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What is Blockchain technology?

Blockchains are ledgers (like Excel spreadsheets), but they accept inputs from lots of different parties. The ledger can only be changed when there is a consensus among the group. That makes them more secure, and it means there's no need for a central authority to approve transactions. As a distributed ledger ecosystem Blockchain can contain financial and/or non-financial transactions that are replicated (distributed) across several systems in near real-time over a peer-to-peer network. Blockchain technology uses cryptography and digital signatures to prove identity, authenticity and enforce read/write access rights, and has mechanisms to make it hard to change historical records, or at least make it easy to detect when someone is trying to change it.

So, it's a spreadsheet, like Excel?
In a way yes, but it has special qualities that make it better than traditional databases.

- **Shared Publicly**: Servers, or nodes, maintain the entries (known as blocks) and every node sees the transaction data stored in the blocks when created.
- **Decentralized**: There is no central authority required to approve transactions and set rules.
- **Secure**: The database is an immutable and irreversible record. Posts to the ledger cannot be revised or tampered with – not even by the operators of the database.
- **Trusted**: Distributed nature of the network requires computer servers to reach a consensus, which allows for transactions to occur between unknown parties.
- **Automated**: The software is written so that conflicting or double transactions do not become written in the data set and transactions occur automatically.

When a block is verified as “true and trustworthy” via the consensus protocol, it is posted practically simultaneously to each consortium members copy of the distributed ledger. Each block has a unique hash key calculated based on the precise content of all the transactions in the block. If the smallest piece of data in the block is tampered with, that hash key becomes immediately invalid, making the tampering immediately evident. When the new block is posted to the ledger, it is linked to and from the preceding block using their respective hash keys. A blockchain database retains the complete and indelible history of all transactions, assets, and instructions executed since the very first one. With this, blockchain allows participating parties, and only those parties, to share accessible, transparent, and trusted information.
Blockchain initially started as the core technology of the digital cryptocurrency system for Bitcoin and Ethereum. It was major supporting technology, that by using data encryption, time stamping, distributed consensus, and economic incentives, provided solution where two nodes do not need to trust each other, as the system itself was constructed to achieve completely decentralized point-to-point transactions, coordination and collaboration to address. With further improvement of technology, Blockchain evolved and became recognized as ecosystem that is recognized within all major industries with a strong potential to revolutionize a series of traditional business models, with the following characteristics:

**Transparency**

All information is stored on the peer-to-peer network and is available to all participants of the network. Because each participant’s identity is each projection in the network is displayed as a series of hash codes by the hash algorithm. Therefore, the actual identity of the user is safely covered and protected. The verification process ensures that scheduled transactions between the parties are recorded and does not reveal either party any private data.
Unchangeability

As all blocks have a unique hash code to record the previous block, any eventual change would affect all subsequent blocks. Modification of one block cannot be verified unless all affected blocks are modified at the same time, and it is also not possible to record changes if the consensus is not reached by all peers. Given the ongoing nature of the new transaction, it is virtually impossible to change any existing block, featuring enhanced traceability of all previous/historical transactions.

Distribution

This may be the most attractive feature of Blockchain technology. In a traditional centralized environment, asset ownership sharing often cannot enforce complete confidence among all participants. There is a strong demand for the data democratization, with more transparent and enhanced technology application and service transparency.

Within a Blockchain network, alike in the sharing economy, all participants are benefiting from common computing source of power whereas information (transactions) rely purely on the same consensus protocol. This approach creates a system that can overcome traditional business limitations and achieve the scale required to support the mainstream industry demands.
To fully understand Blockchain, we must arise over all aspects from the basic sharing ledger structure and its application. Technology itself overcomes requirements that were commonly applied for less tech savvy fiat money transactions, financial systems and global market interaction. Benefits are extended, and the application is spread all the way to the government, health, science, logistics, gaming, investment, legal, and many other sectors. Decentralized and self-governing system represented by Blockchain technology is attracting more and more people’s attention and research. Current number of Blockchain projects exceeded 2,000 ventures, with the total value of globally encrypted digital assets over US$90 billion. Block chain/Digital Assets user population is also rapidly increasing. From initial number of 2 million users worldwide (early 2013) to more than 25 million users in the first quarter of 2018.

Our research and industry intelligence suggest rapid growth, with more than 200 million users expected by the beginning of 2020 within the global Blockchain/Digital asset technology. Further analysis is indicating that by the time of year 2025, global users base will rise and exceed the scale of 1 billion participants, covering both service providers and users. Undoubtedly growing popularity of Blockchain technology, lead to numerous additional application scenarios that will enhance and reshape technical solutions.
Future Application of Blockchain Technology

As already mentioned we can identify several major sectors that are eager to apply Blockchain as their backbone technology and undergo through the major changes to increase its profit potential and overall industry development.

Smart Contracts in the Legal Profession

Digital revolution potential in the legal industry and blockchain is the technology leading this transformation. The law is being digitized. If you have ever had to close a mortgage or been part of any legal dispute you know that lawyers are good at creating tons of paperwork. If we can digitize the process of keeping track of the paper trail, then it will reduce the cost and potential for human error. It could be a game changer. Firms like Stampery are focused on recording everything on a shared ledger that becomes irrefutable digital proof that this legal event happened between two parties. Application on anything from a marriage to a divorce proceeding; a house sale to a land reclamation; and anything else that involves digital proof. Cutting costs out of the legal system from administration to time would be a game changer for the legal profession.

Clearing and Settlement

Clearing and settlement costs the financial industry billions of dollars yearly. Global banking giant Santander believes Blockchain technology could save the industry $20 billion a year which would be a huge benefit to consumers in lower fees for transacting things like wire transfers, money grams, and clearing fees on investment trades. Let’s look at a simple example. Currently if you sell a stock the transaction takes 3 days (T+3) to complete and settle and the money to show up in your account. If we see a universal adoption of blockchain technology in the financial market that transaction settlement and clearing could go from a 3-day process to an almost immediate process.

Payments

Swift, the interbank payments platform, has been testing a system for a few years that they believe will be how all cross-border payments are processed in the future.
New system will be able to adapt and include blockchain in the future, with the biggest hindrance to the interbank payment system using Blockchain today is the sheer volume of transactions that are done. Blockchain testing process is revolutionizing peer to peer direct payments and doing it in real time transactions with no bank delay.

**Smart Assets**

All components being bought and sold in the supply chains of the world are aiming for optimization through being recorded in near real-time on a shared ledger. Having real time transactions around bills of lading and letters of credit, recording of the bill and then documenting the movement of the assets. Digitization of the bills and letters of credit will enable a smarter system where we can record more than just a product’s serial number and value like the current systems allow. Potential is to record virtually any other information like destination, who is shipping it, who is shipping it when it reaches port, tax, and government clearance. That is why it’s a smarter tracking system. The banks that invests and adopts this sort of system will have a competitive advantage in the future.

**Accounting and Auditing**

Blockchain technology offers enhanced transparency and accessibility of financial and non-financial information which could profoundly impact current record-keeping, reporting, assurance and governance practices. Systems and processes, including controls, would take a different form but will remain important and essential. In a blockchain future, management could give a set of blockchain digital “keys” to external auditors that would provide unprecedented access to detailed, timestamped information about all transactions. Such access could significantly impact an auditor’s approach to an audit. Enterprises that use the blockchain could conduct continuous internal audits on their processes, supply an audit trail and provide account analysis at the push of a button.

**Insurance**

Blockchain technology can be instrumental in setting up insurance operations between participating peers, without requiring any centralized institution to control the affairs. Participating members may pay premiums, in form of cryptocurrencies and insurance policies can be issued in form of smart contracts.
Some participants may act as validators/ authenticators for claims, etc. There is an omnipresent crisis of trust in the financial services industry. Even though the large banks are the focal point, the erosion of trust impacts all businesses. Lack of trust, high costs and inefficiency of the insurance industry all play a part in the extraordinary high levels of underinsurance. For example, only 17% of California households carry earthquake insurance even though the likelihood of experiencing losses from an earthquake are high. Blockchain facilitates building trust of consumers because it provides transparency.

**Corporate and Financial Services**

Cash in the form of digital currencies could clear directly without the need for reconciliations to third-party records. In addition, the instantaneous settlement of transactions would eliminate the time currently required to clear transactions through third parties. Accounts receivable and accounts payable balances could be embedded in a new form of smart contract that could be programmed to route funds automatically once certain conditions have been met (e.g., based on delivery receipts and agreed payment schedules). Inventories could be updated based on "asset transfer "smart contracts that would respond to a "buy message "from the buyer inventory management system. Intangible assets reflecting intellectual property rights could be reflected as “smart royalty contracts" which could be programmed to route funds automatically. Disagreements over property ownership could be eliminated by the timestamping feature of the blockchain. Capital assets could be recorded on a blockchain. Ownership could be readily transferred in a manner like the transfer of digital currencies discussed above. Additional blockchain ledgers could be established to record repairs and maintenance. The full maintenance history of capital assets would be readily available and transferable as well. This could be referenced in insurance clauses. Corporate loans could be fully digitized as "smart loan contracts “and deployed onto a blockchain. Once represented as blockchain smart contracts, these debt obligations could be readily transferrable, and their history automatically tracked to maturity.

**Impact on Governance**

Government’s responsibility - fiduciary, legal, and to the taxpayer creates an incentive for ensuring accurate transfers of value between relevant stakeholders within and between agencies, between the government and third parties, and between government and the citizenry. Organizations using blockchain could be more transparent because blockchain could enable the
disclosure of a fully traceable and timestamped record of all decisions and actions by management and the board of directors. BoardRoom is an early example of a blockchain governance application being developed on the Ethereum blockchain. In future applications, shareholders could also digitally record their votes on the blockchain regarding shareholder proposals.

Gaming and Entertainment

There is an obvious correlation between gaming and the blockchain industry. Transforming the gaming world will not happen overnight. However, we see more and more efforts to integrate blockchain into gaming through many different methods. One of the most popular ventures is by using blockchain-based currency to buy, sell, or trade in-game items. The lines between in-game commerce and real-world commerce are blurring as we speak. There are numerous ways blockchain technology can affect the gaming industry in the future. Using blockchain for trading in-game assets is one popular venture. There is also an option to integrate cryptocurrencies into existing games. Especially when it comes to online games, this latter option is well worth exploring for the developers. It remains to be seen if any major games will ever integrate existing cryptocurrencies. It seems more likely they will build their own digital assets to facilitate such changes. It is also possible to use blockchain to store gaming-related data. Since the ledger is immutable and transparent, there can be no arguments over how things evolved. For simple games, this makes a lot of sense. For bigger projects, this solution can be used to successfully store gameplay data associated with player accounts, for example. It prevents the need to store everything on centralized servers. Moreover, with a blockchain, multiple copies of this important data will exist always. On the collaboration front, the opportunities should not be overlooked either. This technology can effectively spawn a whole new generation of game masters. For some people, it can even turn into a full-time job. Creating engaging stories and getting paid for doing so through a blockchain-based currency are just some of the possibilities. The world of gaming can benefit a lot from this technology. One thing the blockchain does well is letting players keep any rewards they earn. Rather than using a centralized service, your data will be stored forever. It is also the user’s prerogative to spend and use these earnings as they see fit. With more and more people pursuing a professional gaming career, it is evident the blockchain will play a role of importance. The number of opportunities for blockchain-related gaming is nearly infinite. The only real limitation is people’s own imagination and desire for success.
What is cloud computing?

Cloud computing is the delivery of on-demand computing services, from applications to storage and processing power, typically over the internet and on a pay-as-you-go basis. Rather than owning their own computing infrastructure or data centres, companies can rent access to anything from applications to storage from a cloud service provider. One benefit of using cloud computing services is that firms can avoid the upfront cost and complexity of owning and maintaining their own IT infrastructure, and instead simply pay for what they use, when they use it. In turn, providers of cloud computing services can benefit from significant economies of scale by delivering the same services to a wide range of customers.

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Cloud computing services cover a vast range of options now, from the basics of storage, networking, and processing power through to natural language processing and artificial intelligence as well as standard office applications. Pretty much any service that doesn’t require you to be physically close to the computer hardware that you are using can now be delivered via the cloud.

Examples of cloud computing

Cloud computing underpins a vast number of services. That includes consumer services like Gmail or the cloud back-up of the photos on your smartphone, though to the services which allow large enterprises to host all their data and run all their applications in the cloud. Netflix relies on cloud computing services to run its video streaming service and its other business systems too and have several other organisations.

Cloud computing is becoming the default option for many apps: software vendors are increasingly offering their applications as services over the internet rather than standalone products as they try to switch to a subscription model. However, there is a potential downside to cloud computing, in that it can also introduce new costs and new risks for companies using it.

Why is it called cloud computing?

A fundamental concept behind cloud computing is that the location of the service, and many of the details such as the hardware or operating system on which it is running, are largely irrelevant to the user.
It’s that the metaphor of the cloud was borrowed from old telecoms network schematics, in which the public telephone network (and later the internet) was often represented as a cloud to denote that the underlying technologies were irrelevant.

**How important is the cloud?**

Building the infrastructure to support cloud computing now accounts for more than a third of all IT spending worldwide, according to research from IDC. Meanwhile spending on traditional, in-house IT continues to slide as computing workloads continue to move to the cloud, whether that is public cloud services offered by vendors or private clouds built by enterprises themselves.

Cloud computing can be broken down into three cloud computing models. Infrastructure-as-a-Service (IaaS) refers to the fundamental building blocks of computing that can be rented: physical or virtual servers, storage and networking. This is attractive to companies that want to build applications from the very ground up and want to control nearly all the elements themselves, but it does require firms to have the technical skills to be able to orchestrate services at that level. Research by Oracle found that two thirds of IaaS users said using online infrastructure makes it easier to innovate, had cut their time to deploy new applications and services and had significantly cut on-going maintenance costs. However, half said IaaS isn’t secure enough for most critical data.

**What is Platform-as-a-Service?**

**PaaS = Platform as a Service**

A Cloud Application Platform

![Diagram of PaaS](image)

Platform-as-a-Service (PaaS) is the next layer up -- as well as the underlying storage, networking, and virtual servers this will also include the tools and software that developers need to build applications on top of: that could include middleware, database management, operating systems, and development tools.
What is Software-as-a-Service?

Software-as-a-Service (SaaS) is the delivery of applications-as-a-service, probably the version of cloud computing that most people are used to. The underlying hardware and operating system is irrelevant to the end user, who will access the service via a web browser or app; it is often bought on a per-seat or per-user basis.

According to researchers IDC SaaS is -- and will remain -- the dominant cloud computing model in the medium term, accounting for two-thirds of all public cloud spending in 2017, which will only drop slightly to just under 60 percent in 2021. SaaS spending is made up of applications and system infrastructure software, and IDC said that spending will be dominated by applications purchases, which will make up more than half of all public cloud spending through 2019.

Cloud computing benefits

The exact benefits will vary according to the type of cloud service being used but, fundamentally, using cloud services means companies not having to buy or maintain their own computing infrastructure.

No more buying servers, updating applications or operating systems, or decommissioning and disposing of hardware or software when it is out of date, as it is all taken care of by the supplier. For commodity applications, such as email, it can make sense to switch to a cloud provider, rather than rely on in-house skills. A company that specializes in running and securing these services is likely to have better skills and more experienced staff than a small business could afford to hire, so cloud services may be able to deliver a more secure and efficient service to end users.
Using cloud services means companies can move faster on projects and test out concepts without lengthy procurement and big upfront costs, because firms only pay for the resources they consume. This concept of business agility is often mentioned by cloud advocates as a key benefit. The ability to spin up new services without the time and effort associated with traditional IT procurement should mean that it is easier to get going with new applications faster. And if a new application turns out to be a wildly popular the elastic nature of the cloud means it is easier to scale it up fast.

Which are the big cloud computing companies?

When it comes to IaaS and PaaS there are only a few giant cloud providers. Leading the way is Amazon Web Services, and then the following pack of Microsoft’s Azure, Google, IBM, and Alibaba.
While the following pack might be growing fast, their combined revenues are still less than those of AWS.

Research said that for many companies the strategy will be to use AWS and one other cloud provider, a policy they describe as AWS + 1. These big players will dominate the delivery of cloud services: Gartner said two thirds of the spending on cloud computing services will go through the top 10 public cloud providers through to 2021.

It’s also worth noting that while all these companies are selling cloud services, they have different strengths and priorities. AWS is particularly strong in IaaS and PaaS but has designs on moving up towards databases. Google (which also offers office productivity tools) is somewhere between the two. IBM and Oracle’s cloud businesses are also made up of a combination of SaaS and more infrastructure-based offerings.

What is the future of cloud computing?

Cloud computing is still at a relatively early stage of adoption, despite its long history. Many companies are still considering which apps to move and when. However, usage is only likely to climb as organisations get more comfortable with the idea of their data being somewhere other than a server in the basement.
Tokens in Blockchain Ecosystem

Native tokens of state of the art public & permissionless Blockchains are part of the incentive scheme to encourage a disparate group of people who do not know or trust each other organize themselves around the purpose of a specific blockchain. The native token of the Bitcoin network also referred to as Bitcoin, has token governance rulesets based on crypto economic incentive mechanisms that determine under which circumstances Bitcoin transactions are validated and new blocks are created.

These blockchain based cryptographic tokens enable distributed Internet tribes to emerge. As opposed to traditional companies that are structured in a top manner with many layers of management (bureaucratic coordination), blockchain disrupt classic top-down governance structures with decentralized autonomous organizations (DAOs). DAOs bound people together not by a legal entity and formal contracts, but instead by cryptographic tokens (incentives) and fully transparent rules that are written into the software.

Only permissionless ledgers (public Blockchains like Bitcoin or Ethereum), need some sort of incentive mechanism to guarantee that block validators do their job according to the predefined rules.

In permissioned (federated/consortium/private) distributed ledger systems, validators and block-creators may be doing their job for different reasons: i.e., if they are contractually obligated to do so. In permissioned environments, validators can only be members of the club and are manually and centrally controlled. Permissioned ledgers, therefore, don’t need a token. Also, please note that the term blockchain in the context of such ledgers is highly controversial.

There are different ways to differentiate between tokens, and please note that Crypto Economics is new, that we are still in the early stages of exploring different roles and types of tokens. With every new Blockchain and every new application layer we will collectively learn by trial and error of what works and what not.
Types of tokens

Usage tokens is any token that is required to use a service. Bitcoin and Ether are the currently most famous examples of usage tokens. Token ownership does not give you any specialized rights within the network, but it does give you access to the service (the Bitcoin payment network and the Ethereum Virtual Machine in the case of BTC and ETH). Scarce tokens combined with a useful service can create massive value for token holders and entrepreneurs.

Additional model is known as a “work tokens”. Those are the one that gives users the right to contribute work to a decentralized network or DAO (whether on blockchain level or smart contract level) and earn in exchange for their work. That work can be serving as an oracle (in the case of Augur), being the backstop in a collateralized debt system (in the case of Maker) or securing the network (in the case of Ethereum when it switches to proof of stake).

These two types of tokens are not mutually exclusive, and some tokens serve as both: usage tokens and work tokens. An example of a token with both characteristics will be ETH when Ethereum transitions from proof of work to proof of stake.
Another way to differentiate between tokens is: Intrinsic, Native or Built-in Tokens of Blockchains like Bitcoin, Ether, etc that serve as block validation incentives (‘miner rewards’); and transaction spam prevention. The logic behind this is that if all transactions are paid, it limits the ability to spam.

Application of tokens came with Ethereum, enabling them to easily be issued on the application layer through smart contracts on the Ethereum Blockchain as so-called complex dApp tokens or complex DAO tokens.

We are witnessing also Asset-backed tokens that are issued by a party onto a blockchain for later redemption. They are the digital equivalent to physical assets. They are claims on an underlying asset (like the gold), that you need to claim from a specific issuer (the goldsmith). The transactions as tokens get passed between people are recorded on the blockchain. To claim the underlying asset, you send your token to the issuer, and the issuer sends you the underlying asset.
Tokens can represent literally any asset. Blockchain architecture matured to provide tokens that would reflect value such as hours’ worth of rooftop solar energy, or currencies/fiat money (USD, EUR, or GBP), means of exchange in gaming industry, a promise for a product in a crowdfund, future download of a song from your favourite artist, an insurance policy, or ticket to an event.

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They can be also used as Token of ownership, Voucher to redeem for physical items on platforms that only permit the sale of digital goods, Software license, Stock certificates, Access rental cars or other vehicles, Ticket or access pass (party, concert, amusement park, etc.), Automated road and bridge tolls, Access recording studio time, online game, a webcam, a Wi-Fi hotspot, opening a locker or storage unit, to access online storage etc.

Legal Status

Blockchain tokens embody the full potential of blockchain technology. For blockchains to unfold their full potential regarding reinventing ownership in the digital realm, the technology needs to be recognized as a system capable of creating an objectively new ontological category. A new kind of thing, which deserves its own regulatory framework that reflects the unique affordances and constraints of blockchain technology.

Broader use is supported by the digital infrastructure introduced through Bitcoin, as represented by “tokens”. A “token” can be defined as a “scarce digital asset based on underlying technology inspired by Bitcoin.” Tokens may use similar codebases but different blockchain databases, with an Ethereum as an example of Bitcoin-inspired token that have its own blockchain and is engineered to be more programmable. All tokens can be issued on top of the Ethereum blockchain, where token buyers are buying private keys, but can be transferred to other parties without consent.
Tokens have a value and therefore a price, they are a new model for technology and can be an alternative to equity-based financing. They do not dilute capital, they introduce a huge increase to buyer base and time-to-liquidity. Every single token launch differs from equity sales; however, they can be issued to share profits too. Tokens can be sold internationally over the internet and are always open for business, remaining the power that decentralize the process of funding technology.

![Funds raised by blockchain-related organizations in the past 12 months (in millions)](chart)

**Major Benefits of Tokens**

- Tokens enable a better-than-free new business model.
- Tokens will introduce the rise of the “tech savvy senior executive.”
- Tokens accommodate immediate custody without an intermediary.
- Tokens can be extended to hardware, as part of the internet of things.

**Blockchain and Cloud Gaming: Transforming the World of Games**

The most effective way to integrate blockchain technology into gaming is to use the same blockchain-based cryptocurrency to reward in-game achievements, to purchase upgrades and game options, and to purchase other games from the online store. It turns out the blurring the line between game-commerce and real-commerce creates freedom and opportunities for players.

But blockchain can do much more. For instance, a blockchain could also be used as a data structure to store gameplay, with each of a player’s moves within the game stored as a transaction in a verifiable ledger.
It’s a simple way to document the record-breaking high scores you earn when no one is around — even for tournament play. In a blockchain-structured game, this storage would happen automatically, and the historic data would be accessible to anyone who receives a key.

Developers could even use blockchain nodes to store executable elements of the game program, linking to them at run-time to create a more varied, unpredictable gaming experience.

Blockchain technology enables four key freedoms for players i.e. freedom to collaborate. Role-playing adventure games enable you to form teams or cohorts to accomplish quests. With blockchain, you might transform your time investment and game-playing skills into a career as a game master, requiring prospective members to buy a place on the team to compensate you for your leadership, management, and story-crafting skills. This is already happening, on a limited basis, in tabletop role-playing games, but blockchain could help the profession grow by supporting game masters. Integration with a blockchain-based cryptocurrency makes it simple to collect the payments, to distribute them to players for excellent performance or prizes, and to share the spoils your cohort earns upon slaying a dragon or rescuing a village.
Blockchain lets you send gifts or loans to team members without leaving the game environment. In fact, clever programmers could associate blockchain-based cryptocurrency with prize objects within the game’s universe. When you give a cohort member a purse full of gold or a fist-sized ruby, the value is not merely symbolic: It’s actual, based on the underlying cryptocurrency’s value within the ecosystem and, crucially outside the game in the game store or the virtual currency exchange. Blockchain helps make interactions with other gamers more social and more lucrative.

Also, it is an open way to interact and negotiate with other players directly, while inside the game and without using the game’s developer, the online host, your bank or credit card provider, or even the game software as an intermediary. It’s a flexible, friction-free alternative to a game-disrupting pop-up window to enable an e-commerce transaction.

Serious gamers accumulate lots of in-game rewards. In traditional gaming, those rewards disappear the moment you log out. They are useful only within a single game, and even then, once you’ve achieved the top level they really aren’t good for much. With blockchain, the rewards you earn stay with you, and you can use them however you want. You can spend them in the game, use them in the game store, hold them as an investment, or transform them into cryptocurrency or fiat at an online exchange.

A very good player could conceivably accumulate enough in-game achievements to play games for a living. Gaming has become a profession in the eSports world already. The next few years will see the continued transformation of gaming from a hobby to a career, at least for some people, much like music or athletics.
Among the new gaming-based careers will be a kind of achievement-mining, in which good players accumulate cryptocurrency through in-game achievements, ad hoc competitions with other players, and wagering on amateur competitions. Blockchain means more game developers and managers will announce tournaments with prizes with rewards in cryptocurrency that winners can use within the game, in the e-store, and in the offline world.

This year is already looking bright for continued adoption and implementation of the blockchain’s peer-to-peer ledger technology. And one major market is prime for blockchain disruption: digital gaming.

In 2017, the digital gaming market generated $108.9 billion. Gaming has taken over the internet to become the second most popular channel on YouTube. The free-to-play (FTP) gaming market has seen consistent YOY growth across markets (FTP PC revenue increased 15% from 2016).
Today, with one in three people—or 2.5 billion—playing FTP games, it’s the largest gaming market across mobile and PC. But the $756 million eSports industry isn’t far behind. It’s expected to generate $1.5 billion by 2020. Overall, the digital gaming industry is expected to grow to $115.8 billion in 2018—an upward trend that’s expected to continue over the next few years.

Betting and digital goods monetization have already begun adopting blockchain technology. Gaming marketplaces began accepting cryptocurrency for in-game item purchases, and numerous start-ups launched their own crypto tokens for secure and transparent betting. Additionally, some of the recent games gave gamers the ability to store tokenized trading cards on the peer-to-peer ledger. The new technology has been sweeping across the gaming industry. But it continues to present a unique and untapped opportunity, particularly in the massive free-to-play market—an opportunity that could push annual digital gaming revenue past the $1 trillion mark with digital gaming goods potentially account for 87 percent of global gaming revenue.

### TOP 20 COUNTRIES

**BY GAME REVENUES IN 2017**

<table>
<thead>
<tr>
<th>RANK</th>
<th>COUNTRY</th>
<th>POP. (M)</th>
<th>ONLINE POP. (M)</th>
<th>TOTAL REVENUES ($M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CHINA</td>
<td>1,388</td>
<td>802</td>
<td>$27,547</td>
</tr>
<tr>
<td>2</td>
<td>UNITED STATES OF AMERICA</td>
<td>326</td>
<td>261</td>
<td>$25,060</td>
</tr>
<tr>
<td>3</td>
<td>JAPAN</td>
<td>125</td>
<td>120</td>
<td>$12,546</td>
</tr>
<tr>
<td>4</td>
<td>GERMANY</td>
<td>81</td>
<td>73</td>
<td>$4,378</td>
</tr>
<tr>
<td>5</td>
<td>UNITED KINGDOM</td>
<td>66</td>
<td>62</td>
<td>$4,218</td>
</tr>
<tr>
<td>6</td>
<td>REPUBLIC OF KOREA</td>
<td>51</td>
<td>47</td>
<td>$4,168</td>
</tr>
<tr>
<td>7</td>
<td>FRANCE</td>
<td>65</td>
<td>57</td>
<td>$2,967</td>
</tr>
<tr>
<td>8</td>
<td>CANADA</td>
<td>37</td>
<td>33</td>
<td>$1,947</td>
</tr>
<tr>
<td>9</td>
<td>SPAIN</td>
<td>46</td>
<td>38</td>
<td>$1,913</td>
</tr>
<tr>
<td>10</td>
<td>ITALY</td>
<td>60</td>
<td>43</td>
<td>$1,875</td>
</tr>
<tr>
<td>11</td>
<td>RUSSIAN FEDERATION</td>
<td>143</td>
<td>113</td>
<td>$1,485</td>
</tr>
<tr>
<td>12</td>
<td>MEXICO</td>
<td>130</td>
<td>84</td>
<td>$1,428</td>
</tr>
<tr>
<td>13</td>
<td>BRAZIL</td>
<td>211</td>
<td>140</td>
<td>$1,334</td>
</tr>
<tr>
<td>14</td>
<td>AUSTRALIA</td>
<td>25</td>
<td>22</td>
<td>$1,234</td>
</tr>
<tr>
<td>15</td>
<td>TAIWAN</td>
<td>23</td>
<td>21</td>
<td>$1,029</td>
</tr>
<tr>
<td>16</td>
<td>INDONESIA</td>
<td>264</td>
<td>72</td>
<td>$880</td>
</tr>
<tr>
<td>17</td>
<td>INDIA</td>
<td>1,343</td>
<td>429</td>
<td>$838</td>
</tr>
<tr>
<td>18</td>
<td>TURKEY</td>
<td>80</td>
<td>49</td>
<td>$774</td>
</tr>
<tr>
<td>19</td>
<td>SAUDI ARABIA</td>
<td>33</td>
<td>25</td>
<td>$631</td>
</tr>
<tr>
<td>20</td>
<td>THAILAND</td>
<td>68</td>
<td>32</td>
<td>$597</td>
</tr>
</tbody>
</table>
Without blockchain, players must count on game publishers or store operators to convert achievements into cash. Some publishers would participate, and others wouldn’t. Policies and restrictions would vary by publisher or by game. Credits accumulated in one game would disappear if the game were to be discontinued. Blockchain supports the conversion of achievements into cryptocurrency that is accepted throughout the gaming world. You can use your blockchain wallet to invest in your own success as a player. You can double-down on the game you’re playing, purchasing options and upgrades. You can enlist the help of expert players or enter expert-only playing levels.

You can use rewards earned playing one game to skip past tedious opening levels in another, although this would require developers to build this possibility function into their games. You can study the moves of expert players, stored automatically and efficiently in the blockchain database, to benefit from their expertise.
Without blockchain and a widely accepted cryptocurrency, such investments are limited to a single game, publisher, or ecosystem. The verification, openness, and freedom from intermediaries offered by blockchain technology make it ideal for breaking through the barriers that separate businesses and players today.

With blockchain, the game designer’s goal doesn’t have to be your goal. Blockchain technology empowers you to pursue your own goals and tailor your gaming experience to your own preferences.

In-game wagering is an example. If you’re playing a neighbourhood simulation, you might bet another player that you could have a better garden or make more virtual friends during a session. You each contribute a bit of cryptocurrency and the winner takes it all. Without a blockchain-based cryptocurrency, you would need to approve each potential transaction with your bank or credit-card provider. And you would need a trusted intermediary to hold funds in escrow until the wager is resolved. With blockchain, such intermediaries — and escrow fees — are unnecessary.

Alternately, you might pay a neighbour to collaborate with you and help you plant virtual crops or build a barn. Blockchain lets you create your own solutions to challenges you encounter in the game. You could do this today in a publisher’s in-game technology of rewards and achievements.
With blockchain’s verified open transaction model, you’re free to create and dissolve such partnerships on an ad hoc basis — including partnerships that the game publisher never anticipated.

Even the most open of today’s gaming platforms restrict your options. The game’s goals and environment are dictated by developers. You play the developer’s game, or you don’t — those are your only options. With blockchain, every player can create new games in the developer’s world by incentivizing certain achievements. You can collaborate with who you like, set game goals and rewards that make sense to you, and play your own game within the developer’s gaming universe.

Example 1. Consensus about the blockchain with no dispute at all. The private chain indicated in grey can be discarded after the game channel is closed.

Example 2. Alice files a dispute and receives the prize money after waiting for the threshold time to elapse. The sequence of moves is recorded permanently in the public blockchain inside of the dispute transaction.

Example 3. Alice files a dispute. Bob resolves the dispute with his next move, and the game continues in agreement. Only the part up to the dispute-resolution transaction needs to be in the public blockchain.
It’s not just monetizing, though that feature is garnering lots of attention. What the approach really implies, long-term, is the creation of a rich world like World of Warcraft in which the game developer’s quests are just the beginning. Players can establish their own quests and assign negotiable achievement points to tasks along the way. Advanced players can accept fees as game masters or as designers of quests. A cohort that’s facing a big challenge might hire mercenaries within the game — temporary cohort members.

Blockchain isn’t necessary for any of these changes, strictly speaking, but once you’ve re-engineered a game for blockchain and digital assets, it’s a small step from developing games to developing game-worlds-as-platforms for customers to create their own adventures – either on their own or with the assistance of experienced guides.

Game developers will be free to implement this feature or not, of course. But some surely will. Historically, the trend is for gaming miniverses to allow more flexibility and freedom for players over time. Games get more and more like real life. Armed with blockchain, future developers could shift their focus to world-building, selling a game as a Quest Kit – a customizable world-building kit plus the infrastructure to create and incentivize behaviours. People could create different quests or communities as they wish using the kit as a starting point, making every player a de facto game developer.

That’s the player’s side. For developers, blockchain represents exciting opportunities to innovate. You can create games that are more compelling. Players will be drawn to games that allow them to earn meaningful rewards instead of mere in-game trophies. They will work harder and longer to achieve milestones. They’ll create strategies and explore your world in ways previous generations of players couldn’t.

**THE SOLUTION**

Our model enables game developers to sell their games using Ethereum platform and smart contracts.

Planned proof-of-concept experiment for a game to be sold using smart contracts:

- Gamer buys a game or in-game good
- Sends Token
- Receives Steam or Gog key
- Token smart contract
- Token distribution

Exemplary distribution breakdown:

<table>
<thead>
<tr>
<th>Game developer 1</th>
<th>34%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Game developer 2</td>
<td>14%</td>
</tr>
<tr>
<td>Game developer 3</td>
<td>25%</td>
</tr>
<tr>
<td>Game developer 4</td>
<td>22%</td>
</tr>
<tr>
<td>Service provider</td>
<td>5%</td>
</tr>
</tbody>
</table>

Instant payment, instant money distribution, secure and transparent.
Your games won’t just have fans, they’ll have enthusiastic collaborators, gamers who help create new adventures for other gamers. That’s one reason so many cryptocurrency start-ups are following into the gaming world these days.

Blockchain also supports you in your desire to be more creative. With an in-game economy that interacts with real-world currency, you can open all sorts of options that never made economic or practical sense before. Custom adventures. Special versions for elite players. Worlds with lots of resources but few rules. Blockchain lets your users collaborate to create their own games within the worlds you envision for them. For example, a game master might create a quest to colonize a certain region of the virtual world or to collaborate in gathering certain kinds of objects — creating games that never existed before. There’s no need to type in a credit card number or type in your PayPal ID. These features can be implemented without breaking the spell that gamers crave, and developers work hard to sustain.

Game developer make those worlds sufficiently enticing to capture their attention. Look for a software development kit that lets you add blockchain technology, including cryptocurrency support with a couple of mouse-clicks.

Higher profits are on the way too. When games are more compelling, players purchase more upgrades and add-ons. They explore optional equipment and additional lands or histories or scenarios.
With online wallets full of cryptocurrency, they’ve earned playing your game, they’ll be eager to purchase more, especially since a fully integrated cryptocurrency makes the purchase friction-free. Plus, the ease of blockchain-based e-commerce means that the e-stores that sell your games can afford to charge a smaller commission, pay you faster, and perhaps create incentives to publish more games for the blockchain platform.

Blockchain is way more than a cryptocurrency, more than a way of allowing interaction without intermediaries. It is also an auditable, verifiable datastore that records players’ moves within a game, serving as a sort of finite-state-machine record of how players progress through the game. Developers have always been able to create such datastores. What’s unique about blockchain is that the data is protected yet verifiable in an open ledger. Having every move of every player automatically recorded opens a world of possibilities.

Developers or sponsors could hold a virtual tournament for a single-player game. Just ask players to send a pointer to the best game they played during the contest period. All their moves are in the datastore, so it’s easy to verify the quality of the entrant’s performance. The sponsor could even publish the move-by-move record of the winning game. New players could challenge record-holders – like playing a legendary master of chess or Go. The datastore lets them step through a one-on-one battle against a great player, analysing the player’s every move before proceeding to the next move.

Play-by-play records could support the development of game coaching and clinics, in which experts analyse players’ performance, pointing out errors and missed opportunities. Similarly, teachers could create seminars in which they analyse and explain the work of expert players. These features have unlikely precedents in the world of table top games, where masters’ moves were recorded on paper. By creating and maintaining records of game-play, blockchain will more efficiently bring those benefits to the world of video games.

Watch for the emergence of big data tools that scan through the game-play records of tens of millions of anonymous players, identifying winning techniques and strategies. That information can help developers make games more challenging and compelling. It can help game coaches and educators create substantive, worthwhile seminars. Gamers can study the information to improve their own play.
Gaming is a $100 billion worldwide industry, and that's just data. Blocks of distributable code can also be stored in blockchain nodes. Every industry group associated with the blockchain movement is starting to assess the potential of incorporating a distributed, verifiable data structure as the basis of a distributed computing system.

Blockchain could address and nullify the security concerns of malicious executable code, not just in games, but everywhere in the internet-connected world.

It is more than certain that we stand at the threshold of a disruptive transformation in the ways games are built and played. The next generation of games will be more flexible, more rewarding, and more profitable for players and developers alike. That is where YKC is setup.
Intro to YKC Project

YKC for short, or Cloud Opening Currency is a coin name based on the open source decentralization of cloud games. It was issued early in the country of Luxembourg and was released on August 1, 2017, totalling 3.33 million YKC tokens.

<table>
<thead>
<tr>
<th>YKC Blockchain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese name (abbreviation)</td>
</tr>
<tr>
<td>English name</td>
</tr>
<tr>
<td>Release Date</td>
</tr>
<tr>
<td>Issuing Country</td>
</tr>
<tr>
<td>Block time</td>
</tr>
<tr>
<td>Total circulation</td>
</tr>
<tr>
<td>Core algorithm</td>
</tr>
<tr>
<td>Proof of work</td>
</tr>
</tbody>
</table>

YKC is an open source decentralized credit service carrier based on cloud games. Through its ecosystem, it encourages enterprises (participants) to share resources with incentives and embed YKC architecture within the consumer ecosystem. It allows businesses to directly form services for customers and form companies through certain algorithms.

For individual users, we build a customer’s personal credit information system more efficiently and conveniently through large amounts of data.

Our Corporate solutions are capable forming a good circulatory system and promote business transactions between companies. With these data, we can effectively promote the company’s image and enhance its credibility and competitiveness.

The advantages of YKC

YKC (tokens) stands for cryptographic digital currency released in March 2017 through its powerful, secure and fast Blockchain system designed to provide gamers and developers with a common ultimate in-game currency solution. It also provides an easy-to-use API that takes only a few seconds and developers can deploy it to their own games.
The consensus mechanism is used to ensure Blockchain network security, while optimized to achieve a shorter block time (30 seconds), and through the easy deployment of API calls for game developers to provide a reliable, easy-to-use framework.

The wallet communication protocol is simple and secure. Game developers need only to focus on game development without considering currency implementation issues and hassle. Technical team behind YKC monitors, and assures the stability of the digital currency, and stands ready to answer any technical advisory services at any time.

YKC Market Development Strategy

The YKC team is currently negotiating cooperation with major game companies around the world and has entered into strategic partnerships with Chilean Dream Sports, Super DT, Fantasy Sports, and Zattikka. At the same time, the team is also in discussions with Spanish Dream Sports, Webelinx Games, NL Fantasy Sports Game company, and few others.

The integration of YKC tokens is expected to continue with expanded YKC’s global application. With the rapid expansion of Blockchain technology in all major business industries, aim is to accelerate the application of cryptocurrency in the gaming industry. Once cooperation with major and large-scale game companies is secured, YKC’s popularity and market share anticipate great breakthrough, and improved business results. With the establishment and promotion of local communities on the global level, YKC expect to experience and gain further recognition and application in its core industry.

Nowadays, there are various game currency types in the cryptocurrency industry, but not as many as market is capable to absorb. The existing game currency models are predominantly relaying on their team’s own resources to develop games and capacity to integrate their own virtual currency. The problem is that due to the limitations of team resources, it is mission impossible to develop a sufficient number of popular games, that leads to not so adequate promotion and application of related virtual currencies.
We, members of YKC team, are capable to clearly identify current problem, thus we decided to cooperate with many experts and additionally strengthen our team in the game industry, choosing to cooperate directly with the mainstream key global players.

YKC Blockchain Architecture

The purpose of YKC Blockchain project is to integrate and enhance concepts based on scripts and original protocols, so that third-party service developers, manufacturers, and users can create consensus-based, standardized, feature-rich, and easy-to-develop. And coordinated applications.

YKC uses Ether’s underlying technology to create an ultimate and abstract base layer. It stands for Blockchain system that allows anyone to create contracts and decentralize applications, setting up their own freely defined ownership rules, transaction methods, and state transfer functions. In the YKC system, the status consists of objects called “accounts” (each account is a 20-byte address) and a state transition group that transfers value and information between the two accounts.

Like the Ether, the account in YKC contains four parts: a random number, a counter used to determine that each transaction can only be processed once, an account balance, a contract code of the account (if any), and an account’s storage (default one is empty).
YKC will support two types of accounts:

- External accounts (controlled by private keys)
- Contract accounts (controlled by contract codes).

All external accounts don’t have code, so once client can send messages from an external account, creating and signing a transaction is done. Each time the contract account receives a message, the code inside the contract is activated, allowing it to read and write internal stores, send other messages, or create contracts.

YKC uses the P2P distributed signature system to ensure security. P2P networks are self-organizing, load-balanced, fault-tolerant, low-cost, and high-availability features. A P2P network made up of many peer nodes can provide huge computing power while having a low cost.
The project’s distributed secure CA solution distributes the digital signature calculations originally performed by high-performance servers to the P2P network, with the following characteristics:

<table>
<thead>
<tr>
<th>Check if the previous block referenced by the block exists and is valid.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check if the time stamp of the block is greater than the referenced previous block and is less than 15 minutes.</td>
</tr>
<tr>
<td>Check whether the block number, difficulty value, transaction root, uncle-root and fuel limit (many of the underlying concepts specific the etheric fang) are valid.</td>
</tr>
<tr>
<td>Check whether the workload of the block is valid.</td>
</tr>
<tr>
<td>Assign $S[0]$ to the STATE_ROOT of the previous block.</td>
</tr>
<tr>
<td>Assign TX to the transaction list of the block. There is a total of $n$ transactions. For $i$ belonging to 0...$n-1$, a state transition $S[i+1] = APPLY(S[i], TX(i))$ is performed. If an error occurs in any of the conversions, or if the gas used to execute the program here exceeds GASLIMIT, an error is returned.</td>
</tr>
<tr>
<td>Assign S_FINAL with $S(n)$ and pay the miner a block bonus.</td>
</tr>
<tr>
<td>Assign TX to the transaction list of the block. There is a total of $n$ transactions. For $i$ belonging to 0...$n-1$, a state transition $S[i+1] = APPLY(S[i], TX(i))$ is performed. If an error occurs in any of the conversions, or if the gas used to execute the program here exceeds GASLIMIT, an error is returned.</td>
</tr>
<tr>
<td>Check if S_FINAL is the same as STATE_ROOT. If the same, the block is valid. Otherwise, the block is invalid.</td>
</tr>
</tbody>
</table>

Technical characteristics

The YKC technology team has many years of cloud gaming and Blockchain development experience. Compared to traditional gaming solution, YKC team pays strict attention towards following features:

Safety

YKC relies on encrypted authentication. Verification of the identity of both parties involved in the game ensures that a “wrong” purchase of weapons cannot be added to the block without involving parties consent. Every time you add a new purchase request you will go through hash calculation and depending purely on the data information exchange consensus of both parties involved in the transaction, it will the results with successful transaction. The existing block completely relies on the previous one, so the feature ensures that malicious participants cannot interfere the purchase history. It is not possible to enter the opponent’s account to purchase weapons services, because if you change the
previous purchase or sale information, the existing hash value will be affected and won’t match with other backups of the ledger.

Fairness

Because the cloud gaming industry relies on the tamper-resistant nature of the Blockchain technology, the authenticity of both parties is completely traceable. No one can modify the rights that exceed the incorporated rule frame, as every block is dependent on the previous one. This assures the fairness of the two sides that are involved in the game, removing possibility of plug-in creation. Result is reflected with cloud game interaction with more reliable and enhanced user experience.

Transparency

YKC essentially aims to secure distributed database that is maintained and synchronized by multiple nodes, for example, multiple counter parties that frequently trade with each other. In addition, transaction data must be consistent across parties before it’s added onto the Blockchain system. This means that from a design point of view it is possible to access the same data (in some cases local data within the organization), leading to highly increased transaction transparency, while traditional systems rely on multiple “hidden data” behind the firewall. The database is invisible from the outside.

Effectiveness

Conceptually, maintaining multiple copies of a database will not be more efficient than a single, centralized database. But in the real world, many parties have already backed up databases containing the same transaction information. In many blocks, the data on the same transaction is inconsistent - resulting in costly and time-consuming reconciliation procedures. The use of distributed ledger system of blocks across organizations can greatly reduce the need for manual reconciliation, that assure cost saving benefit.
In addition, and on a case to case basis YKC can allow each regional game to obtain a locally amended common game version, which will result in eliminating the inequality for gaming application that cannot be expanded.

**Allocation and launch guideline for YKC Tokens**

Our strategy of raising project operations is focus on launching of the etheric currency. The reward will be invested in product research and development process, according to the agreed proportion. Plan is to increase our team expanding local and international expert knowledge, further development of community operations, improvement of marketing and sales department and more. As the project progresses, the team will gradually start with release of reserved tokens for inviting and motivating high-level Blockchain developers to join our community.

**Distribution of tokens**

A total of 33.3 million copies were distributed, during funding period of one month. After handing out 12.32 million tokens, the crowd funding should reach a target of 1.68 million euros (EUR), with each token’s exchange rate equal to 0.14 euros. Once the token is issued, it will be registered in the mainstream exchanges within a very short time.
Planning and Process Development

- The project was established in July 2017 along with its core team.

- August 2017: YKC Kaiman Game chain tokens issued ICO course framework, with market circulation of 12.32 million.

- Between August and September 2017, the market research of the game market and Investment company was completed. The fund raising was also completed.

- The cloud game system framework design started in October 2017, at the same time it reached strategic cooperation with multiple game company companies.

- The formulation of the core system was completed in November 2017; the cloud game digital identity authentication system and the cloud game server were confirmed.

- December 2017, the cloud game system completed the beta test.

- November-December 2017: YKC tokens were on line with the DCP of Thai Exchange.

- Expected completion of the ICO start-up work is set for the period of March-June 2018.

- 2018 May-June: Expected to be on the Main Board of the world’s first class large exchange.

- The core system is expected to be completed in June and December 2018; Preparation work is under way to Cloud Game Digital Authentication System, Cloud Game Server Validation, Blockchain Model and Smart contract system.

- January-February 2019: expected improvement of the authentication function for the cloud games.

- March-June 2019: Expected to complete the cloud game system upgrade and investment smart contract system development.

- July-October 2019: Expected to complete the development of cloud game digital identity authentication system before the end of 2018, providing free API interface and third-party docking platform.
YKC Reinvestment Strategy

We will use the 20% of the company's net profit from one business quarter to repurchase the YKC currency in the every next one (quarter). Once the online platform is integrated and launched at domestic and foreign exchanges, the repurchase of YKC currency will be annulled. Our users and clients will be able to send query through the Blockchain browser and ensure acquisition transparency until total value reach 10 million YKC coins.

Release plan and use of funds

- Initial release: 37% (12.32 million)
- From August 2018, lift the ban and release 18% (6 million) 12 months
- From August 2019, lift the ban and release 18% (6 million) 12 months
- From August 2020, lift the ban and release 18% (6 million) 12 months
- From August 2021, lift the ban and release 9% (3 million) 12 months
YKC Fund Distribution

Capital ratio 1:
45% of the funds raised by the ICO public offer will be used for the application development and system operation, maintenance of the cloud game system, plus rewards for team members, research and development funds, etc.

Capital ratio 2:
45% will be allocated for brand awareness and promotion of cloud games, including the continuous advertising and popularization of YKC applications for traditional and Blockchain industries. Funds will be used also to provide financial support for various game platforms, ensuring that YKC quickly gain market recognition and accumulate trading users

Capital ratio 3:
10% as YKC operations team's reserves and emergency funds meant to be used in case of unforeseen emergencies
YKC International Team

Jovan Jovanovic

**Project Supervisor**
Managing Partner at Wang Capital Ltd
Professor at International Economics School of Shenzhen
Chair of European Blockchain Network Laboratory
Kent Business School Graduate

Eddy Benson

**Project Manager**
Member of Lincoln University Hi-tech Association
Specialist in Hi-Tech Business Development,
International Sales Strategies and Big Data Research

Ricardo Johnson

**Project Deputy Manager**
Senior Blockchain and E-Commerce Expert
Member of American-Brazilian Big Data Association
UCLA Graduate
Jorgen Van Bilter

**Software Consultant**
Certified C++ Expert, NY Institute of Science
Founder of Nordic Blockchain Alliance
New York University Graduate

Mike Sword

**Senior IT Consultant**
Member of the Canadian National Association of E-Commerce
University of Toronto Graduate
Member of Ontario Technology Institute

Alfred Bergerstein

**Senior IT Consultant**
Berlin University Graduate
Specialized in Big Data and Cloud Expert Solutions
Member of US-German Cloud Data Association