{N}ODI.US

A Case For Ethereum Node Servers On The Moon,

For Archiving Land Claims To The Blockchain

Lee Holmes
labs@drstrangelet.com
https://nodi.us

ABSTRACT

Problem: *As private companies begin to land on the moons surface, what global legislation or policies are in place to accommodate these new pioneers.*

Solution: *To insure productive commercial development, heritage protection and incentivize future growth, NODIUS argues for the archiving of activities by private companies on the moon in the form of globally publicly accessible records on the Ethereum Blockchain.*

OVERVIEW

The moon has come into focus once again for the world, as small companies, large corporations, universities and governments will soon begin landing an army of robots on it's surface. This smart silicon invasion will begin under the banner of exploration, and will quickly turn into the largest land rights management problem in our collective histories. What's at stake are the seemingly endless resources the moon has harbored, undisturbed for billions of years, and how these resources will be used for generations to come once humans and robots return to the moon, permanently.

How will the world account for this new race to the moon, wild west mentality, when it comes time to address the problems from outbound development. The United Nations has many agreements outlining what should be done, and the Office for Outer Space Affairs has stated:

> *The Moon Agreement was considered and elaborated by the Legal Subcommittee from 1972 to 1979. The Agreement was adopted by the General Assembly in 1979 in resolution 34/68. It was not until June 1984, however, that the fifth country, Austria, ratified the Agreement, allowing it to enter into force in July 1984. The Agreement reaffirms and elaborates on many of the provisions of the Outer Space Treaty as applied to the Moon and other celestial bodies, providing that those bodies should be used exclusively for peaceful purposes, that their environments should not be disrupted, that the United Nations should be informed of the location and purpose of any station established on those bodies. In addition, the Agreement provides that the Moon and its natural resources are the common heritage of mankind and that an international regime should be established to govern the exploitation of such resources when such exploitation is about to become feasible* [2].

The two take aways from this agreement, that are most important for in any future system created allowing for proper accounting of any and all moon activities are, "*the Moon and its natural resources are the common heritage of mankind*" and, "*an international regime should be established to govern the exploitation of such resources when such exploitation is about to become feasible*". These two statements get right to the heart of major foundational problems that outward expansion presents, how does everyone benefit if the moon belongs to all of us and how are these early pioneers to be governed without hindering scientific and commercial development?

Governments, whether it be local or global are not the nimblest of structures. Their guiding principles, noble as they may be, often slow development in any new space of creation. A great example is the internet, which through DARPA and universities came to life more than 50 years ago. It wasn't until the internet was opened up for private commercial development did it become the information juggernaut we use today, everyday, all day. As A&E HISTORY'S states:

> In 1992, a group of students and researchers at the University of Illinois developed a sophisticated browser that they called Mosaic. (It later became Netscape.) Mosaic offered a user-friendly way to search the Web: It allowed users to see words and pictures on the same page for the first time and to navigate using scrollbars and clickable links. That same year, Congress decided that the Web could be used for commercial purposes. As a result, companies of all kinds hurried to set up websites of their own, and e-commerce entrepreneurs began to use the Internet to sell goods directly to customers.[3]

Even if governments attempt to develop the protocols called for by the private sector, would their efforts be honored globally and transparently? In a recent Reuters article, The United States Federal Aviation Administration has begun to expand it's launch review process to include future moon management:

> The Federal Aviation Administration, in a previously undisclosed late-December letter to Bigelow Aerospace, said the agency intends to "leverage the FAA's existing launch licensing authority to encourage private sector investments in space systems by ensuring that commercial activities can be conducted on a non-interference basis." […]Bigelow could set up one of its proposed inflatable habitats on the moon, and expect to have exclusive rights to that territory - as well as related areas that might be tapped for mining, exploration and other activities. […] However, the FAA letter noted a concern flagged by the U.S. State Department that "the national regulatory framework, in its present form, is ill-equipped to enable the U.S. government to fulfill its obligations" under a 1967 United Nations treaty, which, in part, governs activities on the moon. […] "We didn't give (Bigelow Aerospace) a license to land on the moon. We're talking about a payload review that would potentially be part of a future launch license request. But it served a purpose of documenting a serious proposal for a U.S. company to engage in this activity that has high-level policy implications," said the FAA letter's author, George Nield, associate administrator for the FAA's Office of Commercial Transportation.[4]

With 50 plus years of internet and space history, and the long slow road to get where we are today, it's safe to say the solutions needed for moon land management would probably be best addressed outside of the arms of any government and if government is not a dependable solution, how can such large problems be addressed, democratically without a centralized governing body?

BLOCKCHAIN

Sometimes the best solution, is the oldest solution in a new package. One such solution is the common ledger already centuries old, but with the advent of the internet and personal computing, we now have an emerging platform called the blockchain. The blockchain gained it's current notoriety as the backbone behind Bitcoin, the digital currency created in 2008 by Satoshi Nakamoto. In his white paper on Bitcoin, Satoshi Nakamoto gives us our first look at the modern ledger:

> *The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. The longest chain not only serves as proof of the sequence of events witnessed, but proof that it came from the largest pool of CPU power. […] The network itself requires minimal structure. Messages are broadcast on a best effort basis, and nodes can leave and rejoin the network at will, accepting the longest proof-of-work chain as proof of what happened while they were gone.*[5]

Currently, seven years after the creation of Bitcoin, and hundreds of other coin platforms, we know the blockchain as a public ledger and a distributed database, that records transactions and maintains a network by communicating nodes running the platforms software. Nick Szabo, an early proponent of Bitcoin and the blockchain, recently wrote:

> *A block chain computer is a virtual computer, a computer in the cloud, shared across many traditional computers and protected by cryptography and consensus technology. A Turing-complete block chain with large state gives us this shared computer. […] Ethereum is a current project that has implemented such a scheme. These block chain computers will allow us to put the most crucial parts of our online protocols on a far more reliable and secure footing, and make possible fiduciary interactions that we previously dared not do on a global network. […] A block-chain computer, in sharp contrast to a web server, is shared across many such traditional computers controlled by dozens to thousands of people. By its very design each computer checks each other's work, and thus a block chain computer reliably and securely executes our instructions up to the security limits of block chain technology, which is known formally as anonymous and probabilistic Byzantine consensus (sometimes also called Nakamoto consensus). […] Often block chain proponents talk about the "decentralized" block chain versus the "centralized" web or centralized institutions. It's actually the protocol (Nakamoto consensus, which is highly distributed) combined with strong cryptography, rather than just decentralization per se, that is the source of the far higher reliability and and much lower vulnerability of block chains. The cryptography provides an unforgeable chain of evidence for all transactions and other data uploaded to the block chain. Many other decentralized or peer-to-peer (P2P) technologies do not provide anything close to the security and reliability provided by a block chain protected by full Byzantine or Nakamoto consensus and cryptographic hash chains.*[6]

With blockchain technology readily available, providing consensus, decentralization, and cryptographic security, it only seems fitting for our time that large global problems could find a solution within the blockchain.

ETHEREUM

Readying for launch is, Ethereum, a decentralized publishing platform featuring next-generation distributed applications [DAPPS].

Ethereum is unlike most digital currency platforms, as it is not solely a network for transacting monetary value, but rather, a network for powering Ethereum based DAPPS. Ether, Ethereum's cryptofuel and currency, powers theses applications on its decentralized network. These open-ended applications can be used to securely execute a wide variety of services including: voting systems, domain name registries, financial exchanges, crowdfunding platforms, company governance, self-enforcing contracts and agreements, intellectual property, smart property and property titles.

Ethereum's creator, Vitalik Buterin, references Nick Szabo's idea of storing property titles within the blockchain in his Ethereum white paper:

> In 2005, Nick Szabo came out with the concept of "secure property titles with owner authority", a document describing how "new advances in replicated database technology" will allow for a blockchain-based system for storing a registry of who owns what land, creating an elaborate framework including concepts such as homesteading, adverse possession and Georgian land tax.[7]

When Ethereum launches, the platform will be a great solution for storing publicly accessible, secure property titles in the form of smart contracts. Vitalik Buterin in his Ethereum white paper has this to say about smart contracts:

> Smart contracts, cryptographic "boxes" that contain value and only unlock it if certain conditions are met, can also be built on top of our platform, with vastly more power than that offered by Bitcoin scripting…[7]

Which is right in line and built upon Nick Szabo ideas of smart contracts:

> Smart contracts: here users (typically two of them) agree via user interface to execute block chain code, which may include transfer of money and other chain-titled assets at various times or under various conditions, transfer and verification of other kinds of information, and other combinations of wet or traditional (off-chain) and dry (on-chain) performance. […] With on-chain smart contracts we will be able to buy and sell many online services and financial instruments by button and slider instead of by laboriously filling out forms that disclose our private information.[6]

No longer in need of the tedious bureaucratic form requesting, filing, acceptance and clearing that most current government systems impose, with an Ethereum Smart Contract, a property title can be created publicly, honestly, democratically with out borders and securely stored on the decentralized blockchain. This is the modern solution for moon land management.

NODIUS

nodius | noun | no·di·us | nō-dē-əs | a rightful & lawful network of nodes.

The intent of Nodius is to bring the Ethereum accounting and archiving platform to the moon. Nodius does this by using small personal satellites called cubesats. The Nodius cubesat network, consisting of individual yet connected nodes known as moo{N}odes, will serve as a centralized gateway to the earth bound decentralized Ethereum network. Only moon pioneers and their technology located on the moon will be able to communicate and submit mission data smart contracts into the moo{N}ode network, thus providing validation and guaranteeing security for their mission programs. Smart Contracts will then be sent back to earths Ethereum Blockchain for consensus verification and historical archiving.

With the proper team and execution, Nodius will position itself as an impartial accounting and archiving gateway on the extra-terrestrial front lines of outward expansion.

moo{N}ode

Each moo{N}ode cubesat will run on the Contiki Operating System and will have a range of applicational uses through various software and hardware system configurations:

- Shielding
- Gyroscope Leveling
- Anchoring
- Power Management
- Solar Panel Deployment
- Telescoping Antenna
- Telecommunications: Local & Remote
- Camera & Laser
- 360° Surveying
- Parcel Blocking & Zoning
- GIS Mapping
- Beacon
- Environmental Warning Systems: Internal & External
- Security & Encryption
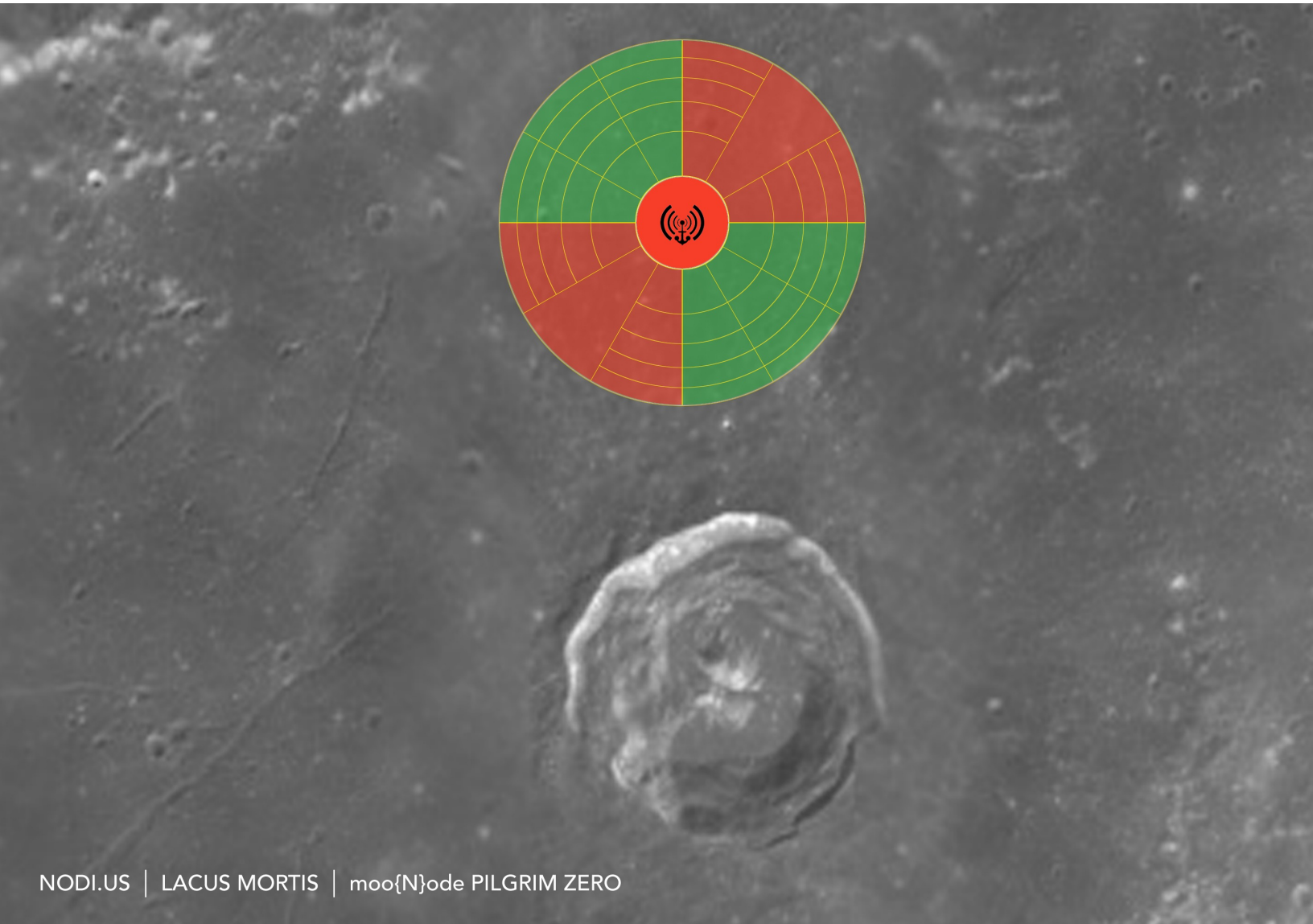- Smart Contracts

Pilgrim Program

The Nodius maiden voyage will consist of two moo{N}ode cubesats, one for lunar orbit and the other for the lunar surface. These two moo{N}odes make up the Pilgrim program.

The Pilgrim Program will use a commercial payload delivery company to reach its objectives on the moon. Astrobotic Technology is one possible delivery company offering trips to lunar orbit and surface as early as Q3 2016.

For lunar orbit, m/n Mayflower, will enter into a frozen Low Lunar Orbit and act as an AIS (Automatic Identification System) Receiver / Transceiver and relay station back to an earth bound base station.

On the lunar surface, m/n Pilgrim Zero, will anchor and deploy survival systems. Once communications between m/n Pilgrim Zero and m/n Mayflower are established, m/n Pilgrim Zero will create a surveyed perimeter via laser for parcel plotting and zoning for Nodius investors, and thus, create the initial smart contracts to be relayed back to the Ethereum network.

Finally anchored and operational, m/n Mayflower and m/n Pilgrim Zero will go into standby mode and await signal hailing from other moon pioneer technology.

NODI.US │ LACUS MORTIS │ moo{N}ode PILGRIM ZERO

MOON SQUATTER

moon squatter | noun | moon squat·ter | moon skwot-er | a person or their avatar who occupies moon land by squatting in order to acquire resources and deed.

With smart contracts being completed and filed on the Nodius moon network and relayed back to earth for submission into the Ethereum network, Moon Squatter will act as the gateway, a Registry of Deeds, between these two worlds. Once a smart contract has made its journey back to earth, it will be submitted to the Ethereum network for consensus and archiving on the blockchain. The records of the accounts and claims of the moon pioneers will now be publicly available and searchable.

Moon Squatter will also produce a yearly hard bound book recording all smart contract claims to date, which will then be offered to the public for purchase and submitted to various global institutions for accessing and archiving.

SUMMARY

To insure productive commercial development, heritage protection and incentivize future growth, Nodius believes the modern solution for a decentralized moon land management program will come from incorporating the global public and the Ethereum Blockchain for accounting and archiving the activities of the new moon pioneers.

Nodius is the anchor for our collective voice in this new era of digital and physical resources.

REFERENCES

[1] Alicia Rossi, "Reflejo - Reflection (cover page moon photo)," https://www.flickr.com/photos/licya/481881310/in/set-72157594552337507, 2007.

[2] United Nations Office of Outer Space Affairs, "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies," http://www.unoosa.org/oosa/SpaceLaw/moon.html, 2015.

[3] A&E Television Networks HISTORY, "The Invention of the Internet," http://www.history.com/topics/inventions/invention-of-the-internet, 2015.

[4] Reuters, Irene Klotz, "Exclusive - The FAA: regulating business on the moon," http://www.reuters.com/article/2015/02/03/us-usa-moon-business-idUSKBN0L715F20150203, 2015.

[5] Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," https://bitcoin.org/bitcoin.pdf, 2008.

[6] Nick Szabo, "The dawn of trustworthy computing," http://unenumerated.blogspot.com/, 2014.

[7] Vitalik Buterin, "Ethereum White Paper: A Next Generation Smart Contract & Decentralized Application Platform," https://github.com/ethereum/wiki/wiki/White-Paper, 2014.