Faculty of Engineering and Technology
Department of Computer Science and Engineering

B.Tech Project Synopsis

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Proposed Title: GeoWake: A Location Based Smart Wake-Up App for Commuters

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Introduction to the Topic:

- **Problem Background**: Many commuters, whether on public transport like the metro or driving, face the anxiety of missing their stop. This is a common problem for those who doze off, are distracted, or are traveling an unfamiliar route.
- **Motivation**: The primary motivation is to create a stress-free commute, allowing passengers to relax, read, or sleep without worrying about constantly checking their location.
- **Importance**: This project is important because it provides a reliable solution to prevent missed stops. It monitors the user's journey in real time and provides a timely alert just before they reach their destination, enhancing the commuting experience.

Aim:

The aim of this project is to design and implement GeoWake, a smart, location-based wake-up app that monitors a user's journey in real time and alerts them just before they reach their destination to make the daily commute stress-free.

Low-level System Design:

The app is built on a modular, service-oriented architecture. The core logic is decoupled from the UI (Screens) and managed by a set of high-priority services.

Screens:
Map Tracking Screen: The main user interface for tracking travel.
Settings Drawer: Handles user preferences and configuration.
Ringtones Screen: Allows selection of alarm sounds.

High-Priority Services:
Tracking Service: The core service responsible for initiating and managing the location stream, checking alarm conditions, and firing the alarm.
Active Route Manager: Manages the current route, calculates progress, and snaps the user's location to the route polyline.
Notification Service: Handles showing the persistent progress notification and the full-screen alarm notification.
Alarm Player: Manages the playback of the selected ringtone when the alarm is triggered

Route Handling & Deviation Services:
Deviation Monitor: Continuously checks if the user's location has deviated from the planned route beyond a set threshold.
Reroute Policy: Enforces a cooldown and battery-tiered logic for when to fetch a new route after a deviation is detected.

Data & Network Services:
Offline Coordinator: Manages fetching route data, prioritizing the local cache before making a network request.
Route Cache: Stores previously fetched routes on-device for offline reliability.
Direction Service & ApiClient: Responsible for making external API calls to get route and places data.

Configuration:
Power Policy: Defines different tiers (High, Medium, Low) for location accuracy and update frequency based on battery level

Objectives:

S.No	Objectives
OB1	To design and implement a smart alert system that automatically notifies the user as they approach their destination
OB2	To provide users with flexible alarm triggers based on remaining time (minutes), distance (kilometers), or the number of transit stops.
OB3	To ensure the app functions reliably even with intermittent or lost network connectivity, such as when underground.
OB4	To build a battery-efficient application by smartly adjusting the frequency of location updates based on the device's battery level.
OB5	To develop a system for monitoring route deviations and automatically triggering a rerouting policy if the user goes off-track

Sustainable Development Goals Aligned to your project

SDG No.	SDG Sub Section	Description
3	Good Health and Well-Being	Lowers commute anxiety and cognitive load with timely, reliable alerts.
9	Industry, Innovation and Infrastructure	Practical, user-centric location innovation (snapping, ETA, transfer events).
11	Sustainable Cities and Communities	Encourages public transit reliability by reducing missed stops and commute stress. Optimizes battery/compute, supporting lower energy use on devices.

Methodology:

Objective	Method/ Methodology	Description
OB1	Real-time Tracking & Alarm Service	The core TrackingService ingests real time position updates from the device's geolocator. A _checkAndTriggerAlarm function continuously evaluates the user's progress against their destination. When the threshold is met, it invokes fireAlarm to trigger a native alarm, play the selected ringtone, and vibrate the device.
OB2	Multi-Mode Alarm Logic	The system accepts an alarmMode parameter (distance, time, or stops). For 'distance' mode, it triggers based on straight-line distance. For 'time' mode, it uses a smoothed ETA calculation (based on distance and speed). For 'stops' mode, it tracks remaining transit stops and triggers when the count is less than or equal to the user's set value.
OB3	Offline Coordination & Caching	The app uses cached route data for offline computations. An OfflineCoordinatorservice is implemented to provide route data either from the local cache or the network, ensuring the app remains functional even if connectivity is lost (e.g., in a subway).
OB4	Tiered Power Policy	A dynamic PowerPolicy is implemented with three tiers (High, Medium, Low) based on the device's battery percentage. This policy adjusts the location accuracy (e.g., high, medium), location update frequency (tick), and the cooldown timer for rerouting, significantly reducing battery drain at lower power levels.
OB5	Deviation Monitoring & Rerouting	A DeviationMonitor service runs with each position update to check the user's offset from the snapped route. If the deviation exceeds a set threshold (e.g., 150 meters), it invokes a ReroutePolicy. This policy, gated by a cooldown timer, requests a new route from the OfflineCoordinator, which is then registered in the ActiveRouteManager.

Expected Outcome:

The expected outcome is a reliable, battery-efficient, and user-friendly mobile application that makes the daily commute easier. GeoWake will allow users to enjoy their journey whether sleeping, reading, or working with the confidence that they will be woken up just before their stop, removing the hassle and stress of missing a destination.

Comments (For Official Use):