FoodChain

Lester Goh and Loo Jia Hong
Supervisor: Dr Loke K.S.
Swinburne University of Technology, Sarawak Campus

Introduction

The idea of FoodChain application system is to provide a secure tracking system of food produce or product from its source (farm or factory) to the consumer. It should allow easy tracking for producers and will be easy for consumers to independent verified. The tracking data is too be entered to the blockchain as the product flows through the supply chain. The use of blockchain makes the data immutable and unfalsifiable after it has been lodged into it.

However, the most important part of the system is that the system must not be open to falsifying and collusion at the point of input. This requires careful implementation and establishment of proper security protocols. We need proof-of-location security protocols and will implement it along the lines of Zhu and Cao (2011). We need other analysis tools to set red flags for suspicious movements. We are in the process of researching the best means to do so.

Implementation

We have implemented a preliminary small scale prototype website to test the ideas. This is not a complete website as it does not yet have integration with blockchain nor are the security protocols ready. It is just a prototype to spark further discussion and research. The prototype is developed using Ruby and Rails. A client app is also developed in Android for query and QR scanning.

Prototype Screens

First we have the login screen for normal users and suppliers. Those without a sign in will need to Sign-up (or register).

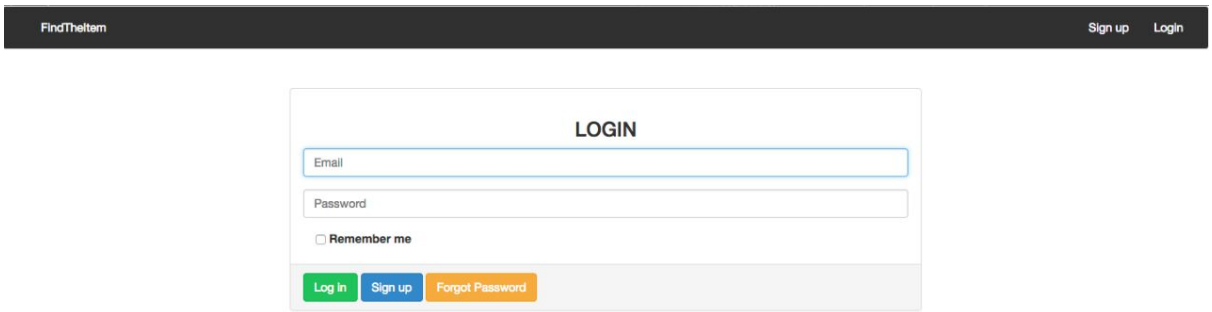

Figure 1. Login Screen.

Next we have the sign up screen for users and suppliers.

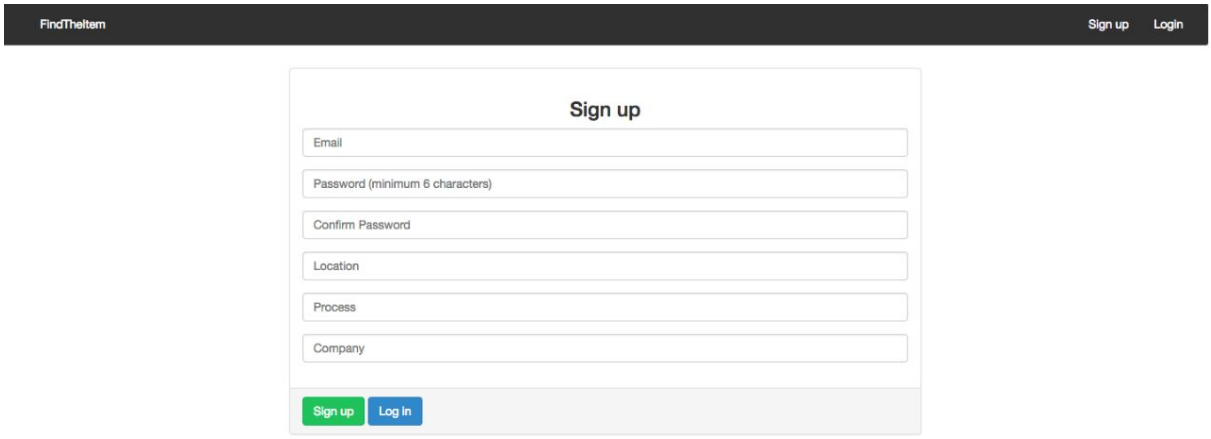

Figure 2. Sign-up Screen

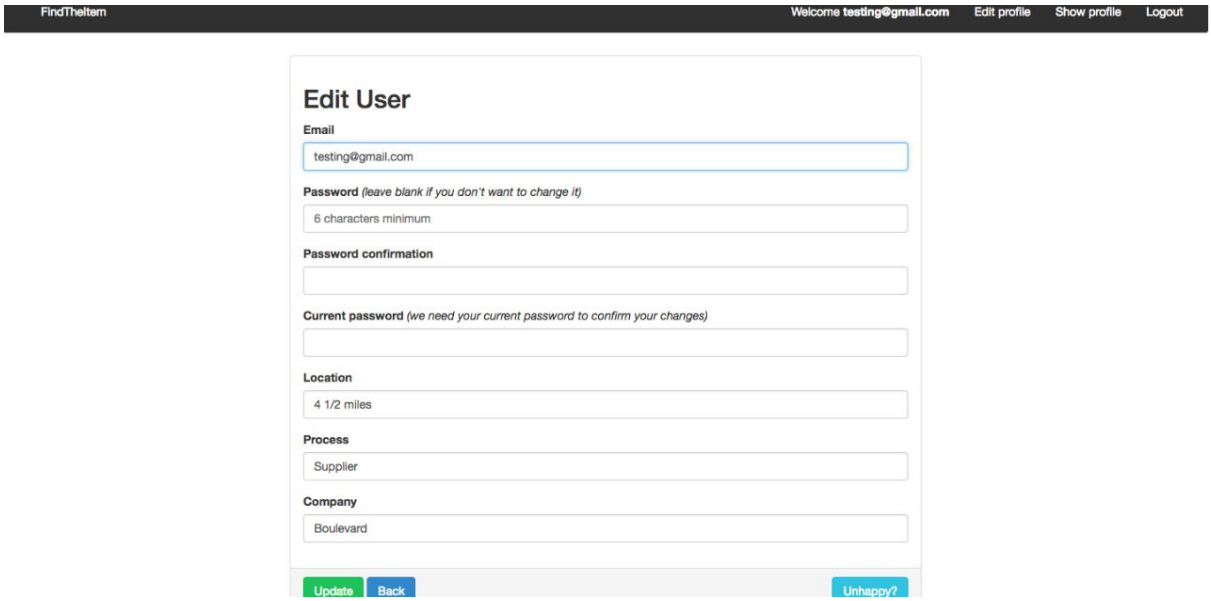

Figure 3. Edit User screen

At sign up or after login the profile can be updated (Fig 3). After login in the user can see a list of items available (Fig 4), and click on that. Alternatively the user with Android app can scan the QR code at the retailers or place of purchase or online website. Figure 4 shows a simplified screen. In practise the list of items should be searchable. Figure 5 shows the origin of the product requested. The screen currently only shows the source not the entire supply chain as it may not be necessary, though at a later stage there may be a toggle for the user/consumer to see the detail trail. This data item will be pulled from the blockchain. The user should also see flagged items that are deemed suspicious, e.g. the timing of movement

The supplier can add items into the local database (Fig 6). Once the movement are scanned (Fig 7), that data will go to blockchain. The movement of the items are added in Fig 8.

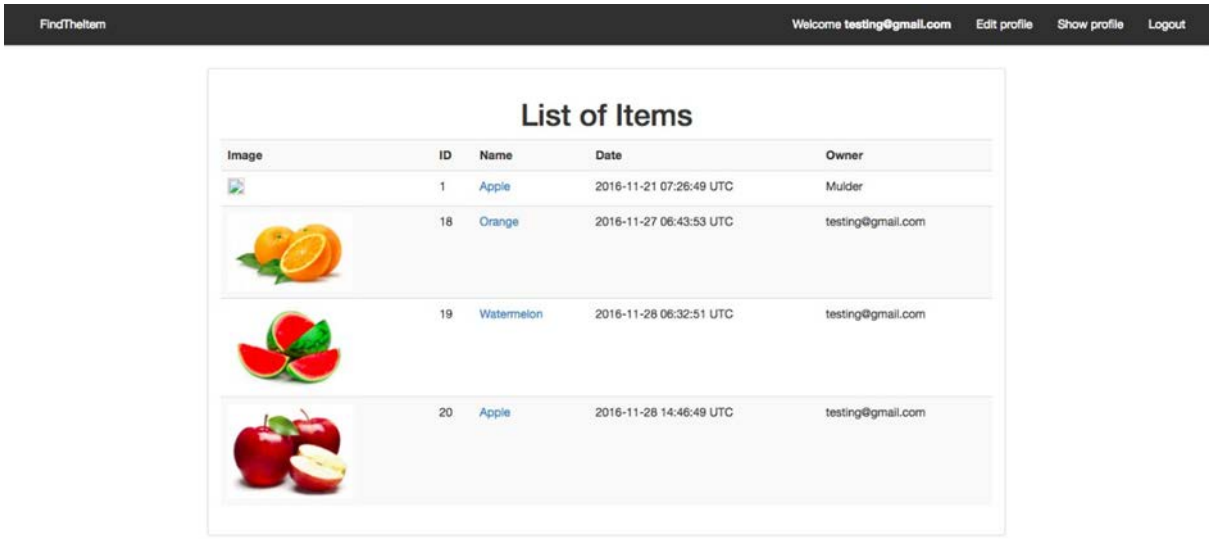

Figure 4. List of products available for tracking information on the blockchain.

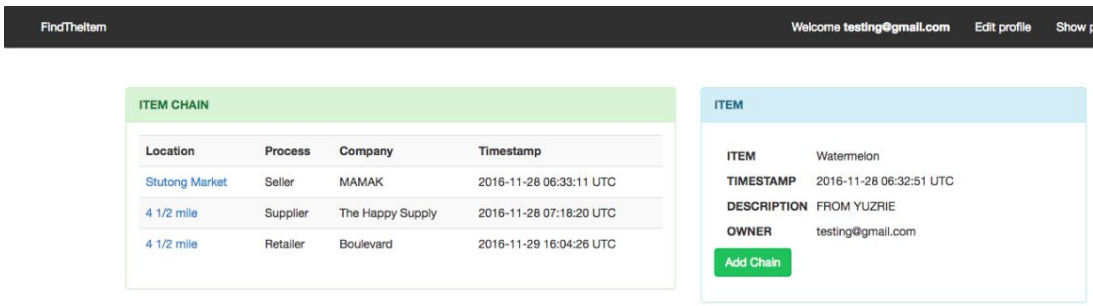

Figure 5. Source of product display

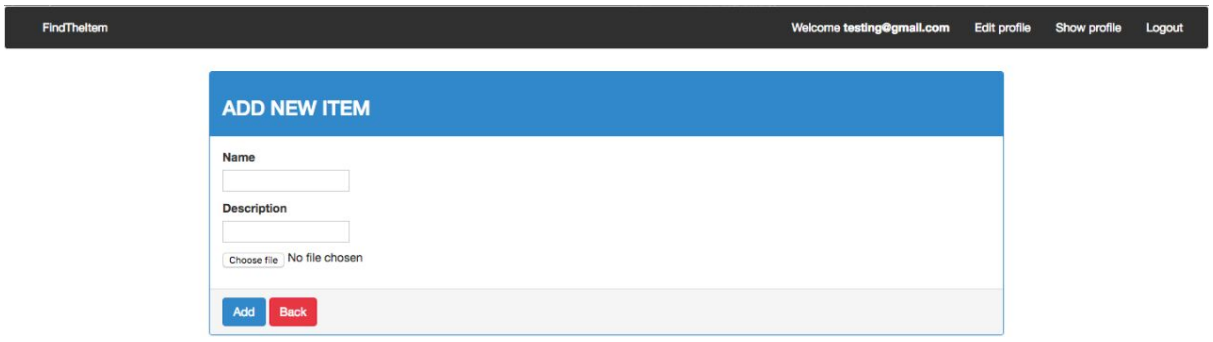

Figure 6. Supplier user can add new items. Fi

Figure 7. Start a new supply movement chain for the item.

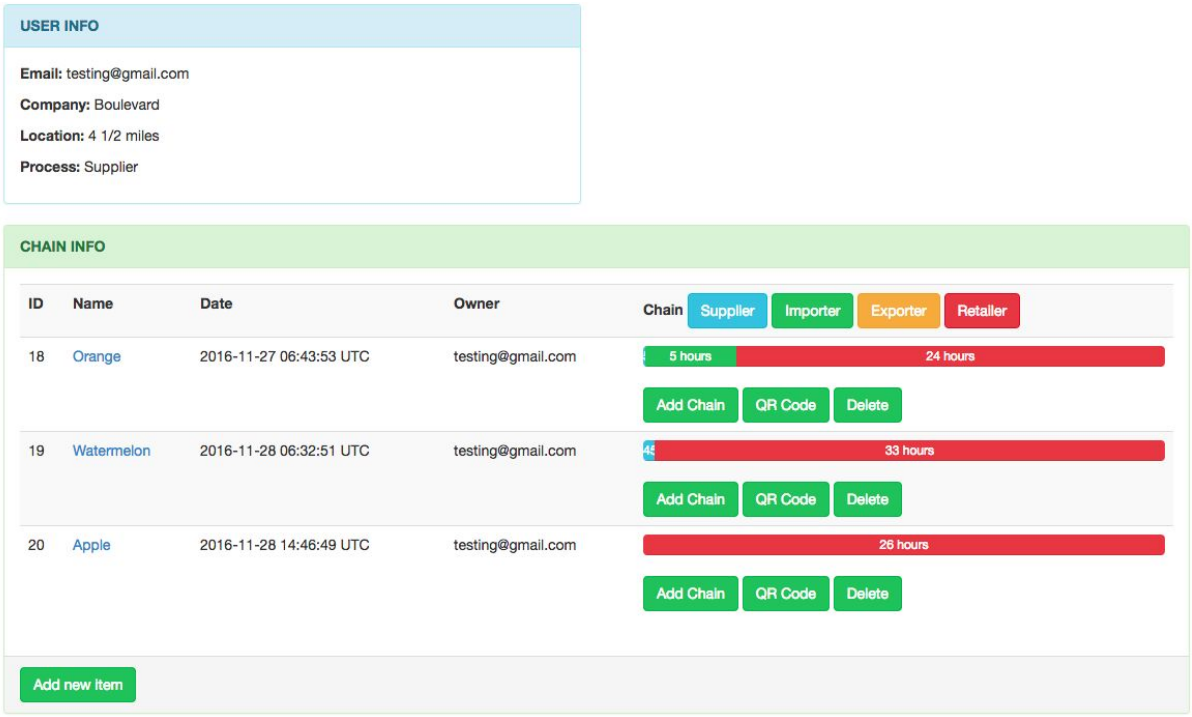

Figure 8 Supply chain movement data for the items.

Currently the Add Chain is done by manual input or by QR code that is attached to the produce. In this prototype the QR code is generated by the website and to be scanned by an Android device without security protocols (yet to be implemented).

Android App Prototype

The Android app have the usual user sign in and registration (Fig 9).

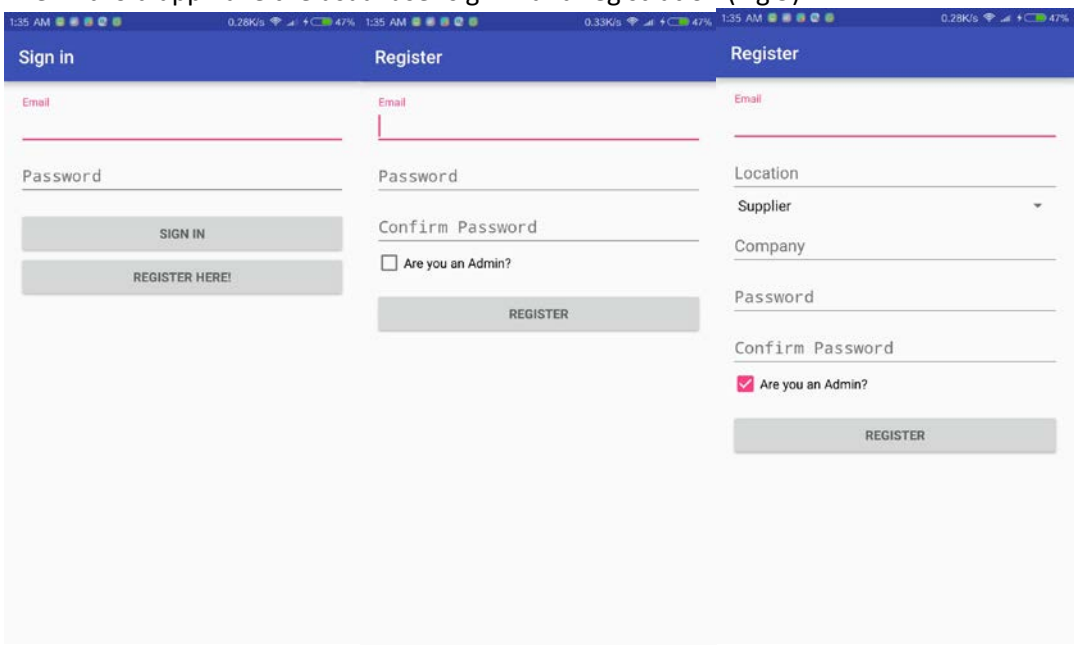

Figure 9. User Sign-in and registration Screen

Figure 10. QR code generation from the website

When the QR code generation is selected (Fig 8), the QR will be displayed (Fig 10). The user then can scan with the Android device and the QR code item will be displayed.

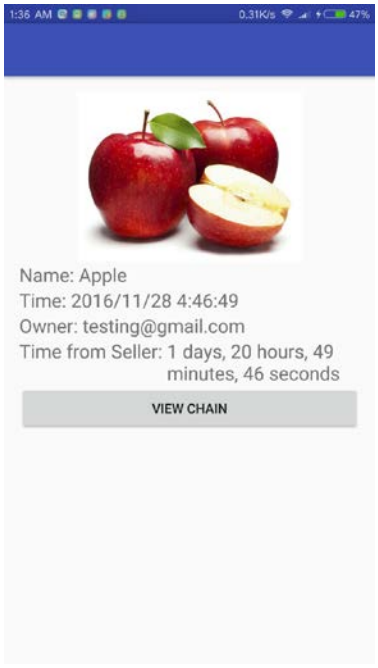

Figure 11. Presentation of Item from QR Code.

Once the QR code have been scanned the item will be displayed on the Android screen (Fig 11). Selecting “View Chain” will result in the values being pulled in from the blockchain (actual from blockchain not implemented yet). Results are as in Figure 12. The information provided are mostly place holders, the actual data to be used has not been decided yet. It is assumed here that the proof-of-location (e.g. Zhu & Cao, 2011) security protocol will be activated here. The Android device that is scanning in the data to the blockchain needs to prove its actual physical location.

The consumer (non-supplier) login will only be able to view the food chain without being able to update the food blockchain.

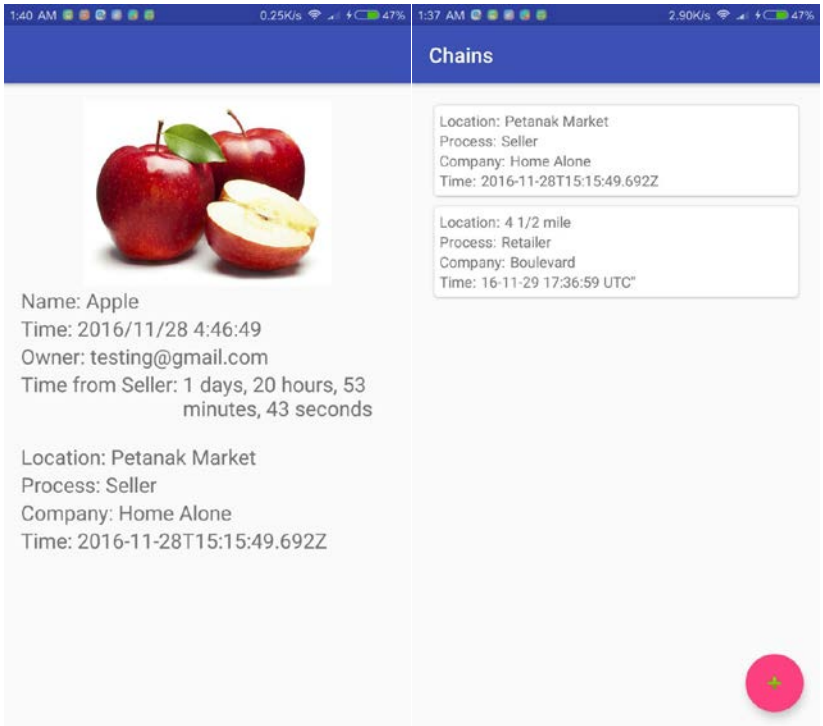

Figure 12. Supply Chain data (to be pulled in from blockchain) for Apple. Information showed are just sample, not actual to be implemented.

References

Giacomo Brambilla and Michele Amoretti and Francesco Zanichelli,"Using Block Chain for Peer-to-Peer Proof-of-Location, " CoRR abs/1607.00174, 2016.

Zhichao Zhu and Guohong Cao, "APPLAUS: A Privacy-Preserving Location Proof Updating System for Location-based Services," IEEE Infocom, 2011.