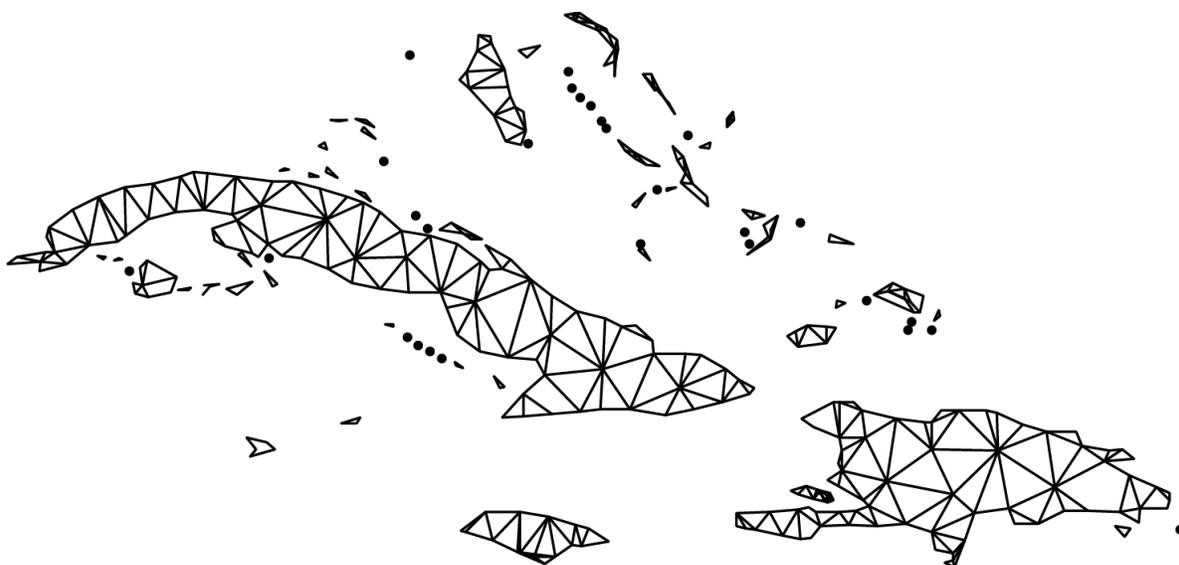




# ARCHIPEL

*Divide and Federate*



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## What is Archipel vision ?

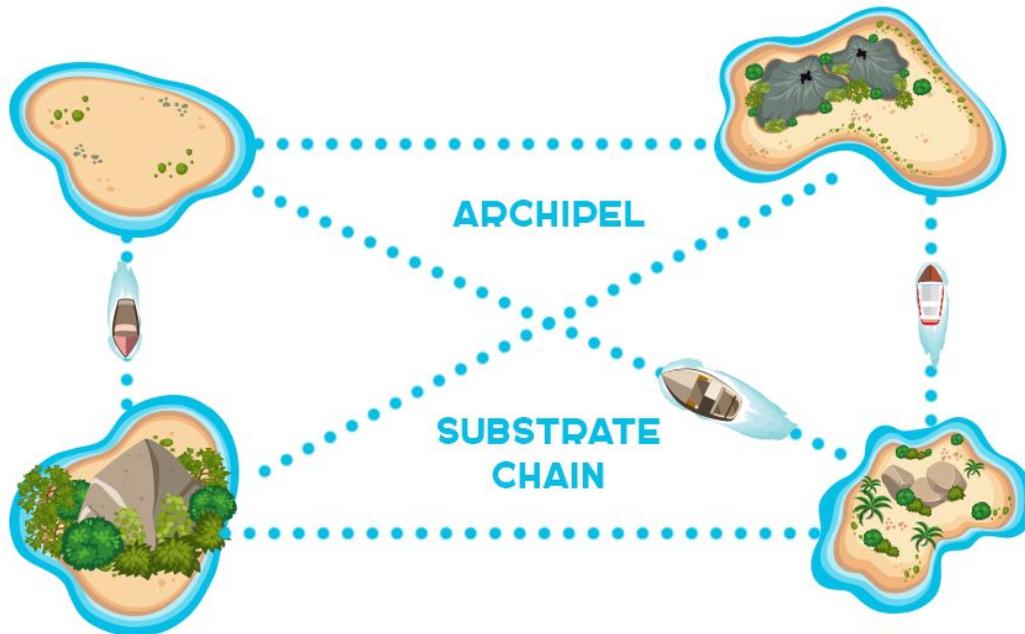
Real **shared economy** and peer to peer economy  
will start with **shared infrastructure**.

If we want to go beyond Blockchain and decentralization buzz words, we need to realise that it remains meaningless if it relies on centralized infrastructure.

We want to materialize decentralization by encouraging the distribution of physical and self-owned nodes.

This contributes to the emergence of drastically new services and allow us **to take our data, self sovereign identity and monetary autonomy back**.

Since ancient times, people tend to unite in groups. This allows them to be stronger and achieve greater things. Why aren't we creating groups of infrastructure to match human interactions and behaviours? We imagine a future where everybody can regroup themselves into federations of their choice. That will allow them to share data, services and even revenues.



We present you the Archipel, the backbone of any federation. It's goal is to allow the creation of your own federation with your friends and family.

In fact a federation is a small linked network of light infrastructure installed in it's members home. Physically this light infrastructure is represented by a custom Mini PC that can replace the home Wifi and Lan router, the home automation server and so on. Furthermore this

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device will also be the endpoint for a large number of blockchain services.

The main pain points of running the decentralized blockchain services are latency and availability.

We want to introduce redundancy, monitoring and failover components for decentralised services to solve these pain points. To coordinate their actions, the federation nodes are synchronized using efficient substrate chain. Thanks to inter-node synchronization, it is now possible to globally run resilient and highly available services with no downtime.

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## **Archipel - run unsinkable services**

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What service do we target first ?

Before pretending to address the centralisation problem of existing services (cloud storage, data privacy, social networks), we must firstly tackle the blockchain new ones. The first targeted service by Archipel is staking service. Nowadays, we see more and more centralised delegated stacking services emerging. We think that this specific merchant services and infrastructure will inevitably lead to centralization and cartelization. We must find a real decentralized solution to prevent the hegemony of Proof-of-Stake firms and do not reproduce the Proof-of-Work centralisation scenario. Because the decentralization goal is to remove intermediaries, we don't want to introduce new intermediaries for staking.

We think it's not too late to try to federate heterogeneous hardware and provide the sufficient quality of service for staking and influence the staking industry.

Thanks to Archipel everybody will be able to create decentralized staking setup and to help reduce the unwanted impacts of staking service merchants, cartels and dealers.

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## **Archipel - your node, your stake**

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## What problem will be solved ?

One of the most important requirements in Proof of Stake protocol is the availability of Validator nodes.

If you want to participate efficiently and not be slashed by the network you need to be always available with nearly zero downtime.

To achieve this you must have a stable network connexion and power supply. Having such infrastructure at home is almost impossible.

In a home setup the downtime is inevitable: power cuts, reboots, internet connection failures. You can try to avoid this with redundant network connections from different ISPs (Internet Service providers).

But even if you will have two separate network connections, it is near impossible for the most of people to have power supply redundancy. We think that it can be a sticking point for a broad adoption of any PoS network which opts to be widely distributed.

Thanks to Archipel, individuals will be able to federate with others nodes, on different locations, using different Internet providers, 4G failover and power redundancy by design. This will provide the needed high availability and will make PoS accessible for everybody.

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## Archipel - high available decentralized staking for everyone

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## What will be your first MVP ?

Archipel project will focus on efficiently solving one problem : allow everyone to bootstrap a federation of decentralized highly available nodes.

### **First PoC**

The Polkadot validators liveness is monitored and supervised by Archipel chain acting as a watchdog. If there is a problem with validator node, Archipel federation will coordinate through a Substrate chain to take an action. It will ensure that one and only one validator is active within the federation at the same time (Active/Passive mode).

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## Second PoC

In the second PoC, the Polkadot validator nodes will be in Active/Active mode. Each node is ready to validate and is connected to Archipel chain via an API. The validator have to check if it is allowed to submit to the Polkadot network. In deed, it have to check if it is currently the elected node within the Archipel federation.

Our goal is to be ready and efficient at Polkadot mainnet launch planned in Q4 2019.

“

**Archipel - zero to one, one to many**

”

What kind of services will come next ?

The Archipel federated nodes will provide huge opportunities for many other services. Other Proof of Stake chains (Cosmos, Dfinity, ETH.2.0), highly available data storage (filecoin, sia storj), highly available task scheduling services for off-chain computing (iExec), everyone will benefit from a decentralized federated infrastructure. Moreover, this kind of redundant service infrastructure can be also used for other Polkadot services like fisherman, collators and other parachains.

An Archipel node will be able to share its services with other federations and even open them to everyone (public access). For instance, if you want to guarantee availability of your IPFS content, you could have your content replicated within an Archipel to assure the data availability thanks to pinning service. You can even be rewarded for storing other's content (filecoin,storj and others).

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**Archipel - Federate, Create and Serve**

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## What are the main components of Archipel solution ?

We believe in the open source paradigm. To build “open execution” platform with blockchain, we must start with open source code.

### **The software part**

To jump into the next generation of peer-to-peer software, we will use **Substrate** : the tool set for blockchain innovators. It will be used to build the Archipel chain. The substrate chain will allow us to perform the p2p communication, state sharing and synchronization between Archipel nodes.

For the decentralized software packaging and delivery, we will use **DAppnode package** system. It uses IPFS and Aragon App to manage software releases. It provides a very simple and intuitive dashboard which allows you to install, upgrade and monitoring any blockchain nodes or software that you want to run on your home light infrastructure.

### **The hardware part**

Firstly, we will promote the usage of existing decentralized hardware (Avado or Dappnode).

Then, we are will prepare a custom hardware Archipel box (multiple LAN interfaces, 4G and power failover). The Archipel box will provide the best out-of-the-box high available light infrastructure that you can have at home.

Again, the essence of an Archipel is to be at your home not in the cloud.

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**Archipel - Archi for Permanent services Ensured by Liveness checks**

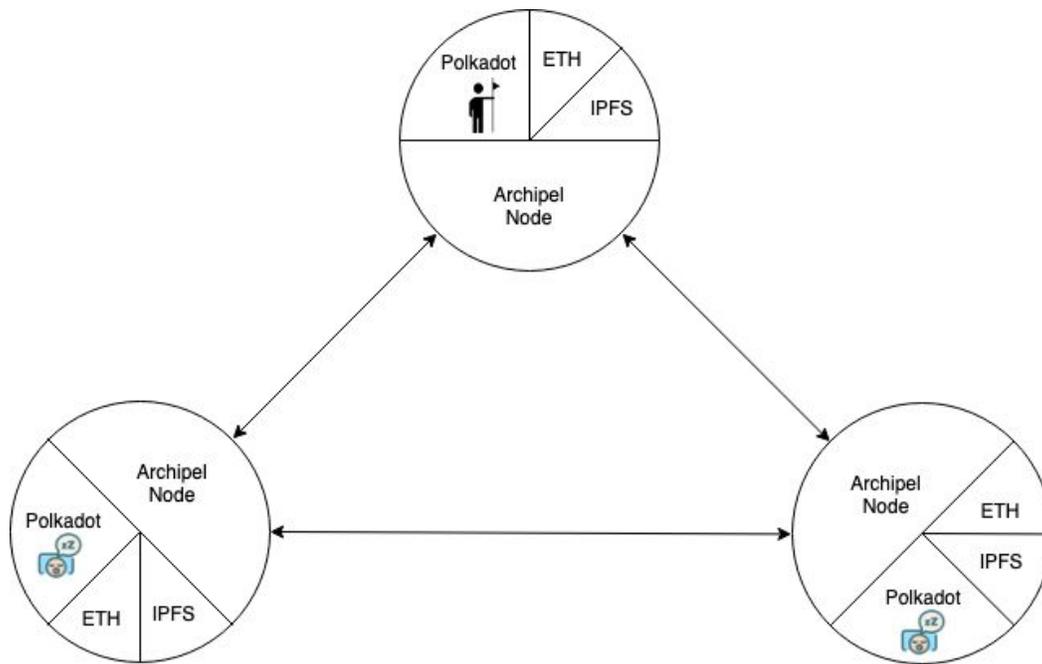
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## How does it work ?

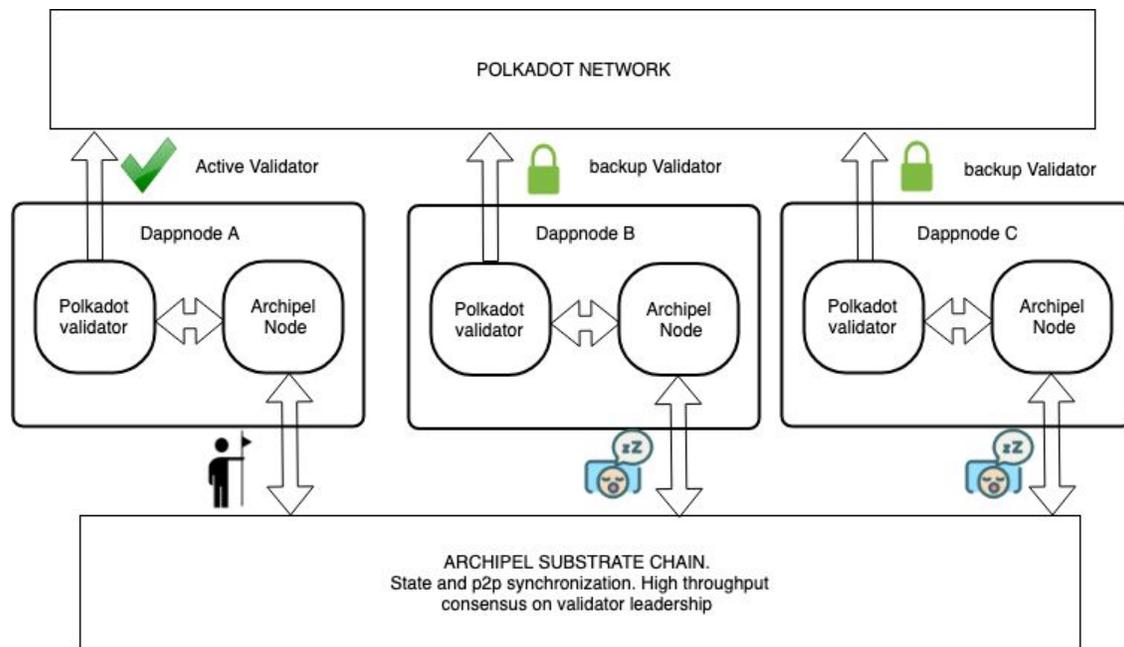
A classic Archipel federation includes few nodes (three to seven nodes ) to allow the fast consensus in the Archipel chain.

The Polkadot validator node and Archipel chain node are deployed on the same hardware using the DAppNode software : <https://dappnode.io/>.



*Archipel federation of three nodes*

Here you have an example of three nodes in different locations (friends or family). Each member has a Polkadot and an Archipel node installed. Of course, you can run any service that you need at the same time and at the same hardware (IPFS, ETH, Bitcoin). You can choose the services you want to run in the DAppNode dashboard. These three nodes group themselves into an Archipel federation. In the federation, all Polkadot nodes share the same validator session key.



*Polkadot validating with Archipel substrate chain*

After launch, each Archipel node starts to store its current state, activities, and performance statistics. This state will be propagated into the Archipel substrate chain.

Using this shared state and statistics, the current best node is elected (see node A with a flag man at the schema). This node will pass in the active mode. Node B and C are in passive mode (Sleeping icon at the schema). Then the active Polkadot validator node (Node A) executes its duty according to the Archipel Substrate chain state. Indeed Archipel nodes are able to choose locally the active Polkadot validator by the aggregation of all peers states and statistics.

The Polkadot stacking modules are customized to be able to connect to the local Archipel chain using an API. These two services are running on the same node using DAppnode software.

Indeed, before validating, the Polkadot node query the Archipel node API for the current leader state. As previously described the current leader is defined thanks to the Archipel Substrate chain.

The Archipel Substrate chain is a blazing fast chain running by nodes within the same federation. Each federation has its own Archipel Substrate chain. Since a federation includes a small number of participants, consensus can be reached very quickly and the response delay for Polkadot validators will be minimal.

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When the leadership state is confirmed on the Archipel Chain, the validator can execute his nominal validator duty as a Polkadot validator.

The usage of the Archipel chain allows to assure that there is only one Polkadot validator with the same session key that validates blocks and propagates them to the network.

It will allow to prevent the double signing, misbehaviour and slashing from the Polkadot network.

From our understanding of the current staking keys Polkadot management, there are :

- Stash accounts key: holding funds
- Controller account key: allow to switch between validating, nominating and idle mode, set preferences and sessions keys
- Sessions keys: used in the running nodes to signed block production or validations
- Transport layer static keys: needed at the libp2p layer to identified node and connexions between them

The first naive idea is to have the same Session key shared and used by all validator nodes within the same Archipel federation.

Active/Active mode means that all nodes try to operate at the same time. Before operating all Archipel nodes must insert theirs state in the archipel Substrate chain. The Archipel node state includes a couple of performance metrics (latency, uptime ...). The node with the best performance will take the slot and operate. Other nodes will switch to the backup mode, ready to take the relay if necessary. Every nodes, regardless its mode, always submits the performance metrics to the Archipel chain.

For the reward distribution within an Archipel, if human (family/friends) coordination is not enough, we can think about creating or using a multisig contract feature.

To sum-up, as the delay is essential for the PoS validators, the Archipel Federation nodes will:

- Operate in Active/Active mode
- Composed of 3, 5, 7 (We will research for the optimal federation size)
- In the same geographical area to have a low latency
- Trusted setup of nodes to allow fast consensus (your family and friends)
- Tolerate individual node instability thanks to the global resilience

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As long as one node is up and running in the federation, your Archipel is alive.

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## Archipel - modular and evolutive design

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What are our Archipel dream ?

We are dreaming that the **Archipel box** will be the **physical manifestation** of the new Web 3.0 vision redefining trust, privacy, security, and identity.

Why using multiple devices in your home ?



*Multiple Devices*



*All-in-one Solution*

Why not to merge them together and have overall and easy access to Web3 infrastructure (blockchains, ipfs etc..) ?

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Archipel box will be able to replace classic Internet provider box, smart home hub, personal assistant hub and other devices that you have at home.

Let's bring a Web3 Archipel Box in all living-rooms by default : root layer for p2p economy.

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## Archipel - Serve Yourself and Serve Your friends in federations

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- Let's introduce an open source TEE in this hardware!
- Let's introduce an HSM (Hardware Security Module) in Archipel box for optimal cryptoprocessing and secure digital keys management!
- Let's introduce and connect an personal assistant module with privacy by design (like SNIPS <https://snips.ai/>)!
- Let's introduce an LCD screen and some buttons to the Archipel box which will be used inside a federation for some operations confirmation (2FA, password recovery mechanisms, administration or validation of some important transactions)!

Let's explain what can do the solutions like DAppnode today. The unstoppable websites: Your frontend is served by IPFS as each DAppnode has an IPFS node up and running. You are able to resolve for instance .eth addresses thanks to Ethereum Naming Service smart contract. This contract stores an IPFS link to your front-end (javascript webpage). Your “backend” is served by any blockchain. You can choose which blockchain you want to install and use in DAppnode control panel (Ethereum, Bitcoin, Polkadot etc).

Yes, we like a lot the DAppnode software, their team and values. We want to empower their vision by adding Archipel features to DAppnode. Together we will allow the creation of new **decentralized resilient service infrastructure**.

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## Archipel - new horizons are open

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What are your non technical dreams about Archipel ?

Launching an artistic movement and contest around the Archipel box: design of dock and case.

Archipel dock will be created by an artist (stone carving, wood carving ...) to fit your node hardware and to enlighten your living room.

Archipel dock and case will be an Non-Fungible Token in some SubstrArt chain.

The Archipel hardware will always have the same size. Using this information any artist will be able to create his own case and then sell it on the special platform.

When a customer (Nodler) will order an Archipel hardware, he will have the option to add his favorite artwork case.

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**Archipel - An esthetic incentive to run yourOwnNode**

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Say no to black or white ugly plastic device boxes in your home! The Archipel's thoughtful and simple design will allow it to become a beautiful element of home decor. The Archipel case will be made from noble materials like high quality wood, stone, ceramic or steel.

Art and Esthetic objects in the living rooms of humans that exist since cavern ages, let's activate this trigger!

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**Archipel - Art triggering decentralized infrastructure**

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What is your business model ?

Our **business model is to model existing businesses,**  
but **divided in light infrastructures**  
strengthened by **federated** nodes.

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### **Our own federation**

Firstly, we will run our own federation with our friends and family to continuously improve our product and create a profitable decentralized staking service solution.

### **Development for other PoS projects**

We will work hard to integrate other PoS projects into Archipel. We will attract other blockchain projects that need high availability for their decentralized services (decentralized staking and others).

### **Archipel Box**

In the future, after finishing the software part, we will create and sell the Archipel Box. As we explained earlier this box will merge all user's home hardware (home router, home automation and personal assistant hubs and many others) and will be optimised for running blockchain services. It will also provide out of the box high availability (network 4G and power failover). The all-in-one hardware solution will allow you to consume less electricity.

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**Archipel - Consume less energy, earn money and save the planet**

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We will never compromise on being open source, independent from big corporation continent and promote decentralized archipel infrastructure.

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**Archipel - Divide and Federate, a non zero sum game**

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## Archipel Corsair Crew



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Sculpting clay, wood, stone, Open Source solution and Open Execution through blockchain, I am a software engineer graduate from Polytech Annecy.

I have a strong backend experience on complex systems working for around 10 years at Orange Information Systems. I started as a developer, endorsed the role of technical leader, and then was in charge of the Build Center Activation department for several business critical projects. This experience brings me a lot, working with many teams, production applications with high availability constraints, performance and security.

After that, I then decide to follow my curiosity, new ideas and intuition, and it leads me to naturally meet and dive into Ethereum and learned its ropes. I work as Blockchain developer at iExec for 2 years now and I am always hunger to learn and explore new technologies coming like Substrate and Polkadot.

I see computing as a science and science evolve thanks to shift. We used to shift from mainframe to client/server architecture. Client/client software and P2P economy is heading. On Board! I want to shift, swing and grapple with this new playground with Archipel project.



## Vladimir Ostapenco

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I am infrastructure, security and cloud engineer. After finishing my Master degree in Information Systems, Networks and Virtual Infrastructure Administration, I developed a deep interest in cybersecurity, AI and blockchain.

During my university studies, I did a lot of research work that could be really useful for Archipel project. I worked on “Implementation and integration of a cluster of embedded systems” and “Comparative study of the performance of different distributed file systems”. I also studied the problem of electricity consumption by embedded systems. I finished my studies with a thesis in log mining and anomaly detection.

Having many years of experience with on premise and cloud infrastructure, I worked with the production environment of different sizes. Starting with a small infrastructure of several dozen users ending with a huge infrastructure of more than forty thousand users.

I am working as blockchain infrastructure engineer at iExec for 2 years. Now I am focused on developing with Rust using Substrate framework.

As a member of the Regional Information Systems Security Club and a certified Cisco Security, my goal is to create and maintain a highly secure, scalable and truly decentralized infrastructure.