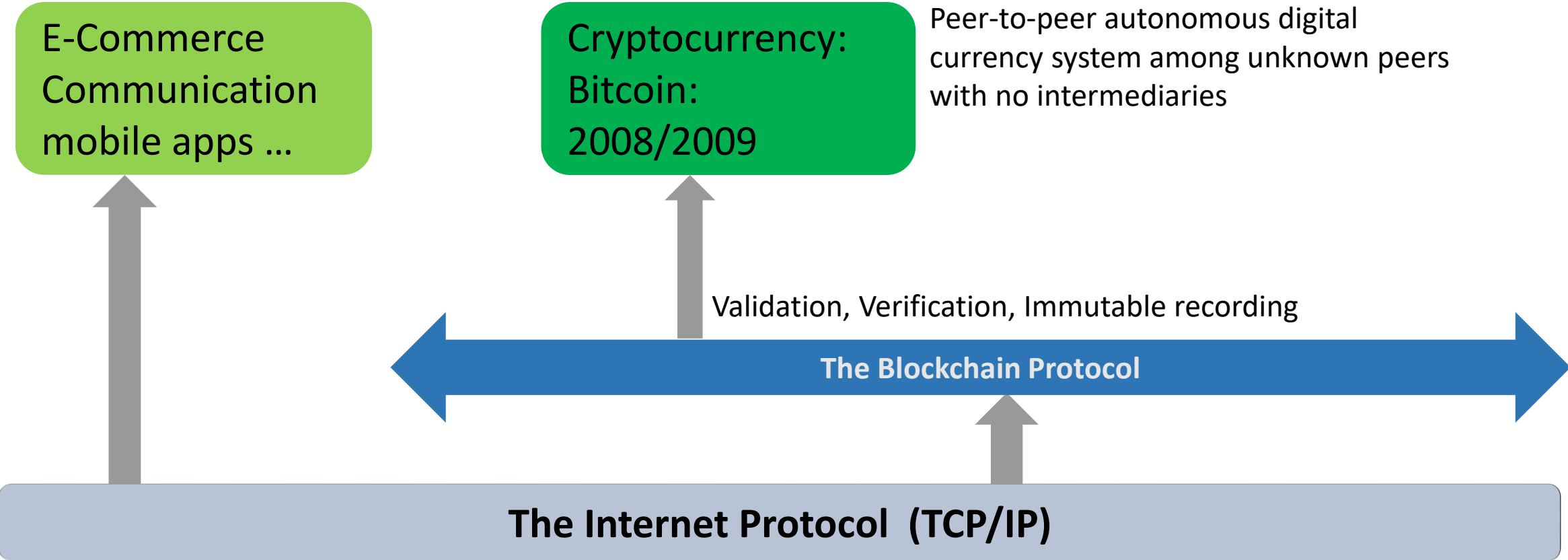


Which Blockchain platforms among  
Ethereum, Hyperledger or Corda will be  
effective for you?

**Presented BY: Dr Abdurashid Turgunov**

**Course name: Blockchain Technology**

# A Brief History of Bitcoin Blockchain



E-Commerce  
Communication  
mobile apps ...

Cryptocurrency:  
Bitcoin:  
2008/2009

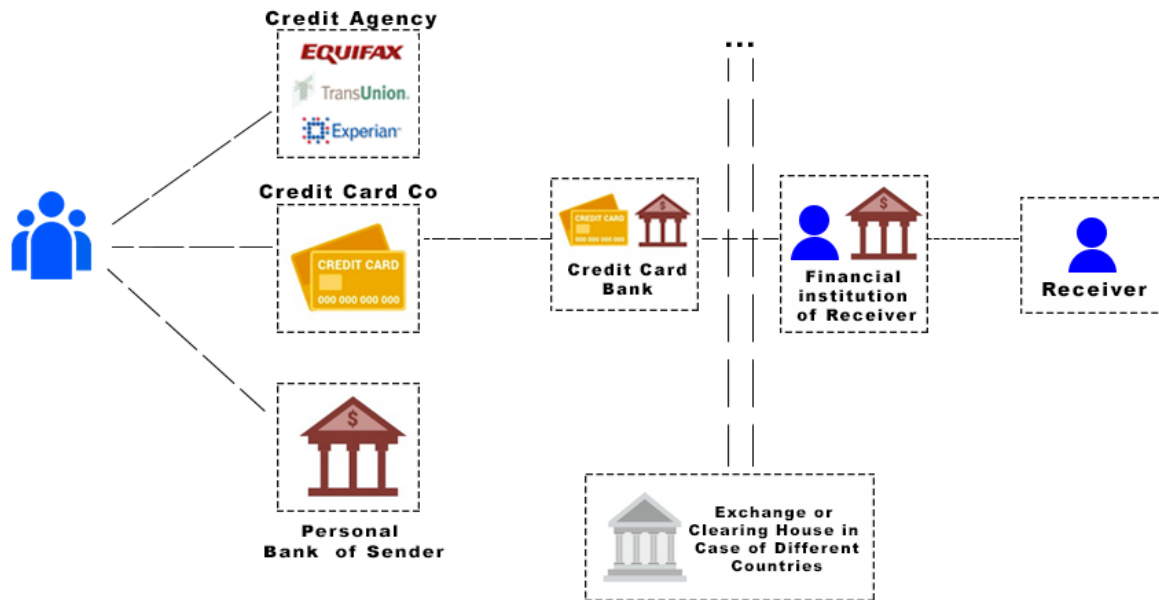
Peer-to-peer autonomous digital  
currency system among unknown peers  
with no intermediaries

Validation, Verification, Immutable recording

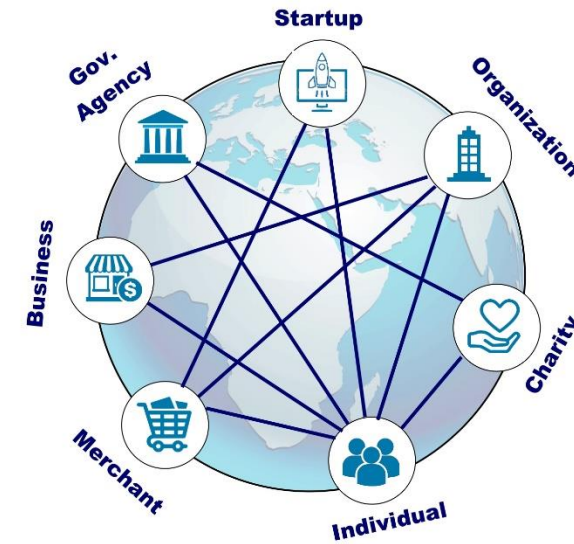
The Blockchain Protocol

The Internet Protocol (TCP/IP)

# Blockchain: THE DECENTRALIZATION INFRASTRUCTURE (1)



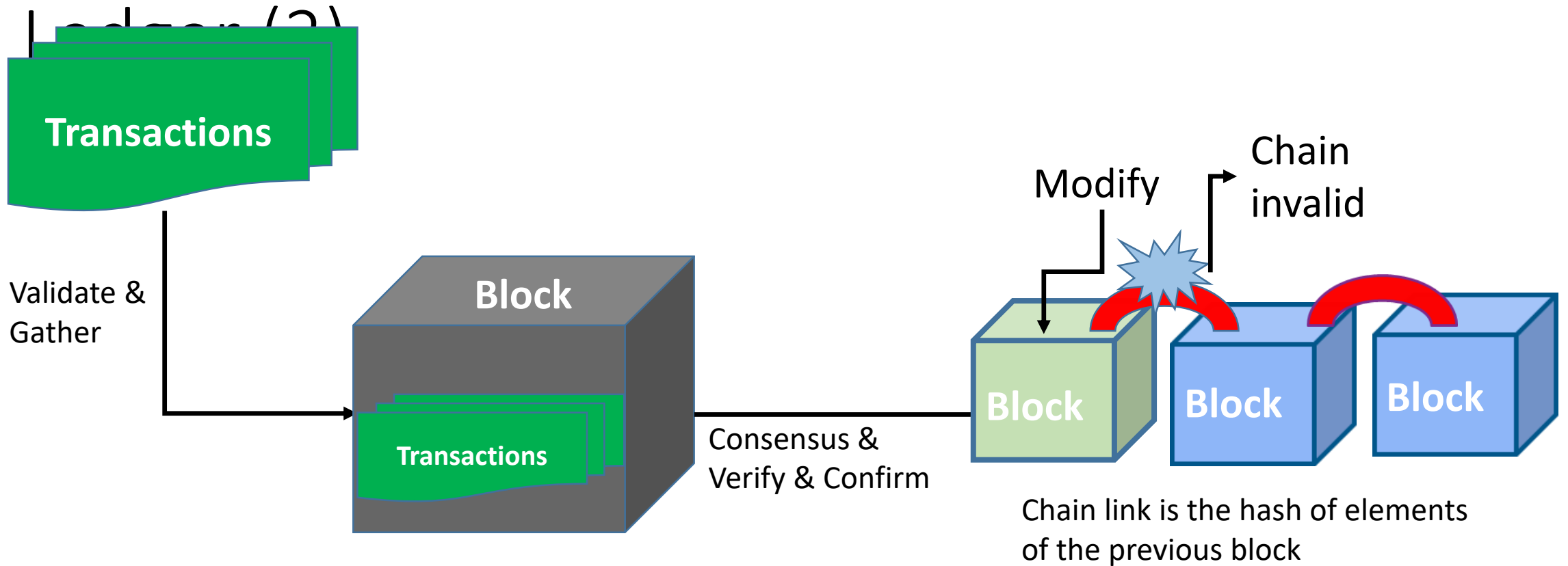
**Traditional Centralized System**



**Decentralized System**

Functions of the intermediaries are shifted to the peer participants and the blockchain nodes:  
Disintermediation: validation, recording, verification using blockchain software

# Blockchain: THE DISTRIBUTED Immutable



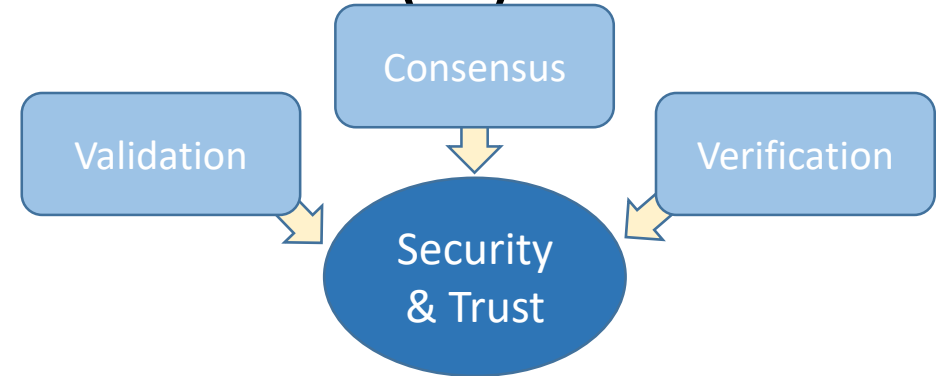
# Blockchain: The DISINTERMEDIATION (3)

The infrastructure supports methods for disintermediation:

- ❖ **validate, verify** and confirm **transactions**
- ❖ record the transactions in a **distributed ledger** of blocks
- ❖ implement a **consensus protocol** for agreement on the validity of blocks
- ❖ create a **tamper-proof record of blocks** (chain of blocks)

Validation, Verification, Consensus, Immutable Recording → Trust, Security

All defined by the blockchain protocol, and implemented by software and hardware.



# Summarizing, Blockchain is About

- ❖ Decentralization
- ❖ Disintermediation
- ❖ Distributed Immutable Ledger

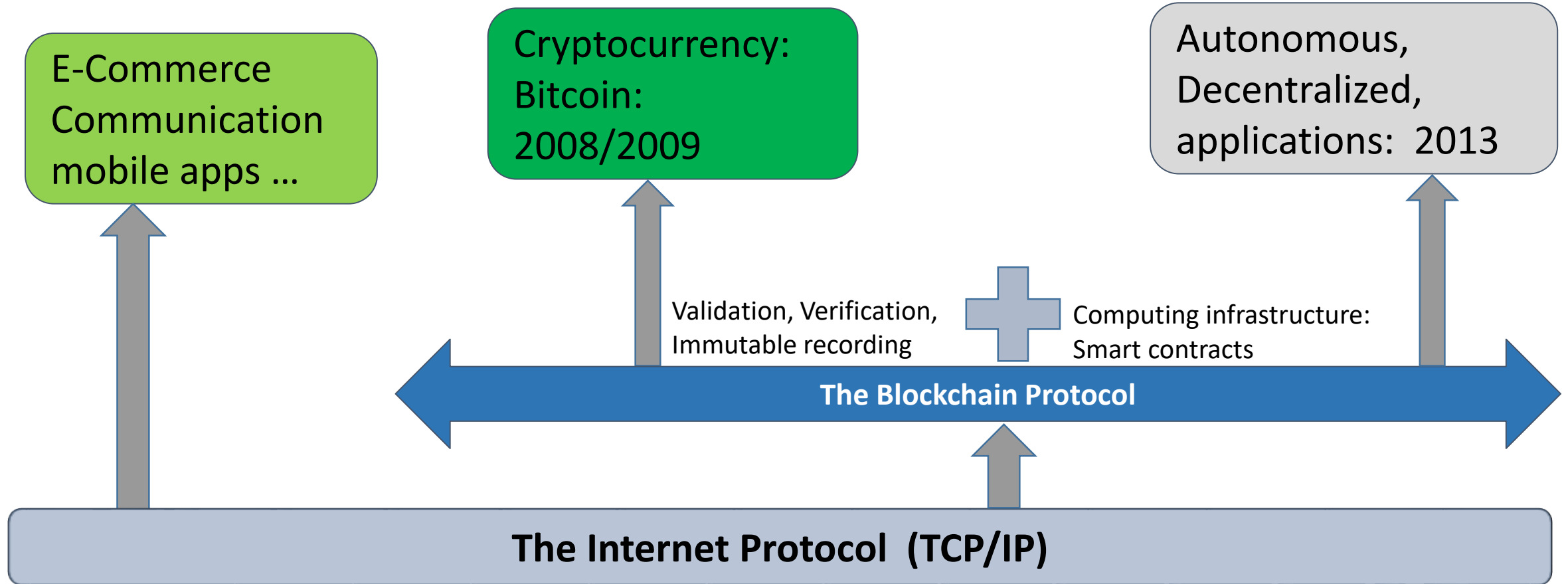
On a strong foundation of more than 40 years of scientific research  
(cryptography, hashing, p2p, consensus protocols)

Enabling automation, accountability, auditability, efficiency, accuracy, fidelity,  
fairness, and inclusiveness.

# Non-cryptocurrency Payload

- ❖ Bitcoin core enabled transactions that enabled a peer-to-peer payment system.
- ❖ Can we transact something other than digital currency?
- ❖ Payload of the blockchain could be genetic assets, proxy vote, warning signals, governance data, provenance data, etc.
- ❖ Many next generation blockchain platforms focused on non-crypto payloads: Hyperledger Fabric.
- ❖ Some others such as Zcash and Multichain focused on privacy through permissioned network.

Blockchain is not about Cryptocurrency anymore!



## Smart Contracts & Ethereum Blockchain

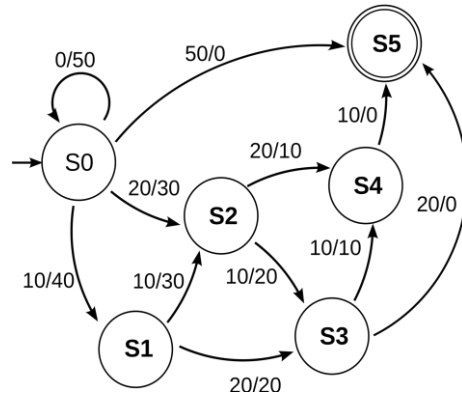
- ❖ A business transaction may involve **conditions, rules, policies, laws, regulations and governing contexts.**
- ❖ Smart contract allows for these real-world scenarios to be realized on a blockchain.
- ❖ Thus a smart contract enables a wide variety of decentralized applications of arbitrary complexity to be implemented on the Blockchain:
  - ❖ **from supply chains to disaster recovery.**
- ❖ Probably many of the applications for the blockchain technology have not been conceived of yet.

# Expanding Ecosystem

Type 1: only cryptocurrency  
Example: Bitcoin



Type 2: Cryptocurrency +  
Smart contract business logic  
Example: Ethereum



Type 3: Only business logic  
+ NO cryptocurrency  
Example: Hyperledger



Type 4: Blockchain platform  
as a service:  
Example: Microsoft Azure



# Public vs Permissioned Blockchain

- ❖ Bitcoin is a public blockchain. Membership is open to all; any body can join and leave as they wish. All the transactions on the chain are available for the whole world even though they may be encrypted.
- ❖ In a permissioned and private blockchain membership is limited to identities with verified credentials. Example: Hyperledger Fabric
  - ❖ The blockchain protocol features a membership service to control/manage membership.
  - ❖ A private blockchain is local to a specific business or environment.
  - ❖ A permissioned blockchain is also known as consortium blockchain, since its typical application is for consortium of businesses such as in an automobile domain. Ex: Big Three consortium blockchain of Ford, Fiat Chrysler and General Motor

# How to Solve a Problem – Ethereum DApp

## Level

Blockchain is NOT solution for all your problems. It is NOT a data repository.

- ❖ You save only the “sliver” of info that is needed for business logic, provenance and governance on the blockchain.
- ❖ Write the use cases for the problem
- ❖ Choose your blockchain. Lets say we choose Ethereum. And Ethereum is not the only blockchain technology. There are many others.
  - ❖ Design and Implement a smart contract solution in Solidity Language
  - ❖ Test it using Remix IDE (Integrated Development Environment)
  - ❖ Develop end-to-end Dapp using Truffle IDE with a graphical user interface
  - ❖ Deploy it on a blockchain for the whole decentralized world to use.

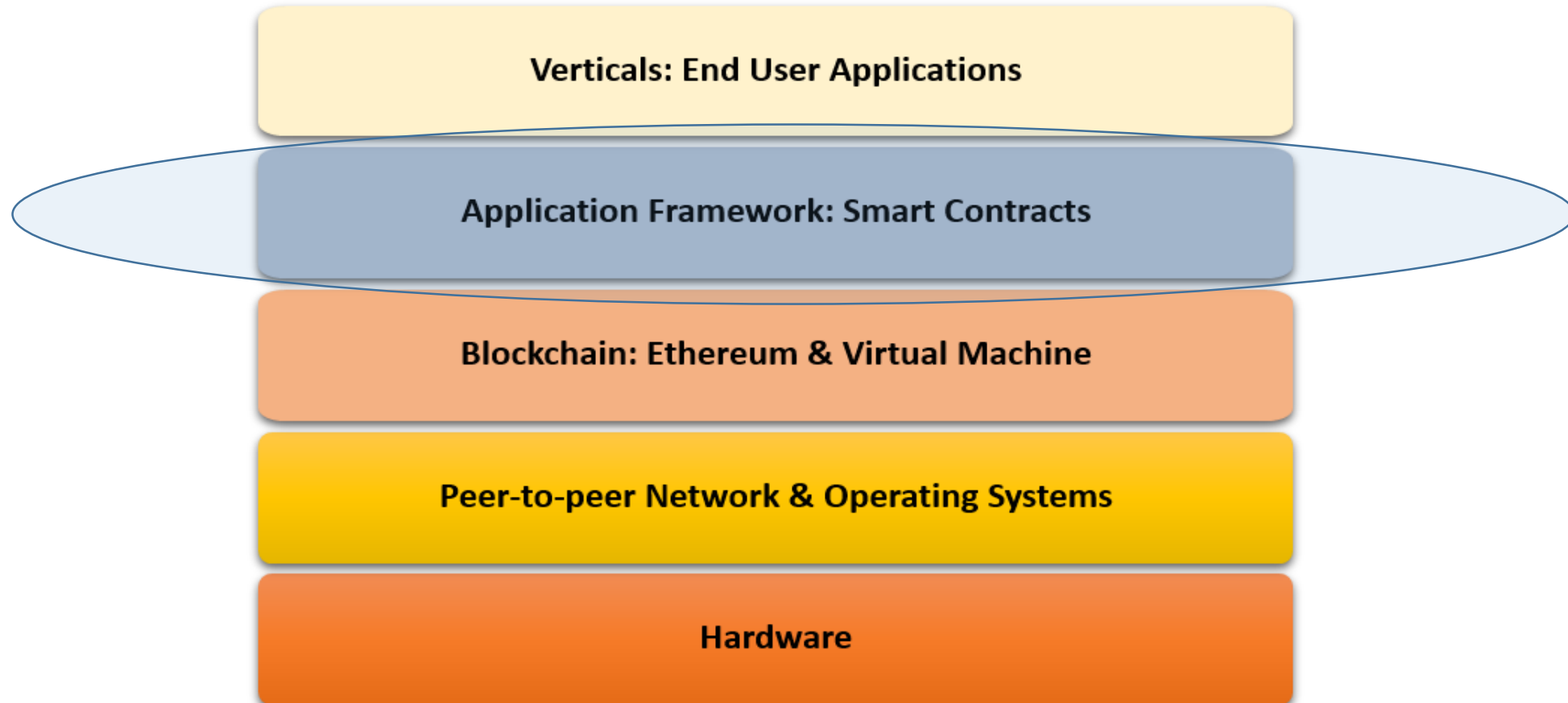
# Smart Contract Language, REMIX Tool

- ❖ In Ethereum context, Solidity is a language for writing smart contracts.
- ❖ It is similar to any object-oriented language.
- ❖ Remix is an integrated prototyping environment for Ethereum smart contracts.



# Dapp Stack on Ethereum Blockchain

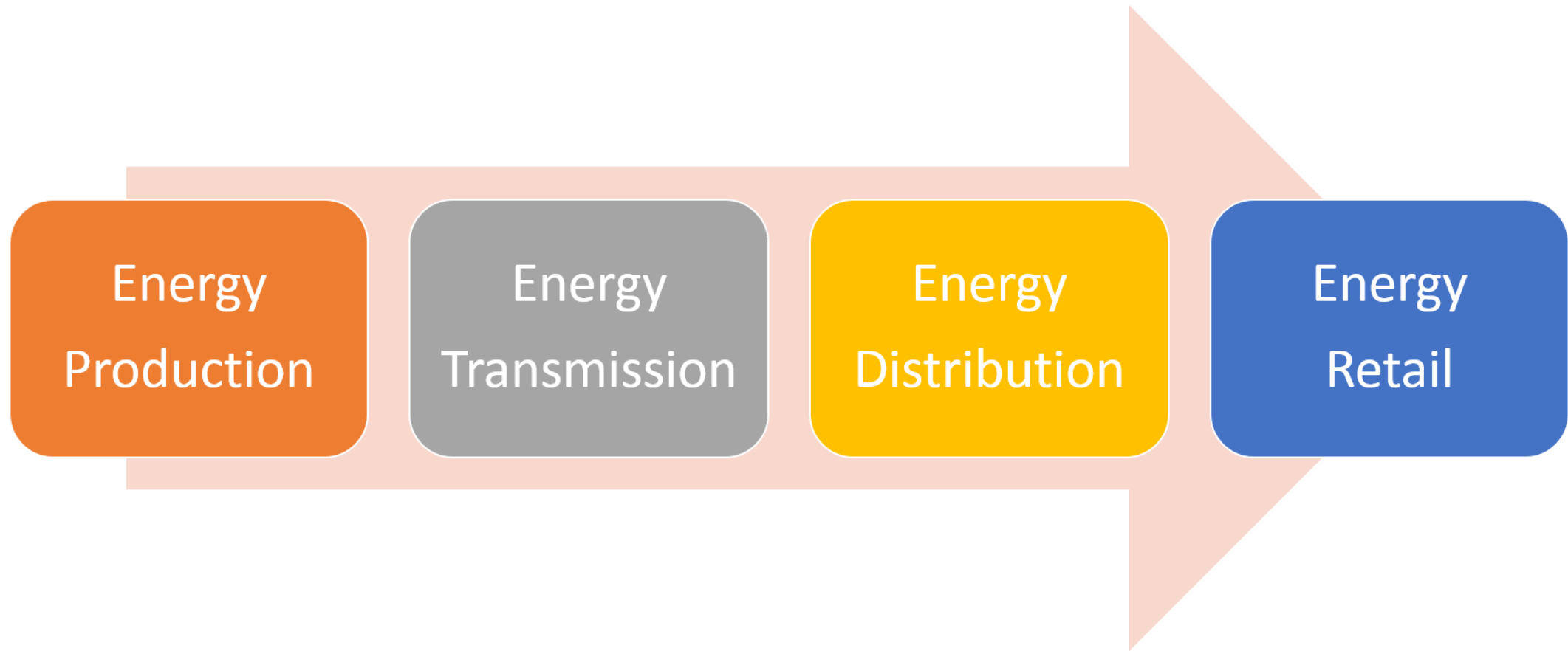
Decentralized Apps Stack



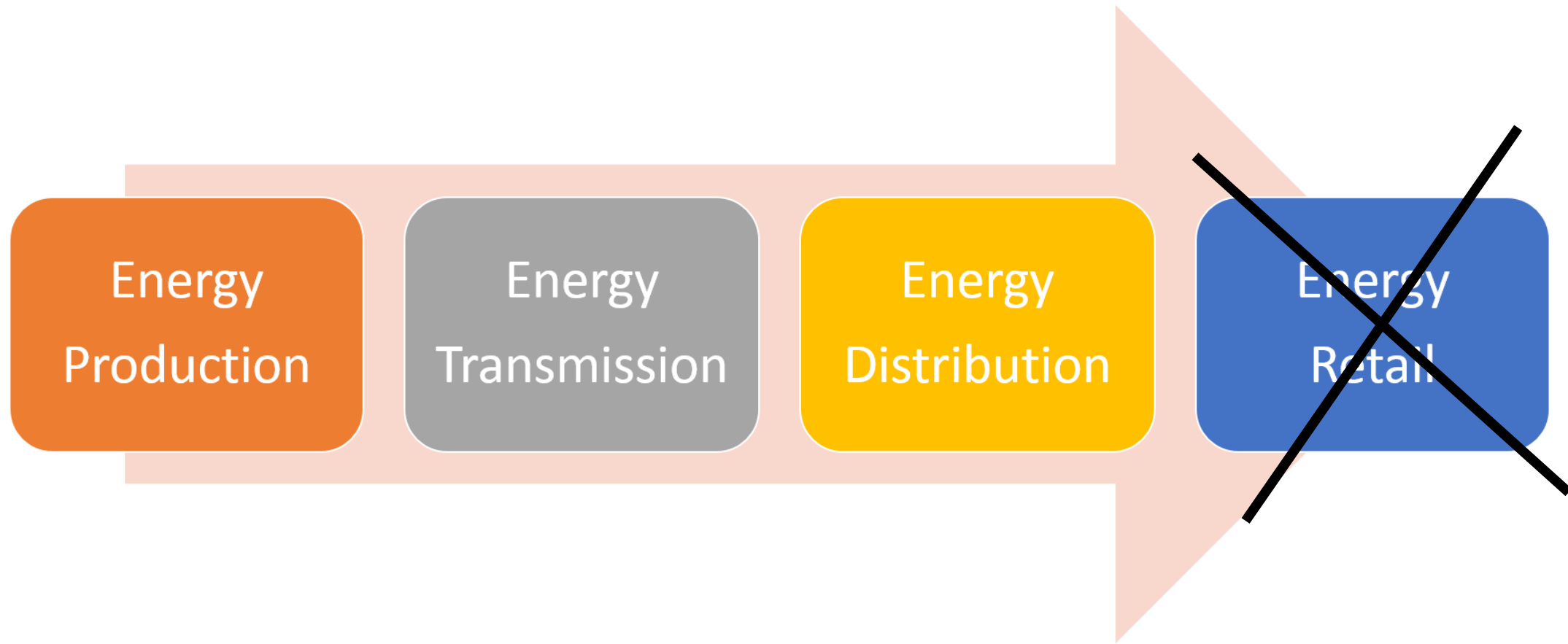
# Blockchain in your Business

- ❖ Do not over-fit blockchain into existing working systems.
- ❖ It is NOT a database. (Instead, use a decentralized database in tandem with blockchain provenance.)
- ❖ Blockchain is NOT a panacea for all your problems.
- ❖ Then what is good for?
- ❖ Problems with
  - ❖ inefficiencies,
  - ❖ barriers to adoption,
  - ❖ decentralized users,
  - ❖ peers or users who are operating beyond boundaries of trust, that do not fit well into our centralized model,
- ❖ Problems with policies, rules, governance, provenance: US Government? NY State?
- ❖ Leapfrog newer initiatives on the blockchain: countries of Estonia, Dubai, India

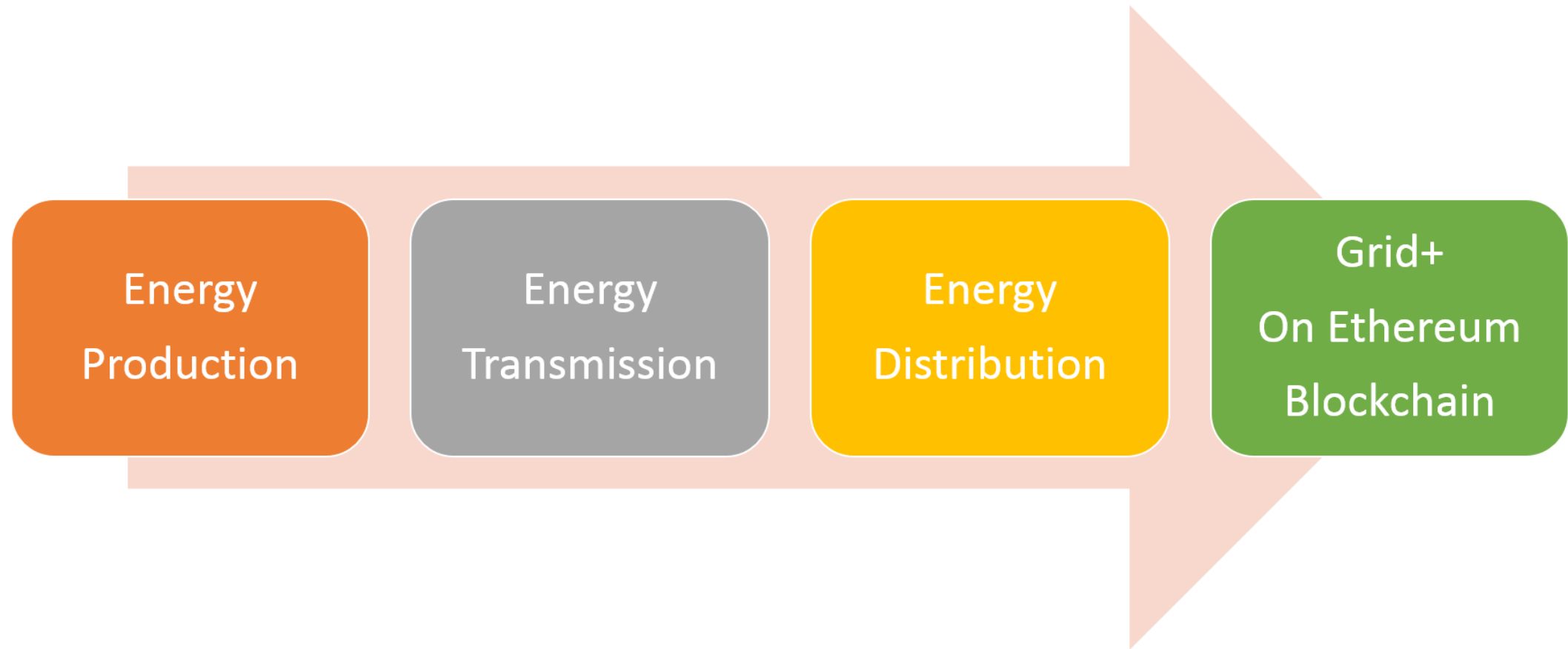
# Disrupting the Energy Markets



# Energy Retail: 50% Admin Overhead



# Energy Retail Grid+ on Ethereum Blockchain



# Blockchain Opportunities

Opportunities	Example
Users of blockchain application platforms	Augur: Prediction market traders
Blockchain education and application development	Coursera specialization on blockchain
Disruptive applications of blockchain in vertical domains	Grid+ energy retailer
Blockchain Dapp development tools and frameworks	Remix, Hyperledger Composer
Blockchain protocol improvement	Ethereum improvement protocol
Blockchain alternatives for decentralized systems	Hashgraph
Fundamental research	Cryptography

# UB Initiatives: How can we help?

- ❖ UB School of Engineering (SEAS) is at the leading edge of educating people about this technology.
- ❖ SEAS' [Coursera Blockchain](https://coursera.org/specializations/blockchain) "Specialization" (coursera.org/specializations/blockchain)
- ❖ 4 courses of 4 weeks of online instruction each with hands-on components.
- ❖ [UB Blockchain Thinklab](http://www.buffalo.edu/ubblockchain.html) supported by President's Circle Club funding
  - ❖ <http://www.buffalo.edu/ubblockchain.html>
  - ❖ Locating resources for your research
  - ❖ Consulting with regional and international businesses
  - ❖ Promoting Buffalo as a world renowned blockchain hub
- ❖ Premier event: UB Blockchain Buildathon April 13-15, 2018 See [ethBuffalo.org](http://ethBuffalo.org)



# Blockchain Characteristics

## A database technology, not an industry

- It can be used to create and track digital representations of any type of asset, item or idea (including natively digital goods)
- It will impact a variety of industries including social media, financial services, healthcare, retail, gaming and energy and can be used for supply chain tracking and identity management.
- It is important to recognize the broad array of assets and other items that can be digitized on blockchains, including tangible assets such as gold, coffee cups, shoes and collectibles.
- Creating a digital representation of an asset does not change the asset's character or nature, nor should it change the asset's treatment under law.

## Not a financial services technology

- It is important for regulators to understand that the technology can be used for both financial and non-financial assets
- Regulatory structures that are implemented must acknowledge that characteristic
- Regulation solely by financial regulators is short-sighted and will undermine its value

## Living in a world of digital representations

- Online shopping is a prominent example - retailers use databases to give us digital versions of goods to look at on the web while we decide our preferences
- Blockchain provides a better database technology for this and other purposes as it does not change the user experience or the legal nature of the asset or item stored in the database

# Blockchain Characteristics

## Strengths lie in transparency, immutability and security

- Core benefits include transparency, censorship resistance (immutability), security and orderly data structures which result in a high degree of auditability and reliability
- Transparency enables identical visibility of ledger information across all users
- It is designed to resist the alteration of data, eliminating asymmetric information
- Blockchains are also distributed, which means there is no single point of failure or attack vector for hackers or other malicious actors

## Solving the “double spend” problem

- Blockchain characteristics allow for the creation of unique digital representations
- This solves the “double spend problem,” defined as the ability to maintain multiple digital copies or replicas of an asset already transferred to someone else
- Blockchain permits certainty in digital transactions and reassures sellers and buyers that the item(s) in the transaction are unique and have not been duplicated or sold to others

# About Block.one




- Block.one is a global leader in high-performance blockchain software. In 2018, it published the EOSIO software, a free, open-source protocol designed to be adapted and utilized by the developer community and companies to create a secure and transparent back-end system.
- EOSIO is regarded as the fastest, most scalable, most active blockchain software in the world. It addresses the limitations of first-generation blockchain platforms while retaining the core benefits of the technology: security, accountability and immutability.
- Block.one also aims to foster a robust blockchain ecosystem through developing and supporting projects built on EOSIO via its venture capital unit, EOS VC.
- The future release of Voice, a social media platform planned to launch on the EOS Public Blockchain, will bring alignment and transparency to Social Media. The platform was designed with users in mind by focusing on returning the value of content to its creators.



EOSIO is a next-generation, open-source blockchain protocol, designed to be adapted and utilized by the developer community and companies to create a secure and transparent back-end system.

EOSIO provides a digital blockchain infrastructure that enables solutions which are fast, free, and secure. It is regarded as the fastest, most scalable, most active blockchain software in the world. It addresses the limitations of first-generation blockchain platforms while retaining the core benefits of the technology: security, accountability and immutability.

Block.one also aims to foster a robust blockchain ecosystem through developing and supporting projects built on EOSIO via its venture capital unit, EOS VC.

-  **Fast** Industry leading transaction speed
-  **Free** Zero transaction fees
-  **Secure** New! Support for WebAuthn

To find out more about EOSIO, visit [eos.io](https://eos.io)



# Blockchain Applications

Blockchain companies have begun disrupting all industries from financial services to online gaming, supply chain and media. 2019 and 2020 will see the maturation of general purpose platforms that will give rise to use cases across industries around the globe.

## Use Cases

- Asset management
- Supply chain logistics & management
- Computing & storage
- Currency exchanges
- Media & adtech
- Online gaming
- Social media
- Lending & crowdfunding
- Healthcare data
- Insurance & underwriting
- Payments & banking
- Financial services
- Infrastructure
- Public records

## Blockchain and Governance

- Transparent elections
- Ends identity theft
- Automation of land registries and title transfers
- Criminal records
- Management of trial evidence
- Auditable universal basic income
- Transparent ownership of public companies
- Replacement of taxes with monetary policy

# Case Study: ID PASS

ID PASS is a sustainable, open-sourced, blockchain-based digital identity solution. It enables governments and humanitarian organizations to issue and verify a decentralized, private, trusted and recoverable form of identity to all population subsets, including citizens, residents and refugees.

- Without a verifiable identity, one-seventh of the global population lacks the right to access essential services such as citizenship, education, justice, health care, banking and insurance.
- However, having an identity document can also constitute a threat to the individual's privacy and safety.
- What is needed is a form of identification that is trusted, secure, and allows the individual to choose when to share or withhold personal information.
- This is facilitated by operating on a decentralized blockchain platform.
- The blockchain is used to anchor the identity while biometric data and other personally identifiable information are stored off-chain, on a smart card.

ID PASS focuses on people who do not have a smartphone or internet access and provides them with a verifiable identity by using blockchain, smart card technology and biometrics. Once enrolled, individuals have the ability to access services using an identity that they can trust, that is verifiable, private, transportable and under their control. ID PASS works both offline and online.

For more information, visit <https://idpass.org>

# Case Study: Eva

Eva is a cooperative ride-sharing application built on the EOSIO blockchain protocol currently operating in Canada with plans to launch globally in other cities.

- Raphaël Gaudreault, Eva's co-founder and CTO, and Dardan Isufi, Eva's Chief Optimization Officer determined that traditional ride-sharing "companies capture around a quarter of market share versus standard taxis, but the money is invested in capitalization in other countries. They simply aggregate the economy and delocalize it."
- Eva intends to address this issue by working as a network of cooperatives based around a new relationship between driver and passenger members that removes the middleman.
- In the Eva model, 85% of each transaction goes to the driver, with the remainder being split between members of the cooperative, an ecosystem "treasury" and a foundation responsible for maintaining the network.
- Blockchain automates these allocations, and, according to Eva's white paper, "improves the ability to integrate different modes of payment while ensuring an anonymous, immutable, and transparent technical protocol."
- "Eva deploys an immutable contract based on the EOS blockchain to offer an open ledger for mobility that keeps members' data anonymous," adds Raphaël Gaudreault.

For more information, visit <http://eva.coop>

# Case Study: GeneOS

GeneOS is a blockchain-enabled data ownership, marketplace, and secure computing platform for genomic big data. It is an all-in-one analytics platform that aggregates everything from DNA to sleep patterns to offer a holistic view of user's wellness.

- By using blockchain, all user data is anonymized and private
- In addition to offering a full wellness data kit, existing data from other external sources can be integrated into GeneOS
- GeneOS takes the data and produces an aggregate health score, displays health findings relevant to the user's DNA and gives personalized health recommendations
- User genomic data is digitized into an income-producing asset - it can be rented out locally using privacy-preserving technology for research and other commercial purposes resulting in the user receiving proceeds in their accounts similar to dividend payments

For more information, visit <https://geneos.me/>

# Summary

- ❖ Blockchain technology is not about cryptocurrency anymore.
  - ❖ It is used for broad range of applications across many industries: finance, healthcare, government, manufacturing, and distribution.
- ❖ Blockchain can enable an inclusive economy.
- ❖ Blockchain has created exciting new opportunities and innovative application models:
  - ❖ Global collaboration systems, self-governing systems, open government.
  - ❖ Private, public and permissioned (consortium) models to meet diverse business needs.
  - ❖ There is a role to play for each and everyone of you.

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