

Задачу синхронізації розкладу руху автобусного сполучення з приміськими потягами слід розглядати з декількох напрямів, а саме:

- створення альтернативного контуру безпересадочного сполучення;
- резервування шляхів реалізації мобільності приміського населення;
- скорочення часу пересування приміського населення.

Це можливо на основі впровадження наступних принципів:

- територіального узгодження пунктів синхронізації руху;
- узгодження провізних можливостей автобусних маршрутів з попитом;
- обліку соціально-економічних аспектів роботи автобусних маршрутів.

[1] Gkiotsalitis, K., Cats, O., & Liu, T. (2023). A review of public transport transfer synchronisation at the real-time control phase. *Transport reviews*, 43(1), 88-107. Advance online publication. <https://doi.org/10.1080/01441647.2022.2035014>

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СПЕЦІАЛЬНІ ПОЛОЖЕННЯ В КОНЦЕПЦІЇ РОЗКЛАДУ ТРАМВАЙ-ПОЇЗД

SPECIAL PROVISIONS IN TRAM-TRAIN OPERATIONAL CONCEPTS

Маркус Лаглер

TU Wien, Інститут транспортних наук (м. Відень, Австрія)

Markus Lagler

TU Wien, Institute of Transportation (Vienna, Austria)

By definition, tram-trains are a mixture between railways and tramways for passenger transportation where vehicles use tramway tracks in cities and railway tracks on out-of-town segments. They provide passengers with one-seat rides from the countryside to urban cores without the need to change from a regional train to a tramway or bus. Especially if railway stations are not located near city centres, tram-trains provide users with an advantage, but this is only feasible if the city centre is compact. [1]

Although some systems have been in use for a long time (for example Vienna–Baden in Austria or Cologne–Bonn in Germany), a trend of building new tram-train systems in Central and Western Europe has emerged after the successful introduction of a tram-train system in Karlsruhe in 1992. [2] In Austria, two tram-train systems currently exist: the Vienna–Baden and the Gmunden–Vorchdorf local railways. In addition, two new systems in the cities of Linz and Salzburg are planned, for one of which TU Wien developed an operational concept [3]. In Ukraine, no tram-train systems currently exist, but tram-trains have been identified as a “promising direction for the development of regional railways”. [4]

Special requirements exist for tram-train vehicles, for example the *guidelines for lightweight rapid transit railcars* in Germany, because tram-train vehicles are lighter

than ordinary railway rolling stock and their safety level has to be increased through other means than the strength of the vehicles. [2] Tram-trains have to be compatible with the technical standards of both railways and tramways (e.g. catenary voltage, platform heights, train control systems, maximum vehicle width, rail and wheel profiles).

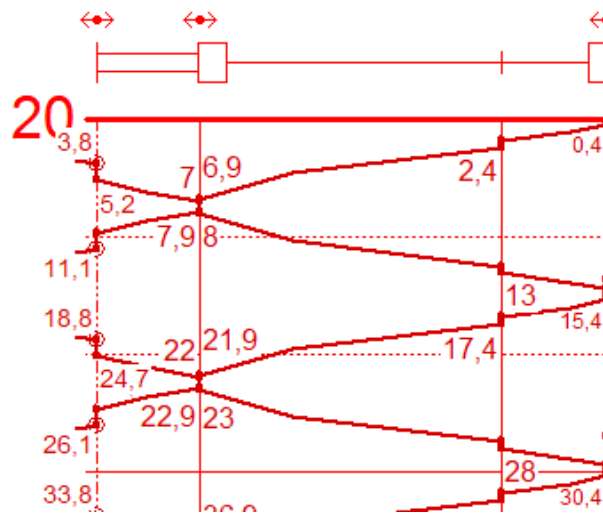


Fig. 1: Example for a cyclic timetable where the headway is 15 minutes. Double and single lines in the upper part denote double- and single-track sections. Squares denote stations.

Regular tramway operation has different requirements than railway operation. Railways have an exact schedule, while tramways tend to have a more flexible approach as they share streets with other road users. In Austria, it is a goal to have cyclic timetables for all passenger trains (long-distance and regional trains) which is encouraged by the Mobility Master Plan of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology. [5] Therefore such cyclic timetables should also be used when planning new tram-train systems (fig. 1). This cyclic schedule of regional trains usually provides for consistent running times throughout the day, while tramways running times differ according to the time of day (rush hour, midday, evening). Trains on railway lines move according to the principle of fixed blocks, while tramways often drive on sight. Additionally, railway lines can have one or two (or even more) tracks, while modern tramways usually have two.

As a result, running times on tramway sections are less predictable and reliable than on railway sections. There are some strategies to overcome this problem. On the one hand it is possible to increase the running times with additional buffers (sometimes called recovery margins [6]) on the tramway sections, on the other hand tramway lines to be used by tram-trains might have their own right-of-ways or priority at traffic lights to strengthen their independence from other road users and to generate reliable running times.

Implementing different running times depending on the time of day like on tramway lines is usually not possible on railway lines. As other passenger trains do not have this feature, such a concept could lead to problems in stations or passing loops on single-track lines. This conflict of interests leads to further compromise being required in timetable design. In Austrian practise it is common to locate passing loops on single-track regional lines after the distance required to drive an

amount of time which is equal to half of headway (see fig. 1). Using this system, in cases with less passenger demand the headway must be a multiple of the rush-hour headway.

As a conclusion, it can be said that the distinctive features of both railways and tramways have to be considered when designing an operational concept for tram-trains.

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[2] A. Pischon, A. Egerer, M. Krauth, Karlsruher Modell wird 25 Jahre alt und macht sich fit für die Zukunft, *Der Eisenbahn-Ingenieur* 11/2017, p. 53–57

[3] M. Lagler, S. Edlinger, V. Hartl-Benz, Das Fahrplankonzept der Regional-Stadtbahn Linz, *Eisenbahntechnische Rundschau* 6/2023, p. 73–77

[4] С. Василенко, Урбаністично-кластерний підхід до формування єдиної пасажирської системи області, *Українські залізниці*, № 1–2 (19–20), 2015, p. 24–29

[5] Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK), *Austria's 2030 Mobility Master Plan*, Vienna 2021

[6] *UIC Code 451-1 Timetable recovery margins to guarantee timekeeping - Recovery margins*, Paris 2000

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УДОСКОНАЛЕННЯ ІНФОРМАЦІЙНО-АНАЛІТИЧНОГО ЗАБЕЗПЕЧЕННЯ ОПЕРАЦІЙНОЇ ДІЯЛЬНОСТІ ПРАЦІВНИКІВ ЗАЛІЗНИЧНОГО ТРАНСПОРТУ В УМОВАХ ВОЄННОГО СТАНУ

IMPROVEMENT OF INFORMATION AND ANALYTICAL SUPPORT OF OPERATIONAL ACTIVITIES OF RAILWAY TRANSPORT WORKERS UNDER MARTIAL LAW

*Док. техн. наук, професор Т.В. Бутько¹, Dr.sc.ing. Mareks Mezitis²,
аспірант Д.А. Гайдук¹,*

¹*Український державний університет залізничного транспорту (м. Харків)*

²*Scientific Institution Transport Academy (Riga, Latvia)*

*Dr.Sc.(Tech.), professor T.V. Butko¹, Dr.sc.ing. Mareks Mezitis²,
postgraduate student D.A. Haiduk¹,*

¹*Ukrainian State University of Railway Transport (Kharkiv)*

²*Scientific Institution Transport Academy (Riga, Latvia)*

Укрзалізниця продовжує діяльність в умовах воєнного стану. Формування якісної системи інформаційно-аналітичного забезпечення сприяє прийняттю ефективних управлінських рішень завдяки збереженню та опрацюванню інформації, що дозволяє своєчасно виявляти проблемні місця та спрогнозувати розвиток подій.

З метою удосконалення обліку, систематизації та аналізу надзвичайних ситуацій, що виникають на залізничному транспорті, у структурних підрозділах АТ «Укрзалізниця» триває впровадження автоматизовано-керуючої системи