



# **ArcLogistics™ Route: A Complete Routing and Scheduling Solution**

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## An ESRI White Paper

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# ArcLogistics Route: A Complete Routing and Scheduling Solution

**Introduction** ESRI® ArcLogistics™ Route software is a complete solution for complex routing and scheduling problems, minimizing costs and improving customer service. Offering a quick and significant return on investment, ArcLogistics Route lends itself to logistics management across all industries including courier and messenger, food and beverage, manufacturing and delivery, local government, and many others.

**Key Features** Use ArcLogistics Route to determine which vehicle should serve each customer location and the best stop sequence to accommodate your customers' time windows while minimizing travel time. ArcLogistics Route offers intelligent routing by taking into account actual network drive times; vehicle characteristics; and renewal points for loading, vehicle capacity, and more. After solving a routing problem, you can export routes and schedules back to a database or print routes with driving directions.

## ArcLogistics Route

- Includes high-quality data (GDT Dynamap/Transportation from Geographic Data Technology, Inc.) for the entire United States from which the user's delivery area can be extracted
- Prompts users to set vehicle speeds over their street networks
- Builds delivery routes based on actual network drive times, not straight-line distances
- Takes into account the specialties of vehicles and drivers
- Imports customer orders from any Open Database Connectivity-compliant database
- Geocodes customer addresses
- Outputs route summary reports, detailed and overview maps, street-level directions, driver manifests, and more
- Integrates with automatic vehicle location (AVL), enterprise resource planning, accounting systems, and other enterprise technologies

With ArcLogistics Route, users can realize savings of 10 to 30 percent in terms of mileage, overtime, and time spent routing. Increasing efficiency means that each vehicle

can visit at least one additional customer location per day. This technology typically pays for itself in less than three months.

**Advanced  
Functionality**

ArcLogistics Route is a fully interactive desktop routing and scheduling software application that helps businesses and organizations deliver goods or services more efficiently, reduce costs, and improve customer service. ArcLogistics Route features advanced solver functionality, street data administrative tools, and application framework environments.

***Solver Functionality***

ArcLogistics Route solver functionality includes an advanced routing and scheduling algorithm that has proven itself in deployments across numerous industries. The benefits of ArcLogistics Route extend beyond calculating routes and being able to accommodate "normal" situations. Logistics management is seldom routine, and the assurance of having a robust and tested solver functionality will save time and money and conserve resources when demands are high. The ArcLogistics Route solver functionality accommodates a wide range of routing and scheduling problems. These are described below.

**Route Renewal**

ArcLogistics Route allows users to specify a route renewal point at any number of user-specified locations. This feature is necessary for fleets that have to return to a depot or visit a depot during a route and resume the route after that stop. For instance, delivery trucks that need to return to a renewal location to pick up additional items to deliver can account for that stop on their original route. Users can choose the location at which they want the route or the vehicle to "renew."

**Priorities**

Orders can be assigned high or normal priorities to designate how they should be assigned in the route. The ability to solve for priority allows for the best allocation of vehicles when more orders exist than resources will allow. ArcLogistics Route is able to ensure that high-priority orders are filled before normal orders when constraints and limitations arise. This translates not only into keeping delivery/service appointments but also better accountability and reliability in an organization's logistics.

**Maximum Hours**

In addition to being able to specify the number of hours in a route before the overtime rate applies, users can enter a number in the Maximum Length box under the Work Day tab to put a hard limit on the number of hours that a route lasts.

**Maximum Hours  
Spent Driving**

Users can limit the number of hours a driver spends traveling in addition to setting a limit on the total number of hours spent on all activities. This feature is useful in complying with state and federal hours of service regulations.

**Hard Time Window  
Routing**

Routing folders can be set to treat all time windows in the folders as "hard" or "soft." Soft time windows can be violated at a penalty controlled by the Time Windows Importance slider. ArcLogistics Route will try to minimize a combination of monetary cost and total time window violation minutes. Hard time windows will not be violated.

***Second Time Window***

Orders can have a second time window for service. This window will only be active in routing folders treating time windows as hard.

<i>Second Day—Past Midnight</i>	Order time windows, vehicle start and lunch times, and location operating hours can all be set to Day 2. Day 2 begins after midnight of the "current" day for a routing folder. With Day 2, the user can specify an order's time window to be 11:00 p.m. (Day 1) to 2:00 a.m. (Day 2). The user can also have night routes that start at 7:00 p.m. (Day 1) and finish at the end location at 3:00 a.m. (Day 2).
<i>Time Window for Lunch</i>	Instead of simply allowing the user to set up lunch for the drivers after a set number of work hours, ArcLogistics Route gives the user the option of setting up lunch during an actual time window (e.g., between 12:00 noon and 2:00 p.m. rather than after approximately four hours of work).
Multiple Specialties	With ArcLogistics Route, users can set up an unlimited number of specialty codes. From this list users can give vehicles and orders as many specialties as they want. ArcLogistics Route will only assign an order to a route that has all its specialties. If no route has all of an order's specialty codes, ArcLogistics Route will not assign the order. If an order has no specialty codes, ArcLogistics Route can assign it to any route including routes with specialties.
Grace Periods	Grace periods specify how long before the start or after the end of its time windows an order can be serviced and still be considered "on time." If an order is serviced within the grace period, ArcLogistics Route will not consider it as violated. Separate early and late grace periods can be set for individual or groups of orders.
User-Specified Constraints	In addition to using weight and volume as constraints in planning logistics, ArcLogistics Route allows for a third user-specified or custom constraint. This user-specified constraint can solve for any numerical/quantitative and cumulative variable that applies to orders and routes.
Default Order Properties	Default service times; time windows; grace periods; and width, volume, and custom capacities for all new orders can be set in the Set Defaults dialog. These defaults apply to imported and entered orders.
<b>Street Data Administration</b>	ArcLogistics Route is an out-of-the box logistics solution including street data and administrative tools.
<b><i>GDT Dynamap/Transportation</i></b>	ArcLogistics Route is packaged with the latest street data from GDT called Dynamap/Transportation, which includes node elevations and is shipped in NAD 83 format. This added value is provided at no additional cost to users. Dynamap/Transportation features one-way streets, physical turn restrictions, improved ramp structures, calculated speed information, and a geocodable database.
Street Data Extraction and Use	Users of ArcLogistics Route are able to work within a service area of up to 200 by 200 square miles. This area can be expanded or other service areas added by purchasing additional credits from ESRI. Additional credits allow dispatchers to control routing for regional areas or several disconnected geographical areas.  ArcLogistics Route allows different vehicles, orders, and locations to operate independently within the same service area. In other words, users are able to have multiple logistics operations using the same street data and service area.

## ArcLogistics Route Administrator

Multiple street data and service areas are easy to manage through ArcLogistics Route Administrator. The functionality of the extract wizard has been broken into separate tasks in the Administrator. From ArcLogistics Route Administrator, users can

- Extract new street data (if they have not exceeded their allowance).
- Update any of the existing street data from the data CD.
- Update speed limits.
- Rebuild the routing and geocoding indexes (if they edit the data externally).
- Rebuild just the geocoding (and spatial) indexes (if they edit only address ranges).

When creating new street data, users will be prompted to enter a name for the street data they want to create. Users are not allowed to rename the existing street data they are updating or editing. After updating street data, ArcLogistics Route will automatically zoom to the center of the last extracted extent. ArcLogistics Route Administrator lets users delete and/or rename service areas and set a service area as default so that the next time the application is opened the service area will be opened.

## Application Framework

The ArcLogistics Route application framework is the underlying technology that allows for processing data and integrating with other systems to provide a complete routing solution.

## Geocoding and Order Import

ArcLogistics Route helps users achieve a better geocoding match rate by taking into account nearest cross streets and postal codes. For better control over geocoding, a user can allow ArcLogistics Route to "fallback match" orders if the input address does not generate a matching candidate. If the input address is similar to a matching street, the order will match. The user has the option to map the Import XY field pair during import. If the Import XY is near a street, then the order will match without even investigating the input address candidates. If Import XY fields are imported, orders will geocode if the XY is over a street.

The user has control over the automatic matching process using the geocoding preferences form. The match ranges that the user sets include Auto Geocode, Manual Geocode, and Fallback. The Auto Geocode range tells ArcLogistics Route to automatically match orders if the highest scoring candidate generated by the input address falls in the Auto Geocode range. The minimum Auto Geocode score is 30. If the best candidate generated by the input address has a score that falls in the Manual Geocode range, that order will remain ungeocoded. If, however, the best candidate generated by the input address has a score that falls in the Fallback range, then ArcLogistics Route will attempt to fallback match the order.

## Why Have a Manual Range?

ArcLogistics Route maximizes the efficiency of the dispatcher by automatically matching the best candidate during order import or by automatically using fallback options when the match is too poor. When the score of the best candidate falls in the Manual Geocode range, it is likely that it is due to a minor error or ambiguity in the input address and a slight change in the input address will quite possibly produce an adequate candidate. The user can control the fallback matching process by changing the priorities of the fallback options that include Cross Street, Postal Code, and Fallback XY.

### ■ Cross Street

In addition to entering a street address, users can provide the cross street nearest the actual location of the order. There are two cross street formats that ArcLogistics Route can interpret as an intersection of two streets. If the Cross Street field contains just one street, then the second cross street is assumed to be the input address street. The user can also explicitly indicate both streets by separating them with an "&."

### ■ Postal Code

ArcLogistics Route checks for Postal Code matches. If a match is found, the postal address is used as a location.

### ■ Fallback XY

Fallback XY has a lower precedence than the input address, while Import XY has a higher precedence than the input address.

Users can control the fallback behavior of the geocoding process by adjusting the fallback priority. The three fallback options can also be ranked, setting which matching technique will be employed. Fallback options can also be disabled.

## ***Manual Geocoding***

Users can manually geocode orders that were not automatically matched during order import. In the Geocode Address dialog, the name and the customer ID of the current order are displayed and users can move backward or forward between a group of orders using the navigation arrows on the main toolbar. Users may also choose to show or hide the map view by clicking the show/hide tool or geocode an order to the selected candidate by clicking the geocode tool.

**Grouping** The available Group By options include None, All, Customer ID, and Address. Since the orders are not grouped initially, None is the default setting. If a user wants to geocode all the orders to the same place, he or she can group by All. Similarly, he or she can geocode all orders that share the same customer ID or the same address by grouping by Customer ID or Address, respectively.

**Filtering** The default is set to show all candidates. However, users may choose to limit the number of candidates shown in the Candidates ListView and Candidates MapView by selecting a filter option in the pulldown menu. ArcLogistics Route can show either the best candidates or all candidates above the chosen cutoff score.

**Candidates ListView** The Candidates ListView displays all candidates generated by the current input address as well as the User Pick, Import XY, and Fallback XY if applicable. The input address candidates are scored from 0 to 100, with 100 being the closest match.

<b>Candidates MapView</b>	<p>The map tools at the top of the Candidates MapView are standard with a few additions.</p> <ul style="list-style-type: none"><li>■ A User Pick tool (a red pushpin) for adding/moving the user pick. Please note that only one user pick may be added. If a user pick does not exist, the User Pick tool adds it. Otherwise, it will move it.</li><li>■ A Zoom to Current Candidate tool (green circle button) that zooms the map in to the current candidate.</li><li>■ A Zoom to Match Point tool (blue square) to zoom to a currently matched coordinate.</li><li>■ A convenient scale bar directly above the map that changes as the user zooms in for a closer look at the streets.</li></ul>
<b><i>Enhanced Export of Routing Files</i></b>	<p>From the Export Routing Folders screen, ArcLogistics Route enables users to export to text files and pick the fields they want exported. After specifying the folder to export into, users can choose either Routes (.txt) or Orders (.txt) in addition to the Access database files (.mdb) and line and point shapefiles (.shp). In addition to being able to pick the fields they want to export, users may also export overview maps, vicinity maps, and directions simply by checking a box in the newly added Export Fields view within the Export Routing Folders screen.</p>
<b><i>Duplicate Routing Folders</i></b>	<p>The duplicate routing folder feature can be used to evaluate alternate routing scenarios and is particularly helpful for users who service more or less the same set of orders and want to evaluate the effects of different ArcLogistics Route settings.</p>
<b><i>Support for Multibyte Languages</i></b>	<p>ArcLogistics Route software's user interface and map labeling support multibyte languages.</p>
<b><i>Tool Tips</i></b>	<p>MapView and TimeView tool tips contain information about orders for easy reference.</p>
<b><i>Scale Bars</i></b>	<p>A scale bar is visible in the MapView, report maps, and exported maps.</p>
<b><i>Find All</i></b>	<p>The Find orders dialog includes a Find All button. Find All is enabled when a search is limited to a single routing folder or to the Orders Inbox. Find All will select all orders in the folder that contain the search text.</p>
<b>ArcLogistics Route Plug-Ins</b>	<p>To extend the capabilities of ArcLogistics Route to solve a specific business problem, plug-ins are available in ArcScripts and through ESRI business partners. For more information on plug-ins for ArcLogistics Route, go to <a href="http://www.esri.com/arclogistics">www.esri.com/arclogistics</a>.</p>
<b><i>Localization</i></b>	<p>ArcLogistics Route includes a component-based localization tool for creating international versions of the software. Users will be able to isolate all country/locale/language-dependent information from the software (or from components) in order to localize it. Also, users can change the words on the user interface to other English words, which can prove quite useful for industry specific vocabulary.</p>

Users interested in localization of ArcLogistics Route should contact their local ESRI international distributor for more information.

**Integration**

ArcLogistics Route integrates with other ESRI software, such as ArcGIS®, and mobile software such as ArcPad®. Integration with other enterprise software, such as enterprise resource planning, supply chain management, and automatic vehicle location, is possible with the help of ESRI business partners.

**SAP R/3 Integration**

The SAP interface has been enhanced to accept a user-defined parameter, allowing the SAP module to be much more dynamic and making integration easier. The parameter can be used to select orders based on a delivery date field.

**Crystal Reports 8.0  
Report Writer  
Extension**

ArcLogistics Route includes Crystal Reports 8.0. Crystal Reports is a powerful report creation and management tool.

**System  
Requirements**

System requirements for ArcLogistics Route are based on the user's product version and platform configuration.

ArcLogistics Route operates under Windows 98, Windows ME, Windows NT 4.0 with service pack 3, Windows 2000, and Windows XP.

**Minimum Requirements**

Processor	Intel Pentium II Processor or higher
Disk Storage	Varies depending on size of street database
Memory	64 MB or higher Virtual Memory 200 MB (free disk space) after installing ArcLogistics Route software
Clock Speed	266 MHz or higher

**For More  
Information**

Evaluate ArcLogistics Route free for 60 days by requesting the evaluation CD at [www.esri.com/arclogistics](http://www.esri.com/arclogistics).