D17.13 CORE Final report on phase one developments of the DHL demonstrator -summary

Executive summary

The DHL Living Lab addresses a global supply chain for Airbus, an aerospace manufacturer which imports parts for aircraft from different parts of the world. In this Living Lab, we consider suppliers located in Spain and Airbus Plant in Poland. DHL provides Airbus with global logistics services, and in this Living Lab we focus on the logistics activities DHL performs to ship these parts from the suppliers in Seville (Spain) to Warsaw (Poland). As the goods are time-sensitive, road transport is the mode of transport from Spain to Poland. The pieces are shipped by truck from the suppliers and Custom warehouse in Seville from where it is transported to the manufacturing plant located in Warsaw.

The main objectives for this Living Lab are summarised as:

- Conducting a review of the risks of all security incidents on a standard route.
- Requirements in “Aircraft on Ground" (AOG) shipments between Spain and Poland.
- Designing hardware components to be embedded along the supply chain containers, through which we obtain a comprehensive implementation security contribution aimed at protecting special aircraft parts and thereby make it highly accurate and competitive with current methods of control.
- Developing software interfaces suitable for joint management by providing real-time transportation and cargo tracking.
- Creating a specific design for a Security Control Tower.
- Integrating and validating prototypes, procedures and interfaces by connection in real life conditions of one year of AOG shipments´ transit.

The demonstrator is divided in four phases:

- Intermediate report on the set-up of the DHL demonstrator: describes the current situation of the supply chain, key notes, corridors and networks including a first overview and analysis of the relevant risks (operational and criminal). (D17.11) [month 12]
- Set-up Phase: describes the configuration of the demonstrator (D17.12) [month 18]
- Phase One: reports on the implementation of the solution in the demonstrator and first results of the demonstrator in the pilot phase (D17.13) [month 24]
- Phase Two: reports on the final results and lessons from the demonstrator. The report includes a reflection on the implications of the CORE approach for the stakeholder community, based on user experiences, feedback and technical and operational performance indicators. (D17.14) [month 48]

This document describes the Final report on phase-one developments of the DHL demonstrator: the implementation of the solution in the demonstrator and first results of the demonstrator in the pilot phase. This is being conducted in the CORE project through the use of defined use cases within the Living Labs that have been designed to showcase the capabilities of the solution and validate that it successfully resolves the key challenges that have been identified within the CORE Description of Work (DoW).

During this period, the main tasks developed have been focused on the technological side, finalizing the connectivity infrastructure between all the systems:

- **WeMob**: This hardware is an on-board device placed inside trucks. The alarms are connected with One Control Platform software (WeMob). The software is connected with warehouses centralized security software (CRA), to prevent and mitigate any security or safety disaster. WeMob measures and follows security aspects during transport and sends all the security information to AM+ (system of DHL).
- **AM+:** This is a mobile technology used to measure and follow operational aspects through the driver's mobile phone during transport. AM+ joins the security and the operational data and transfers the information to **the Global Supply Chain Visibility tool** (GSCVT).
- **The Global Supply Chain Visibility Tool**: GSCVT displays live data feeds received from WeMob and AM+. The main goal of GSCVT is to collect security and operational data in a more user-friendly manner, by utilizing Google maps and its corresponding API as the general interface. The tool allows the user to track and trace shipment status and relevant cargo-handling information. The visibility tool shows real-time status of each vehicle.

In addition to the development of the VT, we have considered other managerial aspects necessary for its implementation:

- Review of the Scope: the existing trade lane of the demonstrator has been modified.
- Use case: According to the new scope, a new use case has been created.
- KPIs: new indicators have been set up due to new scope. KPIs have been divided into Operation and Security indicators.
- Requirements VT: DHL together with Inlecom have identified operational and security mandatory data to be provided by the VT.

Throughout these past months, several face to face meetings and weekly call conferences have taken place in order to progress on the VT development. A large list of decisions has been discussed and agreed within the partnership, without any conflicts arising. Connectivity between different systems has been an on-going challenge and different parties have worked jointly to develop it. Due to this joint work, problems faced were overcome successfully. A sense of communication and knowing how to listen to one another has been a key aspect in the success of the demonstrator's progress.

This LL implements a collaborative Global Supply Chain Visibility tool, as described in the Description of Work, incorporating input from a number of Demonstrators. The following table provides a detailed mapping between the DoW specifications and the actual implementation work.

Problem, ambition and goal of demonstrator

This deliverable is the final report on phase one developments of the DHL demonstrator, including the definition of the overall goal and ambition for the Living Lab, crucial partners and stakeholders, and the scope of the Living Lab system, as a sub-system of the real-world logistics environment. An environment & system analysis describes both the Living Lab system itself and its environment. Stakeholders, processes, products and technology are analysed in their current state. The Final report on phase one developments of the DHL demonstrator indicates the exact research questions and functionalities that are being tested within the DHL Living Lab and the use cases are described.

In this section, the overall ambition of the DHL Living Lab is addressed, as well as the link with the overall CORE project ambition. A particularity of this Living Lab is the fact that the whole movement of goods from the supplier in Seville (Spain) to the manufacturer in Warsaw (Poland) is the responsibility of DHL. Therefore, their main ambition is a secure and efficient supply chain for Airbus. The success behind the pilot depends on how DHL is going to enhance quality services in its general logistics services and in the particular case of Airbus business.

The overall ambition of this Living Lab is:

- The DHL Living Lab contributes to and makes use of risk analysis and the monitoring supply chain operations based on embedded devices.
- The embedded devices interfaces with the CORE ecosystem are aimed, on one hand, to reinforce the transport management system ensuring knowledge of security assets, time-sensitive goods status and geo-location and, on the other hand, to strengthen readiness of first responders upon deviations from security and operational KPIs.

In this case, the overall ambition corresponds only to DHL's ambitions, as there are some additional stakeholders in the Living Lab, but with more interest than real ambition to be met.

In the DHL Living Lab, supply chain operations are monitored using embedded devices ('Visibility'). The embedded devices ('Security technology') interface with the CORE ecosystem to create awareness of time-sensitive goods status and location. Based on Advanced risk management and processing of the data in a Security Control tower, DHL can respond to deviations from security and operational KPIs and deliver a more resilient supply chain. In phase two, it will be investigated whether Customs can piggy-back on implementation of these security concepts by DHL ('System based supervision').

The Global Supply Chain Visibility Tool (GSCVT) developed in WP5, has been customized based on the DHL needs, to consolidate and display live data feeds received from a number of DHL legacy supply chain systems in a more user-friendly manner, by utilizing Google maps and its corresponding API as the general interface. Information including network infrastructure, logistics services and vulnerability points are represented as vector data and displayed through user selectable layers.

The tool allows the user to select the layer of his interest, making the map a visualization tool for both real-time and static data, facilitating verification of the transportation status of all shipments and relevant cargo-handling information.

Furthermore, the GSCVT has been built to display risk assessment information including risk indices and probabilities of incidents that are received from MTVA, and from other integrated systems that are purposed to calculate and provide this kind of information. It is currently under investigation which systems will be involved in this integration and the exact information that is required for this calculation and what would be the final form of the Risk results.

Short description of scope of the demonstrator

The Living Lab ambition states the expected result, whereas the Living Lab scope defines where this result is achieved. The Living Lab scope therefore states the boundaries of the Living Lab and a first high level description of what is within this system.

Living lab methodology

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

Summary of Set-up phase

The "set-up" was focused on the definition of the overall goals, ambition and scope for the Living Lab and on the identification and consultation of crucial partners. Furthermore, the legal framework, procedures, protocols for communication and deliverables were defined and issues identified. The building block contained four elements, for which the results is described in the following paragraphs

- Living Lab Ambition
- Living Lab Scope

- Living Lab Partners
- Living Lab Implementation Plan (LLIP)

Living Lab Ambition:

The ambition of DHL is to have a secure and efficient supply chain for Airbus. The success behind the pilot responds to DHL enhanced quality services in general and a more accurate and detailed tracking for Airbus pieces. The overall ambition of this Living Lab was:

- The DHL Living Lab will contribute to, as well as make use of risk analysis, monitoring supply chain operations based on embedded devices.
- The embedded devices will interface with the CORE ecosystem to aid the transport management system ensuring knowledge of security assets and time-sensitive goods status and location, and turn, readiness of first responders upon deviations from security and operational KPIs.
- In the DHL Living Lab, supply chain operations will be monitored using embedded devices ('Visibility'). The embedded devices ('Security technology') will interface with the CORE ecosystem to ensure knowledge of time-sensitive goods status and location. Based on Advanced risk management and processing of the data in a Security Control tower, DHL can respond to deviations from security and operational KPIs and deliver a more resilient supply chain. Later on, it will be investigated whether Customs can piggy-back on implementation of these security concepts by DHL ('System based supervision') but at the moment it is not yet in scope.

Living Lab Scope:

Scope in set-up Phase has been changed compare to last report. The previous scenario was considering collection in US supplier to Airbus Plant in Seville. New scenario proposed is from Seville Airport/suppliers to Airbus Plant in Warsaw, Poland.

- Living Lab Partners: each partner has stated its own ambition regarding the Living Lab.
- Living Lab Implementation Plan (LLIP):
- For the implementation of the LL, following task has been completed:
- Preconditions for success, external dependencies and assumptions (relevant legal frameworks, Confidential Agreements, import/export regulatory frameworks)
- Identification of risks: LL execution, partners' contact person changes, technology risks, Safety and Security risk and Budget Risk.
- Deliverables and milestones

The initial **RISK ANALYSIS (T17.2.1)** of the demonstrator has been completed. The work started at the beginning of the project and the initial analysis ended, as planned, in month 21 of the project. ZLC analysed all the risks of the operation based on the perception of "likelihood" and "impact" (lead time related) of risk events and afterwards ZLC performed control measures to mitigate risks. Due to the change of the trade lane, the Risk Analysis will be updated in the coming months: we are not considering Air transportation; therefore, the previously analysed risks have been removed.

The lead of the next task **EMBEDDED DEVICES (T17.2.2)** is DHL and it contains the subtask SOFTWARE (led by Inlecom) and HARDWARE (led by DHL). Both subtasks are in progress now. We are working on the connection between systems. The partners are still working on the link between security systems, operational systems and the visibility tool. It is necessary to understand all the data of the operation and the alarms so that the visibility tool can show the risk, the alarms and the KPIs. This task is not finished, and we will do an update for the full scale. As scope has changed recently, we have to update requirements accordingly.

The task TRANSPORT **MANAGEMENT SYSTEM (T17.2.3),** that is led by CLMS, is in progress together with the subtasks MONITORING ON ROUTE, led by EBOS, and COMMUNICATION PROTOCOLS AND SIMULATION ENVIROMENTS, led by Inlecom. All of the partners involved in this task and the previous task are working together to connect the devices and the transport management system. As explained in Chapter 3.2, connectivity infrastructure is being developed:

- Connection between WeMob and AM+: Linking all the information from WeMob and TMS/AM+. Installation of the WeMob platform in an external hosting environment. FULL Web Platform for the Security System and management by the CRA. Development of SMS messaging platform through an IP platform. Analysis of sending and receiving data. WeMob Design. Development of the AM+ interfaces. Integration of the detailed route to WeMob for managing routes ("tunnelling") with CRA operators.
- Connection between WeMob/AM+ to Visibility Tool: Last step in connections is already defined and the final interface is adapted in order to achieve a complete integration.

The **INTEGRATION &VALIDATION (T17.2.4)**: Prototypes and interfaces have been defined. But until implementation of the Visibility Tool embedded devices will not be installed in vehicles.

All the requirements for the technical solutions (both hardware and software components for monitoring and tracking of shipments), connections and the use cases have been defined. Query databases and indicators of relevant incidents to transported goods due to different causes (crime, accidents and others) from outstanding actors of the sector (Governments, insurance companies and associations) have been identified.

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

The demonstrator is now in phase one, as the set-up phase has been completed. The connection between security systems, operational systems and the visibility tool is currently in progress. The goal is to collect and make available all the operational data, enabling the Visibility Tool (VT) to show the relevant risks, alarms and KPIs.

On the one hand, different sensors installed in the vehicles supply the VT (through WeMob) with security incidents (Figure 5). On the other hand, AM+ provides operational data. The VT displays in real time both parameters providing the operator a complete tracking and tracing of the goods transported.

Once this connectivity infrastructure is implemented in the Demonstrator environment, we will test the connection and install the alarms in the DHL fleet. As a new scenario has been identified, we will be able to perform first testing in a real environment with embedded devices installed in the truck.

The operational scenario considered in the last report (Lane US-Spain) has been modified due to DHL's external reasons (explained in section 3.3). The current flow is between Customs Office/suppliers located in Seville (Spain) and the Airbus Plant in Poland (EADS PZL Warszawa-Okęcie) (Figure 3-3). DHL provides Airbus with global logistics services, and in this Living Lab we focus on the logistics activities DHL performs to ship these parts from the suppliers in Seville to Poland. As the goods are time-sensitive, road transport is the mode of transport from Spain to Poland. The pieces are shipped by truck from the suppliers and Custom Office in Spain from where they are transported to the manufacturing plant located in Warsaw (Poland).

For this reason, a new scenario has been set up:

<u>IMPORT/EXPORT CLEARENCE:</u>

- Material from out of EU arrives at the Custom Office in Seville Airport (Lamaignere Customs). **Lamaignere staff requests T1 document** in order to transport material from Customs in

Seville's San Pablo Airport to Airbus Custom in Dos Hermanas, Seville. A daily route (van/truck) from DHL collects material and transports it to Airbus Customs in Dos Hermanas, Seville.

- Material arrives at Customs in Seville. Material is checked and unloaded. Customs Officers manage documentation in order to release material.
- Customs staff inserts Transport Request (TR) into DHL system in order to ship material.

VISIBILITY TOOL Engagement:

- Visibility Tool informs Control Tower that material has arrived to Customs Office in Dos Hermanas Seville and can be collected.
- Visibility Tool informs Control Tower that different suppliers in Seville area have requested to pick up and deliver more material to Poland.

USE CASE: Road Transportation (Spain-Poland)

- DHL Control Tower in Valencia (Spain) receives Transport Request (TR) to pick up material from Customs Office in Dos Hermanas Seville and suppliers in Seville area.
- Trucks collect material from Customs Office and Suppliers (check TR number, number of parcels and weight) VT displays Loading time, problems with documentation/packaging if existing, loading delays if existing, truck GPS position, estimated time of arrival to final destination, weather status, traffic conditions (alternative routes, if needed), parking in high risk areas.
- Truck in transit to Poland (5 working days trip to Poland). VT displays truck in transit and GPS position at any time, material missed, material stolen and accident during the transport, alternative route in case of traffic jam or weather conditions, estimated time of arrival.

- **OPERATONAL INCIDENT EN ROUTE**: Visibility tool displays notification alarm of "Traffic Jam" in the planned route and delay of two hours in the Estimated Time of Arrival. Control Tower operator checks alternative routes and sends new routing to driver in order to avoid traffic problems.
- **SECURITY INCIDENT EN ROUTE**: In new routing, truck has to make the mandatory 45 minutes break, and stop the truck in a non-secure Parking (black point). Control Tower receives alarm with notification of "Parking in high risk areas". Operator checks nearest secure parking; depending on the driving time left, the VT calculates a feasible parking spot, and sends information to driver. In case no availability is possible, then, the VT instructs the driver with the necessary security precautions. Driver goes to the indicated secure parking to do the mandatory break.
- Material is delivered after 5 working days in final destination EADS PZL Warszawa-Okęcie Plant. Material is unloaded. VT displays arrival time, problems during unloading, if existing, or delay, if existing (compare with the Estimated Time of Arrival as planned).
- Final status of VT displays material delivered.

Actions performed since last report

Regarding the Visibility Tool, connectivity is still an ongoing task:

Connection between WeMob and AM+:

- Linking all the information from WeMob and TMS/AM+. Installation of the WeMob platform in an external hosting. FULL Web Platform for the Security System and management by the Central of Alarms Reception (CRA).
- Development of SMS messaging platform through an IP platform.
- Analysis of sending and receiving data
- WeMob Design

- Development of the AM+ interfaces
- Integration of the detailed route to WeMob for managing routes ("tunnelling") with CRA operators.

In order to integrate a system, it is necessary to define the type of messages to send (queues, ftp).

- Types of messages: The types of messages managed in the AM+ platform are exchanged with different interfaces and with the affected systems in the scope of this project. The types of messages belonging to AM+ are transformed to different formats depending on the external system to integrate. The type of messages is related to the truck status: security alarms, driving status, etc.

The exchange of information referring to alarms, tracking, consumption, etc. between both systems is necessary on a daily basis. To make this possible, both systems must share a series of parametrical entities in the integration. For example, an alarm notified about one vehicle (which has a particular encoding in WeMob) must be identified in AM+ previously, so a one-to-one correspondence between both systems is needed.

For this purpose, two kinds of entities are established:

- Supplies: These parametric entities must be supplied in both systems (AM+ and WeMob) during the initial phase of the system's parameterization and configuration: Driver, Tractor, Trailer, Driver state…
- Operation: It refers to those entities that account for the large share of the entities that must be synchronized through the asynchronous messaging system and that is used continuously on time: Start Route/end Route, Alarms, Tracking, Consumption, Temperature, Driver identification by tachograph.

Connection between WeMob / AM+ to Visibility Tool:

Last step in connections has already been defined: the integration is one-way; AM+ publishes information in XML format, with an .xsd schema to be able to validate the messages. AM+ publishes messages to a messaging queue to which the Visibility Tool is subscribed. AM+ publishes in an SFTP folder those messages to be processed by the Visibility Tool. Once processed, they are moved to a backup folder. If an error occurs, they are sent to an 'error process' folder for further processing.

Type of messages from AM+ to Visibility Tool: In the initial phase of the project, the configuration of messages to be sent matches the AM+ types. In addition, the need to adapt the final interface is assessed in order to achieve complete integration.

Concurrently, we are working on the development of the Global Supply Chain Visibility Tool: Validate the Planned Route Structure: Transfer Request Number on a Specific Route (a predefined path of a vehicle - Starting-Point, Stops, Unloading-Point).

Decisions made since last report

First week of March 2016, we were informed that DHL lost part of the Business regarding International Shipments in the Airbus project. DHL will no longer manage the transport from out of Europe to Spain, but only European transports. The reasons for this change of scope is beyond DHL's control and will impact directly the project's development. The current scenario of the demonstrator includes the transportation of AOG parts from the USA suppliers to the Airbus Military facilities (consignee) in Seville, through air and truck transportation. As this part of the business will not be managed by DHL, a modification of the scope has been carried out.

We have studied different possible solutions in order to minimize the impact in the scope of the Demonstrator. On one hand, we did not want to change the essence of the project, and on the other

hand, we had to take advantage to the maximum of the work done to avoid delays in the deadlines of the work plan. All the advantages and disadvantages have been studied and partners have come to an understanding for this change approval.

For this reason, we decided to modify the existing trade lane, and from now on, the new trade lane is: Spain-Poland. As part of the Airbus contract, DHL is shipping on a weekly basis (once/twice a week), full trucks from Seville to Poland and the other way around. The decision of change of trade lane has been proposed by DHL and agreed together with the partnership. We have informed the CORE Project Manager of this change in order to obtain approval.

Considering this new trade lane, IT tasks developed under the GSCVT will not be affected. The change of scope does not have further impacts on the technical side for the systems involved (AM+/ WeMob), VT screens, layers, or search options.

KPIs have been reviewed and modified accordingly with the new trade lane. The previous scenario has considered a leg between US suppliers and Madrid Airport. This leg has been removed and implications in KPIs and security risk have been modified. New KPIs and risk assessment consider the new leg between Seville and Warsaw, taking into account a transit time of 5 days between origin and destination. This terrestrial leg will be longer than in the previous scenario (1 day transit time), which will provide the chance to simulate more risk incidents occurring in the transport of goods. Airbus main transports are by road, so this new scenario makes more sense as it is closer to reality.

This change of scope will not affect the planning of activities and will not delay the due date of the deliverables or project deadlines. We do not expect that any significant problem will arise with this change of scope.

The new scenario presented and agreed upon is briefly described below.

Material from out of EU arrives at the Customs Office in San Pablo Airport in Seville (Lamaignere Customs). Lamaignere staff requests T1 document in order to transport material from Custom in Lamaignere to Airbus Customs in Dos Hermanas, Seville. A daily route (van/truck) from DHL collects material and transports it to Airbus Customs in Dos Hermanas, Seville. Material arrives at Customs Dos Hermanas. Material is checked and unloaded. The Customs' staffs manage documentation in order to release material. DHL truck collects material for Poland in Customs and then makes a milk run around Seville suppliers to collect rest of Airbus parts. Once the truck has completed all the collections, it starts the route to Poland. Material is delivered after 5 working days in final destination EADS PZL Warszawa-Okęcie Plant. The new operation process flow has been described accordingly to the new trade lane.

<u>Agreed actions to facilitate the new business case:</u>

- DHL to review the current KPIs and update them accordingly
- Inlecom to update the Visibility Tool according to the new trade Lane
- Pilot will be based on off-line (not on the internet) experience of the tool and evaluation/assessment of the KPIs
- Full scale demo will be done on the basis of a live demo type where partners from the horizontal work packages will discuss/promote the work done
- ILS will evaluate the possibility to simulate the security incidents

Partner engagement during process

The team work is working well and no conflicts have arisen among the partners. English is the official project language and there have been no cultural/language barriers in the team. Monthly telcos with all partners are established in order for partners and activity teams to interact. Also, specific working

groups with partners involved in different tasks are established and they communicate through bi-weekly call conferences. Individual partner call conferences are maintained to discuss individual partner tasks and developments and periodic technical and work meetings (face to face) are set up with all partners. Lastly, a daily or weekly contact is made between DHL and ZLC as the WP leader. Another weekly call has been set up between ILS and DHL in order to progress on the VT.

Dissemination activities performed during past months

We were invited to the "*UNCEFACT Transport and Logistics Domain*" meeting in Valencia, the 9th-10th March 2016. The Foundation Valenciaport hosted this event organised by UN/CEFACT in cooperation with IPSCA and PROTECT.

The first day of the meeting was devoted to UN/CEFACT T&L domain specific projects and activities, whereas the second day was a "Special Topics day" and included information and discussions on International Standards, IMO SOLAS Container Weighing Regulations, EDIFACT as well as Single Window.

A large part of the T&L meeting was focused on the Multimodal Transport Data Model (MMT) project. A group of more than 60 experts from private and public sector were asked to look for synergies and cooperation within the Supply Chain Reference Model.

We were invited because the organisation and participants wanted to learn more about DHL's involvement in the CORE project, as there are connections between CORE and the group of Multimodal Transport Data Model (MMT) project.

During the second day, Javier Rivas from DHL presented the Airbus Demonstrator within the CORE project.

Upcoming dissemination activities:

The European Commission has invited DHL to present Airbus Demonstrator on the 13th Annual Meeting of the International Working Group on Land Transport Security (IWGLTS). The meeting will take place the 11-12-13th of May in Brussels. The presentation will be on the 12th, during the Session 5: Road Cargo Transport Security. This international group was created at state level, first of all as part of the G8 plan, and then extended to include:

- Canada (2013 chair), Singapore (2012 chair), Netherlands (2014 chair), Australia, Belgium, France, Germany, Russian Federation, Indonesia, Israel, Italy, Japan, Korea, Malaysia, Philippines, People's Republic of China, Spain, USA and the UK.
- UNECE and the European Commission are also part of the group and the UIC Security Division participates to represent the interests of railway stakeholders.

Another dissemination activity has been scheduled next May 24, 2016, in ZLC (Zaragoza, Spain) during the 2nd Global Supply Chain Research Forum. This Forum will encompass two events: the Research Fest on May 23, 2016, where final research projects will be presented, covering a range of topics focused on various supply chain aspects; and the Research Panel Discussion on May 24, 2016, where companies and researchers will have an opportunity for networking and discussing the latest research trends in logistics and supply chain management applied to real life success cases. The research panel discussion will be divided into two main reach areas:

- Supply Chain Visibility for Boosting Resilience Variability and unpredictability of arrival time of cargo during shipments can cause substantial economic losses for manufacturing companies in terms of brand image and unmet customer demand. While these companies have learned to address risks that cause delays by inflating safety stocks and pipeline inventories, it still leads to increased capital tied up and storage costs for firms. Improving monitoring and traceability of cargo through enhanced information exchange will ensure a better visibility in

the complex tracking operations and a mitigation of risks that affect the unexpected variability of time-delivery and ultimately building supply chain resilience.

- Supply Chain Digitalization According to SCM's World global survey of 1,000+ supply chain professionals conducted in September 2015, the most disruptive technology for supply chain strategy is related to digitalization. Big data analytics, digital supply chain, Internet of Things or Physical Internet are key areas where supply chain managers are investing their innovation efforts and obtaining fruitful results in terms of better performance and ultimately greater value. Digitalization enables the supply chain to deliver profound insights that can help manufacturers, logistics service providers and other key actors in an agile world. Digitalization will enable organizations to transform their existing hybrid supply chain structures into more flexible, open, agile, and collaborative digital models, saving time, money and resources.

DHL Supply Chain Spain will participate as speaker at this event and will present the developments that have been carried out in the DHL Living Lab of the CORE project.

Qualitative description of the demonstrator results

During this last period, a number of meetings have taken place to capture the requirements of the DHL Demonstrator. Few changes have been introduced during the process. Special focus was also given to describing the as-is Customs Clearance process and mapping in GSCVT's functionality, both on the visual aspect as well as the feeding mechanisms running in the background. A significant portion of work was also invested to identify the information provided by AM+ to the tool, and how this is presented depending on the selected filtering criteria and visual layers.

The basic GSCVT functionality developed under work package 5, have been adjusted and enriched to accommodate DHL requirements, introducing the following 3 visible panels visible customized to visualize those requirements:

- Left panel the "Filtering Criteria" and the selection area of the "Map Layers" (both areas including the unique elements of DHL).
- Right panel the "Filtered Results", "Custom Clearance List", "Transport Details" and "Operational/Security Incidents" along with the "Operational Events".
- Middle panel is the map where the routes with the truck information and alerts are visually represented.

To represent the two side panels (left and right side of the screen), which are loaded whenever a DHL user logs in to the GSCVT, two controls have been created. The design of those controls has been frequently changed and implemented according to the preferences of the demonstrator. To accommodate those controls, changes were made to the database in order to map them onto the appropriate user. Based upon this input, GSCVT has evolved to flexibly handle different control interfaces as imposed by each business scenario.

Additionally, a Windows Service has been created in order to constantly look for and retrieve any pushed messages containing information that needs to be displayed on GSCVT (notification messages, vehicle position messages, etc.). To test this service, we have created sample XML messages in order to push dummy data into the queue, and whenever the Windows Service retrieves those XMLs, these are stored in the Database.

Furthermore, GSCVT was modified in order to constantly check the Database for any new XML entries. In the case that new messages exist, they are retrieved, separated according to their type and utilised & visualized accordingly.

Last but not least, the initially provided business case (material arrives at Seville airport, passes through customs' clearance steps, and transferred to Seville) was fully implemented and visualised.

The implementation of this scenario required, along with other tasks, the modification of the User Interface (the two controls), the creation of new dummy XML messages and the publishing of GSCVT on the company's live server. This task has been done before the change of trade lane, with current scenario we need to adapt it to new situation.

Several advanced Search Filters have been created in the VT in order to facilitate the operator's daily tasks. Through these filters, the operator can easily check the status/position of the routes. In case of operational or security incidents, the problem can be identified and a faster response can be applied. At any time, the truck can be tracked and traced, and filters make VT a user-friendly search engine.

Due to last minute change in the trade Lane, we are currently working on implementing the new use case of DHL from Seville to Poland. VT is currently adapted to the new flow, and some slight changes have to be made.

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

Technical KPIs has been reviewed. We have defined Operational KPIs considering SLA requirements and useful data for the day-to-day operations. On the other hand, Security KPIs gathers all the related data which will be used to increase resilience in the Supply Chain. KPIs have been selected in order to have measurable and realistic output after the implementation of the demonstrator. We could have chosen other security and operational KPIs considering other kind of incidents: terrorism attack, bomb alerts, etc. But as project life is quite short, these threats are not likely to happen. We have preferred to select incidents that we expect to happen in order to deduce outstanding figures. Another reason is that we have to be able to improve KPIs after the implementation of the Visibility Tool.

The range has been fixed considering historical data. As we are already measuring KPIs as part of the contract with Airbus, we have historical data providing this frame of reference. Some other indicators have no a reference range because there is no historical, so they will be based on VT testing to create a baseline. After the implementation of the Visibility Tool we will be able to extract KPIs that without the tool we are not able to measure. With the Visibility Tool we will control many aspects not consider before its implementation: Parking in black points, Unauthorized Route/Driver, Panic button, etc.

The aim of the KPIs selected is to track, trace and record any kind of incident during the transport related to operations and security. Some of the KPIs will aim to warn about potential risks happening: parking in black points, unauthorized driver/route, lost signals, mobile phone not connected and jamming. Based on KPIs we will be able to identify weaknesses and threats along the supply chain in order to increase the resilience.

Conclusions

The table below summarizes the successes and barriers addressed in the DHL Living Lab. The key factor of the success of the demonstrator is the connectivity infrastructure. Several systems have to be integrated in the Visibility Tool and an intensive and continuous work has been done in order to reach all the DHL requirements. As many IT actors are involved in this demonstrator, coordination tasks have been a challenge inside the partnership.

As a result of this Phase One, the first output regarding the GSCVT is tangible and concrete. All the related scenario and requirements needed for its development have been fixed, conceptual basis and practical examples.

On the way, we have faced some significant problems like the change of scope. Due to that, we have redefined scope and reviewed KPIs. Another barrier encountered is the difficulty of inclusion of some of the identified risks in the demonstrator as these are unlikely to happen. A simulation in that case will be the solution to surpass this barrier.

Despite some delays, the steps, which needed to be taken prior to starting Phase Two, have been accomplished. Reports on the final results and lessons from the demonstrator will be carried out to reflect the implications of the CORE approach for the stakeholder community, based on user experiences, feedback and technical and operational performance indicators.

Subject	Successes	Barrier
solutions tested in LL	• The Global Supply Chain Visibility Tool is easy to use • The link between system as a way of integrate the external IT solutions • Quick fix to detect risks	• Risk and Security data difficult to access • For demonstration purposes it will be difficult to use real security incidents, since these do not happen very often. Security events will instead be simulated and used as an input for the demonstration
LL Process	• Information transparency between partners • Process transparency • Final user involvement in operational part • Final user involvement in security part • Connections between systems • Information required in the systems • Information showed in the visibility tool • The KPI's necessary • Stakeholders analysis • The integration with external parties • Implications with DHL current Business Models have been identified	• Larger and smaller players with different IT maturity levels • Change of scope in Demonstrator

Figure 5-1 Advanced Search Filters in GSCVT

Next steps

The next step will be the Phase Two (D17.14): Base on user experiences a technical and operational analysis will take place in order to evaluate the tool. A testing in real will be launched and implications of the CORE approach for the stakeholders will be assessed for the submission of the final report. Following task will be done in next phase:

- Final connections between systems WeMob and AM+ with the Visibility Tool.
- Final customization of the Visibility tool to consolidate and visualize all provide information flows (ST.17.2.2.1)
- Installation of Embedded devices in in the DHL fleet. Connections of the mobile equipment and the launch of the information systems and software. (ST.17.2.2.2 and ST17.2.4.1)
- Interfaces: combination of the three levels of communication channels in order to check availability of the source. The next task will be to integrate equipment, implementation of Service location platform in the first responder and development on extraction data from lead times and vehicles. (ST17.2.3.1) and (ST17.2.4.2)

- Testing in real: once embedded devices install and three levels of communications connected, first testing with real shipments from Seville to Warsaw. (ST17.2.3.2)
- KPIs results analysis.
- Modification if needed in VT requirements base on operator's feedback. Regarding usefulness of screens, layers, options, etc.
- Refining/tuning of technical issues of VT: connectivity, exchange messaging, location, jamming, etc.
- Implications of the CORE approach for the stakeholders.
- Implications of the Business Model and potential usage of the VT for other business.