# BigchainDB:
# A Scalable Blockchain Database

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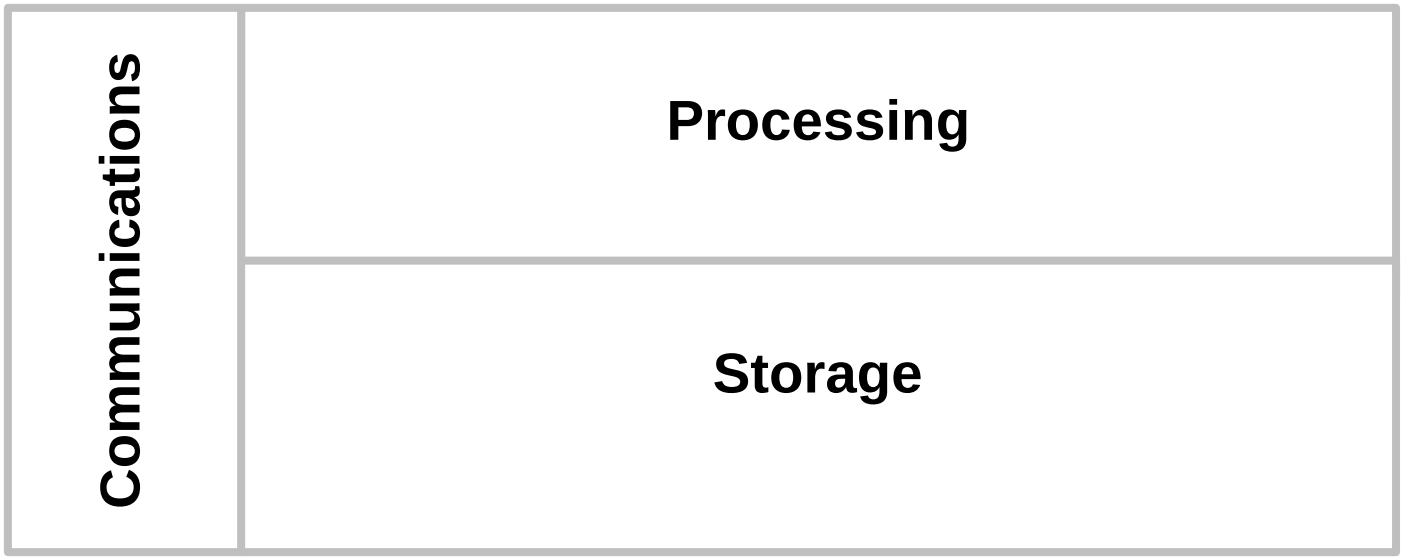
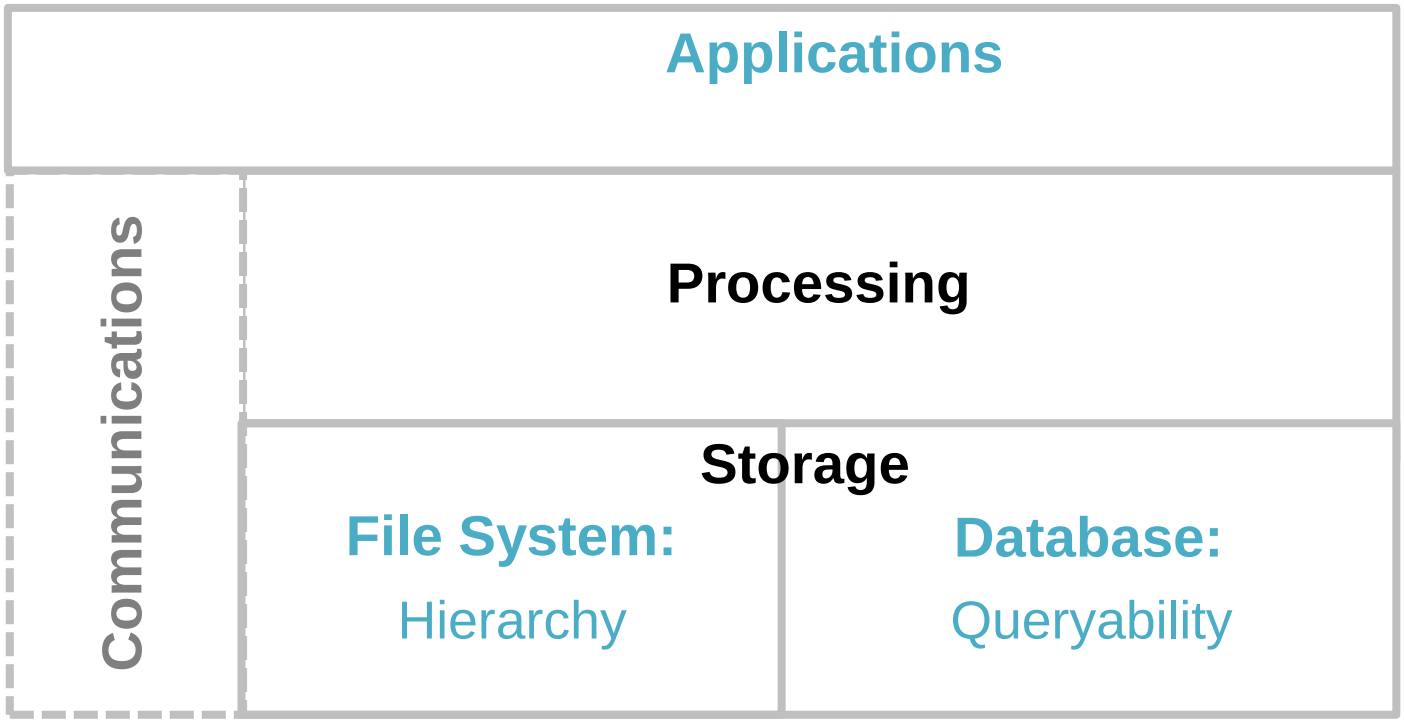
BIGCHAINDB

ascribe®

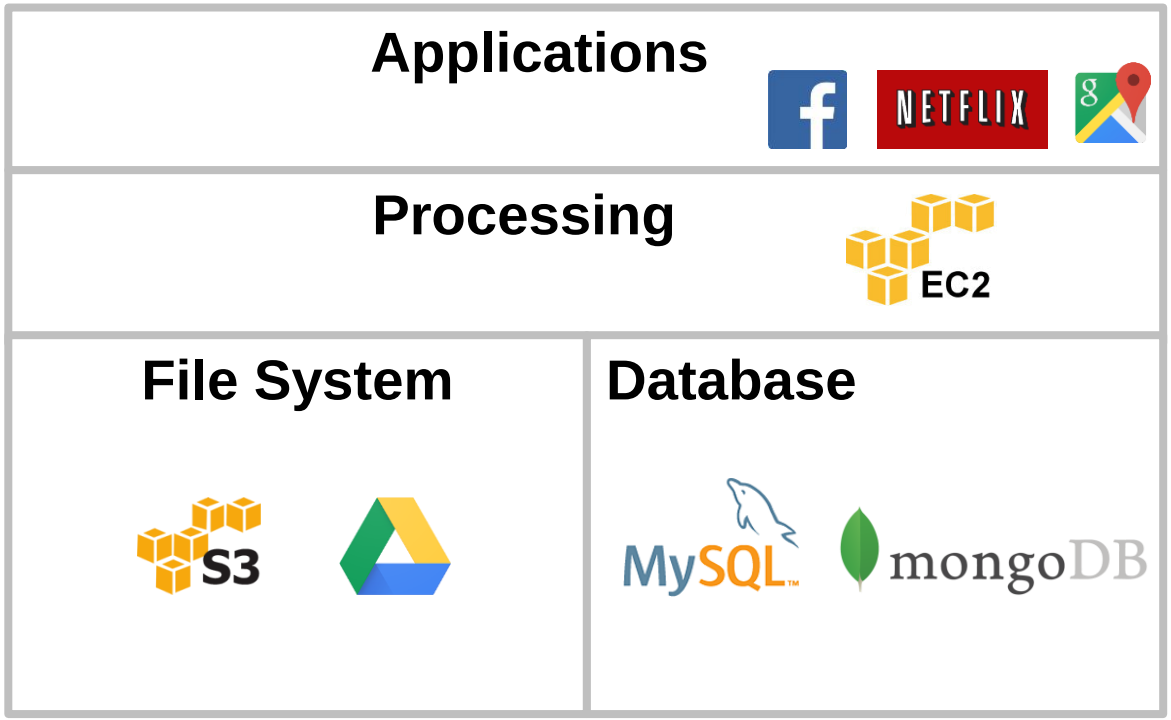
# The Elements of Computing



# Modern Application Stacks



# The modern cloud application stack

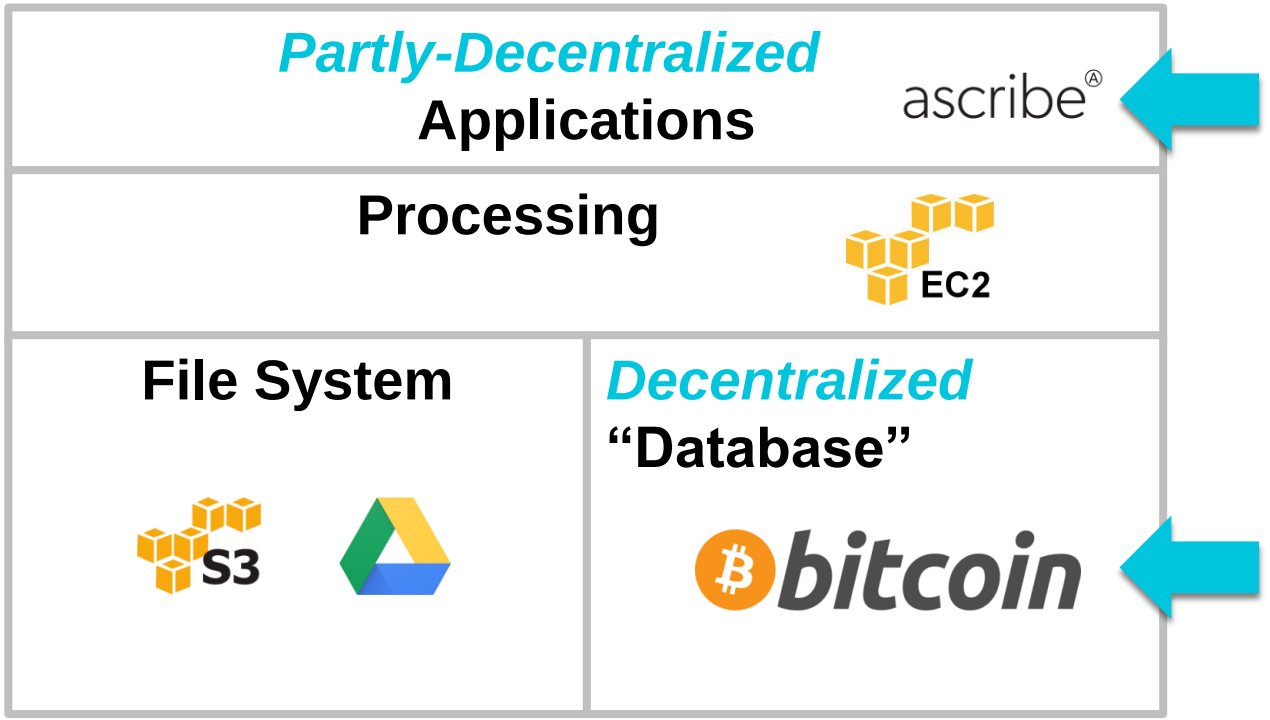


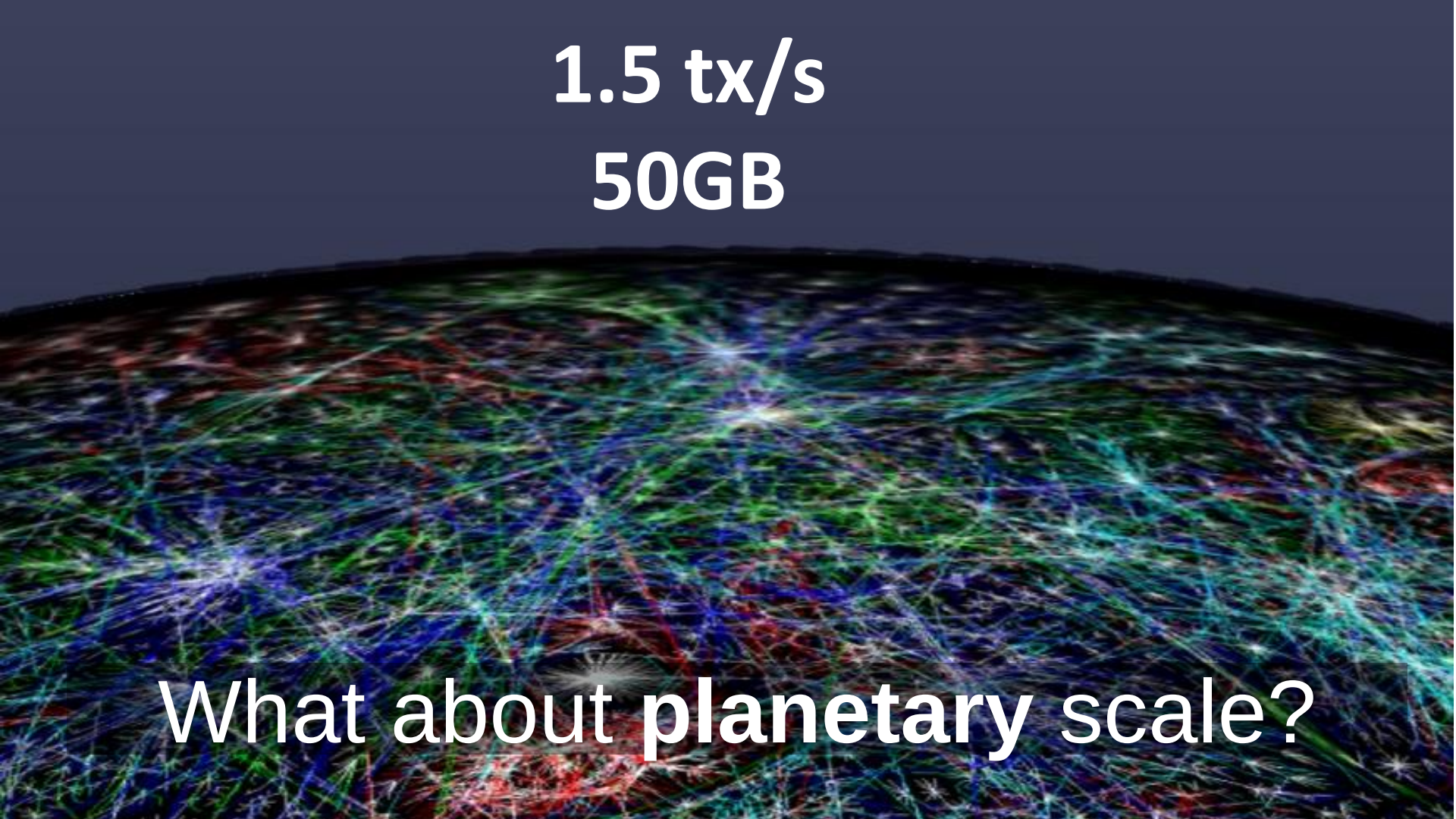
# Along came Bitcoin…

**“Magic Internet Money”**

# Bitcoin sparked a revolution

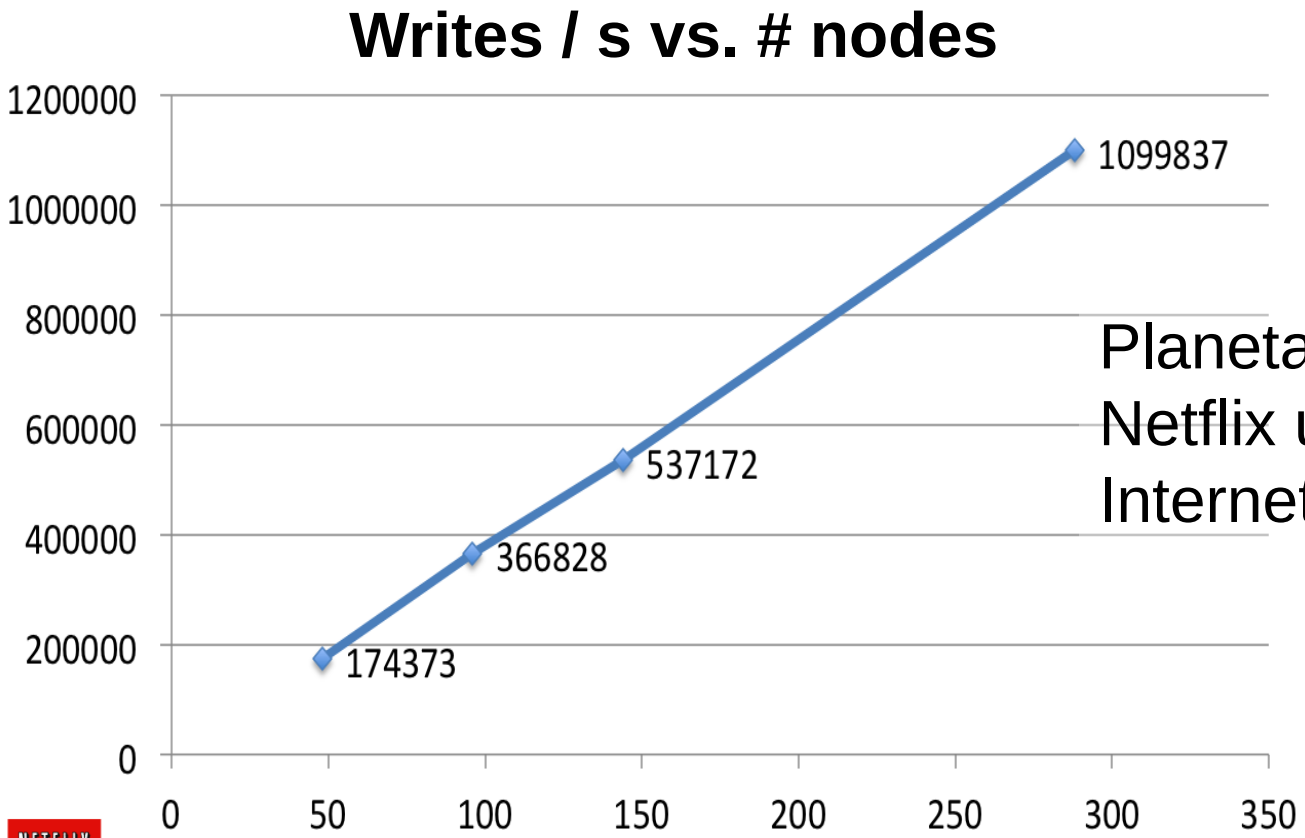
*Truly own digital assets, supply chain visibility, ….*




1.5 tx/s
50GB
What about **planetary** scale?

Planetary scale:
Netflix uses 37% of
Internet bandwidth

# “Big data” Distributed DBs




Planetary scale:
Netflix uses 37% of
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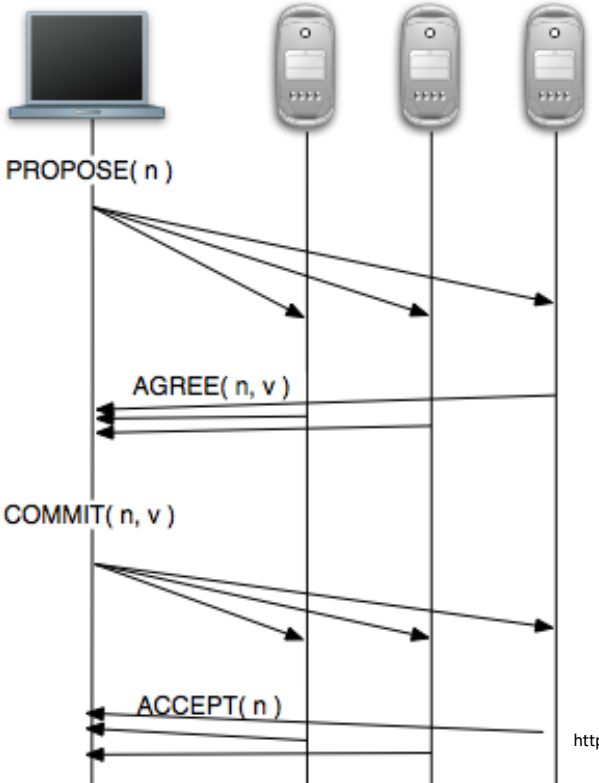
NETFLIX

http://1.bp.blogspot.com/-ZFtW7MFMqZQ/TrG5ujuDGdI/AAAAAAAAAWw/heceeMD50x4/s1600/scale.png

# To be Distributed,
# Big Data DBs Must Solve Consensus




Byzantine Consensus (1982)

Paxos (1990/1998)

https://medium.com/the-bigchaindb-blog/the-writings-of-leslie-lamport-abridged-a67df77f464#.1lr34qt6s
http://the-paper-trail.org/blog/consensus-protocols-paxos/

# Two ways to scale up

**Big data-fy the blockchain**

- Builds on man-decades of work
- Significant scalability hurdles?

<or>

**Blockchain-ify big data**

- Builds on man-centuries (millennia?) of work
- Scalability challenges already resolved
- Needs decentralized control, immutability, ..

# “Blockchain-ify”

**Decentralization:** no single entity owns or controls

**Immutability:** tamper-resistant

**Assets:** Can issue & transfer assets

**Blockchain (noun):** hashed-together chain of blocks (1991!)

**Blockchain (noun):** storage that is decentralized + immutable + assets

**Blockchain (*adj):*** decentralized + immutable + assets

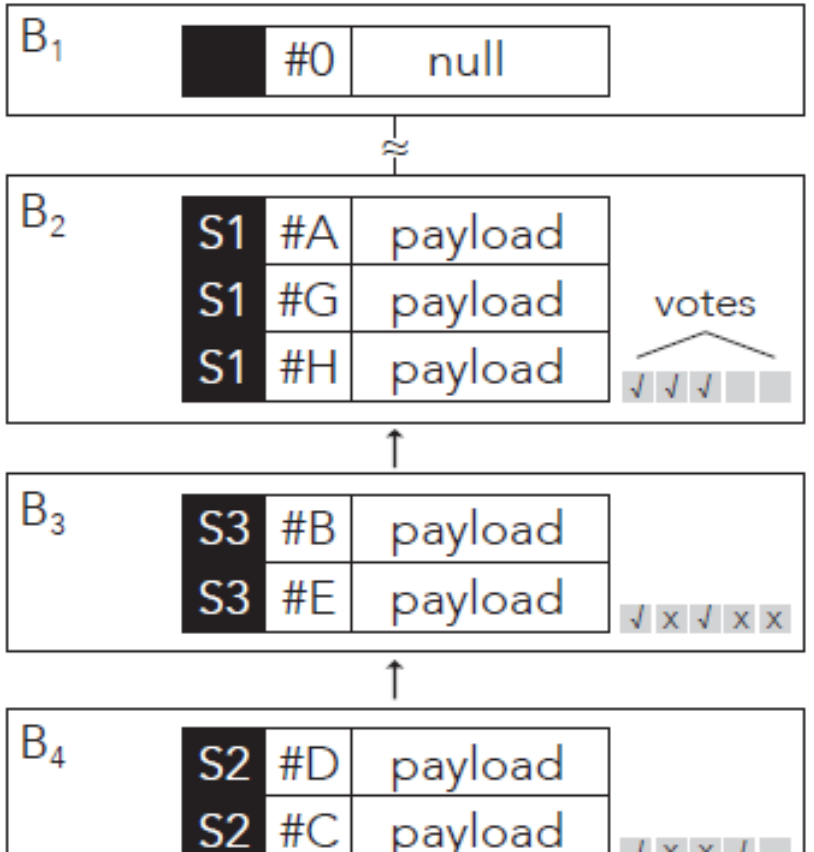
# How to Blockchain-ify Big Data

**Retain Big Data DB's Performance**

- Let the Paxos derivative *solve order*. Get out of its way!
- It naturally builds a log of *all* txs

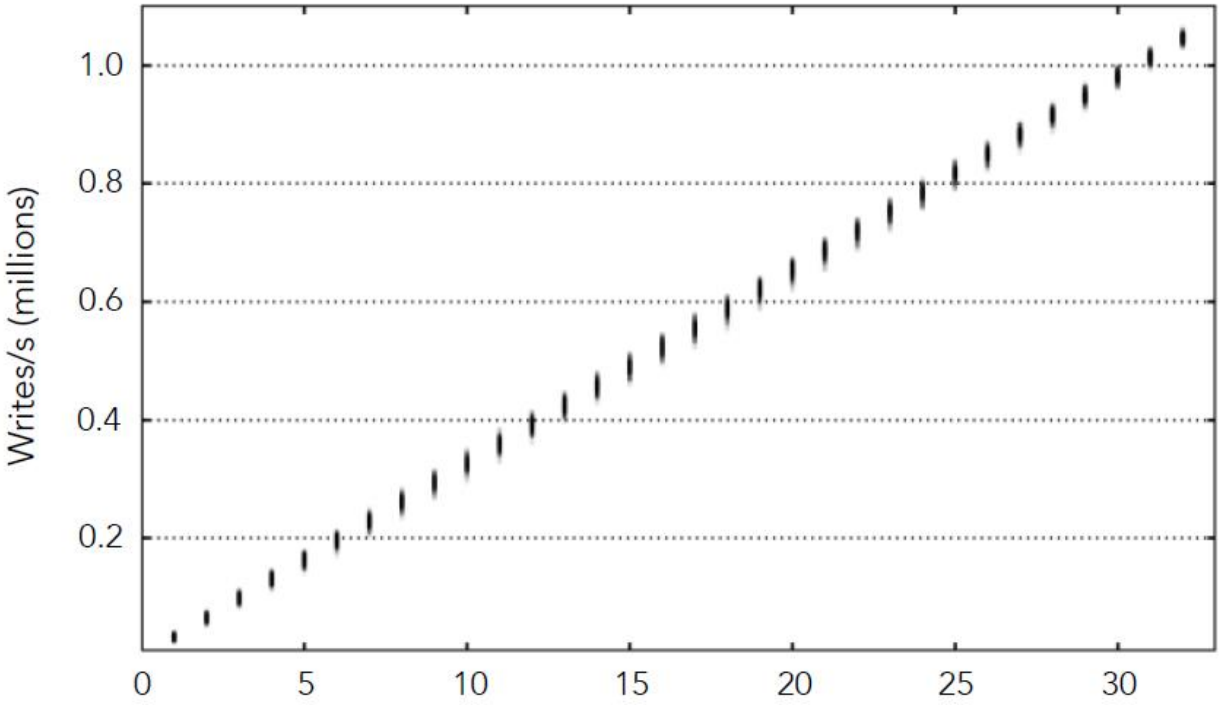
**Add in blockchain characteristics**

- **Decentralization:** federation voting on txs. Group into blocks for speed.
- **Immutability:** hash on prev. blocks
- **Assets:** Digital signatures etc.



# Benchmarks

**Writes / s vs. # nodes**




www.bigchaindb.com/whitepaper

# This is BIGCHAIN DB

## Throughput
>1,000,000 writes/s

## Latency
Less than 100 ms

## Capacity
Petabytes with each node adding 48TB

## Scalability
Performance increases as nodes are added

## Query
Database is fully queryable

| | Traditional blockchains | Big Data | BIGCHAINDB |
|---|---|---|---|
| Immutability | ☑ | | ☑ |
| Decentralized control | ☑ | | ☑ |
| Assets | ☑ | | ☑ |
| High Throughput | | ☑ | ☑ |
| Low Latency | | ☑ | ☑ |
| High Capacity | | ☑ | ☑ |
| Rich Permissioning | | ☑ | ☑ |
| Query Capabilities | | ☑ | ☑ |

# Use Case: Diamond Fraud

everledger

everledger Powered by ascribe

This certificate is up to date as of 07/12/2015 - 12:15:32 GMT.
To verify current status, please go to: http://www.everledger.io/sdf68sv1

EVERLEDGER REPORT OF AUTHENTICITY - PAGE 1 of 4

ID: 17uZBwSbLGfXy3vRRMWzF5PMjFVNc1tkQ2

EVERLEDGER REPORT OF AUTHENTICITY

EVERLEDGER REPORT OF AUTHENTICITY - HUMAN READABLE MESSAGE

| | |
|---|---|
| Shape and Cutting Size: | Round Brilliant |
| Measurements: | 6.41 - 4.42 x 3.97 mm |
| Carat weight: | 1 Carat |
| Lab name: | GIA |
| LAB ID: | 32HHT54v |

1. PROVENANCE

ID: 17uZBwSbLGfXy3vRRMWzF5PMjFVNc1tkQ2

2 LAB REPORT IMAGE

ID: 17uZBwSbLGfXy3vRRMWzF5PMjFVNc1tkQ2

3. LAB REPORT METADATA

ID: 17uZBwSbLGfXy3vRRMWzF5PMjFVNc1tkQ2

EVERLEDGER REPORT OF AUTHENTICITY - CRYPTOGRAPHIC INFO

Use the summary and signature below to authenticate this certificate: http://everledg.er/1Srz45Q

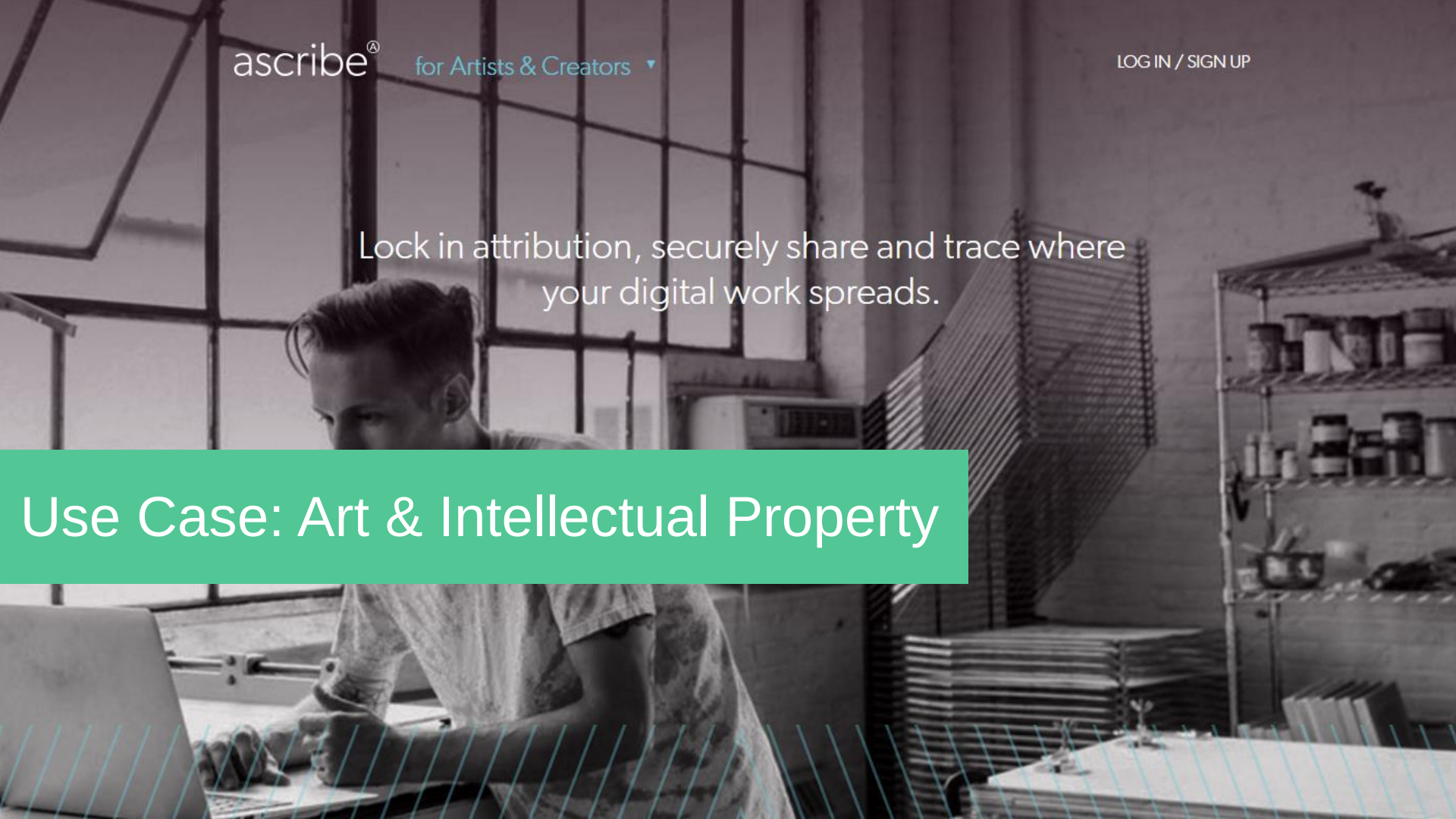
CRYPTOGRAPHIC MESSAGE (CHARACTER BY CHARACTER EQUIVALENT OF HUMAN READABLE MESSAGE):

SHA256hashoftheimageis1.ProvenanceID17uZBwSbLGfXy3vRRMWzF5PMjFVNc1tkQ22.LABREPORTIMAGEID17uZBwSbLGfXy3vRRMWzF5PMjFVNc1tkQ23.LABREPORTMETADATAID17uZBwSbLGfXy3vRRMWzF5PMjFVNc1tkQ2

SIGNATURE:

438B24CE06182FA3AA82BC285F867D03FB73F3BCC0F73FDBA6EC2BFF7088E011E60355B7DC75D5745A9D5CA2A8115512FF835C4ABEF6869BF6A991668A820F3FB03A48C6A9E05834716F650068E8E07E5266620BA8159438B24CE06182FA3AA82BC285F867D03FB73F3BCC0F73FDBA6EC2BFF7088E011E60355B7DC75D5745A9D5CA2A8115512FF835C4ABEF6869BF6A991668A820F3FB03A48C6A9E05834716F650068E8E07E5266620BA815948DC265605D23FAF016CB46ACD4BCBE75F08D0DEBD7AF55E4CB085B9A0A14583F135DBB399121B24ED1L438B24CE06182FA3AA82BC285F867D03FB73F3BCC0F73FDBA6EC2BFF7088E011E60355B7DC75D5834716F650068E8E07E5266620BA815948DC265605D23FAF016CB46ACD4BCBE75F08D0DEBD7AF55E4CB085B9A0A14583F135DBB399121B24ED1L48DC265605D23FAF016CB46ACD4BCBE75F08D0DEBD7AF55E4CB085B9A0A14583F135DBB399121B24ED1L

# Use Case: Medical Journals / Supply Chain




# Use Case: Art & Intellectual Property

# Enterprise Use Cases Made Possible by BIGCHAINDB

## Capital Markets

Determine exposure in real-time and position on trades

Streamline Back Office functions

Faster Reconciliations

## IoT & Supply Chain

Prevent fraud via transparency, certificates

Detect fraud and leakage using analytics

See bottlenecks and delays in real-time

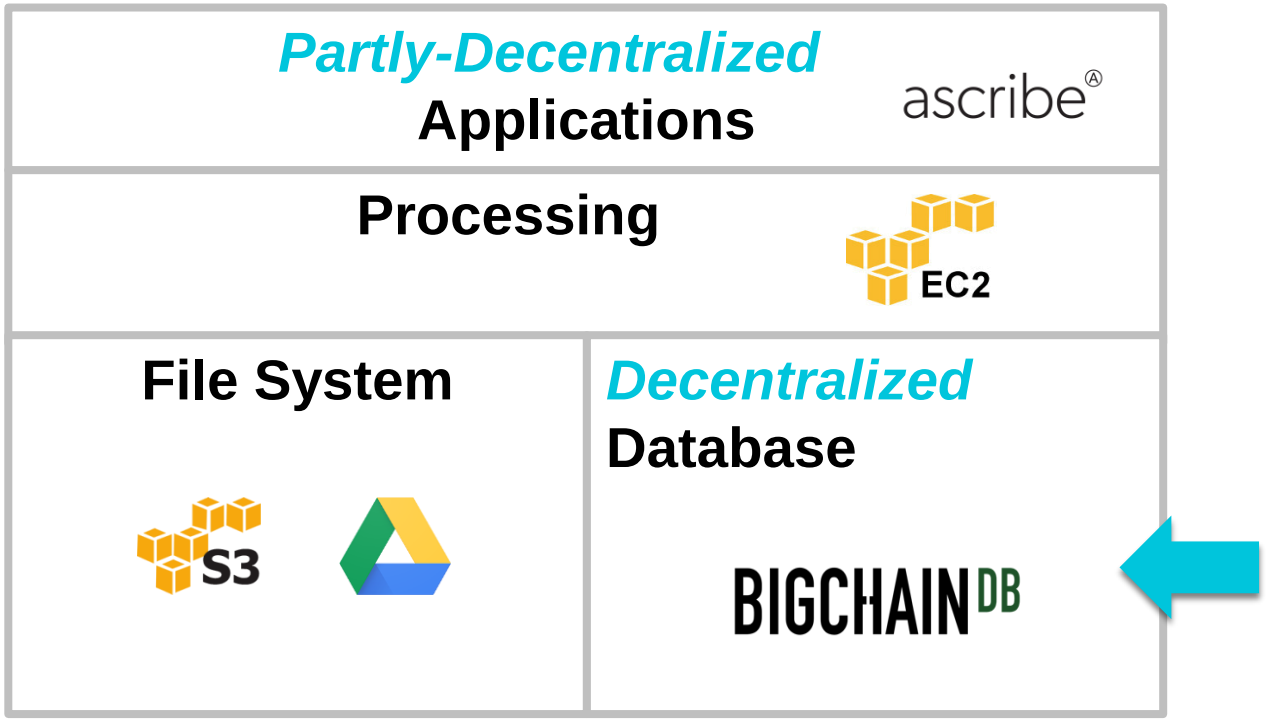
## Payments

Reduce risk and cost of escrow

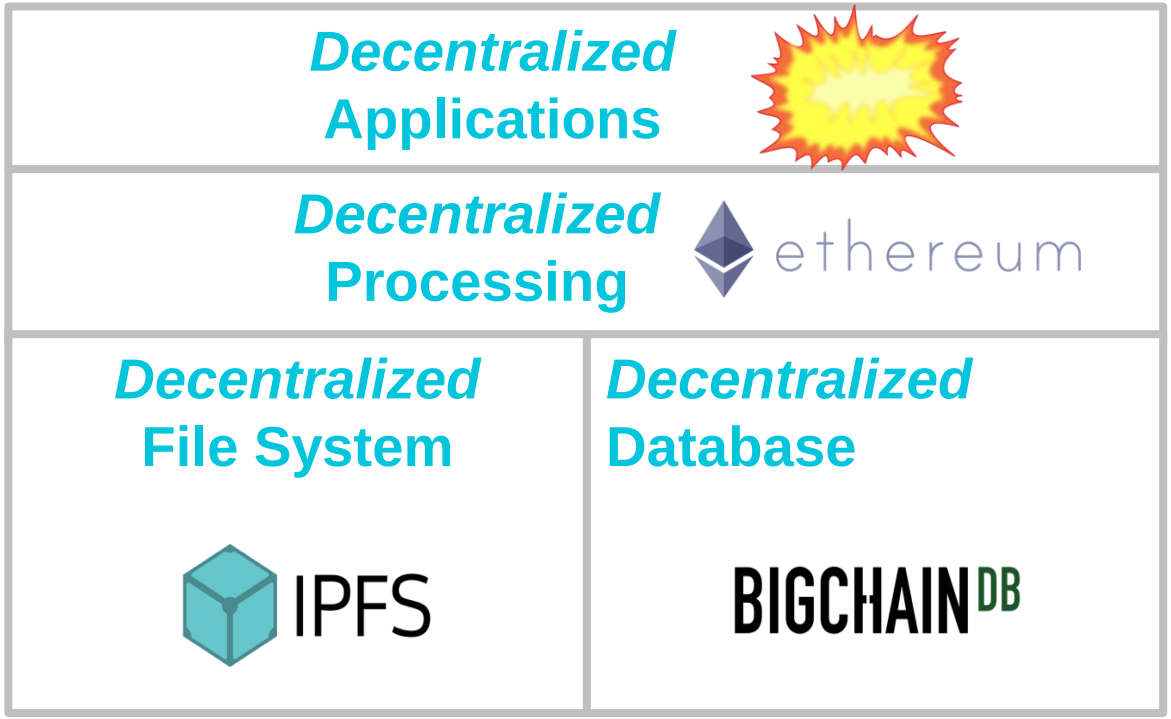
Reduce time to transmit funds

Provide audit trail and receipts

# A Decentralized DB for the Planetary-Scale Cloud



# Bonus: A DB for the Emerging Planetary-Scale *Decentralized* Cloud



# BigchainDB:
# A Scalable Blockchain Database
# For the Planet & The Enterprise
# (& Wrigley)

github.com/bigchaindb
bigchaindb.com/whitepaper

NETWORK ILLUSTRATION
BY OPTE PROJECT