

Railway Operation and Capacity

Deadline: Friday 11 September 2026 at 23:59

Capacity, double track, mixed traffic

Investigating double track lines and capacity dependencies of different running times as a consequence of stops along the line (only one track per direction).

We assume two train categories:

- Local trains stopping at every halt and station
- Regional trains with a limited stopping pattern

We investigate the dependence between the number of stops for local trains (n) between stations A and B and the interval (T_{int}) between the trains of the same category (every 10, 15 or 20 minutes).

Infrastructure



The speed profile, signalling system and rolling stock dynamics are not specified, but we are given the following assumptions:

$$\text{Running time stopping train} = \text{Running time direct train} + 2n$$

where n = the number of stops for the local train and all running times are in minutes (min.).

The minimum headway into and out of stations A and B is 1,5 min.

Exercise 1

Use UIC405E to investigate the maximum number of halts between stations A and B (n) for different service intervals between two local trains (T_{int}). In this exercise the regional trains do not stop between stations A and B.

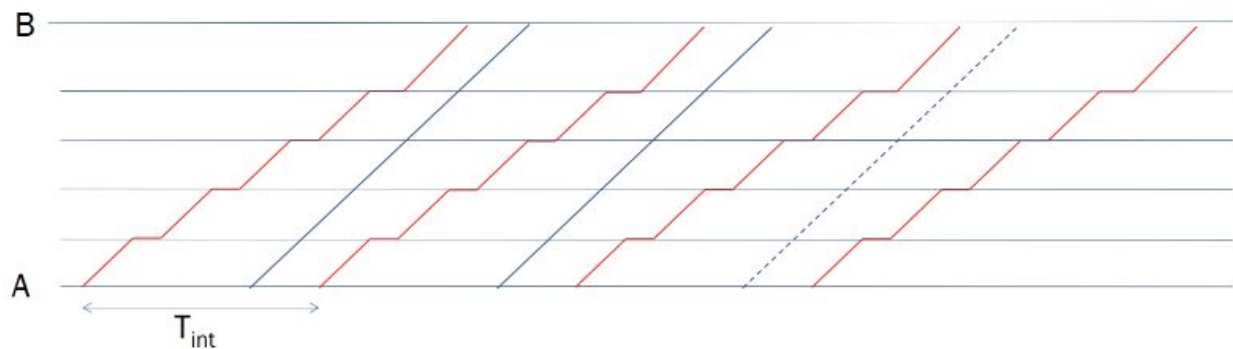
Use the formula (without dividing the line into sections):

$$K_p = \frac{T}{t_m + t_{\text{buff}}} \quad \text{where}$$

T = Period for the analysis

t_m = Average minimum headway

t_{buff} = buffer (for robustness)

Graphic timetable for direction A-B (exercise 1)

Local trains in red colour ($n = 4$ in this example)

Regional trains without a stop between A and B in blue colour

Use the formula for $T = T_{\text{int}}$ (10, 15 or 20 min).

The practical capacity shall be $K_p = 2$ (1 red and 1 blue train during T_{int}).

$t_{\text{buff}} = 0,5$ min between two trains

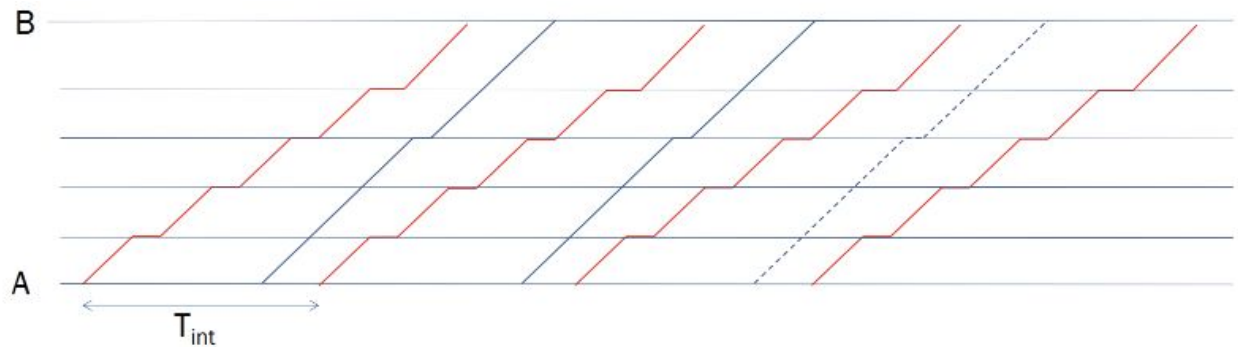
How many stops for the local trains between A and B (n) are possible without influencing the blue trains?

Exercise 2

Now we assume that the regional trains stop between A and B at a halt in the middle of the line with the assumption that the local trains stop at least three times between station A and station B. There is no difference in the running and dwell times for the local trains and the regional trains at this halt.

Use UIC405E to investigate the maximum value of (n) , that is, the number of halts between stations A and B for different service intervals between two local trains (T_{int}) in this case.

Graphic timetable for direction A-B (exercise 2)



Use the formula with the period for the analysis $T = T_{\text{int}}$.

The practical capacity should be $K_p = 2$.

How many stops for the local trains (n) are possible now without influencing the regional trains?

Exercise 3

Now we look at the opposite direction, the track from B to A.

The local trains stop at every halt between B and A.

The regional trains stop between A and B at the first stop after station B, which means stop n .

Identify the formula that describes the dependency between the interval for the local trains (T_{int}) and the maximum number of stops along the line (n) for the local trains, without affecting the regional trains.

It is recommended to visualize the situation with a simplified graphic timetable.