DIGITAL PLATFORM

LIGHTPAPER

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ENSURING QUALITY THROUGH DIGITAL TRUST

Today, reliable product quality is key to being competitive in the market. Expectations placed on quality control and assurance in value chains are increasing. For most manufactured and distributed goods, quality control is either legally required or a prerequisite for payment by the partners along the value chain. At the same time, the Industrial Internet of Things (IIoT) is rapidly transforming value chains and manufacturing. It promises to unlock higher yields and efficiency, increase production speed, and make value chains more flexible. Given this reality, business cases based on, or involving machines, without human interaction, will start affecting our markets very soon.

The dilemma: quality assurance and control are still strongly human-based processes and therefore relatively manual, costly and prone to error. They require many measures to ensure trust, which is often based on audits, redundant control points, certificates, training, and multiple other efficiency-slowing, building blocks. Moreover, highly regulated privacy rules and regulations and even more incremental data payment business models are calling for novel solutions.

Opening a digital window in value chains

The solution we are developing provides a framework to create digital trust by simply translating human trust in quality control into a more efficient M2M interaction. Compared to current processes, this solution opens a 24/7 digital window to the "healthiness" of value chains, quality control and production environments.

Our novel, multi-patented technology, which is based on several blockchain layers, crypto anchors, digital certificates and smart contracts, will provide one "single source of truth". Aside from guaranteeing trust in M2M payments, audits, recalls, and other reliability and transparency-based data requests, this will also accelerate new (data) business cases between machines such as pay-per-part, pay-per-use and pay-per-performance, thus reducing human interaction to the benefit of our customers and their partners.

LACK OF TRUST and DISCONNECTED DATA IN LABS AND PROCESSES

Many **laboratories and companies** still operate in "data isolation" and don't adequately share data with their business partners. In companies, a lack of trusted data transparency along value chains is considered a root cause of multiple problems affecting end consumers and manufacturers alike.

- Isolated data silos lead to inefficient processes
- Lacking access to data creates inefficiencies along value chains
- Unrealized business potential from not harnessing the intrinsic value of data
- Complicated processes to meet standards and comply with regulatory requirements

Lack of trusted product data causes higher production costs, longer man-ufacturing cycles, inefficient pay-ment cycles and audit overhead. **In laboratories,** test results are often saved and shared in **paper or document form** adding many extra steps to QA/QC and testing procedures. The system allows a digital interface between the stakeholders of lab information that is secure and efficient.

Lab results are captured, signed, and tied to the test medium using a crypto anchor to ensure the lab results are permanently tied to the physical object being processed and to ensure that the data cannot not be tampered or altered afterwards.

Our technology allows detailed insight into the lab process for the stakeholders at any point in time, reducing friction, time and complexity of data access. Its unique architecture allows for precise regulation of data access to control what is shared with business partners.

Our technology also allows laboratories to add additional value to their services by making test results instantly available and more reliable.

bata and goods are now one

Our technology is designed to solve the complicated challenge of adapting the systems of thousands of companies and vendors in order to be able to communicate about value chains. However, our platform neither replaces your data infrastructure nor stores data itself. Instead, it makes them accessible to all involved parties, solving the following underlying challenges:

- Anchoring a physical object to a digital identity.
- Making this digital identity available for parties involved in a supply chain to attach and request data that is associated with this object.
- Ensuring that these parties have the matching set of permissions to access this data.
- Processing smart contracts to automatically fulfill agreements when conditions in a supply chain are met.

What process was used to test this product?

> Where is this batch of products? It needs to be recalled.

Who is liable for the heat damage to these goods?

Our platform does not necessarily contain the data but it does allow you to find the data you are interested in by establishing an index of parties that are involved.

All parties involved in the value chain are in control of their data and who has access to it:



Business network, process control software

Is now integrated into the whole product lifecycle and has access to detailed information.



QA/QC teams

Are directly able to communicate with the process and add value to their tests.



Regulatory bodies

Can access audit data without interfering in day-to-day operations and work with stakeholders to quickly assess situations.



Business partners

Can efficiently share data attached to goals while maintaining confidentiality and trust. Smart contracts reduce workload and increase productivity.

ENABLING DIGITAL PRODUCTS

Our digital product platform enables information and service exchange in supply chains and production environments.

Providing data and documentation with products is a standard practice that is required to ensure proper use, safety, and documentation. In many cases product information is a legal requirement. Leveraging crypto anchors, existing products can be expanded to include digital content and functionality.

Provide digital content

Through a digital twin, additional content can be included with a product. Certification, audit material, application information, and training information can be directly tied to a physical object, ensuring they are easy to find and unlocked for the right customer.

Provide strong proof of authenticity

A crypto anchor is next to impossible to clone or falsify. Customers can check the authenticity of products and work with confidence. Processes can reference the object identity in their resulting certificates, for example, using an authentic consumable in a test.

Integrate into processes and devices

We enable connected devices to interact with products. Process parameters can automatically be adjusted by the consumable data or stock information adjusted at the time of use. Pay per use models can be automatically processed.

Build a vibrant ecosystem

The digital product platform enables products to interact with each other and allows for new combinations, usage models and data exchange even between physically separated processes.



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THE DIGITAL WINDOW NINDOW INTO YOUR Value CHAIN

Today versus tomorrow

In the example below, the raw material supplier on the left sells a product to the manufacturer on the right. For the final product, quality checks in a lab are required.

These checks produce a CoA (Certificate of Analysis) that guarantees the quality requirements are met. Communication and decisions about the quality of products are currently processes handled by humans. In a highly automated supply chain, this can quickly become a bottleneck.

Because future quality must be assured digitally, we facilitate a process that is currently being carried out manually. We ensure that machines can communicate trustfully with each other by providing an M2M trust framework that enables automated quality workflows without human intervention



In the future





M2M TRUST FRAMEWORK

As humans, we have created a sophisticated toolbox to judge the quality of products. We use tools such as training, standard operating procedures (SoPs), quality tests, institutions, authenticity, and our own instinct to judge and determine if a product might pass a requirement. We have complex systems in place that are very precisely defined but can also judge the entirety of a situation. Machines currently have no access to these frameworks and cannot access the physical world in the way we do.

To ensure that machines can communicate trustfully with each other, we provide a M2M trust framework that enables automated quality workflows without human intervention, thereby leveraging several tools to facilitate the transition from manual to fully automated processes:







Crypto anchors

We leverage crypto anchors to create crypto objects, a patented technology that allows binding digital data with real-world anchors cryptographically. We call this a digital twin. Crypto anchors are next to impossible to clone or manipulate and are therefore suited to the high demands placed on digital solutions.

Digital certificates

Digital certificates can replace traditional paper certificates with a new digital counterpart. When a lab issues a certificate, it (implicitly references the consumables used, the operators' training, the SoP used, and many other data points. Currently, all of this data must be provided along with the certificate or furnished during an audit. A digital certificate can reference and validate all these data points automatically and instantly.

Smart contracts

To enable machines to make secure transactions between business partners, a suitable procedure needs to be in place. Today this is an SoP. We freeze procedures in a so-called smart contract. Our platform generates smart contracts automatically without any manual involvement of the contractual parties. Compared to a traditional computer program, a smart contract is constructed so that both or even more parties run the same program. However, there are mechanisms to make sure the computers are always in sync, meaning they do the same calculations on the same data all the time. The result of these calculations is key. It can determine the outcome of a lab procedure and therefore guide on significant monetary and legal value. The smart contract enforces that all parties follow the same guidelines and come to a consensus. The result of the smart contract is kept in a blockchain for further reference and to permanently freeze it.



Digital formats

Digital formats are the basis for exchanging data between parties. We are leveraging existing formats such as GS1 EPCIS for shipment information exchange or AniML for lab data.

These formats are designed for machines which makes them highly efficient and standardized. This gives them a significant advantage over traditional paper or PDF documents that can differ significantly and need human interpretation or redaction.

Our platform extends and connects these formats with cryptographic mechanisms to make them a reliable transport base to communicate with other systems in production or the lab. ADD A DIGITAL IDENTITY TO YOUR LAB RESULTS

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THE LAST DIGITAL MILE

Connecting to the physical world

Through our anchoring technologies and gateway device we can bridge the last di-gital mile to enable a secure and tight coupling between the digital and physical world



Digital	Digital twins of physical objects and processes	
Cyber-Physical	Anchoring technologies	Gateway device
Physical	Products, goods	Connected lab equipment



PROCESS COMPANION

The companion brings workflows and objects into the digital world.

The companion is used to collect data and act in the physical world. It provides several sensors and connectivity options to enable operators to carry out digital SoPs.

The first version of this device comes with a reader for our Securalic® Security pigments and various contextual sensors (e.g., location, QR-, Data-Matrix-Code reading, Biometrics).

The companion is fully integrated with the Gateway. In combination, the two devices form a powerful toolkit for in-field applications.





Digital Gateway

The Gateway is the door for external devices and services to the system. It is at the core of our interoperability strategy to enable true M2M efficiency.

The Gateway handles the process of establishing a secure connection over Wireless or Wired network connections. It has a broad range of interfacing options like Bluetooth, UART, Serial, and inter-circuit interfaces. The device is designed to be a drop-in fit into existing systems to quickly provide support without much interference.

Crypto anchors

Crypto anchors are the technologies that are used to securely identify and also authenticate objects. They feature a way of identifying each object individually and are virtually impossible to clone. This makes them perfect for guaranteeing that a products identity remains intact.

Securalic®

Securalic[®] Taggants are already incorporated as proof of authenticity into a wide range of our existing Healthcare and Life Science products as well as into a variety of industrial and consumer products.

The Companion is capable of detecting and identifying Securalic[®] Taggant directly on the product.

Securalic[®] customers are brand owners from many different industries such as pharmaceuticals, luxury goods, tobacco, OEM parts, automotive parts, etc.





As a worldelass science and technology company, we can provide an extensive product offering for security and brand protection that could also be used for incorporation into future applications.

Securalic[®] Reveal Taggants are incorporated directly into the product material itself or applied to the surface of the product; for example, into the masterbatch of plastic components, as a constituent of various coatings, printing inks, fibers and banknotes. Invisible to the eye, the taggants used in Securalic[®] Reveal can only be detected using speciastensors.



P-CHIP[©]

is a digital crypto anchor that uses a micro transponder to enable the identification of an object.

The chip itself is $500x500x100 \ \mu m$ in size and is powered using a photocell. A laser or LED is used to deliver power and clock pulses to the chip. This design allows the p-Chip to achieve a remarkably small footprint as no induction coils or oscillators are necessary. The technology is quick enough for most in-line applications and is also able to be used in bulk-reading scenarios using specialized readers.

The p-Chip reader is connected using the Gateway.

(i) The p-Chip is roughly 100x smaller than the picture on this page.

CREATED WITH LEADING EXPERTISE

More than 350 years ago our company began pushing the boundaries of possibility. Ever since then we have been discovering and developing technologies that can change the landscape of entire industries. Through our innovations we aim to businesses. build next-generation Based on our company's expertise and assets we discover and scale up exciting technologies and business models.

We are a renowned provider of core technologies, materials and services for anticounterfeiting, brand authentication, security and tracking of physical assets. Through our company's innovations, we are further expanding core business strategies, intellectual property (IP) and technologies to include both physical and digital assets applicable to web, Cloud and distributed ledger ap-plications, enabling a digital project platform. Our company is the owner of the patent families "Composite Security Marking" and "Reader device for reading а marking comprising a Physical unclonable Function". Together, these patents explain the overall concept of developing an unclonable ecosystem and provide the overall requirements for the physical and digital architecture of the ecosystem. The systems described in this Lightpaper apply and illustrate our company's expertise in security materials along with the broad market knowledge and access of our Healthcare and Life Science business sectors, as well as in many additional industrial value chains.

Life Science

- Tools and laboratory supplies for research and biotech production.
- >300,000 stockkeeping units, including biochemicals, protein technologies, reference materials, supplies, tools.
- End-to-end workflow support for Biolabs.
- Pathogen testing and hazard avoidance in the food supply chain.
- Track-and-Trace capabilities for regulated industries.

Healthcare

- >60 million patients around the world use our products daily.
- Market leading brands, e.g. Concor®, Euthyrox®, Glucophage® and Saizen®
- Market leader in fertility drugs and integrated fertility treatments

Electronics

- Liquid crystals, OLED materials
- Antireflective coatings
- Next-gen materials
- Coatings, effect pigments, laser markings
- Counterfeit protection



CURIOUS? GET IN TOUCH

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