Buyer's Reference Manual

Merkato Version 2.1

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Contents

What is Merkato?

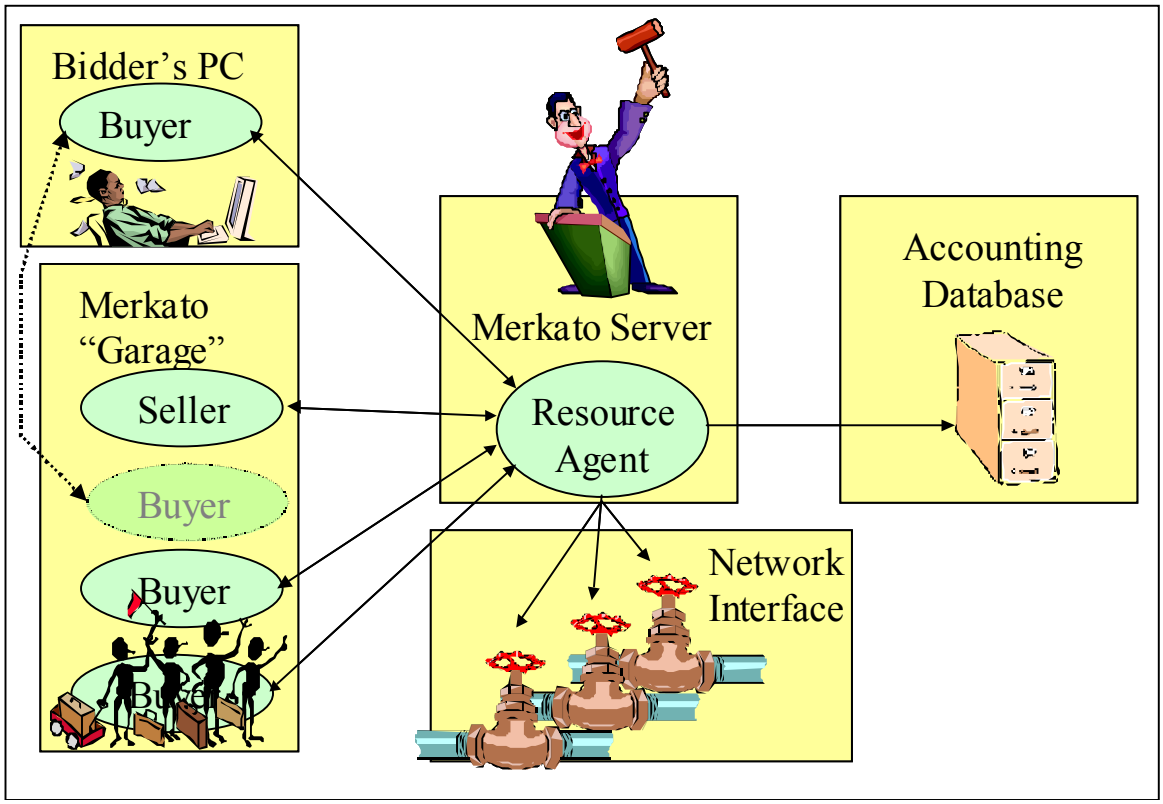
Merkato is a unique way to obtain bandwidth, on demand, at fair and equitable prices.

There are two ways to purchase bandwidth in a Merkato system.

- You can get a fixed amount of bandwidth, at a fixed price, for a fixed term
- You can create a bidding strategy and contend for bandwidth with other buyers at frequent intervals, establishing a *fair market price* based on supply and demand

The first method is called the Reservation market. The second method is called the Spot market.

The spot market provides a true balanced supply-and-demand marketplace. The Merkato spot market uses a patent-pending Progressive Second Price Auction mechanism to collect bids from multiple buyers, analyze the bids to determine the natural market price for this bandwidth, and then automatically apportion that bandwidth to the successful bidders at the market price. The components of the Merkato system are illustrated below.



Buyers, Sellers, and Agents

Agents are programs within Merkato that interact on behalf of buyers and sellers. Buyers of bandwidth configure their agents with the price they are willing to pay for a range of available quantity. The seller configures an agent with a quantity of bandwidth for sale and a minimum price for that quantity. Buyer agents then express what they are willing to pay for bandwidth in the form of bids, consisting of a unit price and a quantity. The bids go to a third type of agent, the Resource agent.

Sellers create a price floor by offering to purchase all the available bandwidth at their lowest acceptable price.

The Resource agent responds to bids with proposed allocations and pricing. The buyer and seller agents can either accept the proposed allocation (by not bidding further), or reject the proposed allocation (by submitting another bid). When there is no more bidding, the auction closes, and the resource agent makes actual allocations.

The entire process takes no more than five minutes. The auction is completely open and fair, with all bidders seeing what the other bidders have offered. The Progressive Second Price auction mechanism (see “Merkato Auction Mechanism: The Progressive Second Price Auction“ on page 78) ensures that all bidders receive their allocation at the fair market price, which is equal to or less than the price they offer.

The Resource Agent

The resource agent is the core of the Merkato system. The Resource agent is responsible for:

- Informing all bidders of the quantity available
- Accepting bids from active bidders
- Determining a proposed allocation of bandwidth for each bidder based on the progressive second price auction rules
- Calculating the market price
- Distributing all this information anonymously to all bidders

These actions occur during a single cycle in the bidding process. Bidders who did not receive an allocation, or whose allocation was less than they wanted, can submit another bid to improve their positions. This cycle continues until bidders are satisfied with their allocations or don't want to bid at the current market price.

When bidding is complete the Resource agent:

- informs all bidders of the final results
- sends the bandwidth distribution information to the Network Service Provisioner (NSP) to implement the bandwidth distribution
- sends the billing information to the accounting database

Automatic Remote Bidding

Although the auction allocation process runs continuously, there is no need to be directly involved at all times. Your Buyer agent bids automatically for you, after you configure it with a profile of the value you place on bandwidth.

You indicate your budget limits, bandwidth desires, and bidding strategy on the Valuation and Strategy windows in the Merkato user interface.

Once you configure your agent you can either bid from your PC using a Java-based application or communicate remotely with your agent. If you operate your agent remotely, it bids on a server co-located with the Resource agent. This location is referred to as the garage.

Bidding from your PC and operating a remote agent each has advantages. On your PC, the Merkato desktop display gives you real-time information about the auction and its participants. If you are not interacting with the agent, you can configure it and upload it to the garage. It will continue to run, and you avoid the chance of ceasing to bid if your PC crashes or you have network connectivity problems.

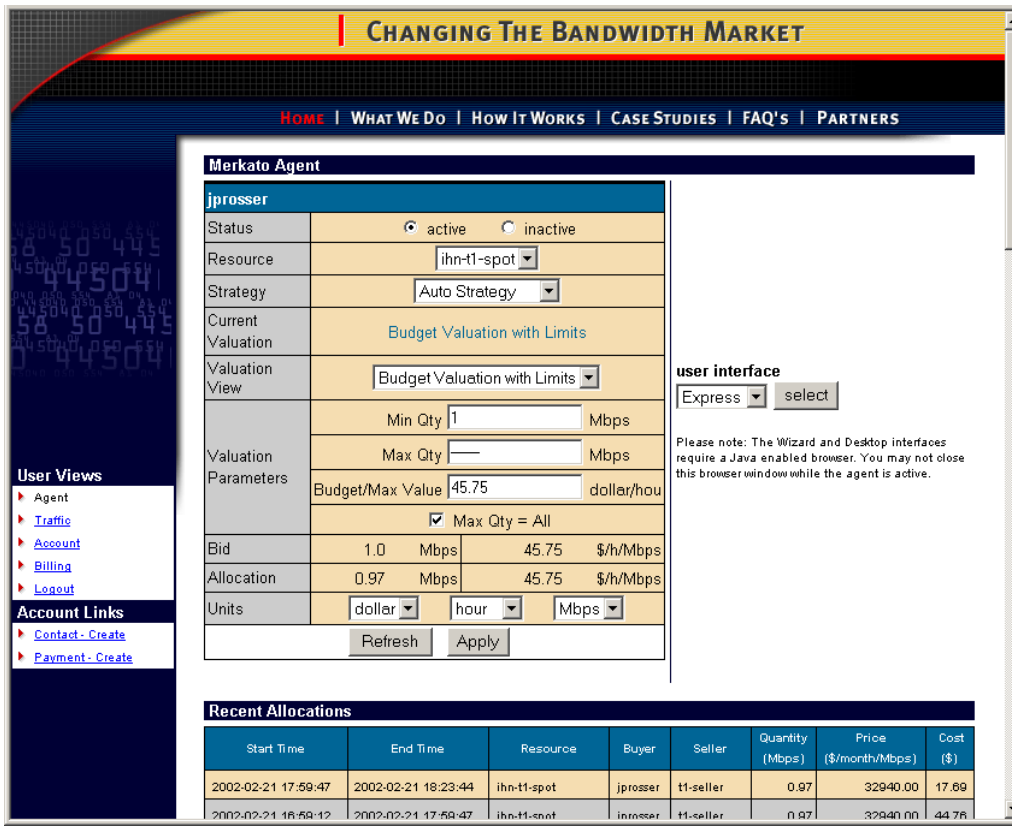
Starting Merkato

Your first point of entry to Merkato is through the Portal, a browser-based application that provides accounting and status information, as well as access to the Merkato agents. Your version of the portal may have a slightly different appearance than shown below, but the functionality is the same.

You first see a page that contains Username and Password fields.

Enter a valid user name and password and click **Login**.

The express agent screen appears, shown below.



From the top-level agent page you can get to the various screens that make up the portal, and to the agent interfaces—Express, Wizard, and Desktop.

Choice of Interface

You can chose from among three interfaces to set preferences, get information, and handle transactions. The User Interface menu gives you three choices.

- The **Wizard** interface walks you through the steps for setting up your Merkato agent to obtain bandwidth. The settings are automatically transferred to your agent and can be viewed and altered from either the Desktop or Express interfaces.
- The **Desktop** interface allows you to purchase bandwidth through a series of user-selectable windows. Your agent is brought to your PC and bids on your behalf from there.
- The **Express** interface lets you obtain status information from, and send configuration information to, an agent in the garage. The Express interface is displayed the Portal page upon successful login. The Express interface is considered advanced because the fields are less interactive than the Java-based Merkato Desktop interface.

When you first log in, the Express interface appears to the left of the interface selection field.

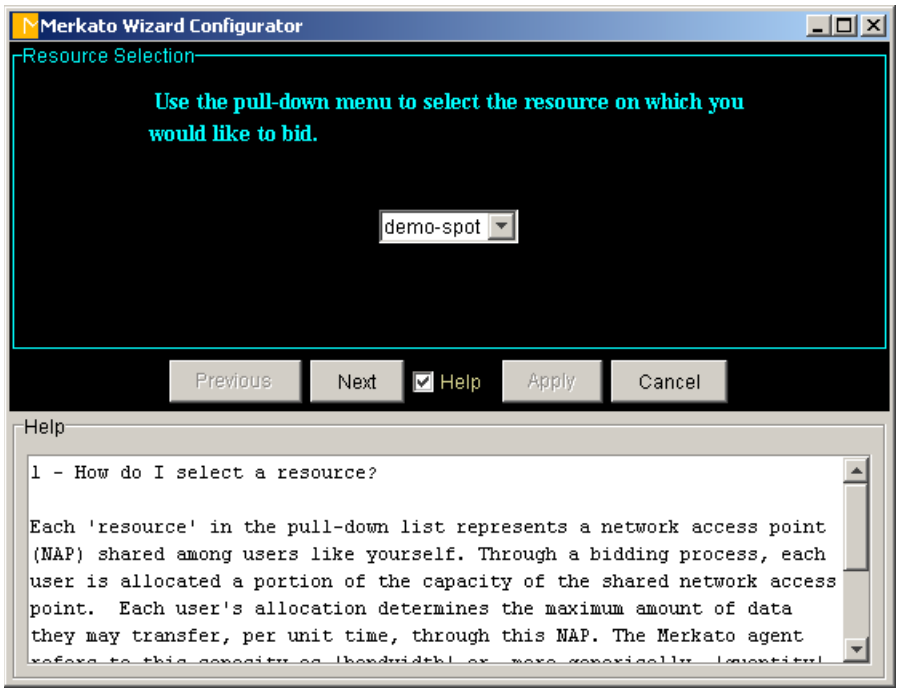
We recommended that you select the Wizard interface first to make basic buying choices. When you become more advanced in your use of Merkato you can make further changes to the Desktop interface. The Desktop interface also gives you the most detailed status information. As you become more proficient with Merkato, you may want to use the Express interface to make quick configuration changes and status checks without downloading your agent to your PC.

Configuration Wizard

The Wizard interface walks you through the steps to set up Merkato to obtain bandwidth. The Wizard may be used alone (when launched from the original login screen) to alter settings to your agent in the garage. It may also be used to alter settings in your agent on your PC (when launched from a pull-down menu-bar in the Desktop interface).

To access the Wizard, select Wizard from the User Interface menu. (See Choice of Interface on page 7.)

When you first launch the Wizard, the following window appears:



The Wizard guides you, step-by-step, through the following configuration choices:

- The resource from which you wish to purchase bandwidth
- The currency, quantity, and time units with which you would like to express your purchasing requirements. (Changes can be made at any time and your previously entered values will be scaled to match your new units.)
- Your minimum bandwidth requirements
- Your maximum bandwidth requirements
- Your budget for purchasing bandwidth
- The state you wish your agent to be left in following the configuration changes (bidding or non-bidding)

Wizard Features

The Help box provides information about the impact of the parameters you are choosing. A check box at the bottom of the screen enables or disables help.

The values configured in your agent, at the time the Wizard is activated, are displayed as initial values in the applicable fields.

Use the **Next** and **Previous** buttons to navigate forward and backward through the Wizard. Until you click **Apply** at the last screen, none of your changes take effect. When you click **Apply** you will see the following confirmation screen.

Click **Yes** to confirm your desire to apply your changes, or click **No** to return to the Wizard.

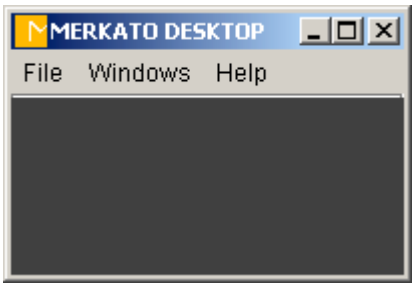
You may click **Cancel** at any time to exit the Wizard without making changes. Merkato will ask you to confirm your desire to exit the Wizard with a dialog box:

Desktop Interface

The Desktop interface allows you to purchase bandwidth through a series of user-selectable windows. Your agent is brought to your PC and bids on your behalf from the Merkato desktop.

To access the Desktop, select Desktop from the User Interface menu. (See Choice of Interface on page 7.)

The Desktop window appears:



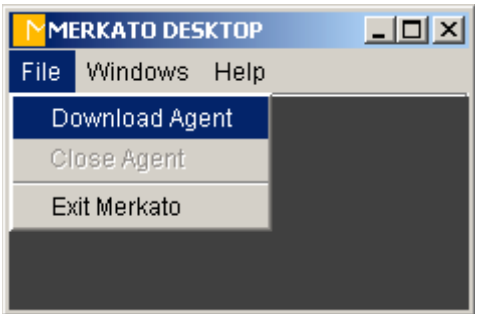
Note: Do not close the Portal browser window when the Merkato Desktop is open. You may browse to other pages, but you must leave the browser window open for the Merkato Desktop to continue operating properly.

The Desktop Agent

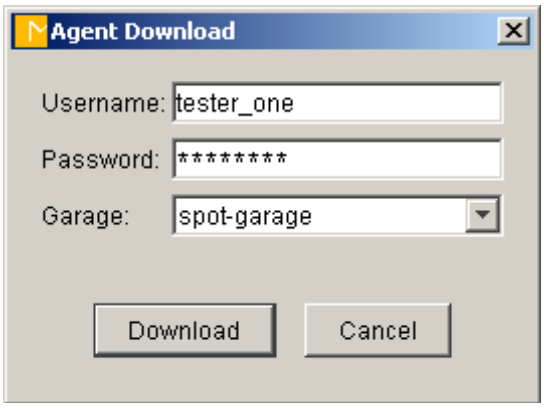
The Merkato Desktop is the window into which you download one or more Merkato agents.

To download an agent, follow these steps:

1. From the File pull-down menu, select "Download Agent."



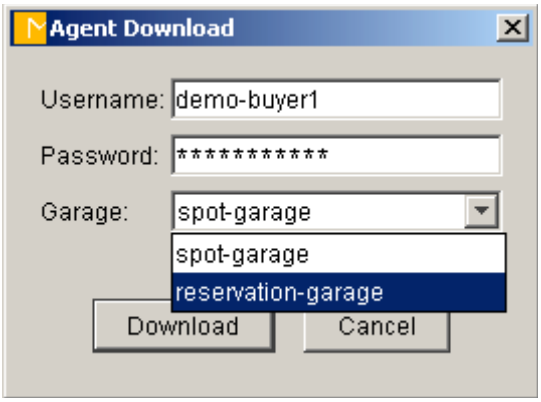
   The Download Agent window appears.



2. Enter the username and password for the desired agent.

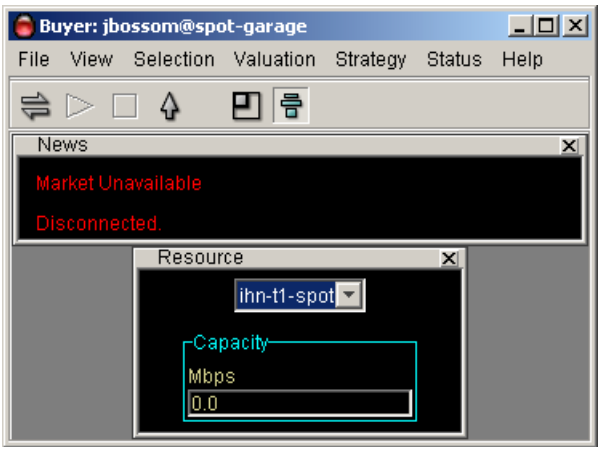
   By default, this is the same as the username and password you used to access the Desktop interface from the initial login; the fields are populated with this information. You may specify another valid username and password to download another agent.

3. If there are Garage choices on a pull-down list that indicates both spot and reservation marketplaces, select the reservation garage and click **Download**.



If you have a single generic choice in the Garage field, your Merkato administrator will have given you two distinct usernames and passwords—one for each market. In this case, make sure that the username and password correspond to the reservation market and click **download**.

The Agent window appears. This is the Agent interface through which you make your reservation.



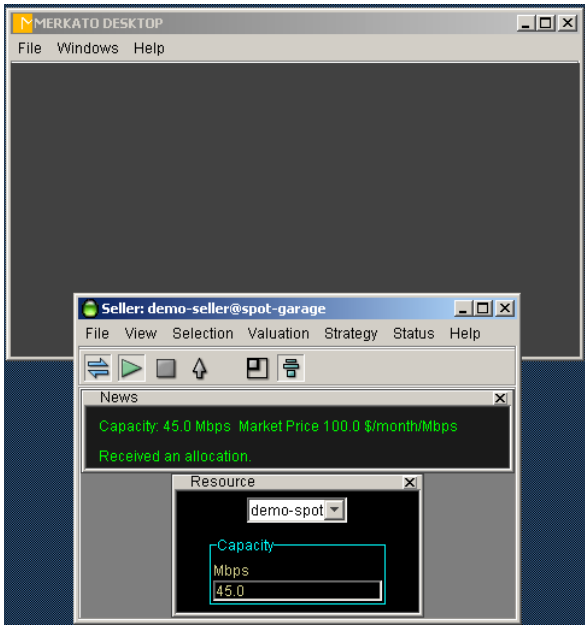
Arranging Agent Windows

When more than one agent is displayed, you may want to arrange the agents on your screen.

Detached From Merkato Desktop

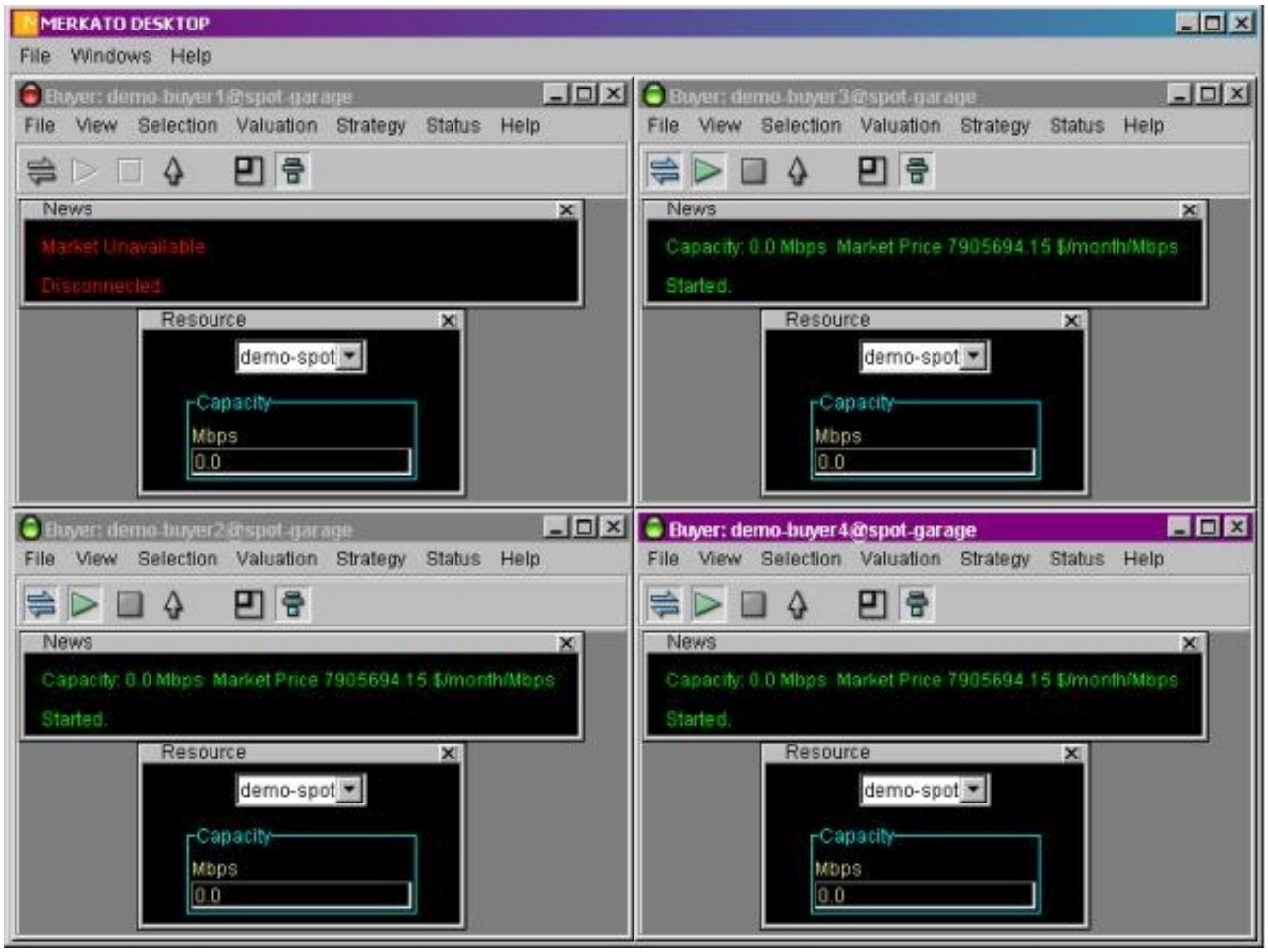
By default, all agent windows appear within the Merkato Desktop window. If you want the agent window to appear as an independent window on your Windows screen, Select Detach All from the Windows pull-down menu, as shown below:

When you select Detach All a check appears beside the name in the menu-bar. The agent can then be viewed outside of the Merkato desktop, as shown below:



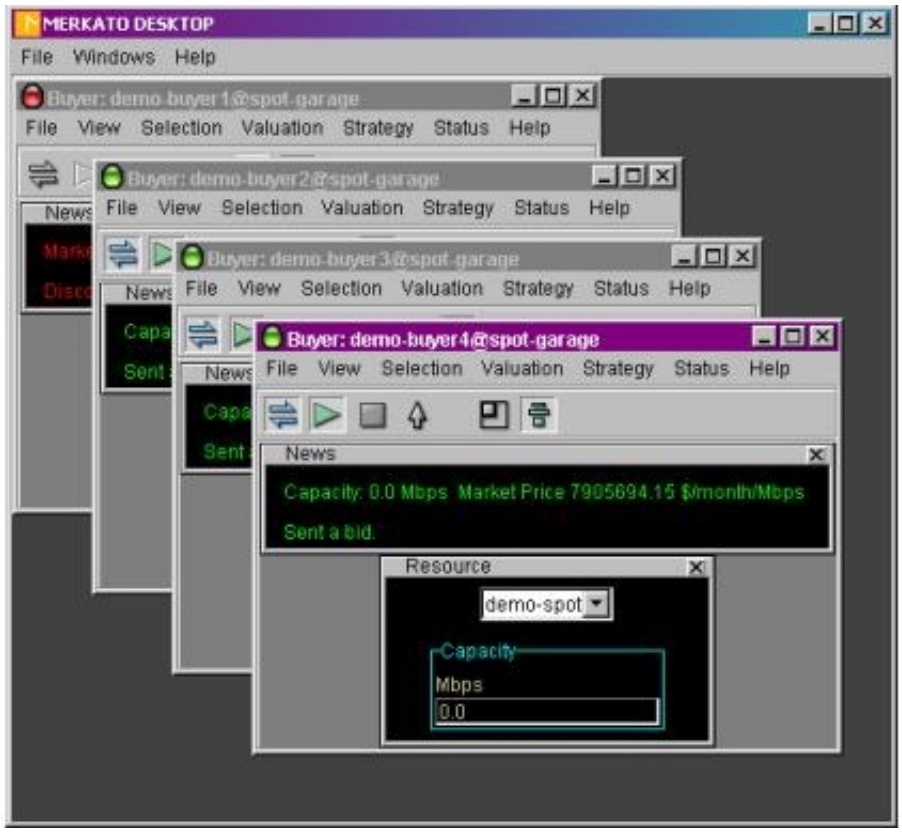
Tiled on Merkato Desktop

Whether the agent windows are inside or outside the Desktop, they can be automatically arranged relative to each other. If you select Tile All from the Windows pull-down menu, the windows arrange themselves in a tight, non-overlapping pattern:



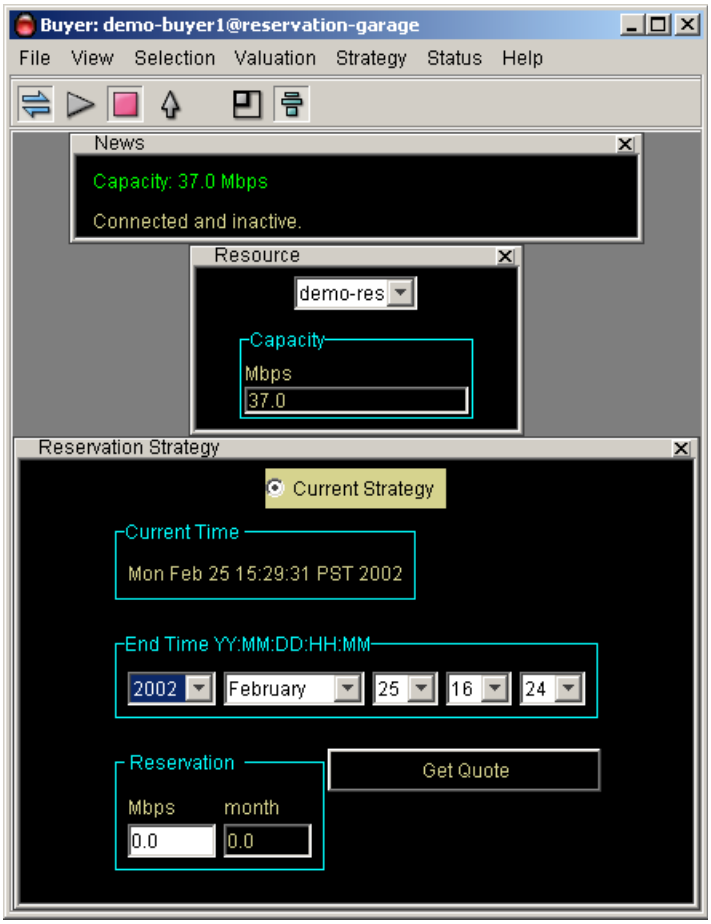
Cascading on Merkato Desktop

If you select Cascade All from the Windows pull-down menu, the windows are all offset from each other and overlap, as shown below.



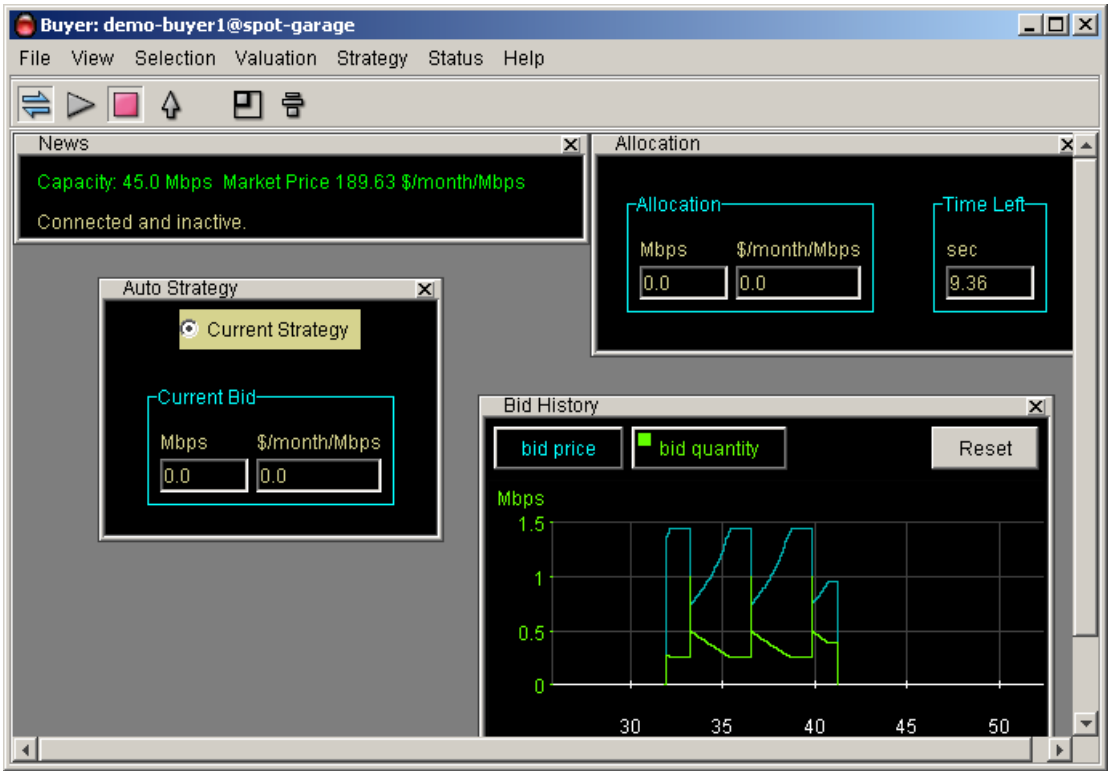
Arranging Sub-Windows within the Agent Window

The agent window consists of smaller sub-windows, each of which can be displayed or closed as you wish. By default, windows are stacked vertically in the agent window, as shown below.



Each time a window is selected for viewing, it appears beneath the previously activated window. To close a window, either click the close-box tab at the upper right hand corner of the window (☒), or de-select the window in the pull-down menu-bar lists. The window closes and the other windows fill in the spot it occupied.

To freely drag boxes within the agent window, de-select the Stack () icon or go to the View pull-down menu and de-select Stack.

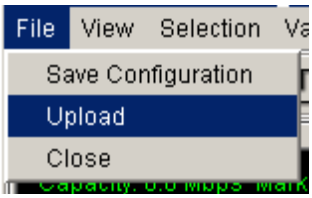


To resize the agent window to exactly match the windows displayed, click the Pack icon () or select Pack from the View pull-down menu.

Uploading an Agent

Your agent obtains bandwidth for you by sending bids to a Resource agent. You may have your agent bid from the "Garage," which normally runs on the same server as the Resource Agent. Your agent may continue to bid on your behalf from a Garage when you close the agent on your PC (using your current Desktop agent settings). This is known as "uploading" your agent. When you upload your agent, all configuration changes are saved and the agent on your PC is closed.

You can upload either by pressing the up-arrow on the icon bar () or by selecting Upload from the File pull-down menu, as shown below:

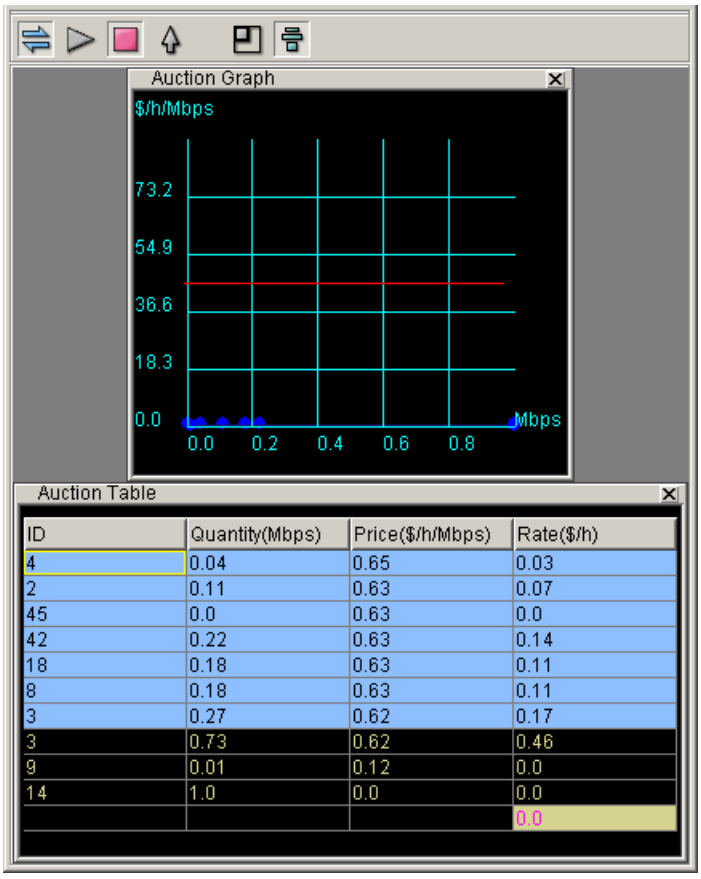


Connect/Start/Stop

The three icons at the upper left of the icon bar indicate “Connect,” “Start,” and “Stop” (from left to right).

When you first download a desktop agent, before you configure it to actively bid, it is disconnected from the auction. Your agent does not bid or allow you to view auction status when it is disconnected, although you can change its configuration. When the connect symbol on the icon bar (on the far left) is un-depressed and un-colored the agent is disconnected.

When you connect to the auction in “Stopped” mode you may observe the auction but you are not participating in it. The Auction Graph (see page 44) and Auction Table (see page 46) show you the current auction in progress and allow you to determine whether you wish to join it. The Auction Graph and Auction table are shown below:



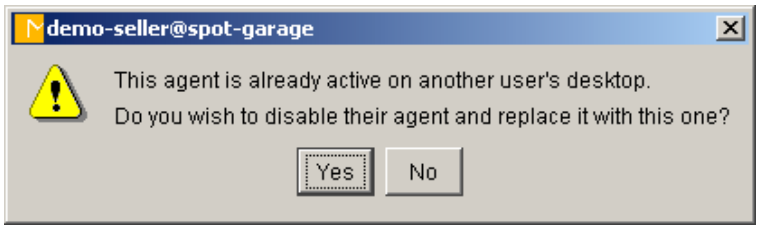
ID	Quantity(Mbps)	Price($/h/Mbps)	Rate($/h)
4	0.04	0.65	0.03
2	0.11	0.63	0.07
45	0.0	0.63	0.0
42	0.22	0.63	0.14
18	0.18	0.63	0.11
8	0.18	0.63	0.11
3	0.27	0.62	0.17
3	0.73	0.62	0.46
9	0.01	0.12	0.0
14	1.0	0.0	0.0
			0.0

When you want to start bidding, either click the Start icon (second from left on the icon bar) or select “Start” under the Selection menu. Bidding starts immediately with the current active settings.

To stop bidding, click the **Stop** icon (third from left on icon bar) or select Stop from the Selection menu. Your agent stops bidding and you are returned to Stop mode and disconnected. To begin viewing the auction again you must reconnect.

Note: You need a Merkato login ID to bid. If two users have the same login, both may try to bid using the same agent. Bidder's names do not appear on the auction chart or auction graph—bidders are identified with arbitrary numbers. There is no way to know whether your agent is already active when you preview an auction (although once you become adept at reading the auction table and auction canvas, it is possible to detect bidders who appear to have your valuation settings).

If an agent is already logged in with the same ID you are using, when you click **Start**, the message below appears. If you click **Yes**, confirming your wish to begin bidding, your agent gains control of the bidding process. The agent on other user's PC is disconnected.



The last user to log in successfully always "wins" control of the agent, and the previous user receives an error message, as shown below, indicating that user's agent is no longer bidding.

Spot Market and Reservation Market Agents

There are two ways to purchase bandwidth in a Merkato system.

- You can request and receive a fixed amount of bandwidth, at a fixed price, for a fixed term
- You can create a bidding strategy and contend for bandwidth with other buyers at frequent intervals

The first method is called the Reservation market and uses a reservation agent. The second method is called the Spot market and uses a spot agent.

Reservations eliminate uncertainty. You know how much bandwidth you will be receiving, for what duration, and for what price.

In the spot market, distribution of bandwidth is based on ranking bidders by price offered. It is possible that for some period of time you will be unable to obtain the full amount of bandwidth you desire because you are out-bid by other buyers.

The spot market provides true bandwidth-on-demand. The changes you make to your agent bidding profile take effect in five to ten minutes. You can even stop bidding entirely for a period.

Reservations may be cancelled, but only if you agree to pay a cancellation fee set by the seller.

The seller sets the reservation market prices. Spot market prices are determined by a unique progressive second price bidding process. You do not necessarily pay what you offer; you pay the unit price of the lowest bidder to be awarded bandwidth. This is the true "market price" for the bandwidth offered by the seller, as established by the community of active buyers. Although not guaranteed to be so, the spot market prices are often lower than reservation market pricing because buyers tend to make short-term reservations if the spot market pricing gets too high.

You need not choose one or the other purchasing option exclusively. Any bandwidth you purchase on the spot market will be added to bandwidth you purchase on the reservation market. Many buyers use the reservation market to "lock in" their minimum required bandwidth, and then use the spot market to purchase additional bandwidth as required.

Depending on how your administrator has set up your Merkato system, you may have separate login usernames for each type of agent or they may share a common username and password. (If different agents share the same username, you have to obtain them from different "garages.")

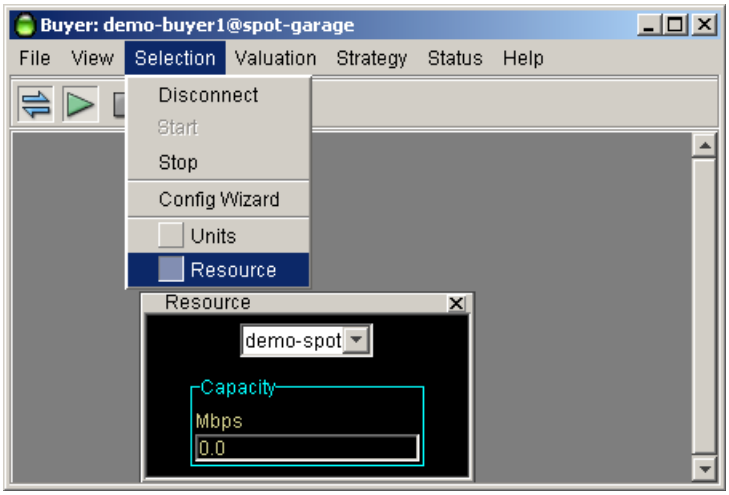
The Spot agent's user interface is described below, followed by the Reservation agent's user interface.

Desktop Agent Window

The desktop agent window consists of multiple sub-windows that may be displayed, or not displayed, as you wish. The sections below describe the windows, in roughly the order a first-time user might access them.

Resource Window

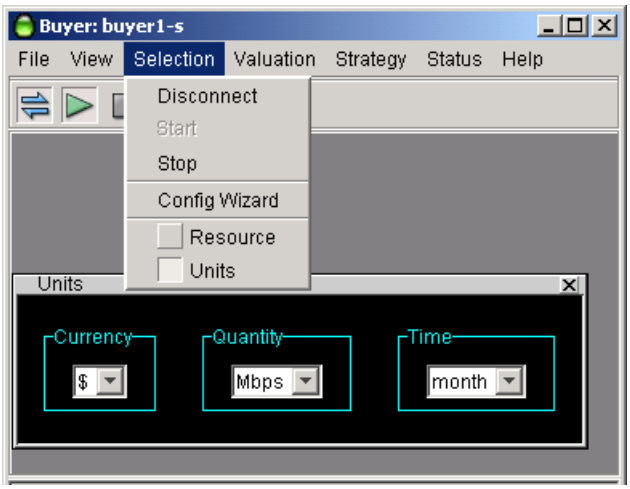
The Resource window includes a pull-down menu of the resources available to the agent. It shows the amount of bandwidth available at the resource selected.



Open the Resource window by selecting it from the Selection pull-down menu. If the agent is connected to the auction, the Capacity display indicates the total amount of bandwidth available for sale.

Note that a single agent can only bid on one resource at a time. If you select one resource, you automatically de-select the others.

Units Window



The Units window lets you select display units for all the other windows as well as for several pop-up message screens.

Currency units supported are dollars (“$”) and cents (“c”).

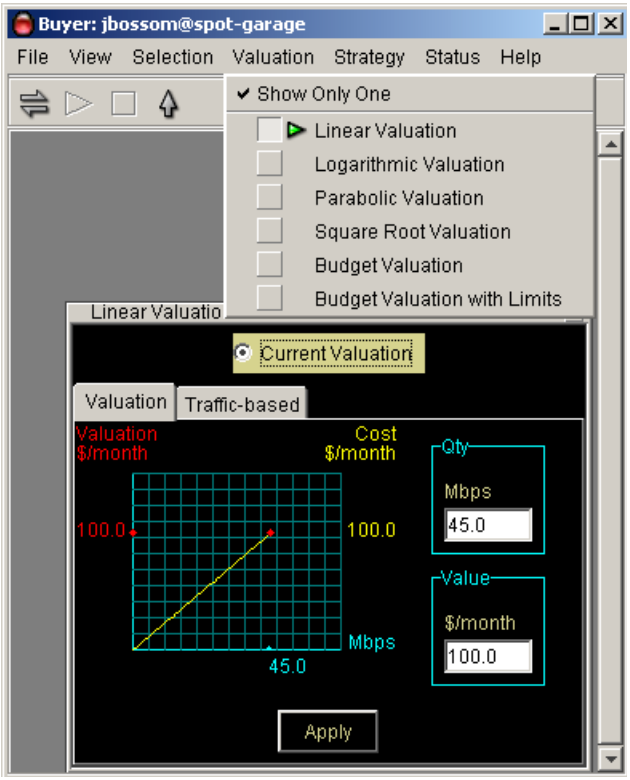
Quantity units supported are kilobits per second (“kbps”), Megabits per second (“Mbps”), and gigabits per second (“Gbps”).

Time units supported are minutes (“min”), hours (“h”), days (“day”), and months (“month”).

The changes to any units take effect immediately. All values in all other windows are automatically scaled to reflect the new units without changing the actual values.

Valuations Overview

Your valuation indicates your maximum willingness to pay for various amounts of bandwidth. In the course of an auction, your agent uses this valuation information to determine whether to bid, how much bandwidth to ask for, and how much to offer, in response to changing market conditions.



You choose a valuation from the Valuation pull-down menu.

The first item in the menu, “Show Only One,” controls whether multiple valuation windows can be displayed. If a check mark appears before this control, only one valuation can appear on the desktop.

Each valuation has a “Current” radio button label at the top of the window. Select the Current button to make a valuation active (this automatically de-selects whichever valuation had been active). The green arrow in the menu-bar pull-down list also indicates which valuation is active.

Valuations use different parameters to change their shapes and values, but all result in a representation of valuation and cost for a quantity of bandwidth. The chart to the left of the numerical entry boxes shows two curves; the red curve represents valuation relative to quantity and the yellow one is a representation of maximum cost relative to quantity. If there appears to be only one curve, then both curves are identical and overlapping.

Red Curve

Valuation, represented by the red curve, is an abstract concept that economists use to indicate the changing value buyers put on a resource. Mathematically, it is the area under the curve (that is, the integral) of unit price verses quantity. Merkato uses this curve to determine the actual bids to be placed.

Yellow Curve

More valuable for non-economists is the yellow curve. This curve represents the maximum out-of-pocket expense you would pay per quantity of allocated bandwidth. Whether you actually pay this amount depends on whether you obtain the last amount of bandwidth sold. (See "Merkato Auction Mechanism: The Progressive Second Price Auction" on page 78).

Types of Valuations

You create a valuation profile by entering values for price and quantity. The following sections describe each valuation profile in detail.

The choices are:

Budget Valuation – Valuation is configured to have a constant cost for all units of bandwidth.

Budget Valuation with Limits – Same as budget valuation but you can set the minimum and maximum bandwidth for which you will offer your fixed cost amount.

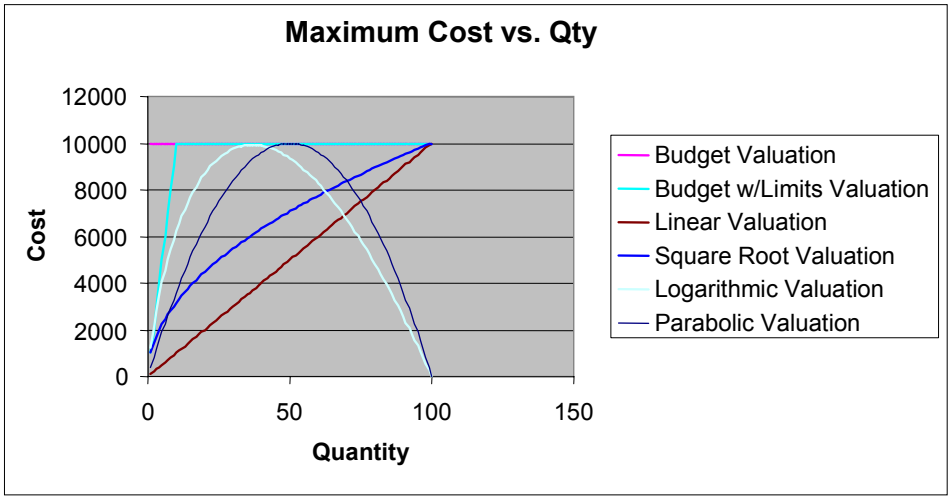
Linear Valuation – Bidding at a constant unit price regardless of the quantity. Similar to a take-it-or-leave-it bid. You may get less quantity than you ask for, but the unit price will never exceed what you offer.

Square Root Valuation – Similar to budget valuation except you lower the total cost you are willing to pay as bandwidth decreases.

Logarithmic Valuation – Use this valuation if you wish to bid aggressively at a mid-point in the quantity range and less aggressively for higher or lower amounts. The agent using this valuation bids most aggressively at 37% if the maximum quantity you specify.

Parabolic Valuation – Use this valuation if you wish to bid aggressively at a mid-point in the quantity range and less aggressively for higher or lower amounts. The agent using this valuation bids most aggressively at 50% if the maximum quantity you specify.

The following chart compares the types of valuations.



This chart shows the relative bidding strategies for each of the valuations, all normalized to a maximum cost of $10,000 per month and a maximum desired quantity of 100 Mbps.

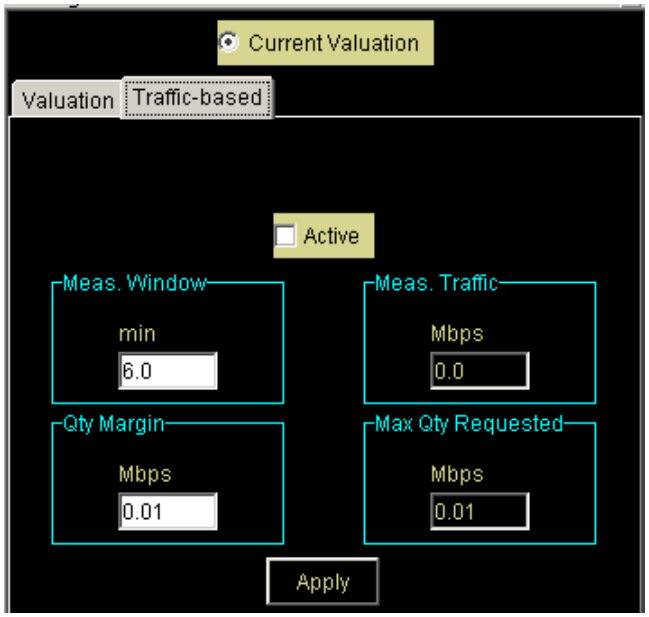
Setting Your Valuation's Max Quantity

You may specify that you want a maximum quantity that is greater than the quantity the seller is offering.

You could do this in case the seller decides to offer more bandwidth later. You may also do this to achieve a desired bid valuation curve (especially when you are using the logarithmic or parabolic valuation—the maximum desired quantity sets the most aggressive bidding point. Your agent will still begin bidding at the amount the seller is offering, at the unit price indicated from your valuation curve.

Your bidding strategy can go beyond entering the amount of bandwidth you want and the price you are willing to pay. Using the Traffic-based tab, you can set your agent to adjust how much bandwidth it bids for as your traffic changes.

Traffic-Based Bidding



Each valuation window has a Traffic-based tab, and each one serves the same function.

If you use the Traffic-based tab in the valuation window, your agent changes its maximum quantity by checking the usage at intervals.

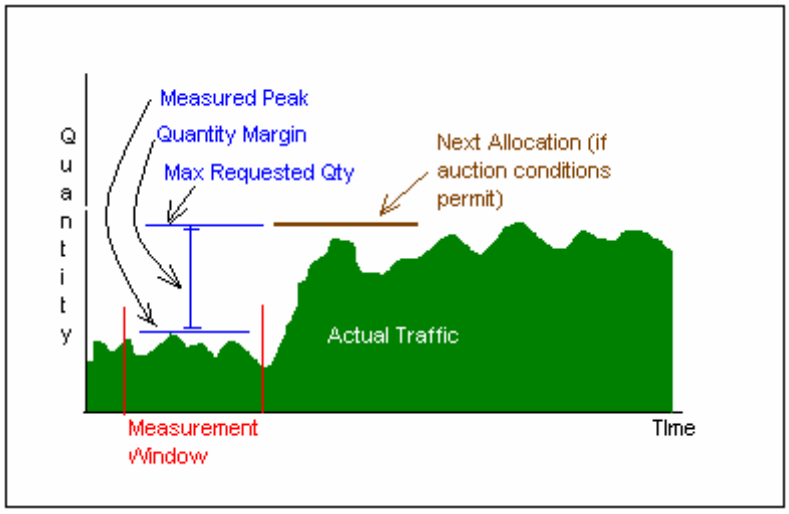
Meas. Window—The Measurement Window. Your agent continuously measures the amount of traffic you generate in five-minute increments. The measurement window setting tells the agent, in minutes, how far back in time to look for the peak five-minute interval. The smallest interval you can select is six minutes. Unless your Merkato administrator has changed this, the largest allowed interval is 200 minutes (in other words, the peak of the last 40 five-minute traffic samples).

Meas. Traffic—Measured Traffic (Display Only field). The peak amount of traffic the agent measures at the interval you set in the Meas. Window field. Merkato uses this peak five-minute interval as the basis for the "Max Quantity Requested" calculation. (See below.)

Qty Margin—Quantity Margin. This is the amount of bandwidth your agent will attempt to obtain above that of the recent measured peak. There are many reasons why you would like to obtain more bandwidth than your recent measured peak. The most significant is that you will not be able to measure peak traffic above your most recently measured peak if your allocation only allows that amount of traffic to pass through the Merkato system (it becomes a self-fulfilling prediction). Similarly, if your traffic goes to zero for any length of time, your agent would start to ask for zero allocation and you would never be able to increase your allocation beyond this value. Select your Quantity Margin to be the maximum expected jump of traffic within a five-minute period.

Max Qty Requested—Maximum Quantity Requested (Display Only field). The Merkato agent adds the measured traffic to the Qty Margin to create this number. This is the value that is carried forward into the main valuation calculation. It is called "Maximum Quantity Requested" because Merkato compares to the "Max Qty" value in the main valuation window. Merkato uses whichever value is smaller as the basis for the maximum quantity requested. (In other words, traffic-based settings can only reduce the amount of bandwidth you ask for relative to the main valuation settings—they will never increase it). Note that the "Max Qty Requested" value only changes the initial bidding point. Should your offered bid price be insufficient to get that amount of bandwidth, your agent uses your pre-determined valuation curve below that value to attempt to obtain as much bandwidth as possible.

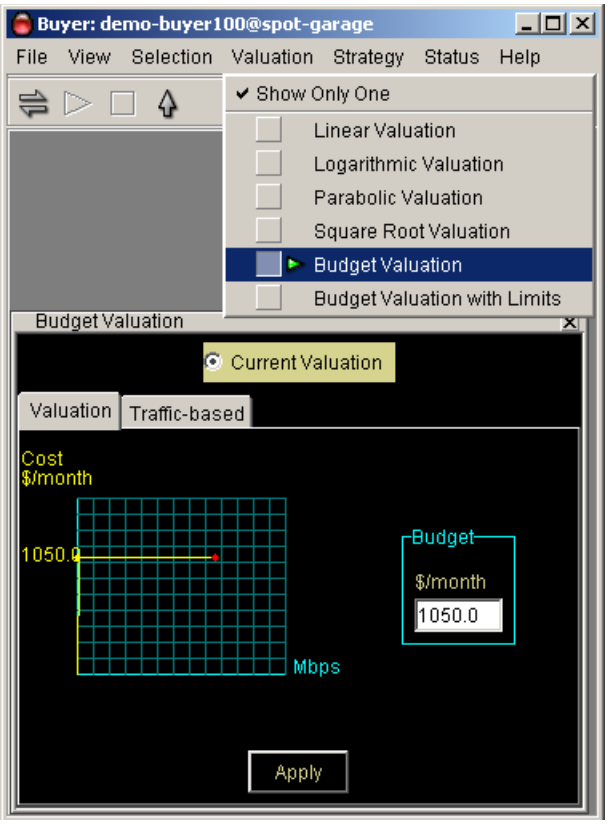
The diagram below, shows the relationships between these various parameters:



Active check box—Checking this box starts Traffic-based bidding on your agent.

Apply—Clicking **Apply** makes the numbers entered in the fields of the Traffic-based window active.

Budget Valuation

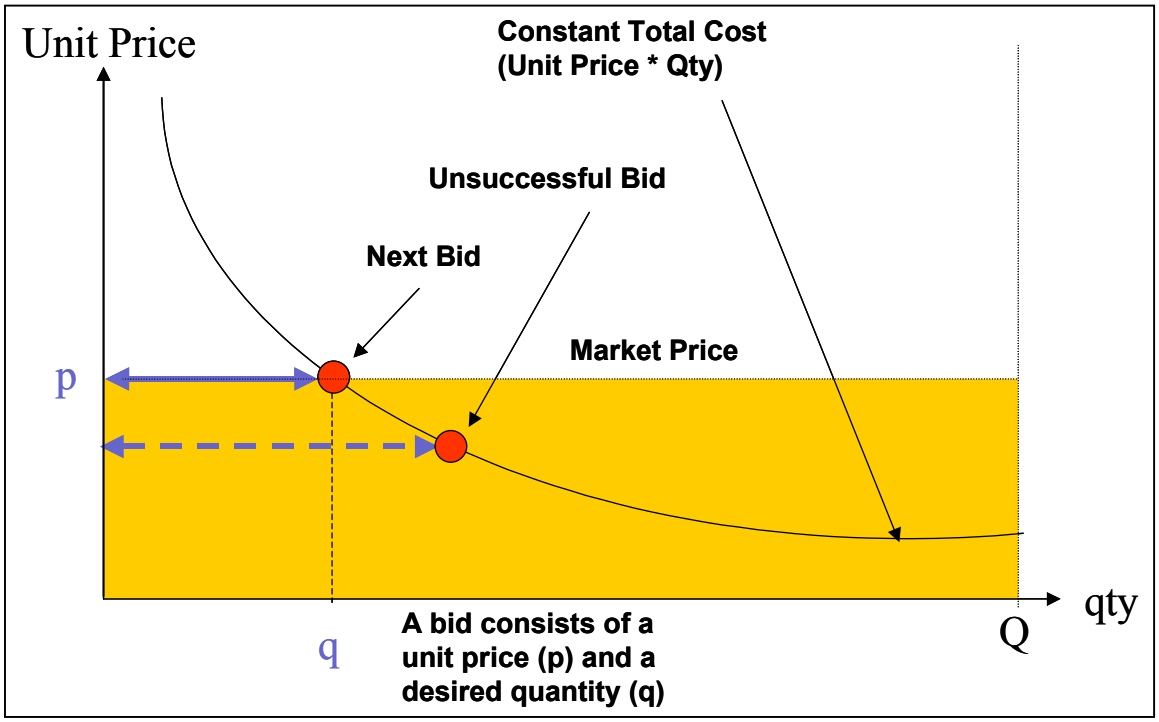


The Budget valuation has a single configurable parameter—the "budget," which is the total out-of-pocket amount you are willing to pay for any amount of bandwidth.

This is the easiest valuation to understand and configure. Use it when you want to purchase the maximum amount of bandwidth possible in each auction round.

Your agent will begin by offering the unit price corresponding to your budget for all the bandwidth available. If your agent finds it will not receive this full allocation because the unit price it offers is too low, it bids again. The new bid raises the unit price offered and lowers the desired quantity requested so that the out-of-pocket amount remains the same. Of course, other agents may re-bid also when your offer is provisionally accepted but theirs is not. This process continues until all bandwidth is apportioned among all bidders who are willing to pay the market price.

The graph below shows the calculation your agent does in response to rising market prices.

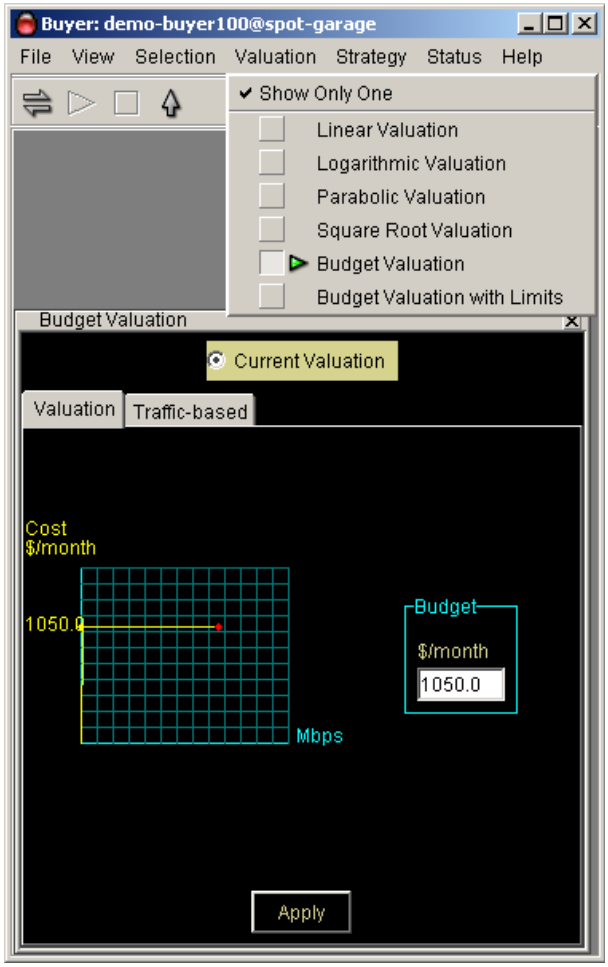


There are two disadvantages to the Budget valuation:

1. Because you begin bidding by asking for all the bandwidth at your budgeted price, you will set the price floor instead of the seller if your unit price is higher than his configured floor price.
2. If your budgeted amount is low compared to other bidders, you could end up paying your entire budget for a very small amount of bandwidth. Your agent will continue to offer your entire budget for amounts as small as 1/500 of what is being offered, before it finally gives up and lets itself receive no allocation.

An advantage of the Budget valuation is that your agent will always begin by bidding for the full amount of bandwidth the seller is offering, whether it increases or decreases over time. With most of the other valuations, you must specify the maximum quantity you are interested in obtaining and would have to increase this setting to obtain more if the seller offered more.

Budget-With-Limits Valuation



The Budget-with-limits Valuation is the one most commonly used, and the only one currently supported by the Wizard configuration application. There are three parameters that determine the bidding behavior for this valuation:

- **Budget** – The maximum out-of-pocket amount you are willing to spend
- **Max Qty** – The maximum amount of bandwidth you desire
- **Min Qty** – The minimum amount of bandwidth for which you are willing to pay your budgeted amount

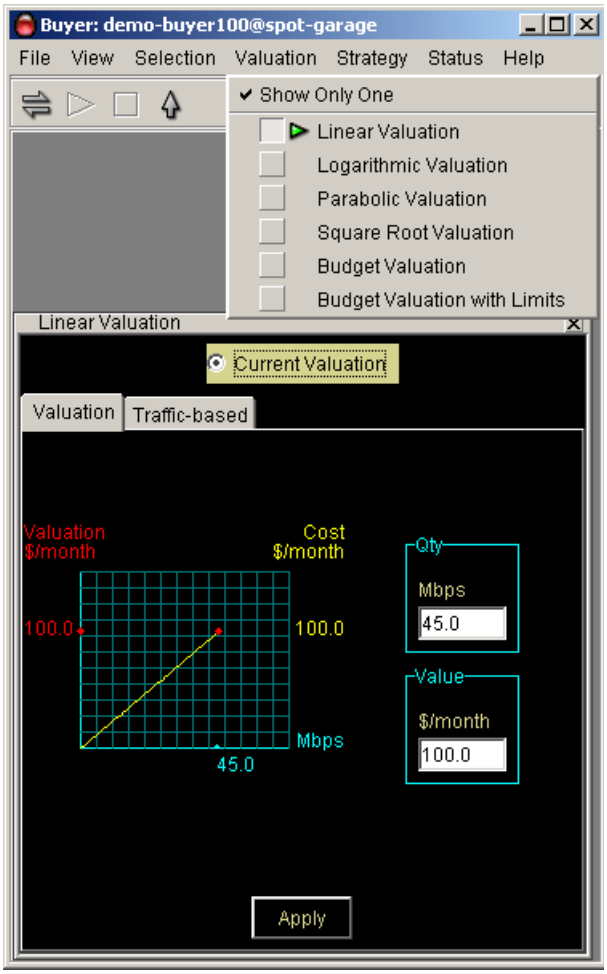
Your agent begins bidding by asking for your configured maximum quantity at the unit price represented by your budget. If your agent finds that it will not receive this allocation, it bids again by lowering the amount of bandwidth requested and raising the unit price proportionally so that the total out-of-pocket amount remains the same. This behavior continues until either the agent receives the amount requested or the minimum specified quantity is reached. At this point, the agent makes one final bid for the minimum quantity at the unit price represented by the budget. Three outcomes are possible:

- The agent receives the requested amount of bandwidth at the market price set by the lowest successful bidder
- The agent is the lowest successful bidder and receives a portion of the requested amount
- The offered bid price is less than the market price and the agent does not receive an allocation this round

There are advantages to this valuation:

-
- By restricting the amount of bandwidth initially requested, you will make bandwidth available for lower bidders who would set the market price and result in you paying less than your budgeted amount for the bandwidth you receive.
- By setting a lower boundary on bandwidth desired, you will not offer your full budget for a very small amount, should bidding become very aggressive. Of course, you run the risk of receiving no allocation of bandwidth at all and share the best-effort queue with the other bidders who also received no allocation, or are currently not participating in the auction.

Linear Valuation



The Linear valuation (formerly called the "inelastic valuation" should only be used in unique situations.

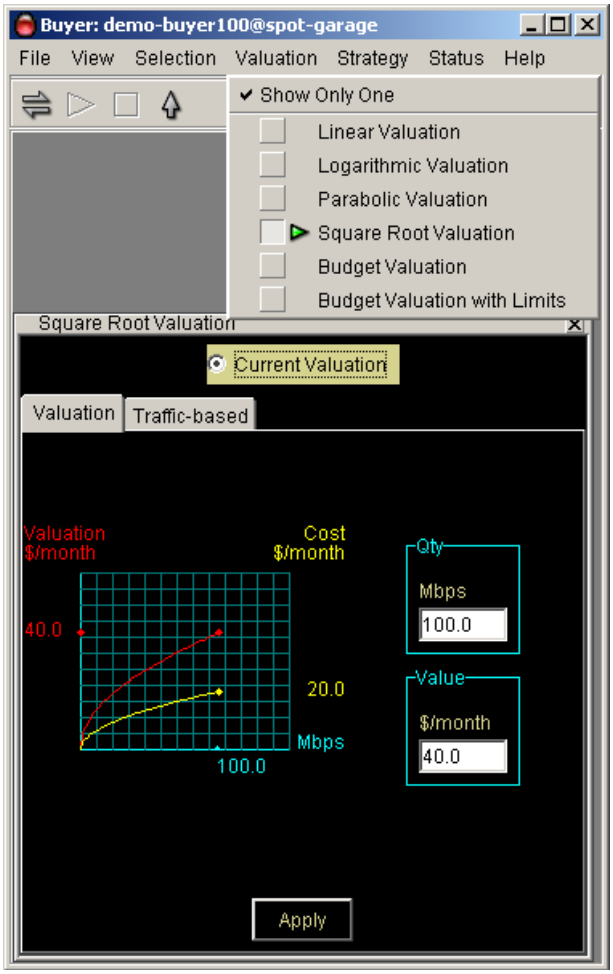
Mathematically, your agent offers the same unit price regardless of the quantity requested, which might at first seem desirable. Practically, however, because the Resource agent ranks bids based on unit price offered, this results in a take-it-or-leave-it offer by your agent. You receive an allocation only if the market price stays at or below your offered price. Your agent is not empowered, as in other valuations, to offer a higher unit price for a lower quantity in order to continue contending for an allocation.

Two configurable parameters determine the behavior of the Linear valuation.

- "Qty" sets the maximum quantity desired. Your agent initially requests this amount, and if rejected, may only request a lower amount at the same unit price.
- "Value" sets the maximum amount of out-of-pocket cost you are willing to pay for the maximum quantity desired. The unit price that your agent will offer in its bids is the "Value" divided by the "Qty."

Note that the cost and valuation curves are identical, so the graph only shows the cost (yellow) curve.

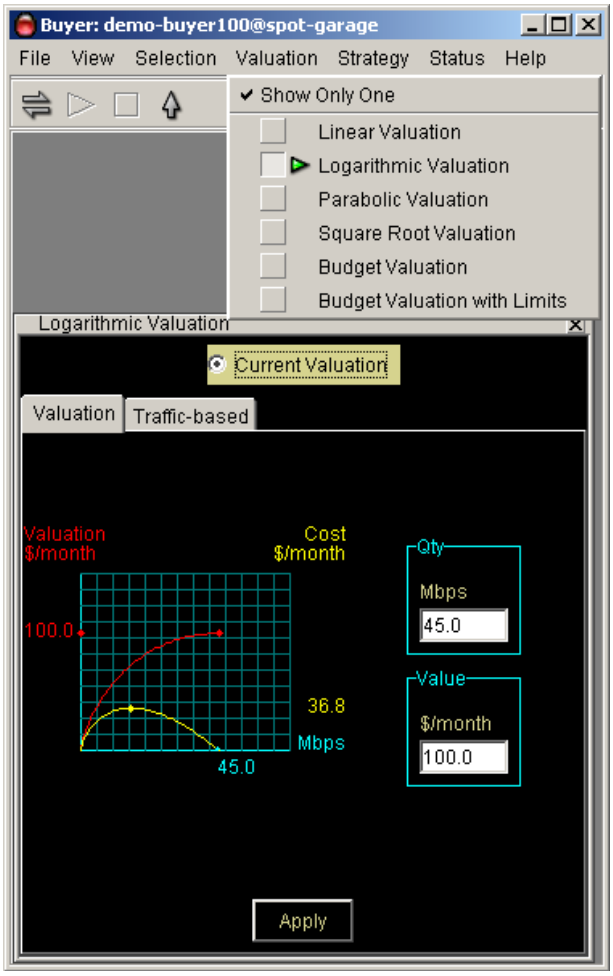
Square Root Valuation



The Square Root valuation (formerly called “the Elastic valuation”) is similar in concept to the budget valuation, but it bids at a reduced overall cost as the market price rises. In other words, as the market price rises, the Square Root agent asks for less bandwidth than a similarly configured Budget agent.

The two configurable parameters for the Square Root valuation are maximum quantity (“Qty”) and maximum value (“Value”). Set the maximum value to the maximum price you are willing to pay should you receive of the maximum quantity you specify. Configure the maximum quantity to correspond to the maximum quantity you would like to be allocated. The maximum cost is always half of the “Value” you enter, as indicated in the chart to the left of the numerical entry boxes.

Logarithmic Valuation



Use this valuation if you wish to bid more aggressively for a certain amount of bandwidth, but progressively less aggressively for amounts above and below that amount. The Logarithmic works such that the maximum cost offered for bandwidth occurs at a mid-point of quantity, rather than at a maximum specified quantity.

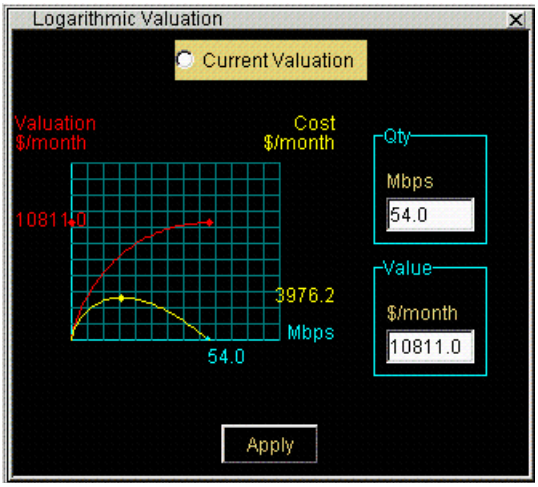
The Logarithmic valuation applies a formula that corresponds to a curve on a chart. Setting the most bandwidth you could possibly want (maximum quantity, "Qty") and a value you place on bandwidth (maximum value "Value") creates a curve. The agent bids based on the relationship of that curve to a third factor, the market rate. The agent reacts based on where the market rate intersects the curve on the graph.

You might want to set the maximum quantity based on one of two possible criteria:

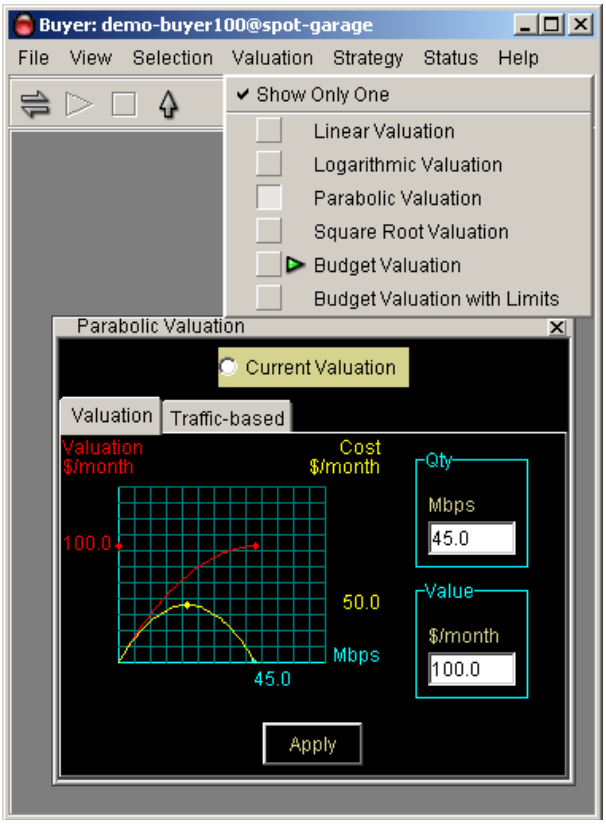
1. Set it to correspond to the greatest amount of bandwidth you would consider obtaining. Note that your agent's bid is zero at this point, so it is impossible for you to receive exactly this amount.
2. Set the maximum quantity to place the peak cost bid at a desired quantity. The peak cost bid will be offered at around 37% of the maximum quantity you

specify. For example, if you wanted to bid most aggressively at 20 Mbps, you would set the maximum quantity to 20/0.37 = 54 Mbps.

Set the maximum value to correspond to the desired maximum cost. The maximum out-of-pocket cost will be approximately 37% of the value you set, as indicated by the graph to the left of the text entry fields. Continuing the previous example, if you are willing to pay up to $200 per Mbps (per month) for the 20 Mbps you desire, this is a total cost of $4,000 per month. The valuation you set is $4,000/0.37 = $10,811, as shown below.



Parabolic Valuation



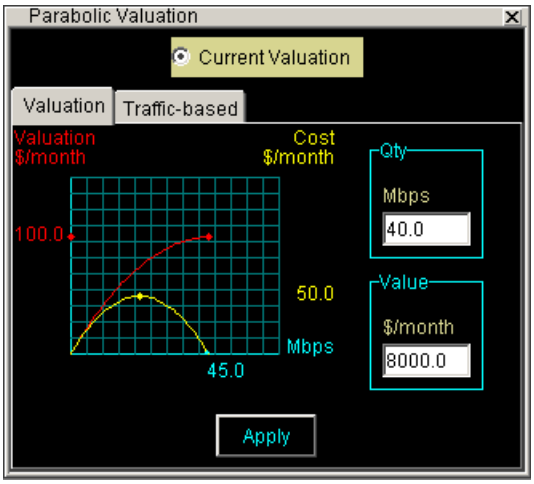
Parabolic works like Logarithmic, but with a slightly different formula. Use this valuation if you want to bid more aggressively for a certain amount of bandwidth, but progressively less aggressively for amounts above and below that amount. The Parabolic valuation works such that the maximum cost offered for bandwidth occurs at a mid-point of quantity, rather than at a maximum specified quantity.

The Parabolic valuation applies a formula that corresponds to a curve on a chart. Setting the most bandwidth you could possibly want (maximum quantity, "Qty") and a value you place on bandwidth (maximum value "Value") creates a curve. The agent bids based on the relationship of that curve to a third factor, the market rate. The agent reacts based on where the market rate intersects the curve on the graph.

You might want to set the maximum quantity based on one of two possible criteria:

1. Set it to correspond to the greatest amount of bandwidth you would consider obtaining. Note that your agent's bid is zero at this point, so it is impossible for you to receive exactly this amount.
2. Set the maximum quantity to place the peak cost bid at a desired quantity. The peak cost bid will be offered at 50% of the maximum quantity you specify. For example, if you wanted to bid most aggressively at 20 Mbps, you would set the maximum quantity to 20/0.5 = 40 Mbps.

Set the maximum value to correspond to the desired maximum cost. The maximum out-of-pocket cost will be 50% of the value you set, as indicated by the graph to the left of the text entry fields. Continuing the previous example, if you are willing to pay up to $200 per Mbps (per month) for the 20 Mbps you desire, this is a total cost of $4,000 per month. The valuation you set is $4,000/0.5 = $8,000, as shown below.

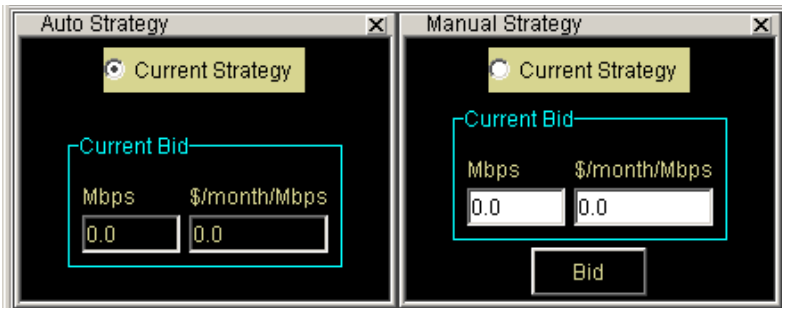


Aside from the slight differences in "peak aggressiveness" quantity, the Parabolic valuation is much less aggressive than the logarithmic valuation when bidding for very low units of bandwidth.

Strategy Overview

Once you have configured your valuation (the value you place on various amounts of bandwidth), you must configure how you want you agent to use that information. There are two strategy options for use in the Spot market: Automatic and Manual, explained below.

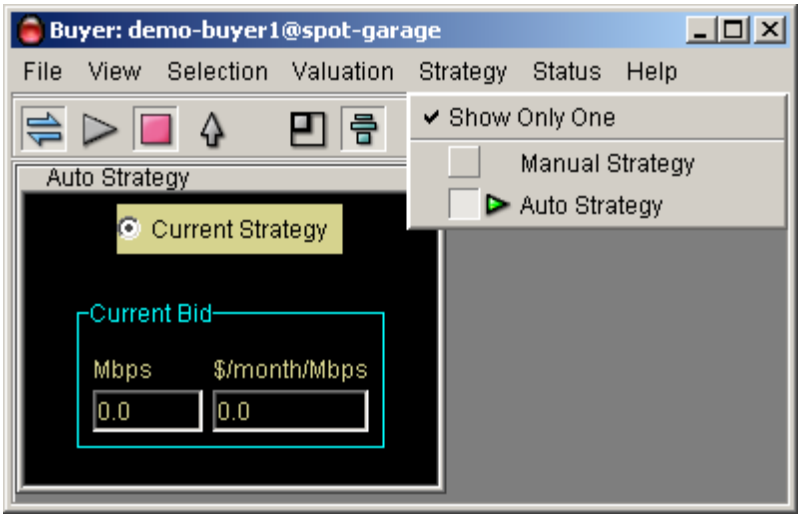
You may view and select strategy settings independently of each other.



To view only one strategy window at a time, with the most recently selected window replacing the previously selected window, select “Show Only One” at the top of the Strategy pull-down menu. A check mark appears next to the list item. If you wish to view multiple strategies at one time, de-select the “Show Only One” option.

Select the active strategy by selecting the “Current Strategy” radio button at the top of each Strategy window. Clicking this button in any window activates that strategy and de-activates the other strategy. A green arrow in the menu-bar list also indicates the current active strategy.

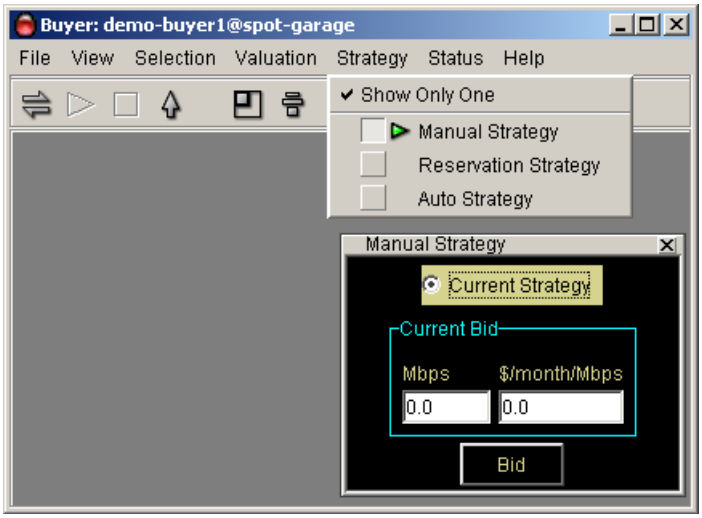
Automatic Strategy



The Automatic strategy is most commonly used. It begins by bidding for the maximum quantity you select (or the seller's entire quantity, whichever is less) at the unit price specified by your valuation settings. (In a Budget valuation, the maximum is All.) If the agent doesn't obtain this amount of bandwidth it bids again, if permitted by the valuation, at an incrementally higher unit price. It adjusts the amount of bandwidth requested to agree with the value you place on the bandwidth. This process continues until either the agent receives the amount it requests or it cannot meet the current market price due to limits imposed by the valuation settings.

The two display fields in the Automatic Strategy window show the current bid: quantity on the left and unit price on the right.

Manual Strategy



Manual strategy ignores the valuation settings completely and allows the user to place bids without a set valuation. Note that these bids are a one-time occurrence and are not submitted automatically in the next auction round. If you wish to place a take-it-or-leave-it bid automatically at each auction round use the Linear valuation and select the automatic strategy

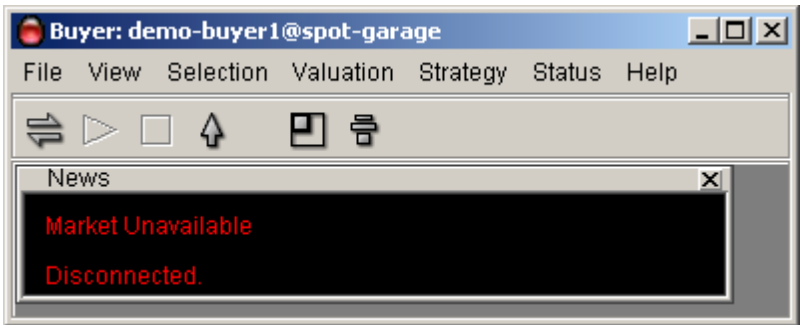
To place a manual bid, enter the quantity desired in the left hand numerical entry box, and the desired unit price in the right hand numerical entry box (pay close attention to the units displayed so you do not make an error). After you enter both numerical values, click **Bid**. Your bid is submitted to the Resource agent. You may observe the results of your bid in the Auction Table or the Auction Chart window.

The initial displayed value in the Manual strategy window is the last bid placed by the Automatic strategy. You may, if you wish, view both the automatic and manual strategy screens simultaneously and quickly activate the manual strategy if you wish to place a bid. If you return to the Automatic strategy, the agent will return to bidding along the original valuation curve according to its standard bidding strategy.

News Windows

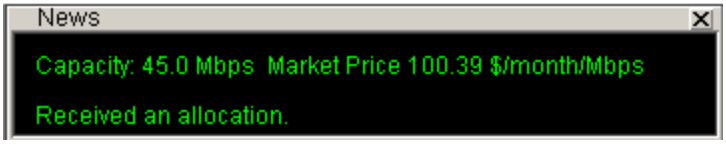
The News window provides real-time status of your Merkato agent. It is useful when you want to get a quick summary of marketplace conditions and confirm the state of your agent.

When your agent is disconnected, you see a News display similar to that below:

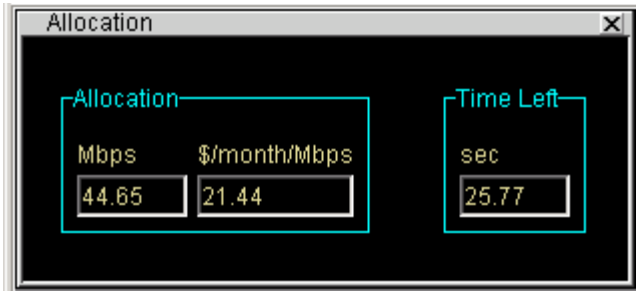


When you are connected but not bidding, the News window looks as like the one shown below. It indicates the capacity being offered by the seller and the current market price of the auction as it is proceeding without your agent's participation.

Once you begin bidding, you will see displays like the ones below, which add information indicating activity between your agent and the resource agent, which conducts the auction.



Allocation Window

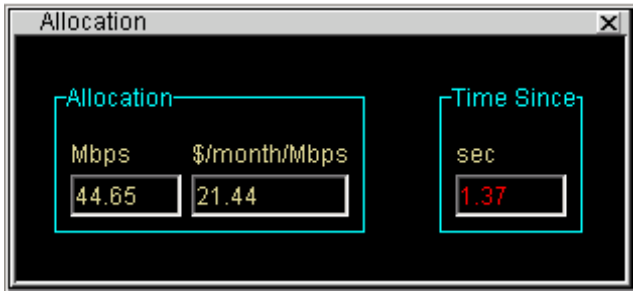


The Allocation window provides information about the quantity of bandwidth bought and the price paid for that bandwidth at the close of each successive auction. It also monitors the time left in the current auction.

When an allocation is made to your agent, it appears in the left-hand side of the Allocation window, and is displayed throughout the next auction. After a period of non-bidding, the allocation indicated is the last one made to this agent when it was last active.

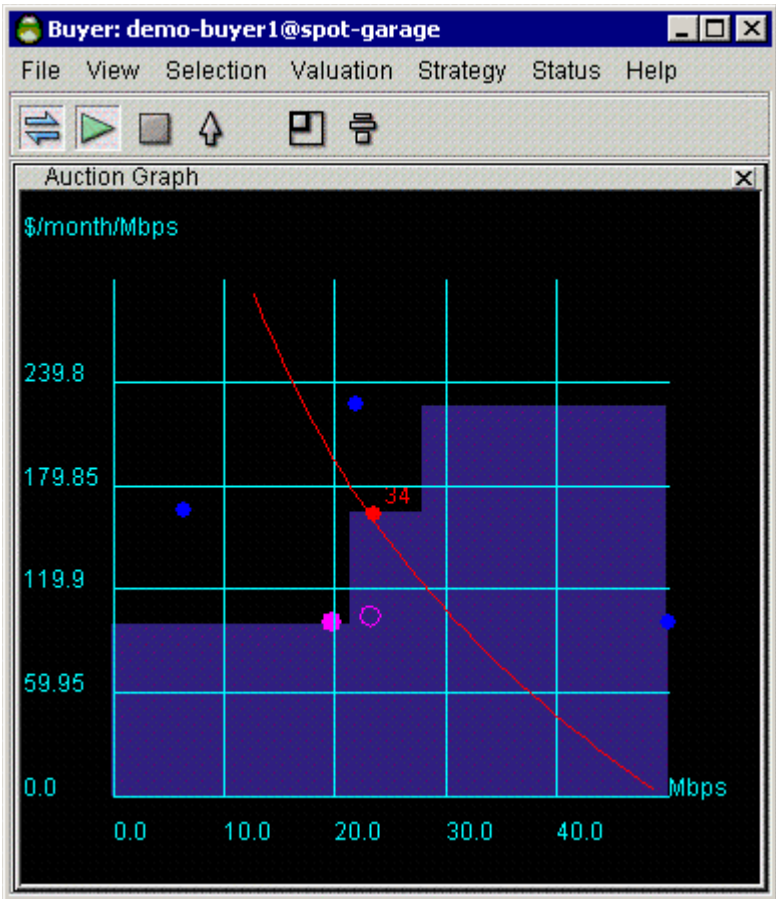
The allocation window also provides a time indicator for the current auction. Each time any buyer places a bid the timer is reset to 60 seconds.

When all bidders cease bidding (either because they are satisfied with their proposed allocation or have dropped out of the bidding at the current market price), the timer counts down to zero. At that point, the resource agent turns the proposed allocations into real allocations. This occurs during a “pause” period. The pause period is indicated by several changes to the time display: the timer label changes from “Time Left” to “Time Since,” the font changing to red, and the counter counting up to the pause limit, rather than counting down, as before (as shown below).



Auction Graph

The Auction graph indicates the state of the Merkato auction in progress, not only for your agent but for all others actively bidding. The Auction graph is shown below:



The graph elements are:

- Auto-scaling Y-axis indicating unit price (axis is scaled to show all current bids).
- Auto-scaling X-axis indicating quantity (axis is scaled to show available quantity.
- Blue dots representing the last bids received from all bidders (excluding bids by your agent).
- A red dot, with ID number, indicating the last bid from your agent
- A magenta circle representing the current proposed allocation for your agent. (Each time any bidder places a bid your agent receives a proposed allocation. If no other bids are received, this is the allocation you would receive.)
- A solid magenta dot indicating the allocation you received during the previous auction round.
- A red line representing your agent's valuation curve, as determined by settings in your active valuation window.

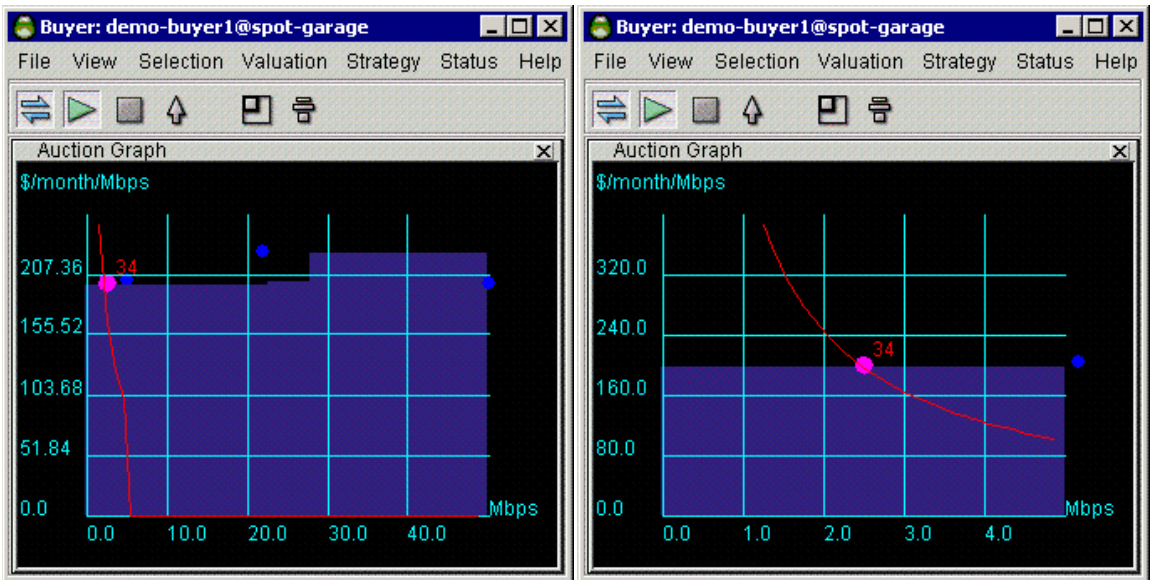
- A blue shaded area representing the allocation of bandwidth to successful bidders, except for any bandwidth allocated to your agent. This area is a series of blocks, where the height represents the unit price paid and the width represents the quantity allocated. (The bandwidth allocated to your agent is the amount of blue under the red dot and to the left.)

The black area above the blue shaded area represents the level at which you would have to place a bid to win a desired amount of bandwidth from a current bidder. Your active valuation curve is visible in relation to other bidders, whether you are bidding or not. This allows you to optimize your valuation curve with respect to the other bidders before you begin actively bidding.

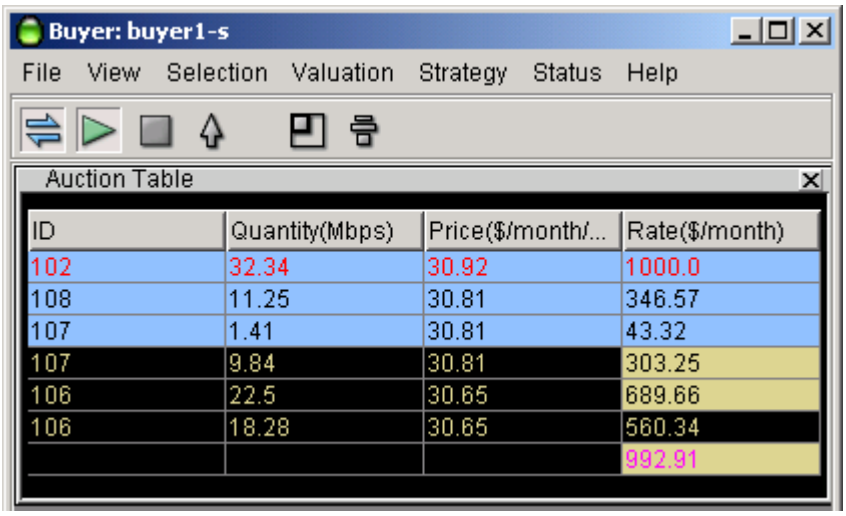
While you are not bidding, the place at which your red curve intersects the top of the blue shaded area indicates the quantity and price of bandwidth you would receive if other bidders placed the bids you can currently observe. Of course, once you start bidding, other bidders will react to your presence in the auction and perhaps raise the market price (the blue shaded area) above what it was without you.

The two screens shown below illustrate this happening, as the bidder reacts to your presence in the marketplace. The best way of fending off other bidders and getting exactly the bandwidth you want is to have your curve nearly vertical at the quantity you desire. (Of course, this also means that you are willing to pay a higher unit price for bandwidth as well.) See the Advanced Buyers Guide for more information.

Clicking on the auction chart changes the scaling from the quantity being offered by the seller to the maximum quantity specified in your valuation. This is useful if your configured maximum is significantly less than the total quantity offered by the seller and you want to "zoom in" on the portion of the chart that is important to you. The unit price (Y) axis auto-scales when you change the quantity scale, as shown below.



Auction Table



The Auction Table gives you a quantitative, real-time view of the auction in progress.

The columns in the table are:

- The ID of the bidder. A bidder receives a new ID whenever it is uploaded from the garage.
- The quantity requested in the last bid placed (note that this may be split into multiple rows, as explained below).
- The price (unit price) requested in the last bid placed.
- The rate represented by the bid. This is the quantity times the price. It is the maximum cost represented by that bid, but not necessarily the price that will be paid by the bidder.

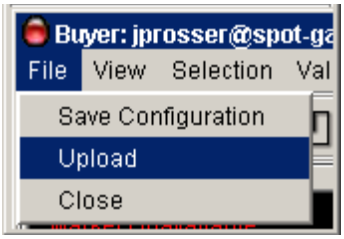
The rows of Auction table are as follows:

- Your agent's last bid is shown in red. The last bids of all other agents are shown in black (in the blue shaded area) or in yellow (in the black area).
- Any bidders, including your agent, that receive an allocation of bandwidth are shown in the blue shaded area. Any bidder who does not receive an allocation is shown in the black area. Bidders that receive only a portion of an allocation are shown in both the blue and black areas, with their quantities split accordingly.
- The black area is used to represent the basis for the actual cost paid by your agent if it has received an allocation of bandwidth. (See “Merkato Auction Mechanism: The Progressive Second Price Auction“ on page 78.) In summary, the yellow shaded areas to the right of the uppermost bidders in the black area indicate the basis of your cost, and the yellow shaded number with magenta font at the bottom of the table indicates your total cost. To figure your corresponding unit price, divide this number by the amount of bandwidth indicated for your agent in the blue shaded area.

The columns of the Auction table may be resized (by clicking and dragging column boundaries in the header) or reordered (by clicking and dragging the column headers themselves).

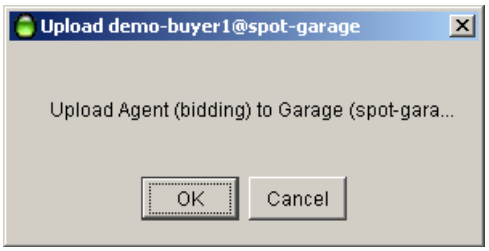
Saving, Uploading, and Exiting

Upload (and Exit)



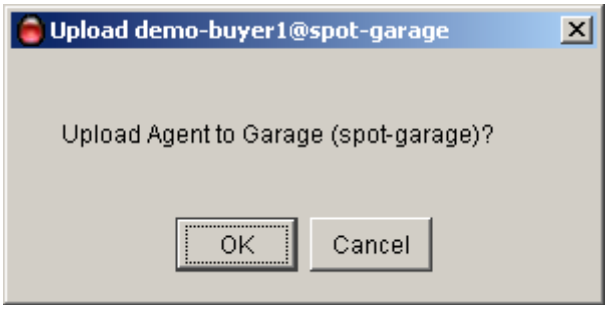
When you end a session on your Desktop, you generally want to upload your agent to the garage to continue bidding on your behalf.

Use either the up-arrow in the icon bar, or the "Upload" menu-bar item in the "File" category to access this function. A confirmation query message appears, as shown below.



The confirmation message indicates the garage where your agent will be placed. If you click **Cancel** you are returned to the Desktop agent and no upload occurs.

The confirmation message indicates whether your agent is bidding. If your agent is stopped when you upload, your confirmation message looks like the one below. (Notice the red circle in the upper left.)



Make sure the bidding state is the one you wish to maintain while your agent is in the garage.

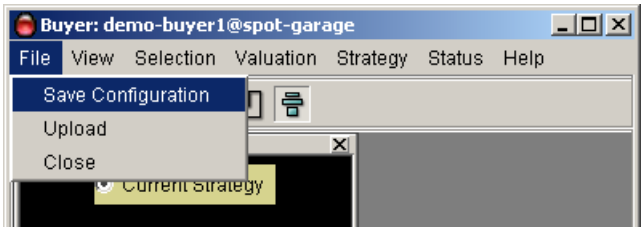
Saving Your Configuration

Saving your configuration lets you save changes to your agent's profile in the garage while you continue to bid from your desktop. While you are bidding on your desktop there is a non-active profile of the agent's parameters stored in the garage, which should be kept up do date.

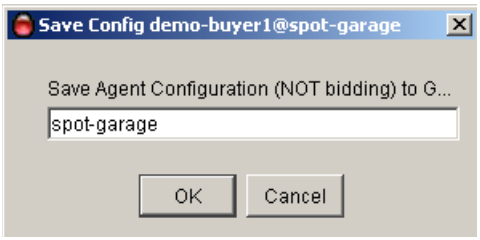
If you don't keep this configuration up to date you could lose the changes you made to your agent while bidding on your desktop if:

- your desktop is rebooted or crashes before you can upload
- another user knows your agent's username and password, logs in and takes control of the agent using the obsolete profile in the garage.

If you want to save the way your agent is configured, but not upload your agent to the garage, from the File menu, select Save Configuration:



A confirmation box appears, asking which garage you want to save your configuration to. (If multiple garages are available, they will appear in a pull-down list.)

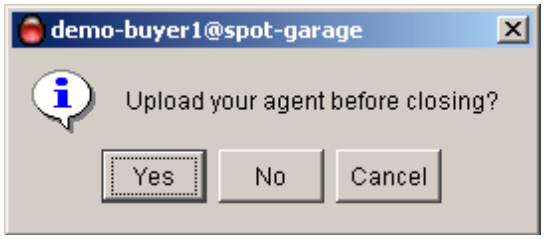


This is useful if there is more than one garage available, and you want to make the same agent configuration available in each garage.

Click **OK** to confirm saving your configuration.

Exit (Without Saving)

In rare instances, you will want to close your Desktop window without updating your agent's profile in the garage. You will do this by selecting **Close** rather than **Upload**. When you do this, the following confirmation screen is displayed:



If you click **Yes**, your agent is uploaded to the garage before it is closed on the desktop.

If you click **No**, your agent closes without any changes saved.

If you click **Cancel**, you return to your Desktop agent; the agent is neither uploaded nor closed.

Help

Help screens are available at both the Desktop and the agent level.

Reservation Agent

The Reservation agent gives you the ability to obtain bandwidth for an extended period of time at a fixed price. The pricing is set by the seller and depends both on the quantity of bandwidth desired and the duration of the reservation. All reservations begin immediately. There is no reservation fee.

Depending on how your Merkato Administrator has configured your account, you will access your reservation agent in one of two ways:

- Your Spot and Reservation agents share a common username (and password), but are stored in separate garages
- Both your Spot and Reservation agents reside in the same garage, but you have unique usernames for each

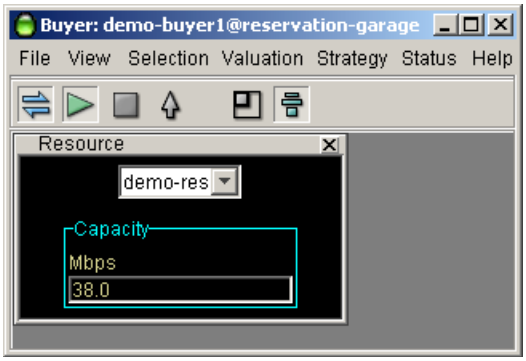
You can cancel reservations any time prior to expiration, but there may be a cancellation fee based on a percentage of the remaining value of the reservation. The seller sets this percentage, which may be any value between 0% (no penalty for cancellation) to 100% (no refund on cancellation). Merkato quotes the cancellation percentage to you when you make the reservation and again when the cancellation is confirmed.

Unlike Spot agents, there is little harm if you exit a Merkato session without uploading a reservation agent. If you don't upload your agent you lose the last changes you made in the reservation quote request window, but not the reservations you have already confirmed. (Confirmed reservations are stored in a Merkato database, not in your reservation agent profile.)

The following sections describe the use of these reservation windows in detail.

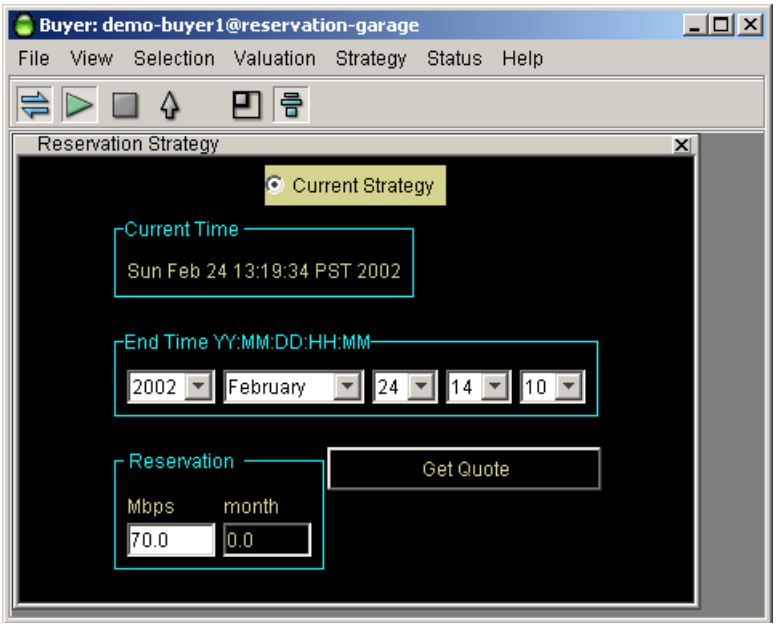
Resource Window

Although a reservation and spot marketplace may allocate the same physical resource, Merkato controls them via separate Resource Agents. In this version of Merkato, bandwidth is pre-assigned to each one of these markets, so reservations do not take bandwidth from the spot market or vice versa.



The Capacity display in the Resource window tells you the bandwidth currently available to you in that marketplace, taking into account quantities currently being allocated to other reservation buyers.

Reservation Strategy



The Reservation Strategy window lets you create a reservation. Since reservations start immediately, there are no "Start Date/Time" entry fields; the current time is displayed. (Note that there may be a delay of as much as five minutes from the time the user confirms a reservation until it becomes active.)

The "Current Time" display is determined by your PCs time setting. Take care that this time is accurate, or the reservation quote duration (which uses your PC system time to determine the current time will differ from the reservation that is granted when the quote is accepted (using the Merkato server system's clock time).

The middle group of pull-down fields represents the end date and time. It is up to the user to make sure that the date is valid (no February 30th, for example). Should you inadvertently enter an invalid date, Merkato attempts to determine your intent and present an equivalent valid date. If this is not what you intended to specify, refuse the reservation and return to the date selection window.

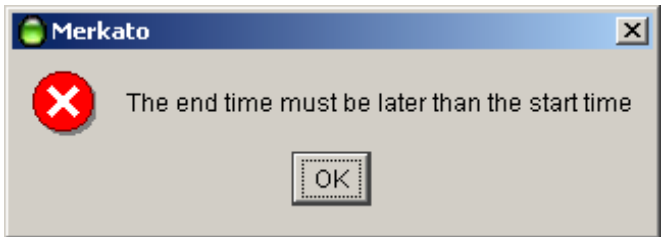
The third group of information entry fields, at the bottom of the window, indicates the desired quantity and calculated duration, respectively. The units for these fields match those selected in the Units window. To complete your desired reservation profile, enter your desired amount of bandwidth and click **Get Quote**. A pop-up confirmation window appears, shown below:

This confirmation form indicates:

- The amount you have requested
- The end date and time of your reservation
- The total cost (unit cost times quantity time duration) of your reservation
- The percentage cancellation fee, applied against the remaining value of the reservation, which will be charged should you elect to terminate a reservation before the end date and time.

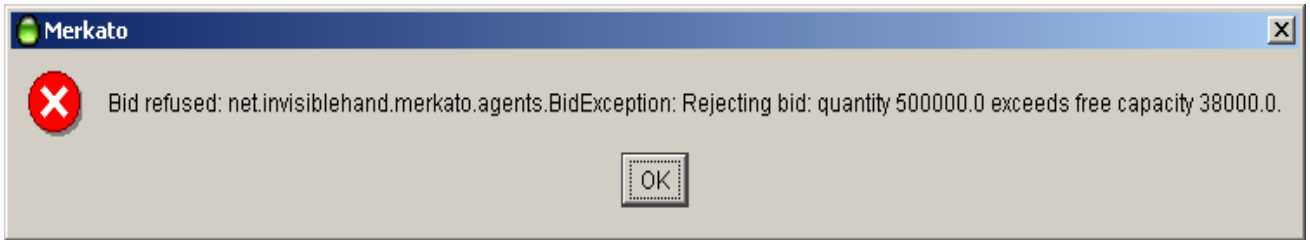
Look over all this information carefully before you click **Accept**. If the end date and time are different than you specified, it indicates that you entered an invalid date and Merkato made the best guess of your intent by adding the duration to the current date and time.

If you inadvertently specify an end date before the start date, the error message appears:



If your reservation is for a time period that is too short, the following error message appears:

If you specify a quantity that cannot be allocated to you due to other active reservations, the following error message appears.

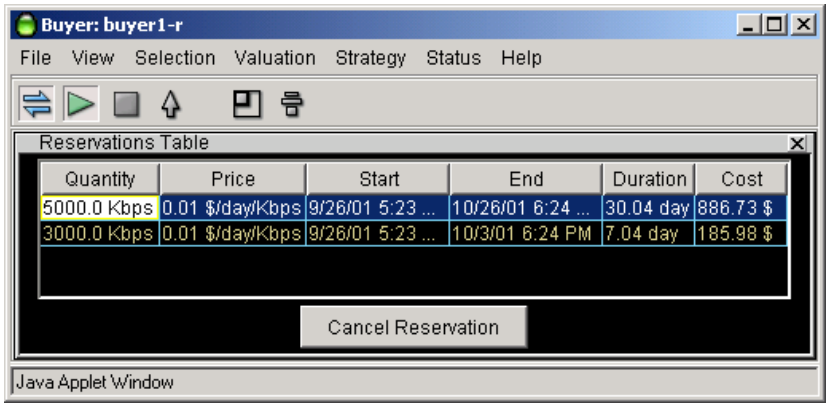


This error message informs you of both your requested quantity and the quantity available, so you can make appropriate adjustments.

Reservations Table

Select the Reservations table from the Status pull-down menu.

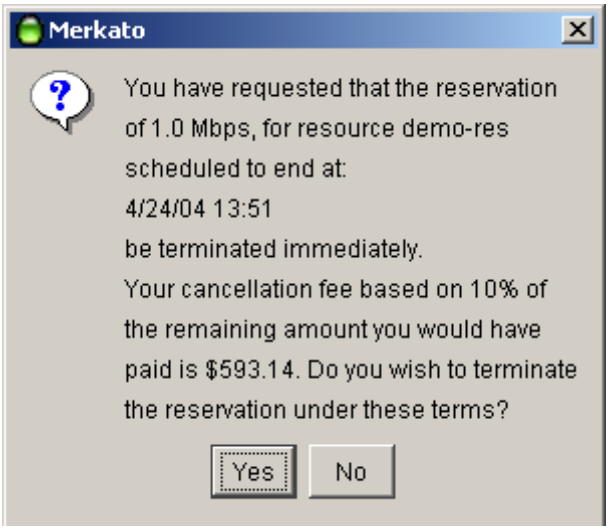
When you confirm your reservation it appears in your Reservation table. The Reservations table lets you view and cancel reservations.



The columns of the reservation table can be resized and reordered. To resize a column, click and drag the boundary line between columns within the column header. To move a column to another position, drag and drop its header either to the right or to the left of its current position.

Should you want to cancel a reservation, click anywhere in the row that represents the reservation. The reservation is highlighted in blue. Then click **Cancel Reservation** at the bottom of the window.

A confirmation pop-up window appears:



The reservation cancellation confirmation screen indicates the following information:

- The quantity of the reservation
- The scheduled end date and time of the reservation

- The percentage cancellation fee that will be applied to the remaining value of your contract if you confirm the cancellation.
- The total amount you will be billed based on the remaining duration of your reservation, the original total value of your reservation, and the percentage cancellation fee.

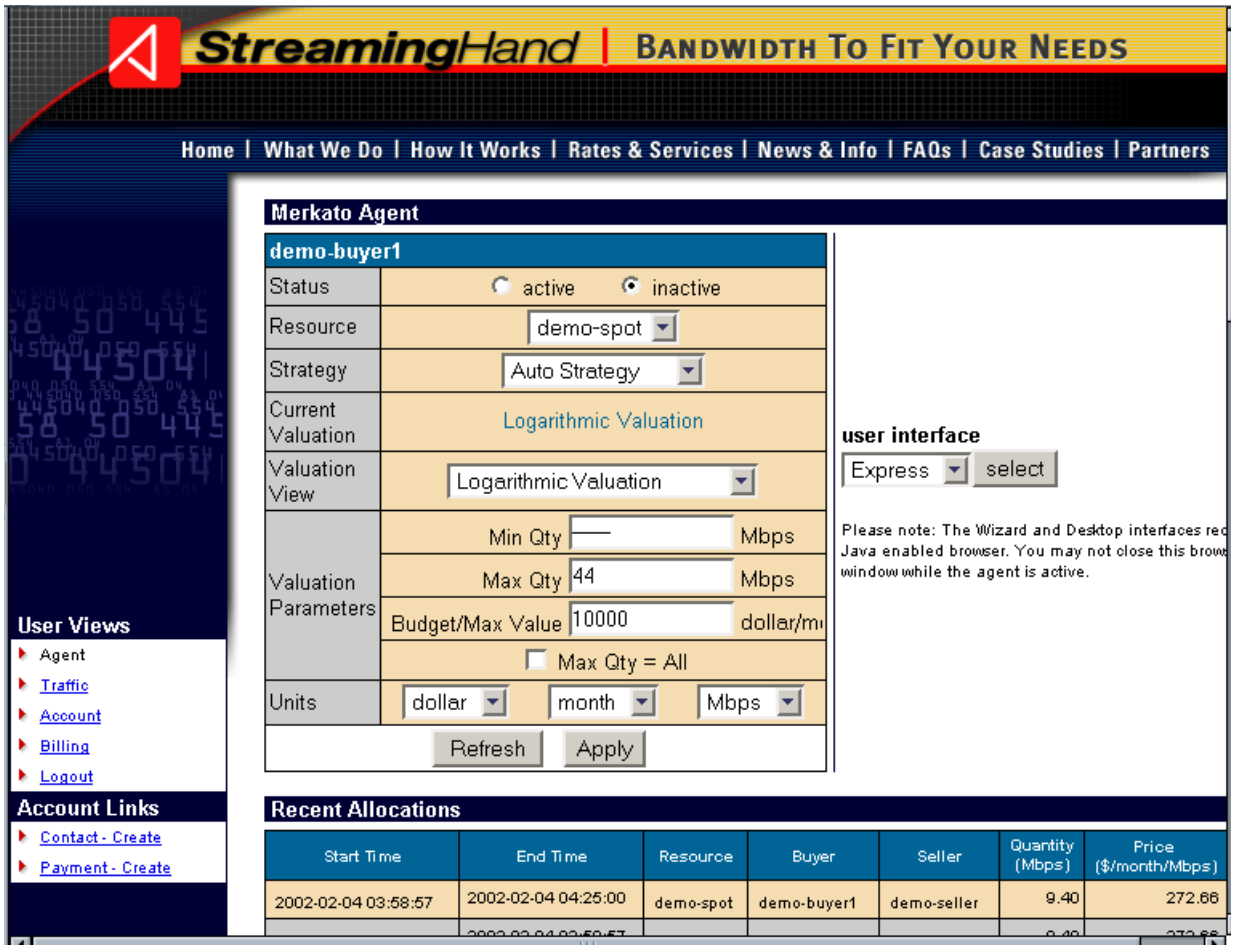
If you wish to proceed with canceling the reservation under these terms, click **Yes**. If you wish to not cancel your reservation, click **No**.

Merkato removes expired reservations from the Reservation table after their end time and date.

Portal

The portal is the entry point to gain access to the agent applications, as well as to obtain historical allocation and billing information. When you select the Streaming Hand web site, the opening screen looks similar to the one below.

If you enter a valid username and password, and click **Login**, the top-level agent screen appears:



The central portion of the window shows the Merkato Agent. This is the express agent interface. Below this area, if you scroll down, are the agent status screens, indicating recent allocations and market price.

To the right, the pull-down user interface menu allows you to select the Wizard, Express, or Desktop interface.

The left portion of the page contains a navigation bar, which provides access to all pages of the portal:

- **Agent** – (The page shown) contains the Express agent interface, the Agent selection pull-down, the allocation table, and market price charts.
- **Traffic** – Contains Monthly, Weekly, and Daily charts of traffic associated with this user.
- **Account** – Contains personal information for this user, including lists of contact and payment records.

- **Billing** – Provides a billing interface that allows the user to create customer queries into the Merkato database, and automatically provides account balance information.
- **Logout** – Returns user to login screen.
- **Contact Create** – Interface to create contact records. Multiple contact records may be created for each account.
- **Payment Create** – Interface to create payment records. Multiple payment records may be created for each account.

Agent View

The Interface pull-down portion of the screen provides access to the Wizard and Desktop agent applications, described in their own sections of this document. The other areas of the Agent page are described below.

Express Agent

The Express interface is an HTML version of the Desktop interface, with some significant differences:

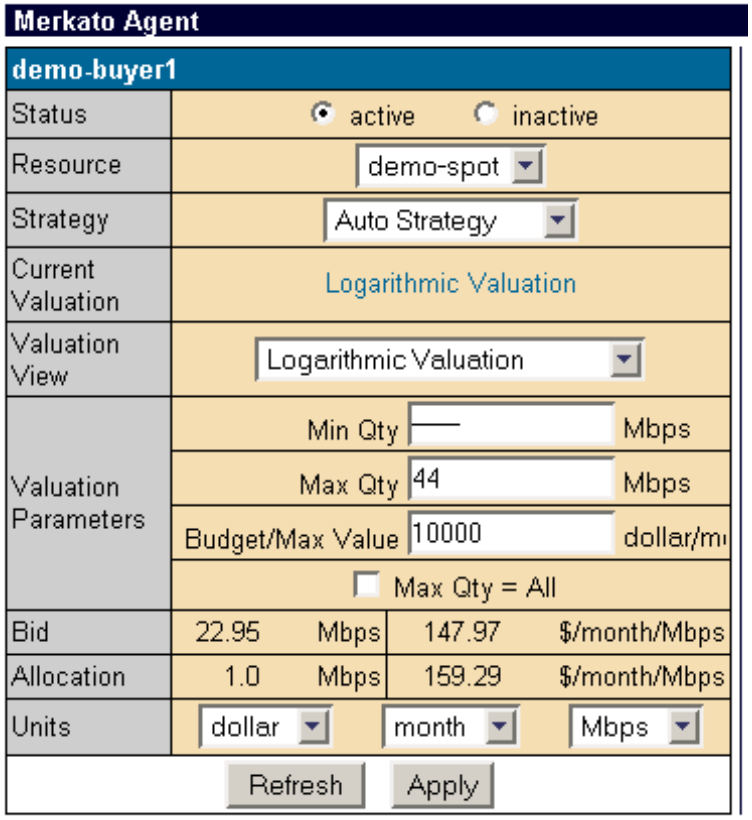
- It leaves your agent in the garage and controls it remotely. Should you inadvertently close this window, it will make no different to your agent in the garage.

Your screen is not updated in real time. You must click the "Refresh" button to update information in status displays.

The Express interface is meant to support advanced users who know what the fields mean and wish to have a quick way to check agent status or make configuration changes.

You access the Express interface through the initial portal browser window. If your agent was active and bidding from the garage, you will see a window like the one below.

The Express agent doesn't allow the same functionality as the Desktop agent. It doesn't support creating or canceling reservations, traffic-usage based valuations, or manual bidding. You can make these settings using the desktop agent and then make unrelated changes via the Express agent.



The two buttons at the bottom of the window control your communication with the Resource agent:

- **Refresh** updates the configuration and status fields in the windows without sending configuration changes to the Resource Agent. Click **Refresh** to return the display to the last saved configuration should you wish to erase changes made to the values prior to applying them.
- **Apply** updates the read-only status fields in the windows and sends configuration changes to the Resource Agent.

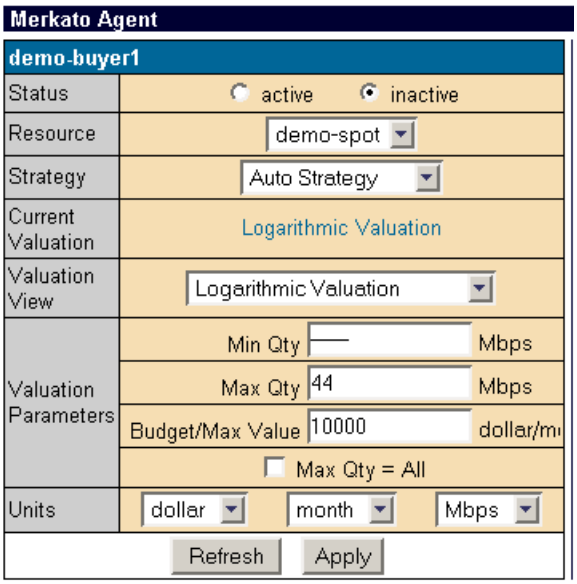
To exit the Express window without sending configuration changes to the Resource Agent click **Refresh**. All values saved the last time changes were applied are restored.

The fields in this display are as follows (identified by their row headers):

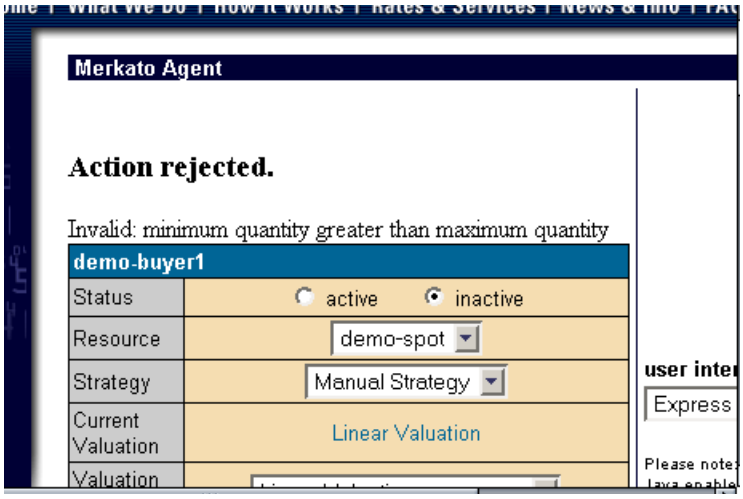
- **Status** – Controls whether the agent is bidding or not. You must click **Apply** for this change to take effect.
- **Resource** – Selection list for the resource for which you are bidding. You must click **Apply** for this selection to take effect.
- **Strategy** – Auto Strategy is the only strategy supported by the Express interface. You can select Manual strategy, but there are no bid entry fields. Creation and cancellation of reservations are not currently supported (although you may view confirmed reservations in the allocation list just below the Express interface in the Portal).

- **Current Valuation** – This is display of the valuation currently in use. To change the current valuation, display another valuation and click **Apply.**
- **Valuation View** – This pull-down menu selection allows you to select and alter settings of valuations without making them active. When you are satisfied with the settings for a new valuation, click **Apply.** The displayed valuation becomes the active (current) one with the configuration values you have entered.
- **Valuation Parameters** – This set of windows contain the settings for the valuation chosen. You must click **Apply** after changes are made, for them to take effect. Not all parameters have meaning for all valuations. If a parameter is not used, its value is indicated as a horizontal bar.
- **Bid** – A read-only display indicating the latest bid submitted. You must click **Refresh** to update this display. If this display is missing, it indicates that your agent is inactive and not bidding.
- **Allocation** – A read-only display indicating the allocation received in the last round. You must click **Refresh** to update this display. If this display is missing, either your agent is inactive or it did not receive an allocation in the previous auction round.
- **Units** – The selections made in this window change the units displayed for all other windows. All values are scaled to reflect the change in units. You need not click **Apply** for this change to take effect.

When your agent is inactive and not bidding from the garage, the Bid and Allocation rows are missing, as shown below.



Error messages are displayed in the browser window, above the Express Interface area:


Merkato Agent
Action rejected.
Invalid: minimum quantity greater than maximum quantity
demo-buyer1
Status
active
inactive
Resource
demo-spot
Strategy
Manual Strategy
Current Valuation
Linear Valuation
Valuation
user inter
Express

Allocation Table

Recent Allocations

Start Time	End Time	Resource	Buyer	Seller	Quantity (Mbps)	Price ($/month/Mbps)	Cost ($)
2002-03-06 18:58:16	2002-03-06 19:40:44	ihn-t1-spot	jbossom	t1-seller	0.10	2000.00	0.20
2002-03-06 18:27:41	2002-03-06 18:58:16	ihn-t1-spot	jbossom	t1-seller	0.07	1957.91	0.10
2002-03-01 17:56:45	2002-03-01 18:17:38	ihn-t1-spot	jbossom	t1-seller	0.47	2194.29	0.50
2002-03-01 17:49:38	2002-03-01 17:56:45	ihn-t1-spot	jbossom	t1-seller	0.47	2194.29	0.17

The Allocation table shows bandwidth allocated to the current user and the amount charged for this bandwidth. Allocations are shown in order (sorted by end date/time); most recent at the top. Confirmed reservations are at the top, followed by the most recent Spot market allocations. Each Spot market allocation entry contains a summary of information for an hour, which generally includes many auction rounds.

The columns are as follows:

- **Start Time –** The start date and time for this allocation
- **End Time –** The end date and time for this allocation
- **Resource –** The name of the bandwidth product allocated
- **Buyer –** The Buyer agent that won the allocation
- **Seller –** The Seller agent that sold the allocation
- **Quantity (Mbps) –** The bandwidth quantity for this allocation. (For Spot market allocations, this is the average quantity obtained over the time period indicated.)
- **Price ($/month/Mbps) –** The unit price for this allocation. (For Spot market allocations, this is the average price obtained over the time period indicated.)
- **Cost ($) –** The bottom-line cost for this allocation. (For Spot market allocations, this is the average cost over the time period indicated.)

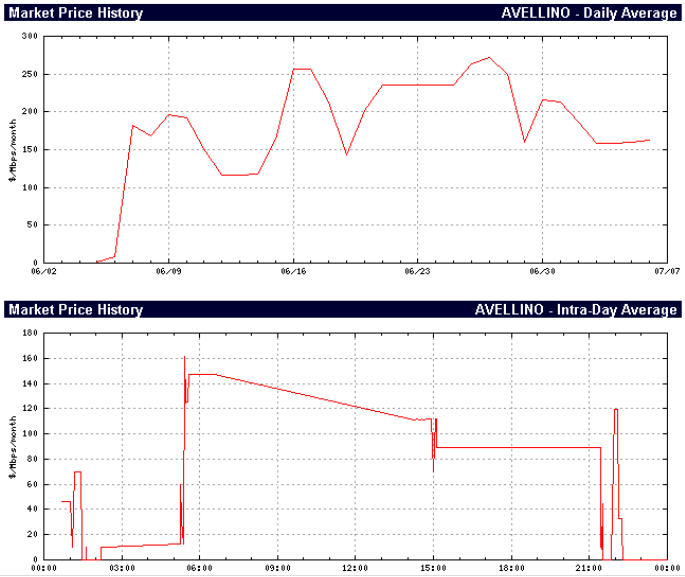
The Allocation table gives you an indication that Merkato auctions have been providing the desired results. You may obtain information for longer timeframes in the Billing page via custom queries.

Market Price

The market price is the price paid for the last unit of bandwidth sold. Under normal operation, all bidders pay this price for the bandwidth they receive. Fluctuations of this price indicate changes in the dynamics of the market—bidders entering or leaving the market or altering their valuation profiles.

The Express interface includes two market price graphs:

- Average market price on an hourly basis.
- Average market price on a daily basis.

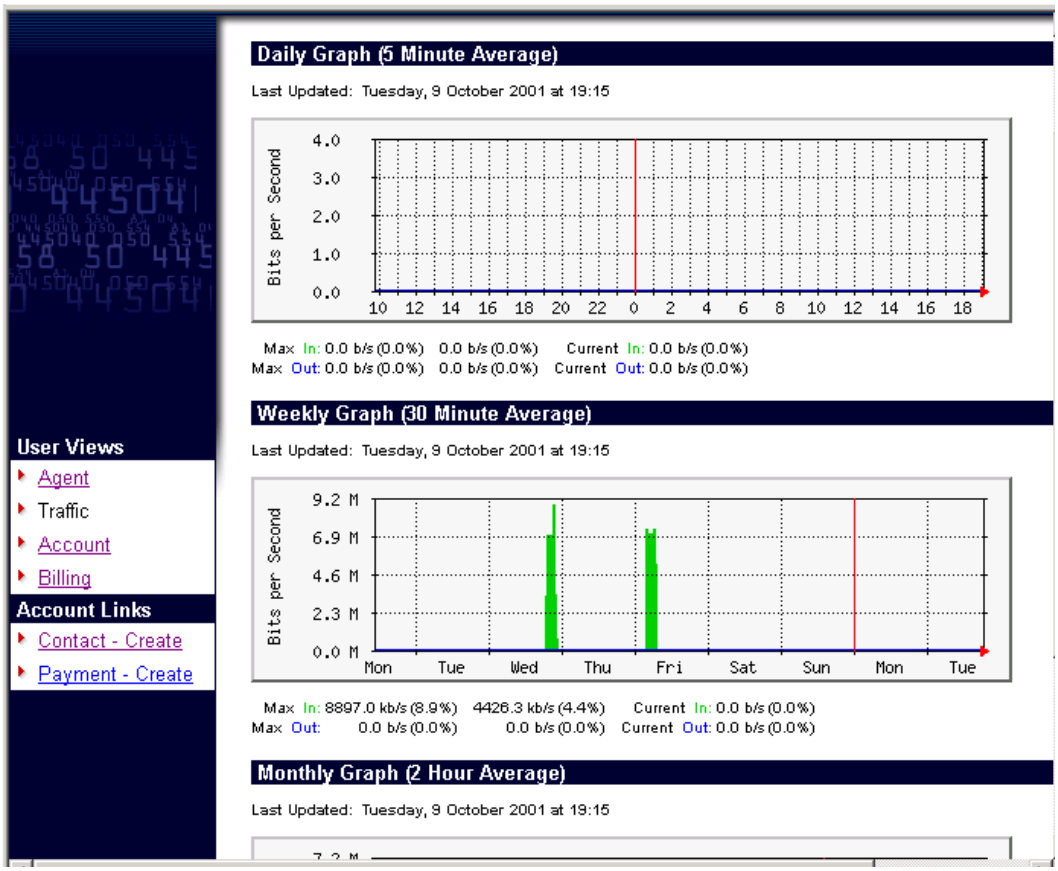


You can infer various kinds of information from these charts. For example:

- If the market price is at the floor price set by the seller, the demand for bandwidth is less than the supply.
- If the market price is above the floor price set by the seller, all the bandwidth available is being sold.

Fluctuations in the price when it is above the floor price indicate that buyers are changing their bidding behavior within the timeframe shown.

Traffic View



The traffic page shows the amount of data transferred through the Merkato network control point by the data stream associated with this user. Three charts are provided to represent three time scales:

- Daily chart showing 5 minute granularity
- Weekly chart showing 30 minute granularity
- Monthly chart showing 2 hour granularity

All three charts are based on five-minute sample intervals. Merkato gathers traffic statistics in both the input and output direction every five minutes. Each five-minute sample represents an average over that five-minute period. In other words, peaks lasting less than five minutes are not accurately represented in the charts. These five-minute samples are used directly in the daily chart. These values are then combined into longer averages for the weekly and monthly charts.

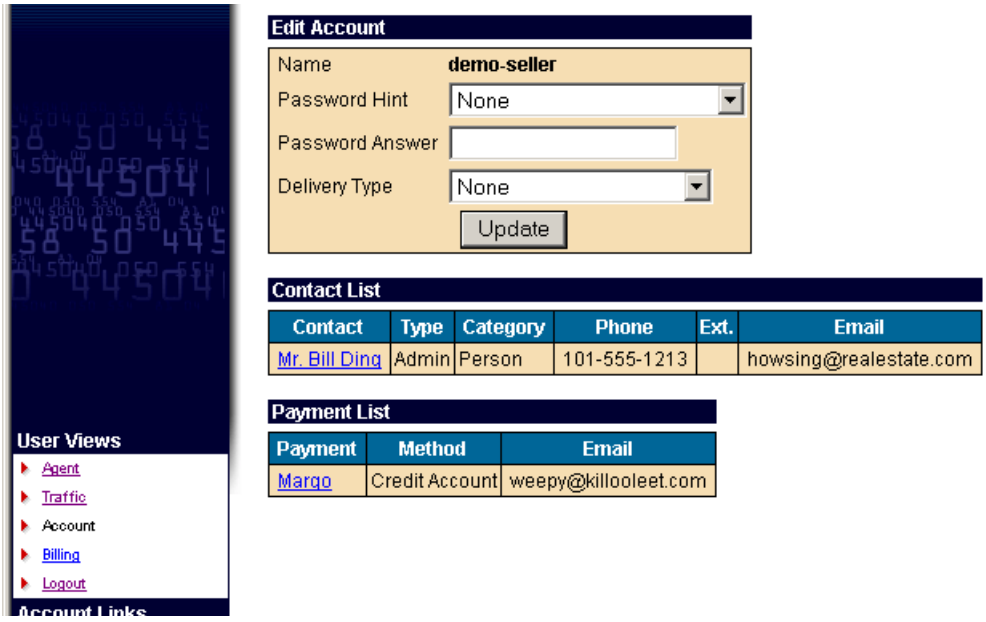
The green-shaded portion of the chart indicates traffic in the incoming direction. Traffic indicated by the blue line is in the outgoing direction. If you are unclear which direction corresponds to “in” and “out” with respect to your application, contact your Merkato administrator.

Below each chart are three columns of figures, indicating the maximum, average, and current values for the period displayed.

Use the traffic charts to help you decide how much bandwidth to purchase on the spot and reservations markets. Often, the best buying strategy is to buy what you normally use on the reservation market, then purchase additional bandwidth during periods of burst demand on the spot market. The traffic charts can also help you select the maximum desired quantity for your spot market valuation settings. There is little performance improvement, but potentially significant cost impact, when you purchase more bandwidth than you need.

Account View

The account screen presents account information for the current user, as well as a list of contact and payment records.



Edit Account

The Edit Account section displays your name, as configured by the Merkato administrator. A password hint and answer can be configured as well, to help you remember your password. (Note: You have to be logged in to see your information, so it won't help you if you can't remember your password. However, you can contact the Merkato administrator, who can obtain this password hint and answer.) The current password hint categories are:

- none
- date of birth
- city of birth
- mother's maiden name
- your pet's name

The response to this question is given in the password answer field. You can provide the delivery mechanism as well. Currently e-mail, regular mail, or both are supported for this field.

Contact List

The contact list contains contact profiles you have created.

Contact List

Contact	Type	Category	Phone	Ext.	Email
Mr. Bill Ding	Admin	Person	101-555-1213		howsing@realestate.com

If you click on any list item it brings up a page that displays the information within this record. If you wish to create a record, use the Contact – create utility, accessible via the page selection menu at the left of the page.

Several contacts can be created for one Merkato user account. Coordinate with your Merkato administrator as to how multiple contacts are to function relative to each other. (You may decide that one contact is sufficient, that many contacts are desirable, that you need a primary contact with backups, and so on).

If you click on an entry, a page appears that indicates the contact information for the record selected. You may alter this information by clicking **Edit**. (See “Contact Create “ on page 75 for an explanation of filling in or altering fields in this form.)

Contact Information

Person	Mr. Bill Ding	Email	howsing@realestate.com
Phone	101-555-1213	URL	
Address	123 Lott Street	Province	
City	Counsel Bluffs	Zip	59592
State	Alberta	Country	Canada

Edit

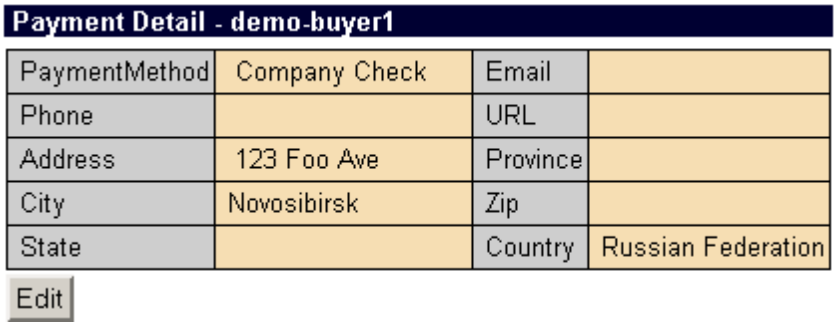
Payment List

The payment list contains the list of payment profiles you have previously created.

Payment List

Payment	Method	Email
Fiodor	Company Check	

If you click on any underlined list item, a larger page appears displaying the information within this record:



Payment Detail - demo-buyer1

PaymentMethod	Company Check	Email	
Phone		URL	
Address	123 Foo Ave	Province	
City	Novosibirsk	Zip	
State		Country	Russian Federation

Edit

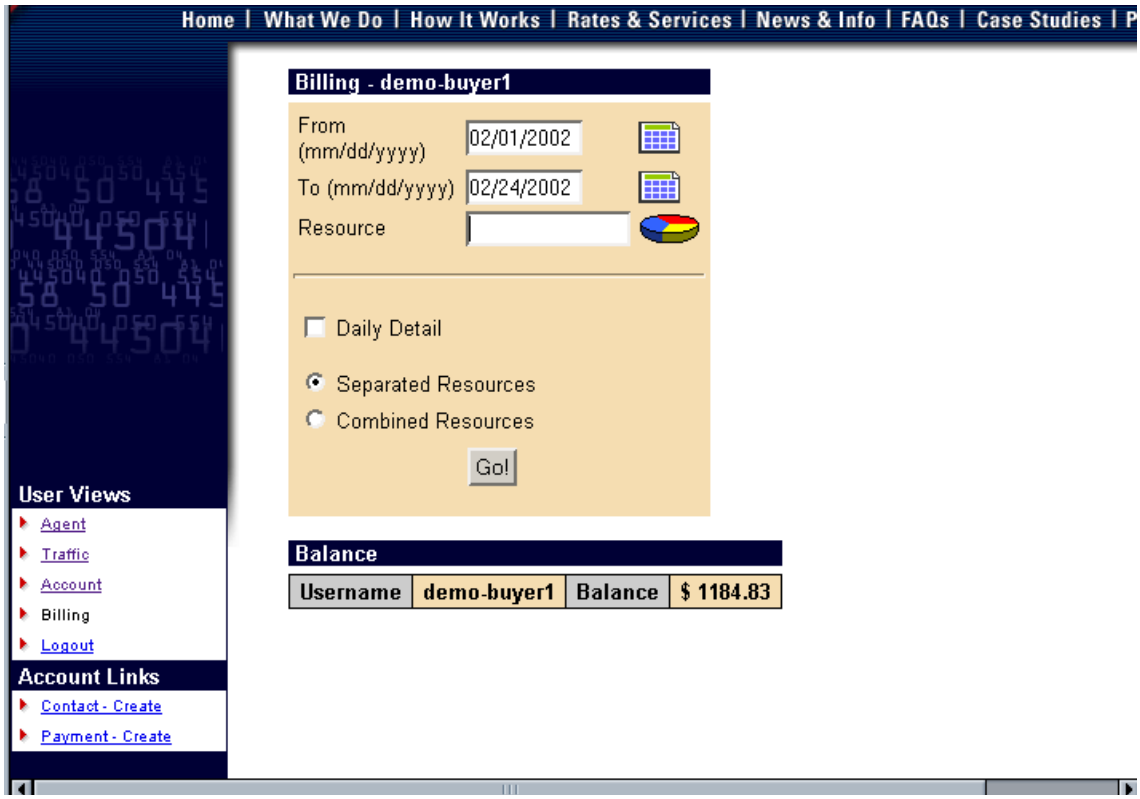
You may alter this information by clicking **Edit** at the bottom of the page.

If you wish to create a new record, use the "Payment – Create" utility, accessible via the page selection menu at the left of the page.

(See "The Create Payment Form" on page 76 for procedures.)

You can create more than one payment method for a user account, but you must contact your Merkato administrator to set how billings to multiple payment profiles are to be handled.

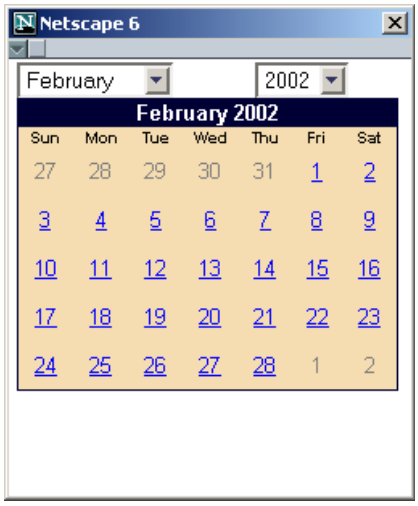
Billing View



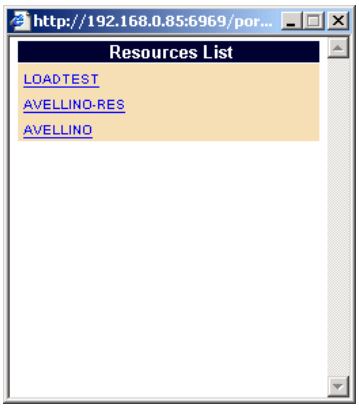
The Billing view allows you to do custom queries of the accounting database as well as display your current balance. The Balance field displays the charges for all known allocations. (In a future release of the portal this will reflect the true balance, minus payments.)

Billing Query Form

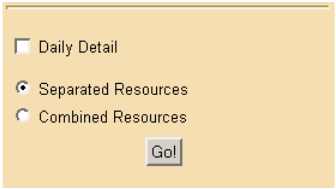
The billing query form allows you to select start and end dates. Rather than enter the dates manually, you can click on the small calendar icon to the right of the field. A pop-up calendar appears from which you can select your start and end dates.



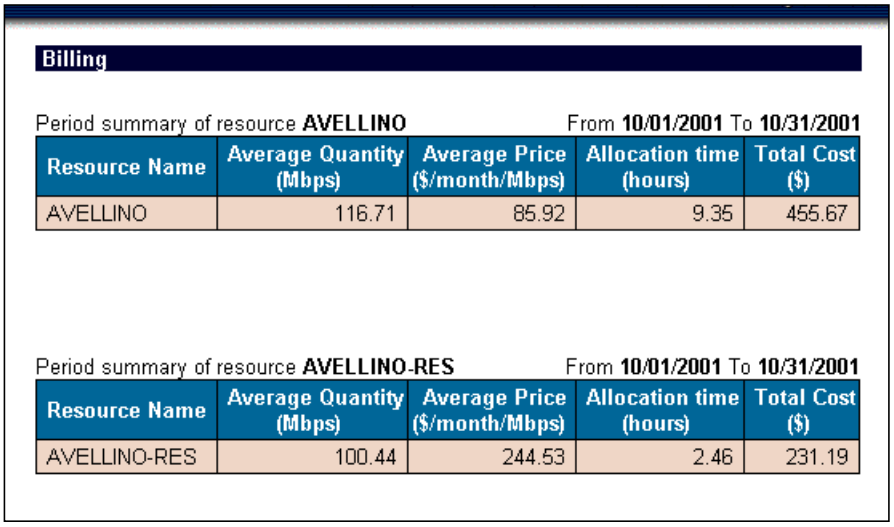
Similarly, when you click the pie-chart icon, a list box appears from which you can select a resource on which to do billing queries.



The selection boxes on the Billing form control how the information is displayed on the screen.



For example, if you select Separated Resources, and leave Daily Detail unchecked, and click **Go!** the view looks like this:



Billing

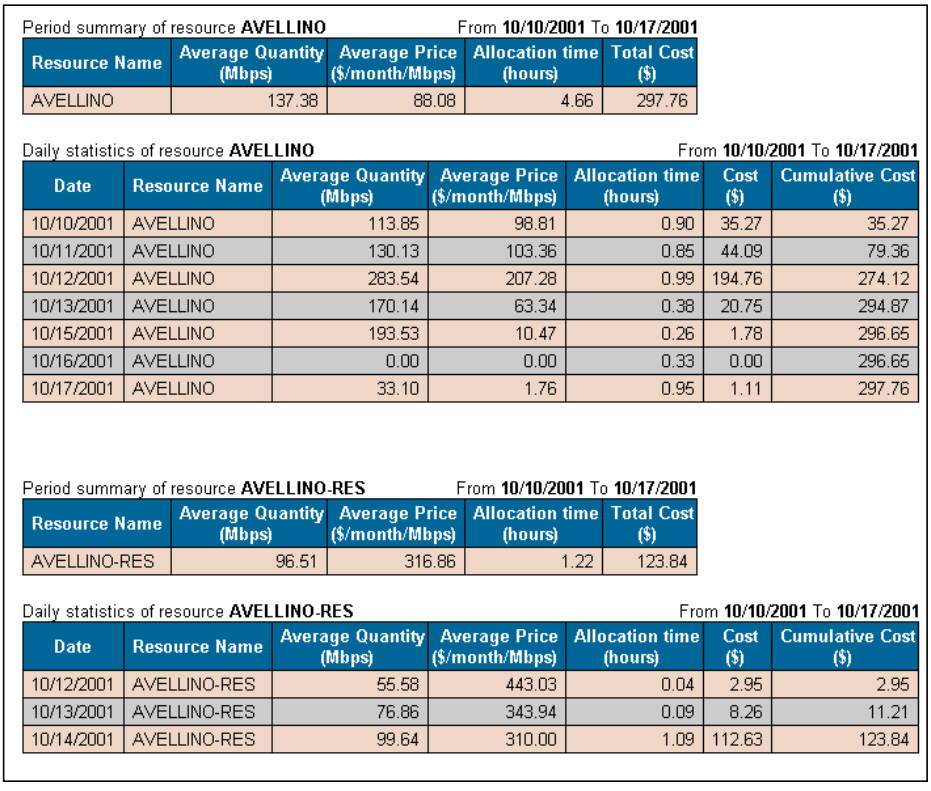
Period summary of resource **AVELLINO** From **10/01/2001** To **10/31/2001**

Resource Name	Average Quantity (Mbps)	Average Price ($/month/Mbps)	Allocation time (hours)	Total Cost ($)
AVELLINO	116.71	85.92	9.35	455.67

Period summary of resource **AVELLINO-RES** From **10/01/2001** To **10/31/2001**

Resource Name	Average Quantity (Mbps)	Average Price ($/month/Mbps)	Allocation time (hours)	Total Cost ($)
AVELLINO-RES	100.44	244.53	2.46	231.19

If you select Separated Resources, check Daily Detail, and click **Go!**, the billing detail appears broken down by date:



Period summary of resource **AVELLINO** From **10/10/2001** To **10/17/2001**

Resource Name	Average Quantity (Mbps)	Average Price ($/month/Mbps)	Allocation time (hours)	Total Cost ($)
AVELLINO	137.38	88.08	4.66	297.76

Daily statistics of resource **AVELLINO** From **10/10/2001** To **10/17/2001**

Date	Resource Name	Average Quantity (Mbps)	Average Price ($/month/Mbps)	Allocation time (hours)	Cost ($)	Cumulative Cost ($)
10/10/2001	AVELLINO	113.85	98.81	0.90	35.27	35.27
10/11/2001	AVELLINO	130.13	103.36	0.85	44.09	79.36
10/12/2001	AVELLINO	283.54	207.28	0.99	194.76	274.12
10/13/2001	AVELLINO	170.14	63.34	0.38	20.75	294.87
10/15/2001	AVELLINO	193.53	10.47	0.26	1.78	296.65
10/16/2001	AVELLINO	0.00	0.00	0.33	0.00	296.65
10/17/2001	AVELLINO	33.10	1.76	0.95	1.11	297.76

Period summary of resource **AVELLINO-RES** From **10/10/2001** To **10/17/2001**

Resource Name	Average Quantity (Mbps)	Average Price ($/month/Mbps)	Allocation time (hours)	Total Cost ($)
AVELLINO-RES	96.51	316.86	1.22	123.84

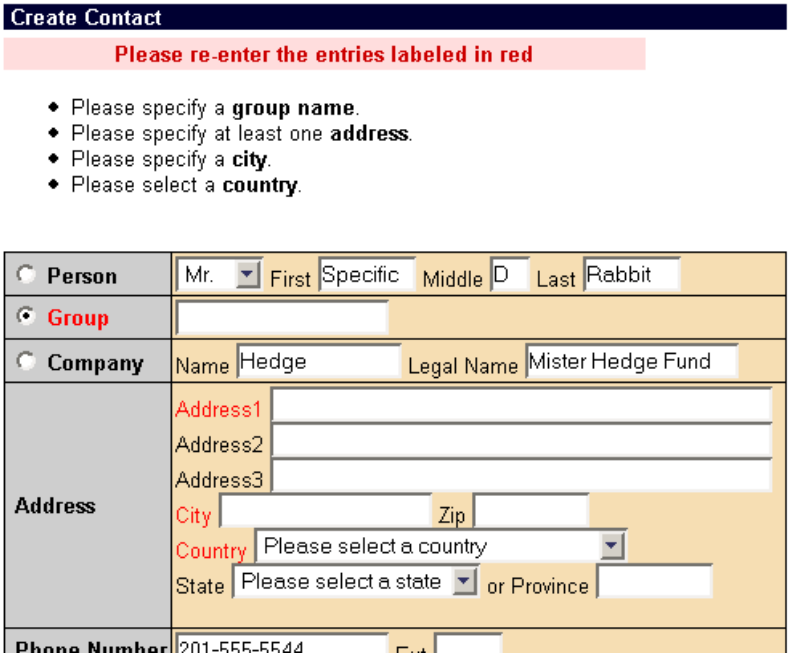
Daily statistics of resource **AVELLINO-RES** From **10/10/2001** To **10/17/2001**

Date	Resource Name	Average Quantity (Mbps)	Average Price ($/month/Mbps)	Allocation time (hours)	Cost ($)	Cumulative Cost ($)
10/12/2001	AVELLINO-RES	55.58	443.03	0.04	2.95	2.95
10/13/2001	AVELLINO-RES	76.86	343.94	0.09	8.26	11.21
10/14/2001	AVELLINO-RES	99.64	310.00	1.09	112.63	123.84

Contact Create Window

The Create Contact window lets you to create contact records. The records are associated with your login.

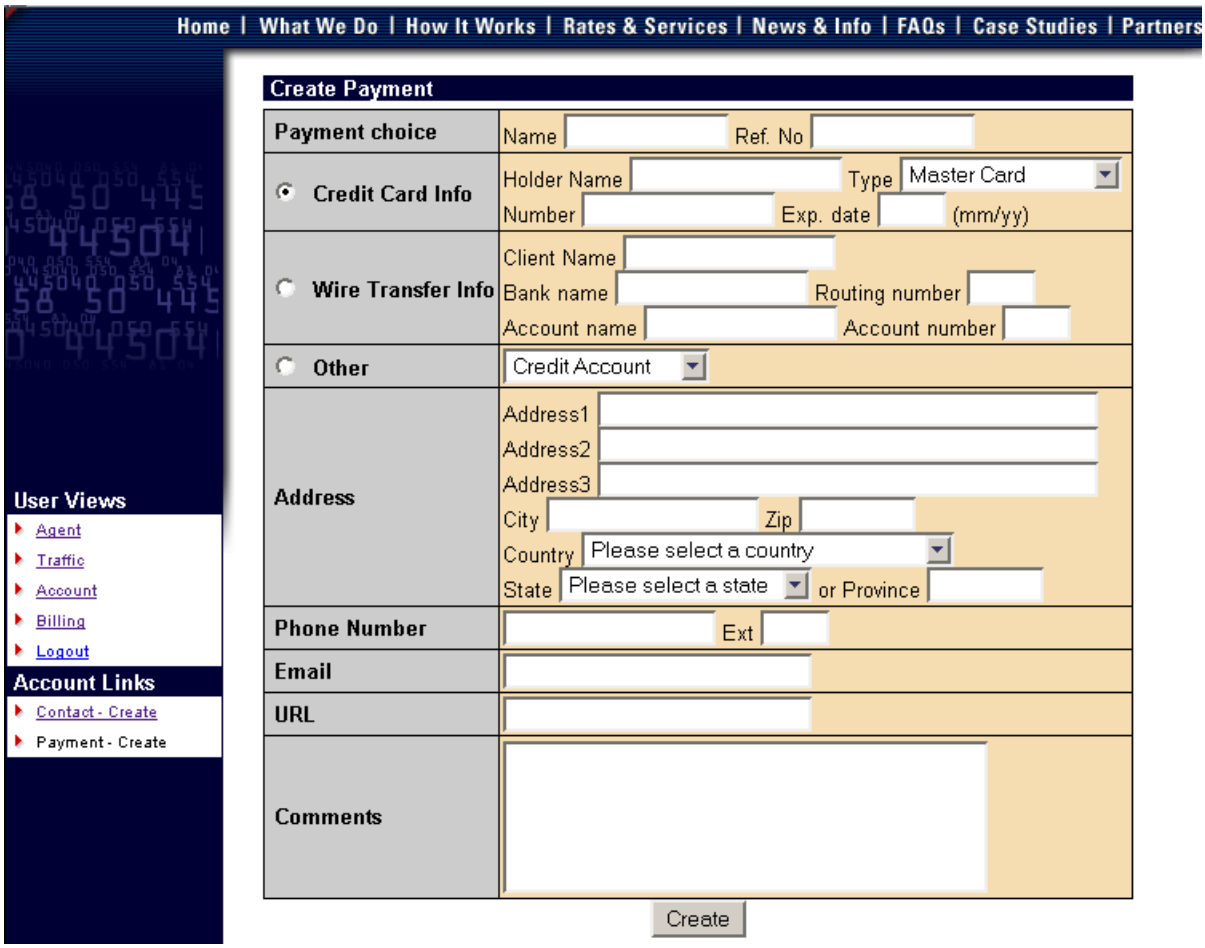
Fill in the fields to supply the contact information. When your entry is complete, click **Create**. If you don't fill in a field, an error screen appears and the field with the error is shown in red. You can edit the record further.



If you wish to edit your entry later, click on the appropriate contact record in the "Account" page, and, when the information is displayed, click **Edit** at the bottom of the form.

The Create Payment Form

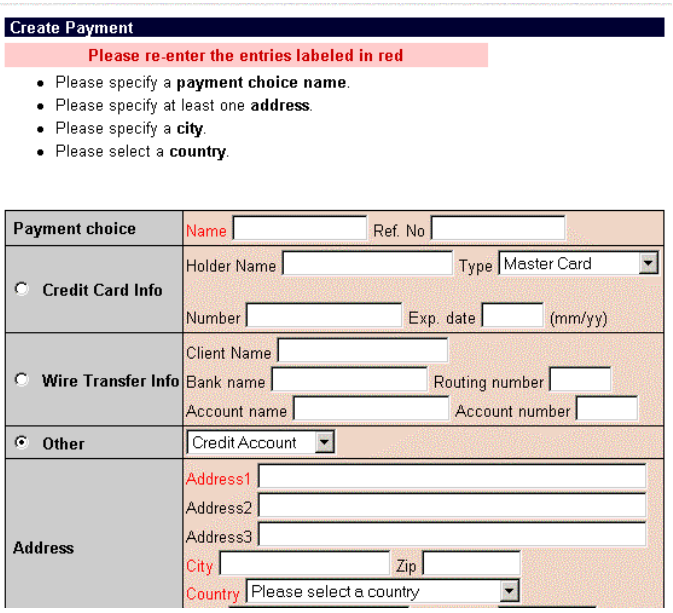
The Create Payment form lets you create a database record for payment information.



The Create Payment form lets you store payment information for a specific account.

When you have completed filling out the form, click **Create** at the bottom of the screen.

If you fail to enter all necessary fields, a message appears indicating which fields need to be fully completed. The missing fields are indicated in red.



Should you desire to edit an existing record, select it in the "Account" page, and click **Edit** An information entry form similar to the original Create form appears, letting you change any record.

Merkato Auction Mechanism: The Progressive Second Price Auction

The patent-pending Progressive Second Price (PSP) auction mechanism creates the rules by which the Merkato marketplace operates. PSP features include:

- The ability to divide resources among many bidders—not just establish one winner
- The ability to react quickly to changes in buyer's valuation of the resource for sale
- The ability to support any number of bidders who may enter or leave the bidding at will
- Establishment of market mechanisms that create a fair market price for bandwidth, benefiting both buyers and sellers
- Creation of market rules that encourage bidders to be maximally truthful about their desires and willingness to pay, allowing auctions to converge quickly

The InvisibleHand Merkato implementation of PSP provides the following additional features:

- Lightweight protocol between bidders and resource agent that does not contribute significantly to bandwidth utilization
- Support for multiple buyers and one seller, as well as multiple sellers and one buyer
- Ability of customers to create automated bidding decisions based on mix-and-match combinations of valuation, budget, and strategy
- Inclusion of sellers as bidders, allowing them to take bandwidth off the market if they do not feel the price is sufficiently high

To understand the Progressive Second Price auction mechanism, it helps to consider the rules and motivations behind a non-progressive simple second price auction.

In a simple auction, where the highest bidder pays the price bid, bidders raise their bids incrementally in successive bidding rounds. Each bidder's goal is to obtain the item at the lowest price, which is the price just above what the second-place bidder is willing to pay.

In an auction where many buyers are bidding for a single item, a second price mechanism is a way to quickly decide the highest bidder without the normal incremental bidding process.

The *second price rule* does away with the incremental bidding—but achieves the same result—by asking each bidder for a single highest bid. The highest bidder wins the item, but pays the amount offered by the second highest bidder. The highest bidder is guaranteed not to overpay for the item by revealing the maximum he or she is willing to pay. The seller gets essentially the same price for the item had the bidding price been raised incrementally until the second place buyer dropped out.

Applying this principle to a divisible resource such as bandwidth requires that the second price auction become "progressive." In a progressive second price auction, each bid consists of a unit price and the quantity desired at that price. The bidders are ranked by unit price and then are tentatively awarded the amount they requested until the supply is exhausted. Unsuccessful bidders may re-bid in order to replace successful bidders in the ranking (hence the term "progressive"). The price every successful bidder pays is the price offered by the lowest successful bidder. (In a strict interpretation of second price rules, it would be the highest unsuccessful bidder(s) who sets the price. However, the "progressive" nature of the bidding tends to turn all bidders into winners, which would leave no basis from which to set the price.)

Eventually, all bidders will have been awarded a share of the bandwidth or dropped out of the bidding because the "market price" is higher than they wish to pay for any amount of bandwidth.

Example:

Assume that the seller has 10 Mbps to sell and 6 bidders are interested. Bids indicate the amount of bandwidth desired, as well as the unit price they are willing to pay. Let's assume that the initial bids are these:

Bidder A: 3 Mbps desired at $100 unit price ($300 total)

Bidder B: 5 Mbps desired at $80 unit price ($400 total)

Bidder C: 3 Mbps desired at $50 unit price ($150 total)

Bidder D: 4 Mbps desired at $30 unit price ($120 total)

Bidder E: 6 Mbps desired at $20 unit price ($120 total)

Bidder F: 3 Mbps desired at $10 unit price ($30 total)

Bidders would be ranked according to their offers as shown in the following chart:

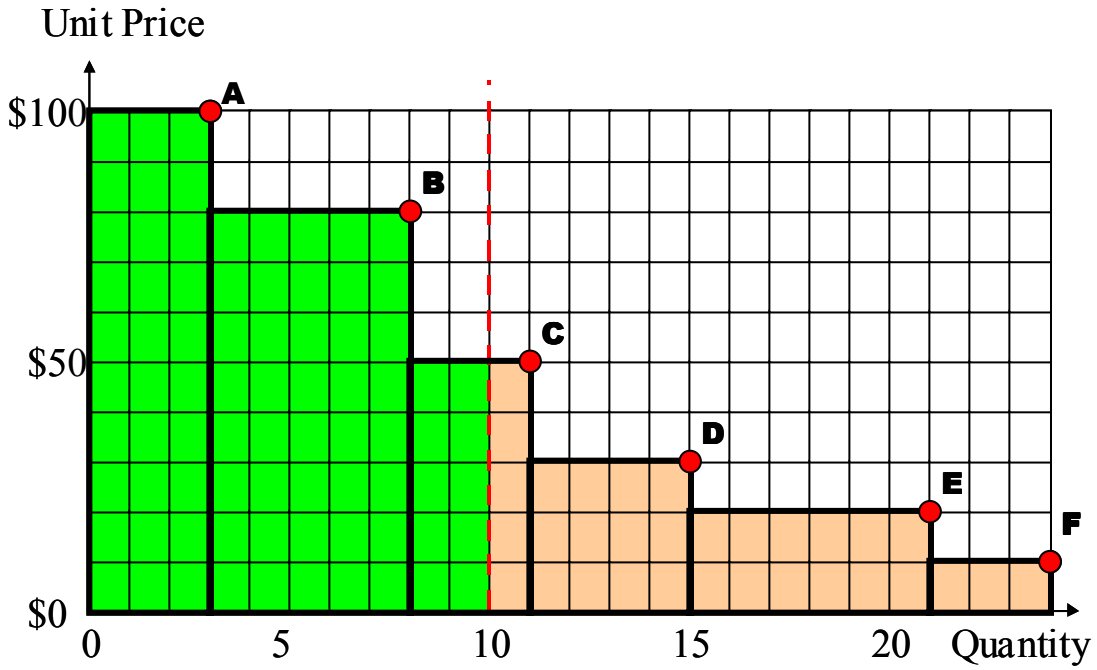


Figure 1. Stacked Bids Received for Portions of 10 Mbps of Bandwidth Offered by Seller

The shaded area represents the amount of money the seller is being offered (unit price times quantity). The green shaded area at the left represents the amount offered by successful bidders.

Now lets look at how the bandwidth would be sold in a Merkato Progressive Second Price auction. To recap, the rules of the second price auction are as follows:

- All bidders may make multiple sequential offers.
- After each offer is received, the Resource agent (that runs the auction) ranks the bids according to price offered and apportions bandwidth to the highest bidders.

- The price at which the lowest successful bidder receives bandwidth is the "market price," that every successful bidder pays.

The bid and re-bid cycle repeats until all bidders are satisfied with the amount of bandwidth received, and their price, or have dropped out of the bidding.

Let's assume that the initial offers from all bidders are as before. All bidders are informed that the current market price is $50 and the successful and unsuccessful bidders are informed of their status and allocation (if any). If the second price auction stopped here, the seller would receive $50 for each unit of bandwidth, or a total of $500 for the 10 Mbps of bandwidth, which is $300 less than he would have received by simply accepting the initial offers. Fortunately for the seller, the process does not end here!

The unsuccessful bidders will bid again, if they can afford to. Bidders "stay in the game" by increasing the unit price offered for bandwidth, above that of the lowest successful bidder.

How can bidders afford to do this if they revealed what they are willing to pay in their first bid? Well, assume that the bidder's initial offer was determined by a total cost limit as opposed to a desired unit price. In this case, the bidder would desire to re-bid as long as a consistent total cost was maintained—by lowering the requested amount of bandwidth proportionally to any increase in offered unit price. (In Merkato, this price-verses-quantity information is carried by the valuation settings.) Let's assume, for simplicity, that all the bidders follow this same strategy and that their initial bids represent their total budget for bandwidth.

Bidder "D" was the highest unsuccessful bidder, offering a unit price of $30 for 4 units of bandwidth. This represents a budget of $120. Bidder "D" sees he can become a successful bidder this round by bidding above a unit price of $50. His next offer could be 60-unit price for 2 Mbps of bandwidth and stay within his budget limits. Each bidder can do this in turn if they find themselves pushed out of the successful bidder's column. Although all the examples so far have involved increments of 1 Mbps of bandwidth, bidders are under no such restriction. Even bidder "F," with a $30 budget, may become a successful bidder by asking for a fractional amount of bandwidth.

A simulation shows that when the bidding ends, the final bids would look like this:

Bidder A: 2.7 Mbps desired at $112 unit price ($300 total)

Bidder B: 3.6 Mbps desired at $112 unit price ($400 total)

Bidder C: 1.3 Mbps desired at $112 unit price ($150 total)

Bidder D: 1.1 Mbps desired at $112 unit price ($120 total)

Bidder E: 1.1 Mbps desired at $112 unit price ($120 total)

Bidder F: 0.2 Mbps desired at $112 unit price ($30 total)

The chart below shows the bids graphically, as before:

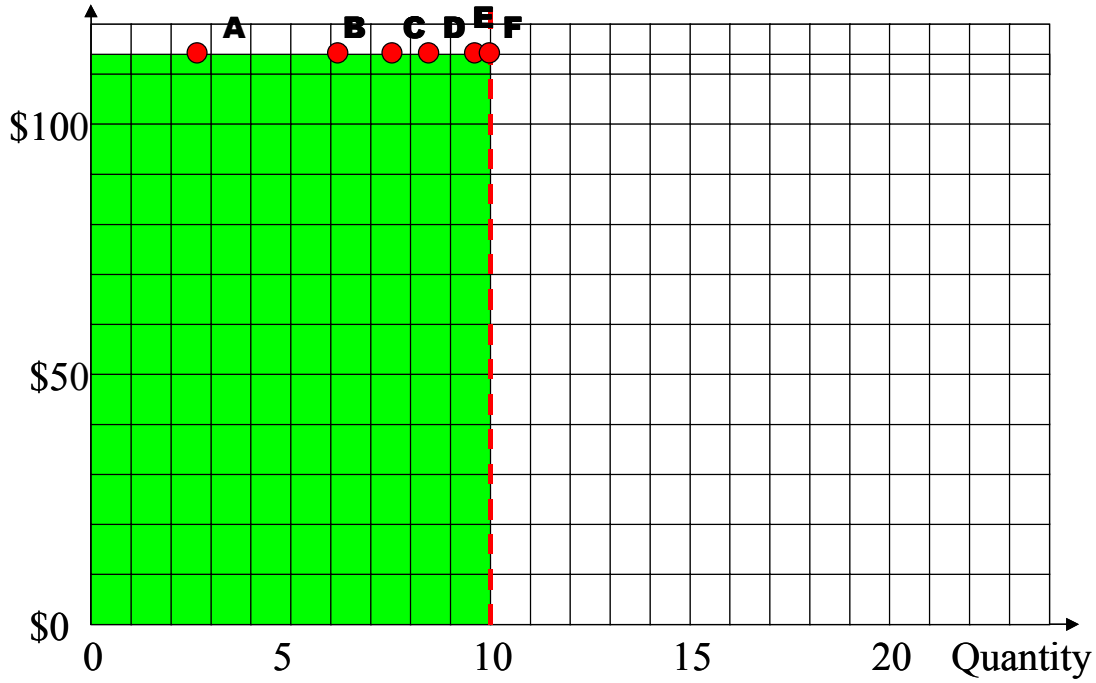


Figure 2 Auction Results Under Progressive Second Price Mechanism

The market price of $112.00 represents the amount all bidders would have to offer in order that all are awarded bandwidth, but stay within their initial budgetAll bidders are "winners" and receive an amount of bandwidth proportional to their willingness to pay and consistent with the bidding policies they established for their Merkato agents.

Advanced Buyers Guide

This section contains advice for the advanced user who is familiar with Merkato and wants to optimize the settings further.

Optimizing Your Valuation Settings

There are various ways you can use the Merkato capabilities to maximize the amount of bandwidth received and minimize your cost

Using the "Max Qty" (or "Qty") valuation settings

The "Max Qty" setting in the Budget-with-limits valuation and the "Qty" settings in the Square Root, Linear, Parabolic, and Logarithmic valuations constrain your agent to purchase no more than the quantity entered. Using this parameter to buy only the amount of bandwidth you need lowers your cost for two reasons:

1. Simple mathematics. Once the market price has been established, if you purchase less bandwidth, you will pay less in total cost.
2. Requesting less bandwidth will often lower the market price for everyone. In Merkato, market price is driven by demand. If all bidders begin their bidding by asking for all the bandwidth the seller has available, the market price is driven up as buyers bid and re-bid in an effort to win an allocation. If a bidder initially asks for a small fixed quantity at a high price, however, they essentially "take that bandwidth off the top" and the other bidders will contend for what is left. The high price bidder will pay what the other bidders determine is the market price based on contention for what is left over.

As an example, if 5 bidders, each with a budget of $5000 bid for a total of 100 Mbps, each would receive an allocation of 20 Mbps at a market price of $250/Mbps. If one bidder decided that 20 Mbps was too much and used the Budget-with-limits valuation to set a maximum quantity of 15 Mbps, demand would drop, the market price would drop to $235 for everyone, and that bidder would pay a total cost of $3530 for the 15 Mbps (as opposed to $5000 for 20 Mbps the bidder didn't really need). Of course the other bidders would benefit from the market price drop as well. However, their benefit would be in the form of increased allocation rather than decreased cost. They would each receive 21.25 Mbps for their $5000 budget.

Using the "Min Qty" setting in the Budget-with-limits valuation

One disadvantage of the Budget valuation is that it never gives up attempting to obtain as much bandwidth as it can for the budgeted amount as market prices rise. This means that in extreme circumstances, a bidder could pay his entire budget for a very small amount of bandwidth. Under the Merkato system, bidders who receive no allocation during a round have their traffic routed through a shared, fixed-bandwidth data path. Ask your Merkato administrator for the size of this "best-effort queue" and use that information to determine the level of bandwidth for which you would rather be in the shared data path

"for free" rather than pay your budget for an allocation of a similar amount. Be conservative, though. The throughput and latency of your data stream when you are in the "best effort queue" depends heavily on how many other bidders are there and how much data they are transferring at the same time.

Bidding Only When You Need Bandwidth

Merkato allows you to stop bidding at any time. If your application requires bandwidth only during certain time of the day or days of the month, consider stopping your agent during periods of inactivity. You can then either pocket the money you save, or use it to raise your budget (and receive a greater allocation) during times when you are actively using the link.

Bidding Lower For Excess Bandwidth

Many people like the benefits of setting a maximum quantity, but would not mind receiving more bandwidth if the price were right. Both the Logarithmic and Parabolic valuation can be used to create such a strategy. (Select between them based on how you wish to bid for low quantities of bandwidth.)

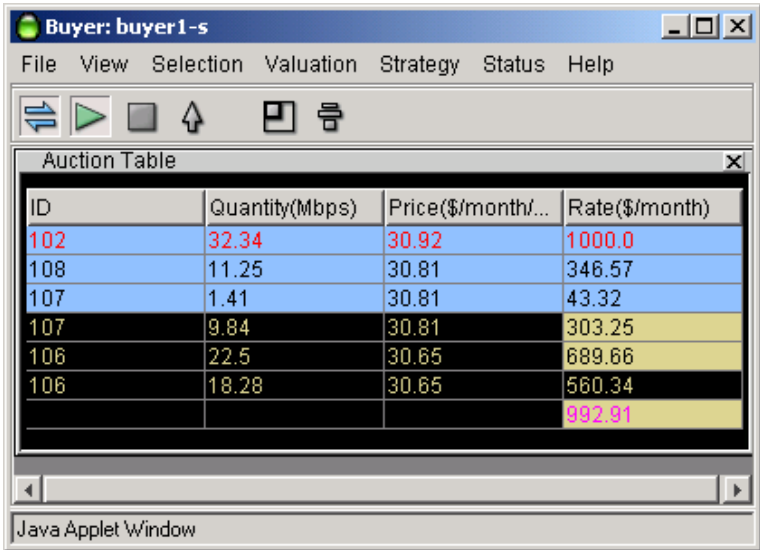
Using Both the Spot and Reservation Markets

The reservation market allows you to purchase bandwidth for an extended time at a fixed price. The spot market reacts quickly to changes in buyer valuation and may result in either savings or a price premium relative to the reservation pricing. A desirable strategy might be to purchase the absolute minimum amount of bandwidth you require via a reservation and then use the Spot market to add additional capacity if the price is attractive or your needs increase unexpectedly.

Using the Bid Table to Estimate Market Prices

Although you can preview an auction without entering it, this information does not indicate directly what impact the participation of your agent has on the market price. You can estimate your impact if you can determine the valuation used by other bidders.

It is sometimes possible to guess a bidder's valuation based on these entries.



- If the "rate" (far right value) of a bidder remains constant, that bidder is most likely bidding on a budget.
- If the quantity (second from left) field is constant, it indicates that the bidder has set a maximum bandwidth level. (The other indicator is that the bidder is offering more than the current market price, but is not driving the market up to the bidder's level.)

If you can divide all bidders into these two categories, you can estimate the market price you will have to pay for any unit of bandwidth, without bidding. Then continue the process as follows.

1. Add up the total bandwidth requested by all bidders who have set a maximum bandwidth level and for whom the market price is lower than their offered price. Subtract this bandwidth from the total the seller is offering.
2. Add up the rates of all the bidders who are using "budget" valuation. Divide this number by the amount of bandwidth remaining from the first calculation. This is the natural market price for this auction.
3. To determine what you would have to pay for an amount of bandwidth, assuming these bidders keep their current valuations and budgets, subtract the bandwidth you want from the total that the "budget" bidders were contending for. Then re-do the market price calculation.

You would have to bid above this calculated price to obtain the bandwidth you desire. You ensure that your agent will bid this amount by using the Budget or Budget-With-Limits valuation and entering a budget equal to this price multiplied by the amount of bandwidth

desired. If you use the Budget-With-Limits valuation, also set the Max Qty to this desired amount of bandwidth.

Valuation Formulas

The formulas from which valuations are derived are provided below. You may wish to enter them into a spreadsheet to analyze them. Remember, these formulas determine what you *bid,* but your actual cost is based on the market price as determined by progressive second price auction rules.

The curves defined by these formulas vary according to settings in the valuation windows. To avoid confusion, the names of the settings have been given in the formulas as:

- **Budget** for budget settings in budget-based valuations
- **MaxQty** for either Max Qty in Budget-with-limits or the single Qty setting in the other valuation windows
- **MinQty** for the minimum quantity setting in the Budget-with-limits valuation
- **MaxValue** for the Value setting in the valuation windows

The variables in the equations are:

- **Price** for the unit price
- **Qty** for the quantity of bandwidth that will be requested at that price

Note that the units do not matter as long as you are consistent throughout:

- Budget is specified in currency-per-unit-time (such as $/month).
- "Quantities" are quantities of bandwidth expressed in Gbps, Mbps, or kbps.
- Price is specified in currency per unit bandwidth per unit time (such as $/Mbps/Month).
- MaxValue is given in terms of currency per unit time (such as $/month).

To convert a price equation to cost, multiply the price equation by the quantity variable ("Qty" in the equations).

Budget Valuation

Price = Budget / Qty

Budget-with-limits Valuation

For Qty < MinQty

Price = Budget / MinQty

For MinQty <= Qty <= MaxQty

Price = Budget / Qty

For Qty > MaxQty

Price = 0

Linear Valuation

For Qty <= MaxQty

Price = MaxValue / MaxQty

For Qty > MaxQty

Price = 0

Square Root Valuation

Note: "SQRT" = Square Root of what follows in parentheses

For Qty <= MaxQty

Price = MaxValue / (2 * SQRT (MaxQty)*SQRT(Qty))

For Qty > MaxQty

Price = 0

Logarithmic Valuation

Note: "Ln" = Natural logarithm of what follows in parentheses

For Qty <= MaxQty

Price = (MaxValue / MaxQty) * Ln(MaxQty / Qty)

For Qty > MaxQty

Price = 0

Parabolic Valuation

For Qty <= MaxQty

Price = 2 * MaxValue * (1 – Qty / MaxQty) / MaxQty

For Qty > MaxQty

Price = 0

- Maximum price bid (at Qty = 0) = 2 * MaxValue / MaxQty
- Maximum cost offered (at half MaxQty) = MaxValue / 2