

# Route planning techniques

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Essentially, route planning involves planning the movement of a particular quantity of goods in vehicles of known capacity. It assumes that goods are supplied from a fixed depot and that the location of individual customers is known. It recognises that restrictions on vehicle operations do occur, due to such factors as constraints on working hours, the total length of daily travel possible and the volume that can be moved within a normal working day. An acceptable solution to the route planning and vehicle-scheduling challenge should provide optimum routes that satisfy the demands of the customers, take account of legal requirements and reflect the efficient and cost effective use of the operator's resources.

A satisfactory solution should provide a schedule of routes that minimise either total distance or time travelled by vehicles. Route planning involves an investigation of all possible routes, applying the following operational conditions:

- The number of calls to a particular delivery point in any single day is limited.
- The total vehicle travel in any day is limited and the driver's time is limited.
- Vehicles have a fixed carrying capacity.
- Volume of goods for each delivery point is known and each drop has a location for which there is an established driving time to and from the warehouse or to the next delivery point.
- The quantity of goods delivered to any drop is smaller than the vehicle's carrying capacity and there is an established time to deliver/collect at the drop point.

A vehicle route is scheduled by taking one order and establishing the time from the depot to the drop, adding the time taken to deliver at the drop and checking that the total time available to the driver is not exceeded and that the vehicle is not over capacity. The next order in geographic proximity is then identified and the time taken to drive from the first customer is added. To this is added the time taken to deliver at the drop. The result is then again checked to ensure that the total time available to the driver is not exceeded and that the vehicle is not over capacity. This procedure continues until one or both of the two constraints are reached; this then fully utilises the available driver's time or the vehicle capacity. This procedure is then repeated for another vehicle until all orders are allocated or all available vehicles are fully loaded.

In terms of the calculation of driving time it should be remembered that it is important to use an average speed, related to the type of vehicle, the nature of the roads over which the journey is taking place and to allow for such things as delays at junctions, hills and urban congestion. Also, for example, climatic conditions may need to be considered. In practice, average speed will be considerably less than the maximum permitted speed for a road.