

First Meeting

Tuesday, September 8, 2020 3:34 PM

No Discord!

Share Numbers for group text

Rotate Recorder Weekly

Share Anything with A. Smadi
↳ He is getting a new email

Team Firewatch

Joe Stanley joined
and introduced himself.

Team Recorder will have bullet
points for each week. Weekly
agenda.

agenda.

Feng Li will be our Instructor

Joe Stanley hopes to Attend weekly meetings

First meetings time

Tuesdays @ 5

Keep Instructors and Joe in the loop.

Weekly Recorder

Copy → Carlos → Meridian → Drew →
↻

Joe Stanley Contact info

joe_stanley@selinc.com

stan3926@alumni.uidaho.edu

509-288-9941

Meridian in charge of Team Meetings

Carlos in charge of documentation

Cory in charge of budget

Drew main client contact

Meeting #2

Thursday, September 10, 2020 4:52 PM

Whats the vision for proj?
Where's the code?

What size of device

How long must it last?

Should it be automatic?

Whats an ideal price?

Long term Vision

↳ Small module that mesh network for infrasound data.

↳ He wants us to set our own goals for the year.

Pseudo parallel processing?

1 ... the carrying forward?

↳ Complex, worth carrying forward?

Code location?

↳ Broken link.

↳ Hoss might have access to old archive.

Project specifications

↳ we can define size etc.

↳ More Automatic is the goal

Range of sensors

↳ Unknown as of now

* Look at tackling one aspect of the Project, not all of them *

Price Range

↳ \$150 → 200 per device

Meridian's Interest

- ↳ small robust design
- ↳ Antenna considerations

EE interests

- ↳ Drew interested in signals
- ↳ Discuss μ Controller options
- ↳ How big does 900 MHz Antenna need to be?

Wild fire frequency?

- ↳ just below our Audible range
- ↳ Do we need such a fancy sensor?

Meeting #3 9/15

Tuesday, September 15, 2020 12:20 PM

Meeting Recorder this week: Carlos Santos

Attendees: Meridian, Carlos, Andrew, Dr. Hess, Cory, Joe, Abdallah

Time start: 5:00 pm

End Time: 5:48 pm

Total Time: 48 minutes

Summary:

1. Dr. Hess will look more into finding out where the documentation archive folder is.
2. Make meetings and meeting invites as easy as possible. Include meeting agenda and zoom link in the email for the upcoming meeting.
3. Sept. 17 budget due (Will be a partial budget).
4. raya@uidaho.edu, ray Anderson is the guy to contact for tech needs.

Notes from meeting [pardon any typos]:

Agenda point 1:

- Answer should be yes for access. Old team should have backed it up. Let's send the link to Dr. Hess for some digging.
- Joe contacted old team. Team said old documentation had been passed to Dr. Hess?
- **Dr. Hess will look more into it for the time being.**

Agenda point 2:

- Big date is the snapshot day
- Check syllabus for more info
- **Sept. 17 draft of budget due (Will be a partial budget)**

By snapshot time we need to define what we want to do. More specifically what can we accomplish in the time allotted. There may be parts we need to simulate via software of end up buying hardware.

Can we and is it possible to build an infrasonic sensor to pick up the waves in question for dirt cheap? [Possible goal for our project]

There is more than one way to detect sound. Also another research point.

A lot of people who work in the 1–2 Hz are geologists. We may need to ask or meet with some to get some ideas.

What are some ways to share data for past, present, and future teams for this project.? It needs to be accessible and reliable. raya@uidaho.edu, ray Anderson is the guy to contact for tech needs.]

Agenda point 3:

- Snapshot day: if need be Dr. Hess can provide examples. Of course this will be different this year around. It may be online. Snapshot day items include goals, timeline, budget, etc.

- SEL may have some equipment we can use (buy) and incorporate it into our project. Why reinvent the wheel?... SEL may be able to loan and or donate for educational purposes.
- Joe commented on doing little processing work on the node devices. Push off the work to something else more powerful. The DSP (Digital signal processing) can be pretty easy and depending on what is being performed. Focus on getting in and out and do DSP later.
- Joe also commented on signal fluctuations and how they are an important aspect to this project. Smoke and nature get in the way.

Agenda point 4:

- A wiki training session will take roughly the second week of October. Only one person from our team needs to go. Information will be sent out in course. For first semester it's mostly a project description, pictures of us, etc. Our wiki page master is an appointment made by the group.

Agenda point 5:

- Has anyone read and or seen a project that kills fire via infrasonic waves? [Possible thing to look at. Find research and or white papers.]

Lastly, make meetings and invites as easy as possible. Include meeting agenda and zoom link in the email for the upcoming meeting.

Meeting #4 9/17

Thursday, September 17, 2020 3:25 PM

Meeting recorder this week: Carlos Santos

Attendees: Carlos, Drew, Cory, Meridian

Start: 3:30 pm

End: 3:46 pm

Goal: To finish the budget document and turn it in.

Cory worked on the document while sharing his screen.

It'll be turned in by Cory.

Possible areas of concern antenna costs or radio equipment. They are not cheap.

Meeting #5 9/22

Tuesday, September 22, 2020 5:40 PM

Meeting Recorder: Meridian

Attendees: Meridian, Carlos, Cory, Drew, Dr. Hess, Joe

Start: 4:10pm

End: 5:37pm

The team worked on the Project Requirements Document.

Drew found an article that shows infrasound detection for wildfires.

Hardware from last team will be in GJ102C if it is still there.

Decided we will focus on simplifying and size reduction.

Will we create a test chamber?

Subwoofer emits frequency range 2-200Hz.

To Do:

Team:

Meeting on Thursday at 3:30 pm in Think Tank

Talk to Fire Science people in CNR

Come up with formal questions for Joe

Dr. Hess:

Attempt to find old teams portfolio.

Ask ME or CE department who the signal processing expert is.

Joe:

Contact the school about a collaborative source control to make data accessible for many years.

Meeting #6 9/24

Friday, September 25, 2020 5:08 PM

Meeting Recorder: Meridian

Attendees: Meridian, Carlos, Cory, Drew

Start: 3:45pm

End: 4:45pm

Discussed the ideas for a system of multiple dumb nodes and a smart node.

Talked about focusing on the mesh network and just having the upload to a PC.

Ideas for a shape that no matter which way it falls it will land right side up – 4 equal sides (pyramid).

Wrote up our questions for Joe.

EE boys task: Attempt to narrow in on the parts list.

Meridian: 3D model the shape.



9/29/2020

• Client Questionnaire

(1) Project Vision

↳ Big Picture:

- Small project & cheap
- Literally thrown out into the wild

↳ Purpose:

- Detect wild fire via infrasonic detection
- Report data back to central location via wireless communication
- Radio Mesh Network (automatically planned)

(2) Budget

" + -

(2) Budget

↳ \$ 2,000

↳ price-per-unit (absolute max \$250)

• Ideally as low as possible

• aim for 50¢

(8) Sensing Range

↳ As big as possible

(9) Project Direction

↳ optional

Optional

~~~~~

# Meeting #8 10/6

Tuesday, October 6, 2020 4:36 PM

Meeting Recorder: Cory

Attendees: Meridian, Carlos, Cory, Drew, Joe Stanley, Dr. Herb Hess

Start: 5:00

End:

Before Meeting: made a purchasing order form.

Gitlab logins

[gitlab.stanleysolutionsnw.com/users/sign\\_in](https://gitlab.stanleysolutionsnw.com/users/sign_in)

Default password: Asdf123\$

- Microcontroller
  - Have we looked at EBAY? No.
  - Concerns about availability of this particular T-beam board
  - Look at the components individually.
  - Use the development board for now, but plan to see what we can roll back to source the core components.
  - Does the board have a charging circuit?
  - AXP192 handles the charging of the external battery.
  - They both think that this is a good choice.
- Purchasing
  - Work through Joe.
  - Get approvals through him and send him the info. He will buy himself.
  - What address?
    - Maybe one of us, so we don't have to deal with the university infrastructure.
    - Decide next meeting where they will ship to.
- Portfolio
  - Copy of all documents that we have had or used
  - Includedata and spec sheets. Always archive the datasheets. More detail is better.
  - Maybe use Gitlab?
  - Plan to zip the whole thing at the end.
- Code
  - ????
- Drew's program
  - He made an EQ program to filter out the higher frequencies.
  - Stacked a series of butterworth filters.
  - What data do we need to send back?
  - Sample at TWICE the frequency we need.
- Other questions?
  - What if a sensor burns out? Network needs to adapt.
  - Joe would like us to have thorough documentation.
- Snapshot
  - Up to 9 slides
  - Define long term goals and short term goals.
  - Define project details.
  - Include development board details
  - Give some individual roles and details about our jobs.
  - Show Solidworks sketches.

# Meeting #9 10/13

Tuesday, October 13, 2020 5:06 PM

Present at Meeting: Carlos, Meridian, Andrew, Dr. Hess

Snapshot day went well. We got lots of good questions. Also, marketing is interested in spot lighting our project.

Boards will be in Saturday Oct. 31.

Snapshot feedback:

Joe: stuff flowed went well, nicely done to team, good job! If we don't want to focus on the power supply issue let him/Dr. Hess know.

Dr. Hess: stuff put together pretty well! We had a budget that made sense. Had a time management schedule that made sense. Focus a tad bit more on the power supply...

**Try to keep the power rails down to a minimum.**

We know where we do the processing, but where does the signal processing happen?

The ESP32 has two cores, is there a way to turn one off? Both?

Design Review is the other biggest event in the Fall Semester, The 13th of November. Usually, it's like a two week thing?! We have a lot of say when it is scheduled! We have to prove we have a design that will work and show the work we have done.

Our second snapshot day will be with our department board. So pros in our area of expertise. They ask hard questions. Think very technical!

**The university has test facilities out in Moscow mountain , priest lake, and a few others for testing. (most owned by people over in CNR). The CNR college Paul Robertson (has done a lot of testing at remote facilities, knows who to ask, what things are like, and lives on Moscow mountain)**

The ECE department has some extra money if we do run out in our budget. (Joe is willing to fork over extra cash in case we need it).

**Joe recommends for us to get some test equipment for sound stuff. It will set us up for success and future teams as well.**



# Meeting #10 10/20

Tuesday, October 20, 2020 5:50 PM

Present: Meridian, Carlos, Cory, Drew, Joe, Dr.Hess, Abdallah

Might want to test both a condenser microphone and a pressure transducer

Can buy infrasound speaker for ~\$10,000

Can make one for ~\$750

Ideas:

Motor and drum

Toothbrush

Arduino Controlled Motor-Magnet

Difference in frequency – 100Hz and 101 Hz

Decisions:

1. Buy subwoofer from walmart/Joe might have one
2. Drum/motor idea
3. Condenser microphone

How To Validate Design:

Create a model and check input and outputs

Software to test software

Design Review:

How will we solve our problem??

- Not Powerpoint
- Use tools (solidworks, spice, etc)
- Explain our deliverables

# Meeting #11 10/27

Tuesday, October 27, 2020 5:36 PM

Present at Meeting: Carlos, Meridian, Cory, Drew, Dr. Hess, Joe, Abdullah

Topics:

- **Wiki page title:** Infrasonic Wildfire Detector
- **Development Board Update:** Boards have arrived. Carlos has two, Cory has one
  - Carlos got the devices talking to each other, the LoRa modules are working
  - Carlos working on a basic GPS
  - Temperature Sensor works
- **Subwoofer:**
  - Joes will bring the equipment to Carlos
- **Design Validation Review**
  - Will likely create a server-side local network to test smart nodes to not worry about security
  - Dr Hess has permission to light a fire outside of Gauss
  - For the drop we can toss it off the balcony at the IRIC

# Meeting #12 11/3

Tuesday, November 3, 2020 4:54 PM

Meeting Recorder this week: Carlos Santos

Attendees: Meridian, Carlos, Andrew, Dr. Hess, Cory, Joe, Abdallah

Time start: 5:00 pm

End Time: 5:48 pm

Total Time: 48 minutes

## Summary:

1. LoRa Range Update
2. Our findings with the subwoofer
3. Amplifier circuit
4. Discuss Gitlab tools for planning
5. Update on the shell design
6. Design review expectations

## Notes from meeting:

### LoRa Range Update

Carlos tested from his house to EP. About a half a mile range. He got messages all across campus. At the water tower, he got a message. Almost a mile LOS.

There were some lost or corrupted messages.

We will need to verify the receipt of the message somehow. Checksum or CRC or something similar.

Is there a standard protocol that we can leverage for our data packets? Need to make it widely applicable and open to interfacing from others.

### Subwoofer findings

Our tests show that the subwoofer responds to low frequency, if it's making anything appreciable we don't know.

### Amplifier circuit

One stage of amplification followed by a filter, and then another amp.

Drew has some simulations on Tina of each.

The amplifier also does some filtering due to the series cap. Removing flattens the response.

The circuit needs some tuning, but it functions about as we expect.

What do we do with all this info once we filter off the frequency?

How can we verify the true behavior of the system?

### Gitlab tools?

Joe hasn't used gitlab specifically, but he has used similar tools.

Gitlab issues boards can be a good solution.

Used to post bugs, research goals, various tasks, etc.

### Shell design

Meridian has been drawing up rough measurements for an enclosure. She has some more work to do, but we need.

### Design review

Hess availability

No 1:30 mwf  
NO midafternoon on Thursday.\

No Wednesday evening.

Joe availability

None at 9 am for joe.

20 minute presentation on our work. Don't be scattered and give the impression we don't know what were doing.

Zoom or in-person?>

Zoom cant demonstrate as well our progress. If we use zoom we will need to share screen with real demonstrations for our work.

Show that we have a solid plan moving forward.

Joe wants the technical info.

Plots, schematics, datasheets, etc. all the source code.

Dr. Swensen and Dr. Li may attend.

We can redeem ourselves if the first design review goes poorly.

Thurs 6

Wed 11:30-12:30

Friday 11:30-12:30

# Meeting #13 11/10

Tuesday, November 10, 2020 4:53 PM

Attendees: Cory Holt, Carlos Santos, Meridian Hass, Herbert Hess, Joe Stanley, Andrew Malinowski, Abdallah Smadi

Time Start: 5:00 pm

Time End: 5:13 pm

Total Time: 13 minutes

Today's agenda:

- A. Update on research tasks (Cory & Carlos).
- B. Update on 3D printing (Meridian).
- C. Update on Schematic for Infrasonic Sensor (Drew).
- D. Any other points of interest

Summary:

We touched on all agenda items. We will save the bulk of information for the CDR on Friday at 11:30 am.

- A. Research updates are going well. All research is in gitlab. We also need to update our portfolio.
- B. Meridian will try to 3D-print on Thursday
- C. Drew is working on design a chevichev (??) filter. He will get more documentation/work on this at the CDR (Concept Design Review).
- D. Concept Design Review:
  - a. Hess will like to see the best tool to show what we have. PowerPoint is not the best tool for everything. Use your best judgment. Determine what will show your things effectively and go with it.
  - b. Also make sure to have your Zoom updated for the CDR.

# Meeting #14 11/17

Tuesday, November 17, 2020 8:20 PM

Recorder: Meridian

Attendees: Cory Holt, Carlos Santos, Meridian Hass, Herbert Hess, Joe Stanley, Andrew Malinowski, Abdallah Smadi

Time Start: 5:00 pm

Time End: 5:24 pm

Total Time: 24 minutes

Today's agenda:

1. Discuss Concept Design Review (positives and negatives)
2. Talk about Future Plans
  - a. Before Break
  - b. After Break
3. Talk about Snapshot 2
4. Anything else anyone wants to update the team on

Summary:

Drew talked to microphone people and we may meet up with them, but the infrasonic sensors are \$3,000.

Asked Joe if we are ok sharing the project work with people – he said yes.

Joe asked if we are ok with our portfolio on gitlab being public – we said yes.

We should assign due dates on gitlab.

We are all going to be back in Moscow after break, and no meeting next week.

Need to order things for January before break.

# Meeting #15 12/8

Tuesday, December 8, 2020 5:39 PM

Recorder: Drew

Attendees: Cory Holt, Carlos Santos, Meridian Hass, Herbert Hess, Joe Stanley, Andrew Malinowski, Abdallah Smadi

Time Start: 5:00 pm

Time End: 5:30pm

- Reviewed the updated schedule
- Updated meeting schedule for next semester
- Radiohead Library: consists of drivers and managers for a wide range of controllers (works with our radio <https://www.airspayce.com/mikem/arduino/RadioHead/>)
- Radiohead is object oriented
- Free GPL license
- Discussed challenges in implementing the mesh network
- Discussed purchasing battery chargers – Joe also has one himself
- Mesh Networking research: <https://nootropicdesign.com/projectlab/2018/10/20/lora-mesh-networking/>