CASSANDRA Report Summary

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Final Report Summary - CASSANDRA (Common assessment and analysis of risk in global supply chains)

Executive Summary:
CASSANDRA addresses the supply chain visibility needs of both business and government in the international flow of containerized cargo. The main strategic goal is to enhance supply chain visibility to improve business operations as well as government’s cross-border security inspections.

The strategic impact for businesses is an improved supply chain performance and cost efficiency by reducing administrative and planning errors along the chain. For this, supply chain management should be based on a transparent and reliable assessment and treatment of risks. For government agencies CASSANDRA improves efficiency and effectiveness. CASSANDRA helps customs to assess business processes and procedures and identify secure supply chains. In this system-based approach, government agencies use a audit methodologies to assess compliance to rules and regulations based on the evaluation of the integrity, reliability and internal consistency of the business and IT systems. By minimizing the attention given to these secure flows and businesses, government agencies can focus on high-risk flows resulting in a higher hit rate and greater effectiveness of security related government inspections.

To provide supply chain actors and government authorities with these accurate data, the project develops a data-sharing concept: the Data Pipeline. CASSANDRA achieves interoperability of heterogeneous systems by combining state of the art IT innovations. Access rights and security mechanisms are implemented in the data pipeline concept to enable secure data sharing. Furthermore, dashboards for supporting businesses and customs for risk management and supply chain visibility are implemented on top of data pipelines for international trade lanes.

In the first year the project consortium delivered a compendium describing the trends in global supply chain management and current practices in risk management and supply chain visibility as a starting point for performing first research on risk management by both businesses and government and setting up a methodology to assess for risks and information quality. The Risk Based Approach looks at risk assessment for a network instead of single entities. The Risk Based Approach, using the assessment methodology, requires input from the data pipeline. In the first year, the consortium drafted the future integration architecture of the pipeline. This future architecture is further split in two phases: (1) support of the LLs supplemented by dashboards and (2) increasing data quality based on full interoperability of all businesses. Dashboard development and the construction of the Phase 1 pipeline was initiated. With respect to Phase 2, a set of concepts has been developed and the development of a Proof of Concept is initiated, together with a first draft of a logistics ontology. For the Living Lab demonstrations, the team identified different trade lanes. These trade lanes are the basis for testing RBA and IT developments in real life situations and provide feedback thus improving both RBA and IT solutions that meet CASSANDRA’s objectives.

At the beginning of the project a public website was launched: www.cassandra-project.eu. The second year has been characterised by advancement of the development of the IT aspects of CASSANDRA: specification of the integration architecture and the interfaces, and development of a security framework. Key in this part of the project has been the
extensive interaction between WP3 (IT development) and WP4 (Living Labs) to develop IT specifications and interfaces consistent with the needs of the Living Labs. In addition, the second year of the project saw large steps in setting up the Living Labs. The Living Labs made definitive steps in specifying the match between tradelane and use case, made successful contact with US Authorities in LL2, and successfully got a tradelane ‘up and running’ in LL1, which has already proven its mettle by revealing shortcomings in trade operations which would otherwise have gone unseen. The RBA work was completed in Year 2 and has yielded a practical Risk Analysis Handbook for industrial parties.

In Year 3, we completed the IT work (security, integration architecture and interfaces). The US – Germany and Iberia – North Africa tradelanes became a fact. We evaluated different elements of the project, looking at cost-benefits, the IT, the risk-based approach and different business cases. Finally, we carried out various dissemination activities from publications and conference presentations to holding external symposia and workshops.

Project Context and Objectives:
The challenges facing international intermodal container logistics are efficiency and security. These seemingly conflicting issues have a common solution: supply chain visibility, where data for visibility can be shared between business and government. Since technical solutions already exist, the challenge lies in integrating solutions across the supply chain.

CASSANDRA will:
- Facilitate the adoption of a risk based approach in the supply chain, on the basis of integral monitoring data on cargo flows and container integrity,
- Build interfaces between existing visibility solutions, and visualisation tools, in an open architecture.
- Demonstrate the integration of data and risk assessment in supply chains in three major trading routes to and from Europe.
- Evaluate the quality of the integral data with business and government.
- Facilitate a dialogue between business and government to gain consensus on the criteria for data sharing between business and government.

The project participants cover all relevant stakeholders, including some global players. This expertise will guarantee the successful adoption of the CASSANDRA solutions. The value drivers in CASSANDRA will include:
- Logistics efficiency benefits.
- Security benefits for business as a result of the risk self-assessment.
- Security benefits for government as a result of the high quality and complete data for government risk analysis.

CASSANDRA will contribute to the priorities of DG TAXUD, will facilitate security and crimefighting priorities of DG Enterprise and DG Justice, Liberty and Security, and enables priorities in the DG TREN Freight Logistics Action Plan, and builds on previous work in standardisation bodies.

The development of integral supply chain data that is the basis for risk based supply chain management and the input for government supervision tasks, as envisaged in CASSANDRA, will set a new standard for global door-to-door goods flows to and from Europe: efficient & secure!

The specific goals of the first year of the project primarily had to do with
- Establishing a shared mental model of supply chain visibility and the main goals of the project among the consortium members. This is strongly represented in the work done in Work Package 1: the compendium, which defines key concepts, and the user requirements, which scope and describe the stakeholders and their most important interests.
- We have been very active in starting up Work Packages 2, 3, 4 and 6, and preparing for those which will start later in the project (e.g. WP5). We strove to actively engage with all work packages from the start of the project, even if their formal starting date was later in the year. By doing this, it is possible to take into account requirements and potential pitfalls in a timely manner, rather than run the risk that problems arise later.
• Kick-starting dissemination activities, such as a standard CASSANDRA presentation, project flyers and goodies, a newsletter, LinkedIn discussion group, etc.

The specific activities of the second year of the project primarily had to do with:
Finishing the IT development work, which includes the integration architecture, the security framework and prototypes for the interfaces for the Living Labs.
• Expediting the starting of the Living Labs. This entailed intensive communication and coordination with the IT partners for development of the interfaces, and with other relevant partners (such as the RBA partners) in order to define and choose suitable use cases for the various tradelanes. Finally, an important and difficult hurdle taken in Year 2 in CASSANDRA entailed ascertaining the cooperation of external parties, such as US and German Authorities in LL2, port communities and customs in Asia, and parties willing to cooperate with the project for Living Lab 3 with Africa. This has been an exceptionally difficult and complex path. We are also very pleased that we have achieved so much in Year 2 of the project, which paves the way for the final year.
• Starting WP5 work on the evaluation. We evaluate different aspects of the impact of our work: a technical evaluation, evaluation of the risk-based approach, socio-economic cost benefit analysis, and quantitative impact assessment including a business case. For these different aspects, we developed methodologies and detailed existing work plans.
• We continued our work disseminating the results of CASSANDRA and engaging with stakeholders. We held a meeting with the Advisory Board, which yielded positive, constructive results. We set out a survey among shippers to gain insight into their needs and match with the project. We organised various workshops with external stakeholders, presented at conferences, actively disseminated through newsletters and the LinkedIn discussion forum, and wrote publications. The public project website can be found at www.cassandra-project.eu.

The activities and objectives of the third and final year of the project were:
• Demonstrate the use of the IT and RBA in the Living Labs. In the case of all tradelanes, the goal was to realize the envisioned transfer of data between supply chain actors.
• Complete the evaluation work on the IT, risk-based approach, cost-benefit analysis and business cases.
• Extensive dissemination of the project activities and results.
• Strengthen the stakeholder engagement and consensus building.

Project Results:
Key commercial benefits linked to the ‘control interventions’ can be grouped into two categories:
- Efficiency gains contributing to reduced landed costs .
- New value propositions enabled by enhanced supply chain control

The next sections highlight these benefits and outlines the contribution to more effective control and supervision by border control agencies.

1.3.1.1 Landed cost reductions from chain control interventions
Two examples of chain control interventions are: the three-way match and the introduction of a tallyman at the point of container stuffing. Both validate the accuracy of data being used for planning downstream activities. The three-way match is often validated downstream by comparing data from different sources, and thus too late for customs to control certain ‘stop-risks’. An alternative is to check the data against reality upstream during consolidation of multiple shipments of goods or stuffing the goods in the container by means of a tallyman. The key benefits associated with these control measures include:
• Operate according to designed supply chain channels
The distinctive design of supply chains for Full Container Loads (FCL) and Less-than-full Container Loads (LCL), where LCL-shipments undergo consolidation of multiple goods shipments before executing the main transport haul, is a common practice resulting in highly efficient and sustainable use of transportation networks. The tallyman was introduced, in combination with a
machine for automatic measurement of box dimensions, to control this effectively, resulting in a reduction of inaccurate packing list information about the stuffed container from over 10% to less than 1% of the consignments.

- Enable supply chain redesigns – destination-based stuffing and cross-docking
Enhanced chain control measures like the tallyman allow for supply chain redesign. Enhanced predictability allows for destination-based stuffing and easy cross-docking in the port of destination, instead of deconsolidation, warehousing, picking and distribution towards regional warehouses or customers. This major step requires farfetched predictability, and is now under consideration in one of the tradelanes. Also the true LCL volumes on a tradelane may appear to be much larger than expected, justifying investments in larger consolidation centres, thus contributing to economies of scale.

- Efficiency in warehousing activities
For one of the freight forwarders also involved in warehousing processes, warehouse handling cost reduction was realised through improved packing and container stuffing. The savings realized through the use of a tallymen and digital box measurement scanning devices corresponds to a potential savings in total handling expenses of € 6.40 per container. Moreover, there is a significant improvement in warehousing revenue, increasing the stack height from an average of 2.5 pallets to 2.8 pallets, leading to a 9.6% increase in warehousing revenue.

1.3.1.2 New value propositions

The CASSANDRA exploitation plan (D7.5) identifies a whole range of value propositions being considered for further exploration and exploitation by CASSANDRA consortium partners, some of them have regularly popped up in the Living Lab approach and are worth highlighting.

1. The service of digitising manual source data at the point of stuffing or consolidation of the container for reuse purposes. Here, the freight consolidation centres in the country of origin could play a valuable role in digitising order and transport documents and providing connectivity to data pipeline infrastructures.

2. Chain controls and validation processes (e.g. electronic version of a tallyman) can be offered as a value added service proposition. This could be to implement a certain control measure and share the outcomes of that measure with other chain partners, or as part of a broader service proposition to identify weaknesses in the chain of custody and implement correspondingly the most effective and cost efficient chain control measures.

3. A consolidation in the market for (customs-) duty management solution providers and supply chain visibility providers, resulting in a limited number of key providers to integrate these two functional areas, e.g. Descartes and IBM. More sophisticated landed cost calculations taking into account the impact of alternative control interventions would strengthen the functional portfolio of these solution providers, and help convince users to buy their software.

1.3.1.3 More effective customs control

The current Customs risk analysis IT systems identify too many transactions as ‘orange’, e.g. too many false-positives, requiring excessive numbers of further analysis and/or requesting additional information sources. This false-positive problem is partly due to inaccurate or insufficient data. Below, we identify some areas of enhanced customs visibility.

1. Construct chains of actors. The data pipeline links different commercial transactions thus allowing the construction of a chain of actors involved in the value chain of a commercial trade transaction. The voluntary sharing of the business dashboard functionality with customs users is one way to improve the Customs process of developing a picture of the value chain actors.

2. Link actor visibility with trustworthiness databases. The Customs dashboard has demonstrated a working interface with Dun&Bradstreet, by linking the actor identification with DUNS-numbers and visualising a selection of the corresponding trustworthiness ranking data about a company. This concept can be further developed.

3. Visualise the source of the data in the customs dashboard. This can help decision makers assess the expected quality of the data submitted. Also the customs value of the declared goods may originate from a commercial invoice, or from a purchase
order of the seller of the goods (consignor).

4. Piggy back on the commercial control mechanisms. Customs needs a way to identify and assess trusted trade lanes in order to apply tailor-made control and supervision models. Trade lane partners need to expose the control measures they apply, as the current AEO-framework does not fully cover this scope. Chain control measures like the tallyman, the three-way data consistency match, partner screening procedures and container integrity applications can help.

CASSANDRA’s main strategic goal is to enhance supply chain visibility to improve business operations as well as government’s cross-border security inspections by extending container visibility to its contents, which is not only relevant to customs from a security perspective, but also for traders to increase effectiveness and efficiency of their operations, especially beyond the container stripping location. CASSANDRA contributes to corporate social responsibility and product and societal safety, by:

• Facilitating the adoption of a risk based approach in designing and managing efficient and secure supply chains by monitoring business data on cargo flows and container integrity.
• Building interfaces between existing information platforms and visibility solutions using sophisticated visualization tools, in a neutral, standardized, and open architecture.
• Demonstrating the integration of data and risk assessment along the supply chain in three major trading routes to and from Europe.
• Evaluating the quality of the integral data with business and government, from a technical, societal, business, risk management and exploitability point of view.
• Facilitating a dialogue between business and government to gain acceptance of the risk based approach and risk self-assessment by business and of the suitability of data use by government agencies for their supervision responsibilities.
• Increasing the transparency and the access to improve the efficiency and to reduce costs thanks to a “Cross Chain Control Dashboard”.
• Improving supply chain performance and cost efficiency by reducing administrative and planning errors along the chain, improving efficiency and effectiveness.
• Helping customs assess business processes and procedures and identify secure supply chains, by minimizing the attention given to these secure flows and businesses.
• Improving transport efficiency, dynamic business relationships and situational awareness by capturing data electronically and controlling the exposure and exchange of data by means of the Data Pipeline.
• Providing a certification which proves the compliance with CASSANDRA assuring the quality and transparency of the process.

CASSANDRA provides a new approach to the exchange of information between the stakeholders involved in supply chain involving digital data exchange (the Data Pipeline) and improved risk assessment. The CASSANDRA framework is the basis for more efficient and effective transport of goods, thus reducing costs and increasing the control of unsecure containers. Society will benefit from the CASSANDRA approach through more efficient transport, which reduces the environmental impact of maritime transport; better monitoring of transport and goods flows, which reduces the misuse by organized crime; and finally the reduction of paper and the facilitation of communication between stakeholders and customs, which results in trade facilitation.

There are many firms that offer similar products, nevertheless CASSANDRA will have a market because it proposes a complete solution and has distinctive points that make it attractive to the customers, such as the use of CASSANDRA Virtual Network (Data Pipeline concept outcome) or the implementation of a Risk Based Approach. Compared to existing solutions in the market, CASSANDRA’s strengths lie in better security schemes for the container flow; it is not only a software service but uniquely connected with different actors in the supply chain in a collaborative scheme increasing ease of access to information, cost reduction and improved operational efficiency. CASSANDRA is an integrated system which does not replace existing systems, but uses information more efficiently which displays it on dashboards.

With the governments expecting to generate new legislation that requires further reduction of CO2 emissions, more free-trade agreements, and the opening of new markets, international trade is expected to grow. These opportunities will make
CASSANDRA more competitive with other solutions. In the same way there exist threats for the use and adoption of CASSANDRA solution like, for example, the few countries that already have developed legislation to enable the use of electronic information and the sharing of information between countries.

1.4 Stakeholders’ approach and exploitation trends
Prioritization of CASSANDRA’s stakeholders and business strategy
An analysis of stakeholders and prioritization has been carried out in order to establish general strategies to engage them for successful deployment of the CASSANDRA solution. The following “power/interest” matrix identifies stakeholder engagement or barriers to collaboration for the supply chain actors within the CASSANDRA framework.

Two main factors have been taken into account:
- “Interest/Level of Commitment” which is determined by:
  o Perceived benefits, Risk exposure, Complexity of Change Management and Competitive necessity
- “Power/Influence” which is defined by:
  o Ownership and availability of relevant data, the willingness to share data by the stakeholders, Regulatory role and negotiation power, IT capabilities, the grade of development and strength of stakeholders’ systems, and Risk management system in place, the level of autonomy

Figure 1 summarises the classification of priorities of the stakeholders according to their level of interest and power.

This analysis allows us to construct the following Power/Interest Matrix (figure 2):

The following conclusions emerge from the stakeholder analysis carried out:

• This stakeholder prioritisation must be considered a general guideline, but different types of supply chains must be considered to come up with “customized” prioritization to focus on the “right” stakeholders to foster engagement.
• “Interest/level of commitment”, “willingness to share data” for shippers and consignees need to be improved as the tendency seems to be only sharing the minimally “required” information. These supply chain actors need to be convinced that the expected benefits from the CASSANDRA solution will materialize, and the costs of adopting the solution will be more than compensated with potential benefits. Moreover, they need to be sure the additional information being shared in the data pipeline will be secure and not be misused.
• The CASSANDRA platform must provide the stakeholders a clear picture of perceived benefits along with the costs of implementation with reduced uncertainty regarding the costs/benefits, especially for the consignee, shipper, and freight forwarders. Long-term impact of the supply chain visibility on performance must be emphasized. Cost/revenue sharing agreements between different stakeholders might prove helpful in raising “interest”.
• There seems to be uncertainty regarding what additional consignment/business related information will be required for the data pipeline and also how this information is going to be used by partners and authorities. Better definition of the required data fields and clear rules on how the information will be used and by whom are essential. Penalties for violating these rules or misusing and abusing sensitive information shared in the pipeline must also be determined.
• Commercial contracts may be needed to determine ownership of cargo information.
• Stakeholders must be convinced that information security will be ensured in the data pipeline.
• Smaller organizations (SMEs etc.) need to be supported, especially regarding the IT infrastructure development and integration activities.
• Government agencies and port authorities need to seriously consider sharing information (within legal boundaries) with the other stakeholders to provide them with the necessary knowledge to quantify the threats to their supply chains.
• The stakeholders with “power” need to form coalitions to drive the change towards the implementation of the data pipeline...
Cross-functional teams from different stakeholders must be formed to share technical expertise, managerial interaction, and more importantly to build trust among firms.

Stakeholders strategy approach
Taking into consideration the previous analysis we can map the groups of stakeholders, the relevant products, and strategy to approach them. The most relevant stakeholders are:

- **Consignees (buyers).** Consignees are at the receiving end of the supply chain. They often are responsible for delivering the right information about the shipments they receive to the customs organization.
- **Freight Forwarders.** The freight forwarding companies are responsible for providing high quality logistics services and must ensure that their internal resources are exploited optimally. Freight forwarders are an integral part of the supply chain as they help optimise response time. Freight forwarders must organise not only the transportation, but must also fulfil all customs procedures.
- **Port Companies.** The Port Companies are classified into container stevedoring companies and Port Warehouses. Basically, stevedoring companies’ functions are related to the “box” itself and not to the content of the box, whereas Port Warehouses handles and are aware of the content of the box.
- **Shipping Lines.** Shipping Lines are responsible for the maritime transportation and also receive goods at the origin. At this point, they become consignor. So they are liable to deliver the goods at destination point to the consignee.
- **Port Authorities, Harbour Master.** The role of the Port Authority is to manage the “public land” and guarantee the security. Depending on the country, the Port Authorities can assume different responsibilities. The Harbour Master is in charge of the maritime security. It controls the access of vessels to the national waters. The main responsibility, related to the cargo, remains in the dangerous goods management.
- **Government Agencies.** Government authorities and legislative agencies play a pivotal role in the uptake of CASSANDRA’s results on the Single Window concept and in the adoption of the seamless integrated data pipeline. Thus, each partner must raise awareness of the significance of the proposed solutions both at the national and We examine the CASSANDRA results in this light using the following variables:

The consortium has been divided into four groups with common characteristics regarding scope, objectives and activity: Stakeholders partners, Authorities partners, IT partners, Research partners,. We provide an overview of which products they wish to exploit and the market “possibilities”.

1. **Supply Chain Stakeholders partners**
   This group is comprised by the following partners: PORTIC, DBH, Portbase, DHL, K+N, BAP, Seacon, APSS, ECT
   The group includes representatives of Port Community Systems companies, terminals, logistics groups and logistics providers, warehousing and distributing companies etc. This group represents some of the most important actors involved in the supply chain.
   The main goal of this group is to improve their own processes and reduce costs and efforts by adopting CASSANDRA solutions such as IT interoperability and Business Dashboards that enable them to offer New (commercial) Services to the clients and acting as node of transmission of CASSANDRA products and services. These exploitation trends of the Supply Chain Stakeholders partners are plotted on the following potential impact/income graph (figure 3):

2. **Authorities partners**
   The consortium counts on the following authorities: HMRC, DCA, SWHB, KLPD.
   The group includes the United Kingdom and Dutch Customs, port authorities and Police agencies giving us an overview of the point of view and goals of the authorities.
Public administration aims to improve their risk analysis, control, supervision and inspection processes. This group of partners is interested in the CASSANDRA Authorities Dashboard of course but also in the application of CASSANDRA Data Pipeline concept in other sectors like Police and the specific implementation of Authorities Dashboard with different actors (Police, Port authorities etc.). Finally they aim to explore New Services based on the CASSANDRA framework as risk management tools, optional dual filing, enforcement vision of goods etc. The exploitation trends of the Authorities partners are plotted on the following potential impact/income graph (figure 4):

3. IT Partners
This group is comprised by the following partners: ATOS, Intrasoft, Descartes, GMV, IBM, GS1. This group includes not only IT and software solutions providers but also a non-profit organization dedicated to designing and implementing global standards as GS1. Its approach to the project is a commercial one oriented to the exploitation of the results of the project incorporating them to its own business strategy.

This kind of organisation aims to exploit mainly: CASSANDRA Authority Dashboard, CASSANDRA Business Dashboard, CASSANDRA Interoperability and to a lesser extent CASSANDRA Risk Analysis Services and CASSANDRA Supply Chain Innovation Services.

The exploitation trends of the IT partners are plotted on the following potential impact/income graph (figure 5):

4. Research partners
The research partners are: TNO, Erasmus, TUD, ISL, ZLC, NSCE, CBRA
This group includes universities, research centres and consulting organisations in the field.
The mission of these kind of organisations are more focused on supporting industry and development and spreading knowledge than on exploiting commercially products and services. The goal is go deeper into research and innovation improving the society conditions in general mainly by the application of IT technologies to the field of study.
This group of partners aims to exploit mainly: CASSANDRA Interoperability Services, Risk Analysis Services and in general Scientific dissemination.

Taking into account that most of those organisations are non-profit, the potential incomes is translated in terms of sustainability and use of knowledge mainly.

The exploitation trends of the Research partners are plotted on the following potential impact/income graph (figure 6):

Potential Impact:
CASSANDRA Business Dashboard:
The Cassandra business dashboards provide increased visibility based on available data of relevant stakeholders. Each of the relevant stakeholders has to provide data. The data is integrated into a relevant data set of for instance a shipment, a container, or a truck. Locations and movements of data (from a time perspective) are made visible.
CASSANDRA Business Dashboard can obtain revenues:
Selling software licenses
• Offering deployment, customization and support services.
• Each owner choose the model most appropriate,
The next activities to consolidate this result are:
• Consolidation of current prototype
• Dissemination of results to promote the participation of early adopters
• Current customs prospection to organize demos and pilots
• Organise customs and authorities workshops to refine the functionalities of the product
• Establish contacts to DG Taxud and WCO

The commercialization of CASSANDRA Business Dashboard will improve:
• exception detection for risks
• pro-active planning based on predicted actions (e.g. arrival of cargo or transport means at a certain time at a location)

CASSANDRA Authority Dashboard:
Authorities can have dashboard to retrieve additional data they require for risk assessment. The retrieved data is an addition to data already received by declarations, although an Authority Dashboard could also be used to assess data directly at its source, i.e. traders. If the latter is the case, a data pull mechanism is implemented.
One can distinguish various subclasses of Authority Dashboards, each of them tailored to requirements of a specific authority. As customs is one of the (main) authorities in CASSANDRA, a Customs Dashboard would be a typical example of an Authority Dashboard developed in the CASSANDRA project. Other dashboards would support port authorities, food safety authorities, police, etc.
An Authority Dashboard can have different implementations, e.g. a portal within the domain of an authority to retrieve data or an app running on a smart device with an underlying security infrastructure like developed in CASSANDRA (see Deliverable 3.2 - security architecture).

CASSANDRA Authorities Dashboard can obtain revenues:
• Selling software licenses
• Offering deployment, customization and support services.
• Each owner choose the model more appropriate within its business model.

The next activities to consolidate this result are:
• -Consolidation of current prototype
• -Dissemination of results to promote the participation of early adopters
• -Current customs prospection to organize demos and pilots
• -Organise customs and authorities workshops to refine the functionalities of the product
• -Establish contacts to DG Taxud and WCO

The commercialization of CASSANDRA Authority Dashboard will improve:
• improved risk assessment
• improved targeting of inspections
• less manual actions for officers (e.g. phone calls)
• less delays in decision making
• less manual actions for traders

CASSANDRA Interoperability Framework:
CASSANDRA Interoperability Framework is in fact a product group consisting of products and services that can also be provided separately. Authority and business dashboards need to be integrated with IT systems of different traders in supply and logistics chains. Data quality will increase if all traders in these supply and logistics chains electronically share data. They can re-use each other’s data without retyping, thus preventing errors. Therefore, not only a dashboard needs to be integrated with the CASSANDRA data pipeline consisting of different traders, but these traders also have to be interoperable.
Interoperability in this perspective implies that message implementation guides can be provided to traders. Port Community Systems provide these guides for their community members, Business Community Systems provide integration services. These already exist. Innovative services are the generation of message implementation guides (XML Schema Definitions) from a semantic model, on ontology. The logistic service concept, introduced in not only CASSANDRA but also in eFreight projects, is used to easily specify these guides. Since these guides stem from the same semantic model with shared concepts, these guides are consistent with each other.

The semantic model, the networked ontology developed by CASSANDRA, is part of the production environment for producing message implementation guides. Since different environments already have vested interests in other guides, potentially based on other models like the WCO data model, a transformation with these other models is supported. It allows traders and authorities to seamlessly share data.

Under the heading of Interoperability Services, various products and services can be developed, namely:
- CASSANDRA Production of message implementation guides
- CASSANDRA Implementation services
- CASSANDRA Transformation services
- CASSANDRA Gateway
- CASSANDRA Access Point
- CASSANDRA Validation & Testing Services
- CASSANDRA Compliance Certification

CASSANDRA Interoperability Framework can obtain revenues:
- Selling consultancy services
- Offering deployment, customization and support services

The next activities to consolidate this result are:
- Elaboration of commercial documentation for the different services offered as well as package of services.
- Elaboration of the specific test to validate customers’ IT services at various levels: messaging, process and information level.
- Elaboration of the criteria to be fulfilled to get the Cassandra certification

The commercialization of CASSANDRA Interoperability Framework will improve:
- Cost reduction by preventing retyping
- Improved data quality by less errors
- Less handling by improved data quality
- Tailored operational solution (best fit, also with Total Costs of Ownership)
- One interface with external partners (business, authorities)
- Service levels provided by external provider.
- Fully CASSANDRA compliant and tested
- Mapping with internal file structures.
- Single Window interface to all relevant authorities managed by a trader
- Low cost, distributed Single Window implementation
- Fully CASSANDRA compliant interface
- Piggy backing on trader data, decrease of administrative burden
- Fully compliant with horizontal supervision
- Prevent testing against operational systems
- Validate and test an implementation before being operational
- Validate against potential different or differences of MIGs of national authorities

CASSANDRA Risk Analysis Services
The CASSANDRA Risk Analysis Services support a trader in analyzing potential supply chain risks. Those risks are considered that are identified in Work Package 2 of the CASSANDRA project. The CASSANDRA manual on identifying risks can be used for this purpose.

Besides identifying risks, potential interventions will be proposed to handle those risks.

CASSANDRA Risk Analysis Services can obtain revenues:
- Selling consultancy services

The next activities to consolidate this result are:
- Elaboration of commercial documentation for the consultancy service.
- Adaptation of documentation and results of WP2 to elaborate consultancy and raining material.

The commercialization of CASSANDRA Risk Analysis Services will get a:
- Robust, resilient supply - and logistic chains

CASSANDRA Supply Chain Innovation Services
To be completed: services for re-engineering processes and chains based with improved data quality and visibility, based on electronic data sharing amongst traders and with authorities. All paper documents are basically eliminated, also depending on the state of adoption of electronic data sharing between businesses and business and authorities

CASSANDRA Supply Chain Innovation services can obtain revenues:
- Selling consultancy services

The next activities to consolidate this result are:
- Definition and elaboration of the procedures and documentation to carried out his services.
- Gather the information and result mainly from WP3 needed to provide this service.
- Elaboration of commercial documentation for the consultancy service.

The commercialization of CASSANDRA Supply Chain Innovation Services will get a:
- Indepth analysis of potential benefits for electronic data sharing
- Analysis of potential supply chain benefits by improved visibility

List of Websites:
The address for the project website is http://www.cassandra-project.eu. The website has been developed and is maintained by ISL and TNO.
The website currently contains:
- General information on the project, such as a project summary, a project outline, facts and figures, and descriptions of the partners
- Links to related projects
- 20 news items in total
- Actual events
- Downloads of project related material like brochures, newsletters, white papers, logo etc.
- Link to our LinkedIn discussion group
- Link to the project movies on YouTube

Furthermore, the website contains an internal area for the project partners only. Here the consortium members can use a discussion forum, can exchange documents or can find all relevant contacts.

After the project the website will be adjusted to show the results and kept alive for 5 years.
Bolstered supply chain security for industry and government

NEERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK - TNO
Netherlands

Security - Standards - Transport

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