Blockchains for Data Scientists

A Blockchain Primer

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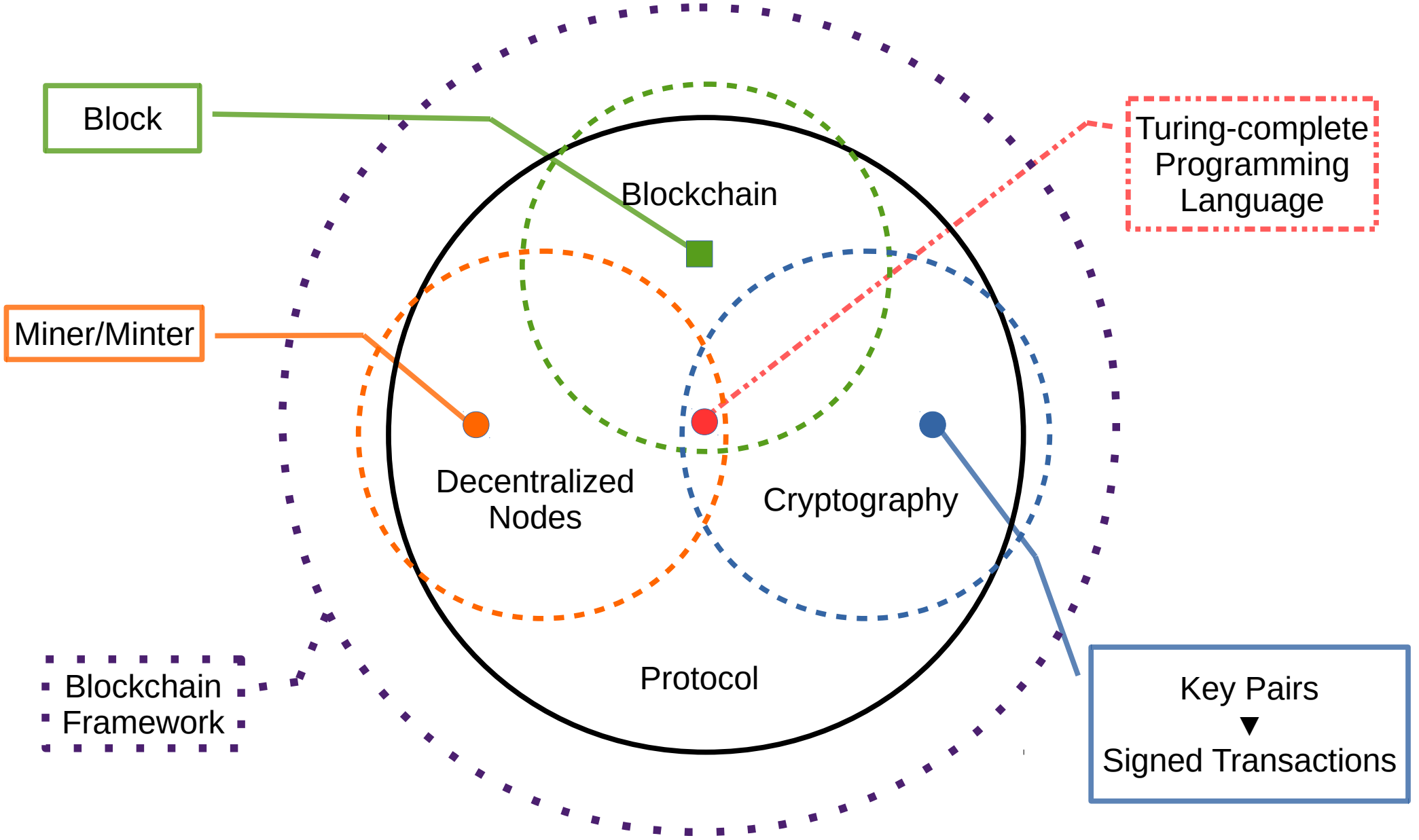
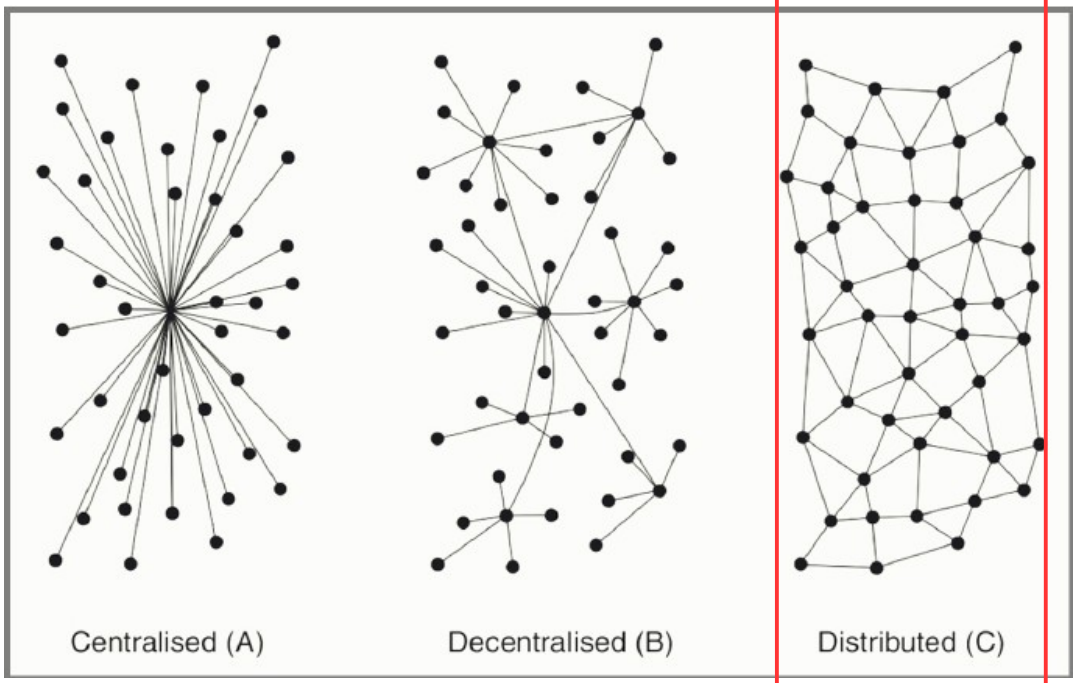
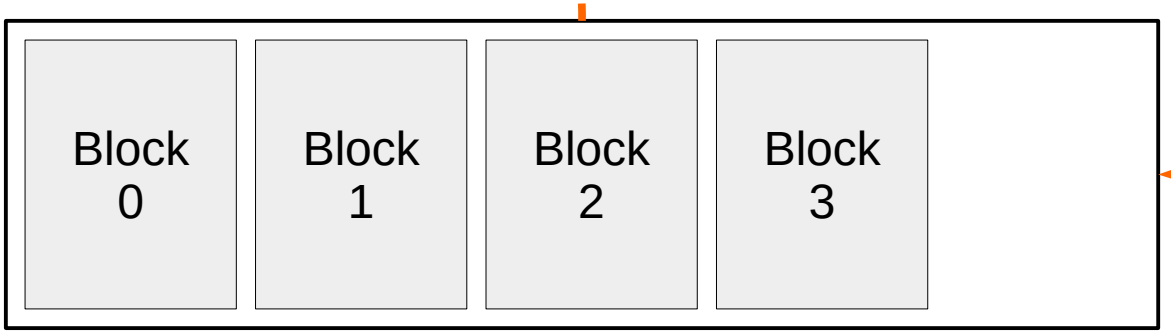
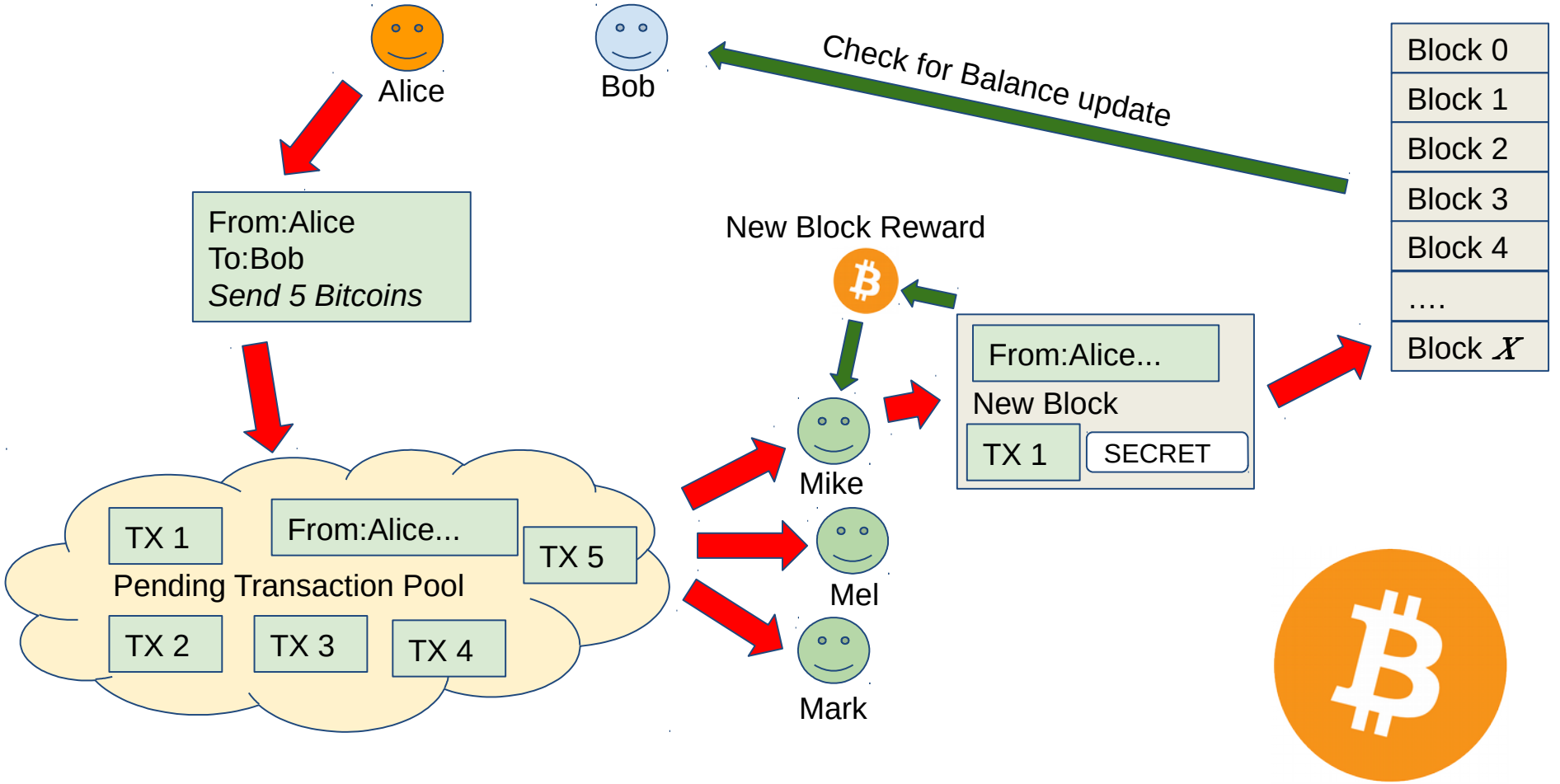
Agenda

- Understand core concepts
- Major Projects
- Algorithms and Methodologies
- Implications
- Going Forward


Block
Blockchain
Turing-complete
Programming
Language
Miner/Minter
Decentralized
Nodes
Cryptography
Protocol
Blockchain
Framework
Key Pairs
▼
Signed Transactions


Centralised (A)
Decentralised (B)
Distributed (C)


Block 0
Block 1
Block 2
Block 3


Alice
Bob
Check for Balance update
Block 0
Block 1
Block 2
Block 3
Block 4
….
Block X
From:Alice
To:Bob
Send 5 Bitcoins
New Block Reward
From:Alice...
New Block
TX 1
SECRET
Mike
Mel
Mark
TX 1
From:Alice...
TX 5
Pending Transaction Pool
TX 2
TX 3
TX 4

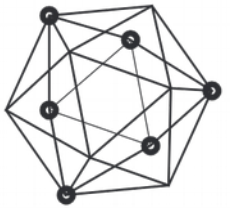
Major Projects

- Bitcoin - the birth of the blockchain
  - Created by “Satoshi Nakamoto” in 2008
  - Volunteer computer network for transferring Bitcoins
  - Maximum 21 mil Bitcoins, 16.6 Mil circulating today
  - Transactions occur directly between 2 people, no middle-men
  - All accounts, balances, and transactions are public
  - Transactions take 10 min. to finalize and are not reversible

Major Projects

- Ethereum - the Smart Contract revolution
  - Created by Vitalik Buterin in 2013 (first released in 2015)
  - The World Computer - compute, communication, storage, security
  - Smart contract code lives on the blockchain; users pay others to run the code
  - No maximum amount of Ether (ETH). Currently 94.5 Million circulating
  - Fast transaction confirmation times (~15 seconds)
  - Forked in Aug 2016 to reverse a hack; Ethereum Classic (ETC) retained the hack

Major Projects



- HyperLedger - enterprise blockchains
  - Multi-industry collaboration project started in 2015 by the Linux Foundation
  - Collaborators include every major financial institution and many tech companies
  - Private, permissioned blockchains for large companies, with arbitrary topologies
  - Intel’s blockchain project is called Sawtooth, targeting IoT (mobile, sensors, etc)
  - IBM’s blockchain project is called Fabric, targeting large enterprises
  - Developer tools are very mature, currently getting the most corporate interest

Major Projects

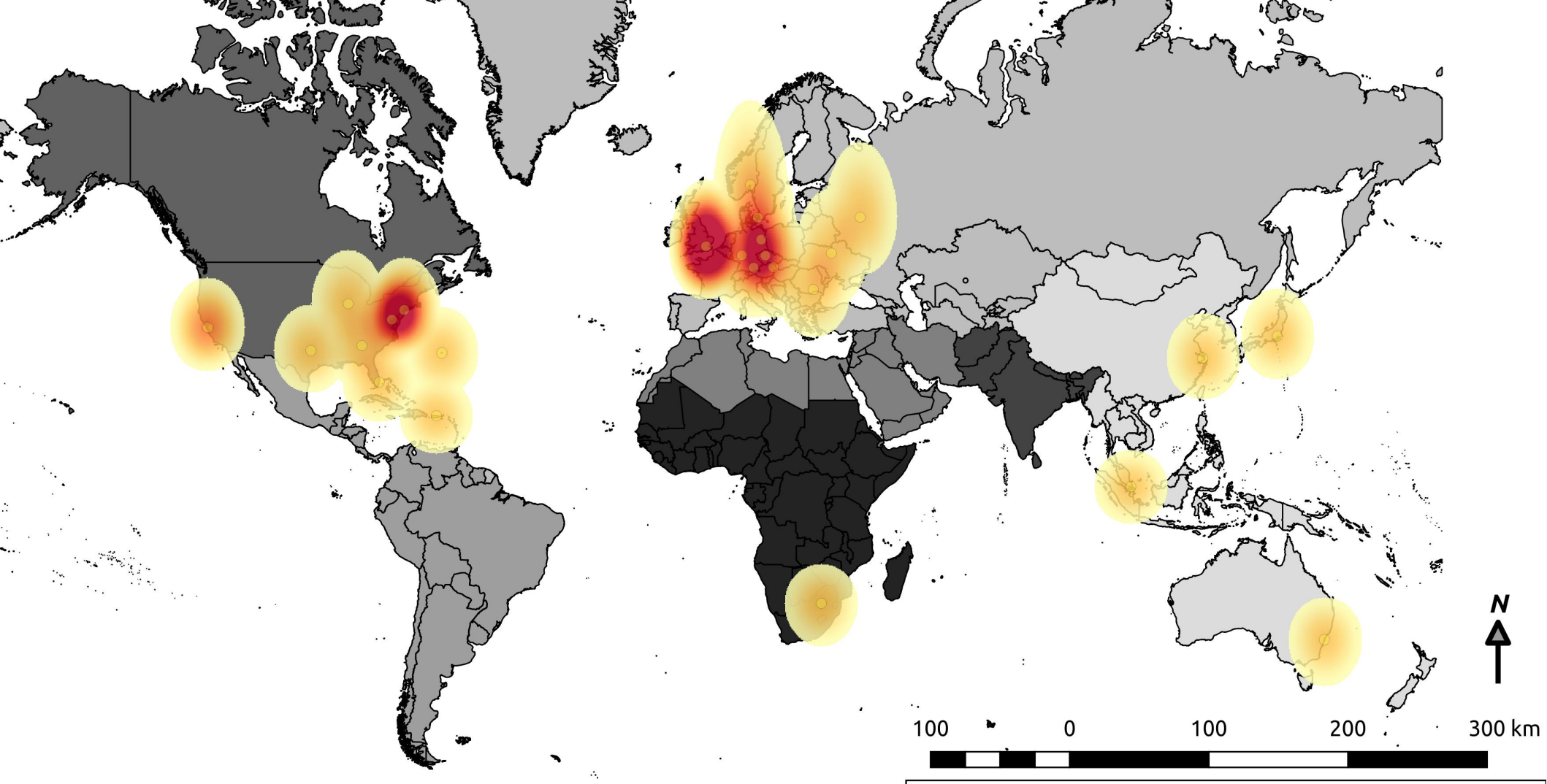
- Open Transactions - blockchain gateways
  - Created by Chris Odom in 2011 and released as open source
  - Currently being heavily developed by StashCrypto for voting pools
  - Client-Server architecture with no blockchain and no transaction history
  - Financial cryptography library for encryption, messaging, and balance tracking
  - Features anonymous digital cash, smart contracts, and custom asset types
  - Recommended usage as an exchange gateway, IoT clients,
  - mobile clients, disposable assets, and temporary tokens

Major Projects

	Namecoin	Censorship-resistant DNS	2011
	Litecoin	silver vs Bitcoin gold	2011
	Ripple	Near-free Paypal	2012
	Dash / Monero	Anonymous, instant transactions	2014
	CureCoin / GridCoin / PrimeCoin	Scientific Research	2014
	Steem / Synereo	Social media platform	2015
	MaidSafe	Distributed data and web apps	2016
CASH	ZCash	Private/selective transparency	2016

Algorithms and Methodologies

- Hashing Algorithms
  - SHA encryption
  - Merkle Tree Structures
- Privacy Algorithms
  - MIT OPAL/Enigma
- Consensus/Governance Algorithms
  - Bitcoin Protocol
  - Ethereum Protocol
  - Many others
- Methodological Applications
  - Sky’s the limit

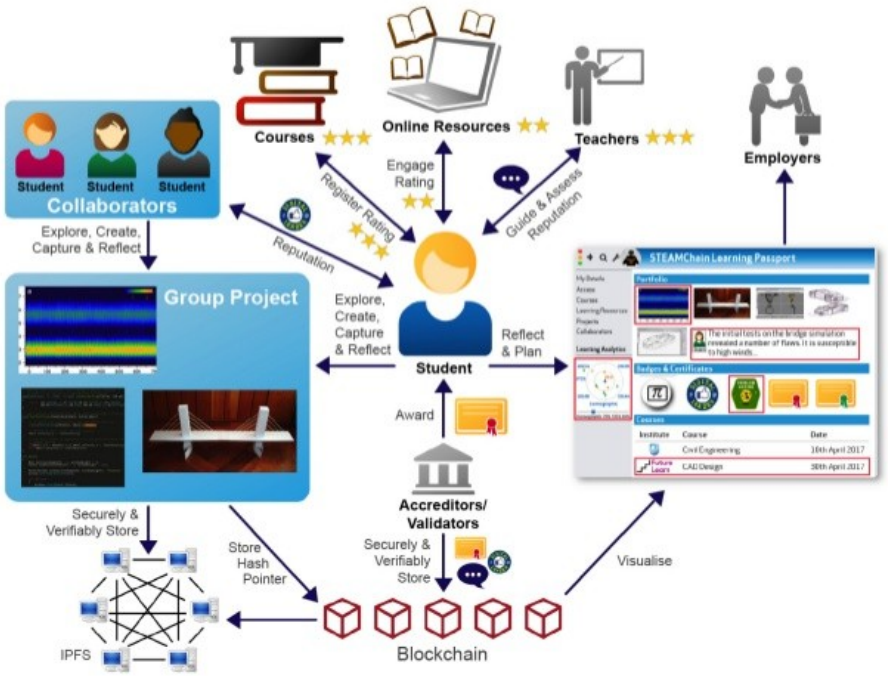


2017 Blockchain Events

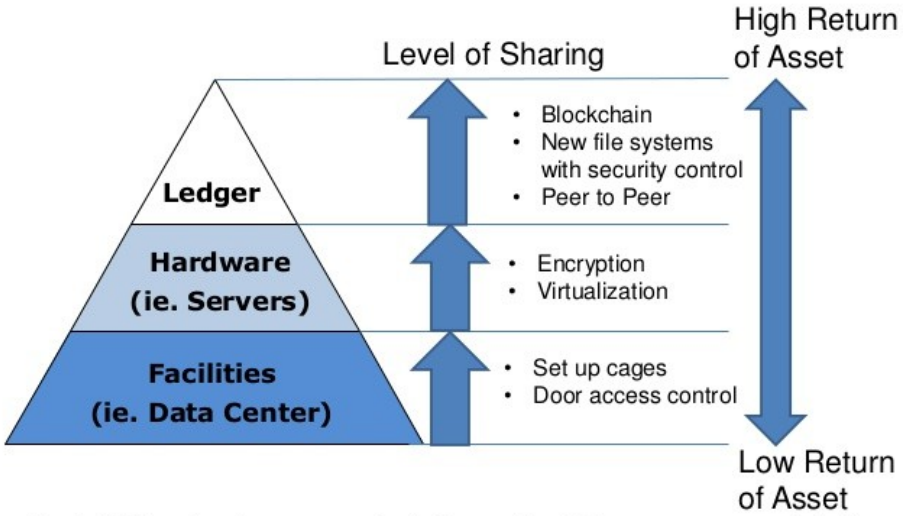
This maps show the locations as listed in the January 16th, 2017 article "These are the world's best blockchain conferences and expos to attend in 2017."
The regions are colored by regions as designated by the World Bank. The density of events ranges from lower numbers of events in light yellow to high density in red.

Created by: Joe Blankenship
Data Used: Andrew Meola/Business Insider (http://www.businessinsider.com/blockchain-conferences-2017-1); Natural Earth Country data


GLOBAL INCOME GROWTH, 1988–2008
REAL INCOME GROWTH
90%
80%
70%
60%
50%
40%
30%
20%
10%
0
-10%
RISING INCOMES IN EMERGING ECONOMIES, MAINLY CHINA
BOOMING GLOBAL ELITE
DECLINE OF DEVELOPED-WORLD MIDDLE CLASS
VERY POOREST LOCKED OUT OF GROWTH
5
15
25
35
45
55
65
75
85
95
POOREST
PERCENTILE OF GLOBAL INCOME DISTRIBUTION
RICHEST

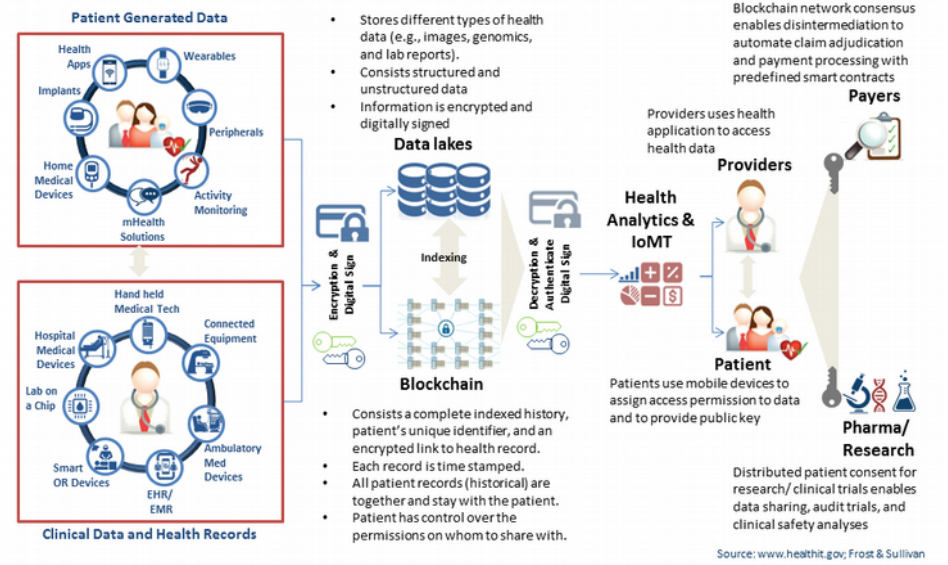


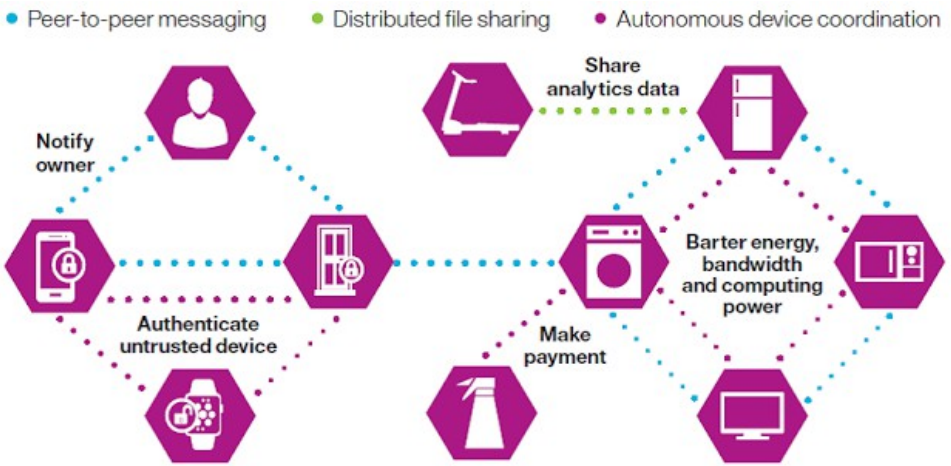
Why Blockchain in Banking Industry



Quote " *If there is only one computer in the world, which company you work for is defined by to which data you are permitted to access* " Unquote

Blockchain Technology – Promising Use Cases for Healthcare Industry





Implications

- Decentralization & distribution
  - Political and economic balances → Power dynamics
- Alternative Economies
  - “Middle Men”
- Speculation and Investment
- Cryptocurrency vs. Fiat vs. Credit
  - Is it money? Is it capital?
- Ethical Computation

Going Forward

- Within Existing Systems
  - See Implications
- In the future
  - Distributed, anonymous, scam-resistant currency exchanges
  - Personal currencies backed by personal value (influenced by your actions, social networks, and biofeedback)
  - Infinite forms of money based on value systems
  - Corporations/Governments will be formalized through DAO governance (liquid democracy)
    - Individual forms of government participating in multiple micro-governance actions
  - “Micro-employment” where most work tasks are available to everyone and payment is based on results

Thanks!

Glossary

- Blockchain
  - a new type of database for storing transactions (series of blocks)
- Miner
  - a computer with special software that packages transactions into blocks to collect rewards
  - Proof of Work vs. Proof of Stake
- Cryptofinance
  - financial tasks guaranteed using strong cryptography
- Cryptocurrency
  - A currency system, secured by cryptography (keys, hashes)
- Wallet
  - Software on your computer storing private keys for your accounts
- Smart Contract
  - Code in accounts used to control transactions
- DAO/DAC
  - Decentralized Autonomous Organization/Corporation

Sources

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