

Insights | Balancing workload in Parcel Delivery

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The challenge

One of the great challenges in parcel delivery is getting the parcel at the right time at the right place. We have seen that during the Christmas Holiday season and Black Friday this is not simple task. And although these enormous peaks in demand will always be a challenge, balancing the workload more evenly over the different zones could provide some relieve. In this contribution we briefly summarize the development and advantages of an advanced and new clustering technique that helps carriers to make better use of their resources.



Key words: Express Delivery Services, Logistics, Service Zone Design, Clustering.

Parcel delivery is a typical and classical logistics problem in which the many customers are scattered throughout a specific area, often subdivided into so-called service zones. By doing this, specific resources (for example the driver and the vehicles) are assigned to these service zones. This is however not very flexible in times of peaks and not all zones require equal resources over time.

The approach

Together with our partners at Optit (Tiziano Parriani and Matteo Pozzi) we worked on optimizing the service zone design, a crucial step in optimizing parcel delivery services. That enabled us to simplify the planning of everyday distribution routes while favoring the driver familiarity with the delivery zone. The clustering technique subdivides the geographical area served by the carrier into service zones taking into account different requirements and parameters. The key driver is the historic demand data, that generates the zones based on equal workload per zone and in addition, trying to minimize the number of zones.

The Benefits

The clustering technique allows to set the preferred number of service zones together with a desired range for the estimated workload for each service zone, as well as several other constraints (such as a limited number of points). Furthermore, the variation of the workload is very limited and can easily be adjusted. It really helps to use the available resources.

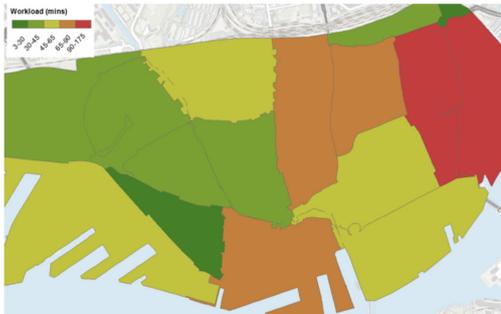
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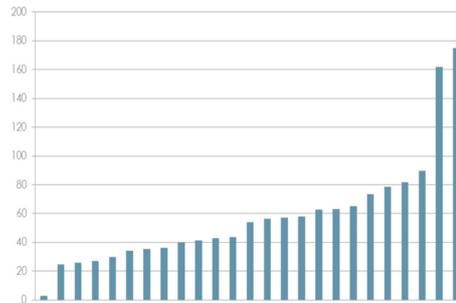


The Old Approach

In the old approach service zones courier were based on ZIP codes, with a different granularity of aggregation depending on the number of digits of the code used. Unfortunately, they are generally too large to be served by a single vehicle and the workload is very unevenly distributed.



PC 4 zones and workload in minutes

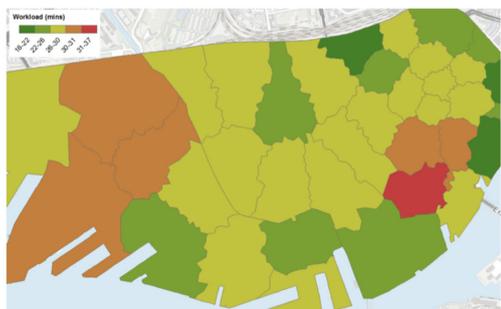


Workload in minutes

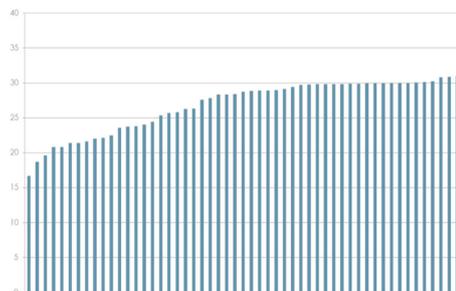
Zones	25
Workload Average	58
Standard Deviation	39

The New Approach

The clustering approach results in a solution with an average workload is about 27 minutes – very close to the target of 30 minutes and the variation of workload very limited (the standard deviation is very low). The methodology improved the effectiveness and reliability of the delivery service, greatly reduced the adjustments required to define the routes based on daily demand and, last but not least, helped to reduce the number of drivers and trucks.



Optimized zones with even workload



Workload in minutes

Zones	54
Workload Average	27
Standard Deviation	4

More information?

For the application please contact Frans Cruijssen (F.Cruijssen@argusi.org)

The methodology is described in more detail in the publication with The original title is: Creation of Optimal Service Zones for the Delivery of Express Packages, (Tiziano Parriani, Matteo Pozzi, Frans Cruijssen) and is being published in AIRO Springer Series (<https://www.springer.com/series/15947>).

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