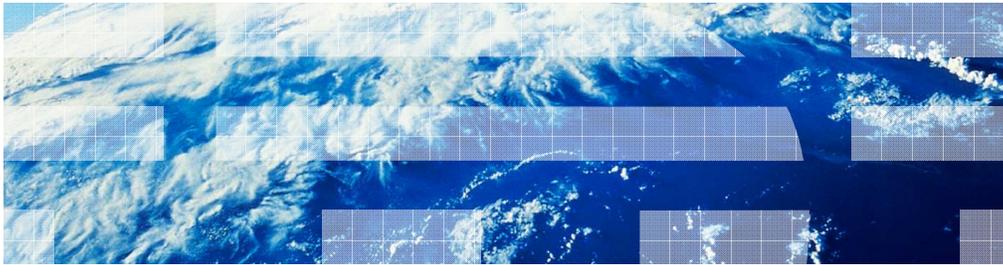


WebSphere Business Monitor

Multi-dimensional analysis



This presentation should provide an overview of multi-dimensional analysis in WebSphere® Business Monitor.

Goals

- Introduce multi-dimensional analysis in WebSphere Business Monitor

This presentation will give you an overview of multi-dimensional analysis and the use of the dimensions and reports widgets in WebSphere Business Monitor.

Agenda

- What are dimensions?
- What is dimensional analysis?
- What is multi-dimensional analysis?
- Dimensions widget
- Reports widget

The agenda for this presentation begins with a discussion of the concepts behind dimensions and multi-dimensional analysis. Then it provides an overview of the dimensions widget and how to configure it. The reports widget is shown next, which has a subset of the dimensions widget capability. An overview of the capability of the reports widget is followed by configuration guidance, and then examples of the different report types.

What are dimensions?

- Process data can be described in terms of:
 - Quantitative data (what you measure or count)
 - Dimensions (how you divide up the data)
- Dimensions provide structure that summarizes measures
- Example quantitative data:
 - Order price, number of sales, shipping time
- Example dimensions:
 - Customer, product, location

Begin by looking at what dimensions provide for you in this analysis. The measurements might be quantitative data, for example 'number of sales'. They might also be more related to a grouping, for example 'customer'. The groupings are dimensions. They allow you to look at quantitative data and summarize them in various ways for further analysis.

What is dimensional analysis?

- Dimensional analysis enables a breakdown of quantitative measures by some grouping (dimension)
- Typically this format:
 - ‘function’ of a ‘measure’ by a ‘dimension’
- For example:
 - **Average of profit by city**
 - **Total of order value by customer**
 - **Maximum of employee salary by time**

Dimensional analysis can be defined as looking at aggregated quantitative measures for specific groupings or dimensions. The aggregated data is a ‘function of a measure’, for example ‘average of profit’ and then the dimension is the grouping, for example ‘by city’. City is a way of grouping your data so that you can analyze the average profit for each city.

Multi-dimensional analysis

- Look at measures by more than one grouping/dimension at a time
- **Average of profit by business unit and by country**
- Dimensions and measures are defined in WebSphere Business Modeler or in the WebSphere Business Monitor toolkit

Multi-dimensional analysis can be thought of as slicing your data by more than one dimensional criteria. For example you can look at the average profit per business unit but then you can add country to that analysis so you can see average profit broken down by both business unit *and* country.

Dimensions and measures can be defined in the business measures view in WebSphere Business Modeler or in the monitor model editor in the WebSphere Business Monitor toolkit.

Dimension levels – Drill up and drill down

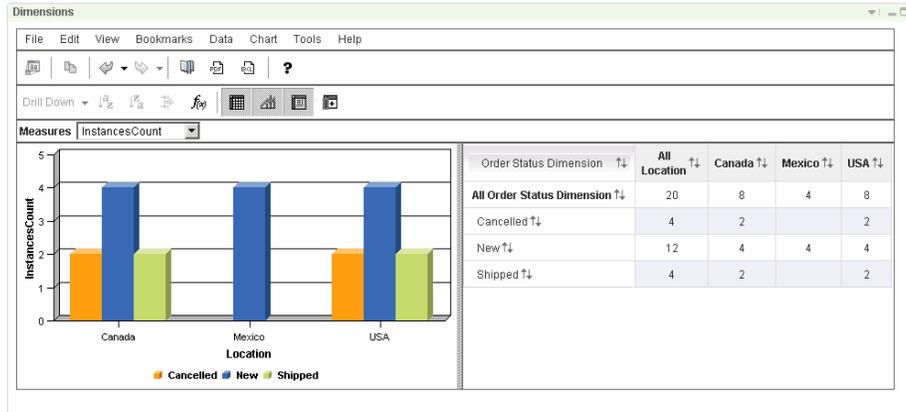
- Dimensions can optionally have multiple levels
- Location
 - Country
 - Region
 - City
- Drill down means to move down to a lower level of analysis
 - Drill down on country to see information by region
 - Drill down on region to see information by city
- Drill up is the opposite
 - Drill up from city to see information by region

Yet another useful capability with dimensions are levels. Instead of looking at the average profit by country, let's introduce different levels of an overall dimension called location. Then you can analyze data by country, region or city. Time is a classic multi-leveled dimension and can be broken down by year, month and day.

Once you have created multi-leveled dimensions you can analyze your data at different levels and can drill up and down amongst these levels, providing bigger or smaller granularity to the analysis.

Dimensions widget

- Generate multidimensional reports that analyze different business aspects of historical business performance data
- Charts and tables present data for analysis against different dimensions
- Enables very powerful analysis of data



8

Multi-dimensional analysis

© 2010 IBM Corporation

The dimensions widget is dedicated to performing dimensional analysis. It consists of a chart and a table. The chart can display many different chart types. In this example a dual-axis vertical bar chart is shown. You can perform very sophisticated analysis with this widget.

Dimensions view

- Built-in dimensions
 - CreationTime
 - TerminationTime
 - Measures
- Measures are the quantitative data that you specify in the model to be aggregated and analyzed.
 - Specified as an aggregate metric in WebSphere Business Modeler or as a measure in the dimensional sub-model of the monitor model using the Monitor toolkit
- Built-in measure
 - InstancesCount

Every monitor model automatically contains certain dimensions and measures and these are shown on this slide. CreationTime and TerminationTime are time based dimensions that contain year, month and day levels. So you can see when the monitor instance is created or terminated. The final dimension that is always provided is called 'Measures'. The measures dimension is where all the quantitative measurements are kept. A quantitative measure is one that was defined as an aggregate metric in the business measures view in WebSphere Business Modeler or as a measure in the dimensional sub-model of the monitor model using the Monitor toolkit.

The monitor model automatically includes a built-in quantitative measure called 'InstancesCount', which provides the number of monitor instances that have been created.

Row, column and page dimensions

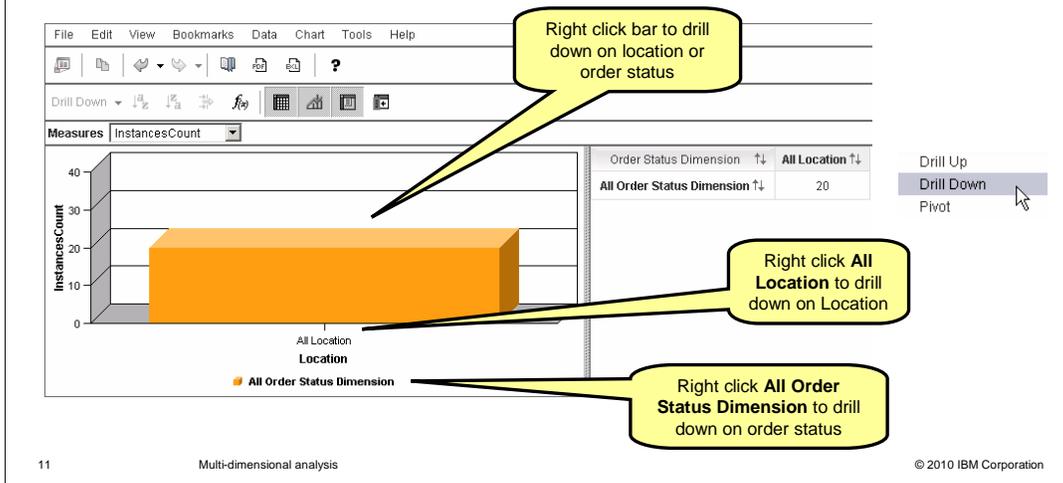


The dimensions widget allows you to set each of your dimensions as either row, column or page dimensions. This affects how the chart and table look. The column dimensions are shown on the table across the top. They are shown on the chart as separate sections on the x-axis. The row dimensions are shown on the table across the left side. They are shown on the chart as separate colored bars on the x-axis. The page dimension is a drop down selection box that allows you to select dimensional values or measures which then affects which quantitative data is shown.

In this example, the location has been specified as a column dimension and has also been drilled down to the country level. So this causes the x-axis in the chart to break up into separate sections for the country. The order status has been specified as a row dimension so this causes the x-axis in the chart to show each order status as a different colored bar. The measures have been specified as the page dimension and the InstancesCount has been selected in the drop down box, so the quantities in the table relate to instance count. Also the y-axis in the chart relates to instance count.

Drill up and drill down

- In this example, the chart is shown at highest level of dimensions (fully drilled up)



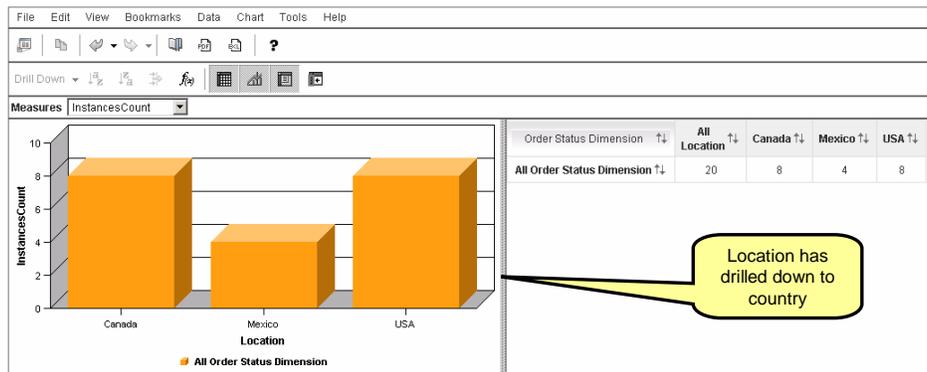
Now you can see the previous chart without any drill downs. The location and order status dimensions are at their top level so there is no breakdown into specific sub-groups. So you can see that there are 20 instances across all locations and all order statuses.

Right clicking on the bar allows you to select drill down and then you are offered which dimension to drill down on. Alternatively you can right click the specific dimension and choose drill down to automatically drill down on the target dimension.

In the next slide you will see the result of a drill down on location.

Drill down example

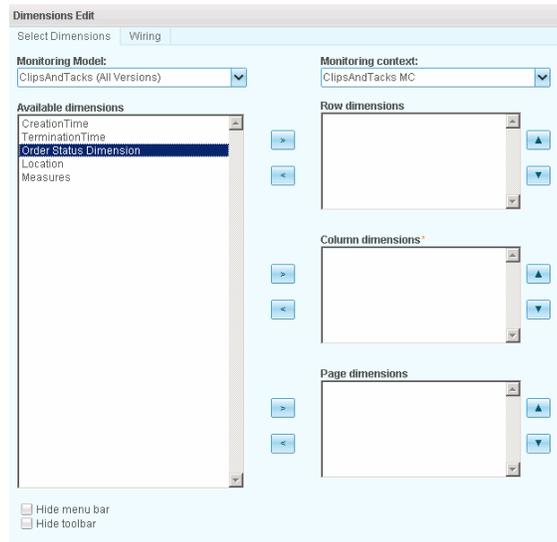
- Result of drilling down on location



Here you can see that after drilling down on location, the country level is shown. So now you see that there are 20 instances for all locations and that includes eight instances in Canada, four instances in Mexico and eight instances in the USA. At this point you can also drill down on order status to see how each of these quantities relates to various order status information.

Dimensions widget – Edit settings

- Choose model and context
- Select dimensions for row, column or page
 - Column requires at least one dimension
 - Page and row are optional
- Typically add measures as page dimension
 - Contains quantitative measures



13

Multi-dimensional analysis

© 2010 IBM Corporation

To configure the widget, enter edit mode on the page then click ‘Edit settings...’ in the widget menu. Select the monitor model and monitor context for that model.

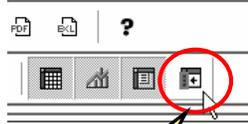
Then you can choose which dimensions to display as row, column or page. You must specify at least one column dimension or there is nothing to display.

Typically you will put measures as a page dimension because these values are quantitative. After configuration is complete, you can select one quantitative measure in the page drop down box which then shows that measure in the chart and table. To perform analysis against a different measure, you can select a different measure in the page drop down box.

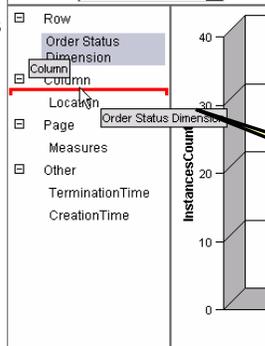
Dimensions widget formatting (1 of 3)

- Customize the chart and table
 - Titles, colors, axis, chart type, grid lines, and more
 - You can bring up the menu on the chart or table
- Further changes to page, row, column dimensions can be done using layout editor
 - Click 'Show Layout' icon
 - Drag and drop dimensions

Data Chart Tools Help



'Show Layout' icon



Drag and drop dimensions

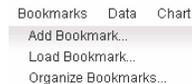
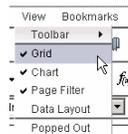
- Sort...
- Drill Up
- Drill Down
- Expand All
- Pivot
- Show Instances
- Show Only
- Hide
- Unhide All
- Keep Only
- Remove Only
- Advanced
- Swap Axes
- Member Filter...
- Calculation Editor...

After configuration is complete, there are options for customizing the display. Right clicking on the chart or table brings up some further options for customizing the appearance of the chart and table. You can sort, pivot, hide, swap axes and more. You can change fonts, titles, and gridlines. Most importantly is the ability to display other chart types like pie charts, waterfalls, radars, histograms and others. You are not restricted to a bar chart.

You can even dynamically change the choices of row, column and page dimensions by clicking the 'show layout' button and then dragging and dropping dimensions.

Dimensions widget formatting (2 of 3)

- Saving formatting when configuring the widget
 - Administrator clicks 'Save Format' while editing the settings
 - Any formatting changes are saved - drill, axis swap, format mask, sorting, and more
 - The initial display when the widget is opened is at the default which was saved by the administrator
 - Similar capability in Bookmarks menu
 - Create and load bookmarks
 - Share bookmarks with other users
 - But you cannot set a default
- Show and hide chart or table (grid)

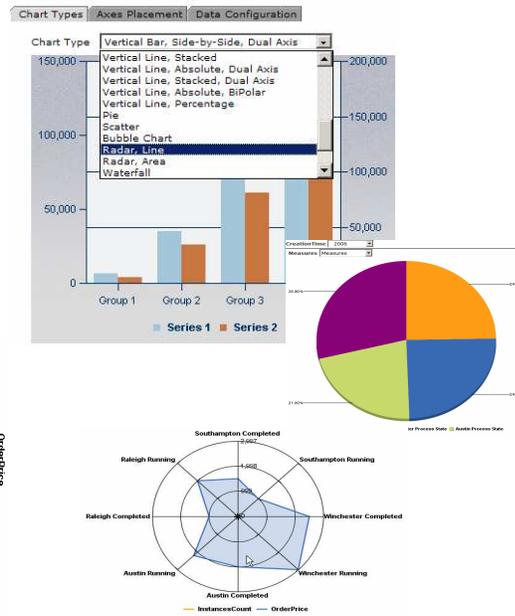
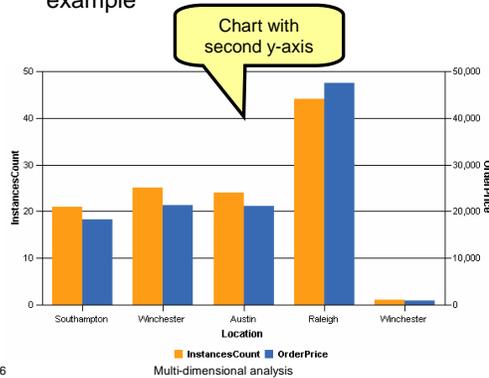
An administrator can also set the formatting options so that the user who logs in will see this formatting as the initial default. Any formatting changes can be saved by pressing the 'Save Format' button during configuration. When the user is actually using the widget, they can also change the formatting, but each time that they log in, the formatting will reset to the default.

Bookmarks provide similar capability. A user can perform formatting and then save a bookmark. Later, the user can load the bookmark and the formatting is loaded automatically. You can also share your bookmarks with other users. However, unlike the administrator formatting, the bookmarks cannot be set as the default for all users.

Other formatting options in the 'View' menu allow you to display only the chart or only the table. Note that the table is called grid in the menu.

Dimensions widget formatting (3 of 3)

- Change chart type
 - Right click, 'Chart Types'
 - On the right are examples of pie and radar area charts
- 'Axes Placement' and 'Data Configuration' tabs
 - Controls what is shown on each axis
 - Useful for dual axis charts as in this example



16

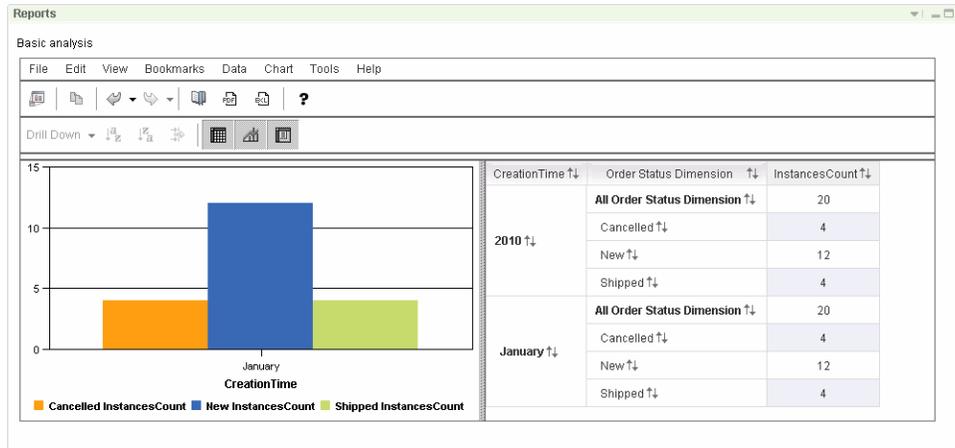
© 2010 IBM Corporation

There are many chart types and it is easy to change between them. Right click and select Chart Types, then on the 'Chart Types' tab choose from the extensive list. On the right of this slide you can see examples of pie and radar area charts.

On the other two tabs, you can also change the placement of dimensions and measures in the chart. So you can even add a second y-axis for displaying a second measure.

Reports widget

- Similar to dimensions widget, except data is displayed relative to a time axis
- There are different types of analysis and this example shows the basic analysis



17

Multi-dimensional analysis

© 2010 IBM Corporation

The reports widget is a special case of the dimensions widget with pre-prepared analysis types and functionality to ease the configuration of the time aspect of the view.

The reports widget always has creation time on the x-axis, so you can easily analyze dimensions as they relate to the creation time of the monitored instances. There are several different types of analysis that you can perform and in this example you see the basic type of analysis.

Four types of analysis

- **Basic** displays the business measures values
- **Quartile** displays the distribution of the data in quartered parts
- **Trend** displays the analysis of the changes in a given item of information over a period of time using Exponentially Weighted Moving Average
- **Control** displays the variation in the business measures that you are measuring to help you understand and reduce the variation

When you configure the reports widget, you can choose from any of these four types of analysis. The basic analysis displays the basic business measure values. Quartile analysis displays the distribution of the data in quartered parts. Trend analysis displays the data using a weighted moving average. Control analysis displays the variation in values relative to the standard deviation.

Reports widget – Edit settings

- Choose one or more measures
 - Built-in measures: sum of new items, sum of resolved items, instances count
 - You can only choose from 'Reports View Measures' or 'Modeled Measures', but not both
- Optionally choose dimension (basic analysis only)
- Choose Analysis type – Basic, quartile, trend, control
- Choose weighting factor (trend analysis only)
- Specify time window and frequency
 - Start date, end date, year-to-date and month-to-date
 - Frequency (daily, monthly, yearly)

Measures

- [-] Reports View Measures
 - Sum of new items
 - Sum of resolved items
- [+] Modeled Measures
 - InstancesCount
 - Average Order Price
 - Sum Order Price
 - Order Count

Dimension:
Order Status Dimension

Analysis type:
Basic

Weighting factor:
0.19

Time range (filters the data to report by the time range you specify)
From:
Friday, January 1, 2010
To:
Thursday, January 28, 2010
Year to Date Month to Date

Frequency:
Daily

19

Multi-dimensional analysis

© 2010 IBM Corporation

To configure the widget, enter edit mode on the page then click 'Edit settings...' in the widget menu.

You need to choose which measures to analyze. There are two built-in measures, the sum of new items and the sum of resolved processes. This is useful if you want to analyze how many instances there have been.

The 'Sum of new items' measure reports the total number of new instances **created** in a specific duration.

The 'Sum of resolved items' measure reports the total number of instances that are **completed** in a specific duration.

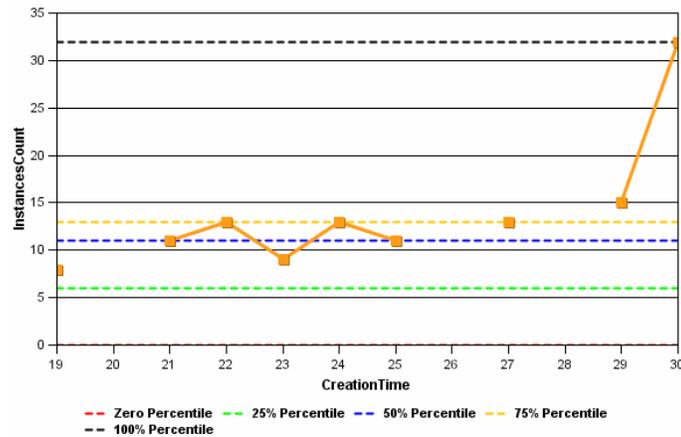
The modeled measures are your own custom measures that you created in the monitor model. You can choose one or more measures from the reports view category or the modeled measures category, but you cannot choose measures from both categories. In the example shown, the items in the first category are gray and not selectable because you have made selections in the second category.

Then you can optionally select a dimension. For basic analysis only, you can select one dimension which is available in the chart in addition to the creation time that is always displayed. You need to select from one of the four analysis types. If you select trend analysis then you can specify the weighting factor for the trend calculation.

You also need to specify a data range and a frequency of data points; daily, monthly, or yearly.

Quartile analysis example

- Displays the value of the boundary at the 25th, 50th, or 75th percentiles of a frequency distribution divided into four parts



20

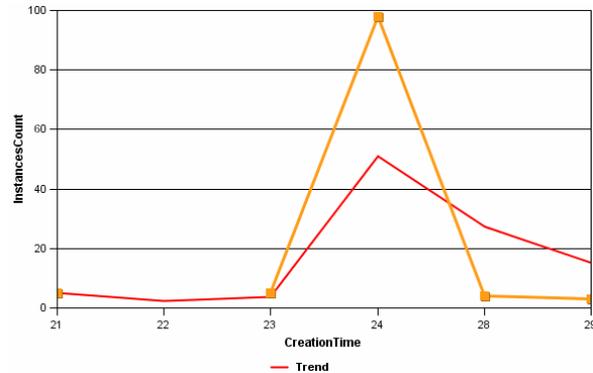
Multi-dimensional analysis

© 2010 IBM Corporation

The quartile analysis shows where the quartile boundaries are for the distribution. In this example it can be seen that on the 29th and 30th of the month the number of processes each day was above 75% of the average day.

Trend analysis example

- Exponentially Weighted Moving Average (EWMA)
- EWMA is the average of historical values that are given weights (by a weighing factor), which exponentially decrease by time



21

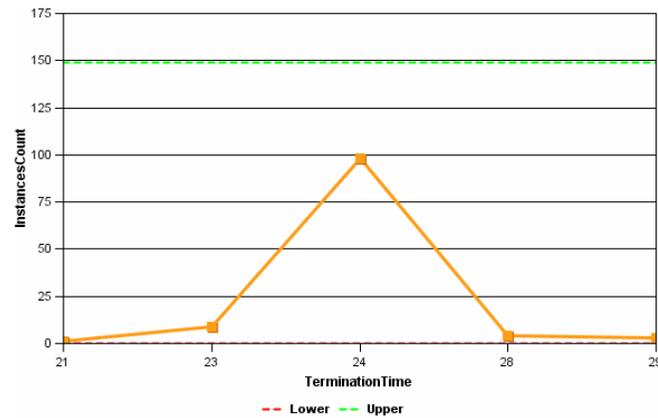
Multi-dimensional analysis

© 2010 IBM Corporation

Trend analysis uses an exponentially weighted moving average. The weighting factor is set as part of the configuration settings. In this example the red line is a trend line whereas the actual values are plotted in orange.

Control analysis example

- Shows boundaries at three times standard deviation
- Used to check that a measure is under control



22

Multi-dimensional analysis

© 2010 IBM Corporation

Control analysis draws boundaries at three times the standard deviation, above and below the average. It is useful for monitoring how stable a measure is over time. If it goes beyond these boundaries then it's a significant deviation from the average.

Summary

- Covered an overview of multi-dimensional analysis in WebSphere Business Monitor

In summary, this presentation covered an overview multi-dimensional analysis and using the dimensions widget and reports widget with WebSphere Business Monitor.

Feedback

Your feedback is valuable

You can help improve the quality of IBM Education Assistant content to better meet your needs by providing feedback.

- Did you find this module useful?
- Did it help you solve a problem or answer a question?
- Do you have suggestions for improvements?

Click to send e-mail feedback:

mailto:iea@us.ibm.com?subject=Feedback_about_WBPM_Monitor_DimensionalAnalysis.ppt

This module is also available in PDF format at: [../WBPM_Monitor_DimensionalAnalysis.pdf](..\\WBPM_Monitor_DimensionalAnalysis.pdf)

You can help improve the quality of IBM Education Assistant content by providing feedback.



Trademarks, disclaimer, and copyright information

IBM, the IBM logo, ibm.com, and WebSphere are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of other IBM trademarks is available on the Web at "[Copyright and trademark information](http://www.ibm.com/legal/copytrade.shtml)" at <http://www.ibm.com/legal/copytrade.shtml>

THE INFORMATION CONTAINED IN THIS PRESENTATION IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY. WHILE EFFORTS WERE MADE TO VERIFY THE COMPLETENESS AND ACCURACY OF THE INFORMATION CONTAINED IN THIS PRESENTATION, IT IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. IN ADDITION, THIS INFORMATION IS BASED ON IBM'S CURRENT PRODUCT PLANS AND STRATEGY, WHICH ARE SUBJECT TO CHANGE BY IBM WITHOUT NOTICE. IBM SHALL NOT BE RESPONSIBLE FOR ANY DAMAGES ARISING OUT OF THE USE OF, OR OTHERWISE RELATED TO, THIS PRESENTATION OR ANY OTHER DOCUMENTATION. NOTHING CONTAINED IN THIS PRESENTATION IS INTENDED TO, NOR SHALL HAVE THE EFFECT OF, CREATING ANY WARRANTIES OR REPRESENTATIONS FROM IBM (OR ITS SUPPLIERS OR LICENSORS), OR ALTERING THE TERMS AND CONDITIONS OF ANY AGREEMENT OR LICENSE GOVERNING THE USE OF IBM PRODUCTS OR SOFTWARE.

© Copyright International Business Machines Corporation 2010. All rights reserved.