



SENECA

Unlimited data. Absolute certainty. Zero compromise.

Seneca makes centralized infrastructure obsolete. We no longer have to choose between powerful, custom experiences or data sovereignty. Unlimited, sensitive data without sharing or losing ownership.

Litepaper v1.2

2023 * Privileged & Confidential



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"Imagine the potential if we aren't constantly required to trade bits of ourselves for digital convenience. Seneca is poised to ignite an era of unprecedented innovation, reinstating liberty and endowing individuals with agency over their invaluable assets."

Adam Sager
Seneca

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OUR PHILOSOPHY

If we don't have agency over our digital lives, we are not free.

We live as much online as offline. While our lives are our own, our digital selves aren't. Data is integral to how we interact and transact – from AI, to the way we learn, communicate, buy, sell, and even, in many cases, build relationships and worship.

Centralized infrastructure, which underpins almost every application we use and the software that runs the businesses we rely on, requires data sharing in order to transact. And once shared, control is lost. This has created a dystopian flywheel: the entity that initially provides the most value transacts the most, owns the most data, and then exploits information asymmetry to extract maximum value. This has given rise to centralized behemoths that wield power and leverage through impenetrable algorithms and information asymmetry.

Surveillance capitalism and privacy issues are well understood, but there is a less obvious yet much deeper problem stemming from the requirement to share data: it curtails the utility and, ironically, the amount of data available for our interactions. This is not just an issue for individuals, it is an issue for businesses as well. The perfect solution, the perfect product, the perfect service may be achievable if all data was brought into a transaction. But why would an individual or business share this data if sharing means losing? This is the paradox of centralized infrastructure: the data most needed to drive certainty, innovation, and trust is the least likely to be used.

This is why we are building Seneca: To create a new kind of infrastructure where every sovereign entity can own their identity and data, with the right tools to navigate and use what's publicly available, what's shared in confidence, and what's uniquely private to them. Imagine if everything about you, with your permission, could be used to deliver the most ideal service to you without you ever losing control of this data. This is a world where research and innovation that usually take years can happen in days, and where every transaction is customized.

With our architecture and data protocol, builders can create comprehensive applications using real data in a safe and trustless manner. By bringing Web3 blockchain technology to real-world use cases that were previously impossible, our ultimate goal is to empower individuals to exercise agency over their lives through data autonomy.

GUIDING PRINCIPLES

THE ULTIMATE TOOL FOR A HYPER-PERSONALIZED INTERNET

The desire for harnessing the power of data and AI is apparent in every industry. The associated risks, however - regulatory compliance, cybersecurity threats, and the high costs of data storage and usage - often serve as barriers to innovation. Seneca aims to break down these barriers. Our unique next-gen blockchain is designed to decentralize applications, yet maintain full application functionality, enabling a new generation of applications to be built without infringing upon private data.

These guiding principles anchor our mission to develop:

01 A system that places data in the owners control

- *Control means data must be:* Decentralized and/or distributed
- *Decentralizing data raises the importance of:* Security and privacy controls
- *Creating a platform for users means a focus on:* Flexible UX

02 A platform that's easy to deploy by businesses & devs

- *For any devs to use it means we need:* Familiar platform and code
- *For businesses to buy in we must ensure:* Similar infrastructure to what used to
- *For businesses to deploy alongside other software it must be:* Highly interoperable

03 A token framework enabling decentralized transactions

- *To promote ops without middlemen we need:* Tokenization tied to data operations
- *To excludes bad actors we must:* Promote security & scalability of system
- *To incentivize devs we must:* Promote network effects between data and platform

THE DATA CHALLENGE

A massive data issue, amplified by AI.

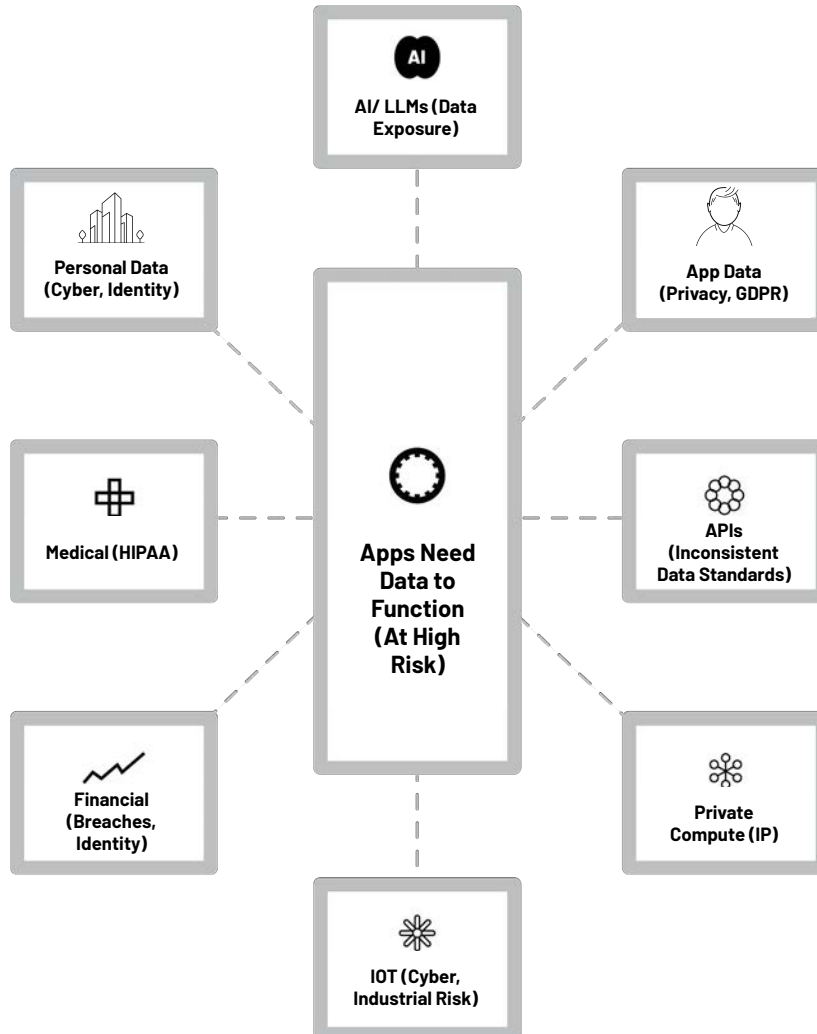
The next decade is expected to see a staggering 100x increase in the use of private and personal data, primarily propelled by AI developments. This data explosion creates daunting challenges for businesses, startups, regulators, and individuals alike.

Challenge 01: Cyber & Regulatory Risks

Financial, operational, identity, and data-related risks arise from data storage, access, and computation.

Challenge 02: Personalization Problem

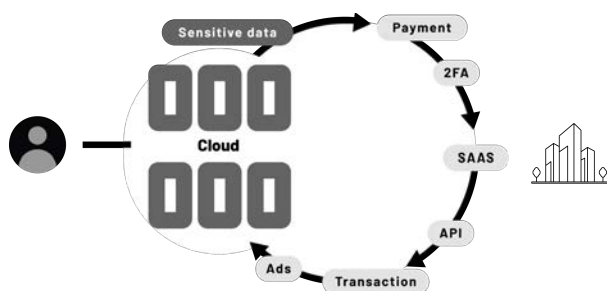
Companies require data to build products & services, but this essential data often resides behind private systems.



CURRENT STATE: COMPOUNDING VULNERABILITIES

CLOUD

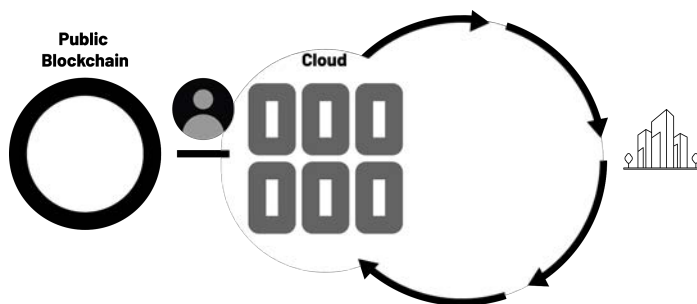
Application Centralization: A Breeding Ground for Data Vulnerabilities



Cloud services necessitate the involvement of multiple providers in every transaction, often leading to data duplication or wide-ranging access permissions, thus multiplying potential vulnerabilities.

BLOCKCHAIN

Mirroring Cloud's Data Problem



Conventional blockchains are not intrinsically designed for comprehensive application development beyond basic transactions (like DeFi). Consequently, they often mirror the same vulnerabilities as traditional cloud services when it comes to complete app decentralization.



Takeaway

*The need for trust exchanges in **cloud** services introduces potentially hundreds of vulnerabilities with each transaction. These vulnerabilities extend beyond cybersecurity, causing the sidelining of the most valuable data due to increased risk and loss of control.*

***Blockchain's** binary approach to public vs. private data operations deters most businesses from adoption. Its lack of infrastructure for comprehensive app decentralization means many of the potential benefits of blockchain technology remain untapped.*

**Blockchains are
not built for
everyday apps.**

400K
Ethereum

vs

10M
Tinder



** daily users*



SOLUTION

Seneca is reshaping the landscape of decentralized architectures, facilitating full application development within heterogeneous, private self-sovereign data environments.

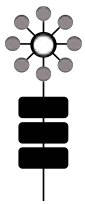
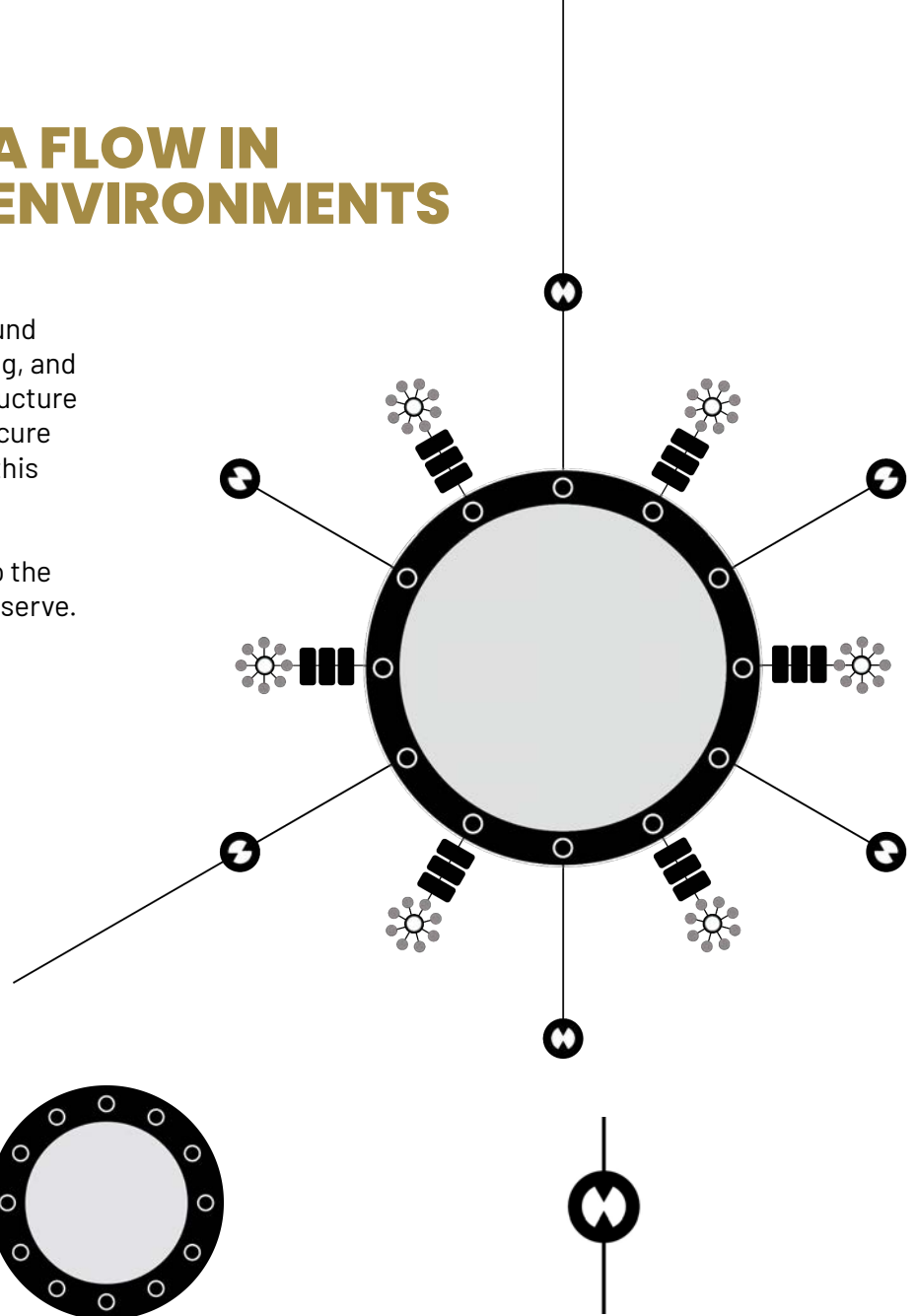
Seneca achieves something unique and extraordinary: We've engineered an environment where **complete applications can be developed and executed, with zero compromises, while ensuring user control – and thus agency, security and identity controls – of all data.**

Seneca unlocks private data to be used in business applications, while virtually eliminating many regulatory and cyber risks.

Seneca's infrastructure represents a paradigm shift: an inherently private, decentralized, and completely permissionless environment is the default. This unprecedented combination unlocks the power of blockchain without sacrificing any functionality of the application.

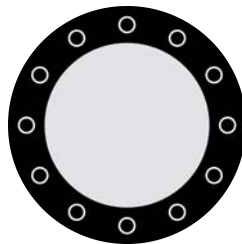
REDEFINING DATA FLOW IN DECENTRALIZED ENVIRONMENTS

Applications fundamentally revolve around data - structuring, accessing, processing, and sharing. Seneca is a blockchain infrastructure that puts a premium on efficient and secure data management. The cornerstone of this structure is Seneca's ecosystem of **heterogeneous Zero Knowledge Environments**, each uniquely tailored to the needs of the data and applications they serve.



Intelligent Data Layers

The heart of Seneca's system is the adaptive data conduit, responsible for intelligently managing the ingress and egress of data between the private ledgers and the ZK Environments. This is the key technology that executes P2P data transfer, enforces privacy, and achieves sovereign data ownership for users.



ZK Environments

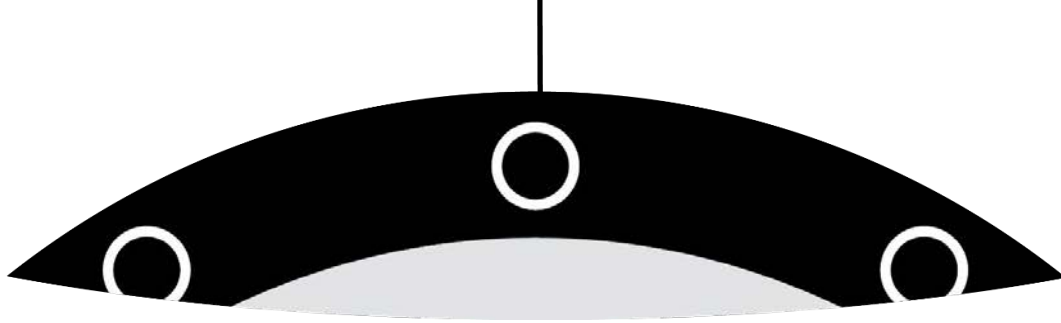
Data in Seneca's system is structured into a series of user- and system-defined environments, all inherently decentralized and predicated on zero-knowledge principles. They operate in three distinct modes:

- **Public:** Designed for transparent interactions
- **Confidential:** Designed for ZK computation
- **Private:** Designed for Self Sovereign Data



Bidirectional Oracles

Seneca's Oracles act like APIs, to facilitate the distribution of validated data and application functionality both within ZK Environments as well as between Seneca and other environments. In essence, this is the interoperability layer between Seneca, other blockchains, and traditional Cloud systems.



Powering the Blockchain

Substrate-based blockchain. Superb transaction throughput through Rust/WASM architecture and future-proofed by the large Substrate-community.



Security

Secured by a runtime that is fully embedded in Trusted Execution Environments like SGX, SEV or TrustZone and the solid cryptographic key architecture behind SR25519.



Scalability

Zero-knowledge environments Inherently scale due to their ability to achieve rapid consensus in any decentralized network. They combine the speed and accessibility of cloud with the underlying security guarantees of a blockchain.



Consensus

Leaderless consensus based on threshold signatures and governance that utilizes self-sovereign identity data.

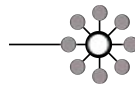


Parachains

Novel use of parachains as a scalability and throughput device by abstracting processing logic into separate parachains.

Powering the ZK Environment

Purpose-built data containers that enforce private ownership and trustless transactions within any given context like storage, compute, data sharing or interoperability.



Private Ledgers

A user-owned, fully private data storage layer that communicates through a peer-to-peer protocol, emphasizing privacy and user ownership.



Data Adaptor

Data Adaptors enable the secure flow of information while preserving privacy and user ownership. They transform and protect data streams according to the specific needs of each interaction, making them the cornerstone of the Seneca system.



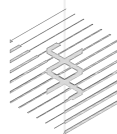
Smart Contracts

Based on the RISC-V framework, build entire apps in smart contracts. Highly performant execution and broad compatibility enable contracts to be written in any language and utilize language-specific packages.



Trusted Execution Environments

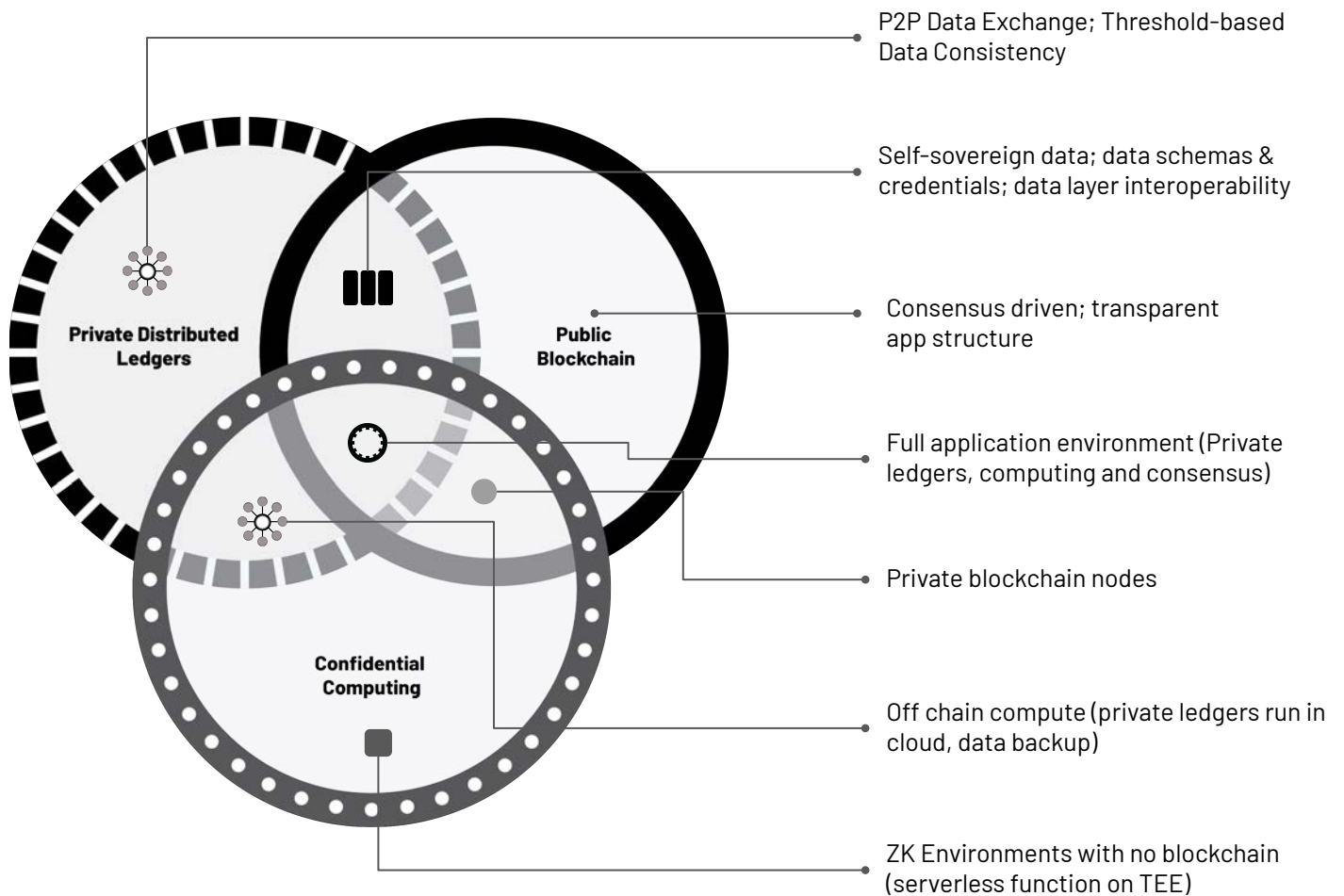
Seneca employs TEEs for secure computation, where Zero Knowledge Execution is implemented. This enables computations to be performed without revealing any sensitive information.



DEFAULT: ALL DATA. PRIVATE. SOVEREIGN.

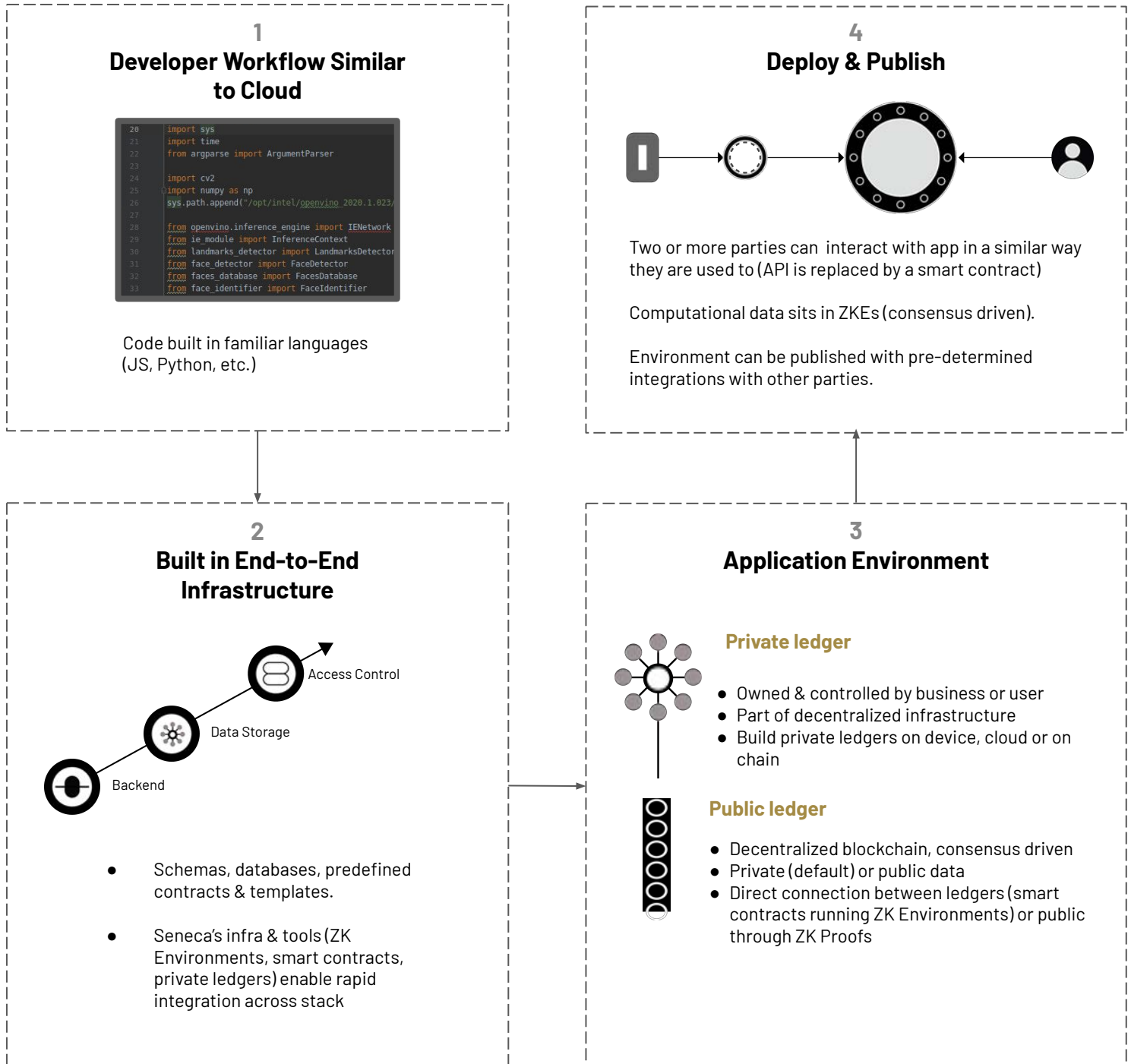
Seneca has designed a superior computational system, enabling entire applications to be built in a decentralized environment.

Seneca embeds the entire runtime in a privacy-preserving mechanism, enabling normal app operation in a decentralized environment, while keeping the data under the owner's control.



SENECA IN USE: DEVELOPMENT & INFRA READY

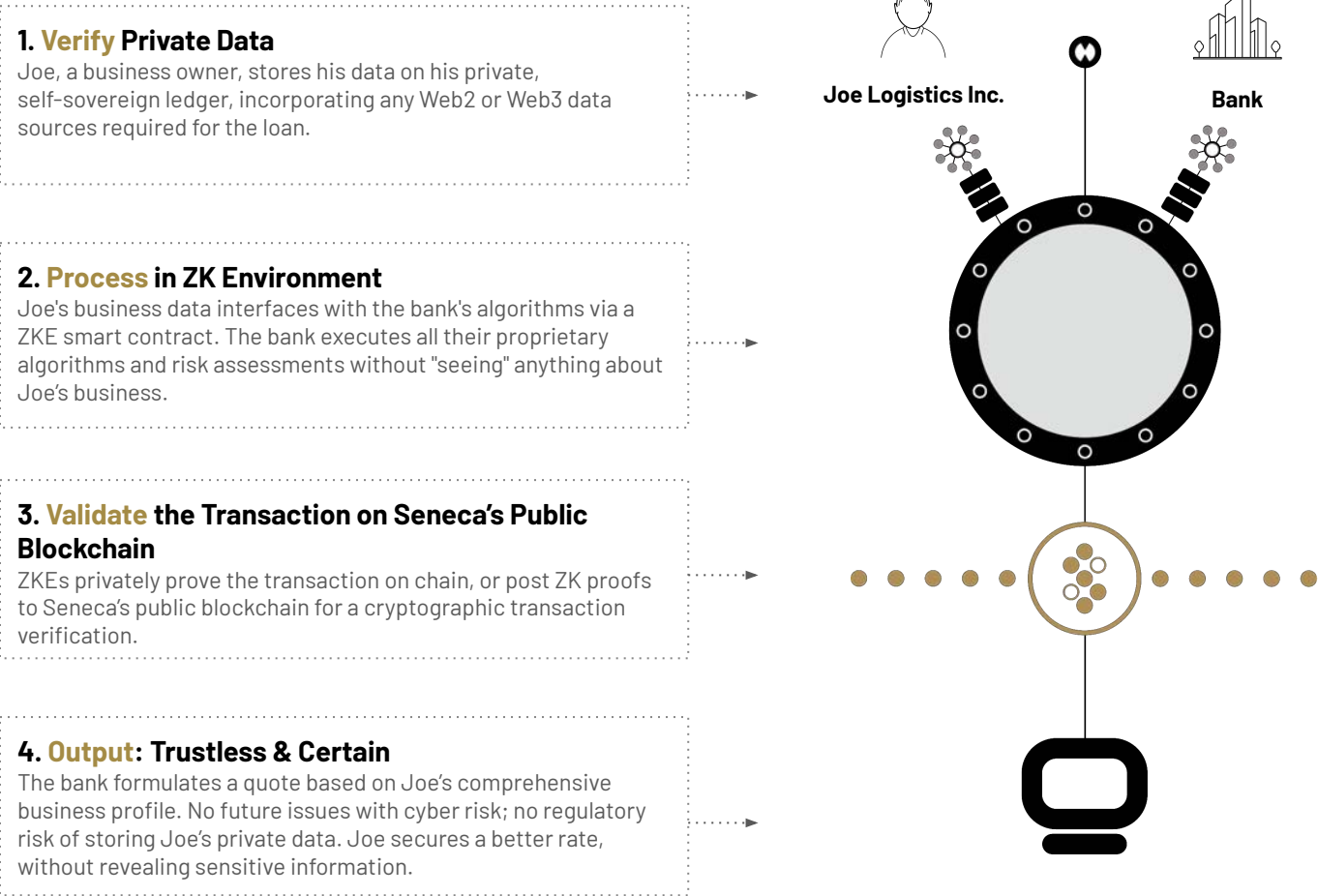
The Seneca experience is designed to make app development functional, fluid and familiar to developers. It is designed to not only look and feel like cloud, but close integrations make it an easy addition, bolt-on, or net new infrastructure for existing enterprises.



SENECA IN USE: APP EXPERIENCE

A case study of how banks can offer business owners a highly customized loan, without the risks involved in storing and managing private data.

Bank loans are traditionally priced based on risk - the unknowns. Zero Knowledge Environments (ZKE) enable transactions where ALL relevant data can contribute, without any actual data sharing.



This single use case could potentially cut \$1 trillion in loan costs

Infinite Data

There are no limits to the data Joe can bring into the transaction because there's no sharing. No data is too sensitive.





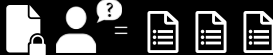









Absolute Certainty

Instead of relying on Joe's words, the bank receives verification from the source, be it Joe's customers, other financial providers, or insurance companies.

No Compromises

The bank operates with exponentially more data and Joe receives a service tailored for him. No privacy is compromised in the process.

Everything changes when you build with all the data while preserving all the trust

Industries	From (Current State)	To (With Seneca)
Finance	One-size-fits-all financial advice 	Tailored planning with privacy 
Medical	Strict industry offers generic, doctor-dependent advice 	Instant, hyper-personalized treatment based on history 
Insurance	Standard plans and limited queries 	Customized policies based on financial & risk profiles 
Real Estate	Long transactions with generic offering matches 	Fast transactions and lending process 
Ecommerce	Products based on segments not individuals 	Perfect-fit products 
B2B Services	Slow integration and concerns of lost IP 	Instant collaboration 
Research	Privacy rules leave exabytes unexplored 	Solving privacy fears unlocks data-intensive discoveries 

SUMMARY: KEY INNOVATIONS

Seneca reconceptualizes the fundamental elements of blockchain, designing a framework from the ground up. This approach empowers businesses to develop applications that tackle real-world challenges effectively and efficiently.

Key Innovations	Key Seneca Technology	Seneca Technology Enables...	Versus Traditional Blockchains
01 Trustless Interactions	Zero-knowledge Environments	Seamless data interoperability, private but permissionless smart contracts	Limited to public smart contracts with restricted data
02 Fully Decentralized Apps	TEEs with Full Executable Runtime in ZKE	Decentralized apps with comprehensive capabilities (storage, access, validation, compute)	Limited to decentralized compute
03 Design & Build Apps In Any Language	RISC-V-based Smart Contract ZKEs	Nearly universal programming language compatibility; cloud-like execution	Necessitates specialized developer languages & complex infrastructure setup
04 Data And Network (Web2 & Web3) Interoperability	Bi-Directional HTTPS Adapters & Parachain Bridges	dApps interface with cloud via API calls and other blockchains through parachain bridges	Oracles (limited, typically one-direction)
05 Cloud-Like Scalability	Private, leaderless consensus based on TSS	Flexible scaling via data-based consensus and processing logic abstracted into parachains	Relies on auxiliary L2s, ZK proofs, and other tools for scaling

TOKEN UTILITY DESIGNED TO AUGMENT A UNIQUE INFRASTRUCTURE

Seneca is the only decentralized platform, owned by the users, that captures the full data lifecycle. Seneca's Digital Transaction Unit, or **DTU**, is designed to maximize ease of data movement across Seneca's fluid ecosystem. It connects every process through cryptographic confirmation and data control - and, unique to our platform, both on the permissionless blockchain and in self sovereign storage.

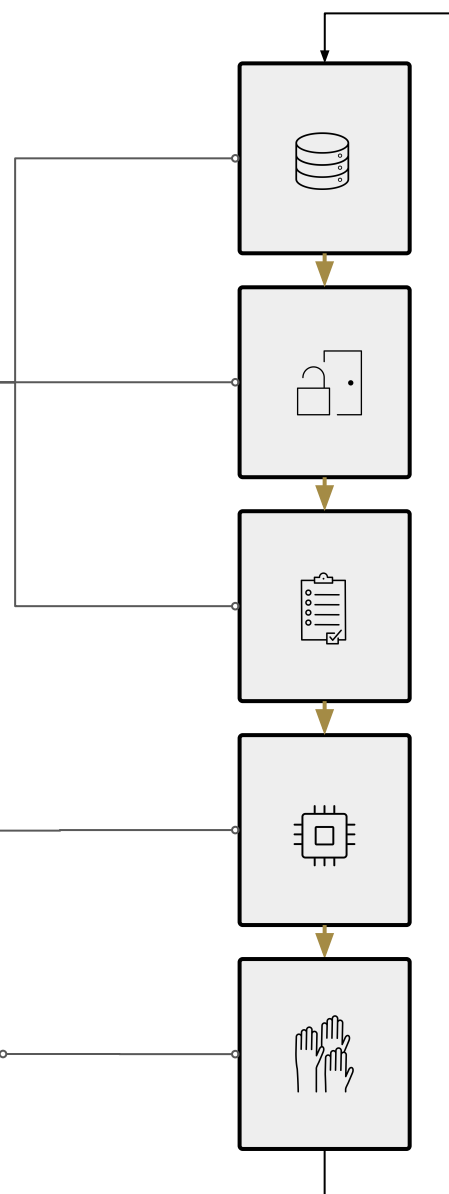
Seneca DTU Key Attributes & Utilities

Access: System-native

multipurpose access token; validating **passport** for both public and private ZK environment access.

Discount: Time-based **discount** and **licensing** allowance to provide both stability to system-wide economy and genuine value for active users.

Operation: Active history of DTU usage, along with sufficient holding for penalties is required to **qualify** for node operation. This is part of a broader system to create a fair, healthy, and sustainably open network.



Data Flow

Storage

Private & Shared
ZK Environments

Access

Authentication &
Reporting

Validation

Data & identity
validation;
source of truth

Compute

Smart contract
execution

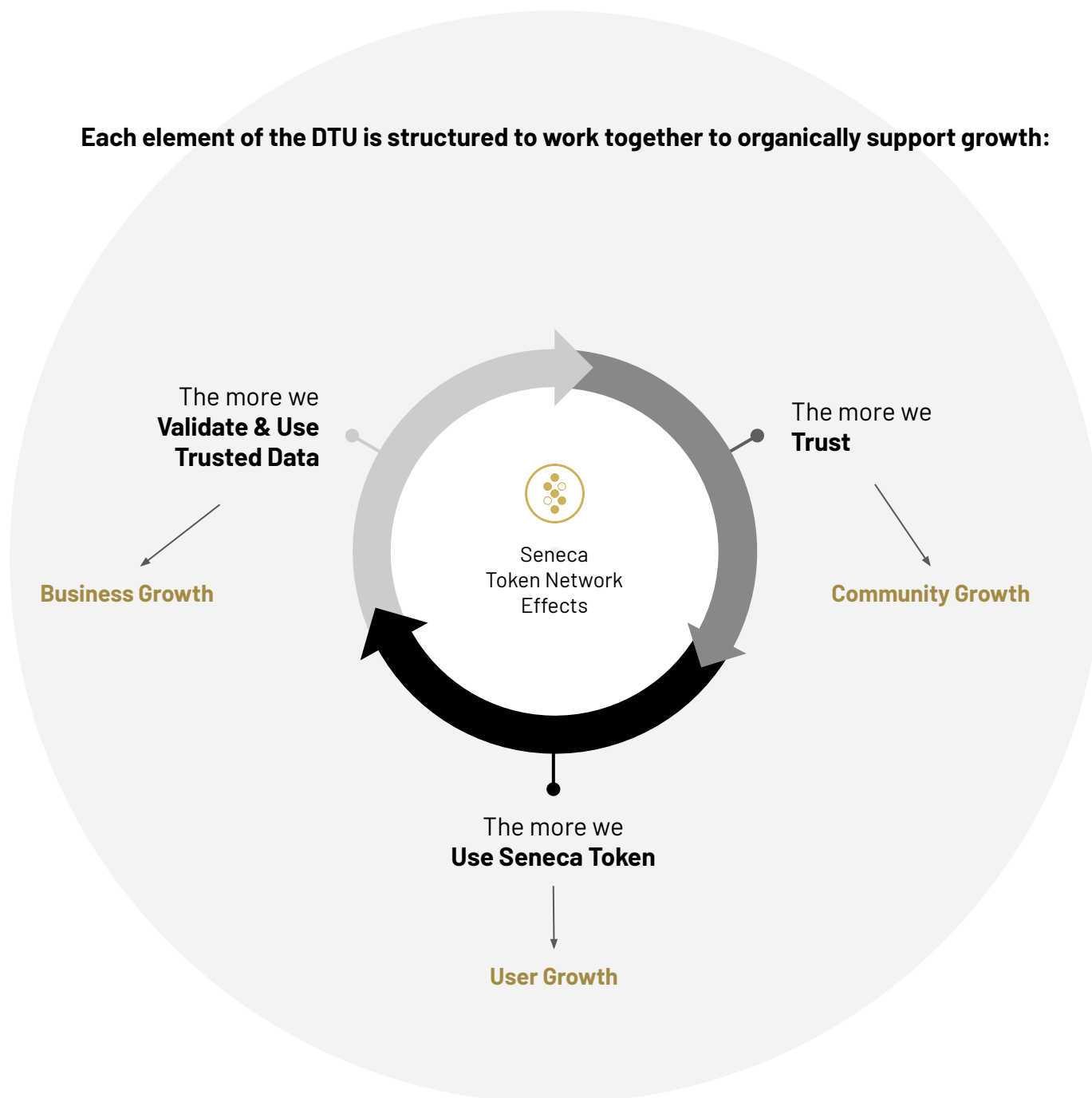
Consensus

Network
operations and
security

TOKEN NETWORK EFFECTS

Seneca's Digital Transaction Unit Token creates and reinforces multiple network effects from every part of the platform and data lifecycle. By capturing the value of Seneca's unique architecture to facilitate public, confidential, *and* private transactions and processes, we've created a one-of-a-kind digital utility that grows in value with additional user adoption, business services, *and* community engagement.

Each element of the DTU is structured to work together to organically support growth:



ROADMAP



TEAM

New thinking is needed.

Seneca assembled a team to fulfill our mission, with each member holding:

- a) A deep-seated passion and relentless focus on changing the prevailing data ownership dynamic across industries today
- b) Profound experience in the underpinning technology and a history of engineering new solutions to complex problems
- c) A dedication to design thinking, ensuring that throughout our infrastructure, we develop products accessible to all builders and innovators

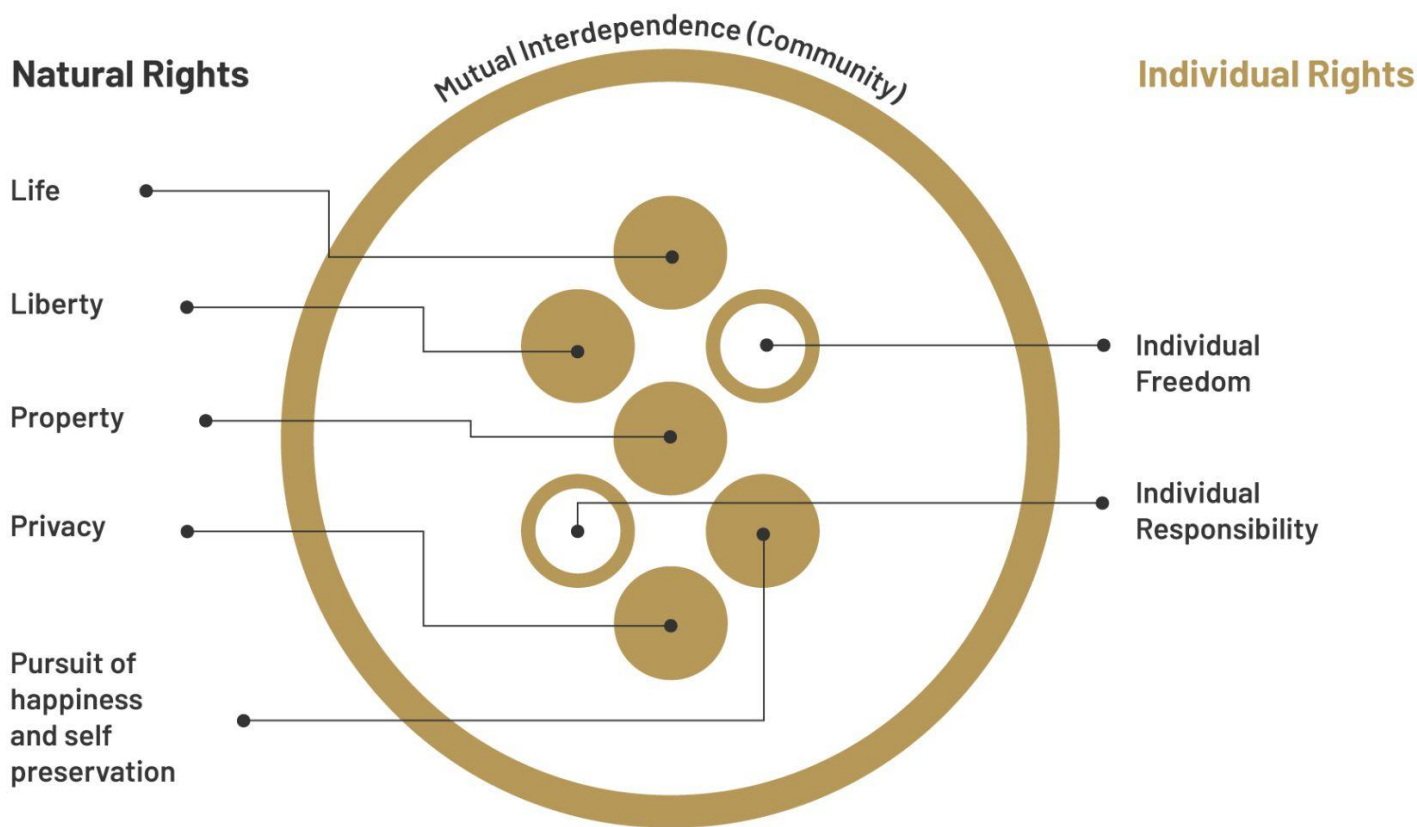
Seneca's team are pioneers in multiple industries: IoT, security, payments, and community building. We have been at the forefront of developing blockchain infrastructure technology (layer 0 and 1), and believe this is the project that will define our lives.

Visit the team page on seneca.tech



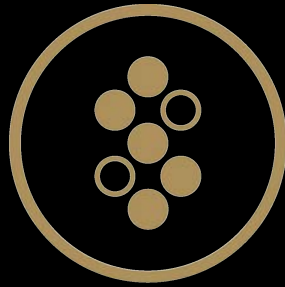
OUR VALUES

A healthy society upholds and promotes natural rights, individual rights, and mutual interdependence.



Agency over our data is essential for realizing our natural rights.

We engineer Seneca to protect users and their information within a system where agency and transparency are complementary. Through this, we ensure respect and defense of individual property rights – physical or digital – by our institutions, secured by our chosen technology.



SENECA

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