# Senior Design Requirements Document

## Panther Shuttle App


**Team Members:**

Joseph Hilte (jhilte2022@my.fit.edu)

Tony Arrington (tarrington2022@my.fit.edu)

Jonathan Suo (jsuo2022@my.fit.edu)

Chase Monigle (cmonigle2022@my.fit.edu)

**Faculty Advisor:**

Professor Khaled Ali Slhoub (kslhoub@fit.edu)

**Client:**

Vincent Borrelli (vborrelli2022@my.fit.edu)

Florida Institute of Technology


September 4, 2025

## Table of Contents

# 1. Introduction

## 1.1 Purpose

The purpose of this document is to define the requirements for the Shuttle App, a mobile application designed to provide university students with reliable and efficient access to campus shuttle services. This document outlines the functional requirements, interface requirements, and performance requirements necessary to ensure that the app meets the needs of its intended users.

## 1.2 Scope

The Shuttle App will allow users to:
- Students can see the shuttle schedule
- Students can see the shuttle in real-time on a campus map.
- Students can receive notifications regarding the shuttle's status, delays, and estimated arrival times.
- Students can see shuttle stops on a map.
- Students can see shuttle capacity.
- Drivers can use tools for scheduling and monitoring shuttle operations.

The system will be available on Android devices. It will operate securely, efficiently, and reliably, ensuring accessibility and data privacy compliance.

## 2. Overall Description

### 2.1 Product Features

The Shuttle App will include the following major features:
- Real-time shuttle tracking.
- Push notifications for status updates.
- Integration with university scheduling and authentication systems.
- Administrative tools for schedule management.
- Driver tools for route and service status updates.

### 2.2 Primary Users

The primary users of the Shuttle App will include:
- Students: Track rides and Shuttle Info.
- Drivers: Update shuttle service status and receive route details.
- Shuttle Managers: Manage schedules, routes, and update map.

### 2.3 Operating Environment

The Shuttle App will operate in the following environment:
- Mobile platforms: Android.
- Requires GPS-enabled device and network connectivity (Wi-Fi/4G/5G).
- Shuttle vehicles have drivers use their phones.
- Backend servers hosted on secure cloud infrastructure with redundancy.

# 3. Specific Requirements

## 3.1 External Interface Requirements

### 3.1.1 User Interfaces

The app shall provide:
- Mobile app interface with map-based tracking.
- Different Tabs for things such as a home page, settings, notifications, live map, and schedule.

### 3.1.2 Hardware Interfaces

- Compatible with GPS-enabled smartphones.
- Android devices for shuttle drivers.

### 3.1.3 Software Interfaces

- University authentication system (TRACKS/Student ID).
- Google Maps API for routing and traffic updates.

### 3.1.4 Communications Interfaces

- Encrypted HTTPS/TLS for all communication.
- Offline mode for schedule browsing.

## 3.2 Functional Requirements

[FR-1] Users shall be able to view real-time shuttle locations on a live map.
[FR-2] The system shall refresh shuttle positions at least every 10 seconds.
[FR-3] Users shall be able to view shuttle schedules and route details.
[FR-4] The system shall provide estimated arrival times at stops.
[FR-5] Users shall receive push notifications for shuttle delays, cancellations, or service interruptions.
[FR-6] Users shall receive reminders and notifications related to schedule updates.
[FR-7] Drivers shall be able to update shuttle status (in service, out of service, etc) using their Android devices.
[FR-8] Drivers shall receive route details through the app.
[FR-9] Shuttle Managers shall be able to update schedules and modify routes.
[FR-10] Shuttle Managers shall be able to update the live map with shuttle availability.

## 3.3 Performance Requirements

[PR-1] The app shall support at least 1,000 concurrent users.
[PR-2] Average response time for loading shuttle locations or schedules shall be $\leq 2$ seconds.
[PR-3] GPS data refresh shall not exceed 10 seconds.
[PR-4] The system shall achieve 99.5% uptime monthly.

### 3.4 Design Constraints

- The Shuttle App shall be developed natively for Android devices to align with driver and user requirements.
- The system must comply with university IT and security policies.
- Sensitive data (such as authentication credentials) shall not be stored locally on devices.
- The app shall integrate with the university's existing TRACKS/Student ID authentication system.

### 3.5 Software System Attributes

- Reliability: The app shall automatically recover from network or server disruptions without data loss.
- Availability: The app shall be accessible 24/7, except for scheduled maintenance windows.
- Security: The app shall use secure authentication (TRACKS login) and encrypted communication (TLS).
- Maintainability: The system shall use modular design principles to allow for future feature expansion.
- Portability: The backend services shall be platform-independent, even though the primary client app will be Android-based.

### 3.6 Other Requirements

- The app shall provide a dark mode option for accessibility and user preference.
- The app shall allow students to save favorite stops or routes for quick access.
- The app shall allow students to filter the live map to show only selected routes or active shuttles.

## 4. Non-Functional Requirements

### 4.1 Performance

[NFR-1] Shuttle location updates shall appear on the live map within ≤ 10 seconds of real-time movement.
[NFR-2] Notifications (e.g., delays, shuttle approaching) shall be delivered within 3 seconds of being triggered.
[NFR-3] The system shall load shuttle schedules and route information in ≤ 2 seconds.

### 4.2 Reliability

[NFR-4] The app shall remain operational during peak student usage (at least 1,000 concurrent users).
[NFR-5] The system shall recover from server or network failures within 60 seconds without data loss.
[NFR-6] Daily backups shall ensure no more than 24 hours of schedule or route data is lost.

### 4.3 Security

[NFR-7] All communication between the app and backend servers shall be encrypted using TLS.
[NFR-8] Student authentication credentials (TRACKS/Student ID) shall be securely stored using salted hashing.
[NFR-9] The app shall prevent unauthorized access to shuttle data (e.g., route modifications).

### 4.4 Usability

[NFR-10] First-time users shall be able to access the live shuttle map within 2 steps from the home screen.
[NFR-11] Users shall be able to learn how to view shuttle routes and schedules within 5 minutes.
[NFR-12] The app shall provide accessible features such as dark mode, large text, and high-contrast options.

## 5. Conclusion

This document outlines the Shuttle App requirements, specifying what the system should do, how it will interact with users and other systems, and the performance criteria it must meet. By adhering to IEEE standards this specification ensures clarity, usability, and alignment with project goals.