ATLAS: A Digital Token Supporting an Open-Source Medical Encyclopedia

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Abstract. Mobile devices and the Internet have changed how caregivers in Western medicine access critical knowledge. Subscription-based online resources now contain the best information for doctors to treat patients. Large publishing houses have monetized this valuable content with paywalls. We propose an open-source online medical encyclopedia with peer-reviewed information available free of charge worldwide. The ATLAS token will be an NEP-5 asset registered on the NEO blockchain used to reward creators of articles and algorithms useful to medical professionals. ATLAS tokens will also be accepted as payment for the processing of continuing medical education (CME) credits awarded to doctors and other professionals for using the platform. In this manner, PeerAtlas can offer a high-quality medical resource created by paid professionals without selling advertising or limiting access with subscriptions.

1. Introduction

The ATLAS token represents the permanent destruction of the world's most unethical paywall: cutting-edge medical knowledge has been separated by money from its physicians and the general public. Timely and well-researched medical advice has great value to caregivers in the rapidly changing world of Western medicine. Realizing this, large publishing companies have cornered the market and erected paywalls to extract high subscription fees. These paywalls keep the highest standard of care away from any patients whose providers cannot afford their prices. Paywalls directly increase the already high cost of health care and medical education. They withhold valuable knowledge, second opinions, and advice from direct access by patients and the general public.

New drugs, medical devices, clinical research, and techniques are transforming the practice of Western medicine more quickly than the rate at which new doctors are trained. This fast-moving academic environment, as well as the rise of computers and the Internet, has led to the rapid adoption of electronic references to aid the clinical decisions of caretakers. Electronic medical resources have quickly matured and now represent the gold standard of Western medical knowledge. They are constantly updating clinical tools that allow doctors to quickly reference today's medical evidence to make the best possible treatment decisions for their patients.

Medical resources are more expensive to create and maintain than other types of Internet libraries, because they require constant attention from a limited pool of highly trained and highly paid professionals. Because of these costs, most of today's best online medical resources still rely on advertising revenue or subscription fees to fund their operations.

Many common ethical vulnerabilities are absent by design in the PeerAtlas ecosystem. These conflicts of interest could include reliance on advertising revenue, reliance on subscription revenue, financial relationships with drug companies or the manufacturers of medical devices, and founders compromised by fiscal or ideological dependence. Because of its highly independent design, the PeerAtlas foundation can direct its community to reward qualified individuals that help its mission in a transparent and ethical manner.

The mission of PeerAtlas is to instantly spread the most modern techniques and knowledge in healthcare, free of charge, worldwide.

2. ATLAS

PeerAtlas will register its digital token, ATLAS, as an NEP-5 asset on the NEO blockchain.

Issuing ATLAS enables a business model that seeks to give PeerAtlas the easy availability of a free medical resource and the high quality of a paid project. ATLAS will transact in two major pathways that directly benefit the project. Firstly, direct donations of ATLAS will be enabled for verified creators of medical articles and algorithms that the community finds useful. This allows contributing professionals to receive compensation for their time and effort. Secondly, medical professionals using the site will be able to send ATLAS tokens to PeerAtlas to process continuing medical education (CME) credits awarded through the PeerAtlas site. To be clear, the ATLAS token does not grant CME credits! CME credits are awarded to medical professionals for their access of the PeerAtlas site's resources over time.

The decision to award CME credits for use of the PeerAtlas platform is made on a case-by-case basis by the licensing authorities of a physician's specialty ("Boards"). In the future, PeerAtlas may have the ability to award CME credits to certain specialties from certain countries, but not to others, depending on its status with the country's medical Boards governing the specialty.

To summarize: CMEs will be awarded to eligible healthcare professionals worldwide for their use of the PeerAtlas platform, in cooperation with the professional licensing authorities of the countries in which they practice. Granting CME credits is an existing mechanism currently used by the top subscription-based medical resource. The ATLAS token will not have the ability to purchase CMEs, as CMEs must be earned through use of the site. The foundation will send earned CMEs to the relevant medical Board when a healthcare provider sends ATLAS to the foundation.

The ATLAS token is intentionally made simple for medical professionals that may be new to blockchain technology.

3. NEO

NEO is a non-profit community-based blockchain project that utilizes blockchain technology and digital identity to:

- Digitize real-world assets by tying them to real-world identities
- Automate the management of digital assets using smart contracts
- Realize a “smart economy” with a distributed network

By combining digital assets, digital identity, and smart contracts, NEO plans to establish a secure blockchain that is accepted by enterprises and governments.

NEO is the premier blockchain platform offering a feature set focused on enabling a regulatory compliant smart economy. NEO stands apart from other blockchain smart contract competitors for the following reasons:

- **Aiming for Regulatory Compliance** - For large companies and governments to operate on the blockchain, these institutions will require the ability to audit these digital assets and transactions. Digital identities will need to be known and verifiable. NEO is committed to making use of the Public Key Infrastructure (PKI) X. 509 standard for identity, which means that NEO will have the ability to issue and confirm digital identities. NEO is building this digital identify mechanism into their ecosystem.

- **Utilizing a Superior Consensus Mechanism** - NEO uses an improvement to the Proof of Work (e.g. Bitcoin) and Proof of Stake (e.g. NXT) consensus mechanisms entitled Delegated Byzantine Fault Tolerance (dBFT). The dBFT is a modification of the Proof of Stake protocol in which holders of NEO tokens can vote for delegates, and the delegates must reach a consensus on acceptable transactions.

- **Processing Transactions Faster** - NEO’s use of dBFT means that its architecture does not require thousands of machines mining to complete a resource expensive algorithm to verify transactions. NEO’s consensus mechanism enables the

blockchain to process in excess of 10,000 transactions a second without transaction costs.

4. Genesis

PeerAtlas will register its digital token, ATLAS, as an NEP-5 asset on the NEO blockchain. The ATLAS token will be a utility token, designated to compensate the contributors of verified medical articles, and exchangeable for continuing medical education (CME) credits, or other digital assets such as NEO, Bitcoin, or fiat currencies on a digital asset exchange.

As per the NEP-5 standard, the smart contract used in the Initial Coin Offering to create the ATLAS token will implement the following methods:

- **TotalSupply –** This method will return the total amount of ATLAS tokens created and issued. The total supply of tokens will be specified as soon as the smart contract is deployed to the NEO blockchain. After the ICO, this value cannot change and will live inside the storage of the smart contract.

- **Name** - This method will return the name of the token. The name will be a String with the value “Atlas”. This value lives on the blockchain as an immutable value of the smart contract.

- **Symbol** – This method will return the symbol of the token. The value will be “ATLAS”. This value resides on the blockchain as an immutable value of the smart contract.

- **Decimals -** This method will return the number of decimals that the ATLAS token will support. To adhere to token standards, the ATLAS token will be divisible by up to 8 decimals. This value resides as an immutable value on the blockchain for the smart contract.

- **BalanceOf** – The BalanceOf method will return the amount of ATLAS tokens at a specified public key address. The balance will be returned as it is stored in the smart contract’s storage. We will need to divide this value by 100,000,000,

because of the “decimals” attribute on this smart contract. The balance of each public key address will be stored on the smart contract. The balance can only be modified in one of 2 ways:

  - During the Initial Coin Offering, ATLAS tokens will be minted when exchanging NEO for ATLAS.

  - During an authorized NEP-5 asset transfer from a sender address to a buyer address. In the context of PeerAtlas, the buyer would be the Doctor on the PeerAtlas platform.

- **Transfer** - The transfer method enables the transferring of ATLAS tokens from one public key address to another. In order to transfer the funds, the owner of the address must sign the transaction by using a supported wallet. The ATLAS token will use the CheckWitness mechanism on these transfers to ensure the owner of the funds has signed the transaction.

By implementing the NEP-5 standard, PeerAtlas will be able to list the ATLAS token on cryptocurrency exchanges that support NEP-5 registered assets.

To enable the ATLAS token to be used as a payment mechanism on the PeerAtlas platform, an interface component will be written to bridge the communication from the PeerAtlas platform to the NEO blockchain. This component will act as a virtual blockchain node. This component will communicate directly with the NEO blockchain seed nodes. This component will expose the PeerAtlas NEP-6 wallets and transactions to the remainder of the PeerAtlas platform as a REST web services. This component may run its own encrypted database, which will serve as a cache of the NEO blockchain to improve read performance.

5**. Website**

PeerAtlas is an open-source medical encyclopedia offering evidence-based support for clinical decisions with medical articles and algorithms. It is currently compatible with mobile and desktop browsers.

PeerAtlas is designed for medical professionals and made freely available to the general public. Civilians and professionals may have questions regarding specific algorithms or other content. There will be an individual talk page or forum thread available for community discussion of each article and algorithm.

6. Community

Identity verification similar to the existing KYC protocols will be instituted for the site's medical professionals. In addition, PeerAtlas will explicitly verify the degree status of its medical professionals.

Civilians (non-medical professionals) may use their real name or a pseudonym to interact with the site if they choose to. Users will be granted read-only access to the site's content without signing up or logging in. This policy benefits anyone that may need rapid access to medical information during an emergency.

Physicians and other healthcare professionals who have not yet verified their identity with PeerAtlas are welcome to interact with the site as a civilian.

Physicians and other degreed healthcare professionals that have completed identity verification may publicly display their name and healthcare degree alongside a blue checkmark on the site. Verified healthcare professionals are eligible to submit original content to PeerAtlas. They may also start earning continuing medical education (CME) credits through their use of the site, which may be certified through their Board if ATLAS tokens are sent to the foundation.

Paying upfront for world-class medical content is expensive, but it should enable rapid acquisition from carefully selected and highly qualified medical contributors. This is an appropriate strategy to employ when creating or rapidly expanding the library into new disciplines.

However, another technique is more sustainable and should build a stronger PeerAtlas community. Personal ATLAS token wallet addresses of content creators who were not paid upfront may be posted at the bottom of medical algorithms and other content following approval by staff. These direct transfers of ATLAS from the community are the best long-term strategy for PeerAtlas to offer paid content for free.

PeerAtlas also plans to generate revenue by certifying professionals' CME credits that they may have earned with their licensing authorities when the professionals send ATLAS tokens to the foundation.

7. Support

There are four primary methods by which supporters may help the PeerAtlas mission.

1. Qualified professionals may submit medical articles, algorithms, and other content that helps the site's mission.

2. Anyone may obtain and hold ATLAS. This may increase demand for ATLAS while reducing its freely available supply.

3. Anyone may send ATLAS tokens to the creators of useful medical content to encourage its creation.

4. Professionals seeking to gain official recognition of any CME credits earned through their use of the site may send the foundation ATLAS tokens to process the credits.

8. Skims

PeerAtlas may not receive a portion of the ATLAS donations that its contributors receive. This is to avoid indirect donations to PeerAtlas from drug companies and other special interests that would benefit from influencing the library. It might be best

for the site to remain financially independent in the future by refusing to accept donations altogether. Regardless of its future donation policies, PeerAtlas should not accept any future sources of revenue that are connected to or induced by specific types of content or recommendations.

This is why compensation for the site's staff should never depend on their specialty's acceptance rate of new content, or the type of content that they decide to accept.

9. Shadows

The site's founders and staff must be beholden in the present and future only to themselves, and categorically disavow present and future financial ties to any special interest that could profit from influencing the recommendations of the library. PeerAtlas Co-Founder Ling Wu is currently employed by a pharmaceutical company as a chemist, and will submit her resignation at the completion of crowdfunding. The team has no other disclosures.

Failure to disavow or failure to disclose these ties, for any possible reason, always justifies immediate dismissal and replacement of the team member. Because this rule enforces patient safety, there can never be an exception.

10. Frontiers

As milestones pass, new frontiers arise.

The most urgent task after completion of crowdfunding is to hire full-time programmers to expand on and polish Dr. Mattson's code. Mobile apps will be added at this time as well.

It is possible that ATLAS will realize long-term benefits from hosting its own blockchain using NEO's efficient dBFT consensus technology with private bookkeeping nodes

hosted by doctors around the world. In this way, the ATLAS token could achieve true decentralization with community governance. However, there are immediate logistics and community benefits to remaining as an NEP-5 asset on the NEO blockchain. The ATLAS token will remain within the NEO ecosystem into the foreseeable future.

It is the 5-15 year goal of PeerAtlas to integrate its operations with existing EMR (Electronic Medical Records) databases after its medical library and peer review systems are in place. There are significant barriers to entering this market, including evolving government regulations, hospital administration and caregivers with a cautious outlook towards new technology, strict patient privacy laws, and the current lack of an overwhelming market leader in EMR technology.

Over a 20-40 year time span, PeerAtlas anticipates a shifting focus towards the use of AI (Artificial Intelligence) to create individualized treatment recommendations and algorithms for specific patients through the use of the patient's existing EMR data. AI could work with anonymized EMR data to offer a worldwide live rolling clinical trial for evidence-based recommendations.

11. Atlas Health Network

PeerAtlas will build the Atlas Health Network, a complete medical ecosystem that provides resources and funding for new medical projects utilizing blockchain technology. In return for providing resources and guidance, all projects on the Atlas Health Network will use the ATLAS token.

12. Skins

The site's founders are physicians as well as entrepreneurs. They will not be judged solely by yearly profits of the foundation. They operate in the presence of their peers' subjective judgement and that of the general public as well. If the practice of medicine is imagined as a grand three-ring circus, then PeerAtlas is probably a highwire.

An executive acting in a manner contrary to the best interests of the site's healthcare providers and their patients, or who gives the impression of having acted in such a manner, will deliver themselves an unhappy triad of social, occupational, and financial damages.

13. Compensation

The site's acting founders will jointly authorize and receive payment for their labors each year, and will also authorize the employment, deployment, and possible compensation of all other positions.

Signing bonuses are usually appropriate for new founders. It is expected that proper administration of PeerAtlas will be time-consuming for the founders and prevent a full-time career in medicine. Legally, these signing bonuses may always come from the foundation's resources. However, the founders wish to begin an unusual tradition of funding the signing bonus of their replacements directly from the pockets of the existing founders. In this manner, executive power could be handed off even at a moment's notice with minimal financial strain to the site. The founders expect that their yearly salary may, or may not, be essentially ceremonial or even nonexistent at times, depending on various circumstances and their best judgement.

Front-loading the executive salaries also makes graceful, lawyer-free exits more probable. Back-loaded executive salaries, exit bonuses, and "golden parachutes" harm the site's financial independence and should be avoided.

14. Replacement

Before the issue arises, founders should contact an interim physician that is likely to be willing and able to perform as a temporary replacement if needed. Permanent replacement founders will assume the title of co-founder and assume responsibilities

as a ‘founder’ even if they did not, in fact, co-found the site. Persons holding power of attorney over a founder may submit the founder’s resignation. All future founders will be degreed physicians.

Founders should moderate their politics and temperament when they are contemplating the replacement of personnel.
When in doubt, the show should go on.

15. Hippocrates

“...Now if I carry out this oath, and break it not, may I gain for ever reputation among all men for my life and for my art; but if I transgress it and forswear myself, may the opposite befall me.”

16. Core Team

Brad Mattson, M.D., Founder

PeerAtlas founder Bradley Mattson, M.D. is a Board-certified radiologist and final year resident at Baystate Medical Center in Springfield, MA.

Colin Closser, M.D., Co-Founder

PeerAtlas co-founder Colin Closser, M.D. is a 2017 graduate of Ross University School of Medicine.

Ling Wu, Ph.D., Co-Founder

PeerAtlas co-founder Ling Wu, Ph.D. is a native of China and trained as a biophysical chemist. She received her bachelor’s degree from Nankai University, China, and her Ph.D. from University of Illinois at Chicago, USA.

Arjun Patel, Full-Stack Designer

Vivek Mittal, Technical Advisor

Joel Garcia, Chief Technical Officer

Rajiev Hallock, Community Operations

Mike Templeman, Head of Marketing

Tarek Siddiki, Security Advisor

Learn more about the project and team at https://www.peeratlas.com