TeraCortex
Unified Logistic Network

Database
Overview

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The Unified Logistic Network (ULN) is a solution that supports vendors and logistic carriers in fulfillment of parcel delivery. It is designed for three main objectives:

- Saving costs for vendors and carriers

- Enabling seamless handover of parcels between different carriers

- Giving customers more control over the fulfillment process

The system relies on the introduction of the Serial Shipment Container Code (SSCC) in combination with advanced image processing capabilities and real time location tracking via a new high speed database.

The SSCC is a worldwide unique identifier standardized by the GS1 that either vendor can associate with an outgoing parcel. Carriers on the road, intermediate parcel handling facilities and finally the delivery agent at the door can use this identifier in all stages of the fulfillment process to access and manage parcel related data.

An important part of the system is the advanced image and video processing of outgoing and incoming parcels. The cameras and related software recognize the parcel labels and dimensions, as well as the status of the package. The data is refined and stored in the ULN database for later use and comparison.

The real time location tracking of all parcels is implemented by GPS receivers in vehicles and mobile devices submitting the respective positions to the database. Given a large number of vehicles and high resolution GPS coordinates this amounts to quite high transaction rates. The ULN database is designed to handle this load. Further it has builtin special data replication functionality to handle low bandwidth connections from and to parcel centers (typically built somewhere on the green field).

A demo system including complete design specification of business cases and data models is available for selected customers.

What are the benefits of the system?

- It drastically reduces the number of failed delivery attempts, because customers can submit a change of destination: "I am not at home. I want to meet my parcel at a new location". The system provides the real time locations of all parcels and vehicles. Based on this information carriers can then decide whether a redirection makes sense. If they confirm, the new destination is stored in the system and used automatically for the delivery process.

- It eases the process of returning parcels. Customers can submit a real time cancellation. This works very much as real time redirection. But here the new destination is the original sender address. Delivery agents do not need anymore to get to the door to find their parcel rejected. And customers do not need anymore print a return label and send the parcel back.

- It enables seamless handover between different carriers. There is no no need anymore to relabel parcels or check them in or out to carrier specific data systems because the SSCC guarantees worldwide compatibility. Still the system supports also carrier specific tracking numbers.

- Vendors and carriers can reduce their data handling systems because their applications can use the ULN database. Application specific interfaces are provided by the ULNDB.

- It allows for real time damage and theft intervention because any manipulations of parcels are recognized at entrance of the next parcel handling facility. The system compares the incoming parcel to the state stored in the ULNDB and fires an alarm if deviations exceed configurable thresholds.

- It allows for easy end to end tracking in case of legal prosecution, VAT fraud or other circumstances.

- It supports mass data analysis on all parcel data across the entire fulfillment chain. This gives valuable insight into behavior of vendors, carriers and customers.

1.2 System overview

The most important compenents of the system are the vender (or sender) outlet, intermediate parcel sorting facilities, transport vehicles and the receiver inlet. In all stages of the fulfillment process data is communicated and processed via the distributed database system. The overall process is easiest to understand, when we follow a parcel from the sender to the receiver.
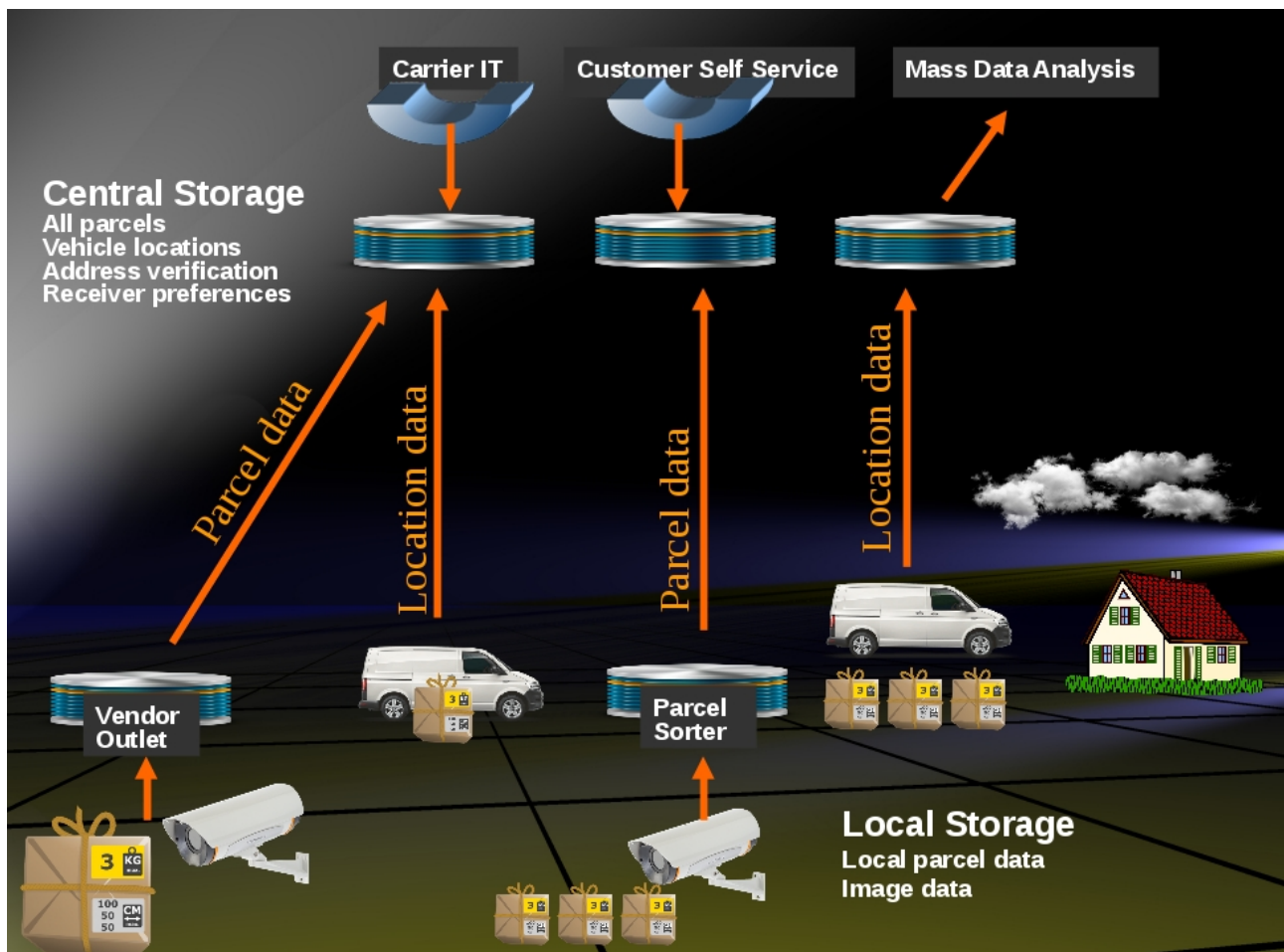

Illustration 1: ULN system overview

A parcel along with its properties like SSCC, sender and receiver is created at the vendor outlet (lower left). Image documentation is captured and stored in the local (vendor premises) part of the distributed database. The parcel data is replicated to the central storage (upper half). Vehicles carrying parcels to local of regional distribution centers and parcel sorters send their location data also to the central storage. There it is associated with the parcel record identified by the SSCC. Distribution centers capture intermediate documentation of the package state. This includes images. Image data is stored locally

while additional parcel data and references to the image data is sent to the central store.

Carrier and vendor IT systems as well as customer self service systems have access to the central storage (from the top). In the database they find the needed information to realize new services like real time redirection, cancellation and damage intervention.

The database system has special properties to ensure safe fulfillment:

- It is distributed and replicated. There is no single point of failure. Even in case of total blackout of intermediate parcel handling facilities the central repository still knows the correct data. Further the next parcel center on the way is able to step in by reading the parcel label and adjusting the data appropriately.

- The database is extremely hardware efficient, means: It saves 90% of hardware cost compared to traditional databases. By this it is able to track concurrently the GPS locations of hundred thousands of vehicles at full resolution in real time.

- Parcel centers may have low speed internet connectivity. The database takes account for this by configurable redundancy. Certain categories of data (image, video) may stay in the parts of the database locally to the respective parcel center. They need not be replicated to the central repository. Only in case of damage intervention the exact state of parcel need to be documented by image data. In this case the database system pulls such data automatically from the local parts and hands it over to authorized client applications. In contrast text based parcel data is always replicated to the central repository.

- The system also features interfaces for mass data export towards data analysis systems. This provides statistical insight into the complete delivery chain and enables the carrier to optimize all processes.