



BRINGING DECENTRALIZATION TO YOUR DOORSTEP: 5 Years in Browsers

*Michelle (Mosh) Lee
IPFS Foundation
FOSDEM, February 2026, Brussels*

IPFS Project



- Started in 2015 with two simple, radical ideas:
Content addressing, all the way down, creates self-certifying data.
Decentralized networks shaped by users, not platforms.
- Today, a family of protocols to store, verify, and share data across distributed networks – the building blocks for a better web.

People use IPFS for 3 main reasons:

1.

Resilient Public Network

Peer-to-peer public network for all. 5+ billion files.

Resilient to censorship and outages.

Content discovery + routing

Data transfer

Data verification

Pinning + persistence

Browser support for ipfs:// + more

2.

Private/ Permissioned Data Sharing

Networks for collaborative archiving, large-scale scientific collaboration, local enterprise networks, & more.

Everything from public

+ roll-your-own gateways

ipfs-cluster

ipfsspec

& more

3.

Content Addressing

Building blocks for content addressing the whole damn internet. Small, fast, interoperable. BYO networking.

IPLD

Content-Addressed Archives (CAR)

DASL + RASL + MASL

CID Congress series

Interop w/ WARC, ZARR, etc.



IPFS Timeline 2015-2025

2015	go-ipfs alpha
2017	Turkish Wikipedia & Catalan referendum sites mirrored on IPFS
2018	Pinata launches
2019	IPFS Camp #1 (Barcelona)
2020	Filecoin network launch
2021	IPFS in Brave browser, NFT boom, Shoah Foundation verifiable archives
2022	IPFS Camp #2 (Lisbon)
2022	Taiwan's MODA site mirrored on IPFS
2023	Renames: go-ipfs → kubo, js-ipfs → helia, IPFS Thing #2 (Iceland)
2023	IPFS goes to space in p2p satellite comms
2023	Bluesky launches using IPLD
2024	helia/verified-fetch released
2024	Rise of the mini-libs: DASL, atcute, dag-cbrrr, rust_cid_npm
2025	Over 5 billion files on IPFS, 41 million Bluesky users of IPLD, ATProto

IPFS makes computing & the web...

More open

BUSINESS · TECHNOLOGY

Turkey Can't Block This Copy of Wikipedia

'The internet is the planet's most important technology'

By Brady Dale · 05/10/17 7:21am

Taiwan's Ministry of Digital Affairs (MODA) is in the process of integrating the InterPlanetary File System (IPFS), a piece of Web3 technology used for

EUREKA STREET

INTERNATIONAL

Inside Catalonia's cypherpunk referendum

06 October 2017



[Blogs](#) | [Information democracy](#) | [Freedom of expression online](#)

No justification for internet censorship during Catalan referendum

By EDRI · October 4, 2017

IPFS makes computing & the web...

More open

Taiwan's Ministry of Digital Affairs (MODA) is in the process of integrating the InterPlanetary File System (IPFS), a piece of

Filecoin Foundation Successfully Deploys InterPlanetary File System (IPFS) in Space

Jan 16, 2024

One small step
for IPFS...

Filecoin Foundation

LOCKHEED MARTIN

IPFS Camp

July 12th, 2024

Storacha x 3s Game Studio:
Decentralized storage
powering games via
Unreal plugin

GAMING & STREAMING

Alexander Kinzler, Adam Grodzki

copy of

less net work for networks

Iroh is a library for building on direct connections between devices, putting more control in the hands of your users.

START NOW

DOCUMENTATION

More efficient

IPFS makes computing & the web...

Maharashtra govt onboards blockchain tech for issuing COVID-19 test certificates

The Maharashtra government, not the onboarded startup, will own and control the data and

More open

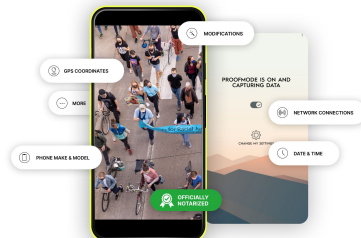
Not *IPFS*,
Not Your NFT.

TRULY OWN WHAT'S YOURS.

More credible

ProofMode Provides Verifiable Camera App - 2024 US Election

29 October 2024



At the 'Biodiversity Olympics,' scientists work to democratize rainforest tech



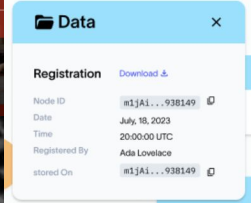
ABHISHYANT KIDANGOOR

29 AUG 2024 · AMAZON

Comments

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**Exposing the Truth:
How Numbers Protocol is
Revolutionizing War Crime
Investigations with
Starling Lab and Rolling Stone**



Join us in exploring new ways to protect journalism's most important documents for the future

By distributing how we host primary source materials, news archives and more, we can eliminate single points of failure

Written by Sanjin Ibrahimovic

Edited by Amanda Hickman and Samantha Sunne

We at DocumentCloud, with support from the [Filecoin Foundation](#) for the [Decentralized Web](#), are uploading documents for long-term preservation and distribution via the Filecoin network and the InterPlanetary File System (IPFS).

More efficient

IPFS makes computing & the web...

More open

More credible

Bluesky Signups Soar By 1 Million After X is Banned in Brazil

The decentralized alternative to X is flooded with new users and sees 15 times its normal traffic over the weekend.

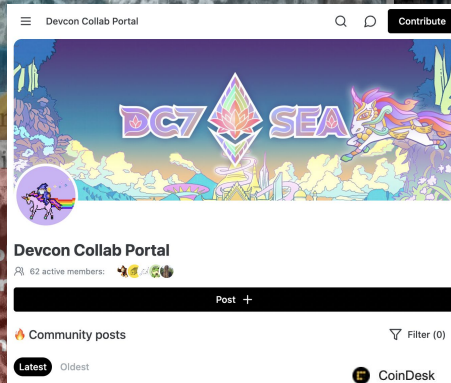
More efficient

More fun

Maharashtra govt onboards blockchain tech for issuing COVID-19 test certificates

The Maharashtra government let the onboarded startup, roll out and control the data and

Not *IPFS*,
Not Your NFT.



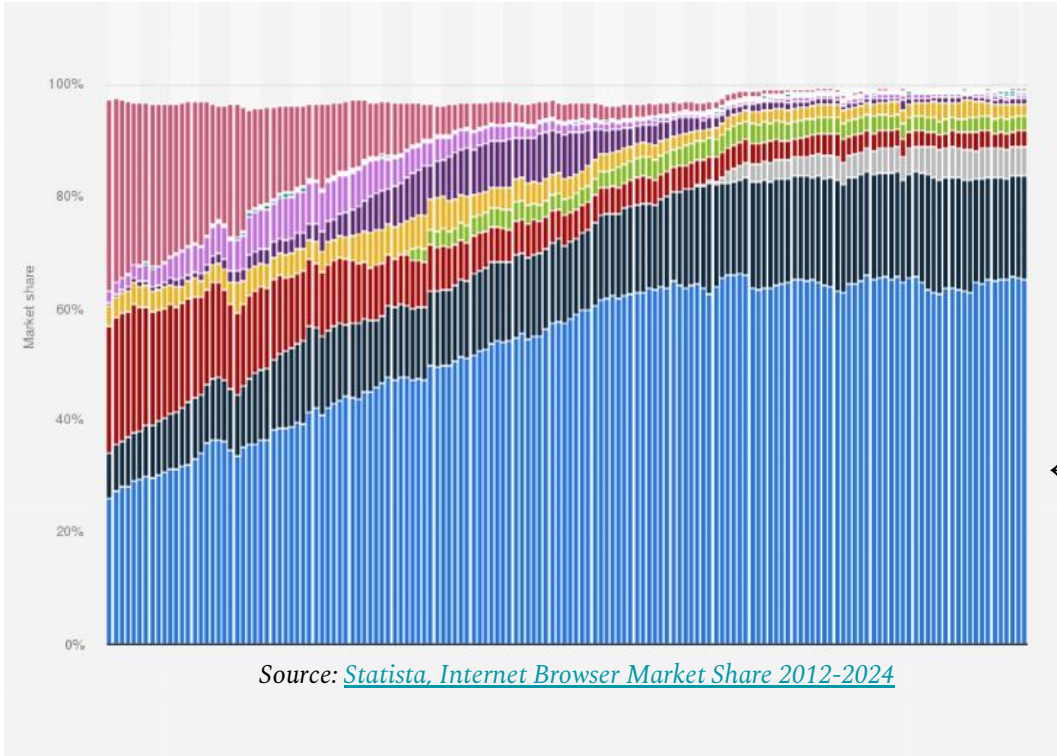
CoinDesk

Huddle01, Blockchain Video Conferencing Project T
Seeks to Outdoor Zoom, Targets \$37M Node Sale

Huddle01, a blockchain project to provide decentralized audio and video conferencing – aiming to provide lower latency virtual meetings than...

1 month ago

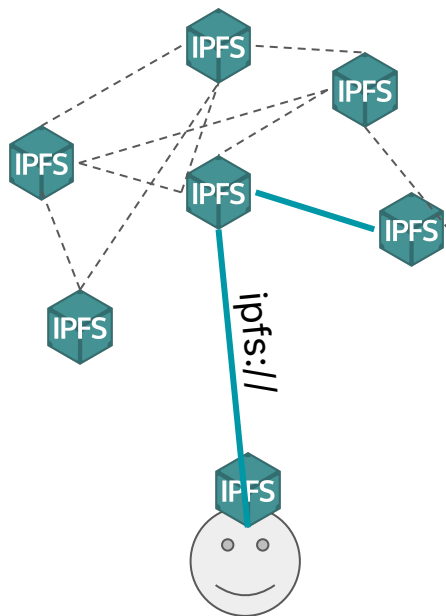
...through a consolidating browser landscape!



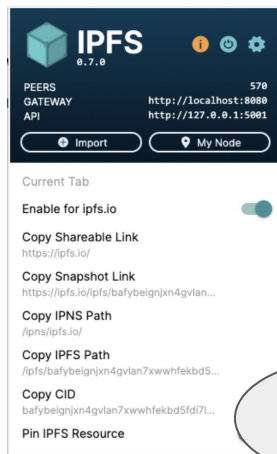
Source: [Statista, Internet Browser Market Share 2012-2024](#)

← GUESS WHO?

P2P: Theory Meets World



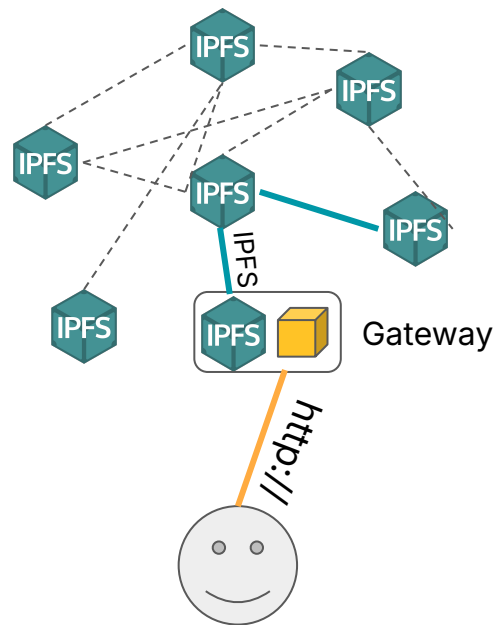
By design, your node talks to other nodes to find & fetch content by CID.



~\ (ツ) _/

je ne parle pas d'IPFS

In practice, most web users aren't running a node.
*50-100 apps installed, 7-10 daily use.
87% of Chrome extensions have <1,000 installs. IPFS Companion: 50,000.*



So in 2018 we introduced gateways (computers that speak both HTTP and IPFS).

P2P: Theory Meets World

`ipfs://cid`

The ideal way. Most browsers don't support this yet.

`https://ipfs.io/cid`

Most users don't have IPFS clients installed, so webapp devs hardcode gateway URLs.

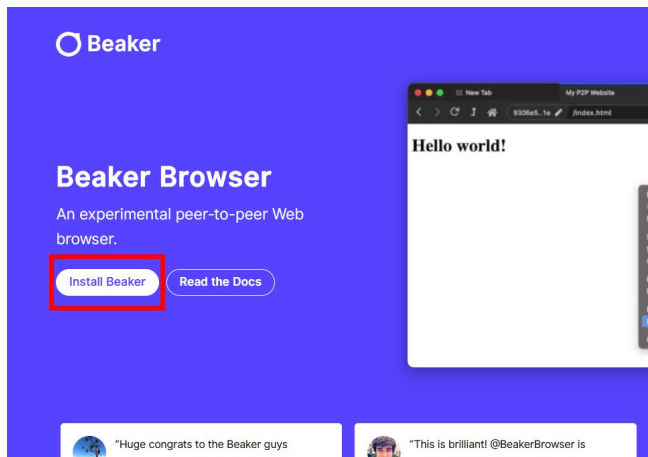
Re-centralization: 2 billion files at peak, 1-4 gateways.

```
{
  imageCID: CID(QmbF8cCCC478X8ux1e4TLTH8jtGZkyWmGT6BpYMuP8HtGUR),
  metadataCID: CID(QmV7P6QdN3geyyNxGQ5MYpa8sc7arA8kigiK5pV27xJNUx),
  mintedNFTId: '1',
  metadataURI: 'ipfs://QmV7P6QdN3geyyNxGQ5MYpa8sc7arA8kigiK5pV27xJNUx',
  metadataJSON: {
    name: 'Screenshots',
    description: 'Medium & Twitter Screenshots',
    image: 'QmbF8cCCC478X8ux1e4TLTH8jtGZkyWmGT6BpYMuP8HtGUR'
  }
},
```

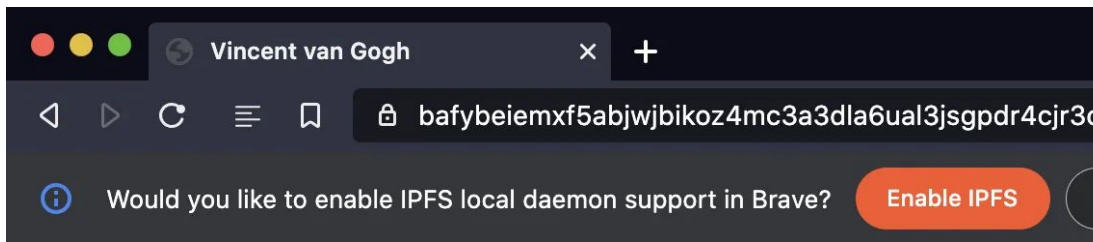
```
22 ipfs.files.add(files, function(err, files) {
23   // 'files' will be an array of objects containing pat
24   if (err) {
25     console.log(err);
26     log(err);
27   } else {
28     console.log(files);
29     document.getElementById('output').innerHTML = "<b>" +
30     <a target='new' href='https://ipfs.io/ipfs/' + files[0].cid + "#9
31     " + "<a target='new' href='http://ipfs.coinmarketrank
32   }
33 }
```

Ok, so let's make browsers more P2P.

Approach 1: New browsers that embrace Web3



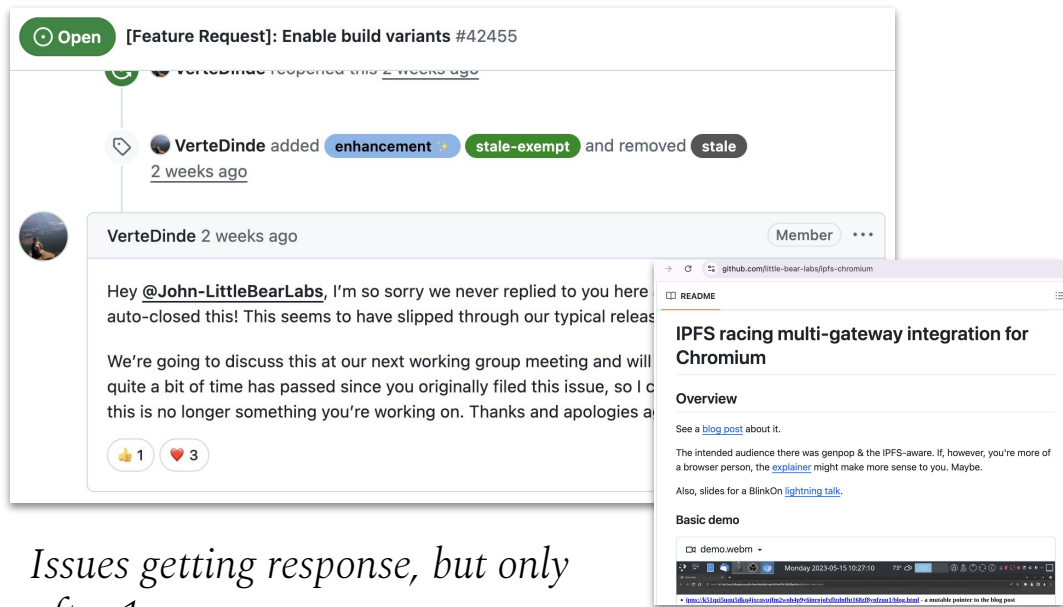
Beaker (dat://)



Brave (ipfs://)

...but it's hard to get people to switch browsers.

Approach 2: Add ipfs:// to popular browsers



The image shows a GitHub issue titled "[Feature Request]: Enable build variants #42455" and a Chromium README titled "IPFS racing multi-gateway integration for Chromium".

GitHub Issue:

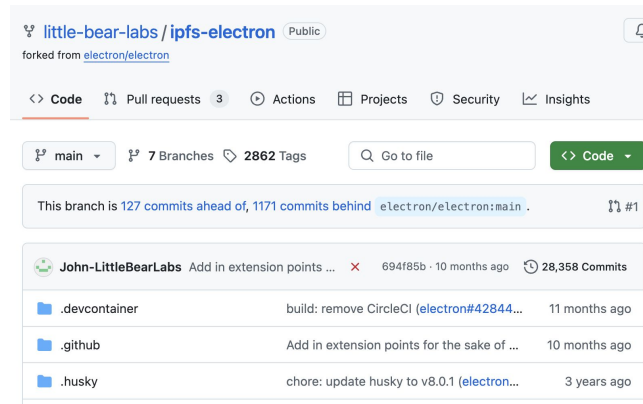
- Issue title: [Feature Request]: Enable build variants #42455
- Labels: enhancement, stale-exempt, removed stale
- Comment by VerteDinde (2 weeks ago):
Hey @John-LittleBearLabs, I'm so sorry we never replied to you here auto-closed this! This seems to have slipped through our typical release cycle. We're going to discuss this at our next working group meeting and will quite a bit of time has passed since you originally filed this issue, so I think this is no longer something you're working on. Thanks and apologies ahead.

Chromium README:

- Title: IPFS racing multi-gateway integration for Chromium
- Overview: See a [blog post](#) about it. The intended audience there was genpop & the IPFS-aware. If, however, you're more of a browser person, the [explainer](#) might make more sense to you. Maybe. Also, slides for a BlinkOn [lightning talk](#).
- Basic demo: demo.webm

Issues getting response, but only after 1 year

Chromium fork



The image shows the GitHub repository for `little-bear-labs/ipfs-electron`.

- Repository: `little-bear-labs/ipfs-electron` (Public)
- forked from `electron/electron`
- Code: 7 Branches, 2862 Tags
- This branch is 127 commits ahead of, 1171 commits behind `electron/electron:main`
- Commits:


Commit	Message	Time
<code>.devcontainer</code>	build: remove CircleCI (electron#42844...)	11 months ago
<code>.github</code>	Add in extension points for the sake of ...	10 months ago
<code>.husky</code>	chore: update husky to v8.0.1 (electron...)	3 years ago

Electron fork (ipfs://)

...but browsers are (rightly) cautious and progress is slow.

Approach 2: Some successes, but slow.

Intent to Ship: Ed25519 in Web Cryptography 1,122 views

 **Javier Fernandez**
to blink-dev

Contact emails
jfern...@igalia.com


Explainer
<https://github.com/WICG/webcrypto-secure-curves/blob/main/explainer.md>

Specification
<https://w3c.github.io/webcrypto/#ed25519>

Design docs



2022: Pre-defined custom protocol handlers in Chromium

 *Summer 2025: Ed25519 shipped in Chrome!*

...we need another path in parallel.

Approach 2: Want to help?

Browsers & Standards Work 2026: Call for Community Input

■ Ecosystem and Usage



mosh

Dec 2025

Dec 2025

1 / 6

Dec 2025

TL;DR: IPFS is planning the next phase of work to make browsers better for the decentralized web – not just IPFS, but any protocol that needs lightweight crypto, peer-to-peer connections, or native browser integration. We need your input on what features matters most.

Background: What We've Accomplished

Over the past 5 years, sustained collaboration with [Igalia](#) ⁵ has delivered real improvements to all major browsers:

- **Ed25519 in WebCrypto API** - [Shipped in Chrome 137](#) ¹ (May 2025), now available in 79% of browsers. This eliminates the need to bundle crypto libraries for signature verification, reducing bundle sizes significantly for projects using content-addressing, decentralized identity, or verifiable credentials.

23d

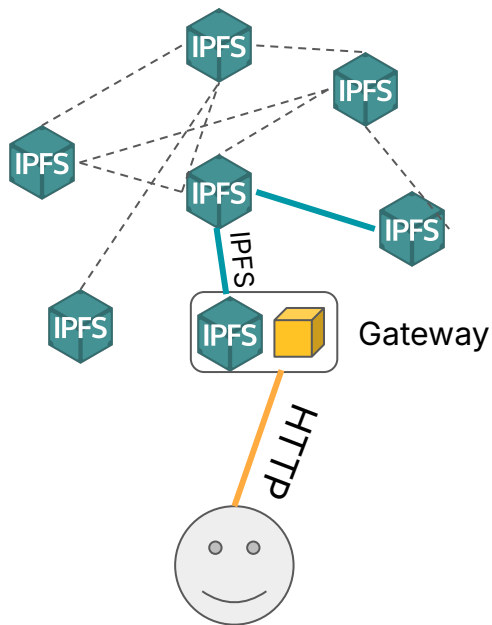
Do you like streaming hashing in WebCryptoAPI? BLAKE3?

Want to webkit to fix localhost bugs? Remote attested TLS?

Share your needs and use cases in the discuss.ipfs.tech forum thread.

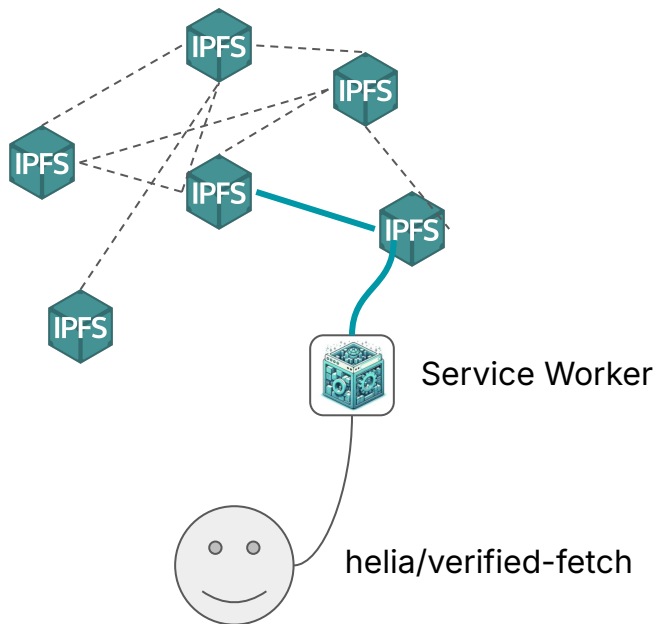
Approach 3: New use of old browser capabilities

Service Workers – a scriptable network proxy in a web browser that manages network requests



Approach 3: New use of old browser capabilities

Service Workers – a scriptable network proxy in a web browser that manages network requests



IPFS Drop-in Service Worker Example

Replace centralized IPFS gateways with resilient and verified retrieval gateways or providers with [@helia/verified-fetch](#) in a drop-in Service Worker.

This example shows how to use a Service Worker to intercept requests to centralized IPFS gateways and retrieve content directly from providers (or self-hosted gateways) with [@helia/verified-fetch](#).

For more information, check out the [deep dive video on YouTube](#).

The **helia/verified-fetch** library within a Service Worker facilitates direct verified retrieval of content-addressed data.

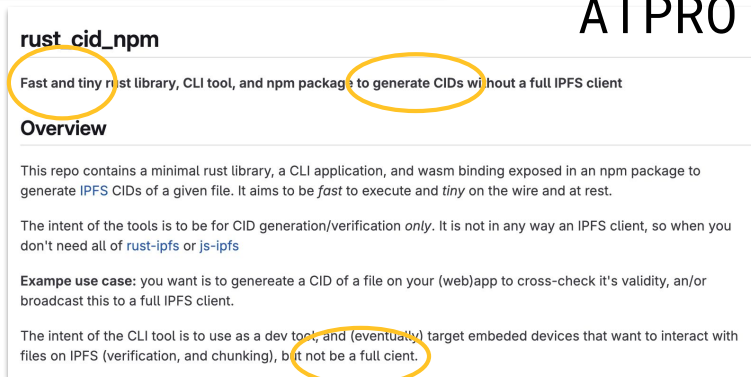
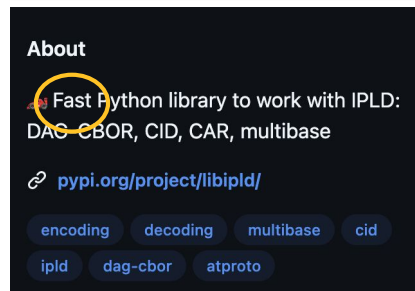
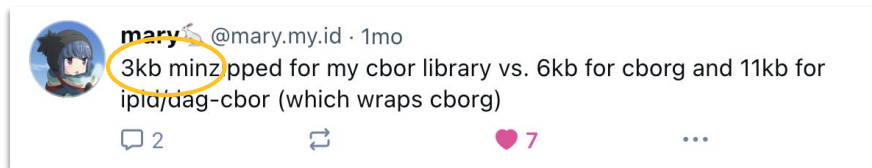
Approach 3: The Post-Gateway Future



- (Now) App devs can add drop-in service workers. Possibilities abound!
- (Soon) ipfs.io gateway experiments to add service workers that push more traffic to true p2p. Progress, monitoring, and metrics published.
- (Late 2026) Expect some rate limiting on gateways.
- Spread the load so the public network can be a true p2p commons.

Approach 4: Don't, Actually

Servers are acceptable if your data is content-addressed + you decentralize who controls the servers.



← COMMUNITY-DRIVEN
MINI LIBS for CIDs &
CBOR, MANY FROM
ATPROTO DEVS



Approach 4: Don't, Actually

Servers are acceptable if your data is content-addressed + you decentralize who controls the servers.


[DASL — Data-Addressed Structures & Links](#) [WHAT](#) [HOW](#) [CODE](#) [SPECS](#)

WHAT IS THIS?

DASL ("dazzle") is a small set of simple, standard primitives for working with content-addressed, linked data. It builds on content addressing, a proven approach used in Git and [IPFS](#) to create reliable content identifiers (known as CIDs) through cryptographic hashing. Content addressing enables robust data integrity checks and efficient networking: systems can verify they received exactly what they asked for and avoid downloading the same content twice. The linked data part lets you link to stuff by its hash. You can build very big graphs with these primitives, such as the graph behind Bluesky.

We call DASL "data-addressed" because it supports a data serialization component that makes [content-addressing](#) sweet and easy when working with subcomponents of the [IPFS](#) universe, but simplified to lower costs, and work well with the web. More specifically, our primitives

- **pave the cowpaths:** we focus on supporting what people actually use. This takes over any consideration of theoretical purity. We're retconning the spec to what people should be.
- **extensibility vs optionality:** extensibility is important for



← YOU MADE US WRITE A
LIGHTER-WEIGHT IPFS
FAMILY SPEC CALLED
✨ DASL ✨

ROBIN @ 3:15p
DECENTRALIZED COMM
DEVROOM

THE HILLS ARE ALIVE

**WITH A DECENTRALIZED DATA OWNERSHIP AND ARCHITECTURE
STRATEGY DRIVEN BY THE TREATMENT OF DATA AS A PRODUCT
AND FEDERATED GOVERNANCE WITHIN A SELF-SERVE INFRASTRUCTURE**



Acknowledgements

All 4,000+ IPFS contributors

Dietrich Ayala

Lidel

Javier Fernandez

John Turpish

Web Transitions

Igalia

IPFS Foundation

Little Bear Labs

Shipyard

Protocol Labs

Chromium, Gecko, Webkit

Juan Benet

...and more.

Contact

Email: mosh@ipfs.io

Bluesky: [@mosh.bsky.social](https://bsky.social/profile/mosh.bsky.social)