Research Statement

My research interests are broadly in the area of systems and networking. The research experience that I have gained in the area of systems and networking has been through my PhD work. I also have research experience in the area of Microwave Antennas through my master's degree project.

Past Work:

My PhD problem deals with devising an efficient low cost solution for providing rural Internet connectivity. For providing low cost Internet connectivity we make use of TDMA based wireless mesh networks and the focus of my PhD problem was to improve the performance of the TDMA mesh networks so as to provide efficient support for different types of traffic such as voice, video, HTTP web browsing traffic, etc.

I have dealt with following three sub-problems for improving the performance in the TDMA mesh networks.

(i) Implementation of TDMA MAC protocol over commodity WiFi hardware

We have devised a technique to efficiently implement TDMA mechanism over commodity WiFi hardware. The technique has high synchronization accuracy with error of only about 10 microseconds even at 6-7 hops. The technique incorporates efficient error recovery mechanism and has generic support for scheduling and routing. We have evaluated the technique in a realistic setting of nine node outdoor and fifteen node indoor testbed.

Working on this problem enabled me to gain experience in system building and Linux kernel device driver programming. It also enabled me to gain experience in setting up outdoor and indoor wireless testbed, carrying out experiments in realistic setting and troubleshooting the issues for proper operation of a realistic wireless mesh network.

(ii) Spatial reuse in outdoor TDMA mesh networks

For this problem we have studied the applicability of low overhead signal to interference ratio (SIR) based technique for enabling spatial reuse in outdoor TDMA mesh networks. Our study unravels key insights into the behaviour of the SIR technique in outdoor mesh network deployments.

Working on this problem further enriched my experience in carrying out experiments in realistic testbeds. It also enabled me to gain familiarity in analyzing the data from measurements for inferencing the key results.

(iii) Performance evaluation of HTTP web browsing traffic in TDMA mesh networks

For this problem we have carried out simulation based analysis to compare the performance of different TDMA scheduling approaches for HTTP web browsing traffic. Our analysis reveals the shortcomings of the existing TDMA MAC protocols and enables us to devise a new TDMA MAC protocol that efficiently supports the HTTP web browsing traffic.

Working on this problem enabled me to gain experience in simulation based analysis of MAC protocols. It also enabled me to gain expertise in C++ programming language for building moderately large software.

Apart from this, I also have research experience in the area of Microwave Antennas having worked on a research project on antennas for my master's degree. This project made me familiar with simulation based analysis of antenna performance, fabricating real antennas and their measurement based performance evaluation.

Proposed Future Work:

Going ahead I intend to carry out meaningful research in the area of systems and networking with a career in academia. I believe that post-doc experience will further enrich my problem solving skills and provide me further exposure in this broad research area. Iam willing to work on any interesting project in the broad area of systems and networking for the postdoc.