

Benefit analysis – DT50

Increasing delivery capacity by
conventional packet automatons and
Delivery trailers

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Introduction

- Benefit analysis is based on an assumption that there is a need to increase the capacity of parcel delivery
- Capacity can be increased with conventional packet automaton (option *Conv*), or with Delivery trailers (option *DT50*), and these options are compared to each other
- Delivery time window for a conventional packet automaton is assumed to be one week and a delivery time window for Delivery trailer is about half of that
- Shorter delivery time window is one reason why Delivery trailer may save operating costs compared to use of the conventional packet automaton

Present automatons

- Parcel delivery arrangement comprises the following:
 - Each of delivery areas (1, 2) comprises nine conventional packet automatons
 - A van transports *daily* parcels between a sortation hub and a delivery area

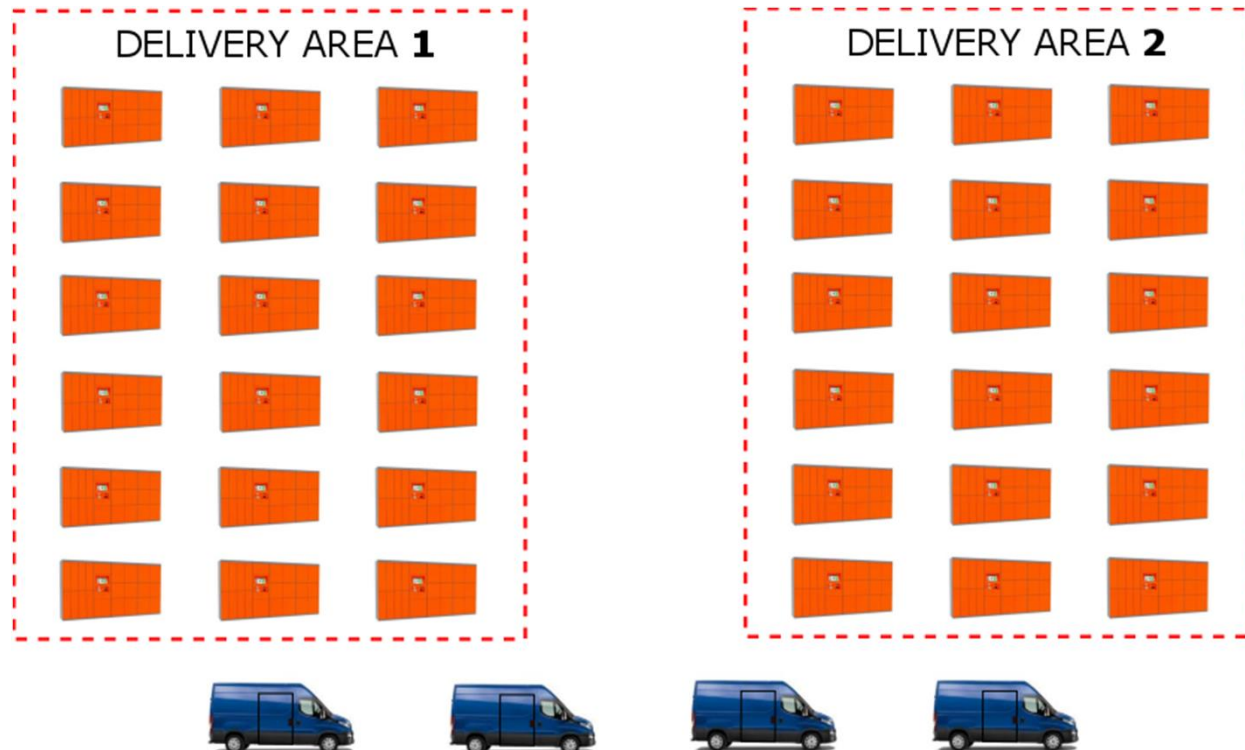


Options

- Benefit analysis concerns two options for increasing the parcel delivery 100% on delivery areas 1 and 2
- Option *Conv* means that the number of conventional packet automatons is doubled (from 9 to 18 per delivery area) and the number of the vans is doubled (from 2 to 4)
- Option *DT50* refers to use of Delivery trailers
- In the both options a delivery cycle starts from a sortation hub and ends to the sortation hub
- In option *DT50 one* Delivery trailer is replaced with another Delivery trailer within *each* delivery cycle

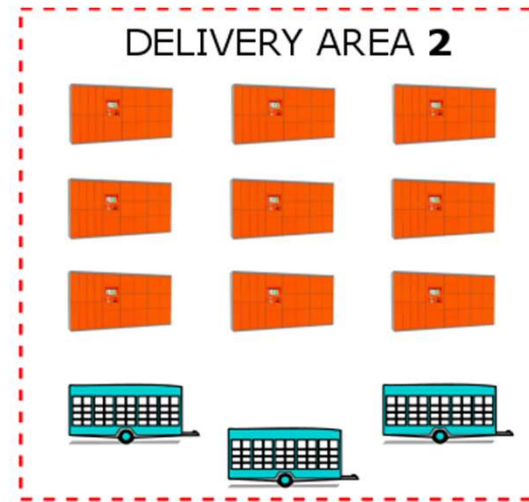
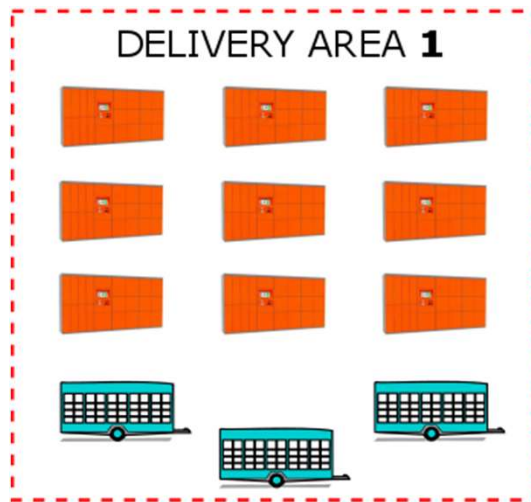
Option *Conv*

- All automatons are conventional packet automatons:



Option *DT50*

- 50% of the automatons are conventional packet automatons and 50% are Delivery trailers
- Three Delivery trailers and one extra trailer per delivery area:



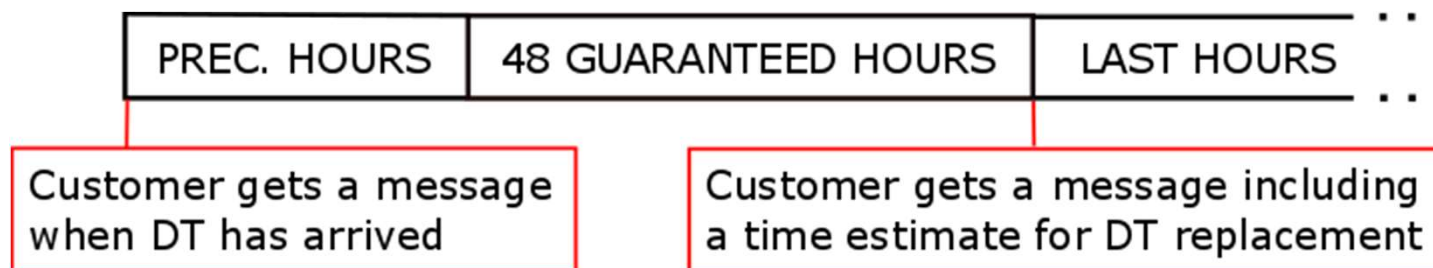
Rotation

- Rotation means that a location of Delivery trailer changes
- Option *DT50* has such rotation that *one* of the three Delivery trailers on a delivery area is replaced with another Delivery trailer *on each third day*
- Rotation is illustrated in the following table in which HUB is a sortation hub and Delivery trailers are numbered from 1 to 4:

DELIVERY	1	4	4	4	3	
AREA	2	2	1	1	1	
	3	3	3	2	2	...
HUB	4	1	2	3	4	...
DAY	MON	TUE	WED	THU	FRE	

Delivery time windows

- Delivery time window for a conventional packet automaton is one week in the both options
- In option *DT50* a customer may choose a conventional packet automaton or Delivery trailer
- If choosing Delivery trailer, the customer has 48 guaranteed hours and so-called preceding hours to collect the parcel
- Delivery time window for Delivery trailer (DT):



Uncollected parcels

- “Last hours” in option *DT50* mean that the customer still has a possibility to collect the parcel
- After the replacement of Delivery trailer the parcel is returned to the sortation hub with Delivery trailer
- Alternatively, the parcel is moved into Delivery trailer that was transported to the delivery site, if there is space
- Generally speaking, uncollected parcels cause unwanted work in the both options
- It may be possible to use, for example, a 5€ deposit
- Then a customer gets the 5€ deposit back, if the customer collects the parcel within the delivery time window

Comparison

- Options *Conv* and *DT50* are now described and next they are compared to each other
- Benefit analysis is based on cost comparisons between option *Conv* and option *DT50*
- Some of the following assumptions concern loading of parcels and some concern transportation of the parcels
- The rest of the assumptions concern employee costs and investment costs
- Benefit analysis can be made with different assumptions or with real data, if available

Loading

- **Assumption 1:** in the both options the trunk of a van is manually loaded by conveying parcels in trolleys into it
- **Assumption 2:** in option *DT50* the trunk of Delivery trailer is manually loaded by conveying parcels in racks into it
- **Assumption 3:** the loading actions last as long in option *Conv* and in option *DT50*
- In other words, two vans can be loaded as fast as one van and Delivery trailer coupled to it
- **Assumption 4:** Delivery trailer provides as much transportation capacity for parcels as a van

Transportation

- Transportation comprises actions on delivery sites, such as parking a van, conveying parcels from the van to a conventional packet automaton, and filling of the automaton
- In option *Conv* a delivery cycle comprises at most *nine* delivery sites, because there are *two* vans per a delivery area
- In option *DT50* a delivery cycle comprises at most *ten* delivery sites, which makes the delivery cycle on average longer (in kilometers and minutes) than in option *Conv*
- Decoupling and coupling of Delivery trailer require time, too
- **Assumption 5:** In option *DT50* a delivery cycle is one hour longer than in option *Conv*

Employee costs

- Employee is here a driver of a van
- **Assumption 6:** in option *Conv* a work day is seven hours and the employee cost is 36000€ per year
- In option *Conv* the total employee cost for delivery areas 1 and 2 is 144000€, because four vans and four drivers are needed for parcel delivery ($4 \times 36000\text{€} = 144000\text{€}$)
- According to assumption 5 a delivery cycle is one hour longer in option *DT50* and thus the employee cost is 41143€ per year ($8/7 \times 36000\text{€} = 41143\text{€}$)
- In option *DT50* the total employee cost for delivery areas 1 and 2 is 82286€, because only two vans and two drivers are needed for parcel delivery ($2 \times 41143\text{€} = 82286\text{€}$)

Investment costs

- **Assumption 7:** a secondhand van costs 30000€
- **Assumption 8:** a new conventional packet automaton costs 10000€
- **Assumption 9:** Delivery trailer costs are two times more than the conventional packet automaton, i.e. 20000€
- In option *Conv* the investment includes nine new conventional packet automatons per delivery area and two extra vans, therefore the investment costs are:
$$2 \times 9 \times 10000\text{€} + 2 \times 30000\text{€} = 240000\text{€}$$
- In option *DT50* the investment includes altogether eight Delivery trailers and the investment costs are 160000€

Benefits

- Investment costs in option *DT50* are 33% smaller than in option *Conv* ($1/100 \times (240000 - 160000) / 240000 = 33\%$)
- Operating costs include in this benefit analysis only employee costs
- As calculated in the above, the total employee cost in option *Conv* is 144000€ and the total employee cost in option *DT50* is 82286€, thus the difference is about 61700€
- Operating costs in option *DT50* are 43% smaller than in option *Conv* ($((144000 - 82286) / 144000 = 43\%)$)
- Savings in the operating costs are 61700€ per year

Why option *DT50* is efficient?

- The more parcels are transported within each delivery cycle the more efficiently the parcel delivery functions
- Main reasons for the efficiency of *DT50* are:
 - Delivery trailer has a shorter delivery time window than a conventional packet automaton
 - Delivery trailer is coupled to a van which is used for transporting parcels to conventional packet automatons
 - Filling of a conventional packet automaton with parcels may take a lot of time compared to decoupling of Delivery trailer