

A Public Database for the Planet



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BIGCHAIN^{DB} IPDB
INTERPLANETARY DATABASE

Motivation





A photograph of a row of five large, cylindrical industrial storage tanks. The tanks are made of a light-colored metal and are arranged in a line. They are situated under a clear blue sky. A blue metal walkway or bridge structure runs across the top of the tanks. To the right of the tanks, there is a tall, light-colored brick building with several windows. The tanks appear to be part of a larger industrial facility.

Here's
your
personal
data

personal
data

“My conclusion is that whatever you put on the internet you lose it.

Maybe keep the rights, but lose the power over it.”

-User on Shapeways blog
(3D printing marketplace)



Current systems of power are creating unequal outcomes

Creative works are backwards

Others' stuff – hard to use legally, pay \$

Your stuff – hard *not* to lose

Your data isn't really yours

Walled gardens – you can't share how you want

Data silos – You can't take it with you if you want to leave



Imagine a more equitable society, where...



Creativity is encouraged

- Creators are fairly compensated
- The cultural commons is protected

Your identity is yours

- You own your personal data
- You manage your reputation
- You choose what to share and what stays private

And more

- Equal opportunity for banking
- Know where your atoms come from

Current systems of power
are creating unequal outcomes

We believe that
technology & governance,
designed appropriately,
can help communities
build a more equitable society



Towards a more equitable society

What can help?
Shared global compute infrastructure

- Decentralized: No single entity owns or controls
- Self-sustaining
- Planetary scale
- All the pieces: processing, file system, database

To develop shared global
compute infrastructure,

we must first understand the
status quo of infrastructure,

...and how to change it
accordingly.

Status quo compute infrastructure

Modern apps use processing, file system, database



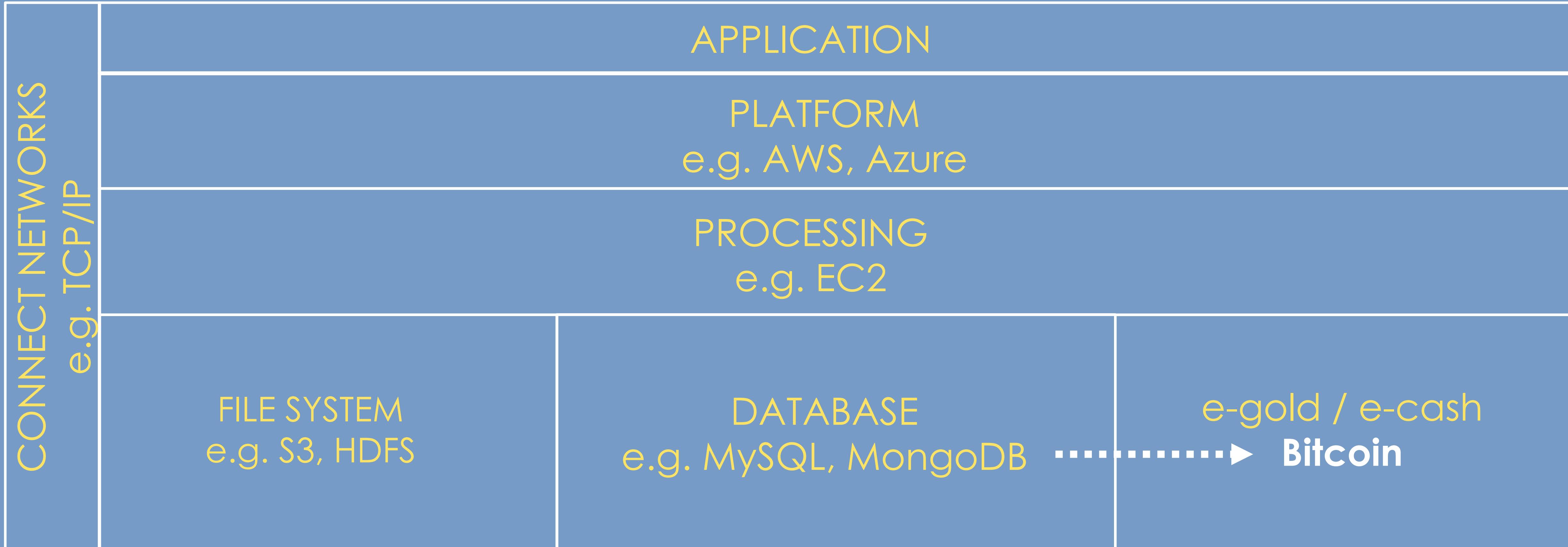
CONNECT NETWORKS e.g. TCP/IP	APPLICATION	
	PLATFORM e.g. AWS, Azure	
	PROCESSING e.g. EC2	
	FILE SYSTEM e.g. S3, HDFS	DATABASE e.g. MySQL, MongoDB

Towards decentralized compute infrastructure



CONNECT NETWORKS e.g. TCP/IP	APPLICATION	
	PLATFORM e.g. AWS, Azure	
	PROCESSING e.g. EC2	
	FILE SYSTEM e.g. S3, HDFS	DATABASE e.g. MySQL, MongoDB Bitcoin blockchain?

Towards decentralized compute infrastructure



Towards decentralized compute infrastructure



CONNECT NETWORKS e.g. TCP/IP, Hyperledger	APPLICATION	PLATFORM e.g. AWS, Azure, Eris/Monax, BlockApps
PROCESSING e.g. EC2, Ethereum, Hyperledger, Tendermint, Lisk	FILE SYSTEM e.g. S3, HDFS, IPFS	DATABASE e.g. MySQL, MongoDB
		e-gold / e-cash Bitcoin, zcash

Towards decentralized compute infrastructure



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Towards decentralized compute infrastructure



CONNECT NETWORKS e.g. TCP/IP, Hyperledger	APPLICATION		
	PLATFORM		
	e.g. AWS, Azure, Eris/Monax , BlockApps		
	PROCESSING		
e.g. EC2, Ethereum , Hyperledger , Tendermint , Lisk		DATABASE	
FILE SYSTEM e.g. S3, HDFS, IPFS		e.g. MySQL, MongoDB BigchainDB + IPDB	
		e-gold / e-cash Bitcoin , zcash	



Elements of a planetary-scale database

1. Blockchain Database

SW: combines best of traditional DBs & blockchains.

BIGCHAINDB

2. Network running

the software, with thoughtful governance

IPDB
INTERPLANETARY DATABASE



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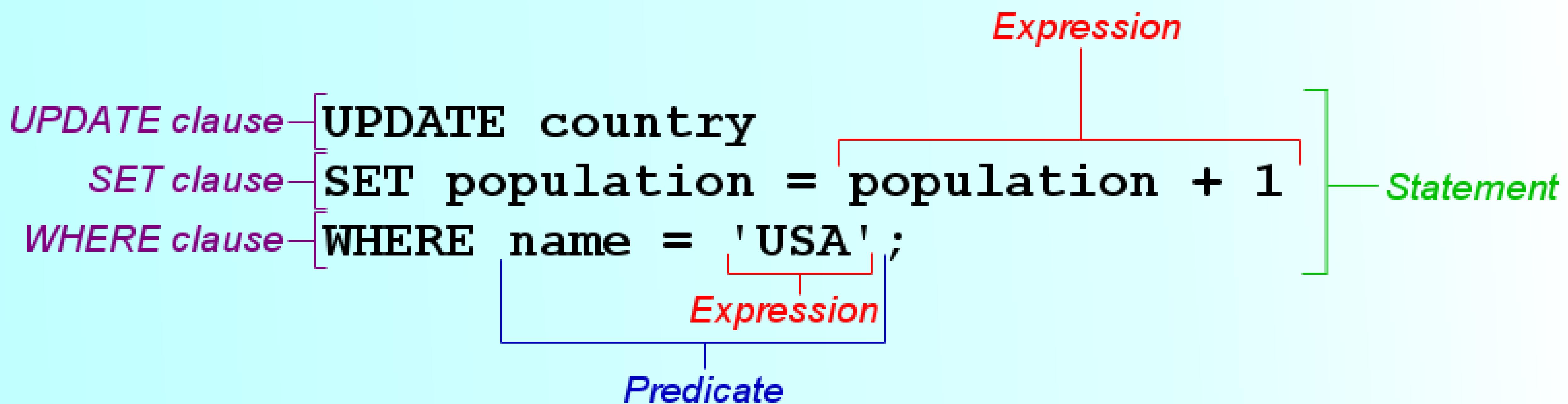
IPDB
INTERPLANETARY DATABASE

What's the difference between a database and a csv file?
Querying. From M's of records, find the relevant ones.

1 Line of standard code, optimized

Vs

50-500 lines of slow custom code, unoptimized





The first “Blue Ocean” DBs: Relational DBs
Benefits: powerful structured querying
Winner: Oracle, 80s and 90s



The next “Blue Ocean” DB: Website-ready DBs

New benefits: lightweight for startups

Winner: MySQL, early 2000s





The next “Blue Ocean” DB: **Distributed / NoSQL DBs**
New benefits: “Big data” scale, flexible schemas
Winner: MongoDB, late 2000s-now



How do “big data” databases scale?

Answer: Distribute storage across many machines, i.e. sharding



A “consensus” algorithm keeps distributed nodes in sync.

How well do “big data” distributed DBs scale?



Writes/s

1,200,000

800,000

600,000

400,000

200,000

0

0

50

100

150

200

250

300

350

Nodes

175,000

367,000

537,000

1,100,000

Example: Cassandra scaling.

More nodes = more throughput, more capacity!



The next blue ocean DB: *blockchain* database
New benefits: decentralized, immutable, native assets
Who: BigchainDB

How to build a scalable blockchain database (BigchainDB)

1. Start with an enterprise-grade distributed DB, e.g. MongoDB
2. Engineer in blockchain characteristics

Decentralized /
Shared Control

- Each DB node is a federation node

Immutable /
Audit Trails

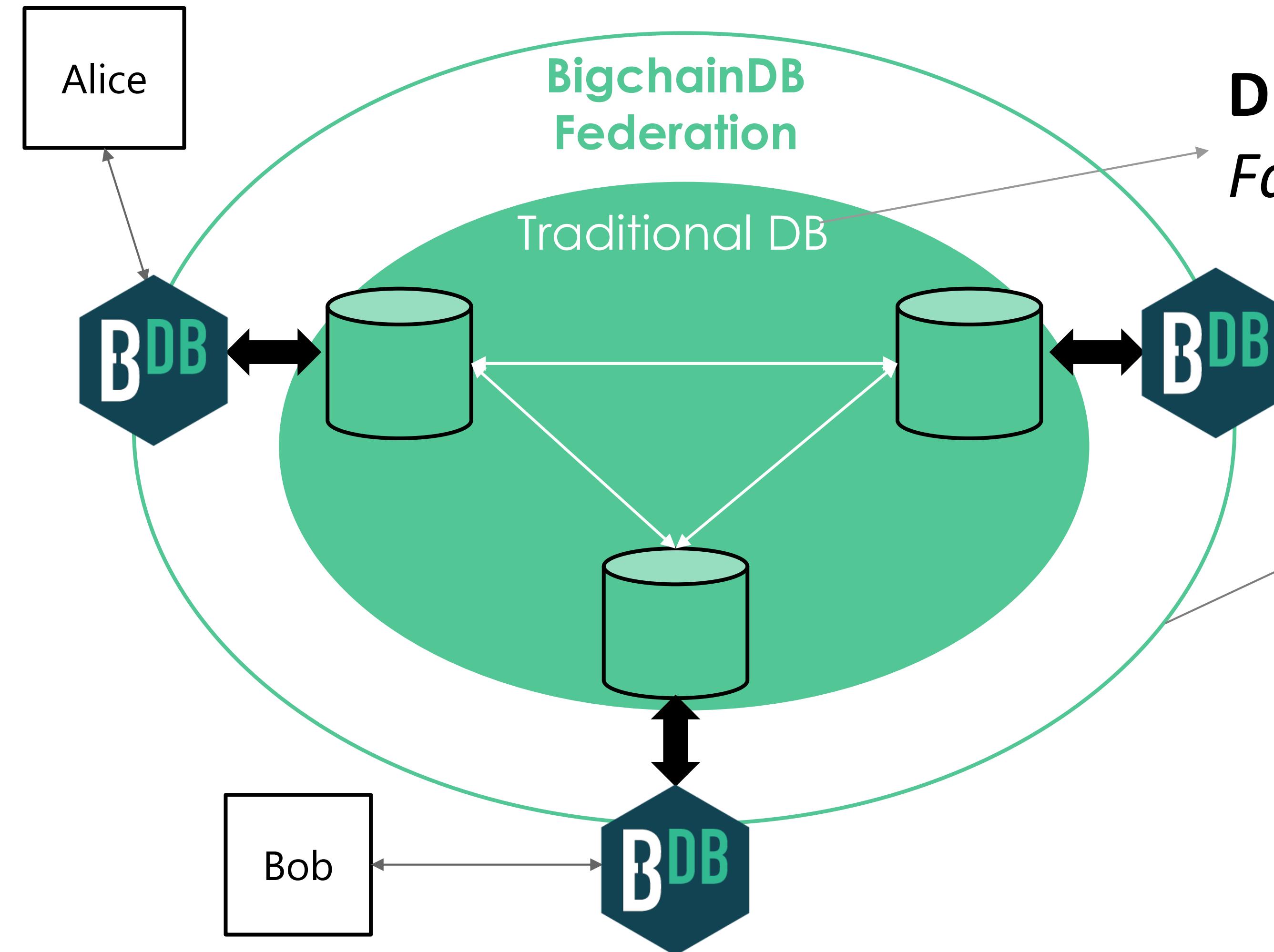
- Hash Previous Blocks
- Append-only

Native assets

- “Own” = have private key
- Asset lives on the database



BigchainDB Architecture: Two-Layer consensus



DB consensus

Fault-tolerant consensus

Blockchain consensus

*Add tolerance to
double-spends + other
byzantine faults*

BigchainDB: best of traditional DBs & blockchains = a blockchain database



	Traditional blockchains	Traditional Databases	BigchainDB
Immutability	✓		✓
Decentralized Control	✓		✓
Native Assets	✓		✓
Scalable		✓	✓
Queryability		✓	✓
Operationalized		✓	✓



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the software, with thoughtful governance

IPDB
INTERPLANETARY DATABASE



- For everyone, everywhere
- Free until heavy usage, then pay web service style
- Initial tech is BigchainDB
- Member caretakers will operate validating nodes



IDPB Caretakers



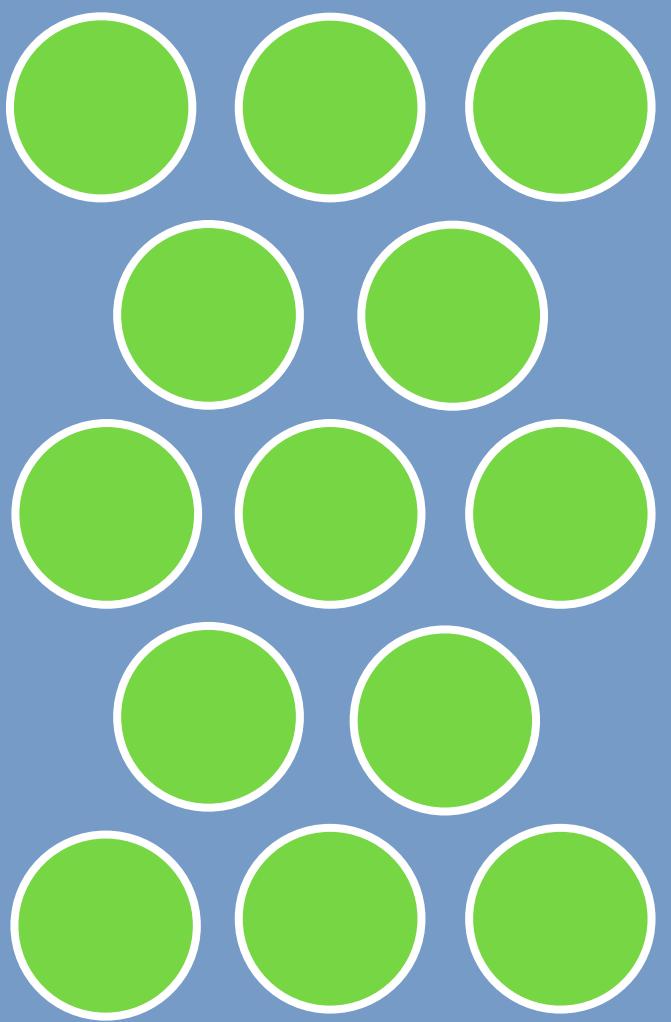
Long-standing commitment to the decentralized
internet

At least half non-profit

Fewer than half in any given country



Caretakers (so far)



Not-for-profit

Blockstack
COALA
Dyne.org
Internet
Archive
OpenMedia
UnMonastery

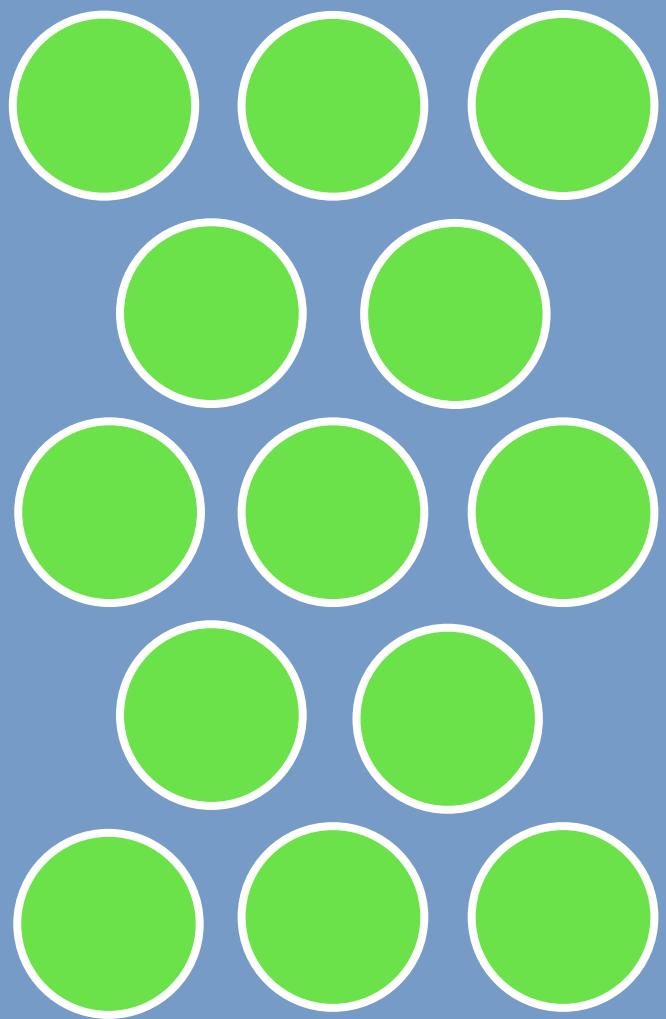
For-profit

ascribe / BigchainDB
ConsenSys
Eris Industries
Protocol Labs (IPFS)
SmartContract.com
Synereo
Tendermint

Governance: caretakers at the heart

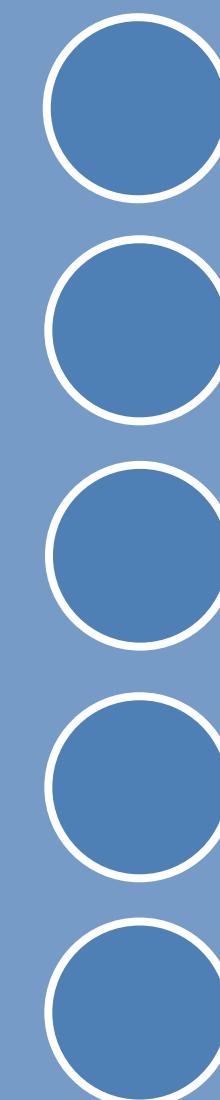


Caretakers vote
caretakers in or out of
the IPDB Foundation.



... And operate the
validating nodes in the
network.

Caretakers
elect a board.



Board hires a
director for
management
duties.



Yes, this could be a DAO.
But not yet. Walk before we
run.

Use Cases

res()nate

Vertical:

IP – Music rights

Value proposition:

A streaming service owned by all



scribe



Vertical:
IP – Digital art

Value proposition:
Enables creators of digital art to get
compensated, via claiming attribution &
licensing

Certificate Of Authenticity

As of 30 November 2015, 17:36:00 GMT, Masha McConaghy is the owner.
To verify current owner, please visit <http://scri.be/1luAOpo>



Currency

Date: 2014
Edition: 3 of 100
Created by: Dan Perjovschi
Owner: Masha McConaghy

ARTWORK DETAILS

Artwork ID: 17uZBwSbLGfxY3vRRMWzF5PMjFVNc1tkQ2
File: currency-2014.jpg (499 KB)

PROVENANCE/OWNERSHIP HISTORY

Apr. 30, 2015, 12:36:19 - Registered by mail@cointemporary.com
May. 01, 2015, 09:46:08 - Transferred to admin
May. 08, 2015, 13:04:59 - Transferred to trent
Nov. 27, 2015, 19:35:14 - Transferred to Masha McConaghy

CRYPTOGRAPHIC STAMP

Use the summary and signature below to authenticate this certificate:
<http://scri.be/1Szr45Q>

Summary: Dan Perjovschi*Currency*3/100*2014*2015Apr30-12:36:19

Signature: 438B24CE06182FA3AA82BC285F867D03FB73F3BCC0F73FDBA6
EC2BFF7088E011E60355B7DC75D5745A9D5CA2A8115512FF835
C4ABEF6869BF6A991668A820F3FB03A48C6A9E05834716F6500
68E8E07E5266620BA815948DC265605D23FAF016CB46ACD4BC
BE75F08D0DEBD7AF55E4CB085B9A0A14583F135DBB399121B24
ED1L

Authenticated by scribe®

Authenteq

Vertical:
Identity

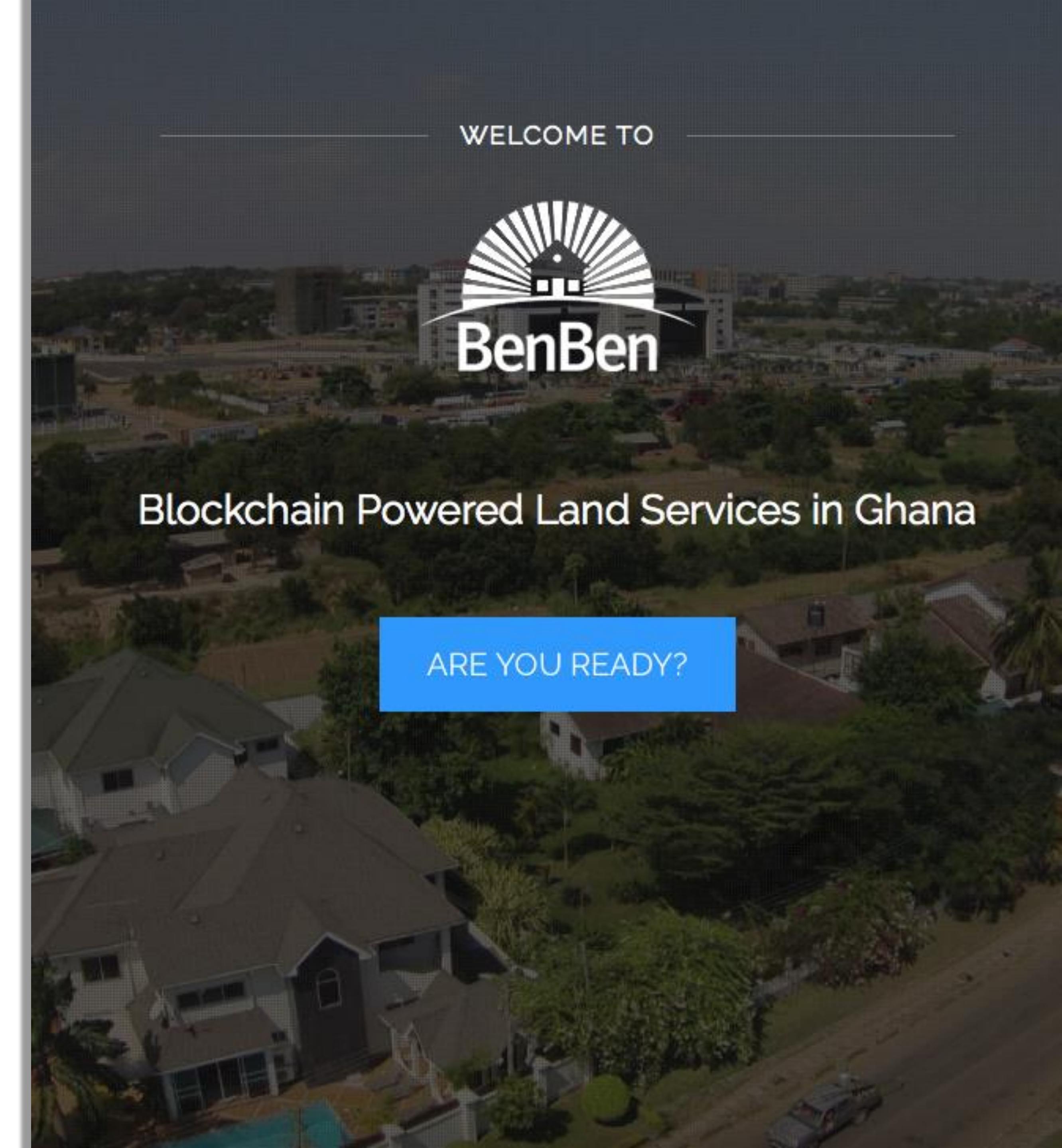
Value proposition:
Low-friction assurance, sovereign personal data



BenBen

Vertical:
Government – Land Registry

Value proposition:
Low-cost registry, less risk of corruption





Recruit

Vertical:
ID - Education Credentials

Value proposition:
reduce fraudulent degrees, lower HR friction



Vertical:
Energy

Value proposition:
manage \$ flow in energy deregulation



Tangent⁹⁰

Vertical:
Supply Chain / Health

Value proposition:
government-mandated
transparent \$ flow



We started with:

Current systems of power
are creating unequal outcomes

But... technology & governance,
designed appropriately,
can help communities
build a more equitable society

Together, we're building decentralized compute infrastructure + applications



PLATFORM e.g. **Resonate**, **ascribe**, **Authenteq**, **Recruit**, **BenBen**

PLATFORM
e.g. AWS, Azure, **Eris/Tendermint**

PROCESSING
e.g. EC2, **Ethereum**, **Hyperledger**

FILE SYSTEM
e.g. S3, HDFS, **IPFS**

DATABASE
e.g. MySQL, MongoDB
BigchainDB + IPDB

e-gold / e-cash
Bitcoin

CONNECT NETWORKS e.g. TCP/IP, **Interledger**



Planetary scale trust for human scale development.

For personal data, compensating creators, and more.

BIGCHAIN^{DB}

@trentmc0

IPDB
INTERPLANETARY DATABASE

bigchaindb.com
ipdb.foundation