# Project Proposal

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Easysleep – moisture detection and notification system to resolve nocturnal enurism

The premise of this project is a device that could help to resolve bedwetting issues. The idea is that this device detects moisture and in addition collects data on the time and date of each incident to identify patterns. If a pattern is identified after a certain period of time (for example 7-10 nights), the device could be set to wake the person up prior to this time by vibrating a bracelet on his/her wrist at first and bringing up lights in the room thus taking the person out of the deep sleep so he/she can go to the toilet on their own. Practical application of this device could be used for children who wet the bed, but also for elderly hospital patients who cannot get out of bed unassisted, a notification of the incident could be sent to the nurses station so that the patient can be assisted without delay.

I have chosen this as my project because my 7 year old daughter has been wetting the bed for some time and interventions such as restricting fluids from a certain time and lifting her from sleep at a certain time to go to the toilet have not worked. My daughter is also sensitive to loud noises, and therefore I feel that a typical sound alarm based commercial bed wetting detection device might cause her undue stress. I would only introduce a sounded alarm as the last step in the waking process with this device. The desired outcome would be to see if a gentler approach with such a device could help resolve the issue.

Technical Description
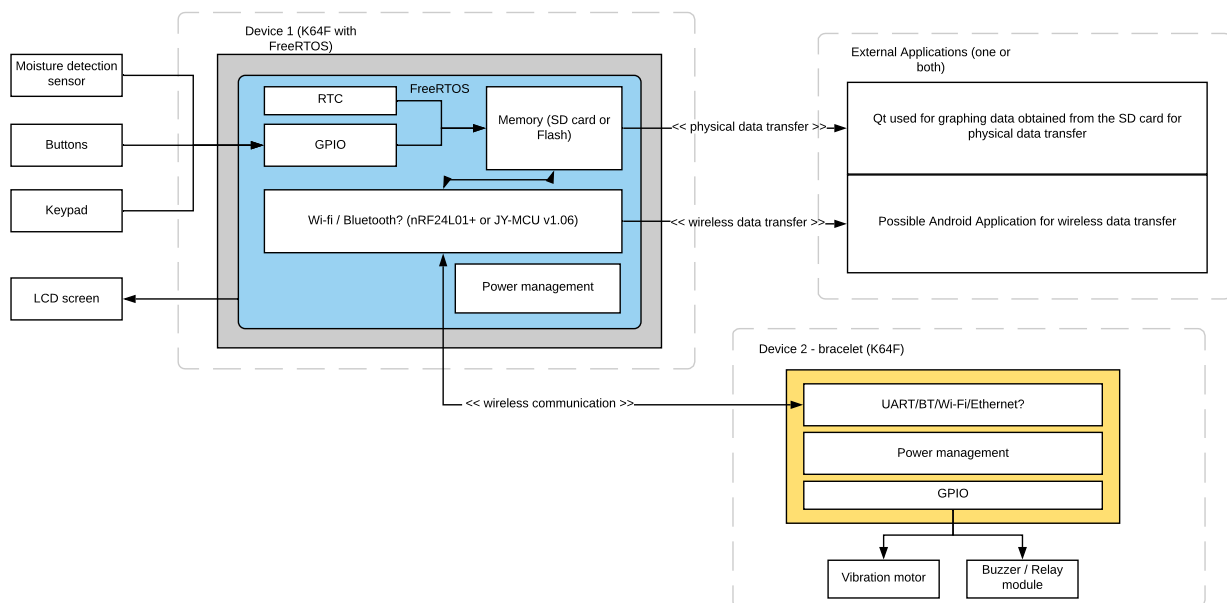
I plan to use two FRDM K64F devices. These are development boards hosting ARM Cortex-M4 processors. The first will focus on moisture detection, data logging and notification initiation to the second device. This first device will use a moisture detecting sensor and will utilize it's Flash memory or an SD card to store the data (decision will be based on outcome of complexity analysis).

I will try to add an LCD screen and a keypad to it to allow for some simple configuration such as time and date and manipulation with the stored data. I hope to use nRF24L01+ or JY-MCU v1.06 for data transmission. The former uses 2.4GHz communication while the latter is a Bluetooth module. I anticipate that the data transmission will be the most challenging element of the project.

The second device (e.g. vibrating bracelet or anklet) will attempt to wake the child up. It will use the same communication module, vibration motor to provide vibrations and a buzzer or a relay that are intended to rouse the sleeping person. This device will be powered by battery supply so it is important to look into power saving modes to effectively use the available energy.

I plan to use FreeRTOS to effectively manage the software running on both devices. I would also like to develop software that could use the collected data for statistics and graphing. To access this data and visualise it, I am considering two options:

a) Removal of the SD card which is then processed by a Qt application
b) Bluetooth with an Android application that could notify the parent or hospital personel.

The majority of the software will be developed using MCUXpresso IDE and C programming language. To be able to monitor the behaviour of the FreeRTOS and running tasks I would like to use SystemView software from SEGGER.

Christmas Demo

For the Christmas Demo, I hope to be able to demonstrate wireless communication between the two devices, interrupt driven moisture detection, simulate vibration motor functionality with an LED and display the results of data logging.

Work Plan

October	setup IDE, order/receive all components, setup GitHub, get moisture detection working with interrupts, get RTC working
November	get wireless communication working
December	setup for demo, get data logging working
January	work on receiving device, vibration motor working, buzzer working
February	if all works so far, setup LCD display and keypad for data manipulation
March	external application development (scope of possible functionality will be decided based on project timeline being on track)
April	wrap up, start writing the project report if not already started

Expected Hardware Requirements

2x	FRDM K64F development boards
2x	nRF24L01+ or JY-MCU v1.06 modules (to be decided later)
1x	moisture detection sensor
1x	vibration motor
1x	LCD display
1x	matrix keypad
1x	relay module