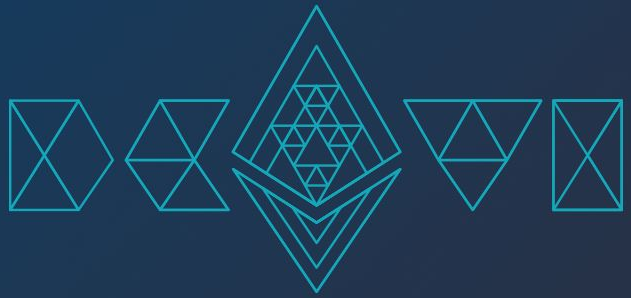
Grantee Day

by ecosystem support program



Privacy & Scaling Explorations

What we do &
how to get involved

Thore
PSE

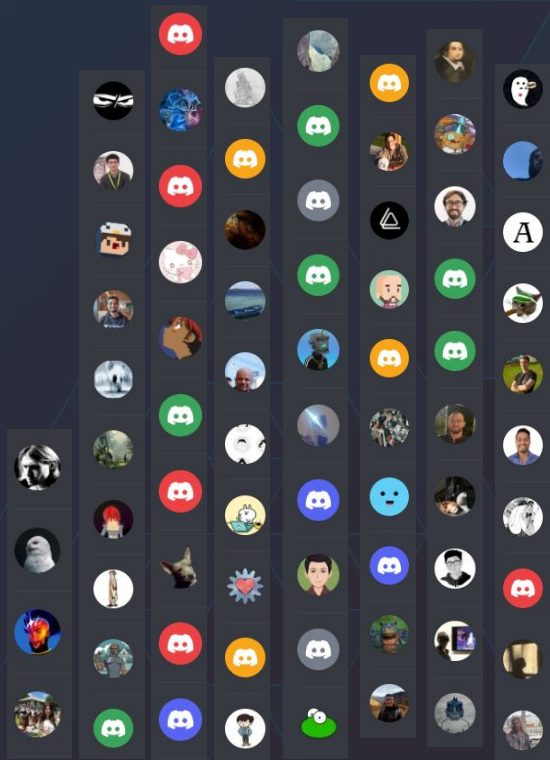
Section 1

What we do

Privacy & Scaling Explorations Team

We explore new use cases for zero knowledge proofs

- We build
  - Circuits
  - Gadgets & Applications
- Other things we do
  - Education
  - Grants



ZKP's on Ethereum

ZKP: proof that you have computed *something* correctly (off chain)

- Generate proof (off-chain)
- Verify proof (on-chain)
- Optionally hide the inputs

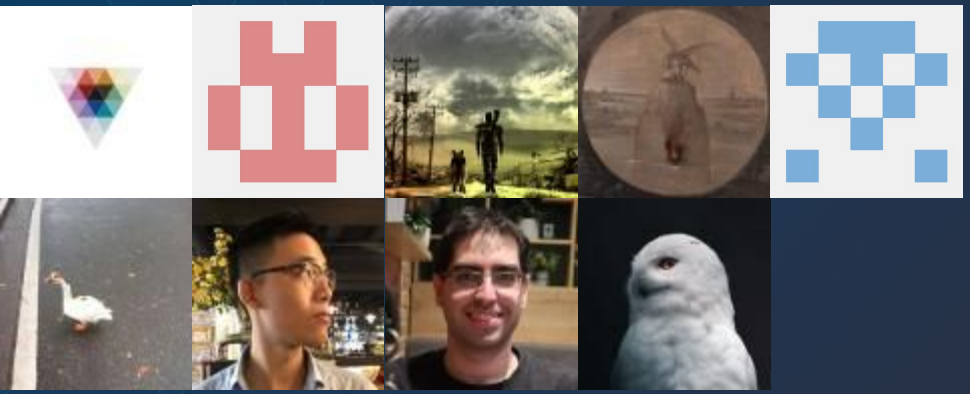
-> Give privacy and scalability back to Ethereum

zkEVM

- Proof Ethereum transaction
- Useful for zk-rollups or light clients (maybe)
- Community edition
- Github: privacy-scaling-explorations/zkevm-circuits
- Vitalik blog
    - Perfect compatibility
    - Disadvantage: prover time

Semaphore

- Privately prove membership of a group
- Circuits, contracts, js libaries
- Allow people to join groups and signal privately
- Semaphore grants round
- Demo on Devcon: TAZ
- semaphore.appliedzkp.org



MACI

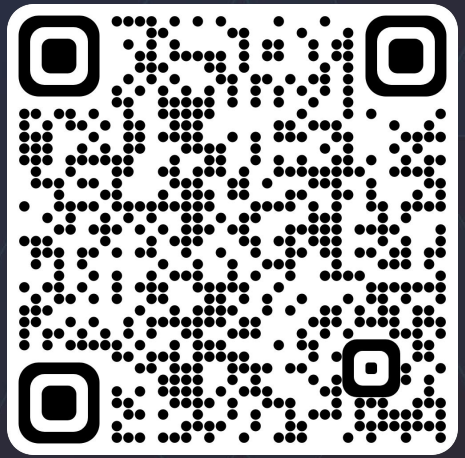
- Bribery resistant voting
- Useful for e.g. quadratic funding
- Users can always override their (encrypted) vote
- Coordinator zk proves that tallied correctly
- Quadratic Funding Devcon, QFI

Section 2

How to get involved

PSE Grants: Semaphore Community Grants

- Dedicated public grants round
- Projects that build on, or extend Semaphore
- Projects at all stages are welcome
- Deadline: Oct 14th (might be extended :))



PSE Grants: L2 Community Grants

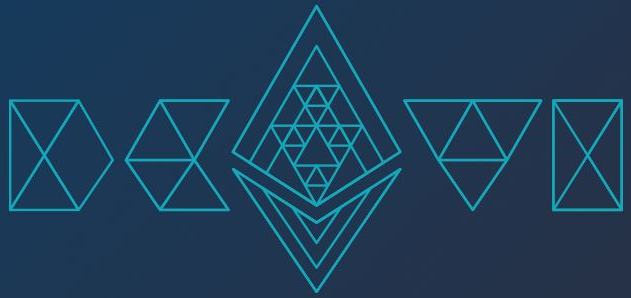
- Support L2 projects
- Rollups, infrastructure, analytics and education
- Projects at all stages are welcome
- Launch Oct 24th

General Grants and Collaboration

- Grants with PSE
  - Who?
    - ZK focussed individuals
  - What?
    - Build on our primitives
    - Come with your own ideas
    - Ask us for ideas
- We are hiring
- Everything is open source

How to get involved

- Check out our projects
  - PSE Website: appliedzkp.org
  - PSE Github: @privacy-scaling-explorations



Thank you!

Thore

Privacy Scaling Explorations (EF)

tg: @zk_th

What Can DAOs Learn From?

Presented by Dream DAO

Introductions

Madison: Co-Founder

Saf: Co-Steward

Dream DAO: We train Gen Z to use web3 for good.

Education

Learning sessions with leaders of web3. Mentorship program.

Internships

Internship program twice per year, at sites like Celo and Regen Network.

Gatherings

Sponsoring conference trips and hosting in-person gatherings.

The Promise of DAOs

Maximizing human coordination

The good news?

We don’t have to reinvent *everything*.

We are solving human problems.

It’s not all tech

Why repeat mistakes when we can learn from them?

What we took inspiration from: Civics Unplugged

Civics Unplugged trains Gen Z to be “civic innovators”. It was essentially an off-chain DAO before they even knew DAOs existed.

- Elected steering committee with a treasury
- Community votes on youth-led projects to fund
- Sub-groups that work on responsibilities like social media and international student experience

Case Study #1: Boy Scouts

The Boy Scouts of America is one of the largest youth organizations in the United States, with about 1.2 million youth participants.

Recruiting Youth

Recruits from existing, values-aligned organizations. Strong emphasis on word of mouth recruitment as well.

Gamification

- Goals are clear: highest level is “Eagle Scout”
- Badges to reward small steps along the way

Case Study #2: Parks

The foundation of public park design and construction is community involvement and gaining consensus.

“Master Plans”

Creates a detailed plan for how the park will be developed. Serves as a blueprint others can learn from. (Open-source :)

Spokes-Council

- Reps of different groups: police/fire depts, Boy scouts, teacher, etc
- Reps go back to smaller groups for meetings
- Anyone can request, all open to the public

Existing for Users

Goals oriented around serving users and extensive mapping of users

Case Study #3: Ecovillages

Small, sustainable physical/co-living communities with their own work, currency, school, and more.

Small Size

Range from 50 to 250 individuals, because with any more it is hard to form a strong community.

Work and Play

Residents of ecovillages have lots of formal structure to keep it running, but have an equal emphasis on community: work and play are interdependent.

Making Money

Most cannot export because of physical isolation, so some make money off of providing education/consulting to outsiders.

Call to Action

Learn from others, and let others learn from you.

Your turn!

What are some examples you know of?

Ecosystem Support Program

Luc L
Team Lead, ESP

What is ESP?

Public facing allocation arm of the Ethereum Foundation

Instead of asking “What should we fund?”, we want to know “What challenges are you facing?”

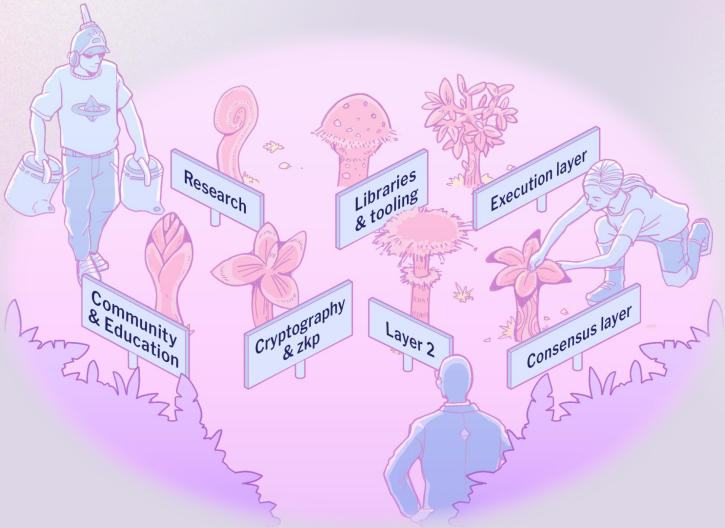
Support is more than just funding

Proactive, rather than reactive

What does ESP support?

Open source

Non-commercial



Benefits Ethereum

Positive sum outcomes

Projects on the lower end of the development stack

What are we looking for?

Grow usage

Grow community

Grow developer base

Grow research capabilities

Improve developer output

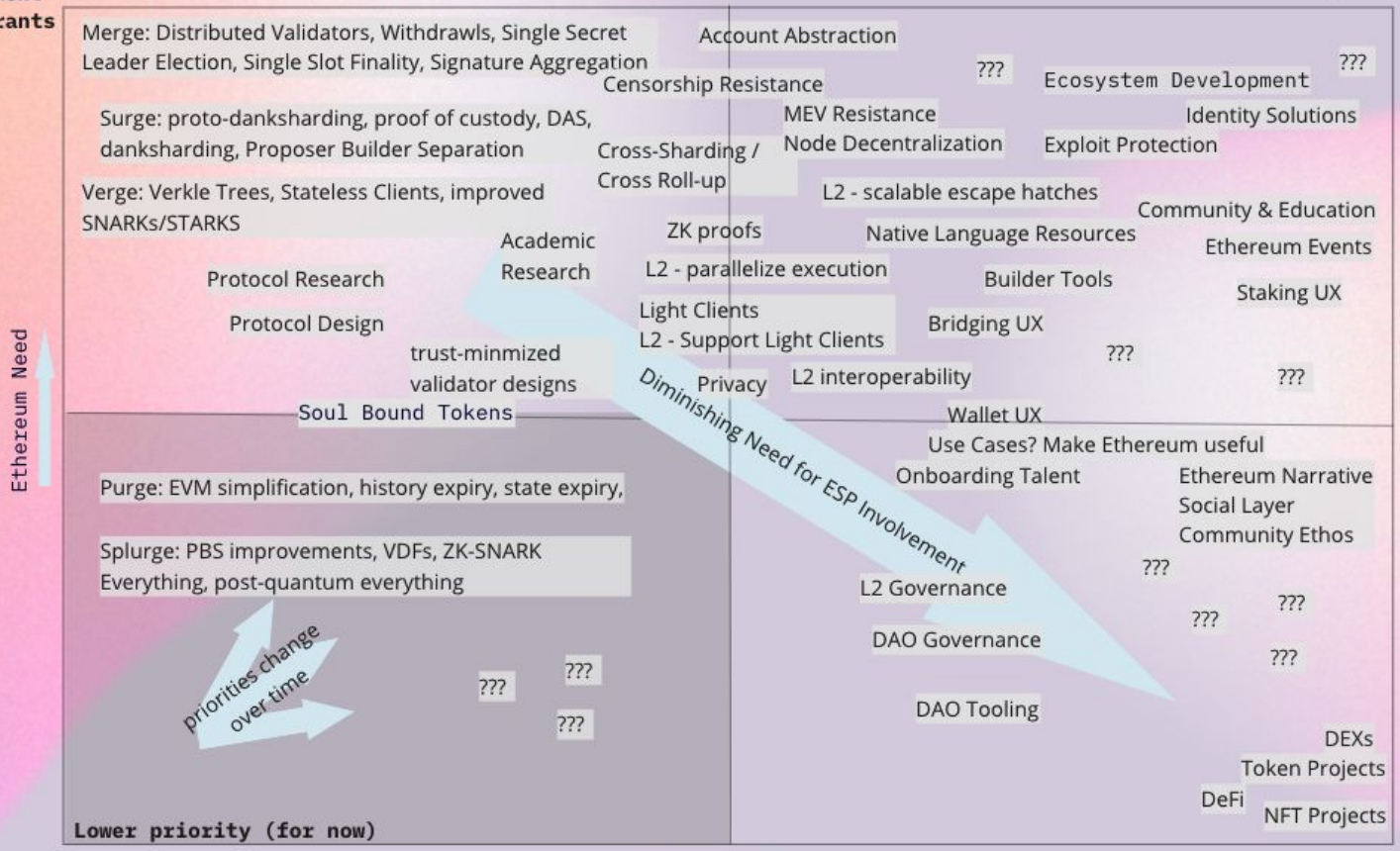
Support R&D that makes Ethereum's tomorrow a reality

Upkeep, i.e. maintaining today's crucial projects

What does all of this mean?

Core Development
- **Targeted grants**
- **RFPs**
- **Challenges**

Support Ecosystem
- **Non-financial support**
- **Grants**
- **Sponsorships**
- **Mentoring**
- **Connections**



What do we stay away from?

Projects that can easily raise funds through VCs or other mechanisms

Projects with a planned token launch or public funding round

NFT projects

Financial products (e.g. trading, investment products)

Token or investment focused events

Hobby activities

ESP
Forms of Support

Office Hours

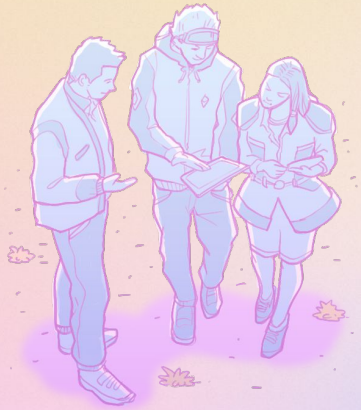
20-minute video calls to offer support in the form of:

- Guidance within the Ethereum ecosystem
- Advice surrounding the grants process
- Feedback on your project before submitting it
- Determining if your project is within the scope of our program
- Identifying other resources and funding opportunities

Sponsorships

Support community events including conferences and hackathons

Capped at $20,000



Sponsorships Evaluation

Are the overall goals of this event Ethereum-aligned?

Is this event hosted in a geographic region that receives limited support?

What speakers will be present at this event?

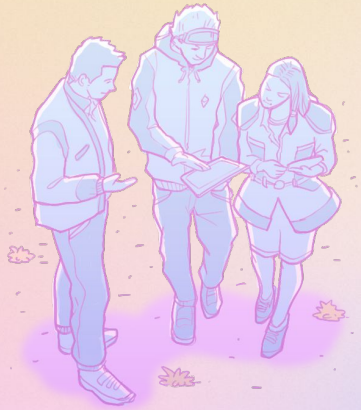
Can the EF's support uniquely help this event?

Small Grants

Projects that are smaller, more experimental, in early stages, or have a shorter timeline

Kickstart a project

Capped at $30,000

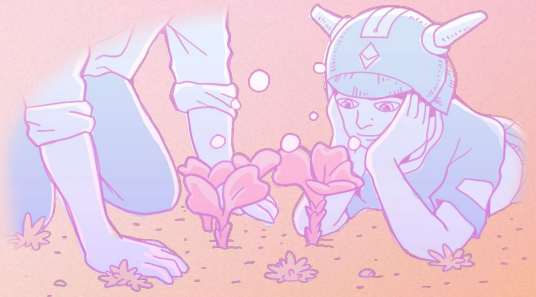


Project Grants

Projects with a larger scope, more complex needs, thorough research, and clearly defined goals and strategies

Undergo process of collaborative review and feedback with advisors within the ecosystem

No cap on funding requests



Grants Evaluation

Problem - how important is the problem to be solved?

Project - how does the proposed project push the state of the art forward, is it feasible, does it add something, how does it fit into the landscape of existing approaches?

People - is this team capable, are they values aligned?

Plan - is the project plan and use of resources sensible?

How do we avoid second order negative impact?

Process

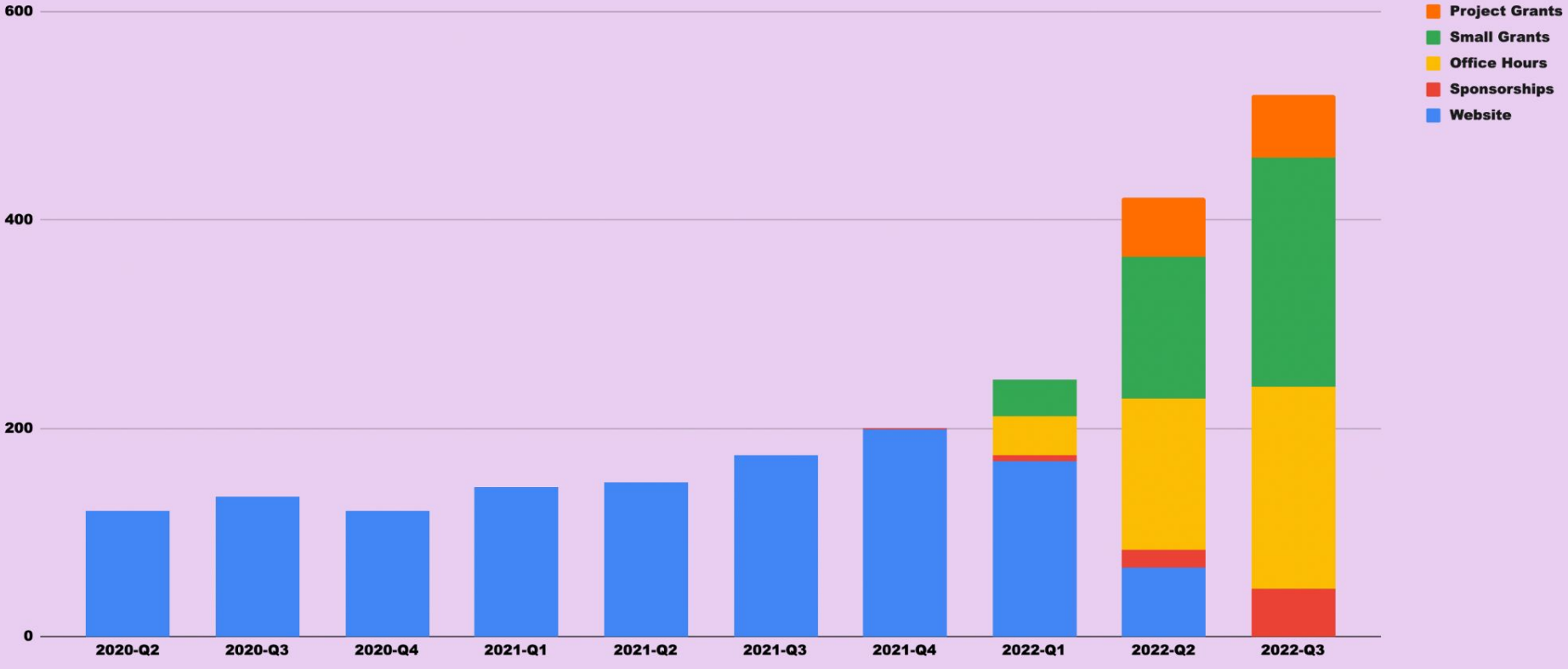
Submit an application via our website

ESP team will get in touch within 1 - 2 weeks

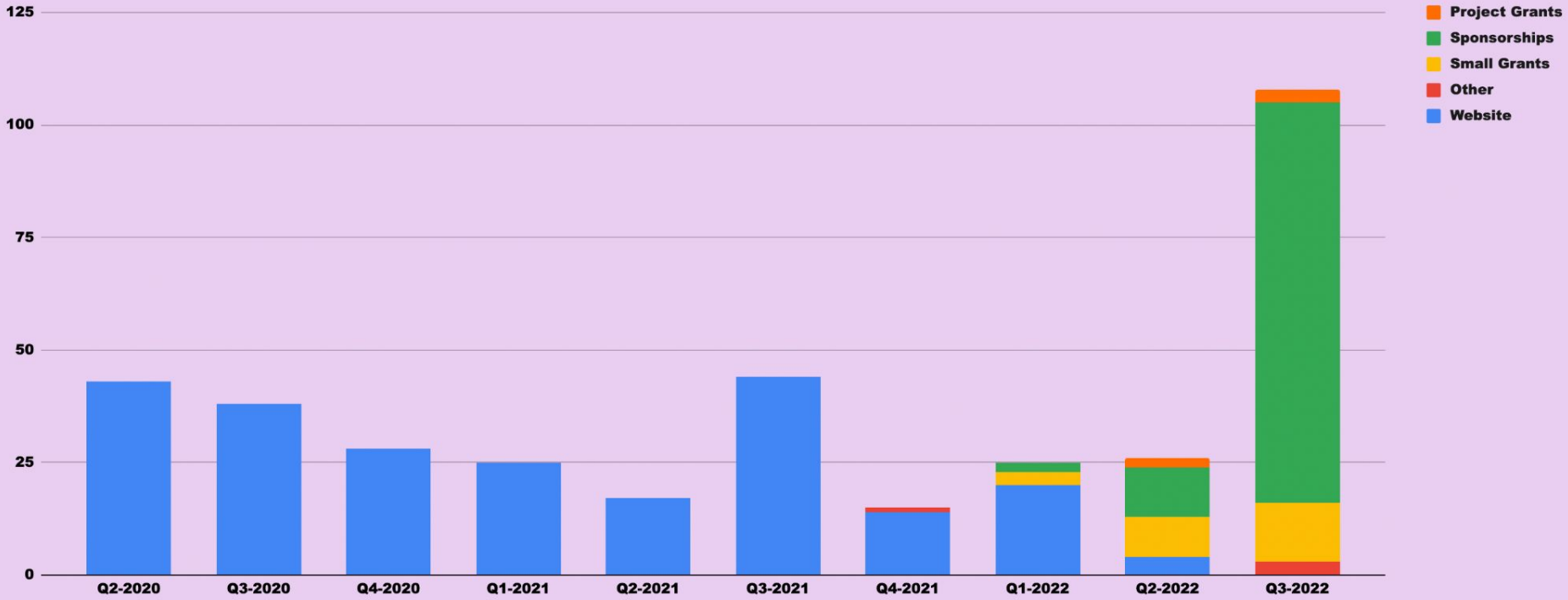
Video call to discuss further

What has ESP been up to?

Applications Received



Awards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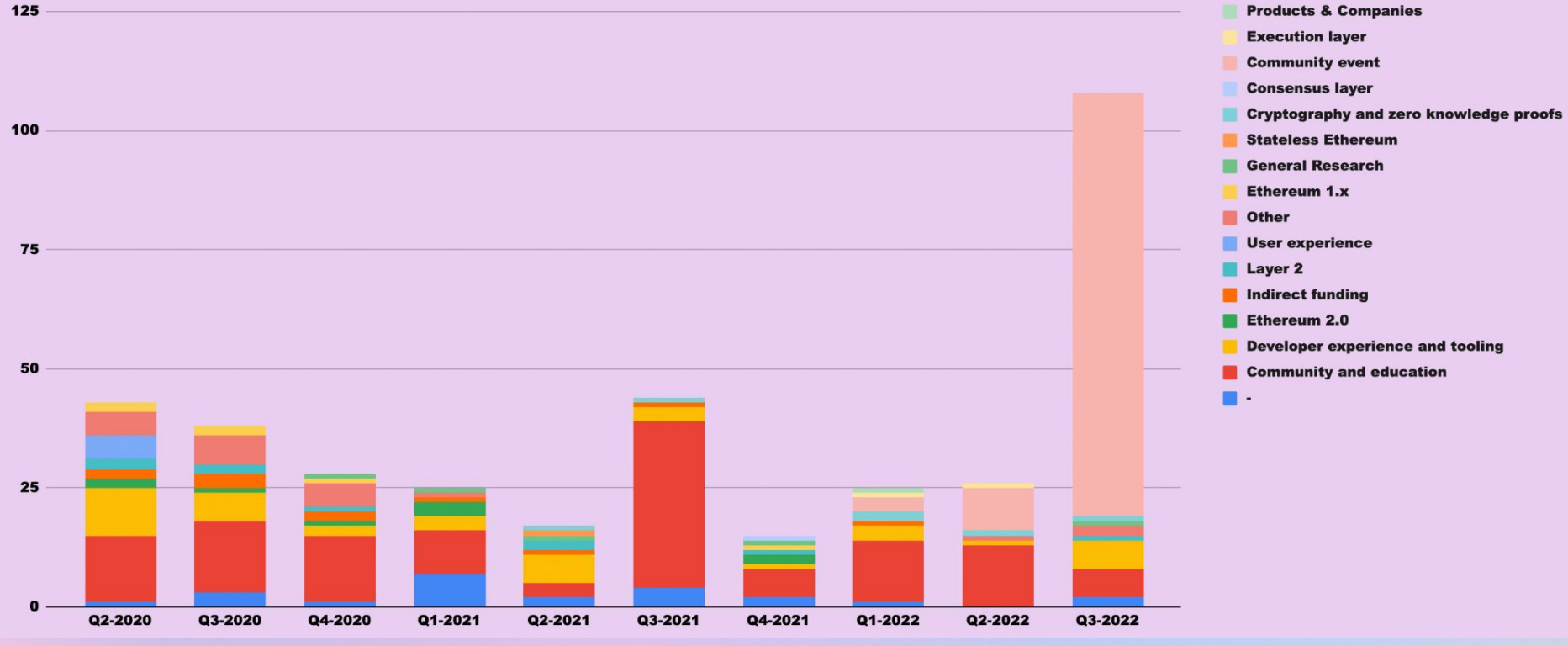
100
75
50
25
0
Q2-2020
Q3-2020
Q4-2020
Q1-2021
Q2-2021
Q3-2021
Q4-2021
Q1-2022
Q2-2022
Q3-2022
Project Grants
Sponsorships
Small Grants
Other
Website

Awards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Q4-2020
Q1-2021
Q2-2021
Q3-2021
Q4-2021
Q1-2022
Q2-2022
Q3-2022
Products & Companies
Execution layer
Community event
Consensus layer
Cryptography and zero knowledge proofs
Stateless Ethereum
General Research
Ethereum 1.x
Other
User experience
Layer 2
Indirect funding
Ethereum 2.0
Developer experience and tooling
Community and education
-

Academic Grants Round

More than $2 million allocated across 39 grants in 7 categories

CATEGORY	# OF PROJECTS	AMOUNT (USD)
Economics	9	$222,067.00
Consensus Layer	9	$483,477.81
P2P Networking	5	$386,592.00
Maximum Extractable Value	5	$351,659.00
Formal Verification	4	$283,165.51
Cryptography and zero knowledge proofs	2	$120,000.00
Other domains	5	$194,807.00

Merge Data Challenge

Document your best Merge data insights in the most readable blog post possible

Up to $30,000 in prizes to be won

Deadline for submission is October 31, 2022

Learn more and apply here!

Semaphore Grants

Submit your proposals for privacy-preserving applications built with Semaphore

Wishlist includes a wide range of domains, including medical, government, and cybersecurity

Deadline for submission is October 28, 2022

Learn more and apply here!

Stay in touch!

ESP Blog

Twitter

Find us at our booth in Devcon on Floor 3!

Q & A

ecosystem
support
program

esp.ethereum.foundation

Web3 is Going Great

Panelists

Brian
0xPARC Foundation

Eda
BuidlGuidl

Jacob
ETHGlobal

Romina
ETHLatam

Moderator

Mauricio
TRU, Tropykus

Sign-In with Ethereum

Anukriti Kunwar

- Product Manager at Spruce
- Prev. Data Program Manager
- Based out of NYC

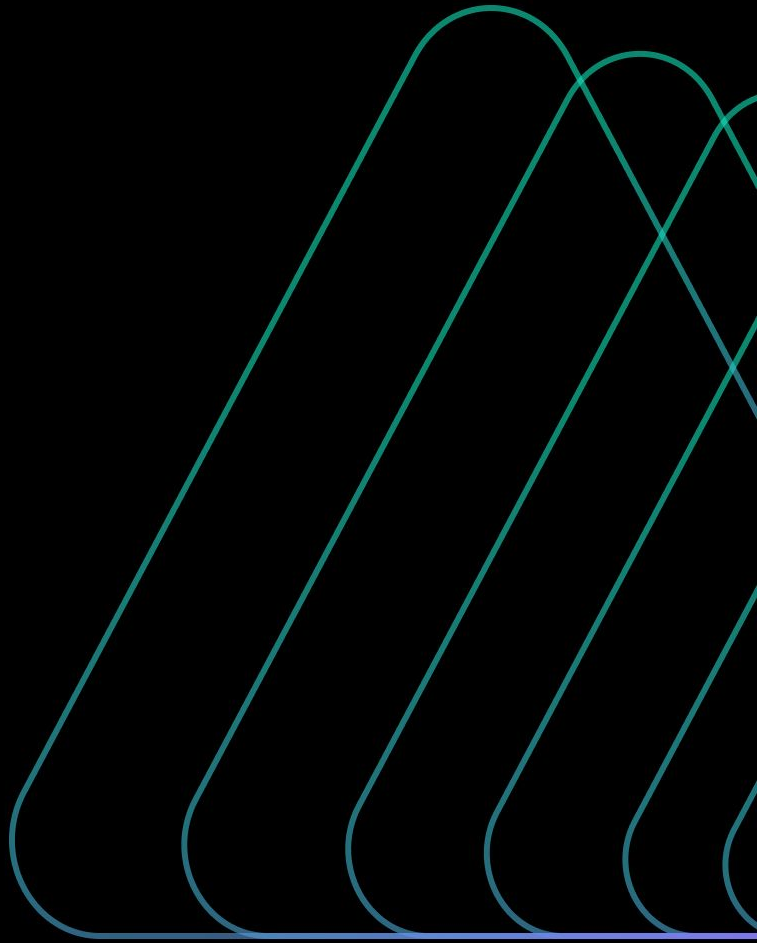
About Spruce

Spruce was founded in 2020 and is a globally distributed team of 20.

Our Mission:
To enable users to control their data across the web

What We'll Cover

- Decentralized Identity
- Big Login Today
- SIWE Crash Course
- SIWE Support & Community
- The Future of SIWE



What is Decentralized Identity?

Statements about reality by anyone,

On-Chain

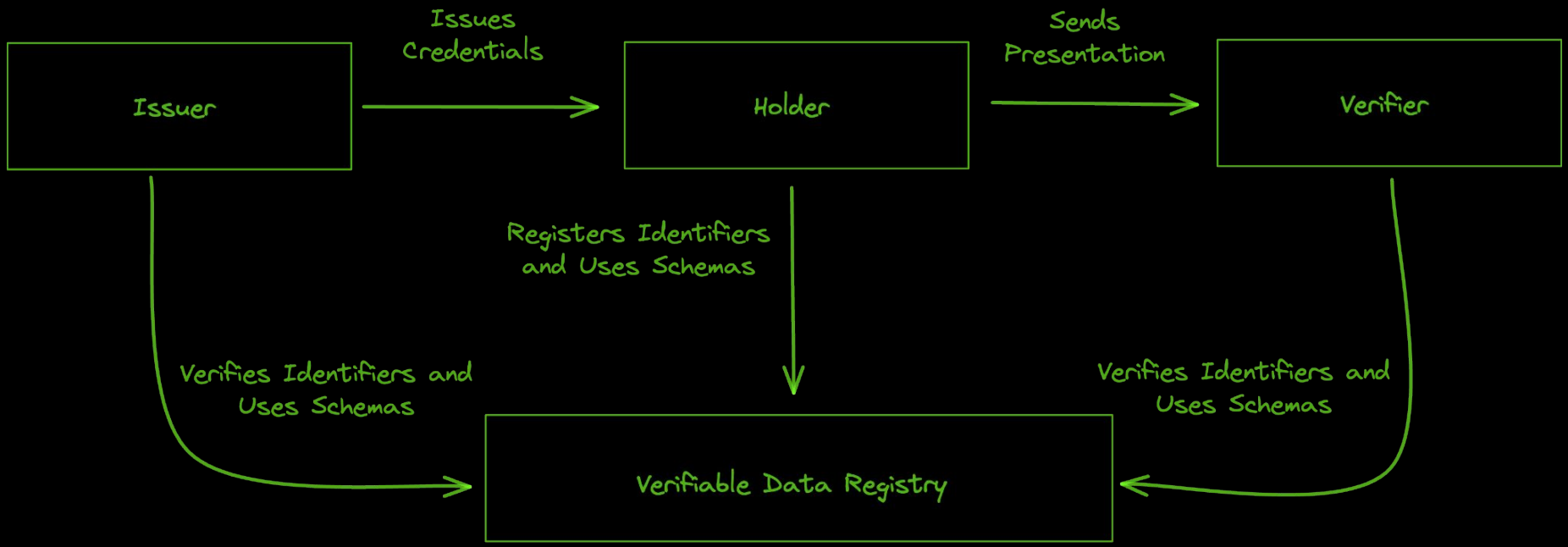
- ETH Balance = 2.4
- Unisocks Holder
- Spent 3 ETH in Gas
- DAO Hack Victim

anukriti.eth

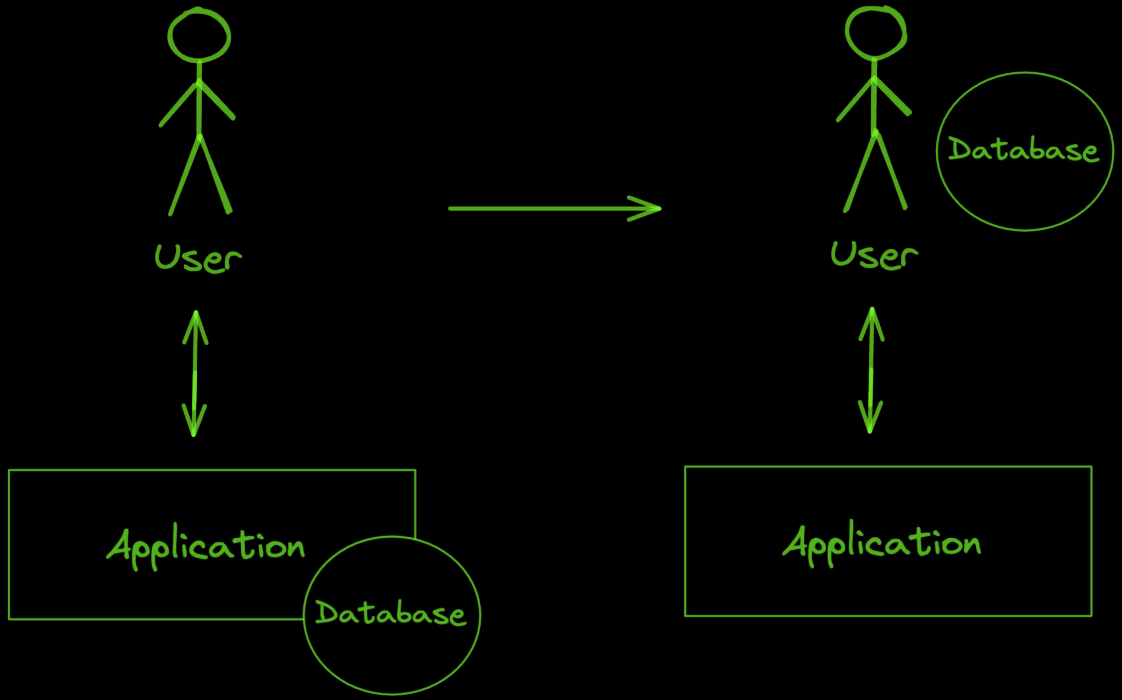
Off-Chain

- Email = ethlad@gmail.com
- Twitter handle = @handle, have over 2,000 followers
- Discord Handle = @sprucewayne#1452
- SoundCloud Handle = WaynePlaysGuitar

Approaches: Off-Chain Statements



The Goal



Goal: Defeat Big Login

Just as cryptography can be used to disintermediate large banks, adding transparency and user control, the same can be done for our digital identities, allowing those who want more ownership to have it

Not Your Keys, Not Your Crypto

Not Your Keys, Not Your Identifier

Ethereum Users *HAVE* Keypairs

Ethereum Wallet MetaMask Reports 21 Million Users, Up 420% Since April

- Key management is already being actively solved by **multiple wallets**.
- Today, they are used mainly to sign **blockchain transactions**.
- With these keys, we can also **move far beyond Web2 identity and simple SSO.**

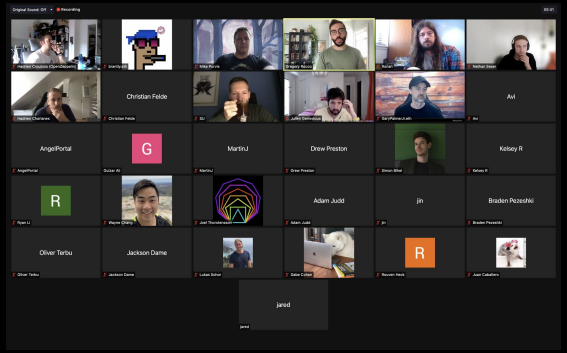
But what’s the first step?

Sign in with Ethereum

Sign-In With Ethereum Support

Sign-In with Ethereum - How Did We Get Here

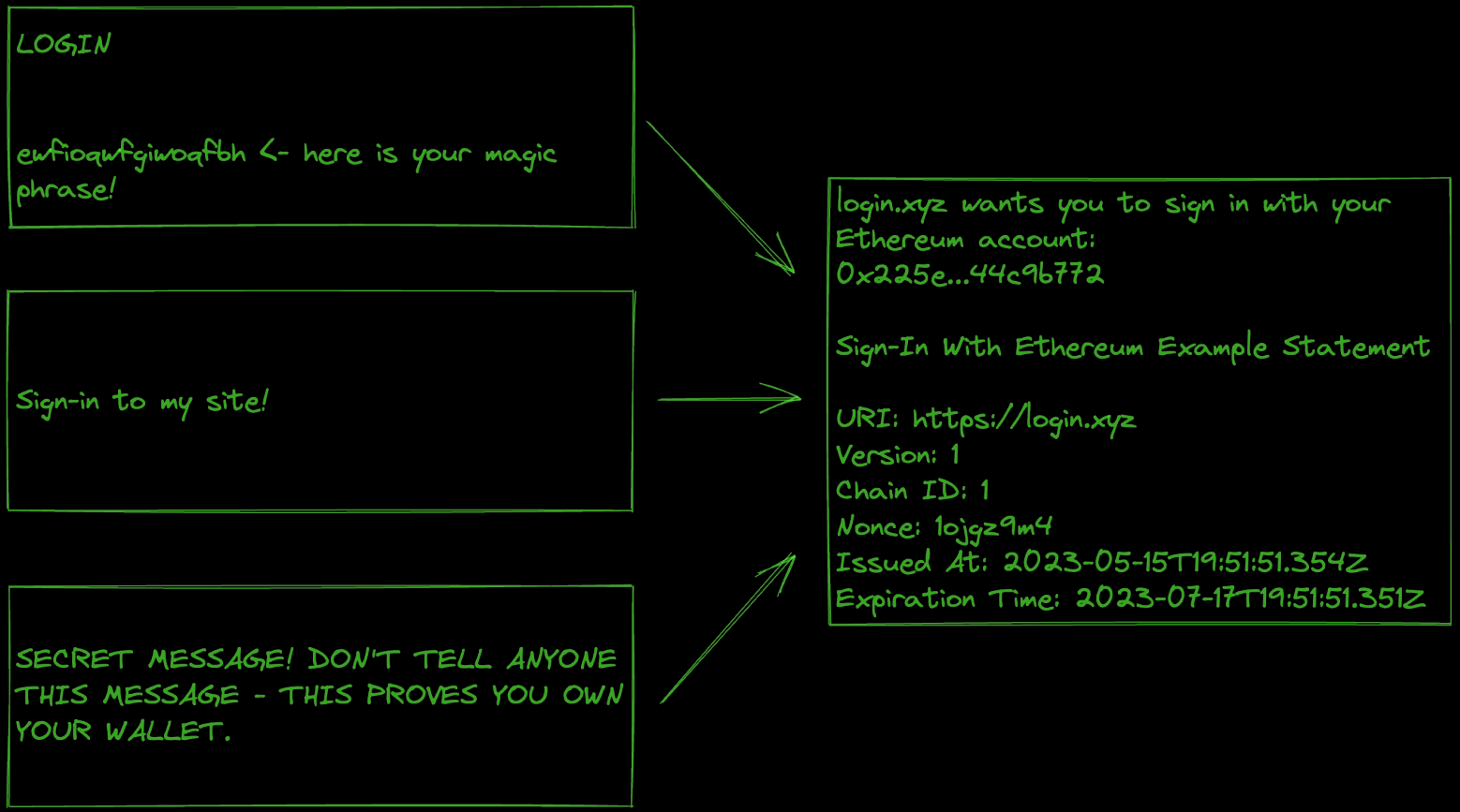
- Public standardization process with community calls
- Ongoing recordings, available minutes, continued iteration
- Combined effort: wallets, dapps, engineers, security engineers



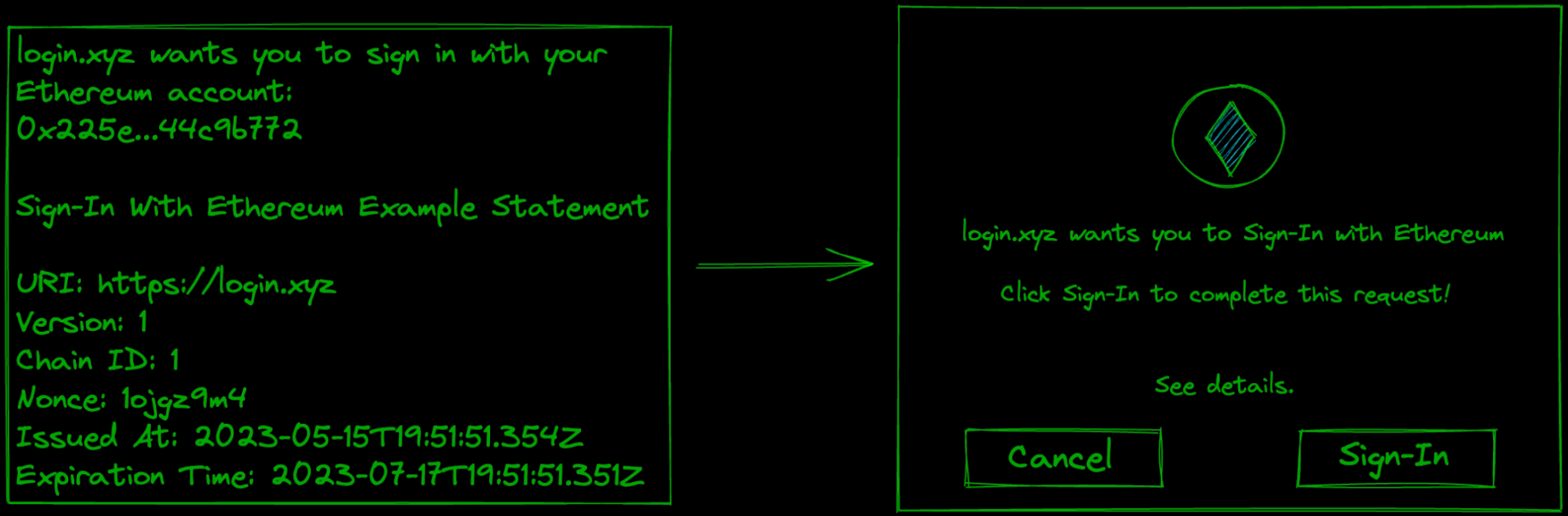
Sign-In with Ethereum Crash Course

Sign-In with Ethereum Crash Course

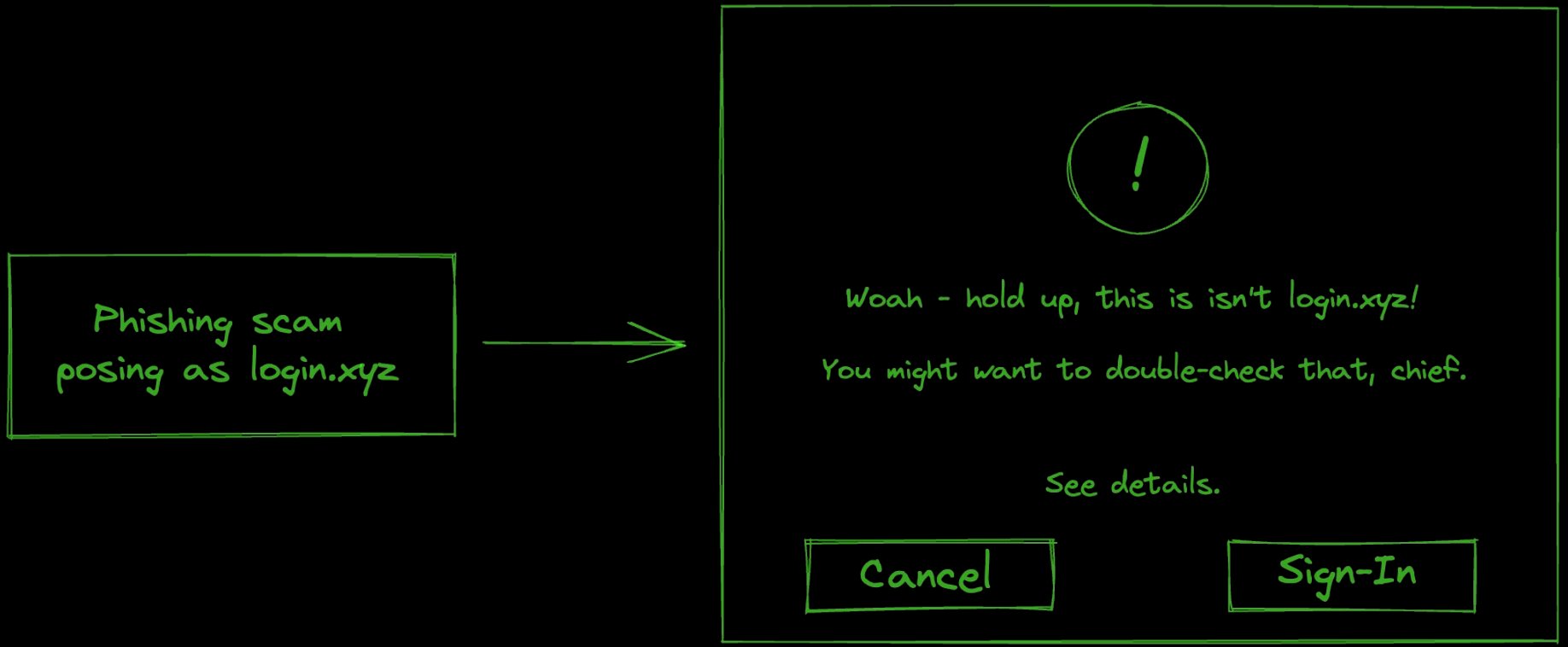
Sign-In with Ethereum Crash Course



Sign-In with Ethereum Crash Course



Sign-In with Ethereum Crash Course

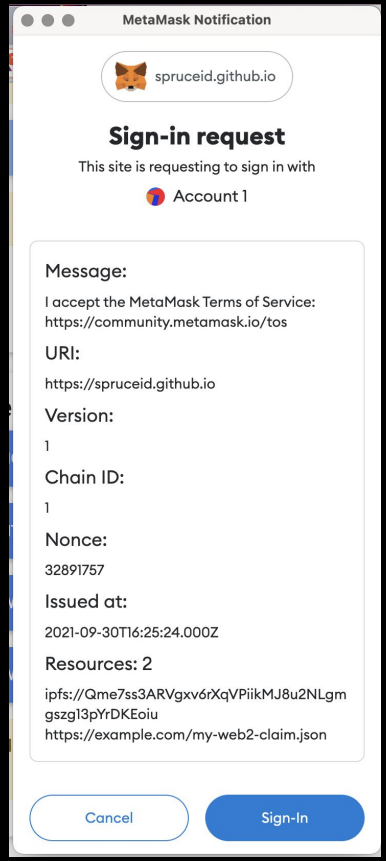


Sign-In with Ethereum Crash Course

```
${domain} wants you to sign in with your Ethereum account:
${address}

${statement}

URI: ${uri}
Version: ${version}
Chain ID: ${chain-id}
Nonce: ${nonce}
Issued At: ${issued-at}
Expiration Time: ${expiration-time}
Not Before: ${not-before}
Request ID: ${request-id}
Resources:
- ${resources[0]}
- ${resources[1]}
...
- ${resources[n]}
```



Sign-In With Ethereum Support

- Wallets
- Applications
- Even Enterprises

WalletConnect

Unlock

Tally

rainbow

CyberConnect

Auth0

boardroom

BETA GameStop NFT

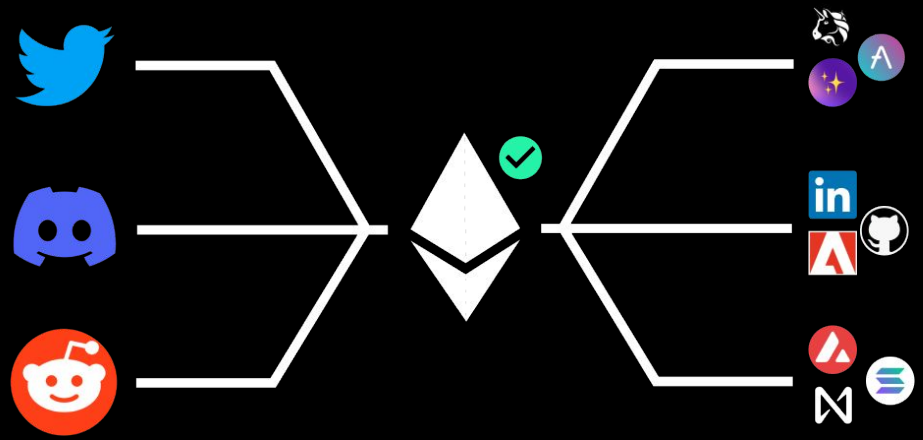
nfty chat

The Future of SIWE

Link social media accounts to addresses

On-chain, cross-chain, and off-chain data are blended

Web2 APIs become trusted data faucets in Web3



PLAID

carta

DocuSign

Surface Data

Deep Data

Maturity of Web3 Identity

We will

to the key-controlled revolution.

Twitter: @spruceid / @bebaakbeyou

https://docs.login.xyz

Building a Post-Merge World

Panelists

Diego
Ethereum on ARM

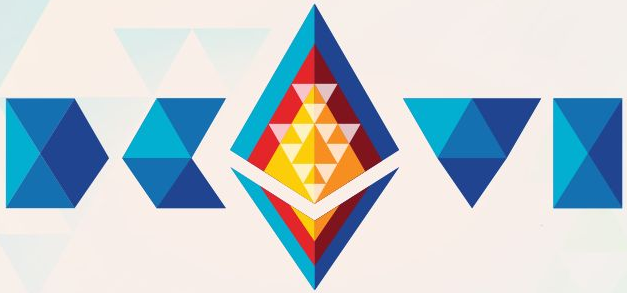
Nixorokish
ETHStaker

Kris
L2BEAT

Paul
Sigma Prime

Moderator

Mario
EF



Account Abstraction

Making accounts smarter

Dror Tirosh & Liraz Siri

Gas Station Network

What is Account Abstraction

Accounts in Ethereum

- Externally Owned Account (EOA) - controlled by an ECDSA key
- Smart Contract - controlled by code

Your current wallet is probably an EOA

The limitations of EOAs - key management is hard

- Tightly coupled with a single key
- Hard to secure - keys get stolen
- Hard to recover - keys get lost

The limitations of EOAs - access control

- No access control granularity - same for all EOAs
- No multisig
- No roles
- No spending policies

The limitations of EOAs - gas payment

- Gas is paid directly by the EOA
- Must maintain ETH balance to pay gas
- No privacy

The limitations of EOAs - efficiency & usability

- No way to batch operations
  - approve+transferFrom - two transactions
- Expensive on-chain reverts

What is account abstraction?

Smart Contract account managed by the user

- Flexible key management and recovery
- Arbitrary access control mechanisms
- Gas payment can be abstracted
- Better efficiency and usability
- Opportunity to innovate where it matters most: UX

Use cases: recovery

- Social recovery
- Dead man’s switch

Use cases: signature abstraction

- Multisig
- Per-device keys
- BLS aggregation
- Quantum resistant signatures

Use cases: roles & policies

- Spending limits
  - Small payments? Seamless from your wallet.
  - Sending $1M? Go get your ledger.
- Multiple roles, delegating specific actions.
  - Payroll can pay employees once a month, with a spending limit and a signature from the controller.
  - Legal can perform on-chain votes with the company's tokens, but can't transfer them.
  - CFO can transfer any sum with 24 hours delay and a signature from another C-level executive.
  - External auditor monitors delayed payments and can veto them, but can't initiate transfers.
- Session keys
  - Ephemeral key kept in the browser can perform less-sensitive operations.

Use cases: gas abstraction

- Gas sponsorship models
- Pay gas with ERC20 tokens
- Privacy - interacting with the blockchain without buying ETH
- Cross-chain operations

Use cases: batching & automation

- Batching and atomicity
- Automating time-delayed and event-driven flows

ERC 4337 - why make it a standard?

ERC-4337 - first step toward protocol level Account Abstraction

- Shared mempool for arbitrary contract wallets
  - A single network of bundlers can serve everyone
- Make contract-wallets a 1st class citizen
  - No need to keep an additional EOA funded to use the wallet
- Separate validation from execution
  - Enables efficient block-building and prevents DoS attacks
- Efficient batching and aggregation
  - Makes rollups cheaper
- No protocol changes
  - Start experimenting now on any EVM chain

What's next?

- Enshrine AA into the protocol without enshrining a particular wallet
- Seamlessly convert existing EOAs to smart contracts
- User can choose the implementation and enjoy new AA features
- Default implementation should emulate an EOA
  - Backward compatible with existing wallets
- Can be achieved in a few ways - still in discussion
  - New transaction type for calling account code - account pays gas
  - New transaction type just for setting account code
  - EIP-3074+EIP-5003 (AUTH+AUTHUSURP)
  - Set default proxy contract for all addresses
  - ...

How do I join the AA revolution?

Build wallets

- Start experimenting with ERC-4337
- Add useful features like batching and key recovery
  - Try some ideas from the first part of this presentation
- Innovate: build cool new features that were not possible with EOAs
- Building a cool ERC-4337 project? Consider applying for an EF grant!
  - https://esp.ethereum.foundation/

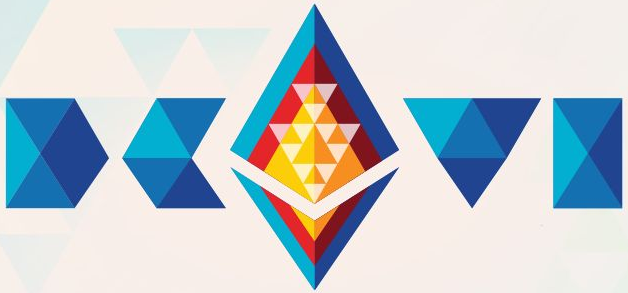
Building a DApp? Consider AA implications

- Consider contract wallets a 1st class citizen
- Do not assume that accounts can sign messages directly
  - Use ERC-1271 to check for signatures if the caller has code
- Start supporting batching in your UI when connected to a contract wallet that supports it
- Consider gas sponsorship models that suit your DApp.
  - Got a token? Your users could pay gas with it when using your dapp.
- Collaborate with wallet devs on ways to improve DApp UX through wallet innovation

Where can I learn more?

Useful links

- ERC-4337 SDK
- ERC-4337
- Account abstraction discord



Thank you!

Dror Tirosh & Liraz Siri

Gas Station Network

@opengsn

Break!

Solidity Dev to ZK Dev

Why and How You Should Start ZK Dev Now

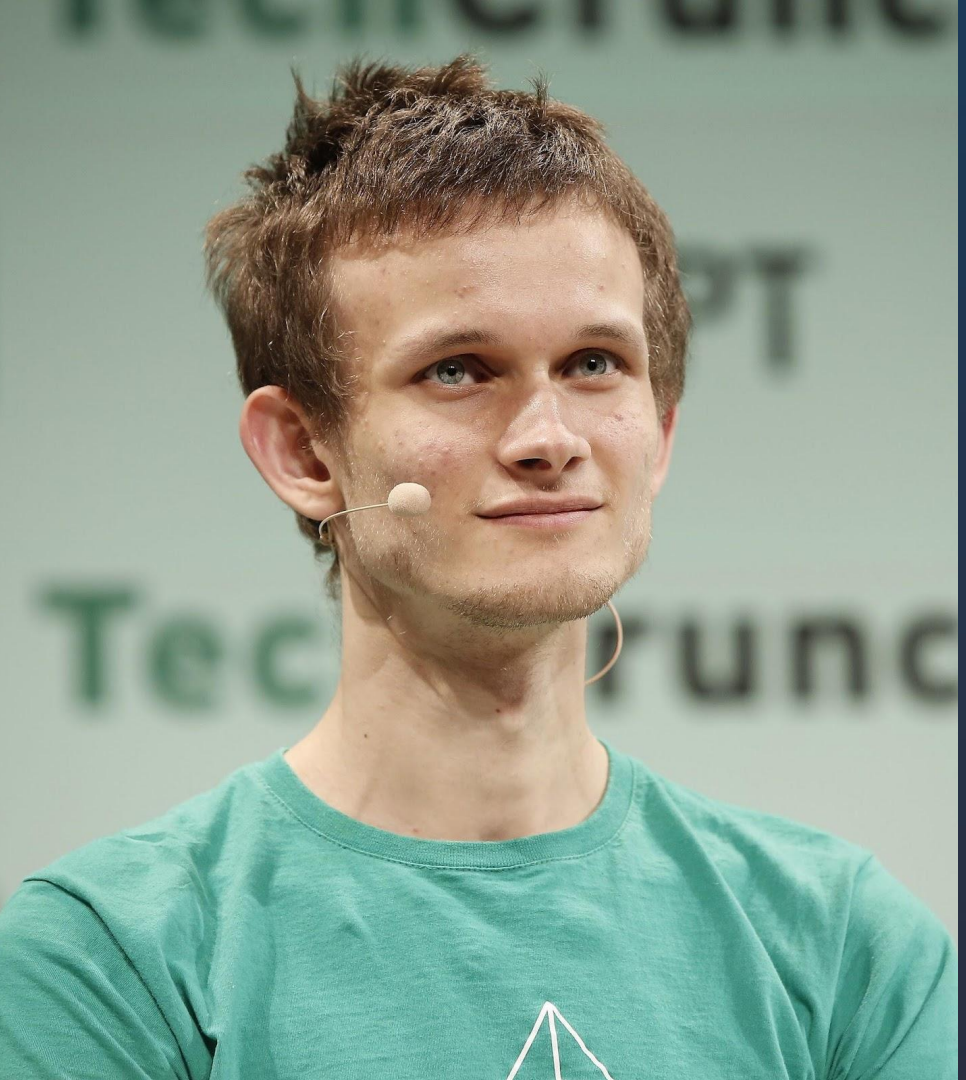
Jack Gilcrest - Ian Brighton

BattleZips - ZK Battleship

What is Web3?

What Does Satoshi Nakamoto Think?

"A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution."



What Does Vitalik Buterin Think?

"What Ethereum intends to provide is a blockchain with a built-in fully fledged Turing-complete programming language that can be used to create 'contracts' that can be used to encode arbitrary state transition functions"

What Does Nick Szabo Think?

"The obscurity of a large random number, so vast that a lucky guess is unlikely in in, if desired, the lifetime of the universe, is the foundation upon which cryptographic protocols, and in turn smart contracts, are built."

What Does Gavin Wood Think?

"In short, we engineer the system to mathematically enforce our prior assumptions, since no government or organisation can reasonably be trusted."

Web3
is Sovereignty
in Cyberspace

Cryptography
is Authority
in Cyberspace

State of Web3

- Zealous conviction in tokenization/ financialization of all assets
- Prioritization of financial prosperity over Web3's core tenants
- Dwindling interest in enterprise use-cases
- Limited throughput contends with unbounded blockspace demand

Decentralized Finance “Lost the Plot”

- Cryptocurrency is seen as a mechanism for profit rather than financial agency
- Capital allocation focused on chasing gains over innovation
- Receding decentralization due to increased government ire

Can We Break Web3 Out of DeFi?

Cue Zero Knowledge Cryptography…

Decentralization	Compliance
Coin Mixers	KYC/AML
Social Media & Identity	Identification Friend or Foe (IFF)
Trustless Computing	IRS Audit Trigger
Proof of Reserves	Controlled Substance Distribution

Semaphore

Anonymous Social Coordination?
ZK Proofs of KYC/AML Compliance?
That's up to you...

Semaphore Community Grant
Round Ends October 28th, 2022

https://esp.ethereum.foundation/semaphore-grants

The Growth of Zero Knowledge Cryptography

1985

First ZK Proof
(Goldwasser, Micali, Rackoff)

2013

Pinocchio (First zkSNARK)
TinyRAM (First ZK VM)

2016

Groth16
(First practical zkSNARK)

2018

First ZK-Rollup (Barry Whitehat)
Circom (Iden3)
First zkSTARK (Starkware)

2019

PLONK (AIR/RAP vs R1CS)

2020

StarkEx (Cairo ZK VM)
Halo 2 (ZCash)

2021

Mina (Snapps ZK VM)
Circom 2.0 (Iden3)

2022

Plonky2 (100x faster than PLONK)
zkEVMs (Hermez, Scroll, zkSync)
ZPrize (XPrize for ZK)

Applying ZK Cryptography to the EVM

An Exploration of Privacy and Scalability on Ethereum

Domain-Specific Languages

Scaling requires expertise

Computation verified on L1

Consensus from root Ethereum Network

SDK abstracts as much ZK complexity as it can

ZK circuit/ proof agnostic to underlying chain

Virtual Machines In ZK

Highly scalable with no effort

Computation verified on L2

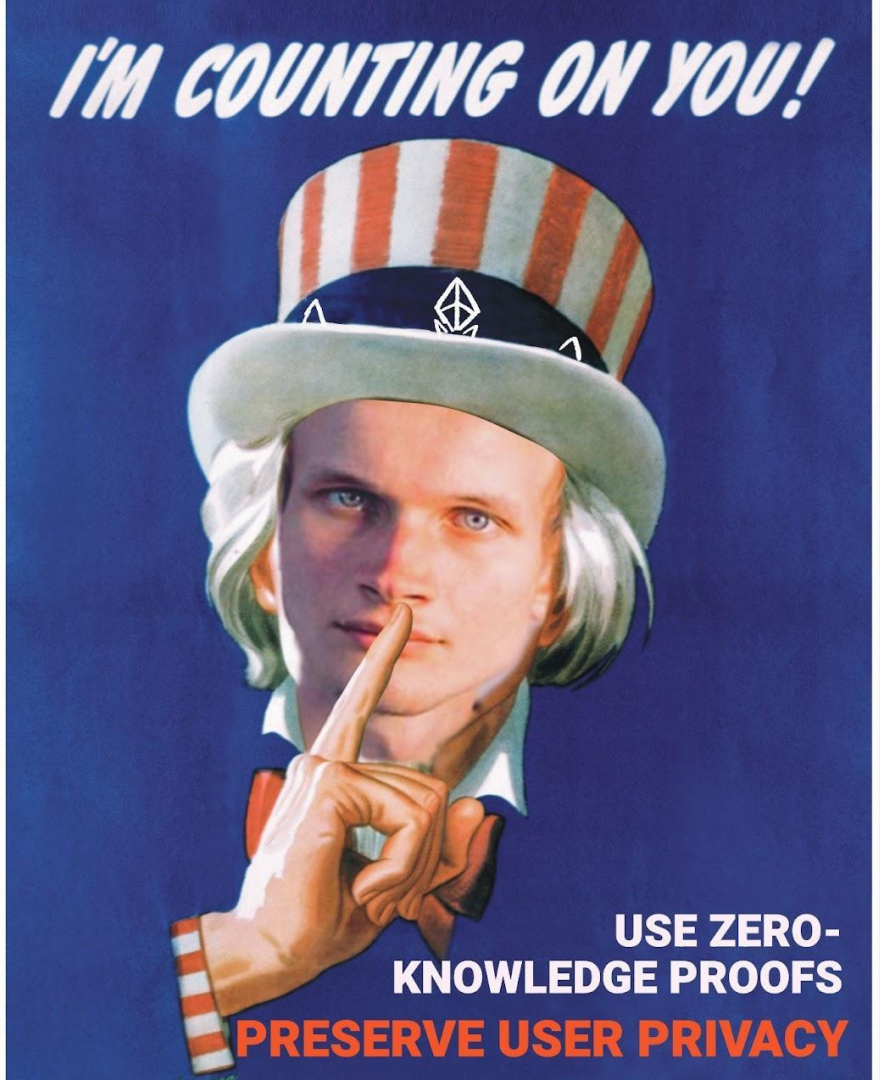
Separate security/ validator set from root Ethereum network

VM Language built specifically abstracted for ZK dev paradigm

Vendor lock-in risk*

Circom

2022 Gold Standard
For ZK DSL's



Jumpstart Your Circom Dev

https://battlezips.com/resources

Circom Topics

Powers of Tau, Groth16 vs PLONK

Multiplexing to Evaluate Conditionals

Circuit-friendly Hashing & Signing

Merkle Trees

First and Third Party Dev Tooling

Implementation Demonstration

BattleZips Road Map

V1 (Feb 2022)

- Private state on public EVM
- No focus on scalability
- Intermediate state is public (even though ships are private)

V2 (EoY 2022)

- State generation & consensus off-chain (state channel)
- ZK-shielded summary of State Channels roll up full game in one on-chain tx
- Intermediate state is shielded
- ZK ELO Score demo

Maturity (2023)

- “Zips” zk state channel pattern
- Application to real-world use cases
- Exploration of multiple layers of Zips

BattleZips V2

State Channel ZK Receipt/ Summary

Generic Proof Types & Their Application

Uses zcash/halo2 instead of iden3/circom for recursion

Proof of a Valid Battleship Game where Alice won and Bob lost

Proof of a Valid Delivery (IoT sensors + chain of custody maintained)

Proof of a vote on PROPOSAL where X% of participants ratified the proposal

Thank you!

BattleZips

Please contact us if you want help starting your ZK Dev journey - we are just paying it forward!

@jp4g_
@brightir2025

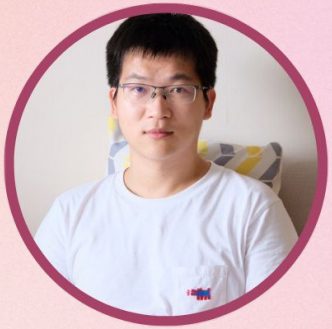
Education across Cultures

Panelists

Camila
Women Build Web3

Divyanshu
Devfolio

Ulaş
ITU Blockchain



Yan
Dapp Learning

Moderator

Luka
EF

Thank you for joining us at Grantee Day!

ecosystem
support
program