

ArcLogistics™ : The Routing and Scheduling Solution for Fleet Management



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ArcLogistics: The Routing and Scheduling Solution for Fleet Management

An Esri White Paper

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ArcLogistics: The Routing and Scheduling Solution for Fleet Management

Introduction Esri® ArcLogistics™ software is a complete solution for complex routing and scheduling problems and helps you minimize costs, maximize productivity, and improve customer service. Offering a quick and significant return on investment for fleets of all sizes, ArcLogistics lends itself to fleet management across all organizations including food and beverage; manufacturing and delivery; plumbing; heating, ventilating, and air conditioning (HVAC); medical services and supplies; local governments; inspectors; courier and messenger services; and utilities and telecommunications.

Key Features Use ArcLogistics to determine which vehicle should serve each customer location and the best stop sequence to accommodate your customers' time windows while minimizing travel distance, time, and cost. ArcLogistics offers intelligent routing by taking into account actual network drive times, distances, street network restrictions, vehicle characteristics, customer characteristics, and more. After solving a routing problem, you can print routes with driving directions, export routes and schedules as text or database files, or export routes to mobile devices including ArcLogistics Navigator.

ArcLogistics features the following:

- Nontechnical workflow-based user interface
- Simplified software deployment—small client download
- Street data, locators for geocoding, and mapping service hosted by Esri
- Automated software updates
- License based on fleet size
- Building routes based on network drive times, distances, and restrictions, not straight-line distances
- Scheduling by calendar days
- Specifying route recurrence by day of week
- Building default routes with different driver/vehicle combinations
- Taking into account specialties of vehicles, drivers, and orders
- Importing customer orders and locations from Microsoft® Excel®, Access®, text, and dBASE files or shapefiles

- Importing drivers, vehicles, mobile devices, default routes, and specialties from Excel, Access, text, and dBASE files
- Importing barriers and zones from shapefiles
- Geocoding customer addresses and allowing manual placement of customer locations
- Using barriers by specific dates
- Creating multiple versions of a day's route plan
- Using satellite imagery or maps
- Outputting route summary reports, detailed and overview maps, street-level directions, driver manifests, CO₂ emissions reports, and more
- Exporting routes and schedules to mobile devices
- Easily adding additional fields for capacities and other text information
- Including "tear-off" views for second monitor display
- Integration with automatic vehicle location (AVL), vehicle navigation, enterprise resource planning, customer relationship management, warehouse management, accounting, and route accounting systems, as well as other enterprise technologies

With ArcLogistics, you can realize savings of 10 to 30 percent in terms of mileage, overtime, time spent routing, and vehicles used. Increased efficiency means that each vehicle may be able to visit more customer locations in less time. This technology typically pays for itself within a few months.

ArcLogistics is a fully interactive Software plus Services (S+S) routing and scheduling software application that helps organizations deliver goods and services more efficiently, reduce costs, and improve customer service. ArcLogistics features advanced solver functionality and an advanced application framework environment to make it easy to use.

Advanced Solver Functionality

ArcLogistics solver functionality includes an advanced routing and scheduling algorithm that has proven itself in deployments across numerous industries. The benefits of ArcLogistics extend beyond calculating routes and being able to accommodate normal situations. Fleet management operations are 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 solver functionality accommodates a wide range of routing and scheduling problems. These are described below.

Priorities

Orders can be assigned high or normal priorities to designate how they should be assigned in the route. The ability to assign priority allows the best allocation of routes when more orders exist than resources will allow. ArcLogistics always tries to route all orders, but in situations where this cannot be done, high-priority orders will get routed at the expense of normal-priority orders. This translates not only into keeping delivery/service appointments but also better accountability and reliability in an organization's fleet management.

Vehicle Capacities

There are two default capacities for your vehicles: Weight and Volume. Volume and Weight are the maximum volume and weight the vehicle can carry. Volume and Weight units are displayed as either metric or imperial units according to your Windows settings. Use the same units you'll use to specify the weight and volume of individual orders, for example, if you'll be using cubic feet and pounds for orders, use cubic feet and pounds for your vehicles.

Additional capacity fields can be added by editing the defaults.xml file found in the ArcLogistics directory. These new capacity fields will be visible in new projects. Additional capacity fields provide an option to specify any other capacity that affects how much your vehicles can carry (e.g., pallets, cases, wheelchairs).

Default Route Capacity

There is one capacity for your default routes: Maximum Orders. Maximum Orders is the number of orders a route can handle. If your routes don't have a maximum number of orders that they can handle, set this field to a high number such as the maximum number of orders your fleet handles in a day. ArcLogistics never exceeds these capacities when assigning orders to routes.

Costs

ArcLogistics builds routes that attempt to minimize costs while meeting order time windows. There are two vehicle costs and three driver costs you can specify.

Vehicle Fixed Cost is what you pay each time you use the vehicle such as a daily rental fee. But if you pay a daily rental fee regardless of whether or not you use the vehicle, do not specify it as a fixed cost. If you have vehicles that are less preferable to operate, you can set a higher fixed cost so that ArcLogistics is less likely to use them.

Vehicle Fuel Economy is used with Fuel Types Price settings to calculate the price per kilometer or mile. For example, a vehicle with a Fuel Economy setting of 12 mpg and a Fuel Types Price setting of \$3.00 per gallon would have a cost per mile of \$0.25. This cost can include the cost of fuel; maintenance; depreciation; and mileage-based wages, fees, or taxes.

Driver Per Hour Salary cost is the hourly wage of the driver. The cost per hour must be greater than zero.

Driver Per Hour OT Salary is the per-hour cost of the driver once overtime begins. The overtime cost per hour must be greater than or equal to the per-hour cost.

Driver Fixed Cost is what you pay each time you use the driver such as a minimum contractual amount for a temporary worker. However, if you pay a minimum contractual amount regardless of whether you use the driver, do not specify it as a fixed cost. If you have drivers that are less preferable to use, you can set a higher fixed cost so that ArcLogistics is less likely to use them.

Specialties

With ArcLogistics, you can set up an unlimited number of specialty codes for vehicles, drivers, and orders. ArcLogistics 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 will not assign the order. If an order has no specialty codes, ArcLogistics can assign it to any route including routes with specialties.

***Default Route
Workday Rules***

ArcLogistics contains many workday rules that the solver considers when calculating routes and schedules. You can set the Start Time Window range to control when routes can begin. Per-hour cost begins accumulating for the route no later than the end of the start range.

From is the earliest time that you want to allow the vehicle to begin its route. ArcLogistics never schedules a route to begin before this time.

To is the latest time that you want to allow the vehicle to begin its route. The larger the range between the earliest and latest start times, the more flexibility ArcLogistics has to vary the start time of your routes so that unproductive time can be reduced.

Time at Start is the average amount of compensated time spent at the beginning of the route, for example, preparing or loading a vehicle. This compensated time is included in all calculations.

Time at End is the average amount of compensated time spent at the end of the route, for example, servicing the vehicle or preparing it for the next day. This compensated time is included in all calculations.

Time at Renewal is the average amount of time spent reloading or unloading the vehicle while at a renewal location, if the renewal location is being used.

Maximum Travel Distance is the maximum distance of a route. The vehicle must return to its end location within this distance.

Maximum Travel Duration is the maximum number of hours that a route can be driven. The vehicle must return to its end location within this time frame.

Maximum Total Duration is the maximum duration of a route including travel time, lunch, order service time, wait time, time at renewal, and time at the start and end of the route. The vehicle must return to its end location within this time frame.

Time Before OT is the number of hours into a route before the overtime hourly rate applies.

Break is the length of the route's break in minutes and the time window for it to occur. The time at break is included in the cost of the route.

Days

Days are the days of the week or date range during which a default route is available for routing.

Locations

Start Location and End Location are the locations where the routes are begun and completed each day. You can double-click the drop-down arrow and choose a location from the list. If you have not already set up a location, you can click the Locations action panel and add it.

Renewal Locations are optional. A renewal location is a location where a driver can reload (or unload) a product midroute when vehicle capacities are either reached or depleted. If a route delivers products, you can set the route's renewal location(s) to where the route can reload, for example, if a route delivers propane, when that route is empty, it returns to the filling station (its renewal location) to refill and then continues its route for the day. If a route picks up products, you can set the route's renewal location(s) to where the route can unload, for example, if a route empties dumpsters, when the route is full, it

	goes to the landfill (its renewal location) to unload and then continues its route for the day.
Locations Time Window	You can set a Locations Time Window to specify when it is open and available for routes to operate from.
Locations Curb Approach	You can set Locations Curb Approach to specify from which side of the street a route must depart and approach the location.
Time Windows	Order Time Windows are the time ranges during which a route must arrive at an order to service it. An order can have two time windows. Max. Violation Time is the number of minutes an order can be serviced after the time window ends.
Service Time	Service time is the number of minutes it takes to service the order. Service time can be in decimal minutes.
Curb Approach	You can set Curb Approach to specify from which side of the street a route must approach the order. This is particularly important when there is a center divider in the street that restricts the approach to an order to one direction.
Order Type	The Order Type can be either Pickup or Delivery. Route capacities are tracked throughout the route if the orders are a mix of both pickups and deliveries.
Zones	Zones are geographic map features associated with a route to send that route into a preferred area. Zones are very useful when your operation has fixed routes with distinct geographies or when you want to tailor routes to specific areas based on your own business logic. If Zones are Hard, a route will only service orders that are within its assigned zone. Zones can be drawn directly in ArcLogistics using a drawing tool, or they can be imported as shapefiles.
Barriers	Barriers are geographic features that completely block the traversibility of the street segments they cover. Barriers can be drawn directly in ArcLogistics using a drawing tool, or they can be imported as a shapefile. Barriers offer a simple and realistic way to manage roadworks, accidents, closed roads, flooded areas, restricted areas, and other conditions that temporarily block roads.
U-turn Policy	By default, the U-turn Policy is set to everywhere.
Application Framework	The ArcLogistics application framework is the underlying technology that allows processing data and integrating with other systems, providing a complete routing system.
Geocoding and Order Import	ArcLogistics includes a default geocoding process that is used to find the position of orders and locations on the street network. Geocoding is determined by several address locators hosted by Esri. ArcLogistics attempts to geocode all orders during the import process. If the x,y coordinates of an order are known, you have the option to import the coordinates along with other relevant order information used for routing. If the Import XY is near a street, the order will match without even investigating the input address candidates. If the x,y coordinates are not known, ArcLogistics will geocode the order by its street address information.

If orders are not located, they will remain ungeocoded. A common reason for this is invalid, misspelled, or missing address information. Simply fix the entry in ArcLogistics and press Enter to update the record. This may fix the issue, allowing the order to be geocoded.

Rematch Address Rematch Address is used for selected orders to display multiple candidate addresses on the map and in the Did You Mean window. Click either a candidate pointer in the map or a candidate address in the Did You Mean window and click either Apply or Apply/Update Address. Use Rematch Address for either geocoded or ungeocoded orders to move, locate, or validate an order's location.

Manual Geocoding You can manually geocode orders that were not automatically matched or did not have any valid candidate addresses to choose from during order import. Simply click the Find Address By Point icon in the top right corner of the map, then click the desired location on the map. This can also be used to move a geocoded order's location if needed.

Versions Versions allow you to create multiple copies of a route schedule to compare the results when changes are made, such as adding or removing orders, moving orders from one route to another, or adding/removing routes.

Interactive Map View The ArcLogistics map view is interactive, allowing you to display geographic data, hide data layers, and change symbology of orders. It also includes preferences to change the display of routing information.

Map Display Preferences The Map Display Preferences contain settings to control the look and behavior of maps in ArcLogistics.

The following settings are available in the Map Display Preferences category:

- Tips—Selectable map tips for orders and stops
- Route shape—Follows streets or straight lines
- Order sequence labeling—On/Off
- Barriers—On/Off
- Zones—On/Off
- Stem time—On/Off
- Auto zoom—On/Off
- Order symbology—Changes the symbol, color, shape, and size used to represent orders on the map

Displaying Map View Layers You can display the following data layers in the map view:

- Zones
- Barriers
- Places—Intended for use with satellite imagery
- Transportation—Intended for use with satellite imagery

- Streets
- Satellite

Reports

ArcLogistics includes ActiveReports 3 from Data Dynamics. This allows you to view and edit the template reports included in ArcLogistics.

Exporting Routing Files

ArcLogistics allows you to set up multiple export profiles. Export profiles allow you to set up easy methods for exporting routes and stops to files for work outside ArcLogistics. You can choose to export either routes or stops in a text file format or choose to export both in an Access database.

Send Routes to Navigator

ArcLogistics can send routes, including the route geometry and stop information, to devices that have ArcLogistics Navigator. ArcLogistics Navigator provides turn-by-turn guidance.

Localization

ArcLogistics will use the regional settings on your computer to format common settings for number formats, time, weight, volume, currency, and date/time format.

Additional text fields can be added by editing the defaults.xml file found in the ArcLogistics directory. These new text fields will be visible in new projects. Additional text fields provide an option to specify any other information that may be important to the operation.

Minimum System Requirements

For the latest information on system requirements and recommended system aspects, visit support.esri.com.

CPU Speed	1.6 GHz recommended or higher
Processor	Intel® Core™ Duo, Intel Pentium®, or Intel Xeon® processors
Operating System	<ul style="list-style-type: none"> ■ Microsoft® Windows® 2000 Professional with Service Pack 3 or higher ■ Microsoft Windows Server® 2003 ■ Microsoft XP Home Edition with Service Pack 1 or higher ■ Microsoft XP Professional Edition with Service Pack 1 or higher ■ Microsoft Windows Vista® ■ Microsoft Windows 7
RAM	1 GB minimum, 2 GB or higher recommended
.NET*	Microsoft .NET Framework 3.5 SP1
Windows Installer*	Microsoft Windows Installer 3.1
SQL*	Microsoft SQL Server® Compact 3.5 SP1
Disk Space—ArcLogistics	Destination drive—At least 10 MB of free disk space for the ArcLogistics application; 1–2 GB of free disk space for project databases

* Added during installation if missing



About Esri

Since 1969, Esri has been helping organizations map and model our world. Esri's GIS software tools and methodologies enable these organizations to effectively analyze and manage their geographic information and make better decisions. They are supported by our experienced and knowledgeable staff and extensive network of business partners and international distributors.

A full-service GIS company, Esri supports the implementation of GIS technology on desktops, servers, online services, and mobile devices. These GIS solutions are flexible, customizable, and easy to use.

Our Focus

Esri software is used by hundreds of thousands of organizations that apply GIS to solve problems and make our world a better place to live. We pay close attention to our users to ensure they have the best tools possible to accomplish their missions. A comprehensive suite of training options offered worldwide helps our users fully leverage their GIS applications.

Esri is a socially conscious business, actively supporting organizations involved in education, conservation, sustainable development, and humanitarian affairs.

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