Low-Power High Speed Multimedia Radio

Project Notes: 2013-11-13

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Issues

- Need to run in a mode without ACK from receiving station. Waiting for ACK at high distance results in collapse of bandwidth due to ACK response time -- causing multiple retransmissions.
- Having issues calculating SNR for various modulations. Equations found online don't equate to values presented by others. Need to figure out how to use equation properly.
- SNR calculation will drive specification for antenna.

Previous Project Steps

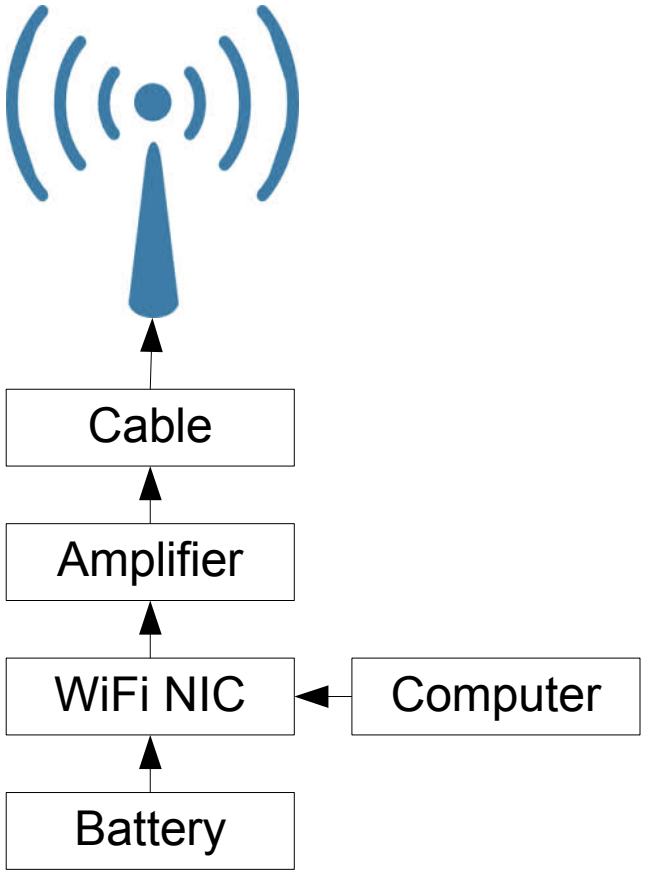
- Get approval from department
- Create radio link budget
- Order Alfa cards
- Setup computers with Linux (Debian)

Next Project Steps

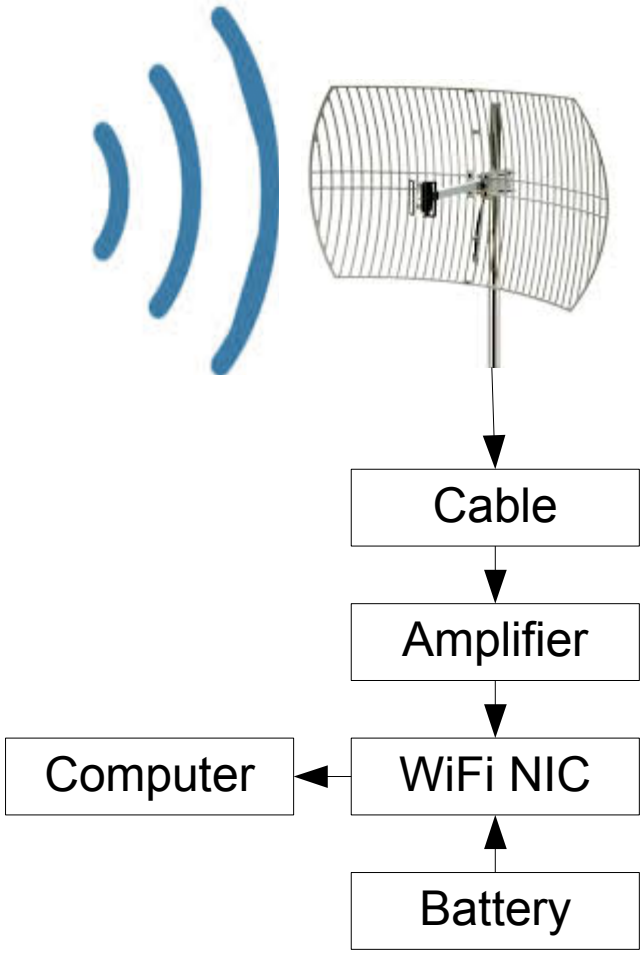
- Calculate needed Signal-To-Noise Ratio (SNR) for various speeds under 802.11b/g.
- Get Alfa AWUS051NH USB adapters to work in Ad-Hoc “Demo” mode.
- Setup test environment where one machine is constantly streaming known data in Ad-Hoc mode.
- Determine what software for doing site survey
- Determine what software for doing signal level, throughput, and error analysis
- Determine if there's a way to turn off ACK in 802.11 (this is major limitation to long distance).
- Select and purchase bi-directional amp
- Select and purchase receive antenna

Hardware Setup

ROCKET



GROUND SEGMENT



Eb/N0

- http://www.eletrica.ufpr.br/evelio/TE111/Eb_N0.pdf
- http://www.sss-mag.com/ebn0.html
- Eb/No is classically defined as the ratio of Energy per Bit (Eb) to the Spectral Noise Density (No).
- Eb/No is the measure of signal to noise ratio for a digital communication system.
- It is measured at the input to the receiver and is used as the basic measure of how strong the signal is.
- Different forms of modulation -- BPSK, QPSK, QAM, etc. -- have different curves of theoretical bit error rates versus Eb/No.
- These curves show the communications engineer the best performance that can be achieved across a digital link with a given amount of RF power.

Calculating Signal-To-Noise Ratio (SNR)

- Need to determine minimum SNR for given speed and modulation.
- Found info from these websites
  - http://www.sss-mag.com/ebn0.html#karn (see section: Comments from Phil Karn)
  - http://www.satcom.co.uk/article.asp?article=21
  - http://www.eletrica.ufpr.br/evelio/TE111/Eb_N0.pdf
- So I need the Eb/N0 curves for various 802.11 modulations. I have found graphics – but no Excel tables with that data so I can do an easy lookup equation.
- I think the equation I need to use is C/N = Eb/No * (R/B). But I'm having issues inputting values. Not sure what units to use – as all attempts don't match tables I've found on other websites.