Device Awareness and Identification
Engineering Science Capstone Design Project

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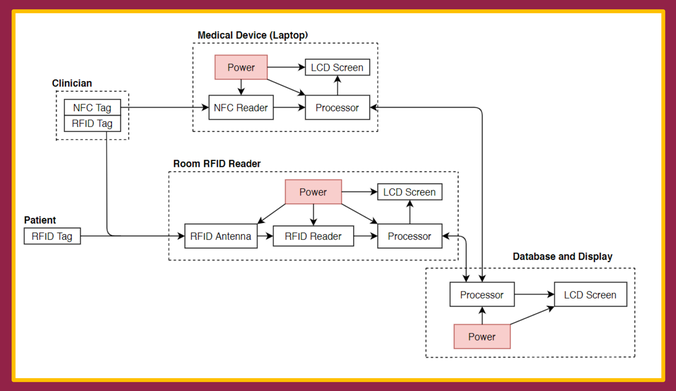
System Diagram



System Diagram Detailed

- Clinicians are assigned an NFC ID and RFID ID
- NFC reader receives ID when clinician's card is scanned
- RFID reader received ID when clinicians card is in the facility (0-10 feet)
- ID read from NFC reader and RFID reader are then sent through Visual Studio to the database
- Clinicians information when and where accessing a medical device is stored into the database
- The information is then sent to excel to be displayed

Technology Utilized

D-Logic NFC reader to associate clinicians with the medical device being accessed. Clinicians scan their card with their UID to represent them logging into the device.

Jadak Thingmagic RFID reader to associate the medical devices and clinicians in an ICU room. The reader detects when a clinician has entered and exited the ICU room.

Visual Studio

C++ was utilized for data transfer throughout the system. Once an ID was detected by either reader Visual Studio starts processing the data

MySQL

MySQL was utilized to store our data from the system. All the information regarding transactions is stored in the database

Excel

Excel was utilized to display the information from the MySQL database

Baxter's Problem Statement

"Too many medical devices act independently of one another. We would like to have a system that can be used by medical devices to identify the patient, the caregivers present (e.g. in the room), the caregiver interacting with the device, and all the other devices that are working with the same patient."

Scope of the Project

- The use of this system where medical devices' locations are identified and communicated with each other within the vicinity of the ICU.
- The system will be used to assist the process of logging nurses into their patient's devices and track their treatment of patients throughout the ICU.
- Intended for incorporation with ICU EMR; will not be using actual EMR system.
- The characters we will be considering in the ICU setting are the nurses, physicians, respiratory therapists, biomedical technicians, and health IT.

Design Requirements

- The system shall track specific clinicians in an ICU environment
  - This mainly includes physicians respiratory therapists and nurses
  - RFID technology used to track this information
- The system shall track specific devices in an ICU environment
  - Medical devices such as infusion pumps and ventilators
  - RFID technology used to do this
- The system shall record the clinicians Identification when using/accessing a medical device
  - NFC technology used to do this

Interviews

- To determine our requirements we conducted several interviews on possible users that may interact with our system
- We interviewed about 20 caretakers in order to make sure the users' workflows in the ICU would be compatible with the system
- From the interviews we were able to pinpoint which characters would interact with our system
  - These characters consisted of Physicians, Respiratory Therapists, Nurses. Health IT and Biomed Techs

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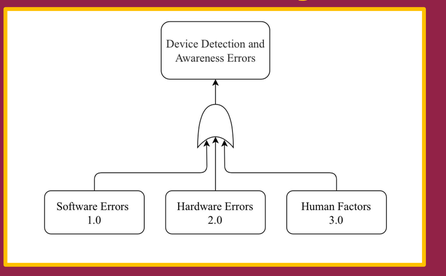
Risk Analysis



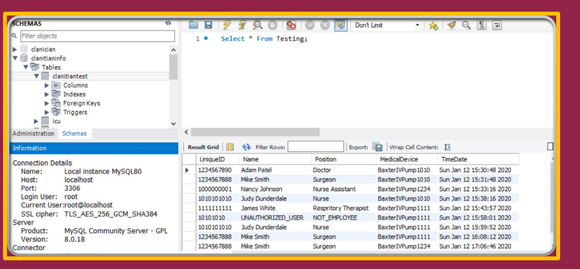
Fault Tree of potential risks within our system

Mitigating the Risks

- Software
  - Error messages
  - Data encryption
- Hardware
  - Cut-off timer (NFC)
  - Additional user-feedback [sound] (NFC)
  - Range efficiency tuning (RFID)
- Human Factors
  - Clinical Validation Study

Final Product

NFC/ RFID interface to detect users in the system



MySQL database storing clinicians' information accessing the system

	A	B	C	D	E	F
1	UniqueID	Name	Position	MedicalDevice	TimeDate	
2	1234567890	Adam Patel	Doctor	BaxterIVPump1010	Sun Jan 12 15:30:48 2020	
3	1234567888	Mike Smith	Surgeon	BaxterIVPump1010	Sun Jan 12 15:31:48 2020	
4	1000000001	Nancy Johnson	Nurse Assistant	BaxterIVPump1234	Sun Jan 12 15:33:16 2020	
5	1010101010	Judy Dunderdale	Nurse	BaxterIVPump1010	Sun Jan 12 15:38:16 2020	
6	1111111111	James White	Respritory Therapist	BaxterIVPump1111	Sun Jan 12 15:43:57 2020	
7	10101010	UNAUTHORIZED_USER	NOT_EMPLOYEE	BaxterIVPump1111	Sun Jan 12 15:58:01 2020	
8	1010101010	Judy Dunderdale	Nurse	BaxterIVPump1111	Sun Jan 12 15:59:52 2020	
9	1234567888	Mike Smith	Surgeon	BaxterIVPump1111	Sun Jan 12 16:08:12 2020	
10	1234567888	Mike Smith	Surgeon	BaxterIVPump1234	Sun Jan 12 17:06:46 2020	
11	1234567888	Mike Smith	Surgeon	BaxterIVPump1234	Sun Jan 12 17:06:46 2020	
12						
13						
14						

Live Excel sheet displaying clinicians' information accessing the system