ProbeLab Value Proposition

💡 **ASK - ROADMAP SPONSORSHIP:** Sponsor $10k-$30k to cultivate data-driven protocol design in Web3.0 and identify the most important bottlenecks across many networks and blockchains.

WHAT: We are raising funding to collectively improve libp2p-based networks, protocols, and implementations' performance through metrics, dashboards, and detailed reports. Our target fundraising amount is $200k for 4 milestones, expected to be completed in the first 6 months of 2024. The list of milestones can be found here.

SERVICE OFFERING - NETWORK HEALTH DIAGNOSTICS: Get a comprehensive health-check of your network within 4-6 weeks from our team of experts. At the end of the diagnosis you will have a list of items that require immediate attention, as well as results from the most important metrics.

WHY: The ProbeLab team has the expertise and tooling to quickly make large improvements to the performance and observability of any libp2p-based network - much faster than any other team or individual. Through expert, organized contributions, we're able to execute a rapid upgrade roadmap - prioritized in conjunction with our funders and customers.

ProbeLab: Expert Protocol Benchmarking & Optimization

The Protocol Benchmarking & Optimization Team (ProbeLab) is on a mission to measure the performance of network protocols for decentralized networks, benchmark these protocols against target performance milestones, and implement improvements to their core design principles.

We focus on understanding the mechanics of internal network protocols, as well as how they interact with other parts of the system. Our expertise lies in network-layer protocols. Our past work focused on IPFS and Filecoin, but our tools and monitoring infrastructure are applicable to the wider Web3.0 space, including Ethereum, Polkadot, Polygon, and others. We dive deep into the protocol as an independent entity and investigate the unknown exogenous factors that influence its performance when operating in the wild. We specialize in network architecture design. Our target is to identify potential bottlenecks and inefficiencies in the way protocols work with each other and provide solutions, accordingly.

Our team has been incubated within Protocol Labs since the early days of IPFS and libp2p, contributing to several vital projects. Our latest work revealing insights about the IPFS network is summarised at: https://probelab.io.

As we expand our scope and footprint beyond IPFS to target libp2p-based networks more generally, our services cover a wide spectrum. The Roadmap Sponsorship is the primary vehicle towards our mission of cultivating a data-driven protocol design culture. Our services extend to tailor-made diagnostic health checks for the P2P layer of your system.

ProbeLab Mission & Impact

We believe that measuring and benchmarking network protocols is not an end, but only a means to an end, which is *Data Driven Protocol Design and Optimisation*. We go beyond increasing the signal to noise ratio to actually distinguish signal from noise, isolate the noise in Web3.0 P2P networks and ultimately save costs for node operators and application providers.

Our track record is summarised at https://probelab.io and the comprehensive set of reports in our Github repository.

Major recent achievements of our group include:

- **IPFS-hosted Website Monitoring:** We have built Tiros, a website performance monitoring tool for websites hosted on IPFS. The tool takes into account all the necessary metrics that help web-developers and infrastructure operators to identify bottlenecks and fix performance. The automated process updates the results at: https://probelab.io/websites/ on a daily basis.

    - References: [probelab.io Websites Section]
- **IPFS Architecture Performance Assessment:** We have built tools to measure the performance contribution of several components of the IPFS Architecture (such as Hydra boosters). We identified that the contribution of some of them to performance was a lot lower than expected, while their maintenance cost was steep. The study resulted in the Hydras being dialed down.
    - References: [Study Report] [IPFS Camp 2022 Talk] [Discussion forum post]
- **libp2p NAT Hole Punching Success Rate:** We orchestrated tooling and infrastructure to measure the success rate of libp2p's NAT Hole Punching technique. We organised and ran a month-long "Hole Punching Campaign" during which we tracked 6.25M hole punches from peers in 167 countries. Our study resulted in several vital improvements to the core software.
    - References: [Study Report] [IPFS Camp 2022 Talk] [Discussion forum post]
- **Unresponsive Nodes Incident:** We have uncovered a severe incident in the IPFS Amino DHT network, which caused half of the network nodes to become unresponsive. We have built tooling to quantify the impact of the incident, coordinated fixes with the community and monitored performance improvements as nodes came back to their normal working order.
    - References: [IPFS Blog]
- **IPFS Release Testing Tool:** We have built Thunderdome, a testing tool for IPFS implementations that can uncover deficiencies and regressions of new IPFS releases. The tool is used by the kubo maintainer team, as well as others in the ecosystem.
    - References: [GH Repo]

We aim to bring to Web3.0 the rigour and maturity that is abundant in Web2.0. We believe that this is the only way for Web3.0 to gain wide adoption and flourish. You can't improve what you don't measure and therefore, maturity can only emerge when teams are dedicated to deep investigations into protocol details and rigorous evaluation of their performance.

Sponsorship: ProbeLab Roadmap

Although the Web3.0 ecosystem is large and thriving, there are still a lot of unknowns and even more unknown unknowns when it comes to the performance of the protocols out in the wild. As such, we have devised a roadmap of 4 milestones that are designed to attack some of the most pressing problems, as identified by us, as well as the community through our recent survey.

Funds from this fundraising round will support work on the roadmap items for the first half of 2024 (January - July 2024). The roadmap items are the following:

1. **IPNS Performance Measurement and Protocol Improvement:** Investigate the protocol design choices of the InterPlanetary Name System and identify space for performance improvement. We will investigate whether the InterPlanetary Name System is as fast as can be and ideate towards an IPNS-v2 design.
2. **Gossipsub Performance and Security Guarantees:** Verify that Gossipsub performs according to its spec when it comes to transporting messages in the Filecoin and Ethereum blockchains.
3. **libp2p bandwidth baseline in different networks:** We will quantify what are the bandwidth requirements for an idle node when participating in networks such as IPFS, Polkadot, Ethereum and Filecoin. We will identify improvement directions in case of excess bandwidth consumption.
4. *<Reserved - TBD by the biggest sponsor>*

A more detailed description of the roadmap items can be found in this Github issue.

Our target fundraising amount for those items is: $200k.

Sponsorship Tiers

We ask the community to sponsor ProbeLab's roadmap by choosing one of the following sponsorship tiers. The ROI for your team is net positive: you spend way less than you'd have to if you wanted to build tools for these metrics in-house.

- **Tailor-made ($30k):** Hire part of the team for 1 month to work full time on an item (e.g., metric) specific to your project.

- **Champion ($20k):** Add a new item to the roadmap that is helpful for your team (but not only specific to your project, aka “Tailor-made”, see above) and suggest which should be removed instead.
- **Guardian ($10k):** You get the chance to *vote on the stack ranking* of roadmap items. This is important, as if the team does not raise enough funds, the last ones on the list will be dropped.

Service Offering: Network Health Diagnostics

If your network is about to scale up, you’re about to launch a new product, or just need better insights to have higher confidence on the performance of your P2P network, the ProbeLab team provides a “Network Health Diagnostics” service to do just that.

Duration: Our team comes in and works exclusively on your network for a period of 4-6 weeks (subject to your specific needs and requirements).

What to expect: At the end of this period, you get a detailed report of metrics to pay attention to, or develop, if they don’t exist. Our team will come up with tooling to provide insights on the most important aspects of your network, subject to the set up and metrics you already capture.

Pricing: The starting price is at $50k, but the exact amount depends on several factors, such as: pre-existing metrics and monitoring tools (if any), network size/complexity and required outcomes, to name a few.

Team Structure

The team consists of three talented software engineers and a team lead.

- **Yiannis Psaras - Research Scientist & Engineering Manager (Team Lead):** Long track record of deep research studies in both academic and industry environments. He has raised millions in funding for his teams in the past to investigate content-based addressing and future Internet architectures with a focus on performance, privacy and decentralisation. Most recently involved in several projects in the IPFS and libp2p Ecosystems as a research scientist, technical project manager and engineering manager.

    - Website, LinkedIn, Github, Google Scholar
- **Ian Davis - Software Engineer:** Focused on building Web3 data analytics and ingestion services. Background in software engineering across a wide range on data-oriented industries including finance, advertising, transportation and library science.
    - LinkedIn, Github
- **Dennis Trautwein - Software and Research Engineer:** Dennis has a strong background in building and maintaining distributed systems for data intensive applications. His background in applied physics makes him capable of designing and performing experiments with scientific rigour.
    - Website, LinkedIn, Github
- **Guillaume Michel - Software and Research Engineer:** Guillaume is passionate about algorithms, complex systems, DHTs and their implementation and performance in the wild. He is a strong supporter and user of privacy-preserving communications and Open Source Software. In the recent past he masterminded, designed and implemented a privacy-preserving solution for the Amino (IPFS) DHT, as well as several other optimisations. Guillaume obtained a joint Master's degree in Computer Science - Cybersecurity from EPFL and ETH Zurich.
    - Website, LinkedIn, Github

Get in touch

You can reach the ProbeLab team through email at: team@probelab.io, or at #probe-lab in Filecoin Slack and IPFS Discord (bridged channel).

FAQs

What is the fundraising and voting cadence?

We are currently fundraising for the next six (6) months, starting from January 2024. Building new measurement tools and maintaining existing monitoring infrastructure requires development effort and brings infrastructure costs. In order for the team to be

able to keep providing the existing services and building new ones to dig deeper into protocol performance, new funds will be needed and will be sought in Q2’24.

How do we know if the team has collected more money than needed for the roadmap?

As part of the sponsorship agreement, we will publish the logos of those that sponsored our work on our website (https://probelab.io) grouped by the sponsorship tier. We plan to investigate the possibility and set up our future fundraising campaigns through fundraising platforms.

What will ProbeLab do with the donations if they collect a larger amount than needed for the suggested roadmap?

Fundraising is a continuous effort for a public good, such as providing public data on the performance networks. That said, the team will fundraise again at the end of the six month period. If more funds are collected during this round, the excess funding will be kept aside to offset the amount needed in the next fundraising round. If the same happens during the next fundraising round, we will expand our team to deliver more items in a shorter period of time.

What happens if the team raises less money than they need to complete the roadmap?

The team will work on the stack-ranked items up until the item where the raised funds run out. In the meantime, the team will continue fundraising, in order to eventually cover all items.

Can I suggest a new item for the roadmap, or can it be amended according to my needs?

You can choose the “Tailor-made” sponsorship tier and get part of the team to work on your specific item. The roadmap for the next 6 months has been fixed by the ProbeLab team after getting input from the community through a survey and a discussion forum issue [link]. You are more than welcome to suggest a new item, which will be considered for the next round. Alternatively, in case of a bigger project, you can consider hiring the ProbeLab team to work on your project independently of this roadmap. Please see relevant question here and get in touch.

What if none of the items on the roadmap are useful to my project/application?

Supporting ProbeLab's work is sponsorship for a wider purpose and vision: bringing rigour to the design and operation of Web3.0 network protocols and advocating for data-driven protocol design. That said, the items that will be investigated in this round will benefit the wider ecosystem and very likely your project as well.

If you have a specific request for some metric or study, you can choose the "Tailor-made" sponsorship tier, or the "Network Health Diagnostics" offering for a more holistic study on your network.

In any case, please make your needs known to the ProbeLab team through the discussion forum issue [link], the measurement survey [link] or the contact details provided further down.

Can ProbeLab provide tailor-made services and studies for my project?

Absolutely! Check the "Tailor-made" sponsorship tier if you're interested in a specific metric, or the "Network Health Diagnostics" offering, if you're interested in a more holistic study on your network. Get in touch over email (team@probelab.io) to discuss further.

What if I can only sponsor with an amount smaller than the Guardian Tier of $10k, e.g., case of very small startups?

Any donation is welcome. However, smaller funds will make it significantly more difficult to collect enough funding to deliver on our roadmap. We believe that the amounts included in the three tiers are small-enough and affordable even for smaller, VC-backed startup companies.

Ultimately, if you had to allocate development effort to come up with those metrics in-house, you would have to pay at least the equivalent of a software developer FTE. By collectively tapping on the ecosystem, we can do that at a much better value for money for each of the contributors.

Is there a 3min summary of what ProbeLab is doing?

Watch this opening track talk at IPFS Thing 2023.

Are there more detailed/technical videos that showcase results of the team?

Sure, here's a list: [Protocol Berg 2023 - Exploring the Role of Centralization in IPFS] [IPFS Camp 2022 - Measurement Track Intro] [IPFS Camp 2022 - NAT Hole Punching] [IPFS Camp 2022 - Hydra's Performance] [IPFS Camp 2022 - IPFS DHT Routing Table Health]

Where is the donation money going?

ProbeLab operates as a Cell, under the non-profit Open Impact Foundation based in Liechtenstein. Donations go directly to the ProbeLab Cell and will be used for the purposes outlined in this document, i.e., suggested roadmap. The structure ensures that the funds cannot be diverted for purposes other than their intended use.

What is blocking you from delivering the items on the roadmap faster (i.e., in less than 6 months)?

Team size and capacity as well as other commitments of the ProbeLab team. The more parties that contribute to the roadmap, the more we can expand our team and its capacity to work on the roadmap items.

Apart from the plots and dashboards, what else can we expect out of this sponsorship?

We plan to establish a quarterly report on "The State of the IPFS network", which will include highlights, new developments and most notable results from our measurements. As we expand our scope to other libp2p-based networks, we will establish relevant reports for those too, subject to sponsorship from interested parties.

We will continue to run our public Office Hours (register in Luma) where anyone is welcome to join for a live discussion and Q&A with the team. The Office Hours have been running for years and have proven very useful both for the team and the community.

We intend to make our datasets public, but this is not our top priority right now. As has already been the case during the last couple of years, we plan to run measurement-specific sessions in the upcoming IPFS Camp and IPFS Thing events, as well as other venues, such as DevConnect and others.

Are there similar initiatives or organizations in Web2.0?

The MLab (https://www.measurementlab.net, initially founded and still heavily supported by Google), RIPE (https://www.ripe.net/) and the Internet Society's Pulse project (https://pulse.internetsociety.org/) are all focusing on measurement aspects of the Internet infrastructure and have been extremely successful and very influential so far. We believe the same rigour should exist for Web3.0 networks and this is what ProbeLab wants to achieve.