CareAI App Documentation: Performance Optimizations

This document provides an overview of the performance and accessibility improvements implemented in the CareAI mobile application. These optimizations are especially important given our focus on senior users, accessibility, battery life, and offline resilience.

Key Performance Enhancements

The following optimizations ensure that the app runs efficiently across a variety of mobile devices, especially those used by seniors with limited system resources.

CareAI - Performance Optimization Report

■ Overview

This report documents all major performance enhancements implemented to ensure CareAI is optimized for real-world usage — particularly for senior users on battery-limited or accessibility-prioritized devices.

■ Battery Saver Mode

- **Hook:** `useSettings`

- **Features Disabled When Active:**

- High-frequency voice feedback

- Haptic vibration (non-essential)

- Animations and transitions (reduced motion)

- **Fallback Mode:** Delays speech playback and minimizes background refresh

■■ Smart Voice Playback

- **Hook:** `useVoiceFeedback`

- **Features:**

- Priority-based message queue

- Delayed playback between messages

- Duplicate suppression per session

- Voice state tracking to avoid overlap

■■ Lazy Component Loading

- **Implementation:**
- Used `React.lazy` and `Suspense` for heavier screens
- Loaded only when needed (e.g. `AnalyticsScreen`, `TransitionHistoryScreen`)
- **Result:** Reduced bundle size and improved app launch time

■ Passive Data Sync

- **Hook:** `useFocusEffect` + background interval checks (6 hrs)
- **Behavior:**
- Data loads only on screen focus or after interval expiration
- Background sync cleans up expired reminders/alerts

■ Memory and Event Cleanup

- **Implementation:**
- `useEffect` cleanup for all side effects
- Speech buffers, timeouts, intervals cleared correctly
- Navigation listeners removed on unmount

■ Virtualized Lists

- **Component:** `VirtualizedList`
- **Enhancements:**
- Optimized props (`initialNumToRender`, `windowSize`)
- `getItemLayout` used where possible
- Reduces memory on large screens like Reminders or Claims

■ Accessibility Optimization

- Integrated with all enhancements:
- Screen reader feedback syncs with voice
- Focus indicators adjusted for screen magnification
- Reduced motion mode respected for animations
- Speech batching aids users with low cognitive stamina

■ Testing Recommendations

Battery Impact
- Enable reminders, voice feedback, and speech queue
- Use real device for 1 hour with and without battery saver

Accessibility

- Navigate app using screen reader (VoiceOver/TalkBack)

- Confirm all feedback is spoken once only

- Test large font scaling

Notifications

- Schedule multiple reminders

- Verify voice playback when app is foregrounded

Offline Mode

- Use airplane mode and retry navigating and syncing

■ Summary

The CareAI app is optimized for low-battery devices, voice-first interaction, and graceful handling of missed or long-delayed feedback. These changes prepare us for real-world testing and app store submission.