Abstract

When one considers the current state of wireless communications, it becomes clear that it is both absolutely amazing and something of a mess. Present communications standards are the result of local optimizations over time that led to a confusing set of suboptimal and fragile wireless standards. Starting from a clean sheet of paper, Bliss Laboratory for Information, Signals, and Systems (BLISS) is considering a fluid set of communications standards co-optimized with flexible but power-efficient computational implementations that will enable the next revolution of wireless communications. The main aim is to enable much higher data rates and much lower data rates with corresponding lower power consumption as the needs of the users vary.

The thesis mainly looks at the different sections of the work done, to prime the development of the protocol development engine. It discusses channel modeling, and system integration of receiver and channel noise. It also proposes a Carrier-Sense Multiple Access (CSMA) Media Access Control (MAC) layer protocol implementation for (Wireless Fidelity) Wi-Fi protocol. This work also talks about the Graphical User
Interface (GUI), which is a part of Protocol Development Kit (PDK) - a combination of the Protocol Recommendation Engine (PRE) and simulation package to aid the development of protocols. It also sheds light on the Automatic Dependent Surveillance - Broadcast (ADS-B) radio protocol, which will eventually replace radar as Air Traffic Control's (ATC) primary tool for separating aircraft.

All the algorithms used in this thesis, to define radio operation were in principle defined by mathematical descriptions; however, to test and implement these algorithms they had to be converted to a computer language. There were multiple phases of this conversion. In the first phase, the implementation of these algorithms was done in Matrix Laboratory (MATLAB). To aid this development, we provided basic radio finite state machines and basic radio algorithmic tools.