

Public Transport Fares

The fare model in VISUM has seen little change over the years, the main reason being that it had proved quite effective in modelling the typical fare systems seen in Europe where most of the more complex public transport models had been built. Fare systems in other parts of the world differ in important aspects, and in VISUM 11.5 we generalized the fare model accordingly.

While in Europe there is a prevalence of integrated ticketing across all modes in a geographic area and a single ticket covers the whole journey from door to door, this is less often the case elsewhere. More typically a metropolitan region is served by many public transport operators, sometimes complementing each other, often competing, and each operator charges fares according to their own fare systems. A passenger buys a new fare each time he boards a vehicle, or at least each time he transfers from one operator to another. Sometimes operators collaborate loosely, granting each other discounted transfers.

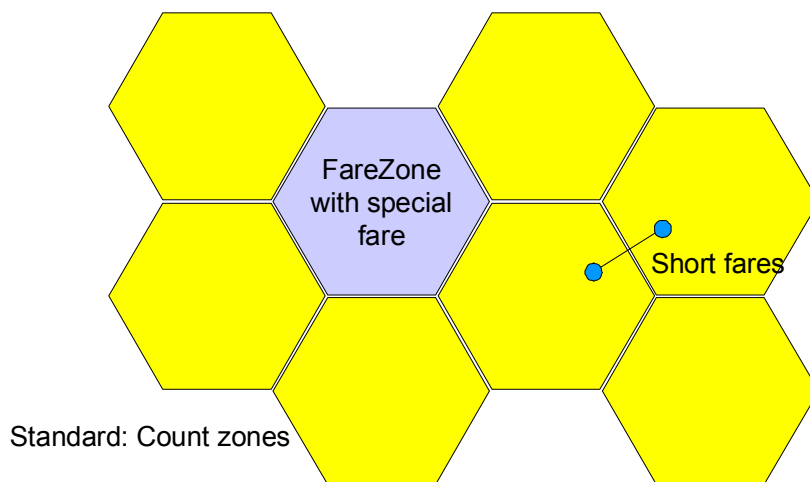
In order to model fare systems of this flavour VISUM 11.5 introduces the concept of fare system. A VISUM public transport model may contain one or several fare systems. Each fare system has a rank and applies to a set of lines, and those sets may overlap. If more than one fare system defines a fare for a given path, the highest-ranking fare system wins, and ties are broken in favour of the cheapest fare. A fare system defines a range of ticket types, which can be restricted to certain demand segments (e.g. concession fares). Ticket types can have one of four different fare structures:

- ▶ distance-based (find the number of fare points in a price look-up table, includes flat fare),
- ▶ zone-based (find the number of traversed fare zones in a price look-up table),
- ▶ from-to zone-based (find the pair of fare zones for first and last stop in a price look-up table) **NEW IN VISUM 11.5**,
- ▶ short-distance fare (flat fare up to a maximum trip length / duration) **NEW IN VISUM 11.5**.

In addition each ticket type has a fare component for initial boarding, and a fare component for transfer boarding (which may depend on the fare system of the previous path leg). Any of these components may be zero.

Like fare systems, ticket types have a rank, and if multiple ticket types are available to a demand segment, the highest-ranking ticket type which defines a price wins. A ticket type fails to define a price for a given journey or path leg, if the look-up table does not contain an entry for the given number of fare-points etc.

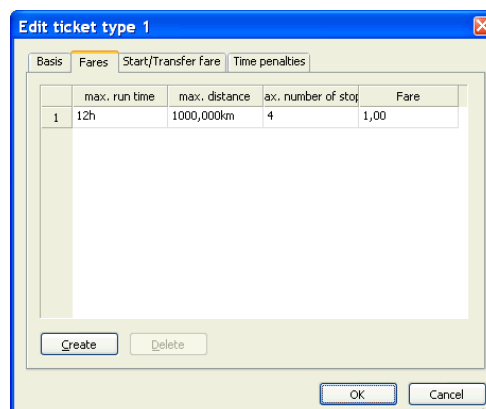
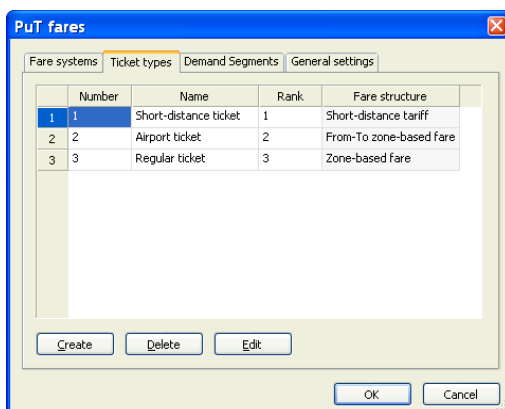
A small example illustrates the interaction of multiple ticket types within one fare system. Assume a single fare system with three ticket types.



Generally the fare system uses a “count the zones” ticket type, for which the geographic area is subdivided into fare zones (hexagons). A price is defined for 1, 2, 3 ... traversed zones. Journeys from / to the airport (special fare zone) are charged according to a different pricing scheme. In addition a short-distance fare applies to all fares up to 4 traversed stops, regardless of fare zone boundaries crossed.

You would model this fare system with three ticket types:

- ▶ The short-fare ticket type would have highest rank (1) and be restricted to 4 stops max.
- ▶ The from-to zone-based airport ticket type would have rank 2, and define a price only for journeys to/from the airport.
- ▶ The regular ticket would be zone-based, and have lowest rank (3).



Edit ticket type 2

Basis Fares Count fare zones Start/Transfer fare Time penalties

	From fare zone	To fare zone	Fare
1	2 Airport	all	5,00
2	all	2 Airport	5,00

Create Delete

OK Cancel

Edit ticket type 3

Basis Fares Count fare zones Start/Transfer fare Time penalties

	Number of fare zones	Fare
1	1	2,00
2	2	3,00
3	3	4,00
4	> 3	5,00

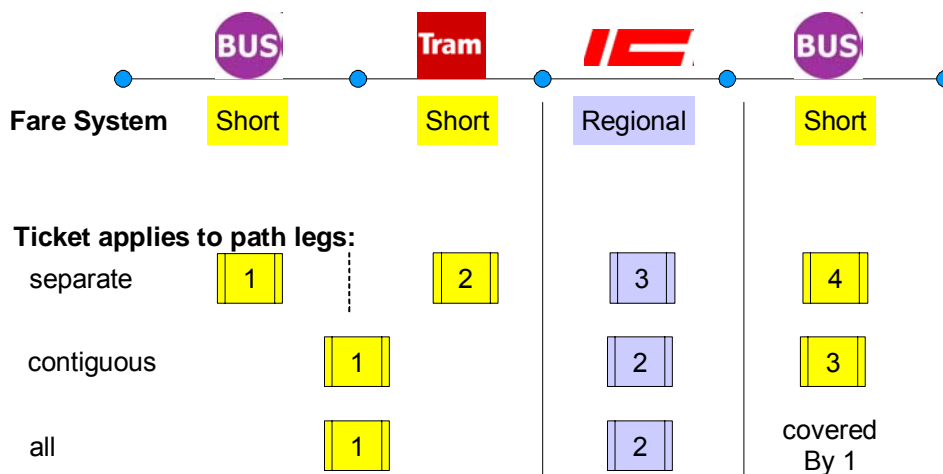
Create Delete

OK Cancel

Finally, fare systems specify whether tickets apply to the complete journey or just a part of it. The three possible options are:

- ▶ Each ticket applies only to a single path leg (i.e. a new ticket is required for each boarding),
- ▶ A ticket applies to a complete, contiguous sequence of path legs within the fare system,
- ▶ A ticket applies to all path legs within the fare system.

Assume that we have two fare systems, one (“Short”) for buses and trams and one (“Regional”) for intercity rail. We want to determine the number of tickets for a path with four legs (three transfers):



The third leg belongs to the “Regional” fare system, so the passenger needs a separate ticket for this leg. The number of tickets for the bus and tram legs depends on the settings for the fare system “Short”. If tickets apply to single legs only, three separate tickets are needed for the bus and tram legs. If one ticket is good for several contiguous legs (free transfers within fare system), then the first two legs are covered by one ticket. If a ticket covers all legs of the fare system, then a single “Short” ticket will do.