

CARTESI

**Lightpaper**

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# Table of Contents

- 03 The Blockchain Adoption Barrier
- 05 Mission of Cartesi
- 08 The Tech
- 12 Whitepaper
- 13 Use Cases
- 16 The Cartesi Token (CTSI)
- 17 Cartesi Cryptoeconomics
- 18 Roadmap
- 19 Partners
- 20 Team
- 22 References & Other Links

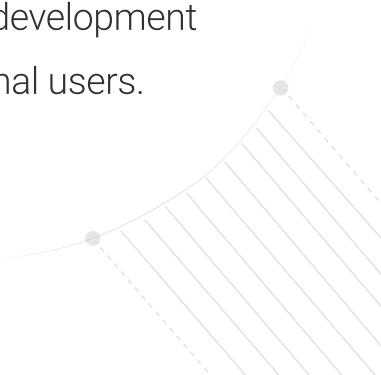
# The Blockchain Adoption Barrier

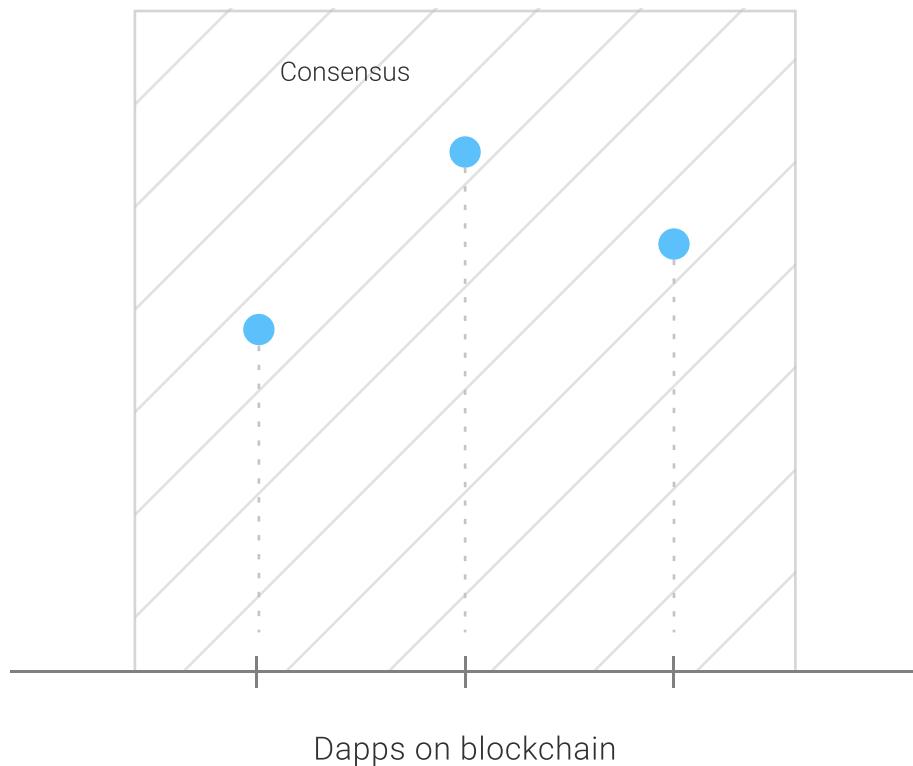


Blockchains supporting smart contracts are often compared to decentralized world computers. In reality, even with immense resources being invested on development and protocol optimizations, even when significant resources are invested in application development, they are far from personal computers or application servers.

Personal computers and application servers run real operating systems, support software that evolved through decades, and do not operate under artificial throughput caps imposed by consensus mechanisms.

As a result, there is a technological abyss between the centralized and decentralized worlds. This can be seen in the power of applications, in the ease of the development process, and in the experience delivered to final users.





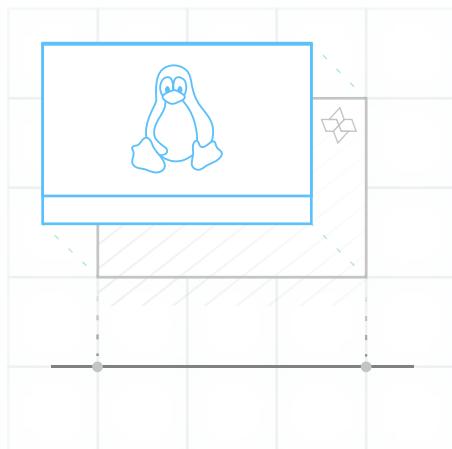
While running computations off-chain compromises decentralization, public blockchain computations are too limited in power, even for a relatively simple DApp. Developers operate with a restricted set of tools to create their DApps, and cannot perform even the simplest operations like opening a compressed file or reading a record from a relational database. These handicaps lead to bad UX and applications with an archaic feeling. They are a formidable barrier for end-user adoption.

Until the abyss between centralized and decentralized software is finally bridged, the decentralized Web will remain an elusive dream.

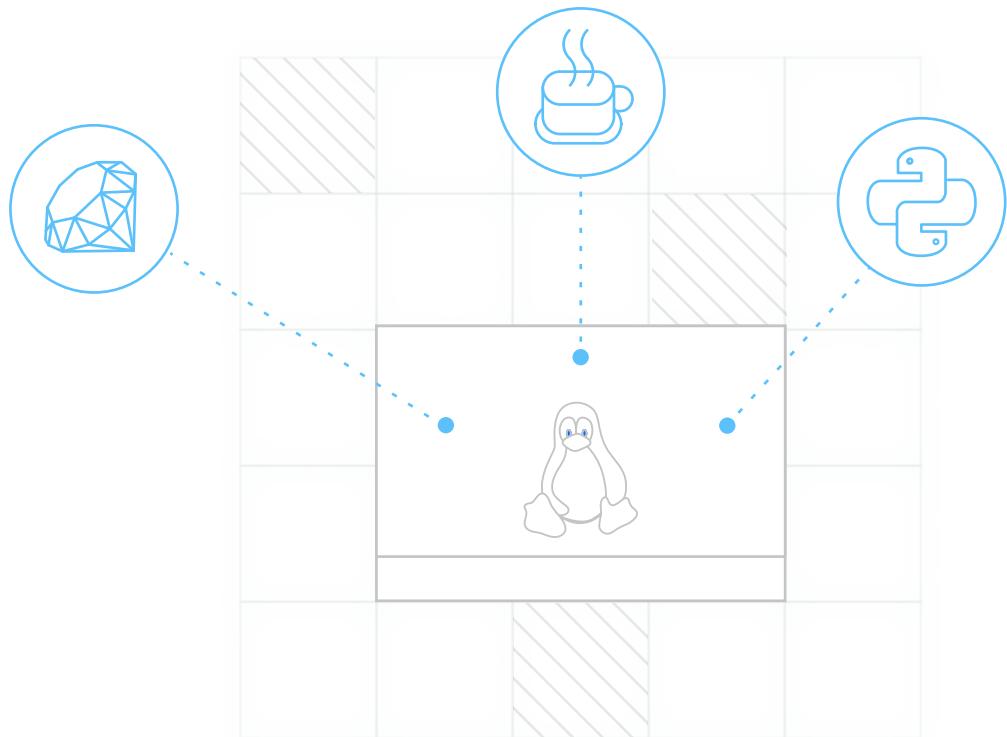
# Mission of Cartesi

Cartesi creates a bridge between Linux and blockchain. It gives DApps massive processing power and industrial-grade programmability.

Cartesi provides a Linux runtime environment for scalable blockchain Dapps. Complex and intensive computations run off-chain, while retaining the security guarantees of the blockchain.



Dapps developed with Cartesi are significantly more powerful and easier to build.



With Cartesi, developers can continue to use the mature software infrastructure they are already proficient with, supported by Linux. They are free from the hassle of limited idiosyncratic blockchain environments. Instead, they can build on decades of software development and combine existing components to build their blockchain applications. Mainstream developers encounter a welcoming, familiar environment on which to express their ideas.

Cartesi will also make DApps portable across the most relevant blockchains, so developers don't have to worry about the longevity of specific blockchain projects.



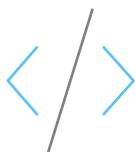
## A Linux Infrastructure for Scalable Dapps



**Scalable:** Intensive computations performed off-chain while retaining the security guarantees of the blockchain



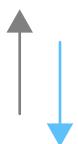
**Expressive:** DApp logic built with a real OS and the option of thousands of open-source software components available for Linux



**Adoptable:** Barriers of adoption removed. Developers use familiar software stacks and popular standards to code DApps



**Fully-Decentralized:** Consensus securely reached on-chain. No reputation protocol, no TEE, or central servers on the cloud

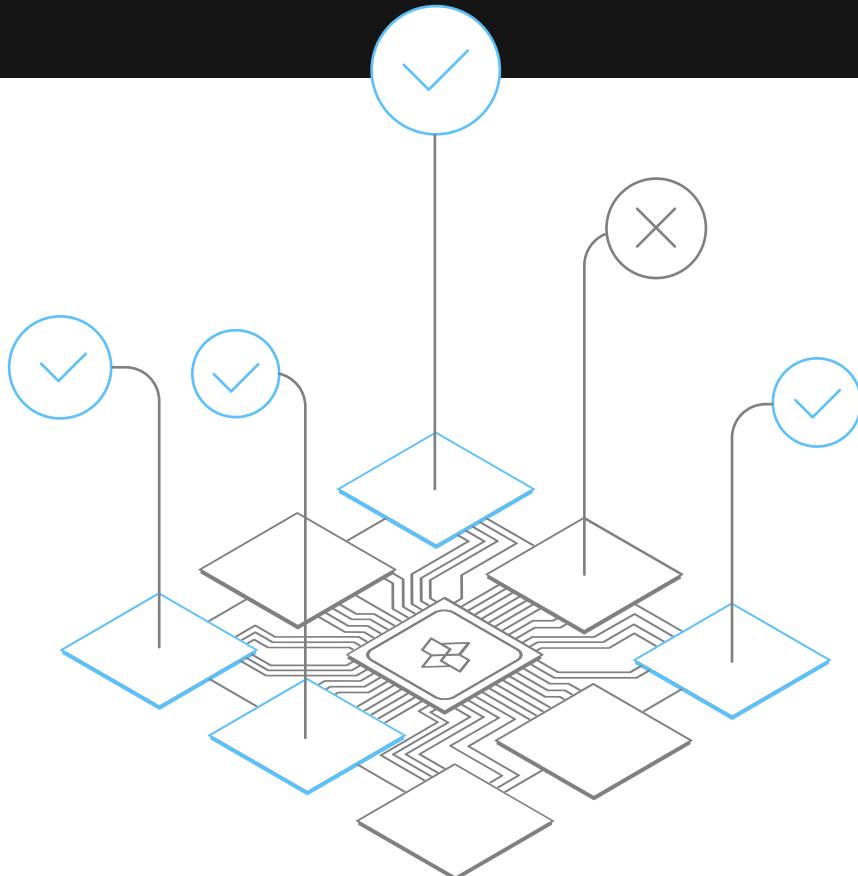


**Portable:** Cartesi will make DApps portable across most important public blockchains that support smart contracts



**Private:** DApp state can be kept private among application participants

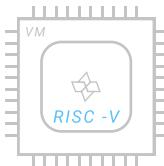
# The Tech



## Cartesi Core

Cartesi Core is an infrastructure comprised of on-chain and off-chain components. In a nutshell, each participant that wants to interact with a Cartesi DApp does so through the off-chain component, which is called the Cartesi Node.

By moving computation off-chain, Cartesi Core removes the processing load from the consensus layer while preserving the security guarantees of the underlying blockchain. That's rendered possible by the combination of three principles.



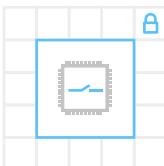
## A Fitting Virtual Machine Architecture

Cartesi includes a custom VM, called the Cartesi Machine, that deterministically emulates a RISC-V microprocessor and runs an embedded Linux distribution. That's where the decentralized logic of the DApp is executed. The Cartesi Machine is self-contained and reproducible. These two properties are necessary for DApp participants to retain verifiability and achieve consensus.



## A Cryptoeconomic Protocol

Cartesi uses economic incentives to encourage DApp participants to engage with the system honestly and in the most efficient way, by responding timely and achieving common agreement on the results of computations that happen off-chain.



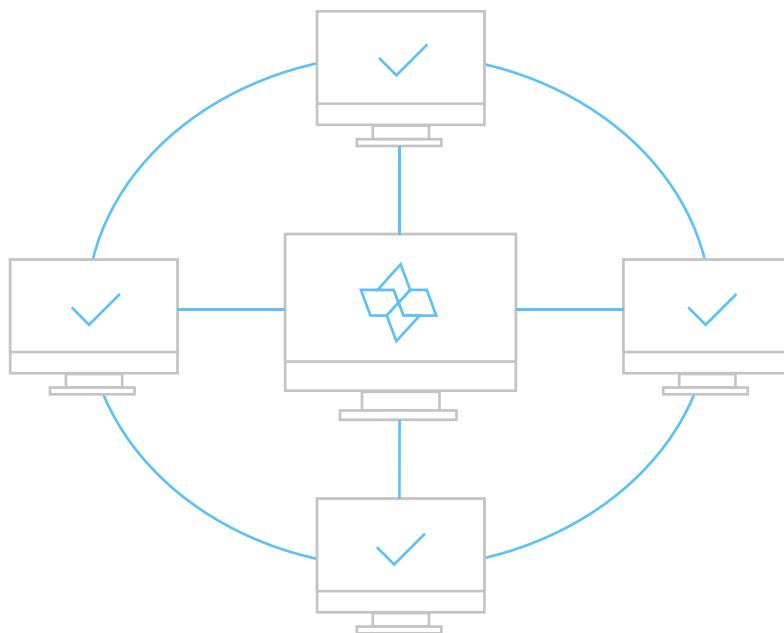
## On-chain Dispute Resolution

If DApp participants fail to achieve agreement off-chain, the blockchain becomes a supreme court mediating a dispute resolution protocol. Bad actors suffer heavy economic punishments, while honest participants are economically compensated by the inconvenience suffered. Even in the rare circumstances when arbitration is needed, the verification process is performed with an interactive protocol that involves a negligible amount of computation and cost for the blockchain.

## Data Ledger

While the Cartesi Nodes greatly expand the computational limits DApps, other scalability problems remain such as the high cost of transactions and the issue of data availability.

To mitigate these problems, while maintaining the system portable across blockchains, Cartesi will develop a decentralized side chain based on Proof of Stake.

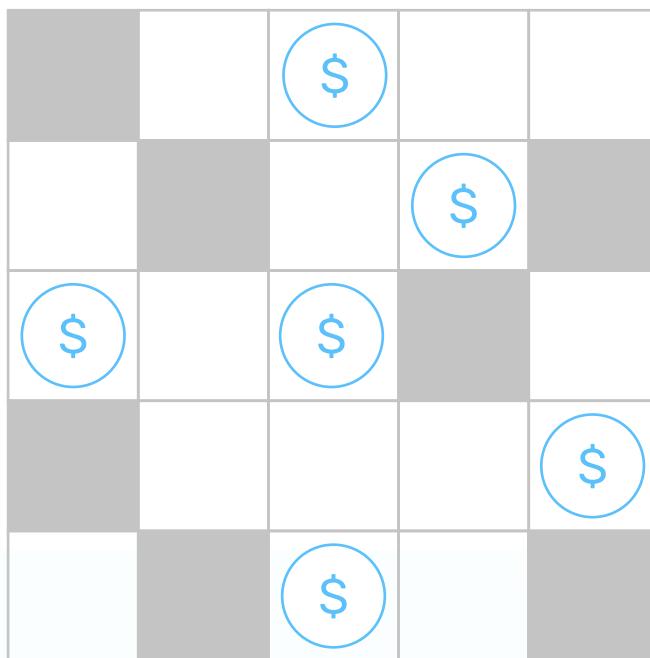


Cartesi's Data Ledger will be optimized to work with the core technology of the Cartesi Machines. It will be built for short term storage, garbage collection, sharding, offchain emulated computations and localized consensus.

Data Ledger will employ a simple and yet robust implementation. This is possible as the main chain will be used in various critical parts of the consensus algorithm, such as random number generation and block ordering.

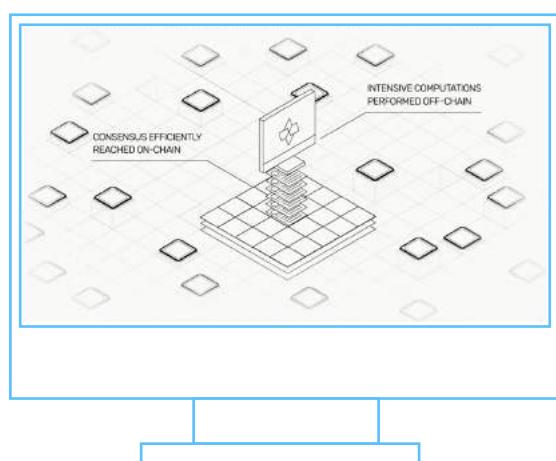
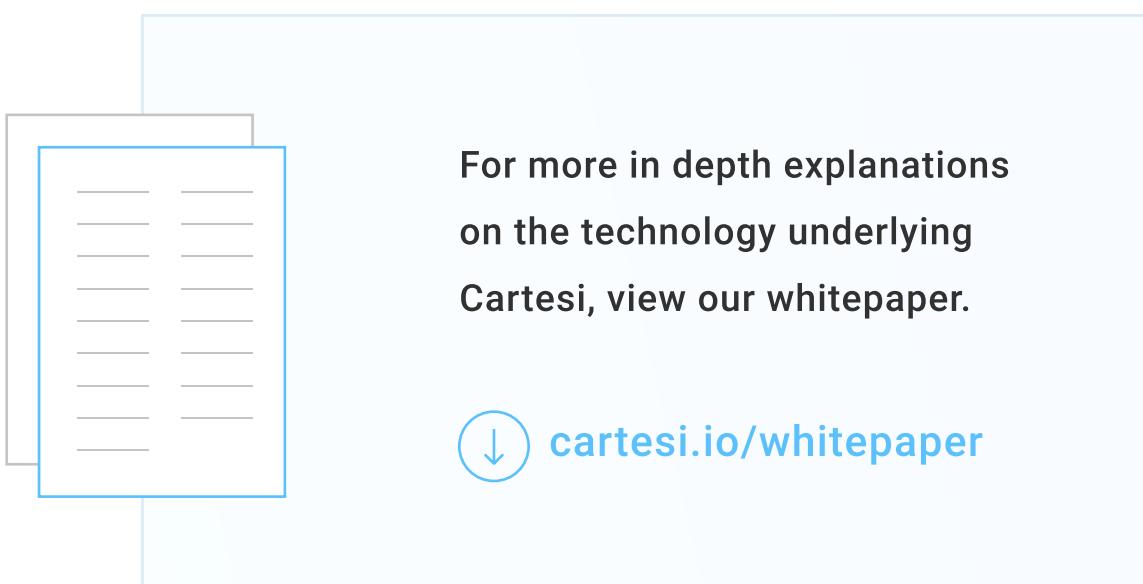
## Mining

Cartesi reserves a 250 million CTSI allocation to a mine. The mine reserve will be used to generate extra incentive for early adopters and miners, helping to bootstrap the Cartesi Network. These tokens will be distributed to Cartesi Nodes being selected by Cartesi Network's PoS algorithm used by the Data Ledger.



The CTSI rewards that miners will obtain from the reserve will gradually reduce with time. That will happen similarly to the way that miners of Bitcoin or Ethereum obtain block rewards, with a geometric decay along the years. These reducing rewards will be offset by the fees collected from Cartesi users for the services provided by the network.

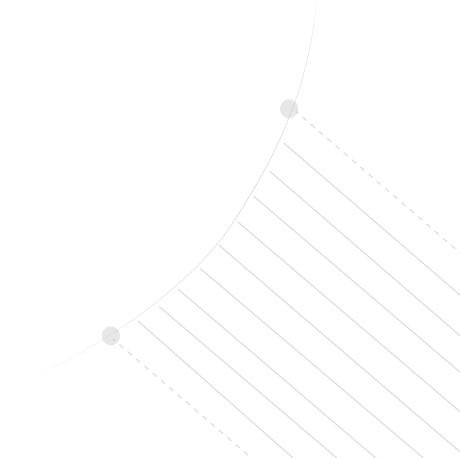
# Whitepaper



# Use Cases



Cartesi allows the creation of a vast array of decentralized applications. It greatly expands the possibilities of current technology with benefits such as: use of traditional software stacks, easy and resourceful development environment, high TPS, high computational throughput, native financial settlement layer, portability across the most relevant blockchains and usability conveniences for DApp users. Cartesi aims to be accessed, used, developed-on in the most convenient fashion, ultimately, to become the prevailing DApp platform.

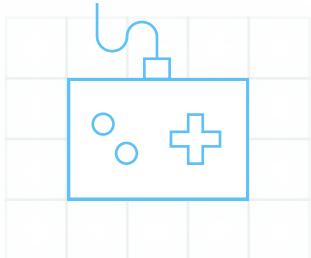


## DeFi



Cartesi applications will be able to read and do complex calculations involving data from multiple sources. This will help interoperability between blockchains and services such as future and insurance markets.

## GAMING



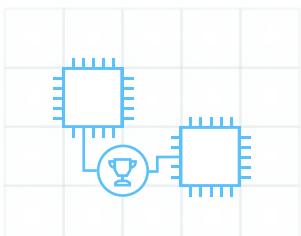
Cartesi will unleash vast new possibilities for blockchain games. Developers will be able to use traditional tools and libraries that can be compiled for Linux. Additionally, game state processing will be free from the computational limits and high fees of blockchains without the need to sacrifice decentralization.

## CREEPS

### Creeps is Cartesi's first use-case and technical demonstration

A fully decentralized tournament without the need to develop smart contracts. All while using software stacks that compile for Linux

## MACHINE LEARNING



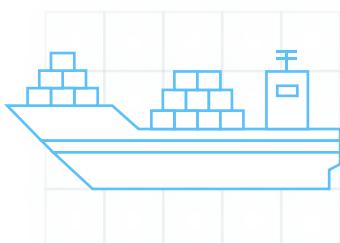
A trustless marketplace for AI and computational tasks. With the power of Cartesi's decentralized automated verification, developers will be able to create services that allow new DApps to outsource and distribute work. This opens new possibilities for lower cost AI, developed by outsourced experts and bots.

## THE FUTURE OF AUTOMATION



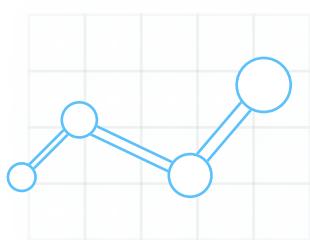
"With the power of Cartesi's decentralized verification, applications will be able to outsource and distribute verifiable work. This opens new possibilities for trustless marketplaces and autonomous systems involving humans and machines, propelling IoT, data science and AI through new business models."

## LOGISTICS & OPTIMIZATION



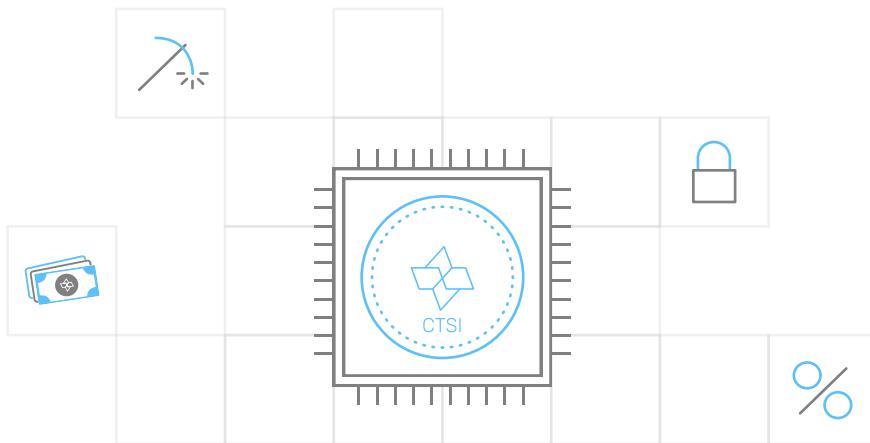
With Cartesi, professionals in fields such as logistics will be able to offer their services and be hired by enterprises internationally and without the need for intermediaries.

## RESEARCH



Outsourced computation will allow for millions of users to lend their idle computing power. This will benefit scientific research, 3d rendering, video transcoding and many other computationally intensive tasks in a trustless way, without reputation systems.

# The Cartesi Token (CTSI)



The Cartesi Token economy has been designed to overcome challenges of usability and scalability of blockchain applications.

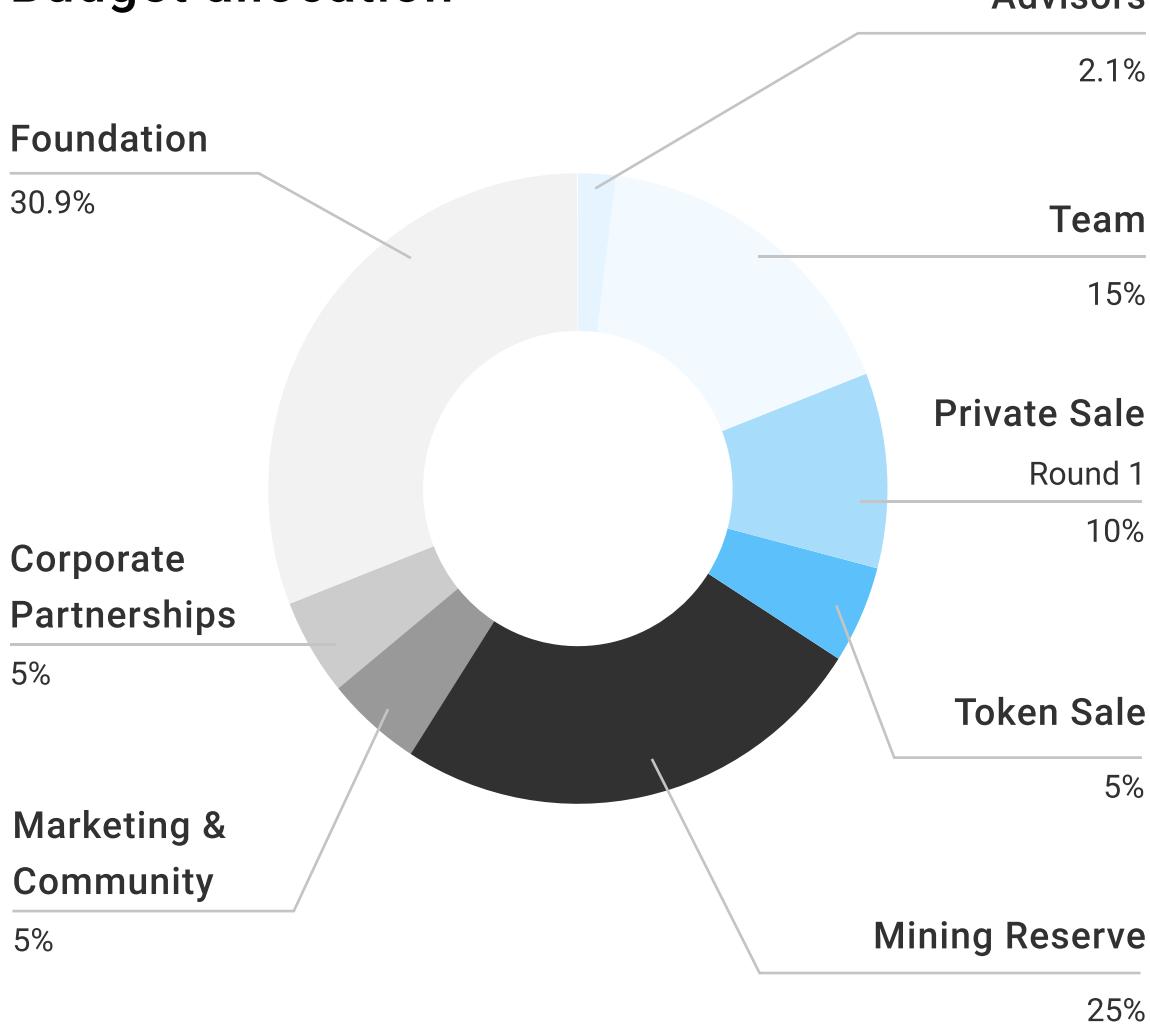
CTSI is an essential ingredient for the proper functioning of Cartesi's Data Ledger, which is a PoS-based side-chain for temporary data storage. Block generators receive CTSI mine rewards and fees paid by parties adding data to the ledger.

The Cartesi Token also plays a fundamental role in Cartesi Core's incentive mechanism. To disincentivize dishonest behavior, Cartesi Nodes that engage in disputes are required to make collateral deposits in CTSI. This protocol guarantees that if a dispute resolution occurs, honest parties are indemnified while dishonest parties are punished.

# Crypto Economics



## Budget allocation



Token economic information is subject to change. This information may or may not reflect accurate information in the future.

# Roadmap

## What We've Achieved

JULY 2017 Research Started

JULY 2018 Cartesi Core's Whitepaper

DECEMBER 2018 Achieved Reproducibility of Computation — Prototype with working demo

Q2 2019 Achieved Verifiability of Computation — Prototype with interactive dispute resolution on the blockchain

Q3 2019 Cartesi Core released as open-source

Q4 2019 Decentralized Tournament Infrastructure

Q1 2020 Cartesi SDK — installation tools, documentation, tutorial.

Q2 2020 Cartesi Network on Testnet

2020 Cartesi Network and Mine on Mainnet

## Up Next

# Partners & Backers

SNZ

L|D<sup>CAPITAL</sup>了得资本

SOSV  
THE ACCELERATOR VC



artesian  
VENTURE PARTNERS

Go Block

NEWFANG

ENTERPRISE  
ETHEREUM  
ALLIANCE

Across  
Asia  
Alliance

TAIWAN  
TECH ARENA

TAIWAN  
STARTUP  
STADIUM  
台灣新創競技場

빅뱅엔젤스  
BIGBANG ANGELS

F3G  
F BIG  
CAPITAL

# Team

CORE



**Erick de Moura**  
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**Augusto Teixeira, PhD**  
Chief Scientific Officer



**Diego Nehab, PhD**  
Chief Technology Officer



**Colin Steil**  
Chief Operating Officer



**Danilo Tuler**  
Head of Engineering



**Felipe Argento**  
Blockchain Engineer



**Carlo Fragni**  
Software Engineer



**Victor Fusco**  
Senior Software Engineer



**Stephen Chen**  
Software Engineer



**Fabiana Cecin, PhD**  
Software Engineer

# Team

## ADVISORS



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Co-Founder of IOTA



**Stas Oskin**

Senior Advisor

Core Dev & Bus Dev of Wings.ai



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programming language



**William Bao Bean**

General Partner at SOSV  
Man. Dir. at Chinaccelerator  
Man. Dir. at MOX



**Boris Povod**

Co-founder of Wings  
Co-founder of Cripti



**Michael Hwang**

Managing Director, Big Bang Angels  
Board Member, Across Asia Alliance



**T.k. Hamed**

6 Year Crypto Veteran  
Growth Hacker & Strategist

# References & Other Links

## Find Out More

<https://cartesi.io>



## Stay In Touch

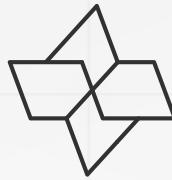
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- 🐦 <https://twitter.com/cartesiproject>
- 💬 <https://discordapp.com/invite/Pt2NrnsS>
- Ⓜ <https://medium.com/cartesi>
- ithub <https://github.com/cartesi>

## Whitepaper

[https://cartesi.io/cartesi\\_whitepaper.pdf](https://cartesi.io/cartesi_whitepaper.pdf)

## Introduction Video

<https://www.youtube.com/watch?v=tYBfDe-14hE>



CARTESI

[cartesi.io](https://cartesi.io)