

**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 getting the code for the network operational with the newly implemented algorithm. The new method works by reading a path and sending from node to node in that path to get to the desired location. This makes our system much simpler and will require less resources. Tim has been working on the sensor for the nodes. We are looking at gypsum as a sensor and seeing how its resistivity changes with water level. Tim conducted a weekend test that collected resistances every 10 seconds. The plot showed a logarithmic time scale of the device saturating in 10 min and coming back to normal over the period of the next few days. This time duration might seem long but dirt takes a while to dry out so this sensor may meet our needs due to how cheaply it can be made.

The home node team ran into problems with the network configuration on the Adafruit 3G module. To figure out the issue, Terver has tried to debugged the AT cop-code command (for SIM 5320A) which associates with the driver package. He also obtained a sim card to test the module and make sure that the network was not the problem that was preventing the module from carrying out http post. Different approach like telnet has been used to test the server and make sure the server was listening. In the meantime, Khoi tried out another alternative 3G solution from Particle. Particle provides hardware development kits, also offers various Cloud database solutions for seamless data transfer.

The Web App team has been working on user features, specifically logging in, tracking

user's owned fields of sensors, and creating test data so we can test our application. Ian met with Kacao from the home-node team, and checked up on the particle web service. It looks like we can pretty easily send data in the proper format to our web service using "webhooks". We need to do some work on our web-app end to receive that data.

**Individual contributions**

<b><u>NAME</u></b>	<b><u>Individual Contributions</u></b>	<b><u>Hours this bi-week</u></b>	<b><u>HOURS Cumulative</u></b>
Ian Harris	Been a little busy with career fair / job search stuff this week, otherwise worked with the home-node team to make sure we had a rest-compatible service in Particle (which we do), met with Khoi to read through some of the docs and get the team access to the web service part of the Particle module that we are using	10	66
Gregory Steenhagen	Working on storing, creating, and updating user information. The backend endpoints for all of that functionality are completed. Working on backend endpoints for data, nodes, homenodes, and other non-user related information.	6	65
Khoi Cao	Ordered alternative 3G module, Got the new 3G module worked and post data to the manufacturer's cloud database. Worked with web team to come up with a new plan for posting the data to the web server, designed the solar-power charging circuit	8	60
Terver Ubwa	Go through the AT command application for sim5320. Go through the .cpp file and the header file provided by adafruit fona. order a 3G sim card for the module. Test the server to make sure it was listening. test the	20	68

	http post application commands using potty to eliminate the incompatibility issue with the fona.		
Tim Lindquist	Reprogramed leaf node code, ordered supply of new hardware, got in touch with companies for info on hydroscopic sensors, cut up gypsum sheetrock from Geiger and attached probes and leads to make sensor. Tested gypsum sensor in wet/dry soil to see how resistivity changed. Worked with steve to implement new network algorithm into design. went to lowes to find gypsum plaster- unsuccessful.	15	88
Steven Warren	ordered and began programming with NRF24I01 radio transceivers. Researched communication protocols and developed our own for our purpose. Prototyping barebones-duino.	10	84

### Pending issues

- **Ian Harris:** After meeting with Khoi Cao, I have a better understanding of what our web app needs to expose as far as REST endpoints, and need to begin work on that.
- **Gregory Steenhagen:** Need to start working on the front end of the site, to get user login, and node claiming working.
- **Khoi Cao:** Verify the compatibility of RF module on the new Particle development kit. Test data traffic on the Particle module if multiple POST or GET request happen at the same time. Need to check the the network coverage in Iowa (T-mobile has a poor network coverage)
- **Terver Ubwa:** get the right AT command combination to post data and create a .cpp library to work with the fona and an arduino as a “middle man”.
- **Tim Lindquist:** Need to find gypsum based plaster to make sensors easier to manufacture and drive consistency. Need a way to test network effectively.
- **Steven Warren:** completing a full network with multiple arduinos and radio

transceivers.

### Plan for coming weeks

- **Ian Harris:** Start setting up end-points for actual data, make sure they are using the proper format (not url arguments). Set up a GET endpoint for a path generator (just an array of ints for now, in a json preferably), set up a POST endpoint for adding nodes, set up a POST endpoint for sending data from nodes. Email John Deere about access to their web application.
- **Gregory Steenhagen:** Get user login working on the front end. Once user login is working, I will work on the user interface for claiming home nodes.
- **Khoi Cao:** Finalize the solar-charging circuit. Keep working with the web team to set up seamless communication between the homenode and the website. Set up a meeting with Sensor team to build radio transceiver on the new Particle module
- **Terver Ubwa:** Get an email reply from the producers of sim5320a with the right AT command combination for fona 3g. start posting data to the server. make a library that would utilize the arduino as a "middle man".
- **Tim Lindquist:** Should set up another automation test for the gypsum to collect more data. Blood samples will be picked up next week so I can start looking at the dielectric properties on that. Code for the leaf nodes is near completion, one more session working on it to complete. If this gets done we can start designing a PCB for the nodes. We also want a PCB for the sensor so it is easy and consistent to make.
- **Steven Warren:** design pcb for leadnodes. Complete radio program across leafnodes and home nodes. Work on sleeping protocol.

### Summary of weekly advisor meeting

**Leaf node:** group discussed new network path plan for communication to simplify part in project. Tim spoke to Geiger about sensors and was told to get into contact with Chemical Engineering department and the Fort Dodge Gypsum Engineers

**Home Node:** The advisor emphasized the importance of getting the home node to start posting http data by next week or exploring a viable alternative. He also expressed concern about the Electron particle charges which were on the high side. However, after discussions and somewhat calculations, the charges were within our target budget.

**Web App:** The web application team continued work as usual, and are on schedule. Some assistance was offered to look over the Particle web service. Ian has some experience working with web services like Particle, and thinks that as long as we can connect that hardware with

the radio transceiver, it would be a workable alternative.

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: 0%

In our meeting we discussed sources to look at for this assignment. Have not started it yet.

3.

**Exceptions that could affect demo/presentation**

We have yet to get the three components of our project working together, if it doesn't go smoothly we will have a lot of work cut out for us. This should be identified as a problem or not in early October.

4.

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

None that need to be discussed