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BLOCKCHAIN FOR SUPPLY CHAIN AND LOGISTICS FORUM

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Assessing the Realities and Opportunities of Blockchain Implementation in Supply Chains

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Blockchain Technology and the Energy Industry

Latest Developments

Presented by Keith Letourneau

May 22, 2018
XChain2
Houston, TX

Cambridge Study – Sep 2017

200 Organizations / 57 Public Sector Institutions



UNIVERSITY OF
CAMBRIDGE

- Blockchain's promise
 - Facilitate asset transfers without need for trusted central authority or intermediaries
 - Reduce fraud (\$4.0 trillion in 2016)
 - Streamline business processes across multiple entities
 - Increase record transparency and ease of audits
- Distributed Ledger Technology (“DLT”) landscape – fluid, highly fragmented, contested, complex
- Hurdles to implementation
 - Regulatory uncertainties and legal risks not yet fully recognized
 - Interoperability with existing systems – still in its infancy
 - Scalability, privacy and confidentiality
- 63% of central banks developing blockchain proofs of concept
 - 15% of OPSIs plan to deploy DLT-based applications this year; 23% within next two years

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World Economic Forum



- WEF estimates that digital transformation of the oil & gas industry could unlock up to \$1.6 trillion of value over the next decade
 - Including - \$170 billion in savings to customers, \$10 billion in productivity improvements, \$30 billion in reducing water usage, \$430 billion in lowering emissions
 - Including – reducing emissions by 1,300 million tons, saving 800 million gallons of water, avoiding spills equivalent to 230,000 bbls.

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Blockchain for Energy 2018 Report

- Prepared by Grid Analyst Colleen Metelista of GreenTech Media
- Between Q2 2017 and Q1 2018 over \$300 million invested in blockchain in the energy industry
- Four predictions for 2018
 1. Increased investment in Blockchain
 - Tepco, Innogy, Centurian – direct investments across 5 startups
 2. US Utilities Enter Pilot Phase
 - Pacific Gas & Electric – budget includes 2 blockchain pilots
 - Ameren – Omega Grid pilot



greentechmedia:

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Blockchain for Energy 2018 Report

3. Wholesale Trading Breaks into Commercial Deployment

- Peer-to-Peer Energy Trading – 59% of planned & completed projects
- 2 European Pilots – dozens of industry partners
- One Office – commercial trading platform that will run on blockchain
- Ponton – will offer full deployment of wholesale trading platform in 2018
- LO3-Epex Spot – in Germany – connecting consumers directly with wholesale market
 - Decentralize energy exchange

4. Other Business Models Will Crystalize

- EV Charging – limited charging infrastructure, no accepted standard for billing, scheduling and payments software
 - E.g., Innogy – in Germany – using Ethereum's public blockchain to pay for EV charging
- Renewable Energy Credits – eliminate double counting, replace legacy platforms

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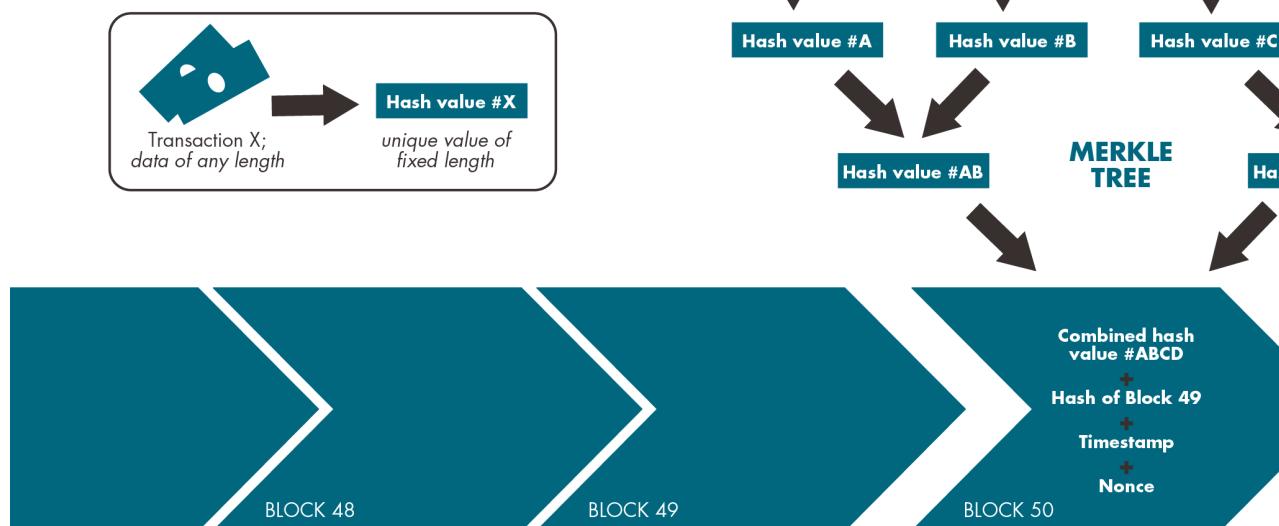
Essential Characteristics of Blockchain Technology

- Decentralized peer-to-peer network
- Ledger accessible to all participants
- Near real-time status/access to transactions
- Key access
- Blockchain's Advantages
 - Immutable records
 - Disintermediation
 - Transparency
 - Better Encryption standards – multi-factor authentication

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Blockchain Basics

HOW THE BLOCKCHAIN WORKS



Reproduction of an original figure in "The Great Chain of Being Sure About Things" by the Economist



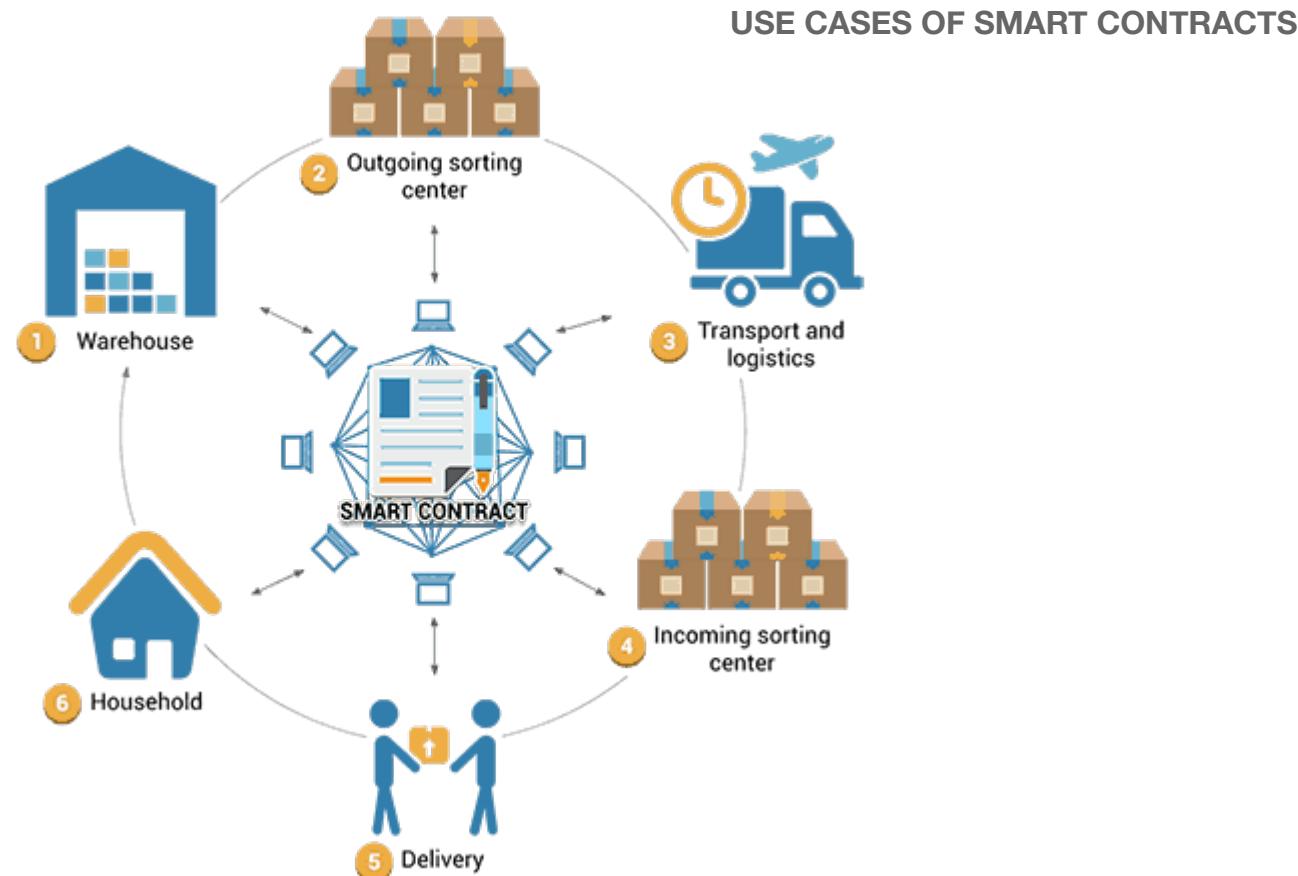
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Role of Smart Contracts

- Misnomer – not a contract
- Limited Utility
- Expedites processing of standardized transactional steps
- Block storage issues

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Smart Contracts – If This Occurs, Then This Happens



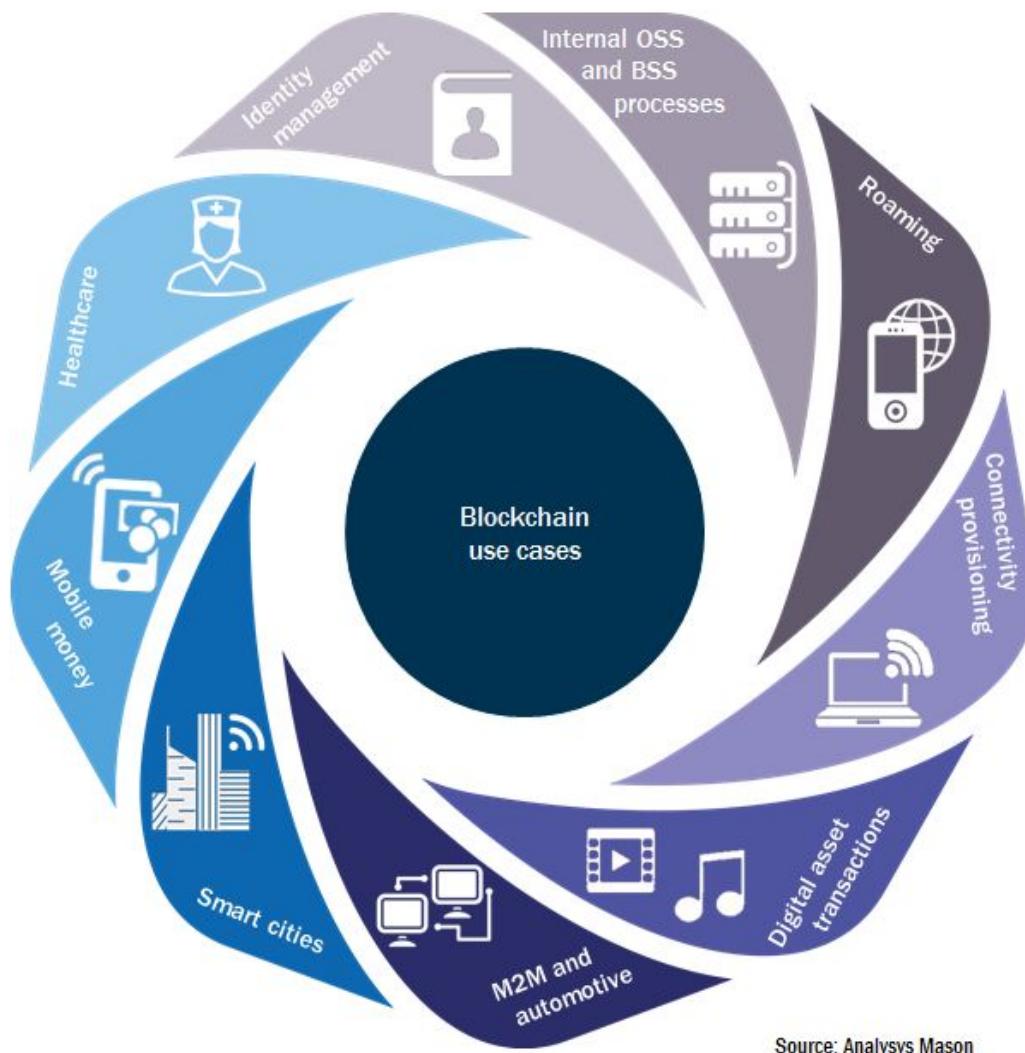
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Supply Chain Management

- Present Day: Point-to-Point
 - Numerous stages and geographic locations
 - Use of intermediaries to consummate transactions, convey information
 - Raises transaction costs with intermediate mark-ups and fees
 - Difficult to trace events and incidents, e.g., counterfeiting, forced labor, damaged goods
- Blockchain: Shared, synchronized information available to all network participants
 - Supply chain status readily available
 - Records transaction details that cannot be altered without consent of all parties
 - Capable of tracing products to origin and raw materials used (eg., tuna tracked from hook to fork using sensors)

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Blockchain Use Cases



Source: Analysys Mason

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Maritime

- Maersk-IBM JV – developed blockchain application to track shipping containers digitizing the supply chain process from start to finish.
 - 90% of world's goods are carried by ocean carriers
 - Program intended to encompass shippers, freight forwarders, carriers, ports and customs authorities
 - Designed to reduce paper trial, reduce cost and complexity of trading, create transparency, reduce fraud and errors, reduce time in transit, improve inventory management, reduce the cost of goods, enhance global trade from both emerging markets and developed countries
 - In 2014, Maersk found that a simple shipment of refrigerated containers from East Africa to Europe can involve nearly 30 people and organization and more than 200 different interactions and communications among them
 - Costs associated with trade documentation are estimated to account for 1/5th of actual transportation costs
- Letters of Credit
- Contracts of Carriage/Bills of Lading
- Digital Bills of Lading
- Tracking containers and goods
 - Hyundai Merchant Marine – shipment of goods from South Korea to China – employed paperless processes – shipment booking, cargo delivery.

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Energy Industry

- Commodities

- Energy trading

- BP, Shell, Statoil, Koch Supply & Trading, Mercuria, ABN Amro, ING and Societe Generale
 - Expected to begin by the end of 2018
 - Ownership is tracked as assets change hands multiple times before settlement
 - LO3 Energy – Siemens – Brooklyn Microgrid – allows small-scale electricity producers (e.g., solar power panel owners) to sell energy to their neighbors via blockchain technology
 - Electron – developing a product that allows consumers switch easily between providers
 - Tokenizing the energy marketplace – Power Ledger, Encointer, SolarCoin
 - Energy Web Foundation (non-profit consortia of multiple energy companies including Duke Energy, Shell, Tepco and Innogy) - four areas where it hopes to see blockchain innovation – billing utilities; determining the origin of energy; meeting the demands of Distributed Energy Resources that add power to or pull from grids; and real-time price negotiation on grids

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Energy Industry

- Supply Chain Management

- Petroteq – overhaul the oil and gas industry's inefficient supply chain management protocols using blockchain
 - Track, monitor and account for petroleum using transparent, immutable and secure DLT
 - Consortia – including PEMEX
- Deloitte 2016 Report – 55% of oil & gas company executives agree that blockchain technology is required to retain competitive edge
- BHP Billiton – uses blockchain to document resource samples and has replaced email and spreadsheet data logs with a single ledger (improves tracking and other supply chain efficiencies)
- Ondiflo (based in Houston) – ConsenSys and Amalto – JV – digital solutions for oilfield services contracts – improved scheduling, dispatching, accurate measurement of discharged fluid volume, precise invoicing, reduction in coding errors, more efficient settlement processes
 - “Ondiflo will deliver efficiency to processes, which today are still largely manual and paper-based, like field ticketing or bill of lading, and are ready for the blockchain.”

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Energy Industry

- Renewable Energy
 - Certificates of Origin
 - Independent auditors assess renewable energy producers and certify their electricity as “green.”
 - These producers then sell Renewable Energy Certificates (RECs) to consumers who want to buy clean energy.
 - Certification process is currently cumbersome and expensive with physical audits – discriminates against small green generators.
 - Power Ledger (Australia) and LO3 Energy (Brooklyn Microgrid) – use blockchain to store generation certificates that are created by tamper-proof meters attached to solar panels.
 - Also store transaction records when certificates are traded so that same unit of generation cannot be resold.
 - Eliminates auditors, transaction costs and price regulation by utilities – making renewable energy investment attractive for small players (See S. Keshav article *How blockchain can democratize green power*, Jan 7, 2018)

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Trade and Finance

- Payment reconciliation
- Trade Finance – paper-intensive processes using bills of lading and letters of credit
 - UBS – digitizing letters of credit
 - Wave (Israel), Ess Docs (Malta), Bolero (UK) – digitizing bills of lading
 - May take up to 5 years to digitize trade ecosystems
 - Batavia – consortium working on int'l trade transactions using blockchain

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Hurdles to Implementation

- Scalability
- Network adoption, Myriad Platforms and Interoperability
- Electricity consumption
 - Energy Web Foundation – development that promises answer to energy blockchain's biggest challenge – power use; proof of authority validation process instead of proof of work; Tosalaba – test version of platform
- Computing power requirements
- Proof of Concept v. Operational Implementation Stage (Not a mature, fully understood area)
 - big disconnect/gap between theory and practice
- Privacy v. Transparency
 - use of “secret transactions” during validation process to keep confidential, sensitive information private yet provide needed transparency to authorized parties such as regulators
- Regulatory Compliance
 - Securities and Commodities regulation
 - Financial surveillance and anti-money laundering

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Blockchain Technology

- Questions?

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