, but is not limited to: Authentication using facial recognition, regulation of campus amenities' access observing and verifying features, alerts in real-time on security breaches, integration with the campus's current systems, registration of users and administration of their profiles, notifications for communication via SMS or email, tools for administrators to control student access, Support services, cross-device compatibility, and search functionality for user identification.

# System Design Decisions and Constraints

## System Design Decisions

|  |  |  |  |
| --- | --- | --- | --- |
| System Design Decision ID | Date | Design Decision | Reason |
| Design Decision -1 | 04/10/2024 | Mobile Platform: Android | Android is selected as the primary platform due to its widespread adoption. |
| Design Decision -2 | 04/10/2024 | Programming Language: Kotlin | Kotlin is a modern programming language that offers concise syntax and full interoperability with Java. |
| Design Decision -3 | 04/10/2024 | Architecture: Model-View-ViewModel (MVVM) | to separate the business logic from the user interface. |
| Design Decision -4 | 04/10/2024 | User Interface Design: Three user interfaces are included, designed to be modern, user-friendly, and intuitive. | To provide a seamless and pleasant user experience. |
| Design Decision -5 | 04/10/2024 | Data design: Optimized for performance and scalability, with user information securely stored in AWS S3 and Firebase Storage. | To handle data efficiently and accommodate future growth. |
| Design Decision -6 | 04/10/2024 | API Integration: Integrated with Spring Boot microservice for backend API and Flask API for face recognition. | To provide additional functionality and improve user experience. |
| Design Decision -7 | 04/10/2024 | Security: Provides multiple layers of security, including encryption of sensitive data and secure authentication methods. | To protect user data and prevent unauthorized access. |
| Design Decision -8 | 04/10/2024 | Mobile Optimization: Optimized for mobile devices with a responsive design. | To ensure that the application looks and works well on a variety of mobile devices |

## System Design Constraints

|  |  |  |  |
| --- | --- | --- | --- |
| **System Design Constraint ID** | **Date** | **Constraint** | **Reason** |
| Design Constraint-1 | 04/12/2024 | Device Compatibility | Ensure compatibility across a diverse range of Android devices. Android devices exhibit differences in screen sizes, processing capabilities, and memory capacities, necessitating compatibility considerations to ensure optimal performance across various devices. |
| Design Constraint-2 | 04/12/2024 | Network Connectivity | Ensure functionality under varying network conditions, including Wi-Fi. The application must operate seamlessly across different network environments to ensure uninterrupted access and functionality for users regardless of their network connection type. |
| Design Constraint-3 | 04/12/2024 | Data Protection | Implement robust measures to safeguard user data, including facial recognition data, from unauthorized access. To uphold user privacy and security, it is imperative to implement stringent data protection mechanisms to prevent unauthorized access to sensitive information such as facial recognition data and user profiles. |

# Software Architectural Design

The software architectural design of the Blink ID application is delineated in this section.

# Software Design - Modules/Classes

|  |  |  |
| --- | --- | --- |
| **Module/Class Name** | **Module Short Name (If there is one)** | **Short Description of the Module/Class** |
| Student Portal | UP | The student portal contains attributes and methods related to student information, including student email, password, and photo. It also includes login and registration functionality, as well as specific features tailored for students. |
| Teacher portal | TP | The Teacher Portal (TP) allows teachers to add students by email, password, and photo, and provides options for managing exams, student lists, and other academic tasks through a user-friendly interface. |
| Admin portal | AP | It manages both student and teacher portals, providing administrators with control over access, activities, and settings. |
| Staff portal | SP | The staff portal is designed for staff members involved in the day-to-day operations of the BlinkID project. It provides them with the tools and functionalities necessary to effectively fulfill their roles and responsibilities. |

## Student Portal

This module focuses on managing user-related attributes and functionalities within the Blink ID application. User in this context encompass students, faculty, and administrative personnel who interact with the system. Below are the key attributes and methods associated with user management.

Attributes:

* Username: A unique identifier assigned to each user for authentication and identification purposes.
* Password: A secure credential used by users to authenticate themselves securely during login.
* Email: The email address linked to the user's account for communication.
* Name: The full name or display name of the user.
* Photo: Serves as a user's picture for purposes of visual identification and authentication.
* Verification of Facial Recognition Data: To preserve student privacy, make sure that any facial recognition data that is being gathered is encrypted and maintained securely. Validate face recognition data during the enrollment and authentication processes to guarantee its accuracy and integrity.

Methods:

* Registration: Enables new users to create an account within the Blink ID system, providing necessary details.
* Login: Allows registered users to securely access their accounts by providing valid credentials.
* Profile Management: Allows users to view his/her tasks created by the admin or teacher edit and update their profile information, including personal details and contact information.
* Username Validation: Verify the uniqueness and compliance with the length criteria of student usernames using username validation. Make sure there are no duplicate usernames by running checks.

## Teacher Portal

The Teacher Portal (TP) facilitates student management by enabling teachers to add students using email, password, and photo. It also offers features for organizing exams, student lists, and other academic tasks in a user-friendly manner. The interface is designed to streamline administrative processes and enhance the teaching experience.

Attributes:

Attributes:

* Teacher ID: An exclusive identifier assigned to each teacher within the BlinkID system.
* Teacher username and password: Login credentials utilized by teachers to access their accounts and perform designated tasks.
* Access level: Specifies the level of access granted to teachers, delineating their permissions within the application. Access levels may encompass privileges such as managing student attendance, viewing student profiles, and accessing academic resources.
* **Add Student :** Ensure that the email and password fields are not empty and meet certain criteria

Methods:

* View student profiles: Allows teachers to access and review detailed profiles of registered students, containing essential information such as academic records, course schedules, and campus activities.
* Access academic resources: Provides teachers with access to a repository of academic resources, including lecture materials, assignments, and supplementary learning materials. Teachers can utilize these resources to enhance their teaching methodologies and support student learning.
* Generate reports: Empowers teachers to generate reports summarizing key metrics and statistics related to student attendance, academic performance, and participation in campus activities. These reports aid in assessing student progress and identifying areas for improvement.

## Admin Portal

The admin portal encompasses attributes and methods pertinent to administrative users responsible for overseeing the BlinkID project. Admin users possess the authority to manage various aspects of the application's functionalities and operations. Below are the primary attributes and methods of the admin portal.

Attributes:

* Admin ID: A unique identifier assigned to each administrative user within the system.
* Admin username and password: Login credentials utilized by admin users to access their accounts and perform administrative tasks.
* Access level: Specifies the level of access granted to admin users, dictating their permissions within the application. Access levels may include privileges such as managing user accounts, overseeing system settings, and monitoring activity logs.
* Admin contact information: Contact details such as email addresses or phone numbers associated with each admin user.

Methods:

* Manage user accounts: Enables admin users to create, modify, or deactivate user accounts within the BlinkID system. This includes managing user permissions and roles.
* Configure system settings: Allows admin users to configure and customize various settings within the BlinkID application, such as facial recognition parameters, authentication protocols, and notification preferences.
* Monitor activity logs: Provides admin users with access to comprehensive logs detailing user activities and system events. Admins can review these logs for security auditing purposes and to track system usage.
* Generate reports: Enables admin users to generate and export reports summarizing key metrics and statistics related to user activity, fundraising campaigns, and donation transactions. These reports facilitate data analysis and decision-making processes.
* Manage application content: Allows admin users to update and manage content displayed within the BlinkID application, such as announcements, FAQs, and informational resources. Admins can ensure that content remains relevant and up-to-date to enhance user experience.

## Staff Portal

The staff portal is designed for staff members involved in the day-to-day operations of the BlinkID project. It provides them with the tools and functionalities necessary to effectively fulfill their roles and responsibilities.

Attributes:

* Staff ID: A unique identifier assigned to each staff member within the system.
* Staff username and password: Login credentials utilized by staff members to access their accounts and perform their designated tasks.
* Access level: Specifies the level of access granted to staff members, dictating their permissions within the application. Access levels may include privileges such as managing user inquiries, processing transactions, and updating inventory.
* Staff contact information: Contact details such as email addresses or phone numbers associated with each staff member.

Methods:

* Handle user inquiries: Allows staff members to address user inquiries, provide support, and resolve issues promptly through various communication channels.
* Process transactions: Empowers staff members to process transactions within the BlinkID system, including donations, payments, and other financial transactions, ensuring accuracy and compliance.
* View activity logs: Grants access to activity logs documenting user interactions, transactions, and system events, enabling staff to monitor activities and track trends for analysis and compliance purposes.
* Generate activity reports: Enables staff members to generate and export reports summarizing key metrics and statistics related to their responsibilities, such as transaction volumes, inventory levels, and user engagement, facilitating informed decision-making.
* Manage announcements: Allows staff members to create, edit, and publish announcements or notifications for users within the BlinkID application, ensuring effective communication of important updates, promotions, or announcements.
* Validate groups: Provides functionality for staff members to validate the membership and permissions of groups within the system, ensuring that group assignments are accurate and align with organizational requirements. This validation helps maintain data integrity and security within the BlinkID project.

# User Interface Design

Student Dashboard:

* The Student Dashboard provides students with a streamlined view of their upcoming exams and assigned groups.
* Students can easily access information regarding exam dates, times, and locations, as well as details about the groups they belong to within the campus community.

Teacher Dashboard:

* The Teacher Dashboard empowers teachers with tools to efficiently manage exams and student groups.
* Teachers can create new exams, set parameters such as duration and grading criteria, and assign students to specific exams.
* Additionally, teachers have the ability to create new student profiles directly from the dashboard and add them to existing or upcoming exams.

Create exams in teacher dashboard:

* Exam Creation Interface: Within the teacher dashboard, educators can access the exam creation interface, where they can define the details of the exam. This includes specifying the exam title, duration, instructions, and any additional parameters relevant to the assessment.
* Adding Questions:Teachers can add questions to the exam from a question bank or create new questions directly within the exam creation interface. They have the flexibility to include various question types such as multiple choice, short answer, essay, and more. Additionally, teachers can set the point values for each question to reflect its importance in the overall assessment.
* Setting Permissions and Access:Teachers can configure permissions and access settings for the exam, specifying which students or groups can participate and when the exam will be available. They can also establish rules for exam behavior, such as whether students can review their answers, receive immediate feedback, or have a time limit for completion. These settings ensure that the exam aligns with the instructional objectives and assessment criteria.

Add Student to Exam:

* When adding a student to an exam, teachers can input the student's information and select the exam to which they will be added.
* After entering the student's details, teachers have the option to validate the student's identity by capturing a real-time photo using the BlinkID application.
* The system then authenticates the student's identity by comparing the captured photo with the student's existing profile photo, ensuring accuracy and security.

Staff dashboard:

* User Management: The staff dashboard provides tools for managing user accounts, including creating, modifying, and deactivating accounts as needed. Staff members can also assign roles and permissions to users, ensuring appropriate access levels within the system.
* Transaction Processing: Staff can access features for processing transactions within the system, facilitating tasks such as donation processing, payment verification, and managing financial records. This functionality enables efficient and secure handling of financial transactions related to the organization's operations.
* Reporting and Analytics: The staff dashboard offers reporting and analytics capabilities, allowing staff members to generate and analyze reports on various metrics such as transaction volumes, user activity, and inventory levels. These insights aid in decision-making processes and help track organizational performance over time.

Creating group in the staff dashboard:

* Group Creation Interface: The staff dashboard features a user-friendly interface for creating groups, where staff members can input group names, and descriptions, and assign group administrators.
* Membership Management: Staff can add or remove members to/from groups, ensuring that individuals are appropriately categorized and assigned to relevant groups based on their roles or responsibilities within the organization.
* Access Control: The staff dashboard allows staff members to configure access permissions for each group, defining which resources, features, or data members of the group can access within the system, ensuring security and data integrity.

Validate the Student Added into9 exam:

* Following the addition of a student to an exam, the Validate Student Added page prompts the teacher to capture a photo of the student using the device's camera.
* The BlinkID application utilizes facial recognition technology to compare the captured photo with the student's pre-existing profile photo stored in the system.
* Upon successful authentication, the teacher receives confirmation that the student has been successfully added to the exam, ensuring that only authorized students participate in the examination process.

Add Student to group:

* When adding a student to a group, administrators or teachers can input the student's information and select the group to which they will be added.
* After entering the student's details, administrators or teachers have the option to validate the student's identity by capturing a real-time photo using the BlinkID application.
* The system then authenticates the student's identity by comparing the captured photo with the student's existing profile photo, ensuring accuracy and security. This process helps maintain data integrity within the system and ensures that only authorized students are added to the group.

Validate the Student Added into group:

* Following the addition of a student to a group, the Validate Student Added page prompts the teacher to capture a photo of the student using the device's camera.
* The BlinkID application employs facial recognition technology to compare the captured photo with the student's pre-existing profile photo stored in the system.
* Upon successful authentication, the teacher receives confirmation that the student has been successfully added to the group, ensuring that only authorized students are included in the group membership. This process enhances security and accuracy in managing group assignments within the system.

# Appendix A – 1.4 Definitions, Acronyms, and Abbreviations

|  |  |  |
| --- | --- | --- |
| **Term** | **Abbreviation / Acronym** | **Definition** |
| UI | User Interface | It describes the interactive and visual features of the Blink ID application that users interact with, such as menus, screens, buttons, and other graphical elements. |
| UX | User Experience | Consists of all aspects of the user's interaction with the Blink ID application, including performance, accessibility, ease of use, and the degree to which the user interface satisfies the needs and expectations of the user. |
| Apk | Android Application Package | The Android operating system distributes and installs mobile applications using the APK (Android Application Package) file format. APK files are utilized in the Blink ID project to install the program on Android smartphones. |
| API | Application Programming Interface | Application Programming Interface, or API, is a collection of conventions, instruments, and standards that enable interoperability between various software programs. APIs make it easier for various application components, such the user interface and the facial recognition module, to connect with one another in the context of the Blink ID project. |

# 8. Appendix B – Entity Diagram of the Software System

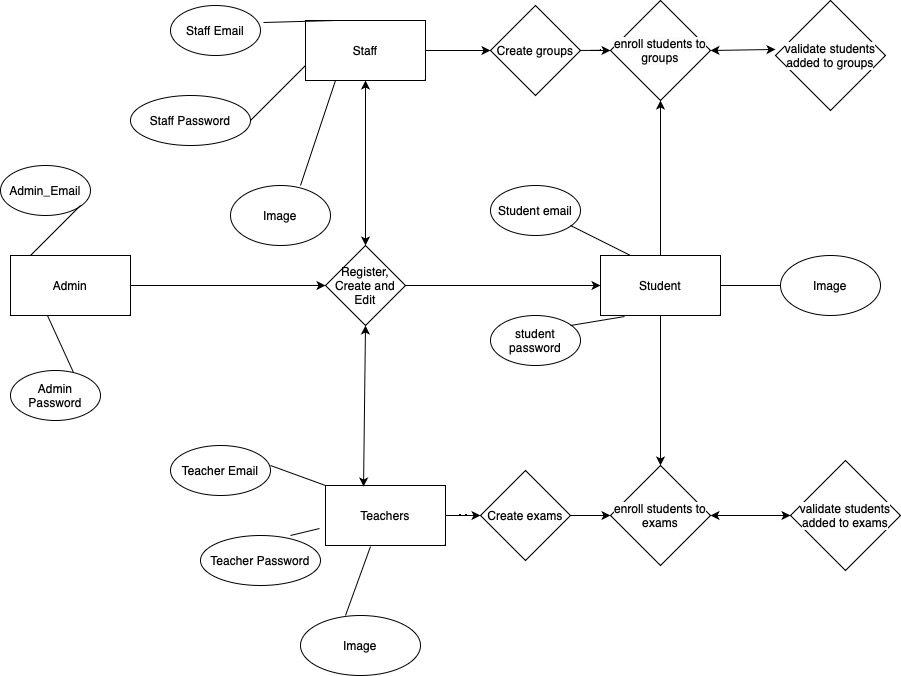


Fig 1: Entity-Relation Model of Blinkid

# 

# 9. Appendix C – User Interfaces

Following are some user interface sketches of the system:

A screenshot of a phone

Description automatically generated A white rectangular object with a black border

Description automatically generated

Fig 1: Login Activity For student Fig 2: Student Dashboard

A screenshot of a phone

Description automatically generated A screenshot of a cell phone

Description automatically generated

Fig 3: Login Activity For Teacher Fig 4: Teacher Dashboard

A screenshot of a login form

Description automatically generated A screenshot of a person's profile

Description automatically generated

Fig 5: Adding Student Fig 6: Success page after adding a student.

A screenshot of a phone

Description automatically generated A screenshot of a phone

Description automatically generated A screenshot of a phone

Description automatically generated

Fig 7: Student List Fig 8: Adding exam.

A screenshot of a cell phone

Description automatically generated A screenshot of a cell phone

Description automatically generated

Fig 9: Exam list Fig 10: Opened new exam that is added (DSA exam)

A screenshot of a cell phone

Description automatically generated A screenshot of a cell phone

Description automatically generated

Fig 11: Adding students to the exam.

A screenshot of a cell phone

Description automatically generated

Fig 12: Student validation.

A screenshot of a phone

Description automatically generated A screenshot of a phone

Description automatically generated A screenshot of a cell phone

Description automatically generated

Fig 13: Adding group. Fig 14: Groups Fig 15: Adding Student to the group.

A screenshot of a phone

Description automatically generated A screenshot of a cellphone

Description automatically generated

Fig 16: Selecting Students to Add in a Group Fig 17: Validation of student in group