Medicare system based on ZigBee

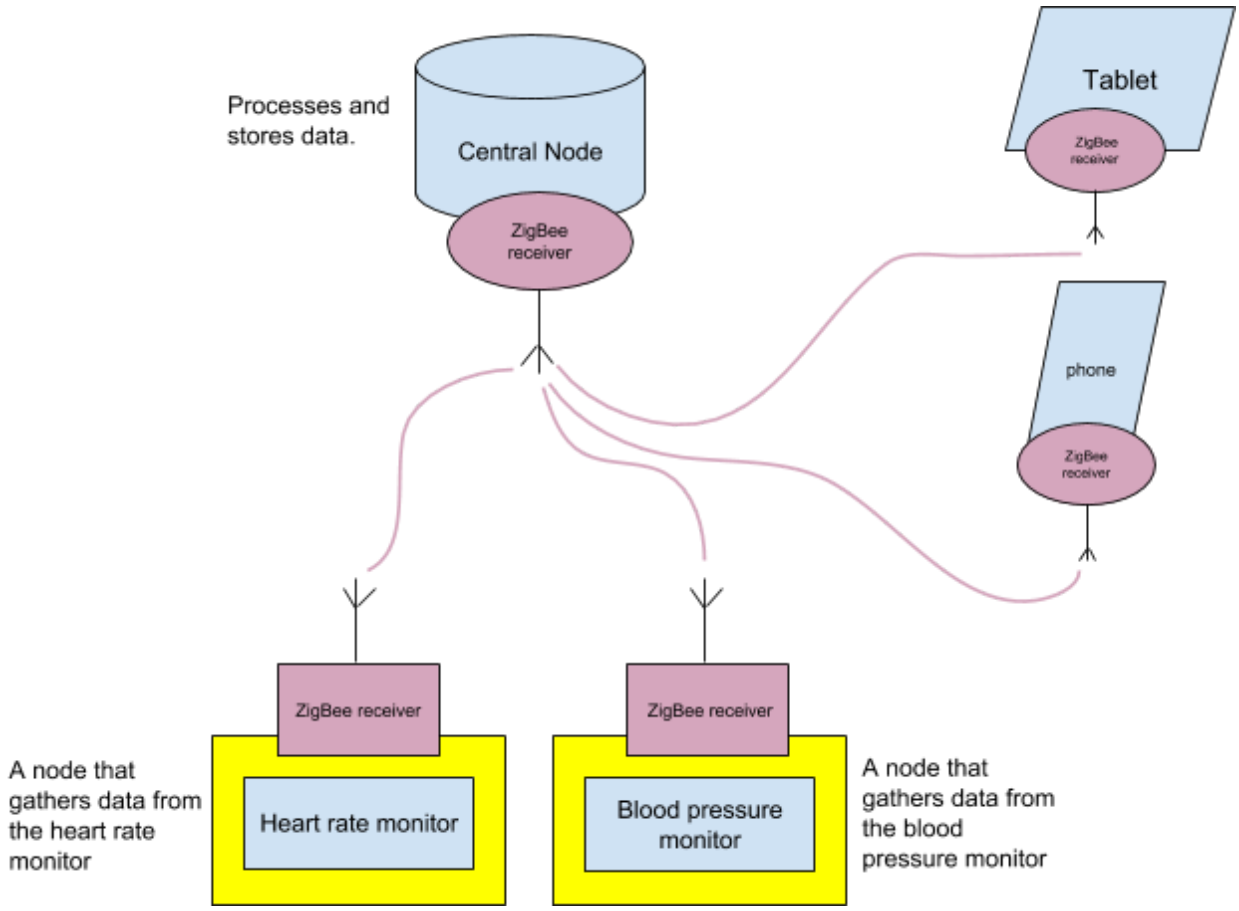
Chelsea Chen
Sam Kim

Project Description

In a hospital or patient care system, responding quickly to changes in patient's health and taking appropriate actions is very important. Although high precision medical devices that measure the state of the patients, such as vital monitors, are very useful in identifying patients' state of health and are heavily used in hospitals, they wouldn't be of much help if doctors or nurses don't get notified of sudden needs of critical care.

Therefore, the motivation of our project is to build a medicare communication system with these medical devices using ZigBee. Data gathered from the medical devices would get transmitted to other nodes, such as a central hospital tablet or a mobile device (eg. a phone). Doctors and nurses can get alerted to critical changes in patients' state of health by simply monitoring nodes within this communication system.

Diagram



Background

We are choosing to use ZigBee because it is suitable for indoor applications, low power, low cost, and open source. Since ZigBee is widely used in many wireless applications, we can also relatively easily learn how to use it as a protocol.

Project details

- To simulate a hospital environment, we'll use 3 to 4 medical monitoring devices. Currently, the types of devices we are thinking of using are:
    - Heart rate monitor
    - Blood pressure monitor
- ZigBee tool we plan on using:
    - ZBOSS: an open source ZigBee stack that supports packet analysis in WireShark (this would help us with debugging)
    - http://zboss.dsr-wireless.com/projects/zboss

Specific steps

1. Create a ZigBee "wrapper" around the medical devices. These could be wireless medical sensors or digital devices that take in monitored data and use the ZigBee protocol to transmit these data.

2. Transmit data in packets from nodes to nodes. This involves figuring out how to package the data (marshalling) and interpret the received data (unmarshalling).

3. Create modules that process the data at the central node. For example, translating sharp changes in heart rate to the corresponding medical conditions and create alerts as another form of data to be sent to the mobile devices.

4. Optimizing the system. For example, skip transmission from the central node to the mobile devices if there is no need for it (ie. only transmit important and urgent information).

References

- Frehill P, Chambers D, Rotariu C, "Using ZigBee to Integrate Medical Devices", Conf Proc IEEE Eng Med Biol Soc. 2007.

- https://ieeexplore.ieee.org/abstract/document/6044716

- https://ieeexplore.ieee.org/abstract/document/1615645