Python Applications with Blockstack

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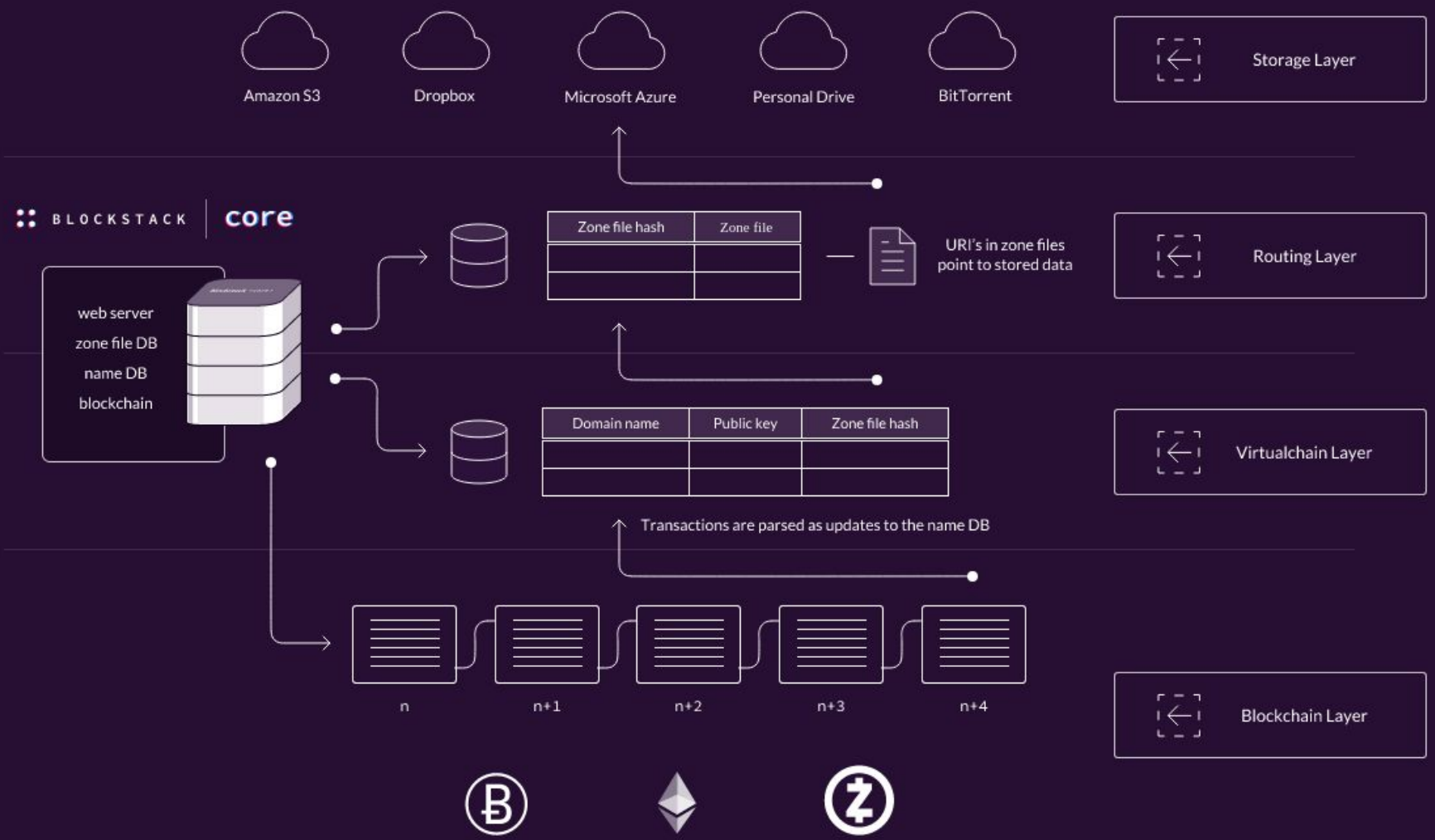
Decentralization Goals

Users

- Own their data
- Control where it’s stored
- Control who can access it

Developers

- No passwords
- No data hosting
- No VMs


Amazon S3
Dropbox
Microsoft Azure
Personal Drive
BitTorrent
Storage Layer
BLOCKSTACK core
web server
zone file DB
name DB
blockchain
Zone file hash
Zone file
URI's in zone files point to stored data
Routing Layer
Domain name
Public key
Zone file hash
Virtualchain Layer
Transactions are parsed as updates to the name DB
n
n+1
n+2
n+3
n+4
Blockchain Layer

Blockchain Layer

- Global, consistent input tape to a replicated state machine
- Peers validate and serialize inputs
- Anyone can append
- Tokens are the append rate-limiter

Virtualchain Layer

Domain name	Public key	Zone file hash

- Embed app-specific inputs in blockchain
- Application validates, not blockchain
- Blockstack is one of many apps
- No PoW → *Fork*-consistent* RSM (!!)
- DCCL 2016

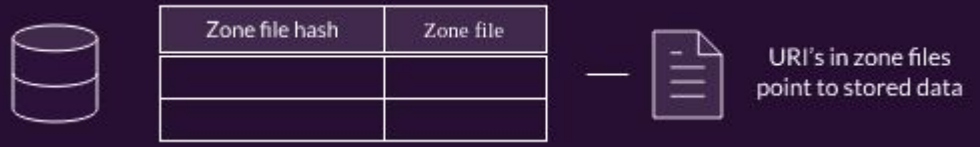
Blockstack's Virtualchain

Domain name	Public key	Zone file hash

- Name registry database RSM
- DB of `(name, public key, 20-byte payload)`
- Payload = hash of a DNS zone file

Nodes that see the **same blockchain** and follow **the same validation rules** derive the **same DB**

Routing Layer



- Zone file hash → Zone file → Off-chain data
- Atlas Protocol: BitTorrent-like zone file replication

```
$ORIGIN judecn.id
$TTL 3600
pubkey TXT
"pubkey:data:04cabba0b5b9a871dbaa11c044066e281c5feb57243c7d2a452f06a0d708613a46ce
d59f9f806e601b3353931d1e4a98d7040127f31016311050bedc0d4f1f62ff"
_file URI 10 1 "file:///home/jude/.blockstack/storage-disk/mutable/judecn.id"
_https._tcp URI 10 1 "https://blockstack.s3.amazonaws.com/judecn.id"
_http._tcp URI 10 1 "http://node.blockstack.org:6264/RPC2#judecn.id"
_dht._udp URI 10 1 "dht+udp://fc4d9c1481a6349fe99f0e3dd7261d67b23dadc5"
```

Storage Layer

- **I/O does not touch the blockchain**
- Storage providers = dumb hard drives

Write

- Sign data
- Upload to zone file URLs

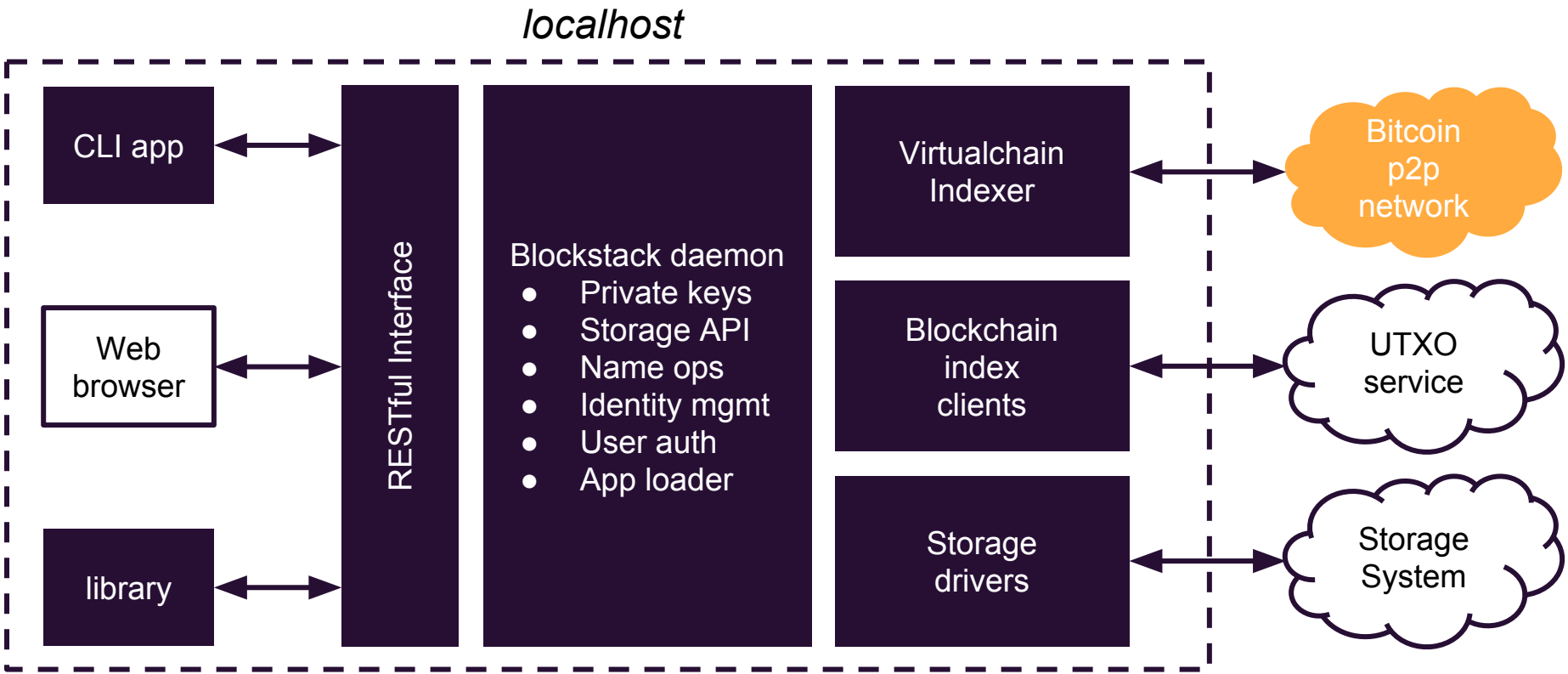
Read

- Get zone file
- Resolve URLs
- Verify signature
- Check fresh

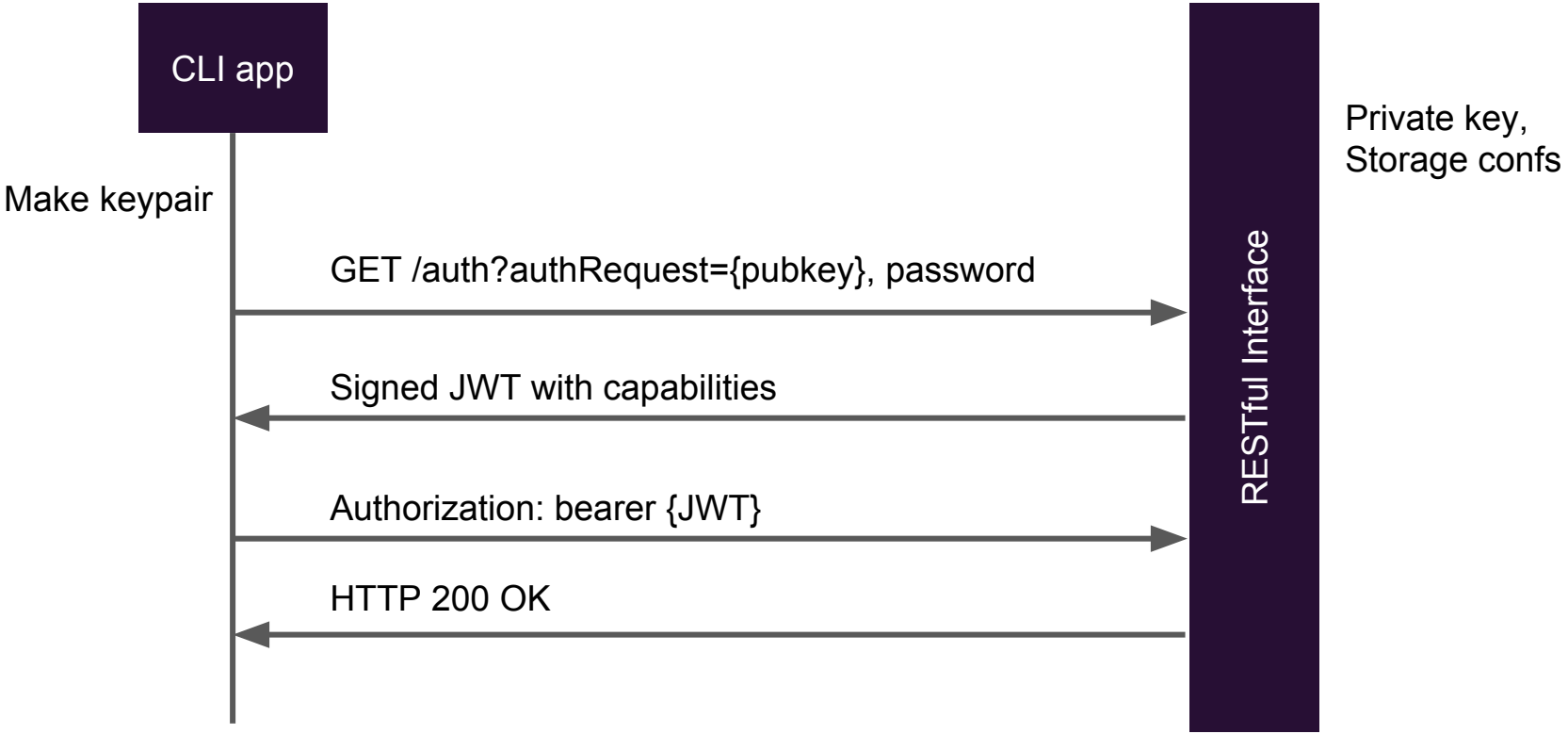
Consistency

- Get zone file
- Resolve URLs
- Verify signature
- Check fresh

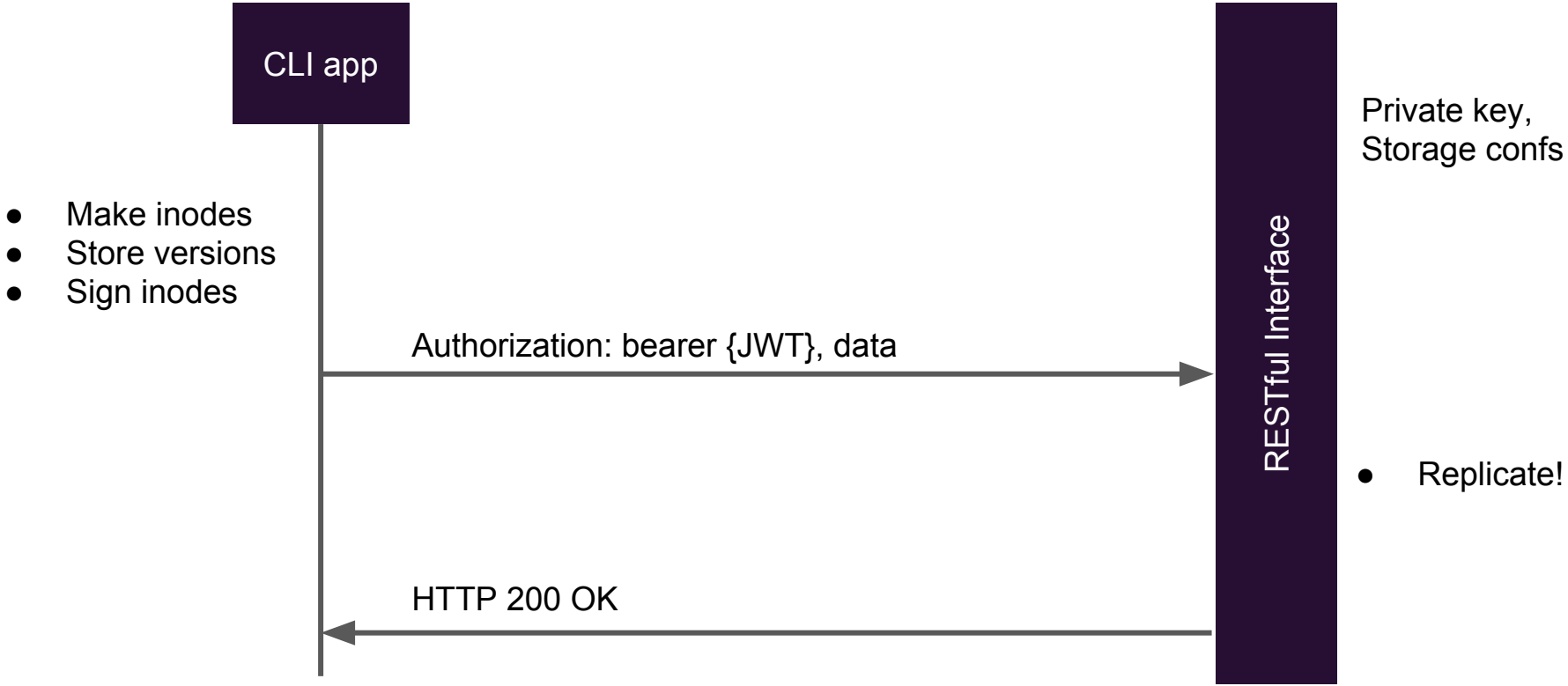
Applications



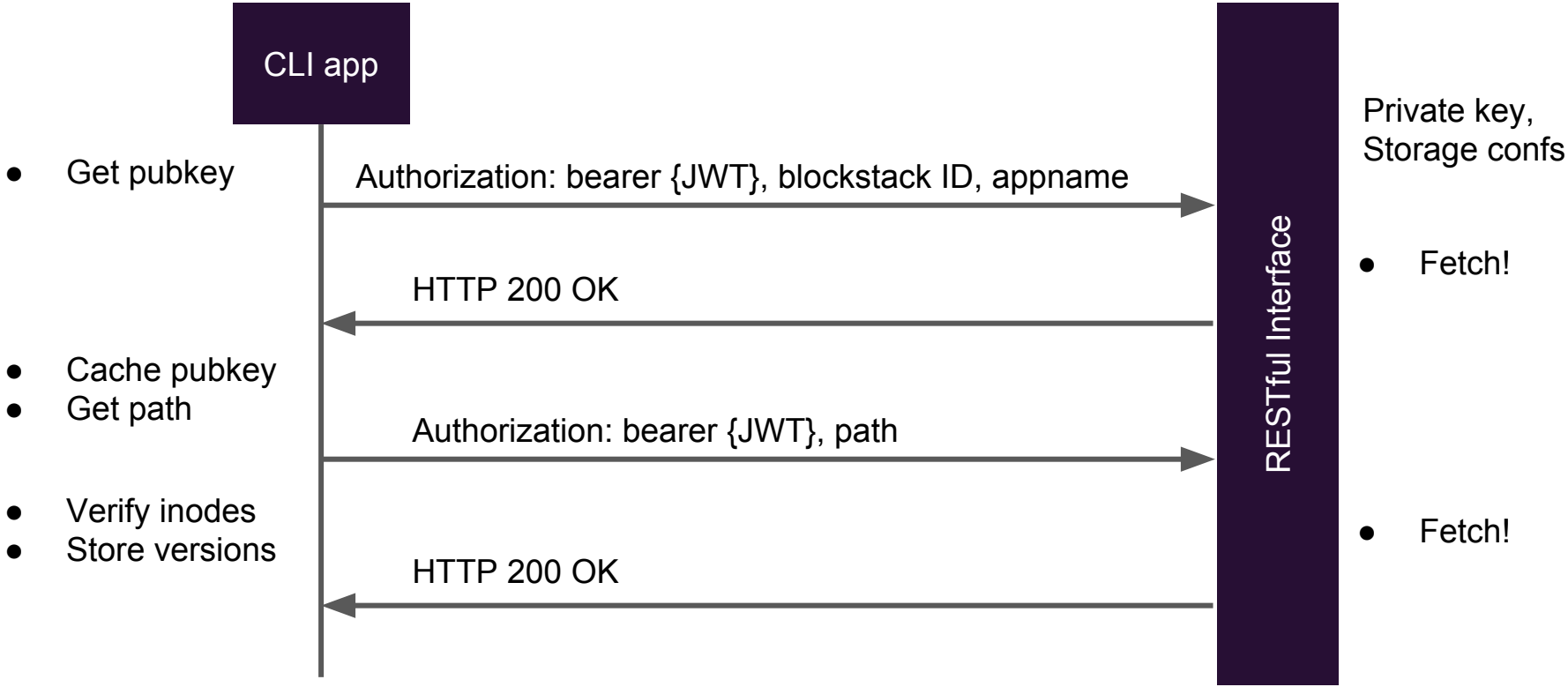
Storage Programming Model: Authentication



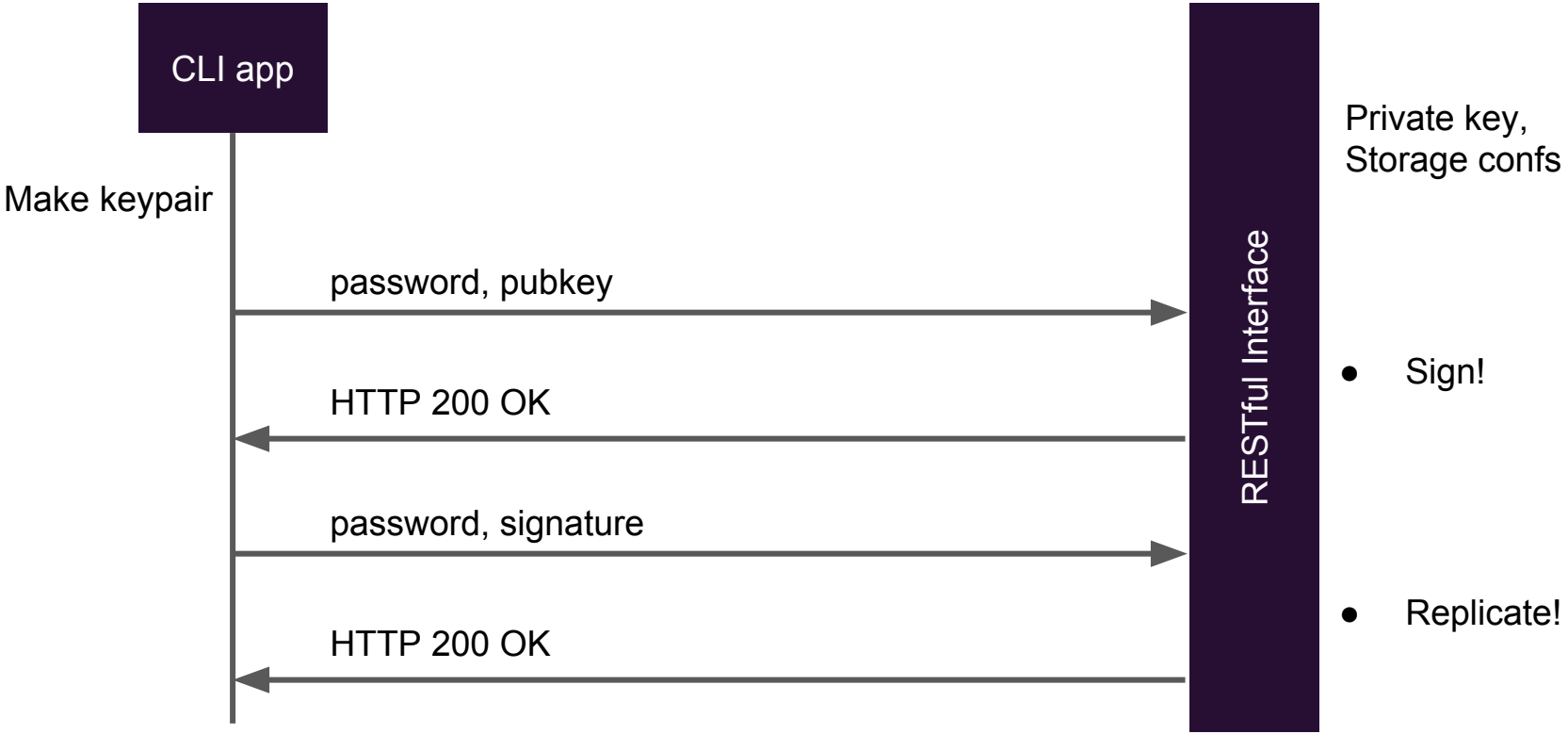
Storage Programming Model: Writes



Storage Programming Model: Reads



Storage Programming Model: Key Discovery



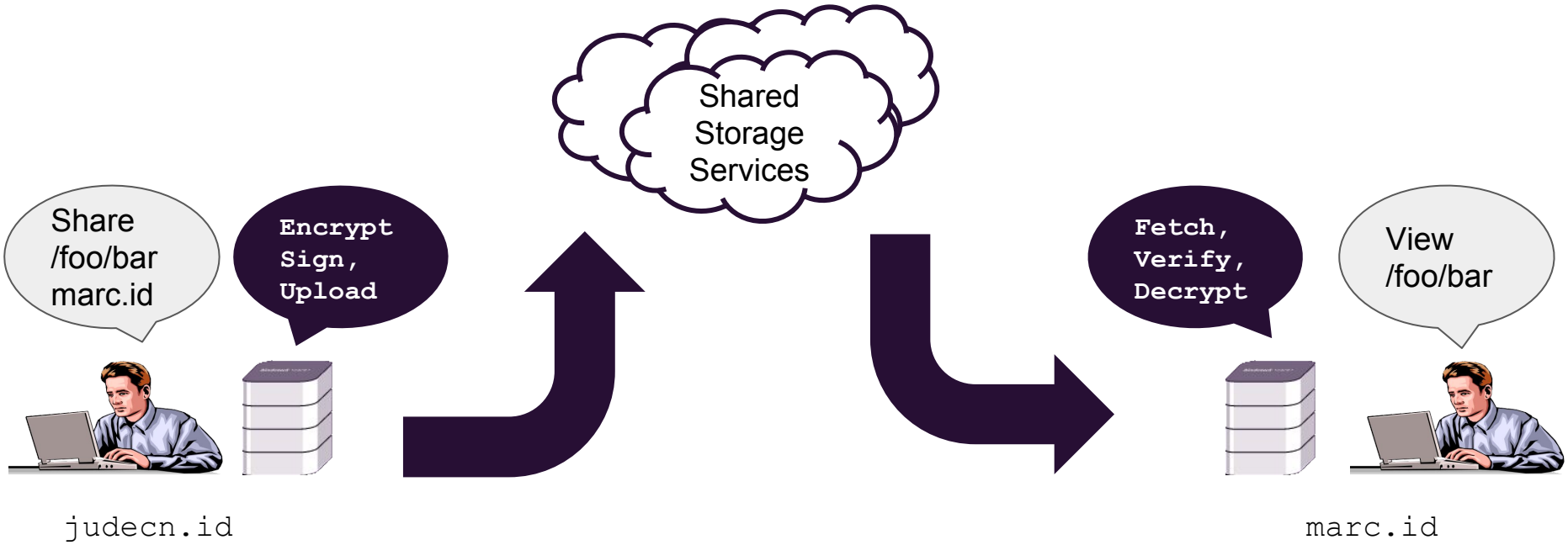
Getting Started with Blockstack

- `brew install gmp libffi openssl # OS X`
- `virtualenv /tmp/blockstack`
- `source /tmp/blockstack/bin/activate`
- `pip install --upgrade pip`
- `git clone https://github.com/blockstack/blockstack-core`
- `cd blockstack-core`
- `git checkout rc-0.14.2`
- `./setup.py build && ./setup.py install`

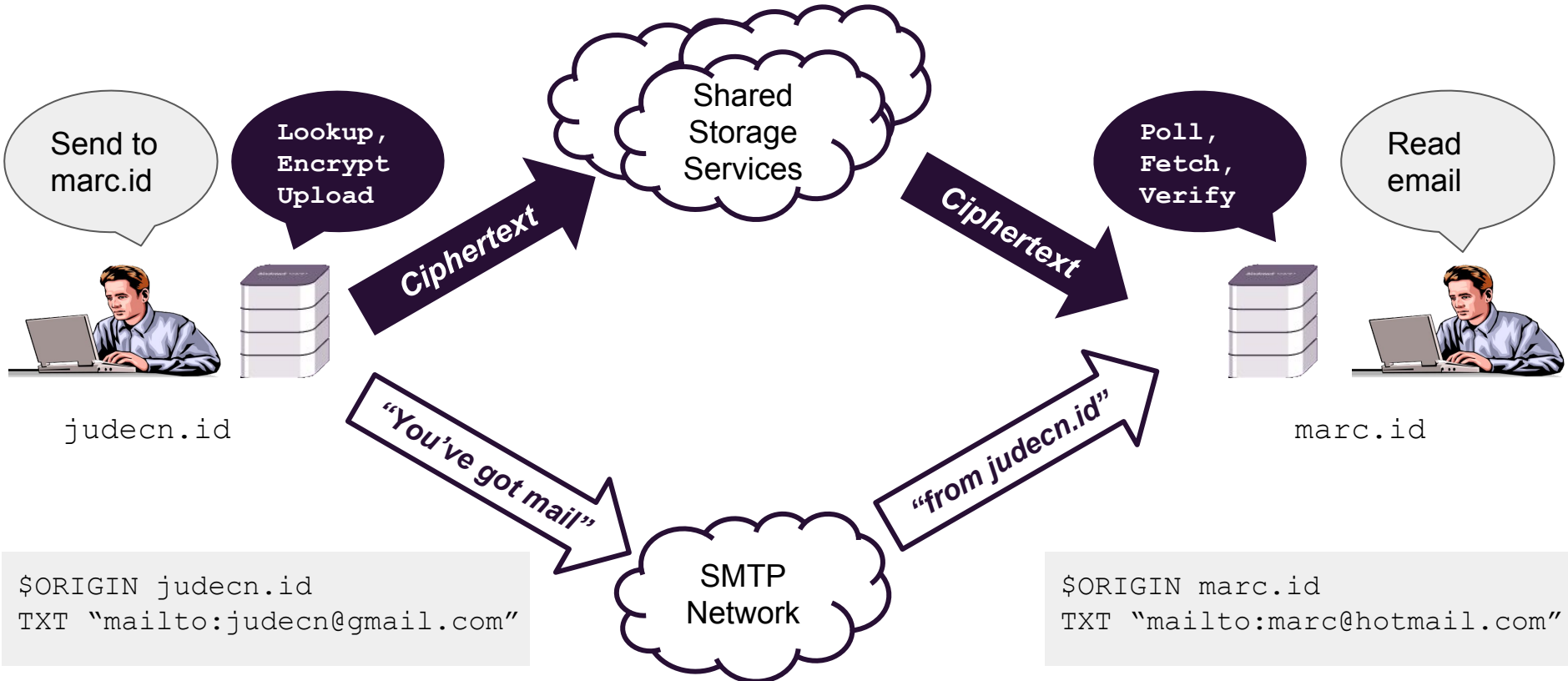
Getting Started with Blockstack

- `blockstack --debug setup`
- `blockstack --debug api start`
- `ps aux | grep blockstack`
- `tail -n 30 ~/.blockstack/api_endpoint.log`
- `cd demos/python-filesharing`

Sample App: Encrypted File-sharing



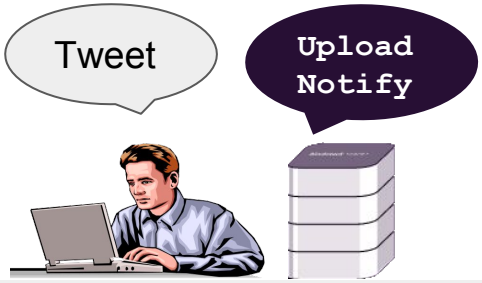
Sample App: Private Email sans PGP



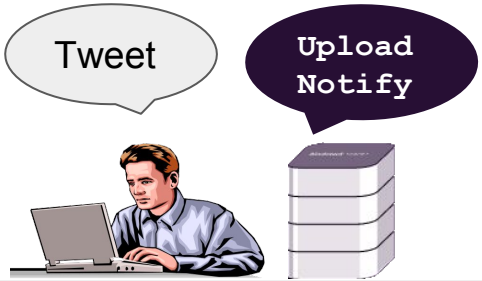

```
$ORIGIN judecn.id
TXT "mailto:judecn@gmail.com"
```

```
$ORIGIN marc.id
TXT "mailto:marc@hotmail.com"
```

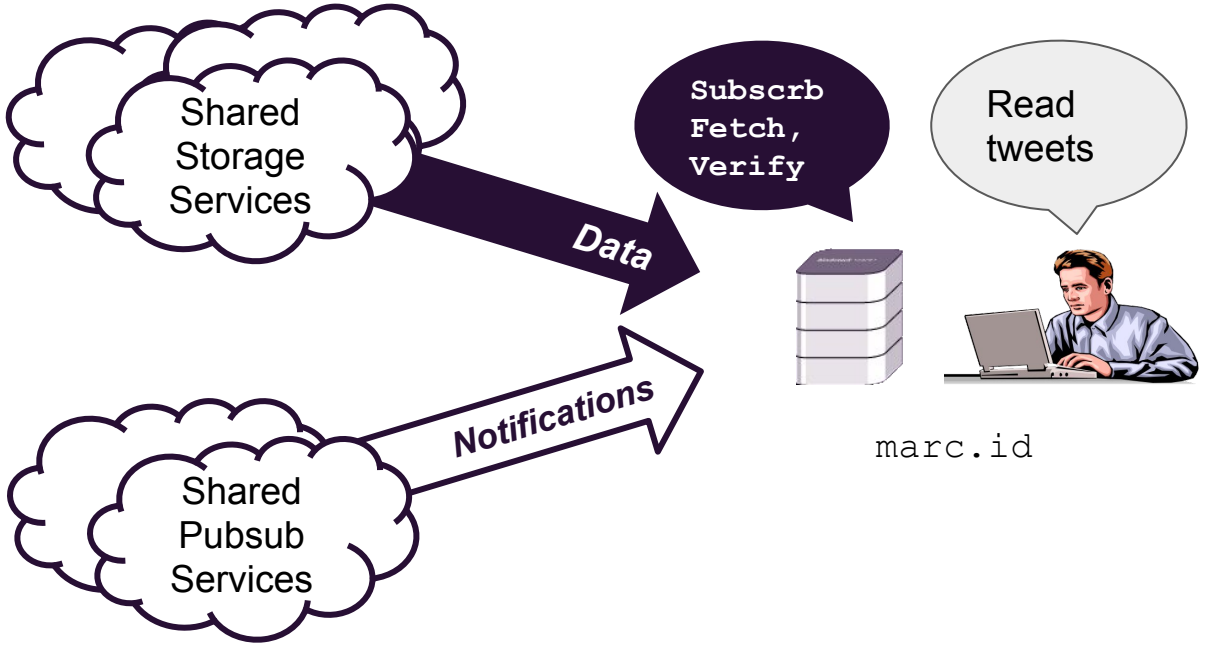
Sample App: Decentralized Twitter




```
$ORIGIN judecn.id
_pubsub URI “irc://freenode”
```




```
$ORIGIN patrick.id
_pubsub URI “zmq://1.2.3.4”
```



Design Patterns

- Reuse legacy Web for availability
  - Identify services in zone file
  - Bulk data via storage service
  - Push notifications via pubsub service
- Use Blockstack for authenticity
  - Authenticates user with pubkey
  - Sign/verify ALL content
  - Auto-managed keyrings

Towards No-Server Applications

- Single-user functionality is client-side
- What about cross-user functionality?
  - Search indexes
  - Analytics
  - Karma
- Edge computing: a possible solution?
  - Crawl users asynchronously
  - Save to developer’s storage

State of the System

- In production for 2+ years
- Over 70,000 names registered
- Peer-reviewed
- Apps by end of Q1 2017
- Open source

https://github.com/blockstack