Welcome to the blockchain

WORDS BY DR NABIL ABOU-RAHME

Photo: William Bout/Unsplash

> " *A blockchain is a special kind of distributed ledger technology that goes after full decentralisation* "

Experts say that we are only beginning to scratch the surface of the potential of blockchain. But for those who aren't experts, what on earth is it? In the first Mott MacDonald Masterclass, a Global Practice Leader, Dr Nabil Abou-Rahme, begins to explain

Welcome to the Blockchain". The song with this title was released online back in November 2014[1]. You've probably never come across it but the purpose was to bring blockchain to the masses. Worth googling if you want a sense of the paradigm shift envisaged by those involved, "decentralise the trust… with blockchain, bitcoin is just the beginning". Three years ago, Bitcoin was still low key and a complementary blockchain called Ethereum had emerged on the scene, sporting an integral programming environment and the possibility of creating applications. Today, those potentially disruptive applications number in the hundreds, and there are multiple public, private and permissioned blockchains evolving alongside Bitcoin and Ethereum.

Three years ago, my own mind was firmly in the "traditional" intelligent transport systems space, waking up slowly to new possibilities through involvement in our corporate digital transformation programme. I took a slight detour through the recent revival of artificial intelligence, and somehow landed at a blockchain conference last autumn, like a fish out of water determined not to be exposed as a total "noob"[2]. Investment capital flowing into blockchain enterprises through initial coin offerings turned exponential last year, adding to the buzz. The cumulative total to August 2017, around $1.8bn, doubled to $3.5bn by November 2017. After a brief lull to consolidate and navigate 'regulatory signals' about securities versus utility tokens, it seems that investment figure is on the rise again.

Decentralisation

The key to understanding blockchain's appeal lies in the wider trend of decentralisation, "the ability to participate in a market and exchange value between peers without the interference of a third-party intermediary who most likely controls and restricts barriers of entry"[3]. What is the underlying driver for decentralisation? Why invest so much in the growth and development of a new economy if it simply offers a marginal efficiency gain or a slightly more complicated way of doing what we do already? Clues to the answer can be found in the timing of the first cryptocurrency and the underlying blockchain described by Satoshi Nakamoto in 2009 – shortly after the global financial crisis demonstrated the failure (or, depending on perspective, the near-miss to a catastrophic failure) of the current 'centralised' financial system.

There is something more going on than mere 'tech-enabled innovation'. The phenomenon we are witnessing is primarily motivated by the belief, among a talented, well connected and amply financed community that a centralised model is prone to failure and that when it does fail, a viable alternative had better be in place. Part of the discovery process is to replicate existing models with blockchain powered alternatives, but that is only a learning step, not the end game. While some are in it for the technology and the possibility of exponential gain, many believe they are building a fairer and more sustainable future. Eliminating human trafficking and mitigating climate change are just as high

on the community's agenda as scalable financial transactions! Many blockchain businesses (and the 'bitcoin billionaires' backing them) place a strong emphasis on being a force for good. Whether tackling blood diamond (Everledger), checking food and drug integrity (Ambrosus), helping reunite refugees with families (Refunite/IOTA), reducing risk of human trafficking (ID2020), creating accountability for climate change (Hack4Climate), or tokenising energy generating assets (Power Ledger), it's all quite far from bitcoin's origins in the zero-trust context of the dark web.

Distributed

Keep in mind that blockchain is more than the individual use cases which attempt to describe it. In other words, more than digital currency, more than smart contracts, more than a secure asset register, and more than a business model disruption. While there are different kinds of distributed databases already in use (for example, MongoDB), a blockchain is a special kind of distributed ledger technology that goes after full decentralisation (distributing all data to all participants)[4]. Blockchains therefore remove the need for a centralised controller altogether by relying instead on network-wide cryptographical verification of append-only transactions.

Private

The appending is the interesting bit, as just changing some numbers across multiple copies of a ledger would be too easy and therefore prone to error or tampering. This is where a working knowledge of cryptography comes in handy as well as appreciating that different blockchains do this bit in their own unique ways. Essentially, if you broadcast a transaction of information or value, you sign that transaction with your private keys. Miners, people set up to work on the blockchain itself, will have prepared new blocks and be scanning the network for transactions (with viable fees attached) to add to those blocks. To secure these fees, they try to hash[5] the block by solving a puzzle, (performing difficult and computationally intensive calculations with a varying probability of success each time). Once a miner finds the hash, they distribute the block on the network and prompt consensus. Checking whether the new block follows the rules is easy and once consensus is achieved

Blockchain is a continuously growing list of records, called _blocks_, which are linked and secured using cryptography

the transaction remains in the block as an immutable snapshot, joined to other snapshots that allow reconstruction of the overall ledger as needed.

Public blockchains have different objectives (payments, applications, transactions, assets) and characteristics (proof algorithms, scalability methods, developer tools). You'll discover debates between the purists (true to the original bitcoin blockchain) and the progressives (pushing the boat out with innovations like "the tangle"), and may also feel a little startled by the pace of development in all these areas. Why does any of this matter? Because databases are an intrinsic part of how modern society operates, so a disruption to something this intrinsic could lead to a full paradigm shift in the economy at large.

Data fuel

I've been using phrases like 'data is the fuel for ITS Applications' for many years now, getting excited at various intervals by the possibility of accessible data markets and

the paradigm shift in thinking towards mobility as a service. I first met our esteemed editor in 2001 or 2002 while collaborating on opposite sides of the table in a UK initiative called the "Travel Information Highway" (does anyone remember experimenting with CORBA?) More recently, I worked on implementing the European Commission's ITS Directive and associated Action Plan, focusing on optimising the collection and provision of road data. One of the seven recommendations taken forward was a set of supporting actions to address the "exchange gap" between public and private sector, including "market making measures" built on "shared goals".

There were numerous examples of good practice when it came to mobility data markets[6] but these were centralised and dependent on investment to operate so that trust could be nurtured and maintained between parties.

When I came across a cheeky little start up at that blockchain conference last year, claiming to have the solution for future mobility, I was not impressed. Imagine how I felt being told "the transport sector knows where it wants to go with real time data and smart technology but doesn't know how to get there"[7]. You mean, we struggle for twenty-five years and then you come along with your jolly old blockchain and sort it all out? "At the moment, transport data is difficult to obtain, holding back insight and progress for the industry". Alright, no need to rub it in, garage start up with your white paper and vapourware. I gave my business card and left.

> **"** *As it turned out, DOVU wasn't a garage start up, but part of a new breed of blockchain enterprises –fully resourced and highly motivated to disrupt the sector norms* **"**

Disruption

As it turned out, DOVU wasn't a garage start up, but part of a new breed of blockchain enterprises –fully resourced and highly motivated to disrupt the sector norms using one or more of the killer applications delivered by blockchain. In this case, a decentralised market of distributed applications promoting the tokenisation of mobility data and the opportunity for peer-to-peer transaction. CEO Irfon Watkins has been described[8] as "the nearest Wales has to Steve Jobs", and a serial entrepreneur where API is concerned. The advisory board is an impressive array of leaders from the gaming, automotive and blockchain sectors (including Rolls Royce and the Ethereum Foundation). The company has investment support from Jaguar Land Rover's investment arm – a cursory look at InMotion's investment grid shows where they see DOVU contributing to a bigger picture[9].

What had they suddenly discovered that we didn't already know after years of labouring in this space? It turns out, it wasn't so much their intelligent transport systems genius but rather their ability to spot and ride the trend towards decentralisation, driving a collaborative model with the automotive sector that could, (with a bit of luck and ambition), reach across all transport data nodes.

The Toyota Research Institute[10] had earlier promoted the idea of data exchange for development of autonomous vehicles. The hypothesis was to place all self-driving car data into a blockchain and then set permissions on how the data would be used. Speculation on these use cases was predictable in terms of marketing opportunities, but with the novel idea that if you provided the data in the first place by making a journey then you might get rewarded for allowing access.

Tokenise

DOVU is out to tokenise big data for the automotive sector. It will create a distributed marketplace for the give and take of transport-related APIs, fuelled by the DOV token – a way of validating participation and recording transactions as well as attributing value contributed or obtained. This is an application of the

Photo: Alex Read/Unsplash

If you think transport has changed in your lifetime, Nabil Abou-Rahme thinks blockchain will be a significant disruptor

shared economy, in which a large data set is tokenised such that your contribution to that whole is captured on the blockchain and reflected in subsequent interactions with that data set. If the platform can address the trust gap by decentralising, tokenising, and motivating contributions then we may be looking at the emergence of a self-organising ecosystem delivering highly converged mobility-related services to the consumer. Many of the individual components exist but blockchain could bring it all together.

This decentralisation of the market itself is part of the innovation, as it increases resilience, reduces barriers to entry and promotes peer validation. Interoperability is another important feature. The company has just announced[11] an accelerator pilot with BMW. If the model works then the solution could be integrated quickly into the automotive supply chain, as a standard specification for OEM. The solution will also be interoperable across blockchains, with development focus on getting it right for Ethereum and IOTA (an important blockchain in relation to connected devices and the internet of things).

Could the value of data contributed really offset the tangible costs of making the journey? If the token at the heart of this mobility project can be exchanged for broader services, then yes! Such an ecosystem acknowledges that you have something to trade and that you have the right to release or withhold it – rather than taking it from you and selling it on to advertisers or other third parties in the way that, for example, Google, Facebook, or Apple have normalised in the last ten years[12]. Micropayments would accrue to your account, each one trivial perhaps but accumulating moment by moment, while enhancing the integrity, trust, and efficiency of the network.

The purpose of this article has been to highlight some of the ways in which blockchain is coming to and already affecting the transport sector. While cryptocurrency speculation has so far proved life changing for a few, the blockchain revolution will prove enabling for many.

Tokenisation of data sets may end up being the secret that unlocks their value efficiently, placing the user at the heart of a seamless, integrated, multimodal, transport service ecosystem.

Welcome to the blockchain.

Footnotes
[1] Video with lyrics accessed here, https://youtu.be/YbzNJr26H-4
[2] Abbreviation of 'newbie', community slang for person who has no clue but pretends they do through overuse of jargon.
[3] https://www.supplychaindive.com/news/blockchain-Sweetbridge-decentralization-supply-chain-management/504362/
[4] For a public setting this is essential whereas for a private blockchain, say internal to a large company, this would be overkill and other forms of distributed ledger with partial decentralisation may be more appropriate.
[5] If you want to go deeper, https://blockgeeks.com/guides/what-is-hashing/ and the website itself is a mine of insight.

[6] http://www.mdm-portal.de/en/
[7] See here for the whitepaper, http://www.dovu.io/whitepaper
[8] https://medium.com/small-giants/100-makers-and-mavericks-2017-7963a1cdbfcc a fascinating read in it's own right
[9] https://www.inmotionventures.com/portfolio/
[10] https://straighttalk.hcltech.com/blockchain-self-driving-cars
[11] https://www.automotiveworld.com/news-releases/bmw-group-uk-announces-chosen-start-ups-innovation-lab/
[12] By the way, if you want a glimpse of the extent to which your data is currently sold on without you seeing any reward, take a look at http://rebecca-ricks.com/paypal-data/ and click a few nodes. Surprised?

DR NABIL ABOU-RAHME is Global Practice Leader, Data Science at Mott MacDonald
nabil.abou-rahme@mottmac.com
MottMac.com

For more about DOVU's Blockchain Powered Mobility Project, see
www.dovu.io