LOYAKK VEGA

BUSINESS RELATIONSHIP PLATFORM

Solution Architecture Overview

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1. Solution Summary

The Loyakk Vega Business Relationship Platform is architected to allow complex exchanges of information and orchestration of workflows - both intra and inter-company. The key business requirements for the platform are as follows:

▶ Seamless interaction across the multiple organizations that are a part of a transaction such as: parent and child legal entities of one organization, its customers, partners, distributors, vendors and suppliers.

▶ Purpose built for Interaction that requires sharing of relationship information, sales and other business data, and similar valuable information with complete security, immutability and auditability

▶ Scope of interaction spans organizations across geographical boundaries.

▶ Ensure complete veracity and consistency of this high-value data and transactions when accessed and shared by multiple entities – across the ecosystem

▶ Interactional model needs to support organizational structure and roles

▶ Variety of transaction types with differing validation models

The Loyakk Vega Platform incorporates these requirements and is being built on existing & known blockchain principles with new and proprietary patent-pending extensions.

The scope of this Solution Overview is, by design, limited to the foundational blockchain aspects of the platform, and will therefore not get into details on the UX Layer, Business Data Repositories, Event Monitoring and Analytics.

Before we discuss platform architecture, for purposes of clarity the following definitions will apply throughout the rest of the document.

▶ Blockchain Core: Our core data layer and the means of inserting and updating data orchestrated by workflows and secured by a blockchain-based data structure that holds encrypted and clear-text data.

▶ Loyakk Vega Platform: The API's that allow interaction with our workflows, our UI, transaction templates and template composer.

▶ Enterprise Business Networks: The network of business entities that interact with each other to complete business transactions. A sampling of network entities will include – customers, partners, vendors, manufacturers, shippers, account managers, and approvers of various types etc. depending on the Industry.

▶ Value Web: We define Value Webs in our Business Overview whitepaper. They are powered by Loyakk Vega nodes and brings together the business partners that constitute the Enterprise's Business Network. The Value Webs focus on information transfer with business context, and have malleable definitions and transaction boundaries.

▶ Loyakk Index: Our team believes in the transformative power of the blockchain – the power that enables the sharing of just enough information from real transactions to help our token holders easily and precisely calculate the proliferation of the Loyakk platform across the Loyakk Enterprise Customer Universe. The Loyakk index is a patent-pending data pipe that allows token holders to gauge the overall health, stability and velocity of the Loyakk platform. The Loyakk index, its underlying data attributes and their real-time values will be persisted in the Loyakk blockchain. The data attributes will terminate in a single smart contract that amalgamates all the data into a single numeric value. We will also offer a template that will allow you to construct your own formula and thereby create your own personalized index. For example, the Loyakk index for a UK token holder may include only transactions originating in UK and the index for a Token Holder in Singapore may include transactions originating in only Singapore. The central Loyakk index will be persisted and hence historical data will be available for all. It is your responsibility to store data from personalized Loyakk templates.

▶ Digitized Assets: Unlike digital representations of securities or cash, the Loyakk network is purpose built to transfer digitized data required by value webs – this could be sales and deal information, videos, audio files, complex technology architecture diagrams, solution design, account performance data etc.

2. Loyakk Vega Business Relationship Platform Architecture

The Loyakk Vega platform is being architected to enable enterprises to leverage the power of blockchain for sharing and movement of data and value, while preserving the hierarchical structure of any organization in the real world. Nuances such as departments or personnel having supervision privileges across different branches, functional privileges for specific transactions e.g. to approve deals, pricing are being architected into the platform.

Given the nature of Enterprise Requirements around scope, span, deployment and manageability, the following are the architectural elements of our Blockchain-powered Data & Deployment Layer:

▶ Our blockchain core enables key features of security, validation and privacy across the broader Enterprise Business network and allows us to construct unique transaction boundaries for enterprises: Private, intra-organization and inter-organization.

▶ Powers a verifiable ledger of transactions across a wide spectrum of digital content that gets exchanged within and across organizations as a part of business. Digital content will span enterprise data variants including sales information, deal data, relationship information and value, and will support clear-text, documents, images, videos, and payments.

▶ The platform builds upon and extends the concepts of multi-party transactions by enabling enterprises to mix public & private transactions across their value webs.

▶ The platform will allow setting of permissions on nodes to participate in consensus mechanism and transactions that will permit use of smart contracts.

▶ Loyakk tokens will be used in order to conduct transactions between parties. The Loyakk Token is essentially a carrier of information and is essential to invoke a "microservice" between any two organizations in the Value Web. The number of tokens that will be used for a particular transaction will be a configurable option based on the parties involved, and the type of transaction. More details on the token can be found in the Tokenomics document.

▶ The platform will allow nodes to maintain their private states (based on participation permissions), as well as public states in a single Blockchain within enterprise scope.

▶ The platform will provide pre-built templates for commonly used transactions in certain industry-specific use cases while allowing customers to develop their own templates by using a base layer of our tools and smart contracts.

2.1 Adaptive & Nested Node Architecture

Loyakk is blending building blocks found in Ethereum - an open platform based on Blockchain that enables developers to build and deploy decentralized applications - and Quorum – a distributed ledger and smart contract platform built on Blockchain by JPMC.

Loyakk is leveraging and extending these two technologies with proprietary patent-pending approaches that are essential for Enterprise usage and adoption of Blockchain capabilities. The custom extensions such as Nested, Full vs. Lean Nodes, Multi-level tree nodes, Flexible transactions across multiple branches of the tree and transactions across organizations, and ability to reference to and reuse key run-time components such as Transaction Manager, Crypto Manager are described here.

The Loyakk Vega Platform will allow permissions-based multi-level tree structure represented by nodes that can be configured for placement at any level in the tree.

The Vega Platform will host materially more data than what the blockchain based ledger was designed to do. Hence we will enable the construction of Full and Lean Nodes. Voting Chains will necessarily need Full Nodes but the Full node is not required for all operations on the platform. Unique to our platform is the ability to convert a Full node into a Lean Node and vice-a-versa depending on changes in the role of particular organization / entity – a common occurrence in enterprise business networks.

The Platform will also enable the concept of Nested Nodes with the construct of Root Node as well Sub-nodes in a tree, essentially allowing hierarchical structure of nodes. This structure better represents how Enterprises are organized and how they interact between the parent organization and its sub-entities. Multiple nodes can co-exist at any given level in the tree to ensure that we can represent sister entities or peers / partners. These nodes can cross Organizational and Geographic boundaries. The Platform will allow the notion of Flexible Transaction Boundaries with Flexible Grouping of nodes to form a virtual organization that may be party to a transaction within or outside the root tree at the time that the transaction is constructed. Once constructed, no new entities can be added to the transaction without approval from the entities already in it.

Figure 1: Flexible Transaction Boundary
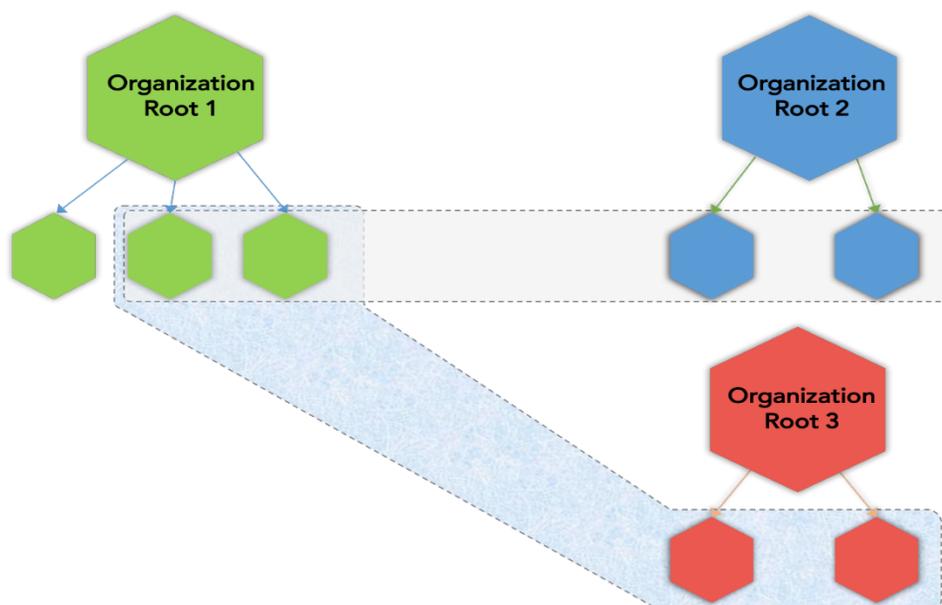
Adding new entities to existing transactions is complex, and has to follow pre-defined rules for participation and engagement. If an entity is added to a transaction, approvers of the addition can decide whether to expose the entire transaction history or expose only the activity from the point in time that the new entity was added. If the entire transaction history is not exposed, the new entity does take on responsibility of dealing with a lack of complete and authenticated provenance of digital assets.

Enterprises will be able to permission nodes for transactions depending on the nature of transaction across multiple root trees.

2.2 Run-Time Architecture

The platform contains proprietary and patent-pending run-time architecture models that enable functionality necessary for enterprise usage. Some runtime components will leverage principles described in Quorum and Corda. For the purposes of this document and ease of user understanding, we will follow nomenclature that is similar to Quorum:

Transaction Manager (TM)

A TM's role in Loyakk Vega platform will be to store and provide access to encrypted private transaction data. It will also be responsible to communicate with other TMs in the network if required based on participation of other nodes and the type of transaction. A TM in the Loyakk network may be used at any level in the tree, or a higher level TM can serve as a TM for any and all sub-level nodes.

Crypto Manager (CM)

CM in Loyakk Vega platform will be responsible for private key management, communication with TM, and encryption and decryption of transaction data. A CM in Loyakk network may be used at the level in the tree or at any level below its own level. We envision that the platform will be deployed across many organizations each with their own security models and protocols, and so will support multiple variants of encryption and decryption. Additionally, these organizations will leverage multiple Hardware Security Module (HSM) infrastructures. Our crypto manager will abstract away the platform's interaction with the underlying security infrastructure and requirements.

Voting Chain (VC)

VC in the Loyakk Vega platform will offer majority-vote based consensus mechanism to verify the transactions.

Validation Manager (VM)

A VM in the Loyakk Vega platform will serve an arbitrator and record holder responsible for maintaining the public as well as private state of transactions in which it participates. The VM will also reconcile all of its state with the VM in immediate next (higher) level, going all the way to the root level. The VM will also reconcile its private state in case of private transactions involving multiple branches and/or levels within a single tree or multiple trees across organizations.

Figure 2: Run-time Architecture

TM = Transaction Manager
VC = Voting Chain
CM = Crypto Manager
VM = Validation Manager
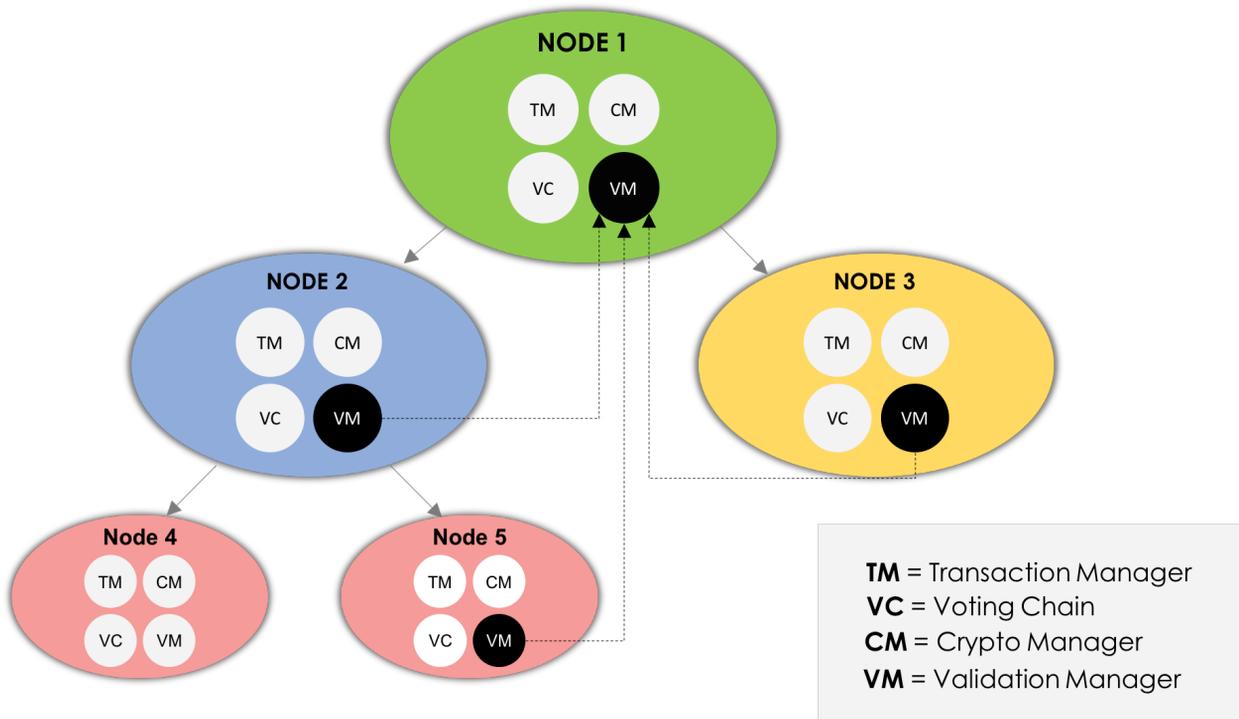
Platform allows VMs at root nodes as well as in lower levels in the tree, where VM at any level will maintain state of public and private transactions at its own level as well as (if required) levels below it. The VM will keep the state in sync with the VM that is the next higher level hierarchy in the tree.

2.3 Private Vs. Public Transactions

In the Loyakk Vega platform, at an organization level, all public and private transactions will be part of a single blockchain. The state maintained at VMs and nodes (at various levels) will depend on their participation in transactions, and permissions given by the administrator.

The platform is being designed to address real-life customer scenarios such as when sub-nodes in one organization's tree sometimes have to work with sub-nodes in another organization. The platform enables:

▶ Mix of Private and Public transactions

▶ Single blockchain architecture, where all public and private smart contract states can be derived from a single blockchain with transactions validated by all nodes

▶ Private smart contract states validated only by permissioned nodes, which can be configured to enable restrictions to participating parties.

▶ The validation mechanism can include third party nodes which are not part of the transaction itself.

▶ High performance - thousands of transactions per second with larger payloads of digitized data assets.

Figure 3: Blending Public & Private States
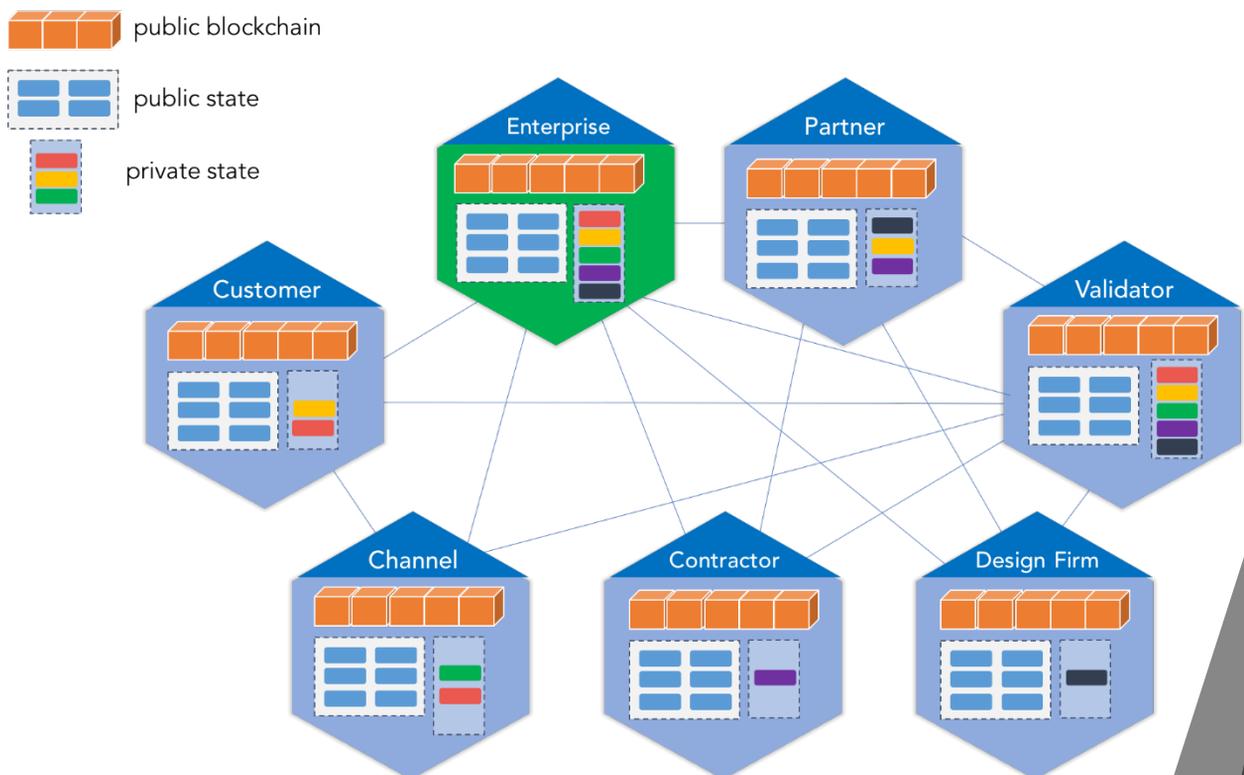
2.4 Voting Based Consensus (Validation)

The Loyakk Vega platform will allow majority-vote based consensus. Only nodes permissioned to view the transactions will be allowed to vote for validity of a private transaction, and certain nodes may be configured to process only public transactions.

Validation of transactions can be configured across following core dimensions (assuming mutual consent between the parties and approval by higher level nodes):

▶ Every single node in the tree will have an ability to verify a transaction, if it has the right permissions

▶ A node may or may not have its private TM, CM or VM components based on the needs, and may point to such components hosted at a higher level in the tree.

▶ Depending on the type of transaction, smart contracts can be components of the transaction

▶ All nodes will keep track of the mandatory public state and selective private states of transactions they are permitted to vote on.

▶ All VMs will be in sync with other VMs at lower levels and hold a collective state of all such lower level VMs, and in case of inter-organization transactions, VMs configured to be part of private transactions.

▶ In case of "virtual organization" across branches of the tree, whether within same organization or across multiple organizations, similar configuration will be allowed whether the group of nodes belong to a single tree with one root or multiple trees with multiple roots.

Advantages

▶ Allow multiple root trees at each primary enterprise level where transactions will be allowed within an organization as well as across multiple organizations

▶ Allow permissioning of nodes at any level in any of the root trees, either individually or as a group, to participate in transaction

▶ Allow maintaining of public and private contract state at any level desired, where the state is reconciled and maintained all the way up to the root of the tree

▶ The Platform will allow cost of transaction/validation to be configurable to be no cost, single-payer or split cost across multiple parties. This will be permitted to a Class of Transactions or to a specific Transaction. Cost of processing a transaction may be split between parties according to prior arrangement, with ability to change it by Administrators on multiple ends.

3. Essential Platform Administration Details

3.1 Permissioning

Administrators and permissioned users will be able to create a tree structure of nodes reflecting real-life hierarchies and needs of any organization. Using the Loyakk Admin Framework, Administrators will be able to do the following tasks:

1. Create multi-level tree structures

2. Create "virtual organizations" by grouping multiple nodes together

3. Define transaction types based on Loyakk-provided templates

4. Define new transaction types and create smart contracts associated with them

5. Assign permissions for verifying transactions

6. Configure TM, VM, etc. setup at each level in the tree depending on grouping and transactions

7. Manage the entire setup and view reports

3.2 Templates

Loyakk will provide industry-specific templates for interactions and transactions that are of common variety such:

▶   Sales data sharing across external organizations

▶   Information exchange involving partner and service providers

▶   payments across parties

Loyakk will also often-used smart contracts to cover many facets of day-to-day business transactions.

Overall, there is a lot of very complex development work for Loyakk to execute on to make the Blockchain elements of the Vega Platform ready for Enterprise Use. The unique blend of the current Loyakk Enterprise Platform, our Pending Patents, and new Blockchain capabilities will give Loyakk a unique competitive advantage to deliver a compelling product to our future customers.

Summary

We will provide a platform with patent-pending technology that will enable enterprises all over the globe to leverage the power of blockchain for a large variety of interactions and complex business processes involving multiple parties – across organizational and geographic boundaries. Interactions & transactions constructed on the Loyakk Vega platform will ride with complex multi-level privacy and carry multiple types of digitized payloads – documents, videos, deal documents, financials etc.

Billions of interactions and transactions happen every single day between enterprises across their business networks. Loyakk will transform these interactions from the ground up, and exponentially increase the value of enterprise relationships across their value chain.

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