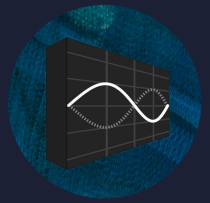
DEVELOPING APPS WITH IPFS APIs

CORE COURSE C

IPFS Camp

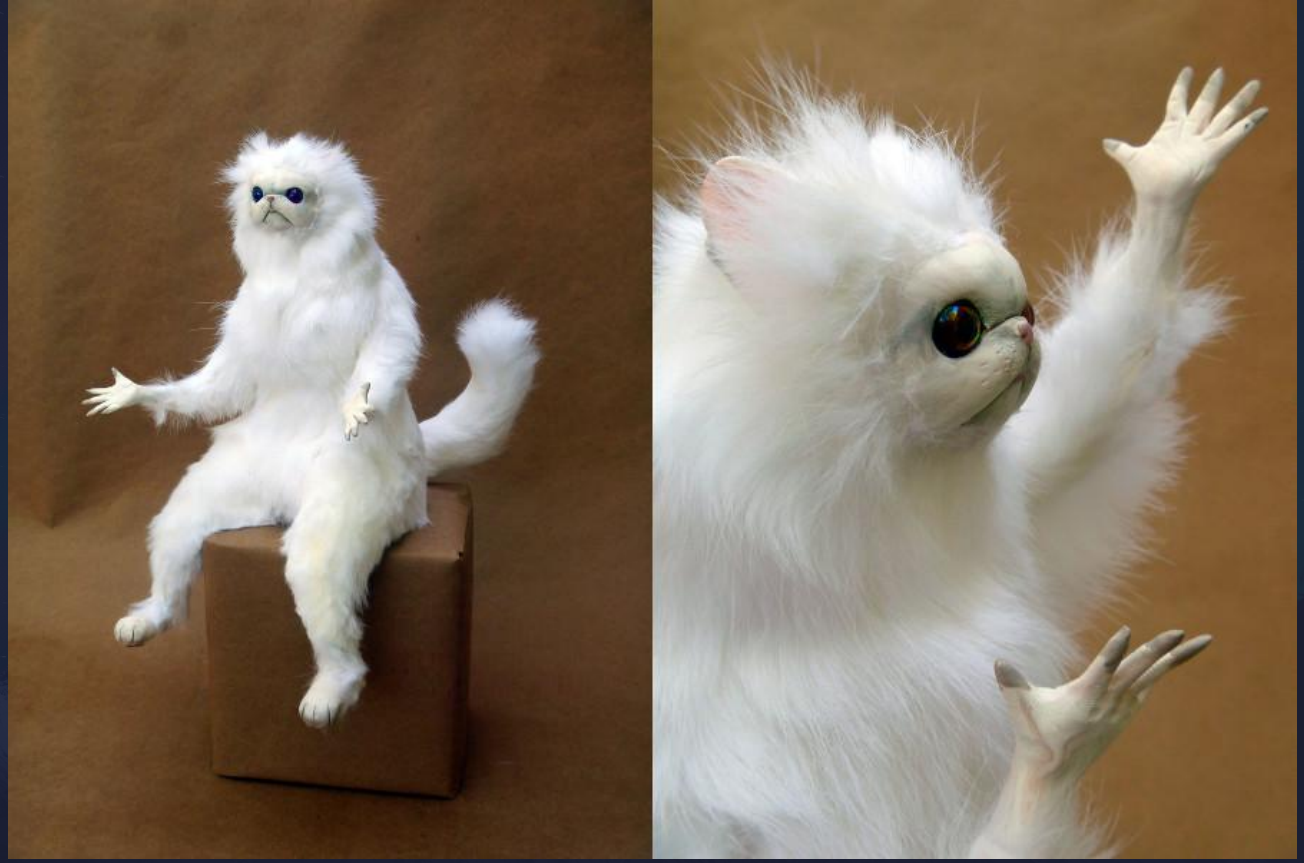


Marcin Rataj
@lidel

Jim Pick
@jimpick

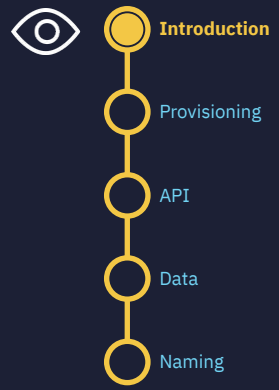
Hugo Dias
@hugomrdias

Using IPFS as a building block in your application



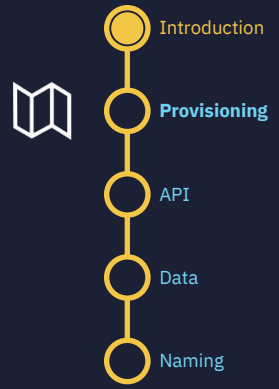
Introduction

Goal: build basic understanding about IPFS in apps..



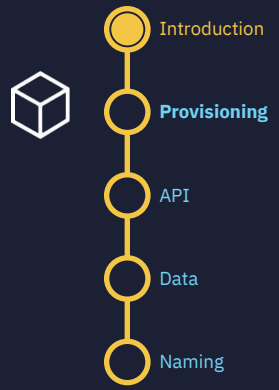
Introduction

Where to run it



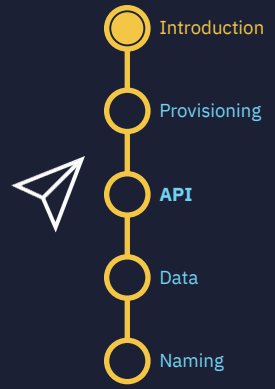
Introduction

What to run



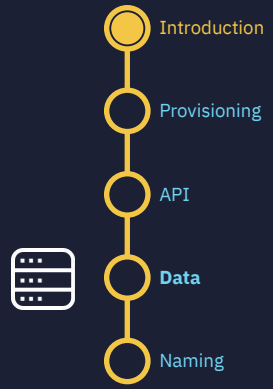
Introduction

How to talk to it



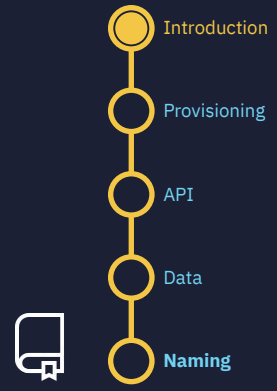
Introduction

How to store data

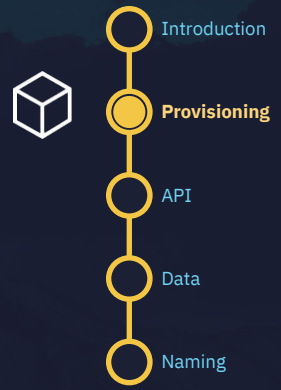


Introduction

How to track updates
(spoiler: by naming things)



Provisioning

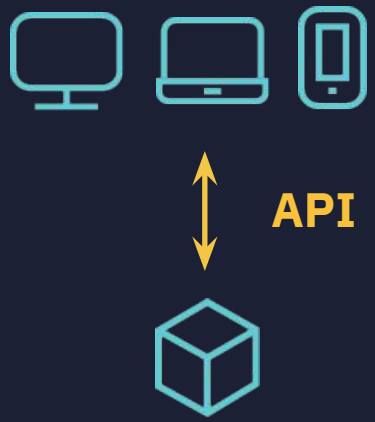


Where to run IPFS

IPFS in Apps:

High Level Patterns

App with API Client



IPFS Service

App

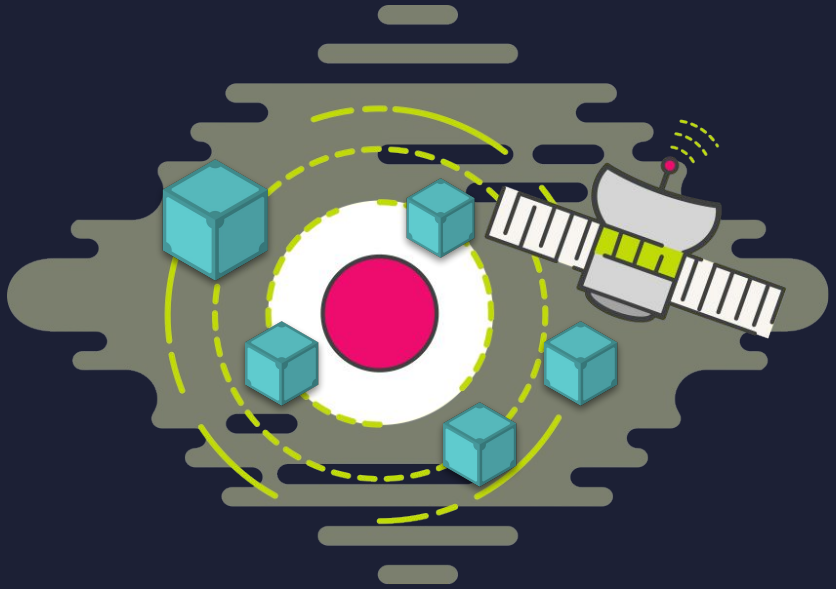
Embedded IPFS Node

IPFS
as a
Backend Service

IPFS node running as a service
within your cloud infrastructure

Backend Service:

Self-hosted



Roll your own:

go-ipfs github.com/ipfs/go-ipfs

ipfs-cluster cluster.ipfs.io

Learn more:

Elective E: Deploying IPFS Infrastructure

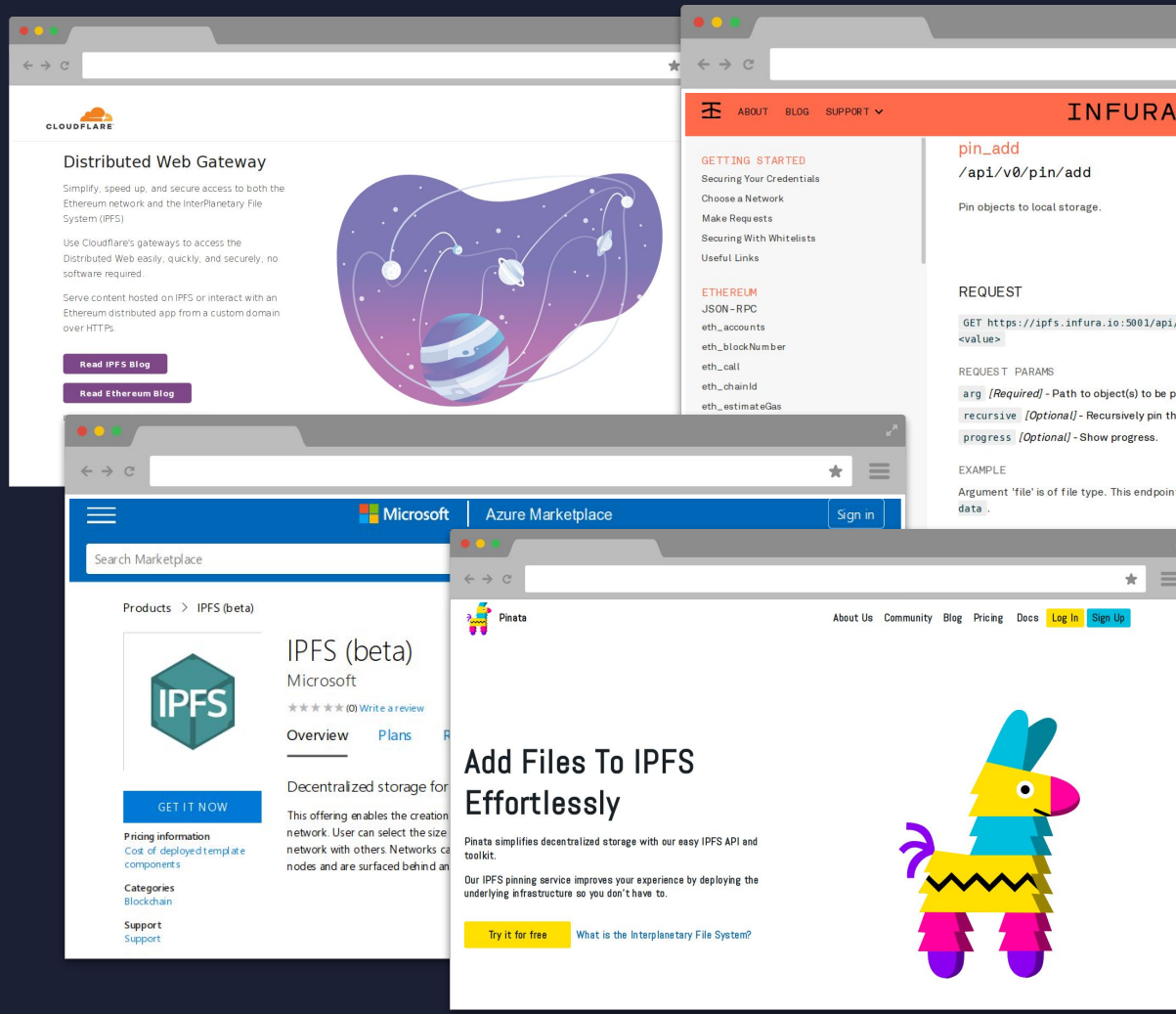
Elective B: IPFS Cluster

Backend Service:

Cloud Providers

IPFSaaS:

Infura
Pinata
Microsoft Azure
Cloudflare

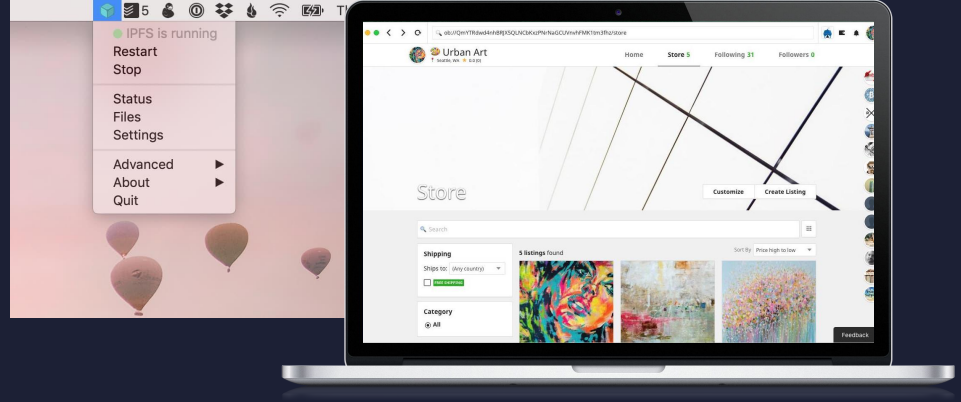


OR..

Embedded IPFS Node

shipping with your app

IPFS Desktop
OpenBazaar

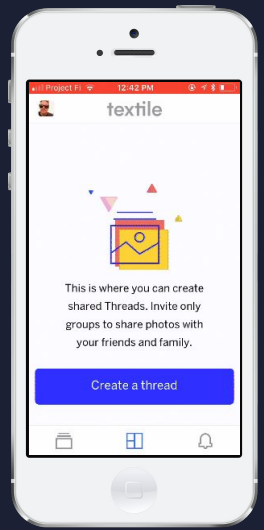


Embedded
go-ipfs

Textile Photos

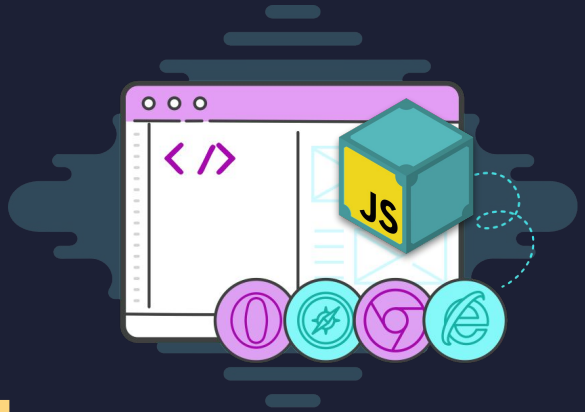
Elective D

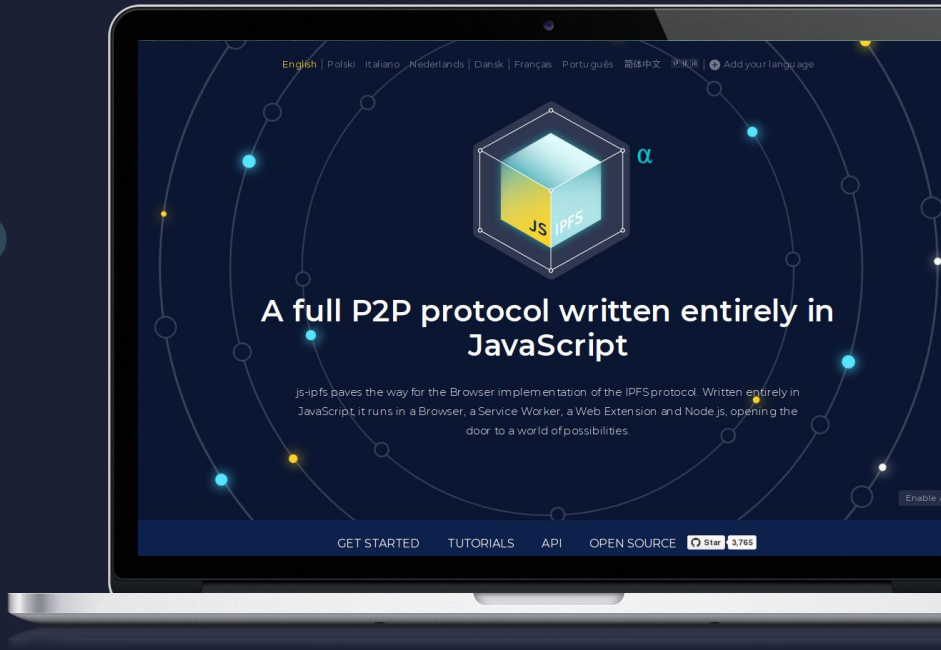
Building DApps with Textile



No need to include the entire thing!

github.com/hsanjuan/ipfs-lite





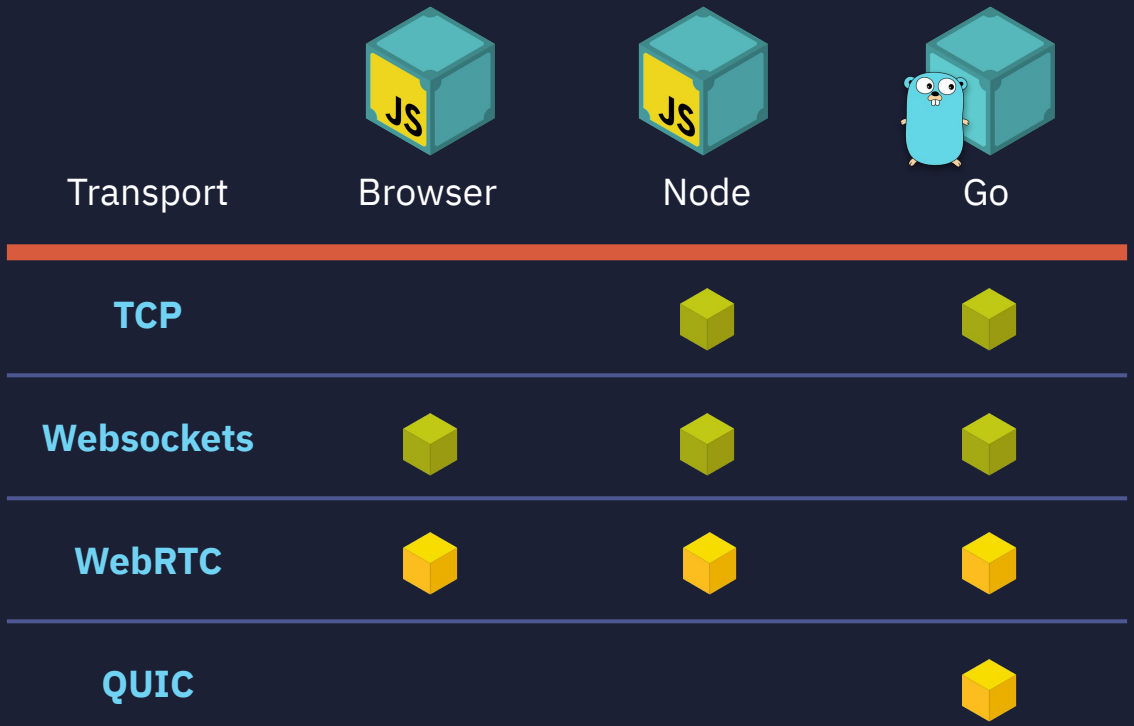
Embedded

js-ipfs

Full IPFS node running in a web context (Web Browser, Electron, Node)

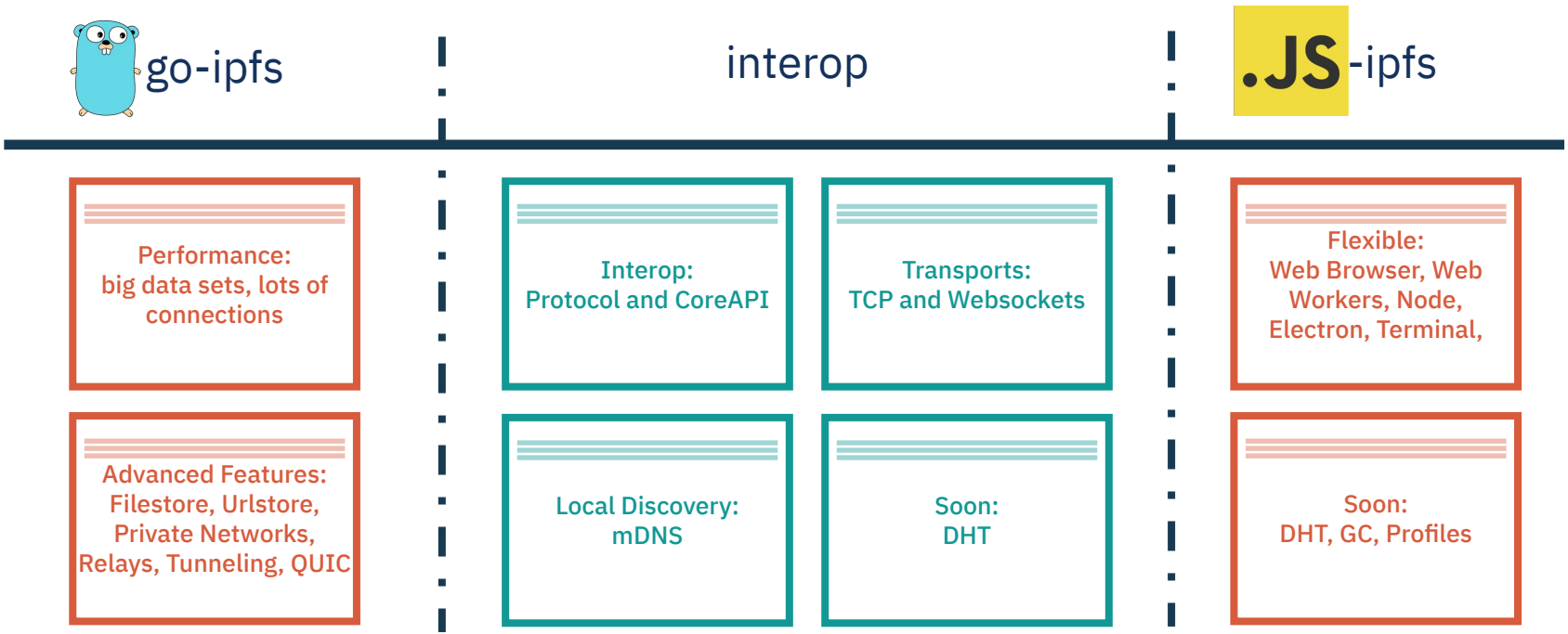
To understand limitations in browsers,
learn about libp2p transports and discovery in **Core Course B**

Transports in js-ipfs & go-ipfs

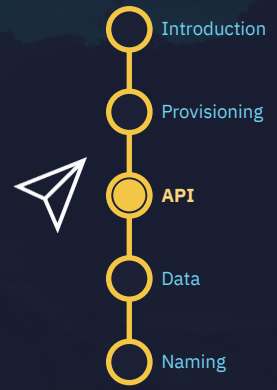


GO- vs JS-

What are the differences?



APIs



IPFS CLI API

docs.ipfs.io/reference/api/cli

$ ipfs --help

docs.ipfs.io/reference/api/cli

```
USAGE
  ipfs - Global p2p merkle-dag filesystem.

SYNOPSIS
  ipfs [--config=<config> | -c] [--debug=<debug> | -D] [--help=<help>] [-h=<h>] [--local=<local> | -L]
[--api=<api>] <command> ...

OPTIONS

  -c,              --config   string - Path to the configuration file to use.
  -D,              --debug     bool   - Operate in debug mode.
  --help                       bool   - Show the full command help text.
  -h                           bool   - Show a short version of the command help text.
  -L,              --local     bool   - Run the command locally, instead of using the daemon.
  --api                        string - Use a specific API instance (defaults to /ip4/127.0.0.1/tcp/5001).
  --enc,           --encoding string - The encoding type the output should be encoded with (json, xml, or text).
Default: text.
  --stream-channels            bool   - Stream channel output.
  --timeout                    string - set a global timeout on the command.

SUBCOMMANDS
  BASIC COMMANDS
      init        Initialize ipfs local configuration
      add <path>  Add a file to IPFS
      cat <ref>   Show IPFS object data
      get <ref>   Download IPFS objects
      ls <ref>    List links from an object
      refs <ref>  List hashes of links from an object
```

IPFS HTTP API

docs.ipfs.io/reference/api/http

$ ipfs daemon

```
Initializing daemon...
go-ipfs version: 0.4.21-
Repo version: 7
System version: amd64/linux
Golang version: go1.12.5
Swarm listening on /ip4/127.0.0.1/tcp/4001
Swarm listening on /ip4/172.17.0.1/tcp/4001
Swarm listening on /ip4/192.168.0.16/tcp/4001
Swarm listening on /p2p-circuit
Swarm announcing /ip4/127.0.0.1/tcp/4001
Swarm announcing /ip4/172.17.0.1/tcp/4001
Swarm announcing /ip4/192.168.0.16/tcp/4001
Swarm announcing /ip6/::1/tcp/4001
API server listening on /ip4/127.0.0.1/tcp/5001
WebUI: http://0.0.0.0:5001/webui
Gateway (readonly) server listening on /ip4/127.0.0.1/tcp/8080
Daemon is ready
```

API port

Gateway port

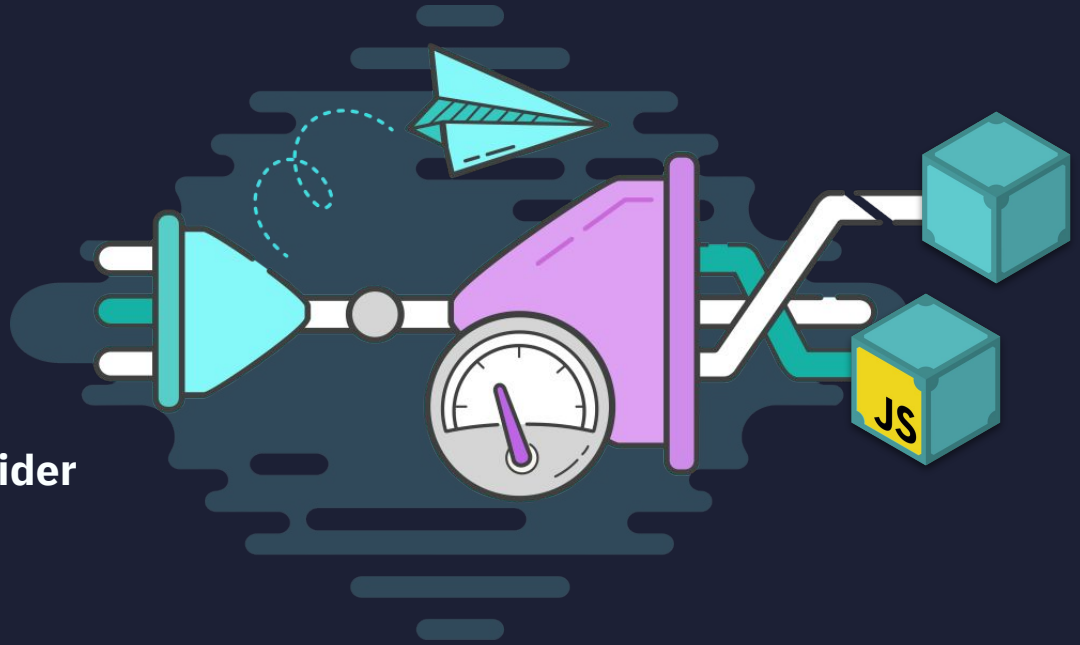
```
$ ipfs id

$ ipfs --api /ip4/127.0.0.1/tcp/5001 id

$ curl http://127.0.0.1:5001/api/v0/id
```

docs.ipfs.io/reference/api/http

Look for **Poster Session** about **IPFS HTTP API**

API Fallback

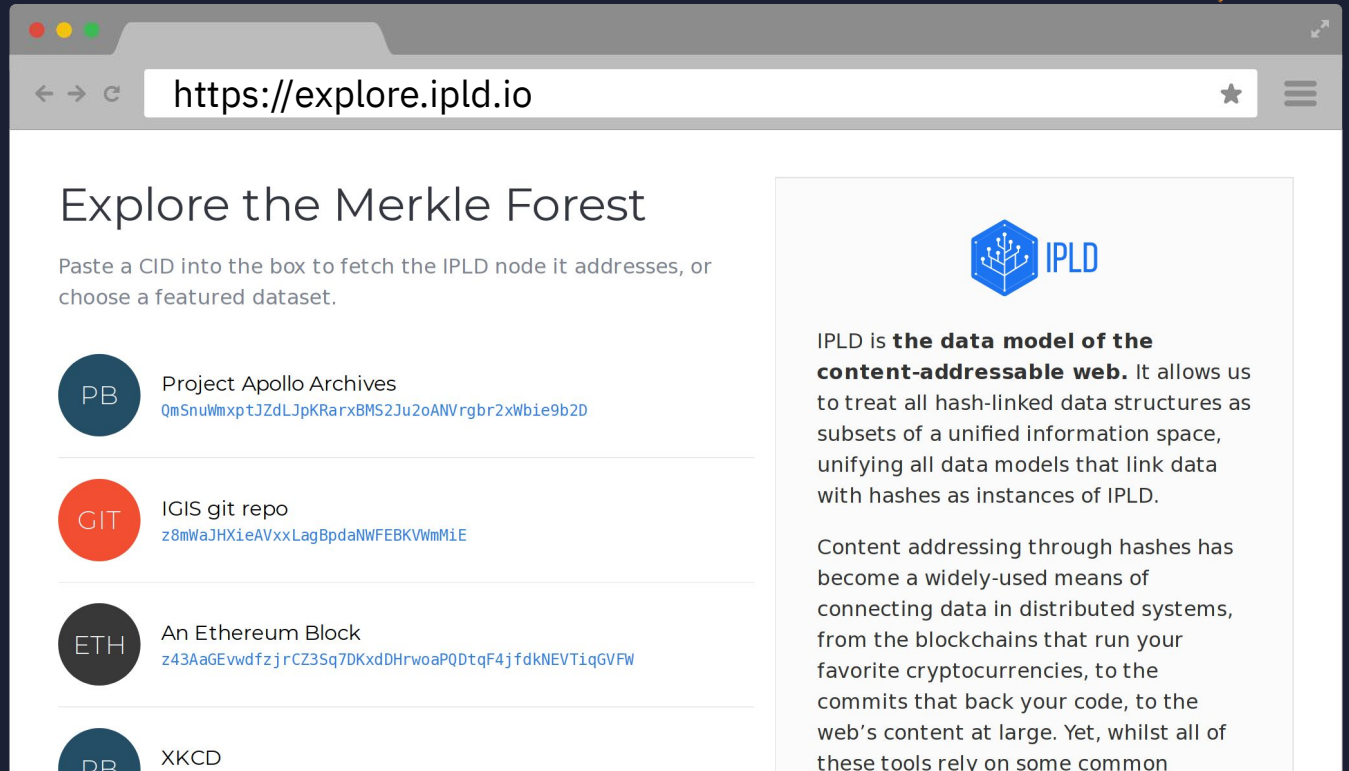
Support **more than one API Provider**



Fallback example:
IPLD Explorer

Open the console to see how the app is looking for the best API

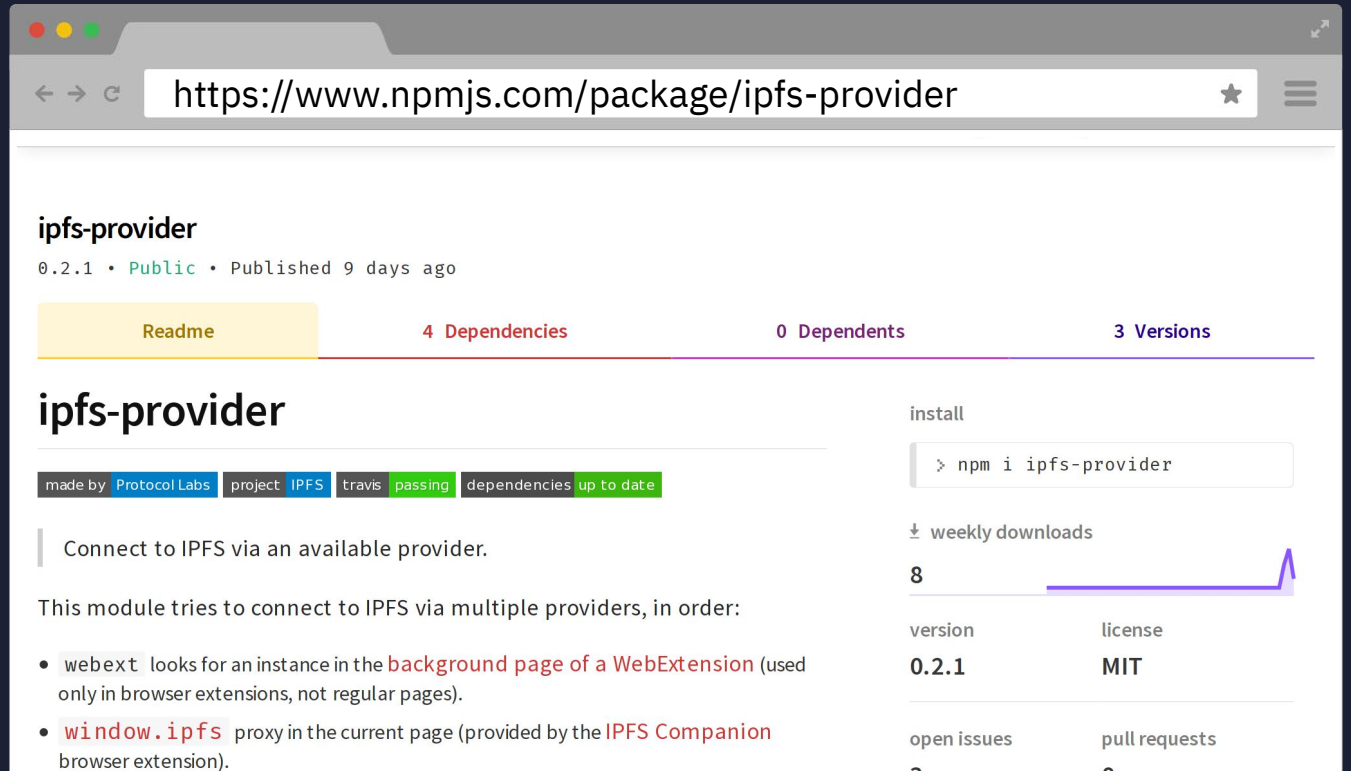
- Application does not care about details of the node, just needs to get the data
- Tries to use API of existing local node via js-ipfs-http-client
- Falls back to spawning embedded js-ipfs



New library:
ipfs-provider

```
$ npm install ipfs-provider
```

- Framework-agnostic
- Customizable fallback
- Extracted from our internal web apps
- Available on a growing number of providers



Demo App

Try on your own!

GET THE APP TEMPLATE CODE

bit.ly/2FCAcWp

Work with those at your table
to complete the code challenges

Coding Challenge #1

connect to the API with js-ipfs-http-client

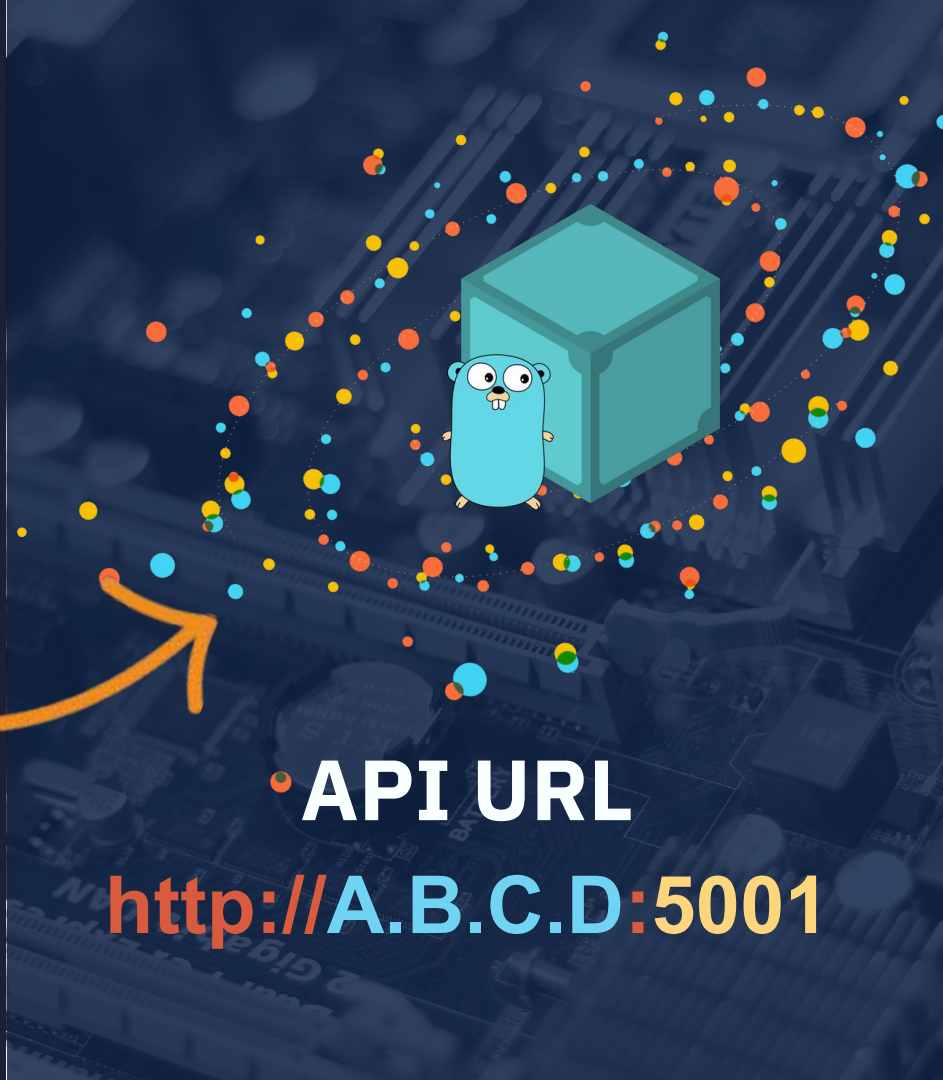
Coding Challenge #1:

Connect to a remote HTTP API

Resources:

docs.ipfs.io/reference/api/http

github.com/ipfs/js-ipfs-http-client

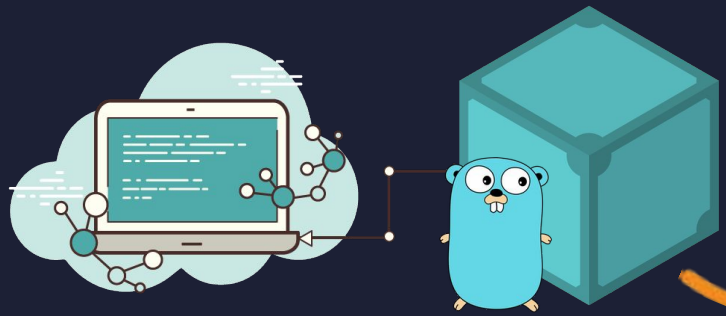


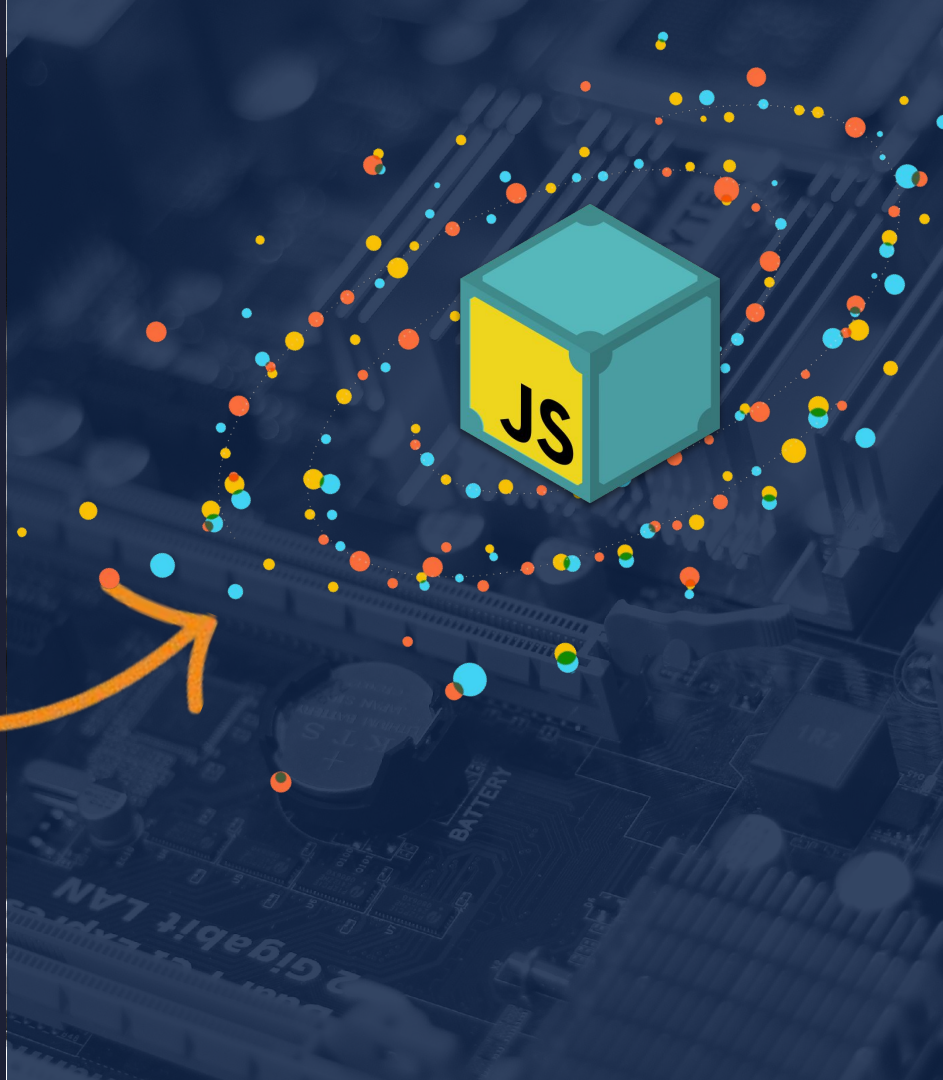
Coding Challenge #2

run js-ipfs in the browser

Coding Challenge #2:

Replace HTTP Client with Embedded JS IPFS



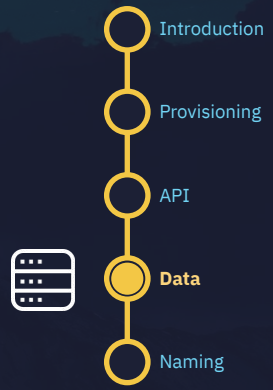


Resources:

github.com/ipfs/js-ipfs#api

github.com/ipfs/js-ipfs#use-in-the-browser

Working with data



Know your APIs:

Use the best API for your data type

Regular files

- `ipfs add`
- `ipfs cat`

Course A: How IPFS deals with Files
Course D: The lifecycle of data in IPFS

Complex data structures

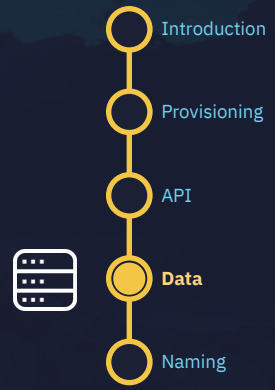
- ipfs dag put
- ipfs dag get

IPLD.io

Posters: IPLD Resolver, IPLD Selectors
Deep Dive: Cross-protocol DAG traversal

Adding files

`ipfs add`



Adding files:

IPFS ADD in the command line

```
$ ipfs add file.jpg
added QmbWqxBEKC3P8tqsKc98xmWNzrzDtRLMiMPL8wBuTGsMnR file.jpg
```

```
$ curl -F file=@file.jpg "http://127.0.0.1:5001/api/v0/add"
{
 "Name":"file.jpg",
 "Hash":"QmbWqxBEKC3P8tqsKc98xmWNzrzDtRLMiMPL8wBuTGsMnR",
 "Size":"119776"
}
```

API port

docs.ipfs.io/reference/api

Coding Challenge #3

adding a file with js-ipfs

Coding Challenge #3:

Add an avatar image, get a CID

```
> const result = await ipfs.add(file)
> result
```

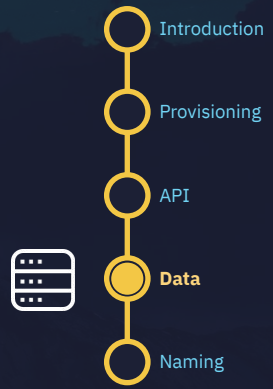
```
[{
 "path":"file.jpg",
 "hash":"QmbWqxBEKC3P8tqsKc98xmWNzrzDtRLMiMPL8wBuTGsMnR",
 "size":"119776"
}]
```

Relevant JS API docs:

github.com/ipfs/js-ipfs#files

Reading files

`ipfs cat`



Reading files:

IPFS CAT in the command line

```
$ ipfs cat QmCID > file.jpg

$ curl "http://{IP}:5001/api/v0/cat?arg=QmCID" > file.jpg
```

API port

$ ipfs daemon

```
Initializing daemon...
go-ipfs version: 0.4.21-
Repo version: 7
System version: amd64/linux
Golang version: go1.12.5
Swarm listening on /ip4/127.0.0.1/tcp/4001
Swarm listening on /ip4/172.17.0.1/tcp/4001
Swarm listening on /ip4/192.168.0.16/tcp/4001
Swarm listening on /p2p-circuit
Swarm announcing /ip4/127.0.0.1/tcp/4001
Swarm announcing /ip4/172.17.0.1/tcp/4001
Swarm announcing /ip4/192.168.0.16/tcp/4001
Swarm announcing /ip6/::1/tcp/4001
API server listening on /ip4/127.0.0.1/tcp/5001
WebUI: http://0.0.0.0:5001/webui
Gateway (readonly) server listening on /ip4/127.0.0.1/tcp/8080
Daemon is ready
```

API port

Gateway port

Reading files:

via the HTTP Gateway

The HTTP Gateway works just like **`ipfs cat`**,
but with the added benefits of HTTP Caching,
directory listing, path addressing:

```
$ curl "http://{IP}:8080/ipfs/QmCID" > file.jpg
```

Gateway port

Coding Challenge #4

reading files with js-ipfs

Coding Challenge #4:

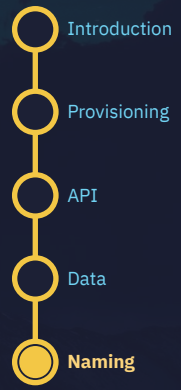
Fetch avatar image by CID

```
> const data = await ipfs.cat(QmCID)
```

Relevant JS API docs:

github.com/ipfs/js-ipfs#files

Tracking updates by naming things



Various ways of mapping:

static name → content path

Use your own:

? → /ipfs/{cid}

Built-in naming system:

IPNS: /ipns/{libp2p-key} → /ipfs/{cid}

Human-readable:

DNSLink: /ipns/{fqdn.tld} → /ipfs/{cid}
ENS: /ipns/{name}.eth.link → /ipfs/{cid}

IPNS 101:

IPNS: Naming with keys

Publishing API:

- `ipfs name publish {cid}` → `/ipns/{keyid}`
- `ipfs name resolve {keyid}` → `/ipfs/{cid}`

Multiple names:

- `ipfs key gen`
- `ipfs name publish --key {keyname}`

Poster Session & Deep Dives: IPNS, Revocation/Rotating of IPNS Keys, Fast IPNS, IPNS link rot

Coding Challenge #5

updating a mutable pointer
with IPNS in js-ipfs

Coding Challenge #5:

Publish data to IPNS

```
> await ipfs.name.publish(cid)
```

Relevant JS API docs:

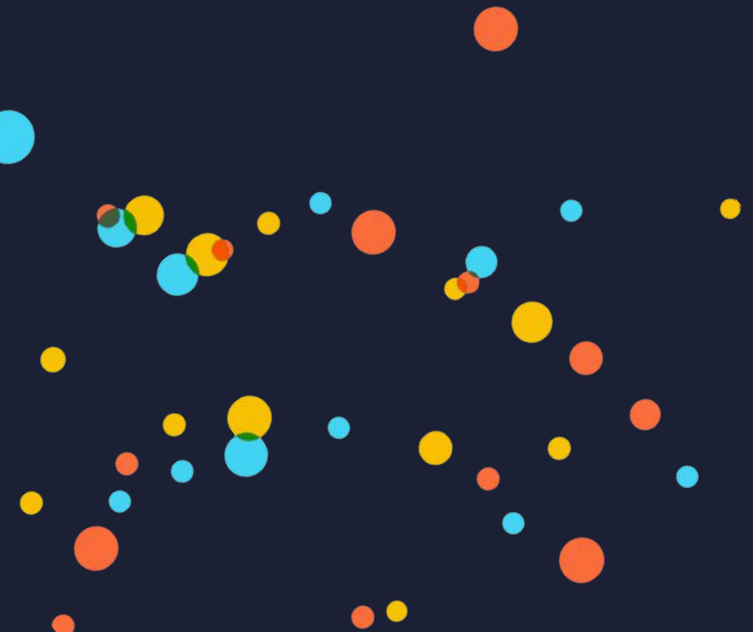
github.com/ipfs/js-ipfs#name

Done!

Let’s recap...

Let's recap:

What we've learned



- Using IPFS as a building block in your application
  - **High Level Patterns** (API+Service or Embedded)
  - Decision space: go-ipfs vs js-ipfs, local vs remote, API types
- Coding Challenges
  - Set up **js-ipfs-http-client** to connect to remote **go-ipfs**
  - Switch from js-ipfs-http-client to **embedded js-ipfs**
  - Work with **adding** and **getting** files
  - Publish **mutable pointer** to immutable content path

YOU HAVE COMPLETED

DEVELOPING APPS WITH IPFS APIs

CORE COURSE C

That's all, folks.

Thank you!

Where to go tomorrow

Elective E: Deploying IPFS Infrastructure

Elective B: IPFS Cluster

Elective D: Building DApps with Textile

Deep Dives: IPNS*, Fast IPNS, Revocation/Rotating of IPNS Keys

Please make room for the next group :^)