

SEH500 Project Proposal

Assistive Audio-Visual Communicator for Non-Verbal Patients

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Board: NXP Freedom K66 (Cortex-M4)

Due Date: October 29, 2025

Problem to be solved:

Non-verbal patients, such as those recovering from a stroke or surgery, face significant challenges in communicating essential needs to caregivers. This inability to express basic requests like needing water or assistance can lead to delays in care, patient distress, and increased stress for caregivers. Existing solutions can be complex or lack the persistent, multi-sensory alerts needed in a busy home or hospital environment.

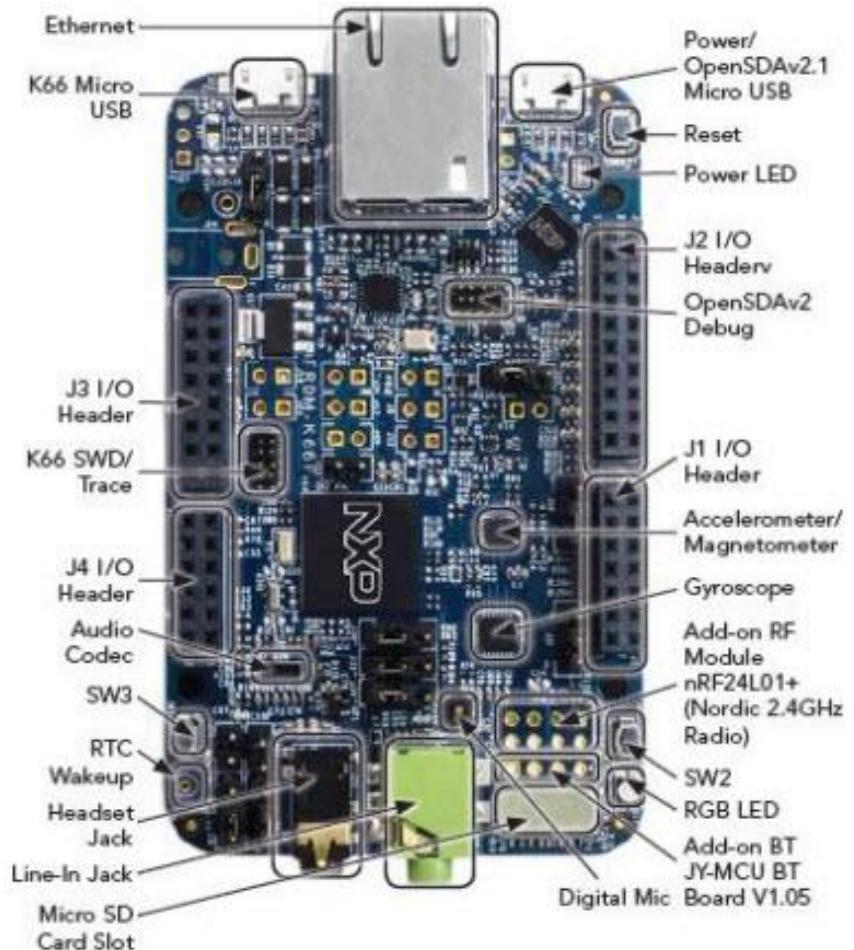
Recommended solution:

This project proposes the development of a standalone assistive communication device on the NXP Freedom K66 board. The system will feature two large, external buttons, each corresponding to a primary patient need (e.g., water, washroom).

When a patient presses a button, the device will initiate two simultaneous, looping alerts. First, it will play a pre-recorded audio snippet of the request from an onboard SD card, repeating the message at a set interval of every ten seconds. Second, a color-coded external LED associated with that specific request (e.g., green for water, red for washroom) will begin to flash continuously. This dual-alert system ensures caregiver attention through both auditory and visual cues. The alerts will persist until a caregiver attends to the patient and presses the same button again to acknowledge the request and cancel the loop.

Peripherals and assembly component:

The solution will utilize the following peripherals: General Purpose I/O (GPIO) with interrupts for button responsiveness, an onboard microSD card slot for storing WAV audio files, and the board's Digital-to-Analog Converter (DAC) for audio playback. Serial communication (UART) will be used for system status logging.





To meet course requirements, a functional block of over 100 lines of GNU Assembler will be written to manage the low-level reading and parsing of WAV file headers from the SD card.

Expected result:

The final prototype will be a dependable device that empowers non-verbal patients to clearly communicate their needs, improving the efficiency and responsiveness of care.