# Blockchain Refresher

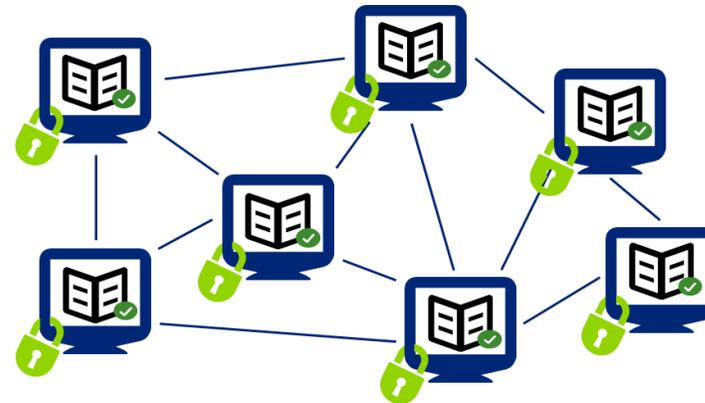# WHAT IS BLOCKCHAIN?

Essence of blockchain technology

- A blockchain is a record, or ledger, of digital events

- It's "distributed" between many different parties

- It is only updated by consensus of the participants in the system

- Once recorded, information can never be changed

- The blockchain contains a certain and verifiable record of every single transaction ever recorded

Current System
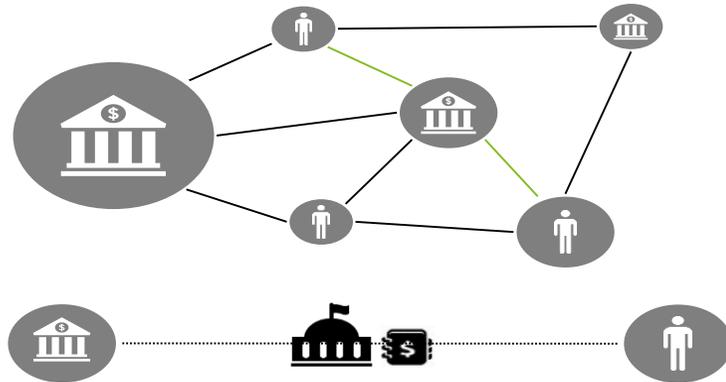
Blockchain System

- **Central authorities** transfers actual value between two parties

- **Multiple intermediaries** and **record-keeping** are required to create trust
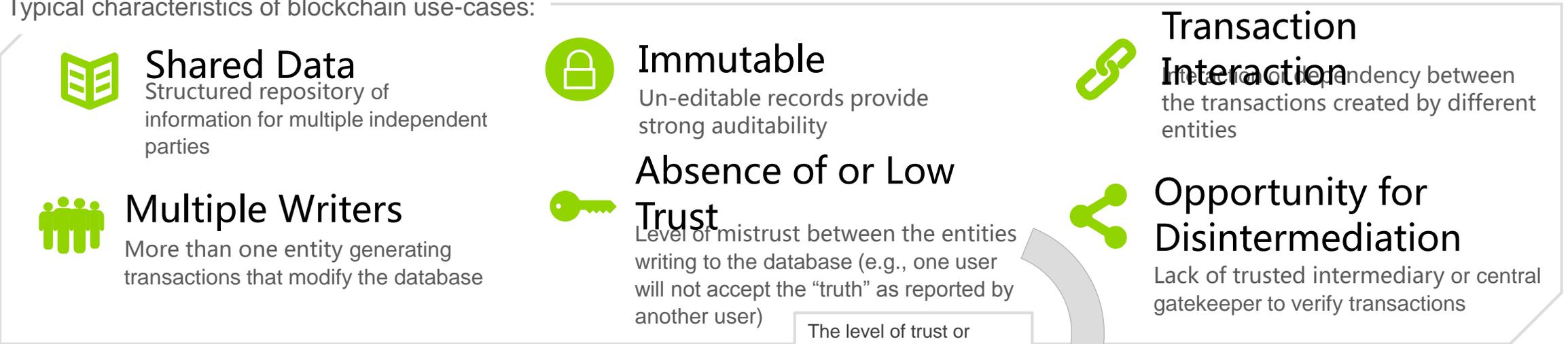
- **Distributed** network of computers (nodes) that maintains a shared source of information

- Transaction data is **immutable**

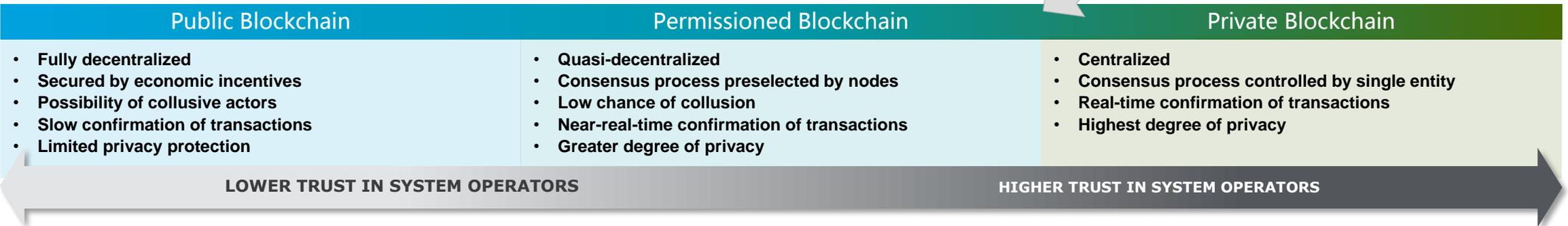- **Trust** is enabled by **cryptographic** algorithm

FUNDAMENTALS

Blockchain's unique value proposition can be best captured in solutions where multiple independent parties need to interact with, update, or reference common set of data

Typical characteristics of blockchain use-cases:

Shared Data
Structured repository of information for multiple independent parties

Multiple Writers
More than one entity generating transactions that modify the database

Immutable
Un-editable records provide strong auditability

Absence of or Low Trust
Level of mistrust between the entities writing to the database (e.g., one user will not accept the "truth" as reported by another user)

Transaction Interaction
Inherent dependency between the transactions created by different entities

Opportunity for Disintermediation
Lack of trusted intermediary or central gatekeeper to verify transactions

> The level of trust or mistrust helps determine the network structure

Blockchain network structures:

Public Blockchain	Permissioned Blockchain	Private Blockchain
• **Fully decentralized** • **Secured by economic incentives** • **Possibility of collusive actors** • **Slow confirmation of transactions** • **Limited privacy protection**	• **Quasi-decentralized** • **Consensus process preselected by nodes** • **Low chance of collusion** • **Near-real-time confirmation of transactions** • **Greater degree of privacy**	• **Centralized** • **Consensus process controlled by single entity** • **Real-time confirmation of transactions** • **Highest degree of privacy**

LOWER TRUST IN SYSTEM OPERATORS   **HIGHER TRUST IN SYSTEM OPERATORS**

WHAT CAN BLOCKCHAIN DO FOR YOU?

A blockchain solution can be initiated as a store or transaction record, serve as a transaction platform and automate business processes

Record Keeping
- A blockchain solution can offer automated, high fidelity and low-cost mechanisms for record keeping
- Requires user-specific encryption keys – records are kept in the ledger but only accessible by authorized users

Transfer of Value
- A blockchain solution enables secure, near real-time, low-cost transfer of value
- A blockchain solution can remove the need for a trusted intermediary
- Both data and value can be transferred to other parties

Smart Contracts
- A smart contract self-executes when certain conditions are met
- A blockchain solution is programmable to trigger transfer of value and information under certain conditions without any third-party intervention
- Stored on the blockchain – distributed and executed across all nodes

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BLOCKCHAIN AND MINIMUM VIABLE ECOSYSTEM

A consortium facilitates collaboration across the ecosystem, allowing appropriate parties to define standards, rules, and authorities by which the ecosystem operates.

What is a minimum viable ecosystem (MVE)?

A small consortium with representation of each role necessary to complete the set of use cases that make the solution viable in the marketplace.
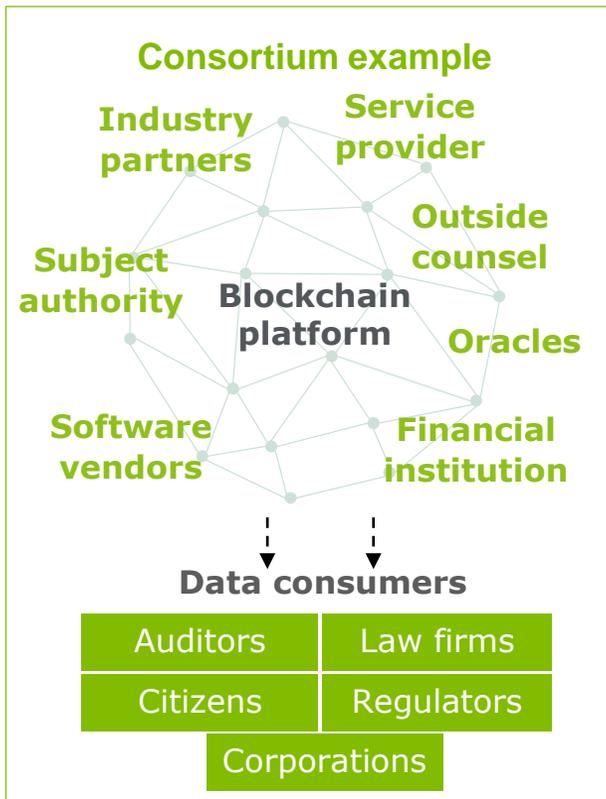
Overview of consortia

What is a minimum viable ecosystem? An alliance of several entities with a common business goal

When are consortia a good fit? When business networks can benefit from multiple entities standardizing business transactions in order to remedy existing inefficiencies

Why are consortia important? Consortia are necessary to align incentives for collaboration, outline roles and responsibilities throughout the network, and orchestrate and support the blockchain platform

What are the tangible benefits? Consortia allow direct teaming of organizations, financial institutions, and regulators. Sharing costs and risks among a group can reduce the impact on any one entity

Consortium example

Industry partners

Service provider

Subject authority

Outside counsel

Blockchain platform

Oracles

Software vendors

Financial institution

Data consumers

Auditors	Law firms
Citizens	Regulators
Corporations	

Building consortia today

What are current examples of consortia?
- Hyperledger
- Enterprise Ethereum Alliance
- The Institutes
- B3i
- Ripple
- R3

How do business relationships and roles change? Consortia have the ability to decentralize operations, distribute costs, introduce standards and close competitive gaps across ecosystem players
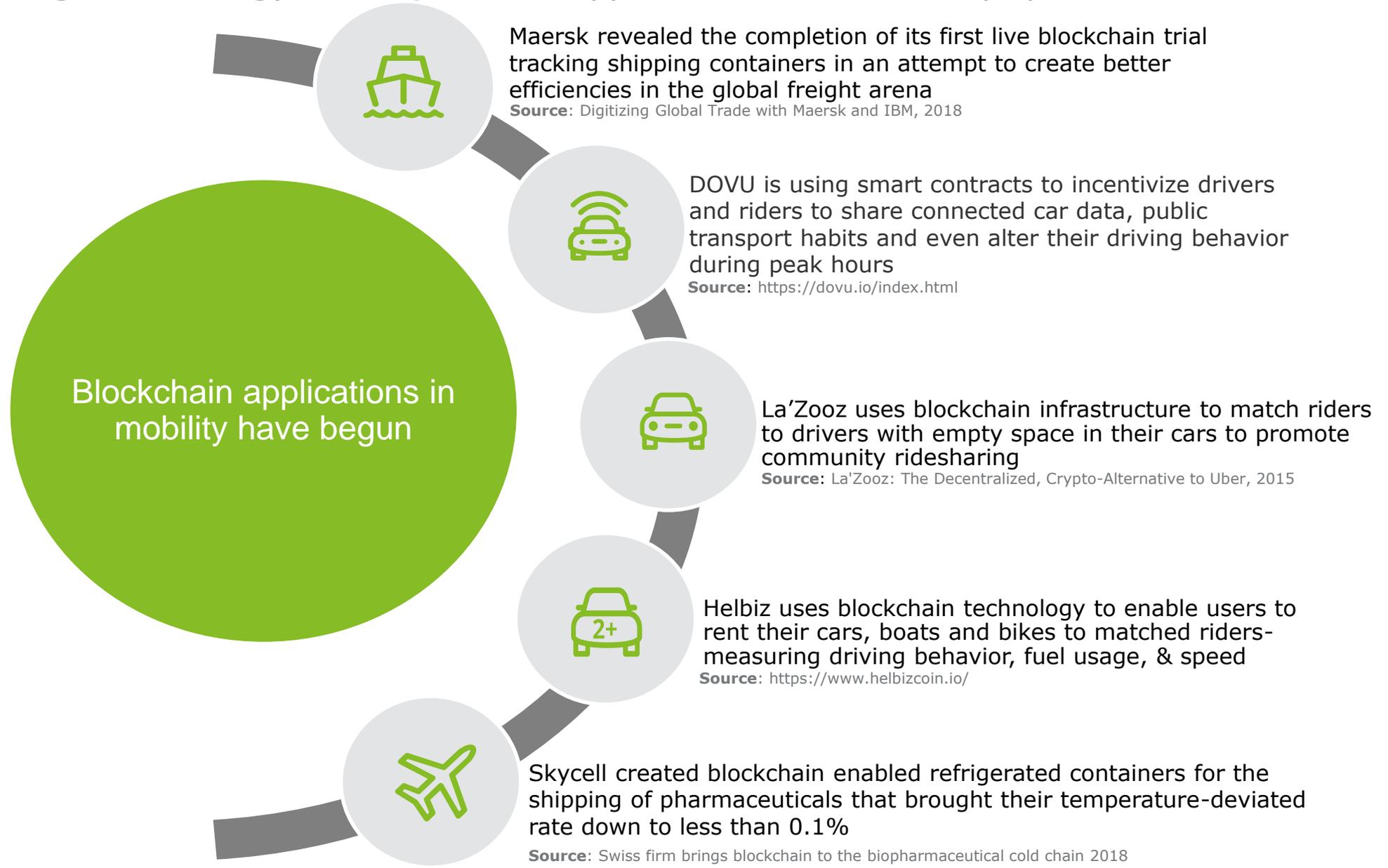
Questions to consider

- Has the target operating model been defined?
- How is the consortium operating on a day-to-day basis?
- Who is liable when issues arise within production?
- What is the process for members to join and/or leave?

BLOCKCHAIN IN THE MOBILITY MARKET

Distributed ledger technology has begun to be applied across the mobility space

Maersk revealed the completion of its first live blockchain trial tracking shipping containers in an attempt to create better efficiencies in the global freight arena

Source: Digitizing Global Trade with Maersk and IBM, 2018

DOVU is using smart contracts to incentivize drivers and riders to share connected car data, public transport habits and even alter their driving behavior during peak hours

Source: https://dovu.io/index.html

Blockchain applications in mobility have begun

La'Zooz uses blockchain infrastructure to match riders to drivers with empty space in their cars to promote community ridesharing

Source: La'Zooz: The Decentralized, Crypto-Alternative to Uber, 2015

Helbiz uses blockchain technology to enable users to rent their cars, boats and bikes to matched riders-measuring driving behavior, fuel usage, & speed

Source: https://www.helbizcoin.io/

Skycell created blockchain enabled refrigerated containers for the shipping of pharmaceuticals that brought their temperature-deviated rate down to less than 0.1%

Source: Swiss firm brings blockchain to the biopharmaceutical cold chain 2018

LOOKING FORWARD

Where can blockchain technology take us in the future of mobility?

Blockchain technology can serve as the founding layer of smart city services

Smart Cities

Public transportation payments could be securely processed via a distributed ledger technology

Contactless Payment

Autonomous Vehicles

Usage Based Insurance

Characteristics like route optimization and speed limit controls in self driving vehicles could be empowered by blockchain technology

Using blockchain as a foundation, insurance companies can create targeted offerings based on user-shared driving data
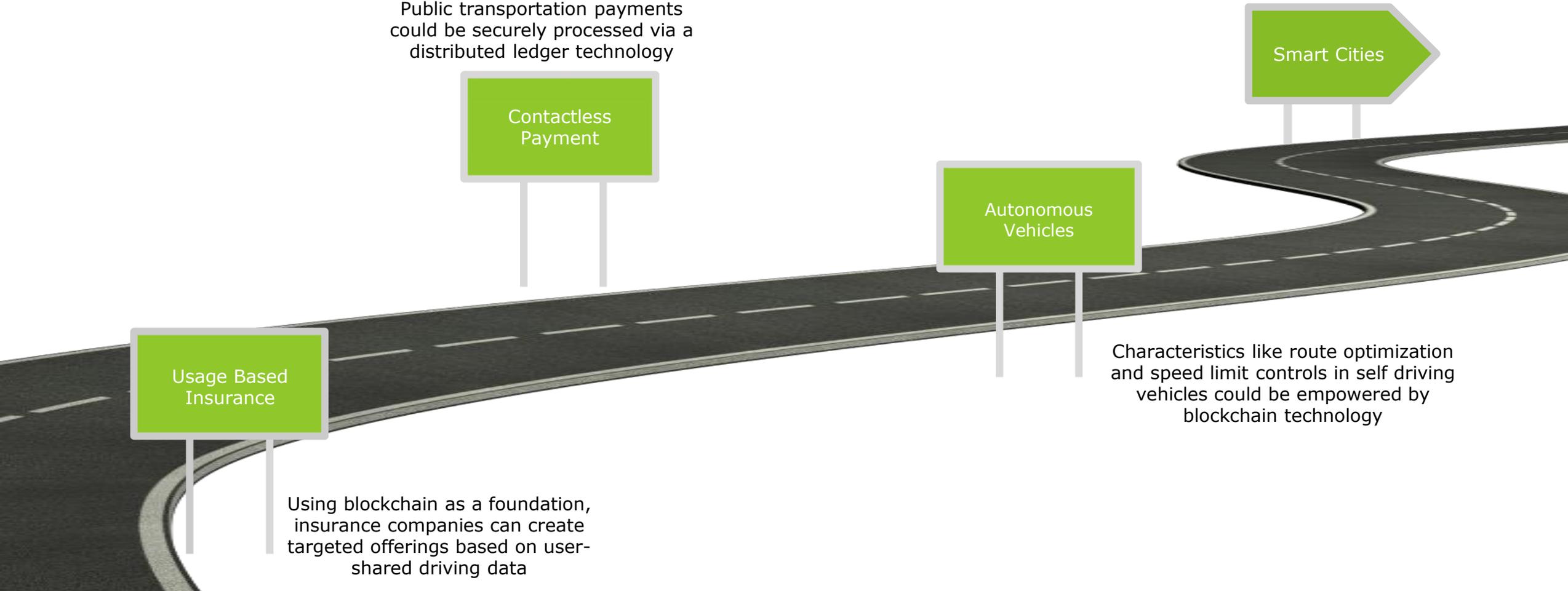
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