What is blockchain?

...separating hype from reality
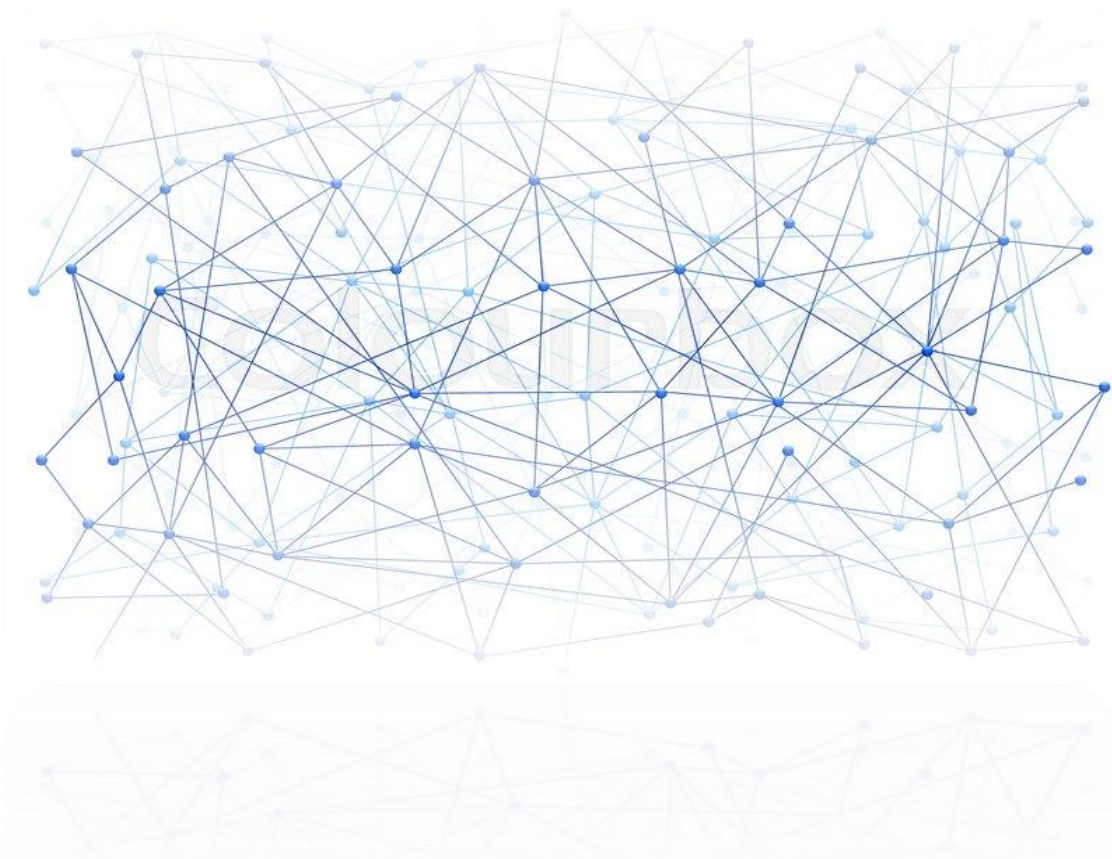
Blockchain: A chain of sequential blocks linked with cryptography.

It is essentially "an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way", without the need of a trusted 3rd party

Distributed ledger technology: In DLT, the implementer has greater control over how it is in fact implemented

What is blockchain?

...fundamentals

- Multiple transactions are grouped in a block (efficiency)
- Blocks are "chained" together cryptographically
- New blocks (mining) are appended to the chain
- "Impossible" to change the order/content of blocks/transactions

Blockchain…adoption

The Hype is Over?

Deloitte 2019 Blockchain Survey showed that **blockchain adoption has shifted**.

As the technology matures……
we have seen a **move away**
from **experiments** toward the
development of **robust
enterprise ready solutions**

Source: https://cri-lab.net/security-in-blockchain-applications/
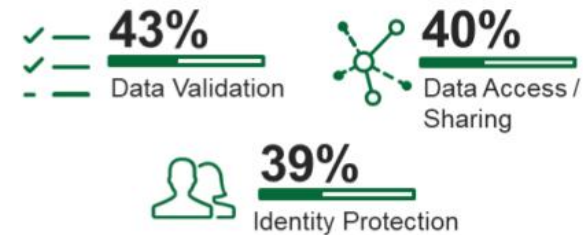
Many architectures

...from open blockchains to DLTs

	Permissionless	Permissioned
Public	• Anyone can **join, read, write** and **commit** • Hosted on **public servers** • **Anonymous**, highly **secure** • **Low scalability** vechain ethereum ₿bitcoin	• Anyone can **join and read** • Only authorized and known participants can **write** and **commit** • **Medium scalability** vechain ripple ethereum
Private	**Not possible /Futile**	• Only authorised participants can **join** and **read.** • Only the network operator and authorised nodes can **write** and **commit.** • **High scalability** Enterprise Ethereum c•rda HYPERLEDGER BLOCKCHAIN TECHNOLOGIES FOR BUSINESS Quorum

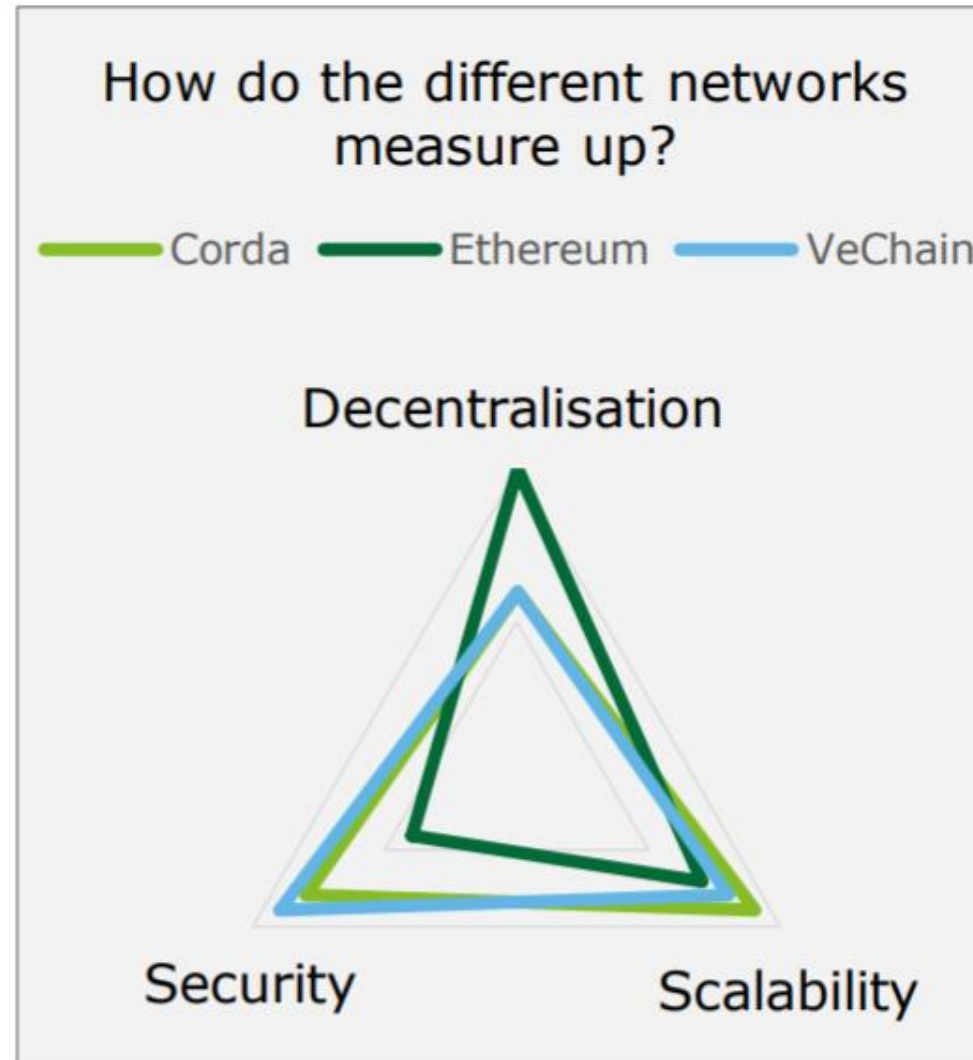We have found that, for the vast majority of enterprise use-cases, a permissioned and private network is usually the best fit.

Hybrid Blockchains

https://www2.deloitte.com/content/dam/Deloitte/ie/Documents/Consulting/Blockchain-Trends-2020-report.pdf

Blockchain…Platforms

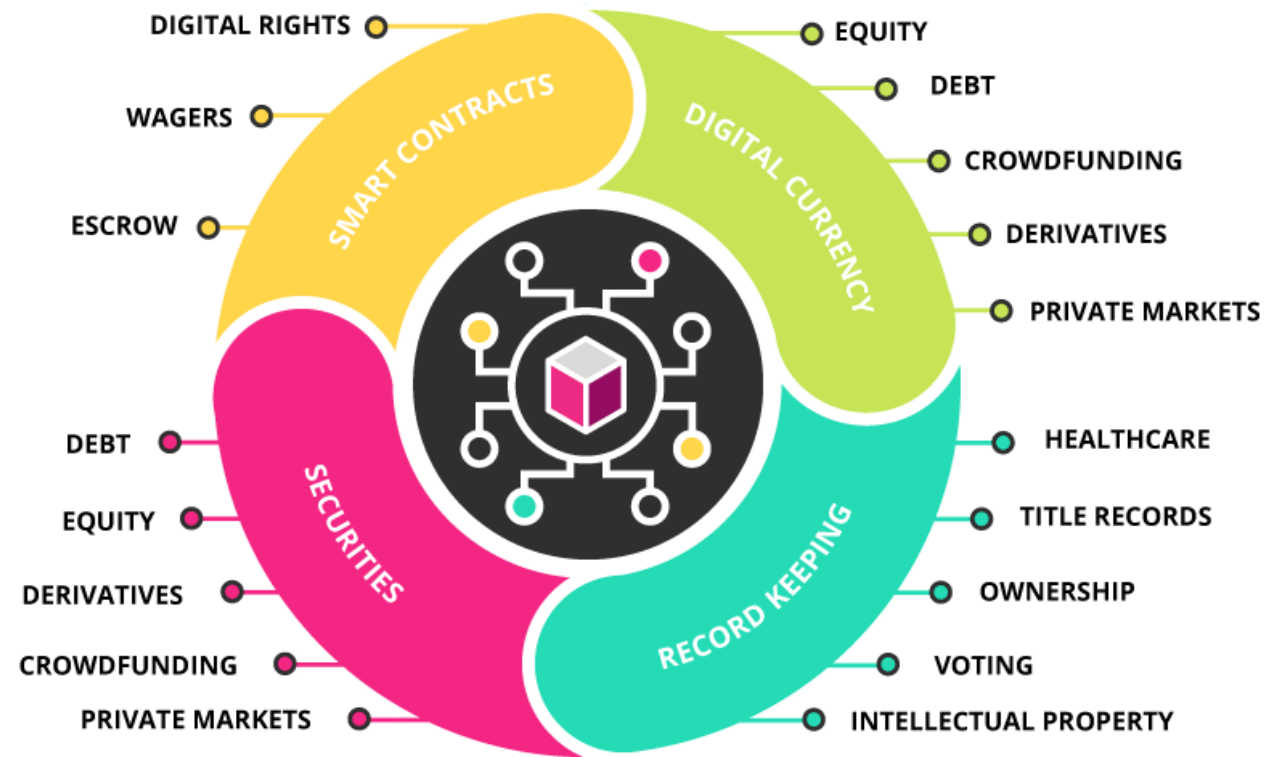*The Blockchain Trilemma*

How do the different networks measure up?

Corda — Ethereum — VeChain

Decentralisation
Security
Scalability

A world of applications

...from cryptocurrencies to so much more

DIGITAL RIGHTS
WAGERS
ESCROW
SMART CONTRACTS

EQUITY
DEBT
CROWDFUNDING
DERIVATIVES
PRIVATE MARKETS
DIGITAL CURRENCY

DEBT
EQUITY
DERIVATIVES
CROWDFUNDING
PRIVATE MARKETS
SECURITIES

HEALTHCARE
TITLE RECORDS
OWNERSHIP
VOTING
INTELLECTUAL PROPERTY
RECORD KEEPING

Source: https://cri-lab.net/security-in-blockchain-applications/

Applies to Healthcare too

... serving the "the age of health data insecurity"

The Problem

- Disparity in Pharma Data
- Fragmented Healthcare solutions
- Slow KYC processes
- Data anonymisation
- Lack of Interoperability and Transparency

A viable Solution

- Blockchain based identity and KYC
- Cross-border applicability
- Privacy management & Patients identity
- Fully Interoperability support
- Management of patient incentive programs
- Regulatory compliance

The Benefits

Easier auditability and operational efficiency
Lower transactional costs through process automation and cross border applicability
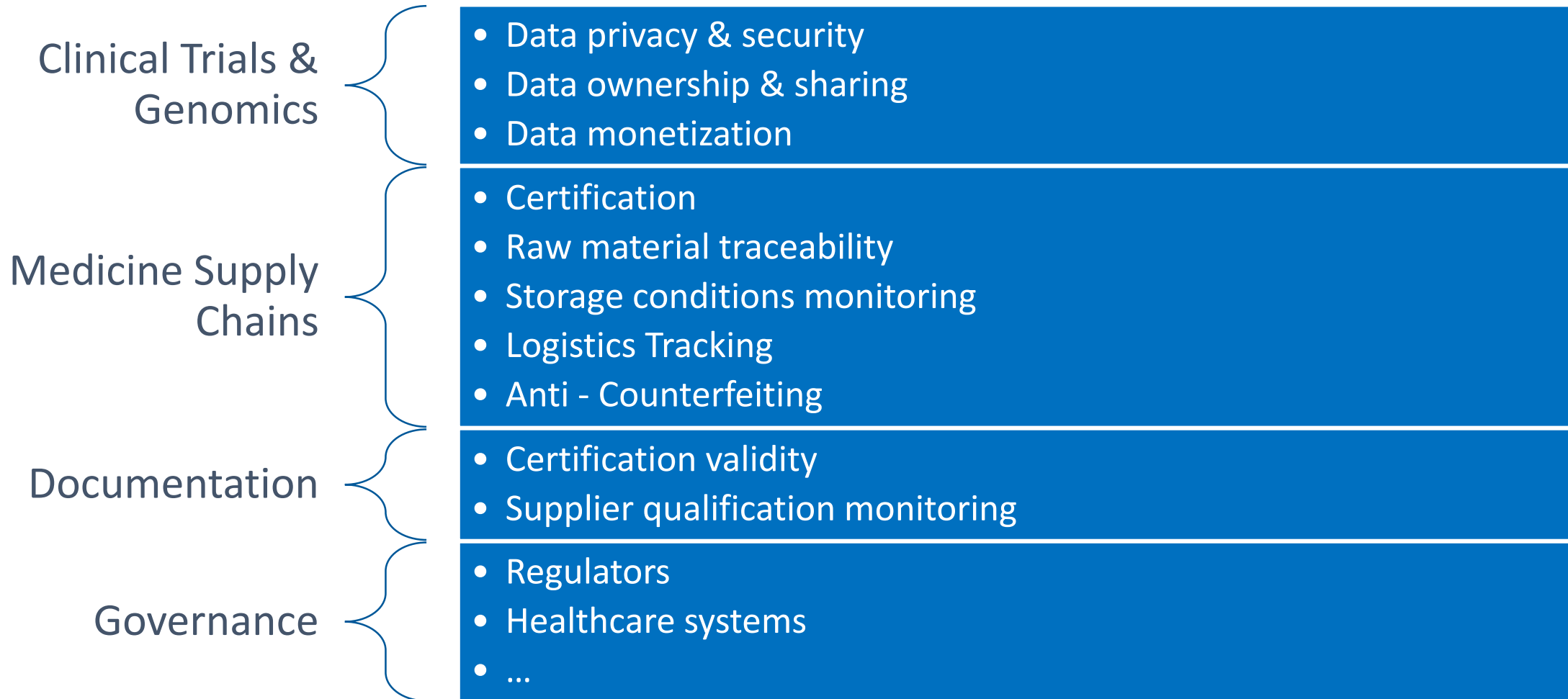Creating a single source of "Truth" for consumer consent

KYC: Know Your Customer

Trust & Integrity is needed...between Stakeholders

...within healthcare Ecosystem

Pain areas

...almost all areas exhibit pain points

Clinical Trials & Genomics

- Data privacy & security
- Data ownership & sharing
- Data monetization

Medicine Supply Chains

- Certification
- Raw material traceability
- Storage conditions monitoring
- Logistics Tracking
- Anti - Counterfeiting

Documentation

- Certification validity
- Supplier qualification monitoring

Governance

- Regulators
- Healthcare systems
- ...

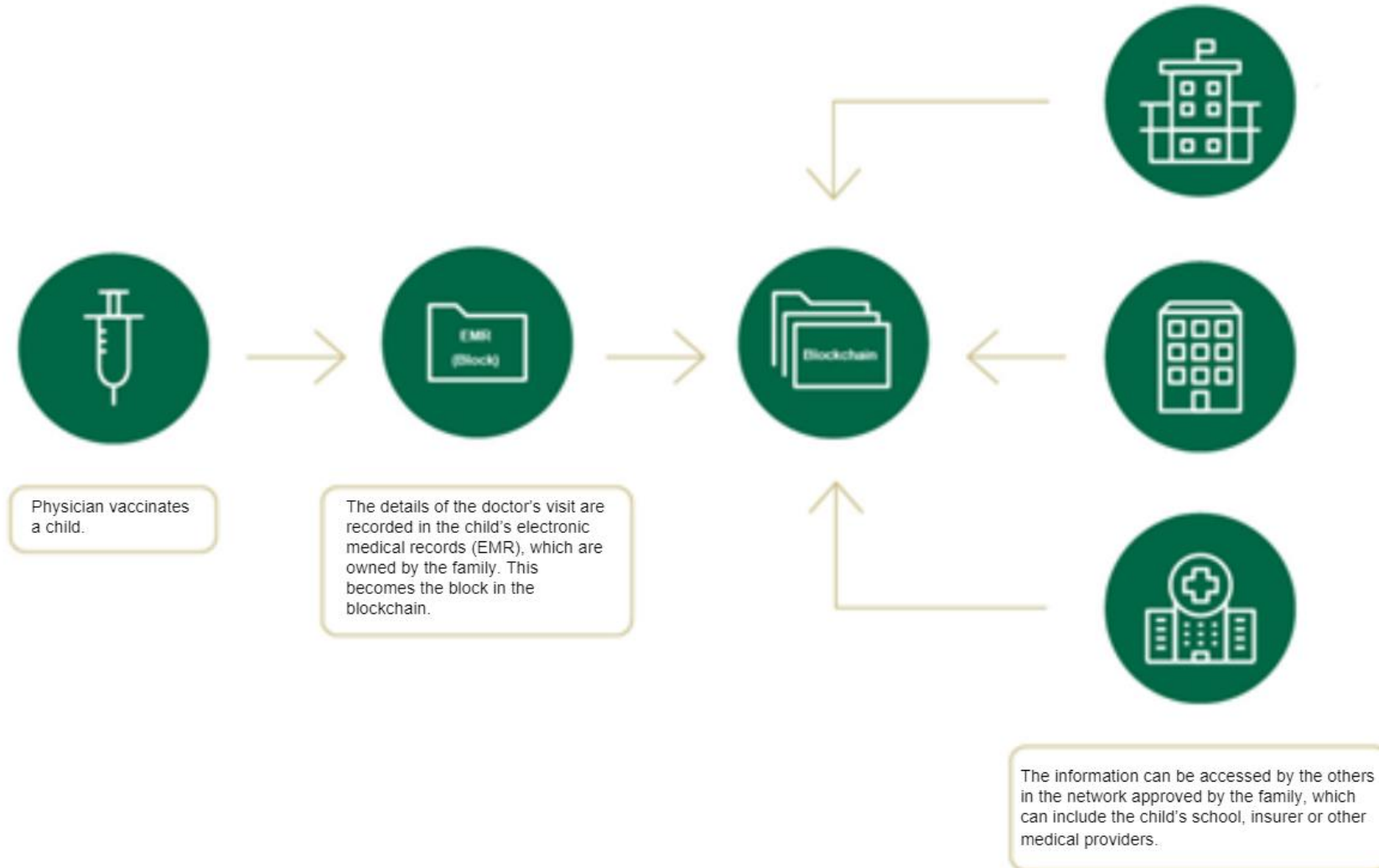# Can blockchain Transform The Healthcare Industries?

...some fundamental elements required

- KYC, "know your customer" verification checks
- Role based stratification of privileges
- Data binding & Data Integrity in Trials
- E-consent & permission handling for data sharing
- Multi-signature verification
- IoT as an entity inclusion
- Certifications and supply chain provenance
- ...even data monetization with attestation

Can blockchain Transform The Healthcare Industries?

...A Healthcare Transaction in the Blockchain

Physician vaccinates a child.

The details of the doctor's visit are recorded in the child's electronic medical records (EMR), which are owned by the family. This becomes the block in the blockchain.

The information can be accessed by the others in the network approved by the family, which can include the child's school, insurer or other medical providers.

https://www.powershow.com/view0/8aa6b3-OGM3M/Blockchain_in_healthcare_powerpoint_ppt_presentation

Blockchain Challenges in the Healthcare Industries

Medical History Management and Sharing

Patient medical data often **reside in separate silos** that make it an arduous task for those who need the data
for **patient diagnosis, treatment, and care**.

Blockchain Challenges in the Healthcare Industries
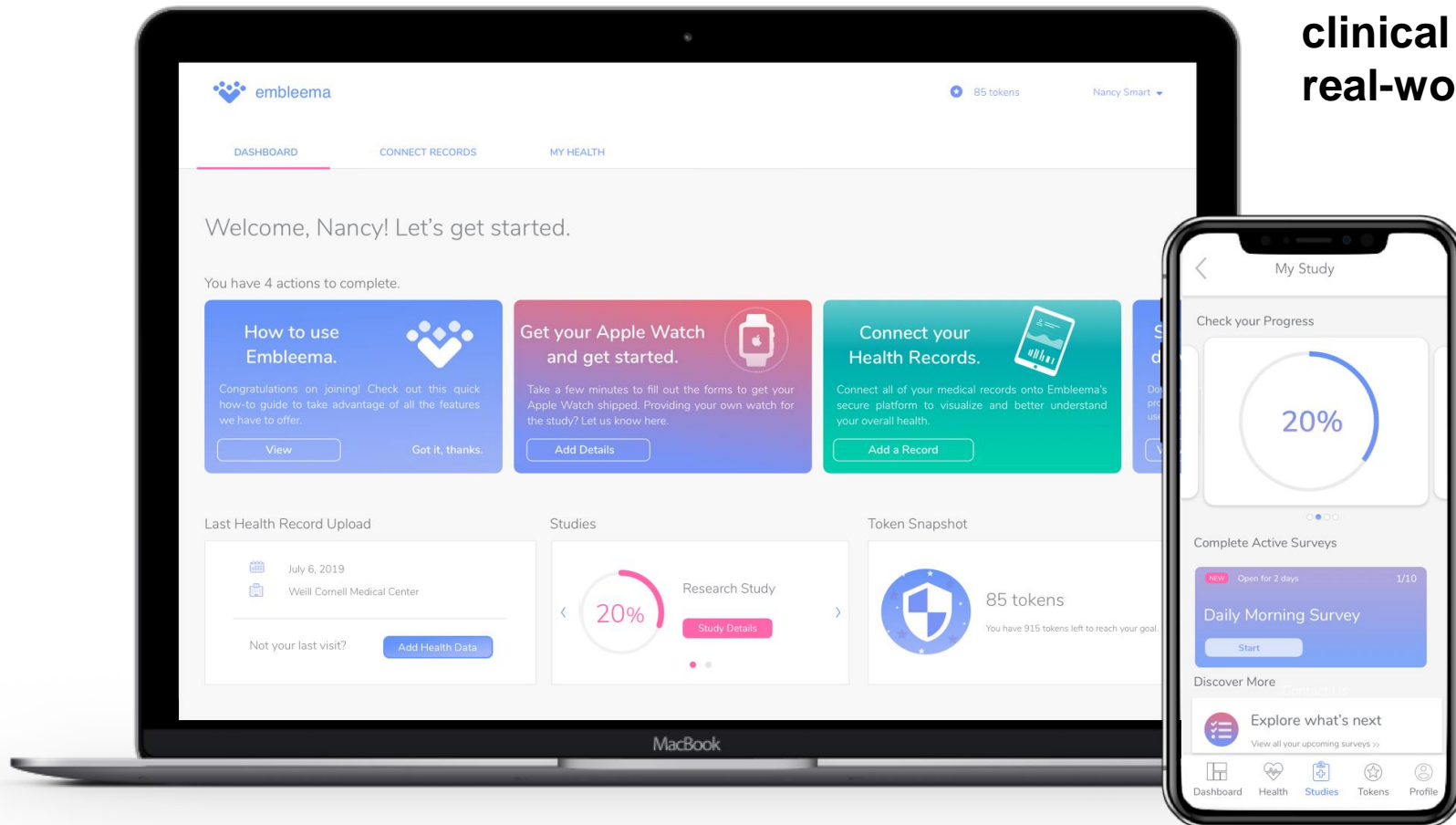
Smart Contracts

Patient-Hospital Contracts

Smart contracts between health organizations and insurance providers.

Blockchain Challenges in the Healthcare Industries

Sell Medical Data on a Blockchain Marketplace

Collects, manages & analyzes of all types of **clinical** &
real-world data with full control from the user.

Blockchain Challenges in the Healthcare Industries

Credentials Verifications for Physicians

Provides hospitals and other healthcare institutions with access to **verified credentials information**

Blockchain Challenges in the Healthcare Industries

Secure Data and Transfer it Safely Between Devices and Health Service Providers

A blockchain approach that enables for **secure recording, transmission, and sharing**
of this information between **devices** and **health service providers**.
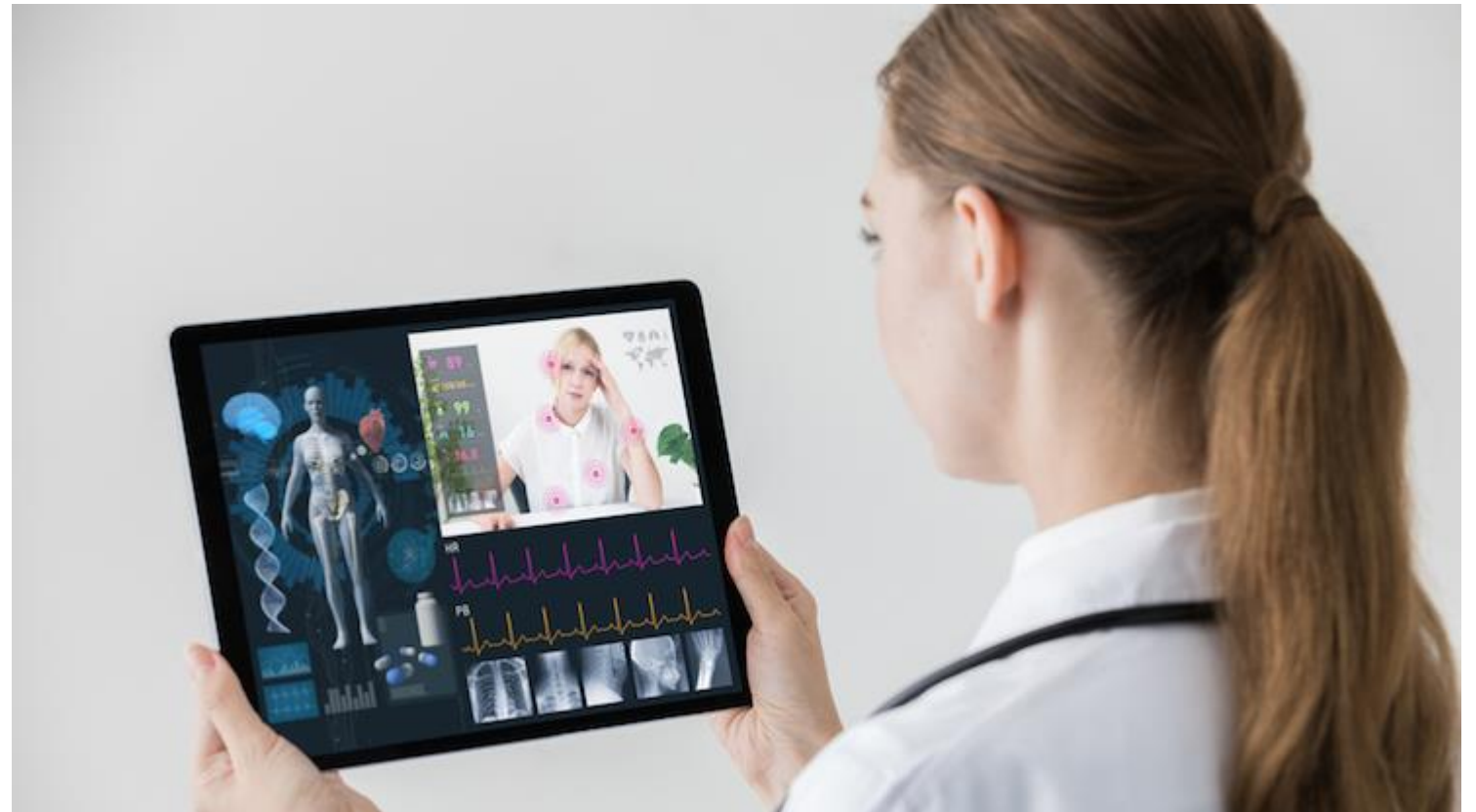
Blockchain Challenges in the Healthcare Industries

Dynamic Consent Management

Blockchain-based platform that serves as the stage for a rapid generation, sharing, and management of patient and healthcare data.

Blockchain Challenges in the Healthcare Industries

Improve Medication Adherence

MyPCR, blockchain-powered Personal Care Record (PCR) platform

- Automates verification of medical adherence
- Ensures patient data integrity and provenance,
- Efficient management of GDPR patient data rights (consent).

Blockchain Challenges in the Healthcare Industries

hospital admission intake process

Index patient ID's and personal
health information on the
Universal
Patient Index

The **FormDrop** app will fill out
forms for patients using their
smartphones - then fax or email
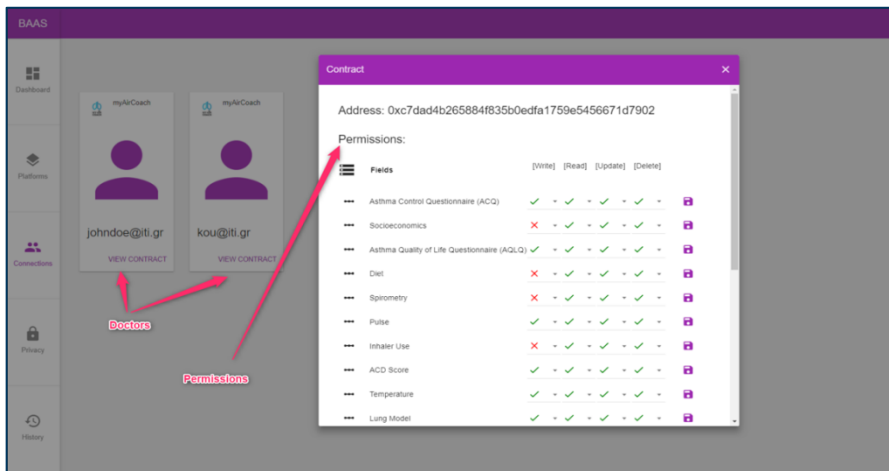the completed form directly to
the point of care.

FormDrop

Blockchain Challenges in the Healthcare Industries

Drug Supply chain

Indicative Examples to Healthcare too

... and several are trying

Gatekeeper H2020 / Aligned with IDS
supporting healthcare platforms to securely handle permission handling and data sharing

simply**vital** health
powering true care

SimplyVital Health
reengineering healthcare by creating the world's largest, top performing health network

MY AIR COACH

MyAirCoach / CERTH/ITI's BaaS Solution

Your Database is SAAVHA Secured

Secured Auditing Application
SAAVHA
by
Verified Hash Algorithm

SAAVHA
simplifies and improves secure interactions between consumers and organizations

It takes collaborative innovation

...Our work with the pharma industry
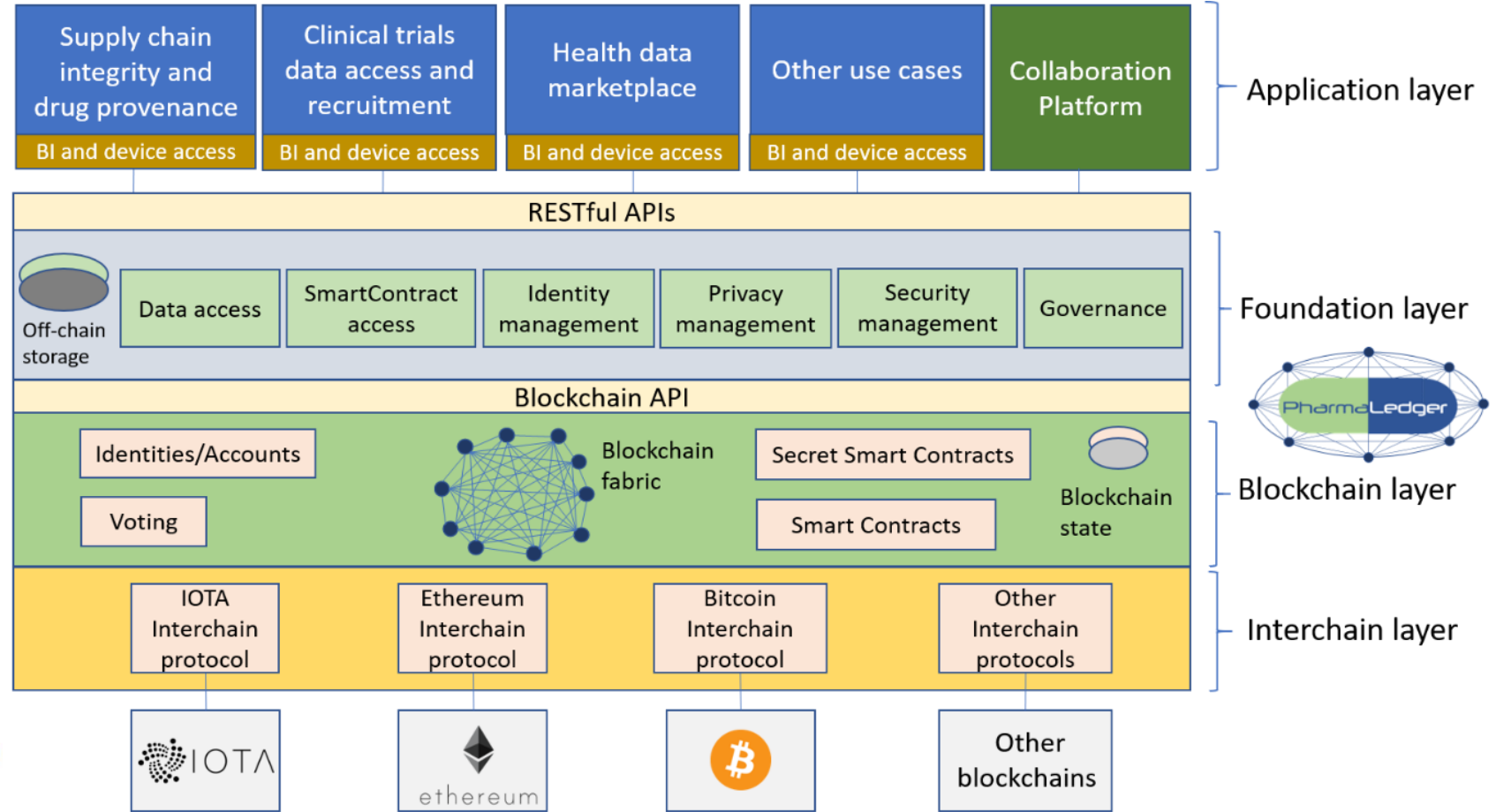
PharmaLedger reference architecture

Please be patient for the next presentation..

The real world is much more complex

...current limitations must be alleviated

**Blockchain/DLT solutions should be able to interoperate**
- Cross chain smart contracts
- Data sharing

Blockchain solutions face scalability issues
- Hardware performance
- Network propagation delays
- Blockchain layer limitations

Regulatory field is not keeping pace or technology is moving too fast. GDPR, Legal Framework, Financing Regulations
- Blockchain Identity (DID) is not fully considered a Self-Sovereign Identity (SSI)
- Smart Contracts do not have legal standing
- Cryptocurrencies & Tokenised economy are a pain to regulate
- Decentralisation of governance

regulatory

interoperability

scalability

Source: https://blockspoint.com/guides/bitcoin/what-is-bitcoin/
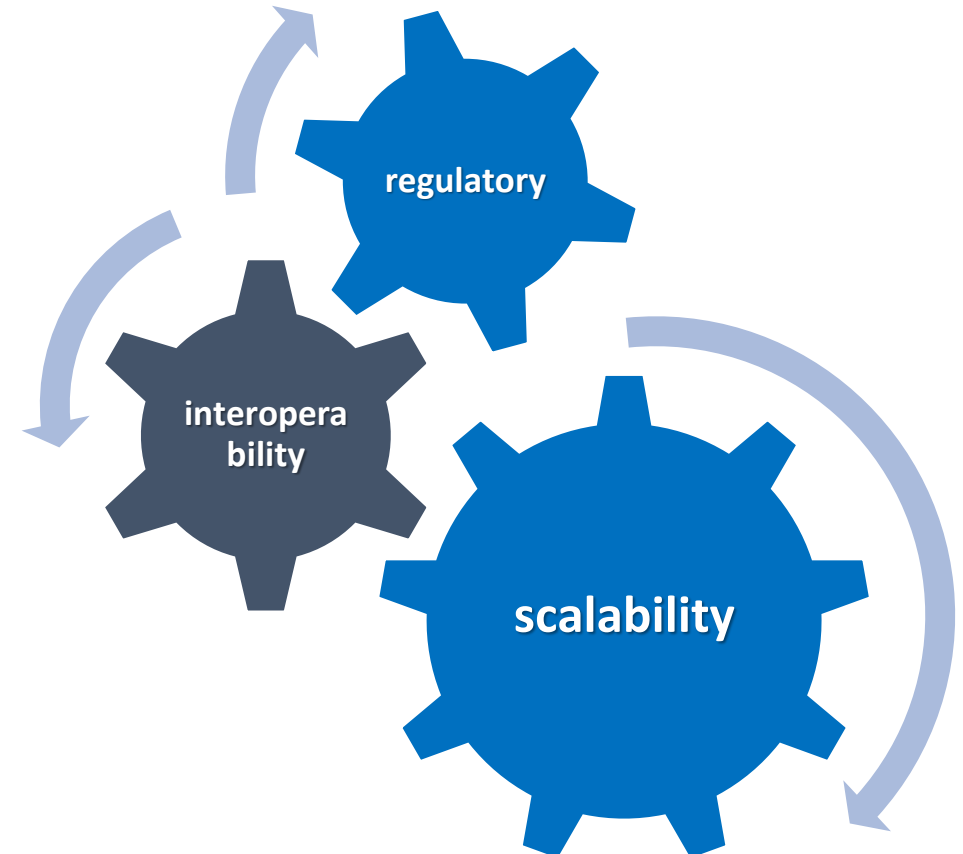
Thank you

Information Technologies Institute
Centre for Research & Technology Hellas

Dr. Konstantinos Votis
Senior Researcher
Head of Blockchain Lab, ITI
EU Blockchain Observatory and Forum Member

kvotis@iti.gr