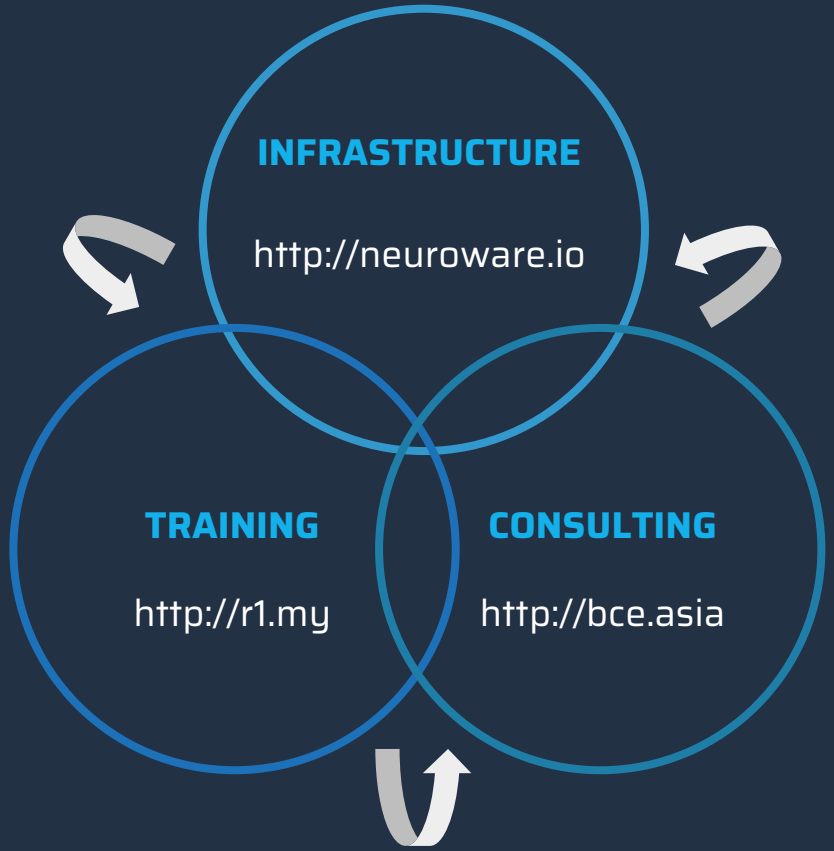
neuroware

an introduction to blockchain use-cases

Updated: 20th of July, 2018

Created by: @NeurowareIO

INTRODUCING NEUROWARE



GLOBAL FUNDING	Only Malaysian company to graduate from 500 Startups Accelerator in Silicon Valley, with funding from Coinsilium too
BUSINESS FOCUS	With DBS, Axiata, Maybank and Securities Commission as clients, we cover a broad spectrum of industries
FULL-STACK SERVICES	We provide corporate blockchain training and workshops along with consulting on solutions utilizing Cortex

BLOCKCHAIN TECHNOLOGY IS COMPLICATED

Blockchains

difficult to choose between a thousand chains with hundreds of different consensus methods and protocols

Massive Data Sets

TeraBytes of data with billions of records requires a lot technical resources, talent and time

Disrupting Businesses

Current tools & services designed for individuals and developers; to replace businesses

Financial Focus

Although crypto-currencies now account for over US$140 billion, they are merely the fuel for data storage

WE SIMPLIFY THINGS

Cortex

we've used decades of distributed ledger developer experience to build a platform that supports the best of the blockchains

Private APIs

We process multiple blockchains and provide dedicated APIs built for individual businesses

Enterprise Solutions

Our products and services have specifically been designed for organizations and businesses

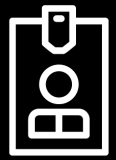
Agnostic Protocols

We have developed non-financial protocols for data and identity that work across multiple blockchains

CORTEX IS THE NAME OF OUR TECHNOLOGY SOLUTION

Regulated Businesses

E-WALLETS
Key Management



E-KYC
With Integrated AML

E-TRUSTEE
Multi-Signature

E-MONEY
Token Factories

Pay for white-labelled services
Use private networks in production

ENTERPRISES

STARTUPS

Subscribe to individual services
Use private networks for testing

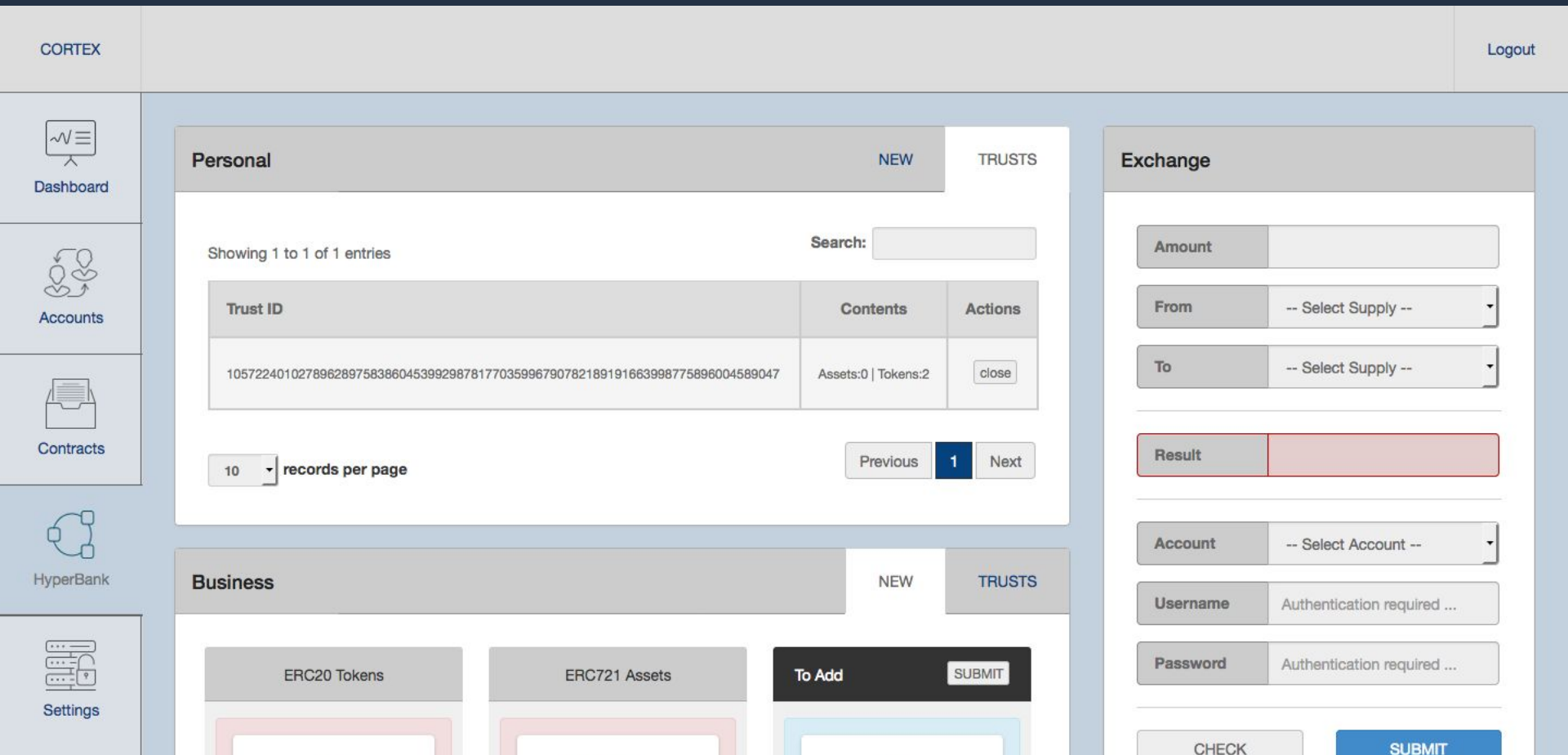
CUSTOM API ENDPOINTS FOR EACH CLIENT

Blockchains & Distributed Protocols

PUBLIC NETWORKS

PRIVATE NETWORKS

CORTEX PROVIDES TRUST VIA SMART CONTRACTS



PARTNERS, INVESTORS, INVITATIONS & PAYING CLIENTS

BANK NEGARA MALAYSIA
CENTRAL BANK OF MALAYSIA

Suruhanjaya Sekuriti
Securities Commission
Malaysia

MINISTRY OF FINANCE MALAYSIA

500 startups

coinsilium

FINNOVASIA

TEDx

BFM 89.9
The Business Station

Asia 8th Annual Premier Banking Technology Event
BankTechAsia '16
Where banking meets technology...

CyberSecurity MALAYSIA

sains®

THE MALAYSIAN INSURANCE INSTITUTE

DBS

axiata

atoplus

BakerHostetler

Maybank

ACTIVE USE-CASE 01

BLOCKCHAIN BASED ENERGY MARKETS

BENEFITS OF A BLOCKCHAIN BASED ENERGY NETWORK

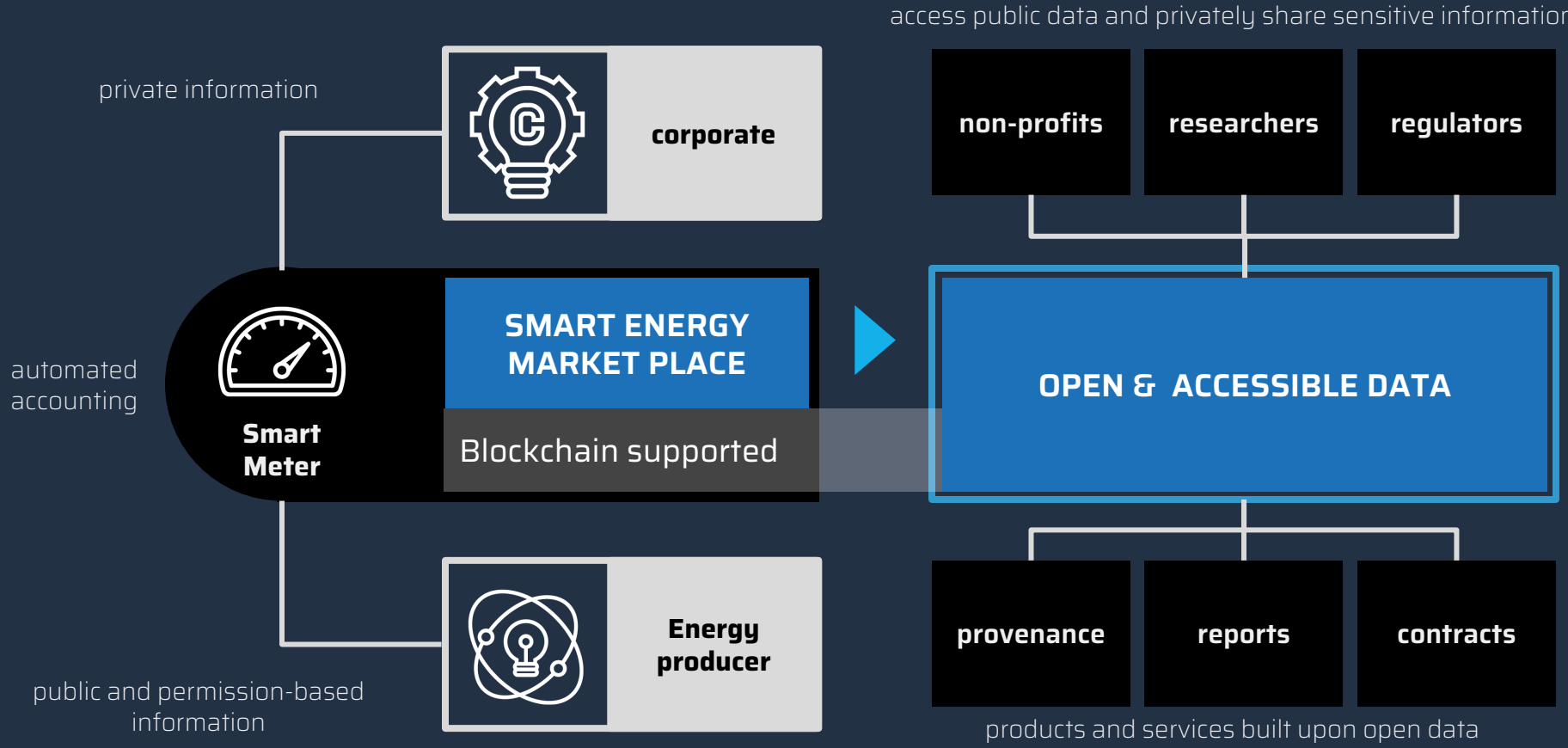
Improving the quality of life for everyone whilst saving costs:

- **SMART METERS** - moving beyond insecure connected cloud devices
- **SMART GRIDS** - store, trade and track energy distribution and transactions
- **SMART CITIES** - introduce new automated services and business models

Improving your business whilst introducing new revenue streams:

- **SMARTER RELATIONSHIPS** - securely share data between trusted parties
- **SMARTER COMPLIANCE** - automate regulation with coded contracts
- **SMARTER DECISIONS** - network analytics with tamper proof audit trails

SECURELY EMPOWERING OPEN INNOVATION



FOUNDATIONS FOR A GLOBAL ENERGY MARKETPLACE

International access to global energy trading

enable open innovation by sharing data

OPEN ENERGY MARKETPLACE

OPEN DATA PLATFORM

Third party integration providers

Corporate blockchain systems

Cross boundary utility/energy producers

Regional hackathon &

OUR PROGRESSIVE APPROACH TO EXPLORING USE-CASES

STEP 1 - Deploy a Blockchain Prototype for a Global Energy Marketplace

- Distributed Content Management & Contact Resource Systems
- Transferable Digital Energy Units Governed by Smart Contracts

STEP 2 - Develop an Analytics Platform as Marketplace Proof of Concept

- Ensure that the marketplace prototype can support third-parties
- Guarantee accountability whilst improving social responsibility

STEP 3 - Integrate with Smart Meters & other Demos for Internet-of-Things

- Develop Digital Identities, e-Signing and Authorization Processes
- Deploy Tools & Resources for new 3rd Party Integration Services

ACTIVE USE-CASE 02

BLOCKCHAIN BASED SECONDARY MARKETS

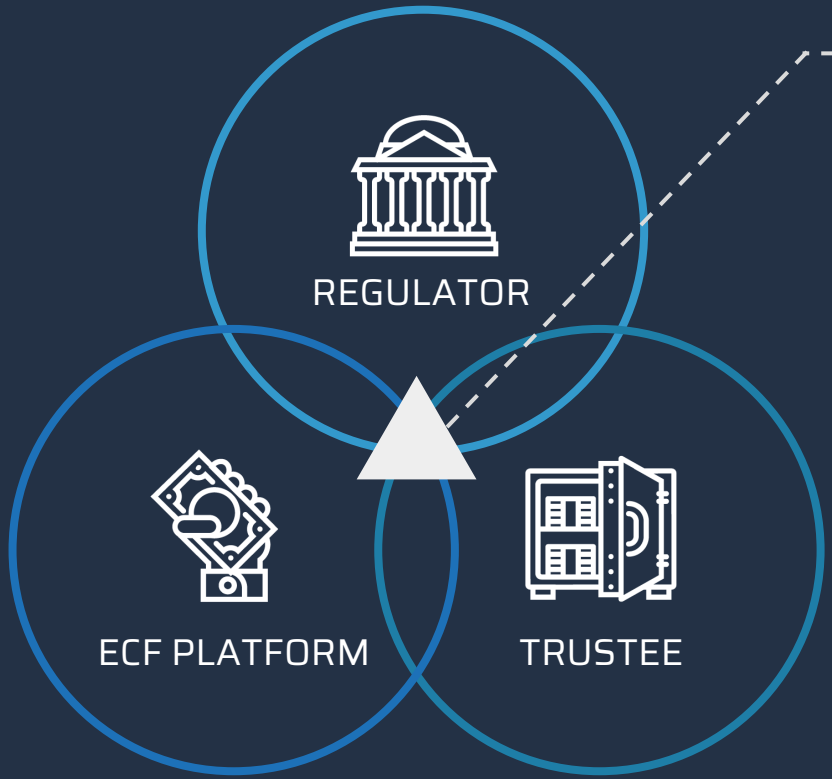
PRESENTING A CASE STUDY OF OUR FINTECH CLIENTS

No real-time insights or monitoring capabilities on regulated market operators (ECF) and their deals	**Regulator**	**DATA**
Handles sensitive data through multiple parties with different standards and practices	**Equity Crowdfunding Platform**	**FACILITATOR**
Utilizing insecure and inefficient methods - the true bottleneck preventing secondary markets	**Trustee**	**MONEY**

Trust

Friction

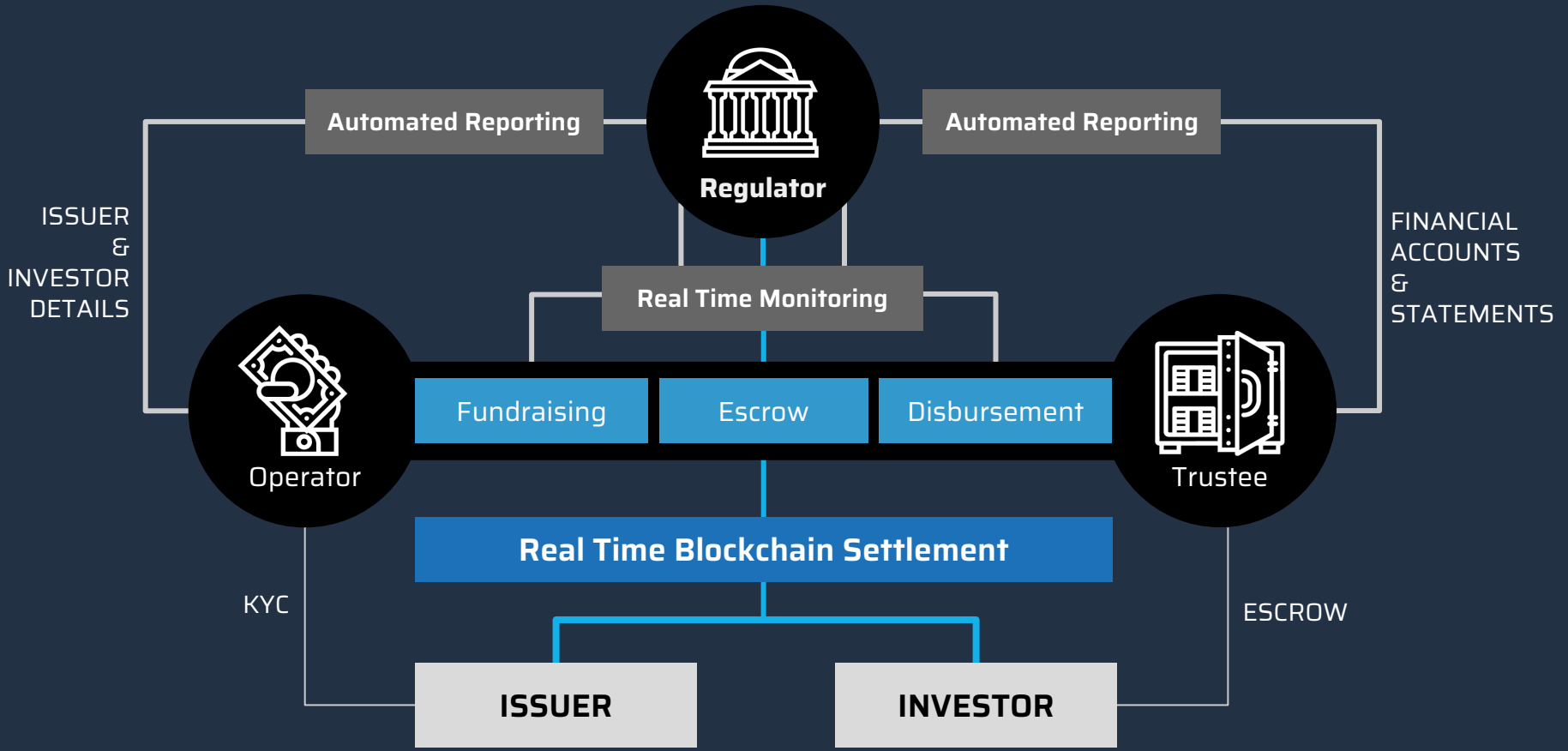
CORTEX SOLVES BOTH INDIVIDUAL & GROUP PROBLEMS



Cortex & Secondary Markets

1	Real-time analytics and automated reporting with an inescapable audit trail of everything
2	Single distributed tamper-proof database securely sharing data with all parties
3	Smart-contract enabled transactions reduce friction, costs and delays in settlement

SECONDARY MARKETS EMPOWERED BY CORTEX



OUR PROGRESSIVE APPROACH TO EXPLORING USE-CASES

STEP 1 - Deploy a Blockchain Prototype for a ECF Operators

- Distributed Content Management & Contact Resource Systems
- Multi-signature (trustless) crypto-investments

STEP 2 - Develop a Regulatory Node Proof of Concept

- Transferable Digital Equity Units Governed by Smart Contracts
- Provide automated auditing and compliance as a protocol

STEP 3 - Integrate with Trustees and (or) Exchanges

- Develop Digital Identities, e-Signing and Authorization Processes
- Deploy Tools & Resources for new 3rd Party Integration Services

ACTIVE USE-CASE 03

BLOCKCHAIN BASED LAND TITLES

CURRENT SYSTEMS OVERVIEW

Established in 2000, currently operational only in Kuala Lumpur.

Development

Strata

Acquisition

Registration

Revenue

Auction

Enforcement

Disposal

Consent

Contains 9 modules to cover all land title operations

CURRENT SYSTEMS PROBLEMS

Adoption

Established in 2000, 18 years later only Kuala Lumpur adopted the system.

Not 100% digitised Kuala Lumpur's land titles yet.

Complicated

Contains 9 modules, each covering a different aspect.

No clear migration process.

Makes the classic mistake of trying to do everything at the same time.

Usability

Web site is extremely old, outdated look and feel.

Non-mobile friendly, and too complicated for non-computer literate personnel to use.

Only supports bahasa.

Interoperability

No plans for interoperability with other systems.

No plans for integration with other government systems.

OPPORTUNITIES FOR US

Adoption

18 years is more than enough to migrate Penang's land titles.

Start small, focus on standardisation.

Set milestones and spend money on data entry personnel.

Complicated

Only focus on land title queries, and verification.

Simplify process for both land title officers and the public.

Have track record of planning and executing large scale projects.

Usability

Have experience with designing modern and simple user interfaces.

Have mobile and responsive design capabilities.

Simple scope means simpler user interaction.

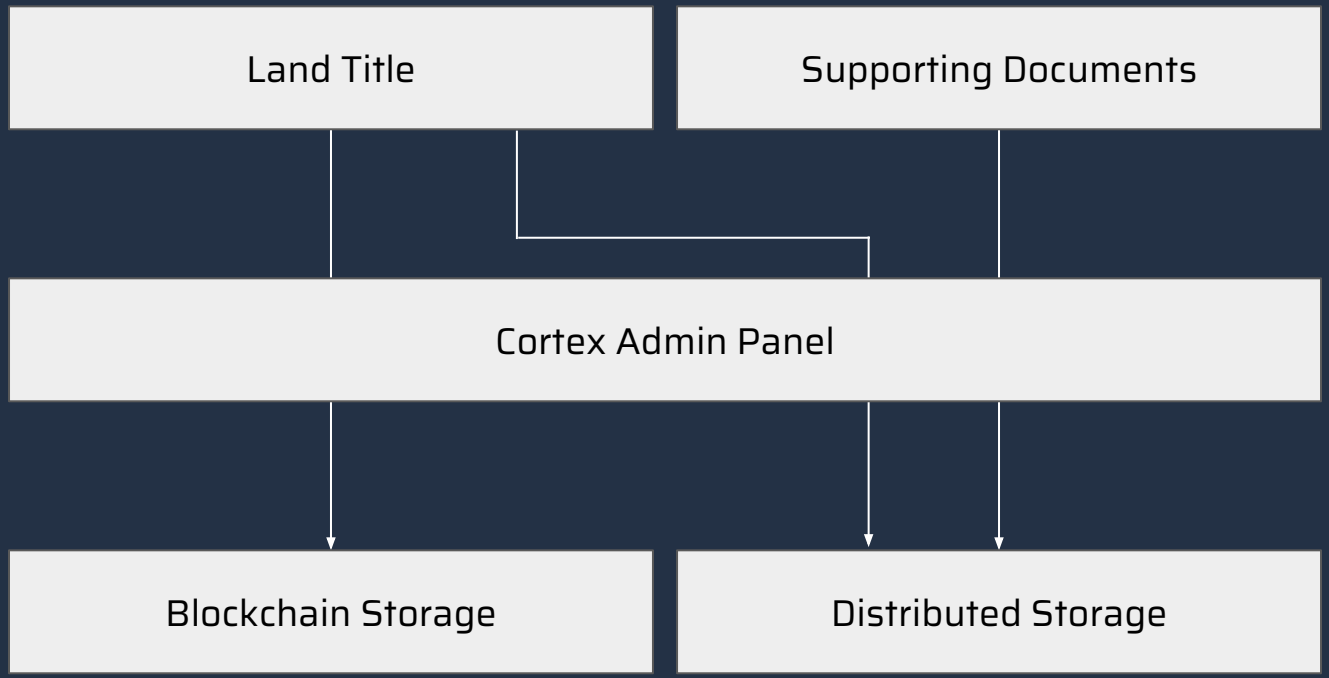
Interoperability

Can work with 3rd party services from the get-go with our API.

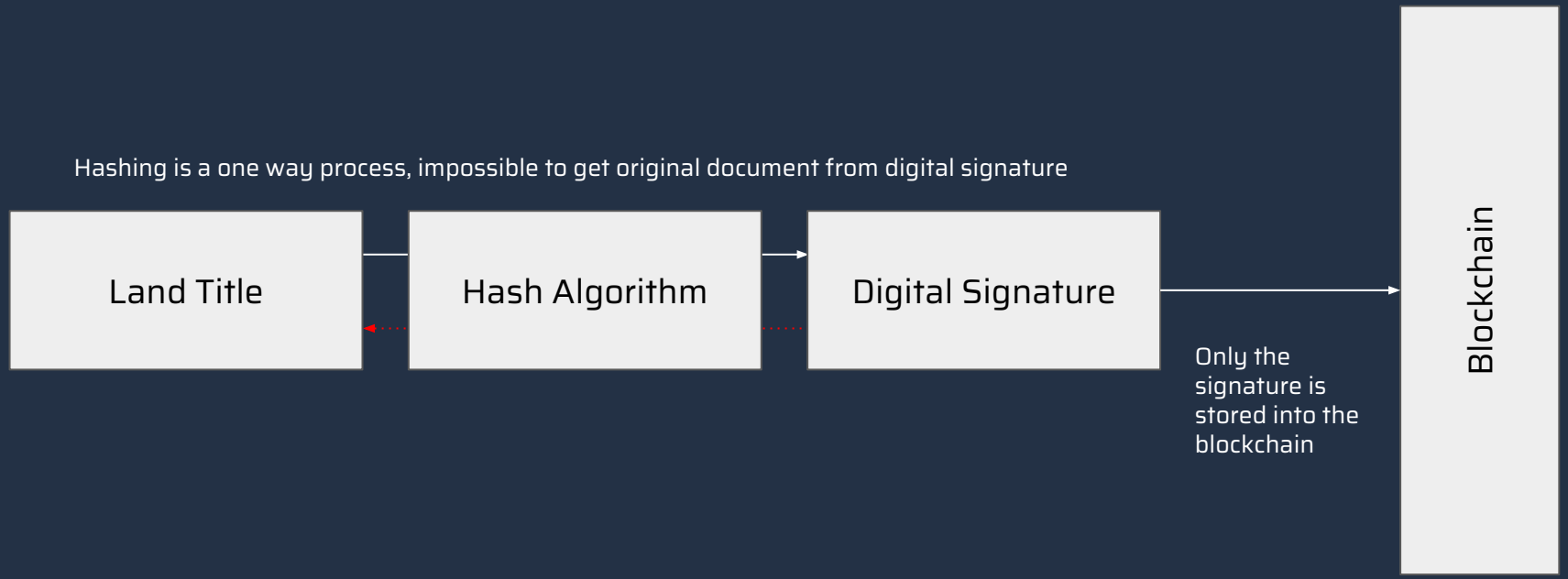
Blockchains inherently encourage interoperability.

Opens up opportunities for new businesses.

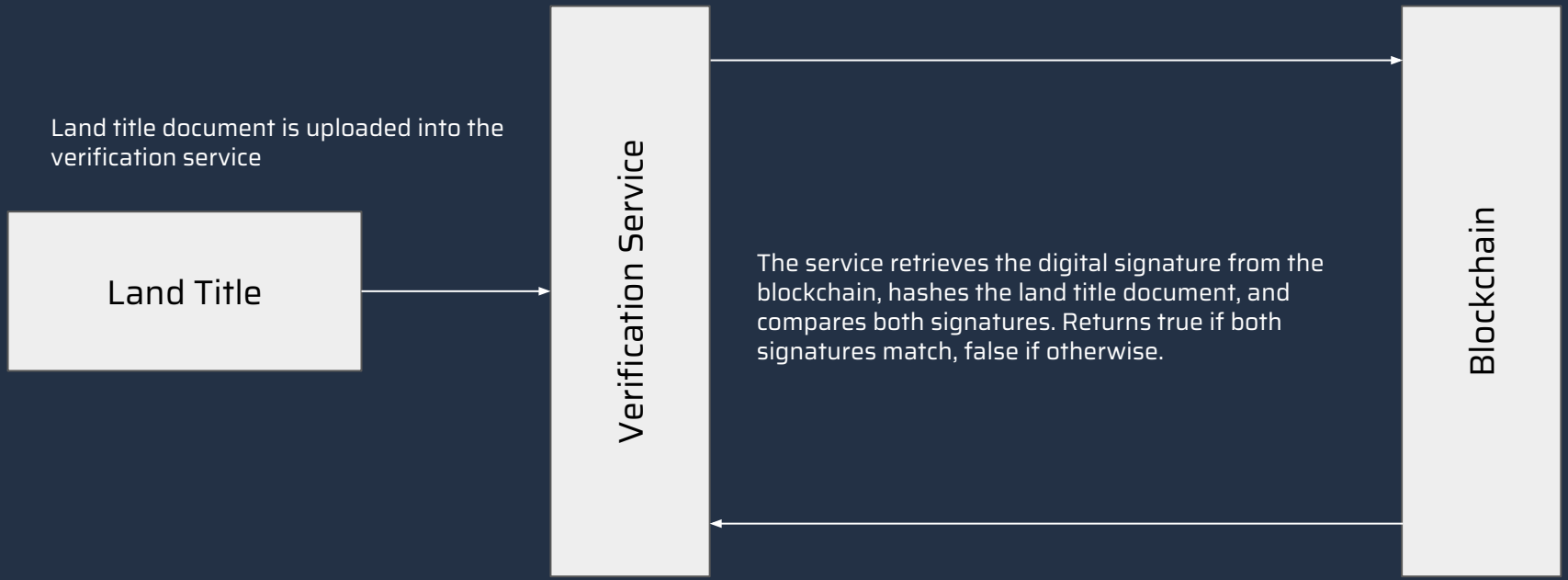
LAND TITLE STORAGE



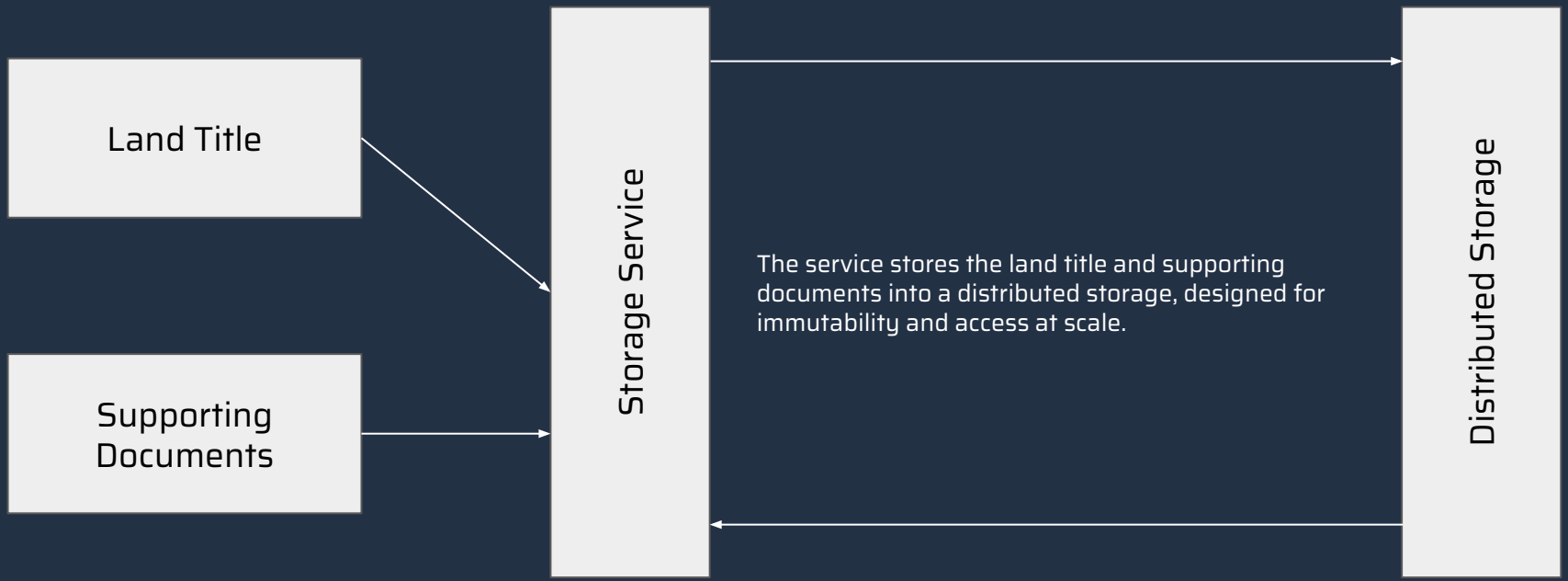
LAND TITLE STORAGE



LAND TITLE STORAGE



LAND TITLE STORAGE



EXPLORING FOUNDATIONAL USE-CASES

DATA

DIFFERENT WAYS DATA CAN BE STORED ON THE BLOCKCHAIN

- Blockchains can provide a tamper proof audit trail for structured data
  - Useful for public data (births, deaths, marriages and education)
  - Ideal for sharing data (identity, loyalty, supply chains and healthcare)

- Alternatively, blockchains can also be used to timestamp data hashes
  - Useful for large data sets (such as data lake authenticity checks)
  - Ideal for compliance (independently verify data timelines)

- Simple applications that require limited data can run autonomously without the need to pay for and (or) service ongoing hosting or server requirements
  - Useful for operating censor resistant applications

WHAT IS A DATA LAKE ...?

- An intelligent repository for storing large quantities and varieties of data
- With a constant stream of data being fed to it from different sources
  - There is an expectation to preserve the original data
  - As well as the precise lineage of data transformation

- Requires unstructured data & structured data with embedded schema
- Leads to a stockpile of archived anonymous yet actionable events
- However, the more routes that lead to and from this lake of data, the more susceptible it becomes to presenting misleading information...

SOME OF THE PROBLEMS FACED BY DATA LAKES

- How can we trust the data coming into the lake?
  - Is it going to the right place & is it coming from who it says it is?
  - If the application is independent - how to change schemas?
- Can we trust the data does not get altered once in the lake?
  - Risks associated with centralized truth for distributed workloads
- How can we trust the data coming out of the lake?
  - Do the right team members have the data specific privileges?

HOW IT ALL FITS TOGETHER

COLLECT DATA

Collect RAW schema-less data using MongoDB - can use GridFS for file storage

Document-Driven Design

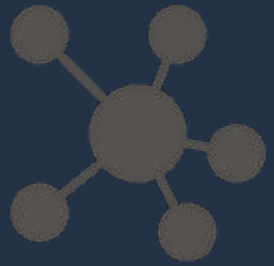
This allows you to storeand query anything

ARCHIVE DATA

Hash batches of data prior to archiving and publicize the meta data to the blockchains

Relational and Replicated

Mixing some of the oldest technologies with the latest



ANALYZE DATA

Use APIs to get data from the archives and prove its validity by checking the blockchains

Polyglot Persistance Prevails

Use the right database for the right job at the right time!

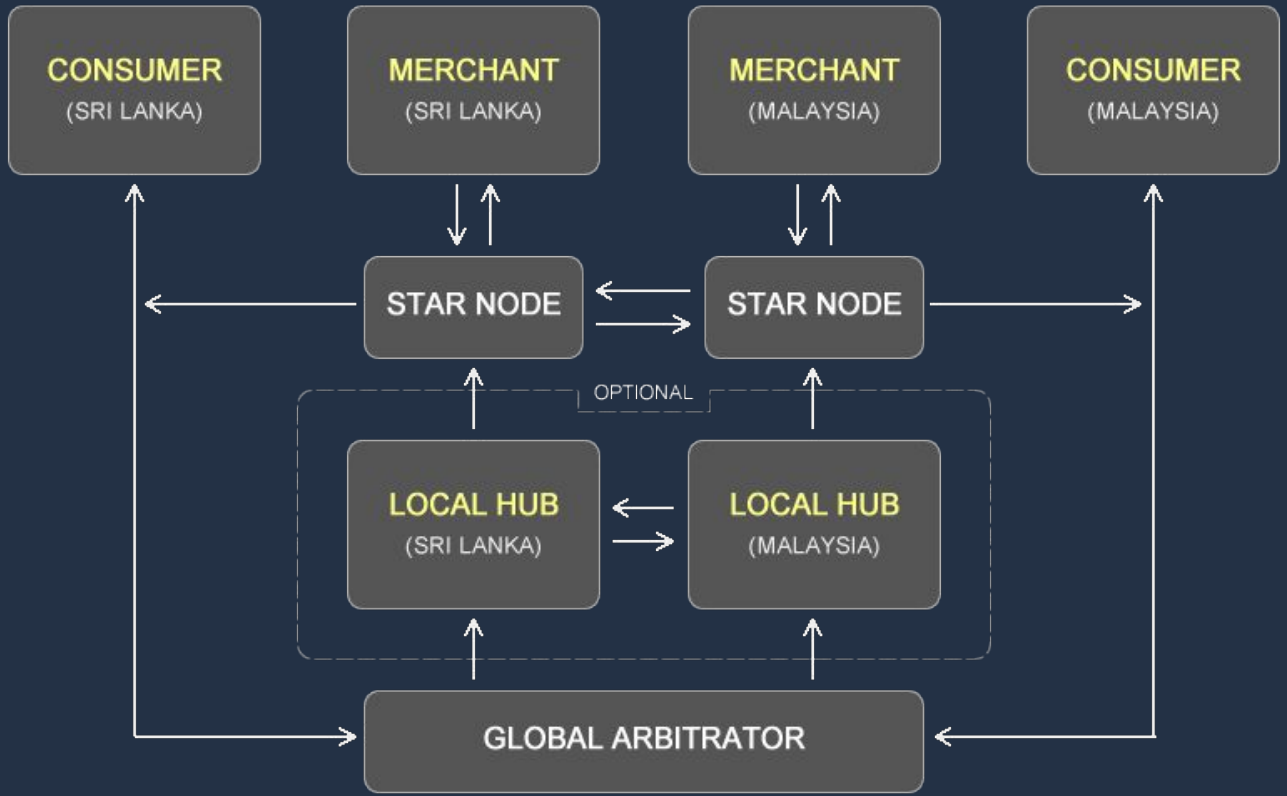
EXPLORING FOUNDATIONAL USE-CASES

TRUST

BANKING ON THE FUTURE OF BLOCKCHAINS

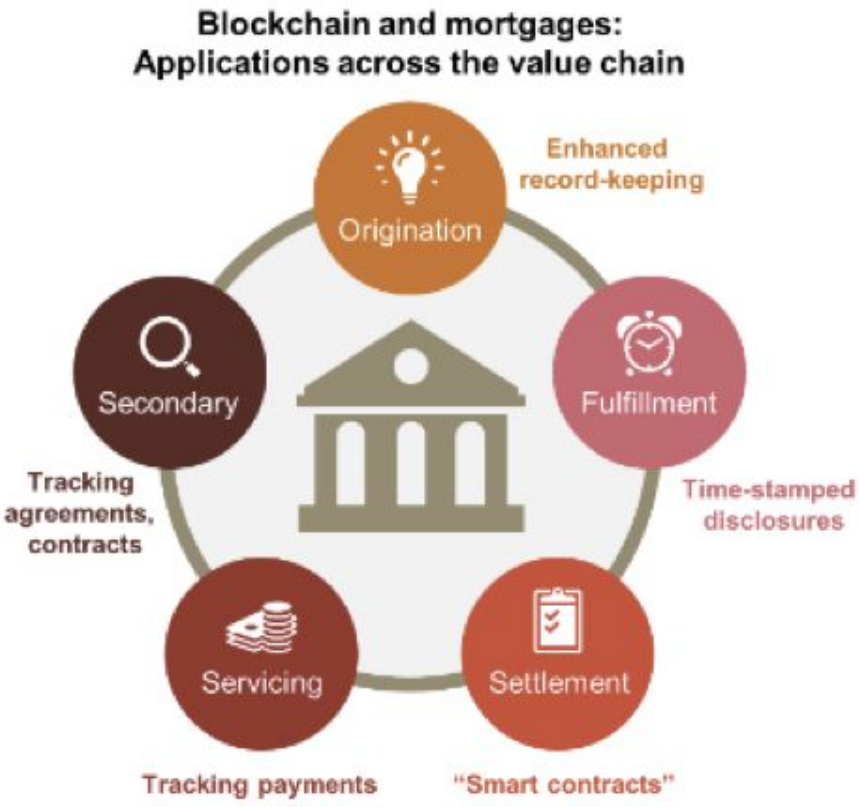
- With banks already KYC and AML compliant, there are no entities more suited to be offering digital currency brokerage and key management
- With the advent of smart-contracts, banking becomes a sequence of code
- Regulation and compliance would be designed as part of the protocol
- If retail and commercial banking processes were 100% based upon blockchains, staffing requirements could be reduced by at least 90%
- Existing internal infrastructure can be replaced by distributed protocols
- Fidelity (USA) - mining bitcoin & ethereum - crypto balances for accounts

LOYALTY POINTS PROVIDE AN IDEAL TESTING GROUND

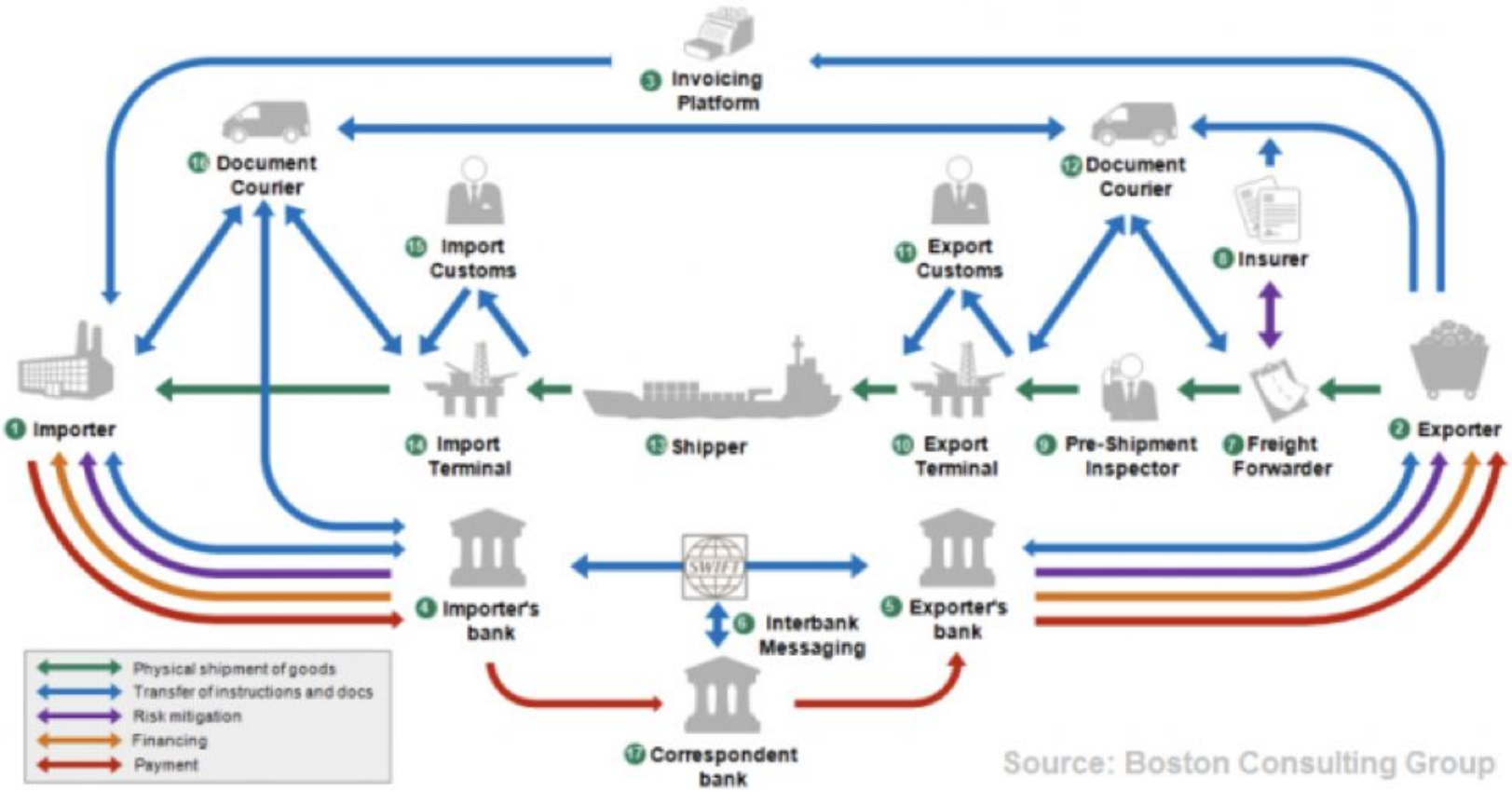


PWC AND MORTGAGES - OUT TO AUTOMATE TRUST

- At origination, blockchain could help establish more accurate record keeping
- At fulfillment, it could provide immutable proof that loan estimates were sent and received on time
- Smart contracts would speed up settlement flows throughout
- In the servicing process, blockchain could track the movement of payments
- And in the secondary markets, it might also provide transparency about the ownership of underlying assets



SUPPLY CHAINS SHOWING THE MOST R&D INVESTED



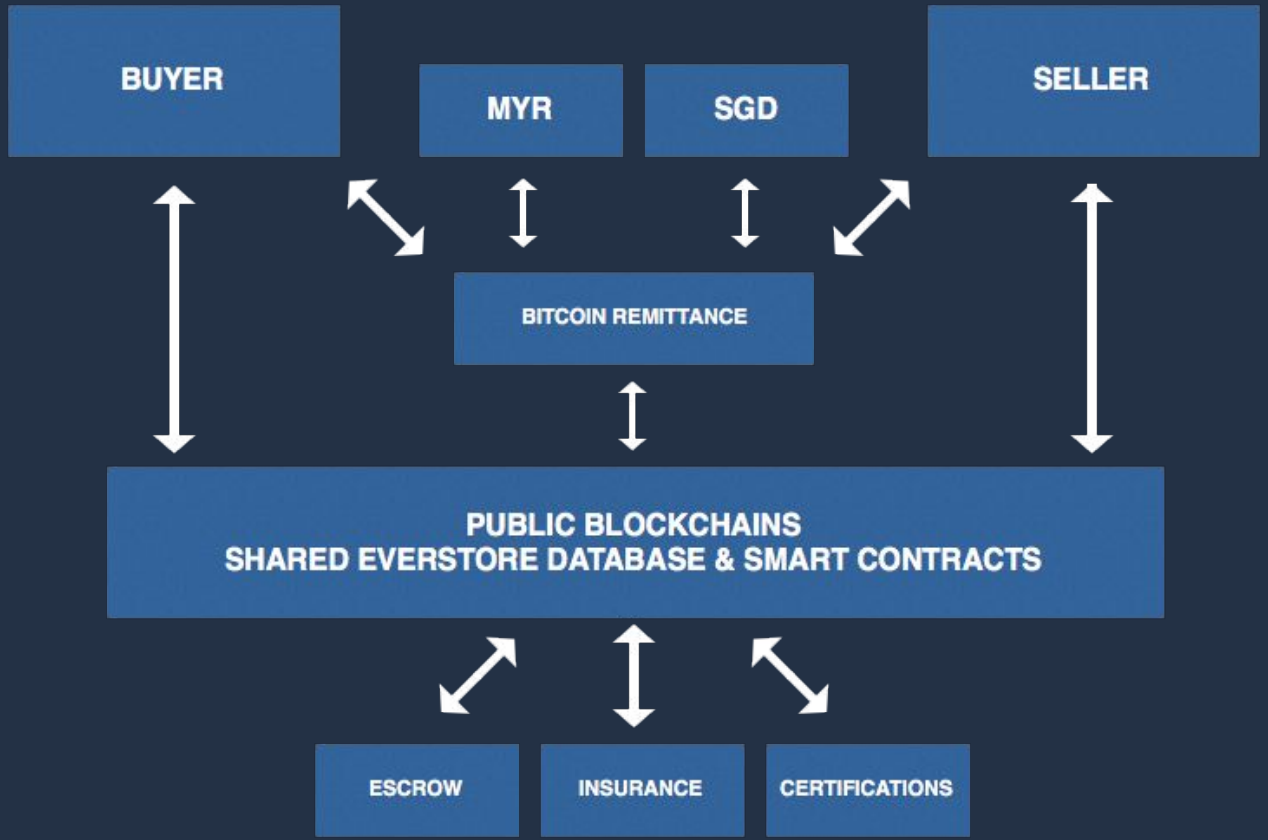
COMMON PROBLEMS WITH SUPPLY CHAINS

- Multiple entities maintaining multiple copies of the truth within easily compromised closed silos requiring painfully slow & expensive reconciliation
- Time consuming requirements for setting-up third-party financial trustees and physical escrow accounting processes between each transaction
- Lack of automation between checkpoints, processes and sensory inputs
- Excessive use and reliance upon physical paper-trails and certification

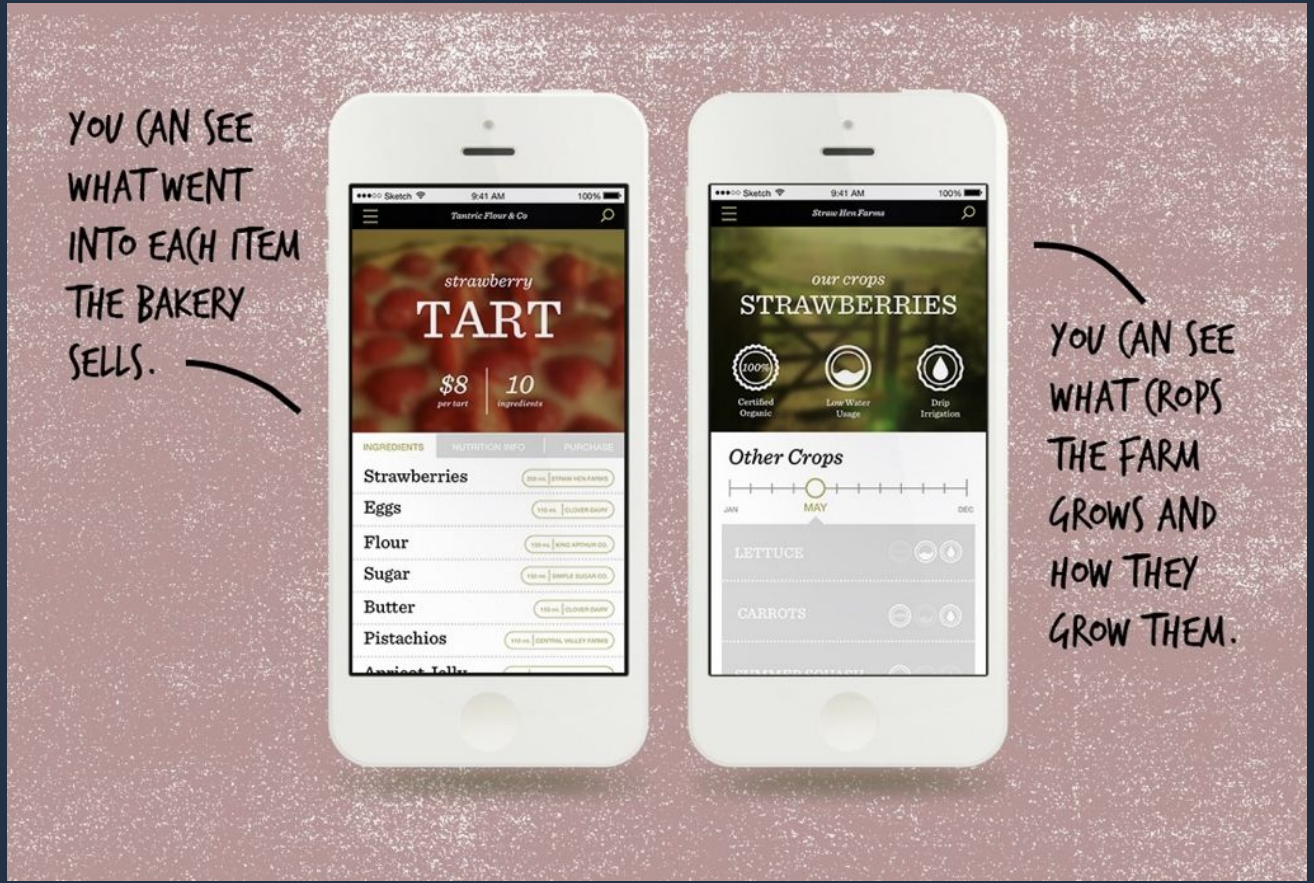
- **ALL OF THESE PROBLEMS EXIST DUE TO A LACK OF TRUST**

  (if only there was a way they could all use the same source of truth)

SIMPLIFYING SUPPLY CHAINS WITH BLOCKCHAINS



IDEO EXAMPLE 1 - PROOF OF PROVENANCE IN SUPPLY CHAINS



IDEO EXAMPLE 1 - P2P SUPPLY CHAINS

NAME A PRICE THAT YOU'D LIKE TO PAY FOR STRAWBERRIES.

ONCE YOU SUBMIT, YOU CREATE A SMART CONTRACT WITH THE FARM WHICH WILL DELIVER STRAWBERRIES IF THE PRICE DROPS BELOW YOUR LIMIT.

IDEO EXAMPLE 1 - IoT BASED SUPPLY CHAINS

YOU CAN SEE THE ENTIRE JOURNEY OF THE FISH FROM BOAT TO MARKET.

INTERNET CONNECTED EQUIPMENT NOTES THE ORIGIN, ROUTE, AND TEMPERATURE OF THE FISH.

ACTIVE USE-CASE 04

BLOCKCHAINS AND HEALTHCARE

HEALTHCARE SET TO BE THE BIGGEST MARKET AFTER FINANCE

- 4% of USA hospitals spend more than US$10 million a year on cybersecurity, whereas 33% of hospitals couldn't estimate their cyber security costs
- Estonia is now the first country to nationalize a blockchain healthcare system
- Dubai took note of Estonia's success - now experimenting with blockchains

WELL OVER US$300M ALREADY SPENT ON R&D

35% of (308) healthcare and life science organizations surveyed plan to launch blockchain based products and services by first quarter of 2017

39% surveyed said they knew very little to nothing about blockchains

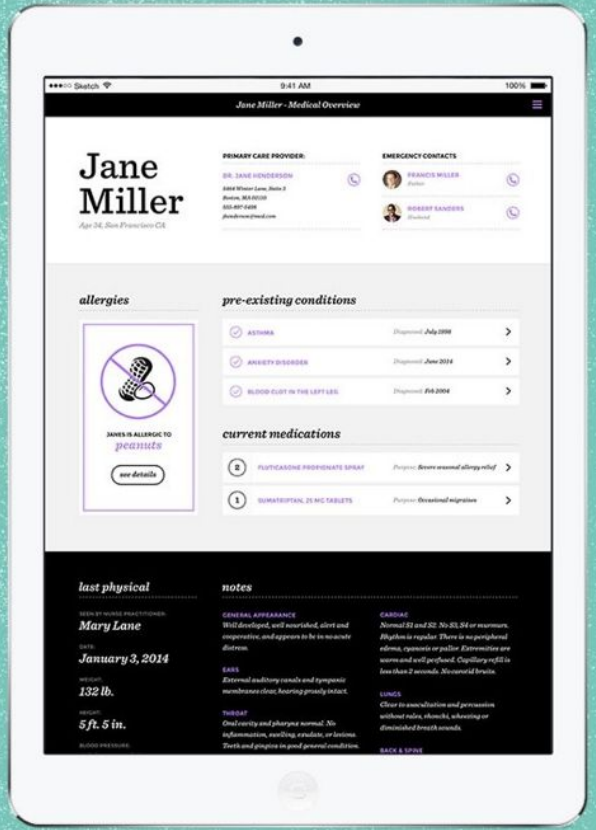
28% had invested US$5M or more on blockchain R&D

With 10% investing US$10M or more

Deloitte.

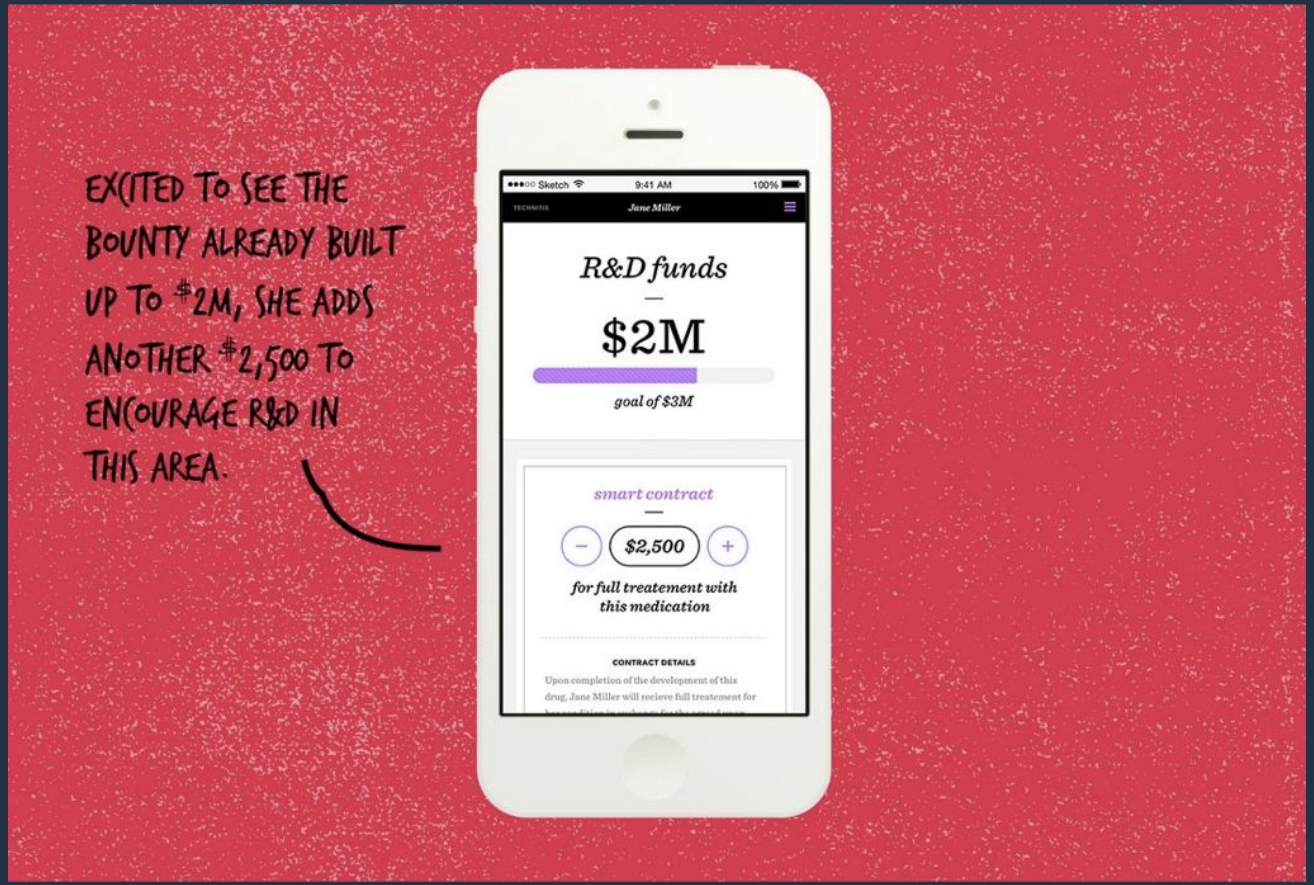
IDEO EXAMPLE 2 - BLOCKCHAIN BASED HEALTHCARE

EMERGENCY HEALTH RESPONDERS CAN SEE ALLERGIES AND OTHER VITAL INFORMATION THAT THEY NEED TO TREAT JANE.



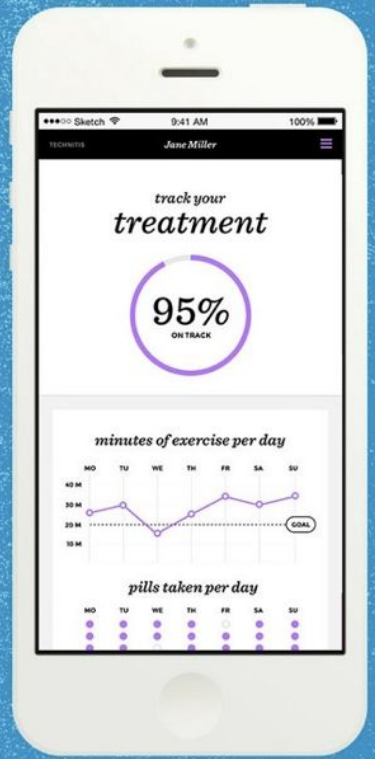
JANE'S PROFILE INCLUDES INFO THAT SHE HAS PROVIDED AS WELL AS INFO FROM HER MEDICAL RECORDS.

IDEO EXAMPLE 2 - ICOs FOR DISEASES



IDEO EXAMPLE 2 - REAL-TIME INTERNATIONAL DATA SOURCING

BY TRACKING ADHERENCE, JANE CAN HOLD HERSELF MORE ACCOUNTABLE AND RECEIVE BENEFITS FROM HER INSURER AT THE SAME TIME.



THE WEALTH OF ANONYMIZED INFORMATION THAT JANE IS CREATING THROUGH HER TREATMENT IS ALSO CAPTURED AND SHARED TO HELP THE COMMUNITY.

BLOCKCHAINS AS A KYC TECHNOLOGY

HOW BLOCKCHAIN EMPOWERED KYC WORKS

HOW BLOCKCHAIN EMPOWERED KYC WORKS

Reporting Institution

Provides eKYC services

e.g. Fintech Company

Identity Institution

Provides identity verification

e.g. National Registry

Banking Institution

Provides financial services

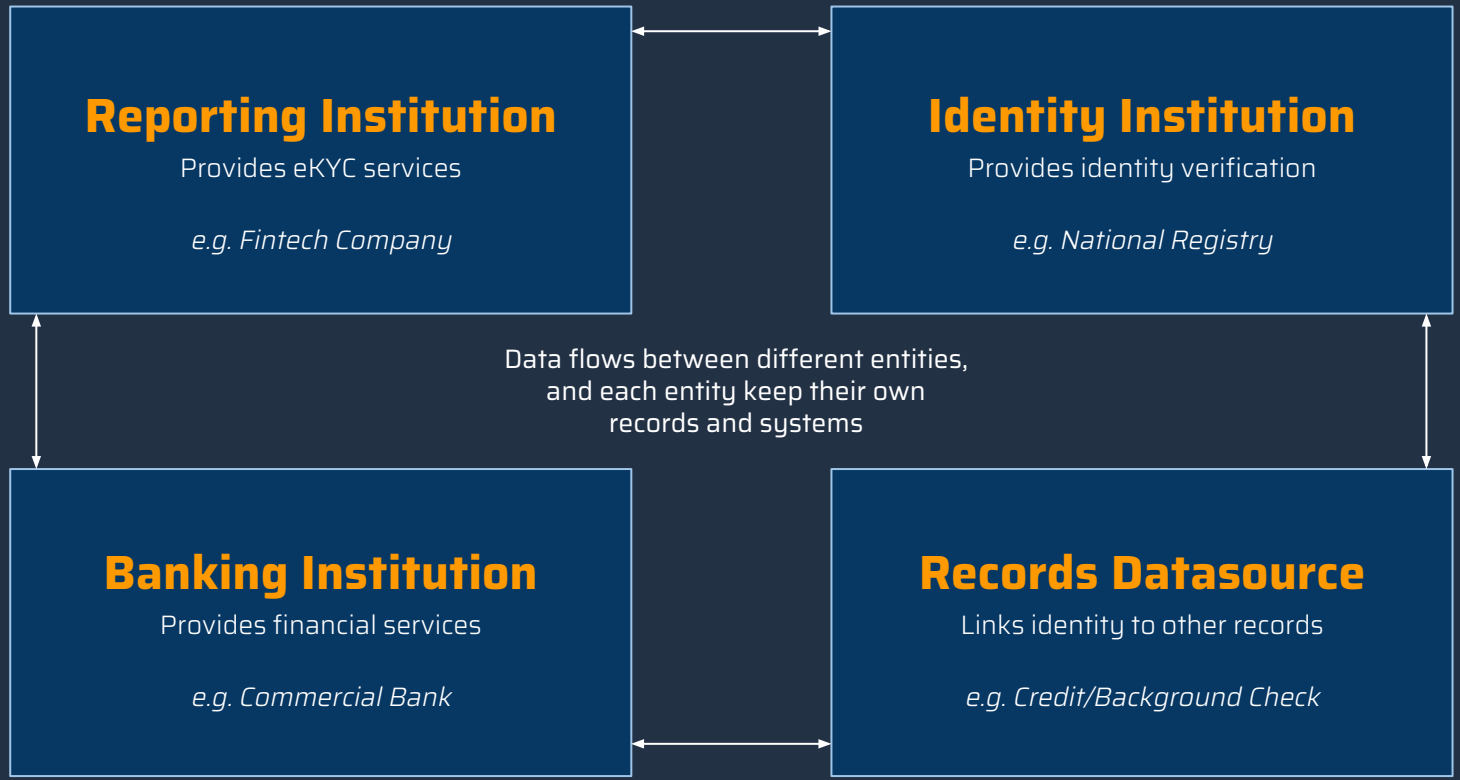
e.g. Commercial Bank

Records Datasource

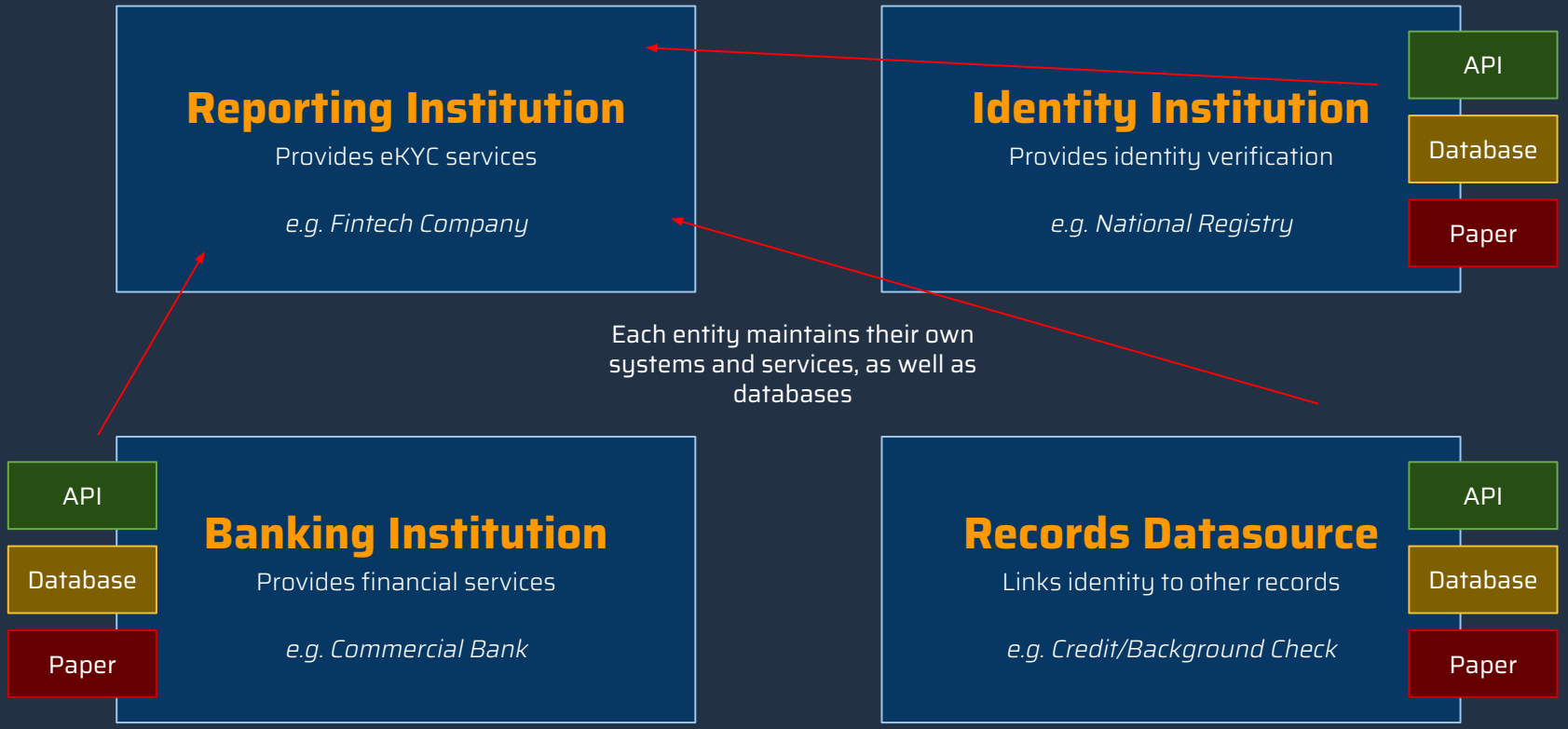
Links identity to other records

e.g. Credit/Background Check

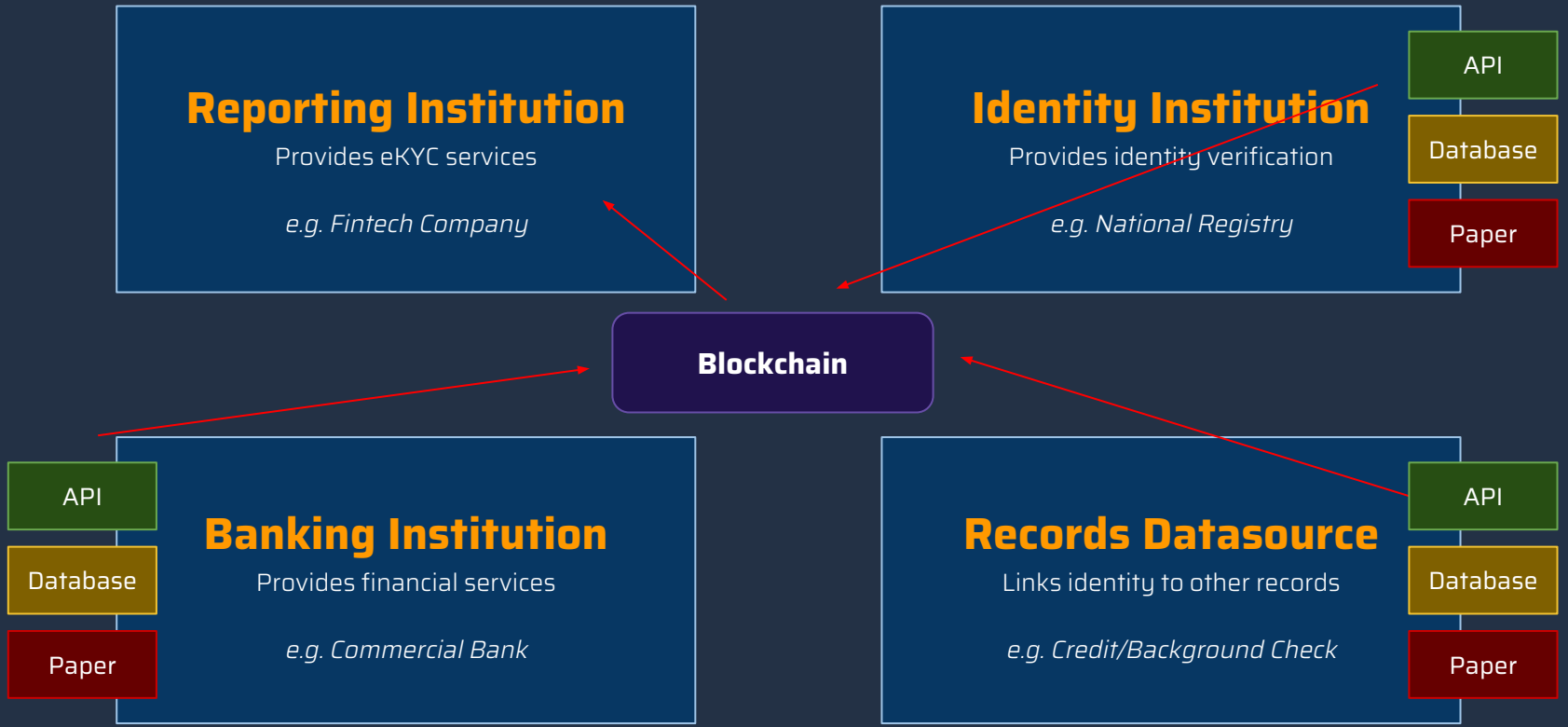
HOW BLOCKCHAIN EMPOWERED KYC WORKS



HOW BLOCKCHAIN EMPOWERED KYC WORKS



HOW BLOCKCHAIN EMPOWERED KYC WORKS



NATIONALIZED BLOCKCHAINS

ACCOUNTABILITY IN GOVERNANCE

IMPROVED GOVERNANCE WITH BLOCKCHAINS

Benefits of
Blockchains
(distributed ledger technology)

9 in 10 *government organizations plan to invest in blockchain for use in financial transaction management, asset management, contract management and regulatory compliance by 2018 **

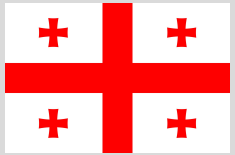
Immutability Inspires Trust	Record keeping especially relating to proof of ownership resides in conventional database structures that are susceptible to failure and corruption that is difficult to trust
Radically Reduce Costs	Radically reduce long-term infrastructure and lower the mid-term time and resources spent protecting users whilst immediately removing public key infrastructure costs
Collaboration & Innovation	Blockchains provide a neutral environment for companies to work together to remove middlemen and intermediaries, which also leads to innovative new business models

* survey conducted by IBM & the Economic Intelligence Unit

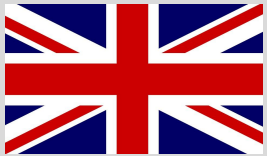
THE BENEFITS OF BLOCKCHAINS

Data owners input data directly to the ledger accessible by all approved parties & stakeholders	**Accuracy**
Ledger transactions are cryptographically signed by owner, ensuring the authenticity of data	**Authenticity**
Smart contracts can ensure that only parties with the proper permissions can decrypt data	**Privacy**
Real Time	Ledger data is accessible immediately without delays for re-entry, transmission or validation
Consistency	Stakeholders can access the same data & documents with limited or unrestricted contract-based access
Availability	Data is shared across multiple nodes, insulating it from failure of any one particular central authority

GLOBAL BLOCKCHAIN GOVERNANCE INITIATIVES



Georgia
LAND REGISTRY



United Kingdom
WELFARE PAYMENTS

Estonia
IDENTITY MANAGEMENT,
E-VOTING, HEALTH RECORDS

Singapore (MAS)
INTERBANK PAYMENTS

Dubai
GLOBAL
BLOCKCHAIN COUNCIL

Delaware, USA
SMART CONTRACTS,
PUBLIC ARCHIVES

neuroware

email the team anytime - founders@neuroware.io