

Memorandum

To: Dr. Tim Titus

From: Cave Climate Monitor Team - Cheng Wang, Jason Damp, Yang Du, and Taylor Begay

Date: 26 October 2018

Subject: Client Memo

Introduction:

Hello Dr. Tim Titus, we are the team that has been assembled for the Cave Climate Monitor Project. Within this memo, you will read excerpts that will give insight into who we are and why we are excited to work alongside you and your company. Following our brief bios, we will each explain our set skills, strengths, and interests that relate to our project. Based on our group skills, interests, and strengths, we presented our thoughts and ideas of what this project means to us and what our vision for the final product will end up looking like. Finally, we have put together a set of questions pertaining to the design and implementation of the project. We look forward to meeting you and working with you over the course of the academic year.

Bios:

1. Jason Damp - Hello, my name is Jason and I am currently working to finish up my Bachelors in Electrical Engineering with a minor in mathematics and mechanical engineering. Since starting my time here at NAU, I have acquired many hobbies related to EE. When I heard the proposal for the Cave Climate Monitor, I instantly made it my first choice. The project implements all of the EE niches that I enjoy; unique wireless communications, data collection via sensory input, and the energy efficiency (long-lasting low power by battery) requirements are all things that I enjoy not only as pass times but as possible career paths that when connected into one project has the potential to help so many scientists. This project also has the potential to go spelunking and spend time outdoors, which I also enjoy.
2. Taylor Begay - Hello, my name is Taylor J. Begay and I am excited to be a part of this research and development. My major is in Electrical

Engineering. I am passionate about mixed-signal embedded systems and so that is why I chose this project to work heavily with analog and digital circuits.

3. Cheng Wang - Hi, my name is Cheng and my major is Electrical Engineering. I like this project because I can use a lot of knowledge I have learned before and it is very interesting for me to work in a cave. I know something about sensor and wireless communication so I think I will do well in this project.
4. Yang Du - My name is Yang and I come from China. I am working in Computer Engineering for my Bachelors degree. For this major, I do well in mathematical analysis and I have good operation ability since I did a lot of electrical labs in China. So, when I heard about the project of Cave Climate Monitor, I immediately put it at the top of my list. I think it is related to my major and interest, and my strength is suited for this project.

Individual Skill Sets:

1. Jason Damp - Microcontroller Experience, C Programming, Power Tool Experience, Industry Experience (Carollo Engineers), Hardware Analysis (Sensor I/O), High-Level Mathematics
2. Taylor Begay - Circuit Analysis, PCB Design, Soldering, C - Programming, Circuit Design and Hardware Implementation, Knowledge on Reading Spec Sheets for Microchips.
3. Cheng Wang - C, Java Programming, FPGA design, VHDL Code, PCB design, Altium Designer, Multisim
4. Yang Du - Circuit Analysis, Mathematical Analysis, FPGA design, C Programming, Knowledge about Power, Micro Processor.

Team Input on Project:

As a team, we have spent time brainstorming and combining our thoughts and ideas to present a rough approach of how we would like the proposed project to be completed. Based on the design requirements, we think that our version of the project will be a prototype for others to build off and develop for their own project specific implementation. Dealing with the open source model, we would like to use

Arduinos for data collection and data transmission between nodes. As far as connecting to a cellular network and transmitting data from the system, we believe that we may need to use a Raspberry Pi if we cannot utilize an arduino for that portion of the design. One of the problems that we all agreed that we may run into is power consumption. Because of that, we will expend a lot of resources making sure that the designed system will meet the one month battery life requirement. As far as physical design, we do not think that meeting the size and weather requirements will be difficult. We hope to spend most of our time implementing features that support configuration changes and ease of use.

Questions:

1. Could you tell us about yourself and your past career experiences?
2. With the complexity and potential large number of parts, will we need to fundraise or will we have a budget set aside from the USGS?
3. Having requirements for both camoflauge and the ability to measure wind speeds, we were wondering what would take precedence due to the difficulty of implementing both.
4. What is the ideal transmission configuration for receiving data back from the cave? Should data be uploaded to the cloud, sent to an email, uploaded to a private server? And what file format should they be?
5. How far should each device be able to communicate with another node?

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