

How to use and interpret optimization charts

Product: CA Capacity Command Center

Release: 2.6

OS: All supported

This information describes how to use and interpret the CCC Resource Score Server Capacity Optimization charts.

October, 2014



1.0 How to use and interpret the CCC Resource Score optimization charts

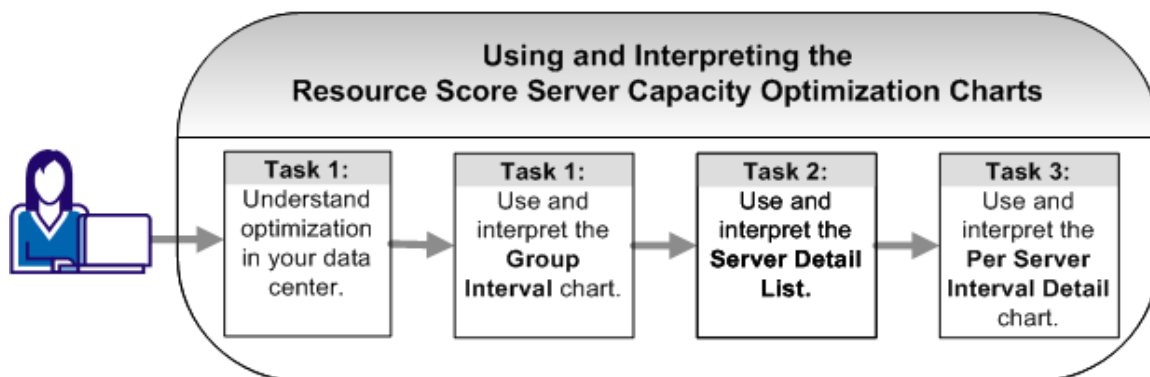
This information describes the CCC optimization charts, including how to interpret the information you see.

The optimization charts provide a visualization of the capacity and memory consumption of servers in terms of optimization categories.

The charts offer drill-down functionality that enables you to see details at the following levels:

- The **Server Capacity Optimization—Group Interval** chart shows consumption and capacity categorized in ranges of Under, Good, Caution, and Over for a group of servers as a whole.
- The **Server Capacity Consumption—Server Detail List** chart shows a list of all servers in the group and shows the planning percentile categorized in ranges of Under, Good, Caution, and Over for each server.
- The **Server Capacity Consumption—Per Server Interval Detail** chart shows consumption for an individual server placed in reference to the capacity of the server categorized in ranges of Under, Good, Caution, and Over.

Note: The capacity consumption of a server is defined as a *CPU Resource Score*, which is a CA-defined rating of computer system and CPU processing power that is based on the number of chips, cores per chip, threads per core, operating system, and scaling factors.



The following topics provide information you need to use and understand the Capacity Consumption charts:

Task	More Information
Understand optimization in your data center	1.1 Understanding optimization in your data center
Use and interpret the Group Interval chart.	1.2 How to use and interpret Server Capacity Optimization—Group Interval
Use and interpret the Server Detail List.	1.3 How to use and interpret Server Capacity Optimization—Server Detail List
Use and interpret the Per Server Interval Detail chart.	1.4 How to use and interpret Server Capacity Optimization—Per Server Interval Detail

1.1 Understanding optimization in your data center

When managing capacity, you have two competing goals - you want to provide the fastest possible response time to users while minimizing the costs of unnecessary excess capacity. To balance these goals, you need to ensure that consumption is neither too high nor too low in relationship to the total available capacity of your servers.

The Server Capacity Optimization charts are another useful tool to enable you to visualize and understand the current state of your data center. At a glance, you can see server consumption and capacity categorized into optimization categories of Under, Good, Caution, and Over.

1.1.1 About the chart details

In a data center, workloads are variable over time, and capacity consumption correspondingly varies over time. The Server Capacity Optimization charts show capacity consumption in relationship to set optimization categories. You can clearly see which servers are under utilized or over utilized. The charts base these categories on a calculated planning percentile rather than an average because workloads vary over time, which means that planning based on average consumption does not provide adequate capacity for periods of peak activity. Planning based on peak consumption is not cost effective because it leaves too much capacity unused for too much of the time. Therefore, Capacity Command Center bases the optimization categories on a planning percentile which represents a reasonable level of high capacity consumption but eliminates outlier values (for example, an atypical activity that causes an unusual spike in consumption) and enables you to balance performance with cost.

1.1.2 Addressing issues

If the charts show that you have many servers that are either over-utilized or under-utilized, then your data center is not as efficient as it could be. You can leverage two CA products to assist in creating the best solution.

For large-scale virtual environments, CA Virtual Placement Manager performs automated analysis and recommends ideal VM placement and server configurations to meet your changing needs.

For large heterogeneous physical environments and virtual environments, CA Capacity Manager performs analysis and enables you to create multiple scenarios to determine the ideal mix of workload reassignments and server configuration changes to maximize the performance and efficiency of your data center.

For more information about these products, see the CA Technologies web site at www.ca.com.

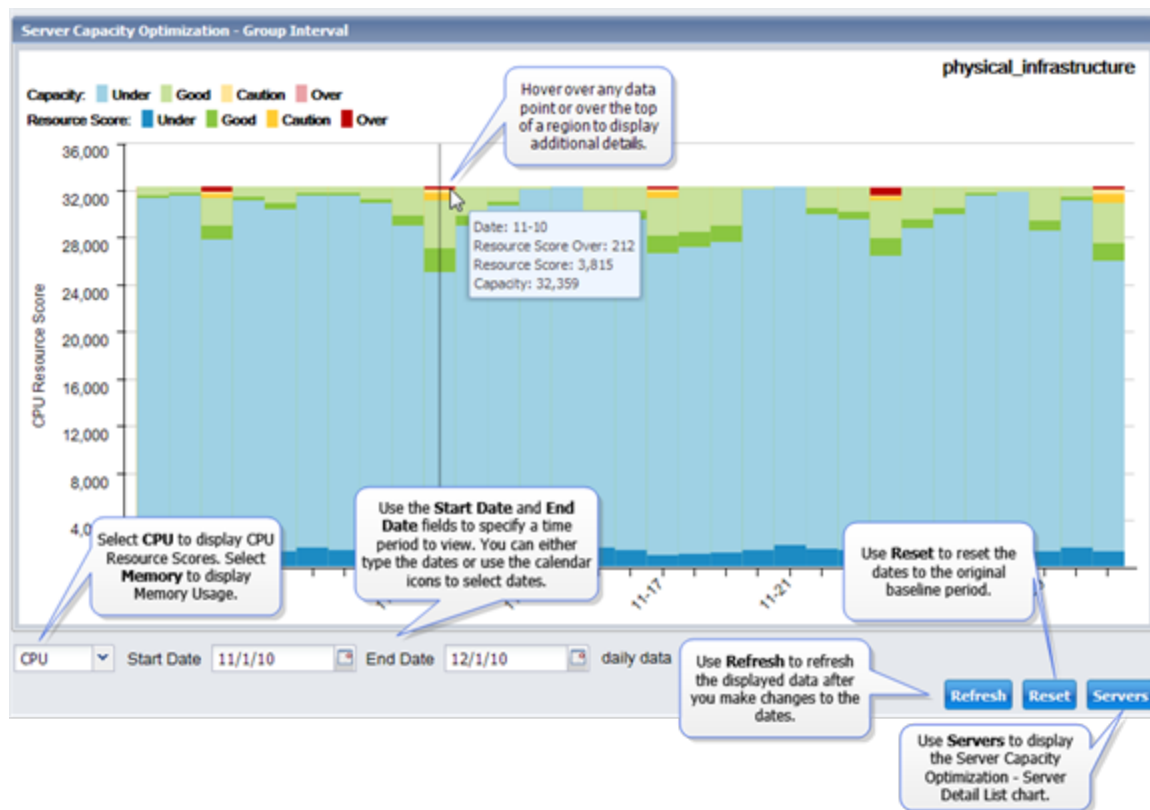
1.2 How to use and interpret Server Capacity Optimization—Group Interval

This chart provides a view of the capacity consumption (Resource Score or Memory) for a group of servers during a specified time period in terms of optimization categories. This server capacity can be shown in terms of either CPU Resource Scores or Memory. The chart includes [advanced interactive navigation options](#), and many functions (including zooming and date selection) can be performed interactively on the chart.

This chart is a valuable aid in ensuring you have both efficient resource usage and adequate performance. As consumption values reach the top of the capacity area within a utilization category, the utilizations of the servers in that category near one hundred percent, and thus the response time of applications running on these servers become increasingly slow.

Note: If you do not include group information in your data, Optimizations are calculated only at the individual server level and the Server Capacity Optimization - Group Interval chart and navigation pane are not displayed.

Figure 1 - Example Server Capacity Optimization - Group Interval chart



1.2.1 Understanding chart values and legends

The chart represents the following values:


Capacity

The capacity for the entire group for each interval, displayed in utilization categories.

The total capacity is the sum of the capacities shown in the utilization categories. You can see the total capacity value by moving the mouse pointer over the top utilization category.

The utilization categories for capacity are as follows:

- **Under (<20%)** - less than 20% of capacity.
- **Good (20% - 60%)** - between 20% and 60% of capacity.
- **Caution (60% - 80%)** - between 60% and 80% of capacity.

 **Over (>80%)** - over 80% of capacity.

Capacity is calculated and displayed as follows:

When daily data is displayed - The value in each utilization category is the sum of capacity for all servers in that utilization category (based on each server's configuration for each day). The total capacity is the sum of capacity for all servers in all categories.

When hourly data is displayed - The value in each utilization category is the sum of capacity for all servers in that utilization category (based on each server's configuration for the day in which the displayed hour occurred). The total capacity is the sum of capacity for all servers in all categories.


Resource Score / Memory


The capacity consumption (Resource Score or Memory) of the entire group displayed in the utilization categories.


The total consumption is the sum of the consumption shown in the utilization categories. You can see the total consumption value by moving the mouse pointer over the top utilization category.

The utilization categories for consumption are as follows:

 **Under (<20%)** - less than 20% of capacity.

 **Good (20% - 60%)** - between 20% and 60% of capacity.

 **Caution (60% - 80%)** -between 60% and 80% of capacity.

 **Over (>80%)** - over 80% of capacity.

Note: You can change the percentage definitions of these categories by editing the system properties file.

Consumption is calculated and displayed as follows:

When daily data is displayed - The consumption value is determined by calculating the average consumption for each server in each utilization category for each hour of the day, summing the hourly averages for each hour of the day, and then reporting the hourly summation that occurred at or just below the indicated percentile. (The default percentile value is 90.) The results are displayed within each utilization category.

Note: A percentile value is chosen to represent the peak consumption because it eliminates outlier values (for example, an atypical activity that causes an unusual spike in consumption). Taking a percentile value (such as a 90th percentile) is usually sufficient to locate a representative peak level of activity.

When hourly data is displayed - The consumption value is determined by calculating the average consumption for each server in each utilization category for each hour in the day, then summing the hourly averages for each hour in the day. The results are displayed within each utilization category.

Note: The average hourly value is used to enable comparison of values collected at different intervals.

Peak Exceeded Capacity Indicator

The point at which the peak usage exceeded the available capacity, which can occur when a VM exceeds its entitlements.

Note: In the case of VMs, it is possible for the actual peak consumption of one or more intervals to exceed the capacity (entitlements) of the VM. If this occurs, the actual peak area is shown rising above the capacity line (marked with the indicator) and a warning message is displayed below the chart.

1.2.2 Using the Server Capacity Optimization—Group Interval chart

The Server Capacity Optimization—Group Interval is an interactive chart.

You can display additional information, as follows:

- Display actual values for each interval by moving the mouse pointer over the utilization categories.
- Display the total capacity and total consumption values by moving the mouse pointer over the top utilization category.
- Click on any utilization category at any interval to display the [Server Detail List](#) chart for servers in that utilization category in that interval.

1.2.2.1 Displaying daily or hourly data

The legend and chart vary depending on the time period you choose using the **Start Date** and **End Date**, as follows:

- If you select a period of ten days or longer, daily data is shown.
- If you select a period of 9 days or less, hourly data is shown.

1.2.2.2 Using the group navigation pane

You can display data for an individual group by selecting the group in the navigation pane on the left.

- Right click on a parent group to display options to quickly expand or collapse the group structure. (Be aware that expanding a very large group might take a significant length of time.)
- Use the filter box to locate specific servers or groups by name string. Click **Enter** or **Go** to display the Per Server Interval Detail chart for the selected server (or to see the Server Detail List if more than one server matches your filter criteria). Enhanced filter specification criteria enable you to create very specific group/server filter combinations.

Note: The groups displayed in the navigation pane consist of the preferred groups and their ancestors. Groups which are included in the navigation pane but that are not preferred groups are grayed-out and cannot be selected.

1.2.2.3 Viewing servers in the group

Use the **Servers** button to display the [Server Detail List](#) chart for the selected time period. This chart includes all servers that make up the group.

Note: You can also click on a utilization category at any interval to display the Server Detail List for that specific interval and utilization category.

1.2.2.4 Changing the chart time period

You can change the time period shown in the chart by using the following fields. After making a change, click **Refresh** to update the data that is displayed on the chart.

Start Date/End Date

Choose a subset of the baseline time period to limit the period of time displayed in the chart. You can enter dates in the fields or you can choose the date by clicking the calendar icon beside each field. After entering new dates, click Refresh to repopulate the chart.

Note: When you change either the Start Date or End Date, the chart is grayed out to indicate that the displayed data no longer corresponds to the dates shown in the Start Date and End Date fields. You must click Refresh to obtain data for the new dates.

When the date range is eight days or less, then the chart displays hourly data instead of daily data.

Note: The granularity of the displayed data is shown next to the End Date field on the chart. This displayed granularity level is not related to the interval at which the data was collected (for example, 5-minute data, 15-minute data).

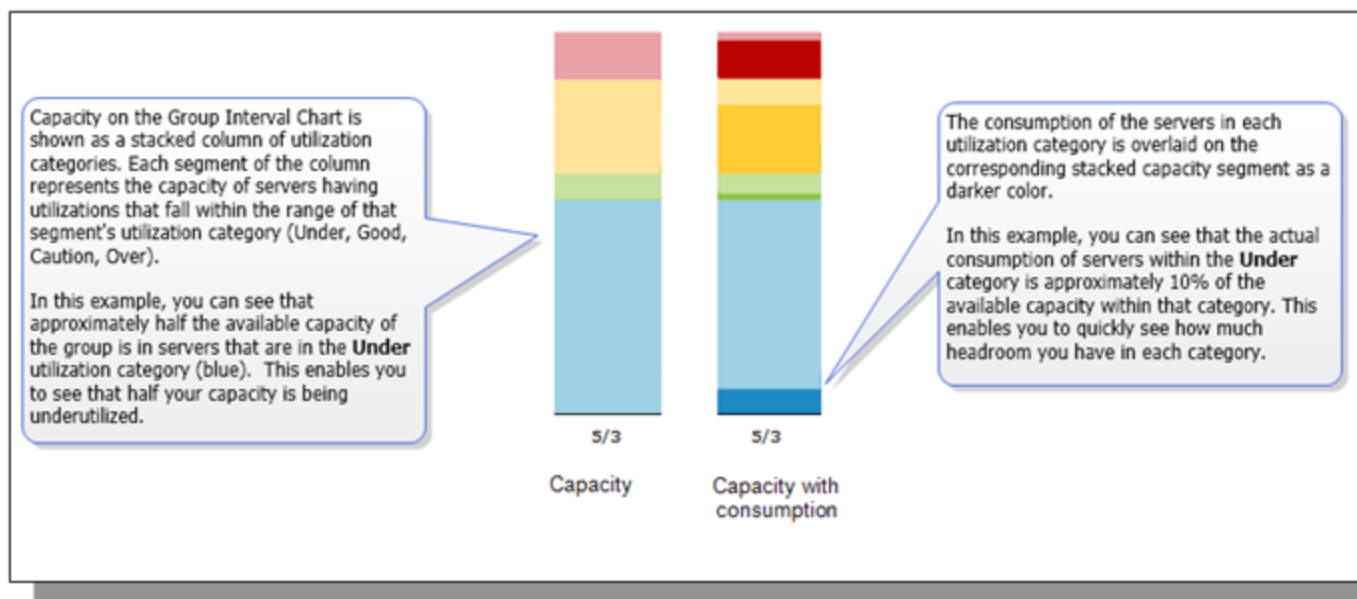
Refresh

Use this button to refresh the data after you make changes to the start or ending dates.

Reset

Use this button to reset the chart to display the last ninety days of data.

1.2.3 Interpreting the Group Interval chart



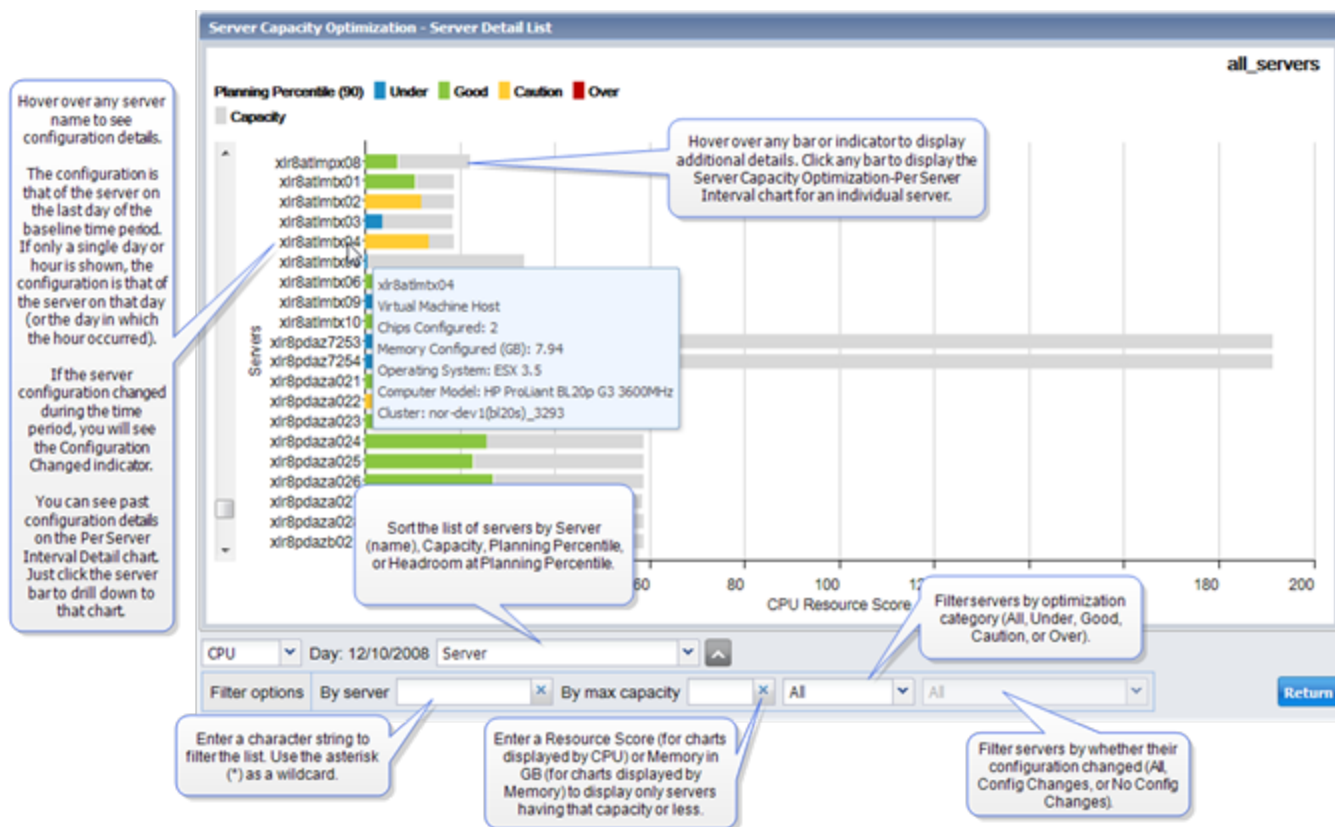
1.3 How to use and interpret Server Capacity Optimization—Server Detail List

This chart provides a view of the capacity and consumption (Resource Scores or Memory) for all servers in the group for the time period that was specified at the group level. The chart also provides the ability to see configuration changes that took place during the displayed time period.

The servers' consumption values are displayed by optimization category (Under, Good, Caution, and Over).

Note: To conserve screen space, ending and beginning nodes which are duplicated in every server name in the group are suppressed. For example, east.serverA.ca.com, east.serverB.ca.com, and east.server C.ca.com will be displayed as serverA, serverB, and serverC. You can see the full server name by moving the mouse pointer over the bar beside each server.

Figure 2 - Example Server Capacity Optimization—Server Detail List



1.3.1 Understanding chart values and legends

When displaying data for the baseline period, the chart shows the following values:

■ Capacity


The capacity (Resource Score or Memory) of each server.


■ Planning Percentile (nn)

The planning percentile of each server. The color shown indicates the optimization category, as follows:

■ **Under (<20%)** - the planning percentile of the server is less than 20% of capacity.

■ **Good (20% - 60%)** - the planning percentile of the server is between 20% and 60% of capacity.

 **Caution (60% - 80%)** - the planning percentile of the server is between 60% and 80% of capacity.

 **Over (>80%)** - the planning percentile of the server is over 80% of capacity.

Note: You can change the percentage definitions of these categories by editing the system properties file.

The planning percentile is calculated as follows:

When the baseline is displayed - The planning percentile for the server for the entire baseline time period. The value is determined by ordering all of the data samples within the baseline date range by their rank percentile and selecting the one that occurs at or just below the indicated percentile. (The default percentile is 90).

When a single day is displayed - The planning percentile for the server for the day indicated. The value is determined by ordering all of the data samples within the day by their rank percentile and selecting the one that occurs at or just below the indicated percentile. (The default percentile is 90).

When a single hour is displayed - The planning percentile for the server for the hour indicated. The value is determined by ordering all of the data samples within the hour by their rank percentile and selecting the one that occurs at or just below the indicated percentile. (The default percentile is 90).

Note: A percentile value is chosen to represent the peak capacity consumption because it eliminates outlier values (for example, an atypical activity that causes an unusual spike in consumption). Taking a percentile value (such as a 90th percentile) is usually sufficient to locate a representative peak level of activity.

Peak Exceeded Capacity Indicator

The point at which the planning percentile exceeded the available capacity.

The indicator is displayed if the **Planning Percentile (nn)** for the server is greater than the most recent capacity of the server. This situation can occur when a VM exceeds its entitlements.

1.3.2 *Using the Server Capacity Optimization—Server Detail List chart*

The Server Capacity Optimization—Server Detail List is an interactive chart. You can display additional information, as follows:

- Display actual values for each server by moving the mouse pointer over the bar in the left-most position.
- Display the total capacity for each server by moving the mouse pointer over the bar in the right-most position. (This bar displays different types of information depending on the sort order that you choose.)
- Click on the bar of any server to display the [Per Server Interval Detail](#) chart for that server.
- Press the **Page Up/Page Down** keys (or up and down arrow keys) to scroll through 20 servers at a time.
- Display configuration changes.

Hovering over a server name shows you the configuration of the server on the last day of the displayed time period. If any change has occurred during that time period, the message "Configuration has changed" is displayed on the tip.

Be aware that the chart compares the configuration on the first day of the time period with the configuration on the last day of the time period. If the configuration changed more than once during the time period and ended with the same configuration with which it started, then the tip will not display the indicator. For example, if a VM started on Host A, moved to Host B, then to Host C, and finally back to Host A, the tip will not indicate a change occurred. However, the changes are indicated on the Per Server Interval Detail chart for the VM.

Note: If there are no preferred groups, the **Navigation** pane and the **Return** button will not be present.

1.3.3 Ways to access the chart

The legend and chart vary based on the method you used to access the chart from the Server Capacity Optimization - Group Interval chart, as follows:

- On the Group Interval chart, click the **Servers** button.

The Server Detail List chart displays daily data for the baseline period regardless of the time period displayed on the Group Interval Chart.

- On the Group Interval chart when daily data is displayed, click a single daily data point.

The Server Detail List chart displays daily data for that single selected day.

- On the Group Interval chart when hourly data is displayed, click a single hour data point.

The Server Detail List chart displays hourly data for that single selected hour.

The time period of the chart varies based on the method you used to display the chart, as follows:

- If you clicked on a utilization category in the Group Interval chart, the time period is that of the selected utilization category.
- If you clicked the **Servers** button on the Group Interval chart, the time period is the baseline time range.

1.3.4 *How to sort and filter the chart*

You can both sort and filter the servers that are displayed in the chart. For more information about sorting and filtering options, click the following links.

1.3.4.1 **Sorting**

You can sort the chart by choosing one of the following sort types from the drop-down list at the bottom of the screen:

- **Server** - sorts the servers by server name.
- **Capacity** - sorts the servers first by the Resource Score Capacity and then by peak utilization.
- **Planning Percentile** - sorts the servers by Planning Percentile in descending order.
- **Headroom at Planning Percentile** - sorts the servers the headroom that was still available at the time that consumption was at the planning percentile.

Note: This value is the difference between the Planning Percentile value and the available capacity of the server.

1.3.4.2 Filtering

You can filter the servers by server name, server capacity, optimization category, or by whether they have had configuration changes or not.

By server

Use the **Filter** field to limit the servers and VMs that are displayed in the charts. You can type a single complete server name or you can use the asterisk (*) as a wildcard to display multiple servers meeting the same criteria.

To clear the filter, click the **X** beside the filter box.

For example:

The string ***VM*** returns: Dest**VM**_11, **VM**_SourceHost_01, and **VM**_SourceHost_02.

The string **VM*** returns **VM**_SourceHost_01 and **VM**_SourceHost_02.

The string ***3** returns the following servers: Dest**VM**_03; Dest**VM**_13, and **VM**_SourceHost_03.

Note: The filter functionality is not case sensitive and will return both upper- and lowercase server names.

To clear the filter, click the **X** beside the filter box.

By max capacity

You can also filter the list of servers that are displayed by limiting the servers based on maximum capacity. Enter a Resource Score or Memory value in the **Capacity** field to limit the displayed servers to those having no more than that amount of capacity.

You might want to do this to make it easier to see details of the smaller servers in your system. For example, if the largest server in your system has a Resource Score of 1000, the x-axis of the chart runs from 0 to 1000, making it difficult to see the peak values for servers with Resource Scores of less than 100. If you limit the displayed servers to those with Resource Scores of 100 or less, the x-axis will run from 0 to 100 and the details will be easier to see. (Servers with Resource Scores of greater than 100 will be removed from the display.)

To clear the filter, click the **X** beside the filter box.

By optimization category

You can filter the list of servers that are displayed by optimization category (**Under**, **Good**, **Caution**, **Over**, or **All**). You might want to do this to make it easier to focus on only servers that are in a particular category causing you concern (for example, you can choose Over to see a list of servers that are exceeding their utilization thresholds).

By configuration changes

You can filter the list of servers that are displayed by whether or not their configuration has changed during the displayed period. **All** shows all servers, whether they have had changes to their configurations or not. **Config Changes** displays only servers which have had one or more configuration changes during the displayed time period. **No Config Changes** displays only servers that have not had a configuration change during the displayed time period.

The configuration information displayed when you move the mouse pointer over the server name is the configuration on the last day of the displayed time period. You can see additional details about configuration changes by clicking the capacity bar of an individual server to view the Per Server Interval Detail chart for that server.

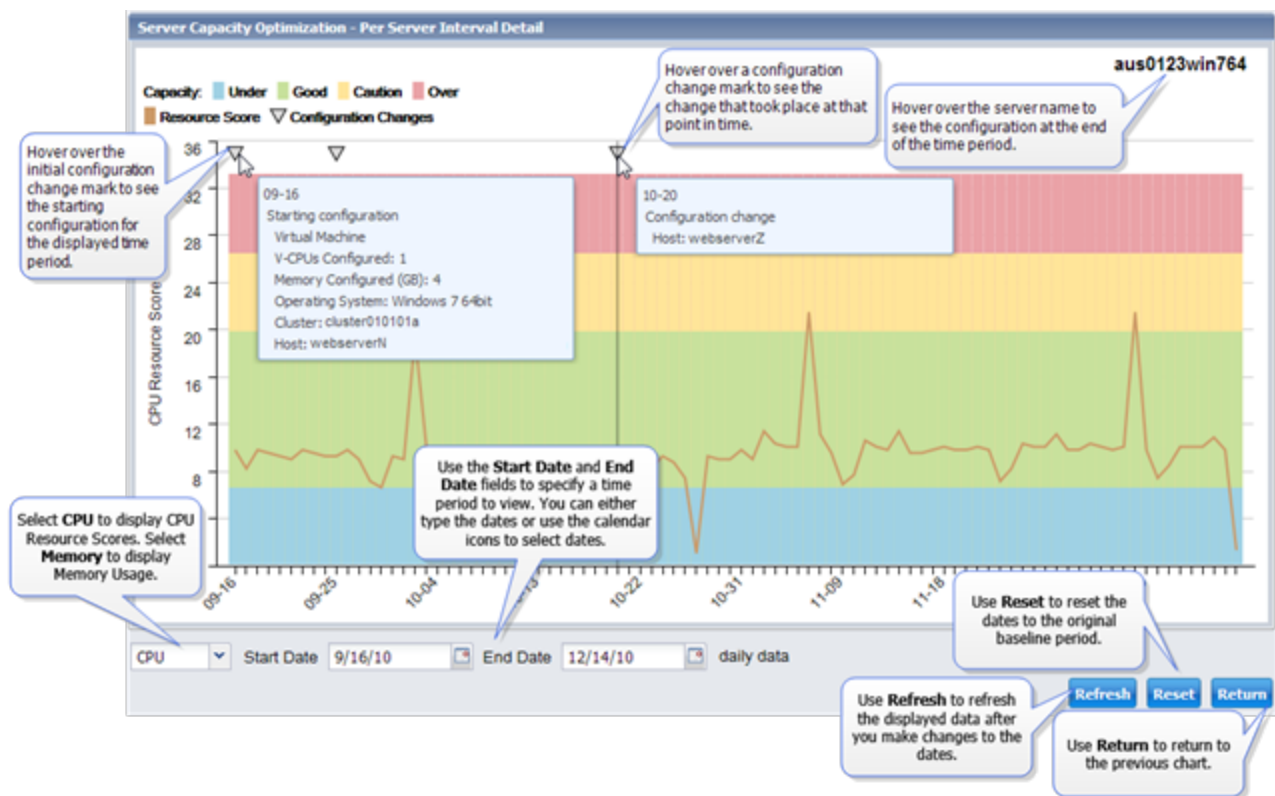
Note: This filter is disabled if none of the servers in the list has configuration changes. It will always be disabled when the server list chart shows only a single hour or day because mid-day configuration changes are always moved forward to the next 12 AM. For example, if a configuration change occurred at 5 AM on 1/25/2012, then it will show as of 12 AM on 1/26/2012.

1.4 How to use and interpret Server Capacity Optimization—Per Server Interval Detail

This chart provides a visualization of the capacity consumption of an individual server during a specified period of divided into four optimization categories (under, good, caution, over). This server capacity can be shown in terms of either CPU Resource Scores or Memory. The chart includes [advanced interactive navigation options](#), and many functions (including zooming and date selection) can be performed interactively on the chart.

The chart lets you quickly view trends, peak and minimum usage, and total capacity for a selected time range. You choose to display CPU Resource Scores or Memory by selecting either **CPU** or **Memory** on the bottom of the screen.

Figure 3 - Example Server Capacity Optimization - Per Server Interval Detail chart



1.4.1 Understanding chart values and legends

Capacity

The capacity (Resource Score or Memory) of the server, displayed as percentages in utilization categories.

The total capacity is the sum of the capacities shown in the utilization categories. You can see the total capacity value by moving the mouse pointer over the top utilization category.

- Under (<20%)** - less than 20% of capacity.
- Good (20% - 60%)** - between 20% and 60% of capacity.
- Caution (60% - 80%)** - between 60% and 80% of capacity.
- Over (>80%)** - over 80% of capacity.

Note: The colors on this chart represent the capacity of the server, as opposed to the slightly darker tones shown on the Server Detail List chart, which represent the planning percentile of the server.

■ Resource Score / Memory

The capacity consumption (Resource Score or Memory) of the server for each interval.

When daily data is displayed - The value is determined by ordering all of the consumption values within the day by their rank percentile and selecting the one that occurs at or just below the planning percentile. (The default planning percentile value is 90.)

When hourly data is displayed - The value is determined by taking all consumption values for the server within a single hour, then reporting the value that occurred at or just below the planning percentile.

Note: A percentile value is chosen to represent the peak capacity consumption because it eliminates outlier values (for example, an atypical activity that causes an unusual spike in consumption). Taking a percentile value (such as a 90th percentile) is usually sufficient to locate a representative peak level of activity.

▼ Configuration Changes

The point at which a configuration change occurred. The first marker shows the configuration as it was at the beginning of the time period. Subsequent markers show only the configuration details that changed. Hover over the name of the server in the upper right corner of the chart to see the configuration as it was at the end of the time period.

+ Consumption Exceeded Capacity Indicator

The point at which the peak usage exceeded the available capacity, which can occur when a VM exceeds its entitlements.

Note: In the case of VMs, it is possible for the actual peak consumption of one or more intervals to exceed the capacity (entitlements) of the VM. If this occurs, the actual peak area is shown rising above the capacity line (marked with the indicator) and a warning message is displayed below the chart.

1.4.2 Using the Server Capacity Consumption—Per Server Interval Detail chart

The Server Capacity Consumption—Per Server Interval Detail is an interactive chart. Display this chart for any server in the group by clicking on the consumption/capacity bars for that server in the **Server Capacity Consumption—Server Detail List** chart.

- Display capacity values for each utilization category by moving the mouse pointer over the utilization categories.
- Display the total capacity values by moving the mouse pointer over the top utilization category.
- Display the actual consumption values for each interval by moving the mouse pointer along the brown Resource Score or Memory line.
- Display configuration information by moving the mouse pointer over the server name.

The legend and chart vary depending on the time period you choose using the Start Date and End Date, as follows:

- If you select a period of ten days or longer, daily data is shown.
- If you select a period of 9 days or less, hourly data is shown.

If the server is part of a group, the group is highlighted in the Navigation Pane on the right.

Note: If you use the Navigation pane to select a different group, the Server Capacity Consumption - Group Interval Chart is displayed for the new group.

1.4.2.1 Changing the chart time period

You can change the time period shown in the chart by using the following fields. After making a change, click **Refresh** to update the data that is displayed on the chart.

Start Date/End Date

Choose a subset of the baseline time period to limit the period of time displayed in the chart. You can enter dates in the fields or you can choose the date by clicking the calendar icon beside each field. After entering new dates, click Refresh to repopulate the chart.

Note: When you change either the Start Date or End Date, the chart is grayed out to indicate that the displayed data no longer corresponds to the dates shown in the Start Date and End Date fields. You must click Refresh to obtain data for the new dates.

When the date range is eight days or less, then the chart displays hourly data instead of daily data.

Note: The granularity of the displayed data is shown next to the End Date field on the chart. This displayed granularity level is not related to the interval at which the data was collected (for example, 5-minute data, 15-minute data).

Refresh

Use this button to refresh the data after you make changes to the start or ending dates.

Reset

Use this button to reset the chart to display the last ninety days of data.

Return

Use this button to return to the previous page of the chart.

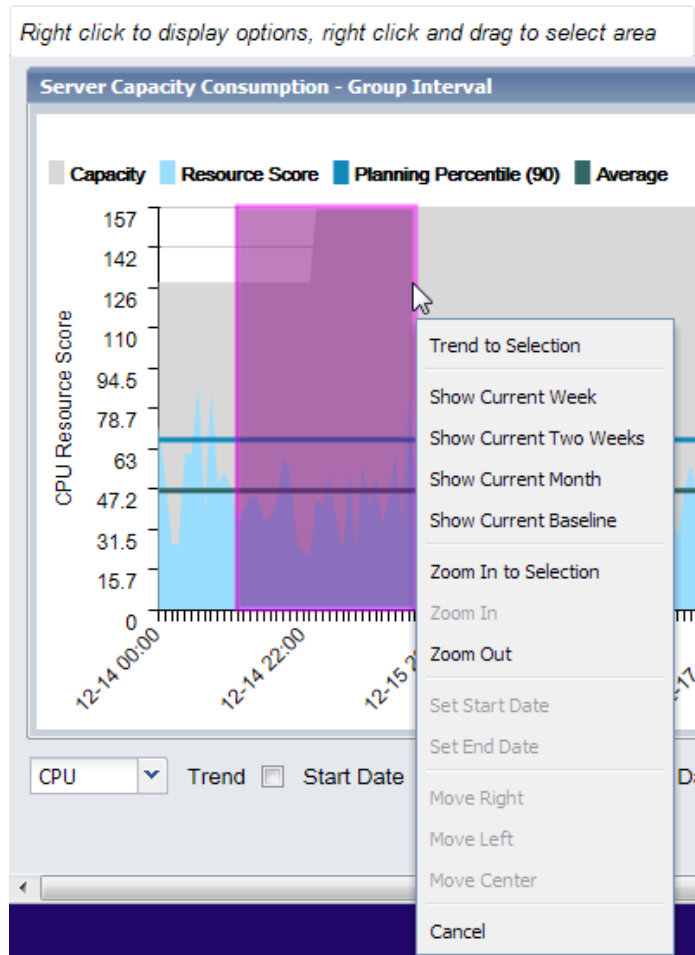
1.5 Interactive chart navigation

The time series charts (such as Resource Score Usage, Optimization, and Placement Replay) include advanced interactive navigation options.

Right mouse button

Using the *right* mouse button, you can

- Click to select a preset date range



(
current week, two weeks, month, or baseline).

- Set the trend line by highlighting a chart region (available on Usage charts only).
- Zoom in by highlighting a chart region.
- Zoom in or zoom out from your current position.
- Point and click to select a new start or end date.
- Move right, left, and center along the baseline.

To use the advanced navigation functionality, either right-click on any point in the chart or right-click and drag to highlight a chart region. A menu enables you to select the navigation function that you need.

Left mouse button

Using the *left* mouse button, you can click to drill in to see more detail. For example, from the group level chart, you can click on a day to see the individual server consumption for that day.

Hover

Move the mouse pointer over server names, dates, and lines on the charts to display informative tool tips.