

16 Viewing Statistics

Use AppTransaction Xpert to generate and display graphs of statistics that measure network and application performance within each tier pair and connection.

Statistics can be graphed in several ways:

- To view statistics for all tier pairs and connections, choose View > Graph Statistics.
- To view statistics for a tier pair or connection, select a packet, message, or group within the relevant connection. Then right-click on the selection and choose “Graph Statistics for Selected Items”.
- To view statistics for a special combination of tier pairs, packets, protocols, etc., write custom scripts. For more information, see Graphing with Scripts. (This functionality requires a license for AppTransaction Xpert Advanced Capabilities or AppTransaction Xpert Plus.)

You can display AppInternals Xpert Transaction Trace Analyzer (*.apptrace) file data in the Tree View page. You can also import statistics generated by external programs such as perfmon and GlancePlus.

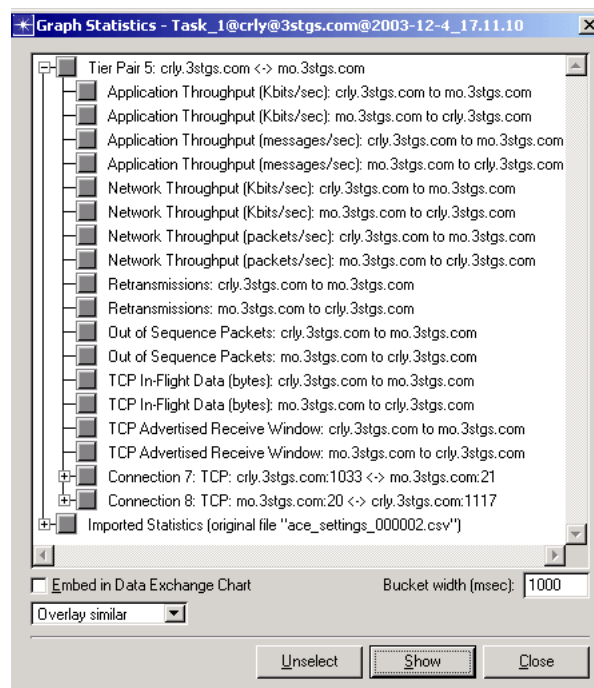
This section includes the following topics:

- Graph Statistics Dialog Box
- Embedding Graphs in the Data Exchange Chart
- Statistic Descriptions
- Creating, Importing, and Viewing Performance Statistics
- Viewing Transaction Trace Analyzer Data

Graph Statistics Dialog Box

The Graph Statistics dialog box shows all available statistics. The treeview organizes statistics by tier pair and (within each tier pair) by connection. To graph one or more statistics, select the statistics and click the Show button.

Figure 16-1 Graph Statistics Dialog Box



For information about native statistics, see [Statistic Descriptions](#)

For information about imported statistics, see [Creating, Importing, and Viewing Performance Statistics](#)

Table 16-1 Graph Statistics Dialog Box

Option/Field	Description
Embed in Data Exchange Chart	If this checkbox is selected, the statistic graph(s) appear embedded in the Data Exchange Chart. (See Embedding Graphs in the Data Exchange Chart .)
Overlay pull-down menu	Specifies whether to overlay similar statistics only, or all statistics, in the same window. The options are: <ul style="list-style-type: none"> • Overlay similar—Overlay both directions of a bidirectional statistic: for example, “Retransmissions: <tier_a> to <tier_b>” and “Retransmissions: <tier_b> to <tier_a>” will appear overlaid in the same graph. This is the recommended setting. • Overlay all—Overlay all selected statistics (regardless of whether they are similar) in the same graph.
Bucket width (msec)	Divides the entire time window into the specified bucket widths and calculates a value for each bucket.

Table 16-1 Graph Statistics Dialog Box (Continued)

Option/Field	Description
Unselect	Unselects all currently selected statistics.
Show	Displays graphs for all selected statistics.

Related Topics

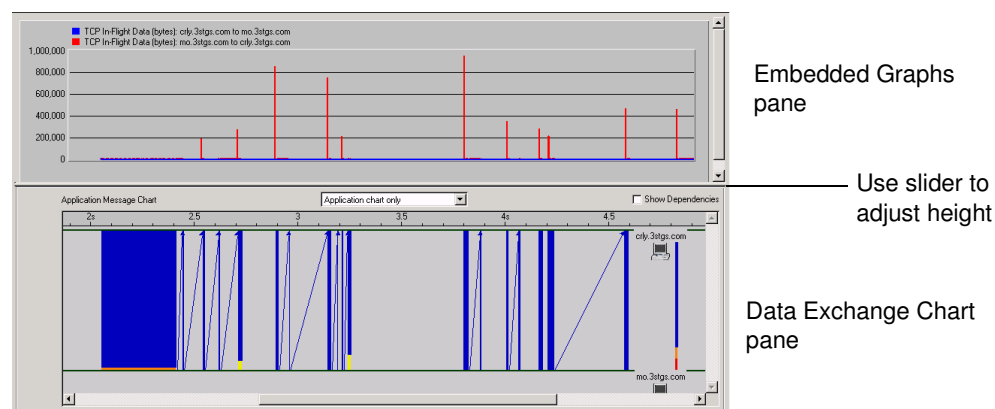
- *Viewing Statistics*

Embedding Graphs in the Data Exchange Chart

Embedding statistic graphs in the Data Exchange Chart is useful when you want to compare how the flow of traffic affects statistic results, because the embedded graphs and the Data Exchange Chart are aligned along the same timeline (x axis).

Note—Statistic graphs can be embedded in the Data Exchange Chart, but not in the Tree View or the Tier Pair Circle.

Figure 16-2 Embedded Statistic Graph: Example



You can perform the following operations on embedded charts:

- Create a new embedded chart—Select the “Embed in Data Exchange Chart” option when you select the statistics to graph. (See Graph Statistics Dialog Box.)
- Remove an embedded chart—While the Data Exchange Chart page is active, choose View > Embedded Statistics > Remove.
- Set the vertical zoom within the embedded graphs pane—While the Data Exchange Chart page is active, choose View > Embedded Statistics > Vertical Scale. Then select an option: 1 Panel, 2 Panels, 3 Panels, Max Panels.

Related Topics

- *Viewing Statistics*

Statistic Descriptions

AppTransaction Xpert divides the entire task duration into individual buckets of time and calculates a mean or total value for each interval. You can change the bucket width in the Graph Statistics Dialog Box.

AppTransaction Xpert can calculate statistics for the following:

- Each tier pair (See Tier-Pair Statistics.)
- Each connection (See Connection Statistics.)

The following table lists the Tier-Pair Statistics.

Table 16-2 Tier-Pair Statistics

Statistic	Description
Application Throughput (Kbits/sec)	Average amount of application data transmitted across all connections from the source to the destination tier.
Application Throughput (messages/sec)	Average number of application messages transmitted across all connections from the source to the destination tier.
Application Turns (sec)	Total number of application turns per second; an application turn occurs when the flow of messages changes direction. For example, when a TierA → TierB message is followed by a TierB → TierA message.
Network Throughput (Kbits/sec)	Average amount of network data transmitted across all connections from the source to the destination tier. This statistic measures throughput of all application data and network protocol overhead.
Network Throughput (packets/sec)	Average number of network packets transmitted across all connections from the source to the destination tier.
Out of Sequence Packets	Total number of out-of-sequence packets (that is, packets in a TCP stream that arrive out of order) for the tier pair. Out-of-sequence packets are usually associated with dropped packets and retransmissions.
Packet Congestion	<p>Average congestion delay for each individual network packet. Specifically, packet congestion is defined by the formula:</p> $\langle packet_congestion \rangle = \langle packet_receive_time \rangle - \langle packet_send_time \rangle - \langle minimum_latency_for_tier_pair \rangle - \langle transmission_delay \rangle - \langle self_congestion \rangle$ <p>“Self-congestion” is the delay caused by congestion as a result of other packets from the same application.</p>
Retransmissions (packets)	Total number of network packets retransmitted across all connections between the source and destination tier.
TCP Advertised Receive Window: $\langle tier_A \rangle$ to $\langle tier_B \rangle$	The TCP receive window size of tier A, as seen from tier B. This value indicates the maximum amount of data that a tier A can accept. If the window size decreases to zero, the window becomes frozen. This can result in a TCP Frozen Window bottleneck in the AppDoctor Diagnosis page.

Table 16-2 Tier-Pair Statistics (Continued)

Statistic	Description
TCP In-Flight Data (bytes)	<i>Tier pairs with TCP connections only</i> —Average amount of in-flight data in all TCP connections between the source and the destination tier. “In-flight data” is defined as data sent from the source tier, but not yet acknowledged by the destination tier, at a given point in time. AppTransaction Xpert updates this statistic when a TCP connection sends a sequence packet or receives an ACK packet. For high-latency, high-bandwidth connections, the amount of in-flight data will be bounded by either the send-window size, the receive-window size, or (ideally) by the product of the bandwidth times the round-trip delay.
TCP Nagle’s Delay (sec)	The amount of delay incurred due to Nagle’s algorithm, which is a sender-side algorithm that reduces the number of small packets sent.

The following table lists the Connection Statistics.

Table 16-3 Connection Statistics

Statistic	Description
Application Throughput (Kbits/sec)	Average amount of application data transmitted across the connection from the source to the destination tier.
Application Throughput (messages/sec)	Average number of application messages transmitted across the connection from the source to the destination tier.
Network Throughput (Kbits/sec)	Average amount of network data transmitted across the connection from the source to the destination tier. This statistic measures throughput of all application data and network protocol overhead.
Network Throughput (packets/sec)	Average number of network packets transmitted across the connection from the source to the destination tier.
Out of Sequence Packets	Total number of out-of-sequence packets (that is, packets in a TCP stream that arrive out of order) for the connection. Out-of-sequence packets are usually associated with dropped packets and retransmissions.
Packet Congestion	<p>Average congestion delay for each individual network packet. Specifically, packet congestion is defined by the formula:</p> $\text{<packet_congestion>} = \text{<packet_receive_time>} - \text{<packet_send_time>} \\ - \text{<minimum_latency_for_tier_pair>} \\ - \text{<transmission_delay>} - \text{<self_congestion>}$ <p>“Self-congestion” is the delay caused by congestion as a result of other packets from the same application.</p>
Retransmissions (packets)	Total number of network packets retransmitted.
TCP Advertised Receive Window: <tier_A> to <tier_B>	The TCP receive window size of tier A, as seen from tier B. This value indicates the maximum amount of data that a tier A can accept. If the window size decreases to zero, the window becomes frozen. This can result in a TCP Frozen Window bottleneck in the AppDoctor Diagnosis page.

Table 16-3 Connection Statistics (Continued)

Statistic	Description
TCP In-Flight Data (bytes)	<i>TCP connections only</i> —Average amount of in-flight data in the connection between the source and the destination tier. “In-flight data” is defined as data sent from the source tier, but not yet acknowledged by the destination tier, at a given point in time. AppTransaction Xpert updates this statistic when a TCP connection sends a sequence packet or receives an ACK packet. For high-latency, high-bandwidth connections, the amount of in-flight data will be bounded by either the send-window size, the receive-window size, or (ideally) by the product of the bandwidth times the round-trip delay.
TCP Sent Sequence and Received Ack Numbers: <tier_A> to <tier_B>	<p>The Sent Sequence Number is the last TCP sequence number to be sent from tier A. This is not the last sent byte, which is <sent_sequence_number> + <packet_length>.</p> <p>The Received Ack Number is the last TCP ACK number to have been received at tier A. The Received ACK Number will frequently be higher than the Sent Sequence Number, but should not be higher than <sent_sequence_number> + <packet_length>.</p>
TCP Sequence Deltas and Ack Deltas	<p>The difference between the TCP sequence numbers of the nth and the $<n-1>$th packets, and the difference between the TCP ACK numbers of the nth and the $<n-1>$th packets.</p> <p>This statistic is useful for viewing the effects of packet drops. If the differences increase over time, this can indicate a problem with the connection.</p>

Related Topics

- *Viewing Statistics*

Creating, Importing, and Viewing Performance Statistics

You can import performance statistics from external files and graph the statistics in AppTransaction Xpert. This feature is useful when you want to see how performance at a specific tier (for example, at a server) changes during a transaction.

Workflow Description

Performance statistics are most useful when they were captured at the same time, and on the same computer. This makes it easy to synchronize the start times of the statistics with the Transaction Analyzer model. Therefore, the best workflow is to capture performance statistics and application traffic from the computer whose performance you want to view.

The recommended sequence of steps is as follows:

- 1) Start the performance-monitoring process.
- 2) Start the traffic capture.
- 3) Run the transaction.
- 4) Stop the application traffic capture.
- 5) Stop the performance-monitoring process.

You can import performance statistics even if they were not captured at the same time as the transaction. To create useful statistics, start the performance-monitoring process and then run the transaction under conditions as close as possible to those when the original transaction was captured. When you import the data, you must synchronize the start times of the performance statistics with the Transaction Analyzer model.

Creating Performance Data Files

Performance statistics from perfmon and system-performance packet traces can be imported into AppTransaction Xpert.

Use any of the following procedures to create the data files:

- Windows—There are three methods for capturing Windows performance data:
 - Creating Windows Performance Data Files with Application Capture Agents (This is the recommended approach for capturing performance data on Windows; because the performance and the traffic packet traces are based on the same clock, it is easy to synchronize the start times.)
 - Creating Perfmon Data Files in Windows NT 4.0
 - Creating Perfmon Data Files in Windows 2000 (Pro/Server), Windows XP, or Windows 2003 Server
- Other platforms—To import performance data from other computers, you must copy your data into a .csv file with the format described in Generic File Format for Performance Statistics.

Creating Windows Performance Data Files with Application Capture Agents

You can capture Windows performance data using AppTransaction Xpert capture agents. This feature allows you to capture application traffic and Windows performance data simultaneously, then view the data together in AppTransaction Xpert. The following procedure describes the general workflow.

Procedure 16-1 Capturing Windows Performance Data with Capture Agents

- 1 Install the latest version of the capture agent on the Windows host.

To download capture agent installer and instructions, go to <https://support.riverbed.com>.

Important—To capture Windows performance data, you must install the Windows capture agent “with Extras”.

- 2 Configure the capture agent: In the Remote Capture Agent Editor (Continuous Captures), select the “Include Server Data” checkbox.
- 3 Perform a capture as described in Procedure 4-6 Capturing Traffic with Capture Manager.

Two files are created in the capture directory:

- The application traffic (*.appcapture) file
- The Windows performance data (*.appcapture.da) file

- 4 Create a Transaction Analyzer model based on the application traffic (*.appcapture) file.
- 5 Import the performance data (*.appcapture.da) file, as described in Procedure 16-4 Importing Performance Statistics into a Transaction Analyzer Model.

End of Procedure 16-1

Creating Perfmon Data Files in Windows NT 4.0

The following procedure describes how to create AppTransaction Xpert-compatible Perfmon files in Windows NT 4.0.

Procedure 16-2 Creating Perfmon Data Files in Windows NT 4.0

- 1 Open the Windows Performance window:
 - 1.1 From the Windows Start menu, choose Run...
 - 1.2 In the Run window, enter **perfmon** and click OK.
- 2 Specify the log options:
 - 2.1 In the Performance window, choose View > Log.
 - 2.2 Add the objects you want to monitor (choose Edit > Add To Log).

Note—You can only add objects here, and not counters.

 - 2.3 Choose Options > Log.
 - ➡ The Log Options dialog box appears.
 - 2.4 Specify the following options:
 - The file name and save directory for the data file.
 - Set the period interval to 1.
- 3 Create the log file:
 - 3.1 Click “Start Log”.
 - 3.2 When you finish collecting data, open the “Log Options” dialog box and click “Stop Log”.
 - ➡ The log file is saved. Note that this log file is in a proprietary format and is not directly readable by AppTransaction Xpert.
- 4 Import data from the log file into the chart:
 - 4.1 Choose View > Chart to switch to the chart view.
 - 4.2 Choose Options > Data From...
 - ➡ The Data From dialog appears.
 - 4.3 Select the Log File radio button and select the log file.
- 5 Add counters (of the objects monitored in the log file) to the chart:
 - 5.1 Choose Edit > Add to Chart.
 - 5.2 Add the desired counters.
- 6 Choose File > Export Chart.
- 7 Set the Save As option to Export CSV Files (*.csv).

8 Specify a filename and click save.

End of Procedure 16-2

Creating Perfmon Data Files in Windows 2000 (Pro/Server), Windows XP, or Windows 2003 Server

The following procedure describes how to create Perfmon files that can be imported into an application task (AppTransaction Xpert) file.

Procedure 16-3 Creating Perfmon Data Files in Windows 2000 (Pro/Server), Windows XP, or Windows 2003 Server

- 1 Open the Windows Performance window:
 - 1.1 From the Windows Start menu, choose Run...
 - 1.2 In the Windows Run menu, enter **perfmon** and click OK.
- 2 Create a log settings file:
 - 2.1 In the treeview pane, select Console Root > Performance Logs and Alerts > Counter Logs.
 - 2.2 Choose Action > New Log Settings..., enter a name, and click OK.
 - ➡ The *<log_settings_name>* dialog box appears.
 - 2.3 In the General tabbed page, add counters and set the sample interval to 1 second.
 - 2.4 In the Log Files tabbed page, specify the file location, file name, and log file type (Text file - CSV).
 - 2.5 In the Schedule tabbed page, set the Start Log option to Manually.
 - 2.6 Click OK to close the *<log_settings_name>* dialog box.
- 3 Create the data log file:
 - 3.1 In the Windows Performance window, select the log settings file that you want to use in the log settings table.
 - 3.2 Choose Action > Start.
 - 3.3 When you finish with the data collection, select the log setting and choose Action > Stop.

End of Procedure 16-3

Generic File Format for Performance Statistics

To import performance data from a computer that is not running Windows NT, 2000, 2003, or XP, you must copy the data into a comma-separated-value (.csv) file that uses one of the formats shown in Figure 16-3 and Figure 16-4. A data file can include multiple statistics.

Figure 16-3 Performance Data File Format A (Absolute Time)

```
#Performance data file uses the following .csv format:

#<time_name> [not used],    <stat_1_name>,    <stat_2_name>,...
#<time_val_1>,              <stat_1_val_1>,    <stat_2_val_1>,...
#<time_val_2>,              <stat_1_val_2>,    <stat_2_val_2>,...

#Example lines:
(PDH-CSV 4.0) (EST) (300),  \\pc5\Memory\% Committed Bytes in Use,  \\pc5\Memory\Available MBytes
11/12/2003 11:34:32.319,    29.64,              111
11/12/2003 11:34:33.334,    29.65,              111
```

Figure 16-4 Performance Data File Format B (Relative Time)

```
#Performance data file uses the following .csv format:

#<time_name> [not used],    <stat_1_name>,    <stat_2_name>,...
#<time_val_1>,              <stat_1_val_1>,    <stat_2_val_1>,...
#<time_val_2>,              <stat_1_val_2>,    <stat_2_val_2>,...

#Example lines:
seconds,                    \\pc5\Processor\%Processor Time,  \\pc5\TCP\Segments/sec
0.319,                      99.9900714679789,                10.307
1.334,                      6.151231094,                    7.89626344003743
```

Creating GlancePlus Statistic Files

AppTransaction Xpert can import performance statistic files generated by GlancePlus. The required file format is shown in the following figure.

The easiest way to create GlancePlus data files is in two steps. First, create a syntax file that specifies the GlancePlus statistics you want to collect. For information about available statistics, see the GlancePlus documentation.

Figure 16-5 GlancePlus Syntax File Format

```
# GlancePlus syntax file has two parts:
# 1) Loop code to print headers
# 2) Print command to output statistic data

# Part 1: Loop code prints out headers once and exactly once per glance
# call, regardless of the "-iterations" value
# "print" line should be in the format:
# print gbl_statdate, ",", gbl_stattime, ",",
# <GlancePlus_stat_name_1>, ",",
# <GlancePlus_stat_name_2>, ",",
# ...
# <GlancePlus_stat_name_n>

# Part 2: print command should have the following format:
# "print" line should be in the format:
# print gbl_statdate, ",", gbl_stattime, ",",
# <GlancePlus_stat_1>, ",",
# <GlancePlus_stat_2>, ",",
# ...
# <GlancePlus_stat_n>

# (NOTE: The entire print command should have no line breaks;
# statistics appear on separate lines here to make
# the format easier to read.)

# Example:

# Part 1 (print headers)
i = i
if (i == 0) then {
print "Date,", "Time,", "gbl_disk_block_write,", "gbl_cpu_total_util"
i = 1
}

# Part 2 (print data)
print gbl_statdate, ",", gbl_stattime, ",", gbl_disk_block_write, ",",
gbl_cpu_total_util
```

After creating a GlancePlus syntax file, enter the following command from a GlancePlus command prompt:

```
glance -adviser_only -syntax <syntax_file_name> -j 1 -iterations <num_of_data_points>
```

Importing Performance Statistics

After creating performance data files, you can import the data into a Transaction Analyzer model.

Procedure 16-4 Importing Performance Statistics into a Transaction Analyzer Model

- 1 Open the Transaction Analyzer model into which you want to import the performance data.
- 2 In the Data Exchange Chart window, choose one of the following operations:
 - For AppInternals Xpert files: File > Import Server Data > AppInternals Xpert Statistics
 - For Windows performance files captured using AppTransaction Xpert capture agents: File > Import Server Data > Server Statistics from AppTransaction Xpert Capture Agents
 - For Windows Perfmon files: File > Import Server Data > Perfmon Statistics
 - For generic performance files: File > Import Server Data > Performance Statistics (.csv)

➡ The Manage Imported Statistics Dialog Box appears; then the “Specify location of statistics file” dialog box appears.
- 3 In the “Specify location of statistics file” dialog box, select the statistics to import.

➡ The Adjust Statistic Parameters Dialog Box appears.
- 4 Specify the “Imported data” option and the time offset between the application task and the imported data, as listed in Table 16-5.
- 5 For each statistic that you do not want to import, set the Keep? field to No.
- 6 Click OK to close the Adjust Statistic Parameters dialog box.

➡ The statistics are imported into the Transaction Analyzer model. All imported statistics appear under “Imported Statistics (original file <filename>)” in the treeview of the Graph Statistics dialog box (Graph > Graph Statistics).
- 7 If the “Manage Imported Statistics” dialog box appears, click OK to close the dialog box.

End of Procedure 16-4

Manage Imported Statistics Dialog Box

The “Manage Imported Statistics” dialog box appears when you import statistics and when you choose Graphs > Manage Imported Statistics. Use this dialog box to import, edit, remove, and show graphs of performance statistics.

Figure 16-6 Manage Imported Statistics Dialog Box

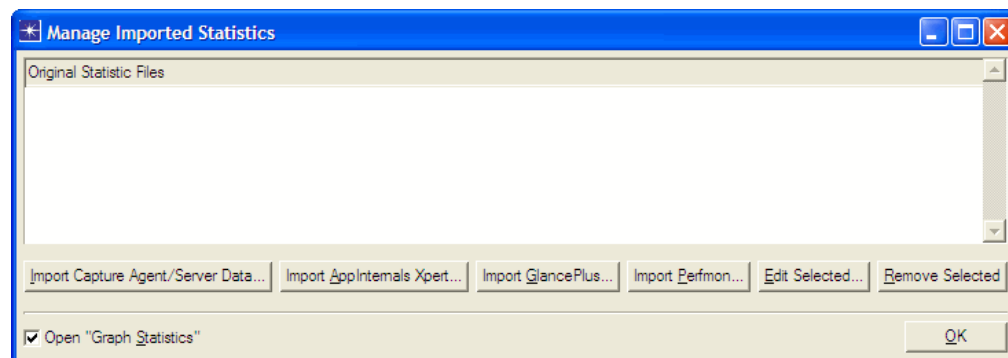


Table 16-4 Manage Imported Statistics Dialog Box

Field/Option	Description
Import Capture Agent/Server Data...	Import new statistics from a Capture Agent/Server data (*.da) file
Import AppInternals Xpert...	Import new statistics from an AppInternals Xpert (*.pan) file
Import GlancePlus...	Import new statistics from a GlancePlus file
Import Perfmon...	Import new statistics from a Perfmon or performance data file
Edit Selected	Edit statistic settings for the selected file in the “Adjust Statistic Parameters” dialog box (see Figure 16-7)
Remove Selected	Remove all statistics from the selected data file
Open “Graph Statistics”	Open the “Graph Statistics” dialog box after clicking OK

Adjust Statistic Parameters Dialog Box

Use the Adjust Statistic Parameters dialog box to include or exclude statistics in a data file, and to synchronize the times for the statistics with those in the Transaction Analyzer model. This dialog box appears when you import a data file, as described in Procedure 16-4. You can also use this dialog box to edit existing statistics, as described in Manage Imported Statistics Dialog Box.

Figure 16-7 Adjust Statistic Parameters Dialog Box

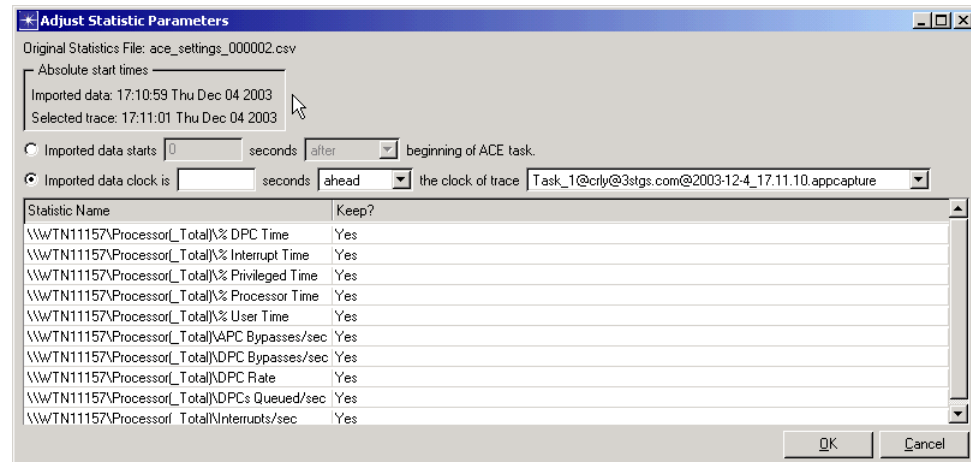


Table 16-5 Adjust Statistic Parameters Dialog Box

Field/Option	Description
<p>“Imported data” radio buttons</p> <p>• “Imported data clock is x seconds [ahead/behind] the clock of trace <capture_file_name>”</p> <p>• “Imported data starts X seconds [after/before] beginning of AppTransaction Xpert task”</p>	<p>Use these options to synchronize the performance statistic times with the application transaction times.</p> <p>This is the preferred option, especially if the performance capture data uses absolute times (as described in Figure 16-3). If the performance data was captured on the same machine as a traffic packet trace, select the traffic file (in the “trace” field) and specify an offset of 0.</p> <p>If the performance data and the traffic packet trace were captured simultaneously but on different computers, you must specify the time difference between the clocks of the two machines as the offset.</p> <p>If the performance data and the traffic packet trace were captured at non-overlapping times, you should use the other synchronization option (“Imported data starts X seconds...”).</p> <p>Select this option only if the statistics file uses relative times (as described in Figure 16-4), and you know the performance data well enough that you can estimate an approximate offset.</p>
Absolute start times	Shows the absolute start time recorded in the selected traffic packet trace (“Selected trace:”) and the performance data file (“Imported data:”)
Statistic Name	Statistic name as recorded in the data file
Keep?	Specifies whether the statistic is imported into the Transaction Analyzer model file

Viewing Transaction Trace Analyzer Data

You can view AppInternals Xpert Transaction Trace Analyzer transaction data (.apptrace) in AppTransaction Xpert. For more information, see Transaction Trace Analysis.