D13.13 – Final report on phase one developments of the Drugs free import demonstrator - summary

Executive summary

The Belgium demonstrator provides best practices in the following areas:

- Assess feasibility of and, if possible, initiate implementing so-called Utility Blocks: Domain-specific frameworks within Globally Networked Customs (GNC) for enabling an industrial implementation of e.g. mutual recognition agreements or procedures for systems-based controls to ensure the integrity of the supply chain. More specifically, potential benefits resulting from simplification of export and transit processes in long distance rail are addressed.
- Data sharing for supply chain visibility and control: This demonstrator will show the practical use of this solution, add additional parties and solutions to capture and share data, and explore the full extent of its benefit to roll out information services very quickly, thereby supporting agility of supply chains and reconciling customs and logistics requirements.

T13.1 is an operational demonstration on drugs free import called the Belgium demonstrator which focuses on demonstrating best practices in the areas of data sharing for supply chain visibility and control dashboard. This demonstrator shows the practical use of a supply chain visibility solution, add additional parties and solutions to capture and share data, and explore the full extent of its benefit to roll out information services very quickly, thereby supporting agility of supply chains and reconciling customs and logistics requirements.

This document is an intermediate report of CORE WP13, task T13.1. The main objectives of this report are:

- To review the use cases and measurement approach.
- To configure the solutions configuration, incl. the CORE capabilities.
- To Implement the B2B and B2C use cases, and ensure their interoperability.
- Validation of the results of the configuration & integration phase.
- To plan the demonstration execution cycles.

Problem, ambition and goal of demonstrator

Geographical scope

This demonstrator focuses on containerized coffee that is imported from Brazil and Colombia, arriving in a warehouse in Antwerp. From Antwerp the transport flow continues to customers in Belgium, Switzerland, Netherlands, Germany, etc.

Involved stakeholders

Efico is the shipper. Consignees, responsible for the receipt of the goods are roasters (95%) or other traders (5%) in Europe. Belgian Customs is involved as the cargo is entering the EU through Belgium.

Import in EU is done as late as possible (to postpone financial obligations), which then leads to transit declaration (NCTS) and import through other Customs Authorities. It is recognized that cooperation with other Customs Authorities (and overlapping Living Labs in which they are active) is important.

Main issue addressed in this Living Lab

The main motivation to organise the Living Lab is business driven. A reliable logistics transport chain with little deviation in delivery time is essential for importing perishable goods such as coffee. To achieve this, the shipper must be well aware of the external risk factors within the logistics chain that may influence the delivery date. Goods such as coffee are imported via trade lanes that are prone to drugs smuggling. On these trade lanes, there is a higher risk of unannounced customs inspections and thus unexpected delays. Such delays occur late in the logistics transport chain which makes them harder to handle and mitigate. The shipper also relies on the service levels of its transport service providers. In case these service levels are not met, unexpected costs may occur for the shipper. In addition, the shipper may experience theft and damaged goods during transport. This Living Lab will identify practical operational problems in the supply chain and demonstrate solutions that can lower the operational costs coming forward from unreliable delivery.

Ambitions of Efico

Efico is aiming to increase visibility in their supply chain and have more reliable delivery times. In case of deviations, Efico wants to inform customers as early as possible in order to take pro-active countermeasures to reduce the impact. Efico wants to validate how Seabridge (the forwarding organization and control tower within the group), as well as customers, can benefit.

Ambitions of Belgian Customs

Belgian Customs is aiming to reduce the number of random inspections, i.e. inspections that are based on more generic security rules, and which increase the number of well targeted inspections. Efico has about 60 containers per year that are getting inspected without customs pre-notifying. Even though this is only about 1,5-2,0% of containers shipped, it has implications for uncertainty and safety margins that have to be taken into account. The ambition of customs is to reduce such figures to a required minimum for safety and security motivations. Specific intelligence can help customs to better target the announced inspections to the right containers. It is not clear yet whether such inspection can be announced to Efico a certain number of hours before arrival in the port of discharge. It has to be investigated what is required in terms of system-based controls to make the above possible – including certification of reliable trade partners (using AEO or similar), mutual recognition (which may involve European Customs), applied procedures, required information & signalling, seal types, etc. This ambition is shared with Efico.

Short description of scope of the demonstrator

Process analysis

In this section, the relevant processes related to the Living Lab, as well as the role of and interaction between partners and stakeholders, are being elaborated.

The categories of issues as experienced in the supply chain and the resulting risks for consequences are described.

Control measures to mitigate risks

This section describes control measures that are being recognized as required to control or mitigate the risks that were described in the full report.

Control measures on an operational level

Several control measures are already available in the market that can generate relevant information to provide a certain level of monitoring. Such examples are (non limitative):

- Container status information provided by the carrier or terminal operator: One can lookup the status information for a single container in the carrier's or terminal operator's website by entering the container number or bill of lading. The lookup possibility is, however, limited to 1 container at a time and the user needs to consult a different website for each carrier. Initiatives that allow to search for containers over different ocean carriers often just route the user to the carrier's website upon entering the container number and have proven to give limited coverage due to delay and incompleteness of carrier information. This is one of the reasons why the solution proposed makes use of multiple data sources to create a reliable and sufficiently complete data set for operational control and performance measurements.
- Vessel position: Vessel tracking is made available through terrestrial and satellite-based networks that locate the vessels by AIS position. Pricing for a professional service level is, however, expensive for individual customers. As shippers often do not have a direct data connection with such providers, manual entry of IMO number through the website is required and can become cumbersome in case multiple vessels have to be tracked. Examples of providers are Vesseltracker, Marinetraffic and others.
- Container Security Devices (CSDs) have been developed over the past years. Depending on the type of device, different parameters can be monitored such as position, intrusion, temperature, humidity etc. The biggest challenges identified for CSDs are the relatively high cost and the return logistics. For this reason, the solution points towards a device-less approach.

The above control measures are, however, sources that provide information independent of each other. Therefore, these sources may also contradict each other, e.g. a carrier reports that the vessel has departed and the CSD still provides a location within the port. Combining these sources of information into a meaningful status in a single dashboard is today not easily available to the shipper.

Control measures on a tactical level

Executing control measures on an operational level has limitations:

- Normally one of the main saving areas of increased visibility and control is the reduction of safety stocks and thereby the need for less working capital. For Efico, it is not possible to reduce safety stocks as these are mainly influenced by the trade process – not by the logistics process. What could serve as an example is a situation in which the coffee producers may temporarily decrease their supply in times of low prices.
- There is no possibility to reduce safety stocks as these are mainly dominated by the trade (e.g. producers not selling at low commodity prices). Organising stock near production (resulting with more logistics reliability) is also an option as the customer requires more certainty. So close-to-customer stock becomes a sales instrument and is part of the terms of contract. Customers issue orders late as a result of a dynamic market, which inhibits long-term planning. In addition, origin stocks are subject to humidity. This requires additional facilities.
- More transparency in carrier performance is necessary. Standstills and unnecessary rerouting negatively impacts cargo condition. This happens during ocean transport (TSS, in which part of the year), during inspections (1-2d), and during inland transport ('trains holds for 1 wk'). Quality loss leads to alternative sourcing of produce.
- Direct pressure on carriers on shipment level is not feasible. What remains is using knowledge to have a better negotiation position during carrier selection.

Living lab methodology

To realise results with this demonstrator, a Living Lab methodology is applied, which follows a cyclical approach. Through this cyclical approach, several solutions can be tested and re-adjusted/improved to fit the needs of the real-life environment. Summary of Set-up phase

Use cases

Three use cases have been identified.

Use Case 1.1: Situational awareness dashboard for shipment tracking, based on a device-less approach

Use Case 1.2: Situational awareness dashboard for ocean carrier performance

Use Case 2.1: Making customs inspections more effective and efficient

Supervision measures

Customs

The main risks addressed are those of drugs being smuggled in containers with coffee bags.

Monitoring integrity of shipped containers with the support of container security devices suffers from the fundamental problem of potential corruption of Custom's officials that are supposed to oversee the container stuffing operations. This comes in addition to the prohibitive costs.

This has directed us towards a device-less and data analysis centered approach, which is aimed to lead to a more effective selection of containers to be inspected (by Customs) and the acquisition of insight (by Efico) as to the factors that might influence what containers are being inspected – thereby achieving more successful inspections (i.e. containers that are used for drugs trafficking) and where possible, bringing down the number of Efico containers inspected.

Logistics

The main risk addressed is cargo damage caused by water pollution, leading to last-minute reordering of goods and commercial damage.

As described in section 2.2.2.2 'Control measures on a tactical level', Efico is not able to properly implement operational control and influence operational decisions by ocean carriers due to the asymmetric relationship between the relatively small shipper and the relatively large carrier. In addition, safety stocks are mainly resulting from trade patterns (price fluctuations etc.) and commercial requirements of the consignee, so logistics reliability by itself cannot substantially influence safety stock levels. As a result, end-to-end visibility (on shipment level) supports no purpose autonomously.

As a result, Efico will focus on increasing control on a tactical level: Gaining knowledge on carrier performance, acquiring insight in detours and standstills, and using that information to negotiate more effectively with carriers.

Policy measures

In addition to the potential ineffectiveness of container security devices, there are other reasons for considering a more pragmatic approach:

- Costs of container security devices are still prohibitively high, mainly because there is a recurring cost in equipment purchase, which also entails handling costs for each individual container.
- No Customs Authority will commit beforehand to specific reductions in inspections, or circumstances under which inspections will be reduced. As a result, the benefits of facilitation by Customs – which are required to outweigh the costs – cannot be assessed, and not even estimated, on beforehand. Given the fact that Efico has experienced limited benefits from its AEO

certification, this does not provide sufficient confidence that a positive ROI business case can be achieved based on expensive container security devices.

The Living Lab will, therefore concentrate on data provisioning to Customs which is as low-cost as possible (for Efico), with as aim to create added value for Belgian Customs, improved carrier performance for Efico and, perhaps, less ineffective customs inspections during import.

The Customs Dashboard will be based on a common approach with the Flora Holland demonstrator to achieve an operational solution that is as efficient as possible.

Security measures

As stated above, measures against risks identified will be data-based, which will have less impact and be less dependent on the business process.

As a result, security measures are mainly related to data governance, in particular concerning the data that is to be provided to Customs through the Customs data pipeline. This data governance will be based on two principles:

- Efico will be enabled to enforce strict rules as to whom is authorized to access the shipment information that is made available.
- The Customs Dashboard will only make available selected data at the time the information is viewed, retrieving the required data based on the enforced authorization rules, and not persisting the data after the view session has been completed.

Current status of the *demonstrator in the* **Living Lab methodology**

This document is an intermediate report of Core Work Package 13. This demonstrator focuses on demonstrating best practices in the areas of Data sharing for supply chain visibility and control. It will show the practical use of this solution, add additional parties and solutions to capture and share data, and explore the full extent of its benefit to roll out information services very quickly, thereby supporting agility of supply chains and reconciling customs and logistics requirements.

The work done on this deliverable addresses following two points:

- It updates the use cases that will be demonstrated, the measurement procedure for assessing the impact, and the CORE solutions that will be demonstrated.
- It reports on the implementation and integration of these solutions that has been done.

The Living Lab has progressed to the “Do / Execution” stage, in particular the technical part of it. This document describes the result of that stage and, in comparison with the previous iteration, is mainly focused on the implementation of the use cases through the configuration and integration of the demonstrator solutions. This enables us to prototype the solution with the end-users which has led to a validation of the use cases and measurement methods.

Actions performed since last report

Performance measurement

As explained in 'Supervision measures', exerting control on individual shipments is not feasible and logistics targeted benefits are based on improved carrier selection. Based on gained knowledge on delays, variability, transhipments, detours and standstills, the following impact is expected:

- Reduction in costs for ocean carrier services
- Reduction in cargo damages
- Reduction in reputation damage
- Reduction in costs for re-ordering goods

However, it is foreseen that this impact can be achieved gradually and will be measurable on the long term only.

Therefore, the KPIs used will focus on knowledge acquisition capabilities that are required to support carrier negotiation and selection processes; as part of such negotiations, reductions in costs and damages can be targeted and (hopefully) achieved.

Decisions made since last report

Incorporating results from last review

After the delivery of D13.12, we have received the following comments on D13.11. Hereafter we identify our response to these comments:

- "KPIs are not in line with the DOW especially in relation to improvements in customs processes, and there is no method for measuring performance. Given the high risk ratings associated with this traffic, the aim to reduce inspection rates below current levels may not be realistic". This point is being addressed as follows:
    - For shipper Efico, the KPI's have been made more quantifiable in '*Table 3-1 Performance Indicators for situational awareness dashboard*'.
    - For BE Customs, a KPI "Hit rate" has been added in '*Table 3-2 Performance Indicators for customs risk assessment*'.
- "While this deliverable is accepted, there is a strong recommendation that additional research be carried out to provide a sharper focus." This point is being addressed as follows:
    - To strengthen the value for BE Customs, information on transhipments from the Visibility Dashboard has been added as data component in the Customs Dashboard. See section 2.7.5.3 and subsequently in the technical architecture of section 3.2.5. It also has implications for interoperability, see section 3.2.6.
- "Greater benefits might be achieved from working to improve the integrity of these consignments through the use of improved technology including, for example, "smart" seals and advanced image analysis, thereby resulting in improved risk analysis and targeting by customs, leading to higher detection rates and greater efficiencies." On this issue, see following explanation:
    - In several points in the deliverable [D13.12], we have presented arguments towards a device-less approach. Based on weighing costs with benefits and the risk of achieving those benefits, this has led to the scope and use cases selected.

Technical decisions

This document is a progression of D13.12. In comparison with D13.12, the following has been carried out:

- Updated the KPI for timely availability of transit times at transhipment ports, after validation of use case with Efico.
- Updated incorporation of transhipment data into Customs Dashboard, after validation of use case with Customs based on the mockup.
- Updated and extended the data analysis, after validation of use case with Customs based on the mockup.
- Decide on architecture, configuration and integration activities.
- Decide on test data samples used for retrieving data elements from relevant input documents. See Appendix 2: Data samples.
- Decide on XML Schemas used for interoperability between system components. See Appendix 3: XML Schemas.

Dissemination activities performed during past months

Dissemination activities were limited to internal consultations within Belgian Customs in order to involve the risk management teams in the validations of the data analysis and the Customs Dashboard. Following a positive outcome of the demonstrations we are anticipating dissemination activities for this demonstrator within the Antwerp Port Community, in close cooperation with the Port of Antwerp and the Antwerp Freight Forwarders' Association (AFFA). More dissemination activities, specific to this demonstrator, will be planned after completion of the first demonstration execution cycle.

It has been agreed that dissemination actions will be planned once concrete results are available from demonstrator execution cycles, see section 5.2 'Next steps'.

Qualitative description of the demonstrator results

The focus of this phase has been on the technical configuration and integration of the CORE solutions for this demonstrator.

1.1.1 Visibility Dashboard

The objective of the Visibility Dashboard is to provide the user with the necessary information to review the details of the logistics process executed. The mechanism to fulfil this goal involves the information provided by various logistics data sources; a business rules engine whereby the data is interpreted with respect to its impact on the structure and timing of the logistics process; and the dashboard UI to present those results.

A specific point of attention, which is required for this demonstrator is that transhipments and other structural changes to the logistics process are being discovered automatically such that these can be used for feeding information to the Customs Dashboard as well as the reporting engine.

The user of the dashboard, which is supposed to be the Shipper Efico as well as BE Customs, can perform searches to zoom in to specific shipments or its details. This information is less critical from a security point of view, in contrast to the commercially sensitive data on parties and cargo handled by the Customs Dashboard.

The user can also access the raw events that are being received, together with the interpretation results based on the application of the business rules.

The user can configure that he wants to be alerted of specific events taking place in the transport chain as shown in Figure 4-8:

Reporting

Based on the operational visibility data collected, reports can be provided to the user on a variety of parameters. An example from a carrier benchmarking report based on a test run on 115 shipments, making use of three different carriers, is presented in the full report. The first sample reports on the percentage of shipments that had an actual arrival time at the PoL that was at least 1d delayed as compared to the planned arrival time. The second sample reports on the percentage of shipments that had a spread between actual arrival time and planned arrival time at the PoL that was at least 2d (positive or negative). The sample used for testing were based on real ocean shipments from a variety of loading ports towards Antwerp during the first quarter of 2016.

1.1.2 Customs Dashboard

The objective of the Customs Dashboard is to provide the user with the necessary information to review the details of any shipment. The mechanism to fulfil this goal involves the information provided by the Connectivity Infrastructure, an Events Data Store where this information is stored and the Customs Dashboard UI. The Connectivity Infrastructure publishes Events that may concern, for example, the reception of a new document or a status update, and the Customs Dashboard consumes the published events, stores them in the Events Data Store and keeps it up to date. This data store contains the minimum required data to allow the quick and effective search through the events. The type of data stored concerns the fields seen in the search section of the dashboard. More specifically, the MRN, the Bill of Landing, the Container Number, the Shipper, Arrival and Shipment Dates and Place of Loading/ Delivery. The user of the dashboard can perform searches against the Events Data Store data only. Once the information in question is located in the results section, a call is made to the Connectivity Infrastructure to retrieve all the necessary data to populate the details section. The response is read-only and no additional data are stored.

KPI values on (technical) solutions tested in the demonstrator the demonstrator

Deliverable D13.14 will address the following:

- Provision of KPIs and their quantitative values expected after the implementation of the CORE solutions in comparison with the baseline measurements (before implementation of CORE concepts).
- Analysis of how measurement values relate to ambitions, goals and expected results (Conclusions that can be drawn from the KPIs).

For the KPI's to be used, please refer to section 'Performance measurement'. The demonstrator execution cycles that will be carried out between M24 and M48 (see 5.2 'Next steps') will generate the actual measurements to support this analysis.

Stakeholder acceptance

Belgian Customs and Efico have been involved in the validation of the data used and the dashboard user interfaces provided, and have accepted these results. During these validations the main comments received, which have led to adjustments in the design of the deployed solutions, were the following:

- 'Can the Visibility Dashboard interface to the Customs Dashboard, so that Customs can be made aware of transhipments, and possibly also of other standstills?' This is reflected in the architecture, see section 3.2.5 'IT Architecture'. It was also the basis for a revised design of the actual implementation, see 4.1.2 'Customs Dashboard'.
- 'Can information about delays and transhipments, which are planned to be part of KPI reports generated after the completion of a set of shipments, also be used to alert Efico in real-time?' This is reflected in section 3.2.1 'Performance measurement'. As a result we have adjusted the TO BE values of the performance indicators:
    - Timely availability of accurate ETA forecast in port of discharge: Focus on availability of this information before ETA.
    - Timely availability of transit times at transhipment ports: Focus on availability of this information 12 hrs after arrival at the transhipment port, before departure.

Qualitative level of "adoption willingness" of internal and external stakeholders

The levels of 'adoption willingness' of internal and external stakeholders will be ascertained as part of the demonstrator execution cycles that will be carried out between M24 and M48, see 5.2 'Next steps'. So far, both Belgian Customs and Efico have indicated during the user validations that the solutions are expected to add practical value in the area of getting better information on supply chain disruptions (Efico) and access to a broader data set that can be used for risk analysis (Belgian Customs). In addition Belgian Customs was very satisfied that such information can be provided by a lightweight and low-cost web-based solution that has no interference with their internal IT systems. Both Efico and Belgian Customs indicated that the information provided was very useful in their operations. Obviously this needs to be confirmed during the demonstrator execution cycles.

Next steps

The activities below are planned to be executed for each demonstration execution cycle. We plan to execute 3 cycles between M24 and M48. The time indications of subtasks are *offsets* (in months) against the start time of each individual demonstration cycle. M24 equals 1.05.2016.

Based on the above, the activities in the demonstration will have following schedule:

M25-M30: Demonstration cycle 1

- Validate feasibility to generate required input data M24+1m = M25
- Affirmation of AS IS and TO BE performance values at start M24+1m = M25
- Living Lab solutions configuration is operational M24+3m = M27
- Ensure the quality of the operational data handling M24+3m = M27
- Operation and measurements during 2 months M24+5m = M29
- Assess actual performance + validate use cases M24+6m = M30
- Review the Living Lab solutions configuration M24+6m = M30
- Plan dissemination actions in cycle 2 M24+6m = M30

M31-M36: Demonstration cycle 2

- Validate feasibility to generate required input data M30+1m = M31
- Affirmation of AS IS and TO BE performance values at start M30+1m = M31

- Living Lab solutions configuration is operational M30+3m = M33
- Ensure the quality of the operational data handling M30+3m = M33
- Operation and measurements during 2 months M30+5m = M35
- Assess actual performance + validate use cases M30+6m = M36
- Review the Living Lab solutions configuration M30+6m = M36
- Plan dissemination actions in cycle 3 M24+6m = M30

M37-M42: Demonstration cycle 3

- Validate feasibility to generate required input data M36+1m = M37
- Affirmation of AS IS and TO BE performance values at start M36+1m = M37
- Living Lab solutions configuration is operational M36+3m = M39
- Ensure the quality of the operational data handling M36+3m = M39
- Operation and measurements during 2 months M36+5m = M41
- Assess actual performance + validate use cases M36+6m = M42
- Review the Living Lab solutions configuration M36+6m = M42

M43-M48: Final evaluation (to be planned later in more detail)

During these execution cycles the following aspects of the deployed solution will be monitored:

1. Usability: True objective usability testing involves a large set of users, which is not possible within this demonstrator. So the focus will be on a qualitative assessment:
    a. Is the deployed solution relevant?
        - To what degree the use cases (see 2.4.1 'Use cases') are being fulfilled?
        - To what degree control measures are being supported which can be used to mitigate the risk (see 2.2.2 'Control measures to mitigate risks') in the logistics process?
    b. Is the deployed solution clear:
        i. Is it simple to use?
        ii. Is it sufficiently familiar to other solutions the user is acquainted with?
        iii. Does the solution provide a consistent experience?
        iv. Does it give the user clear guidance on how to use it?
        v. Does it give the use direct feedback when interacting with the solution?
        vi. Does it fit the user's mental model and what they expect to see?
        vii. Is it easy to learn?
2. Effectiveness: This will be measured by the KPI's for this demonstrator (see 3.2.1 'Performance measurement').
3. Efficiency: The solution has been implemented in a way that there is no interference whatsoever with internal systems of Efico or Belgian Customs. Data sources, as far as these are used from within Efico, are being sent to the demonstrator without requiring any manipulation on the side of Efico. Moreover, by opting for a device-less solution, the costs are

being kept to a minimum in order to pursuade the involved stakeholders that a positive business case is feasible. The costs vs benefits will be reviewed as part of the demonstration execution, based on the actual experience of the users.

4. Reliability: Is the deployed solution available and accessible? This will measured by the standard system availability KPI's and will be implemented as part of our future commercial solutions. In addition the KPI's listed in *Table 3-1* are used to determine the availability of reliable data from an end-user perspective, which in our experience is more critical than the uptime of the system.