WHITE PAPER

Unibright – the unified framework for blockchain based business integration

unibright.io

team@unibright.io

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Stefan Schmidt
stefan@unibright.io

Marten Jung
marten@unibright.io

Thomas Schmidt
Ingo Sterzinger
Günter Schmidt
Moritz Gomm
Klaus Tschirschke
Tapio Reisinger
Fabian Schlarb
Daniel Benkenstein
Bastian Emig

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Abstract

The purpose of Unibright is to leverage the promises of blockchain technology for all those driving business. Unibright is a unified framework for blockchain-based business integration.

Unibright establishes a template based, visual definition of business integration workflows and serves with automatic smart contract generation. The Unibright framework wants to enable cross-blockchain and cross-system connections and provides all system components to support a blockchain-based business integration process.

This whitepaper points out the benefits of using blockchain technology in the field of business integration, and what unsolved issues can be addressed thereby. It shows why a unifying framework like Unibright is mandatory to turn all these benefits to account and evolves the details of the Unibright concept.

Contents

1 What is Unibright?

1.1 The Unibright view on the blockchain

The blockchain as a concept can be assessed from different point of views. It is important to understand the view of the Unibright team on the blockchain to understand the framework and the constructive applications Unibright offers and to answer the question: "What is Unibright?"

We understand the blockchain[1] as a data structure that is technically implemented in a decentralized peer-to-peer network and offers the possibility to define and hold both data and functions in single blocks, the *smart contracts*.[2] Some features promised by blockchain technology, like built-in security and information completeness, predestine it for use in the business integration domain.

1.2 The promises of blockchain technology

We focus on the needs and demands of secure and efficient business integration. The challenges in business integration exist independently from an implementation strategy. Business integration is already happening and there will be cases, where existing technologies completely suffice to meet the demands, no matter if these technologies are based upon technical knowledge of the last decade or even the last millennium.

Nevertheless, there has been a demand and a reason for moving on, say, from

[1] There is no widely agreed definition of *blockchain*. Its description is still fuzzy due to the rapid change in research, knowledge and development in that domain. Colloquially, *blockchain* is widely used as an equivalent to *Bitcoin*, which is certainly as wrong as understanding a product like *Dropbox* as an equivalent to *Cloud*. In some definitions, a blockchain is characterized a "different kind of database", a view which is too broad and technical in our opinion.

In our understanding, a blockchain[1] first and foremost means a data structure, a linked list. Every item, or *block* is inseparably connected to its predecessor by the use of cryptographic methods, which define hash functions on the content of the predecessor block and verify the result in the following block. This chain is constantly growing as blocks with transactions are added to it with a new set of recordings in a linear, chronological order.

Technically, a blockchain is a replicated structure, where each node in a peer-to-peer network holds a copy of the blockchain. Each node performs the transactions included in a block, thus establishing a decentralized consensus. The blockchain is secure by design and has complete information about the addresses and their content right from the genesis block to the most recently completed block. Data wise, a block can consist of variables of primitive datatypes (the "state") and functions which read or manipulate the current state.

[2] In our understanding, smart contracts[2] (also called self-executing contracts, blockchain contracts, or cryptocontracts) are simply computer programs that act as agreements where the terms of the agreement can be pre-programmed with the ability to self-execute. Smart contracts reside inside a blockchain and enable trusted transactions and agreements to be carried out among anonymous parties without the need for a central authority or enforcement mechanism. They render transactions transparent, traceable and irreversible.

a direct "information-by file exchange" strategy, over a proprietary middleware solution exchanging self-defined structured data to a cloud solution building upon industry conformant exchange formats.

We understand the blockchain as next step in this evolution to solve certain problems and meet certain doubts in the area of middleware- and cloud-based business integration.

Some of the commonly agreed advantages and promises of blockchain technology encompass:

Disintermediation
: Information exchange between two parties without the intermediation through a third party, eliminating counterparty risk.

Durability, Reliability, Longevity
: Due to the decentralized structure, a blockchain does not have a central point of failure, hence being better able to withstand malicious attacks.

Transparency
: Changes to public blockchains are publicly viewable by all participating nodes.

Immutability
: Transactions cannot be altered or deleted due to the cryptographic link structure of all blocks in the chain.

Lower transaction costs
: By eliminating third party intermediaries and overhead costs for exchanging assets, blockchains have the potential to greatly reduce transaction fees.

SAP, one of the world leading ERP-software vendors, sums up the blockchain trend as follows[3]:

"Every business is based on transactions. But these transactions are often routed through third-party intermediaries like banks, lawyers, and brokers which can make processing time-consuming and expensive. Blockchain technology has the potential to reduce the role of middlemen, dramatically speeding up multi-participant transactions and lowering costs, while ensuring all parties are protected. People, businesses, machines, and algorithms would be free to transact and communicate with one another in a frictionless way. This is the promise of blockchain."

1.3 The potential of blockchain technology

Aside from the Hype factor, that accompanies every new technology, the blockchain technology already yielded its proof of concept and its real-life relevance with the bitcoin[4] implementation and the Ethereum[5] environment, among others.

Without regard to the use of the blockchain technology as a tool for business integration, experts agree on the potential of blockchains regarding growth and distribution (see fig. 1).

grandviewresearch.com[6] predicts:

"The global blockchain technology market size was valued at USD 509.1 million in 2015 and is predicted to gain momentum over the forecast period. The blockchain technology is one of the most promising upcoming technological trends in the information technology domain."

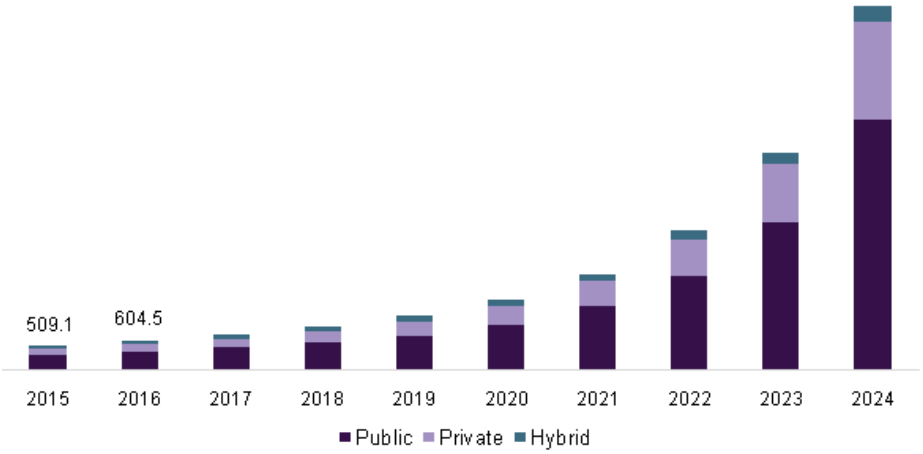

Figure 1: Global blockchain technology market by type, 2015 - 2024 (USD Million)[6]

As with every new technology, it will take time to establish the blockchain concept in "the mainstream", just as it took powerful and working tools like *Dropbox* to solidify a real understanding of the concept *cloud* to the majority of non-expert users.

Arvind Krishna, director of research at IBM, states[7]

"[] those companies will be around when the blockchain goes mainstream that create software that makes it easy for businesses and consumers to actually implement all of blockchains possibilities."

He adds an example by likening the blockchain technology to the early days of email:

"[] even though email technology had been around for years, it still took the likes of AOL to package it in a way that got lots of people to use it."

We believe that the demand for smart contracts will continue to grow as automated interactions between systems, applications and digital individuals is becoming more and more widespread in our society.

The experience of arising technologies in the past and the conviction that blockchain technology will find its way into the IT mainstream leads us to our Unibright mission.

1.4 The Unibright mission

Our mission is to provide the first unified framework for blockchain-based business integration. We expect blockchain technology to become pervasive and therefore want to make the use of blockchain technology more feasible and profitable for those driving real business and not "only" exchanging crypto currencies.

We are confident to be well positioned to become the first provider for blockchain based business integration. We strive for bringing the promises of blockchain technology usage to the next level for business professionals.

We are aware of and are gaining motivation out of the fact that complex enterprise system landscapes already exist. Some of these will not be touched for years, paying tribute to the principle of *"never changing a running system"*. We do not see this as a defect - quite the contrary: It is an essential motivation of those standing for Unibright to offer a high-level concept and practical tools to integrate existing processes and IT-landscapes into the promising ecosystems of blockchains. We address existing teams with experts in different domains and want to make it easier for those teams to use the blockchain as one part of their versatile solutions.

During the analysis stage of the Unibright ecosystem it turned out that we have to operate on two levels of modelling to achieve blockchain based business integration a software architectural level and an end user driven application level. Both levels are presented in more detail in the following sections.

So what is Unibright? **Unibright is a unified framework for blockchain-based business integration and a set of applications leveraging this framework.**

2 Business Integration

2.1 What is Business Integration?

In our understanding, business integration[8] is the use of system architectural principals, software architecture and implementation to integrate a set of enterprise computer applications. It means the integration, automation and optimisation of IT based business processes within and beyond the walls of a company's organisation.

The purpose of business integration may be data integration, abstraction from specific vendors systems to ensure independence and integrity, providing common front-ends and standardized queries on available data.

In demarcation of related terms, we understand business integration as one motivation to define business processes[3] and implement business workflows[4] on top of them.[9] [10]

Commonly agreed challenges to business integration can be named:

Message Exchange

Within a business workflow, different parties of a business process will need to exchange messages. Message formats, the reasons triggering a message and actions following the message have to be defined.

Notifications

When a message is sent, the sender wants to make sure the message arrived. The recipient may need to inform the sender on missing information. The notification can be part of the message exchange itself, thus leading to potential recursive problems.

State Management

[3] We understand a business process as a collection of activities that produce a specific service or product, hence to achieve a particular goal in a business context. Multiple parties may be involved in the business process. A business process can be described in an informal manner (e.g. as a detailed written concept) and/or be technically formalized (e.g. as a flowchart). In our understanding, the business process defines the requirements that have to be met to achieve the defined goal, but not necessarily the technical steps which address these requirements.

[4] In our understanding, a business workflow is the logical definition of a business process. The goal to be achieved (as described in the business process) is transformed into a set of activities, moving and/or transforming information or material from one activity or party to another. Activities within a workflow are structured and arranged in sequences, which may also feature parallel activities. The workflow defines a deterministic path through the graph-oriented activity sequence, including conditions, iterations and the integration of external data, which may in turn be provided from another workflow. A business workflow is technically describable, storable and verifiable by a set of rules, definitions and constraints.

Parties have to keep track of already sent messages and notifications, leading to the necessity of resending messages, update information or cancellation of processing.

Control Flow

Workflows have to be enabled to react on different parameters changing, by defining control flow with elements like decisions, choices, loops or exceptions.

Changing Requirements

Existing workflows will have to be updated. Parties have to be added, system components may be changed and changes in established control flows may be introduced.

Data Integrity

Different message formats on different parties will need mappings to ensure content integrity.

Technical Integrity

Different channels, protocols and messages have to be orchestrated to keep all parties connected to the business integration process.

Security

It has to be assured that the desired partner is reached, data holding information needs encryption and validation.

Cost estimate

It is necessary to keep track of resources (e.g. time and money spent) to evaluate the cost-benefit ratio.

2.2 Why and how should blockchain technology be used for business integration?

During the past decades, several technical approaches to business integration have been established.

In our understanding, the blockchain technology should be seen as an add-on to existing middleware[5] or cloud based[6] architectures, which have already

[5]Using Middleware, a central instance, also called the broker, resides in the centre of the network, and provides all message transformation, routing, and any other functionality. All communication between applications must flow through this hub, allowing the broker to maintain data concurrency for the network as well as enabling new connections to be added.

This approach delivers a central configuration repository and enables the applications to communicate asynchronously, without awaiting response from the recipient. Unfavourable, at the same time this central instance hast to be considered a single point of failure.

[6]Using a cloud based software solution for business integration means dividing a classical

replaced outworn point-to-point[7] architectures. [11], [12]

Looking back on the challenges to business integration presented before, we compare these different approaches with regard to their ability to meet these challenges (fig. 2).

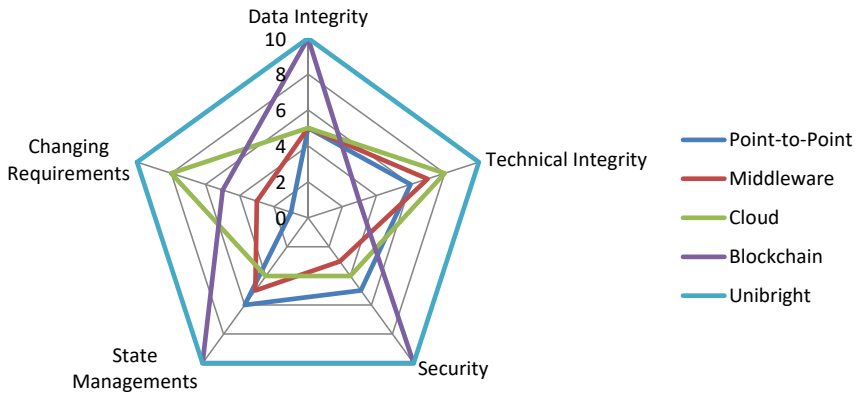

Figure 2: Meeting challenges on business integration

The Blockchain as a concept has clear advantages in some areas of business integration. Still it most probably will only be one part in a complete business integration scenario, having to be included in existing IT landscapes, of whatever state they are.

A blockchain infrastructure consists of an independent peer-to-peer network without a central instance. To be part of this infrastructure and to integrate with it, every party has to be part of the blockchain, meaning running or interacting with a blockchain node (fig. 3).

middleware solution into smaller units, that can be run as services in a distributed server landscape ("The cloud") connected over the Internet. These units may provide storage services like databases, computing, message queuing, caching and many more. Well-designed cloud based software solution are easily scalable and reproducible, to ensure fast adjustment when it comes to peak loads or to expanding the services to different areas of the world. The flexibility, scalability and cost-efficiency promised by Cloud computing has seen rapid acceptance within many stakeholders in the world of business integration. The dependency ("lock-in") on the cloud providing instance or company is enormous, in terms of availability as well as in terms of security and trustfulness about possible misuse of data and transactions.

[7]In a point-to-point model, a specific connector is implemented for each pair of applications or systems that have to communicate. This connector handles data transformation, integration, and any other messaging related services that take place between the specific pair of components it is connecting. When additional components are added to the infrastructure, the number of point-to-point connections required (and to be maintained) to create a complete integration architecture increases exponentially.

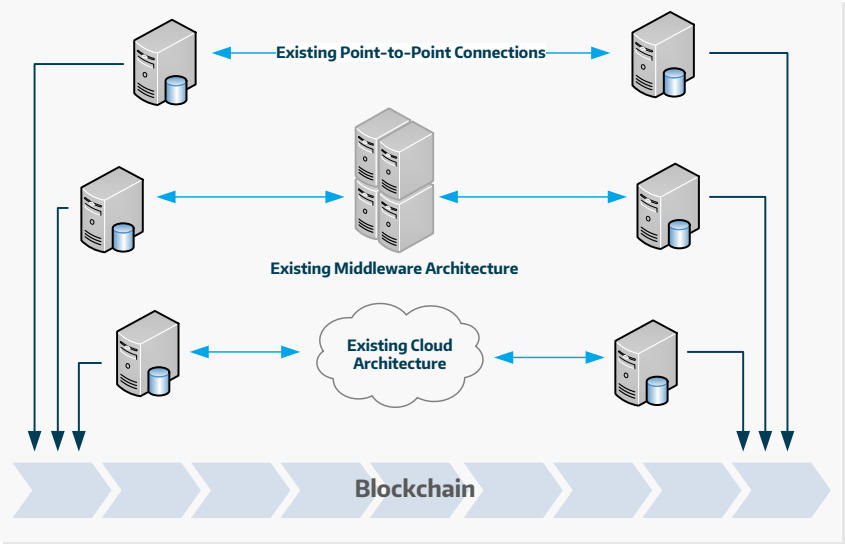

Figure 3: Including the blockchain in existing IT landscapes

In this setup, the blockchain is monitored all the time for new events or transactions. To use the blockchain as a part of a business integration system, the current information state of the blockchain can be harmonised with information from non-blockchain systems like ERP- and legacy-systems.

From a technical point of view, this means existing IT-infrastructure is connected to local blockchain nodes to interact with them, for example in calling functions in smart contracts or watching events raised and transactions performed by smart contracts.

2.3 Conclusion

To benefit from the promises the blockchain offers, we need a concept that allows us to integrate specific blockchain technologies into existing IT- and business integration landscapes, which leads us to the Unibright concept.

3 The Unibright Concept

3.1 The Unibright Software Architecture

The blockchain world is still a highly vibrant market, emitting numerous new cryptocurrencies or even new blockchains in short time.

Despite all the promising advantages of blockchain, there are some intriguing problems that exist with creating or coding smart contracts today. Generally speaking, programming smart contracts is complex and error prone and uses a different approach compared to existing programming for business software.

Today, creating smart contracts for a blockchain platform requires the usage of a specific programming language like Solidity for Ethereum. For companies wanting to use multiple blockchains this involves different programming languages which all come with their own requirements and shortcomings. Furthermore, extending and managing a smart contract is expensive and requires specialist knowledge, as user friendly or visually oriented tools are lacking in the field of smart contract development today.

To ensure reliable and enduring business integration based on blockchain technology, we need a superordinate concept of abstracting from specific blockchain implementations. This ensures adaptability and an indispensable level of abstraction. It also reduces dependency on single blockchains, taking into account that there will be new blockchain implementations, bringing their own smart contract syntax with them.

In terms of business process modelling these superordinate concepts already exist. We do not reinvent any wheel here, but adapt parts of those concepts for using them in a blockchain related environment: We describe business processes as workflows, as presented in previous chapters.

When it comes to smart contracts, we need a concept enabling us not only to abstract from a certain platform specific implementation, but also from the type of a smart contract - smart contracts differ with regard to their function or role in the distributed application: A smart contract can operate as data storage, as a dispatcher, as a state machine, as a factory generating new smart contracts and many more.

In our vision, a smart contract can be executed in different blockchain implementations and can be integrated in different types of enterprise system landscapes. Although our current implementations work on the Ethereum blockchain, our concept enables us to be blockchain agnostic.

To combine these different levels of abstraction, we introduce a combination of Contract Interfaces, use case related templates and generation of multi-inherited smart contracts and smart adapters. The basic underlying concept is

the Unibright Contract Interface, which is presented in more detail later.

3.2 Unibright Application Level

We defined a set of system components supporting all phases of a business integration process. This helps us to abstract from the different roles in a business process, to address different levels of (expert) knowledge and to attend different execution domains:

- Business integration workflows are designed locally with the *Unibright Business Workflow Designer*.
- The automatically generated code is deployed, maintained and updated as Smart Contracts into a specific blockchain by the *Unibright Contract Lifecycle Manager*.
- Existing Unibright conformant smart contracts are monitored and queried by the *Unibright Explorer*, using automatically generated Smart Query Sets.
- Business processes, IT and ERP-Systems in the enterprise domain as well as other blockchains are integrated by the *Unibright Connector*. *Smart Adapters* using automatically generated configurations enable standardized connections via common technologies. The included *Mapping engine* transfers interface defined objects into domain specific objects for further processing.

These applications focus on business process and workflow specialists, software architects, blockchain developers and domain IT specialists in equal measure, assuring that the particular expert knowledge can be used without requiring expert knowledge in all of the other domains.

3.3 The Unibright Contract Interface, Templates, Use cases and Smart Contracts

The central part of the Unibright ecosystem will be the *Unibright Contract Interface (UCI)*:

The UCI defines the main structure, state variables, mappings and methods which every generated Smart Contract automatically implements, thus marking a smart contract Unibright conformant. It is the irremovable guarantee of recognizing smart contracts as part of the Unibright ecosystem, ensuring that Unibright conformant smart contracts can be found, called, maintained and connected.

Content-wise, the UCI will offer the fundament to integrate smart contracts into different blockchains and system landscapes.

Operators of the Unibright ecosystem will be able to visually define workflows and choose from a set of Templates. Templates pre-define typical business workflows on a high level of abstraction. By choosing a certain template, the operator will be automatically given a suitable subset of all available workflow tool set items and an initial example workflow which can be customized to the needs of a special use case.

Each template is supposed to bring its own purpose-built interface, which the generated smart contract will implement in addition to the basic Unibright Contract Interface (fig. 4).

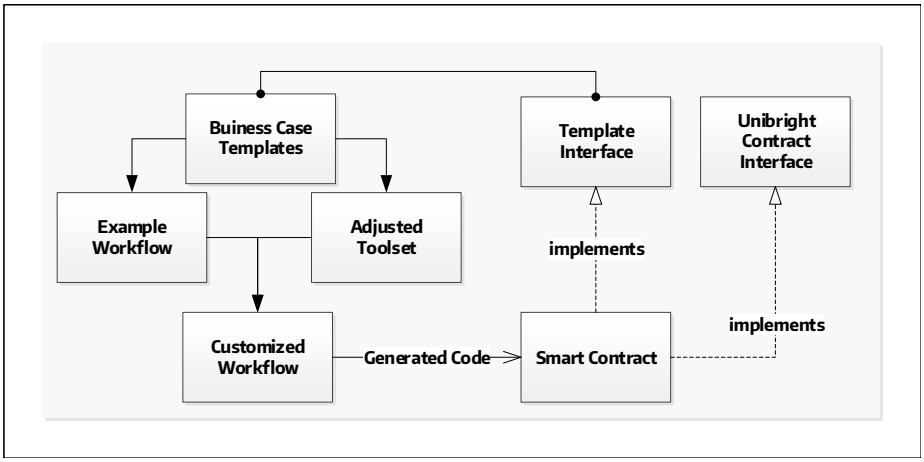

Figure 4: Inheritation Hierarchy

Technically, smart contracts are small computer programs, coded in a blockchain specific high-level programming language. These languages will differ in their syntax, but will share common paradigms of structural and object oriented programming. Some of these paradigms will be assumed in our concept to work, like the existence of primitive datatypes like strings, integers or bools, the possibility to unite a set of primitive datatypes in some kind of structure (structs) and to define functions working on these datatypes and optionally returning values.

The set of templates will be constantly enhanced to serve other use cases and different industries.

3.4 The Unibright smart contract lifecycle

Smart contracts are enclosed code-blocks, stored and executed in a blockchain. Unibright will offer standardized, abstract views and control mechanisms on top

of any specific blockchain technology to create a set of automatically generated smart contracts for each specific business workflow. All Unibright conformant smart contracts will implement the Unibright Contract Interface, which ensures logical access in every layer (fig. 5).

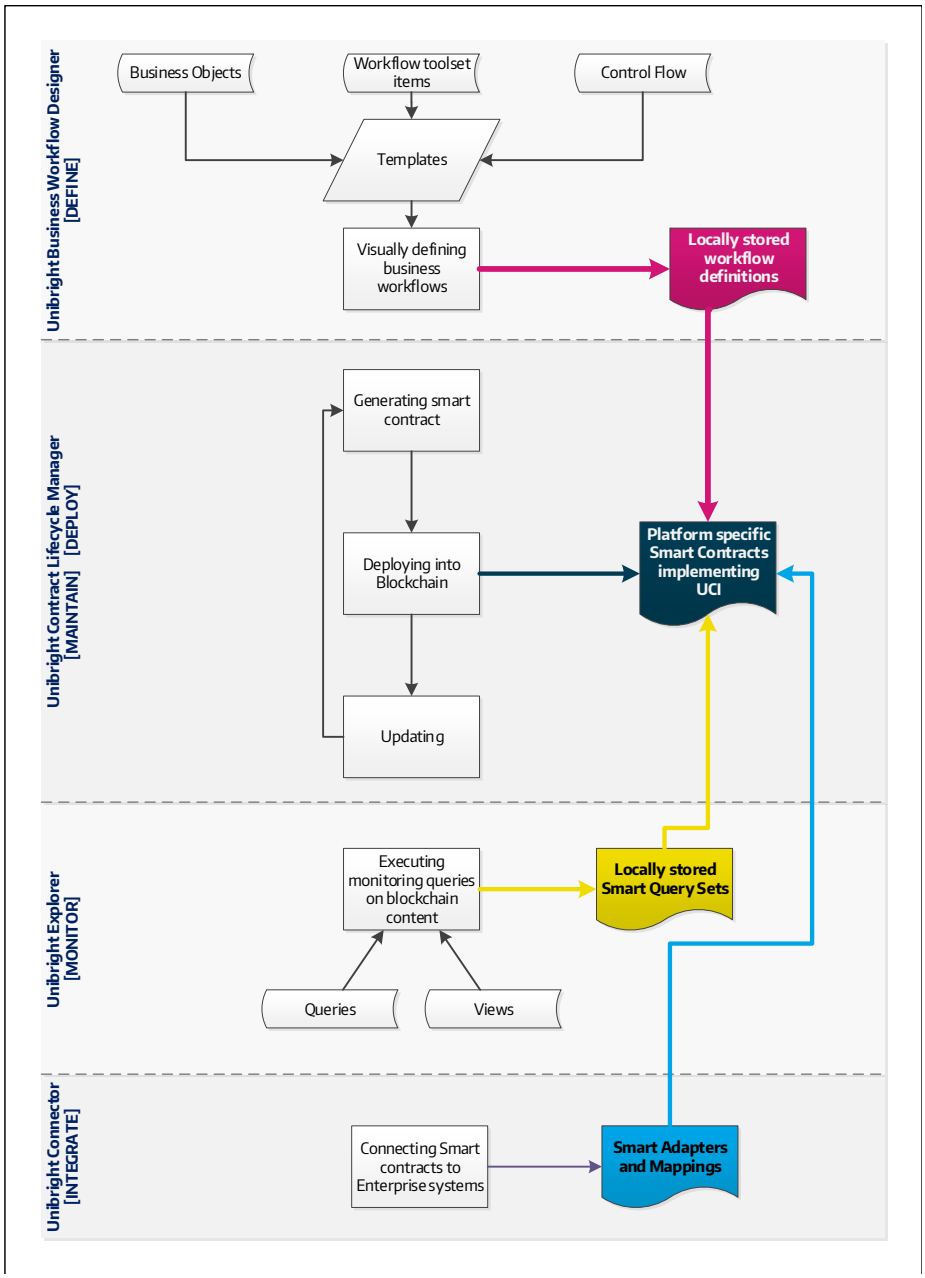

Figure 5: The Unibright smart contract lifecycle

3.4.1 Defining Unibright conformant business workflows

Business workflows are based on use case specific templates, which include an adaptable basic workflow and corresponding workflow tool set items. By selecting the appropriate template for a business use case the user will be able to build his specific needs on top of the already existing base logic coming from the template. He will be able to do this visually, with the Unibright Business Workflow Designer (fig. 6), so no programming skills are needed. The resulting workflow definition is blockchain independent, saved locally and can be compiled to different blockchain platforms.

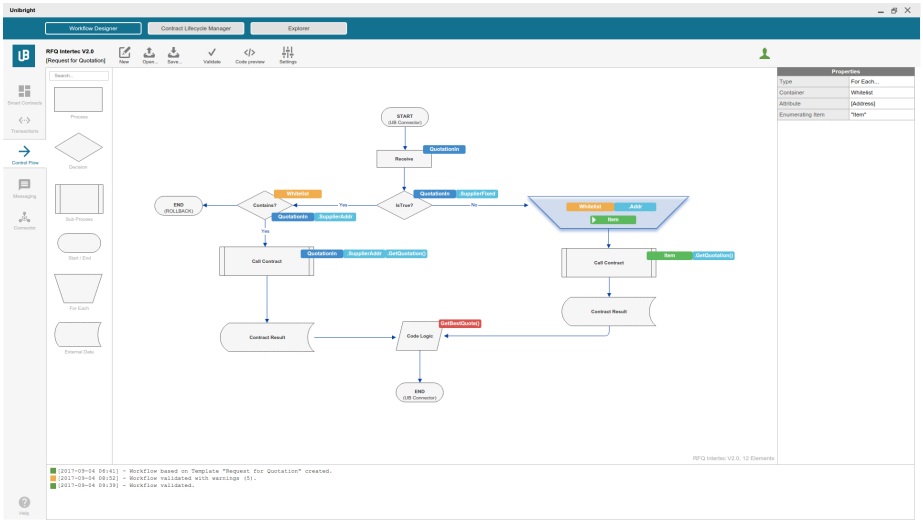

Figure 6: The Unibright Business Workflow Designer

3.4.2 Generating, deploying and maintaining Unibright conformant smart contracts

Each template will bring its own interface defining basic attributes and functions to be implemented by a blockchain specific smart contract. For example, some workflow templates may include the interface "Delegable" which prepares the routing of function calls to other smart contract instances.

The Unibright Contract Lifecycle Manager (fig. 7) will be the tool to generate, deploy and maintain Unibright conformant smart contracts.

After having defined a specific workflow based on one or more Unibright templates, the user will be able to compile the workflow definition to a blockchain specific implementation. At the time of writing the first blockchain environment to be supported is Ethereum; thus the compilation leads to Solidity code.

After its creation, the smart contract will be deployed to its destined blockchain. Moreover, an update or adaption of the deployed code is possible. Referring to

the example above, smart contracts implementing the Unibright "Delegable-Interface" can be marked as outdated and be replaced with a new version. Existing smart contracts can also be paused or terminated if needed.

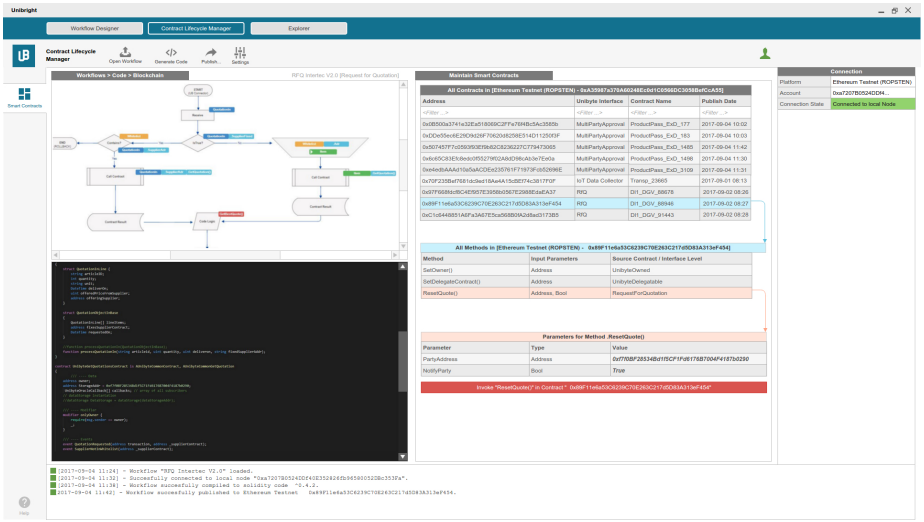

Figure 7: The Unibright Contract Lifecycle Manager

3.4.3 Exploring and querying Unibright conformant smart contracts

Those smart contracts being published to a "real world"-blockchain will be queried and monitored in a blockchain independent manner with the Unibright Explorer (fig. 8). The user will be able to see all data and transaction flow of all their deployed, Unibright conformant smart contracts in one place.

Reoccurring queries, composing information from different smart contracts will be be saved locally as query sets. Queries might be assembled to views and also contain conditions. An example for such a specific query in the context of a shipping process monitoring could be *"Show all containers registered in Hong Kong within the last month with a reported temperature more than 30 degree Celsius"*.

A first set of Smart Queries is automatically generated based on the use case related template used for the integration workflow.

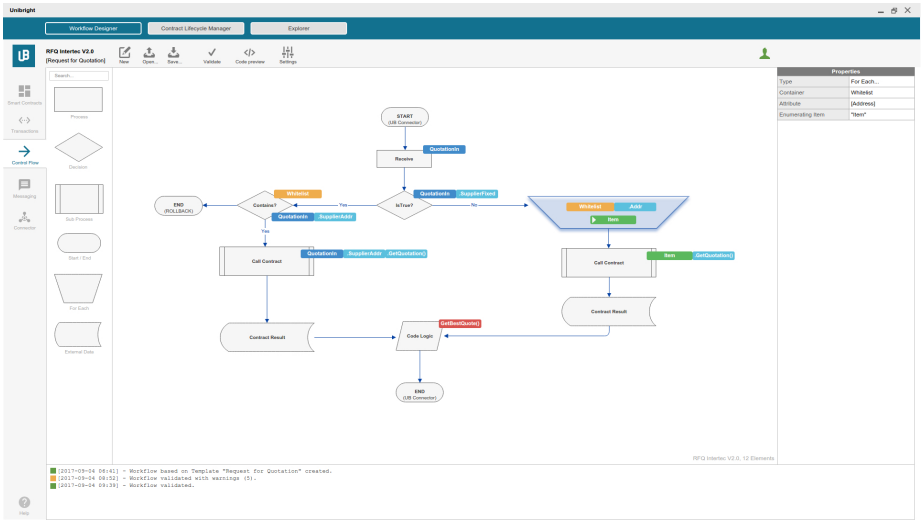

Figure 8: The Unibright Explorer

3.4.4 Connecting and integrating Unibright conformant smart contracts

The Unibright Connector aims to connect existing IT-landscapes and separated IT-systems to the blockchain world. *Smart Adapters* encapsulate communication technologies to different target platforms (ERP systems or other blockchains) via different channels (RFC, REST, SOAP, WebServices [13], ...). Their initial configuration will be automatically generated based on the systems designed in the basic workflow.

Off-chain systems, like SAP ERP or SAP PI, can be connected to be part of blockchain based business integration. For example, programs residing in a SAP-System will be able to call functions in Unibright conformant smart contracts, using the standardized communication channels offered by the suitable Smart Adapter (fig. 9).

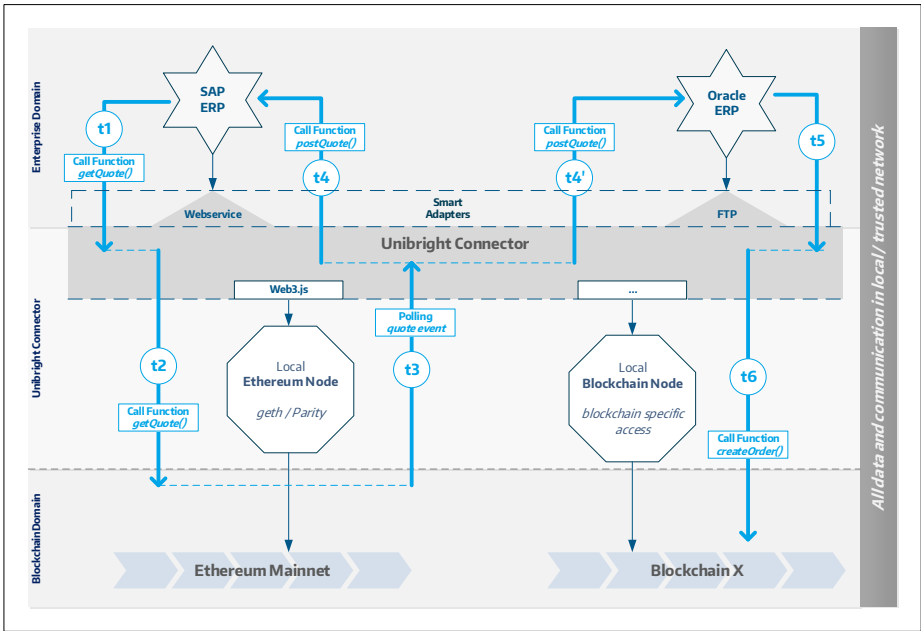

Figure 9: The Unibright Connector Architecture

The Unibright Connector also enables the subscription to events raised by Unibright conformant smart contracts in a specific blockchain. A smart contract can trigger actions by being polled by the connector which forwards these actions to all subscribed receivers (fig. 10).

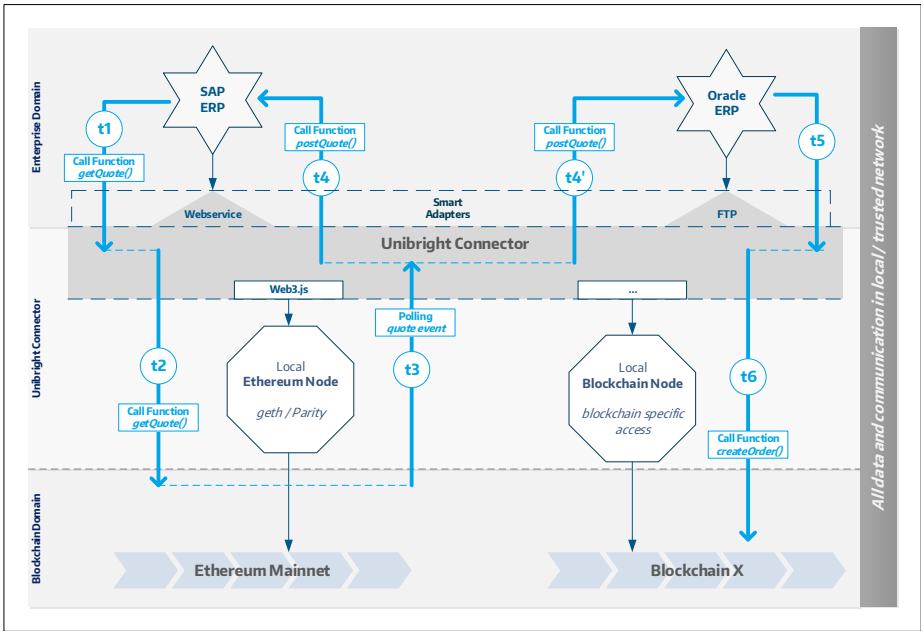

Figure 10: Process Sequence viewed from the Unibright Connector

The Unibright connector contains an xml based, configurable *Mapping Engine* to ensure smart contract data is applicable to IT-system specific objects.

The Unibright Contract Lifecycle Manager as well as the Unibright Explorer use the Unibright Connector to connect to the relevant blockchain.

3.4.5 Orchestrating Unibright workflows - Cross Blockchain Business Integration

As explained above, visually defined workflows will be automatically rendered into platform specific smart contracts. Multiple workflows might be orchestrated to a complete business integration scenario by automatically rendered smart adapter configurations. This will enable integration scenarios with more than one blockchain involved (fig. 11).

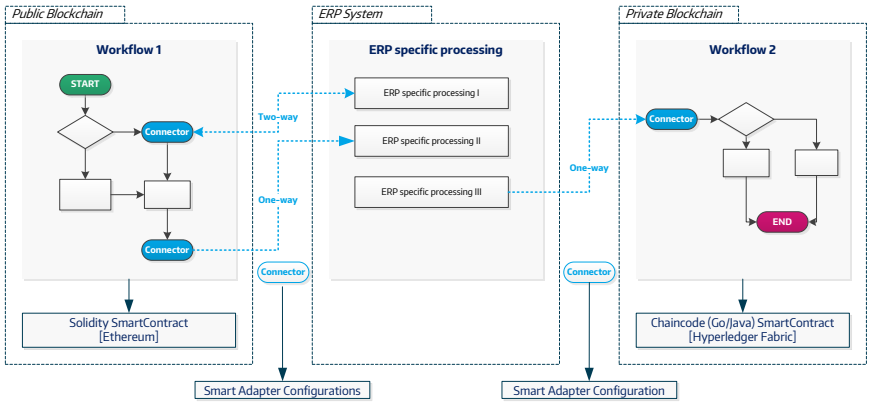

Figure 11: Orchestrating workflows

For example, a global player demands to set up a private blockchain in a non-trustful environment. The smart contract implementing the (partial) business workflow defined for this area can be connected to the company's ERP system. This system may be connected to another (public) blockchain, holding another Unibright smart contract. Both smart contracts are generated automatically out of visually defined workflows, even if they address completely different blockchain implementations. The Smart Adapters in the Unibright Connector are meant to ensure a smooth integration. Their configuration can be generated automatically by defining the system boundaries and involved systems in the respective workflows.

We want the Unibright software architecture also to allow to automatically render workflows into platform specific, non-blockchain code, e.g. a SAP specific workflow configuration (fig. 12). This will be subject of further research and development.

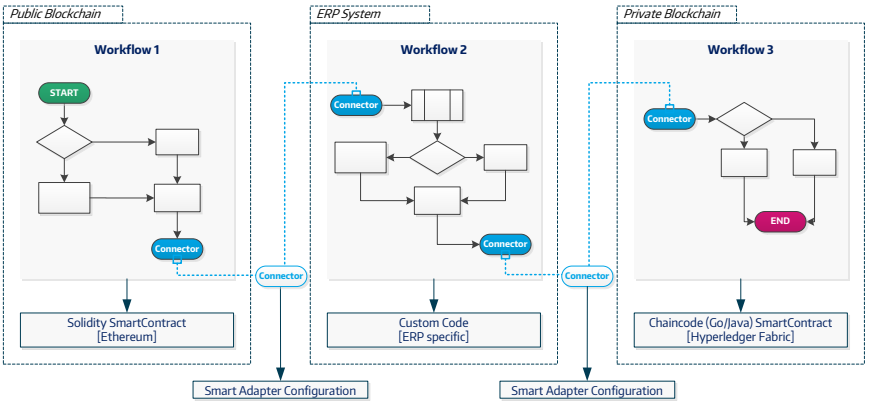

Figure 12: Generating non-blockchain code

3.5 The Unibright Ecosystem

Striving to be the first framework provider for unified blockchain based business integration, the Unibright ecosystem will bundle all components needed to empower the business integration lifecycle.

- Use case related business objects, conditions and actions are orchestrated into template based workflows with the *Unibright Business Workflow Designer*.
- A template holds a template specific interface, which is implemented by a smart contract in addition to the Unibright Contract Interface (UCI), and is then deployed into and maintained in the blockchain by the *Unibright Contract Lifecycle Manager*.
- All Smart queries and monitoring tasks on the smart contracts (by *Unibright Explorer*) are working against the Interfaces, abstracting from the blockchain domain specific implementation.
- Smart contracts can interact directly with a specific blockchain, or interact with enterprise systems and other blockchains via the *Unibright Connector*.
- The *Smart Adapters* (included in the Unibright Connector) encapsulate communication channels suitable for specific systems that have to be integrated.
- The *Mapping Engine* (included in the Unibright Connector) transfers interface defined objects into domain specific objects for further processing.

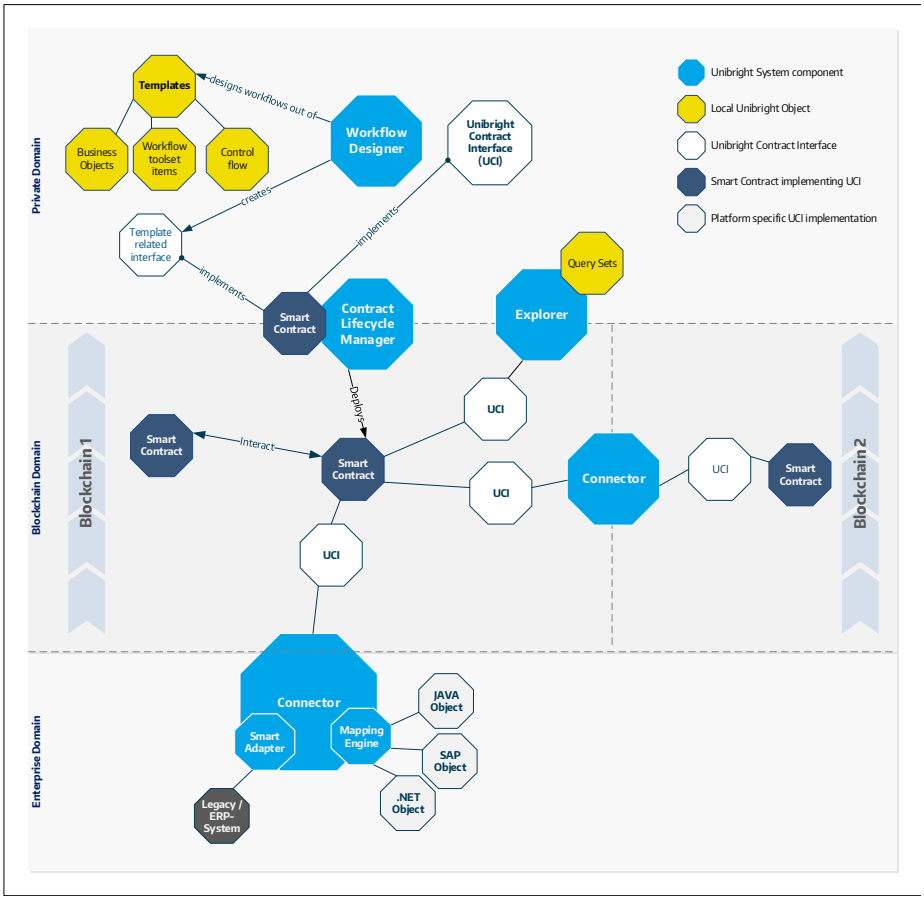

Figure 13: The Unibright Ecosystem

4 Implementation Details

The implementation of all Unibright components follows the central concepts blockchain technology offers. Disintermediation, security and transparency are foundations of all components. All data and transaction flow during design-time and runtime of Unibright conformant smart contracts will stay in the respective user domain.

The Unibright Contract Lifecycle Manager and the Unibright Explorer will interact with the local node to maintain smart contracts or query contracts via the Unibright Connector. The Connector is supposed to enable interaction with Unibright conformant smart contracts by interacting with the local blockchain nodes residing in the respective company's domain (fig. 14). By interacting only with local nodes, we use the communication pattern that most of the applications interacting with blockchain use, like wallets or mining software.

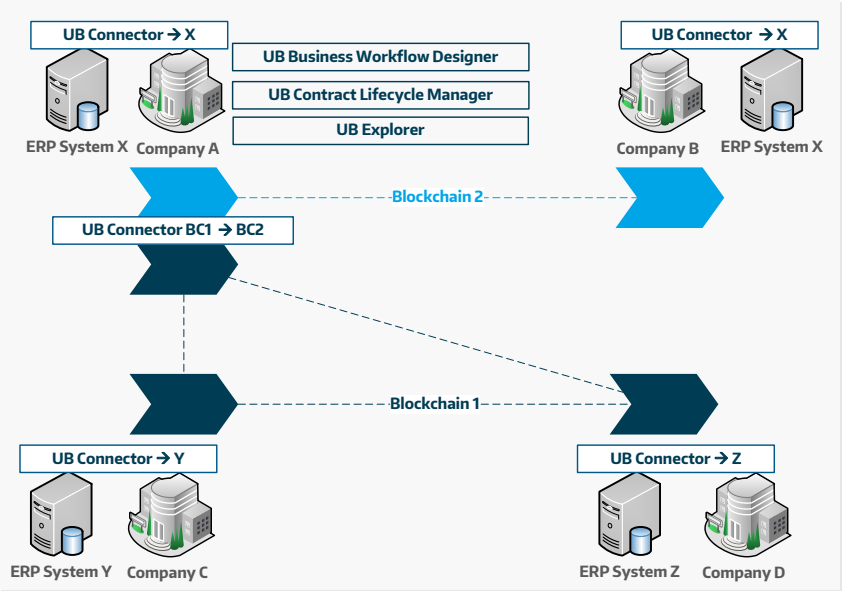

Figure 14: Business Integration with Unibright system components

For a company leveraging the Unibright framework there is no trust needed for a third party. The company can keep total control of all the information and data used.

Currently the Unibright system components are focusing the Ethereum environment, using the web3.js library for communicating with the local blockchain node. Other blockchain technologies will be evaluated and added to the Unibright framework as they gain market relevance.

5 Examples for blockchain based business integration with the Unibright Framework

This section illustrates some examples of real-world business integration scenarios which could benefit from the outstanding advantages of blockchain technology and the Unibright framework.

We envisage that all use cases can be implemented by setting up on Unibright workflow templates. The designed workflows result in automatically rendered Unibright conformant smart contracts for various blockchains which then can be connected to off-chain IT landscapes.

5.1 Get Quotation for Material

(*Request for Quotation*-Template)

5.1.1 Challenge

A purchaser needs to reorder a certain material. The requirement is determined in the purchasers backend ERP-System.

5.1.2 Unibright solution

A Unibright conformant smart contract triggers potential suppliers to get a quotation on the required material, providing additional information like the requested quantity, a desired delivery date and a proposed prime cost.

Potential suppliers are able to decide on the offer by direct interaction between Unibright conformant smart contracts (e.g. neglecting all Requests under a certain volume) or integrating an off-chain backend system via the Unibright connector (e.g. starting capacity planning workflows in SAP).

5.1.3 Envisaged benefits using the Unibright framework

The blockchain technology enables automatic interaction between different smart contracts without intermediation, secure and reproducible. The compatibility to the Unibright Contract Interface allows these smart contracts to be connected to enterprise systems.

5.2 Product Pass Approval

(*Multi Party Approval*-Template)

5.2.1 Challenge

A jewellery company develops new necklaces which are about to be manufactured abroad, and then distributed by the company-owned web shop. The approval process involves different departments and consists of different steps. Some of these steps are dependent on the fulfilment of other steps, and some are accomplishable independently.

5.2.2 Unibright solution

Unibright conformant smart contracts interact by setting states of their respective approval. The current state of the approval process is accumulated in a central smart contract which holds the control flow and implicitly decides on the final approval state.

5.2.3 Envisaged benefits using the Unibright framework

The current state of the approval workflow is implicitly represented by the available blocks in the blockchain. The blockchain acts as a state-machine: secure, reliable and deterministic. The Unibright Explorer can be frequently used to check the current state of the approval process, showing the complete information flow of all participating parties.

5.3 Shipping Process Monitoring

(*Data Collector*-Template)

5.3.1 Challenge

In an Internet of Things (IoT)[14] enabled plant, different types of sensors on trucks, machines and containers deliver information on the current state of a shipping process. These pieces of information have to be collected and displayed properly.

5.3.2 Unibright solution

The different actors interact with Unibright conformant smart contracts to update the ongoing shipping process and show the respective states of the involved entities.

5.3.3 Envisaged benefits using the Unibright framework

The blockchain acts as an immutable data keeper, secure and reliable. The Unibright Explorer can be used to supervise the ongoing process, improving the

speed of analysis and the quality of tracking.

5.4 Tracking of resources during a production process

(*Batch tracing*-Template and *Data Collector*-Template)

5.4.1 Challenge

A manufacturing company in the food industry wants to enable backtracking of all raw materials used in a final product, a bottled lemonade. Parts of this production process are the mixing of basic ingredients delivered by different suppliers and identified by electronically readable lot numbers. The final product is bottled and sold in various tray combinations to resellers and restaurants. By the mention of a unique identifier on each sold tray combination the company wants to be able to name all original lots of the raw materials.

5.4.2 Unibright solution

All goods receipts, their usage in the production process and their merging into the final product are inserted into the blockchain as Unibright conformant smart contracts.

5.4.3 Envisaged benefits using the Unibright framework

Locally storable query sets in the Unibright Explorer enable the user to find specific information about lot usage in the production process. The blockchain is both acting as data keeper and as a state machine representing the current state of a production process.

5.5 Invoice release

(*Multi Party Approval*-Template)

Once an Invoice with all its information is entered into the Unibright conformant smart contract, the contract analyses the invoice, decides which approvals are needed and interacts with other smart contracts to request the needed approvals.

5.6 Aircraft Production History

(*Asset Lifecycle*-Template)

The Unibright conformant smart contracts generated for this business case enable the user to keep track of ownership transferals, maintenance and repair history and logs special events like damages or refurbishments in the complex

lifecycle of an aircraft production. For all parties getting in touch with the final product (e.g. the airline using the aircraft to offer a specific flight) the safety and reliability of the involved aircraft is traceable in a trustworthy environment.

5.7 New Hire

(*Multi Party Approval*-Template and *Project Management*-Template)

The Unibright conformant smart contract gathers required information on the applicant (a "background check") and decides upon pre-defined rules and additionally requested data if an applicant qualifies for a personal interview. The smart contract can trigger notifications, request needed approvals and automatically send confirmations to the applicants and the Human Resource Department.

5.8 Insurance claim processing

(*ClaimProcessing*-Template)

The Unibright conformant smart contract performs error checking, initiates approval workflows and calculate pay-outs based on the claim, the underlying policy and the event occurring. Based on this template the smart contract can even pay out automatically against the insurable event without the policyholder having to a make a claim or the insurer having to administer the claim.

5.9 Milestone based project payment

(*Milestone Payment*-Template)

The Unibright conformant smart contract continuously checks defined milestone conditions for payments that should be made. This enables all parties involved in a project to agree upon a payment plan based on terms that are executed reliably by the Unibright conformant smart contract.

5.10 ...and many more

More business integration challenges can be met by deriving workflows from a growing number of Unibright templates. Updates will be presented on the Unibright website and the corresponding blog. The shared underlying concept of the Unibright Contract Interface ensures maintainability and connectivity.

6 Outlook

This document described the Unibright framework for blockchain based business integration. All the components needed for the complete business integra-

tion lifecycle have been presented and are available for usage in the Ethereum blockchain. The Unibright Connector enables ERP-Systems, third-party legacy systems and custom build software to be part of the Unibright framework. The foundation laid constitutes a complete ecosystem ready to be used for workflows using blockchain technology.

Regarding the implementation, we have to harden our technology to guarantee the top quality level we want to offer. Besides improving our existing components, we will create new templates for use cases we identify in different industries. In the medium term we aim to support other blockchain technologies besides Ethereum, like Stratis[15], NEO[16], Hyperledger Fabric[17], or whatever will arise in this vibrant technological environment.

The next steps to become the first and leading provider for blockchain based business integration are:

- Quality assurance of the existing components
- Create templates for use cases requested and identified
- Support other blockchain technologies besides Ethereum
- Develop new smart adapters
- Establish a marketplace for third-party developers to offer tools for Unibright conformant smart contracts

7 Token Sale

7.1 General

The Token Generation Event will create and distribute 150 million Unibright tokens. The Unibright Token is a token empowering the Unibright Framework:

- Unibright Token will be the only payment option to register Unibright conformant smart contracts. Only registered contracts can be published, maintained and queried using the Unibright framework.
- Unibright Token will be the only way of payment for our additional services, for example using the smart adapters provided by the Unibright connector to integrate existing ERP-Systems to the blockchain.
- Business specific templates or system specific smart adapters are meant to be traded on a still to be developed marketplace for add-ons. This marketplace will be powered by Unibright Tokens.

Symbol	UBT
Type	ERC20
Start date date token sale	April 10th 2018 at 1:00 PM UTC (14:00 CET)
Maximum Supply	150 Million tokens
Sold in public token sale	100.5 Million tokens (unsold tokens will be burned)
Price	1 UBT = 0,14 USD
Minimum Cap (including all pre-sales)	2,200,000 USD
Maximum Cap (public token sale)	13,542,375 USD
Accepted Cryptocurrencies	ETH, BTC, others via Shapeshift.io
Minting/Mining	No
Jurisdiction	Germany

Table 1: Key facts

We plan to launch the ICO on April 10th 2018 at 1:00 PM UTC (14:00 CET) and it will last for at most 4 weeks, ending on May 10th 2018 1:00 PM UTC or ending instantly when all tokens are sold.

The token sale will be managed by Ambisafe Financial (ambisafe-financial.com), one of the leading global blockchain services and initial coin offering solutions provider companies. Ambisafe has a track record of more than 15 successfully managed token sales with more than 55,0000 participants.

7.2 Token Sale Bonuses

- First quarter of tokens (25,125 Mio UBT): 10% bonus
- Second quarter of tokens (25,125 Mio UBT): 5% bonus
- Remainder of the tokens (50,25 Mio UBT minus bonus tokens): 0% bonus

Promo/Referral: Every token sale participant will receive a unique referral link. When sharing that link with other users, the participant will automatically get a 5% bonus transferred into his wallet from newly bought tokens using that referral link.

7.3 Token Distribution

- 67% in the public token sale
- 9% sold to early purchasers
- 6% to the team (locked up for 12 months)

- 12% cold storage liquidity reserve
- 6% legal / token sale expenses

7.4 Token Sale Proceeds Distribution

- (At least) 50% for platform development
- (Up to) 20% Template Generation for Business Use-Cases
- 15% for PR and marketing
- 15% setting up partnerships in industry, bootstrapping pilot customers

7.5 Token Compliance and regulation

Unibright is working with outside legal counsel to ensure compliance with relevant laws in its home jurisdiction, Germany, and internationally. Our goal is to be as compliant as possible within such a regulatory environment. Please note though that the national and international regulatory framework of blockchain and distributed ledger technology in general and related applications is in the process of being clarified and might change. It is possible that the interpretation and application of existing laws and regulations may be amended or adapted and could also be subject to legislative initiatives at national and international level. Clarification of and changes to the regulatory framework could adversely affect the Unibright, its products and Unibright Tokens without us having influence on such developments. That said, the contents of this document do not constitute legal advice and we encourage prospective purchasers with concerns to consult with an attorney. We expect the regulatory environment to evolve as the cryptocurrency space matures.

7.6 Knowledge required

The purchaser of Unibright tokens undertakes that she/he understands and has significant experience of tokens, blockchain systems and services, and that she/he fully understands the risks associated with the token sale as well as the mechanism related to the use of tokens (incl. storage). Unibright shall not be responsible for any loss of Unibright Tokens or situations making it impossible to access Unibright tokens, which may result from any actions or omissions of the user or any person undertaking to acquire Unibright Tokens as well as in case of hacker attacks or any other events.

7.7 Risks

Acquiring Unibright tokens and storing them involves various risks, in particular the risk that Unibright may not be able to launch its operations and provide the envisaged services. Therefore, and prior to acquiring Unibright tokens any user should carefully consider the risks, costs and benefits of acquiring Unibright tokens in the context of the token sale and, if necessary, obtain any independent advice in this regard. Any interested person who is not in the position to accept or to understand the risks associated with purchase, holding and use of Unibright Tokens as indicated in the Terms & Conditions of the token sale and further unknown and unforeseeable risks should not acquire Unibright tokens.

7.8 Important Disclaimer

This white paper shall not and cannot be considered as an invitation to enter into an investment. It does not constitute or relate in any way nor should it be considered as an offering of securities in any jurisdiction. The white paper does not include nor contain any information or indication that might be considered as a recommendation or that might be used to base any investment decision. This document does not constitute an offer or an invitation to sell shares, securities or rights belonging to Unibright or any related or associated company. The Unibright Tokens are just a utility token which can be used only on the Unibright platform and is not intended to be used as an investment. Unibright is not to be considered as advisor in any legal, tax or financial matters. Any information in the white paper is given for general information purpose only, and Unibright does not provide any warranty as to the accuracy and completeness of this information. Given the lack of crypto-token qualifications in most countries, each buyer is strongly advised to carry out a legal and tax analysis concerning the purchase and ownership of Unibright Token according to their nationality and place of residence.

This paper is subject to change. It will be amended from time to time to include further findings. Any amended versions of this paper will be published on our website; only the most recent version of the whitepaper published on the website is the relevant whitepaper.

References

[1] M. Pilkington, *Blockchain Technology: Principles and Applications.* research handbook on digital transformations ed., 2016.

[2] C. D. Clack, V. A. Bakshi, and L. Braine, *Smart Contract Templates: foundations, design landscape and research directions.* CoRR - Computing Research Repository - arXiv, 2016.

[3] https://www.sap.com/trends/blockchain.html, *SAP*, 2017 (accessed August 15, 2017).

[4] S. Nakamoto, *Bitcoin: A peer-to-peer electronic cash system.* 2008.

[5] V. Buterin. Ethereum: A next-generation smart contract and decentralized application platform, 2014.

[6] http://grandviewresearch.com/industry-analysis/blockchain-technology market, *Grand View Research*, 2016 (accessed August 15, 2017).

[7] http://fortune.com/2017/05/23/blockchain-chasm-of-death bitcoin, *IBM*, 2017 (accessed August 15, 2017).

[8] C. David, D. Guy, and F. Vernadat, "Architectures for enterprise integration and interoperability: Past, present and future," *Computers in Industry*, vol. 59, no. 7, pp. 647–659, 2008.

[9] A.-W. Scheer and M. Nuettgens, *ARIS architecture and reference models for business process management.* business process management ed., 2000.

[10] G. Mentzas, C. Halaris, and S. Kavadias, *Modelling business processes with workflow systems: an evaluation of alternative approaches.* international journal of information management ed., 2001.

[11] W. Emmerich, "Software engineering and middleware: a roadmap," in *Proceedings of the Conference on the Future of Software Engineering*, 2000.

[12] D. Yuri, C. Ngo, R. Strijkers, and C. De Laat, "Defining inter-cloud architecture for interoperability and integration," *CLOUD COMPUTING*, 2012.

[13] M. zur Muehlen, J. V. Nickerson, and K. D. Swenson, "Developing web services choreography standards—the case of rest vs soap," *Decision Support Systems*, vol. 40, no. 1, 2005.

[14] M. Atzori, *Blockchain-Based Architectures for the Internet of Things: A Survey.* 2016.

[15] https://stratisplatform.com, *Stratis Blockchain*, 2017 (accessed September 30, 2017).

[16] https://neotracker.io, *Neo Blockchain*, 2017 (accessed September 30, 2017).

[17] https://www.hyperledger.org/projects/fabric, *Hyperledger Fabric*, 2017 (accessed September 30, 2017).

unibright.io

team@unibright.io