Advisor Meeting 20-01-27 8:30 a.m.

Background:

- From Rural Broadband NSF proposal
- Dr. Daniels talked to some people from 4H
  - Realized that wireless/mobile networks are hard to understand (ad-hoc, etc.)
- Project will involve portable nodes to hand out to kids at a school. Some will have cameras, others will be relay nodes
- Project will also include a display (laptop and projector) that shows video. Nodes will be rearranged as part of an activity to improve network speed

Goals:

- Durable
- Ad-hoc
- Flexible Visualizations
- Portable & Rechargeable
- Large Scale (not small rooms – outdoor or throughout a building)

Key Design Elements

- We want to be able to decrease the signal strength of our nodes so that the results are actually interesting (i.e. decrease WiFi strength)
- We want to be able to control the system power consumption
- We want to be able to determine the relative position of each node in the network
  - Outdoors: Geolocation via GPS
  - Indoors: Location via WiFi
- Video will be a key part of the system
  - Easy on a Raspberry Pi
  - High bandwidth, dropped packets will be easy to notice
  - Adjustable resolution/framerate would be helpful, black & white or color
  - Use UDP?
- We should also track other metrics that require less bandwidth than video
  - Temperature
  - Power Consumption
  - Battery Level
- The system will have a single base station with at least one monitor attached
  - The base station will run a VM/Docker image that is runnable on an "average" computer
  - Emphasis on non-technical users
  - We might also use a Raspberry Pi as a web server and/or a web-based app that runs on a laptop
  - We may need to purchase additional WiFi dongles for extra network connections on our devices
- We should allow nodes to be added to the network on the fly (while the others are up and running)
- $50 or less is optimal

Design Guidance:

- Lay out a functional design with no implementation details at first
  - Pictures, Diagrams, Naming. Work top-down
  - State what each component does, but not how it is done
- Then, ask questions about what's possible
- Make sure you're not missing any major functional blocks ("glue")
- In the first half of the first semester, figure out:
  - Where does each team member belong?
  - Draw a use case diagram(s) to determine functions
  - Name stuff
  - Think a bit about implementation technologies to evaluate
  - Security considerations (protect devices on network)
  - Figure out which technologies carry the highest risk of not working
    - Do feasibility tests
- Take documentation seriously but don't overdo it