

The background of the slide is a dark, abstract network visualization. It features numerous blue, starburst-like nodes of varying sizes, interconnected by a dense web of thin, orange lines. The overall structure is complex and organic, resembling a neural network or a data flow diagram. The text is overlaid on this background in white, providing a high-contrast, legible presentation.

# Blockchain and the Future of Networking

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@API\_Economics

# GovTech Labs & DataNet @ UCL



Dr Zeynep Engin  
Founder / CEO GovTech Lab



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Chair of Advisory Board GovTech Lab



# Why Care about Blockchain?

- Blockchain is a disruptive to the telecommunications industry as the iPhone
  - The iPhone decimated the service layer of the telecom value chain
  - Blockchain can reduce the costs of core network and infrastructure
- It represents a fundamental transformation for the manner in which we – and our customers - will conduct business
  - It provides the opportunity to dramatically reduce cost of operations
  - Provides the opportunity to create new revenue streams
  - Can provide data integrity in an era of increasing privacy requirements



# What is a Blockchain?

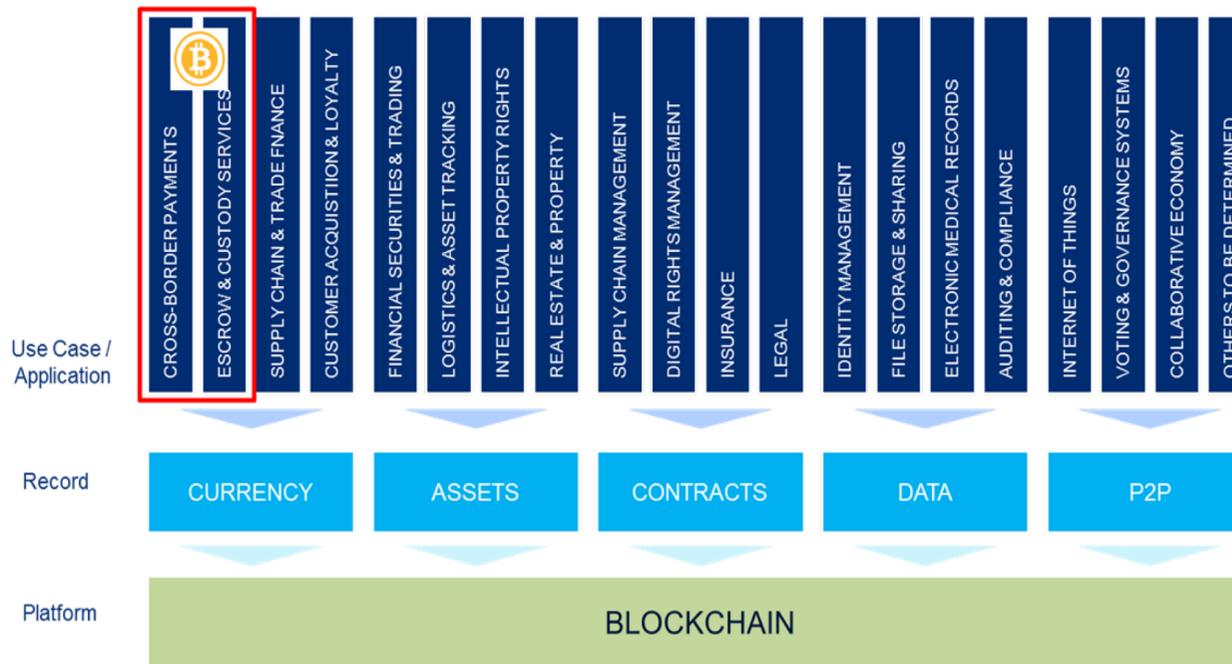
A Blockchain allows untrusting parties to co-create a **permanent, unchangeable** and **transparent record** of exchange and processing **without relying on a central authority.**

*N.B: The terms “blockchain” and “distributed ledger” are often used interchangeably, but they are not always the same thing!*



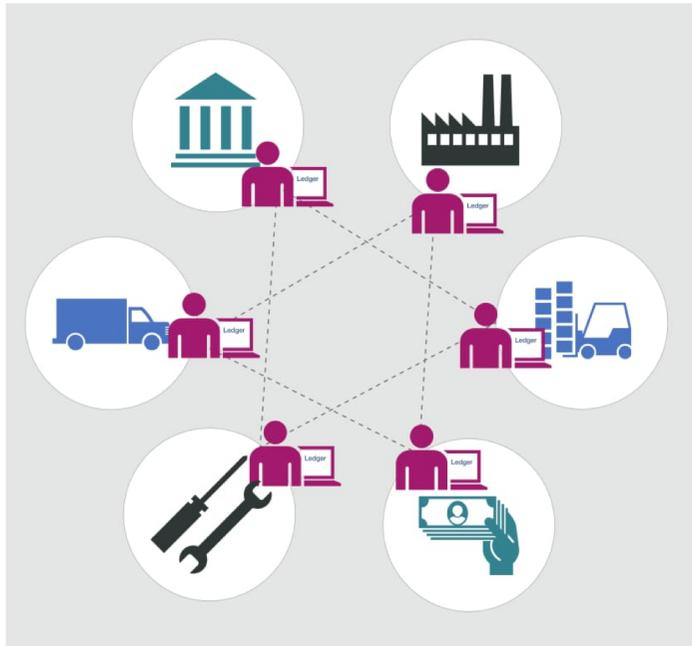
# Blockchain is much bigger than Bitcoin

DISTRIBUTED LEDGERS ARE PLATFORMS UPON WHICH VARIOUS APPLICATIONS CAN BE BUILT WELL BEYOND FINANCIAL SERVICES





# Today's Transactions



- Separate ledgers in each institution with no oversight – high risk for human error and fraud
- Paper-driven processes create delays and errors
- Dependence on intermediaries to ensure trust increases transaction costs and time delays

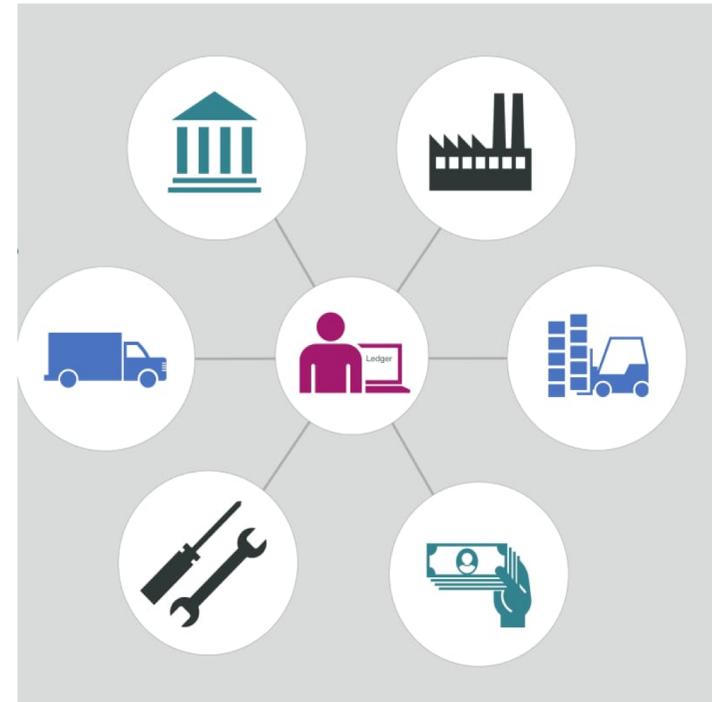
Previous generations of digital technology have been about *data* and *information* and how to exchange it faster and more securely

***Business Mindset “Apply IT to do the same business processes faster”***



# Tomorrow's transactions

- Single shared ledger that provides evidence of tampering
- New records cannot be added without all parties applying a consensus mechanism
- Records cannot be changed without all parties seeing it
- Dramatic reduction in paper-based systems and costs
- Reduced potential for fraud



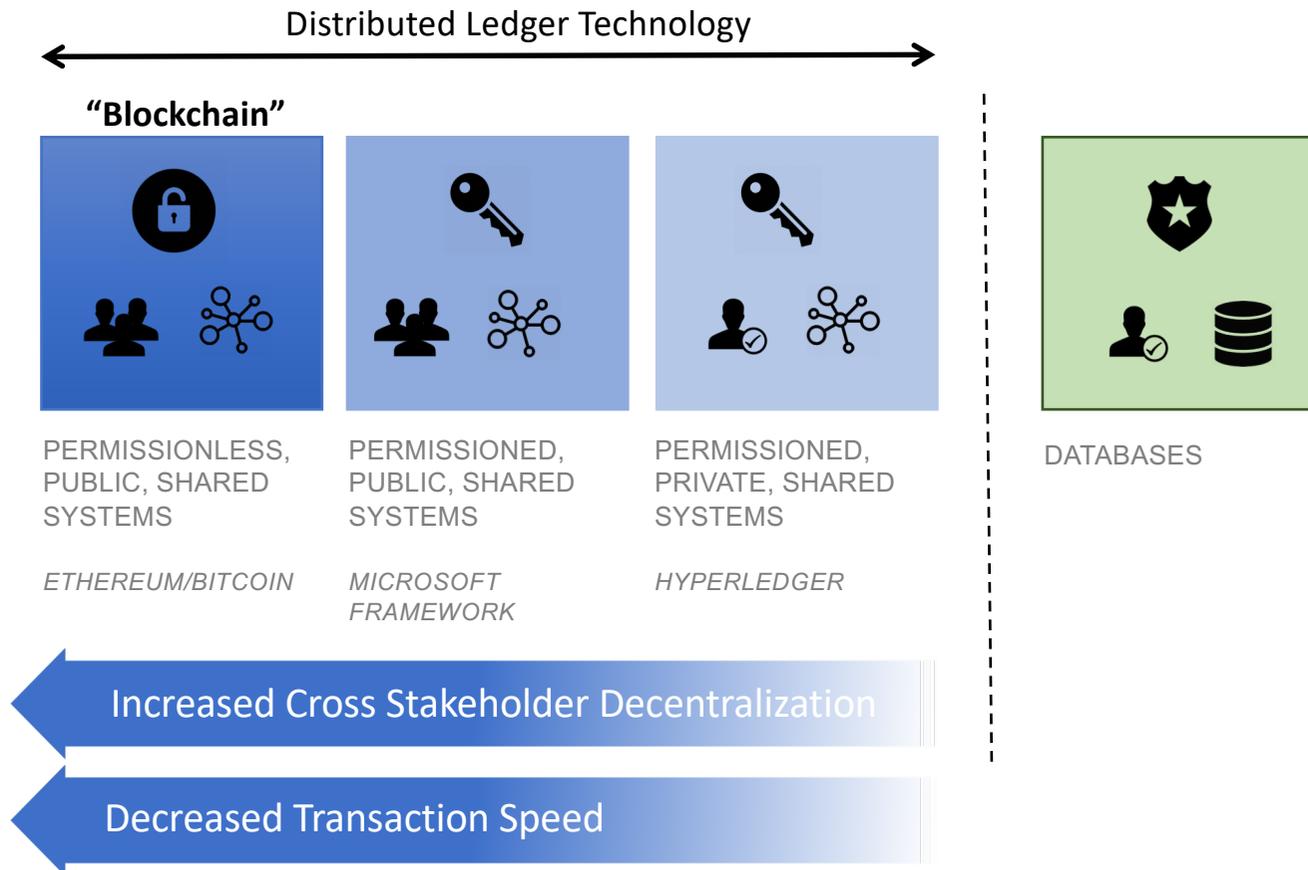
**Blockchain is about the exchange of *value***

Instant, decentralized, pseudonymous value transfer is  
now possible

*Business Mindset “Apply IT to completely redefine business processes”*



# Types of Distributed Ledgers



# Blockchain and Networking – a Long-term view



# Why DataNet?

- Digital Transformation is transforming nearly every aspect of society
- This is not business as usual but with technology doing the work – this is **business as *unusual*** – our established economic/business methods completely fail to give answers to the problems we are facing
- Data is now having a transformational impact on national and international seats of power
- With regards to data, we are really at a similar level as the early stages of the Internet
- Blockchain can help with some of these issues and **DataNet** is how we are planning to address it



# Data and the Transformation of the Four Seats of Power

## Government and International Orgs

- Traditional Power base called on mainly to regulate and set policy
- Data is redefining how citizens engage and keep tabs on their representatives
- Data is redefining how governments engage and keep tabs on their citizens
- Dramatic challenge to the notion of 'democracy' as we have known it until now

- Emerging Power base challenging both government and financial institutions
- Replacing large parts of industry
- Power base is one of the least diverse due to systemic problems; re-enforces already existing biases
- Access to data is access to control/power/money

## Silicon Valley (formerly known as 'industry')

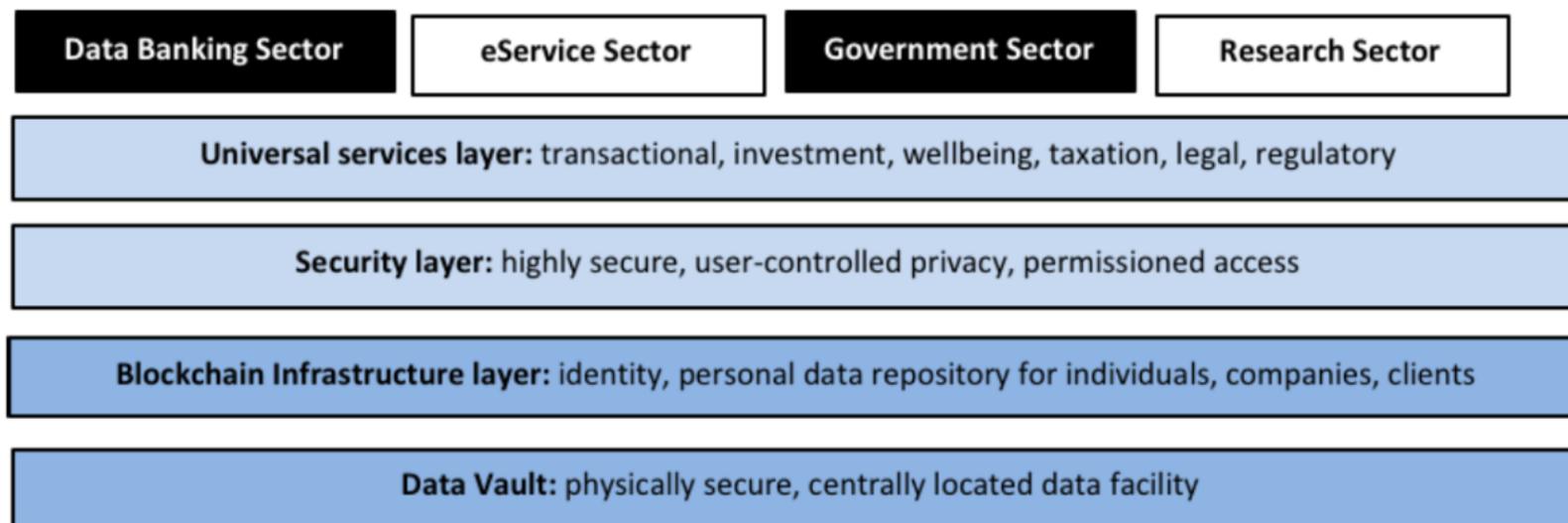
## Financial Institutions

- Traditional Power base called on to create and manage monetary flows
- Data redefining what money is (e.g. Bitcoin) and how it is created
- Data used to exclude people from power base (e.g. advanced algorithmic trading)
- Data used to facilitate access for financially underserved/unbanked

- Power base called on to provide empirical proof to the other 3 sources of power
- Data tools redefining the implementation of the scientific method
- Data tools are challenging the rigour of established pieces of work
- Power base is one of the least diverse due to systemic problems

## Research

# DataNet



# DataNet

- Datanet
  - – Infrastructure pioneered by a government
  - – Provided secure sharing of private data
  - – Unique IP address for every person, company, project, collaboration, and algorithm's data
  - – Consolidates proprietary data networks projects
- ID, Privacy, Trust
  - – Uniform Data Locator (UDL) provides extensible addressing to all private data
- Data Industry
  - Creates new global industry sectors
  - Sectors:
    - Data Banking (cf. retail finance) transacting and monetising your personal data
    - Digital Law – providing Juridical + legal services globally



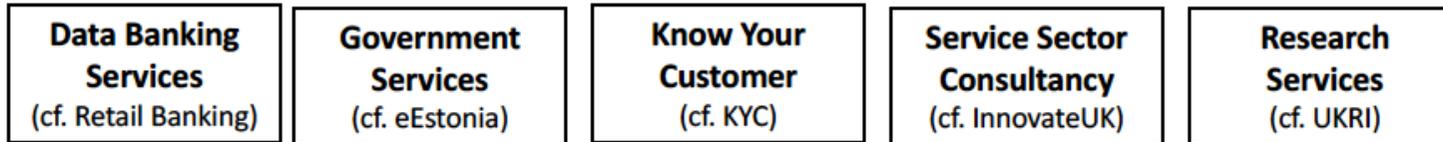
# Universal Data Infrastructures

- Communications built on top of the existing Internet
- Global Blockchain data infrastructure
  - **Addressing**
    - IP-like address for every entity (personal, company, project, consortium, algorithm) with an associated data store
    - UDL – extensible Uniform Data Locator (cf. URL) for every data item
    - Tagging – data tagged by content, plus an intelligent referencing system
  - **Security and Permissioned access**
    - Strong privacy security for data DLT and associated databases
    - Owner permissioned access (e.g. patient, doctor)
    - Environment (cf. app) to control subsequent use by recipient (e.g. harvesting)
- – Trust
  - KYC-like system to manage access (personal, company, project, consortium, algorithm)
  - Dynamic Trust rating – sophisticated system to dynamically manage the ‘trust’ level of all entities
- Commercial and proprietary applications built on top

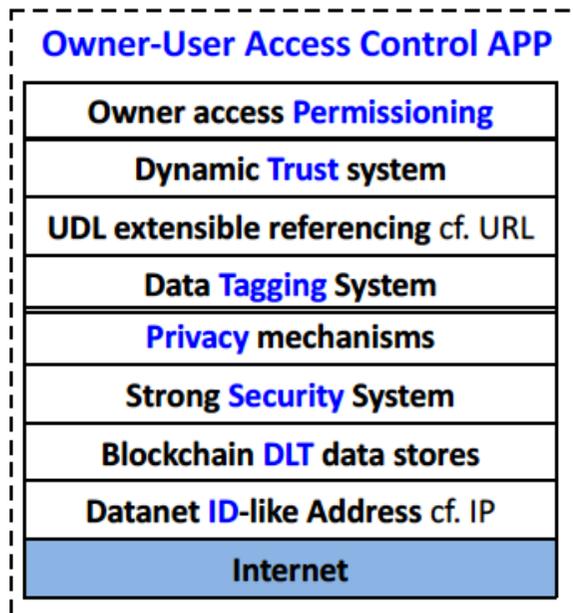


# DataNet Technology Stack and Protocols

## Applications



## Datanet Protocols



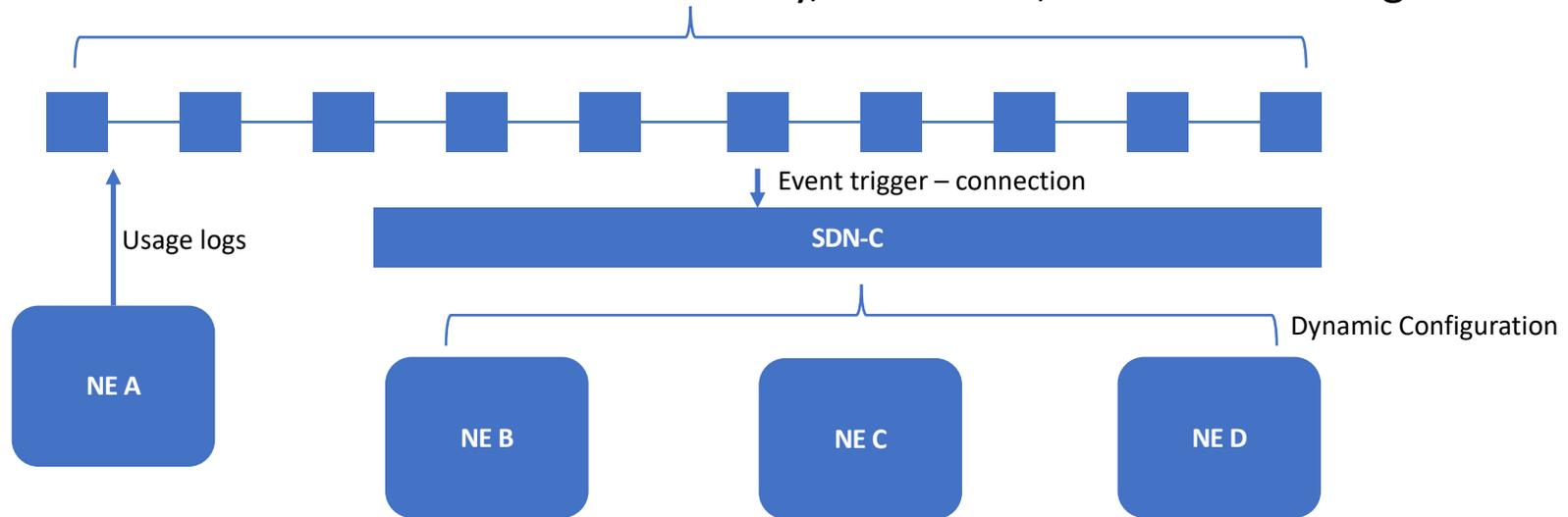
# Blockchain and Networking – a near-term view



# Blockchain as an Orchestrator

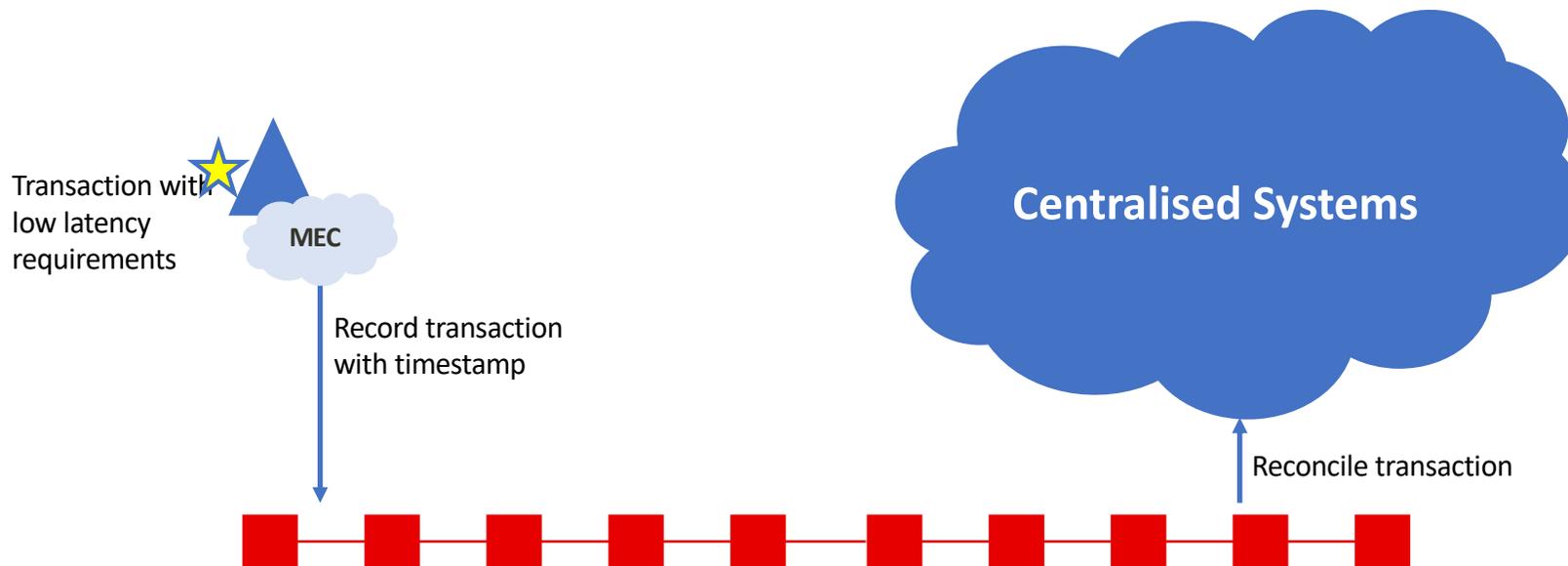
- Using a Private Permissioned Ledger to monitor network and automate connectivity
- Removes network signalling, reducing network complexity
- Reduces cost of operations for some types of operator networks

## Smart Contract Enabled DLT with Policy, Fulfilment, Control and Usage



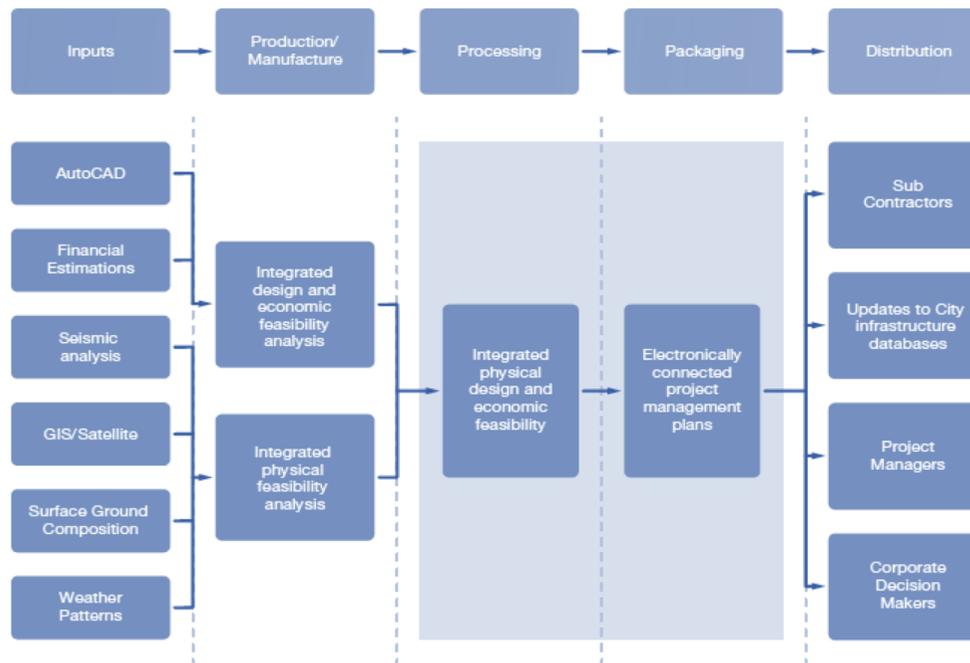
# Blockchain and Mobile Edge Cloud Co-ordination

- Blockchain registers transactions “on the edge” for speed of transaction (lower latency)
- Uses Blockchain’s offline functions to deliver high speed transactions close to edge
- Provides an irrefutable record of the fact the transaction occurred, reducing risk of fraud and contention over billing
- Reduces complexity and delivers greater flexibility across the network



# Blockchain and Data Supply Chains

Figure 11: Information Value Chain for Integrated Management of development process



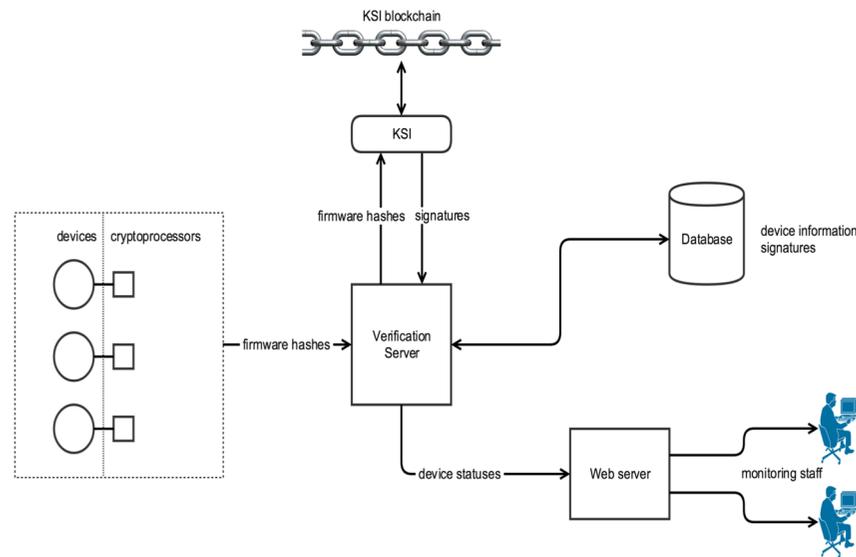
Source Mulligan 2011/ Mulligan & Ericsson 2014

# Blockchain and Data Supply Chains

Supply Chain	Characteristics	Data Supply Chain	Emergent areas
Flow of physical artefacts (materials, products, services) from initial source(s) to final customer.	Content	Flow of multisource, multiform data artefacts (or even processed data, information or knowledge) from inbound and outbound activities of the firm	Data heterogeneity Data quality Data privacy and security
Demand-led supply chain (only produce what is pulled through), targeting in production maximisation, revenue and value creation, quality, service, safety, etc.  Price-driven (strategically decoupled and price driven)	Strategy	Innovation-led (through ideas, practices, and business models; value for DSC is not solely created from an information product/ service but also through the disruption of the existing business and operational models).  Outcome-driven (strategically coupled and value driven)	Data generation and exploitation Innovation (business model and product/service development)
Shared information across the whole chain (end to end pipeline visibility). Collaboration and partnership (mutual gains and added value for all)	Integration	Integration of multiple data sources (internal and external to the focal firm). Collaboration, interconnection and value co-creation (value through business model innovation)	Multisource data Interconnectivity
IT enabled; Physical manufacturing systems; agile and lean; mass customization methods	Tools/ Methods	Analytics-enabled; Cyber-physical manufacturing systems; agile, lean and real-time; tailored customization methods	Data collection, processing, storage methods/ tools and provenance Data Analytics

Source: Gurguc Z., Mulligan C.E.A., 2018, International Journal of Production Research

# Blockchain-enabled data integrity solution – Energy Networks (IoT)



Zylka, K. Masters Thesis: (2015) Supervisors: Mulligan, C.E.A & Knottenbelt, W.

# Thank-you

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