Performance Evaluation of First Generation CLEARWIRE Radios

(Sponsor: Clearwire, Inc.)

In places where DSL and cable modems are not available, the remaining option is a wireless ISP. A wireless ISP (known as a WISP) sets an antenna on a tower and broadcasts an Internet signal to everyone within sight. Subscribers rig an antenna on their roof pointed at the WISP antenna, plug in a special 'modem' and end up with a fast reliable internet connection.

CLEARWIRE Technologies is a WISP that provides internet connection for home and businesses via CLEARWIRE Radios (or modems) (see Fig. 1). CLEARWIRE uses a network of powerful base stations to transmit signals to and from the modem. The idea is very similar to the cell phone technology.

Figure. 1. A laptop connected to internet via Clearwire Radio/Modem. No antenna mounted on the roof is needed.

In this project the basic performance of 1st Generation (1G) CLEARWIRE RADIOS is evaluated in terms of FTP and HTTP DOWNLOAD speeds. Results show that:

- When one uses a LINUX SERVER and a WINDOWS NT CLIENT, an FTP DOWNLOAD speed that corresponds to a throughput of approximately 93% of the total throughput can be achieved via CLEARWIRE RADIOS.
- The HTTP DOWNLOAD speeds measured, however, were more modest and were approximately 53% of the total achievable throughput, which suggests that there may be room for improvement.

In an effort to improve the HTTP DOWNLOAD speed of the 1G CLEARWIRE RADIOS, data compression and asymmetrical downlink and uplink channel allocation were investigated:

- It was shown that neither of these two schemes provide a tangible improvement to HTTP DOWNLOAD speed.
- Proposals to improve HTTP DOWNLOAD speed that can be implemented by the CLEARWIRE RADIO protocol were made.

Finally, some of the key features of a realistic Internet access environment, which need to be taken into account by the radio protocol of 2G and 3G CLEARWIRE RADIOS are discussed. Based on these features, limitations of the current radio protocol of 1G systems are highlighted.

REFERENCES

[1] O.K. Tonguz, A.E. Xhafa, and P. Roychowdhury, "Performance Evaluation and Improvement of First Generation CLEARWIRE Radios," Technical Report.