

# golem

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## Base

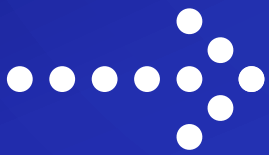
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# Data Autonomy: A New Path Forward



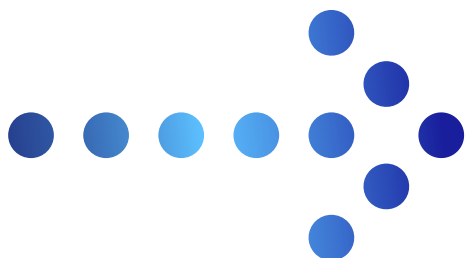
The way people use the Internet is currently split into two realms that mostly exist in parallel: the evolving, Blockchain-driven Web3 and the more traditional Internet, sometimes called Web2. While both approaches have distinct strengths and are continuously expanding in scope and impact, their separation makes it difficult for users to navigate and fully use their combined potential.

**Under the Web2 paradigm**, managing data has historically meant setting up dedicated infrastructure and overseeing its operations. Today, this complexity can be avoided by renting hardware, subscribing to cloud services, or using specialized web applications. However, these solutions come with major trade-offs, such as the risk of centralization and censorship, account management burdens, and vendor lock-in. While convenient, these services ultimately raise a critical concern: data ownership remains uncertain when it's stored on "someone else's server."

**Web3 promised a revolution**, and has already begun transforming user interactions and transactions by shifting trust from central entities to decentralized protocols. These protocols establish trust through advanced mathematics and cryptography, eliminating the need for centralized intermediaries. While most current use cases focus on storing and transferring value (e.g., through Blockchain-based tokens), this technology still offers a wealth of unexplored possibilities. One of the most exciting yet largely untapped areas of opportunity is data management. So far, Blockchain's potential hasn't been fully leveraged with a data-first approach. However, recent advancements are making user-controlled data a practical reality, paving the way for a future where individuals and organizations have full ownership over it.

**This is the commitment of Golem Base.** The vision behind Golem Base is built on the idea that data autonomy should be the norm, not the exception. Its goal is to empower users with greater control over their data, without adding unnecessary complexity.

In an age where decentralization ethos becomes increasingly important, collaboration becomes essential to ensure the technological revolution that benefits everyone, not just a select few. Those who step forward now can help shape our digital future. **This document is an invitation to be part of that journey.**



# What is Golem Base

**Golem Base's** goal is to become the gateway to a universal and extendable Data Availability Layer, empowering users by seamlessly integrating the strengths of Web2 and Web3 to provide greater control, independence, and accessibility of their data. Designed as an open platform for a trustless, permissionless, and serverless environment, it will enable cost-efficient data management in the Web3 environment while maintaining familiar Web2 standards for database interaction, such as query languages. The inherent strengths of Blockchain, combined with a data-centric approach, provide a compelling alternative for legacy systems rooted in the Web2-only world.

**The promise of Golem Base** isn't just theoretical. Through real-world applications and collaborative projects, it seeks to aid individuals and organizations in moving toward a future where data is handled on their terms. It is built to support diverse needs, providing a flexible framework for practical solutions, such as:

## Web2

- serverless websites & newsletters
- ticketing systems,
- marketplaces,
- knowledge-base
- ...

## Web3

- data availability layer for various protocols
- additional metadata for smart contracts  
(e.g. RWA descriptors, images, additional assets)
- alternative for claim mechanisms based on NFTs
- ...

# Technical Teaser

**Golem Base** is a Layer 2 Network deployed on Ethereum, acting as a gateway to various Layer 3 DataBase Chains (DB-Chains).

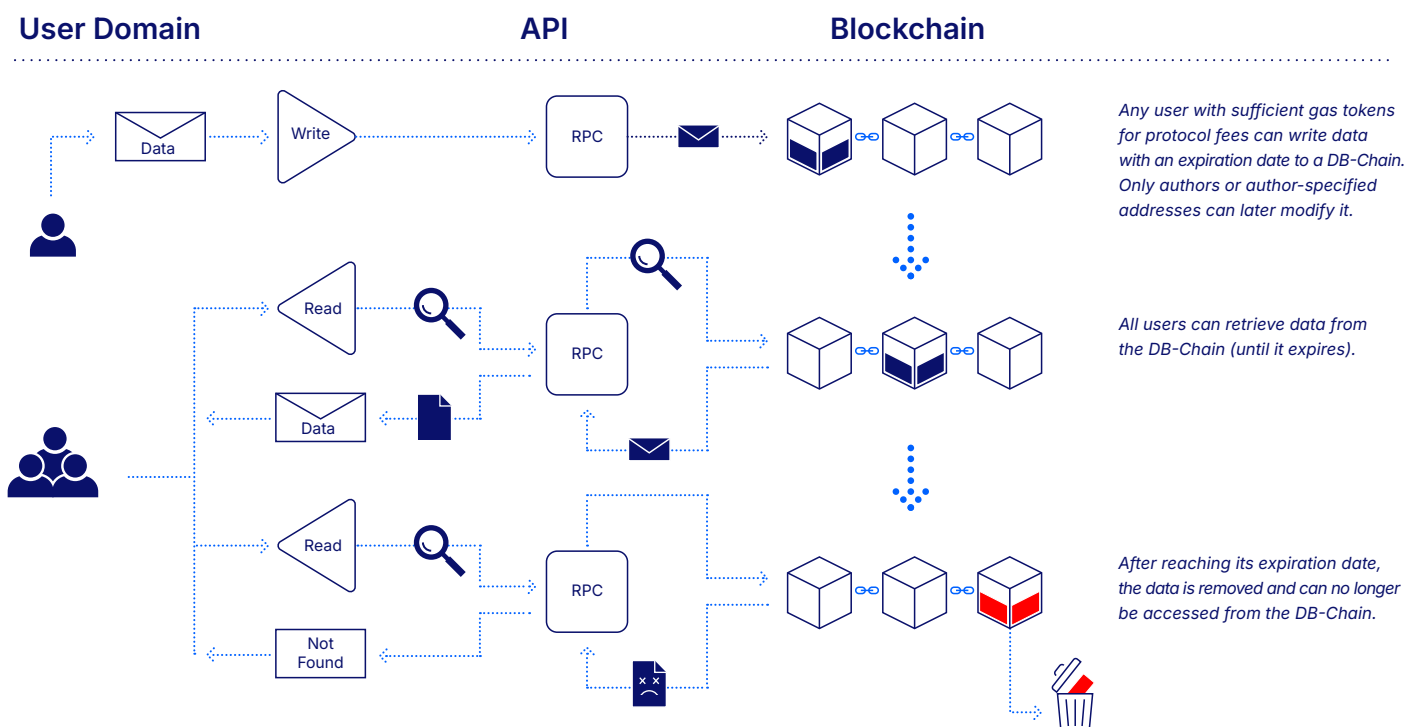
**DB-Chain** is a Golem Base-specific Layer 3. Its goal is to manage structured and unstructured data and maintain consensus. A DB-Chain is a Blockchain tailored explicitly for data storage and retrieval. Users can manage and access the data through familiar CRUD (create, read, update, and delete) operations provided via RPC (remote procedure call).

**Storage Economics:** Data storage costs are denominated in GLM (the default gas token) and calculated based on data size, expiry time, and current storage load. This helps to ensure predictable resource management and pricing. After the expiration time, data is removed from the DB-Chain.

**Configuration Capabilities:** DB-Chains can be configured to use custom database engines that support accessing data with familiar query languages.

By default DB-Chains are designed to be permissionless and trustless. When necessary, they can be configured for trusted or permissioned scenarios with customizable data expiration logic.

*User interactions with DB-Chain when expiration logic is enabled:*



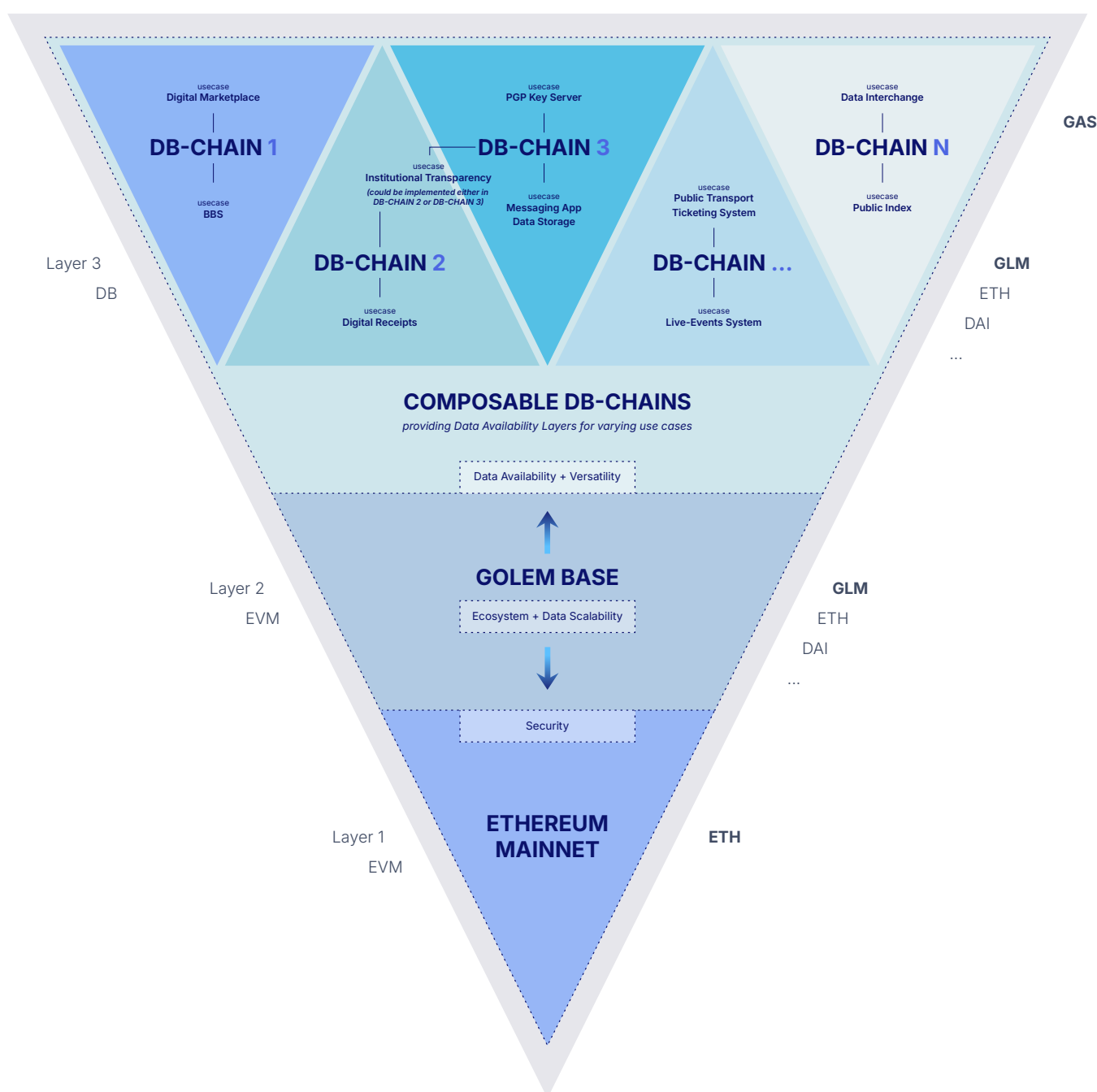
# Fundamentals Outline

This section explores the key principles that define the Golem Base architecture and ecosystem.



# Seamless Integration with Ethereum's Ecosystem

Golem Base (Layer 2) is designed to be an entry point to its ecosystem of user-defined DataBase-Chains (Layer 3), enabling a wide array of applications. This approach supports seamless, secure, and cost-efficient execution, paving the way for a wide range of potential applications. Golem Base is set to offer users the combined strengths of Layer 3 versatility, Layer 2 scalability, and Layer 1 security.



## Multitoken Gas System

Integral to Golem Base's framework is its multitoken gas system, with the GLM as its default gas token. This system is crafted to provide users with flexible choices for transaction fees, which aids user adoption.

## The Layer 2 Sequencer

The Layer 2 sequencer is the core component of Golem Base, tasked with efficiently organizing and validating network transactions. Initially adopting the common centralized approach to facilitate rapid scaling, the sequencer is positioned to transition towards decentralization.

## Flexibility Through Composable Architecture

Flexibility is at the forefront of Golem Base's modular architecture. This design philosophy supports deploying customizable database solutions catering to specific use cases. By design, DataBase Chains (DB-Chains) can incorporate various database engines – such as SQL or MongoDB – as long as they meet Golem Base requirements. Each DB-Chain is free to have its own technical configuration (e.g. custom sequencer), tokenomy, and permissions structure – or lack thereof.

# Embracing Ethereum

Ethereum stands out as the only ecosystem adopting the philosophy of scaling through Layer 2 solutions. Essentially, Layer 1 (Ethereum Mainnet) serves as the security backbone, while Layer 2s provide affordable transaction fees and rapidly introduce new features, fueling the entire ecosystem's growth.

Golem Base follows this approach, aligning with Ethereum's vision and aims to introduce a data-centric perspective across the entire ecosystem. With improving interoperability standards, Golem Base will become increasingly interconnected with Ethereum and its Layer 2s.

## Tokenomy

### GAS Token

Golem Base will use **GLM as its default gas token** for transaction fees both on its Layer 2 and Layer 3s. However, with Ethereum's upcoming Pectra upgrade, Golem Base is set to also integrate ETH and other tokens as alternative means of gas payments. This approach enhances accessibility and aligns with Ethereum's latest advancements, simplifying onboarding and broadening participation.

### ETH Burn

**ETH gas-burning mechanisms**, initiated at both Layer 1 and Layer 2, can further strengthen Ethereum's economic model. Golem Base is designed to participate in this economic effort from the day of its launch. Initially this will be done by implementing custom mechanisms, but as soon as common standards are in place, they will be integrated into the Golem Base protocol.

## A Supportive Ecosystem

The Project's tokenomics will support early adopters and builders, through various incentive programs and mechanisms, including gas refunds, preferential gas fees, and other means.

# A Comparative Overview

To highlight how Golem Base differs from existing approaches, the table below compares key characteristics.

|                                          | Web 2 Database             | Golem Base                                                                                 | Web3                                                                        |
|------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Permissionless and Trustless Environment | No                         | Customizable                                                                               | Yes                                                                         |
| Censorship Resistant                     | No                         | Customizable                                                                               | Yes                                                                         |
| Serverless                               | No                         | Yes                                                                                        | Yes                                                                         |
| Users Retain Control Over their data     | Varies                     | Yes                                                                                        | Yes                                                                         |
| Cost-Efficient                           | Depending on Configuration | Increased due to architecture based on combination of L2 & L3s that prune unnecessary data | Storing data within traditional blockchains is generally not cost-efficient |
| Supporting Query Languages               | Yes                        | Yes                                                                                        | No                                                                          |
| Data-Centric                             | Yes                        | Yes                                                                                        | Not Yet :)                                                                  |
| Open Source Software                     | Sometimes                  | Yes                                                                                        | Typically                                                                   |

# Benefits

Golem Base creates new possibilities for projects from either Web2 or Web3 realms by introducing a solution that combines the strengths of both worlds. Here are some of the key benefits Golem Base offers across the different architectures.

## For Web2

Golem Base introduces an infrastructure-less Data Availability Layer with no DevOps requirements, and no reliance on centralized entities. It incorporates best practices refined through over a decade of Blockchain experience, such as settlement logic.

## For Web3

Until now, major Blockchains have primarily created value by enabling the transfer of various assets and providing robust logic and infrastructure to track state transitions within decentralized ledgers.

Golem Base introduces a data-centric approach with an affordable Data Availability Layer. This improves both interoperability within the broader ecosystem and the utility of existing Blockchains.

## For the Ethereum Ecosystem

Ethereum's utility can be significantly improved by integrating new Layer 2 and Layer 3 solutions that introduce innovative methods of storing, processing, and interacting with Blockchain data rather than strictly adhering to EVM compatibility.

Golem Base's approach defines a new concept, "Ethereum Domain Specific Engine" (EDSE). An EDSE wouldn't have to rely on the Ethereum Virtual Machine (EVM) to process transactions and state. Instead, it could use specialized engines tailored to specific use cases – akin to Domain Specific Languages (DSLs) – which, while narrower in scope, can provide greater efficiency and superior performance compared to the general-purpose EVM.

Golem Base exemplifies a data-centric approach, illustrating one of many potential applications enabled by an "Ethereum Domain Specific Engine" (EDSE). In the case of Golem Base, DB-Chains can utilize repurposed database engines instead of relying on the EVM to process transactions and state.

This approach also enhances the expressiveness of RPC read methods, particularly by enabling database-style queries.

## For DePIN

Decentralized Physical Infrastructure Networks (DePINs) are systems that enable individuals or entities to collectively deploy, operate, rent, and manage real-world physical infrastructure. For DePINs to effectively serve their purpose, they require robust marketplace foundations capable of resource discovery, settlements, and comprehensive data exchange to facilitate effective collaboration among participants.

Most DePIN marketplaces require customized development and configuration to accommodate their highly specific needs. Given the high performance demands, existing Blockchain technology is often not optimal for development of these marketplaces. This limitation encourages exploration of alternative solutions, primarily based on peer-to-peer (P2P) communication models, or the concurrent use of centralized models at the same time, sacrificing the spirit of Web3.

Centralized solutions are fast and can be relatively inexpensive, but they face issues with data availability and/or ownership. On the other hand, pure P2P-based solutions, which do not use Blockchain, can be cheap but struggle with secure scaling in an untrusted environment.

Moreover, there are no established standards for creating such components from scratch, let alone for leveraging proven, battle-tested building blocks.

Golem Base aims to provide a robust Data Availability Layer, laying a strong foundation for creating next-generation marketplaces. Its modular design offers flexibility to meet the diverse needs of DePIN projects, while staying true to the core ethos of Web3.

***One of the first projects  
to incorporate this approach  
will be the Golem  
Network Marketplace.***

# Security and Integrity

Golem Base's design focuses on applying inherent Blockchain features to data management.



## Ethereum-Backed Security

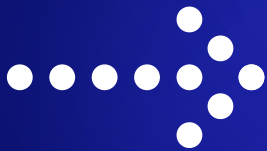
The integration with Ethereum establishes the platform's security by leveraging the features of Ethereum's Layer 1 (Mainnet), which aligns with the general approach to the development of Layer 2s. The DB-Chains, in turn, secure access to data and integrity with cryptographic mechanisms already used in existing Blockchain systems and by anchoring themselves in the main Layer 2 (Golem Base).

## Flexible Permissioning

While Golem Base design offers a permissionless environment as its foundation, it is flexible enough to accommodate use cases requiring varying permission levels. Specific instances of DB-Chains can be configured to operate within strongly permissioned environments, catering to projects with strict access control requirements. This adaptability maintains the core principle of decentralization, while allowing application-specific security enhancements.

# The Path Towards Decentralization

Golem Base is committed to a journey of gradual and thoughtful decentralization across governance, protocol design, and general development. This incremental approach is a deliberate choice and based on processes refined through over a decade of Ethereum ecosystem development, as outlined by the L2Beat project <sup>1</sup>.



<sup>1</sup> The L2Beat project focuses on providing onchain transparency, by delivering accurate and reliable information on Layer 2s, available at <https://l2beat.com>.

## Initial Approach

Golem Base will start centralized to some extent, including centralized sequencers and execution nodes to ensure rapid development and threat mitigation. All components will be made available as open-source software, allowing the community to audit, verify, and engage in shaping the system's future.

## Community-driven Development and Governance

Once the project goes live, its growth and development will be determined based on Golem Base Improvement Proposals (GBIPs). Inspired by Ethereum's approach, this model will enable community participation in shaping the Golem Base platform.

In the early stages, the founding team will govern the project. Over time, as both the community and the team gain hands-on experience, participation will gradually shift to decentralized mechanisms.



# Real-World Use Cases

Golem Base is set to reshape digital ecosystems by transforming how data is managed and accessed. Its architecture enables a wide array of real-world applications. While the following examples illustrate Golem Base's anticipated impact across various sectors, they represent only a glimpse into the platform's potential.



## Digital Marketplaces

Golem Base is set to streamline the creation and use of custom marketplaces.

This strategy enables efficient discovery of resources and services, including virtual machines, network infrastructure, graphics rendering, AI inference, scientific computations, and more – all without unnecessary intermediaries.

## Bulletin Board Systems

Golem Base enables the creation of permissionless Bulletin Board Systems (BBS) without reliance on centralized servers, preserving data integrity and ensuring they are censorship resistant.

## Serverless Websites and Newsletters

Golem Base enables a straightforward way to deliver content. Its architecture eliminates the need for traditional server maintenance, which empowers individuals and organizations to host digital content such as websites, newsletters, or status pages – all with minimal overhead.

## Data Interchanges

As industries that depend on sensitive information, such as energy, healthcare, and finance, undergo rapid transformation, trustworthy data interchange becomes essential.

Golem Base aims to provide a solution. Grid managers, local governments, and other institutions can manage and exchange critical data from multiple parties without relying on vendor dependencies or third-party tooling constraints.

## And Many More

In addition to the examples above, Golem Base provides a solid foundation for both Web2 and Web3 projects. Some of the possible use cases, include:

- ..... Event ticketing systems
- ..... Public transportation
- ..... Public commitments
- ..... Web3 RWA (Real World Assets)
- ..... NFTs metadata
- ..... Additional descriptors for smart contracts  
(e.g., ERC-20 supplementary information  
such as icons, team names, or websites)
- ..... Public knowledge repositories

# An Ecosystem for Everyone

An open environment where community-driven proposals play an important role results in a healthy ecosystem.

Golem Base aligns its development with real-world use cases and aims to deliver a platform where participants from Web2 and Web3 (including DePIN) can shape the future of data.

# Team



→ **Piotr Janiuk**  
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Founder, Idea



→ **Pawel Burgchardt**  
*"Warburg"*  
Execution,  
Ideation Process



→ **Jonas Chevalier**  
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Team Management



→ **Patrick H. Morris**  
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Blockchain Specialist



→ **Aldo Borrero González**  
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Blockchain Specialist



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Developer, DevOps



→ **Ramses de Norre**  
Developer, SDK



→ **Lorenzo Manacorda**  
Developer,  
Infrastructure



→ **Jakub Urbanowicz**  
Developer,  
Tooling, Usecases

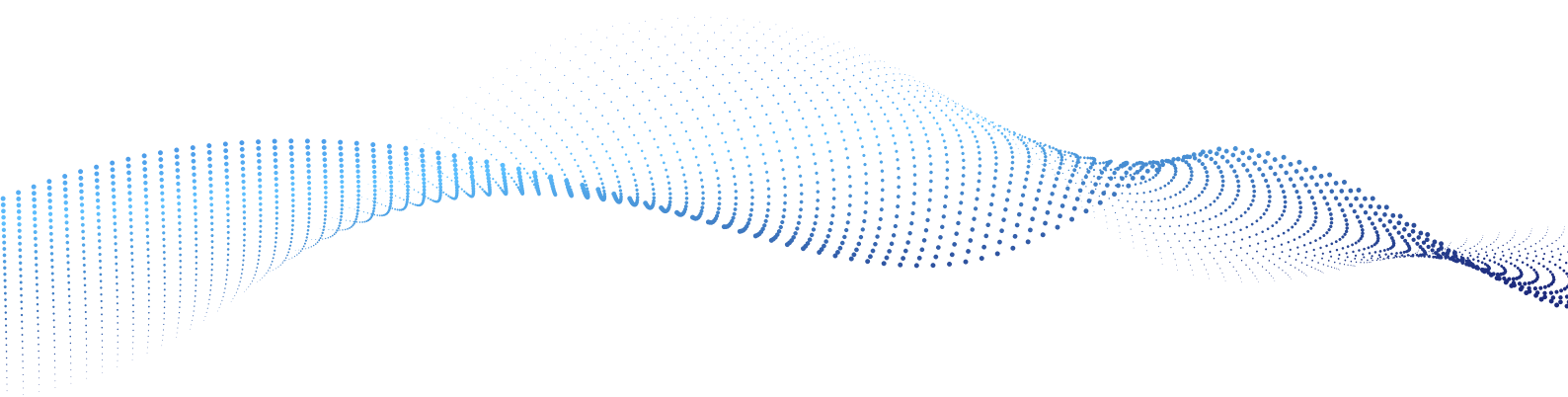
# Get Involved

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Join us on the journey to data autonomy with Golem Base. Whether you're a developer, visionary or decentralization enthusiast, your participation is key to shaping a future of data.

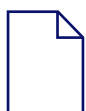
Connect with our community on Discord, contribute to our development efforts, and explore more on our landing page. Stay updated by subscribing to our newsletter.

***See you at [golem-base.io](https://golem-base.io)***



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*If you're interested in the origins of Golem Base, you can learn more by following this link:*



**Golem Base Origins**

golem Base



<https://twitter.com/golemproject>



<http://discord.gg/golem>



<https://reddit.com/r/GolemProject/>

[golem-base.io](https://golem-base.io)

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