

## **Concurrent Code Spread Spectrum Demonstrators**

### **Client**

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### **Description**

Concurrent Code Spread Spectrum (CCSS) is a new form of spread spectrum that permits multiple signals to be overlaid without the need for separate spreading codes for each signal. This not only adds a high degree of jam resistance, but also permits communication channels to exist without the need for a MAC (medium access control) layer or protocol thus virtually eliminating the hidden node problem. The goal of this project is to develop one or two technology demonstrators using audio-based signaling consisting of chirps (the resulting signal sounds like a Geiger counter) issued from the speakers that are received via the computer's audio input. The first demonstrator, Chat, would let users send messages to specific other users (or broadcast to all users). Each broadcast is made without regard to whether other platforms are currently broadcasting. Messages are displays as they are received. The second demonstrator, Defender, splits the platforms into three groups – an attacker, a set of scouts, and a defender. The attacker broadcasts random messages in an attempt to jam the communications channel. The scouts broadcast reports indicating when they received an attack broadcast (and also periodically issue reports giving their precise location within the room). The defender broadcasts nothing but instead listens to the reports from the scouts and computes the attacker's location. On option at that point would be for the defender to aim a Nerf Rocket Launcher at the attacker, but it would be sufficient for the defender to just display the attacker's estimated location.

### **Technology**

The underlying signal technology (the CCSS waveforms and how to generate and process them) is well-developed very straight-forward to understand. The key element will be developing an app that can access the sound hardware and utilize it in real time.

### **Requirements**

- App must work on at least one platform (Windows/Linux/Apple/Android/iOS).
- Either the Chat or the Defender app must be completed (both, if possible).
- Language is flexible, but Python, Java, or some variant of C is preferred.

### **Student Benefits**

- Learn about and use a breakthrough technology.
- Gain experience with utilizing audio capabilities in real-time applications.

### **Location**

Flexible. Interaction with the client will occur at CSM.