

Cryptocurrency price monitoring web application design

Team : 640

Yuqing Cheng, Peng Tong, Xue Zhao, Yuan Gao

1 INTRODUCTION AND APP DESCRIPTION

Our app is named Ccmonitor, which comes from Cryptocurrency Monitor. Ccmonitor connects to Coinbase APIs and polls cryptocurrency prices to provide information of cryptocurrencies. It allows users to choose the cryptocurrencies they feel interested in to monitor and select specific cryptocurrencies with the desired threshold to create alerts and get emails when the chosen cryptocurrency crosses a price threshold or there's an arbitrage opportunity.

Besides signing users up directly to Ccmonitor, we adopted OAuth2 to allow users sign in with third party accounts, Github and Google accounts. We used Redux to manage users state, combining structures in store into a general state to render. We made use of React Router to manage the controllers and achieve dynamic routing, routing that takes place as our app is rendering. Also, to implement the Email services, we chose Bamboo to make it flexible and easy to use email for Elixir. Bamboo.SendGridAdapter is being used and helped a lot. As for data visualization, we found Echarts really useful to draw graphs for users to easily get the idea of the overall behavior and trend of the currency they are interested in. Apart from all these technologies, we also get help from Font Awesome, Google Fonts and some other third parties to beautify our UI, such as Github and Google login icon, our font styles, and adding the browser tab icon for our app.

Overall, our Ccmonitor is a complex and integrated web app that combined a number of latest technologies and we will continue to work hard to provide best experience to our users.

2 INTERACT WITH APPLICATION

There are four main pages in our application.

2.1 Index Page

Index page contains three main parts: navbar, news, and coin info of three types of cryptocurrency.

- If the user is not logged in, he/she can only see the log in and sign up dropdown on the navbar.
- By clicking the log in dropdown, the user can log in with google or github account. Or he/she can log in using his/her own account on our website.
- By clicking the sign up dropdown, the user can sign up an account on our website.
- If the user is logged in, he/she can access coins info page, alert page and notification center page via button on navbar.
- Left part of main body in index is news part, where our application will show the latest cryptocurrency news. By clicking the news title, we can view the detail of that new on news websites.
- Right part of main body in index is coin info part, where our application will show the real time price, change since open, and open price of three different coins(BTC, ETH, LTC). By clicking the coin name, we can enter the specific info page of that type of coin.

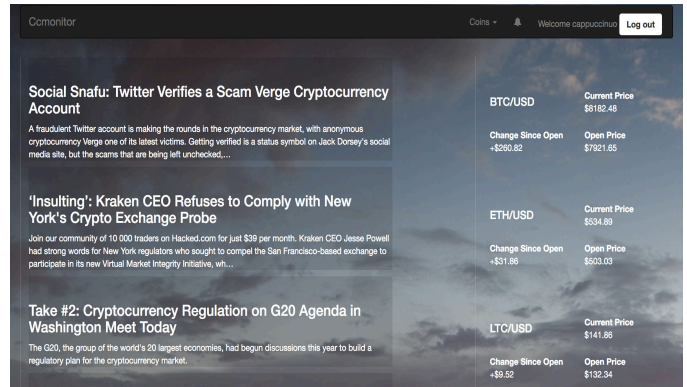


Figure 1: Index Page

2.2 Coin Info Page

The coin page shows specific info of each coin. An intelligent and detailed chart and a table of historical data is shown to the users. Users can get information from Echarts which are more direct to compare data changes and trace back to understand the trend.

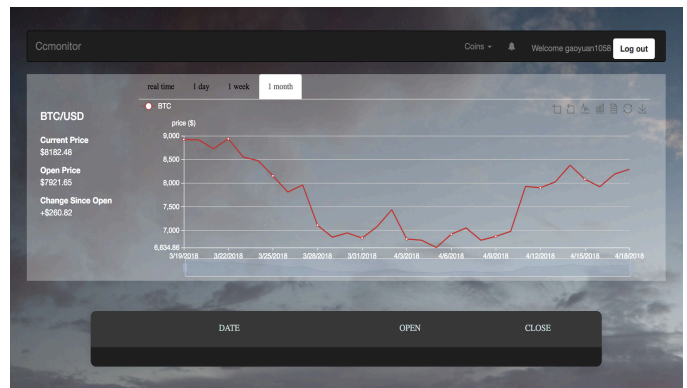


Figure 2: BitCoin Info Page

2.3 Alert Page

There are two parts of our alert page, new subscribe and my alert.

To subscribe a new alert, the user can click coins on nav bar and click subscribe. Users can choose coin type(BTC, LTC, ETH), alert type(Ascending or Descending), as well as the threshold of that alert.

To check all the alerts that the user has, the user can click my alert on alert page, the user can delete the alert by clicking the trash icon.

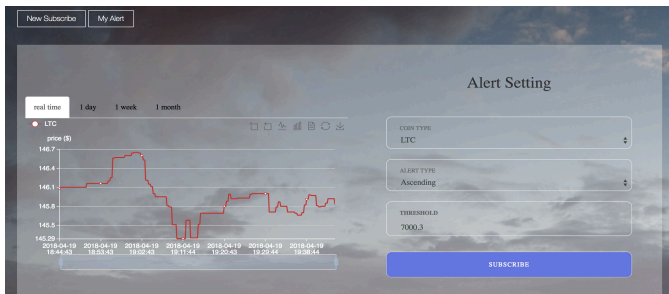


Figure 3: Alert Page

COIN TYPE	ALERT SETTING	CREATE TIME
BTC	DES + 8190	2018-4-19
BTC	ASC + 9000	2018-4-19
BTC	DES + 8190	2018-4-19
LTC	ASC + 7000.2	2018-4-19

Figure 4: My Alert Page

2.4 Message Page

The user can check all the messages the server sent him/her by clicking my alert on alert page. Also the message page provide the function to filter all the message, including filter the messages by coin type, filter the messages by alert type.

Coin Type	Alert Type	Content	Sent Date
ETH	Descending	Dear customer, ETH price is now \$6002, which has met your lower limit setting.	2018-4-17
ETH	Ascending	Dear customer, ETH price is now \$7002, which has met your upper limit setting.	2018-4-17
BTC	Descending	Dear customer, BTC price is now \$6001, which has met your lower limit setting.	2018-4-17
BTC	Ascending	Dear customer, BTC price is now \$7001, which has met your upper limit setting.	2018-4-17

Figure 5: Message Page

3 SERVER-SIDE STATE

3.1 Database Entities

We store some entities permanently in postgres db at server-side. These entities include person, alert-setting and messages. A person has an id, name, email, hashed_password, provider (google or github) and a token from provider. An alert-setting has an id, threshold, coin_type (BTC, ETH or LTC), alert_type (ascending or descending) and a person_id as foreign key. A message has an id, content, coin_type and alert_type used for filtering at front-end. Browser can access and update/delete these entities through corresponding APIs and controllers using ajax call, and ajax callback would dispatch the front-end store and reflect changes.

3.2 Agent State

Apart from those in-database entities, real-time prices of cryptocurrencies are stored in Phoenix Agent and pushed to browser through web-socket by Phoenix Channel. The real-time price data is fetched from coinbase API through our server-side Nodejs client and supplied to Phoenix Agent through web-socket, too. In the Phoenix Agent, the state of real-time prices has a structure like this:

```
%"BTC" => [], "ETH" => [], "LTC" => [], "time" => [],
```

where a series of prices in last 5000 seconds with 10 seconds as interval for each cryptocurrency is stored, also the corresponding timestamps are stored. The series of prices and timestamps have a maximum length of 500, which is maintained by the Nodejs client. These real-time prices are used to support the front-end echarts for users to observe a real-time price change in 5000 seconds.

3.3 Structures in Store

We maintained a store to create and manage a set of data structures, utilizing Redux to combine these structures into a completed state for components to render. Data structures in store include: "users" that contains all users in our application, "token" contains the token of current user, "login" contains login information, "signup" contains register information, "alerts" contains all the alerts set by current user, "messages" contains all the emails that have been sent to current user, "current_coin_type" represents which type of coin user is viewing, "prices" contains the real time prices for coins, "historical_prices" contains historical prices for coins.

4 RELATED API

4.1 Coinbase

We used Coinbase API to get real time prices for coins. Real time price provides important information for users to keep track of the newest status of interested coins. User behaviors like purchase and sell are closely related to real time price. Besides, real time price is the foundation of other functionalities of our application, like sending messages when the price reached certain threshold configured by users. Coinbase provides simple API to get real time price of different coin types. On the server side, we got real time price every five seconds, then pushed price into browser-side state through web socket.

4.2 Crypto Compare

We used CryptoCompare API to get historical prices for coins. Historical price data can provide users a straightforward sense of the trending and potential of coins, which is necessary for users to make trading decision. And CryptoCompare provides free and concise API to get historical price data. It parameters to set the time period to aggregate the data over (for daily it's days, for hourly it's hours) and the number of data points to return. We used CryptoCompare to get the past 24 hours, one week, one month, six months and one year's history prices for coins, saving these prices into state and rendering them into charts and tables.

4.3 Crypto Coins News API

We use crypto coins news api, which provides breaking cryptocurrency news - focusing on Bitcoin, Ethereum, ICOs, blockchain technology, and smart contracts. We can fetch all the news in JSON format by using AJAX's GET method. To display the news, we use title, description, and URL of that JSON data. Every time the user enter our page, the page will display the top 5 crypto news. In this way, the user can know the latest news of cryptocurrency.

4.4 OAuth API(Google and Github)

We used Github and Google APIs to allow users to sign in with their existing accounts in Github and Google. This is a much more convenient way to get access the desired information for the visitors who are not willing to spend several minutes to register or lazy to input their name and email again and again. The users want to get to the detailed page immediately and so we offer them this kind of convenience. Also, emails are a required field for our user table, which will be satisfied by getting the email addresses from Github and Google when making advantage of their APIs. We first have to register our app, Ccmonitor, on the developers console of Github and Google and get the client ID and the client secret, as well as filling out the redirect url of our web app to take people to the successful-login page(index page). We adopted ueberauth_Google and ueberauth_Github. So we added ueberauth and ueberauth_Google and ueberauth_Github to our defp deps block. Created a scope "/auth" block to handle our authentication with Google and Github routes for get "/provider". And also inside our config/config.exs, we will start the process of configuring our application to authenticate with Google and Github. We updated our AuthController to add the Ueberauth plug and useful signin, signout and callback functions. Also setting up user table with provider, which can be Github and Google.

5 COMPLEX PART OF APPLICATION

5.1 Real Time Prices Monitoring at Server Side

A complex part of our app is finding a way to monitor real-time prices for cryptocurrencies at server-side. This is necessary because our app needs to:

- 1. reflect real-time price change through e-charts,
- 2. send user alert emails based on the real-time price change.

Actually, it is the second point makes it necessary to monitor real-time prices in server instead of in browser. However, we used coinbase as external API to get real-time price data, but it doesn't supply a Phoenix/Elixir SDK, so we need to find a work-around.

Our solution is building a server-side Nodejs client, which could work with a corresponding SDK from coinbase and connect with Phoenix server through websocket. In the Nodejs client, we used a recursive setTimeout function to fetch real-time price data every 10 seconds, and we used Phoenix Channel to push the data to Phoenix server through websocket. Since the real-time browser data is also supplied through websocket, it's convenient to let Nodejs client and browsers join at the same channel, so every price update in Nodejs client could reflect in browsers through this channel. Since the Nodejs client is deployed on server and is the only

data source to update price data in channel, thus the monitoring of real-time price data on server is implemented.

5.2 Display Data via Chart

To give users a clear and straightforward presentation of coin prices, in PriceChartComponent, we utilized Echarts to draw the chart for real time prices and historical prices of selected coin. While implementing this component, first we need to distinguish real time price and historical price, because real time price is pushed by server through socket and history price is returned by API request. To achieve that, we maintained a variable to indicate whether user wanted to view real time price chart or historical chart, detecting whether the variable need to be toggled after each user selection. Besides, since we provided three different coin types, the chart should have ability to show price of different coin types in a single component. To achieve that, we maintained a current_coin_type variable in state to indicate current coin type being selected. Based on the value of this variable, chart will show corresponding prices for specific coin type. Also, we need to adjust the appearance of the chart (like font, color, axis) to keep consistency with the overall page style.

6 CHALLENGES AND SOLUTIONS

6.1 Authentication with Social Media Account

A challenge we faced was implementing login with Github/Google in our SPA. The auth controller in Phoenix works well with html.eex templates by putting call-back user information in session. However our app is a SPA that maintains a browser-side state as store, which is not easy to get user information from session. Besides, our app supports signup/signin with out website account instead of Github or Google, it is uneasy to integrate three type of users together and let them behave equivalently.

Our solution is giving every user a server-generated token with Token.sign and use this token to uniform users from different login providers. For our own users, the token is generated at TokenController as soon as they successfully login, and is sent back to browser through ajax callback. As for user login by providers, their user_id is first fetched at PageController from session, and the token is generated at PageController and sent to browsers through window variable. Furthermore, the user information in session will be removed at PageController to avoid confusion in the future. Our front-end app component will mount to detect token from cookies and token from window variable to update the login status.

6.2 Alert Email Distribution

Another challenging part of our project is alert sending through email. As mentioned before, there's a Nodejs client updating cryptocurrency prices and pushing the data to Phoenix Channel through websocket, thus it's natural to put alert handling in the handle_in function in the channel file. As soon as a new price data is received from Nodejs client, a query to database will be made to find all alert-settings in alerts table according to specific condition: 1. what type of cryptocurrency it is, 2. whether the price is ascending or descending, 3. whether the price change is passing the threshold. In handle_in function of the channel, all alert-settings that meet

above conditions will be fetched with user information preloaded to get user email information.

The next step is sending emails. We used Bamboo to compose email and push composed email to Bamboo's Mailer, and we chose to use `deliver_later` to send emails in the background to avoid blocking the server process. The real email-sending service is supported by SendGrid, who is well integrated with Bamboo where it can be used as `SendGridAdapter`.