



BLOCKCHAIN TECHNOLOGY

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3:00 PM to 6:00 PM

*Your moderator:
David Snyder, 42TEK, Inc.*

THE BASICS



- Blockchain technology provides a distributed ledger, instead of a central database
- the distributed ledger is made up of blocks of data that are chained together with cryptography that makes it almost impossible to make changes once something is recorded
- Blockchain is what makes Bitcoin and other cryptocurrencies work
- it is not a panacea — sometimes ordinary databases are just fine
- Blockchain is predicted to become like TCP/IP and PKI - the technologies we use everyday when we use the Internet
- Hundreds of companies are experimenting with Blockchain

- **Financial Uses of Blockchain Dominate the Discussion**
- **Non-Financial Uses are Also Important**
- **Personal interest:**
 - **Connected Devices - “Internet of Things”**
 - **Data from These Billions of Devices**
 - **Ensuring data quality and security**

HOW BLOCKCHAIN COULD CHANGE FINANCE

<https://www.youtube.com/watch?v=sYduOfRLHq0>



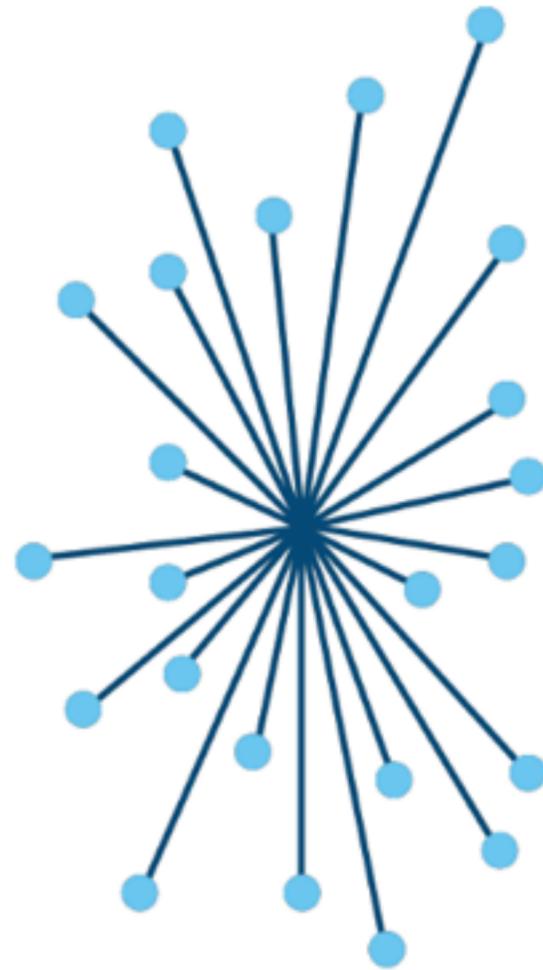
How Blockchain could change finance.mp4

KEY CONCEPTS

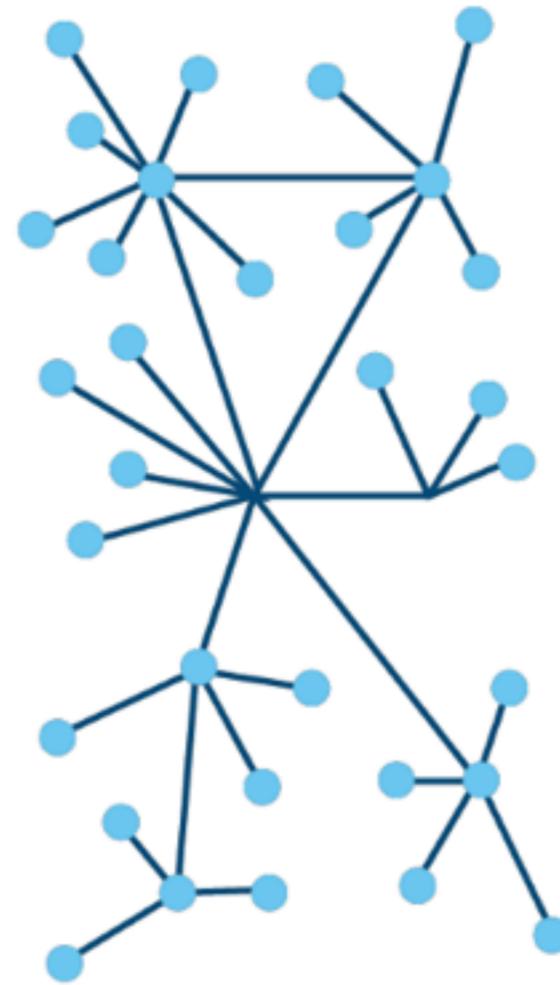


- no central authority (as opposed to centrally managed databases)
- distributed ledger - a shared record of transactions
- trust through immutable, time-stamped records
- keeping track of transactions and preventing “double spending”
- a series of blocks of data, chained together cryptographically using “hashes”
- “proof of work” by “miners” who secure transactions into the chain of blocks by performing difficult computations
- “permissionless” block chains vs. “permissioned”

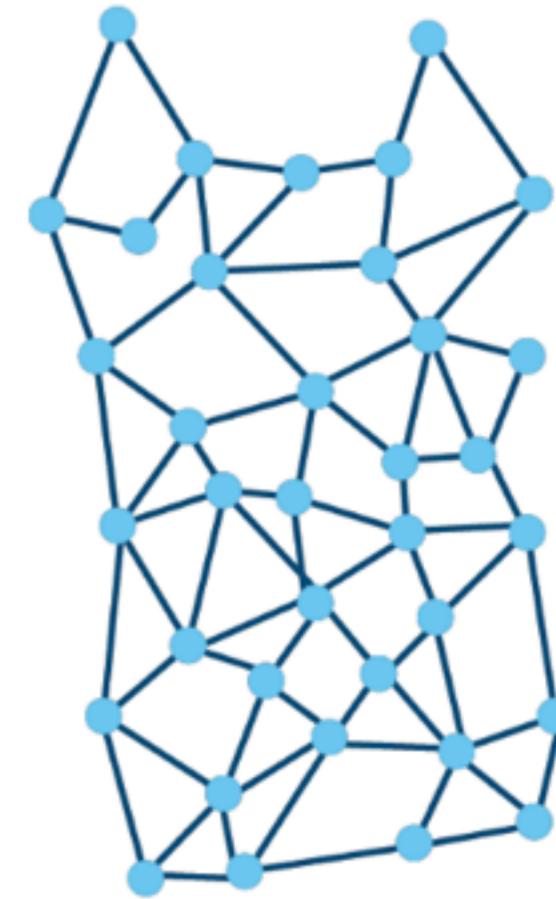
TYPES OF NETWORKS



Centralized

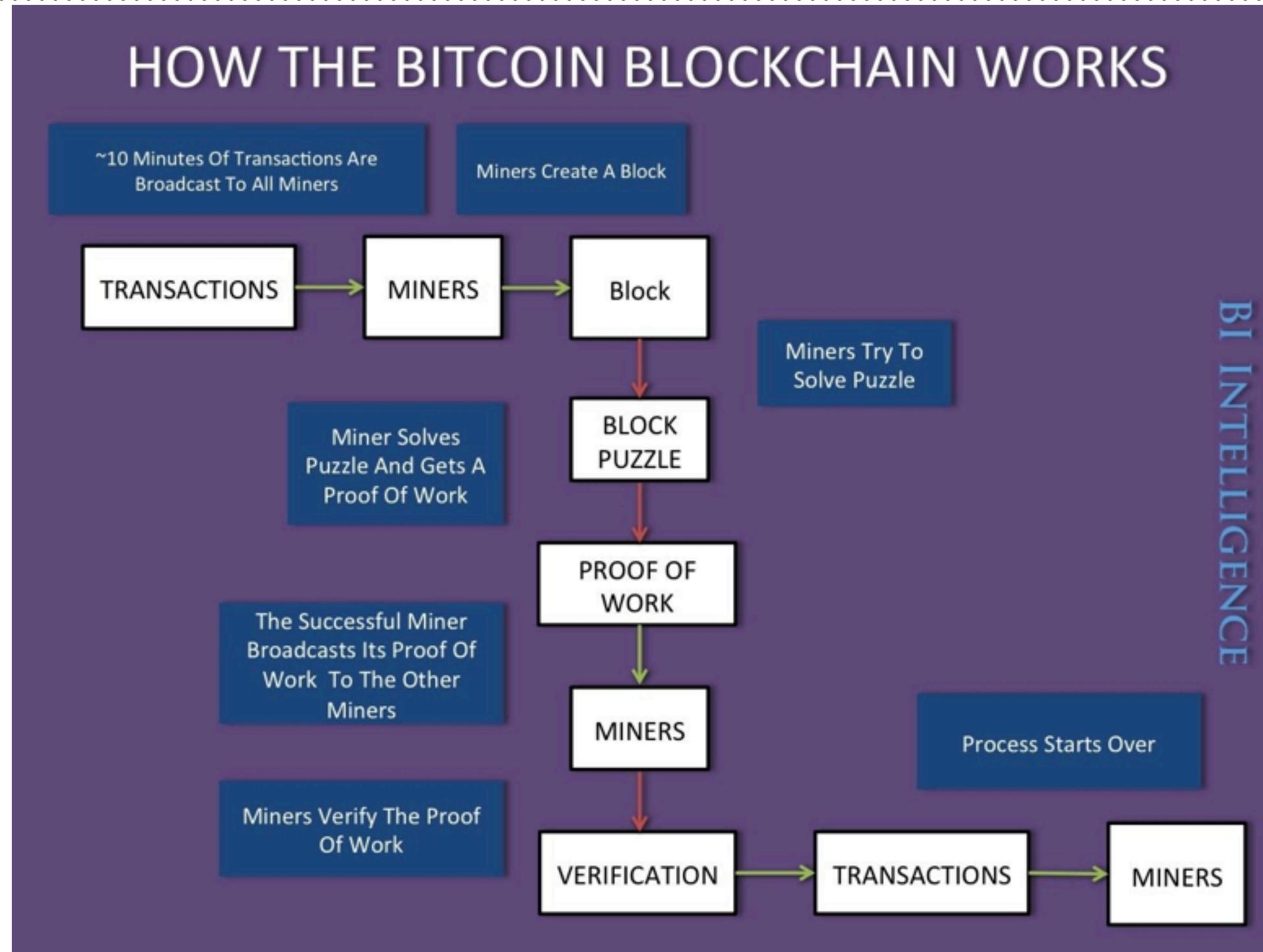


Decentralized



Distributed

HOW THE BITCOIN BLOCKCHAIN WORKS



WHAT DOES THE HASH FUNCTION DO?



David Snyder
Test File
October 19, 2016 3:50 PM

Test content.
Palo ALto, CA

3.14159
2.718

It is a mathematical algorithm that maps data of arbitrary size to a bit string of a fixed size (a hash function) which is designed to also be a one-way function, that is, a function which is infeasible to invert.

— Wikipedia

SHA-256

1bcc31c1267e576b680244b21bd2c6e90420e7dcd1ae376bcb570c06d1cbf8a7

David Snyder
Test File
October 19, 2016 3:50
PM

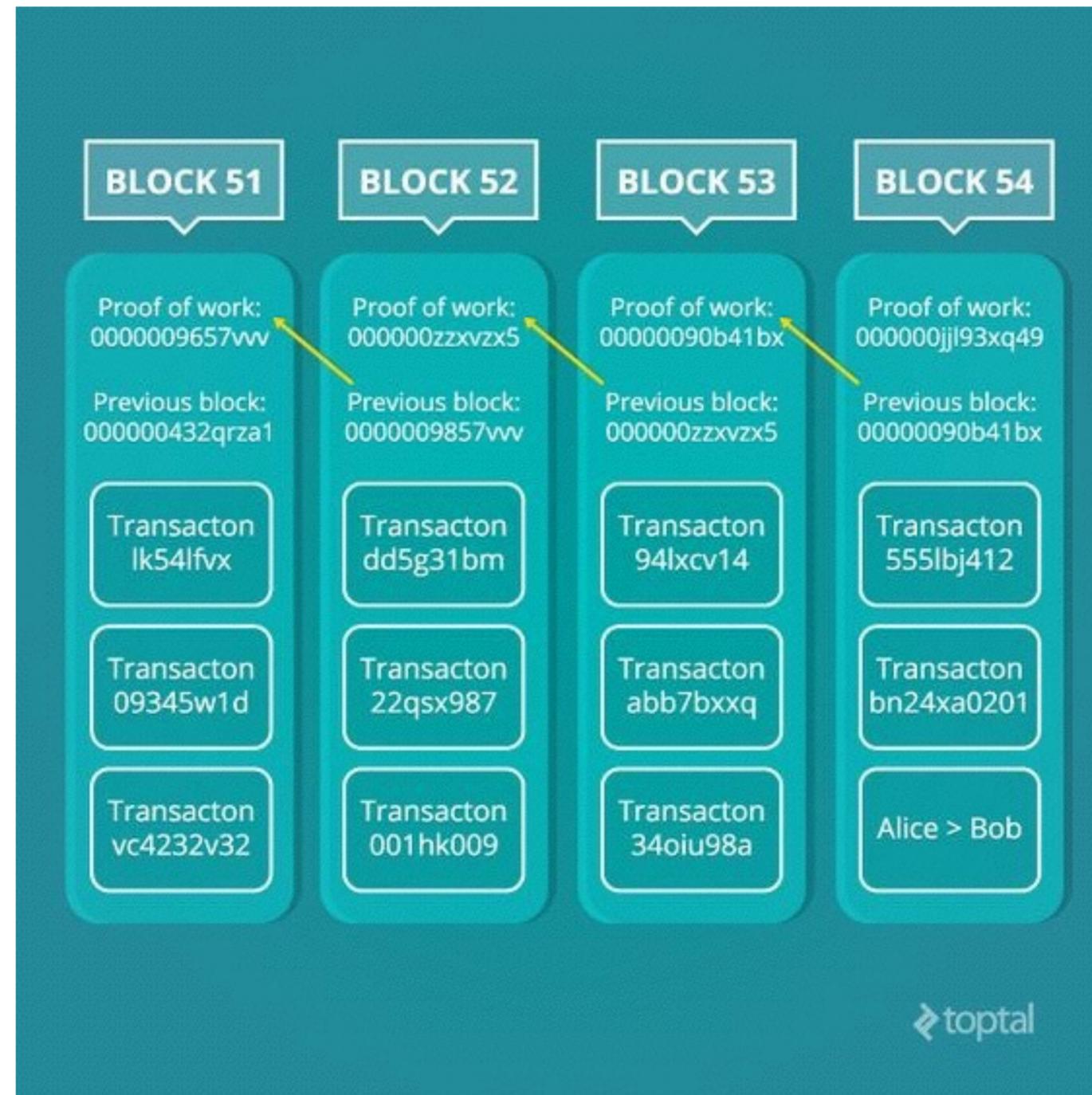
Test content.
Palo ALto, CA

3.14159

SHA-256

bc0f1ef50af75a0ebb8ad42a5839823a7da563b5ad328efdcbbcc3cd2366cdc4

CHAINING OF BLOCKS



A hash of the previous block is included in the next block





<http://firstpartner.net/news/new-market-map-defines-blockchain-ecosystem>

Blockchain numbers

\$921 million Cumulative VC investment in Bitcoin & blockchain companies to Oct 2015. \$462 million of this in 2015 alone.

\$121 million Largest cumulative funding total - raised by Bitcoin computer developer 21inc.¹

805 Number of early stage Bitcoin & blockchain companies identified by Venture Scanner²

30+ Banks & Financial Institutions known to be testing, analysing or investing in the blockchain technologies³

11m Number of registered Bitcoin wallets in Sept 2015 - up from 6.6m in Sept 2014⁴

106,000 Number of merchants who accept Bitcoin⁴

\$4.9bn Bitcoin capitalisation Nov 2015. Bitcoin accounts for around 90% of the capital value of all cryptocurrencies⁵

\$2.7bn value of Bitcoin trading in Sept 2015⁶

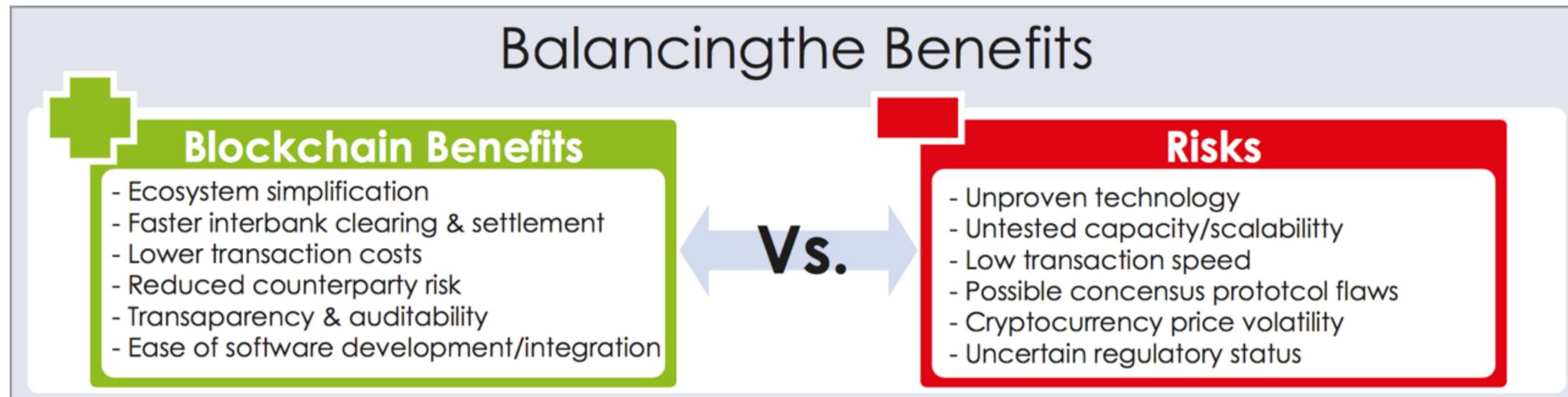
475 Bitcoin ATMs installed worldwide⁷

Sources:

- 1 CoinDesk & Crunchbase
- 2 Venturescanner.com reviewed Nov 2015
- 3 FirstPartner research
- 4 CoinDesk State of Bitcoin Report Q3 2015
- 5 Blockchain.info checked 16th Nov 2015
- 6 Bitcoinity.org
- 7 Coin ATM Radar checked Oct 2015

805 early stage Bitcoin and blockchain companies (2015)

\$2.7 billion value of Bitcoin trading in Sept 2015
\$11.6 billion value of Bitcoin trading Nov 1 2016



PROS & CONS



- *“If trust and robustness aren’t an issue, there’s nothing a blockchain can do that a regular database cannot.”* — Gideon Greenspan, CEO of Coin Sciences Ltd. (www.multichain.com)
- When is it a good idea to use blockchain technology?
 - 1) you need a shared database; 2) you need a database with multiple writers; 3) you have a situation with multiple non-trusting writers; 4) you do not want to rely on a trusted intermediary; 5) you desire interaction between transactions in the database
- When is it a bad idea to use block chain technology?
 - If you lack any of the five above conditions

[based on writings of Gideon Greenspan]

*Centralized
databases are
better for
confidentiality*

*Blockchains are
better for
robustness*

BLOCKCHAIN APPLICATIONS BEYOND CURRENCY



General	Escrow transactions, bonded contracts, third-party arbitration, multiparty signature transactions
Financial transactions	Stock, private equity, crowdfunding, bonds, mutual funds, derivatives, annuities, pensions
Public records	Land and property titles, vehicle registrations, business licenses, marriage certificates, death certificates
Identification	Driver's licenses, identity cards, passports, voter registrations
Private records	IOUs, loans, contracts, bets, signatures, wills, trusts, escrows
Attestation	Proof of insurance, proof of ownership, notarized documents
Physical asset keys	Home, hotel rooms, rental cards, automobile access
Intangible assets	Patents, trademarks, copyrights, reservations, domain names

from Blockchain: Blueprint for a New Economy by Melanie Swan (2015)

ANOTHER VIEW



Blockchain Use Cases



Finance	Healthcare	Distribution	Food/ Agriculture	Manufacturing	Others
Currency exchange	Electronic Medical record	Transport records	Breeding records	Product guarantee information	Digital content
Deposit/ money transfer	Genome data	Storage records	Growth data	Manufacturing management	Sharing economy
Crowd-funding	Vital signs	Sales records	Soil data	Product assurance	Artwork ownership
Smart securities	Past medical history	Marketplace	Processing records	Robots/ Sensors	Jewels and precious metals
Smart contract	Prescription records	Digital currencies	Shipping data	After-sales service	Space development
Social banking	Hospital information	Mining chips	Sales and marketing	Supplier/Component tracking	Government and voting
Digital assets	Healthcare costs	Used goods sales	Management information	Transaction Records	Virtual nations

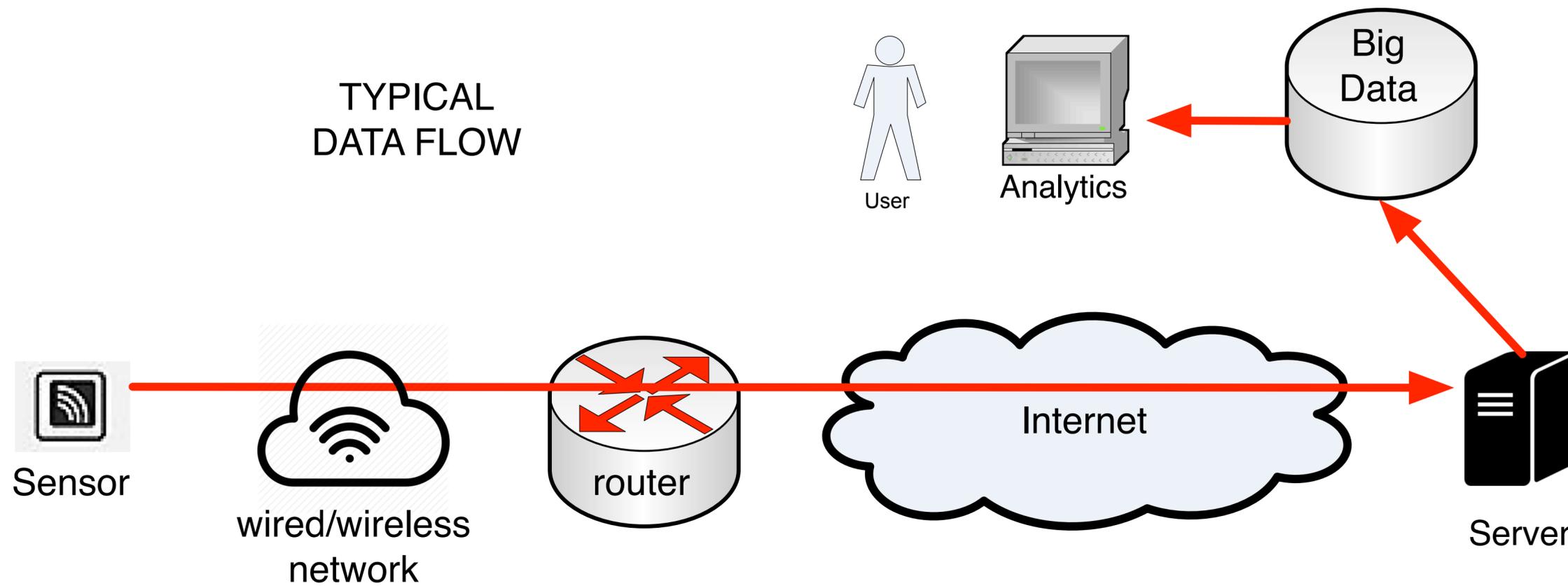
Source: Blockchain2.0 http://www.digitalmoney.or.jp/wp-content/uploads/2015/08/20150814_Blockchain2.0.pdf, correcting document

IOT VULNERABILITIES

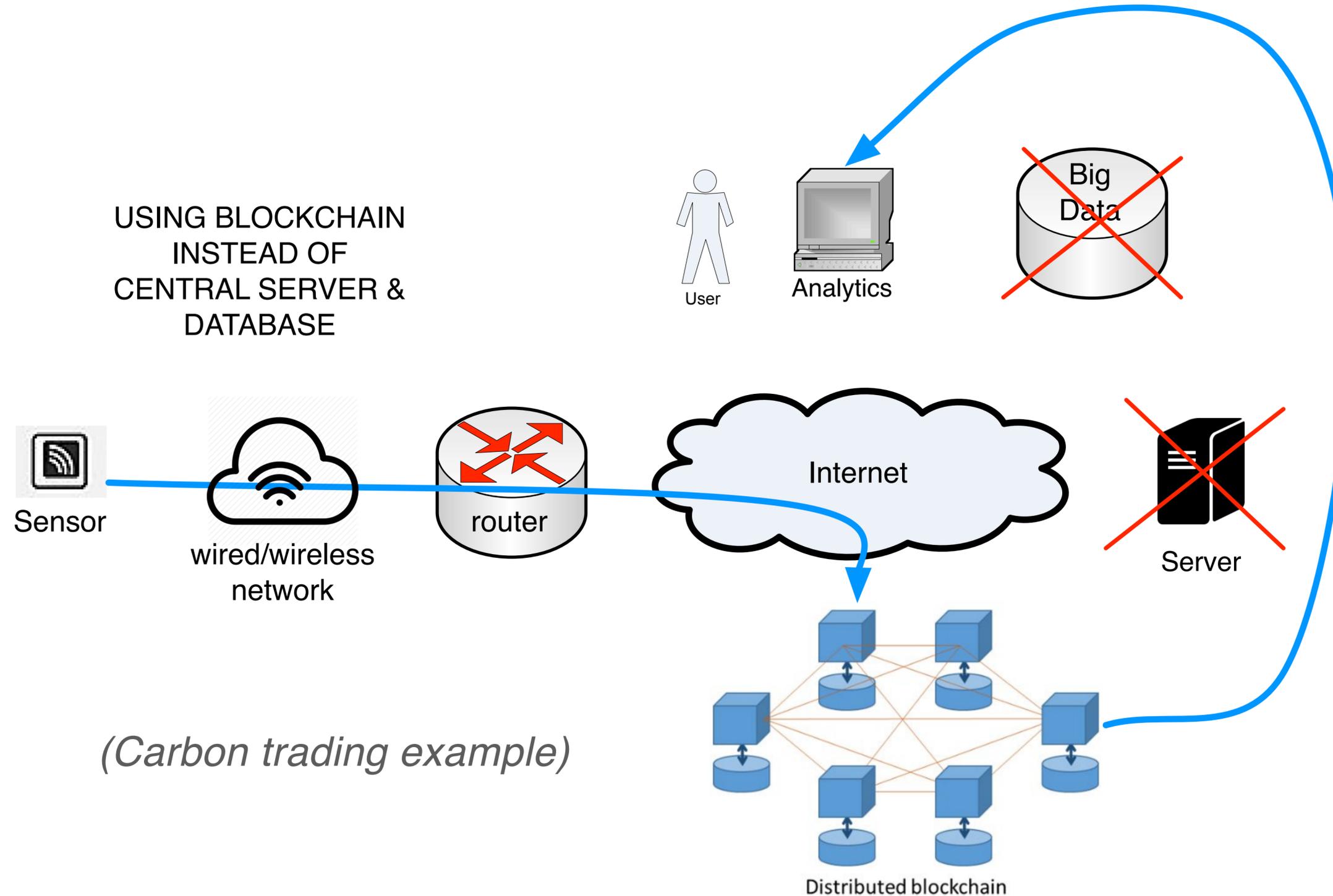


- “Black Hat: Nest thermostat turned into a smart spy in 15 seconds” ([Computerworld](#))
- “Watch out, new parents—internet-connected baby monitors are easy to hack” ([fusion.net](#))
- “When 'Smart Homes' Get Hacked: I Haunted A Complete Stranger's House Via The Internet” ([Forbes](#))
- “Connected devices are easily hacked. Why aren't we holding manufacturers accountable?” ([recode.net](#))
- “IoT Devices as Proxies for Cybercrime” ([krebsonsecurity.com](#))
- “No wonder we're being hit by Internet of Things botnets. Ever tried patching a Thing?” ([theregister.co.uk](#))

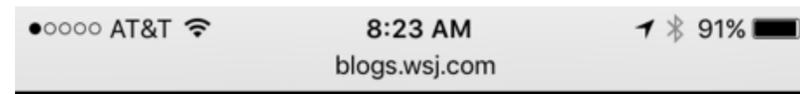
INTERNET OF THINGS



INTERNET OF THINGS WITH BLOCKCHAIN



IOT DATA QUALITY



CIO JOURNAL.

NEXT STORY >

Build Data Quality Into the Internet of Things

By

THOMAS H. DAVENPORT AND THOMAS C. REDMAN

Aug 26, 2015 3:03 pm ET

1 COMMENTS



- **Accuracy.** *Do the values that have been accumulated from across the network of IoT devices accurately reflect what was produced at each device? For example, if we have ten devices within the same room reporting the ambient temperature, are all of those devices reporting the same temperature, or temperatures that are within a reasonable deviance from each other?*

- **Consistency.** *Are the values logged within the big data environment consistent with the context in which the values were produced by each device? For example, if multiple events are reported by an app on a mobile device and they are tagged with a geolocation, are those geolocations the same or close to each other?*

- **Completeness.** *Have all the data values been accumulated at the big data environment? Are there any gaps in a series of reported events or sensor values that should have been captured?*

- **Timeliness.** *Are the values being captured within a reasonable time frame? If much of the data is streamed and coming from a wide variety of devices, are there monitoring points to ensure that the collective data set is synchronized?*

Characteristics of IoT data quality - David Loshin | April 27, 2016

<http://blogs.sas.com/content/datamanagement/2016/04/27/characteristics-iot-data-quality/>



Anne Connelly, Ledger Labs

Canada's leading blockchain consulting company. Working on Smart Contracts.

Aldo Carrascoso, Align Commerce

Enables enable businesses and payment platforms to send and receive payments in local currency using the block chain.

Abhishek Gutgutia, Accenture

Actively looking to connect to enterprise startups in IoT, Blockchain / Bitcoin, Security, SaaS/PaaS/IaaS.

Ryan Orr, Chronicled

The Chronicled platform provides a digital record of your real world things.

Shahryar Sedghi, IBM

Blockchain Solutions Architect.

***Use Contact form at
www.42tek.com to
request slides***

*moderator: David M. Snyder
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