

Department of Electronic and Telecommunication Engineering

Internet of Things
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Currency Converter Service Project Report



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1 Introduction

1.1 Overview

Foreign exchange market is a global market, where people around the world buy and sell different foreign currencies everyday for various purposes. One purpose of the traders in the market is engaging in day-trading activities, and is performed by normal people who intend to gain profits and earn from small price mismatches that are available for short time periods. Day traders' activity is influenced by historical fluctuations of foreign currency prices as well as the information gained from several technical indicators. These indicators are generated by performing various mathematical transformations on the time series charts of currency prices. This information is of much value for Day Traders and they usually buy this market information from their trusted services.

This project focuses on providing foreign exchange market day-traders, a set of useful information, by using a currency API that provides live currency prices of various currencies around the world. Usually, historical currency price data are provided freely on a daily basis only, but these rates change by minute values, every few seconds. Day traders require these fast changing values and must pay a considerable price to access this information. Therefore, by storing the live currency data in a Firebase Realtime database, we are able to provide more information to Day Traders and other users.

The users of our application are able to log in using their email and password, and specify the currency type which they are interested in. Next, they are able to specify maximum (ceiling) and minimum (floor) values for the exchange rate (as a percentage of the exchange rate at the time of request) and receive notifications when the currency price crosses either of these thresholds. The notifications will be sent via emails as well as by a Buzzer, which would ring to notify the users. Therefore, the notifications would reach the user at times when he/she is offline as well, through the Buzzer ringing. These ceiling and floor values allow Day Traders to evaluate the performance of their investment over time, without having to monitor the variation of exchange rates manually.

An LCD screen displays the exchange rates of 6 types of currencies as stated below.

1. GBP - Great Britain Pound
2. JPY - Japanese Yen
3. USD - US Dollar
4. KWD - Kuwait Dinar
5. AUD - Australian Dollar
6. EUR - Euro

The display is refreshed every 30 seconds and shows whether each exchange rate has increased or decreased over the last 30 seconds.

Since the foreign exchange market is an international market, it operates 24 hours a day and five days a week. However, during the weekend the market closes its trading activities. The functioning of this application is turned off an hour after the trading activities are closed for a particular week and reopened an hour before the trading activities are resumed for the following week.

1.2 Objectives

This project aims at making exchange rates of a user's preference, freely available with updates at 30 second intervals. The overall platform with user authentication and live dashboards helps boost the activities currency markets.

- Inform the user when the investment has exceeded a certain percentage of profit (ceiling) or diminished below a certain percentage of loss (floor), even when he/she is offline via an alarm.

- This will allow them to make quick decisions and responses regarding their investments. To send detailed emails of the exchange rate behaviour at times when the thresholds have been crossed.
- Display historical variations of currency exchange rates and several technical analysis charts through live dashboards. These help the Day-Traders make useful predictions.
- To display rapid variations of currency exchange rates via an LCD display and whether the exchange rate has increased or decreased within the preceding 30 second interval.
- Ensure that the NodeMCU, and the resource constrained devices in this application operate in an energy efficient manner.

1.3 Scope

The scope of the project includes an application using IOT concepts, tools and standards to provide timely information to Day Traders. This provides the users with the following.

1. Exchange rate of 6 currencies - updated every 30 seconds
2. Buzzer and Email notifications when set thresholds for exchange rates are exceeded
3. A dashboard displaying the variations of exchange rate and Technical indicators over time (updated hourly).

The basic components of which the application comprises are given below.

1. **A realtime database** (using Google Firebase)
2. **An open-source API** providing currency exchange rates
3. **A Node-Red Dashboard** to display variations of the four technical indicators
4. **A Buzzer** to notify the user when the set thresholds for exchange rates have been exceeded
5. **An LED Display** to display exchange rate variations
6. **A Node-MCU** for accepting requests of the human users as well as to send control signals to a Buzzer and the LED Display
7. **A client mobile phone** as the user interface

The MQTT protocol is used to facilitate communication between NodeMCU and the Node-RED application. The deep sleep mode of the NodeMCU is used to save power of the NodeMCU and the other constrained devices, during the weekend hours when the forex market is closed.

2 Methodology

2.1 Architecture

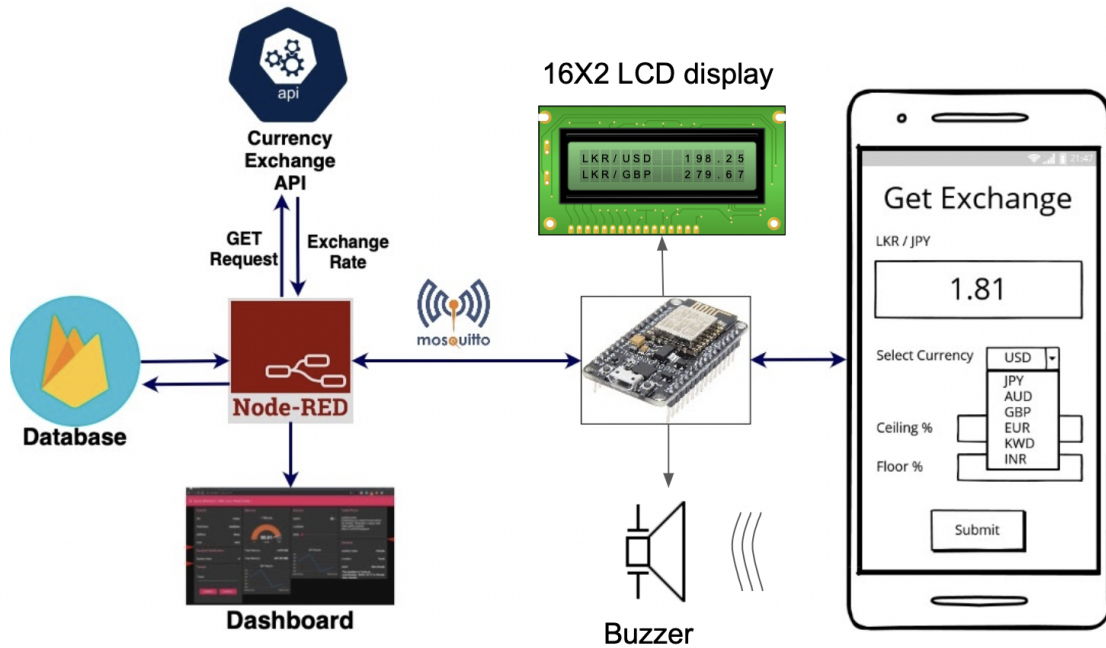


Figure 1: Architecture of the entire solution

2.2 Functionalities of NodeMCU

2.2.1 Hosting Web Interface for User

2.2.2 Authentication and authorization flow

2.2.3 Setting up the MQTT Broker

2.2.4 Decoding compact received data

2.2.5 Sensing alerts and notifying the user

2.2.6 Supporting the LCD 16x2 display

2.2.7 Sleep function of the NodeMCU

2.3 Functionalities of the Node-RED Application

2.3.1 Extracting Data from the Exchange Rate API

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3 Results and Discussion

4 Conclusion

5 Annexes