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Common assessment and analysis of risk in global supply chains

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Living Labs

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1 Introduction

The Cassandra project aimed to make container logistics more efficient and effective by enabling and facilitating the combination of existing information sources in supply chains into new and better visibility that allows the assessment of risks by both business and government. A new data sharing concept, the so-called 'data pipeline', and a risk based approach were detailed and demonstrated in the course of the Cassandra project. Cassandra built interfaces between existing information platforms and visibility solutions to capture high quality, integral monitoring data on cargo flows and container integrity. The project produced sophisticated visualisation tools to monitor supply chains in a neutral, standardised, and open architecture. This enhanced visibility should facilitate the adoption of a risk based approach in designing and managing efficient and secure supply chains by business.

The objective of the Living Lab Asia-Europe was to demonstrate the innovative concepts and products developed in the Cassandra project in a real-life context between Asia and Europe on several trade lanes. A trade lane is a specific flow of goods from origin A to destination B and served to restrict the scope of the demonstration. Figure 1.1 shows the structure of the Living Lab with four trade lanes, three pipeline configurations as described in the Cassandra R&D work, and the industry partners and solution providers involved. In total there were three operational trade lanes. The first runs between Yantian in China and the UK, with the port of Felixstowe as entry point to the UK. For the demonstration with the Netherlands, there was one trade lane from Penang in Malaysia and one from Shanghai in China to the Netherlands. Finally, there was the special situation with a trade lane from Singapore to the Netherlands that was extensively explored but not implemented. All these trade lanes had the port of Rotterdam as entry point to the Netherlands.

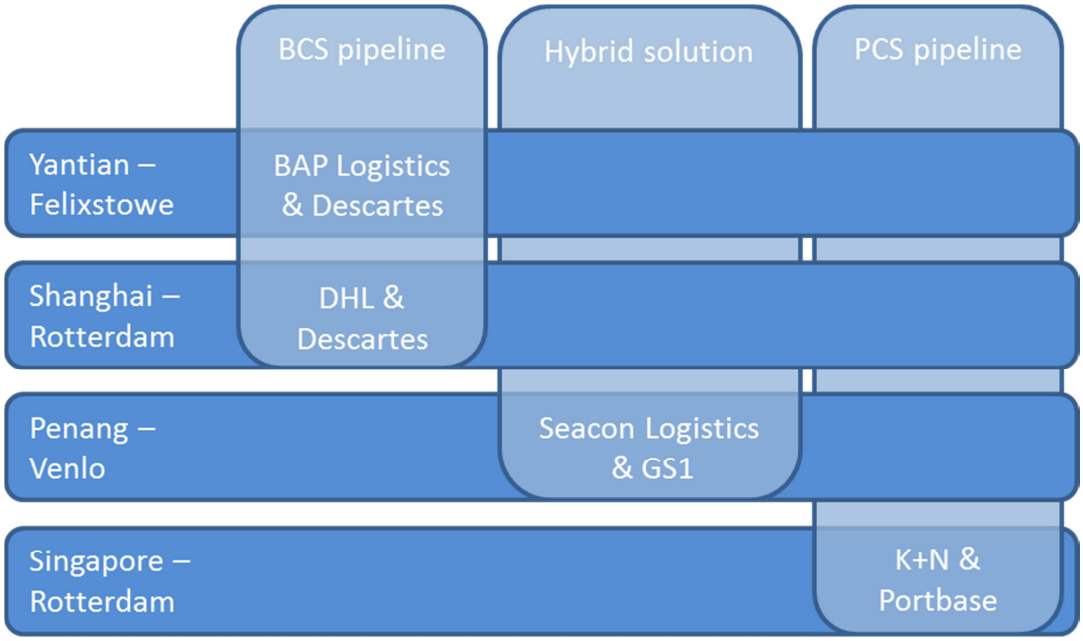

Figure 1.1. Living Lab structure

The key Cassandra concepts implemented in the Living Lab are summarised as follows:

- End-to-end supply chain security, through visibility of the actors, goods and logistics;

- Data pipeline as a technical concept to realise the data exchange in the supply chain that is needed to improve visibility and thereby end-to-end supply chain risk control.
- Data from the source as an enabler to improve data quality;
- Risk based approach for businesses to assess supply chain risks and to identify the data elements needed to improve control of these risks;
- The re-use of business risk control and original business data for government purposes also called the piggy-backing principle

Reading instruction

The purpose of this document is to present in a short and concise way the methodology and findings of the Living Lab Asia to Europe. The findings of the Living Labs include evaluation of the Living Lab process, recommendations and satisfaction of the participants with the process and products in generic terms. The evaluation of the Cassandra concepts will be performed in WP500 and documented in its deliverables.

In the next chapters, the reader finds a short description and the main findings from the four trade lanes in the Living Lab and two solution descriptions by Descartes and GS1. The full report of the Living Lab Asia-Europe, including all details of the methodology, description of the trade lanes, solutions that were delivered, etc., can be found in the annex to this document.

2 Cassandra Living Lab Methodology

The first result of the Cassandra Living Lab Asia-Europe is a first version of a Living Lab methodology. While executing the Cassandra Living Labs it became clear that there is not yet a framework that supports Living Lab practitioners to successfully prepare and run a Living Lab. The Cassandra Living Labs were therefore guided by a self-developed four-step approach that prescribes a preparation phase, technical realisation of the pipeline, risk assessment, and pilot and evaluation. Although this provided some guidance, many generic lessons can be derived from the Cassandra Living Labs. To structure these lessons learned and make them applicable for other Living Labs, a Living Lab methodology was developed. During the Cassandra project, two papers[1,2] were published that raise the issue of a lacking Living Lab methodology and that give a first draft of a Living Lab methodology.

Lucassen et al. (2014)[2] arrive at the following definition for a Living Lab, in which the complexity of developing and running a Lab is clearly visible:

"A Living Lab is a test environment for cyclical development and evaluation of complex, innovative concepts and technology, as part of a real-world, operational system, in which multiple stakeholders with different background and interests work together towards a common goal, as part of medium to long-term study".

For the Cassandra project, a Living Lab was chosen as the right form of demonstrator because the concepts and technology are both complex and because stakeholders from both public and private organisations are involved. Also the solutions should be applicable and integrated in the current way of working and system architecture of the involved organisations, and thus be part of the real-world immediately.

Klievink and Lucassen[1] argue that Living Labs, as a collaborative innovation approach, are able to support the adoption of innovative information infrastructures. A Living Lab helps identifying gains that come from the tested innovations and can also support the specification of solutions and stimulate further adoption of these solutions. Aspects that can influence innovative developments are external pressure, readiness, the trust and relationship between partners. Living Labs offer the possibility to create a safe environment in which parties can create sufficient mutual understanding and trust to perform the crucial first steps in specifying the requirements for a pipeline. The collaborative innovation approach of a Living Lab can give adoption of innovative solutions and concepts a boost by focusing not just on the benefits that parties can gain from the innovation. It also respects and deals with the added (perceived) vulnerability that such innovations bring for the participants, even during early stages.

Lucassen et al. (2014)[2] describes the goal of developing a Living Lab methodology as "bringing the industry and project practitioners the benefits of consistency in research and evaluation across Living Labs, and structured knowledge building to facilitate a learning curve of critical issues and lessons learned that help make each Living Lab successful".

The first version of the Living Lab framework is shown in Figure 2.1. The framework starts at the top left with stating the ambition for the Living Lab in a set-up activity in the 'Plan' phase.

[1] Klievink and Lucassen (2013) "Facilitating adoption of international information infrastructures: a Living Labs approach", IFIP WG8.5 EGOV Conference 2013 (published in Springer LNCS)
[2] Lucassen, Klievink and Tavasszy (2014) "A Living Lab Framework: facilitating the adoption of innovations in international information infrastructures", TRA Conference 2014

The methodology should be seen as a set of iterative processes where new findings and ideas need to be checked continuously with earlier assumptions and plans. This automatically means there are multiple, smaller design loops during each phase of a Living Lab. The four phases are as follows:

- The crucial aspect in the ***Plan*** phase is the building of common knowledge about the environment, the concepts and technologies to be tested, use cases that need to be executed and requirements for implementation. This phase demands much stakeholder commitment and trust building, which determine to a large part the success of the Living Lab.
- In the ***Do*** phase, the focus is on implementing changes in the Living Lab environment, actually performing tests and gathering data for evaluation analysis. This means that not only the Living Lab environment might need to be prepared but also some of the surrounding systems, as a Living Lab is also a system in a system.
- The ***Check*** phase is the last phase of a single iteration in the Living Lab framework. The quality of the system analysis, use cases and KPIs are now reflected in the results of the Do phase. KPIs are evaluated and the impact on for example business models, regional or national economy or an industry sector are determined. Here is a crucial point in the Living Lab framework in which it needs to be decided whether the Living Lab is completed or another iteration is needed.
- The ***Act*** phase takes the results of the evaluation and impact assessment and uses these to improve the design or start a new iteration in the Living Lab. This might also mean that some activities in the Plan and Do phase will need to be reviewed or rebuild. Although the act phase does not contain any particular activity for now, it is a crucial phase in a Living Lab environment where cyclical development, complex challenges and medium to long term research with small improvement cycles ask for an iterative approach.

The environment and stakeholder commitment blocks include on-going activities that need to be performed to keep the Living Lab up-to-date with important developments in the environment and to guarantee stakeholder commitment during the whole runtime of the Living Lab.

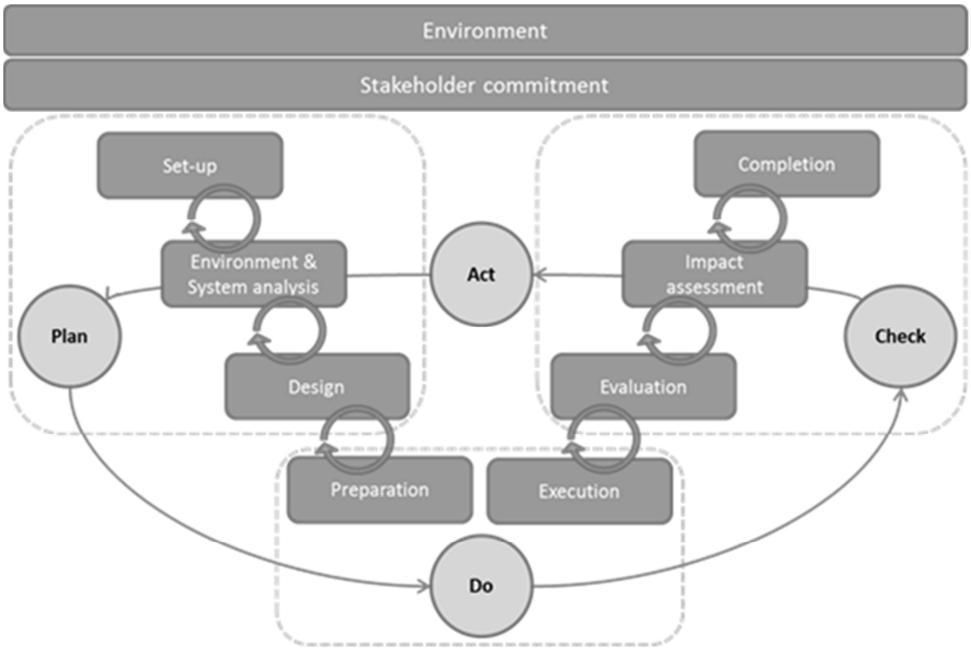

Figure 2.1. First version of the Living Lab methodology by Lucassen et al.

Lucassen et al. (2014) concluded that “the high level in which the blocks are now defined is not nearly specific enough to help practitioners”, therefore additional work is needed in

detailing each step. The following lessons learned were derived from the Cassandra Living Labs and should be included in any further work on the Living Lab methodology:

Agree on the proper scope and level of ambition

- When demonstrating innovative concepts it is important to keep in mind that there is a reason that these innovations were not yet fully implemented by industry partners. Innovations are innovative and there can be issues when implementing them;
- A demonstration starts with a clear ambition;
- The level of ambition of the project sometimes needs to be separated from the level of ambition in a Living Lab and expectations of stakeholders need to be managed as such. A clear decision on what will be demonstrated and what will only be part of the R&D work is needed;
- The risk of enlarging demonstration scope needs to be properly identified and managed.

Have the right stakeholders involved

- Decisions that have a large influence on the demonstration outcome are preferably made inside the consortium and not depend on parties outside the consortium;
- Stakeholders who are crucial for the success of the project need to be involved, preferably in the consortium but if not then at least closely related to the consortium members;

Work in teams and the role of a neutral LL coordinator

- Working in dedicated teams for specific trade lanes or the Living Lab as a whole helps create an open and safe environment for learning and sharing;
- People working in the teams of a multidisciplinary project like Cassandra need a certain set of competences, willingness to learn and engagement. Very importantly, they need communication skills in order to create a positive team atmosphere and work effectively;
- The role of a (neutral) coordinator is important to moderate discussions, facilitate mutual understanding with necessary functional translations and solve conflicts.

Build trust

Create the right level of trust that is needed to showcase the ambition. An important lesson learned is to engage a broader group of stakeholders than strictly needed in solution design because understanding the design aspects of the solutions helps create trust during use.

Cyclical approach to development and solution testing

A cyclical approach to development and testing delivers results soon and makes it easier to discuss next steps. It also helps keep stakeholders engaged and to align with their expectations, especially when it is difficult to formulate very concrete requirements upfront.

Managing the demonstration time line

- When the time line for a demonstration is fixed, it is important to correctly assess all the risks for delay and communicate these clearly;
- Even when involving larger players with high IT maturity levels, it can be difficult to implement changes within short time frames;
- When there is high dependency on stakeholders outside the consortium, this needs to be identified and communicated upfront and a go/no go decision needs to be scheduled to make a joint decision whether to continue.

3 Cassandra DASC methodology: Data Analysis for Supply Chains

The key Cassandra concepts include supply chain visibility, the development of a pipeline for data exchange, data from the source as a key principle for capturing quality data. All these concepts have data at the heart. To get a good understanding of the data that are available in the trade lanes within the scope of the demonstration, a thorough process and data analysis were performed. The methodology for this analysis was developed in the Cassandra project and is named the DASC methodology: Data Analysis for Supply Chains. This methodology was used in the Living Lab Asia-Europe. This chapter describes the DASC methodology and some recommendations for further improvement.

Structuring the supply chain with events

For each of the trade lanes in the Living Lab Asia-Europe a detailed process mapping was made to get insight into all the processes in which important data generation takes place, documents are created (including digital documents and customs declarations) and data are exchanged with other parties in the chain. Data exchange was in many cases still done with paper documents and therefore an example dossier of all documents used in the trade lane for a particular example transaction was collected. Derived from the various mappings, a generic list of supply chain events and milestones could be created that describes any supply chain in generic terms. When looking at a detailed level, all parties have slightly different processes: the order of process activities is different or they have a different activity name. On a bit higher level a generalisation of the process is possible.

A short list of events or milestones is shown in Table 3.1, together with the owner or executer of the event. These are the events that were especially relevant for the Cassandra project as they can contribute to the data pipeline with important sets of data. Activities that were for example omitted are manufacturing, transshipment, vessel handling at port and warehousing and financial transactions. Also, no distinction has been made between carrier haulage and merchant haulage – this might result in additional administrative events. This list could be further expanded by transport milestones. These transport milestones confirm a container's location at a specific point in time.

The owner of an event is important as this is the most appropriate source of the data related to the event. For some events, the owner can be specified by the International Commercial Term (Incoterm) that is applicable. For the creation of this table, the Free on Board Incoterm was assumed. The exact mapping of this table to a supply chain is therefore very trade lane specific.

Process Event	Owner	Explanation & Remarks
Purchase Order	Buyer	The purchase order has been placed by the buyer
Export booking completed	Forwarder	Bookings for transport on the export side of the trade lane are confirmed. This includes transport orders for all hinterland and ocean legs, as well as the shipping instruction to the ocean carrier.
Empty Out	Contracting carrier	This is a transport milestone where an empty container is assigned to the booking for ocean transport and handed over to a truck driver.
Stuffed	Consignor	This includes the "Consignment Completion Point" that confirms the container manifest and thus what goods have been loaded in a container exactly.
Commercially Invoiced	Seller	The goods that were loaded are invoiced to the buyer. Usually this information is input for the export declaration.

Cleared for loading	Customs	In case of import in Europe: Authority at first port of call in EU approves loading of the container based on the entry summary (ENS) declaration that was filed by the ocean carrier.
Cleared for export	Customs	The Customs authority at export approves export of the cargo/goods based on the export declaration that was filed.
Exit confirmed	Operator at exit (Terminal)/ Customs	In Europe the operator at export confirms loading of a container and departure of the vessel, thus exit of the container out of the EU.
Export completed	Contracting carrier	This includes the completion of all documents in the export file, including master bill of lading and house bill of lading.
Cleared for discharge	Customs	In case of entry in Europe: Authority at the port of discharge in EU approves discharge of the container based on the summary declaration for temporary storage (SAL) that was filed by the ocean carrier.
Import booking completed	Forwarder	Bookings for transport on the import side of the trade lane are confirmed. This includes transport orders for all hinterland legs.
Cleared for import	Customs	The Customs authority at import approves import of the cargo/goods based on the import declaration that was filed.
De-stuffed	Consignee	The goods have been unloaded of the container and this activity thus confirms the container manifest.
Empty returned	Contracting carrier/ Terminal (depot)	This is a transport milestone where the again empty container is delivered to the carrier's empty depot.

Table 3.1. Short list of Cassandra trade lane events

Data from the source

An important aspect of the Cassandra concept is the data from the source principle. This specifies the most appropriate source of data as the process activity from which data originates. This would be the owner of the event Based on the key events and the data analysis, the key data elements linked to each event can be determined. This combination of event, event owner and data set indicates the proper source of data and thus guides the implementation of the data from the source principle. Table 3.2 shows the typical data sets and some example data elements of three Cassandra events: Export booking completed, Stuffed and Cleared for Export.

Event	Owner	Typical data sets	Examples (not complete)
Export booking completed	Forwarder	Carrier booking and transport order confirmation	Port of loading and discharge, empty depot, location and time of stuffing, means of transports
Stuffed	Consignor	Container manifest details	Consignor, goods identifications, quantities, packaging, container seal
Cleared for export	Customs	EU Customs Code Annex 37 or equivalent data set	Exporter, consignor, goods description, quantities, HS codes, country of origin and export

Table 3.2 Assignment of sets of data elements to the Cassandra events

Each supply chain can be mapped on the table of events and the availability of the related data sets can then be analysed. Availability of data can be assessed by checking whether the data set is available at the event owner, whether it is digitised or not, whether the data has been processed securely – without chance of further error due to manual re-entry – and whether it has been validated by control functions.

When gathering data from the supply chain and combining them to the Cassandra events, some difficulties arise. The first difficulty is how the data sets can be linked so that a user of the data can browse through the data set from single shipment to purchase order to final delivery. Analysis showed that there is no single reference number that is used throughout the chain. For example, the container number is assigned to the ocean carriage booking when the container is handed out at the empty depot. Although the container number is used as a common reference in the transport chain it cannot be used to retrieve purchase order data before the stuffing event has linked it to a shipment and purchase order. Second difficulty is assigning the actors to the various events. For example, when only the purchase order event has been completed, it is usually not possible to name forwarders or ocean carrier so these actors will merely pop up in the data. The supply chain thus needs to be dynamically configured. This is further troubled by the lack of a commonly used standard to identify parties uniquely.

Validating data quality

Collecting data from the source should provide a better guarantee of data quality but in many cases alternative data sources might need to be used, for example because no digital data is available at the source or because data will not be shared for confidentiality reasons. Alternative data sources can also be used to validate earlier received information, thus confirming data quality or indicating errors. When using data from the Cassandra pipeline, it is important to assess the quality of the data, in other words, to know whether the data comes from the source or not. Especially when the scale of implementation increases it can be valuable to assess this automatically. The DASC methodology does not yet specify data quality according to the data's characteristics. This could be possible using meta data to assess quality, for example by recording the data source by naming the party or process or by recording additional process information that informs on data quality, for example that the data was validated by a control function before being shared. Cross-checking and alerting can be used to validate data quality by comparing multiple sources and statistical information can inform on the history of data quality from a source. Additional data quality issues that still need to be tackled are data access and security and authorised parties that may change or delete data.

Further use of the DASC methodology

The DASC methodology as used in the Cassandra project can be used in other R&D projects or initiatives when the data from the source principle is applied. Also, when worked out in more detail, the framework of events and data sources can be used as a reference framework for assessing data quality in a supply chain which can be interesting for auditors. For this, chain and data control measures need to be included in a reference model for data validation. The Cassandra project never aimed to develop a standard methodology for data analysis so further research can be done to align it with existing initiatives for standardisation of supply chain analysis, such as the Buy-Ship-Pay model that was developed by UN/CEFACT[3].

[3] http://tfig.unece.org/contents/buy-ship-pay-model.htm

4 The BAP Logistics Yantian-Felixstowe trade lane

BAP Logistics is one of four industry partners in the Cassandra project and is the leading participant of the Yantian-Felixstowe trade lane. BAP offers value added logistics in the port of Felixstowe. For their customers, BAP plays a vital role in the supply chain by offering quality control and reliability in the consolidation and deconsolidation of shipments that are shipped around the globe. Improving their customer's supply chain is the key ambition for BAP and for this they are continually looking for innovative solutions.

In the Cassandra project, BAP's ambition was to increase service levels to customers, in partnership with partners in the UK and in China. The focus was on delivering visibility of shipments and thereby reliability and trust in container content. With this, the ambition was to improve, reduce or even remove the warehousing function on both ends of the supply chain Visibility was also deemed particularly valuable for seasonal products or promotions. It has happened that a container with promotional goods was not delivered on time, without special reasons for delay, thereby directly affecting the success of the promotion and also pushing shipments directly into long term inventory. Alerting could be a means to assess the risk of delay earlier and prepare mitigation actions.

The Cassandra solutions for BAP Logistics were tested and evaluated in a demonstration trade lane between Yantian (China) to Felixstowe (UK). The consolidator and freight forwarder on the Chinese side of the chain was also involved. Several overseas trips were made to understand the Chinese operations and discuss with Chinese partners the possible benefits of creating full visibility of their operations for the joint customer.

Visibility: delivered!
To deliver the visibility that would be valuable to BAP's customer, a combination of purchase order visibility, shipment tracking and transport milestones was needed. Normally, this kind of information is available in various systems - like ERP, warehouse and transport management systems - and in different documents along the chain. The challenge in this trade lane was to combine this information in one data model and then link the various events real-time. The challenge was especially large because purchase orders and shipments from multiple shippers were consolidated in a container.

Figure 4.1 shows how multiple purchase order lines can be combined in three containers. These three containers were combined in one carrier booking and on one master bill of lading. The purchase orders are linked to a specific container during container stuffing. The visibility solution should enable users to drill down from one instance to another, for example starting with a purchase order line, then zoom in on the booking for ocean transport and the container manifest of a specific container.

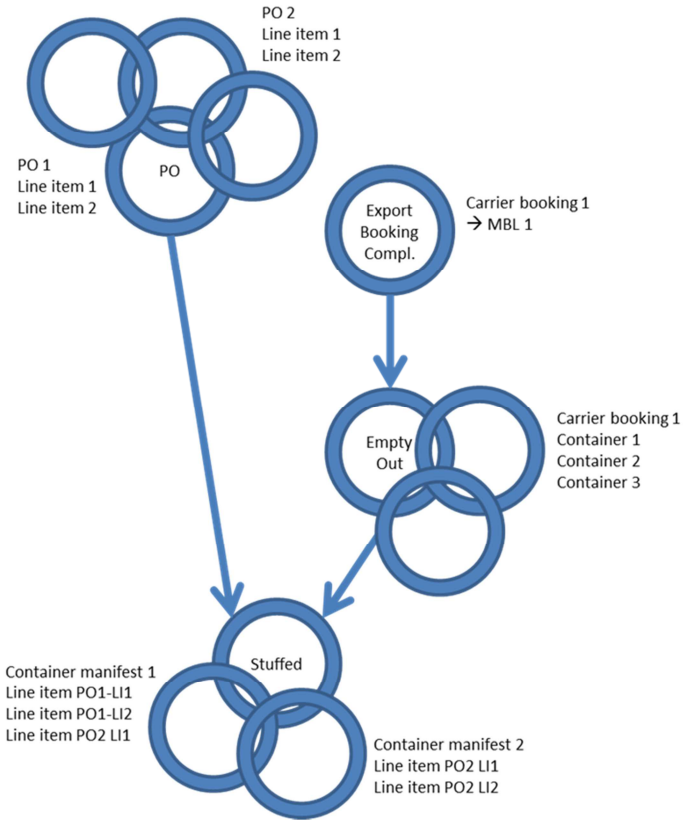

Figure 4.1: Complexity in an LCL trade lane

The crucial part of the supply chain information that was needed to deliver the desired benefits for BAP's customer was the data from the so-called Consignment Completion Point (CCP). The CCP in this trade lane is the moment of stuffing in which the actual container content is confirmed by the tally man who oversees the loading operation. Knowing this is a controlled process in Yantian, and thus increasing the reliability of the data, makes the information in the visibility solution even more valuable.

The visibility solution was developed by Cassandra partner Descartes (Figure 4.2). It includes various views on shipment, container, purchase order, transport means (e.g. ocean vessel) and bookings. Interfaces with the BAP Logistics system, the purchase order tracking system, the systems of the forwarder and consolidator in Yantian, (data from) the customs agent in the UK, the ocean carriers and an AIS provider were used to create full visibility. The information in the solution is updated daily and thus provides a reliable overview of supply chain activities. Alerting is also included in the functionality and the following alerts are examples of what was implemented:

- Quantity discrepancies between purchase order and container manifest;
- Alert specific containers containing promotional/seasonal products as these are top priority;
- Alert containers that have missed the vessel they were due to depart on;
- Vessel delays or early arrival;
- Unexpected transhipments;
- Customs Release in the UK.

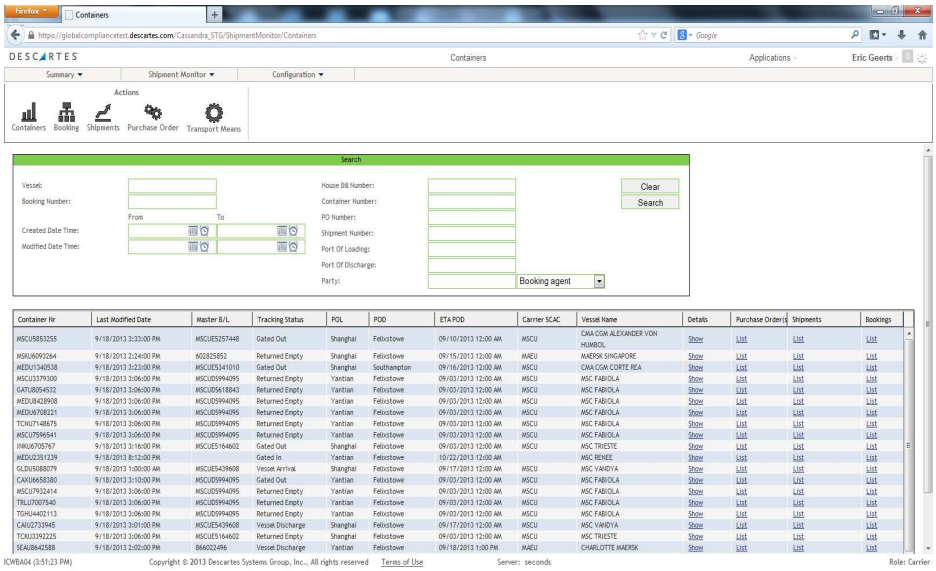

Figure 4.2: Result: Complete visibility in the Descartes solution (www.descartes.com)

From warehousing to stacking and promotions picked in China

BAP Logistics aimed to offer their customers better visibility to improve reliability and trust in container content. The developed visibility solution enabled this, meaning BAP was able to optimise warehousing for its customer in this trade lane. Around 140 loaded containers per month could be kept in a dedicated BAP stacking area, thus freeing up valuable warehousing space for BAP Logistics and ***lowering the warehousing rates for the customers***. This would not have been possible without full visibility and trust on what products and quantities were in each of these containers. The costs saving for both BAP and their customer was around 80% of the original rate for warehousing.

The improved reliability and trust also allowed ***targeted stuffing of containers with promotional products by the Chinese consolidator*** for specific stores. These are called Origin Pick promotions, and allow BAP Logistics to provide a Just in Time style service to their customer in the UK. The alerting functionality made it possible for BAP Logistics to actively monitor the containers, their contents and the time lines for final delivery to stores. Preparation for several promotions, like Valentine's day and Easter could be supported during the trial period. This was done using the alerts for containers containing Origin Pick promotions and for expected container delay. Overall, the visibility and alerting has led to ***reduced (long term) storage*** in Felixstowe. Also the Origin Pick promotions in general allowed for reduced storage at the freight forwarder in China.

In addition to this, BAP Logistics saw a clear benefit for improved warehouse planning based on better visibility of the container content combined with the vessel tracking. Especially the number of cardboard boxes and cargo type was important for the de-stuffing operation. In addition to this, the solution included volumetric data which allowed BAP Logistics to derive the pallet configuration prior to operation thus providing warehouse staff with better information upfront. Overall, BAP Logistics estimates a ***cost saving in warehousing of around 25%*** for more efficient operations, both administrative and warehousing. Also a revenue increase of around 10% is expected as a result of improved packaging and use of warehouse space.

Having more detailed packaging information also brought to light issues with inefficient goods consolidation. BAP's customer has detailed requirements for when a container is allowed to be shipped as a full container load directly from the factory instead of via the consolidation centre. Some boxes turned out to be over-dimensioned, thus consuming more container

volume than strictly needed and in some cases this resulted in box and product damage. Visibility thus resulted in new regulations and fining of suppliers by the buyer in order to reduce packaging issues.

Looking ahead

Early in the demonstrations in the Cassandra project, it was clear that the BAP Logistics demonstration holds a strong case for visibility solutions. BAP therefore decided to join the consortium for the FP7 Core project. In the Core project, the visibility solution will be further improved and linked to UK Customs to enable piggy-backing by UK customs on the supply chain data. Expected results are more cooperation between BAP and UK Customs, increased security and perhaps even better facilitated trade. The visibility solution will be applied to other trade lanes to show its transferability.

"Participation in the CASSANDRA project meant for BAP that we were able to identify ways of improving quality compliance measures and reducing costs for our customers".

5 The Seacon Logistics Penang – Venlo trade lane

Seacon Logistics is one of four industry partners in the Cassandra project and the leading participant of the Penang-Venlo trade lane. Seacon Logistics offers its customers complete freight forwarding services including value added logistics and customs brokerage. Even before the Cassandra project, Seacon Logistics started development of a 4PL control tower solution that improves visibility of supply chain performance for their customers. This solution should lead to improved planning, reducing stock levels in the supply chain as well as the number of airfreight pallets (for high priority goods) and improving supplier performance, etc.

In the Cassandra project, Seacon Logistics' ambition was to capture digital and high quality data at the source in order to re-use information, avoid errors from manual data entry and improve visibility on the shipments and containers. This should also lead to further opportunities for supply chain improvements. Capturing data from the source is a crucial principle in the Cassandra project. In this demonstration Seacon Logistics collaborates with their customer Océ Technologies. Océ is interested in increased visibility to improve warehouse operations in Venlo. Especially information on exact container content is important.

The need for high quality data for Seacon Logistics becomes clear from the risk analysis that was performed during the project. Examples of important risks for Seacon Logistics are risks related to business continuity and customer satisfaction, unexpected delays (e.g. due to transhipments) and use of incorrect values on declarations. Current practice to mitigate these risks is to continuously check the status of time-critical shipments by phone, track & trace systems of ocean carriers, etc. This is a time consuming activity and is even more complicated in overseas logistics as time differences, language barriers and cultural differences affect the effectiveness of communication.

The Cassandra solutions for Seacon Logistics were tested and evaluated in a demonstration trade lane between Penang (Malaysia) to Venlo (Netherlands). The agent of Seacon Logistics in Malaysia, who coordinates all forwarding activities locally, was also heavily involved. Focusing on capturing data from the source means that the focus is on the Malaysian side of the trade lane. Therefore, during the design stage, various stakeholders in the Penang area – consignor, haulier, Penang terminal and ocean carrier agent – were interviewed and informed about the Cassandra project.

Capturing data at the source in Malaysia
To deliver the visibility and availability of high quality digital information in the supply chain, an easy-to-use and easy-to-adopt tool for data capture in Malaysia was needed. The crucial activities in Malaysia were the activities performed by Seacon's agent. This agent handles all documentation for the trade lane and is a central node in communication between all the parties involved locally. The agent in Malaysia had no IT support when this project started and relied heavily on communications by phone, fax and email. The much needed information was therefore not yet available digitally. In this demonstration the challenge was first to support digitisation of the information with a data capture tool and then to visualise the information in such a way that it is attractive and understandable for the customers of Seacon Logistics.

Seacon Logistics decided to design the data capture tool so that it is easy-to-use and also supportive for the agent's processes. This would encourage the tool's use without adding any administrative burden and costs to the chain. Seacon Logistics estimates other agents in their network could benefit from using the tool as well and decided this would be their primary target group.

The data capture tool developed in the Cassandra project by Seacon Logistics is designed as a workflow tool in which subsequent steps can be executed by different parties. The workflow starts with a purchase order step that needs to be completed by the buyer. In this case, purchase order information was provided by Océ Technologies. The following steps then include a shipping instruction from the shipper, booking of ocean carriage and stuffing. In the final step the export process is completed by adding details from the export declaration and the master bill of lading.

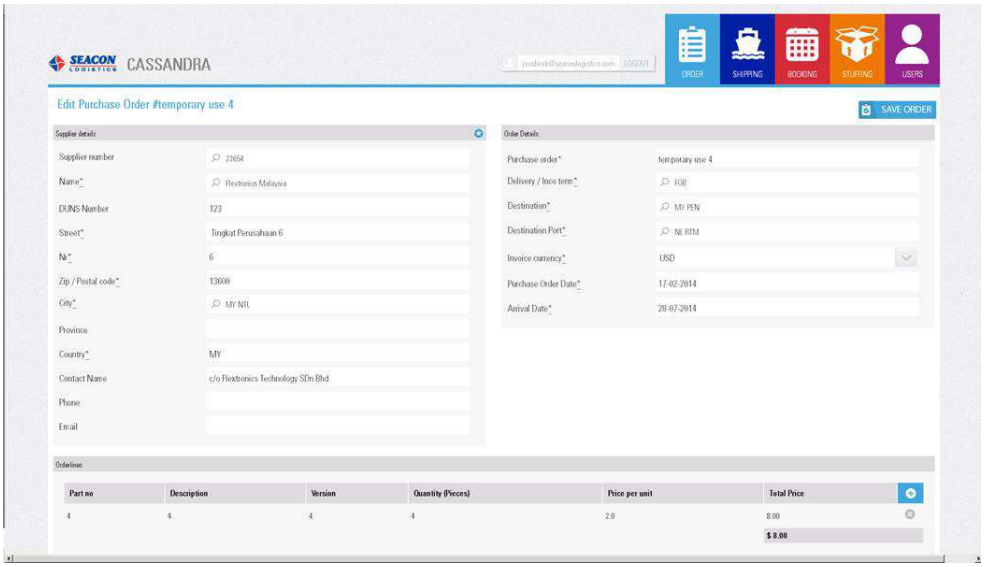

Figure 5.1: Building visibility step-by-step

Ready for expansion

The data capture tool was used by Seacon's agent in Malaysia during the trial period. The first evaluation showed that the tool is user friendly and easy to understand. Hardly any instruction was needed to get the Malaysian organisation started. Although the tool is now already in use for this trade lane, the functionality and data quality can be further improved by also making it available to for example the customs broker in Malaysia. By doing so, the agent will not only be supported but can even see a decrease in work load for administrative tasks and focus more on the value added activities they perform.

The data capture tool has shown Seacon Logistics that it can greatly improve their data quality, especially in timeliness. It can also limit the amount of time spent for entering data in their own systems because the data can now be interfaced automatically. Because of this, Seacon will continue improving the data capture tool after the Cassandra project. Enhancements that are envisioned are connections with terminals and/or carriers to capture transport milestones automatically, customisation or configuration of the tool to specific customer or trade lane needs and integration with the 4PL control tower concept. With these enhancements, it should be possible to refine the trade lane of Océ Technologies between Penang and Venlo but also support other supply chains.

Océ Technologies could use the Cassandra solutions to have real-time visibility of the containers that were approaching their warehouse. The confirmed content of containers helped them improve their inbound process and their planning for further production activities.

Early in the demonstration in the Cassandra project, it was clear that the Seacon Logistics demonstration holds a strong case for developing a trusted trade lane concept for trade

facilitation from Dutch Customs. Both Seacon Logistics and Dutch Customs therefore decided to join the consortium for the FP7 Core project. In the Core project, the concept of a trusted trade lane, as an extension of the trusted trader concept, will be further researched and if possible implemented.

“Participation in the Cassandra project meant for Seacon Logistics that we are able to optimise the visibility and security of Multimodal Intercontinental Trade Lanes for our Customers”.

6 The DHL Shanghai – Ridderkerk trade lane

DHL Global Forwarding (DGF) is one of four industry partners in the Cassandra project and is the leading participant of the Shanghai - Ridderkerk trade lane. DHL Global Forwarding (DGF) offers its customers complete freight forwarding services including value added logistics and customs brokerage. DHL Ocean secure is a separate division within DGF and focuses on shipments of exceptionally high value that need special handling and/or special security measures, for example the use of container security devices (CSDs) to monitor container integrity, temperature, humidity, etc.

In the Cassandra project, the DHL's ambition was to improve supply chain visibility for both the internal organisation and its customers. DHL benefits from the timely and more precise identification of exception events. This allows for intervention and recovery procedures before large disturbances take place, especially in the case of sensitive and/or high value cargo where this can have critical or irreversible effects. Potentially critical exceptions may include late connections or deliveries, sub-quantity, sub-quality, regulatory violations and excess costs. More visibility can help DHL improve processes and risk mitigation strategies. Enhancement of the data pool for statistical analysis may also offer benefits for DHL in selecting proper equipment and routings for specific cargos, and establishing dedicated handling procedures where required, appropriate and viable.

The Cassandra solutions for DHL were tested and evaluated in a demonstration trade lane between Shanghai (China) to Ridderkerk (Netherlands). Both the European DHL organisation and the office in Shanghai were involved. For setting up this trade lane, DHL collaborated with one of its customers. This customer was keen on increasing their visibility on the incoming shipments for supply chain monitoring but also for support of compliance related activities.

Challenges in setting up the demonstration
Setting up and implementing the solution in this demonstration was a challenging process because of the limited time that was available. Preparations did not start until the summer of 2013. When the customer in the Shanghai - Ridderkerk trade lane joined some interfacing between DHL and Descartes had already taken place, which means that at least some data were available in the pipeline as early as the end of 2013.

This demonstration thus also showed that even when involving large players with higher IT maturity levels, it can still be difficult to implement changes to their architecture on time for demonstration. Because the demonstration is part of an R&D process, it is sometimes difficult to raise the right level of urgency within organisations to develop and implement changes in IT infrastructure. Even when this can be done, sometimes long lead times exist because the project needs to follow the standard change processes that are in place.

The result of these difficulties was that the amount of data that became available to the pipeline was quite limited. So although a Cassandra visibility solution was implemented, it could not yet deliver the benefits that were envisioned.

Contribution to the demonstration of the Cassandra concepts
The Shanghai - Ridderkerk trade lane add the use of container security devices (CSDs) to the experiences of the other trade lanes. This increases the amount of data in the pipeline and dashboard solutions, thus enhancing visibility and user experience. Moreover, it shows that the solution by Descartes that was developed earlier for the Yantian - Penang trade lane is transferable and could have realised similar benefits in this trade lane if the data had been more complete. The original ambition to include invoice information in this demonstration

would have been extremely interesting as this was not done at all in other trade lane demonstrations.

The pipeline information is near real-time and this is certainly an improvement to the as-is situation. Also the dashboard can provide the customer with confirmed container content, although the necessary level of data availability to link container content to the purchase orders has not yet been achieved. Also, the dashboard and pipeline do not yet contain enough detail to support filing of declarations in the Netherlands.

Reflection on the benefits that were expected

Focus of the DHL customer in the Shanghai - Ridderkerk trade lane was on improved visibility. Especially detailed information on container content and expected arrival (track & trace). This visibility was only partially delivered as there was not enough time and opportunity to deliver all the necessary interfacing. Consequently, the delivered visibility during the lifetime of the project was of limited value.

Possible benefits of improved supply chain visibility for DHL are in the timely and more precise identification of exception events. The alerting functionality of the dashboard plays a key role here. Although the functionality works in other trade lanes, it can only be tested for specific alerts that are valuable to DHL when there is enough volume that includes certain exceptional events that actually trigger the functionality. This was not yet the case in the Cassandra demonstration for this trade lane.

The use of CSDs was prepared in the DHL organisation and in the pipeline and business dashboard. Importing of CSDs through Hong Kong did not encounter any issues but the exporting of CSDs, attached to the containers, from Shanghai unexpectedly did. A documentation issue caused the use of CSDs to be substantially delayed. The issue was solved no sooner than early May 2014 which means that just a very small amount of containers were shipped with CSDs.

When writing this document, it is expected that the demonstration on the Shanghai – Ridderkerk trade lane will continue for a few months after the end of the Cassandra project. The involved parties are able to deliver some of the necessary interfaces to improve significantly data availability in the near future and have therefore decided they see enough opportunities that make it worthwhile to continue the work at their own expense.

7 The Singapore – Rotterdam trade lane

The objective of the demonstration between Singapore and Rotterdam was to deliver a proof of concept for a pipeline solution with a combination of a PCS and BCS configuration. This was supported by participants from within the consortium – K+N, Portbase, DHL and Seacon Logistics – and significant support of a party outside the consortium. Although significant effort was spent setting up the demonstration, the trade lane did not actually 'go live'. However, as the conceptual development of the demonstrator was very well advanced and can be used in future demonstrations a short summary of ideas and lessons learned is presented in this chapter.

For this trade lane, there was important commitment from Singapore Customs, hosting a BCS in Singapore. Three of four industry partners in the consortium were involved, as well as two solution providers. To get this trade lane demonstration running, a shipper was needed, exporting goods from Singapore to Rotterdam. Both K+N and DHL made great efforts to involve their customers but due to external factors, for example take overs and other investment projects, none of the customers was able to or could be convinced to give their consent to participate in the demonstration. Alternatively, a suitable import lane from the Netherlands to Singapore was explored with Seacon Logistics, but also this didn't give a positive result. So unfortunately, at the end of 2013, further efforts to set up this trade lane had to be stopped.

The primary ambition for this demonstration was to support customs compliance. Innovations to be implemented were: pre-filling of both export and import declarations with data from the source and multiple filing of ENS declarations. Improved visibility was deemed interesting in order to derive and implement opportunities for supply chain improvements, but in general this was considered a second rate benefit for this trade lane. The direct benefits for forwarders in this trade lane would be reduced administration efforts (in both time and costs) for lodging of declarations. For the European Customs administration, receiving declarations with data from the source would improve the quality of data for the risk assessment. For Singapore Customs the development of such functionalities would have had the benefit of facilitating trade to and from Singapore, especially import and export related activities in addition to Singapore's functions as a transshipment hub.

A BCS-PCS combinations as the Cassandra pipeline
To realise pre-filling of declarations in Singapore, the current situation of declaration filing for export declarations was analysed in detail. In Singapore there is interaction with Singapore customs to receive a clearance for export and with the European customs to receive a clearance for loading. The carrier lodges the entry summary (ENS) declaration for this. Both of the clearances need to be received before the container can be loaded on the vessel and the export process completed.

The Customs system in Singapore is called TradeNet®. Various solution providers in Singapore developed so-called TradeNet® front-end applications that can be linked to transport management systems (TMSs) and in which a user can create and file customs declarations to the TradeNet® system. This already facilitates declaration filing to some extent, depending on the information that is available in the TMS. Singapore Customs also hosts a business community platform called TradeXchange®. The ambition for this platform is to facilitate trade with all kind of functionalities. For example, shippers can upload requests for permits and insurance through the platform. In cooperation with solution providers, Singapore customs has also developed functionality to enable the front-end applications to retrieve data from the TradeXchange® platform. Shippers can share data about stuffing and invoicing via the system. The declarant can upload this information in the TradeNet® front-

end, check the information, add some fields and then submit the declaration. This very much resembles the data from the source principle in Cassandra and makes re-use of source data possible for the benefit of the declarant. TradeXchange® does not yet include functionality for multiple filing of ENS declarations but it was envisioned that this could be developed in the Cassandra project.

The pipeline that was envisioned for the Singapore-Rotterdam trade lane was a combination of a PCS and BCS as visualised in Figure 7.1. The configuration needs a (standardised) interface between the BCS/PCS to exchange data so that together they provide full visibility on shipments and containers and share data with all the parties in the chain. The BCS on Singapore side is the TradeXchange® platform. On the Rotterdam side, two options were explored, Portbase as PCS and Descartes as BCS.

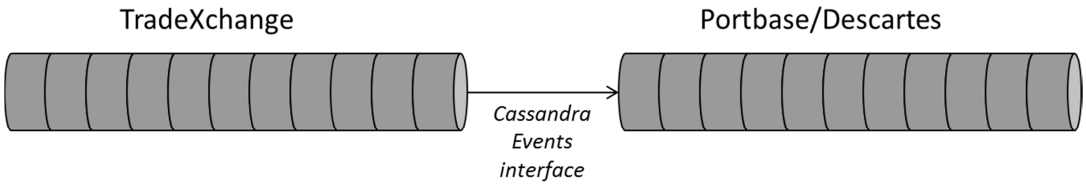

Figure 7.1: Singapore-Rotterdam pipeline configuration

For the BCS and PCS to exchange information, an interface is needed. Although the interface specification was never fully completed the concept for sharing information followed the decision for the interface with the Customs dashboard. The interface would use a Standard Business Document Header (SBDH) in combination with UN/CEFACT messages – e.g. DESADV, IFTMIN, IFTMCS and INVOICE – as body. The UN/CEFACT message would be extended with attributes to also capture the source of each data element, as typically, each message could be constructed from data from various sources. In the future, other attributes could be added to inform the receiver about data that were checked, process controls in place, etc., so that improved risk assessment is also possible.

The importance of PCS and BCS in constructing pipelines

The demonstration between Singapore and Rotterdam was unique in that it would have been the only demonstration of a PCS-BCS configuration. Other demonstrations showed that using a BCS or PCS can enable especially smaller companies to share information with partners without much IT effort and costs and without long lead times for set-up. This makes it necessary to explore a PCS-BCS configuration further. In such a configuration, the efforts for creating a pipeline solution go hand-in-hand with other (local) investments that are already made, so that the community can benefit from using a PCS, BCS or single window solution. In addition to this, the creation of Cassandra pipelines with PCSs and BCSs can quickly result in a Cassandra pipeline network that has a great geographical coverage. A Cassandra pipeline network is visualised in figure 7.2.

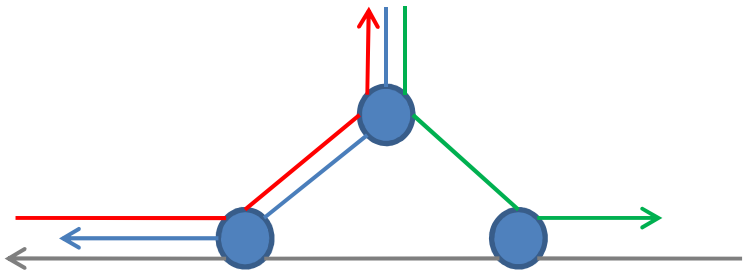

Figure 7.2: A network of pipelines with PCS-BCS configurations

8 Solution by Descartes for Cassandra

Descartes provides logistic IT solutions worldwide to different types of companies: manufacturers, retailers, logistic service providers, etc. Solutions include messaging and data conversion services, transport management systems and Customs and regulatory compliance. In the Cassandra project, Descartes was the solution provider in trade lanes between Asia and Europe and between Europe and the United States. Three out of four industry partners were supported with Descartes solutions to create a pipeline and visibility.

The Cassandra concept has a data exchange functionality at heart: the Cassandra Data pipeline. Sharing high quality data across the global supply chain in real-time is a challenge even when many businesses already have IT solutions in place; the variety in IT solutions and in the solutions' maturity levels create difficulties. Moreover, the use of a variety of standards can also be a problem. As part of the Cassandra architecture, three main components can be distinguished: 1. the data exchange functionality or pipeline itself, 2. a business dashboard for visibility by supply chain actors and 3. a customs dashboard for visibility and piggy-backing (i.e. reusing business data) by customs.

The innovation at the source
One of the core principles of the pipeline is that data is captured at the source, meaning that the data comes from the process where it originates. In total, around 150 data elements are relevant to capture in the pipeline. Depending on additional functionalities on top of the pipeline, for example declaration filing, this number can increase. For each trade lane demonstration, a process and information analysis showed where each of the data elements needed to be captured.

Within the Cassandra project multiple methods have been used to connect to the various data sources and partners. Some partners have been able to push messages, for others Descartes has worked with a subscription process or a pull process. In the case of subscription, data or events were subscribed to, in order to capture additional data on a specific shipment or container. In the pull process, data could be queried on request – for example the interface between the pipeline and the Customs dashboard – or on a regular time interval. Experience from the Living Lab shows that a lot of business processes and interactions in international supply chains are still managed with low tech IT capabilities, in some cases separately from transport management or freight forwarding systems. In practice, EDI is thus less used than was anticipated as most of the time only larger companies use this standard. Interfacing with small local players was therefore difficult because their IT solutions sometimes did not have the proper interfaces or they did not have the resources to implement these interfaces.

The limited use of standards and advanced interfacing capabilities shows the need for a platform offering connectivity solutions, especially to smaller players in the industry, as part of the Cassandra pipeline. By connecting to a logistics community platform such as Descartes, companies can save the effort to connect to all their partners individually while still supporting different message formats when communicating with partners and customers, including information in Excel formats. When connecting with new partners this can also significantly reduce the on-boarding time. Even with large players, setting up new connections can cause timing issues mainly due to prioritisation of IT efforts.

Most data elements that were fed to the Cassandra pipeline during the demonstrations were already available to supply chain partners in various messages. The innovation was not in capturing new data elements, but in getting the data elements in higher quality from the source. The big change was thus not in getting more data that were unavailable before, but

getting them from sources that were unavailable before. In some cases, standard messaging could still be re-used as transport mechanisms for the data, for example when capturing purchase order information from the buyer. However, the data from the messages are converted into a multi-entity data model once they enter the data pipeline.

Messages provide information on one or more entities: order, shipment, container, object. Every message that is received is linked to a main entity and this automatically updates the data of other entities that are linked. For example a house bill of lading message that contains a container reference will also update the container information and not only the shipment entity.

Understanding what's in the pipeline

When the pipeline data need to be visualised or re-used in other solutions offered by Descartes, for example for declaration filing, the data need to be converted to a multi-entity data model. The entities that are now included in the Cassandra solution are the purchase order, bookings (e.g. carrier booking), container, shipment and object or transport means (e.g. ocean vessel). Usually there is no single, unique reference number that can be used through the whole supply chain. It is therefore very important to define the correct links between the different entities (n-m links) and to allow for dynamic and intelligent linking of entities. This challenge is visualised in Figure 8.1. It shows how two completely separate sets of data exist before they are linked together at the moment of stuffing, also called the Consignment Completion Point (CCP). The first set of data is the purchase order information. In most demonstrations it was not possible to link this directly to a dispatch advice that also included the number and type of containers that would be used. Because of this, the purchase order could not yet be linked to the booking that was made with the ocean carrier. This booking contains the number of containers and the type (e.g. 40ft) which is then also a reference for releasing empty containers at the depot ('Empty Out'). Consequently, the stuffing moment is the first moment when the various reference numbers – purchase order number, carrier booking reference, container number – are brought together.

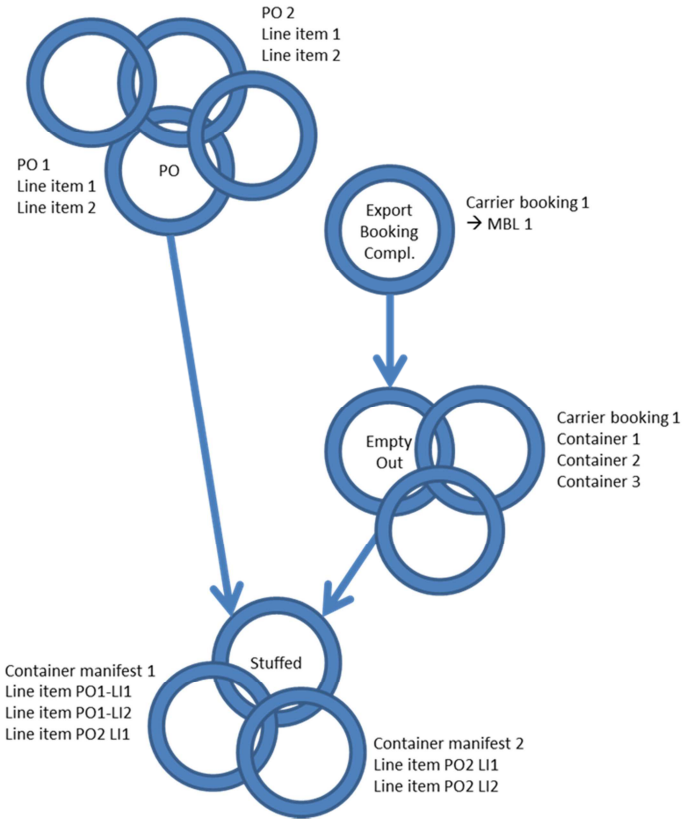

Figure 8.1: N-M links between the different entities in the data model

Apart from the challenge of handling multiple entities, another issue that was solved in the Cassandra solution is that messages need to be interpreted independent of the timing of their arrival. Not all parties are able to provide information real-time so the order of arriving messages can be different from the sequence of supply chain events. Also, although most supply chains are similar, not all supply chains are exactly equal, meaning that a dynamic configuration of the supply chain is needed. This also requires a lot of flexibility in the functionality that uses the pipeline data. Other issues that were solved are related to shipment and container lifecycle aspects. Containers are re-used and shipments can be consolidated and later deconsolidated into different shipments which should not tamper with the earlier constructed n-m relations.

In addition to storing the data elements, the data pipeline also stores the source of the information and all previous versions of the data element. The source of the information is registered so that users can always check who has provided information on a certain entity and when, thus supporting the assessment of data quality. The earlier versions of a data element are kept as well, allowing the alerting functionality of the dashboard to indicate contradicting information. This has been demonstrated for the container and shipment milestone fields with alerts for unexpected transshipment.

Visualising orders, shipments, containers and objects

The business dashboard developed by Descartes uniquely combines shipment monitoring, including milestones, multi-leg and vessel tracking, insight into the content of a container and its related shipments and purchase orders. This is done through a multi-party many-to-many data access model that allows future scalability and also security. The business dashboard is a visualisation of data available in the pipeline, including:

- Container and consignment details and status monitoring;
- Full audit trail of the data sources with meta data;

- Supply chain actor information, roles and relations.

Within the business dashboard the data can be accessed from different views related to the entities: purchase order, bookings (e.g. carrier booking), container, shipment and object or transport means (e.g. ocean vessel). For every entity there are different screens available, for example detailed information, transport milestones and container security device information. The user can easily navigate through these screens and also drill-down or up to other related entities.

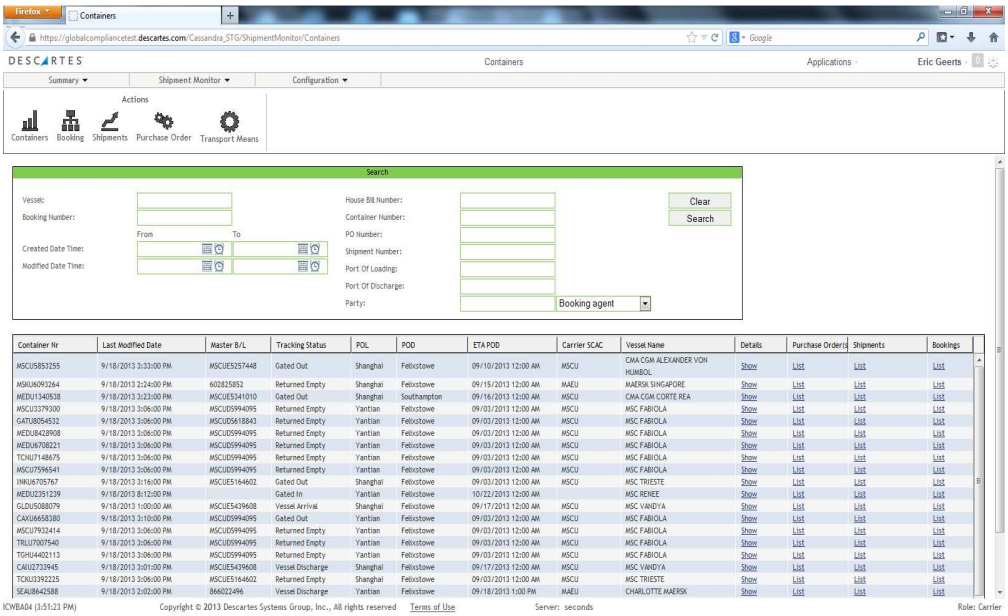

Figure 8.2: Monitoring shipments in one screen

Active alerts to support control

To support monitoring and control, the alerts can be configured by the user. Four types of alerts were identified:

1. Alerts directly related to alert messages (e.g. CSD breach);
2. Alerts raised from conflicting information in one data element field (e.g. quantity reported differently by different sources PO and container manifest);
3. Milestone or event alerts (e.g. comparison of Estimated and Actuals);
4. Business Intelligence / Business Rule like alerting, where data from multiple fields is combined to detect an alert (e.g. combining product quantity, product weight and checking container empty mass versus container gross weight).

During the Cassandra demonstrations some alerts were already configured and tested by the industry partners. Examples of implemented alerts are quantity discrepancies between PO and container manifest, alert specific containers for containing promotional/seasonal products, alert containers that have missed the vessel they were due to depart on, vessel delays or early arrival and unexpected transhipments.

The Cassandra business dashboard by Descartes can be further integrated in Descartes' suite of supply chain solutions and become commercially available.

9 Solution by GS1 for Cassandra

GS1 is dedicated to the design and implementation of global standards and solutions to improve the efficiency and visibility of supply and demand chains globally and across sectors. GS1 is an international not-for-profit association with member organisations in over 100 countries. Together with Seacon Logistics, GS1 delivered the solutions for the Penang – Venlo trade lane.

Obtaining quality data from all sources along the chain
Integration with the various partners that are involved is one of the challenges in creating a high quality data set that provides good visibility in the supply chains. A supply chain is a set of companies and other organisations involved in trading and other business relationships with one another. In many cases, supply chains are concerned with the trade of physical objects such as tangible products, parts, raw materials, and the like. Supply chains may also involve trade of non-physical objects such as music downloads, video-on-demand, telephony services, electricity, virtual world products, and so on.

An open supply chain is one in which the complete set of trading partners is not known in advance and which changes continually. This has great significance for the architecture of information systems. The building blocks of an information systems architecture are the interfaces between different system components. In a supply chain context the most important interfaces are those that exist between different companies in the supply chain. For example, in an interface for communicating digital purchase order information, one company (the buyer) is the sender of data, and another company (the seller) is the receiver. In a closed supply chain, a fixed universe of trading partners is known in advance, and so interfaces can be negotiated in a controlled, coordinated way, and change management is simplified because all parties can agree to make changes simultaneously. In an open supply chain, by contrast, the parties on either side of an interface may not even know about each other.

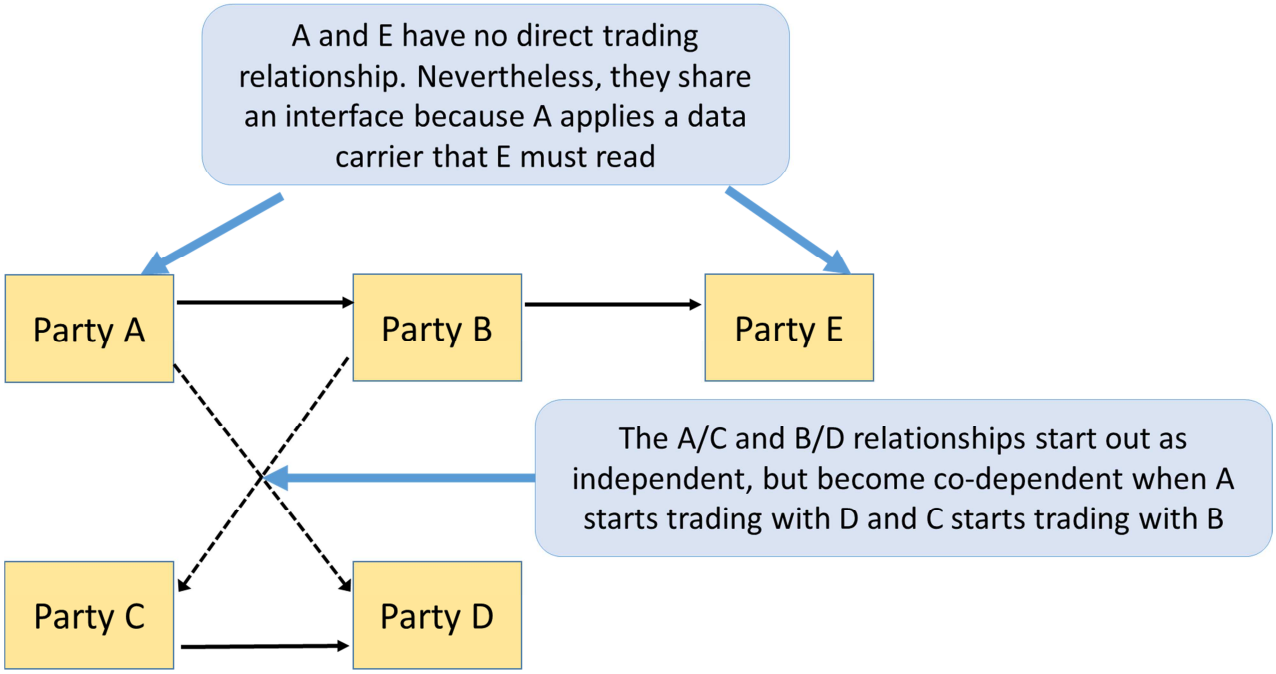

Figure 9.1: Two types of Supply chain interfaces

The open nature of supply chain interfaces manifests itself in two ways, as illustrated in Figure 9.1.

- Firstly, an interface may exist between two companies that do not have a direct business relationship. For example, a manufacturer may mark a product with machine-readable data in a bar code, the product is sold to retailers through distributors, and this bar code is read by all retailers who receive the product. The bar code is an interface between the manufacturer and the retailers, but the manufacturer's only direct business relationship is with distributors.
- Secondly, as trading relationships come and go, a company may find that it needs to extend an existing interface to encompass new companies. For example, suppose that Companies A and B are in a trading relationship and utilise an electronic interface for exchanging purchase order and invoicing information. Companies C and D are in a similar relationship. Sometime later, Company A may find that it needs to trade with Company D, and likewise C may find that it needs to trade with B. Company A would like to use the identical interfaces and supporting information systems to trade with C as it does to trade with B, and likewise for C as it trades with B and D.

Both of these manifestations of open supply chains have a profound influence on the design of information interfaces. They require that interface definitions are negotiated and implemented outside the context of any particular trading relationship. They need to be adhered to by all parties so that interoperability will be achieved despite the fact that the companies on each side of the interface are not able to negotiate in advance. It leads to the definition of broadly accepted industry standards, in which the emphasis is placed on interoperability, maximum applicability to a broad range of business contexts, and minimisation of choices that require pre-coordination between interfacing parties. These are precisely the principles that underlie GS1 Standards.

Use of GS1 standards to support data consistency

GS1 provides the foundation for an approach to the integration of information across supply chains. This approach, called the "digital supply chain," provides for the maximum flexibility in utilising information to improve supply chain business processes.

The digital supply chain approach is as follows:

- *Globally Unique Identification:* All assets of interest in the supply chain should be identified with a globally unique identifier at the lowest level (e.g. Global Trade Item No.).
- *Affixing as Few Data Carriers as Possible:* If an asset is physically handled, one or more physical data carriers should be affixed to carry the asset's unique identification (and no other information). The circumstances in which the asset is handled will dictate which data carriers are suitable (e.g. UHF RFID, GS1-128 Bar Code, GS1 DataMatrix, etc). In general, as few data carriers as possible should be used.
- *Use Master Data to Carry Asset Attributes:* All descriptive attributes of an asset should be carried in master data associated with the asset's unique identification rather than carried on the asset itself through supplementary data in a physical data carrier. Supply chain parties should standardise the smallest set of master data attributes that is adequate to convey what business processes need to know about an asset and communicate those attributes using synchronisation or other means.
- *Use Common Data Definitions in Business Documents, Internal and External:* Business data exchanged between applications within a company and between companies should refer to assets using their unique identification. Descriptive information about those assets needed to process the data may then be obtained through master data. To the extent possible, other data contained in electronic documents should make use of standardised definitions.

Product tracking and performance monitoring

In the Cassandra project, GS1 has been involved in the Living Lab Asia-Europe, together with Seacon Logistics. In the Living Lab, GS1 demonstrated the use of the EPCIS (Electronic Product Code Information Service) standard for tracking events along the supply chain and by improving existing GS1 functionality with a business dashboard to not only track products but also monitor performance across the chain. The Cassandra events were described with a combination of standard EPCIS event messages. These event messages are mostly used for tracking physical movement of items along the chain. The Cassandra events are mainly administrative events and the use of EPCIS event messages for this was new. With this, it became possible to add meta data and master data about the product and the supply chain process.

The GS1 dashboard has specific instances for buyers, sellers and freight forwarders, tailored to their respective needs. A screen shot of the Dashboard for the seller is shown in Figure 9.2. For example the dashboard shows the outstanding and completed purchase orders, any discrepancies between purchase orders and confirmed container manifest and also indicates the expected arrival of purchase orders in the coming weeks. By clicking on the diagram bars, the user can access detailed information of the purchase order or the container manifest, thus monitoring product progress along the chain and also performance of the supply chain partners. The dashboard uses data from the Cassandra events and EPCIS messages for administrative events that were exchanges between Seacon Logistics and GS1.

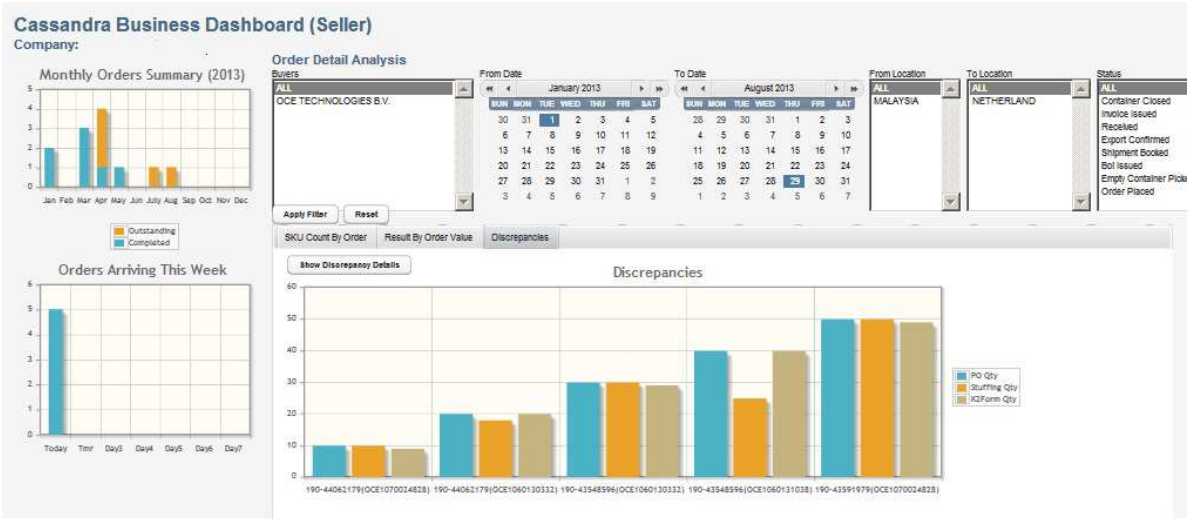

Figure 9.2: EPCIS Dashboard for the seller of goods

10 Results and evaluation of the demonstration purpose

Cassandra pipeline configurations and the backbone
The Asia-Europe Living Lab has delivered a broad demonstration of all the pipeline configurations, thereby allowing the overall Cassandra concept to be properly evaluated[4]. These configurations and their demonstration in the Living Lab Asia-Europe have been summarised in Table 10.1. The reason for making a combination of the EPCIS and trader pipeline configuration reflects the situation in practice. Seacon Logistics wanted to develop their own part of the overall solution because they saw a business advantage in doing so. Companies can thus decide to develop certain functionality in-house and outsource other parts of the solution. Both solutions can however develop further as stand-alone pipelines.

Configuration type	Demonstration in the Living Lab
PCS pipeline configuration	Singapore-Rotterdam
EPCIS pipeline configuration	-
BCS pipeline configuration	Yantian-Felixstowe Shanghai-Ridderkerk
Trader pipeline configuration	-
Hybrid solution	Penang-Venlo: EPCIS + Trader

Table 10.1 Overview of Cassandra pipeline configurations in the Living Lab

In general, it can be concluded that all the Living Lab demonstrations are good examples of the configuration types that are described in the Cassandra IT roadmap. In some cases, some differences with the ideal picture exist but there were reasons to deviate from this.

Data from the source and data quality
Capturing data from the source is one of the key principles of the project and all Living Lab 1 trade lanes have focused on this for all data elements that were included in the pipeline. The demonstration that reflects this best is the Penang-Venlo demonstration where a workflow portal was developed that is linked to the Cassandra events that enables capturing of event data directly from the party that executes the event.

Data analysis in the Living Lab showed that there are around 150 data elements in the supply chain that are of interest to capture in the data pipeline but not all these elements could be captured. In each demonstration, data capture started with the sources that were most readily available. After that the priority was on capturing data about the goods and the parties that are involved. In some cases however, the data in the demonstration was still cloaked because of a lack of trust between the project partners due to not knowing each other sufficiently well. Although this did not influence the proof of concept, it did affect the user experience for the dashboards.

The Living Lab demonstrations have in all cases succeeded in combining purchase order data with shipment details, party information and transport milestones although data completeness differed a lot between various trade lanes. In only limited cases some of the financial data, for example from invoices, were partially captured. Only in one of the demonstrations was CSD data available.

Capturing more data and data from more sources would only have been possible if there had been an opportunity to include more development cycles and if it had been possible to convince third parties to provide interfacing to the pipelines. Issues that prevented an

[4] The evaluation of the Cassandra concepts will be performed in Wp500 and therefore not discussed in this deliverable.

increase in development cycles were high development efforts for building solutions from scratch and insufficient scoping of the solutions. For some trade lanes it was difficult to convince third parties to deliver their information to the pipeline on time. Information that is now lacking because of this are carrier and terminal milestones, invoice information, and sometimes also declaration data. Identified reasons for not being able to convince third parties were:

- Lack of urgency in timing of delivery;
- Lack of resources with the third party to understand what needed to be done and to deliver the actual interface;
- Lack of commitment from higher management to assign resources;
- Lack of willingness to contribute without a significant monetary compensation.

A single entry point for business for real-time information
A single entry point for supply chain information was delivered in all trade lanes with a business dashboard. The business dashboards that were implemented in the Asia-Europe Living Lab were provided by Descartes and GS1.

All the pipeline information is near real-time and this is certainly an improvement with the pre-Cassandra situation in all the trade lanes. For some trade lanes, there was originally a weekly data exchange between parties (including more limited information) or information was shared as a paper dossier that was completed after vessel sailing and receipt of the master bill of lading. In some cases, certain information was not shared at all.

Customs and compliance innovations
Dutch and UK Customs had different ambitions of how pipeline information should be made available to them.

- Dutch Customs did not want the Cassandra pipeline information to interfere with the data from the declarations, in terms of for example the difference between legally required and optionally provided data. In addition to this, further integration of the optional information in Dutch customs' risk assessment modules of was not feasible within the scope of Cassandra. A dashboard would be sufficient to support their employees in risk assessment. In the future, further integration of pipeline data with the risk assessment system is desirable.

- For UK Customs, it would have been much more desirable from the start if the data had been made available to their new risk assessment system for real-time pre-departure, pre-arrival and declaration processing and risk assessment. This system already combines information from various sources and compares this automatically with the declaration data. Adding the pipeline as an additional source would support UK Customs and Border Force employees in a way that is integrated with their current way of working.

In the Cassandra project, the industry partners in the consortium only agreed that Customs would be able to see the information on the shipments but never to have the data. This is an important distinction, as seeing the information in a dashboard only supports ad hoc risk assessment for a particular shipment but providing the actual data to Customs in such a way that they can also be stored enables trend analysis. Here, the shared data would extend beyond the data that is already shared with Customs in legal declarations. Sharing of data in declarations or the same data as in declarations is obviously no issue. Because of this, it was decided to create only a Customs dashboard that supported querying of data for specific Cassandra shipments. This reflects the ambition of Dutch Customs for the Cassandra project but does not address UK Customs' ambition.

Table 10.2 summarises the extent to which the various trade lanes have delivered data to the Customs dashboard. In addition to the issue of data completeness, in some cases sensitive business information was cloaked which also limited the user experience.

Type of data	Yantian-Felixstowe	Penang-Venlo	Shanghai-Ridderkerk
Goods information	Good	Good	Reasonable
Party information	Good, although partly cloaked	Reasonable	Good
Transport information	Reasonable	Limited	Reasonable
Monetary information	-	-	-

Table 10.2 Overview of data types delivered to the Customs dashboard

UK Customs had access to the information in the pipeline via the customs dashboard. However, UK Customs would have preferred to see this extended with links between the pipeline and the UK declaration systems directly so that they have higher quality data in their own risk assessment systems as well. Because this was not included, the practical use of the Customs dashboard was of limited value and therefore it was not used in daily practice. Also, the amount of data in the customs dashboard was assessed to be a bit limited. The living lab has shown how the functionality can work and how it can be expanded in the future, but for now, the functionality and offered data is not yet complete enough according to UK Customs.

Dutch Customs also had access to the information in the pipeline via the customs dashboard. But, although the Customs dashboard delivery allowed for six months of evaluation, the trade lanes to the Netherlands were delayed and therefore there time available for testing was even more limited. Not all the information could be provided by the trade lanes to the Netherlands, although the most important required information on parties involved and goods descriptions were made available to some extent. Especially the mentioning of the commercial parties behind the transactions was of added value as the ENS (and SAL) declarations only mention the forwarder as consignor and consignee in these trade lanes. So, although the available data is limited it could clearly show some of the potential already.

The Singapore-Rotterdam trade lane was the only trade lane in the Asia-Europe Living Lab that would demonstrate the concept of multiple filing for ENS and also for export and import declarations and could have brought the demonstration of compliance innovations a lot further. The Descartes system has a module that can generate ENS declarations and UK import declarations and these could have been connected to the pipeline and probably demonstrate this as well for the Yantian-Felixstowe demonstration. It was however no longer feasible due to time constraints to implement this connection and the declaration filing functionality in the Living Lab once it became clear the Singapore-Rotterdam trade lane would not be implemented. In hindsight, this opportunity should have been identified earlier and the risk for the Singapore-Rotterdam trade lane should have been assessed more correctly. By doing this, it would have been possible to demonstrate more of the compliance innovations and also satisfy the ambition of UK Customs at least to some extent by providing them pipeline information from better sources in the official declarations.

Progress beyond the state of the art

The Living Lab Asia-Europe has shown that the IT maturity in international supply chains is very diverse. Although technological solutions for data sharing were and are being developed these have not been implemented in the logistics industry to a particularly large extent. The Living Labs have demonstrated how some solutions can provide benefits to logistics solution providers and their customers and also how they can be implemented gradually. In addition to this, the Living Labs have also shown that the uptake of these solutions can be stimulated with demonstrations and can bring ideas for further improvement that otherwise would not have been found. But another important lesson is that in some cases (like the difficult involvement of shippers shows) the industry is not eagerly awaiting these solutions or is not

easily convinced of the added value of spending any amount of effort in realising visibility. A conclusion is that the investments will only be made when there is a very clear business case for doing so. This business case might not easily be recognised, as the problems and benefits of visibility might reside with very different actors or departments in the supply chain. Collaboration between businesses and with governments authorities can overcome this issue. At the same time, it also brings additional challenges of its own.

The idea of the Cassandra pipeline was formed at the end of the Integrity project and although the Cassandra R&D work has developed the idea further, the logistics industry and its solution providers not stood still in the meantime. During the Living Labs, workshops were organised with trade lane partners outside of the consortium to discuss the work on the Cassandra pipeline and business dashboards. It became apparent that these companies have their own in-house systems that perform some or much of the functionality of the Cassandra dashboard. Some of these systems also provide near real-time interfacing with supply chain partners. Differences were in the clear focus of Cassandra on capturing data from the source which was not always an important prerequisite for the companies. Also the sharing of data with other parties in the chain was not yet apparent for the companies outside the consortium and their systems were not always ready to support this. But it is a logical next step for them. Sharing data in a standardised way to really create what the Cassandra project describes as the 'Backbone' will be more difficult as these solutions focus more on trade lane or company specific solutions. The developments in the industry and the solutions that are already developed outside the Cassandra project show that the Cassandra solutions are no longer unique. This development also shows that the market for exploiting the Cassandra solutions and ideas is perhaps becoming increasingly ready for real-time data sharing and inevitably also for making this data sharing more efficient through standardisation.

Continuation of the work after the Cassandra project

During the Cassandra project, it became apparent that not all ideas could be implemented before the end of the project. Some of the partners involved in the Yantian-Felixstowe and Penang-Venlo demonstration therefore decided to join in the FP7 Core project where the use of the Cassandra pipeline to improve security and risk assessment will be evaluated further. The efforts of the Cassandra project will be re-used where possible. Also, scalability issues will be tackled as the solutions will be expanded to other trade lanes.

Because the work on the Shanghai-Ridderkerk trade lane was not completed in the Cassandra project, the participants in this trade lane have now decided to extend the collaboration outside the project. DHL and Descartes will therefore enable the DHL customer to fully assess the benefits of visibility through the Cassandra solutions offered.

Dutch Customs is continuing its work on distinguishing trusted traders from trusted trade lanes. Some of the lessons learned from the Living Lab Asia-Europe will be re-used and also some of the Dutch participants in the Living Lab have been invited to collaborate further in operationalising this concept.

EUROPEAN COMMISSION

SEVENTH FRAMEWORK PROGRAMME
THEME Monitoring and tracking of shipping containers
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Cassandra
Common assessment and analysis of risk in global supply chains

WP400
Living Labs

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List of Abbreviations and Definitions

API	Application Programming Interface
ATA	Actual time of arrival
ATS	Actual time of shipping
BCS	Business Community System
CFS	Container Freight Station (consolidation centre)
CIF	Cost, Insurance, Freight (Incoterm)
CN	China (UN/LOCODE)
CRN	Conveyance Reference Number
CSD	Container security device
D&B	Dun & Bradstreet
Data from the source	Data from the originating process, provided by the process executor who controlled and knows what has happened, and is the best provider of trustworthy data.
DCA	Dutch Customs Authority
EAN	European Article Number
EFTA	European Free Trade Association
ENS	Entry Summary (declaration)
EPCIS	Electronic Product Code Information Services (standard)
ERP	Enterprise Resource Planning: Business management software that can include functionality for manufacturing, finance, logistics, procurement, product planning, etc.
ESB	Enterprise Service Bus
ETA	Expected time of arrival
ETS	Estimated time of shipping
FCL	Full Container Load
FF	Freight Forwarder
FOB	Free On Board (Incoterm)
FXT	Felixstowe (UN/LOCODE)
GB	United Kingdom (UN/LOCODE)
HMRC	Her Majesty's Revenue and Customs (UK Customs)
HBL#	House Bill of Lading number
ID	Identification
IFTMCS	International Forwarding and Transport Message – Contract Status
K+N	Kuehne + Nagel
KPI	Key Performance Indicator
LCL	Less than Container Load

LL	Living Lab
MBL#	Master Bill of Lading number
MoT	Means of Transport
MRN	Movement Reference Number
MY	Malaysia (UN/LOCODE)
NL	Netherlands (UN/LOCODE)
NVOCC	Non Vessel Operating Common Carrier
PO	Purchase Order
PCS	Port Community System
PEN	Penang (UN/LOCODE)
PoD	Port of Discharge
POD	Place of Delivery
PoL	Port of Loading
RBA	Risk Based Approach
RBGC	Risk based government supervision
RBSCM	Risk based supply chain management
RID	Ridderkerk (UN/LOCODE)
RTM	Rotterdam (UN/LOCODE)
SBDH	Standard Business Document Header
SCT	Singapore Container Terminal (UN/LOCODE)
SG	Singapore (country) (UN/LOCODE)
SGP	Shanghai port (UN/LOCODE)
SHA	Shanghai (UN/LOCODE)
SIN	Singapore (city) (UN/LOCODE)
TPP	Tanjung Pelepas (UN/LOCODE)
UCR	Unique Consignment Reference
UK	United Kingdom
UN	United Nations
VEN	Venlo (UN/LOCODE)
YICT	Yantian International Container Terminal
YTN	Yantian (UN/LOCODE)

Index

11 Introduction

11.1 Background of the project

With increasing flows of containerized traffic and growing emphasis on (national) security, businesses and governments are seeking efficient and effective means to ensure full supply chain control and security through better visibility. Government agencies require that the cargo is remained secure from the point of origin, during transit and until the point of deconsolidation and domestic distribution. If this can be guaranteed, this could then lead to government agencies shifting from the (physical) control of goods and containers to a modern risk based regulatory supervision. An important prerequisite for risk based regulatory supervision is the introduction of a risk based supply chain management. This means that all dimensions of supply chain management should be based on a transparent and reliable assessment and treatment of risks. The assessment of risks depends to a large extent on the availability of timely, reliable and complete information. A critical factor in a risk based approach is the confidence that government should have about the source, reliability and information content and quality of data that is presented to them by business. The fact that business uses the same data for their own risk assessment can be an important quality signal.

The Cassandra project aimed to make container logistics more efficient and effective by enabling and facilitating the combination of existing information sources in supply chains into new and better visibility that allows the assessment of risks by both business and government. A new data sharing concept, the so-called ‘data pipeline’, and a risk based approach were to be detailed and demonstrated in the course of the Cassandra project. Cassandra should build interfaces between existing information platforms and visibility solutions to capture high quality, integral monitoring data on cargo flows and container integrity. The project should thus produce sophisticated visualization tools to monitor supply chains in a neutral, standardized, and open architecture. This enhanced visibility should facilitate the adoption of a risk based approach in designing and managing efficient and secure supply chains by business.

Living Labs were used to investigate and demonstrate the concepts of the Cassandra project. A Living Lab is a form of action research in which relevant stakeholders – both public and private – collaborate to design, demonstrate and evaluate innovative concepts. There were three Living Labs (LLs) in the project and this document reports on the process and findings of the Living Lab between Asia and Europe. Figure 1.1 shows the structure of the project and the position of the Living Labs within it. Work packages 200 and 300 are the R&D work packages that needed to produce the detailed concepts and products for testing. These were crucial input to the Living Labs. The Living Labs then fed the evaluation of the various concepts and products in work package 500. The main outcomes of the project are defined at the bottom of the diagram: a vision on the system based approach to government supervision, and related to that, a vision on the risk based approach to supply chain management.

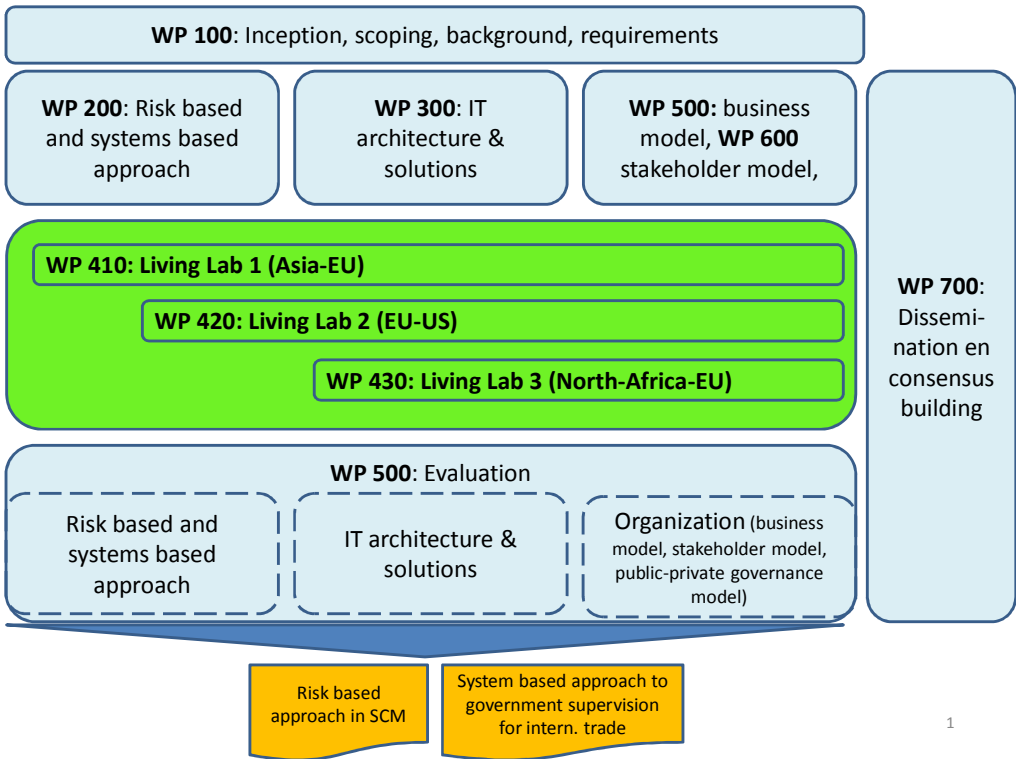


Figure 1.1 Cassandra project overview

11.2 Objective and scope for Living Lab 1

The objective of the Living Lab was to demonstrate the innovative concepts and products developed in the Cassandra project in a real-life context and provide quality input to the evaluation. As became clear in figure 1.1, the success of the Living Lab was highly dependent on the outcomes of WP200 and WP300.

Each Living Lab contained one or more specific trade lanes. A trade lane is a specific flow of goods from origin A to destination B and served to restrict the scope of the demonstration. Between origin and destination there can be intermediate nodes, like container terminals or inland hubs, and connecting transport legs. Each location or leg has parties connected to it that are either involved in the organization or execution at the node or on the leg. Another type of involved party can be the party that is owning and paying for the process, the end customer.

Although a trade lane restricts the scope very well, one should be aware of the context that surrounds it and that influences the demonstration. Figure 1.2 shows a trade lane from origin A to destination B and its possible context. The blue arrow shows the trade lane that is in scope, the grey arrows are out of scope. The small circles indicate intermediate nodes or adjacent parties and locations. A and B reflect the start and end location and the consignor and consignee. Both A and B have parties involved in planning and execution that are directly connected to them (the smaller circles) and that can influence the operations on this location. B also has an additional trade lane – indicated by the grey arrow – approaching it. This can be an additional flow of goods from another origin, for another customer, coming for example into B's deconsolidating warehouse. Although the scope of the trade lane is limited to the blue flows, it still means that B's original operation needs to be maintained for the grey flows and that this operation should not influence the evaluation of the tested concepts. The same holds for consignor A, which can also ship to location C. Various country authorities and industry interest groups can be involved.

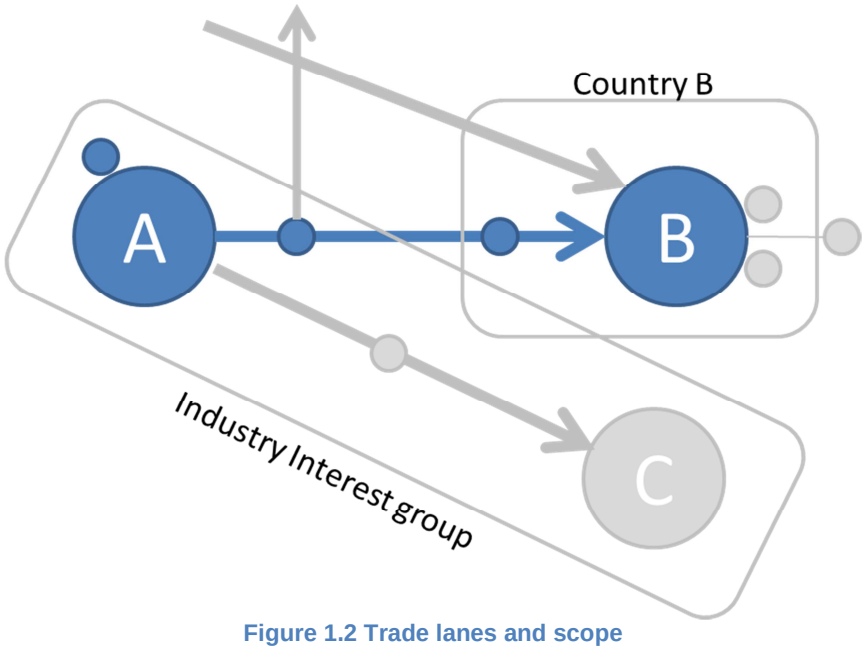


Figure 1.2 Trade lanes and scope

Living Lab 1 operated between Asia and Europe and had trade lanes that start in Asia and end in either the United Kingdom or the Netherlands. For the reader's ease of understanding, these flows are separately presented in this document.

Figure 1.3 shows the trade lanes that were part of the demonstration involving the United Kingdom. Two trade lanes were identified and eventually it was decided to go ahead with only one of them. This trade lane is running between China and the UK and has the port of Felixstowe as entry point to the UK. The second trade lane was between the UK and various other locations like Australia, Brazil and China. Work on this trade lane was postponed until the first lane was sufficiently mature but was eventually put out of scope.

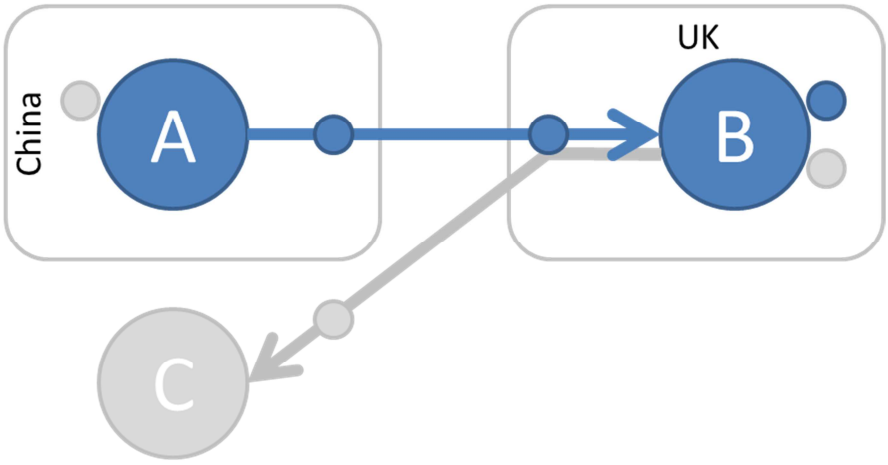


Figure 1.3 Trade lanes for the United Kingdom

Figure 1.4 shows the overall scope for the Netherland's situation. There was one trade lane (A to B) from Malaysia to the Netherlands and one from China to the Netherlands (D to E). There was also one trade lane identified from the Netherlands to China but this one has been left out of scope. Finally, there was the special situation with a trade lane from Singapore to

the Netherlands that was extensively explored but not implemented. All these trade lanes had the port of Rotterdam as entry point to the Netherlands.

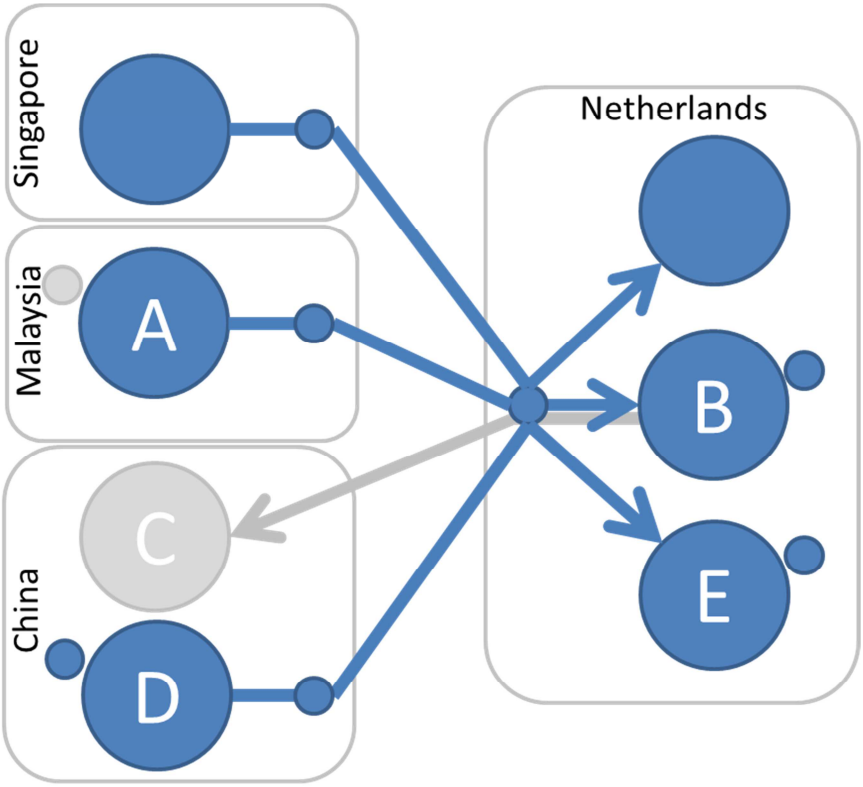


Figure 1.4 Trade lanes for the Netherlands

11.3 Limitations

The Living Labs were meant to implement solutions and provide input to evaluation. Although it supported the R&D work directly, it was never intended to design the desired Cassandra solutions, such as the pipeline, in the Living Lab itself. Of course, some products left room for the Living Lab participants to implement the product in their own way. For example, some of the business dashboards facilitated the use of alerts. It was left to the participants in the trade lane to choose the alerts they are interested in.

In general, the scope of demonstrations and the ability to implement certain changes is limited by the support of the participants in a trade lane. Here, participant does not only refer to the Cassandra partners, who already committed themselves, but especially to third parties that could contribute significantly to the demonstration. The project team was not always able to convince external parties to contribute to the demonstration. Some of these parties would only contribute when receiving payment in return. In all cases, the team has focused on capturing information that was reasonably available according to the following priorities, established in Wp100:

1. Goods information – e.g. buyer/seller goods description from purchase order and packing lists;
2. Party information – e.g. on buyer, seller and carrier;
3. Transport information, including Track & Trace milestones, or other information related to the fulfilment of the contract of carriage;
4. Monetary information, including invoice and payment data;
5. Data required by law for Customs import and export purposes including safety and security.

11.4 Reading instructions

The purpose of this document is to present the process and findings of the Living Lab Asia to Europe. The evaluation of the Cassandra concepts will be performed in Wp500 and documented in its deliverables. The findings of the Living Labs in this document will include evaluation of the Living Lab process, recommendations and satisfaction of the participants with the process and products in generic terms. The document will describe the trade lanes in more detail, both the as-is situation before Cassandra implementation and the to-be situation, and their findings in separate chapters and paragraphs. This document is thus en extensive version of the D4.1 White paper report.

In the next chapter, the Cassandra concepts will be described in more detail. Especially the possible configurations of the pipeline will be summarized, based on deliverables of Wp300. Chapter 3 will then describe the Living Labs approach in four different steps and background on data collection and analysis. The following chapters describe the Living Lab Asia-Europe trade lanes in more detail, first the UK trade lane and then the trade lanes for the Netherlands. These chapters describe detailed processes, IT configurations, stakeholders and participants and implemented pipeline solution. Some of the developed solutions have been implemented in multiple trade lanes and in that case the solution description is only included once, and in the first trade lane section where applied. Other chapters then include references to the solution descriptions only. A short evaluation per trade lane can be found at the end of each section. Overall conclusion and recommendations, including recommendations for the methodology, will be described in chapter 6.

12 Cassandra concepts put to practice

12.1 Introduction to the Cassandra concepts

The key Cassandra concepts that needed to be implemented in the Living Lab are summarized as follows:

- End-to-end supply chain security, through visibility of the actors, goods, information, and logistics;
- Data pipeline as a technical concept to realize the data exchange in the supply chain that is needed to improve visibility and thereby end-to-end supply chain risk control;
- Data from the source as an enable to improve data quality;
- Risk based approach for businesses to assess supply chain risks and to identify the data elements needed to improve control of these risks;
- The re-use of business risk control and original business data for government purposes also called the piggy-backing principle.

Background and guidance to these implementations came from R&D work packages WP100, WP200 and WP300 and detailed information on these concepts can be found there. The results that are directly relevant for the reader's understanding of this document are shortly summarized in the remainder of this chapter.

Below figure 2.1 shows how the evaluation work package, WP500, translated and structured these concepts to concrete benefits for supply chain participants. At the bottom are three benefits for the data pipeline (DP) concept, being plain data sharing, higher data quality and better visibility. The piggy-backing principle (PBP) should result in benefits of re-use for purposes other than their intended use. This PBP also connects Risk-based supply chain management (RBSCM) with Risk-based government supervision (RBGS). RBSCM should result in benefits in two categories: reduction of probability of unfortunate events and reduction of impact. RBGS should lead to improved risk assessment by government authorities.

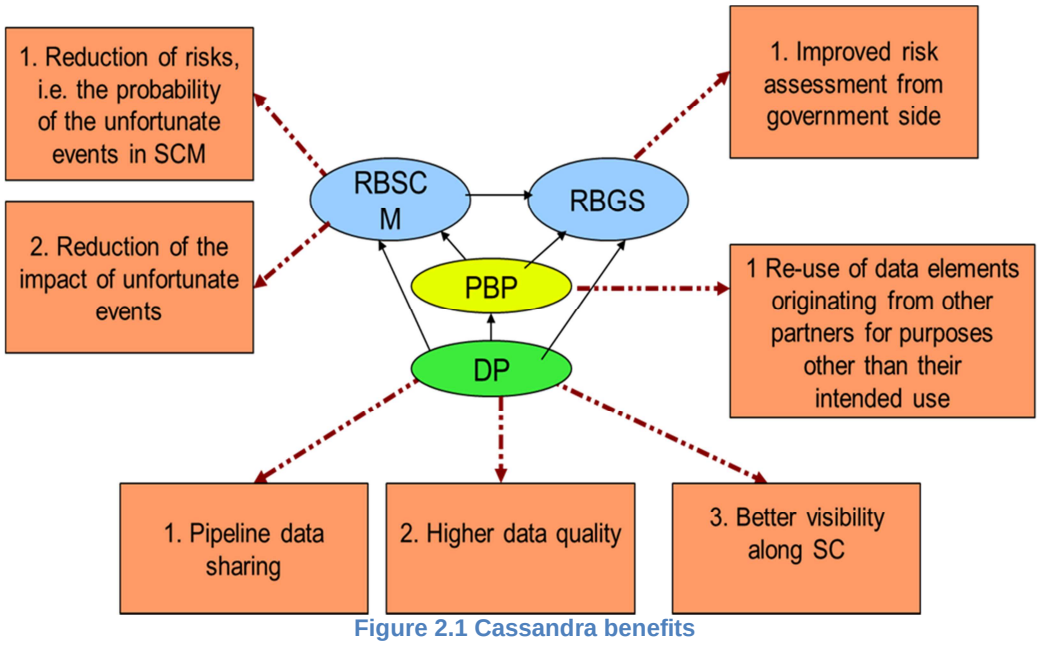


Figure 2.1 Cassandra benefits

The exact benefits that were identified by the evaluation work package are described in more detail in D5.4. They were written down as so-called use cases that specify how the use of certain functionality or methodology leads to an expected benefit. These use cases are listed in table 2.1. These use cases will later on be used to summarize the expected benefits in each trade lane demonstration.

Cassandra use cases
1. Early data completion check on declarations
2. Three-way data consistency check
3. Tally and match documents during stuffing
4. Data re-use – pre-filling declarations
5. Exception reporting for shipment planning
6. Exception reporting for potentially dangerous goods or gas inside containers
7. Exception reporting for demurrage and detention
8. Exception reporting for container integrity with CSDs
9. Advanced notification of container loading (on vessel) and transshipments
10. Advanced notification (and prognostics) on vessel Arrival
11. Advanced notification of Customs inspection
12. Multiple filing Entry Summary Declaration
13. Commercial information in customs dashboard to reduce background checks

Table 2.1 Cassandra use cases

12.2 Summary of possible pipeline configurations

This summary of possible pipeline configurations is based on deliverables D3.22 and D3.5 and is repeated here for ease of the reader. The detailed trade lane description will contain references to the various pipeline configurations that are presented in more general terms here in this paragraph.

In the IT architecture a distinction is made between the information layer and the application layer. The Cassandra data pipeline is a virtual information sharing infrastructure for sharing supply chain data in international supply chains. It forms the information layer of the overall Cassandra IT solution. So-called 'Business applications' provide end-user functionality, using information that they retrieve from the information layer. The customs dashboard is a business application for a targeting officer, using information retrieved from the underlying Cassandra data pipeline. The business dashboard is also a business application that uses the same underlying data pipeline. One can develop more business applications (supporting different functionalities for different users) on top of the same information layer. An important aspect in realizing this architecture is defining an API, i.e. an agreed-upon interface describing how business applications exchange information with the underlying information layer.

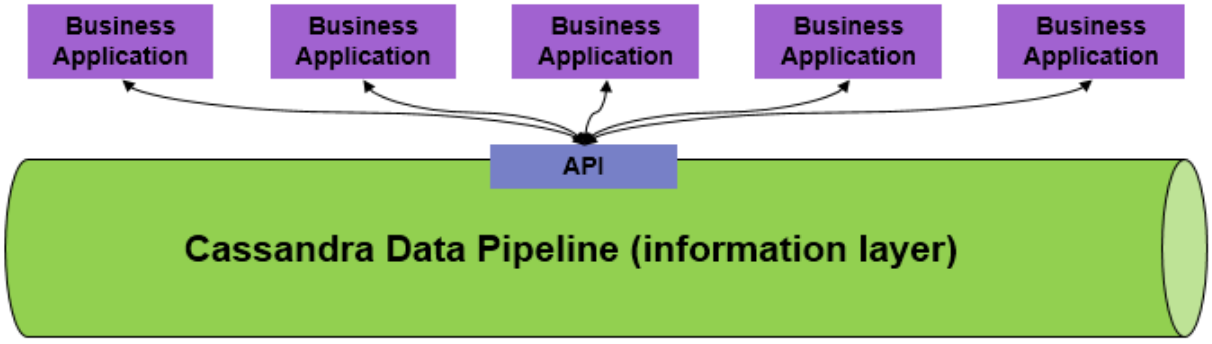


Figure 2.2 Cassandra information layer, API and business applications

The challenge of the Cassandra Backbone design is to have an open system for all parties without forcing the use of systems of a specific solution provider. Taking this into account the Cassandra backbone will need to be a network of different available logistic nodes semantically connected by unified interfaces.

The following pipeline configurations were defined:

- PCS pipeline (see Figure 2.3 below): globally interconnected Port Community Systems exchange data, including local (de-)consolidation data and terminal milestones indicating the actual departure or arrival of containers. The figure shows interconnected PCSs that capture trader data, e.g., from the forwarder, or the terminal. One country can have one or more PCSs.

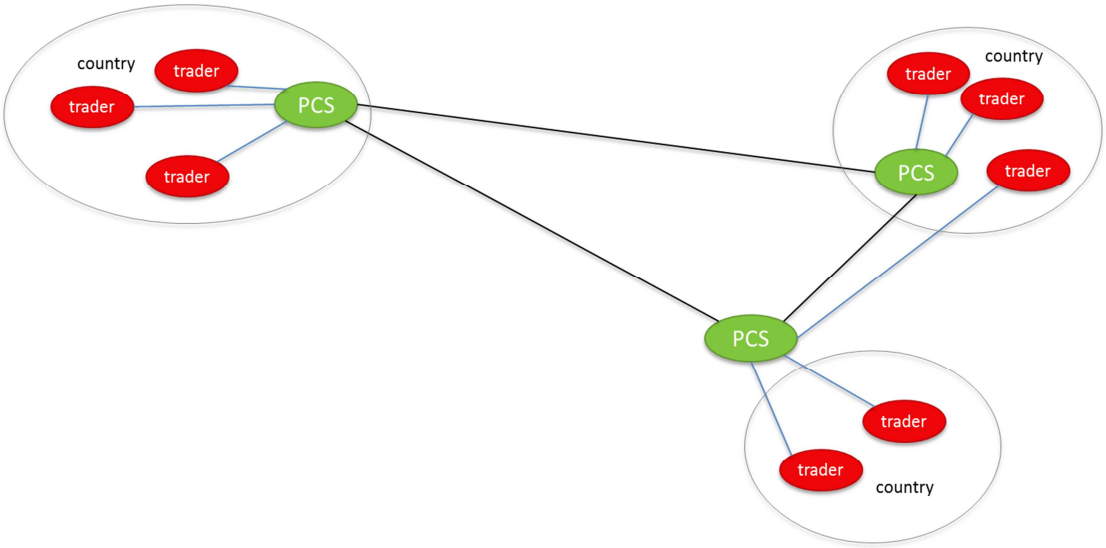


Figure 2.3 Cassandra configuration 1: PCS pipeline

- GS1 EPCIS pipeline (see figure 2.4 below): globally interconnected GS1 solutions based on an extension of EPCIS for Cassandra (EPCIS), including transport and terminal milestones indicating the actual departure and arrival of containers. The current implementation of the GS1 EPCIS solution stores events linked to the identification of objects and is focused on track and trace for products and packages. A GS1 EPCIS implementation does not yet store actual details of objects, but is able to store relations between objects, e.g. an aggregate event to indicate that 1 object has been aggregated into another object, like putting a box on a pallet. Events stored in different implementations can be retrieved via a discovery service.

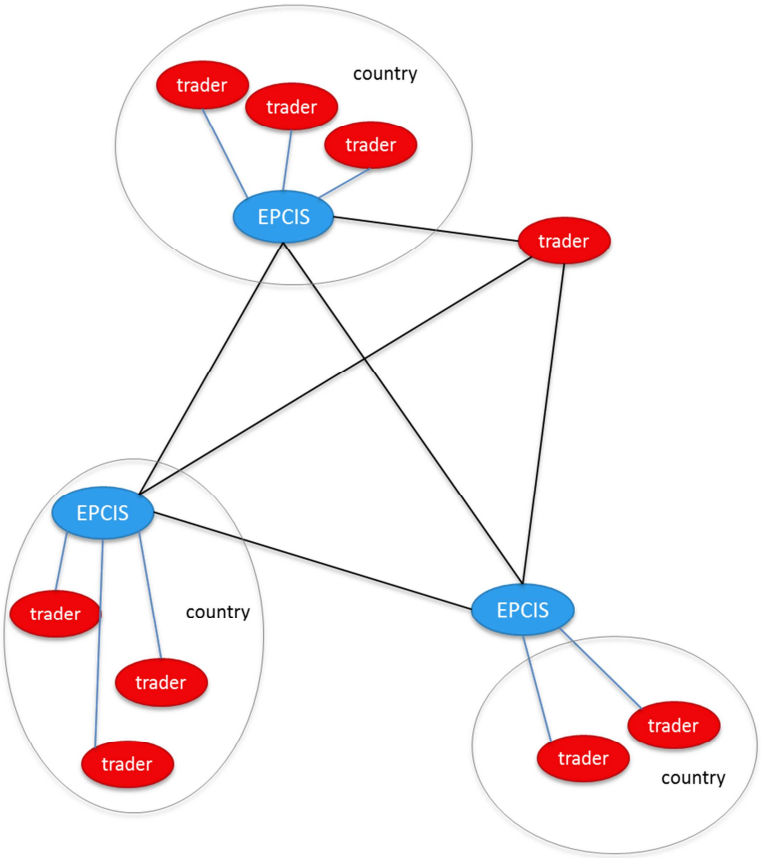


Figure 2.4 Cassandra configuration 2: EPCIS pipeline

- BCS pipeline (see Figure 2.5 below): a global pipeline based on data sharing amongst traders that are members of a Business Community System. Basically, a BCS is owned by (a number of) its members, e.g. East Port Technologies (China), customs e.g. TradeXchange® (Singapore), or is commercially operating, like Descartes. BCSs can operate regionally, can be tailored for specific use, e.g. customs declarations, or promote a wide variety of functionality, thereby approaching an ERP. A BCS that is part of a pipeline shares its data with other BCSs that operate in other regions or in other domains.

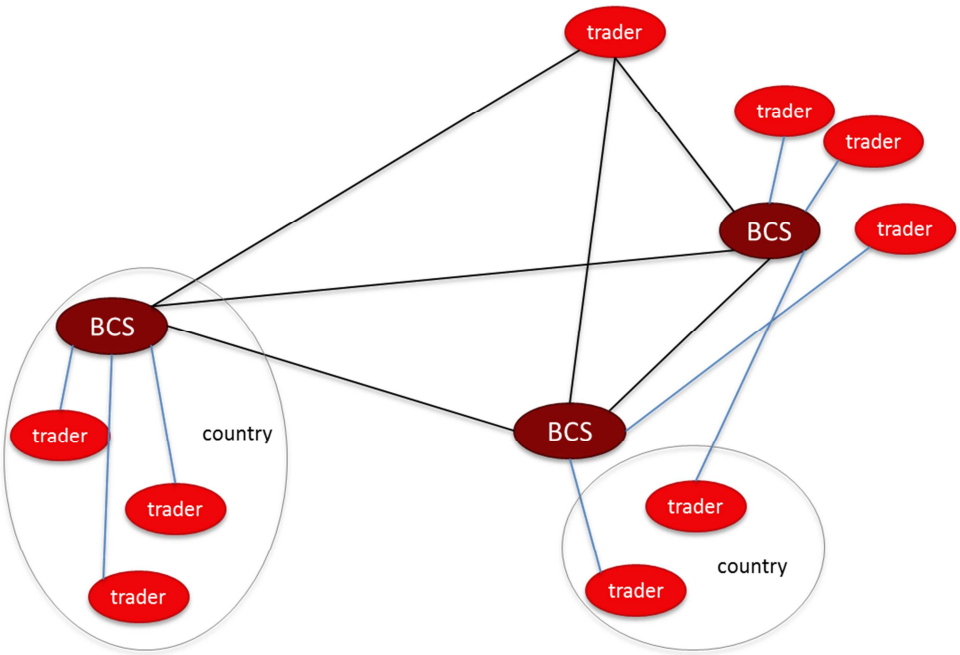


Figure 2.5 Cassandra configuration 3: BCS pipeline

- Trader pipeline: a global pipeline based on the existing system of a globally operating trader, which can either be a shipper or a forwarder. E.g. traders like globally operating forwarders (e.g., Kuehne & Nagel, or DHL), sometimes working on both sides of the supply chain are already able to capture a lot of relevant supply chain data thus constituting the beginning of a pipeline. The improvements that could be necessary to compile a complete pipeline is to focus on capturing data from the source, thus integrating further with customers and partners and making data available for re-use to others.
- Hybrid solutions: a pipeline that is formed as a combination of the above mentioned solutions, e.g. using a trader system in combination with a GS1 EPCIS implementation of a BCS. Probably, a number of these hybrid solutions can/will be created, looking at the diversity in the logistics industry. Also in the Living Labs, we find several hybrid solutions as this fitted the current implementations and ambitions of the participants best.

To provide the participants with the necessary visibility, two types of dashboards can be linked to the pipeline, a business dashboard and an authority dashboard. In general, business dashboards are directly linked to the pipeline as they are both business driven and business owned solutions. Customs authorities of the Netherlands (DCA) and UK (HMRC) can access data in the backbone via a web service (SOA), thus pulling information from the pipeline. A Discovery Service (DS) or Aggregated Discovery Service (ADS) is not required as the number of traders is limited within the project demonstration.

12.3 Risk Based Approach Handbook

As a result of T210 and T220, a Risk Based Approach (RBA) handbook[5] was written to provide businesses in the Living Labs with a practical guide to implement the Cassandra Risk Based Approach within their own organizations. By using this handbook, the businesses should be able to:

- Have an insight on risks that are associated with their products and services, also linked to the mission statement on a strategic level, and not only within their own company but also within their network;
- Prioritize risks by also using business-government interaction on strategic and tactical level;
- Increase their internal and external risk awareness;
- Set up a continuous monitoring and evaluation method of risk management within their business and network;
- Identify, assess and design mitigation measures on an operational level.

The Cassandra RBA was defined in the handbook as an improved risk management method that looks at risks at an individual actor level but also on a network or chain level. According to the handbook, businesses should address risk management on three different levels: the strategic level, the tactical level and the operational level. The exercise thus starts with following the approach for an individual company. The next step would be to involve trade lane partners in the approach to define risks and joint mitigation measures together in a risk-based approach for supply chain management (RBSCM).

Businesses can share supply chain visibility data, also about their risk mitigations, not only with each other but also with supervision authorities. This re-use for governmental purposes is called the piggy-backing principle. For the piggy-backing principle to work it is important to have business-government interaction to make sure the risks can be aligned. In this third step towards a complete risk based approach including risk based government supervision (RBGS), piggy backing and cooperation with government supervision authorities is needed.

[5] This is not a formal Cassandra deliverable. Therefore the outlines are shortly repeated in this paragraph.

13 Approach/methodology

13.1 The Living Labs approach

To implement the right concepts in each Living Lab and to coordinate the whole process properly, a short Living Lab handbook was written for Living Lab 1 that described four steps to complete the process. This handbook included the following steps which will be described in more detail in the following sections:

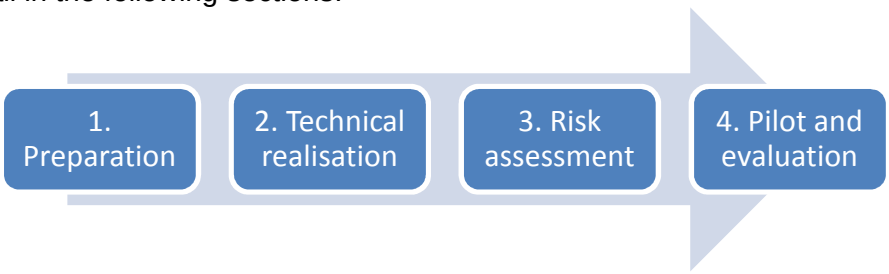


Figure 3.1 4 Steps of the Living Lab Handbook

The activities in the preparation stage needed to determine how the Cassandra concepts, further developed in WP200 and WP300, could be translated and applied to the specific Living Lab trade lane. The exact implementation of the concepts will be very trade lane specific although the evaluation work package describes the end benefit of the use cases in generic terms.

13.1.1 Preparation

The goal of the preparation stage was: *To define who will be involved in what way and give input to possibilities for a Cassandra technical solution.* For this stage, five activities were prescribed:

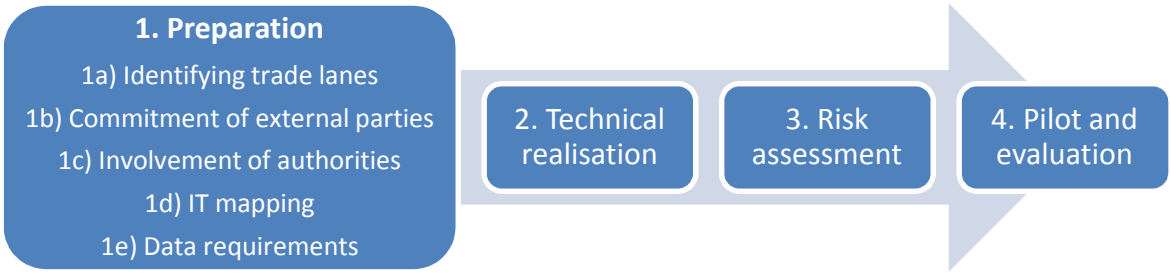


Figure 3.2 Preparation stage of the LL Handbook

To set-up a demonstration and at the same time get a good understanding of the Cassandra concepts that can be implemented, the trade lanes must be selected and described in detail. The trade lanes were chosen in close cooperation with the four freight forwarders that are part of the consortium and are all participants in this Living Lab. The freight forwarders had to identify trade lanes that would include cooperating customers and partners, as permission from these parties was essential when using their data. Other crucial factors for the trade lanes were a steady volume (the size is not per se important, but the stability in volumes is), preferably a source in Asia and otherwise a destination. When selecting the final trade lanes for the demonstration, the coordinator aimed for diversity in origin location, type of flow, and type of partners. The trade lanes were described in more detail by collecting information on the processes of the various actors throughout the supply chain in terms of information management, document flow and data sharing, and customs procedures. More information

on data collection and analysis can be found in paragraphs 3.2 and 3.3. The results of these analyses were important indicators for the suitability of the chosen trade lane and input for the detailed pipeline design.

To coordinate the efforts more easily and to make sure all participants developed the required level of knowledge, trade lane teams were formed for each trade lane. These teams consisted not only of some experts from the freight forwarder, but also of experts from the Cassandra solution providers. These teams were formed as soon as the coordinator, together with the forwarder, could decide on the type of configuration, as described in 2.2. With this, also the proper solution provider could be selected and invited to the team.

One of the most important criteria for selection of a trade lane was the cooperation of actors in the supply chain that were outside the consortium, as innovations cross into various process steps and thereby can affect these actors as well. The entire supply chain is effected and being tested within a living lab. This includes suppliers, freight forwarders, customs officials, and end customers or consignees. The primary actors were the signed partners in the project. However, contacts must also be made with other parties involved to determine cooperation and feasibility of implementing concepts within the living lab. These parties were contacted by the forwarder and the coordinator together. Where needed, an informed consent letter was signed to guarantee data confidentiality in the project and get official consent. An example of the letter of consent can be found in deliverable D9.5 ‘Ethics report’.

Involvement of authorities was already guaranteed for the United Kingdom and the Netherlands because the Dutch Customs Authority (DCA) and Her Majesty’s Revenue and Customs (HMRC; UK Customs) are partners in the consortium. Together, these two organisations made the effort of approaching Customs organizations in China, Hong Kong, Singapore and Malaysia to inform them of the project and ask for their cooperation where needed. The focus of the Cassandra project is mainly on customs compliance and risk assessment and therefore no other authorities, such as food safety or port security have been approached in this Living Lab. Involvements of the various authorities is further described in the specific trade lane chapters.

Because the next step in the handbook is the realisation of a technical solution for the data pipeline, an IT mapping needed to be made in the preparation phase. This mapping taught the project team about the as-is IT architecture in the trade lane and its maturity. This is important input to make a selection for the preferred pipeline configuration and to get the right solution provider involved for each trade lane. Next to this, discussing the IT architecture alongside the process was crucial to identify the proper sources of data, according to the data from the source principle.

An assessment of data requirements and availability was needed to make sure that the trade lane had all the necessary partners involved/committed, and would thus be able to capture a sufficient set of data elements to test the Cassandra concepts. It was accepted upfront that it would be unlikely to capture all data elements in the pipeline in any of the trade lanes. However, a subset of these, based on the earlier mentioned prioritization of data types, should be enough to test the concepts. Also, trade lanes would be different, capturing different subsets of the data and the Living Lab could in total thus still demonstrate the possibilities of the data pipeline and RBA.

The whole process in this preparation stage was iterative and several loops were necessary to gather all the information needed to come up with a detailed trade lane overview as input for a technical design and the implementation of an RBA.

13.1.2 Technical realisation

The goal of the technical realisation stage was: *To define how the Cassandra technical solution will look for the trade lane, build the technical solution, release and maintain.* For this stage, four activities were prescribed:

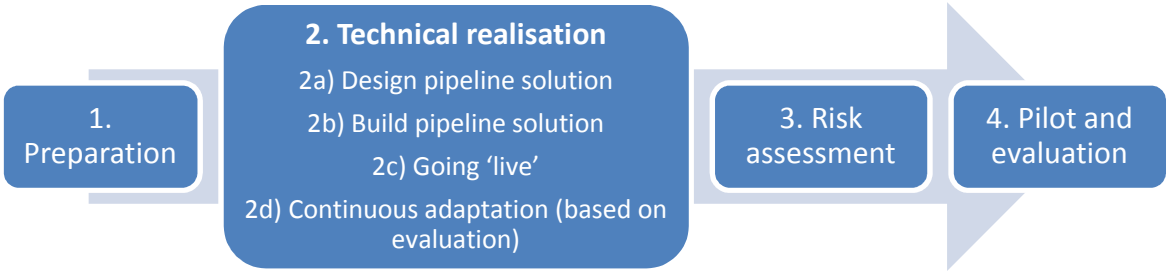


Figure 3.3 Technical realisation stage of the LL Handbook

The design of the pipeline needed to fit with the as-is architecture in each trade lane as was mentioned earlier, but also the various pipeline configurations that are possible needed to be reflected in the Living Lab as a whole. Because organisations are most motivated when the project goal fits with their inter-company business strategy, the coordinator investigated ambitions of all partners individually. Together with the partners, a final choice was made for the pipeline configurations. When selecting the configuration for each of the trade lanes, the coordinator aimed for the use of elements of all pipeline configurations in the Living Lab as a whole.

As soon as the configuration was chosen, detailed designs could be created that specified how the pipeline would be developed exactly. In doing this, choices needed to be made for the phasing of the solutions or for the data capture. Where possible the prioritization of data types as discussed in the Limitations section of chapter 1 was used.

The coordinator aimed for a gradual implementation of the concepts and solution in each trade lane so that the participants could learn the possibilities of the Cassandra solutions during use. With their reflections, it would be possible to improve the solutions in various improvement cycles. Therefore there is continuous adaptation as a separate step in the handbook.

13.1.3 Risk assessment

The goal of the risk assessment stage was: *To investigate the risk assessment methodology in business and align this with assessment of authorities, design a new methodology for both business and authority, implement and maintain.* For this stage, five activities were prescribed:

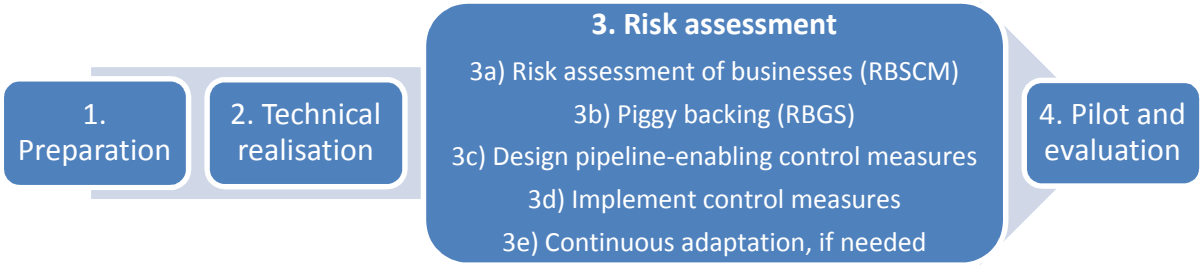


Figure 3.4 Risk assessment stage of the LL Handbook

The RBA Handbook developed in Wp200 and shortly described in section 2.3 was the most important input for the activities in this stage. Based on the handbook, a two day workshop was designed for businesses where on day 1 the RBA handbook was followed for the individual businesses to complete step 3a 'Risk assessment of businesses by self-assessment'. On the second day, the experience from the Living Lab trade lanes was used to look at risk assessment for the whole logistics chain (RBSCM). In the afternoon, a representative from the relevant customs authority was invited to join the discussion on possible piggy-backing and the business-government interaction protocol to complete step 3b (RBGS). Results of the business-government interaction discussion were already described in D2.3 'Risk assessment protocols'[6]. This two day workshop has been held with all four freight forwarders in the Living Lab Asia-Europe.

The workshop has mainly resulted in further ideas for improvement of the various dashboards and alerting functionality. Where the pilot time line and development efforts permitted this, the ideas were implemented, and steps 3c and 3d could be completed. However, the RBA workshops resulted in only a limited number of logistics process changes.

13.1.4 Pilot and evaluation

The goal of the pilot and evaluation stage was: *To identify business opportunities and improvements, in order to implement and evaluate them.* For this stage, four activities were prescribed:

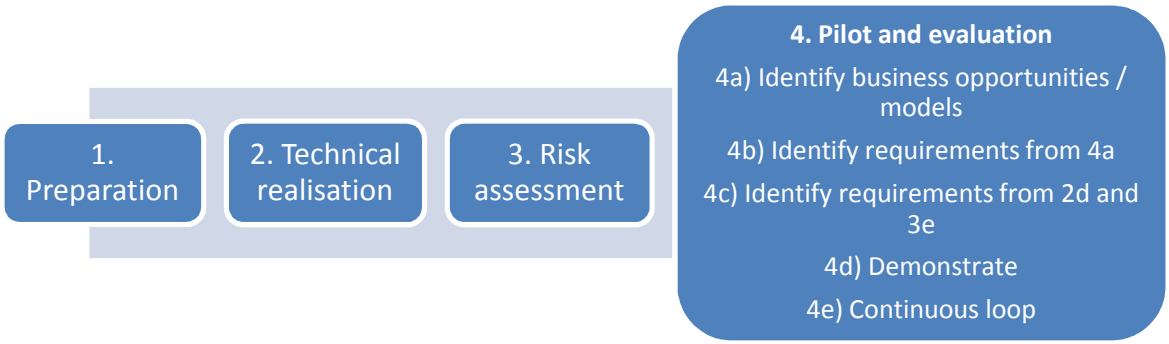


Figure 3.5 Pilot and evaluation stage of the LL Handbook

The activities in this stage were executed, where possible and needed, together with WP500. This resulted in an overview of possible use cases that described clear practical benefits for the participants. Based on these and various evaluation sessions during the pilot phase, some additional requirements were identified and implemented. These could include improvements for the technical realisation and for the control measures. Also performance issues were solved.

13.2 Data Collection Procedures

Two types of data collection can be distinguished for the Living Labs: the collection of data or information that was needed to get the Living Lab started and the collection of data in the data pipeline. The latter is described later in this document for each trade lane separately, when also IT architecture, pipeline configurations and data sources are discussed. This paragraph will therefore discuss only the procedures for data collection to set-up the trade lanes.

[6] This is a confidential deliverable.

Data collections for the Living Lab set-up was mainly done in the preparation phase, described in paragraph 3.1.1. The following procedures were used to get a common understanding and design:

- Interview material of T140; Here, freight forwarders were interviewed about their processes (high level), their needs for visibility, requirements for a solution and risk assessment;
- Living Lab workshop with forwarders; For each forwarder, a separate workshop was organized to discuss the forwarder's ambitions in the project and possible trade lanes. This resulted in follow up activities to gather more information on the trade lanes and a first overview of their processes;
- Living Lab workshop with forwarders and solution providers; For each trade lane team, a separate workshop was organized to get all people introduced to the trade lane and to get a first understanding of the detailed processes, the possible configurations and solution's functionalities;
- Fact finding trips to Asia; In total 4 trips were made of which 2 to Hong Kong/China, 1 to Malaysia and 1 to Singapore. The goal of these trip was to present the project to partners overseas, gather commitment, and very importantly gather insight in detailed processes and as-is IT architecture of these overseas partners;
- Living Lab design workshop with forwarders and solution providers; For each trade lane team, a separate workshop was organized to round up the preparation stage and to decide on the final configuration and trade lane set-up and to come up with a work plan that specified the work to done for the first release of the solutions;
- Bi-weekly teleconferences for each of the trade lane teams to discuss progress of the activities and to answer questions, resolve issues, etc. If needed, face to face meetings were planned to have longer discussions. These have been planned several times for each of the trade lanes;
- Face to face meetings on the yearly Cassandra meetings; On each yearly meeting, there was a day planned for 1 to 2-hour workshops for each trade lane team;
- Joint WP500/Living Lab workshop to define the use cases with benefits for each forwarder in Living Lab 1;
- Living Lab presentations of workshops with external parties to present the progress and results of the project work. Organized where there was interest or need for support of external parties.

13.3 Data Analysis Procedures and Generic results

13.3.1 Process analysis with Events & Milestones

For each of the trade lanes a detailed process mapping was made to get insight in at least all the processes where important data generation takes place, processes where documents are created (including digital documents and customs declarations) and where data is exchanged with other parties in the chain. Data exchange is still mainly done with paper documents and therefore an example dossier of all documents used in the trade lane for a particular example transaction was collected.

Derived from the various mappings, a generic list of supply chain events and milestones could be created that describes, for about 90% correct, all the trade lanes. Of course, when looking at the details, all forwarders have slightly different processes, the order of process activities is just different or the name of an activity varies. But on a bit higher level, a generalization of the process is possible. This generalized overview was used to structure further analysis and will be used to report on the various trade lanes in this document, not only for their processes but also for data sources and data sets that are available in the pipeline.

A long list of events or milestones is shown in table 3.1, together with the event type and the owner or executer of the event. This owner is important as this is also the party that is the appropriate source of the data that is resulting from the event. For example, when a purchase order is placed (created), the buyer knows what he wants to order exactly and he is therefore the source and the appropriate party to provide the PO data to the pipeline. It needs to be kept in mind that this is a generic process with generic owners for each of these events. The buyer is normally the party that creates the PO but if the vendor manages the buyer's inventory, it is the vendor who is the owner of the event, and if inventory management and purchasing is outsourced to a logistics service provider, the logistics service provider is the owner of the event. For some events, the owner is specified by the International Commercial Terms (Incoterm) that is applicable. For the creation of this table, the Free on Board Incoterm was assumed. The exact mapping of this table to a supply chain is therefore very trade lane specific.

Event	Type	Owner	Remarks
PO placed	Administrative	Buyer	
PO received	Administrative	Seller	
PO confirmed	Administrative	Seller	
Transport order placed	Administrative	Seller/Shipper	Also called "shipping order"
Transport order received	Administrative	Forwarder	
Ocean booking placed	Administrative	Forwarder	The shipping instruction, used to create the bill of lading, is sent later when more details are known on the shipment
Ocean booking confirmed	Administrative	Contracting carrier	
First leg booking placed	Administrative	Forwarder	Can be repeated for a second leg, then an in-between node/ terminal is needed. Also called "inland transport order"
First leg booking received	Administrative	Inland operator	
First leg booking confirmed	Administrative	Inland operator	Can be repeated for a second leg, then an in-between node/terminal is needed
Empty Out	Physical - Container	Contracting carrier	
Consignment to be shipped compared with technical specification and purchase order	Physical	Seller/Shipper/ Consolidator	This is where the data pipeline adds value for the buyer and reduces risk of commercial and regulatory non-compliance
Notified of shipping	Administrative	Shipper	Also called advanced Shipping notification, often sent to the consignee/buyer (The PO describes what is required and the Shipping Note says what will be shipped)
Stuffed	Physical - Goods	Shipper/Consolidator	
Container manifest confirmed	Physical - Goods	Shipper/Consolidator	"**Consignment completion point**", confirmation of packing list completed, e.g. by Tally man
House Bill of Lading created	Administrative	Forwarder	Only applicable when forwarder is in charge of stuffing.
Invoice created	Administrative	Seller	

Invoice received	Administrative	Buyer	
Shipping Instruction created	Administrative	Forwarder	Sent by same party that made the ocean booking
Shipping Instruction received	Administrative	Contracting carrier	This is input for the ENS and the ship manifest
ENS declaration filed 24 hours prior to loading	Administrative	Contracting carrier or third party (can be the forwarder)	For EU import only
ENS declaration received	Administrative	Customs	Authority at first port of call in EU
Movement Reference Number issued and cleared for loading or held pending query (Do Not Load)	Administrative	Customs	Authority at first port of call in EU
Export declaration filed	Administrative	Customs broker	
Export declaration received	Administrative	Customs	Authority at export
Cleared for export	Administrative	Customs	Authority at export
Departed at origin	Physical - Container	Inland operator	Also called 'Origin departure (pick-up)'
Gate in at terminal of exit	Physical - Container	Terminal	
Loaded on vessel	Physical - Container	Terminal	
Departed at terminal of exit	Physical - Vessel	Operating carrier	Also called Vessel Departure
Exit confirmed	Administrative	Operator at exit (Terminal)/Customs	Not applicable for all countries
Master Bill of Lading created	Administrative	Contracting carrier	
Master Bill of Lading received	Administrative	Forwarder	
Master Bill of Lading forwarded	Administrative	Forwarder at export	
Master Bill of Lading received	Administrative	Forwarder at import	
Summary declaration for discharge filed	Administrative	Operating carrier	Also called 'Summary declaration for temporary storage'
Summary declaration for discharge received	Administrative	Customs	Authority at entry
Cleared for discharge	Administrative	Customs	Authority at entry
Arrived at terminal of entry	Physical - Vessel	Operating carrier	
Discharged from vessel	Physical - Container	Terminal	
Commercially released	Administrative	Contracting carrier	
First leg booking placed	Administrative	Forwarder	Can be repeated for each subsequent leg.
First leg booking confirmed	Administrative	Inland operator	Can be repeated for each subsequent leg.

Transit declaration filed	Administrative	Customs broker	
Transit declaration received	Administrative	Customs	Authority at entry
Cleared for transit	Administrative	Customs	Authority at entry
Import declaration filed	Administrative	Customs broker	
Import declaration received	Administrative	Customs	Authority at import
Cleared for import	Administrative	Customs	Authority at import
Gate out	Physical - Container	Terminal	
Delivered to Consignee	Physical - Container	Inland operator	
De-stuffed	Physical - Goods	Consignee	
Container manifest confirmed	Physical - Goods	Consignee	Confirmation of container content at de-stuffing
Empty returned	Physical - Container	Contracting carrier/ Terminal (depot)	

Table 3.1. Long list of Cassandra trade lane events

The table 3.1 is tailored to the scope of Cassandra. Activities that were for example omitted are manufacturing, transshipment, vessel handling at port and warehousing. Also detailed events for consolidation and de-consolidation in container freight stations have not been included in the generic overview. Also, no distinction has been made between carrier haulage and merchant haulage – this might result in additional administrative events.

This long list only contains events that take place at a specified location by a specified event executor and can be, therefore, further expanded by transport milestones. These transport milestones confirm a container's location at a specific point in time. These transport milestones can come from tracking devices that use e.g. GPS or from AIS services.

For ease of use and reporting purposes, the long list of Cassandra trade lane events was summarized to a short list of 15 key events shown in table 3.2. For the creation of this short list, the administrative events for sending and receiving certain documentation or confirming bookings have been combined and the event was assigned to the owner that is most crucial for this group of activities in the sense that he can stop the supply chain. For example, the export declaration events are all assigned to the Customs at export since the Customs authority can block progress by not confirming/clearing the declaration. In addition to these events, transport milestones can be used.

Event	Type	Owner	Remarks
Purchase Order	Administrative	Buyer	
Export booking completed	Administrative	Forwarder	This includes transport orders for all hinterland and ocean legs, and the shipping instruction
Empty Out	Physical – Container	Contracting carrier	
Stuffed	Physical - Goods	Consignor	This includes the "Consignment Completion Point" that confirms the container manifest
Commercially Invoiced	Administrative	Seller	
Cleared for loading	Administrative	Customs	Authority at first port of call in EU
Cleared for export	Administrative	Customs	Authority at export
Exit confirmed	Administrative	Operator at exit (Terminal)/ Customs	

Export completed	Administrative	Contracting carrier	This includes the completion of all documents, including master bill of lading and house bill of lading
Cleared for discharge	Administrative	Customs	Authority at entry
Import booking completed	Administrative	Forwarder	This includes transport orders for all hinterland legs
Cleared for transit	Administrative	Customs	Authority at entry
Cleared for import	Administrative	Customs	Authority at import
De-stuffed	Physical - Goods	Consignee	
Empty returned	Physical - Container	Contracting carrier/ Terminal (depot)	

Table 3.2. Short list of Cassandra trade lane events

Considering the Cassandra scope and special focus on data about the goods, the following events are especially relevant:

- Purchase order;
- Stuffed, including a Purchase Order, Shipping/Packing Note comparison
- Invoice created;
- De-stuffed.

When considering the second most important requirement for information about the parties that are involved in the trade lane, the following events are interesting:

- Purchase order to identify the buyer;
- Stuffed to identify the consignor/consolidator;
- Commercially invoiced to identify the seller;
- Export/Import booking completed to identify the transport operators;
- De-stuffed to identify the consignee/deconsolidator.

These key events will be used further on in this document to identify key data elements and their source and to report on the trade lanes. All trade lanes and their scope were mapped to this ideal list. The IT configuration for each trade lane then shows how this data was captured.

13.3.2 Data analysis for supply chains (DASC)

An important Cassandra concept is the data from the source principle. This specifies the most appropriate source of data as the process activity where data originates from. For each data element, it therefore needs to be specified which is the appropriate process activity or event and how the data for that event is stored in a particular trade lane, e.g. by whom and in which system. This paragraph will further specify the link between data elements and events. How the data can be made available to the pipeline is described in the specific trade lane sections in chapters 4 and 5.

During preparation of the Living Lab, a dossier analysis was performed to identify the data elements that are normally exchanged in global logistics chains. The dossier included all kinds of documents, both paper and electronic, exchanged by all parties in scope. All data elements were simply identified without reference to the originating document. Only their reference to the originating event, as discussed in the previous paragraph, is relevant. Appendix A contains the long list of data elements that resulted from this exercise.

The data from the source principle prescribes that the best data source is the process or event where the data originates from. Based on this, specific categories of data are linked to the events in table 3.3. The table shows groups of data elements from the long list as

presented in appendix A. When sourcing for information, these typical data sets can be expected to be delivered when reporting on an event. The example data elements are resulting from the dossier analysis and are usually available in a logistics chain.

Event	Owner	Typical data sets	Examples (not complete)
Purchase Order	Buyer	Order details	Seller and buyer, goods identifications, quantities, terms of delivery and payment
Export booking completed	Forwarder	Carrier booking confirmation, Transport order confirmation, Request for transport details	Port of loading and discharge, empty depot, location and time of stuffing, countries of routing and means of transports
Empty Out	Contracting carrier	Empty out container milestone	Timestamp for Empty Out, container number
Stuffed	Consignor	Container manifest details	Consignor, goods identifications, quantities, packaging, container seal
Commercially Invoiced	Seller	Invoice details	Seller and buyer, goods identifications, quantities, price/value, terms of payment, currency
Cleared for loading	Customs	EU Customs Code Annex 30A or equivalent data set	Consignor, consignee, declarant, goods description, quantities, transport details at the border
Cleared for export	Customs	EU Customs Code Annex 37 or equivalent data set	Exporter, consignor, declarant, goods description, quantities, HS codes, values, country of origin and export, transport details at the border
Exit confirmed	Operator at exit (Terminal)/ Customs	Exit confirmation	Timestamps for shipment exit, vessel, container numbers
Export completed	Contracting carrier	Master B/L and House B/L (leading marks and numbers as required by national Carriage of Goods by Sea Act)	Consignor, consignee, goods description, terms of delivery/transport
Cleared for discharge	Customs	Annex 30A or equivalent data set	Consignor, consignee, declarant, goods description, quantities, transport details at the border
Import booking completed	Forwarder	Transport order confirmation, Request for transport details	Port of discharge, location and time of de-stuffing, countries of routing and means of transports
Cleared for transit	Customs	Annex 37 or equivalent data set	Consignee, declarant, goods description, quantities, country of dispatch, transport details at the border
Cleared for import	Customs	Annex 37 or equivalent data set	Importer, consignee, declarant, goods description, quantities, HS codes, values, country of origin and import, transport details at the border
De-stuffed	Consignee	Container manifest confirmation details	Consignee, goods identifications, quantities, packaging, container seal

Empty returned	Contracting carrier/ Terminal (depot)	Empty in container milestone	Timestamp for Empty In, container number

Table 3.3. Assignment of sets of data elements to the Cassandra events

Below table 3.4 shows a mapping of the reference numbers that are used in a logistics chain to the Cassandra events. It shows what reference numbers are available, used or needed when a certain event takes place. For example, the container number is assigned to the ocean carriage booking when the container is handed out at the empty depot. Reference numbers for transport means, e.g. truck license plate, conveyance reference numbers for ocean transport, etc., are omitted from this table because they have less relevance in the Cassandra project than the reference numbers for the administrative process and the goods handling processes. But these reference numbers become relevant, and they are being used in the trade lanes, when transport milestones are used for tracking and tracing of containers. Reference numbers to identify parties, such as customer ID are also not included as understanding of these numbers is usually highly context specific.

Event	Owner	Purchase order #	Item #	Booking #	Container movement #	Container #	Seal #	Commercial Invoice #	HBL# (House Bill of Lading #)	MBL# (Master Bill of Lading #)	MRN # (Movement Reference #)
Purchase Order	Buyer	x	x								
Export Booking Completed	Forwarder			x	x						
Empty Out	Contracting carrier				x	x					
Stuffed	Consignor	x	x			x	x		o		
Commercially Invoiced	Seller	x				x		x			
Cleared for loading	Customs										x
Cleared for Export	Customs					x					x
Exit Confirmed	Operator at exit/ Customs					x					
Export Completed	Contracting carrier					x			x	x	
Cleared for Discharge	Customs					x					x
Import Booking Completed	Forwarder					x				o	
Cleared for Transit	Customs					x					x
Cleared for Import	Customs					x					x
De-stuffed	Consignee	x	x			x	x		o		
Empty Returned	Contracting carrier			x		x					

Table 3.4. Mapping of reference numbers to events; x should be mandatory, o is optional

An important conclusion of this table is that there is usually not one single reference number that can be used to track the progress of events throughout the chain. Especially the start of the chain is problematic. The process starts with a purchase order number, that has only references to good identifications and parties such as seller and buyer. From the dossier analysis, it was concluded that the PO number is often not used when arranging for transport with a forwarder and therefore the PO number cannot be linked to any of the transport bookings. The container number becomes only available at Empty Out and the link to the PO number and the goods is only made at stuffing. Until this moment, there are two sets of information that can be available in the pipeline, but cannot yet be linked together. This is shown in figure 3.6.

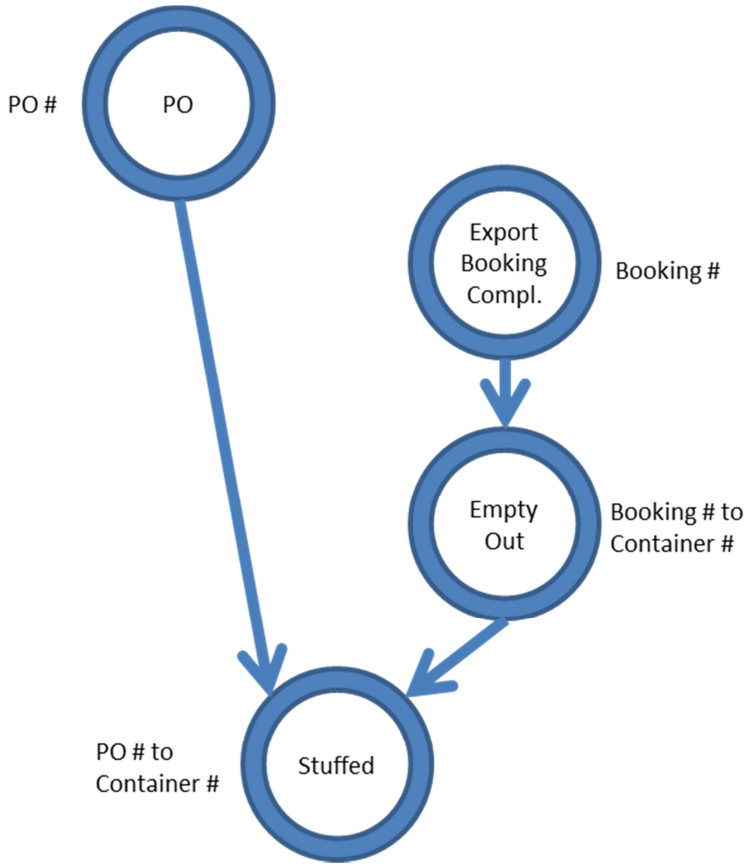


Figure 3.6 Reference numbers linking the various events at the start of the chain

Apart from the goods information in Cassandra, it is important to state the parties that are involved in the chain. As a result of the dossier analysis, the parties that were named in the documentation related to the Cassandra events are given in table 3.5. The table thus gives an overview of what parties can be expected to be identified at what point in time. For example, when only the purchase order event has been completed, it is usually not possible to name any of the forwarders or the ocean carrier. For these results, it is important to note that a lot of the trade lanes use their own type of documentation or information exchange. The table can therefore not so easily be generalized and therefore a lot of parties are listed as optional in this table.

Event	Owner	Manufacturer	Consignor	Seller	Exporter	Declarant at export	Forwarder at export	Operator at exit	Ocean Carrier	Operator at entry	Declarant at import	Forwarder at import	Consignee	Buyer	Importer
Purchase Order	Buyer	o	o	x	o								x	x	
Export Booking Completed	Forwarder		o	o	o		x		x				o	o	
Empty Out	Contracting carrier								x						
Stuffed	Consignor	x	x											o	
Commercial-ly Invoiced	Seller		o	x									o	x	
Cleared for loading	Customs		x						o				x		
Cleared for Export	Customs		x	x	x	x									
Exit Confirmed	Operator at exit/ Customs							x	o						
Export Completed	Contracting carrier						x		x			o			
Cleared for Discharge	Customs								x	x					
Import Booking Completed	Forwarder											x			
Cleared for Transit	Customs										x		x	x	x
Cleared for Import	Customs										x		x	x	x
De-stuffed	Consignee		o										x	o	
Empty Returned	Contracting carrier								x						

Table 3.5. Mapping of parties to events; x should be mandatory, o is optional

Apart from the goods information in Cassandra, it is important, especially from a risk assessment perspective, to state the locations where the goods or containers are being handled. Although this is of course also interesting from a track and trace perspective, track and trace is not the primary reason to look for this information in the pipeline. As a result of the dossier analysis, the locations that were named in the documentation related to the Cassandra events are given in table 3.6. For example, in case one reports on the 'Stuffed' event, it should be mandatory to report on the stuffing location.

Event	Owner	Country of origin	Country of export	Empty depot location for pick up	Stuffing location	Port of Loading	Port of Discharge	Country of dispatch for transit	Country of destination	Place of Delivery
Purchase Order	Buyer	x	x						x	o
Export Booking Completed	Forwarder		o	x	x	x	x		o	o
Empty Out	Contracting carrier			x						
Stuffed	Consignor	x	x		x					
Commercially Invoiced	Seller		x						o	
Cleared for loading	Customs				x	x	x			
Cleared for Export	Customs	x	x						x	
Exit Confirmed	Operator at exit/ Customs					x				
Export Completed	Contracting carrier				o	x	x			
Cleared for Discharge	Customs									
Import Booking Completed	Forwarder						x		x	x
Cleared for Transit	Customs						o	x	x	x
Cleared for Import	Customs	x					o		x	o
De-stuffed	Consignee									x
Empty Returned	Contracting carrier									

Table 3.6. Mapping of locations to events; x should be mandatory, o is optional

In addition to the above details, an overall list of data elements that are requested by European customs authorities for importing goods from outside the EU is given in appendix B. This list of 60 data elements was used as a checklist to see whether the most important data elements, from a customs perspective could be captured in the data pipeline. When business wants to use the pipeline to generate compliance documents, this is also the minimal set of data elements that is needed to achieve that goal.

An important consideration here is that the above tables show the owner of the event and therefore the ideal source that should provide the data to the pipeline. This might not always be possible and alternative sources could be needed. The descriptions of the trade lanes in the next chapters will indicate where these alternatives were used.

13.3.3 Data quality assessment

Collecting data from the source is one of the core principles in the Cassandra project and is stated to provide a better guarantee of data quality. But in many cases, alternative data sources might need to be used, e.g. because no digital data is available at the source or because data will not be shared for confidentiality reasons, etc. When using data from the Cassandra pipeline, it is important to assess the quality of the data, in other words, to know whether the data comes from the source or not.

To facilitate data validation, the pipeline should record the source of each data element. To start with, the providing party can be named as the source. When more detailed information is available, also the process or activity where the data originates from can be named. A further improvement would be to not only name the process but also measures that were taken to guarantee data quality. A good example of this is the use of a tally man during the container stuffing process. If data of this activity was shared with the pipeline it would be beneficial not only to know that the packaging and quantity information comes from the source (stuffing process) but that also a tally man was in place to verify the data (data quality measure). If the user of the data sees this, it means he could have much more confidence in using the data for example for customs declarations, without having seen the actual container content.

In the implementation of the data from the source principle in the Living Lab, the following prioritization was used:

1. Record source of the data by naming party;
2. Record source of the data by naming process;
3. Record additional process information that informs on data quality.

Although the Cassandra R&D work packages delivered principles to further assess data quality with advanced auditing mechanisms, these developments were not ready on time to be implemented in the Living Labs.

14 Trade lane running to Felixstowe

This chapter describes the trade lane to Felixstowe that was used in the Living Lab. This chapter will give an overview of the trade lane characteristics, the results of the process and data analysis for the as-is situation at project start as well as the design considerations and resulting to-be situation. More specifically:

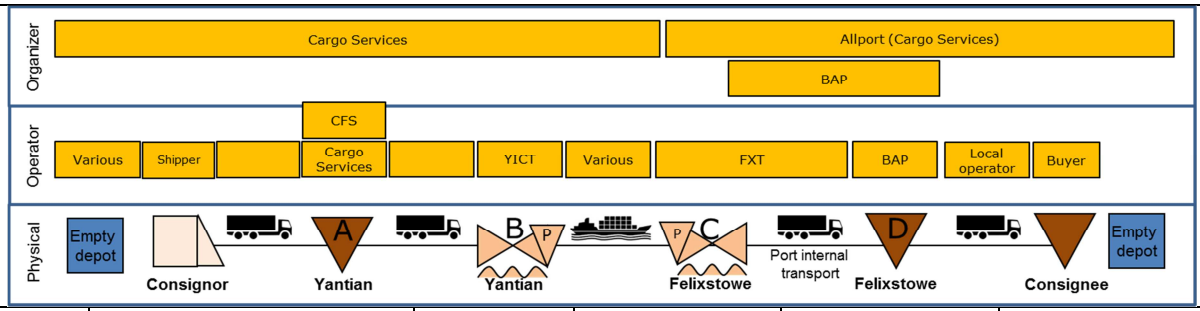
- it identifies the specific flows of goods;
- the parties that are involved;
- their positions and interests;
- the identification of better sources of data from a supply-chain perspective (instead of that of an individual company);
- the sources of data that can be opened-up in the pipeline and discussion on why other sources could not be made available;
- identifying the regulatory/customs involvement;
- final solution description.

It also reflects on the use of the Cassandra solutions, the expected benefits for the users and a more generic reflection on the Living Lab by the trade lane partners.

14.1 The Yantian-Felixstowe trade lane of BAP

14.1.1 As-Is situation

Trade lane characteristics
The BAP trade lane in Cassandra runs from the consolidation centre in Yantian (China) to the deconsolidation centre in Felixstowe (UK). The logistics chain is owned by a UK retailer who wishes to remain anonymous, although the retailer is fully informed about the project's proceedings. The characteristics of the container flow on this trade lane are summarized in below table.



ID	Location type / name	Location / Country*	Operator	Organizer	Contractor
A	Container Freight Station Yantian – **Consignment Completion Point**	YTN / CN	Hong Kong Shing Kee Group/ Cargo Services	Cargo Services	Retailer
B	Yantian international container terminal (YICT)	YTN / CN	YICT	Carriers	Carriers
C	Port of Felixstowe (owner: Hutchison)	FXT / GB	Port of FXT	Carriers	Carriers
D	Warehouse BAP	FXT / GB	BAP	BAP	Allport (owner: Cargo Services)

ID	Modality type	Passing countries*	Operator	Organizer	Contractor
AB-RO	Road	CN	Trucker	Cargo Services	Cargo Services
BC-OC	Ocean	CN - GB	Maersk, MSC, Evergreen	Cargo Services	Retailer
CD-RO	Road	GB	Port of FXT	BAP	

Overall characteristics	
End customer / Supply chain owner	UK Retailer (anonymous)
Goods packaging type (bulk, containerized, palletized, parcel)	Containerized
Goods description / type	Consumer household ware
FCL/LCL classification	LCL
Incoterm	Free on Board
Special requirements for goods?	N
Border crossing involved?	Y; China to UK by ocean
EU border crossing involved?	N
Estimated volume	2000 containers/year

Logistics services in scope			
	Transport planning		Stacking
X	Transport execution	X	Loading / Unloading
	Warehousing	X	Customs compliance / Filing
X	Consolidation / Deconsolidation		

Table 4.1 Yantian-Felixstowe trade lane characteristics

Location A is a consolidation centre or container freight station (CFS) that is owned and partially operated by the Hong Kong Shing Kee Group (SKG). The CFS in Yantian is a customs controlled warehouse with its own customs team and used by different consolidators of which Cargo Services is one. Sellers deliver their products to the CFS. Cargo Services is responsible for temporary storage, quality control, consolidation and optimized packing of the container depending on destination port centric operations or port to distribution centre logistics. The Cassandra trade lane starts from the consolidation process since the UK retailer wants to keep its suppliers absolutely confidential and therefore outside the scope of any project. Also, the process further downstream might be increasingly complicated by the large number of suppliers and limited technical maturity was expected.

The trade lane stops after deconsolidation as this is sufficient to cover the core aspects of the Cassandra project. Including further distribution in the UK would mean adding more complexity to the Living Lab without adding to the core research questions. The import declaration in the UK is included in the scope.

Partners and stakeholders in the Yantian-Felixstowe trade lane

The main parties and their project involvement for this trade lane are summarized in below table.

Involved Consortium partners	***Contributing external parties***	***Informed external parties***
BAP Logistics	Cargo Services	Hong Kong Shing Kee Group (SKG, warehouse operator Yantian)
UK Customs	Allport (Cargo Services UK	East Port Technology

	subsidiary)	
UK Border Force	UK retailer (anonymous)	Shenzhen South e-port Co.
Descartes	Port of FXT (Hutchison Ports,)	Hong Kong customs
		Maersk, MSC & Evergreen (for delivery of container milestones)
		MCP (Destin8)

Table 4.2 Yantian-Felixstowe trade lane involved parties

During the course of the project, it was investigated whether East Port Technology could contribute to this trade lane. For this, they needed to become a consortium partner. In the end, this process failed and therefore their contribution was limited. The course of events regarding their possible partnership with the Cassandra consortium is reported in appendix C.1.

Process analysis

A detailed process analysis was made of the Yantian-Felixstowe trade lane. The information was gathered through workshops with BAP, Descartes, Allport and Cargo Services. Two trips to Hong Kong and Yantian were made. Workshop minutes are included in Appendix C.2.

The result of the detailed analysis is shown in table 4.3 where the process of the trade lane is described with the Cassandra events. Greyed rows are out of scope.

Event	Owner	Remarks
Purchase Order	Retailer	
Export booking completed	Cargo Services	Cargo Services makes the ocean carriage booking under the contract of the UK retailer. Local trucking is arranged for by Cargo Services as well.
Empty Out	Contracting carrier	
Stuffed	Cargo Services	This is the “Consignment Completion Point” that confirms the container manifest. See text for further detail.
Commercially Invoiced	Seller	
Cleared for loading	Customs	
Cleared for export	Customs	
Exit confirmed		
Export completed	Contracting carrier	Only the house bill of lading is in scope.
Cleared for discharge	Customs	
Import booking completed	Allport	This includes only limited information on the deconsolidation planning and distribution
Cleared for transit		
Cleared for import	UK Customs	Allport files the import declarations
De-stuffed	BAP	
Empty returned	Contracting carrier	

Table 4.3 Cassandra trade lane events for Yantian-Felixstowe

Some Cassandra events were placed out of scope for this trade lane. Because the trade lane starts with consolidation by the forwarder, the seller is out of scope and therefore the invoicing event is out of scope as well. The customs process in China was initially in the scope of the project, but it proved impossible to include East Port Technology in the consortium and therefore data capture for the customs information was impossible. In addition to this, the fact that all customs compliance documentation in China needs to be in Chinese and no functionality for automatic translation was available in the consortium, made it also increasingly difficult and less valuable for European stakeholders to capture this sort of

information. The process of exit confirmation was out of scope because the Yantian International Container Terminal played no active role in the project. Cargo Services sends the Shipping instruction to the ocean carrier and some carriers use the shipping instruction to create the ENS declaration. In this case, it is not sure whether the ocean carrier re-uses the shipping instruction information and because the actual filing is done by the contracting carrier this event was placed outside the scope of the project. Clearance for discharge is not in scope for the Cassandra trade lanes as ship compliance is of less relevance. Transit declarations were not in scope because they are not used as the BAP warehouse is in a customs controlled area on the port of Felixstowe.

The Consignment Completion Point is an important milestone in the Cassandra project and is part of the 'Stuffed' event. In this trade lane, Cargo Services carries out physical quality control on behalf of the UK buyer and loads the goods in the containers. A tallyman supervises the container loading and checks whether everything is loaded according to the container manifest. This manifest was used earlier to create the shipping instruction (basis for the ENS declaration) and the export declaration. During loading of the container five photos are taken in different stages. These photos are stored for three months. The container is always loaded according to the container manifest. If there is a problem with loading the goods and the container manifest cannot be followed exactly, the loading process is put on hold. If there is no solution to get the container loaded exactly according to the manifest, Cargo Services will have to change both the shipping instruction to the ocean carrier and the export declaration and this means additional work. Therefore the container manifest is strictly followed and that is why the initial planning of shipments, so creation of the container manifests, is an important process step for Cargo Services. Only when the goods are cleared for export the container doors are closed and the container is sealed.

For the 'Export completion' event it is important to note that in the current process Cargo Services receives the carrier Bill of Lading and forwards this to its UK partner, together with all documentation (invoices, origin documents (A-form), inspection reports and packing lists). The document set becomes available about three days after vessel departure and is forwarded to Allport by courier. Information sharing between Asia and Europe is therefore not real-time.

The 'De-stuffing' event is important in this trade lane because the UK retailer is very keen on the compliance of arriving shipments with the initial purchase order and packaging requirements. Therefore, BAP logistics is hired to verify the content of each container by box count. Together, BAP and Cargo Services improved compliance with retailer's quality levels up to 99,7% on this trade lane in the last years. Error rates discovered at 'De-stuffing' on the UK retailer's other trade lane that does not benefit from the BAP and Cargo Services quality control remain at about 15%.

Data analysis and sources

The below table gives an overview of the Cassandra events that are in scope for the Yantian-Felixstowe trade lane and the important considerations when analysing the available data sources.

Event	Owner	Typical data sets	Remarks
Purchase Order	Retailer	Order details	All purchase order details are stored in a PO management system that is accessible for not only the retailer but also Cargo Services and Allport.
Export booking completed	Cargo Services	Carrier booking confirmation, Transport order confirmation, Request for transport details	Trucking information is available from Cargo Services. Carrier booking confirmations are not stored digitally by Cargo Services but are available from the carriers.
Empty Out	Contracting carrier	Empty out container milestone	Timestamp available from the carriers.
Stuffed	Cargo Services	Container manifest details	Cargo Services is the appropriate source for this. Container manifests are generated in their freight forwarding system and confirmed after stuffing.
Export completed	Cargo Services (HBL only)	Master B/L and House B/L	The house bill of lading is generated by the Cargo Services freight forwarding system after confirmation of stuffing, sometimes after receipt of the MBL of the carrier as manual data entry is needed.
Import booking completed	Allport	Transport order confirmation, Request for transport details	Transport planning for distribution is generated by Allport. No details of this process are known.
Cleared for import	UK Customs	Annex 37 or equivalent data set	The import declaration is generated by Allport, based on the PO management system, that was also updated by Cargo Services after stuffing. The declaration data cannot be made available by Allport, but the resulting clearance can.
De-stuffed	BAP	Container manifest confirmation details	Resulting box count of the de-stuffing process is kept in a BAP owned system which is also used to generate e.g. labels.
Empty returned	Contracting carrier	Empty in container milestone	Timestamp available from the carriers.

Table 4.4 Data analysis results for Yantian-Felixstowe

Below figure 4.1 shows the complexity that was encountered with the identification and combination of data sources in an LCL trade lane like this one. All relationships between events and objects can be many-to-many. The figure shows how this can look at the start of the trade lane. Multiple purchase orders were sent to various suppliers who all deliver their shipments to the Cargo Services warehouse. Cargo Services then makes one booking for ocean carriage for multiple containers. Multiple 'Empty out' events and also multiple stuffing events take place, one per container. But the container level cannot be the lowest level where links between events are made. When using the pipeline for visibility at, for example PO level, PO items can be distributed over multiple containers and this means that it is necessary to track of goods line items in the PO. This is also shown in figure 4.1 when line items of PO1 and PO2 are combined in container 1. When a user looks up a Master bill of lading in the pipeline, and wants to drill down to the purchase orders, this means that multiple reference numbers and several layers of cross-referencing are needed to make this possible.

This issue needs to be solved in the detailed data mapping for implementation of the pipeline.

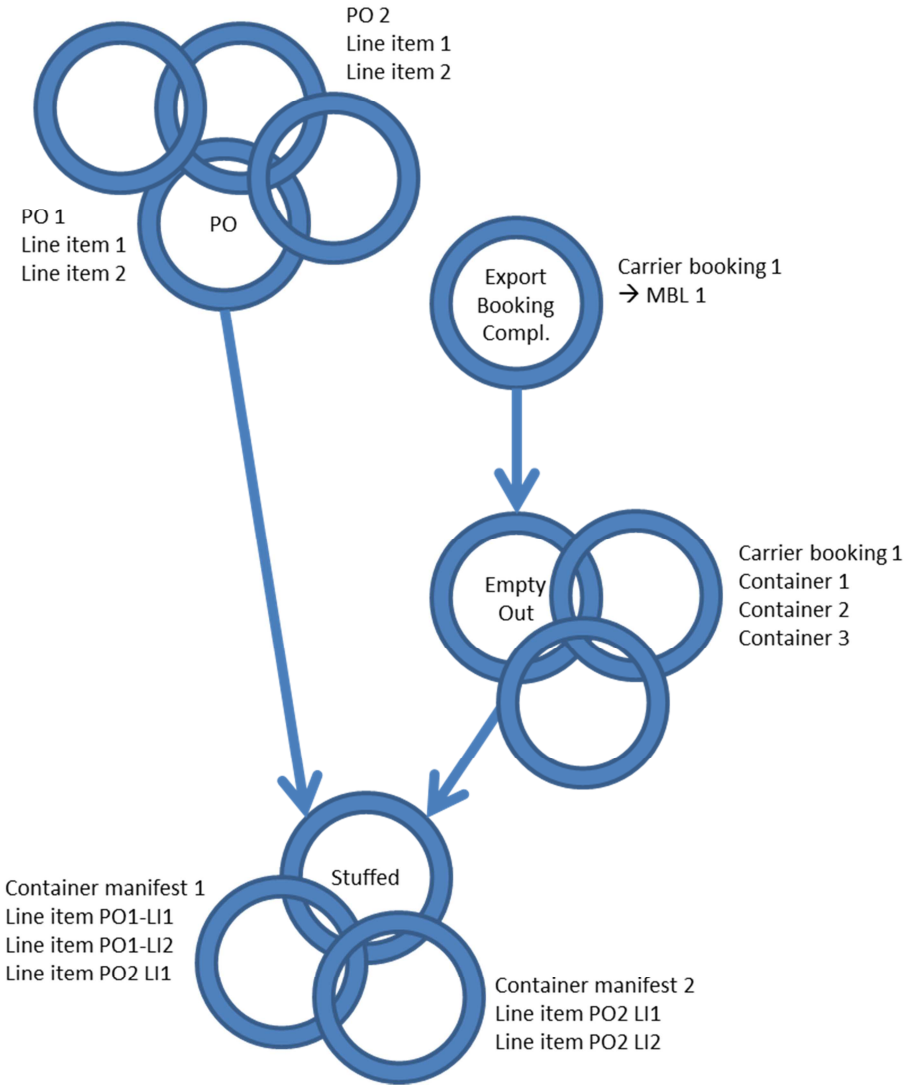


Figure 4.1 Complexity of various reference numbers in an LCL trade lane

Risk assessment

BAP sells its business activities by promising high quality, value added logistics, a good reputation and to save cost for the customer. BAP aims to manage its risks by constantly focusing on internal improvement and planning several months ahead. They stated that having customer contracts in place could make a company lazy because there is less incentive to keep improving. Also, as a small to medium sized company, BAP thinks that also its number of risks is limited.

BAP is located only in the Port of Felixstowe and because their logistics product is directly related to overseas logistics, their performance is linked to that of the Port of Felixstowe itself. The development of the London Gateway is therefore not only a challenge for the Port of Felixstowe, in trying not to lose business, but also for BAP. BAP works closely with the Port of Felixstowe as partners and thinks this helps both organizations in mitigating this risk. BAP is aware that with these strategic relationships they have, not only with the port of Felixstowe but also with customers, their number one risk is in losing these relationships.

The risks BAP has to deal with are mostly risks of their customers that they try to solve or mitigate. A good example is the role BAP has as a deconsolidator in this trade lane. BAP checks the container content against the container manifest and whether all packaging and stuffing is done according to the retailer's requirements. Suppliers and shippers will be fined when the stuffing is not performed correctly. According to BAP, this penalty has a positive effect on supply chain performance. BAP works closely with their overseas partner Cargo Services in this trade lane so that some checks can be performed on the Chinese side of the trade lane. However, not all shipments for this retailer are shipped via the Cargo Services' CFS so inspection in the UK is still necessary. According to BAP, prerequisites for making this successful are clear requirements, clear definitions, data sharing and fines.

Examples of risks related to BAP's operations or risks that BAP manages for their customers are:

- Container does not arrive;
- Container is late, which can lead to:
  - Insufficient workforce available at container arrival (due to bad data quality on expected arrival). This is partly covered in the business continuity plan by training personnel for various import/export lanes or activities;
- Container physically holds other goods than declared in the container manifest. This can be due to for example:
  - Discrepancies in volume metrics, a container can perhaps hold more packages than the documentation states (and this is not allowed by the retailer);
  - Shipper does not/cannot describe the goods properly;
- Hazardous containers, that need fumigation, are not identified upfront, which causes unexpected delay of up to 2 weeks;
- Data unavailability (BAP will not open a container when no data is available on its content).

Having quality data is an important prerequisite for most of BAP's operations as they check container actual content against documentations and expectations. Proper data management should therefore be a top priority for BAP, be part of their unique selling points and the risks related to it should be high on their mitigation priority list.

Based on the data pipeline that was implemented, better data should become available and should serve as the basis for further discussing the automated alerts and the controls that could be put in place.

Mapping of current IT systems

On overview of the IT systems that are currently used in the Yantian-Felixstowe trade lane is presented in figure 4.2. It shows the various IT systems on top of the layers for physical operators and organizers as presented in table 4.1. Only the IT systems that are crucial for the Cassandra events in scope for this trade lane were identified and analysed. LIMA is the purchase order management system, owned by Allport and also used by the UK retailer and Cargo Services. The LIMA system is also used as a freight management system by Allport and is the basis for creating import declarations. Import declarations are filed with help of the UK Customs system CHIEF. EDISON is the freight forwarding system of Cargo Services. Various ocean carriers are used on this trade lane and therefore their IT systems box also states 'various'. Destin8 is the port community system in the port of Felixstowe. DBS is the system owned and used by BAP. SKG is also the customs broker and uses two IT systems for creating Chinese export declarations. More information about these systems can be found in appendix C.2 and in the next section on interactions with government authorities.

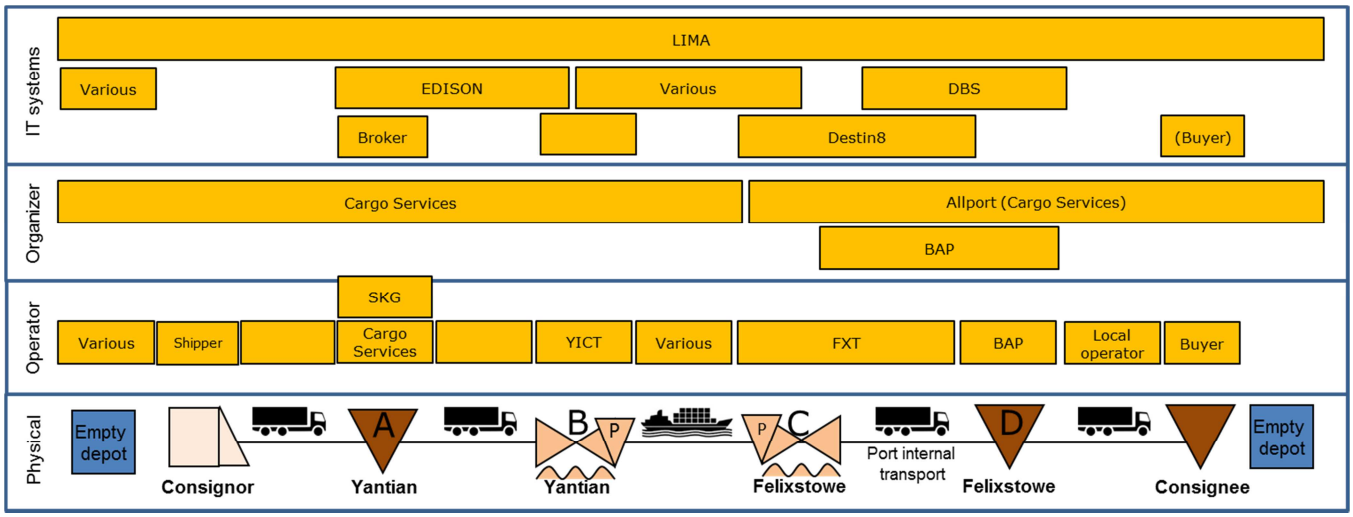


Figure 14.1: IT Mapping for Yantian-Felixstowe

Event	Owner	IT system
Purchase Order	Retailer	LIMA
Export booking completed	Cargo Services	EDISON + Carrier system
Empty Out	Contracting carrier	Carrier system
Stuffed	Cargo Services	EDISON
Export completed	Cargo Services (HBL only)	EDISON
Import booking completed	Allport	LIMA
Cleared for import	UK Customs	LIMA + CHIEF (UK Customs)
De-stuffed	BAP	DBS
Empty returned	Contracting carrier	Carrier system

Table 14.5: Cassandra events from IT systems

Table 4.5 shows the results of combining table 4.4 and figure 4.2 and thus which IT systems are ideally used for capturing data for each of the Cassandra events in scope for this trade lane.

Mapping of interactions with government authorities

From the Chinese side of the trade lane there is interaction with the Chinese customs to receive a clearance for export. Clearance needs to be received before Cargo Services can complete the 'Stuffed' event. Figure 4.3 shows the preparation by Cargo Services from the 'Export booking completed' event to the 'Stuffed' event. The clearance for loading needs to be given by EU Customs. The declaration needs to be send to EU Customs 24 hours prior to container loading. The time lines in the trade lane are tight and this can mean that the declaration is filed before stuffing, but it can also take place after stuffing when the container has been transport to the Yantian International Container Terminal.

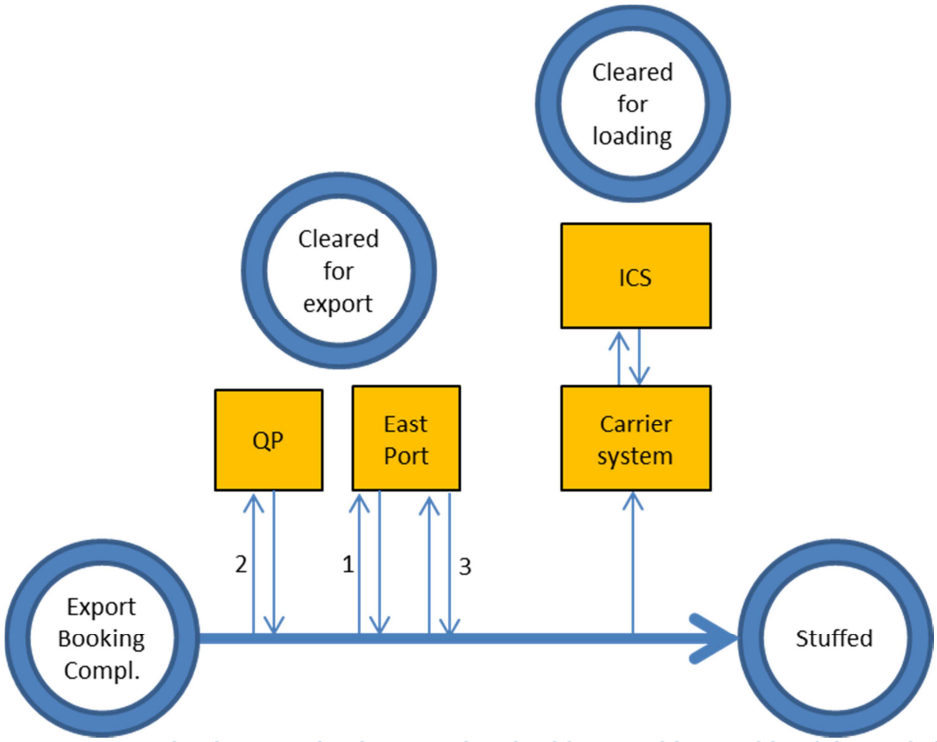


Figure 4.3: Interaction between business and authorities on Chinese side of the trade lane

The customs team of SKG uses two different systems to get the goods cleared for export:

- QP system: National customs system which is installed on a special computer, provided by the Chinese government;
- WMS of SKG including a module by East Ports technology; The WMS is an SKG owned system and the East Port module is provided by the regional Yantian customs authority. The East port module is installed on the SKG computer and communicates with the custom's system through EDI.

The customs team starts with generating a so-called UCR number in the East Port module (1). This UCR is then used in the QP system where an export declaration is filed for Chinese customs (2). This declaration details among others the shipper, origin and destination, packaging, weight, goods description, value and HS code and is also used for tax purposes. If Chinese customs gives a green light for the shipment an MRN-like number is given as response. This MRN number starts with the regional code (5316 for Yantian), year (2012), export/import code (0/1) and a unique number. An example is 531620120166556892. The next step in the export clearance process is a regional customs declaration which is used for risk assessment by customs and also inventory control of the SKG warehouse which is a bonded warehouse. This declaration will state the MRN and the UCR, a warehouse reference number and the goods details and is send to Yantian customs using the East Port module (3). Based on this information, Yantian customs decides whether physical inspection is necessary. Physical inspections are always performed in the SKG warehouse. Before final clearance the goods are not allowed to leave the CFS. The export declaration is sent to customs before actual loading of the container has taken place. It is therefore based on the planned container manifest.

For receiving a clearance for loading, the planned container manifest is used to create a shipping instruction for the ocean carrier. Cargo Services sends the shipping instruction to the carrier by email. The carrier will make a European Union, Import Control System, Entry Summary Declaration (ENS), possibly using the Shipping Note data provided by Cargo

Services, to the first port of entry into the European Union which, in this trade lane, is UK Customs. The ICS system automatically compares the data received with the EU Common Risk Rules and generates a Movement Reference Number or a 'Do Not Load' message for high risk goods.

Having issued Bills of Lading to the shippers/consignors, the Carrier will produce a Vessel Manifest as a list of all Bills of Lading and as a record of what the vessel is carrying. In this China to UK trade lane that Manifest is lodged, through the Felixstowe Port Community System, Destin8, with Border Force in the UK prior to the vessels arriving. Border Force are able to carry out risk assessment on the goods prior to the vessel arriving. This system is out of scope of the current Cassandra project. The import declaration is sent by Allport, through the Destin8 port community system to the UK import declaration system CHIEF. Overall, the situation looks like the presentation in figure 4.4. There is no interface or interaction between the Chinese Customs export declaration (out of scope), the EU ICS declaration made by the carrier (out of scope), the inwards vessel manifest (out of scope) or the UK Customs import declaration to CHIEF (out of scope).

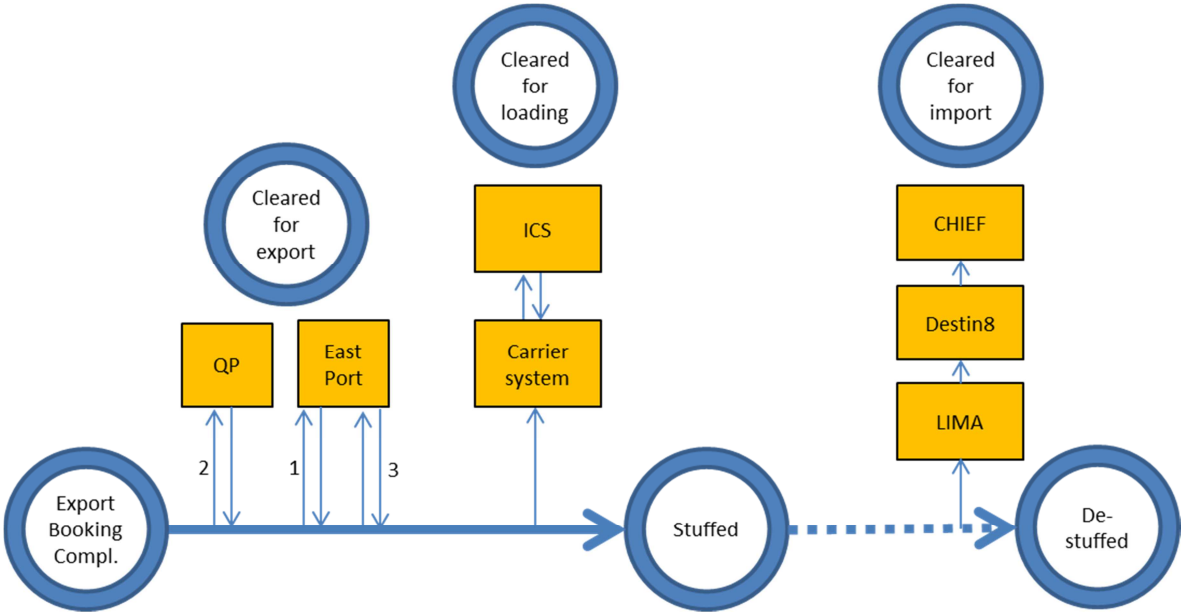


Figure 4.4: Interaction between business and authorities for Yantian-Felixstowe

The targeting officer is a customs officer specialized in assessing risk for trade movements. This is done using data from a variety of sources but for pre-arrival risk assessment the vessel manifest is the main source of data. The Cassandra Project research revealed that about 60% of vessel inward manifests do not carry enough data to allow proper risk assessment. The Import Control System and the CHIEF system have their own, separate, risk engines.

The ICS system distinguishes between green, amber and red categories, based on the characteristics of the information provided in the ENS declarations. Green means that goods present no risk and can be loaded, red means they must physically be inspected. The targeting officers are left to assess the amber category, usually because the information in the declaration was not sufficient to base an automated risk assessment on. The result of their assessment is that goods can be loaded or that physical inspection is required.

Targeting officers require additional information about the trade transactions in order to decide whether there is an actual risk that justifies inspection. In current working practices,

targeting officers often use the telephone or other manual procedures to collect additional information about a shipment.

14.1.2 To-Be situation: Demonstration plan

Design of pipeline configuration

As was also described in deliverable D3.5, the pipeline created for the BAP trade lane is of a BCS pipeline configuration type (see figure 2.5). The configuration builds upon the Global Logistic Network (GLN) of Descartes (which can be seen as a global BCS) as technical implementation of the pipeline. The GLN of Descartes is a world-wide network of nearly 3,500 traders, including various ocean carriers. This GLN is linked to a business dashboard, also developed by Descartes and to the Customs dashboard, developed by IBM and Intrasoft. Although the two dashboards are visualized in a similar way, the interface is different. The business dashboard is immediately linked to all data in the pipeline. The Customs dashboard is interrogating the pipeline with a pull-mechanism, requesting a subset of data.

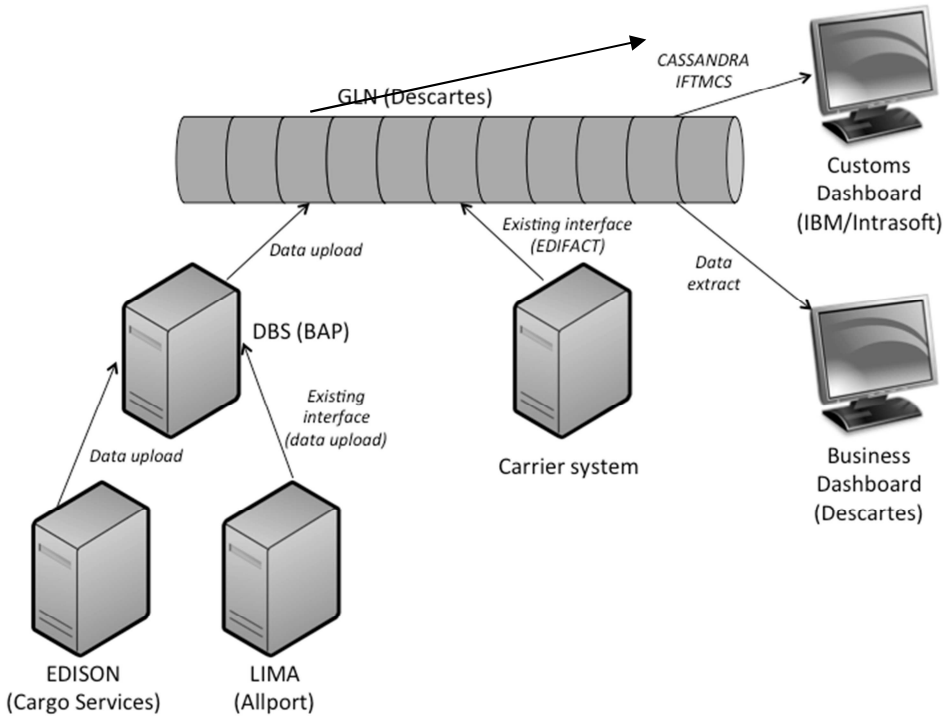


Figure 2.5 Yantian-Felixstowe pipeline configuration

Figure 4.5 shows the pipeline configuration in combination with the data sources that were identified in the previous section and table 4.6 links these to the Cassandra events as well. Although all the ideal sources for the data are linked to the pipeline, they are not all linked directly. DBS serves as an intermediate for LIMA and EDISON. This was a prerequisite for the UK retailer as they can now clearly monitor the information sharing about their trade with the Cassandra project as this is always restricted to the data they can see in DBS. For them, this was a prerequisite to approve of the trade lane being used in the project. The reason is entirely linked to confidentiality of the data in a project setting and there is no specific reason for the retailer to maintain this situation in a real-life situation outside the Cassandra project. So although ideally all sources should be linked to the pipeline directly (omitting unnecessary interfaces) the configuration still respects the data from the source principle as the data is not changed in the DBS system but only processed.

Event	IT system source	Provided to pipeline by
Purchase Order	LIMA	DBS
Export booking completed	EDISON + Carrier system	DBS
Empty Out	Carrier system	Carrier system
Stuffed	EDISON	DBS
Export completed	EDISON	DBS
Import booking completed	LIMA	DBS
Cleared for import	LIMA	DBS
De-stuffed	DBS	DBS
Empty returned	Carrier system	Carrier system

Table 14.6 Cassandra events from IT systems to pipeline

A large piece of missing information in the as-is situation of this trade lane were the Terminal (or Carrier) milestones. Neither LIMA nor DBS had reliable information about the loading of the container on the vessel, the vessel route, vessel estimated arrival (ETA), vessel actual arrival (ATA), and the discharge of the container. Information about some of these milestones are contained in LIMA (and via the direct feed later also in DBS), but are entered in the system via manual input (the information is gained from webpages of the shipping lines, without any automated connection). To solve this white spot in the pipeline, two options were considered:

1. Use SICIS (as developed in the FP7 Integrity project) for tracking terminal milestones;
2. Use GLN from Descartes to connect to carriers and retrieve terminal milestone information indirectly through them.

It was decided by the team to go for the GLN option of Descartes because Descartes is involved in the Cassandra project, and more importantly the Descartes solution has a wider application and presents more visibility than just the terminal milestones, which could create additional business benefits.

Functionality of the Descartes pipeline and business dashboard
The business dashboard is a visualisation for:

- Container and consignment details and status monitoring;
- Full audit trail of the data sources and meta data;
- Supply chain actor information, roles and relations.

With this, the dashboard also allows to monitor the data quality. It provides a Collaborative multi-party environment where data can be shared, including a security model based on user and company roles, relationships and transactions. Based on this information, “value added services” can be created, such as alerts & notification, or pre-fill Customs declarations. A conceptual picture of the configuration is depicted below. The GLN collects data from various sources: either information is pushed by the data providers, either it’s pulled, or a combination of both.

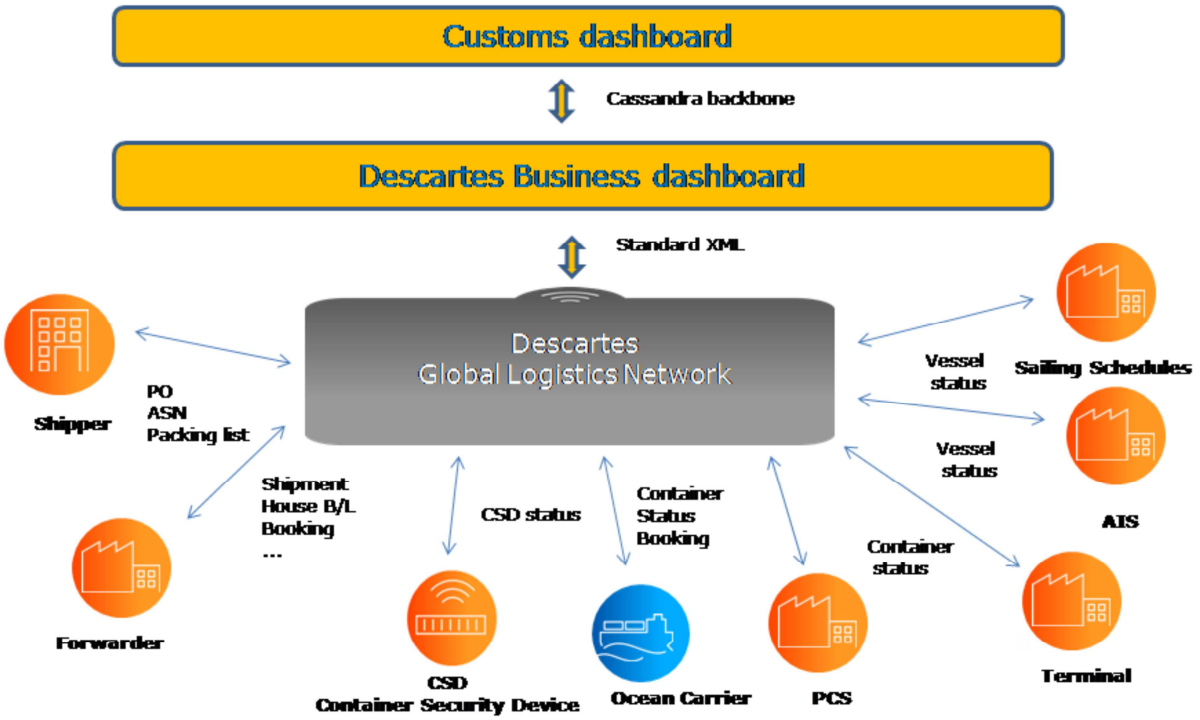


Figure 14.6 Conceptual visualization of the GLN and business dashboard

Figure 4.7 shows the functional architecture of the Descartes functionality in more detail and shows the boundaries of what can be called the data pipeline and the business dashboard:

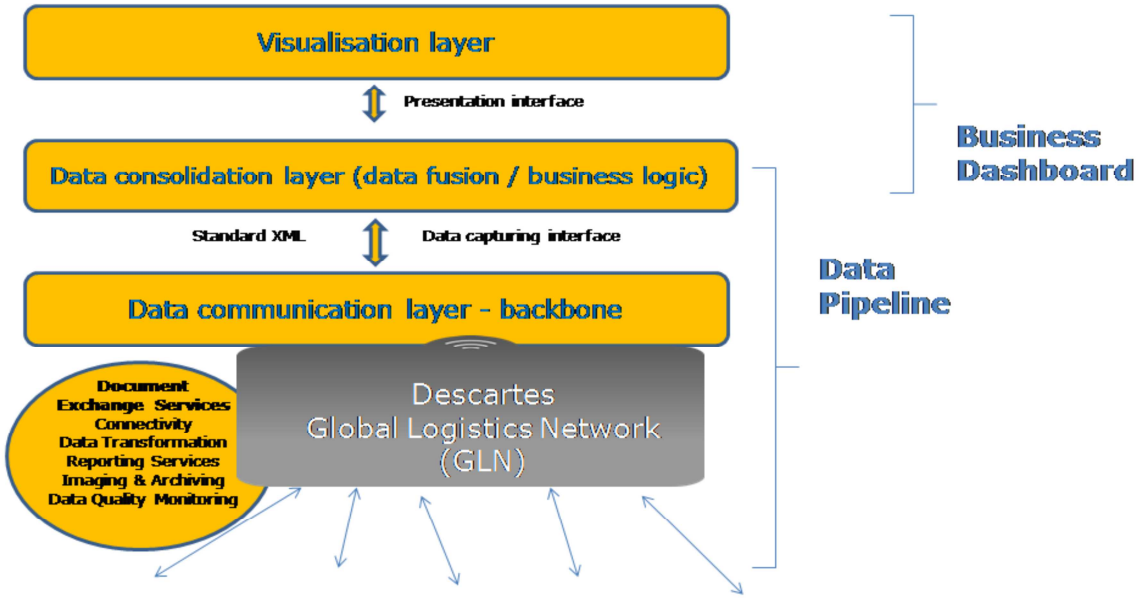


Figure 14.7 Functional architecture of Descartes pipeline and dashboard

Within the business dashboard the data can be accessed from different views, also called entities:

- Shipments;

- Purchase order;
- Containers;
- Bookings;
- Transport means (vessel).

All these entities are linked to each other via common references, such as booking reference, bill of lading number, container number, purchase order number, shipment number etc. For every entity there are different screens:

- Overview list, including status's and links to the other entities;
- Detailed information, including message history;
- Transport milestone information (for containers & shipment);
- Container security device information (when applicable);
- Party information.

Some example screen shots are available in figures 4.8 and 4.9.

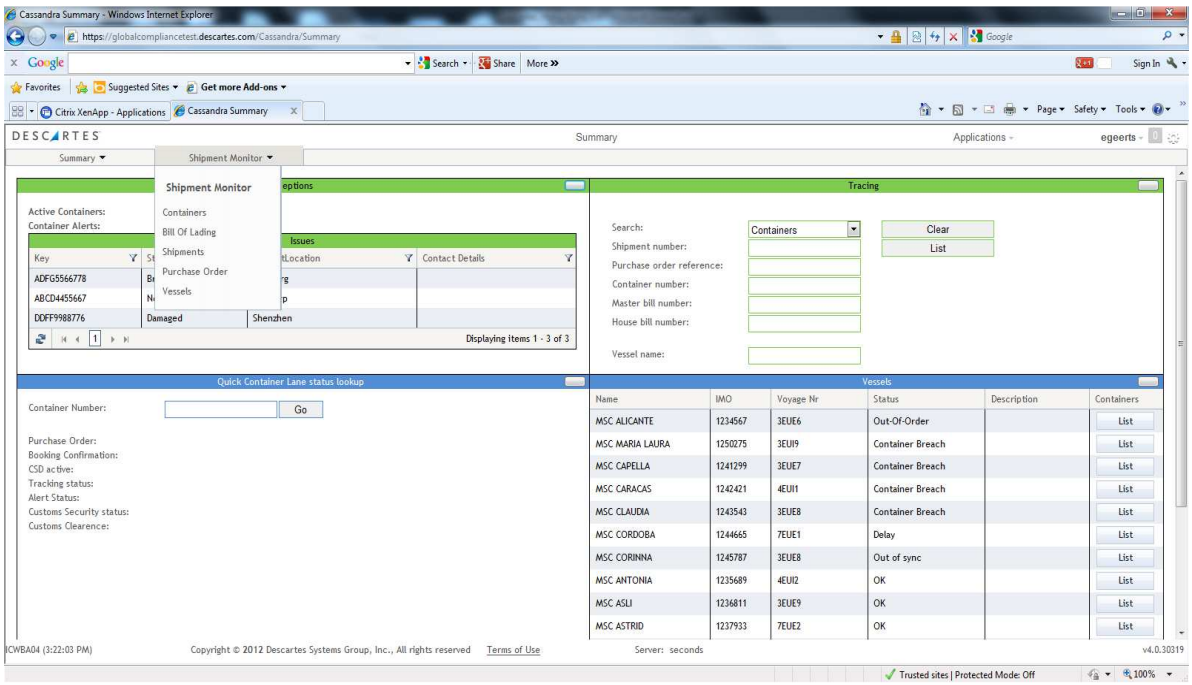


Figure 14.8 Screen shot of the overview page

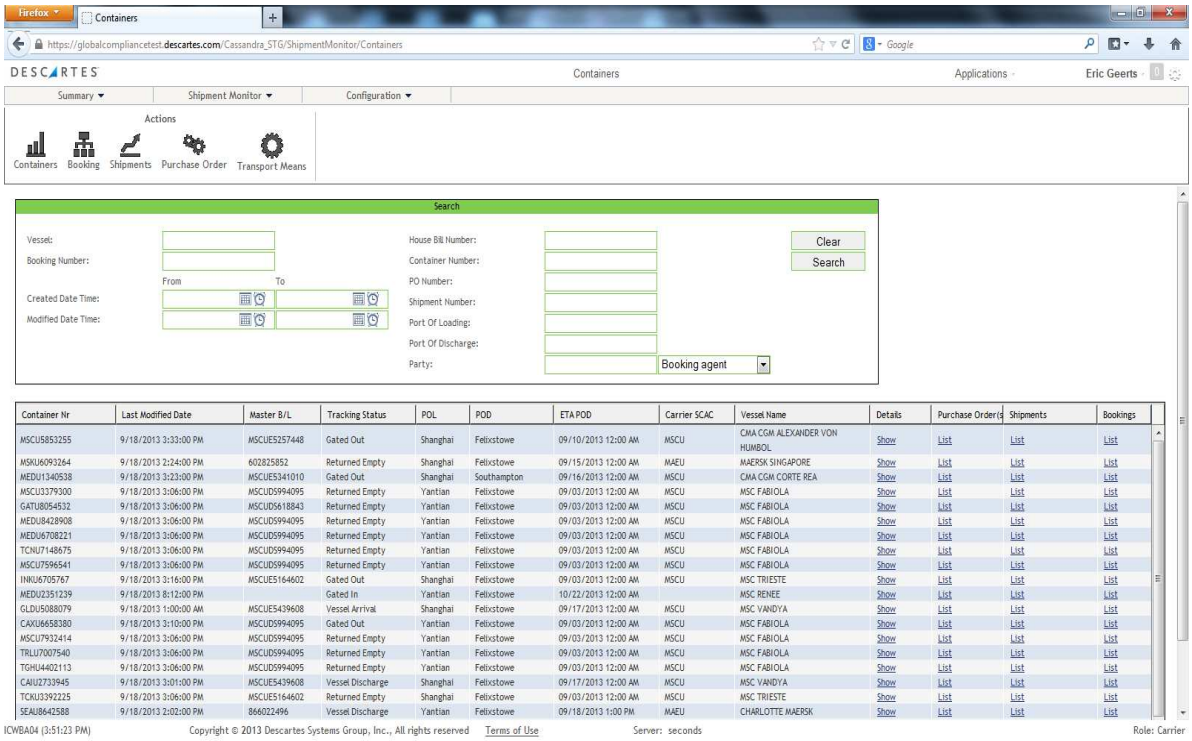


Figure 14.9 Screen shot of the shipment monitor

Every message that is received is linked to a main entity (e.g. shipment, container) and this also automatically updates the data of other entities that are linked. For example a house bill of lading message that contains a container reference will also update the container information.

For each entity there is a message history that keeps track of all transactions, including the sender and the source of the information. The user can also click through to the message content on the Global Logistics Network. For certain fields there is also functionality that indicates when multiple sources or the same source have sent contradictory information for the field, showing also the audit trail of the different values. Figure 4.10 shows an example of the screen with the list of received messages for a certain container.

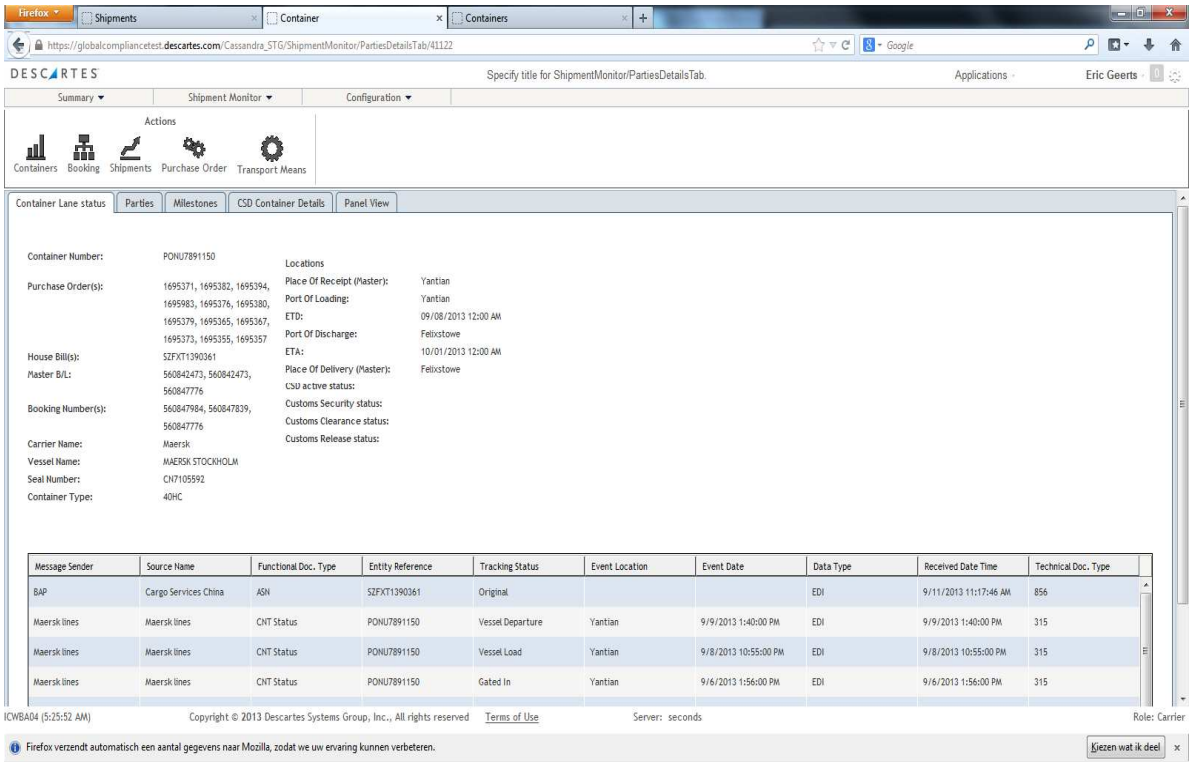


Figure 14.10 Screen shot of message trail for Container Lane status

Also the parties involved in the trade lane can be viewed in the dashboard. Figure 4.11 shows an example of a screen with four parties' business cards (which are empty for confidentiality reasons).

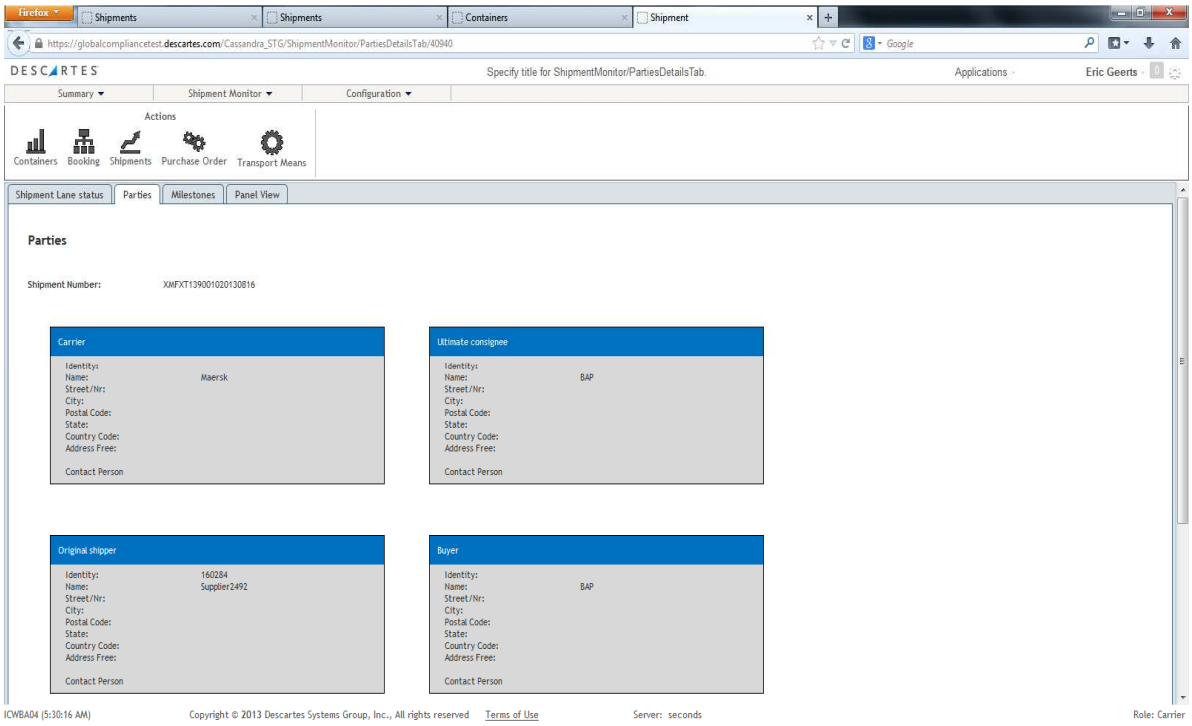


Figure 14.11 Screen shot of Party information

In constructing the business dashboard Descartes experienced the following challenges:

- Define shipment and container lifecycle;
  - Which part of the supply chain is covered by the same definition of a "shipment"?;
- Identify the links between the various business documents/transactions;
  - Many "n to m" relationships between for example purchase order, shipment, container, Bill of Lading and transport means;
  - Dynamic way of constructing the supply chain: no fixed order;
  - No single reference like UCR to track the whole supply chain;
  - Need for different views on the data in the dashboard, which are "hyperlinked";
- Alignment of party addressing mechanism;
  - Which addressing mechanisms are used? DUNS, EORI, proprietary, etc.;
  - How to address community systems and to identify true source of data;
  - Alignment on supply chain roles: origin forwarder, ocean carrier, etc.;
  - Data security model for sharing data;
  - Fixed versus flexible company access rights.

RBA and process/organisational innovations

The data that is available in the pipeline can not only be used for monitoring but also automatic cross-checking of data and alerting can be put in place to further support the work of operational staff when managing shipments. These alerts can help BAP, Allport and Cargo Services to be in control of their supply chain in a more efficient way.

Four types of alerts were identified:

5. Alerts directly related to alert message (e.g., CSD breach);
6. Alerts raised from conflicting info in one data element field (e.g., quantity reported differently by different sources PO and container manifest);
7. Milestone or event alerts (e.g. comparison of Estimated and Actuals);
8. Business Intelligence / Business Rule like alerting, where data from multiple fields is combined to detect an alert (e.g., combining product quantity, product weight and container empty mass and check this with container gross weight).

Based on the operations and risks of BAP and its customers, and the available pipeline data, the following alerts were implemented in the business dashboard:

- Quantity discrepancies between PO and container manifest (type 2);
- Difference between ETA and ATA of ocean vessels (type 3);
- Alert specific containers for Origin Pick promotions as these are top priority (type 3);
- Vessel name changes (type 3);
- Unexpected transhipments (type 3);
- Customs Clearance, only implemented for the UK import clearance (type 4);
- Customs Release (type 4);
- When a booking to a vessel is not confirmed as loaded by the Shipping Line, i.e. when a Container has missed the vessel it was due to depart on (type 4)
- Vessel Delays or early arrival (type 3);

No additional process measures were taken to put in additional data validation points or manual checks, etc.

Alerts will show up in the different overviews of the dashboard, as well as in the detailed information screens, and also e-mail notifications can be automatically sent. Figure 4.12 shows an example of how an alert status is reported in the dashboard.

Container Nr	Creation Date	Last Modified Date	Master B/L	Alert Status	Tracking Status
XMDY2339846	9/18/2013 9:02:01 AM	9/1/2013 10:00:00 PM	MDY2_MSCUX6845692	ATA diff vs ETA	Vessel Arrival

Figure 14.12 Screen shot of Alert status

Functionality of the customs dashboard by IBM and Intrasoft

The Customs Dashboard assists risk assessment by providing additional data to ICS and import declarations submitted by a third party (e.g. ocean carrier, freight forwarder or importer/exporter). The additional data should be shown in a comprehensive view, preferably allowing for the possibility to 'dig deeper' and access further information about the involved parties. The Customs dashboard also supports the functionality to retrieve information about parties (e.g. importer, exporter, or other relevant supply chain partners) from the Dun & Bradstreet database through a service call to this database. The Cassandra Customs Dashboard is therefore:

- A business application (i.e. an application used by a business user);
- Used by a customs targeting officer performing risk assessment of cargo trade transactions;
- Allowing the targeting officer to retrieve supply chain information about the transaction at hand from supply chain partners via the Cassandra hubs, such as Descartes, Portbase and GS1 EZ-Track;
- Aimed to provide the targeting officer with data about the transaction, which is of higher quality than the data in the ENS document (Entry Summary Declaration);
- With the ultimate goal to support the targeting officer decision making process, determining whether the cargo should or should not be inspected.

The goal of the Customs dashboard is to provide the targeting officer access to extra information about amber transactions, to enable the targeting officer to make a decision whether the cargo at hand needs to be inspected (i.e. make the declaration red) or not (i.e. make it green). The customs dashboard use case is therefore triggered by the targeting officer manually, after the targeting officer established that a transaction has been selected amber in the risk assessment system.

The usage of the Customs dashboard by a targeting officer can be described with a use case, which is a description of the usage of a system by an actor and thus also describes the functional requirements of a system. The use case, summarized in table 4.7, starts when Customs wants to obtain additional supply chain information about a 'targeted' (so called 'amber') declaration that has been submitted to Customs in the usual way (i.e.: the current modus operandi around submitting entry summary declarations, summary declarations for temporary storage, import declarations and export declarations remains unchanged). The decision to target this declaration is typically done in a risk assessment system which is outside the scope of this use case. The Customs dashboard will be used to assist cases where the risk assessment system was not able to make a decision whether or not to inspect the cargo. We refer to these declarations as "amber" ("green" declarations are declarations for which the risk assessment system decided that no inspection is required; red declarations are declarations for which the risk assessment system decided that inspection is required).

1. The use case begins when the targeting officer wishes to find data about a consignment in addition to the data received from the manifest, the ICS system or the import declaration. The targeting officer needs to obtain a container number or bill of lading number from any one of these systems. The targeting office enters an ID and an ID type (container number, HBL# or MBL#) and requests the system to obtain additional information from within a specified data range. By default, this data range is set to be between 0 and 28 days but this can be updated by the user if needed. Users can search information based on three criteria: a container number, HBL# or MBL#.
2. The Customs dashboard application requests this information from all Cassandra hubs, through the agreed-upon API (service interface). This request includes the requested ID, ID type (container/HBL/MBL), minimum and maximum data age and requesting user ID.
3. Results are being received from the Cassandra hubs. The dashboard displays any results as they come in and waits – if applicable – until all hubs have returned a result.
4. The dashboard displays a list of the results, with the basic information for each result and allows the user to view additional details.
5. The user selects a result to view additional details.
6. The system shows detailed information for the selected result
7. The targeting officer uses the information to decide whether or not the transaction poses a risk, and thus whether or not inspection is required. The use case ends.
Note: it has been decided in Cassandra that the officer records the inspection decision in the risk assessment system that Customs already possesses, and not in the Customs dashboard.

Table 14.7 Use case description for the Customs dashboard

For the sake of confidentiality and accountability, usage of the Cassandra Customs Dashboard is restricted to duly authorized and hence authenticated users. For this reason whenever you access the Cassandra Customs Dashboard (for the first time) you will be prompted by the below login screen (Figure).

Figure4.13 Login screen

The Search Criteria screen (Figure 4.14) allows users to search for supply chain events related to a specific supply chain object by querying the Cassandra Hubs. The user has several fields that can be used to query a number of other systems to gather more information about the business transaction for the declaration at hand. One of these is the minimum and maximum data age which will be supplied to the Cassandra hubs to filter their results. Depending on where the shipment comes from (and thus how long the transport takes), the targeting officer would typically only be interested in the data of a specific container in the several weeks, but occasionally a wider data range might be required. The data range that is returned will always be constrained to the retention times of the Cassandra hubs themselves. The search is performed based on one of the following object types:

Container, a House Bill of Lading or a Master Bill of Lading. The user is then presented with a list of results (if any) for which he can view additional details. For parties for which a suitable identifier, in this case the DUNS idea or extensive address detail, is available additional data can be requested from an external source (Dun & Bradstreet). The targeting officer registers the decision on whether to inspect or not in the existing risk assessment system (out of scope of the Customs dashboard).

Figure 4.14 Search Criteria screen

The Search Response screen, shown in figure 4.15, displays the (initial) responses received from the Cassandra Hubs in response to the search request.

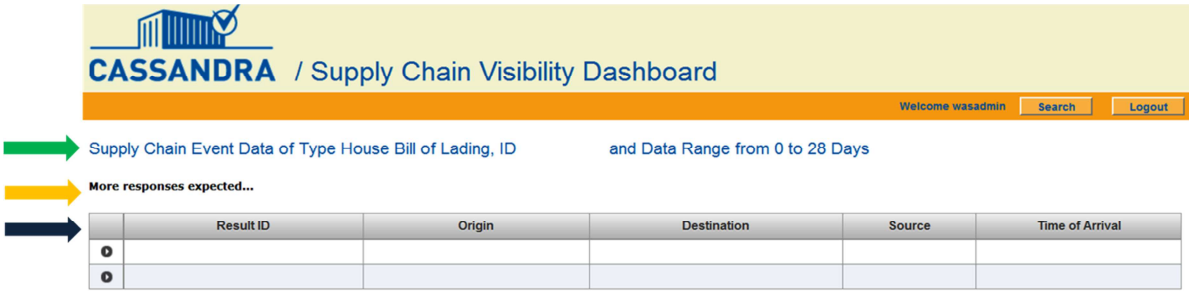


Figure 4.15 Search Response screen

This screen is divided in three sections:

- The first one is on the top of the main screen and it is the summary of the query that was submitted in the previous page (search criteria screen), as shown in figure 4.16.

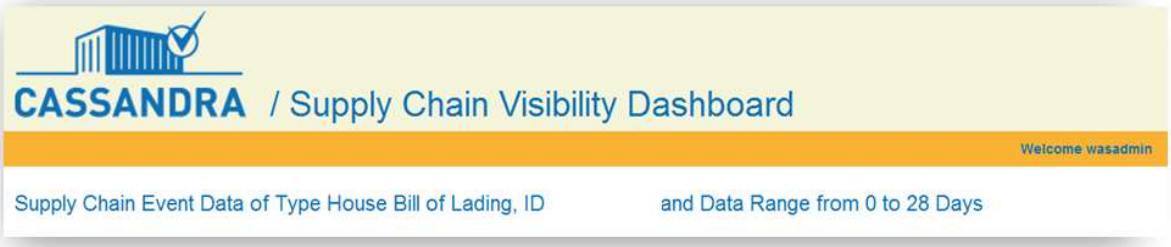


Figure4.16 Query Summary

- The second area (from the top) informs you about the status of the search processing. If the search completed, this area is empty. If more responses are still expected, it will display "*More responses expected*"; finally when additional responses are received it will display "*New results received*" together with a Update Results button that you can use to view the new results.
- The last section is the result table, as shown in figure 4.17.

Figure 4.17 Result Table

In this table the user can see a list of responses with basic information for each response. The user has the option to view additional information for each response by clicking the (Expand) button on the left of each result record. When he does, the essential parts of a response which are the Parties and the Goods, will be displayed as depicted in figure 4.18.

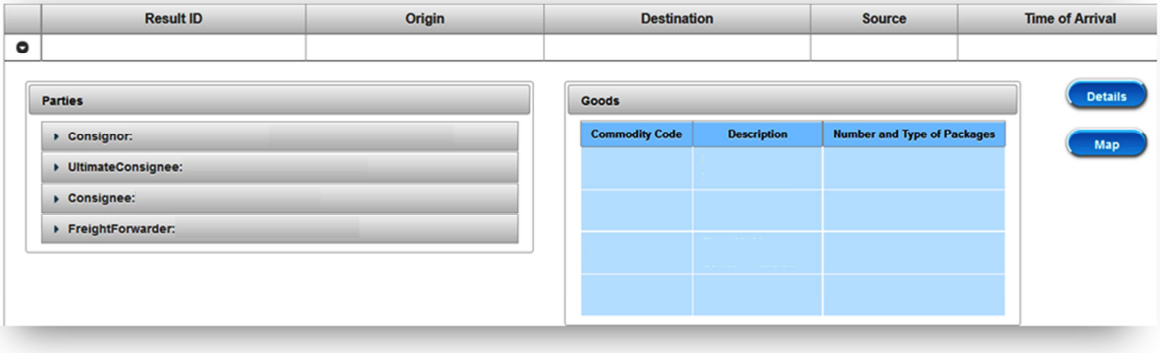


Figure 4.18 Expanded view of response

The role and name of each party is displayed as a tab of an accordion panel. The user has the option to request for viewing Dun & Bradstreet details for each party, by clicking the party name. When he does, the accordion panel will open and the Dun & Bradstreet details for the specific party will (if available) be displayed as shown in figure 4.19 on the left side of the screen.

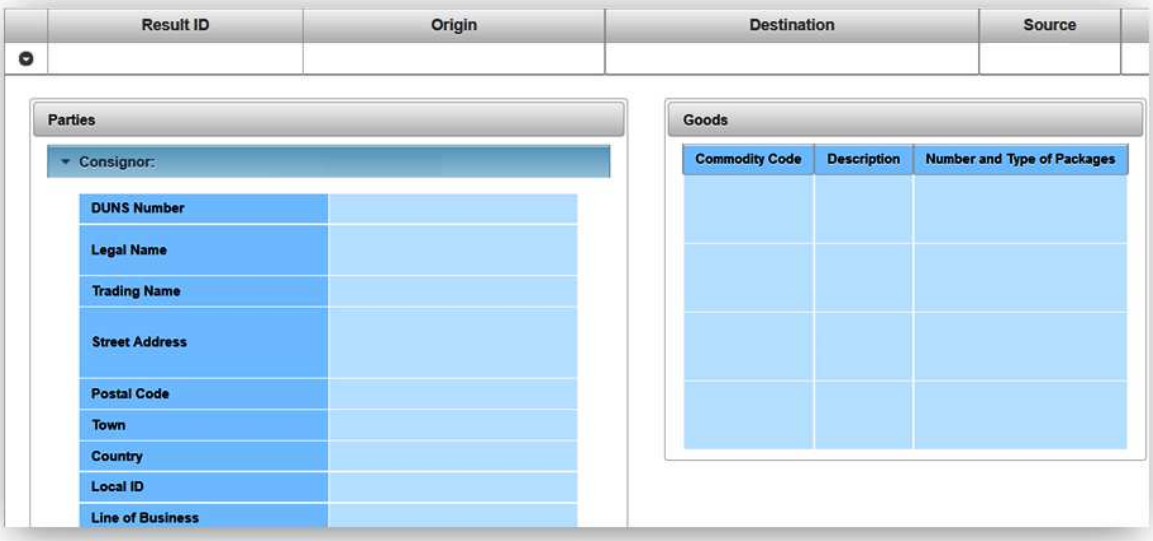


Figure 4.19 Dun & Bradstreet details

Information about goods is displayed in a separate table on the right side of the screen.

The expanded view also contains two buttons, as shown in figure 4.18, giving the user supplementary options. These are:

Details button, see Figure 4.20
Map button, see Figure 4.21

View Detailed Response of a Cassandra Hub
From the expanded view (figures 4.18 and 4.19) the user has the option to view more details by pressing the “Details“ button. Then, he can see the detailed message which contains all the information as it was retrieved from the source hubs, as shown in figure 4.20.

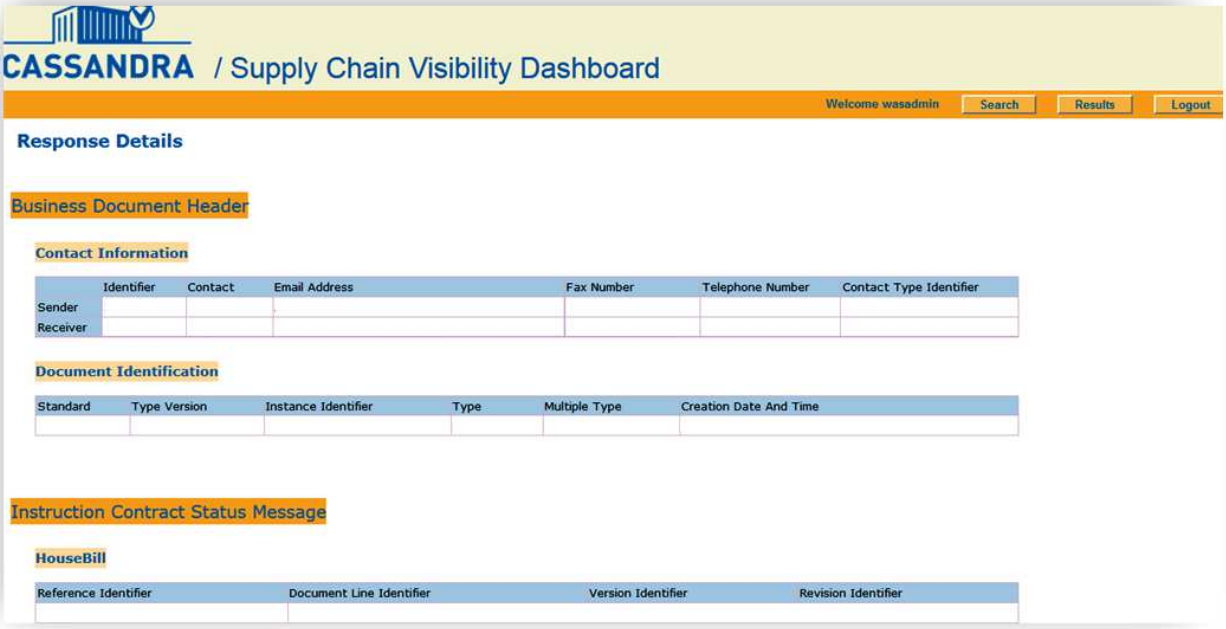


Figure 4.20 Details Screen

The information displayed in this screen is categorized into the following categories:

- *House Bill*: information regarding the identifier of the reference, its version, etc.
- *Parties*: information regarding the companies that participate in the movement, their role (consignor, consignee, ultimate consignee, shipper, etc.), and companies' information such as address.
- *Goods*: information regarding goods such as goods code, goods description, package type and quantity, etc.
- *Locations*: information regarding location identifier and location name based on various locations such as delivery place, acceptance, document issue, origin, discharge and loading.
- *Schedule*: information regarding estimation of time for specific locations.
- *Equipment*: information regarding containers, seals and booking numbers.
- *Transport*: information regarding transport requirements and vessels.

View Supply Chain Event Locations
The geographical locations of the origin and destination of the movement are shown using Maps (Figure 4.21). This feature is not available for all locations.

Figure4.21: Locations Map Screen

API for retrieving information from the Cassandra pipeline
The Customs Dashboard implements a "data-pull" method towards the Cassandra pipeline. This interface allows the customs officers to issue a query through the Customs Dashboard to all the Cassandra Hubs in order to retrieve data from them. The interface is implemented as a REST Web service. The interactions among systems are performed on the basis of the Cassandra message which adopts the GS1 standardized message envelope, the "*Standard*

Business Document", which consists of the UN/CEFACT "*Standard Business Document Header*"[7] (SDBH) and a message payload. The message payload allows the Cassandra message to be extended in order to support and be adapted to future needs. Currently, the data exchanges between the Customs dashboard and the Cassandra Hubs are realized through the UN/EDIFACT IFTMCS message ("*International Forwarding and Transport Message*") which has been slightly modified, using attributes, to fit the Cassandra need for stating the original source of the data on data element level. The IFTMCS message is a simple consignment message, typically related to the container stuffing, which contains goods and transport related information for a consignment.

The Cassandra Customs Dashboard integrates also with the D&B (Dun & Bradstreet[8]) which is commercial database containing business (organization's) information which has been accumulated from more than 220 companies from all around the world. This integration allows customs officers to retrieve more information regarding the organizations and their business data.

Compliance related innovations
The compliance related innovation that is implemented is the use of the Customs dashboard. The Yantian-Felixstowe pipeline is connected to the Customs dashboard and can thus provide UK customs with additional background information on the containers for pre-arrival risk assessment purposes.

Given the Chinese requirements for the use of designated IT infrastructure for the filing of export declarations, there could be no expected benefit of the Cassandra implementation for this type of activity. By a possible involvement of East Port Technology, it would have been possible to investigate benefits of re-using the data of the export declaration or cross-validating the data with other information sources, but unfortunately this could also not be explored (see Appendix C.1).

Filing of ENS declarations and import declarations to European customs was originally in scope for demonstration. Descartes has functionality available to create these types of declarations but unfortunately, it was not possible during project timespan to make the necessary interfaces between the various Descartes modules. The main reason that this did not have a priority is that there was no urgency or indication of the involved business partners that this would lead to sufficient benefits. In this particular trade lane, Allport already uses LIMA, which is updated by Cargo Services on container manifest, to create the import declaration. The carriers were not part of the project consortium and as multiple filing would not lead to benefits for the freight forwarders in the consortium, this was not given priority. The project team therefore focused on enriching the dashboard with more information and implemented alerting to reach the visibility goals.

14.1.3 Expected benefits
In general, the purpose of introducing the Cassandra concept in the Yantian-Felixstowe trade lane was to improve visibility on the shipments and containers in order to derive and implement opportunities for supply chain improvements. In addition to this, some benefits from exception handling and data re-use were envisaged.

Typical trade lane specific benefits identified
Most of the identified benefits would be beneficial for the retailer but can also be seen as increased service level to their customer by BAP, Allport and Cargo Services:

[7] http://www.gs1.org/docs/gsmp/xml/sbdh/SBDH_v1_3_Technical_Implementation_Guide_i1.pdf
[8] http://www.dnb.com/

- Visibility will give more reliability and also trust in container content. Based on this, it will be possible to remove the warehousing function for some of the containers and store the goods in the container in a BAP stacking area instead of stripping the container and storing the goods in the more expensive BAP warehouse. This kind of temporary storage will be officially allowed under new customs legislation. Combined with the possibility of Cargo Services to perform stuffing for specific regions or even specific stores, this can diminish the UK costs for logistics significantly.
- Visibility will also make it possible to actively monitor the containers, their contents and the time lines for final delivery to stores. This is especially interesting for seasonal products or promotions. It has happened that a container with seasonal product was not delivered on time although no special delay occurred. The goods then had to stay in the warehouse for a year before they could be sold. Alerts for order fulfillment for requested delivery dates can avoid these things from happening and improve service levels, customer satisfaction and reduce inventory costs.
- Visibility can also promote the cooperation between merchandising and logistics department and help improve reliability and trust in the supply chain operations. Because merchandisers want to be sure of product availability, containers are sometimes stored at the terminal for long times, creating buffers to mitigate uncertainty in delivery. This type of risk mitigation means unnecessary long lead times and high storage costs and can be avoided by enhancing reliability in on-time delivery through enhanced chain visibility.

In addition to this, BAP saw a clear benefit for improved warehouse planning that should results from more advanced information about the container manifest and especially the vessel tracking. Although the upstream information from LIMA was considered to be quite good, BAP was especially interested in improving data on e.g. number of carton boxes and cargo type because this greatly affects their de-stuffing operation. Improving the quality of this information will lead to improved staff and operations planning. Moreover, improved data availability on planned and actual unloading time of containers is convenient for the planning, especially for high priority containers with seasonal products or promotional goods. Overall, visibility in the supply chain would provide BAP with a good position to develop additional value added services for its customers.

Cargo Services thought there would be an interesting benefit for their subsidiary Allport, e.g. in preparing for import declarations, not only for efficiency but also for quality. In addition to this, Allport thinks it can benefit from a pre-clearance that can in the future perhaps be given based on pipeline information availability to customs, as this would improve both planning of inland transport and warehouse activities in the UK.

In the requirements elicitation workshops with the Customs Container Targeting Teams in the UK and the Netherlands it was concluded that, in addition to the regular data flow to customs, the major benefit of a Customs Dashboard would be in facilitating risk assessment by providing additional data relating to declarations submitted by a third party (e.g., ocean carrier, freight forwarder or importer/exporter). The most important data required by customs is the ‘real consignor’, the ‘real consignee’ and the ‘actual goods description’. The notions “real” and “actual” are important here because the ENS often does not include qualitative data to describe these data elements. For example the ENS would state that a shipment is sent from a logistics company in China (consignor) to a logistics company in the EU (consignee), hiding the real parties (buyer, seller) behind the business transaction. The customs dashboard will allow them to retrieve this information without the need for phone calls, faxes or emails. With the customs dashboard, they can use a single dashboard to request information from various such sources and view it all in one place.

Benefits linked to identified use cases

The expected benefits in this trade lane that will also be included in the project evaluation and benefit quantification are linked to the Cassandra use cases of Wp500 in table 4.8 and mapped to the benefit structure, presented earlier in chapter 2, in figure 4.22. Use cases 6 and 8 were out of scope as no dangerous goods were transported in this trade lane and no CSDs or electronic seals were used for container integrity monitoring. Multiple filing of ENS was not implemented as was described earlier in this document. Without a direct and complete flow of commercial data from the pipeline to customs it is not possible to 'piggy back' on that data and apply risk assessment IT systems to it. The Customs dashboard was not sufficient for UK Customs to apply an early release under Customs Freight Simplified Procedures or enhancing data and customer relationships. Use case 13 is implemented but BAP and Allport expect limited benefit from this use case as they already experience limited inspections/background checks for the containers in this trade lane.

Cassandra use cases	Beneficiary
1. Early data completion check on declarations	Allport
2. Three-way data consistency check	UK retailer, BAP
3. Tally and match documents during stuffing	UK retailer, BAP
4. Data re-use - prefilling declarations	Allport
5. Exception reporting for shipment planning	BAP
6. Exception reporting for potentially dangerous goods or gas inside containers	
7. Exception reporting for demurrage and detention	UK retailer, Allport, BAP
8. Exception reporting for container integrity with CSDs	
9. Advanced notification of container loading (on vessel) and transshipments	BAP, Allport
10. Advanced notification (and prognostics) on vessel Arrival	BAP, Allport
11. Advanced notification of Customs inspection	
12. Multiple filing Entry Summary Declaration	
13. Commercial information in customs dashboard to reduce background checks	Allport

Table 4.8 Cassandra use cases in Yantian-Felixstowe trade lane

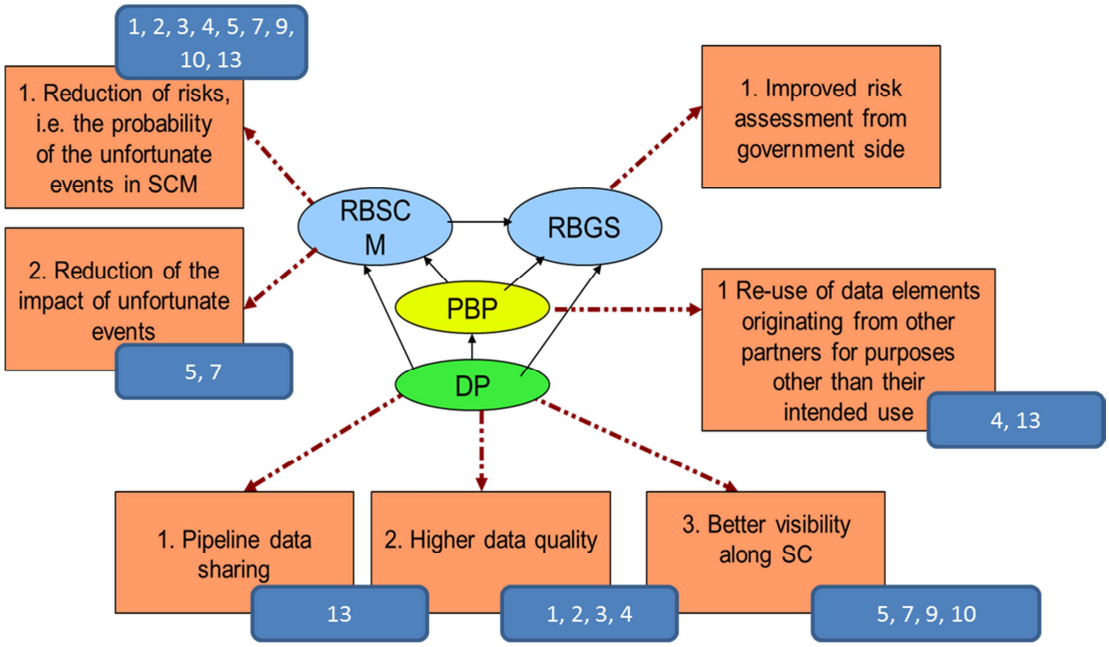


Figure 14.22 Cassandra use cases in Yantian-Felixstowe trade lane mapped to Cassandra benefits

14.1.4 During pilot phase

The pilot phase for the pipeline and business dashboard in the Yantian-Felixstowe trade lane started in September 2012 when the first version of the business dashboard became available to BAP. The Customs dashboard became operational in September 2013. The demonstration ends with the project end in May 2014. In total around 17,000 containers were processed in the pipeline.

Because the additional data from Cargo Services goes through BAP's system, they have had not only a dashboard implemented during pilot phase, but they also had some benefits from the improved data availability in their DBS. In daily operations, the DBS was still used by the operational staff to plan warehouse and de-stuffing operations. The dashboard was mainly in use by BAP's experts to investigate whether process improvements are possible. This has led to BAP and Allport changing some of their procedures during pilot phase to valorise the benefits of increased visibility. Although the dashboard was not used by Allport in an operational setting, the dashboard was presented and explained and feedback was received. The results will be reported in section 4.1.5.

UK Customs and Border Force has not used the customs dashboard as an additional information source next to their existing risk assessment tooling. Although the dashboard was evaluated for the technical evaluation in work package 5, it was not used in normal operations.

Implementation of Cassandra use cases

For a correct evaluation of the Cassandra Living Lab, it is important to understand the extent to which the use cases have been implemented in the trade lane demonstrations. For this, we distinguish three types of implementation:

- Theoretical: Cooperation in the Living Lab provides the users with enough understanding of the Cassandra concept to give an educated guess on the benefit of a use case would it have been implemented in the demonstration;
- Proof of concept: The use case has been (partially) implemented in the demonstration but is not (yet) used in a real-life setting where measurements could take place, or, although the use case was implemented, it is very difficult to isolate the exact effect of the use case on the operational environment, e.g. due to many external factors of influence, and measurement was not possible;
- Operational result: The use case has been implemented in a real-life setting and has led to measurable results.

For the Yantian-Felixstowe trade lane, table 4.9 give an overview of how the use cases have been implemented. An operational result is possible for use cases 2 and 3 as these were already implemented in the processes at Cargo Services and BAP before the project started and the dashboard is just a means to facilitate further information sharing. In addition, the data for these use cases became available in their operational system as well, so therefore the effect on operations could be measured. Use case 13 also results in an operational result as the dashboard will be used in the Customs' pre-arrival departments, although only the Cassandra shipments can be found in the dashboard. Use case 7 can only be evaluated theoretically because it was not yet possible to include demurrage and detention data in the business dashboard. Based on the current functionality, both visibility and alerts, it should however be possible to give a proper estimate of its implementation and benefit. A proof of concept remains for the other use cases. Two experts at BAP Logistics use the dashboard regularly but it is not yet used by the whole operational team. Therefore BAP Logistics'

experts will have a good idea of the benefits of the dashboard and visibility in the dashboard has already led to some process improvements, although no operational results can be measured.

Cassandra use cases	Implementation
1. Early data completion check on declarations	Proof of concept
2. Three-way data consistency check	Operational result
3. Tally and match documents during stuffing	Operational result
4. Data re-use - prefilling declarations	Proof of concept
5. Exception reporting for shipment planning	Proof of concept
7. Exception reporting for demurrage and detention	Theoretical
9. Advanced notification of container loading (on vessel) and transshipments	Proof of concept
10. Advanced notification (and prognostics) on vessel Arrival	Proof of concept
13. Commercial information in customs dashboard to reduce background checks	Operational result

Table 4.9. Implementation of Cassandra use cases in Yantian-Felixstowe trade lane

14.1.5 Reflection and lessons learned

Reflection on the Living Lab process
Setting up this demonstration was a smooth process, mostly because this trade lane has also been used in the FP7 Integrity project and the BAP participants were experienced with project demonstration and implementation of innovative concepts in practice. This meant that the high level processes and partners in the trade lane were already known and that the team just needed to zoom in on the aspects that were especially relevant for the Cassandra project.

Because the preparation for the trade lane set-up was rather quickly completed, the team could soon be expanded with team members from Descartes. Descartes was chosen because there were numerous IT sources in the trade lane and Descartes offered the ability to consolidate these sources and deliver a business dashboard and carrier milestones in addition to that. There have not been any significant changes in the project team that could have caused any difficulty.

The trade lane team worked with a cyclical approach to implement further improvement gradually throughout the project. The team made a good start with focusing on the data that was readily available in DBS. After that, the carrier milestones were added to get a good first overview of the visibility in the business dashboard's first version. This first version could then be presented to the trade lane partner in China to give them a good understanding on what we were aiming for. This lead to the identification of more relevant data (sources) and feeding that into the DBS and GLN. Early 2013 the data in the GLN and dashboard was reasonably complete and the team could proceed with the implementation of alerting mechanisms.

The possible inclusion of East Port Technology as a consortium partners and the negative result did not have a negative influence on the developments in this trade lane. The data that East Port Technology could have provided was an addition to the business data of BAP, Cargo Services and Allport and the developments were not at any point slowed down because of the discussion with East Port Technology.

Reflection on the demonstration purpose
When looking at the Cassandra principles that were input for the demonstrations, it can be concluded that the Yantian-Felixstowe trade lane has proven a good example of a pipeline

demonstration in most ways. Some differences with the ideal picture exist but there were reasons to deviate from this.

The team was able to deliver a single entry point for supply chain visibility (business dashboard) by combing data from various supply chain partners - this was also data from the source. We have succeeded in combining purchase order data with the shipment details, some party information and the transport milestones, thus delivering most of the data types as described in section 1.3. We did capture some of the financial data, e.g. from invoices, but not all. Although we were restricted to capture the data via DBS only, and not directly from the other IT systems, this did not have a negative impact on the amount or type of data that we could capture. It was only due to a monitoring requirements from the end customer and this did not further influence the demonstration outcome.

The pipeline information is near real-time and this is certainly an improvement with the as-is situation in this trade lane. Originally, there was a weekly data upload to DBS which came from the LIMA system. The LIMA system was only updated after vessel sailing. By adding an interface with the EDISON system, BAP is now able to receive data much earlier, from around the moment the container is stuffed, checked, and closed. In addition to this, all uploads are now daily instead of weekly.

The RBA workshop resulted in feedback on the RBA handbook but also in concrete ideas for alerting that could be beneficial to BAP and the supply chain as a whole. BAP advised Wp200 to make the RBA handbook more practical and explain readers how to make it their own. This could be improved by detailing the steps between the theory and the concrete checklists and include hints and tips for kicking off the overall process. Also the handbook could describe how a company can learn from other examples and where to find this information. An overview of best practices should become available. Various alerts were implemented to support the daily operations at BAP and improve risk assessment. Risks identified in the RBA workshop that were thus addressed were container delays, container content not matching the documentation, and data unavailability.

Data validation was implemented by stating the source of all data elements in the business dashboard, as a mixture of party and IT systems. This is an implementation of the first type of data quality assessment as described in section 3.3.3. It was not yet possible to include references to the relevant processes or control measures, other than that it was visible that the container had been stuffed at the CFS, thus ensuring the CFS process including a tally-man was involved. Although this is a good start, it can only be interpreted correctly by people with detailed knowledge of the processes, especially at the CFS.

UK Customs only had access to the information in the pipeline via the customs dashboard. However, UK Customs wanted to see this extended with links between the pipeline and the UK data and declaration systems directly so that they have higher quality data in their own risk assessment systems as well. Because this was not included, they thought the use of the Customs dashboard was of too little value and therefore it was not used. The Descartes system has a module that can generate ENS declarations and UK import declarations and this module could be connected to the GLN to pre-fill the declarations. It was however not feasible to implement this connection and the declaration filing functionality in the Living Lab due to time constraints.

Reflection on the expected benefits

The first benefit that was expected by BAP for their customer was that visibility would give more reliability and also trust in container content. Indeed, the business dashboard could deliver this and BAP was able to optimize warehousing. It was possible to store goods in the ocean containers in a dedicated BAP stacking area. In January 2014, 140 containers in a 4

week period, were now stacked instead of de-stuffed and contents put in the warehouse. A flat fee is charged to the customer of £5.50 for each container stacked. The standard Quay Rent Charge for these would have been £26. The saving is £20.50 per day, or 79%, per container for BAP's customer. These savings also reflect BAP's saving for warehouse operations and use.

The improved reliability and trust also allowed targeted stuffing of containers by Cargo Services for specific stores. These are called Origin Pick promotions, and allow BAP to provide a Just in Time style service to their customers. With notification of late vessel arrival, the containers can be handled more efficiently, leading to reduced long term storage here in Felixstowe. Also the Origin Pick promotions in general allow for reduced storage at the Freight Forwarders in China.

Visibility was also expected to make it possible for BAP to actively monitor the containers, their contents and the time lines for final delivery to stores, especially for seasonal products or promotions. Special alerts were implemented for containers containing origin picked promotions and for expected container delay, based on changes in ETA, transshipment, etc. During the pilot, preparation for several promotions, like Valentine's day and Easter could thus be supported. This was relevant for in total 43 containers. With these alerts, also the inbound planning for these containers could be improved.

In addition to this, BAP saw a clear benefit for improved warehouse planning based on better visibility on the container content combined with the vessel tracking. Especially the number of carton boxes and cargo type was important. In addition to this, the dashboard delivered volumetric data which allowed BAP to derive the pallet configuration prior to the actual de-stuffing, thus proving warehouse staff with better information upfront. Overall, BAP estimates a cost saving of around 25% for more efficient operations, both administrative and warehousing. Also a revenue increase of around 10% is expected because of improved packaging and use of warehouse space.

Having more detailed packaging information also brought to light issues with inefficient goods consolidation. The retailer has detailed requirements for when a container is allowed to be shipped as an FCL directly from the factory instead of via the CFS as an LCL. Also, some boxes turned out to be over dimensioned, thus consuming more container volume than strictly needed and in some cases this resulted in box damage and consequently product damage. Sharing more detailed information with partners resulted in new regulations and fines from the retailer on certain suppliers and more efficient LCL processes by reducing packaging issues in the CFS.

Allport thought the business dashboard had some similar functionality as their own system LIMA. The additional functionality that the Cassandra dashboard offers, like some of the alerting and the integrated information was considered nice to have but not (yet) essential. Since the start of the Cassandra project, Allport has invested in their systems and they would have to find a good reason to implement more extended functionality such as that the Cassandra dashboard offers.

The benefits for UK Customs are limited as they thought most benefits could come from having the data directly in their systems instead of in the customs dashboard only. Also, the amount of data in the customs dashboard was assessed to be limited, especially due to the sensitivities of the UK retailer. The living lab has shown how the functionality can work and how it can be expanded in the future, but for now, the functionality and offered data is not yet complete enough according to UK Customs. Especially more detailed information on the invoice and goods value is necessary.

More details on the benefits of Cassandra for the various trade lane partners can be found in the work package 5 deliverables.

15 Trade lanes running to the Netherlands

This chapter describes the trade lanes to Rotterdam that were used in the Living Lab. This chapter will give an overview of the trade lane characteristics, the results of the process and data analysis for the as-is situations at project start as well as the design considerations and resulting to-be situations. More specifically, for each of the trade lanes:

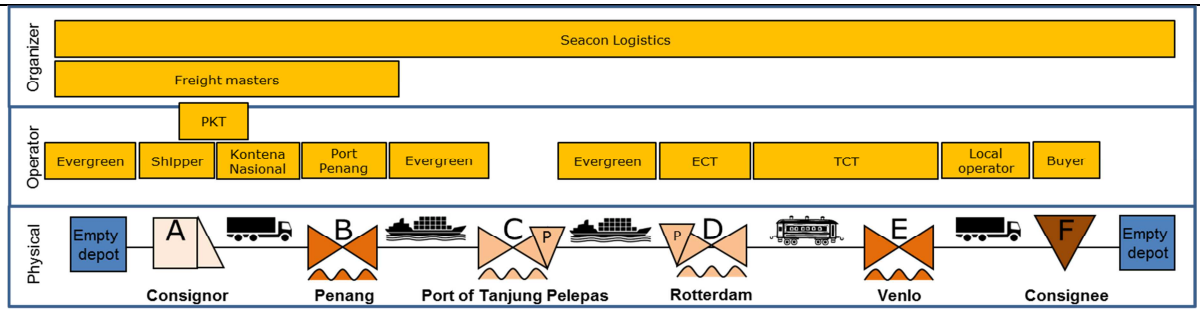
- it identifies the specific flows of goods;
- the parties that are involved;
- their positions and interests;
- the identification of better sources of data from a supply-chain perspective (instead of that of an individual company);
- the sources of data that can be opened-up in the pipeline and discussion on why other sources could not be made available;
- identifying the regulatory/customs involvement;
- final solution description.

It also reflects on the use of the Cassandra solutions, the expected benefits for the users and a more generic reflection on the Living Lab by the trade lane partners.

15.1 The Penang – Venlo trade lane of Seacon Logistics

15.1.1 As-Is situation

Trade lane characteristics
The first Seacon Logistics trade lane in Cassandra runs from the shipper's factory in Penang, Malaysia, to the warehouse of the buyer in Venlo, the Netherlands. The logistics chain is partly owned by Océ Technologies and partly by the shipper in Malaysia. The shipper wishes to remain anonymous, although the local organization in Malaysia is informed about the project. The characteristics of the container flow on this trade lane are summarized in below table.



ID	Location type / name	Location / Country*	Operator	Organizer	Contractor
A	Shipper factory, Penang	PEN / MY	Shipper	Shipper	Shipper
B	Penang Port	PEN / MY	Penang Port	Penang Port	Carriers (mainly Evergreen)
C	Port of Tanjung Pelepas	TPP / MY	Portof Tanjung Pelepas	Port of Tanjung Pelepas	Carriers (mainly Evergreen)
D	Port of Rotterdam, ECT terminal	RTM / NL	ECT	ECT	Carriers (mainly Evergreen)
E	Inland terminal, TCT Venlo	VEN / NL	TCT	TCT	EGS

F	Warehouse Océ Technologies	VEN / NL	Océ Technologies	Océ Technologies	Océ Technologies
ID	**Modality type**	**Passing countries***	**Operator**	**Organizer**	**Contractor**
AB-RO	Road	MY	Kontena Nasional	Freight masters	Shipper
BC-OC	Ocean (feeder)	MY	Evergreen	Freight masters	Seacon Logistics
CD-OC	Ocean	MY - NL	Evergreen	Freight masters	Seacon Logistics
DE-RA	Rail	NL	EGS	Seacon Logistics	Seacon Logistics
EF-RO	Road	NL	Kontena Nasional	Seacon Logistics	Seacon Logistics

Overall characteristics	
End customer / Supply chain owner	Océ Technologies
Goods packaging type (bulk, containerized, palletized, parcel)	Containerized
Goods description / type	Office electronics & Spare parts
FCL/LCL classification	FCL
Incoterm	Free on Board
Special requirements for goods?	N
Border crossing involved?	Y; Malaysia to Netherlands by ocean
EU border crossing involved?	N
Estimated volume	100 containers/year

Logistics services in scope			
X	Transport planning		Stacking
X	Transport execution	X	Loading / Unloading
	Warehousing	X	Customs compliance / Filing
	Consolidation / Deconsolidation		

Table 5.1 Penang-Venlo trade lane characteristics

Location A is the factory of the shipper/seller organization near the port of Penang. The Cassandra trade lane starts with the purchase order and planning of shipments because this is where purchase orders are transferred to shipments, ocean bookings and containers and thus where most important information can be sourced. The export declaration in Malaysia is included in the scope.

The trade lane stops at delivery of the container to the buyer's warehouse as this is sufficient to cover the core aspects of the Cassandra project. The import declaration in the Netherlands is not included in the scope because this is done via entry in the records.

Partners and stakeholders in the Penang-Venlo trade lane

The main parties and their project involvement for this trade lane are summarized in below table.

Involved Consortium partners	*Contributing external parties*	*Informed external parties*
Seacon Logistics	Freight masters Logistic	Malaysian Customs
Dutch Customs	Océ Technologies	Shipper
ECT		Kontena Nasional (local trucker, Penang)
GS1		PKT (customs agent Penang)
		Evergreen

Table 5.2 Penang-Venlo trade lane involved parties

Logistic Service Provider Freight Masters is Seacon's partner in Malaysia and also works for the shipper as freight forwarder for pre-carriage.

Process analysis

A detailed process analysis was made of the Penang-Venlo trade lane. The information was gathered through workshops with Seacon Logistics and meeting with Seacon's agent Freight master's in Penang, GS1, Océ Technologies, the shipper, the local trucker in Penang, the ocean carrier and the port of Penang. One trip to Penang was made. Workshop minutes are included in Appendix D.1.

The result of the detailed analysis, is shown in table 5.3 where the process of the trade lane is described with the Cassandra events. Greyed rows are out of scope.

Event	Owner	Remarks
Purchase Order	Océ Technologies	
Export booking completed	Freight masters	Freight masters makes the ocean carriage booking under the contract of Seacon Logistics. Local trucking is also arranged for by Freight masters by order of the shipper.
Empty Out	Contracting carrier	
Stuffed	Shipper	This is the "Consignment Completion Point" that confirms the container manifest.
Commercially Invoiced	Seller	The invoice is created as a confirmation of the container manifest directly after stuffing of the container.
Cleared for loading	Customs	Malaysian Customs
Cleared for export	Customs	Malaysian Customs
Exit confirmed		
Export completed	Contracting carrier	Both the master and the house bill of lading are in scope.
Cleared for discharge	Customs	European Customs at first port of call
Import booking completed	Seacon Logistics	
Cleared for transit	Seacon Logistics	
Cleared for import	Buyer	
De-stuffed	Buyer	
Empty returned	Contracting carrier	

Table 5.3 Cassandra trade lane events for Penang-Venlo

As the ambition of Seacon Logistics in this project is to get data from the source from their agents, the focus is on the export side of the trade lane and therefore all events in the Netherlands are out of scope.

Some Cassandra events on the export side were also placed out of scope for this trade lane. When the container is loaded and the confirmed container manifest information is available, the commercial invoice is created by the shipper directly and forwarded to freight masters. A

container manifest is not a recognized document in the shipper's organization so they see the invoice as a confirmation of the container content. The shipper guaranteed the project team that the invoice always reflects the result of the stuffing process and thus container content because this is requested in their system. They never found discrepancies between container manifest and invoice. As the physical process of stuffing is outside the consortium members' control and a directly linked document is unavailable, this event is out of scope. The result of the event is however included in the scope as the invoice document becomes available. The ENS declaration is prepared by Freight masters in the Shipping instruction but the actual filing is done by the contracting carrier and thus outside the scope of the project. The same holds for the carrier milestones, including the Empty Out. The filing of an export declaration is part of the trade lane scope as this activity is partly executed and monitored by a close partner of Freight masters. The process of exit confirmation was out of scope because the Port of Penang played no active role in the project. Export completion is part of the scope. Freight masters creates a House Waybill and sends this to the shipper. The shipper does not receive the Sea Waybill from Evergreen. This document is directly forwarded to Seacon Logistics.

The document set is completed after vessel departure and then forwarded to Seacon Logistics. Seacon Logistics receives the document set about six days after vessel departure. Before that, Seacon Logistics has no detailed information available.

Data analysis and sources

The below table gives an overview of the Cassandra events that are in scope for the Penang-Venlo trade lane and the important considerations when analysing the available data sources. Although the stuffed event itself is not in scope for direct data capture it is implicitly available in the commercially invoiced event. Because of the relevance of the consignment completion point in the Cassandra project, it is kept in the table for reference.

Event	Owner	Typical data sets	Remarks
Purchase Order	Océ Technologies	Order details	The purchase order is forwarded to the shipper by the buyer and can be made available for the project to Seacon Logistics.
Export booking completed	Freight masters	Carrier booking confirmation, Transport order confirmation, Request for transport details	Freight masters has details available on both the trucking and the ocean booking.
Stuffed	Shipper	Container manifest details	
Commercially Invoiced	Seller	Invoice details	Commercial invoice is used as a confirmation of container manifest. This invoice is forwarded to Freight masters so it can be used for export declaration.
Cleared for export	Customs	Annex 37 or equivalent data set	The invoice is the leading document in creating the export declaration. Result of the clearance and reported back to PKT (agent) and then to Freight masters.
Export completed	Contracting carrier and Freight masters	Master B/L and House B/L	The house bill of lading is generated by Freight masters after receipt of the master bill of lading from the ocean carrier.

Table 5.4 Data analysis results for Penang-Venlo

Below figure 5.1 shows the complexity that was encountered with the identification and combination of data sources in the Penang-Venlo trade lane. Complexity is here due to the fact that some events needed to stay out of scope for the data capture and this means that the reference numbers cannot be linked properly at the right point in time. In this trade lane, the 'empty out' and 'stuffed' events are out of scope, but at these events very important combinations are made between booking number, container number and purchase order number. The first available event after these needs to make up for this, meaning that the pipeline should be able to link purchase orders to container numbers and booking numbers, based on the invoice information. The RD number that is shown in this picture is used by all the local partners to link the various events together before a container number is available. This RD number is generated by the trucking company at the first moment of booking container transport and from that moment also used by Freight masters and the shipper. Although this RD number can be used for this trade lane demonstration, it is by no means a generic solution.

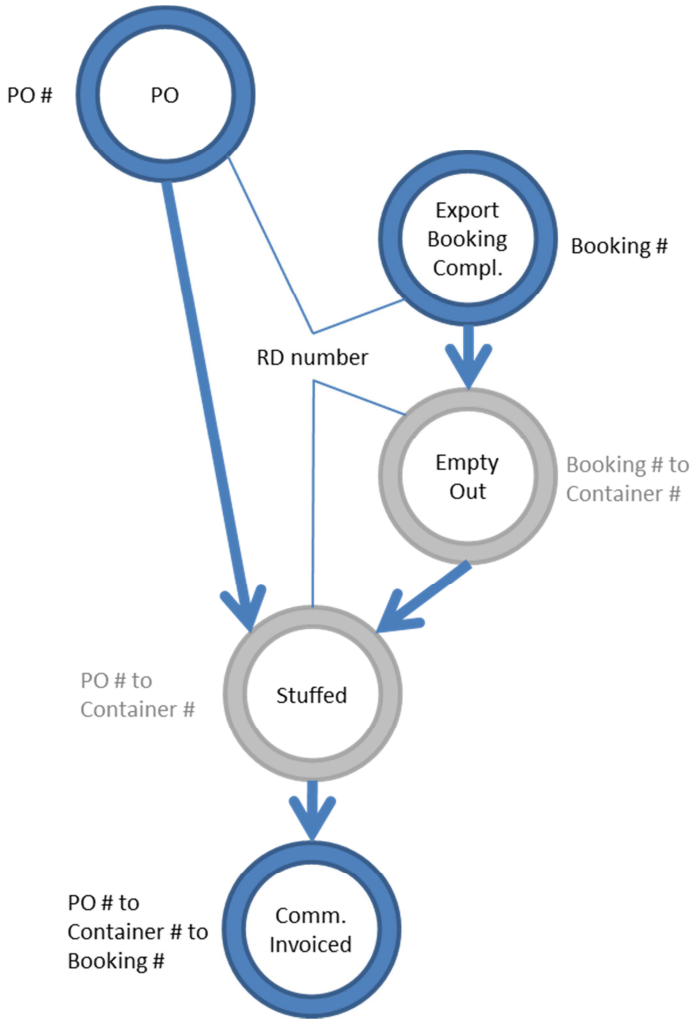


Figure 5.1: Complexity of various reference numbers in Penang-Venlo

Risk assessment and the RBA

The RBA workshop showed that Seacon has implemented some basic controls and risk measures. One example includes the use of a 'blacklist'. Seacon maintains a comprehensive 'blacklist' of products they do not work with. Examples of commodities that are blacklisted include: cigarettes, gold, gemstones, binoculars (dual use goods) and weaponry.

The RBA handbook first outlines the risk management activities by prioritizing company products, services and risks, starting from the mission statement. For Seacon Logistics, this resulted in the following strategic risks:

- Not able to fulfill targets for customer satisfaction, especially related to long term customer commitment;
- Non-compliance with laws and regulations;
- Liability for unintended criminalities;
- Non-hedgeable liability towards customers, especially relevant in overseas logistics;
- Non-hedgeable liability towards customer and government that influences market position, reputation, business continuity, for example coming from specific supply chain solution, fiscal representation, etc.

Within these risks, Seacon Logistics recognizes two types: Risks related from the commodity or product type and risks related to operations. Risk related to Commodity/Product type resulted in the earlier mentioned blacklist on products. Example categories on the list:

- Cigarettes, gold and gemstones because these product have a high risk for theft;
- Binoculars and weaponry (dual use goods, specialty products and products that need special licenses) because this is no expertise of Seacon Logistics and if, from ignorance you deliver products to a wrong party or wrong nation, then management is jointly and severally liable;
- Goods for which import quotas apply, because there is a higher risk for fraud;
- Personal affects (e.g. in international moving industry), because Seacon Logistics has little influence on foreign government activities (careless inspections, resulting in broken personal affects) because the company is not specialized in this.

Examples of risks related to operations are:

- Using incorrect values on declarations;
- Incorrect implementation of supply chain solutions like fiscal representation;
- Risks related to business continuity in carrying out regular operations;
- Risks related to transshipments, e.g. connected vessel is missed;
- Unknown and unexpected transhipments (leading to e.g. delayed delivery);
- Disruptions in hinterland transport, etc.

During the workshop, two examples were worked out in more detail: 1. Late arrival of a shipment at the customer's premises (hinterland example); 2. Late arrival of a shipment (overseas example).

Current practice in this situations is to continuously check the status of time-critical shipments by phone, track & trace systems of ocean carriers, etc. This is a time consuming activity and is even more complicated in overseas logistics as time differences, language barriers and cultural differences affect the effectiveness of communication.

When the indicators for these risks would be available in a business dashboard, automatic alerting could be put in place to support the operations department with managing time-critical shipments. Relevant indicators that were mentioned are:

- Confirmation of milestones on different legs and on crucial administrative permissions like releases from security filings;

- Discrepancies in declaration filing, e.g. discrepancies between security filing and import declarations can lead to fines or delays;
- Traffic jams or other road, rail or waterway obstructions;
- Weather conditions that can delay transport execution;
- Strikes on handling locations or with transport providers;
- Other unfortunate events (power failure).

Based on the data pipeline that was implemented, better data should become available and should serve as the basis for further discussing the automated alerts and the controls that could be put in place.

Mapping of current IT systems

An overview of the IT systems that are currently used in the Penang-Venlo trade lane is presented in figure 5.2. It shows the various IT systems in top of the layers for physical operators and organizers as presented in table 5.1. Only the IT systems that are crucial for the Cassandra events for this trade lane were identified and analysed. The IT systems in Malaysia are available at the shipper (system by BAAN) and the trucking company (system called Haulage ME). The customs agent has a system supplied by Malaysian Customs to generate and file export declarations. Freight masters has no IT system and uses Excel spread sheets to manage bookings. Seacon uses a TMS system that holds information on the Dutch side of the trade lane only. More information about these systems can be found in appendix D.1 and in the next section on interactions with government authorities.

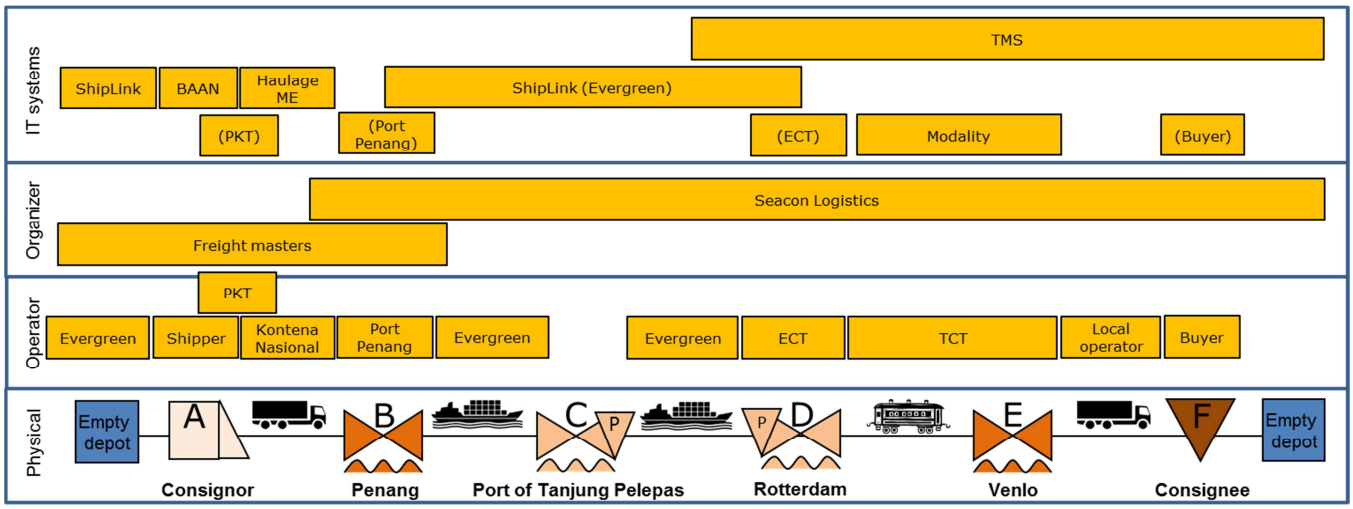


Figure 5.1 IT Mapping for Penang-Venlo

Event	Owner	IT system
Purchase Order	Océ Technologies	(Océ Technologies)
Export booking completed	Freight masters	*None (MS Office only)*
Stuffed	Shipper	BAAN
Commercially invoiced	Seller	BAAN
Cleared for export	Customs	(PKT/Malaysian Customs)
Export completed	Contracting carrier and Freight masters	*Evergreen global system and None (MS Office only)*

Table 5.5 Cassandra events from IT systems

Table 5.5 shows the results of combining table 5.4 and figure 5.2 and thus which IT systems are ideally used for capturing data for each of the Cassandra events for this trade lane. It shows directly that most of the important IT systems are not available with project partners or

with direct affiliates. Therefor digital information capture from IT systems would be complicated.

Mapping of interactions with government authorities

From the Malaysian side of the trade lane there is interaction with the Malaysian customs to receive a clearance for export and with the European customs to receive a clearance for loading. Both of these clearances need to be received before the container can be loaded on the vessel. Figure 5.3 shows the interactions in relation to the various Cassandra events.

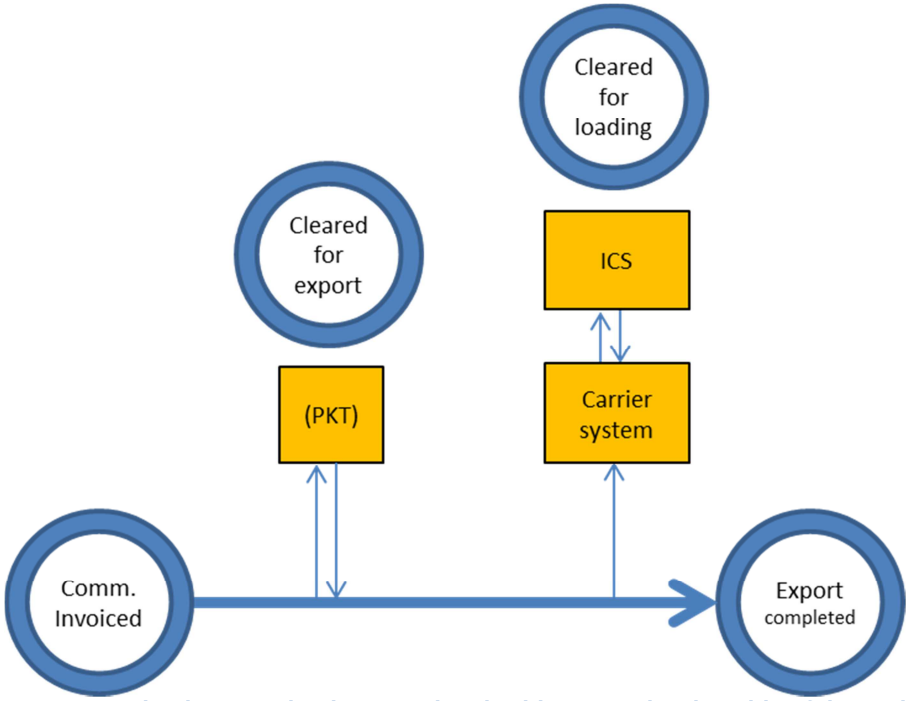


Figure 5.3 Interaction between business and authorities on Malaysian side of the trade lane

Freight masters forwards the commercial invoice, together with the relevant booking information to PKT. PKT only uses this information to complete the export declaration form. After sending the declaration to customs, it takes about 45 minutes to receive a response. If the response is positive, PKT informs Freight masters that the container is released and can be transported to the Penang port. When it arrives at the Penang port, the seal is checked and when this is intact, the container is accepted for gate in by the port and is officially released/ cleared for export. The container is officially exported when it leaves the Penang port. The transshipment port Tanjung Pelepas is also located in Malaysia but no customs formalities take place there. For the shipper, as licensed manufacturer it is important to have a correct administration of imports and exports since the balance of both import and export determine the duties to be paid at the end of the accounting period. So therefore, the declaration of both import and export are equally important.

For receiving a clearance for loading, the commercial invoice is used to create a shipping instruction for the ocean carrier. The shipping instruction is sent to the carrier by email. The ocean carrier typically uses the shipping instruction to create the ENS declaration which is sent to the customs authority of the first port of entry in the EU (ICS system). The shipping instruction is thus based on the commercial invoice which is also a confirmation of the stuffing event.

15.1.2 To-Be situation: Demonstration plan

Design of pipeline configuration
As was also described in deliverable D3.5, the pipeline created for the Seacon Logistics trade lane is an EPCIS pipeline configuration type (see figure 2.4). The configuration builds upon the existing EPCIS solution as technical implementation of the pipeline but is combined with a portal for data capture developed by Seacon Logistics. The data portal is provided by Seacon to their agent Freight masters to support them with digital data capture and fill their gap in the IT architecture. The EPCIS is linked to a business dashboard, also developed by GS1 and to the Customs dashboard, developed by IBM and Intrasoft.

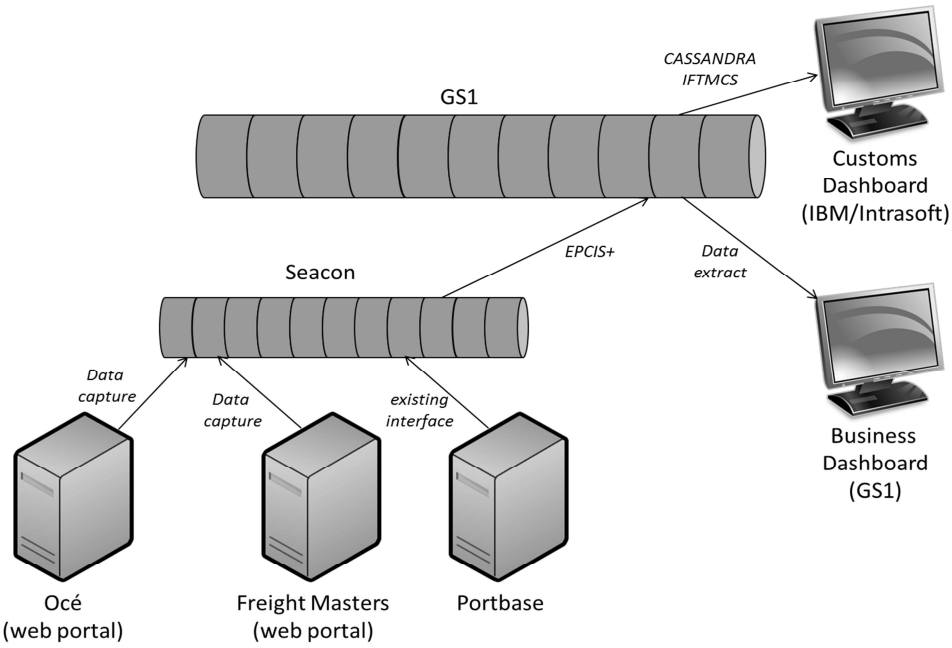


Figure 5.4 Penang-Venlo pipeline configuration

Figure 5.5 shows the pipeline configuration in combination with the data sources that were identified in the previous section and table 5.6 links these to the Cassandra events as well. Because of the limited IT maturity on the Malaysian side, a data store needed to be developed to support data capture in Malaysia. Because Seacon Logistics knows this problem exists with other agents in their network as well, they decided to develop this data capture portal designed for manual key-in of information for the various Cassandra events. For them the investment is also interesting as it would give them the ability to get this digital data from the source in their own system real-time which reduces manual data key-in from the paper document set upon arrival in the Netherlands and it can immediately be combined with the data from the Dutch side of the trade lane, e.g. from Portbase. The information becomes available to the EPCIS pipeline via XML messages from Seacon to GS1.

Event	IT system source	Provided to pipeline by
Purchase Order	(Océ Technologies)	Seacon web portal
Export booking completed	*none*	Seacon web portal
Stuffed	BAAN	
Commercially invoiced	BAAN	Seacon web portal
Cleared for export	(PKT/Malaysian Customs)	Seacon web portal
Export completed	*none*	Seacon web portal

Table 5.6 Cassandra events from IT systems to pipeline

Based on the standardized EPCIS XML messages, some special XML Cassandra messages were developed by GS1 to support data transfer from Seacon to EPCIS. Seacon Logistics communicates with external parties via an enterprise service bus (ESB). Communication is possible through EDI, flat file, xml, etc. XML messages were developed and are described in more detail in the next section.

One of the advantages of using the EPCIS system in this trade lane is the fact that its use was made obligatory for Malaysian re-exporters by Malaysia customs. This could help the capturing of transport milestones in Malaysia and provide a good overview of the aggregated shipment. During the course of the project, it was investigated whether Smartag, the company involved in EPCIS implementation in Malaysia could contribute to this trade lane. For this, they needed subcontracted funding. In the end, it was decided that their involvement would not contribute sufficiently in relation to the involved costs. The course of events regarding their possible involvement, their possible added value to the solution and the final considerations are reported in appendix D.2.

Functionality of the Seacon data capture tool

Table 5.7 shows how the Cassandra events have been implemented in the Seacon Logistics web portal. The web portal can be seen as a workflow tool where subsequent steps can be executed by one party or by different parties for each step. Seacon has designed the portal and the steps in such a way that it fits the processes they see at their agents, which are the primary target group for the tool. An additional step ‘Shipping’ has been added that is a step executed ideally by the shipper and that confirms shipment (despatch advice) and requests transportation at the same time. In the Penang-Venlo trade lane this step is executed by the shipper when they request, via Excel spread sheet, a certain number of containers to be available for stuffing at their factory at a certain date/time and with specific ocean carriage booking. As the event for commercial invoicing is usually not interesting in the process of Seacon’s agents, they decided not to develop a specific step in the workflow in this first version of the tool. For the Malaysian trade lane, the ‘commercially invoiced’ event is covered in a step called ‘Stuffing’ because the commercial invoice can be considered a confirmed container manifest. So although the stuffing event itself is not in scope, the data is captured via the invoice event and the data is processed in the Seacon web portal that is called ‘Stuffing’.

Event	Seacon web portal
Purchase Order	Purchase Order
	Shipping
Export booking completed	Booking
Stuffed	Stuffing
Commercially invoiced	Stuffing
Cleared for export	Export declaration
Export completed	Export complete

Table 5.7 Cassandra events in the Seacon Logistics web portal

Figure 5.5 shows a screen of the Seacon data capture tool for entering a purchase order. The various steps are visible in the top right. Each user only sees the steps he/she is authorized to use. Currently, the purchase order can only be entered manually. In the future, an EDI connection will be possible as well.

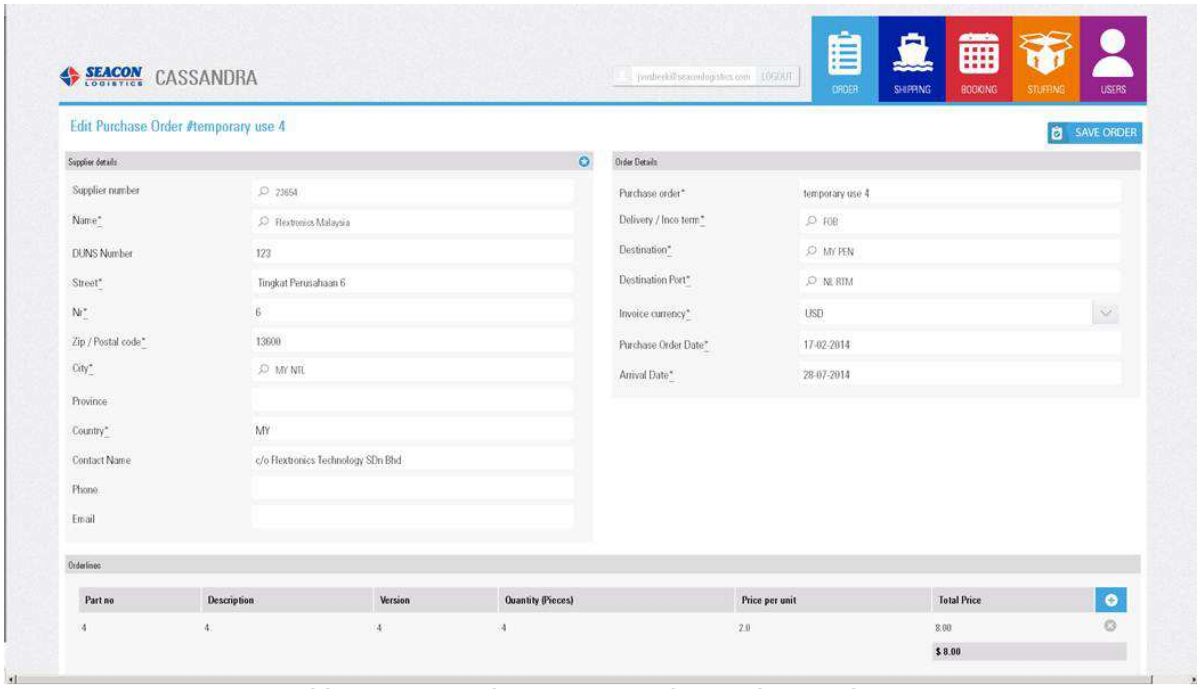


Table 5.5 Seacon data capture tool – Purchase order step

Figure 5.6 shows a part of the step where the booking information, mostly the carrier booking confirmation can be linked to the purchase order and shipping information. This is a step that is typically performed by the forwarder or agent who makes the bookings, thus Freight masters can input the booking information with the shipment information provided by the carrier.

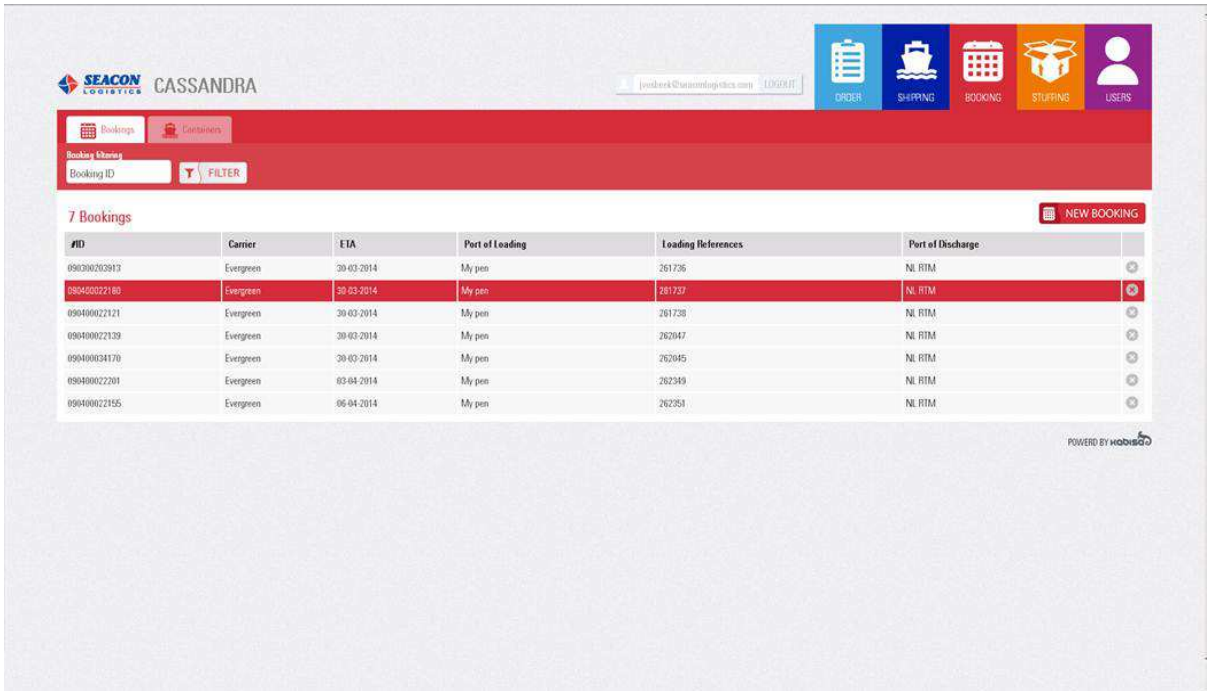


Table 5.6 Seacon data capture tool – Booking step

Figure 5.7 shows the step where the actual stuffing is being reported. The user can report any discrepancies from the original purchase order, thus limiting the amount of work. This step is typically performed by the shipper but during the demonstration, this was by Freight masters, based on the invoice information they receive immediately after stuffing.

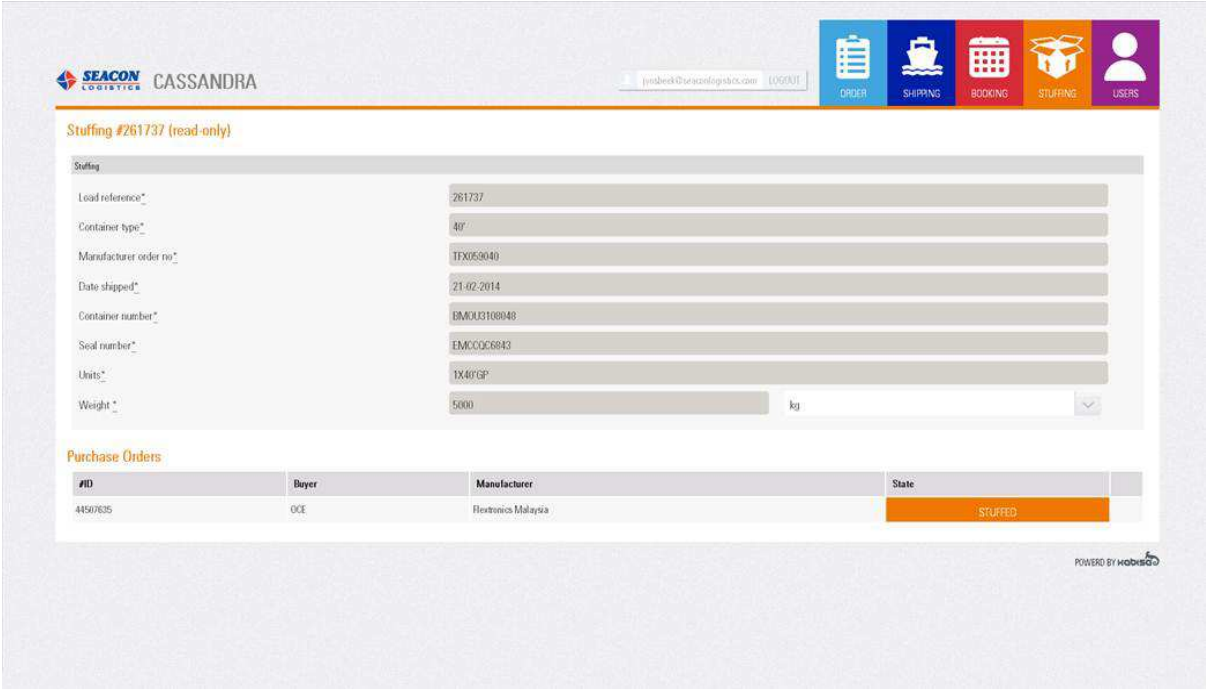


Table 5.7 Seacon data capture tool – Stuffing step

EPCIS messages between Seacon and GS1

The Seacon Logistics data capture tool communicates with the GS1 EPCIS system and the business dashboard via XML messages that were specifically developed for the Cassandra events. The mapping of these messages to the Seacon web portal steps and the Cassandra events can be found in table 5.7. The EPCIS events follow the Cassandra events and there is no event directly linked to the Seacon step 'Shipping'. There is however an additional event 'Empty container picking up' which is linked to the Cassandra event 'Empty Out' but has no equivalent in the Seacon Logistics portal. GS1 decided to develop this event anyway as it includes a very important linkage between container number and carrier booking. This event is used in the demonstration and sent by Seacon together with the XML message that reports on the 'Stuffed' event, after they have completed the step 'Stuffing'.

Event	Seacon web portal	EPCIS event message
Purchase Order	Purchase Order	Purchase Order
	Shipping	
Export booking completed	Booking	Shipment booked
Empty Out		Empty container picking up
Stuffed	Stuffing	Staging outbound
Commercially invoiced	Stuffing	Commercially invoiced
Cleared for export	Export declaration	Cleared for export
Export completed	Export complete	Export completed

Table 5.7: From Cassandra events to EPCIS event messages

Originally, the EPCIS system knows the types of messages as described in table 5.8. The EPCIS is tailored towards tracking products, packages and shipments and therefore knows for example an aggregate event to understand that a product is loaded in a box and a set of boxes loaded on a pallet. Normally, the EPCIS events contain the identifications of a product, a box, a location, etc. The type of event informs on the activity that was performed. This methodology is a good basis for describing the Cassandra events as well, although the Cassandra events contain more information about an activity, e.g. not only the fact that a booking has been made by a certain party, but also the vessel the container will be shipped on, ports of loading and discharge, cargo closing windows, etc. The standard EPCIS events

therefore need to be combined to describe the various Cassandra events and updated to include more fields of information about the event itself.

Event message name	Description
Object event	Describes an event pertaining to an EPC as it moves through the supply chain – from birth (ADD) through midlife (OBSERVE) to death (DELETE)/
Aggregate event	Describes an event pertaining to a physical aggregation of child EPCs to a parent EPC, such as Unit to Inner Case to Outer Case to Pallet to Shipping Container.
Transaction event	Describes the definitive association or disassociation of one or more EPCs to a Business Transaction.

Table 5.8 Standard EPCIS event messages

The Cassandra events were described with a combination of standard EPCIS events as it is described in table 5.9. For example, to report on the 'Purchase order' event, two types of events are needed: a transaction event and a multiple object event. The transaction event contains the generic PO details while the multiple object event contains the item numbers and quantities. The transaction event can be compared with a PO header and the multiple object event with the line items. The transaction list details the reference numbers that need to be searchable, e.g. when the EPCIS discovery service looks for event messages related to a certain container number.

Cassandra event	**Purchase Order**		**Export Booking Completed**	**Empty Out**
1 message per:	PO	Item	Leg	Container #
Event message type	Transaction	Multiple objects	Transaction	Multiple object
Parent ID	[PO #]			
EPC list	{ Item # + PO #}	Item # + PO #	[Booking #]	[Seal #]
Transaction list	PO # { Item # + PO # }	PO # Item # + PO #	Booking # Container movement #	Booking # Container movement # Container # Seal #
Cassandra event	**Stuffed**		**Commercially Invoiced**	
1 message per:	Container #	Item # + PO #	Invoice #	
Event message type	Aggregate	Multiple object	Transaction	
Parent ID	[Seal #]		[Seal #]	
EPC list	{ Item # + PO # }	[Item # + PO #]	[Invoice #]	
Transaction list	Booking # Container # Seal # { Item # + PO # }	Booking # Container # Seal # Item # + PO # PO #	Invoice # Seal # Container # {item # + PO # } PO#	
Cassandra event	**Cleared for Export**		**Export Completed**	**Container Received**
1 message per:	Customs MRN #	Customs item + container #	MBL#	Delivery Note
Event message type	Transaction	Multiple Object	Transaction	Transaction
Parent ID	[Customs MRN #]		[MBL #]	[Delivery Note #]
EPC list	Seal #	Item #s + PO #s	{ Seal # }	{ Seal # }

Transaction list	Customs MRN # Container # Seal # booking # {Invoice #} {item # + PO#}	Container # Seal # Customs MRN # Item # + PO# PO #	MBL # { Container # } { Seal # } {Item # + PO#}	Delivery Note # { Container # } { Seal # } {Item # + PO#}

Table 5.9: Cassandra EPCIS combined event messages

Each standard EPCIS event includes an extension field where additional data can be included and this extension field was used to capture additional event information. The information in this field will not be searchable but it can be extracted from the message by the dashboard. The tag names that are used in this extension field are according to the terminology that is commonly used in the Penang-Venlo trade lane and is not (yet) according to a specific international standard.

When multiple messages need to be send, the standard business document header was used.

Functionality of the GS1 business dashboard

The GS1 Business dashboard includes three different views tailored to specific users:

- The shipper/ seller of the goods;
- The logistics service provider;
- The buyer of the goods.

Below figure 5.8 shows the overview screen for the seller. At the top right, there is filter functionality on buyer, dates, locations and supply chain status. At the top left there is an overview of outstanding and completed purchase orders for the current year. By clicking on the bars in this diagram, the user can see the details of the various purchase orders, including the line items, quantities, etc. In the bottom left portion, the dashboard shows the orders' expected time of arrival to the buyer for the next 7 days. By clicking on the bars, detailed purchase order information is available. On the bottom right, there are three tabs with additional information. In the first tab 'Result by Order GTIN/SKU count', the dashboard shows there are 19 POs with only 1 GTIN/SKU number, five POs with two GTIN/SKU numbers, etc. On the second tab 'Result By Order Value', the dashboard will group the POs according to their dollars value. Clicking on the bars in this diagram shows among others the invoice details, including item prices and currency exchange rates. The third tab 'Discrepancies', groups the POs with different percentages of discrepancies in quantity per GTIN/SKU between purchase order, stuffing, invoicing and export declaration.

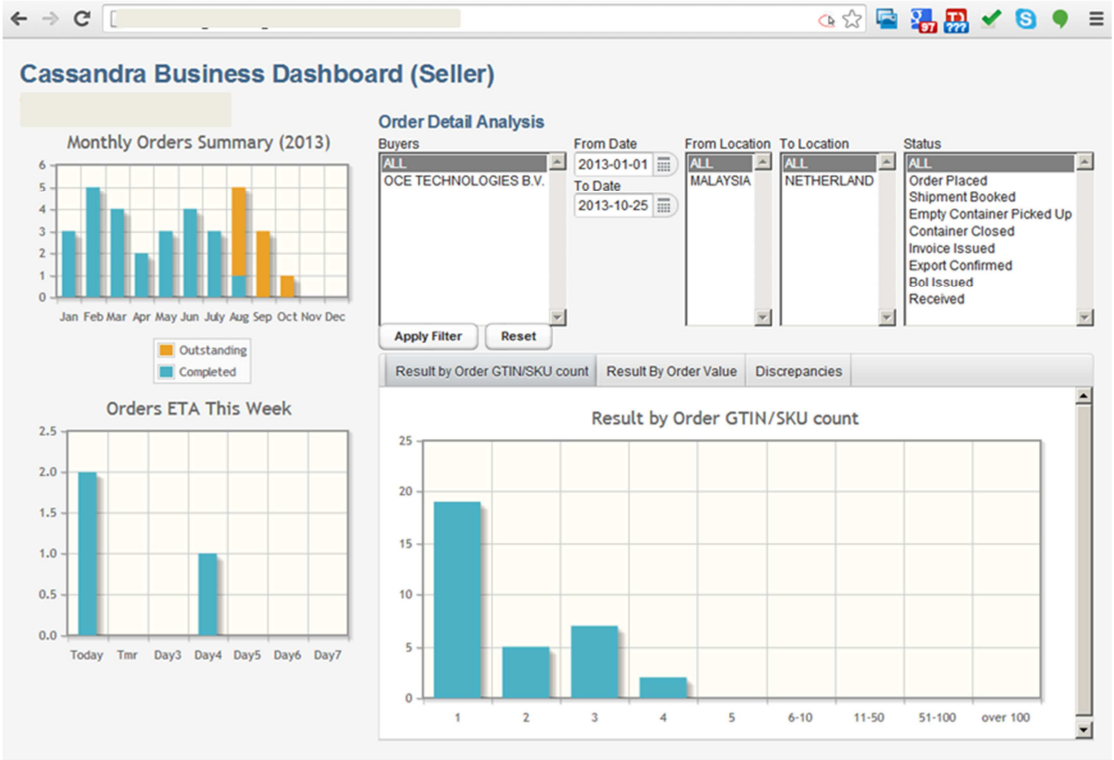


Figure 5.8: Cassandra GS1 Business dashboard for commercial parties

Figure 5.9 shows a similar dashboard that is tailored for use by logistics service providers. At the top right, there is filter functionality on buyers and sellers, dates, locations and status. The top left shows an overview of outstanding and completed shipment bookings. Again, clicking on the bars shows a pop-up screen with details about the shipment bookings, such as loading data, carrier booking, etc. In the bottom left portion, the dashboard shows the containers that are expected to be discharged from ocean vessel to the buyer's side of the trade lane within 7 days. Again, by clicking on the bars, detailed information is available. Similar to the commercial parties' dashboard, this one shows the tabs 'Result by Order GTIN/SKU count' and 'Result By Order Value'.

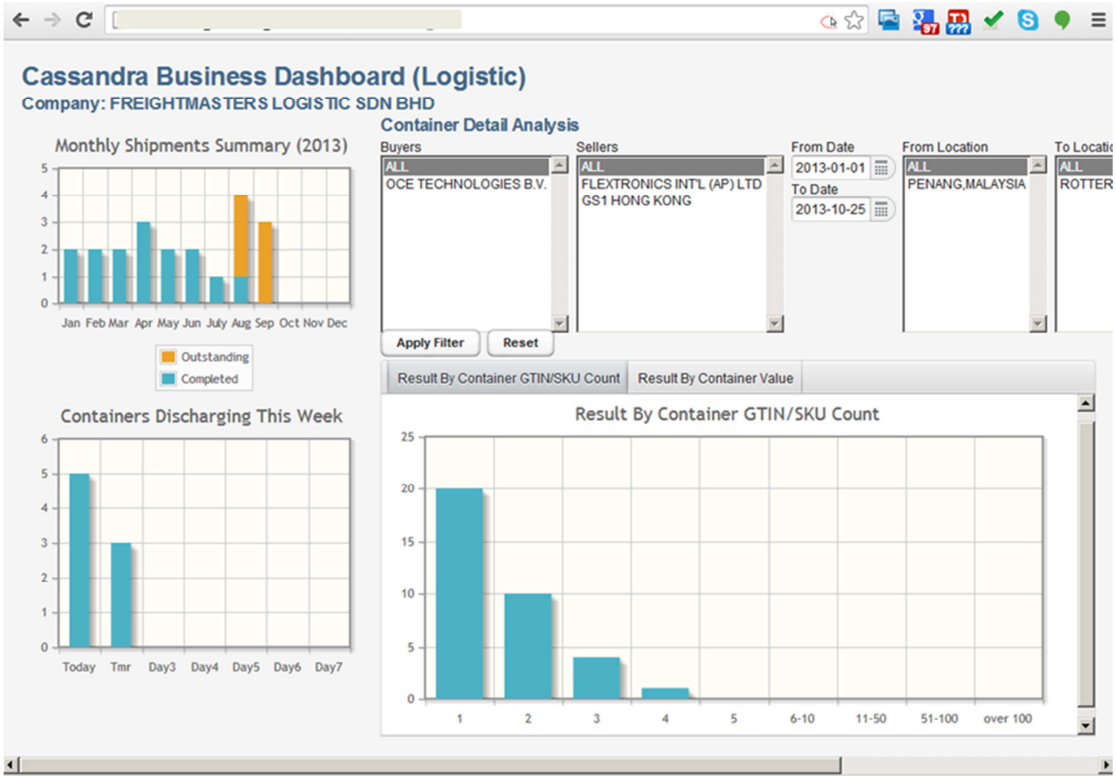


Figure 5.9: Cassandra GS1 Business dashboard for logistics service providers

RBA and process/organisational innovations

With the data capture tool that Seacon Logistics has developed, data can be captured at the source, which is one of the crucial aspects of the Cassandra concept. Already the knowledge of the process and the data from the source provides Seacon Logistics with better ability to control the activities and also to actively show their ability to control to supervising authorities for example as part of the AEO assessment.

In addition to this, alerting can be used or process improvements suggested. Due to timing constraints and the amount of work that was already needed to develop the data capture tool, no alerting functionality has been developed, other than the overview of discrepancies in the GS1 dashboard. However, more alerting functions can easily be included in both the Seacon data capture tool and the GS1 dashboard in a later phase.

Functionality of the IBM/Intrasoft customs dashboard

The functionality of the customs dashboard is identical for all trade lanes in the Living Lab between Asia and Europe. Detailed information in available in section 4.1.2.

Compliance related innovations

The compliance related innovation that is implemented is the use of the Customs dashboard. The Penang-Venlo pipeline is connected to the Customs dashboard and can thus provide Dutch customs with additional background information on the containers for pre-arrival risk assessment purposes.

Just as in China, Malaysian Customs prescribes the use of specific software to file declarations. Because of this, it was not possible to re-use digital information in the Seacon portal to fill the export declaration. Because it was not feasible to involve Smartag in the project (see appendix D.2) there was also no opportunity to directly capture data from the export declaration and share that with the pipeline. The ‘export declaration’ event is still in

scope however and includes limited information on the result of this event, like the customs document number and HS codes.

Filing of ENS declarations was originally in scope for demonstration but it was not possible during project timespan to make the necessary interfaces between the GS1 pipeline and the carrier system to feed them with the data. The main reason is that due to the limited IT maturity in this trade lane a lot of effort was put into development of a data capture portal that is feasible for use in trade lanes around the globe and development of new Cassandra EPCIS event messages.

15.1.3 Expected benefits

In general, the purpose of introducing the Cassandra concept in the Penang-Venlo trade lane was to capture digital and high quality data at the source (Malaysian side of the trade lane) in order to re-use information, avoid errors from manual data entry and improve visibility on the shipments and containers in order to derive and implement opportunities for supply chain improvements. In addition to this, some benefits coming from functionalities for exception handling and data re-use were envisaged.

Typical trade lane specific benefits identified

More specifically, Océ is interested in increased visibility to improve warehouse operations in Venlo. With the business dashboard they expected to find not only improved information on container arrival in Venlo but also on exact container content. With the more detailed information, Océ can improve their inbound processes and further planning of activities.

In addition to the above, Seacon expects to find new business opportunities due to increased visibility of the supply chain. Better real time information on milestones and container position can be used to provide better visibility for customers. A combination of the data pipeline and in future perhaps container devices can be direct input to and support for the Seacon 4PL control tower concept. Due to the continuous performance monitoring, customers of the 4PL concept can do improved planning, which reduces stock levels in the supply chain, reduce the number of airfreight pallets (for high priority goods), improve supplier performance, etc.

Benefits for Freight masters can be expected in the area of better operational support with IT tooling in general, leading to administrative efficiencies and reduced risk of errors.

Dutch Customs expects improved data for their risk assessment. This is related to more timely information before vessel arrival in the Netherlands and perhaps even before vessel departure in Asia, improved correctness of data, e.g. stating true consignor and consignee, and better understanding of the level of control in the supply chain by businesses. This last point is of course related to a risk based approach and Cassandra's vision on an AEO+ concept.

Benefits to be formally evaluated

The expected benefits in this trade lane that will also be included in the project evaluation and benefit quantification are linked to the Cassandra use cases in table 5.10 and mapped to the benefit structure, presented earlier in chapter 2, in figure 5.10. Use cases 2 and 3 are out of scope as the stuffing process itself is also not in scope. Use cases 6 and 8 are out of scope as no dangerous goods are transported in this trade lane and no CSDs or electronic seals are used for container integrity monitoring. Multiple filing of ENS was not implemented as was described earlier in this document. Advanced notification of inspection by customs is implemented for all AEO-certified carriers as they receive notifications of containers to be inspected three days upon arrival. However, the Cassandra project did not add to this. Use cases 1 and 4 can be assessed but are of limited value in this particular case because import declarations are made through entry in the records for this trade lane. Use case 13 is

implemented but Seacon Logistics expects limited benefit from this use case as they already experience limited inspections/background checks for the containers in this trade lane.

Cassandra use cases	Beneficiary
1. Early data completion check on declarations	Seacon
2. Three-way data consistency check	
3. Tally and match documents during stuffing	
4. Data re-use - prefilling declarations	Seacon
5. Exception reporting for shipment planning	Seacon
6. Exception reporting for potentially dangerous goods or gas inside containers	
7. Exception reporting for demurrage and detention	Seacon
8. Exception reporting for container integrity with CSDs	
9. Advanced notification of container loading (on vessel) and transshipments	Seacon
10. Advanced notification (and prognostics) on vessel Arrival	Seacon
11. Advanced notification of Customs inspection	
12. Multiple filing Entry Summary Declaration	
13. Commercial information in customs dashboard to reduce background checks	Seacon, Océ

Table 5.10. Cassandra use cases in Penang-Venlo trade lane

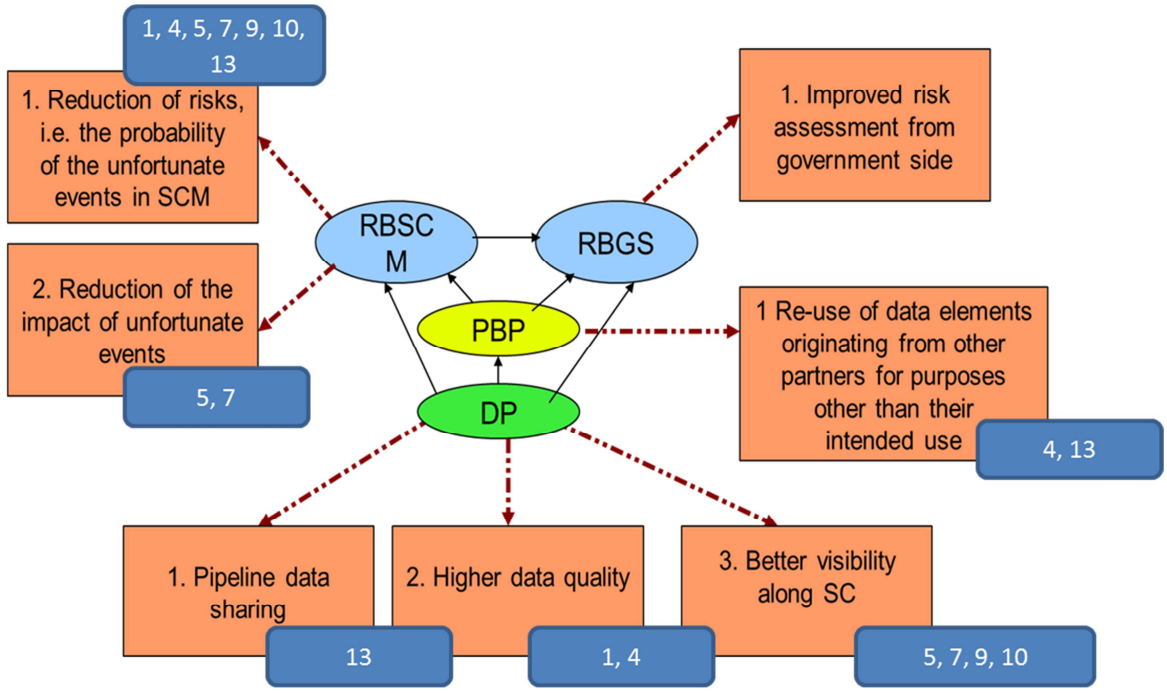


Figure 5.10: Cassandra use cases in Penang-Venlo trade lane mapped to Cassandra benefits

15.1.4 During pilot phase

The pilot phase for the pipeline and business dashboard in the Penang-Venlo trade lane started in February 2014 when the first version of both the data capture tool and the business dashboard became available to Freight masters and Océ. The Customs dashboard became operational in September 2013 and was therefore only used for this trade lane from February 2014 onwards. The demonstration ends with the project end in May 2014. The time for actual testing in this trade lane was therefore limited. In total around 15 containers were processed in the pipeline.

The use of the data capture tool was entirely with Océ for the first step and Freight masters for the subsequent steps. Freight masters performed all the steps on the Malaysian side, on behalf of some of the other partners to test its use and to limit the necessary investments in time from other participants in the trade lane who have a less strong affiliation with the project. The data capture tool was designed for multiple users and access levels so in time, the tool can be made available to for example the shipper, the haulier and the customs agent and develop new interfaces with the ocean carrier to further support operations. Given the short time available for actual piloting, this improvement cycle was no longer foreseen in the Cassandra project.

The GS1 business dashboard was used and evaluated by the shipper, Océ, Seacon Logistics and Freight masters. The dashboard was used as an additional tool alongside their normal operations and for Freight masters in addition to the data capture tool.

Seacon Logistics did not use the data capture tool itself for their daily operations but has developed an interface from this tool to their transport management system so that they could benefit from timely and digital data in their own system.

The Customs' pre-arrival department has used the customs dashboard as an additional information source next to their existing risk assessment tooling. The dashboard is used when a container has hit an automated risk profile and needs further investigation by a Customs employee. In this case, the employee assesses the available declaration data and in addition the data in the customs dashboard. When there is still a need for further information, the declarant will be contacted to provide a dossier.

Implementation of Cassandra use cases
For a correct evaluation of the Cassandra Living Lab, it is important to understand the extent to which the use cases have been implemented in the trade lane demonstrations. For this, we distinguish three types of implementation:

- Theoretical: Cooperation in the Living Lab provides the users with enough understanding of the Cassandra concept to give an educated guess on the benefit of a use case would it have been implemented in the demonstration;
- Proof of concept: The use case has been (partially) implemented in the demonstration but is not (yet) used in a real-life setting where measurements could take place, or, although the use case was implemented, it is very difficult to isolate the exact effect of the use case on the operational environment, e.g. due to many external factors of influence, and measurement was not possible;
- Operational result: The use case has been implemented in a real-life setting and has led to measurable results

For the Penang-Venlo trade lane, table 5.11 give an overview of how the use cases have been implemented. An operational result could not be measured for any of the use cases because of the limited time of testing. Use cases 1, 4, 5 and 13 could however be evaluated with a proof of concept. Use case 7, 9 and 10 can only be evaluated theoretically because it was not yet possible to include demurrage and detention data and carrier milestones in the business dashboard. Based on the current functionality, it should however be possible to give a proper estimate of its possible implementation and benefit.

Cassandra use cases	Implementation
1. Early data completion check on declarations	Proof of concept
4. Data re-use - prefilling declarations	Proof of concept
5. Exception reporting for shipment planning	Proof of concept

7. Exception reporting for demurrage and detention	Theoretical
9. Advanced notification of container loading (on vessel) and transshipments	Theoretical
10. Advanced notification (and prognostics) on vessel Arrival	Theoretical
13. Commercial information in customs dashboard to reduce background checks	Proof of concept

Table 5.11. Implementation of Cassandra use cases in Penang-Venlo trade lane

15.1.5 Reflection and lessons learned

Reflection on the Living Lab process

Setting up this demonstration was a challenging process as not only visibility but also data capture functionality was needed and the detailed process in Malaysia was rather new to the project team. Quite soon, GS1 was chosen as the partnering solution provider so that Seacon Logistics could focus on data capture and GS1 on visibility and business dashboard.

The trade lane team worked with a cyclical approach to implement improvements to the solution gradually throughout the project. The team started with focusing on the data that is available with Seacon Logistics' agent in Malaysia. The whole set-up of the solution meant that the data capture tool was the bottleneck in the demonstration. Although the GS1 dashboard was completed earlier and was connected to the customs dashboard, it could not be fed with data before the data capture tool was (partly) finished. The data capture tool was delivered in two steps in early 2014. Because of this, it was no longer possible to investigate the possibility of adding additional data sources like carrier or terminal milestones.

Reflection on the demonstration purpose

When looking at the Cassandra principles that were input for the demonstrations, it can be concluded that the Penang-Venlo trade lane has proven a good example of how data can be captured at the source. In addition to this, it showed an alternative approach of sharing information between partners with the GS1 messages. All in all, the demonstration shows a pipeline in most ways.

The most important aspect of the Penang-Venlo pipeline is that it constitutes two pipelines. The Seacon data capture tool has no visibility functionality but can be considered a pipeline as well. The GS1 EPCIS system can also function as a pipeline on its own and combine information from various sources and visualizing the result in the business dashboard. Although this can seem like additional work, it does however reflect the actual situation in practice where companies can decide to develop certain functionality in-house and to outsource others, like the visibility dashboard. The events between the two systems is not yet standardized but it re-uses GS1 standards to some extent, making standardization possible in the future.

The pipeline information is near real-time and this is certainly an improvement with the as-is situation in this trade lane where Seacon Logistics received the shipment dossier about one week after vessel departure. Also, the functionality support digital data capture on the Malaysian side of the trade lane which provides opportunities for further automation and also reduces the possibility of errors.

The RBA workshops resulted in feedback on the RBA handbook but also in some ideas for alerting that could be beneficial to the partners in the supply chain and/or Seacon Logistics. No alerts were implemented in the Seacon Logistics portal or the GS1 dashboard due to timing constraints.

Data validation was implemented by logging user details when a user records information in one of the steps. The pipeline has been prepared for sharing this user information, e.g. the organization the user belongs to, with the GS1 system and then also with the Customs dashboard. This gives the user of the Customs dashboard the opportunity to see what the

source organization is of the data elements. Because in the first phase, the data capture system is mainly used by Seacon Logistics and Freight masters, this is not yet fully implemented.

Dutch Customs had access to the information in the pipeline via the customs dashboard. Not all the information that can be visualized in the Customs dashboard could be provided by the Penang-Venlo trade lane, although the most important required information on parties involved, and goods descriptions were made available. In fact there was no additional information made available on top of the legally required ENS data that Dutch Customs already had. However, customs still recognized the value of the optional filing of additional trade data in the dashboard functionality.

Reflection on the expected benefits

The first benefit that was expected by Seacon Logistics for their customer was that visibility would give more reliability and also trust in container content and container arrival. Indeed, the business dashboard could deliver insight in container content but not yet on expected arrival. This was because the focus was first on the Malaysia side of the trade lane and not on capturing hinterland logistics data from Rotterdam to Venlo. Because the actual duration of the demonstration was limited, no actual operational benefits could be measured.

In addition to the above, Seacon expected to find new business opportunities due to increased visibility of the supply chain for customers but also as support for the Seacon 4PL control tower concept and continuous performance monitoring. The data capture tool has shown Seacon Logistics that it can improve their data quality, especially in timeliness and also limit the amount of time spent for entering data in their own systems. Due to the time spent on developing the data capture tool itself, it was not yet possible to further integrate the data capture tool with the control tower system, although that is in scope for future enhancement.

Benefits for Freight masters can be expected in the area of better operational support with IT tooling in general, leading to administrative efficiencies and reduced risk of errors. During testing phase the tool was used by Freight masters in parallel to the normal operations which caused an additional workload. Also, because Freight masters was doing data entry for the other Malaysian parties as well as their own process data. The tool was however positively evaluated by Freight masters and considered very user friendly. It is planned to make further improvement in the future.

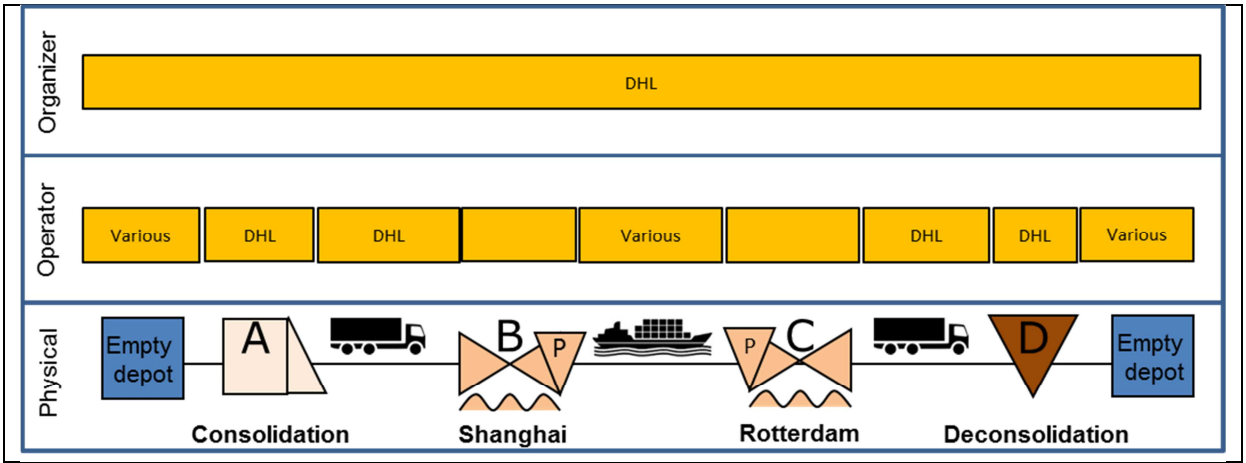
Dutch customs was able to use the Customs dashboard with the Penang-Venlo information only for a very limited time. Dutch Customs thinks the dashboard helped greatly in assessing the risk on incoming containers. Next to the fact that additional data can be and was made available in the dashboard -which increases effectiveness of risk assessment-, the dashboard highly serves the reduction of administrative trade burdens. Also without a dashboard customs can and will ask additional information on top of the ENS data. But these requests are filled to the carrier by e-mail of phone. This carrier often doesn't have the requested info available, so he has to contact other parties in the chain to retrieve it. This is a time and money consuming effort. By making data available in the dashboard all these administrative cost consuming burdens are reduced to almost zero. Although Dutch Customs could evaluate the functionality of the Customs dashboard and give an indication of the expected use and benefit for the future, they were not able to show concrete results for the parties in this trade lane. However, the Seacon Logistics data capture tool and link to the Customs dashboard provides great opportunity for Seacon Logistics to enroll in a new program by Dutch Customs to define not only *trusted traders* but also *trusted trade lanes*.

More details on the benefits of Cassandra for the various trade lane partners can be found in the work package 5 deliverables.

15.2 The Shanghai – Ridderkerk trade lane of DHL

15.2.1 As-Is situation

Trade lane characteristics
The DHL trade lane in Cassandra runs from the DHL consolidation centre in Shanghai, China, to the DHL deconsolidation centre in Ridderkerk, the Netherlands. The logistics chain is fully owned by DHL's customer (in this document called 'Customer') but controlled by DHL. The characteristics of the container flow on this trade lane are summarized in below table.



ID	Location type / name	Location / Country*	Operator	Organizer	Contractor
A	Consolidation centre Shanghai	SHA / CN	DHL	DHL	Customer
B	Port of Shanghai	SGP / CN	Terminal	Terminal	Carrier
C	Port of Rotterdam	RTM / NL	Terminal	Terminal	Carrier
D	Deconsolidation centre Ridderkerk	RID / NL	DHL	DHL	Customer

ID	Modality type	Passing countries*	Operator	Organizer	Contractor
AB-RO	Road	CN	Trucker	DHL	DHL
BC-OC	Ocean	CN - NL	Carrier (various)	DHL	DHL
CD-RO	Road	NL	Trucker	DHL	DHL

Overall characteristics	
End customer / Supply chain owner	Anonymous
Goods packaging type (bulk, containerized, palletized, parcel)	Containerized
Goods description / type	Electronic (consumer) products
FCL/LCL classification	FCL
Incoterm	CRF/CIF
Special requirements for goods?	N
Border crossing involved?	Y; China to Netherlands by ocean
EU border crossing involved?	N

Estimated volume	10-20 containers/week		
Logistics services in scope			
X	Transport planning		Stacking
X	Transport execution	X	Loading / Unloading
	Warehousing	X	Customs compliance / Filing
X	Consolidation / Deconsolidation		

Table 5.12: Shanghai- Ridderkerk trade lane characteristics

Location A is the consolidation centre of DHL in Shanghai. The Cassandra trade lane starts with the consolidation because this is where the container manifest is created at the consignment completion point. The DHL customer usually does not know what goods will be delivered exactly to the DHL consolidation center by their suppliers and at what time. DHL combines the received shipments from the suppliers in an FCL shipment. Filing of the export declaration in China is not included in the scope, although capturing the information that was used to create it, such as HS codes and quantities, is.

The trade lane stops at deconsolidation at the DHL warehouse in Ridderkerk as this is sufficient to cover the core aspects of the Cassandra project. Filing of the import declaration in the Netherlands is partly in scope. The actual filing is not, but sharing the pipeline data with the customer, to support declaration filing, is.

Partners and stakeholders in the Shanghai-Ridderkerk trade lane
The main parties and their project involvement for this trade lane are summarized in below table.

Involved Consortium partners	***Contributing external parties***	***Informed external parties***
DHL	DHL customer	Various carriers
Dutch Customs		
Descartes		

Table 5.13: Shanghai- Ridderkerk trade lane involved parties

Process analysis
Due to timing restrictions – the demonstration started mid 2013 - no detailed process analysis was made of the Shanghai-Rotterdam trade lane. Instead, the detailed analysis of the other trade lanes was re-used to get a good understanding of the chain quickly. The information was gathered through workshops with DHL, Descartes and the customer.

The result of the detailed analysis, is shown in table 5.14 where the process of the trade lane is described with the Cassandra events. Greyed rows are out of scope.

Event	Owner	Remarks
Purchase Order	Customer	This is a standing purchase order for a year
Export booking completed	DHL	
Empty Out	Contracting carrier	
Stuffed	DHL	This is the “Consignment Completion Point” that confirms the container manifest. DHL decides on consolidation.
Commercially Invoiced	Supplier/ Customer	The supplier sends the invoice to the buyer’s subsidiary in Hong Kong. The subsidiary sends an intercompany invoice to the buyer’s office in the Netherlands.
Cleared for loading	Customs	

Cleared for export	Customs	
Exit confirmed		
Export completed	Contracting carrier and DHL	Includes both the master bill of lading and the house bill of lading
Cleared for discharge	Customs	
Import booking completed	DHL	This includes only limited information on the hinterland logistics and deconsolidation planning
Cleared for transit		
Cleared for import	Customer	
De-stuffed	DHL	
Empty returned	Contracting carrier	

Table 5.14: Cassandra trade lane events for Shanghai- Ridderkerk

Some Cassandra events were placed out of scope for this trade lane. Either on Chinese or on Dutch side it is not possible to feed into declaration system or extract information directly out of it. Therefore all compliance related events are out of scope. It is however in scope to capture the product related data in the pipeline so that it can at least offer visibility and can support declaration filing, although manual key-in into the declaration system will still be necessary. This data is mainly captured from the 'Stuffed' and 'Commercially invoiced' events. The ENS declaration is prepared by DHL in the Shipping instruction but the actual filing is done by the contracting carrier and thus outside the scope of the project. De-stuffing by DHL has been put out of scope due to timing restrictions, as capturing data at the Chinese side of the trade lane was deemed more important.

Data analysis and sources

The below table gives an overview of the Cassandra events that are in scope for the Shanghai-Ridderkerk trade lane and the important considerations when analysing the available data sources.

Event	Owner	Typical data sets	Remarks
Purchase Order	Customer	Order details	Purchase Order is available with the DHL customer and the supplier but not with DHL Shanghai.
Export booking completed	DHL	Carrier booking confirmation, Transport order confirmation, Request for transport details	DHL has all the data about the process in their global forwarding system. Only customs related data is kept in separate systems for liability purposes.
Empty Out	Contracting carrier	Empty out container milestone	
Stuffed	DHL	Container manifest details	DHL creates the container manifest based on the received goods from the suppliers and performs stuffing.
Commercially Invoiced	Supplier/ Customer	Invoice details	Both a supplier invoice and an intercompany invoice are used.
Export completed	Contracting carrier and DHL	Master B/L and House B/L	
Import booking completed	DHL	Transport order confirmation, Request for transport details	DHL has all the data about the process in their global forwarding system.
Empty returned	Contracting carrier	Empty in container milestone	

Table 5.15: Data analysis results for Shanghai-Ridderkerk

Risk assessment

After applying the RBA handbook in a two day workshop, is was concluded that DHL is very much in control of their processes. They have risk experts and risk managers for all different pillars of the company and risk management operations systems throughout the organization.

The RBA handbook first outlines the risk management activities by prioritizing company products, services and risks, starting from the mission statement. In March 2009, Deutsche Post DHL introduced its corporate strategy 'Strategy 2015' which lays out the vision as:

- Remain the Postal Service Provider for Germany (Die Post für Deutschland)
- Become the Logistics Company for the World.

The mission statement then summarizes how DHL plans to achieve this and consists of four main aspects:

- We want to make our customers, employees and investors more successful.
- We always demonstrate respect without compromising on results.
- We simplify our customers' lives.
- We want to make a positive contribution to our world.

The workshop focused on three strategic risks that can be derived from the company strategy. These are the risk of losing long term partnerships, the risk of unrealizable growth and the risk of not obtaining improvement in operational excellence. The risk of losing a strategic relation with a customers was broken down in risks for not offering competitive rates, not complying with expected performance and risk of take-overs or bankruptcy of the customer of outsourcing of procurement and thus losing control. For managing supplier relationships, DHL focuses on strategic partnerships, resulting in a reduced number of suppliers. DHL has scorecards for all suppliers, which provide feedback on how to rank a provider. Financial health is an important aspect. Because of volatility in ocean freight rates, partnerships, in combination with sufficient volume, are also essential in negotiating contracts and rates. With the need for operational excellence and improvement, it is essential to improve quality of the product and reduce operational risks, also on behalf of the customer. For this, automated data transfer and visibility are important prerequisites. With 50,000 customers, it can be expected that implementation of automated monitoring solutions result in a positive business case.

DHL has implemented risk control in their organizations by measuring KPIs on as much processes as possible, especially when related to transport execution for their customers and customer satisfaction. KPIs are measured on department, station, national and global level. Examples of these KPIs are:

- Reaction time from order placement to response by DHL;
- Lead time from pickup to final delivery;
- Delivery to schedule (currently 99.5%);
- Timeliness of reporting for different milestones in the process and the transport chain, which differs per customer or segment. For example, there can be up to 50 or 60 milestones for consumer electronics;
- Arrival and departure of truck at DC dock of customer;
- Failure of data entry, typo's are measured as well;
- Correctness of invoicing to customer. For example it is measured how often DHL has to re-send an invoice. With 1000 invoices a day this is an important process and KPIs get a lot of attention.

Event messaging and alerting from the pipeline would be helpful. The Cassandra pipeline could help in establishing links but then needs to provide additional value to what GT-Nexus and Intra are already offering. Checks for completeness and correctness could be such an added value. Timetables for ocean vessels are for example different in GT-Nexus and Inttra and DHL now compares the tables manually. DHL can develop its own solution for this, but this will probably be too costly.

Mapping of current IT systems

An overview of the IT systems that are currently used in the Shanghai-Ridderkerk trade lane is presented in figure 5.11. It shows the various IT systems in top of the layers for physical operators and organizers as presented in table 5.12. Only the IT systems that are crucial for the Cassandra events in scope for this trade lane were identified and analysed. DHL has a global information system, called LOGIS, which holds the data to all DHL shipments worldwide. This system is also fed with some information from external parties, such as ocean carriers and customers and also includes a portal for customers. Outside the scope of the trade lane and this figure, there is the system of the customer. The customer system holds the purchase orders and is used for import declarations in the Netherlands. The customer was not able to deliver interfaces with their system during the course of the Cassandra project and its system is therefore no part of the mapping.

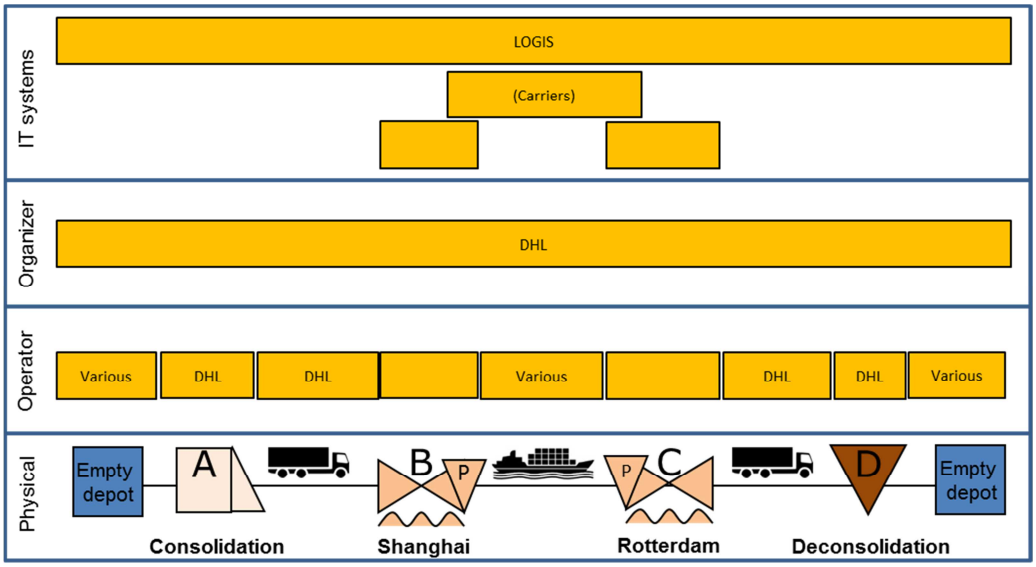


Figure 5.11: IT Mapping for Shanghai-Ridderkerk

Event	Owner	IT system
Purchase Order	Customer	-
Export booking completed	DHL	LOGIS
Empty Out	Contracting carrier	(Various carriers)
Stuffed	DHL	LOGIS
Commercially Invoiced	Supplier/ Customer	-
Export completed	Contracting carrier and DHL	(Various carriers) and LOGIS
Import booking completed	DHL	LOGIS
Empty returned	Contracting carrier	(Various carriers)

Table 5.16: Cassandra events from IT systems

Table 5.16 shows the results of combining table 5.15 and figure 5.11 and thus which IT systems are ideally used for capturing data for each of the Cassandra events in scope for this trade lane. It shows directly that most of the data in this trade lane needed to come from

the DHL system and the carrier's system. Some of the purchase order information was available with DHL although not in their system and not digitized. Because of this, the information could not (automatically) be made available to the pipeline before the end of the project.

Mapping of interactions with government authorities
From the Chinese side of the trade lane there is interaction with the Chinese customs to receive a clearance for export and with the European customs to receive a clearance for loading. Both of these clearances need to be received before the container can be loaded on the vessel. These interactions were described in more detail for the Yantian-Felixstowe trade lane in section 4.1.1. For the Yantian-Felixstowe trade lane the warehouse operator was in charge of filing the actual declarations. In this trade lane DHL is responsible for the filing.

15.2.2 To-Be situation: Demonstration plan

Design of pipeline configuration
As was also described in deliverable D3.5, the pipeline created for the DHL trade lane is of a BCS pipeline configuration type (see figure 2.5). The configuration builds upon the Global Logistic Network (GLN) of Descartes (which can be seen as a global BCS) as technical implementation of the pipeline. Connections between Descartes and the Carrier systems, existing in Descartes' GLN system, are being reused. Connections to CSD provider platforms were created to include container tracking and integrity data. This GLN is linked to a business dashboard, also developed by Descartes and to the Customs dashboard, developed by IBM and Intrasoft.

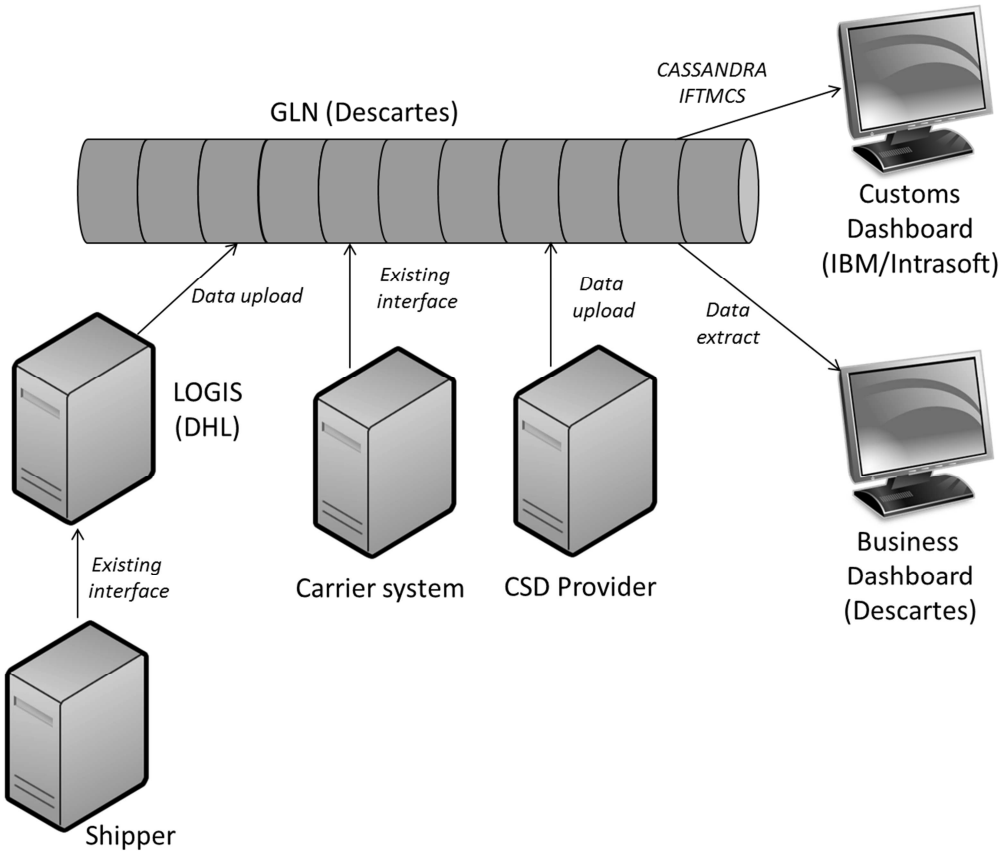


Figure 5.12: Shanghai-Ridderkerk pipeline configuration

Figure 5.12 shows the pipeline configuration in combination with the data sources that were identified in the previous section and table 5.17 links these to the Cassandra events as well.

As becomes clear from the table, all ideal sources could be connected to the pipeline except the source for purchase order data. Some purchase order data (not all) could be sourced from the DHL system as DHL checks the shipments against the purchase order information they receive from the customer. The PO information is however not automatically retrievable from this system the information was thus provided to the pipeline by a manual interface. Although DHL has the carrier milestones from some carriers directly in their LOGIS system, the Descartes GLN usually has more of this information available. Therefore it was chosen to use the existing Descartes functionality to provide this information to the pipeline.

Event	IT system source	Provided to pipeline by
Purchase Order	Customer	Manual process
Export booking completed	LOGIS	LOGIS
Empty Out	Various carriers	Various carriers via Descartes
Stuffed	LOGIS	LOGIS
Commercially Invoiced	-	-
Export completed	Various carriers	Various carriers via Descartes
Import booking completed	LOGIS	LOGIS
Empty returned	Various carriers	Various carriers via Descartes

Table 5.17: Cassandra events from IT systems to pipeline

In addition to the above described data sources, also CSDs were used to monitor container integrity and goods conditions (temperature, humidity, etc.) and provide real-time container tracking. Three types of CSDs were used. Special interfaces were developed between the Descartes GLN and the CSD providers to pick up the signals and make data on container location and possible breach available in the pipeline and dashboard.

Functionality of the Descartes pipeline and business dashboard
The functionality of the Descartes business dashboard is identical for all trade lanes in the Living Lab between Asia and Europe. Detailed information is available in section 4.1.2.

Functionality of the IBM/Intrasoft customs dashboard
The functionality of the customs dashboard is identical for all trade lanes in the Living Lab between Asia and Europe. Detailed information is available in section 4.1.2.

Compliance related innovations
The compliance related innovation that was implemented is the use of the Customs dashboard. The Shanghai-Ridderkerk pipeline is connected to the Customs dashboard and can thus provide Dutch customs with additional background information on the containers for pre-arrival risk assessment purposes.

Given the Chinese requirements for the use of designated IT infrastructure for the filing of export declarations, there could be no expected benefit of the Cassandra implementation for this type of activity. By a possible involvement of East Port Technology, it would have been possible to investigate benefits of re-using the data of the export declaration or cross-validating the data with other information sources, but unfortunately this could also not be explored as was already described for the Yantian-Felixstowe trade lane (see also Appendix C.1).

Filing of ENS declarations and import declarations to European customs was originally in scope for demonstration. Descartes has functionality available to create these types of declarations but unfortunately, it was not possible during project timespan to make the necessary interfaces between the various Descartes modules. LOGIS is technically able to provide data for the ENS and 10+2 declaration, as it already does through Descartes for ports in the United States and Canada.

15.2.3 Expected benefits

In general, the purpose of introducing the Cassandra concept in the Shanghai-Ridderkerk trade lane was to improve visibility on the shipments and containers in order to derive and implement opportunities for supply chain improvements and support of compliance. The Shanghai-Ridderkerk trade lane adds specific data elements for security purposes (CSD information) to the experience that is gathered from the other Asia-Europe trade lanes.

Typical trade lane specific benefits identified

Focus of the customer in the Shanghai-Ridderkerk trade lane was on improved visibility. Especially detailed information on container content and expected arrival (track & trace) was of importance. Next to this, focus was on declaration data that was used in China (for potential re-use in the Netherlands) and comparison between seller's invoices and intercompany invoices to support compliance.

Possible benefits of improved supply chain visibility for DHL are in the timely and more precise identification of exception events. This allows for intervention and recovery procedures before large disturbances take place, especially in the case of sensitive and/or high value cargo where this can have critical or irreversible effects. Potentially critical exceptions may include late connections or deliveries, sub-quantity, sub-quality, regulatory violations and excess costs. More visibility can help DHL improve processes and risk mitigation strategies. Enhancement of the data pool for statistical analysis may also offer benefits for DHL in selecting proper equipment and routings for specific cargos, and establishing dedicated handling procedures where required, appropriate and viable.

Dutch Customs expects improved data for their risk assessment. This is related to more timely information, before vessel arrival in the Netherlands and perhaps even before vessel departure in Asia, improved correctness of data, e.g. stating true consignor and consignee, and better understanding of the level of control in the supply chain by businesses. This last point is of course related to a risk based approach and Cassandra's vision on an AEO+ concept.

Benefits to be formally evaluated

The expected benefits in this trade lane that will also be included in the project evaluation and benefit quantification are linked to the Cassandra use cases in table 5.18 and mapped to the benefit structure, presented earlier in chapter 2, in figure 5.13. Use case 2 was originally in scope for the pilot and evaluation but could not be implemented because there was no solution to capture purchase order information during the runtime of the project. Gathering data on the invoices to perform at least a two way match of container manifest to invoice was also not possible. Use case 3 was out of scope as no changes to the stuffing process itself can be made during the pilot. Use cases 6 is out of scope as no dangerous goods are transported in this trade lane. Multiple filing of ENS was not implemented as was described earlier in this document. Advanced notification of inspection by customs is implemented for all AEO-certified carriers as they receive notifications of containers to be inspected three days upon arrival. The DHL customer is an AEO certified company.

Cassandra use cases	Beneficiary
1. Early data completion check on declarations	Customer, DHL
2. Three-way data consistency check	
3. Tally and match documents during stuffing	
4. Data re-use - prefilling declarations	Customer, DHL
5. Exception reporting for shipment planning	DHL
6. Exception reporting for potentially dangerous goods or gas inside containers	
7. Exception reporting for demurrage and detention	Customer, DHL

8. Exception reporting for container integrity with CSDs	DHL
9. Advanced notification of container loading (on vessel) and transshipments	DHL
10. Advanced notification (and prognostics) on vessel Arrival	DHL
11. Advanced notification of Customs inspection	
12. Multiple filing Entry Summary Declaration	
13. Commercial information in customs dashboard to reduce background checks	Customer, DHL

Table 5.18. Cassandra use cases in Shanghai-Ridderkerk trade lane

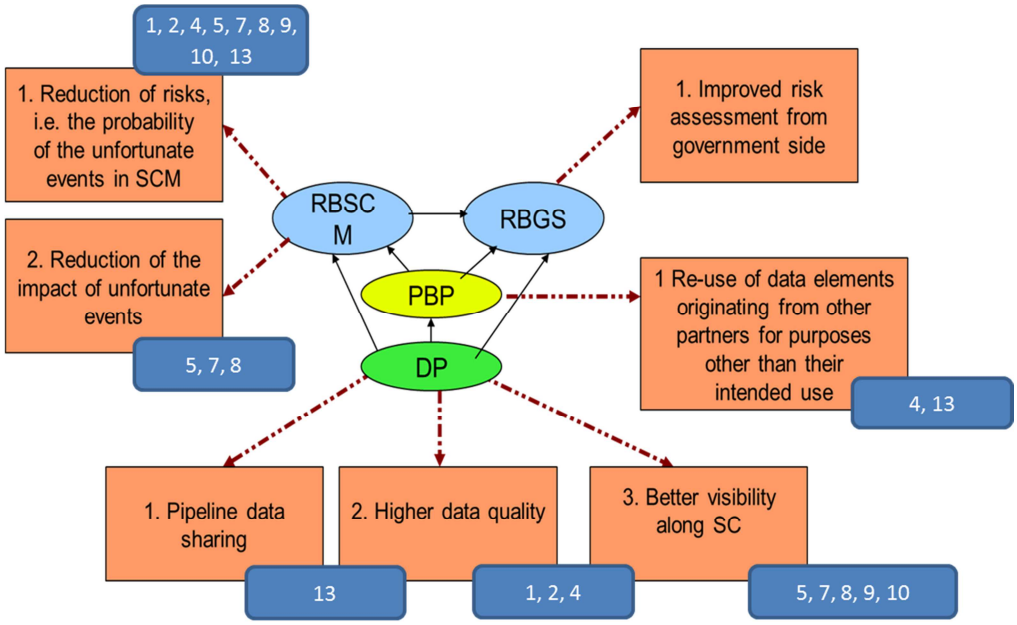


Figure 5.13: Cassandra use cases in Shanghai-Ridderkerk trade lane mapped to Cassandra benefits

15.2.4 During pilot phase

The pilot phase for the pipeline and business dashboard in the Shanghai-Ridderkerk trade lane started in October 2013 when the first data of this trade lane became available in the pipeline. The Customs dashboard became operational in September 2013 and was therefore only used for this trade lane from October 2013 onwards. The demonstration ends with the project end in May 2014. In total around 13,000 containers were processed in the pipeline. Three containers were transported with CSDs.

The use of CSDs was prepared in the DHL organization and in the pipeline and business dashboard. Importing of CSDs through Hong Kong did not encounter any issues but the exporting of CSDs, attached to the containers, from Shanghai unexpectedly did. A documentation issue caused the use of CSDs to be substantially delayed. The issue was solved no sooner than early May 2014 which means that just a very small amount of containers were shipped with CSDs.

The Descartes business dashboard was used and evaluated by DHL and the customer. The dashboard was used as an additional tool alongside their normal operations and without automated interaction from pipeline to operational systems. The DHL process was adapted to the use of CSDs on a selected number of containers on this trade lane.

The Customs' pre-arrival department has used the customs dashboard as an additional information source next to their existing risk assessment tooling. The dashboard is used when a container has hit an automated risk profile and needs further investigation by a Customs employee. In this case, the employee assesses the available declaration data and

in addition the data in the customs dashboard. When there is still a need for further information, the declarant will be contacted to provide a dossier.

Implementation of Cassandra use cases
For a correct evaluation of the Cassandra Living Lab, it is important to understand the extent to which the use cases have been implemented in the trade lane demonstrations. For this, we distinguish three types of implementation:

- Theoretical: Cooperation in the Living Lab provides the users with enough understanding of the Cassandra concept to give an educated guess on the benefit of a use case would it have been implemented in the demonstration;
- Proof of concept: The use case has been (partially) implemented in the demonstration but is not (yet) used in a real-life setting where measurements could take place, or, although the use case was implemented, it is very difficult to isolate the exact effect of the use case on the operational environment, e.g. due to many external factors of influence, and measurement was not possible;
- Operational result: The use case has been implemented in a real-life setting and has led to measurable results

For the Shanghai-Ridderkerk trade lane, table 5.19 give an overview of how the use cases have been implemented. An operational result for DHL is possible for use cases 8, 9 and10. Use case 13 also results in an operational result as the dashboard will be used in the Customs' pre-arrival departments, although only the Cassandra shipments can be found in the dashboard. Use case 7 can only be evaluated theoretically because it was not yet possible to include demurrage and detention data in the business dashboard. Based on the current functionality, it should however be possible to give a proper estimate of its possible implementation and benefit. A proof of concept remains for use cases 1, 4 and 5 where DHL and its customer have the benefit of using better data to improve hinterland planning, warehouse operations and filing declarations, although the data pipeline is not yet fully integrated in their processes.

Cassandra use cases	Implementation
1. Early data completion check on declarations	Proof of concept
4. Data re-use - prefilling declarations	Proof of concept
5. Exception reporting for shipment planning	Proof of concept
7. Exception reporting for demurrage and detention	Theoretical
8. Exception reporting for container integrity	Operational result
9. Advanced notification of container loading (on vessel) and transshipments	Operational result
10. Advanced notification (and prognostics) on vessel Arrival	Operational result
13. Commercial information in customs dashboard to reduce background checks	Operational result

Table 5.19. Implementation of Cassandra use cases in Shanghai-Ridderkerk trade lane

15.2.5 Reflection and lessons learned

Reflection on the Living Lab process
Setting up this demonstration was a challenging process because of the limited time that was available, as the preparation did not start until the summer of 2013. When DHL's customer joined the interfacing between DHL and Descartes had already been prepared which means that at least some data were available in the pipeline as early as the end of 2013.

The Living Lab process here learnt us that even when involving large players with higher IT maturity levels, it can still be difficult to implement changes to their architecture on time for demonstration. Because the demonstration is part of an R&D process, it is sometimes difficult to raise the right level of urgency within organizations to develop and implement

changes in IT infrastructure. Even when this can be done, sometimes long lead times exist because the project needs to follow the standard change processes that are in place.

Reflection on the demonstration purpose
The Shanghai- Ridderkerk trade lane adds the use of CSDs to the experiences of the other trade lanes, thus enhancing the pipeline and dashboard solutions. Moreover, it shows that the solution that was developed earlier for other trade lanes is transferable to other supply chains and also realize similar benefits there (as long as the needed data can be fed to the pipeline). The original ambition to include invoice information to this demonstration would have been extremely interesting as this was not done at all in the other trade lane demonstrations.

The pipeline information is near real-time and this is certainly an improvement to the as-is situation. The dashboard can provide the customer with confirmed container content, although the necessary level of data availability has not yet been achieved due to implementation difficulties. Also, the dashboard and pipeline do not yet contain enough detail to support filing of declarations in the Netherlands.

Dutch Customs had access to the information in the pipeline via the customs dashboard. Not all the information that can be visualized in the Customs dashboard could be provided by the Shanghai-Rotterdam trade lane, although the most important required information on parties involved, and goods descriptions were made available.

Reflection on the expected benefits
Focus of the buyer in the Shanghai-Ridderkerk trade lane was on improved visibility. Especially detailed information on container content and expected arrival (track & trace). This visibility was only partially delivered as there was not enough time and opportunity to deliver all the necessary interfacing. Track & trace information of ocean carriage was available but the link to detailed shipments was incomplete as not all ocean carriers that are used on the trade lane could be connected to the pipeline. The link between shipments and purchase order information was delivered but not complete as only limited purchase order information was available. Because of all this the delivered visibility was of limited value. Next to this, focus was on declaration data that was used in China (for potential re-use in the Netherlands) and comparison between seller's invoices and intercompany invoices to support compliance. This was not delivered and the potential benefit can therefore not be evaluated.

Possible benefits of improved supply chain visibility for DHL are in the timely and more precise identification of exception events. The alerting functionality of the dashboard plays a key role here, but although the functionality works in other trade lanes, it can only be tested for specific alerts that are valuable to DHL when there is enough volume that includes certain exceptional events that actually trigger the functionality. This was not yet the case in the Cassandra demonstration.

When writing this document, it is expected that the demonstration of the pipeline and business dashboard on the Shanghai –Ridderkerk trade lane will continue for a few months after the end of the Cassandra project. The involved parties are able to deliver some of the necessary interfaces to improve significantly data availability in the near future and have therefore decided they see enough opportunities that make it worthwhile to continue the work at their own expense. Continued demonstration of the Customs dashboard is not possible due to the end of the license for use.

Dutch customs was able to use the Customs dashboard with the Shanghai-Ridderkerk information and although the data set in the Customs dashboard was not complete it

included already some important data on the commercial parties behind the transaction. With this, Dutch Customs thinks the dashboard helps greatly in assessing the risk on incoming containers. Especially the mentioning of the customer as the commercial party behind the transactions was of added value as the ENS (and SAL) declarations only mentioned DHL as consignor and consignee in this trade lane. So, although the available data was limited it could clearly show the top priority of customs to have insight in the commercial parties involved. By doing this, the customer could benefit more of their AEO status.

Next to the fact that additional data was made available in the dashboard -which increases effectiveness of risk assessment-, the dashboard highly serves the reduction of administrative trade burdens. Also without a dashboard customs can and will ask additional information on top of the ENS data. But these requests are filled to the carrier by e-mail of phone. This carrier often doesn't have the requested info available, so he has to contact other parties in the chain to retrieve it. This is a time and money consuming effort. By making data available in the dashboard all these administrative cost consuming burdens are reduced to almost zero.

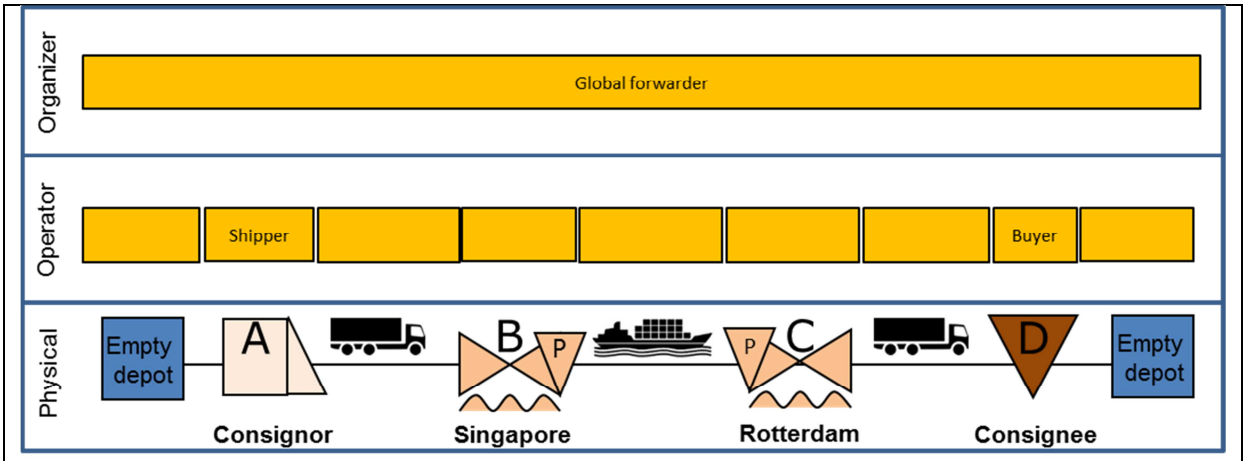
More details on the benefits of Cassandra for the various trade lane partners can be found in the work package 5 deliverables.

15.3 The Singapore – Rotterdam trade lane

During the Cassandra project, significant effort was spent in setting up a demonstration between Singapore and Rotterdam because the combination of participants in this trade lane, both within the consortium and outside, could result in a very good proof of concept for a pipeline solution with a combination of a PCS and BCS configuration as described in section 2.2 of this document. For this trade lane, there was strong commitment from Singapore Customs by agreeing to host a BCS in Singapore. To get this trade lane demonstration running, a shipper was needed, exporting goods from Singapore to Rotterdam. Both K+N and DHL made great efforts to involve their customers but due to external factors, e.g. take overs, other investment projects, etc., none of the customers was able to participate in the demonstration. Alternatively, a suitable import lane from the Netherlands to Singapore was also explored with Seacon Logistics, but also this didn't give a positive result. Unfortunately, at the end of 2013, further efforts to set up this trade lane had to be stopped. Because the ideas have been worked out quite far, as to guarantee quick demonstration start when a suitable shipper was found, and to honour all the efforts of consortium partners and third parties, the ideas for this trade lane are presented in this paragraph.

15.3.1 As-Is situation

Trade lane characteristics
The characteristics of a typical container flow on the Singapore-Rotterdam trade lane are summarized in below table. For simplicity, this represents a direct transport from consignor to consignee without the use of (de)consolidation centres.



ID	Location type / name	Location / Country*	Operator	Organizer	Contractor
A	Shipper factory	SIN / SG	Shipper	Shipper	Shipper
B	PSA Singapore Terminals (Port of Singapore)	SCT / SG	SCT	SCT	Carrier
C	Port of Rotterdam	RTM / NL	Terminal	Terminal	Carrier
D	Buyer warehouse	RTM / NL	Buyer	Buyer	Buyer

ID	Modality type	Passing countries*	Operator	Organizer	Contractor
AB-RO	Road	SG	Trucker	Forwarder	Forwarder
BC-OC	Ocean	SG - NL	Carrier	Forwarder	Forwarder
CD-RO	Road	NL	Trucker	Forwarder	Forwarder

Overall characteristics	
End customer / Supply chain owner	-
Goods packaging type (bulk, containerized, palletized, parcel)	Containerized
Goods description / type	-
FCL/LCL classification	FCL
Incoterm	-
Special requirements for goods?	-
Border crossing involved?	Y; Singapore to Netherlands by ocean
EU border crossing involved?	N
Estimated volume	-

Logistics services in scope			
X	Transport planning		Stacking
X	Transport execution	X	Loading / Unloading
	Warehousing	X	Customs compliance / Filing
	Consolidation / Deconsolidation		

Table 5.20: Singapore-Rotterdam trade lane characteristics

In this example trade lane, location A is the factory of the shipper/seller organization where the trade lane starts with receiving the purchase order, planning of shipments and after that stuffing. Transport is arranged for by the global forwarder. The export declaration in Singapore would have been included in the scope and could be filed by either the shipper,

the seller or the forwarder. The trade lane stops at delivery of the container to the buyer's warehouse.

Partners and stakeholders in the Singapore-Rotterdam trade lane
The main parties and their project involvement for this trade lane are summarized in below table.

Involved Consortium partners	***Contributing external parties***	***Informed external parties***
Kuehne + Nagel (K+N)	Singapore Customs	Various shippers and buyers
DHL		
Seacon Logistics		
Dutch Customs		
Portbase		
Descartes		

Table 5.21: Singapore-Rotterdam trade lane involved parties

For both Kuehne + Nagel and DHL not only the European offices were involved but also the local branches in Singapore.

Process analysis
A detailed process analysis was made of a Singapore-Rotterdam trade lane for K+N. The information was gathered through workshops with K+N, Singapore Customs and Portbase. One trip to Singapore was made. Workshop minutes are included in Appendix F.1.

The result of the detailed analysis, is shown in table 5.22 where the process of the trade lane is described with the Cassandra events. Greyed rows are out of scope.

Event	Owner	Remarks
Purchase Order	Buyer	
Export booking completed	Forwarder	
Empty Out	Contracting carrier	
Stuffed	Shipper	This is the "Consignment Completion Point" that confirms the container manifest.
Commercially Invoiced	Seller	
Cleared for loading	EU Customs	
Cleared for export	Singapore Customs	
Exit confirmed		
Export completed	Contracting carrier	Both the master and the house bill of lading are in scope.
Cleared for discharge	Customs	
Import booking completed	Forwarder	
Cleared for transit	Dutch Customs	
Cleared for import	Dutch Customs	
De-stuffed	Buyer	
Empty returned	Contracting carrier	

Table 5.22: Cassandra trade lane events for Singapore-Rotterdam

The ambition for this trade lane was to facilitate compliance by re-use of data for both the export and the import declaration, in combination with multiple filing of the ENS declaration. The data would be captured from the Cassandra events 'Export booking completed',

'Stuffed', and 'Commercially Invoiced'. Optionally, CSDs would have been used for detailed container tracking and a guarantee of container integrity.

Mapping of current IT systems

A detailed mapping of the IT systems that are used in the Singapore-Rotterdam trade lane is omitted as this trade lane was investigated for various forwarders and it is not useful to repeat all of the results in this document. For a better understanding by the reader of the to-be situation, table 5.23 shows the generic results of combining a typical example trade lane with table 5.22 and thus which IT systems are ideally used for capturing data for each of the Cassandra events in scope for this trade lane.

Event	Owner	IT system
Export booking completed	Forwarder	TMS
Stuffed	Shipper	ERP
Commercially invoiced	Seller	ERP
Cleared for loading	EU Customs	Customs (ICS)
Cleared for export	Singapore Customs	TradeNet®
Export completed	Contracting carrier	Carrier system
Cleared for transit	Dutch Customs	Customs
Cleared for import	Dutch Customs	Customs

Table 5.23: Cassandra events from IT systems

Mapping of interactions with government authorities

From the Singapore side of the trade lane there is interaction with Singapore customs to receive a clearance for export and with the European customs to receive a clearance for loading. Both of these clearances need to be received before the container can be loaded on the vessel. On the European side of the trade lane an import declaration, or sometimes a transit declaration is needed. Figure 5.14 shows the interactions in relation to the various Cassandra events.

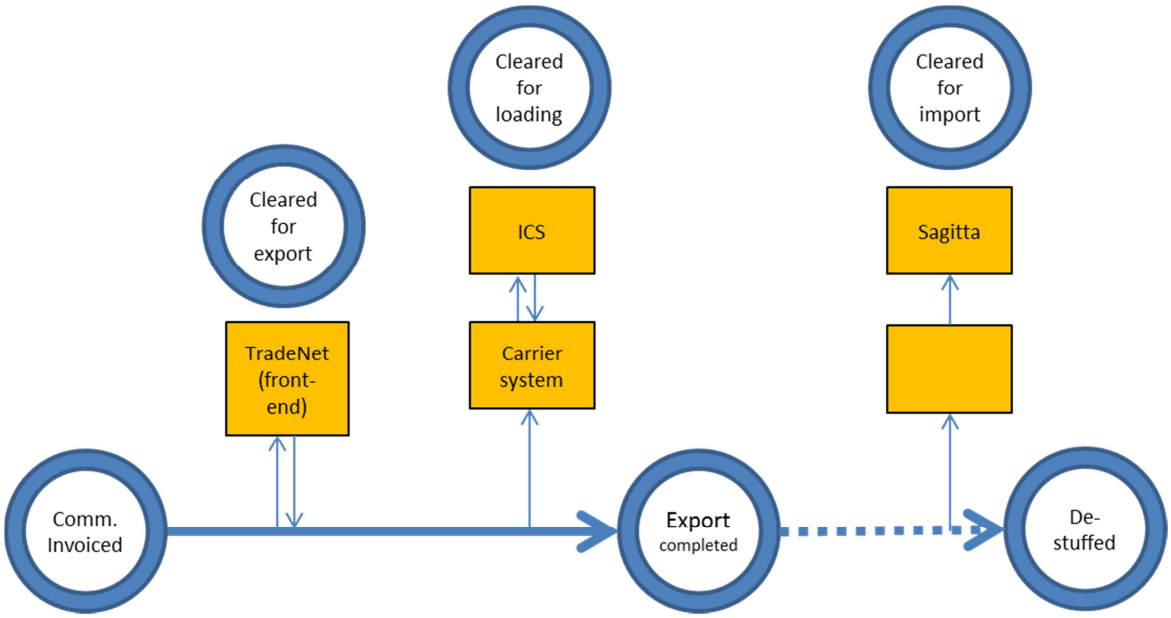


Figure 5.14: Interaction between business and authorities in the trade lane

Singapore's National Single Window is called TradeNet®. Various solution providers in Singapore developed so-called TradeNet® front-end applications that can be linked to TMS/ERP systems and where a user can create and file customs declarations to the TradeNet® system. In cooperation with solution providers, Singapore Customs has

developed functionality in these front-end applications to retrieve data from the TradeXchange® platform. Shipper data about stuffing and invoicing will then be shared with TradeXchange® by the shipper. The declarant can upload this information in the TradeNet® front-end, check the information, add some fields and then submit the declaration. This very much resembles the data from the source principle in Cassandra and makes re-use of source data possible at the benefit of the declarant. Singapore Customs also has developed other applications for the re-use of data, e.g. for permits and insurance.

For receiving a clearance for loading, usually the commercial invoice, or else the container manifest, is used to create a shipping instruction for the ocean carrier. The shipping instruction is send to the carrier by email or by direct interfacing with carrier system. The ocean carrier typically uses the shipping instruction to create the ENS declaration which is sent to the customs authority of the first port of entry in the EU (ICS system).

In the Netherlands, the Sagitta system handles import declarations. Various solution providers have solutions on the market that can create and file declarations to Sagitta. K+N. DHL and Seacon Logistics all use different solution providers. When import is done through entry in the records, a transit declaration is needed to transport the goods to the buyer's warehouse. The transit declaration then replaces the need for an import declaration.

15.3.2 To-Be situation: Demonstration plan

Design of pipeline configuration
The pipeline that was envisioned for the Singapore-Rotterdam trade lane was a combination of a PCS and BCS configuration (see figures 2.3 and 2.5). The configuration needs a (standardized) interface between the BCS/PCS to exchange data between the two of them so that together they can provide full visibility. The BCS on Singapore side is the TradeXchange® platform. On the Rotterdam side, two options were explored, Portbase as PCS for the K+N demonstration and Descartes as BCS for the DHL demonstration. Both Portbase and Descartes would also communicate to the Customs dashboard, developed by IBM and Intrasoft. Descartes also developed a business dashboard.

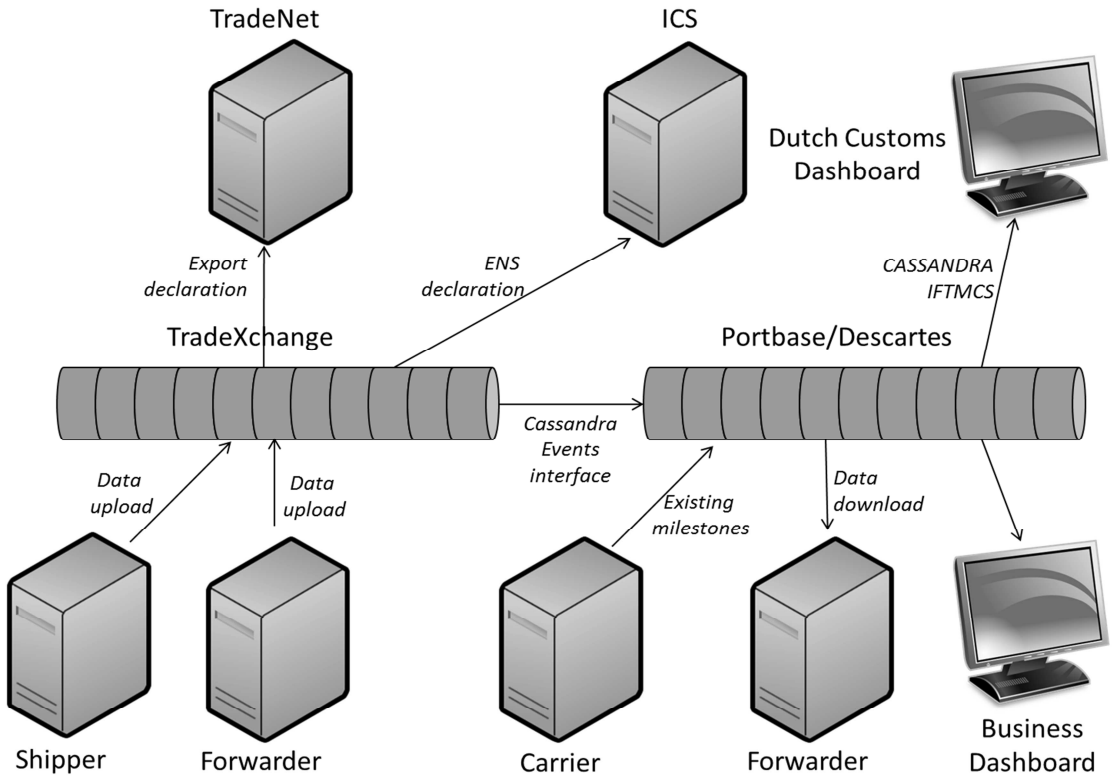


Figure 5.15: Singapore-Rotterdam pipeline configuration

Figure 5.15 shows the pipeline configuration in combination with the data sources that were identified in the previous section and table 5.24 links these to the Cassandra events as well. TradeXchange® has existing message specifications to allow shipper and seller to share information such as stuffing and invoicing information with their business partners. In the Cassandra demonstration, the information from the forwarder can also be uploaded via a same interface specification to TradeXchange® the shipper/seller is using to pre-fill the export declaration. In a similar way, TradeXchange® can develop an application to create an ENS, based on data from multiple sources, and send that to EU Customs. TradeXchange® would then share the information with Portbase/Descartes and from there the information is shared real-time with the forwarder's office in the Netherlands, with the business dashboard and the customs dashboard.

Event	IT system source	Provided to pipeline by
Export booking completed	TMS	Forwarder
Stuffed	ERP	Shipper
Commercially invoiced	ERP	Shipper/Seller
Cleared for loading	Customs (ICS)	From TradeXchange® to ICS
Cleared for export	TradeNet®	TradeNet® (front & back end)
Export completed	Carrier system	-
Cleared for transit	Customs	Customs
Cleared for import	Customs	Customs

Table 5.24: Cassandra events from IT systems to pipeline

Cassandra messages between TradeXchange® and Portbase/Descartes

For the BCS and PCS to exchange information, an interface specification was needed. Although the specification was never fully completed (because it was also not implemented in any of the other trade lanes) the concept for sharing information here followed the decision

for the interface with the Customs dashboard. The interface would use a Standard Business Document Header (SBDH) in combination with a UN/CEFACT message as body. The UN/CEFACT message would be extended with attributes to also capture the source of each data element as typically, each message could be constructed from data from various sources. In future, other attributes could be added to inform the receiver about data that was checked, process controls in place, etc., so that improved risk assessment is possible. Table 5.25 below shows the UN/CEFACT messages that were considered. For the 'Cleared for export' event, the TradeXchange® message SDS could have been used.

Event	UN/CEFACT messages
Purchase Order	PO or DESADV
Export booking completed	IFTMIN or IFTSTA
Stuffed	IFTMCS
Commercially invoiced	INVOICE
Cleared for export	-

Table 5.25: UN/CEFACT messages as part of the Cassandra interface

Compliance related innovations
The compliance related innovations that were planned to be implemented was the pre-filling of both export and import declarations, multiple filing of ENS and of course the use of the Customs dashboard.

15.3.3 Expected benefits

In general, the primary purpose of introducing the Cassandra concept in the Singapore-Rotterdam trade lane was to support customs compliance. After that, improved visibility was deemed interesting in order to derive and implement opportunities for supply chain improvements, but in general this was considered a second rate benefit.

Typical trade lane specific benefits identified
The direct benefits for the forwarders would be reduced administration efforts (in both time and costs) for lodging of declarations. Other identified possible benefits of improved supply chain visibility for K+N were in the timeliness and accuracy of information, especially when this is needed for the billing process (e.g. gate out and gate in to calculate and charge demurrage). Next to this, it can lead to better management of demurrage (and related costs), increased efficiency (enter data only once), automated billing, optimized planning and better risk identification and mitigation.

Dutch Customs could expect improved data for their risk assessment. This is related to more timely information, before vessel arrival in the Netherlands and perhaps even before vessel departure in Asia, improved correctness of data, e.g. stating true consignor and consignee, and better understanding of the level of control in the supply chain by businesses. This last point is of course related to a risk based approach and Cassandra's vision on an AEO+ concept.

For Singapore Customs the further developments of TradeXchange® functionalities has the benefit of facilitating trade to and from Singapore, especially import and export related activities in addition to Singapore's functions as a transhipment hub.

15.3.4 Reflection and lessons learned

Reflection on the Living Lab process
Setting up this trade lane followed the same process as for the other trade lanes. For K+N it was quite soon decided to work with Portbase. K+N already has a global IT system that can be an example of a business pipeline. However, a further collaboration with Portbase in the

Netherlands was expected to be beneficial to share better and more information digitally. Due to good contacts between Dutch Customs and Singapore Customs, Singapore Customs was very soon made aware of the Cassandra project and thought the developments were very much in line with their own TradeXchange® developments. Therefore they were very interested in participating and supporting this project. As K+N already identified Singapore to Rotterdam as a potential trade lane for the project, the team was quickly formed.

The process of getting a common understanding of the trade lane in the team also followed the same steps as for the other trade lanes and this worked well. The European part of the team prepared a draft analysis of the trade lane and then travelled to Singapore to get more details on the Singapore side of the trade lane and meet with the local representatives. During a two day workshop the full analysis was completed and the to-be solution for the pipeline described.

The most crucial aspects of this trade lane and eventual bottleneck in setting it up was the involvement of a shipper that had actual exports from or imports to the Singapore area. Some suitable customers of K+N were approached but this was not successful. Eventually, it was decided for K+N to focus on the Living Lab Europe-US and development of the RBA and ask DHL and Seacon Logistics if they could contribute to the Singapore-Rotterdam trade lane with a customer. That the involvement of a suitable customer was not possible shows how difficult it can be to attract additional participants during the project. The difficulty in getting the right level of support originated from the following:

- External factors, e.g. one of the approached parties was recently taken over and could not get management support for involvement in this stage.
- No available funding for being involved, e.g. in spending time for workshops and evaluations. Some interface with the shipper's systems was envisioned and even offering to have the development work done by the project partners or Singapore Customs did not help.
- Limited benefits of being involved. As the shipper was usually not the party making the customs declarations, the benefits for the shipper were not deemed considerable enough to support the involvement.

Work with K+N and Portbase for this trade lane continued until early 2013. DHL and Descartes were consulted with in the next months until end of 2013. Seacon Logistics was involved during the summer of 2013. Singapore Customs has been supporting the project from start until the development of a Singapore-Rotterdam trade lane was eventually stopped at the end of 2013. The reason to stop the efforts was that it was no longer feasible to set up a running trade lane in the remaining months of the project duration.

Reflection on the demonstration purpose

The Singapore-Rotterdam trade lane makes a good example of the Cassandra demonstration purposes as it focuses on the PCS-BCS configuration. In the Asia-Europe Living Lab it was the only trade lane with this configuration, and it would have shown a good comparison of practicality, benefits and scalability with the other trade lanes.

Resulting from the configuration, there was the need to develop a new interface between the PCS and BCS. The idea was to extend the customs dashboard interface for this. In doing so, it would have resulted in more effort for design and development for this interface which could have been re-used by the Customs dashboard as well. Also, it would have given the project a better understanding of the feasibility of using such an interface in the business community and thus also to what extent piggy backing by Customs on this interface in the future could be expected.

The clear focus on customs related innovations was also a strong point of this trade lane. It was the only trade lane in the Asia-Europe Living Lab that included multiple filing for ENS and export and import declarations. The other trade lanes have more focus on delivering supply chain visibility benefits.

The three ways in which this trade lane would stand out between the others and add valuable new insights to the projects was the reason why so much effort has been spent on setting up a Singapore-Rotterdam pipeline. It is also the reason why this effort is still considered valuable and why the trade lane is documented in this deliverable.

16 Results and evaluation

The results and evaluation of the Cassandra Living Lab Asia-Europe have been divided over two areas:

- Results and evaluation for the Living Lab process. This evaluates the process that was followed and describe in what extend that was successful. Also, it provides lessons learnt for new Living Labs in a similar environment;
- Results and evaluation of the demonstration purpose. This evaluates how the Living Lab supported the answering of the research questions of the Cassandra project and whether it provides sufficient covering of the Cassandra principles to apply its results as full answers to the research questions.

Although the various trade lane chapters have also evaluated on the expected benefits for the parties involved, this evaluation is not continued further as this is the task of the Cassandra evaluation work package. The deliverables of the evaluation work package will report on the realised benefits and how they contribute to a business case for implementation of the Cassandra solutions. In addition to expected business benefits, the evaluation work package will also evaluate the technical solutions for their fit with the Cassandra requirements, the Risk based approach and business-government interactions and the societal benefits. Therefore, all these aspects are not addressed in this chapter.

The Living Lab should show a clear progress beyond the state of the art before project start and thus indicate how the industry in general can benefit from the work done in the Cassandra project. Other than this, the demonstrations and solutions should also show a clear ability to be expandable beyond the scope and timeline of the project. The exploitation plan and project final report will report on these aspects, but the evaluation of the demonstration purpose will also briefly reflect on this from a Living Lab Asia-Europe point of view.

16.1 Results and evaluation of the Living Lab process

The need for a Living Lab methodology
The first result of the Cassandra Living Lab Asia-Europe is a first version of a Living Lab methodology. While executing the Cassandra Living Labs it became clear that there is not yet a framework that supports Living Lab practitioners on how they can successfully prepare and run a Living Lab. The Cassandra Living Labs were therefore guided by a self-developed 4 step approach that prescribes a preparation phase, technical realisation of the pipeline, risk assessment and pilot & evaluation. Although this provided some guidance, a lot of generic lessons could be derived from the Cassandra Living Labs. To structure these lessons learned and make them applicable for other Living Labs, a Living Lab methodology was developed. During the Cassandra project, two papers were published that raise the issue of a lacking Living Lab methodology and that give a first draft of a Living Lab methodology.

- Klievink & Lucassen: “Facilitating adoption of international information infrastructures: a Living Labs approach”, presented at IFIP EGOV conference 2013, published in Springer LNCS (nominated for best paper award);
- Lucassen, Klievink and Tavasszy: “A Living Lab Framework: facilitating the adoption of innovations in international information infrastructures”, presented at TRA conference 2014.

The goal of developing a Living Lab methodology is “bringing the industry and project practitioners the benefits of consistency in research and evaluation across Living Labs, and structured knowledge building to facilitate a learning curve of critical issues and lessons learned that help make each Living Lab successful”. The following definition for a Living Lab, where the complexity of a Lab study is clearly visible:

“A Living lab is a test environment for cyclical development and evaluation of complex, innovative concepts and technology, as part of a real-world, operational system, in which multiple stakeholders with different background and interest work together towards a common goal, as part of medium to long-term study”.

The first version of the Living Lab framework is shown in figure 6.1. The framework starts on the top left with stating the ambition for the Living Lab in a set-up activity in the ‘Plan’ phase. The methodology should be seen as a set of iterative processes where new findings and ideas need to be checked with earlier assumptions and plans continuously. This automatically means there a multiple, smaller design loops during each phase of a Living Lab. The four phases are as follows:

- The crucial aspect in the ***Plan*** phase is the building of common knowledge on the environment, the concepts and technologies to be tested, use cases that need to be executed and requirements for implementation. This phase demands a lot of stakeholder commitment and building trust which determines to a large part the success of the Living Lab.
- In the ***Do*** phase, the focus is on implementing changes in the Living Lab environment, actually perform tests and gather data for evaluation analysis. This means that not only the Living Lab environment might need to be prepared but also some of the surrounding systems, as a Living Lab is also a system in a system.
- The ***Check*** phase is the last phase of a single iteration in the Living Lab framework. The quality of the system analysis, use cases and KPIs are now reflected in the results of the Do phase. KPIs are evaluated and the impact on for example business models, regional or national economy or an industry sector are determined. Here is a crucial point in the Living Lab framework where it needs to be decided whether the Living Lab is completed or another iteration is needed.
- The ***Act*** phase takes the results of the evaluation and impact assessment and uses these to improve the design on start a new iteration in the Living Lab. This might also mean that some activities in the Plan and Do phase will need to be reviewed or rebuild. Although the act phase does not contain any particular activity for now, it is a crucial phase in a Living Lab environment where cyclical development, complex challenges and medium to long term research with small improvement cycles ask for an iterative approach.

The environment and stakeholder commitment blocks include on-going activities that need to be performed to keep the Living Lab up to date with important developments in the environment and to guarantee stakeholder commitment during the whole runtime of the Living Lab.

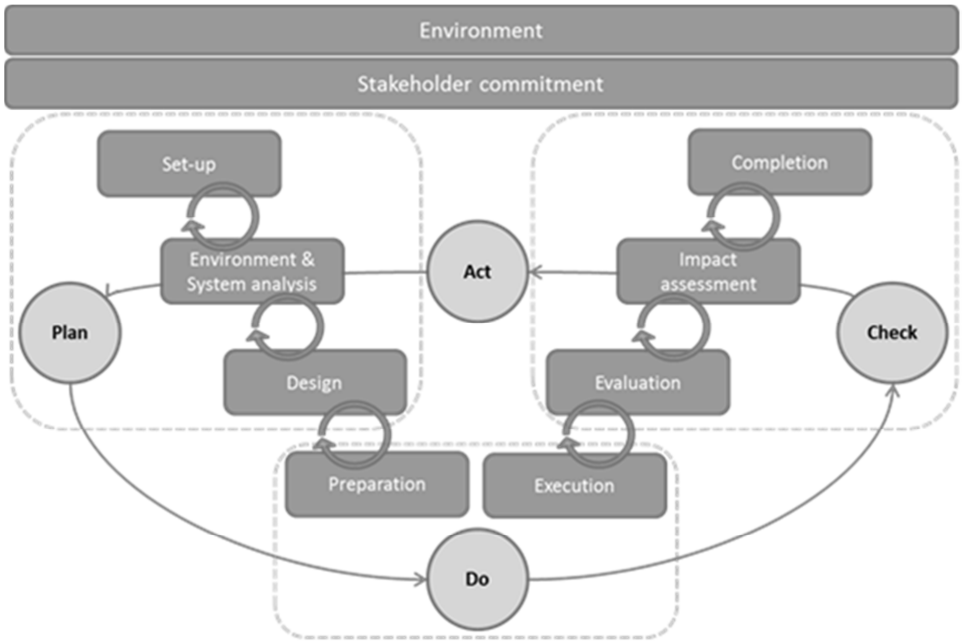


Figure 6.1 First draft of the Living Lab methodology by Lucassen et al.

Lucassen et al. concluded that "the high level in which the blocks are now defined is not nearly specific enough to help practitioners", therefore additional work is needed in detailing each step. The following lessons learned were derived from the Cassandra Living Labs and should be included in any further work on the Living Lab methodology:

Agreeing on the proper scope and level of ambition
When demonstrating innovative concepts it is important to keep in mind that there is a reason that these innovations were not yet fully implemented by industry partners. Innovations are innovative and there can be issues when implementing them, for example resulting from not comprehending the business case for the solutions thus not feeling the sense of urgency, having a too wide gap between current maturity levels and the innovation's needed maturity levels and sometimes just between what a demonstration team should do and what it can do.

A demonstration starts with a clear ambition. When including demonstrations within an R&D project, it is of course difficult to state a concrete ambition including a clear guidance on the actual solution to be tested at the start of the project as it is likely that this needs more R&D work. This is not an issues as long as the project timeline and deadlines correctly reflect the amount of work that is needed, that the participants can/will keep the deadlines and that the ambition for both parts is in line with the resources and overall time line as well. However, the Cassandra Living Lab Asia-Europe started at month 8 of the project and although this catered for some R&D work to be at least started, the R&D work was not finished. This made that during some time, the Living Labs were looking for guidance where this could not yet be offered. This gave the coordinator two options to act: Either to wait until the R&D was more completed and give more clear guidance on the solutions that needed to be implemented, or start making decisions in the Living Lab that were in line with the Cassandra principles although it was not yet clear whether they would also be in line with the results of the R&D work. The ambitions for the Living Labs were high and the amount of development work that was needed even for the simplest solution was still significant so therefore the coordinator decided to continue and take the risk of non-compliance with the R&D outcomes. The results of this becomes clear in the next section on the evaluation of the demonstration purpose. It is however a valuable lesson for demonstrations in R&D projects in general.

In line with the previous, but also a valuable lesson on its own is that the level of ambition of the project sometimes needs to be separated from the level of ambition in a Living Lab and expectations of stakeholders need to be managed as such. At the start of the Cassandra project, it was the ambition for the Living Labs to demonstrate a Cassandra pipeline, preferably a distributed system, where all actors could see what was needed, where and when they needed, that Customs could see all data of the transactions in the pipeline to optimally support risk based supervision and a system based approach and that the offered solution would also be scalable, etc. This is ambitious in the sense of IT innovation, it is ambitious in the sense of risk management and supply chain control and also in business government interaction. Quite soon, it became clear to some partners in the projects that the ambition could not be completely fulfilled for the Living Labs as it was too far away from the current way of working and could therefore not (yet) be implemented in a real-world environment. Although this was clear to some, it was not clear to all and because of this not all expectations were managed successfully. It caused some partners to be unhappy with the outcomes of the Cassandra Living Labs and the outcomes of the Living Labs were sometime confused with the outcomes of the project. In hindsight, it is still difficult to see how the Living Labs can have come further in fulfilling the original ambitions. But an important lesson is that a clear decision on what would be demonstrated and what would only be part of the R&D work is needed. It is important to have more clear roadmaps for the Living Labs, that these are updated throughout the project, that they are related to the R&D work and also part of the overall project roadmap and they are made available to all partners.

The risk of enlarging demonstration scope should be properly identified and managed. For the Penang-Venlo demonstration it was originally not foreseen that a data capture tool would be developed. Focus was originally on developing integrators, a dashboard and functionality for a control tower. When setting up this demonstration it became clear that a data capture tool was needed as the existing IT maturity level in Malaysia was not sufficient for connecting it to a Cassandra pipeline. This meant that the scope of development work became larger and although the work was divided between the two partners involved and additional budget was made available, it became too difficult to deliver the whole set of components – data capture tool, visibility solutions and data sharing between business and pipeline and pipeline and Customs dashboard – on time to enable a long enough evaluation time. In hindsight this should perhaps have been managed by implementing other (existing) solutions, or by decreasing the scope of supply chain events.

Having the right stakeholders involved

Decisions that have a large influence on the demonstration outcome are preferably made inside the consortium, but the decision whether to include a particular trade lane in the Cassandra demonstration could only be made outside of the consortium. The four industry partners in the Cassandra project were logistics service providers, either forwarding organisations or (de)consolidators. The decision to include only this kind of organisations was made because the Integrity project concluded that the single involvement of shippers was not sufficient as they did not show the urgency to make the needed changes to involve in container tracking. For Cassandra, it was therefore decided that it would be better to invite the logistic service providers as they directly influence the logistics process and would therefore be more motivated to engage in R&D activities in this area. This conclusion is actually still correct but Cassandra learns us something in addition to this. The logistics service providers were motivated to engage in the project and support the activities and be involved in demonstrations. But logistics service providers are never owners of the supply chain and the goods, and therefore it was not their final decision whether to include a particular trade lane in the Cassandra demonstration. The decision was to be made by their customers and the owners of the chains: the shippers. For some trade lanes the approval by the shippers became a serious bottleneck. The difficulty in getting the right level of support from the approached shippers originated from the following:

- External factors caused the shipper to decide negatively, e.g. one of the approached parties was recently taken over and could not get management support for involvement in this stage.
- No available funding for being involved, e.g. in spending time for workshops and evaluations. Some interface with the shipper's systems was envisioned and even offering to have the development work done by the project partners or Singapore Customs did not help.
- Limited benefits of being involved. As the shipper was usually not the party making the customs declarations, the benefits for the shipper were not deemed considerable enough to support the involvement.

Stakeholders that are crucial for the success of the project according to one of the consortium members need to be involved, preferably in the consortium but if not then at least closely related to the consortium members. GS1's objective in the Cassandra project was to demonstrate the importance of the use of (GS1) standards in the Cassandra pipeline solution. GS1 standards are predominantly used by the retail industry. Because it was already difficult to engage shippers in the Cassandra demonstration, it was even more difficult to engage a shipper, that was preferably a customer of one of the four industry partners, and was also a GS1 member and an active user of GS1 standards in the parts of the supply chain that Cassandra is focusing on. This task has proven too difficult and although some GS1 standards were applied in the Penang-Venlo trade lane, the result did not fully meet GS1's objective.

Having the right stakeholders involved also means that the less needed stakeholders need to be identified as well. Cassandra was successful in identifying already in the first year of the project that the SICIS solution developed in Integrity could no longer be used. This meant there was enough time to engage with other consortium partners and focus on alternative solutions. One of the alternatives was to include East Port Technology as a consortium partner. Although it was decided in the second year of the project that they would not become a partner this did not have a negative influence on the developments in this trade lane as there had been a clear scope for their involvement and they were not on the critical path of developments.

Working in teams and the role of the neutral LL coordinator

Working in dedicated teams helps in creating an open and safe environment for learning and sharing. For each of the trade lanes a team was composed that included the industry partner and a solution provider. This team was responsible for creating the pipeline and the business dashboard. First step in the process was to understand each other's ambitions in the Cassandra demonstration and after that to get a common understanding of the trade lane actors, processes and data involved. Working jointly on a common understanding of the trade lane and the stakeholder's needs not only brings knowledge but also improved the relationship and team spirit. The Living Lab showed that a specific, shared and well-understood objective for the cooperation is crucial for selecting the team members and also for final success.

Being involved in a multidisciplinary project like Cassandra demands certain competence and skills of team members. The Cassandra projects bring IT innovations to the logistics and supply chain industry but in a lot of cases this did not mean that the team members had significant understanding of both domains. The people working in the teams needed a certain set of competences, willingness to learn and engage and very importantly communication skills in order to create a positive team atmosphere and work effectively. Cultural and language barriers can create further difficulties that need to be managed.

The role of a (neutral) coordinator is important to moderate discussions, facilitate mutual understanding with necessary functional translations and solve conflicts. The common understanding is the crucial starting point for developing a common roadmap to implement the Living Lab solutions. If creating common understanding is not properly addressed and the roadmap and reasoning behind it are not well understood by all team members this will continue to cause difficulties during the Living Lab and can seriously affect the outcomes. The role of a neutral coordinator is even more important when there is a partnership where power relations can affect the openness of discussions. In the Cassandra project, this was sometimes a problem when business and Customs needed to work together. All organizations in the Cassandra Living Lab were eventually able to put aside their normal roles and collaborate but their natural behaviour remains first choice. Having a neutral coordinator can help bring this balance back in the teams.

Trust

In a large demonstration such as the Cassandra Living Lab it is important to create the right level of trust that is needed to showcase the ambition. There was close collaboration between pipeline IT providers and Customs dashboard IT providers in designing the interfaces between the two. There was also close collaboration between pipeline providers and their clients (industry partners, i.e. importers who provide the data for the pipeline). However, these industry partners were not actively engaged in the design of the Customs dashboard, as they were indirect stakeholders rather than direct stakeholders (in this context, "direct" means system users or owners of interfacing systems). Yet industry partners are the owners of the data in the systems of the pipeline providers. Because of their limited involvement, the industry partners were not sufficiently aware of the developments in the Customs dashboard and this negatively affected their level of trust in what would happen to their data once it was made available to the Customs dashboard and thus also negatively affected the data quality there. Due to this, some (highly) sensitive data was cloaked in the pipeline and therefore also in the Customs dashboard. Although this did not affect the technical proof of concept of the solution, it did influence the user experience, especially for the users of the Customs dashboard. An important lesson learned for the future is thus to engage a broader group of stakeholders than strictly needed in solution design and put even more focus on building trust.

Cyclical approach to development and test

A cyclical approach to development and test delivers results soon and makes it easier to discuss next steps. It also helps in keeping stakeholder engaged and to align with their expectations, especially when it was difficult to formulate very concrete requirements upfront. The trade lane teams worked with a cyclical approach to implement further improvement gradually throughout the project. The teams started with focusing on the data that was readily available with the project partners and after that included data that was available through existing interfaces, e.g. the carrier milestones in the Descartes pipeline. This first version could then be presented to other partners in the trade lane partner to explain them what we were doing and what we asked of them. This was really helpful in convincing partners in China, the UK and the Netherlands.

Managing the demonstration time line

When the time line for demonstration is fixed, it is important to correctly assess all the risks for delay and communicate these clearly. The Cassandra project had a clear end date from the start and although three years is quite long, it is not very long when the R&D work should be partly completed before demonstration teams can start developing solutions. Also the ambition of running the Living Labs in the real-world logistics' system posed further difficulties as this meant that the demonstration environment needs to be integrated with the existing business systems. Although these risks were identified and where possible dealt

with by the coordinator, they were not always communicated to other partners in the project in such a way that they could really understand the difficulties and adapt their expectations.

Even when involving larger players with high IT maturity levels, it can be difficult to implement changes within short time frames. Large organisations normally have higher IT maturity levels but with their size they regularly lose flexibility. Usually, these organisations have long wish lists for IT changes and there are only limited resources available. Also, the change process is sometimes standardised for control purposes meaning that even small changes cannot be made quickly. This means that although the demonstration team can have proper understanding of what changes are needed, it does not mean that the changes can be implemented easily. Because the demonstration in Cassandra is part of an R&D process, it is sometimes difficult to raise the right level of urgency within organizations to develop and implement changes in IT infrastructure. This is especially the case for partners that are outside the consortium.

When there is high dependency on stakeholders outside the consortium, this needs to be identified and communicated upfront and a go/no go decision needs to be scheduled to make a joint decision on whether to continue. This issue was most apparent when trying to involve a shipper in the Singapore-Rotterdam trade lane. With K+N and Portbase the trade lane work was continued until early 2013. DHL and Descartes were consulted within the next months until end of 2013. Seacon Logistics was also involved during the summer of 2013. In the end, all partners involved agreed on stopping the work that was done here. But in hindsight this go/no go decision should have been scheduled earlier because it left no room to continue with K+N and Portbase in another trade lane and the team was lucky to find an option for a third trade lane between Shanghai and Ridderkerk that could be set up rather easily.

Summary of what went well and what could have gone better in the Living Lab process
Below table 6.1 summarizes what went well in the Living Lab process and what were the points that could have gone better.

What went well
Working in trade lane teams contributed to an open and safe environment for knowledge sharing.
The trade lane teams shared a common, specific trade lane ambition which helped to deliver the right results and also team spirit.
The neutral coordinator had knowledge of both logistics and IT and was able to moderate discussions and create common understanding.
The right level of trust was created in the trade lane teams.
A cyclical approach to development and test was applied successfully.

What could have gone better
The Living Lab ambition was not always clear and the Living Lab was at some points affected by lack of guidance from the R&D work in this.
The level of ambition for the Living Lab should have been separated from the overall project ambition more explicitly.
Scope changes should have been better assessed and managed.
Crucial decision makers or influencers of Living Lab success should have been in the consortium or at least very closely related to it.
The right level of trust was not created in the larger group of solution providers and industry partners resulting in some cloaked data.
Risks related to the demonstration time line were not always successfully communicated to all relevant partners. This includes scheduling of go/no go decisions.

Table 6.1 Summary of what went well and what could have gone better

16.2 Results and evaluation of the demonstration purpose

Cassandra pipeline configurations and the backbone
Ideally, the Living Lab gives a broad demonstration of all the pipeline configurations so the overall Cassandra concept can be properly evaluated and the Asia-Europe Living Lab has succeeded quite well in this. The Cassandra project has described several possible configurations of a pipeline. These configurations and their demonstration in the Living Lab Asia-Europe have been summarized in table 6.2. The table shows that the EPCIS and trader configurations have only been demonstrated as a combination in the Penang-Venlo trade lane. The reason for making a combination reflects the situation in practice. Seacon Logistics wanted to develop their own part of the overall solution because they saw a business advantage in doing so. Companies can thus decide to develop certain functionality in-house and outsource other parts of the solution. Both solutions can however develop as stand-alone pipelines.

Configuration type	Demonstration in the Living Lab
PCS pipeline configuration	Singapore-Rotterdam
EPCIS pipeline configuration	-
BCS pipeline configuration	Yantian-Felixstowe Shanghai-Ridderkerk
Trader pipeline	-
Hybrid solution	Penang-Venlo: EPCIS + Trader

Table 6.2 Overview of Cassandra pipeline configurations in the Living Lab

In general, it can be concluded that all the Living Lab demonstration are good examples of the configuration types that are described in the Cassandra IT roadmap. In some cases, some differences with the ideal picture exist but there were reasons to deviate from this. The Singapore-Rotterdam trade lane would have made a good example of PCS configuration and it would have shown a good comparison of practicality, benefits and scalability with the other trade lanes.

In line with expectations, the Living Lab Asia-Europe has not demonstrated a distributed pipeline. All the demonstrations in the Living Lab have a central data repository, including the hybrid solution which has two repositories of data. When setting up the Living Lab, the R&D work on how a distributed system would work was not yet finished. Later, the distributed solution has been put in the Cassandra IT roadmap as being a more advanced phase that could not yet be implemented in the scope of the Cassandra project. The Living Lab coordinator was thus correct in proceeding with the implementation of pipeline configurations as shown in table 6.1 before completion of the IT roadmap. By doing so the Living Lab results have already contributed to explaining the Cassandra principle and thus paving the way for more advanced solutions in the next years.

The challenge of the Cassandra Backbone design is to have an open system for all parties without forcing the use of systems of a specific solution provider. To create such a backbone, various nodes need to be semantically connected by unified interfaces as is shown in figure 6.2 (same as 2.2.). The work in the Living Labs was simplified by having the pipeline and business dashboard (‘business application’) delivered by the same solution provider, meaning that part of the interfaces in 6.2 are no interfaces between different solutions. The Living Lab has therefore not prescribed anything for this interface. The biggest challenge in the Living Lab was the agreement on the interface to the Customs dashboard as this needed to be unified for the various trade lanes. In the end it was agreed that the most favourable solution was the use of UN/CEFACT xml messages – already used in most of the trade lanes and with the solution providers – as there are messages for carrying business data. Because the Customs dashboard supports the idea of Customs piggy-backing on business efforts, this

was thought more reasonable than introducing new messages. In line with the cyclical approach in the Living Labs it was decided to start with an interface including just one UN/CEFACT message with extensions to contain routing-data and other customs-specific data. It was an option to extent that amount later but this did not happen due to timing issues. In addition, the chosen message can carry most of the information that was already available in the pipeline and thus the message itself was not the bottleneck. Although the chosen solution was agreed upon by the solution providers in the Living Lab, the solution was not agreed on by all partners in the Cassandra project. Arguments against the chosen solution are that it is not sufficiently scalable and that the solution limits the data availability to the Customs dashboard to too large an extent. Future work is needed to further assess and improve the chosen solution.

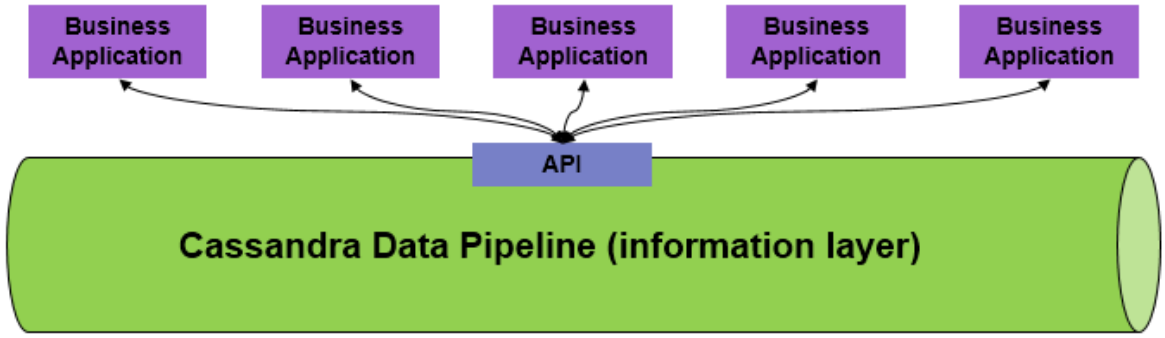


Figure 6.2/2.2 Cassandra information layer, API and business applications

The Singapore-Rotterdam trade lane would have made an important contribution to the development of a Cassandra Backbone because the pipeline made up of two PCS/BCS solution would have also needed a unified interface in the middle. It was envisioned that this interface work in a similar way as the interface to the Customs dashboard. Developing this trade lane further would have resulted in more effort for design and development for this interface which could have been re-used by the Customs dashboard as well. Also, it would have given the project a better understanding of the feasibility of using such an interface in the business community and thus also to what extent piggy backing by Customs on this interface in the future could be expected.

Data from the source, data quality and validation

Capturing data from the source is one of the key principles of the project and all Living Lab trade lanes have focused on this for all data elements that were included in the pipeline. The demonstration that reflects this best is the Penang-Venlo demonstration where a workflow portal was developed that is linked to the Cassandra events and that enables capturing of event data directly from the party that executes the event.

Data analysis in the Living Lab showed that there are around 150 data elements in the supply chain that are of interest to capture in the data pipeline but not all these elements could be captured. In each demonstration, data capture started with the sources – following the data from the source concept – that were most readily available. After that the priority was on capturing data about the goods and the parties that are involved. This worked best in the Yantian-Felixstowe trade lane where there was close cooperation with the consolidator in Yantian and confirmed data from the stuffing event could be captured. In some cases however, the data in the demonstration was still cloaked because of a lack of trust between the project partners due to not knowing each other sufficiently well. Although this did not influence the proof of concept, it does affect the user experience for the dashboards.

The Living Lab demonstrations have in all cases succeeded in combining purchase order data with shipment details, party information and transport milestones although data

completeness differed a lot between various trade lanes. In only limited cases some of the financial data, for example from invoices, were captured but never all. Only in one of the demonstrations was CSD data available. Data completeness was sometimes in a direct conflict with the data from the source principle as this made implementation more challenging.

Capturing more data and data from more sources would only have been possible if there had been an opportunity to include more development cycles and if it had been possible to convince third parties to provide interfacing to the pipelines. For some trade lanes it was already difficult to get a first version of a working pipeline solution. Multiple development cycles would have been needed to improve the amount of data in the pipeline. Issues that prevented this were high development efforts for building solutions from scratch and insufficient scoping of the solutions. For some trade lanes it was difficult to convince third parties to deliver their information to the pipeline on time. Identified reasons for this were:

- Lack of urgency in timing of delivery;
- Lack of resources with the third party to understand what needed to be done and to deliver the actual interface;
- Lack of commitment from higher management to assign resources;
- Lack of willingness to contribute without a significant monetary compensation.

Data validation was only implemented by stating the source of all data elements in the business dashboard or logging the source in log files. The source was then stated as a mixture of party and IT systems. This is an implementation of the first type of data quality assessment:

- Record source of the data by naming party;
- Record source of the data by naming process;
- Record additional process information that informs on data quality.

It was not yet possible to include references to the relevant processes or control measures. Although this is a good start, it can only be interpreted correctly by people with detailed knowledge of the processes. The reason this was not yet more fully implemented was due to timing restrictions. It was decided to focus first on capturing a reasonable amount of data in the pipeline and implementing business alerts in the dashboard.

DASC methodology

The DASC (Data analysis for Supply Chains) methodology as used in the Cassandra project can be used in other R&D projects or initiatives when the data from the source principle is applied. Also, when worked out in more detail, the framework of events and data sources can be used as a reference framework for assessing data quality in a supply chain which can be interesting for auditors. For this, chain and data control measures need to be included in a reference model for data validation. The Cassandra project never aimed to develop a standard methodology for data analysis so further research can be done to align it with existing initiatives for standardization of supply chain analysis, such as the Buy-Ship-Pay model that was developed by UN/CEFACT[9].

A single entry point for business for real-time information

A single entry point for supply chain information was delivered in all trade lanes with a business dashboard. Table 6.3 shows the business dashboards that were implemented in the Asia-Europe Living Lab. The business dashboards of Descartes were identical for the

[9] http://tfig.unece.org/contents/buy-ship-pay-model.htm

Yantian-Felixstowe and the Shanghai-Ridderkerk trade lanes. A business dashboard for the Singapore-Rotterdam trade lane was not yet foreseen as first focus was on support of compliance activities.

Trade lane	Business dashboard by
Yantian-Felixstowe	Descartes
Penang-Venlo	GS1
Shanghai-Ridderkerk	Descartes

Table 6.3 Overview of Cassandra business dashboards in the Living Lab

All the pipeline information is near real-time and this is certainly an improvement with the pre-Cassandra situation in all the trade lanes. For some trade lanes, there was originally a weekly data exchange between parties (including more limited information) or information was shared as a paper dossier that was completed after vessel sailing and receipt of the master bill of lading. In some cases, certain information was not shared at all.

Risk-based approach

At the start of the Living Labs it was envisioned that a risk-based approach would be implemented as well, but the R&D work showed that implementation of alternative business-government interaction procedures in a demonstration environment was very difficult. As a consequence the concepts of a Risk Based Approach, a Risk Protocol and 'piggy backing' as described in WP 200 were not implemented. Therefore, the innovations and potential benefits were assessed during workshops but no actual changes were implemented.

The Risk-based approach workshops did however result in a better understanding of certain risks in the trade lanes and provided ideas for implementing alerting functionality in the business dashboards. Risks identified in the RBA workshop that were thus addressed were container delays, container content not matching the documentation, and data unavailability.

Customs and compliance innovations

Dutch and UK Customs had different ambitions of how pipeline information should be made available to them.

- Dutch Customs did not want the Cassandra pipeline information to interfere with the data from the declarations, in terms of for example the difference between legally required and optionally provided data. In addition to this, further integration of the optional information in Dutch customs' risk assessment modules of was not feasible within the scope of Cassandra. A dashboard would be sufficient to support their employees in risk assessment. In the future, further integration of pipeline data with the risk assessment system is desirable.
- For UK Customs, it would have been much more desirable from the start if the data had been made available to their new risk assessment system for real-time pre-departure, pre-arrival and declaration processing and risk assessment. This system already combines information from various sources and compares this automatically with the declaration data. Adding the pipeline as an additional source would support UK Customs and Border Force employees in a way that is integrated with their current way of working.

In the Cassandra project, the industry partners in the consortium only agreed that Customs would be able to see the information on the shipments but never to have the data. This is an important distinction as seeing the information in a dashboard only supports ad hoc risk assessment for a particular shipment but providing the actual data to Customs in such a way that they can also be stored enables trend analysis. Here, the shared data would extend beyond the data that is already shared with Customs in legal declarations. Sharing of data in

declarations or the same data as in declarations is obviously no issue. Because of this, it was decided to create only a Customs dashboard that supported querying of data for specific Cassandra shipments. This reflects the ambition of Dutch Customs for the Cassandra project but does not address UK Customs' ambition.

All trade lanes are linked to the Customs dashboard and the data is provided by the solution providers that developed the Cassandra pipelines as is reflected by table 6.4.

Trade lane	Data provided to Customs dashboard by
Yantian-Felixstowe	Descartes
Penang-Venlo	GS1
Shanghai-Ridderkerk	Descartes

Table 6.4 Overview of data sources for Cassandra Customs dashboards in the Living Lab

For the data needs of the Customs dashboard it was agreed that the priorities for the various kinds of information could be listed as follows:

- Goods information;
- Party information;
- Transport information, including Track & Trace milestones, or other information related to the fulfilment of the contract of carriage;
- Monetary information, including invoice and payment data.

The prioritization of data types was used when prioritizing the data capture in the trade lanes but eventually not all trade lanes were able to deliver the same level of data completeness. This was also clearly reflected in the Customs dashboard where for some trade lanes the data provided was only limited. Table 6.5 summarizes the extent to which the various trade lanes have delivered data to the Customs dashboard. In addition to the issue of data completeness, in some cases sensitive business information was cloaked which also limited the user experience.

Type of data	Yantian-Felixstowe	Penang-Venlo	Shanghai-Ridderkerk
Goods information	Good	Good	Reasonable
Party information	Good, although partly cloaked	Reasonable	Good
Transport information	Reasonable	Limited	Reasonable
Monetary information	-	-	-

Table 6.5 Overview of data types delivered to the Customs dashboard

UK Customs had access to the information in the pipeline via the customs dashboard. However, UK Customs wanted to see this extended with links between the pipeline and the UK declaration systems directly so that they have higher quality data in their own risk assessment systems as well. Because this was not included, they thought the use of the Customs dashboard was of too little value and therefore it was not used. Also, the amount of data in the customs dashboard was assessed to be a bit limited. The living lab has shown how the functionality can work and how it can be expanded in the future, but for now, the functionality and offered data is not yet complete enough according to UK Customs. Especially more detailed information on the invoice and goods value is necessary and inclusion of the Master Bill of Lading is essential to link the data to the manifest information in other systems.

Dutch Customs also had access to the information in the pipeline via the customs dashboard. But although the Customs dashboard delivery allowed for six months of evaluation, the trade lanes to the Netherlands were delayed and therefore time available for testing was even more limited. Not all the information could be provided by the trade lanes to

the Netherlands, although the most important required information on parties involved, and goods descriptions were made available to some extent. Especially the mentioning of the commercial parties behind the transactions was of added value as the ENS (and SAL) declarations only mention the forwarder as consignor and consignee in these trade lanes. So, although the available data is limited it could clearly show some of the potential already.

The Singapore-Rotterdam trade lane was the only trade lane in the Asia-Europe Living Lab that included multiple filing for ENS and also for export and import declarations and could have brought the demonstration of compliance innovations a lot further. The Descartes system has a module that can generate ENS declarations and UK import declarations and these could have been connected to the pipeline and probably demonstrate this as well for the Yantian-Felixstowe demonstration. It was however no longer feasible due to time constraints to implement this connection and the declaration filing functionality in the Living Lab once it became clear the Singapore-Rotterdam trade lane would not be implemented. In hindsight, this opportunity should have been identified earlier and the risk for the Singapore-Rotterdam trade lane should have been assessed more correctly. By doing this, it would have been possible to demonstrate more of the compliance innovations and also satisfy the ambition of UK Customs at least to some extent by providing them pipeline information from better sources in the official declarations.

Progress beyond the state of the art

The Living Lab Asia-Europe has shown that the IT maturity in international supply chains is very diverse and although technological solutions for data sharing were and are being developed these have not been implemented in the logistics industry to a particular large extent. The Living Labs have demonstrated how some solutions can provide benefits to logistics solution providers and their customers and also how they can be implemented gradually. In addition to this, the Living Labs have also shown that the uptake of these solutions can be stimulated with demonstrations and can bring ideas for further improvement that otherwise would not have been found. But another important lesson is that in some cases – like the difficult involvement of shippers shows –, the industry is not eagerly awaiting these solutions or else is not easily convinced of the added value of spending any amount of effort in realizing visibility. A conclusion is that the investments will only be made when there is a very clear business case for doing so and this might not easily be recognized as the problems and benefits of visibility might reside with very different actors or departments in the supply chain. Collaboration between businesses and also with governments authorities can overcome this issue, but also brings additional challenges of its own.

The idea of the Cassandra pipeline was formed at the end of the Integrity project and although the Cassandra R&D work has developed the idea further, the logistics industry and its solution providers not stood still in the meantime. During the Living Labs, workshops were organised with trade lane partners outside of the consortium to discuss the work on the Cassandra pipeline and business dashboards. It became apparent that these companies have their own in-house systems that perform some or much of the functionality of the Cassandra dashboard. Some of these systems also provide near real-time interfacing with supply chain partners. Differences were in the clear focus of Cassandra on capturing data from the source which was not always an important prerequisite for the companies. Also the sharing of data with other parties in the chain was not yet apparent for the companies outside the consortium and their systems were not always ready to support this. But it is a logical next step for them. Sharing data in a standardized way to really create what the Cassandra project describes as the ‘Backbone’ will be more difficult as these solutions focus more on trade lane or company specific solutions. The developments in the industry and the solutions that are already developed outside the Cassandra project show that the Cassandra solutions are no longer unique. This development also shows that the market for exploiting the Cassandra solutions and ideas is perhaps becoming increasingly ready for real-time data

sharing and inevitably also for making this data sharing more efficient through standardisation.

Summary of what went well and what could have gone better
Below table 6.6 summarizes what went well in fulfilling the demonstration purpose and what were the points that could have gone better.

What went well
The Living Lab Asia-Europe demonstrated good examples of the configuration types that are described in the Cassandra IT roadmap.
The data from the source principle was implemented in all Living Labs
The Living Lab demonstrations have in all cases succeeded in combining purchase order data with shipment details, party information and transport milestones.
Business dashboards were delivered in all trade lanes and all trade lane pipelines were eventually connected to the Customs dashboard.
Business dashboards offered the possibility to record the source of data elements, thus supporting data validation.
The DASC methodology in an unexpected but interesting side product of the Living Lab Asia-Europe.
The Living Lab has shown that the uptake of solutions can be stimulated with demonstrations and can bring ideas for further improvements that otherwise would not have been found.

What could have gone better
There was not yet consensus in the Cassandra consortium on the chosen interface solution for the Customs dashboard.
Data completeness differed a lot between the various trade lanes.
Testing period for the Dutch Customs dashboard was too limited due to timing issues with delivery of the pipeline solutions.
Expectations for the implementation of the Risk based approach principles should have been better managed.
Ambition and expectation of UK Customs in the Living Lab Asia-Europe should have been better managed.

Table 6.6 Summary of what went well and what could have gone better

16.3 Continuation of the work after the Cassandra project

Already during the Cassandra project, it became apparent that not all ideas could be implemented before the end of the project. Some of the partners involved in the Yantian-Felixstowe and Penang-Venlo demonstration therefore decided to join in the FP7 Core project where the use of the Cassandra pipeline concept to improve security and risk assessment will be evaluated further. The efforts of the Cassandra project will be re-used where possible. Also, scalability issues will be tackled as the solutions will be expanded to other trade lanes.

Because the work on the Shanghai-Ridderkerk trade lane was not completed in the project, the parties are now evaluating if it is possible for them to extend their collaboration outside the Cassandra project and therefore enable the commercial party in the trade lane to fully assess the benefits of visibility through the Cassandra solutions offered.

Dutch Customs is continuing its work on distinguishing trusted traders from trusted trade lanes and this work will continue after the Cassandra project. Some of the lessons learned from the Living Lab Asia-Europe will be re-used and also some of the Dutch participants in the Living Lab have been invited to collaborate further in operationalising this concept.

The work on the Living Lab methodology has already been proceeded in the FP7 LogiCon project where a Handbook is being developed for use in logistics Living Labs. The lessons learned from the Cassandra Living Lab Asia-Europe are also included there. This includes both the aspects that went well and what could have gone better.

Appendix A – Long list of data elements

Below table shows the long list of data elements, in random order, that were identified from the dossier analysis of the Cassandra trade lanes. In addition, the table also shows the relevance of the data elements for compliance according to annexes 37 (import and export) and annex 30A (ENS). The list starts with the reference numbers.

	Box for export in Annex 37	Box for import in Annex 37	Box for ENS in Annex 30a		Box for export in Annex 37	Box for import in Annex 37	Box for ENS in Annex 30a		Box for export in Annex 37	Box for import in Annex 37	Box for ENS in Annex 30a
Purchase order #				Number of items	5	5	5	Requested Arrival Date of goods			
Item #				Item price		42		Actual arrival date of goods			
Booking #				Origin criterion				Inland mode of transport	26	26	
Container movement #				Certificate of origin reference				Booking reference			
Container #	31	31		Origin stamp of country				Name and address of Inland Carrier (Haulier)			
Seal #				Origin stamp of consignor				Voyage number			
Commercial Invoice #				Place and date of origin stamp				ETS (inland leg)			
Conveyance Reference Number				Inspection Affiliate code				ATS (inland leg)			
Transport Document Number				Inspection number				ETA (inland leg)			
HBL# (House Bill of Lading Nr)				Inspection Report number				Name and address of departure location			
MBL# (Master Bill of Lading Nr)				Quality inspection date				Name and address of arrival location			
MRN # (Movement Reference number, return number of customs)				Quality inspection conclusion				Identifier of means of transport (e.g. vessel name, truck license plate)			
Name and address Shipper	2	2	2	Quality inspection authorized signature				Name and address of Terminal of loading			
Name and address Seller				Item EAN number (barcode)				Actual Gate in at Terminal (export leg)			
Name and address Exporter				Net mass	38	38		Location of goods	30	30	30

Country of export	15	15		Consignment Dimensions (L*W*H)				Place of loading for Ocean Carriage	27		
Manufacturer				Gross mass	35	35	35	Place of unloading for Ocean Carriage			
Country of origin	34	34		Limit gross weight container				Countries of Routing			
Name and address Consignee	8	8	8	Empty depot location for pick up				Identity and nationality active means of transport at departure	18	18	
Name and address Buyer				Empty container Request date/time				Identity and nationality active means of transport on border crossing	21	21	21
Name and address Importer				Empty container Release date/time				Identity and nationality active means of transport at arrival			
Country of destination	17	17		Actual Empty container Release date/time				Mode of transport at the border	25	25	
Declarant identification	14 & 50	14		Container type				Voyage number			
Incoterms	20	20		#Containers (Quantity)				Notify party Name and address			9
Terms of payment				Shipment type				Special stowage request			
Nature of transaction (Community code Annex 38)	24	24		Shipping marks			31	Place issueing Bill of Lading			
Invoice currency	22	22		Seal number				Service contract number			
Exchange rate	23	23		Name and address Ocean Carrier Agent				Declaration procedure	37	37	
Total amount invoiced	22	22		Name and address Ocean carrier				Declaration Type Identifier	1	1	
Method of payment transport charges				Container delivery cut off date / time				Summary declaration ID/ Previous document	40	40	
Requested date/time for Stuffing				Shipping Instruction cut off date / time				Person Lodging Summary declaration			14
Actual date/time of stuffing				ETS (ocean leg)				Valuation Method for items		43	
Stuffing location				ATS (ocean leg)				Statistical value	46	46	
ID of Warehouse (Export)	49	49		Actual Date/time Shipped				Calculation of taxes	47	47	
ID of Warehouse (Import)	49	49		ETA (ocean leg)				Deferred payment of customs duties and/or tax credit	48	48	

Forwarder name and address				Date Cargo Received at POD				Declaration date			
Goods description				Place of Receipt Pre-carriage				Signature/ Authentication	54	54	54
Item number (goods)	32	32	32	Port of Loading				Country Code first place of arrival (EFTA Country code intended office of entry)			
Item description				Port of Discharge				Date & Time first place of arrival (EFTA Country)			
Customs item description				Place of Delivery				Other Specific Circumstance Indicator			
Commodity code				Actual date/time of loading on board				If quota, order nr. of tariff quota for which declarant is applying		39	
Customs item description International				Name of vessel at departure / Mother Vessel name				Preference Data			
Commodity code International	33	33	33	Feeder Vessel/Flight name				Licensing Data			
UN Dangerous Goods Code				Confirmation of exit				Customs office of exit	29		
Type of packages	31	31		Vessel Closing Date/Time				Customs office of entry	53	29	
Number of packages	6 & 31	6 & 31	6					UCR (Unique Consignment Reference Number, commercial ref.nr. intended offices of transit)	7 & 51	7	7

Appendix B – Customs list of 60 data elements

Below table shows a list of 60 data elements, resulting from combination of the Annex 30A and the Annex 37 for an example of importing goods from outside the EU.

Country of export	Carrier
Country of destination	Identity & Nationality active MoT at departure
Item value (price)	Countries of routing
Invoice currency	Identity & Nationality active MoT on border crossing
Total amount invoiced	Mode of transport at the border
Exchange rate	First place of arrival code
Nature of transaction	Date & Time first place of arrival
Delivery terms	Identity & Nationality active MoT at arrival
Transport charges method of payment	Shipping marks
Consignor	Other specific circumstance indicator
Consignee	Unique CRN
Identification of warehouse (export)	Transport document number
Identification of warehouse (import)	Person lodging summary declaration
Consignment weight (Net mass)	Declaration procedure
Goods description	Quota (Box 39)
Type of packages	Summary declaration ID/ Previous document
Number of packages	Valuation method for items
Number of items	Statistical value
Goods item number	Calculation of taxes
Commodity code/ Tariff number code	Deferred payment
Country of origin	Declaration date
UN Dangerous goods code	Declarant/Representative/ Principal/Importer of record/Applicant ID number
Equipment ID number (if containerised)	Signature/ Authentication

Place of loading for sea carriage	Preference data
Place of unloading for sea carriage	Licensing data
Gross mass (kg)	Declaration Type Identifier
Seal number	Customs office of exit
Location of goods	Notify party
Inland mode of transport	Customs office of entry
Conveyance reference number	

Appendix C – Background to the Yantian-Felixstowe trade lane

C.1 Possible involvement of East Port Technology

The following texts are fragments from the period reports one and two and explain how the possible involvement of East Port Technology (EPT) was initiated and evaluated.

Periodic report period 1:
Originally, we had budgeted for costs associated with hosting SICIS, which is a data base with shipping information to be used in CASSANDRA. SICIS could eventually not be used in CASSANDRA but because the data in SICIS would prove extremely beneficial to CASSANDRA, it was decided to obtain access via East Ports Technology, a Chinese IT SME that falls under Chinese Customs. Albert Veenstra and Heather Griffioen visited with EPT in December 2011 to discuss the possibilities. It was agreed that EPT would accede to the project following their validation. They would provide access to the SICIS kind of data and otherwise contribute to the project from the Chinese perspective.

Periodic report period 2:
The validation of East Port Technology took near to a year to complete, at which time, priorities on both the part of the project and the part of EPT had changed. It was no longer auspicious for us to cooperate in the way we had originally envisaged. We mutually decided not to continue with the accession of EPT to CASSANDRA.

C.2 Workshop minutes

Below tables show the minutes of the workshops that were held for the Yantian-Felixstowe trade lane. The minutes are for the workshops with external parties only and not for all smaller project team meetings and teleconference meetings. Minutes were made anonymous were this was expected from the external parties.

Date	22 February 2012
Location	Felixstowe, UK
Attendees	Ronnie Brooks (BAP), Robin Smith (BAP), John Prop (BAP), David Hesketh (HMRC), Martijn van der Horst (RSM), Huib Aldewereld (TUD), Inge Lucassen (TNO) and representatives of Allport and UK Border force
Responsible for minutes	Inge Lucassen, TNO

Allport is a UK based company that was bought by the Hong Kong based company Cargo Services about one year ago. They work together on the CASSANDRA Living Lab trade lane for a UK retailer.

The retailer negotiates contracts with ocean carriers. Cargo Services (CS) arranges for sea carriage for each container. 75-80% of containers is shipped with MSC. Allport receives information about the vessel the containers are arriving on in the UK about 10 days before vessel ETA. Sometimes containers are transshipped in Singapore.

The system LIMA was originally owned by Allport but is now also used by CS. LIMA is used as an internal tracking system where purchase order and shipments are tracked. There is only one instance of LIMA, which is simultaneously available to both Allport and CS. BAP receives a weekly data dump from LIMA which is uploaded in the BAP system DBS.

Allport is responsible for making import declaration for the retailer. However, Allport is not liable for correctness of the declarations. Therefore, the retailer performs regular audits and checks on the declarations filed by Allport. Currently, Allport has a score of 99,7% correct declarations and they are still aiming on increasing this to 100%.

Allport starts the import clearance process about 7 days before arrival of the goods in the UK. Allport is allowed to use a simplified procedure and the retailer makes monthly payments for import duties. To make import declarations, Allport needs the document set that belongs to the shipment (B/L, invoice, origin documents (A form), inspection reports, etc). These documents are physically send to Allport about 3 days after stuffing and departure of the vessel. Documents are collected by CS and when the document sets is not complete, CS will chase further information that Allport needs. The manifest information is needed to complete the declaration and this information is sometimes really late, e.g. just a few days before ship arrival in Felixstowe (especially for carrier Maersk).

Receiving a commercial release on the containers is only a problem when manifest information comes available really late. Because house waybills (also called Forwarder Cargo Receipt (FCR)) are used from Hong Kong to FXT (no original bill of lading) a commercial release is usually on arrival. An issue that Allport and BAP have with the commercial release is that Maersk has an expiry date on the release of 7 days. Sometimes the container stays on the quay side for 30-40 days (for example when there is no warehouse capacity at BAP). Allport doesn't officially allow the containers to be shunted to a storage facility but sometimes this is done anyway. Releasing the container from this storage facility is time consuming. MSC allows containers to stay on the quay side so there is no issue with MSC. Allport has requested for an open end release but so far this hasn't worked.

For the CASSANDRA trade lanes we mainly look at LCL shipments from the CS warehouses in Shenzhen and Hong Kong. Direct shipments (CYCY) are also handled by Allport and BAP. In direct shipments, CS is not able to check the exact content of the container during stuffing. Regular inspections are carried out by BAP on behalf of the retailer to check for PO compliance. There are also penalties for suppliers that do not deliver according to Purchase Order or do not provide correct cargo information. The retailer contacts suppliers directly in case of discrepancies (CS, Allport and BAP play no role in this). Allport does perform the task to reclaim import duties for goods that turned out to be missing. These discrepancies are usually loading issues (e.g. incorrect number of items) and usually not product issues (e.g. incorrect good information).

Allport sees benefits in a green lane facility from Felixstowe because this can result in a better planning of inland transport and warehousing (also for BAP). Also a reduced number of inspections might be beneficial although they have an average of only 1 inspection per month.

Products that are handled by BAP for this retailer are tinned tuna, sweets, chocolates, frozen poultry and plastic kitchenware. During the demonstration it might be considered to involve port health in combination with Destin8. This is considered to be a good future opportunity by all meeting participants.

Date	2 March 2012
Location	Hong Kong, China
Attendees	Albert Veenstra (TNO), Inge Lucassen (TNO) and representatives of Cargo Services
Responsible for minutes	Inge Lucassen, TNO

Cargo Services (CS) is a Hong Kong based company and also has a location in Yantian, China. Both locations have a warehouse operation. Total number of employees is 400. About one year ago, CS bought the UK company Allport. The Hong Kong location mainly deals with clothing products. Most of the UK retailer business goes through the Yantian warehouse and/or port.

The UK retailer business where CS is involved in can be divided over FCL (+80%) and LCL shipments. The retailer negotiates contracts for sea carriage with various carriers and instructs CS on the division of transport orders over the different contracted carriers.

For the FCL business, the Purchase order is sent by the retailer to the shipper directly. CS receives a copy of the PO in the LIMA system. The shipper then decides on the date of shipping and instructs CS accordingly (necessary number of containers and date). CS makes the booking for sea carriage and also arranges for empty containers to be made available. The shipper arranges for pick-up of the empty container, loading at the shipper's location and delivery of the container to the port terminal.

The shipper is also responsible for delivering ENS information to the carrier and making the export declaration. CS is not involved in these processes.

For the LCL business, the Purchase order is also sent by the retailer to the shipper directly. CS receives a copy of the PO in the LIMA system. The LIMA system is structured around the purchase orders. Shipment details are all related to these purchase orders. CS works with a separate warehouse management system that is structured around shipment orders. The retailer instructs the shipper on which warehouse/port to use for this shipment (Hong Kong or Yantian). The shipper informs CS on the expected delivery of the shipment to the CS warehouse. The shipper arranges for the transportation of the shipment to the warehouse and the preparation of the export declaration information. The truck arrives at the CS warehouse (CFS bonded warehouse in Yantian) and the driver hands over the goods and the documents for the export declaration. The CFS warehouse has a special customs team (third party operation) which checks the export declaration information and forwards the final export declaration to the China customs. The goods can only be shipped from the warehouse when the goods are cleared for export. CS makes sea carriage bookings (for LCL, main carrier is Evergreen) and arranges for the empty containers. CS also appoints shipments to containers and prepares and provides the ENS information to the carrier accordingly. One the vessel has left the Yantian port, the B/L is made available by the shipping line. The shipper meets CS in the CS office for document exchange. B/L is handed over to the shipper, and the shipper hands over a document set that contains the invoice, packing list, A form (origin document) and inspection reports. CS checks the document set and forwards these physical documents to Allport. Allport needs these documents to make the UK import declaration. Allport is preparing a document upload facility in LIMA so that digital documents can be uploaded and linked to the purchase orders. Hard copy documents are forwarded to Allport because CS is not aware if UK customs would accept digital documents (or digitally forwarded and re-printed documents) as part of the import declaration.

We have spoken about the CASSANDRA trade lane and how we want to develop a visibility dashboard and experiment with customs export=import data sharing. We talked about a business visibility dashboard on top of DBS, and perhaps in time also linked to LIMA. LIMA holds most information in digital data format, only the container manifest is a pdf document. The invoice is now a hard copy document but the basic information (data elements) on good prices etc is also available in LIMA. We also spoke about the possible participation of East Ports in the project and how we need to capture the export declaration data. CS will check which system is used by the CFS customs team. This will determine next steps to involve East ports in this trade lane, the need to ask CFS for support, and to determine how to capture export declaration data. Terminal milestones might be available here if Hutchison and East Ports collaborate on a Chinese platform. Since LIMA holds all the purchase order information and before end of 2012 also the digital documents, it makes sense to create a full visibility dashboard linked to LIMA as well. Inge will check whether UK customs will accept digital documents as part of a trade facilitation concept. CS says that availability of the documents is now linked to the hand-over of the B/L because of convenience (one combined hand over of physical documents) but that documents might be available earlier when they are uploaded to LIMA by the carrier. Since Evergreen is the main carrier for LCL, it might be interesting to involve Evergreen in a later stage to see if they can contribute to the pipeline as well.

Date	17-19 September 2012
Location	Hong Kong and Yantian, China
Attendees	Ronnie Brooks (BAP), Eric Geerts (Descartes), Raymond Law (Descartes Hong Kong), David Hesketh (HMRC), Albert Veenstra (TNO), Inge Lucassen (TNO) and representatives of Cargo Services and SKG
Responsible for minutes	Inge Lucassen, TNO

General information

Policy of the retailer has changes and about 80% of the shipments now go through the Cargo Services (CS) warehouses in Yantian and Hong Kong. This is because there can be more control on the shipment and loading of the goods and to maintain the retailer's quality standards. CS plays an important role in the trade lane. Some FCL shipments are still send directly but it is expected that the retailer will move to 100% warehouse shipping to have better control on the shipment quality. This means that all shipments are delivered to the CS warehouse location, even when this is an FCL shipment, and that CS consolidates according to retailer wishes. This means that it is also possible to

create mixed shipments from different suppliers that are destined for a specific UK region, DC or store. This will simplify logistics on the UK side.

For other shippers, CS also does quality inspection of the items. For the customer in this trade lane this is not yet done. Also, CS has a scan and pack process for another customer, where goods are repacked and the goods and boxes are scanned. This automatically feeds into the customer's system.

For the CASSANDRA trade lane, the good flows that are in scope, are the flows that are shipped via the CS warehouses, especially the one in Yantian.

Process for LCL
The Purchase order is sent by the retailer to the shipper directly. CS receives a copy of the PO in the LIMA system. The shipper then decides on the date of shipping and instructs CS accordingly (necessary number of containers, goods description and date) by filling in an Excel template for the Shipping Order (s/o). The s/o does mention the supplier of the goods, which is normally a selling agency. The address of the supplier is the office address of the selling agency. The factory address is usually not provided. The retailer has commercial reasons to keep factory locations secret and this information is also not shared with CS unless absolutely necessary. CS checks the s/o with the PO. In case a quality inspection is necessary, CS waits for the report of the inspection agency SPS. When the report is received, CS makes the booking for sea carriage and confirms the s/o with a requested date of delivery to the container freight station (CFS). The CFS in Yantian is a customs controlled warehouse with its own customs team and used by different consolidators of which CS is one.

The shipper arranges for the transportation of the shipment to the warehouse and the preparation of the export declaration information. The truck arrives at the CS warehouse and the driver hands over a goods sample and the documents for the export declaration: Commercial invoice, Packing list, etc. The CFS warehouse has a special customs team (third party operation) which checks the export declaration information. It checks if the documentation is consistent and whether this corresponds with the goods sample. If the customs teams accepts the documentation the goods can be unloaded.

CS makes sea carriage booking (main carrier is Evergreen) and arranges for the empty containers. The booking information is registered in the EDISON system. The S/o is also registered in the EDISON system and linked to the booking. Based on the different s/o's a container manifest is prepared that details for each item the PO number, Sb SKU number, destination, goods description, HS code, number of pieces, packaging and weight. The container manifest also states the container number and type, vessel, port of loading and port of destination. The container manifest is used to create the shipping instruction for the ocean carrier. The shipping instruction is send to the carrier by email. The ocean carrier typically uses the SI to create the ENS declaration. The SI can be send to the carrier before actual loading of the container has taken place.

The customs team uses different systems to get the goods cleared for export:

- QP system: National customs system which is installed on a special computer, provided by Chinese government;
- WMS with East Ports module; The WMS is a CFS system and the East Port module is provided by the regional, Yantian customs authority. The East port module is installed on a CFS computer.

The customs team starts with generating a UCR number in the East Port module. This UCR is then used in the QP system where an export declaration is filed for Chinese customs. This declaration details among others the shipper, origin and destination, packaging, weight, goods description, value and HS code and is also used for tax purposes. If Chinese customs gives a green light for the shipment an MRN like number is given as response. This MRN number start with the region code (5316), year (2012), export/import code (0/1) and a unique number. Example: 531620120166556892. The next step in the export clearance process is a regional customs declaration which is used by customs for risk assessment and inventory control in the CFS. This declaration will state the MRN and the UCR, a warehouse reference number and the goods details. The declaration is send to Yantian customs with the East Port module and via EDI messaging. Based on this information, Yantian customs decides whether physical inspection is necessary. Physical inspections are

performed in the warehouse. Before final clearance the goods are not allowed to leave the CFS. The export declaration can be send to customs before actual loading of the container has taken place. It is therefore based on the planned container manifest. Typically, it takes one day to file both declarations and receive the responses of customs. The process takes of course longer when physical inspection is needed. The total process takes about 2 hours of work per shipment. Both systems require manual key-in.

CS loads the goods in the container. A tallyman supervises the container loading and checks whether everything is loaded according to the container manifest. During loading of the container 5 photos are taken in different stages. These photos are stored for 3 months. The container is always loaded according to the container manifest. If there is a problem with loading the goods that means the container manifest cannot be followed exactly, the loading process is put on hold. If there is no solution is possible to get the container loaded according to the manifest, CS will have to change the shipping instruction to the ocean carrier and the export declaration. This means additional work for CS and that is why the container manifest is strictly followed and why the planning of shipments, so creation of the container manifests, is an important process step. A copy of the container manifest is taped to the inside of the container door. Only when the goods are cleared for export the container doors are closed and the container is sealed. The container will be transported to the Yantian container terminal by truck.

Yantian port has a sort of PCS called EasyPort. This system is expected to register a confirmation of exit for the trader at exit, similar to the situation in UK and NL. Once the vessel has left the Yantian port, the B/L is made available by the shipping line. CS is mentioned on the B/L as the consignor of the goods. A CS waybill is used between CS and the supplier. Within 3 days after vessel departure, CS updated LIMA with the container manifest and vessel details and the vessel load confirmation. The information is keyed into LIMA. There is not yet an interface available between EDISON and LIMA but CS is considering this for future improvements.

CS forwards the physical documents of the shipments to Allport. Allport needs these documents to make the UK import declaration. Allport is preparing a document upload facility in LIMA so that digital documents can be uploaded and linked to the purchase orders. Hard copy documents are forwarded to Allport because CS is not aware if UK customs would accept digital documents (or digitally forwarded and re-printed documents) as part of the import declaration.

Note on direct FCL: For direct FCL shipments from supplier to UK the customs process is slightly different. In that case the export declaration is made by a customs broker of behalf of the supplier after container stuffing and before delivery of the container at the container terminal. In case a physical inspection is needed, it will be performed at the container terminal and not at the factory. This trade lane is out of scope for the trade lane demonstration but the CASSANDRA event model needs to cater for this situation as well. As this situation resembles the Seacon trade lane, this is not expected to be an issue.

IT systems
The LIMA system is structured around the purchase orders. Shipment details are all related to these purchase orders. CS works with a separate freight forwarding system, EDISON, that is structured around shipment orders. EDISON is an in-house system of CS and used for s/o, creation of shipping instruction to the ocean carrier, creation of jobs for loading – container manifest- and invoices. There are no direct interfaces with other systems and parties so all communications are done by email and phone.

Considerations for CASSANDRA pipeline
Ronnie Brooks states that information sharing with the pipeline is only agreed by the retailer if this is done via the controlled environment of DBS. DBS therefore needs to be fed with all the information via a data dump which is not the same as real time event information. At the moment, there is a weekly data dump from LIMA. Cordon and Ronnie agree that this can be made a daily data dump if necessary. Also the inclusion of more data elements is no problem. Of course, the data elements that are shared need to be approved by the retailer.

CS would be willing to key in the container manifest information in LIMA directly after container

stuffing instead of after vessel departure. This process can only be done for a subset of containers because it directly affects operations. It will take CS 1-2 days to complete this after container stuffing. Typically, there are 3 days between container stuffing and vessel departure.

Descartes has presented an intermediate version of the business dashboard. Receiving carrier tracking information is already a standard functionality of Descartes and can be realized if one of the B/L parties gives approval for this information sharing. Availability of milestones depend on the carrier, but typically these milestones are:

- EO: Empty out at empty container depot;
- GI: Gate In at terminal of loading;
- ATL: Actual time of loading;
- V ATD: Vessel actual time of departure;
- V ATA: Vessel actual time of arrival;
- ATU: Actual time of unloading;
- GO: Gate out at terminal of unloading;
- EI: Empty in at empty container depot.

Eric will provide Ronnie with this application document and Ronnie will try to arrange approval for this. Descartes is working on new functionality that will make the vessel sailing schedule available to its users. This can be interesting for CASSANDRA as well. Receiving carrier milestones can be easier when Descartes receives a digital copy of the booking confirmation. Together with the approval for container milestones, this will be discussed with the retailer and Evergreen.

The business dashboard makes a clear distinction between POs, shipments, container manifest and vessel details. According to the trade lane process these are all n to no relations. The different situations need to be described and mapped to the event messages to see whether this is not going to be an issue in the Descartes data model, dashboard, and CASSANDRA data model. Also the situation of selling containers during ocean carriage, perhaps even to multiple buyers complicates this by adding more n to n relations on the buying side. This is not only important for the BAP trade lane but for all CASSANDRA trade lanes.

Because of this information structure, one large data dump from LIMA can be difficult to sort out for Descartes. Eric will therefore work with John (BAP) to see if it is possible to divide the LIMA information over different csv files so that the structure better resembles the Descartes model and also the CASSANDRA event structure. It might be good to get a dump directly from the EDISON system, in addition to a LIMA data dump. This will be investigated by John and Eric and CS will be consulted on this.

David states that Destin8 has an important information hub function for Felixstowe customs, because CUSCAR and CUSDEC declarations go via Destin8 to the CHIEF system and Destin8 performs the customs inventory control function for the FXT terminal. UK Border force also uses Destin8 as information source. He would therefore prefer that Destin8 also has a clear function in the CASSANDRA pipeline. By this, the information of the UK side of the trade lane which is already largely available in Destin8 can be included in the pipeline. David knows that the key to find related data in Destin8 will be the vessel and voyage number. This information then needs to be available in the pipeline before vessel arrival in FXT.

Identified benefits for trade lane parties

CS thinks there will be no direct benefits for them in using the CASSANDRA pipeline. Everybody does however see some benefits for CS' subsidiary Allport, e.g. in preparing for import declarations.

BAP has a clear benefit for improved warehouse planning that results from more advanced information about the container manifest and especially the vessel tracking. The container manifest details will be received in DBS but the combination with the vessel tracking details is made in the Descartes dashboard.

Most benefits were identified for the retailer:

- Visibility will give more reliability and also trust in container content. Based on this, it will be

possible to remove warehousing function for some of the containers and store the goods at BAP in the container instead of the more expensive warehouse. This means a negotiation with the carrier will be needed to make longer use of containers for storage purposes but this is not expected to be big problem. Combined with the possibility of CS stuffing for specific regions or even specific stores, this can diminish the UK costs for logistics significantly. This kind of temporary storage will be officially allowed under new customs legislation that is now being prepared.

- Visibility will also make it possible to actively monitor the containers, their contents and the time lines for final delivery to stores. This is especially interesting for seasonal products. It has happened that by accident a container with seasonal product was forgotten to be delivered on time. The goods then had to stay in the warehouse for a year before they could be sold. Inventory management can thus be improved.
- Visibility can also promote the cooperation between merchandising and logistics department and help improve reliability and trust in the supply chain operations. Because merchandisers want to be sure of product availability, containers are sometimes stored at the terminal for long times. This means unnecessary long lead times and high storage costs.

The last 2 benefits can be monitored and measured by introducing KPIs. These KPIs can later also be included in the dashboard. Derived from this, there can also be financial benefits, such as reduction of interest.

HMRC wants to have better information for risk assessment. Also, HMRC wants insight in discrepancies in for example goods amounts and value difference between export and import. Value differences can exist because of inclusion of logistics costs on only one side, depending on the Incoterm but sometimes the goods are overvalued at export and undervalued at import to try to obtain tax benefits. Ideally, the pipeline should help indicate this.

Appendix D – Background to the Penang – Venlo trade lane

D.1 Workshop minutes

Below tables show the minutes of the workshops that were held for the Penang-Venlo trade lane. The minutes are for the workshops with external parties only and not for all smaller project team meetings and teleconference meetings. Minutes were made anonymous were this was expected from the external parties.

Date	12-13 April 2012
Location	Penang, Malaysia
Attendees	Johan Vosbeek (Seacon Logistics), Virginia Dignum (TUD), Raymond Ng (GS1 HK), K.W. Ho (GS1 HK), Albert Tsang (GS1 HK), Goh Chiang Fein (GS1 Malaysia), Inge Lucassen (TNO) supported by William Lim (Freight Masters (FM), Seacon's local agent)
Responsible for minutes	Inge Lucassen, TNO

Meeting with shipper

The shipper notes that the container volume on this trade lane is likely to decrease to 1-2 containers per week, where this was earlier more than 10 containers per week. Océ has a hub in Singapore (operated by DHL) which is increasingly used (30-40 containers per week). The shipper will ship the goods to the hub (by truck) and from there the goods are distributed over the Océ locations around the world. FM is not involved in the trucking of these containers to Singapore. The team notes that the volume of the trade lane is not crucial for its success and that it does not affect their interest in the trade lane.

When the shipper needs to ship containers to Océ in Venlo directly, they make a booking with FM by email. They inform on the number and type of containers and the required feeder loading date. *(Note: Evergreen has 2 feeder vessels per week from Penang to Tanjung Pelepas Port (TPP, southern Malaysia) which directly connect to the two Evergreen ocean vessel that sail from TPP to Rotterdam.)* FM then makes the booking with the carrier Evergreen (under Seacon contract). FM also contacts the forwarder that acts as a haulier and informs them on the empty depot and the necessary transport (of empty and full container) from the shipper's premises to Penang port. FM confirms the booking of the vessel to the shipper. When the container is loaded and the P/L information is available (no official P/L is created), the commercial invoice is created and forwarded to FM. FM creates a Freight Masters Waybill and sends this to the shipper. The shipper does not receive the Sea Waybill from Evergeen.

The shipper has a system from Baan that is supported by their in house IT team. In this system they key in the PO from Océ. The information is updated with the actual shipment details (P/L details) and based on this a commercial invoice is printed. The Baan system can print the invoice but it is unknown if it can also report in other formats. The invoice is scanned and emailed as attachment to FM. The hard copy invoice is stored and no digital document is available in the system. FM keeps the shipment details for the shipper in an excel spreadsheet called ShipLog. This ShipLog file is used on special request of the shipper and it is not used for other FM customers. The shipper uses this file to communicate with their other freight forwarders as well. The ShipLog file is shared with the shipper to inform them on their bookings at different moments.

Evergreen (EVG)

Evergreen receives the booking with number of containers and container type and requested feeder departure date from FM. EVG adds the specific vessel information to this booking and confirms the booking to FM and the empty depot that needs to supply the empty container. When the empty containers are picked up at the empty depot, the specific container numbers are linked to the booking and this information is forwarded to EVG. Because the shipper might swap containers for different bookings, the container number is checked at arrival at the port of Penang and the container number is then definitely linked to the booking. EVG provides the seals that are used by the shipper with the

empty containers. Some customers want to use their own seals but EVG prefers that their own seals are used. Because the seal number is not checked at the Penang port, it sometimes happens that the wrong seal number is linked to a certain container. The (Customer's) seal numbers are mentioned in the goods description field in the Sea waybill.

To produce the ENS declaration for the shipment, EVG only needs the Océ EORI number and HS codes for each specific shipment. The EORI number is used to identify the European buyer. Malaysia does not use EORI numbers to identify business parties but a Registration Number. EVG knows the shipper and only needs the HS codes to generate the correct goods description. The HS code and EORI number are used to make the ENS declaration and to produce the Sea waybill.

EVG has a global IT system that is called Shipment Link. Support and management of this system is done in Taipei. This system holds the container tracking information. This information can be shared with customers via a customer portal but EVG does not use INTTRA to distribute this tracking information. Customers can also use the web portal to send EVG a shipping instruction (SI). FM however creates a SI in Excel and emails this to the EVG office in Penang. Shipment Link can also receive SIs via EDI messages but only a subset of customers uses this functionality. Because of limited EDI and web portal use for SI, the EVG team has to key in all the booking details in the system.

Penang Port

The Penang port is a Custom port and not part of a Free Trade Zone. The port is responsible for checking the status of import containers, because Malaysian customs do not play a large role in import. The Malaysian customs are present in the port to deal with export containers and possible inspections.

The Penang port shares all the vessel and container information with Malaysian customs, through their own system (Malaysian customs log on to the port system as they also do with other port systems in Malaysia, different terminals all have different systems). The port system can communicate with shipping companies via the standardized EDI messages (COPRAR, COREOR and BAPLIE). Ftp communication is also possible.

The Penang port is willing to share milestones on the specific containers that are involved in this Living Lab but only when the shipper and FM formally give consent for sharing the terminal milestones. Also, it was noted that costs are involved for these milestones and that this must be discussed with Port management.

PKT

FM forwards the commercial invoice to PKT who is responsible for the export declaration. The shipper always stays liable for the correctness of the export declaration but responsibility is transferred to FM and from there to PKT. PKT only uses the booking information from FM and the commercial invoice from the shipper to complete the export declaration form. After sending the declaration to customs, it takes about 45 minutes to receive a response. If the response is positive, PKT inform FM that the container is released and can be transported to the Penang port. When it arrives at the Penang port, the seal is checked and when this is intact, the container is accepted for gate in by the port and is officially released/ cleared for export. It is possible that the export declaration is not approved. PKT then needs to contact customs to request information on the reason of rejection. This might mean that a correction to the export declaration is needed (the shipper needs to be contacted for additional/ corrected information) or an inspection might be needed. When an inspection is needed, this is communicated with FM. FM then contacts the shipper to discuss if either FM or the shipper will be present at the container inspection. An exporter's representative needs to be present at inspection when the seal is broken. The container needs to be transported to the Penang port, where it will be transported to the in-port examination area. Container inspection always takes place at Penang and never at the transshipment port.

PKT checks the HS codes of the goods when they enter the information in the declaration form. There is no responsibility for choosing the correct HS code but they act in the interest of the shipper as the customer. For the shipper, as licensed manufacturer it is important to have a correct administration of imports and exports since the balance of both import and export determine the

duties to be paid at the end of the accounting period. So therefore, the declaration of both import and export are equally important.

PKT uses the customs system to prepare the declaration. All information needs to be keyed into the system, although the system offers some support (e.g. filling goods description based on HS code). The declaration is then sent via EDI to the central customs system. An EDI response is received to inform on acceptance and rejection.

Kontena Nasional (KN)
KN is used by the shipper as a haulier and works also for other freight forwarders of the shipper than FM. The booking for container transport is forwarded to KN by FM. KN creates an RD number for this booking and this RD booking is used as a reference by FM, KN and the shipper (because the container number is not yet available). The RD number is unique.

When a shipment is planned for container loading, the shipper sends the requested container delivery time and the related transport information of that shipment in a ShipLog file to KN. With the ShipLog file, KN can link to the information of FM and knows at which empty depot the container needs to be picked up. When the empty container is picked up, the RD number is linked to the container number. Information of the trucks and the transport milestones are recorded because there is direct radio contact between the drivers and the KN office. Upon pick up, the driver hears which container number needs to be picked up exactly and the driver checks the seal of the container (the seal is always closed by the shipper and needs to be closed, otherwise the driver is not allowed to take the container). The following milestones are tracked by KN: Container ready to collect, Truck arrival at premises, Receipt of exact container number, Seal intact & Container collect, Truck leaving from premises, Truck arrival at Penang port gate, Discharge of container from truck.

KN has its own in-house system that generates the RD numbers, tracks the bookings, truck and driver information and truck milestones.

D.2 Possible involvement of Smartag

The possible involvement of Smartag in the Penang-Venlo trade lane was discussed in a meeting in Penang on 13 April 2012. After that, the Cassandra trade lane team had several teleconference meetings with Smartag that resulted in a description of their possible contributions, goals, impact and required development and a final decision to not include them as subcontractors for the Cassandra project. The course of events and considerations are described in this chapter.

Goal
The aim of the involvement of Smartag in the Malaysia trade lane is to provide a guarantee of container integrity from Shipper to Tanjung Pelepas port (last Malaysian port where container is handled) and to provide container milestones on this leg. Additional data capture by Smartag can include the Malaysian export declaration and the vessel manifest.

Description of Involvement
Smartag uses RFID tags for container sealing and tracking. Fixed RFID readers are positioned at the gates of Malaysian free zones and in ports of Penang and Tanjung Pelepas. Handheld readers are also available and can be distributed with trade lane partners. Two types of RFID tags are available:

- Active seal: Only available to read container status with RFID readers at checkpoints. Seal will give an alert to the Smartag system in case of integrity breach at checkpoints;

- Active seal with GPS and GPRS: Constant reading of container position with GPS. Seal will give an immediate alert to the Smartag system in case of integrity breach.

For the CASSANDRA trade lane, using the Active seals will be sufficient. Alerts in case of integrity breach, and with that guaranteed integrity, are an important prerequisite from Dutch Customs. Real-time tracking and integrity monitoring with GPS is considered unnecessary as the distance between shipper's premises and the port of Penang is only 6 miles.

The seals and RFID readers will communicate with the Smartag system, which is built according to the EPCIS GS1 standard and compatible with the GS1 Hong Kong system and the business dashboard. The Smartag system will provide the business dashboard with at least the following container locations/milestones:

- Container seal at factory;
- Container start journey/leave factory;
- Container gate in at Penang port;

The number of provided milestones can be extended when the seals are not removed until arrival in Venlo. However, no fixed RFID readers are available in the Netherlands so reading needs to take place using handhelds and is perhaps only possible at the final destination in Venlo. An extra milestone in Venlo might on itself not be of sufficient interest to bear the extra costs for keeping the tags on the container for the overseas journey. The project team did not consider this one additional milestone of sufficient benefit as it is not in proportion to the costs involved.

In the existing Smartag system, Smartag captures the form K8 declarations and manifest of goods that are re-exported from Malaysia from free-zones. The goods were brought into Malaysia but were never released for circulation. This information can be shared with other Customs parties around the globe. With this type of functionality, declarations for re-export can be captured from Malaysian Customs in the CASSANDRA trade lane. If a manufacturer imports raw material (duty not paid) using Form K8, the export process will be also using Form K8 and the duty can be calculated and paid after re-exportation. If the export process in the Penang-Venlo trade lane uses a Form K8, Smartag already has the data integration with Malaysian Customs. With this information, Smartag could also deliver the ENS (Entry summary security declaration) to Dutch customs.

In the Seacon trade lane export declarations are made with Form K2 as they are real exports and not re-exports. For this case, Smartag does not yet have the data integration in place. In addition to this, Smartag knows that the current system of Malaysian Customs is up for replacement so creating new interfaces with the current system might not be a good investment. Alternative data capturing for this case would be a direct interface with the customs broker, but as they use customs owned software, this is not feasible.

Estimated process impact
Estimated impact of Smartag involvement on the business parties in the trade lane is as follows:

- Placement of the RFID seal on the container, by the shipper or the haulier Kontena Nasional. The seal can be placed and removed while the container doors stay closed;
- Reading of RFID tag at start journey, by shipper or Kontena Nasional;

Smartag will provide the shipper and/or Kontena Nasional with sufficient tags and one handheld reader and will organize for tag removal in the port of Tanjung Pelepas and reverse logistics.

Required development
For the container milestones and integrity, Smartag and GS1 Hong Kong need to work on data exchange between their platforms. The platforms are both EPCIS so already compatible.

When export declaration and vessel manifest need to be captured from Malaysian Customs, an additional interface for form 2 needs to be developed. Smartag will then also need to develop a service to create an ENS declaration and send this to the European ICS system. Approval of Malaysian Customs is required to share this data with Dutch Customs. Additionally, some information from the manifest and declaration could be shared with the GS1 EPCIS pipeline but this depends on authorizations to share this data with third parties.

Conclusions
Because no information capture is already possible from the K2 form declarations, the most important added value of integrating the Smartag system comes from the use of the tags and container tracking. In Cassandra, container tracking is only a second topic after tracking the consignment (goods) information and capturing party information. Logistics and tracking information is added where reasonably possible and of direct interest to the trade lane participants. The container milestone information that can be provided by the Smartag system is valuable in the sense that it can provide the supporting logistics information and guarantee the container's integrity in the Malaysian part. But because the logistics information is not of the most priority in the project and because Seacon Logistics indicated that at this moment they do not see a business case for testing smart tags as part of their business model, and because no long distance inland travelling is needed to the Port of Penang, it is not in the interest of the project to spend budget on subcontracting Smartag.

The project team thinks the Smartag functionality fits really well with the Cassandra vision and that it is beneficial for international trade and logistics. It is therefore unfortunate that the trade lane that was selected from Malaysia does not better match with their current functionality. The project team very much appreciated their willingness to share their knowledge and information.

Appendix E – Background to the Shanghai – Rotterdam trade lane

E.1 Workshop minutes

Date	7 June 2013
Location	Eindhoven, Netherlands
Attendees	Sebastian Seidel (DHL), Inge Lucassen (TNO) and representatives of the DHL customer
Responsible for minutes	Inge Lucassen, TNO

The Cassandra vision and project were presented to the customer in order to investigate their possible involvement in the project. The customer responded positively and indicated the following interests in the concepts:

- Visibility on shipments and track & trace;
- More data on the compliance activities in China to support compliance in NL;
- Automated alerts on discrepancies between invoices and declarations;
- Customs facilitation resulting from a future RBA/AEO+ concept.

Characteristics for the Shanghai-Ridderkerk trade lane were further discussed. DHL is the partner for consolidation and deconsolidation. The customer has yearly, standing purchase orders for their suppliers on volume, prince and spread of delivery but does not know what shipments are coming exactly at what time. DHL is contacted by the suppliers when they have a shipments ready and is thus the first to know what is shipped. More visibility would thus be welcome. Invoicing of supplier is done to a subsidiary in Hong Kong. The subsidiary then invoices to the Dutch company.

Date	7 June 2013
Location	Eindhoven, Netherlands
Attendees	Sebastian Seidel (DHL), Eric Geerts (Descartes) and representatives of the DHL customer
Responsible for minutes	Sebastian Seidel (DHL), Eric Geerts (Descartes)

The Descartes business dashboard was presented to the customer.

Changes to IT for the customer need to be requested about 1 year in advance so it is not possible to make changes to the customer's systems or create interfaces to the pipeline before the project ends. This means no purchase order information can be made available from the customer. Also, no data feed from the pipeline to any of the customs systems is possible. The customer thinks that the PO is being shared with DHL so it should be possible to source the PO information from DHL as an alternative.

The customer is especially interested in receiving the HS code of the products that was used in China and any data that contributes to visibility and track & trace. Carrier milestones can be received in the GLN for most carriers once the contracting party approves of this. It needs to be investigated which carriers are used exactly on this trade lane and who needs to give approval.

Appendix F – Background to the Singapore – Rotterdam trade lane

F.1 Workshop minutes

Below tables show the minutes of the workshop that was held for the K+N trade lane in Singapore. The minutes are for the workshops with external parties only and not for all smaller project team meetings and teleconference meetings. Minutes were made anonymous were this was expected from the external parties.

Date	6-7 August 2012
Location	Singapore, Singapore
Attendees	Roman Balog (K+N), Hans Rook (Portbase), Huib Aldewereld (TU Delft), Inge Lucassen (TNO) and various representatives of Singapore Customs, K+N Singapore and Kewill
Responsible for minutes	Inge Lucassen, TNO

Agenda for 6 August:

9AM-10AM	Introductory meeting between Singapore customs and Inge Lucassen
10AM-12AM	Short introduction of all participants and introduction and updates on CASSANDRA and K+N trade lane
1PM-3PM	K+N Operations & Customs – Run through of the operational, Asian side of the trade lane. Discussion on different customs procedures involved in the trade lanes, information sources and information availability and quality. Also, what customs systems/portals are used to file the declarations.
3.15PM-5PM	K+N Customs IT – Overview of how K+N's front-end TradeNet® portal by Kewill works and possible integration with TradeXchange®

TradeXchange® is a business community system hosted by Singapore Customs. Kewill and TradeXchange® take part in a national project called TPIB (Trade Portal Integrated Chain) which focuses also on data capture at the source. This data capture includes especially the PO, P/L and commercial invoice from the shipper. These document are made available in TradeXchange® by the shipper in an xml format. Kewill is one of the TradeNet® front end providers that can then capture this data from TradeXchange® to pre-fill the export declaration. K+N then only needs to add certain information elements and check to overall declaration before it is submitted. K+N Singapore, Kewill and Singapore customs take part in this project. Different shippers have already been contacted to discuss their interest and involvement but nothing is implemented as yet.

The export declarations for non-controlled goods (50%) must now be filed after vessel departure. For controlled goods this needs to be done before vessel departure. From April 2012, all declarations need to be filed 8hrs before vessel departure. In case of LCL, K+N SIN uses a freight station in the port free zone which is owned and operated by a third party. In that case, the NVOCC operator that operates the freight station arranges for the container. In SIN, the free trade zones are located in the port and airport area. So if goods will be brought to SIN by ocean and also re-exported by ocean, the goods will stay in the port free trade zone. No transit declaration is then needed. Only when the transport modes differ, a transshipment permit is necessary to transport goods between the different free trade zones. To proof re-exporting of the goods, different B/Ls of incoming and outgoing shipments need to be presented to customs or the border control agency. This situation is especially relevant for the K+N gateway concept. If that is used as part of the Cassandra demonstration, more details of this process and problem are needed.

Agenda for 7 August:

9AM-12AM	Introduction to TradeXchange® and TradeNet®, including IT landscape and interfaces, existing and planned functionalities Introduction to Portbase, including IT landscape and interfaces, existing and planned functionality, especially within CASSANDRA Update & discussion on CASSANDRA IT vision: Backbone and Dashboards presentation by CASSANDRA team
2PM-5PM	Discussion on usage and benefits of available information for K+N Singapore and NL, TradeXchange®, Portbase and Dutch customs and input to the data requirements for the information exchange between Portbase and TradeXchange® Mapping of Portbase & TradeXchange® functionalities and IT landscape on the K+N trade lanes + Definition of next steps

TradeXchange® already has functionality to support the insurance process. Currently, a function to support the Letter of Credit process and the transfer of title is under construction. According to Singapore customs, banks and insurance companies will also be interested to know of this project. The idea is to include an introduction of the project to these parties in a next visit to Singapore when the trade lanes from SIN are also more progressed.

An additional functionality to create and send ENS declarations based on the data in the TradeXchange® platform is also an option for Singapore Customs. Development would dependent on the relevance for the project and can be discussed in a later phase.

Proposed plan and next steps
The proposed plan for a CASSANDRA pipeline configuration includes the information sharing on SIN side, also part of the national project TPIC. Some additional interfaces might need to be developed.

The following information exchanges will be according to a CASSANDRA standard:

- TradeXchange® to Portbase
- Portbase to Customs dashboard
- KN Login to Customs dashboard

For the CASSANDRA standard, event based messages will be used. The exact format of these messages is still under construction.. The different deliverables here are:

- Overview of events and their mapping to the K+N trade lane and timings (first draft by Inge and Huib in week 33)
- List of data elements that are of interest to capture in the different events (first draft by Inge and Huib in week 34)
- Technical message specification

To evaluate the benefits of the demonstration for the different parties involved, use cases will be used. The use cases will be described in detail and will as such support both implementation and evaluation. For the K+N trade lane from SIN to RTM 3 use cases are identified:

- Support export declaration, beneficiary K+N SIN
- Support import declaration, beneficiary K+N NL
- Support risk assessment, beneficiary DCA and K+N NL

Date	23 October 2012
Location	Basel area, Swiss

Attendees	Gé Coenen (Seacon Logistics), Johan Vosbeek (Seacon Logistics), Inge Lucassen (TNO) and representatives of anonymous Seacon customer
Responsible for minutes	Inge Lucassen, TNO

The Cassandra vision and project were presented to the Seacon Logistics customer in order to investigate their possible involvement in the project on a trade lane from Venlo to Singapore. The customer had interests in the following concepts:

- More data on compliance activities;
- Value added service on the TradeXchange® platform as benefit for the Singapore office.

Characteristics for the envisioned trade lane and the commitment of the customer were shortly discussed. Especially, an interface from their ERP to Seacon logistics' data capture tool would be needed to start the process properly with the purchase order. The customer indicated that they needed some more internal discussion to come to a decision.

Note: Eventually, the customer responded negatively as they could at the moment not offer the right level of commitment to any project.