

GuildOne's Smart Contract Engine for Corda

GuildOne

Smart contracts are key to blockchain transactions.¹ A smart contract is a computer program that encodes the transactional terms of an agreement (or contract) such that the relevant transactions trigger automatically on fulfillment of those terms. They define the transactional terms of an agreement in the same way that a traditional contract does, but automatically monitor and execute those terms.²

The crucial advantage of smart contracts is that they provide the ability to standardize and automate the actions or events that trigger commercial transactions, so that transactions can take place automatically without the need for an intermediary (or middle man). This avoids costly delays due to traditional administrative processes and allows for instant value exchange upon the completion of the triggering event, such as the delivery of a good. By agreeing to the contractual terms in advance, and encoding those terms, smart contracts also reduce costly disputes over the interpretation of the terms.

ConTracks: The Smart Contract Engine Powering EBX

Smart contracts are central to the functionality of Energy Block Exchange (EBX), GuildOne's blockchain business network for energy transactions. EBX was developed on R3's Corda blockchain platform and drastically reduces transaction costs, mitigates costly data and contract disputes, and allows for nearinstant exchange of value in energy transactions. In 2018, GuildOne conducted the world's first oil and gas royalty transaction using blockchain.

EBX can be thought of as a network or community of parties that want to transact together quickly, securely and transparently, without intermediaries. Those transactions are made possible by ConTracks, the smart contract engine running on the EBX business network. ConTracks is GuildOne's smart contract engine built on Corda, R3's blockchain platform for financial transactions. Corda was developed specifically for transactions in the finance and banking sector. It meets the highest security and auditing standards of one of the most complex and highly regulated industries in the world, while also providing for the transparency and disintermediation of blockchain. Corda, therefore, supports and facilitates the transactional focus of EBX and ConTracks.

This white paper will examine how ConTracks works, the role of contract facts and formulae in ConTracks implementation, and how its features can be used to scale ConTracks to support a number of complex, multiparty transactions in a variety of industries.

Business Benefits of ConTracks

ConTracks provides a framework to construct smart contracts on EBX, ensuring counterparty interoperability and compatibility. It enables digital assets and other shared facts to flow easily and securely between counterparties on EBX or similar business networks. This creates the potential for enterprises to conduct transactions between business units quickly and securely, with a strong audit trail, creating significant organizational efficiencies.

¹ It should be noted that in this paper "transactions" is used to refer to financial or commercial transactions, not the database unit of work.

² Corda contracts also "refer to a legal prose document that states the rules governing the evolution of the state over time in a way that is compatible with traditional legal systems. This document can be relied upon in the case of legal disputes." (https://docs.corda.net/key-concepts-contracts.html, accessed February 8, 2919).

The benefits of ConTracks that are realized on the EBX network are also transferable to other business sectors. Additionally, ConTracks also creates the potential for the creation and exchange of fungible tokens on the business network. For instance, a token could be created to represent the value of an oil and gas royalty. This could then be exchanged for a unit that represents value derived from some other commodity or activity, such as the reduction of methane emissions. This creates the seeds of new financial instruments that could lead to new efficiencies, greater liquidity and new ways to create and capture value for commodities.

Smart Contracts and Royalty Transactions

GuildOne's 2018 EBX genesis royalty transaction was the first successfully executed oil and gas royalty smart contract transaction using blockchain. It was also an effective demonstration of how smart contracts work in royalty-based transactions. These are particularly well suited for smart contracts because they are often complex, involve numerous stakeholders (who often have competing interests) and are subject to costly delays due to disagreements over data or the interpretation of contractual terms.

Smart contracts can eliminate or mitigate many of these friction points. They do so by ensuring that the terms of the contract are transparent (or known to both parties) and consensualized (or agreed to by both parties). As such, they drastically reduce conflicts due to differing facts or interpretations. These same contracts can also automate calculations and payments. This allows for immediate transfer of value, which also eliminates manual intervention that could lead to dispute and/or administrative error, both of which can cause costly delays and relational damage. These smart contract benefits are not restricted to just royalty transactions but are also applicable to many other multiparty transactions in which privacy, security and disintermediation are valued.

ConTracks and EBX: How it works

ConTracks can process a wide variety of multiparty transactions. This versatility lies in its design and functionality, both of which address a thorny issue of smart contracts: how to standardize diverse, highly varied conventional contracts.

Commercial contracts, by their nature, are highly specific documents that are negotiated between parties with differing, often competing, interests. Contractual parties may be operating in different industry segments with different business models. This means that they may have different payment types with different payment triggers. Further, they are affected by the inherent subjectivity of language. There is thus no standardization of contract language or terms. Smart contract developers must, therefore, seamlessly integrate a vast number of contract variables such as counterparty relationships, metadata, terms, rules and constraints.

That said, the terms that govern the actual transactions are not as diverse. Transactions tend to be somewhat formulaic: generally speaking, a particular event (such as delivery of a unit of a commodity) triggers a predetermined result (such as the payment of X dollars per unit). ConTracks resolves the issue of non-standardization by representing transaction variables as "facts" which are then expressed, or processed, through formulae that are encoded into the particular contract. These facts describe

the particular contract, party or event that pertains to the particular transaction. Each of these facts is discussed below.

Contract facts: Facts that are known at the time the contract is agreed to, that define the transaction governed by the contract and that do not change over the course of the contract. In the case of oil and gas royalties, these could include the:

- Contract parties
- Role of parties, such as: payor, payee, etc
- Particular well the contract applies to
- Product being produced (such as oil or gas)
- The number of barrels being produced
- The time period of production
- Payment formula, such as X dollars/barrels of oil produced

Party facts: Terms or specifications that are unique to, and that describe, each party and its role within the contract. Party facts do not change over the course of the contract. In the case of oil and gas royalties, these could include the:

- Party A name
- Party B name
- Party A royalty interest percentage
- Party B royalty interest percentage

Event facts: An event is an action or occurrence (such as the delivery of a good) that is defined in a smart contract, and agreed to by parties to the contract, and that triggers a result (such as the calculation of payment), as defined in the smart contract and agreed to by the parties. For oil and gas transactions, event facts could include the:

- Monthly oil well production (volume)
- Date of commodity delivery
- Volume of commodity delivered
- Production, custody transfer and so on

Events may trigger results (such as a payment) that then serve as events for subsequent, or derived, events (such as a payment to a third-party). In this case, the results of one event "chain" to become an input for another event. Events that are triggered by the results of preceding events are known as "derived events."

Event Handlers and Validation

ConTracks manages events through a program known as an "event handler". Event handlers are scripts that run automatically when an event occurs. Events trigger a result system that looks for contracts that are "listening" for that type of event, as coded in formulae that are tied to that particular contract. The event handler tells a contract which particular events apply to, or trigger, the contract. ConTracks formulae also include a validation expression to ensure that the data that is entered as part of an event falls within the parameters specified in the particular smart contract and is, therefore, valid.



Figure 1: A ConTracks Event Handler

Formulae

ConTracks uses formulae to interpret contract facts to trigger the transaction. The formulae contain the contract facts and commands for the contract to execute. Once a triggering event contained in the formula is detected by the contract (using the event handler), it will execute the transaction according to the commands in the formula.

Formulae are expressed in a domain specific language (DSL), which is a simple expression library. They create results—such as payments to counterparties or submission of reports to regulators—which are distributed to the entitled parties, as dictated by the contract. Those results could also create a derived event, as described in the previous section.



Figure 2: ConTracks Royalty Amount Formula

Templates: The Key to Scalability

While smart contracts have tremendous potential to create efficiencies and cost savings, the number of commercial contracts that a company may have to manage makes the concept of encoding terms for all of those contracts prohibitive. Moreover, the terms and/or parties of a commercial contract may change during the course of that agreement. How can this be managed in an efficient, comprehensive manner? Further, how can the smart contract be replicated to apply to new commercial contracts with different counterparties without entailing the need to code an entirely new smart contract, effectively negating the efficiency gains that smart contracts are intended to create?

The ConTracks solution to these thorny issues is to create "templates" for the quick, easy creation, revision or adaptation of contracts. A ConTracks template is a reusable, customizable framework that defines the variables, rules and relationships that can be adapted for use in specific smart contracts to avoid the need to create a new contract for each agreement on the ledger.

Through the use of ConTracks templates, smart contracts can be created for a variety of commercial contracts without the need to author software for each use case. Templates are standardized enough to incorporate and accept all kinds of events (such as delivery of a good) and results (such as royalty interest payment), while mitigating the risk and expense that future data-migration requirements into the same template might entail. This solves the issue of how to generate contracts quickly and easily enough to reap the benefits of scale and efficiency that smart contracts are intended to generate.

ConTracks: A Cross-Industry Smart Contract Engine

ConTracks is highly efficient at encoding contracts, processing events and results and enacting payments. It is designed to facilitate any type of multi-party transactions that can be represented as facts in a formula. It is also industry-agnostic, so is transferable to any other vertical in which multiparty transactions can be automated. This gives it tremendous flexibility across a wide variety of sectors and transaction types (or use cases).

Templates allow ConTracks to produce contracts for new transactions or agreements quickly and easily. Further, because templates are framework contracts, they can be created in advance, giving GuildOne the ability to create a "library" of templates to draw from. This gives ConTracks, and the business networks that use it, tremendous scalability.

These functions could be beneficial in any domain in which a formula is used to derive a result, such as energy, agriculture, minerals, commodities, entertainment, royalty-based media and so on. The agnostic, versatile nature of ConTracks is also applicable in the development and exchange of fungible tokens, which may be transacted between companies in different sectors and used to complete a variety of transactions.

About GuildOne: GuildOne is a pioneering technology company providing advanced data solutions and business intelligence to oil and gas companies seeking to boost business performance. This includes applying proprietary solutions to identify outstanding royalty opportunities and generate revenue completeness. Since 2015, GuildOne has invested in the research and development of emerging technologies such as blockchain, smart contracts, machine learning and artificial intelligence. This culminated in the 2018 unveiling of Energy Block Exchange (EBX), the first blockchain business network to transact an energy smart contract. Learn more at: http://guild1.com.

About R3: R3 is an enterprise blockchain software firm working with a broad ecosystem of more than 300 members and partners across multiple industries from both the private and public sectors to develop on Corda, our open-source blockchain platform, and Corda Enterprise, a commercial version for enterprise usage.

R3's global team of over 190 professionals in 13 countries is supported by over 2,000 technology, financial, and legal experts drawn from our global member base.

Corda is the outcome of over two years of intense research and development by R3 and its members and meets the highest standards of the banking industry, yet is applicable to any commercial scenario. It records, manages and executes institutions' financial agreements in perfect synchrony with their peers, creating a world of frictionless commerce. Learn more at www.r3.com.

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