Blockchain-based Digital ID Platform for Refugee Camps in Kenya

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Overview

The global refugee[1] crisis has increasingly worsened over the past decades. Specifically since 2005 there has been a severe increase of over 340% in the global refugee count. According to the UN Refugee Agency (UNHCR)[2], by the end of 2017 there were 71.4m refugees worldwide, compared to 21.1m at the end of 2005. This crisis is a major concern for governments and non-government organizations (NGOs) alike, not only from a humanitarian perspective but also from economical and geopolitical perspectives.

The refugee situation in Kenya today is further exacerbated by political developments and the humanitarian situation in the two main refugee producing countries i.e. South Sudan and Somalia. The humanitarian situation in Sub-Saharan Africa continues to remain fragile in 2019 with over 24 million people in need of assistance in the region.

The majority of refugees[3] in Kenya originate from Somalia (54.5%). Other major nationalities are South Sudanese (24.4%), Congolese (8.8%) and Ethiopians (5.9%). Other nationalities include Sudan, Rwanda, Eritrea, Burundi, Uganda who make up 6.4% of the total population of refugees in Kenya which stood at 485,524 as at October 2019. Almost half of the refugees in Kenya (44%) reside in Dadaab, 40% in Kakuma and 16% in urban areas (mainly in the capital city of Nairobi).

The ongoing unrest in Burundi and Democratic Republic of Congo is likely to result in an increase of refugees from both countries, however recent developments in Ethiopia that are moving towards a more stable political situation is a positive shift in reducing the influx of asylum seekers from Ethiopia.

The fluid security situation in Kenya, especially after the 2013 terrorist attacks led by the Somalia based Al Shabaab group resulted in a desire to undertake more work in Somalia to make return and reintegration sustainable. Between December 2014 and October 2019, 84,823 Somalis have been assisted by UNHCR and its partners to voluntarily return to Somalia. In addition, the results of a 2016 verification exercise of the population in Dadaab reflected an overall population reduction of 60,000 individuals. 69,811 individuals within the verified numbers expressed willingness to return to their country of origin. The exercise also resulted in the identification of 40,454 cases of double registration (persons who either possess a Kenyan ID or are on record as having applied for one)

In our view, this crisis encapsulates the following key challenges:

- Difficulties in tracking and sharing refugee migration data among governments and NGOs
- Lack of valid identity documents (IDs) of refugees

[1] By "refugee" we refer to the UN Refugee Agency's (UNHCR) term "person of concern", which includes refugees, asylum-seekers, internally displaced persons (IDP), returnees, stateless persons and other persons of concern

[2] http://popstats.unhcr.org/en/overview

[3] https://www.unhcr.org/ke/figures-at-a-glance

There are global initiatives led by the UN, such as Migration Data Portal and Global Compact for Migration[4] (GCM), and the Internal Displacement Monitoring Center[5] (IDMC). Both of these initiatives are collecting data in order to build a global database to help tackle the crisis. However, while the former is still in its very early stages[6], the latter focuses on internally displaced persons only, not on the broader definition of refugees. Still, we believe that both platforms' main hindrance is that they are both centralized systems.

We believe that a blockchain-based solution could tackle the challenges mentioned above and would provide a transparent infrastructure that governments and NGOs alike could easily adopt and share. Moreover, since the solution we present is highly modular, it could easily launch as a local initiative and then quickly develop into a global solution.

Dadaab and Kakuma Refugee Camps

Dadaab and Kakuma are UNHCR camps situated in Kenya, providing asylum to refugees from Somalia (Dadaab) and South Sudan and Ethiopia (Kakuma). They are the largest refugee camps in the country, and are among the largest in the world, hosting more than 400,000 residents altogether[7][8].

Both camps are popularly known for their entrepreneurial environment and the financial markets that have evolved there. According to the World Bank,[9] there are around 2,000 businesses, operated and owned by the residents, in Kakuma alone. A recent study by the Refugee Study Center at Oxford University[10] crowns Kakuma as an "exemplar of the shift towards private sector-led development in refugee contexts". In addition, the camp has a university campus that provides higher education. And yet, what demonstrates above all the economical potential in Kakuma is the VC platform that operates there (Kakuma Ventures[11]) and the Refugee Magazine[12] that is "written by and for those living in Kenya's two largest refugee camps, Kakuma and Dadaab".

At the base of this environment is the Bamba Chakula ("get your food" in Swahili) programme, that was designed and has been carried out in those camps, by WFP since 2015. In this plan, refugees get a mobile currency supplied through Safaricom, the largest mobile network operator in Kenya, instead of cash or food. They may then use this currency only at selected traders. It seems that Bamba Chakula proves once again that an innovative approach and thinking "out of the box" are critical when trying to tackle large scale problems such as improving the lives of hundreds of thousands of refugees.

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[4] https://migrationdataportal.org/themes/global-compact-migration
[5] http://www.internal-displacement.org/
[6] Consultations have begun in December 2017, and since then six data bulletins were published
[7] https://www.unhcr.org/ke/dadaab-refugee-complex
[8] https://www.unhcr.org/ke/kakuma-refugee-camp
[9] https://www.worldbank.org/en/news/feature/2018/09/27/in-kenya-refugees-are-opening-up-frontiers-the-pull-of-investing-in-underserved-areas
[10] https://www.rsc.ox.ac.uk/publications/doing-business-in-kakuma-refugees-entrepreneurship-and-the-food-market
[11] https://www.kakumaventures.com
[12] https://www.filmaid.org/refugee-magazine

Furthermore, the successful implementation of a digital cash program, for several years now, as well as the entrepreneurial and innovative environment in both camps, make them excellent candidates for taking this program to the next level. In addition, due to the enclosed/ring fenced environment in both camps, it will be possible to study and test innovations within a relatively contained environment that will further enhance learnings to improve and make them more relevant to the users. We believe that the next phase should be deploying a blockchain-based platform that will provide a combined solution, not only for financial needs, but also for social aspects such as digital identity, education and others. However, before we further discuss that platform we would like to briefly introduce blockchain technology.

Blockchain Technology

Blockchain is a disruptive technology that combines the merits of modern cryptography and distributed ledgers. As the name suggests, a blockchain ledger consists of a chain of data blocks, sealed cryptographically and time-stamped. Each new block is a repository of the latest added data (in the form of transactions) and is linked to the previous block. The chain propagates at predefined time intervals as new blocks are added, thus forming a chronological chain that is a trail of the underlying transactions. As the ledger is decentralized. there is no central entity that is responsible for validating transactions and updating the ledger. Each node on the network must maintain its own copy of the ledger and validate new transactions independently. New transactions are executed, *i.e.* written into a new block, only if the nodes reach a consensus on their legitimacy. The criteria for reaching consensus vary across different blockchain protocols.

Among the core features of blockchain ledgers, three are most relevant for our discussion: security, immutability and transparency.

- Security - the ledger is distributed, therefore in order to compromise the data one must hack multiple nodes at once, in order to tamper with the consensus process or implant false data retroactively[13]
- Immutability - once new data is written, approved and sealed it cannot be modified or overridden
- Transparency - anyone can access the data once it has been sealed and added to the chain

In other words, blockchain allows running a *trustless* platform, in which parties interact without having to trust one another. As long as they trust the *protocol*, they are certain that the data is valid and that they can continue interacting. This new form of interaction is a tremendous breakthrough that allows developing new solutions for old problems. For instance, digital rights management, supply chain monitoring, cross border peer-to-peer payment at a minimal fee, etc.

[13] Further discussion of blockchain security is beyond the scope of this paper. However, we would like to note that blockchain is considered to provide maximal data security given current available computation power

Biometrics Systems 101

Using biometric identifiers[14] (BI) as a distinctive and measurable characteristic of individuals is not a new concept. The Babylonians[15] and the ancient Chinese used fingerprints as a legitimate mean of signing business transactions. The first forensic use of identifying fingerprints was recorded in India in 1858. Among of the common biometric identifiers are fingerprints, face recognition, DNA, iris recognition etc. Those are all unique identifiers, therefore the most reliable means of identity authentication. BIs differ from one another in terms of their security vs convenience, and it is important to remember that none of them is considered as *the* ideal BI. Moreover, even with the most advanced technology no BI can provide a foolproof guaranteed identification of an individual. In recent years, there has been a growing use of BIs as part of issuing IDs such as passports, driving licenses, etc. In parallel, there has also been a growing concern of the consequent threat to privacy. We dwell on that later in this paper.

Biometric systems are designed to either authenticate (*i.e.* determine whether the person is who she says she is) or identify (*i.e.* determine whether the person is *not* who she says she is). Both rely on statistical matching algorithms to determine whether the BI sample matches an existing record. In order for an individual to be biometrically identified she must first enroll, meaning that the BIs are digitally captured and stored, on a database, a card or both. Whenever the individual's BIs are sampled again, they are compared to the available record, on the database or the card.

UNHCR has recently announced a new phase of its Population Registration and Identity Management EcoSystem (PRIMES)[16], launched in refugees camps in Kenya (including in Dadaab and Kakuma). Among others, it collects biometric data from refugees, at this point only fingerprints. This information, could serve as the first block for building the blockchain-based digital ID in the platform we discuss.

Digital Identity over Blockchain

Before we discuss our suggested blockchain platform, we would like to introduce related concepts of digital identity and other existing blockchain-based ID solutions.

The most innovative concept of a digital identity is Self-Sovereign Identity (SSI). It is still at its earliest phase of formation, thus under debate and lacking consensus on what it exactly is or how it will work. It suggests three types of digital identity relationships:

- Centralized - the traditional model in which the individual's identity and digital credentials are provided by the organization it interacts with, *e.g.* banks, ecommerce website, etc.

[14] While biometric identity refers to both physiological and behavioural characteristics of an individual, in this paper's context we refer only to the physical ones

[15] https://www.usmarshals.gov/usmsforkids/fingerprint_history.htm

[16] https://www.unhcr.org/ke/14973-unhcr-upgrades-its-data-management-system-to-improve-efficiency.html

- Federated - new third party entities, called Identity Providers (IDP), are in charge of issuing digital identity and credentials, which are federated to the organizations with whom the individual interacts. Examples may be using one's social network identity to log in to other online services
- Self Sovereign Identity - full peer-to-peer relationship. Each peer controls a cryptographic wallet that stores all its IDs. With each interaction, the other peer may attest the validity of the documents. For instance, when a person uploads an academic degree, it interacts with the academic institute and it cryptographically signs the transaction meaning that it attests the validity of the document. Both the document and the attestation are stored on the peers' wallets. Whenever required, the person may share the certified academic degree with any other party. Each transaction in which the information is shared and accepted serves as an additional proof for its credibility and authenticity. Another example may be proving claims such as "over 21". Upon reaching that age, the person will interact with the relevant government agency to get this confirmation based on the issued birth certificate.

Suggested Solution

We propose a blockchain-based solution that solves the identity problem immediately, as we regard this to be the crux of the matter. On the refugee side, with a new official identity, the refugee is instantly and officially recognized by an asylum state. From the receiving state's (whether Kenya, or any other country) perspective, identifying refugees on arrival allows for better monitoring and data sharing as part of a multinational effort for coordinating humanitarian assistance. Additional features, e.g. digital wallets, can be added rather simply to the platform down the road.

The platform will be deployed as a permissioned blockchain, meaning that there are certain restrictions on joining as a node and accessing data. Naturally, this is due to privacy matters. The nodes may be national immigration services, border checkpoints or aid organizations. They will be the ones that carry out the enrollment and identification process, including writing new identities on the blockchain as a proof of registration and authentication. The nodes are also users on the blockchain, meaning that they interact with the refugee in form of transactions.

So, whenever a person enters a border checkpoint and self declares to be a refugee, the process will be the following:

1. **Enrollment** - regardless of whether the person obtains an official ID or not, she enrolls in the biometric identity platform, *i.e.* a new biometric ID is generated on the spot along with a cryptographic wallet. This wallet stores the new ID and all other relevant metadata, e.g. location, time, additional documents provided by the refugee, relatives etc.
2. **Identification** - once the biometric ID is available, the checkpoint tries to identify the individual, to verify whether there are no other matching IDs on the ledger
3. **Data transmission** - the individual makes his first transaction on the blockchain, in which she sends all that info to the checkpoint. The data is encrypted so that only both sides can read it. All other nodes will only be able to verify that there has been a transaction between user X to node Y at time Z. They know where node Y is located, and they are able to extract

from this transaction the cryptographic digest[17] of the biometric identity. This allows them to look for a match when they generate a new biometric identity for a refugee

Once all three steps are done, the refugee may be referred to the next steps of the "standard" procedure, according to the receiving state's immigration policy

There are many benefits to this platform, stemming from core features of blockchain, as discussed earlier:

- Efficient end-to-end process
- Refugees get a new immutable digital ID proving their existence and documenting their asylum request
- Multi-purpose new ID with an immediate use and additional uses down the road, e.g. cryptographic wallet
- Secure platform providing refugees with maximal level of privacy
- Information is easily shared ***only*** among nodes on border checkpoints and humanitarian aid organizations. Therefore, in special situations, e.g. locating lost family members, the process is fast, simple and easy location of lost family members at the receiving state
- Each checkpoint can easily track the amount of refugees it has assisted. In that manner, national immigration services can easily aggregate accurate data from all checkpoints, in real-time
- Receiving states and aid organizations can better track and monitor refugees influx and improve cooperation

In addition to the above there could be supplementary uses for providing the refugees with a digital ID one-to-one linked to a cryptographical wallet.

- **Financial inclusion** - these cryptographic wallets are not only digital wallets holding digital currencies. They are much more than that. The key difference lies in the identification procedure that their owners have undergone. As they have been fully and *unequivocally* identified by a local authority, it means that they have complied with, if not exceeded, the requirements of standard financial KYC procedures. This means that these wallets are de-facto a perfect substitute for a bank account. As such, they can serve for any other purpose that a bank account does, rather than just for the monthly deposits made by the aid organization and purchasing food items. Hence, the refugees can instantly take an active part in the local (and perhaps even global..) market.
- **Education and other empowering activities** - so far we have only discussed the use of one currency in the refugee camps, used for the purchase of food supplies. However, cryptographic wallets can hold additional virtual currencies to be used for multiple purposes. The power of new token economies is providing opportunities to design incentive mechanisms that are not based only on money. An example may be motivating camp residents to acquire education. For that purpose a new "education token" may be issued, that can only be used for participating in designated educational initiatives in the camp. This token may be distributed *in addition* to the monthly proceeds used for buying food supplies. While this is merely a simple example, it opens a door for an abundance of opportunities to incentivize and motivate empowering activities.

[17] A digest is the output of a cryptographic hash function. In a nutshell, those are one-to-one mathematical functions that stand at the base of modern cryptography. Further discussion is beyond the scope of this paper

Still, there are certain challenges involved with this platform. The main challenge doesn't concern blockchain directly, but it is inherent to all biometric identity systems. As close as biometric identifiers get, they are still not completely foolproof and rely on *statistical* algorithms, therefore a certain level of identification errors is inevitable. We consider this as a technical challenge that can and should be resolved by the biometric identification equipment provider. Moreover, this technology is developing fast and the platform keep getting more sophisticated and accurate. In our context, there can be multiple layers of generating the new identity, that do not rely only on BIs, as discussed earlier. Another major challenge is user privacy. In our view, blockchain is the optimal solution to tackle that and further discussed in the next section.

Privacy Concerns

Privacy is a major pain point in any platform that manages and holds user data. Any centralized database is prone to hacking and data leakage. GDPR aims to allow individuals to control their personal data, especially determine who can access it, where is it stored and when it is put into use. Let us examine several aspects of this concern and how we think they can be mitigated.

The most basic feature of this platform concerns access level to individuals' private data. In our view it is only reasonable that once an individual arrives at a checkpoint asking for asylum, that checkpoint (and the immigration service that it represents) is entitled to maintain full access to her personal data. Furthermore, in order to provide the refugee the opportunity for a fresh start at the receiving state, it *has* to hold her biometric identifying data, as it does for its residents. Still, checkpoints from other countries are most definitely not entitled to access that data, for privacy considerations. They will only gain access to the "public" data, *i.e.* individuals' arrival at different checkpoint (nodes) at certain times. Modern cryptography is fully capable of providing this kind of data access differentiation.

The major threat is defending the platform from being hacked and stealing sensitive data. Blockchain introduces a new concept for improving overall data security through modern cryptography and decentralization. It is arguably the most secure platform there currently is, that allows multiple parties to interact efficiently. In order to hack it, it would require hacking multiple nodes at once as mentioned above. Furthermore, there are two levels of security on our platform - network security and transaction security. The network security is covered by the type of the network, which is a permissioned blockchain, while the transaction security is covered by the blockchain protocol, *i.e.* the data encryption.

Our suggested platform will run over a permissioned blockchain, in which nodes must be approved prior to joining the network. Only government agencies or recognized aid organizations could become nodes, thus making sure that the private information does not fall into the wrong hands. On the transaction level, the data is encrypted and can only be accessed using a private key, which is held by the individual only. This means that nodes have full info, only on the transactions (*i.e.* refugees) that they were part of. This means that each checkpoint does not know the identities of refugees who went through a neighboring checkpoint, they only know that they were there. This solution prevents data breaches, as even if someone manages to imposter as a legitimate node, all

he gets access to is a ledger of encrypted transactions. The data is encrypted by so many different entities, each has access only to small portion of it. In certain cryptocurrency blockchain networks, people may hold substantial amounts of cryptocurrencies, making it worthwhile to try to hack their wallet. While our platform it seems that no one would actually be interested in hacking a specific wallet, as there is no reward involved.

Last but not least, while nodes can only access a limited portion of an individual's details, if any, the individual may be notified each and every time that a certain node shares his data. This results in a privacy level that years ahead of that in most civil data platform in Western world countries.

Summary

The data shows that the influx of global refugees is worsening as time goes by. Moreover, as unfortunate as it may be, it seems that this problem will never be fully resolved, and that there will always be those who are forced to leave their homes, under tragic consequences, to seek shelter somewhere else.

Of all the potential positives that blockchain can enable we find that improving the efficiency of government-related services is among the most prominent. A blockchain-based global database could be a forward thinking and innovative approach towards helping the global effort for solving the refugee crisis. It has great potential to aid multiple governments, while also making the day to day lives of documented and undocumented refugees logistically more comfortable. Furthermore, we believe that this platform can be a key strategic element to solving a global humanitarian problem and improving the lives of the weakest individuals in our society.

The B Team

The B Team is a global collective of business and civil society leaders working to create new norms of corporate leadership today, for a better tomorrow. Together, these leaders are holding themselves and their peers accountable for a new way of doing business—one that measures success not only by financial performance, but also by the health of people and our planet—for the benefit of generations to come.

The B Team was co-founded by Sir Richard Branson and Jochen Zeitz, and includes Leaders Ajay Banga, Oliver Bäte, Marc Benioff, Sharan Burrow, Kathy Calvin, David Crane, Emmanuel Faber, Christiana Figueres, Mats Granryd, Arianna Huffington, Dr. Mo Ibrahim, Yolanda Kakabadse, Isabelle Kocher, Guilherme Leal, Andrew Liveris, Indra Nooyi, Dr. Ngozi Okonjo-Iweala, François-Henri Pinault, Paul Polman, Mary Robinson, Ratan Tata, Hamdi Ulukaya, Zhang Yue and Professor Muhammad Yunus.

Hexa Foundation

Hexa Foundation is an not-for-profit organization focused on using blockchain to create social impact. The organization was co-founded by Netta Korin, who comes to the Foundation following years of experience in business, government and non-profit industries. Most recently, Netta worked as a Senior Advisor in the Israeli Ministry of Defense to General Yoav (Poly) Mordechai, Head of CoGAT, and has an in-depth knowledge of the socioeconomic problems in the Gaza Strip. Prior to that position, Netta worked as a Senior Advisor to Deputy Minister Dr. Michael Oren in the Prime Minister's Office in Israel, focusing on Palestinian issues. Netta has held board positions in several non profit foundations in both Israel and the United States.

The Hexa Foundation is part of the Orbs Group. Both were created by the founders of Orbs, a blockchain platform for consumer applications. Orbs Group is the largest group dealing in blockchain solutions in Israel, with close to 60 employees focused on the blockchain field. The Hexa Foundation aims to use blockchain for social impact and harness the mind power of our ecosystem and network to help solve the region's and the world's most pressing humanitarian problems.

For more information please contact Netta Korin (netta@hexa.org)