‘S.R.M’

A blockchain solution for a perishable supply chain

NEEDS ANALYSIS DOCUMENT

Design Patterns for Blockchain – BCDV 1011
George Brown College
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SupplyBlock Risk Management Inc.

A PERISHIBLE SUPPLY CHAIN START-UP.

We are leveraging *Distributed Ledger Technology* by integrating *Blockchain* infrastructure and *Ethereum Smart Contracts* in our business model.

We strive to streamline how perishable supply chains work for manufacturers, transporters, and distributors.

Our business will facilitate distributers in monitoring commodity status and pinpoint the specific area of failure to minimise costs related to product recalls.

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Goals

What is the client trying to achieve?

- Trying to reduce the cost by not bearing the cost of damaged batteries.
- Trying to verify genuine source to avoid counterfeits.
- Ensure verifiable quality of the battery (quality assurance).

How do we measure that?

- Measure the temperature of the batteries during transit recommended 15 degrees (Extreme -40C and 50C degrees).
- Traceable signature of product, including product ID/type, timestamp of signature creation, product serial number, and random nonce (to avoid counterfeit products).

Problem statement

- Reliability of tracking of batteries and avoiding the cost of recall.

Stakeholders

Who is involved?

- For our solution:
    - Manufacturers, Transporters, Distributers, and the Aviation Authorities.
- More details impact:
    - Manufacturer, Insurance, Transporter, Distributer, Third-party retailer, consumers, MRO (maintenance, repair, overhaul) services, Aviation Authorities.

What are the roles that they play?

- Manufacturers:
    - Create quality consumer products that are safe and free from defects.
- Transporters:
    - Transport goods safely and maintain all required environmental conditions.
    - Ensure best practices of only properly packaged goods enter the system.
- Distributers:
    - Ensure only batteries in excellent condition are being sold.
- Authorities:
    - Audit, regulate and ensure all rules and regulations are met accurately by all parties.

What are their restrictions?

- Manufacturers:
    - Maintain compliance with authorities when manufacturing drone batteries.
- Transporters:
    - Maintain compliance with authorities when transporting drone batteries.
    - Ensure they implement the required equipment to monitor environmental conditions (temperature) and battery status (charge level must not be above or below 50%).
- Distributers:
    - Maintain compliance with authorities when selling drone batteries.
    - Acquire all required licences for selling drone batteries, as some drones could be categorised as a dangerous good.
- Authorities**:**
    - Laws change with new governments. The new regulations must be communicated and held up effectively.

State Data

What is the system tracking?

- Cryptographic Signature.

What needs to be captured?

- Temperature, humidity, charge level.
- Location of the battery
- Current holder of the battery.
- Date & time of production, type of battery.

What is generated?

- Status of the battery
    - Condition (temperature, charge level, number of cycles to expiry).
    - Location of the battery.

Restrictions

Are there restrictions by roles/users?

- Ensuring charge is kept to 50% and maintain right temperature by transporter.

Are there date/time restrictions?

- Battery expiry date.
- Time required to transport the battery.

Limitations by rules?

- Trucks can only operate during certain times.
- Required Ontario freight rules.
- Trucks cannot go above certain number of kilograms.

Exceptions

Can any of the rules be broken under certain circumstances?

- Temperature should be 10C though if it goes in between -40C and 50C it should be fine.
- The manufacturer or distributer amend when they want the product to be picked up or delivered.
- If the truck being used by to transport must be changed due to technical/mechanical difficulties.

Should any new rules be added in certain circumstances?

- If authorities change rules of transportation, we must abide.

What about edge conditions?

- If our driver is an accident that damages the products, then we have an issue – We need insurance.

References

ANSI. (2007). ANSI C18.2M - *American National Standard for Portable Rechargeable Cells and Batteries*.

Bowen, M. (2020). *Lithium Cell and Battery Test Summary*. Bureaudg.com. Retrieved 16 June 2020, from https://www.bureaudg.com/media/1121/051818-lithium-cell-and-battery-test-summary.pdf.

Copeland, J. (2018). *Upcoming Changes to UN 38.3 Lithium Battery Testing* - In Compliance Magazine. In Compliance Magazine. Retrieved 16 June 2020, from https://incompliancemag.com/article/upcoming-changes-to-un-38-3-lithium-battery-testing/.

Decès-Petit, C., Zhang, L., Hernander, M., Fatih, K., Rossetto, M., & James, B. (2016). *Lithium Battery Transport Research Program*. Nrc-publications.canada.ca. Retrieved 16 June 2020, from https://nrc-publications.canada.ca/eng/view/ft/?id=f9e3fb8a-13ee-4052-aa52-7f3c419fcc45.

IEC. (2014). IEC 60086 - *Safety of Lithium Batteries*.

IEC. (2012). IEC 62281 - *Safety of primary and secondary lithium cells and batteries during transport*.

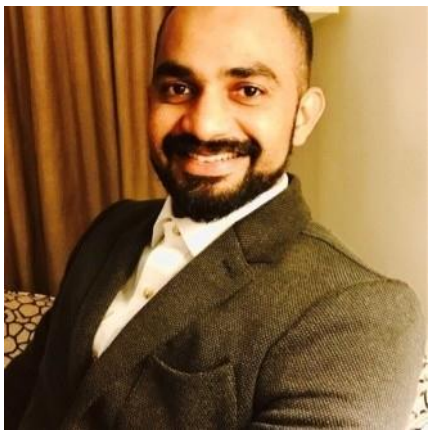
IEEE. (2008). IEEE 1625 - *Standard for Rechargeable Batteries for Multi-Cell Mobile Computing Devices*.

Transport Canada. (2019). *Lithium battery transport research* - Transport Canada. Tc.gc.ca. Retrieved 16 June 2020, from https://www.tc.gc.ca/eng/tdg/lithium-battery-transport-research.html.

UN-CETDG. (2009). *Recommendations on the Transport of Dangerous Goods: Manual of tests and criteria, vol. 11*. United Nations Publications.

UN Manual of Tests and Criteria, Sixth Revised Edition Sub-Section 38.3. Prba.org. (2016). Retrieved 16 June 2020, from https://www.prba.org/wp-content/uploads/Sub-section-38.3-UN-Manual-6th-Revised-Edition-with-corrections.pdf.

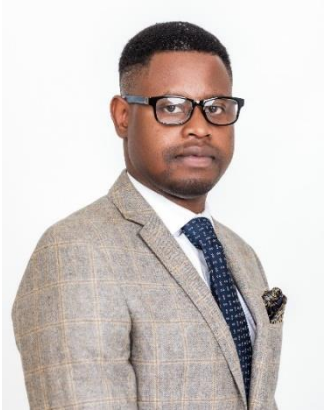
Team Bio



Cherukkatil Naseer

Nas is a Blockchain Development student at George Brown College and Director of NLM UA-Systems. He believes that rapid development in AI, IoT and Blockchain would create better efficiency and security in most of the industries and would open more jobs/business opportunities in new sectors. Nas has been well-trained on avionics products of Boeing and Airbus commercial Aircrafts. He holds UA (Unmanned Aircraft) Pilots certificate approved by CAAS. He served Red-cross, Singapore as a volunteer for two years where he trained on First Aid and CPR. He spends his free time flying, building, and modifying drones.

Henry Eriko Mwenge

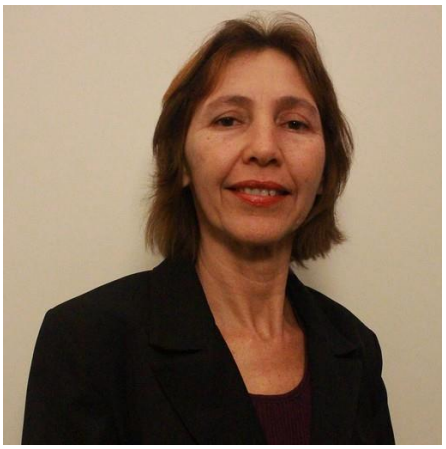


Eliko 岳飞 is the co-founder of The Briefcase Trader and is responsible for producing the company's equity research reports. He is the chief editor of The Briefcase Trader Soft Commodity and Livestock Report. Eliko is passionate about commodities and developing a fully integrated Structured Commodity Trade Finance network specific to emerging markets. He enjoys playing rugby, birdwatching, and beekeeping.

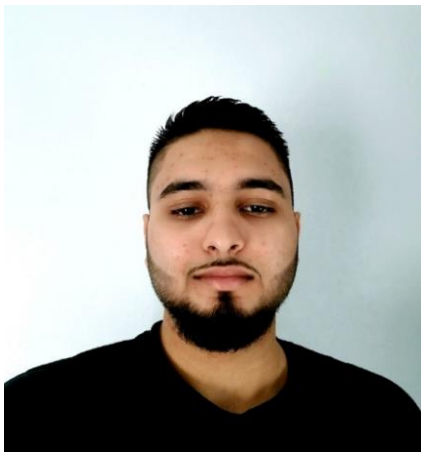
Lorran Sutter

Lorran is a Computational Engineer that studied a couple of different fields, such as computational modeling, numerical methods, computer graphics and machine learning. He has work experience in web development mainly employing C# in developing web crawlers and automated tests for large legal management systems. Engineer by background and programmer by heart, in love with Python and JavaScript. Always looking for innovative and disruptive technologies, which led him to start studying Blockchain Development in George Brown College. He believes that humanity must rely on technology to build a better future.

Wanja Mascarenhas



Wanja Mascarenhas is an IT professional and educator. As a developer, Wanja worked in the banking industry. As an educator, she taught computational algorithms, programming, data structures, and operational research. She spends her free time volunteering. She loves talking with friends and sharing experiences. Wanja is currently studying Blockchain Development at George Brown College.



Zakariya Jasat

Zak has lived and worked in nations across the globe, making him an empowered multicultural business administrator. He is exceptional at adapting to change, managing human resources, and viewing situations through several lenses. He has helped set up businesses from the ground up and lead multiple keystone projects. He truly appreciates the importance of owning strategic objectives by improving organizational performance through boosting employee engagement and creating a healthy organizational culture through fostering diversity and inclusion. Zak is a calculated risk taker, motivated self starter and is always committed to leaving a legacy that inspires positive change everywhere he goes. He is the strong open-hearted wind that ignites powerful contribution.