QUARTZ™

Quartz – Blockchain Solutions for Enterprises and Ecosystems

Overview

Today, when we think of a disruptive technology, we often think of blockchain. And, when we think of blockchain, especially, in the context of the financial industry, we think of real-time processing, transparency and collaboration. Blockchain is best leveraged when applied to business problems involving data duplication, reconciliations, excessive messaging, and the lack of trust and transparency between counterparties. Blockchain today is fostering collaboration between multiple organizations in a value chain, eliminating redundancies, and reducing risk and time. It is being explored in areas as varied as digital identities and registries, payments, clearing and settlements and information exchange.

Why? The financial services world is replete with siloed legacy systems and intermediaries that add costs and delays to transaction processing and settlement, while also reducing efficiency. Fragmented IT and data architectures lead to multiple versions of the truth, making costs of reconciliations between firms untenable, resulting in avoidable processing errors and a lack of trust.

Co-existence.
Integration, Interoperability.

Organizations are working towards enabling truly connected ecosystems with real-time, efficient transaction processing, minus intervention from intermediaries. Blockchain, with its ability to synchronize data across participating entities, builds trust and encourages firms to collaborate in setting up such ecosystems. Firms will be well served to adopt a philosophy of "coexistence" -- of combining the best of their legacy infrastructure with blockchain. Reusing existing systems and infrastructure, even while moving parts of the business or operations onto blockchain, can help remove risk and save costs. This is a more pragmatic approach as opposed to a big bang adoption of emerging technology.

The introduction of blockchain into an ecosystem implies that it needs to integrate all connecting systems or nodes. Such an integration is needed, not only to connect various connecting systems to blockchain, but to also allow the ecosystem to leverage standard messaging networks including ISO, FIX, FIXML etc as applicable. In addition, organizations are likely to explore aspects such as interoperability of technologies—and even blockchain platforms. Data exchange between various blockchain networks will be the first step towards interoperability, which will further extrapolate to transaction flows.

Quartz is designed keeping in mind these principles of co-existence, integration and interoperability. It can help make your organization agile, significantly reduce transaction processing timelines and costs related to data exchange with upstream as well as downstream systems. With data masking, privacy and anonymity--the premises on which the solution is designed--your organization can focus on enhancing its core competitive strengths in an environment of utmost security. Quartz comprises:

- Business solutions in the form of Quartz Smart solutions and blockchain enabled solutions
- Platform solutions, namely, the Quartz Gateway, the Quartz DevKit and Quartz Command Center
- Support for Networks and Ecosystems

Business Solutions

Quartz business solutions are targeted at helping the entire financial industry - commercial and private banks, market infrastructure institutions, custodians, insurance companies, asset and wealth management firms, registrars and transfer agents leverage blockchain.
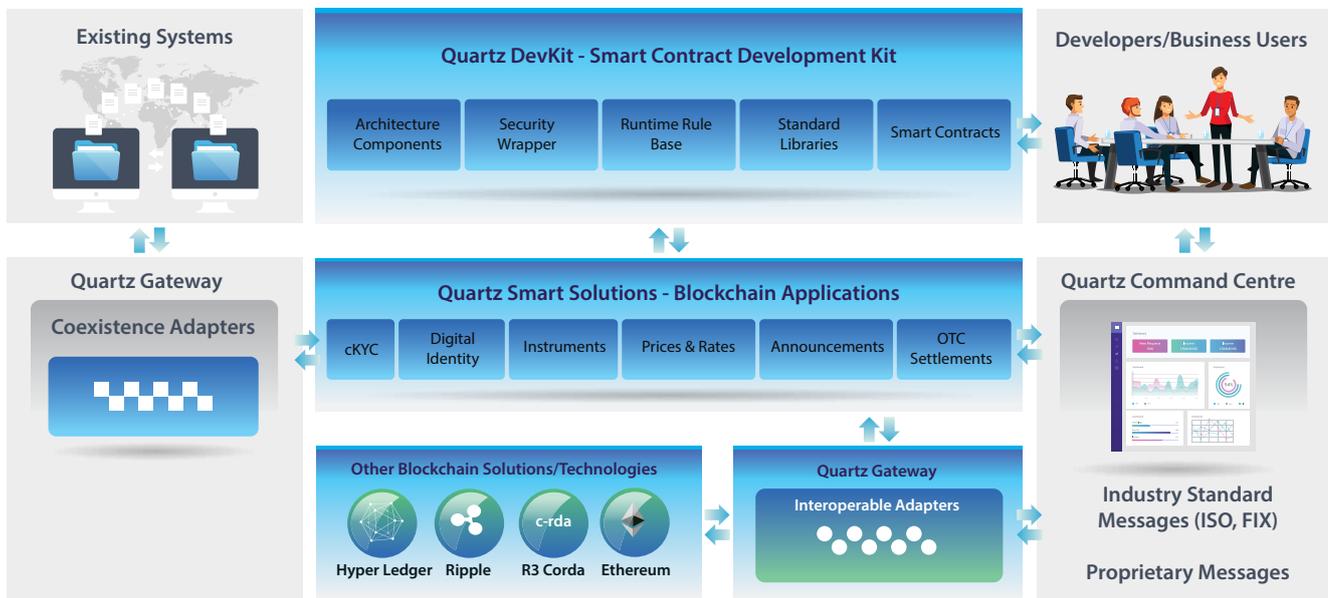
Quartz Smart Solutions

Quartz Smart Solutions are comprehensive solutions with business (domain) aware "Smart Contracts" that help drive processing on the blockchain platform. A Smart contract is a 'self-executable' software that is stored on the ledger and triggered either as a result of specific events occurring within it or from pre-configured rules that are programmed into these contracts. Each Quartz solution supports a specific business function across different business entities that form part of the ecosystem for that business function, for example:

Quartz OTC Settlement: Drives settlement processing on the blockchain, with the depository and custodians/brokers operating as nodes on a common ledger. This solution delivers the ability to complete settlements real-time, as opposed to a T+n settlement model

Quartz Announcements: Allows the capture and instantaneous dissemination of accurate, trusted announcements to all participants on the blockchain, thereby eliminating duplication of information and associated reconciliation challenges

Quartz cKYC: Allows KYC services to be provided seamlessly over the blockchain as opposed to each of the connecting nodes/organizations managing the KYC process individually

Blockchain-enabled solutions: Our solutions are continuously being enhanced to embed 'blockchain awareness'. With this strategy, our existing customers have the power to integrate with blockchain platforms, to publish and consume information related to their businesses, and perform transactions seamlessly between databases and blockchain based data stores.

Existing Systems

Quartz DevKit - Smart Contract Development Kit

| Architecture Components | Security Wrapper | Runtime Rule Base | Standard Libraries | Smart Contracts |

Developers/Business Users

Quartz Gateway
Coexistence Adapters

Quartz Smart Solutions - Blockchain Applications

| cKYC | Digital Identity | Instruments | Prices & Rates | Announcements | OTC Settlements |

Quartz Command Centre

Other Blockchain Solutions/Technologies

Hyper Ledger   Ripple   R3 Corda (c-rda)   Ethereum

Quartz Gateway
Interoperable Adapters

Industry Standard Messages (ISO, FIX)

Proprietary Messages

Platform Solutions

Quartz DevKit

The Quartz DevKit is designed to help developers who are part of an IT team introduce blockchain into their business processes, and generate, compile, package, and deploy business code on the blockchain. By deploying a combination of the Quartz DevKit and specific business components, blockchain implementation is simplified within existing processes in an organization, thus enabling faster launch timeframes.

Quartz Gateway

The Quartz Gateway is a single, smart channel that can help integrate with third-party solutions with various blockchain platforms and technologies. Using the Quartz Gateway, organizations can connect seamlessly to the blockchain, thereby eliminating the need for large scale and continuous changes to be made to these systems. The Quartz Gateway also facilitates interoperability between blockchain and messaging standards such as ISO and FIX/FIXML, as well as other existing messaging networks.

Quartz Command Center

The Quartz Command Center helps a blockchain sponsor, to administer and maintain oversight of the entire blockchain network. It provides a comprehensive visual representation of all the activities taking place within the blockchain ecosystem at any point in time, and allows the IT user of the sponsor to make key decisions when administering the network.

Networks and Ecosystems

Blockchain has the power to bring organizations together by creating ecosystems that amplify the value delivered by each on a stand-alone basis. Such ecosystems have the potential to drive transformation across sectors, including retail, healthcare, insurance and utilities apart from the banking and financial services sector. Quartz can help organizations in the creation of such industry networks and ecosystems, and facilitate easy connectivity to them. It can thus help organizations harness the power of Business 4.0, a TCS framework designed to help our customers experience personalization, create exponential value, leverage the power of ecosystems, and embrace risk. It can redefine how organizations can collaborate, leverage their collective strengths and create strong business value for their end customers.

The Quartz Advantage

- **Co-existence:** Blockchain is widely acknowledged as a solution that brings about positive disruptive innovation in the way services are delivered; however, we believe that core systems on conventional databases will continue to co-exist with blockchain based solutions, and for applications where they are most relevant. Quartz and Quartz Gateway are built on this philosophy and can integrate with third-party solutions and various blockchain based systems and networks.

- **Integration:** The Quartz set of solutions are simple and lightweight and can seamlessly bring together third-party solutions, legacy applications and messaging middleware. Our solutions can therefore reduce entry barriers to blockchain adoption by insulating connecting systems from the complexities of the underlying blockchain.

- **Interoperability:** Blockchain is an evolving technology with different platforms that are likely to provide varied features. There is therefore a need to interoperate with multiple blockchain technologies, platforms and ecosystems to realize its true benefits.

Leveraging these architectural principles and using Quartz, your organization can:

- Process and settle transactions real-time (T+0)
- Automate business processes and functions with Smart Contracts
- Eliminate data duplication and associated reconciliation issues
- Ensure data integrity with cryptographic encryption of data, making it immutable
- Restrict access (private permissioned ledger) to ensure greater security
- Help integrate existing/legacy systems with blockchain solutions

Blockchain is a disruptive technology and, as it evolves, markets are finding newer ways to leverage its benefits. Quartz can help you operate at the forefront of technology innovation and spearhead blockchain adoption successfully within your enterprise and beyond.

Connect with us to know more about how we can help your organization tap into the full potential of blockchain technology.

TATA CONSULTANCY SERVICES

Experience certainty.

About Tata Consultancy Services Ltd (TCS)

Tata Consultancy Services is an IT services, consulting and business solutions organization that delivers real results to global business, ensuring a level of certainty no other firm can match. TCS offers a consulting-led, integrated portfolio of IT and IT-enabled infrastructure, engineering and assurance services. This is delivered through its unique Global Network Delivery Model^{TM}, recognized as the benchmark of excellence in software development. A part of the Tata Group, India's largest industrial conglomerate, TCS has a global footprint and is listed on the National Stock Exchange and Bombay Stock Exchange in India.

For more information, visit us at **www.tcs.com**

IT Services
Business Solutions
Consulting