

# **Technology for Transportation Bidding at The Home Depot<sup>1</sup>**

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## **1. Company overview**

The Home Depot was founded in 1978 in Atlanta, Georgia, and is currently the world's largest home improvement retailer with over 1000 stores and 37 distribution centers in 45 states of the United States, as well as in five Canadian provinces, Puerto Rico, and Chile. The Home Depot expects to be operating over 1,900 stores in the Americas by the end of the year 2003.

Home Depot stores cater to do-it-yourselfers, as well as home improvement, construction and building maintenance professionals. An average Home Depot store is approximately 130,000 square feet, and stocks approximately 40,000 to 50,000 different kinds of building, home improvement, and lawn and garden products, including variations in color and size. The newer stores also include a 15,000-25,000 square foot garden center.

In June 1999, Home Depot launched its expanded Website ([www.homedepot.com](http://www.homedepot.com)) which includes more than 150 interactive how-to projects, personalized customer home pages and interactive features such as project calculators. In the near future, Home Depot plans to fully integrate its Website with its stores that will allow consumers to use the Internet and the stores in combination. Home Depot customers will be able to check product availability on-line and purchase in a store, order on-line and pick up at a store, buy on-line and return a product to a store and utilize an in-store kiosk for project information and product listings, among other options.

The Home Depot, currently the 4<sup>th</sup> largest retailer in the United States is projected to become 2<sup>nd</sup> only to Wal-mart by year end 2000, with reported net sales for fiscal 1999 of \$38.4 billion and employs approximately 226,000 people. Its stock is publicly traded (NYSE:HD) since 1981 and is included in the Standard & Poor's 500 Index and the Dow Jones 30 Industrial Index.

## **2. Logistics and transportation challenges at Home Depot**

The Home Depot is credited as being the innovator in the home improvement retail industry by combining the economies of scale inherent in a warehouse format with a high level of customer service. In the warehouse-style retail format pioneered by the company, each of the Home Depot stores is also a warehouse, where industrial racks are used to display the merchandise and to stack the inventory. Combining a retail store and warehouse in one location helps the company to keep the costs down by reducing the overhead and to increase customer satisfaction by offering a wide variety of products and reducing stock-outs. Home Depot's retailing strategy also focuses on high quality merchandise and excellent customer service. Home Depot stores offer a variety of services, including, free design and decorating consultations, truck and tool rental, home delivery, free potting, and many other services to accommodate customers' home improvement needs.

Managing the logistics of this retailer giant is no easy task. It requires the coordination of over 7000 suppliers, numerous carriers and over 1000 stores and 37 distribution centers. Adding to the complexity is the rapid growth of the company with its plan to expand to over 1,900 stores in the

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Americas by 2003. The company's logistics infrastructure also needs to support its growing online operations. Home Depot's current e-commerce strategy utilizes the company's existing stores as fulfillment centers or pick-up centers for products being ordered on-line by customers. A key component of Home Depot's logistics is managing the transportation of over 40,000 SKUs between suppliers, warehouses and retail locations. Over 90% of Home Depot's products move via trucks. In 1999, the company made approximately 7.1 million less-than-truckload (LTL) shipments and 219,000 truckload (TL) shipments. With the planned addition of new stores and the new logistics strategy, these volumes are expected to change to 4.7 million (LTL) and 877,000 (TL) in 2003, with a significant growth in TL shipments and a reduction in LTL shipments. Home Depot is planning to expand its existing network with cross-dock facilities, which will allow them to consolidate the shipments from the suppliers and to the stores and reduce the total amount of LTL shipments.

### **3. Traditional process for transportation bidding**

Up until about four years ago, Home Depot's transportation bidding process was completely manual. Home Depot would provide the carriers with origin and destination zip codes for the locations in its network, and aggregate demand forecasts (expected number of annual moves) for each origin-destination pair (referred to as a lane). Carriers did not, however, have information on Home Depot's demand or growth patterns. Based on this sparse and aggregate information, carriers would bid on each origin-destination pair separately.

One of the drawbacks of this bidding process was that it lacked the flexibility for carriers to reflect groups of lanes that they wished to win together. This was a serious omission from the bidding process: Due to the physical considerations and cost structure of operating a truck, carriers can operate some groups of lanes more efficiently (cost effectively) than any subset. Bidding for each lane individually made it difficult for carriers to incorporate cost synergies (across lanes) into their bids.

In an effort to improve the efficiency of the bidding process, in 1996, Home Depot semi-computerized the bidding process by asking the carriers to submit their bids on a standardized Excel spreadsheet on a diskette. Nevertheless, Home Depot continued to procure bids for lanes on an individual basis and limit the information that was provided to the carrier regarding the flow of orders on a lane. Carriers continued to be unable to make informed bidding decisions or adequately reflect any synergies across lanes. In the absence of accurate demand data, carriers made several assumptions about the actual distribution of demand throughout the year. One optimistic approach employed by carriers was to assume that the demand is distributed evenly throughout the year; a pessimistic approach was to estimate that all the demand realizes during one week or one month of the year. Either estimate was very likely to be far away from reality, and could result in a carrier either bidding too low and losing money, or bidding too high and not winning a potentially profitable lane.

In summary, the traditional bidding process had a number of serious limitations:

- (a) It did not provide the carriers with good visibility to Home Depot's network and lacked detailed demand information on the network.
- (b) It did not allow carriers to bid on combinations of lanes to achieve potential synergies. This, combined with the lack of detailed demand information, prevented the carriers from submitting bids that accurately reflect their cost structures.
- (c) The manual bidding process was very inefficient.

## 4. An innovative process for transportation bidding

To achieve higher efficiency and effectiveness in transportation services, Home Depot partnered with i2 Technologies to develop a flexible bidding mechanism for truckload shipments. The new bidding process provides detailed information to the carriers about Home Depot's network and demand, and allows carriers to bid for combinations of lanes, as well as for individual lanes. This helps carriers to better analyze the impact of certain bidding alternatives on their own network, and to achieve synergies, for example, by creating "continuous" moves which don't require empty travel between the lanes. Furthermore, the new bidding mechanism is Internet-based, which allows carriers to create and submit their bids electronically via a standard format. The first successful application of this new bidding process was completed in January 2000.

### 4.1. Information provided by Home Depot

Before the bidding process begins, Home Depot provides potential bidders with information on

- origin and destination locations,
- lane details, and
- demand forecasts.

A *location* is a title for one or more actual origin(s) or destination(s). A location could be a *point*, such as a single vendor, distribution center or store, or it could be a *zone*, such as a cluster of vendors or a cluster of stores. As before, a *lane* is a unique origin-destination pair requiring a specific type of service and equipment. Lanes can be point-to-point (e.g., vendor to DC), point-to-zone (e.g., DC to cluster of stores), zone-to-point (e.g., cluster of vendors to DC), or zone-to-zone (e.g., cluster of vendors to cluster of stores). Under the new bidding process, in addition to its origin and destination, Home Depot specifies for each lane the average route distance, average number of stops, demand forecast (truckloads), equipment requirements (e.g., dry van, 53' van, flatbed, decked van) and service requirements. Aggregated demand volume forecasts for different equipment types and for different lanes are presented in Tables 1 and 2. Detailed daily and weekly demand forecasts are also provided to the bidders, which include seasonal fluctuations in demand and new stores through December 2000. New stores are modeled after existing stores with similar characteristics and their estimated opening dates are provided to the bidders.

Table 1: Demand forecasts by equipment type

Equipment type	Lanes	Loads
Dry van	317	41,847
53' van	25	5,343
Flatbed	268	5221
Decked van	13	41
Total	623	52,452

Table 2: Demand forecasts by lane type

	Loads	Lanes
Point-to-point	24,574	171
Point-to-zone	25,153	402
Zone-to-point	146	3
Zone-to-zone	2579	47
Total	52,452	623

## **4.2. Bidder Information**

In addition to selecting carriers that could satisfy Home Depot's transportation needs at a reasonable price, Home Depot was also concerned with selecting carriers that were of an acceptable quality and with whom Home Depot could develop a promising business relationship. In order to achieve this end, Home Depot screened carriers before inviting them to participate in the bidding process. Carriers were asked to supply Home Depot with information concerning their financial stability, geographic coverage, claim history, equipment age, total yearly revenues, etc. While the carriers were asked to provide this information voluntarily, most of these statistics can be obtained from outside sources (for example, the Department of Transportation).

Based on the carriers' characteristics, Home Depot was able to eliminate several carriers with whom they did not feel they could establish a fruitful business relationship. The primary reason that carriers were not invited to bid was questionable financial stability. Some carriers were eliminated due to poor quality records while others were considered to be too small in size to become a significant partner with Home Depot. In addition to using this information to screen bidders, Home Depot would use this information throughout the bid evaluation process when developing feasible solutions when selecting winning bidders.

## **4.3. Bidding Software**

Three main pieces of software were used during the bidding process: (1) Shipper bid support (SBS), (2) Carrier bid response tool (CBR), and (3) Bid selection optimization.

The SBS module assists Home Depot in analyzing their network and in deciding on which lanes to put out for bid. For the first implementation of the new bid process, Home Depot decided to focus only on a specific part of their business, namely, on vendor-to-store direct shipments. The lanes that were put out for bid accounted for about 52,000 moves, approximately one fourth of all the collect, in-bound to store moves within Home Depot's network. Next year, Home Depot plans to include the DC-to-store lanes in the bidding process as well.

To help carriers analyze the demand data provided by Home Depot and create bids that complement their existing networks and cost structures, Home Depot created the CBR module. This module was made available to carriers for download via the Home Depot website. The CBR module includes a graphical user interface to help carriers visualize the physical structure of the shipper's network and the relative locations of the lanes in a potential combination bid. The module also has the standard template for carriers to prepare and submit their bids. Via this module, carriers can submit their bid on selected lanes and lane groups. In addition to their minimum price requirements, carriers can convey to Home Depot the type of equipment they plan to use if awarded the lane(s), the maximum number of moves and the maximum dollar volume they wish to be awarded.

## **4.4. Bidding rules**

Under the new bidding process, carriers are able to bid on groups of lanes in addition to bidding on individual lanes. Lane groups may represent geographic areas, groups of facilities or may simply be created by the carrier to fit into his existing schedule. To maintain maximum flexibility, and at a possible cost to computational complexity, Home Depot decided to not restrict the lane groups on which a carrier can bid. That is, a carrier was allowed to bid on any

combination of lanes; a lane could be bid as many times and in as many combinations as a carrier wanted.

A particular origin-destination route may contain more demand volume than any one carrier can handle (or more than is desirable to assign to only one carrier). Therefore, Home Depot, when necessary, partitioned the demand and creates several distinct lanes. This allowed them to restrict carriers to bid for all of the volume on a lane.

A carrier's bid for a lane (or lane group) represents the minimum price that carrier must be paid in order to service that lane (or lane group). In order to avoid situations where the carriers do not wish to service the lanes they have been awarded, Home Depot allows carriers to specify additional restrictions (or "constraints") on their aggregate bids. For example, to ensure that the total lanes awarded to a carrier do not exceed its available capacity, a carrier might limit the number of loads awarded by geographical area or by asset usage. In addition, carriers can specify the total dollar volume of business that they wish to win. In addition, carriers can submit "OR" bids of the following form: "I would like to be awarded either combination bid A or combination bid B, (but not both)". Given the flexibility provided by this bidding structure, carriers are bound to execute any bid submitted in the event that they are awarded that bid. As a further deterrent to carriers reneging on their awarded lanes, Home Depot informed all bidders that in the event of reneging on a bid, Home Depot would take that lane plus other (possibly more profitable) lanes that the carrier had won.

The carriers had no information about their competitors' bids when they placed their own; that is, the bids were sealed. Home Depot preferred the single round, sealed-bid approach to a multi-round sealed bid or iterative open cry process (whereby bidders can see their competitors' bids as they are placed and respond accordingly). They believed that, were the bidding to be conducted such that bidders had the opportunity to respond to their opponents' observed bids, it could result in a damaging price war between carriers, with some carriers submitting unprofitable bids. While procuring transportation services at a lower price could bring a short-term gain to Home Depot they also recognized the negative effects of low prices on the quality of their carriers' service. Lower quality could manifest itself in service problems, reducing the priority of Home Depot as a shipper, and likely default in service. All these negative outcomes would eventually be more costly than any short-term rate savings. Hence, it was not in Home Depot's best interest to have carriers bid below their reservation prices and operate at a loss - They felt that a single round would minimize this possibility.

#### **4.5. Selection of the winning bids**

After all the bids are submitted, Home Depot selects the "best" collection of bids and awards the lanes to the carriers in that set. The best solution takes into account the carriers bids, restrictions on lanes awarded and several (nonexplicit) factors that are of importance to Home Depot. In the selection process, Home Depot solves what is called a *set partitioning* problem. The goal is to select a subset of the submitted bids, such that: (1) the collection of the selected bids covers the lanes originally put out for bid, (2) Each lane belongs to at most one selected single or combination bid, (3) The selection satisfies shipper and carrier constraints, and (4) In addition to being at a reasonable cost, the selection meets Home Depot's objectives on several non-price dimensions; for example carrier reliability, load balancing among carriers, and giving preference to incumbent carriers. Carriers do not have any knowledge of Home Depot's preferences nor of how these factors will influence the selection of the awarded bids

Before starting the selection process, Home Depot screens or preprocesses all the submitted bids and eliminates the ones that are “dominated” by others. For example, if two carriers submitted the exact same combination bid, and one bid is better than the other one in terms of the multiple selection criteria, then the lower quality bid can sometimes be eliminated without affecting the quality of the final solution.

The number of possible combinations one needs to consider for selecting the winning bids is enormous. To effectively search for the “best” solution, Home Depot uses an integer programming based optimization tool for this process. Because of the combinatorial nature of the process, the lowest cost bid on a lane or group of lanes may not always win a lane.

## **5. Implementation and results of the new bidding process.**

Since the new bidding process is significantly different than the previous bidding process, Home Depot conducted a one week long training program for the carriers in late August 1999, before the bidding process began. The training program consisted of 2 sessions per day, with approximately 10 carriers attending each session. Each carrier sent one representative to attend the training, and the backgrounds of the attendees ranged from pricing specialists, to operations managers to sales representatives. Home Depot also provided the carriers with a toll-free number for assistance about the questions on the bidding process, and the line was very well utilized receiving hundreds of calls with various questions. In order to improve the training process for the next round of bidding, Home Depot kept detailed records of these calls in a database, including information about the company name, caller’s name and position, the type of questions asked, etc.

Home Depot initially designed the bidding process to be completed in one round. However, due to unsatisfactory solutions on particular lanes in the first round, some of the lanes were opened up again for bidding in a second round. The due date for the bids in the first round was the last week of September. The results of the first round were announced before the end of October, where about 80% of the lanes were (conditionally) awarded. For the remaining 20% of the lanes, Home Depot held a second round of bidding and invited only 62 bidders, of which 36 submitted bids. There were a number of reasons why Home Depot did not award all the lanes in the first round. For some of the lanes, Home Depot did not receive enough bids, which limited Home Depot’s carrier selection alternatives for those lanes and in some cases none of the bids on a particular lane satisfied Home Depot’s requirements. Before inviting carriers to bid in the second round, Home Depot used the bid selection optimization tool to do what-if analysis for identifying those carriers who were most likely to submit “acceptable” bids in the second round. After the bids from the second round were collected, Home Depot used the bid selection optimization tool again to award the remaining lanes.

A large number of carriers participated in the bidding process. A summary of carrier participation statistics is as follows:

- Provided carrier profile information 192
- Invited to participate in bid 111
- Submitted Round 1 Bid
  - CBR-generated 91
  - Backup rate matrix only 5
- Invited to continue to round 2 62
- Submitted Round 2 bid 36

Most of the carriers utilized the carrier response tool (CBR) in creating and submitting bids. A handful of carriers (mainly those carriers who found the combinatorial bidding process too complicated) chose to submit backup rate matrices instead, where they submitted rates in a 48×48 matrix for each pair of states. In that case, the rate for transporting goods from a location in state  $i$  to a location in state  $j$  was indicated by entry  $(i,j)$  of the matrix.

A good number of bids were received on each lane. A summary of bid statistics is as follows:

Number of carriers bidding in a lane

- Average 14
- Minimum 2
- Maximum 33

	<u>% lanes</u>	<u>% loads</u>
At least 5 carriers bidding	94.4	97.1
At least 10 carriers bidding	73.4	86.7

The contracts with the carriers were finalized by early January 2000 and the new rates became effective right after that.

As we mentioned before, Home Depot expected that carriers had the capability to execute any bid they submitted. For some reason if a carrier is not able to provide the capacity he promised for certain lanes on a continuous basis, Home Depot can either renegotiate the price with the carrier or find another carrier to award those lanes. The bid selection optimization tool aids Home Depot in the process of price negotiation and alternative carrier selection as well, via providing solutions to what-if scenarios.

## 6. Lessons learned

The new bidding process was a big success. It not only provided Home Depot with better rates, but many of carriers also expressed increased satisfaction from the part of the business they were awarded.

After the bidding process was completed, Home Depot surveyed the carriers and received feedback ranging from “This is great, this is the future!” to “This is too complex, it can’t work”. Part of the reason why some carriers found the process too complex can be attributed to the very short training time. One representative from each carrier attended a half-day session to learn about the bidding process and the bidding software, and this was clearly not enough. Another problem was that the representatives attending the training session were specializing in one part of the carrier’s business such as operations, sales or pricing, but the bidding process clearly requires expertise in more than one area. In the future, Home Depot plans to have a two-day training session and invite at least two representatives from each carrier, one from operations and one from pricing. The training session will also increasingly emphasize the importance and the potential benefits of combination bids.

The next step after awarding the lanes to carriers is the day-to-day execution of transportation operations. Home Depot is currently in the process of designing an execution system, which will help them monitor various parameters such as demand levels, capacity availability and carrier performance.

## 7. Transportation Bidding

It is interesting to note that Home Depot was not the first company to employ this type of conditional bidding in the selection of their transportation. In the early 90's, Sears Logistics Services (SLS) saved over \$84 million (over 13% of their costs) by running six combinatorial bids for selecting its transportation providers over 854 lanes. Interestingly, there are several differences in the structure of the SLS bidding process and the one finally chosen by Home Depot. The bidding process employed by Sears is run in an iterative setting, i.e., bidders are provided with several rounds in which to change their bids, in response to information revealed by their competitors in the previous round. In addition, SLS chose to greatly restrict the number of carriers who would be eligible to participate in the bidding process. After carefully evaluating several carriers operational and financial characteristics, only 14 carriers were deemed "qualified" to participate in the bidding process.

It is interesting to note that both SLS and Home Depot chose to notify all bidders of the identity of all other carriers who were invite to bid.

## 8. Discussion

1. Under their traditional bidding process, Home Depot restricted carriers to bidding on lanes independently (that is, no conditional bids were permitted). Under this bidding process, what are some of the methods Home Depot could have used to guarantee that carriers were not forced to accept lanes at an unprofitable price?
2. Home Depot provided strong reasons in favor of limiting this conditional bidding process to a single bidding round. What may be some reasons in favor of allowing the bidding process to take place over multiple rounds (as done by Sears)?
3. Home Depot incorporated several non-price criteria; for example carrier reliability, load balancing among carriers, and giving preference to incumbent carriers, when determining the optimal lane assignment. However, carriers were not made aware of Home Depot's preferences nor of how these factors will influence the selection of the awarded bids. Discuss the consequences of keeping the carriers uninformed in this dimension. In particular, how would this effect the carriers' bidding decisions?
4. When searching for the best lane assignment, Home Depot actively eliminated from consideration several types of assignments. Discuss why the following assignments could be considered undesirable by Home Depot?
  - a) A single carrier is assigned all of Home Depot's business in a particular region.
  - b) Home Depot comprised the bulk of the carrier's business.

## 9. Problem Description and Questions

You are a decision-maker in a trucking company that is participating in Home Depot's combinatorial bidding process. In addition to your company, there are 8 other trucking companies that are participating; all the carriers differ in size or regions in the US in which they operate. Given below is the information about all of the carriers (including your company), Home Depot's transportation needs, demand, and the bidding procedure<sup>2</sup>.

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<sup>2</sup> The data in this section is generated artificially for the purposes of this case, and has no resemblance to the actual data from Home Depot.

The United States is divided into four major regions: NW, SW, NE, and SE. Home Depot owns two main distribution centers in each region, denoted by DC 1 and DC 2, and is searching for carriers to transport goods between certain pairs of distribution centers (the entire list is given in the following table and Figure).

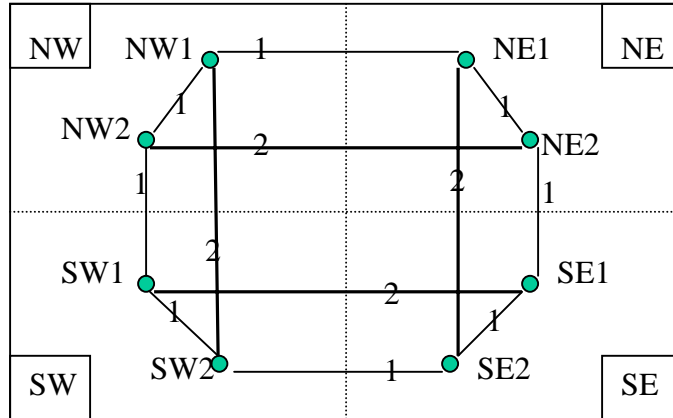


Figure: A line between a pair of cities denotes distance (both ways) between that pair.

NW		NE
1,5,7,9		2,6,7,9
3,5,8,9		4,6,8,9
SW		SE

Figure: Companies eligible to bid in different regions. A company eligible to bid in more than one region is also eligible to bid on the lanes between those regions.

All the carriers share the following cost structure:

- A carrier incurs a fixed cost of \$100 to service only one region (the fixed cost is the same for all regions).
- A carrier incurs a fixed cost of \$150 to service exactly (any) two regions.
- A carrier incurs a fixed cost of \$180 to service exactly (any) three regions.
- A carrier incurs a base cost of \$100 per unit distance to operate a truck.
- It costs the carrier an additional \$50 per unit distance to operate a truck while carrying a full truckload.

While carriers have identical cost structures, they do differ in their ability to service regions. Almost all of the carriers are limited in the regions in which they can operate. Four of the carriers (numbered 1,2,3, and 4 and referred to as regional carriers) can only service one region; four others (numbered 5,6,7,8 and referred to as national carriers) can service two adjacent regions; and one carrier (numbered 9 and referred to as a global carrier) can service any region in the U.S.

Home Depot has a known amount of goods that must be transferred between distribution centers on a weekly basis. This amount is given in table 3 under the column “Demand”. Each carrier owns sufficient equipment to transport 1 unit of Demand at any point in time. Therefore, some lanes will require that more than one carrier operate between the two distribution centers in order to satisfy Home Depot’s demand. It is important to note that Home Depot currently has demand only between certain pairs of distribution centers. Carriers, however, may travel between any pair of distribution centers within their allowable regions. Carriers may choose any distribution center as its starting point (or home base). The starting distribution center must be in a region in which the carrier is able to operate.

The carriers are bidding to win an annual contract with Home Depot. The distances between any two distribution centers are given in the table below. For any carrier, it takes 1 day to complete one unit distance of travel. Should a carrier win a lane, it must be able to service that lane’s weekly demand in a timely fashion. Therefore, a carrier must ensure that it is bidding for a “feasible” schedule, that is, the lanes that it proposes to operate together allow a carrier to complete its route within 7 days time and be back at its starting point at the start of the next week.

There are a total of 24 lanes that are available for bidding. NW1-NW2 indicates the lane in the northwest region going from DC 1 to DC 2. NW1-SW2 indicates the lanes joining DC 1 in region NW to DC 2 in region SW.

### **Bidding Structure**

Carriers may submit bids for groups of lanes (or for individual lanes) in their region. A carrier can bid on any combination of lanes; a lane may be bid as many times and in as many combinations as a carrier wants. The maximum allowable bid is \$400 per unit distance. Home Depot will disregard any bid above the maximum allowable amount.

If a carrier is submitting a bid on an individual lane, then the bid is of the form:  
(Lane; Bid)

A Bid indicates minimum price per unit distance the carrier will accept to service this lane.

If a carrier is submitting a bid on a group of lanes, then the bid is of the form:  
(Lane\_1,Lane\_2, ...Lane\_N; Bid)

In this case, a carrier’s Bid indicates the minimum price per unit distance the carrier is willing to accept in order to service Lane\_1 through Lane\_N, *conditional* on him being awarded *all* of the lanes in his bid.

<b>Lane</b>	<b>Companies eligible to bid</b>	<b>Demand</b>	<b>Distance</b>
NW1-NW2	1,5,7,9	2	1
NW2-NW1	1,5,7,9	2	1
NE1-NE2	2,6,7,9	2	1
NE2-NE1	2,6,7,9	2	1

SW1-SW2	3,5,8,9	2	1
SW2-SW1	3,5,8,9	2	1
SE1-SE2	4,6,8,9	2	1
SE2-SE1	4,6,8,9	2	1
NW1-SW2	5,9	1	2
SW2-NW1	5,9	1	2
NW2-SW1	5,9	1	1
SW1-NW2	5,9	1	1
NE2-SE1	6,9	1	1
SE1-NE2	6,9	1	1
NE1-SE2	6,9	1	2
SE2-NE1	6,9	1	2
NW2-NE2	7,9	1	2
NE2-NW2	7,9	1	2
NE1-NW1	7,9	1	1
NW1-NE1	7,9	1	1
SW1-SE1	8,9	1	2
SE1-SW1	8,9	1	2
SW2-SE2	8,9	1	1
SE2-SW2	8,9	1	1

## Questions

- 1) Formulate a bidding strategy for your company. You are carrier # \_\_\_\_.
- 2) Explain the reasoning behind your bidding strategy. You need to address a number of issues including:
  - a) Why you chose to bid on the lanes and groups of lanes you submitted?
  - b) What influenced your bid prices?
  - c) How did you incorporate the presence of your competitors (regional, national and global) into your bid?
  - d) Which of your company's characteristics, e.g., geographical coverage abilities, gave you a competitive advantage that you exploited in your bid?
  - e) Which of your company's characteristics gave you a competitive disadvantage and how you dealt with that in your bid?
- 3) Provide an algorithm for your bidding strategy. The algorithm should clearly explain the steps you went through in generating your bids. The algorithm should be designed and written in such a way that another company (possibly with similar cost structure and characteristics as your company) could use it in bidding for its own capacity in a similar bidding process.

When all of the bids have been collected, they will all be returned to each of the groups (companies). Each group is expected to find a "good" feasible solution for Home Depot, that is, a collection of bids that assigns each demand load on each lane to no more than one carrier, at minimal cost to Home Depot. If you are unable to find a feasible solution that satisfies all of Home Depot's demand, find the best one that satisfies at least 75% of Home Depot's total demand.

- 4) It is possible that the optimal solution that you find in question #3 does not have your company dispatched for your desired routes or for only a portion of them. In what way must you reconfigure your bid in order for your desired dispatch to be present in the optimal solution?