Lithopia: Engaging Stakeholders in Blockchain and Satellite Futures

Section 1: Summary

Use Case Summary			
Use Case ID:	ENT-001	**Use Case Type:**	Horizontal
Submission Date:	March 14, 2019	**Is Use Case supporting SDGs**	Yes
Use Case Title:	Lithopia: engaging stakeholders in blockchain and satellite futures	**Domain:**	Internet of Things
Status of Case	PoC	**Sub-Domain**	Land Registries
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Proposing Organization	BISITE, University of Salamanca, Spain		
Short Description	Template of Hyperledger Fabric based service (chaincode) that uses satellite data as a trigger and explores stakeholder engagements in blockchain futures. The contract is featured in a design fiction parody of a "smart village," but it can be utilized by activists reclaiming symbolic ownership of various resources on an NGOs operated ledger for mobilization through land-art performances.		
Long description	Lithopia https://github.com/anonette/lithopia is a parody of a "smart" blockchain-managed village that uses open satellite data to trigger smart contracts on the Hyperledger Composer/Fabric. It reflects the current search for national cryptocurrencies and speculative investments in mining, such as ICOs or Lithium reserves in the Czech Republic. It is a functional prototype of a Node-RED interface/dashboard connected to the blockchain smart contracts on Hyperldger over a REST API service. It uses open data from Sentinel 2A Copernicus to change ownership of a location or a resource when covered by 10 x 10 m textile creating a pixel of data for the satellite. The project supports inclusive and democratic "future-making" (anticipatory governance) against the current misuses of emerging technologies in the so-called predictive, anticipatory and frictionless design. The villagers in Lithopia govern their affairs in an extremely transparent, but also aesthetic manner. Special long gestures and large LiCoins, but also acts of covering spaces in a land-art, Christo manner trigger the transactions. Lithopian DLT is inspired by Micronesian island of Yap that uses large stone coins to preserve their oral memory of ownership, marriages, and important events. Lithopians deploy smart contracts as a form of oral culture timestamping emphasizing genealogy over exchange and stewardship over ownership. The project is currently installed at the Milan design Triennial until September 2019.		

<table>
<tr><td>SDG in Focus (when applicable)</td><td colspan="3">Goal 1: end of poverty (1.4 supports ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services)

Goal 9: resilient infrastructure (9.1, 9.3, 9a -c)

Goal 11: inclusive and safe settlements and safeguarding of cultural and natural heritage (11.1, 11.3, 11.4, 11a)

Goal 13: combat climate change (13.b)

Goal 15: sustainable use of terrestrial ecosystems(15.6, 15.9)

Goal 16: effective, accountable institutions (16.6, 16.7)</td></tr>
<tr><td>Value Transfer:</td><td>Assets changing ownership</td><td>Number of Users:</td><td>Users registered on the permissioned Hypereldger Fabric blockchain network (unknown limitations)</td></tr>
<tr><td>Types of Users:</td><td colspan="3">Citizens, artists, activists</td></tr>
<tr><td>Stakeholders</td><td colspan="3">Investors, owners of a property, tenants, property management teams, public administration workers, indigenous groups</td></tr>
<tr><td>Data:</td><td colspan="3">The contract includes human actors and external data from Sentinel 2A satellites and online services (Twitter, Weather, Cryptocurrency exchanges).

1. Sentinel 2A data shared over an API service developed for the project (http://anonette.net:8000/summary/). It updates on when is the satellite available in a given GPS location. It includes custom made visual recognition/tracking system searching for 1 pixel (10 x 10m) of red color data in a given location.

2. Human actor’s data include identification data of participants in the blockchain network and assets. The Hyperledger Composer BNA (business network archive) includes cto file defining the users (participants), assets and the transactions (adding data from satellites and changing the ownership of an asset) in the JS script file. The ACL file them defines access control rules. The BNA data are available through a REST API (http://anonette.net:3000/explorer/ - only authorized users).

Privacy is ensured by the Hyperledger Fabric blockchain structure of creation of different channels, where one needs the authorization to access any specific channel in the blockchain network achieved through the Certification Authority(CA) of the blockchain architecture.

The interface to interact with the blockchain is Node-RED dashboard. Currently, you can add and see participants, properties and also types of partnerships. The DLT solution interacts with Twitter and external data over the dashboard (following weather data over open API and cryptocurrency exchanges influencing the decision to trigger the contracts).

This PoC connecting satellite API with Hyperledger Composer REST API and Node-RED interface is currently stored only on one server with limited privacy and access for the developers and workshop participants.</td></tr>
<tr><td></td><td colspan="3">The PoC is used in a design fiction project with fake participants and assets for testing purposes and as a tool to engage stakeholders in workshops. We plan to use identification mechanism offered by Hyperledger Composer Certification Authority and their channel tool. The participants are not anonymous.</td></tr>
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Predicted Outcomes:	1. Properties registered on the ledger symbolically change ownership through land-art mobilization and performance by individuals or group of citizens in front of the satellites at a given time. 2. The dashboard informs the participants about the right time and weather condition to cover a given area and trigger the transaction. It also keeps a record of participants interested in a specific cause and the type of properties they try to own symbolically. It gives them tools (sentiment analysis of Twitter feeds and cryptocurrency exchange) to make the decisions.

Overview of the Business Problem or Opportunity

The tool is an opportunity for various stakeholders to understand and test the possibilities of Hyperledger based blockchain systems through a real near future scenario. It can also be used by NGOs and indigenous groups to reclaim symbolic ownership of natural resources or property by supporting an alternative ledger and a type of a ritual in front of the satellites. It is a tool to mobilize citizens to manage various resources which need stewardship by the commons or that have cultural and other value for a given group.

Why Distributed Ledger Technology?

Anticipatory governance of emerging DLT infrastructure is possible only if we involve a diversity of stakeholders to be part of the early development of a given technology. DLT, in this case, is a tool for stakeholder engagement over design fiction scenario with real prototypes. It has a potential to be used as a tool for public participation in the management of natural and other resources on a ledger operated by NGOs and various organizations interested in such land uses or to support the plea of indigenous population for symbolic ownership of their ancestral land etc. The solution offers a tool to understand and be part of the decision making about future infrastructure and to support the diversity of users. It also provides a dashboard allowing stakeholders to follow the use of such a tool in a design fiction or real scenario. It can enable immutability of records that concern ownership of property of natural resources and land and enable stakeholders to start important conversations about commons, climate exchange, and other pressing issues.

Section 2: Current process

Current Solutions

There are plans to use blockchain and satellite data in land registries with real-time data on conditions etc., but there are no PoC we could discuss. There is a company offering infrastructure for crypto-spatial coordinates that will support future services based on Ethereum https://foam.space/, but no use cases, only a protocol. The existing blockchain satellite solutions work mainly on the issue of a resilient and alternative blockchain infrastructure, such as https://blockstream.com/satellite/ or https://spacechain.com/. The independent space-based imagery and satellite data analytics companies (for example http://skylabanalytics.com/, https://www.rezatec.com/, https://www.planet.com/) offer aerial or satellite data collection platforms used for natural disasters monitoring, business intelligence, digital farming, real estate, retails and tourism intelligence, etc. None of them, however, uses or offers blockchain services. Their market is still rather niche, they have to educate their clients on the type of information, and automation satellite data offer. We claim that the blockchain solutions are necessary for satellite data because of the possible forgeries made by AI/machine learning algorithms that can simulate aerial images in the future. Furthermore, satellite data do not need to be only passive, but an active channel of communication and expression of communities and individuals through interventions. There are no current solutions that use

interventions on specific sites to generate satellite data except fake cardboard cutouts of planes and military gear in cases of military intelligence.

Existing Flow (as-is)		
Step	**User Actions**	**System Actions**
1.	Satellite data analytics company uses data generated by their satellites or buys data from satellite providers to offer custom made analytics to different companies and stakeholders (agriculture, insurance, tourism, etc.).	There are closed API's for satellite imagery and data which the clients buy or they buy reports based on these data, but there is no blockchain currently involved in managing their accuracy and transfer.
2.		

Process scheme (as-is)

Data and information (as-is)		
Data	**Type**	**Description**
1		
2		

Participants and their roles (as-is)		
Actor	**Type/Role**	**Description**
1	Satellite data provider	An entity that sells satellite data
2	Satellite data analytics provider	An entity that analyzes and provides reports
3	Company or stakeholder	An entity that buys the data or reports

Other Notes
The emerging satellite data and analytics market will need to use blockchain technologies to guarantee the accuracy of the offered data. Accurate data are essential for any attempts to automatize processes and use the strategic value of such information in smart contracts and actionable intelligence.

Section 3: Expected process

Expected Flow (to-be)		
Step	**User Actions**	**System Actions**
1.	A company, NGO or policy actor requests data about a specific location/time which they use for their analytics or as a trigger for smart contracts they created on the DLT.	DLT checks if there are free data about the given location available (in the example we have it is an API service for open data from Sentinel 2A where we can use get and post commands http://anonette.net:8000/summary/). If the information is not open/free, a call to satellite data providers to post their offers is issued by the DLT. DLT emits<call for price and data/offer>
2.	The satellite providers offer the service (data) in various cryptocurrencies.	The interledger integration enables payment in different cryptocurrencies which DLT accepts. DLT emits <payment event>. The satellite providers register the payment and provide access to their data (API) with info on the metadata which are based in the ledger via some queries (timestamp proving the authenticity of the data).
3.	The satellite providers use the DLT when uploading their data on the cloud to timestamp the files and to be able to prove their authenticity. They offer their services and data in various cryptocurrencies on the DLT.	The satellite providers cloud or system updates the ledger continuously with uploaded data to authenticate their origin and provenance. The notary, records keeper, proof of existence type of contract provides a link to authenticate the data when offered to the users and clients. DLT emits<record proof>
4.	Trigger event: marker visible on the GPS location that triggers a smart contract on the DLT	When a visual marker is visible on the location (or other satellite provided data marker), the DLT updates the info on the assets and participants based on the contract.

Process scheme (to-be)

Participants and their roles		
Actor	**Type/Role**	**Description**
1	Satellite data providers	Authenticates data on the DLT, provides offers of data and services.
2	Stakeholders, NGOs, clients	Clients are seeking information or trigger data from satellites for their contracts on the DLT.

Data and information		
Data	**Type**	**Description**
1	Documents and data	Visual information or data timestampted on the DLT at the time of their upload on the server or cloud of the satellite providers.
2	Interledger payment transactions	Transfer of money between satellite data providers and their clients.
3	Request for satellite data	GPS location, image resolution and DN value, spectrum (visible, infrared etc.)

Security and privacy

1. Data authenticity and privacy are two requirements, which permissioned DLTs guarantee. All data is encrypted and protected;

2. DLT system should be able to provide mechanisms of DLT data integrity control (link to check the timestamp of a file);

3. DLT system should provide interledger integration for payments.

4. DLT system enables smart contracts with satellite data (over REST API).

Main Success Scenario + expected time line

1. All information timestamping, exchange and payments occur in DLT in automatic mode;

2. Payments are transferred using digital currency over interledger integration without human verification;

Conditions (pre- or post-)

1. The satellite data providers have a contract with the user interested in their service;

2. Users and providers must be registered in the identity solution on the DLT;

3. The data and services used in the transactions must be registered as assets;

4. Smart contracts must be deployed;

5. All parties are connected to DLT-network.

Performance needs

1. Transactions processing near real time;

2. 24/7/365 availability;

Legal considerations

1 Regulation (EC) 45/2001. The parties in the DLT, have to sign that they are aware of the limits and will not break the law.
2. Data from International intergovernmental organizations such as the European Space Agency (ESA) are not subject to EU law, including the GDPR (we are using Sentinel 2A).

Risks

1. Security risks;

2. Interledger vulnerabilities;

3. Risks related to DLT immaturity.

Special Requirements

1. More mature market for satellite data;
2. Better awareness about current satellite technologies and their capabilities.

External References and Miscellaneous

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Other Notes

Any assumptions, issues

Appendix 1:
Domains and subdomains for use cases categorization

Vertical:

1. Finance
    a. Financial management & accounting
    b. International & interbank payments
    c. Clearing and settlement
    d. Reduction of Fraud
    e. Financial messaging
    f. Asset lifecycles and history
    g. Trade finance
    h. Regulatory compliance & audit
    i. AML/KYC
    j. Insurance
    k. Peer-to-peer transactions
2. Healthcare
    a. Pharma
    b. Biotechnology
    c. Medicine
3. Industries
    a. Manufacturing
    b. Energy
    c. Chemical
    d. Retail
    e. Real estate
    f. IT and telco
    g. Supply chain management
    h. Transportation
    i. Agriculture
4. Government and public sector
    a. Taxes
    b. Government and non-profit transparency
    c. Legislation, compliance & regulatory oversight
    d. Voting
    e. Taxation and customs
    f. Intellectual property management
    g. Land Registries

Horizontal:

1. Identity management
2. Security management
    a. Public Key Infrastructure
3. Internet of Things
4. Data processing, storage and management
    a. Data Validation (includes provenance)

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