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Technology & Suppliers

Enterprise Blockchain Essentials Guide

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Blockchain platforms have evolved from their cryptocurrency origins. They are now being built to target enterprise use cases across many different industries (from financial services, through manufacturing and the supply chain, to healthcare, insurance, government, telecoms, and more). They're also becoming far better integrated with business systems and complementary technologies like IoT and business analytics platforms – and coming ready-built as managed services, wrapped in enterprise-friendly tools and utilities to make it easier to adopt in production environments.

MWD Advisors is a specialist advisory firm which provides practical, independent industry insights to business leaders and technology professionals working to drive change with the help of digital technology. Our approach combines flexible, pragmatic mentoring and advisory services, built on a deep industry best practice and technology research foundation.

Paper prepared for ORACLE

Top takeaways

1

Moving from proofs-of-concept to production

Many organisations are now looking beyond their proof-of-concept and pilot projects, towards making blockchain work for them in a production environment. This transition tends to succeed when there's support and sponsorship from senior line-of-business / organisational representatives; and where there's an understanding of the project's context in the market or ecosystem in which it's designed to operate (as well as across a single business). Organisations are also looking to vendors with enterprise credentials to help their blockchain projects make the jump to production and make blockchain work for them in the way the rest of their IT works.

2

Enterprise IT demands enterprise blockchain

The main technology market focus is now on the practical aspects of production-readiness that help customers move from proofs-of-concept to deploying at scale, across ecosystems. Blockchain deployments need to behave more like traditional IT capabilities, so blockchain becomes 'just another part of the IT estate'. This requirement manifests in two areas:

- Development and test considerations – i.e. safer, easier, more robust coding environments for smart contracts and decentralised applications; integrations with key enterprise systems (such as systems of record, identity management, and IoT platforms); and interoperability with other ledgers (because, pragmatically, organisations will inevitably find themselves members of many blockchain networks across the business over time).
- Operational considerations – from setup (such as network provisioning, configuring and member on-boarding); through resilience (high availability, backup, disaster recovery, monitoring, etc.); security (encryption, transaction privacy, etc.); and performance (both of the network, and of the choice of consensus mechanism, the use of any sidechains for parallelism, etc.).

3

Blockchain platforms have evolved

First-generation blockchains can be typified by the Bitcoin blockchain network – public and open, relying on expensive and slow consensus mechanisms, and with limited on-chain functionality (though supporting the creation of 'trust anchors' that provide proofs-of-existence for hashed documents, databases, and so on). Ethereum's smart contract platform heralded the arrival of a second generation, built to execute autonomous, decentralised applications. A third generation is now taking the capabilities and characteristics of earlier incarnations and tailoring it for enterprise suitability – and that means wrapping blockchain services in the enterprise tooling outlined above, as well as developing targeted SaaS applications that utilise blockchain for specific use cases (like tracking and traceability).

The blockchain story so far: three generations

We covered the emergence of blockchain and what the technology is (and isn't) good for in our earlier report Blockchain for business: What is it and why should care?

What we've also seen is that, in the relatively short time that organisations have been developing blockchain technology applications, the technology has seen three major generations evolve. Each generation marks a step-change in capabilities, and a turning point in blockchain's applicability and adoption in mainstream business use cases.

The three sections below outline the three generations of blockchain technology to date.

From crypto origins, through token value exchange, to digital fingerprinting and 'trust anchors'

The first generation of blockchain is typified by the technology that underpins the Bitcoin cryptocurrency. It's open and public; it uses a *Proof-of-Work* consensus mechanism, requiring the incentivisation of *miners* (and so is expensive, and slow to run); and it was designed primarily to record transactions for the exchange of tokenised value (e.g. Bitcoin transfers between wallets).

On the surface the transaction cost, block size (and what you can store in blocks), scalability and speed of, say, the Bitcoin blockchain would appear to limit its appeal in the enterprise… unless your business is accepting retail payments in cryptocurrencies. Even if you're looking for a platform to facilitate payment transfers, you're better off considering something with a more modern architecture like Stellar, or Ripple (which doesn't rely on mining for its consensus) because Bitcoin's throughput just wouldn't keep up. However, even these examples have limited scope for further enterprise use beyond crypto token exchange – they're intended to rival inter-bank transfer systems like the SWIFT network, and in their current iteration they're not targeting wider use cases beyond financial payments.

However, the fact that Bitcoin is the most mature, longest unbroken, public blockchain also brings other benefits that organisations can take advantage of. It provides a chain upon which to 'anchor' data with a cryptographic fingerprint. Other public blockchains can be used for this too (we'll explore this more later).

As we explained in Blockchain for business: What is it and why should care? most first generation blockchains don't store 'real' (non-cryptocurrency) data in the blockchain itself, because too much of that can lead to 'chain-bloat' (where there's so much data being committed that it becomes too slow and costly to do anything useful). Instead they store 'digital fingerprints' (hash values) of the data that link to digital assets which have been stored elsewhere, off-chain (but somewhere accessible by *bone fide* interested parties – the InterPlanetary File System (IPFS) is often used in cases where decentralisation needs to be preserved across the storage layer, and so simply linking to a single organisation's cloud storage account wouldn't be acceptable). In these cases the blockchain then is used to track ownership of these assets, and act as an immutable log of activity. It means that these blockchains can provide a 'proof of existence' for an item of hashed content (such as a document, process output, database, or private blockchain sidechain) in addition to enabling trivial tasks like making cryptocurrency payments.

Some vendors have focused initially on 'anchoring' as a way of blockchain-enabling their offerings to provide capabilities that enhance trust in ecosystem scenarios when extending process reach beyond the enterprise boundary.

Smart contract platforms, and the era of decentralised applications

Post-Bitcoin developments in blockchain technology have enabled complex business logic (in the form of 'smart contracts' or 'chaincode') to be encoded into blockchains, running against data either held on-chain or elsewhere, and used as part of an autonomous, decentralised workflow. It's arguably this advance that's paved the way for an explosion of non-cryptocurrency interest in blockchain technology – enabling people to effectively develop distributed applications that reside and run on a blockchain (triggered by external events and pulling in data from the Internet or IoT).

The development of the Ethereum open-source, public blockchain-based distributed computing platform in 2015 signalled the dawn of blockchain's second generation. With Ethereum (and the myriad variants borne of forked Ethereum code, or based upon its principles), distributed applications can be built using 'smart contract' scripting functionality and executed on participating network nodes. In some cases these are performed on the public Ethereum mainnet; other instances make use of private Ethereum networks to enhance transaction confidentiality (and provide more control over transaction speed, network performance, and even choice of consensus mechanism). Some instances bring the ability to link or anchor these private transactions periodically to the mainnet, in order to provide an immutable log that guards against the threat of bad actors attempting to subvert the consensus on smaller networks.

Although Ethereum does have its own cryptocurrency (Ether), the tokens are mined as part of Ethereum's Proof-of-Work consensus process and used to pay for the computational resources that run the distributed applications on its platform.

In addition to organisations deploying the open source Ethereum itself, J.P.Morgan has developed what it refers to as an "enterprise-focused version of Ethereum" in the form of Quorum (addressing concerns around privacy and scalability, etc.) – which is available as part of a number of Blockchain-as-a-Service offerings. Microsoft announced its Azure Blockchain Workbench in October 2018, which features a *Proof-of-Authority* based Ethereum; and ConsenSys offshoot Kaleido has partnered with AWS to offer an Ethereum-based service through the AWS Marketplace.

The Ethereum Foundation, which oversees the development of the Ethereum platform, has begun to address some enterprise concerns too through the work of the Enterprise Ethereum Alliance (EEA). The EEA's members are drawn from enterprises, start-ups, academics, and technology vendors – all with an interest in how Ethereum develops for the enterprise. In July 2018 the EEA has announced the Enterprise Ethereum Architecture Stack – a conceptual framework which characterises and standardises components from the Ethereum ecosystem to show how the upcoming Enterprise Ethereum standards-based specification will fit together. Its hope is that this will provide user groups and vendors with the means to construct standards-based solutions on Ethereum that satisfy enterprise requirements (like privacy, scaling, tooling and application development), without having to build everything from scratch. Three months later, the EEA announced that it was entering into an agreement with Hyperledger (from the Linux Foundation) to become associate members of each other's groups – further strengthening the drive to bolster Ethereum's enterprise credentials as blockchains level-up to production-readiness (as well as fostering greater inter-ledger interoperation, as organisations start to become members of more diverse blockchain networks).

Production-ready, enterprise-grade, integrated blockchain at scale

A third generation of blockchains have focused specifically on the needs of enterprises wanting to deploy blockchains in full-scale production – boosting core enterprise-friendly capabilities (relating to consensus mechanism choices, privacy features through channels and sidechains, etc.), and also providing wrap-around tooling and integrations.

It's here where major established enterprise technology vendors are setting out their stalls with a spread of enterprise blockchain frameworks and tools, and blockchain-enabled applications, all designed to operate and integrate in production environments.

Although there are still concepts to be proven in some potential blockchain usage scenarios, many organisations are now starting to look beyond this phase to explore more about what the business benefit is (to the individual enterprise, and to the wider ecosystem it inhabits as a whole). Projects tend to succeed when there's a line-of-business / organisational strategy sponsor; and where there's an understanding of the context in the market / ecosystem, as well as across the business. Organisations are also looking to vendors with enterprise credentials to help their blockchain projects make the jump to production and make blockchain technology work for them in the way the rest of their IT works.

Many enterprise vendors are members of Hyperledger, and have offerings based on its projects (such as the Fabric blockchain framework); some offer Ethereum-based solutions, tailored for the enterprise; and R3 is marketing its Corda blockchain platform at use cases beyond its financial services base now (there's an open source version alongside a commercial variant, which sports enterprise extensions).

Notwithstanding the work of the EEA (described above), there's also a range of third generation blockchain platforms that have sprung up in an effort to plug Ethereum's perceived gaps in meeting enterprise needs. However, with the drive towards standardisation in the Ethereum landscape, and the interoperability amongst the Hyperledger stable, smaller independent players will find it increasingly difficult to differentiate a novel platform in a way that doesn't put off enterprise buyers (with their need for stability, reliability, scalability, interoperability, etc.).

Oracle's Blockchain offering

Oracle initially launched its Hyperledger Fabric-based Blockchain Platform at its OpenWorld conference in October 2017, two months after the company joined the Linux Foundation's Hyperledger project. It became generally available, as Oracle Blockchain Platform, in July 2018 (offering the automated recovery capabilities inherent in Oracle Cloud Platform's suite of autonomous services). It's a fully-managed PaaS (part of the Oracle Cloud Platform) built on the Hyperledger Fabric permissioned blockchain framework. The Oracle Blockchain Platform features a variety of enterprise-grade services that provide continuous backup, point-in-time recovery, rapid provisioning, and simplify the operational management of a blockchain network. The product offers plug-and-play integrations with key business applications within or through Oracle Cloud (leveraging Oracle's container lifecycle management, identity management, and event services), recognising the need to support heterogeneous environments – including on-premise environments and non-Oracle clouds alongside Oracle Cloud (the Blockchain Cloud Service also provides support for interoperability with non-Oracle Hyperledger Fabric instances).

Oracle's aim is to offer an enterprise-friendly platform that leverages the advantages of blockchain to a customer base more at home with 'traditional' business applications. The Oracle Blockchain Plaform leverages Oracle's enterprise-grade integration, provisioning, support, and management capabilities to offer customers a platform designed to help them take the next steps beyond proofs-of-concept to bring production services online (with all the attendant issues around scalability, on-boarding, security, integration, etc.)

Oracle has positioned its Oracle Blockchain Platform as a distributed ledger cloud platform for customers looking either to build new blockchain-based applications, and/or extend their current SaaS, PaaS, IaaS (ERP) and on-premises applications with blockchain capabilities to provide "tamper-resistant transactions on a trusted business network.". Oracle's 'extras' (on top of Hyperledger Fabric) are designed to build on the open source framework with capabilities that simplify and accelerate blockchain deployment, leverage identity management cloud to provide high level of security protections, and provide tailored support for specific use cases (through the involvement of the company's industry teams) in the areas of ERP, supply chain / manufacturing, and open banking.

Oracle's go-to-market approach for the Oracle Blockchain Platform has four parts, focusing on:

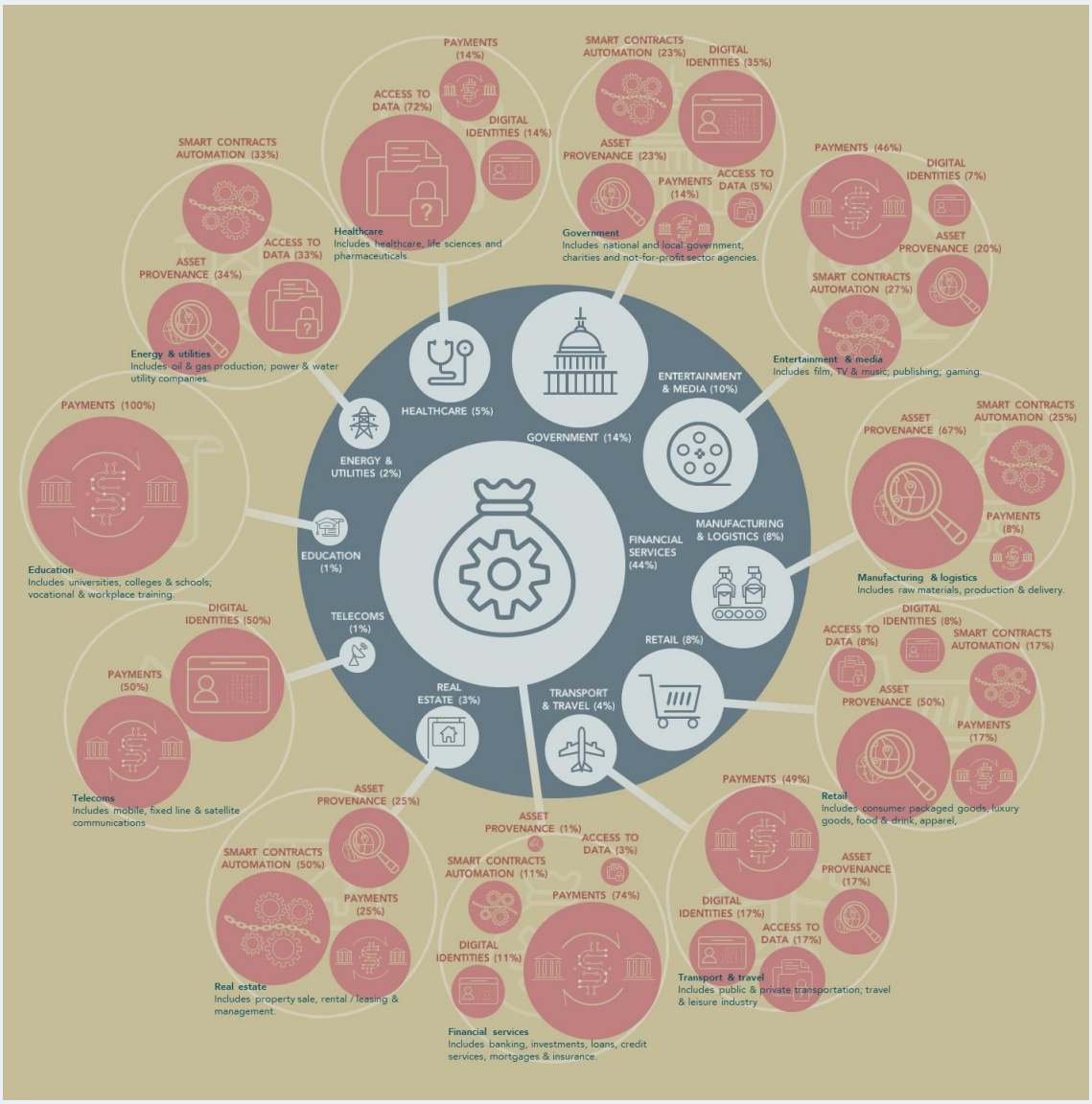
- Customers of its wider platform and on-premises applications.
- Targeting start-ups via the company's start-up accelerator programme; SaaS and packaged applications.
- Software vendors looking to incorporate blockchain into their offering or build on a pre-assembled platform.
- System integrators (global SIs, regional firms, and specialist blockchain boutiques).

What next for blockchain in business?

As well as the trends we're seeing in blockchain as organisations seek to move their proofs-of-concept on to production services, demanding more production-grade blockchain products (based on more enterprise-friendly blockchain platforms), we're also tracking an increasing level of diversity in the types of blockchain projects being undertaken (and the industries experimenting with putting them to use); and the evolution of new business models and networks around blockchain-infused ways of working.

For example, as our ongoing blockchain project-tracking research shows (as illustrated in figure 1 below), we're now seeing far more instances of blockchain initiatives being announced outside of the technology's initial base in financial services. This isn't just manufacturing and government (where we saw the most non-fintech interest six months ago); there's far more blockchain showing up in other industries like retail, healthcare, transport and travel, too.

Figure 1 Where and how is blockchain being used today?



Source: MWD Advisors

In addition, we've seen the spread of project types levelling out: when we started tracking blockchain projects in 2017 we saw an overwhelming sea of payment platform projects springing up – a natural major use case from blockchain's cryptocurrency origins, this set has been joined by as strong a showing for asset provenance projects (with a growing number of vendors eager to assemble a coherent offering that injects blockchain capabilities into supply chain management solutions to provide trusted platforms that service wide business ecosystems).

Although a number of recent news reports appear to be anticipating a slow-down in blockchain interest in the financial services sector (as predicted benefits maybe aren't being seen as quickly or easily as had been hoped, or where regulatory concerns are forcing a pause in procedures before moving to production), we're seeing a lot of excitement about use cases relating to asset provenance and automation in manufacturing, logistics and supply chain management.

Interestingly it's also here where vendors have chosen more to focus on embedding blockchain as part of a wider solution – usually alongside IoT technologies, often with AI and analytics too – rather than lead on it as more of a solo technology play.

As for the evolution of new ways of working inspired by blockchain, this is manifesting as explorations of new revenue streams beyond the efficiencies borne of disintermediation (enabled by increased trust and transparency being brought to a previously asymmetric relationship). Barriers to collaboration are being removed as the ways in which organisations interact with each other and with individuals change. As a natural consequence, we expect that organisations will rapidly become more likely to encounter multiple blockchain platforms and networks, making it ever more imperative to crack inter-ledger interoperability as well as single blockchain platform integration with traditional business systems.

These new blockchain initiatives will require business cases that determine how benefits of new ways of working are realised by all parties involved (not just a statement of overall value to the network as a whole); and these approaches will be used to incentivise new partners to join existing networks rather than start their own. However, a move towards blockchain platforms that seek to attract non-founder members will require thinking in advance around governance issues and questions of influence and value distribution. We're already seeing this play out in the supply chain arena, with new blockchain vendor / trade partner consortia like the Global Shipping Blockchain Network. Shipping companies start to question whether their interests are likely to be best served by joining an existing platform dominated by such a large industry player.