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| **Emulating a TCP-Over-UDP Connection Using an ESP32 Dev Board**  CS 5283-50 Computer Networks  Team Members: Brian Goldsmith & Damon Raynor |

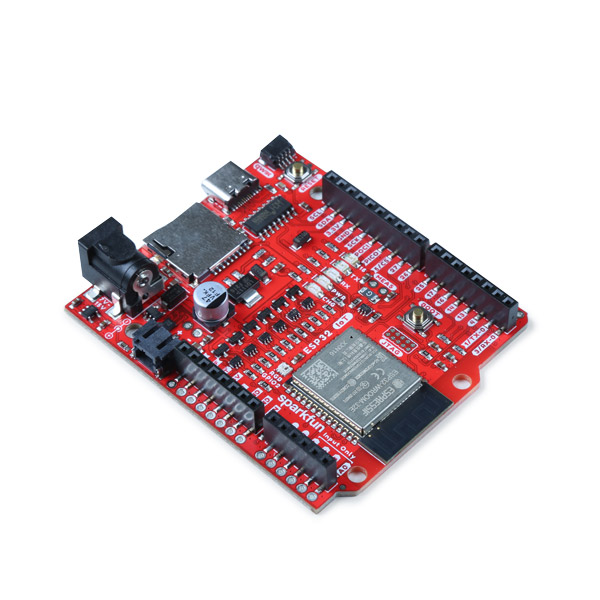
1. Abstract
2. Project Description

The purpose of this project is to explore Wi-Fi data communication over the internet from one physical device (our personal CPU/laptop) to another (an ESP32 Development Board). Our main goals are to:

1. Visually demonstrate the TCP-over-UDP Handshake protocol.
2. Successfully send messages from one physical device to another over Wi-Fi.
3. Observe and capture the traceroute of relevant network traffic between the physical devices.

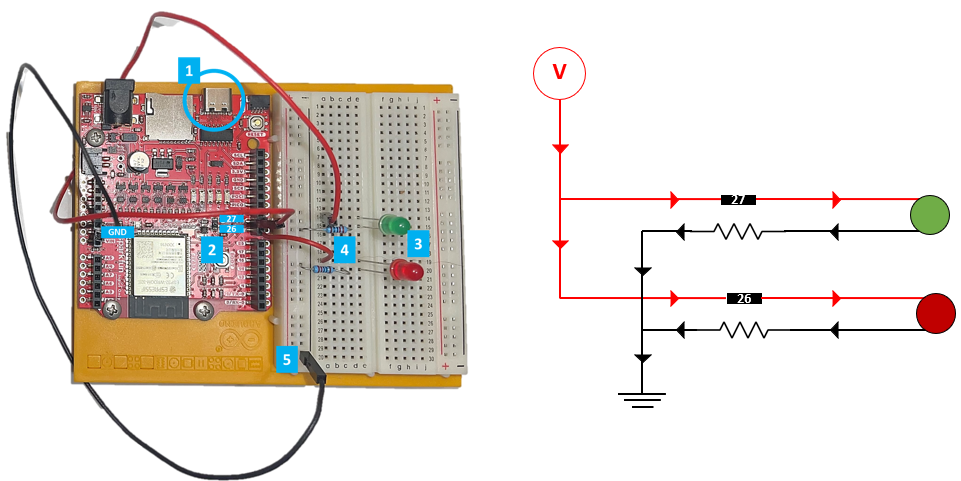
In order to meet our goals, we went through the process of procuring, programing and setting up an ESP32 Development board and ancillary electrical components (to aid in visualizing successful connections and transfers of data). The remainder of this report details (1) our approach to choosing and configuring our hardware setup, (2) programming the client and server comms channel, and (3) analyzing the results of our traceroute captures.

1. Embedded Device Description and Setup
   1. ESP32 Development Board High Level Overview



The SparkFun IoT RedBoard is an ESP32 Development Board that includes everything but the kitchen sink! Espressif's ESP32 WROOM is a powerful WiFi and Bluetooth® MCU module that targets a wide variety of applications. At the core of this module is the ESP32-D0WDQ6 chip which is designed to be both scalable and adaptive. The IoT RedBoard can target a wide variety of applications, ranging from low-power sensor networks to the most demanding tasks, such as voice encoding, music streaming, and MP3 decoding.

* 1. Hardware Circuit Layout



1. Network Protocol Suite

Table 1: Network Protocol Suite

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| --- | --- |
| **Network Layer** | **Protocol** |
| Application | Custom |
| Transport | UDP |
| Network | IP |
| Link | Wi-Fi |

1. High level code architecture

Diagram, timeline

Description automatically generated

1. Observed Network Traffic