**Senior Design Project Assignment 5**

**Final PROPOSAL**

**Due Tuesday April 16, 2013**

**Complete ALL sections**

(1) A hard copy of this assignment must be turned in. The hardcopy must be signed by all team members and the faculty advisor

(2) The assignment must also be submitted via email as a WORD compatible attachment. 1 email submission per team with all team members cc’d on email. No signatures are required for the email submission. The attachment must be named using the following convention: LastName\_FirstName\_ENGR4169\_FINAL PROPOSAL

**Team Name:**

NAME

**Team Members (maximum 4 members)**

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| --- | --- | --- | --- | --- |
| **Last Name** | **First Name** | **Email\*** | **Dept.** | **Signature** |
| **Thibodeau** | **Brian** | [tuc69335@temple.edu](mailto:tuc69335@temple.edu) | **ECE** |  |
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|  |  |  |  |  |

**\*Email address will be used to develop Senior Design listserv. You will be required to check this address regularly (e.g. daily)**

**Advisor: By signing below, the faculty member agrees to be the Team Advisor and attests that the resources required for this project are available or obtainable.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Last Name** | **First Name** | **Email** | **Dept.** | **Signature** |
|  |  |  |  |  |

**Sr Design Course Coordinator:**

|  |  |  |
| --- | --- | --- |
| **Last Name** | **First Name** | **Email** |
| **Sillage** | **Thomas** |  |

**If majority of team or project is CE: Dr. Ryan**

**EE: Dr. Sullivan**

**ME: Dr. Cohen**

**Project Title:**

Title

**Project URL:**

New website

**Project Description:**

**4 Paragraphs:**

**1) What** is the problem you are addressing?

Satellites have had a major impact in our society, in our present day, satellites have been used to broadcast several of our wireless information and has been the interest of Amateur Radio

Disasters like 9/11 and Hurricane Katrina brought to national attention the need for readily available communications. In those two events, the Automatic Packet Reporting System (APRS) was utilized as a form of digital communication to aid in emergency response decisions when commercialized forms of communication systems such as cell phones and land lines were unavailable. To ensure that packets propagate to their intended target, APRS uses digital repeaters (digipeaters) to relay packets across large distances. However, in 2004 the APRS community moved towards a new paradigm that allows for more effective and efficient routing of packets. Under the old paradigm (RELAY-WIDE system), the increasing popularity and number of digipeaters resulted in re-transmissions of the same APRS packet (duplicates). In the new paradigm (WIDEn-N system), duplicate elimination algorithms are utilized to prevent the retransmission of a single APRS packet. The problem that we are addressing is how to utilize software defined radio (SDR) to implement an APRS digipeater for the Philadelphia region which adheres to the new WIDEn-N paradigm. By using SDR, we achieve a much more cost effective solution that makes it more robust and scalable to future improvements of the system.

**2)** **How** will you address the problem?

We will address the problem by configuring NI’s Universal Software Radio Peripheral (USRP) 2920 as an APRS digipeater that uses audio frequency shift-keying (AFSK) and the AX.25 protocol. Features of NI’s USRP 2920 include an easy-to-use software reconfigurable RF platform that operates in the 50MHz-2.2GHz. Our software defined APRS digipeater will serve as Philadelphia’s local WIDE area digipeater to relay information packets to extended destinations while adhering to the WIDEn-N paradigm.

**3) How** will you validate your project through testing?

In general, a digipeater receives and subsequently transmits APRS broadcasts to its intended target. Our software-defined digipeater will consist of a laptop, the USRP, and two antennas for receiving and transmitting APRS broadcasts. The USRP will demodulate APRS broadcasts and provide the inlying audio frequency shift-keying (AFSK) digital information to the laptop via the AX.25 data link layer protocol in a Linux environment. The laptop will use GNU Radio to acquire these packets, decode them, store them, re-encode them, and subsequently relay them back to the USRP for further propagation to its designated target.

A Timewave PK-96 Packet Terminal Node Controller (TNC) provided to us by Temple's K3DS Amateur Radio station will be used to verify that our digipeater works as intended. We can essentially broadcast APRS packets to the digipeater using the TNC and see if it correctly propagates the broadcast to another home or wide-area digipeater in the surrounding area in accordance to the WIDEn-N routing system.

**4) What** will you deliver at the end of the second semester?

Using the radio equipment made available by the College of Engineering, a modem capable of modulating and demodulating will be implemented on an FPGA to establish a communication with Amateur Radio Satellite. Thus our deliverable at the end of the second semester will be an FPGA configured as a Packet Radio modem that interfaces with the amateur radio clubs antennas to communicate with Amateur Radio Satellites