Home Automation

Submitted in partial fulfillment of the requirements for the award of degree of

BACHELOR OF ENGINEERING
IN
COMPUTER SCIENCE & ENGINEERING

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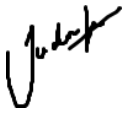

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Chandigarh University, Gharuan
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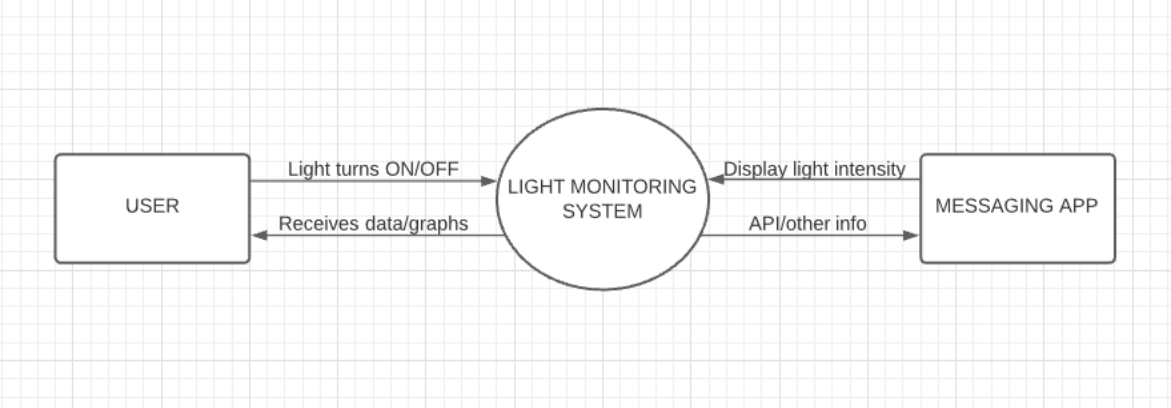
Project Design and Modelling

DFD (Data Flow Diagram) Level 0



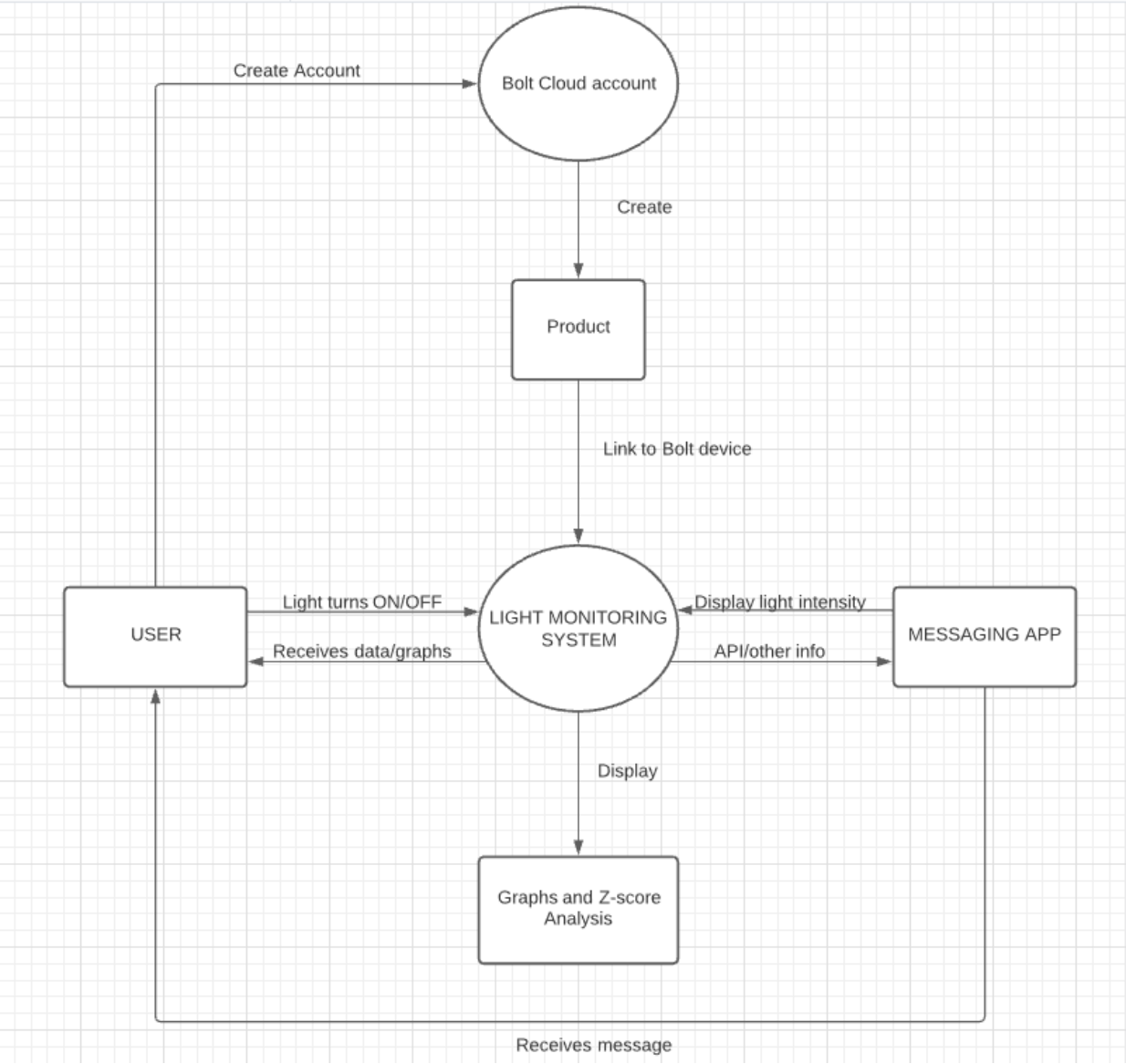
DFD Level 0 is also called a Context Diagram. It's a basic overview of the whole system or process being analyzed or modeled. It's designed to be an at-a-glance view, showing the system as a single high-level process, with its relationship to external entities. It should be easily understood by a wide audience, including stakeholders, business analysts, data analysts and developers.

Here, the rectangle shapes represents the External entity. The arrows connecting the rectangular shapes that is external entity represents data flow or the flow of data between external entities. And finally the circular part represents the Process that will be performed. In this level 0 DFD(Data flow diagram), the User turns the light off/on, then the Light Monitoring system operates and configures specific information or API's. After using the messaging API (Twillo application), the user receives the text message on their smartphone whether the light is on or off and also we can display light intensity data.

DFD Level 1 provides a more detailed breakout of pieces of the Context Level Diagram. You will highlight the main functions carried out by the system, as you break down the high-level process of the Context Diagram into its subprocesses.

After the overview of the design explained in DFD level 0, here is the detailed explanation. User creates a account on the Bolt cloud and just signs up and link or add the product that is the Light Monitoring System to the cloud. After performing these operations the user would be able to see the predictable graph and the Z- Score Analysis of the intensities of light at different timings.

DFD (Data Flow Diagram) Level 1

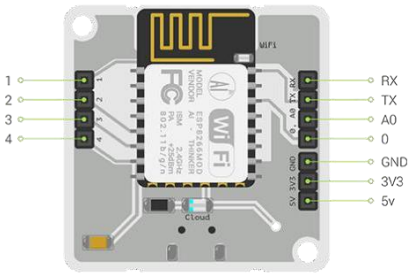


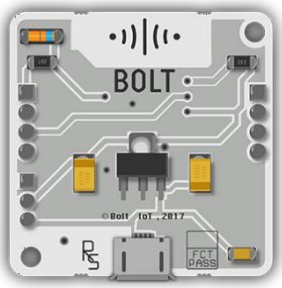
Circuit Design

WiFi Module

Device View

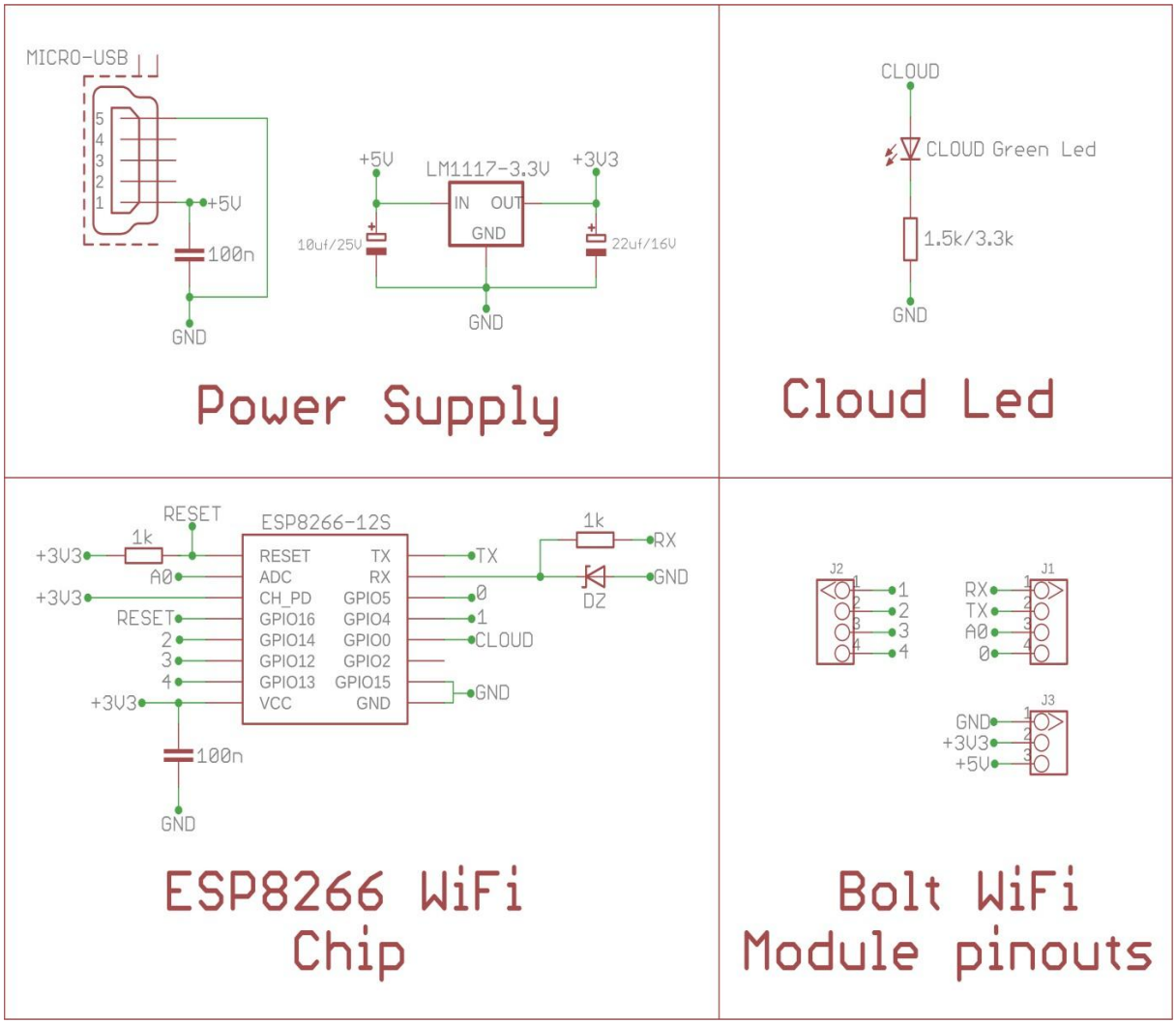
In our project we have used the BOLT WiFi Module.



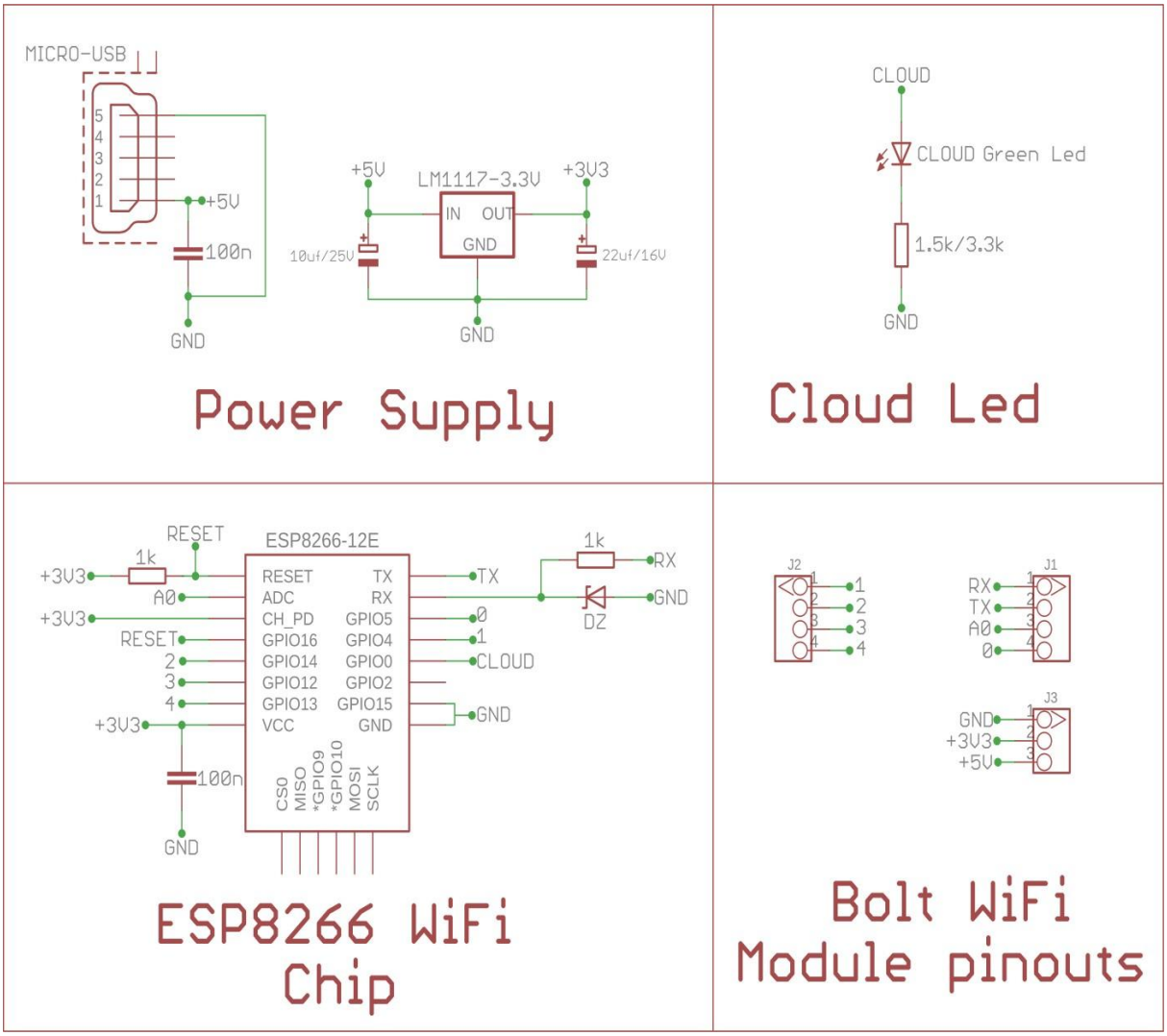


The Internet of Things (IoT) is nothing new, it has been with us for over a decade, but in this time we have seen the price of devices fall from hundreds of dollars to less than $10! The ESP8266 (and the newer ESP32) have really shaken the world of IoT from being pretty much a novelty industry (we all remember fridges that tweet and ovens that force us to accept an end user licence agreement) into a citizen science revolution where sensors across the world are monitoring climate change, animal migration patterns and much more.

WiFi Module with ESP8266-12E



WiFi Module with ESP8266-12S



General Specifications

Parameters	Details
Connectivity and Processing Module	ESP8266 with custom firmware
MCU	32-bit RISC CPU: Tensilica Xtensa LX106
Power	5V/1A DC via Micro-USB port or 5V and GND pins
Operating Voltage	3.3V
CPU Clock Frequency	80 MHz
MCU Internal Memory	64 KB of instruction RAM; 96KB of data RAM
MCU External Memory	4 MB Flash memory [QSPI]
GPIO pins	5 Digital pins [3.3V logic]
ADC	1 pin 10 bit ADC [0-1V input]
PWM	All 5 Digital pins capable of PWM [Software PWM]
Dimensions	35mm x 35mm
Boot Time	Less then 1 second

Connectivity

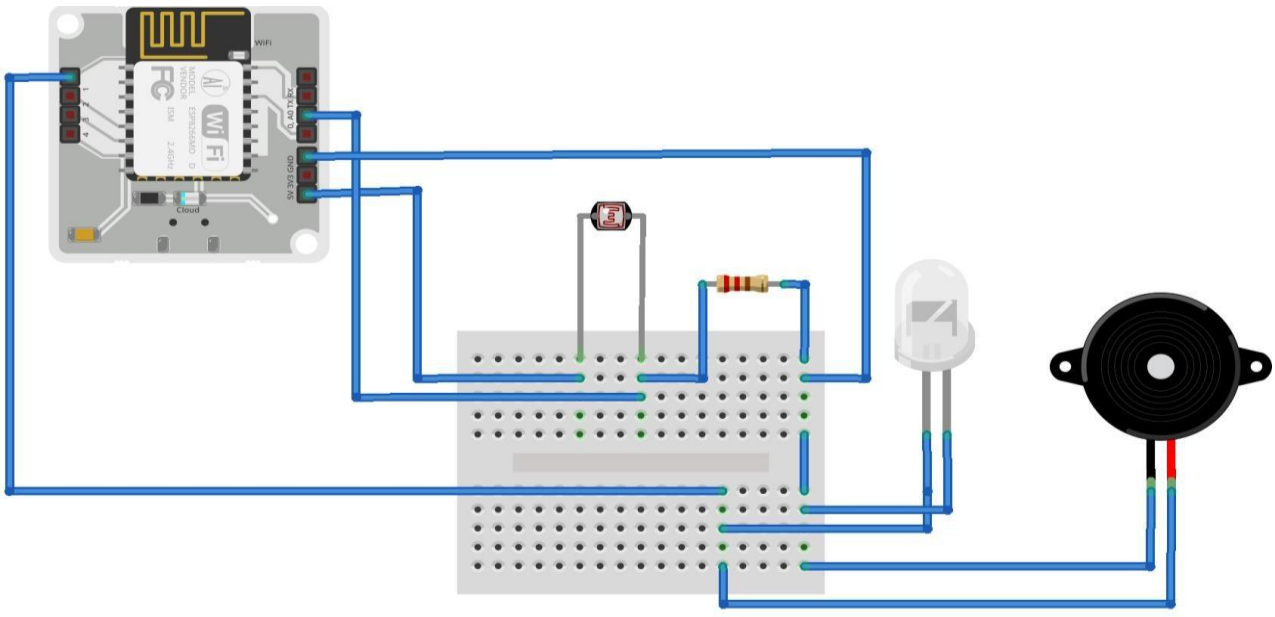
Parameter	Details
WiFi	802.11 b/g/n Automatic AP mode if not connected to WiFi WEP/WPA/WPA2 authentication Only works with 2.4 GHz WiFi
UART	8-N-1 3.3V TTL UART [using TX, RX, GND pins] [2400,4800, 9600,19200 baudrate]
Cloud	Default: Bolt Cloud (https://cloud.boltiot.com) Optional: Custom cloud using Bolt APIs

LED Indicators

Parameter	Details
WiFi LED - WiFi connectivity	1) Slow blinking: Trying to find and connect to WiFi network 2) Fast blinking: User has connected via Bolt IoT app for setup 3) Stable: Connected to WiFi
Cloud LED – Bolt Cloud connectivity	1) Stable: Connected to Bolt Cloud 2) Off: Not connected to Bolt Cloud 3) Dim: Insufficient power/ incorrect boot

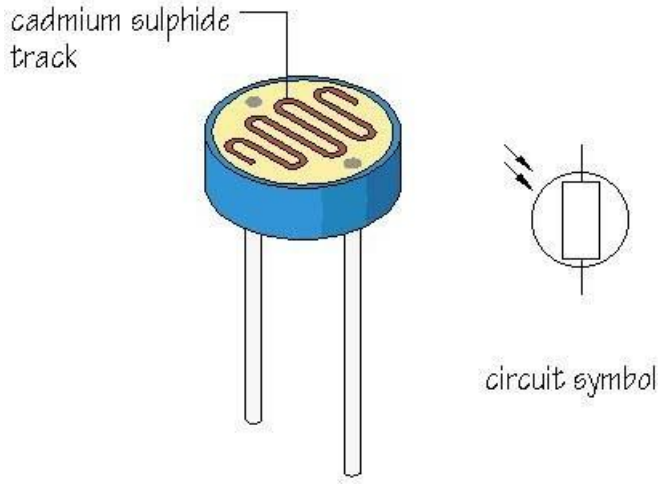
Circuit Connection

The system monitors light intensity and detects anomalous conditions.

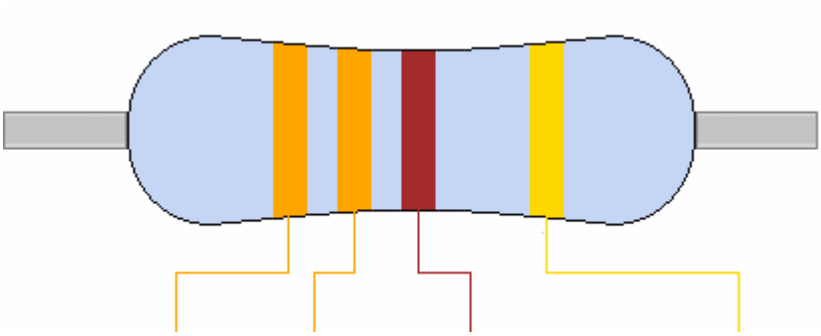


Components of Circuit Diagram

LDR (Light Dependent Resistor)

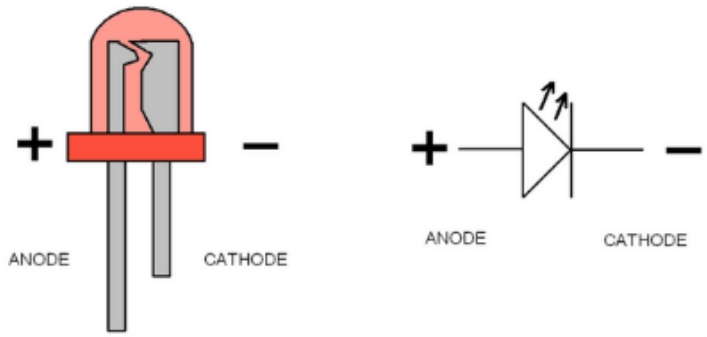


Resistor 330 ohm

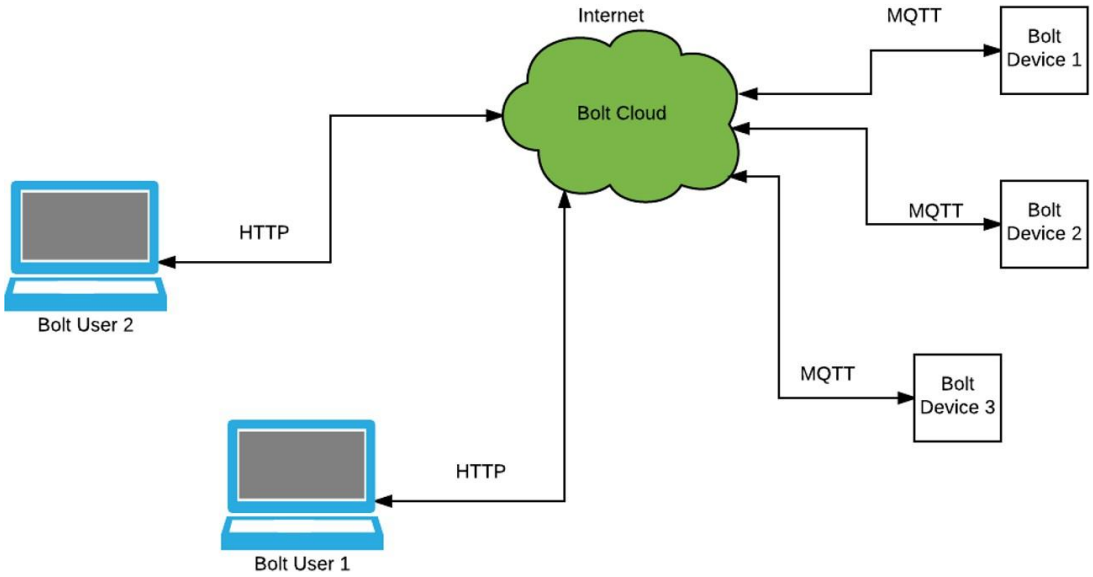


orange orange brown gold

LED (Light Emitting Diode)



Communication chart of Bolt Devices with Bolt Cloud



The communication of Bolt devices with Bolt Cloud happens over the MQTT communication protocol. MQTT stands for Message Queue Telemetry Transport. But why do we need to have a protocol such as MQTT for communication when HTTP & HTTPS protocols are so popular and widely used for communication?

Although these protocols are popular, the amount of overhead data that is sent over the Internet for managing the communication is quite a lot. Overhead data is the data which is sent along with the actual message/data which conveys the extra information required to understand the message/data sent. The overhead data varies from protocol to protocol. This is fine in case of systems such as mobile phones, laptops, desktop computes that have the hardware capabilities and the network capabilities to send the extra overhead data. MQTT contains very low overhead and hence becomes ideal for IoT communication.MQTT is a pub-sub messaging protocol. Pub refers to publishing and sub refers to subscribing.