Large pilot case in market conditions of a trusted collaborative vehicle network

Deliverable D4.3

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Executive Summary

Since some years e-commerce has been a booming market in Europe and it is almost sure that this development will continue. This growth has had a significant impact on the corresponding e-commerce supply chain, in particular for the so-called “last-mile” delivery. Due to the rising numbers of shipments, traditional parcel delivery companies had to enlarge their delivery fleets to fulfil the requirements of last mile deliveries for their end customers. As a result urban congestion has increased significantly, because traditional delivery vehicles regularly clog streets during peak traffic periods.

Another impact is that the expansion of delivery fleets increase congestion and air (especially fine particle) pollution. Furthermore, a considerable number of underutilized delivery vehicles is available in the economic cycle. The NexTrust pilot aims to pool these company owned vehicles outside of their regular working hours for e-commerce deliveries. By deploying these vehicles as “white vans”, the pilot case 4.1 “Pilot design of a trusted collaborative vehicle network for e-commerce deliveries” will contribute to the main goals of the NexTrust project:

- Reduction of deliveries,
- reduction of greenhouse gas (GHG) emissions and
- improvement of load factors.

The first large pilot case is in Dresden, Germany. The pilot case is part of WP 4 “e-commerce logistics innovation”. This pilot case concentrates on three main aspects:

- To form a horizontal collaboration between delivery vehicle owners (i.e. grocery chains, retail chains, newspaper delivery networks, rental companies) in a trusted network by tapping and pooling their “underutilized” fleets. This will lead to a more efficient and sustainable use of resources by extending the “driving” hours during which the vehicles are used.
- To share the knowledge about fleet capabilities and also capacities within a legal and trusted framework, which is conducted by a trustee.
- To set up an IT-platform that enables collaborative approaches for collecting and fulfilling the shipment orders. This is achieved by a strong transport management backbone, a real-time visibility of vehicle locations, which routes deliveries and shares capacities.

The task leader for the pilot case 4.1 is FIEGE Logistics, one of Europe's leading logistics providers, with a long-standing reputation as a pioneer in contract logistics and e-commerce. The vast experiences of Fiege in e-commerce have been contributed to the pilot design report.

For the development of the pilot design a three-step methodology has been used:

1. Identification of opportunities
2. Preparation of implementation
3. Operation model pilot case

This document gives an overview about the important deliverables of each step. The focus is the presentation of the IT-platform for enabling parcel delivery in a collaborative network. The IT platform allows retailers, vehicle owners and drivers to register for joining the collaborative network. All platform users receive a state-of-the-art web-User Interface (web-UI) as well as a smartphone app. The platform assimilates shipment orders from retailers, builds transport units and tours for sustainable delivery as well as books vehicles. These tours are then offered to drivers. Once accepted by a driver, the platform navigates the driver through the tour operation.

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1 Introduction

1.1 Objective and Structure of NexTrust

The NexTrust objective is to increase efficiency and sustainability in logistics by developing inter-connected trusted collaborative networks along the entire supply chain. These trusted networks, built horizontally and vertically, will fully integrate shippers, LSPs and intermodal operators as equal partners. To reach a high level of sustainability, we will not only bundle freight volumes, but shift them off the road to intermodal rail and waterway. NexTrust will build these trusted networks ideally bottom up, with like-minded partners, adding multiple layers of transport flows that have been de-coupled and then re-connected more effectively along the supply chain. NexTrust will develop C-ITS cloud based smart visibility software to support the re-engineering of the networks, improving real-time utilization of transport assets. NexTrust will focus on research activities that create stickiness for collaboration in the market, validated through pilot cases in live conditions. The action engages major shippers as partners (Beiersdorf, Borealis, Colruyt, Delhaize, KC, Mondelez, Panasonic, Philips, Unilever) owning freight volumes well over one million annual truck movements across Europe, plus SME shippers and LSPs with a track record in ICT innovation. The pilot cases covers the entire scope of the call and also a broad cross section of entire supply chain (from raw material to end customers) for multiple industries. The creation and validation of trusted collaborative networks will be market oriented and implemented at an accelerated rate for high impact. We expect our pilot cases to reduce deliveries by 20 % to 40 % and with modal shift to reduce greenhouse gas (GHG) emissions by 40 % to 70 %. Load factors will increase by 50 % to 60 % given our emphasis on back-load/modal shift initiatives. NexTrust will achieve a high impact with improved asset utilization and logistics cost efficiency, creating a sustainable, competitive arena for European logistics that will be an inspirational example for the market.

1.2 Objective and Structure of E-Commerce Pilot Cases (WP 4)

Workpackage 4 (WP 4: e-commerce pilot cases) is tackling the overall NexTrust goals within the e-commerce market, as well as building a trusted collaborative network across the European markets.

Online retail sales, so called e-commerce, is a booming business sector. The impressive growth has created a significant impact on the delivery component of e-commerce supply chain, also called “last-mile” delivery. The e-commerce boom leads to a continuous expansion of delivery fleets of the traditional parcel networks, which must fulfil the so-called last mile deliveries to end customers. The logistics sector uses predominantly small delivery vehicles, such as 7.5 tons lorries as well as smaller delivery vans with a weight of up to 3.5 tons.

The massive growth of e-commerce mainly contributes to urban congestion as traditional delivery vehicles pollute the air especially during peak hours. Moreover, e-commerce is raising customer expectations in terms of delivery convenience. This means a major challenge, because customers would like to receive parcels at their homes within a relatively narrow time window. This can lead to several delivery attempts by parcel carriers before they finally reach the recipient. One reason is that these networks typically run deliveries during morning-/day times according to their capacity planning. These delivery structures of standard parcel carriers today do not focus enough on (1) the

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"being at home" of the shipment recipients and (2) on enabling appointed deliveries to end customers. Several attempts to deliver packages at homes make the e-commerce business very expensive, because of rising costs for the environment and logistics. There are already ideas to change from home delivery to "multi-channel"-options such as delivery to a store (collect & go) or to a parcel collection point. These solutions will only partially solve the home delivery issues. Nevertheless, last mile delivery of e-commerce companies still remains inefficient in terms of costs and asset utilization.

The expansion of delivery fleets to meet the growing demand as well as network inefficiencies increase congestion and air (especially fine particle) pollution. At the same time, a considerable number of underutilized delivery vehicles is available in the market. The NexTrust pilot wants to pool company owned vehicles outside of their regular working hours for e-commerce deliveries.

1.3 Purpose and Scope of E-Commerce Pilot Case

This pilot case has its focus on the societal and mobility challenge of e-commerce by building a collaborative trusted network around multiple, independently owned vehicles, tapping and pooling this "underutilized" pool of existing transport equipment. These fleets are typically in use for eight to ten hours per day; while vehicles are theoretically capable to run 24 hours. Especially in the evening hours the vehicles are available, when the end customer wants to receive his/her goods.

This network uses the existing asset capacity more efficiently and improves the last mile delivery service from the receiver perspective, offering "appointed" deliveries, meaning agreed upon delivery dates/limited time windows to end customers that will lead to an increased efficiency of home delivery. With this e-commerce innovation, the project could achieve a real breakthrough in last mile delivery, which might then be scaled and even replicated across Europe. The envisioned trusted collaborative, multiple vehicle delivery network, compared with the situation of today, is visualised below.

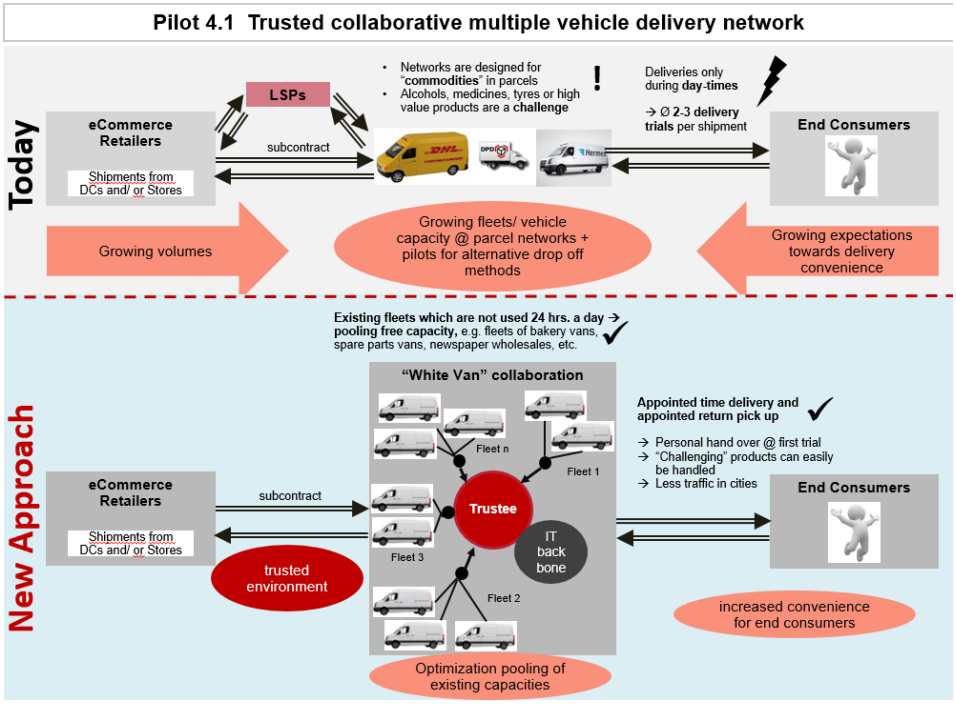

Figure 1: Approach pilot 4.1

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The envisioned delivery network will have an impact on ecological, economical and societal issues in relation to e-commerce and parcel delivery. In order to evaluate, manage and control this impact, key performance indicators (KPIs) have to be established and measured. In accordance to the KPIs of the entire NexTrust project, establishing the delivery network is estimated to

- reduce deliveries (due to the reduction of unsuccessful delivery attempts),
- reduce GHG emissions and
- increase load factors.

In order to make these essential KPIs manageable within the pilot case, they were used as basis for specific performance indicators. These pilot KPIs are not only supposed to be used to manage the delivery network during the pilot case and to evaluate the performance ex post after the pilot case, but also offer the opportunity to act as guidelines while designing the pilot. Based on the above described pilot's objectives and the essential NexTrust KPIs, the following pilot KPIs were identified as relevant:

- Increasing average usage time of vehicles
- Decoupling growth of delivery fleets and growth of amount of shipments
- More rapid renewal of existing vehicle fleet
- Reducing unsuccessful attempts of delivery
- Reducing urban congestion and maximum peaks of traffic

The task leader for the pilot case 4.1 is FIEGE Logistik, one of Europe's leading logistics providers, with a long-standing reputation as a pioneer in contract logistics and e-commerce. 10 years ago, FIEGE started as a full service provider for fulfilment solutions and established a network with companies which want to sell their products online. This vast experience with logistics processes was combined with innovative and scalable IT-services around e-commerce. Today, FIEGE is managing up to 30 e-commerce web shops for major customers across 11 European countries (Germany, Belgium, Netherlands, United Kingdom, Switzerland, Austria, Italy, Poland, Czech Republic, Slovakia, Hungary). Specific e-commerce experience and business involvement is an important factor for the innovative development of the pilot cases in target, which will work on the following main tasks:

- To build a horizontal collaboration between vehicle owners in a trusted network
- To share the knowledge about fleet capabilities
- To set up an IT-platform

In this report (D4.3) all aspects of the three step methodology are summarized. The theoretical background of the pilot case and the respective assumptions are documented in the pilot design report D4.1 "Pilot design of a trusted collaborative vehicle network for e-commerce deliveries". The complete functionality of the above mentioned IT-platform is demonstrated in the report D4.2.

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1.4 3-step Methodology

The pilot case 4.1 is using the proven 3-step methodology:

- **Phase I – Identification:** Understanding the AS-IS situation and the requirements of different stakeholders
- **Phase II – Preparation:** Designing of the network and the offered product
- **Phase III – Operation:** Operating the network and adjustment of the network

Currently, the pilot case 4.1 is in the 3rd phase.

1.5 Involved Partners in the Pilot

The following partners of NexTrust have given input to this pilot case:

- GS1 Germany
- Kneppelhout Korthals
- Pastu Consult
- TRI-VIZOR NV
- Vlerick Business School
- Vrije Universiteit Amsterdam

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2 Identification of Opportunities (step 1)

2.1 As-Is Situation CEP Market and Shared Economy Models

The goal of WP 4 for is to identify if a shared economy model can be combined with the CEP market.

The development of the courier-express-parcel (CEP) market is significantly driven by the rapid growth of the B2C e-commerce sector [KIL14]. In 2015 the EU28 countries achieved a turnover of 455.3 bn €, 7.4 % up on last year [ECF16].

The CEP market is highly competitive. The increasing amount of shipments attracts more and more players to benefit from the expansion. This leads to service innovations by LSPs and new competitors. Innovative approaches are e.g. a flexible delivery time slot, a fast delivery and transparency during the delivery process. The willingness to pay for standard services is, however, rather limited by the end customer. Furthermore, the CEP-market is a price-driven market. The proposed innovative service wants to enter this market by offering high convenience to retailers and end customers. The Same Day Delivery (SDD) service is still a niche services on the CEP market, which is suitable for a new delivery network to get access to the market. The future success of SDD is a controversial topic in the CEP and e-commerce market (see e.g. [BER14a]). The immediate availability of products strives to overcome the disadvantages of e-commerce in comparison with stationary retailers concerning direct availability of goods after the purchase.

Most sharing economy models rely on the idea of sharing unused or underutilized assets [PWC15a]. Although sharing resources is not new to the world and is offered in various industries such as rentals or leasing models, the concept of the sharing economy is based on two core pillars [PWC15a] [IZA15]. On one hand, it is based on more and more changing customers' preferences which value access to resources over ownership, including the idea of more sustainable and more personal form of consumption. On the other hand, it relies on the widespread use of digital technologies most notably the mobile internet. With this, transaction costs of sharing models can be reduced to a minimum and allow to build a cost efficient network [IZA15]. In parcel deliveries the shared economy approach is innovative.

2.2 To-Be Situation Expectation of the Market

Analyses of the service preferences and demands of end customers and retailers [MET15], [OKH13] show that customers have high expectations in terms of delivery time slots, time of delivery and transparency. This will be taken into account in pilot 4.1:

- Flexibly appointed delivery time slots

  The customers will be offered time windows of maximum two hours on specified delivery dates, which will be most suitable for the operations and scheduling within the delivery network. They are furthermore offered to agree to that day and time window or will be offered other time windows to pick the most convenient. These time windows will include evening hours until 11.00 pm (incl. Saturdays).

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- Same day & next day delivery

  Customers expect delivery in less than 24 hours. Therefore the delivery network will strive to deliver as much shipments as possible as same day deliveries. This is mostly valid for metropolitan areas. If SDD is not possible, the shipments are ought to be delivered next day.

- Transparency

  Respecting the customers' demand for control of the delivery process, the delivery network will offer quality information services. This includes prior notification of the expected delivery hour via text message and/or email to the recipient. Additionally, it is desired to enhance the transparency of shipment information. The customers will be offered the possibility to track and trace shipments via mobile app and web portal.

The analyses of customers' and retailers' preferences show the above summarised demand for parcel delivery services. However these services have to be seen in light of (additional) costs they impose on parcel delivery. The e-commerce market is highly cost competitive. Retailers negotiate prices with the LSPs and are able to realize prices, which are close to be only cost-covering [BIR15a][BIR15b][SAH13]. It is therefore expected, that the retailers' willingness to pay higher prices for same day delivery is low. In this case, additional costs for special delivery options such as appointed time slots and same day delivery will be passed down to the customer. This is confirmed by practices such as Amazon Prime or parcelbox2go, which charge the customer. Customers however are also price sensitive. The willingness to pay extra for additional delivery services depends on the price of the purchased goods.

2.3 Opportunities for the pilot

Based on the analyses of the CEP market, e-commerce market and shared economy models, the product offered by the WP 4 should:

- focus on the B2C market to profit from powerful and sustainable growth,
- make use of consolidated shipping (no courier shipments, no line hauls) to profit from economies of scale,
- focus on one-person-handling to limit personnel costs during delivery (shipments up to 31.5 kg) and
- avoid price competition by quality services.

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3 Preparation for Implementation (step 2)

3.1 White Van Collaboration

Creating a trusted collaborative vehicle network for e-commerce deliveries relies on a sufficient number of vehicles to be used within the delivery network. These neutrally collared vehicles are called the White Van Fleet (WVF). Analysis shows that WVF are well utilized in the mornings (with peak utilization at 8.00 am) and tend to be underutilized in the afternoon and night. The average distance covered by a vehicle is 59 km per day. 90 % of all vehicles are used for maximum eight hours per day. The utilization curve is shown in the following figure [KID10] [KID12]:

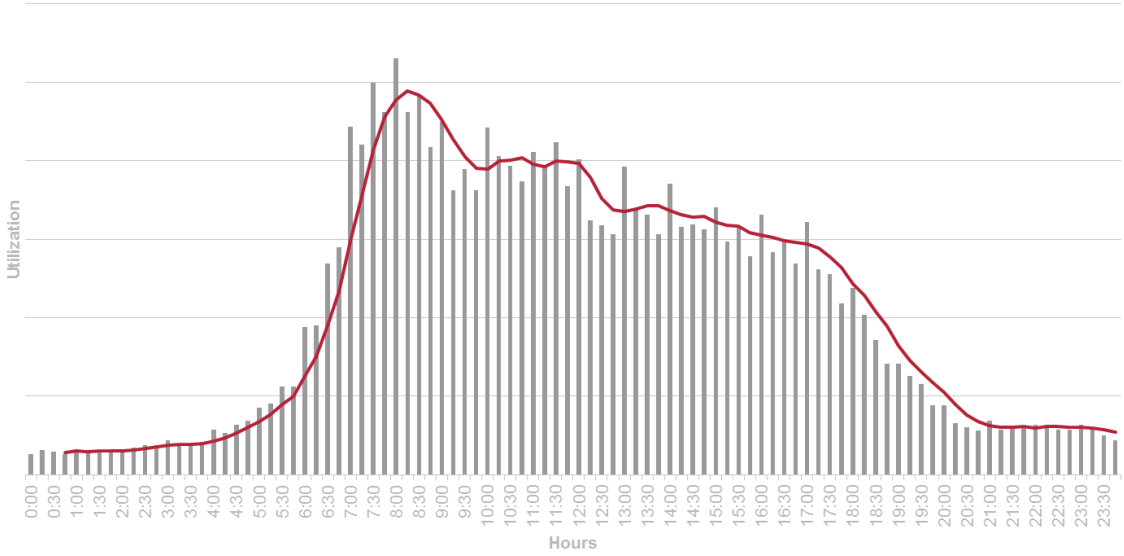

Figure 2: Utilization of vehicles during one day KiD 2010

Two key learnings for the pilot case are based on the analyses:

- There is high potential of neutral resources:
  - Almost 20 % of the vehicles are white;
  - Only 4 % of the resources are active in the CEP-branch;
  - More than 70 % of the vehicles belong to commercial sectors which can collaborate within the white van collaboration.
- Vehicles have an overall low degree of utilization:
  - The average utilization of the vehicles is 4 % over the whole day;
  - After 5:00 pm the utilization drops to an average of 2 %.

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The low degree of utilization can be eliminated with an open collaborative vehicle delivery network. The network operates in the opposite to the normal WVF peak utilization. The trusted collaborative vehicle network has impact on ecological-, economical- and social- KPIs. For example, a multi usage of an existing fleet reduces in total urban congestion as well as decoupling growth of delivery fleets.

Suitable vehicles within the WVF are vans, e.g. Mercedes Vito, VW Transporter, Ford Transit types with a minimum of 5 m³ load capacity. A desk research indicates that 3.8 million potential vehicles in Germany are available [KBA15].

3.2 Service and Product Design

The product definition is highly important for the success of the pilot, because the CEP market is competitive. Based on expert interviews and discussion with retailers in Germany the project focus is on time slot and same day delivery. Parcels will be delivered in the evening (6 pm to 11 pm). This time frame for deliveries is feasible for the majority of the end customer because the likelihood to meet the end customer at home is high. This fact has impact to the NexTrust KPIs. Several studies also came to the conclusion that the majority of customers favours SDD with suitable time windows as an additional service option [MET15].

In the following the detail views and interaction of the service for this pilot are explained:

- **End customer view**
  - The customer places his order in the web shop and typically receives the order confirmation immediately by email.
  - Following his order confirmation email from the web shop, the customer receives a separate email offering the time slot delivery option – this option is active for a specified time period.
  - Having booked the preferred time slot on the NexTrust website, the customer receives the time slot confirmation by email. If customer has entered his/her cell phone number he/she receives a SMS message 30 minutes before the delivery time slot.
- **Retailer view**
  - Orders are being generated as usual by the customers. No integration of the time slot service into the check-out process.
  - The backend system of the web shop hand over some basic information, e.g. customer address, email, no. of parcels, shipment/order number.
  - The administration of the time slot service works completely via the NexTrust IT system.
  - Following a successful delivery, a proof of delivery (POD) is transmitted back into the back-end system of the web shop.
- **Fulfillment center view**
  - Parcels for the time slot delivery are being separated physically in the warehouse:
    - A) With scanning process prior to loading carrier trucks/swap bodies: modified barcode label leads to no read => separation of parcels prior to physical loading.

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- B) Without scanning: separation of parcels in the packing process via IT dialogue.

- Consolidated pick-up of parcels at the fulfillment center by NexTrust vehicles, est. twice per day. Further allocation of parcels to delivery vehicles is handled by NexTrust.

3.3 Trusted Network including Role of Trustee

In general, a trustee is an independent third party between cooperating shippers, which functions as a “black box" to avoid the exchange of commercially sensitive information. Within the management of the e-commerce supply chain the trustee has operational responsibility, which includes the following two areas in the execution of the last-mile:

1. Platform operator

   The coordination between stakeholders is based on a platform that delivers the technology for communication/interaction between stakeholders. This platform has to be operated and maintained. In particular, the platform operator monitors all processes/operations inside of the network. The platform operator provides the software and is responsible for the smooth interaction of all stakeholders. Additionally his task is the continuous improvement of the system.

2. Trusted network

   The trustee takes part as an advanced 4 PL with trustee functions and provides logistic services for each stakeholder. Every stakeholder has a direct contract with the trustee and the trustee decides about the usage of the best available resources.

   The trustee has three main goals:

   - Fair payment for vehicle owner
   - Fair payment for driver
   - Sustainable dispatching (with focus on drivers and vehicles)

   In general, trusted collaborative networks are built up horizontally and vertically. To enable effective anti-trust compliant cooperation, a neutral trustee supports and coordinates the involved parties.

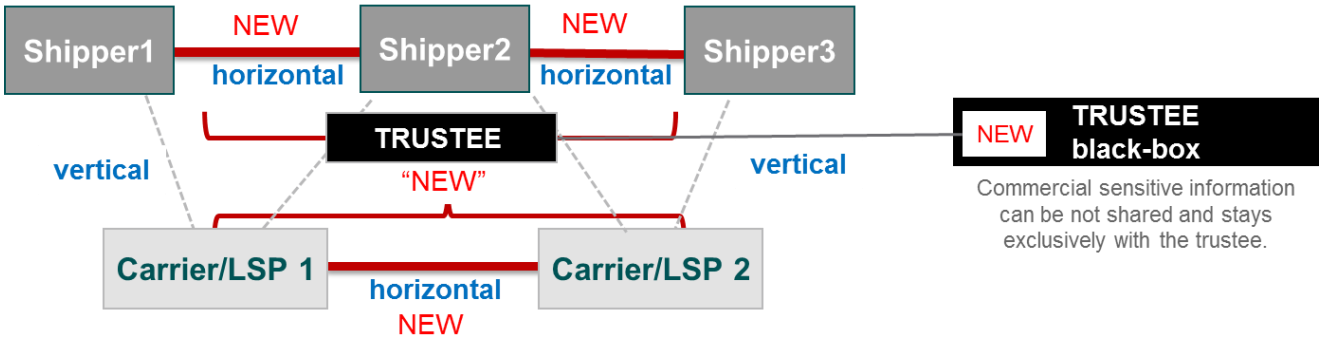

Figure 3: Trusted collaborative network

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The last mile collaboration between multiple vehicle owners needs a strong IT backbone and support to execute a sustainable trusted network. The pilot case therefore needs to establish first an advanced 4PL structure with trusted functions:

- to be able to bundle white vans to a trusted fleet network and
- to be able to switch from underutilization to an optimal utilization level which leads to reduction of empty mileage and appointed time delivery in a sustainable way.

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3.4 IT backbone

A process model for the collaborative network has been developed with the following main processes shown in the following figure:

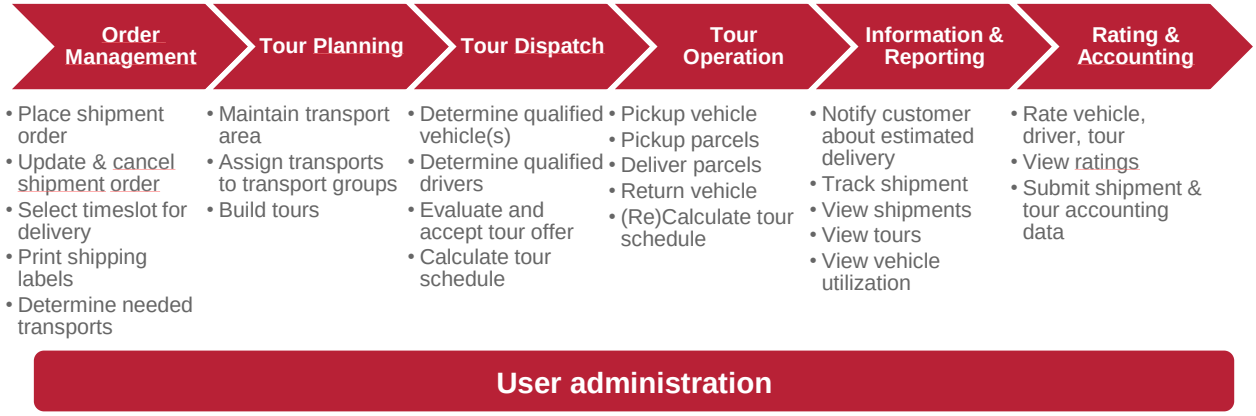

Figure 4: Main process of the NexTrust e-commerce platform

The IT platform allows retailers, vehicle owners and drivers to register for joining the collaborative network. The platform assimilates shipment orders from retailers, so that the end customer can select a timeslot for the delivery. With this functionality, unsuccessful delivery attempts can be reduced. Based on the shipment orders, the platform builds transport units and tours for sustainable delivery as well as books vehicles. Furthermore, the tour sequence, the tour segments and finally the route are calculated. For this calculation congestions and peaks of traffic will be taken into account. These tours are then offered to drivers. Once accepted by a driver, the platform navigates the driver through the tour operation. Before the actual delivery the end customer receives a text message with the dedicated delivery time, as the platform recalculates the tour schedule during the entire tour operation. After the successful delivery the driver gets rated and the relevant data will be transmitted to accounting.

In general, the platform is prepared for multi-language usage. For each pilot case the language of the respective country is used.

The following participants are involved in the NexTrust e-commerce platform:

- Retailer
- End customer
- Trustee
- Vehicle owner
- Driver

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3.5 Objective of Pilot KPIs

The pilot KPIs are based on the essential NexTrust KPIs: reduce deliveries, reduce GHG emissions and increase load factors. To prove the positive impact of the envisioned delivery network, the KPIs are supposed to be measured and evaluated over the course of the pilot. This calls for a precise description of each pilot KPI. In addition, the expected development of the KPIs due to the design of the pilot will be explored.

1. Increasing average usage time of vehicles

   By using existing vehicle resources the degree of capacity utilization will be enhanced, since vehicles are often used only in one shift. By using the same pool of vehicles in the evening hours for delivering parcels, the degree of productive using time could increase up to 50 %.

   This KPI will be monitored and evaluated during the pilot.

2. Decoupling growth of delivery fleets and growth of amount of shipments

   The increasing number of e-commerce shipments, leads to larger delivery fleets. This in turn leads to higher input of resources, raw materials and waste materials. By decoupling the growth of the delivery fleets and the amount of shipments, input and waste can be reduced.

   Due to the design of the pilot the vehicle fleet will be stable although the amount of shipments is growing.

3. More rapid renewal of existing vehicle fleet

   Typically vehicles are leased or used for a certain period of time and mileage. The additional use of vehicles for parcel delivery results in a higher mileage and a shorter life cycle. Thus the vehicle fleet is renewed earlier. The renewal of e.g. a Volkswagen van generates approx. 19% less CO2 emissions during the complete life cycle [VW15]. Due to this fact the vehicle fleet is in total more sustainable.

4. Reducing unsuccessful delivery attempts

   Unsuccessful attempts of delivery require additional handling of the parcel without additional benefits. The resources put in the additional handling, like time, energy or consumption of storage space are wasted. Reducing the number of attempts of unsuccessful delivery will directly reduce the waste of resources.

   Due to the fact of appointed or agreed delivery time windows, the number of unsuccessful delivery attempts can be reduced.

   This KPI will be monitored and evaluated during the pilot.

5. Reducing urban congestion and maximum peaks of traffic/congestion

   Urban congestion arises from traffic demand which approaches or reaches the maximum capacity of road infrastructure. With this, interaction between vehicles slows the speed of the traffic stream and leads to longer trip times and increased vehicular queuing and therefore to more emissions of air pollutants. By balancing traffic demand and by this reducing peak demands congestion can be decreased. In addition, a more balanced traffic demand embanks the amount of particulates during critical seasons and supports the compliance with threshold values set by the EU air pollution policy.

   Parcel delivery of the WVF will take place in the late afternoon and evening hours. This is directly related to the verified underutilization. In accordance to these findings, peaks in terms

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of road traffic are identified during morning, noon and early afternoon hours. By restrictively delivering parcels during non-peak times, the average productivity is higher than by delivering parcels also during peak hours.

In addition to the above mentioned KPIs the GHG emission per parcel will be calculated and monitored for the pilot phase.

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4 Operation Model Pilot Case (step 3)

4.1 Process Model

A shipment starts with the submission of a retailer's shipment order to the NexTrust e-commerce platform. Once the shipment has been created, retailers (and end customers) can use the platform to get information about the current status of their shipment(s).

The platform processes the shipment by determining the actual transports that are required for delivery (depending on whether it is a direct delivery from the retailer's warehouse to the end customer or an indirect delivery via a consolidation center) and assigns these transports to tours for delivery.

Transports derived from incoming shipments can be assigned to tours as long as a tour has remaining capacity – this is also possible just before tour start. However, at some point in time a tour needs to be dispatched, i.e. a driver and a vehicle need to be selected and booked. The platform find and reserve an available vehicle and offer the tour to qualified drivers.

A driver who has accepted to operate a tour will be provided with additional tour details before tour start. At this time the driver has access to the calculated route details and the estimated delivery schedule via his mobile device. Step-by-step instructions will guide him through the tour.

A tour always starts with the pickup of the vehicle. The driver scans parcel labels upon pickup and delivery with his mobile device and the information about each tour stop is reported back to the platform (status of delivery, timestamps and additionally information). This information is used to re-calculate the time schedule and send up-to-date notifications about the estimated delivery times to the end customers.

During tour execution the related shipments receive status information. After the shipment has been successfully delivered a proof of delivery (POD) is submitted to the retailer. A successful delivery could also be a delivery to the neighbor or a safe place. In those cases all relevant information (e.g. shipment addresses, all status information, signature) are attached to the POD. Finally the retailer is invoiced for the shipment.

At the end of the tour the vehicle is returned. Subsequently, both driver and vehicle owner will be credited for the tour.

The successful implementation of the NexTrust e-commerce platform will be shown by one demonstration cases.

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4.2 Pilot Case in Market Conditions

The focus is a simple show case to demonstrate the happy path and the basic functions of the NexTrust e-commerce platform. Further functions have been developed and can be shown if required. First insights can be shown, but it is not possible to show any live data due to privacy reasons.

4.2.1 Basic Information of Demonstration Case

An end customer “Tom Jerry” orders from the retailer “Directly GmbH” one shipment to his home address. The shipment will be picked up and will be delivered to the end customer. In the pilot case in Dresden several shipments will be allocated to one tour.

4.2.2 Order Management

The retailer sends all the information of the shipment via email to the trustee. The trustee enters all the shipment information in the web-UI of the NexTrust e-commerce platform:

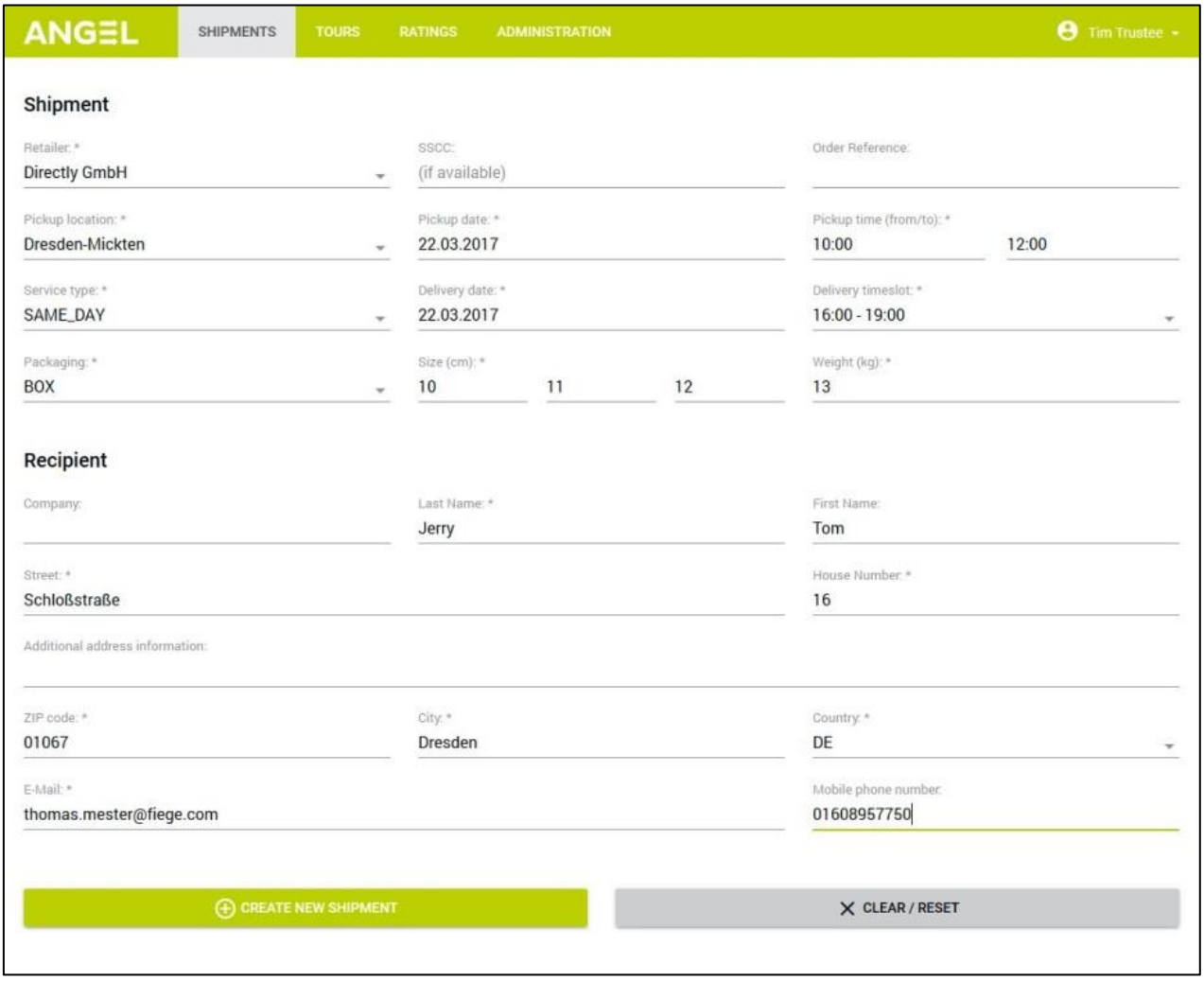

Figure 5: Web-UI: Enter shipment order

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There are three different options to enter the shipment information in the web-UI of the NexTrust e-commerce platform:

• Manually (as shown in Figure 5),

• Comma-separated-values (CSV) file upload or

• RESTful application programming interface (API)

Once the shipment is created, it is shown in the shipment-overview:

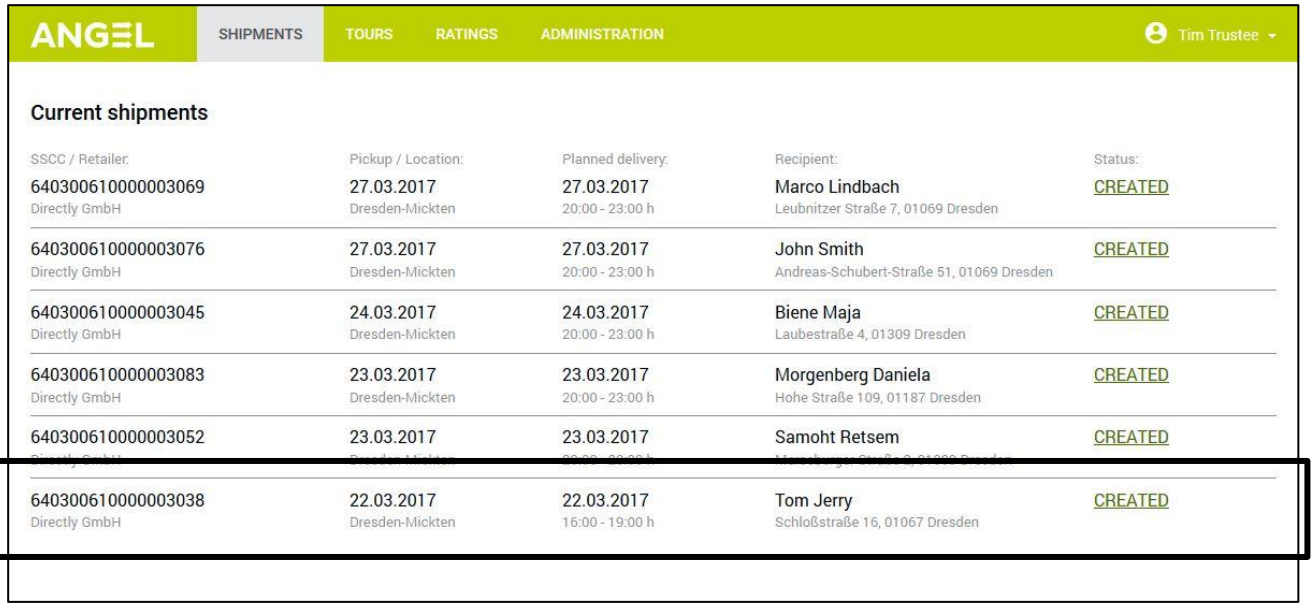

Figure 6: Web-UI: Shipment overview

After creating the shipment, the platform calculates the amount of transports. In this case the shipment will be transported directly. Therefore only one transport is created in the database. For an efficient dispatching process transport will be grouped in transport groups.

Once the transport is created, the system checks if the transport is matching to an existing transport group based on certain attributes:

- area of the pickup address
- area of the delivery address
- pickup timeslot
- delivery timeslot
- operation date
- current utilization of the transport group

If there is a matching transport group, this transport is added to that group. Otherwise a new transport group is created. After the transport is assigned to a matching transport group the shipment status is changed to PLANNED.

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The transport group occurs in the web-UI for the dispatcher and is shown in the following overview:

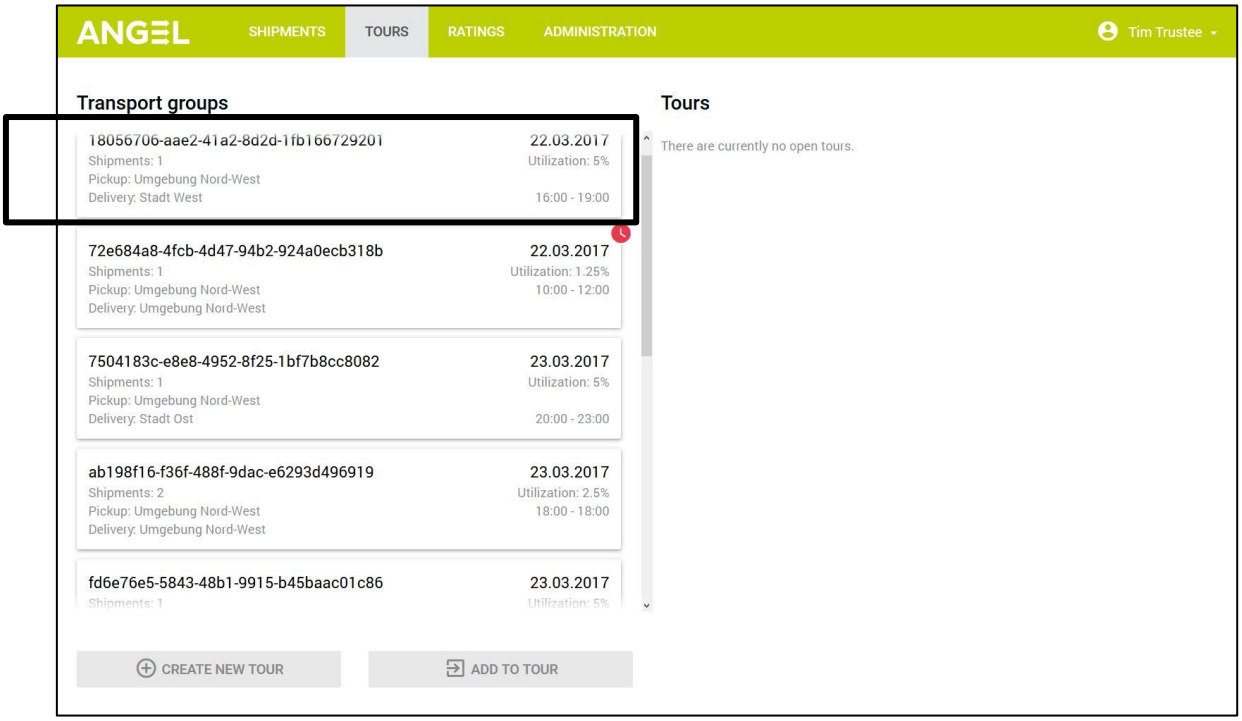

Figure 7: Web-UI: Overview transport groups

The utilization of each transport group is calculated based on the amount of shipments.

4.2.3 Tour Planning

Based on the built transport group a tour is created. Therefore, the trustee selects a single transport group and creates a concrete new tour. This is also executed in the web-UI as shown before:

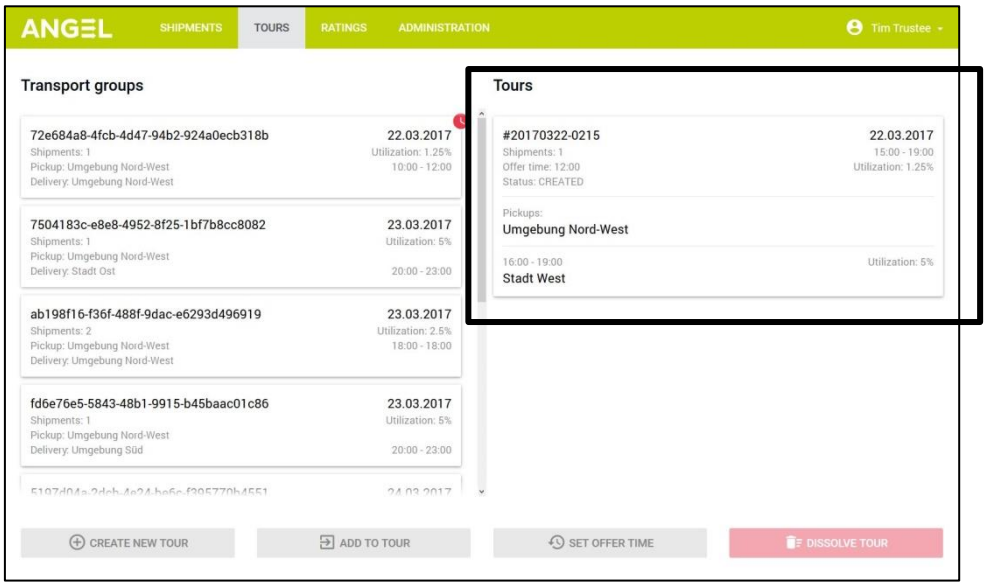

Figure 8: Web-UI: Assignment of transport groups to tours

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4.2.4 Tour Dispatch

Based on the maintained availability of the vehicles the platform determines and reserves a suitable vehicle to operate a concrete tour. If no suitable vehicle is found by the system a fallback vehicle will be assigned to the tour. Criteria to find qualified vehicles include availability (date and time) and pickup/return locations in relation to the tour route (based on due date/time of the attached shipments on this tour). The determined vehicle is blocked by the system and the tour status changes to VEHICLE_ASSIGNED.

After the reservation of a vehicle the platform offers the tour to the drivers and generates a list of all available drivers. If no suitable driver for the tour is found by the system, a fallback driver will be assigned to the tour. Based on different criteria the NexTrust e-commerce platform allocates the preferred drivers and sends them a tour offer. In the smartphone app the potential driver evaluates the offered tour and accepts it.

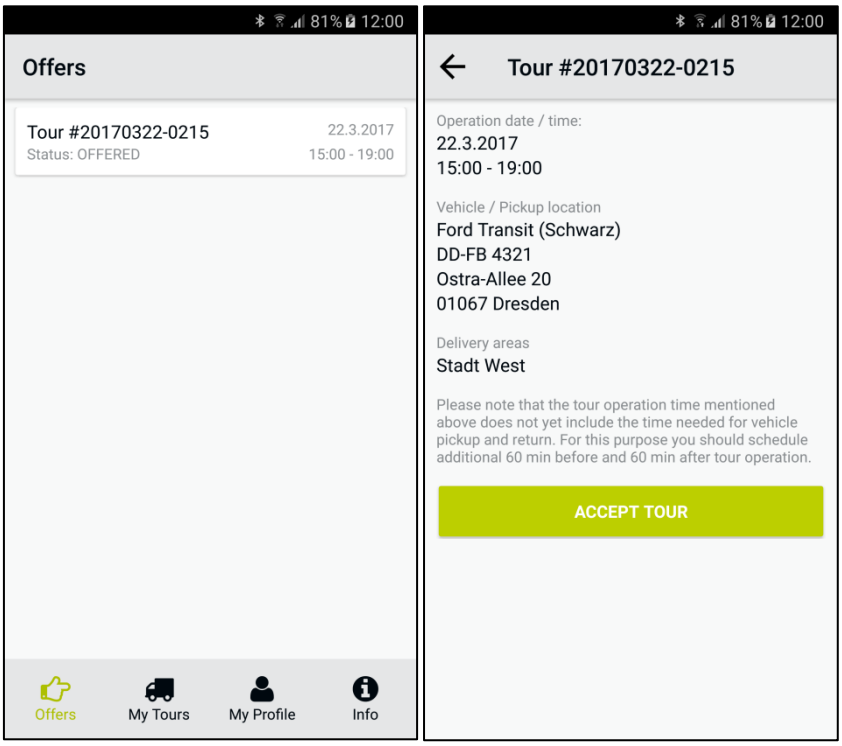

Figure 9: Smartphone App: Tour offer for driver

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If one driver chooses the tour, the tour is assigned to this driver, the vehicle is booked and the tour status is changed to DISPATCHED. The accepted tour is now displayed in the smartphone app in the menu bar “Accepted” in “My Tours” as well in the shipment overview in the web-UI as shown below:

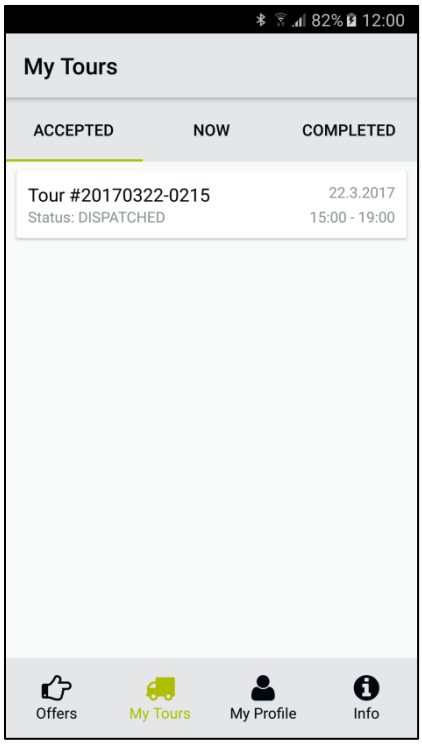

Figure 10: Smartphone App: My Tours for driver

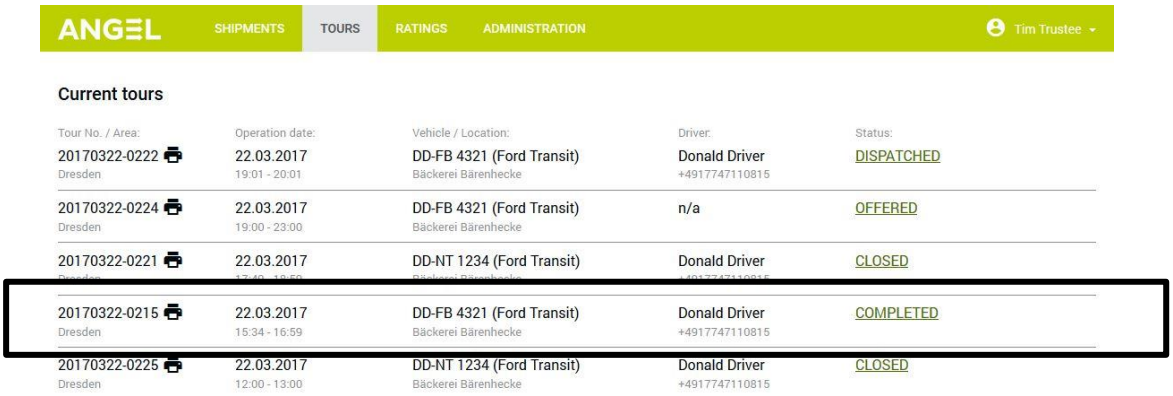

Figure 11: Web-UI: My current tours for drivers

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After the tour is scheduled the customer receives a message one hour before planned delivery time. In this demonstration case the delivery timeslot is from 3pm to 7pm; the IT platform informs the customer at 3pm about the actual time of delivery:

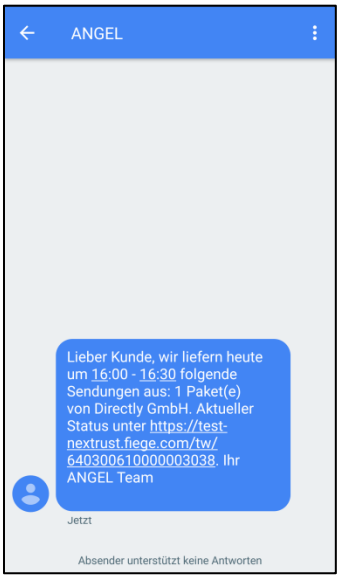

Figure 12: Text message: Customer notification about delivery[1]

[1] Dear Customer, we expect to deliver your parcel today between 16:00 – 16:30. Following parcels will be delivered at your place: 1 Parcel from Directly GmbH. Tracking Status on http://test.nextrust.fiege.com/tw/640300610000003038. Your Team

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4.2.5 Tour Operation

The driver is able to start the tour operation if the tour is in status CLOSED. To start the tour the driver selects the tour in the list “My tours” and the single tasks are displayed in the smartphone app:

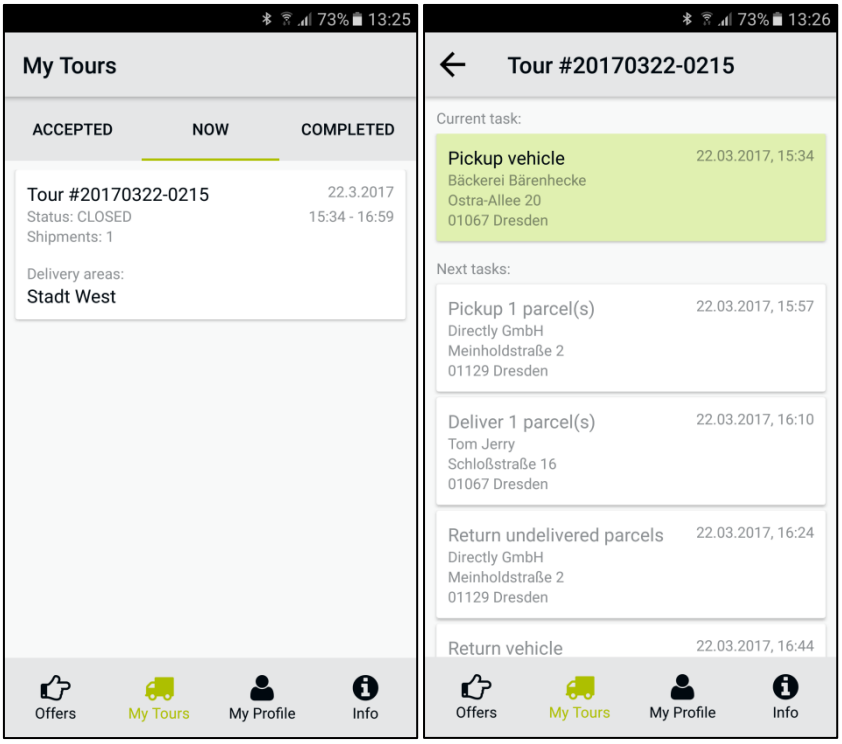

Figure 13: Smartphone App: My tours

By clicking on the task the driver opens the first task “Pickup Vehicle”. On a detailed screen the details for handover the vehicle are displayed. Then the driver enters the handover protocol data and confirms vehicle handover by completing the task.

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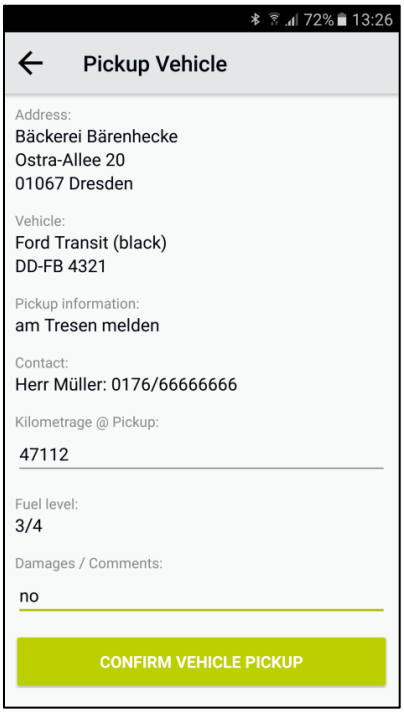

Figure 14: Smartphone App: Pick up vehicle task details

Next task is “Pickup Parcels”. In the task details the pickup information is displayed and the driver is requested to scan all shipment labels. The platform validates the scanned SSCC-No. In case of an unexpected SSCC-No. an error occurs:

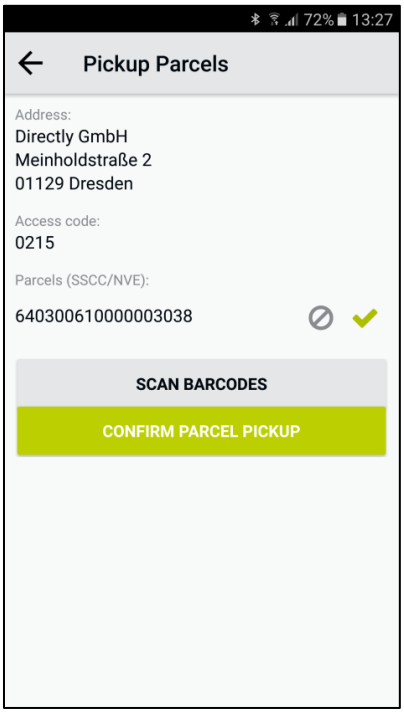

Figure 15: Smartphone App: Pick up parcel task details

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The task of delivering parcels is quite the same as pickup parcels. The task is finished if the customer confirms the handover of the shipments by a signature on the mobile device. In case of any damages or rejections the driver can set an appropriate flag in the smartphone app:

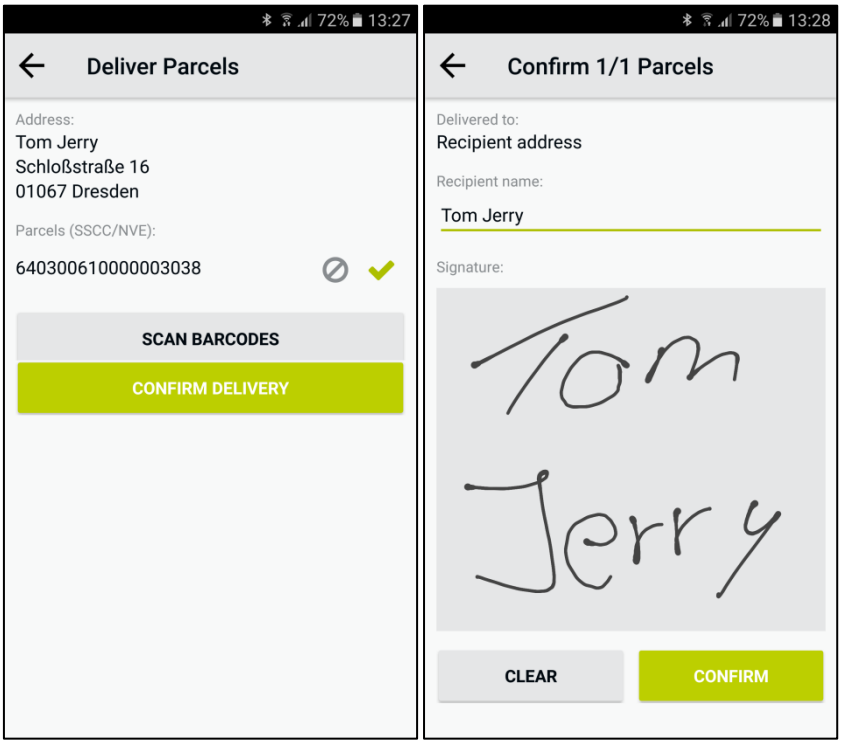

Figure 16: Smartphone App: Delivery parcel task details

After delivery of the shipment to the end customer, the platform sets the shipment status to DELIVERED, sets transport status to FINISHED and records a timestamp in the database.

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4.2.6 Rating

After the successful delivery the end customer receives a text message with an embedded link to rate the driver.

By clicking on the link in the text message the end customer will be forwarded to NexTrust web-UI to rate the driver. The end customer can select out of a five star rating between disappointed up to excellent service. The end customer can also give individual feedback in the comment field, as shown below:

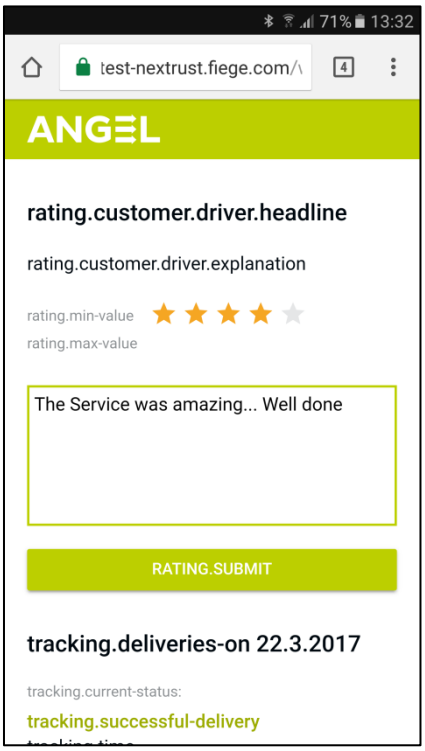

Figure 17: Web-UI: Overview ratings

The rating is linked to the shipment and driver. The overall rating is calculated and the driver can see his own rating in the overview.

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5 Concluding Remarks

5.1.1 White Van Collaboration

The potential of using unutilized vehicles is high. The average duration of using a vehicle is eight to ten hours a day. The success of the pilot depends on usage of the underutilized vehicles for the delivery network. The first feedback from retailers and vehicle owners indicates that the design of the pilot is able to acquire sufficient resources and customers to join the network.

5.1.2 Service and Product Design

The structure of a designed network is unique to the German CEP market. The SDD market is at an early stage in Europe. At the moment no retailer offers a nationwide SDD in metropolitan areas. There are only a few retailers who offer SDD for selected metropolitan areas. Additionally, from end customer perspective the focus on time slot and same day delivery was the right decision.

5.1.3 Trusted Network including Role of Trustee

As mentioned in chapter 3.3 the trustee will tackle two functions:

1. Platform operator
2. Trusted network with an advanced 4PL

Those main duties are one of the success factors of the pilot. Especially on vehicle owner's side, there is only a limited willingness to take over business responsibility of a new business model. Currently the vehicle owner prefers to take the role as a supplier than a collaborative partner.

5.1.4 IT backbone

In general, the agile approach for the IT implementation is helpful and appropriate for research and development projects. In agile projects the product owner (PO) is the constant connection between the business unit and the development team. As such he has a prominent function. The PO is responsible for the adjustment of priorites of the features according to current business needs and business value of the features. Thereby, the PO has a direct, short-term influence on the order in which the features are implemented.

Additionnaly, the agile methodology offers the opportunity for continuous improvement. Since the current version of the system is demonstrated and rolled out for further tests after each sprint, short feedback-cycles are given and new insights and ideas can be developed and integrated into the backlog and the software very quickly. This approach not only gives the PO the possibilty to design the system after the actual needs and increase the functional, it also sets the foundation for acceptance in production. This approach allows the implementation of the first feedback of the drivers to improve the usibility of our mobile app.

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Acronyms and Abbreviations

ACROYNM	EXPLANATION
API	Application Programming Interface
B2C	Business to Consumer
BPMN	Business Process Model and Notation
CEP	Courier, Express, Parcel
CSV	Comma Separated Values
FIEGE	FIEGE Logistik
GHG	Green House Gas
ICT	Information and Communication Technology
KPI	Key Performance Indicator
LSP	Logistics Service Provider
MVP	Minimum Viable Product
POD	Proof of Delivery
PO	Product Owner
SDD	Same Day Delivery
SSL	Secure Sockets Layer
SSCC	Serial Shipping Container Code
UI	User Interface
WVF	White Van Fleet

Table 1: Acronyms and abbreviations

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 635874