Pangea Jurisdiction
and **Pangea Arbitration Token (PAT)**

The Internet Of Sovereignty

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*Abstract: The **Pangea Software** is a **Decentralized Opt-In Jurisdiction** where Citizens can conduct **peer-to-peer arbitration** and **create their own Nations**. Pangea uses the Panthalassa mesh, which is built using Secure Scuttlebutt (SSB) and Interplanetary File System (IPFS) protocols. This enables Pangea to be highly resilient and secure, conferring resistance to emergent threats such as high-performance quantum cryptography. Pangea is blockchain agnostic, but uses the Ethereum blockchain for the time being. In the future, other chains such as Bitcoin, EOS, Tezos, Tangle and Bitlattice can be integrated with Pangea.*

*The **Pangea Arbitration Token (PAT)** is an ERC20 compatible in-app token for the Pangea Jurisdiction. The PAT token is proof-of-reputation for Citizens, issued when Citizens create a contract, successfully complete a contract or resolve a dispute attached to a contract. PAT is an algorithmic reputation token; an arbitration currency based on performance, rather than purchasing power, popularity, or attention.*

PAT is minted on the BITNATION DBVN Contract. The distribution mechanism for the PAT token on Pangea is an autonomous agent, Lucy, which will initially launch on Ethereum as a smart contract. This mechanism will be blockchain agnostic and can be ported to any viable smart contract platform. An oracle chosen by Bitnation will help to facilitate this (semi) autonomous distribution mechanism in a decentralized and secure fashion.

Keywords**:** *blockchain, self-governance, holacracy, panarchy, reputation, cryptographic tokens, smart contracts, bitcoin, ethereum, mesh networks, quantum computing, machine learning*

DISCLAIMER: This paper is subject to change until the day of the official ICO launch.

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1. Introduction

1.1 BITNATION: A Decentralised Borderless Voluntary Nation (DBVN)

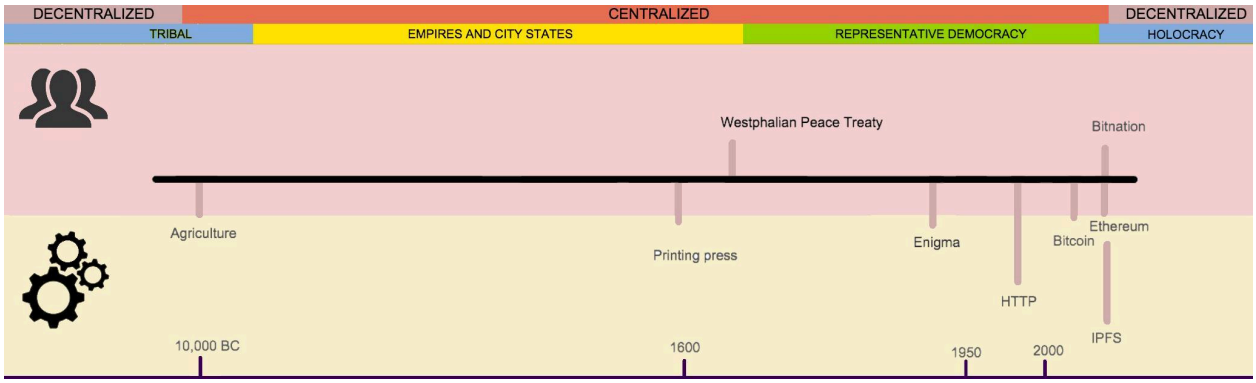

Figure 1: the evolution of governance

BITNATION provides core infrastructure (in the form of a Do-it-Yourself toolkit) for Virtual Nations. That means a platform that provides a robust Jurisdiction for all new Decentralized Borderless Voluntary Nations (DBVNs).

Pangea is BITNATION's Polycentric Decentralised Jurisdiction, on which Virtual Nations can be built, agreements among Citizens (and between Citizens and service providers) made, and disputes resolved. Pangea is also an incentive network which can be used to host a range of future governance services for Virtual Nations as DApps and bots.

BITNATION's vision is a global free market for governance services. A post-Nation State world of Virtual Nations, City States and Autonomous Communities which **compete for Citizens** by providing a range of decentralised, opt-in governance services from which all people can choose. In our world *sovereignty shifts decisively from the State to the Citizen*, and humanity reclaims freedom of choice when accessing governance services.

This vision sharply contrasts with current world order, where Citizens are forced to compete with one another to receive their desired governance outcomes - a process that often leads to violence and conflict. In BITNATION's world, becoming a Citizen of a Virtual Nation is as simple as applying for citizenship from a mobile phone chat, and competition for Citizens and creative destruction among Virtual Nations drives down costs and improves the quality of services for everyone. In a BITNATION future there is little incentive for violence because every one of us is a potential customer.

BITNATION *Genesis* is the proof-of-concept Decentralised Borderless Virtual Nation (DBVN). We are an open source movement, anyone can build their own DBVN on BITNATION *Genesis*, and already over **200 new Nations** have been registered. We have over **100 Embassies, and Consulates**, and over **10,000 Citizens** on all five continents, a dynamic community of **2000 contributors** on our Slack channel and we offer a range of services in-house or in partnership with other providers.

1. The widely used **BITNATION blockchain Public Notary** for a range of legal purposes - marriages, wills, birth certificates, company registration, land titles, freelance agreements, loan agreements and so on;

2. The **BITNATION Refugee Emergency Response (BRER),** which provides a blockchain ID for stateless people. BRER's software won the *Grand Prix and Award for Best Idea at the UNESCO NETEXPLO 2017*;
3. Partnerships with third party governance service providers such as **Exosphere Education Program**[1] **SpaceChain's** open source space hardware and software program, **resilience.me** basic income protocol, and **Dragonfly's** physical security service;
4. BITNATION organized the world's first **Blockchain Marriage and World Citizenship ID, Blockchain Land Title, Birth Certificate and Refugee Emergency ID** during 2014 and 2015.

The core function of any nation is to protect its citizens and their assets through an enforceable Jurisdiction (the practical authority to administer justice within its defined area of responsibility). Security and Justice ensure that our assets, including our bodies, are safe from violence and dispossession. Increasingly Security and Justice are merging as more of our assets become digital.

1.2 BITNATION Pangea Platform: Take the Law into Your Own Hands

State Sovereignty is no longer compatible with our ever more interconnected lives. Governance 1.0 is more often than not the source of grievances, conflicts and war. Increasingly the Nation State[2] oligopoly represents a global geographical apartheid[3]. Ethics aside, State Sovereignty is also impractical. It both fails to adequately address our local needs **and** our global challenges. So far the only alternative to State Sovereignty that has been actively explored is multilateral governance, where Nation States pool their sovereignty to minimise competition through institutions such as the United Nations and European Union. But this model reduces rather than enhances Citizen sovereignty, and therefore the choices they can make about the governance services they receive.

To outcompete Westphalian sovereignty[4] we need to provide a credible alternative to the nation state's core function - its *raison d'etre* - the provision of Security and Jurisdiction[5]. The only way to outcompete nation states is by providing better, more secure, faster, cheaper and peer-to-peer alternatives for these services. In other words, the global Westphalian oligopoly needs competition from decentralised, borderless and voluntary (opt-in) governance services. Through this process the nation state will face *death by irrelevance*[6].

Thus **Pangea's *Raison D'etre is* Jurisdiction as a Service (JaaS).** Decentralised arbitration paves the way for humanity to reclaim personal sovereignty and return to peer-to-peer transactions. Pangea increases individual autonomy and enhance collective governance service delivery systems by leveraging existing decentralized encryption tools and technologies.

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[1] https://exosphe.re/

[2] The principle of state sovereignty underlies the modern international system of states. The origins of this system are often traced in scholarly and popular literature to the Peace of Westphalia, signed in 1648, which ended the Thirty Years' War in Europe.

[3] Wender, Andrew *Looking Beyond the Westphalian Nation-State: Challenging the Modernist Vision of History with Alternative Political Orders and Worldviews*, 2015.
http://www.telospress.com/looking-beyond-the-westphalian-nation-state/

[4] https://en.wikipedia.org/wiki/Westphalian_sovereignty

[5] Nozick, Robert. *Anarchy, State, and Utopia,* Basic Books 1974

[6]Tarkowski Tempelhof, Susanne, RT Keiser Report 2015. https://www.youtube.com/watch?v=j3Nkol6MGVo

1.3 BITNATION Pangea Use Cases

1. **A Decentralized Jurisdiction Citizens Can Use to Create their Own Nations.**

The term DBVN derives from the term Decentralized Autonomous Organization (DAO) and first appeared in the original Bitnation Whitepaper of 2014. A DBVN is defined as:

- ***Decentralized****: Decentralization is the process of redistributing or dispersing functions, powers, people or things away from a central location or authority. In the realm of a DBVN, decentralization translates into both technological and human decentralization - through striving for P2P (Peer-to-Peer) technology, modular interfaces, API (Applications Programming Interface) layers, and forkable (duplicated) code. This means that every user can become its own node and transform the platform to their own liking. Decentralization also benefits from not having any single point of failure in the event of an attack. Human nodes should be able to reorganize themselves in resilient nodes no matter what part of the network comes under attack - be it human or other technological factors. In practice, this means that various clusters, regional or otherwise, are entirely autonomous.*
- ***Borderless****: DBVN's do not limit their services to any specific geographical area, ethnicity or other categories of populations. They have no borders or ports of entry: no land boundaries, airports, coastlines, or seaports. DBVN's provide services to all areas, regardless of where it is located. Some would claim that a DBVN is 'virtual' by design. Although virtual-by-design is an intuitive assumption, it does not have to be based entirely in the virtual world, nor its services.*
- ***Voluntary****: DBVN's do not use force, fraud, or coercion, nor subject their citizens to involuntary servitude, peonage, debt bondage, or slavery. Due to the fact that DBVN's are voluntary in nature, they are inherently free of persecution, intimidation, reprisals, and other forms of systematic violence. DBVN's compete in a free market where customers, the "citizens" of the platform, voluntarily choose which DBVN's they want to use-- including the option of using several DBVN's, or none at all, or if they so choose to create their own DBVN.*
- ***Nation****: A nation is a large group of people who share a common language, culture, ethnicity, descent, or history. In the case of DBVN's it is likely that people would be as connected through mutual interests and goals as they would more traditional commonalities such as culture and language. A nation is a voluntary formation rather than a governing entity (i.e. a state). We provide the tools for governance but do not impose them, nor do we impose any specific code of law or regulations."*

Examples of possible DBVNs:

- **Digital Communities:** There are many communities that strives for a greater degree of autonomy from society. When it comes to digital communities, organizations like the Pirate Party and Anonymous and their various groups comes to mind. But it can also be people who identify with a specific ethnicity or religion for instance, that's not the main ethnicity or religion in the nation state where they live, like countries with a large diaspora spread around the world. These digital communities can easily create their own DBVNs on Pangea, where they can organize themselves according to self-selected group belonging rather than forced upon geographic parameters.
- **Special Economic Zones (SEZ) and other geographic communities:** Local communities can also use the DBVN creation function. For instance, there are an estimated five thousand Special Economic Zones in the world, and this number is growing rapidly. SEZs can use Pangea to create

an “out of the box” Jurisdiction for their economic area, or Startup City. Examples of other geographical DBVNs could be refugee camps/refugee cities, self-sustainable communities, Seasteads, neighbourhoods and apartment buildings.

Entering and Leaving a DBVN. One of the functions of Pangea is to provide its citizens with a blockchain ID: a Virtual Citizenship. Virtual Citizenship is “opt-in and opt-out”: meaning users can choose to apply for Citizenship of a specific Nation or cancel it **whenever they want**. Users can also choose to become a Citizen of many different nations, or none of them, it’s **up to the individual to decide.** Citizenship of a Virtual Nation provides access to the Virtual Nation’s governance services. Citizens can interact with their Nation(s) and gain access to their governance services on Pangea through *smart contracts* deployed on the blockchain.

```
pragma solidity ^0.4.8;

contract Factory {
        event NationCreated(address at, address creator, string name, string type, string meta);
        event NationCollapsed(address nation);

        event CitizenshipApplication(address nation, address applier);
        event CitizenshipAccepted(address nation, address citizen);
        event CitizenshipRevoked(address nation, address citizen);

        event Vote(address nation, address voter, bool inSupport);

        address[] public nationsList;
        mapping (address => Nation) public nations;

        uint public totalCitizens;
        address[] public allCitizens;
        mapping (address => address[]) public citizens;

        struct Nation {
                address creator;
                address at;

                string name;
                string nation_type; // Holocracy, meritocracy...
                string meta;        // To store an URL, a description...

                uint nbCitizens;
                address[] citizens;

                uint nbVoters;
                address[] voters;
                mapping (address => Vote);

                address[] waitingApplications;
                ma
        }

        struct Vote {
                address voter;
                bool inSupport;
                string reason;
        }

        modifier onlyCreator(address at) {
                if (nations[at].creator != msg.sender) throw;
```

2. A Decentralized Jurisdiction Allowing Citizens to Make Robust Agreements and Resolve Disputes Using Peer-to-Peer Arbitration.

Imagine being able to make complex legal agreements at ease from your smartphone, through a user friendly chat interface, similar to WeChat, Signal, WhatsApp, or Facebook Messenger, but without the time, costs and bureaucracy of public notaries, lawyers and regulators. And if a dispute arise, you can select the arbitrator of your choice on a free market for arbitration, depending on your budget and preference, the same way you would choose a rental apartment on AirBnB or a vendor on eBay.

Example of Agreements and Peer-to-Peer Dispute Resolution:

- **Business Agreements:** Imagine being a freelance in Brazil, assisting a UK based Bitcoin Exchange to translate their website into Brazilian Portuguese. Until now there has not been a practical jurisdiction for these kind of international online agreements. Pangea provides an easy way to draw up a contract peer-to-peer, resolve any disputes that arise, and incentivise contract compliance through the reputation system.
- **Private Agreements and Essential Records:** In Uganda, Iran, Chechnya and many other countries, being homosexual results in prosecution by the government. However, a gay or lesbian couple might still want to engage in a legal union, in order to protect their assets, by tying their union to ownership records of, for instance, their home ownership records, mutual savings wallets, willa and child care contracts. They can do so on Pangea.
- **Market for Freelance Arbitrators, Smart Contracts and Laws:** Anyone can sign up as an arbitrator on Pangea and offer arbitration services, regardless of nationality or education. You could be a Wall Street lawyer offering to arbitrate complex mergers and acquisitions, or a car motor dealer, offering to resolve car sales disputes. Each arbitrator sets their own fee rate and availability, and describes their experience and expertise, and the code of laws and jurisdictions they know well. Citizens entering into contracts can choose arbitrators based on price, reputation and expertise. At a later stage, Pangea will evolve into a marketplace for smart contracts too, and will be rewarded for creating, auditing and improving smart contracts.

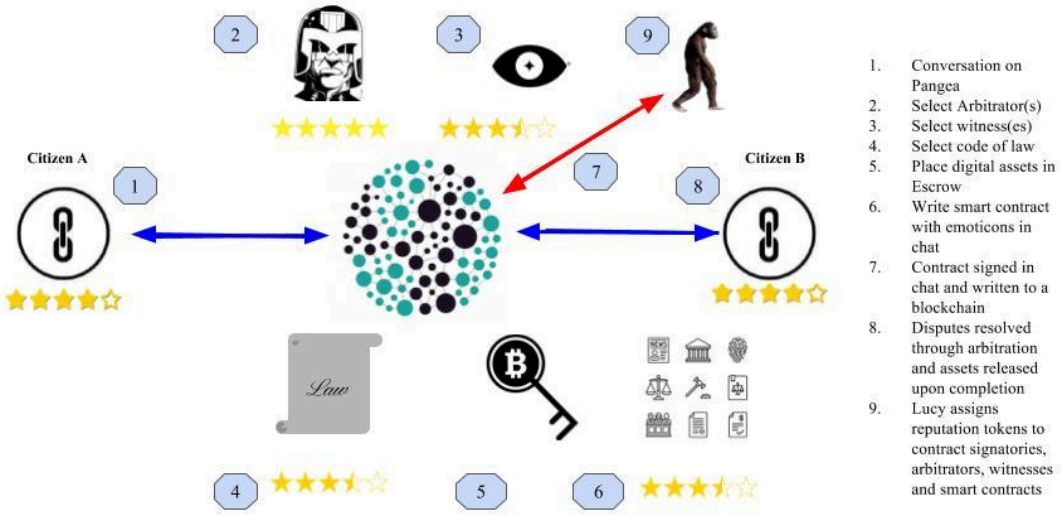

Figure 2: using Pangea for peer-to-peer contracts and arbitration

2. Pangea Concept Overview: A Polycentric Blockchain Jurisdiction

BITNATION's Pangea software is a Decentralized Jurisdiction for the peer-to-peer creation, arbitration and enforcement of agreements. Pangea communicates with the Ethereum blockchain to create and execute Smart Contracts (or *Nomic Contracts* - designed to evolve through human arbitration - like Common Law - rather than driven by the 'code is law' philosophy analogous to Civil Code). The Pangea frontend is built as an intuitive mobile chat application.

The Nation State Oligopoly: governments with geographic monopolies have been the rule through much of human history, their borders determined largely by the reach of their weapons technology. Since people within the borders of a city state, kingdom or nation state tended to have shared culture, history, language and values, with little means of communication outside their own communities, cohesion around narratives of shared experience or values was relatively easy.

The invention of survey methods and navigable maps in Europe during the 16th century created the technology for accurately fixing territorial borders[7]. Soon afterwards, in Europe, the Treaty of Westphalia (1648) established the Nation State as the standard for governance in the West and the concept spread globally in the 19th century. By the 21st century, the Nation State had completely supplanted colonial empires, unincorporated territories in Africa, Asia, Oceania and the Americas and smaller ethnic and city states such as those in Italy and Germany, creating an oligopoly of governance and claiming nearly every square meter of habitable space on the globe.

Not all nations have been territorial. A number of ethnic groups have retained non-territorial national identities through history, notably the Jewish and Roma peoples in Europe[8]. However as the Nation State closed in they became ever more subject to persecution. While the defined borders and cultural cohesion of the Nation State provided some relief from the near-constant violence of imperial wars, in our own era the borders themselves continue to be a persistent source of conflict and instability and contribute to arbitrary economic and social hierarchies.

Decentralised Nations. After 400 years of increasingly centralised governance, the Web 3.0 technological revolution is making decentralised governance a real possibility. BITNATION's Decentralised Borderless Virtual Nation (DBVN) is a peer-to-peer alternative to territorial Nation States in the same way that the Decentralized Autonomous Organization (DAO) pioneered by Ethereum is peer-to-peer alternative to centralised for-profit and non-profit organisations[9][10].

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[7] Mercator, Frisius, Deventer et. al

[8] To this category could be added the Zoroastrians in Iran and south-Asia, the Coptic Christians in Egypt and the Middle East, Berbers in North Africa and many others worldwide. In Africa and Southeast Asia most pre-colonial kingdoms were at best very loosely territorially bounded.

[9] The term DBVN was coined by BINATION founder **Susanne Tarkowski Tempelhof** in 2014 and the structure and technology is elaborated in the initial Bitnation White Paper and Github repository
https://docs.google.com/document/d/1r_VqWrKQw07E06XAtMv_cZnFyBZma4PFTBJpM5GuzbA/edit
https://github.com/Bit-Nation/BITNATION-Constitution

[10] A decentralized autonomous organization (DAO), sometimes labeled a decentralized autonomous corporation (DAC), is an organization that is run through rules encoded as computer programs called smart contracts. A DAO's financial transaction record and program rules are maintained on a blockchain. There are a growing number of examples of this business model.

BITNATION is not only the world's first prototype DBVN, it is also the organization building Pangea, the software infrastructure for virtual nations. Pangea is both a jurisdiction for DBVNs, and the platform on which new DBVNs can be built and joined, and their governance services accessed.

DBVN Citizens: DBVN Citizens voluntarily opt-in to the set of rules established in each Virtual Nation they join using Pangea. In the case of BITNATION this currently requires creation of an account on our platform and adherence to the BITNATION constitution.[11] Once the Pangea Alpha and/or PAT tokens are released a further condition will be the purchase of one or more PAT master tokens. On release, PAT tokens will be distributed to existing citizens free of charge (one per Citizen). If abuse of this process is detected BITNATION can use core contributor **Johan Nygren**'s *proof-of-identity* protocol to prevent individuals or organisations from creating a multitude of accounts.

Decentralised Jurisdiction: Wikipedia defines a jurisdiction as *the practical authority granted to a legal body to administer justice within a defined area of responsibility*[12]. Pangea's decentralised jurisdiction addresses all four core elements of the administration of justice:

Codes of Law

- On Pangea users can write smart contracts in chat which refer to an existing code of law (e.g. Common Law, Sharia Law, ULEX, UNIDROIT, or Civil Code), or upload their own laws or a template smart contract containing bespoke rules to govern agreements.

Mediation and Arbitration

- Pangea manages the dispute resolution process for agreements made on the platform;
- Users choose human Arbitrator(s) or dispute resolution DApps such as CrowdJury.

Incentivisation, Deterrent and Enforcement

- Pangea is an incentive network. A Token-driven reputation System provides incentives for contract compliance (rather than the threat of prison, for instance) and to ensure nomic evolution of smart contract rulesets (digital law);
- A MultiSig Escrow holds mutual assets (money, tokenized land titles, car assets, etc) until an agreement is successfully completed.

Defined Area of Responsibility

- The Pangea Jurisdiction Platform allows DVBNs and P2P agreements to be created with clearly defined limits on to which organisations and individuals their rules apply.

Nomic (or Evolutionary) Law: digital and analog are not the same with regard to rule enforcement. In digital space everything must be quantified in order to be computable. As a result a blockchain jurisdiction must rely on scores, on ratings, on collaborative filtering, on digital representations of sentiment, of opinion, of thought to decide which holons, contractors, arbitrators, rules (the digital equivalent of laws) are best suited to Citizen's purposes.

The Pangea blockchain jurisdiction will use a new evolutionary method of rule generation which does not rely on voting, politics, or anything more than feedback loops, stigmergy, Nomic structures, and voluntary collaborative filtering. The best set of rules in the form of smart contracts developed on Pangea will rise

[11] https://bitnation.co/
[12] https://en.wikipedia.org/wiki/Jurisdiction

to the top and become recommended for continued use by Citizens based on reputation scores generated by informed users, developers and auditors. A specific PAT sub-token is created for rating smart contracts for this purpose and through the use of IPFS, an Oracle and an Autonomous Agent (Lucy), Pangea will be able to semi-autonomously distribute reputation to smart contracts based on performance (fitness). Through this process a body of rules (smart contracts) suited for various purposes will emerge in the Pangea jurisdiction and evolve through use to best serve Citizen's needs[13].

A Nomic structure is a good architecture for rule making in the digital space. Pangea will have chains of rules, self-enforcing smart contracts, and rules for changing rules. The blockchain provides an accounting ledger, a function for tracking time, a mechanism for developing shared consensus, or even a collective memory (exocortex). Smart contracts represent a set of rules. To provide better feedback, each smart contract will have a reputation score measured in PAT proof-of-nomic sub-tokens. By allowing each smart contract to have a reputation, to be rated, to be reviewed, or peer reviewed, the Pangea jurisdiction will improve the quality of each set of rules as fitness is evaluated and the newest rules are optimized to become the fittest. This fitness function is critical to the optimization process while stigmergy is the indirect swarm[14] coordination mechanism.

Due to the nature of the blockchain it is possible to track everything a BITNATION Citizen chooses to publicly share through Pangea. This digital trail is very similar to the pheromone trail used by insects and for that reason we can think of this function as digital pheromones. In the case of blockchains you have the ability to create public or private lists, to follow any list, or any participant in the network, creating the stigmergic swarm coordination[15]. If a particular set of rules is good, then as more participants in the swarm discover how good it is, they can follow this set of rules, which will strengthen the digital or virtual pheromone trail, to take this set of rules viral.

To make this work on Pangea, we require an ability to rate every component in the system through a secure (and pseudo-anonymous) feedback mechanism. Thus Pangea ensures:

1. Every smart contract has a reputation rating, a set of metrics which are community determined to represent (fitness). This functions as the community standard for quality control.
2. Every Citizen or Holon have a personal reputation score whether an organization, a human, AI, or something in between.
3. Every Citizen should have followable lists (this enables stigmergy by producing trails). Samir follows the list of Edmund then Edmund follows the list of Alicia, etc.
4. Every Citizen is able to rate every component, follow other Citizens or Holons, follow smart contracts, rate smart contracts, continuously, and in real time.

[13] This element was first developed by BITNATION contributor **Dana Edwards** and the full paper can be read here https://docs.google.com/document/d/1l00egk-PyNIE4-kHZwFGA-asIB_rsIRwtbMPDZ0JYJ8/edit

[14]See BITNATION adviser **Rick Falkvinge**'s book *Swarmwise* https://falkvinge.net/2013/02/14/swarmwise-the-tactical-manual-to-changing-the-world-chapter-one/

[15] Stigmergy is a consensus social network mechanism of indirect coordination, through the environment, between agents or actions. The principle is that the trace left in the environment by an action stimulates the performance of a next action, by the same or a different agent. In that way, subsequent actions tend to reinforce and build on each other, leading to the spontaneous emergence of coherent, apparently systematic activity.

2.1 Pangea Technology Overview: Panthalassa, A Quantum Resistant Mesh Network

All contracts begin with a *conversation* between Citizens, and smartphone chat is increasingly becoming the go-to tool for conducting business in emerging markets. For those reasons, we are convinced that our Jurisdiction needs a chat interface. Enter our communications protocol Panthalassa[16].

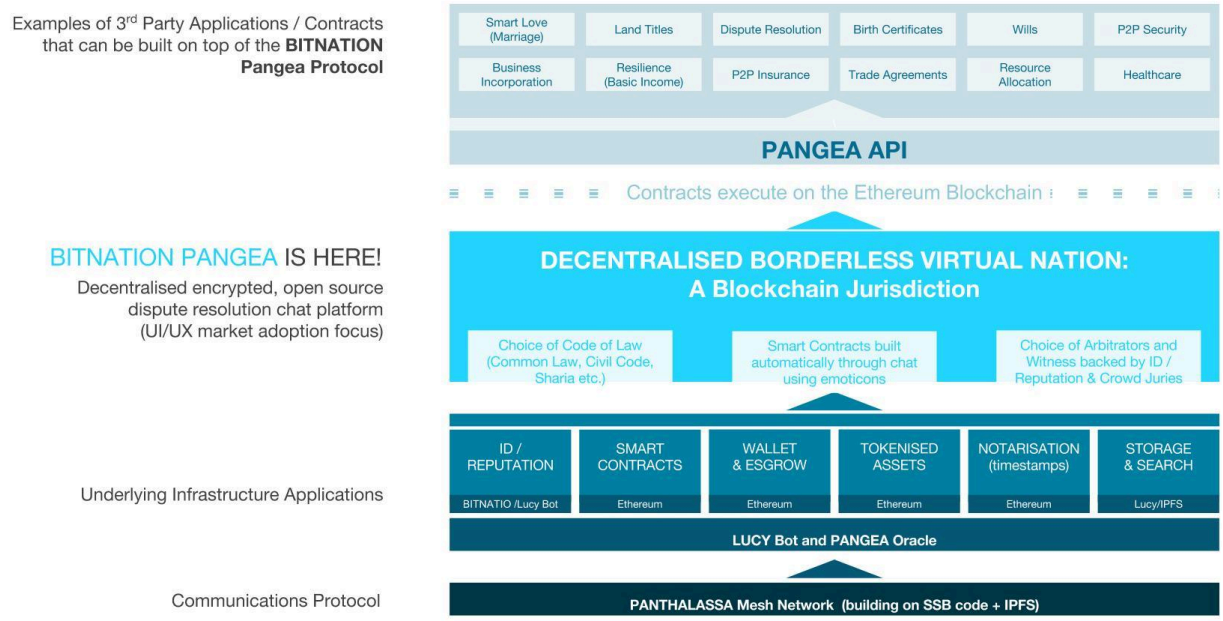

Figure 3: Pangea platform vision

Panthalassa is a **quantum resistant mesh network** used to distribute any kind of data, it is used to implements the chat feature of Pangea. Panthalassa is built using using ideas from the bigger projects in the peer to peer ecosphere: Secure Scutllebutt (SSB), IPFS, DAT and Zeronet.

The goal of Panthalassa is to provide users with a secure and decentralized **mesh network**[17]. Panthalassa will offers the ability to use *bridges* to the different blockchains such as Ethereum, Rootstock, EOS or anything else, this let users interact *with hundreds of blockchains without needing to run a specific node*, such feature is going to considerably helps those projects to *scale*.

Panthalassa is constructed as a **Delay Tolerant Network** (DTN)[18]. Citizens can use Panthalassa to chat with each other, share files, interact with their nation and much more.

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[16] Panthalassa is the prehistoric ocean that surrounded the Pangean landmass
https://en.wikipedia.org/wiki/Panthalassa

[17] A mesh network is a network topology in which each node relays data for the network. All mesh nodes cooperate in the distribution of data in the network. It can be applied to both wired and wireless networks. https://en.wikipedia.org/wiki/Mesh_networking

[18] Delay-tolerant networking (DTN) is an approach to computer network architecture that seeks to address the technical issues in heterogeneous networks that may lack continuous network connectivity. Examples of such networks are those operating in mobile or extreme terrestrial environments, or planned networks in space.

We are highly prioritizing the **quantum resistance** feature, indeed quantum computers will make RSA and elliptic curve encryption irrelevant sooner than later[19], thus we need a *future proof* solution.

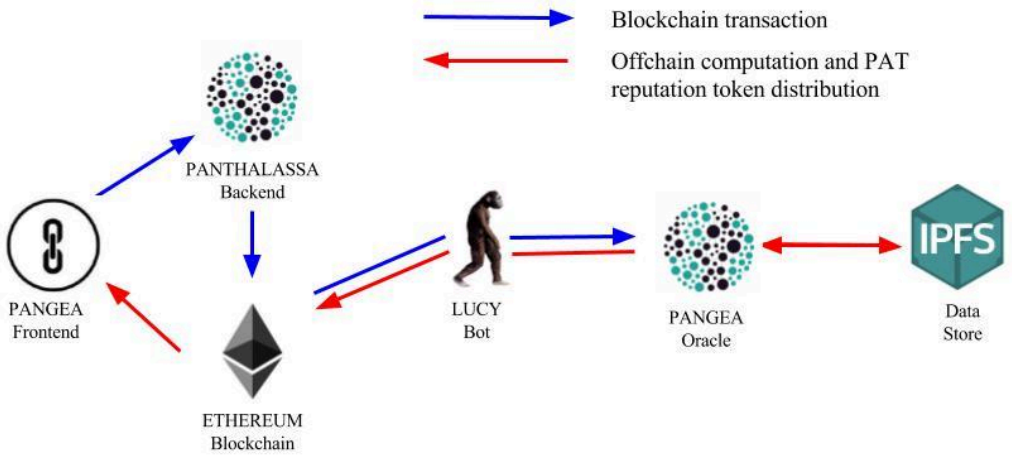


Figure 4: Pangea system architecture

Thanks to a *gossip protocol* and to IPFS *file caching feature*, data will be easily and seamlessly replicated, thus making them available **even when their owner goes offline**.

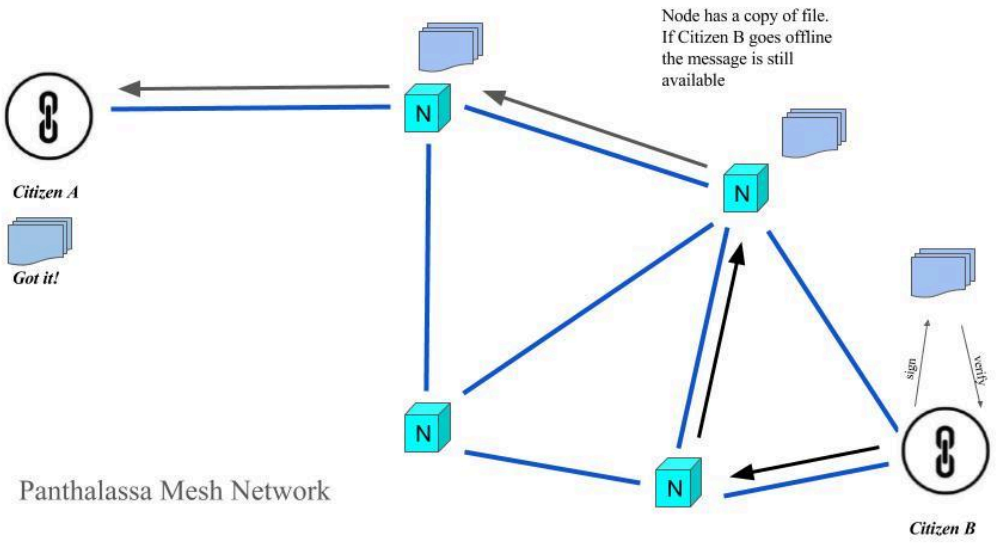


Figure 5: Panthalassa Mesh Overview

[19]As of 2017, the development of actual quantum computers is still in its infancy, but experiments have been carried out in which quantum computational operations were executed on a very small number of quantum bits. Both practical and theoretical research continues, and many national governments and military agencies are funding quantum computing research in an effort to develop quantum computers for civilian, business, trade, environmental and national security purposes, such as cryptanalysis. https://en.wikipedia.org/wiki/Quantum_computing

Users will often want to communicate privately and to avoid making all their data public. Panthalassa will make use of a **quantum safe OTR and SIGNAL based protocol**, to provide Citizens with **ephemeral messages**[20] and **forward secrecy**.

*Our first Proof-Of-Concept (POC) developed by **Eliott Teissonniere** is now available available on Github at https://github.com/Bit-Nation/BITNATION-Panthalassa.*

2.1.1 Pangea pre-Alpha

Panthalassa use ideas and code from the open source communications protocol SSB - invented and developed by **Dominic Tarr** - which provides a secure, decentralised communications platform and mesh network on which users can communicate without risk to their personal security or privacy.

SSB's ingenious design allows the user to carry around their own data, rather than trusting it to centralised servers - as is currently the case with WhatsApp, Signal, and Facebook Messenger, for example. This means that as long as there are two people on the network, the network will remain alive, providing remarkable resilience.

SSB also allows users to operate without access to an internet connection - through mesh networks, sneakernets and gossip protocols. Imagine the possibilities for places with limited or no access to a working internet connection.

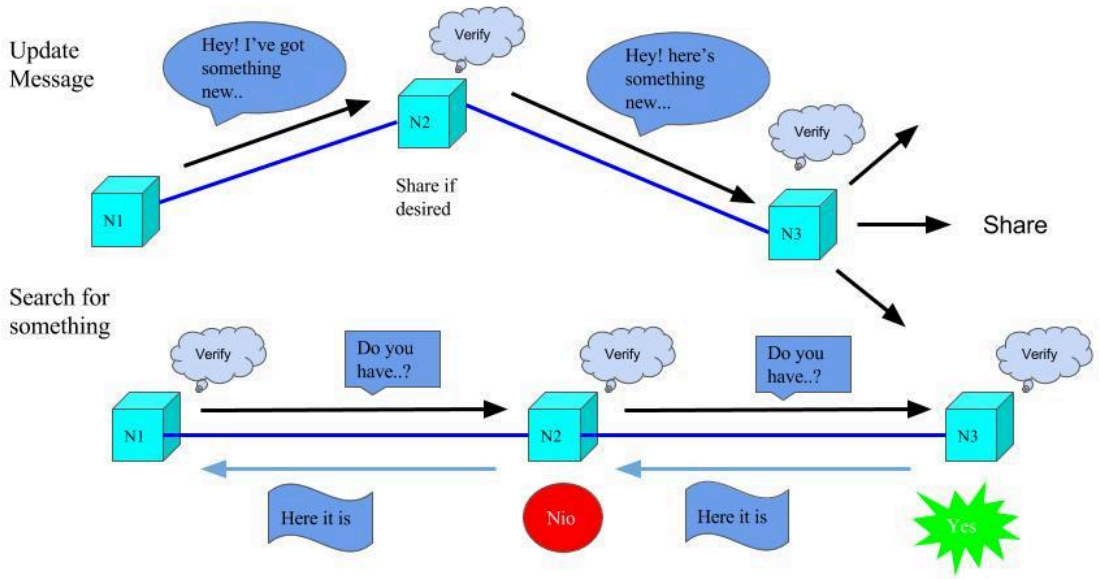


Figure 6: Panthalassa gossip and search protocols

[20] Massages which are not permanently stored by the network.

A number of clients have been developed by the Scuttlebutt community to interact with SSB. Currently the most popular clients are Patchwork and Patchbay. The Pangea pre-Alpha builds on the Patchwork client, but we will soon change to a custom client more adapted to modular mobile chat UX/UI.

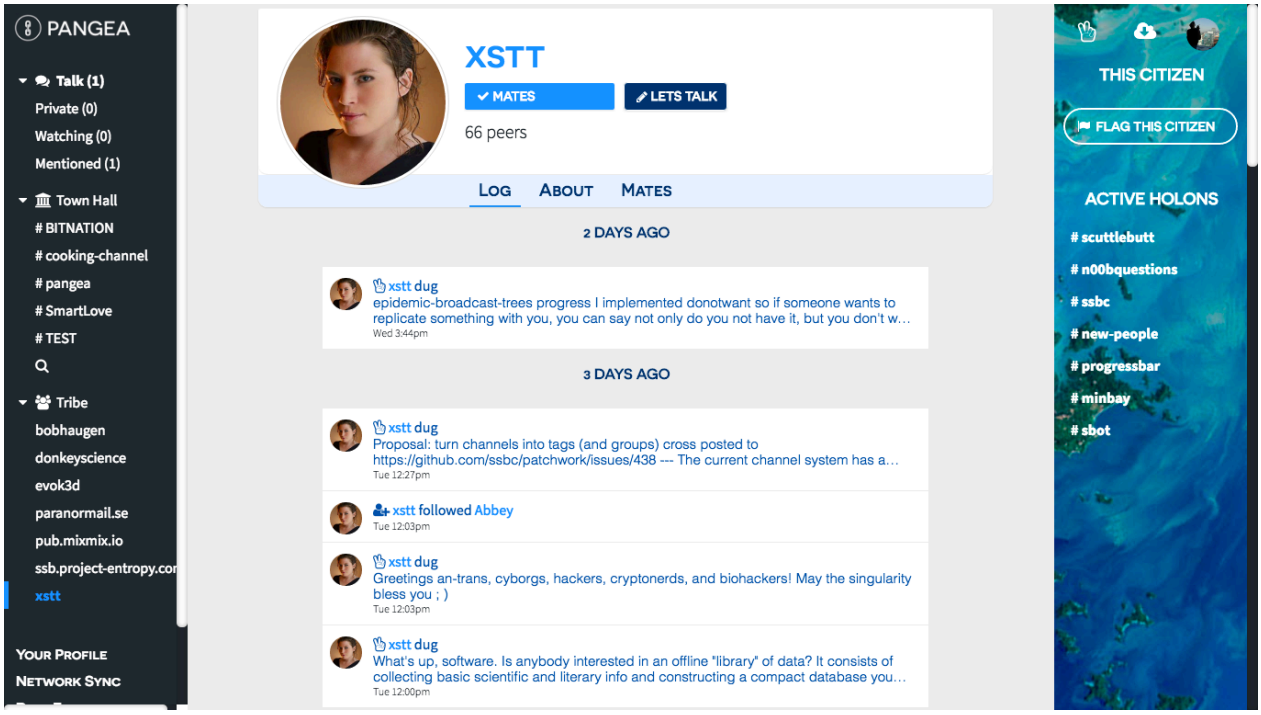


Figure 7: SSB-based Pangea pre-Alpha Screenshot (Mac Desktop Client)[21]

2.1.2 Lucy, The Oracle and The Exocortex

PAT tokens are minted by the DBVN. However the distribution mechanism for PAT tokens on Pangea is an autonomous agent, ***Lucy***[22], which will initially launch on Ethereum as a smart contract. This mechanism will be blockchain agnostic and can be ported to any viable smart contract platform. An oracle chosen by Bitnation will help to facilitate this (semi) autonomous distribution mechanism in a decentralized and secure fashion. Lucy is tasked to read contract information (hashes and pubkeys) stored in .txt files on IPFS to inform the token distribution based on contract execution, using a multisignature Oracle[23]. Iterations later, Lucy intends to evolve into our Exocortex (an external "brain" for Pangea)[24], in combination with the contract registry, and further empowered by distributed cloud computing platforms such as iEx.ec or Golem.

[21] Accessible at https://github.com/Bit-Nation/BITNATION-Pangea

[22] Lucy was the name given to the hominin female fossilised skeleton discovered by Donald Johnson, Mary Leakey and Yves Coppens in Kenya in 1971. At the time, she was the earliest known human ancestor. https://en.wikipedia.org/wiki/Lucy_(Australopithecus)

[23] In complexity theory and computability theory, an oracle machine is an abstract machine used to study decision problems. It can be visualized as a Turing machine with a black box, called an oracle, which is able to solve certain decision problems in a single operation. https://en.wikipedia.org/wiki/Oracle_mach

[24] An exocortex is a hypothetical artificial external information processing system that would augment a brain's biological high-level cognitive processes. https://en.wikipedia.org/wiki/Exocortex

2.1.3 IPFS Contract Registry

SSB has a built-in storage function for handling data-light items such as profile pictures and photo uploads. Panthalassa expands this function by using IPFS to store and search case evidence, contract templates, legal codes and more. A contract registry specifically designed for Smart Contracts, individual Laws, and Codes of Laws is being developed by **Eliott Teissonniere** for Panthalassa. The ability to rate contracts with *proof-of-nomic* reputation sub-tokens creates the context in which *Nomic Laws* evolve on the platform (i.e. a set of laws that are updated on usability criteria).

IPFS does not have native encryption functionality. If there are smart contracts or pending disputes where documents or case-evidence must remain confidential, Panthalassa uses another layer to automate the process of encrypting confidential documents. One method would be to set a multisig for access to the documents or evidence that is shared only with the people in each virtual jurisdiction related to the contract or dispute with a timer. In this way Pangea mimics real life where case-evidence is kept in a secure room until needed by the court, plaintiffs and defendants, or where confidential documents are held securely by lawyers or in bank vaults. As in legacy legal systems, confidential documents are not viewable anywhere else.

2.1.4 Languages: Golang/Rust and ReactJS

The first POC of the Panthalassa core is developed in Golang, which is a memory safe language developed by Google. Go allows us to rapidly develop a safe working implementation[25]. The ream is currently considering the Rust language for a second POC which will be used to compare both languages and then choose which one to use for the release.

The Pangea frontend uses ReactJS, which permits the development of a responsive interface, emphasising to our *mobile first* approach. This choice was also driven by the size of the JS community, and that many BITNATION contributors are familiar with JS, and prefer it to other languages[26]. BITNATION will encourage alternative protocol implementations in other languages like C++, Python or Clojure, as the Ethereum foundation does with Ethereum[27].

2.1.5 Smart Contracts: Blockchain Compatibility

All our smart contracts are written in Solidity, a language introduced to be used with Ethereum and which is integrated in other projects supporting smart contracts.
Ethereum is the first blockchain to be integrated with Pangea, for the purpose of creating Smart Contracts. Bitcoin will be integrated as soon as the Rootstock protocol - which is also using Solidity - has been publicly launched and tested on the market.
The recently launched Tezos and EOS decentralised ledgers are others potential alternative as well as future chains like Tauchain or IOTA and post-blockchain technologies like Tangle and Bitlattice. As other more secure alternative contract languages and blockchains emerge, they will be integrated easily thanks to the bridge feature of Panthalassa.

[25] https://en.wikipedia.org/wiki/Go_(programming_language)
[26] https://en.wikipedia.org/wiki/React_(JavaScript_library)
[27] https://www.ethereum.org/foundation

2.1.6 Examples of Possible Pangea 3rd Party Governance DApps and Chatbots

Pangea's API (Application Programming Interface) will allow DApp (Decentralized Applications) and chat bot developers to create third party applications as services on Pangea that Citizens or DBVNs that live on Pangea could choose to use. Examples could include applications such as:

- **Peer-to-Peer Financial Redistribution:** For instance **Johan Nygren**'s work with **resilience.me** to build a peer-to-peer basic income protocol, as well as a redistribution scheme called Taxeme could be opted into by individual Citizens on Pangea, or adopted by DBVNs for all their Citizens
- **Crowd Arbitration:** Pangea's native arbitration system is focused on peer-to-peer arbitration. However for Citizens who prefer other types of arbitration, for instance that of a Crowdjury, DApp such as **CrowdJury** could provide that option.
- **Peer-to-Peer Security:** For actual physical security, a 3rd Party Developer could develop a DApp to for instance provide a form of 'neighbourhood watch' in their area - similar to the concept of for instance **Cell 411** and other security applications.

2.1.7 Using Other Cryptocurrencies on Pangea

Although all transaction fees on Pangea are charged in PAT, the Pangea wallet aims to integrate as many currencies as possible in order to let Citizens choose the currency they prefer to pay for services before conversion on the system to PAT. Particular effort will be placed on adding privacy-centric currencies, including, but not limited to, **DASH**, **Monero** and **Zcash**.

3. Pangea Arbitration Token (PAT)

3.1 Pangea Arbitration Token Purpose and Structure

PAT is designed specifically to reward rules compliance and performance on the Pangea platform, and is not primarily a currency, even though the master token will be tradable on crypto currency exchanges and used to charge for transaction fees on the platform. PAT is minted by the BITNATION DBVN and is an Ethereum Smart Contract[28] containing a master token which is tradable and serves as a reward token, and which also governs three non-tradable reputation tokens, each with specific functions and attributes. These are:

- *Proof-of-Agreement (POA):* A Non-Tradable Reputation Token for Pangea users and arbitrators which is governed by performance criteria for smart contract creation and execution;
- *Proof-of-Collective (POC):* A Non-Tradable Reputation Token for DBVNs, user groups and governance services created on Pangea, it is governed by user satisfaction with collective contract creation and execution;
- *Proof-of-Nomic (PON):* Non-Tradable Reputation Token for Contracts, Laws and Legal Codes governed by user satisfaction.

[28] Smart contracts are computer protocols that facilitate, verify, or enforce the negotiation or performance of a contract, or that make a contractual clause unnecessary. Smart contracts often emulate the logic of contractual clauses. Proponents of smart contracts claim that many kinds of contractual clauses may thus be made partially or fully self-executing, self-enforcing, or both. Smart contracts aim to provide security superior to traditional contract law and to reduce other transaction costs associated with contracting.https://en.wikipedia.org/wiki/Smart_contract

Similar to the Proof-of-Content model developed by Daniel Larimer and Ned Scott for Steemit[29], Pangea blocks will be created based on ***Proof-of-Agreement***, (i.e. non-tradable tokens are minted automatically by creation and successful execution of Smart Contracts on Pangea).

Every contract created on the platform will have a contract ID, associated public key(s), and possibly other additional IDs, addresses, or codes, as is deemed necessary. These identifiers, public keys, codes and addresses will be stored in the BITNATION contract registry on IPFS which will act as an external data source for the token distribution mechanism through the Lucy bot.

3.2 Pangea Reputation System - Proof-of-Agreement (POA) Token Mechanism

POA non-tradable tokens build an individual user's reputation on Pangea**.** When Pangea Citizens create and complete contracts - and resolve disputes relating to these contracts - they are rewarded with the POA portion of PATs. POAs are non-tradable to prevent user reputations being bought or sold. Making the POA portion of the PAT token non-tradable ensures that reputation can only be gained through successful contract creation, dispute resolution and execution, and *not* through monetary means or popularity.

Each individual Citizen has a *unique and searchable identifier*, a **Public Key[30],** which is part of the core SSB functionality and looks like this:
`@Plpq/a6gYB19l41OsLdYRYqDRwO6WL+63n6np1D7Yvo=.ed25519`

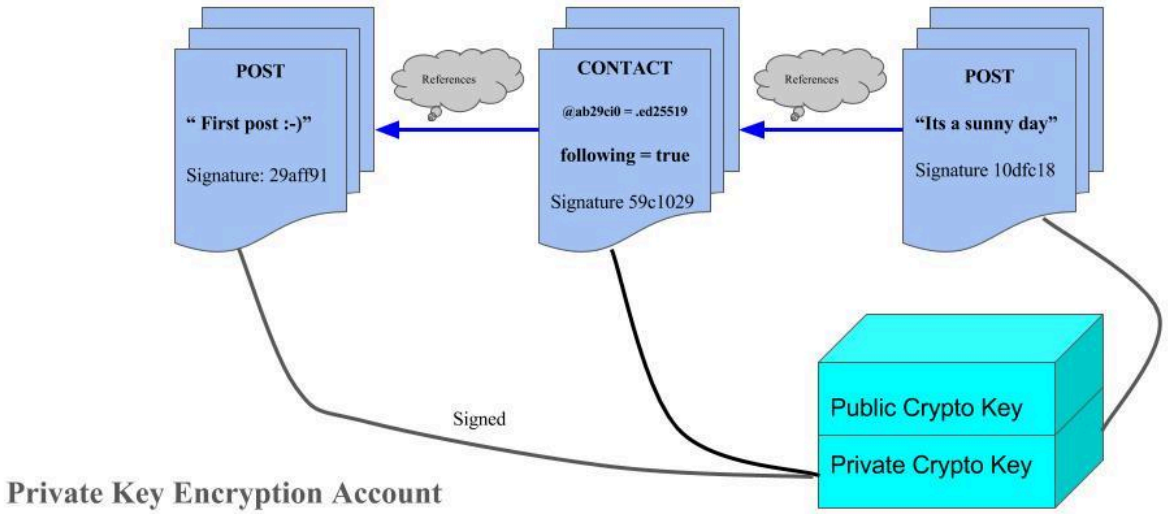


Figure 8: dual key encryption

[29] https://steemit.com/steem/@liondani/steem-whitepaper-download

[30] A cryptographic system that uses two keys -- a public key known to everyone and a private or secret key known only to the recipient of the message. https://en.wikipedia.org/wiki/Public-key_cryptography

When Citizens do anything on Pangea, whether sending a public message, conducting a private conversation or creating a smart contract, the individual user automatically *signs* the action as a consequence of being the specific person attached to that unique identifier (similar to signing each message and action with a PGP signature).

In addition to the PAT reputation mechanism, Pangea already has a form of 'community approval mechanism': the SSB protocol is based on message broadcasting between people who choose to follow each other. Citizens could choose to add external verification methods in the future, such as social media verification, uploaded utility bills, or government-issued identification documents.

Pangea has *de facto* sybil-attack resistance due to the time and energy it takes to create a trustworthy profile. This is not a cast-iron guarantee against bad actors, but it provides a strong disincentive. Further on, the cost of creating and executing a contract through the miners fees makes the cost/opportunity ratio for a potential Sybil attack undesirable.

Contracts between individuals (or individuals representing groups) are created through the Private Conversation function on Pangea - currently named "Talk", which is end-to-end encrypted and can host up to seven participants (for the time being). Participants, Witnesses, Arbitrators and Escrows are added to the private conversation, which when satisfactorily agreed by participants, can be turned into contracts that are entered on the Ethereum or Bitcoin blockchains.

In the event uPort, Civic or a similar identification system becomes widely adopted by the market, we will integrate the best option as a platform login function, at minimum.

3.3 Pangea Arbitration Token (PAT) - Master Token Mechanism

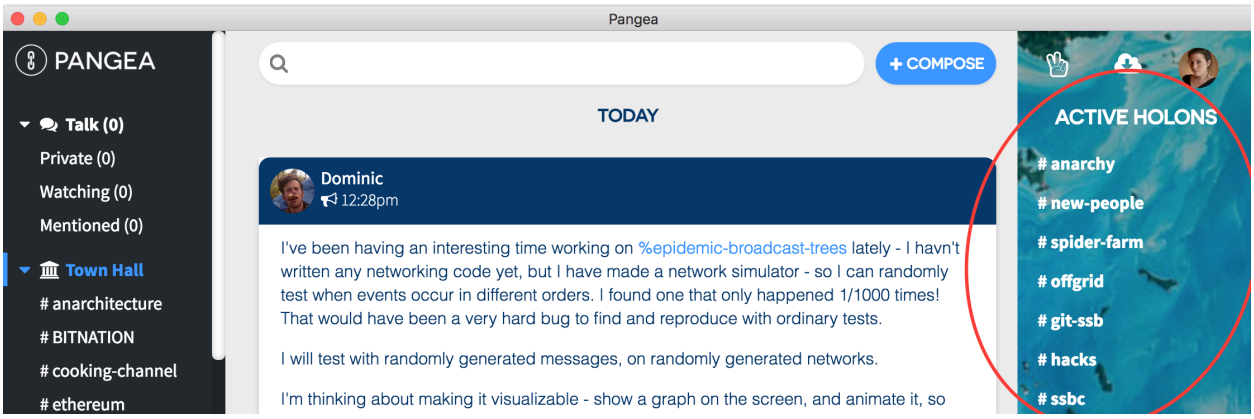
PAT master tokens are tradable tokens minted by the BITNATION DBVN through a smart contract. Unlike some tokens, they do not confer voting rights on holders. 34% of PAT master tokens are released on Pangea as rewards for Citizens who build up POA reputation. This portion will be used as a tradable token to reward the accumulation of individual and group reputation. Nevertheless, master token holdings are not indicative of reputation themselves and thus reputation cannot be traded on the platform. This portion of PAT master tokens also collects revenues generated by Pangea through small transaction fees on arbitration charges and contract timestamping on blockchains.

A further 34% of PAT master tokens will be sold to external stakeholders through a two stage Token Distribution Event (also known as an Initial Coin Offering), to generate resources for the construction of Pangea and to build a broad external stakeholder community which encourages user adoption.

The remaining 32% of the PAT mater tokens is reserved to reward BITNATION founders, contributors, advisors and current BITNATION Citizens and early Pangea adopters for developing, improving and maintaining the system (18% pre-allocated and 14% reserved as options and bounties).

3.4 Collective Versus Individual PAT - Proof-of-Collective (POC)

The ability of Citizens to create their own Nations in the Pangea Jurisdiction is a core feature of the platform. Pangea's software enables the creation of intentional sovereign communities - including Decentralized Borderless Voluntary Nations (DBVN) - by choosing and applying one or several codes of law, a dispute resolution mechanism and a decision making mechanism and adding governance services as DApps. DBVNs are functionally similar to "Channels" in SSB and Slack (see screenshot below). Eventually Pangea will permit DBVNs to nest into other DBVNs, allowing hierarchical scalability when the need arises.



Decentralized Borderless Voluntary Nation (DBVN) functionalities:

- A DBVN relies on smart contracts to govern community interactions
- Transactions and rules are maintained on a blockchain (usually Ethereum)
- Creation of Constitution (governs membership including how to enter and how to leave, benefits and responsibilities, core principles, etc)
- Choice of Legal Code (e.g. Common Law, Civil Law, Sharia, etc)
- Choice of Economic Model (e.g. Capitalism, Socialism, Communism, Taxemes, etc)
- Choice of Decision Making Model (e.g. Democracy, Holacracy, Theocracy, Futurarchy, Autocracy, etc)
- Choice of Jurisdiction (e.g. Pangea, or an external nation state jurisdiction)
- Definition of Governance Services (Security, Jurisdiction, Education, Healthcare, Infrastructure, etc)
- A DBVN scales through people forming Holons, a self-organized system. Sometimes synonymous with 'holacracy' and 'swarm methodology', it has been successfully implemented in organizations such as the Pirate Party, Bitcoin, Linux and Anonymous.

As with individual reputation, group reputation must be governed within strictly measurable parameters, with as narrow a scope as possible. The reputation of a group will be measured by the human members of the group, based on whether the governing entity (the DBVN, Port, Embassy etc.) fulfills its intention and promises set forth in its constitution. As with individual reputation, collective reputation tokens are also non-tradable. Should Citizens wish to have a function to 'rate' interactions with groups of which they are not members, such functionality could be created as a Third Party Application.

3.5 Contracts, Laws and Legal Codes PAT - Proof-of-Nomic (PON)

Just as individuals and groups build reputation, contracts, laws and legal codes are also be subject to reputation. In this case reputation will not be automated, but be based on human judgement: upvoting and downvoting the laws, legal codes and contracts created on Pangea, based upon their various abilities and utilities, including but not limited to:

- User Friendliness and Comprehensiveness;
- Efficiency, Security, Trustworthiness and Predictability;
- Openness (source code access and documentation).

Voting on laws, legal codes, and contract usability (in a similar way to Reddit or Steemit) allows individual laws, contract templates and entire legal codes to evolve nomically, akin to how Common Law has evolved.[31] We call this sub-token Proof-of-Nomic (PON). Initial thinking on integrating Nomic Law in the Pangea context was developed by **Dana Edwards** in 2016.

PON sub-tokens are non-transferable, but their value can be eliminated through downvotes. PONs attribution will be handled through the IPFS contract registry (via the intermediates of Lucy and the Oracle).

The purpose of PON is to provide users with a reliable way to check that a law, code of law or contract template will execute the functions as intended before selection for use. For instance, a Citizen could provide a contract template with a flawed source code, but since other Citizens have had the opportunity to vet the source code which corresponds to the contract deployed, it should not generate many 'upvotes'. That means the community can "catch" the flaw and if necessary downvote the contract, which will incentivise the contract creator to address the problem or lose reputation as a contract template creator. That example can be extended across all the different elements of a contract.

Extending the rating system to Laws and Legal Codes helps Citizens to navigate the many choices of laws and legal codes that will be offered on Pangea, much as user feedback on Yelp, hotels.com and AirBnB's, user ratings and comments aid customers in making informed decisions. In order to avoid Sybil attacks[32], the PON reward will be calculated based on the votes obtained by a specific contract **and** the reputation of voters (the amount of POAs they have). Thus making a Sybil attack useless since having a good reputation takes time.

[31] Nomic is a game invented by philosopher Peter Subic in 1982. It's a game in which changing the rules is a move. The Initial Set of rules does little more than regulate the rule-changing process. The Initial Set of rules were published in Hofstadter's "Metamagical Themas" column in Scientific American in June of 1982. The evolution of Common Law through legal precedent established through case law can be viewed as a Nomic process https://en.wikipedia.org/wiki/Nomic

[32] The **Sybil attack** in computer security is an attack wherein a reputation system is subverted by forging identities in peer-to-peer networks. It is named after the subject of the book *Sybil*, a case study of a woman diagnosed with dissociative identity disorder.

4. PAT Game Theory and BITNATION Business Model

4.1 Pangea Incentive Network - Mechanism and Network Effect

As described in **Part 2**, PAT tokens are released from the BITNATION DBVN onto Pangea after a contract is created and executed. A portion of the tokens released become tradable PATs, used to reward Citizens hosting pubs, and Citizens who have accumulated POA's (non-tradable reputation tokens). Thus, the more people who use Pangea to create contracts, the more users benefit. This modality incentivizes peer-to-peer promotion and adoption, creating a de-facto network effect to organically grow user adoption. It also incentivizes late adopters to get engaged on the platform.

4.2 Pangea Revenue Model

The Pangea revenue model is based on two sources of income, relating to contract creation and execution respectively:

1. A small transaction fee on the amounts arbitrators, judges and juries charge for their services on Pangea (in Bitcoin, Ether or other cryptocurrencies converted on-platform into PAT);
2. A small transaction fee on top of the amount miner's charge to timestamp and execute smart contracts created on Pangea on Ethereum or other integrated blockchains (also converted into PAT).

Revenue is charged in PAT, convertible from other cryptocurrencies on the platform. 40% of the platform revenue is distributed to PAT token holders. The revenue will be paid to token holders in PAT. 60% of the revenue will be kept in reserve for platform development and other expenses. Development priorities and budgets will be discussed through forums like consider.it and the final budget allocation will be made through the multisignature delegates. Below is a very conservative estimate of Pangea revenues in euro equivalent after five years.

Table 1: BITNATION Pangea business model - year five revenue projections (euro)

	Projected Annual Revenues After 5 Years	
	Revenue Streams	*Revenue*
	Smart Contract Notarisation	€ 14,880,000
	Dispute Resolution Market	€ 12,000,000
	Smart Contract Development Market	€ 10,000,000
	Total Revenues	€ 36,880,000

Revenue has been calculated from the ground up, using existing data on Bitnation market adoption on the bitnation.co website (use of Public Notary, World Citizen ID, Citizen adoption and Embassy and Consulate creation).

User adoption statistics have been estimated from data on the online legal services market , mobile chat application use, mobile phone adoption in emerging markets, and the '*System D'* economy[33]. The target market for early adopters has been defined as 'tech-savvy self-identified World Citizens' in the BRICs and *'Next Eleven Markets'*[34], piggybacking on polling which indicates more general disillusionment with the state, as well as political unrest and increased cryptocurrency adoption (factors which extend to other markets in Europe, Asia and North America). Detailed financial projections can be provided upon request.

Our business model takes platform fees into account, but *not* the potential increases in PAT token value, which is highly speculative, but likely to significantly impact revenues. In addition to the Pangea platform, BITNATION also develop a series of arbitrator bots and DApps that live on other chat platforms and link back to Pangea, including but not limited to: Signal, Telegram, Status.im, Firechat, Messenger, WeChat, Kik and WhatsApp. These DApps serve to drive traffic to Pangea, create additional brand awareness and, potentially, provide an additional revenue source.

4.3 Pangea Decision Making Mechanism

PAT Token holders do not have voting rights, in order to avoid the 'tyranny of the majority' problem[35]. Instead, BITNATION is governed by the principles of ***liquid holacracy***. This encourages participants to form holons and execute their own ideas without requiring the consent of any other parties (such as other citizens, BITNATION Core Contributors, or other entities). Virtual Nations (DBVNs) can be formed directly on the Pangea platform and will stand or fall based upon their ability to attract Citizens or members[36]. Since Pangea is built on open-source technologies, a group of individuals who disagree with the fundamental functions or direction of BITNATION, Pangea or PAT have the ability to fork the code, and create a version which suits them better.

The original BITNATION DBVN contract was developed in 2016 by **Alex Van de Sande** together with **Susanne Tarkowski Tempelhof** in Rio de Janeiro, Brazil, based on an existing MIST wallet DAO

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[33] **System D** economy refers to the 'black' and 'grey', or unregualted global economy
http://freakonomics.com/2011/11/01/the-black-market-is-the-second-largest-economy-in-the-world/

[34] **The Next Eleven** (known also by the numeronym N-11) are the eleven countries – Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, the Philippines, Turkey, South Korea and Vietnam – identified by Goldman Sachs investment bank and economist Jim O'Neill in a research paper as having a high potential of becoming, along with the BRICS countries, among the world's largest economies in the 21st century.
https://en.wikipedia.org/wiki/Next_Eleven

[35] A scenario in which decisions made by a majority place its interests above those of an individual or minority group, constituting active oppression comparable to that of a tyrant or despot.
https://en.wikipedia.org/wiki/Tyranny_of_the_majority

[36] **Holacracy** is a specific social technology or system of organizational governance developed by HolacracyOne, LLC in which authority and decision-making are distributed throughout a holarchy of self-organizing teams rather than being vested in a management hierarchy.http://www.holacracy.org/

contract. It was launched on the blockchain together with the BITNATION Constitution in early 2016. The contract was later on upgraded by **Johan Nygren** who added a patch against the recursive call vulnerability which led to The DAO hack in 2016. The contract has since been modified by **Eliott Teissonniere** with help from **Alex Van de Sande** to reflect the organisational changes required by Pangea platform development and the design of the PAT token.

BITNATION's organizational structure consists of several elements:

- **Decentralized Borderless Voluntary Nations (DBVNs):** BITNATION
- **Pangea:** The software
- **Holons:** Groups of people within a DBVN working towards a specific end. This can mean a holon dedicated to a specific subject like marketing of Pangea, or it can be a holon totally disconnected from BITNATION's operation, let us say a holon working on organizing social events.
- **Genesis Holon:** The core BITNATION executive holon, consisting of persons who make executive decisions on the strategic direction of the DBVN. Members of the genesis holon are selected on the basis of commitment to BITNATION, expertise in designated fields of work, and performance over time. Although membership will change, change is designed to have an inherent slowness worked into it, in order to provide long-term stability and continuity. Members of the Genesis Holon are the 'Guardians of the DBVN', essentially.
- **Core Contributors:** People who contribute significantly to core functions of the DBVN (like tech, community, finance, etc) at a certain point in time.
- **Citizens:** People who subscribe to the vision, philosophy and goals set out by the DBVN (in our case, the constitution) and subscribe to join as a Citizen, to enjoy the services the DBVN offers.
- **Ambassadors:** People who take an active role in BITNATION on a volunteer or semi volunteer basis, with a greater level of insight and engagement than an average Citizen. There are different types of Ambassadors, some focused on community engagement, others on diplomacy.
- **Embassies & Consulates:** Physical places for Citizens to meet, work and occasionally live. Can be a public spaces or private homes.
- **Allies:** Entities who have actively cooperated with the DBVN. Can be a private company (e.g. Exosphere), another DBVN, or even a Nation State (e.g. Estonia).
- **Spork-DBVNs:** DBVNs created on the genesis DBVN, living on the Pangea software.
- **Fork-DBVNs:** DBVNs created through forking the Pangea software into a brand new branch of the software.
- **Ports:** administrative entities, such as for-profit or nonprofit entities in different Nation State jurisdictions designed to interact with old world legacy systems such as banks and governments on behalf of BITNATION or other DBVNs (e.g. BITNATION PORT ONE (BNP1) in Singapore).

The diagram below presents a summary of BITNATION's organizational structure, and how it is intended to evolve organically over time. For example, the tech holon will grow in significance when we are in software development phases, and the community holons will grow in significance in market adoption phases. Additionally, the proximity of various holons to each other also shifts organically based on the particular stage in the evolution of BITNATION and Pangea.

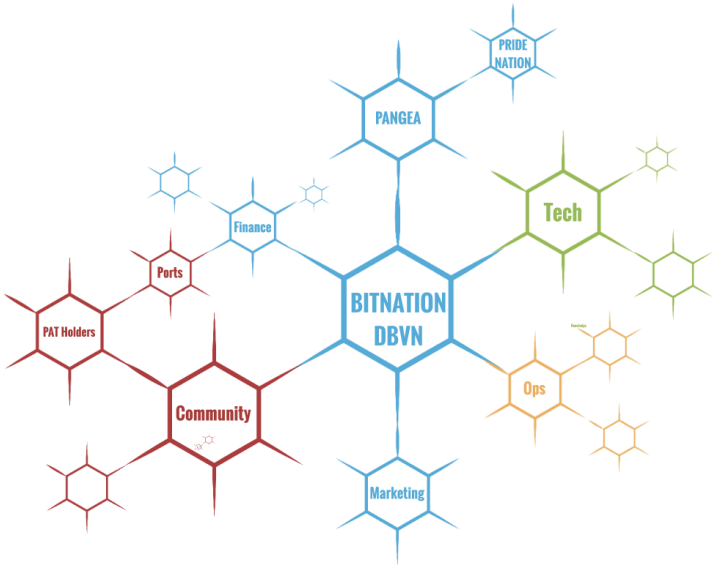

Figure 9: BITNATION liquid holacratic structure

4.4 PAT Distribution

The PAT token functions not only to provide incentives for dispute resolution, and the creation and design of smart contracts within the Pangea jurisdiction incentive network, but also to build and monetize good behaviour amongst participants. PAT will drive the expansion of the Pangea community of Virtual Nations and Citizens. There are 42 Billion PAT master tokens (in the spirit of the Hitchhiker's Guide to the Galaxy!). The purpose of having a large amount of tokens is also to ensure there are enough tokens in the future to reward users who have accumulated non-tradable reputation tokens. At the time of writing 5.88 Billion have been reserved (18%), primarily to founders, contributors and early adopters. Each PAT token is divisible by 18.

34% of the remaining tokens are allocated for distribution to new stakeholders during the ICO, 34% for release as incentives for Pangea users (on the platform) and 14% is reserved for allocation to future contributors to BITNATION software design, development, update, maintenance, user adoption and community engagement.

In order for token-based incentive networks to be effective, a wide distribution of tokens is desirable. If the Token Distribution Event is completed within a few hours or days, there are risks that total contributions will be limited to just a handful of addresses. We aim to ensure the decentralisation of PAT ownership not just by maximising the number of stakeholders when tokens are sold, but also by encouraging people who believe in virtual nations and decentralisation to own tokens.

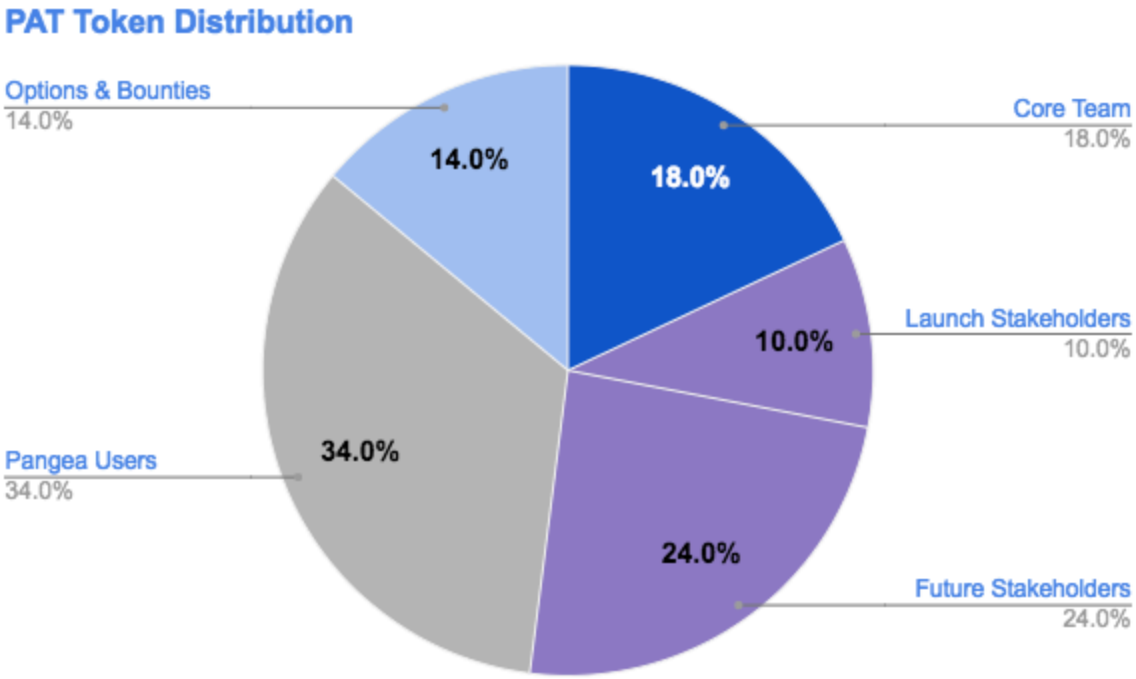

Figure 10: Total PAT token distribution

Our goal is maximise both the quantity and orientation of token-holders to ensure decentralisation and build a stakeholder community aligned with our vision. To maximise quantity, PAT tokens will be sold during the Initial Coin Offering (ICO) using a continuous release model which optimises opportunities for smaller token holders to participate over a 25 month period.

To maximise orientation, 36% of our tokens are reserved to reward Pangea users for building up non-tradable reputation tokens - allowing users to directly earn tokens by making agreements, resolving disputes, arbitrating disputes and writing new smart contract code (see section 3 for the automatic reward mechanism).

ICO Token Release. 34% of the tokens will be released continuously over 25 months. During the first 'Launch' month token release will be hard capped at 140 million tokens per day for the first 30 days. During the Launch month we will sell 4.2 billion tokens (10%). 20% of this initial launch offering (2% overall) will be reserved for allocation to preferred stakeholders during the first 48 hours of the ICO to enable a degree of preferential engagement by committed supporters. After the first 10% has been sold, we will sell 1% per month for the next 24 months (420 Million tokens/month) at a rate of 14 million tokens per day, after which the ICO is concluded.

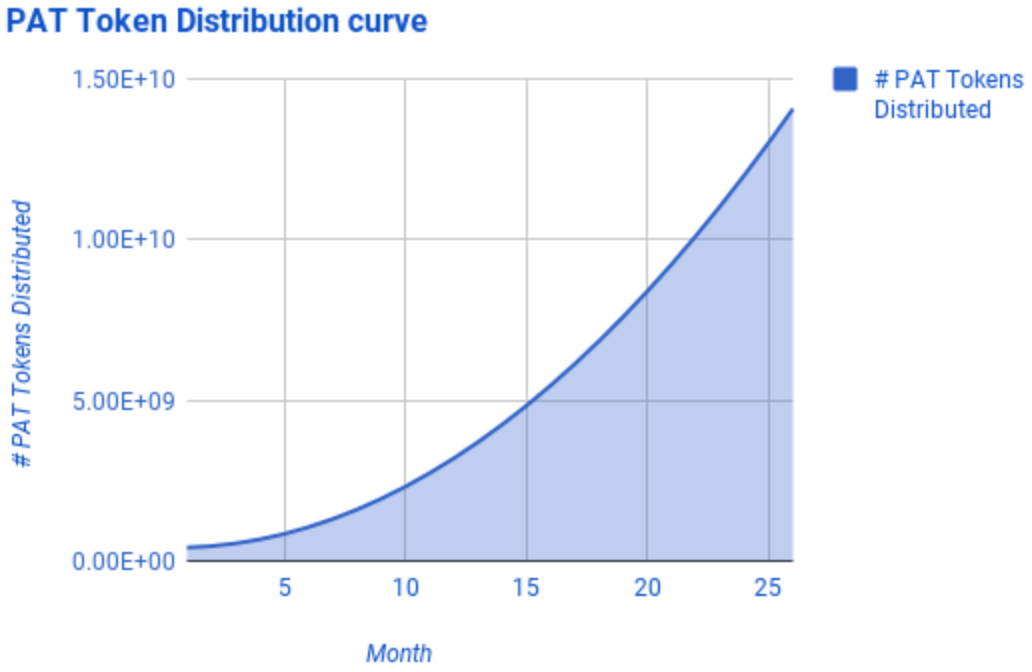

Figure 11: ICO token distribution curve (34% of total PAT tokens)

We will use the "continuous release ICO model" as designed by **Alex Van de Sande** (who has advised us on the ICO model). This will allow for continuous liquidity for the first 2 years of operations while we build Pangea and encourage user adoption. This will encourage a larger stakeholder community to emerge.

Tokens will not be priced but rather hard coded to sell to the highest bidder: 97 million per minute for the first month. This is probably a large enough amount to encourage investors to put their bid on the order book and eventually get their investment over time, reducing the need to rush and thus stress the Ethereum network.

Non-ICO Token Release. In addition to the 34% sold during the ICO, 32% of tokens will be pre-allocated to founders, present and future core contributors, and early adopters (pre-ICO BITNATION Citizens). Of this allocation, 18% will be for pre-ICO contributors, Citizens and Founders, and 14% reserved for future options and bounties.

ICO Smart Contracts. The ICO code is based on two smart contracts: one represents the tokens purchased and the other one is the continuous ICO. The token is ERC-20 compatible. Tokens can be "minted" by the DBVN through the ICO contracts as a reward for buyers. The latest version of our ICO contract is being implemented by ABDK Consulting which will also audit the DBVN code.

The remaining 34% of tokens will be used to credit people who have built up a large amount of non-tradable reputation tokens on Pangea, as outlined earlier in the whitepaper.

Post ICO Token Conversion: All tokens will be automatically converted to the final PAT token (1:1) as per the ICO/ token contract, when PAT is released with the Pangea full Alpha.. Existing BITNATION XBN CounterParty tokens will be exchanged for PAT tokens at an equivalent value.

ICO Funds Release. Funds are released using the BITNATION DBVN liquid holacratic decision making mechanism. The pre-agreed Milestone Based ICO Launch Funds (10% of total PAT) Release Schedule is:

- 15% End of Presale ICO
- 15% Panthalassa implementation
- 10% Panthalassa Smart Contract Integration
- 10% Pangea UI/ UX design
- 10% PAT Token release
- 10% Lucy and Oracle release
- 10% IPFS Contract and Document Registry
- 10% Pangea Public Alpha Launch
- 10% Pangea API

All funds raised above US$5M will be used to fund 3rd Party Governance DApp developers, local Embassies and Consulates, bug bounties, and contributor rewards.

Proposals will be publicly discussed on BITNATION's project page, powered by consider.it.

4.5 Roadmap

Table 2; BITNATION roadmap

Activity	**Date**	**Remarks**
BITNATION is founded	14 of July 2014	Whoop Whoop!
Multiple blockchain pilots are undertaken, including the world's first marriage, world citizenship, birth certificate, refugee emergency ID and land titles. Ambassador Network takes off all over the world.	Q3 2014 - Q3 2015	Interesting times
First iteration of Pangea is launched on NXT/ HZ	Q3 2015	Later on scrapped due to the realisation that all agreements starts with a conversation, hence needs a communication protocol as code base. Ouch.

New website is launched, initially including the option for users to register as Citizens, and later on as Embassies, Allies and Nations	Q4 2015	An accidental proof-of-concept
Public Notary is launched in cooperation with e-Estonia, used by thousands of people for things like freelance agreements, loan agreements, marriages, wills, birth certificates, etc.	Q4 2015	Not an accidental proof-of-concept
Decision is made to build on SSB after months of researching chat protocols and user markets	Q1/Q2 2016	And so it begins...
Additional services are added to test on market - education, security etc, through 3rd Party Providers	Q2/Q3 2016	Fun, but better to stick to core platform development!
Pangea pre-Alpha client built on SSB/ Patchwork released for Linux and Mac	Q4 2016	Apparently there's not many Windows developers in the Bitnation community!
Initial design of Panthalassa Initial design of IPFS Contract Registry	Q1/ Q2 2017	
Pangea Ethereum Smart Contract integration Panthalassa API Spork-DBVN Creation	Q2/ Q3 2017	We are here now!
Panthalassa Release ICO and Token Release Lucy and Oracle Design	Q3 2017	
Public Beta release, including arbitration market Final PAT token upgrade	Q4 2017/ Q1 2018	
Pangea API and Dev tools for 3rd Party Developers released	Q2 2018	
Pangea Beta mainstream market launch	Q3 2018	(after extensive security bounties, as well as community

		and focus group testing)
The exocortex (fully developed AI & AR integration)…	2020	...

5. Additional Information

5.1 Install Pangea pre-Alpha (SSB)

New version coming soon

The Pangea pre-Alpha desktop client for Linux and Mac can be found here.

Once you've installed Pangea, you will need to connect to the network. Go to the upper right corner of the client, and click on the icon looking like a cloud with an arrow on it. Then go to "Join Holon". There you will need to enter a @pubcode which will connect you to the network. It might take time the first time as the message chain synchronizes, please be patient.

@pubcodes can be found on the BITNATION Slack channel, you can also get one on request. As @pubcodes can expire, you might have to try several codes before finding one that works. This process will be simplified in the future through using automated @pubcode bots.

5.2 About BITNATION

BITNATION is the world's first Decentralized Borderless Voluntary Nation (DBVN). BITNATION started in July 2014 by **Susanne Tarkowski Tempelhof**. BITNATION hosted the world's first blockchain marriage, birth certificate, refugee emergency ID, World Citizenship, DBVN Constitution and more. Its website, including the Public Notary proof-of-concept, is used by thousands of BITNATION Citizens and Embassies around the world. BITNATION is the winner of UNESCO's Netexplo Award 2017.

Wikipedia - Pre-Foundational Paper - Founding Document - Original 2014 Whitepaper - DBVN Constitution and Code - Yearly Summary 2016 - Blog

4.3 Join the Community

GitHub - Slack - Trello Dev - Facebook Page - Facebook Group - Twitter - Steemit - Reddit - Bitnation.co - AngelList

4.4 Further reading

- Bitcoin Whitepaper
- Ethereum Whitepaper
- Rootstock Whitepaper
- SSB Resources
- IPFS Whitepaper

Competing legal codes and Polycentric Jurisdictions

- Paul-Emile de Puydt on Panarchy
- David Friedman on Polycentric Law

We are the Birth of a New Virtual Nation

We are a Future for Our World and Humanity

We are Sentinels, Universal and Inalienable

We are Creativity and Visionary

We are Rights and Freedoms

We are Tolerant and Accepting

We are Polity and Entity

We are Privacy and Security

We are Openness and Transparency

We are a Dream and a Reality

We are BITNATION