Global peer to peer merkle dag file system

- Kishan Sagathiya (@kishansagathiya)

  (Member of IPFS, Software Engineer at Protocol Labs)

IPFS

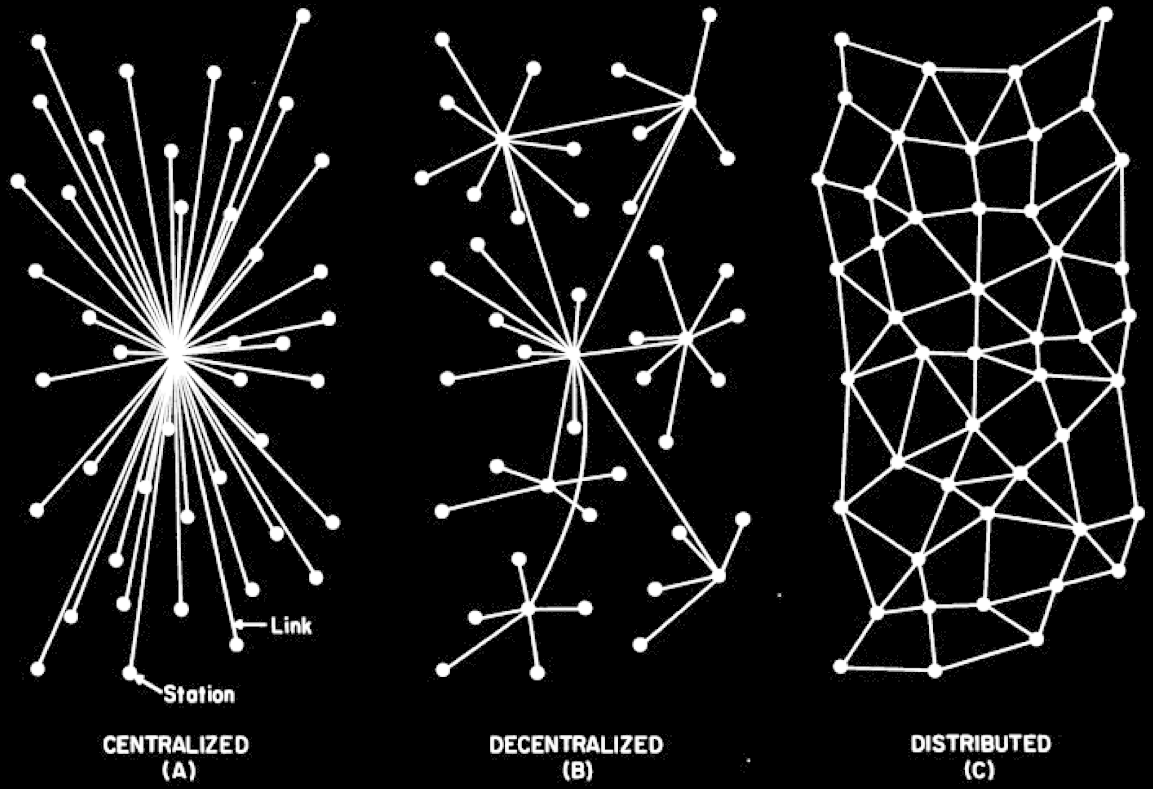


FIG. 1 — Centralized, Decentralized and Distributed Networks

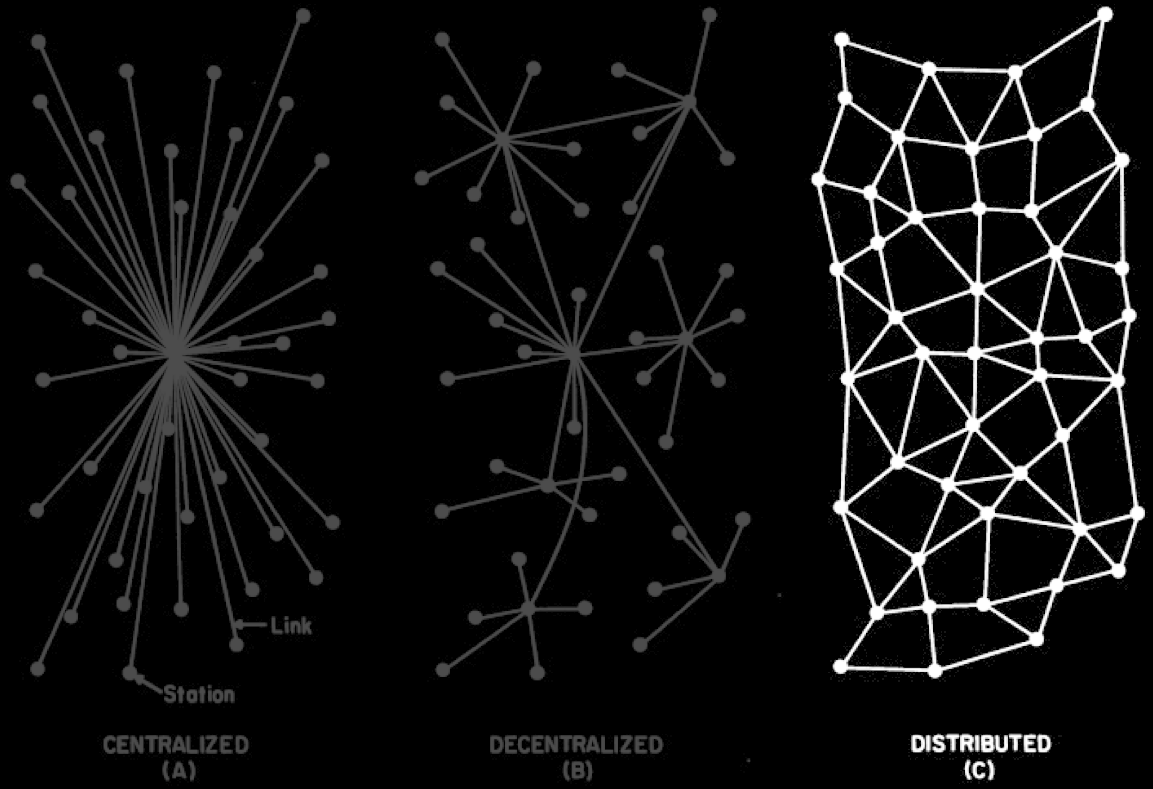


FIG. 1 — Centralized, Decentralized and Distributed Networks

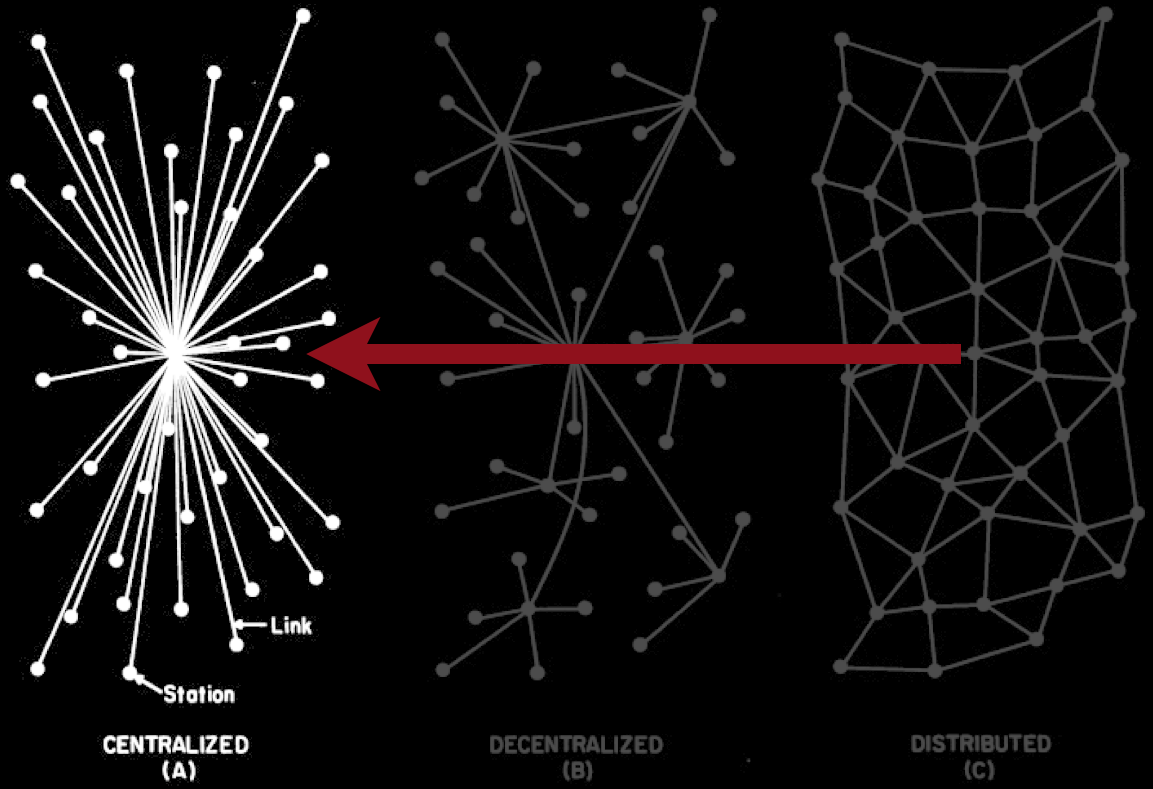


FIG. 1 — Centralized, Decentralized and Distributed Networks

Location Addressing

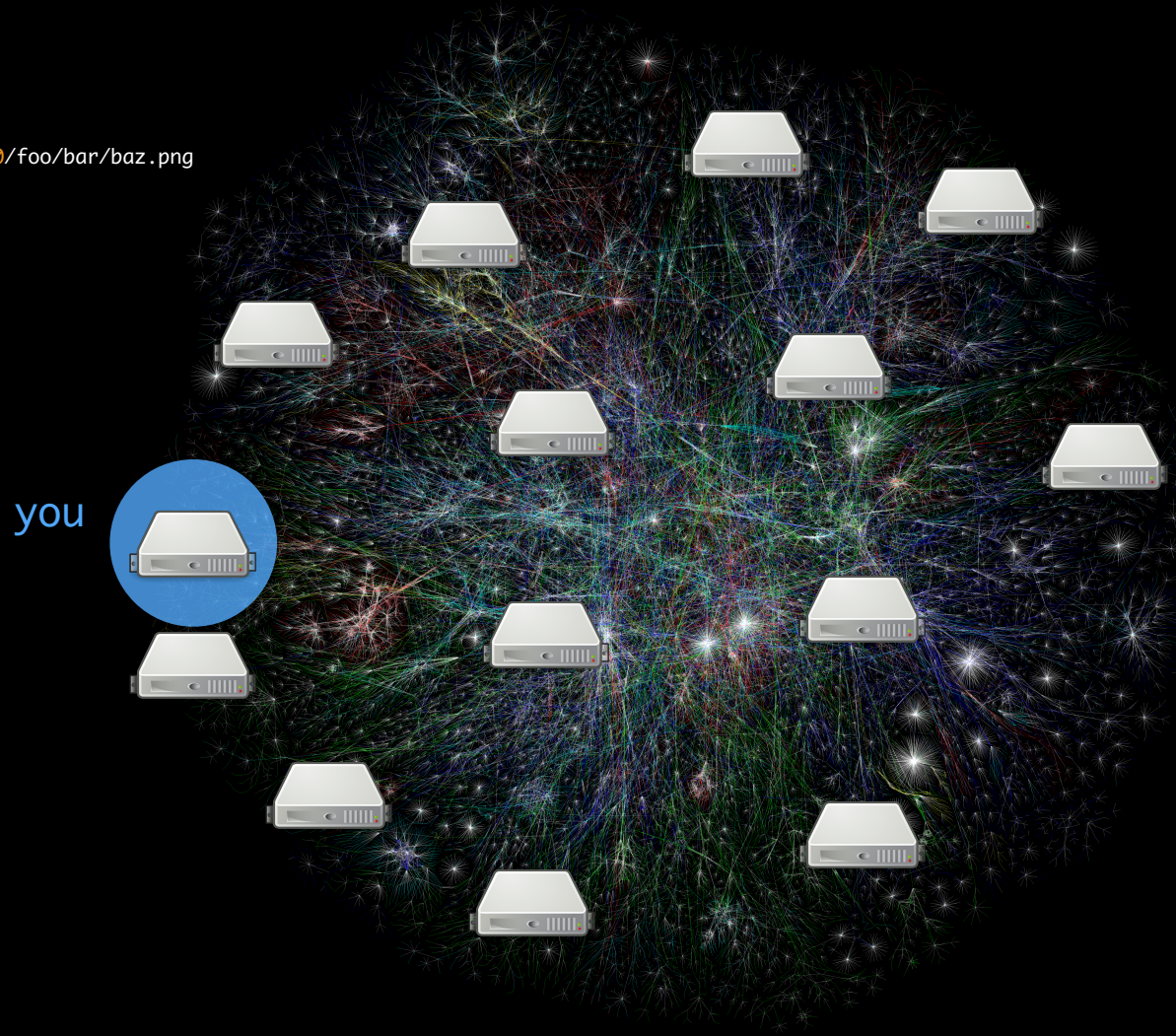
http://example.com/foo/bar/baz.png

http://10.20.30.40/foo/bar/baz.png

location path

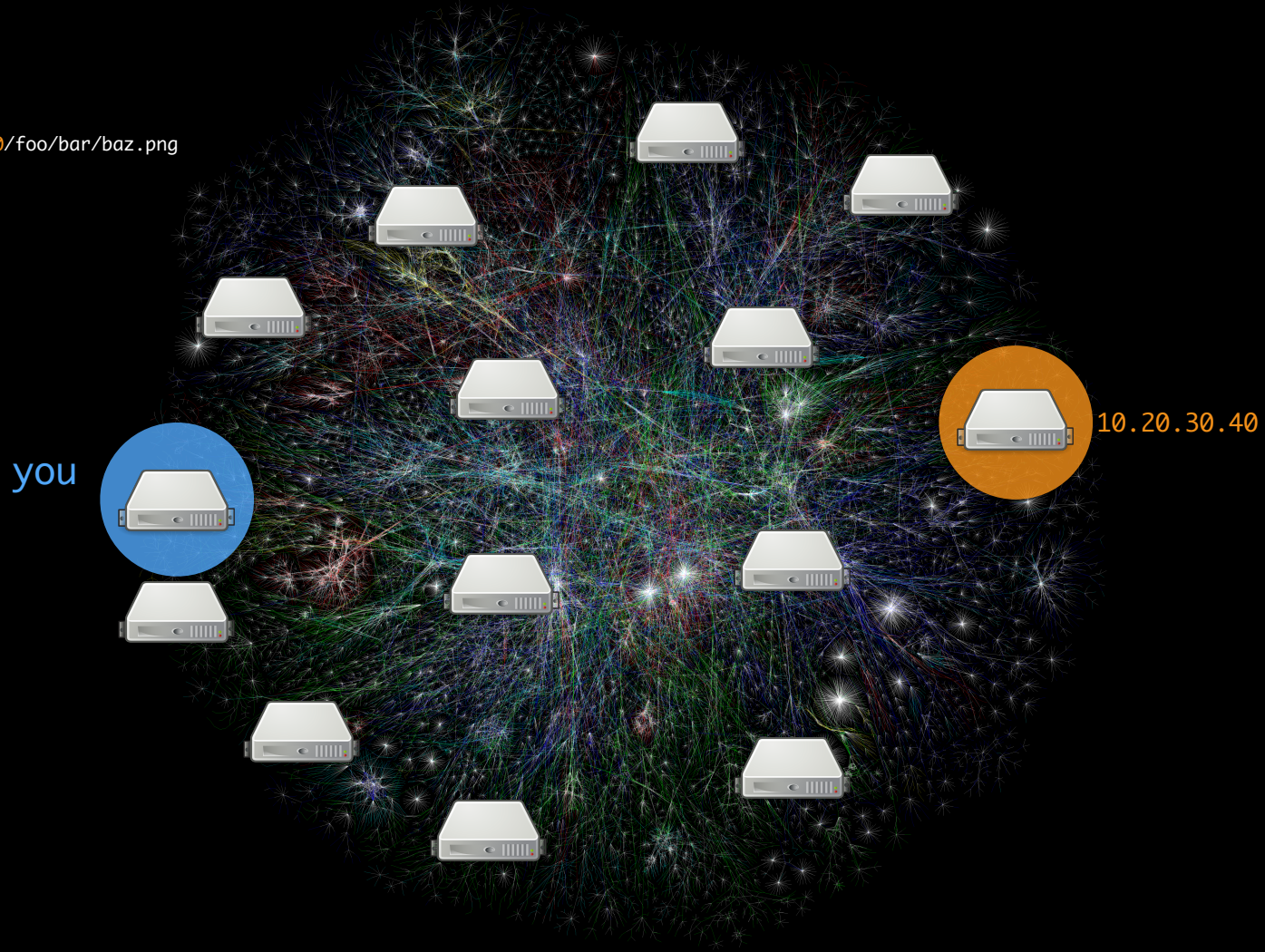
IPFS

http://10.20.30.40/foo/bar/baz.png



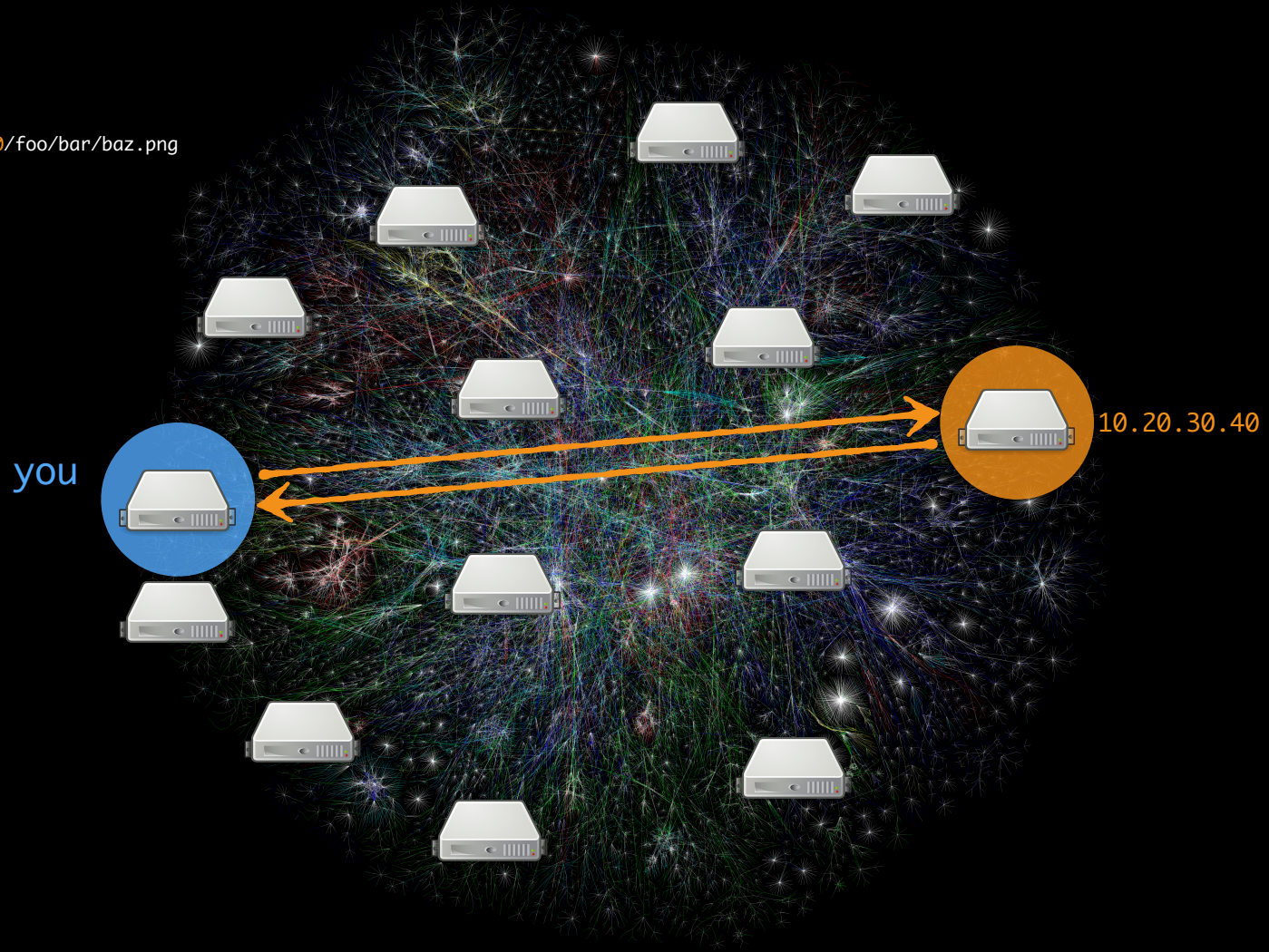
IPFS

http://10.20.30.40/foo/bar/baz.png

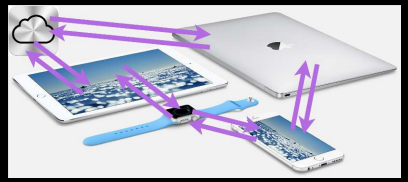


IPFS

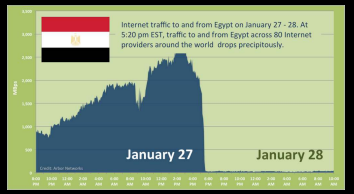
http://10.20.30.40/foo/bar/baz.png



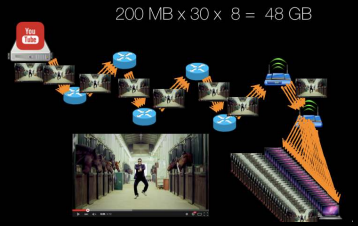
the web has problems



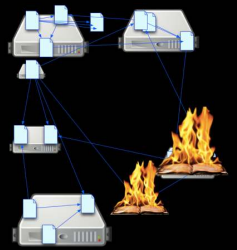
bad in mobile and IoT



censorship

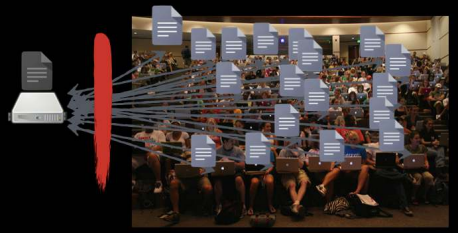


huge inefficiencies



links break

bad security model



no offline use

Content Addressing

http://example.com/foo/bar/baz.png

http://10.20.30.40/foo/bar/baz.png

location path

http://

http://

location path

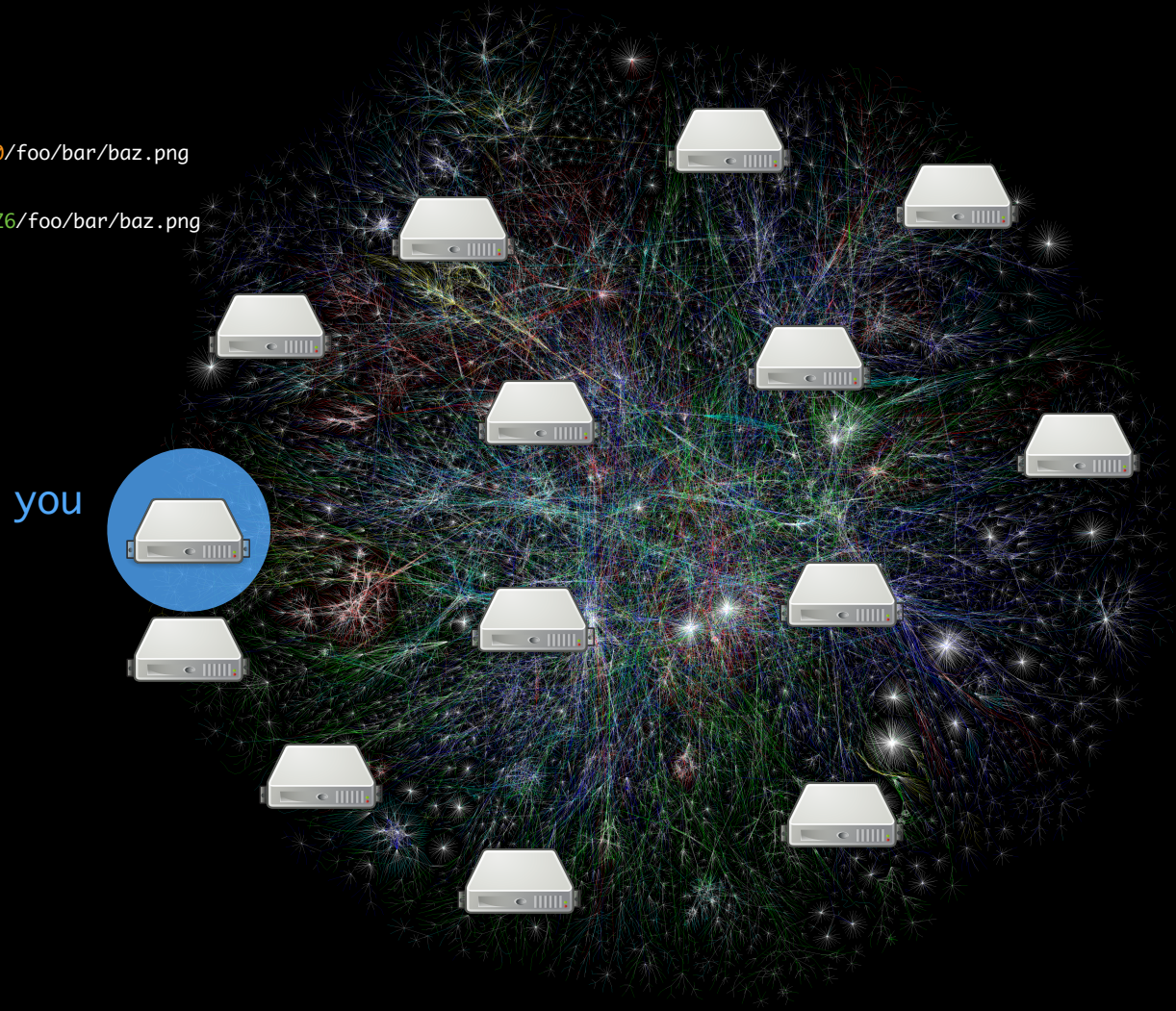
/ipns/example.com/foo/bar/baz.png

/ipfs/QmW98pJrc6FZ6/foo/bar/baz.png

content path

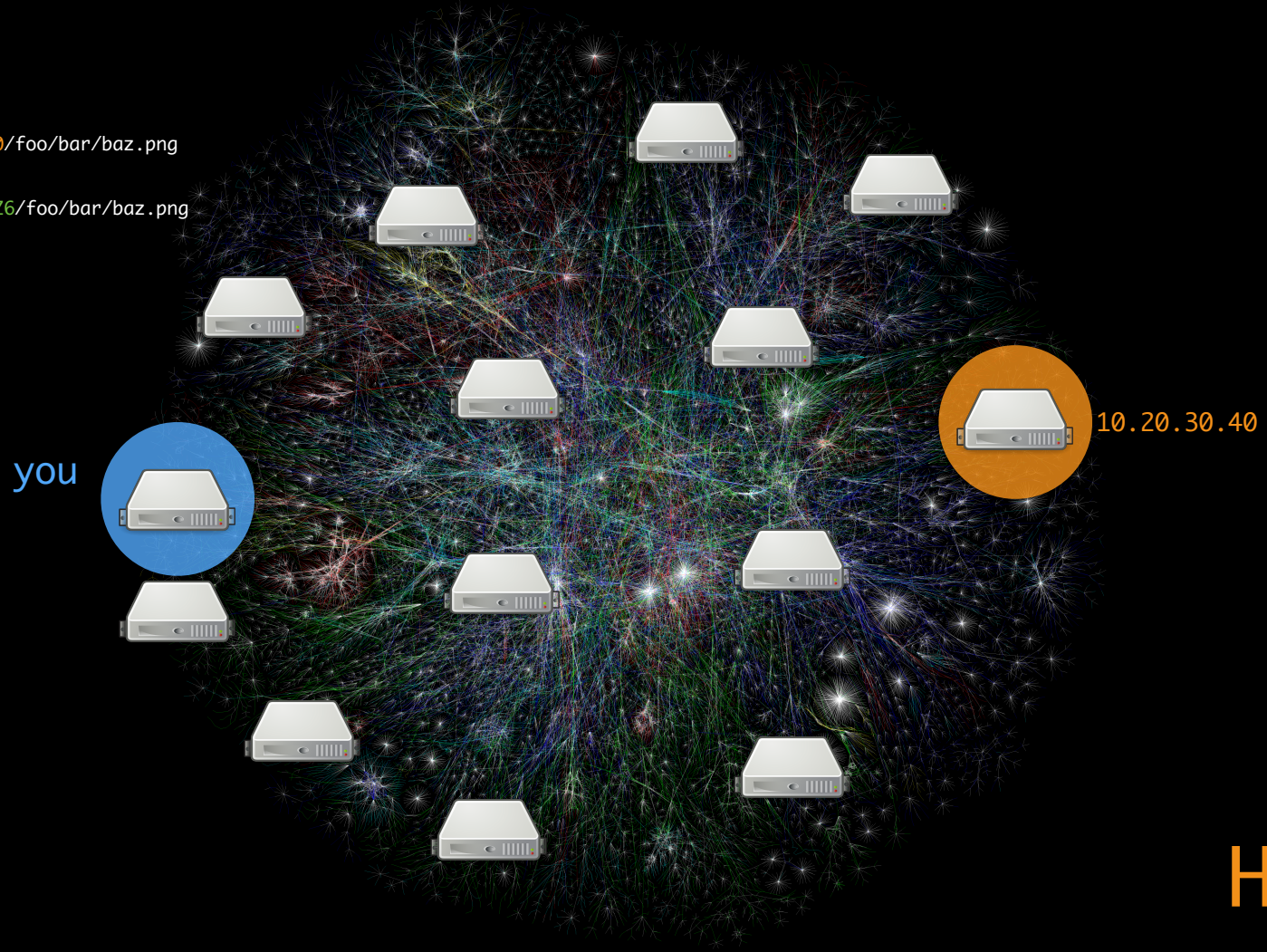
http://10.20.30.40/foo/bar/baz.png

/ipfs/QmW98pJrc6FZ6/foo/bar/baz.png



http://10.20.30.40/foo/bar/baz.png

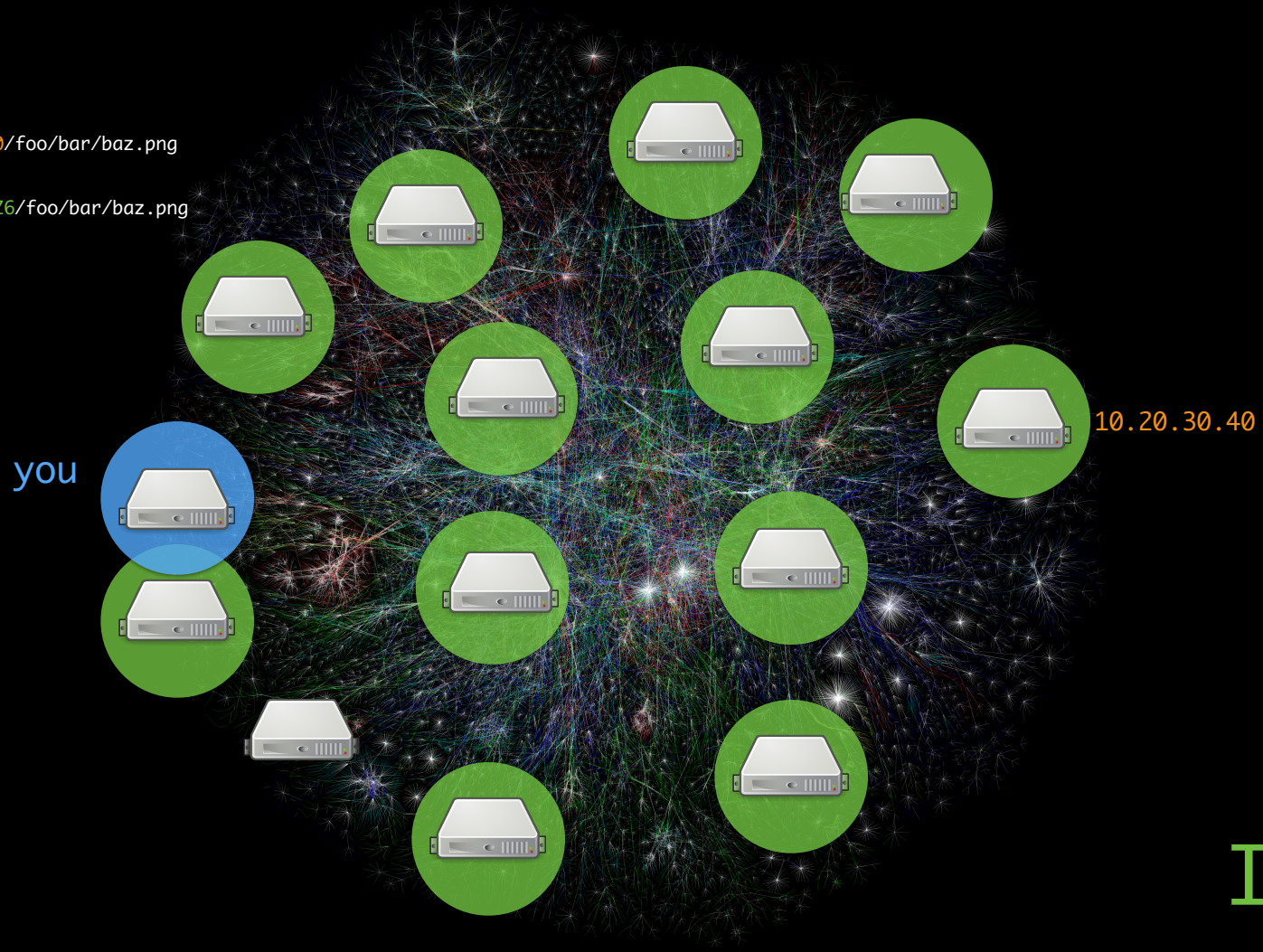
/ipfs/QmW98pJrc6FZ6/foo/bar/baz.png



HTTP

http://10.20.30.40/foo/bar/baz.png

/ipfs/QmW98pJrc6FZ6/foo/bar/baz.png

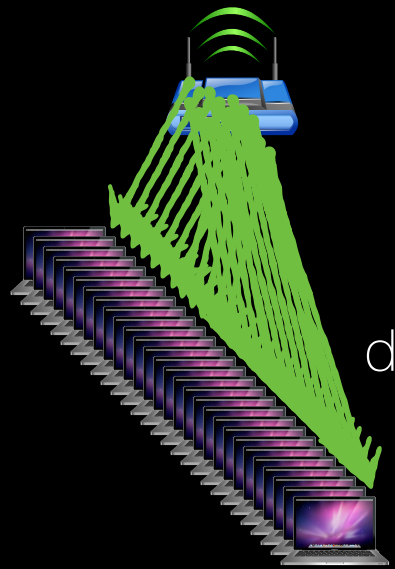


IPFS

/ipfs/

p2p
distribution

/ipfs/



p2p
distribution

IPFS

The Permanent Web

a new hypermedia distribution protocol

web

SFS

git

BitTorrent

+ DHT

IPFS

www
web

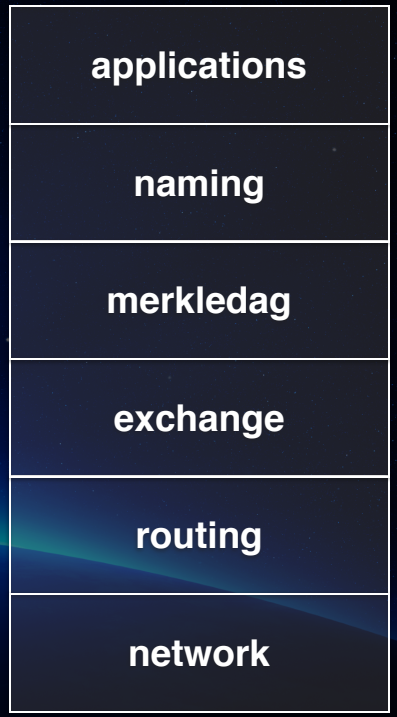
SFS

git

BitTorrent

DHT

IPFS


applications
naming
merkledag
exchange
routing
network

- global distributed file system
  for Unix-like OSes
- share content using NFS

namespaces. SFS introduced a technique for building *Self-Certified Filesystems*: addressing remote filesystems using the following scheme

```
/sfs/<Location>:<HostID>
```

where `Location` is the server network address, and:

```
HostID = hash(public_key || Location)
```

10.2 Git Internals - Git Objects

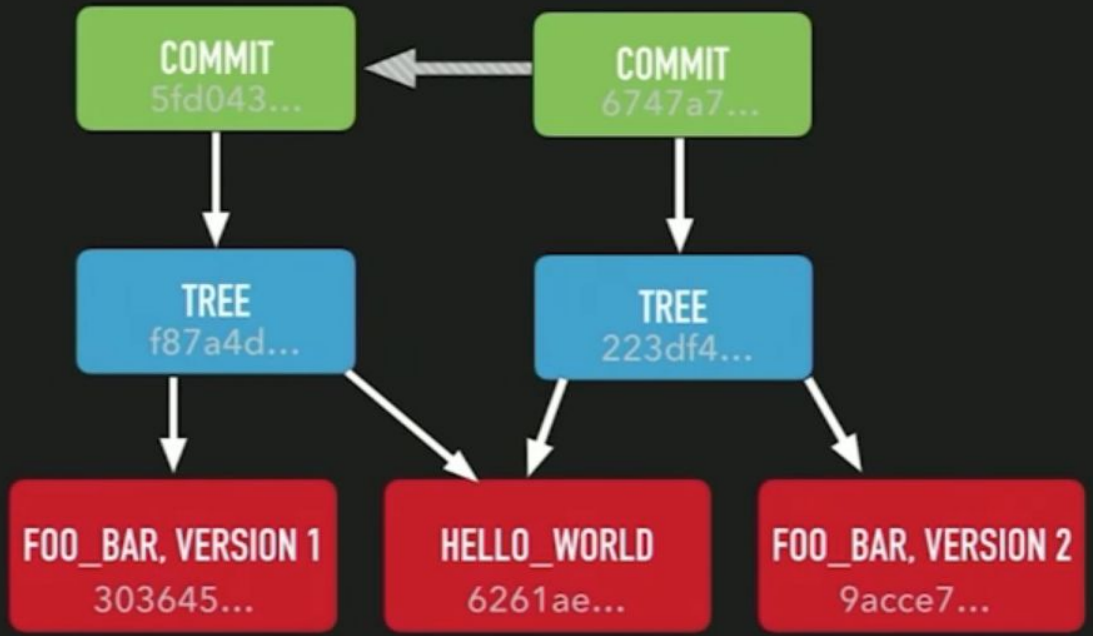
Git Objects

Git is a content-addressable filesystem. Great. What does that mean? It means that at the core of Git is a simple key-value data store. What this means is that you can insert any kind of content into a Git repository, for which Git will hand you back a unique key you can use later to retrieve that content.

```
$ echo 'test content' | git hash-object -w --stdin
d670460b4b4aece5915caf5c68d12f560a9fe3e4
```

```
$ find .git/objects -type f
.git/objects/d6/70460b4b4aece5915caf5c68d12f560a9fe3e4
```

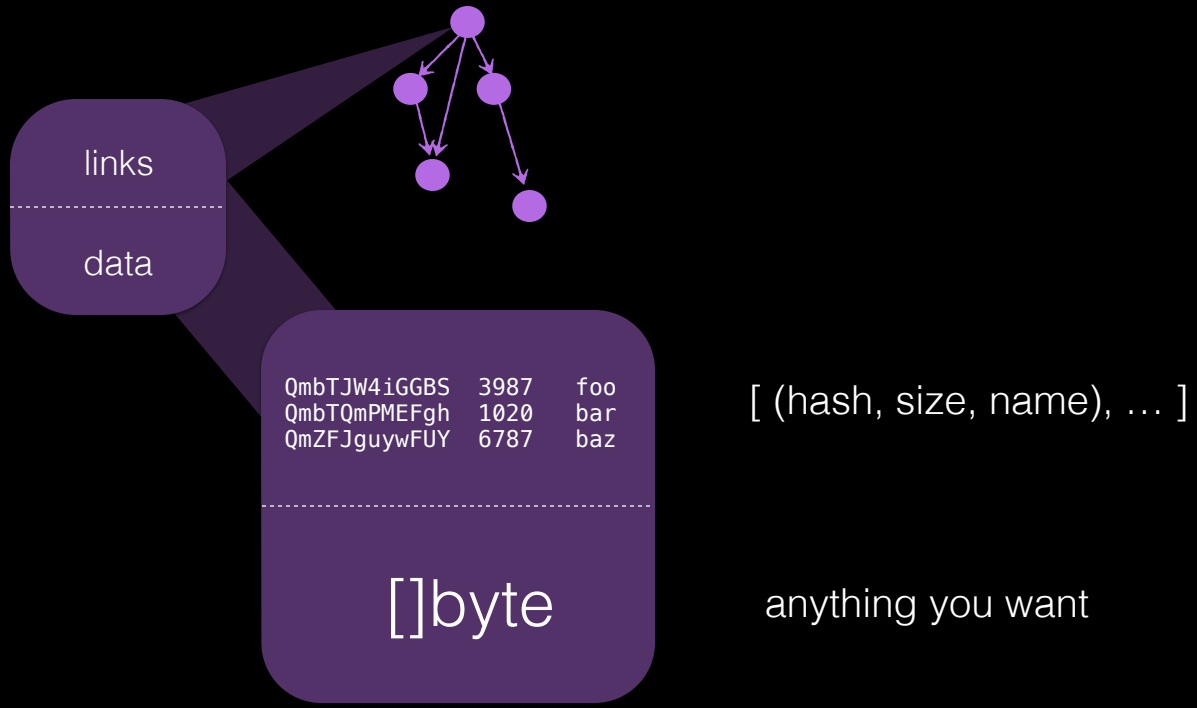
MERKLE DAG


COMMIT
5fd043...
COMMIT
6747a7...
TREE
f87a4d...
TREE
223df4...
FOO_BAR, VERSION 1
303645...
HELLO_WORLD
6261ae...
FOO_BAR, VERSION 2
9acce7...

Merkle DAGs help in

- De-duplication
- Data Integrity

in IPFS
data forms a dag



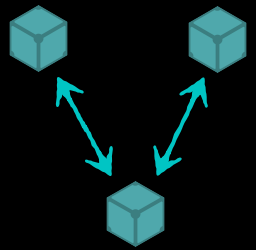
an IPFS node

an IPFS node

has pki based identity

an IPFS node

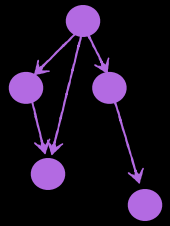
has pki based identity



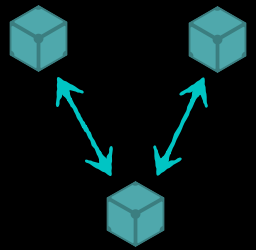
connects to others

an IPFS node

has pki based identity



can store part of the dag



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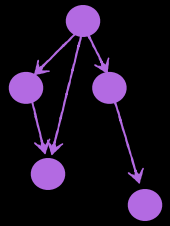
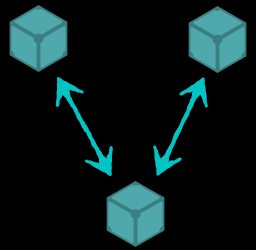
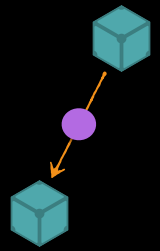


can store part of the dag



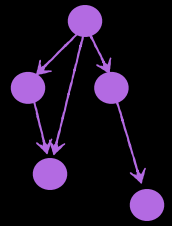
connects to others



can get more from peers

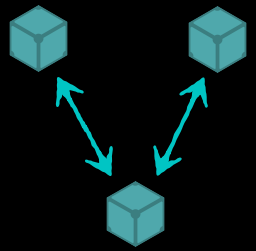
an IPFS node

has pki based identity

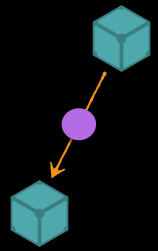


can store part of the dag

can be run as a server



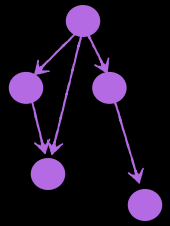
connects to others



can get more from peers

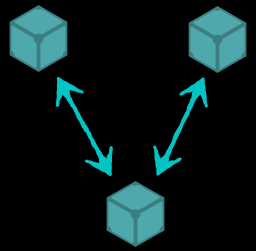
an IPFS node

has pki based identity

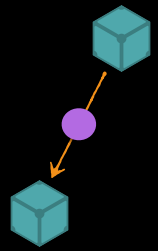


can store part of the dag

can be run as a server

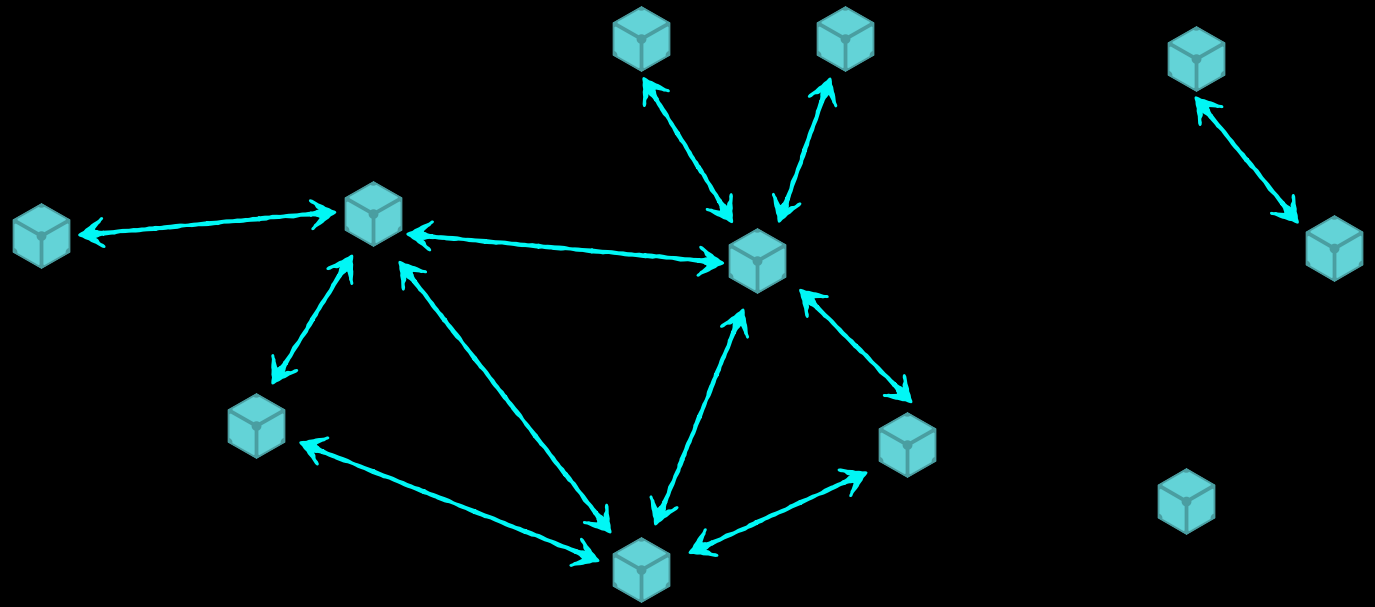


connects to others



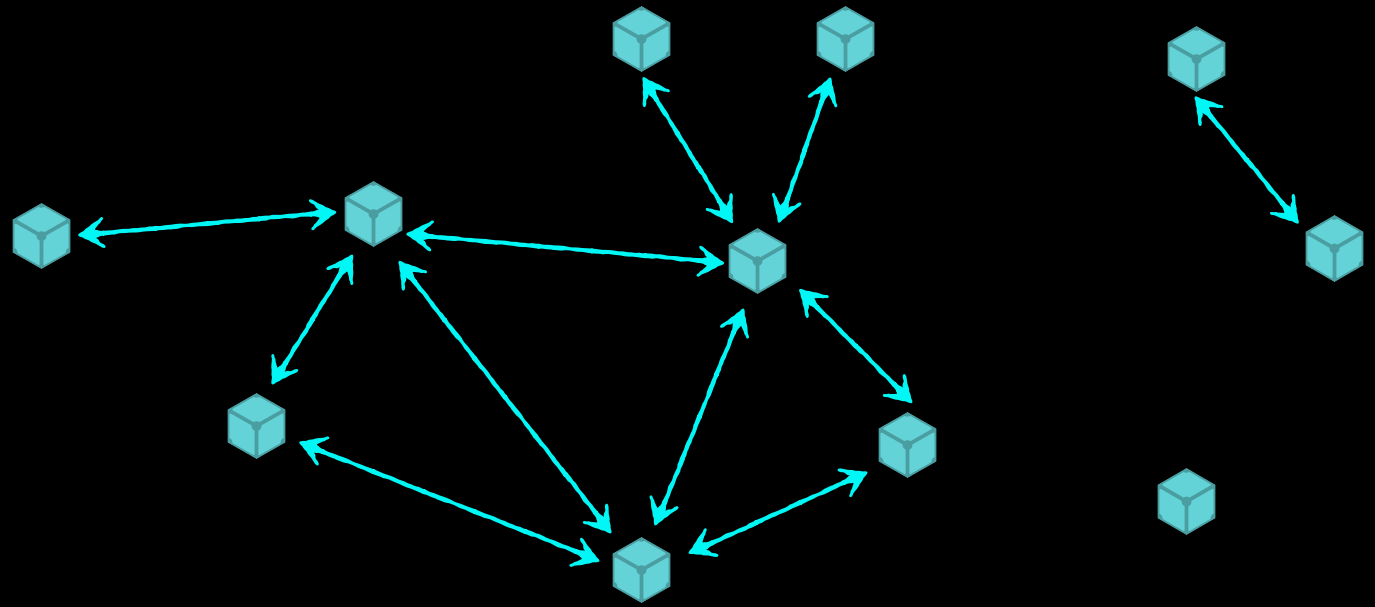
can get more from peers

or embedded in apps



IPFS nodes form p2p networks

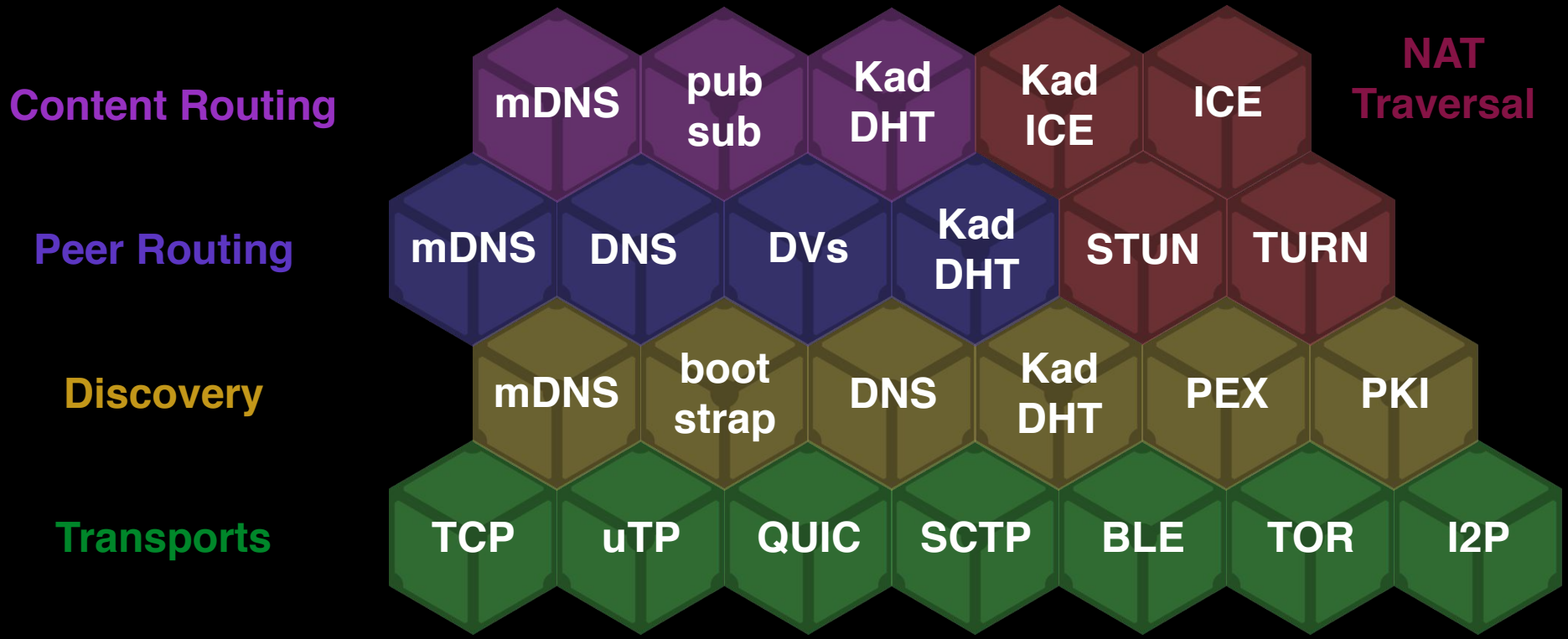
transport agnostic and with NAT traversal

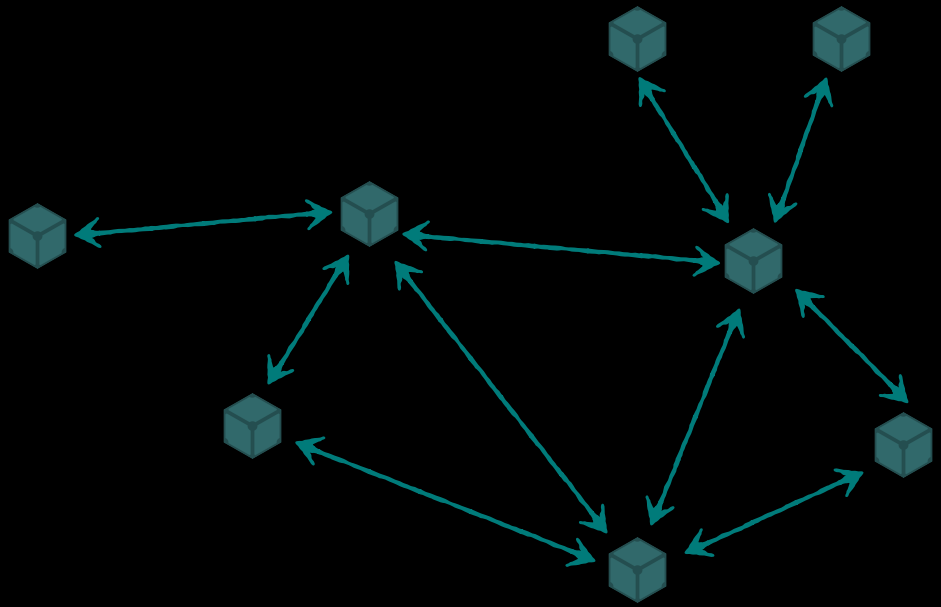


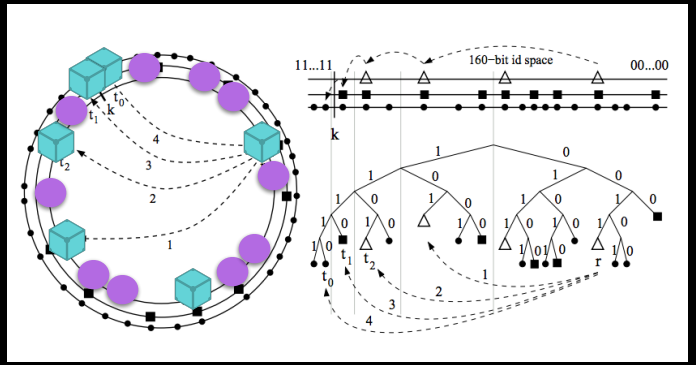
IPFS nodes form p2p networks

transport agnostic and with NAT traversal

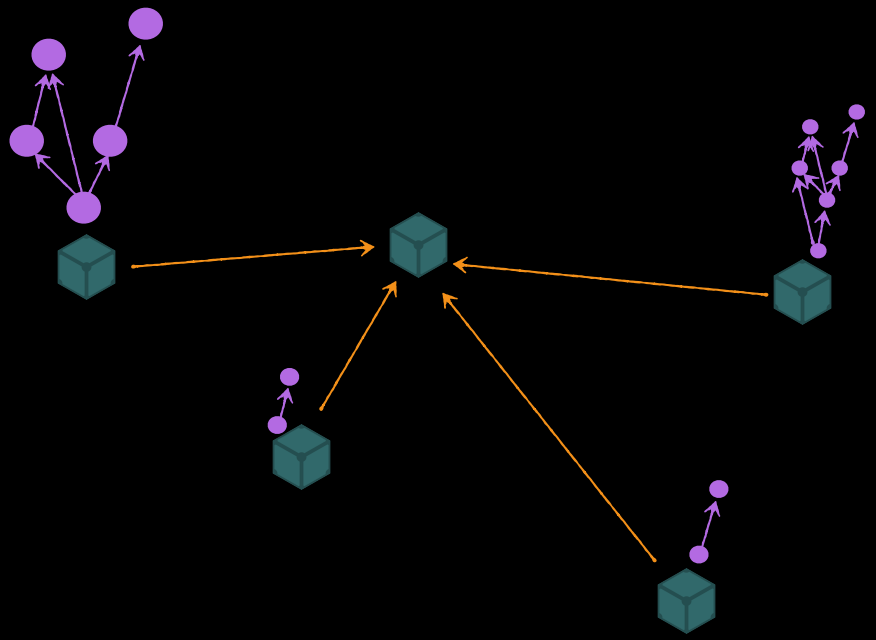
libp2p a collection of peer-to-peer protocols







they find each other and content
with routing systems, like DHTs

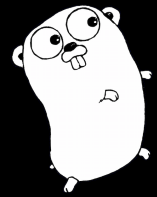


and exchange dag nodes
like files in http or bittorrent

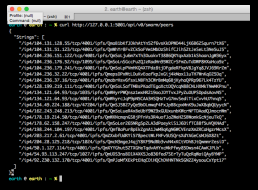
in go-ipfs:

ipfs node

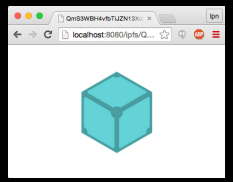
cli



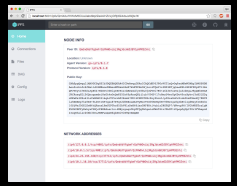
library



http api



http/ipfs gateway

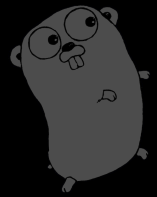


webui

in go-ipfs:

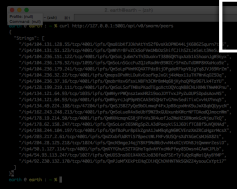
ipfs node

cli

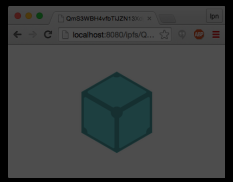


library

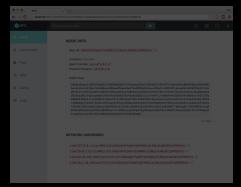
DEMO



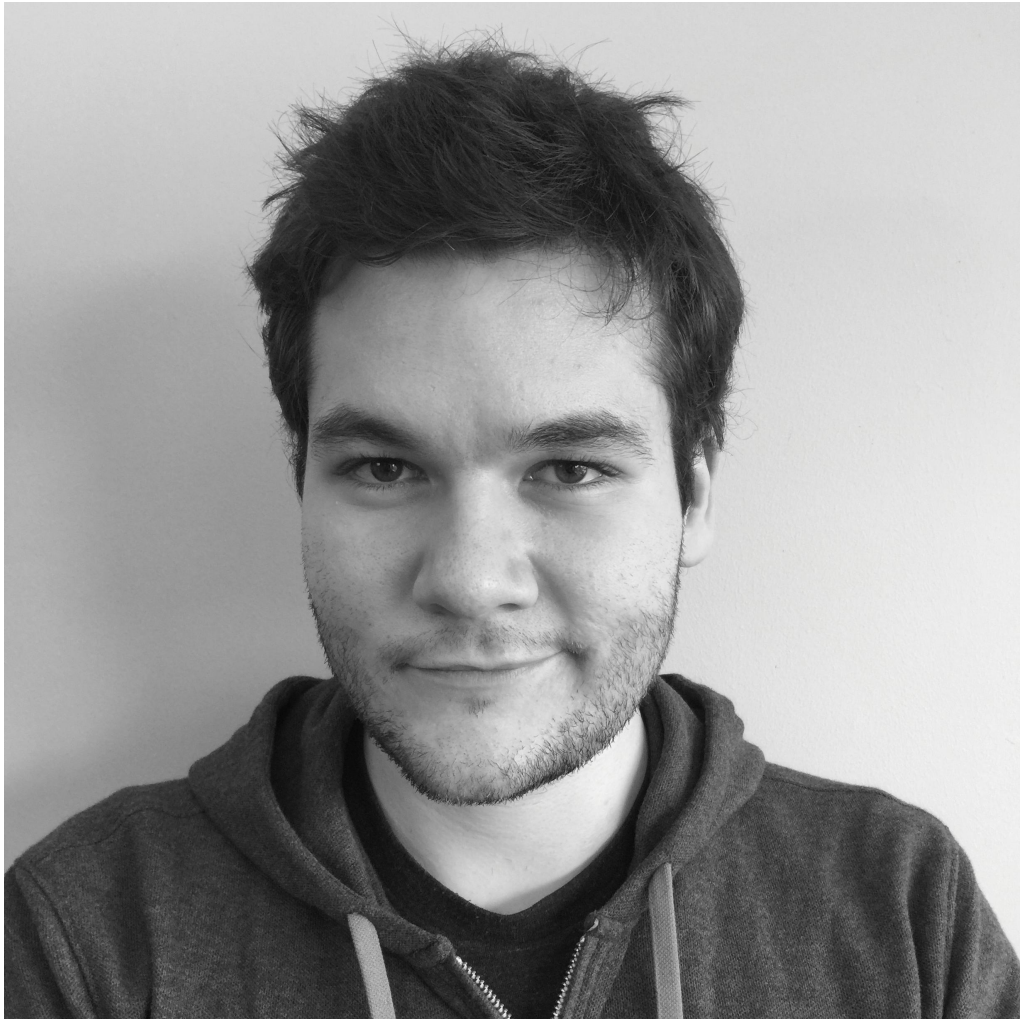
http api



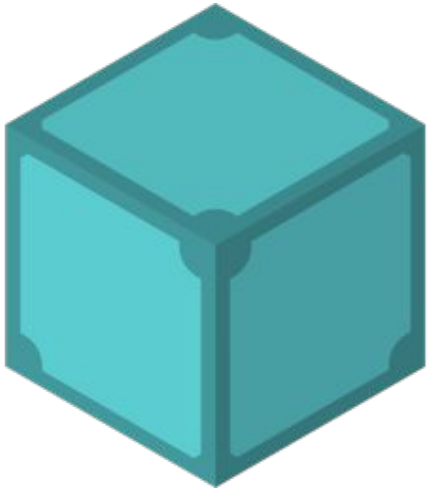
http/ipfs gateway



webui



Juan Benet
(Creater of IPFS)



IPFS

go-ipfs http://github.com/ipfs/go-ipfs

(We ❤️ contributions)