Group number: **Dec1713**

Project title: **IoT Monitor**

Client &/Advisor: **Geiger**

Team Members &/Role:
Ian Harris: Team Leader - Web Role
Tim Lindquist: Key Idea - Leafnode Role
Gregory Steenhagen: Webmaster -Web Role
Steven Warren: Communication -Leafnode Role
Terver Ubwa - 3G Node
Khoi Cao - 3G Node

1.

Bi-Weekly Summary

The past two weeks the leaf node group worked on finalizing the wireless protocol. An issue they ran into was the wireless chip provider supplied a bad yield to our group and about half the transceivers were operational. We proceeded to order from a new supplier and received working chips. We are now aware of the threat of counterfeit chips when trying to buy cheaply. With the working chips we tested our network with 4 nodes spaced apart. We successfully communicated through the network to receive data at each node.

Home node: following the recommendation from our advisor, home node team quickly build, test and debug a transceiver using RF radio signal. We have successfully established bidirectional communication to transfer small data packets. An automated testbench was still being developed to determine the stability of the connection in a long period of time. In addition, we got the internet module working with 2G connection enabled. Most recently, the home node system was able to POST data to a website and GET the feedback from the server to retrieve sensor path.

This week the web development team made a big decision as to how we were going to arrange our website. Previously, we had everything built into a spring-boot application, but one of our web developers had little experience with spring. In an effort to move things along a little faster, we opted to spend the time to separate the front and back ends where we now have a

Larvel application serving our web pages, and our spring boot application hosting our endpoints and interacting with our other team and database. This will allow completely separate front and back end development which should help us hit our deadlines more comfortably with less pain of having to learn new technology. We have already made good progress. We have the applications separated and have resolved the inevitable conflicts this caused, as well as getting some new features up like extra pathing test endpoints and new filtering/organization features for our front end.

Individual contributions

NAME	Individual Contributions	Hours this bi-week	HOURS Cumulative
Ian Harris	Did work related to getting our test endpoints back up. We had a bit of a shift in how we are handling our web application; we now have separate front and back end applications. This took some trial and error which meant a lot of debugging and research, but we got it done and are ready to more forward.	7	75
Gregory Steenhagen	Developed the entire front-facing portion of our website, using the Laravel framework with PHP. User login, account creation, homenode claiming/editing, and data viewing is completed. Users can also reset their password via email, and the site is secure. Also spent time getting the site up and running on our server with the spring boot endpoints. Needed to modify the apache configuration file to setup a virtual host to redirect endpoint traffic to a different port.	25	90
Khoi Cao	Set up and tested bi-directional communication between home node and leaf nodes. Attempted to generate an automation script to verify the connection stability.	12	72
Terver Ubwa	worked on bi communication between the home node and the website. Wrote a c code for the arduino to implement AT command for posting data. wrote the AT command for	10	78

	the 2G module to retrieve data from a website.		
Tim Lindquist	Worked on node code for the protocol to access all the data in the network. Wrote a test "home node" to simulate homenodes task. Received blood and plasma samples from ABE began to do some bookkeeping on the different specifications of each sample. Worked with the data from the gypsum sensor automated test I set up two weeks prior. Began to create a barebones arduino using an ATmega 328p and tried bootloading/programming through ICSP pins.	15	103
Steven Warren	Worked on the node protocols to get the "leaf nodes" communicating as a network. Beginning to work on breadboard circuit & PCB for the future	10	94

Pending issues

- **Ian Harris:** Nothing getting in the way at the moment, we had some issues last week but were able to address those on the web side of things.
- **Gregory Steenhagen:** No issues at the moment. All deployment issues were taken care of last week, now just need to finish development.
- **Khoi Cao:** Work with Terver to design a container for the Home node system. Integrate the solar-charging circuit into the container. Collaborate with Leaf Node to understand their data packets. Program Arduino to encapsulate the data and relay to the web server.
- **Terver Ubwa:** Getting an effective bi communication between the home node and the sensor nodes.
- **Tim Lindquist:** Ran into a problem when trying to bootload/program the ATmega 328p. Looking for a solution for what I did wrong. Possible causes the AVR programmer pin out was a bit strange that I received from ETG and may be incorrect. The 328p they gave me may have already had a bootloader on it and that's why it threw the error, forgot my IC extractor tool so couldn't test if this was the case. I know it is possible so this is likely to be solved soon.
- **Steven Warren:** Ensuring the wireless NRF chips are working as expected.

Plan for coming weeks

- **Ian Harris:** This week I need to pull in GPS coordinates from our database and use those to calculate a shortest path from our home node to the destination. This wil allow us to have a much more performant communication path.
- **Gregory Steenhagen:** Add data analysis to our website, using the data from leafnodes. Finish endpoint development to add homenodes/readings to the database when a request is made to our api.
- **Khoi Cao:** Integrate 2 parts of Home node's communication (with web and leaf node) into one program. Create an automation script to demo the operation. If time permitting, fix the compatibility issue of RF radio module with Particle board (alternative option)
- **Terver Ubwa:** write the c code to implement AT command for the home node GET command. Try to establish an effective communication between the home node and the sensor node.
- **Tim Lindquist:** Fix bootloader issue, wire up prototype on breadboard. Design a schematic and PCB layout. Get a few ordered + parts for REV 1 of the node.
- **Steven Warren:** Design PCB and do breadboard Arduino w/ nrf24l01+ and ensure it works as expected.

<u>**Summary of weekly advisor meeting**</u>

Leaf node: Demoed to Dr. Geiger our working network protocol. He asked us to set up a few more nodes in the system for the following week. We discussed the timeline for how things were going to go to finish the project up by the end of the semester. The second Dr. Geiger wasn't able to attend so we held a meeting with the group members and productivity discuss issues in all our subgroups.

Home Node: following the recommendation from our advisor, we came to a conclusion on which of the internet module to go with(which was the 2G option). We also updated our advisor and the rest of the group on our ability to now post data. In the second group meeting, our advisor was not able to make it but we were able to discuss in detail what was required of the home node by the other group such as retrieving a path from the server. We then modified our initial design to now include a GET to retrieve sensor path from the server and a POST to post the sensor data and also post a request for a new path if one of the nodes is dead.

Web App: After a light scolding from our advisor, we got our app kicked into gear and have made significant progress in the last week. In the short term, we have test endpoints up so our home-node team can practice sending and receiving data while we work on filling out those features. The front end looks really slick, and the backend endpoints are in progress, but we don't foresee any issues there. With some encouragement from Dr. Geiger, we did some research into competitive projects including Aquajet and John Deere. Both provided some

insights as to what information we should provide to our users, which we shared with our advisor. It appears our app has feature parity, and we've identified a couple places we can improve upon the existing design.

On the front-facing portion of our website, we have nearly completed development. Users can now join/login, and have the ability to reset their passwords and update their profile information. Once logged in, users can add home nodes to their account by entering the homenodes unique id. Once the home node is joined with the user's account, they can also view all of that homenodes leafnode data. User's can set a nickname for each homenode they add to make it easier to decipher between the homenodes. All that is left for the front-facing website, is data analysis, and any other settings that need to be changable for the user.

2.
Status Summary of Extra Credit Homeworks

Bluemix assignment: 100% complete
We wrote about a hardware firewall and how it can be used in our network of nodes to prevent false data injection. Submitted 9/28

Related Research: 5%

We have started looking at the related articles you suggested for our group.

3.

Exceptions that could affect demo/presentation

We need to start moving now with getting parts order incase we run into issues in November. We hope to have our sub groups come together at the end of October to meet this deadline and set us on the path to completion.

4.

Any Items more-remotely related to the project that need to be discussed.

None that need to be discussed