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Internet of People

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Abstract

This paper is a living document, a **blueprint** for a technical evolution. Over time it will be revised, as blueprints tend to be, to meet the needs of a future we cannot always predict. It describes **why** we are building the Internet of People, **how** we are doing it and **what** resources and organizations are necessary to achieve this. It also explains our relationship with other projects, most notably the Libertaria project, and how we connect with them and why.

The intended audience for this paper is not technical experts; this paper is for everybody interested in IoP. Thus, it is not a white paper. Instead, we are calling it our “blue paper”, blue because it is both a blueprint and roadmap describing the vision behind IoP and a high-level approach for how to achieve it.

This paper is intended to be as brief as possible to convey the overarching vision of the project. For readers with more technical expertise or who require more detailed information, we will be releasing several more in-depth yellow papers about the various projects inside the IoP ecosystem.

Introduction

The Internet of People (IoP) is a complete infrastructure for apps and payments without centralized servers and without intermediaries, gatekeepers and companies in between. Instead, it is completely decentralized and based on free-to-join nodes.

Thanks to the granularity of the software components that make up the nodes, they can be configured to run on many devices, from a powerful server, home computer, Raspberry Pi, or even a smartphone or IoT device. People connect to these IoP nodes and enjoy the services they provide. The nodes also let people connect directly without a middleman in between.

Why Internet of People?

The Problem

The vision of an Internet for/of the people stems from the recognition of several problems that plague our daily digital lives. Problems that reduce our freedom, even though the Internet was intended to make us more free. By enabling faster access and exchange of information, the Internet should have helped decentralize information. But instead we are now at a point where most of our data, even **private data**, travels to and is stored on centralized servers, effectively **mining us** for information. Every private message on Facebook, every mouse click on an advertisement, every scroll on YouTube is recorded somewhere for later use. Mostly this use is benign or even beneficial: used to feed algorithms which tailor offers for goods and services. But everything that can be used will at some point be **misused**.

Our private data is no exception here. In the modern digital economy, the people are the product. We are all exposed to platform-based economic models. But IoP will change this. IoP returns data control to its rightful owners—the people—and disrupts the platform-based economy through extreme disintermediation. We are not against business, we just want to put them back where they belong.

The Solution

The main property of the P2P economy is disintermediation. This translates into cheaper transactions and diminishes the influence of platforms that end up being locked up in silos and exposed to immense security risks and crippling data breaches. The minimum infrastructure to run a computer system is two devices directly connected to each other. This is also the limit on disintermediation.

This minimum disintermediation capability is what allows for person-to-person apps (P2P apps). When used for business, this translates into the cheapest business transaction possible and a broader person-to-person economy.

Internet of People Charter

Mission Statement

The Internet of People connects people securely and directly without any obstacles. IoP technology aims to remove all intermediaries which do not provide real value.

IoP Core Principles

Things have profiles.

People have profiles and people have an Identity.

- ⬢ IoP first - People first
- ⬢ IoT second - Things serve humans
- ⬢ Every human being has a face and a public profile
- ⬢ People can have many profiles and many roles for different purposes
- ⬢ People maintain their own profiles for public use
- ⬢ People are always in full control of the amount of privacy they want to have for their profiles / roles
- ⬢ Identity belongs only to the people, no third party can maintain identities
- ⬢ Privacy around identity and its properties is non-negotiable
- ⬢ Simply fighting the existing is not good enough, you must build better alternatives

“ People are always in full control of the amount of privacy they want to have for their profiles / roles ”

Internet of People Charter

Technology Principles

- ⬢ Decentralized first (global)
- ⬢ Distributed second (community)
- ⬢ Centralized third (local)
- ⬢ Networks are trustless
- ⬢ Protocols are permission-less
- ⬢ Systems are non-discriminating

We are giving individuals unprecedented amounts of freedom while encouraging them to be socio-environmentally responsible community members that run sustainable but effective economies based on collaboration and cooperation. We run under our own charter, we define our own rules and seek our own destiny while sailing under the flag of IoP according to the constitution of Libertaria.

Summary: IoP is...

- ⬢ Privacy first
- ⬢ Direct connections between people without unnecessary intermediates
- ⬢ Open and inclusive diverse and decentralised but interconnected communities
- ⬢ Self governance and liquid democracy

How does IoP work?

The technological foundation for the Internet of People consists of three main components:

- ⬢ Peer-to-Peer Server Network
- ⬢ Person-to-Person (P2P) apps
- ⬢ A cryptocurrency (the IoP token)

How does IoP work?

Peer-to-Peer Server Network

The peer-to-peer network is established by lightweight server applications (daemons) running on hardware nodes (PCs, Raspberry Pis and other compatible devices). The nodes accept and reply to messages from other nodes (to establish the network) and P2P apps (user applications) using IoP's protocols.

P2P apps are distributed (end-user) applications for mobile or desktop that are built to communicate with each other via a direct TCP connection. In order to connect securely, the P2P app establishes an outgoing TCP connection to a service on the node and the service attempts to relay the connection to another user's instance of the P2P app or reply with an indication that the other user is not available.

The network is bootstrapped by individually owned hardware nodes. Not every user needs to have a running node: IoP is made with real people and freedom in mind, and they should not need to set up anything they do not want to or do not understand. We envision that most end users will use dApps that automatically connect to IoP nodes. In fact, we expect only IoP Chapters will set up those nodes (for more information on IoP's Chapter and Division system, see the Community Structure section). As the IoP network follows the Libertaria Mercury protocol, it will be open and free for anybody to join. We want to encourage power users to set up many nodes to strengthen the network. Thus, in contrast to Bitcoin, IoP will incentivise node owners. For example, node owners can offer services that earn transaction costs. This will be explained later in more detail.

Each node will run one or more of the following services depending on the needs of the entity hosting the node (memory/CPU constraints, privacy, completeness):

- ◆ Content Addressable Network (CAN) Server
- ◆ Location Based Network (LOC) Server
- ◆ Proximity Server
- ◆ Profile Server

How does IoP work?

Peer-to-Peer Server Network

A brief overview of each type of server follows. More detailed, technical yellow papers will be made available for each service.

Full Nodes

A 'full node' is defined to be a node running all the available peer-to-peer services and the IoP Core wallet that ensures the integrity and strength of the IoP blockchain.

Content Addressable Network (CAN) Server

The Content Addressable Network (CAN) server is responsible for storing and serving content for P2P apps. By providing a network where content is directly addressable, nodes and P2P apps can find content without regard to which node it is stored on. The nodes that include a CAN server form what is effectively a distributed database. This is more or less equivalent to a content delivery network (CDN) in current centralized systems but built using peer-to-peer technology based on a customized fork of IPFS.

Location Based Network (LOC) Server

The foundation for geographically located services is the Location Based (LOC) Network. This is a peer-to-peer network of nodes that dynamically self-organize based on a specific geo-location configured by the operator of the node hosting them. Profile and Proximity servers register with the LOC network to establish their location and therefore become geo-localized. This capability enables features that would be difficult to achieve without it.

Establishing relationships between location-based nodes also helps secure the network against some kinds of attacks by providing a web of trust of these nodes on top of a mostly untrusted underlay network provided by internet service providers.

How does IoP work?

Peer-to-Peer Server Network

At a more technical level, LOC nodes organize using the following concepts:

Unrelated Nodes

LOC-enabled nodes can join the network with no configured relationships to other nodes. Unrelated nodes are not trusted by default. Any one of them can be a malicious node of any kind. Thus interactions with unrelated nodes should be carried out with special care. Other nodes can then find them and choose to include them into the following organizational categories.

Colleague Nodes

LOC-enabled nodes may need to provide P2P app services globally. By forming groups based upon hosted services, the node can avoid resource wasting connections from other nodes which they are not configured to handle. These related nodes are considered to be Colleagues.

Neighbor Nodes

On the other end of proximity scale, LOC-enabled nodes will also form groups based on relative physical distance from each other. This organizational structure enables discovery of services that are more local to the user, enabling P2P app discovery for things like markets, public services, local governance, etc. These related nodes are considered to be Neighbors.

Using these cached node connection types, each node hosting a LOC server provides a Node Network Map made up of a Neighborhood Map and a World Map. The Neighborhood Map is more granular and covers a smaller area, while the World Map is less granular but covers the entire globe.

P2P apps searching for a user can then hop from a known LOC server (the one their Profile Server is registered to) to another node across the globe or a closer neighborhood to find app services or people.

Peer-to-Peer Server Network

Profile Server

Profile Servers allow end users to expose their user profiles to their peers in order to be found on the network, connect to others, and exchange information using a P2P app. P2P apps will locate a Profile Server to connect to or from nodes in close geographical proximity or connect to a specific node that the user chooses.

Application Services are defined as P2P App communication channels available for apps to use in app-to-app data communication. Each Application Service has its own message protocol provided by the hosted application itself. End users communicate between each other through apps that rely on Application Services and could use dApps like an IoP Explorer to find profiles of a specific type for a specific purpose.

Profile Servers provide the following basic services:

- ⬢ Profile Check In/Out: User agents check in end user profiles once they are online. This allows other end users to find them, connect with them and communicate with them
- ⬢ Application Service Check In/Out: Application Services also check in when they are online, to signal that their channel is open.
- ⬢ Application Service Call: An application service at one end user device can place a call to a remote instance of itself through Profile Servers. This call is for signaling purposes: exchanging connection requests and agreeing on P2P communication details.

Peer-to-Peer Server Network

Proximity Server

Proximity Servers provides **real time** location and location-based **activity information** for a P2P app's connected users. Proximity Servers are intended to be utilized primarily on nodes that might be moving around (on a bus, in a food truck, street food cart, etc.). A proximity server registers its general location with the LOC network and answers queries from hosted applications needing location/activity information for application in a particular area.

The following are some example use cases enabled by the proximity server:

- ⬢ Taxi services (Uber like or fleet based)
- ⬢ Public transportation services (buses, trains, subways, trolleys)
- ⬢ Family/Friend/Group locator services
- ⬢ Interest based people finding applications (dating, club members, games)
- ⬢ Food/Merchandise delivery and tracking
- ⬢ Logistics applications (delivery/service vehicle tracking, fleet management)
- ⬢ Car pooling and sharing applications
- ⬢ Autonomous car ride services
- ⬢ Real time motor sports (rally, baja, drone, airplane, boat racing)
- ⬢ Travel tracking and scheduling (airplane, bus, train)
- ⬢ Maritime tracking (shipping)
- ⬢ People explorer (augmented/mixed reality information overlays)

To facilitate its stated purpose, the proximity server allows any app/user to store, update, and search app/user activity-related information. Depending on the needs of the app/user, that information may be updated frequently (within limits). App/users will be able to delete records at any time, even before submitted expiration. App/users can search on location, activity information, or user.

How does IoP work?

P2P Apps

The profile and proximity servers exist to facilitate person-to-person (P2P) applications, or dApps.

P2P Apps are end-user applications written by third-party developers or members of the IoP Community.

IoP Connect is a P2P app which demonstrates one way to connect people using the IoP infrastructure and protocols in the form of a basic messaging application.

How does loP work?

Cryptocurrency

The loP token (IOP) is a cryptocurrency derived from the latest version of Bitcoin Core using the same SHA256 algorithm with a unique PoW (proof of work) consensus algorithm. The IOP token is designed to:

- ◆ Distribute block rewards to the loP community and its members fairly
- ◆ Reduce the need for high powered/high power consumption mining
- ◆ Run services in the loP ecosystem around nodes and apps

loP Core (the wallet and miner daemon) uses a one-of-a-kind PoW system that only allows new tokens to be mined from whitelisted addresses (permissioned mining) and caps the amount of block rewards that any one address can mine in a given window. In comparison to the usual model for scarce resources like gold or Bitcoin, where those with power and money exert undue control over ownership and distribution, the IOP token is a scarce resource that is part of the shared commons (like the planet and its ecosystems). Think of the Internet of People as a community-owned digital cooperative of people and resources.

The whitelisted addresses include a number of administrative licenses and one license per Chapter, as described in the Community, Structure and Governance section below. The cap is currently a factor of 2 and the window is 2016 blocks. This means that even if a mining license is used on hardware with a very powerful CPU, that license will not be rewarded with more than twice the average miner reward count. This average is recalculated every block reward for a window of 2016 blocks.

The loP token is intended to be used for transactions between users using P2P apps built for the loP nodes and the Mercury protocol ecosystem, thus enabling a P2P economy.

Like any currency-based economy, the P2P economy requires buyers, sellers, something to trade (goods and services) and the currency to be actively used for payment. Therefore the loP token's value relative to existing forms of money will be determined by its scarcity, availability, and usefulness.

Community Structure & Governance

“The Internet of People Community is a robust ecosystem consisting of volunteers, chapters, academics and research centers, business and private developers and the many people out there.”

The loP token supports the whole loP Community, and the community forms a digital [cooperative](#). The decentralized loP Community collaborates with the loP Chapters and loP Ventures as an even larger digital cooperative. The loP digital cooperative does not run on top of a centralized platform that needs to be fueled by buying gas from the owners. It is an independent, decentralized and free network of nodes and protocols. Anyone who wants to join can do so for free. Everyone who joins can use the chain and transact without discrimination or restrictions. In this sense, participating and using loP to transact is permissionless, trustless, borderless and non-discriminating.

Chapters

The loP Chapter structure is a novelty in the crypto and blockchain space and has been operational since late 2016. Chapters are local regionally defined entities with a strong focus on the local market and with mining licences to fund activities in these regional environments. The chapter system is intended to create a network that is as distributed as possible, both in terms of people and location. The territorial restriction ensures maximum decentralization. New Chapters can be established after a testing period and onboarding process, with the community having the ultimate decision on whether the new Chapter is created.

To correct for the emergent centralization that we see in Bitcoin and Litecoin and most other coins, mining is not permissionless. Mining is granted on a consensus basis to the most committed chapters around the globe. In this sense, loP is a permissioned chain, running a PoW algorithm, but following a system that is similar to a delegated Proof-of-Stake system (dPoS, like for example Lisk). Following this nomenclature, loP is a dPoW system.

Chapters compete to acquire one of the mining licenses. This competition takes the form of public education, spreading the word and attracting new members. In the future, we imagine these chapters building long-term crypto-academies.

The choice of which chapters receive licences is made by the community itself, with the Chapters deemed most valuable to the community granted a license. The chosen chapters mine loP, which they can use to support projects. To maintain their licences they will build networks in their community.

The community votes on this and other issues which affect loP as a whole. This voting system prevents malicious actors from exploiting the system. Thus, individual users indirectly govern the development of the chapters, their distribution and thus the overall development of the loP network.

Governance

The Internet of People has a unique and strong governance system with two components: internal community governance and public governance. This balances power and keeps the project healthy by avoiding stalls and bottlenecks.

Our upcoming IoP Community & Governance Paper will explain the sociopolitical structure of the whole IoP family and provide a detailed plan for how to set up IoP as a self-governing digital cooperative. What follows here is a brief overview.

Part of the global governance is that every wallet owner can vote for their favourite chapters, propose projects and can try to get them implemented, with voting results recorded on the blockchain. The voting and proposal systems are open, permissionless and non-discriminating.

But the community is so much more than wallet owners and chapters. There are also divisions and other actors that make up a decentralized community. To govern this structure most effectively, we naturally have to introduce certain rules. Over time, we will develop the protocols and smart contracts to implement these rules and processes transparently and efficiently.

Thus, IoP is building a truly worldwide digital cooperative that consists of many entities, properties and actors.

Before we put specific rules into place, they will be sandboxed to evaluate how well they work and whether they can be exploited.

Divisions

While the chapters work locally to achieve great things in their respective regions, the loP division system ensures people cooperate effectively at a global level.

A division is a professional structure within the loP community which brings together people from across all chapters with the same professional background or interests. Divisions are staffed by community members and led by the most capable / experienced people in the division. This takes the best aspects of the corporate world and combines them with a non-hierarchical decentralized organisation, leaving out the pyramidal centralized structure which plagues so many companies and states.

The purpose of the division system is to bring the best and brightest of our global community together to in a decentralized ecosystem to develop high quality dApps and use cases on top of the loP infrastructure. Divisions are not responsible for developing this infrastructure; that responsibility falls to loP's core developers at loP Ventures.

Current IoP Divisions

Management & Strategic Planning

- Product Management
- Entrepreneurial Council
- Business Analysis
- Finance
- Business Development

Marketing

- Public Relations
- Content Creation
- Translation
- Influencers/Social Media
- Event Management

UI / UX & Graphic Design

Development

- Frontend Development
- Backend Development
- App Development
- Automated / Manual Software Testing
 - Quality Assurance
 - Beta Tester

Customer Care

- Moderation
- Technical Support

IT Administration / Infrastructure

- Safety / Security

Member / Chapter Services

Legal

Libertaria

During the development of the IoP Community, it has become clear that many aspects of the IoP vision for a truly decentralized society require further research and development. Many of our existing societal institutions will need to be reimagined and redesigned. This is a complex iterative process.

The Libertaria movement (with new legal entities backing it) was established to:

- ⬢ Provide a framework for this evolution from a technical platform and community to a decentralized society.
- ⬢ Remove legal/business encumbrances

Libertaria is separate from IoP, giving the movement the freedom to iterate and innovate the IoP technical foundation. However, there is naturally a large initial overlap of contributors to both projects, ensuring a smooth transition for the technical backbone and knowledge.

“Broadly speaking, Libertaria focuses on research and development, building infrastructure, and defining protocols and socio-economic standards, while IoP focuses on making these ideas into reality, by building apps, supporting blockchain-based services and establishing the first complete local community inside the Libertaria Movement.”

Three of the Libertaria projects will directly benefit the Internet of People in the short term:

- ⬢ Project Mercury
- ⬢ Project Titania
- ⬢ Project Hydra

Relationship with loP

The **Mercury Project** will provide the next generation implementation of the loP protocols and services. Mercury will build on and enhance the loP peer-to-peer network, specifically the following servers and the protocols they use to communicate with P2P apps and between themselves:

- ⬢ Profile Server
- ⬢ Content Addressable Network (CAN) Server
- ⬢ Location Based Network (LOC) Server
- ⬢ Proximity Server

In addition, new functionality and improvements will be developed, including:

- ⬢ Developer friendly client implementations (SDK) and support
- ⬢ The original vision for an Open Social Graph and protocols
- ⬢ Grid computing/AI
- ⬢ An enhanced version of the Connect P2P app with improvements to services and protocols
- ⬢ Application Services and Standardization Libraries

For more information about the Mercury Project, please see the [**Mercury White Paper**](#).

Relationship with IoP

The **Titania Project** will provide a custom, secure, minimal operating system and consumer level hardware for nodes. With Titania, IoP nodes will be securely deployed to the P2P Mercury network in a very easy, convenient way. The user has full control over their own node if he owns one or he can connect to another trusted one via his smartphone.

The **Hydra Project** is a directed acyclic graph of Merkle trees (graph of hashes) and a multichain protocol to interact with it. It will be the blockchain backbone providing interoperability between side- and child chains implementing the Hydra protocols, including:

- ⬢ Atomic swaps between side chains where possible
- ⬢ Storing the edges for the Open Social Graph on chain
- ⬢ Security for the side chains
- ⬢ Side chain templates for P2P apps to create their own blockchain/token



Roadmap Overview

Chapter Governance

Develop processes for growing IoP community through the Chapters. Chapter Governance

IoP Prototype Nodes

- Publish Full Node
- Publish Titania OS Node

IoP Core

- Implement pico denominations
- Wallet micro payment support

**Q4
2017**

P2P Network

Migrate nodes to Mercury Connect Services

P2P Apps

- Update Connect App
- Mercury Connect SDK

IoP Core

- Implement Algorand
- Scale blockchain

**Q1
2018**

P2P Economy

- Open Social Graph
- Micro payments on chain

IoP Core

- PoS/PoW mining
- Hydra Integration

**Q2
2018**

Roadmap current situation

IoP Token

In the near future the IoP Token will transform from a digital commodity into a currency-like token with multiple properties of utility.

Current IoP Token specifications

Currently, there is a supply of just under 3 million tokens, each consisting of 10^8 integral satoshis. The final supply is just short of 21 million tokens (our theoretical maximum is **2 063 039 797 690 000** satoshis).

- ⬢ Our code is based on the latest bitcoin version with some modifications
- ⬢ 8 decimals (satoshis) per coin like bitcoin
- ⬢ Not ready for coffee on chain

Future changes to loP Token

New Denomination

We will change the denomination ciphers from 8 to 12 to enable pico transactions. The amount of tokens will remain the same, but will be divided into 20 630 397 976 900 000 000 satoshis (we call them picos).

Algorand Consensus, hybrid PoS/PoW, new Blockchain

After that we will concentrate all our energy on developing a working open source Algorand implementation and replacing the Bitcoin consensus with our own [Algorand implementation](#).

We will then switch to a PoS / PoW hybrid system, with Chapters mining to finance the divisions and community developments and a PoS implementation to incentivize running a blockchain-capable loP Node. The nodes will offer services to their communities. People will be able to stake loPs and thus take an active part in the ecosystem. In this way we will establish a power equilibrium between miners and people. Later, we will create better tools for community governance and mutual checkpoints.

Bridge to Hydra

loP will be the first reference implementation of an independent child-chain connected to Hydra which enables the first true decentralized p2p economy ever.

Future Token Properties

- ◆ Ready for nano payments
- ◆ Superior Algorand Consensus
- ◆ Complete rewrite of the blockchain optimized for scaling
- ◆ Switch to PoW/PoS hybrid System
- ◆ Bridge to Hydra / connecting to Hydra Protocol

Roadmap details

Mercury Protocol

The Mercury Protocol needs a complete rewrite and overhaul in design for Phase 2. With Libertaria's help, it took loP over a year to build Mercury Phase 1. This was because no examples of a true decentralized stack existed before. We expect development to be much faster for Phase 2.

The Mercury protocol will be connected with the Hydra protocol to enable the loP Nodes to store immutable data and utilize Libertaria's P2P economy through dApps.

Decentralized Stack

Once these steps are complete, we will have a decentralized stack that applications can make use of. With this underlying framework, the community, developers and entrepreneurs will be able to build real decentralized p2p apps that do not sit on top of platforms in a vendor lock.

Decentralized Apps

loP will start working on dApps once Mercury Phase 1 is fully complete and the first prototypes like the Connect app are considered usable. This will occur before the Mercury rewrite.

IoP Ventures Company

The IoP Community is independent and governs itself. Its developer company, IoP Ventures, has the role of securing IoP's further development in alignment with the Libertaria standard protocols for a decentralized society. Another important function of IoP Ventures is attracting developers and setting up a stable work environment for them.

We have a [public high-level roadmap](#) to show the community what we are currently on.

In addition, IoP Ventures will work on real-world dApps that compete with traditional businesses. The details would go beyond the scope of this paper, but two examples would be the first truly peer-to-peer taxi app or a decentralized profile finder app, which would have many different uses (e.g., securing expert help, offering services, exchanging goods, or even dating). A fully decentralized stack enables many services which are currently impossible, such as finding an apartment to rent without using and paying an intermediary.

The IoP Community embraces innovative developers and, via IoP Ventures, provides them with a real-world competitive company to collaborate with and bring their disruptive projects to life.