

0.40/foo/bar/baz.png

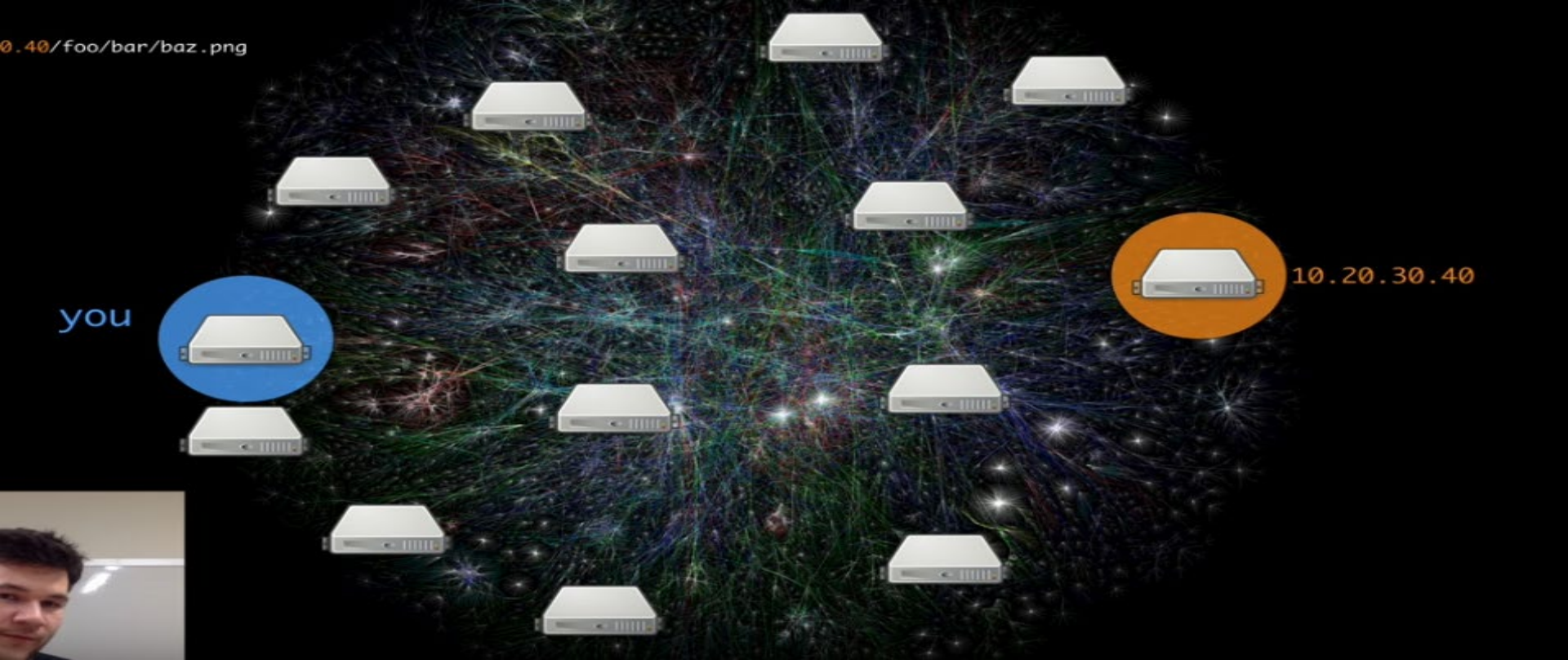


Image Source: <https://www.youtube.com/watch?v=skMTdSEaCtA>

# From Repository to the Distributed Web

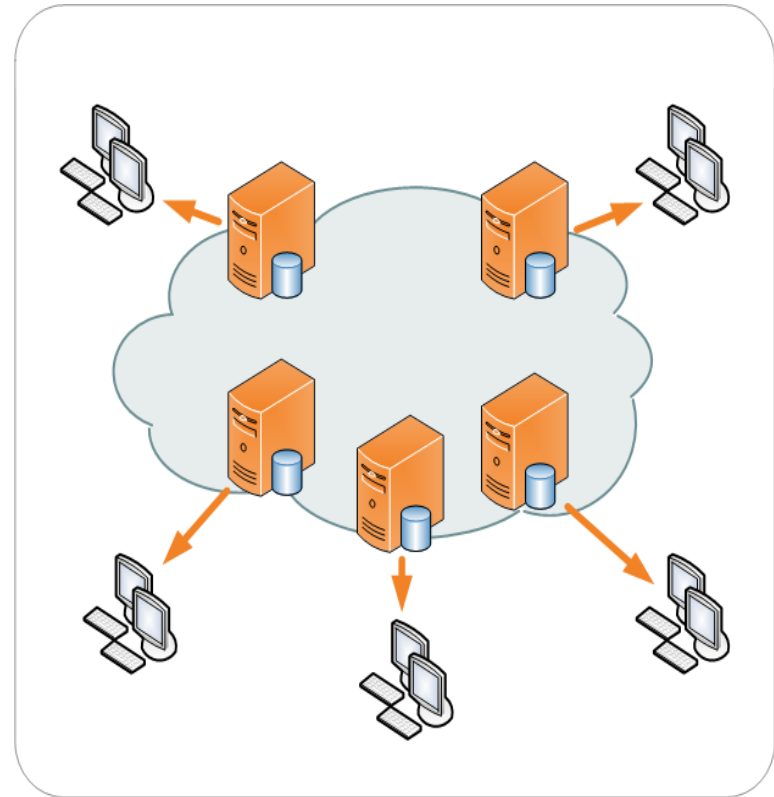
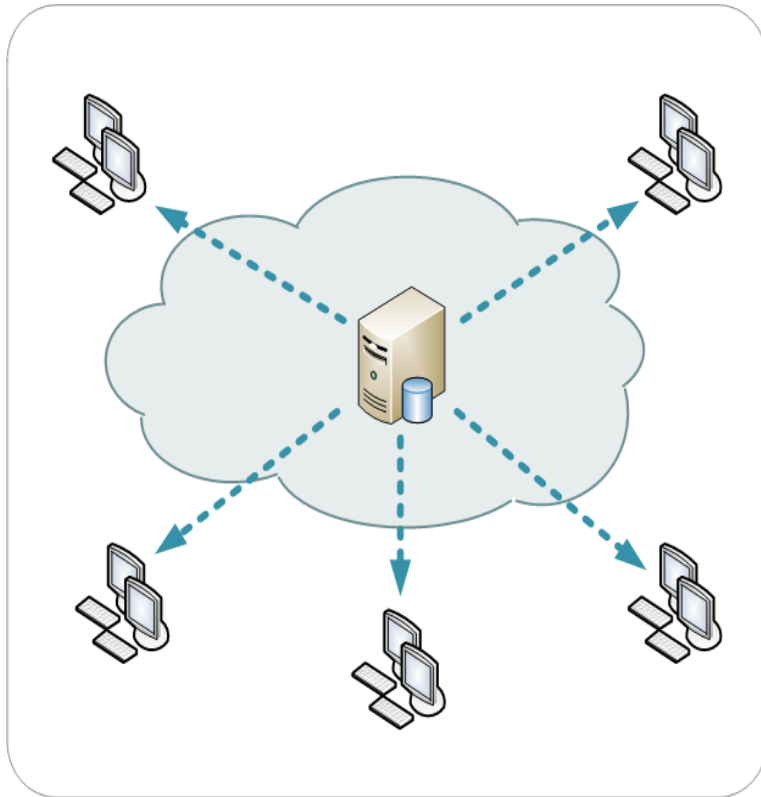
Stephen Downes

November 20, 2018

E-Learning 3.0

# Content Delivery Network (CDN)

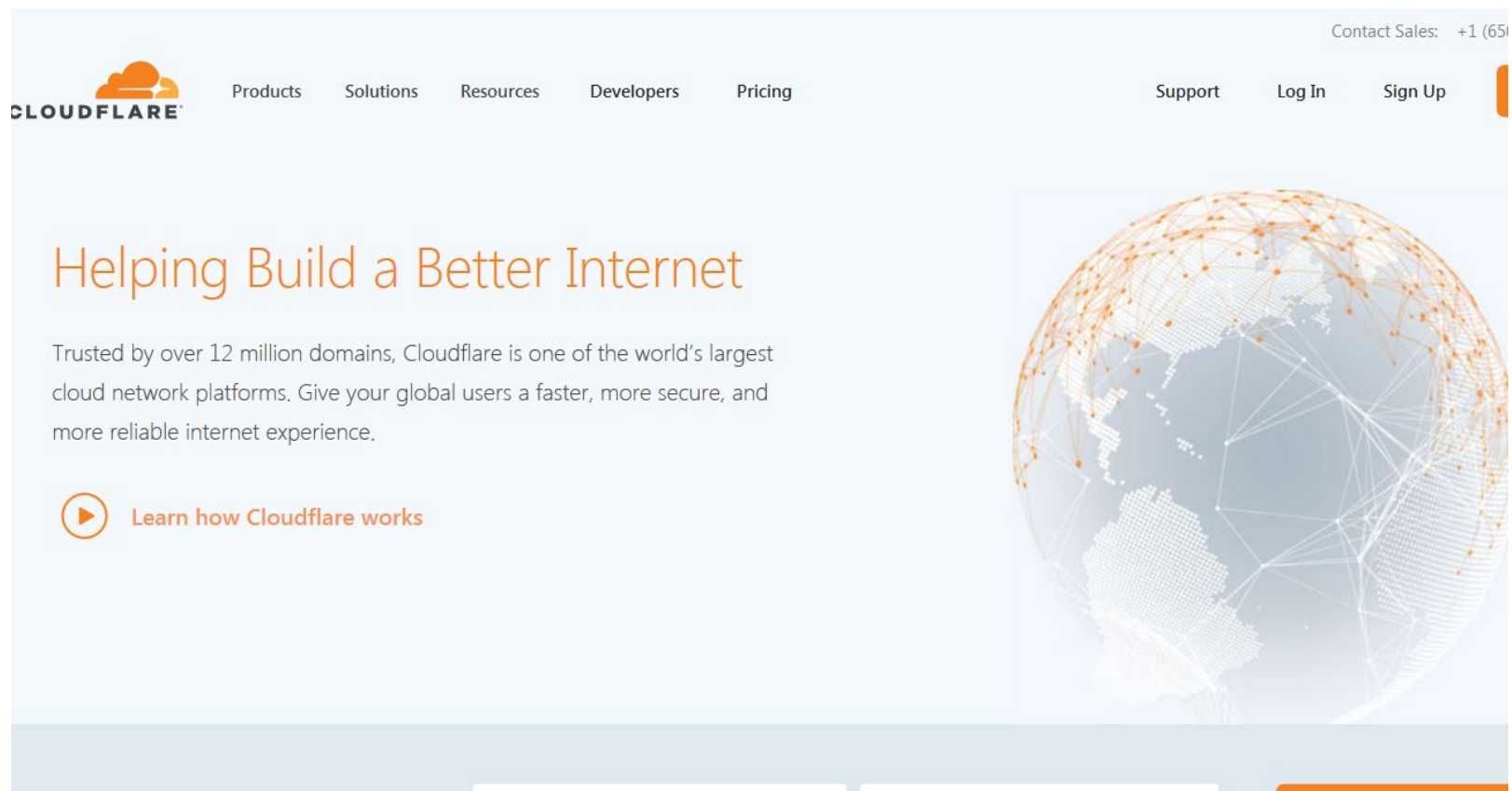
[https://en.wikipedia.org/wiki/Content\\_delivery\\_network](https://en.wikipedia.org/wiki/Content_delivery_network)



A content delivery network or content distribution network (CDN) is a geographically distributed network of proxy servers and their data centers. The goal is to distribute service spatially relative to end-users to provide high availability and high performance.

# Cloudflare

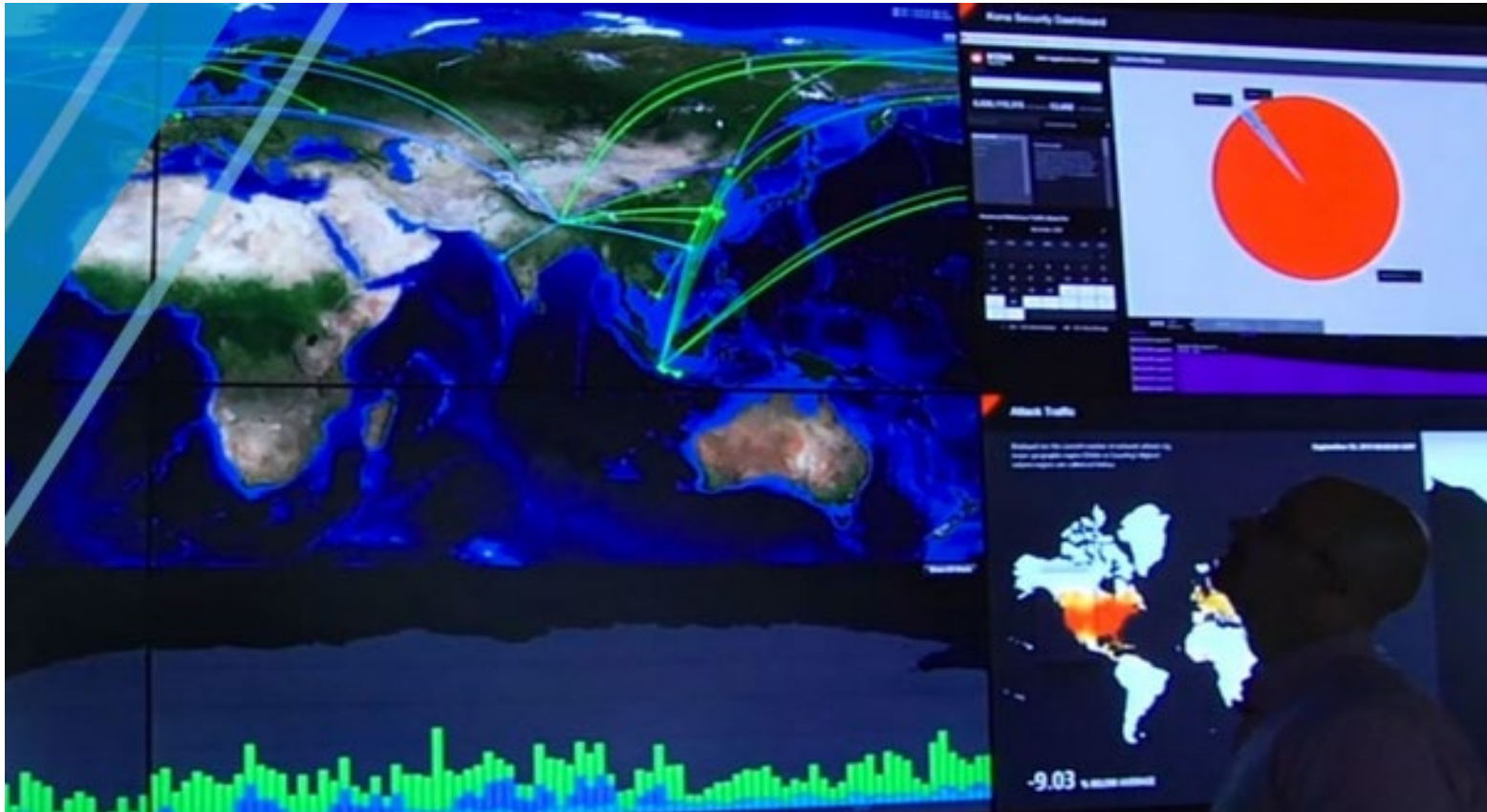
<https://www.cloudflare.com/>

A screenshot of the Cloudflare homepage. The top navigation bar includes the Cloudflare logo on the left, followed by links for Products, Solutions, Resources, Developers, and Pricing. On the right side of the navigation bar, there are links for Support, Log In, and Sign Up, along with a contact number: Contact Sales: +1 (650) 321-7973. The main content area features the headline "Helping Build a Better Internet" in a large, orange font. Below the headline is a paragraph of text: "Trusted by over 12 million domains, Cloudflare is one of the world's largest cloud network platforms. Give your global users a faster, more secure, and more reliable internet experience." To the right of this text is a large, stylized graphic of a globe with a network of orange lines and dots representing connections. At the bottom left of the main content area, there is a play button icon followed by the text "Learn how Cloudflare works".

“Caching content on Cloudflare's network reduces the number of requests to an origin by serving static content from a Cloudflare data center, lowering bandwidth consumption from the origin.”

# Akamai

<https://www.akamai.com/us/en/cdn/>



“Content Delivery Networks, also known as CDNs, carry nearly half of the world’s Internet traffic. They are ubiquitous by their presence and mitigate the challenges of delivering content over the Internet.”

# Peer-to-Peer CDNs

<https://en.wikipedia.org/wiki/Peer-to-peer>

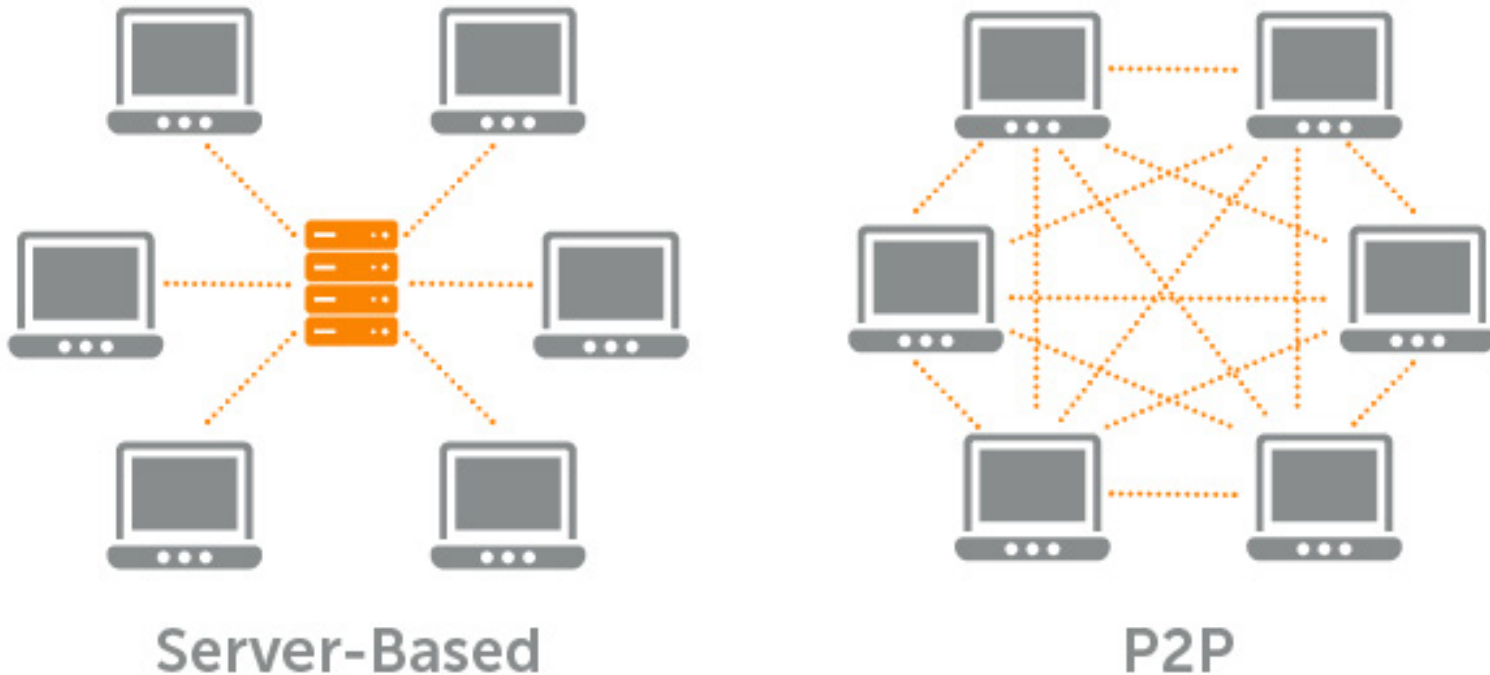


Image: <https://www.wowza.com/blog/six-benefits-of-p2p-unicast-streaming>

“Peers make a portion of their resources, such as processing power, disk storage or network bandwidth, directly available to other network participants, without the need for central coordination by servers or stable hosts. Peers are both suppliers and consumers of resources”

# BitTorrent / uTorrent

<https://lifehacker.com/285489/a-beginners-guide-to-bittorrent>

μTorrent (Ad-Free) 3.5.3 (build 44358) [32-bit]

File Options Help

Now  
Upgrade to Pro  
Torrents (1)  
Labels  
Feeds (0)  
Devices (0)

#	Name	Playback	Size	Status	Down Speed	Up Speed	ETA	Seeds/Peers
	bbb_sunflower_1080p_60fps_normal.mp4	Play Now	339 MB	[F] Seeding			∞	0.243

Files Info Peers Trackers Speed

Downloaded: 100.0 %  
Availability: 1.000

**Transfer**

Time Elapsed:	5m 50s	Remaining:	∞	Wasted:	190 MB (0 hashfails)
Downloaded:	339 MB	Uploaded:	0 B	Seeds:	0 of 9 connected (0 in swarm)
Download Speed:	0.0 kB/s (avg. 2.1 MB/s)	Upload Speed:	0.0 kB/s (avg. 0 B/s)	Peers:	0 of 37 connected (0 in swarm)
Down Limit:	∞	Up Limit:	∞	Share Ratio:	0.000
Status:	[F] Seeding				

**General**

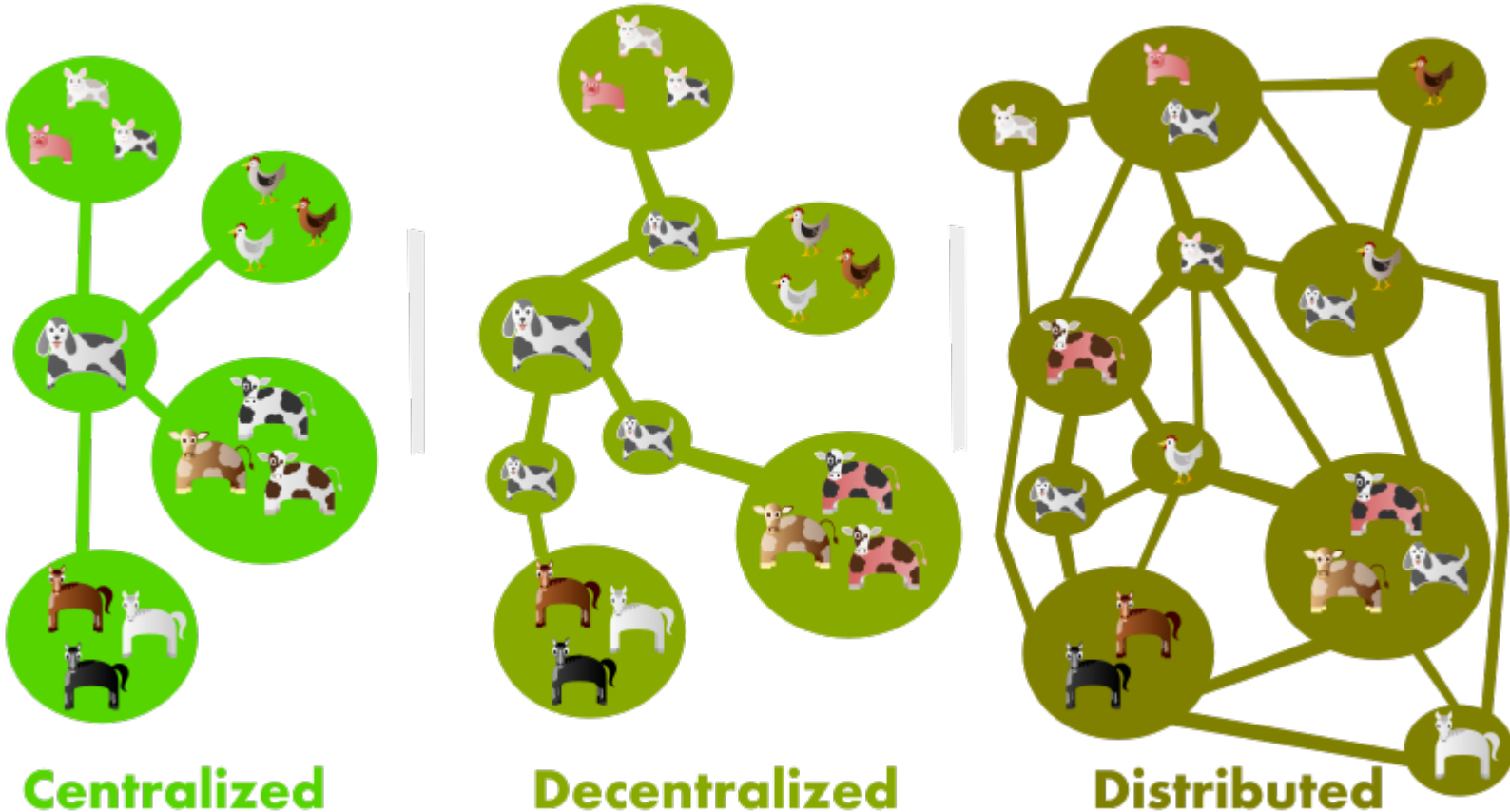
Save As:	C:\Users\XercesBlue\Downloads\bbb_sunflower_1080p_60fps_normal.mp4	Pieces:	679 x 512 kB (have 679)
Total Size:	339 MB (339 MB done)	Created By:	uTorrent/3320
Created On:	12/17/2013 11:22:39 AM		

DHT: 335 nodes (Login) D: 2.4 kB/s T: 79.5 kB U: 0.7 kB/s T: 18.7 kB

“Peers make a portion of their resources, such as processing power, disk storage or network bandwidth, directly available to other network participants, without the need for central coordination by servers or stable hosts. Peers are both suppliers and consumers of resources” Eg. <https://www.utorrent.com>

# Dweb Project

<https://hacks.mozilla.org/2018/07/introducing-the-d-web/>



A few examples of decentralized or distributed projects that became household names are Napster, BitTorrent and Bitcoin. Some of these new dweb projects are decentralizing identity and social networking... and others are distributed application protocols or platforms

# Beaker Browser

<https://beakerbrowser.com/>

**Beaker**

Explore About Documentation [Install Beaker](#)

## A browser for the next-generation Web

Beaker is an experimental browser for exploring and building the peer-to-peer Web.

[Install Beaker](#) [Take a tour](#)

PIXEL-EYEZ READ-ONLY [Make an editable copy](#)

Files Network About [dat://4bcecf\\_f6](#)

. / 60.47 kB		
fonts	Apr 23, 2018, 2:55pm	--
images	Apr 23, 2018, 2:55pm	--
.datignore	May 8, 2018, 12:58pm	10 B
dat-links.js	Apr 23, 2018, 2:52pm	138 B
dat.json	Jul 6, 2018, 4:10pm	111 B
index.html	Apr 23, 2018, 3:04pm	4.47 kB

Props to @pfraze and @taravanci who are building the future of the Web! Go download @BeakerBrowser and see for yourself 🙌👍👍

"The new @BeakerBrowser dev experience is good. Really good."

"wow it is SO fun to get stuff up SO FAST on the p2p web using @BeakerBrowser"

"Creating my first WebApp in @BeakerBrowser and it's so much fun! Finally feel like I am starting to understand javascript..."

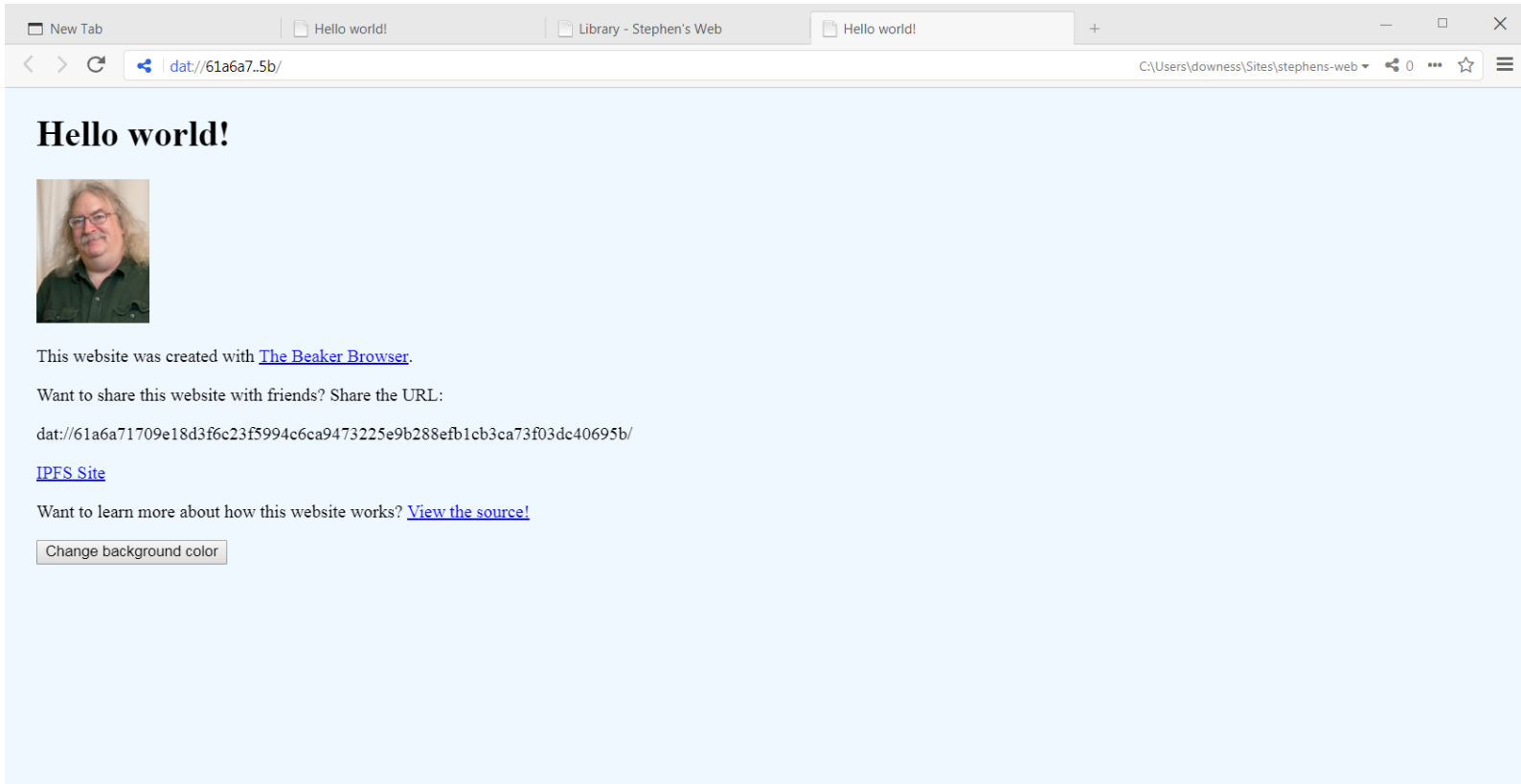
[Show more](#)

A browser for the next-generation web, Beaker is an experimental browser for exploring and building the peer-to-peer Web.



# Beaker Browser

<https://beakerbrowser.com/>

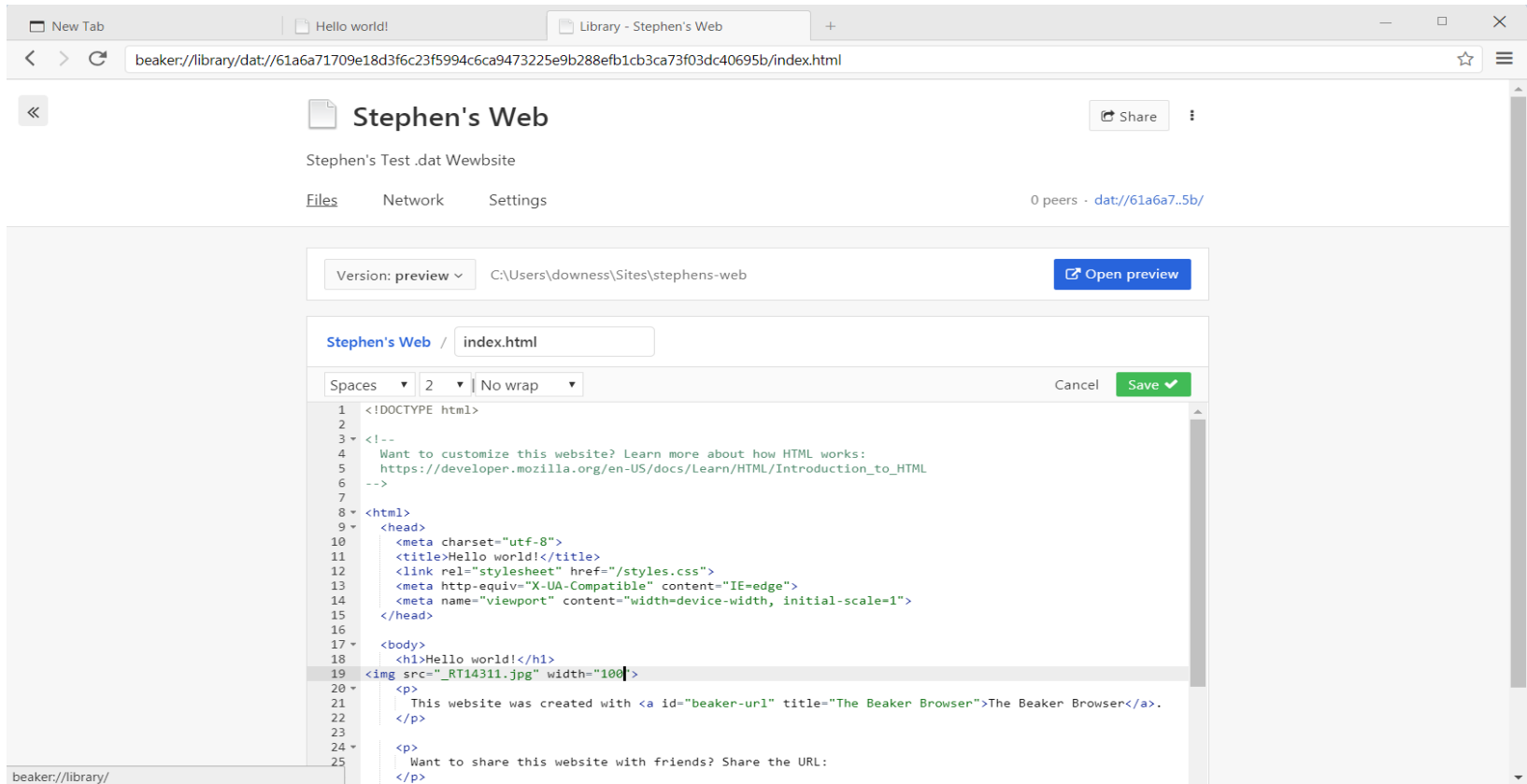


A browser for the next-generation web, Beaker is an experimental browser for exploring and building the peer-to-peer Web.

- View a page: <dat://61a6a71709e18d3f6c23f5994c6ca9473225e9b288efb1cb3ca73f03dc40695b/>

# Beaker Browser

<https://beakerbrowser.com/>



A browser for the next-generation web, Beaker is an experimental browser for exploring and building the peer-to-peer Web.

- Editing page

# Hashbase

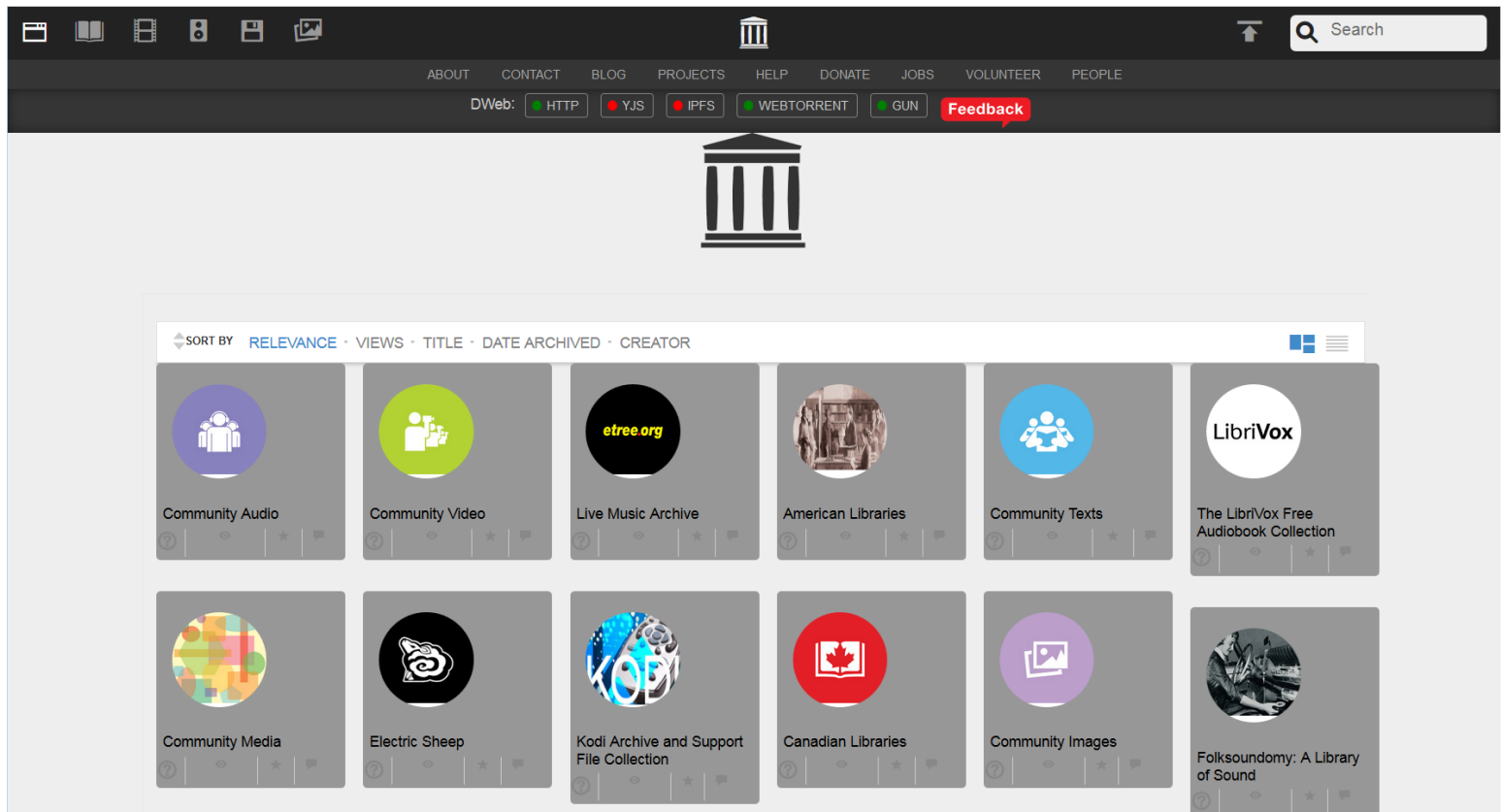
<https://hashbase.io/>

The screenshot shows the Hashbase website homepage. At the top left is the text "#\_hashbase". At the top right are links for "About", "Login", and a blue "Sign up" button. The main heading is "Hosting for the peer-to-peer Web." followed by the subtext "Keep your files online, even when your computer is turned off." Below this is a form with a text input labeled "Your email" and a blue "Sign up for free" button. A link for "Learn more" is positioned below the form. To the right of the form is a video player with a large blue play button and the text "Watch the demo". The background features a light blue circuit board pattern. At the bottom, there is a "Featured apps" section with three items: "PasteDat" (with a red icon and description "Share snippets of text, code, and markdown"), "RSS" (with a green icon and description "RSS reader for peer-to-peer websites and blogs"), and "Photos" (with a blue icon and description "Manage photo albums and share photos privately").

Publishing with Dat means that peers will contribute bandwidth, but only if they're online and sharing your files. If nobody's hosting your files, then they won't be accessible. That's where Hashbase comes in. We act as a "super peer" that makes sure your content is always available.

# Dweb version of Internet Archive

<https://dweb.me/arc/archive.org/details?>

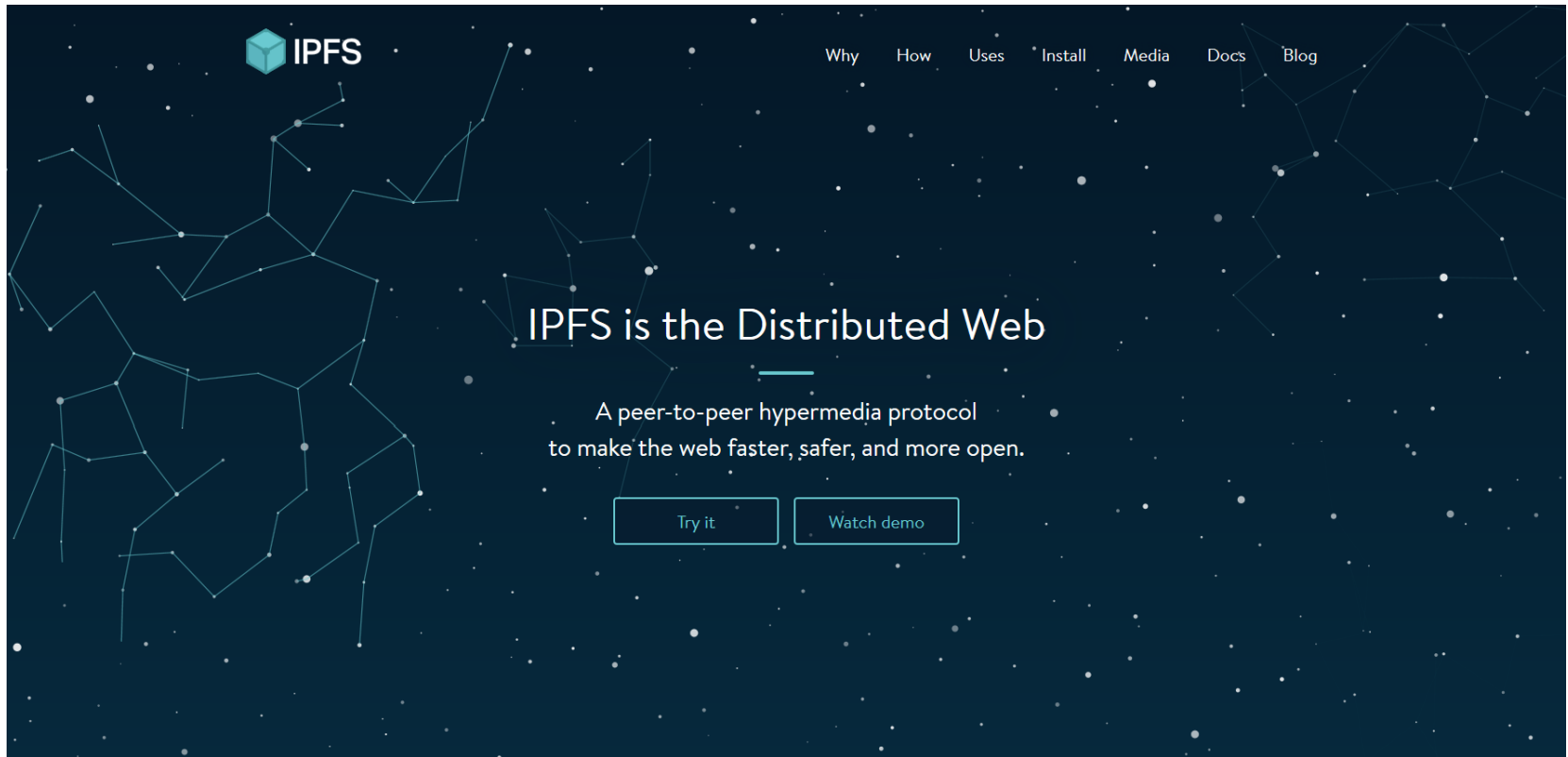


“Archive.org is testing a decentralized version, or DWeb version, of their web site that allows their content to be delivered over peer-to-peer connections with different hosts sharing portions of or the same content.”

<https://www.bleepingcomputer.com/news/technology/archiveorg-has-created-a-decentralized-or-dweb-version-of-their-site/>

# Inter Planetary File System (IPFS)

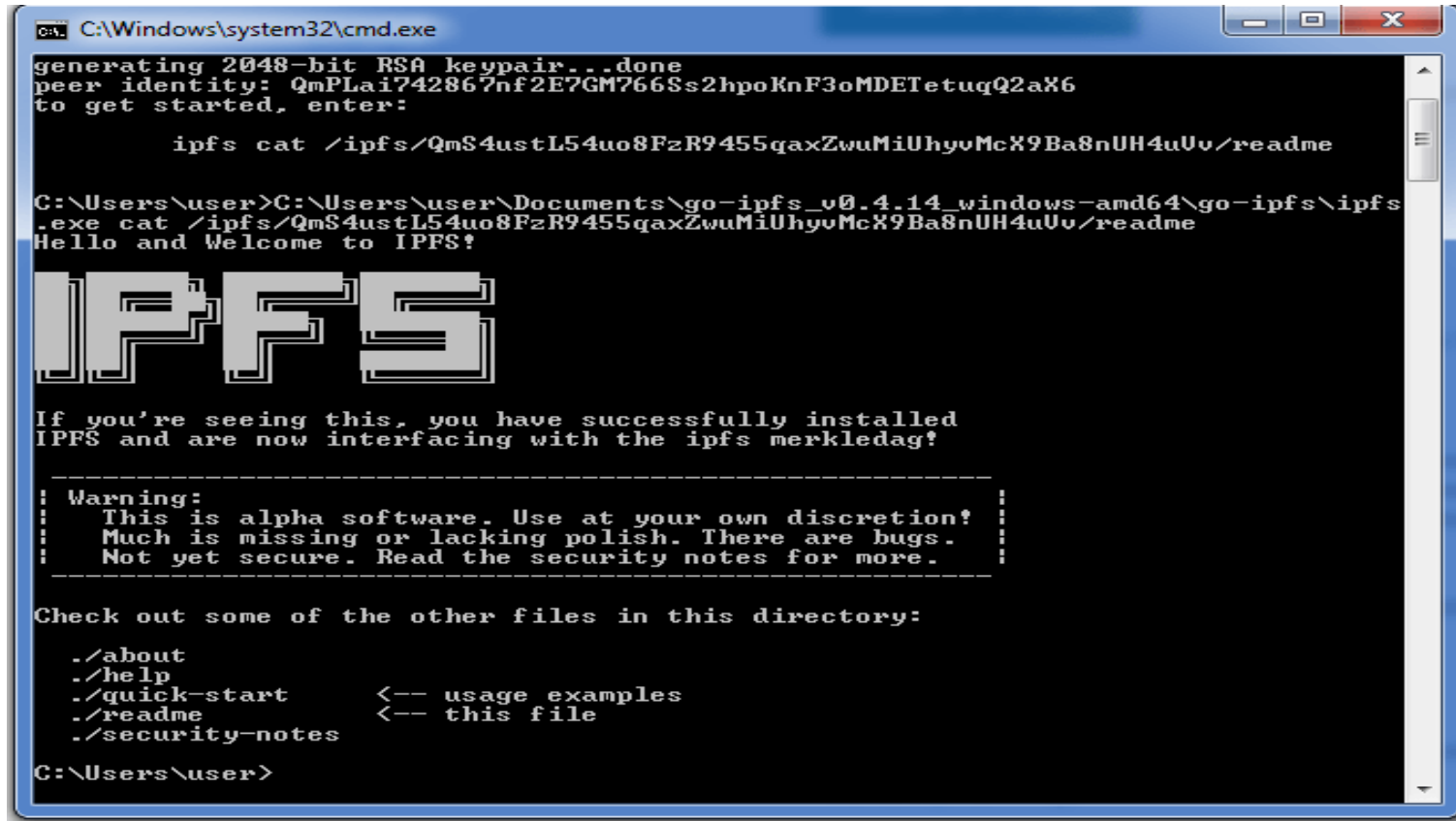
<https://ipfs.io/>



Each file and all of the blocks within it are given a unique fingerprint called a cryptographic hash. When looking up files, you're asking the network to find nodes storing the content behind a unique hash.

# Installing IPFS

<https://blockchainmind.com/installation-procedure-of-ipfs-on-windows-platform/>



```
C:\Windows\system32\cmd.exe
generating 2048-bit RSA keypair...done
peer identity: QmPLai742867nf2E7GM766Ss2hpoKnF3oMDEtetuqQ2aX6
to get started, enter:

    ipfs cat /ipfs/QmS4ustL54uo8FzR9455qaxZwuMiUhyvMcX9Ba8nUH4uUv/readme

C:\Users\user>C:\Users\user\Documents\go-ipfs_v0.4.14_windows-amd64\go-ipfs\ipfs
.exe cat /ipfs/QmS4ustL54uo8FzR9455qaxZwuMiUhyvMcX9Ba8nUH4uUv/readme
Hello and Welcome to IPFS!

IPFS

If you're seeing this, you have successfully installed
IPFS and are now interfacing with the ipfs merkledag!

-----
Warning:
This is alpha software. Use at your own discretion!
Much is missing or lacking polish. There are bugs.
Not yet secure. Read the security notes for more.
-----

Check out some of the other files in this directory:

./about
./help
./quick-start    <-- usage examples
./readme        <-- this file
./security-notes

C:\Users\user>
```

IPFS is an application that runs on your computer. Installing it involves creating a 'node' on the IPFS network, identified by a public key, and running an IPFS daemon, which will share your files (and other people's files) with the IPFS network. Cf <https://www.youtube.com/watch?v=4O053XvP3fs>

# IPFS Companion

<https://github.com/ipfs-shipyard/ipfs-companion>

IPFS

Qm-Hash Explore

## Explore the Merkle Forest

Paste a CID into the box to fetch the IPLD node it addresses, or choose a featured dataset.

- PB** Project Apollo Archives  
`QmSnuUmxptJZdL3pKRarx8MS2Ju2oANVrgrbr2xWb1e9b2D`
- GIT** IGIS git repo  
`z8mWaJHX1eAVxxLagBpdaNfEBKvNm1E`
- ETH** An Ethereum Block  
`z43AaGEvwdfzjrCZ35q7DKxdDhrwoaPQDtqF4jfdkNEVT1qGVFW`
- PB** XKCD  
`QmdmQXB2mzChmMeKY47C43LxUdg1NDJ5MwKMKxDu7RgQm`

**IPLD**

IPLD is the **data model of the content-addressable web**. It allows us to treat all hash-linked data structures as subsets of a unified information space, unifying all data models that link data with hashes as instances of IPLD.

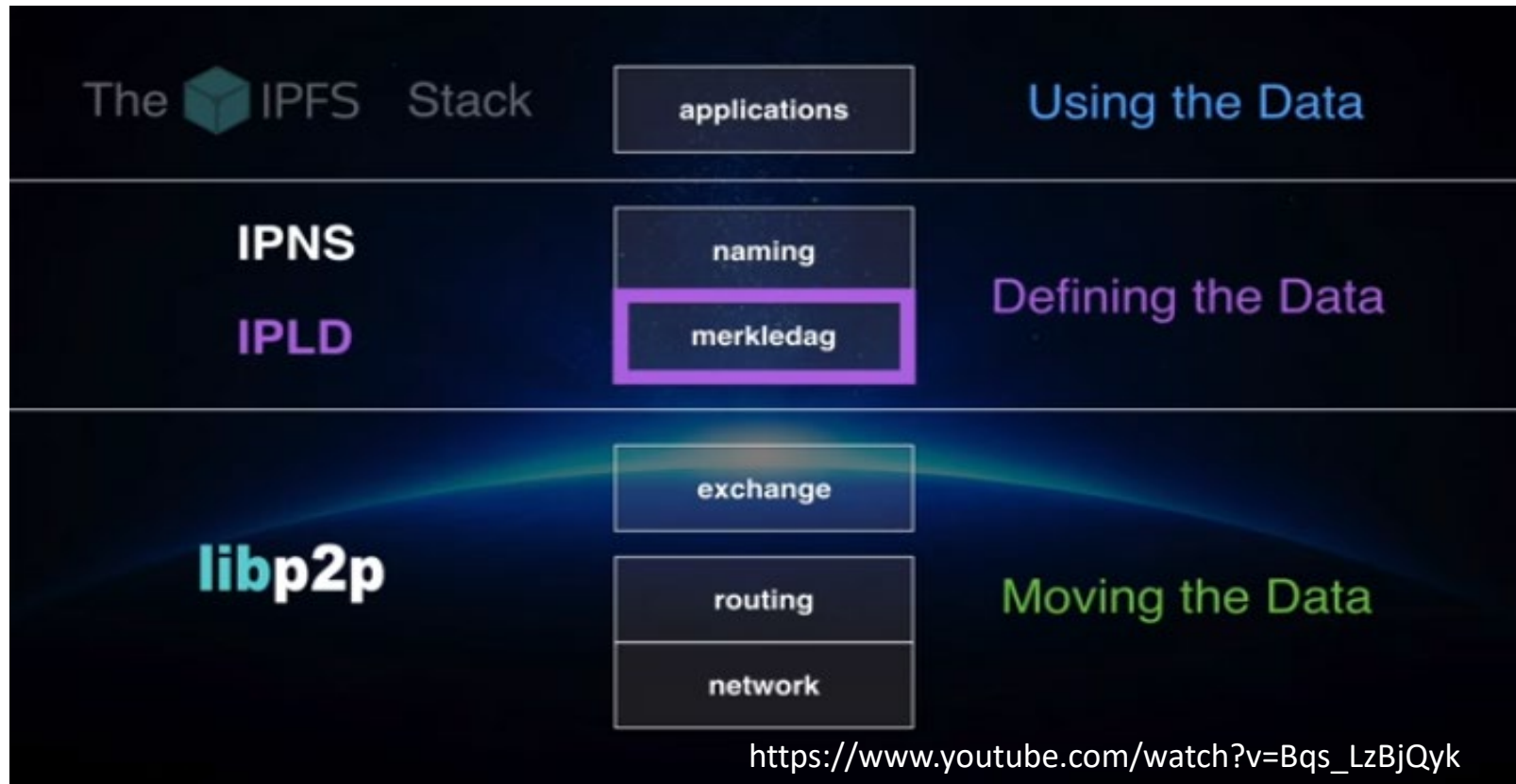
Content addressing through hashes has become a widely-used means of connecting data in distributed systems, from the blockchains that run your favorite cryptocurrencies, to the commits that back your code, to the web's content at large. Yet, whilst all of these tools rely on some common primitives, their specific underlying data structures are not interoperable.

Enter IPLD: a single namespace for all hash-inspired protocols. Through IPLD, links can be traversed across protocols, allowing you to explore data regardless of the underlying protocol.

“This add-on enables everyone to access IPFS resources the way they were meant: from locally running IPFS node” Firefox: <https://addons.mozilla.org/en-US/firefox/addon/ipfs-companion/> Chrome: <https://chrome.google.com/webstore/detail/ipfs-companion/nibjojkomfdiaoaajekhjakgkdhaomnch?hl=en>

# Inter-Planetary Linked Data (IPLD)

<https://ipld.io/>

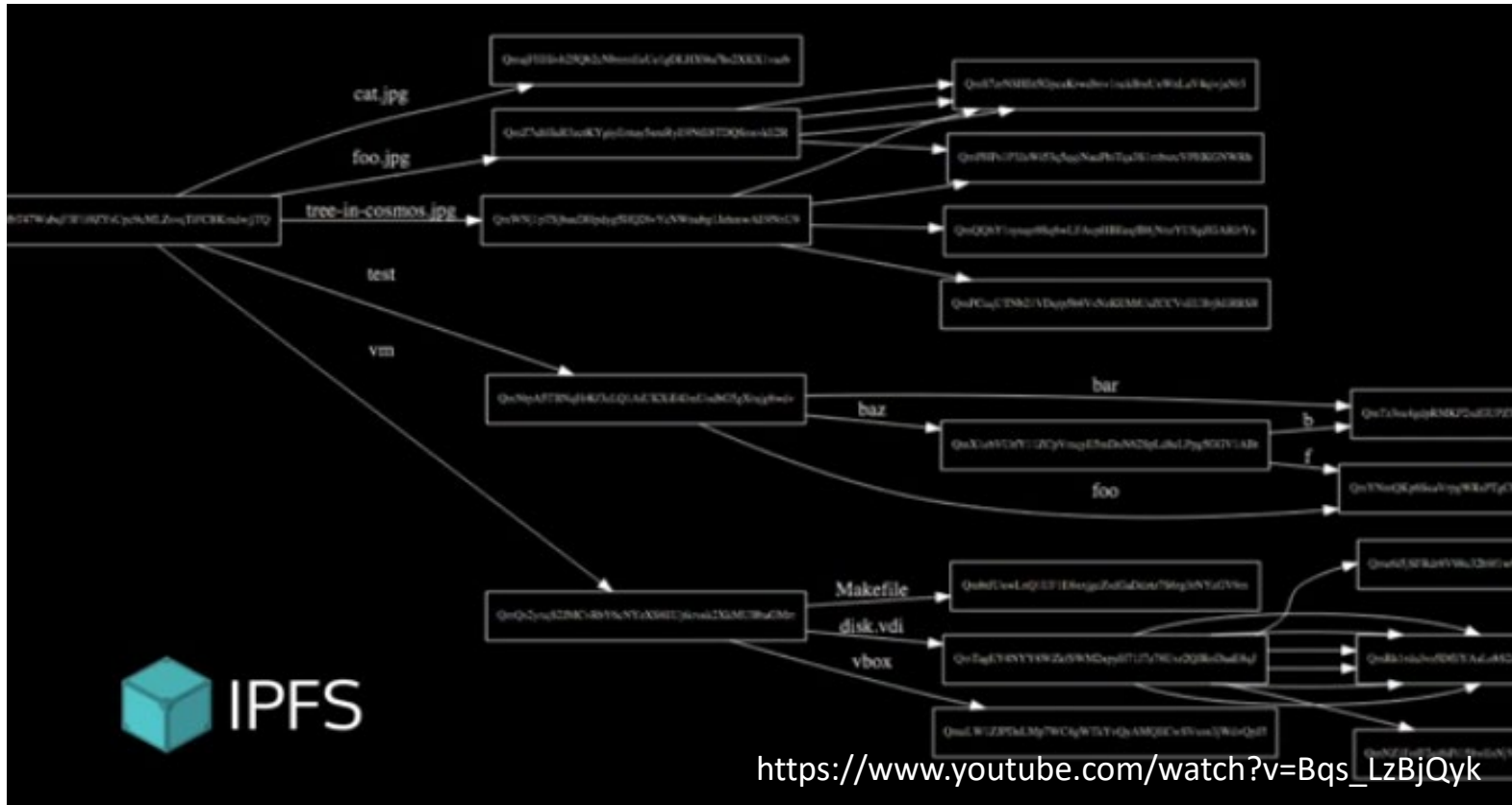


IPLD is the data model of the content-addressable web. It allows us to treat all hash-linked data structures as subsets of a unified information space, unifying all data models that link data with hashes as instances of IPLD.



# Inter-Planetary Linked Data (IPLD)

<https://ipld.io/>



IPLD is the data model of the content-addressable web. It allows us to treat all hash-linked data structures as subsets of a unified information space, unifying all data models that link data with hashes as instances of IPLD.

# Inter-Planetary Linked Data (IPLD)

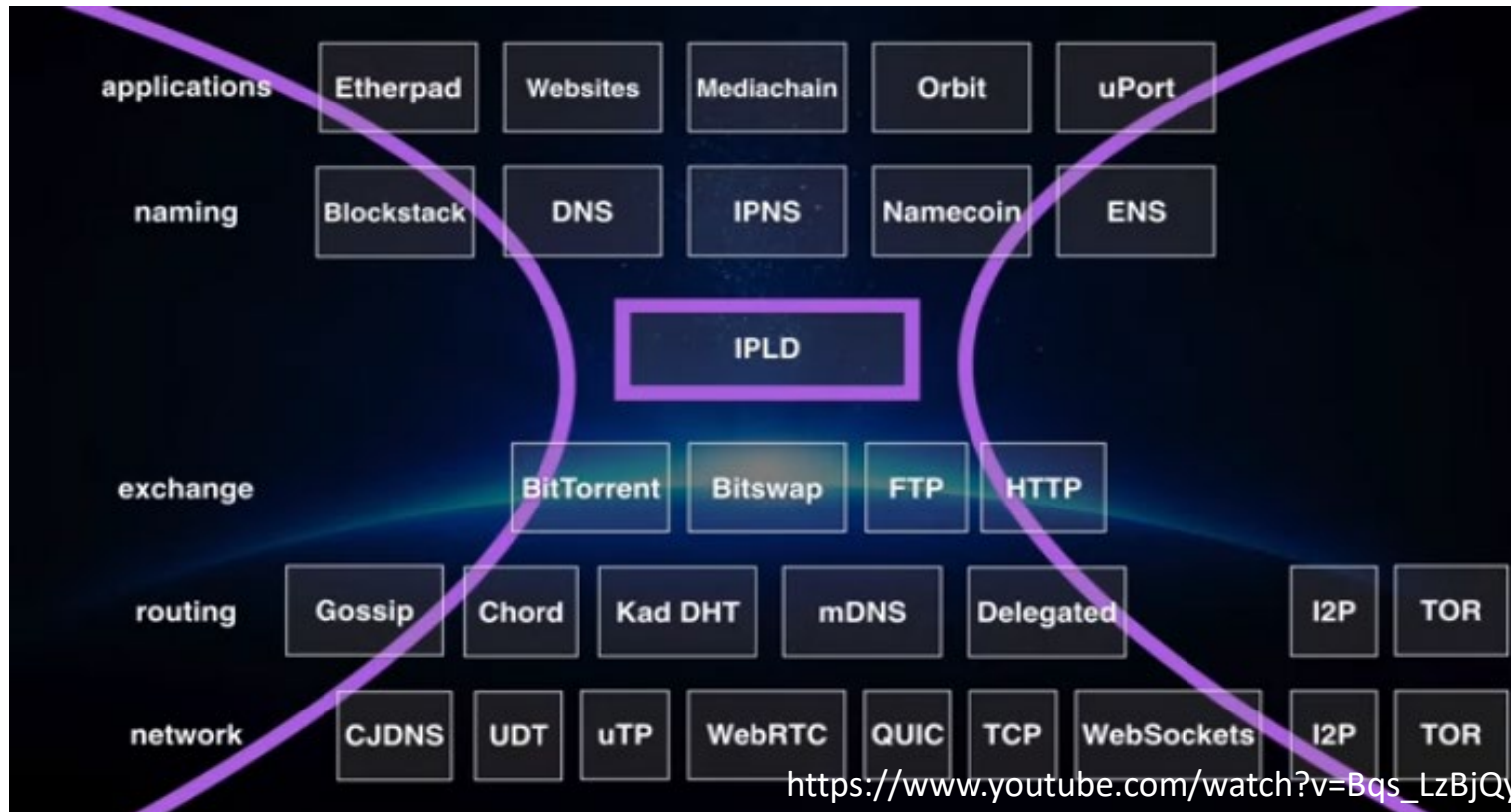
<https://ipld.io/>



IPLD is the data model of the content-addressable web. It allows us to treat all hash-linked data structures as subsets of a unified information space, unifying all data models that link data with hashes as instances of IPLD.

# Inter-Planetary Linked Data (IPLD)

<https://ipld.io/>



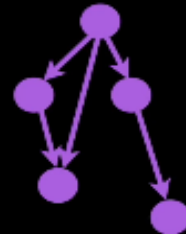
IPLD is the data model of the content-addressable web. It allows us to treat all hash-linked data structures as subsets of a unified information space, unifying all data models that link data with hashes as instances of IPLD.

# Inter-Planetary Linked Data (IPLD)

<https://ipld.io/>

## IPLD components

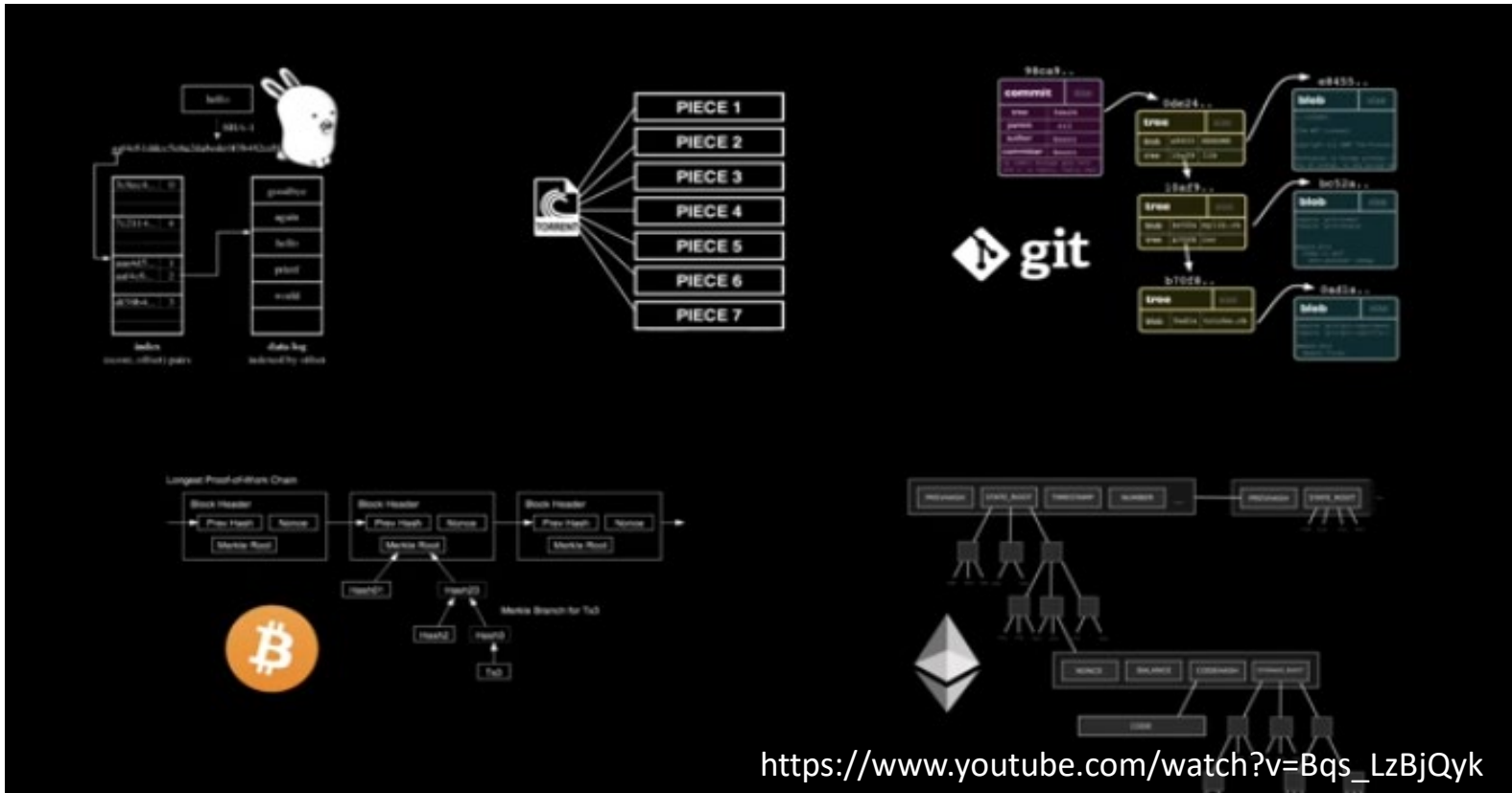
- **CID** a format for hash-links
- **Data Model** for universal resolution
- **Serialization Formats** per-data struct support
- **Tools & Libraries** to work with IPLD
- **IPLD Selector** for selecting subgraphs
- **IPLD Transformations** for computing



[https://www.youtube.com/watch?v=Bqs\\_LzBjQyk](https://www.youtube.com/watch?v=Bqs_LzBjQyk)

IPLD is the data model of the content-addressable web. It allows us to treat all hash-linked data structures as subsets of a unified information space, unifying all data models that link data with hashes as instances of IPLD.

# Distributed, Authenticated, Hash-Linked Data Structures



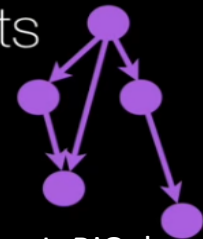
These are all Merkle Trees (clockwise from top left) Plan 9 from Bell Labs, BitTorrent, Git, Ethereum, BitCoin

# Content Identifier

<https://docs.ipfs.io/guides/concepts/cid/>

## CID: Content Identifier

- **CID** is a format for hash-links (merkle-links)
- Uses **Multihash** for multiple hash fn support
- Uses **Multibase** for multiple encodings
- Uses **Multicodec** for multiple serialization formats



[https://www.youtube.com/watch?v=Bqs\\_LzBjQyk](https://www.youtube.com/watch?v=Bqs_LzBjQyk)

A *content identifier*, or CID, is a label used to point to material in IPFS. It doesn't indicate *where* the content is stored, but it forms a kind of address based on the content itself.

# Content Identifier

<https://docs.ipfs.io/guides/concepts/cid/>

## CID format

```
<cidv1> ::= <mbp><version><mcp><mh>  
  
<mb> ::= <multibase-prefix>  
<version> ::= <cid-version>  
<mcp> ::= <multicodec-packed-code>  
<mh> ::= <multihash>
```

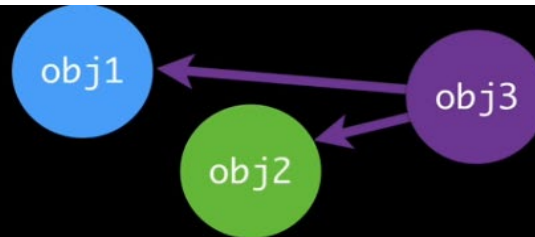
[https://www.youtube.com/watch?v=Bqs\\_LzBjQyk](https://www.youtube.com/watch?v=Bqs_LzBjQyk)

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# Content Identifier

<https://docs.ipfs.io/guides/concepts/cid/>

```
> var ipfs = require('ipfs')  
  
> ipfs.add(obj1)  
> ipfs.add(obj2)  
> ipfs.add(obj3)  
  
> ipfs.resolve("QmUUuaDDWvRG23zyzBQVv43etRqmbGCRNhgZYu9qvZ88Bg")  
{ "data": "Hello " }  
  
> ipfs.resolve("QmSVuc2kjbtcFQ9ur8fnyKUKvSyLZMTBVbZugJWChydAHV")  
{ "data": "World\n" }  
  
> ipfs.resolve("QmUUuaDDWvRG23zyzBQVv43etRqmbGCRNhgZYu9qvZ88Bg/data")  
"Hello "  
  
> ipfs.resolve("QmSVuc2kjbtcFQ9ur8fnyKUKvSyLZMTBVbZugJWChydAHV/data")  
"World "
```



[https://www.youtube.com/watch?v=Bqs\\_LzBjQyk](https://www.youtube.com/watch?v=Bqs_LzBjQyk)

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