

# Secure Scuttlebutt

## Peer-to-peer Collaboration and Community Infrastructure



**March 15, 2020**  
**LibrePlanet**  
**Boston, MA**



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@f/6sQ6d2CMxRUhLpspgGIu1DxDCwYD7DzFzPNr7u5AU=.ed25519

# Me



**@cel**

Developer  
git-ssb, patchfoo, sbotc

Using SSB since 2014

# SSB

## Efficient Reconciliation and Flow Control for Anti-Entropy Protocols

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### ABSTRACT

The paper shows that anti-entropy protocols can process only a limited rate of updates, and proposes and evaluates a new state reconciliation mechanism as well as a flow control scheme for anti-entropy protocols.

Categories and Subject Descriptors: C.2.1 [Computer-Communication Networks]: Network Architecture and Design – *network communications*; C.2.4 [Computer-Communication Networks]: Distributed Systems – *distributed applications*; D.1.3 [Programming Techniques]: Concurrent Programming – *distributed programming*; D.4.4 [Operating Systems]: Communications Management – *network communication*; D.4.5 [Operating Systems]: Reliability – *fault tolerance*;

General Terms: Algorithms, Reliability.

Additional Key Words and Phrases: Epidemics, Anti-Entropy, Gossip, Flow Control

### 1. INTRODUCTION

Anti-entropy, or *gossip*, is an attractive way of replicating state that does not have strong consistency requirements [3]. With few limitations, updates spread in expected time that grows logarithmic in the number of participating hosts, even in the face of host failures and message loss. The behavior of update propagation is easily modeled with well-known epidemic analysis techniques. As a result, many distributed applications use gossip to contain various inconsistencies.

In spite of its popularity, little study has been done into how gossip protocols behave under high update load. Gossip protocols purport to deliver messages within a certain configurable number of rounds with high probability, and thus provide synchronous guarantees. Like any other syn-

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chronous communication channel, gossip has capacity that is limited by available bandwidth for transporting gossip data and CPU cycles for generating and processing the gossip messages. Under high update load, a gossip protocol may not be able to send all updates required to reconcile differences between peers. Updates would take arbitrary time to propagate as the gossip channel gets backed up.

Gossip protocols are designed to be non-invasive and have predictable performance, and for this a designer has to fix not only the gossip rate per participant but also the maximum size of gossip messages (*e.g.*, maximum UDP packet size). While this avoids network and CPU overload, it also limits the capacity of the gossip channel.

This paper makes two contributions. First, it presents a new state reconciliation mechanism that is designed both for minimal CPU overhead and for situations in which only limited bandwidth is available (Section 3). Second, it proposes and analyzes a flow control scheme for gossip (Section 4). Related work is discussed in Section 5.

### 2. GOSSIP BASICS

There are two classes of gossip: *anti-entropy* and *rumor-mongering* protocols. Anti-entropy protocols gossip information until it is made obsolete by newer information, and are useful for reliably sharing information among a group of participants. Rumor-mongering has participants gossip information for some amount of time chosen sufficiently high so that with high likelihood all participants receive the information. In this paper, we shall focus on anti-entropy—reconciliation and flow control for rumor-mongering have received considerably attention already (see Section 5).

Let  $\mathcal{P} = \{p, q, \dots\}$  be a set of participants. Each participant maintains state, which we model as a mapping  $\sigma \in \mathcal{S} = \mathcal{K} \rightarrow (\mathcal{V} \times \mathcal{N})$ . Here  $\mathcal{K}$  is a set of keys,  $\mathcal{V}$  a set of values, and  $\mathcal{N}$  an infinite ordered set of version numbers.  $\sigma(k) = (v, n)$  means that key  $k$  is mapped to value  $v$  and version  $n$ . A more recent mapping for the same key contains a larger version number. Both value and version number spaces contain a  $\perp$  element, and in case of  $\mathcal{N}$ ,  $\perp$  is the lowest element. Initially all keys on all participants are mapped to  $(\perp, \perp)$ .

A participant’s state is mutable and is replicated onto all participants. We model this as a mutable mapping  $\mu_p : \mathcal{P} \rightarrow \mathcal{S}$  maintained by each participant  $p$ . A participant  $p$  is only

- p2p, f2f, e2e
- gossip protocol
- social network
- application platform

### Epidemic Broadcast Trees<sup>\*</sup>

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### Abstract

*There is an inherent trade-off between epidemic and deterministic tree-based broadcast primitives. Tree-based approaches have a small message complexity in steady-state but are very fragile in the presence of faults. Gossip, or epidemic, protocols have a higher message complexity but also offer much higher resilience.*

*This paper proposes an integrated broadcast scheme that combines both approaches. We use a low cost scheme to build and maintain broadcast trees embedded on a gossip-based overlay. The protocol sends the message payload preferably via tree branches but uses the remaining links of the gossip overlay for fast recovery and expedite tree healing. Experimental evaluation presented in the paper shows that our new strategy has a low overhead and that is able to support large number of faults while maintaining a high reliability.*

### 1. Introduction

Many systems require highly scalable and reliable broadcast primitives. These primitives aim at ensuring that all correct participants receive all broadcast messages, even in the presence of network omissions or node failures. Gossip protocols [8] have emerged as a highly scalable and resilient approach to implement reliable broadcast. Unfortunately, in steady-state, gossip protocols exhibit an excessive message overhead in order to ensure reliability with high probability. On the other hand, tree-based broadcast primitives have a small message complexity in steady-state, but they are very fragile in the presence of failures, lacking the natural resilience of epidemic protocols.

<sup>\*</sup>This work was partially supported by project “P-SON: Probabilistically Structured Overlay Networks” (POS.C/EIA/60941/2004).

%xRPUKpUVLyyMJw/obpJXGy18D3N3VJKE4d6B0bXFGDk= . sha256

%ipyEyC3o0DPTf2X/GyCzU7vgPB/Ut5uay4MtT5w3X9U= . sha256

# Cypherlinks

## Message

%0ys+Dg6P0h8LvykiMTQW5L43iwuJpuv0IiVW5RZs9Cw=.sha256

## Blob

&C93joU14xSFH3cVJM6ZZQdAr+WXIiDLIyUQDZ//y4qw=.sha256

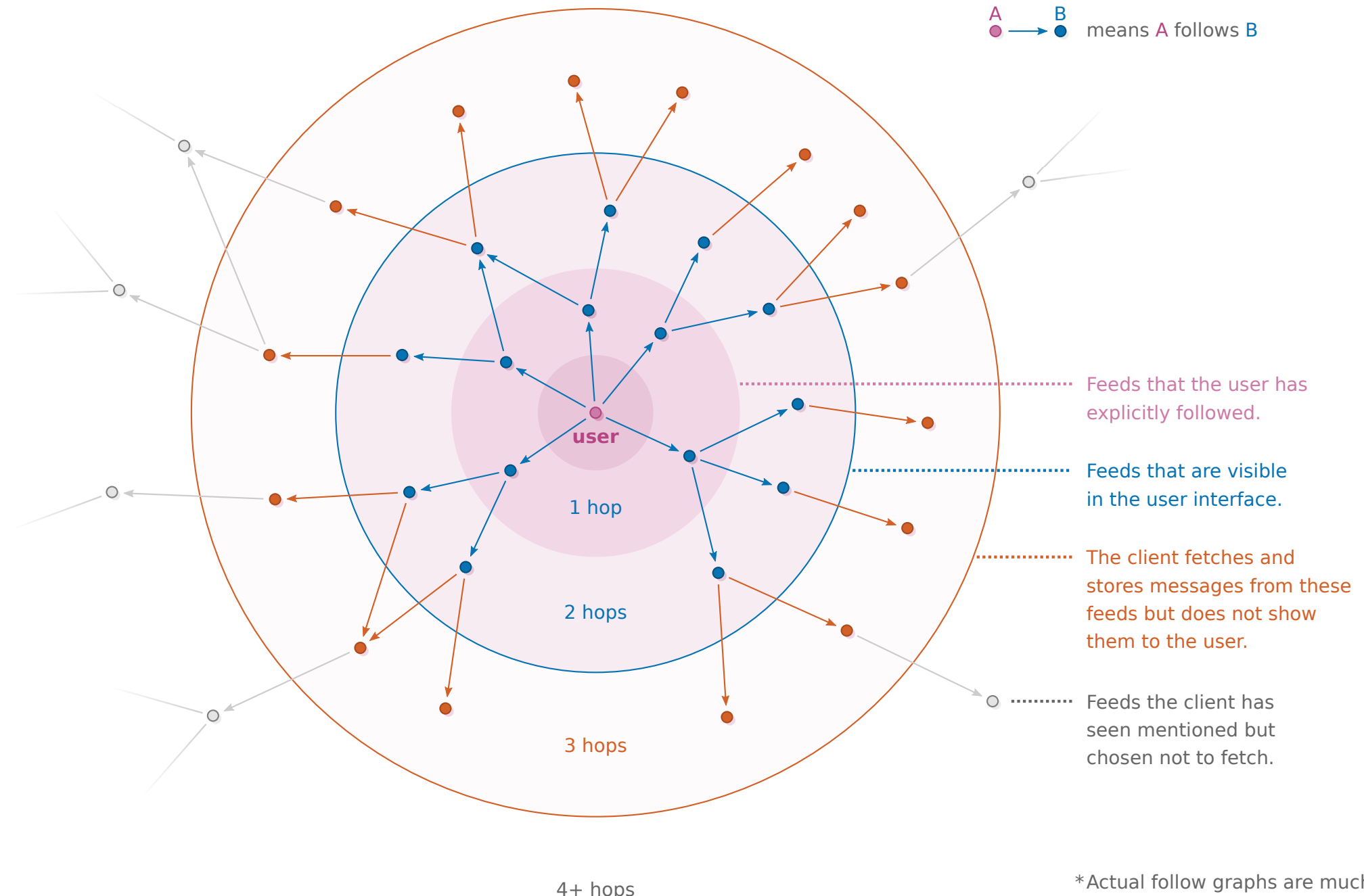
## Feed

@f/6sQ6d2CMxRUhLpspgGIu1DxDCwYD7DzFzPNr7u5AU=.ed25519

# Message

```
{
  "key": "%8XKAub/+keTb0XU+eS1/r2+wDMfk0369fLJ57Re9Ku0=.sha256",
  "value": {
    "previous": "%0tpLhWn8nC1iA+thcZnVYt5Nm60tUvkFXMuHdB9roS4=.sha256",
    "author": "@C3iYh/12s01uvKq1KcZLFXSySzx0kHxXN8rtNB5MGA=.ed25519",
    "sequence": 1359,
    "timestamp": 1506213306259,
    "hash": "sha256",
    "content": {
      "type": "post",
      "text": "hello world"
    },
    "signature": "Nz4W0u0MpXU2xXUgW+cGTLCiU1BCYiHQFWvyUnppq+YmwV1TZM
5+FM12SAc1A2BFgRdHyG6Y91DCXHJdMFiMAw==.sig.ed25519"
  }
}
```

# Social graph



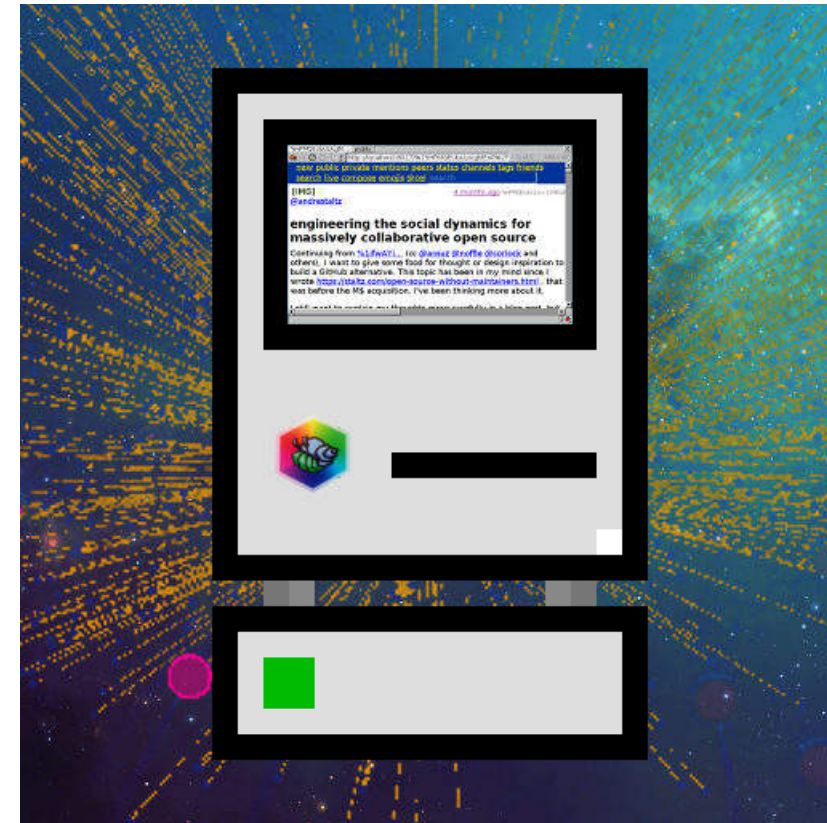
\*Actual follow graphs are much more interconnected and mess

%xRixf1ofCAtiz2/MKbzfcOGXYGBgFbrA4iuYRfHvmW8=.sha256

# Pubs



%7Puw6nBVX0uaL/Q7C6jv4sJiv2xcVv465JoyQseLPcs=. sha256



%AsywVupvKB2HcnGX70Msuo7G32uq+sEM0+qGzJ3YZ9w=. sha256

# Herm[i]es



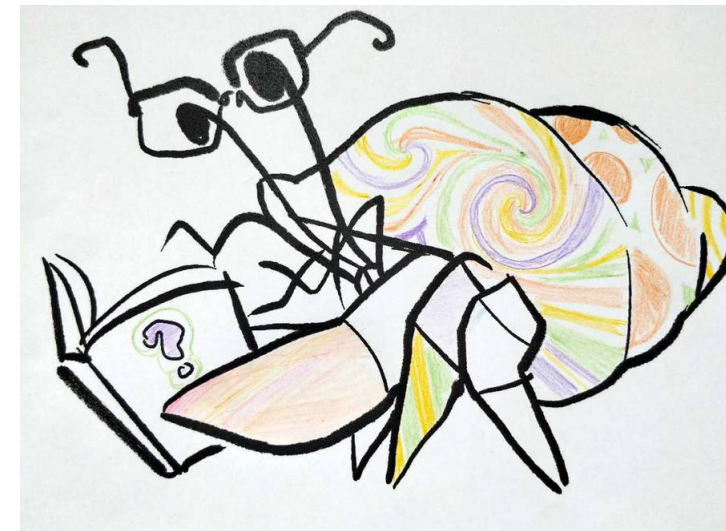
%1mP6wJqkUFbeke8b0FJ8DCcF1n7rWJaaoms/gN3FzAA=. sha256



%6Yk17b5uYr429NTJEvtPYQijCvyA5nK/EZh55mj5574=. sha256



%muLMFIRjAuMi0s7gKGQrisWF9QEX7PjHJR7HrwmNbac=. sha256

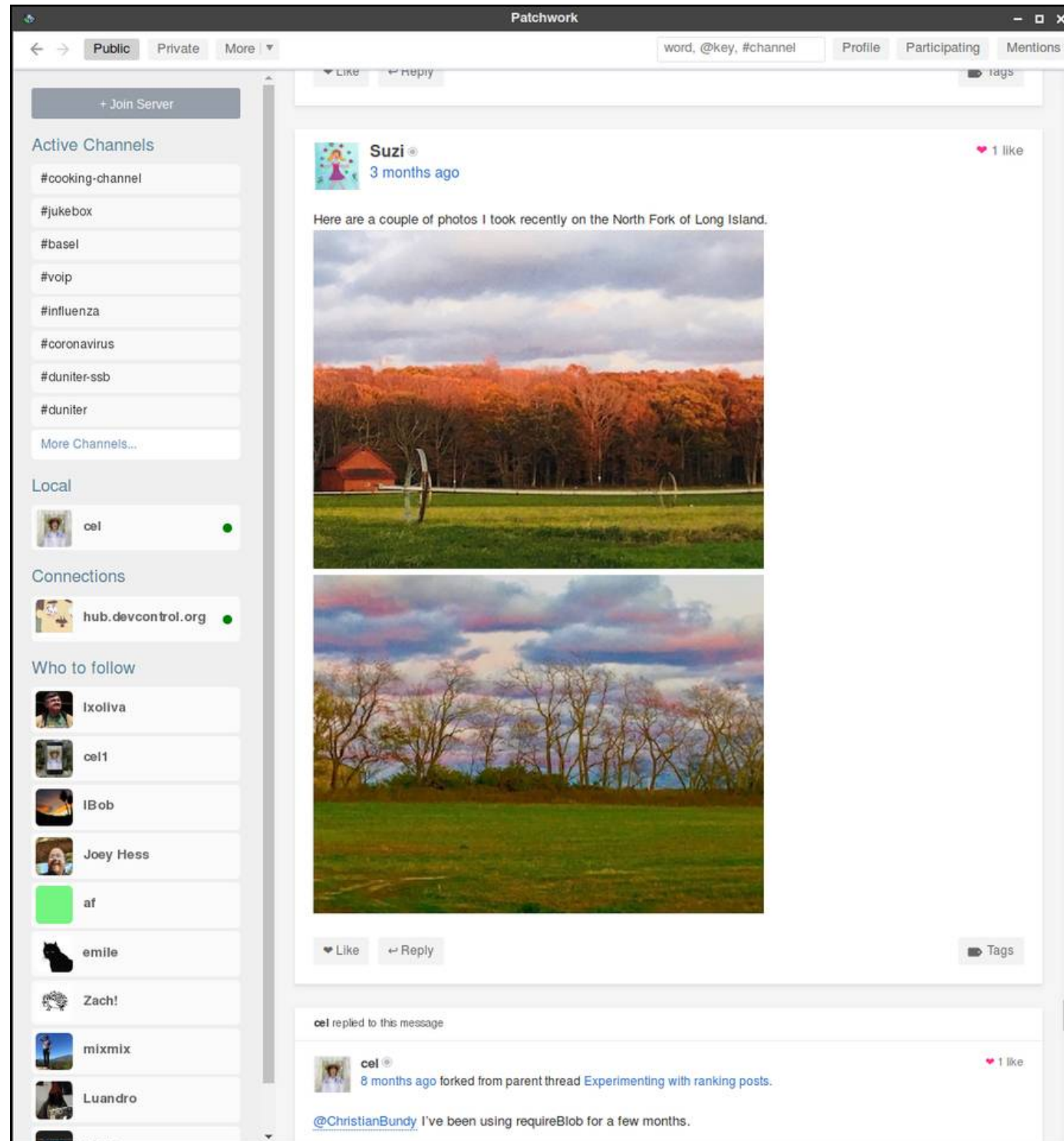


%PeCILG550GNA/6V6dnWoIX6v8KdRHHVqyPBgYT9neU6g=. sha256



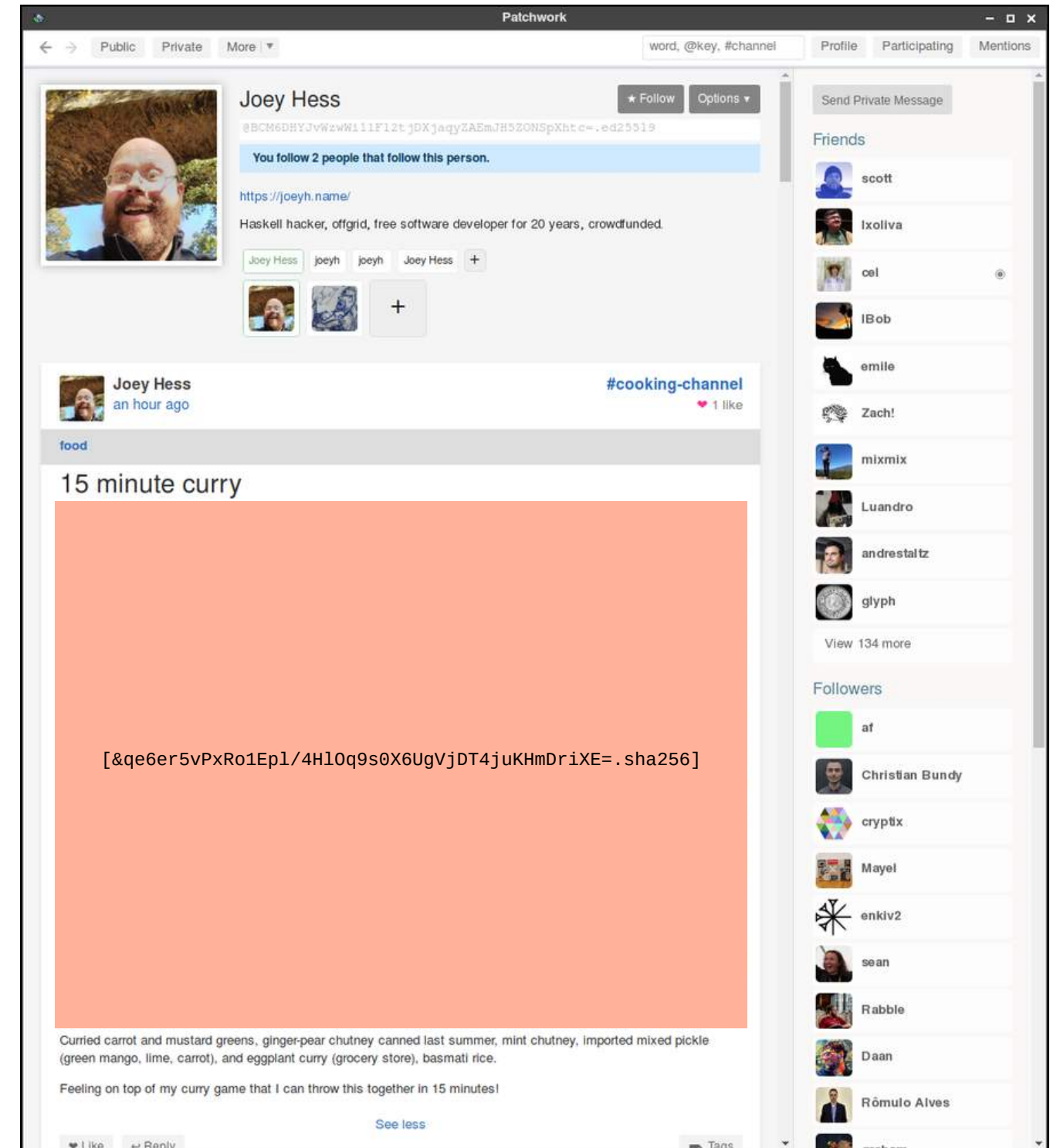
# Patchwork

## Public Feed



%n/hAHVDJevZ92Nteu0CK1x9YKDDxqejPsPB/jw491lc=. sha256

## Profile



%xZ8vcTR67JCFtY0YsnSgsWIKfAnJarg8aMMY5ELjTrA=. sha256

# Patchwork

## Tags

The screenshot shows the Patchwork web interface. On the left is a sidebar titled 'Tags Used By You' and 'Community Tags'. The 'Community Tags' section is divided into 'Most Active' and 'Recent' categories, listing various tags like 'bookmark', 'resource-sharing', 'mmt', 'moderation', 'art', 'pictures', etc. The main feed displays two posts:

- Post 1:** User **dcs** posted 'Hello from MIT!' a year ago, accompanied by a photograph of the MIT campus. It has 5 likes and 1 tag.
- Post 2:** User **mixmix** posted 'Kyoto' 2 years ago, with a sub-header 'Arashiyama'. The text says '@piet is currently in Japan, which I'm super envious of. I totally fell in love with Kyoto while I was there and wanted to share the places I thought were really special'. Below the text is a photograph of a bamboo forest. It has 10 likes and 1 tag (#japan).

%+1kBGWr4TMZkKvXCn7VboGkv6G23c32Kun2x19m3Qjk=. sha256

%0rpoHSyVRiKjY9lSXkjF+B68x+d8RNyVJy/ErvAF82T8=. sha256

## Thread

The screenshot shows a thread in the Patchwork interface. The main post is by user **mnin**, posted 5 months ago, with the title 'Scuttle Jams ~ P2P Open Sounds 🎵 & P2P Mixing'. It includes the tags #faerie-musicians and #faerie-ringtones, and has 9 likes. The post content features an image of a hand holding a glowing orange star-shaped locket, with a caption: 'image is a screenshot from Sailor Moon Star Locket Melody, showing a star shaped locket in a hand'. Below the image, the text reads: 'OHkay ~ friends, musicians of the scuttleverse, collect your inspirations and sounds from [this thread](#) 🌟 and create your own musicalness and share HERE:'. There are 'Like' and 'Reply' buttons, and a 'Tags' button.

Below the main post are two referenced messages:

- Message 1:** 'mnin referenced this message: thanks for the reminder!'
- Message 2:** 'mnin referenced this message: cc: @Matt McKegg @KawaiiPunk @Marlon @...'

At the bottom of the thread is a post by user **Marlon**, posted 5 months ago, with the title 'sunrise on the docks'. It has 16 likes and includes a video player showing a duration of 0:00 / 0:00.

%wCR3H38WfELY0FRno/PpKBqgo90Gk273ya+mRM4kDxQ=. sha256


%lCX+0gVrPgs44b6meFz3kE54r4CW19y0oiU6rrV6GQU=. sha256

# Patchwork - Gatherings

Patchwork


Public Private More

word, @key, #channel Profile Participating Mentions


 **glyph**  
Added a gathering 3 days ago  
♥ 2 likes

## Scuttlecamp 2

Monday, June 8, 2020 9:00 AM EDT Edit Details



Attendees (5)



Attending  Can't Attend

[ English ]

5-day gathering in a lush, rural village setting, where Butts from around the world can gather to cultivate relationships, share food and language, and practice tending the peer-to-peer garden.

The gathering will be held in Moinho, a small village of approximately 300 residents in the Alto Paraíso municipality of Goiás, Brazil.


More info can be found in the [event guide](#).

# Patchbay

## Thread

Patchbay

/posts /inbox /notifications /gatherings /settings /polls /posts



**glyph**  
2 weeks ago

Chicken of the woods (*Laetiporus sulphureus*) season has officially begun for me

This is the second time I've spotted this species while cycling along a road. The [first time](#) was roughly two years ago. We have a common area here in the village, which consists of some grassy fields surrounded by trees and includes a stream along one side. There's a road running beside the stream, which just so happens to be part of my route to the village center. I've gotten quite proficient at spotting mushrooms while moving (on bicycle or in a motor vehicle). I saw this one in the morning and returned to harvest and photograph just before sunset (a wee bit of secrecy goes a long way when you're foraging - don't tell the whole world!).


Oh yeah, and I was greeted by an owl when I went to harvest. Big bushy bugger plopped down onto the road ahead of me. *Nice to see you, owl-san. You too, glyph-san.*

These fungi are saprophytes, sometimes acting as weak parasites. They produce a brown cubical rot (as a result of decomposing the pulpy cellulose). I love how the fungus is fruiting from the interface of bark and wood. There are far more primordia along the trunk but not visible in these photos.

af: @glyph very nice story. basic q: do mushrooms provide any level of protein? ...

glyph: Thanks @af basic q: do mushrooms provide any level of protein? Yes, often in quite large amounts. Here's a paper on La...

kira: your foraging tales are the best @glyph ...



**enktiv2**

**The Redundant Daily Redundant**  
a daily digest of what I've been reading

3 10  
0

0 0  
0

%RP5p5qBqjsW/5Rl68xGIcn58X3MiyinsqsbLTHWbnM4=.sha256

# Patchbay apps

## Polls

The screenshot shows a web browser window with the Patchbay interface. The poll is titled "SSB browser walkthrough" and asks "Lets decide on a date". A "Gathering" link is provided. The poll is set for "America/New\_York (UTC -5)". A calendar shows dates from Jan 31 to Feb 4, with Feb 3 highlighted. Three participants (arj, mixmix, punkmonk) are listed with their voting status for each date.

	Jan 31 FRI 15:00	Feb 1 SAT 15:00	Feb 2 SUN 15:00	Feb 3 MON 15:00	Feb 4 TUES 15:00
3 participants	1 ✓	1 ✓	1 ✓	3 ✓	1 ✓
arj	✓	✓	✓	✓	✓
mixmix				✓	
punkmonk				✓	

%FMqOZqJIdj3VD59nMw+acmZFvQ/OSXaWr+cfdIH6F9s=. sha256

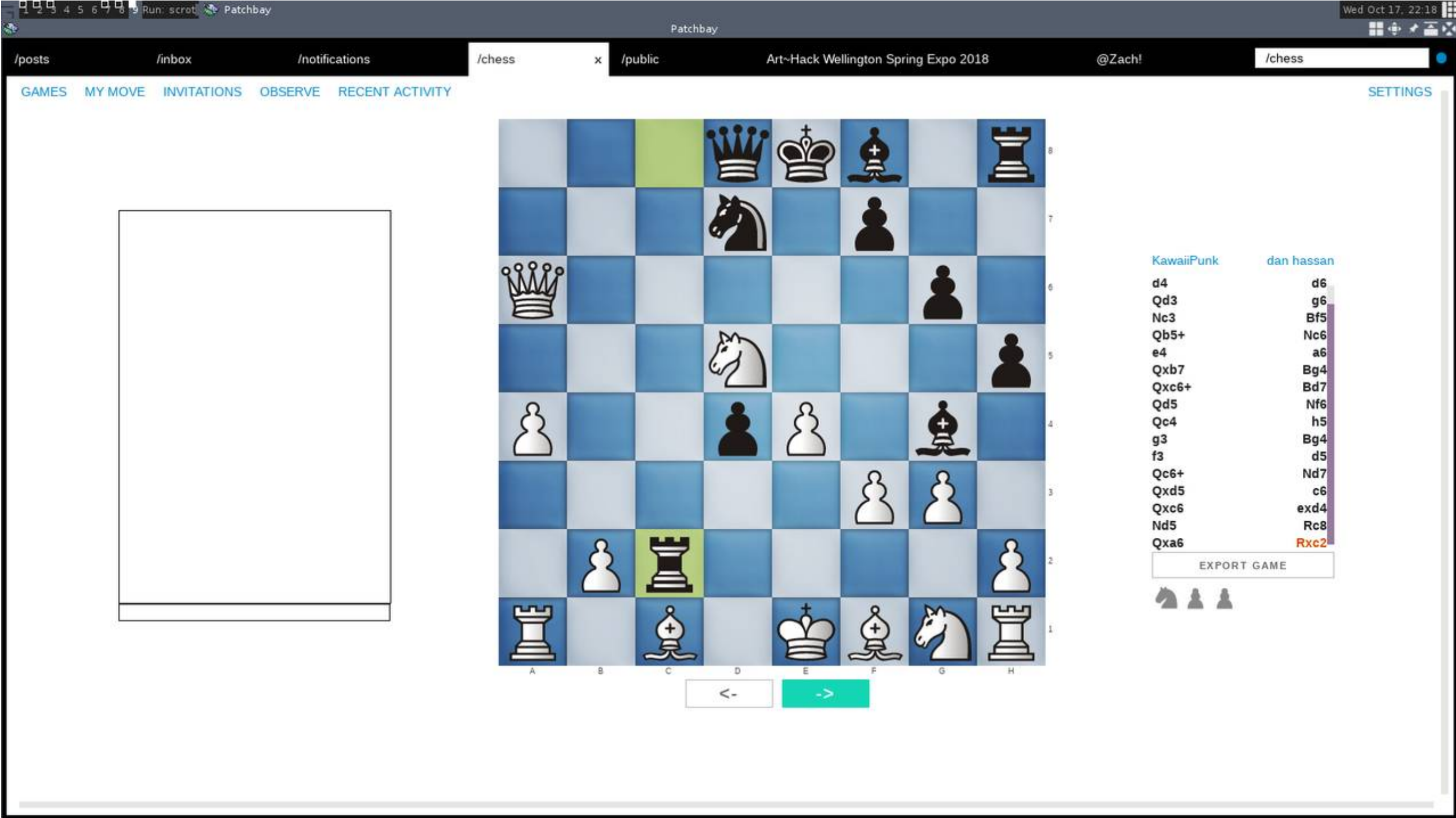
## Books

The screenshot shows a book list on the Patchbay website. The books listed are "The Left Hand of Darkness" by Ursula Le Guin, "Invisible: How Young Women with Serious Health Issues Navigate Work, Relationships, and the Pressure to Seem Just Fine" by Michele Lent Hirsch, "Artemis" by Andy Weir, and "The Martian".

- The Left Hand of Darkness** by Ursula Le Guin  
The Left Hand of Darkness tells the story of a lone human emissary to Winter, an alien world whose inhabitants can choose -and change - their gender. His goal is to facilitate Winter's inclusion in a growing intergalactic civilization. But to do so h...  
3 months ago
- Invisible: How Young Women with Serious Health Issues Navigate Work, Relationships, and the Pressure to Seem Just Fine** by Michele Lent Hirsch  
Though young women with serious illness tend to be seen as outliers, young female patients are in fact the primary demographic for many illnesses. They are also one of the most ignored groups in our medical system—a system where young women, especial...  
3 months ago
- Artemis** by Andy Weir  
Artemis takes place in the late 2080s and is set in Artemis, the first and only city on the moon. It follows the life of porter and smuggler Jasmine "Jazz" Bashara as she gets caught up in a conspiracy for control of the city  
4 months ago
- The Martian**

# Patchbay apps 2

## Chess



# Patchfox

The screenshot shows a browser window with several tabs open, including 'Patchfox - Pul', 'Patchfox - X', 'Recursive', 'API Docs', 'Hello worl', 'patchfox/', 'micropyth', 'Captive P', 'docker-sync b', and 'Patchfox'. The address bar shows 'moz-extension://537f4804-e099-4294-bf19-2505561a0c5c/inde...'. The browser's toolbar includes navigation buttons, an extension icon for 'Patchfox', and various utility icons. The main content area displays a tweet from 'SoapDog' posted '10 hours ago' with the hashtag '#patchfox'. The tweet title is 'Incoming new release'. The text of the tweet reads: 'So the rewrite of patchfox to the new mithril database will be a longer project than I anticipated. Because of that I'll keep working on the svelte codebase as well as it is more complete and is already being used by people. I was burning out a bit trying to rewrite things like crazy so that I could quickly migrate to the new codebase but doing things quickly and recklessly is what I got me into the current messy version. I want to move the mithril version to move a bit more slower and carefully, but I also want people to keep using patchfox and receiving updates so this a shitty situation (not unlike *python 2* and *python 3* migration/overlap where both things were alive and diverting). So before the Basel event is over, I'll have a new release from the master branch.' Below the tweet are 'Like', 'Fork', and 'Reply' buttons, and a list of users who subscribed to the hashtag: Thomas Renkert, Tobi, and farewellutopia. On the left side of the browser, a 'Patchfox' extension menu is open, showing a search bar with 'patchfox', a field for 'In reply to' containing a long alphanumeric string, and a message input area with the text: 'Building a new release here based on the Svelte branch. I've tweaked things so that some messages types draw less attention than others. You can see on the screenshot below that the `_subscription_` messages appear as a single line without a background:'. The menu also includes options for 'Channel', 'Public', 'Popular', 'Your Profile', 'Mentions', 'Release Notes', 'Settings', 'Source Code on Github', 'Source Code on Sourcehut', 'Issues on Github', 'Help', and 'New Post (c)'.

The screenshot shows the 'Patchfox 2020.3.1' release notes page. The page has a dark theme and a navigation menu on the right side. The menu items are: 'Public' (P), 'Popular' (O), 'Your Profile' (F), 'Mentions' (M), 'Release Notes', 'Settings' (S), 'Source Code on Github', 'Source Code on Sourcehut', and 'Issues on Github'. At the bottom of the menu are 'Help' and 'New Post (c)' buttons. The main content area is mostly obscured by the menu.

%vNnZtiCaFum3VGH2c0hbvaeMCXJnV19HrQhH7WkPtO=.sha256

%iAuYhV5rAs+t/+gyWvIlPOTSnmnE19Sjdj6bZlSnRRA=.sha256

# patchfoo

The screenshot shows a web browser window with a dark theme. The address bar contains a long URL. The page header has navigation links: new, public, private, mentions, peers, status, channels, friends, search, live, compose, emojis, and @cel. A search bar is visible. The main content area shows a post from @Rick, 3 hours ago, with a text description and a file selector. Below it is a reply from @micro, 2 hours ago, which includes a link to a GitHub repository and a mention of @cel's #patchfoo. At the bottom, there is a 'File selector' button and 'raw' and 'preview' options.

1 2 3 4 5 6 7 8 9 [1] Dillo: %l9ugSOMdY2Yd4d5Y9/2WQVHONLkDUS9j5WBN6i/bXpo=.sha256 dwm-6.1

Sleepy Pi 2 - I... %37R0jD8BHg1NiY... Internationalis... %l9ugSOMdY2Yd4d... GitHub - noffle...

http://localhost:8027/%25l9ugSOMdY2Yd4d5Y9%2F2WQVHONLkDUS9j5WBN6i%2FbXpo%3D.sha256 0 of 0 8.0 KB

new public private mentions peers status channels friends search live compose emojis @cel

search

[IMG] 3 hours ago %l9ugSOMdY2Yd4d5Y9/2WQVHONLkDUS9j5WBN6i/bXpo=.sha256 md raw dig

@Rick

Hi scuttlers,  
Does anyone know the best ssb client (or maybe a comparison) for a small screen on a #raspberrypi I will be using their 7" touchscreen. This will be a "phone/camera/communicator" type thing. Installed is #Rasbian While this basically is a desktop, I'm hoping to use mostly just the touchscreen and virtual keyboard. So far I only have experience using #Patchwork but I'm wondering about other options as well.  
Thanks!

[IMG] 2 hours ago %Yb00rcfxM6A2gaUfVeCv8oTuFKNi0s010L4Y6eklDoM=.sha256 branch md raw dig

@micro

↳ Hi scuttlers, Does anyone know the best ssb client (or maybe a compari...

You may want to check out @cel's #patchfoo . Regular install instructions are <https://github.com/noffle/sailing-patchfoo> . I tried searching my scuttleverse for a #git-ssb link to patchfoo but came up with nothing TT.

#channel

reply

File selector raw preview

%03uj3mNvhbwTNb7Mo/30FNo46pYKakNvc3G0Y0DYif8=.sha256



# Oasis

The image shows a screenshot of a social media post. On the left is a vertical sidebar with navigation options: Publish, Extended, Popular, Latest, Topics, Profile, Mentions, Private, Search, and Settings. The main post is by Christian Bundy, posted 7 hours ago. The title is 'Oasis 2.13.1'. The text of the post says: 'Oops. I don't think I've posted any releases since 2.8.0, but there have been tons of improvements to the app since then. Off the top of my head:'. This is followed by a bulleted list of features and fixes. At the bottom of the post, it says: 'If anyone wants to check it out, I'll include the install instructions below. There's also a public demo and a GitHub repository if you like.' The word 'Installation' is partially visible at the very bottom of the post content.

**Publish**

**Extended**

**Popular**

**Latest**

**Topics**

**Profile**

**Mentions**

**Private**

**Search**

**Settings**

**Christian Bundy** 7h

## Oasis 2.13.1

Oops. I don't think I've posted any releases since 2.8.0, but there have been tons of improvements to the app since then. Off the top of my head:

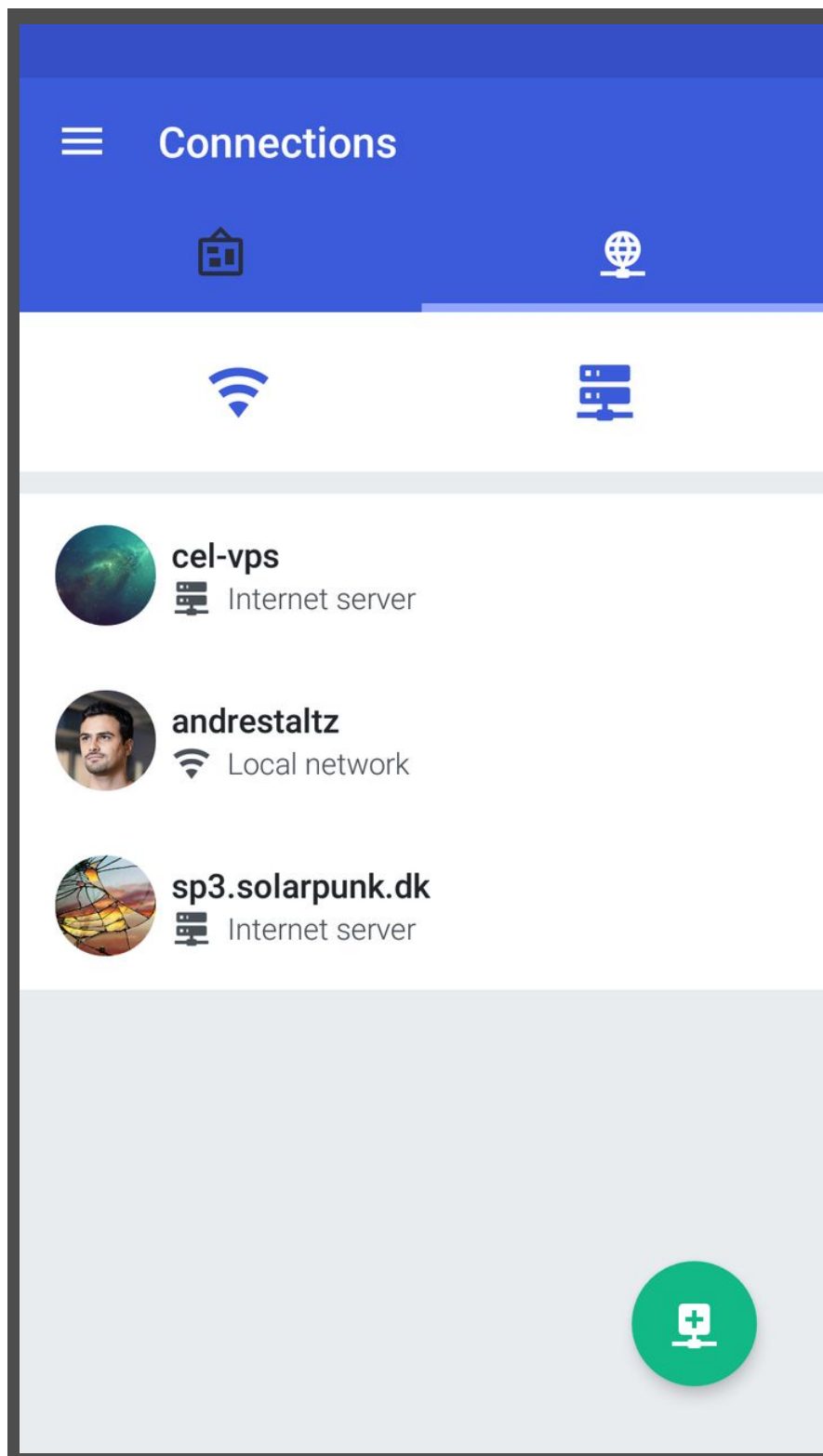
- Follow, unfollow, block, unblock
- More networking info and actions (including offline mode)
- Way faster private message rendering
- Works with Patchwork running in background (!)
- Sidebar navigation with cute emoji
- Very very basic internationalization (need help translating!)
- Removed strangers from main feed
- Add Extended and Topics views
- Add public viewer mode
- Fix 8 trillion bugs

If anyone wants to check it out, I'll include the install instructions below. There's also a public demo and a GitHub repository if you like.

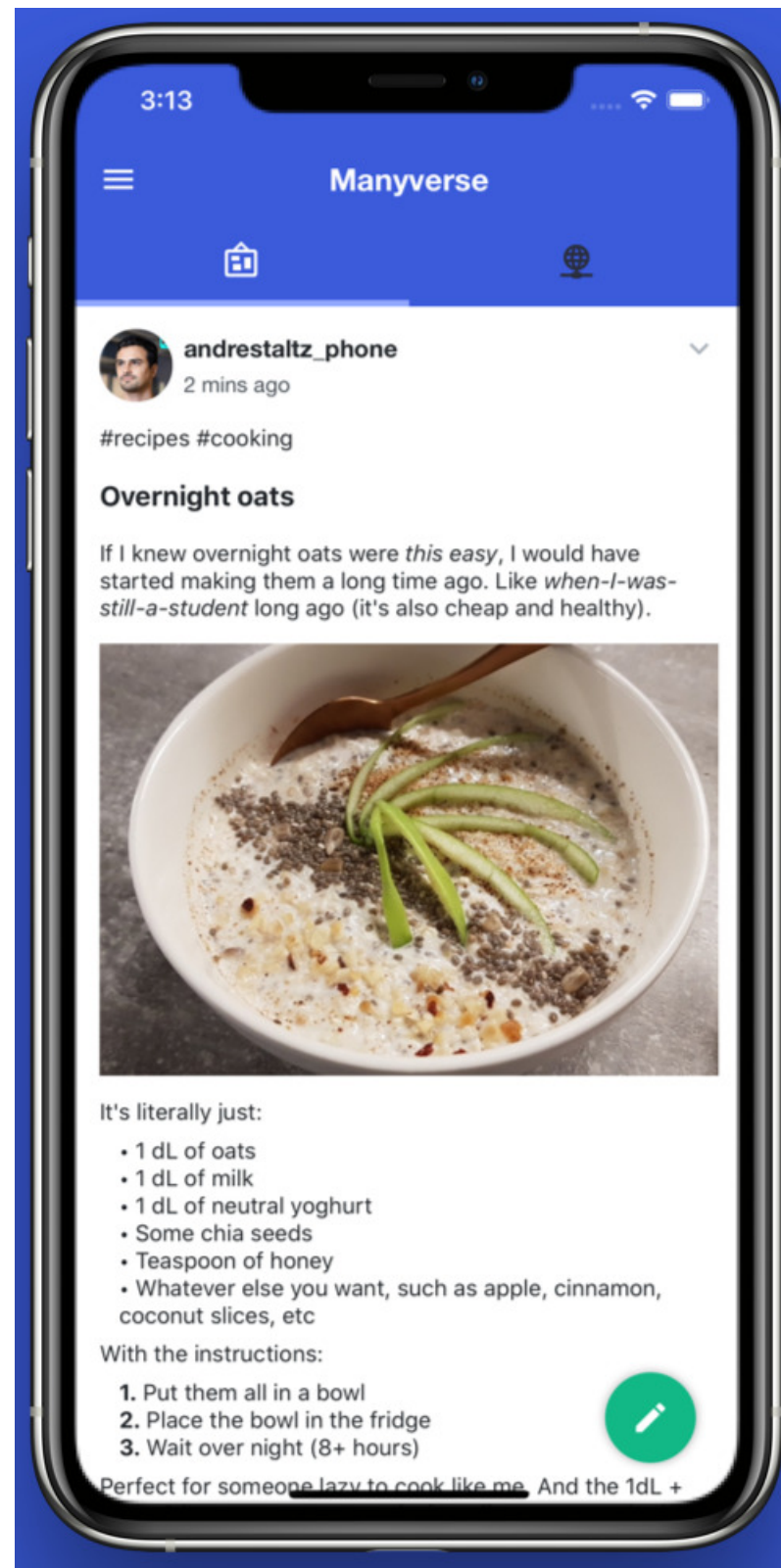
**Installation**



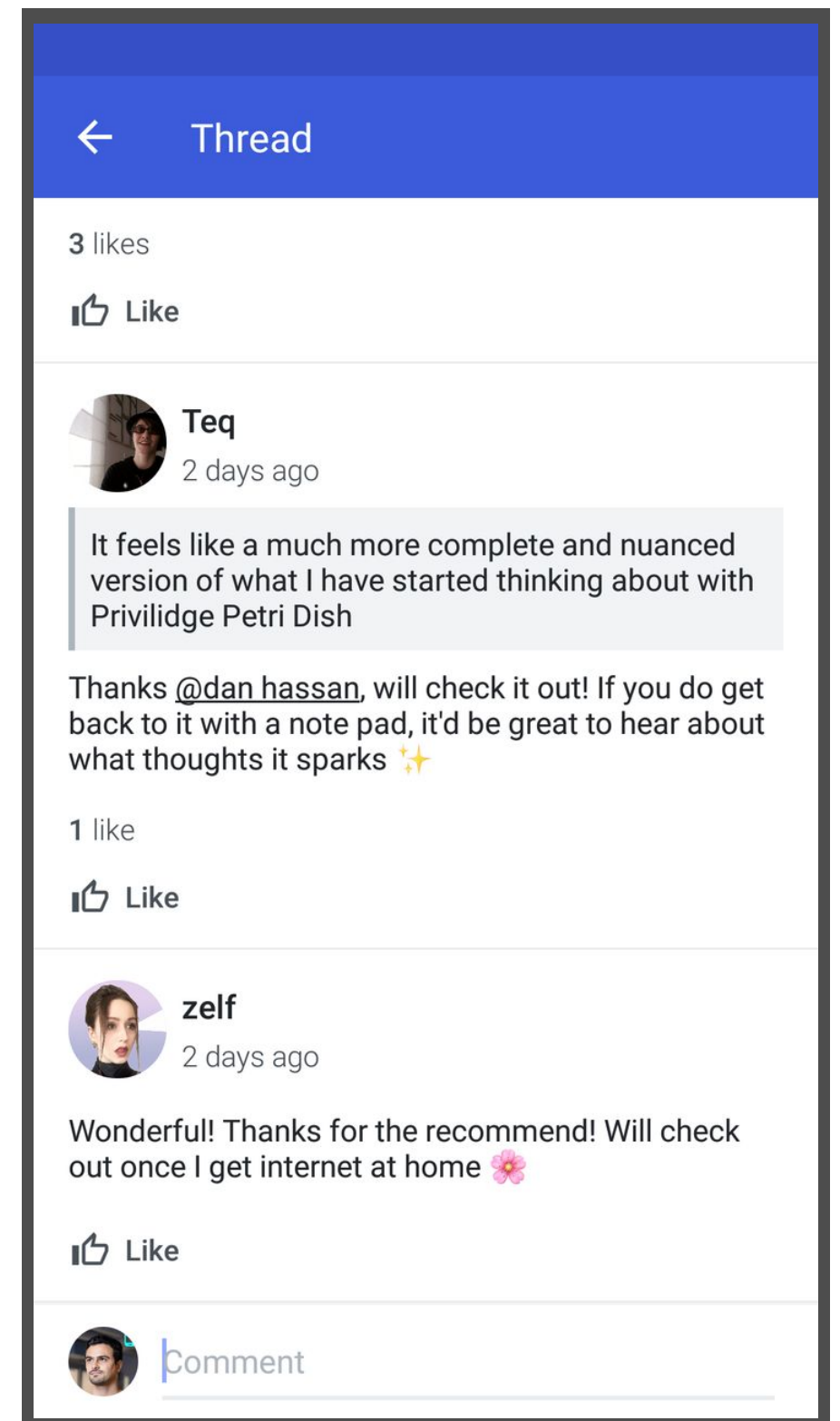
# Manyverse



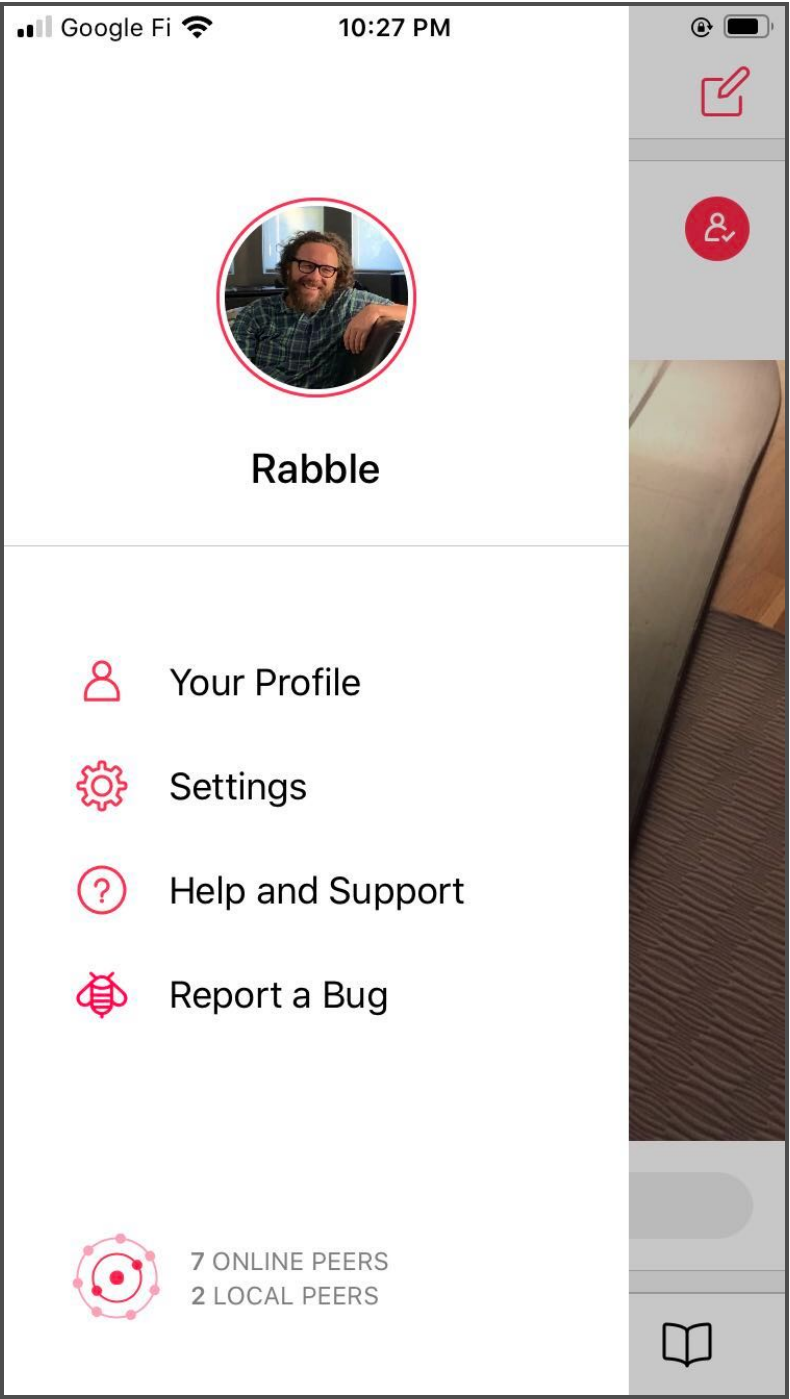
%P7B6o2keZ3UNVWqohSzTzGwzkt7Xum0cehoe6GpkZXQ=.sha256



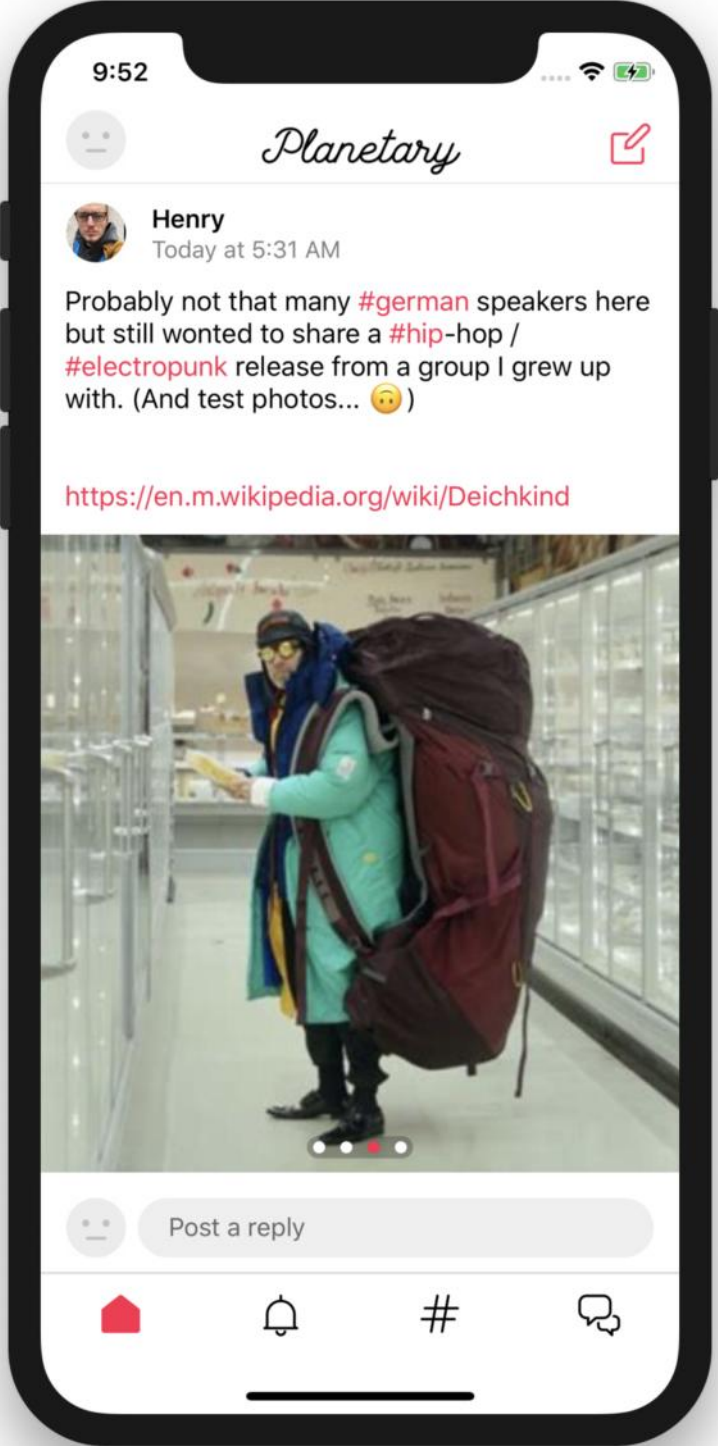
%yNkrJtnHyR4LcgzYvJ3nYdvQ1U3i2S1Vxzs7v0H5WU=.sha256



# Planetary

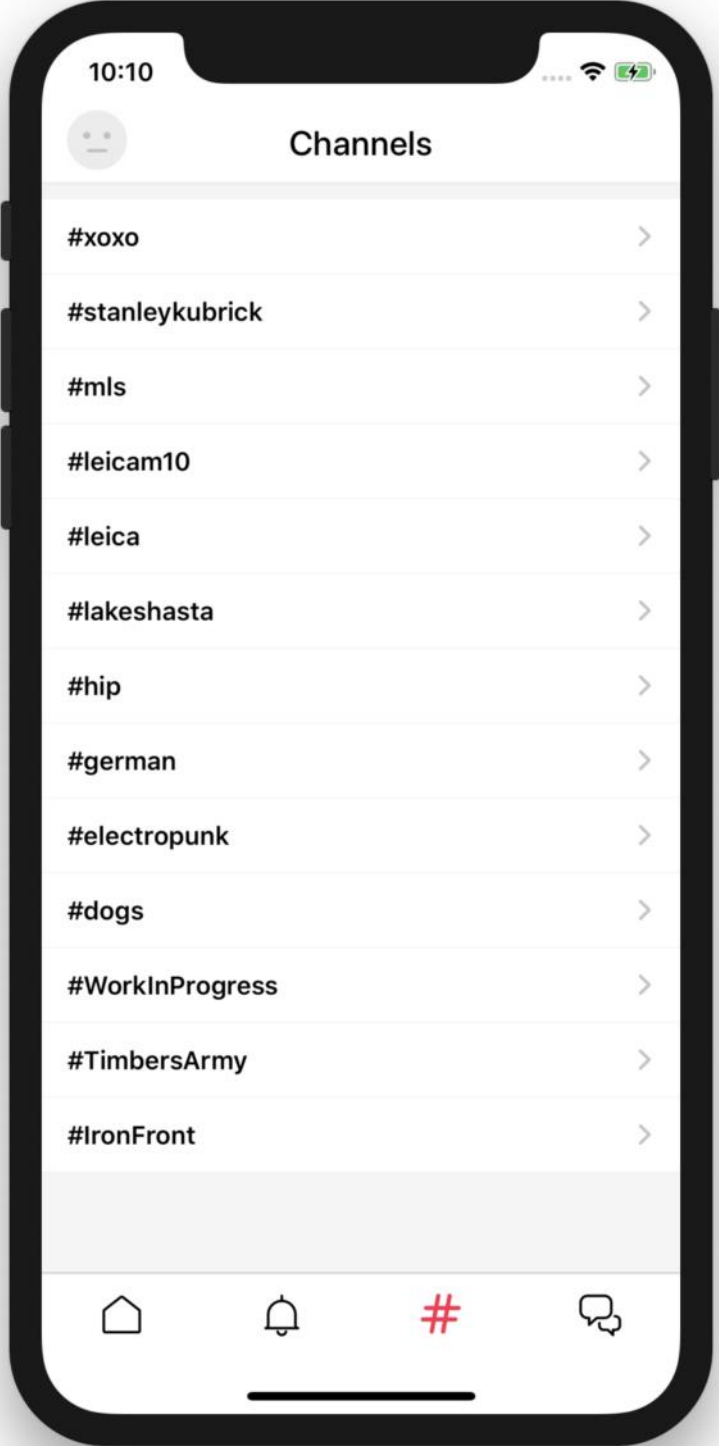


%I/I5Gcw48qtCYCdF8tViB2kT3DXzvGBISh8mAdaDRFY=.sha256



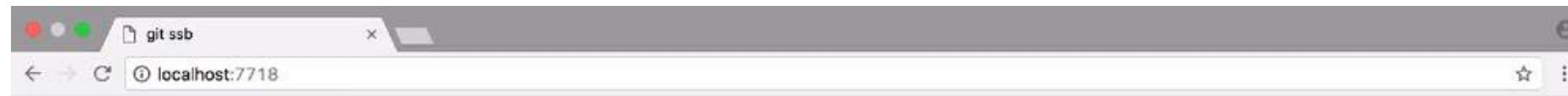
iPhone Xs — 13.0

%SD3WszbEsswBRHhj6cCffckD2ZhwF6iJ/OCKwQmLG0Y=.sha256



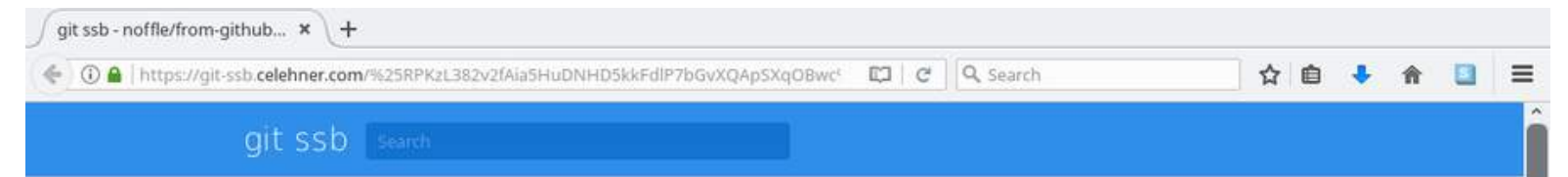
iPhone Xs — 13.0

# git-ssb



## git-ssb

- John pushed to patch-profile 3 hours ago
- noffle pushed to grid-point-store 9 hours ago
- noffle created repo grid-point-store 9 hours ago
- John created repo patch-profile 11 hours ago
- substack pushed to random-access-idb 17 hours ago
- CustomDesigned pushed to patchfoo 21 hours ago
- regular pushed to ssb-cms a day ago
- regular pushed to ssb-cms a day ago
- regular pushed to ssb-cms a day ago
- John pushed to patch-settings a day ago
- John pushed to patch-settings a day ago
- John created repo patch-settings a day ago
- cel pushed to blobstrap a day ago
- cel created repo blobstrap a day ago
- cel pushed to blobbify-dkg-lock a day ago



## noffle / from-github-to-git-ssb

Code Activity Commits Issues Pull Requests

Branch: master

SSB ssb://%RPKzL382v2fAia5HuDNHD

Stephen Whitmore committed credit mix Latest: d5e9bb6 on 6/6/2017, 12:38:35 PM

- README.md
- collaborators.md
- git-ssb\_activity.png
- git-ssb\_repo.png
- patchwork.jpg

### README.md

Read this on SSB for best results: <http://git-ssb.celehner.com/%25RPKzL382v2fAia5HuDNHD5kkFdIP7bGvXQApSXqOBwc%3D.sha256>

### From GitHub to git-ssb

#### A guide to hacking *together* on the distributed web

If you're curious about the distributed web, and the prospect of using git collaboratively without a central, closed-source point of origin, you came to the right place!

git-ssb is a great fit for just this. This guide tries to act as a transition aide for GitHub users into the world of git-ssb. It assumes rudimentary knowledge of GitHub. It will walk through:

1. understanding what "SSB" is.
2. installing scuttlebot -- the SSB peer server -- and joining the network.
3. installing the `git-ssb` command and the `git-ssb-web` web interface.
4. a walkthrough of using git-ssb to do common GitHub workflows (creating repos, making pull requests, merging pull requests, issues, etc).

# More apps

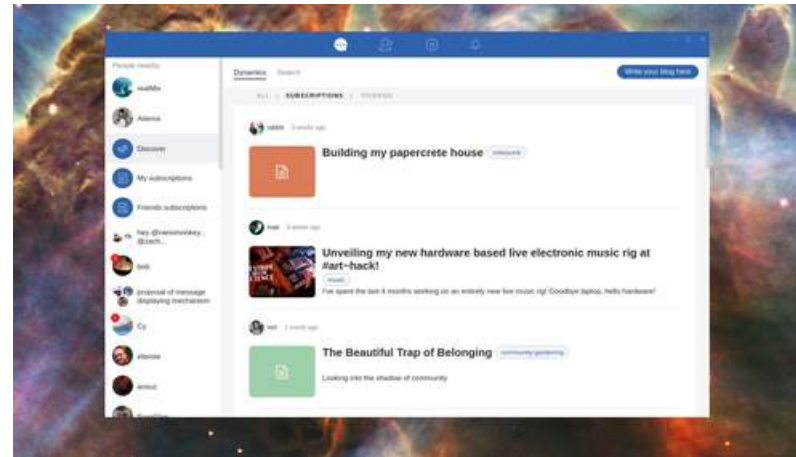
- Sunrise Social
- SurfCity
- ScuttleShell
- ssb-npm-registry
- ssb-viewer
- ssb-dns
- ssb-mutual
- yap
- mvd
- HackyArt

...

```
Public Mode
Jul 10 11:00 @squicq patchwork doesn't display them, but i think it knows about them
Jul 10 11:06 @squicq like if you're in a channel and someone scats with that channel hash, patchwork shows "I new up date", but when you click it, nothing happens because it knows something came in but not how to handle it
Jul 10 11:07 @squicq searching-wise: if i search for "ttag, guys", it says "2 results" but shows nothing :)
Jul 10 11:07 @squicq kind of funny
Jul 10 11:11 @squicq In patchbay you see the scat messages, but they are minimised down
Jul 10 11:21 @squicq "I new update", haha!
Jul 10 11:21 @squicq @blancew, so that you have to 'uncollapse' them to see the text?
Jul 10 12:17 @squicq Yeah, does the same for any of the "other" message types (like chess messages for example)
Jul 10 12:18 @squicq looks at "scat"
Jul 10 21:38 @dangerousbeans oh yeah oopse I meant 28 weeks later, 28 months later would be pretty epic though especially if animals started catching Rage
Jul 10 21:38 @dangerousbeans I was always disappointed with The Walking Dead for not coming up with new scarier zomb ie ideas, like zombie horses or zombie dogs or zombie children
Jul 10 21:38 @dangerousbeans they should pay me for these ideas
Jul 11 02:09 @squicq
Jul 11 02:11 @squicq I enjoyed TWD when the series first started, and I even watched it all the way to season 5, but along the way I felt Groundhog Day creeping in. I'm not even sure what season they are at now. 6?
Jul 11 02:13 @squicq here's the latest music video from carl grimes: walkers be trippin' w https://youtu.be/Q9AM9Ch97U8
Jul 11 03:03 @dangerousbeans it was great up until they realised that (spoilers) the mullet dude wasn't actually lea ding them anywhere and they all just sort of stopped on the highway and all the storylines ended. It felt really obvi ous that that was the point where the season was meant to end, but they had to just come up with some new stories
Jul 11 04:58 @dangerousbeans lol @ video
> |
```

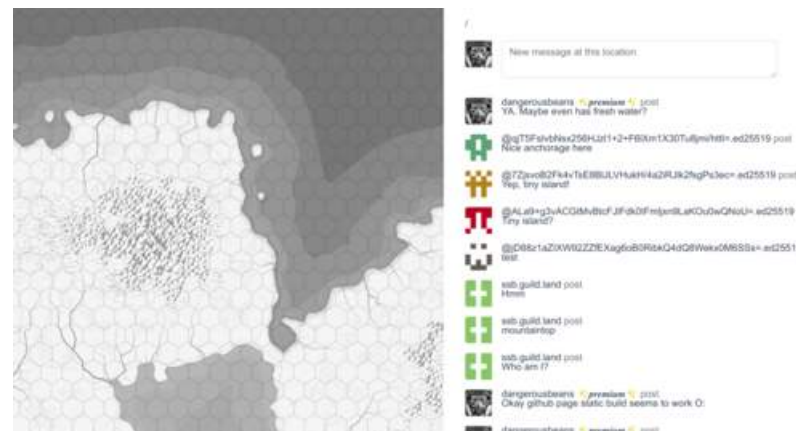
## scat (ssb-chat)

%R801Mq6vKv3100DueYJdP3fBzuOKLBYC5IftdvQ5N9I=. sha256



## TickTack

%ZGfik3+hbI0uKkpG0aRijrFHLNy6PwduuJ2BnR/Bg4=. sha256

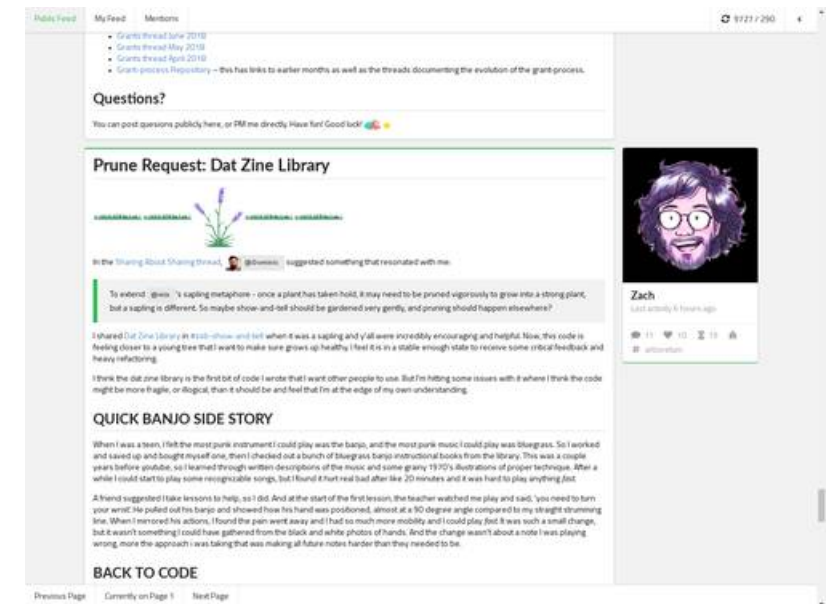


## Guild Lands

%hagbVpbADoNQ6zmhovB3HhzRzrcSEKY0G0g3Dd+QMwE=. sha256



## tale:net



## ngx-ssb-client

# Implementations

Full: Node.js, Go, Rust

Partial: C, Python, Java, Swift, Erlang

Crypto: C (libsodium)



`%6AoUPXJH+SdKjPC/FoQ/8xjQBo5WE+i0qNyrmiqRAMA=.sha256`

# Funding

@elavoie

%zmv8Fvm3a7qnAVBs207se5JLJXqsrqjBZwB88/Bv8DQ=.sha256

2019-04-03

## Proposal HC16: Budget

**Total: 85106 Euros**

The percentage below have been obtained by averaging the suggestions of individual Council members, that is why we end up with cents. If someone would like to see what were the suggestions of Council members, message me and I will compile them for the records.

Budget Item	Description	Amount (Euros)	% Total	Comm. Sugg.
<b>Core Protocol</b>		<b>19236.31</b>	<b>22.60</b>	<b>22.00</b>
Core Development	<a href="#">HC10</a>	6254.42	7.35	
Sunrise Choir	<a href="#">Mix Suggestion</a> , <a href="#">Original Announcement</a>	5668.43	6.66	
Pre-Partial Developer Payment	<a href="#">HC09</a>	1331.83	1.56	
GitMatching	<a href="#">HC14</a>	4647.31	5.46	
Emergency funds	<a href="#">Discussion</a> , to Cel	1334.31	1.57	
<b>Clients and Applications</b>		<b>22486.42</b>	<b>26.42</b>	<b>27.00</b>
Manyverse	<a href="#">Announcement</a> , <a href="#">Open Collective</a> , <a href="#">Repository</a>	8482.51	9.97	
Patchwork	<a href="#">#patchwork</a> , <a href="#">Repository</a>	5392.21	6.34	
Patchbay	<a href="#">#patchbay</a> , <a href="#">Repository</a>	3397.16	3.99	
Patchfox	<a href="#">#patchfox</a> , <a href="#">Repository</a>	1968.54	2.31	
PeachCloud	<a href="#">#peachcloud</a> , <a href="#">Repositories</a>	3245.99	3.81	
<b>Community Gardening</b>		<b>21269.20</b>	<b>24.99</b>	<b>25.00</b>
Discretionary Funds	<a href="#">HC03</a>	4400.77	5.17	
Website	<a href="#">HC05 Power Transfer</a>	7735.18	9.09	
Newsletter	<a href="#">HC06</a>	2746.34	3.23	
Local Gossip	<a href="#">#the-local-gossip</a>	1828.82	2.15	
ScuttleShip	<a href="#">Idea</a>	2350.12	2.76	
For Distribution	<i>Mugs, stickers, camps at festivals, etc</i>	2207.97	2.59	
<b>Coordination</b>		<b>12755.62</b>	<b>14.99</b>	<b>15.00</b>
Handshake Council (Counsellors)	<a href="#">HC01</a>	10047.69	11.81	
Facilitator <a href="#">@elavoie</a>	Idem	2707.92	3.18	
<b>Other</b>		<b>9358.45</b>	<b>11.00</b>	<b>11.00</b>
General Buffer	Unexpected expenses	6003.76	7.05	
Fundraiser	<a href="#">HC08</a>	3354.69	3.94	

[#handshake-council](#)

Enspiral Grant - Card  
 Dfinity Grant - Process  
 Handshake Grant - Council  
 Open Collectives



# Scuttlecamp



%hLhNMksptjCxNi+B77DHrYEu26jDTrqgGsfb1+NvuWA=. sha256

# Diversity and Inclusion

@mnin

%FuphnCqkqeH0YU2oFkLppAQ9qSK1URbXTPYozEhL7JE=.sha256

2019-05-07

→ [@mary Part of me is thinking of increasing the surface area of those wh...](#)

↳ [@Christian Bundy Mmm, I've been thinking about think and letting ideas ...](#)

↳ [Patchwork Working Group: Skeleton Crew If you haven't already read Matt'...](#)

## SSB community Inspo

I'm also inspired by and actively learning from examples across ssb and from the organising of scuttle camp, on how diversity and inclusivity were prioritized and fostered.

Main examples being:

[@Alanna](#)

- asking and prompting us all on [Who would you like to welcome to ScuttleCamp?](#)

In my experience, to support diversity and enrich everyone's experience, you have to go the extra mile to reach out. I believe there are some awesome people in the Scuttleverse who may not come unless we proactively invite them and offer extra support (financial or otherwise).

[@mixmix](#)

- reserved tickets for scuttle camp to [support diversity + inclusion as a priority](#)
- opening arms and offering support for those who are shy-er or new with [Get to know people a little before scuttle-camp](#)
- transparency in [Diversity & Inclusion updates](#)  
↳ What's not immediately visible right now is the makeup of who is attending (the gathering is ok, but it's out of sync with who is currently registered). Here's an anonymised breakdown of the humyns (NOTE we did ask people registering about e.g. gender, so these numbers may be off)

[@dan hassan](#)

- e.g actively [nominating](#) and nudging people to come
- Meetings for [supporting folx to come to scuttlefest](#) - some key valuable diverse folx came, thanks to this work!

[@noffle](#)

- actively tagging and nudging people [here!](#)

I can thank these people, for their OG initiative, support and nudges, for really making me feel invited, valued, and wanting to be sticking around here. :laughing:

Plus there's so many more examples of various people who've supported me personally, or/and had interests in diversity + personally willing to support, had engaged positively or called out toxicity, and taken the initiatives to make inclusion a priority.

That's what gives me lots of hope, that there's *an existing social layer* of willingness. The number of people actively participated in the [gender FLOSS thread](#) was astounding.

[@mixmix](#)

%co2sCeVn9L1UEvS2EIf99vVX4E0ya6VoVUdxXWrv8w=.sha256 [#scuttlecamp](#)

2020-03-02

[moebius\_journey.jpg]

## Diversity / Inclusion / Accessibility > Scuttlecamp

My dream is that Scuttlecamp (and thence the future dreaming of scuttlebutt) is accessible to a wider range of people. I did a bunch of work towards this for Scuttlecamp 1, and for dweb camp.

### I would like to support someone to take up this mantle for Scuttlecamp 2

The job looks like asking for money/ support, building communication / relationships with people who might benefit from scholarships, and making sure budgets line up. I am very keen to offer my experience to help someone else learn about and do this work.

### FAQ

#### Why can't [@glyph](#) + [@Luandro](#) do this?

*They've already taken on a massive role of organisation + care. They don't have capacity to safely take this on as well*

#### Wait is this just boring admin / handing out money?

*Haha, no. This is people work (with a minor side of spreadsheets). We recorded some podcasts ([part 1](#), [part 2](#)) about the personal impact this work has had on us.*

*TL;DR it's incredibly rewarding, has built lasting connections, and has led me to learn a lot about myself and the world. I cannot recommend it enough as an opportunity.*

#### Is this hard?

*It can be challenging. Remember you won't be alone, you'll have people who've done this work to help you get started, and to offer guidance and support. Hopefully we can get a couple of people to take this on so you'll be doing it as a duo*

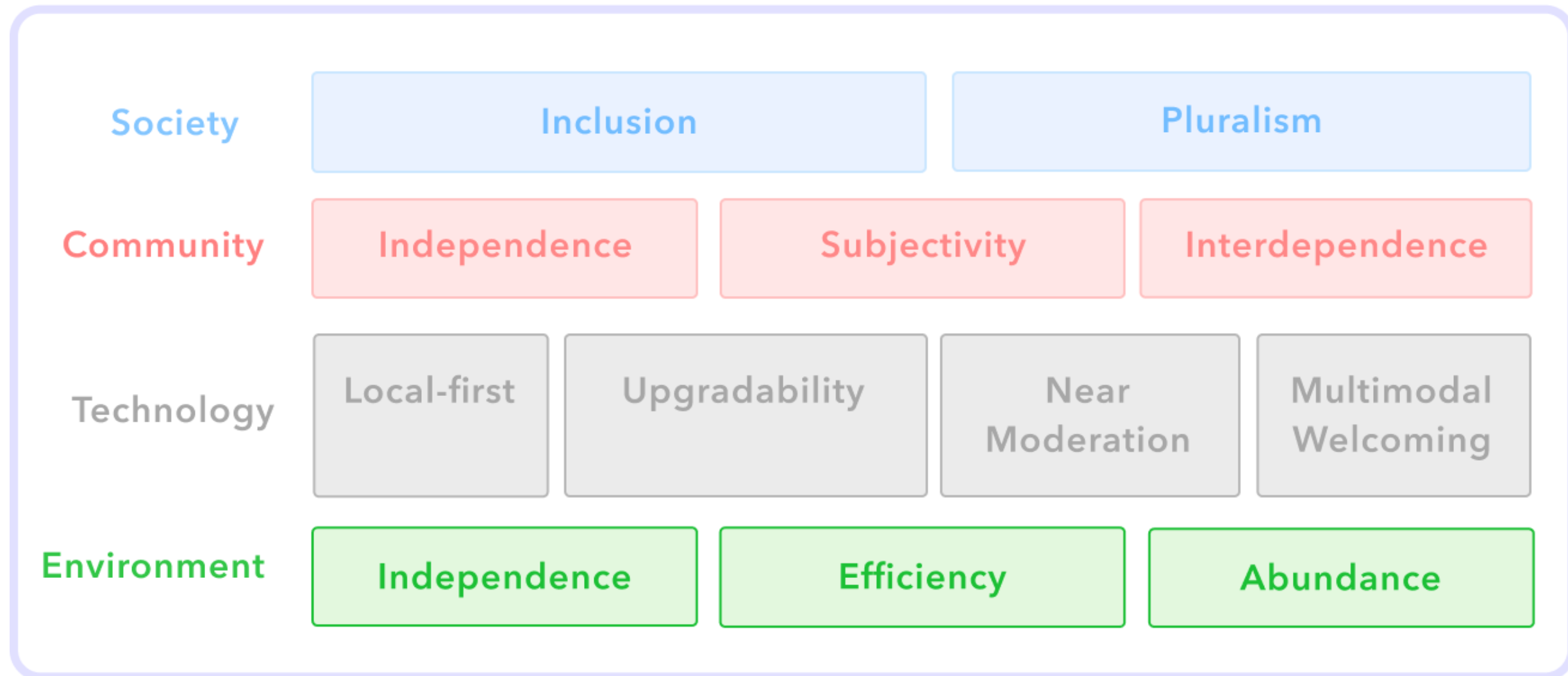
## Next step

If you're keen / interested:

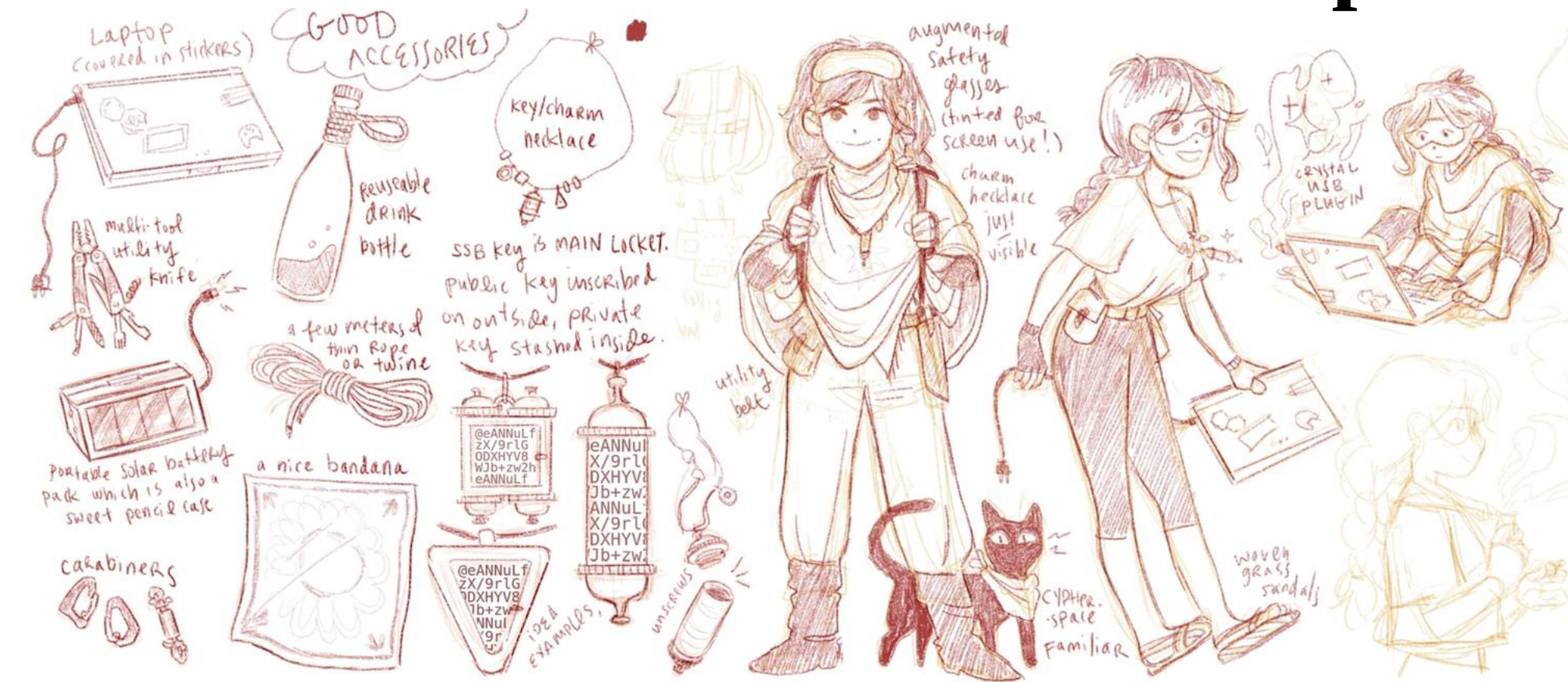
- :hand: Put your hand up here, and mention [@glyph](#) / me
- :question: Ask a question <3

# Principles stack

## Harmony & Reflection



# Solarpunk



[%0h9biRh7teJlwtWD6gFkzSBv8fZlXj9Qr3HrbHPkgwU=.sha256](#)

[%uKy6Lo0gTFRIt/pMXowWHU7ZbioE04kQgJ/K3I4WTPc=.sha256](#)



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[%SaFh1Tea8Mqh02NRFQxoKKjWhnFAzb8JaJm0ss52Nj4=.sha256](#)

# Boats



%on6hMTG1QZ5zW+UqawDcdNmYHdReFS8GuEXvmozL64M=.sha256



## Alchemist

%FdmACu6aDF4SbbVuh8B1xDSusVoUCrri1YU+KkttrAk=.sha256

# Crab meet



%sV6uNHQeYiMh+GHjMCQCCFP9pigTRTq6WXpFsNKsEQw=. sha256



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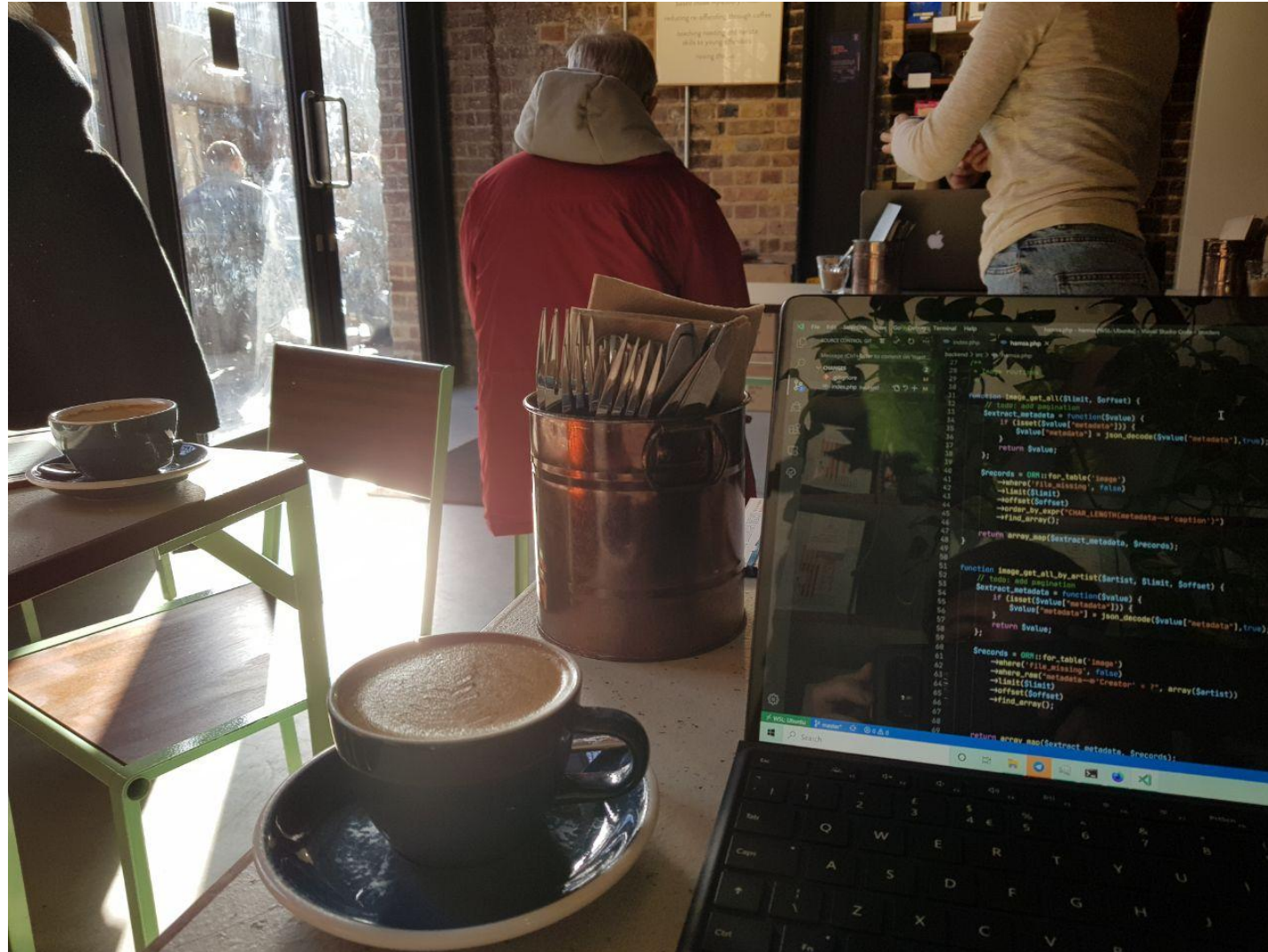


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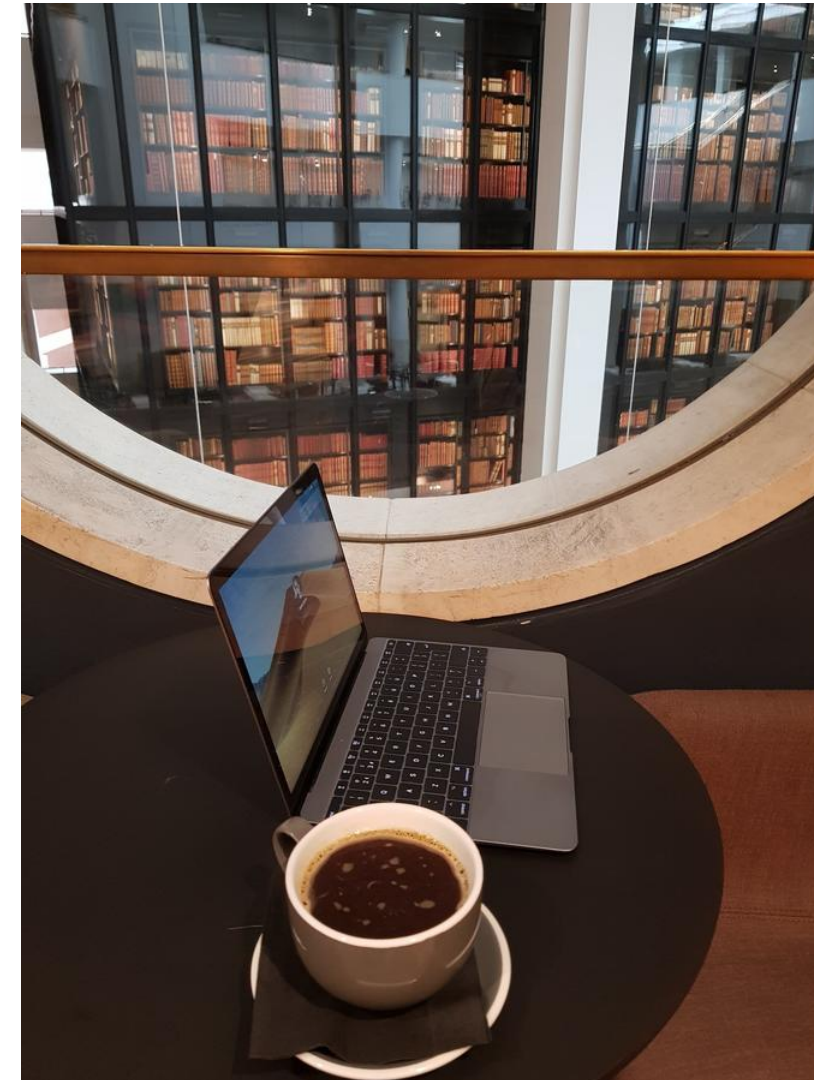


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# #showmeyourcoffee

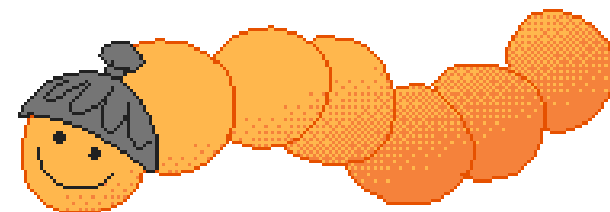


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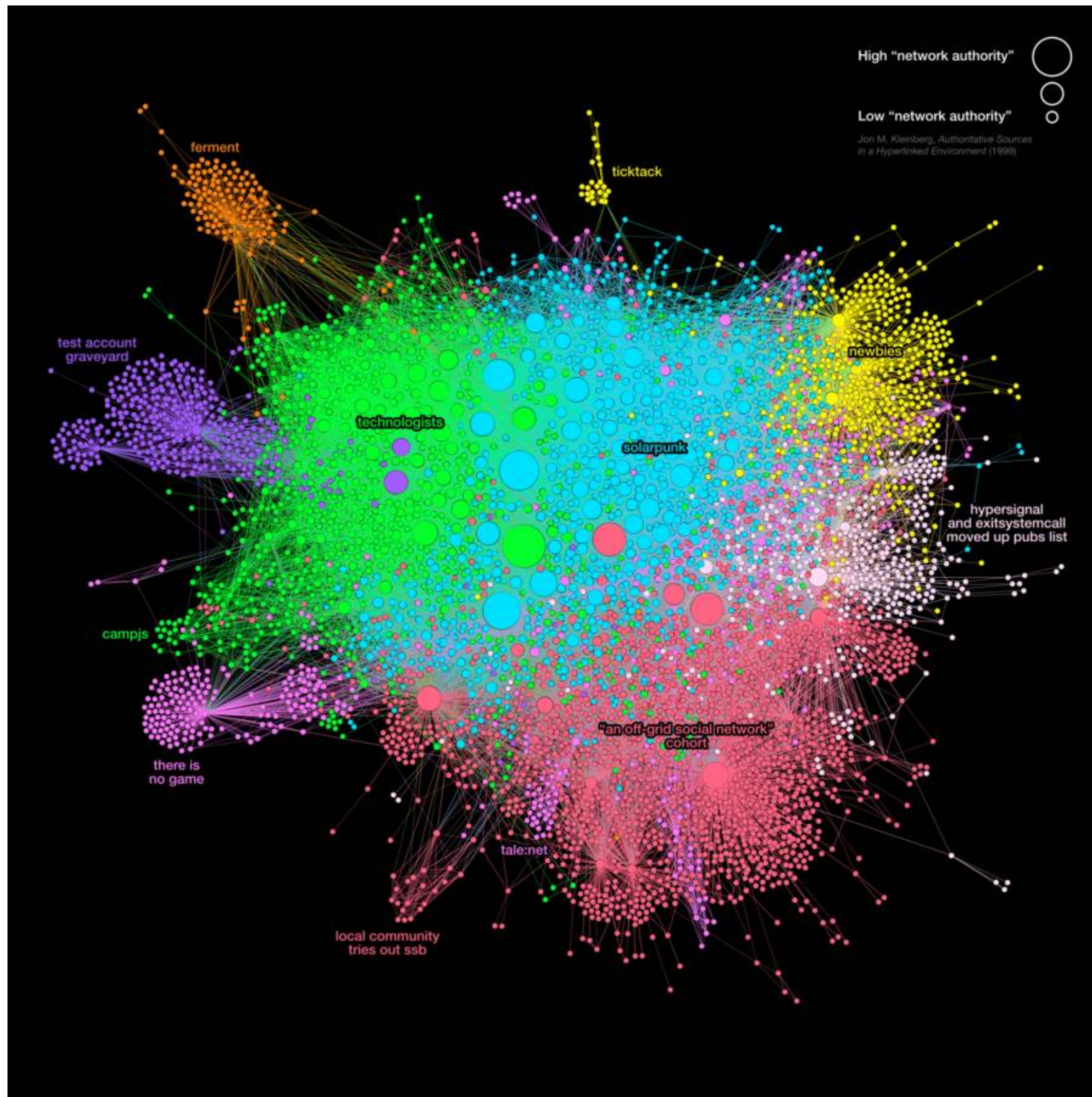
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# #foffee

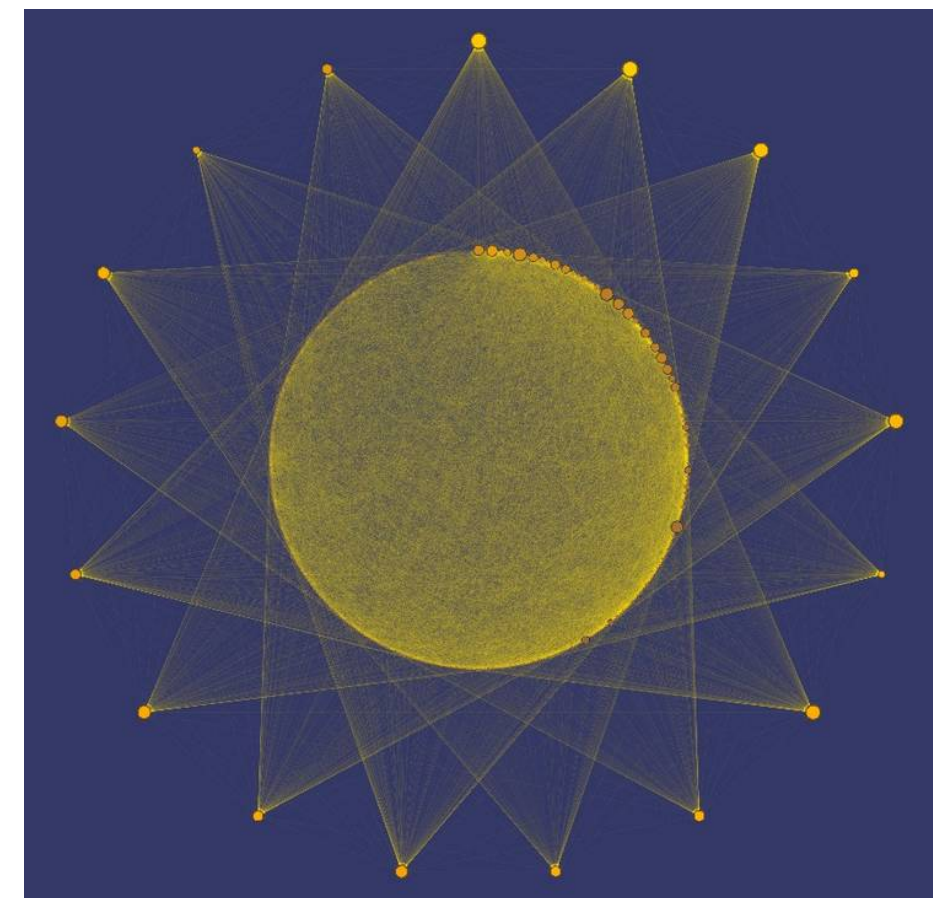


%sHjosVsDkCpb2nH9KixU9wr9T3wGMwtfrooQ0891Y14=. sha256

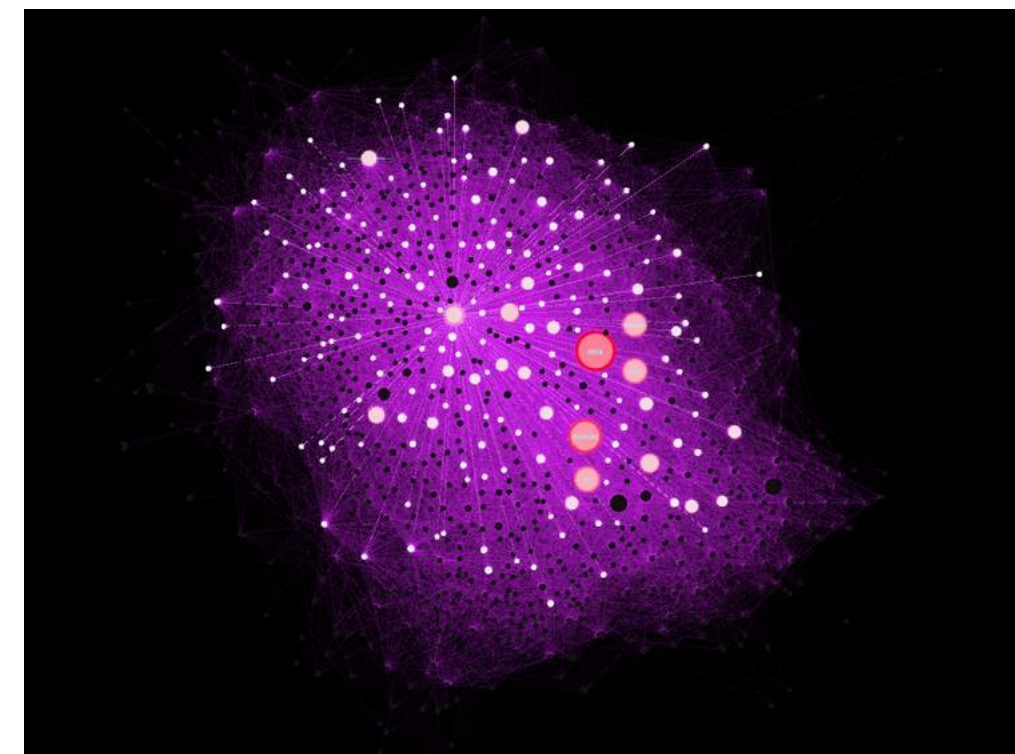
# Network graphs



%utU1BefFYqHwcfQaz4r5bZUil9YtYyTik1j6d7ymVyE=. sha256



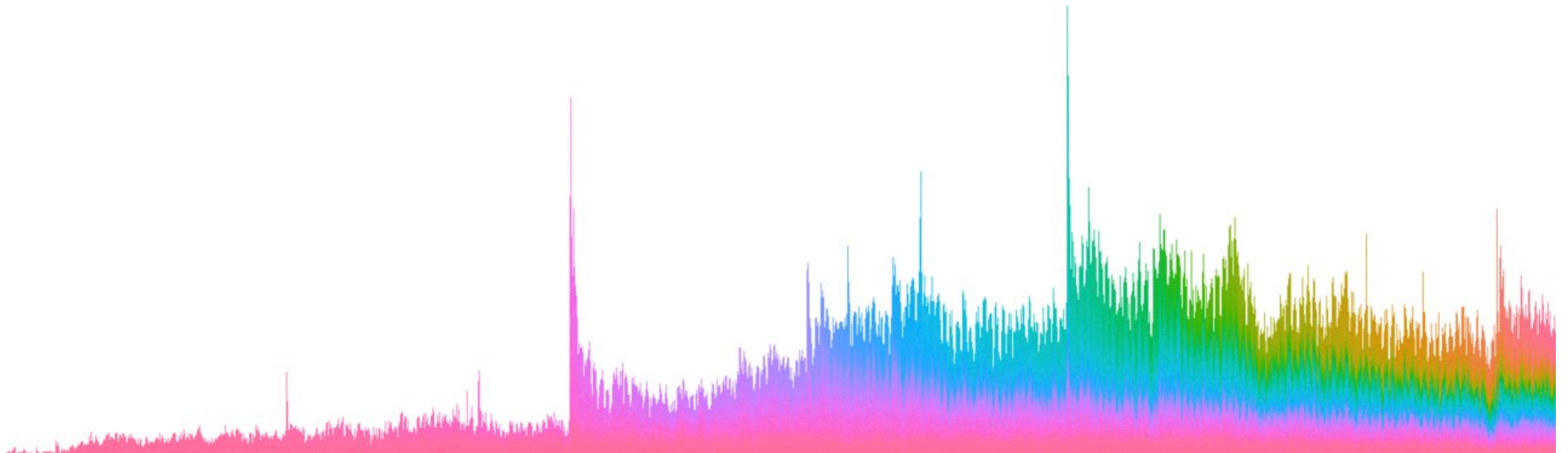
%Qy84JD3wGrXSC3/nfar9DAzWPP4aku6CIc0Sr6/CC/E=. sha256



%ZC0Dq83xRs+sbU8YXxZ1MP1FP1u9i2wyIYAu6GCTqNo=. sha256



# Network activity graph



2015-08-05 - 2020-03-05

<https://ssb.celehner.com/activity/>

# Published research

## A Broadcast-Only Communication Model Based on Replicated Append-Only Logs

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This article is an editorial note submitted to CCR. It has NOT been peer reviewed.  
The authors take full responsibility for this article's technical content. Comments can be posted through CCR Online.

### ABSTRACT

This note is about the interplay between a data structure, the append-only log, and a broadcasting communication abstraction that seems to induce it. We identified real-world systems which have started to exploit this configuration and highlight its desirable properties. Networking research should take note of this development and adjust its research agenda accordingly.

### CCS CONCEPTS

• **Networks** → Network design principles; • **Software and its engineering** → Publish-subscribe / event-based architectures; • **Information systems** → Linked lists; • **Computer systems organization** → Peer-to-peer architectures; Fault-tolerant network topologies; • **Theory of computation** → Data structures and algorithms for data management;

### KEYWORDS

Global broadcast, append-only logs, distr. systems design, trust.

### 1 INTRODUCTION

In August 2018 I learned about a project called Secure Scuttlebutt (SSB) – an overlay network created by D. Tarr in 2014 that is tailored for decentralized social applications. This note aims at extracting the gist of SSB, which is that networking with arbitrary data packets could be replaced by networking with coherent data structures. The question is “what are suitable data structures” and what would corresponding networking primitives look like. SSB gives a very radical answer to this, although in retrospect SSB's choice seems natural if one starts from first principles.

In the analog world, propagation of perturbations is the basis of information dissemination: Depending on the physical constraints, a *wavefront* is carrying information omnidirectionally (wireless, water surface) or directionally (in a wire or fiber). However, in computer networks, the unidirectional style has become the dominant and default communication model on which today's network architectures are based, starting from the fact that data packets typically have a source *and* a destination, so do circuits, or we observe wordings like “wireless link” and note that routing algorithms are graph-based, hence link-oriented, without exception.

In a broadcast-centric world, **there is no destination**, just a source; wireless transmission is not a link but naturally implements broadcast; routing is not required because perturbations just propagate infinitely far if not blocked. We should ask ourselves whether

broadcast wouldn't be the better *base level* abstraction on which to build other communication services, turning point-to-point communication into a minor (and often inferior) corner case.

Surprisingly, we find a tight relationship between the broadcast model and a data structure, namely append-only logs, that this note wants to highlight. We believe that looking at communication problems from a data structure point of view is an important step towards a better understanding of reliable, synchronized, secure and privacy-preserving operations of distributed applications.

We start by describing the properties of a particular broadcast abstraction which still is somehow close to physical phenomena (potentially making the mapping to the analog realm easier), but is abstract enough such that one can recursively refine and implement this abstraction. A suitable candidate for this abstraction are solitons i.e., information packets that propagate as a solitary wave.

### 2 LOCAL AND GLOBAL SOLITARY WAVES

Solitons[6] are particle waves or wave packets which travel through space without leaving any disturbance behind them. Such solitary waves have been observed from biology to cosmology and have important applications in communications, for example fiber optics.

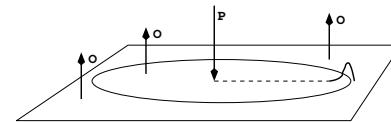


Figure 1: A perturbation triggered by a station  $P$  propagates as a solitary wave to all observers  $O$ .

The purpose of this note is to take solitons *as the inspiration* for a communication model whose operation is best described in terms of an initial perturbation that propagates in a wave-like form, in all directions. Such a broadcast model shall obey the following three properties:

- (1) Each perturbation source has a globally unique identifier that is carried with each perturbation it triggers.
- (2) A perturbation and its value eventually reaches all anonymous observers.
- (3) All observers sense subsequent perturbations coming from a specific source in the same order.

Using middleware language, the communication primitive having above properties can also be described as reliable, ordered broadcast

## Secure Scuttlebutt: An Identity-Centric Protocol for Subjective and Decentralized Applications

Dominic Tarr  
ssb:@EMovhf1rFk4NihAKnRNhrf  
RaqIhBv1Wj8pTxJNgvCCY=.ed25519

Aljoscha Meyer  
TU Berlin, Germany  
aljoscha.t.meyer@campus.tu-berlin.de

### ABSTRACT

Secure Scuttlebutt (SSB) is a novel peer-to-peer event-sharing protocol and architecture for social apps. In this paper we describe SSB's features, its operations as well as the rationale behind the design. We also provide a comparison with Named Data Networking (NDN), an existing information-centric networking architecture, to motivate a larger exploration of the design space for information-centric networking primitives by formulating an identity-centric approach. We finally discuss SSB's limitations and evolution opportunities.

### CCS CONCEPTS

• **Networks** → Network architectures; • **Software and its engineering** → Publish-subscribe / event-based architectures; • **Computer systems organization** → Peer-to-peer architectures; • **Information systems** → Linked lists.

### KEYWORDS

Secure Scuttlebutt, Information-Centric Networking, Push vs. Pull

### ACM Reference Format:

Dominic Tarr, Erick Lavoie, Aljoscha Meyer, and Christian Tschudin. 2019. Secure Scuttlebutt: An Identity-Centric Protocol for Subjective and Decentralized Applications. In *6th ACM Conference on Information-Centric Networking (ICN '19)*, September 24–26, 2019, Macao, China. ACM, New York, NY, USA, 11 pages. <https://doi.org/10.1145/3357150.3357396>

### 1 INTRODUCTION

A simple conceptual architecture for community applications consists of a global data pool to which every person can contribute and where every person can tap into the shared data – data sharing being the purpose of such applications. This model still is valid if one adds access control to the picture, either tied to the data (encryption giving access to content only to entitled holders of the decryption keys) or encrypting data in transit (login and TLS). Facebook and other centrally organized social app service providers fit well under

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*ICN '19, September 24–26, 2019, Macao, China*  
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ACM ISBN 978-1-4503-6970-1/19/09.  
<https://doi.org/10.1145/3357150.3357396>

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this global data pool model but have been strongly criticized for abusing their central provisioning position. The “decentralized web movement” [18] is the most visible technical response to this critique, pointing out implementation alternatives.

One of these alternatives is a project called Secure Scuttlebutt (SSB) that started in 2014. After several iterations of protocol design and implementation, SSB has become a stable service for over 10,000 users offering them rich media community applications with strong cryptographic protection (end-to-end encryption and metadata privacy) and running in pure peer-to-peer mode.

### Selective Complete Log Replication

SSB relies on the core insight that each participant is only interested in a *subset* of the global data pool, thus it is feasible to locally store all the data a participant is interested in. To partition the data pool, all data is associated with the *identity* that produced it. Participants select their slice of the data pool by specifying the set of identities whose data they care about. This creates a “social graph” along whose edges data flows (Figure 1). Even as the overall system scales, the amount of data any single peer is interested in and thus needs to handle stays roughly the same.

Each participant can publish data to their single-writer, append-only log. This choice of data structure allows efficient replication and verification of the integrity of received data. Replicating these larger slices of the data pool comes with an unusual set of trade-offs, discussed throughout the paper. As it turns out, replicated logs form a solid foundation for implementing many classes of applications.

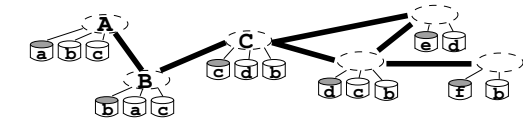


Figure 1: SSB's “Internet of Identities” – Users A, B and C replicate logs ( $a, b, \dots$ ) based on whom they follow:  $C$  does not follow  $A$ , hence has no log  $a$ .  $A$  and  $B$  follow each other such that when  $A$  follows  $C$ ,  $A$  will get  $C$ 's log  $c$  via  $B$ : new content is pushed directly if possible and through intermediary friends if necessary.

### Subjective Reader

Because replication in SSB is selective and driven by a peer's social graph, different end devices will have access to different sets of log

# Other initiatives

## Faerie rings

@Powersource %31xETMTN1+h1Pv52HgNmZwF6GyJYJz9H08tHHTwidp0=. sha256 2019-03-04

### Faerie ring mitosis

[lots of rings]

Coming out of scuttle camp and with [the last faerie ring v.1](#) coming up, it feels like the right time to sprout new rings.

#### Brief description

For those unfamiliar with the concept, here's a brief description of the concept:

- max 8 people
- a call once a fortnight for 2-3 months
- everyone has a turn checking in
  - how's it going?
- there's a host (who changes)
  - opens & closes the circle
  - makes sure everyone gets to speak

the rest of the format can grow to fit that group, perhaps things like

- a focus question
- asks / offers : do you have something you'd like to get help with / to offer ?
- freestyle

This description is taken from [mix's original invocation](#) where you also can read more about it.

#### Organizing this

##### Seed hosts

While the host changes with time, it's good if the first host is someone who is in the current faerie ring or has experience with similar things, to get the new ring off to a good start. Tagging the people in the current ring, but others could step up.

[@Matt McKegg](#) [@Mikey](#) [@Christian Bundy](#) [@Piet](#) [@noffle](#) [@mix](#) [@Zach!](#) [@Dominic](#)

##### Faeries

That's the official term now ok :P Basically other people interested in being in the rings but who aren't comfortable being the initial host. Tagging people who've expressed interest/went to the microsolidarity session at scuttle camp (sorry if I miss someone!) other people that I think would be interested.

[@Zenna](#) [@mu](#) [@Emmi Bevensee](#) [@Alanna](#) [@Teq](#) [@Songvi](#) [@cel](#) [@cblgh](#) [@Louise](#) [@Isak](#) [@happy0](#) [@andrestaltz](#) [@KawaiiPunk](#)

**If you're interested in either role please comment below. If you could be up for being a seed host please indicate so.**

:sparkles::sparkles::sparkles:

[#faerie-rings](#) [#microsolidarity](#)

## Community Infrastructure Learning Group

@punkmonk %L9X+oakILqFsb0GCHv7mXmf52vzxaTX/iNMA4GTnwe0=. sha256 2019-09-13

### Community Infra Together

#### Context

Recently, I started a fellowship for an organization that works with a local school district to build out capacity for the school to create makerspaces within their own schools, and to provide STEM/STEAM related projects tied to core state educational standards.

Additionally, the organization is looking for new ways to coordinate with schools, the community, local government, internally etc. I was initially invited to apply for this fellowship due to my interests in p2p tech and hopefully to be able to apply some of these ideas.

With that in mind, I'm very interested in learning more about running the needed p2p infrastructure effectively, reliably and safely. I'm familiar with running these things for my own use, but not when providing tools for a larger community.

#### Is anyone interested in assembling a learning group focused on running various p2p services?

Initially, starting with an ssb pub and working onto more advanced topics like safely running a cjdns public node.

If anyone, no matter what skill level, is interested in being part of a **p2p infra learning group** it would be great to go through it together and help each other learn. This would also provide real value to the scuttlebutt community (and others) as more maintained ssb pubs, cjdns nodes, dat seeders etc are added to the ecosystem at large.

This is an opportunity to develop a p2p blueprint that could be handed to any interested community, with best practices laid out for them to initially follow. As we learn, those learnings should be documented and given back to the commons for further iteration.

Drop a line in this thread if interested and a gathering can be created later for further discussion.

Here is a cryptpad with some initial ideas: <https://cryptpad.fr/code/#!/2/code/edit/Uq-w6COLPAe9Meaw3y81zzTr/>

those interested should feel free to add or edit

## crypto-mutual-aid

@punkmonk %VeBBSKCWC6F8/06nIVdh56HoFR1cekjPMh+qKLGi0pA=. sha256 2020-01-30

### cryptaid

i'd like to try a small mutual aid experiment. this is an idea that has always been intriguing having grown up in an area where mutual aid networks are fairly prevalent among a [certain demographic](#). the idea always resonated with me especially during times of being un-insured/un-insurable.

the experiment could focus on alleviating small, unplanned hiccups for participants ie. "i need a weekly bus pass to go to job interviews" or "i have to work but i need a sitter today!" or "i'm unexpectedly sick and need help paying the \$100 copay" orrr "i had an unplanned car bill, and need a few bucks for groceries till payday"

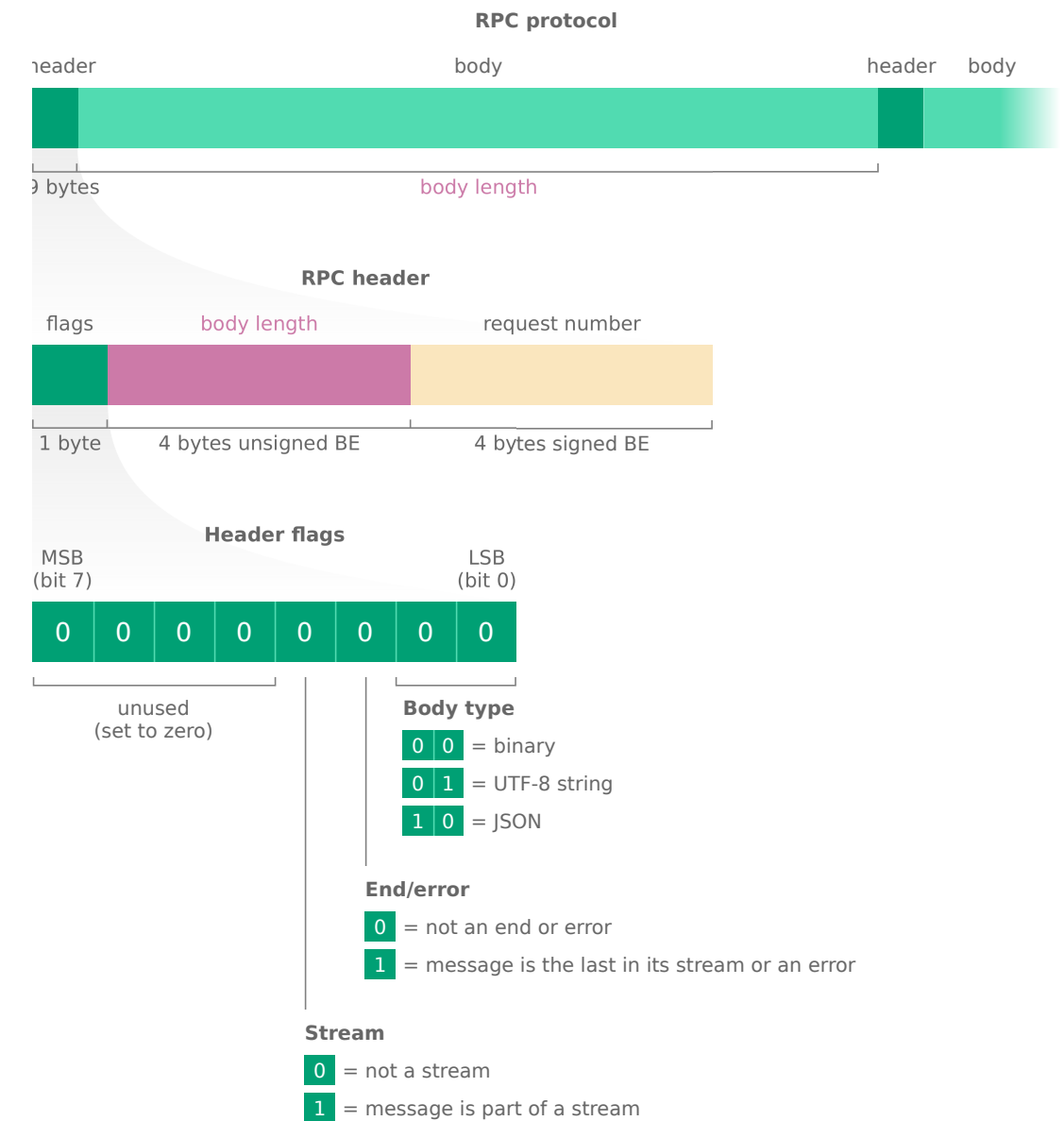
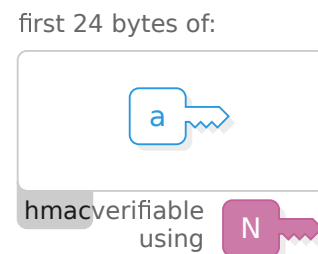
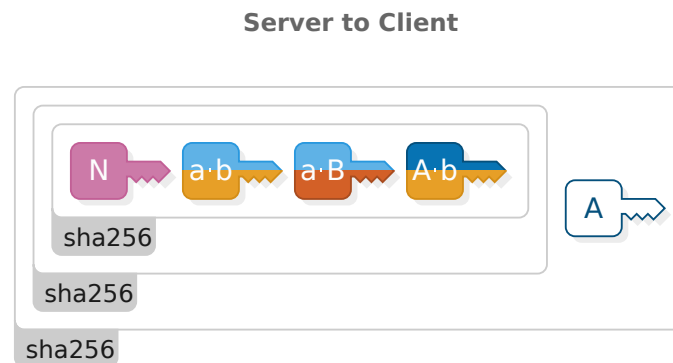
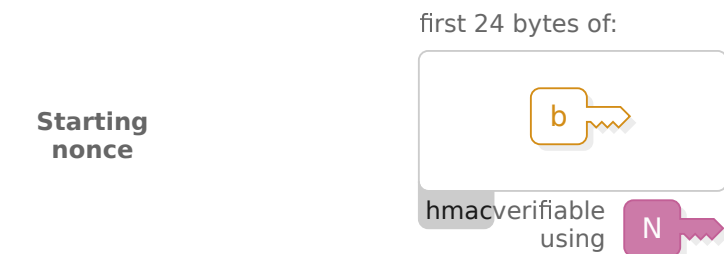
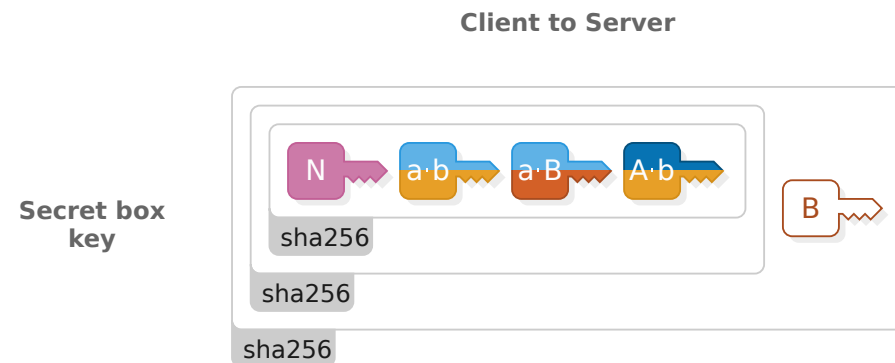
this could require fairly low monthly input from members but might be able to do some good down the line alleviating stressful financial situations. i don't know exactly what the right amount should be for a monthly payment, but something south of \$50 USD is what i had in mind and i'd propose using cryptocurrency since it might make experimentation a bit easier than a bank.

[#cryptocurrency](#) [#mutualaid](#)

# Protocol Guide

<https://ssbc.github.io/scuttlebutt-protocol-guide/>

%YkIPtiAe4VHc4YjeYJ1MPMsdxE2soNyQjzgj+4iXNo=.sha256



# Future

- Organizations
- Grants
- Planetary
- Deletion, partial replication

## Private groups

[@mixmix](#) %QxdVyQu8Cu3lD+DGQhiTUUr21DvtyFNkZV8oHunzd2w=.sha256 [#ssb-show-and-tell](#) 2020-02-29

### ssb-private2

this module isn't done, and is standing on a bunch of pull-requests which need merging, and specs which need finalising .. but tonight I just got a very sweet test passing.

Check out how easy this code is going to be:

```
server.private2.group.create('waynes world', (err, data) => {
  const { groupId } = data

  const content = {
    type: 'announce',
    text: 'summer has arrived in wellington!',
    recps: [groupId]
  }

  server.publish(content, (err, msg) => {
    server.get({ id: msg.key, private: true, meta: true }, (err, msg) => {
      console.log(msg.value.content)
      // {
      //   type: 'announce',
      //   text: 'summer has arrived in wellington!',
      //   recps: [
      '%mo4uFJ8z52wditPjmMNSuZeZZJFgM9EE09ZQZGCVixU=.cloaked' ]
      // }

      server.close()
    })
  })
})
```

## **Links and further resources**

**<https://scuttlebutt.nz/>**

<https://scuttlebot.io/>

<https://ssbc.github.io/scuttlebot/>

<https://modules.scuttlebutt.nz/>

<https://opencollective.com/secure-scuttlebutt-consortium/>

[https://en.wikipedia.org/wiki/Secure\\_Scuttlebutt](https://en.wikipedia.org/wiki/Secure_Scuttlebutt)

# Thanks

<https://ssb.celehner.com/lp2020.pdf>

%gtKiSW6Es1gXh/DphgmyMNXjVr9f7D/8Ro6wPyBxfSI=.sha256