

UNIVERSAL HOSTLESS

SUBSTRATE

FOR A POST-SERVERLESS FUTURE 

**Calgary Edition** 🧑

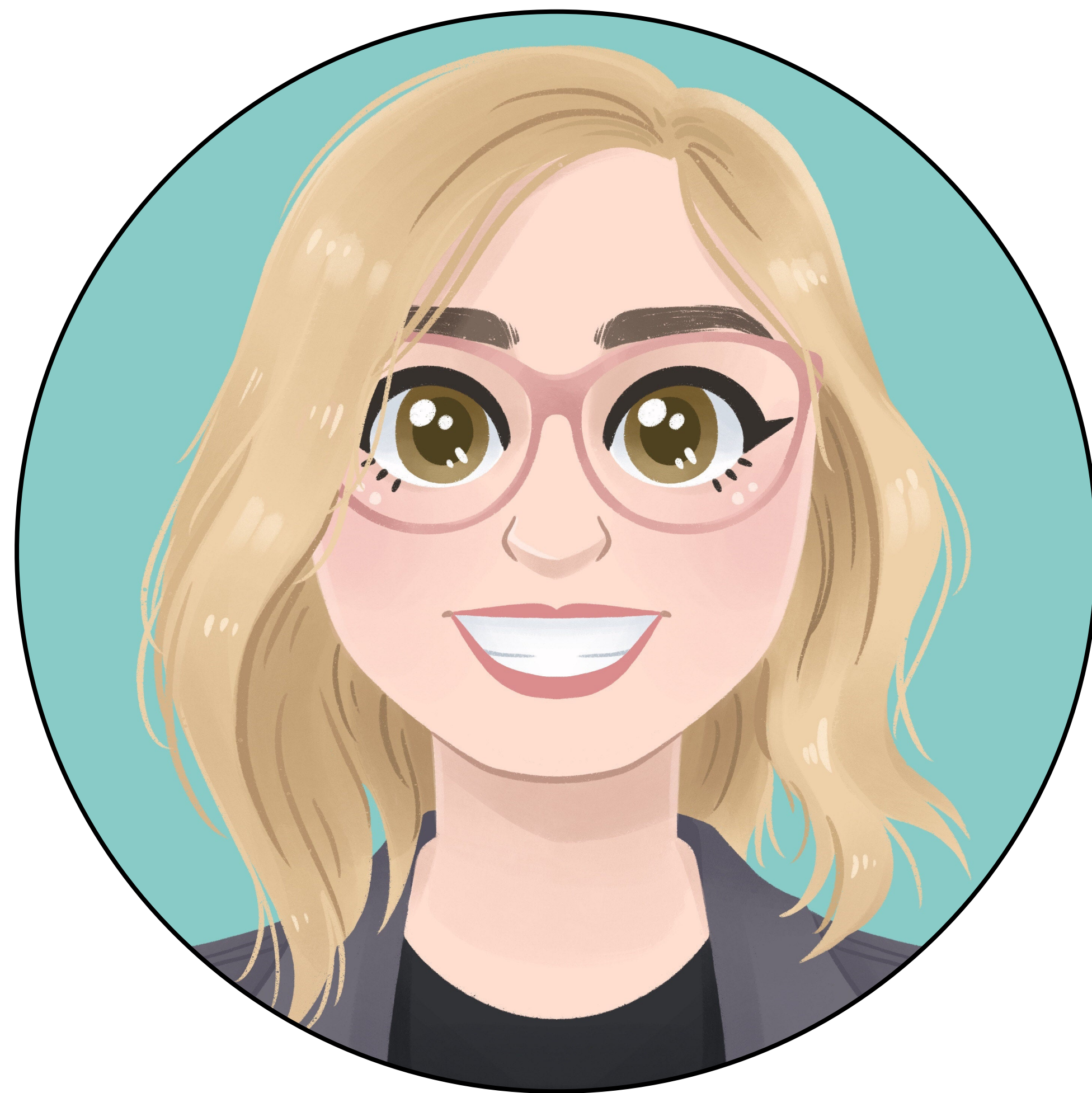
UNIVERSAL HOSTLESS ✨

SUBSTRATE 🌕

FOR A POST-SERVERLESS FUTURE 🚀

# A UNIVERSAL HOSTLESS SUBSTRATE

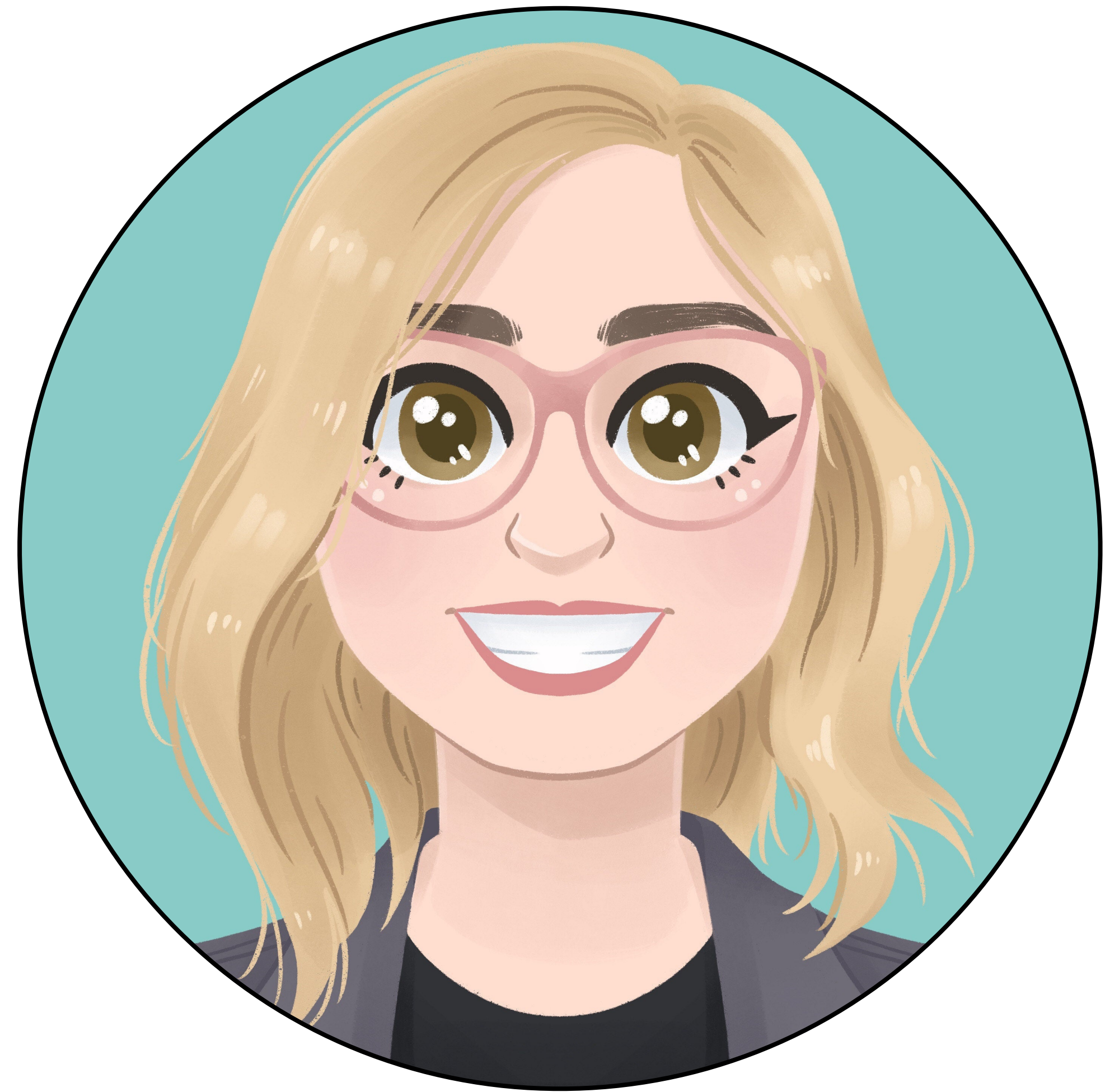
BROOKLYN ZELENKA, @expede



# A UNIVERSAL HOSTLESS SUBSTRATE

BROOKLYN ZELENKA, @expede

- Cofounder/CTO at Fission
  - <https://fission.codes>
- Originally from here!
- FP, PLT, VMs
- Previously an Ethereum Core Dev
  - EIPs 615, 902, 1066, 1444
  - ECIP 1050 🎉🎉🎉
- Lately lots of IPFS, Ed25519, and IndexedDB



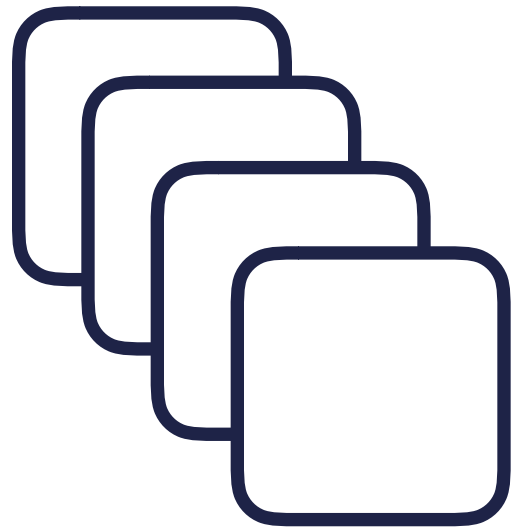
**A UNIVERSAL HOSTLESS SUBSTRATE**

PARADIGM WAVES

# A UNIVERSAL HOSTLESS SUBSTRATE

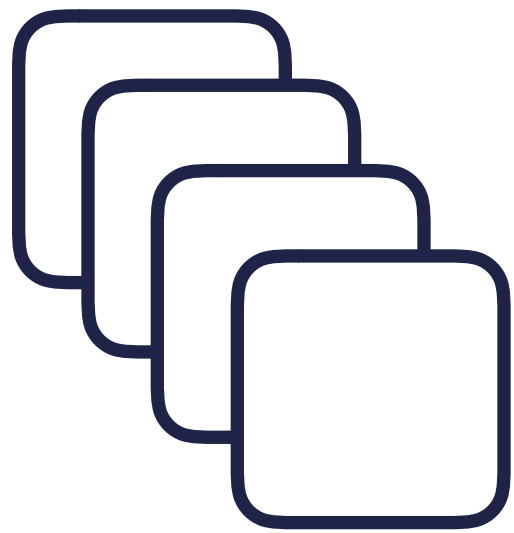
## PARADIGM WAVES

CONTAINERS



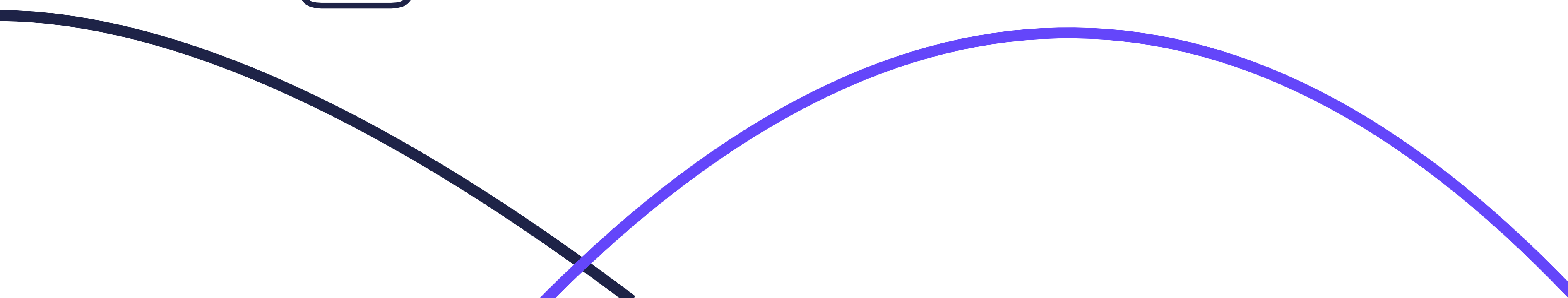
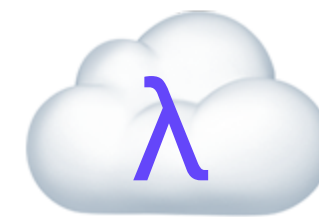
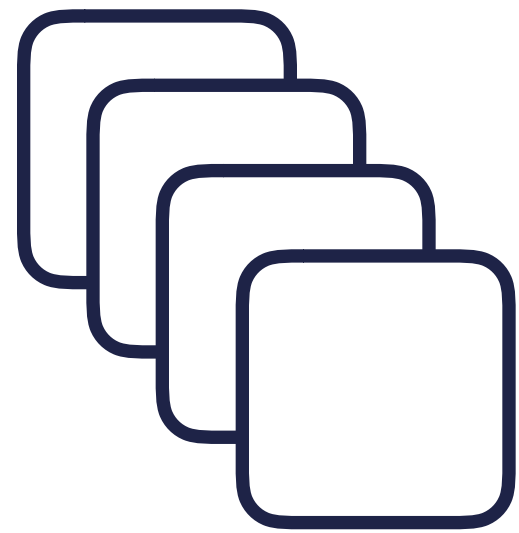
# A UNIVERSAL HOSTLESS SUBSTRATE PARADIGM WAVES

CONTAINERS



# A UNIVERSAL HOSTLESS SUBSTRATE

## PARADIGM WAVES





# A UNIVERSAL HOSTLESS SUBSTRATE

## PARADIGM WAVES



**A UNIVERSAL HOSTLESS SUBSTRATE**

NATIVE SDK FOR THE WEB

**A UNIVERSAL HOSTLESS SUBSTRATE**  
NATIVE SDK FOR THE WEB



# A UNIVERSAL HOSTLESS SUBSTRATE

## NATIVE SDK FOR THE WEB



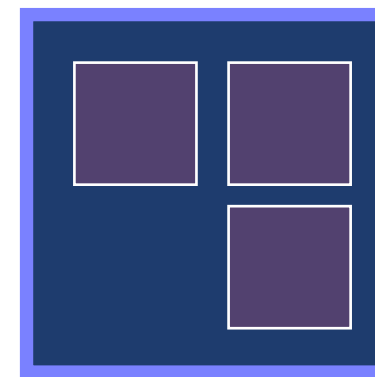
# A UNIVERSAL HOSTLESS SUBSTRATE

## NATIVE SDK FOR THE WEB



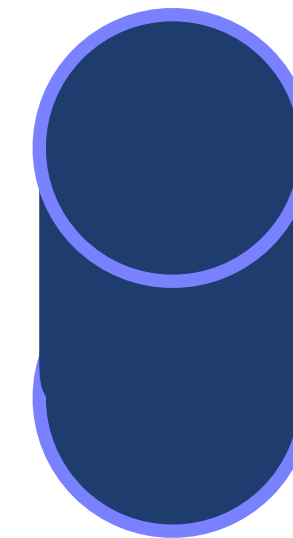
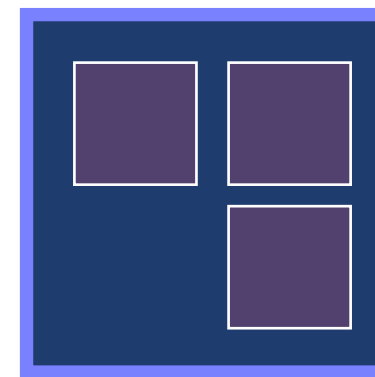
# A UNIVERSAL HOSTLESS SUBSTRATE

## NATIVE SDK FOR THE WEB



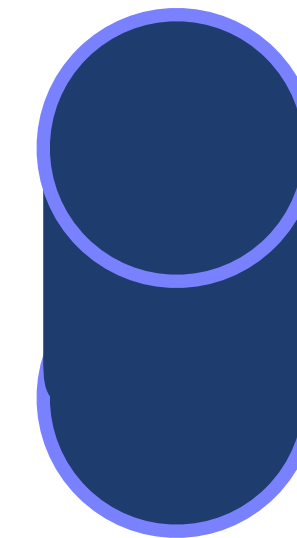
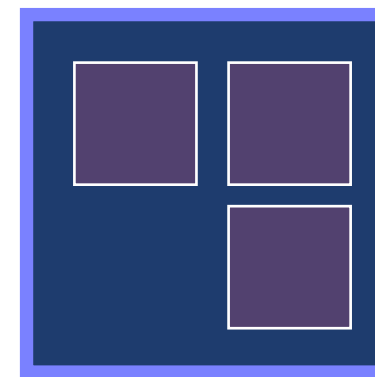
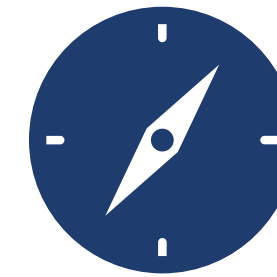
# A UNIVERSAL HOSTLESS SUBSTRATE

## NATIVE SDK FOR THE WEB



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A UNIVERSAL HOSTLESS SUBSTRATE

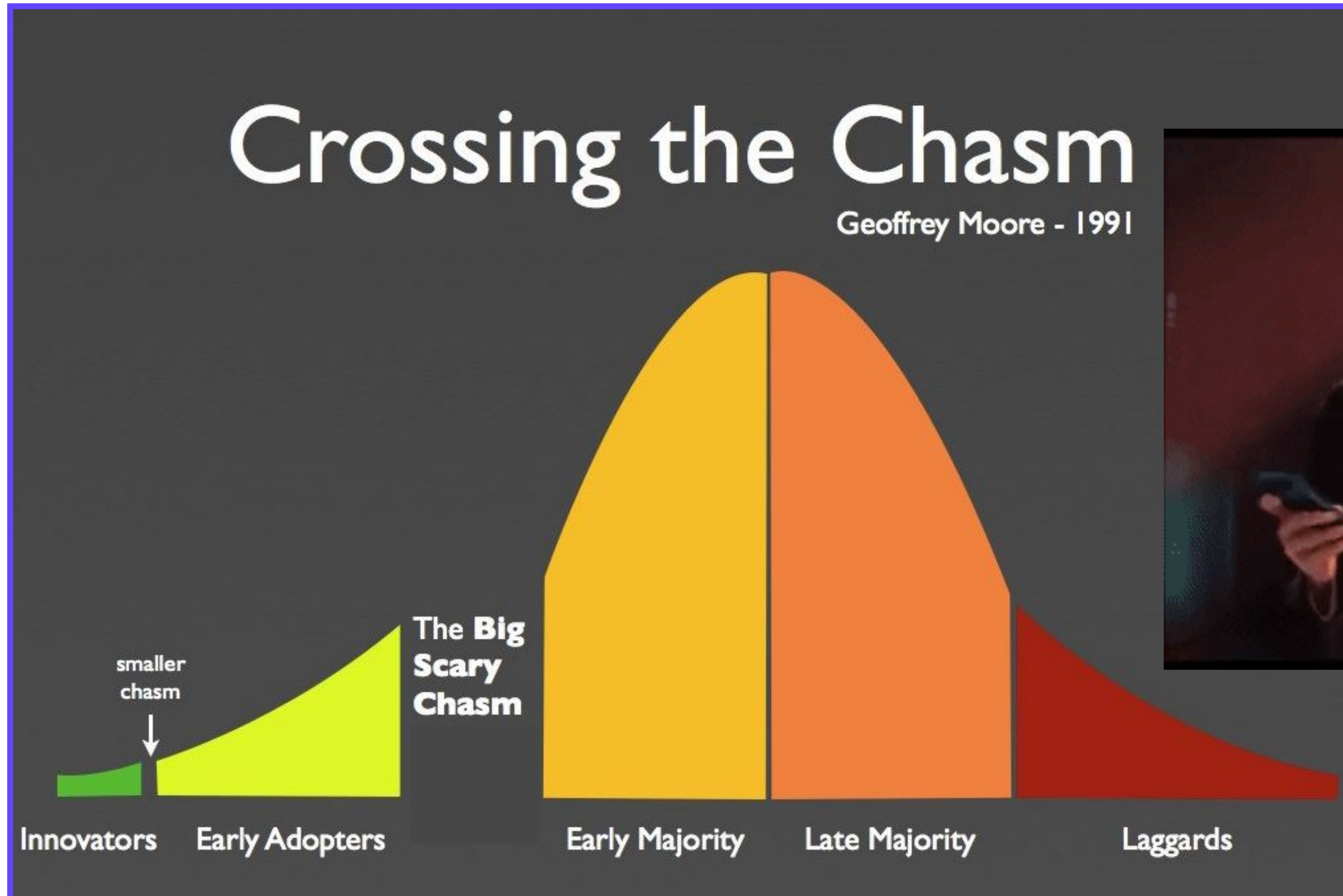
UPSHOT?

# A UNIVERSAL HOSTLESS SUBSTRATE

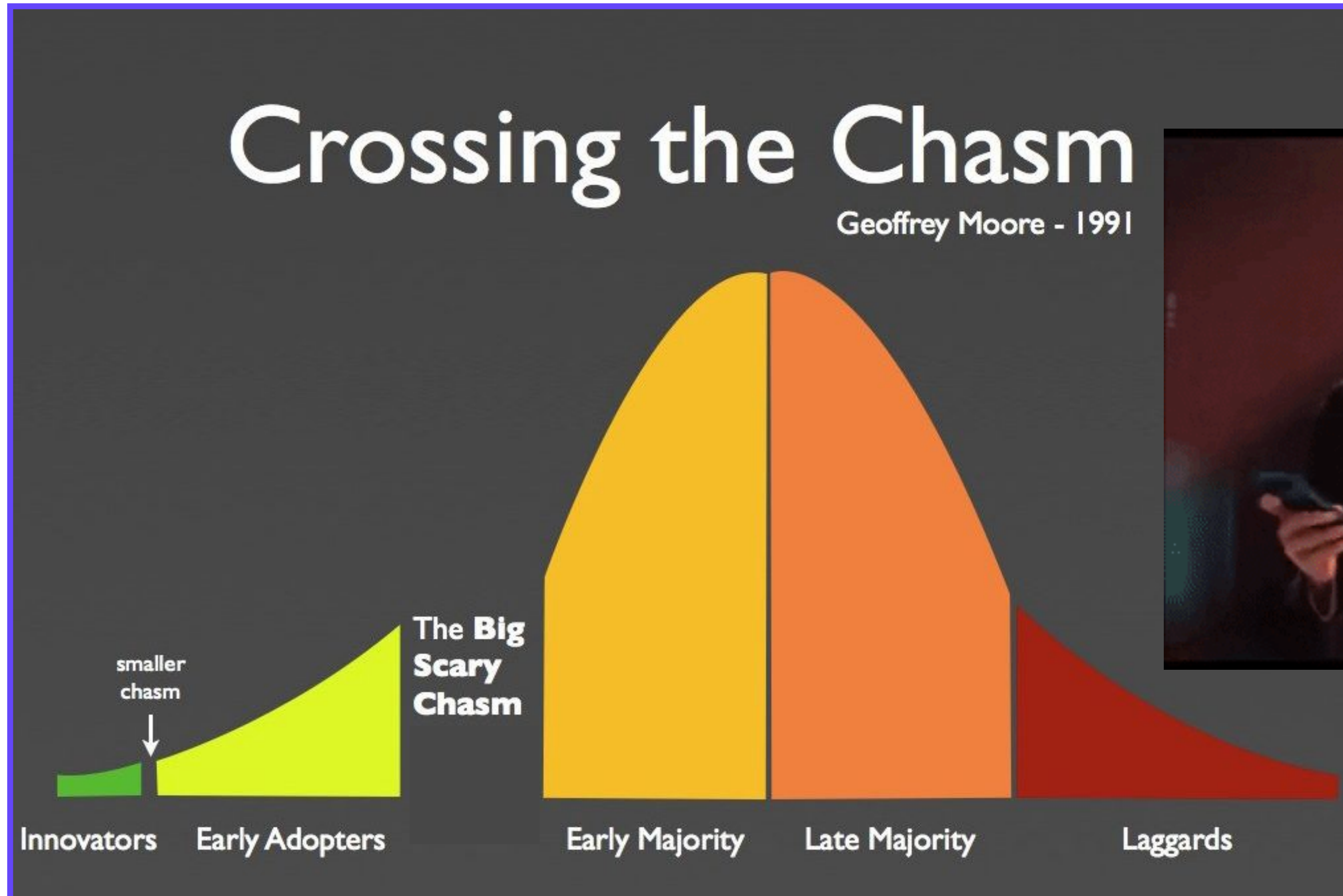
## UPSHOT?

- Go from zero to production *on a plane* ✈️
- Move data to compute and vice versa 🔄
- Logarithmic scaling 📈
- Serve areas that lack sufficient cloud hardware 🖥️
- *Anyone* can be a service provider (lower bar to entry) 👩 👨

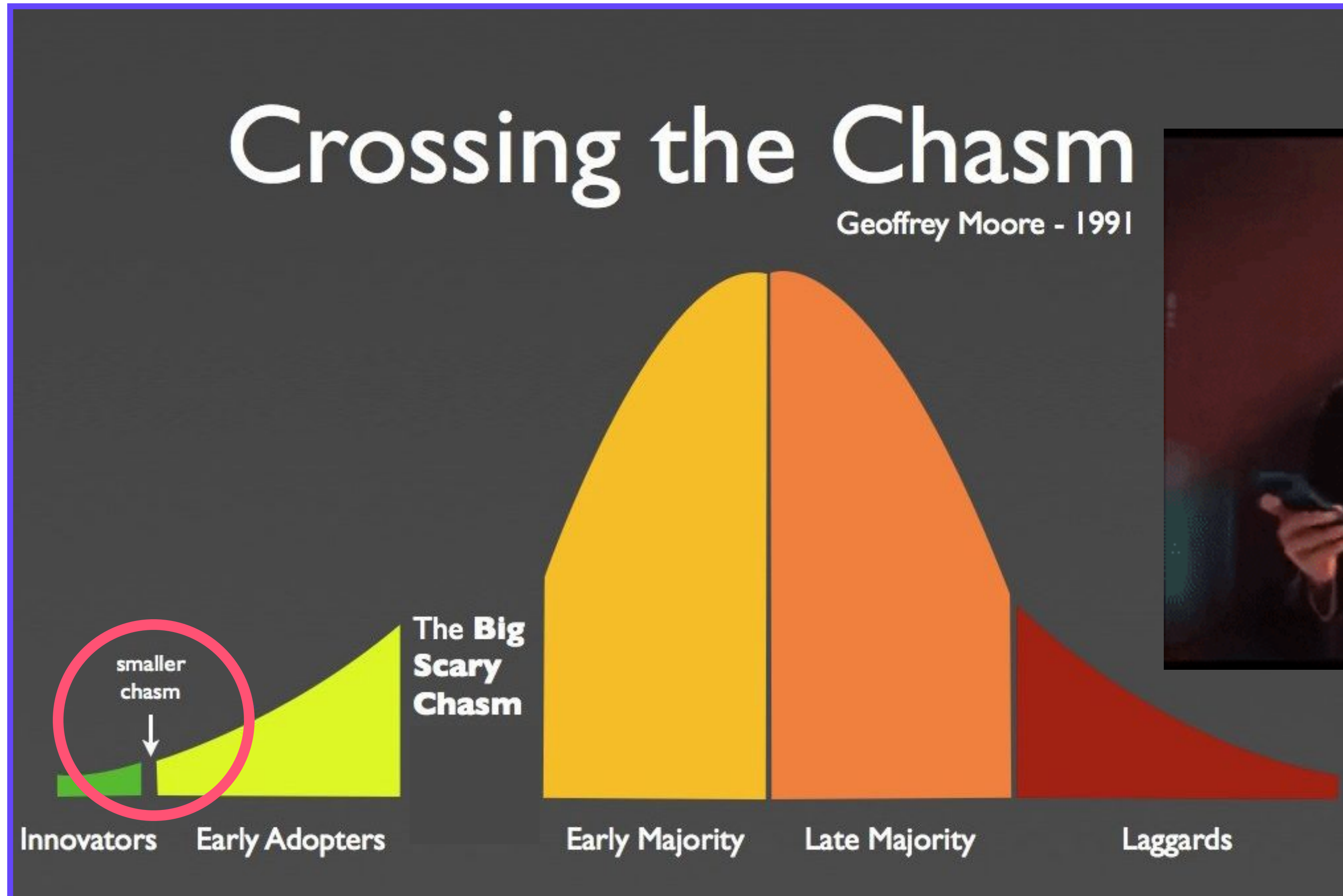
A UNIVERSAL HOSTLESS SUBSTRATE  
WHY NOT NOW?



A UNIVERSAL HOSTLESS SUBSTRATE  
WHY NOT NOW?



# A UNIVERSAL HOSTLESS SUBSTRATE WHY NOT NOW?



COMMONS INFRASTRUCTURE

# COMMONS INFRASTRUCTURE

 **A SUBSTRATE FOR EVERYONE** 

COMMONS INFRASTRUCTURE

OPEN SOURCE

Lots of people work on it, everybody benefits from it, and then people can build upon it (even in a revenue generating fashion)



TED LEUNG (2005)



# COMMONS INFRASTRUCTURE OPEN NETWORKS

Lots of people work on it, everybody benefits from it, people can build upon it (even in a revenue generating fashion), and it's "owned" by everyone.

By participating — even with competitive goals — you are cooperating by serving the content and running compute of others.



IPFS PRIMER

# IPFS PRIMER

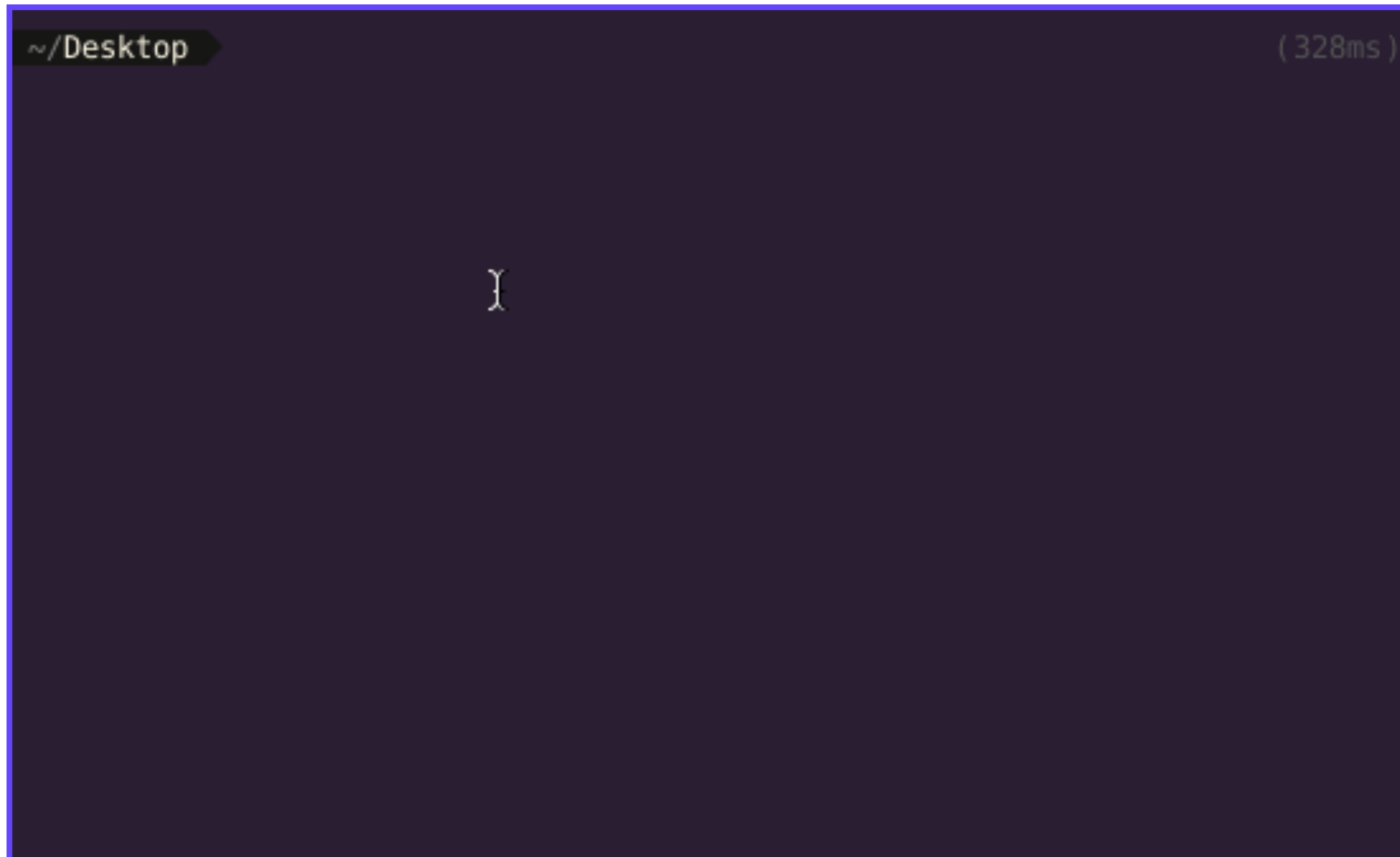


**MEET THE CONTENT-ADDRESSABLE WEB**



# IPFS PRIMER

## INTERPLANETARY FILE SYSTEM



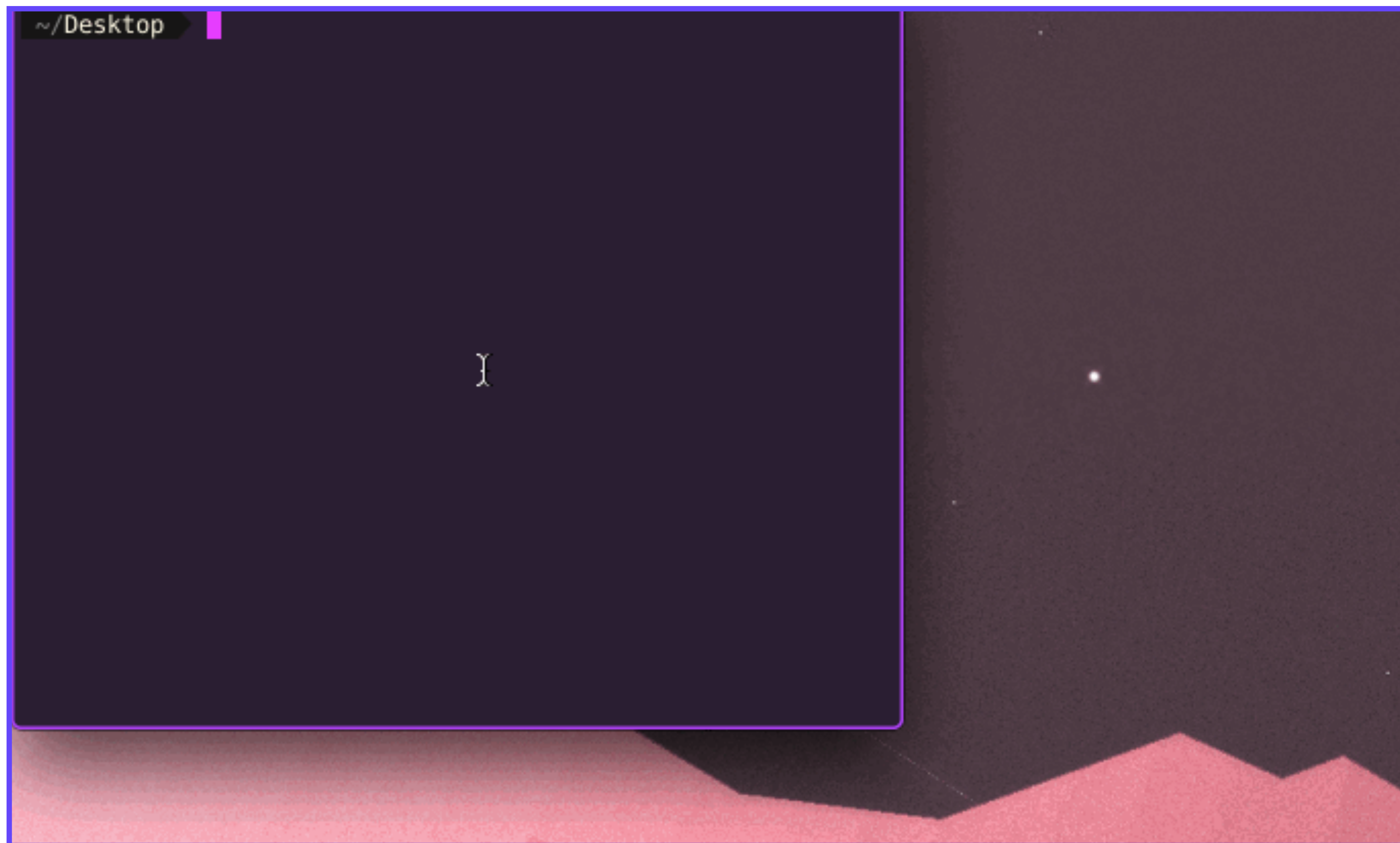
# IPFS PRIMER

## INTERPLANETARY FILE SYSTEM

```
~/Desktop (328ms)  
}
```

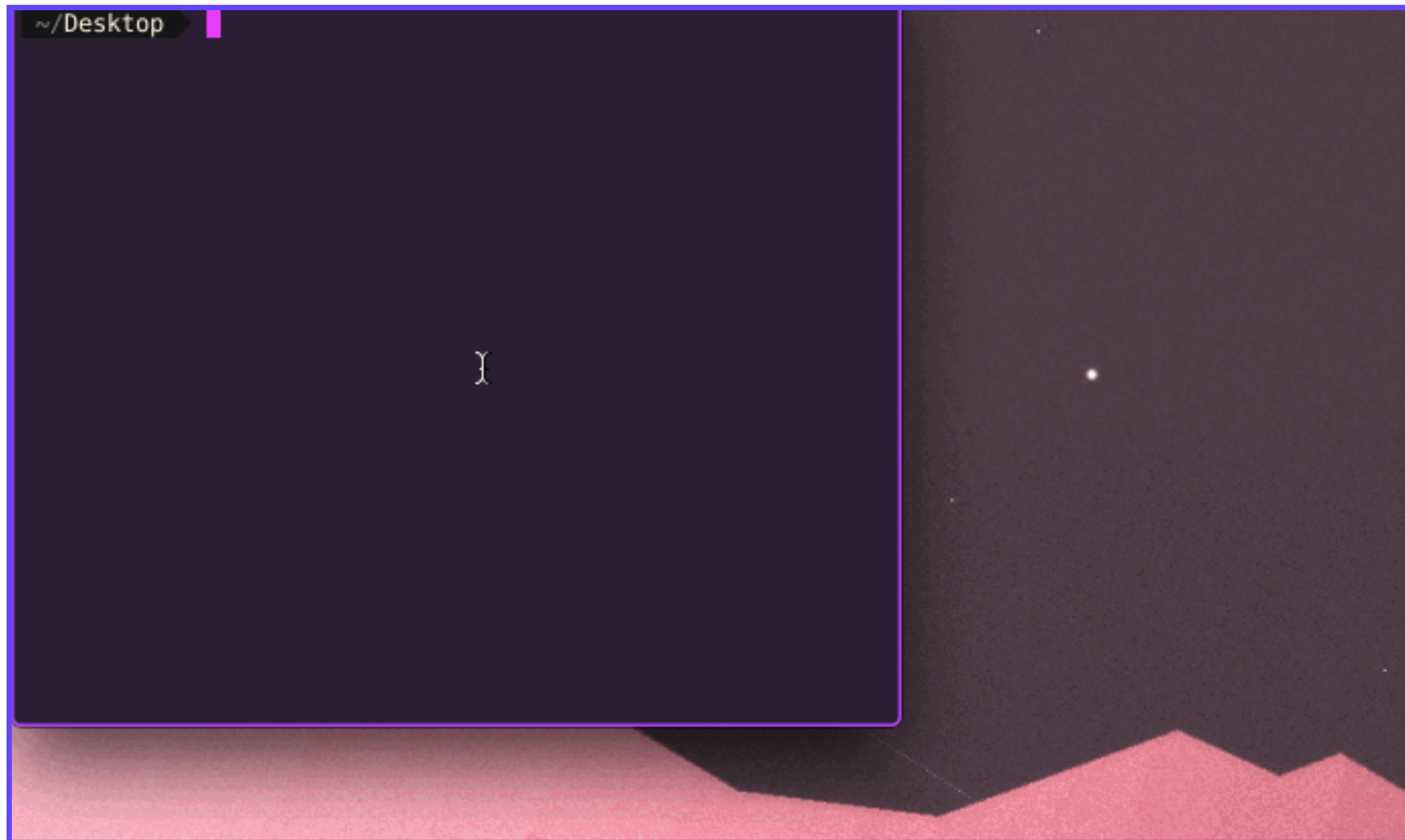
# IPFS PRIMER

## INTERPLANETARY FILE SYSTEM



# IPFS PRIMER

## INTERPLANETARY FILE SYSTEM



**IPFS PRIMER**

THE WEB TODAY



# IPFS PRIMER

## THE WEB TODAY

- Predominantly single-source (per file) server/client

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- Like a key/value store **{ip => {path => content}}**

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- Like a key/value store **{ip => {path => content}}**
- “Location addressing”
  - DNS maps names to IP addresses
  - Focused on the physical network

VIRTUAL ADDRESS

PHYSICAL LOCATION

# IPFS PRIMER

## THE WEB TODAY

- Predominantly single-source (per file) server/client
- Like a key/value store **{ip => {path => content}}**
- “Location addressing”
  - DNS maps names to IP addresses
  - Focused on the physical network
- Mutable addressing
  - `www.foo.com/baz` may be JSON today, but a video tomorrow
  - ...or altered content

VIRTUAL ADDRESS

PHYSICAL LOCATION

# IPFS PRIMER

## CONTENT ADDRESSING

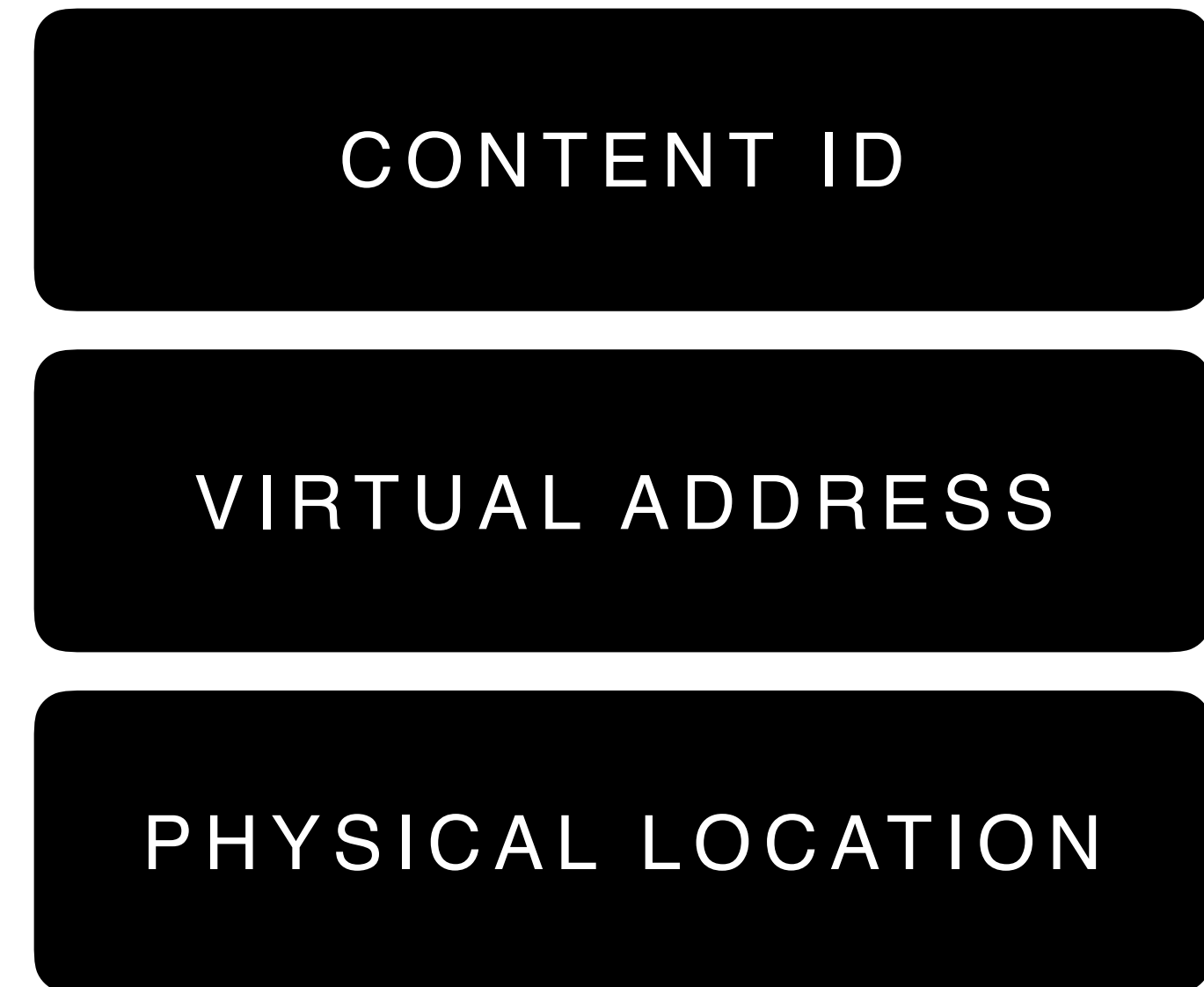
VIRTUAL ADDRESS

PHYSICAL LOCATION

# IPFS PRIMER

## CONTENT ADDRESSING

- A layer of abstraction above location



# IPFS PRIMER

## CONTENT ADDRESSING

- A layer of abstraction above location
- Like a key/value store **{hash(content) => content}**
  - Content hash AKA “content identifier” or CID
  - Special “universal” relationship to content

CONTENT ID

VIRTUAL ADDRESS

PHYSICAL LOCATION

# IPFS PRIMER

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- Like a key/value store **{hash(content) => content}**
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- Does not care where it lives

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## CONTENT ADDRESSING

- A layer of abstraction above location
- Like a key/value store **{hash(content) => content}**
  - Content hash AKA “content identifier” or CID
  - Special “universal” relationship to content
- Focused on *the data*
- Does not care where it lives
- Still have paths
  - Immutable DAG
  - Why no loops?

CONTENT ID

VIRTUAL ADDRESS

PHYSICAL LOCATION

**IPFS PRIMER**

LINKED DATA

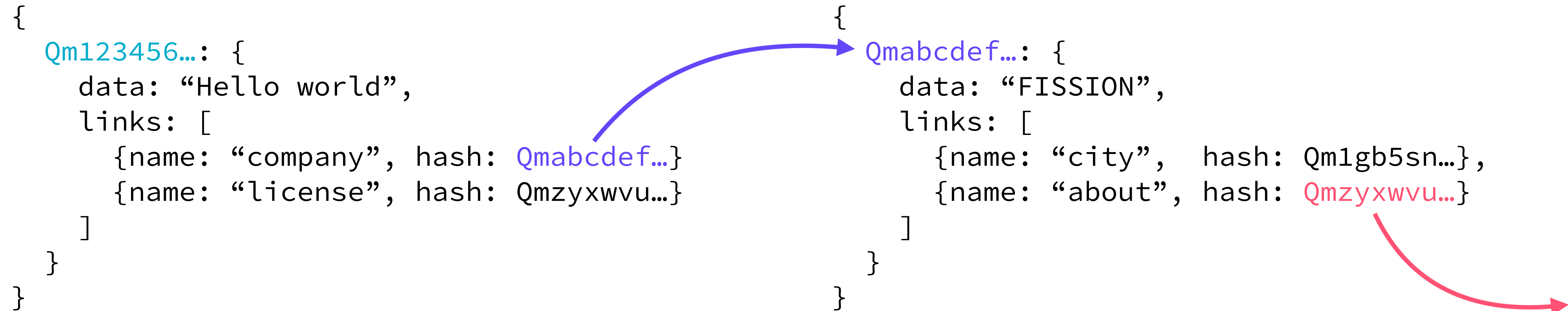
# IPFS PRIMER

## LINKED DATA

```
{
  Qm123456...: {
    data: "Hello world",
    links: [
      {name: "company", hash: Qmabcdef...}
      {name: "license", hash: Qmzyxwvu...}
    ]
  }
}
```

# IPFS PRIMER

## LINKED DATA




# IPFS PRIMER

## LINKED DATA


```
{  
  Qm123456...: {  
    data: "Hello world",  
    links: [  
      {name: "company", hash: Qmabcdef...}  
      {name: "license", hash: Qmzyxwvu...}  
    ]  
  }  
}
```

```
{  
  Qmabcdef...: {  
    data: "FISSION",  
    links: [  
      {name: "city", hash: Qm1gb5sn...},  
      {name: "about", hash: Qmzyxwvu...}  
    ]  
  }  
}
```



```
ipfs cat /ipfs/Qm123456.../company/about/founder  
=> "Brooke"
```

**IPFS PRIMER**

ROUTING & LOOKUP  

IPFS PRIMER

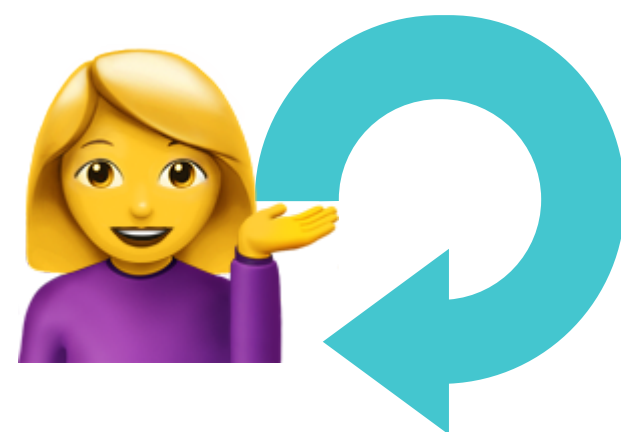
ROUTING & LOOKUP  





# IPFS PRIMER

ROUTING & LOOKUP  



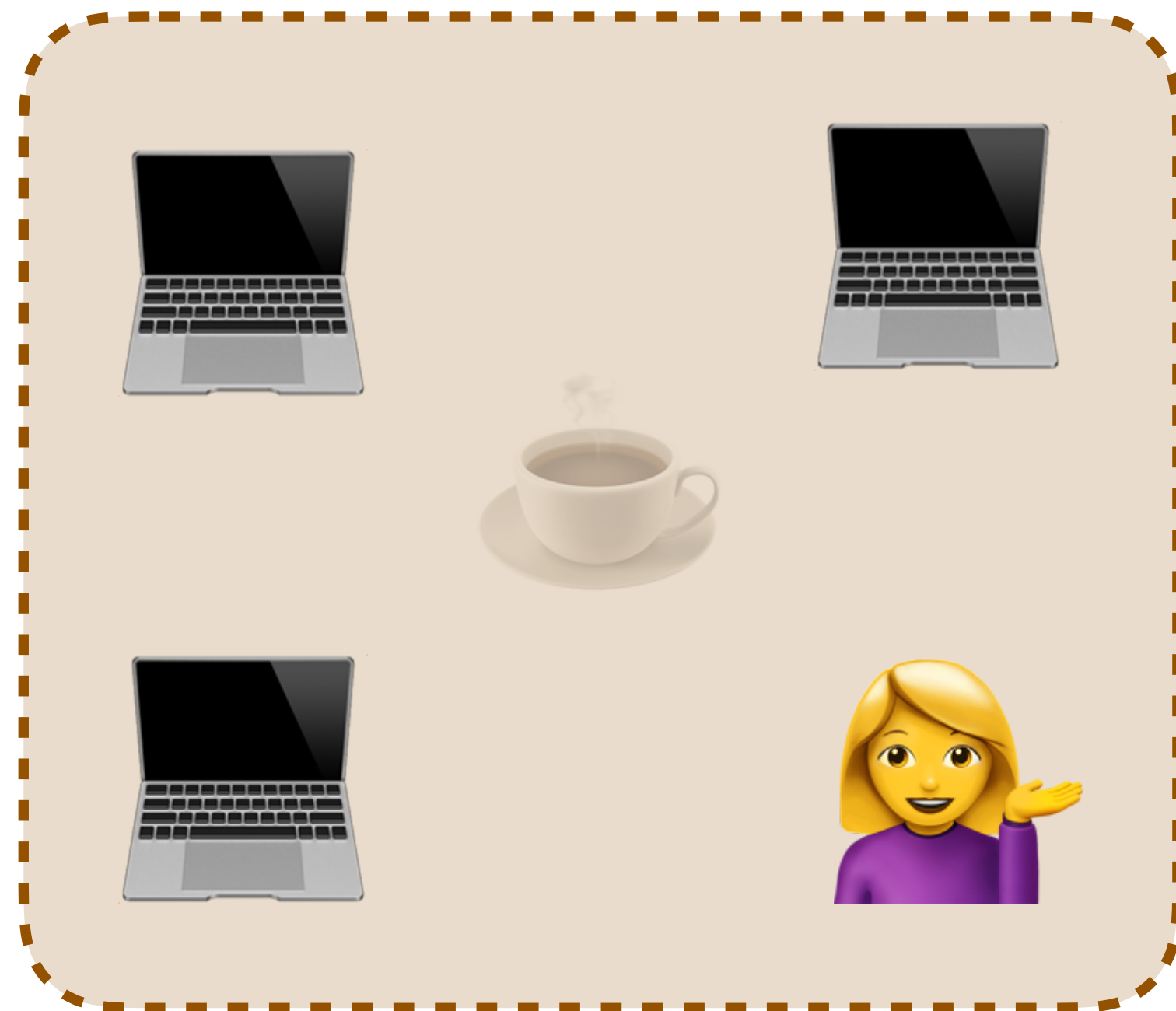
IPFS PRIMER

ROUTING & LOOKUP  



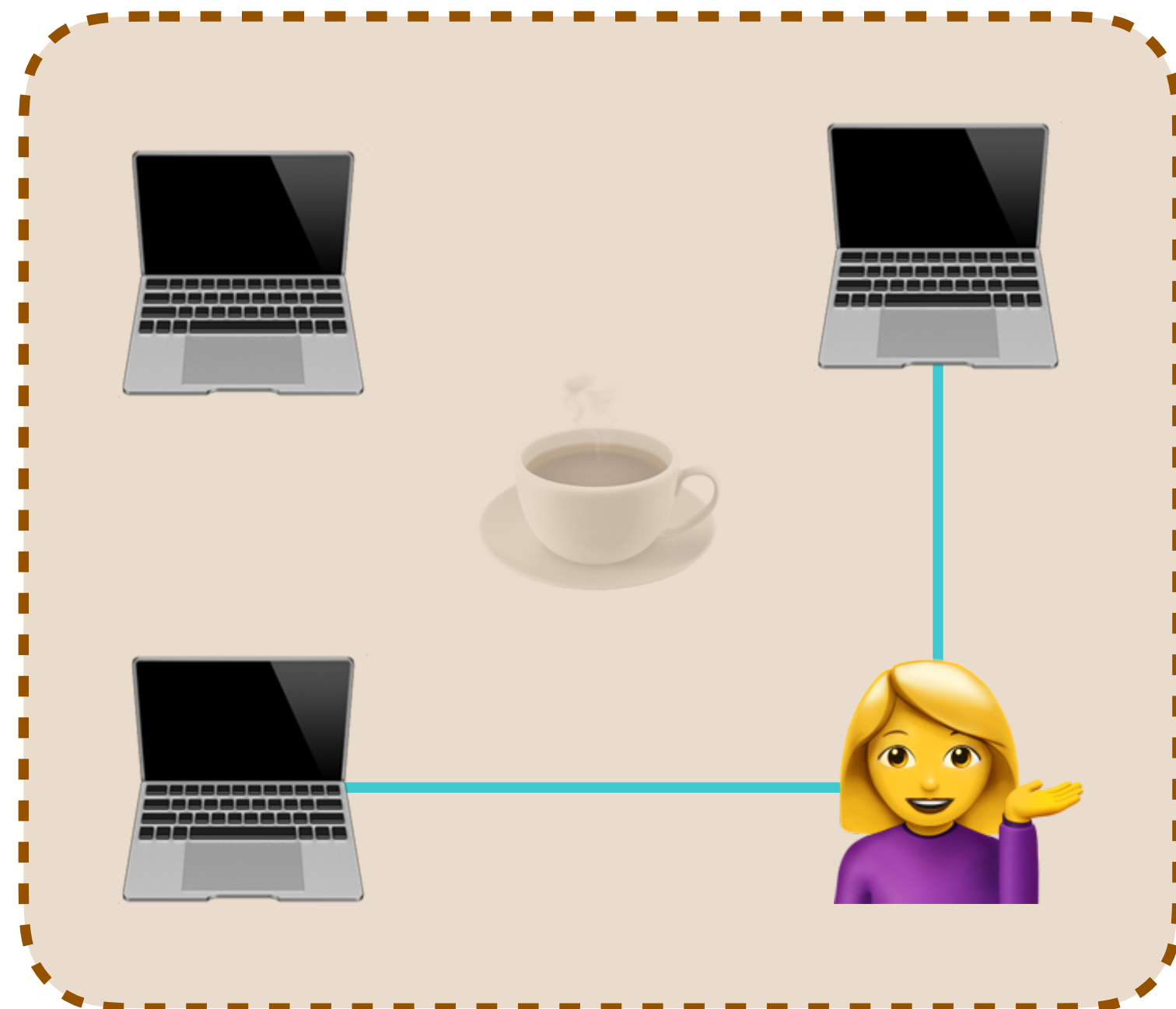
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## ROUTING & LOOKUP



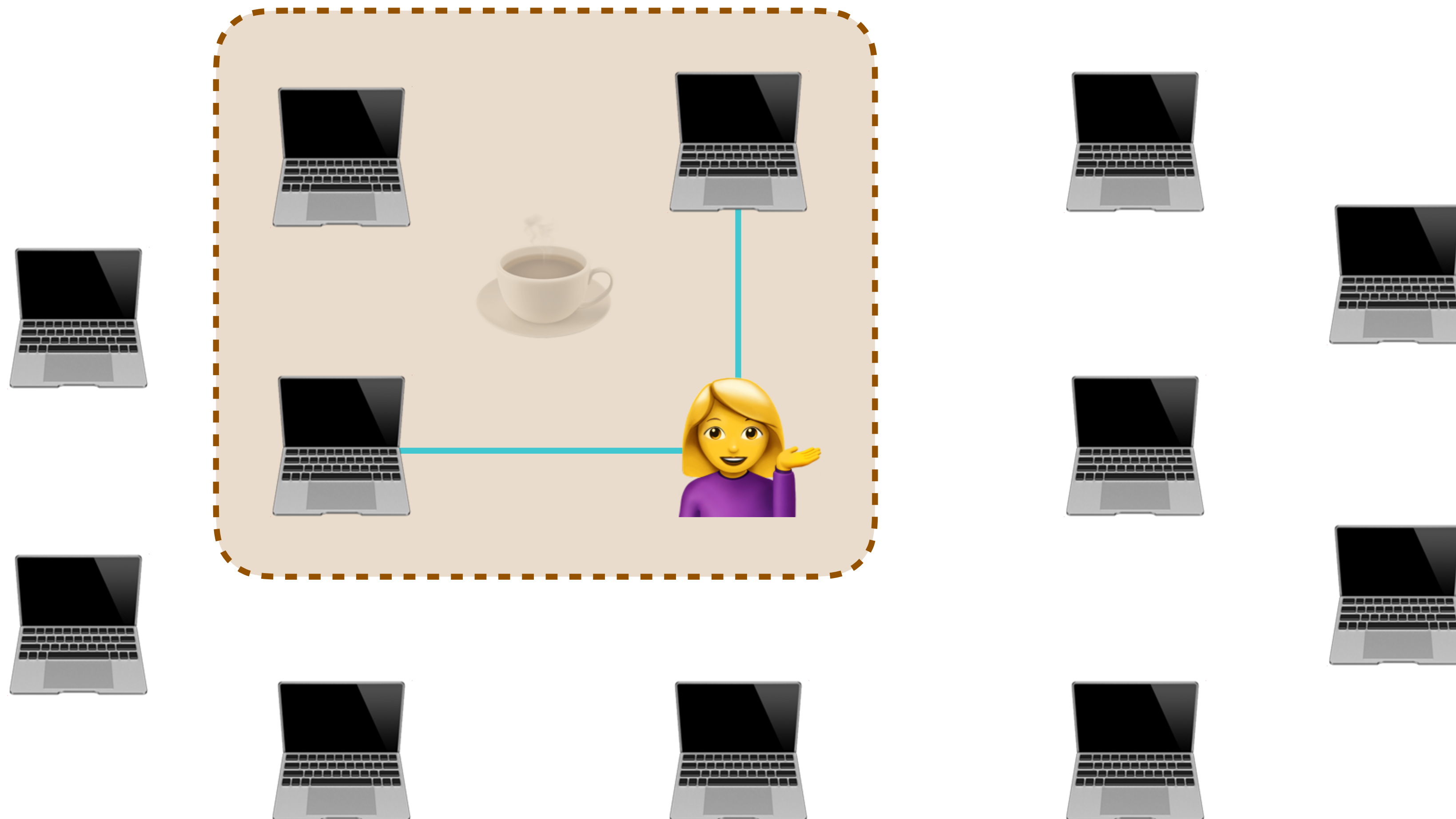
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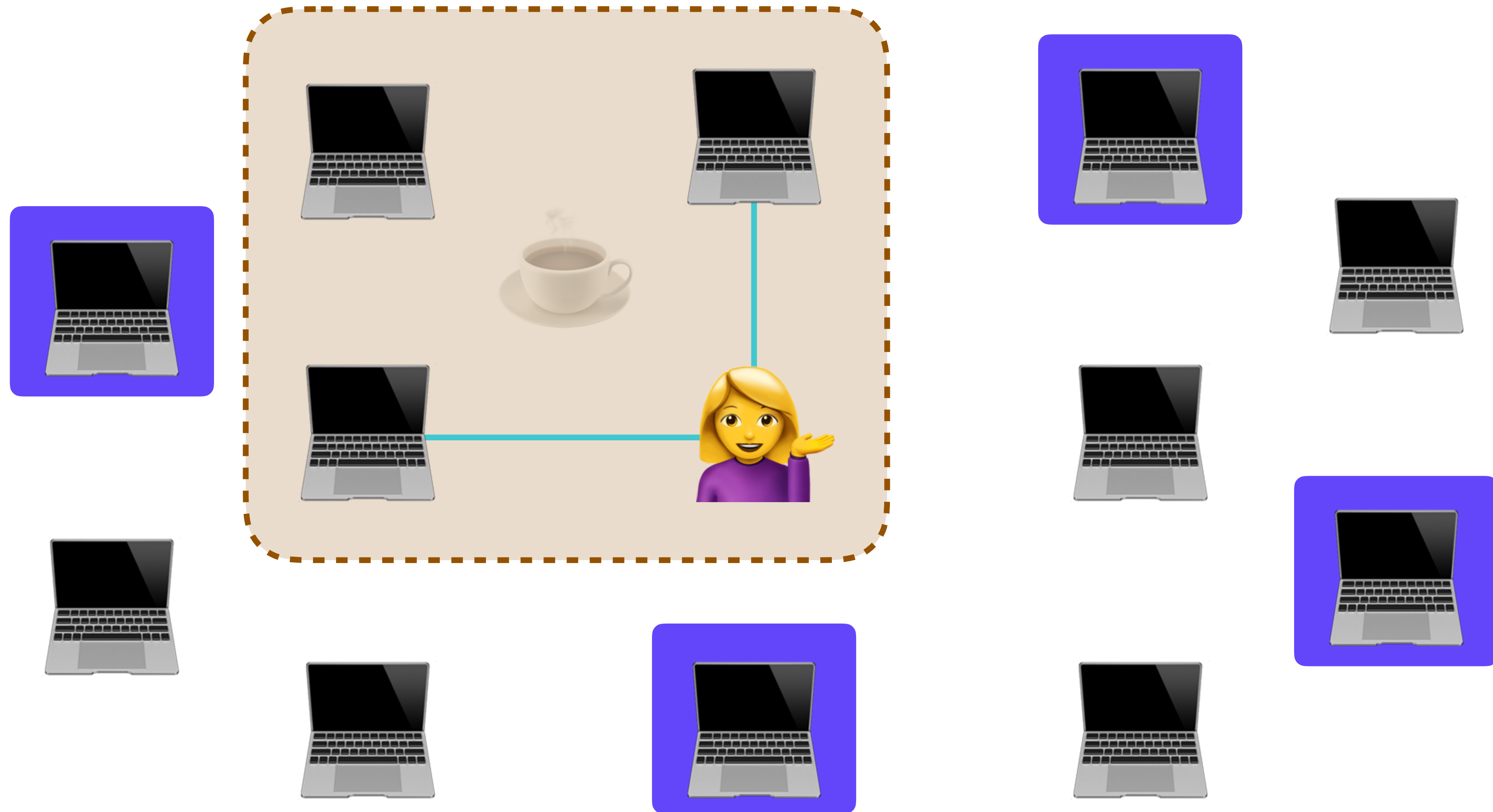
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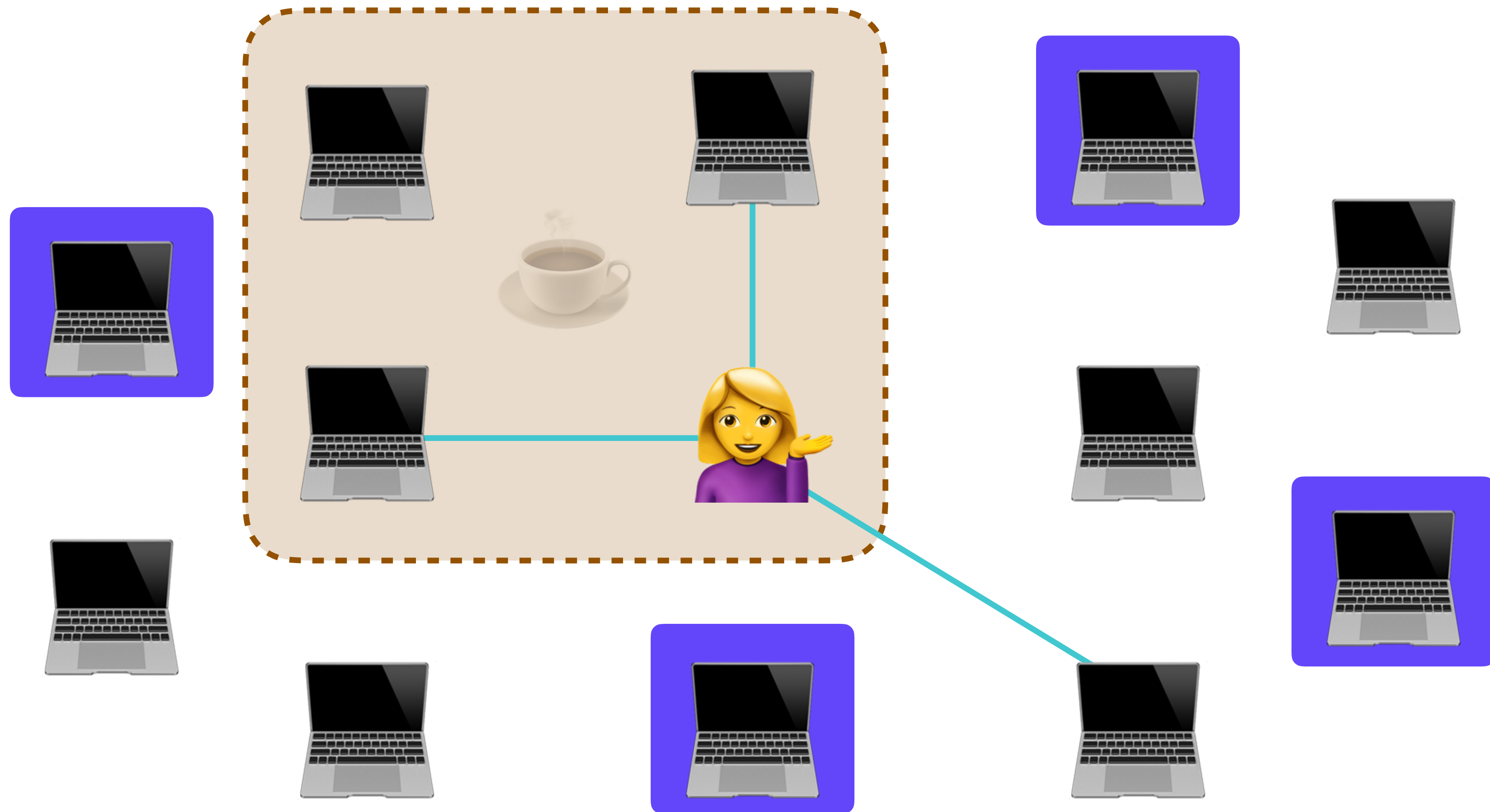
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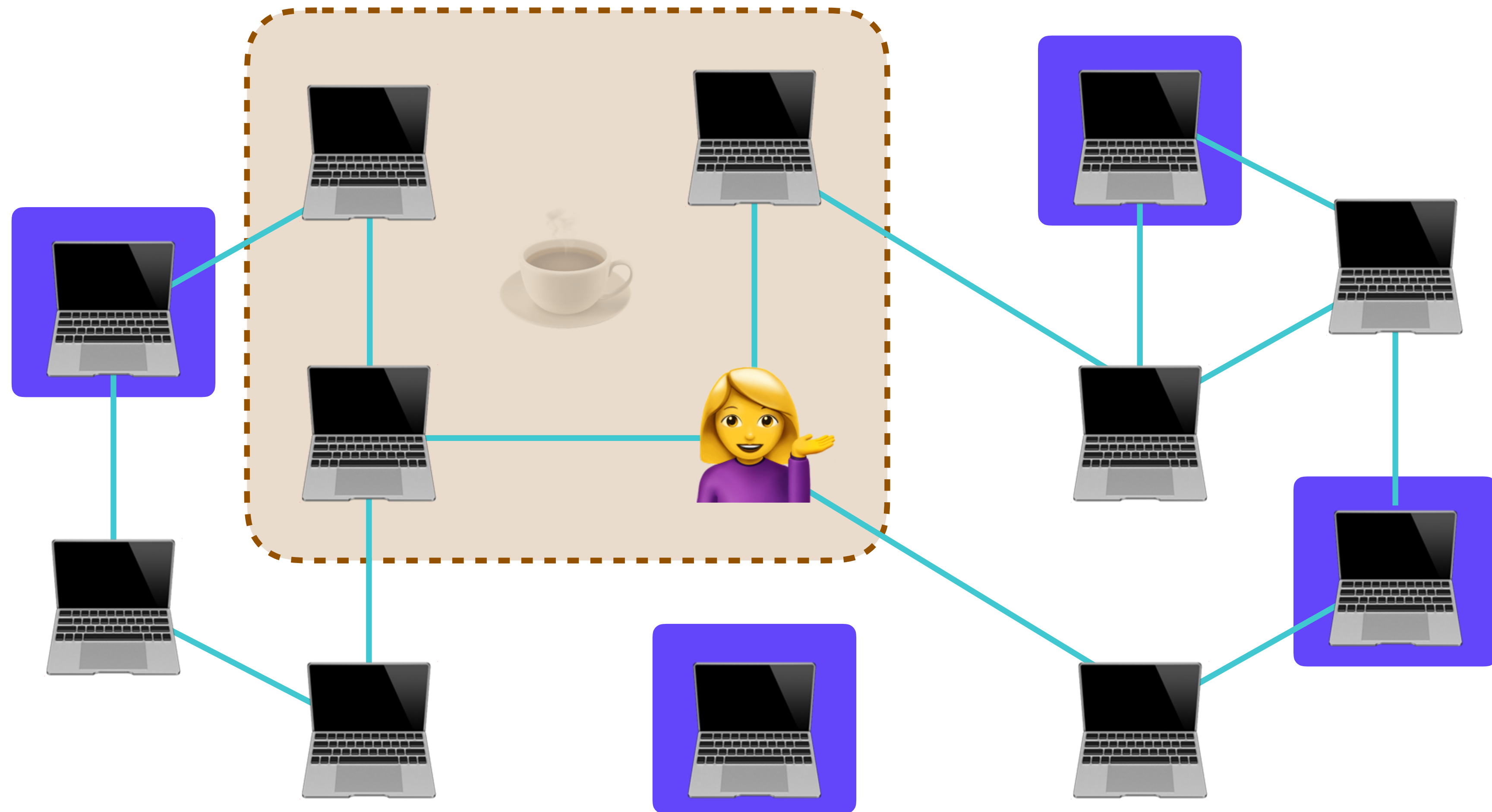
# IPFS PRIMER

## ROUTING & LOOKUP



# IPFS PRIMER

## ROUTING & LOOKUP 🔍 🌊





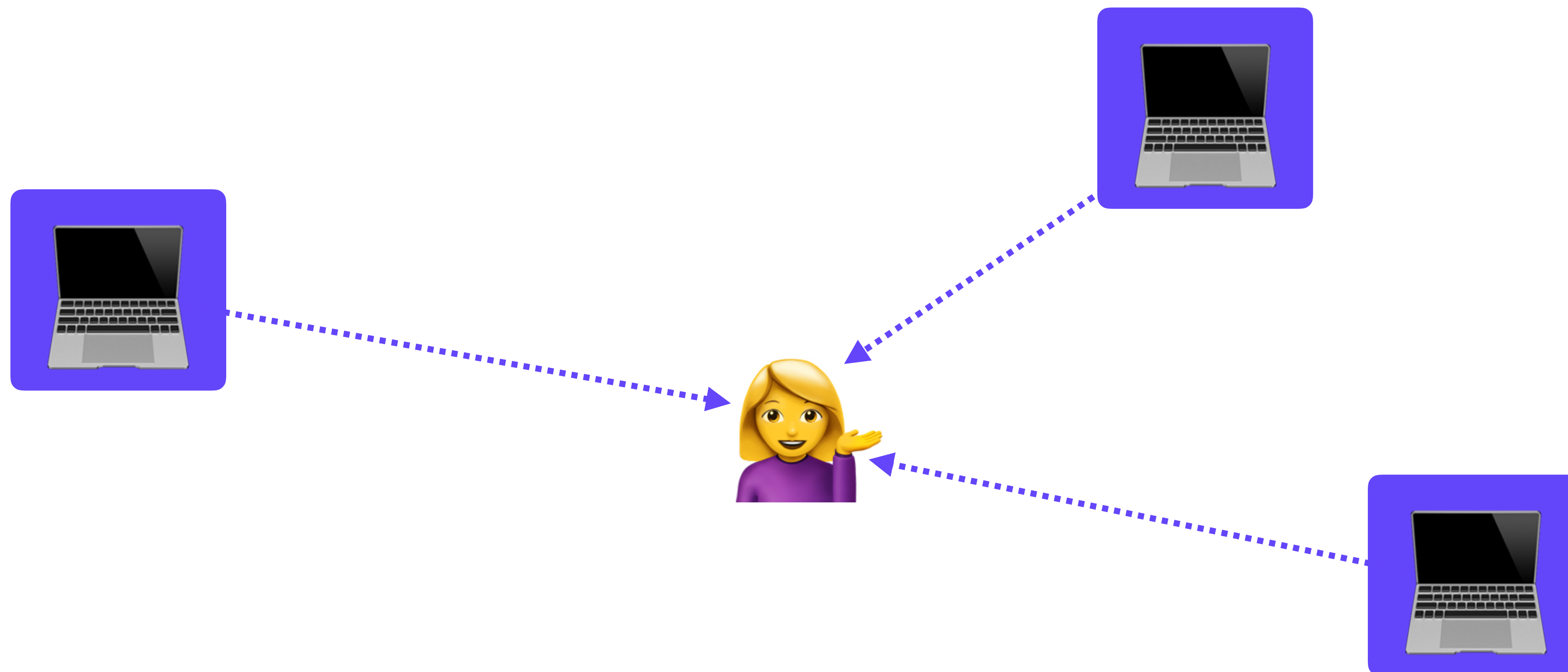
# IPFS PRIMER

## ROUTING & LOOKUP 🔍 🌊



# IPFS PRIMER

## ROUTING & LOOKUP 🔍 🌊



# QUICK DEMO

## GETTING ONLINE

```
~/Desktop ▶ mkir antwerp  
  
}
```

# QUICK DEMO

## GETTING ONLINE

```
~/Desktop ▶ mkir antwerp  
  
}
```


# QUICK DEMO

## NO STEP 2












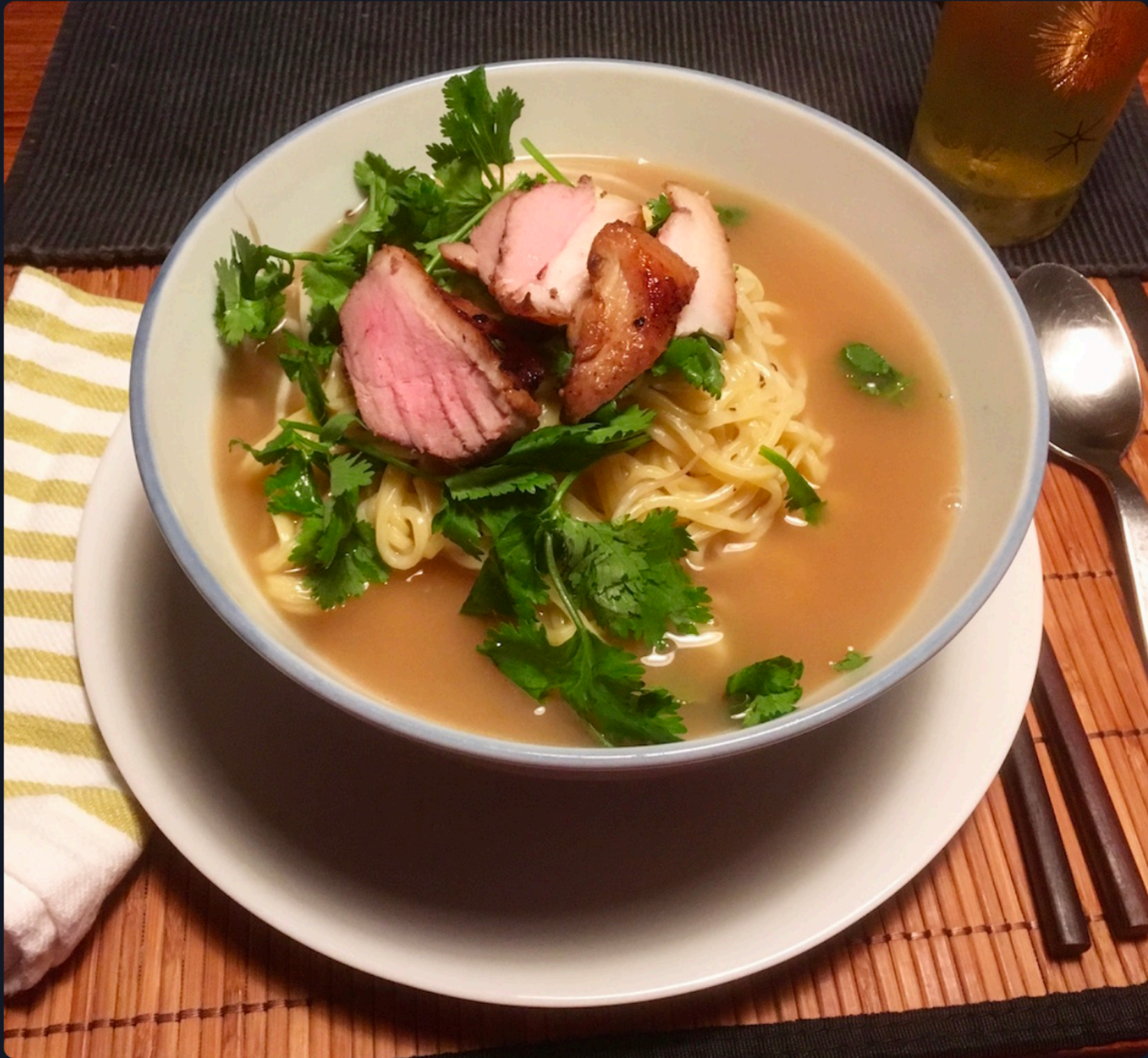
# QUICK DEMO




## FISSION DRIVE

 [IHK4DGJ1RDwV](#) / [Photos](#)

NAME

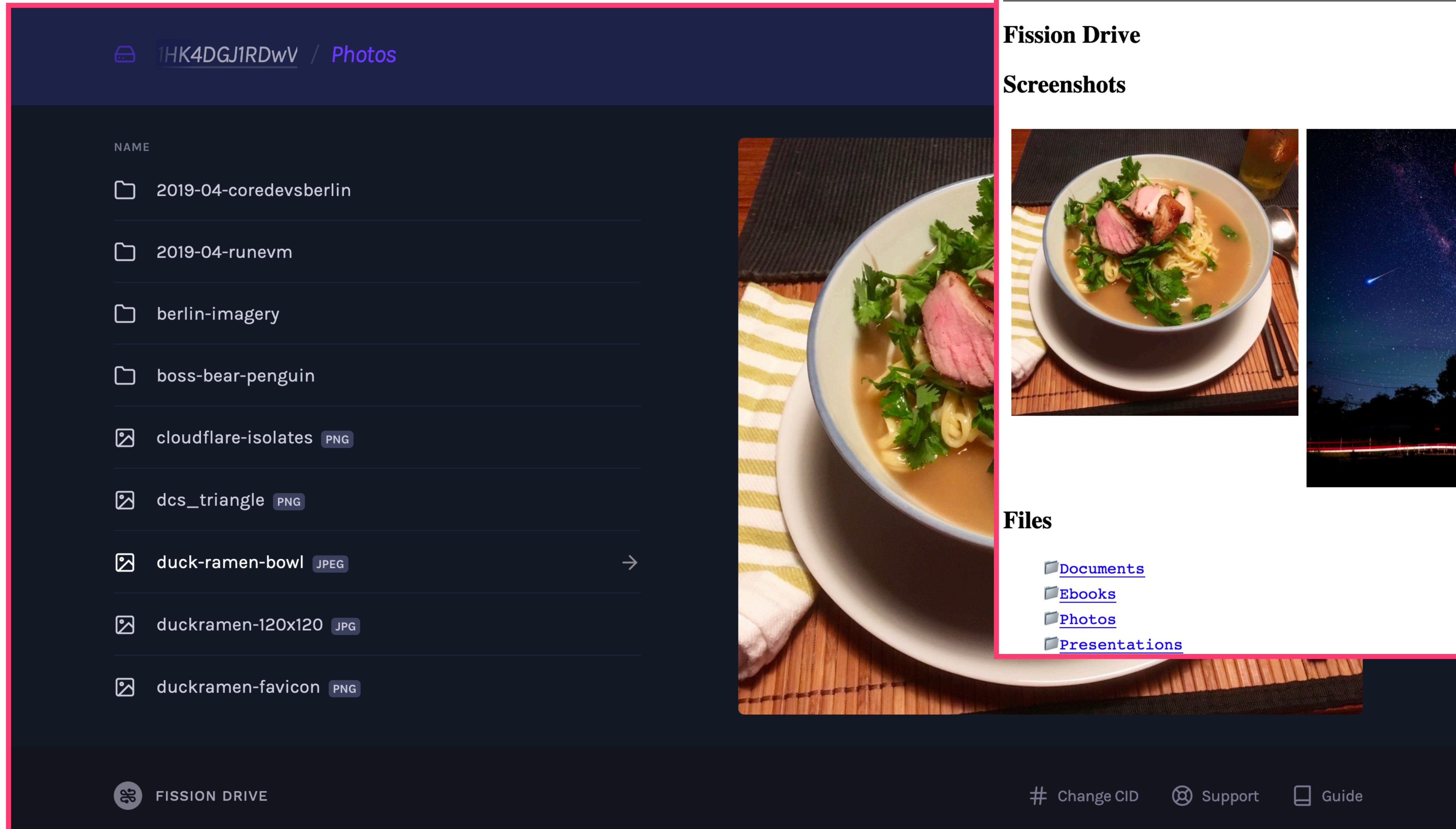
-  2019-04-coredevsberlin
-  2019-04-runevm
-  berlin-imagery
-  boss-bear-penguin
-  cloudflare-isolates PNG
-  dcs\_triangle PNG
-  duck-ramen-bowl JPEG [→](#)
-  duckramen-120x120 JPG
-  duckramen-favicon PNG



 FISSON DRIVE # Change CID  Support  Guide

# QUICK DEMO

# FISSION DRIVE



The screenshot displays the Fission Drive interface. At the top, the address bar shows the ID `IHK4DGJ1RDwV` and the path `Photos`. Below this is a list of files and folders:

- 2019-04-coredevsberlin
- 2019-04-runevm
- berlin-imagery
- boss-bear-penguin
- cloudflare-isolates PNG
- dcs\_triangle PNG
- duck-ramen-bowl JPEG →
- duckramen-120x120 JPG
- duckramen-favicon PNG

The main preview area shows a large image of a bowl of ramen with pork and green onions. To the right of the preview, there are two smaller images: a bowl of ramen and a night sky with the Milky Way and a red planet.

At the bottom of the interface, there is a navigation bar with the Fission Drive logo and the text "FISSION DRIVE". On the right side of the navigation bar, there are three icons: a hash symbol for "Change CID", a speech bubble for "Support", and a document icon for "Guide".

## boris

This is a short bio.

- Website: [blog.bmannconsulting.com](http://blog.bmannconsulting.com)
- Twitter: [@bmann](https://twitter.com/bmann)

## Fission Drive

### Screenshots



### Files

- [Documents](#)
- [Ebooks](#)
- [Photos](#)
- [Presentations](#)

D I D S



DIDS



**HIGHLY AUTHENTIC**



**DIDS**

STANDARDIZATION

# DIDS

## STANDARDIZATION

- W3C
- Microsoft
- BC Government
- Public-key cryptography
- Truly “universal” UUIDs
- Agnostic about backing
- For users, devices, and more

FEBRUARY 12, 2018

### Decentralized digital identities and blockchain: The future as we see it

By Alex Simons, Vice President of Program Management, Microsoft Identity Division

#### EXAMPLE 2: Minimal self-managed DID Document

```
{
  "@context": "https://w3id.org/did/v1",
  "id": "did:example:123456789abcdefghi",
  "publicKey": [{
    "id": "did:example:123456789abcdefghi#keys-1",
    "type": "RsaVerificationKey2018",
    "owner": "did:example:123456789abcdefghi",
    "publicKeyPem": "-----BEGIN PUBLIC KEY...END PUBLIC KEY-----\r\n"
  }],
  "authentication": [{
    // this key can be used to authenticate as DID ...9938
    "type": "RsaSignatureAuthentication2018",
    "publicKey": "did:example:123456789abcdefghi#keys-1"
  }],
  "service": [{
    "type": "ExampleService",
    "serviceEndpoint": "https://example.com/endpoint/8377464"
  }]
}
```

**DIDS**

CLAIMS

**DIDS**

CLAIMS

- Principle of least information
- “Can attest that this user is over 18”
- All claims signed with private key
- Age, credentials, country residency, job history, event attendance, ...

PORTABLE COMPUTE

# PORTABLE COMPUTE

 **JUST ADD MORE POWER TO JS & WASM AND STIR** 

PORTABLE COMPUTE

 *DYNAMIC* FAAS



# PORTABLE COMPUTE

## DYNAMIC FAAS

- Run everything locally by default
  - Good for devs with powerful machines
  - Slow for students with Chromebooks

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- Farm out longer running computation to service providers
  - ...dynamically at runtime

# PORTABLE COMPUTE

## DYNAMIC FAAS

- Run everything locally by default
  - Good for devs with powerful machines
  - Slow for students with Chromebooks
- Farm out longer running computation to service providers
  - ...dynamically at runtime
- Heavy compute, parallel workloads, &c

**PORTABLE COMPUTE**

APPROACH & TRADE-OFFS

# PORTABLE COMPUTE

## APPROACH & TRADE-OFFS

- Code-as-data
- Memoization
- Compiler techniques at web scale (“world computer”)
- Network latency (normally zero, now x)
- Restricted subset (e.g. total)
- Event-based w/ two-phase commit
- Trusted (incl. AWS Lambda 🙋)

**PORTABLE COMPUTE**

EVENT BASED (ABSTRACT USER STREAM, CRDTS)



# PORTABLE COMPUTE

EVENT BASED (ABSTRACT USER STREAM, CRDTS)

Off-Platform Side Effect Stream



Platform Effect Stream



Pure Function Stream



Base Event Stream



# PORTABLE COMPUTE

EVENT BASED (ABSTRACT USER STREAM, CRDTS)

Off-Platform Side Effect Stream



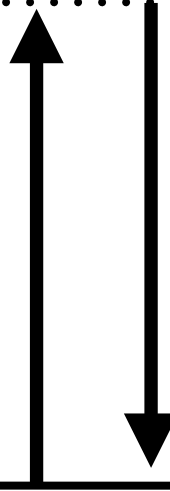
Platform Effect Stream



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Base Event Stream





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EVENT BASED (ABSTRACT USER STREAM, CRDTS)

Off-Platform Side Effect Stream



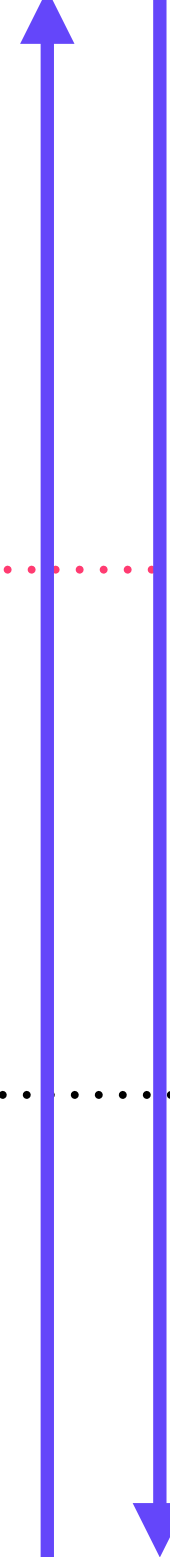
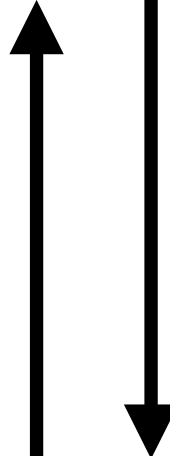
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EVENT BASED (ABSTRACT USER STREAM, CRDTS)

Off-Platform Side Effect Stream



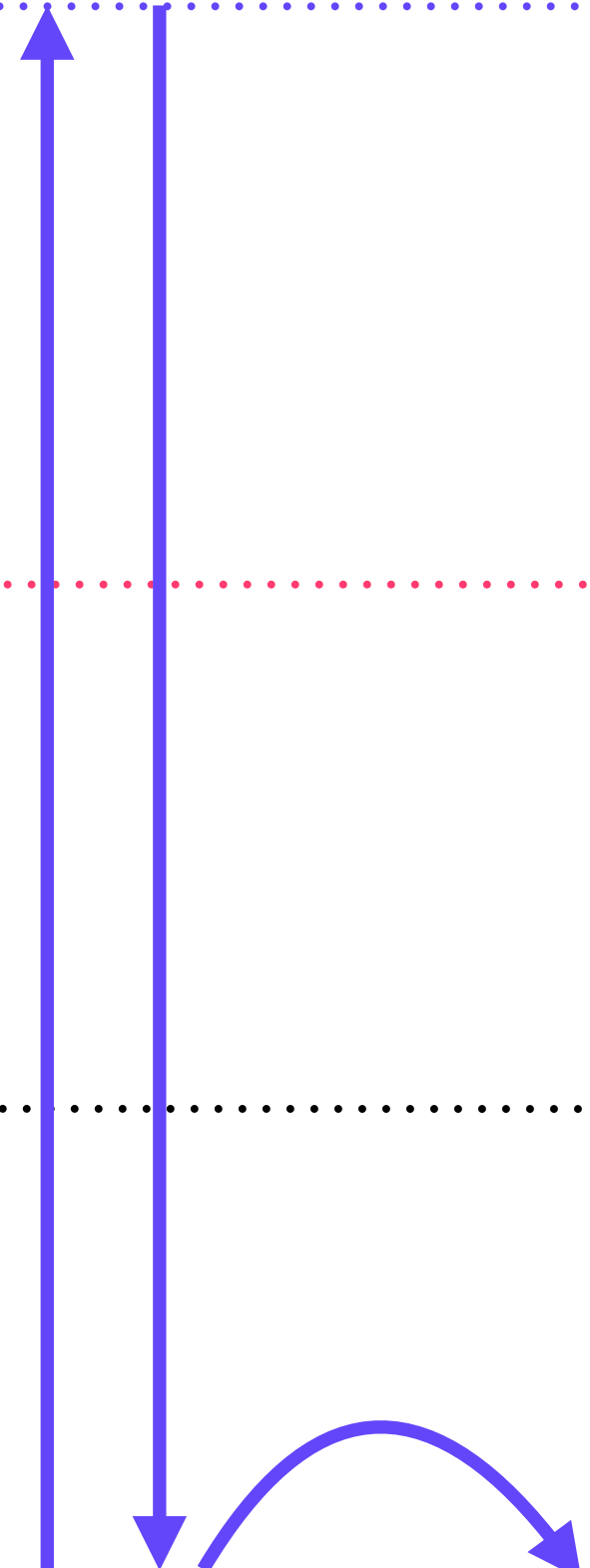
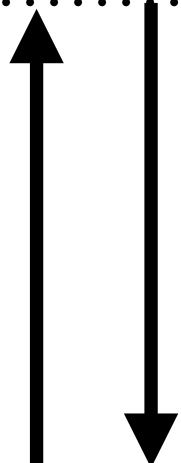
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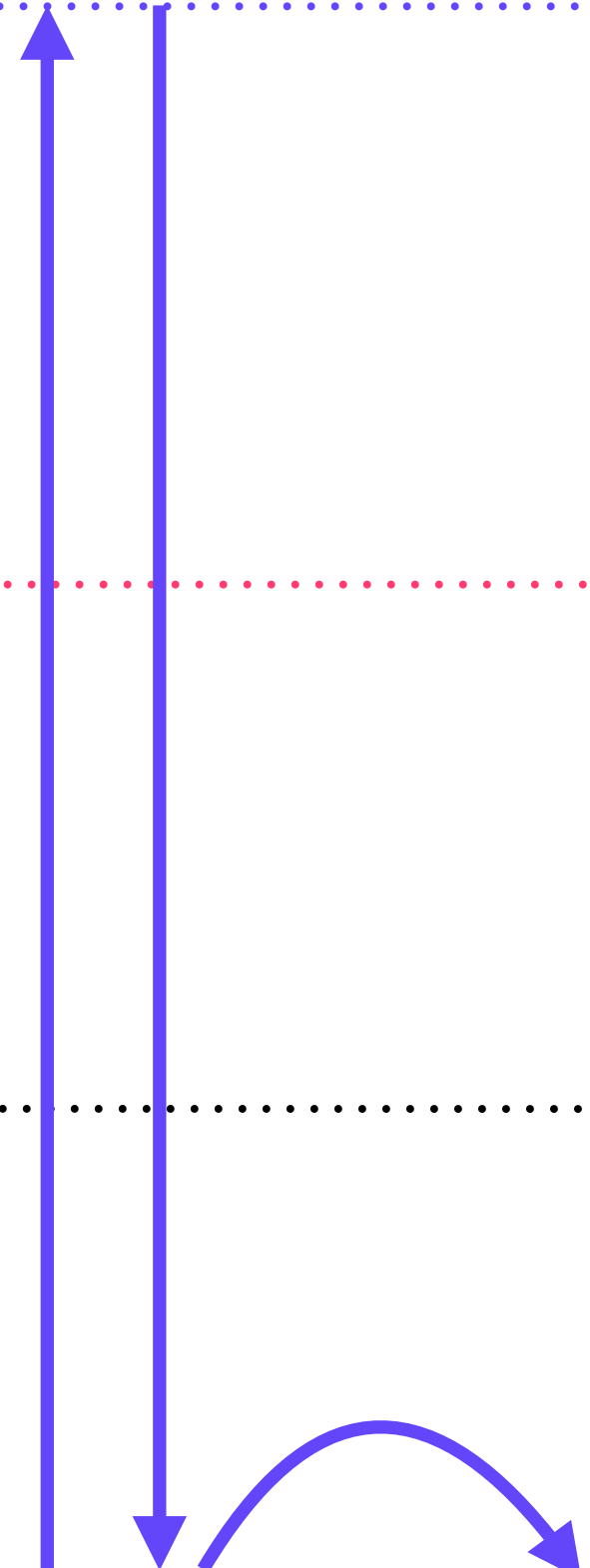
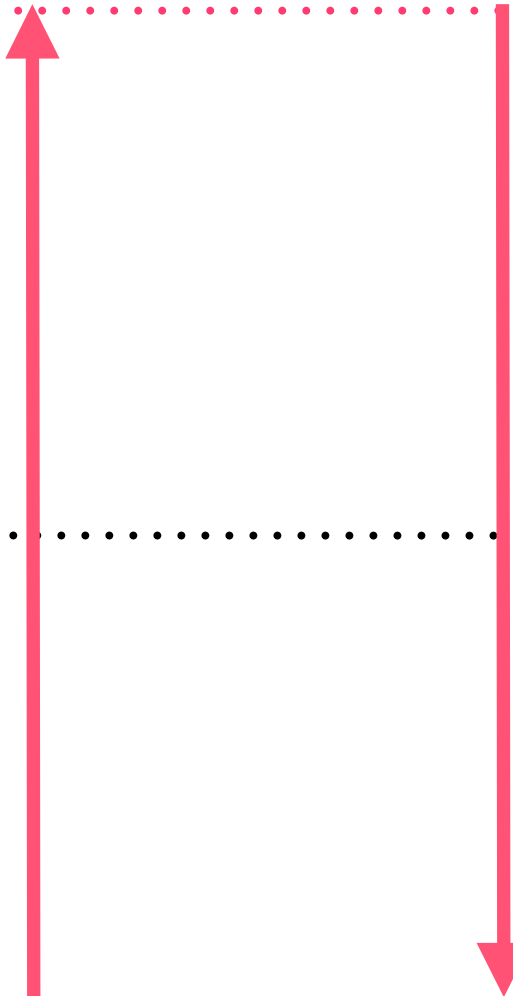
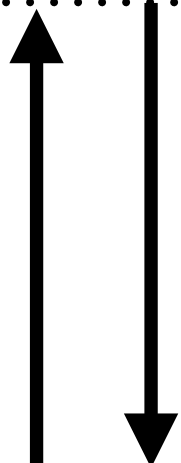
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Pure Function Stream



Base Event Stream



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EVENT BASED (ABSTRACT USER STREAM, CRDTS)

Off-Platform Side Effect Stream



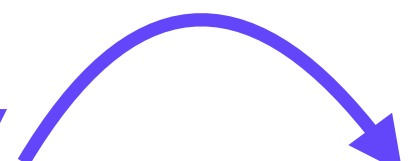
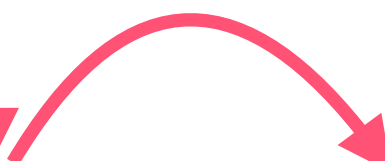
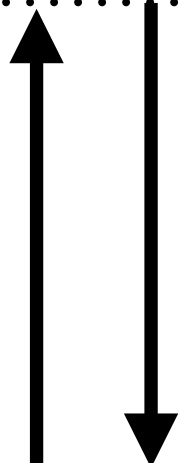
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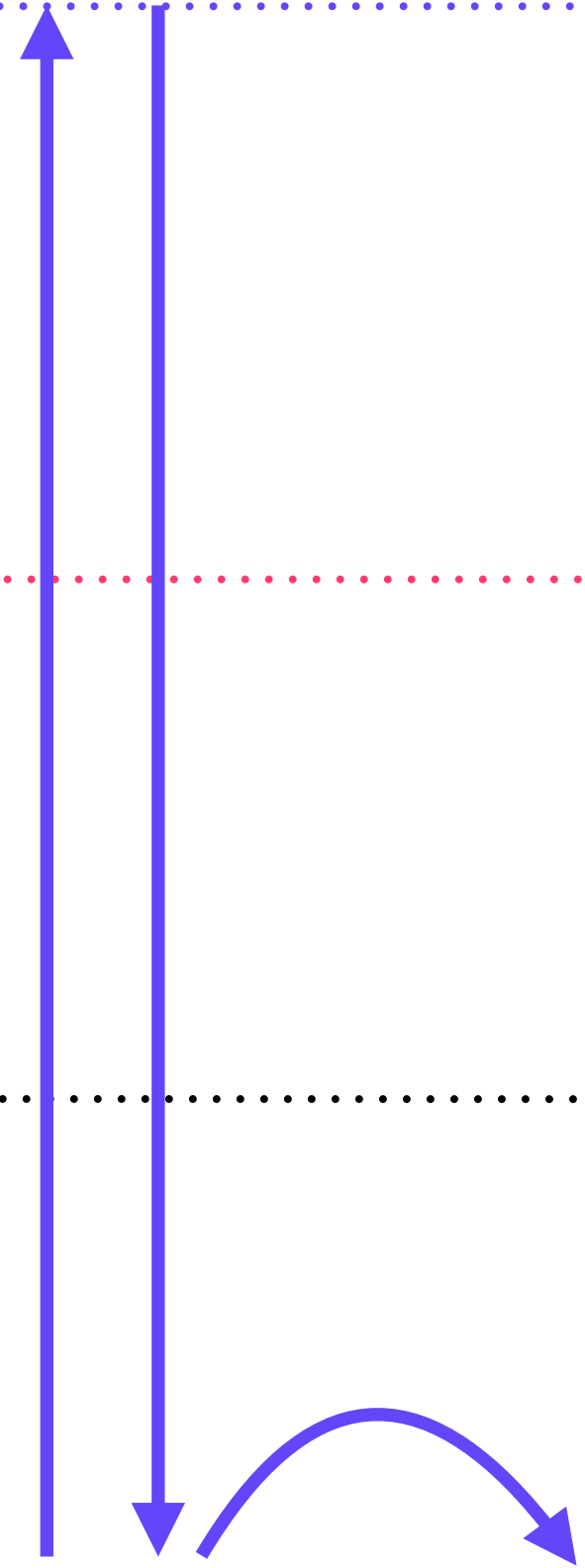
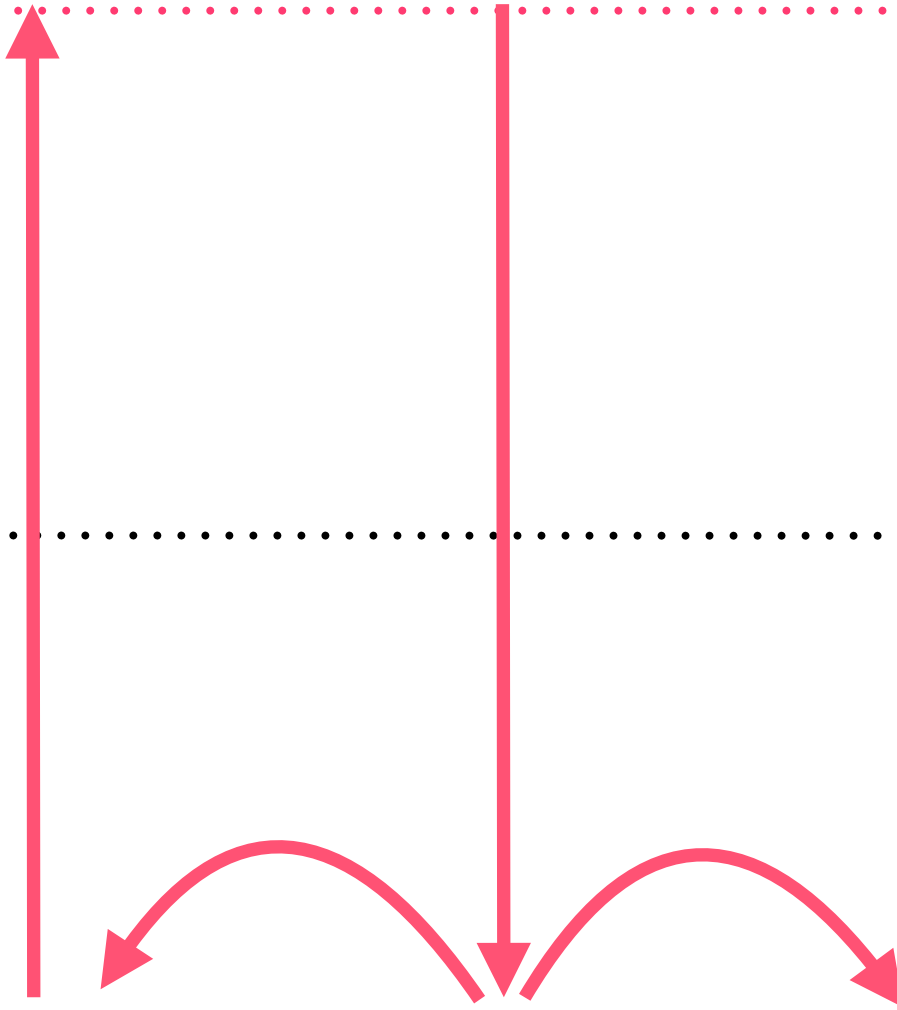
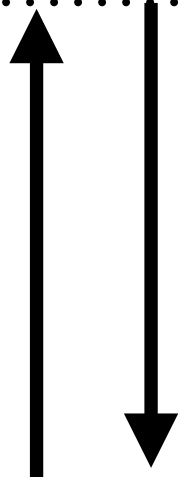
Platform Effect Stream



Pure Function Stream



Base Event Stream



THE FUTURE

THE FUTURE

 LIKE... WITH JET-PACKS 

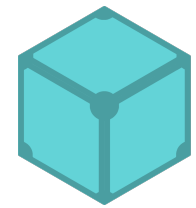
**THE FUTURE**

THE NEXT WAVE OF PLATFORMS



# THE FUTURE

## THE NEXT WAVE OF PLATFORMS



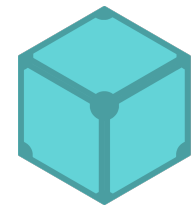
Global  
Storage

FILES 

DATABASE 

# THE FUTURE

## THE NEXT WAVE OF PLATFORMS



Global  
Storage

FILES 

DATABASE 



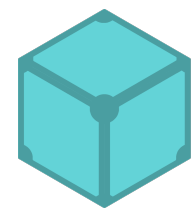
Digital  
Scarcity

IDENTITY 

CHECKPOINTS 

# THE FUTURE

## THE NEXT WAVE OF PLATFORMS



Global  
Storage

FILES 

DATABASE 



Digital  
Scarcity

IDENTITY 

CHECKPOINTS 



Portable  
Compute

DISTRIBUTED COMPUTE 

SMART CONTRACTS 

**THE FUTURE**

THE END OF HISTORY

# THE FUTURE

## THE END OF HISTORY

High Touch

Invisible

Custom

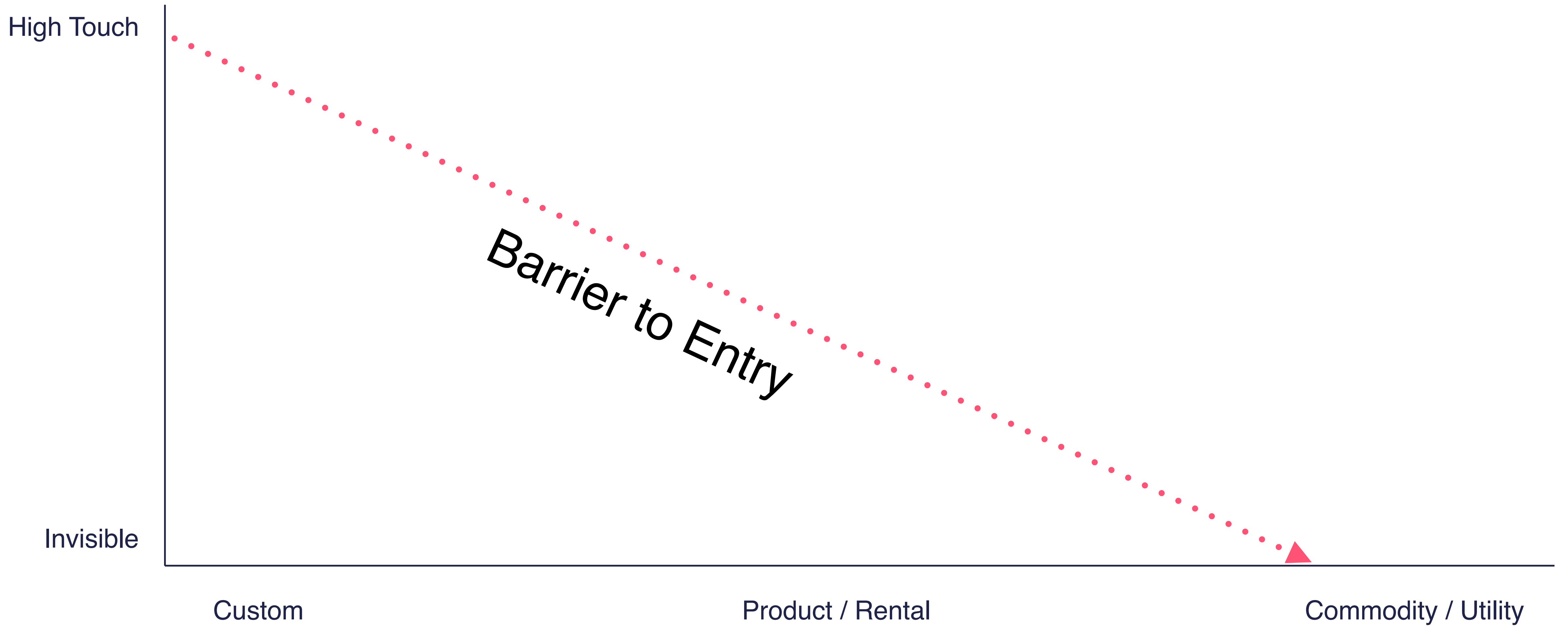
Product / Rental

Commodity / Utility



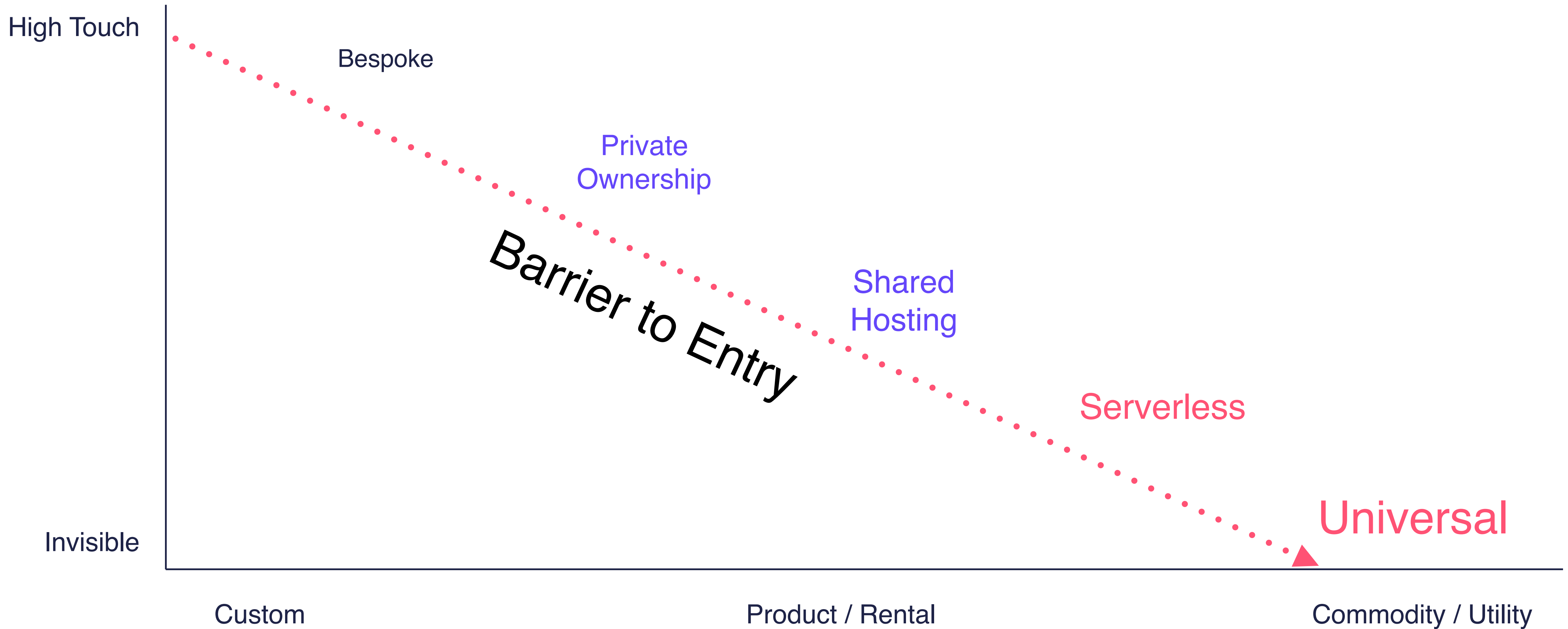
# THE FUTURE

## THE END OF HISTORY



# THE FUTURE

## THE END OF HISTORY



<https://fission.codes>  
<https://talk.fission.codes>  
<https://tools.fission.codes>



THANK YOU, CALGARY



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