Blockchain Technology Primer

WAEA Annual Meeting

Coeur d'Alene, ID

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Overview

- **Summary**
  - Shared digital record of transactions
- **Features**
  - What it can do & what it can’t do
- **Use Case Themes**
  - Efficiency, transparency, trust, third-parties
- **Conclusions**

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Blockchain ≠ Bitcoin

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Summary

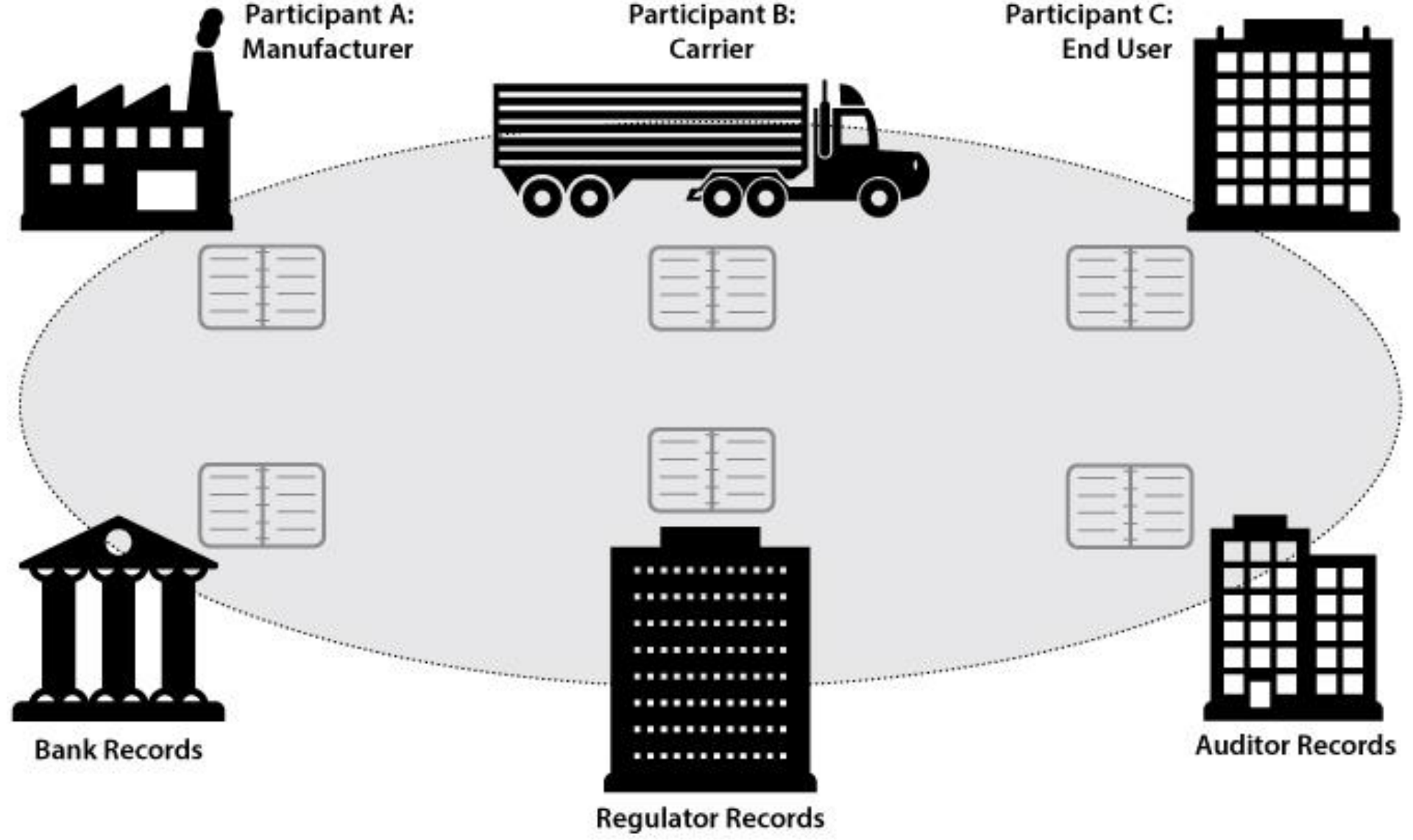
Blockchain

A shared, digital ledger that is accurate & agreed-upon.

Source: St. Louis Fed

Summary: Distributed Ledger Network

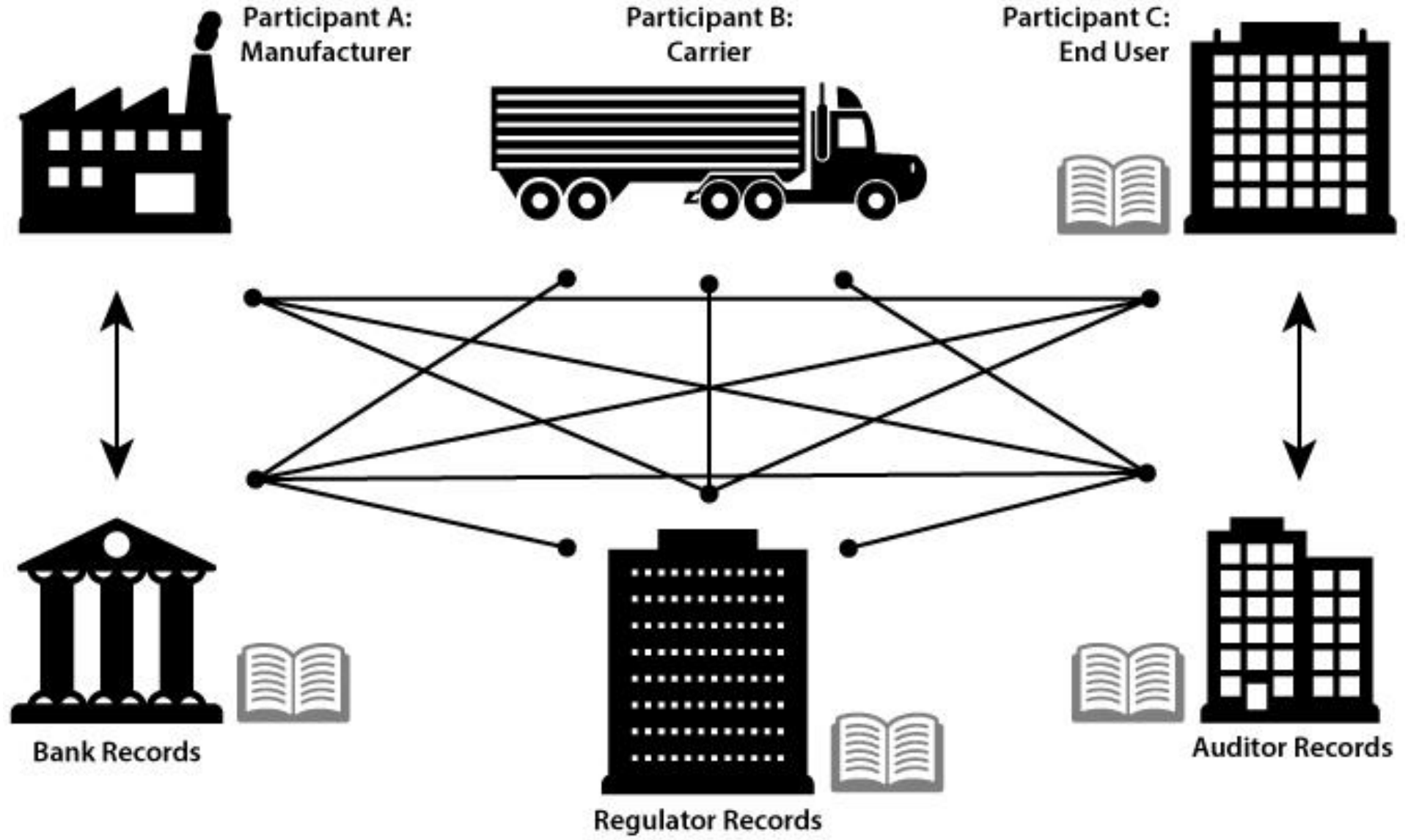
Blockchain



Source: St. Louis Fed

Summary: Traditional Local Networks

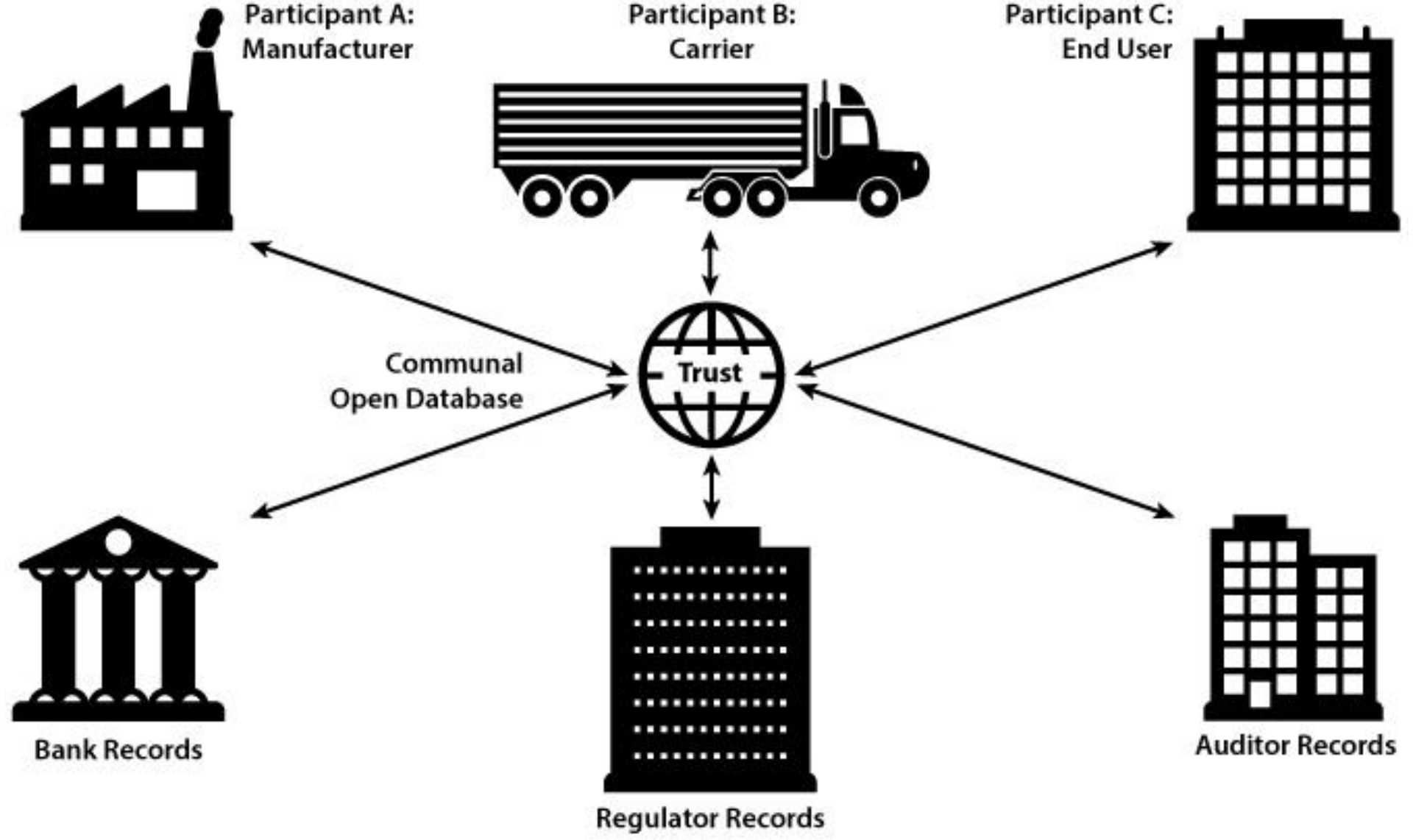
Microsoft Excel



Source: St. Louis Fed

Summary: Client-Server Network

Google Sheets



Source: St. Louis Fed

Summary: Definition

Blockchain

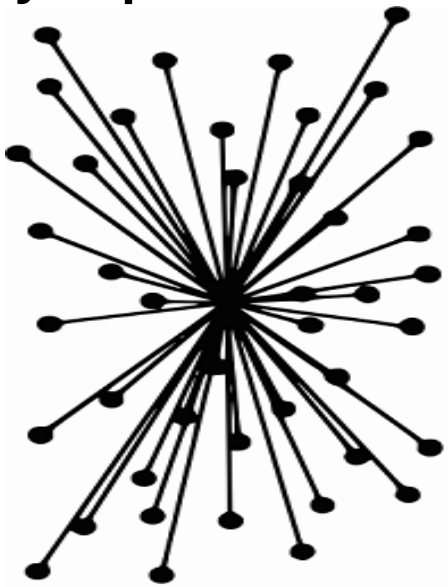
A shared, digital ledger that is accurate & agreed-upon.

Source: St. Louis Fed

Summary: Shared

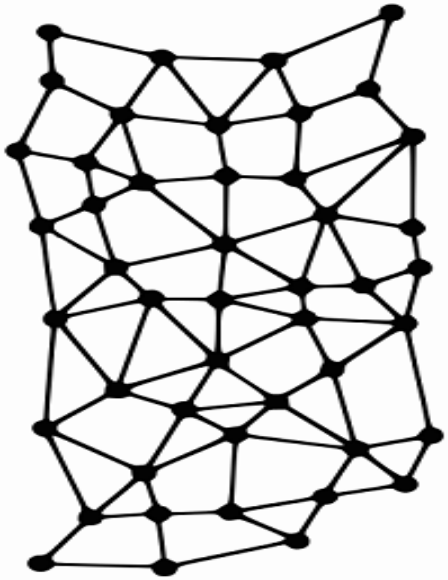
- **Each person has a copy of the digital ledger (blockchain)**
  - **Shared = Distributed**
- **Every copy will be identical**
- **Example: Authoritative knowledge**

Encyclopedia Britannica



Centralized

Wikipedia



Distributed

Summary: Accurate & agreed-upon

- **How blockchains maintain their accuracy & reach agreement is a unique attribute**
  - **Other characteristics exist in other record-keeping systems**
- **Uses computer algorithms to create agreement**
  - **"Miners" solve these computer algorithms ("mining")**
  - **This work ensures that the transaction meshes with what has already transpired on the blockchain**
  - **This creates and maintains an accurate record of <u>all</u> transactions**
- **Agreement method can vary by blockchain**

Source: St. Louis Fed

Summary: Key components

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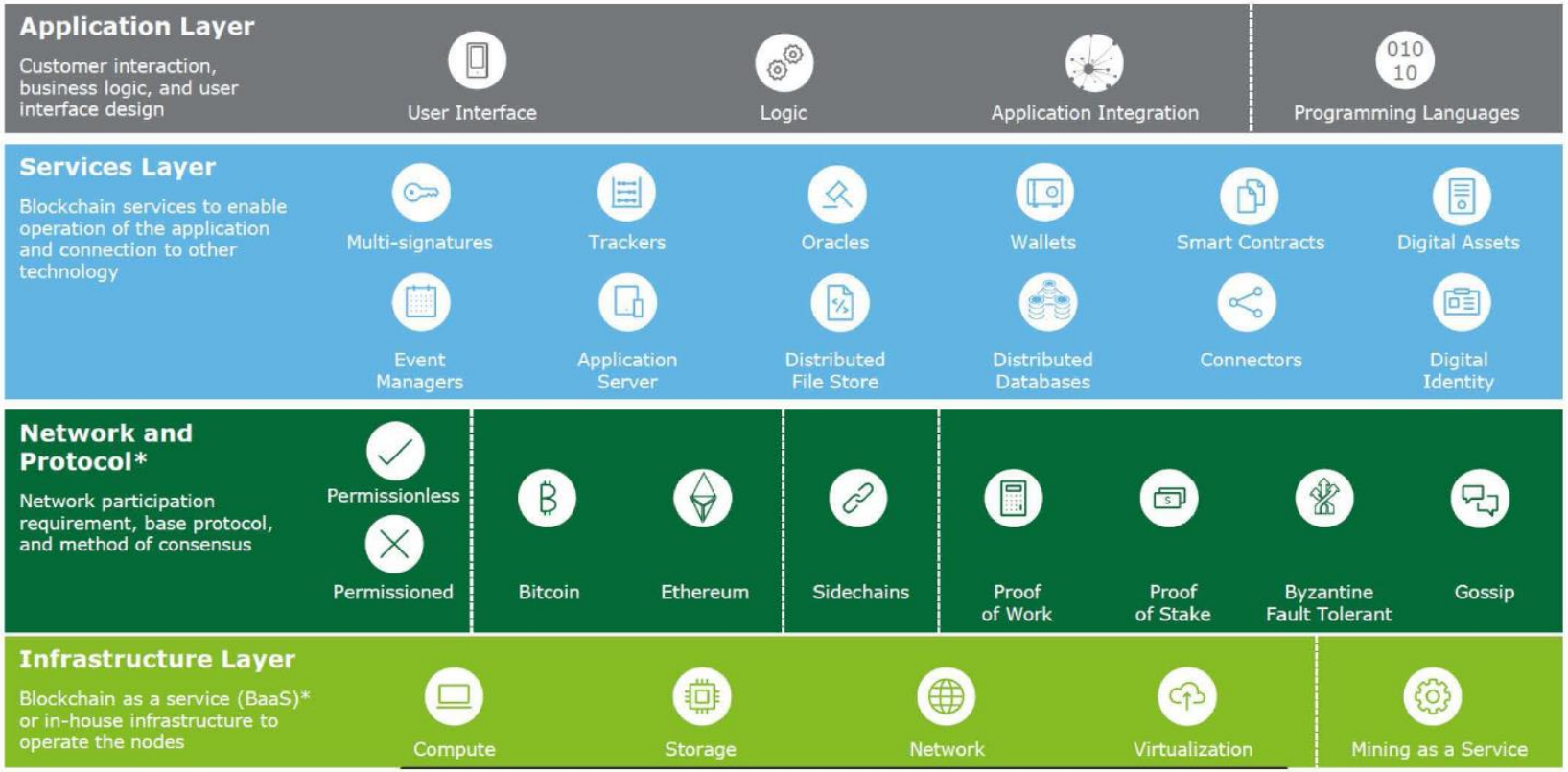
The Key Components of Blockchain



Source: Rob Jennings

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Features

What it can do

- **Maintain the integrity of the blockchain**
  - Fraud, errors, & mistakes do not exist on the blockchain*
- **Eliminate the need for a trusted intermediary**
  - A blockchain is a trustless environment^
- **Enhance transparency^**
- **Eliminate redundancies**

What it can't do

- **Make humans perfect outside the blockchain**
  - People can still commit fraud & make mistakes when adding info onto the blockchain
  - Need to use additional technology to avoid this
- **Translate the physical world to the digital world by itself**
- **Has some issues around speed & scale^**

* Some technical caveats
^ See public vs private discussion

Features: Public vs Permissioned vs Private

	Public	Permissioned	Private
Centralization	Decentralized	Mixed	Centralized
Agreement Process	Economic incentives	Node process	Single entity control
Confirmation Speed	Slow	Faster	Real-time
Privacy	Limited	Greater privacy	Highest-degree
Trust among Participants	Low	Moderate	High

- **Tradeoffs come down to speed and trust (mostly)**

Source: Rob Jennings

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Use Case Themes

- **Increase efficiency, reduce redundancies**
  - Eliminate extra records and reduce paperwork
  - Enable multiple editors of data access to enter data
- **Increase transparency**
  - Provide better visibility into records held elsewhere
- **Increase trust in the system itself**
  - Not in the individual user
  - Trust in the program and process that verifies the information
- **Reduce reliance on external, third-parties**

Use Case Needs

Supporting technology & infrastructure

- RFID, sensors, IoT, etc.

New partnerships

- Vertical – Example: Food manufacturers & farmers
- Horizontal – Example: Distributors
- New players

More research

- Economics, technology, farm practices, & more

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Conclusions

Summary

- Blockchain is a new distributed, digital ledger technology based on a special mechanism to create agreement & ensure accuracy.

Features

- While the blockchain itself is internally secure, getting the physical world uploaded to its digital world requires additional investment.

Use Cases

- Examples inside and outside agriculture seek to impact efficiency, transparency, trust, third-parties.

Questions & Discussion

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