

# Piloting of Smart Billing Platform results in productive go-live

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## Introduction

During the process of developing the user journeys and the prototypes for the 3 use cases outlined in the Grant 645: Smart Billing Platform Prototype, the system was discussed in detail with a large invoicing and debt collection corporation in the Netherlands as well as some other business stakeholders.

As a result of these deliberations, one client intends to build a full-fledged productive system incorporating these use cases. Initially the system will focus on the first use case “invoice verification” and the second use case “smart billing”. It is envisaged to bring all 3 use cases into production. The intended system would make a larger use of the Casper blockchain and IPFS, than the current state of the prototype submitted in Milestone 3.

Due to the competitive nature of the business and the custom twist, that the client intends to put on the use cases, the client wishes to remain unnamed and keep any client specific enhancements to the system confidential until the system is released later this year.

Nonetheless, this document will summarize some of the key findings that were made during the piloting and discussions of the use cases in the above grant with the client and other involved business parties.

## Background Information:

The 3 use cases which were covered in Milestone 3 addressed the following 3 problems:

### 1. Invoice Fraud

Today, invoices are usually sent as PDFs or UBLs via email or via a web platform, which, however, is subject to increasing fraud. This has become a serious issue over the last years and individuals and companies lose hundreds of millions to billions of euros per year due to fake invoices in the Netherlands alone.

## **2. Lack of clarity and transparency for underlying contracts**

The lack of clarity about invoices poses challenges in debtor management and collection. Often, there are disputes, e.g., about whether an invoice is due for payment or whether the deliverables as specified in the underlying contracts between the creditor and the debtor have been properly delivered. The lack of clarity about invoices leads not only to significant inefficiencies in debtor management and collection due to the frequent manual interventions, but also to unsatisfactory client experiences.

## **3. Illiquid trade finance markets**

Liquidating invoices is a long-winded process and often requires complex and expensive refinancing through banks. The valuation and risk assessment which are necessary to facilitate the trading of invoices requires specialized knowledge. Contracts for these trades are complex and usually not standardized. All this results in an illiquid market.

The Smart Billing Platform prototype that was built in Milestone 3 of Grant 645 addresses the above problems in the following way:

### **Detailing of the three Use Cases**

#### **1. Invoice Verification Engine**

Suppliers can upload invoices in the form of a Universal Business Languages (UBL) file to the Smart Billing Platform. The Platform then structures each submitted invoice in the form of a smart contract between the supplier of the invoice and the Smart Billing Platform on the Noumena Platform and furthermore makes each invoice in the form of a signed and encoded JSON available on IPFS.

Recipients of the invoice can then upload the same UBL file, which they receive through some electronic format from the supplier, directly to the API of the system or through the user interface which is publicly available through /verify-invoice on the platform. The system compares the uploaded invoices to its records based on the invoice values and informs the recipient whether the invoice is known to the system and all values coincide with the values submitted by the original supplier.

For an additional level of trust and security, recipients can also compare the invoices directly to the immutable record of the invoices provided on IPFS. For which the supplier can pass along the link to the IPFS record to the receiver together with the bill.

The DID management smart contract from Milestone 2 is used to delegate the right to sign and upload the invoice to IPFS for this and all subsequent use cases. For more details on this smart contract see the following [README file](#).

#### **2. Smart Billing Engine**

Modeling invoices as Smart Contracts ("Smart Bills") can overcome many of the challenges regarding the in-transparency of invoices and underlying contracts in debtor management: Smart Bills can contain the full data and logic required to validate and process invoices, providing the required transparency. Smart Bills are self-contained and - whilst derived - independent of the original contracts such that they can be processed by third parties without needing to know the details about underlying agreements that have been established between the counterparties in the past. Automated smart contracts that are aware of the underlying delivery by being integrated into logistics and ERP systems, can trigger payments whenever specific events (Milestones) within the logistics chain occur. This is possible even whilst sharing the minimal necessary private data through usage of DIDs, stored on an enterprise grade public blockchain like the Casper chain.

For this prototype, contracts and their milestones were modeled within the smart contracts of the Noumena Platform. Whenever a milestone is reached, invoices are automatically created and placed on IPFS for the verification through Use Case 1: Bill Verification

Given the highly individual and customized nature of milestones, the conditions to meet a milestone and the respective connectivity to IoT sensors such as GPS sensors are reserved for the implementation of an MVP of this solution. The implemented smart bills incorporate various logical checks, such as the completeness of milestones compared to the overall value of the contract and various date time related conditions.

### **3. Bill tokenization and factoring**

A secondary market for the trading of invoices has been created. Bills that are uploaded to the system by the supplier or that have been created by the smart contracts from the 2nd Use Case Smart Billing, can be offered on a Marketplace to potential investors. Upon purchasing these invoices, the ownership of the specific invoice is transferred to the buyer and the buyer now owns the debt represented by the invoice towards the original recipient of the invoice.

Through the use of the Nucleus Finance platform, described in Milestone 5 of this grant these invoices will be tokenized and made tradeable on the Casper blockchain itself. This prototype creates the foundation for that marketplace.

## **Conclusions through the testing and piloting with clients:**

Using the prototype submitted under Milestone 3, we have conducted a pilot with a large invoice management and debt collection business.

The overall feedback was very positive and resulted in discussions around making productive versions of these prototypes. The consensus seemed to be that there was a big market potential for these prototypes and they would add a lot of value to the current invoicing processes.

Some of the key conclusions that were reached are summarized below:

## Bill verification use case:

### 1. Seamless integration into customer systems

Due to the high volume of invoices created by business throughout the year, it is essential to directly integrate the system with the clients invoicing system. While the Smart Billing Platform can create a standardized API which is available for integration with client systems, it usually represents a significant effort and huge barrier of entry for clients to adapt their systems to connect to this standardized API.

For this reason, it is essential to build plugins for the most common invoice management systems such as SAP Invoice Management and Ariba.

### 2. Minimizing the effort to the invoice recipient

Invoice recipients do not want to deal with complicated cryptographic keys or administrative processes. In the case of B2C invoices, customers want to just be able to verify an invoice in the most simplistic manner as was built for the prototype, a drag and drop onto a trusted web portal.

For the case of B2B systems, batch processing and dedicated plugins similar to the ones mentioned for the invoice management systems above are needed.

### 3. Trusted central party & Transparency

The prototype which was developed is based on a single trusted party, which is the owner of the Smart Billing Platform. In order to maximize trust in the system and the owner, it is important that rigorous onboarding processes are followed when onboarding new invoice suppliers and that these processes are openly documented.

It would furthermore be advantageous, if the central party that provides the verification service had an accreditation or support of a global trusted body.

### 4. Extension of the system to additional formats

While the prototype only covers UBL formatted invoices, it should be extended to also include PDF based bills.

## Smart Billing:

### 1. Significant increase in transparency

Through the creation of a smart billing system as envisioned within the prototype of Milestone 3, transparency on contracts and milestones can be created across a company and its suppliers/partners.

One of the problems often faced when dealing with multi-milestone contracts, is that

different departments within a company as well as key stakeholders outside of the company are not always aware of the current status of the contracts.

While the project team might have submitted a milestone already, the finance department is unaware of this and has not yet created the invoice and the project stakeholder with the client still thinks that the milestone is in an initial phase.

Smart Contracts ensure that all stakeholders have exactly the same understanding of the contract and ensure that minimal overhead is needed for invoicing and milestone delivery, since such tasks can be automated by the smart contract.

## 2. Need for library of interfaces

While smart contracts with smart billing functionality can be immensely advantageous for simplifying business and reducing overhead, they require integration with a wide variety of systems ranging from invoicing systems, ERP systems, IoT Devices and manual human interfaces.

For such a scenario it would be useful to provide an easy to configure library of standardized interfaces together with the smart billing system that can be configured by the operators of the system to integrate with upstream and downstream systems and sensors.

A selection of interfaces could be: REST, SOAP, ODBC, JDBC, OData, MQTT and many more.

## 3. Extension to support the contracting phase

It would be useful for stakeholders if the Smart Billing system would be extended to also support the contracting phase. I.e. the provision of initial LOIs between parties, the creation and digitization of draft proposals outlining the intended milestones and permitting users to collaborate on the definition of the milestones and finally the creation of final and digitally signed contracts between the parties.

## Bill Tokenization

### 1. On-chain ownership with off-chain automation

While the tokenization of invoices on a blockchain such as the Casper blockchain provides significant advantages in proof and transfer of ownership, the automation of processes around the invoice such as automated reminders with interest rate calculation, creation of ceded invoices and possible recalls of erroneous invoices is rather cumbersome.

For that reason the system of a digital twin, where the off-chain token/smart contract representation of the bill manages the business logic around the bill and the on-chain

token affirms the ownership of the bill, has proven to be a very reliable and useful concept.

## 2. Regulations around invoice factoring

Factoring of invoices is a financial service that involves the purchase of accounts receivable from a company at a discount by a financial institution or factor. While factoring invoices can provide a number of benefits to businesses, such as improved cash flow and reduced credit risk, there are also regulatory issues that companies need to be aware of.

Some of the regulatory problems that companies might face around factoring of invoices include:

- a. Compliance with consumer protection laws: In some jurisdictions, factoring of invoices may be considered a form of lending and may be subject to consumer protection laws. Companies that engage in factoring of invoices need to ensure that they comply with these laws and regulations.
- b. Compliance with anti-money laundering laws: Factoring of invoices can be used as a means of laundering money or financing terrorist activities. Companies that engage in factoring of invoices need to comply with anti-money laundering laws and regulations.
- c. Disclosure requirements: In some jurisdictions, companies that engage in factoring of invoices may be required to disclose certain information to their customers, such as the fact that invoices are being sold or assigned to a factor.
- d. Tax considerations: Factoring of invoices can have tax implications for both the company selling the invoices and the factor. Companies need to ensure that they comply with all relevant tax laws and regulations.
- e. Usury laws: Some jurisdictions have usury laws that limit the interest rates that can be charged on loans. Companies that engage in factoring of invoices need to ensure that they comply with these laws.

## 3. Single vs multiple factoring of invoices

The question as to whether such a system should permit the multiple factoring of invoices came up multiple times. While invoices can be factored multiple times, the overall conclusion was not to do so. Here are some advantages and disadvantages of factoring invoices multiple times:

Advantages of factoring invoices multiple times:

- a. Factoring invoices multiple times can provide a business with additional funding, which can be useful if the business is experiencing cash flow problems.

- b. Factoring invoices multiple times can provide a business with greater flexibility in terms of when it receives funding and how it manages its cash flow.

Disadvantages of factoring invoices multiple times:

- a. Factoring invoices multiple times can be complex and time-consuming, requiring a significant amount of administrative effort.
- b. Factoring invoices multiple times can be more expensive than factoring them once, as each factor will charge a fee for its services.
- c. Factoring invoices multiple times can damage a business's reputation, particularly if customers become aware of the practice.

## Conclusion:

In conclusion, the testing and piloting of the Smart Billing Platform has been successful, and we are making progress towards bringing the first use case live into production. The platform is intended to be built on the Casper blockchain and IPFS, providing a secure and tamper-proof platform for billing and invoice management. We are also scoping and defining the second use case for a second contract and exploring opportunities for the third use case. The Smart Billing Platform has the potential to generate significant traffic on the Casper blockchain, and we are excited about its potential to help more customers facilitate their billing processes.