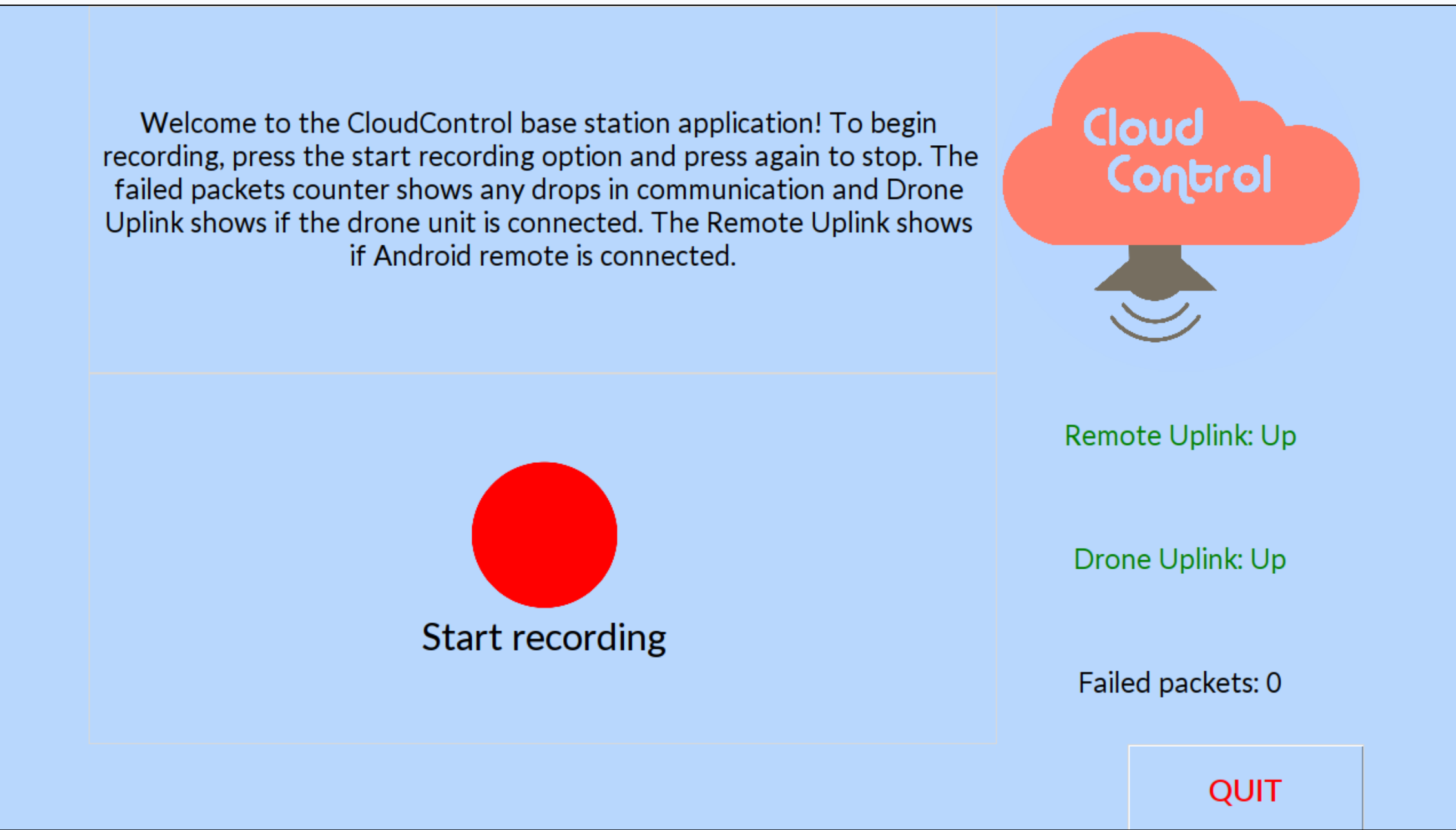# Cloud Control

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Background

Communicating with groups of people during an emergency situation is an extremely important and challenging task. The Cloud Control project aims to relay messages from a ground control system to a target audience under a drone without being physically present.

- Ground Control System:
  - User interface running on Raspberry Pi touch screen with a microphone
  - Drone controller with user interface and mic
- Drone Module:
  - PCB with speaker system mounted on drone

User Interface

Welcome to the CloudControl base station application! To begin recording, press the start recording option and press again to stop. The failed packets counter shows any drops in communication and Drone Uplink shows if the drone unit is connected. The Remote Uplink shows if Android remote is connected.

Remote Uplink: Up

Drone Uplink: Up

Start recording

Failed packets: 0

QUIT

Software Design

- Ground Control System:
  - Python user interface running PyAudio which passes binary audio samples to be sent over the NRF module
- Drone Module:
  - NRF receives the binary audio samples and passes them to the microcontroller
  - The microcontroller passes the samples to the audio codec which converts and outputs an analog signal to the speaker system
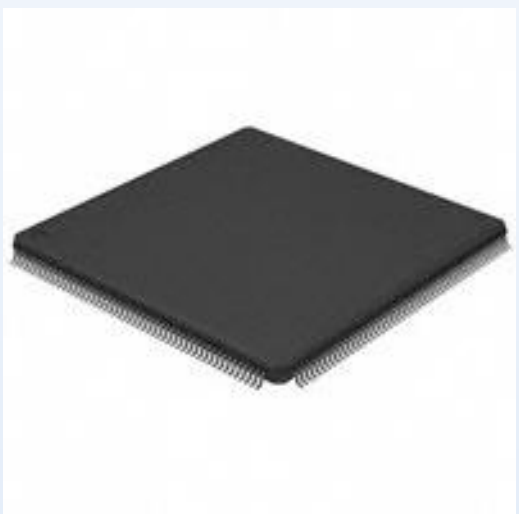
System Block Diagram
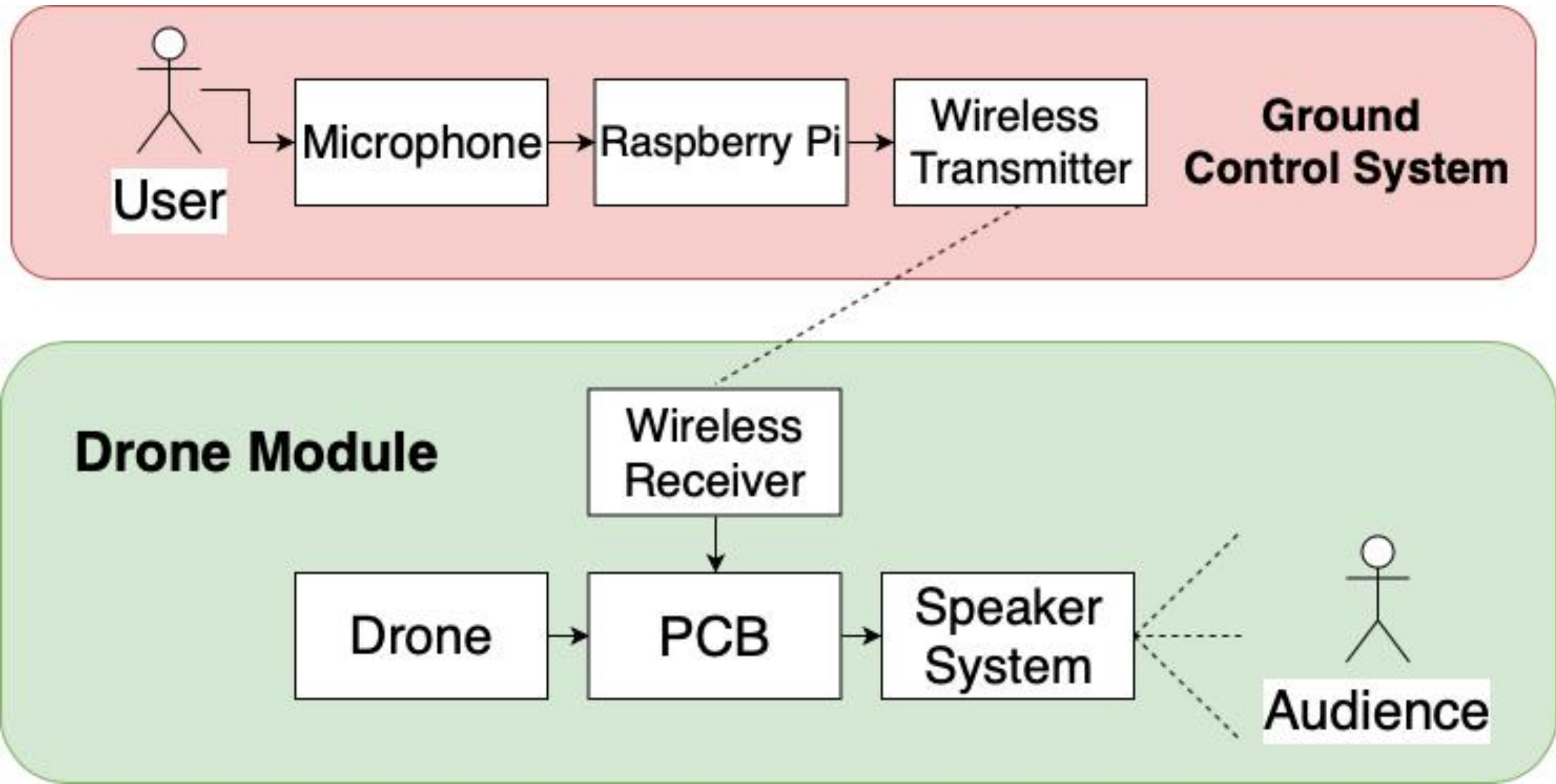
Critical Hardware Components

Ground Control System
- Raspberry Pi 3B+
- Touch screen user interface
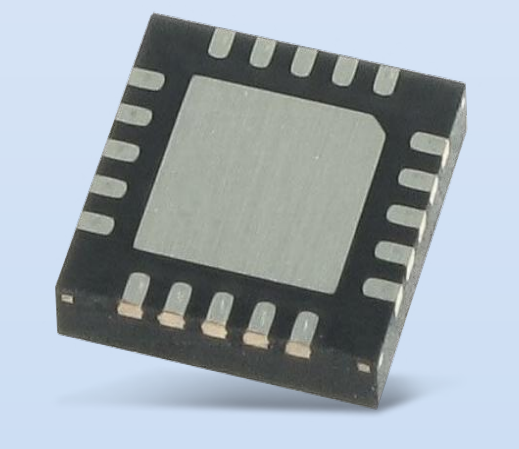- Microphone for recording

LPC4088 Microcontroller
- Main chip on PCB
- Receives audio samples from NRF and passes them to codec

NRF24 Wireless Module
- Connected to ground control and drone module
- Sends/receives digital audio samples
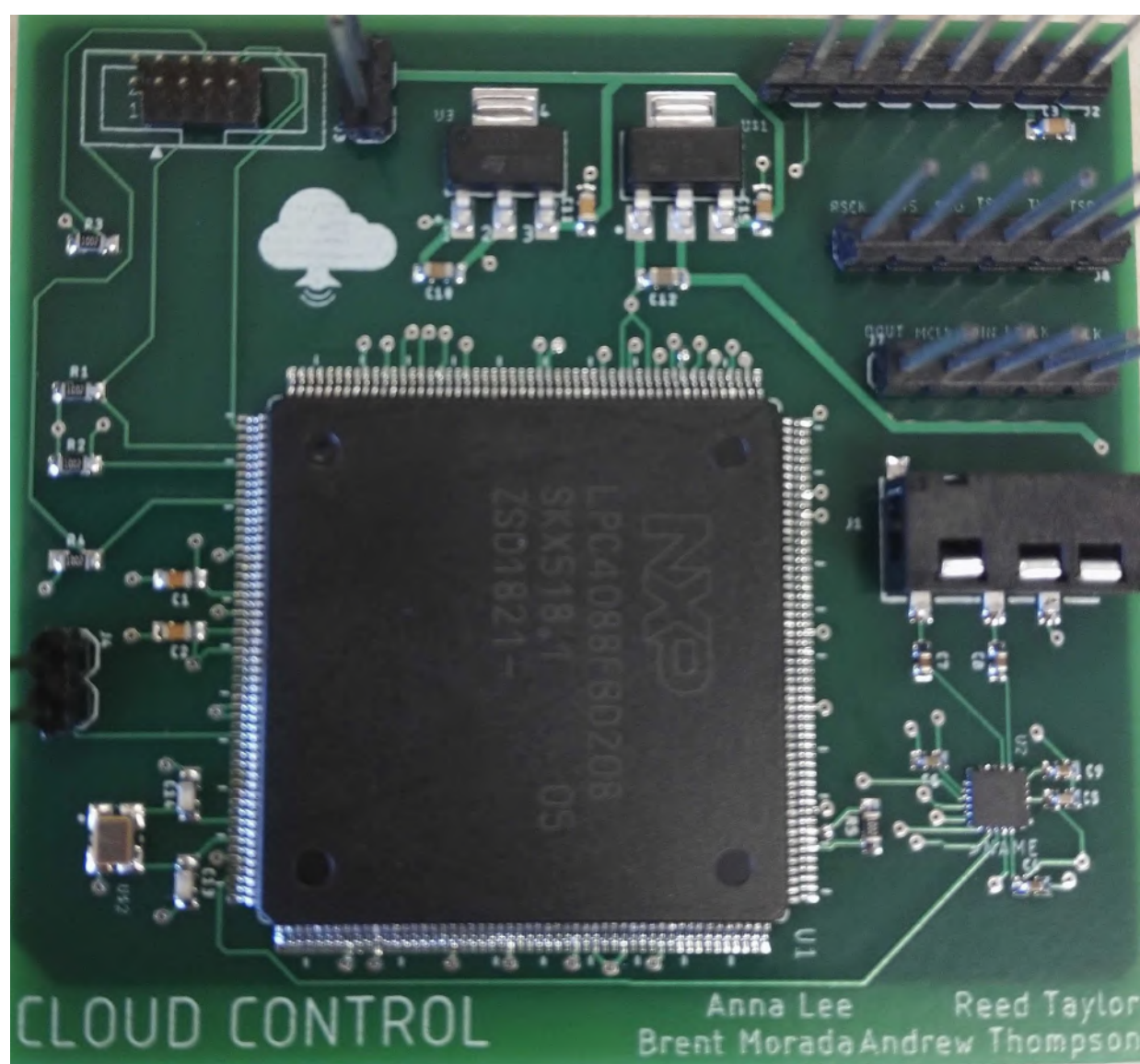
Audio Codec
- Converts digital audio samples and outputs them as an analog signal

Speaker System
- Receives analog signal, amplifies it, and outputs it pointing directly down from the drone towards the audience

Printed Circuit Board

- 4 layers
- Custom designed
- Lightweight (16g)
- Low-power
- 2.25 x 2.43 in

Drone

Yuneec Typhoon-H
- Hexacopter drone with lifting capacity of 2 lbs
- Quiet for a drone of this size (comparable volume to a quadcopter)

Final Product

Drone Module

Ground Control System

AeroVironment™

Qualcomm

UC SANTA BARBARA engineering