

# Hardening the Commons

- Capability Maturity Model Research Workshop

**Summer of Protocols Team**

Venkatesh Rao, Sam Chua, Josh Stark, Trent

Van Epps, Tim Beiko, Timber Schroff

# **This is a RESEARCH workshop!**

We have a good question, we don't have a good answer... yet!

**We're not here to teach. You're here to help us find some good strawman answers**

Your contributions will help shape the **Summer of Protocols 2025 agenda/work**

You can continue to follow the work at **[summerofprotocols.com](http://summerofprotocols.com)**

**"How to harden the commons?" is in our opinion one of the most important research questions in the emerging science of protocols!**

# Goal of this workshop

The goal of this workshop is to try and put together everything we collectively know about capture/censorship-resistance, decentralized governance, permissionless innovation, cryptography, cryptoeconomics, etc. into a **Capability Maturity Model (CMM)** that can serve as a roadmap for anyone who wants to harden a commons resource.

**Harden in 2 senses:** As in “radiation hardening” electronics against damaging radiation, and “hardness” in the sense of ability to make strong commitments (Josh Stark).

**Commons in the broadest possible sense:** Ethereum L1, open-source projects, physical public spaces, social media, natural environment, democratic processes, cultural heritage etc.

# Commons: Working Definition + Candidate Examples

Systems for producing or stewarding shared resources – Trent Van Epps

- Ethereum L1
- Open-source projects
- Physical public spaces
- Social media feeds
- Natural environment
- Democratic processes
- Cultural heritage
- Common Law
- Irrigation systems
- Predictive knowledge in a prediction market

**Not all examples may fit the idea perfectly!**



←Take a photo of the slide when you see this icon

# Elinor Ostrom's 8 rules for managing the commons

1. **Define boundaries:** Clearly define who has access to what
2. **Adapt rules:** Tailor rules to the local context
3. **Participate:** Involve the community in decision-making
4. **Monitor:** Regularly monitor the commons
5. **Sanction:** Use graduated sanctions for those who abuse the commons
6. **Resolve conflict:** Make conflict resolution easily accessible
7. **Give legal status:** Grant the commons legal status so they can organize
8. **Network:** Embed the commons within larger networks



Treat as thought-starter, not gospel!

# Shared GDrive folder to dump your final CMM model



You will generate **a final one-sheet drawing** of your CMM through this workshop. Put all your **team members names** on it and **take a photo** when you are done.

**Upload your image file to this folder**

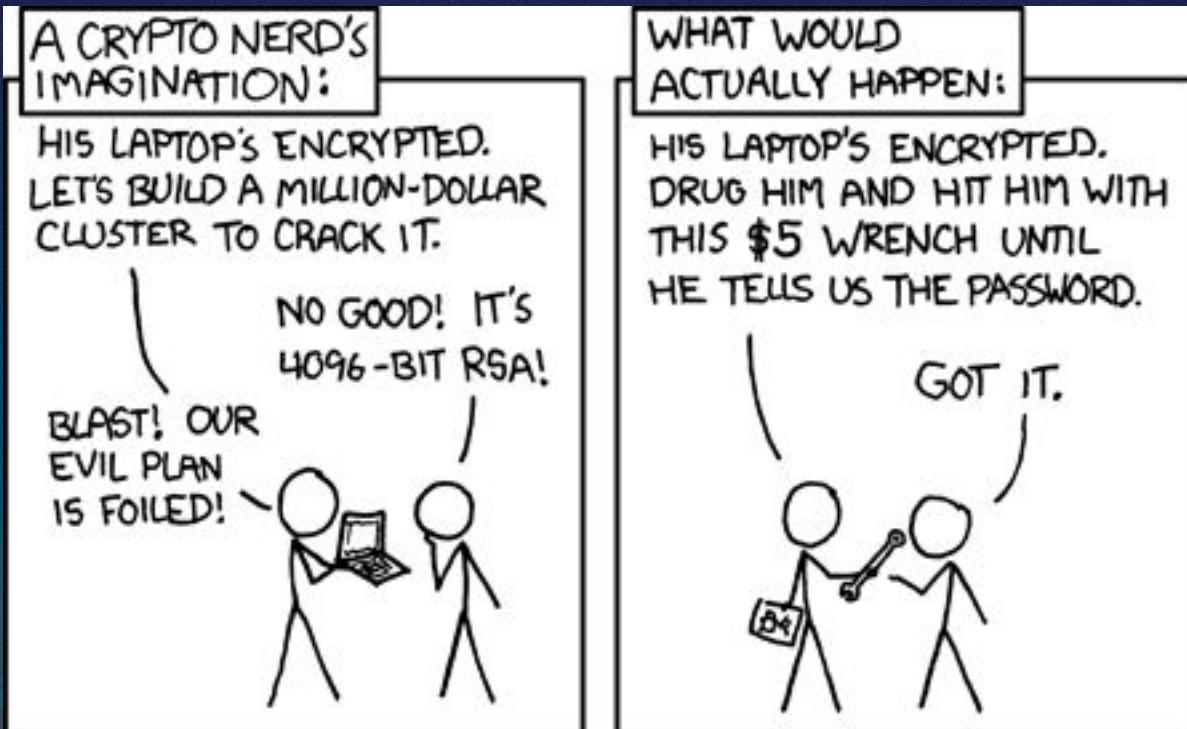
If you have issues just hand your paper sheet to **Timber**

We'll post a notes on  
[forum.summerofprotocols.com](http://forum.summerofprotocols.com)  
eventually.

# Agenda

1. Overview of the workshop and Capability Maturity Models (10 minutes)
2. Set of 5 alternating provocations + 5 breakouts to refine CMM (2h 05 min)
  - a. **Bounding box** (8 minutes + 17 minutes) – Venkatesh Rao
  - b. **The punk spirit** (8 minutes + 17 minutes) – Samuel Chua
  - c. **Designing for hardness** (8 minutes + 17 minutes) – Josh Stark
  - d. **Short break (10min)**
  - e. **Enclosure/capture threats** (8 minutes + 17 minutes) – Trent Van Epps
  - f. **Hardened commons + Ethereum** (8 minutes + 17 minutes) – Tim Beiko
3. Sharebacks from groups: (20 minutes)
4. Town hall comments (10 minutes)
5. Wrap-up and next steps (5 minutes)

# Short version of the hardening problem



# **What is a CMM?**

A CMM (Capability Maturity Model) is a well-known model to help analyze and synthesize how an organization acquires new capabilities by evolving/learning through multiple "levels" over several years

Yes, it can turn into LinkedIn middle-manager technocratic bullshit, but when done well it can really help you think about how large groups can acquire significant new capabilities

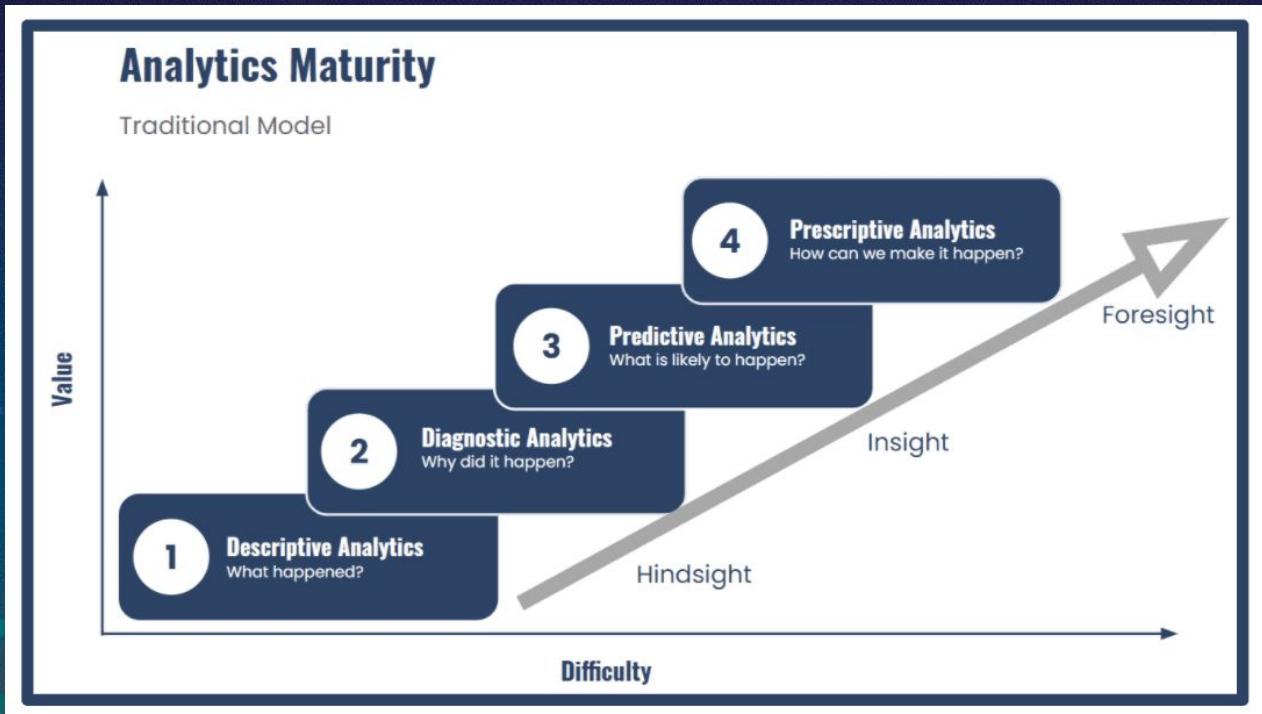
We will need to adapt the approach a bit to apply it to commons, since it is for traditional orgs.

# CMM Example 1: A Generic Template



Source: <https://www.linkedin.com/pulse/capability-maturity-model-cmm-5-levels-mutwakil-abdalla/>

# CMM Example 2: Analytics



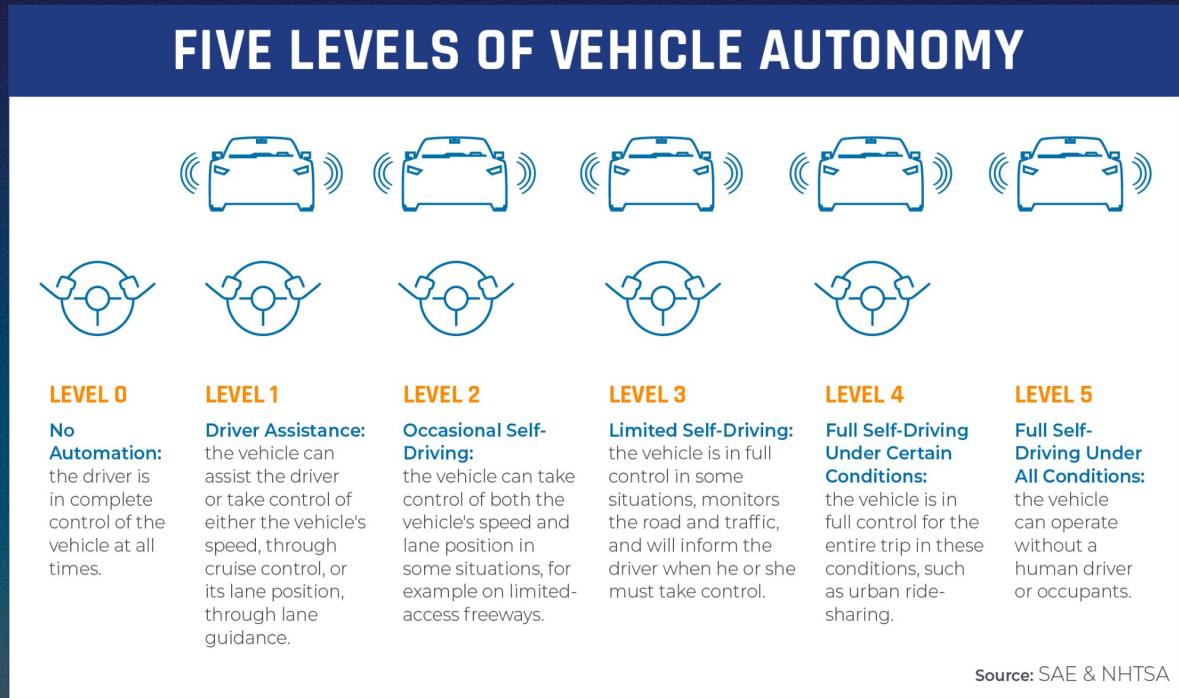
**Source:** <https://www.phdata.io/blog/what-is-analytics-maturity-framework/>

# CMM Example 3: Security in generic template

	Initial 1.0	Developing 2.0	Defined 3.0	Managed 4.0	Optimized 5.0
People	Activities unstaffed or uncoordinated	Infosec leadership established, informal communication	Some roles and responsibilities established	Increased resources and awareness, clearly defined roles and responsibilities	Culture supports continuous improvement to security skills, process, technology
Process	No formal security program in place	Basic governance and risk management process, policies	Organization-wide processes and policies in place but minimal verification	Formal infosec committees, verification and measurement processes	Processes more comprehensively implemented, risk-based and quantitatively understood
Technology	Despite security issues, no controls exist	Some controls in development with limited documentation	More controls documented and developed, but over-reliant on individual efforts	Controls monitored, measured for compliance, but uneven levels of automation	Controls more comprehensively implemented, automated and subject to continuous improvement

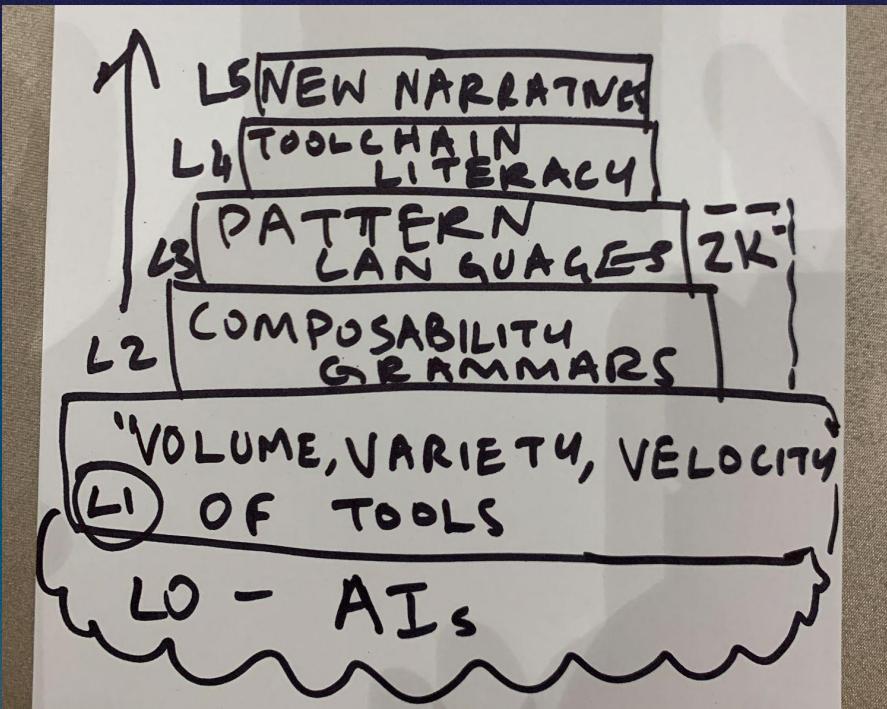
Source: <https://security-architect.com/how-to-assess-security-maturity-and-roadmap-improvements/>

# Example 4: Self-Driving Autonomy



Source: SAE and NHTSA

# Web3 Tool Adoption CMM



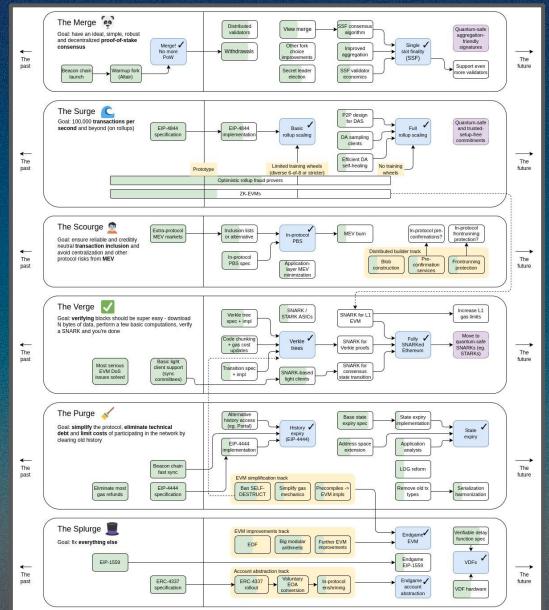
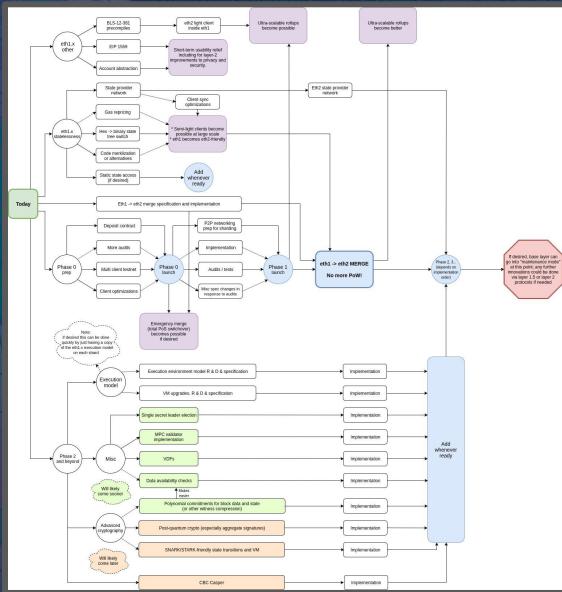
Just made fresh in "Web of Roots" workshop

# Example 4: Vitalik's Ethereum Roadmaps

2020

2022

2024



2024 Oct 29  
Possible futures of the Ethereum protocol, part 6: The Spurgle

2024 Oct 26  
Possible futures of the Ethereum protocol, part 5: The Purge

2024 Oct 23  
Possible futures of the Ethereum protocol, part 4: The Verge

2024 Oct 20  
Possible futures of the Ethereum protocol, part 3: The Scourge

2024 Oct 17  
Possible futures of the Ethereum protocol, part 2: The Surge

2024 Oct 14  
Possible futures of the Ethereum protocol, part 1: The Merge

2024 Sep 28

vitalik.eth.limo

The screenshot shows a mobile browser displaying a series of articles by Vitalik Buterin about possible futures for the Ethereum protocol, starting from the Merge and progressing through the Verge, Purge, and Spurgle stages. The URL is vitalik.eth.limo.



# How to make a CMM

1. Pick a **specific important commons** to think about (eg: software, natural water body)
2. Pick a **specific target social group** that is trying to mature its capabilities
3. Define **4-7 levels**. Traditional ones are: *initial, managed, defined, quantified, optimized.*
4. **Name each level** and characterize it in terms of **people/technologies/capabilities**
5. Try and **define a test for each level** by which you know if a commons has achieved it
6. Can be visualized as a **pyramid**, a ramp, or a growing stack. **Pick a visualization.**
7. The journey is a **collective learning curve** from ad hoc/unmanaged or absent state of capabilities to mature and refined
8. Often there is an evolution **from scattered/fragmented to integrated/coordinated**
9. Often there is **codification/documentation** too
10. Both the **organizational structure and the people in it are learning** and forming procedural memories that will **survive people leaving/joining**



## Special challenges for us

1. CMMs are typically conceptualized for **top-down traditional organizations** with leadership imposing **fiat training programs**. How does this work for **bottom-up communities**?
2. CMMs often rely on **process codification and documentation**. How does that work with **illegible communitarian foundations**.
3. CMMs are usually about **technocratic management** (esp middle managers) how do you install them with focus on **direct technological agency**?
4. CMMs often focus on **acquisition and installation** of behaviors and capabilities but fail to think about **maintenance/entropy**, which is particularly important for commons

**Provocation #1: Venkatesh Rao**

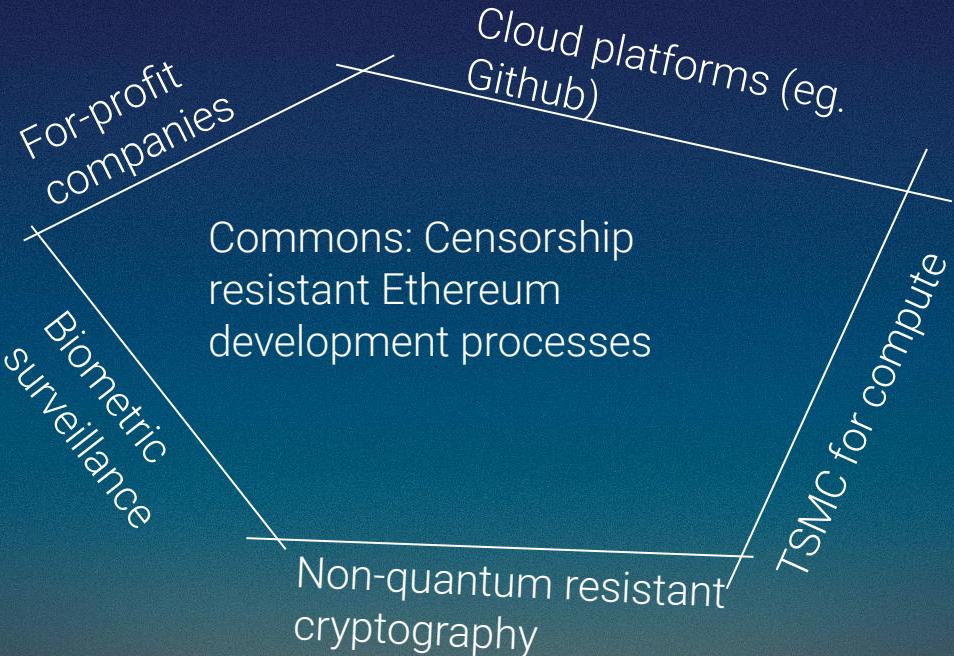
**BOUNDING BOXES**

# **Provocation #1: Venkatesh Rao**

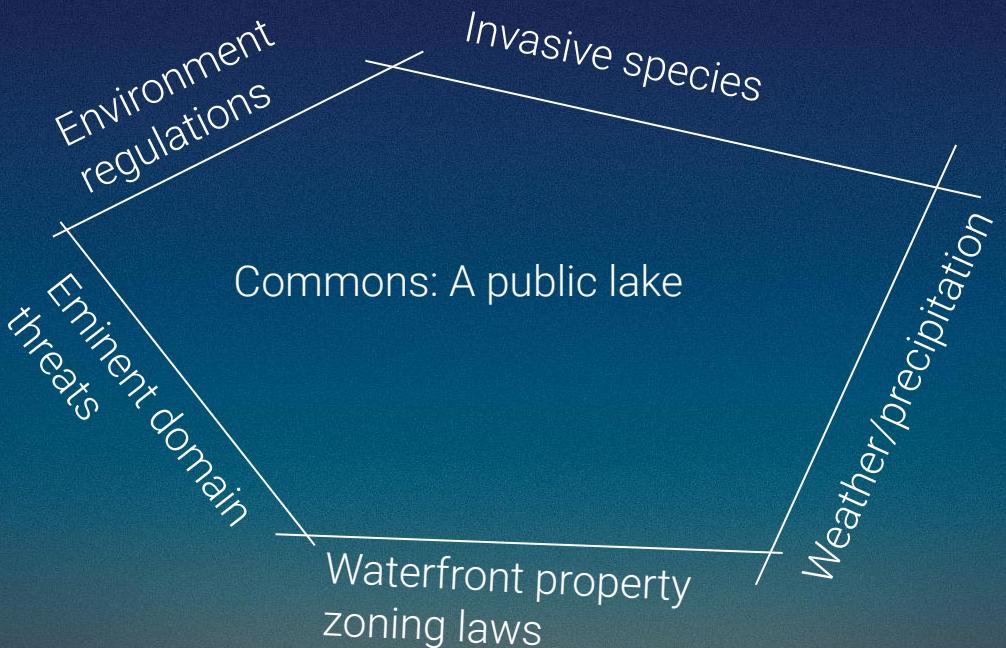
Define the BOUNDING BOX of your chosen commons. Some useful questions:

1. What is the “physical medium” of the commons?
2. Who are the “neighbors”
3. What is the nature of the boundaries?

# Example: A Digital Commons



# Example: A Physical Commons



# Breakout #1:

**Form a group of 3-5 people (SoP alumni please spread out)**

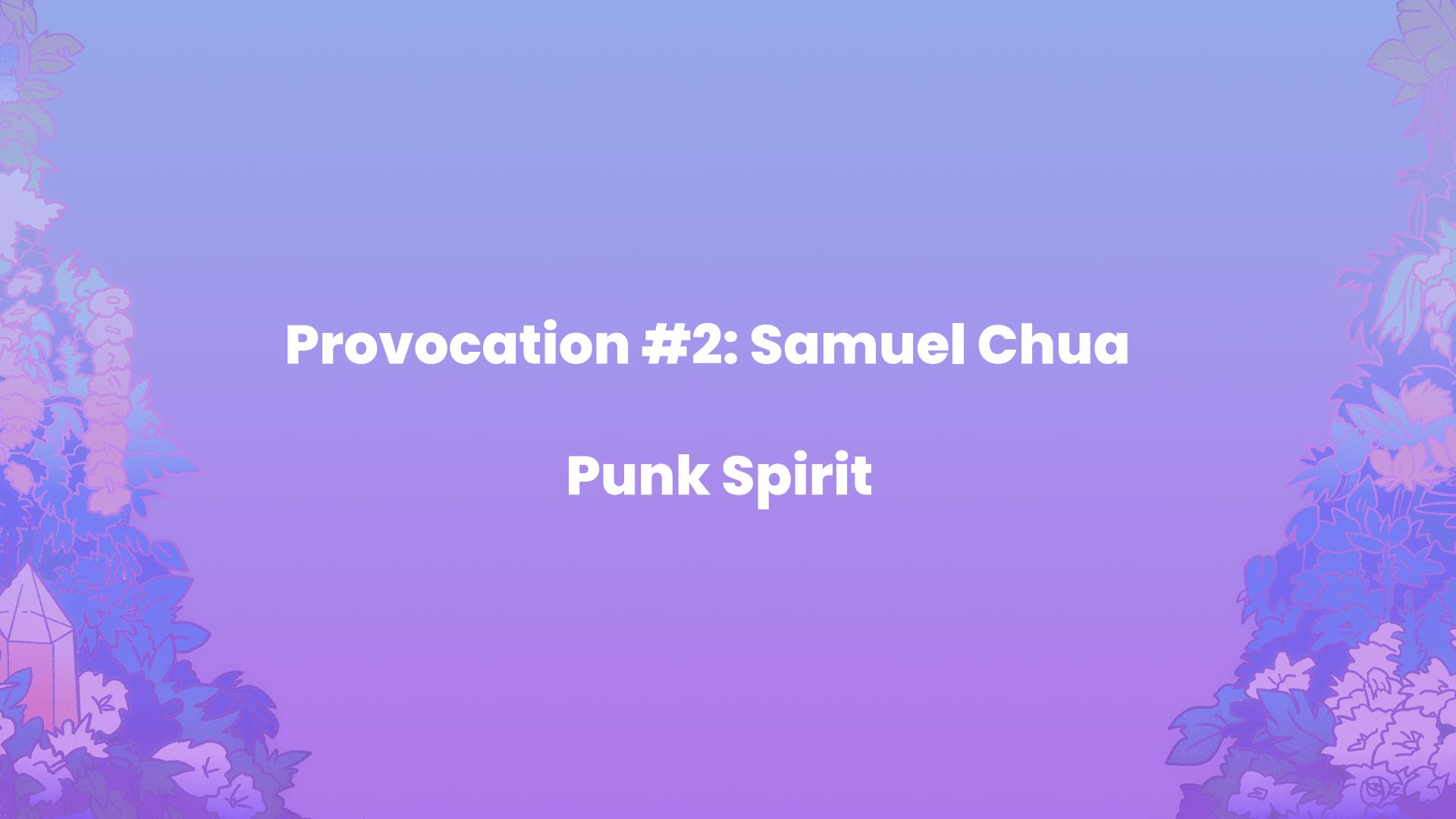
Choose a target commons to work on, \_\_\_\_\_

...and a target population (can be heterogeneous) think about: \_\_\_\_\_

Brainstorm material environment conditions and constraints that affect this commons. Draw a **bounding box** to think about this if helpful.

Pick and sketch a visualization template to use, check that the template includes room for the following (initial versions, you will iterate through the 5 breakouts)

- Set of named levels
- Set of associated capabilities/skills the people/context have at that level
- Tests for whether capabilities are at a given level



**Provocation #2: Samuel Chua**

**Punk Spirit**

# The Spirit of Punk

## The Small vs. The System

'Punk' genre as non-heroic, even anti-heroic  
About the world as much as about the characters  
Asymmetric conflict:  
small indie protagonists vs. big institutional antagonists

## 'Prep' = The Opposite of 'Punk'

PREP	PUNK
INSIDER / ELITE DESTINED FOR 'GREAT' THINGS SCHOoled FOR 'SUCCESS' INSTITUTIONAL	OUTSIDER / EVERYMAN WHAT'S 'DESTINY'? SCHOOL OF HARD KNOCKS ALIENATED

## Technology without Technocracy

Governance without Governments  
Roads without Rulers

## Punks Proliferate when Systems

Suck

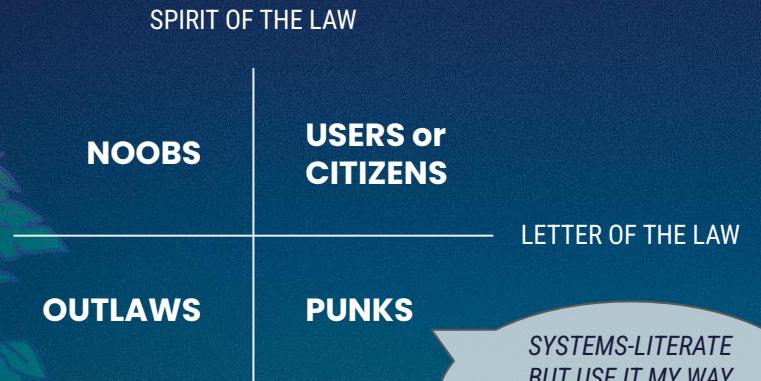
SUCKY SYSTEMS



GOOD SYSTEMS

# A Systems View of Punk

Aligned in Letter, but not in Spirit



Punk is not about UX, but about X-UX  
(EXCEPTION-AL USE EXPERIENCES)

Affordances vs.  
Instructions

GIVE ME WHAT I CAN DO SHOW ME HOW TO DO IT	TELL ME WHAT TO DO CONTROL HOW I USE THIS

Punk: Emergent Use,  
Evolution, Exaptation,  
Creativity, Mutation, Etc.

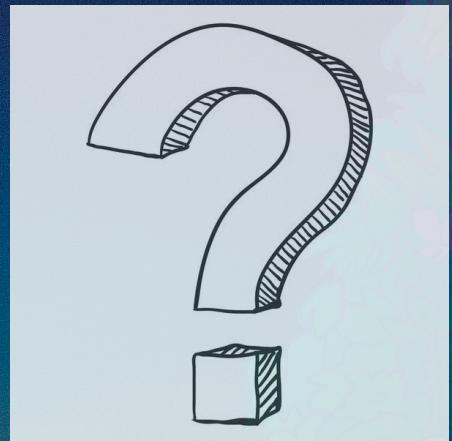
Powerful, Important, and also Dangerous

# Punk-Prone vs. Punk-Proof Systems?

PUNK-PRONE



PUNK-PROOF



Or here?

Is the 'sweet spot' here?

## **Breakout #2:**

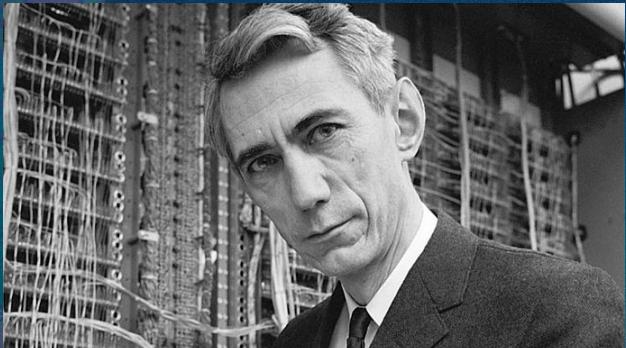
- Think about punk/hacker aspects of your CMM, and its target culture level
- Identify the appropriate level of “punkishness” for your hardening problem
- Revise/refine your levels to reflect the punkishness needed

# **Provocation #3: Josh Stark**

**Hardness**

# Provocation #3: Josh Stark

## Primer: What kind of **idea** is hardness?



The Bell System Technical Journal  
Vol. XXVII No. 3 July, 1948

A Mathematical Theory of Communication  
By C. E. SHANNON

INTRODUCTION

THE recent development of various methods of modulation such as PCM and PPM which exchange bandwidth for signal-to-noise ratio has increased the interest in a mathematical theory of communication. In particular, it is a natural consequence of the important papers of Nyquist<sup>1</sup> and Hartley<sup>2</sup> on this subject. In the present paper we will extend the theory to include a number of new factors, in particular the effect of noise in the channel, and due to the nature of the statistical process of the original message and due to the nature of the random destruction of the channel.

The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the messages have *meaning*; that is they refer to or are correlated according to some criterion with certain physical or material entities. These semantic aspects of communication are irrelevant to the engineering problem. The significant aspect is that the actual message is one selected from a set of possible messages. The system must be designed to operate on the average according to the one which will actually be chosen since this is unknown at the time of design.

If the number of messages in the set is finite then this number or any monotonic function of this number can be regarded as a measure of the information produced by the use of the set, all choices being equally likely. As was pointed out by Hartley the most natural choice is the logarithmic function. Although this definition must be generalized considerably when we consider the influence of the statistics of the message and channel we have a continuous range of measures, we will in all cases use an essentially logarithmic measure.

The logarithmic measure is more convenient for various reasons:

1. It is practically more useful. Parameters of engineering importance

<sup>1</sup> Nyquist, H., "Certain Factors Affecting Telegraph Speed," *Bell System Technical Journal*, v. 1924, p. 126; also see his "Topics in Telegraph Transmission Theory," *A. I. E. E. Trans.*, v. 47, April 1928, p. 617.  
<sup>2</sup> Hartley, R. V. L., "Transmission of Information," *Bell System Technical Journal*, July 1928, p. 535.

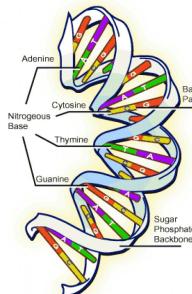
379

### The Informational Capacity of the Human Ear

Homer Jacobson<sup>1</sup>

Department of Chemistry,  
Hunter College, New York City

New concepts of the nature and measure of information (*1*, *4*) have made it possible to specify quantitatively the informational capacity of published estimate (*5*) gives 330,000 total number of monaurally distinguishable frequencies and intensities. Dividing this figure by the number of discriminations measured,  $1.3 \times 10^4$  is an estimate of the approximate average time needed to distinguish between two tones in a second. The same figure can be used for independent calculation. An extrapolation of the data (*1*) on the efficiency of perception



# Provocation #3: Josh Stark



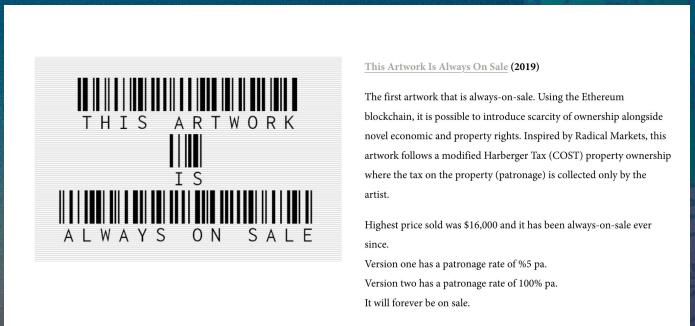
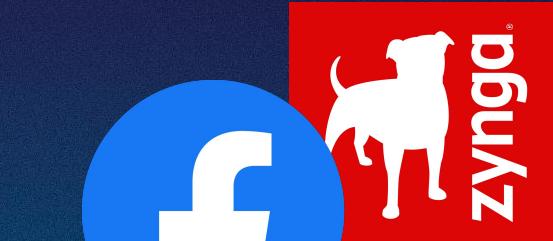
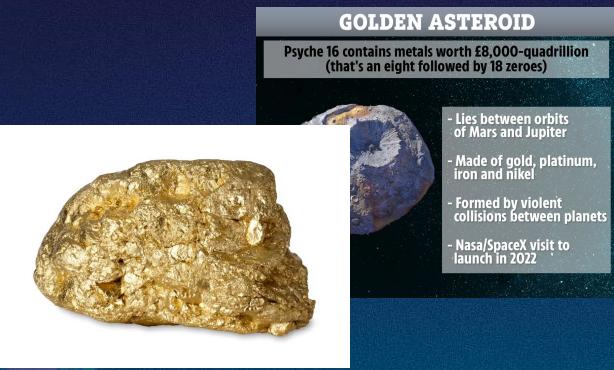
# Provocation #3: Josh Stark

## Hardness:

1. The capability to make a specific outcome very likely to be true in the future, for the purpose of enabling human social coordination
2. A measure of the certainty or security of a specific outcome.

Atoms, institutions, and blockchains let people program hardness to create social coordination tools like money, commercial or political relationships, and more.

# Provocation #3: Josh Stark



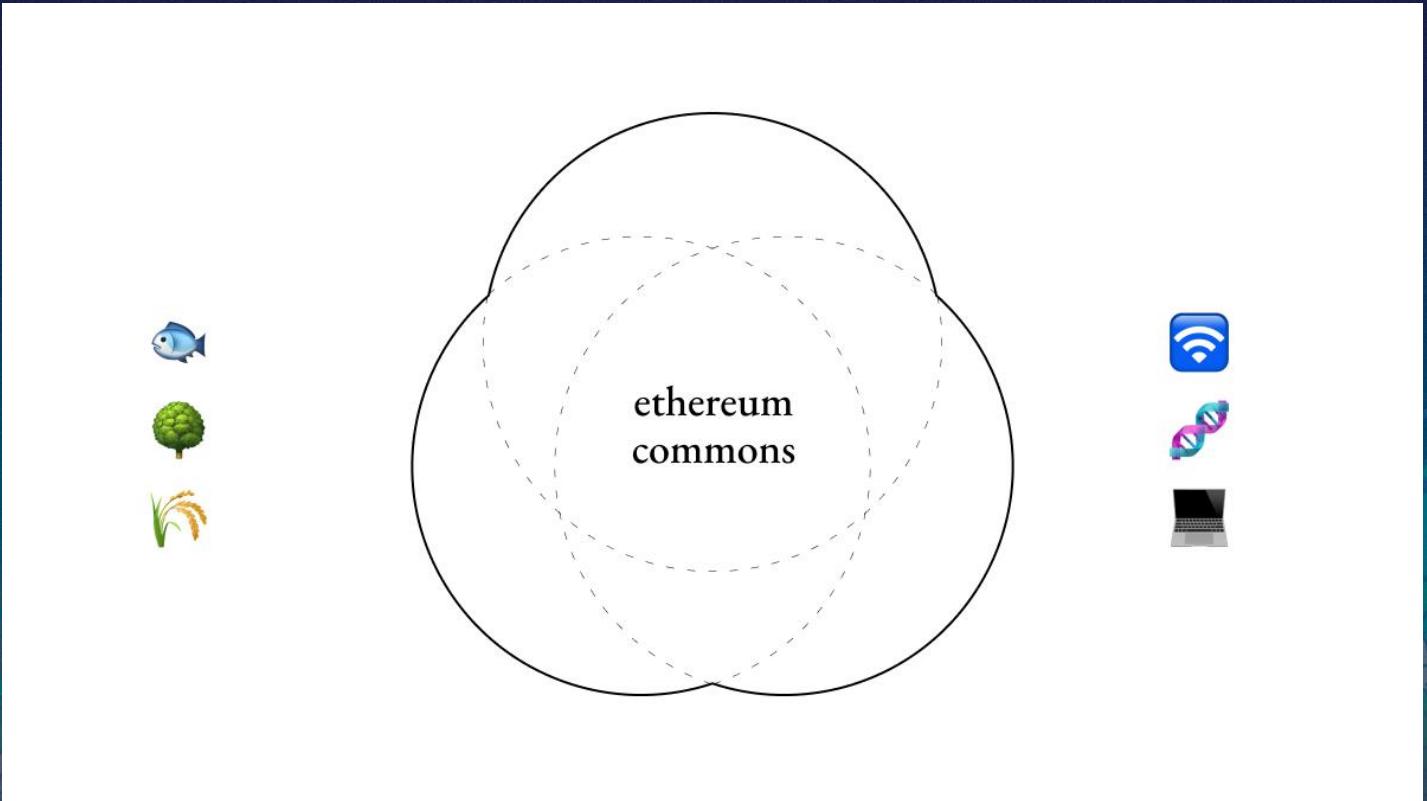
## **Breakout #3:**

- Think about where the “hardness” in your commons comes from (Josh Stark sense)
  - What outcome is your commons trying to make more likely/certain?
- Brainstorm the threats your commons faces and what it takes to harden (radiation sense) against them
- Revise/refine your level descriptions to integrate hardness in both senses

# **Provocation #4: Trent Van Epps**

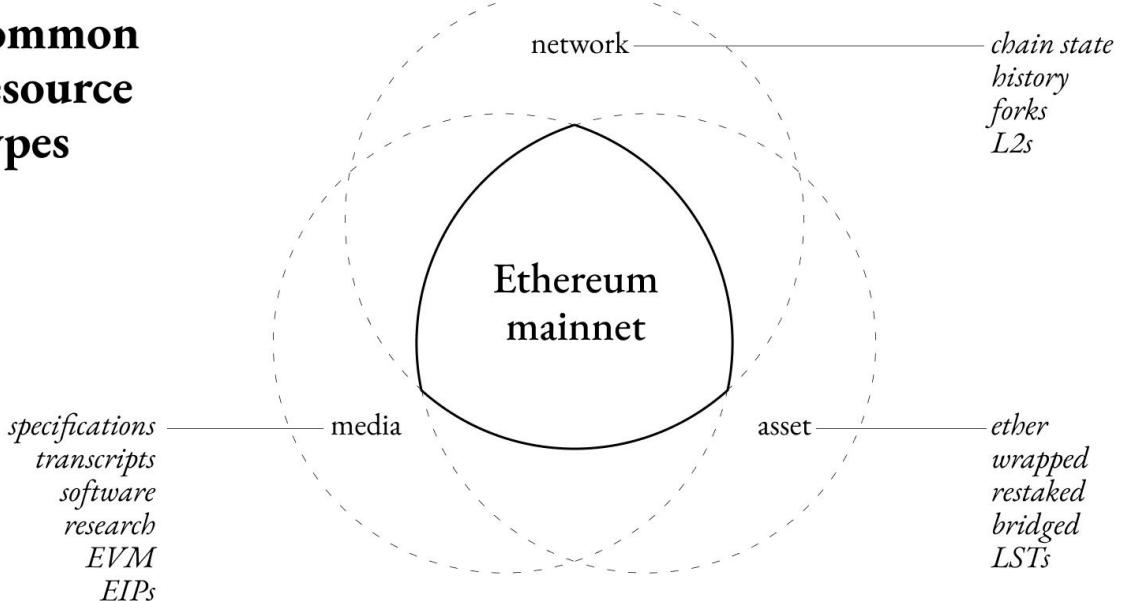
**Enclosure**

# Provocation #4: Trent Van Epps

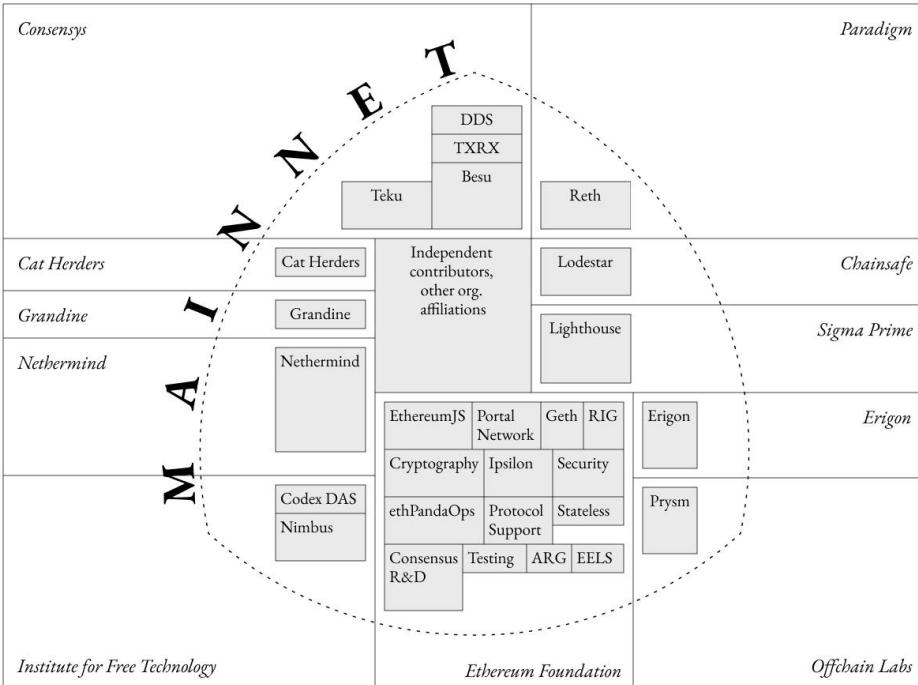


# Provocation #4: Trent Van Epps

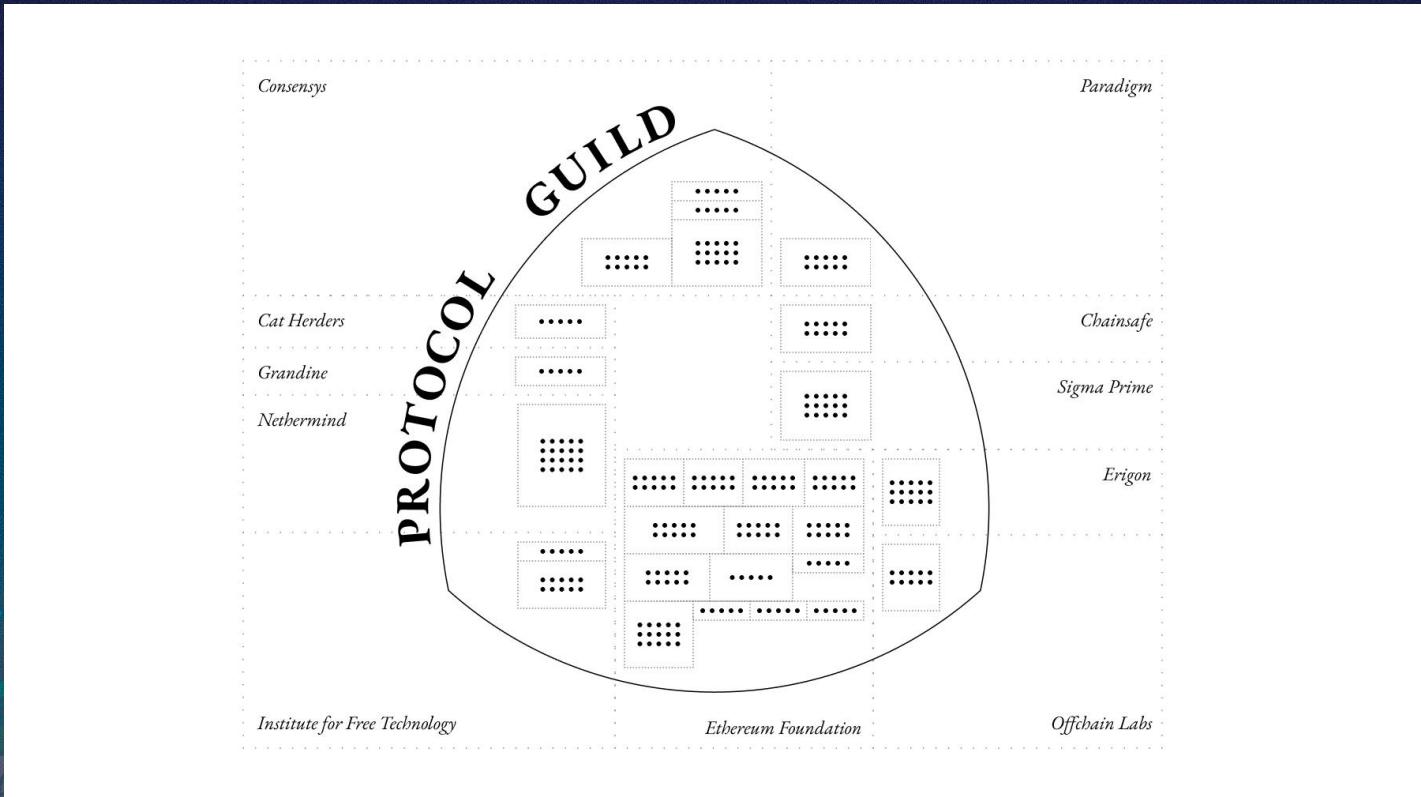
three  
common  
resource  
types



# Provocation #4: Trent Van Epps



# Provocation #4: Trent Van Epps



## **Breakout #4:**

- Think about the enclosure and capture dynamics in your commons
- Analyze the psychology/incentives of the individuals in your target group for defection risks
- Think about external actors who might try to capture/enclose
- Think about mechanisms to defend against capture/enclosure and whether they are reflected in your capability maturity levels
- Revise/refine accordingly

# **Provocation #5: Tim Beiko**

## **Ethereum**

# Provocation #5: Tim Beiko

Ethereum hardness:

- Globally homogeneous
- Independently auditable
- Permissionlessly accessible

... but, Ethereum has a poor view into the “outside world” -> oracle problem

# hardened foundation

## ERC20 LEADERBOARD

 Tether USDT	54.91B USD
 Lido Staked Ether STETH	25.51B USD
 USDC USDC	25.44B USD
 Wrapped stETH WSTETH	11.06B USD
 Shiba Inu SHIB	10.74B USD
 Wrapped Bitcoin WBTC	9.88B USD
 WETH WETH	7.85B USD
 Chainlink LINK	7.53B USD

## NFT LEADERBOARD

 CryptoPunks	2.13B USD
 Bored Ape Yacht Club	0.68B USD
 ENS	0.63B USD
 Pudgy Penguins	0.51B USD
 Chromie Squiggle by Snowfro	0.26B USD

## PROJECTS

▲ #	▲ NAME	RISKS	▲ TYPE <small>i</small>	▲ STAGE	▲ TOTAL VALUE LOCKED <small>i</small>
1	 Arbitrum One		Optimistic Rollup <small>W</small>	STAGE 1	\$15.15B ▲ 15.5%
2	 Base		Optimistic Rollup <small>OP</small>	STAGE 0	\$9.02B ▲ 16.5%
3	 OP Mainnet		Optimistic Rollup <small>OP</small>	STAGE 1	\$6.43B ▲ 15.4%
4	 Mantle		Optimum <small>OP</small>	N/A	\$1.90B ▲ 26.0%
5	 Blast		Optimistic Rollup <small>OP</small>	STAGE 0	\$1.53B ▲ 19.2%
6	 Scroll		ZK Rollup	STAGE 0	\$1.13B ▲ 16.9%
7	 Linea		ZK Rollup	STAGE 0	\$1.02B ▲ 27.0%
8	 ZKSync Era		ZK Rollup <small>↔</small>	STAGE 0	\$961.34M ▲ 20.8%
9	 Starknet		ZK Rollup <small>W</small>	STAGE 0	\$766.29M ▲ 26.8%

# hardened culture

anyone can kill your contract #6995

Closed ghost opened this issue on Nov 6, 2017 · 17 comments

ghost commented on Nov 6, 2017 · edited by ghost

I accidentally killed it.

<https://etherscan.io/address/0x863df6bf4469f3ead0be8f9fc91a907b4>

75 4 123 64 24 52 3

Total Value Hacked (USD)  
**\$9.04b**

Total Value Hacked in DeFi (USD)  
**\$6.25b**

Total Value Hacked in Bridges (USD)  
**\$2.87b**

Monthly sum

bert mate

On April 21st 2023 justin Drake [34](#), samczsun [25](#), and myself received a disclosure from the user who performed the unbundling attack on April 3 [29](#). They requested that they be called the term "low-carb-crusader" instead of "sandwich the ripper" or similar nomenclature in return for disclosing details on a unique block equivocation strategy that should be mitigated. The following post shares a timeline and details of this strategy. Flashbots relay logs confirm that the strategy was never used in production.

Why do we need a hard fork?

Since September 18th (TO) the Ethereum network has been under attack by a person or group resulting in large delays before transactions were processed. The network is currently filled with pending transactions which is causing users delays in processing their transactions. You can think of this as a denial of service (DoS) attack on the Ethereum blockchain.

Ethereum is a Dark Forest

08.28.2020 | By Dan Robinson, Georgios Konstantopoulos

This is a horror story.



## Future of Ethereum

- Further upgrades to decentralization, censorship resistance, quantum resistance
- Progressive upgrades to efficiency and scale
- Upgrades to DAS enable 100k+ TPS on L2
- We have scaled enough that a wide variety of applications are possible: ENS, consumer payments, social, "mixed financial + non-financial" ... build them!

justin drake



# hardened commons

## Growing Our Impact

Launched in 2019, Gitcoin Grants is a quarterly initiative that empowers people and collectives in web3 projects and causes they believe in.

While we started small, we've kept growing our grants each year.

In 2022, the amount of funding we raised was 3000% higher than when we started in 2019.

### Review of Gitcoin Quadratic Funding Round

Special thanks to the Gitcoin team and especially Fred Chen for working on this.

The next round of Gitcoin Grants quadratic funding has just finished, and we have the numbers for how much each project has received since its last reward.

We propose a design for philanthropic- or publicly-funded funding to allow linear optimal provision of a decentralized self-organizing ecosystem of public goods. The concept extends ideas from Quadratic Voting to a funding mechanism for endogenous community formation. Citizens make public goods contributions to projects of value to them. The amount received by the project is (proportional to) the square of the sum of the square roots of contributions received. Under the "standard model" this mechanism yields first best public goods provision. Variations can limit the cost, help protect against collusion and aid coordination. We discuss applications to campaign finance, and highlight directions for future analysis and experimentation.

Key words: public goods, free rider problem, mechanism design

### Quadratic Voting \*

Steven P. Lalley<sup>1</sup> E. Glen Weyl<sup>2</sup>  
February 2015

#### Abstract

We argue that quadratic pricing of votes on collective decisions is better than linear pricing. This has some of the virtues of quadratic voting by the no-pool rule, but it does not require a selectorate to carry out costly voting rounds where only one person's vote makes a difference. We also show that all type-symmetric lotteries are Pareto dominated by quadratic voting rules. The change in the efficient price-taking outcome as the population size grows large, with inefficiency generally decaying as  $1/n$ . We discuss the robustness of these conclusions and their implications for market and institution design.

\*Keywords: social choice, collective decisions, large markets, costly voting, vote trading

\$0 .7m  
2019

\$2 .8m  
2020

2021 2022

### A Flexible Design for Funding Public Goods

Vitalik Buterin  
Ethereum Foundation  
Zoe Hitzig  
Harvard University, [zoehitzig.scholar.harvard.edu](https://zoehitzig.scholar.harvard.edu)  
E. Glen Weyl  
[McMullinResearch@gmail.com](mailto:McMullinResearch@gmail.com)

We propose a design for philanthropic- or publicly-funded funding to allow linear optimal provision of a decentralized self-organizing ecosystem of public goods. The concept extends ideas from Quadratic Voting to a funding mechanism for endogenous community formation. Citizens make public goods contributions to projects of value to them. The amount received by the project is (proportional to) the square of the sum of the square roots of contributions received. Under the "standard model" this mechanism yields first best public goods provision. Variations can limit the cost, help protect against collusion and aid coordination. We discuss applications to campaign finance, and highlight directions for future analysis and experimentation.

Key words: public goods, free rider problem, mechanism design

## From prediction markets to info finance

2024 Nov 09

See all posts

### Futarchy: Vote Values, But Bet Beliefs

by Robin Hanson

This short "manifesto" describes a new form of government. In "Futarchy" we would vote on values, but bet on beliefs. Elected representatives would formally define and manage an after-the-fact measurement of national welfare, while market speculators would say which policies they expect to raise national welfare.

Futarchy seems better than autocracy (i.e., kings and dictators), but it still has problems. There are today vast differences in wealth among nations, and we can not attribute most of these differences to either natural resources or human abilities. Much of the difference seems to be that the poor nations (many of which are democracies) are those that more often choose policies, policies which hurt most everyone in the nation. And even rich nations frequently adopt such policies.

### Feedback and review

One of the Ethereum applications that I think have been the most interesting to me the most are prediction

### Presidential Election Winner 2024

Donald Trump 99.8%

Kamala Harris <1%

Source: Polymarket.com

Mar Apr May Jun Jul Aug Sep Oct Nov

1H 6H 1D 1W 1M ALL

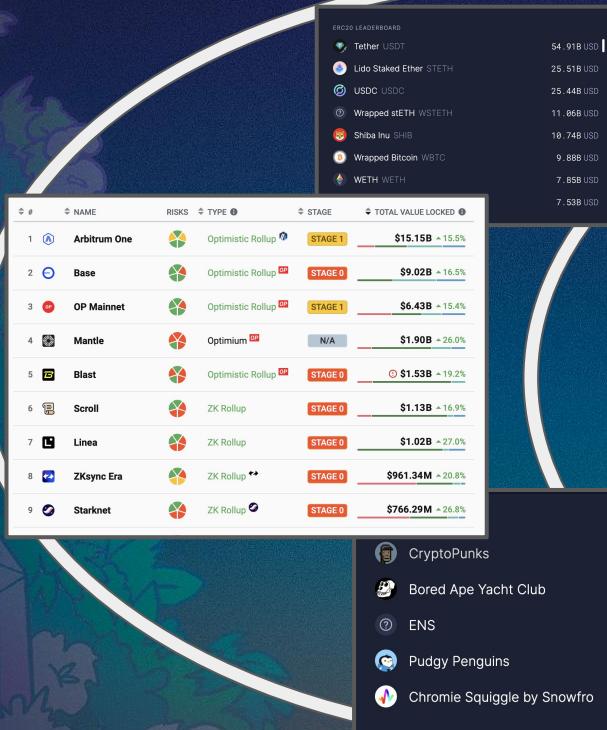
100%  
80%  
60%  
40%  
20%  
0%

and Alex Tabarrok for

was an active user  
look, mommy, my  
ned \$58,000  
his year, I have been  
market.



# Provocation #5: Tim Beiko



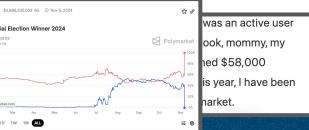
## From prediction markets to info finance

2024 Nov 09 | See all posts

### Futarchy: Vote Values, But Bet Beliefs

This short "Futarchy" describes a new form of governance. In "Futarchy," users can bet on what they believe will happen in the future. If they're right, they win. If they're wrong, they lose. This is a way to make sure that the people who are most interested in a particular outcome are the ones who have the most power to influence it.

One of the Ethereum applications that are most predictive

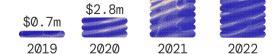


## Growing Our Impact

Launched in 2019, Gitcoin Grants is a quarterly initiative that empowers people and collectives in web3 projects and causes they believe in.

While we started small, we've kept growing goods each year.

In 2022, the amount of funding we raised was 3000% higher than when we started in 2019.



## Research

## Ethereum is a Dark Forest

08.28.2020 | By Dan Robinson, Georgios Konstantopoulos

This is a horror story.



## **Breakout #5:**

Brainstorm how Ethereum's evolving technical capabilities and/or "cultural hardness" can be used to improve your CMM. Some things to consider:

- Why is Ethereum the right source of hardness? Would others be better? If so, how?
- How can people "bypass" Ethereum? Oracle risks, shifting norms, etc.
- Is there a positive feedback loop between the hardness provided by Ethereum and the commons' long-term sustainability?

Finalize your model and make a clean copy to be shared with rest of workshop participants (we will collect/scan/distribute these final versions)

# **Sharebacks from groups**

Refer to your CMM whiteboard list and briefly describe

1. The levels
2. One thing that was hard
3. One big insight about the process of coming up with a CMM

# Town Hall

General comments on the workshop and broader learnings/reactions

# Wrap-Up and Next Steps

1. Comments from Tim and Venkat
2. If you're interested in helping us continue to develop this, let us know
3. Program information: <https://summerofprotocols.com>