Blockchain based low-cost light weight real-time package monitoring

1. **Please share your solution \***

The solution comprises of a small form-factor tracking device, a cloud based blockchain network along with an application server through which the location of a device can be traced.

The major components of the solution are:

* Tracking device
* Blockchain network
* Application server

Tracking device:

The tracking device comprises of a microcontroller working in low power mode so as to preserve energy, GPS module, persistence storage in the form of SD card, battery and a GSM module with a sim card.

The device receives location data from GPS satellites using the GPS module and forwards it to the blockchain network through the GSM module. If during transit, the device loses cellular network, e.g. a highway where cellular network may not be available however GPS data will be available because of less attenuation in such areas; the device would store the location data in the in-device persistence store i.e. an SD card and upon regaining cellular network this information would be synched back to the blockchain network thereby maintaining continuity. The microcontroller acts as the intermediary between the various components of the tracking device.

The device would update the location information to the blockchain in regular intervals where the time between each interval can be set before the device is started. During each transmission, the device would remain in a low power mode such that the battery life in maximized, this will ensure that the device keeps updating location information the entire journey. The device is being aimed to provide a battery life of 1-1.5 month.

Blockchain Network:

Since the main purpose of the solution is to make sure that package location can be identified and can become a trusted source to validate its course of journey during transit, utilizing a traditional database-application model would fail to provide the much needed security and trust. Hence, a blockchain network is essential to store this location information. Blockchain being immutable in nature provides more trust into the system and all stakeholders would then agree to the device location even if one makes a false claim. The blockchain is made using open-source frameworks which has been validated in the industry and is so a very secure and stable way of storing such information

Application Server:

The data stored in the blockchain network is used to provide a visual representation of the device location and the places it has been to in a map based application. The application crunches through the data and provides a very simple UI which helps the seller to get all the information regarding the device throughout the transit journey.

1. **What other solutions have you seen in the market for this problem? What has been the flaws in those solutions? \***There are no comprehensive solutions in the market. Most provide location data using GPS/GLONASS but have various flaws as follows:

* Location data stored in an in-device logger and once the device is retrieved and the log is analyzed. This will not be helpful to trace lost items
* Location data transmitted using Bluetooth and Wi-Fi. This would not be feasible as the package would travel long distances
* Trackers transmitting long-range over the cellular network but lacking location logger. This won’t be feasible as the package might travel in places where the cellular network is absent thereby breaking continuity in package tracing

Additionally, some have a form factor that is not feasible for embedding in packages. There are a few trackers which provide appropriate hardware but they do not have a proper application or a secured blockchain-like system that provides end-to-end visibility

1. **Please define the problem statement as understood by you \***

* The seller has no real-time visibility & is completely dependent upon logistic partners(LP) to get information about the movement of a High-Value Package(HVP). This sometimes results in lost packages in transit due to improper handling of HVP
* In certain cases, LPs make false claims regarding customer reachability & returns the HVP back to the seller without attempting a delivery at the customer’s doorsteps. This creates a lot of confusion as customers claim that they were not contacted and LP claims that they have. However, there is no way for the seller to verify who is speaking the truth

1. **What positive and unique results do we expect to see from your solution? \***

Upon implementing the solution, there would be the following positive and unique results:

* Real-time visibility of the package location
* Continuity in package tracing even in the event of cellular network unavailability
* All parties involved, seller, logistic partner and customer would have to agree to the location data as it is stored in a blockchain which is immutable in nature
* Ease of acquiring insurance as blockchain network is immutable and brings more trust into the system
* Small form factor owing to custom PCB design which can be embedded in package
* Data security and retention due to the combined benefits of the persistence storage and blockchain
* The tracking device is being aimed for a battery life of 1-1.5 months by adopting a low power mode when not transmitting and transmitting only when there is a change in location or package movement

1. **What is the estimated investment required to implement your solution at our end? \***

The various components of a single tracking device bought from retail market which adds to the one time fixed cost like micro-controller, GSM/GPRS module, Persistence storage (SD card slot), GPS Module, SIM card, power source together cost around Rs 4000 for a prototype model. This value will be considerably lesser for a production ready tracker. Additionally, the cellular data plan, server required for hosting the application and blockchain network can be hosted on cloud platforms which offer various low cost pay as you go models.