

# HP LoadRunner

Software Version: 12.01

## Analysis User Guide

Document Release Date: July 2014

Software Release Date: July 2014



# Legal Notices

## Warranty

The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

The information contained herein is subject to change without notice.

## Restricted Rights Legend

Confidential computer software. Valid license from HP required for possession, use or copying. Consistent with FAR 12.211 and 12.212, Commercial Computer Software, Computer Software Documentation, and Technical Data for Commercial Items are licensed to the U.S. Government under vendor's standard commercial license.

## Copyright Notice

© Copyright 1993-2014 Hewlett-Packard Development Company, L.P.

## Trademark Notices

Adobe® is a trademark of Adobe Systems Incorporated.

Microsoft® and Windows® are U.S. registered trademarks of Microsoft Corporation.

Oracle and Java are registered trademarks of Oracle and/or its affiliates.

UNIX® is a registered trademark of The Open Group.

## Documentation Updates

The title page of this document contains the following identifying information:

- Software Version number, which indicates the software version.
- Document Release Date, which changes each time the document is updated.
- Software Release Date, which indicates the release date of this version of the software.

To check for recent updates or to verify that you are using the most recent edition of a document, go to: <http://h20230.www2.hp.com/selfsolve/manuals>

This site requires that you register for an HP Passport and sign in. To register for an HP Passport ID, go to: <http://h20229.www2.hp.com/passport-registration.html>

Or click the **New users - please register** link on the HP Passport login page.

You will also receive updated or new editions if you subscribe to the appropriate product support service. Contact your HP sales representative for details.

## Support

Visit the HP Software Support Online web site at: <http://www.hp.com/go/hpsupportsupport>

This web site provides contact information and details about the products, services, and support that HP Software offers.

HP Software online support provides customer self-solve capabilities. It provides a fast and efficient way to access interactive technical support tools needed to manage your business. As a valued support customer, you can benefit by using the support web site to:

- Search for knowledge documents of interest
- Submit and track support cases and enhancement requests
- Download software patches
- Manage support contracts
- Look up HP support contacts
- Review information about available services
- Enter into discussions with other software customers
- Research and register for software training

Most of the support areas require that you register as an HP Passport user and sign in. Many also require a support contract. To register for an HP Passport ID, go to:

<http://h20229.www2.hp.com/passport-registration.html>

To find more information about access levels, go to:

[http://h20230.www2.hp.com/new\\_access\\_levels.jsp](http://h20230.www2.hp.com/new_access_levels.jsp)

**HP Software Solutions Now** accesses the HPSW Solution and Integration Portal Web site. This site enables you to explore HP Product Solutions to meet your business needs, includes a full list of Integrations between HP Products, as well as a listing of ITIL Processes. The URL for this Web site is <http://h20230.www2.hp.com/sc/solutions/index.jsp>

## About this PDF Version of Online Help

This document is a PDF version of the online help. This PDF file is provided so you can easily print multiple topics from the help information or read the online help in PDF format. Because this content was originally created to be viewed as online help in a web browser, some topics may not be formatted properly. Some interactive topics may not be present in this PDF version. Those topics can be successfully printed from within the online help.

# Contents

Analysis User Guide .....	1
Welcome to the Analysis User Guide .....	14
LoadRunner Online Help .....	14
Additional Online Resources .....	14
What's New in LoadRunner 12.00 and 12.01 .....	16
Analysis .....	22
Working with Analysis .....	22
Introduction to Analysis .....	22
Analysis Overview .....	22
Analysis Basics .....	24
Analysis API .....	25
Network Virtualization .....	25
How to Customize the Layout of Analysis Windows .....	26
Analysis Toolbars .....	27
Session Explorer Window .....	29
Open a New Graph Dialog Box .....	31
Print Graphs or Reports .....	32
Configuring Analysis .....	33
Summary Data Versus Complete Data .....	33
Importing Data Directly from the Analysis Machine .....	33
How to Configure Settings for Analyzing Load Test Results .....	35
General Tab (Options Dialog Box) .....	36
Result Collection Tab (Options Dialog Box) .....	38
Data Aggregation Configuration Dialog Box (Result Collection Tab) .....	43
Database Tab (Options Dialog Box) .....	45
Advanced Options Dialog Box (Database Tab) .....	51
Web Page Diagnostics Tab (Options Dialog Box) .....	52
Session Information Dialog Box (Options Dialog Box) .....	53
Viewing Load Test Scenario Information .....	54
Viewing Load Test Scenario Information .....	54

How to Configure Controller Output Messages Settings .....	55
Controller Output Messages Window .....	56
Summary Tab .....	57
Filtered Tab .....	60
Scenario Run Time Settings Dialog Box .....	62
Defining Service Level Agreements .....	63
Service Level Agreements Overview .....	63
Tracking Period .....	64
How to Define Service Level Agreements .....	65
How to Define Service Level Agreements - Use-Case Scenario .....	66
Service Level Agreement Pane .....	69
Advanced Options Dialog Box (Service Level Agreement Pane) .....	70
Goal Details Dialog Box (Service Level Agreement Pane) .....	72
Service Level Agreement Wizard .....	72
Select a Measurement Page .....	73
Select Transactions Page .....	74
Set Load Criteria Page .....	75
Set Percentile Threshold Values Page .....	77
Set Threshold Values Page (Goal Per Time Interval) .....	78
Set Threshold Values Page (Goal Per Whole Run) .....	80
Working with Application Lifecycle Management .....	80
Managing Results Using ALM - Overview .....	80
How to Connect to ALM .....	81
How to Work with Results in ALM - Without Performance Center .....	82
How to Work with Results in ALM - With Performance Center .....	83
How to Upload a Report to ALM .....	86
HP ALM Connection Dialog Box .....	87
Upload Report to Test Lab Dialog Box .....	90
Analysis Graphs .....	91
Analysis Graph Types .....	91
Configuring Graph Display .....	93
How to Customize the Analysis Display .....	93
Display Options Dialog Box .....	94
Editing Main Chart Dialog Box (Display Options Dialog Box) .....	96
Chart Tab (Editing MainChart Dialog Box) .....	98
Series Tab (Editing MainChart Dialog Box) .....	99
Legend Window .....	100
Measurement Description Dialog Box .....	104

Measurement Options Dialog Box .....	105
Legend Columns Options Dialog Box .....	106
Apply/Edit Template Dialog Box .....	107
Color Palettes .....	109
Color Palette Dialog Box .....	110
Working with Analysis Graph Data .....	113
Determining a Point's Coordinates .....	113
Drilling Down in a Graph .....	113
Changing the Granularity of the Data .....	115
Viewing Measurement Trends .....	117
Auto Correlating Measurements .....	117
Viewing Raw Data .....	118
How to Manage Graph Data .....	119
Drill Down Options Dialog Box .....	122
Auto Correlate Dialog Box .....	123
Graph/Raw Data View Table .....	126
Graph Properties Pane .....	128
Filtering and Sorting Graph Data .....	129
Filtering Graph Data Overview .....	129
Sorting Graph Data Overview .....	130
Filter Conditions .....	130
Custom Filter Dialog Box .....	143
Filter Dialog Boxes .....	144
Filter Builder Dialog Box .....	147
Hierarchical Path Dialog Box .....	149
Scenario Elapsed Time Dialog Box .....	149
Set Dimension Information Dialog Box .....	150
Vuser ID Dialog Box .....	151
Cross Result and Merged Graphs .....	153
Cross Result and Merged Graphs Overview .....	153
Cross Result Graphs Overview .....	153
Merging Types Overview .....	154
How to Generate Cross Results Graphs .....	156
How to Generate Merged Graphs .....	157
Merge Graphs Dialog Box .....	158
Vuser Graphs .....	159
Vuser Graphs Overview .....	159
Rendezvous Graph (Vuser Graphs) .....	159

Running Vusers Graph .....	160
Vuser Summary Graph .....	161
Error Graphs .....	162
Error Graphs Overview .....	162
Errors per Second (by Description) Graph .....	162
Errors per Second Graph .....	163
Error Statistics (by Description) Graph .....	164
Error Statistics Graph .....	165
Total Errors per Second Graph .....	166
Transaction Graphs .....	167
Transaction Graphs Overview .....	167
Average Transaction Response Time Graph .....	167
Total Transactions per Second Graph .....	170
Transaction Breakdown Tree .....	171
Transactions per Second Graph .....	172
Transaction Performance Summary Graph .....	173
Transaction Response Time (Distribution) Graph .....	175
Transaction Response Time (Percentile) Graph .....	176
Transaction Response Time (Under Load) Graph .....	177
Transaction Summary Graph .....	178
Web Resources Graphs .....	179
Web Resources Graphs Overview .....	179
Hits per Second Graph .....	180
Throughput Graph .....	181
HTTP Status Code Summary Graph .....	182
HTTP Status Codes .....	183
HTTP Responses per Second Graph .....	185
Pages Downloaded per Second Graph .....	186
Retries per Second Graph .....	188
Retries Summary Graph .....	189
Connections Graph .....	190
Connections per Second Graph .....	191
SSLs per Second Graph .....	192
Web Page Diagnostics Graphs .....	193
Web Page Diagnostics Tree View Overview .....	194
Web Page Diagnostics Graphs Overview .....	194
How to View the Breakdown of a Transaction .....	196
Web Page Diagnostics Content Icons .....	197

Web Page Diagnostics Graph .....	198
Page Component Breakdown Graph .....	200
Page Component Breakdown (Over Time) Graph .....	202
Page Download Time Breakdown Graph .....	204
Page Download Time Breakdown (Over Time) Graph .....	205
Page Download Time Breakdown Graph Breakdown Options .....	207
Time to First Buffer Breakdown Graph .....	209
Time to First Buffer Breakdown (Over Time) Graph .....	211
Client Side Breakdown (Over Time) Graph .....	214
Client Side Java Script Breakdown (Over Time) Graph .....	215
Downloaded Component Size Graph .....	216
User-Defined Data Point Graphs .....	218
User-Defined Data Point Graphs Overview .....	218
Data Points (Average) Graph .....	219
Data Points (Sum) Graph .....	220
System Resource Graphs .....	220
System Resource Graphs Overview .....	221
Server Resources Performance Counters .....	221
Linux Resources Default Measurements .....	221
Windows Resources Default Measurements .....	223
Server Resources Graph .....	225
Host Resources Graph .....	226
SiteScope Graph .....	227
SNMP Resources Graph .....	228
Linux Resources Graph .....	229
Windows Resources Graph .....	230
HP Network Virtualization Graphs .....	231
Packet Loss Graph .....	232
Average Latency Graph .....	234
Average Bandwidth Utilization Graph .....	236
Average Throughput Graph .....	237
Total Throughput Graph .....	239
Network Monitor Graphs .....	241
Network Monitor Graphs Overview .....	241
Network Delay Time Graph .....	242
Network Segment Delay Graph .....	243
Network Sub-Path Time Graph .....	244
Web Server Resource Graphs .....	245



Web Server Resource Graphs Overview .....	245
Apache Server Measurements .....	246
IIS Server Measurements .....	246
Apache Server Graph .....	247
Microsoft Information Internet Server (IIS) Graph .....	248
Web Application Server Resource Graphs .....	249
Web Application Server Resource Graphs Overview .....	249
Web Application Server Resource Graphs Measurements .....	250
Microsoft Active Server Pages (ASP) Graph .....	261
Oracle9iAS HTTP Server Graph .....	261
WebLogic (SNMP) Graph .....	262
WebSphere Application Server Graph .....	262
Database Server Resource Graphs .....	263
Database Server Resource Graphs Overview .....	263
DB2 Database Manager Counters .....	263
DB2 Database Counters .....	265
DB2 Application Counters .....	272
Oracle Server Monitoring Measurements .....	277
SQL Server Default Counters .....	279
Sybase Server Monitoring Measurements .....	280
DB2 Graph .....	286
Oracle Graph .....	287
SQL Server Graph .....	288
Sybase Graph .....	289
Streaming Media Graphs .....	289
Streaming Media Graphs Overview .....	290
Media Player Client Monitoring Measurements .....	290
RealPlayer Client Monitoring Measurements .....	291
RealPlayer Server Monitoring Measurements .....	292
Windows Media Server Default Measurements .....	294
Media Player Client Graph .....	295
Real Client Graph .....	296
Real Server Graph .....	297
Windows Media Server Graph .....	298
J2EE & .NET Diagnostics Graphs .....	298
J2EE & .NET Diagnostics Graphs Overview .....	299
How to Enable Diagnostics for J2EE & .NET .....	299
Viewing J2EE to SAP R3 Remote Calls .....	299

J2EE & .NET Diagnostics Data .....	301
Example Transaction Breakdown .....	302
Using the J2EE & .NET Breakdown Options .....	307
Viewing Chain of Calls and Call Stack Statistics .....	310
The Chain of Calls Windows .....	311
Understanding the Chain of Calls Window .....	312
Graph Filter Properties .....	315
J2EE/.NET - Average Method Response Time in Transactions Graph .....	316
J2EE/.NET - Average Number of Exceptions in Transactions Graph .....	317
J2EE/.NET - Average Number of Exceptions on Server Graph .....	318
J2EE/.NET - Average Number of Timeouts in Transactions Graph .....	319
J2EE/.NET - Average Number of Timeouts on Server Graph .....	320
J2EE/.NET - Average Server Method Response Time Graph .....	321
J2EE/.NET - Method Calls per Second in Transactions Graph .....	322
J2EE/.NET - Probes Metrics Graph .....	323
J2EE/.NET - Server Methods Calls per Second Graph .....	325
J2EE/.NET - Server Requests per Second Graph .....	326
J2EE/.NET - Server Request Response Time Graph .....	327
J2EE/.NET - Server Request Time Spent in Element Graph .....	328
J2EE/.NET - Transactions per Second Graph .....	330
J2EE/.NET - Transaction Response Time Server Side Graph .....	331
J2EE/.NET - Transaction Time Spent in Element Graph .....	332
Application Component Graphs .....	334
Microsoft COM+ Performance Graphs Overview .....	334
Microsoft .NET CLR Performance Graphs Overview .....	334
COM+ Average Response Time Graph .....	335
COM+ Breakdown Graph .....	336
COM+ Call Count Distribution Graph .....	338
COM+ Call Count Graph .....	340
COM+ Call Count Per Second Graph .....	342
COM+ Total Operation Time Distribution Graph .....	344
COM+ Total Operation Time Graph .....	346
Microsoft COM+ Graph .....	347
.NET Average Response Time Graph .....	351
.NET Breakdown Graph .....	352
.NET Call Count Distribution Graph .....	354
.NET Call Count Graph .....	355
.NET Call Count per Second Graph .....	356

.NET Resources Graph .....	357
.NET Total Operation Time Distribution Graph .....	362
.NET Total Operation Time Graph .....	363
Application Deployment Solutions Graphs .....	364
Application Deployment Solutions Graph Overview .....	364
Citrix Measurements .....	365
Citrix Server Graph .....	371
Middleware Performance Graphs .....	372
Middleware Performance Graphs Overview .....	372
IBM WebSphere MQ Counters .....	373
Tuxedo Resources Graph Measurements .....	375
IBM WebSphere MQ Graph .....	377
Tuxedo Resources Graph .....	378
Infrastructure Resources Graphs .....	379
Infrastructure Resources Graphs Overview .....	379
Network Client Measurements .....	379
Network Client Graph .....	380
SiteScope Graph .....	381
HP Service Virtualization Graphs .....	382
Service Virtualization Graphs Overview .....	382
Flex Graphs .....	383
Flex RTMP Throughput Graph .....	383
Flex RTMP Other Statistics Graph .....	384
Flex RTMP Connections Graph .....	385
Flex Streaming Delivery Graph .....	386
Flex Average Buffering Time Graph .....	387
WebSocket Statistics Graphs .....	388
Diagnostics Graphs .....	389
Siebel Diagnostics Graphs .....	389
Siebel Diagnostics Graphs Overview .....	389
Call Stack Statistics Window .....	390
Chain of Calls Window .....	393
Siebel Area Average Response Time Graph .....	395
Siebel Area Call Count Graph .....	396
Siebel Area Total Response Time Graph .....	397
Siebel Breakdown Levels .....	398
Siebel Diagnostics Graphs Summary Report .....	403
Siebel Request Average Response Time Graph .....	404

Siebel Transaction Average Response Time Graph .....	405
Siebel DB Diagnostics Graphs .....	406
Siebel DB Diagnostics Graphs Overview .....	407
How to Synchronize Siebel Clock Settings .....	408
Measurement Description Dialog Box .....	408
Siebel Database Breakdown Levels .....	410
Siebel Database Diagnostics Options Dialog Box .....	413
Siebel DB Side Transactions Graph .....	414
Siebel DB Side Transactions by SQL Stage Graph .....	415
Siebel SQL Average Execution Time Graph .....	416
Oracle 11i Diagnostics Graphs .....	416
Oracle 11i Diagnostics Graphs Overview .....	416
Measurement Description Dialog Box .....	417
Oracle Breakdown Levels .....	418
Oracle 11iDB Side Transactions Graph .....	421
Oracle 11iDB Side Transactions by SQL Stage Graph .....	422
Oracle 11i SQL Average Execution Time Graph .....	423
SAP Diagnostics Graphs .....	423
SAP Diagnostics Graphs Overview .....	423
How to Configure SAP Alerts .....	423
SAP Diagnostics - Guided Flow Tab .....	424
SAP Diagnostics Application Flow .....	426
Dialog Steps per Second Graph .....	427
OS Monitor Graph .....	428
SAP Alerts Configuration Dialog box .....	429
SAP Alerts Window .....	430
SAP Application Processing Time Breakdown Graph .....	432
SAP Primary Graphs .....	432
SAP Average Dialog Step Response Time Breakdown Graph .....	433
SAP Average Transaction Response Time Graph .....	434
SAP Breakdown Task Pane .....	434
SAP Server Time Breakdown (Dialog Steps) Graphs .....	438
SAP Server Time Breakdown Graph .....	439
SAP Database Time Breakdown Graph .....	440
SAP Diagnostics Summary Report .....	441
SAP Interface Time Breakdown Graph .....	442
SAP System Time Breakdown Graph .....	443
SAP Secondary Graphs .....	443

Work Processes Graph .....	444
Analysis Reports .....	445
Understanding Analysis Reports .....	445
Analysis Reports Overview .....	445
Analyze Transaction Settings Dialog Box .....	446
Analyze Transactions Dialog Box .....	448
New Report Dialog Box .....	450
Analysis Report Templates .....	452
Report Templates Overview .....	452
Report Templates Dialog Box .....	452
Report Templates - General Tab .....	454
Report Templates - Format Tab .....	456
Report Templates - Content Tab .....	457
Analysis Report Types .....	459
Summary Report Overview .....	459
Summary Report .....	460
HTML Report .....	466
SLA Reports .....	467
Transaction Analysis Report .....	468
Importing External Data .....	470
Import Data Tool Overview .....	470
How to Use the Import Data Tool .....	470
How to Define Custom File Formats .....	472
Supported File Types .....	472
Advanced Settings Dialog Box (Import Data Dialog Box) .....	475
Define External Format Dialog Box .....	476
Import Data Dialog Box .....	478
Troubleshooting and Limitations - Analysis .....	481
General .....	481
Graphs .....	481
Microsoft SQL Server .....	482
HP LoadRunner Tutorial .....	484
HP LoadRunner Analysis API Reference .....	485

# Welcome to the Analysis User Guide

Welcome to the HP LoadRunner Analysis User Guide. This guide describes how to use the LoadRunner Analysis graphs and reports in order to analyze system performance.

You use Analysis after running a load test scenario in the HP LoadRunner Controller or HP Performance Center.

HP LoadRunner, a tool for performance testing, stresses your entire application to isolate and identify potential client, network, and server bottlenecks.

HP Performance Center implements the capabilities of LoadRunner on an enterprise level.



## LoadRunner Online Help

LoadRunner Help is an online help system that describes how to use LoadRunner. You can access the LoadRunner Help in the following ways:

- Select HP Virtual User Generator Help, HP Controller Help, or HP Analysis Help from the **Help** menu of any of the LoadRunner components to open the LoadRunner Help home page. The home page provides quick links to the main help topics.
- Click F1 on any window or dialog box to open the LoadRunner Help to the topic that describes the currently displayed screen.
- Use the Help menu in LoadRunner to access the Knowledge Base and other useful resources.

## Additional Online Resources

The following online resources provide more information for LoadRunner users:

Resource	URL
<b>HP Software Web site</b>	<a href="http://www.hp.com/go/software">http://www.hp.com/go/software</a>
<b>HP Software Support</b>	<a href="http://www.hp.com/go/hpsoftwaresupport">http://www.hp.com/go/hpsoftwaresupport</a>
<b>Troubleshooting &amp; Knowledge Base</b>	<a href="http://h20230.www2.hp.com/troubleshooting.jsp">http://h20230.www2.hp.com/troubleshooting.jsp</a>
<b>LoadRunner Community Forums</b>	<a href="http://www.hp.com/go/lrpc">http://www.hp.com/go/lrpc</a>
<b>LoadRunner Blog</b>	<a href="http://h30499.www3.hp.com/t5/HP-LoadRunner-and-Performance/bg-p/sws-585">http://h30499.www3.hp.com/t5/HP-LoadRunner-and-Performance/bg-p/sws-585</a>
<b>HP Live Network (HPLN)</b>	<a href="https://hpln.hp.com/group/performance-center-and-loadrunner">https://hpln.hp.com/group/performance-center-and-loadrunner</a>
<b>LoadRunner Integrations</b>	<a href="http://support.openview.hp.com/sc/solutions/index.jsp#tab=tab1">http://support.openview.hp.com/sc/solutions/index.jsp#tab=tab1</a>
<b>LoadRunner on Twitter</b> 	<a href="https://twitter.com/hploadrunner">https://twitter.com/hploadrunner</a>
<b>LoadRunner on Linked In</b> 	<a href="http://www.linkedin.com/groups?home=&amp;gid=1879289">http://www.linkedin.com/groups?home=&amp;gid=1879289</a>

# What's New in LoadRunner 12.00 and 12.01

## Support for load generators on the cloud

- Easily provision cloud load generators from the Controller.
- Ability to run tests on load generators on HP Cloud Compute (added in 12.01)
- Ability to run tests on load generators on Amazon EC2

## Enhanced communication interface between Controller and load generators

- Ability to configure the ports between all LoadRunner components—Controller, load generator, MI Listener, and Monitor over Firewall
- Ability to connect from Controller to load generator, MI Listener, and Monitor over Firewall via proxy
- Use of Network Connection profiles that let you configure connection information, such as port and proxy, separately for each load generator.
- Ability to configure load generators to accept communication only from trusted Controllers using SSL authentication.
- Improved support and enhanced usability for SSL security, with OpenSSL fixes (added in 12.01)

## Network and security manager

- New utility to configure network and security settings for LoadRunner agent, for both local and remote machines.



## Improvements and added features in VuGen

- Enhanced replay summary with transaction breakdown including new time-trend charts.
- Support for editing common file types in VuGen editor—not limited to Vuser scripts
- Ability to cancel a recording session without overwriting script
- Improved stability and performance for Web correlations
- Improved search capabilities
- Debugger improvements
- Ability to disable snapshot creation during replay (added in 12.01)
- Ability to add extra files to parser list and extract steps from extra files (added in 12.01)
- Ability to configure Enhanced XML view (added in 12.01)
- Ability to create a Web correlation from the Replay snapshot (added in 12.01)

## Enhancements and added integrations for protocols

- Web HTTP/HTML:
  - HTML5 WebSocket support.
  - TruClient to Web HTTP/HTML protocol script converter
  - SSL utility for performing various *OpenSSL* commands through a user-friendly interface.
  - SPDY support.
  - Internet Explorer 11 support
  - TLS 1.1, TLS 1.2, and NPN support
  - Enhanced asynchronous support with ResponseHeader callback

- Usability and troubleshooting enhancements such as ability to identify recording failure and suggest a possible fix
- Correlation improvements
- **Linux support:** Replay support on Linux-based load generators was added for the following protocols: ODBC (added in 12.01), FTP, IMAP, LDAP, POP3, SMTP, and Windows Sockets
- **TruClient:** Support for rendezvous points, IP Spoofing, VTS, and HP network virtualization
- **Silverlight:** Support for latest version and IP Spoofing
- **SAP-Web:** Design Studio support in VuGen
- **LDAP:** Support for latest version of LDAP SDK
- **RDP:** Support for latest version of RDP (updated in 12.01)
- **Flex:** Support for the latest Flex SDK
- **Java over HTTP:** Support for mixed, chunked, and gzipped data in HTTP server responses(added in 12.01)
- **.NET:** Support for version 4.5
- **Citrix:** Support for latest client receiver, ability to run multiple published applications in the same session, and latest XenDesktop support
- **Windows Sockets:** General improvements and enhanced usability for correlations (added in 12.01)
- **SAP:** The SAP Application Testing by HP, HANA Edition (LoadRunner and Quality Center/Application Lifecycle Management) has received a Premium Qualification for SAP Vendor Branded Resellers. This certification is effective from LoadRunner 11.50 and Application Lifecycle Management 11.00.

## Analysis Improvements

- New graphs for WebSocket messages and connections (added in 12.01)
- Reduction in HTML report generation time (added in 12.01)

## New supported technologies and platforms

- Windows Server 2012 R2 and Windows 8.1 support (added in 12.01)
- Support for Internet Explorer 11, Chrome version 30, and Firefox version 23
- Support for latest versions of Eclipse, JUnit, NUnit, Jenkins, and Selenium (updated in 12.01)
- Revised Linux load generator support matrix and support for SUSE (added in 12.01)

## External IDE integration/add-ins for LoadRunner scripts and applications

- Ability to invoke the Controller directly from Visual Studio and Eclipse
- Add-in for Visual Studio 2012 for VuGen scripts and unit test developers
- Support for latest version of Eclipse

## Improvements in Virtual Table Server (VTS)

- Create multiple running instances of VTS
- Run VTS commands and batch files from the command line
- VTS support through a JavaScript API
- Populate data tables with sample data from the main menu
- Ability to monitor VTS changes from administrator user interface (added in 12.01)

For details, see the Virtual Table Server documentation. This is available with the VTS installation under the DVD's Additional Components folder.

## Integration with latest HP product versions

- HP Service Virtualization
- HP Diagnostics

- HP SiteScope
- HP Unified Functional Testing (UFT)
- HP Application Lifecycle Management (ALM)

## Improved documentation

- Workflow diagrams added to user guide for testing and script creation processes
- Enhancements to Flex, Web HTTP/HTML, and TruClient protocol documentation, with added tasks and procedures
- Improved organization of function reference including additional code samples and the new WebSocket functions
- Enhanced Citrix documentation streamlining the process of recording a Citrix session.

## General enhancements

- Simplified product installation with shorter installation time
- Enhancements in the Linux load generator installation (added in 12.01)
- Usability Improvements when working with multiple applications (added in 12.01)
- Non-admin user support: LoadRunner components can now run under a standard user account and with UAC and DEP enabled—an administrator account is no longer required. This applies to all LoadRunner components and tools.
- HP Network Virtualization integration enhancements
- Database API functions are now available for all C language protocols
- Enhanced Citrix section, providing updated and streamlined documentation on setting up your Citrix environment and testing Citrix applications. (added in 12.01)

## Community license bundle

- LoadRunner now delivered with the Community bundle which replaces the Instant-on license with the following features:
  - A permanent bundle with 50 Vusers
  - All protocols are included except for GUI (UFT), COM/DCOM and protocols in the template bundle

## Mobile license bundle

- A custom license bundle for testing mobile applications, including the Mobile Application - HTTP/HTML, TruClient Ajax - Mobile, and SMP protocols (added in 12.01)

For a complete list of supported integrations and product versions, see the Software Support site at [www.hp.com/go/hpsoftwaresupport](http://www.hp.com/go/hpsoftwaresupport). or select **Help > HP Software Support Online**. Click the **Self-solve** tab, and search for the LoadRunner Product Availability Matrix for this version.

# Analysis

Welcome to the HP LoadRunner Analysis User Guide. This guide describes how to use the LoadRunner Analysis graphs and reports in order to analyze system performance.

You use Analysis after running a load test scenario in the HP LoadRunner Controller or HP Performance Center.

HP LoadRunner, a tool for performance testing, stresses your entire application to isolate and identify potential client, network, and server bottlenecks.

HP Performance Center implements the capabilities of LoadRunner on an enterprise level.

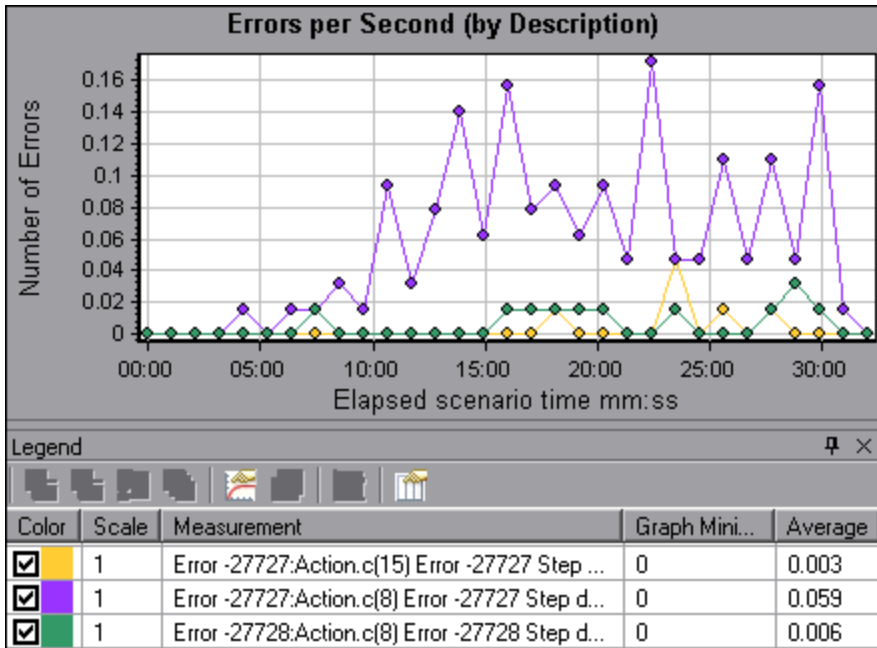
## Working with Analysis

### Introduction to Analysis

#### Analysis Overview

Welcome to LoadRunner Analysis, HP's tool for gathering and presenting load test data. When you execute a load test scenario, Vusers generate result data as they perform their transactions. The Analysis tool provides graphs and reports enabling you to view and understand the data.

Each graph has a legend which describes the metrics in the graph. You can also filter your data and sort it by a specific field.



To monitor the scenario performance *during* test execution, use the online monitoring tools described in the *HP LoadRunner User Guide*. To view a summary of the results *after* test execution, use one or more of the following tools:

- **Vuser log files.** These files contain a full trace of the load test scenario run for each Vuser. These files are located in the scenario results folder. (When you run a Vuser script in standalone mode, these files are stored in the Vuser script folder.)
- **Controller Output window.** The output window displays information about the load test scenario run. If your scenario run fails, look for debug information in this window.
- **Analysis Graphs.** Standard and protocol-specific graphs help you determine system performance and provide information about transactions and Vusers. You can compare multiple graphs by combining results from several load test scenarios or merging several graphs into one.
- **Analysis Graph Data and Raw Data Views.** These views display the actual data used to generate the graph in a spreadsheet format. You can copy this data into external spreadsheet applications for further processing.
- **Analysis Reports.** This utility enables you to generate a summary of each graph. The report summarizes and displays the test's significant data in graphical and tabular format. You can generate reports based on customizable report templates.

## Analysis Basics



This section describes basic concepts that will enhance your understanding of how to work with Analysis.

### Creating Analysis Sessions


When you run a load test scenario, LoadRunner stores the run-time data in a result file with an .lrr extension. LoadRunner **Analysis** is the utility that processes this data and generates graphs and reports.

When you work with the LoadRunner Analysis, you work within an Analysis *session*. This session contains one or more sets of scenario results (.lrr file). Analysis stores the display information and layout settings for the active graphs in a file with an .lra extension.

### Starting Analysis

You can open Analysis as an independent application or directly from the Controller. To open Analysis as an independent application, choose one of the following:

- **Start > All Programs > HP Software > HP LoadRunner > Analysis**
- The Analysis shortcut on the desktop

To open Analysis directly from the Controller, click the **Analysis** button  on the toolbar or select **Results > Analyze Result**. This option is only available after running a load test scenario. Analysis takes the latest result file from the current scenario, and opens a new session using these results. You can also instruct the Controller to automatically open Analysis after it completes scenario execution by selecting **Results > Auto Load Analysis**.

### Collating Execution Results

When you run a load test scenario, by default all Vuser information is stored locally



on each Vuser host. After scenario execution, the results from all of the hosts are automatically collated or consolidated in the results folder.

You disable automatic collation by choosing **Results > Auto Collate Results** from the Controller window, and clearing the check mark adjacent to the option. To manually collate results, choose **Results > Collate Results**. If your results have not been collated, Analysis will automatically collate the results before generating the analysis data.

## Troubleshooting

If the behavior of Analysis is unpredictable and unexpected messages appear, this might be a result of UAC Virtualization having been enabled for Analysis. You can disable UAC Virtualization on the **Analysis.exe** process in the Windows Task Manager.

## Analysis API

The LoadRunner Analysis API enables you to write programs to perform some of the functions of the Analysis user interface, and to extract data for use in external applications. Among other capabilities, the API allows you to create an analysis session from test results, analyze raw results of an Analysis session, and extract key session measurements for external use. An application can be launched from the LoadRunner Controller at the completion of a test. For more information, see the *Analysis API Reference*.

To view this guide, go to **Start > All Programs > HP Software > HP LoadRunner > Documentation > Analysis API Reference**. In icon-based desktops, such as Windows 8, search for **API** and select **Analysis API Reference** from the results.

**Note:** The Analysis API is only supported for 32-bit environments. If you use Visual Studio to develop your script, make sure to define x86 as the platform in the project options.

## Network Virtualization

LoadRunner integrates with HP Network Virtualization. This enables you to test point-to-point performance of WAN or other network deployed products under real-world network conditions. By installing software on your load generators, you introduce highly probable effects such as latency, packet loss, and link faults over

your network. As a result of this, your scenario performs the test in an environment that better represents the actual deployment of your application.

You can create more meaningful results by configuring multiple load generator machines or groups on a single load generator with the same unique set of network effects, and by giving each set a unique location name, such as NY- London. When viewing scenario results in Analysis, you can group the metrics according to their location names.

For details, see ["HP Network Virtualization Graphs" on page 231](#).

## How to Customize the Layout of Analysis Windows

This task describes ways to customize the layout of the windows of the Analysis session.

### Open Windows

You can open a window or restore a window that was closed by selecting the name of the relevant window from the **Windows** menu.

### Lock/Unlock the Layout of the Screen

Select **Windows > Layout Locked** to lock or unlock the layout of the screen.

### Restore the Window Placement to the Default Layout

Select **Windows > Restore Default Layout** to restore the placement of the Analysis windows to their default layout.

**Note:** This option is available only when no Analysis session is open.

### Restore the Window Placement to the Classic Layout

Select **Windows > Restore Classic Layout** to restore the placement of the Analysis windows to their classic layout. The classic layout resembles the layout of earlier versions of Analysis.

**Note:** This option is available only when no Analysis session is open.

## Reposition and Dock Windows

You can reposition any window by dragging it to the desired position on the screen. You can dock a window by dragging the window and using the arrows of the guide diamond to dock the window in the desired position.

### Note:

- Only document windows (graphs or reports) can be docked in the center portion of the screen.
- **Windows > Layout Locked** must not be selected when repositioning or docking windows.

## Using Auto Hide

You can use the Auto Hide feature to minimize open windows that are not in use. The window is minimized along the edges of the screen.

Click the **Auto Hide** button on the title bar of the window to enable or disable Auto Hide.



## Analysis Toolbars













This section describes the buttons that you access from the main Analysis toolbars.

### Common Toolbar

This toolbar is always accessible from the toolbar at top of the page and includes the following buttons:

User interface elements are described below:


UI Element	Description
	Create a new session.
	Open an existing session.









UI Element	Description
	Generate a Cross Result graph.
	Save a session.
	Print item.
	Create an HTML report.
	View runtime settings.
	Set global filter options.
	Configure SLA rules
	Analyze a transaction.
	Undo the most recent action.
	Reapply the last action that was undone.
	Apply filter on summary page
	Export Summary to Excel

## Graph Toolbar

This toolbar is accessible from the top of the page when you have a graph open and includes the following buttons

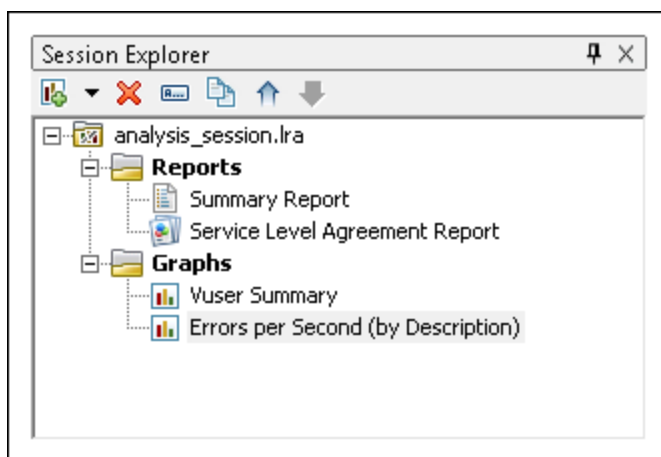
User interface elements are described below:


UI Element	Description
	Set filter settings.

UI Element	Description
	Clear filter settings.
	Set granularity settings.
	Merge graphs.
	Configure auto correlation settings.
	View raw data.
	Add comments to a graph.
	Add arrows to a graph.
	Set display options.





## Session Explorer Window

This window displays a tree view of the items (graphs and reports) that are open in the current session. When you click an item in the Session Explorer, it is activated in the main Analysis window.



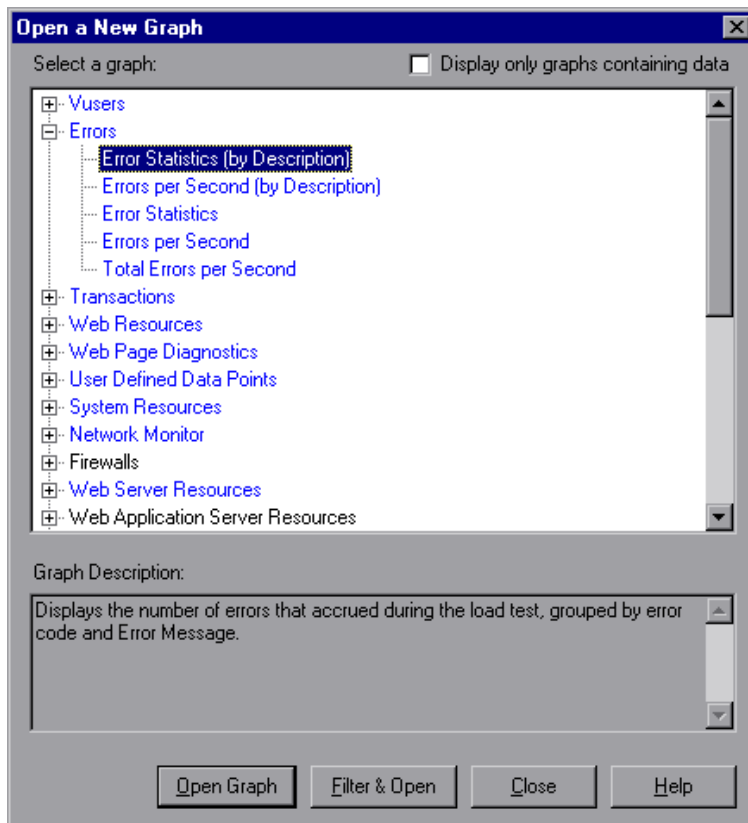
<b>To access</b>	Use one of the following: <ul style="list-style-type: none"><li>• <b>Session Explorer</b></li><li>• <b>Session Explorer &gt; Reports &gt; Summary Report</b></li><li>• <b>Session Explorer &gt; Reports &gt;Service Level Agreement Report</b></li><li>• <b>Session Explorer &gt;  &gt; Analyze Transaction</b></li><li>• <b>Session Explorer &gt; Graphs</b></li></ul>
------------------	--

User interface elements are described below:

<b>UI Element</b>	<b>Description</b>
	Add a new graph or report to the current Analysis session. Opens the Open a New Graph dialog box. For details, see <a href="#">"Open a New Graph Dialog Box" on the next page</a>
	Delete the selected graph or report.
	Rename the selected graph or report.
	Create a copy of the selected graph.

## Open a New Graph Dialog Box

This dialog box enables you to select the graph type to activate in the main Analysis window.




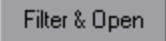
To access

Session Explorer > Graphs > 

User interface elements are described below:

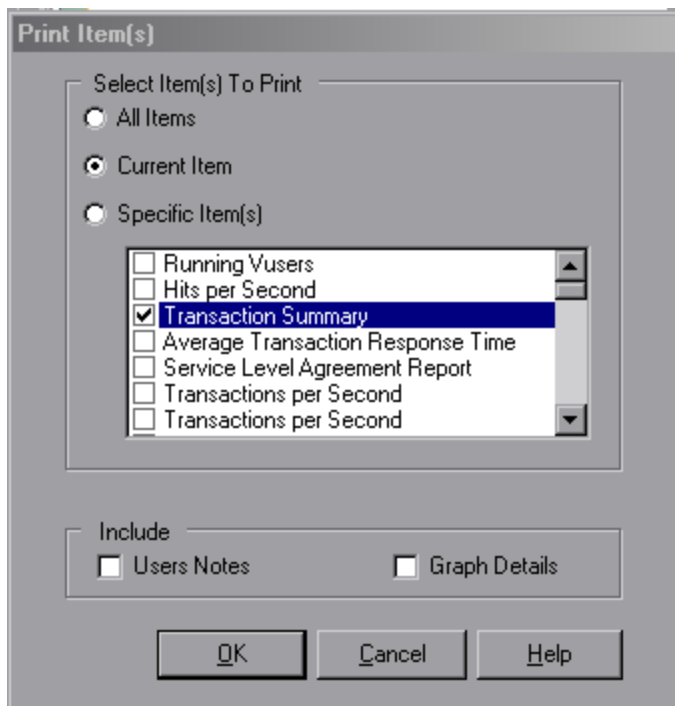
UI Element	Description
Select a graph	Displays list of graph types.
Display only graphs containing data	If checked, only graphs that contain data are listed (in blue) in the Select a graph area.

, continued

UI Element	Description
<b>Graph Description</b>	Displays detailed information about the selected graph.
	Analysis generates the selected graph and adds it to the Session Explorer.
	Opens the graphs Graph Settings dialog box. For details, see <a href="#">"Filter Dialog Boxes" on page 144</a> . This option enables you to apply filter conditions on the selected graph before the graph is displayed.

## Print Graphs or Reports

This dialog box enables you to print graphs or reports



### To access

Do one of the following:

- **File > Print**
- **Main toolbar > **



User interface elements are described below:

UI Element	Description
<b>Select Items to Print</b>	<ul style="list-style-type: none"><li>• <b>All Items.</b> Prints all graphs and reports in the current session.</li><li>• <b>Current Item.</b> Prints the graph or report currently selected in the Session Explorer.</li><li>• <b>Specific Item(s).</b> Select the graphs or reports to print.</li></ul>
<b>Include</b>	<ul style="list-style-type: none"><li>• <b>User Notes.</b> Prints the notes in the User Notes window.</li><li>• <b>Graph Details.</b> Prints details such as graph filters and granularity settings.</li></ul>

## Configuring Analysis

### Summary Data Versus Complete Data

In large load test scenarios, with results exceeding 100 MB, it can take a long time for Analysis to process the data. When you configure how Analysis generates result data from load test scenarios, you can choose to generate complete data or summary data.

**Complete data** refers to the result data after it has been processed for use within Analysis.

**Summary data** refers to the raw, unprocessed data. The summary graphs contain general information such as transaction names and times. Some fields are not available for filtering when you work with summary graphs.

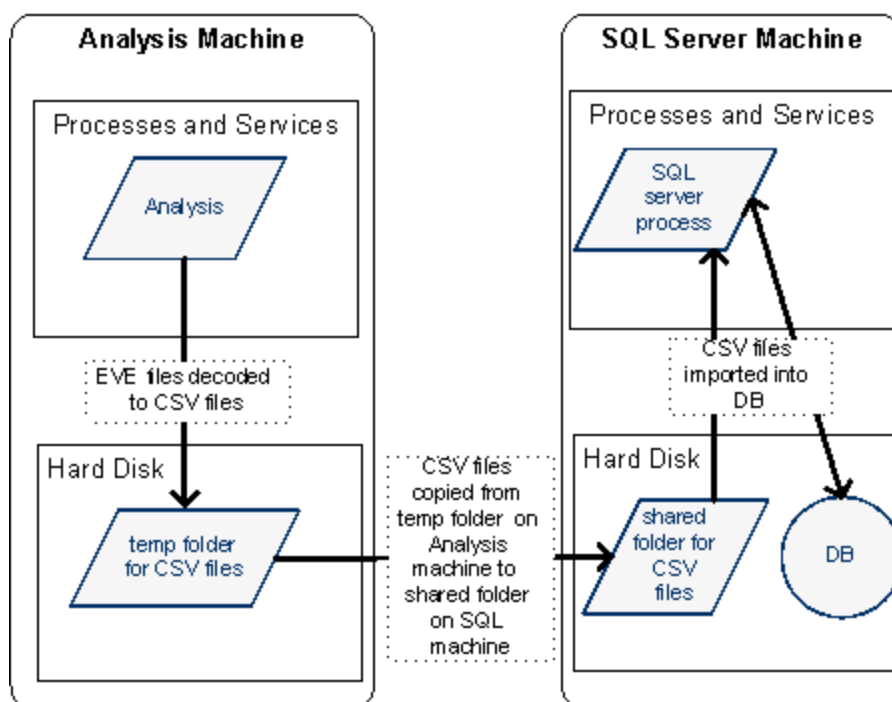
Note that some graphs will not be available when viewing only the summary data.

### Importing Data Directly from the Analysis Machine

If you are using an SQL server / MSDE machine to store Analysis result data, you can configure Analysis to import data directly from the Analysis machine.

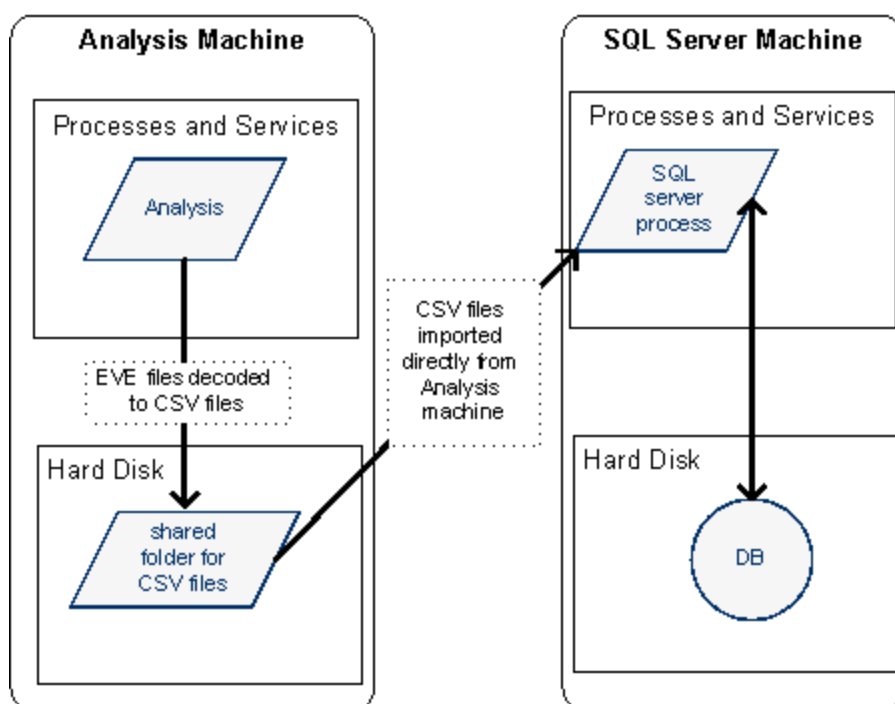
## Importing Data from the SQL Server

If you do not select the option to import data directly from the Analysis machine, Analysis creates CSV files in a local temp folder. The CSV files are copied to a shared folder on the SQL Server machine. The SQL server engine then imports the CSV files into the database. The following diagram illustrates the data flow:



## Importing Data from the Analysis Machine

If you selected the option to import data directly from the Analysis machine, Analysis creates the CSV files in a shared folder on the Analysis machine and the SQL server imports these CSV files from the Analysis machine directly into the database. The following diagram illustrates the data flow:



## How to Configure Settings for Analyzing Load Test Results

The following steps describe how to configure certain Analysis settings that significantly impact the way in which Analysis analyzes load test results.

### Configure how Analysis processes result data

You define how Analysis processes result data from load test scenarios in the **Tools > Options > Result Collection** tab. For example, you can configure how Analysis aggregates result data, to what extent the data is processed, and whether output messages are copied from the Controller. For details on the user interface, see ["Result Collection Tab \(Options Dialog Box\)" on page 38](#).

### Configure template settings

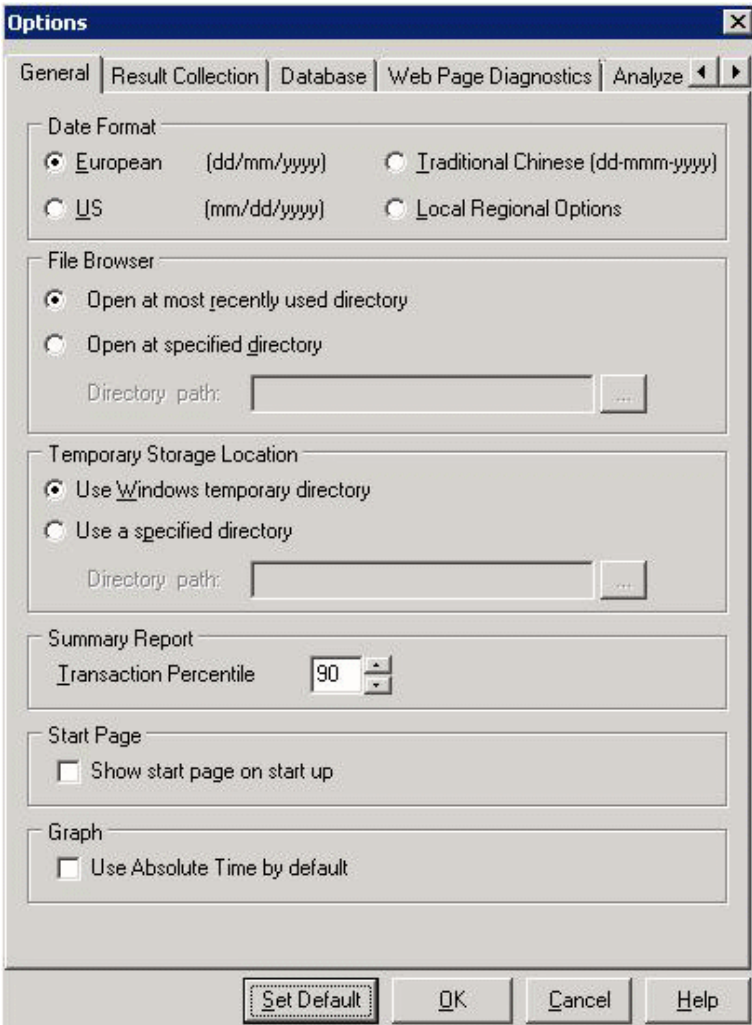
For details on the user interface, see ["Apply/Edit Template Dialog Box" on page 107](#).

### Configure analysis of transactions

You configure how transactions are analyzed and displayed in the summary report in the **Summary Report** area of the **Tools > Options > General** tab. For details, see the description of "[General Tab \(Options Dialog Box\)](#)" below.

## General Tab (Options Dialog Box)

This tab enables you to configure general Analysis options, such as date formats, temporary storage location, and transaction report settings.



To access	Tools > Options > General tab.
-----------	--------------------------------

<b>See Also</b>	<a href="#">"How to Configure Settings for Analyzing Load Test Results" on page 35</a>
-----------------	--

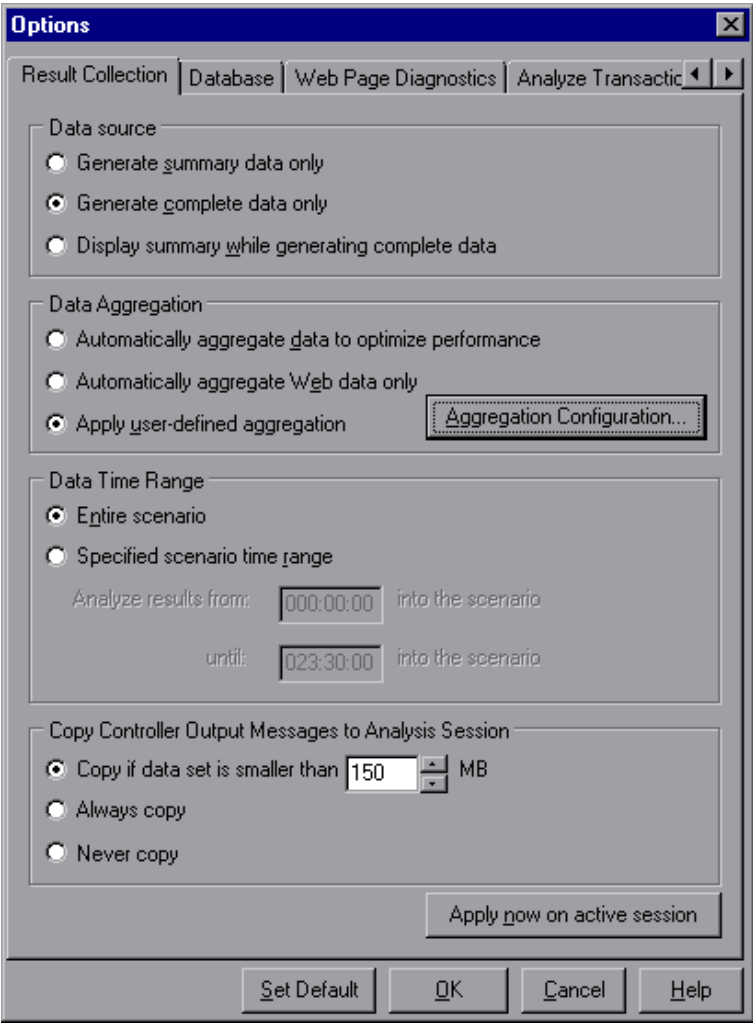
User interface elements are described below:

UI Element	Description
<b>Date Format</b>	<p>Select a date format for storage and display. (For example, the date displayed in the Summary report)</p> <ul style="list-style-type: none"><li>• <b>European.</b> Displays the European date format.</li><li>• <b>US.</b> Displays the U.S. date format.</li><li>• <b>Traditional Chinese.</b> Displays the Traditional Chinese date format.</li><li>• <b>Local Regional Options.</b> Displays the date format as defined in the current user's regional settings.</li></ul> <p><b>Note:</b> When you change the date format, it only affects newly created Analysis sessions. The date format of existing sessions is not affected.</p>
<b>File Browser</b>	<p>Select the directory location at which you want the file browser to open.</p> <ul style="list-style-type: none"><li>• <b>Open at most recently used directory.</b> Opens the file browser at the previously used directory location.</li><li>• <b>Open at specified directory.</b> Opens the file browser at a specified directory.</li></ul> <p>In the <b>Directory path</b> box, enter the directory location where you want the file browser to open.</p>

UI Element	Description
<b>Temporary Storage Location</b>	<p>Select the directory location in which you want to save temporary files.</p> <ul style="list-style-type: none"><li>• <b>Use Windows temporary directory.</b> Saves temporary files in your Windows temp directory.</li><li>• <b>Use a specified directory.</b> Saves temporary files in a specified directory.</li></ul> <p>In the <b>Directory path</b> box, enter the directory location in which you want to save temporary files.</p>
<b>Summary Report</b>	<p>Set the following transaction settings in the Summary Report:</p> <ul style="list-style-type: none"><li>• <b>Transaction Percentile.</b> The Summary Report contains a percentile column showing the response time of 90% of transactions (90% of transactions that fall within this amount of time). To change the value of the default 90 percentile, enter a new figure in the <b>Transaction Percentile</b> box.</li></ul> <p>The Transaction Percentile value is only applied to newly created templates . To create a new template, select <b>Tools &gt;Templates</b>. For details, see <a href="#">"Apply/Edit Template Dialog Box" on page 107</a>.</p>
<b>Start Page</b>	<p>Select <b>Show start page on start up</b> to display the <b>Welcome to Analysis</b> tab every time you open the Analysis application.</p>
<b>Graph</b>	<p>Select the way in which graphs shows the Elapsed Scenario Time on the x-axis.</p> <p><b>Use Absolute time.</b> Shows an elapsed time based on the absolute time of the machine's system clock. If not checked, shows the elapsed time relative to the start of the scenario. The default is unchecked.</p>

## Result Collection Tab (Options Dialog Box)

This tab enables you to configure how Analysis processes result data from load test scenarios.



To access	Tools > Options > Result Collection tab.
Important information	The options in this tab are pre-defined with default settings. It is recommended to use these default settings unless there is a specific need to change them. Changing some of the settings, such as default aggregation, can significantly impact the amount of data stored in the Analysis database.
See Also	<a href="#">"How to Configure Settings for Analyzing Load Test Results" on page 35</a>

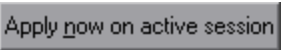
User interface elements are described below:

UI Element	Description
Data Source	<p>In this area, you configure how Analysis generates result data from load test scenarios.</p> <p><b>Complete data</b> refers to the result data after it has been processed for use within Analysis. <b>Summary data</b> refers to the raw, unprocessed data. The summary graphs contain general information such as transaction names and times. For more details on summary data versus complete data, see <a href="#">"Summary Data Versus Complete Data" on page 33</a>.</p> <p>Select one of the following options:</p> <ul style="list-style-type: none"><li>• <b>Generate summary data only.</b> If this option is selected, Analysis will not process the data for advanced use with filtering and grouping.</li><li>• <b>Generate complete data only.</b> If this option is selected, the graphs can then be sorted, filtered, and manipulated.</li><li>• <b>Display summary data while generating complete data.</b> Enables you to view summary data while you wait for the complete data to be processed.</li></ul> <p><b>Note:</b> If you selected one of the options to generate complete data, you can define how Analysis aggregates the complete data in the <b>Data Aggregation</b> area.</p>



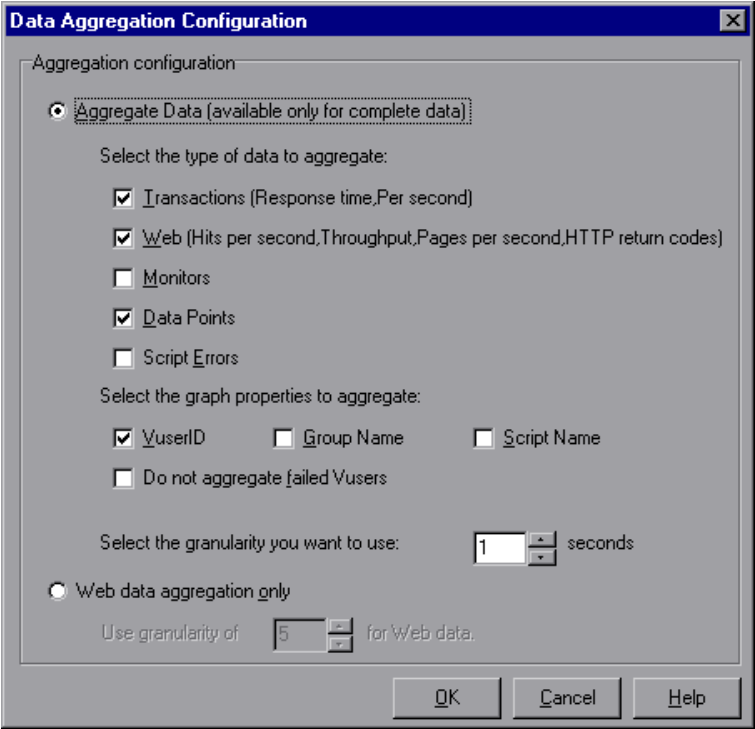
UI Element	Description
<b>Data Aggregation</b>	<p>If you chose to generate complete data in the <b>Data Source</b> area, you use this area to configure how Analysis aggregates the data.</p> <p>Data aggregation is necessary in order to reduce the size of the database and decrease processing time in large scenarios.</p> <p>Select one of the following options:</p> <ul style="list-style-type: none"><li>• <b>Automatically aggregate data to optimize performance.</b> Aggregates data using built-in data aggregation formulas.</li><li>• <b>Automatically aggregate Web data only.</b> Aggregates Web data only using built-in data aggregation formulas.</li><li>• <b>Apply user-defined aggregation.</b> Aggregates data using settings you define.</li></ul> <p>Click the <b>Aggregation Configuration</b> button to open the Data Aggregation Configuration Dialog Box and define your custom aggregation settings. For details on the user interface, see "<a href="#">Data Aggregation Configuration Dialog Box (Result Collection Tab)</a>" on page 43.</p>

UI Element	Description
<b>Data Time Range</b>	<p>In this area you specify whether to display data for the complete duration of the scenario, or for a specified time range only. Select one of the following options:</p> <ul style="list-style-type: none"><li>• <b>Entire scenario.</b> Displays data for the complete duration of the load test scenario</li><li>• <b>Specified scenario time range.</b> Specify the time range using the following boxes:<ul style="list-style-type: none"><li>■ <b>Analyze results from.</b> Enter the amount of scenario time you want to elapse (in hh:mm:ss format) before Analysis begins displaying data.</li><li>■ <b>until.</b> Enter the point in the scenario (in hh:mm:ss format) at which you want Analysis to stop displaying data.</li></ul></li></ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"><li>• It is not recommended to use the <b>Specified scenario time range</b> option when analyzing the Oracle 11i and Siebel DB Diagnostics graphs, since the data may be incomplete.</li><li>• The <b>Specified scenario time range</b> settings are not applied to the Connections and Running Vusers graphs.</li></ul>

UI Element	Description
<b>Copy Controller Output Messages to Analysis Session</b>	<p>Controller output messages are displayed in Analysis in the Controller Output Messages window. Select one of the following options for copying output messages generated by the Controller to the Analysis session.</p> <ul style="list-style-type: none"><li>• <b>Copy if data set is smaller than X MB.</b> Copies the Controller output data to the Analysis session if the data set is smaller than the amount you specify.</li><li>• <b>Always Copy.</b> Always copies the Controller output data to the Analysis session.</li><li>• <b>Never Copy.</b> Never copies the Controller output data to the Analysis session.</li></ul>
	Click this button to apply the settings in the Result Collection tab to the current session. The Controller output data is copied when the Analysis session is saved.

## Data Aggregation Configuration Dialog Box (Result Collection Tab)

If you choose to generate the complete data from the load test scenario results, Analysis aggregates the data using either built-in data aggregation formulas, or aggregation settings that you define. This dialog box enables you to define custom aggregation settings.



To access	Select <b>Tools &gt; Options &gt; Result Collection</b> . Select the <b>Apply user-defined aggregation</b> option and click the <b>Aggregation Configuration</b> button.
Important information	In this dialog box, you can select granularity settings. To reduce the size of the database, increase the granularity. To focus on more detailed results, decrease the granularity.

User interface elements are described below:

UI Element	Description
<b>Aggregate Data</b>	<p>Select this option to define your custom aggregation settings using the following criteria:</p> <ul style="list-style-type: none"><li>• <b>Select the type of data to aggregate.</b> Use the check boxes to select the types of graphs for which you want to aggregate data.</li><li>• <b>Select graph properties to aggregate.</b> Use the check boxes to select the graph properties you want to aggregate.</li></ul> <p>To exclude data from failed Vusers, select <b>Do not aggregate failed Vusers</b>.</p> <p><b>Note:</b> You will not be able to drill down on the graph properties you select in this list.</p> <ul style="list-style-type: none"><li>• <b>Select the granularity you want to use.</b> Specify a custom granularity for the data. The minimum granularity is 1 second.</li></ul>
<b>Web data aggregation only</b>	<p>Select this option to aggregate Web data only. In the <b>Use Granularity of X for Web data</b> box, specify a custom granularity for Web data.</p> <p>The minimum granularity is 1 second. By default, Analysis summarizes Web measurements every 5 seconds.</p>

## Database Tab (Options Dialog Box)

This tab enables you to specify the database in which to store Analysis session result data and to configure the way in which CSV files will be imported into the database.

Options

General

Result Collection

Database

Web Page Diagnostics

Analyze

☐ Access 2000

☒ SQL Server/MSDE

☐ SQLite

Server Details

Server Name:

ABC

☐ Use Windows integrated security

User Name:

sa

Password:

Shared Folder Details

☐ Import data directly from Analysis machine

Shared folder on MS SQL Server

Shared folder path:

\\ABC\Data\

Local folder path:

C:\MSSQL7\Data

Shared folder on Analysis Host

Shared folder path:

Test parameters

Compact database

Hint

Advanced

Set Default

OK

Cancel

Help

To access	Analysis > Tools > Options > Database tab.
-----------	--

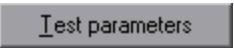


HP LoadRunner (12.01)

Page 46 of 486

<b>Important information</b>	Analysis data can be saved in one of three formats. Select the format based on the size of the analysis session file, as shown in the table below:	
	<b>Size of the Analysis session file</b>	<b>Recommended format</b>
	<ul style="list-style-type: none"> <li>Less than 2 GB</li> </ul>	Access 2000
	<ul style="list-style-type: none"> <li>2 GB to 10 GB</li> </ul>	SQL Server/MSDE <b>Note:</b> Select SQL Server/MSDE if you need to work in multithread mode.
	<ul style="list-style-type: none"> <li>More than 10 GB</li> </ul>	SQLite <b>Note:</b> The SQLite format allows you to store up to 32 terabytes of data.
	<b>Note:</b> Both the Access 2000 database format and the SQLite format are embedded databases. The session directory contains both the database and the analysis data.	
<b>See also</b>	<a href="#">"Importing Data Directly from the Analysis Machine" on page 33</a>	

User interface elements are described below:

UI Element	Description
<b>Access 2000</b>	Instructs LoadRunner to save Analysis result data in an Access 2000 database format. This setting is the default.
<b>SQL Server/MSDE</b>	Instructs LoadRunner to save Analysis result data on an SQL server / MSDE machine. If you select this option, you have to complete the <b>Server Details</b> and <b>Shared Folder Details</b> , described below.

UI Element	Description
<b>SQLite</b>	<p>Instructs LoadRunner to save Analysis result data in an SQLite database format.</p> <p>If you choose this format, you will not be able to work in multithread mode.</p>
<b>Server Details area</b>	SQL server / MSDE machine details. See description below.
<b>Shared Folder Details area</b>	SQL server / MSDE machine shared folder details. See description below.
	<p>Depending on which database you are using, this button performs the following action:</p> <ul style="list-style-type: none"> <li>• <b>For Access.</b> Checks the connection parameters to the Access database and verifies that the <b>delimiter</b> on your machine's regional settings matches the Microsoft JET delimiter on the database machine.</li> <li>• <b>For SQL server / MSDE.</b> Checks the connection parameters, the existence of a shared server directory, whether there are write permissions on the shared server directory, and whether the shared and physical server directories are synchronized.</li> <li>• <b>For SQLite.</b> This button is disabled.</li> </ul>
	<p>When you configure and set up your Analysis session, the database containing the results may become fragmented. As a result, it will use excessive disk space. For Access databases, the <b>Compact database</b> button enables you to repair and compress your results and optimize your database. This button is disabled if you choose <b>SQLite</b>.</p> <p><b>Note:</b> Long load test scenarios (duration of two hours or more) will require more time for compacting.</p>
	<p>Opens the Advanced Options dialog box, allowing you to increase performance when processing LoadRunner results or importing data from other sources. This button is disabled if you choose <b>SQLite</b>. For user interface details see <a href="#">"Advanced Options Dialog Box (Database Tab)" on page 51</a>.</p>



## Server Details Area

If you choose to store Analysis result data on an SQL server / MSDE machine, you need to complete the server details. User interface elements are described below:


UI Element	Description
<b>Server Name</b>	The name of the machine on which the SQL server / MSDE is running.
<b>Use Windows integrated security</b>	Enables you to use your Windows login, instead of specifying a user name and password. By default, the user name "sa" and no password are used for the SQL server.
<b>User Name</b>	The user name for the master database.
<b>Password</b>	The password for the master database.

## Shared Folder Details Area

If you store Analysis result data on an SQL server / MSDE machine, you need to provide the shared folder details. User interface elements are described below:

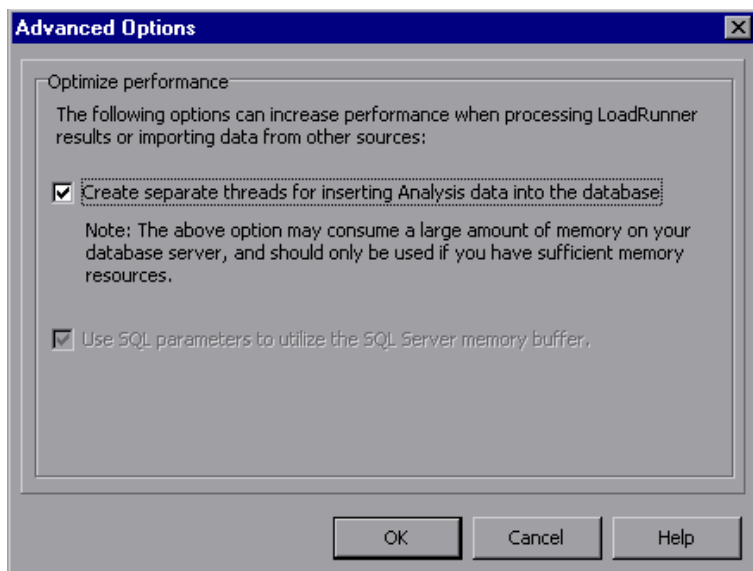
UI Element	Description
<b>Import Data Directly from Analysis machine</b>	Select this option to import data directly from the Analysis machine. For details on this option, see <a href="#">"Importing Data Directly from the Analysis Machine" on page 33</a> .

UI Element	Description
<b>Shared Folder on MS SQL Server</b>	<ul style="list-style-type: none"> <li>• <b>Shared folder path.</b> Enter a shared folder on the SQL server / MSDE machine. For example, if your SQL server's name is fly, enter \\fly\&lt;Analysis database folder&gt;.</li> </ul> <p>This folder has different functions, depending on how you import the Analysis data:</p> <ul style="list-style-type: none"> <li>■ <b>If you did not select the option to import data directly from the Analysis machine</b>, this folder stores permanent and temporary database files. Analysis results stored on an SQL server / MSDE machine can only be viewed on the machine's local LAN.</li> <li>■ <b>If you selected the option to import data directly from the Analysis machine</b>, this folder is used to store an empty database template copied from the Analysis machine.</li> <li>• <b>Local folder path.</b> Enter the real drive and folder path on the SQL server / MSDE machine that correspond to the above shared folder path. For example, if the Analysis database is mapped to an SQL server named fly, and fly is mapped to drive D, enter D:\&lt;Analysis database folder&gt;.</li> </ul> <p>If the SQL server / MSDE and Analysis are on the same machine, the logical storage location and physical storage location are identical.</p>

UI Element	Description
<b>Shared Folder on Analysis Host</b>	<p>If you selected the option to import data directly from the Analysis machine, the <b>Shared folder path</b> box is enabled. Analysis detects all shared folders on your Analysis machine and displays them in a drop-down list. Select a shared folder from the list.</p> <p><b>Note:</b></p> <ul style="list-style-type: none"><li>• Ensure that the user running the SQL server (by default, SYSTEM) has access rights to this shared folder.</li><li>• If you add a new shared folder on your machine, you can click the refresh button  to display the updated list of shared folders.</li><li>• Analysis creates the CSV files in this folder and the SQL server imports these CSV files from the Analysis machine directly into the database. This folder stores permanent and temporary database files.</li></ul>

## Advanced Options Dialog Box (Database Tab)

This dialog box enables you to increase performance when processing LoadRunner results or importing data from other sources.



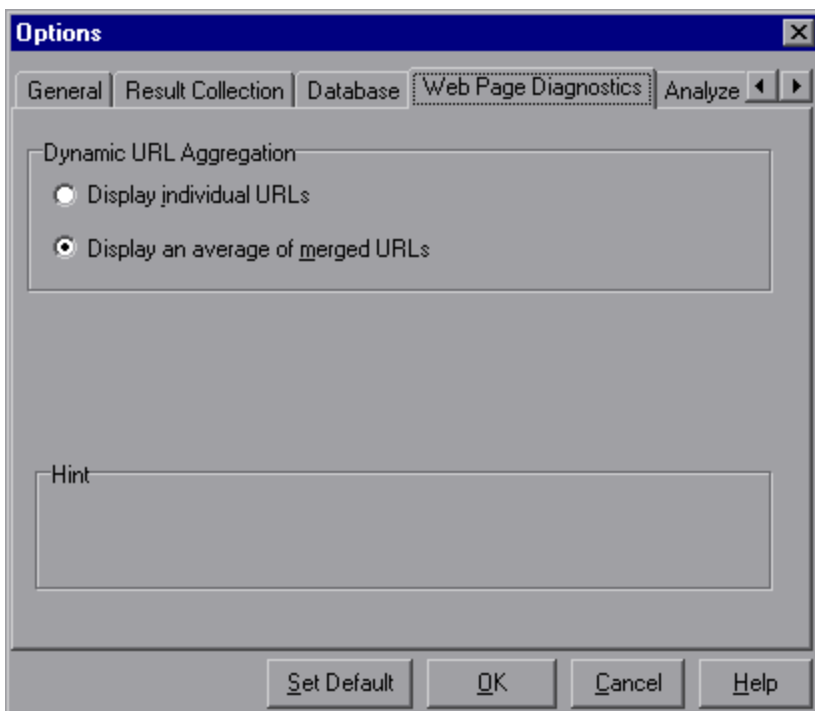
<b>To access</b>	<b>Analysis &gt; Tools &gt; Options &gt; Database tab &gt; Advanced button</b>
<b>See also</b>	<a href="#">"Database Tab (Options Dialog Box)" on page 45</a>

User interface elements are described below:

UI Element	Description
<b>Create separate threads for inserting Analysis data into the database.</b>	This option may consume a large amount of memory on your database server, and should only be used if you have sufficient memory resources.
<b>Use SQL parameters to utilize the SQL Server memory buffer.</b>	This option is only enabled when you store Analysis result data on an SQL server or MSDE machine.

## Web Page Diagnostics Tab (Options Dialog Box)

This tab enables you to set Web page breakdown options. You can choose how to aggregate the display of URLs that include dynamic information, such as a session ID. You can display these URLs individually, or you can unify them and display them as one line with merged data points.



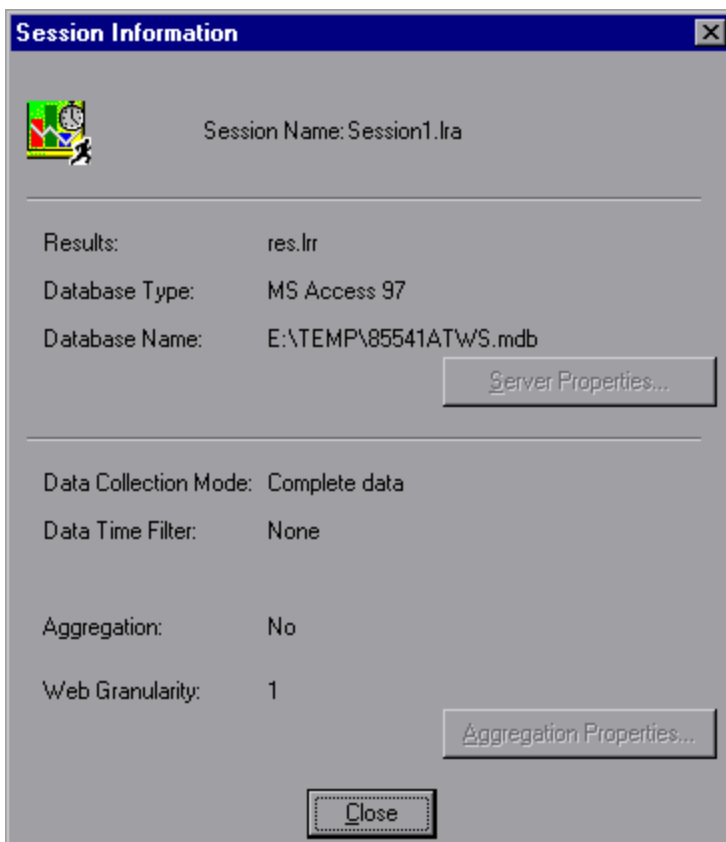
To access	Tools > Options > Web Page Diagnostics tab
-----------	--

User interface elements are described below:

UI Element	Description
Display individual URLs	Displays each URL individually
Display an average of merged URLs	Merges URLs from the same script step into one URL, and displays it with merged (average) data points.



## Session Information Dialog Box (Options Dialog Box)

This dialog box enables you to view a summary of the configuration properties of the current Analysis session.



<b>To access</b>	<b>File &gt; Session Information</b>
------------------	--------------------------------------

User interface elements are described below:

UI Element	Description
	Displays the type of data aggregated, the criteria according to which it is aggregated, and the time granularity of the aggregated data.
	Displays the properties of the SQL server and MSDE databases.
<b>Aggregation</b>	Indicates whether the session data has been aggregated.
<b>Data Collection Mode</b>	Indicates whether the session displays complete data or summary data.
<b>Data Time Filter</b>	Indicates whether a time filter has been applied to the session.
<b>Database Name</b>	Displays the name and directory path of the database.
<b>Database Type</b>	Displays the type of database used to store the load test scenario data.
<b>Results</b>	Displays the name of the LoadRunner result file.
<b>Session Name</b>	Displays the name of the current session.
<b>Web Granularity</b>	Displays the Web granularity used in the session.

## Viewing Load Test Scenario Information

### Viewing Load Test Scenario Information

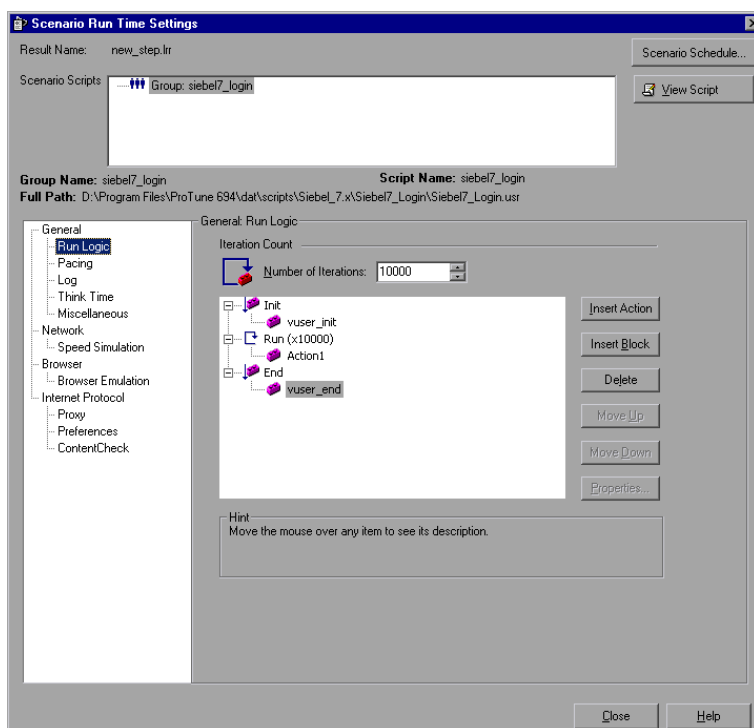
In Analysis, you can view information about the load test scenario which you are analyzing. You can view the scenario run time settings and output messages that were generated by the Controller during the scenario.

You can view information about the Vuser groups and scripts that were run in each scenario, as well as the run time settings for each script in a scenario, in the Scenario Run Time Settings dialog box.

**Note:** The run time settings allow you to customize the way a Vuser script is executed. You configure the run time settings from the Controller or Virtual User Generator (*VuGen*) before running a scenario. For information on configuring the run time settings, refer to the *HP Virtual User Generator User Guide*.

Choose **File > View Scenario Run Time Settings**, or click **View Run Time Settings** on the toolbar.

The Scenario Run Time Settings dialog box opens, displaying the Vuser groups, scripts, and scheduling information for each scenario. For each script in a scenario, you can view the run time settings that were configured in the Controller or VuGen before scenario execution.



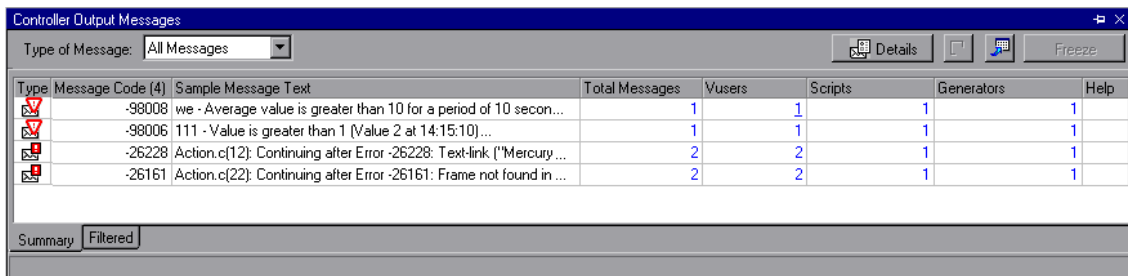
## How to Configure Controller Output Messages Settings

This task describes how to configure settings for output messages.

1. Choose **Tools > Options** and select the **Result Collection** tab.
2. In the **Copy Controller Output Messages to Analysis Session** area, choose one of the following options:
  - **Copy if data set is smaller than X MB.** Copies the Controller output data to the Analysis session if the data set is smaller than the amount you specify.
  - **Always Copy.** Always copies the Controller output data to the Analysis session.
  - **Never Copy.** Never copies the Controller output data to the Analysis session.
3. Apply your settings.
  - To apply these settings to the current session, click **Apply now to active session**.
  - To apply these settings after the current session is saved, click **OK**.

## Controller Output Messages Window

This window displays error, notification, warning, debug, and batch messages that are sent to the Controller by the Vusers and load generators during a scenario run.



<b>To access</b>	<b>Windows &gt; Controller Output Messages</b>
<b>Important information</b>	<ul style="list-style-type: none"> <li>The Summary tab is displayed by default when you open this window.</li> <li>Analysis searches for the output data in the current Analysis session. If the data is not found, it searches in the scenario results folder. If Analysis cannot locate the results folder, no messages are displayed.</li> </ul>

User interface elements are described below:



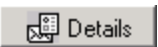


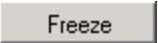

UI Element	Description
Summary Tab	See <a href="#">"Summary Tab" below</a>
Filtered Tab	See <a href="#">"Filtered Tab" on page 60</a>

## Summary Tab







This tab displays summary information about the messages sent during a scenario run.

To access	Controller Output Messages window > Summary tab
Important Information	You can drill down further on any information displayed in blue.
Parent topic	<a href="#">"Controller Output Messages Window" on the previous page</a>
See also	<a href="#">"Filtered Tab" on page 60</a>

User interface elements are described below:

UI Element	Description
	Displays the full text of the selected output message in the Detailed Message Text area at the bottom of the Output window.
	<b>Remove all messages.</b> Clears all log information from the Output window.
	<b>Export the view.</b> Saves the output to a specified file.
 	<ul style="list-style-type: none"> <li>• <b>Freeze.</b> Stops updating the Output window with messages.</li> <li>• <b>Resume.</b> Resumes updating the Output window with messages. The newly updated log information is displayed in a red frame.</li> </ul>

UI Element	Description
<b>Detailed Message Text</b>	Displays the full text of the selected output message when you click the <b>Details</b> button.
<b>Generators</b>	Displays the number of load generators that generated messages with the specified message code.
<b>Help</b>	Displays an icon if there is a link to troubleshooting for the message.
<b>Message Code</b>	Displays the code assigned to all similar messages. The number in parentheses indicates the number of different codes displayed in the Output window.
<b>Sample Message Text</b>	Displays an example of the text of a message with the specified code.
<b>Scripts</b>	Displays the number of scripts whose execution generated messages with the specified code.
<b>Total Messages</b>	Displays the total number of sent messages with the specified code.

UI Element	Description
Type	<p>The type of message being displayed. The following icons indicate the various message types. For more information about each type, see <b>Type of Message</b> below:</p> <ul style="list-style-type: none"><li> Batch</li><li> Debug</li><li> Errors</li><li> Notifications</li><li> Warnings</li><li> Alerts</li></ul>


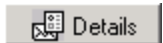








UI Element	Description
<b>Type of Message</b>	<p>Filters the output messages to display only certain message types. Select one of the following filters:</p> <ul style="list-style-type: none"> <li>• <b>All messages.</b> Displays all message types.</li> <li>• <b>Batch.</b> Sent instead of message boxes appearing in the Controller, if you are using automation.</li> <li>• <b>Debug.</b> Sent only if the debugging feature is enabled in the Controller. (Expert mode: <b>Tools &gt; Options &gt; Debug Information</b>). For more information, see "Options &gt; Debug Information Tab" on page 242.</li> <li>• <b>Errors.</b> Usually indicate that the script failed.</li> <li>• <b>Notifications.</b> Provides run-time information, such as message sent using <code>lr_output_message</code>.</li> <li>• <b>Warnings.</b> Indicates that the Vuser encountered a problem, but the scenario continued to run.</li> <li>• <b>Alerts.</b> Indicates a warning.</li> </ul>
<b>Vusers</b>	Displays the number of Vusers that generated messages with the specified code.

## Filtered Tab

This tab displays a drilled down view by message, Vuser, script, or load generator. For example, if you drill down on the Vuser column, the Filtered tab displays all the messages with the code you selected, grouped by the Vusers that sent the messages.

<b>To access</b>	<b>Controller Output Messages</b> window > <b>Summary</b> tab. Click the blue link on the column that you wish to view more information about.
<b>Important information</b>	The tab appears when you click on a blue link in the Summary tab.
<b>See also</b>	<a href="#">"Summary Tab" on page 57</a>


User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Element	Description
	<b>Previous/Next View.</b> Enables you to move between the various drill down levels.
 Details	Displays the full text of the selected output message in the Detailed Message Text area at the bottom of the Output window.
	<b>Export the view.</b> Saves the output to a specified file.
 Refresh	Refreshes the Filtered tab with new log information that arrived in the Output window updated in the Summary tab.
<Message icon>	Displays an icon indicating the type of message by which the current Output view is filtered.
Active Filter	Displays the category or categories by which the current Output view is filtered.
Viewed By	<p>Displays the name of the column on which you selected to drill down. The following icons indicate the various message types:</p> <ul style="list-style-type: none"> <li> Batch</li> <li> Debug</li> <li> Errors</li> <li> Notifications</li> <li> Warnings</li> <li> Alerts</li> </ul>

UI Element	Description
<b>Detailed Message Text</b>	Displays the full text of the selected output message when the <b>Details</b> button is selected.
<b>Message</b>	Displays all instances of the sample message text.
<b>Script</b>	The script on which the message was generated. If you click the blue link, VuGen opens displaying the script.
<b>Action</b>	The action in the script where the message was generated. If you click the blue link, VuGen opens the script to the relevant action.
<b>Line #</b>	The line in the script where the message was generated. If you click the blue link, VuGen opens the script and highlights the relevant line.
<b># Lines</b>	The total number of lines in the script where the Vuser failed.
<b>Time</b>	The time the message was generated.
<b>Iteration</b>	The iteration during which the message was generated.
<b>Vuser</b>	The Vuser that generated the message.
<b>Generator</b>	The load generator on which the message was generated. If you click the blue link, the Load Generator dialog box opens.
<b># Messages</b>	The number of messages generated by a specific Vuser.

## Scenario Run Time Settings Dialog Box

This dialog box enables you to view information about executed load test scenarios, as well as the run time settings for each script in a scenario.

<b>To access</b>	Toolbar > 
<b>See also</b>	<a href="#">"Viewing Load Test Scenario Information" on page 54</a>

User interface elements are described below

UI Element	Description
Result Name	The name of the result file.
Scenario Scripts	Displays the result set for each executed scenario, as well as the Vuser groups and scripts that were run in the scenario.
Group Name	Displays the name of the group to which the selected script belongs.
Full Path	Displays the script's full directory path.
Script Name	Displays the name of the selected script.
Scenario Schedule	Displays goal-oriented or manual scenario scheduling information for the selected scenario.
View Script	Opens the Virtual User Generator, so that you can edit the script. For more information on editing scripts, refer to the <i>HP Virtual User Generator User Guide</i> .

## Defining Service Level Agreements

### Service Level Agreements Overview

Service level agreements (SLAs) are specific goals that you define for your load test scenario. After a scenario run, HP LoadRunner Analysis compares these goals against performance related data that was gathered and stored during the course of the run, and determines whether the SLA passed or failed.

Depending on the measurements that you are evaluating for your goal, LoadRunner determines the SLA status in one of the following ways:

SLA Type	Description
<b>SLA status determined at time intervals over a timeline</b>	<p>Analysis displays SLA statuses at set time intervals over a timeline within the run. At each time interval in the timeline—for example, every 10 seconds—Analysis checks to see if the measurement's performance deviated from the threshold defined in the SLA.</p> <p>Measurements that can be evaluated in this way:</p> <ul style="list-style-type: none"> <li>• <b>Transaction Response Time (Average) per time interval</b></li> <li>• <b>Errors per Second per time interval</b></li> </ul>
<b>SLA status determined over the whole run</b>	<p>Analysis displays a single SLA status for the whole scenario run.</p> <p>Measurements that can be evaluated in this way:</p> <ul style="list-style-type: none"> <li>• <b>Transaction Response Time (Percentile) per run</b></li> <li>• <b>Total Hits per run</b></li> <li>• <b>Average Hits (hits/second) per run</b></li> <li>• <b>Total Throughput (bytes) per run</b></li> <li>• <b>Average Throughput (bytes/second) per run</b></li> </ul>

You can define and edit SLAs in the Controller or in Analysis.

## Tracking Period

When you define service level agreements (SLAs) an SLA for measurements that are evaluated over a timeline, Analysis determines SLA statuses at specified time intervals within that timeline. The frequency of the time intervals is called the **tracking period**.

An internally-calculated tracking period is defined by default. You can change the tracking period by entering a value in the Advanced Options dialog box which Analysis plugs into a built-in algorithm to calculate the tracking period. For details, see ["Advanced Options Dialog Box \(Service Level Agreement Pane\)" on page 70](#).



## How to Define Service Level Agreements



This task describes how to define service level agreements (SLAs).

You can define service level agreements (SLAs) which measure scenario goals over time intervals, or over a whole scenario run. For details, see ["Service Level Agreements Overview" on page 63](#).

**Tip:** For a use-case scenario related to this task, see ["How to Define Service Level Agreements - Use-Case Scenario" on the next page](#).

### 1. Prerequisites

If you are defining an SLA for Average Transaction Response Time, your scenario must include a script that contains at least one transaction.

### 2. Run through the SLA wizard

In the Service Level Agreement pane, click **New** to open the Service Level Agreement wizard. For user interface details, see ["Service Level Agreement Wizard" on page 72](#).

- a. Select a measurement for the SLA.
- b. If you are defining an SLA for Average Transaction Response Time or Transaction Response Time (Percentile), select the transactions to include in your goal.
- c. (Optional) When evaluating SLA statuses over a timeline, select load criteria to take into account and define appropriate load value ranges for the load criteria. For an example, see ["How to Define Service Level Agreements - Use-Case Scenario" on the next page](#).
- d. Set thresholds for the measurements.

- If the **Average Transaction Response Time** or **Errors per Second** exceed the defined thresholds, Analysis will produce a **Failed SLA** status.
- If **Transaction Response Time(Percentile)**, **Total Hits per run**, **Average Hits (hits/second) per run**, **Total Throughput (bytes) per run**, or **Average Throughput (bytes/second) per run** are lower than the defined threshold, Analysis will produce a **Failed SLA** status.

### 3. [Define a tracking period - optional](#)

For measurements whose SLA statuses are determined over time intervals, you need to define the frequency of the time intervals, that is, the **tracking period**. For details, see ["Tracking Period" on page 64](#).

For user interface details, see ["Advanced Options Dialog Box \(Service Level Agreement Pane\)" on page 70](#).

### 4. [Results](#)

When analyzing your scenario run, HP LoadRunner Analysis compares the data collected from the scenario run against the SLA settings, and determines SLA statuses which are included in the default Summary Report.

## How to Define Service Level Agreements - Use-Case Scenario

This use-case scenario describes how to define a service level agreement (SLA) for Average Transaction Response Time.

### 1. [Background](#)

The administrator of HP Web Tours would like to know when the average transaction response time for booking a flight and searching for a flight exceeds a certain value. Assume that your scenario includes a script that includes the following transactions: **book\_flight** and **search\_flight**.

### 2. [Start the SLA wizard](#)

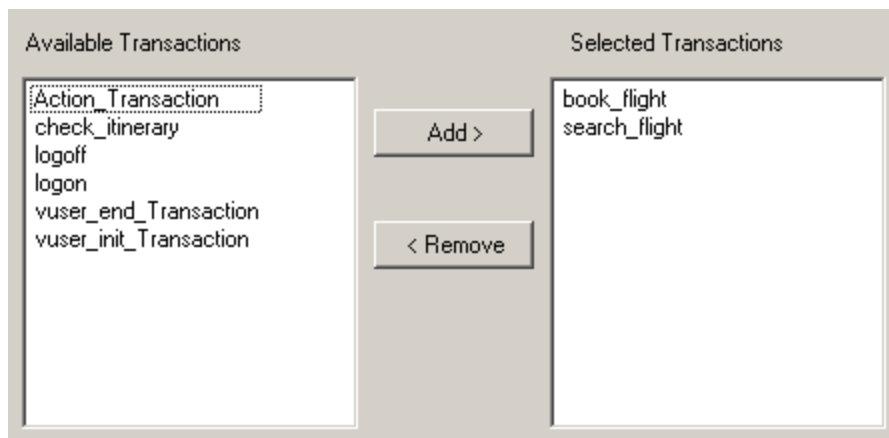
In the Service Level Agreement pane, click **New** to open the Service Level Agreement wizard.

### 3. Select the measurement for the SLA

On the Select a Measurement page, under **Select a Measurement for Your Goal**, in the **Transaction Response Time** box, select **Average**.

### 4. Select the transactions to evaluate in your goal

On the Select a Transaction page, select the transactions to be evaluated: **book\_flight** and **search\_flight**.



### 5. Select a load criterion and define appropriate ranges of load - optional

On the Select Load Criteria page, select the load criterion to take into account when evaluating the average transaction response time.

In this case, to see the effect that various quantities of Vusers running on the system has on the average transaction response time of each transaction, in the **Load Criteria** box, select **Running Vusers**.

Then set the value ranges for the running Vusers:

Consider less than 20 Vusers to be a light load, 20 - 50 Vusers an average load, and 50 Vusers or more a heavy load. Enter these values in the Load Values boxes.

**Note:**

- You can set up to three in-between ranges.
- Valid load value ranges are consecutive—there are no gaps in the range—and span all values from zero to infinity.

Load Criteria: Running Vusers

Load Values:

- ☒ Less than 5
- ☒ Between 5 - 10
- ☒ Greater than or equal to 10

## 6. Set thresholds

On the Set Threshold Values page, you define the acceptable average transaction response times for the transactions, taking into account the defined load criteria.

In this case, define the same threshold values for both transactions as follows: for a light load, a reasonable average response time can be up to 5 seconds, for an average load, up to 10 seconds, and for a heavy load, up to 15 seconds.

Running Vusers			
Transaction Name	<20	≥20 and <50	≥50
book_flight	5	10	15
search_flight	5	10	15

**Tip:** To define the same thresholds for all the transactions, you can type the values in the table nearer the bottom of the Set Threshold Values page, and click **Apply to all transactions**.

## 7. Define a tracking period - optional

When SLA statuses for a measurement are determined at time intervals over a timeline, the frequency of the time intervals is determined by the **tracking period**.

This step is optional because an internally-calculated tracking period of at least 5 seconds is defined by default. You can change the tracking period in the Advanced Options dialog box:

- a. In the Service Level Agreement pane, click the **Advanced** button.
- b. Select **Tracking period of at least X seconds**, and select a tracking period. The time intervals are calculated by Analysis according to a built-in algorithm and as a function of the value you enter here.

**Example:**

If you select a tracking period of 10, and the aggregation granularity for the scenario (defined in Analysis) is 6, then the tracking period is set to the nearest multiple of 6 that is greater than or equal to 10, that is, Tracking Period = 12.

For details, see ["Tracking Period" on page 64](#).

For user interface details, see ["Advanced Options Dialog Box \(Service Level Agreement Pane\)" on the next page](#).

## 8. Results

When analyzing your scenario run, Analysis applies your SLA settings to the default Summary Report and the report is updated to include all the relevant SLA information.

For example, it displays the worst performing transactions in terms of defined SLAs, how specific transactions performed over set time intervals, and overall SLA statuses.





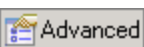
## Service Level Agreement Pane

This pane lists all the service level agreements (SLAs) defined for the scenario.

To access	Tools menu > <b>Configure SLA Rules</b> > <b>Service Level Agreement</b> pane
-----------	---


<b>Relevant Tasks</b>	<ul style="list-style-type: none"> <li>• <a href="#">How to Design a Goal-Oriented Scenario</a></li> <li>• <a href="#">How to Design a Manual Scenario</a></li> <li>• <a href="#">"How to Define Service Level Agreements" on page 65</a></li> <li>• <a href="#">"How to Define Service Level Agreements - Use-Case Scenario" on page 66</a></li> </ul>
<b>See also</b>	<a href="#">"Service Level Agreements Overview" on page 63</a>

User interface elements are described below:

UI Element	Description
 New	Starts the Service Level Agreement wizard where you can define new goals for the load test scenario.
 Details	Opens the Goal Details dialog box which displays a summary of the details of the selected SLA.
 Edit	Opens the Service Level Agreement wizard where you can modify the goals defined in the SLA.
 Delete	Deletes the selected SLA.
 Advanced	<p>Opens the Advanced Options dialog box where you can adjust the tracking period for measurements that are evaluated per time interval over a timeline.</p> <p>For more information, see <a href="#">"Tracking Period" on page 64</a>.</p> <p>For user interface details, see <a href="#">"Advanced Options Dialog Box (Service Level Agreement Pane)" below</a>.</p>
<b>Service Level Agreement list</b>	Lists the SLAs defined for the scenario.

## Advanced Options Dialog Box (Service Level Agreement Pane)

This dialog box enables you to define a tracking period for load test scenario.


<b>To access</b>	<b>Tools</b> menu > <b>Configure SLA Rules</b> > <b>Service Level Agreement</b> pane >  <b>Advanced</b>
<b>Important information</b>	The tracking period is calculated by Analysis according to a built-in algorithm and as a function of the value entered here.
<b>Relevant tasks</b>	<ul style="list-style-type: none"> <li>• <a href="#">"How to Define Service Level Agreements" on page 65</a></li> <li>• <a href="#">"How to Define Service Level Agreements - Use-Case Scenario" on page 66</a></li> </ul>
<b>See also</b>	<a href="#">"Service Level Agreements Overview" on page 63</a>

User interface elements are described below:

<b>UI Element</b>	<b>Description</b>
<b>Internally calculated tracking period</b>	<p>Analysis sets the tracking period to the minimum value possible, taking into account the aggregation granularity defined for the scenario. This value is at least 5 seconds. It uses the following formula:</p> $\text{Tracking Period} = \text{Max} (5 \text{ seconds}, \text{aggregation granularity})$
<b>Tracking period of at least X seconds</b>	<p>Determines the minimum amount of time for the tracking period. This value can never be less than 5 seconds.</p> <p>Analysis sets the tracking period to the nearest multiple of the scenario's aggregation granularity that is greater than or equal to the value (X) that you selected.</p> <p>For this option, Analysis uses the following formula:</p> $\text{Tracking Period} = \text{Max}(5 \text{ seconds}, m(\text{Aggregation Granularity}))$ <p>where <b>m</b> is a multiple of the scenario's aggregation granularity such that <b>m(Aggregation Granularity)</b> is greater than or equal to <b>X</b>.</p> <p><b>Example:</b> If you select a tracking period of X=10, and the aggregation granularity for the scenario is 6, then the tracking period is set to the nearest multiple of 6 that is greater than or equal to 10, that is, Tracking Period = 12.</p>


## Goal Details Dialog Box (Service Level Agreement Pane)

This dialog box displays the thresholds that were set for the selected SLA.

<b>To access</b>	<b>Tools</b> menu > <b>Configure SLA Rules</b> > <b>Service Level Agreement</b> pane >  Details
<b>Important information</b>	If you defined load criteria as part of your SLA, the threshold values are displayed per the defined load value ranges.
<b>See also</b>	<a href="#">"Service Level Agreements Overview" on page 63</a>

## Service Level Agreement Wizard

This wizard enables you to define goals or **service level agreements** (SLAs) for your load test scenario.

<b>To access</b>	<b>Tools</b> menu > <b>Configure SLA Rules</b> > <b>Service Level Agreement</b> pane >  New
<b>Important information</b>	There are two modes for the Service Level Agreement wizard. The pages included in the wizard depend on the measurement that is selected. See the wizard maps below.
<b>Relevant tasks</b>	<ul style="list-style-type: none"><li>• <a href="#">"How to Define Service Level Agreements" on page 65</a></li><li>• <a href="#">"How to Define Service Level Agreements - Use-Case Scenario" on page 66</a></li></ul>
<b>Wizard map - Goal measured per time interval</b>	The <a href="#">Service Level Agreement Wizard</a> contains: <b>Welcome</b> > <a href="#">"Select a Measurement Page" on the next page</a> > <a href="#">("Select Transactions Page" on page 74)</a> > <a href="#">"Set Load Criteria Page" on page 75</a> > <a href="#">"Set Threshold Values Page (Goal Per Time Interval)" on page 78</a>



<b>Wizard map - Goal measured over whole scenario run</b>	The <a href="#">Service Level Agreement Wizard</a> contains:  <b>Welcome</b> > <a href="#">"Select a Measurement Page" below</a> > ( <a href="#">"Select Transactions Page" on the next page</a> ) > <a href="#">"Set Threshold Values Page (Goal Per Whole Run)" on page 80</a>
<b>See also</b>	<a href="#">"Service Level Agreements Overview" on page 63</a>

## Select a Measurement Page

This wizard page enables you to select a measurement for your goal.

<b>Important information</b>	<ul style="list-style-type: none"><li>General information about this wizard is available here: <a href="#">"Service Level Agreement Wizard" on the previous page</a>.</li><li>There are two modes for the Service Level Agreement wizard. The wizard pages that follow depend on the measurement that you select on this page. See the wizard maps below.</li></ul>
<b>Wizard map - Goal measured per time interval</b>	The <a href="#">"Service Level Agreement Wizard" on the previous page</a> contains:  <b>Welcome</b> > <a href="#">Select a Measurement Page</a> > ( <a href="#">"Select Transactions Page" on the next page</a> ) > <a href="#">"Set Load Criteria Page" on page 75</a> > <a href="#">"Set Threshold Values Page (Goal Per Time Interval)" on page 78</a>
<b>Wizard map - Goal measured over whole scenario run</b>	The <a href="#">"Service Level Agreement Wizard" on the previous page</a> contains:  <b>Welcome</b> > <a href="#">Select a Measurement Page</a> > ( <a href="#">"Select Transactions Page" on the next page</a> ) > <a href="#">"Set Threshold Values Page (Goal Per Whole Run)" on page 80</a>
<b>See also</b>	<a href="#">"Service Level Agreements Overview" on page 63</a>

User interface elements are described below:

UI Element	Description
<b>SLA status determined over the whole run</b>	<p>Evaluates a single SLA status for the whole scenario run. Select one of the following measurements:</p> <ul style="list-style-type: none"><li>• <b>Transaction Response Time (Percentile)</b></li><li>• <b>Total Hits per run</b></li><li>• <b>Average Hits (hits/second) per run</b></li><li>• <b>Total Throughput (bytes) per run</b></li><li>• <b>Average Throughput (bytes/second) per run</b></li></ul>
<b>SLA status determined per time intervals over a timeline</b>	<p>Evaluates SLA statuses at set time intervals within the run. Select one of the following measurements:</p> <ul style="list-style-type: none"><li>• <b>Average Transaction Response Time</b></li><li>• <b>Errors per Second</b></li></ul> <p>The time intervals at which the SLA statuses are evaluated are known as the <b>tracking period</b>. For details, see <a href="#">"Tracking Period" on page 64</a>.</p>

## Select Transactions Page

This wizard page enables you to select transactions to evaluate as part of your goal.

<b>Important information</b>	<ul style="list-style-type: none"><li>• General information about this wizard is available here: <a href="#">"Service Level Agreement Wizard" on page 72</a>.</li><li>• This page is displayed when creating an SLA for Transaction Response Time by Average or by Percentile.</li><li>• In order to define an SLA for Transaction Response Time by Average or by Percentile, at least one of the Vuser scripts participating in the scenario must include a transaction.</li><li>• You can select multiple transactions using the CTRL key.</li></ul>
------------------------------	--

<b>Wizard map - Goal measured per time interval</b>	The <a href="#">"Service Level Agreement Wizard"</a> on page 72 contains: <b>Welcome</b> > <a href="#">"Select a Measurement Page"</a> on page 73 > <a href="#">(Select Transactions Page)</a> > <a href="#">"Set Load Criteria Page"</a> below > <a href="#">"Set Threshold Values Page (Goal Per Time Interval)"</a> on page 78
<b>See also</b>	<a href="#">"Service Level Agreements Overview"</a> on page 63

User interface elements are described below:

UI Element	Description
<b>Available Transactions</b>	<p>Lists the transactions in the Vuser scripts participating in the scenario.</p> <p>To move a script to the <b>Selected Transaction</b> list, select it and click <b>Add</b>.</p>
<b>Selected Transactions</b>	<p>Lists the transactions in the Vuser scripts participating in the scenario that have been selected for the SLA.</p> <p>To remove a script from this list, select it and click <b>Remove</b>.</p>

## Set Load Criteria Page

This wizard page enables you to select load criteria to take into account when testing your goal.

<b>Important information</b>	<ul style="list-style-type: none"><li>• General information about this wizard is available here: <a href="#">"Service Level Agreement Wizard"</a> on page 72.</li><li>• This page is displayed only when defining an SLA that determines SLA statuses per time interval over a timeline.</li><li>• In the next wizard step (Set Threshold Values page), you will set different thresholds per each of the load ranges that you select here.</li></ul>
------------------------------	---

, continued

<b>Wizard map - Goal measured per time interval</b>	The "Service Level Agreement Wizard" on page 72 contains: <b>Welcome</b> > "Select a Measurement Page" on page 73 > ("Select Transactions Page" on page 74) > <b>Set Load Criteria Page</b> > "Set Threshold Values Page (Goal Per Time Interval)" on page 78
<b>See also</b>	"Service Level Agreements Overview" on page 63

User interface elements are described below:

UI Element	Description
<b>Load Criteria</b>	The relevant load criteria that you want to use  <b>Example:</b> If you want to see the impact of running Vusers on the measurement, select <b>Running Vusers</b> .  To define an SLA without load criteria, select <b>None</b> .

, continued

UI Element	Description
<b>Load Values</b>	<p>Valid load value ranges are consecutive—there are no gaps in the range—and span all values from zero to infinity.</p> <ul style="list-style-type: none"><li>• <b>Less than.</b> Enter the upper value for the lower range of values for the load criteria.</li></ul> <p>The lower range is between 0 and the value you entered. It does not include the upper value.</p> <p><b>Example:</b> If you enter 5, the lower range of values for the load criteria is between 0 and 5, but does not include 5.</p> <ul style="list-style-type: none"><li>• <b>Between.</b> The in-between range of values for the load criteria. Enter lower and upper values for this range. The lower range is included in this range; it does not include the upper value.</li></ul> <p><b>Example:</b> If you enter 5 and 10, the in-between range of values for the load criteria is from 5 and up to, but not including, 10.</p> <p><b>Note:</b> You can set up to three in-between ranges.</p> <ul style="list-style-type: none"><li>• <b>Greater than.</b> Enter the lower value for the upper range of values for the load criteria.</li></ul> <p>The upper range includes values from the value you entered and on.</p> <p><b>Example:</b> If you enter 10, the upper range of values for the load criteria is from 10 and on.</p>
<b>Selected Measurement</b>	The measurement selected for the goal.

## Set Percentile Threshold Values Page

This wizard page enables you to select load criteria to take into account when testing your goal.

<b>Important information</b>	<ul style="list-style-type: none"><li>• General information about this wizard is available here: <a href="#">"Service Level Agreement Wizard" on page 72</a>.</li><li>• The Percentile SLA enables you to measure whether the percentage of transaction samples meets the defined threshold criteria.</li><li>• You can enter a threshold value to 3 decimal places.</li></ul>
<b>Wizard map - Goal measured over whole scenario run</b>	The <a href="#">"Service Level Agreement Wizard" on page 72</a> contains:  <b>Welcome</b> > <a href="#">"Select a Measurement Page" on page 73</a> > ( <a href="#">"Select Transactions Page" on page 74</a> ) > <b>Set Percentile Threshold Values Page</b>
<b>See also</b>	<a href="#">"Service Level Agreements Overview" on page 63</a>

User interface elements are described below:

UI Element	Description
<b>Selected Measurement</b>	The measurement selected for the goal.
<b>Percentile</b>	Percentage of transactions to measure against the configured threshold.
<b>Provide threshold value for all transactions</b>	To apply one set of threshold values to all transactions selected for the goal, enter the threshold value and click <b>Apply to all</b> . These values are applied to all the transactions in the Thresholds table at the bottom of the page.
<b>Transaction name</b>	The transaction from the scenario run.
<b>Threshold</b>	The threshold value for the selected transaction.

## Set Threshold Values Page (Goal Per Time Interval)

This wizard page enables you to set thresholds for the measurements you are evaluating in your goal.

<b>Important information</b>	<ul style="list-style-type: none"> <li>General information about this wizard is available here: <a href="#">"Service Level Agreement Wizard" on page 72</a>.</li> <li>If you defined load criteria in the <a href="#">"Set Load Criteria Page" on page 75</a>, you must set thresholds per each of the defined load ranges. If you did not define load criteria, you set one threshold value. For Average Transaction response time, you set threshold values for each transaction.</li> <li>You can enter a threshold value to 3 decimal places.</li> </ul>
<b>Wizard map - Goal measured per time interval</b>	<p>The <a href="#">"Service Level Agreement Wizard" on page 72</a> contains:</p> <p><b>Welcome</b> &gt; <a href="#">"Select a Measurement Page" on page 73</a> &gt; (<a href="#">"Select Transactions Page" on page 74</a>) &gt; <a href="#">"Set Load Criteria Page" on page 75</a> &gt; <b>Set Threshold Values Page (Goal Per Time Interval)</b></p>
<b>See also</b>	<a href="#">"Service Level Agreements Overview" on page 63</a>

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Element	Description
<b>&lt;Thresholds table&gt;</b>	<p>The thresholds for your goal. If you defined load criteria, enter thresholds for each range of values.</p> <p><b>Note:</b> If the maximum threshold value is exceeded during a particular time interval during the run, Analysis displays an SLA status of <b>Failed</b> for that time interval.</p>
<b>Apply to all</b> (Average Transaction Response Time goal only)	<p>To apply one set of threshold values to all transactions selected for the goal, enter the threshold values in this table and click <b>Apply to all transactions</b>. These values are applied to all the transactions in the Thresholds table at the top of the page.</p> <p><b>Note:</b> Threshold values for selected transactions do not have to be the same. You can assign different values for each transaction.</p>
<b>Selected Measurement</b>	The measurement selected for the goal.

## Set Threshold Values Page (Goal Per Whole Run)

This wizard page enables you to set minimum thresholds for the measurements you are evaluating in your goal.

<b>Important information</b>	General information about this wizard is available here: <a href="#">"Service Level Agreement Wizard" on page 72</a> .
<b>Wizard map - Goal measured over whole scenario run</b>	The <a href="#">"Service Level Agreement Wizard" on page 72</a> contains:  <b>Welcome</b> > <a href="#">"Select a Measurement Page" on page 73</a> > <b>Set Threshold Values Page (Goal Per Whole Run)</b>
<b>See also</b>	<a href="#">"Service Level Agreements Overview" on page 63</a>

User interface elements are described below:

UI Element	Description
<b>Selected measurement</b>	The measurement selected for the goal.
<b>Threshold</b>	The minimum threshold value for the selected measurement.  <b>Note:</b> If the value of the measurement is lower than this threshold during the run, Analysis displays an SLA status of <b>Failed</b> for the entire run.

## Working with Application Lifecycle Management

### Managing Results Using ALM - Overview

Analysis works together with HP Application Lifecycle Management (ALM). ALM provides an efficient method for storing and retrieving scenario and analysis



results. You can store results in an ALM project and organize them into unique groups.

In order for the Analysis to access an ALM project, you must connect it to the Web server on which ALM is installed. You can connect to either a local or remote Web server.

When working against an ALM server with Performance Center, the ALM integration has several additional capabilities, such as the ability to save the Analysis session to a new location, and upload a report from the file system to ALM. For details, see ["How to Work with Results in ALM - With Performance Center" on page 83](#).

For more information on working with ALM, see the *Application Lifecycle Management User Guide*.

## How to Connect to ALM

To store and retrieve results from ALM, you need to connect to an ALM project. You can connect or disconnect from an ALM project at any time during the testing process.

You can connect to one version of HP ALM from Analysis and a different version from your browser. For more information, see the **Important Information** section in ["HP ALM Connection Dialog Box" on page 87](#).

### Connect to ALM

1. Select **Tools > HP ALM Connection**. The HP ALM Connection dialog box opens.
2. Enter the required information in the HP ALM Connection dialog box, as described in ["HP ALM Connection Dialog Box" on page 87](#).
3. To disconnect from ALM, click **Disconnect**.

**Note:** If you authenticated through CAC mode and disconnected from the ALM server, you need to restart Analysis before reconnecting in CAC mode.

## How to Work with Results in ALM - Without Performance Center

The following steps describe the workflow for working with results saved in an ALM project, whose server does not have a Performance Center installation.

When working against an ALM server with HP Performance Center, there are several differences. For more information, see ["How to Work with Results in ALM - With Performance Center" on the next page](#).

### 1. [Connect to ALM](#)

Open a connection to the ALM server and project that contains the LoadRunner result or Analysis session files. For task details, see ["How to Connect to ALM" on the previous page](#).

### 2. [Open an existing Analysis session file - optional](#)

- a. Select **File > Open**.
- b. In the left pane select a script.
- c. In the right pane, select the results for which the Analysis session file was created.
- d. Click **OK**.

### 3. [Create a new Analysis session file from the raw data - optional](#)

This procedure describes how to create a new Analysis session file on the ALM server, from the raw results file. If an Analysis session file already exists for the raw data, you can choose to overwrite the existing file.

- a. Select **File > New**.
- b. In the left pane select a script.
- c. In the right pane, select the results you want to analyze.
- d. Click **OK**.

### 4. [Save the LoadRunner results file](#)

When you are finished analyzing your results and creating reports or graphs, save the changes. Select **File > Save**. The Analysis session file is in the ALM project.

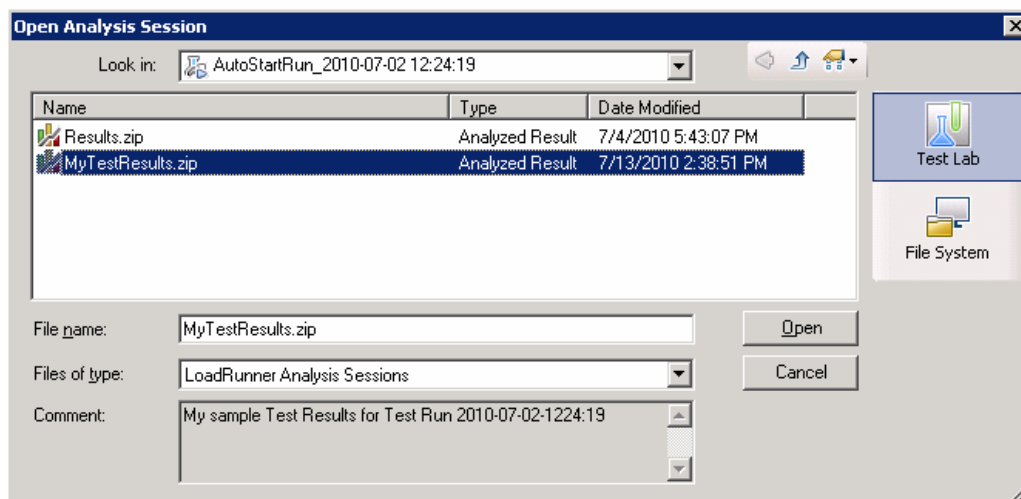
**Note:** When working with ALM without Performance Center, **Save As** is not supported—you cannot save the Analysis session file to another location.

## How to Work with Results in ALM - With Performance Center

ALM servers with Performance Center, allow you to perform the following operations:

### Open an existing Analysis Session file

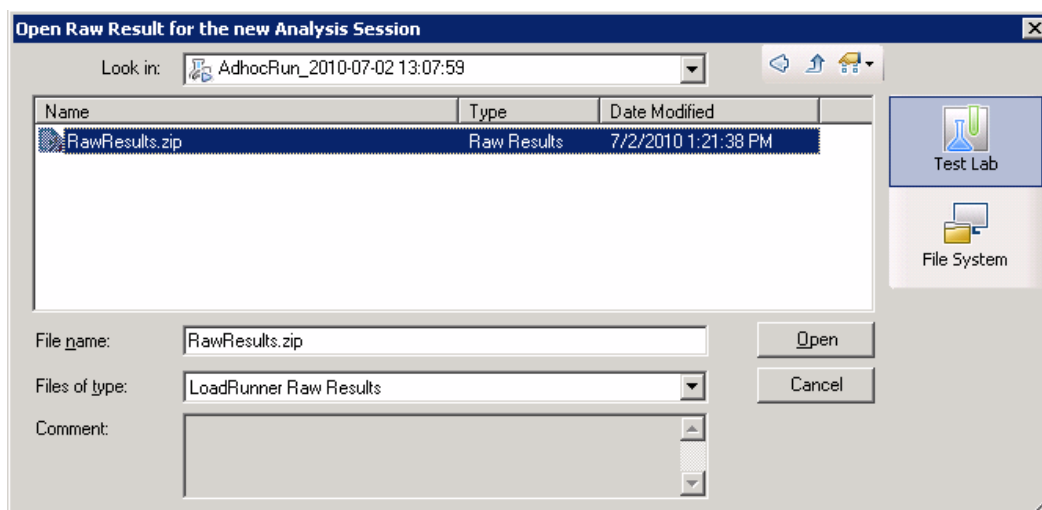
1. Select **Tools > HP ALM Connection** and make sure your connection to ALM is open.
2. Select **File > Open**.
3. Drill down to the Run level within the Test Plan module, and select an individual run.
4. Select a zip file containing the Analysis session file.



5. Click **Open**.

## Open raw data and create a new Analysis session

1. Select **Tools > HP ALM Connection** and make sure your connection to ALM is open.
2. To create a new Analysis session file from the raw data, select **File > New**.
3. Drill down to the Run level within the Test Plan module, and select an individual run.
4. Select a zip file containing the run's raw data.

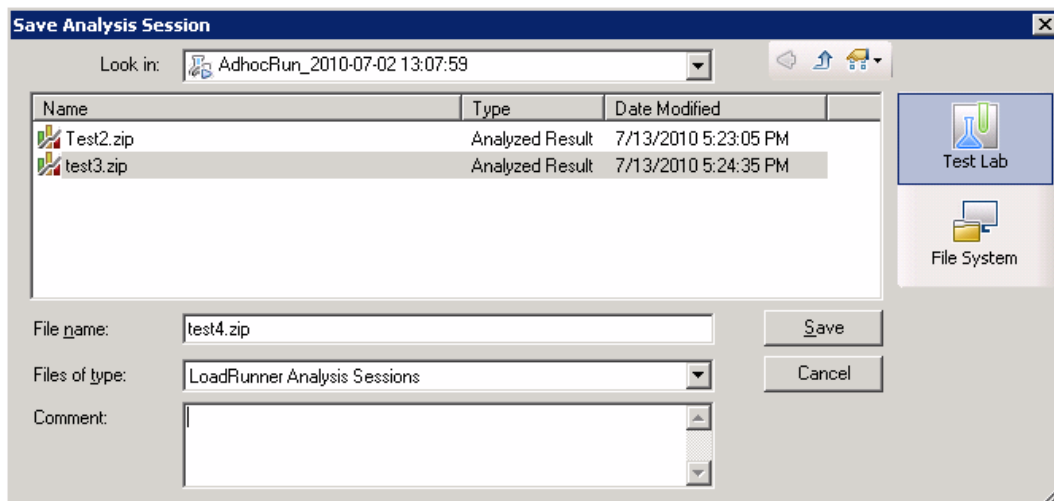


5. Click **Open**.

## Save the changes to the Analysis session file

1. Complete your changes to the Analysis results.
2. Select **Tools > HP ALM Connection** and make sure your connection to ALM is open.
3. Select **File > Save**.
4. To save an Analysis session that was opened from the file system, click the **Test Lab** module button.

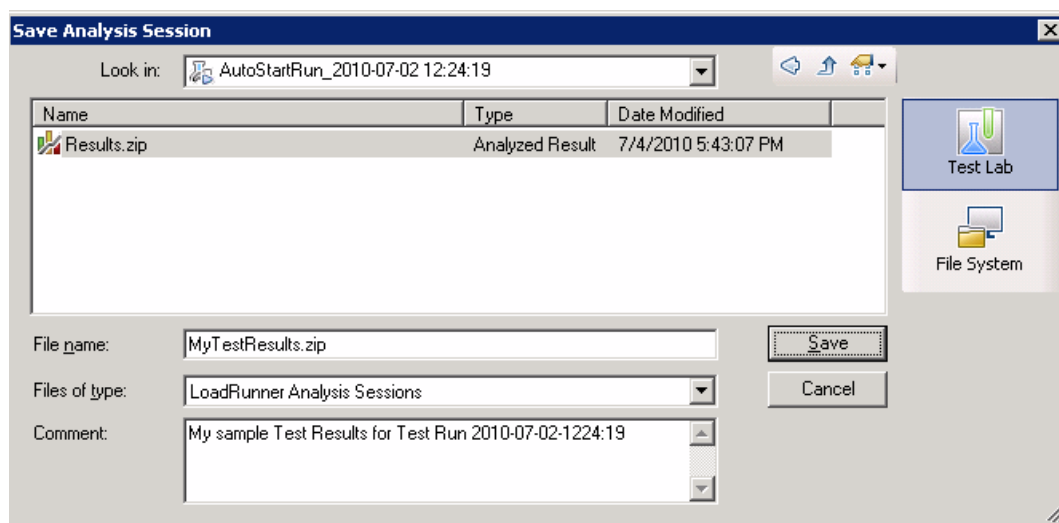
5. Drill down to the Run level within the Test Plan module, and specify a name for the zip file.



6. Provide a comment about the Analysis session (optional).
7. Click **Save**.

## Save the Analysis session file to a new ALM location

1. Select **Tools > HP ALM Connection** and make sure your connection to ALM is open.
2. Open an Analysis session file from the file system, or from ALM as described above.
3. Select **File > Save as**.
4. Drill down to the Run level within the Test Plan module, and select an individual run.
5. Specify a name for the Analysis session zip file. The name *Results* is reserved.



6. Provide a comment about the Analysis session (optional).
7. Click **Save**.

## Integration Methods - TestPlan or TestLab

Analysis uses different integration methods for ALM projects with Performance Center extensions, depending on how it was invoked:

- Through the Web-interface or from the Controller—**TestPlan** integration is used.
- Through a manual launch, connected to a project through the HP ALM Connection dialog box—**TestLab** integration is used.

## How to Upload a Report to ALM

The following steps describe how to upload a report from the file system to an ALM's Test Lab module. This capability is only available for ALM installation with Performance Center.

When working against an ALM server with HP Performance Center, there are several differences. For more information, see ["How to Work with Results in ALM - With Performance Center"](#) on page 83.

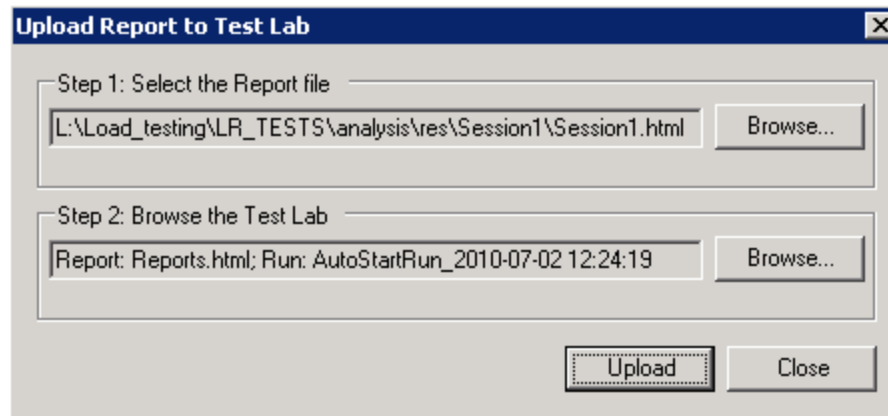
### 1. **Connect to ALM**

Open a connection to the ALM server and project that contains the LoadRunner result or Analysis session files. For task details, see ["How to Connect to ALM"](#)

on page 81.

## 2. Open the Upload dialog box

Select **Tools > Upload Report to Test Lab**.



## 3. Select a report

Click **Browse** in the **Step 1** section. The **Select the Report file** dialog box opens. Select an HTML or XML file from the file system. Click **Open**.

## 4. Select a location on ALM

Click **Browse** in the **Step 2** section. The **Select Location for the Report** dialog box opens. Navigate to a Run level in the Test Lab module. Specify a name for the report and include any relevant comments. Click **OK**.

## 5. Begin the upload

Click **Upload**. The upload begins.

# HP ALM Connection Dialog Box

This dialog box enables you to connect to an ALM project.

HP ALM Connection

Step 1: Connect to server

Server URL:

Example: http://server:8080/qcbin

☐ Reconnect to server on startup

Connect

Step 2: Authenticate user information

User name:

Password:

☐ Authenticate on startup

Authenticate

Step 3: Login to project

Domain:

Project:

☐ Login to project on startup

Login



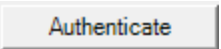
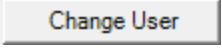
OK


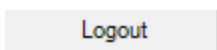
Help

To access	Tools > HP ALM Connection
Important information	<p>You can connect to one version of HP ALM from LoadRunner and a different version of HP ALM from your browser.</p> <p>You can only connect to different versions of HP ALM if one of the versions is HP ALM 11.00 or higher.</p> <p><b>Note:</b> Before you connect to ALM through the LoadRunner interface, it is recommended that you first connect to the HP ALM server through your browser.This automatically downloads the ALM client files to your computer.</p>
Relevant tasks	<a href="#">"How to Connect to ALM" on page 81</a>

User interface elements are described below:

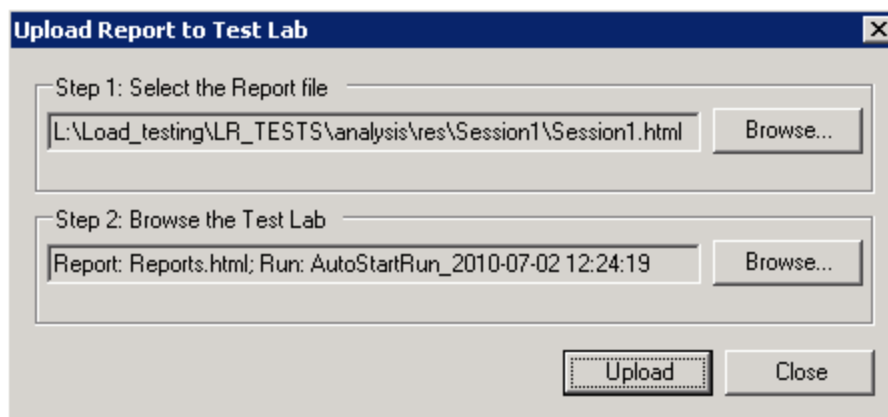


UI Element	Description
<b>Step 1: Connect to Server</b>	<ul style="list-style-type: none"> <li>• <b>Server URL.</b> The URL of the server on which ALM is installed. The URL must be in the following form <b>http://&lt;server_name:port&gt;/qcbn</b>.</li> <li>• <b>Reconnect to server on startup.</b> Automatically reconnect to the server every time you start LoadRunner.</li> <li>•  /  . Connects to the server specified in the <b>Server URL</b> box. Only one button is visible at a time, depending on your connection status.</li> </ul>
<b>Step 2: Authenticate User Information</b>	<ul style="list-style-type: none"> <li>• <b>User Name.</b> Your ALM project user name.</li> <li>• <b>Password.</b> Your ALM project password.</li> <li>• <b>Authenticate on startup.</b> Authenticates your user information automatically, the next time you open the application. This option is available only if you selected <b>Reconnect to server on startup</b> above.</li> <li>•  . Authenticates your user information against the ALM server.</li> </ul> <p>After your user information has been authenticated, the fields in the Authenticate user information area are displayed in read-only format. The Authenticate button changes to  .</p> <p>You can log in to the same ALM server using a different user name by clicking <b>Change User</b>, entering a new user name and password, and then clicking <b>Authenticate</b> again.</p>

UI Element	Description
<b>Step 3: Login to Project</b>	<ul style="list-style-type: none"> <li>• <b>Domain.</b> The domain that contains the ALM project. Only those domains containing projects to which you have permission to connect to are displayed.</li> <li>• <b>Project.</b> Enter the ALM project name or select a project from the list. Only those projects that you have permission to connect to are displayed.</li> <li>• <b>Login to project on startup.</b> This option is only enabled when the <b>Authenticate on startup</b> check box is selected.</li> <li>•  /  . Logs into and out of the ALM project.</li> </ul>

## Upload Report to Test Lab Dialog Box

This dialog box enables you to upload an Analysis report to an ALM project's Test Lab module.



<b>To access</b>	<b>Reports &gt; Upload Report to Test Lab</b>
------------------	---

User interface elements are described below:

UI Element	Description
<b>Step 1: Select the report file</b>	Allows you to select an Analysis report from the file system. You can select an HTML report, or Rich report in XML format.

UI Element	Description
<b>Step 2: Browse the test lab</b>	Allows you to select an location within the Test Lab module, for the report.  <b>Note:</b> You must drill down to the level of a Run within the Test Lab module.
<b>Upload</b>	Begins the uploading of the report. If the uploading succeeds, the Analysis issues a message.

## Analysis Graphs

### Analysis Graph Types



Analysis graphs are divided alphabetically into the following categories:

- **Application Components.** Provides information about resource usage of the Microsoft COM+ server and the Microsoft NET CLR server. For more information, see ["Application Component Graphs" on page 334](#).
- **Application Deployment Solutions.** Provides information about resource usage of the Citrix server. For more information, see ["Application Deployment Solutions Graphs" on page 364](#).
- **Database Server Resources.** Provides information about database resources. For more information, see ["Database Server Resource Graphs" on page 263](#).
- **Errors.** Provides information about the errors that occurred during the load test scenario. For more information, see ["Error Graphs" on page 162](#).
- **Firewalls.** Provides information about firewall server resource usage. For more information, see [Firewall Server Monitor Graphs](#).

- **Flex Graphs.** Provides information about resource usage of the Flex server. For more information, see ["Flex Graphs" on page 383](#).
- **Infrastructure Resource.** Provides information about resource usage of FTP, POP3, SMTP, IMAP, and DNS Vusers on the network client. For more information, ["Infrastructure Resources Graphs" on page 379](#).
- **J2EE & .NET Diagnostics.** Provides information to trace, time, and troubleshoot individual transactions through J2EE & .NET Web, application, and database servers. For more information, see ["J2EE & .NET Diagnostics Graphs" on page 298](#).
- **Middleware Performance.** Provides information about resource usage of the Tuxedo and IBM WebSphere MQ servers. For more information, see ["Middleware Performance Graphs" on page 372](#).
- **Network Monitor.** Provides information about the network delays. For more information, see ["Network Monitor Graphs" on page 241](#).
- **Streaming Media.** Provide information about resource usage of streaming media. For more information, see ["Streaming Media Graphs" on page 289](#).
- **System Resources.** Provide statistics relating to the system resources that were monitored during the load test scenario using the online monitor. This category also includes graphs for SNMP monitoring. For more information, see ["System Resource Graphs" on page 220](#).
- **Transactions.** Provide information about transaction performance and response time. For more information, see ["Transaction Graphs" on page 167](#).
- **User Defined Data Points.** Provide information about the custom data points that were gathered by the online monitor. For more information, see ["User-Defined Data Point Graphs" on page 218](#).
- **Vuser Graphs.** Provide information about Vuser states and other Vuser statistics. For more information, see ["Vuser Graphs" on page 159](#).
- **Web Application Server Resources.** Provide information about the resource usage for various Web application servers. For more information, see ["Web Application Server Resource Graphs" on page 249](#).
- **Web Page Diagnostics.** Provide information about the size and download time of each Web page component. For more information, see ["Web Page](#)

[Diagnostics Graphs" on page 193.](#)

- **Web Resources.** Provide information about the throughput, hits per second, HTTP responses per second, number of retries per second, and downloaded pages per second for Web Vusers. For more information, see ["Web Resources Graphs" on page 179.](#)
- **Web Server Resources.** Provide information about the resource usage for the Apache and MS IIS Web servers. For more information see ["Web Resources Graphs" on page 179.](#)
- **WebSocket Statistics.** Provide information about the communication over WebSockets. For more information see ["WebSocket Statistics Graphs" on page 388.](#)

## Configuring Graph Display

Analysis allows you to customize the display of the graphs and measurements in your session so that you can view the data displayed in the most effective way possible.


### How to Customize the Analysis Display

The following steps describes how to customize the display of analysis. You can customize the display of the graphs and measurements in your session so that you can view the data displayed in the most effective way possible.

#### Enlarging a section of the graph


To zoom in or enlarge a section of the graph, move and hold down the left mouse button over the section of the graph you want to enlarge.

#### Using comments in a graph

To add a comment to a graph, click  and then click the mouse over the section of the graph where you would like to add a comment. Type your comment in the Add Comment dialog box.

To edit, format or delete a comment from the graph, click the comment and apply your change in the Edit Comments dialog box. In the left pane, verify the relevant comment is selected before you edit, format or delete.

## Using arrows in a graph

To add an arrow to a graph, click  and then click the mouse button within the graph to position the base of the arrow.

To delete an arrow from a graph, select the arrow and press Delete.

## Using the User Notes Window

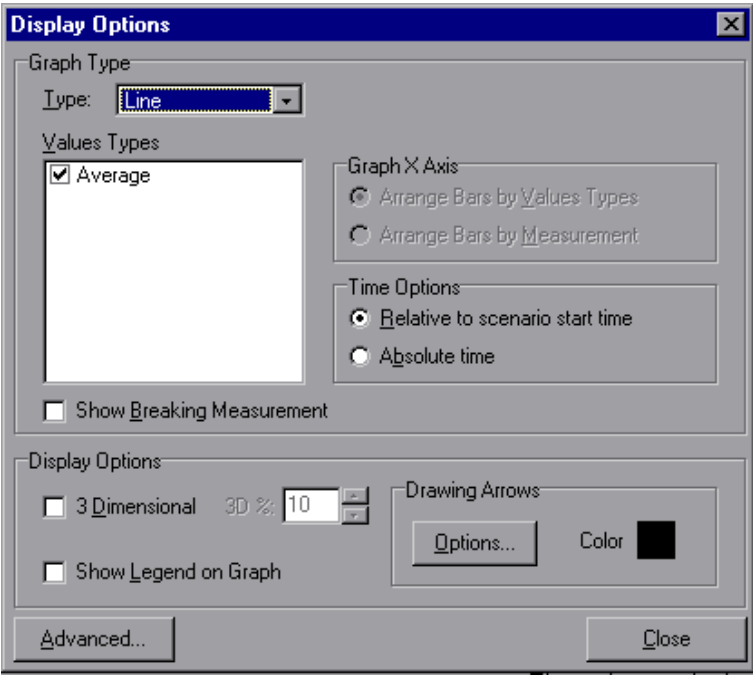
In the User Notes window (**Windows > User Notes**), you can enter text about the graph or report that is currently open. The text in the User Notes window is saved with the session.

To view the text that you entered for a specific graph or report, select the relevant graph or report and open the User Notes window (**Windows > User Notes**).

# Display Options Dialog Box

This dialog box enables you to select the graph type and configure the display of the graph.


**Note:** This option is not available for all graph types.



To access	View > Display Options
See also	<ul style="list-style-type: none"><li>• <a href="#">"Editing Main Chart Dialog Box (Display Options Dialog Box)" on the next page</a></li><li>• <a href="#">"Chart Tab (Editing MainChart Dialog Box)" on page 98</a></li><li>• <a href="#">"Series Tab (Editing MainChart Dialog Box)" on page 99</a></li></ul>

User interface elements are described below:

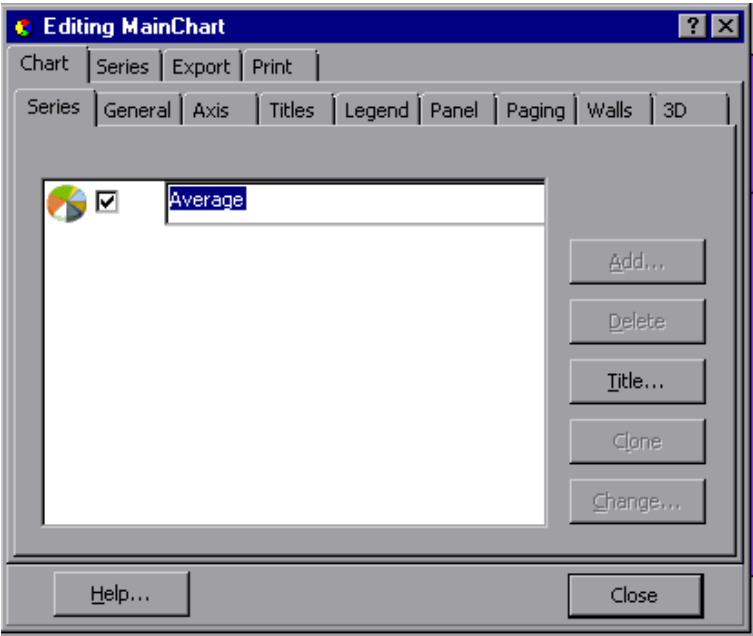
UI Elements	Description
Type	Select the type of graph to display from the drop-down list.
Values Types	Select the type of display information from the list of available values. For example, a bar graph displaying Average Transaction Response Time can be configured to display minimum, maximum, average, STD, count, and sum averages.
Graph X Axis (Bar graphs only)	Select the bar arrangement along the x-axis. You can arrange the bars by value types or measurement.

UI Elements	Description
<b>Time Options</b>	Select the way in which the graph shows the Elapsed Scenario Time on the x-axis. You can choose an elapsed time relative to the beginning of the scenario or an elapsed time from the absolute time of the machine's system clock.
<b>Show Breaking Measurement</b>	Select this check box to display the name and properties of the breaking measurement at the top of the graph (disabled by default).
<b>3 Dimensional</b>	Select this check box to enable a 3-dimensional display of the graph.
<b>3D %</b>	Specify a percentage for the 3-dimensional aspect of lines in the graph. This percentage indicates the thickness if the bar, grid, or pie chart.
<b>Show Legend on Graph</b>	Select this check box to display a legend at the bottom of the graph.
<b>Drawing Arrows</b>	Allows you to configure the style, color, and width of arrows you draw to highlight graph information.
	Opens the <b>Editing MainChart</b> dialog box. For more information, see <a href="#">"Editing Main Chart Dialog Box (Display Options Dialog Box)"</a> below.

## Editing Main Chart Dialog Box (Display Options Dialog Box)

This dialog box enables you to configure the look and feel of your graph as well as its title and the format of the data.





To access	View > Display Options > Advanced button
See also	<ul style="list-style-type: none"><li>• <a href="#">"Display Options Dialog Box" on page 94</a></li><li>• <a href="#">"Chart Tab (Editing MainChart Dialog Box)" on the next page</a></li><li>• <a href="#">"Series Tab (Editing MainChart Dialog Box)" on page 99</a></li></ul>

User interface elements are described below:

UI Element	Description
Chart tab	Enables you to configure the look and feel of your entire graph. You set Chart preferences using the following tabs: For details, see <a href="#">"Chart Tab (Editing MainChart Dialog Box)" on the next page</a> .
Series tab	Enables you to control the appearance of the individual points plotted in the graph. You set Series preferences using the following tabs. For details, see <a href="#">"Series Tab (Editing MainChart Dialog Box)" on page 99</a> .
Export tab	Enables you to store the current graph to an image file in the format of your choice—BMP, JPG, or EMF. You can also export the graph's data to HTML, Excel, or XML

UI Element	Description
<b>Print tab</b>	Enables you to print only the graph itself without the legend and other data such as the User Notes.

## Chart Tab (Editing MainChart Dialog Box)

This tab enables you to configure the look and feel of your entire graph.

<b>To access</b>	<b>View &gt; Display Options &gt; Advanced button &gt; Chart tab</b>
<b>See also</b>	<ul style="list-style-type: none"> <li>• <a href="#">"Display Options Dialog Box" on page 94</a></li> <li>• <a href="#">"Editing Main Chart Dialog Box (Display Options Dialog Box)" on page 96</a></li> <li>• <a href="#">"Series Tab (Editing MainChart Dialog Box)" on the next page</a></li> </ul>

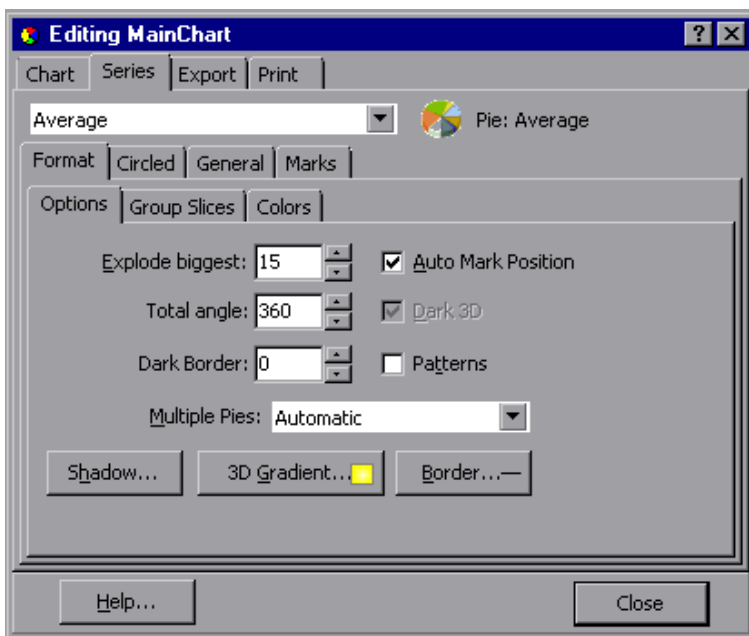
User interface elements are described below:

UI Element	Description
<b>Series tab</b>	Select the graph style (for example, bar or line), the hide/show settings, line and fill color, and the title of the series.
<b>General tab</b>	Select options for print preview, export, margins, scrolling, and magnification.
<b>Axis tab</b>	Select which axes to show, as well as their scales, titles, ticks, and position.
<b>Titles tab</b>	Set the title of the graph, its font, background color, border, and alignment.
<b>Legend tab</b>	Set all legend related settings, such as position, fonts, and divider lines.

UI Element	Description
<b>Panel tab</b>	Show the background panel layout of the graph. You can modify its color, set a gradient option, or specify a background image.
<b>Paging tab</b>	Set all page related settings, such as amount of data per page, scale, and page numbering. These settings are relevant when the graph data exceeds a single page.
<b>Walls tab</b>	Set colors for the walls of 3-dimensional graphs.
<b>3D</b>	Select the 3-dimensional settings, offset, magnification, and rotation angle for the active graph.

## Series Tab (Editing MainChart Dialog Box)

This page enables you to control the appearance of the individual points plotted in the graph.



<b>To access</b>	<b>View &gt; Display Options &gt; Advanced button &gt; Series tab</b>
------------------	---

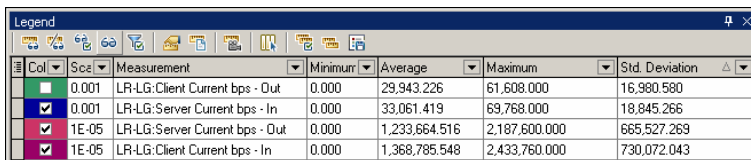
- See also**
- ["Display Options Dialog Box" on page 94](#)
  - ["Editing Main Chart Dialog Box \(Display Options Dialog Box\)" on page 96](#)
  - ["Chart Tab \(Editing MainChart Dialog Box\)" on page 98](#)

User interface elements are described below:

UI Element	Description
<b>Format tab</b>	Set the border color, line color, pattern, and invert property for the lines or bars in your graph.
<b>Point tab</b>	Set the size, color, and shape of the points that appear within your line graph.
<b>General tab</b>	Select the type of cursor, the format of the axis values, and show/hide settings for the horizontal and vertical axes.
<b>Marks tab</b>	Configure the format for each point in the graph.

## Legend Window

This window enables you to configure the color, scale, minimum, maximum, average, median, and standard deviation of each measurement appearing in the graph.










Col	Scale	Measurement	Minimum	Average	Maximum	Std. Deviation
0.001		LR-LG:Client Current bps - Out	0.000	29,943.226	61,608.000	16,980.580
0.001		LR-LG:Server Current bps - In	0.000	33,061.419	69,768.000	18,845.266
1E-05		LR-LG:Server Current bps - Out	0.000	1,233,664.516	2,187,600.000	665,527.269
1E-05		LR-LG:Client Current bps - In	0.000	1,368,785.548	2,433,760.000	730,072.043






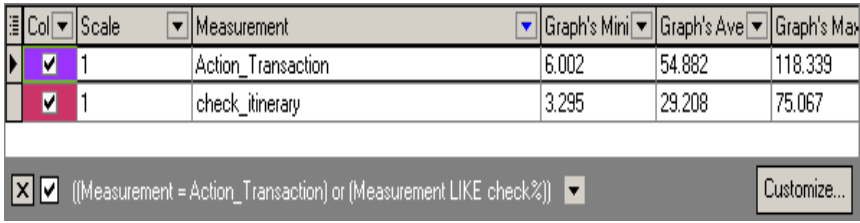
**To access** **Analysis Window > Legend window**

<b>Tip</b>	<p><b>Filtering:</b> To show only certain values, click the down arrow in the selected column and click <b>Custom</b>. The Custom Filter dialog box opens. For details, see <a href="#">"Custom Filter Dialog Box" on page 143</a>.</p> <p><b>Sorting:</b> To sort the measurements by a specific metrics, select a column header once to display the measurements in ascending order. Click it again to display them in descending order.</p>
<b>See also</b>	<ul style="list-style-type: none"> <li>• <a href="#">"Measurement Description Dialog Box" on page 104</a></li> <li>• <a href="#">"Measurement Options Dialog Box" on page 105</a></li> </ul>

## Legend Toolbar

User interface elements are described below:

UI Element	Description
	<b>Show.</b> Displays the selected measurements in the graph.
	<b>Hide.</b> Hides the selected measurements in the graph.
	<b>Show only Selected.</b> Displays the highlighted measurement only.
	<b>Show All.</b> Displays all the available measurements in the graph.
	<b>Filter.</b> Filters the graph by the measurements selected in the Legend window. You can select multiple measurements. To clear the filter, select <b>View &gt; Clear Filter/Group By</b> .
	<b>Configure.</b> Opens the Measurement Options dialog box that enables you to configure measurement options (for example, set color and measurement scale). For more information, see <a href="#">"Measurement Options Dialog Box" on page 105</a> .
	<b>Show Description.</b> Opens the Measurement Description dialog box that displays the name, monitor type, and description of the selected measurement. For more information, see <a href="#">"Measurement Description Dialog Box" on page 104</a> .

UI Element	Description
	<b>Animate.</b> Displays the selected measurement as a flashing line.
	<b>Configure Columns.</b> Opens the Legend Columns Options dialog box that enables you to select the columns to display in the Legend window.
	<b>Copy Selection.</b> Copies the selected rows to the clipboard. You can paste the data in a text file or a spreadsheet.
	<b>Copy All.</b> Copies all of the legend data to the clipboard, regardless of what is selected. You can paste the data in a text file or a spreadsheet.
	<b>Export.</b> Saves the legend data to a CSV file.
<b>&lt;Custom filter&gt;</b>	<p>After adding a custom filter (by expanding the down arrow in the column headers), the window shows them at the bottom of the legend. Click the <b>x</b> button to remove the filter, or clear the check box to disable it temporarily. For details, see <a href="#">"Custom Filter Dialog Box" on page 143</a>.</p> 
<b>Customize</b>	Opens the Filter Builder and allows you to save your filter settings to a file.

## Legend grid shortcut menu

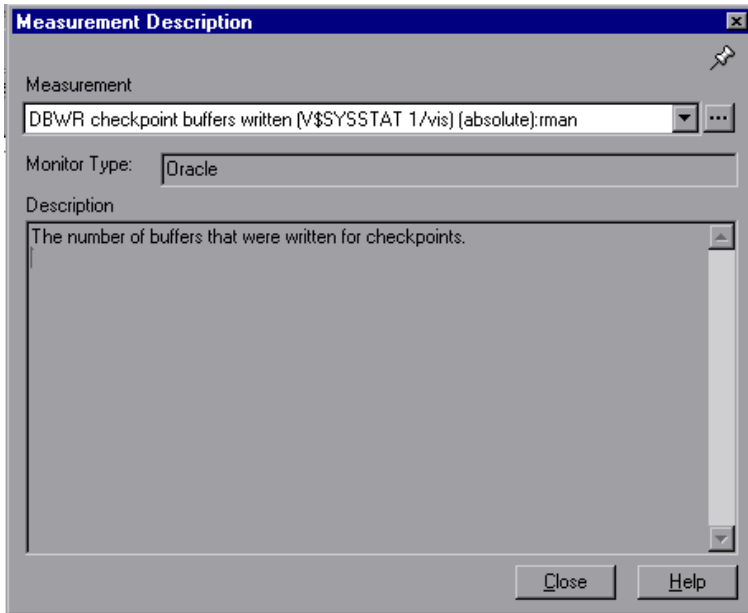
User interface elements are described below:


UI Element	Description
<b>Show</b>	Displays the selected measurements in the graph.

UI Element	Description
<b>Hide</b>	Hides the selected measurements in the graph.
<b>Show only Selected</b>	Displays the highlighted measurement only.
<b>Show All</b>	Displays all the available measurements in the graph.
<b>Filter</b>	Filters the graph by the measurements selected in the Legend window. You can select multiple measurements. To clear the filter, select <b>View &gt; Clear Filter/Group By</b> .
<b>Configure</b>	Opens the Measurement Options dialog box that enables you to configure measurement options (for example, set color and measurement scale). For more information, see <a href="#">"Measurement Options Dialog Box" on page 105</a> .
<b>Show Description</b>	Opens the Measurement Description dialog box that displays the name, monitor type, and description of the selected measurement. For more information, see <a href="#">"Measurement Description Dialog Box" on the next page</a> .
<b>Animate</b>	Displays the selected measurement as a flashing line.
<b>Auto Correlate</b>	Opens the Auto Correlate dialog box that enables you to correlate the selected measurement with other monitor measurements in the load test scenario. For more information on auto correlation, see <a href="#">"Auto Correlating Measurements" on page 117</a> .
<b>Configure Columns</b>	Opens the Legend Columns Options dialog box that enables you to select the columns to display in the Legend window.
<b>Web Page Diagnostics for &lt;selected measurement&gt;</b>	Displays a Web Page Diagnostics graph for the selected transaction measurement (only available for the Average Transaction Response Time and Transaction Performance Summary graphs).
<b>Break down</b>	Displays a graph with a breakdown of the selected page (only available for the Web Page Diagnostics graphs).

## Measurement Description Dialog Box

This dialog box shows you additional information about the selected measurement.



To access	Legend Toolbar > 
See also	<ul style="list-style-type: none"><li>• <a href="#">"Legend Window" on page 100</a></li><li>• <a href="#">"Measurement Options Dialog Box" on the next page</a></li></ul>

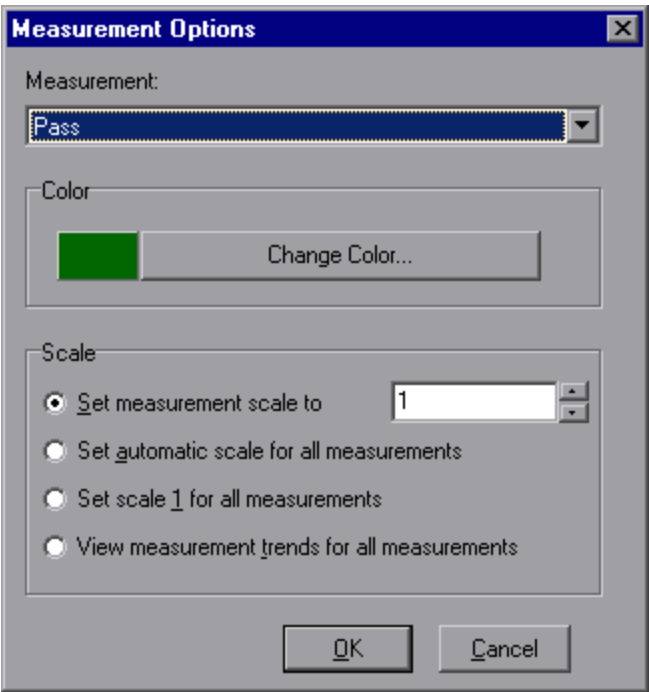
User interface elements are described below:


UI Element	Description
Measurement	Displays the name of the selected measurement. Click the drop-down arrow to select a different measurement.
Monitor Type	Displays the type of monitor used to obtain the selected measurement.
Description	Displays a description of the selected monitored measurement.
SQL	If an SQL logical name is in use, displays the full SQL statement.



# Measurement Options Dialog Box

This dialog box enables you to set the color and the scale for any measurement of the graph you selected.



To access	Legend Toolbar > 
See also	<ul style="list-style-type: none"><li>"Legend Window" on page 100</li><li>"Measurement Description Dialog Box" on the previous page</li></ul>

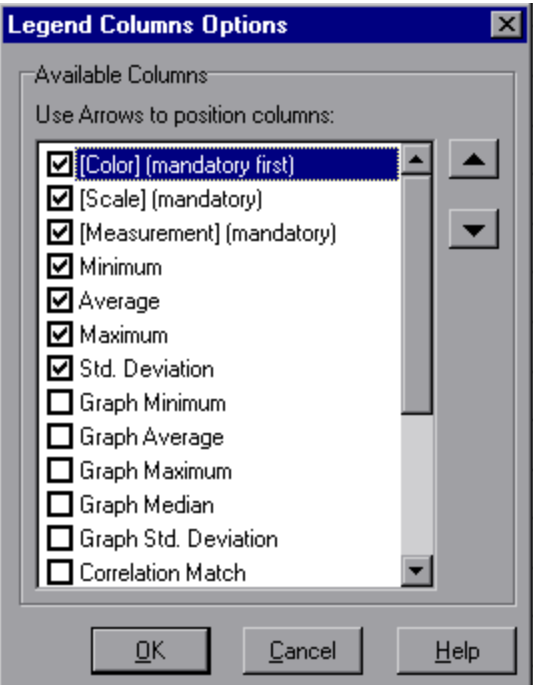
User interface elements are described below:

UI Element	Description
Measurement	Select a measurement to configure.
Change Color	Select a new color for the selected measurement.

UI Element	Description
Scale	<p>Select the desired scale option:</p> <ul style="list-style-type: none"><li>• Set measurement scale to x. Select the scale with which you want to view the selected measurement.</li><li>• Set automatic scale for all measurements. Uses an automatic scale optimized to display each measurement in the graph.</li><li>• Set scale 1 for all measurements. Sets the scale to one for all measurements in the graph.</li><li>• View measurement trends for all measurements. Standardizes the y-axis values in the graph, according to the following formula: <math>\text{New Y value} = (\text{Previous Y Value} - \text{Average of previous values}) / \text{STD of previous values}</math>.</li></ul>

## Legend Columns Options Dialog Box

This dialog box enables you to select the columns to be displayed.



To access	View > Legend Columns
-----------	-----------------------

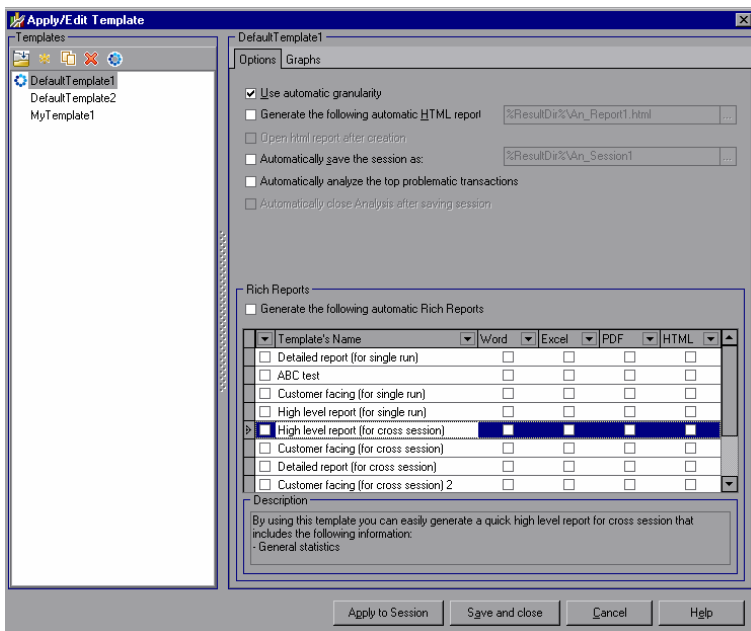
**See also** ["Legend Window" on page 100](#)

User interface elements are described below:

UI Element	Description
<b>Available Columns</b>	<p>Select or deselect the check boxes to the left of the column names to show or hide the columns respectively.</p> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>The Color, Scale, and Measurement columns are mandatory and cannot be deselected.</li> <li>To rearrange the order in which the columns appear (from left to right), you use the vertical arrows to the right of the Available Columns list to place the columns in the desired order.</li> </ul>

## Apply/Edit Template Dialog Box






This dialog box enables you to configure template settings and select report template options. Using this dialog box, you can create new templates, open existing ones, and set the default template for your sessions.



**To access**

**Tools > Templates**

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Element	Description
<b>Templates</b>	<p>Select one of the following buttons:</p> <ul style="list-style-type: none"> <li> Browse for a template.</li> <li> Add a new template. Enter the title of the new template in the <b>Add new template</b> dialog box.</li> <li> Duplicate the selected template.</li> <li> Delete the selected template.</li> <li> Set the selected template as the default.</li> </ul>
<b>Use automatic granularity</b>	Applies the default Analysis granularity (one second) to the template. For information about setting Analysis granularity, see <a href="#">"Changing the Granularity of the Data" on page 115</a> .
<b>Generate the following automatic HTML report</b>	Generates an HTML report using the template. Specify or select a report name. For information about generating HTML reports, see <a href="#">"HTML Report" on page 466</a> .
<b>Open html report after creation</b>	If you selected the option of generating an automatic HTML report, select this option to automatically open the HTML report after it is created.
<b>Automatically save the session as</b>	Automatically saves the session using the template you specify. Specify or select a file name.
<b>Automatically analyze the top problematic transactions</b>	Automatically generates Transaction Analysis reports for the transactions with the worst SLA violations. Reports are generated for a maximum of five transactions. For more information about Transaction Analysis reports, see <a href="#">"Analyze Transactions Dialog Box" on page 448</a> .

UI Element	Description
<b>Automatically close Analysis after saving session</b>	Automatically closes Analysis after a session is automatically saved (using the previous option). This prevents the running of multiple instances of Analysis.
<b>Generate the following automatic Rich Reports</b>	The selected reports are added to the template.
<b>&lt;check box on left of Template's Name&gt;</b>	Select to add report template to selected template. The reports are added to the session.
<b>Word</b>	Generates a report using the selected report template to MS Word.  <b>Note:</b> Take into account that the content load may affect the table format within the MS Word document.
<b>Excel</b>	Generates a report using the selected report template to Excel.
<b>PDF</b>	Generates a report using the selected report template to PDF.
<b>HTML</b>	Generates a report using the selected report template to HTML.
<b>Graphs tab</b>	Displays the list of graphs that are included in the template. When the template is applied to a session, the graphs are displayed under Graphs in Session Explorer. If there is no data in the session, the graphs are not created.
<b>Apply to Session</b>	Applies your changes to the current analysis session without closing the dialog box.

## Color Palettes

Color Palettes allow you to define the colors that will be used in Analysis graphs and to allocate those colors to specific series. There is a general, default palette and you can also define a Color Palette for a specific session. You can add new

colors to a palette and delete existing colors from a palette, but a palette must contain at least thirty two colors.

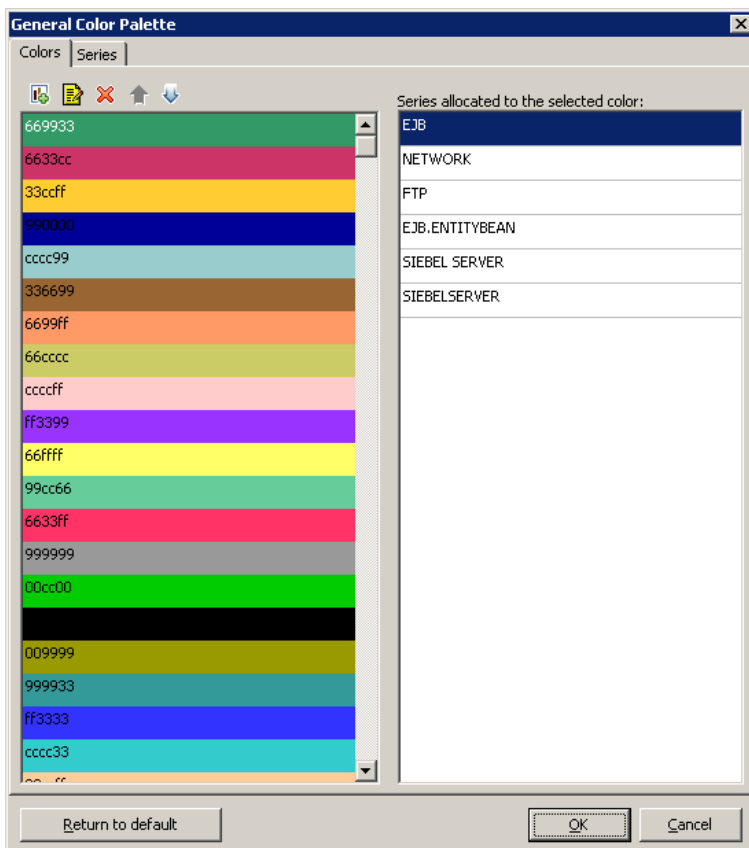
When a new session is created, or when you open an existing session that does not have a Graph Colors file, Analysis uses the general color palette. When you open an existing session that has a Graph Colors file, Analysis uses the file from the session folder.

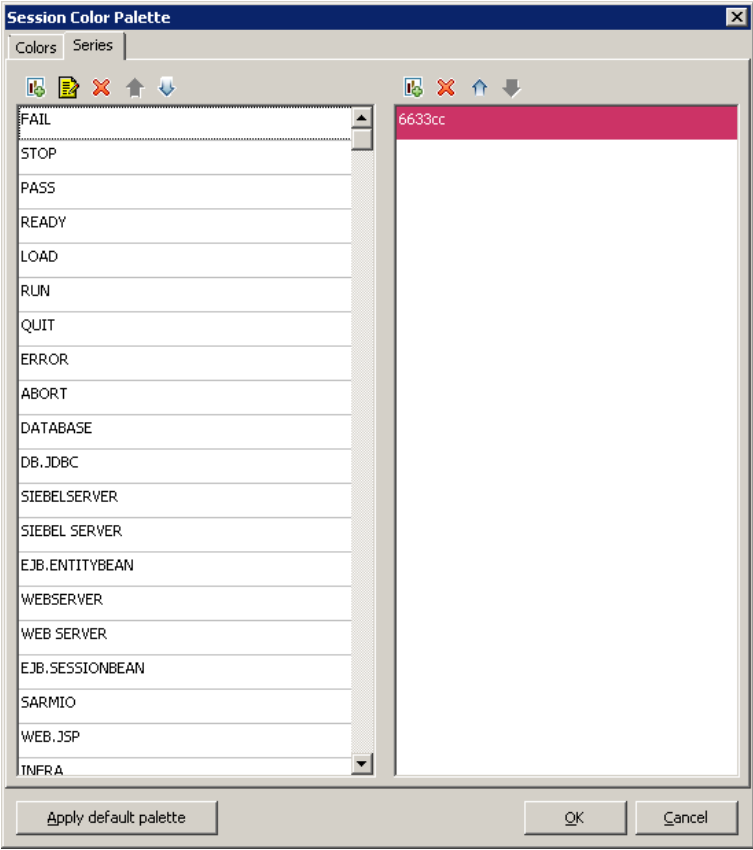
The colors are allocated to the graph in the order they appear in the palette. Colors allocated to a series, are used to represent graph elements for the series in the order the colors were allocated. To change the colors in the graph, update the palette, close and re-open the graph.

For more information, see ["Color Palette Dialog Box" below](#).

## Color Palette Dialog Box

This dialog box enables you to configure the colors that will be used in graphs. You use the General Color Palette to define a default set of colors for all graphs and the Session Color Palette to define the set of colors for a specific session.



















To access	<ul style="list-style-type: none"><li>• Tools &gt; General Color Palette</li><li>• Tools &gt; Session Color Palette</li></ul>
See also	<a href="#">"Color Palettes" on page 109</a>

User interface elements are described below:

UI Elements>	Description
<div>Return to default</div>	<div>Restores the palette to the currently saved General Palette.</div> <div><b>Note:</b> This button appears on the General Color Palette, not on the Session Color Palette.</div>

UI Elements>	Description
<div>Apply default palette</div>	<p>Applies the default palette as the session palette.</p> <p><b>Note:</b> This button appears on the Session Color Palette, not on the General Color Palette.</p>
<b>Colors tab</b>	Allows you to configure the colors on the palette.
	Add a new color to the palette.
	Replace an existing color with a new color.
	Delete a color from the palette.
	Move the color upwards.
	Move the color downwards.
<b>Series tab - left pane</b>	Allows you to configure the series on the palette.
	Add a new series to the palette.
	Edit a series.
	Delete a series from the palette.
	Move the series upwards.
	Move the series downwards.
<b>Series tab - right pane</b>	Allows you to define colors for the selected series.
	Add a color to the series.
	Delete a color from the series.
	Move the color upwards.



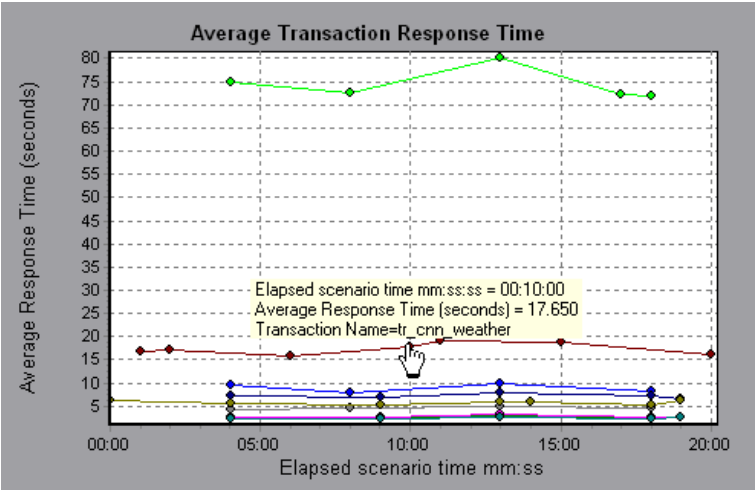
UI Elements>	Description
	Move the color downwards.

# Working with Analysis Graph Data

Analysis contains several utilities that enable you to manage graph data to most effectively view the displayed data.

## Determining a Point's Coordinates

You can determine the coordinates and values at any point in a graph. Place the cursor over the point you want to evaluate and Analysis displays the axis values and other grouping information.



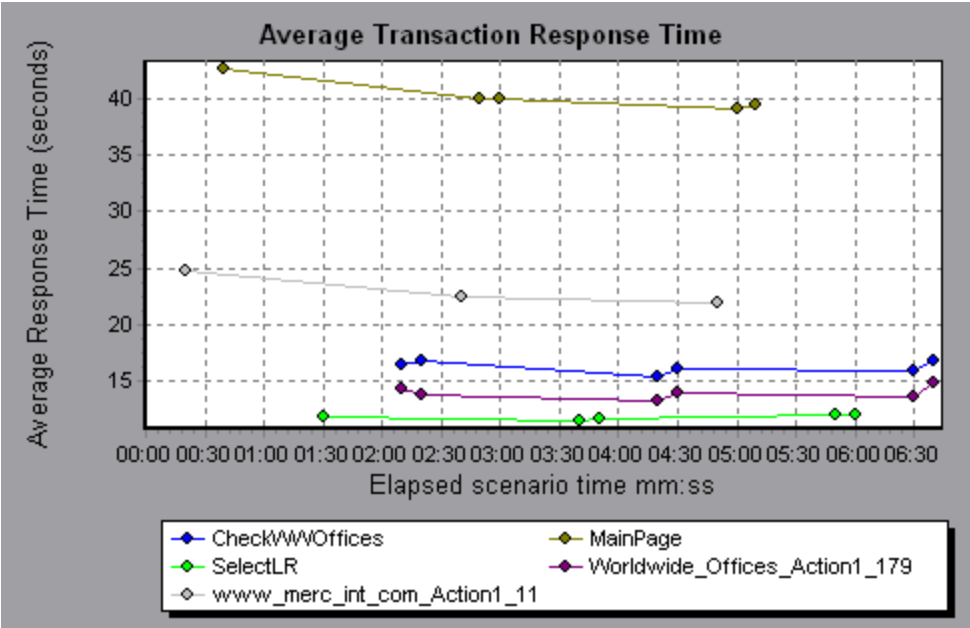
## Drilling Down in a Graph

*Drill down* enables you to focus on a specific measurement within your graph and display it according to a desired grouping. The available groupings depend on the graph. For example, the Average Transaction Response Time graph shows one line per transaction. To determine the response time for each Vuser, you drill down on one transaction and sort it according to Vuser ID. The graph displays a separate line for each Vuser's transaction response time.

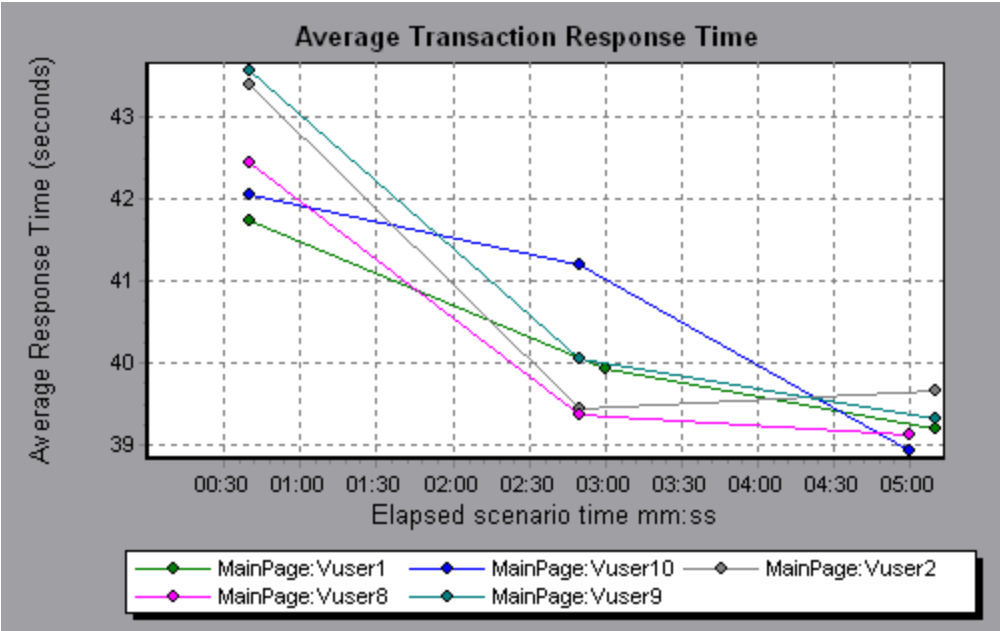
**Note:** The drill down feature is not available for the Web Page Diagnostics

graph.

The following graph shows a line for each of five transactions.



When you drill down on the MainPage transaction, grouped by Vuser ID, the graph displays the response time only for the MainPage transaction, one line per Vuser.



You can see from the graph that the response time was longer for some Vusers than for others.

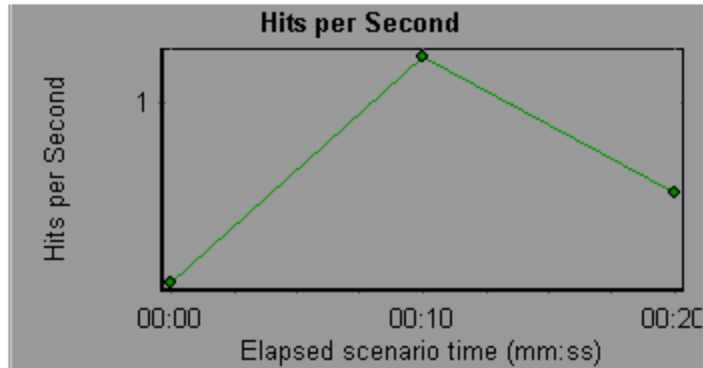
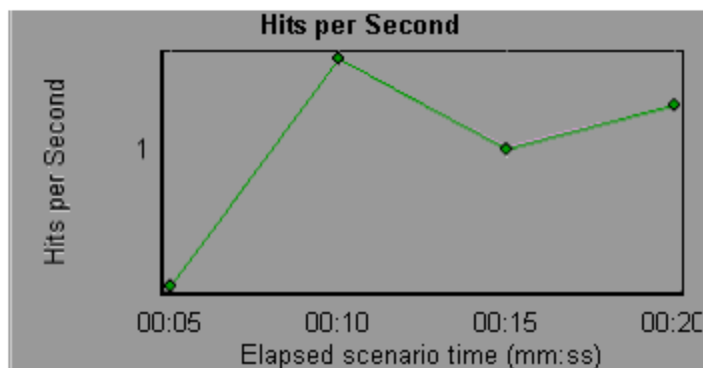
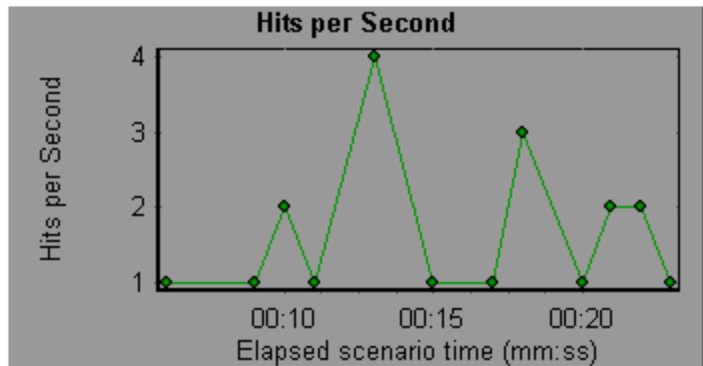
To determine the response time for each host, you drill down on one transaction and sort it according to host. The graph displays a separate line for the transaction response time on each host. For more information on drilling down in a graph, see ["How to Manage Graph Data" on page 119](#).

## Changing the Granularity of the Data

You can make the graphs easier to read and analyze by changing the granularity (scale) of the *x-axis*. The maximum granularity is half of the graph's time range. To ensure readability and clarity, Analysis automatically adjusts the minimum granularity of graphs with ranges of 500 seconds or more.

In the following example, the Hits per Second graph is displayed using different granularities. The y-axis represents the number of hits per second within the granularity interval. For a granularity of 1, the y-axis shows the number of hits per second for each one second period of the load test scenario.

For a granularity of 5, the y-axis shows the number of hits per second for every five-second period of the scenario.



In the above graphs, the same load test scenario results are displayed in a granularity of 1, 5, and 10. The lower the granularity, the more detailed the results. For example, using a low granularity as in the upper graph, you see the intervals in which no hits occurred. It is useful to use a higher granularity to study the overall Vuser behavior throughout the scenario.

By viewing the same graph with a higher granularity, you can see that overall, there was an average of approximately 1 hit per second.

## Viewing Measurement Trends

You can view the pattern of a line graph more effectively by standardizing the graph's y-axis values. Standardizing a graph causes the graph's y-axis values to converge around zero. This cancels the measurements' actual values and allows you to focus on the behavior pattern of the graph during the course of the load test scenario.

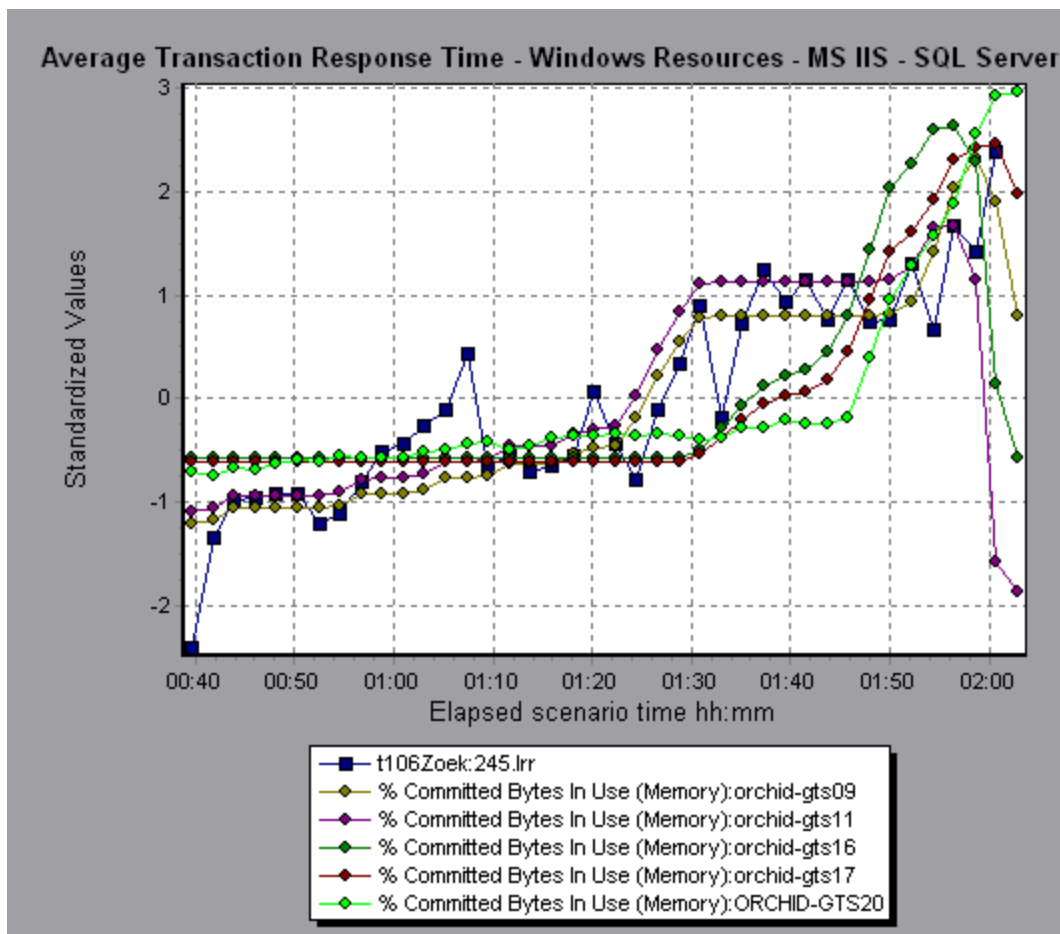
Analysis standardizes the y-axis values in a graph according to the following formula:

$$\text{New Y value} = (\text{Previous Y Value} - \text{Average of previous values}) / \text{STD of previous values}$$

## Auto Correlating Measurements

You can detect similar trends among measurements by correlating a measurement in one graph with measurements in other graphs. Correlation cancels the measurements' actual values and allows you to focus on the behavior pattern of the measurements during a specified time range of the load test scenario.

In the following example, the **t106Zoek:245.Irr** measurement in the Average Transaction Response Time graph is correlated with the measurements in the Windows Resources, Microsoft IIS, and SQL Server graphs. The five measurements most closely correlated with **t106Zoek:245.Irr** are displayed in the graph below.



**Note:** This feature can be applied to all line graphs except the Web Page Diagnostics graph.

## Viewing Raw Data

You can view the actual raw data collected during test execution for the active graph. The Raw Data view is not available for all graphs.

Viewing the raw data can be especially useful in the following cases:

- To determine specific details about a peak—for example, which Vuser was running the transaction that caused the peak value(s).
- To perform a complete export of unprocessed data for your own spreadsheet application.

For user interface details, click ["Graph/Raw Data View Table"](#) on page 126.

## How to Manage Graph Data

The following list includes the utilities you can use in Analysis to enable you to manage graph data to most effectively view the displayed data.

### Determine a point's coordinates

To determine the coordinates and values at any point in a graph, place the cursor over the point you want to evaluate. Analysis displays the axis values and other grouping information.

### Drill down in a graph

Drill down enables you to focus on a specific measurement within your graph and display it according to the desired grouping.

1. Right-click on a line, bar, or segment within the graph, and select **Drill Down**. The **Drill Down Options** dialog box opens, listing all of the measurements in the graph.
2. Select a measurement for drill down.
3. From the **Group By** box, select a group by which to sort.
4. Click **OK**. Analysis drills down and displays the new graph.

To undo the last drill down settings, choose **Undo Set Filter/Group By** from the right-click menu.

- To perform additional drill-downs, repeat steps 1 to 4.
- To clear all filter and drill down settings, choose **Clear Filter/Group By** from the right-click menu.

### Filter the data


This task describes how to filter the data and create custom filters.

1. In the Legend window, click the column header of the measurement you want to use as a base for the filter.
2. To show a single entry, expand the drop-down list and select that entry.

3. To create a custom filter, select **Custom** in the drop-down list. The Custom Filter dialog box opens.
4. Select an evaluation expression and provide a value. To use wildcards, use an underscore, **\_**, to represent a single character and **%** for multiple characters. For details, see "[Custom Filter Dialog Box](#)" on page 143.
5. To provide additional criteria, select a logical operator, **AND** or **OR** and set up the second expression.

## Change the granularity of the data

This task describes how to change the granularity of a graph.

1. Click inside a graph.
2. Select **View > Set Granularity**, or click the **Set Granularity** button . The Granularity dialog box opens.
3. Enter the granularity of the x-axis and select a time measurement. The maximum granularity is half of the graph's time range.
4. To ensure readability and clarity, LoadRunner automatically adjusts the minimum granularity of graphs with ranges of 500 seconds or more.
5. Click **OK**.

## View measurement trends

This task describes how to activate the View Measurements Trends option from a line graph.

1. Select **View > View Measurement Trends**, or right-click the graph and choose **View Measurement Trends**. Alternatively, you can select **View > Configure Measurements** and check the View measurement trends for all measurements box.

**Note:** The standardization feature can be applied to all line graphs except the Web Page Diagnostics graph.

2. View the standardized values for the line graph you selected. The values in the



Minimum, Average, Maximum, and Std. Deviation legend columns are real values.

To undo the standardization of a graph, repeat step 1.

**Note:** If you standardize two line graphs, the two y-axes merge into one y-axis.

## Auto correlate measurements

You can detect similar trends among measurements by correlating a measurement in one graph with measurements in other graphs. Correlation cancels the measurements' actual values and allows you to focus on the behavior pattern of the measurements during a specified time range of the load test scenario.

1. From a graph or legend, right-click the measurement you want to correlate and choose **Auto Correlate**. The Auto Correlate dialog box opens with the selected measurement displayed in the graph.
2. Select a suggested time range method and time range.
3. If you applied a time filter to your graph, you can correlate values for the complete scenario time range by clicking the **Display** button in the upper right-hand corner of the dialog box.
4. To specify the graphs you want to correlate with a selected measurement and the type of graph output to be displayed, perform the following:
  - Select the **Correlation Options** tab.
  - Select the graphs to correlate, the data interval, and output options, as described in ["Drill Down Options Dialog Box" on the next page](#).
  - On the **Time Range** tab, click **OK**. Analysis generates the correlated graph you specified. Note the two new columns—**Correlation Match** and **Correlation**—that appear in the Legend window below the graph.

To specify another measurement to correlate, select the measurement from the Measurement to Correlate box at the top of the Auto Correlate dialog box.

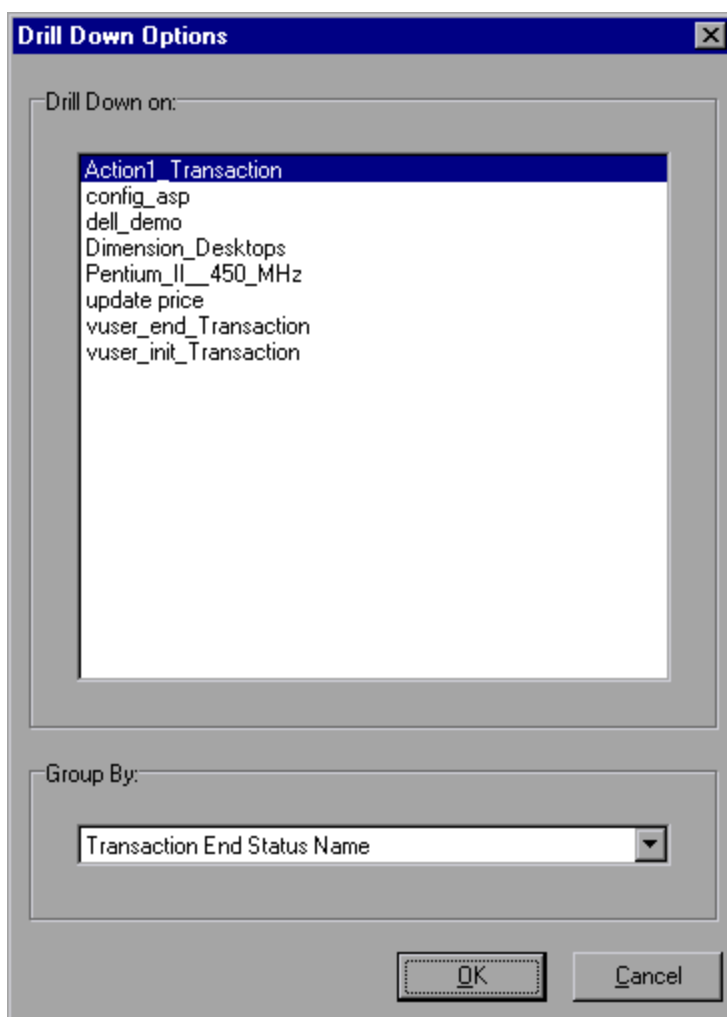
The minimum time range should be more than 5% of the total time range of the measurement. Trends which are smaller than 5% of the whole measurement will be contained in other larger segments.

Sometimes, very strong changes in a measurement can hide smaller changes. In cases like these, only the strong change is suggested, and the **Next** button will be disabled.

**Note:** This feature can be applied to all line graphs except the Web Page Diagnostics graph.

## Drill Down Options Dialog Box

This dialog box lists all the measurements in the graph.



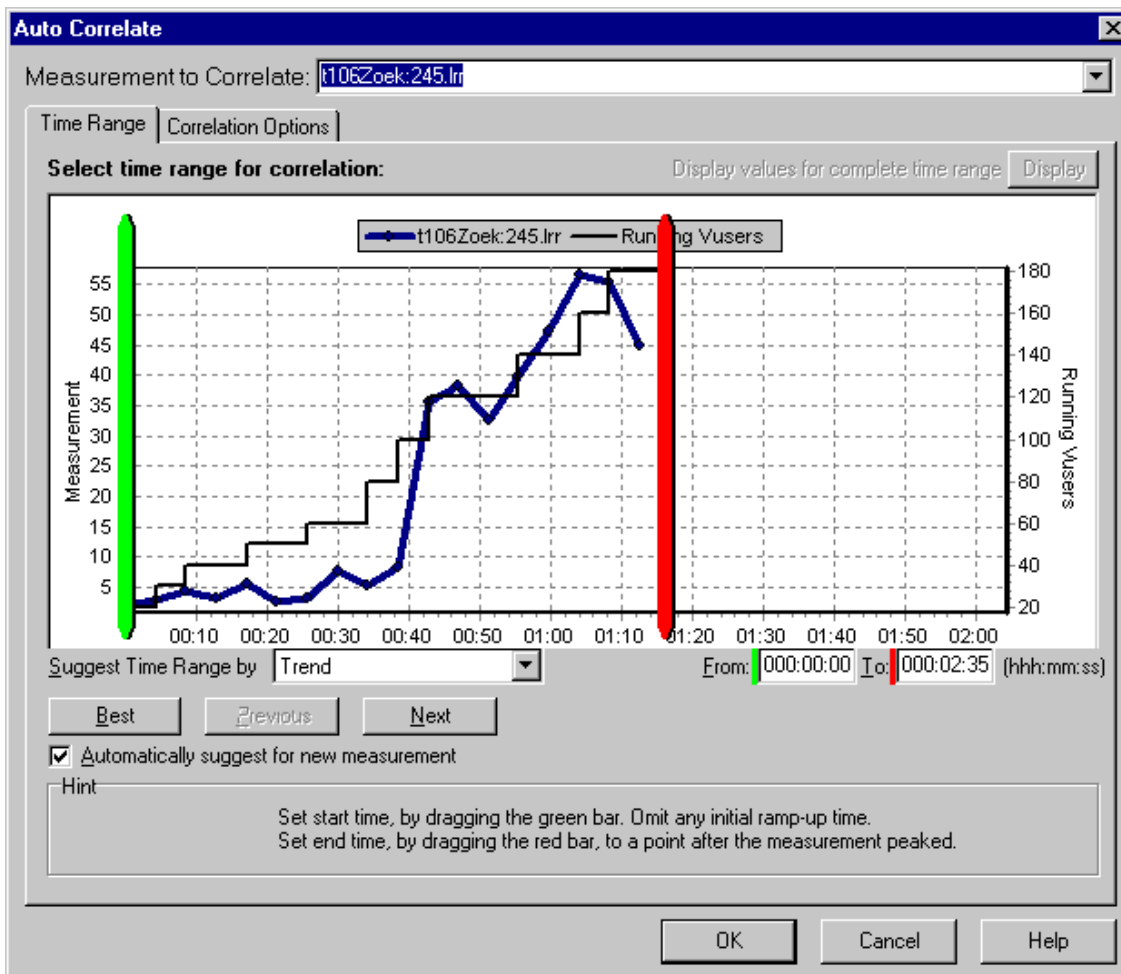
<b>To access</b>	<Right-click> graph line/bar/segment > <b>Drill Down</b>
<b>See also</b>	<a href="#">"Drilling Down in a Graph" on page 113</a>

User interface elements are described below:

UI Element	Description
<b>Drill Down on</b>	Filter graph by selected transaction.
<b>Group By</b>	The selected transaction is sorted by selected criteria.

## Auto Correlate Dialog Box

This dialog box enables you to configure settings used to correlate measurements from the selected graph with measurements in other graphs.



<b>To access</b>	Click on a graph and select <b>&gt; Auto Correlate</b> from the right-click menu
<b>Important information</b>	You can also use the green and red vertical drag bars to specify the start and end values for the scenario time range.
<b>Note</b>	The granularity of the correlated measurements graph may differ from that of the original graph, depending on the scenario time range defined.
<b>See also</b>	<a href="#">"Auto Correlating Measurements" on page 117</a>

## Time Range Tab

The **Time Range** tab of the Auto Correlate dialog box enables you to specify a load test scenario time range for the correlated measurement graph.

User interface elements are described below:

UI Element	Description
<b>Measurement to Correlate</b>	Select the measurement you want to correlate.
<b>Display values for complete time range</b>	Click <b>Display</b> to correlate values for the complete scenario time range. This option is available only if you applied a time filter to your graph.
<b>Suggest Time Range By</b>	Analysis automatically demarcates the most significant time period for the measurement in the scenario. <ul style="list-style-type: none"><li>• <b>Trend.</b> Demarcated an extended time segment which contains the most significant changes.</li><li>• <b>Feature.</b> Demarcates a smaller dimension segment which forms the trend.</li></ul>
<b>Best</b>	Choose the time segment most dissimilar to its adjacent segments.
<b>Next</b>	Suggest the next time segment for auto correlation. Each suggestion is successively less dissimilar.

UI Element	Description
<b>Previous</b>	Return to the previous suggestion of a time segment.
<b>Automatically suggest for new measurement</b>	Generates new suggestions each time that the Measurement to Correlate item changes.
<b>From</b>	Specify a start value (in hh:mm:ss format) for the desired scenario time range.
<b>To</b>	Specify an end value (in hh:mm:ss format) for the desired scenario time range.

## Correlation Options tab

You use the **Correlation Options** tab to set the graphs to correlate, the data interval, and the output options.

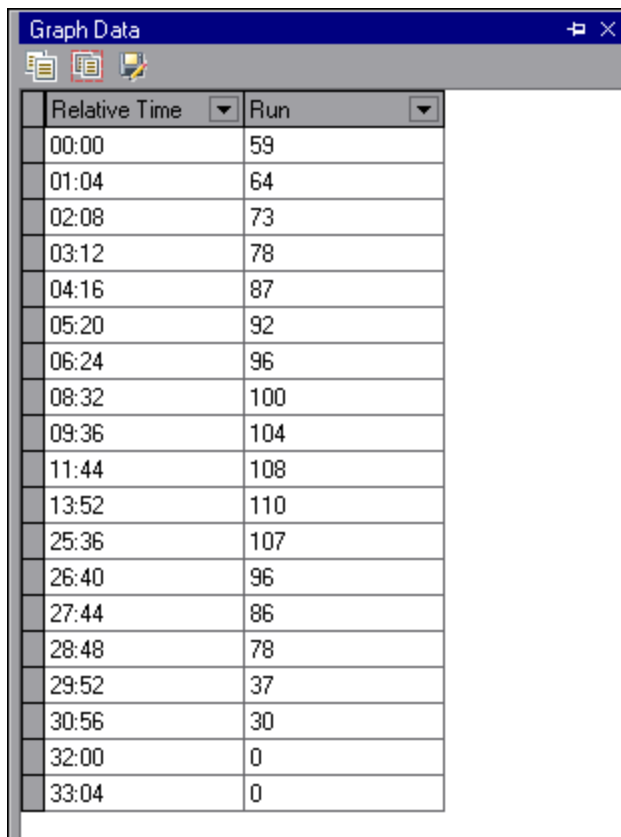
User interface elements are described below:

UI Element	Description
<b>Select Graphs for Correlation</b>	Select the graphs whose measurements you want to correlate with your selected measurement.
<b>Data Interval</b>	Calculate the interval between correlation measurement polls. <ul style="list-style-type: none"><li>• <b>Automatic.</b> Uses an automatic value, determined by the time range.</li><li>• <b>Correlate data based on X second intervals.</b> Enter a fixed value.</li></ul>

UI Element	Description
<b>Output</b>	<p>Choose the level of output displayed.</p> <ul style="list-style-type: none"><li>• <b>Show the X most closely correlated measurements.</b> Displays only the specified number of measurements most closely related to the selected measurement. The default value is 5.</li><li>• <b>Show measurements with an influence factor of at least X%.</b> Displays only those measurements that converge to the specified percent with the selected measurement. The default value is 50%.</li></ul>

## Graph/Raw Data View Table

You can view graph data in spreadsheet view or raw data view. The data is instantly displayed on request.





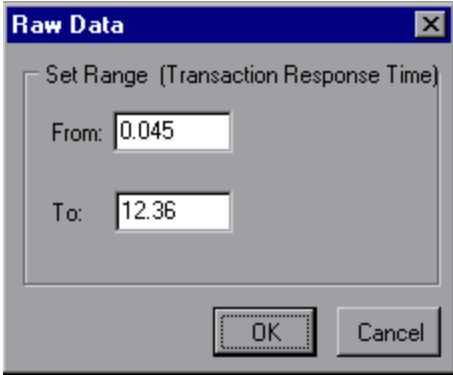


The screenshot shows a window titled 'Graph Data' with a table containing two columns: 'Relative Time' and 'Run'. The table lists 20 rows of data, showing a peak in the 'Run' column at 08:32.

Relative Time	Run
00:00	59
01:04	64
02:08	73
03:12	78
04:16	87
05:20	92
06:24	96
08:32	100
09:36	104
11:44	108
13:52	110
25:36	107
26:40	96
27:44	86
28:48	78
29:52	37
30:56	30
32:00	0
33:04	0

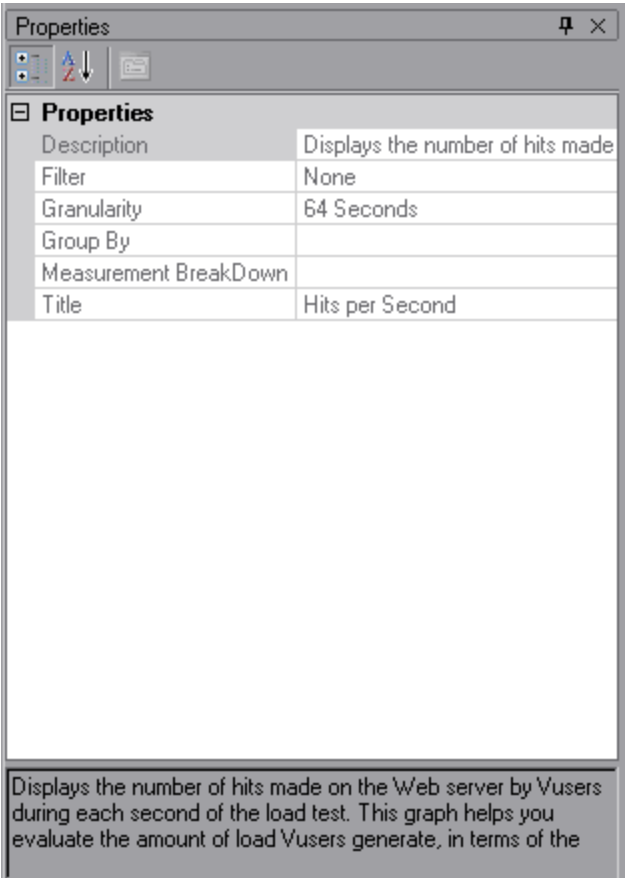
<b>To access</b>	<p>Click the appropriate tab on the right border of the Analysis window or do one of the following:</p> <ul style="list-style-type: none"> <li>• <b>Windows &gt; Graph Data</b></li> <li>• <b>Windows &gt; Raw Data</b></li> </ul>
<b>Note</b>	Raw Data is not available for all graphs.

User interface elements are described below:

UI Element	Description
	Copies the data that you have selected.
	Copies the spreadsheet to the clipboard. You can paste to a spreadsheet.
	Saves the spreadsheet data to an Excel or CSV file. In Excel, you can generate your own customized graphs.
	Use the buttons on the toolbar to navigate through the table, and mark any records for future reference.
<b>Relative Time</b>	The first column in the Graph Data window. displays the elapsed scenario time (the x-axis values). The following columns displays the relative y-axis values for each measurement represented on the graph.
<b>Raw Data dialog box</b>	<p>In <b>Set Range</b>, set a time range.</p> 

# Graph Properties Pane


This pane displays the details of the graph or report selected in the Session Explorer. Fields that appear in black are editable. When you select an editable field, an edit button is displayed next to the selected field value.



To access	One of the following: <ul style="list-style-type: none"><li>• <b>Windows &gt; Properties</b></li><li>• Select a graph in the Session Explorer, and select <b>Properties</b> from the right-click menu.</li></ul>
-----------	--

User interface elements are described below:



UI Element	Description
	Enables you to edit the value for the selected field.
<b>Graph fields</b>	<ul style="list-style-type: none"> <li>• <b>Filter.</b> Shows configured filter.</li> <li>• <b>Granularity.</b> Shows configured granularity.</li> <li>• <b>Group By.</b> Shows the filter for selected group.</li> <li>• <b>Measurement Breakdown.</b> Shows the measurements of the graph.</li> <li>• <b>Title.</b> Shows the name of the graph in the graph display window.</li> </ul>
<b>Summary Report fields</b>	<ul style="list-style-type: none"> <li>• <b>Description.</b> A short summary of what is included in the summary report.</li> <li>• <b>Filter.</b> Shows configured filter for the summary report.</li> <li>• <b>Percentile.</b> The Summary Report contains a percentile column showing the response time of 90% of transactions (90% of transactions that fall within this amount of time). To change the value of the default 90 percentile, enter a new figure in the <b>Transaction Percentile</b> box.</li> <li>• <b>Title.</b> The name of the summary report.</li> </ul>
<b>Transaction Analysis Report fields</b>	When clicking the edit button for some of the fields, the Analyze Transaction Settings dialog box opens, enabling you to edit some of the Analyze Transaction settings.

## Filtering and Sorting Graph Data

### Filtering Graph Data Overview

You can filter graph data to show fewer transactions for a specific segment of the load test scenario. More specifically, you can display four transactions beginning

from five minutes into the scenario and ending three minutes before the end of the scenario.

You can filter for a single graph, in all graphs in a load test scenario, or in the summary graph.

The available filter conditions differ for each type of graph. The filter conditions also depend on your scenario. For example, if you only had one group or one load generator machine in your scenario, the Group Name and Load Generator Name filter conditions do not apply.

**Note:** You can also filter merged graphs. The filter conditions for each graph are displayed on separate tabs.

## Sorting Graph Data Overview

You can sort graph data to show the data in more relevant ways. For example, Transaction graphs can be grouped by the Transaction End Status, and Vuser graphs can be grouped by Scenario Elapsed Time, Vuser End Status, Vuser Status, and Vuser ID.

You can sort by one or several groups—for example by Vuser ID and then Vuser status. The results are displayed in the order in which the groups are listed. You can change the grouping order by rearranging the list.

## Filter Conditions

### Common Filter Condition Options

The following filter conditions are common to many graphs:

Filter Condition	Filters the graph according to...
Host Name	The name of the Host machine. Select one or more hosts from the drop-down list.
Transaction End Status	The end status of a transaction: <i>pass</i> , <i>fail</i> , <i>stop</i> .

Filter Condition	Filters the graph according to...
Scenario Elapsed Time	The time that elapsed from the beginning to the end of the load test scenario. For more information about setting the time range, see <a href="#">"Scenario Elapsed Time Dialog Box" on page 149</a> .
Vuser ID	The Vuser ID. For more information, see <a href="#">"Vuser ID Dialog Box" on page 151</a> .
Script Name	The name of the script.
Group Name	The name of the group to filter by.
Think Time	The Think Time option in the graph filter for complete mode is turned off by default. The transaction time displayed shows pure time.

## Vuser Graphs

You can apply the following filter conditions to Vuser graphs:

Filter Condition	Filters the graph according to...
Vuser Status	The Vuser status: <i>load, pause, quit, ready, run</i>
Vuser End Status	The status of the Vuser at the end of the transaction: <i>error, failed, passed, stopped</i> .
Number of Released Vusers	The number of Vusers that were released.
Rendezvous Name	The name of the rendezvous point.

## Error Graphs

You can apply the following filter conditions to Error graphs:

Filter Condition	Filters the graph according to...
Error Type	The type of error (per error number).
Parent Transaction	The parent transaction.
Line Number in Script	The line number in the script.

## Transaction Graphs

You can apply the following filter conditions to Transaction graphs:

Filter Condition	Filters the graph according to...
Transaction Name	The name of the transaction.
Transaction Response Time	The response time of the transaction.
Transaction Hierarchical Path	The hierarchical path of the transaction. For more information on setting this condition, see <a href="#">"Hierarchical Path Dialog Box" on page 149</a> .

## Web Resource Graphs

You can apply the following filter conditions to Web Resources graphs:

Filter Condition	Filters the graph according to...
Web Resource Name	The name of the Web resource.
Web Resource Value	The value of the Web resource.
Web Server Resource Name	The name of the Web Server resource.
Web Server Resource Value	The value of the Web Server resource.

## Web Page Diagnostics Graphs

You can apply the following filter conditions to Web Page Diagnostics graphs:

Filter Condition	Filters the graph according to...
<b>Component Name</b>	The name of the component.
<b>Component Response Time</b>	The response time of the component.
<b>Component DNS Resolution Time</b>	The amount of time the component needs to resolve the DNS name to an IP address, using the closest DNS server.
<b>Component Connection Time</b>	The time taken for the component to establish an initial connection with the Web server hosting the specified URL.
<b>Component First Buffer Time</b>	The time that passes from the component's initial HTTP request (usually GET) until the first buffer is successfully received back from the Web server.
<b>Component Receive Time</b>	The time that passes until the component's last byte arrives from the server and the downloading is complete.
<b>Component SSL Handshaking Time</b>	The time take for the component to establish an SSL connection. (Applicable to HTTPS communication only.)
<b>Component FTP Authentication Time</b>	The time taken for the component to authenticate the client. (Applicable to FTP protocol communication only).

Filter Condition	Filters the graph according to...
<b>Component Error Time</b>	The average amount of time that passes from the moment a component's HTTP request is sent until the moment an error message (HTTP errors only) is returned.
<b>Component Size (KB)</b>	The size of the component (in kilobytes).
<b>Component Type</b>	The type of component: <i>Application; Image; Page; Text</i>
<b>Component Hierarchical Path</b>	The hierarchical path of the component. For more information on setting this condition, see <a href="#">"Hierarchical Path Dialog Box" on page 149</a> .
<b>Component Network Time</b>	The amount of time from the component's first HTTP request, until receipt of ACK.
<b>Component Server Time</b>	The amount of time from when the component receives of ACK, until the first buffer is successfully received back from the Web server.
<b>Component Client Time</b>	The average amount of time that passes while a component request is delayed on the client machine due to browser think time or other client-related delays.

## User Defined Data Point Graphs

You can apply the following filter conditions to User-Defined Data Point graphs:

Filter Condition	Filters the graph according to...
<b>Datapoint Name</b>	The name of the data point.
<b>Datapoint Value</b>	The value of the data point.

## System Resources Graphs

You can apply the following filter conditions to System Resource graphs:

Filter Condition	Filters the graph according to...
<b>System Resource Name</b>	The name of the system resource.
<b>System Resource Value</b>	The value of the system resource. See <a href="#">"Set Dimension Information Dialog Box" on page 150</a> .

## Network Monitor Graphs

You can apply the following filter conditions to Network Monitor graphs:

Filter Condition	Filters the graph according to...
<b>Network Path Name</b>	The name of the network path.
<b>Network Path Delay</b>	The delay of the network path.
<b>Network Path Father</b>	The father of the network path.
<b>Network SubPath Name</b>	The name of the network subpath.
<b>Network SubPath Delay</b>	The delay of the network subpath.
<b>Network Full Path</b>	The full network path.
<b>Network Segment Name</b>	The name of the network segment.
<b>Network Segment Delay</b>	The delay of the network segment.
<b>Network Segment Full Path</b>	The full network segment path.

## Firewall Graphs

You can apply the following filter conditions to Firewall graphs:

Filter Condition	Filters the graph according to...
<b>Firewall Resource Name</b>	The name of the Firewall resource.
<b>Firewall Resource Value</b>	The value of the firewall resource. See <a href="#">"Set Dimension Information Dialog Box" on page 150</a> .

## Web Server Resource Graphs

You can apply the following filter conditions to Web Server Resource graphs:

Filter Condition	Filters the graph according to...
<b>Measurement Name</b>	The name of the measurement.
<b>Measurement Value</b>	The measurement value. See <a href="#">"Set Dimension Information Dialog Box" on page 150</a> .

## Web Application Server Resource Graphs

You can apply the following filter conditions to Web Application Server Resource graphs:

Filter Condition	Filters the graph according to...
<b>Resource Name</b>	The name of the resource.
<b>Resource Value</b>	The value of the resource. See <a href="#">"Set Dimension Information Dialog Box" on page 150</a> .

## Database Server Resource Graphs

You can apply the following filter conditions to Database Server Resource graphs:



Filter Condition	Filters the graph according to...
Database Resource Name	The name of the database resource.
Database Resource Value	The value of the database resource. See <a href="#">"Set Dimension Information Dialog Box"</a> on page 150.

## Streaming Media Graphs

You can apply the following filter conditions to Streaming Media graphs:

Filter Condition	Filters the graph according to...
Streaming Media Name	The name of the streaming media.
Streaming Media Value	The value of the streaming media. See <a href="#">"Set Dimension Information Dialog Box"</a> on page 150.

## ERP/CRM Server Resource Graphs

You can apply the following filter conditions to ERP/CRM Server Resource graphs:

Filter Condition	Filters the graph according to...
ERP/CRM Server Resource Name	The name of the ERP/CRM server resource.
ERP/CRM Server Resource Value	The value of the ERP/CRM Server resource. See <a href="#">"Set Dimension Information Dialog Box"</a> on page 150.
ERP Server Resource Name	The name of the ERP server resource.
ERP Server Resource Value	The value of the ERP server resource. See <a href="#">"Set Dimension Information Dialog Box"</a> on page 150.

## Siebel Diagnostics Graphs

You can apply the following filter conditions to Siebel Diagnostics graphs:

Filter Condition	Filters the graph according to...
<b>Siebel Transaction Name</b>	The name of the Siebel transaction.
<b>Siebel Request Name</b>	The name of the Siebel request.
<b>Siebel Layer Name</b>	The name of the Siebel layer.
<b>Siebel Area Name</b>	The name of the Siebel area.
<b>Siebel Sub-Area Name</b>	The name of the Siebel sub-area.
<b>Siebel Server Name</b>	The name of the Siebel server.
<b>Siebel Script Name</b>	The name of the Siebel script.
<b>Response Time</b>	The response time of the Siebel transaction.
<b>Siebel Chain of Calls</b>	The chain of calls for the Siebel transaction.

## Siebel DB Diagnostics Graphs

You can apply the following filter conditions to Siebel DB Diagnostics graphs:

Filter Condition	Filters the graph according to...
<b>Transaction Name - SIEBEL</b>	The name of the Siebel DB transaction.
<b>SQL Chain of Calls</b>	The SQL chain of calls for the Siebel DB transaction.
<b>SQL Alias Name</b>	The SQL alias name for the Siebel DB transaction.
<b>SQL Response Time</b>	The SQL response time of the Siebel DB transaction.

## Oracle 11i Diagnostics Graphs

You can apply the following filter conditions to Oracle 11i Diagnostics graphs:

Filter Condition	Filters the graph according to...
<b>Transaction Name - ORACLE</b>	The name of the Oracle transaction.
<b>SQL Chain of Calls</b>	The SQL chain of calls for the Oracle transaction.
<b>SQL Alias Name - Oracle</b>	The SQL alias name for the Oracle transaction.
<b>SQL Response Time</b>	The SQL response time of the Oracle transaction.
<b>Oracle SQL Parse Time</b>	The SQL parse time of the Oracle transaction.
<b>Oracle SQL Execute Time</b>	The SQL execute time of the Oracle transaction.
<b>Oracle SQL Fetch Time</b>	The SQL fetch time of the Oracle transaction.
<b>Oracle SQL Other Time</b>	Other SQL time for the Oracle transaction.

## Java Performance Graphs

You can apply the following filter conditions to Java Performance graphs:

Filter Condition	Filters the graph according to...
<b>Java Performance Resource Name</b>	The name of the Java performance resource.
<b>Java Performance Resource Value</b>	The value of the Java performance resource.

## J2EE & .NET Diagnostics Graphs

You can apply the following filter conditions to J2EE & .NET Diagnostics graphs:

Filter Condition	Filters the graph according to...
<b>Transaction Name</b>	The name of the Java transaction.
<b>Method Chain of Calls</b>	The chain of calls for the Java method.
<b>Layer Name</b>	The name of the layer.
<b>Class Name</b>	The name of the class.
<b>Method Name</b>	The name of the method.
<b>SQL Logical Name</b>	The SQL logical name for the Java transaction.
<b>Response Time</b>	The response time of the Java transaction.
<b>Host Name - J2EE/.NET</b>	The name of the host for the J2EE & .NET transaction.
<b>Application Host Name - (VM)</b>	The name of the application host for the VM.
<b>Transaction Request</b>	The request for the transaction.
<b>Transaction Hierarchical Path</b>	The hierarchical path of the transaction. For more information on setting this condition, see <a href="#">"Hierarchical Path Dialog Box" on page 149</a> .

## Application Component Graphs

You can apply the following filter conditions to Application Component graphs:

Filter Condition	Filters the graph according to...
<b>Component Resource Name</b>	The resource name of the component.
<b>Component Resource Value</b>	The value of the component resource. See <a href="#">"Set Dimension Information Dialog Box" on page 150</a> .
<b>COM+ Interface</b>	The interface of the COM+ component.
<b>COM+ Response Time</b>	The response time of the COM+ component.
<b>COM+ Call Count</b>	The call count of the COM+ component.
<b>COM+ Method</b>	The method of the COM+ component.
<b>.NET Resource Name</b>	The resource name of the .NET component.
<b>.NET Value</b>	The .NET resource value. See <a href="#">"Set Dimension Information Dialog Box" on page 150</a> .
<b>.NET Class</b>	The class of the .NET component.
<b>.NET Response Time</b>	The response time of the .NET component.
<b>.NET Call Count</b>	The call count of the .NET component.
<b>.NET Method</b>	The method of the .NET component.

## Application Deployment Graphs

You can apply the following filter conditions to Application Deployment graphs:

Filter Condition	Filters the graph according to...
<b>Citrix Resource Name</b>	The name of the Citrix resource.

Filter Condition	Filters the graph according to...
Citrix Resource Value	The value of the Citrix resource. See <a href="#">"Set Dimension Information Dialog Box" on page 150.</a>

## Middleware Performance Graphs

You can apply the following filter conditions to Middleware Performance graphs:

Filter Condition	Filters the graph according to...
Message Queue Resource Name	The name of the message queue resource.
Message Queue Resource Value	The value of the Message Queue resource. See <a href="#">"Set Dimension Information Dialog Box" on page 150.</a>

## Infrastructure Resource Graphs

You can apply the following filter conditions to Infrastructure Resource graphs:

Filter Condition	Filters the graph according to...
Network Client	The name of the network client.
Network Client Value	The value of the network client. See <a href="#">"Set Dimension Information Dialog Box" on page 150.</a>

## External Monitor Graphs

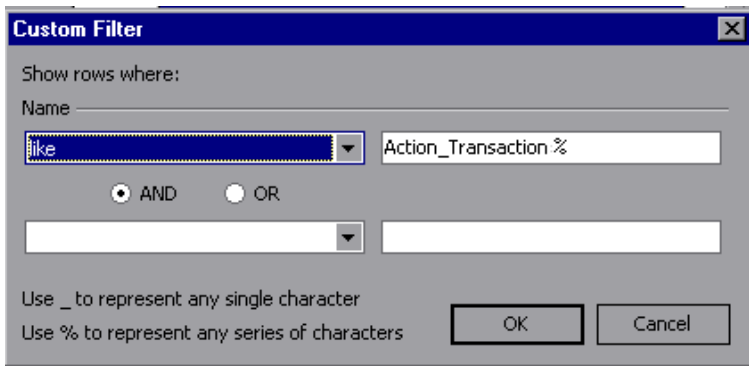
You can apply the following filter conditions to External Monitor graphs:

Filter Condition	Filters the graph according to...
External Monitor Resource Name	The name of the external monitor resource.

Filter Condition	Filters the graph according to...
<b>External Monitor Resource Value</b>	The value of the external monitor resource. See <a href="#">"Set Dimension Information Dialog Box"</a> on page 150.

## Custom Filter Dialog Box

This dialog box enables you to customize your filter criteria.



<b>To access</b>	Do the following: <ol style="list-style-type: none"> <li>1. In a <b>Legend</b> window, click a column header.</li> <li>2. Expand the down arrow and choose <b>(Custom)</b>.</li> </ol>
<b>Tip</b>	You can use wildcards: <ul style="list-style-type: none"> <li>• Use _ to represent a single character.</li> <li>• Use % to represent a series of characters.</li> </ul>
<b>See also</b>	<a href="#">"Legend Window"</a> on page 100

User interface elements are described below:

UI Element	Description
<b>&lt;First Evaluator Expression&gt;</b>	A drop-down list of evaluation expressions such as <b>equals</b> , <b>is greater than</b> , <b>like</b> , and so forth, followed by a value.

UI Element	Description
<b>Operator</b>	The logical operator by which to add a second expression: <b>AND</b> or <b>OR</b> .
<b>&lt;Second Evaluator Expression&gt;</b>	A drop-down list of evaluation expressions such as <b>equals</b> , <b>is greater than</b> , <b>like</b> , and so forth, followed by a value.




For example, the above image shows how to filter the data for transactions that begin with the phrase "Action\_Transaction", using **Like** and **Action\_Transaction%**.

After you save a customization for one of the metrics, the Analysis displays it in the lower section of the Legend window.

## Filter Dialog Boxes

The filter dialog boxes (Graph Settings, Global Filter, and Analysis Summary Filter) enable you to filter the data that is displayed in the graph or report.

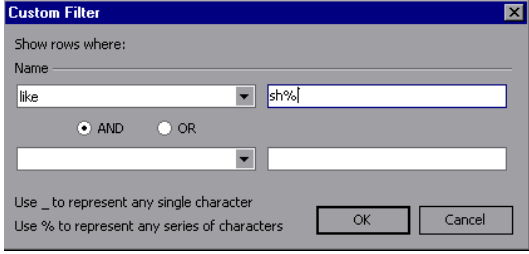
When adding a graph, the filter and sort button is displayed which enables you to filter and sort data before the graph is displayed.

<b>To access</b>	<p><b>Use one of the following:</b></p> <ul style="list-style-type: none"> <li>• <b>View &gt; Set Filter/Group By</b> or click </li> <li>• <b>File &gt; Set Global Filter</b> or click </li> <li>• <b>View &gt; Summary Filter</b> or click </li> </ul>
<b>Note</b>	Some of the following fields are not displayed in all of the filter boxes.

User interface elements are described below:



UI Element	Description
<b>Filter Condition</b>	Select criteria and values for each filter condition that you want to employ. The applicable filter conditions are displayed for each graph. For details on each graphs filter conditions, see the chapter on the relevant graph.
<b>Criteria</b>	Select "=" (equals) or "<>" (does not equal).

UI Element	Description
<p><b>Values</b></p>	<p>The filter conditions are grouped into three value types (discrete, continuous, and time-based).</p> <p>A discrete value is a distinct integer (whole number) or string value such as Transaction Name or Vuser ID. Select the check box(es) of the value(s) that you want to include in your filter. You can also customize your filter by entering wild cards to depict any single character or any series of characters.</p>  <ul style="list-style-type: none"> <li>• A continuous value is a variable dimension that can take any value within the minimum and maximum range limits, such as Transaction Response Time. You set the dimension information for each measurement in the <a href="#">"Set Dimension Information Dialog Box"</a> on page 150.</li> <li>• A time-based value is a value that is based on time relative to the start of the load test scenario. Scenario Elapsed Time is the only condition that uses time-based values. You specify time-based values in the <a href="#">"Scenario Elapsed Time Dialog Box"</a> on page 149.</li> </ul> <p>For some filter conditions, one of the following dialog boxes opens to enable you to specify additional filtering details:</p> <ul style="list-style-type: none"> <li>• <a href="#">"Set Dimension Information Dialog Box"</a> on page 150</li> <li>• <a href="#">"Vuser ID Dialog Box"</a> on page 151</li> <li>• <a href="#">"Scenario Elapsed Time Dialog Box"</a> on page 149</li> <li>• <a href="#">"Hierarchical Path Dialog Box"</a> on page 149: Enables you to display the hierarchical path of a transaction or component, or a method chain of calls.</li> </ul>


UI Element	Description
<b>Transaction Percentile</b>	The Summary Report contains a percentile column showing the response time of 90% of transactions (90% of transactions that fall within this amount of time). To change the value of the default 90 percentile, enter a new figure in the <b>Transaction Percentile</b> box.
<b>Set Default</b>	Displays the default criteria and values for each filter condition.
<b>Clear All</b>	Deletes all of the information you entered in the dialog box.
<b>Group By settings</b>	<p>Use these settings to sort the graph display by grouping the data. You can group the data by:</p> <ul style="list-style-type: none"><li>• <b>Available groups.</b> Select the group by which you want to the sort the results, and click the right arrow.</li><li>• <b>Selected groups.</b> Displays a list of all the selected groups by which the results will be sorted. To remove a value, select it and click the left arrow.</li></ul>
<b>Reset all graphs to their defaults prior to applying the Global Filter</b>	All graphs filter settings are reverted to their default.

## Filter Builder Dialog Box

The Filter Builder dialog box enable you to design, add, and edit filters for your graph.

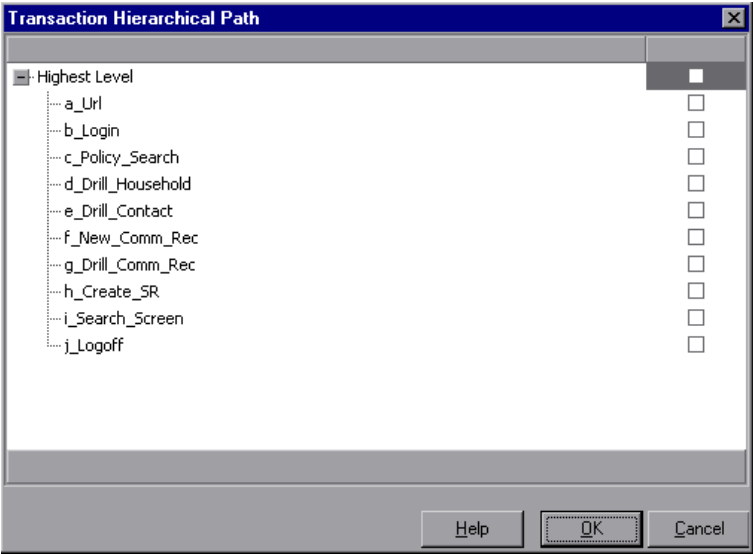
<b>To access</b>	<p><b>Use one of the following:</b></p> <ol style="list-style-type: none"> <li>1. In the Legend pane, expand the down arrow in a column header.</li> <li>2. Select <b>Custom</b> to open the Custom Filter dialog box. Provide filter details and click OK.</li> <li>3. Click <b>Customize</b> in the filter entry in the lower part of the <b>Legend</b> pane.</li> </ol>
<b>See also</b>	<a href="#">"Custom Filter Dialog Box" on page 143</a>

User interface elements are described below:

<b>UI Element</b>	<b>Description</b>
<b>Filter button</b>	<p>Opens a menu with the following options:</p> <ul style="list-style-type: none"> <li>• <b>Add Condition.</b> Add another condition for the current filter.</li> <li>• <b>Add Group.</b> Adds a second condition, joined by a logical operator AND or OR, to the last condition in the list.</li> <li>• <b>Clear All.</b> Removes all of the conditions in the window.</li> </ul>
	<p>Opens a menu with the following options:</p> <ul style="list-style-type: none"> <li>• <b>Add Condition.</b> Add another condition for the current filter.</li> <li>• <b>Add Group.</b> Adds a second condition, joined by a logical operator AND or OR, to the selected condition in the list.</li> <li>• <b>Remove Row.</b> Removes the selected condition.</li> </ul>
<b>Open</b>	Opens an <b>.flt</b> file saved from a previous session.
<b>Save as</b>	Saves all of the conditions to an <b>.flt</b> file.

# Hierarchical Path Dialog Box

This dialog box enables you to display the hierarchical path of a transaction or component, or a method chain of calls.



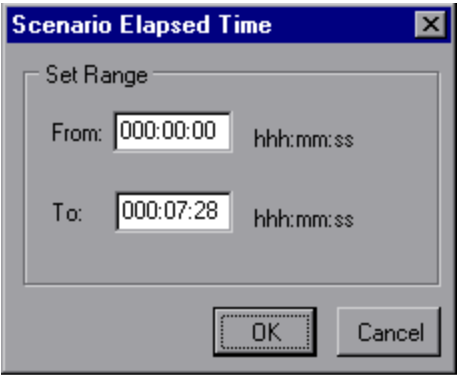
To access	View menu > Set Filter/Group by > Filter condition pane > Transaction, Component Hierarchical Path or a method chain of calls
-----------	---

User interface elements are described below:

UI Element	Description
Transaction, Component Hierarchical Path or a method chain of calls	Select the box for the path where you want to start to see results. Only the selected path and its immediate sub-nodes will be displayed.

# Scenario Elapsed Time Dialog Box

This dialog box enables you to specify the start and end time range for the graph's x-axis.



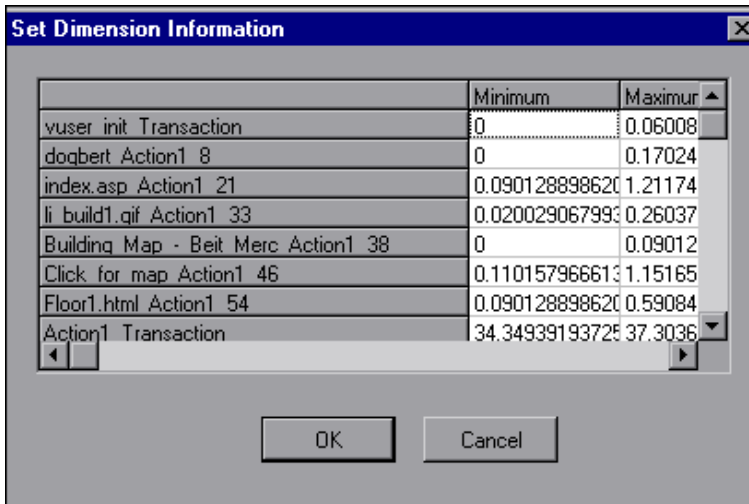
To access	View menu > Set Filter/Group by > Filter condition pane > Scenario Elapsed Time
Note	The time is relative to the start of the scenario.

User interface elements are described below:

UI Element	Description
From	Specify a start value for the desired range.
To	Specify an end value for the desired range.

## Set Dimension Information Dialog Box

This dialog box enables you to set the dimension information for each measurement (transaction, number of released Vusers, resource) in the result set. You specify the minimum and maximum values for each measurement you want in the analysis. By default, the full range of values for each measurement is displayed.



**To access**

You can open this dialog box from the following locations:

- **Transaction graphs > View menu > Set Filter/Group by > Filter condition pane > Transaction Response Time**
- **Vusers graph > Rendezvous graph > View menu > Set Filter/Group by > Filter condition pane > Number of Released Vusers**
- **All graphs that measure resources (Web Server, Database Server, and so on) > View menu > Set Filter/Group by > Filter condition pane > Resource Value**

**Note**

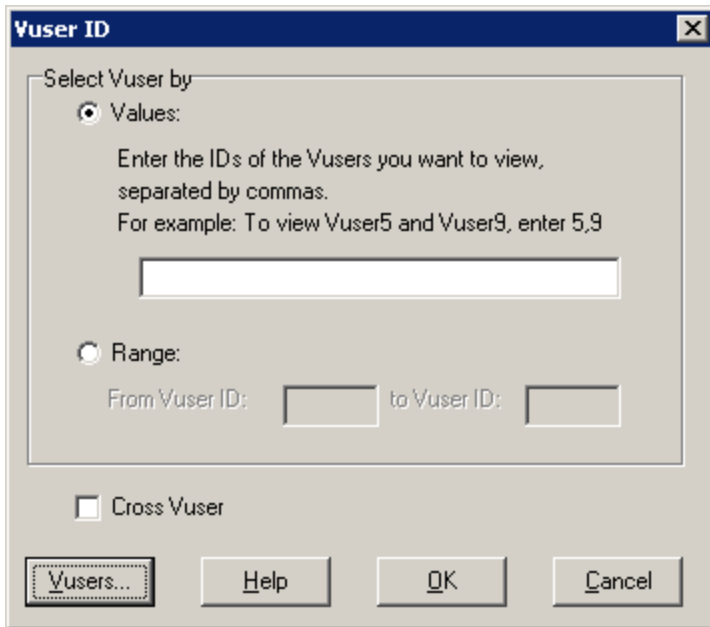
If you are specifying the start and end time for a transaction (in minutes:seconds format), the time is relative to the beginning of the load test scenario.

User interface elements are described below:

UI Element	Description
<b>Minimum</b>	Specify a minimum value for the measurement.
<b>Maximum</b>	Specify a maximum value for the measurement.

## Vuser ID Dialog Box

This dialog box opens to enable the entering of additional filter information for the Vuser ID filter condition.



<b>To access</b>	<b>View menu &gt; Set Filter/Group by &gt; Filter condition pane &gt; Vuser ID</b>
------------------	--

User interface elements are described below:

<b>UI Element</b>	<b>Description</b>
<b>Value</b>	Enter the Vuser IDs of the Vusers you want the graph(s) to display, separated by commas.
<b>Range</b>	Specify the beginning and end of the desired range of Vusers you want the graph(s) to display.
<b>Cross Vuser</b>	<p>Cross Vuser transactions are transactions that start with one Vuser and end with a different Vuser, such as sending an email. Selecting this check box places the value "CrossVuser" in the Vuser ID filter. By default, the check box is not selected.</p> <p><b>Note:</b> Only transaction graphs have Cross Vuser data.</p>
<b>Vusers</b>	Displays the existing Vuser IDs from which you can choose.



# Cross Result and Merged Graphs

## Cross Result and Merged Graphs Overview

Comparing results is essential for determining bottlenecks and problems. You use Cross Result graphs to compare the results of multiple load test scenario runs. You create Merged graphs to compare results from different graphs within the same scenario run.

## Cross Result Graphs Overview

Cross Result graphs are useful for:

- Benchmarking hardware
- Testing software versions
- Determining system capacity

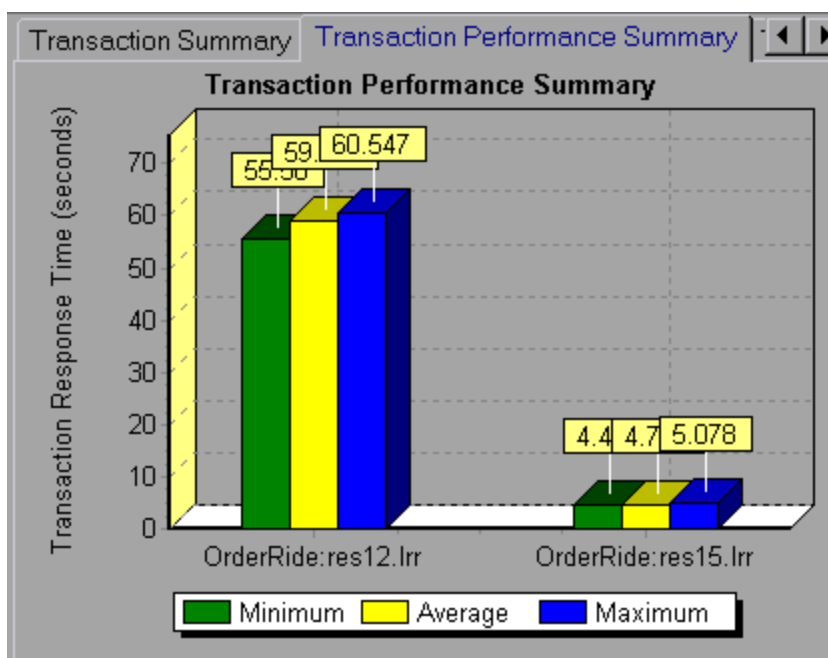
If you want to benchmark two hardware configurations, you run the same load test scenario with both configurations and compare the transaction response times using a single Cross Result graph.

Suppose that your vendor claims that a new software version is optimized to run quicker than a previous version. You can verify this claim by running the same scenario on both versions of the software, and comparing the scenario results.

You can also use Cross Result graphs to determine your system's capacity. You run scenarios using different numbers of Vusers running the same script. By analyzing Cross Result graphs, you can determine the number of users that cause unacceptable response times.

In the following example, two scenario runs are compared by crossing their results, **res12**, and **res15**. The same script was executed twice—first with 100 Vusers and then with 50 Vusers.

In the first run, the average transaction time was approximately 59 seconds. In the second run, the average time was 4.7 seconds. It is apparent that the system works much slower with a greater load.



The Cross Result graphs have an additional filter and group by category: **Result Name**. The above graph is filtered to the **OrderRide** transaction for results **res12**, and **res15**, grouped by **Result Name**.

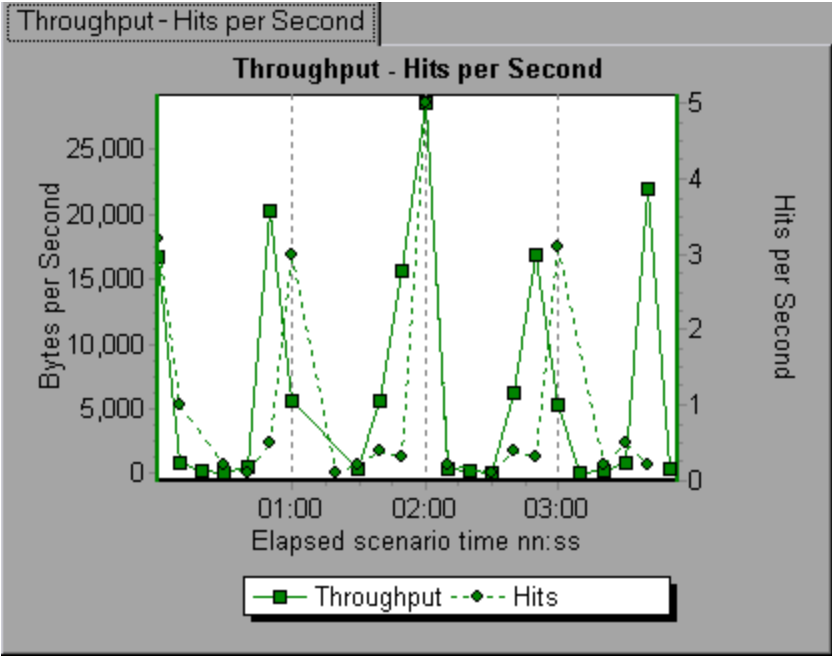
## Merging Types Overview

Analysis provides three types of merging:

### Overlay

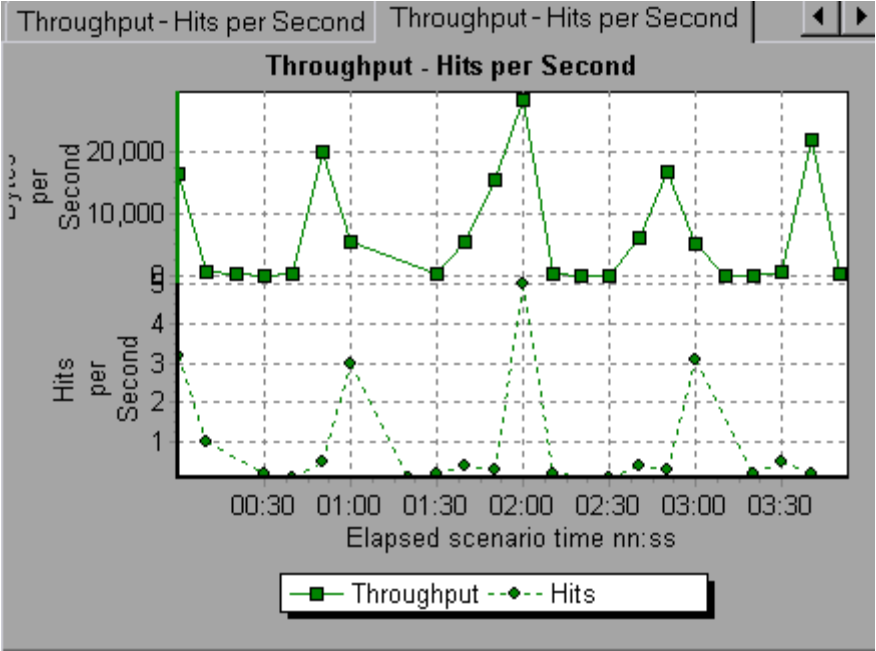
Superimpose the contents of two graphs that share a common x-axis. The left y-axis on the merged graph shows the current graph's values. The right y-axis shows the values of the graph that was merged. There is no limit to the number of graphs that you can overlay. When you overlay two graphs, the y-axis for each graph is displayed separately to the right and left of the graph. When you overlay more than two graphs, Analysis displays a single y-axis, scaling the different measurements accordingly.

In the following example, the Throughput and Hits per Second graph are overlaid with one another.



### Tile

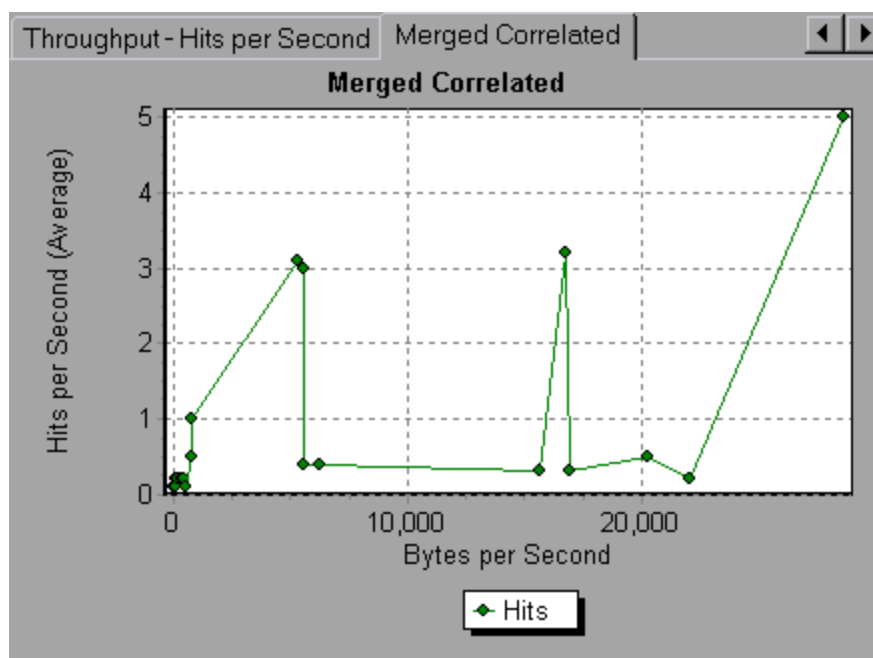
View contents of two graphs that share a common x-axis in a tiled layout, one above the other. In the following example the Throughput and Hits per Second graph are tiled one above the other.



## Correlate

Plot the y-axis of two graphs against each other. The active graph's y-axis becomes the x-axis of the merged graph. The y-axis of the graph that was merged, becomes the merged graph's y-axis.

In the following example, the Throughput and Hits per Second graph are correlated with one another. The x-axis displays the bytes per second (the Throughput measurement) and the y-axis shows the average hits per second.



## How to Generate Cross Results Graphs

This task describes how to create a Cross Result graph for two or more result sets. The Cross Result dialog box enables you to compare the results of multiple load test scenario runs.

1. Choose **File > Cross With Result**. The Cross Results dialog box opens.
2. Click **Add** to add an additional result set to the **Result List**. The Select Result Files for Cross Results dialog box opens.
3. Locate a results folder and select its result file (.lrr). Click **OK**. The scenario is added to the Result List.

4. Repeat steps 2 and 3 until all the results you want to compare are in the Result List.
5. When you generate a Cross Result graph, by default it is saved as a new Analysis session. To save it in an existing session, clear the **Create New Analysis Session for Cross Result** box.
6. Click **OK**. Analysis processes the result data and asks for a confirmation to open the default graphs.

**Note:** When generating a Cross Results Session, verify that the transaction names do not contain a <\_> or <@> symbol. This will cause errors to occur when attempting to open the Cross Results graphs.

After you generate a Cross Result graph, you can filter it to display specific scenarios and transactions. You can also manipulate the graph by changing the granularity, zoom, and scale.

You can view a summary report for the Cross Result graph.

## How to Generate Merged Graphs

This task describes how to merge the results of two graphs from the same load test scenario into a single graph. The merging allows you to compare several different measurements at once. For example, you can make a merged graph to display the network delay and number of running Vusers, as a function of the elapsed time.

You can merge all graphs with a common x-axis.

1. Select a graph in the Session Explorer or select its tab to make it active.
2. Choose **View > Merge Graphs** or click **Merge Graphs**. The Merge Graphs dialog box opens and displays the name of the active graph.
3. Select a graph with which you want to merge your active graph. Only the graphs with a common x-axis to the active graph are available.
4. Select the merge type and a title for the merged graph. By default, Analysis combines the titles of the two graphs being merged. For more information, see ["Merge Graphs Dialog Box" on the next page](#).

5. Click OK.
6. Filter the graph just as you would filter any ordinary graph.

## Merge Graphs Dialog Box

This dialog box enables you to merge two graphs into a single graph.

<b>To access</b>	<b>View &gt; Merge Graphs</b>
<b>Important information</b>	In order to merge graphs, the graphs' x-axes must be the same measurement. For example, you can merge Web Throughput and Hits per Second graphs, because their x-axes are Scenario Elapsed Time.
<b>See also</b>	<a href="#">"Merging Types Overview" on page 154</a>

User interface elements are described below:

UI Element	Description
<b>Select Graph to merge with</b>	The drop-down list shows all of the open graphs that share a common x-axis measurement with the current graph. Select one of the graphs in the list.
<b>Select type of merge</b>	<ul style="list-style-type: none"><li>• <b>Overlay</b>. View contents of two graphs that share a common x-axis. The left y-axis on the merged graph shows the current graph's values. The right y-axis shows the values of the graph that was merged with the current graph.</li><li>• <b>Tile</b>. View contents of two graphs that share a common x-axis in a tiled layout, one above the other.</li><li>• <b>Correlate</b>. Plot the y-axes of two graphs against each other. The active graph's y-axis becomes the x-axis of the merged graph. The y-axis of the graph that was merged, becomes the merged graph's y-axis.</li></ul>

UI Element	Description
Title of Merged Graph	Enter a title for the merged graph. This title will appear in the Session Explorer ( <b>Windows &gt; Session Explorer</b> ).

## Vuser Graphs

### Vuser Graphs Overview

During load test scenario execution, Vusers generate data as they perform transactions. The Vuser graphs let you determine the overall behavior of Vusers during the scenario. They display the Vuser states, the number of Vusers that completed the script, and rendezvous statistics. Use these graphs in conjunction with Transaction graphs to determine the effect of the number of Vusers on transaction response time. For more information about Transaction graphs, see ["Transaction Graphs" on page 167](#).

### Rendezvous Graph (Vuser Graphs)

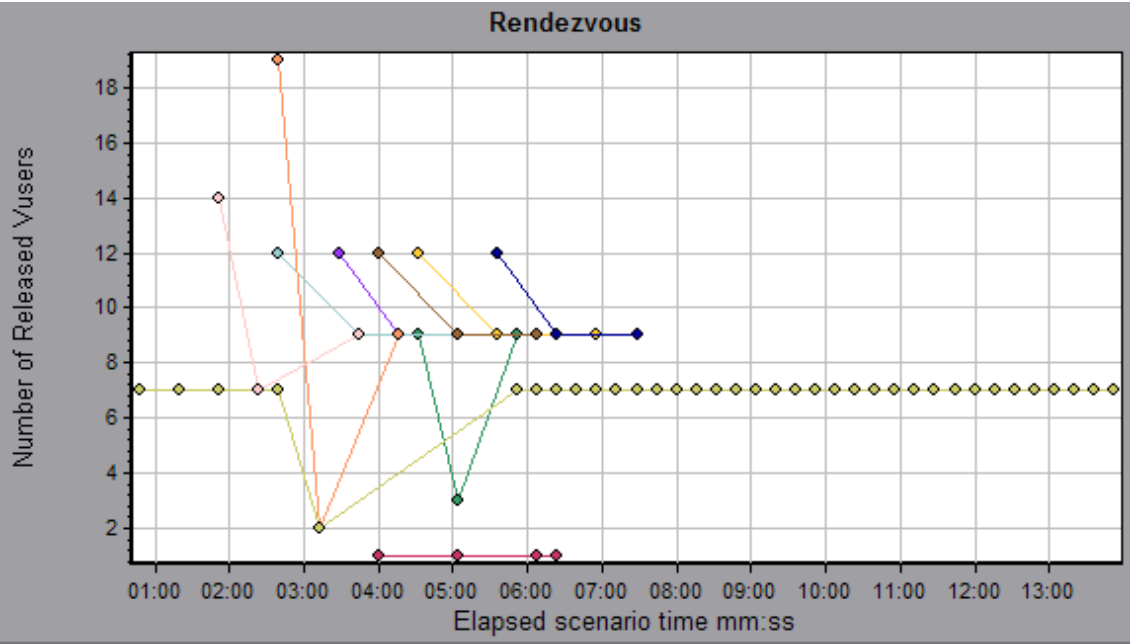
During a scenario run, you can instruct multiple Vusers to perform tasks simultaneously by using **rendezvous points**. A rendezvous point creates intense user load on the server and enables LoadRunner to measure server performance under load. For more information about using rendezvous points, see the *HP Virtual User Generator User Guide*.

This graph indicates when Vusers were released from rendezvous points, and how many Vusers were released at each point.

<b>Purpose</b>	Helps you understand transaction performance times.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Number of Vusers that were released from the rendezvous.

<b>Tips</b>	Compare this to the <b>Average Transaction Response Time</b> graph. When you so this, you can see how the load peak created by a rendezvous influences transaction times.
<b>See also</b>	<a href="#">"Vuser Graphs Overview" on the previous page</a>

Example



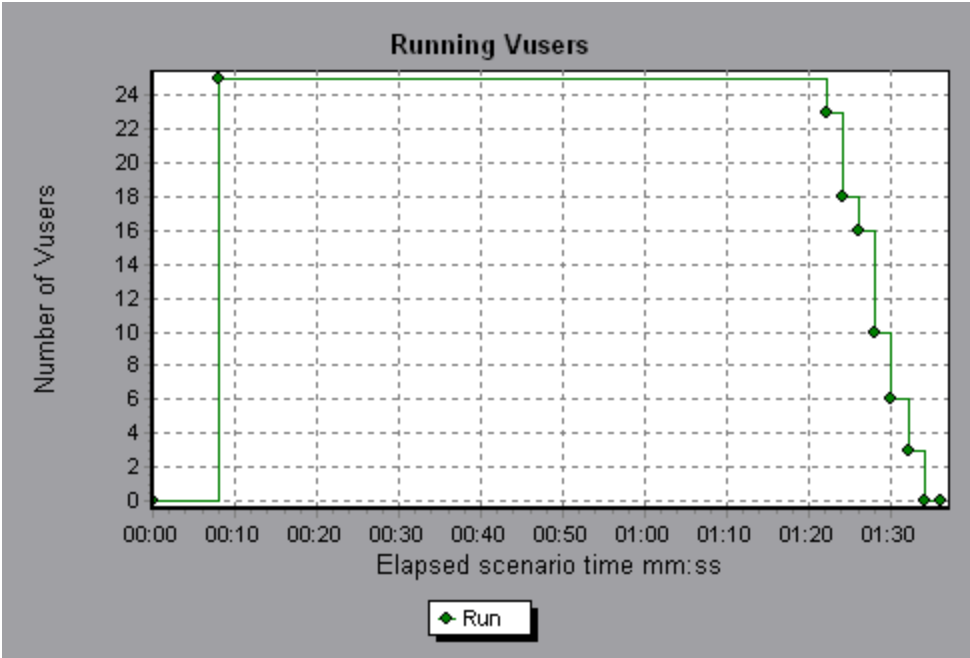
Running Vusers Graph

This graph displays the number of Vusers that executed Vuser scripts and their status during each second of the test.

<b>Purpose</b>	Helps you determine the Vuser load on your server at any given moment.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Number of Vusers in the scenario.
<b>Note</b>	By default, this graph only shows the Vusers with a <b>Run</b> status. To view another Vuser status, set the filter conditions to the desired status. For more information, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a> .
<b>See also</b>	<a href="#">"Vuser Graphs Overview" on the previous page</a>



Example

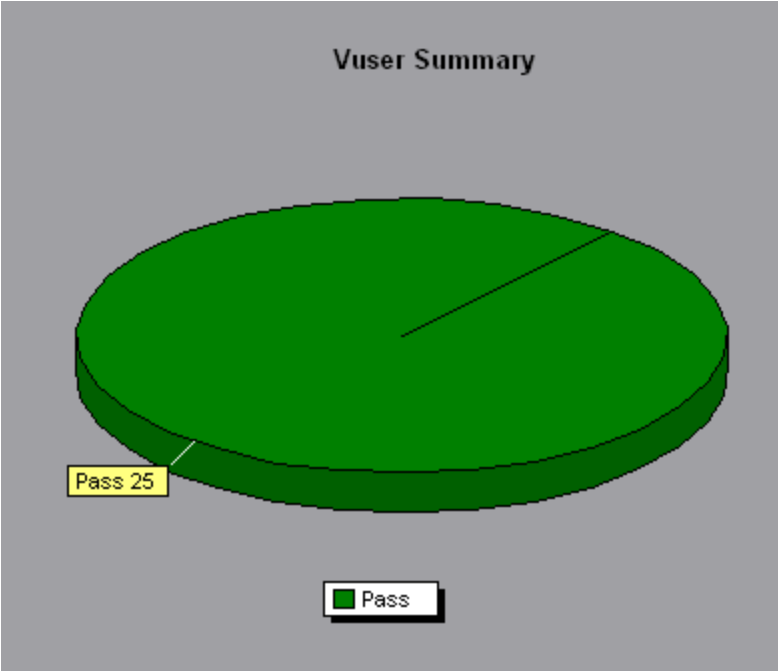


# Vuser Summary Graph

This graph displays a summary of Vuser performance.

Purpose	Lets you view the number of Vusers that successfully completed the load test scenario run relative to those that did not.
Note	This graph may only be viewed as a pie.
See also	<a href="#">"Vuser Graphs Overview" on page 159</a>

Example



# Error Graphs

## Error Graphs Overview

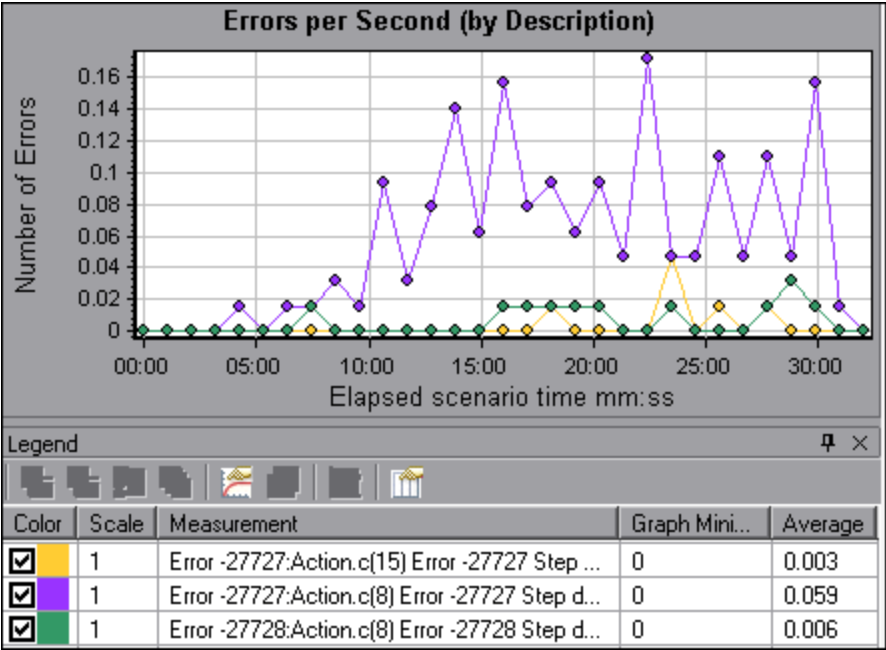
During load test scenario execution, Vusers may not complete all transactions successfully. The Error graphs let you view information about the transactions that failed, stopped, or ended in errors. Using the Error graphs, you can view a summary of errors that occurred during the scenario and the average number of errors that occurred per second.

## Errors per Second (by Description) Graph

This graph displays the average number of errors that occurred during each second of the load test scenario run, grouped by error description. The error description is displayed in the legend.

X-axis	Elapsed time since the start of the run.
Y-axis	Number of errors.
See also	<a href="#">"Error Graphs Overview" above</a>

Example

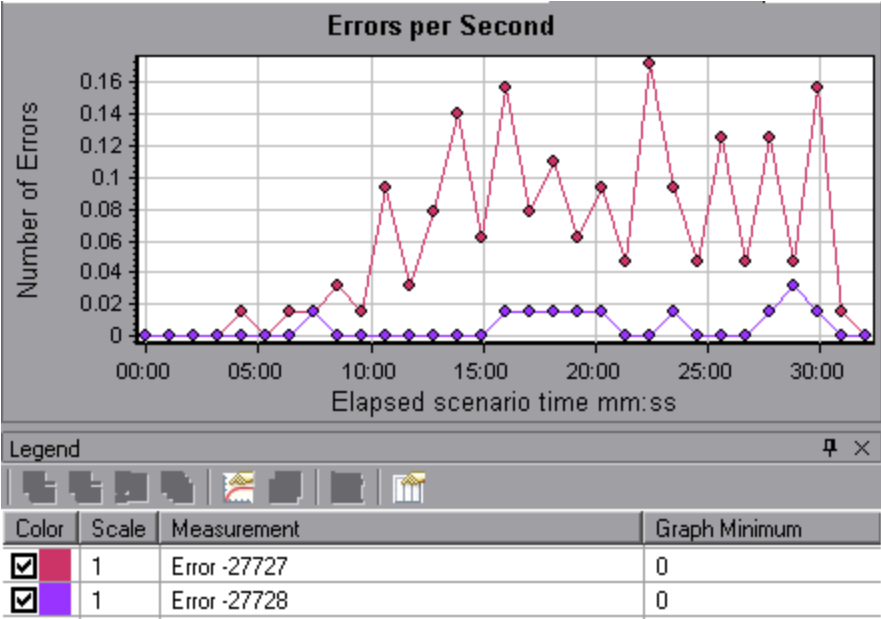


Errors per Second Graph

This graph displays the average number of errors that occurred during each second of the load test scenario run, grouped by error code.

X-axis	Elapsed time since the start of the run.
Y-axis	Number of errors.
See also	<a href="#">"Error Graphs Overview" on the previous page</a>

Example

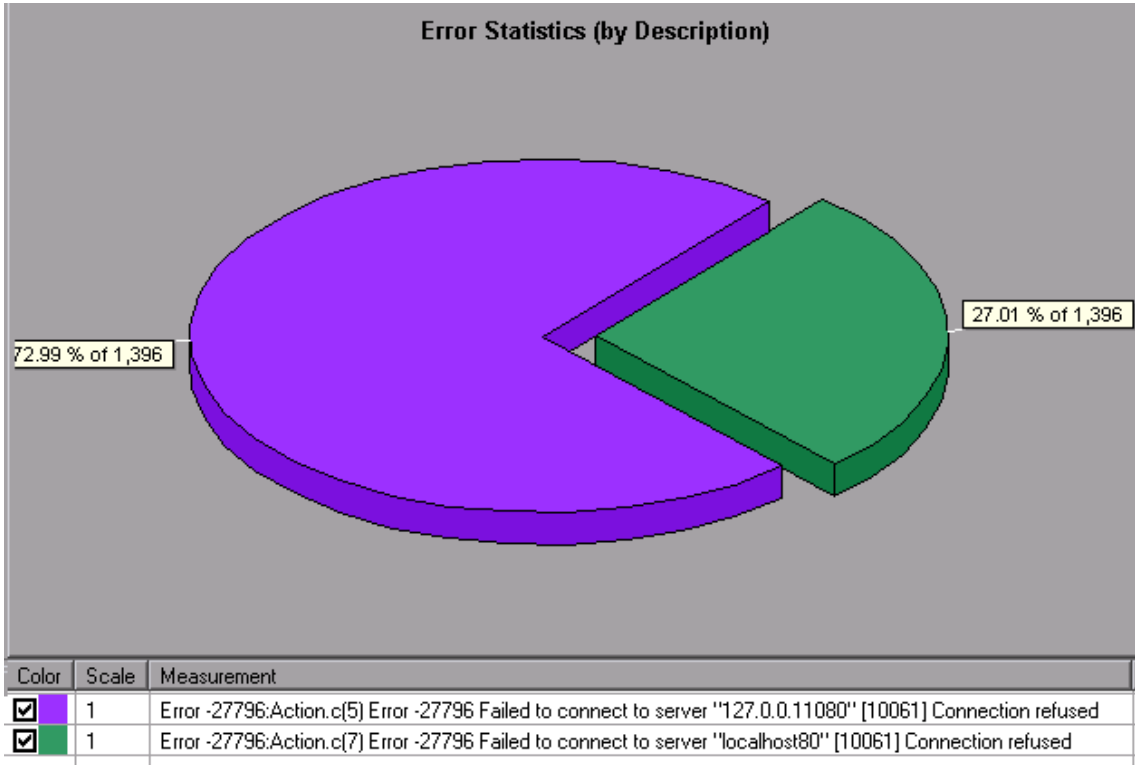


## Error Statistics (by Description) Graph

This graph displays the number of errors that accrued during load test scenario execution, grouped by error description. The error description is displayed in the legend.

Note	This graph may only be viewed as a pie.
See also	<a href="#">"Error Graphs Overview" on page 162</a>

### Example



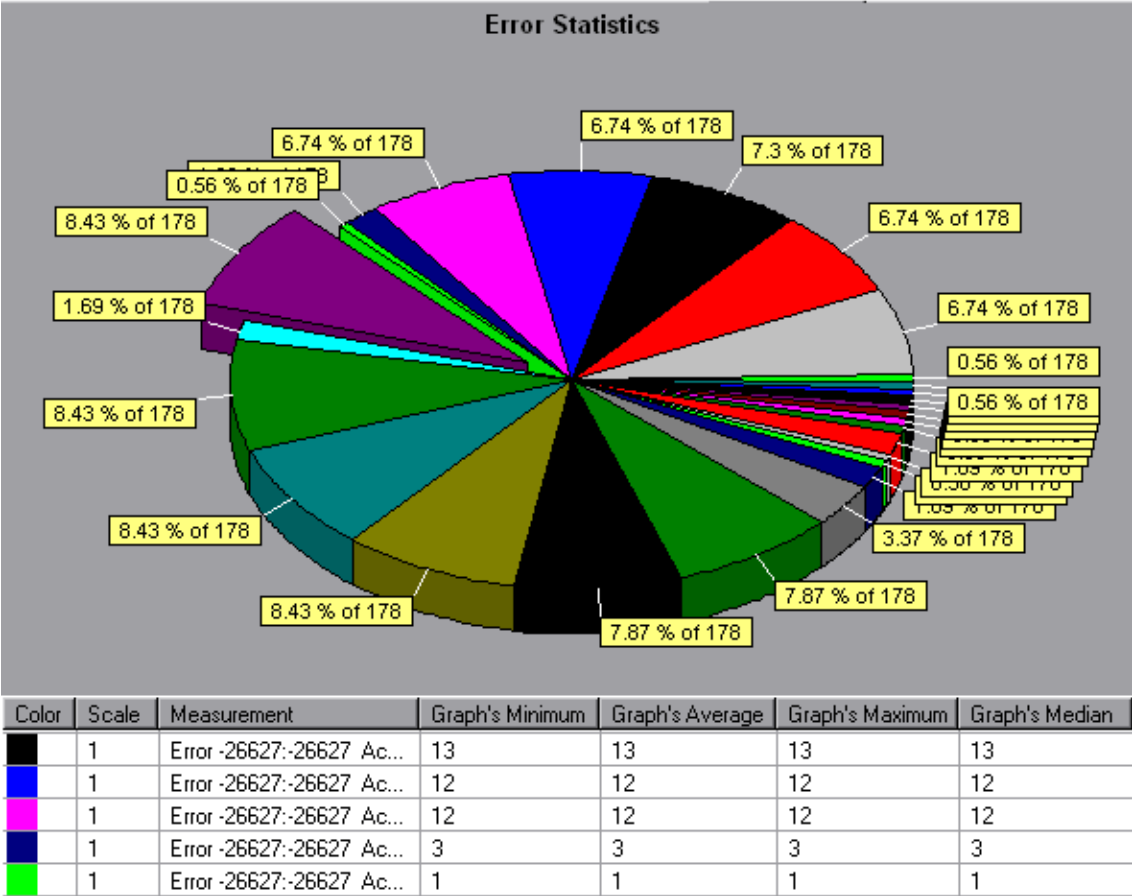
## Error Statistics Graph

This graph displays the number of errors that accrued during load test scenario execution, grouped by error code.

Note	This graph may only be viewed as a pie.
See also	<a href="#">"Error Graphs Overview" on page 162</a>

### Example

In the following example, out of a total of 178 errors that occurred during the scenario run, the second error code displayed in the legend occurred twelve times, comprising 6.74% of the errors.

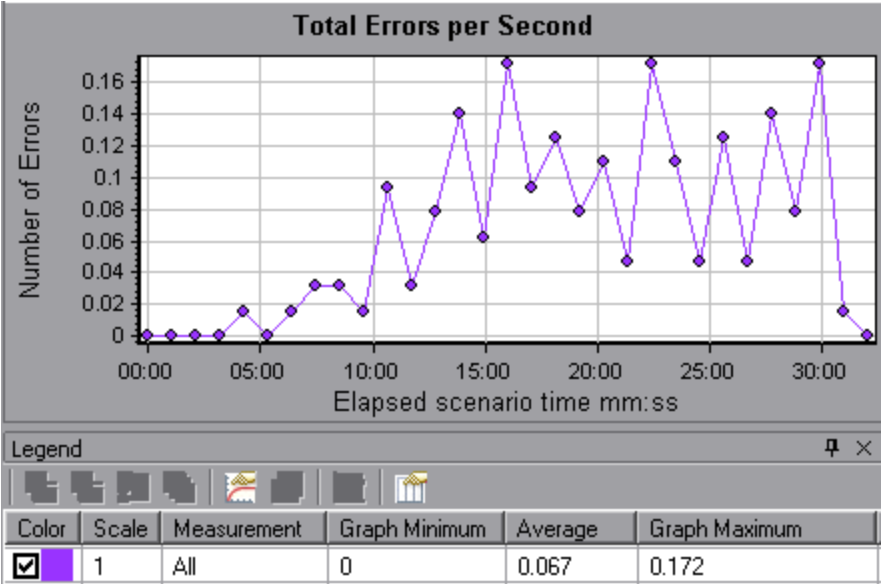


## Total Errors per Second Graph

This graph displays the average number of errors that occurred during each second of the load test scenario run. (complete: add sentence about being sum of all errors)

X-axis	Elapsed time since the start of the run.
Y-axis	Number of errors.
See also	"Error Graphs Overview" on page 162

### Example



# Transaction Graphs

## Transaction Graphs Overview

During load test scenario execution, Vusers generate data as they perform transactions. Analysis enables you to generate graphs that show the transaction performance and status throughout script execution.

You can use additional Analysis tools such as merging and crossing results to understand your transaction performance graphs. You can also sort the graph information by transactions.

For more information, see ["Introduction to Analysis" on page 22](#).

## Average Transaction Response Time Graph

This graph displays the average time taken to perform transactions during each second of the load test scenario run.

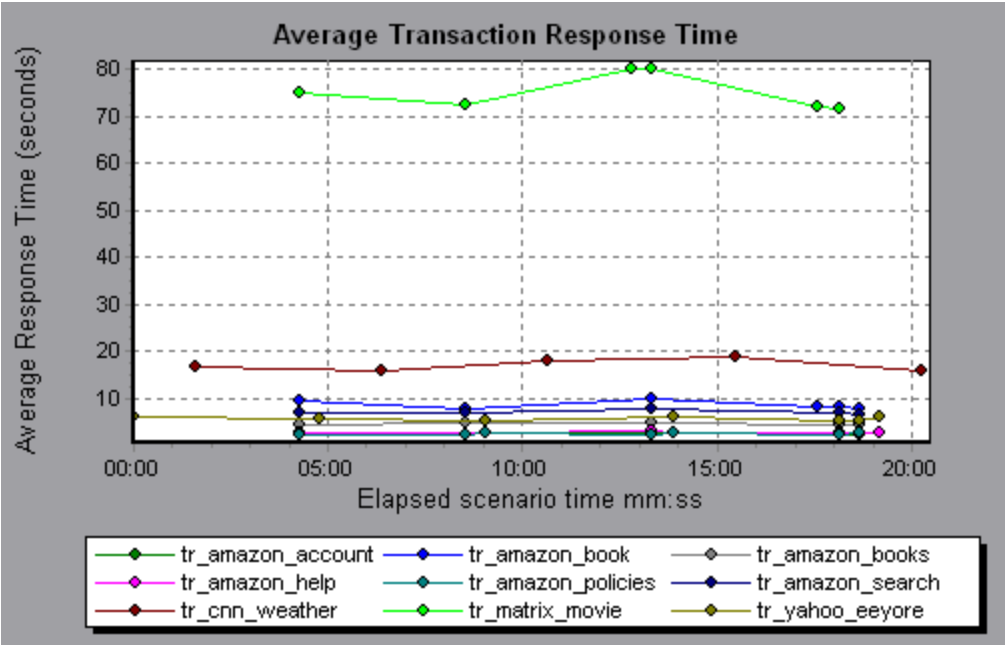
<b>Purpose</b>	If you have defined acceptable minimum and maximum transaction performance times, you can use this graph to determine whether the performance of the server is within the acceptable range.
----------------	---

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Average response time (in seconds) of each transaction
<b>Breakdown options</b>	<p><b>Transaction Breakdown</b></p> <p>You can view a breakdown of a transaction by right-clicking the transaction in the graph and selecting <b>Show Transaction Breakdown Tree</b>. In the Transaction Breakdown Tree, right-click the transaction you want to break down, and select <b>Break Down &lt;transaction name&gt;</b>. The Average Transaction Response Time graph displays data for the sub-transactions. For more details, see "<a href="#">Transaction Breakdown Tree</a>" on page 171.</p> <p><b>Web Page Breakdown</b></p> <p>To view a breakdown of the Web page(s) included in a transaction or sub-transaction, right-click it and select <b>Web Page Diagnostics for &lt;transaction name&gt;</b>. For more information on the Web Page Diagnostics graphs, see "<a href="#">Web Page Diagnostics Graphs</a>" on page 193.</p>



<b>Tips</b>	<p><b>Granularity</b></p> <p>This graph is displayed differently for each granularity. The lower the granularity, the more detailed the results. However, it may be useful to view the results with a higher granularity to study the overall Vuser behavior throughout the scenario. For example, using a low granularity, you may see intervals when no transactions were performed. However, by viewing the same graph with a higher granularity, you will see the graph for the overall transaction response time. For more information on setting the granularity, see <a href="#">"How to Manage Graph Data" on page 119</a>.</p> <p><b>Compare with Running Vusers</b></p> <p>You can compare the Average Transaction Response Time graph to the Running Vusers graph to see how the number of running Vusers affects the transaction performance time. For example, if the Average Transaction Response Time graph shows that performance time gradually improved, you can compare it to the Running Vusers graph to see whether the performance time improved due to a decrease in the Vuser load.</p>
<b>Note</b>	By default, only transactions that passed are displayed.
<b>See also</b>	<a href="#">"Transaction Graphs Overview" on page 167</a>

Example

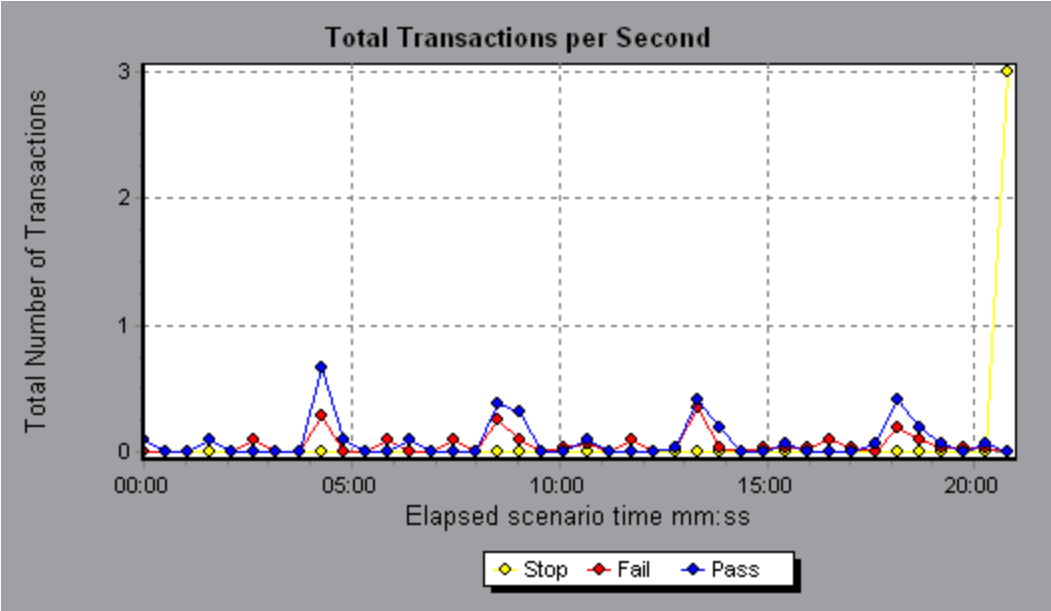


## Total Transactions per Second Graph

This graph displays the total number of transactions that passed, the total number of transactions that failed, and the total number of transactions that were stopped, during each second of a load test scenario run.

<b>Purpose</b>	Helps you determine the actual transaction load on your system at any given moment.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Total number of transactions performed during the scenario run.
<b>See also</b>	<a href="#">"Transaction Graphs Overview" on page 167</a>

Example



# Transaction Breakdown Tree

The Transaction Breakdown Tree displays a tree view of the transactions and sub-transactions in the current session. From the tree, you can breakdown transactions and view the results of the breakdown in either the Average Transaction Response Time or Transaction Performance Summary graph.

To access	In either the Average Transaction Response Time or Transaction Performance Summary graph, right-click in the graph and select <b>Show Transaction Breakdown Tree</b> .
Important information	After you breakdown a transaction, you can return to the original transaction graph by reapplying the global filter ( <b>File &gt; Set Global Filter</b> ) or by undoing your breakdown actions using <b>Edit &gt; Undo Last Action</b> .

User interface elements are described below (unlabeled elements are shown in angle brackets):

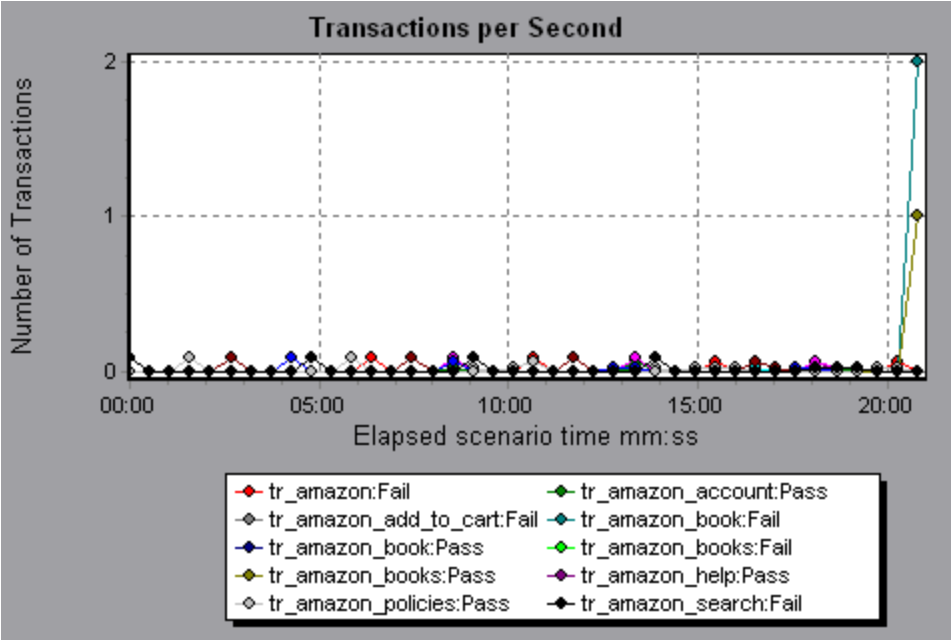
UI Element	Description
<Right-click menu>	<ul style="list-style-type: none"> <li>• <b>Break Down From Highest Level.</b> Displays data for the highest level hierarchical path of a transaction.</li> <li>• <b>Break Down &lt;transaction name&gt;.</b> Displays data for the sub-transactions in the Average Transaction Response Time or Transaction Performance Summary graph.</li> <li>• <b>Show Only &lt;transaction name&gt;.</b> Displays data only for the selected transaction/sub-transaction.</li> <li>• <b>Web Page Diagnostics for &lt;page name&gt;.</b> Displays a breakdown of the Web page(s) included in a transaction or sub-transaction in the Web Page Diagnostics graphs. For details, see "<a href="#">Web Page Diagnostics Graphs</a>" on page 193.</li> </ul>

## Transactions per Second Graph

This graph displays, for each transaction, the number of times it passed, failed, and stopped during each second of a load test scenario run.

<b>Purpose</b>	Helps you determine the actual transaction load on your system at any given moment.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Number of transactions performed during the scenario run.
<b>Tips</b>	Compare with the <b>Average Transaction Response Time</b> Graph. Doing this helps you analyze the effect of the amount of transactions upon the performance time.
<b>See also</b>	<a href="#">"Transaction Graphs Overview" on page 167</a>

### Example



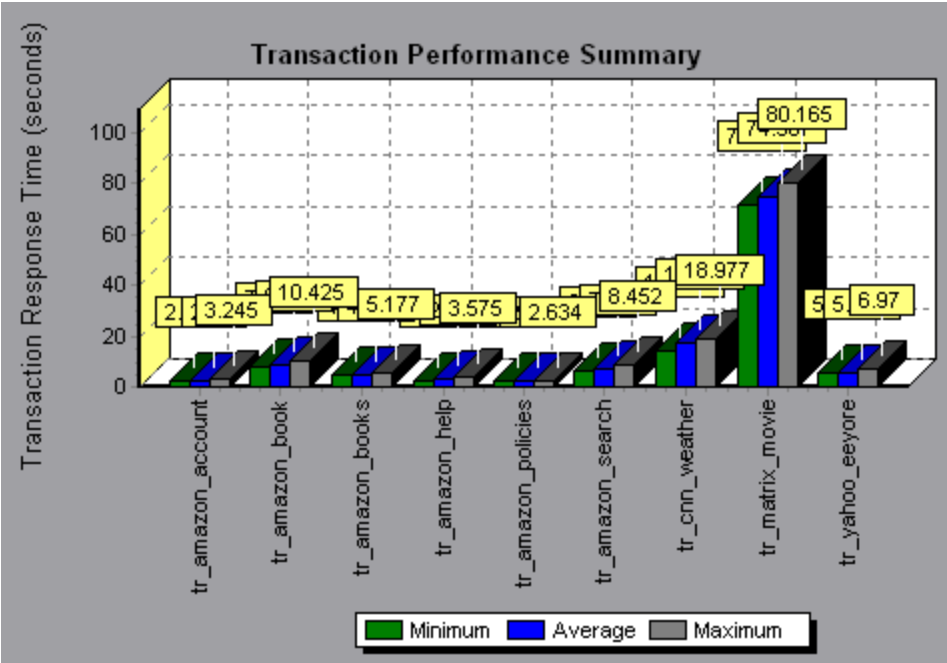
## Transaction Performance Summary Graph

This graph displays the minimum, maximum and average performance time for all the transactions in the load test scenario.

<b>X-axis</b>	Name of the transaction.
<b>Y-axis</b>	Response time—rounded off to the nearest second—of each transaction.

<b>Breakdown options</b>	<h3>Transaction Breakdown</h3> <p>You can view breakdown of a transaction in the Transaction Performance Summary graph by right-clicking the transaction in the graph and selecting <b>Show Transaction Breakdown Tree</b>. In the Transaction Breakdown Tree, right-click the transaction you want to break down, and select <b>Break Down &lt;transaction name&gt;</b>. The Transaction Performance Summary graph displays data for the sub-transactions. For more details, see <a href="#">"Transaction Breakdown Tree" on page 171</a>.</p> <h3>Web Page Breakdown</h3> <p>To view a breakdown of the Web page(s) included in a transaction or sub-transaction, right-click it and select <b>Web Page Diagnostics for &lt;transaction name&gt;</b>. For more, see <a href="#">"Web Page Diagnostics Graphs" on page 193</a>.</p>
<b>See also</b>	<a href="#">"Transaction Graphs Overview" on page 167</a>

Example



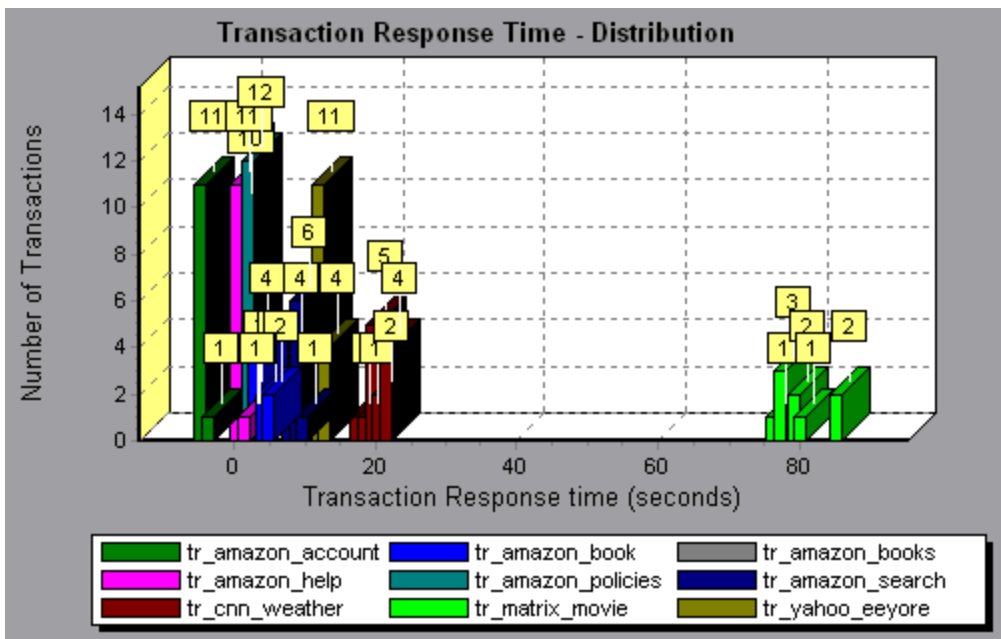
## Transaction Response Time (Distribution) Graph

This graph displays the distribution of the time taken to perform transactions in a load test scenario.

<b>Purpose</b>	If you have defined acceptable minimum and maximum transaction performance times, you can use this graph to determine whether the performance of the server is within the acceptable range.
<b>X-axis</b>	Transaction response time (rounded down to the nearest second).
<b>Y-axis</b>	Number of transactions executed during the scenario.
<b>Tips</b>	Compare with <b>Transaction Performance Summary</b> Graph to see how the average performance was calculated.
<b>Note</b>	This graph can only be displayed as a bar graph.
<b>See also</b>	<a href="#">"Transaction Graphs Overview" on page 167</a>

### Example

In the following example, most of the transactions had a response time of less than 20 seconds.



## Transaction Response Time (Percentile) Graph

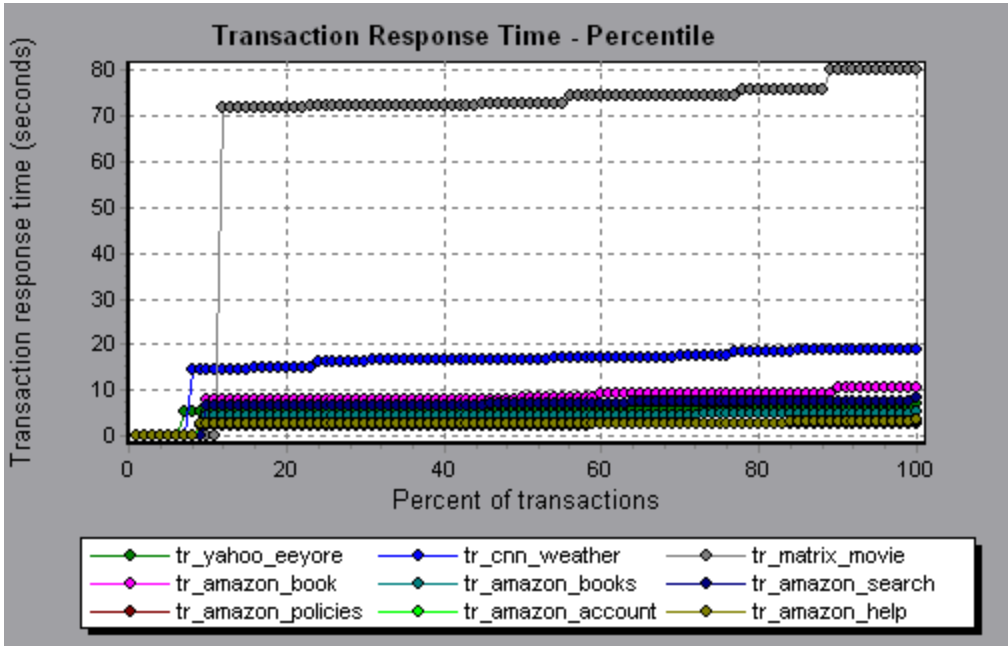
This graph analyzes the percentage of transactions that were performed within a given time range.

<b>Purpose</b>	Helps you determine the percentage of transactions that met the performance criteria defined for your system. In many instances, you need to determine the percent of transactions with an acceptable response time. The maximum response time may be exceptionally long, but if most transactions have acceptable response times, the overall system is suitable for your needs.
<b>X-axis</b>	Percentage of the total number of transactions measured during the load test scenario run.
<b>Y-axis</b>	Maximum transaction response time (in seconds).  <b>Note:</b> Analysis approximates the transaction response time for each available percentage of transactions. The y-axis values, therefore, may not be exact.
<b>Tips</b>	Compare with the <b>Average Response Time</b> Graph.  A high response time for several transactions may raise the overall average. However, if the transactions with a high response time occurred less than five percent of the time, that factor may be insignificant.
<b>See also</b>	<a href="#">"Transaction Graphs Overview" on page 167</a>

### Example

In the following example, fewer than 20 percent of the tr\_matrix\_movie transactions had a response time less than 70 seconds.



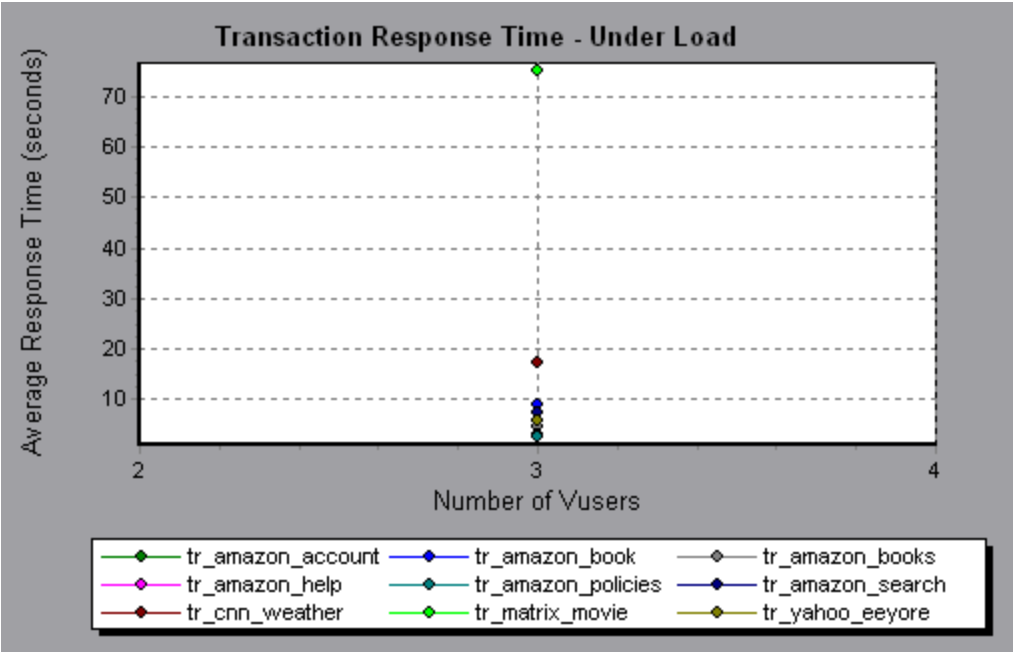


## Transaction Response Time (Under Load) Graph

This graph is a combination of the Running Vusers and Average Transaction Response Time graphs and indicates transaction times relative to the number of Vusers running at any given point during the load test scenario.

<b>Purpose</b>	Helps you view the general impact of Vuser load on performance time and is most useful when analyzing a scenario with a gradual load.
<b>X-axis</b>	Number of running Vusers
<b>Y-axis</b>	Average response time (in seconds) of each transaction.
<b>See also</b>	<a href="#">"Transaction Graphs Overview" on page 167</a>

Example

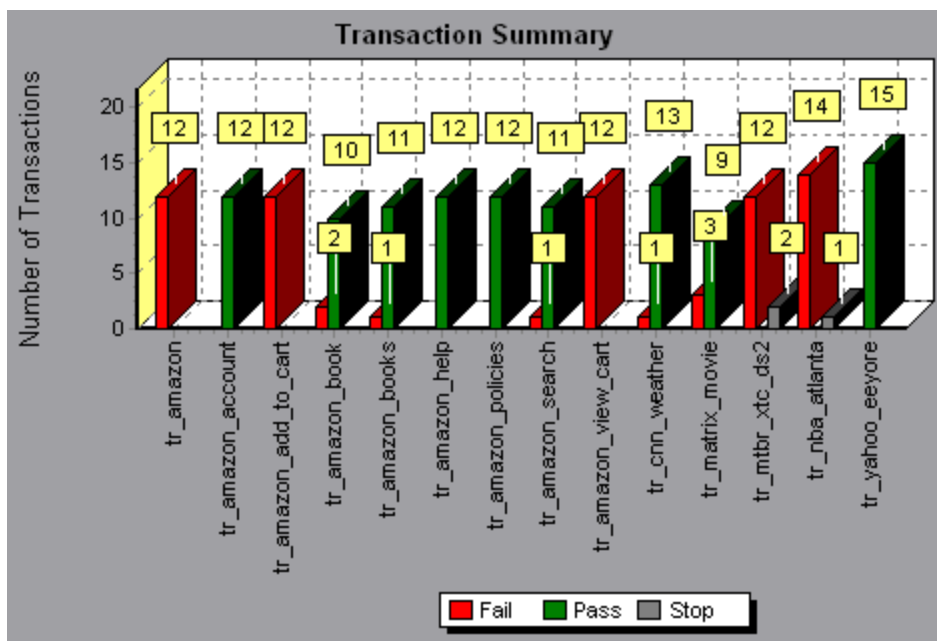


# Transaction Summary Graph

This graph summarizes the number of transactions in the load test scenario that failed, passed, stopped, and ended in error.

X-axis	Name of the transaction
Y-axis	Number of transactions performed during the scenario run.
See also	<a href="#">"Transaction Graphs Overview" on page 167</a>

### Example



## Web Resources Graphs

### Web Resources Graphs Overview

Web Resource graphs provide you with information about the performance of your Web server. You use the Web Resource graphs to analyze the following data:

- Throughput on the Web server
- The number of hits per second
- The number of HTTP responses per second
- The HTTP status codes returned from the Web server
- The number of downloaded pages per second
- The number of server retries per second
- A summary of the server retries during the load test scenario
- The number of open TCP/IP connections

- The number of TCP/IP connections per second
- The number of new and reused SSL connections opened per second

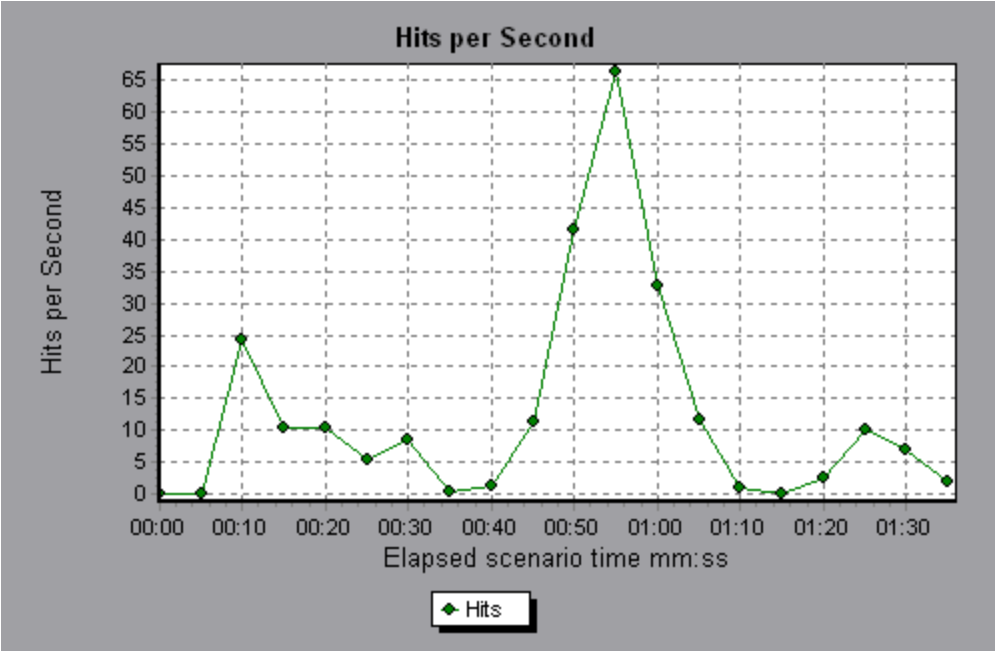
## Hits per Second Graph

This graph shows the number of HTTP requests made by Vusers to the Web server during each second of the load test scenario run.

<b>Purpose</b>	Helps you evaluate the amount of load Vusers generate, in terms of the number of hits.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Number of hits on the server.
<b>Tips</b>	Compare to the <b>Average Transaction Response Time</b> graph to see how the number of hits affects transaction performance.
<b>Note</b>	You cannot change the granularity of the x-axis to a value that is less than the Web granularity you defined in the General tab of the Options dialog box.
<b>See also</b>	<a href="#">"Web Resources Graphs Overview" on the previous page</a>

### Example

In the following example, the most hits per second took place during the fifty-fifth second of the scenario.



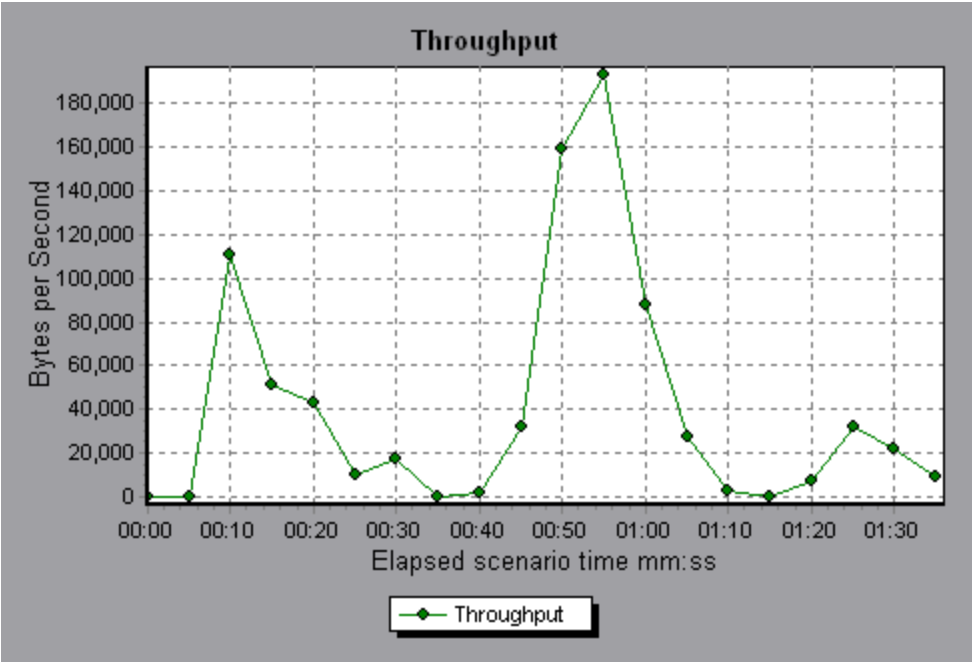
## Throughput Graph

This graph shows the amount of throughput on the server during each second of the load test scenario run. Throughput is measured in bytes or megabytes and represents the amount of data that the Vusers received from the server at any given second. To view throughput in megabytes, use the **Throughput (MB)** graph.

<b>Purpose</b>	Helps you evaluate the amount of load that Vusers generate, in terms of server throughput.
<b>X-axis</b>	Elapsed time since the start of the scenario run.
<b>Y-axis</b>	Throughput of the server, in bytes or megabytes.
<b>Tips</b>	Compare to the <b>Average Transaction Response Time</b> graph to see how the throughput affects transaction performance.
<b>Note</b>	You cannot change the granularity of the x-axis to a value that is less than the Web granularity you defined in the General tab of the Options dialog box.
<b>See also</b>	<a href="#">"Web Resources Graphs Overview" on page 179</a>

### Example

In the following example, the highest throughput is 193,242 bytes during the fifty-fifth second of the scenario.



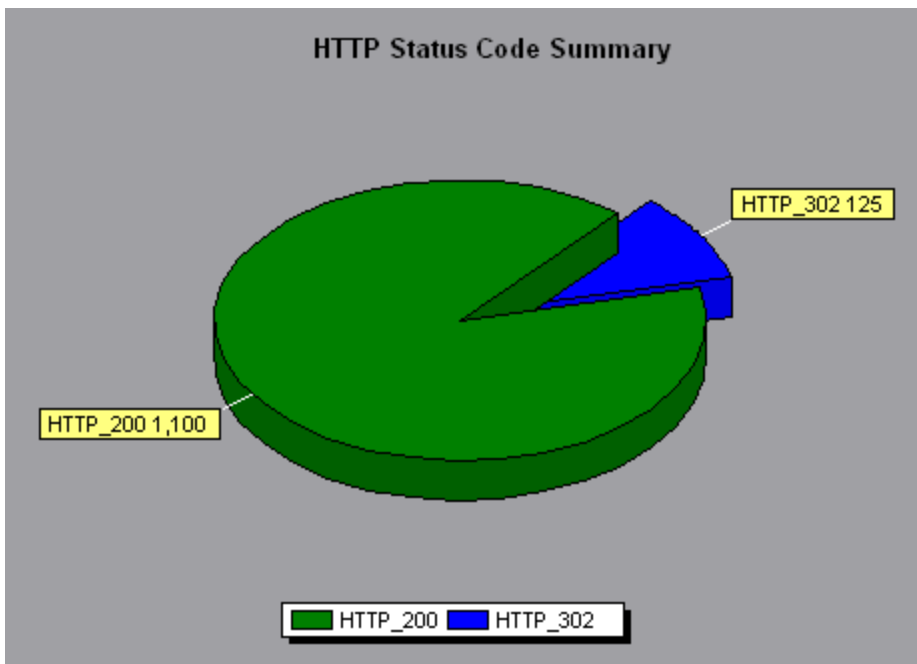
## HTTP Status Code Summary Graph

This graph shows the number of HTTP status codes returned from the Web server during the load test scenario run, grouped by status code. HTTP status codes indicate the status of HTTP requests, for example, "the request was successful", "the page was not found".

<b>Tips</b>	<a href="#">Locate scripts which generated error codes</a> Use this graph together with the HTTP Responses per Second graph to locate those scripts which generated error codes.
<b>Note</b>	This graph can only be viewed as a pie.
<b>See also</b>	<ul style="list-style-type: none"><li>• <a href="#">"Web Resources Graphs Overview" on page 179</a></li><li>• <a href="#">"HTTP Status Codes" on the next page</a></li></ul>

### Example

In the following example, the graph shows that only the HTTP status codes 200 and 302 were generated. Status code 200 was generated 1,100 times, and status code 302 was generated 125 times.



## HTTP Status Codes

The following table displays a list of HTTP status codes:

Code	Description
200	OK
201	Created
202	Accepted
203	Non-Authoritative Information
204	No Content
205	Reset Content
206	Partial Content
300	Multiple Choices

, continued

Code	Description
301	Moved Permanently
302	Found
303	See Other
304	Not Modified
305	Use Proxy
307	Temporary Redirect
400	Bad Request
401	Unauthorized
402	Payment Required
403	Forbidden
404	Not Found
405	Method Not Allowed
406	Not Acceptable
407	Proxy Authentication Required
408	Request Timeout
409	Conflict
410	Gone
411	Length Required
412	Precondition Failed
413	Request Entity Too Large
414	Request - URI Too Large
415	Unsupported Media Type



, continued

Code	Description
416	Requested range not satisfiable
417	Expectation Failed
500	Internal Server Error
501	Not Implemented
502	Bad Gateway
503	Service Unavailable
504	Gateway Timeout
505	HTTP Version not supported

For more information on the above status codes and their descriptions, see <http://www.w3.org>.

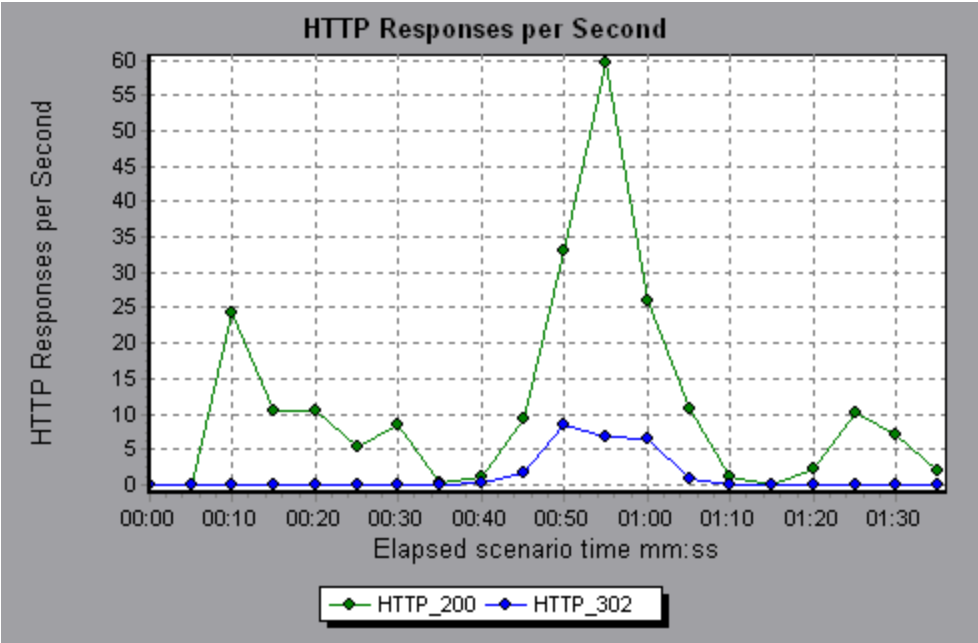
## HTTP Responses per Second Graph

This graph shows the number of HTTP status codes returned from the Web server during each second of the load test scenario run, grouped by status code. HTTP status codes indicate the status of HTTP requests, for example, "the request was successful", "the page was not found".

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Number of HTTP responses per second.
<b>Tips</b>	<p><a href="#">Locate scripts which generated error codes</a></p> <p>You can group the results shown in this graph by script (using the "Group By" function) to locate scripts which generated error codes. For more information on the "Group By" function, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a>.</p>
<b>See also</b>	<ul style="list-style-type: none"> <li>• <a href="#">"Web Resources Graphs Overview" on page 179</a></li> <li>• <a href="#">"HTTP Status Codes" on page 183</a></li> </ul>

Example

In the following example, the greatest number of 200 status codes, 60, was generated in the fifty-fifth second of the scenario run. The greatest number of 302 codes, 8.5, was generated in the fiftieth second of the scenario run.



Pages Downloaded per Second Graph

This graph shows the number of Web pages downloaded from the server during each second of the load test scenario run.

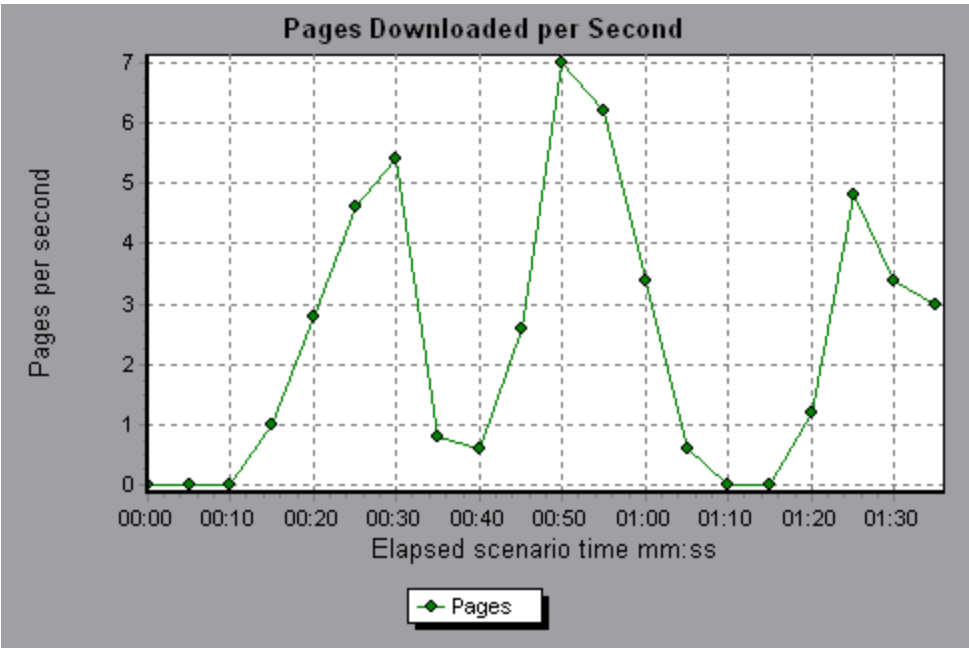
Like the Throughput graph, the Pages Downloaded per Second graph represents the amount of data that the Vusers received from the server at any given second. However, the Throughput graph takes into account each resource and its size (for example, the size of each .gif file, the size of each Web page). The Pages Downloaded per Second graph takes into account only the number of pages.

Purpose	Helps you evaluate the amount of load Vusers generate, in terms of the number of pages downloaded.
X-axis	Elapsed time since the start of the run.
Y-axis	Number of Web pages downloaded from the server.

<b>Note</b>	To view the Pages Downloaded per Second graph, you must select <b>Pages per second (HTML Mode only)</b> from the run time settings Preferences tab before running your scenario.
<b>See also</b>	<a href="#">"Web Resources Graphs Overview" on page 179</a>

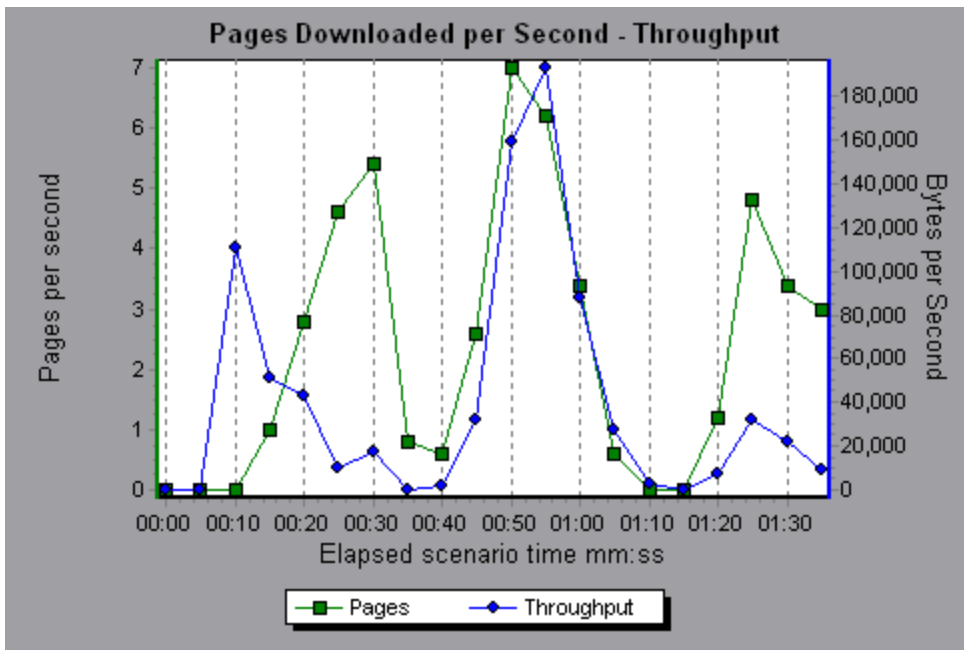
**Example 1**

In the following example, the greatest number of pages downloaded per second, about 7, occurred in the fiftieth second of the scenario run.



**Example 2**

In the following example, the Throughput graph is merged with the Pages Downloaded per Second graph. It is apparent from the graph that throughput is not completely proportional to the number of pages downloaded per second. For example, between 10 and 25 seconds into the scenario run, the number of pages downloaded per second increased while the throughput decreased.



## Retries per Second Graph

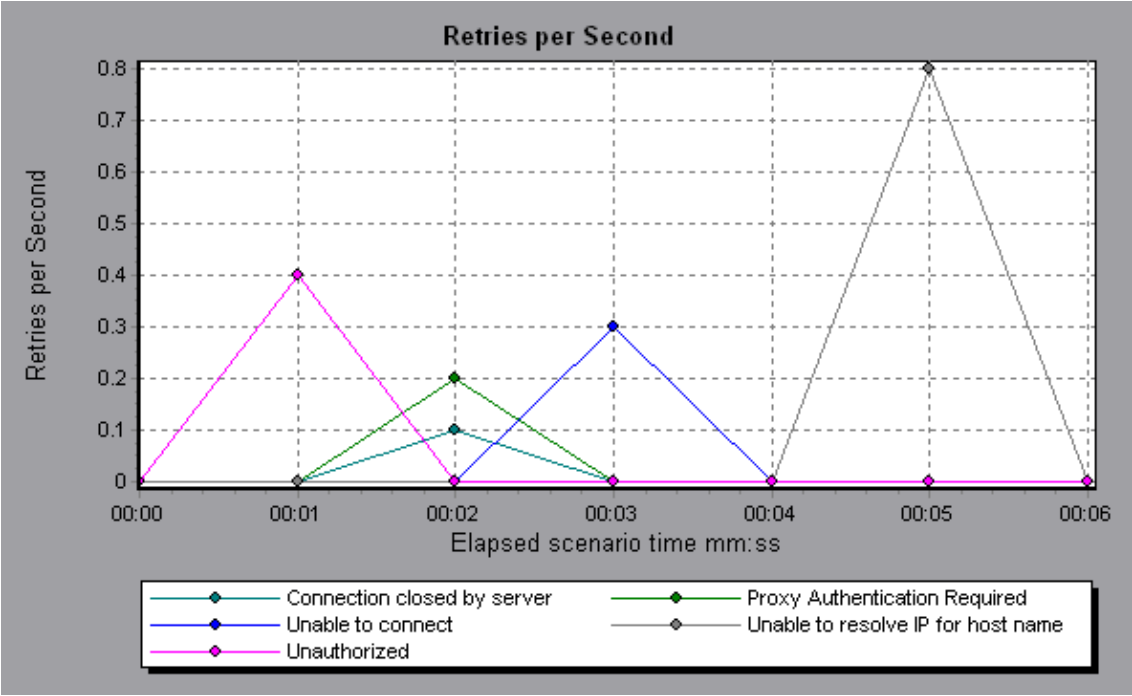
This graph displays the number of attempted server connections during each second of the load test scenario run. A server connection is retried when:

- the initial connection was unauthorized
- proxy authentication is required
- the initial connection was closed by the server
- the initial connection to the server could not be made
- when the server was initially unable to resolve the load generator's IP address

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Number of server retries per second.
<b>See also</b>	<a href="#">"Web Resources Graphs Overview" on page 179</a>

### Example

In the following example, the graph shows that during the first second of the scenario, the number of retries was 0.4, whereas in the fifth second of the scenario, the number of retries per second rose to 0.8.



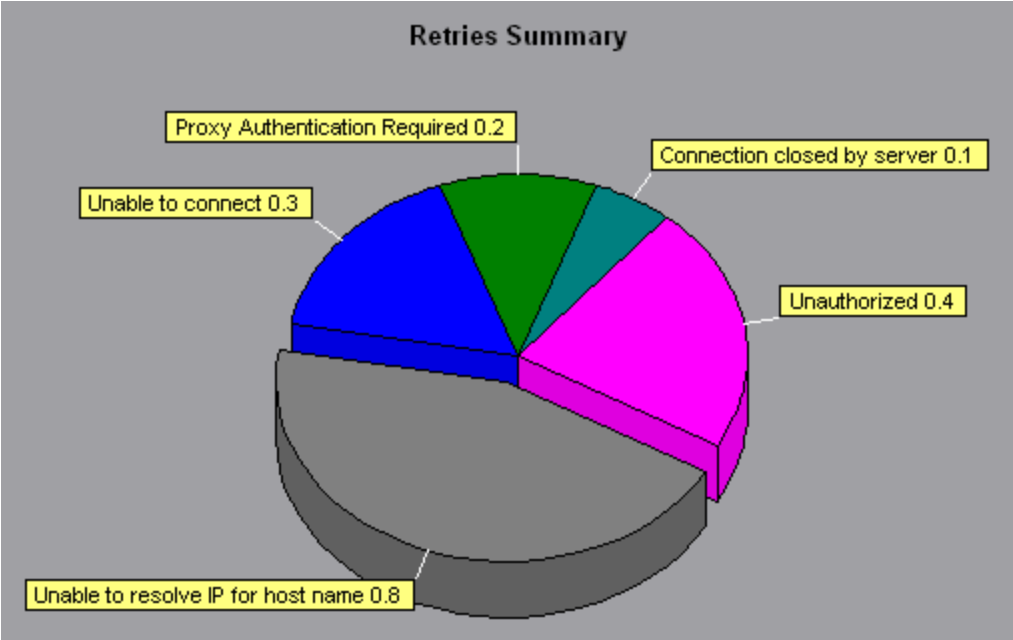
## Retries Summary Graph

This graph shows the number of attempted server connections during the load test scenario run, grouped by the cause of the retry.

<b>Tips</b>	<b>Determine when server retries were attempted</b> Use this graph together with the Retries per Second graph to determine at what point during the scenario the server retries were attempted.
<b>Note</b>	This graph may only be viewed as a pie.
<b>See also</b>	<a href="#">"Web Resources Graphs Overview" on page 179</a>

### Example

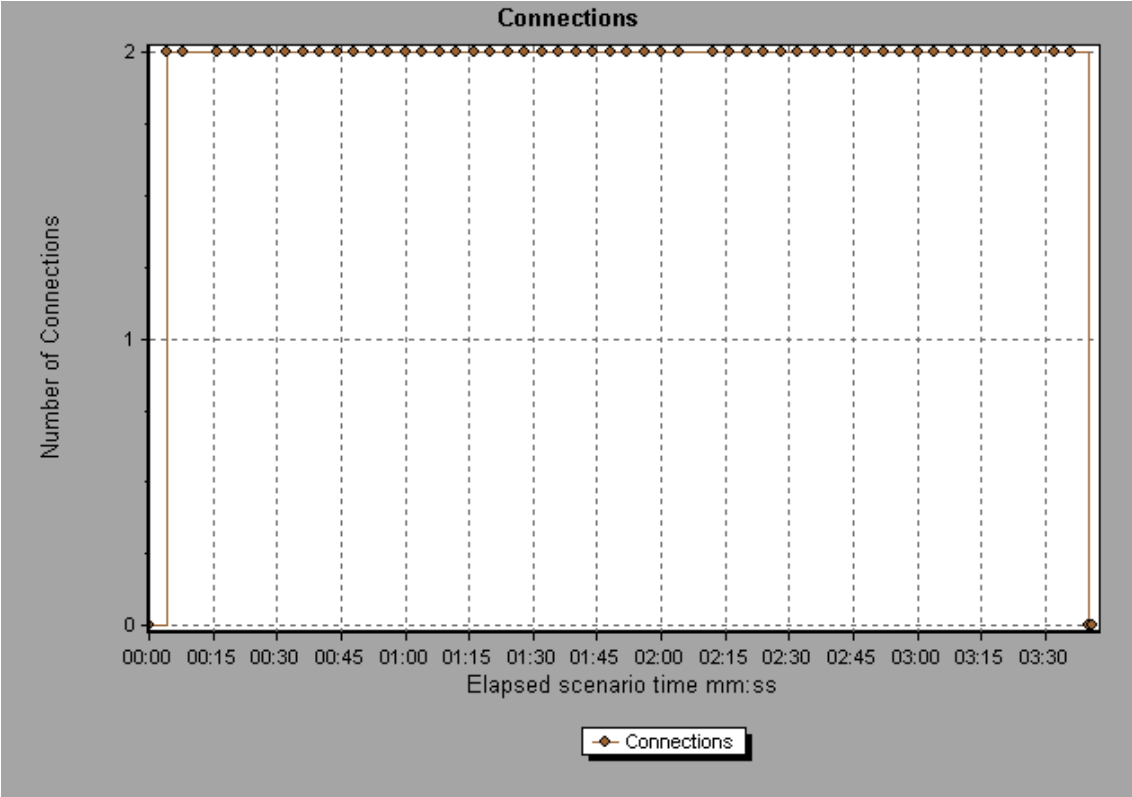
In the following example, the graph shows that the server's inability to resolve the load generator's IP address was the leading cause of server retries during the scenario run.



## Connections Graph

This graph shows the number of open TCP/IP connections (y-axis) at each point in time of the load test scenario (x-axis). Depending on the emulated browser type, each Vuser may open several simultaneous connections per Web server.

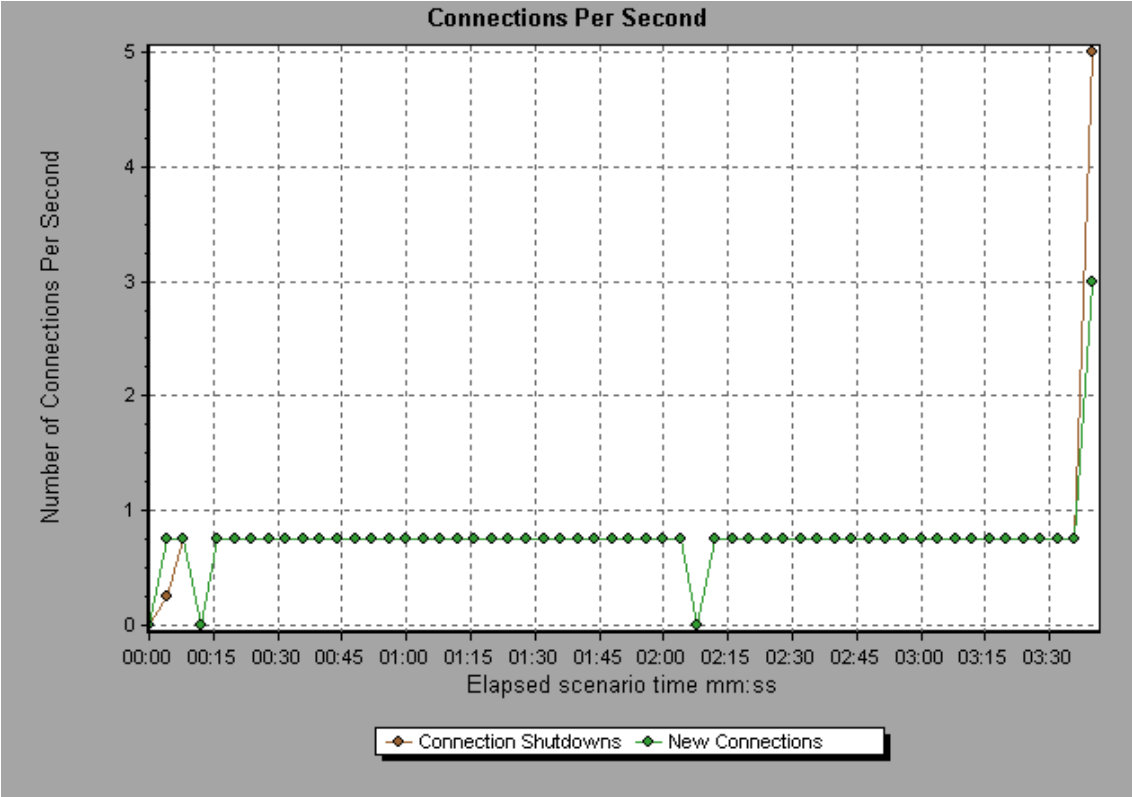
<b>Purpose</b>	This graph is useful in indicating when additional connections are needed. For example, if the number of connections reaches a plateau, and the transaction response time increases sharply, adding connections would probably cause a dramatic improvement in performance (reduction in the transaction response time).
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Open TCP/IP connections.
<b>See also</b>	<a href="#">"Web Resources Graphs Overview" on page 179</a>



## Connections per Second Graph

This graph shows the number of new TCP/IP connections (y-axis) opened and the number of connections that are shut down for each second of the load test scenario (x-axis).

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	TCP/IP connections per second.
<b>Tips</b>	<p><b>New connections versus hits per second:</b></p> <p>The number of new connections should be a small fraction of the number of hits per second, because new TCP/IP connections are very expensive in terms of server, router and network resource consumption. Ideally, many HTTP requests should use the same connection, instead of opening a new connection for each request.</p>
<b>See also</b>	<a href="#">"Web Resources Graphs Overview" on page 179</a>



## SSLs per Second Graph

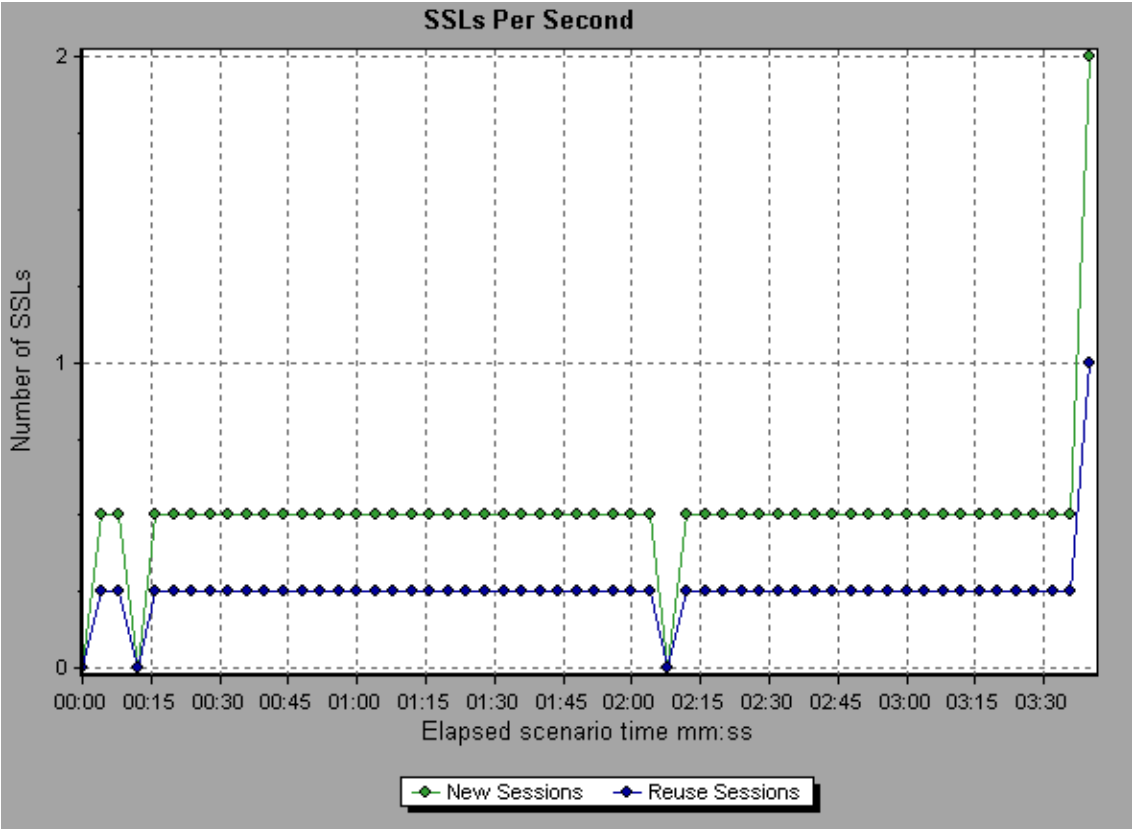
This graph shows the number of new and reused SSL Connections (y-axis) opened in each second of the load test scenario (x-axis). An SSL connection is opened by the browser after a TCP/IP connection has been opened to a secure server.

X-axis	Elapsed time since the start of the run.
Y-axis	Number of SSL Connections



<b>Tips</b>	<p><b>Reduce SSL connections</b></p> <p>Creating a new SSL connection entails heavy resource consumption. Therefore, you should try to open as few new SSL connections as possible. Once you've established an SSL connection, you should reuse it. There should be no more than one new SSL connection per Vuser.</p> <p>In cases where you reset TCP connections between iterations (<b>VuGen Run-Time Settings &gt; Browser Emulation node &gt; Simulate a new user on each iteration</b>), you should have no more than one new SSL connection per iteration.</p>
<b>See also</b>	<p><a href="#">"Web Resources Graphs Overview" on page 179</a></p>

Example



# Web Page Diagnostics Graphs

## Web Page Diagnostics Tree View Overview

The Web Page Diagnostics tree view displays a tree view of the transactions, sub-transactions, and Web pages for which you can view Web Page Diagnostics graphs. For more information about Web Page Diagnostics graphs, see ["Web Page Diagnostics Graph" on page 198](#).

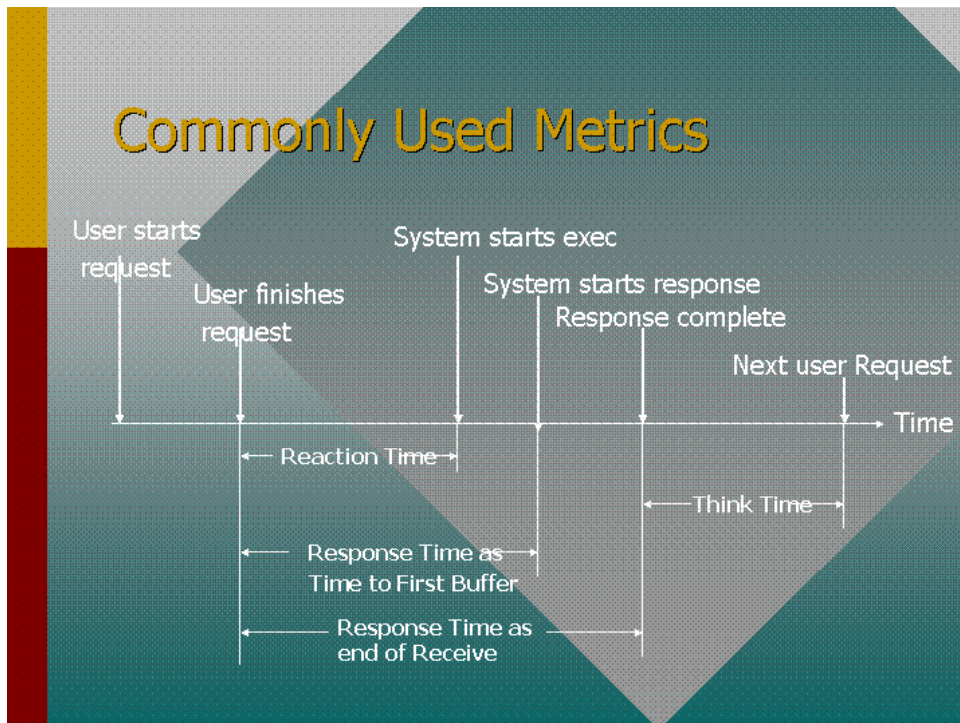
The Web Page Diagnostics graphs enable you to assess whether transaction response times were affected by page content. Using the Web Page Diagnostics graphs, you can analyze problematic elements—for example, images that download slowly, or broken links—of a Web site.

## Web Page Diagnostics Graphs Overview

Web Page Diagnostics graphs provide you with performance information for each monitored Web page in your script. You can view the download time of each page in the script and its components, and identify at what point during download time problems occurred. In addition, you can view the relative download time and size of each page and its components. Analysis displays both average download time and download time over time data.

You correlate the data in the Web Page Diagnostics graphs with data in the Transaction Performance Summary and Average Transaction Response Time graphs in order to analyze why and where problems are occurring, and whether the problems are network- or server-related.

The following diagram illustrates the sequence of events from the time an HTTP request is sent:



**Note:** Because server time is being measured from the client, network time may influence this measurement if there is a change in network performance from the time the initial HTTP request is sent until the time the first buffer is sent. The server time displayed, therefore, is estimated server time and may be slightly inaccurate.

You begin analyzing the Transaction Performance Summary and Average Transaction Response Time graphs with the Web Page Diagnostics graph, which displays the average download time (in seconds) for each monitored Web page during each second of the load test scenario run. The x-axis represents the elapsed time from the beginning of the scenario run. The y-axis represents the average download time (in seconds) for each Web page.

In order for Analysis to generate Web Page Diagnostics graphs, you must enable the Web Page Diagnostics feature in the Controller before running your scenario.

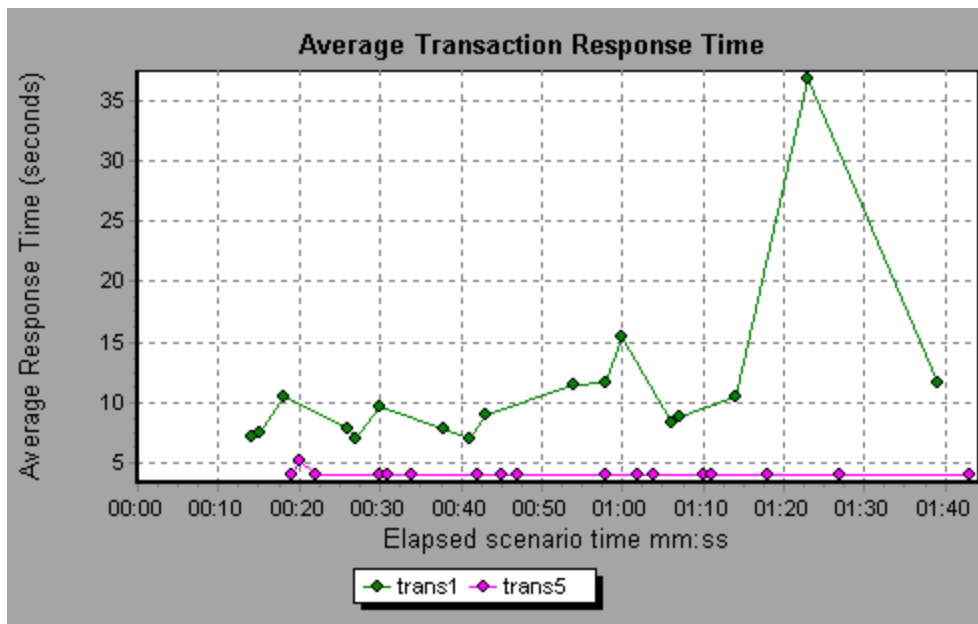
1. From the Controller menu, choose **Diagnostics > Configuration** and select the **Enable the following diagnostics** check box.
2. Under **Offline Diagnostics**, click **Enable** to the right of **Web Page Diagnostics (Max. Vuser Sampling: 10%)**.

**Note:** It is recommended that, in VuGen, you select **HTML-based script** in the Recording tab of the Recording Options dialog box.

For more information on recording scripts, refer to the VuGen section in the *LoadRunner User Guide*.

## How to View the Breakdown of a Transaction

The Web Page Diagnostics graphs are most commonly used to analyze a problem detected in the Transaction Performance Summary or Average Transaction Response Time graphs. For example, the Average Transaction Response Time graph below demonstrates that the average transaction response time for the trans1 transaction was high.



Using the Web Page Diagnostics graphs, you can pinpoint the cause of the delay in response time for the trans1 transaction.


This task describes how to breakdown a transaction.

1. Right-click trans1 and select **Web Page Diagnostics** for trans1. The Web Page Diagnostics graph opens and the Web Page Diagnostics tree appear. An icon appears next to the page name indicating the page content. See ["Web Page Diagnostics Content Icons"](#) on the next page.

2. In the Web Page Diagnostics tree, right-click the problematic page you want to break down, and select **Break Down <component name>**. Alternatively, select a page in the **Select Page to Break Down** box that appears under the Web Page Diagnostics graph. The Web Page Diagnostics graph for that page appears.


**Note:** You can open a browser displaying the problematic page by right-clicking the page in the Web Page Diagnostics tree and selecting **View page in browser**.








3. Select one of the following available breakdown options:
  - **Download Time.** Displays a table with a breakdown of the selected page's download time. The size of each page component (including the component's header) is displayed. See the ["Page Download Time Breakdown Graph" on page 204](#) for more information about this display.
  - **Component (Over Time).** Displays the ["Page Component Breakdown \(Over Time\) Graph" on page 202](#) for the selected Web page.
  - **Download Time (Over Time).** Displays the ["Page Download Time Breakdown \(Over Time\) Graph" on page 205](#) for the selected Web page.
  - **Time to First Buffer (Over Time).** Displays the ["Time to First Buffer Breakdown \(Over Time\) Graph" on page 211](#) for the selected Web page.

To display the graphs in full view, click the  button. You can also access these graphs, as well as additional Web Page Diagnostics graphs, from the Open a New Graph dialog box.

## Web Page Diagnostics Content Icons

The following icons appear in the Web Page Diagnostics tree. They indicate the HTTP content of the page.

Name	Description
	<b>Transaction.</b> Specifies that the ensuing content is part of the transaction.

Name	Description
	<b>Page Content.</b> Specifies that the ensuing content, which may include text, images, and so on, is all part of one logical page.
	<b>Text content.</b> Textual information. Plain text is intended to be displayed as-is. Includes HTML text and style sheets.
	<b>Multipart content.</b> Data consisting of multiple entities of independent data types.
	<b>Message content.</b> An encapsulated message. Common subtypes are news, or external-body which specifies large bodies by reference to an external data source.
	<b>Application content.</b> Some other kind of data, typically either uninterpreted binary data or information to be processed by an application. An example subtype is Postscript data.
	<b>Image content.</b> Image data. Two common subtypes are the jpeg and gif format.
	<b>Resource content.</b> Other resources not listed above. Also, content that is defined as "not available" is likewise included.

## Web Page Diagnostics Graph

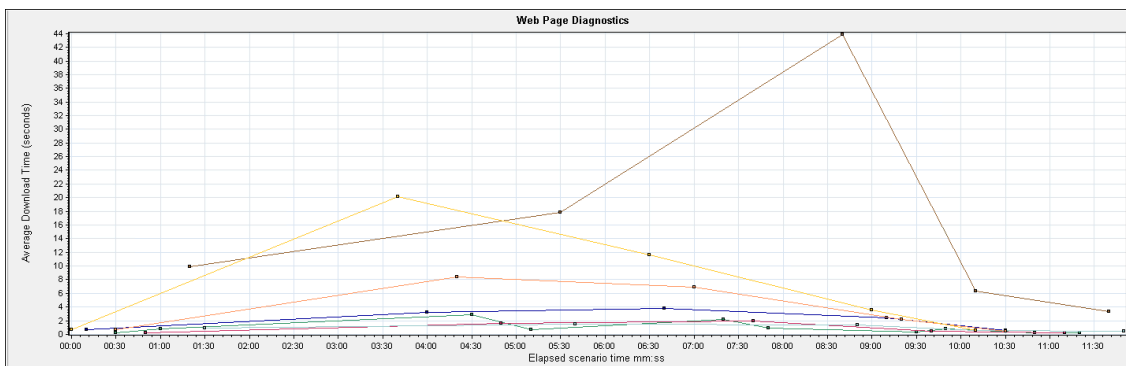
The Web Page Diagnostics graph provides you with performance information for each monitored Web page in your script. You can view the download time of each page in the script and its components, and identify at what point during download time problems occurred. In addition, you can view the average download time of each page and its components.

<b>Purpose</b>	This graph enables you to determine at what point during scenario execution a network or server problem occurred, that may have affected access to the Web page.
<b>X-axis</b>	Elapsed time from the beginning of the scenario run.
<b>Y-axis</b>	The download time (in seconds) for each Web page in the download process.

<b>Tips</b>	<ul style="list-style-type: none"> <li>Choose a page in the <b>Select Page to Break Down</b> drop-down box.</li> <li>To isolate the most problematic components, you can sort the legend window according to the average number of seconds taken to download a component. To sort the legend by average, double-click the <b>Average</b> column heading.</li> </ul>
<b>Diagnostic Options</b>	<p>You can choose one of the following options to drill down on the results. For sample graphs, see below.</p> <ul style="list-style-type: none"> <li><b>Download Time</b> - as a bar graph</li> <li><b>Component (Over Time)</b> - as a line graph</li> <li><b>Download Time (Over Time)</b> - as an area graph</li> <li><b>Time to First Buffer (Over Time)</b> - as an area graph</li> </ul>
<b>See also</b>	<a href="#">"Web Page Diagnostics Tree View Overview" on page 194</a>

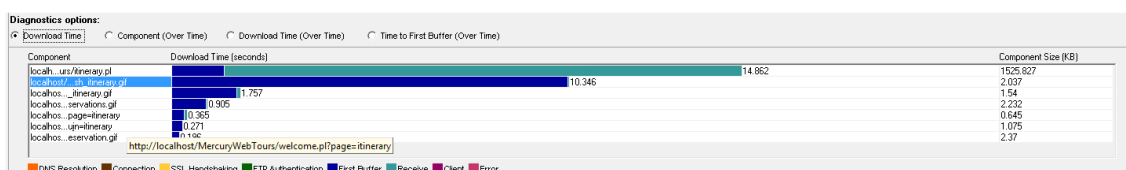
## Example

This graph enables you to monitor the download time during the scenario execution, to determine at what point network or server problems occurred.



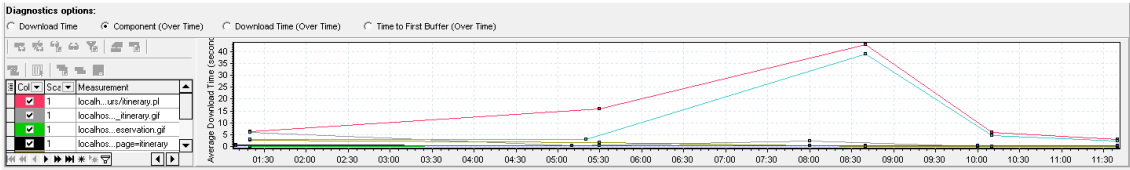
## Download Time

In the following example, the download time for the `itinerary.pl` page was the greatest during the **Receive** stage.



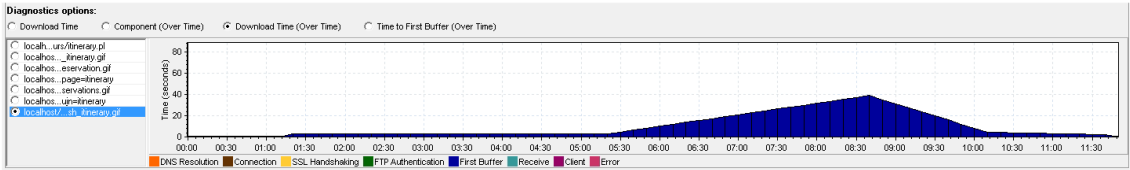
### Component(Over Time)

In the following example, the download time for the `itinerary.pl` component was the greatest at approximately 8:40 into the scenario.



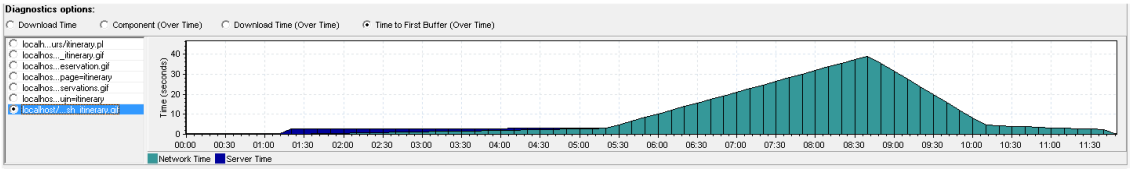
### Download Time (Over Time)

The following graph shows the download time for the `itinerary.pl` page as an area graph.



### Time to First Buffer (Over Time)

In the following example, the download time for the `splash_itinerary.gif` file was the greatest approximately 8:40 into the scenario.



## Page Component Breakdown Graph

This graph displays the average download time (in seconds) for each Web page and its components.

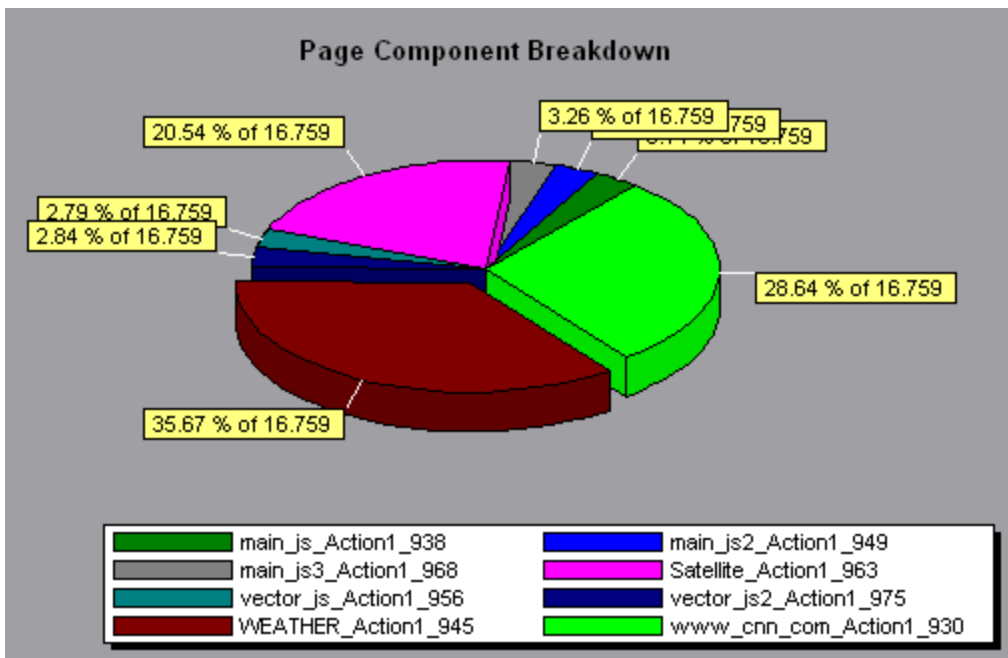
<b>Breakdown options</b>	To ascertain which components caused the delay in download time, you can break down the problematic URL by double-clicking it in the Web Page Diagnostics tree.
--------------------------	---



<b>Tips</b>	To isolate problematic components, it may be helpful to sort the legend according to the average number of seconds taken to download a component. To sort the legend by average, click the <b>Graph's Average</b> column.
<b>Note</b>	The graph can only be viewed as a pie.
<b>See also</b>	<a href="#">"Web Page Diagnostics Graphs Overview" on page 194</a>

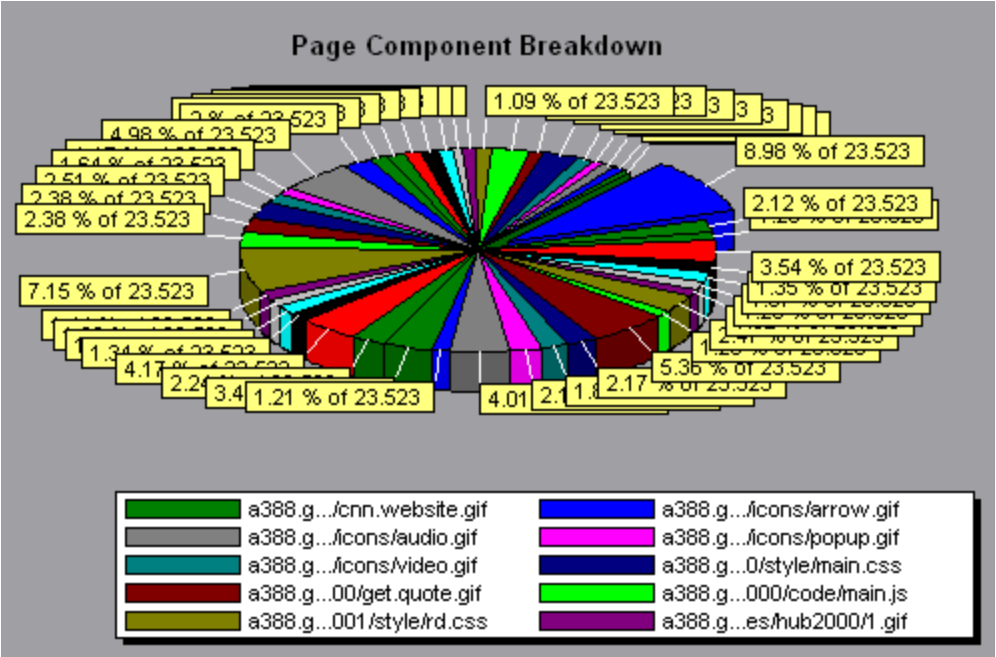
### Example

The following graph demonstrates that the main cnn.com URL took 28.64% of the total download time, compared to 35.67% for the www.cnn.com/WEATHER component.



### Example

The graph shows that the main cnn.com/WEATHER component took the longest time to download (8.98% of the total download time).



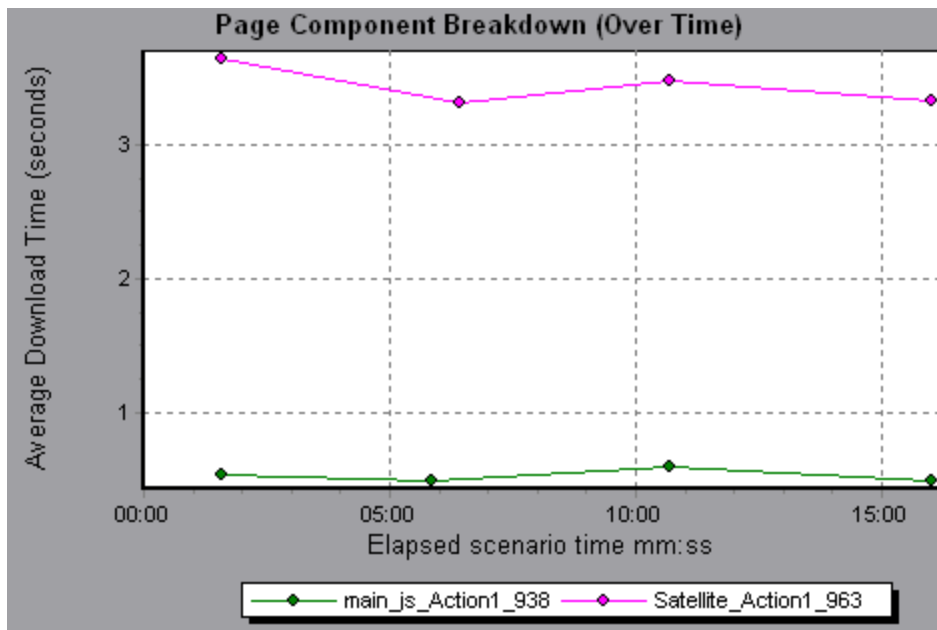
## Page Component Breakdown (Over Time) Graph

This graph displays the average response time (in seconds) for each Web page and its components during each second of the load test scenario run.

<b>X-axis</b>	The elapsed time from the beginning of the scenario run.
<b>Y-axis</b>	The average response time (in seconds) for each component.
<b>Tips</b>	<ul style="list-style-type: none"><li>To isolate the most problematic components, it may be helpful to sort the legend window according to the average number of seconds taken to download a component. To sort the legend by average, double-click the <b>Average</b> column heading.</li><li>To identify a component in the graph, you can select it. The corresponding line in the legend window is selected.</li></ul>
<b>See also</b>	<a href="#">"Web Page Diagnostics Graphs Overview" on page 194</a>

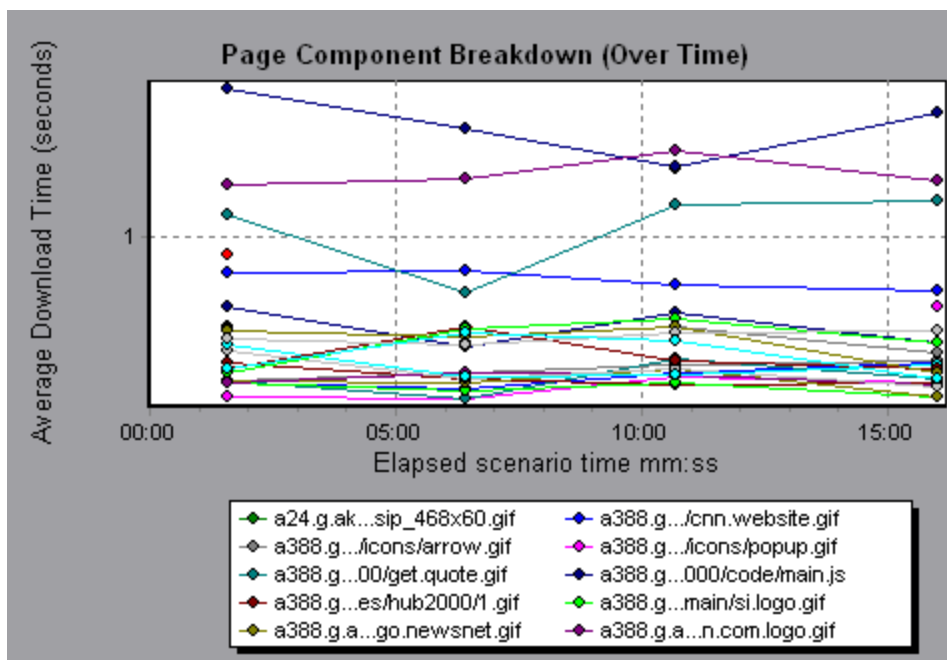
### Example

The following graph demonstrates that the response time for Satellite\_Action1\_963 was significantly greater, throughout the scenario, than the response time for main\_js\_Action1\_938.



### Example

Using the graph, you can track which components of the main component were most problematic, and at which point(s) during the scenario the problem(s) occurred.



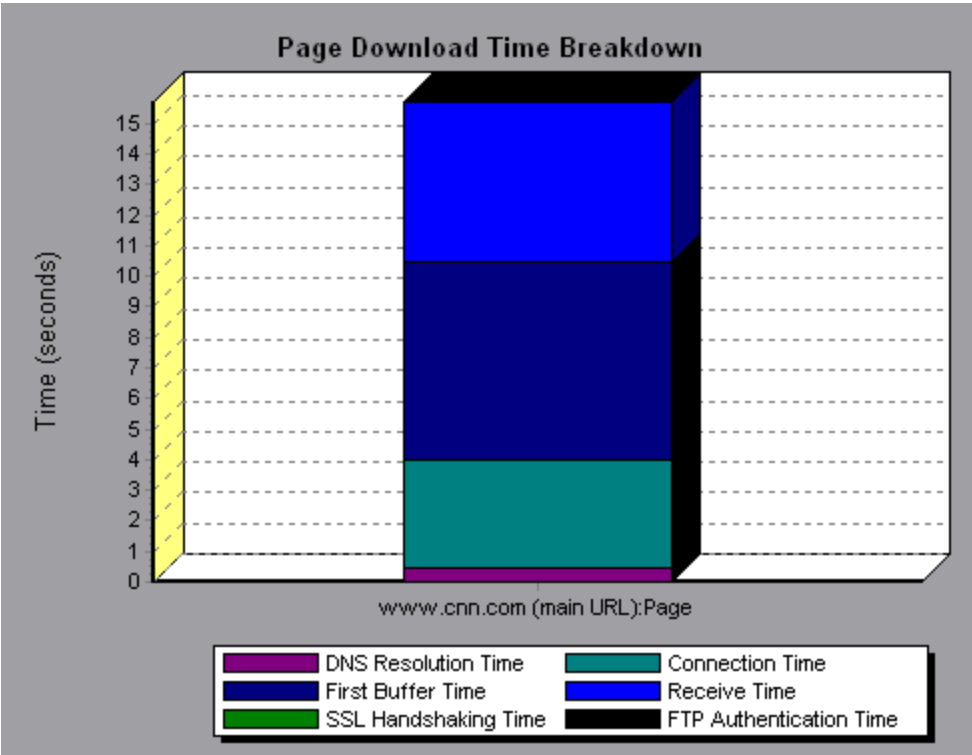
# Page Download Time Breakdown Graph

This graph displays a breakdown of each page component's download time.

<b>Purpose</b>	Enables you to determine whether slow response times are being caused by network or server errors during Web page download.
<b>Breakdown options</b>	<p>For breakdown options, see <a href="#">"Page Download Time Breakdown Graph Breakdown Options"</a> on page 207.</p> <p><b>Note:</b> Each measurement displayed on the page level is the sum of that measurement recorded for each page component. For example, the Connection Time for www.cnn.com is the sum of the Connection Time for each of the page's components.</p>
<b>See also</b>	<a href="#">"Web Page Diagnostics Graphs Overview"</a> on page 194

## Example

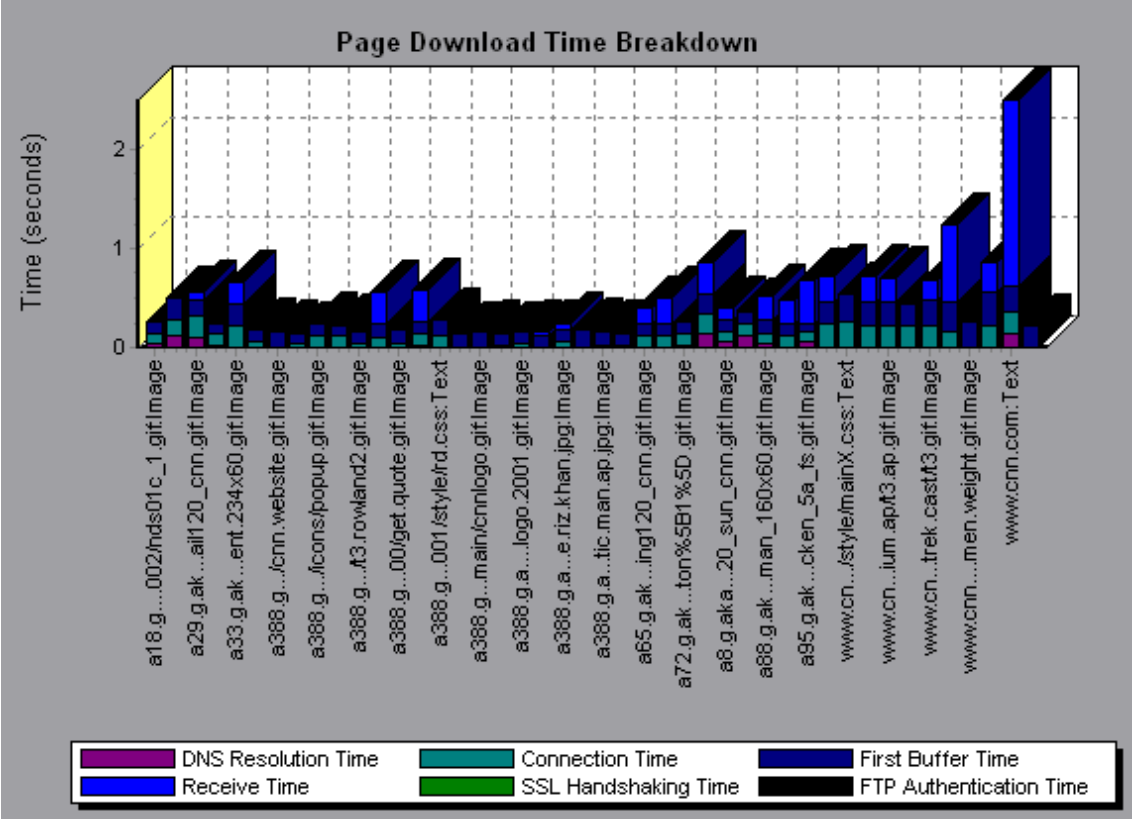
The Page Download Time Breakdown graph demonstrates that receive time, connection time, and first buffer time accounted for a large portion of the time taken to download the main cnn.com URL.



Example

If you break the cnn.com URL down further, you can isolate the components with the longest download time, and analyze the network or server problems that contributed to the delay in response time.

Breaking down the cnn.com URL demonstrates that for the component with the longest download time (the www.cnn.com component), the receive time accounted for a large portion of the download time.



## Page Download Time Breakdown (Over Time) Graph

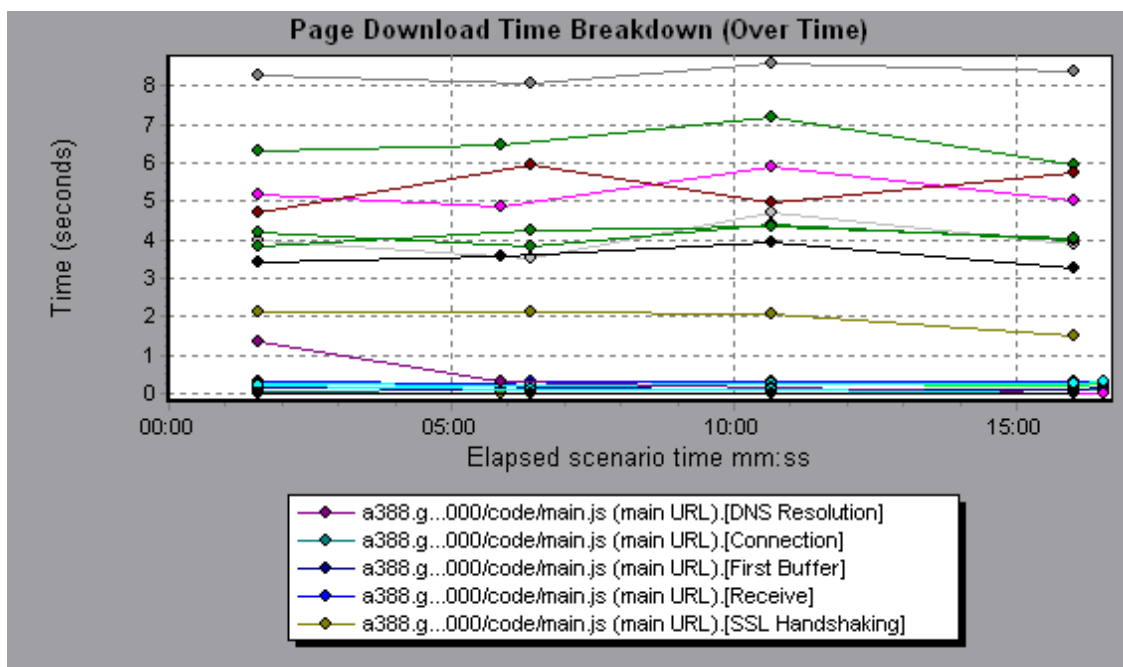
The graph displays a breakdown of each page component's download time during each second of the load test scenario run.

<b>Purpose</b>	This graph enables you to determine at what point during scenario execution network or server problems occurred.
----------------	--

<b>X-axis</b>	Elapsed time from the beginning of the scenario run.
<b>Y-axis</b>	Time (in seconds) taken for each step in the download process.
<b>Tips</b>	To isolate the most problematic components, you can sort the legend window according to the average number of seconds taken to download a component. To sort the legend by average, double-click the <b>Average</b> column heading.
<b>Notes</b>	<ul style="list-style-type: none"> <li>Each measurement displayed on the page level is the sum of that measurement recorded for each page component. For example, the Connection Time for www.cnn.com is the sum of the Connection Time for each of the page's components.</li> <li>When the Page Download Time Breakdown (Over Time) graph is selected from the Web Page Diagnostics graph, it appears as an area graph.</li> </ul>
<b>See also</b>	<a href="#">"Web Page Diagnostics Graphs Overview" on page 194</a>

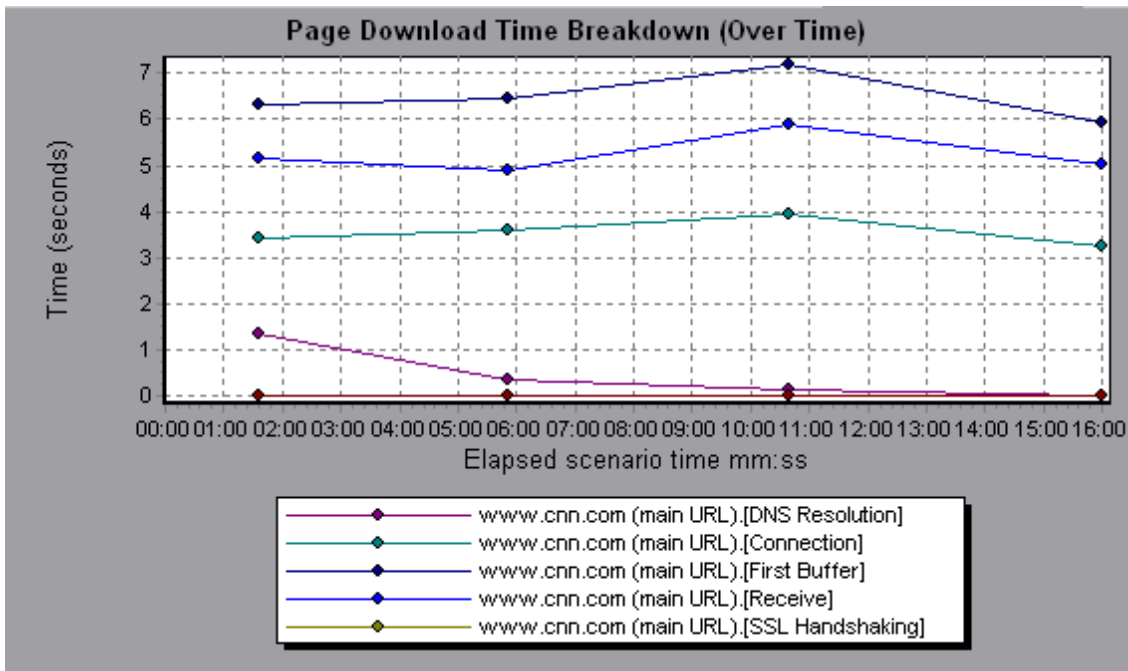
## Example

This graph enables you to determine at what point during scenario execution network or server problems occurred.



## Example

In the example in the previous section, it is apparent that cnn.com was the most problematic component. If you examine the cnn.com component, the Page Download Time Breakdown (Over Time) graph demonstrates that **First Buffer** and **Receive** time remained high throughout the scenario, and that **DNS Resolution** time decreased during the scenario.



## Page Download Time Breakdown Graph Breakdown Options

The Page Download Time Breakdown graph breaks down each component by DNS resolution time, connection time, time to first buffer, SSL handshaking time, receive time, FTP authentication time, client time, and error time.

These breakdowns are described below:

Name	Description
DNS Resolution	Displays the amount of time needed to resolve the DNS name to an IP address, using the closest DNS server. The DNS Lookup measurement is a good indicator of problems in DNS resolution, or problems with the DNS server.

Name	Description
Connection	Displays the amount of time needed to establish an initial connection with the Web server hosting the specified URL. The connection measurement is a good indicator of problems along the network. It also indicates whether the server is responsive to requests.
First Buffer	<p>Displays the amount of time that passes from the initial HTTP request (usually GET) until the first buffer is successfully received back from the Web server. The first buffer measurement is a good indicator of Web server delay as well as network latency.</p> <p><b>Note:</b> Since the buffer size may be up to 8K, the first buffer might also be the time it takes to completely download the element.</p>
SSL Handshaking	<p>Displays the amount of time taken to establish an SSL connection (includes the client hello, server hello, client public key transfer, server certificate transfer, and other—partially optional—stages). After this point, all the communication between the client and server is encrypted.</p> <p>The SSL Handshaking measurement is only applicable for HTTPS communications.</p>
Receive	<p>Displays the amount of time that passes until the last byte arrives from the server and the downloading is complete.</p> <p>The Receive measurement is a good indicator of network quality (look at the time/size ratio to calculate receive rate).</p>
FTP Authentication	<p>Displays the time taken to authenticate the client. With FTP, a server must authenticate a client before it starts processing the client's commands.</p> <p>The FTP Authentication measurement is only applicable for FTP protocol communications.</p>
Client Time	Displays the average amount of time that passes while a request is delayed on the client machine due to browser think time or other client-related delays.



Name	Description
Error Time	Displays the average amount of time that passes from the moment an HTTP request is sent until the moment an error message (HTTP errors only) is returned.

## Time to First Buffer Breakdown Graph

This graph displays each Web page component's relative server/network time (in seconds) for the period of time until the first buffer is successfully received back from the Web server.

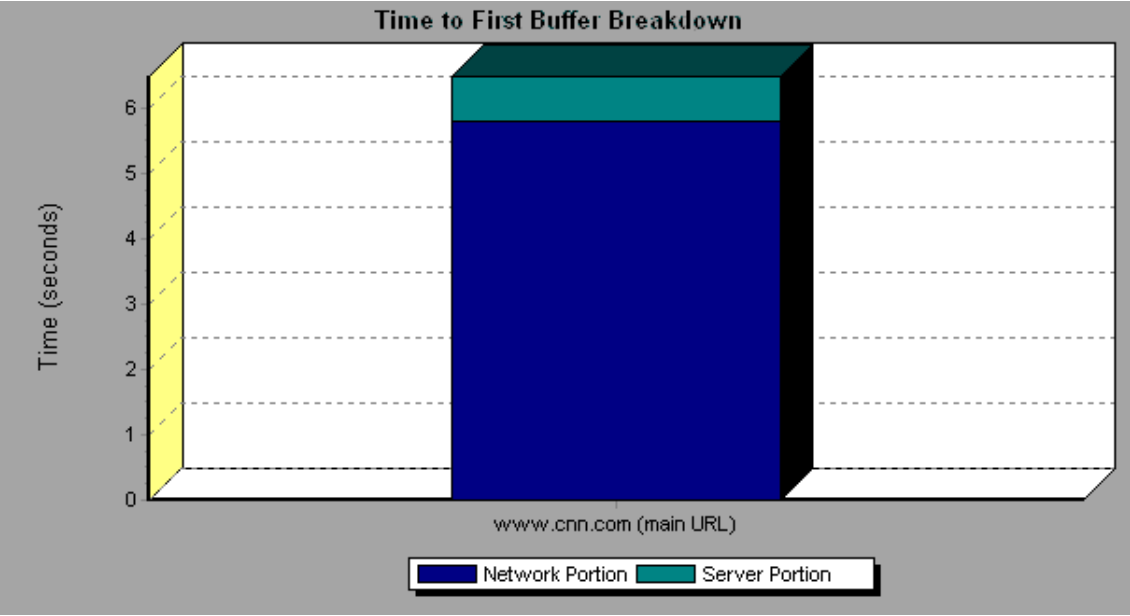
**Note:** This graph is only relevant when the load generator does not use a proxy to connect to the application under test. If the load generator is connected through a proxy, this graph will only show the proxy latency—not the AUT latency.

<b>Purpose</b>	If the download time for a component is high, you can use this graph to determine whether the problem is server- or network-related.
<b>X-axis</b>	Specifies the name of the component.
<b>Y-axis</b>	Shows the average network/server time (in seconds) for each component.
<b>Measurements</b>	<ul style="list-style-type: none"><li>• Network time is defined as the average amount of time that passes from the moment the first HTTP request is sent until receipt of ACK.</li><li>• Server time is defined as the average amount of time that passes from the receipt of ACK of the initial HTTP request (usually GET) until the first buffer is successfully received back from the Web server.</li></ul>

<b>Note</b>	<ul style="list-style-type: none"><li>• Each measurement displayed on the page level is the sum of that measurement recorded for each page component. For example, the network time for www.cnn.com is the sum of the network time for each of the page's components.</li><li>• Because server time is being measured from the client, network time may influence this measurement if there is a change in network performance from the time the initial HTTP request is sent until the time the first buffer is sent. The server time displayed, therefore, is estimated server time and may be slightly inaccurate.</li><li>• The graph can only be viewed as a bar graph.</li></ul>
<b>See also</b>	<a href="#">"Web Page Diagnostics Graphs Overview" on page 194</a>

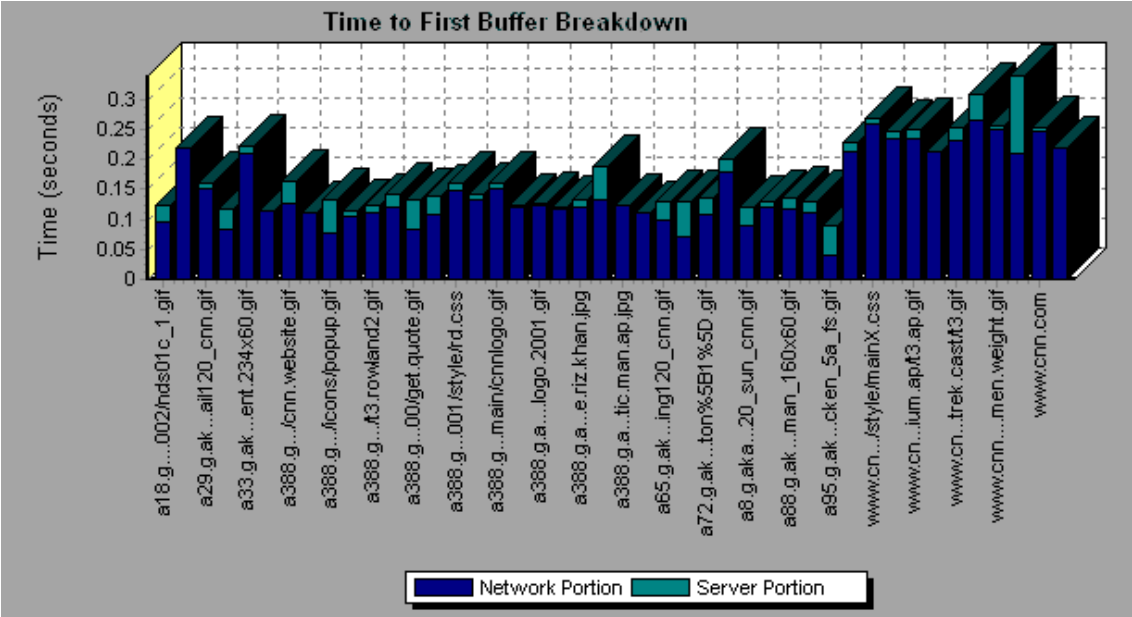
**Example**

In the following example it is apparent that network time is greater than server time.



**Example**

In the following example shows that you can break the main cnn.com URL down further to view the time to first buffer breakdown for each of its components. It is apparent that for the main cnn.com component (the first component on the right), the time to first buffer breakdown is almost all network time.



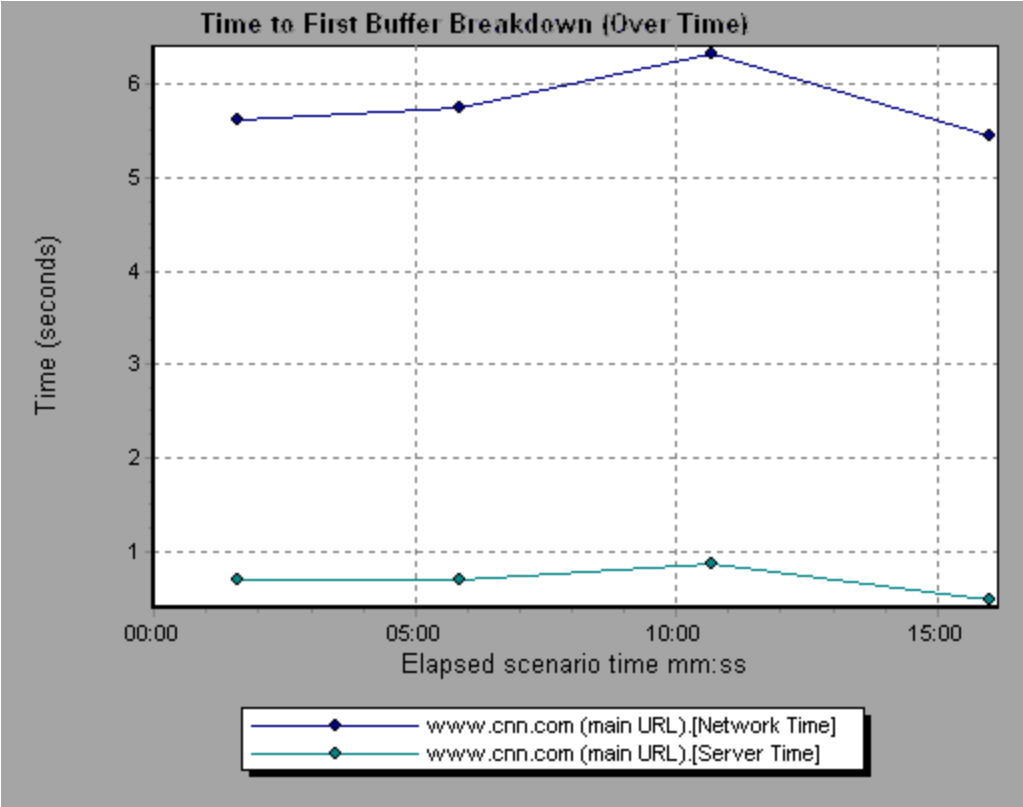
## Time to First Buffer Breakdown (Over Time) Graph

This graph displays each Web page component's server and network time (in seconds) during each second of the load test scenario run, for the period of time until the first buffer is successfully received back from the Web server.

**Note:** This graph is only relevant when the load generator does not use a proxy to connect to the application under test. If the load generator is connected through a proxy, this graph will only show the proxy latency—not the AUT latency.

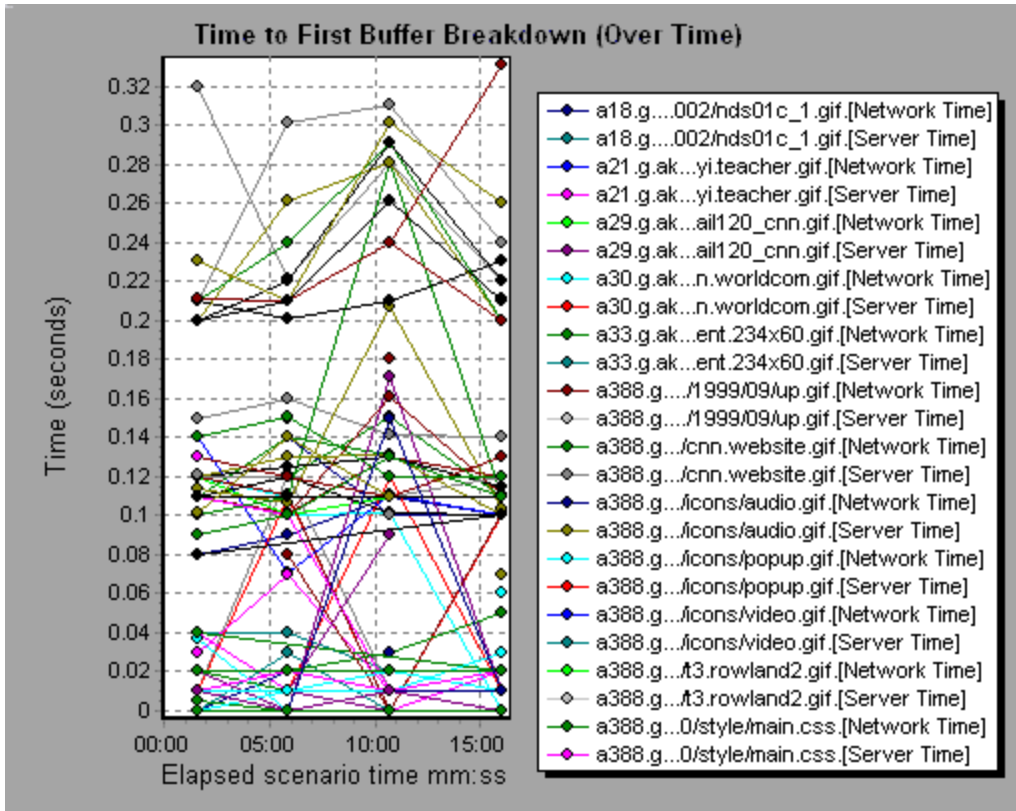
Purpose	You can use this graph to determine when during the scenario run a server- or network-related problem occurred.
X-axis	Elapsed time from the beginning of the scenario run.
Y-axis	Average network or server time (in seconds) for each component.

<b>Measurements</b>	<ul style="list-style-type: none"><li>• Network time is defined as the average amount of time that passes from the moment the first HTTP request is sent until receipt of ACK.</li><li>• Server time is defined as the average amount of time that passes from the receipt of ACK of the initial HTTP request (usually GET) until the first buffer is successfully received back from the Web server.</li></ul> <p><b>Note:</b> Because server time is being measured from the client, network time may influence this measurement if there is a change in network performance from the time the initial HTTP request is sent until the time the first buffer is sent. The server time displayed, therefore, is estimated server time and may be slightly inaccurate.</p>
<b>Note</b>	<ul style="list-style-type: none"><li>• Each measurement displayed on the page level is the sum of that measurement recorded for each page component. For example, the network time for www.hp.com is the sum of the network time for each of the page's components.</li><li>• When the Time to First Buffer Breakdown (Over Time) graph is selected from the Web Page Diagnostics graph, it appears as an area graph.</li></ul>
<b>See also</b>	<a href="#">"Web Page Diagnostics Graphs Overview" on page 194</a>



## Example

In the following example you can break the main cnn.com URL down further to view the time to first buffer breakdown for each of its components.



## Client Side Breakdown (Over Time) Graph

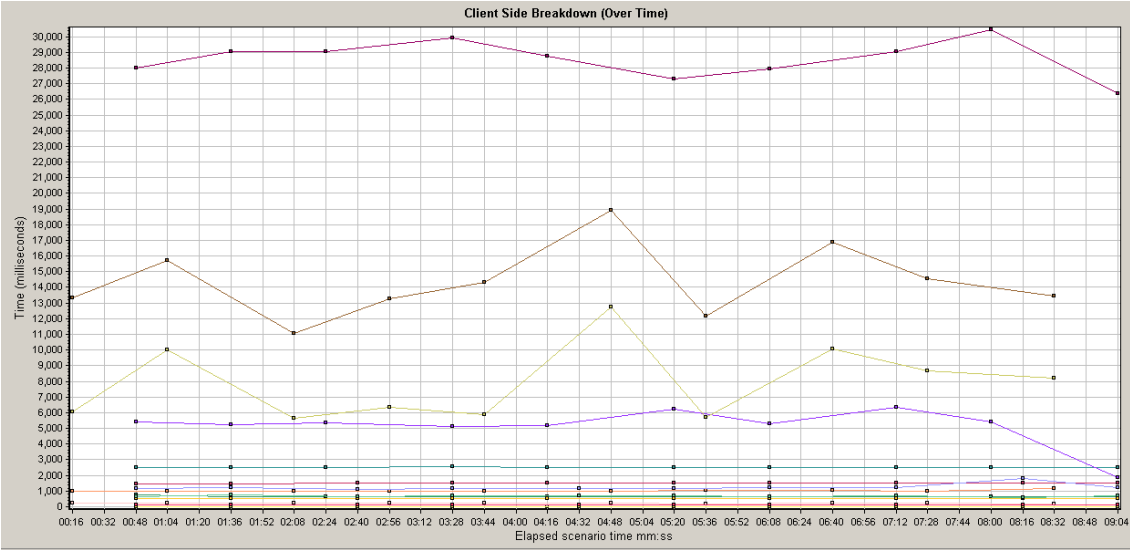
This graph displays the client side breakdown of each transaction during each second of the load test scenario run.

<b>X-axis</b>	The elapsed time from the beginning of the scenario run.
<b>Y-axis</b>	The average response time (in seconds) for each transaction.

<b>Tips</b>	<ul style="list-style-type: none"><li>• To isolate the most problematic transactions, it may be helpful to sort the legend window according to the average number of seconds taken for the transaction to run. To sort the legend by average, double-click the <b>Average</b> column heading.</li><li>• To identify a transaction in the graph, you can select it. The corresponding line in the legend window is selected.</li></ul>
<b>See also</b>	<a href="#">"Web Page Diagnostics Graph" on page 198</a>

**Example**

Using the graph, you can track which transactions on the client side were most problematic, and at which point(s) during the scenario the problem(s) occurred.



# Client Side Java Script Breakdown (Over Time) Graph

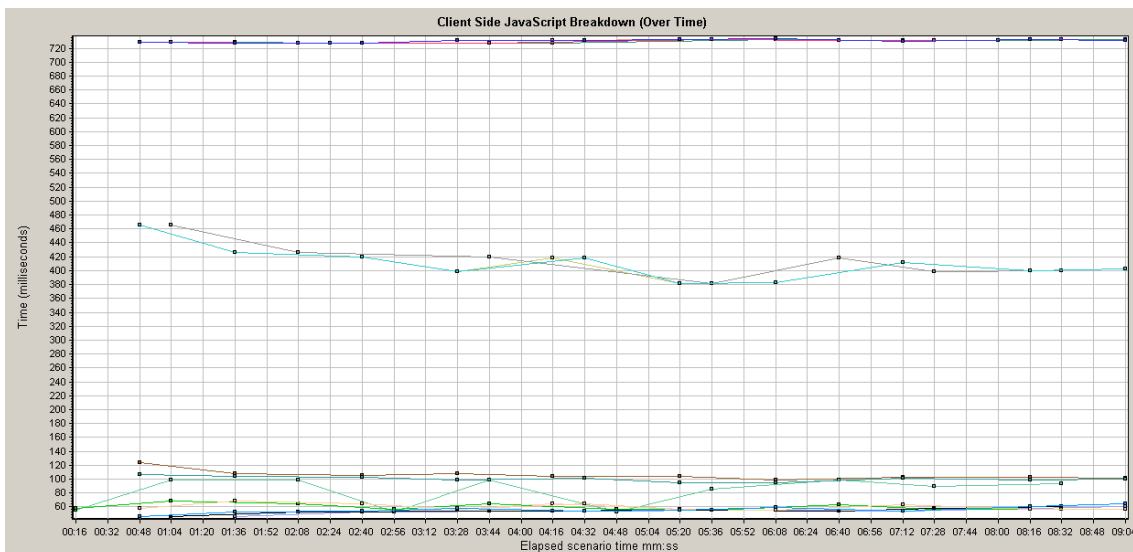
This graph displays the client side breakdown of each JavaScript transaction during each second of the load test scenario run.

<b>X-axis</b>	The elapsed time from the beginning of the scenario run.
<b>Y-axis</b>	The average response time (in seconds) for each transaction.

<b>Tips</b>	<ul style="list-style-type: none"> <li>To isolate the most problematic transactions, it may be helpful to sort the legend window according to the average number of seconds taken for the transaction to run. To sort the legend by average, double-click the <b>Average</b> column heading.</li> <li>To identify a transaction in the graph, you can select it. The corresponding line in the legend window is selected.</li> </ul>
<b>See also</b>	<a href="#">"Web Page Diagnostics Graph" on page 198</a>

## Example

Using the graph, you can track which transactions on the client side were most problematic, and at which point(s) during the scenario the problem(s) occurred.



## Downloaded Component Size Graph

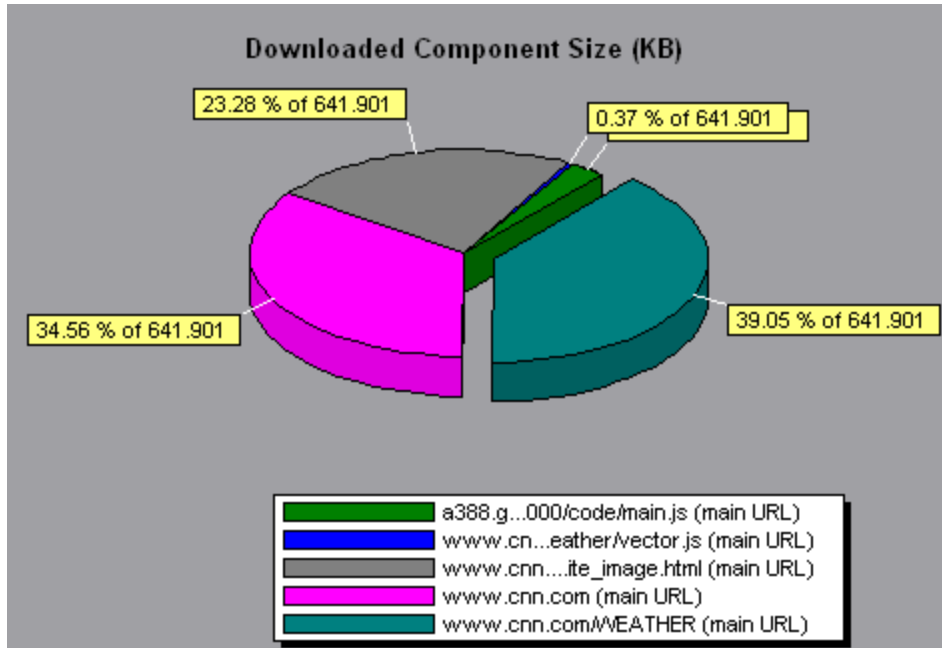
This graph displays the size of each Web page component.

<b>Note</b>	<ul style="list-style-type: none"> <li>The Web page size is a sum of the sizes of each of its components.</li> <li>The Downloaded Component Size graph can only be viewed as a pie graph.</li> </ul>
<b>See also</b>	<a href="#">"Web Page Diagnostics Graphs Overview" on page 194</a>



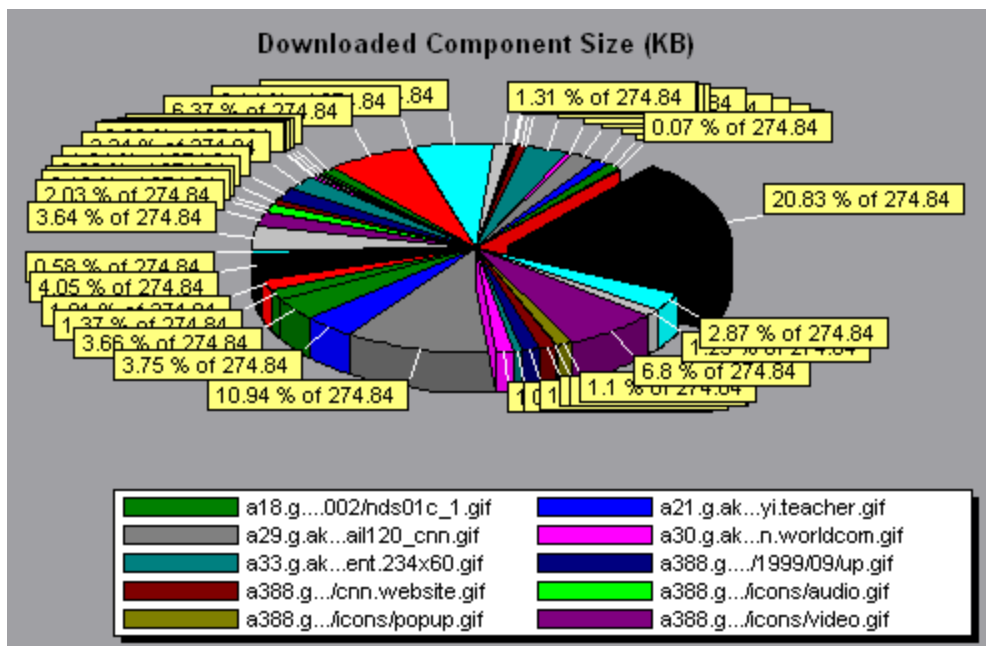
### Example

In the following example the [www.cnn.com/WEATHER](http://www.cnn.com/WEATHER) component is 39.05% of the total size, whereas the main [cnn.com](http://www.cnn.com) component is 34.56% of the total size.



### Example

In the following example the [cnn.com](http://www.cnn.com) component's size (20.83% of the total size) may have contributed to the delay in its downloading. To reduce download time, it may help to reduce the size of this component.



## User-Defined Data Point Graphs

### User-Defined Data Point Graphs Overview

The User-Defined Data Point graphs display the values of user-defined data points. You define a data point in your Vuser script by inserting an `lr_user_data_point` function at the appropriate place (`user_data_point` for GUI Vusers and `lr.user_data_point` for Java Vusers).

```
Action1()
{
    lr_think_time(1);
    lr_user_data_point ("data_point_1",1);
    lr_user_data_point ("data_point_2",2);
    return 0;
}
```

For Vuser protocols that support the graphical script representations such as Web and Oracle NCA, you insert a data point as a User Defined step. Data point information is gathered each time the script executes the function or step. For more information about data points, refer to the Function Reference.

Data points, like other Analysis data, are aggregated every few seconds, resulting in less data points shown on the graph than actually recorded. For more information, see ["Changing the Granularity of the Data" on page 115](#).

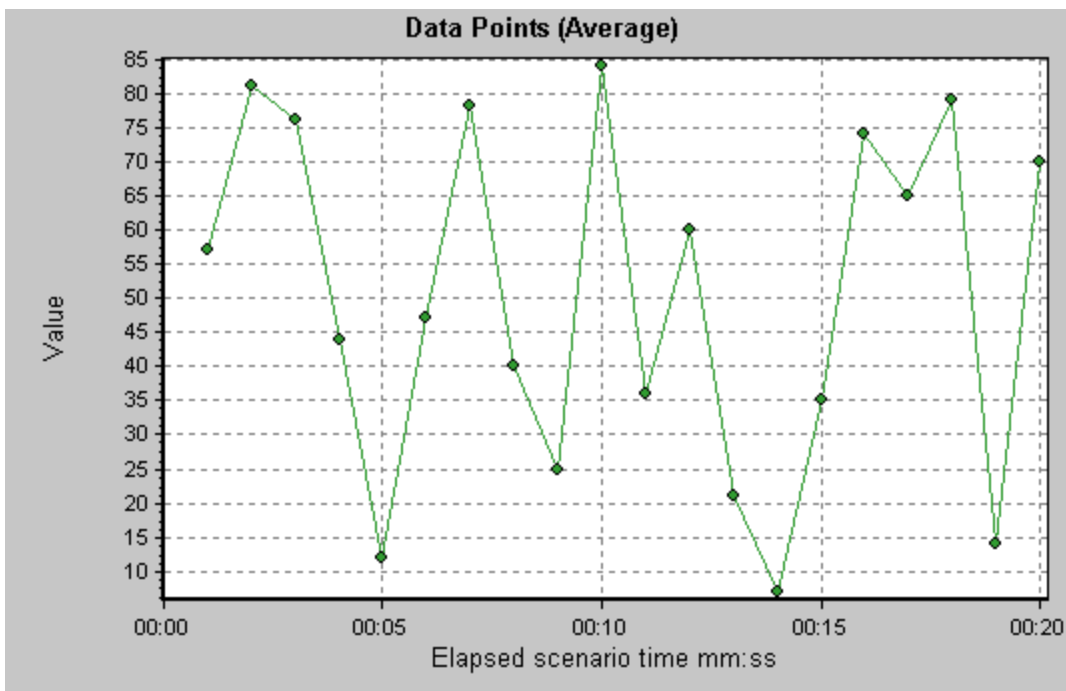
## Data Points (Average) Graph

This graph shows the average values that were recorded for user-defined data points during the load test scenario run.

<b>Purpose</b>	This graph is typically used in cases where the actual value of the measurement is required. Suppose that each Vuser monitors CPU utilization on its machine and records it as a data point. In this case, the actual recorded value of CPU utilization is required. The Average graph displays the average value recorded throughout the scenario.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The average values of the recorded data point statements.
<b>See also</b>	<a href="#">"User-Defined Data Point Graphs Overview" on the previous page</a>

### Example

In the following example, the CPU utilization is recorded as the data point `user_data_point_val_1`. It is shown as a function of the elapsed scenario time.



# Data Points (Sum) Graph

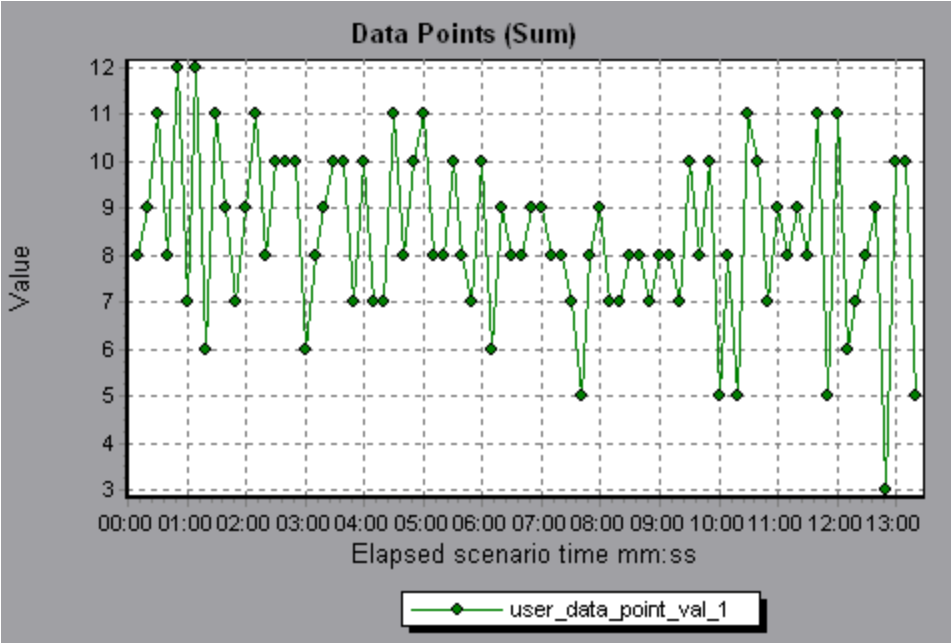
This graph shows the sum of the values for user-defined data points throughout the load test scenario run.

This graph typically indicates the total amount of measurements which all Vusers are able to generate. For example, suppose only a certain set of circumstances allow a Vuser to call a server. Each time it does, a data point is recorded. In this case, the Sum graph displays the total number of times that Vusers call the function.

X-axis	Elapsed time since the start of the run.
Y-axis	The sum of the recorded data point values.
See also	<a href="#">"User-Defined Data Point Graphs Overview" on page 218</a>

## Example

In the following example, the call to the server is recorded as the data point user\_data\_point\_val\_1. It is shown as a function of the elapsed scenario time.



# System Resource Graphs

## System Resource Graphs Overview

System Resource graphs display the system resource usage measured by the online monitors during the load test scenario run. These graphs require that you specify the resources you want to measure *before* running the scenario. For more information, see the section on online monitors in the LoadRunner Controller documentation.

## Server Resources Performance Counters

The following table describes the available counters:

Monitor	Measurements	Description
<b>CPU Monitor</b>	Utilization	Measures CPU utilization.
<b>Disk Space Monitor</b>	Disk space	Measures the amount (in MB) free disk space and the percentage of disk space used.
<b>Memory Monitor</b>	MB free	Measures the amount of free memory (in MB).
	Pages/sec	Measures the number of virtual memory pages that are moved between main memory and disk storage.
	Percent used	Measures the percentage of memory and paging file space used.
<b>Services Monitor</b>		Monitors processes locally or on remote systems. Can be used to verify that specific processes are running.

## Linux Resources Default Measurements

The following default measurements are available for Linux machines:

Measurement	Description
<b>Average load</b>	Average number of processes simultaneously in 'Ready' state during the last minute.
<b>Collision rate</b>	Collisions per second detected on the Ethernet.
<b>Context switches rate</b>	Number of switches between processes or threads, per second.
<b>CPU utilization</b>	Percent of time that the CPU is utilized.
<b>Disk rate</b>	Rate of disk transfers.
<b>Incoming packets error rate</b>	Errors per second while receiving Ethernet packets.
<b>Incoming packets rate</b>	Incoming Ethernet packets per second.
<b>Interrupt rate</b>	Number of device interrupts per second.
<b>Outgoing packets errors rate</b>	Errors per second while sending Ethernet packets.
<b>Outgoing packets rate</b>	Outgoing Ethernet packets per second.
<b>Page-in rate</b>	Number of pages read to physical memory, per second.
<b>Page-out rate</b>	Number of pages written to pagefile(s) and removed from physical memory, per second.
<b>Paging rate</b>	Number of pages read to physical memory or written to pagefile(s), per second.
<b>Swap-in rate</b>	The rate by which disk content is swapped into the machine's memory in Kbps.
<b>Swap-out rate</b>	The rate by which the machine's memory is being swapped out to disk in Kbps.
<b>System mode CPU utilization</b>	Percent of time that the CPU is utilized in system mode.
<b>User mode CPU utilization</b>	Percent of time that the CPU is utilized in user mode.

## Windows Resources Default Measurements

The following default measurements are available for Windows Resources:

Object	Measurement	Description
<b>System</b>	<b>% Total Processor Time</b>	The average percentage of time that all the processors on the system are busy executing non-idle threads. On a multi-processor system, if all processors are always busy, this is 100%, if all processors are 50% busy this is 50% and if 1/4 of the processors are 100% busy this is 25%. It can be viewed as the fraction of the time spent doing useful work. Each processor is assigned an Idle thread in the Idle process which consumes those unproductive processor cycles not used by any other threads.
<b>Processor</b>	<b>% Processor Time</b>	The percentage of time that the processor is executing a non-idle thread. This counter was designed as a primary indicator of processor activity. It is calculated by measuring the time that the processor spends executing the thread of the idle process in each sample interval, and subtracting that value from 100%. (Each processor has an idle thread which consumes cycles when no other threads are ready to run.) It can be viewed as the percentage of the sample interval spent doing useful work. This counter displays the average percentage of busy time observed during the sample interval. It is calculated by monitoring the time the service was inactive, and then subtracting that value from 100%.
<b>System</b>	<b>File Data Operations/sec</b>	The rate at which the computer issues read and write operations to file system devices. This does not include File Control Operations.

, continued

Object	Measurement	Description
<b>System</b>	<b>Processor Queue Length</b>	The instantaneous length of the processor queue in units of threads. This counter is always 0 unless you are also monitoring a thread counter. All processors use a single queue in which threads wait for processor cycles. This length does not include the threads that are currently executing. A sustained processor queue length greater than two generally indicates processor congestion. This is an instantaneous count, not an average over the time interval.
<b>Memory</b>	<b>Page Faults/sec</b>	This is a count of the page faults in the processor. A page fault occurs when a process refers to a virtual memory page that is not in its Working Set in the main memory. A page fault will not cause the page to be fetched from disk if that page is on the standby list (and hence already in main memory), or if it is in use by another process with which the page is shared.
<b>PhysicalDisk</b>	<b>% Disk Time</b>	The percentage of elapsed time that the selected disk drive is busy servicing read or write requests.
<b>Memory</b>	<b>Pool Nonpaged Bytes</b>	The number of bytes in the non-paged pool, a system memory area where space is acquired by operating system components as they accomplish their appointed tasks. Non-paged pool pages cannot be paged out to the paging file. They remain in main memory as long as they are allocated.



, continued

Object	Measurement	Description
Memory	Pages/sec	The number of pages read from the disk or written to the disk to resolve memory references to pages that were not in memory at the time of the reference. This is the sum of Pages Input/sec and Pages Output/sec. This counter includes paging traffic on behalf of the system cache to access file data for applications. This value also includes the pages to/from non-cached mapped memory files. This is the primary counter to observe if you are concerned about excessive memory pressure (that is, thrashing), and the excessive paging that may result.
System	Total Interrupts/sec	The rate at which the computer is receiving and servicing hardware interrupts. The devices that can generate interrupts are the system timer, the mouse, data communication lines, network interface cards, and other peripheral devices. This counter provides an indication of how busy these devices are on a computer-wide basis. See also <b>Processor:Interrupts/sec</b> .
Objects	Threads	The number of threads in the computer at the time of data collection. Notice that this is an instantaneous count, not an average over the time interval. A thread is the basic executable entity that can execute instructions in a processor.
Process	Private Bytes	The current number of bytes that the process has allocated that cannot be shared with other processes.

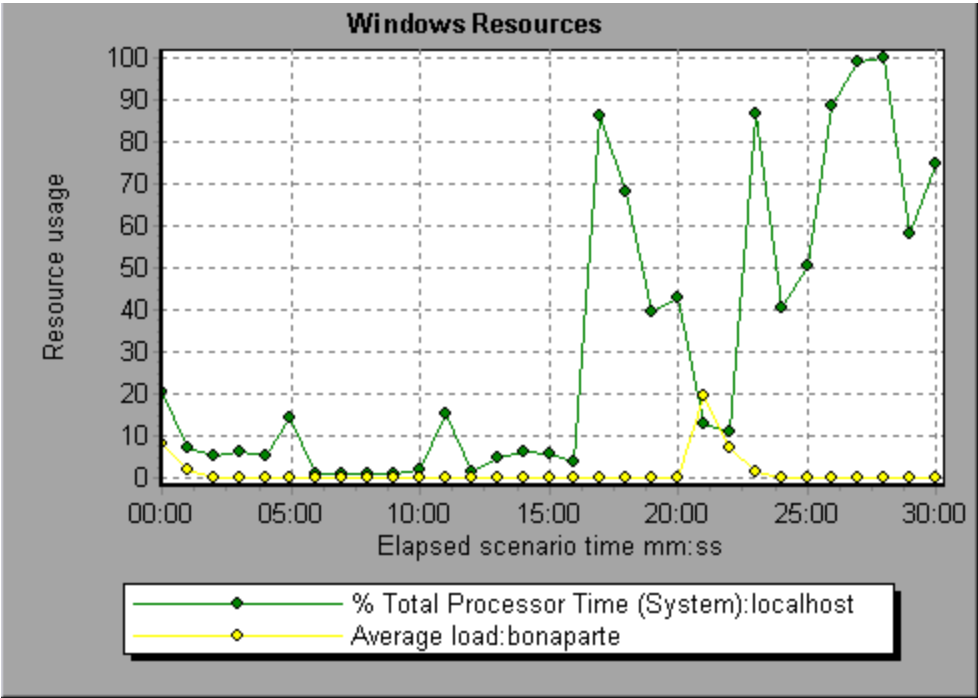
## Server Resources Graph

This graph shows the resources (CPU, disk space, memory, or services) used on remote Linux servers measured during the load test scenario.

<b>Purpose</b>	This graph helps you determine the impact of Vuser load on the various system resources.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The usage of resources on the Linux server.
<b>See also</b>	<a href="#">"System Resource Graphs Overview" on page 221</a> <a href="#">"Server Resources Performance Counters" on page 221</a>

**Example**

In the following example, Windows resource utilization is measured during the load test scenario. It is shown as a function of the elapsed scenario time.



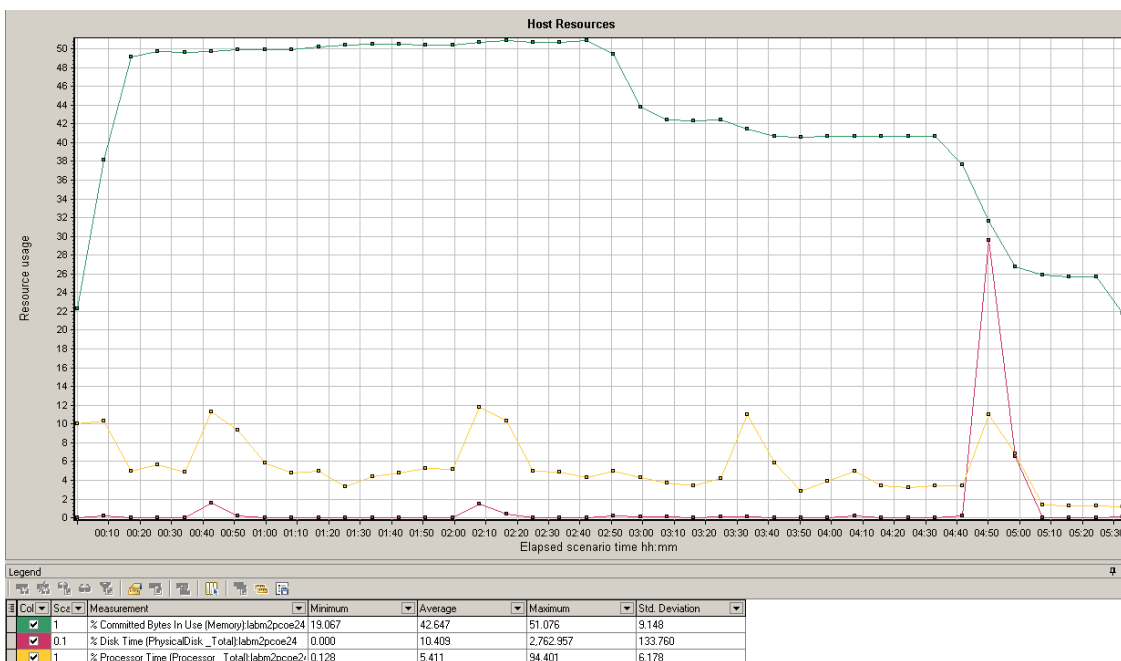
**Host Resources Graph**

This graph displays a summary of the System Resources usage for each Windows based Performance Center host (Controller and Load Generators). measured during the load test scenario.

<b>Purpose</b>	This graph helps you determine the impact of Vuser load on the various host resources.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The usage of resources on the Windows hosts.
<b>See also</b>	<a href="#">"System Resource Graphs Overview" on page 221</a>

## Example

In the following example, you can see a peak in the usage of Disk Time and Processor Time as the Memory Usage gets less towards the end of the load test.



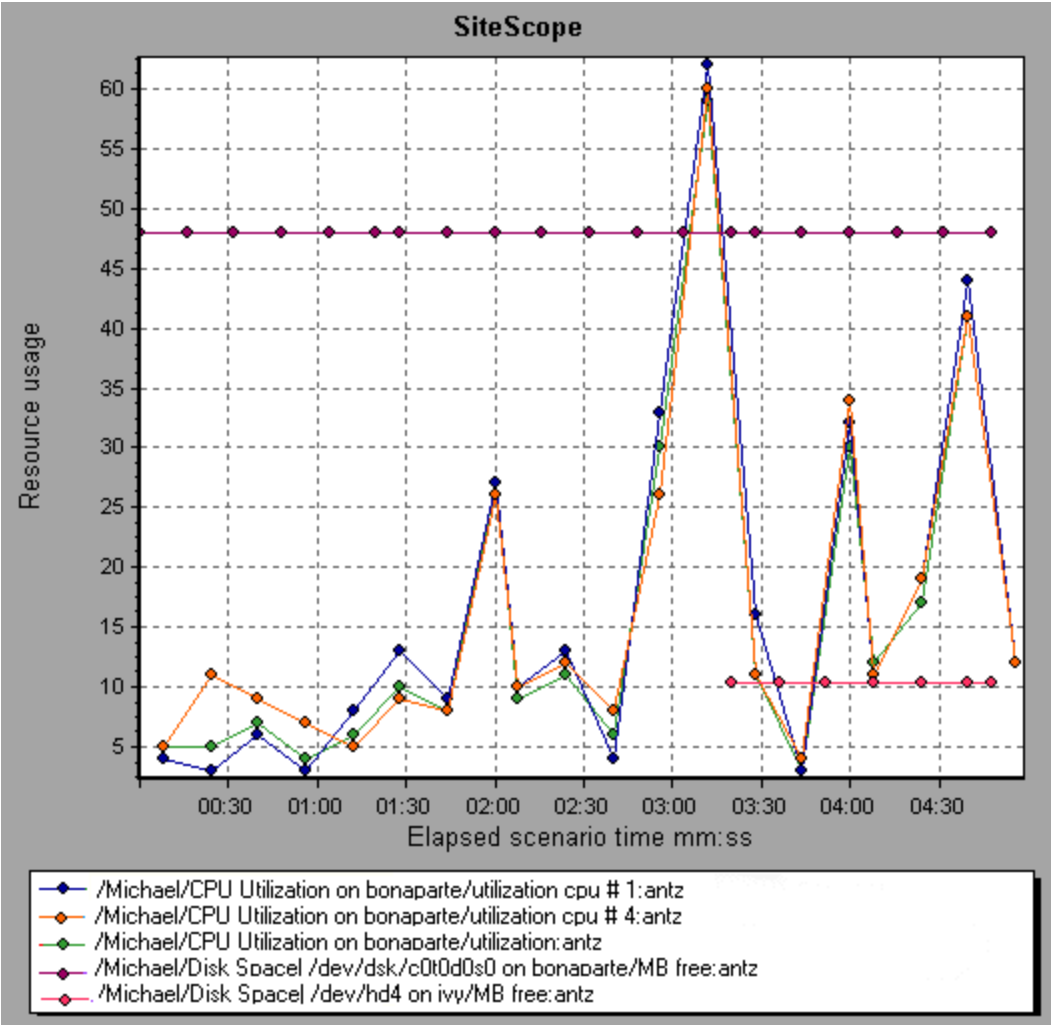
## SiteScope Graph

This graph displays statistics about the resource usage on the SiteScope machine during the load test scenario run.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage on the SiteScope machine.
<b>See also</b>	<a href="#">"System Resource Graphs Overview" on page 221</a>

## Example

In the following example, the percentage of memory resources used, the number of pages read per second, and the CPU utilization.



## SNMP Resources Graph

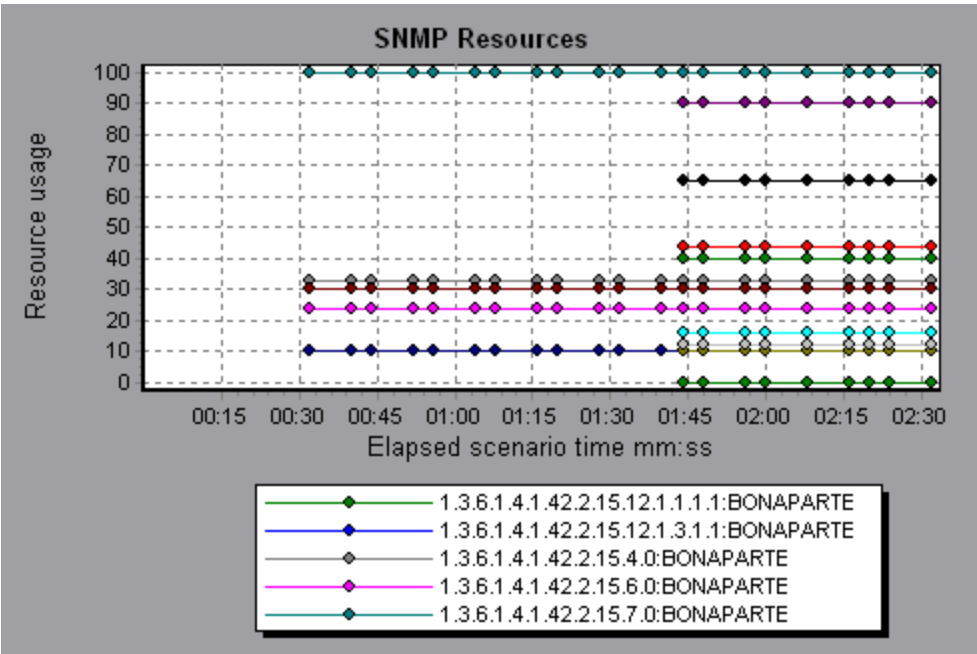
This graph shows statistics for machines running an SNMP agent, using the Simple Network Management Protocol (SNMP).

X-axis	Elapsed time since the start of the run.
Y-axis	The usage of resources on a machine running the SNMP agent.

<b>Note</b>	To obtain data for this graph, you need to enable the SNMP monitor (from the Controller) and select the default measurements you want to display, before running the scenario.
<b>See also</b>	<a href="#">"System Resource Graphs Overview" on page 221</a>

**Example**

In the following example SNMP measurements are displayed for a machine called bonaparte.



**Linux Resources Graph**

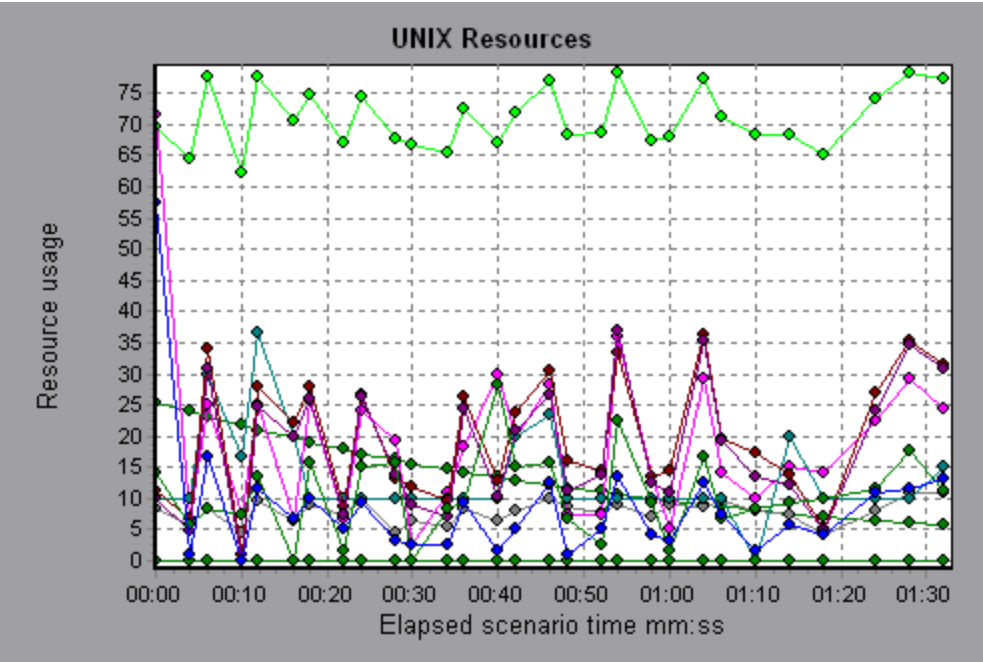
This graph shows the Linux resources measured during the load test scenario. The Linux measurements include those available by the `rstatd` daemon: average load, collision rate, context switch rate, CPU utilization, incoming packets error rate, incoming packets rate, interrupt rate, outgoing packets error rate, outgoing packets rate, page-in rate, page-out rate, paging rate, swap-in rate, swap-out rate, system mode CPU utilization, and user mode CPU utilization.

<b>Purpose</b>	This graph helps you determine the impact of Vuser load on the various system resources.
----------------	--

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The usage of resources on the Linux machine.
<b>Note</b>	To obtain data for this graph, you need to select the desired measurements for the online monitor (from the Controller) before running the scenario.
<b>See also</b>	<a href="#">"Linux Resources Default Measurements" on page 221</a>

**Example**

In the following example Linux resources are measured during the load test scenario.



**Windows Resources Graph**

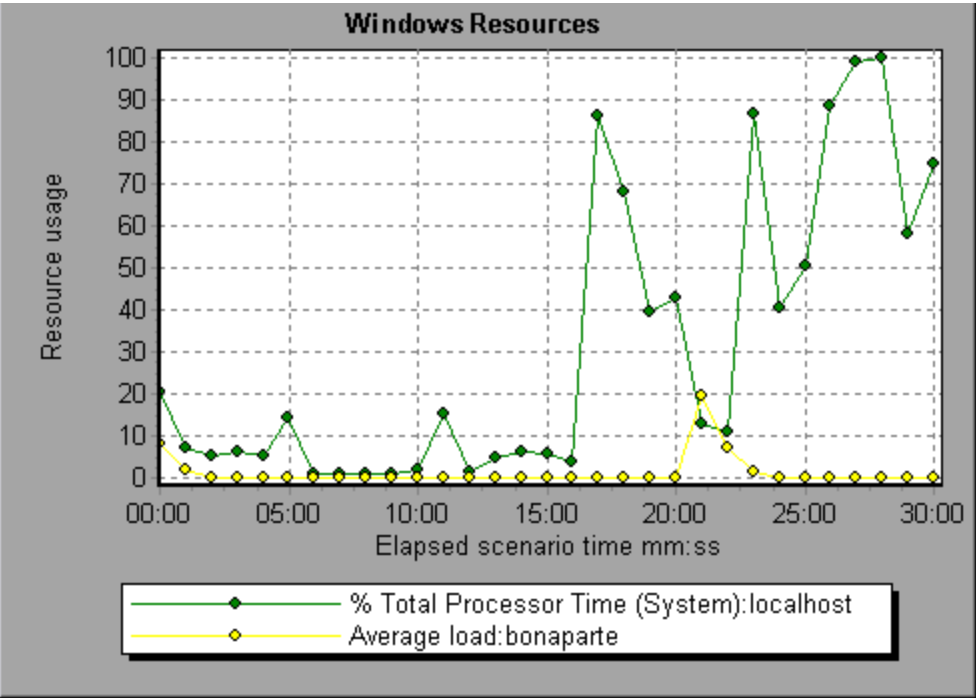
This graph shows the Windows resources measured during the load test scenario. The Windows measurements correspond to the built-in counters available from the Windows Performance Monitor.

<b>Purpose</b>	This graph helps you determine the impact of Vuser load on the various system resources.
----------------	--

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The usage of resources on the Windows machine running the load test scenario.
<b>Note</b>	To obtain data for this graph, you need to select the desired measurements for the online monitor (from the Controller) before running the scenario.
<b>See also</b>	<a href="#">"System Resource Graphs Overview" on page 221</a> <a href="#">"Windows Resources Default Measurements" on page 223</a>

**Example**

In the following example Windows resources are measured on the server running the load test scenario.



# HP Network Virtualization Graphs

## Packet Loss Graph

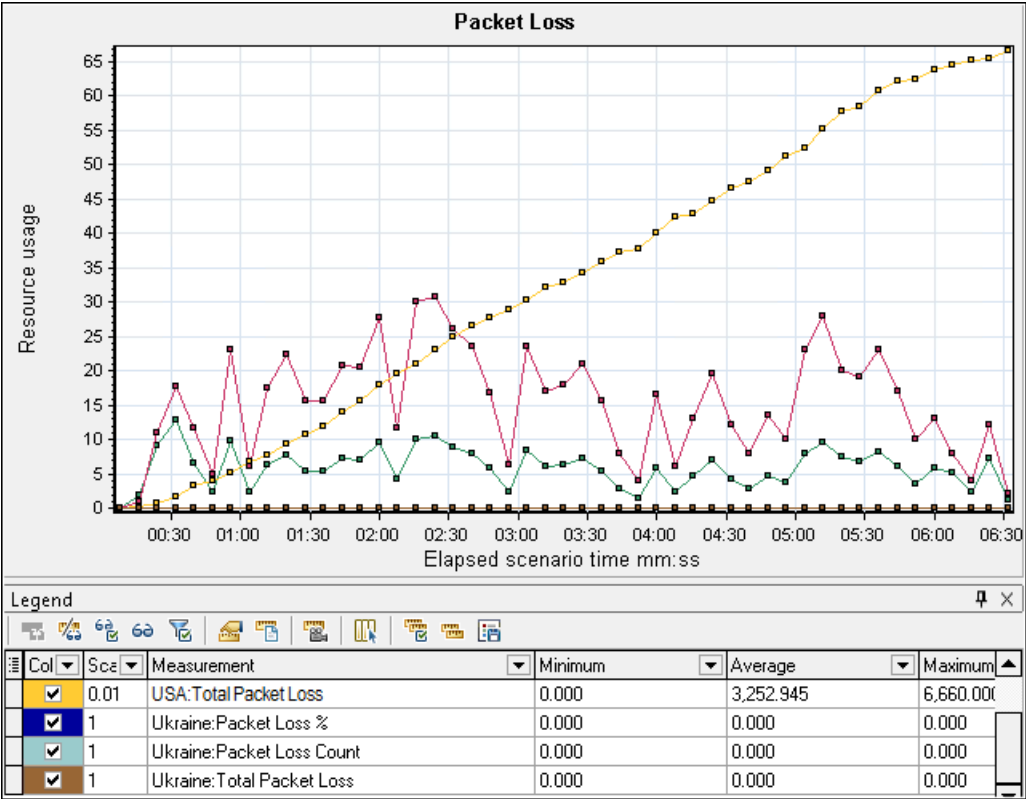
This graph shows packets lost during the last second of the scenario run. Packet loss occurs when data packets fail to reach their destination. It can result from gateway overload, signal degradation, channel congestion, or faulty hardware.

<b>Purpose</b>	Helps you understand how many data packets were lost over a specific time interval.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	<p>The following measurements:</p> <ul style="list-style-type: none"><li>• The percentage of lost packets from all packets that were sent.</li><li>• The number of data packets that were lost over 60 seconds.</li><li>• The total number of packets that were lost.</li></ul>
<b>Note</b>	You cannot change the granularity of the x-axis to a value that is less than the Web granularity you defined in the General tab of the Options dialog box.
<b>Tip</b>	<p>For LoadRunner Analysis (not applicable to monitoring graphs):</p> <p>To view information for a specific location:</p> <ol style="list-style-type: none"><li>1. Click within the graph.</li><li>2. Select <b>Set Filter/ Sort By</b> from the right-click menu to open the Graph Settings dialog box.</li><li>3. In the <b>Filter condition</b> section, select the <i>Location Name</i> row, and select the desired location from the drop-down list.</li></ol>
<b>See also</b>	<a href="#">"HP Network Virtualization Graphs" on the previous page</a>



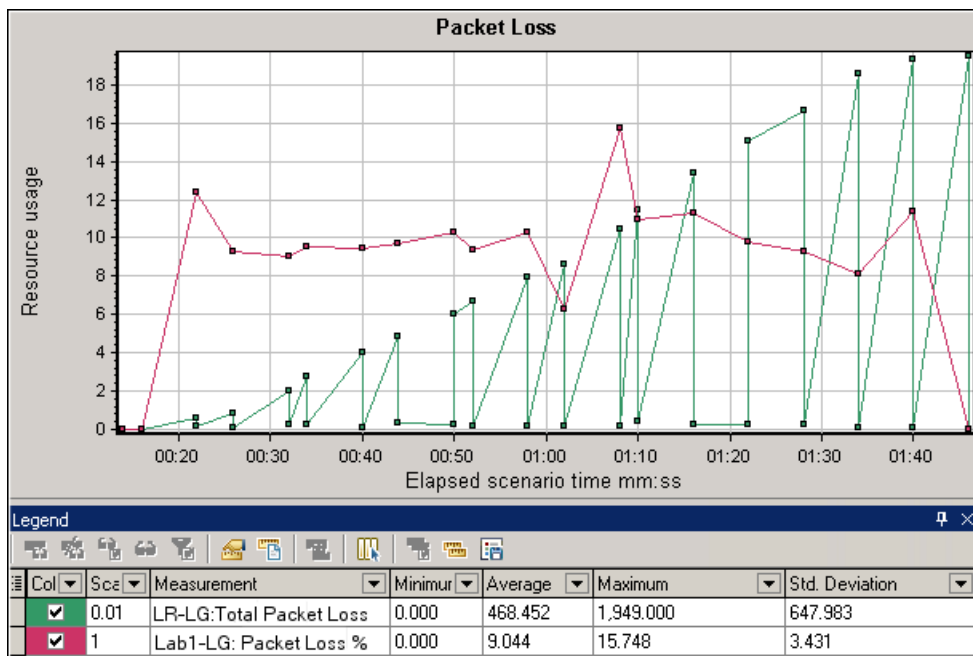
Example - Network Virtualization Per Group

The following example shows how the total of packet loss for the **USA** group increased as the scenario progressed.



## Example - Network Virtualization Per Load Generator

In the following example, you can see that the packet loss is grouped by load generator. This was the mode selected when you enabled Network Virtualization for the scenario.



## Average Latency Graph

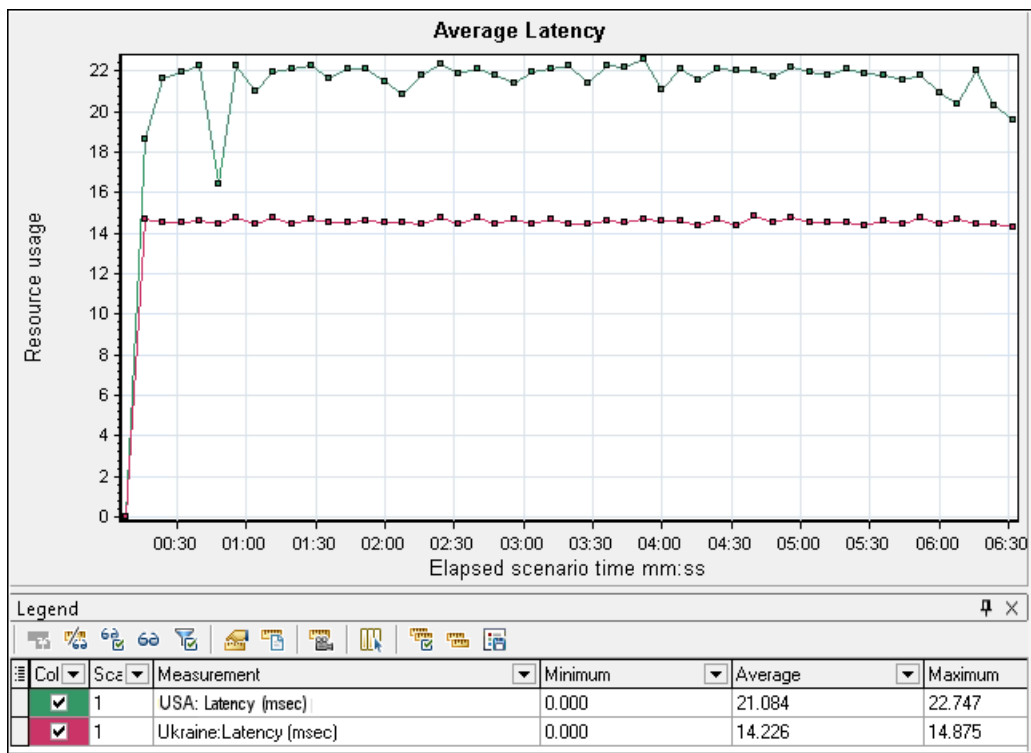
This graph shows the average recorded time required for a packet of data to travel from the indicated source point to the required destination, measured in milliseconds in the last 60 seconds.

<b>Purpose</b>	Helps you evaluate the time required for a packet of data to travel over the network.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The average latency—the time in milliseconds required for a packet of data to reach its destination, per 60 second intervals.
<b>Note</b>	You cannot change the granularity of the x-axis to a value that is less than the Web granularity you defined in the General tab of the Options dialog box.

<b>Tips</b>	<p>For LoadRunner Analysis (not applicable to monitoring graphs):</p> <p>To view information for a specific location:</p> <ol style="list-style-type: none"> <li>1. Click within the graph.</li> <li>2. Select <b>Set Filter/ Sort By</b> from the right-click menu to open the Graph Settings dialog box.</li> <li>3. In the <b>Filter condition</b> section, select the <i>Location Name</i> row, and select the desired location from the drop-down list.</li> </ol>
<b>See also</b>	<ul style="list-style-type: none"> <li>• <a href="#">"HP Network Virtualization Graphs" on page 231</a></li> <li>• <a href="#">"Custom Filter Dialog Box" on page 143</a></li> </ul>

### Example - Network Virtualization Per Group

In the following example, you can see that the latency for the **USA** group reached its peak at nearly 4 minutes into the scenario run, while the **Ukraine** group remained fairly constant at approximately 14 msec.



If you enabled Network Virtualization per load generator (and not per group), the graph shows the measurements per load generator, as shown in the ["Packet Loss Graph" on page 232](#).

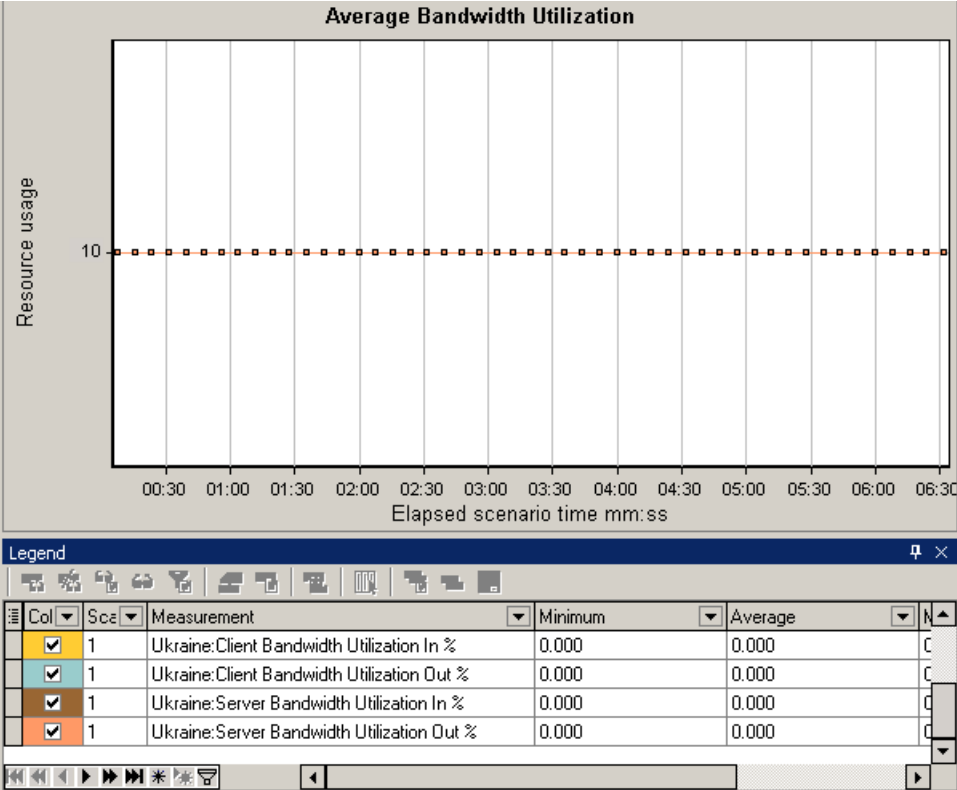
## Average Bandwidth Utilization Graph

This graph shows the average bandwidth utilized by a virtual user or a virtualized location from the maximal available bandwidth allocated for it during the last second, measured in percentages.

<b>Purpose</b>	Helps you evaluate the bandwidth used over your network.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The percentage of bandwidth utilization.
<b>Note</b>	You cannot change the granularity of the x-axis to a value that is less than the Web granularity you defined in the General tab of the Options dialog box.
<b>Tips</b>	<p>For LoadRunner Analysis (not applicable to monitoring graphs):</p> <p>To view information for a specific location:</p> <ol style="list-style-type: none"><li>1. Click within the graph.</li><li>2. Select <b>Set Filter/ Sort By</b> from the right-click menu to open the Graph Settings dialog box.</li><li>3. In the <b>Filter condition</b> section, select the <i>Location Name</i> row, and select the desired location from the drop-down list.</li></ol>
<b>See also</b>	<a href="#">"HP Network Virtualization Graphs" on page 231</a>

### Example

In the following example, you can see that the bandwidth utilization for all locations and measurements, was constant at 10%.



If you enabled Network Virtualization per load generator (and not per group), the graph shows the measurements per load generator, as shown in the ["Packet Loss Graph" on page 232](#).

## Average Throughput Graph

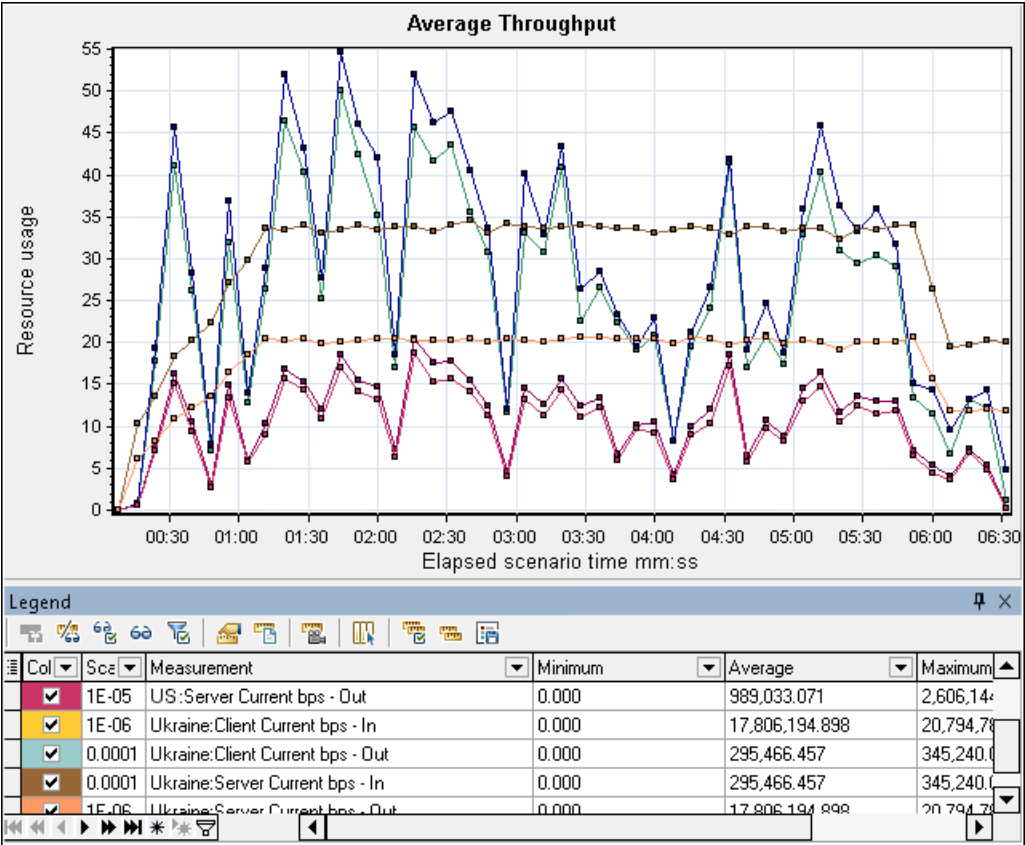
This graph shows the average data traffic passing to or from the virtualized location, measured in kilobytes per second (kbps).

Purpose	Helps you evaluate the amount of load Vusers generate, in terms of the number of server and client throughput. The graph shows metrics for input and output traffic for both the server and client machines. Use the legend below the graph to determine the line color for each metric.
X-axis	Elapsed time since the start of the run.

<b>Y-axis</b>	<p>The rate of data passing to and from the virtual location, in kbps for the following metrics per group or load generator:</p> <ul style="list-style-type: none"><li>• Input to the client machine</li><li>• Output from the client machine</li><li>• Input to the server machine</li><li>• Output from the server machine</li></ul>
<b>Note</b>	<p>You cannot change the granularity of the x-axis to a value that is less than the Web granularity you defined in the General tab of the Options dialog box.</p>
<b>Tips</b>	<p>For LoadRunner Analysis (not applicable to monitoring graphs):</p> <p>To view information for a specific location:</p> <ol style="list-style-type: none"><li>1. Click within the graph.</li><li>2. Select <b>Set Filter/ Sort By</b> from the right-click menu to open the Graph Settings dialog box.</li><li>3. In the <b>Filter condition</b> section, select the <i>Location Name</i> row, and select the desired location from the drop-down list.</li></ol>
<b>See also</b>	<p><a href="#">"Total Throughput Graph" on the next page</a></p>

Example

In the following example, the average server input throughput was the lowest for the Ukraine group.



If you enabled Network Virtualization per load generator (and not per group), the graph shows the measurements per load generator, as shown in the ["Packet Loss Graph" on page 232](#).

Total Throughput Graph

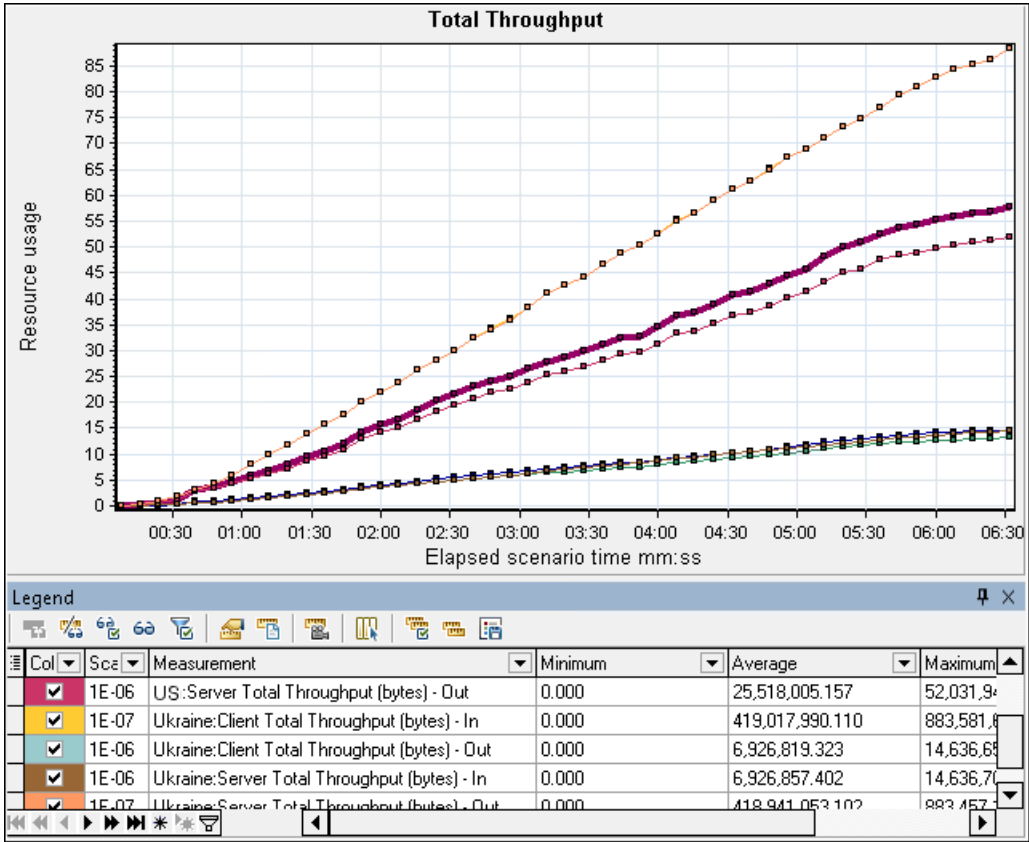
Displays the total data traffic passing to or from the virtualized location, measured in kilobytes.

<b>Purpose</b>	<p>Helps you evaluate the total amount of load that Vusers generate while running a scenario with network virtualization.</p> <p>The graph shows metrics for input and output traffic for both the server and client machines. The legend below the graph indicates the line color for each of these metrics.</p>
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Throughput of the server, in kilobytes per second (Kbps).
<b>Note</b>	You cannot change the granularity of the x-axis to a value that is less than the Web granularity you defined in the <b>General</b> tab of the Options dialog box.
<b>Tips</b>	<p>For LoadRunner Analysis (not applicable to monitoring graphs):</p> <p>To view information for a specific location:</p> <ol style="list-style-type: none"><li>1. Click within the graph.</li><li>2. Select <b>Set Filter/ Sort By</b> from the right-click menu to open the Graph Settings dialog box.</li><li>3. In the <b>Filter condition</b> section, select the <i>Location Name</i> row, and select the desired location from the drop-down list.</li></ol>
<b>See also</b>	<a href="#">"Average Throughput Graph" on page 237</a>

### Example

In the following example, the highest throughput level was for the input data to the client, for the **Ukraine** group.





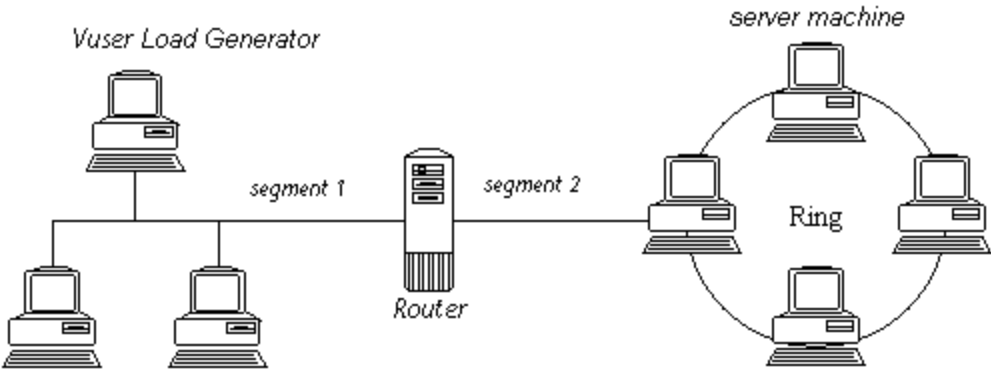
If you enabled Network Virtualization per load generator (and not per group), the graph shows the measurements per load generator, as shown in the ["Packet Loss Graph"](#) on page 232.

# Network Monitor Graphs

## Network Monitor Graphs Overview

Network configuration is a primary factor in the performance of applications and Web systems. A poorly designed network can slow client activity to unacceptable levels. In an application, there are many network segments. A single network segment with poor performance can affect the entire application.

The following diagram shows a typical network. To go from the server machine to the Vuser machine, data must travel over several segments.



To measure network performance, the Network monitor sends packets of data across the network. When a packet returns, the monitor calculates the time it takes for the packet to go to the requested node and return.

The Network Sub-Path Time graph displays the delay from the source machine to each node along the path. The Network Segment Delay graph displays the delay for each segment of the path. The Network Delay Time graph displays the delay for the complete path between the source and destination machines.

Using the Network Monitor graphs, you can determine whether the network is causing a bottleneck. If the problem is network-related, you can locate the problematic segment so that it can be fixed.

In order for Analysis to generate Network monitor graphs, you must activate the Network monitor before executing the load test scenario. In the Network monitor settings, you specify the path you want to monitor. For information about setting up the Network monitor, see [Network Delay Monitoring](#).

# Network Delay Time Graph

This graph shows the delays for the complete path between the source and destination machines (for example, the database server and Vuser load generator). The graph maps the delay as a function of the elapsed load test scenario time.

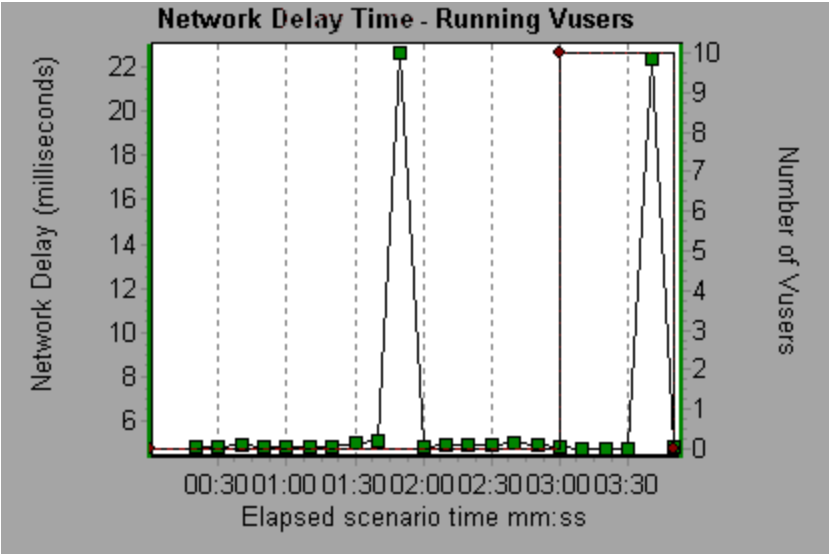
Each path defined in the Controller is represented by a separate line with a different color in the graph.

<b>X-axis</b>	Elapsed time since the start of the run.
---------------	--

Y-axis	Network delay time.
Tips	<p><b>Merge graphs to determine network bottleneck</b></p> <p>You can merge various graphs to determine if the network is a bottleneck. For example, using the Network Delay Time and Running Vusers graphs, you can determine how the number of Vusers affects the network delay.</p>
See also	<p>"Network Monitor Graphs Overview" on page 241</p>

**Example**

In the following example of a merged graph, the network delays are compared to the running Vusers. The graph shows that when all 10 Vusers were running, a network delay of 22 milliseconds occurred, implying that the network may be overloaded.



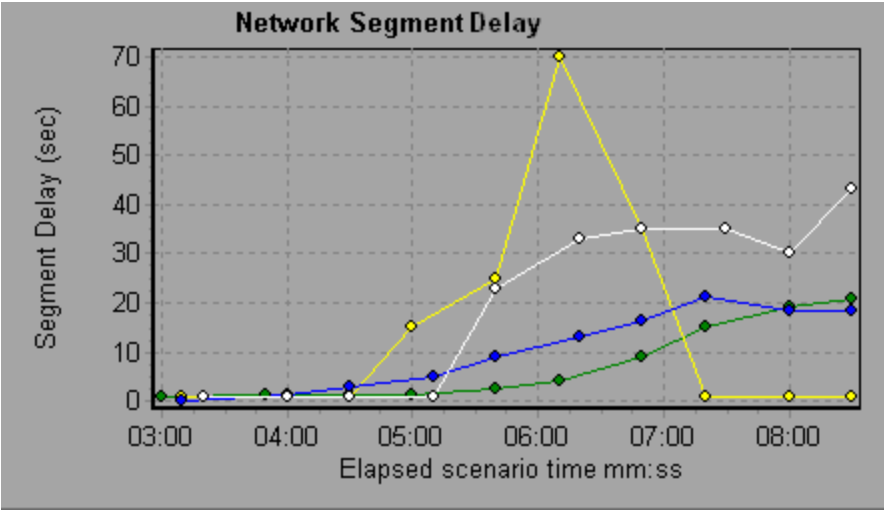
**Network Segment Delay Graph**

This graph shows the delay for each segment of the path according to the elapsed load test scenario time. Each segment is displayed as a separate line with a different color.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Network delay time.
<b>Note</b>	The segment delays are measured approximately, and do not add up to the network path delay which is measured exactly. The delay for each segment of the path is estimated by calculating the delay from the source machine to one node and subtracting the delay from the source machine to another node. For example, the delay for segment B to C is calculated by measuring the delay from the source machine to point C, and subtracting the delay from the source machine to point B.
<b>See also</b>	<a href="#">"Network Monitor Graphs Overview" on page 241</a>

Example

In the following example, four segments are shown. The graph indicates that one segment caused a delay of 70 seconds in the sixth minute.



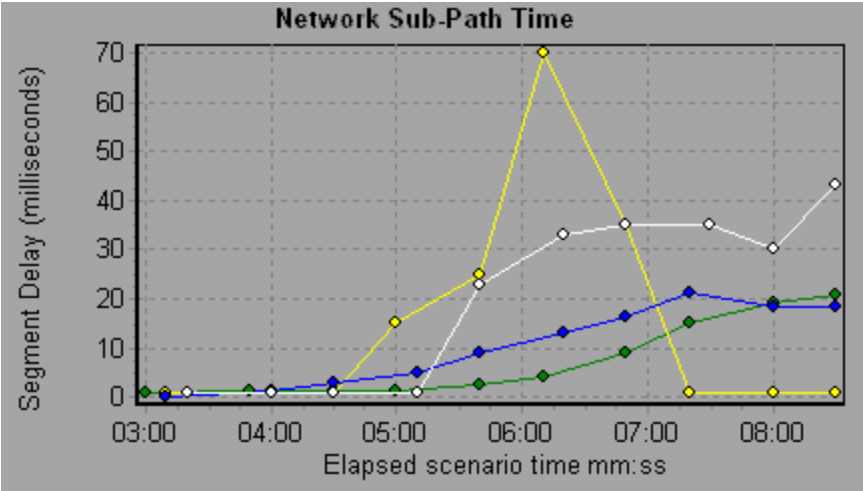
Network Sub-Path Time Graph

This graph displays the delay from the source machine to each node along the path according to the elapsed load test scenario time. Each segment is displayed as a separate line with a different color.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Network delay time.
<b>Note</b>	The delays from the source machine to each of the nodes are measured concurrently, yet independently. It is therefore possible that the delay from the source machine to one of the nodes could be greater than the delay for the complete path between the source and destination machines.
<b>See also</b>	<a href="#">"Network Monitor Graphs Overview" on page 241</a>

**Example**

In the following example, four segments are shown. The graph indicates that one segment caused a delay of 70 milliseconds in the sixth minute.



# Web Server Resource Graphs

## Web Server Resource Graphs Overview

Web Server Resource graphs provide you with information about the resource usage of the Apache and Microsoft IIS Web servers. In order to obtain data for these graphs, you need to activate the online monitor for the server and specify which resources you want to measure before running the load test scenario. For information on activating and configuring the Web Server Resource monitors, see [Web Server Resource Monitoring Overview](#).

In order to display all the measurements on a single graph, Analysis may scale them. The Legend window indicates the scale factor for each resource. To obtain the true value, multiply the scale factor by the displayed value.

## Apache Server Measurements

The following default measurements are available for the Apache server:

Measurement	Description
<b># Busy Servers</b>	The number of servers in the Busy state
<b># Idle Servers</b>	The number of servers in the Idle state
<b>Apache CPU Usage</b>	The percentage of time the CPU is utilized by the Apache server
<b>Hits/sec</b>	The HTTP request rate
<b>KBytes Sent/sec</b>	The rate at which data bytes are sent from the Web server

## IIS Server Measurements

The following default measurements are available for the IIS server:

Object	Measurement	Description
<b>Web Service</b>	<b>Bytes Sent/sec</b>	The rate at which the data bytes are sent by the Web service.
<b>Web Service</b>	<b>Bytes Received/sec</b>	The rate at which the data bytes are received by the Web service.
<b>Web Service</b>	<b>Get Requests/sec</b>	The rate at which HTTP requests using the GET method are made. Get requests are generally used for basic file retrievals or image maps, though they can be used with forms.
<b>Web Service</b>	<b>Post Requests/sec</b>	The rate at which HTTP requests using the POST method are made. Post requests are generally used for forms or gateway requests.

, continued

Object	Measurement	Description
Web Service	Maximum Connections	The maximum number of simultaneous connections established with the Web service.
Web Service	Current Connections	The current number of connections established with the Web service.
Web Service	Current NonAnonymous Users	The number of users that currently have a non-anonymous connection using the Web service.
Web Service	Not Found Errors/sec	The rate of errors due to requests that could not be satisfied by the server because the requested document could not be found. These are generally reported to the client as an HTTP 404 error code.
Process	Private Bytes	The current number of bytes that the process has allocated that cannot be shared with other processes.

## Apache Server Graph

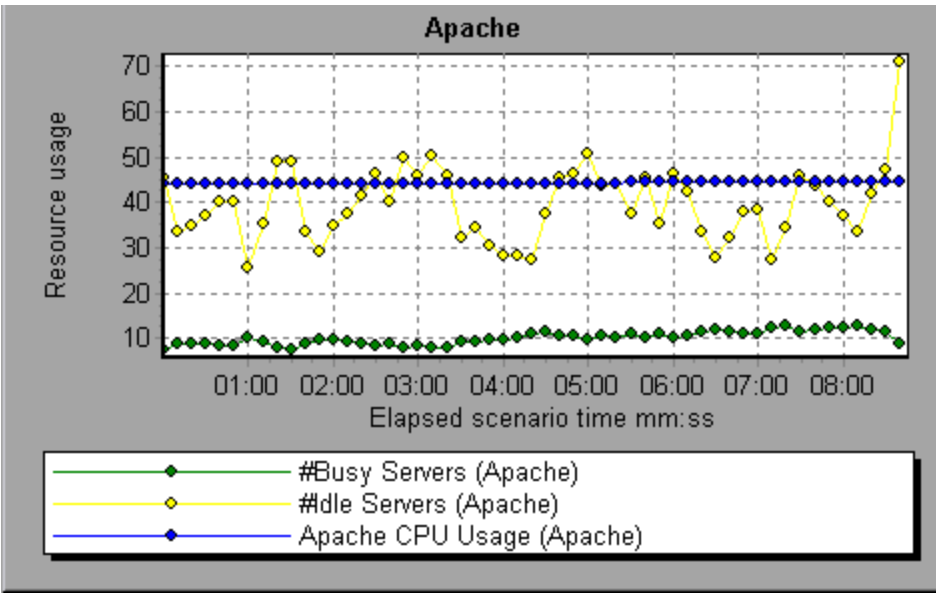
This graph shows server statistics as a function of the elapsed load test scenario time.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage on the Apache server during the scenario run.
<b>Note</b>	To obtain data for this graph, you need to enable the Apache online monitor (from the Controller) and select the default measurements you want to display, before running the scenario.
<b>See also</b>	<a href="#">"Web Server Resource Graphs Overview" on page 245</a> <a href="#">"Apache Server Measurements" on the previous page</a>

### Example

In the following example, the CPU usage remained steady throughout the scenario. At the end of the scenario, the number of idle servers increased. The number of busy servers remained steady at 1 throughout the scenario, implying that the Vuser only accessed one Apache server.

The scale factor for the **Busy Servers** measurement is 1/10 and the scale factor for CPU usage is 10.



## Microsoft Information Internet Server (IIS) Graph

This graph shows server statistics as a function of the elapsed load test scenario time.

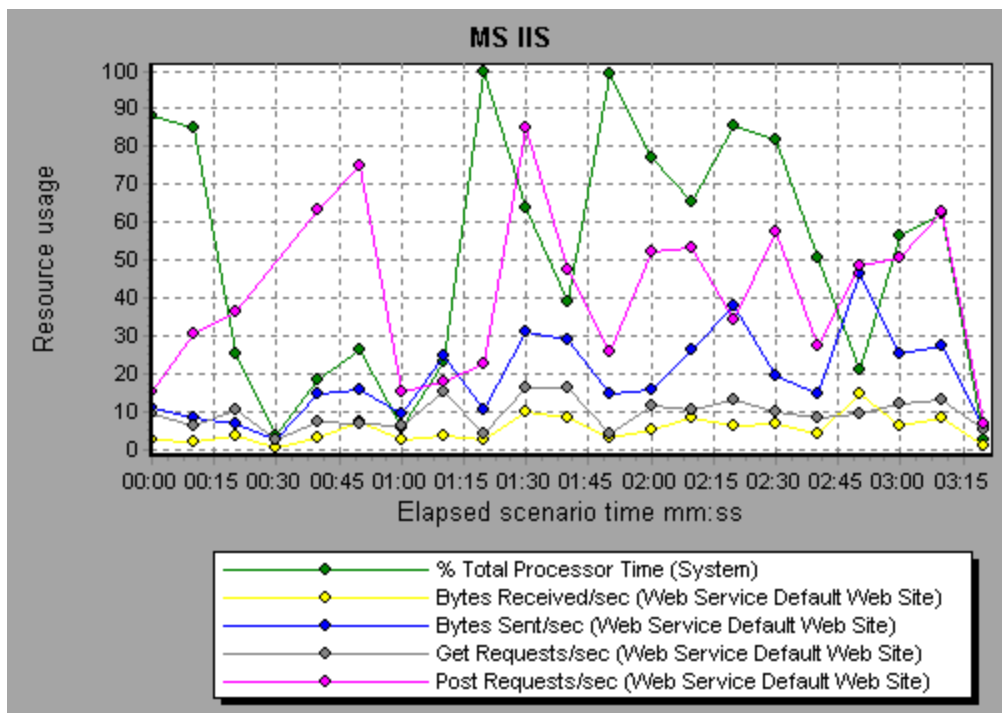
X-axis	Elapsed time since the start of the run.
Y-axis	The resource usage on the MS IIS.
Note	To obtain data for this graph, you need to enable the MS IIS online monitor (from the Controller) and select the default measurements you want to display, before running the scenario.
See also	<a href="#">"Web Server Resource Graphs Overview" on page 245</a> <a href="#">"IIS Server Measurements" on page 246</a>

### Example



In the following example the **Bytes Received/sec** and **Get Requests/sec** measurements remained fairly steady throughout the scenario, while the **% Total Processor Time**, **Bytes Sent/sec**, and **Post Requests/sec** measurements fluctuated considerably.

The scale factor for the **Bytes Sent/sec** and **Bytes Received/sec** measurements is 1/100, and the scale factor for the **Post Requests/sec** measurement is 10.



## Web Application Server Resource Graphs

### Web Application Server Resource Graphs Overview

Web Application Server Resource graphs provide you with resource usage information about the Ariba, ATG Dynamo, BroadVision, ColdFusion, Fujitsu INTERSTAGE, iPlanet (NAS), Microsoft ASP, Oracle9iAS HTTP, SilverStream, WebLogic (SNMP), WebLogic (JMX), and WebSphere application servers.

In order to obtain data for these graphs, you need to activate the online monitor for the application server and specify which resources you want to measure before running the load test scenario.

When you open a Web Application Server Resource graph, you can filter it to show only the relevant application. When you need to analyze other applications, you can change the filter conditions and display the desired resources.

In order to display all the measurements on a single graph, Analysis may scale them. The Legend window indicates the scale factor for each resource. To obtain the true value, multiply the scale factor by the displayed value. For more information on scaled measurements, see the example in ["Web Server Resource Graphs Overview" on page 245](#).

## Web Application Server Resource Graphs Measurements

### Microsoft Active Server Pages (ASP) Measurements

The following default measurements are available for Microsoft Active Server Pages:

>Measurement	Description
<b>Errors per Second</b>	The number of errors per second.
<b>Requests Wait Time</b>	The number of milliseconds the most recent request was waiting in the queue.
<b>Requests Executing</b>	The number of requests currently executing.
<b>Requests Queued</b>	The number of requests waiting in the queue for service.
<b>Requests Rejected</b>	The total number of requests not executed because there were insufficient resources to process them.
<b>Requests Not Found</b>	The number of requests for files that were not found.

, continued

>Measurement	Description
<b>Requests/sec</b>	The number of requests executed per second.
<b>Memory Allocated</b>	The total amount of memory (in bytes) currently allocated by Active Server Pages.
<b>Errors During Script Run-Time</b>	The number of failed requests due to run time errors.
<b>Sessions Current</b>	The current number of sessions being serviced.
<b>Transactions/sec</b>	The number of transactions started per second.

## Oracle9iAS HTTP Server Modules

The following table describes some of the modules that are available for the Oracle9iAS HTTP server:

Measurement	Description
<b>mod_mime.c</b>	Determines document types using file extensions.
<b>mod_mime_magic.c</b>	Determines document types using "magic numbers".
<b>mod_auth_anon.c</b>	Provides anonymous user access to authenticated areas.
<b>mod_auth_dbm.c</b>	Provides user authentication using DBM files.
<b>mod_auth_digest.c</b>	Provides MD5 authentication.
<b>mod_cern_meta.c</b>	Supports HTTP header metafiles.
<b>mod_digest.c</b>	Provides MD5 authentication (deprecated by mod_auth_digest).

, continued

Measurement	Description
<b>mod_expires.c</b>	Applies Expires: headers to resources.
<b>mod_headers.c</b>	Adds arbitrary HTTP headers to resources.
<b>mod_proxy.c</b>	Provides caching proxy abilities.
<b>mod_rewrite.c</b>	Provides powerful URI-to-filename mapping using regular expressions.
<b>mod_speling.c</b>	Automatically corrects minor typos in URLs.
<b>mod_info.c</b>	Provides server configuration information.
<b>mod_status.c</b>	Displays server status.
<b>mod_usertrack.c</b>	Provides user tracking using cookies.
<b>mod_dms.c</b>	Provides access to DMS Apache statistics.
<b>mod_perl.c</b>	Allows execution of Perl scripts.
<b>mod_fastcgi.c</b>	Supports CGI access to long-lived programs.
<b>mod_ssl.c</b>	Provides SSL support.
<b>mod_plsql.c</b>	Handles requests for Oracle stored procedures.
<b>mod_isapi.c</b>	Provides Windows ISAPI extension support.
<b>mod_setenvif.c</b>	Sets environment variables based on client information.
<b>mod_actions.c</b>	Executes CGI scripts based on media type or request method.
<b>mod_imap.c</b>	Handles imagemap files.

, continued

Measurement	Description
<b>mod_asis.c</b>	Sends files that contain their own HTTP headers.
<b>mod_log_config.c</b>	Provides user-configurable logging replacement for mod_log_common.
<b>mod_env.c</b>	Passes environments to CGI scripts.
<b>mod_alias.c</b>	Maps different parts of the host file system in the document tree, and redirects URLs.
<b>mod_userdir.c</b>	Handles user home directories.
<b>mod_cgi.c</b>	Invokes CGI scripts.
<b>mod_dir.c</b>	Handles the basic directory.
<b>mod_autoindex.c</b>	Provides automatic directory listings.
<b>mod_include.c</b>	Provides server-parsed documents.
<b>mod_negotiation.c</b>	Handles content negotiation.
<b>mod_auth.c</b>	Provides user authentication using text files.
<b>mod_access.c</b>	Provides access control based on the client host name or IP address.
<b>mod_so.c</b>	Supports loading modules (.so on UNIX, .dll on Win32) at run time.
<b>mod_oprocmgr.c</b>	Monitors JServ processes and restarts them if they fail.
<b>mod_jserv.c</b>	Routes HTTP requests to JServ server processes. Balances load across multiple JServs by distributing new requests in round-robin order.

, continued

Measurement	Description
<b>mod_ose.c</b>	Routes requests to the JVM embedded in Oracle's database server.
<b>http_core.c</b>	Handles requests for static Web pages.

## Oracle9iAS HTTP Server Counters

The following table describes the counters that are available for the Oracle9iAS HTTP server:

Measurement	Description
<b>handle.minTime</b>	The minimum time spent in the module handler.
<b>handle.avg</b>	The average time spent in the module handler.
<b>handle.active</b>	The number of threads currently in the handle processing phase.
<b>handle.time</b>	The total amount of time spent in the module handler.
<b>handle.completed</b>	The number of times the handle processing phase was completed.
<b>request.maxTime</b>	The maximum amount of time required to service an HTTP request.
<b>request.minTime</b>	The minimum amount of time required to service an HTTP request.
<b>request.avg</b>	The average amount of time required to service an HTTP request.
<b>request.active</b>	The number of threads currently in the request processing phase.

, continued

Measurement	Description
<b>request.time</b>	The total amount of time required to service an HTTP request.
<b>request.completed</b>	The number of times the request processing phase was completed.
<b>connection.maxTime</b>	The maximum amount of time spent servicing any HTTP connection.
<b>connection.minTime</b>	The minimum amount of time spent servicing any HTTP connection.
<b>connection.avg</b>	The average amount of time spent servicing HTTP connections.
<b>connection.active</b>	The number of connections with currently open threads.
<b>connection.time</b>	The total amount of time spent servicing HTTP connections.
<b>connection.completed</b>	The number of times the connection processing phase was completed.
<b>numMods.value</b>	The number of loaded modules.
<b>childFinish.count</b>	The number of times the Apache parent server started a child server, for any reason.
<b>childStart.count</b>	The number of times "children" finished "gracefully." There are some ungraceful error/crash cases that are not counted in childFinish.count.
<b>Decline.count</b>	The number of times each module declined HTTP requests.
<b>internalRedirect.count</b>	The number of times that any module passed control to another module using an "internal redirect".
<b>cpuTime.value</b>	The total CPU time utilized by all processes on the Apache server (measured in CPU milliseconds).

, continued

Measurement	Description
<b>heapSize.value</b>	The total heap memory utilized by all processes on the Apache server (measured in kilobytes).
<b>pid.value</b>	The process identifier of the parent Apache process.
<b>upTime.value</b>	The amount of time the server has been running (measured in milliseconds).

## WebLogic (SNMP) Server Table Measurements

The Server Table lists all WebLogic (SNMP) servers that are being monitored by the agent. A server must be contacted or be reported as a member of a cluster at least once before it will appear in this table. Servers are only reported as a member of a cluster when they are actively participating in the cluster, or shortly thereafter.

Measurement	Description
<b>ServerState</b>	The state of the WebLogic server, as inferred by the SNMP agent. <b>Up</b> implies that the agent can contact the server. <b>Down</b> implies that the agent cannot contact the server.
<b>ServerLoginEnable</b>	<b>True</b> if client logins are enabled on the server.
<b>ServerMaxHeapSpace</b>	The maximum heap size for this server (in KB).
<b>ServerHeapUsedPct</b>	The percentage of heap space currently in use on the server.
<b>ServerQueueLength</b>	The current length of the server execute queue.
<b>ServerQueueThroughput</b>	The current throughput of execute queue, expressed as the number of requests processed per second.



, continued

Measurement	Description
<b>ServerNumEJBDeployment</b>	The total number of EJB deployment units known to the server.
<b>ServerNumEJBBeansDeployed</b>	The total number of EJB beans actively deployed on the server.

## WebLogic (SNMP) Listen Table Measurements

The Listen Table is the set of protocol, IP address, and port combinations on which servers are listening. There will be multiple entries for each server: one for each (protocol, ipAddr, port) combination. If clustering is used, the clustering-related MIB objects will assume a higher priority.

Measurement	Description
<b>ListenPort</b>	Port number.
<b>ListenAdminOK</b>	<b>True</b> if admin requests are allowed on this (protocol, ipAddr, port) combination; otherwise false.
<b>ListenState</b>	<b>Listening</b> if the (protocol, ipAddr, port) combination is enabled on the server; <b>Not Listening</b> if it is not. The server may be listening but not accepting new clients if its server Login Enable state is false. In this case, existing clients will continue to function, but new ones will not.

## WebLogic (SNMP) ClassPath Table Measurements

The ClassPath Table is the table of classpath elements for Java, WebLogic (SNMP) server, and servlets. There are multiple entries in this table for each server. There may also be multiple entries for each path on a server. If clustering is used, the clustering-related MIB objects will assume a higher priority.

Measurement	Description
<b>CPType</b>	The type of CP element: Java, WebLogic, servlet. A Java CPType means the CP element is one of the elements in the normal Java classpath. A WebLogic CPType means the CP element is one of the elements in weblogic.class.path. A servlet CPType means the CP element is one of the elements in the dynamic servlet classpath.
<b>CPIndex</b>	The position of an element within its path. The index starts at 1.

## WebSphere Application Server Monitor Run-Time Resource Measurements

Contains resources related to the Java Virtual Machine run time, as well as the ORB.

Measurement	Description
<b>MemoryFree</b>	The amount of free memory remaining in the Java Virtual Machine.
<b>MemoryTotal</b>	The total memory allocated for the Java Virtual Machine.
<b>MemoryUse</b>	The total memory in use on the Java Virtual Machine.

## WebSphere Application Server Monitor BeanData Measurements

Every home on the server provides performance data, depending on the type of bean deployed in the home. The top level bean data holds an aggregate of all the containers.

Measurement	Description
<b>BeanDestroys</b>	The number of times an individual bean object was destroyed. This applies to any bean, regardless of its type.

, continued

Measurement	Description
<b>StatelessBeanDestroys</b>	The number of times a stateless session bean object was destroyed.
<b>StatefulBeanDestroys</b>	The number of times a stateful session bean object was destroyed.

## Websphere Application Server Monitor BeanObjectPool Measurements

The server holds a cache of bean objects. Each home has a cache and there is therefore one BeanObjectPoolContainer per container. The top level, BeanObjectPool, holds an aggregate of all the containers data.

Measurement	Description
<b>NumGetFound</b>	The number of calls to the pool that resulted in finding an available bean.
<b>NumPutsDiscarded</b>	The number of times releasing a bean to the pool resulted in the bean being discarded because the pool was full.

## Websphere Application Server Monitor OrbThreadPool Measurements

These are resources related to the ORB thread pool that is on the server.

Measurement	Description
<b>ActiveThreads</b>	The average number of active threads in the pool.
<b>TotalThreads</b>	The average number of threads in the pool.
<b>PercentTimeMaxed</b>	The average percent of the time that the number of threads in the pool reached or exceeded the desired maximum number.

## Websphere Application Server Monitor DBConnectionMgr Measurements

These are resources related to the database connection manager. The manager consists of a series of data sources, as well as a top-level aggregate of each of the performance metrics.

Measurement	Description
<b>ConnectionWaitTime</b>	The average time (in seconds) of a connection grant.
<b>ConnectionTime</b>	The average time (in seconds) that a connection is in use.
<b>ConnectionPercentUsed</b>	The average percentage of the pool that is in use.

## Websphere Application Server Monitor TransactionData Measurements

These are resources that pertain to transactions.

Measurement	Description
<b>NumTransactions</b>	The number of transactions processed.
<b>ActiveTransactions</b>	The average number of active transactions.
<b>TransactionRT</b>	The average duration of each transaction.
<b>RolledBack</b>	The number of transactions rolled back.
<b>Timeouts</b>	The number of transactions that timed out due to inactivity timeouts.
<b>TransactionSuspended</b>	The average number of times that a transaction was suspended.

## Websphere Application Server Monitor ServletEngine Measurements

These are resources that are related to servlets and JSPs.

Measurement	Description
<b>ServletErrors</b>	The number of requests that resulted in an error or an exception.

## Websphere Application Server Monitor Session Measurements

These are general metrics regarding the HTTP session pool.

Measurement	Description
<b>SessionsInvalidated</b>	The number of invalidated sessions. May not be valid when using sessions in the database mode.

## Microsoft Active Server Pages (ASP) Graph

This graph displays statistics about the resource usage on the ASP server during the load test scenario run.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage on the ASP server.
<b>Note</b>	To obtain data for this graph, you need to enable the Microsoft ASP online monitor (from the Controller) and select the default measurements you want to display, before running the scenario.
<b>See also</b>	<a href="#">"Web Application Server Resource Graphs Overview" on page 249</a> <a href="#">"Web Application Server Resource Graphs Measurements" on page 250</a>

## Oracle9iAS HTTP Server Graph

This graph displays statistics about the resource usage on the Oracle9iAS HTTP server during the load test scenario run.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage on the Oracle9iAS HTTP server.
<b>Note</b>	To obtain data for this graph, you need to enable the Oracle9iAS HTTP online monitor (from the Controller), and select the default measurements you want to display, before running the scenario.
<b>See also</b>	<a href="#">"Web Application Server Resource Graphs Overview" on page 249</a> <a href="#">"Web Application Server Resource Graphs Measurements" on page 250</a>

## WebLogic (SNMP) Graph

This graph displays statistics about the resource usage on the WebLogic (SNMP) server (version 6.0 and earlier) during the load test scenario run.

<b>X-axis</b>	The elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage on the WebLogic (SNMP) server.
<b>Note</b>	To obtain data for this graph, you need to enable the WebLogic (SNMP) online monitor (from the Controller) and select the default measurements you want to display, before running the scenario.
<b>See also</b>	<a href="#">"Web Application Server Resource Graphs Overview" on page 249</a> <a href="#">"Web Application Server Resource Graphs Measurements" on page 250</a>

## WebSphere Application Server Graph

This graph displays statistics about the resource usage on the WebSphere application server during the load test scenario run.

<b>X-axis</b>	Elapsed time since the start of the run.
---------------	--

<b>Y-axis</b>	The resource usage on the WebSphere Application server.
<b>Note</b>	To obtain data for this graph, you need to configure the WebSphere Application Server online monitor (from the Controller) and select the default measurements you want to display, before running the scenario.
<b>See also</b>	<a href="#">"Web Application Server Resource Graphs Overview" on page 249</a> <a href="#">"Web Application Server Resource Graphs Measurements" on page 250</a>

## Database Server Resource Graphs

### Database Server Resource Graphs Overview

The Database Server Resource graphs show statistics for several database servers. Currently DB2, Oracle, SQL server, and Sybase databases are supported. These graphs require that you specify the resources you want to measure *before* running the load test scenario. For more information, see the section on online monitors in the LoadRunner Controller documentation.

### DB2 Database Manager Counters

Measurement	Description
<b>rem_cons_in</b>	The current number of connections initiated from remote clients to the instance of the database manager that is being monitored.
<b>rem_cons_in_exec</b>	The number of remote applications that are currently connected to a database and are currently processing a unit of work within the database manager instance being monitored.
<b>local_cons</b>	The number of local applications that are currently connected to a database within the database manager instance being monitored.
<b>local_cons_in_exec</b>	The number of local applications that are currently connected to a database within the database manager instance being monitored and are currently processing a unit of work.

, continued

Measurement	Description
<b>con_local_dbases</b>	The number of local databases that have applications connected.
<b>agents_registered</b>	The number of agents registered in the database manager instance that is being monitored (coordinator agents and subagents).
<b>agents_waiting_on_token</b>	The number of agents waiting for a token so they can execute a transaction in the database manager.
<b>idle_agents</b>	The number of agents in the agent pool that are currently unassigned to an application and are therefore "idle".
<b>agents_from_pool</b>	The number of agents assigned from the agent pool.
<b>agents_created_empty_pool</b>	The number of agents created because the agent pool was empty.
<b>agents_stolen</b>	The number of times that agents are stolen from an application. Agents are stolen when an idle agent associated with an application is reassigned to work on a different application.
<b>comm_private_mem</b>	The amount of private memory that the instance of the database manager has currently committed at the time of the snapshot.
<b>inactive_gw_agents</b>	The number of DRDA agents in the DRDA connections pool that are primed with a connection to a DRDA database, but are inactive.
<b>num_gw_conn_switches</b>	The number of times that an agent from the agents pool was primed with a connection and was stolen for use with a different DRDA database.
<b>sort_heap_allocated</b>	The total number of allocated pages of sort heap space for all sorts at the level chosen and at the time the snapshot was taken.



, continued

Measurement	Description
<b>post_threshold_sorts</b>	The number of sorts that have requested heaps after the sort heap threshold has been reached.
<b>pipedsortsrequested</b>	The number of piped sorts that have been requested.
<b>pipedsortsaccepted</b>	The number of piped sorts that have been accepted.

## DB2 Database Counters

Measurement	Description
<b>appls_cur_cons</b>	Indicates the number of applications that are currently connected to the database.
<b>appls_in_db2</b>	Indicates the number of applications that are currently connected to the database, and for which the database manager is currently processing a request.
<b>total_sec_cons</b>	The number of connections made by a sub-agent to the database at the node.
<b>num_assoc_agents</b>	At the application level, this is the number of sub-agents associated with an application. At the database level, it is the number of sub-agents for all applications.
<b>sort_heap_allocated</b>	The total number of allocated pages of sort heap space for all sorts at the level chosen and at the time the snapshot was taken.
<b>total_sorts</b>	The total number of sorts that have been executed.
<b>total_sort_time</b>	The total elapsed time (in milliseconds) for all sorts that have been executed.

, continued

Measurement	Description
<b>sort_overflows</b>	The total number of sorts that ran out of sort heap and may have required disk space for temporary storage.
<b>active_sorts</b>	The number of sorts in the database that currently have a sort heap allocated.
<b>total_hash_joins</b>	The total number of hash joins executed.
<b>total_hash_loops</b>	The total number of times that a single partition of a hash join was larger than the available sort heap space.
<b>hash_join_overflows</b>	The number of times that hash join data exceeded the available sort heap space.
<b>hash_join_small_overflows</b>	The number of times that hash join data exceeded the available sort heap space by less than 10%.
<b>pool_data_l_reads</b>	The number of logical read requests for data pages that have gone through the buffer pool.
<b>pool_data_p_reads</b>	The number of read requests that required I/O to get data pages into the buffer pool.
<b>pool_data_writes</b>	Indicates the number of times a buffer pool data page was physically written to disk.
<b>pool_index_l_reads</b>	The number of logical read requests for index pages that have gone through the buffer pool.
<b>pool_index_p_reads</b>	The number of physical read requests to get index pages into the buffer pool.
<b>pool_index_writes</b>	The number of times a buffer pool index page was physically written to disk.
<b>pool_read_time</b>	The total amount of elapsed time spent processing read requests that caused data or index pages to be physically read from disk to buffer pool.

, continued

Measurement	Description
<b>pool_write_time</b>	The total amount of time spent physically writing data or index pages from the buffer pool to disk.
<b>files_closed</b>	The total number of database files closed.
<b>pool_async_data_reads</b>	The number of pages read asynchronously into the buffer pool.
<b>pool_async_data_writes</b>	The number of times a buffer pool data page was physically written to disk by either an asynchronous page cleaner, or a pre-fetcher. A pre-fetcher may have written dirty pages to disk to make space for the pages being pre-fetched.
<b>pool_async_index_writes</b>	The number of times a buffer pool index page was physically written to disk by either an asynchronous page cleaner, or a pre-fetcher. A pre-fetcher may have written dirty pages to disk to make space for the pages being pre-fetched.
<b>pool_async_index_reads</b>	The number of index pages read asynchronously into the buffer pool by a pre-fetcher.
<b>pool_async_read_time</b>	The total elapsed time spent reading by database manager pre-fetchers.
<b>pool_async_write_time</b>	The total elapsed time spent writing data or index pages from the buffer pool to disk by database manager page cleaners.
<b>pool_async_data_read_reqs</b>	The number of asynchronous read requests.
<b>pool_lsn_gap_clns</b>	The number of times a page cleaner was invoked because the logging space used had reached a pre-defined criterion for the database.
<b>pool_drty_pg_steal_clns</b>	The number of times a page cleaner was invoked because a synchronous write was needed during the victim buffer replacement for the database.

, continued

Measurement	Description
<b>pool_drt_y_pg_thrsh_clns</b>	The number of times a page cleaner was invoked because a buffer pool had reached the dirty page threshold criterion for the database.
<b>prefetch_wait_time</b>	The time an application spent waiting for an I/O server (pre-fetcher) to finish loading pages into the buffer pool.
<b>pool_data_to_estore</b>	The number of buffer pool data pages copied to extended storage.
<b>pool_index_to_estore</b>	The number of buffer pool index pages copied to extended storage.
<b>pool_data_from_estore</b>	The number of buffer pool data pages copied from extended storage.
<b>pool_index_from_estore</b>	The number of buffer pool index pages copied from extended storage.
<b>direct_reads</b>	The number of read operations that do not use the buffer pool.
<b>direct_writes</b>	The number of write operations that do not use the buffer pool.
<b>direct_read_reqs</b>	The number of requests to perform a direct read of one or more sectors of data.
<b>direct_write_reqs</b>	The number of requests to perform a direct write of one or more sectors of data.
<b>direct_read_time</b>	The elapsed time (in milliseconds) required to perform the direct reads.
<b>direct_write_time</b>	The elapsed time (in milliseconds) required to perform the direct writes.
<b>cat_cache_lookups</b>	The number of times that the catalog cache was referenced to obtain table descriptor information.
<b>cat_cache_inserts</b>	The number of times that the system tried to insert table descriptor information into the catalog cache.

, continued

Measurement	Description
<b>cat_cache_overflows</b>	The number of times that an insert into the catalog cache failed due the catalog cache being full.
<b>cat_cache_heap_full</b>	The number of times that an insert into the catalog cache failed due to a heap-full condition in the database heap.
<b>pkg_cache_lookups</b>	The number of times that an application looked for a section or package in the package cache. At a database level, it indicates the overall number of references since the database was started, or monitor data was reset.
<b>pkg_cache_inserts</b>	The total number of times that a requested section was not available for use and had to be loaded into the package cache. This count includes any implicit prepares performed by the system.
<b>pkg_cache_num_overflows</b>	The number of times that the package cache overflowed the bounds of its allocated memory.
<b>appl_section_lookups</b>	Lookups of SQL sections by an application from its SQL work area.
<b>appl_section_inserts</b>	Inserts of SQL sections by an application from its SQL work area.
<b>sec_logs_allocated</b>	The total number of secondary log files that are currently being used for the database.
<b>log_reads</b>	The number of log pages read from disk by the logger.
<b>log_writes</b>	The number of log pages written to disk by the logger.
<b>total_log_used</b>	The total amount of active log space currently used (in bytes) in the database.
<b>locks_held</b>	The number of locks currently held.

, continued

Measurement	Description
<b>lock_list_in_use</b>	The total amount of lock list memory (in bytes) that is in use.
<b>deadlocks</b>	The total number of deadlocks that have occurred.
<b>lock_escals</b>	The number of times that locks have been escalated from several row locks to a table lock.
<b>x_lock_escals</b>	The number of times that locks have been escalated from several row locks to one exclusive table lock, or the number of times an exclusive lock on a row caused the table lock to become an exclusive lock.
<b>lock_timeouts</b>	The number of times that a request to lock an object timed-out instead of being granted.
<b>lock_waits</b>	The total number of times that applications or connections waited for locks.
<b>lock_wait_time</b>	The total elapsed time waited for a lock.
<b>locks_waiting</b>	The number of agents waiting on a lock.
<b>rows_deleted</b>	The number of row deletions attempted.
<b>rows_inserted</b>	The number of row insertions attempted.
<b>rows_updated</b>	The number of row updates attempted.
<b>rows_selected</b>	The number of rows that have been selected and returned to the application.
<b>int_rows_deleted</b>	The number of rows deleted from the database as a result of internal activity.
<b>int_rows_updated</b>	The number of rows updated from the database as a result of internal activity.

, continued

Measurement	Description
<b>int_rows_inserted</b>	The number of rows inserted into the database as a result of internal activity caused by triggers.
<b>static_sql_stmts</b>	The number of static SQL statements that were attempted.
<b>dynamic_sql_stmts</b>	The number of dynamic SQL statements that were attempted.
<b>failed_sql_stmts</b>	The number of SQL statements that were attempted, but failed.
<b>commit_sql_stmts</b>	The total number of SQL COMMIT statements that have been attempted.
<b>rollback_sql_stmts</b>	The total number of SQL ROLLBACK statements that have been attempted.
<b>select_sql_stmts</b>	The number of SQL SELECT statements that were executed.
<b>uid_sql_stmts</b>	The number of SQL UPDATE, INSERT, and DELETE statements that were executed.
<b>ddl_sql_stmts</b>	The number of SQL Data Definition Language (DDL) statements that were executed.
<b>int_auto_rebinds</b>	The number of automatic rebinds (or recompiles) that have been attempted.
<b>int_commits</b>	The total number of commits initiated internally by the database manager.
<b>int_rollbacks</b>	The total number of rollbacks initiated internally by the database manager.
<b>int_deadlock_rollbacks</b>	The total number of forced rollbacks initiated by the database manager due to a deadlock. A rollback is performed on the current unit of work in an application selected by the database manager to resolve the deadlock.

, continued

Measurement	Description
<b>binds_ precompiles</b>	The number of binds and pre-compiles attempted.

## DB2 Application Counters

Measurement	Description
<b>agents_ stolen</b>	The number of times that agents are stolen from an application. Agents are stolen when an idle agent associated with an application is reassigned to work on a different application.
<b>num_assoc_ agents</b>	At the application level, this is the number of sub-agents associated with an application. At the database level, it is the number of sub-agents for all applications.
<b>total_sorts</b>	The total number of sorts that have been executed.
<b>total_sort_ time</b>	The total elapsed time (in milliseconds) for all sorts that have been executed.
<b>sort_ overflows</b>	The total number of sorts that ran out of sort heap and may have required disk space for temporary storage.
<b>total_hash_ joins</b>	The total number of hash joins executed.
<b>total_hash_ loops</b>	The total number of times that a single partition of a hash join was larger than the available sort heap space.
<b>hash_join_ overflows</b>	The number of times that hash join data exceeded the available sort heap space
<b>hash_join_ small_ overflows</b>	The number of times that hash join data exceeded the available sort heap space by less than 10%.



, continued

Measurement	Description
<b>pool_data_l_reads</b>	The number of logical read requests for data pages that have gone through the buffer pool.
<b>pool_data_p_reads</b>	The number of read requests that required I/O to get data pages into the buffer pool.
<b>pool_data_writes</b>	The number of times a buffer pool data page was physically written to disk.
<b>pool_index_l_reads</b>	The number of logical read requests for index pages that have gone through the buffer pool.
<b>pool_index_p_reads</b>	The number of physical read requests to get index pages into the buffer pool.
<b>pool_index_writes</b>	The number of times a buffer pool index page was physically written to disk.
<b>pool_read_time</b>	The total amount of elapsed time spent processing read requests that caused data or index pages to be physically read from disk to buffer pool.
<b>prefetch_wait_time</b>	The time an application spent waiting for an I/O server (prefetcher) to finish loading pages into the buffer pool.
<b>pool_data_to_estore</b>	The number of buffer pool data pages copied to extended storage.
<b>pool_index_to_estore</b>	The number of buffer pool index pages copied to extended storage.
<b>pool_data_from_estore</b>	The number of buffer pool data pages copied from extended storage.
<b>pool_index_from_estore</b>	The number of buffer pool index pages copied from extended storage.
<b>direct_reads</b>	The number of read operations that do not use the buffer pool.
<b>direct_writes</b>	The number of write operations that do not use the buffer pool.

, continued

Measurement	Description
<b>direct_read_reqs</b>	The number of requests to perform a direct read of one or more sectors of data.
<b>direct_write_reqs</b>	The number of requests to perform a direct write of one or more sectors of data.
<b>direct_read_time</b>	The elapsed time (in milliseconds) required to perform the direct reads.
<b>direct_write_time</b>	The elapsed time (in milliseconds) required to perform the direct writes.
<b>cat_cache_lookups</b>	The number of times that the catalog cache was referenced to obtain table descriptor information.
<b>cat_cache_inserts</b>	The number of times that the system tried to insert table descriptor information into the catalog cache.
<b>cat_cache_overflows</b>	The number of times that an insert into the catalog cache failed due to the catalog cache being full.
<b>cat_cache_heap_full</b>	The number of times that an insert into the catalog cache failed due to a heap-full condition in the database heap.
<b>pkg_cache_lookups</b>	The number of times that an application looked for a section or package in the package cache. At a database level, it indicates the overall number of references since the database was started, or monitor data was reset.
<b>pkg_cache_inserts</b>	The total number of times that a requested section was not available for use and had to be loaded into the package cache. This count includes any implicit prepares performed by the system.
<b>appl_section_lookups</b>	Lookups of SQL sections by an application from its SQL work area.

, continued

Measurement	Description
<b>appl_section_inserts</b>	Inserts of SQL sections by an application from its SQL work area.
<b>uow_log_space_used</b>	The amount of log space (in bytes) used in the current unit of work of the monitored application.
<b>locks_held</b>	The number of locks currently held.
<b>deadlocks</b>	The total number of deadlocks that have occurred.
<b>lock_escals</b>	The number of times that locks have been escalated from several row locks to a table lock.
<b>x_lock_escals</b>	The number of times that locks have been escalated from several row locks to one exclusive table lock, or the number of times an exclusive lock on a row caused the table lock to become an exclusive lock.
<b>lock_timeouts</b>	The number of times that a request to lock an object timed-out instead of being granted.
<b>lock_waits</b>	The total number of times that applications or connections waited for locks.
<b>lock_wait_time</b>	The total elapsed time waited for a lock.
<b>locks_waiting</b>	The number of agents waiting on a lock.
<b>uow_lock_wait_time</b>	The total amount of elapsed time this unit of work has spent waiting for locks.
<b>rows_deleted</b>	The number of row deletions attempted.
<b>rows_inserted</b>	The number of row insertions attempted.
<b>rows_updated</b>	The number of row updates attempted.

, continued

Measurement	Description
<b>rows_selected</b>	The number of rows that have been selected and returned to the application.
<b>rows_written</b>	The number of rows changed (inserted, deleted or updated) in the table.
<b>rows_read</b>	The number of rows read from the table.
<b>int_rows_deleted</b>	The number of rows deleted from the database as a result of internal activity.
<b>int_rows_updated</b>	The number of rows updated from the database as a result of internal activity.
<b>int_rows_inserted</b>	The number of rows inserted into the database as a result of internal activity caused by triggers.
<b>open_rem_curs</b>	The number of remote cursors currently open for this application, including those cursors counted by `open_rem_curs_blk`.
<b>open_rem_curs_blk</b>	The number of remote blocking cursors currently open for this application.
<b>rej_curs_blk</b>	The number of times that a request for an I/O block at server was rejected and the request was converted to non-blocked I/O.
<b>acc_curs_blk</b>	The number of times that a request for an I/O block was accepted.
<b>open_loc_curs</b>	The number of local cursors currently open for this application, including those cursors counted by `open_loc_curs_blk`.
<b>open_loc_curs_blk</b>	The number of local blocking cursors currently open for this application.
<b>static_sql_stmts</b>	The number of static SQL statements that were attempted.
<b>dynamic_sql_stmts</b>	The number of dynamic SQL statements that were attempted.

, continued

Measurement	Description
<b>failed_sql_stmts</b>	The number of SQL statements that were attempted, but failed.
<b>commit_sql_stmts</b>	The total number of SQL COMMIT statements that have been attempted.
<b>rollback_sql_stmts</b>	The total number of SQL ROLLBACK statements that have been attempted.
<b>select_sql_stmts</b>	The number of SQL SELECT statements that were executed.
<b>uid_sql_stmts</b>	The number of SQL UPDATE, INSERT, and DELETE statements that were executed.
<b>ddl_sql_stmts</b>	This element indicates the number of SQL Data Definition Language (DDL) statements that were executed.
<b>int_auto_rebinds</b>	The number of automatic rebinds (or recompiles) that have been attempted.
<b>int_commits</b>	The total number of commits initiated internally by the database manager.
<b>int_rollbacks</b>	The total number of rollbacks initiated internally by the database manager.
<b>int_deadlock_rollbacks</b>	The total number of forced rollbacks initiated by the database manager due to a deadlock. A rollback is performed on the current unit of work in an application selected by the database manager to resolve the deadlock.
<b>binds_precompiles</b>	The number of binds and pre-compiles attempted.

## Oracle Server Monitoring Measurements

The following measurements are most commonly used when monitoring the Oracle server (from the V\$SYSSTAT table):

Measurement	Description
<b>CPU used by this session</b>	The amount of CPU time (in tens of milliseconds) used by a session between the time a user call started and ended. Some user calls can be completed within 10 milliseconds and, as a result, the start- and end-user call time can be the same. In this case, 0 milliseconds are added to the statistic. A similar problem can exist in the operating system reporting, especially on systems that suffer from many context switches.
<b>Bytes received via SQL*Net from client</b>	The total number of bytes received from the client over Net8.
<b>Logons current</b>	The total number of current logons.
<b>Opens of replaced files</b>	The total number of files that needed to be reopened because they were no longer in the process file cache.
<b>User calls</b>	Oracle allocates resources (Call State Objects) to keep track of relevant user call data structures every time you log in, parse, or execute. When determining activity, the ratio of user calls to RPI calls gives you an indication of how much internal work is generated as a result of the type of requests the user is sending to Oracle.
<b>SQL*Net roundtrips to/from client</b>	The total number of Net8 messages sent to, and received from, the client.
<b>Bytes sent via SQL*Net to client</b>	The total number of bytes sent to the client from the foreground process(es).
<b>Opened cursors current</b>	The total number of current open cursors.

, continued

Measurement	Description
<b>DB block changes</b>	Closely related to consistent changes, this statistic counts the total number of changes that were made to all blocks in the SGA that were part of an update or delete operation. These are changes that generate redo log entries and hence cause permanent changes to the database if the transaction is committed. This statistic is a rough indication of total database work and indicates (possibly on a per-transaction level) the rate at which buffers are being dirtied.
<b>Total file opens</b>	The total number of file opens being performed by the instance. Each process needs a number of files (control file, log file, database file) in order to work against the database.

## SQL Server Default Counters

Measurement	Description
<b>% Total Processor Time</b>	The average percentage of time that all the processors on the system are busy executing non-idle threads. On a multi-processor system, if all processors are always busy, this is 100%, if all processors are 50% busy this is 50% and if 1/4 of the processors are 100% busy this is 25%. It can be viewed as the fraction of the time spent doing useful work. Each processor is assigned an Idle thread in the Idle process which consumes those unproductive processor cycles not used by any other threads.
<b>Cache Hit Ratio</b>	The percentage of time that a requested data page was found in the data cache (instead of being read from disk).
<b>I/O - Batch Writes/sec</b>	The number of pages written to disk per second, using Batch I/O. The checkpoint thread is the primary user of Batch I/O.
<b>I/O - Lazy Writes/sec</b>	The number of pages flushed to disk per second by the Lazy Writer.

, continued

Measurement	Description
<b>I/O - Outstanding Reads</b>	The number of physical reads pending.
<b>I/O - Outstanding Writes</b>	The number of physical writes pending.
<b>I/O - Page Reads/sec</b>	The number of physical page reads per second.
<b>I/O - Transactions/sec</b>	The number of Transact-SQL command batches executed per second.
<b>User Connections</b>	The number of open user connections.
<b>% Processor Time</b>	The percentage of time that the processor is executing a non-idle thread. This counter was designed as a primary indicator of processor activity. It is calculated by measuring the time that the processor spends executing the thread of the idle process in each sample interval, and subtracting that value from 100%. (Each processor has an idle thread which consumes cycles when no other threads are ready to run). It can be viewed as the percentage of the sample interval spent doing useful work. This counter displays the average percentage of busy time observed during the sample interval. It is calculated by monitoring the time the service was inactive, and then subtracting that value from 100%.

## Sybase Server Monitoring Measurements

The following tables describe the measurements that can be monitored on a Sybase server:



Object	Measurement	Description
Network	Average packet size (Read)	Reports the number of network packets received.
	Average packet size (Send)	Reports the number of network packets sent.
	Network bytes (Read)	Reports the number of bytes received, over the sampling interval.
	Network bytes (Read)/sec	Reports the number of bytes received, per second.
	Network bytes (Send)	Reports the number of bytes sent, over the sampling interval.
	Network bytes (Send)/sec	Reports the number of bytes sent, per second.
	Network packets (Read)	Reports the number of network packets received, over the sampling interval.
	Network packets (Read)/sec	Reports the number of network packets received, per second.
	Network packets (Send)	Reports the number of network packets sent, over the sampling interval.
	Network packets (Send)/sec	Reports the number of network packets sent, per second.
Memory	Memory	Reports the amount of memory (in bytes) allocated for the page cache.

, continued

Object	Measurement	Description
<b>Disk</b>	<b>Reads</b>	Reports the number of reads made from a database device.
	<b>Writes</b>	Reports the number of writes made to a database device.
	<b>Waits</b>	Reports the number of times that access to a device had to wait.
	<b>Grants</b>	Reports the number of times access to a device was granted.
<b>Engine</b>	<b>Server is busy (%)</b>	Reports the percentage of time during which the Adaptive Server is in a "busy" state.
	<b>CPU time</b>	Reports how much "busy" time was used by the engine.
	<b>Logical pages (Read)</b>	Reports the number of data page reads, whether satisfied from cache or from a database device.
	<b>Pages from disk (Read)</b>	Reports the number of data page reads that could not be satisfied from the data cache.
	<b>Pages stored</b>	Reports the number of data pages written to a database device.

, continued

Object	Measurement	Description
<b>Stored Procedures</b>	<b>Executed (sampling period)</b>	Reports the number of times a stored procedure was executed, over the sampling interval.
	<b>Executed (session)</b>	Reports the number of times a stored procedure was executed, during the session.
	<b>Average duration (sampling period)</b>	Reports the time (in seconds) spent executing a stored procedure, over the sampling interval.
	<b>Average duration (session)</b>	Reports the time (in seconds) spent executing a stored procedure, during the session.
<b>Locks</b>	<b>% Requests</b>	Reports the percentage of successful requests for locks.
	<b>Locks count</b>	Reports the number of locks. This is an accumulated value.
	<b>Granted immediately</b>	Reports the number of locks that were granted immediately, without having to wait for another lock to be released.
	<b>Granted after wait</b>	Reports the number of locks that were granted after waiting for another lock to be released.
	<b>Not granted</b>	Reports the number of locks that were requested but not granted.
	<b>Wait time (avg.)</b>	Reports the average wait time for a lock.

, continued

Object	Measurement	Description
SqlSrvr	<b>Locks/sec</b>	Reports the number of locks. This is an accumulated value.
	<b>% Processor time (server)</b>	Reports the percentage of time that the Adaptive Server is in a "busy" state.
	<b>Transactions</b>	Reports the number of committed Transact-SQL statement blocks (transactions).
	<b>Deadlocks</b>	Reports the number of deadlocks.
Cache	<b>% Hits</b>	Reports the percentage of times that a data page read could be satisfied from cache without requiring a physical page read.
	<b>Pages (Read)</b>	Reports the number of data page reads, whether satisfied from cache or from a database device.
Cache	<b>Pages (Read) /sec</b>	Reports the number of data page reads, whether satisfied from cache or from a database device, per second.
	<b>Pages from disk (Read)</b>	Reports the number of data page reads that could not be satisfied from the data cache.
	<b>Pages from disk (Read)/sec</b>	Reports the number of data page reads, per second, that could not be satisfied from the data cache.
	<b>Pages (Write)</b>	Reports the number of data pages written to a database device.
	<b>Pages (Write) /sec</b>	Reports the number of data pages written to a database device, per second.

, continued

Object	Measurement	Description
<b>Process</b>	<b>% Processor time (process)</b>	Reports the percentage of time that a process running a given application was in the "Running" state (out of the time that all processes were in the "Running" state).
	<b>Locks/sec</b>	Reports the number of locks, by process. This is an accumulated value.
	<b>% Cache hit</b>	Reports the percentage of times that a data page read could be satisfied from cache without requiring a physical page read, by process.
	<b>Pages (Write)</b>	Reports the number of data pages written to a database device, by process.
<b>Transaction</b>	<b>Transactions</b>	Reports the number of committed Transact-SQL statement blocks (transactions), during the session.

, continued

Object	Measurement	Description
Transaction	Rows (Deleted)	Reports the number of rows deleted from database tables during the session.
	Inserts	Reports the number of insertions into a database table during the session.
	Updates	Reports the updates to database tables during the session.
	Updates in place	Reports the sum of expensive, in-place and not-in-place updates (everything except updates deferred) during the session.
	Transactions/sec	Reports the number of committed Transact-SQL statement blocks (transactions) per second.
	Rows (Deleted) /sec	Reports the number of rows deleted from database tables, per second.
	Inserts/sec	Reports the number of insertions into a database table, per second.
	Updates/sec	Reports the updates to database tables, per second.
	Updates in place/sec	Reports the sum of expensive, in-place and not-in-place updates (everything except updates deferred), per second.

## DB2 Graph

This graph shows the resource usage on the DB2 database server machine as a function of the elapsed load test scenario time.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage on the DB2 database server.

<b>Note</b>	In order to monitor the DB2 database server machine, you must first set up the DB2 monitor environment. You then enable the DB2 monitor (from the Controller) by selecting the counters you want the monitor to measure.
<b>See also</b>	<a href="#">"Database Server Resource Graphs Overview" on page 263</a> <a href="#">"DB2 Database Manager Counters" on page 263</a> <a href="#">"DB2 Database Counters" on page 265</a> <a href="#">"DB2 Application Counters" on page 272</a>

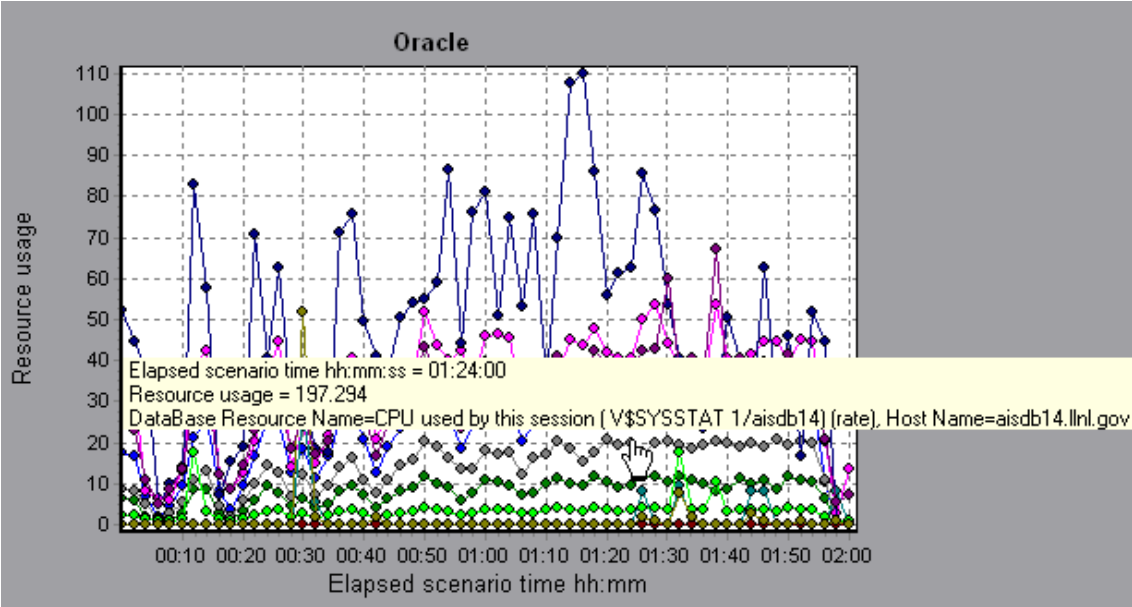
## Oracle Graph

This graph displays information from Oracle V\$ tables: Session statistics, V\$SESSTAT, system statistics, V\$SYSSTAT, and other table counters defined by the user in the custom query.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage on the Oracle server.
<b>Note</b>	To obtain data for this graph, you need to enable the Oracle online monitor (from the Controller) and select the default measurements you want to display, before running the scenario.
<b>See also</b>	<a href="#">"Database Server Resource Graphs Overview" on page 263</a> <a href="#">"Oracle Server Monitoring Measurements" on page 277</a>

### Example

In the following example, the V\$SYSSTAT resource values are shown as a function of the elapsed load test scenario time:



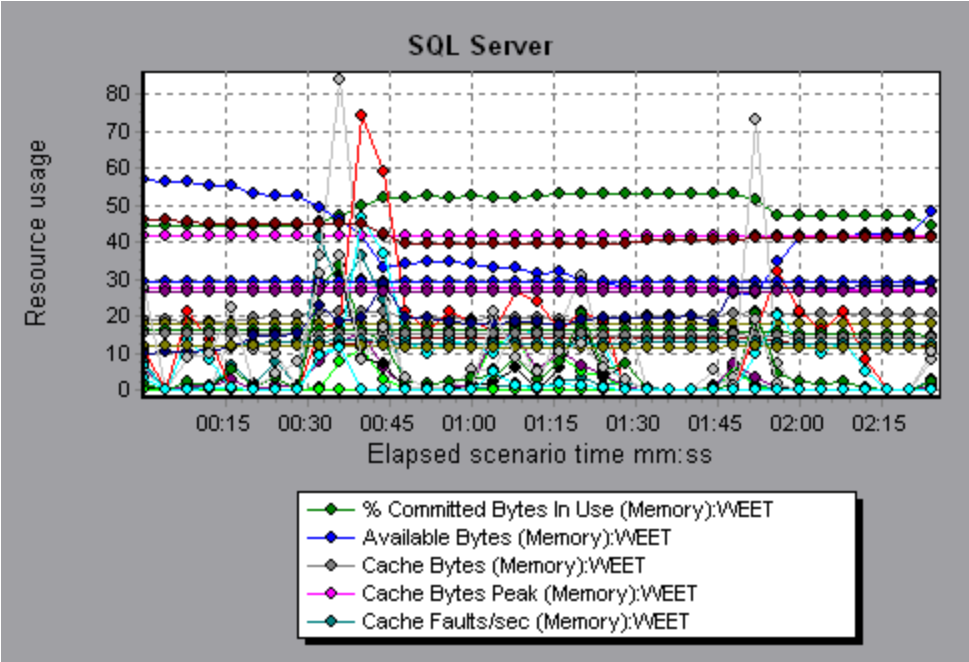
## SQL Server Graph

This graph shows the standard Windows resources on the SQL server machine.

<b>X-axis</b>	Elapsed time since the start of the load test scenario run.
<b>Y-axis</b>	Resource usage
<b>Note</b>	To obtain data for this graph, you need to enable the SQL Server online monitor (from the Controller) and select the default measurements you want to display, before running the scenario.
<b>See also</b>	<a href="#">"Database Server Resource Graphs Overview" on page 263</a> <a href="#">"SQL Server Default Counters" on page 279</a>

### Example





## Sybase Graph

This graph shows the resource usage on the Sybase database server machine as a function of the elapsed load test scenario time.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage on the Sybase database server.
<b>Note</b>	In order to monitor the Sybase database server machine, you must first set up the Sybase monitor environment. You then enable the Sybase monitor (from the Controller) by selecting the counters you want the monitor to measure.
<b>See also</b>	<a href="#">"Database Server Resource Graphs Overview" on page 263</a> <a href="#">"SQL Server Default Counters" on page 279</a>

## Streaming Media Graphs

## Streaming Media Graphs Overview

Streaming Media Resource graphs provide you with performance information for the RealPlayer Client, RealPlayer Server, Windows Media Server, and Media Player Client machines.

In order to obtain data for Streaming Media Resource graphs, you need to install the RealPlayer Client and activate the online monitor for the RealPlayer Server or Windows Media Server before running the load test scenario.

When you set up the online monitor for the RealPlayer Server or Windows Media Server, you indicate which statistics and measurements to monitor. For more information on installing and configuring the Streaming Media Resource monitors, see [Media Player Client Performance Counters](#).

In order to display all the measurements on a single graph, Analysis may scale them. The Legend window indicates the scale factor for each resource. To obtain the true value, multiply the scale factor by the displayed value.

## Media Player Client Monitoring Measurements

The following table describes the Media Player Client measurements that are monitored:

Measurement	Description
<b>Average Buffering Events</b>	The number of times Media Player Client had to buffer incoming media data due to insufficient media content.
<b>Average Buffering Time (sec)</b>	The time spent by Media Player Client waiting for sufficient amount of media data in order to continue playing media clip.
<b>Current bandwidth (Kbits/sec)</b>	The number of kbits per second received.
<b>Number of Packets</b>	The number of packets sent by server for a particular media clip.

, continued

Measurement	Description
<b>Stream Interruptions</b>	The number of interruptions encountered by Media Player Client while playing a media clip. This measurement includes the number of times Media Player Client had to buffer incoming media data, and any errors that occurred during playback.
<b>Stream Quality (Packet-level)</b>	The percentage ratio of packets received to total packets.
<b>Stream Quality (Sampling-level)</b>	The percentage of stream samples received on time (no delays in reception).
<b>Total number of recovered packets</b>	The number of lost packets that were recovered. This value is only relevant during network playback.
<b>Total number of lost packets</b>	The number of lost packets that were not recovered. This value is only relevant during network playback.

## RealPlayer Client Monitoring Measurements

The following table describes the RealPlayer Client measurements that are monitored:

Measurement	Description
<b>Current Bandwidth (Kbits/sec)</b>	The number of kilobytes in the last second.
<b>Buffering Event Time (sec)</b>	The average time spent on buffering.
<b>Network Performance</b>	The ratio (percentage) between the current bandwidth and the actual bandwidth of the clip.

, continued

Measurement	Description
<b>Percentage of Recovered Packets</b>	The percentage of error packets that were recovered.
<b>Percentage of Lost Packets</b>	The percentage of packets that were lost.
<b>Percentage of Late Packets</b>	The percentage of late packets.
<b>Time to First Frame Appearance (sec)</b>	The time for first frame appearance (measured from the start of the replay).
<b>Number of Buffering Events</b>	The average number of all buffering events.
<b>Number of Buffering Seek Events</b>	The average number of buffering events resulting from a seek operation.
<b>Buffering Seek Time</b>	The average time spent on buffering events resulting from a seek operation.
<b>Number of Buffering Congestion Events</b>	The average number of buffering events resulting from network congestion.
<b>Buffering Congestion Time</b>	The average time spent on buffering events resulting from network congestion.
<b>Number of Buffering Live Pause Events</b>	The average number of buffering events resulting from live pause.
<b>Buffering Live Pause Time</b>	The average time spent on buffering events resulting from live pause.

## RealPlayer Server Monitoring Measurements

The following table describes the RealPlayer Client measurements that are monitored:

Measurement	Description
<b>Current Bandwidth (Kbits/sec)</b>	The number of kilobytes in the last second.
<b>Buffering Event Time (sec)</b>	The average time spent on buffering.
<b>Network Performance</b>	The ratio (percentage) between the current bandwidth and the actual bandwidth of the clip.
<b>Percentage of Recovered Packets</b>	The percentage of error packets that were recovered.
<b>Percentage of Lost Packets</b>	The percentage of packets that were lost.
<b>Percentage of Late Packets</b>	The percentage of late packets.
<b>Time to First Frame Appearance (sec)</b>	The time for first frame appearance (measured from the start of the replay).
<b>Number of Buffering Events</b>	The average number of all buffering events.
<b>Number of Buffering Seek Events</b>	The average number of buffering events resulting from a seek operation.
<b>Buffering Seek Time</b>	The average time spent on buffering events resulting from a seek operation.
<b>Number of Buffering Congestion Events</b>	The average number of buffering events resulting from network congestion.
<b>Buffering Congestion Time</b>	The average time spent on buffering events resulting from network congestion.
<b>Number of Buffering Live Pause Events</b>	The average number of buffering events resulting from live pause.
<b>Buffering Live Pause Time</b>	The average time spent on buffering events resulting from live pause.

## Windows Media Server Default Measurements

Measurement	Description
<b>Active Live Unicast Streams (Windows)</b>	The number of live unicast streams that are being streamed.
<b>Active Streams</b>	The number of streams that are being streamed.
<b>Active TCP Streams</b>	The number of TCP streams that are being streamed.
<b>Active UDP Streams</b>	The number of UDP streams that are being streamed.
<b>Aggregate Read Rate</b>	The total, aggregate rate (bytes/sec) of file reads.
<b>Aggregate Send Rate</b>	The total, aggregate rate (bytes/sec) of stream transmission.
<b>Connected Clients</b>	The number of clients connected to the server.
<b>Connection Rate</b>	The rate at which clients are connecting to the server.
<b>Controllers</b>	The number of controllers currently connected to the server.
<b>HTTP Streams</b>	The number of HTTP streams being streamed.
<b>Late Reads</b>	The number of late read completions per second.
<b>Pending Connections</b>	The number of clients that are attempting to connect to the server, but are not yet connected. This number may be high if the server is running near maximum capacity and cannot process a large number of connection requests in a timely manner.

, continued

Measurement	Description
<b>Stations</b>	The number of station objects that currently exist on the server.
<b>Streams</b>	The number of stream objects that currently exist on the server.
<b>Stream Errors</b>	The cumulative number of errors occurring per second.

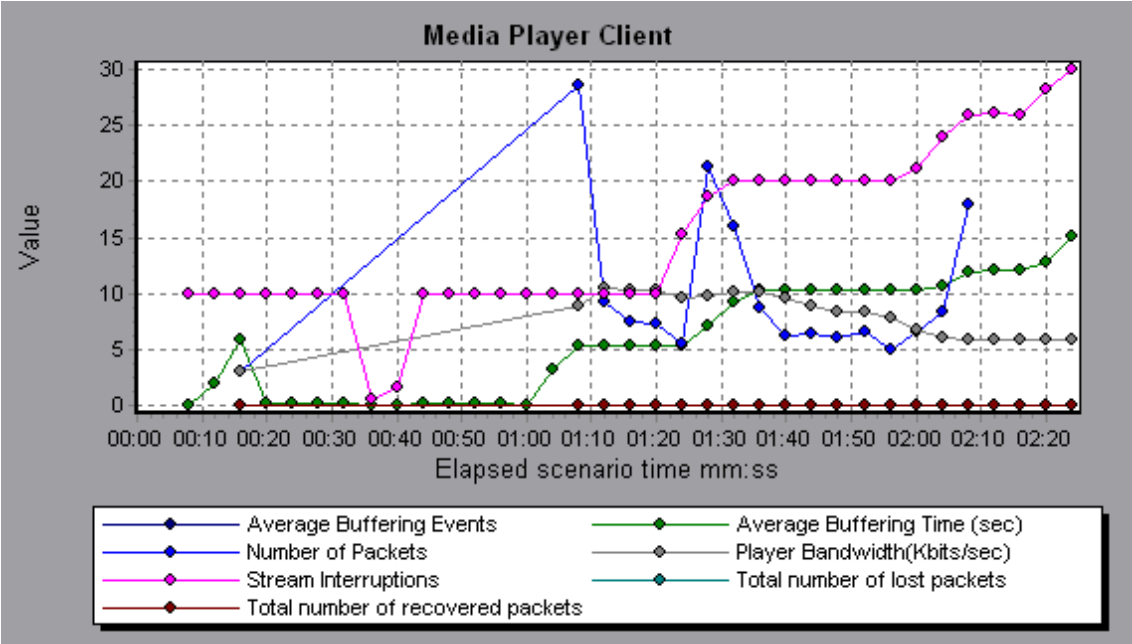
## Media Player Client Graph

This graph shows statistics on the Windows Media Player client machine as a function of the elapsed load test scenario time.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage on the Windows Media Player client machine.
<b>See also</b>	<a href="#">"Streaming Media Graphs Overview" on page 290</a> <a href="#">"Media Player Client Monitoring Measurements" on page 290</a>

### Example

In the following example the **Total number of recovered packets** remained steady during the first two and a half minutes of the scenario. The **Number of Packets** and **Stream Interruptions** fluctuated significantly. The **Average Buffering Time** increased moderately, and the **Player Bandwidth** increased and then decreased moderately. The scale factor for the **Stream Interruptions** and **Average Buffering Events** measurements is 10, and the scale factor for **Player Bandwidth** is 1/10.



## Real Client Graph

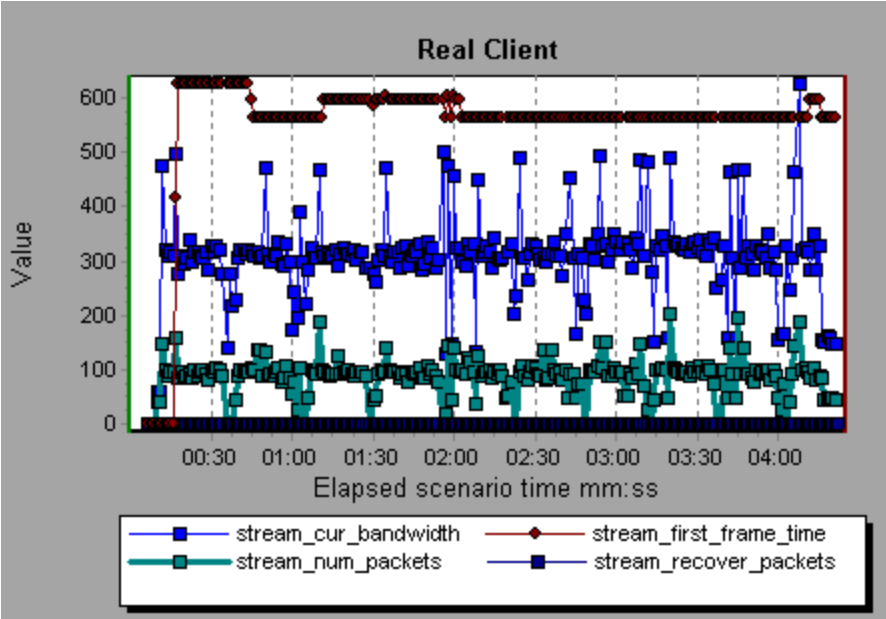
This graph shows statistics on the RealPlayer client machine as a function of the elapsed load test scenario time.

X-axis	Elapsed time since the start of the run.
Y-axis	The resource usage on the RealPlayer client machine.
See also	<a href="#">"Streaming Media Graphs Overview" on page 290</a> <a href="#">"RealPlayer Client Monitoring Measurements" on page 291</a>

### Example

In the following example this graph displays the Total Number of Packets, Number of Recovered Packets, Current Bandwidth, and First Frame Time measurements during the first four and a half minutes of the scenario. The scale factor is the same for all of the measurements.





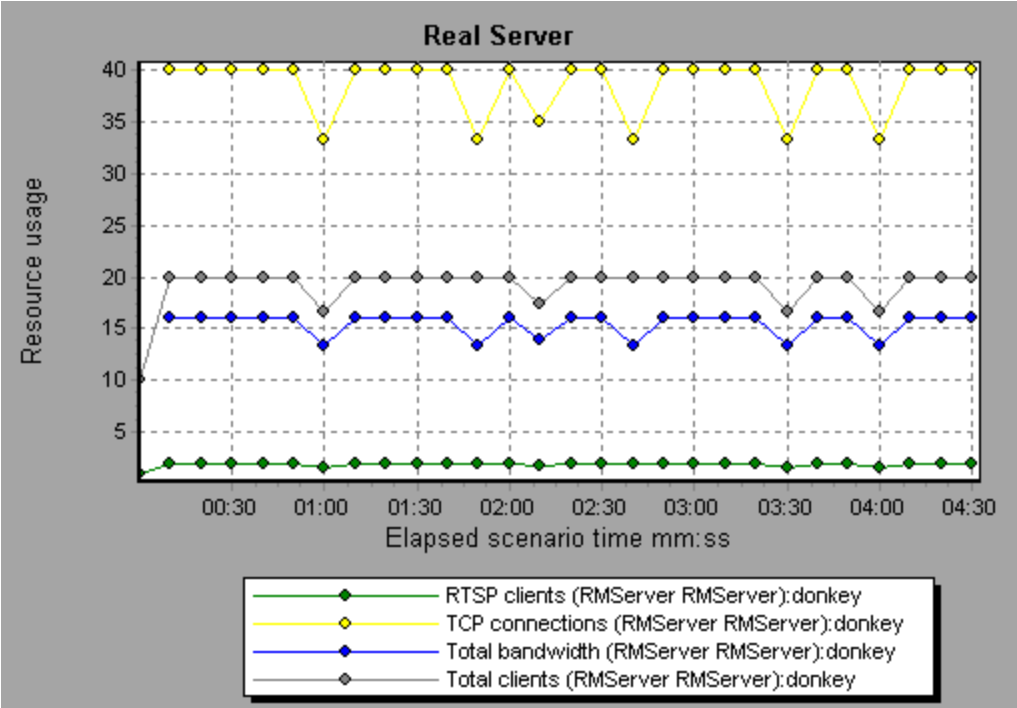
## Real Server Graph

This graph shows RealPlayer server statistics as a function of the elapsed load test scenario time.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage of the RealPlayer server machine.
<b>Note</b>	To obtain data for this graph, you need to enable the RealPlayer Server online monitor (from the Controller) and select the default measurements you want to display, before running the scenario.
<b>See also</b>	<a href="#">"Streaming Media Graphs Overview" on page 290</a> <a href="#">"RealPlayer Server Monitoring Measurements" on page 292</a>

### Example

In the following example this graph displays the Total Number of Packets, Number of Recovered Packets, Current Bandwidth, and First Frame Time measurements during the first four and a half minutes of the scenario. The scale factor is the same for all of the measurements.



## Windows Media Server Graph

This graph shows the Windows Media server statistics as a function of the elapsed load test scenario time.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Resource usage.
<b>Note</b>	To obtain data for this graph, you need to enable the Windows Media Server online monitor (from the Controller) and select the default measurements you want to display, before running the scenario.
<b>See also</b>	<a href="#">"Streaming Media Graphs Overview" on page 290</a> <a href="#">"Windows Media Server Default Measurements" on page 294</a>

## J2EE & .NET Diagnostics Graphs

## J2EE & .NET Diagnostics Graphs Overview

The J2EE & .NET Diagnostics graphs in LoadRunner Analysis enable you to trace, time, and troubleshoot individual transactions and server requests through J2EE & .NET Web, application, and database servers. You can also pinpoint problem servlets and JDBC calls to maximize business process performance, scalability, and efficiency.

The J2EE & .NET Diagnostics graphs are comprised of two groups:

- **J2EE & .NET Diagnostics Graphs.** These graphs show you the performance of requests and methods generated by virtual user transactions. They show you the transaction that generated each request.
- **J2EE & .NET Server Diagnostics Graphs.** These graphs show you the performance of all the requests and methods in the application you are monitoring. These include requests generated by virtual user transactions and by real users.

## How to Enable Diagnostics for J2EE & .NET

To generate Diagnostics for J2EE & .NET data, you must first install HP Diagnostics.

Before you can use HP Diagnostics with LoadRunner, you need to ensure that you have specified the Diagnostics Server details in LoadRunner. Before you can view Diagnostics for J2EE & .NET data in a particular load test scenario, you need to configure the Diagnostics parameters for that scenario. For more information, see the section on online monitors in the LoadRunner Controller documentation.

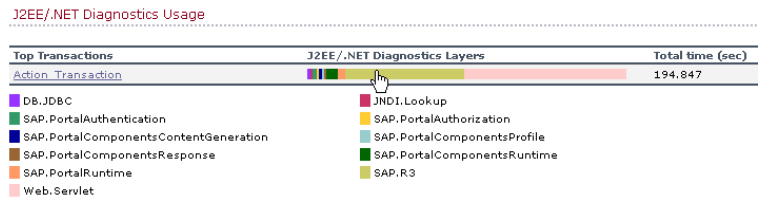
**Note:** To ensure that valid J2EE/.NET diagnostics data is generated during the scenario run, you must manually mark the beginning and end of each transaction in the Vuser script, rather than using automatic transactions.

## Viewing J2EE to SAP R3 Remote Calls

The *Remote Function Call* (RFC) protocol in SAP allows communication to take place between SAP J2EE and SAP R3 environments. When remote calls take place between SAP J2EE and SAP R3 environments, Analysis displays information about the RFC functions, including the name of each function.

You view information about RFC functions by breaking down the SAP R3 layer. You can view the RFC function information in a graph display or in the Chain Of Calls window.

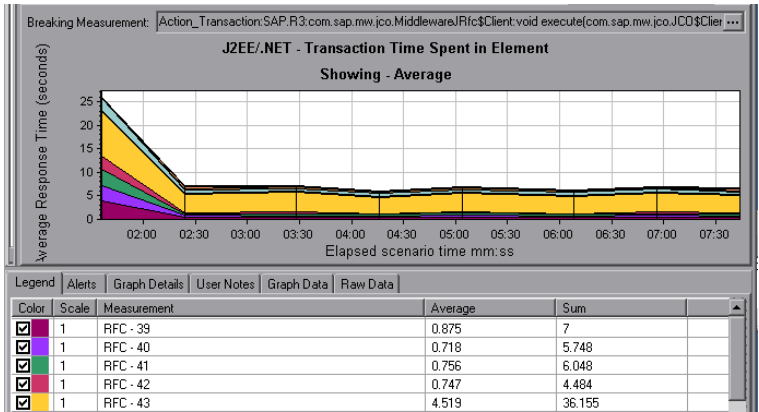
1. Go to the **J2EE/.NET Diagnostics Usage** section of the Summary Report. Next to the relevant transaction, click the color representing the **SAP.R3** layer.



The J2EE/.NET - Transaction Time Spent in Element graph opens, representing the SAP.R3 layer.

2. Right click the graph and choose **J2EE/.NET Diagnostics > Break down the class to methods**.
3. Break down the graph further by right clicking the graph and choosing **J2EE/.NET Diagnostics > Break down the method to SQLs**.

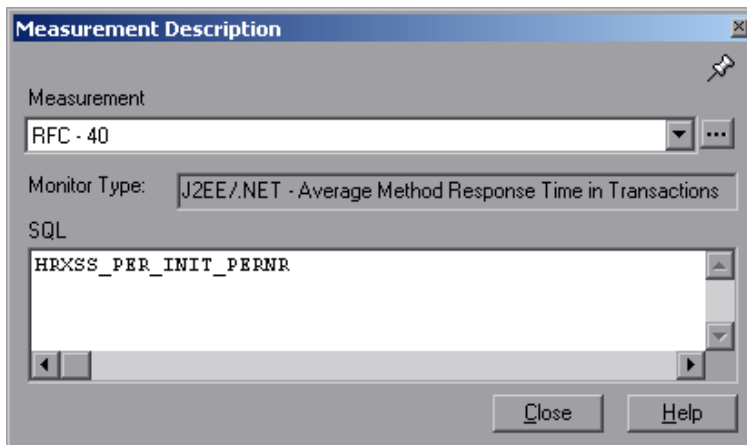
The graph is broken down into the different RFC functions.



4. To view the name of each RFC function, right click an RFC measurement in the **Measurement** column in the graph legend and choose **Show measurement description**.

The Measurement Description dialog box opens. The name of the RFC function

is displayed in the SQL box.



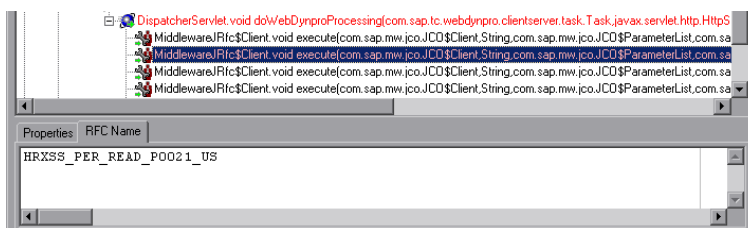
## View RFC function information in the Chain Of Calls window

1. Go to the **J2EE/.NET Diagnostics Usage** section of the Summary Report. Next to the relevant transaction, click the color representing the **SAP.R3** layer.

The J2EE/.NET - Transaction Time Spent in Element graph opens, representing the SAP.R3 layer.

2. Right click the graph and choose **J2EE/.NET Diagnostics > Show chain of calls**.

The Transaction chain of calls window opens. When you click any of the RFC functions, in the **Measurement** column, the name of the function is displayed in the lower pane in the **RFC Name** tab.



## J2EE & .NET Diagnostics Data

The J2EE & .NET Diagnostics graphs provide an overview of the entire chain of activity on the server side of the system. At the same time, you can break down J2EE/.NET layers into classes and methods to enable you to pinpoint the exact location where time is consumed. In addition, you can view custom classes or

packages that you set the J2EE/.NET probe to monitor. You can also view the transaction chain of calls and call stack statistics to track the percentage of time spent on each part of the transaction.

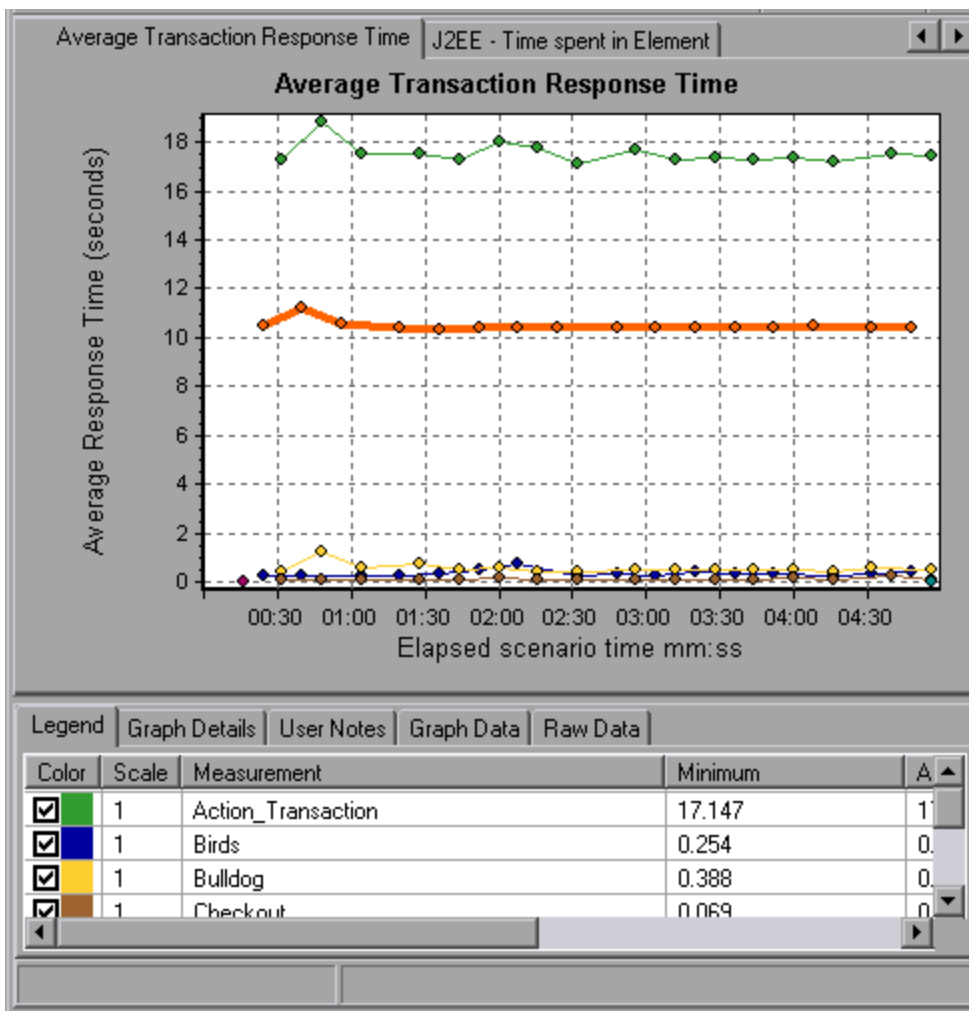
You can correlate the end user response time with the Web server activity (Servlets and JSPs data), application server activity (JNDIs), and back-end activity of database requests (JDBC methods and SQL queries).

## Example Transaction Breakdown

The following graphs illustrate the breakdown of a transaction to its layers, classes, and methods.

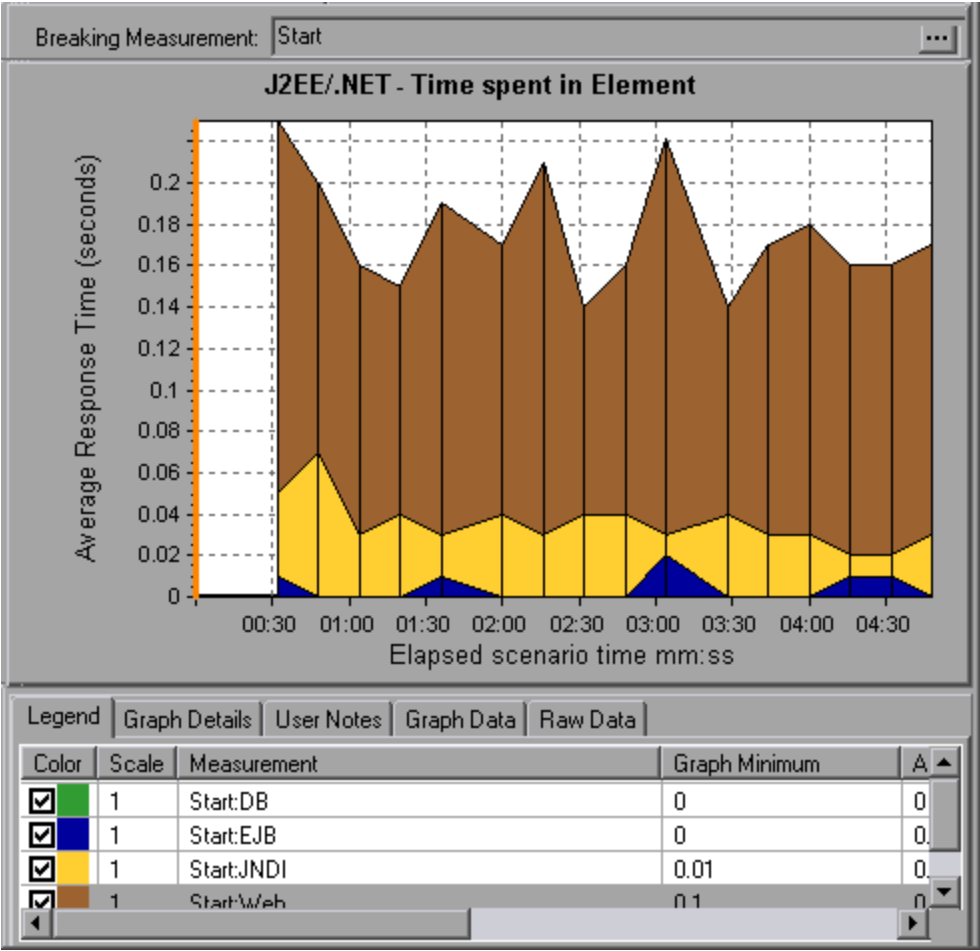
### Transaction Level

The following figure shows the top level Average Transaction Response Time graph. The graph displays several transactions: **Birds**, **Bulldog**, **Checkout**, **Start**, and so on.



## Layer Level

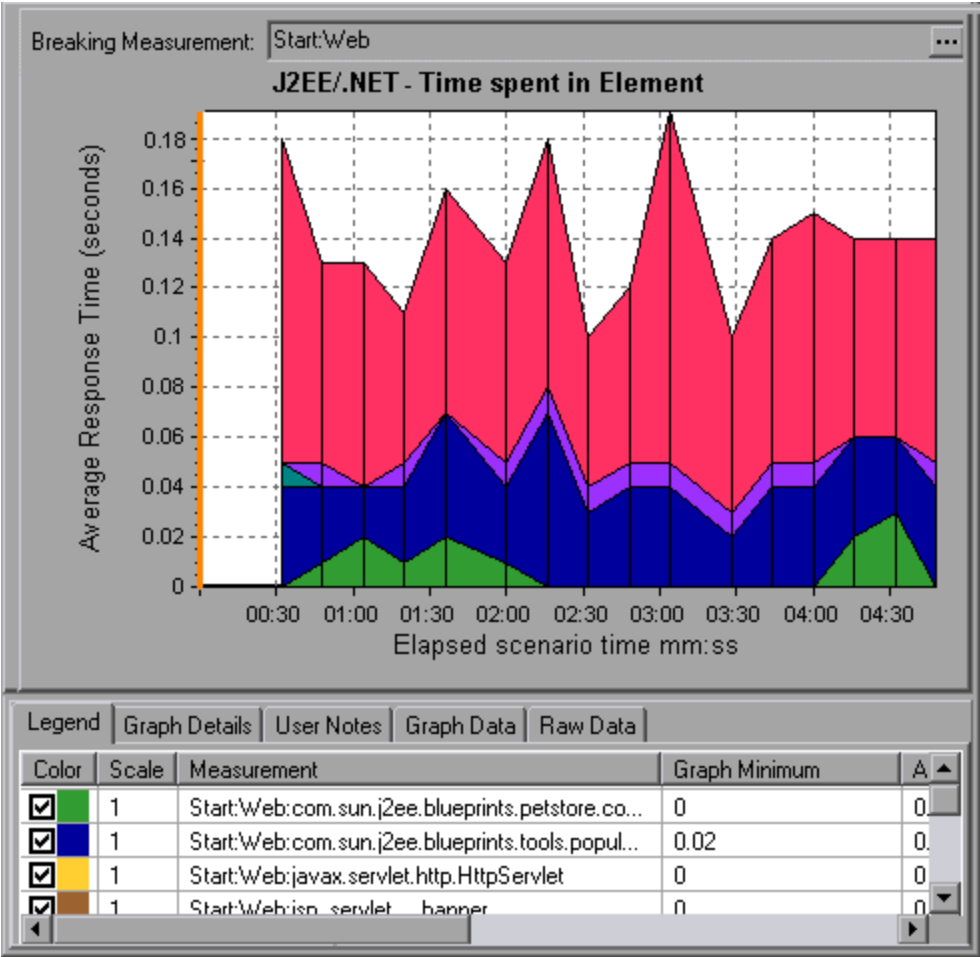
In the following figure, the **Start** transaction has been broken down to its layers (DB, EJB, JNDI, and Web). In J2EE/.NET transactions, the Web layer is generally the largest.



### Class Level

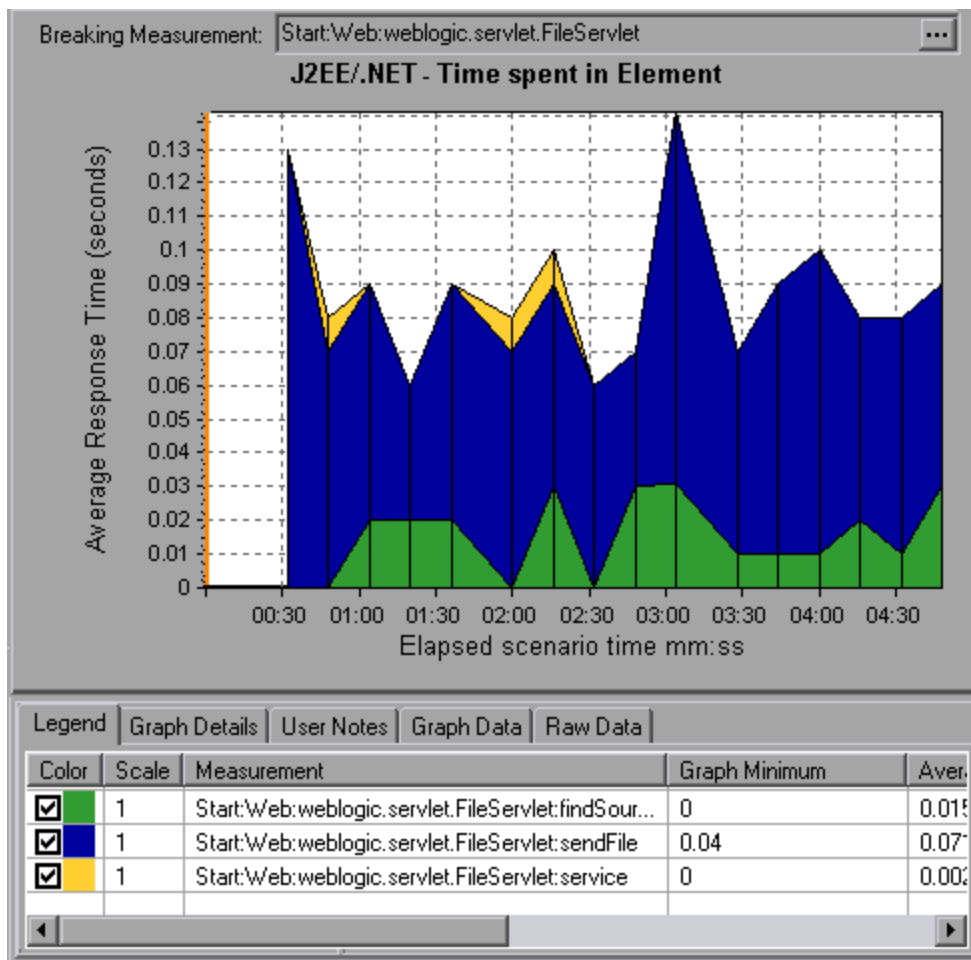
In the following figure, the Web layer of the **Start** transaction has been broken down to its classes.





### Method/Query Level

In the following figure, the `weblogic.servlet.FileServlet` component of the Web layer of the Start transaction has been broken down to its methods.



**Note:** Some JDBC methods can invoke SQLs which can be broken down further. In this case there is another level of breakdown, that is SQL Statements. For the methods that can not be further broken down into SQL statements when reaching this level of breakdown, you see **NoSql**.

## Cross VM Analysis

When a server request makes a remote method invocation, the J2EE & .NET Diagnostics graphs display certain measurements relating to the classes and methods involved in these requests. These measurements are displayed at a layer, class and method level. The VM making the call is referred to as the *caller VM*, and the VM that executes the remote call is the *callee VM*.

The measurements are described below:

Measurements	Description
<b>Cross VM Layer</b>	A measurement that represents a dummy layer that integrates the data from the remote classes and methods in server requests that take place across two or more virtual machines.
<b>Remote-Class</b>	A measurement that represents a dummy class that integrates the data from the remote methods in server requests that take place across two or more virtual machines.
<b>Remote-Class: Remote Method</b>	A measurement that represents a dummy method. Remote-Class: Remote Method measures the total time, call count, exclusive latency, minimum and maximum values, standard deviation, and so on of the methods that are executed remotely, relative to the caller virtual machine.

**Note:** Since this data is measured on the caller virtual machine the exclusive latency will include all of the time required for making the remote method invocation such as network latency.

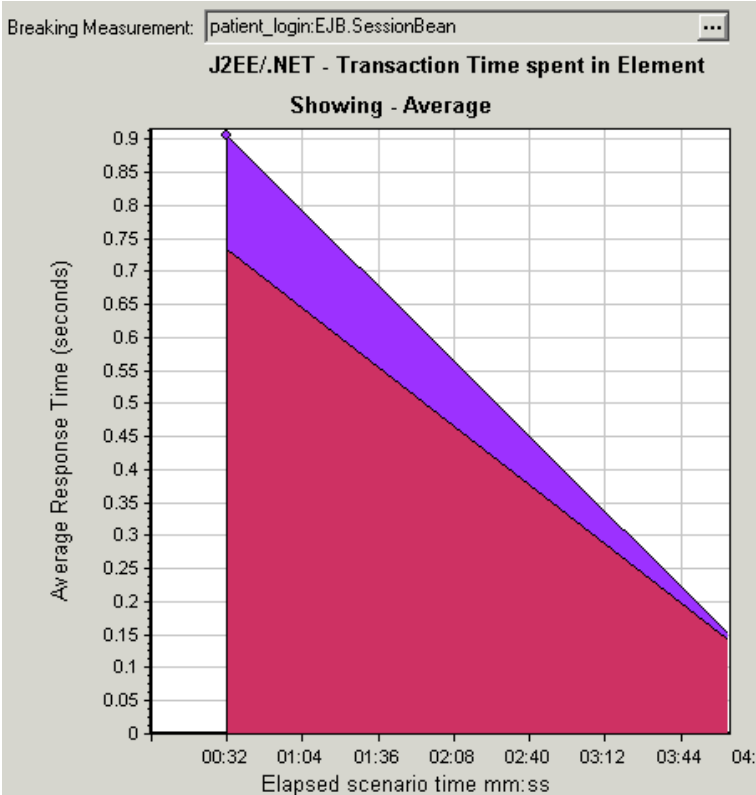
## Using the J2EE & .NET Breakdown Options






J2EE & .NET breakdown options are described.


<b>To access</b>	<p>Use one of the following to access breakdown options:</p> <ul style="list-style-type: none"> <li>• &lt;J2EE &amp; .NET Graphs&gt; View &gt; J2EE &amp; .NET Diagnostics</li> <li>• &lt;J2EE &amp; .NET Diagnostics Graphs&gt; &gt; select transaction &gt; short-cut menu &gt; J2EE &amp; .NET Diagnostics</li> <li>• See toolbar options for each breakdown level</li> </ul>
<b>Notes</b>	<ul style="list-style-type: none"> <li>• The breakdown menu options and buttons are not displayed until an element (transaction, server request, layer) is selected.</li> <li>• If there is no URI in the SQL, URI-None appears in front of the full measurement description in the Measurement Description dialog box.</li> </ul>

See also	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a>
----------	---

User interface elements are described below :

UI Element	Description
<Right-click> transaction in Average Response Time Graph	<p>Choose J2EE/.NET Diagnostics &gt; Show Server Requests. A new graph opens showing the breakdown of the selected transaction. The name of the transaction is displayed in the Breaking Measurement box.</p>  <p>The screenshot shows a window titled "J2EE/.NET - Transaction Time spent in Element" with a subtitle "Showing - Average". The "Breaking Measurement:" field contains "patient_login:EJB.SessionBean". The graph plots "Average Response Time (seconds)" on the y-axis (0 to 0.9) against "Elapsed scenario time mm:ss" on the x-axis (00:32 to 04:00). The graph area is filled with a red color, and a purple shaded region is visible above the red area, indicating a range of response times. The data points show a steady decrease in response time as the scenario progresses.</p> <p>You can view the full SQL statement for a selected SQL element by choosing <b>Show measurement description</b> from the Legend window right-click menu. The Measurement Description dialog box opens displaying the name of the selected measurement and the full SQL statement.</p>

UI Element	Description
	To view transaction properties for the breakdown measurement, click the <b>Breaking Measurement</b> button. To disable this feature, choose <b>View &gt; Display Options</b> , and clear the <b>Show Breaking Measurement</b> check box.
	<p>Select <b>View &gt; J2EE/.NET Diagnostics &gt; Break down the server request to layers</b>, or click the measurement breakdown button in the toolbar above the graph.</p> <p><b>Note:</b> The option in the J2EE/.NET Diagnostics menu, and the tool tip of the measurement breakdown button, vary according to the element that you want to break down. For example, when you select a server request, the menu option and tool tip are <b>Break down server request to layers</b>.</p>
	Select <b>View &gt; J2EE/.NET Diagnostics &gt; Show VM</b> , or click the <b>Show VM</b> button in the toolbar above the graph. This breaks the data down to the application host name (VM).
	<p>Select <b>View &gt; J2EE/.NET Diagnostics &gt; Undo Break down the server request to layers</b>, or click the <b>Undo &lt;Measurement Breakdown&gt;</b> button in the toolbar above the graph.</p> <p><b>Note:</b> The option in the J2EE/.NET Diagnostics menu, and the tool tip of the measurement breakdown button, vary according to the element whose breakdown you want to undo. For example, when you select a layer, the menu option and tool tip are Undo break down server request to layers.</p>
	Select <b>View &gt; J2EE/.NET Diagnostics &gt; Hide VM</b> , or click the <b>Hide VM</b> button in the toolbar above the graph.

UI Element	Description
	<p>Display the chain of call or call stack statistics in the measurements tree window: Drag the orange time line on to the graph to the time specifying the end of the period for which you want to view data, and select <b>View &gt; J2EE/.NET Diagnostics &gt; Show Chain of Calls</b>, or click the Show Chain of Calls button in the toolbar above the graph.</p> <p><b>Note:</b> A measurement that is broken down in the Average Method Response Time in Transactions graph will be different from the same measurement broken down in the J2EE/.NET - Transaction Time Spent in Element graph. This is because the J2EE/.NET - Average Method Response Time in Transactions graph displays the average transaction time, whereas the J2EE/.NET - Transaction Time Spent in Element graph displays the average time per transaction event (sum of method execution time).</p>

## Viewing Chain of Calls and Call Stack Statistics

You can view the chain of calls for transactions and methods. The chain of calls answers the question "Whom did I call?"

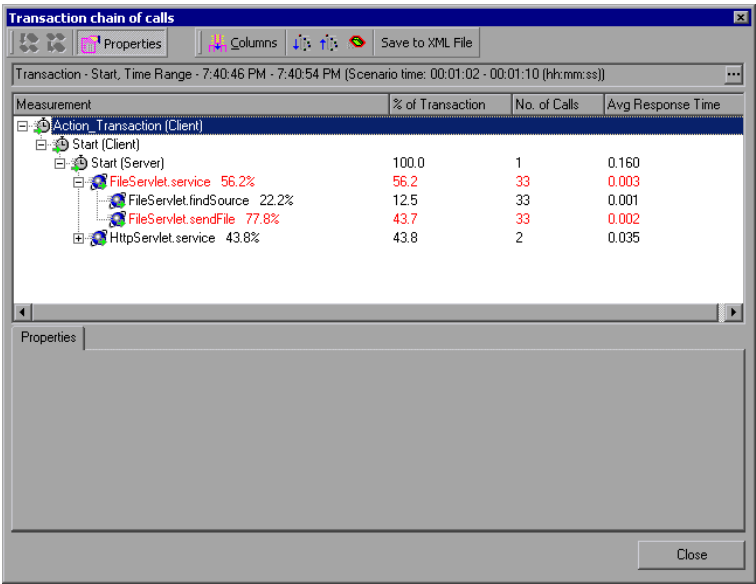
You can also view the call stack statistics for methods. Call stack statistics answer the question "Who called me?"

Chain of call and call stack statistics data are shown in the measurements tree window. The title of the window changes depending on which kind of data you are viewing.

- To set the point to which the measurements tree window relates, you must drag the orange time line to the desired spot.
- To view transaction call chains, right-click a component and choose **J2EE/.NET Diagnostics > Show Chain of Calls**. The Chain of Calls window opens displaying the chain of calls from the parent transaction downwards.
- To view method statistics, in the Chain of Calls window right-click a method and choose **Show Method Chain of Calls** or **Show Method Call Stack Statistics**.

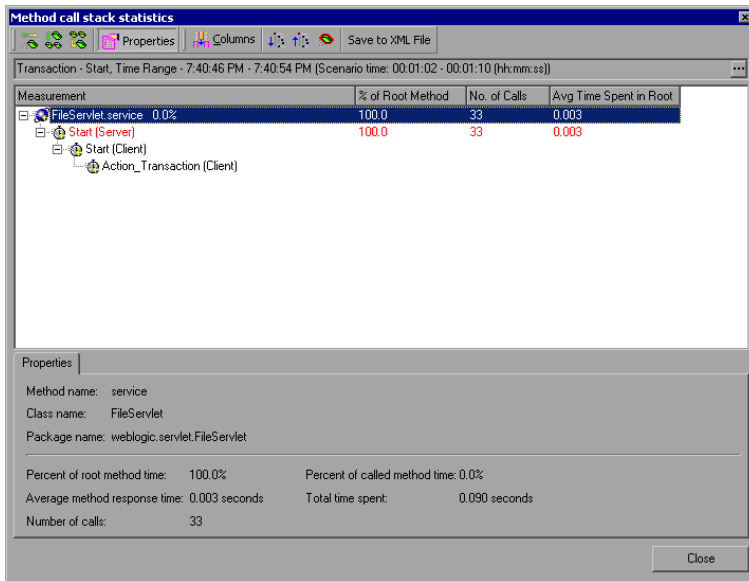
## The Chain of Calls Windows

You use the Chain of Calls window to view the components that the selected transaction or method called. In the following figure, all the calls in the critical path of the Start server-side transaction are displayed.



**Note:** Each red node signifies the most time consuming child of its parent.

You use the Call Stack Statistics window to view which components called the selected component. In the following figure, the **FileServlet.service** was called by Start (Server), which was called by Start (Client), and so on, down to the transaction at the bottom of the chain.







## Understanding the Chain of Calls Window

User interface elements are described below:

UI Element	Description
	<b>Switch to Method Chain of Calls.</b> When the call stack statistics data is displayed, displays the method chain of calls data (only if the root is a method).
	<b>Switch to Method Call Stack Statistics.</b> When the method chain of calls data is displayed, displays the method call stack statistics data (only if the root is a method).
	<b>Show Method Chain of Calls.</b> Displays the Chain of Calls window.
	<b>Show Method Call Stack Statistics.</b> Displays the Call Stack Statistics window.
	<b>Properties.</b> Hides or displays the properties area (lower pane).



UI Element	Description
	<b>Columns.</b> Enables you to select the columns shown in the Calls window. To display additional fields, drag them to the desired location in the Calls window. To remove fields, drag them from the Calls window back to the Columns chooser.
	<b>Expand All.</b> Expands the entire tree.
	<b>Collapse All.</b> Collapses the entire tree.
	<b>Expand Worst Path.</b> Expands only the parts of the path on the critical path.
<b>Save to XML File</b>	Saves the tree data to an XML file.
<b>Method Properties</b>	Area. Displays the full properties of the selected method.
<b>SQL Query</b>	Displays the SQL query for the selected method. (For Database only.)The following columns are available in the Chain of Calls window:

The following columns are available in the Chain of Calls window:

Column	Description
<b>Measurement</b>	Name of the method, displayed as <b>ComponentName:MethodName</b> . In the case of a database call, query information is also displayed. The percent shown indicates the percentage of calls to this component from its parent.
<b>% of Root Method</b>	Percentage of the total time of the method from the total time of the root tree item.
<b>No of Calls</b>	Displays the amount of times this transaction or method was executed.

Column	Description
<b>Avg Response Time</b>	Response time is the time from the beginning of execution until the end. Average response time is the total response time divided by the number of divided by the number of instances of the method.
<b>STD Response Time</b>	The standard deviation response time.
<b>Min Response Time</b>	The minimum response time.
<b>Max Response Time</b>	The maximum response time.
<b>% of Caller</b>	Displays the percentage of method time in relation the parent method time.
<b>Total time</b>	Displays the total method execution time, including the child execution time.

The following columns are available in the Call Stack Statistics window:

Column	Description
<b>Measurement</b>	Name of the method, displayed as <b>ComponentName.MethodName</b> . In the case of a database call, query information is also displayed. The percent shown indicates the percentage of calls to this component from its child.
<b>% of Root Method</b>	Percentage of the total time of the transaction (or method) from the total time of the root tree item.
<b>No. of Calls to Root</b>	Displays the amount of times this transaction or method was executed.

Column	Description
<b>Avg Time Spent in Root</b>	Time spent in root is the time that the sub-area spent in the root sub-area/area/transaction.  Average Time Spent in Root time is the total time spent in the root divided by the number of instances of the method.
<b>STD Time Spent in Root</b>	The standard deviation time spent in the root.
<b>Min Time Spent in Root</b>	The minimum time spent in the root.
<b>Max Time Spent in Root</b>	The maximum time spent in the root.
<b>% of Called</b>	Displays the percentage of method time in relation the child method time.
<b>Total Time Spent in Root</b>	Displays the total method execution time, including the child execution time.

## Graph Filter Properties

You can filter the J2EE & .NET Diagnostics graphs so that the displayed data is more suitable to your needs. You can filter using the following methods:

- Before opening a graph, enter filter criteria in the **Graph Properties** box of the **Open Graph** dialog box. For more information, see ["Open a New Graph Dialog Box" on page 31](#).
- From an open graph, enter filter criteria in the **Filter condition** fields in a filter dialog box. For more information, see ["Filter Dialog Boxes" on page 144](#) and ["Drilling Down in a Graph" on page 113](#).

User interface elements are described below:

UI Element	Description
<b>Class Name</b>	Shows data for specified classes.
<b>Layer Name</b>	Shows data for specified layers.
<b>Scenario Elapsed Time</b>	Shows data for transactions that ended during the specified time.
<b>SQL Logical Name</b>	Shows data for specified SQL logical names. Due to the length of some SQL names, after you choose an SQL statement it is assigned a "logical name." This logical name is used in the filter dialog, legend, grouping, and other places in place of the full SQL statement. You can view the full SQL statement in the Measurement Description dialog box ( <b>View &gt; Show Measurement Description</b> ).
<b>Transaction Name - J2EE/.NET</b>	Shows data for a specified transaction.

Some JDBC methods have the ability to invoke SQL's (each method can invoke several different SQL's) so there is another level of breakdown which is the SQL statements.

**Note:** For the methods that do not have SQL statement when reaching this level of breakdown you see **NoSql**.

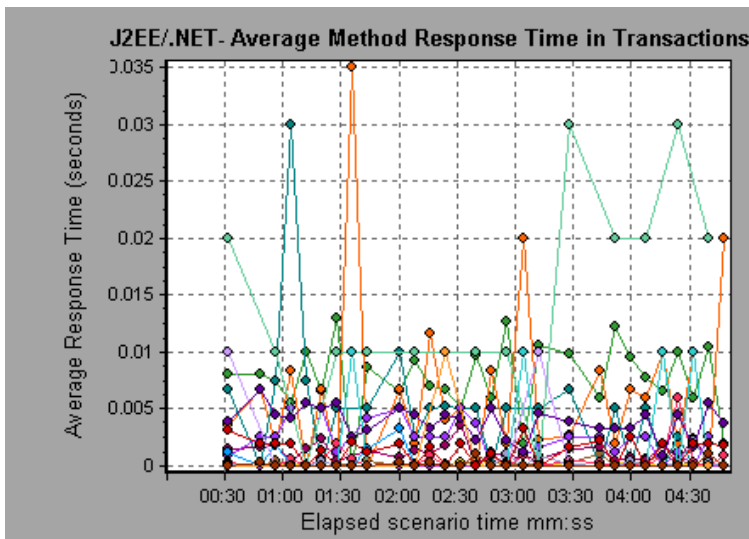
## J2EE/.NET - Average Method Response Time in Transactions Graph

This graph displays the average response time for the server side methods, computed as Total Method Response Time/Number of Method calls. For example, if a method was executed twice by an instance of transaction A and once by another instance of the same transaction, and it took three seconds for each execution, the average response time is  $9/3$ , or 3 seconds. The method time does not include calls made from the method to other methods.

<b>X-axis</b>	Elapsed time.
---------------	---------------

<b>Y-axis</b>	Average response time (in seconds) per method
<b>Breakdown options</b>	<a href="#">"Using the J2EE &amp; .NET Breakdown Options" on page 307</a>
<b>See also</b>	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a>

### Example

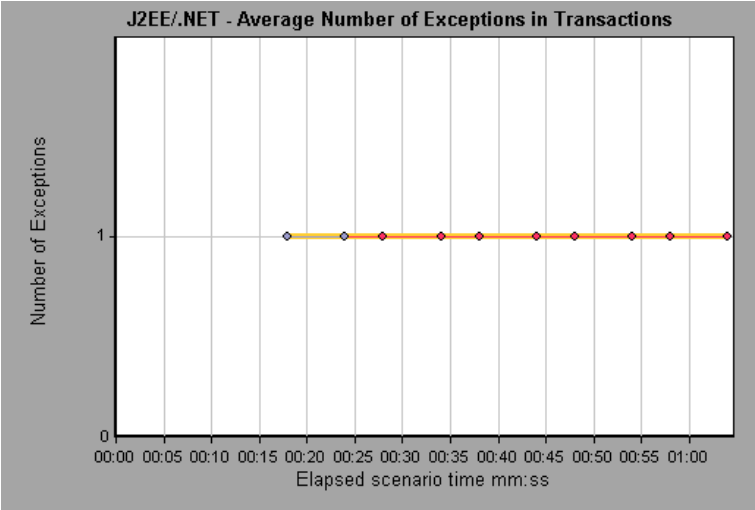


## J2EE/.NET - Average Number of Exceptions in Transactions Graph

This graph displays the average number of code exceptions per method, transaction, or request that were monitored during the selected time range.

<b>X-axis</b>	Elapsed time.
<b>Y-axis</b>	Represents the number of events.
<b>Breakdown options</b>	To break the displayed elements down further, see <a href="#">"Using the J2EE &amp; .NET Breakdown Options" on page 307</a> .
<b>See also</b>	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a>

### Example

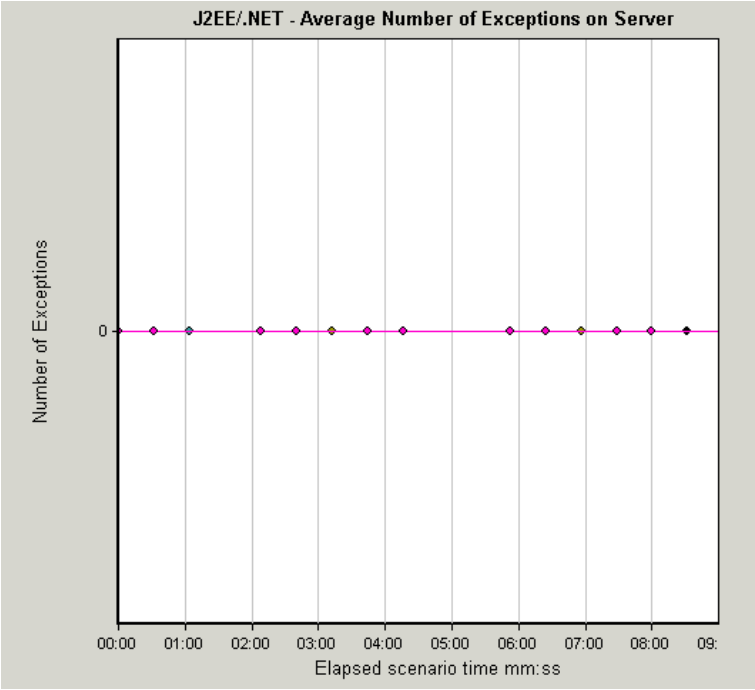


## J2EE/.NET - Average Number of Exceptions on Server Graph

This graph displays the average number of code exceptions per method that were monitored during the selected time range.

X-axis	Elapsed time of the scenario run.
Y-axis	Number of events.
Breakdown options	<a href="#">"Using the J2EE &amp; .NET Breakdown Options" on page 307</a>
See also	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a>

### Example

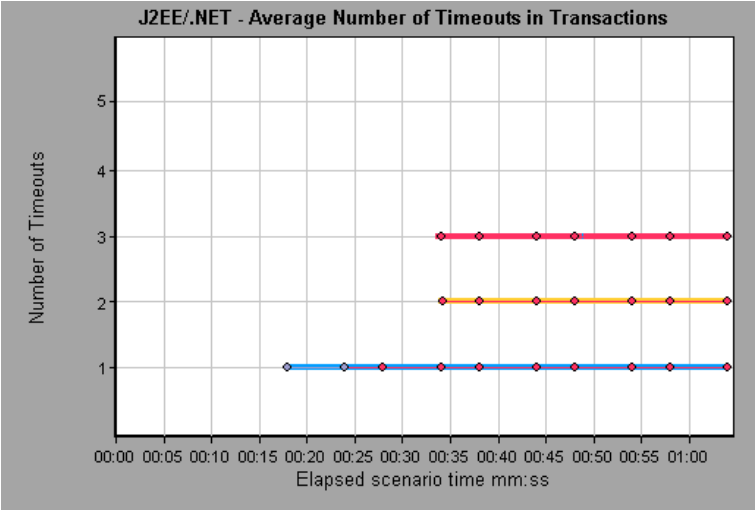


## J2EE/.NET - Average Number of Timeouts in Transactions Graph

This graph displays the average number of timeouts per method, transaction, or request that were monitored during the selected time range.

X-axis	Elapsed time since the scenario run.
Y-axis	Represents number of events.
Breakdown options	<a href="#">"Using the J2EE &amp; .NET Breakdown Options" on page 307</a>
See also	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a>

### Example



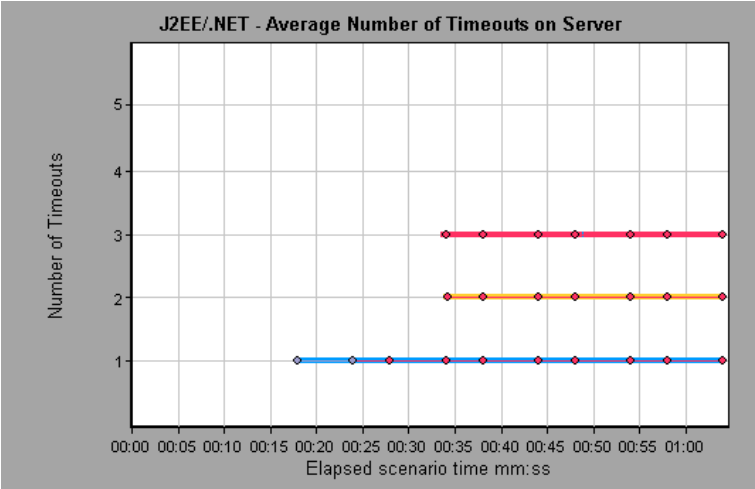
## J2EE/.NET - Average Number of Timeouts on Server Graph

This graph displays the average number of timeouts per method that were monitored during the selected time range.

X-axis	Elapsed time since the scenario run.
Y-axis	Number of events.
Breakdown options	<a href="#">"Using the J2EE &amp; .NET Breakdown Options" on page 307</a>
See also	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a>

### Example



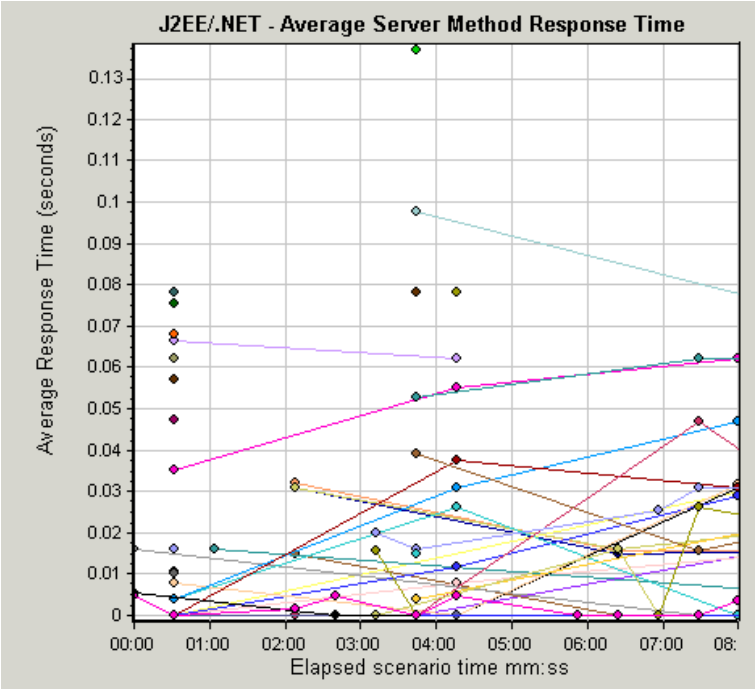


# J2EE/.NET - Average Server Method Response Time Graph

This graph displays the average response time for the server side methods, computed as Total Method Response Time/Number of Method calls.

X-axis	Elapsed time since the scenario run.
Y-axis	Average response time (in seconds) per method.
Breakdown options	<a href="#">"Using the J2EE &amp; .NET Breakdown Options" on page 307</a>
Note	The method time does not include calls made from the method to other methods.
See also	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a>

## Example



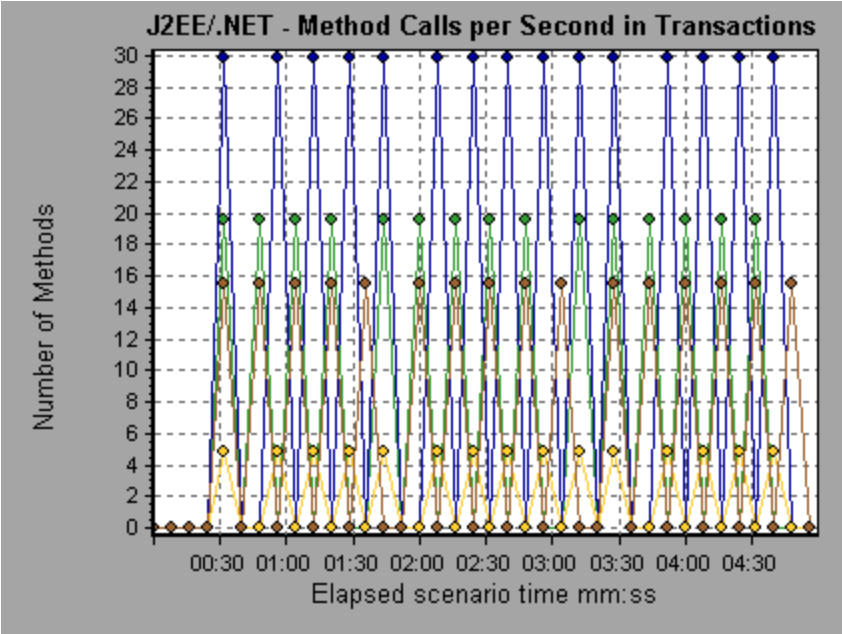
## J2EE/.NET - Method Calls per Second in Transactions Graph

This graph displays the number of completed sampled transactions during each second of a load test scenario run.

The number of transactions included in the sample is determined by the sampling percentage set in the Diagnostics Distribution dialog box in the Controller (Diagnostics > Configuration).

<b>X-axis</b>	Elapsed time.
<b>Y-axis</b>	Represents the number of completed sampled transactions per second.
<b>Breakdown options</b>	To break the displayed elements down further, see <a href="#">"Using the J2EE &amp; .NET Breakdown Options"</a> on page 307.
<b>See also</b>	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview"</a> on page 299

### Example



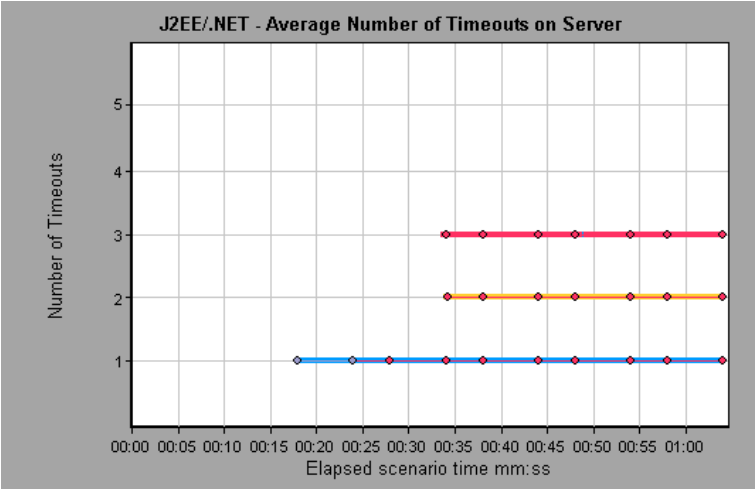
## J2EE/.NET - Probes Metrics Graph

This graph displays performance metrics collected by HP Diagnostics probes. Metrics include JVM related data such as Heap usage and Garbage Collection, application server specific metrics, JDBC (Java Database Connectivity) metrics, and more.

<b>X-axis</b>	Elapsed time since the scenario run.
<b>Y-axis</b>	<p>Resource usage. The following probe metric data is provided for offline analysis:</p> <ul style="list-style-type: none"><li>• <b>HeapUsed</b></li><li>• <b>GC Collections/sec</b></li><li>• <b>GC time Spent in Collections</b></li></ul> <p>To include additional Probe metric data in offline Analysis, you use the Diagnostics configuration file, <b>etc./offline.xml</b>. For more information, see the <i>HP Diagnostics Server Installation and Administration Guide</i>.</p>

<b>Data Grouping</b>	<p>By default, the data in the graph is grouped by Category Name (the Diagnostics metric category name) and Probe Name. As a result, the default format for the measurement name is the graph is:</p> <p>&lt;Name of metric from Diagnostics (unit of metric)&gt;:&lt;Diagnostics metric category name&gt;:&lt;Probe name&gt;</p> <p>If the measurement unit is a count, no unit name is displayed in parentheses.</p>
<b>Important Information</b>	<p>By default, the following probe metric data is provided for offline analysis: <b>HeapUsed</b>, <b>GC Collections/sec</b>, and <b>GC time Spent in Collections</b>. To include additional Probe metric data in offline Analysis, you use the Diagnostics configuration file, <b>etc/offline.xml</b>. For more information, see the <i>HP Diagnostics LoadRunner and Performance Center-Diagnostics Integration Guide</i> .</p> <p>For example, for the following measurement name:</p> <ul style="list-style-type: none"> <li>• the name of the metric is <b>GC Time Spent in Collections</b>.</li> <li>• the value is measured as a percentage.</li> <li>• the metric category name is <b>GC</b>.</li> <li>• the Probe name is <b>MyJBossDev</b></li> </ul> <p>In addition to the regular Analysis filter criteria, you can also filter and group by the Diagnostics metrics collector name and the host name.</p>
<b>Note</b>	<p>You need to synchronize the operating system time settings on the Controller machine and the Diagnostics Servers to ensure accurate display of the elapsed scenario time in the Probe Metrics graph.</p>
<b>See also</b>	<p><a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a></p>

## Example

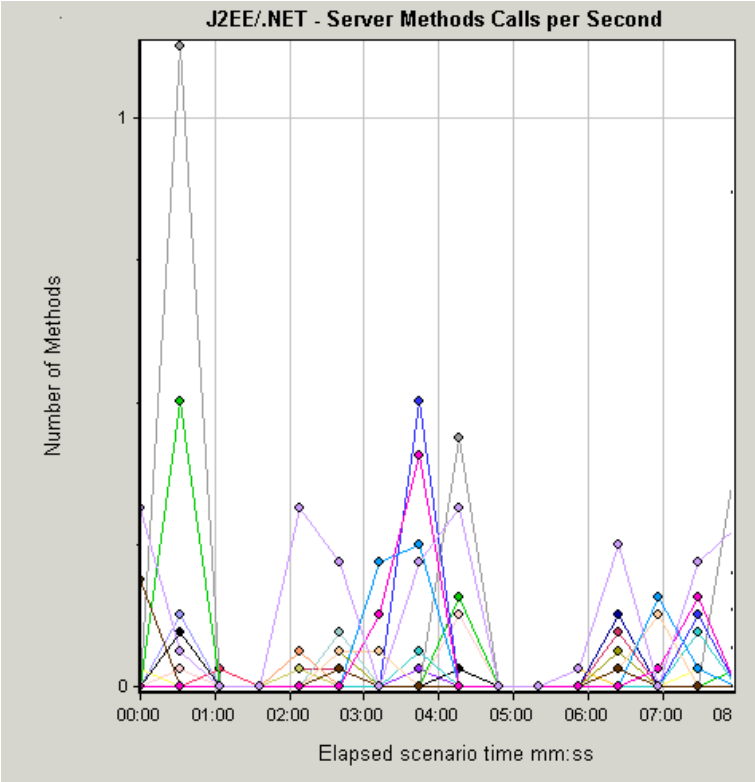


## J2EE/.NET - Server Methods Calls per Second Graph

This graph displays the number of completed sampled methods during each second of a load test scenario run.

X-axis	Elapsed time of the scenario run.
Y-axis	Number of completed sampled methods per second.
Breakdown options	<a href="#">"Using the J2EE &amp; .NET Breakdown Options" on page 307</a>
Note	The number of methods included in the sample is determined by the sampling percentage set in the Diagnostics Distribution dialog box in the Controller ( <b>Diagnostics &gt; Configuration</b> ).
See also	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a>

### Example

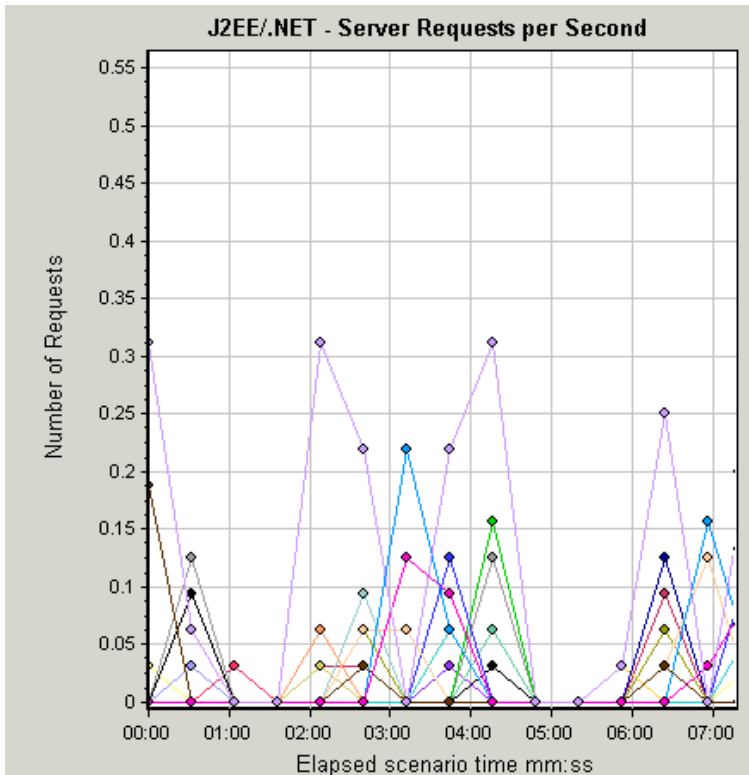


## J2EE/.NET - Server Requests per Second Graph

This graph displays the number of completed sampled requests during each second of a load test scenario run.

<b>X-axis</b>	Elapsed time of the scenario run.
<b>Y-axis</b>	Number of completed sampled requests per second.
<b>Breakdown options</b>	<a href="#">"Using the J2EE &amp; .NET Breakdown Options" on page 307</a>
<b>Note</b>	The number of requests included in the sample is determined by the sampling percentage set in the Diagnostics Distribution dialog box in the Controller ( <b>Diagnostics &gt; Configuration</b> ). For more information, see the section on online monitors in the LoadRunner Controller documentation.
<b>See also</b>	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a>

### Example

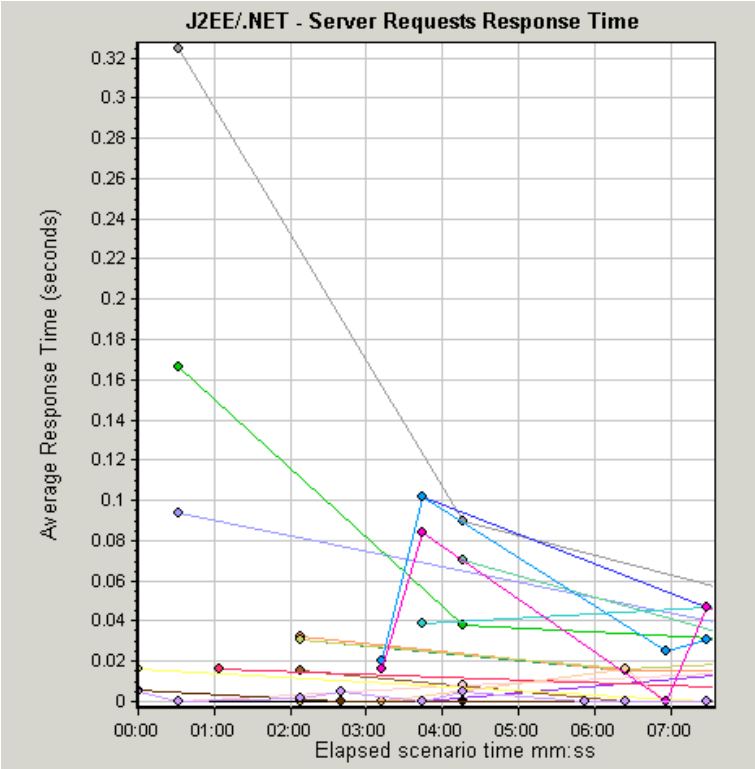


## J2EE/.NET - Server Request Response Time Graph

This graph displays the server response time of requests that include steps that cause activity on the J2EE/.NET backend.

<b>X-axis</b>	Elapsed time of the scenario time.
<b>Y-axis</b>	Average time (in seconds) taken to perform each request.
<b>Breakdown options</b>	<a href="#">"Using the J2EE &amp; .NET Breakdown Options" on page 307</a>
<b>Note</b>	The reported times, measured from the point when the request reached the Web server to the point it left the Web server, include only the time that was spent in the J2EE/.NET backend.
<b>See also</b>	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a>

### Example



## J2EE/.NET - Server Request Time Spent in Element Graph

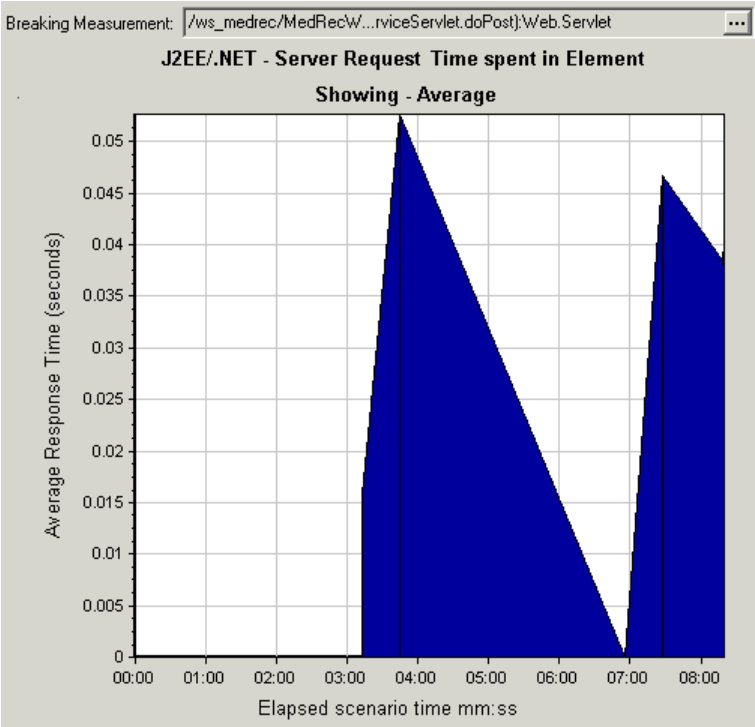
This graph displays the server response time for the selected element (layer, class, or method) within each server request.

<b>Purpose</b>	The time is computed as Total Response Time/Total Number of Server Requests. For example, if a method was executed twice by an instance of server request A and once by another instance of the same server request, and it took three seconds for each execution, the average response time is $9/2$ , or 4.5 seconds. The server request time does not include the nested calls from within each server request.
<b>X-axis</b>	Elapsed time of the scenario run.
<b>Y-axis</b>	Average response time (in seconds) per element within the server request.



<b>Breakdown options</b>	<a href="#">"Using the J2EE &amp; .NET Breakdown Options" on page 307</a>
<b>Filtering properties</b>	<p>The display of the graph is determined by the Graph Properties selected when the graph is opened, as described:</p> <p><a href="#">None</a></p> <ul style="list-style-type: none"><li>■ Time spent in each server request</li></ul> <p><a href="#">Server request</a></p> <ul style="list-style-type: none"><li>■ Filtered by server request. Grouped by layer.</li></ul> <p><a href="#">Server request and layer</a></p> <ul style="list-style-type: none"><li>■ Filtered by server request and layer. Grouped by class.</li></ul> <p><a href="#">Server request, layer, and class</a></p> <ul style="list-style-type: none"><li>■ Filtered by server request, layer, and class. Grouped by method.</li></ul>
<b>Tips</b>	<p>To obtain data for this graph, you must first install HP Diagnostics. Before you can view Diagnostics for J2EE &amp; .NET data in a particular load test scenario, you need to configure the Diagnostics parameters for that scenario. For more information, see the section on online monitors in the LoadRunner Controller documentation.</p>
<b>See also</b>	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a>

### Example



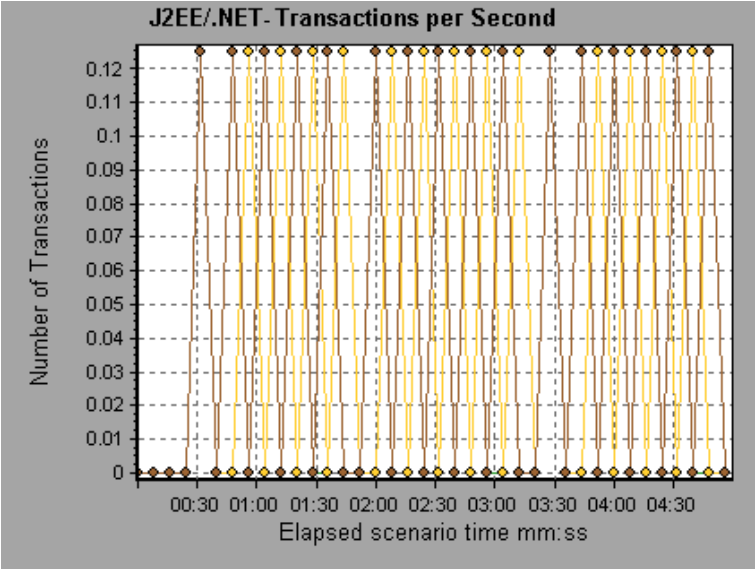
## J2EE/.NET - Transactions per Second Graph

This graph displays the number of completed sampled transactions during each second of a load test scenario run.

The number of transactions included in the sample is determined by the sampling percentage set in the Diagnostics Distribution dialog box in the Controller (**Diagnostics > Configuration**). For more information, see the section on online monitors in the LoadRunner Controller documentation.

<b>X-axis</b>	Elapsed time.
<b>Y-axis</b>	Number of completed sampled transactions per second
<b>Breakdown options</b>	To break the displayed elements down further, see <a href="#">"Using the J2EE &amp; .NET Breakdown Options"</a> on page 307.
<b>See also</b>	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview"</a> on page 299

### Example

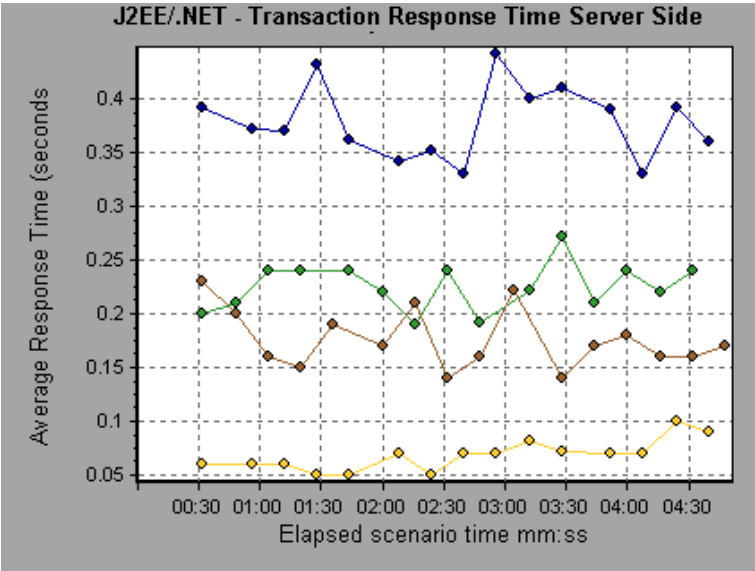


## J2EE/.NET - Transaction Response Time Server Side Graph

This graph displays the transaction server response time of transactions that include steps that cause activity on the J2EE/.NET backend. The reported times, measured from the point when the transaction reached the Web server to the point it left the Web server, include only the time that was spent in the J2EE/.NET backend.

<b>X-axis</b>	Elapsed time.
<b>Y-axis</b>	Average response time (in seconds) of each transaction.
<b>Breakdown options</b>	<a href="#">"Using the J2EE &amp; .NET Breakdown Options" on page 307</a>
<b>See also</b>	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a>

### Example



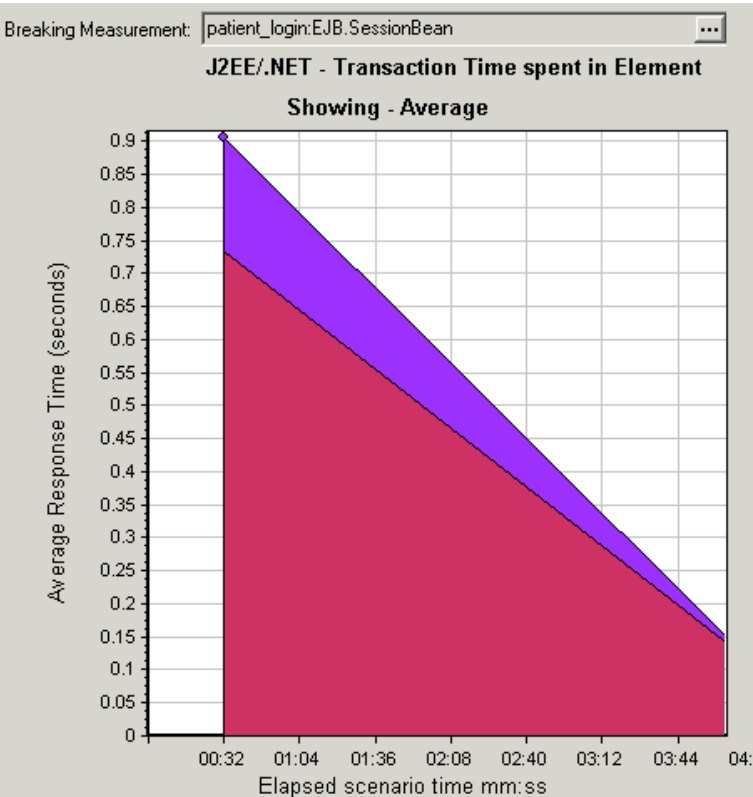
## J2EE/.NET - Transaction Time Spent in Element Graph

This graph displays the server response time for the selected element (layer, class, or method) within each transaction.

<b>X-axis</b>	Elapsed time.
<b>Y-axis</b>	Average response time (in seconds) per element within the transaction.
<b>Breakdown options</b>	<p>The display of graph data is determined by the graph properties selected when the graph was opened, as described in the following table: For information on filtering on graph data, see <a href="#">"Filtering Graph Data Overview" on page 129</a>.</p> <p>You can break down the displayed elements. For more information, see <a href="#">"Using the J2EE &amp; .NET Breakdown Options" on page 307</a>.</p>
<b>Tips</b>	To obtain data for this graph, you must enable the J2EE & .NET Diagnostics module (from the Controller) before running the load test scenario.

<b>Note</b>	The time is computed as Total Response Time/Total Number of Transactions. For example, if a method was executed twice by an instance of transaction A and once by another instance of the same transaction, and it took three seconds for each execution, the average response time is 9/2, or 4.5 seconds. The transaction time does not include the nested calls from within each transaction.
<b>See also</b>	<a href="#">"J2EE &amp; .NET Diagnostics Graphs Overview" on page 299</a> <a href="#">"Filtering and Sorting Graph Data" on page 129</a>

Example



## Graph Data Display

If you filter by these properties...	The graph data is displayed like this
None	Time spent in each transaction.
Transaction	Filtered by transaction. Grouped by layer.
Transaction and layer	Filtered by transaction and layer. Grouped by class.
Transaction, layer, and class	Filtered by transaction, layer, and class. Grouped by method.

# Application Component Graphs

## Microsoft COM+ Performance Graphs Overview

Microsoft COM+ performance graphs provide you with performance information for COM+ interfaces and methods.

In order to obtain data for these graphs, you need to activate the various Microsoft COM+ performance monitors before running the load test scenario.

When you set up the Microsoft COM+ performance online monitors, you indicate which statistics and measurements to monitor. For more information, see the section on online monitors in the LoadRunner Controller documentation.










## Microsoft .NET CLR Performance Graphs Overview

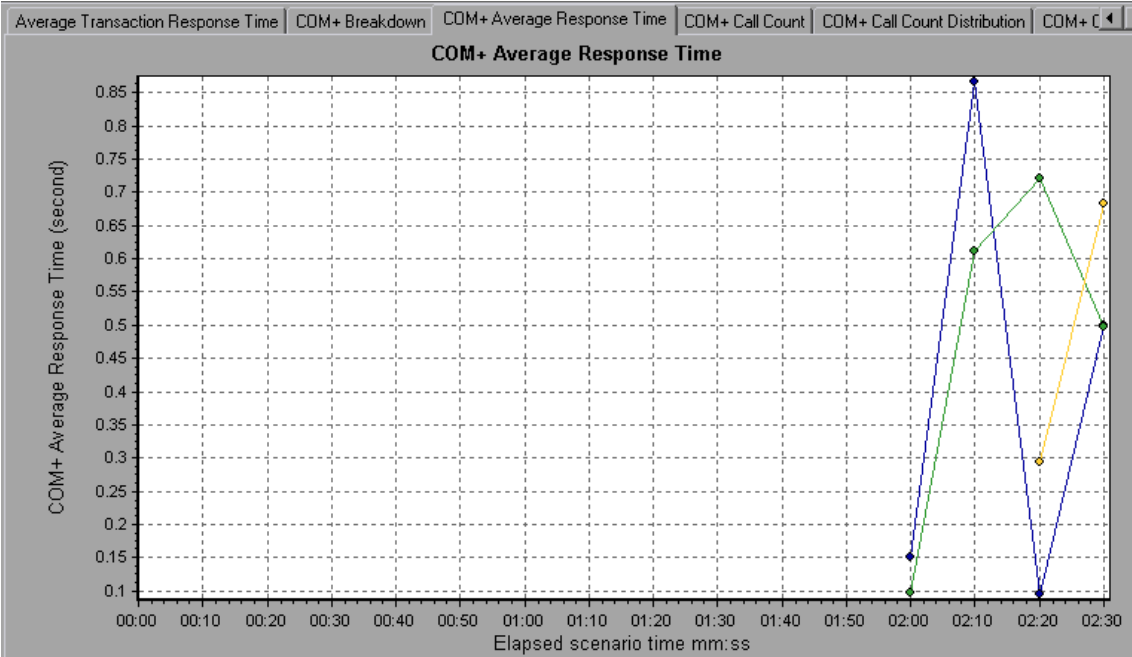
The .NET CLR performance graphs provide you with performance information for .NET classes and methods. To obtain data for these graphs, you must activate the .NET CLR performance monitor before running the load test scenario run.

Displayed measurements are specified using the .NET monitor. For more information, see the section on online monitors in the LoadRunner Controller documentation.

## COM+ Average Response Time Graph

This graph specifies the average time COM+ interfaces or methods take to perform during the load test scenario.

X-axis	Elapsed time from the beginning of the scenario run.																								
Y-axis	Average response time of a COM+ interface or method.																								
Breakdown options	<p>Each interface or method is represented by a different colored line on the graph. The legend frame (which is found below the graph) identifies the interfaces by color:</p> <table><tr><th>Color</th><th>Scale</th><th>Measurement</th><th>Minimum</th><th>Average</th><th>Maximum</th></tr><tr><td><input checked="" type="checkbox"/> </td><td>1</td><td>ContrRnd\COMPlusServer.ConstTime\Dispatch</td><td>0.096</td><td>0.499</td><td>1.501</td></tr><tr><td><input checked="" type="checkbox"/> </td><td>1</td><td>ContrRnd\COMPlusServer.ConstTime\_ConstTime</td><td>0</td><td>0.5</td><td>1.502</td></tr><tr><td><input checked="" type="checkbox"/> </td><td>1</td><td>ContrRnd\COMPlusServer.RandomTime\_RandomTime</td><td>0.058</td><td>0.391</td><td>0.747</td></tr></table> <p>This legend shows that the blue colored line belongs to the COM+ interface <b>_ConstTime</b>. Looking at the graph above, we see that this interface has higher response times than all other COM+ interfaces. At 2:10 minutes into the scenario, it records an average response time of 0.87 seconds.</p> <p><b>Note:</b> The 0.87 second data point is an average, taken from all data points recorded within a 10 second interval (the default granularity). You can change the length of this sample interval.</p> <p>Viewing CON+ Methods</p> <p>The table initially displays COM+ interfaces, but you can also view the list of COM+ methods by using drill-down or filtering techniques. For more information, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a> and <a href="#">"Drilling Down in a Graph" on page 113</a>.</p>	Color	Scale	Measurement	Minimum	Average	Maximum	<input checked="" type="checkbox"/> 	1	ContrRnd\COMPlusServer.ConstTime\Dispatch	0.096	0.499	1.501	<input checked="" type="checkbox"/> 	1	ContrRnd\COMPlusServer.ConstTime\_ConstTime	0	0.5	1.502	<input checked="" type="checkbox"/> 	1	ContrRnd\COMPlusServer.RandomTime\_RandomTime	0.058	0.391	0.747
Color	Scale	Measurement	Minimum	Average	Maximum																				
<input checked="" type="checkbox"/> 	1	ContrRnd\COMPlusServer.ConstTime\Dispatch	0.096	0.499	1.501																				
<input checked="" type="checkbox"/> 	1	ContrRnd\COMPlusServer.ConstTime\_ConstTime	0	0.5	1.502																				
<input checked="" type="checkbox"/> 	1	ContrRnd\COMPlusServer.RandomTime\_RandomTime	0.058	0.391	0.747																				
Tips	To highlight a specific interface line in the graph, select the interface row in the legend.																								
See also	<a href="#">"Microsoft COM+ Performance Graphs Overview" on the previous page</a>																								



## COM+ Breakdown Graph

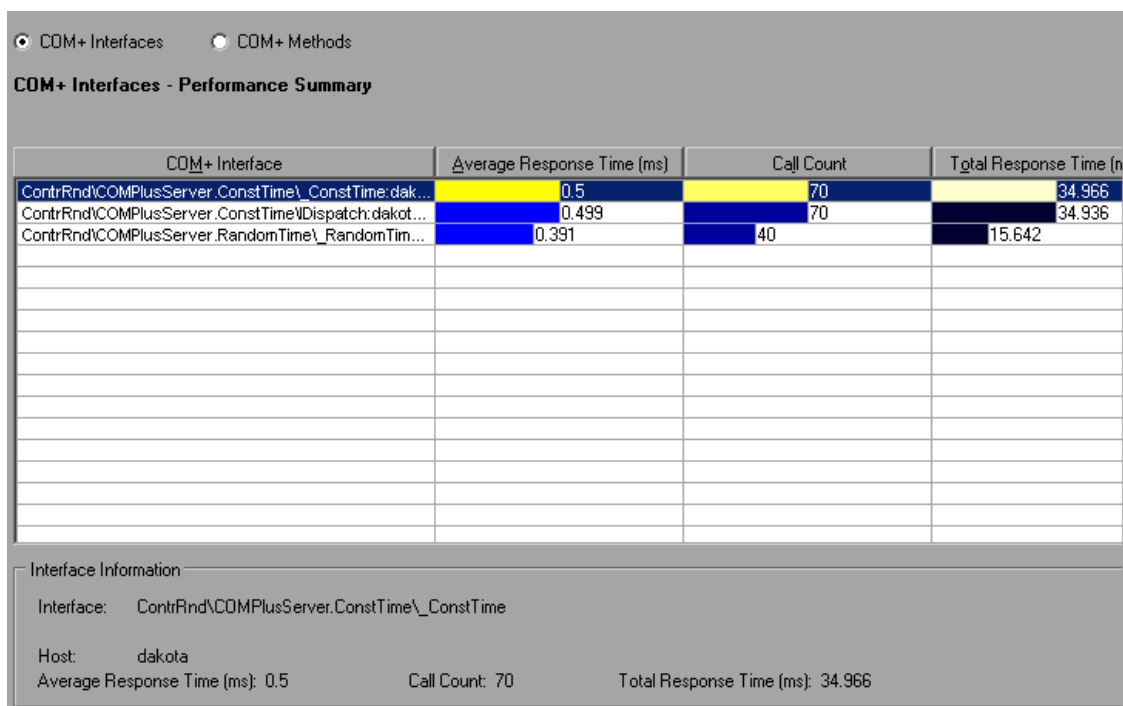
This graph summarizes fundamental result data about COM+ interfaces or methods and presents it in table format.

<b>Purpose</b>	Using the COM+ Breakdown table, you can identify the COM+ interfaces or methods which consume the most time during the test. The table can be sorted by column, and the data can be viewed either by COM+ interface or COM+ method.
----------------	---












Breakdown options	<p><b>Average Response Time</b></p> <p>The <b>Average Response Time</b> column shows how long, on average, an interface or method takes to perform. The graphical representation of this column is the <a href="#">"COM+ Average Response Time Graph" on page 335</a>.</p> <p><b>Call Count</b></p> <p>The next column, <b>Call Count</b>, specifies the number of times the interface or method was invoked. The graphical representation of this column is the <a href="#">"COM+ Average Response Time Graph" on page 335</a>.</p> <p><b>Total Response Time</b></p> <p>The final column, <b>Total Response Time</b>, specifies how much time was spent overall on the interface or method. It is calculated by multiplying the first two data columns together. The graphical representation of this column is the <a href="#">"COM+ Average Response Time Graph" on page 335</a>.</p> <p>The graphical representations of each of these columns are the <a href="#">"COM+ Average Response Time Graph" on page 335</a>, the <a href="#">"COM+ Call Count Distribution Graph" on the next page</a> and the <a href="#">"COM+ Total Operation Time Distribution Graph" on page 344</a></p> <p>Interfaces are listed in the <b>COM+ Interface</b> column in the form <b>Interface:Host</b>. In the table above, the <b>_ConstTime</b> interface took an average of .5 seconds to execute and was called 70 times. Overall, this interface took 34.966 seconds to execute.</p>
-------------------	--

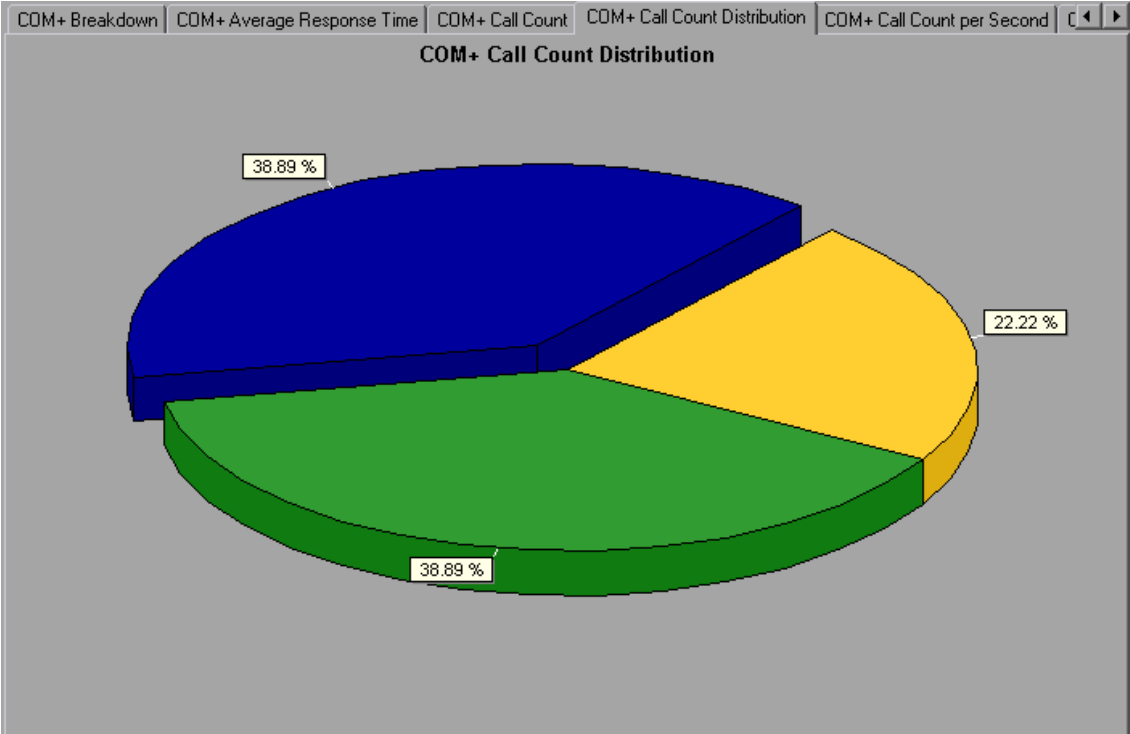
<b>Tips</b>	<h2>Sorting List</h2> <p>To sort the list by a column, click on the column heading. The list above is sorted by <b>Average Response Time</b> which contains the triangle icon specifying a sort in descending order.</p> <h2>Viewing COM+ Methods</h2> <p>The table initially displays COM+ interfaces, but you can also view the list of COM+ methods.</p> <p>To view the methods of a selected interface, select the <b>COM+ Methods</b> option. You can also double-click on the interface row to view the methods. The methods of the specified interface are listed in the <b>COM+ Method</b> column.</p>
<b>See also</b>	<p><a href="#">"Microsoft COM+ Performance Graphs Overview" on page 334</a></p>



## COM+ Call Count Distribution Graph

This graph shows the percentage of calls made to each COM+ interface compared to all COM+ interfaces. It can also show the percentage of calls made to a specific COM+ method compared to other methods within the interface

<b>Breakdown options</b>	<p>The number of calls made to the interface or method is listed in the <b>Call Count</b> column of the <a href="#">"COM+ Breakdown Graph" on page 336</a> table.</p> <p>Each interface or method is represented by a different colored area on the pie graph. The legend frame (which is found below the graph) identifies the interfaces by color:</p> <table><tr><th>Color</th><th>Scale</th><th>Measurement</th><th>Graph Average</th></tr><tr><td></td><td>1</td><td>ContrRnd\COMPlusServer.ConstTime\IDispatch</td><td>70</td></tr><tr><td></td><td>1</td><td>ContrRnd\COMPlusServer.ConstTime\_ConstTime</td><td>70</td></tr><tr><td></td><td>1</td><td>ContrRnd\COMPlusServer.RandomTime\_RandomTime</td><td>40</td></tr></table> <p>This legend shows that the green colored area belongs to the COM+ interface <b>IDispatch</b>. Looking at the example graph below, we see that 38.89% of calls are made to this interface. The actual figures can be seen in the <b>Call Count</b> column of the <a href="#">"COM+ Breakdown Graph" on page 336</a> table.</p> <p>Viewing COM+ Methods</p> <p>The table initially displays COM+ interfaces, but you can also view the list of COM+ methods by using drill-down or filtering techniques. For more information, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a> and <a href="#">"Drilling Down in a Graph" on page 113</a>.</p>	Color	Scale	Measurement	Graph Average		1	ContrRnd\COMPlusServer.ConstTime\IDispatch	70		1	ContrRnd\COMPlusServer.ConstTime\_ConstTime	70		1	ContrRnd\COMPlusServer.RandomTime\_RandomTime	40
Color	Scale	Measurement	Graph Average														
	1	ContrRnd\COMPlusServer.ConstTime\IDispatch	70														
	1	ContrRnd\COMPlusServer.ConstTime\_ConstTime	70														
	1	ContrRnd\COMPlusServer.RandomTime\_RandomTime	40														
<b>Tips</b>	<p>To highlight a specific interface line in the graph, select the interface row in the legend.</p>																
<b>See also</b>	<p><a href="#">"Microsoft COM+ Performance Graphs Overview" on page 334</a></p>																






## COM+ Call Count Graph

This graph displays the number of times COM+ interfaces and methods are invoked during the test.

X-axis	Elapsed time from the beginning of the scenario run.
Y-axis	How many calls were made to a COM+ interface or method.

Breakdown options

Each interface or method is represented by a different colored line on the graph. The legend frame (which is found below the graph) identifies the interfaces by color:

Color	Scale	Measurement	Graph Minimum	Average	Graph Maximum
	1	ContrRnd\COMPlusServer.ConstTime\Dispatch	0	1.777	13
	1	ContrRnd\COMPlusServer.ConstTime\_ConstTime	0	1.777	16
	1	ContrRnd\COMPlusServer.RandomTime\_RandomTime	0	1.015	20

This legend shows that the yellow colored line belongs to the COM+ interface **\_RandomTime**. Looking at the graph above, we see that calls to this interface begin at the beginning of the scenario run. There are 20 calls at the 2:20 minute point.

Viewing COM+ Methods

The table initially displays COM+ interfaces, but you can also view the list of COM+ methods by using drill-down or filtering techniques. For more information, see ["Filtering and Sorting Graph Data" on page 129](#) and ["Drilling Down in a Graph" on page 113](#).

Note

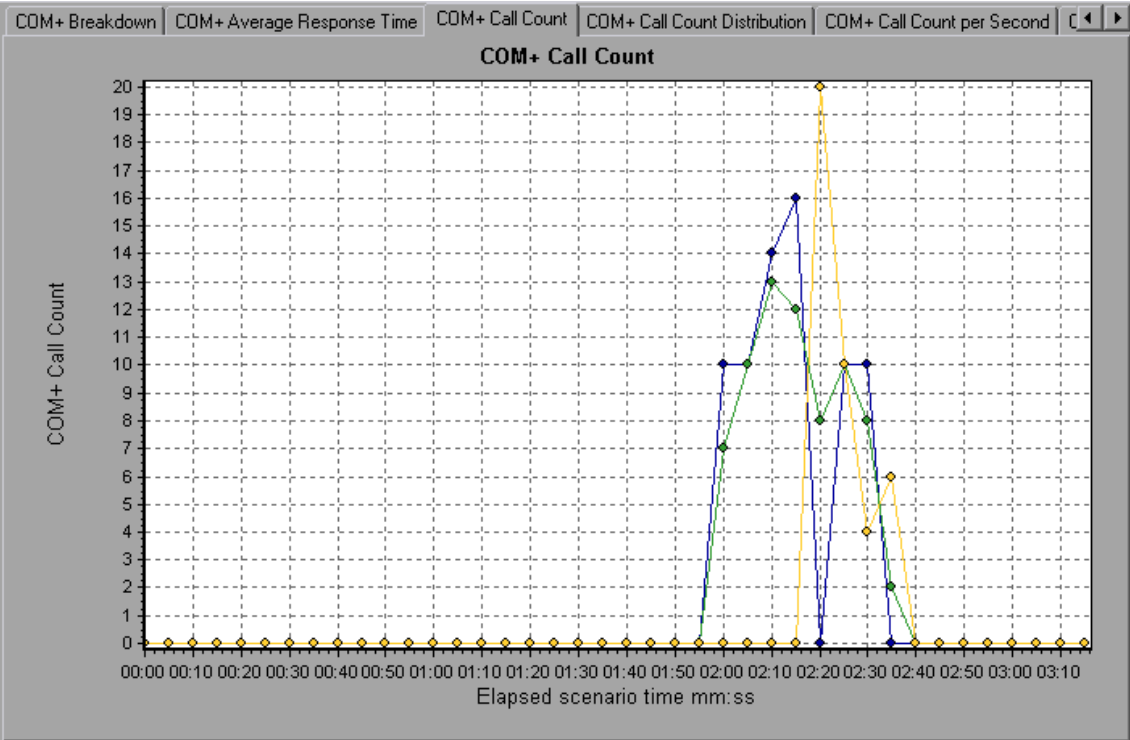
The call count is computed by multiplying the call frequency by a time interval. As a result, the reported measurement may be rounded.

Tips

To highlight a specific interface line in the graph, select the interface row in the legend.

See also

["Microsoft COM+ Performance Graphs Overview" on page 334](#)






# COM+ Call Count Per Second Graph

This graph shows the number of times per second a COM+ interface or method is invoked.

Breakdown options

This graph is similar to the ["COM+ Call Count Graph" on page 340](#) except that the y-axis indicates how many invocations were made to a COM+ interface or method per second.

Each interface or method is represented by a different colored line on the graph. The legend frame (which is found below the graph) identifies the interfaces by color:

Legend   Graph Details   User Notes   Graph Data   Raw Data						
Color	Scale	Measurement	Graph Minimum	Average	Graph Maximum	
<input checked="" type="checkbox"/> 	1	ContrRnd\COMPlusServer.ConstTime\IDispatch	0	0.355	2.6	
<input checked="" type="checkbox"/> 	1	ContrRnd\COMPlusServer.ConstTime\_ConstTime	0	0.355	3.2	
<input checked="" type="checkbox"/> 	1	ContrRnd\COMPlusServer.RandomTime\_RandomTime	0	0.203	4	

This legend shows that the green colored line belongs to the COM+ interface **IDispatch**. Looking at the graph above, we see that calls to this interface begins 1:55 minutes into the scenario run. There is an average of 2.5 calls per second at the 2:10 minute mark.

Viewing COM+ Methods

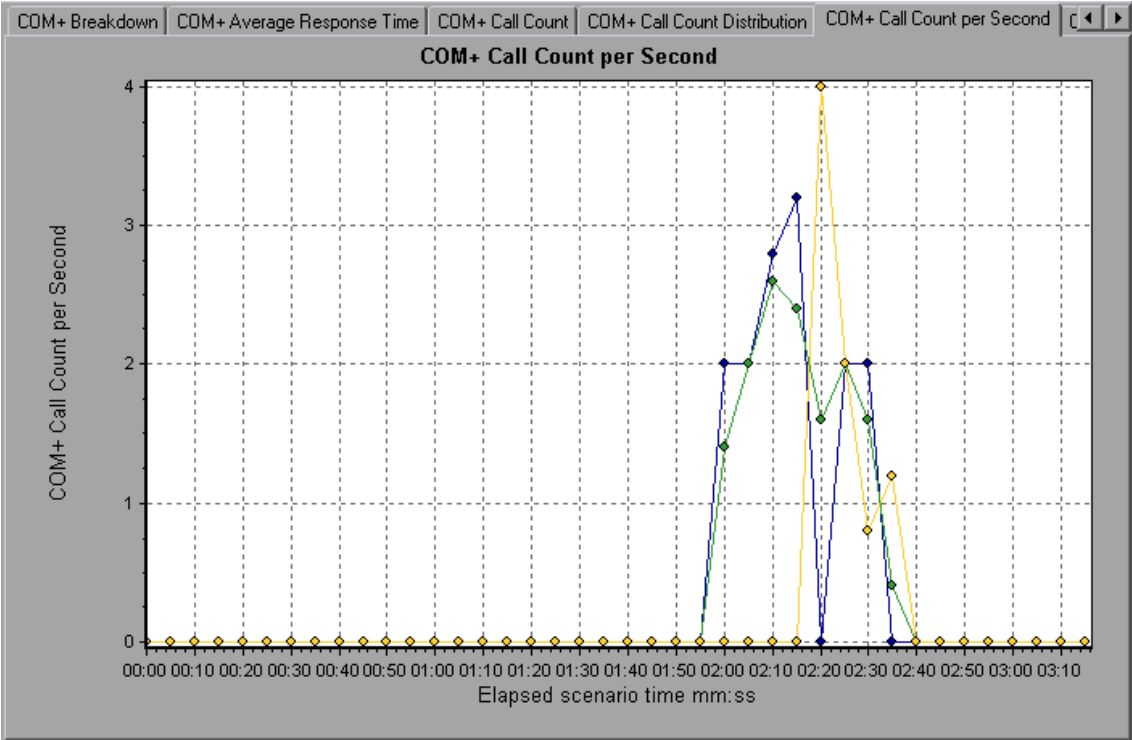
To view the average response time of the individual methods within a COM+ interface, see ["Filtering and Sorting Graph Data" on page 129](#) and ["Drilling Down in a Graph" on page 113](#).

Tips

To highlight a specific interface line in the graph, select the interface row in the legend.

See also

["Microsoft COM+ Performance Graphs Overview" on page 334](#)



# COM+ Total Operation Time Distribution Graph

This graph shows the percentage of time a specific COM+ interface takes to execute in relation to all COM+ interfaces. It can also show the percentage of time a COM+ method takes to execute in relation to all COM+ methods within the interface.










<b>Purpose</b>	Use it to identify those interfaces or methods which take up an excessive amount of time.
----------------	---

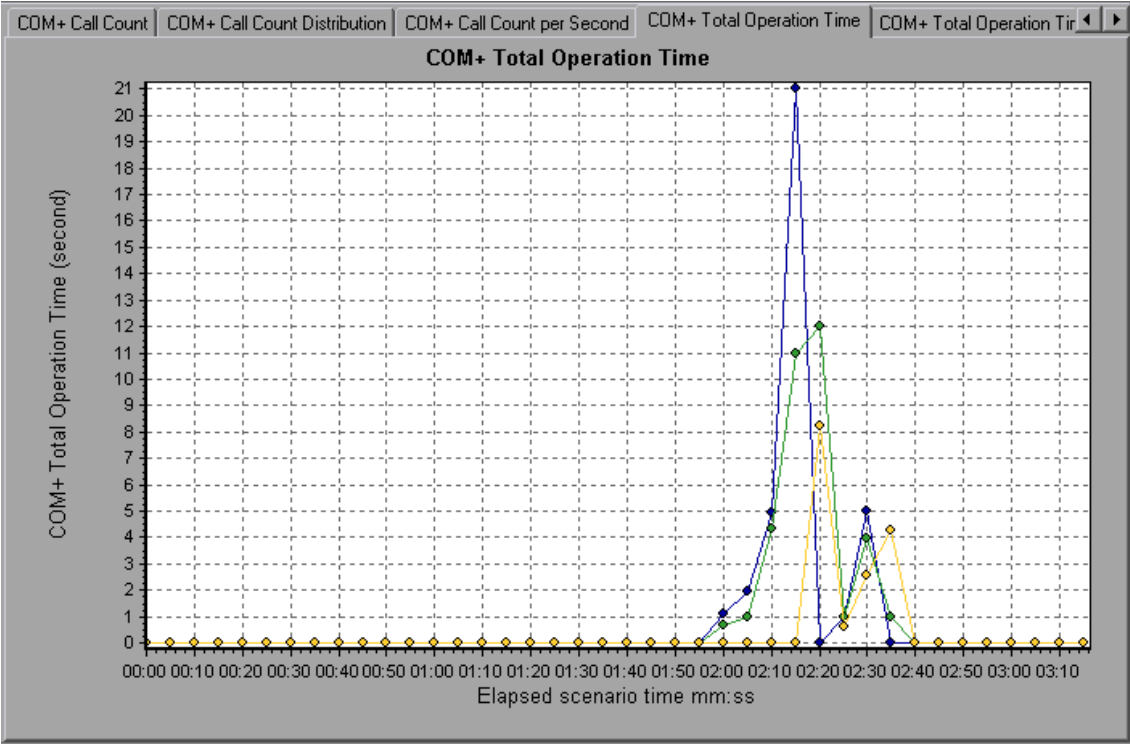




## COM+ Total Operation Time Graph

This graph displays the amount of time each COM+ interface or method takes to execute during the test.

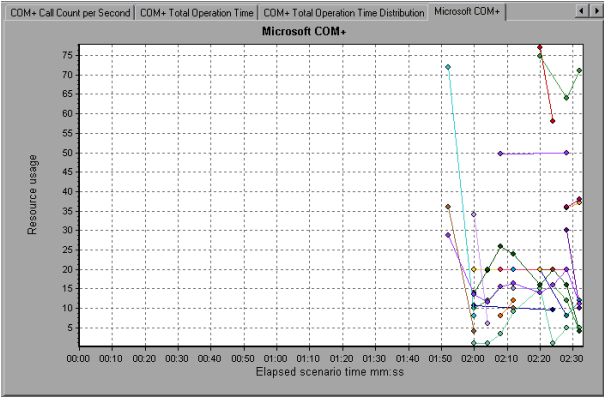
<b>Purpose</b>	Use it to identify those interfaces or methods which take up an excessive amount of time.																								
<b>X-axis</b>	Elapsed time from the beginning of the scenario run.																								
<b>Y-axis</b>	Total time a COM+ interface or method is in operation.																								
<b>Breakdown options</b>	<p>Each interface or method is represented by a different colored line on the graph. The legend frame (which is found below the graph) identifies the interfaces by color:</p> <table><tr><th>Color</th><th>Scale</th><th>Measurement</th><th>Graph Minimum</th><th>Average</th><th>Graph Maximum</th></tr><tr><td></td><td>1</td><td>ContrRnd\COMPlusServer.ConstTime\Dispatch</td><td>0</td><td>0.887</td><td>12.008</td></tr><tr><td></td><td>1</td><td>ContrRnd\COMPlusServer.ConstTime\_ConstTime</td><td>0</td><td>0.887</td><td>21.026</td></tr><tr><td></td><td>1</td><td>ContrRnd\COMPlusServer.RandomTime\_RandomTime</td><td>0</td><td>0.397</td><td>8.24</td></tr></table> <p>This legend shows that the blue colored line belongs to the COM+ interface <b>_ConstTime</b>. Looking at the graph above, we see that throughout the scenario, this interface consumes more time than any other, especially at 2 minutes and 15 seconds into the scenario run, where the calls to this interface take an average of 21 seconds.</p> <p>Viewing COM+ Methods</p> <p>The table initially displays COM+ interfaces, but you can also view the list of COM+ methods by using drill-down or filtering techniques. For more information, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a> and <a href="#">"Drilling Down in a Graph" on page 113</a>.</p>	Color	Scale	Measurement	Graph Minimum	Average	Graph Maximum		1	ContrRnd\COMPlusServer.ConstTime\Dispatch	0	0.887	12.008		1	ContrRnd\COMPlusServer.ConstTime\_ConstTime	0	0.887	21.026		1	ContrRnd\COMPlusServer.RandomTime\_RandomTime	0	0.397	8.24
Color	Scale	Measurement	Graph Minimum	Average	Graph Maximum																				
	1	ContrRnd\COMPlusServer.ConstTime\Dispatch	0	0.887	12.008																				
	1	ContrRnd\COMPlusServer.ConstTime\_ConstTime	0	0.887	21.026																				
	1	ContrRnd\COMPlusServer.RandomTime\_RandomTime	0	0.397	8.24																				
<b>Tips</b>	To highlight a specific interface line in the graph, select the interface row in the legend.																								
<b>See also</b>	<a href="#">"Microsoft COM+ Performance Graphs Overview" on page 334</a>																								



## Microsoft COM+ Graph

This graph shows the resource usage of COM+ objects as a function of the elapsed load test scenario time.

X-axis	Elapsed time since the start of the run.																																																															
Y-axis	The resource usage of COM+ objects.																																																															
Breakdown Options	<p>Each COM+ object is represented by a different colored line on the graph. The legend frame (which is found below the graph) identifies the objects by color:</p> <table><tr><th>Color</th><th>Scale</th><th>Measurement</th><th>Minimum</th><th>Average</th><th>Maximum</th><th>Std. Deviation</th></tr><tr><td></td><td>1</td><td>ContFind\Authenticate.dakota</td><td>3.994</td><td>12.482</td><td>16.376</td><td>3.84</td></tr><tr><td></td><td>10</td><td>ContFind\COMPlusServer.ConstTime\Dispatch\InvokeMethod.Duration.dakota</td><td>0.096</td><td>0.905</td><td>1.901</td><td>0.459</td></tr><tr><td></td><td>10</td><td>ContFind\COMPlusServer.ConstTime\Dispatch\InvokeMethod.Frequency.dakota</td><td>0.399</td><td>1.747</td><td>2.596</td><td>0.638</td></tr><tr><td></td><td>10</td><td>ContFind\COMPlusServer.ConstTime\Object.Activate.dakota</td><td>0.599</td><td>1.997</td><td>3.395</td><td>1.398</td></tr><tr><td></td><td>10</td><td>ContFind\COMPlusServer.ConstTime\Object.Create.dakota</td><td>0.799</td><td>3.995</td><td>7.19</td><td>3.195</td></tr><tr><td></td><td>10</td><td>ContFind\COMPlusServer.ConstTime\Object.Deactivate.dakota</td><td>0.999</td><td>1.998</td><td>2.996</td><td>0.998</td></tr><tr><td></td><td>10</td><td>ContFind\COMPlusServer.ConstTime\Object.Destroy.dakota</td><td>0.999</td><td>1.998</td><td>2.996</td><td>0.998</td></tr><tr><td></td><td>1</td><td>ContFind\COMPlusServer.ConstTime\InvokeMethod.Duration.dakota</td><td>96.69</td><td>96.496</td><td>97.19</td><td>0.796</td></tr></table>	Color	Scale	Measurement	Minimum	Average	Maximum	Std. Deviation		1	ContFind\Authenticate.dakota	3.994	12.482	16.376	3.84		10	ContFind\COMPlusServer.ConstTime\Dispatch\InvokeMethod.Duration.dakota	0.096	0.905	1.901	0.459		10	ContFind\COMPlusServer.ConstTime\Dispatch\InvokeMethod.Frequency.dakota	0.399	1.747	2.596	0.638		10	ContFind\COMPlusServer.ConstTime\Object.Activate.dakota	0.599	1.997	3.395	1.398		10	ContFind\COMPlusServer.ConstTime\Object.Create.dakota	0.799	3.995	7.19	3.195		10	ContFind\COMPlusServer.ConstTime\Object.Deactivate.dakota	0.999	1.998	2.996	0.998		10	ContFind\COMPlusServer.ConstTime\Object.Destroy.dakota	0.999	1.998	2.996	0.998		1	ContFind\COMPlusServer.ConstTime\InvokeMethod.Duration.dakota	96.69	96.496	97.19	0.796
Color	Scale	Measurement	Minimum	Average	Maximum	Std. Deviation																																																										
	1	ContFind\Authenticate.dakota	3.994	12.482	16.376	3.84																																																										
	10	ContFind\COMPlusServer.ConstTime\Dispatch\InvokeMethod.Duration.dakota	0.096	0.905	1.901	0.459																																																										
	10	ContFind\COMPlusServer.ConstTime\Dispatch\InvokeMethod.Frequency.dakota	0.399	1.747	2.596	0.638																																																										
	10	ContFind\COMPlusServer.ConstTime\Object.Activate.dakota	0.599	1.997	3.395	1.398																																																										
	10	ContFind\COMPlusServer.ConstTime\Object.Create.dakota	0.799	3.995	7.19	3.195																																																										
	10	ContFind\COMPlusServer.ConstTime\Object.Deactivate.dakota	0.999	1.998	2.996	0.998																																																										
	10	ContFind\COMPlusServer.ConstTime\Object.Destroy.dakota	0.999	1.998	2.996	0.998																																																										
	1	ContFind\COMPlusServer.ConstTime\InvokeMethod.Duration.dakota	96.69	96.496	97.19	0.796																																																										
See also	"Microsoft COM+ Performance Graphs Overview" on page 334																																																															



Authentication Metrics

Measurement	Description
Authenticate	Frequency of successful method call level authentication. When you set an authentication level for an application, you determine what degree of authentication is performed when clients call into the application.
Authenticate Failed	Frequency of failed method call level authentication.

Application Event

Measurement	Description
Activation	Frequency of application activation or startup.
Shutdown	Frequency of application shutdown or termination.

Thread Event

Measurement	Description
Thread Start	Rate at which single-threaded apartment (STA) thread for application have been started.

, continued

Measurement	Description
<b>Thread Terminate</b>	Rate at which single-threaded apartment (STA) thread for application have been terminated.
<b>Work Enqueue</b>	Event sent if a work is queued in single thread apartment object (STA). Note: These events are not signaled/sent in Windows Server 2003 and later.
<b>Work Reject</b>	Event sent if a work is rejected from single thread apartment object (STA). Note: These events are not signaled/sent in Windows Server 2003 and later.

## Transaction Events

Measurement	Description
<b>Transaction Duration</b>	Duration of COM+ transactions for selected application.
<b>Transaction Start</b>	Rate at which transactions have started.
<b>Transaction Prepared</b>	Rate at which transactions have completed the prepare phase of the two-phase protocol.
<b>Transaction Aborted</b>	Rate at which transactions have been aborted.
<b>Transaction Commit</b>	Rate at which transactions have completed the commit protocol.

## Object Events

Measurement	Description
<b>Object Life Time</b>	Duration of object existence (from instantiation to destruction).
<b>Object Create</b>	Rate at which new instances of this object are created.
<b>Object Destroy</b>	Rate at which instances of the object are destroyed.
<b>Object Activate</b>	Rate of retrieving instances of a new JIT-activated object.
<b>Object Deactivation</b>	Rate of freeing JIT-activated object via SetComplete or SetAbort.
<b>Disable Commit</b>	Rate of client calls to DisableCommit on a context. DisableCommit declares that the object's transactional updates are inconsistent and can't be committed in their present state.
<b>Enable Commit</b>	Rate of client calls to EnableCommit on a context. EnableCommit declares that the current object's work is not necessarily finished, but that its transactional updates are consistent and could be committed in their present form.
<b>Set Complete</b>	Rate of client calls to SetComplete on a context. SetComplete declares that the transaction in which the object is executing can be committed, and that the object should be deactivated on returning from the currently executing method call.
<b>Set Abort</b>	Rate of client calls to SetAbort on a context. SetAbort declares that the transaction in which the object is executing must be aborted, and that the object should be deactivated on returning from the currently executing method call.

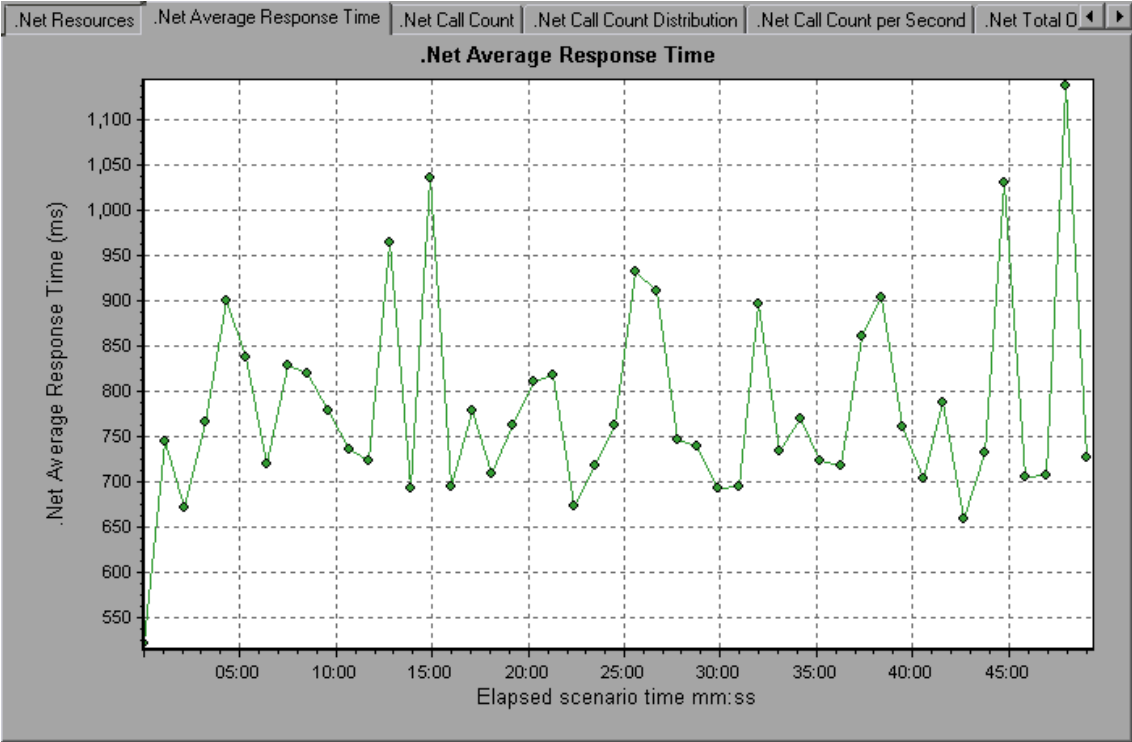
## Method Events

Measurement	Description
Method Duration	Average duration of method.
Method Frequency	Frequency of method invocation.
Method Failed	Frequency of failed methods (i.e. methods that return error HRESULT codes).
Method Exceptions	Frequency of exceptions thrown by selected method.

## .NET Average Response Time Graph

This graph specifies the average time that .NET classes or methods took to perform during the load test scenario run.

<b>X-axis</b>	Elapsed time from the beginning of the scenario run.
<b>Y-axis</b>	Average response time of a .NET class or method.
<b>Breakdown options</b>	The graph initially displays .NET classes, but you can also view the individual methods within a .NET class by using drill-down or filtering techniques. For more information, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a> and <a href="#">"Drilling Down in a Graph" on page 113</a> .
<b>Tips</b>	<p>You can change the length of the sample interval.</p> <p><b>Hint:</b> To highlight a specific class line in the graph, select the class row in the legend (displayed below the graph).</p>
<b>See also</b>	<a href="#">"Microsoft COM+ Performance Graphs Overview" on page 334</a>



## .NET Breakdown Graph

This graph summarizes fundamental result data about .NET classes or methods and presents it in table format.

<b>Purpose</b>	Using the .NET Breakdown table, you can identify the .NET classes or methods which consume the most time during the test. The table can be sorted by column, and the data can be viewed either by .NET class or .NET method.
----------------	--



### Breakdown options

The **Average Response Time** column shows how long, on average, a class or method took to perform. The next column, **Call Count**, specifies the number of times the class or method was invoked. The final column, **Total Response Time**, specifies how much time was spent overall on the class or method. It is calculated by multiplying the results from the first two columns together.

Classes are listed in the **.NET Class** column in the form **Class:Host**. In the table above, the **AtmMachineSample.AtmTeller** class took an average of 783 seconds to execute and was called 50,912 times. Overall, this class took 39,316 seconds to execute.

To sort the list by a column, click the column heading.

Each column in the .NET Breakdown graph is graphically represented by another graph.

The table initially displays .NET classes, but you can also view the list of .NET methods. To view .NET methods, select the **.NET Methods** option, or double-click the class row. The methods of the specified class are listed in the **.NET Method** column.

### See also

["Microsoft COM+ Performance Graphs Overview" on page 334](#)

HTTP Responses per Second	Average Transaction Response Time	Transaction Response Time (Distribution)	.Net Breakdown	.Net Average
<input checked="" type="radio"/> .Net Classes <input type="radio"/> .Net Methods				
<b>.Net Classes - Performance Summary</b>				
.Net Class	Average Response Time (ms)	Call Count	Total Response T	
AtmMachineSample.dll\AtmMachineSample.AtmTeller:1...	783.316	50,192	39,316	
<b>Class Information</b> Class: AtmMachineSample.dll\AtmMachineSample.AtmTeller Host: localhost Average Response Time (ms): 783.316    Call Count: 50,192    Total Response Time (ms): 39,316,191				

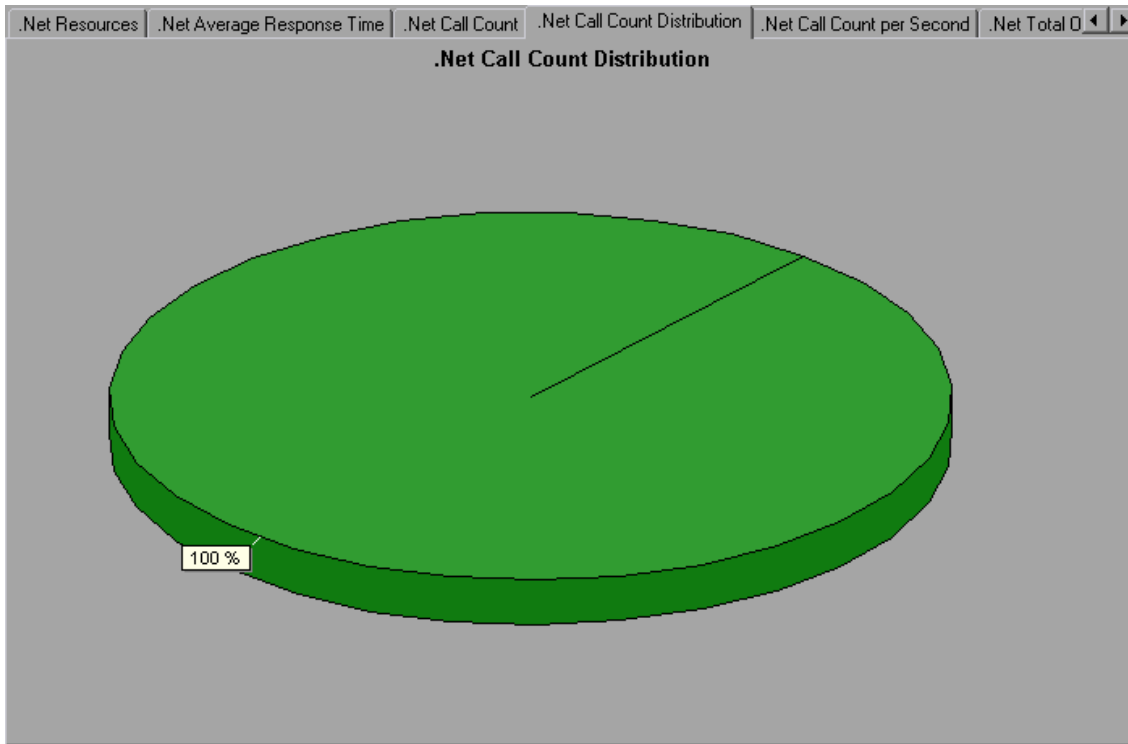
## .NET Breakdown graph

.NET Breakdown Column	Graphical Representation
Average Response Time	.NET Average Response Time Graph.
Call Count	.NET Call Count Graph.
Total Response Time	.NET Total Operation Time Distribution Graph.

## .NET Call Count Distribution Graph

This graph shows the percentage of calls made to each .NET class compared to all .NET classes. It can also show the percentage of calls made to a specific .NET method compared to other methods within the class

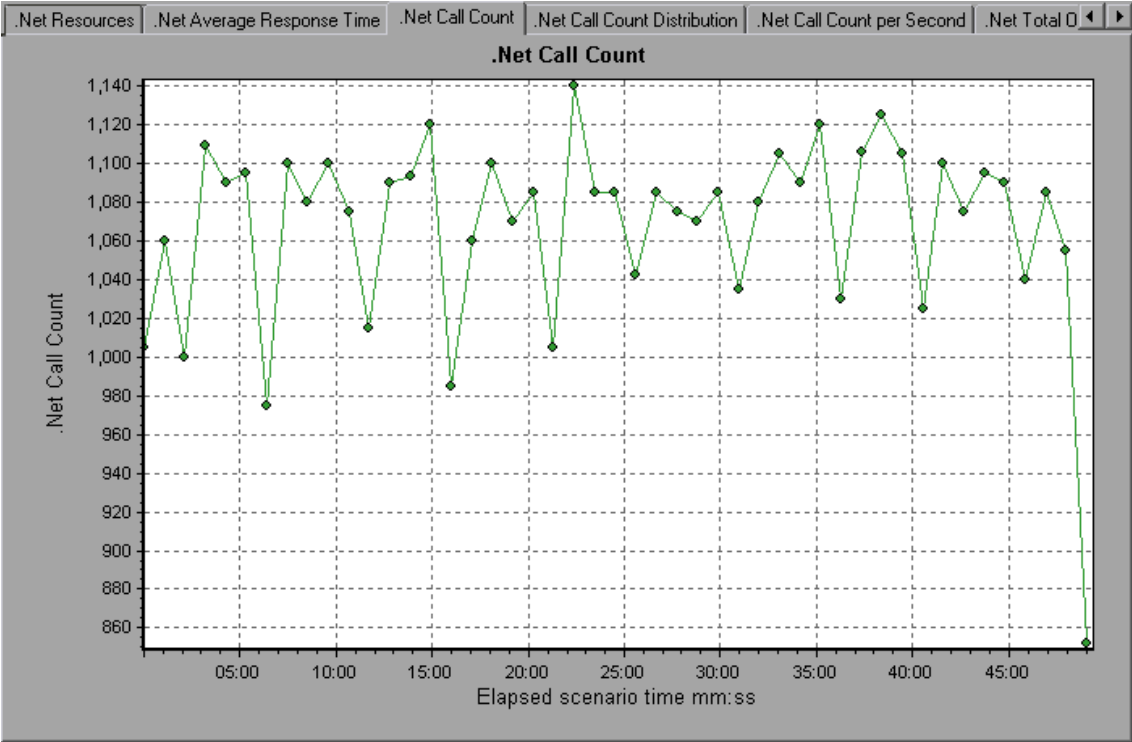
<b>Breakdown options</b>	<p>The number of calls made to the class or method is listed in the <b>Call Count</b> column of the .NET Breakdown graph table.</p> <p>The graph initially displays .NET classes, but you can also view the individual methods within a .NET class by using drill-down or filtering techniques. For more information, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a> and <a href="#">"Drilling Down in a Graph" on page 113</a>.</p>
<b>Tips</b>	<p>To highlight a specific class line in the graph, select the class row in the legend (displayed below the graph).</p>
<b>See also</b>	<p><a href="#">"Microsoft COM+ Performance Graphs Overview" on page 334</a></p>



## .NET Call Count Graph

This graph displays the number of times that .NET classes and methods are invoked during the test.

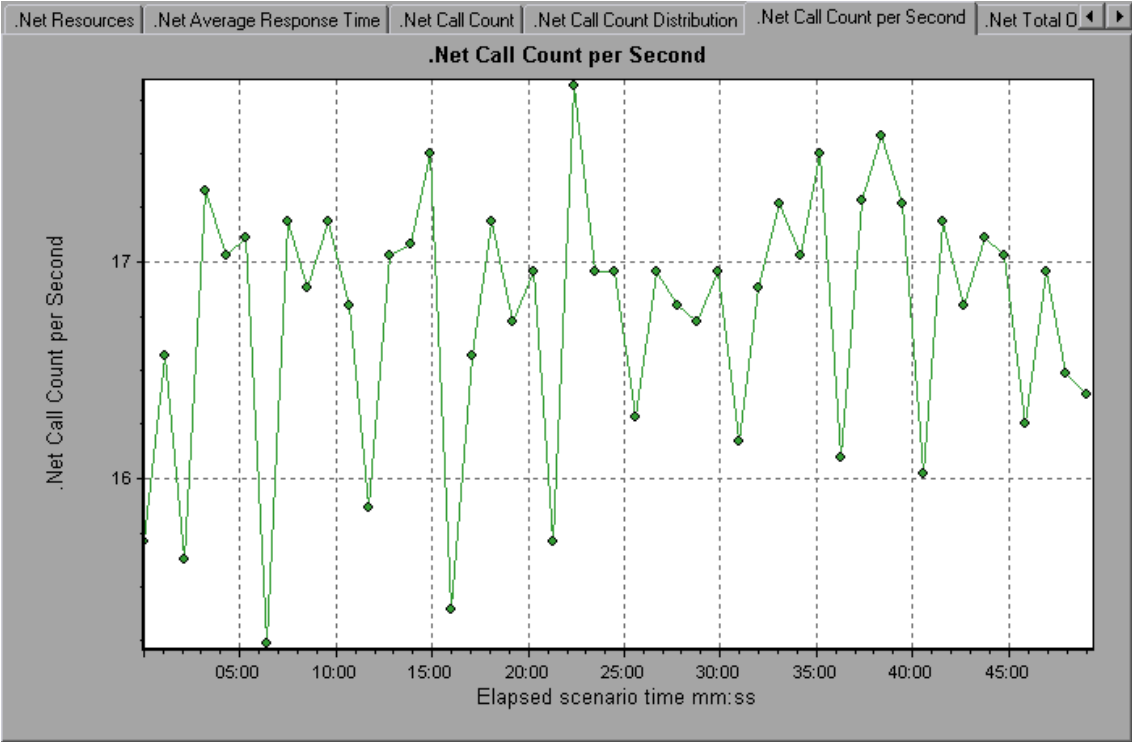
<b>X-axis</b>	Elapsed time from the beginning of the scenario run.
<b>Y-axis</b>	Indicates how many calls were made to a .NET class or method.
<b>Breakdown options</b>	The graph initially displays .NET classes, but you can also view the individual methods within a .NET class by using drill-down or filtering techniques. For more information, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a> and <a href="#">"Drilling Down in a Graph" on page 113</a> .
<b>Tips</b>	To highlight a specific class line in the graph, select the class row in the legend (displayed below the graph).
<b>Note</b>	The call count is computed by multiplying the call frequency by a time interval. As a result, the reported measurement may be rounded.
<b>See also</b>	<a href="#">"Microsoft COM+ Performance Graphs Overview" on page 334</a>



## .NET Call Count per Second Graph

This graph shows the number of times per second that a .NET class or method is invoked.

<b>Breakdown options</b>	<p>This graph is similar to the .NET Call Count graph except that the y-axis indicates how many invocations were made to a .NET class or method per second.</p> <p>The graph initially displays .NET classes, but you can also view the individual methods within a .NET class by using drill-down or filtering techniques. For more information, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a> and <a href="#">"Drilling Down in a Graph" on page 113</a>.</p>
<b>Tips</b>	<p>To highlight a specific class line in the graph, select the class row in the legend (displayed below the graph).</p>
<b>See also</b>	<p><a href="#">"Microsoft COM+ Performance Graphs Overview" on page 334</a></p>







# **.NET Resources Graph**

This graph shows the resource usage of .NET methods as a function of the elapsed load test scenario time.

Breakdown options

Each .NET method is represented by a different colored line on the graph. The legend frame (located below the graph) identifies the methods by color:

Color	Scale	Measurement	Minimum	Average	Maximum
	0.01	AtmMachineSample.dll\AtmMachineSample.At...	390.749	888.061	37848.727
	10	AtmMachineSample.dll\AtmMachineSample.At...	1	4.244	10
	0.1	AtmMachineSample.dll\AtmMachineSample.At...	190.944	194.783	207.318
	10	AtmMachineSample.dll\AtmMachineSample.At...	1	4.235	10

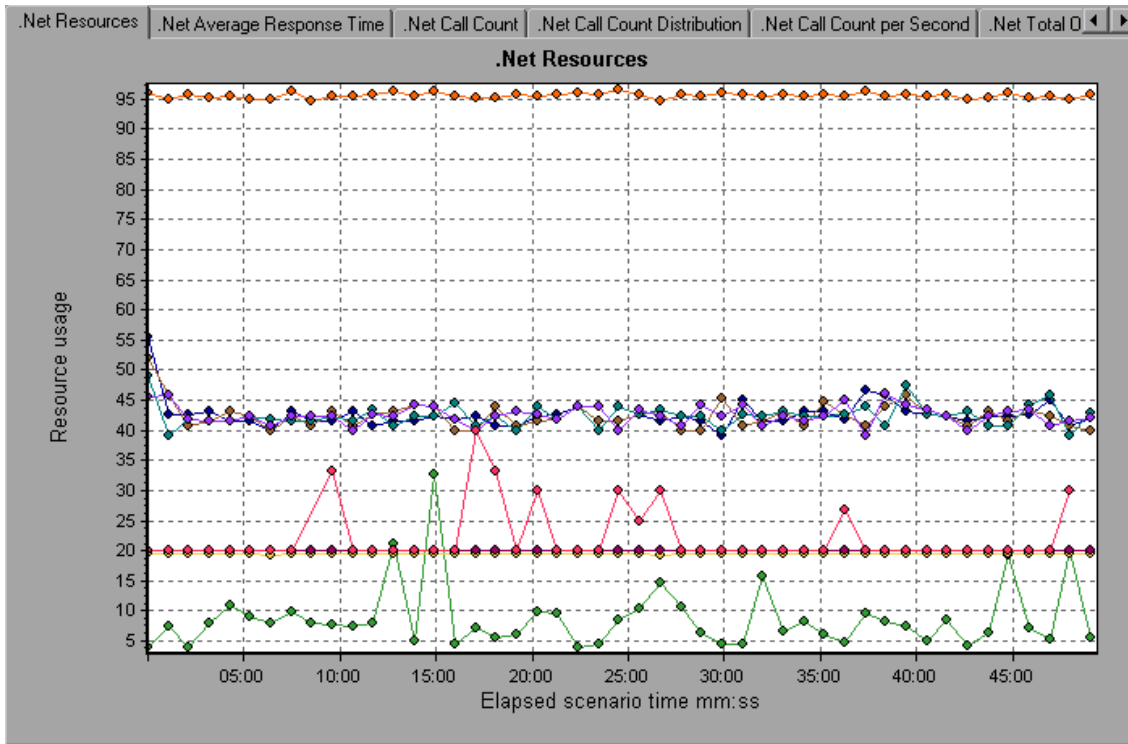
You can monitor .NET counters at the application, assembly, class, and method levels. Measurements that take place before the application is fully loaded (such as Assembly Load Time, that measures the time it takes to load an assembly) will not be measured.

The following tables describe the counters that can be measured at each level. All durations are reported in seconds, and all frequencies are reported per five-second polling periods. For example, if 20 events occur in a 5 second polling period, the reported frequency is 4.

- ["Application Level" on the next page](#)
- ["Assembly Level" on page 361](#)
- ["Class Level" on page 361](#)
- ["Method Level" on page 362](#)

See also

["Microsoft COM+ Performance Graphs Overview" on page 334](#)



## Application Level

Measurement	Description
<b>Application Lifetime</b>	Monitors the duration of the application in seconds.
<b>Exception Frequency</b>	Monitors the number of exceptions per second, in the five second polling period.
<b>JIT (Just In Time) Duration</b>	Monitors the time (in seconds) it takes for the JIT to compile code.
<b>Thread Creation Frequency</b>	Monitors the number of threads that are created in a polling period.
<b>Thread Lifetime</b>	Monitors the duration of threads.

Measurement	Description
<b>Domain Creation Frequency</b>	Monitors the number of domain creations in a polling period. (Domains protect areas of code. All applications run in a domain which keeps them encapsulated, so that they cannot interfere with other applications outside the domain.)
<b>Domain Load Time</b>	Monitors the time it takes to load a domain. (Domains protect areas of code. All applications run in a domain which keeps them encapsulated, so that they cannot interfere with other applications outside the domain).
<b>Domain Unload Time</b>	Monitors the time it takes to unload a domain. (Domains protect areas of code. All applications run in a domain which keeps them encapsulated, so that they cannot interfere with other applications outside the domain).
<b>Domain Lifetime</b>	Monitors the duration of a domain. (Domains protect areas of code. All applications run in a domain which keeps them encapsulated, so that they cannot interfere with other applications outside the domain).
<b>Module Creation Frequency</b>	Monitors the number of modules that get created in a polling period. (Modules are groups of assemblies that make up a DLL or EXE).
<b>Module Load Time</b>	Monitors the time it takes to load a module. (Modules are groups of assemblies that make up a dll or exe).
<b>Module Unload Time</b>	Monitors the time it takes to unload a module. (Modules are groups of assemblies that make up a dll or exe).
<b>Module Lifetime</b>	Monitors the duration of a module. (Modules are groups of assemblies that make up a dll or exe).
<b>Garbage Collection Duration</b>	Monitors the duration between the start and stop of Garbage Collection.



Measurement	Description
<b>Garbage Collection Frequency</b>	Monitors the number of breaks for Garbage Collections in a polling period.
<b>Unmanaged Code Duration</b>	Monitors the duration of the calls to unmanaged code.
<b>Unmanaged Code Frequency</b>	Monitors the number of calls to unengaged code in a polling period.

## Assembly Level

Measurement	Description
<b>Assembly Creation Frequency</b>	Monitors the number of assembly creations in a polling period. (Assemblies hold the .NET byte code and metadata).
<b>Assembly Load Time</b>	Monitors the time it takes to load an assembly. (Assemblies hold the .NET byte code and metadata).
<b>Assembly Unload Time</b>	Monitors the time it takes to unload an assembly. (Assemblies hold the .NET byte code and metadata).
<b>Assembly Lifetime</b>	Monitors the duration of an assembly. (Assemblies hold the .NET byte code and metadata).

## Class Level

Measurement	Description
<b>Class Lifetime</b>	Monitors the duration of a class.
<b>Class Load Time</b>	Monitors the time it takes to load a class.
<b>Class Unload Time</b>	Monitors the time it takes to unload a class.

## Method Level

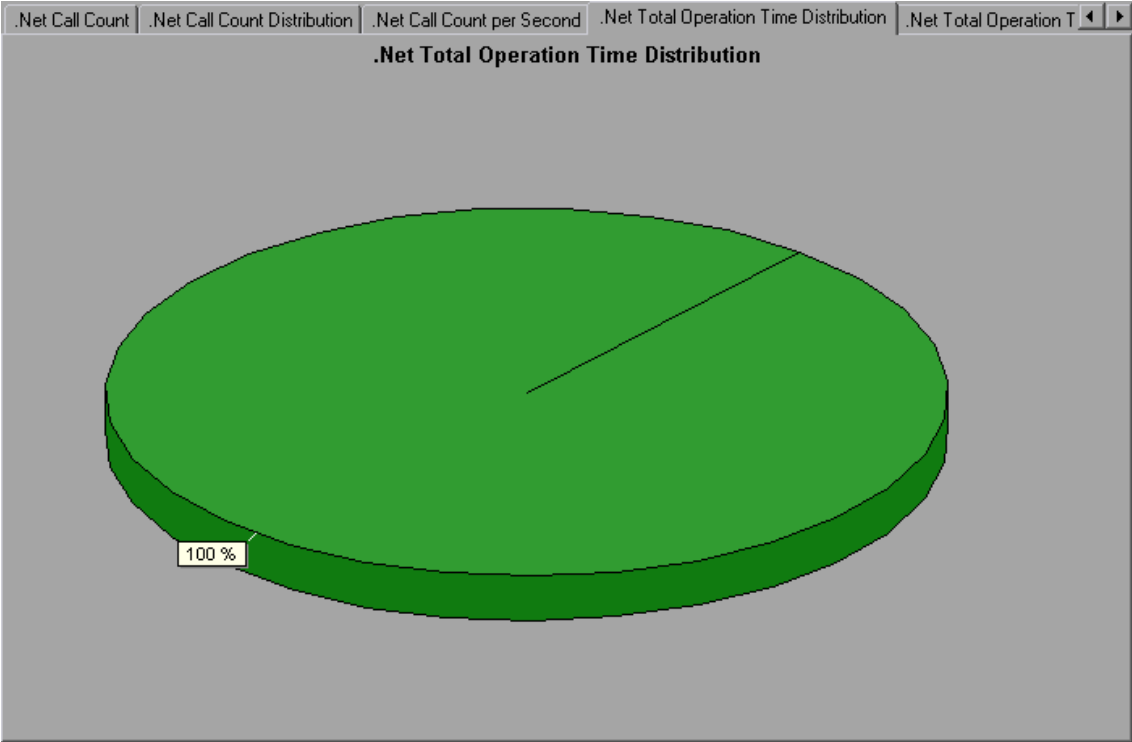
At the method level, the measured time is per method, exclusive of other methods, calls to unmanaged code, and garbage collection time.

Measurement	Description
Method Duration	Monitors the duration of a method.
Method Frequency	Monitors the number of methods called in a polling period.

## .NET Total Operation Time Distribution Graph

This graph shows the percentage of time that a specific .NET class took to execute in relation to all the .NET classes. It can also show the percentage of time that a .NET method took to execute in relation to all the .NET methods within the class.

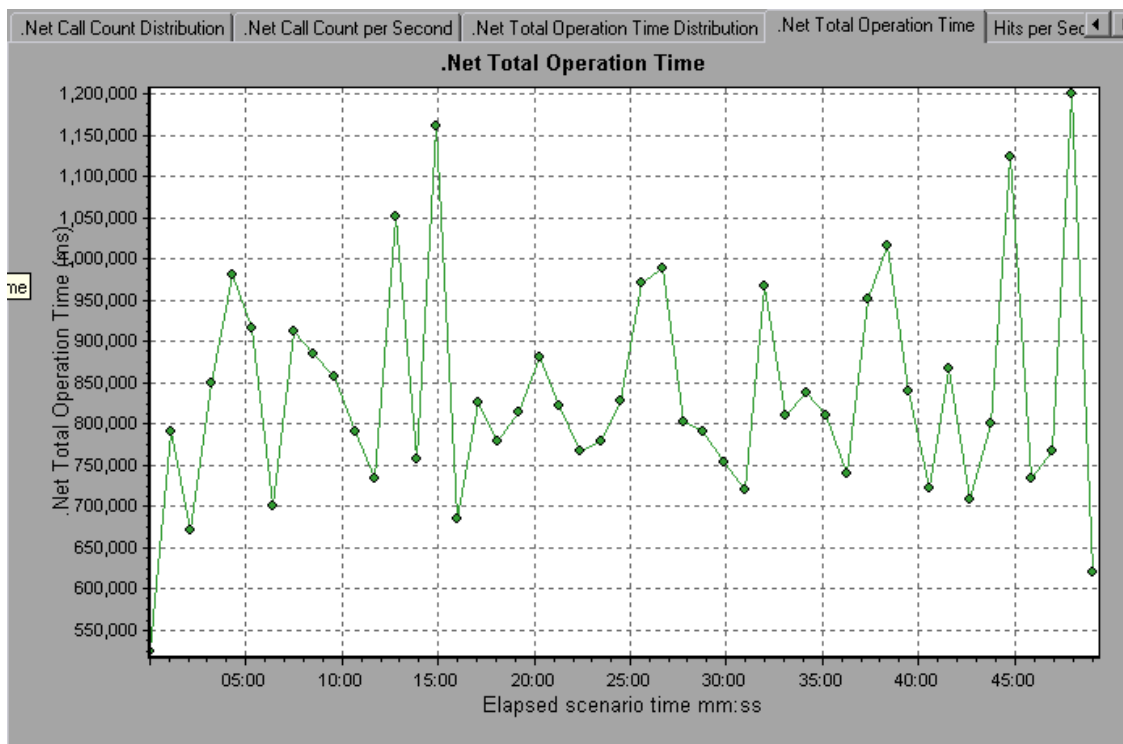
<b>Purpose</b>	Use this graph to identify those classes or methods that take an excessive amount of time.
<b>Breakdown options</b>	The graph initially displays .NET classes, but you can also view the individual methods within a .NET class by using drill-down or filtering techniques. For more information, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a> and <a href="#">"Drilling Down in a Graph" on page 113</a> .
<b>Tips</b>	To highlight a specific class line in the graph, select the class row in the legend (displayed below the graph).
<b>See also</b>	<a href="#">"Microsoft COM+ Performance Graphs Overview" on page 334</a>



## .NET Total Operation Time Graph

This graph displays the amount of time that each .NET class or method took to execute during the test.

<b>Purpose</b>	Use this graph to identify those classes or methods that take an excessive amount of time.
<b>X-axis</b>	Elapsed time from the beginning of the scenario run.
<b>Y-axis</b>	Total time a .NET class or method is in operation.
<b>Breakdown options</b>	The graph initially displays .NET classes, but you can also view the individual methods within a .NET class by using drill-down or filtering techniques. For more information, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a> and <a href="#">"Drilling Down in a Graph" on page 113</a> .
<b>Tips</b>	To highlight a specific class line in the graph, select the class row in the legend (displayed below the graph).
<b>See also</b>	<a href="#">"Microsoft COM+ Performance Graphs Overview" on page 334</a>



## Application Deployment Solutions Graphs

### Application Deployment Solutions Graph Overview

LoadRunner's Citrix Server monitor provides you with information about the application deployment usage of the Citrix server during a load test scenario execution. In order to obtain performance data, before you execute the scenario you need to activate the online monitor for the server and specify which resources you want to measure.

For more information on activating and configuring the Citrix monitors, see the section on online monitors in the LoadRunner Controller documentation.

## Citrix Measurements

### Non-Virtual Counters

Measurement	Description
<b>% Disk Time</b>	The percentage of elapsed time that the selected disk drive services read or write requests.
<b>% Processor Time</b>	The percentage of time that the processor executes a non-Idle thread. This counter is a primary indicator of processor activity. It is calculated by measuring the time that the processor spends executing the thread of the Idle process in each sample interval, and subtracting that value from 100%. (Each processor has an Idle thread which consumes cycles when no other threads are ready to run.) It can be viewed as the percentage of the sample interval spent doing useful work. This counter displays the average percentage of busy time observed during the sample interval. It is calculated by monitoring the time the service was inactive, and then subtracting that value from 100%.
<b>File data Operations/sec</b>	The rate that the computer issues Read and Write operations to file system devices. It does not include File Control Operations.

, continued

Measurement	Description
<b>Interrupts/sec</b>	The average number of hardware interrupts the processor receives and services per second. It does not include DPCs, which are counted separately. This value is an indirect indicator of the activity of devices that generate interrupts, such as the system clock, the mouse, disk drivers, data communication lines, network interface cards and other peripheral devices. These devices normally interrupt the processor when they have completed a task or require attention. Normal thread execution is suspended during interrupts. Most system clocks interrupt the processor every 10 milliseconds, creating a background of interrupt activity. This counter displays the difference between the values observed in the last two samples, divided by the duration of the sample interval.
<b>Output Session Line Speed</b>	This value represents the line speed from server to client for a session in bps.
<b>Input Session Line Speed</b>	This value represents the line speed from client to server for a session in bps.
<b>Page Faults/sec</b>	A count of the Page Faults in the processor. A page fault occurs when a process refers to a virtual memory page that is not in its Working Set in main memory. A Page Fault will not cause the page to be fetched from disk if that page is on the standby list, and hence already in main memory, or if it is in use by another process with whom the page is shared.

, continued

Measurement	Description
<b>Pages/sec</b>	The number of pages read from the disk or written to the disk to resolve memory references to pages that were not in memory at the time of the reference. This is the sum of Pages Input/sec and Pages Output/sec. This counter includes paging traffic on behalf of the system Cache to access file data for applications. This value also includes the pages to/from non-cached mapped memory files. This is the primary counter to observe if you are concerned about excessive memory pressure (that is, thrashing), and the excessive paging that may result.
<b>Pool Nonpaged Bytes</b>	The number of bytes in the Nonpaged Pool, a system memory area where space is acquired by operating system components as they accomplish their appointed tasks. Nonpaged Pool pages cannot be paged out to the paging file, but instead remain in main memory as long as they are allocated.
<b>Private Bytes</b>	The current number of bytes this process has allocated that cannot be shared with other processes.
<b>Processor Queue Length</b>	The instantaneous length of the processor queue in units of threads. This counter is always 0 unless you are also monitoring a thread counter. All processors use a single queue in which threads wait for processor cycles. This length does not include the threads that are currently executing. A sustained processor queue length greater than two generally indicates processor congestion. This is an instantaneous count, not an average over the time interval.
<b>Threads</b>	The number of threads in the computer at the time of data collection. Notice that this is an instantaneous count, not an average over the time interval. A thread is the basic executable entity that can execute instructions in a processor.
<b>Latency – Session Average</b>	The average client latency over the life of a session.

, continued

Measurement	Description
<b>Latency – Last Recorded</b>	The last recorded latency measurement for this session.
<b>Latency – Session Deviation</b>	The difference between the minimum and maximum measured values for a session.
<b>Input Session Bandwidth</b>	The bandwidth (in bps) from client to server traffic for a session in bps.
<b>Input Session Compression</b>	The compression ratio for client to server traffic for a session.
<b>Output Session Bandwidth</b>	The bandwidth (in bps) from server to client traffic for a session.
<b>Output Session Compression</b>	The compression ratio for server to client traffic for a session.
<b>Output Session Linespeed</b>	The line speed (in bps) from server to client for a session.

## Virtual Channel Counters

All the counters in the following table are measured in bytes per second (bps):

Measurement	Description
<b>Input Audio Bandwidth</b>	The bandwidth from client to server traffic on the audio mapping channel.
<b>Input Clipboard Bandwidth</b>	The bandwidth from client to server traffic on the clipboard mapping channel.



, continued

Measurement	Description
<b>Input COM1 Bandwidth</b>	The bandwidth from client to server traffic on the COM1 channel.
<b>Input COM2 Bandwidth</b>	The bandwidth from client to server traffic on the COM2 channel.
<b>Input COM Bandwidth</b>	The bandwidth from client to server traffic on the COM channel.
<b>Input Control Channel Bandwidth</b>	The bandwidth from client to server traffic on the ICA control channel.
<b>Input Drive Bandwidth</b>	The bandwidth from client to server traffic on the client drive mapping channel.
<b>Input Font Data Bandwidth</b>	The bandwidth from client to server traffic on the local text echo font and keyboard layout channel.
<b>Input Licensing Bandwidth</b>	The bandwidth from server to client traffic on the licensing channel.
<b>Input LPT1 Bandwidth</b>	The bandwidth from client to server traffic on the LPT1 channel.
<b>Input LPT2 Bandwidth</b>	The bandwidth from client to server traffic on the LPT2 channel.
<b>Input Management Bandwidth</b>	The bandwidth from client to server traffic on the client management channel.
<b>Input PN Bandwidth</b>	The bandwidth from client to server traffic on the Program Neighborhood channel.
<b>Input Printer Bandwidth</b>	The bandwidth from client to server traffic on the printer spooler channel.
<b>Input Seamless Bandwidth</b>	The bandwidth from client to server traffic on the Seamless channel.
<b>Input Text Echo Bandwidth</b>	The bandwidth from client to server traffic on the local text echo data channel.

, continued

Measurement	Description
<b>Input Thinwire Bandwidth</b>	The bandwidth from client to server traffic on the Thinwire (graphics) channel.
<b>Input VideoFrame Bandwidth</b>	The bandwidth from client to server traffic on the VideoFrame channel.
<b>Output Audio Bandwidth</b>	The bandwidth from server to client traffic on the audio mapping channel.
<b>Output Clipboard Bandwidth</b>	The bandwidth from server to client traffic on the clipboard mapping channel.
<b>Output COM1 Bandwidth</b>	The bandwidth from server to client traffic on the COM1 channel.
<b>Output COM2 Bandwidth</b>	The bandwidth from server to client traffic on the COM2 channel.
<b>Output COM Bandwidth</b>	The bandwidth from server to client traffic on the COM channel.
<b>Output Control Channel Bandwidth</b>	The bandwidth from server to client traffic on the ICA control channel.
<b>Output Drive Bandwidth</b>	The bandwidth from server to client traffic on the client drive channel.
<b>Output Font Data Bandwidth</b>	The bandwidth from server to client traffic on the local text echo font and keyboard layout channel.
<b>Output Licensing Bandwidth</b>	The bandwidth from server to client traffic on the licensing channel.
<b>Output LPT1 Bandwidth</b>	The bandwidth from server to client traffic on the LPT1 channel.
<b>Output LPT2 Bandwidth</b>	The bandwidth from server to client traffic on the LPT2 channel.

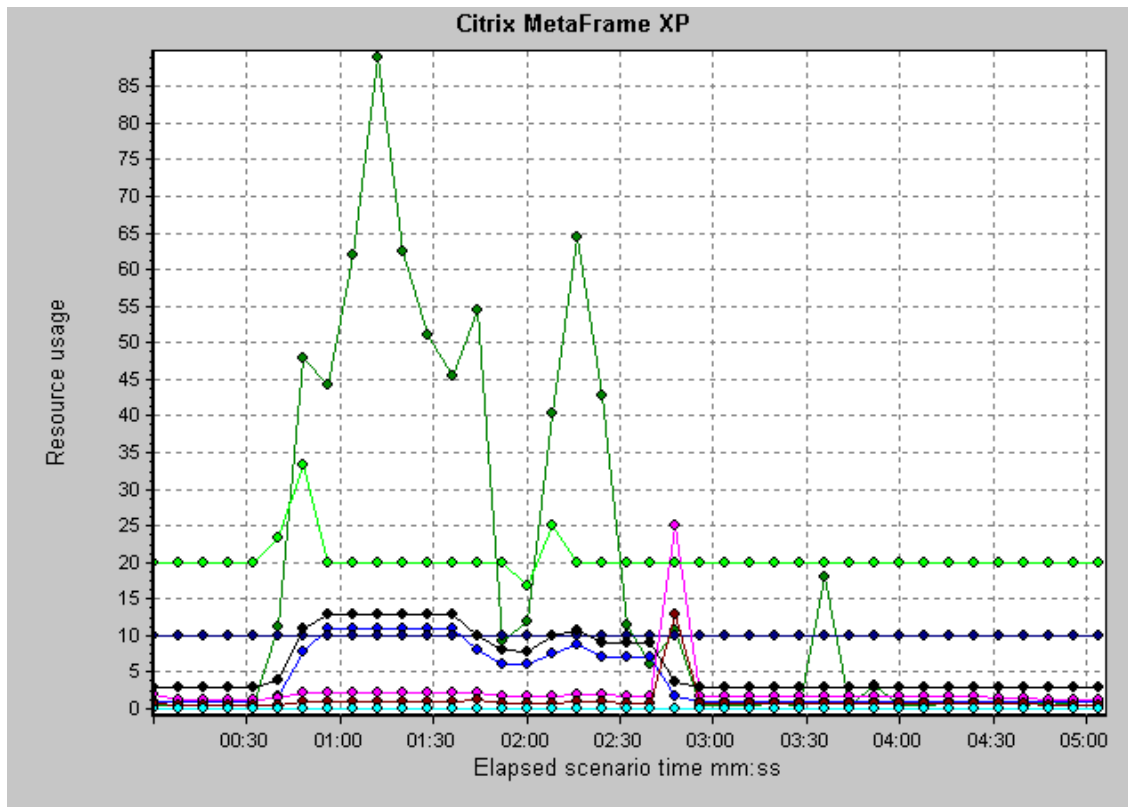
, continued

Measurement	Description
<b>Output Management Bandwidth</b>	The bandwidth from server to client traffic on the client management channel.
<b>Output PN Bandwidth</b>	The bandwidth from server to client traffic on the Program Neighborhood channel.
<b>Output Printer Bandwidth</b>	The bandwidth from server to client traffic on the printer spooler channel.
<b>Output Seamless Bandwidth</b>	The bandwidth from server to client traffic on the Seamless channel.
<b>Output Text Echo Bandwidth</b>	The bandwidth from server to client traffic on the local text echo data channel.
<b>Output Thinwire Bandwidth</b>	The bandwidth from server to client traffic on the Thinwire (graphics) channel.
<b>Output VideoFrame Bandwidth</b>	The bandwidth from server to client traffic on the VideoFrame channel.

## Citrix Server Graph

This graph is an Application Deployment solution which delivers applications across networks. The Citrix Server monitor is an Application Deployment Solution monitor, which provides performance information for the Citrix server.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage on the Citrix server.
<b>Note</b>	To obtain data for this graph, you need to enable the Citrix Server monitor (from the Controller) and select the default measurements you want to display, before running the scenario.
<b>See also</b>	<a href="#">"Application Deployment Solutions Graph Overview" on page 364</a> <a href="#">"Citrix Measurements" on page 365</a>



## Middleware Performance Graphs

### Middleware Performance Graphs Overview

A primary factor in a transaction's response time is the middleware performance usage. LoadRunner's Middleware Performance monitors provide you with information about the middleware performance usage of the Tuxedo and IBM WebSphere MQ servers during a load test scenario execution. To obtain performance data, you need to activate the online monitor for the server and specify which resources you want to measure before executing the scenario.

For more information, see the section on online monitors in the LoadRunner Controller documentation.

## IBM WebSphere MQ Counters

### Queue Performance Counters

Measurement	Description
<b>Event - Queue Depth High (events per second)</b>	An event triggered when the queue depth reaches the configured maximum depth.
<b>Event - Queue Depth Low (events per second)</b>	An event triggered when the queue depth reaches the configured minimum depth.
<b>Event - Queue Full (events per second)</b>	An event triggered when an attempt is made to put a message on a queue that is full.
<b>Event - Queue Service Interval High (events per second)</b>	An event triggered when no messages are put to or retrieved from a queue within the timeout threshold.
<b>Event - Queue Service Interval OK (events per second)</b>	An event triggered when a message has been put to or retrieved from a queue within the timeout threshold.
<b>Status - Current Depth</b>	The current count of messages on a local queue. This measurement applies only to local queues of the monitored queue manager.
<b>Status - Open Input Count</b>	The current count of open input handles. Input handles are opened so that an application may "put" messages to a queue.
<b>Status - Open Output Count</b>	The current count of open output handles. Output handles are opened so that an application may "get" messages from a queue.

## Channel Performance Counters

Measurement	Description
<b>Event - Channel Activated (events per second)</b>	An event generated when a channel, waiting to become active but inhibited from doing so due to a shortage of queue manager channel slots, becomes active due to the sudden availability of a channel slot.
<b>Event - Channel Not Activated (events per second)</b>	An event generated when a channel attempts to become active but is inhibited from doing so due to a shortage of queue manager channel slots.
<b>Event - Channel Started (events per second)</b>	An event generated when a channel is started.
<b>Event - Channel Stopped (events per second)</b>	An event generated when a channel is stopped, regardless of source of stoppage.
<b>Event - Channel Stopped by User (events per second)</b>	An event generated when a channel is stopped by a user.
<b>Status - Channel State</b>	The current state of a channel. Channels pass through several states from stopped (inactive state) to running (fully active state). Channel states range from 0 (stopped) to 6 (running).

, continued

Measurement	Description
<b>Status - Messages Transferred</b>	The count of messages that have been sent over the channel. If no traffic is occurring over the channel, this measurement will be zero. If the channel has not been started since the queue manager was started, no measurement will be available.
<b>Status - Buffer Received</b>	The count of buffers that have been received over the channel. If no traffic is occurring over the channel, this measurement will be zero. If the channel has not been started since the queue manager was started, no measurement will be available.
<b>Status - Buffer Sent</b>	The count of buffers that have been sent over the channel. If no traffic is occurring over the channel, this measurement will be zero. If the channel has not been started since the queue manager was started, no measurement will be available.
<b>Status - Bytes Received</b>	The count of bytes that have been received over the channel. If no traffic is occurring over the channel, this measurement will appear as zero. If the channel has not been started since the queue manager was started, no measurement will be available.
<b>Status - Bytes Sent</b>	The count of bytes that have been sent over the channel. If no traffic is occurring over the channel, this measurement will appear as zero. If the channel has not been started since the queue manager was started, no measurement will be available.

## Tuxedo Resources Graph Measurements

The following table describes the default counters that can be measured. It is recommended to pay particular attention to the following measurements: % Busy Clients, Active Clients, Busy Clients, Idle Clients, and all the queue counters for relevant queues.

Monitor	Measurements
<b>Machine</b>	<p><b>% Busy Clients.</b> The percentage of active clients currently logged in to the Tuxedo application server that are waiting for a response from the application server.</p>
	<p><b>Active Clients.</b> The total number of active clients currently logged in to the Tuxedo application server.</p>
	<p><b>Busy Clients.</b> The total number of active clients currently logged in to the Tuxedo application server that are waiting for a response from the application server.</p>
	<p><b>Current Accessers.</b> The number of clients and servers currently accessing the application either directly on this machine or through a workstation handler on this machine.</p>
	<p><b>Current Transactions.</b> The number of in use transaction table entries on this machine.</p>
	<p><b>Idle Clients.</b> The total number of active clients currently logged in to the Tuxedo application server that are not waiting for a response from the application server.</p>
	<p><b>Workload Completed/second.</b> The total workload on all the servers for the machine that was completed, per unit time.</p>
	<p><b>Workload Initiated/second.</b> The total workload on all the servers for the machine that was initiated, per unit time.</p>
<b>Queue</b>	<p><b>% Busy Servers.</b> The percentage of active servers currently handling Tuxedo requests.</p>
	<p><b>Active Servers.</b> The total number of active servers either handling or waiting to handle Tuxedo requests.</p>
	<p><b>Busy Servers.</b> The total number of active servers currently busy handling Tuxedo requests.</p>
	<p><b>Idle Servers.</b> The total number of active servers currently waiting to handle Tuxedo requests.</p>
	<p><b>Number Queued.</b> The total number of messages which have been placed on the queue.</p>



, continued

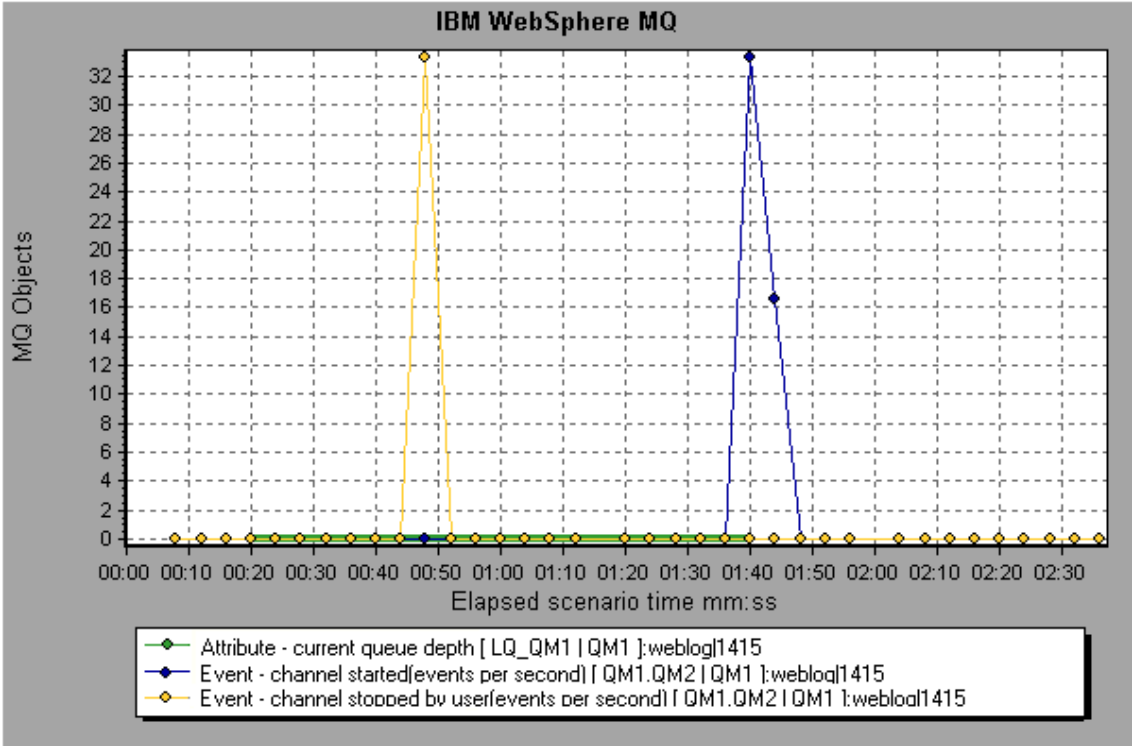
Monitor	Measurements
<b>Server</b>	<b>Requests/second.</b> The number of server requests handled per second.
	<b>Workload/second.</b> The workload is a weighted measure of the server requests. Some requests could have a different weight than others. By default, the workload is always 50 times the number of requests.
<b>Workstation Handler (WSH)</b>	<b>Bytes Received/sec.</b> The total number of bytes received by the workstation handler, per second.
	<b>Bytes Sent/sec.</b> The total number of bytes sent back to the clients by the workstation handler, per second.
	<b>Messages Received/sec.</b> The number of messages received by the workstation handler, per second.
	<b>Messages Sent/sec.</b> The number of messages sent back to the clients by the workstation handler, per second.
	<b>Number of Queue Blocks/sec.</b> The number of times the queue for the workstation handler blocked, per second. This gives an idea of how often the workstation handler was overloaded.

## IBM WebSphere MQ Graph

This graph shows the resource usage of IBM WebSphere MQ Server channel and queue performance counters as a function of the elapsed load test scenario time.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage of the IBM WebSphere MQ Server channel and queue performance counters.
<b>Note</b>	To obtain data for this graph, you need to enable the IBM WebSphere MQ monitor (from the Controller) and select the default measurements you want to display, before running the scenario.

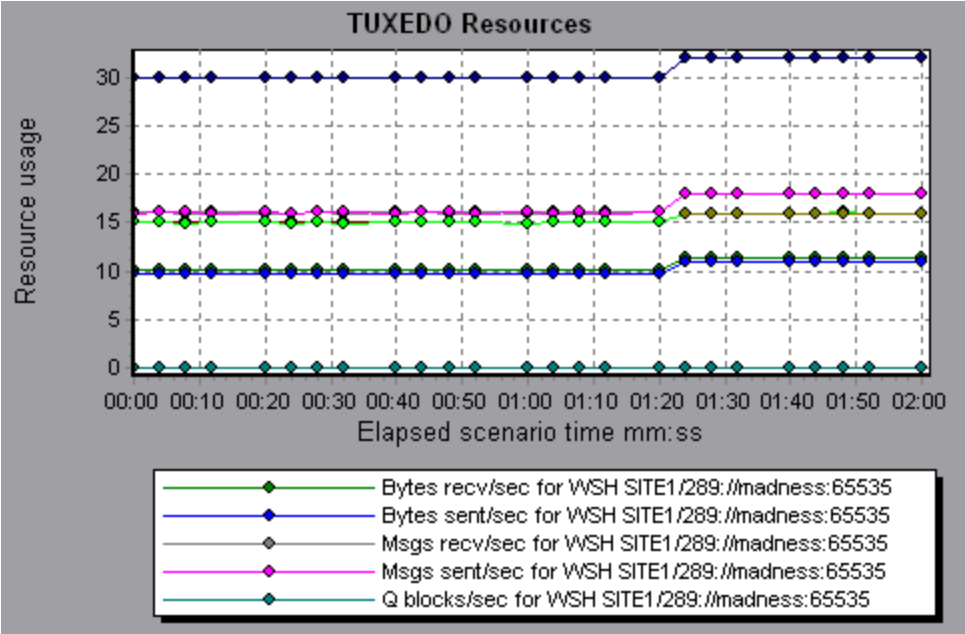
<b>See also</b>	<a href="#">"Middleware Performance Graphs Overview" on page 372</a> <a href="#">"IBM WebSphere MQ Counters" on page 373</a>
-----------------	---



## Tuxedo Resources Graph

This graph provides information about the server, load generator machine, workstation handler, and queue in a Tuxedo system.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource usage on the Tuxedo system.
<b>Note</b>	To obtain data for this graph, you need to enable the TUXEDO monitor (from the Controller) and select the default measurements you want to display, before running the scenario.
<b>See also</b>	<a href="#">"Middleware Performance Graphs Overview" on page 372</a> <a href="#">"Tuxedo Resources Graph Measurements" on page 375</a>



# Infrastructure Resources Graphs

## Infrastructure Resources Graphs Overview

LoadRunner's Infrastructure Resources monitor provides you with information about the performance of FTP, POP3, SMTP, IMAP, and DNS Vusers on the network client during load test scenario execution.

## Network Client Measurements

Measurement	Description
Pings per sec	Number of pings per second.
Data transfer bytes per sec	Number of data bytes transferred per second.
Data receive bytes per sec	Number of data bytes received per second.
Connections per sec	Number of connections per second.
Accept connections per sec	Number of connections accepted per seconds.

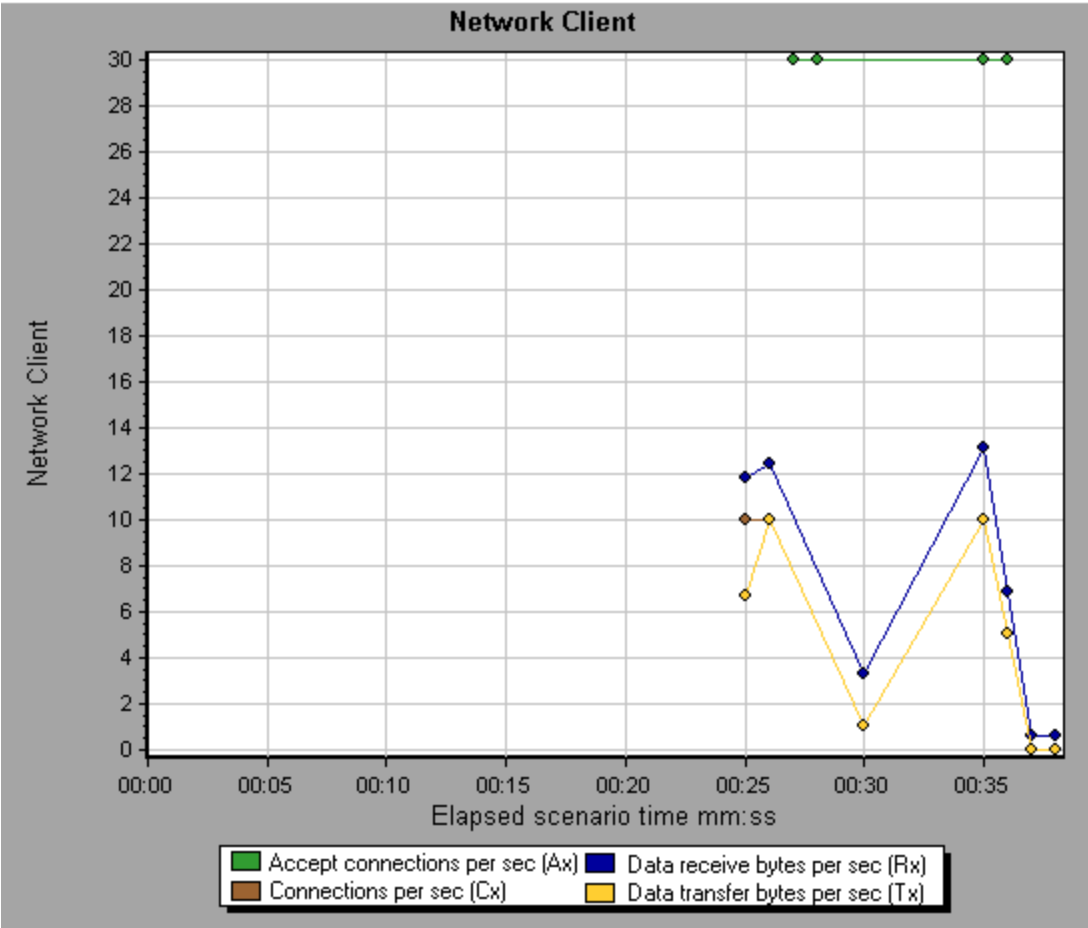
, continued

Measurement	Description
SSL Connections per sec	Number of SSL connections per second.
SSL Data transfer bytes per sec	Number of SSL data bytes transferred per second.
SSL Data receive bytes per sec	Number of SSL data bytes received per second.
SSL Accept connections per sec	Number of SSL connections accepted per seconds.

## Network Client Graph

This graph displays network client data points for FTP, POP3, SMTP, IMAP, and DNS Vusers during a load test scenario run.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The resource value of the network client data points..
<b>See also</b>	<a href="#">"Infrastructure Resources Graphs Overview" on the previous page</a>



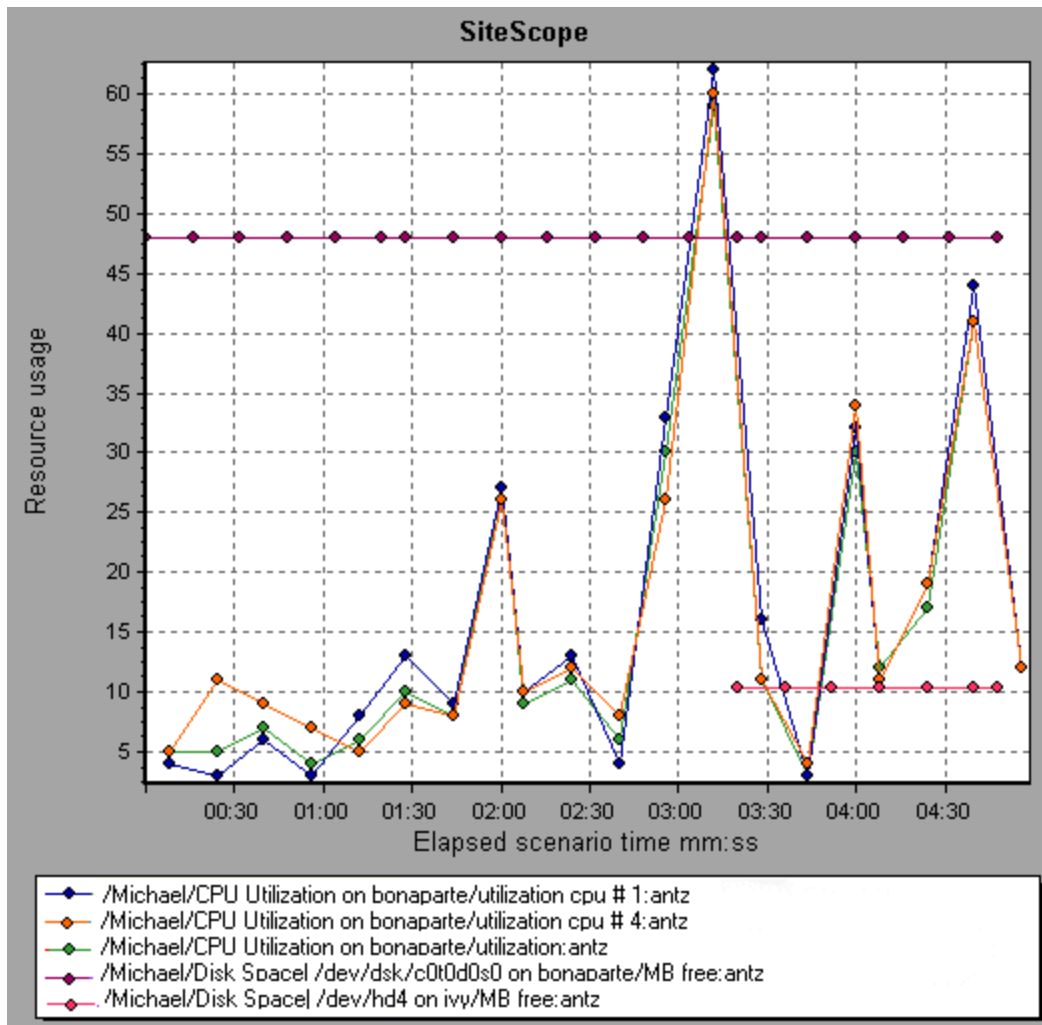
# SiteScope Graph

This graph displays statistics about the resource usage on the SiteScope machine during the load test scenario run.

X-axis	Elapsed time since the start of the run.
Y-axis	The resource usage on the SiteScope machine.
See also	<a href="#">"System Resource Graphs Overview" on page 221</a>

## Example

In the following example, the percentage of memory resources used, the number of pages read per second, and the CPU utilization.



## HP Service Virtualization Graphs

### Service Virtualization Graphs Overview

The Service Virtualization graphs are similar to the corresponding monitors used by the LoadRunner Controller. For details, see [Service Virtualization Monitoring Overview](#).

## Flex Graphs

Flex graphs provide you with information about the performance of your Flex server. You use the Flex graphs to analyze the following data:

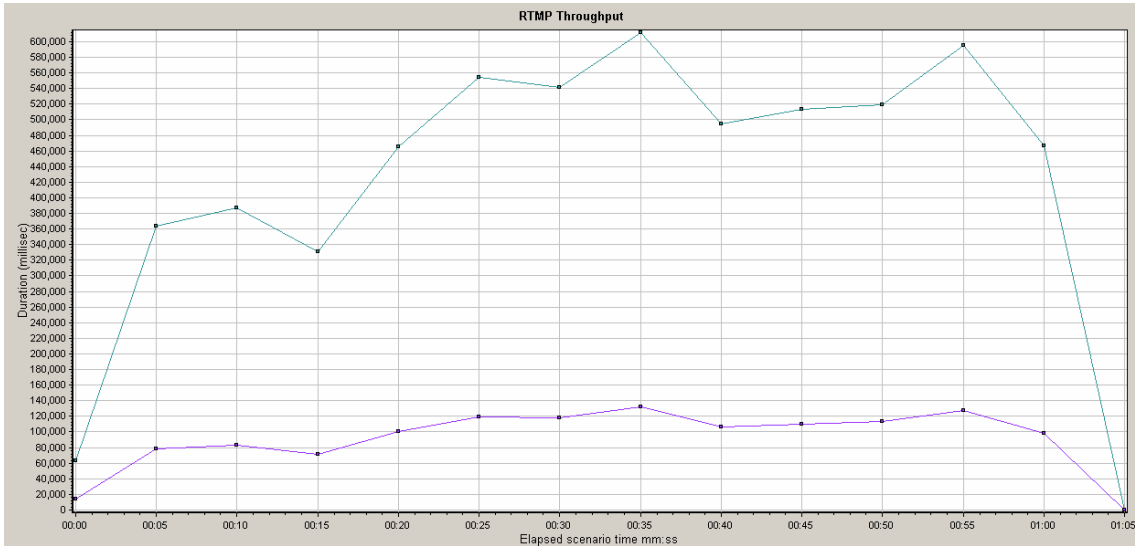
### Flex RTMP Throughput Graph

This graph shows the amount of throughput (in bytes) on the RTMP/T server during each second of the load test scenario run. The throughput represents the amount of data that the Vusers received from the server or sent to the server at any given second.

<b>Purpose</b>	Helps you evaluate the amount of load that Vusers generate, in terms of server throughput.
<b>X-axis</b>	Elapsed time since the start of the scenario run.
<b>Y-axis</b>	Throughput of the server in bytes
<b>Note</b>	You cannot change the granularity of the x-axis to a value that is less than the Web granularity you defined in the General tab of the Options dialog box.

#### Example

In the following example, the highest throughput is over 600,000 bytes during the thirty-fifth second of the scenario.



## Flex RTMP Other Statistics Graph

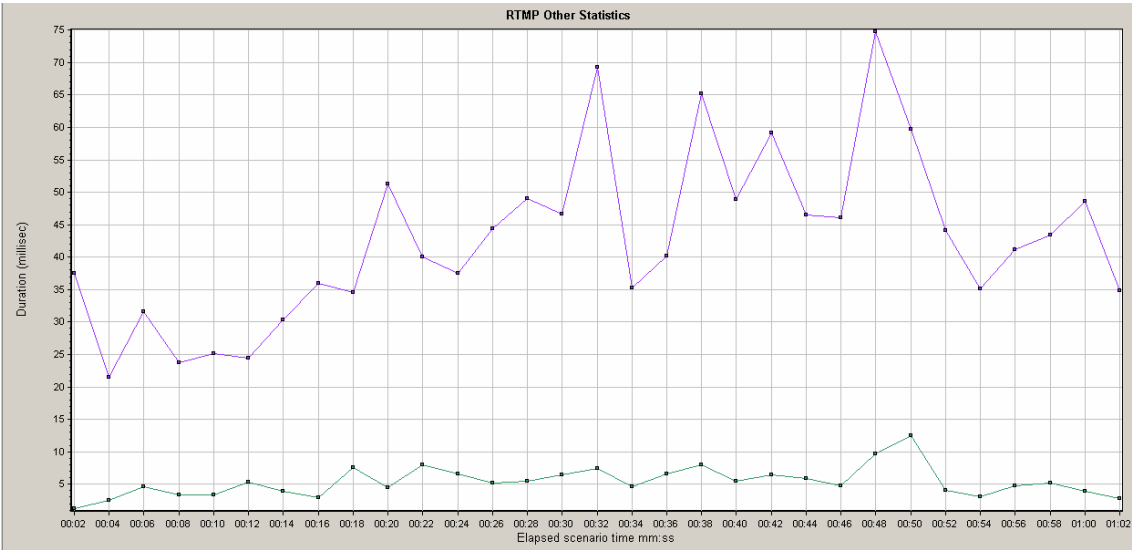
This graph shows various statistics about Flex RTMP Vusers.

<b>Purpose</b>	The graph shows the duration taken to perform various RTMP tasks.
<b>X-axis</b>	Elapsed time since the start of the scenario run.
<b>Y-axis</b>	Task duration (in milliseconds).

### Example

In the following example,the RTMP Handshake has a duration of seventy five milliseconds at the forty eighth second of the scenario.





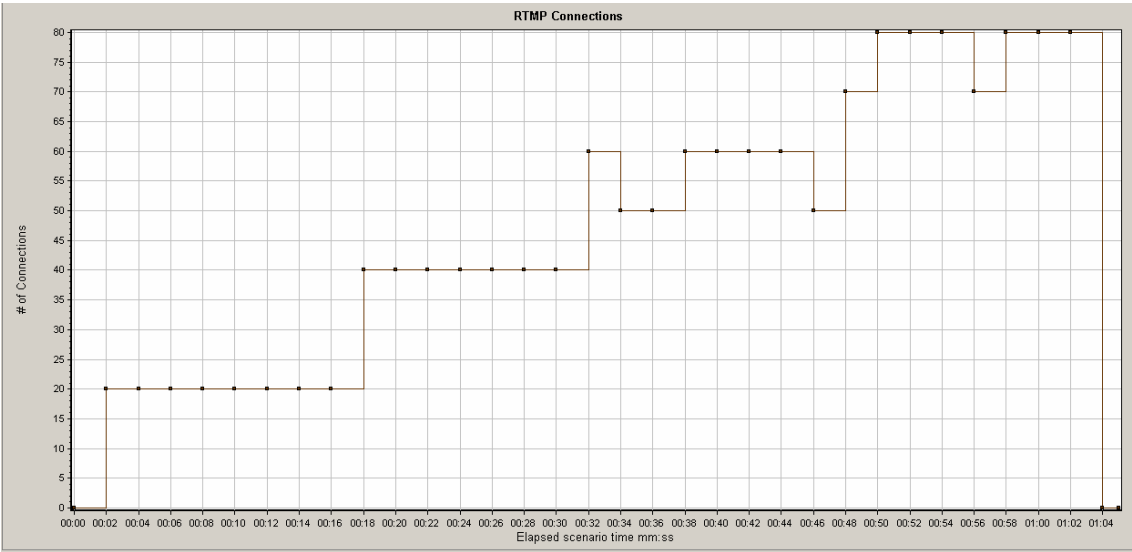
## Flex RTMP Connections Graph

This graph shows the number of open RTMP connections at any time during the load test scenario run. The throughput represents the amount of data that the Vusers received from the server or sent to the server at any given second.

<b>Purpose</b>	This graph is useful in indicating when additional connections are needed. For example, if the number of connections reaches a plateau, and the transaction response time increases sharply, adding connections would probably cause a dramatic improvement in performance (reduction in the transaction response time).
<b>X-axis</b>	Elapsed time since the start of the scenario run.
<b>Y-axis</b>	Number of connections.

### Example

In the following example, between the forty-eighth second and the fifty-sixth second of the scenario there are eighty open connections.



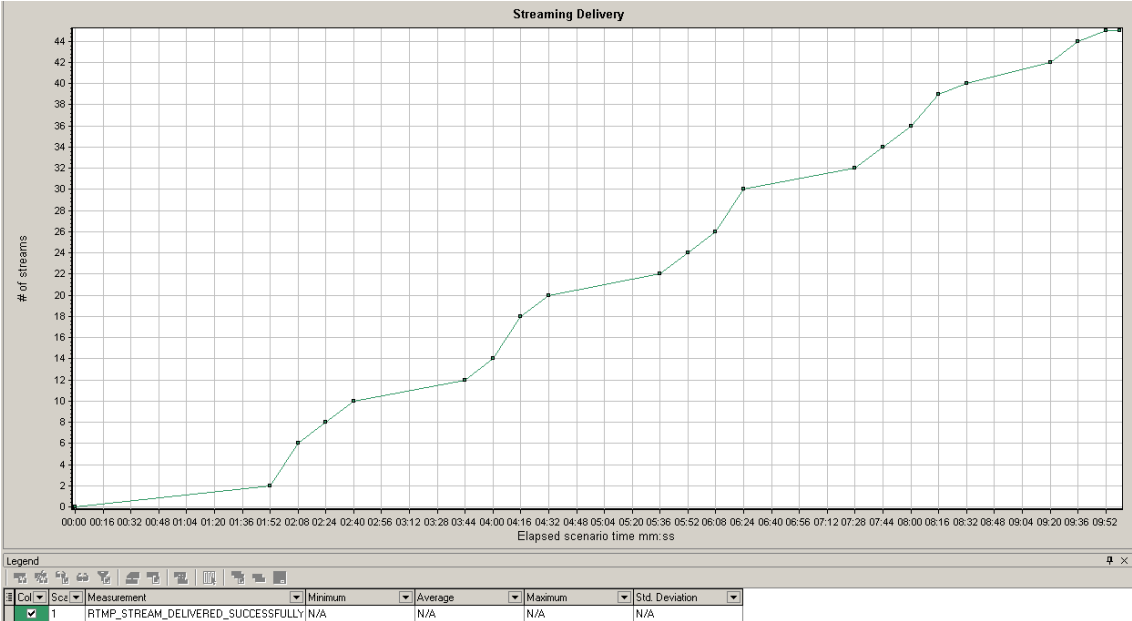
## Flex Streaming Delivery Graph

This graph displays the total number of streams that were successfully delivered by the server. A successful delivery is indicated when the server initiates a "NetStream.Stop" message at the end of the requested stream.

<b>Purpose</b>	Helps you evaluate the amount of load that Vusers generate, in terms of server throughput.
<b>X-axis</b>	Elapsed time since the start of the scenario run.
<b>Y-axis</b>	Number of streams delivered

### Example

In the following example, the graph rises at a forty five degree angle, indicating a constant number of streams being delivered over time..



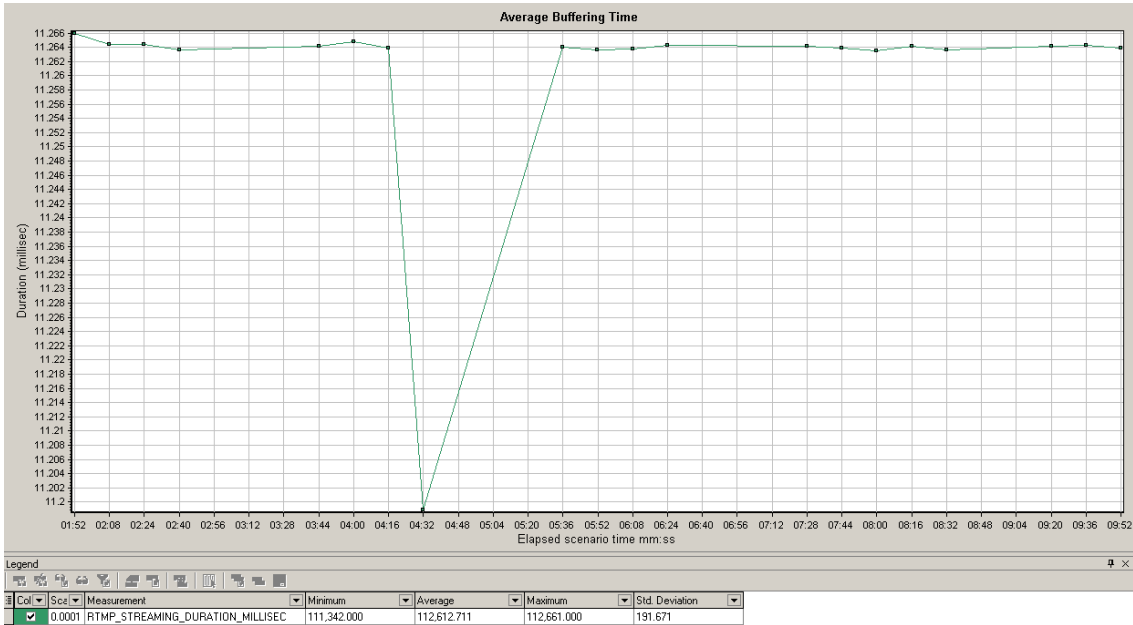
## Flex Average Buffering Time Graph

This graph displays the average buffering time for RTMP streams.

<b>Purpose</b>	Helps you evaluate the amount of load that Vusers generate, in terms of time spent for streams in the buffer.
<b>X-axis</b>	Elapsed time since the start of the scenario run.
<b>Y-axis</b>	Buffering time in milliseconds

### Example

In the following example, the buffering time reaches its lowest after 4 minutes and 32 seconds of the scenario before climbing up to a peak again. You should compare it to other graphs to see what happened at that time.



## WebSocket Statistics Graphs

The **WebSocket Statistics** graphs provides you with statistics for the WebSocket data during the scenario run, such as byte rate, connection status, and the number of messages.

X-axis	Elapsed time since the start of the run.
Y-axis	WebSocket per second throughout the whole scenario.

The **WebSocket Statistics** graphs are:

- **WebSocket Bytes per second.** This graph shows the number of bytes that were sent and received per second.
- **WebSocket Connections per second.** This graph shows the number of new, failed, and closed connections. I
- **WebSocket Messages per second.** This graph shows the number of WebSocket messages that were sent, per second.

To gather these statistics, enable the **WebSocket Statistics** monitors before running your scenario.

## Diagnostics Graphs

You can open Diagnostics graphs that were generated in earlier versions of LoadRunner.

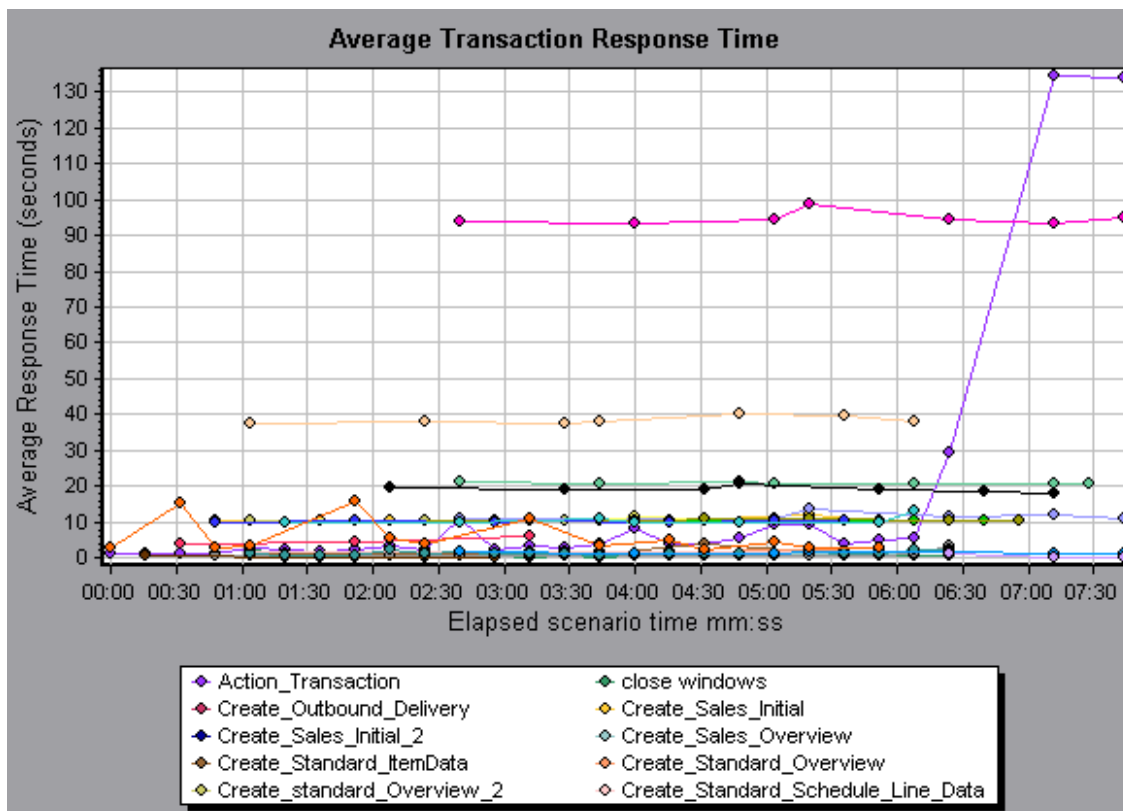
## Siebel Diagnostics Graphs

### Siebel Diagnostics Graphs Overview

Siebel Diagnostics graphs enable you to trace, time, and troubleshoot individual transactions through Web, application, and database servers.

To analyze where problems are occurring, you correlate the data in the Siebel Diagnostics graphs with data in the Transaction Response Time graphs.

You begin analyzing these graphs with the transaction graphs that display the average transaction response time during each second of the load test scenario run. For example, the following Average Transaction Response Time graph demonstrates that the average transaction response time for the **Action\_Transaction** transaction was high.



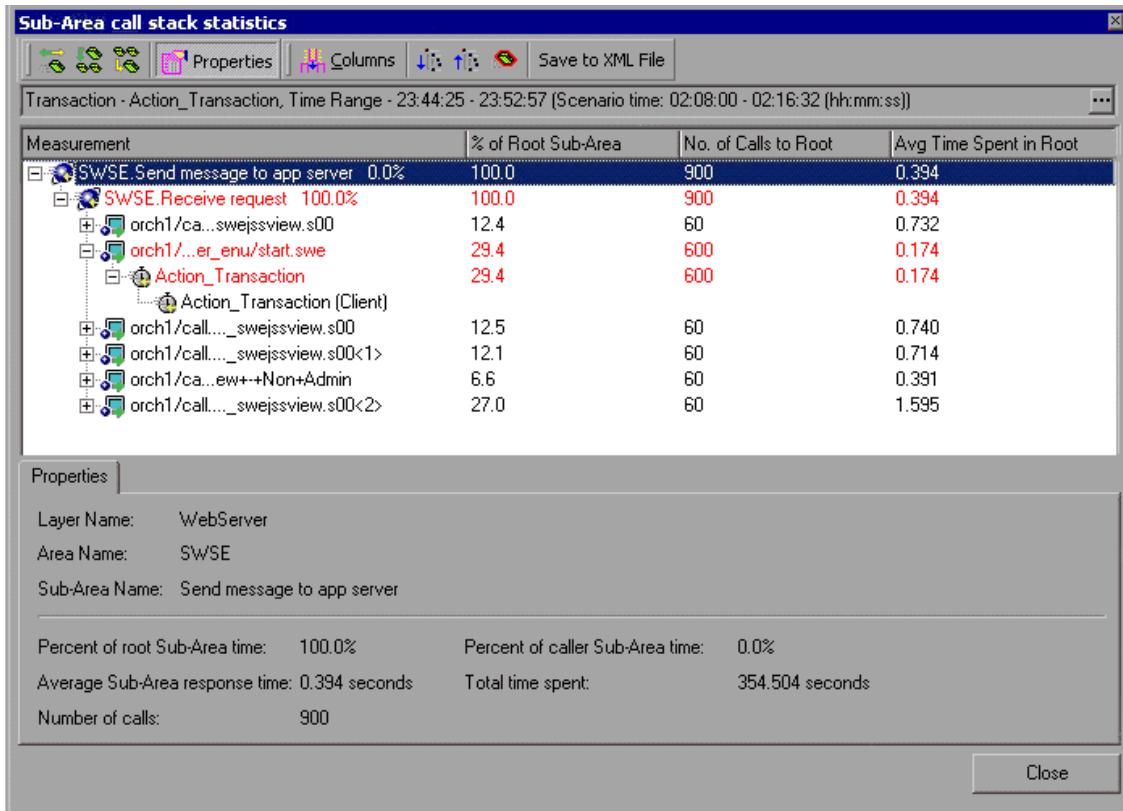
Using the Siebel Diagnostics graphs, you can pinpoint the cause of the delay in response time for this transaction.

Alternatively, you can use the Summary Report to view individual transactions broken down into Web, application, and database layers, and the total usage time for each transaction. For more information, see ["Siebel Diagnostics Graphs Summary Report" on page 403](#).

**Note:** A measurement that is broken down in the Average Transaction Response Time graph will be different from the same measurement broken down in the Siebel Diagnostics graph. This is because the Average Transaction Response Time graph displays the average transaction response time, whereas the Siebel Diagnostics graph displays the average time per transaction event (sum of Siebel Area response time).

## Call Stack Statistics Window




This window enables you to view which components called the selected component.



To access	Analysis window > <Siebel> graph > right click sub-area and select <b>Siebel Diagnostics &gt; Show Sub-Area Call Stack Statistics</b>
See also	<a href="#">"Siebel Diagnostics Graphs Overview" on page 389</a>

User interface elements are described below:

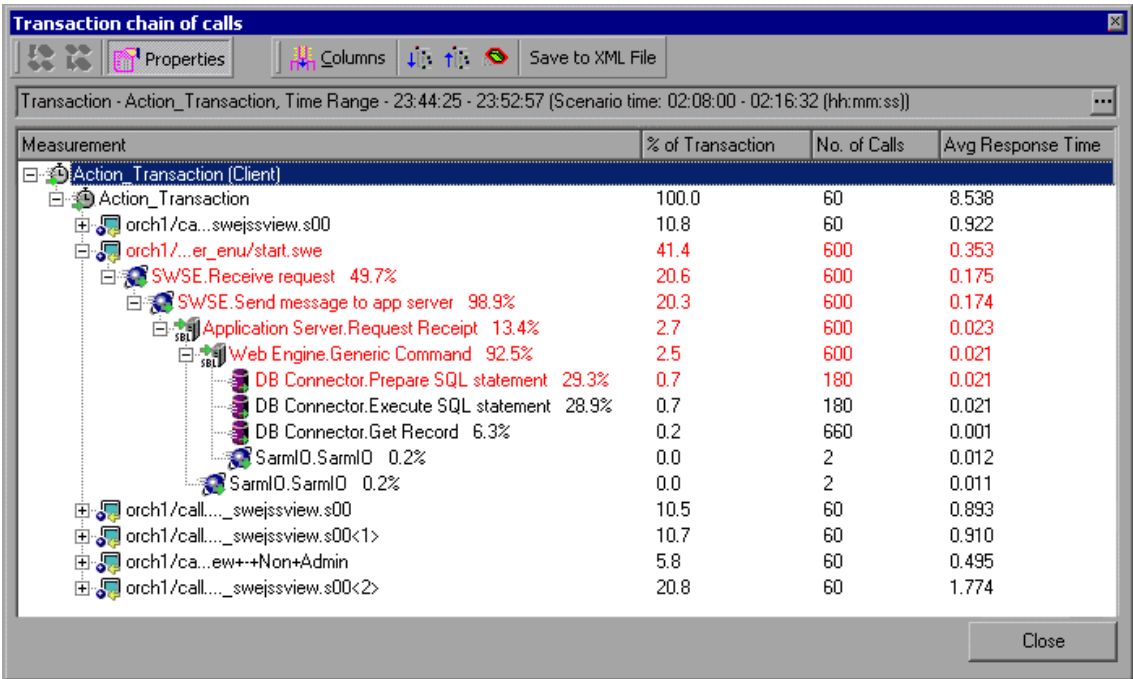
UI Element	Description
Measurement	Name of the sub-area, displayed as <b>AreaName:SubAreaName</b> . In the case of a database call, query information is also displayed. The percent shown indicates the percentage of calls to this component from its child.
% of Root Sub-Area	Displays the percentage of sub-area time in relation the total root sub-area time.
No. of Calls to Root	Displays the amount of times this transaction or sub-area was executed.

UI Element	Description
<b>Avg Time Spent in Root</b>	Time spent in root is the time that the sub-area spent in the root sub-area//transaction.  Average Time Spent in Root time is the total time spent in the root divided by the number of instances of the sub-area.
<b>STD Time Spent in Root</b>	The standard deviation time spent in the root.
<b>Min Time Spent in Root</b>	The minimum time spent in the root.
<b>Max Time Spent in Root</b>	The maximum time spent in the root.
<b>% of Called</b>	Displays the percentage of sub-area time in relation the child sub-area time.
<b>Total Time Spent in Root</b>	Displays the total sub-area execution time, including the child execution time.
	<b>Expand All.</b> Expands the entire tree.
	<b>Collapse All.</b> Collapses the entire tree.
	<b>Expand Worst Path.</b> Expands only the parts of the path on the critical path.
<b>Save to XML File</b>	Saves the tree data to an XML file.
<b>Properties</b>	<b>Properties</b> Area. Displays the full properties of the selected sub-area.
<b>SQL Query</b>	<b>SQL Query.</b> Displays the SQL query for the selected sub-area (For Database only).









## Chain of Calls Window

This window enables you to view the components that the selected transaction or sub-area called. The following figure shows all the calls in the critical path of the parent **Action\_Transaction** server-side transaction are displayed.



To access	<p>Use one of the following:</p> <ul style="list-style-type: none"><li>• To view transaction call chains - right click a component and select <b>Siebel Diagnostics &gt; Show Chain of Calls</b></li><li>• To view sub-area statistics - right click sub-area and select <b>Show Sub-Area Chain of Calls</b></li></ul>
Note	<p>Each red node signifies the most time consuming child to its parent.</p>

User interface elements are described below:

UI Element	Description
	<b>Switch to Sub-Area Chain of Calls.</b> When the sub-area call stack statistics data is displayed, this displays the sub-area chain of calls data (only if the root is a sub-area).
	<b>Switch to Sub-Area Call Stack Statistics.</b> When the sub-area chain of calls data is displayed, this displays the sub-area call stack statistics data (only if the root is a sub-area).
	<b>Show Sub-Area Chain of Calls.</b> Displays the Sub-Area Chain of Calls window.
	<b>Show Sub-Area Call Stack Statistics.</b> Displays the Sub-Area Call Stack Statistics window.
	<b>Properties.</b> Hides or displays the properties area (lower pane).
	<b>Columns.</b> Enables you to select the columns shown in the Calls window. To display additional fields, drag them to the desired location in the Calls window. To remove fields, drag them from the Calls window back to the Columns chooser.
<b>Measurement</b>	Name of the sub-area, displayed as <b>AreaName:SubAreaName</b> . In the case of a database call, query information is also displayed. The percent shown indicates the percentage of calls to this component from its parent.
<b>% of Transaction/ Root Sub-Area</b>	Displays the percentage of sub-area time in relation the total transaction/root sub-area time.
<b>No of Calls</b>	Displays the amount of times this transaction or sub-area was executed.
<b>Avg Response Time</b>	Response time is the time from the beginning of execution until the end. Average response time is the total response time divided by the number of instances of the area/sub-area.

UI Element	Description
<b>STD Response Time</b>	The standard deviation response time.
<b>Min Response Time</b>	The minimum response time.
<b>Max Response Time</b>	The maximum response time.
<b>% of Caller</b>	Displays the percentage of sub-area time in relation the parent sub-area time.
<b>Total time</b>	Displays the total sub-area execution time, including the child execution time.

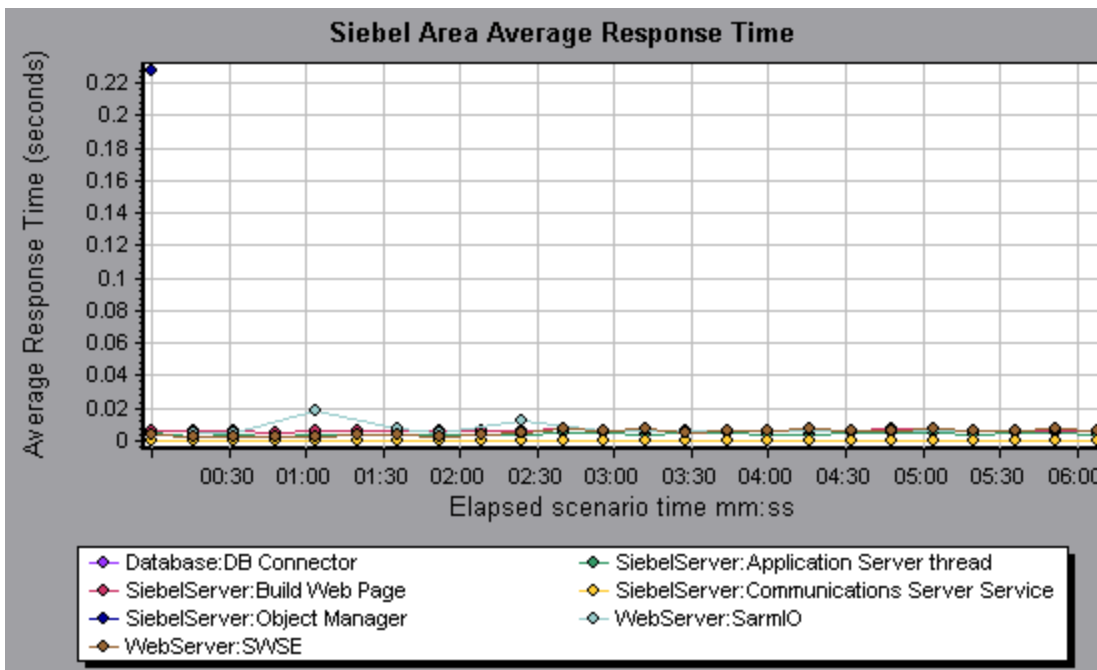
## Siebel Area Average Response Time Graph

This graph displays the average response time for the server side areas, computed as the total area response time divided by the number of area calls.

<b>Purpose</b>	For example, if an area was executed twice by one instance of transaction A, and once by another instance of the same transaction, and it took three seconds for each execution, then the average response time is $9/3$ , or 3 seconds. The area time does not include calls made from the area to other areas.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Average response time (in seconds) per area.
<b>Breakdown options</b>	For breakdown options, see <a href="#">"Siebel Breakdown Levels" on page 398</a> .

<b>Tips</b>	<p>You can filter the Siebel graphs by the following fields:</p> <ul style="list-style-type: none"> <li>• <b>Transaction Name.</b> Shows data for the specified transaction.</li> <li>• <b>Scenario Elapsed Time.</b> Shows data for transactions that ended during the specified time.</li> </ul> <p>For more information on filtering, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a>.</p>
<b>See also</b>	<a href="#">"Siebel Breakdown Levels" on page 398</a>

### Example



## Siebel Area Call Count Graph

This graph displays the number of times that each Siebel area is called.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	The call count.
<b>Breakdown options</b>	For breakdown options, see <a href="#">"Siebel Breakdown Levels" on page 398</a> .

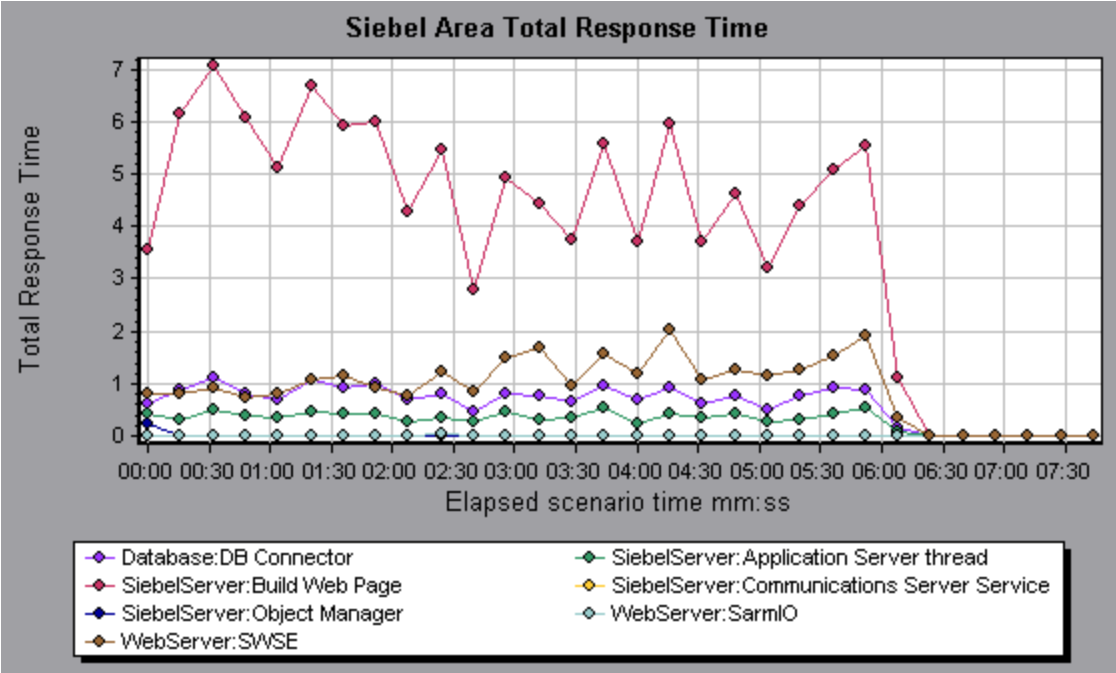
<b>Tips</b>	<p>You can filter the Siebel graphs by the following fields:</p> <ul style="list-style-type: none"><li>• <b>Transaction Name.</b> Shows data for the specified transaction.</li><li>• <b>Scenario Elapsed Time.</b> Shows data for transactions that ended during the specified time.</li></ul> <p>For more information on filtering, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a>.</p>
<b>See also</b>	<a href="#">"Siebel Diagnostics Graphs Overview" on page 389</a>

## Siebel Area Total Response Time Graph

This graph displays the total response time of each Siebel area.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Average response time (in seconds) per area.
<b>Breakdown options</b>	For breakdown options, see <a href="#">"Siebel Breakdown Levels" on the next page</a> .
<b>Tips</b>	<p>You can filter the Siebel graphs by the following fields:</p> <ul style="list-style-type: none"><li>• <b>Transaction Name.</b> Shows data for the specified transaction.</li><li>• <b>Scenario Elapsed Time.</b> Shows data for transactions that ended during the specified time.</li></ul> <p>For more information on filtering, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a>.</p>
<b>See also</b>	<a href="#">"Siebel Diagnostics Graphs Overview" on page 389</a>

### Example



## Siebel Breakdown Levels

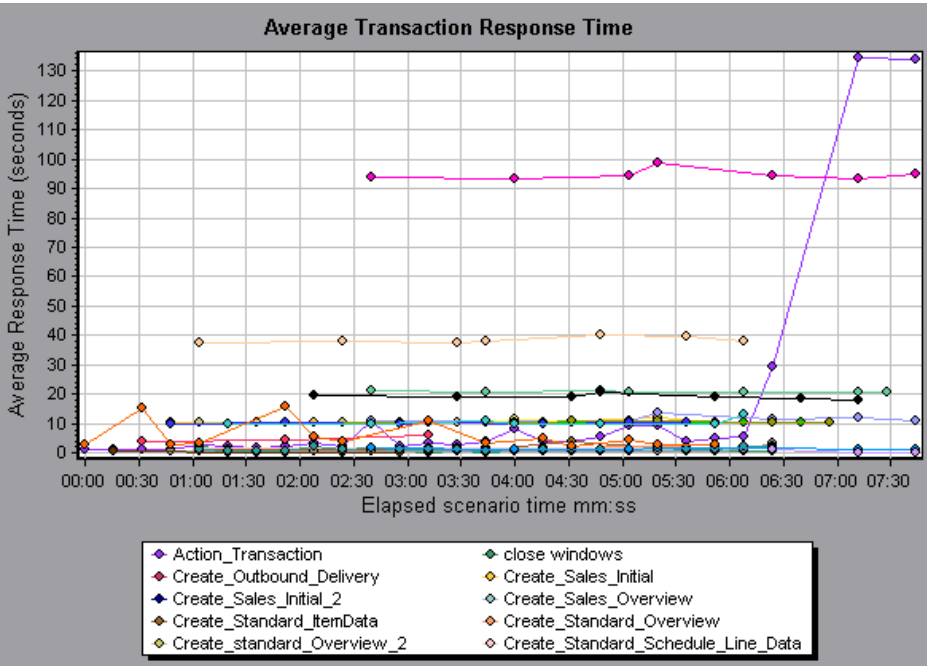
You can break down Siebel layers into areas, sub-areas, servers, and scripts to enable you to pinpoint the exact location where time is consumed.

To access	<p>Use one of the following to access breakdown options:</p> <ul style="list-style-type: none"><li>• &lt;Siebel Diagnostics Graphs&gt; &gt; View &gt; Siebel Diagnostics</li><li>• &lt;Siebel Diagnostics Graphs&gt; &gt; select transaction &gt; short-cut menu &gt; Siebel Diagnostics</li></ul> <p>See toolbar options for each breakdown level.</p>
Important Information	<p>The breakdown menu options and buttons are not displayed until an element (transaction, layer, area, sub-area) is selected.</p>
See also	<p><a href="#">"Siebel Diagnostics Graphs Overview" on page 389</a></p>

Siebel Breakdown Levels are described below:

Transaction  
Level

The following figure displays the top level Average Transaction Response Time graph. The graph displays several transactions.



**Layer Level**

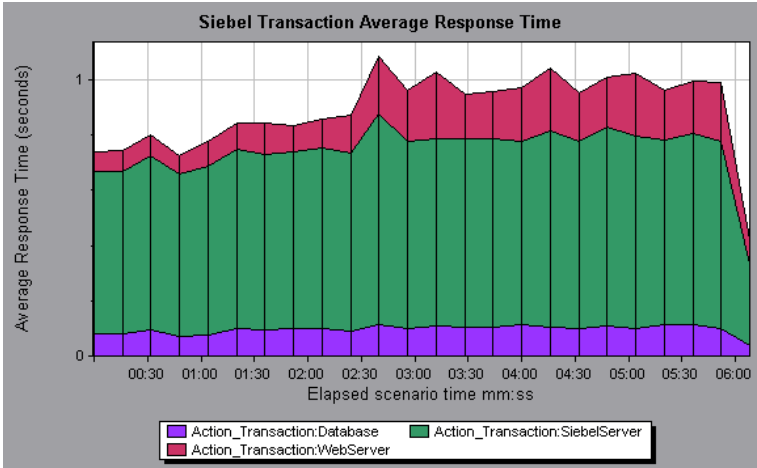


**Siebel Layer Breakdown** button shows the breakdown of the selected transaction.



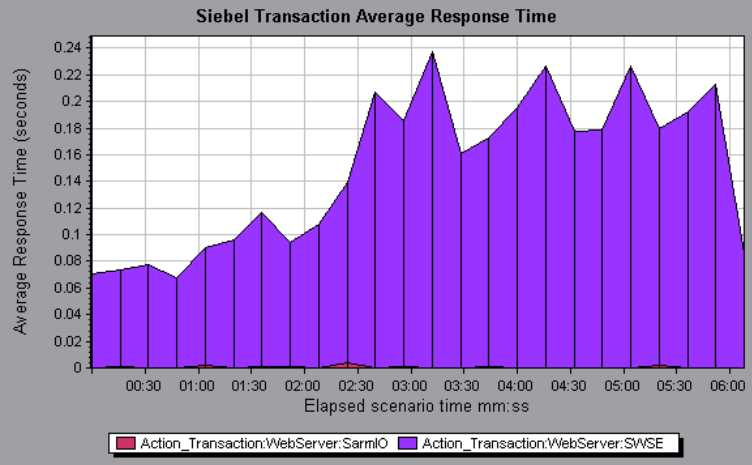




**Undo Siebel Layer Breakdown** returns the graph to the transaction level.


In the following figure, the Action\_Transaction transaction has been broken down to its layers (Siebel Database, Application, and Web).





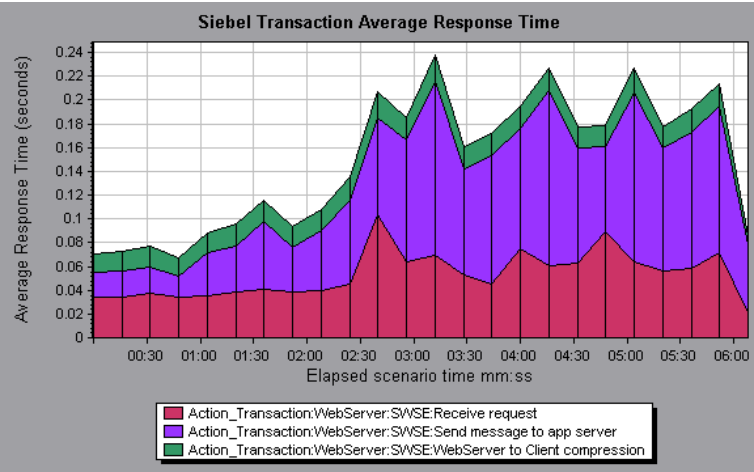
<p><b>Area Level</b></p>	<p> <b>Siebel Area Breakdown</b> button breaks the data down to its Siebel areas.</p> <p> <b>Undo Siebel Area Breakdown</b> button returns the graph to the layer level.</p> <p>In the following figure, the Web layer of the Action_Transaction transaction has been broken down to its Siebel areas.</p>  <p>The graph, titled "Siebel Transaction Average Response Time", shows the average response time in seconds on the y-axis (ranging from 0 to 0.24) against elapsed scenario time in mm:ss on the x-axis (ranging from 00:30 to 06:00). The data is represented by a purple area chart with vertical grid lines. The response time starts at approximately 0.07 seconds at 00:30, rises to about 0.11 at 01:30, then fluctuates between 0.16 and 0.23 seconds from 02:30 onwards. A legend at the bottom identifies two series: "Action_Transaction\WebServer:SarmIO" (pink) and "Action_Transaction\WebServer:SWSE" (purple). The pink series is barely visible, indicating a very low response time compared to the purple series.</p>
<p><b>Script Level</b></p>	<p> <b>Siebel Script Breakdown</b> button breaks the data down to its Siebel scripts. You can only break down to the script level from the scripting engine area.</p> <p> <b>Undo Siebel Script Breakdown</b> button returns the graph to the sub-area level.</p> <p>You can break a transaction down further to its Siebel script level. You can only break down to the script level from the scripting engine area.</p>

**Sub-Area  
Level**

 **Siebel Sub-Area Breakdown** button breaks the data down to its Siebel sub-areas. You can only break down to the sub-area level from the area level.

 **Undo Siebel Sub-Area Breakdown** button returns the graph to the area level.

In the following figure, the area level of the Action\_Transaction transaction has been broken down to its Siebel sub-area.



<b>Server Level</b>	<div data-bbox="451 233 496 279"></div> <b>Siebel Server Breakdown</b> button to group the data by Siebel server.  <div data-bbox="451 354 496 401"></div> <b>Undo Siebel Server Breakdown</b> button ungroups data in the graph.  In the following figure, the Action_Transaction;WebServer:SWSE:Receive Request transaction has been broken down to its Siebel servers. Server level breakdown is usual for pin pointing overloaded servers and for load balancing.  <div data-bbox="451 695 1203 1161"><table border="1"><caption>Approximate data points from Siebel Transaction Average Response Time graph</caption><thead><tr><th>Elapsed scenario time (mm:ss)</th><th>Average Response Time (seconds)</th></tr></thead><tbody><tr><td>00:30</td><td>0.035</td></tr><tr><td>01:00</td><td>0.035</td></tr><tr><td>01:30</td><td>0.040</td></tr><tr><td>02:00</td><td>0.040</td></tr><tr><td>02:30</td><td>0.100</td></tr><tr><td>03:00</td><td>0.065</td></tr><tr><td>03:30</td><td>0.050</td></tr><tr><td>04:00</td><td>0.070</td></tr><tr><td>04:30</td><td>0.060</td></tr><tr><td>05:00</td><td>0.090</td></tr><tr><td>05:30</td><td>0.055</td></tr><tr><td>06:00</td><td>0.020</td></tr></tbody></table></div>	Elapsed scenario time (mm:ss)	Average Response Time (seconds)	00:30	0.035	01:00	0.035	01:30	0.040	02:00	0.040	02:30	0.100	03:00	0.065	03:30	0.050	04:00	0.070	04:30	0.060	05:00	0.090	05:30	0.055	06:00	0.020
Elapsed scenario time (mm:ss)	Average Response Time (seconds)																										
00:30	0.035																										
01:00	0.035																										
01:30	0.040																										
02:00	0.040																										
02:30	0.100																										
03:00	0.065																										
03:30	0.050																										
04:00	0.070																										
04:30	0.060																										
05:00	0.090																										
05:30	0.055																										
06:00	0.020																										

## Siebel Diagnostics Graphs Summary Report

The Siebel Usage section of the Summary Report provides a usage chart for the Siebel layer breakdown. This report is available from the Session Explorer or as a tab in the Analysis window.

<b>Breakdown options</b>	<p>The Siebel Layer Usage section breaks the individual transactions into:</p> <ul style="list-style-type: none"><li>• Web Server</li><li>• Siebel Server</li><li>• Database Layers</li><li>• Total usage time for each transaction</li></ul>
<b>Tips</b>	<p>To view server side diagnostics data from the Summary Report, click the Siebel layer on which you want to perform transaction breakdown. The Siebel Transaction Response Time graph opens displaying the breakdown of the selected transaction.</p>
<b>Note</b>	<p>If you do not see diagnostics data on the Summary Report, check if you are using a user-defined template. To view relevant data, choose a different template from the list of templates, or create and apply a new template. For more information about using templates, see <a href="#">"Apply/Edit Template Dialog Box" on page 107</a>.</p>
<b>See also</b>	<p><a href="#">"Siebel Diagnostics Graphs Overview" on page 389</a></p>

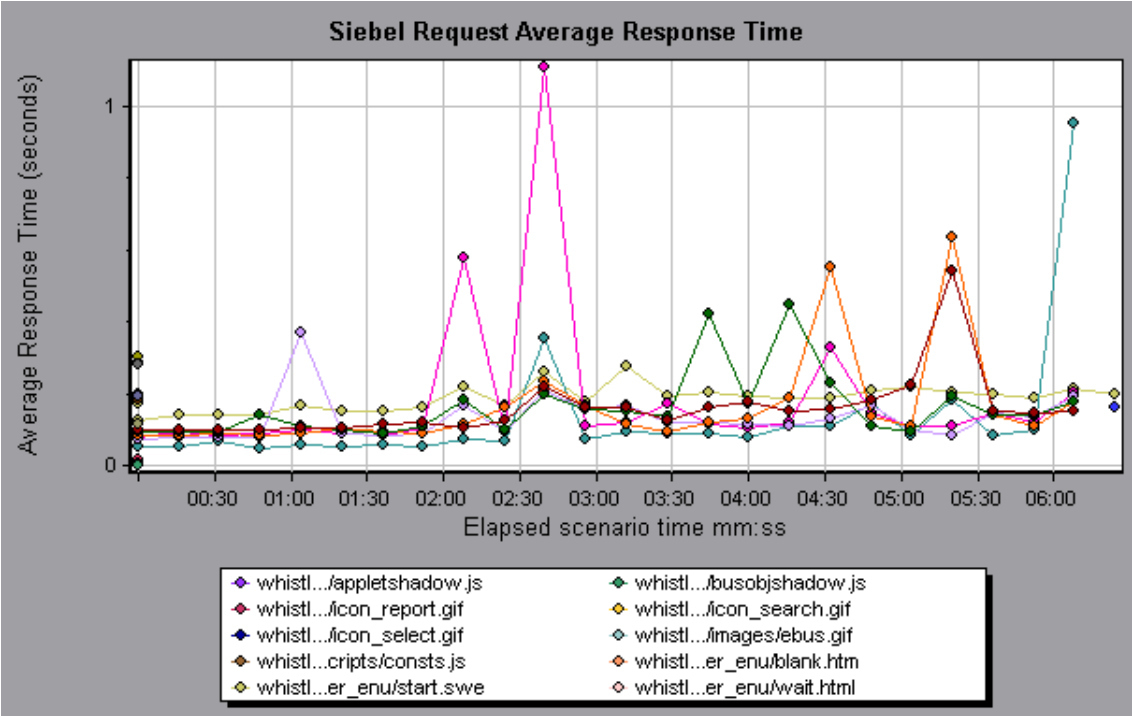
## Siebel Request Average Response Time Graph

This graph displays the response time per HTTP request.

<b>Purpose</b>	<p>The time is computed as the total request response time divided by the total number of instances of the specific request. For example, if a request was executed twice by one instance of transaction A, and once by a second instance of transaction A, and it took three seconds to execute each request, then the average response time is <math>9/3</math>, or 3 seconds. The request time does not include the nested calls from within each request.</p>
<b>X-axis</b>	<p>Elapsed time since the start of the run.</p>
<b>Y-axis</b>	<p>Average response time (in seconds) per area.</p>
<b>Breakdown options</b>	<p>For breakdown options, see <a href="#">"Siebel Breakdown Levels" on page 398</a>.</p>

<b>Tips</b>	<p>You can filter the Siebel graphs by the following fields:</p> <ul style="list-style-type: none"><li>• <b>Transaction Name.</b> Shows data for the specified transaction.</li><li>• <b>Scenario Elapsed Time.</b> Shows data for transactions that ended during the specified time.</li></ul> <p>For more information on filtering, see <a href="#">"Filtering and Sorting Graph Data"</a> on page 129.</p>
<b>See also</b>	<a href="#">"Siebel Diagnostics Graphs Overview"</a> on page 389

Example



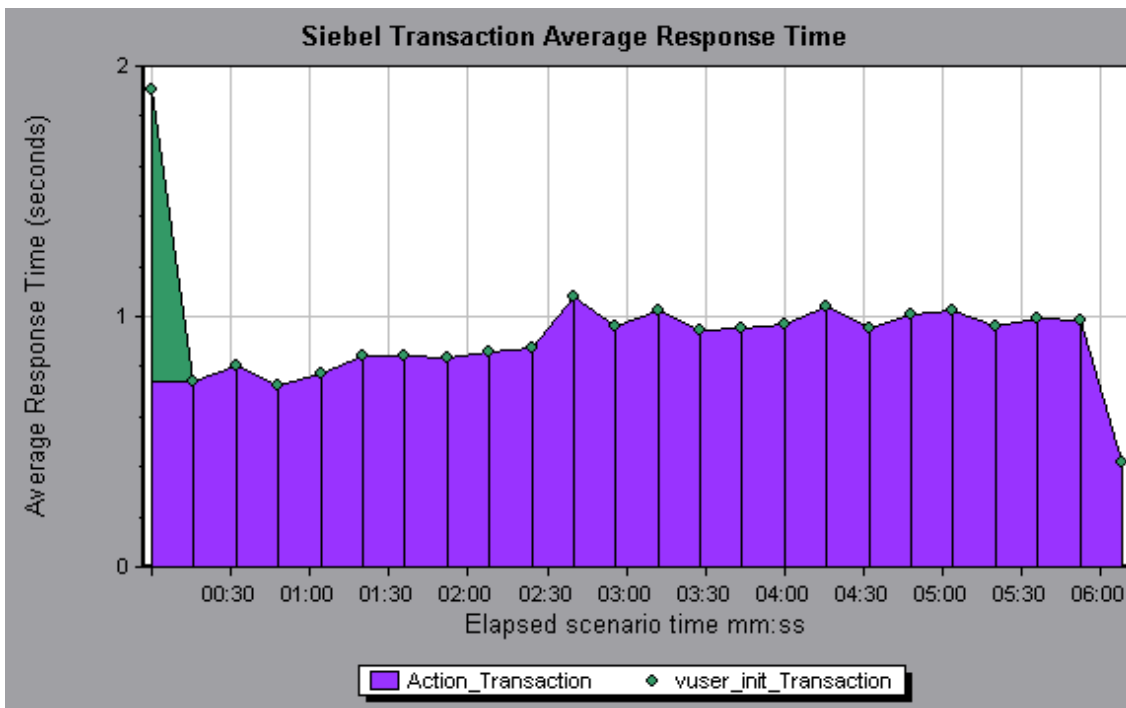
## Siebel Transaction Average Response Time Graph

This graph displays the server response time for the selected area (layer, area, or sub-area) within each transaction, computed as the total response time for that layer or area divided by the total number of relevant transactions.

<b>X-axis</b>	Elapsed time since the start of the run.
---------------	--

<b>Y-axis</b>	Average response time (in seconds) per area.
<b>Breakdown options</b>	For breakdown options, see <a href="#">"Siebel Breakdown Levels" on page 398</a> .
<b>Tips</b>	<p>You can filter the Siebel graphs by the following fields:</p> <ul style="list-style-type: none"> <li>• <b>Transaction Name.</b> Shows data for the specified transaction.</li> <li>• <b>Scenario Elapsed Time.</b> Shows data for transactions that ended during the specified time.</li> </ul> <p>For more information on filtering, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a>.</p>
<b>See also</b>	<a href="#">"Siebel Breakdown Levels" on page 398</a>

### Example



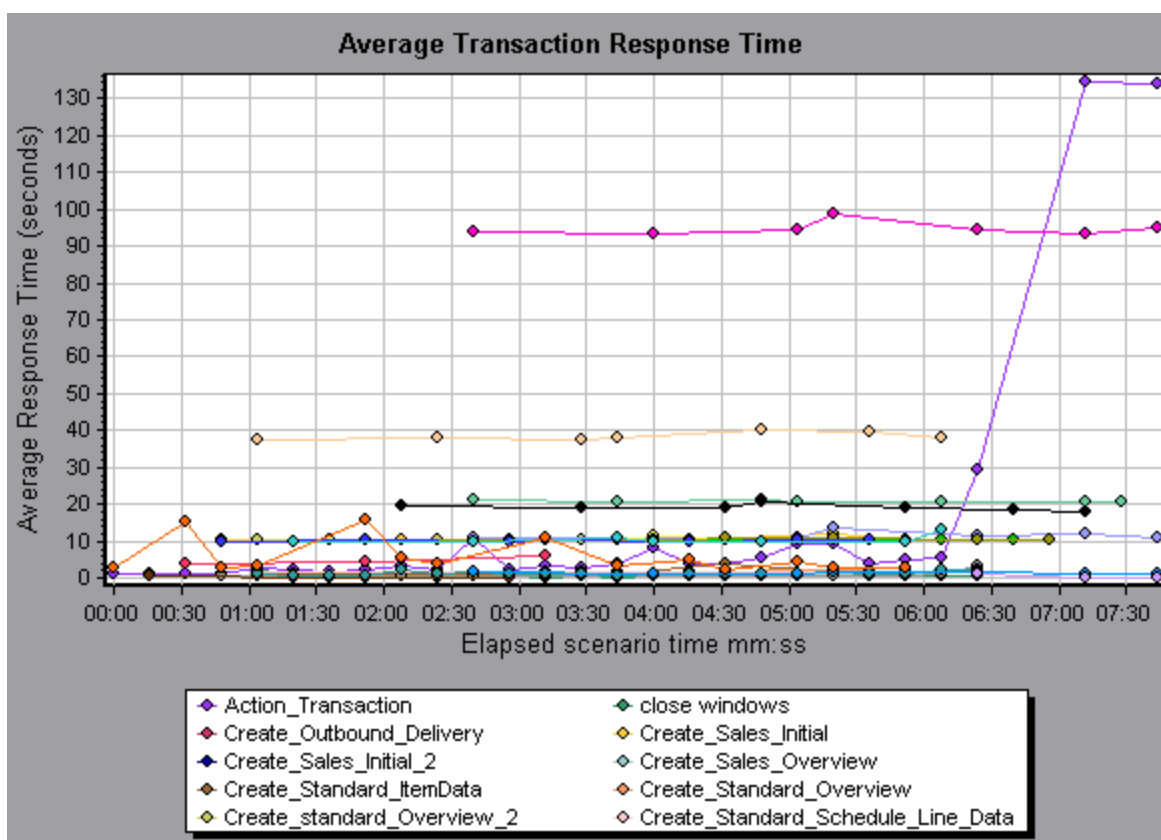
## Siebel DB Diagnostics Graphs

## Siebel DB Diagnostics Graphs Overview

Siebel DB Diagnostics graphs provide you with performance information for SQLs generated by transactions on the Siebel system. You can view the SQLs for each transaction, identify the problematic SQL queries of each script, and identify at what point problems occurred.

To analyze where problems are occurring, you correlate the data in the Siebel DB Diagnostics graphs with data in the Transaction Response Time graphs.

You begin analyzing these graphs with the transaction graphs that display the average transaction response time during each second of the load test scenario run. For example, the following Average Transaction Response Time graph demonstrates that the average transaction response time for the `query_for_contact` transaction was high.



Using the Siebel DB Diagnostics graphs, you can pinpoint the cause of the delay in response time for this transaction.

**Note:** A measurement that is broken down in the Average Transaction Response Time graph will be different from the same measurement broken down in the Siebel DB Side Transactions graph. This is because the Average Transaction Response Time graph displays the average transaction time, whereas the Siebel DB Side Transactions graph displays the average time per transaction event (sum of SQL component response times).

## How to Synchronize Siebel Clock Settings

This task describes how to synchronize the Load Generator and Siebel application server clocks to ensure that the correlation of SQLs to transactions is correct.

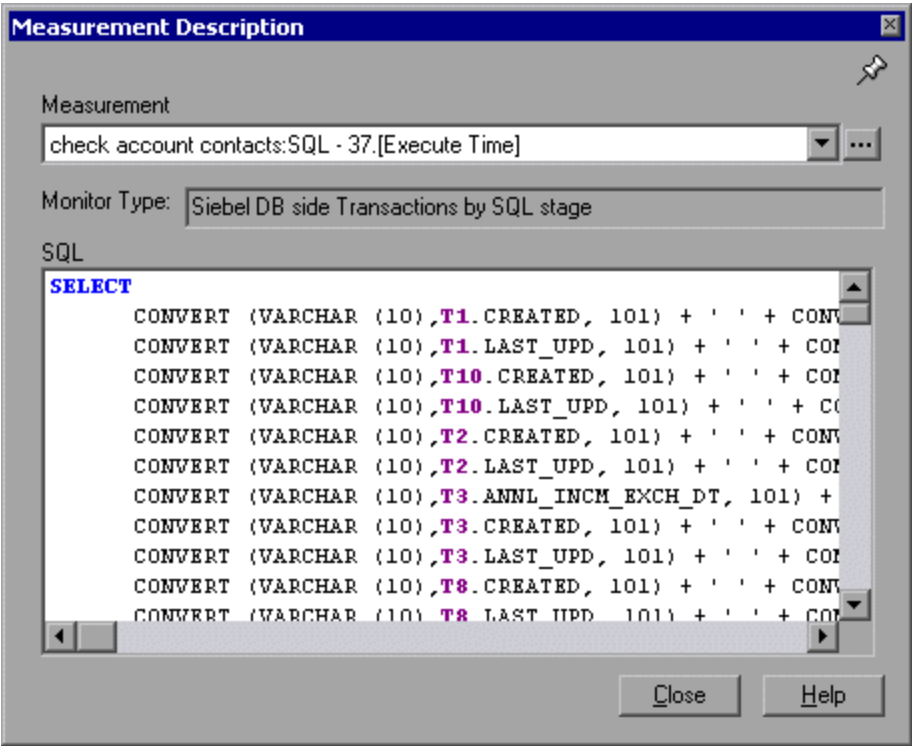
1. Choose **Tools > Siebel Database Diagnostics Options**.
2. Select **Apply Application Server time settings**.
3. Click **Add** and enter the information as described in "[Siebel Database Diagnostics Options Dialog Box](#)" on page 413.
4. Click **OK** to save the data and close the dialog box.


**Note:** You must reopen the results file for time synchronization to take effect.

## Measurement Description Dialog Box





You can view the full SQL statement for a selected SQL element by choosing **Show measurement description** from the Legend window. The Measurement Description dialog box opens displaying the name of the selected measurement and the full SQL statement.





To access	Legend window > 
See also	<a href="#">"Siebel Database Breakdown Levels" on the next page</a>

User interface elements are described below:

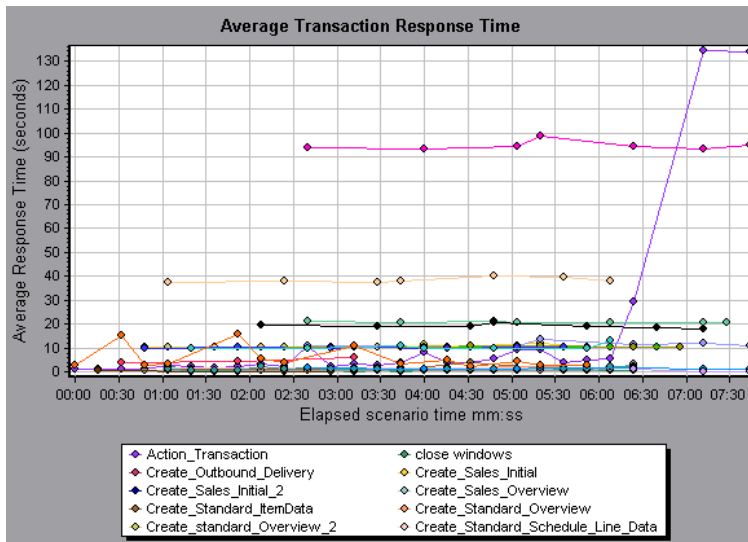
UI Element	Description
	Break the data down to a lower level.
	Return to the previous level.
	To keep the focus on the Measurement Description dialog box, click the <b>Stay on Top</b> button. This enables you to view the full SQL statement of any measurement by selecting it in the Legend window. Click the button again to remove the focus.
	Click the <b>Breaking Measurement</b> button to display the Transaction Name and SQL Alias Name of the selected measurement.

## Siebel Database Breakdown Levels

You can break down Siebel layers into areas, sub-areas, servers, and scripts to enable you to pinpoint the exact location where time is consumed.

<b>To access</b>	<p>Use one of the following to access breakdown options:</p> <ul style="list-style-type: none"> <li>• <b>&lt;Siebel DB Diagnostics Graphs&gt; &gt; View &gt; Siebel DB Diagnostics</b></li> <li>• <b>&lt;Siebel DB Diagnostics Graphs&gt; &gt; select transaction &gt; short-cut menu &gt; Siebel DB Diagnostics</b></li> <li>• See toolbar options for each breakdown level</li> </ul>
<b>Important information</b>	The breakdown menu options and buttons are not displayed until a transaction is selected.
<b>See also</b>	<a href="#">"Siebel DB Diagnostics Graphs Overview" on page 407</a>

Siebel Breakdown Levels are described below:

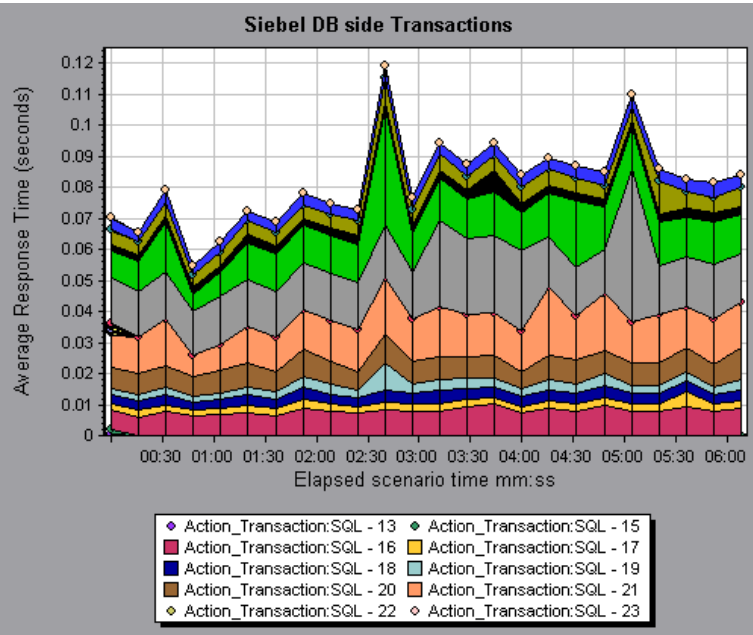
<b>Transaction Level</b>	<p>The following figure displays the top level Average Transaction Response Time graph. The graph displays several transactions. You can break this graph down to show the SQL statements and the SQL stages level.</p>  <p>The graph, titled 'Average Transaction Response Time', plots 'Average Response Time (seconds)' on the Y-axis (0 to 130) against 'Elapsed scenario time mm:ss' on the X-axis (00:00 to 07:30). Multiple data series are shown, each representing a different transaction. Most transactions maintain a low response time (below 20 seconds) throughout the scenario. However, the 'Action_Transaction' series (purple line with diamond markers) shows a sharp increase in response time starting around 06:00, peaking at approximately 130 seconds near the end of the scenario. Other transactions like 'Create_Outbound_Delivery' (orange) and 'Create_Sales_Initial' (yellow) show moderate, stable response times around 30-40 seconds.</p>
--------------------------	--

SQL  
Statements  
Level




**Siebel SQL Statements Breakdown** button shows the breakdown of the selected transaction.

In the following figure, the Siebel DB Side Transactions graph displays the Action\_Transaction broken down to its SQL statements.

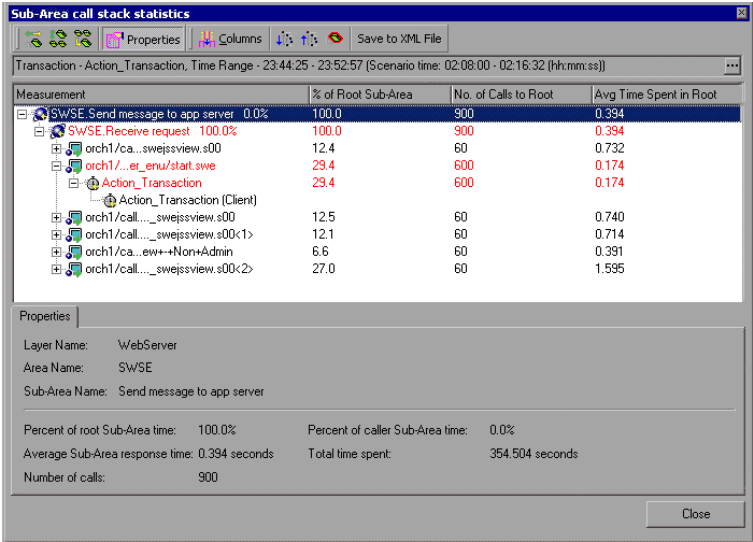


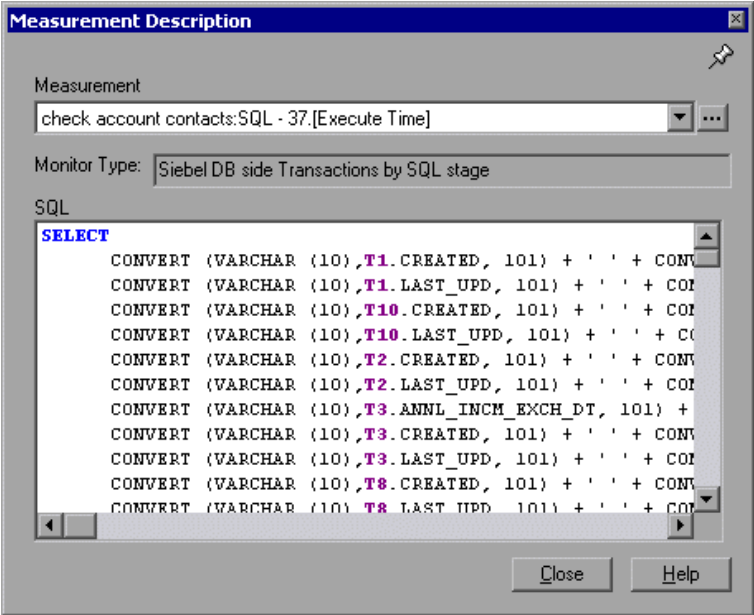
SQL Stages  
Level

 **Measurement Breakdown** button breaks the data down to a lower level.

 **Undo Breakdown Measurement** button returns to the previous level.

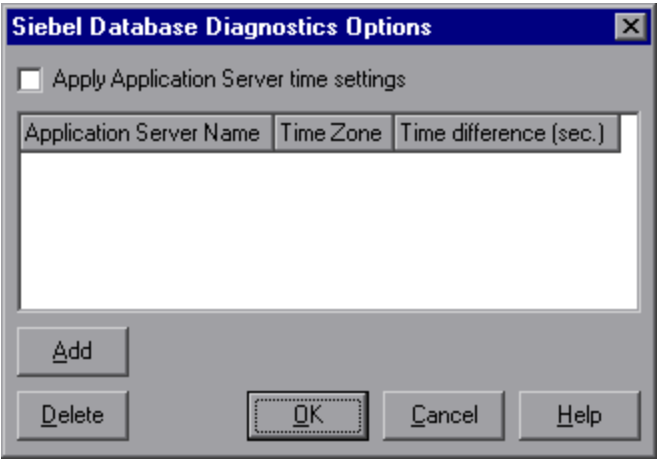
In the following figure, the Siebel DB Side Transactions by SQL Stage graph displays Action\_Transaction:SQL-33 broken down to its SQL stage: Prepare, Execute, and Initial Fetch.



<b>Show measurement description</b>	<p>You can view the full SQL statement for a selected SQL element by choosing <b>Show measurement description</b> from the Legend window. The Measurement Description dialog box opens displaying the name of the selected measurement and the full SQL statement.</p> 
<b>See also</b>	<a href="#">"Siebel DB Diagnostics Graphs Overview" on page 407</a>

## Siebel Database Diagnostics Options Dialog Box

This dialog box enables you to synchronize the Load Generator and Siebel application server clocks.



<b>To access</b>	<b>Tools &gt; Siebel Database Diagnostics Options</b>
<b>Note</b>	You must reopen the results file for time synchronization to take effect.
<b>See also</b>	<a href="#">"How to Synchronize Siebel Clock Settings" on page 408</a>

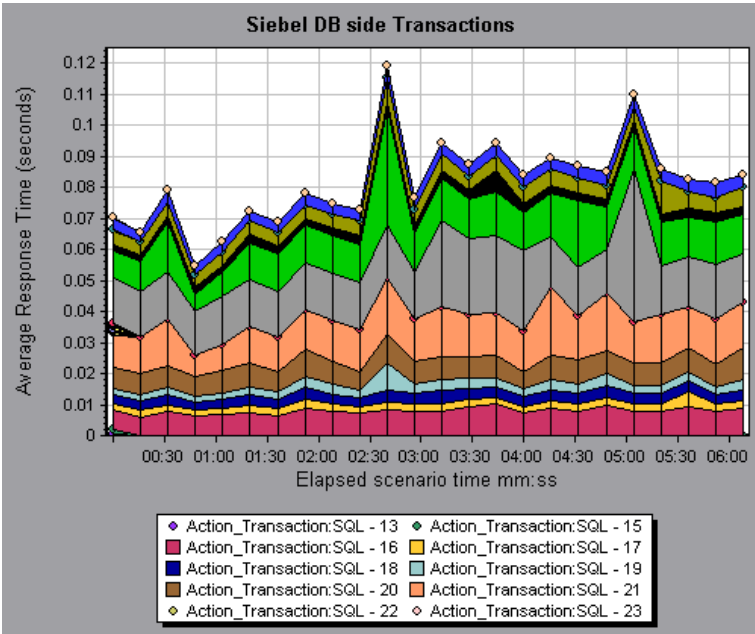
User interface elements are described below:

UI Element	Description
<b>Apply Application Server time settings</b>	Enables the synchronized time settings option.
<b>Application Server Name</b>	Enter the name of the Siebel application server.
<b>Time Zone</b>	Enter the time zone of the Siebel application server (GMT or Local). GMT means the application server time is reported in GMT time, and local means the application server time is reported in local time.
<b>Time Difference (sec.)</b>	Enter the time difference (in seconds) between the load generator and the Siebel application server. Use the minus sign ("-") if the time on Siebel application server is ahead of the load generator. For example, if the application server time is two minutes ahead of the load generator time, enter -120 in the time difference field.
<b>Add</b>	Enables you to add an application server's time settings to the list.
<b>Delete</b>	Deletes the server breakdown time settings from the list.

## Siebel DB Side Transactions Graph

This graph displays the average transaction execution time in the Siebel database.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Average response time (in seconds) of each transaction.

<b>Breakdown options</b>	<p>You can break down a transaction in the Siebel DB Side Transactions graph to view its SQL statements. In the following figure, the <b>Action_Transaction</b> transaction is broken down to its SQL statements.</p>  <p><b>See also</b> <a href="#">"Siebel DB Diagnostics Graphs Overview" on page 407</a></p>
--------------------------	--

## Siebel DB Side Transactions by SQL Stage Graph

This graph displays the time taken by each SQL, grouped by SQL stage: Prepare, Execute, and Initial Fetch.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Average time (in seconds) taken to perform each SQL stage.
<b>Breakdown options</b>	<a href="#">"Siebel Database Breakdown Levels" on page 410</a>
<b>See also</b>	<a href="#">"Siebel DB Diagnostics Graphs Overview" on page 407</a>

## Siebel SQL Average Execution Time Graph

This graph displays the average execution time of each SQL performed in the Siebel database.

<b>Purpose</b>	This enables you to identify problematic SQLs regardless of the transaction that produced them. You can then choose <b>Show measurement description</b> from the Legend window to view the full SQL statement. The SQL statements are listed by a numeric ID.
<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Average response time (in seconds) of each SQL.
<b>Breakdown options</b>	<a href="#">"Siebel Database Breakdown Levels" on page 410</a>
<b>See also</b>	<a href="#">"Siebel DB Diagnostics Graphs Overview" on page 407</a>

## Oracle 11i Diagnostics Graphs

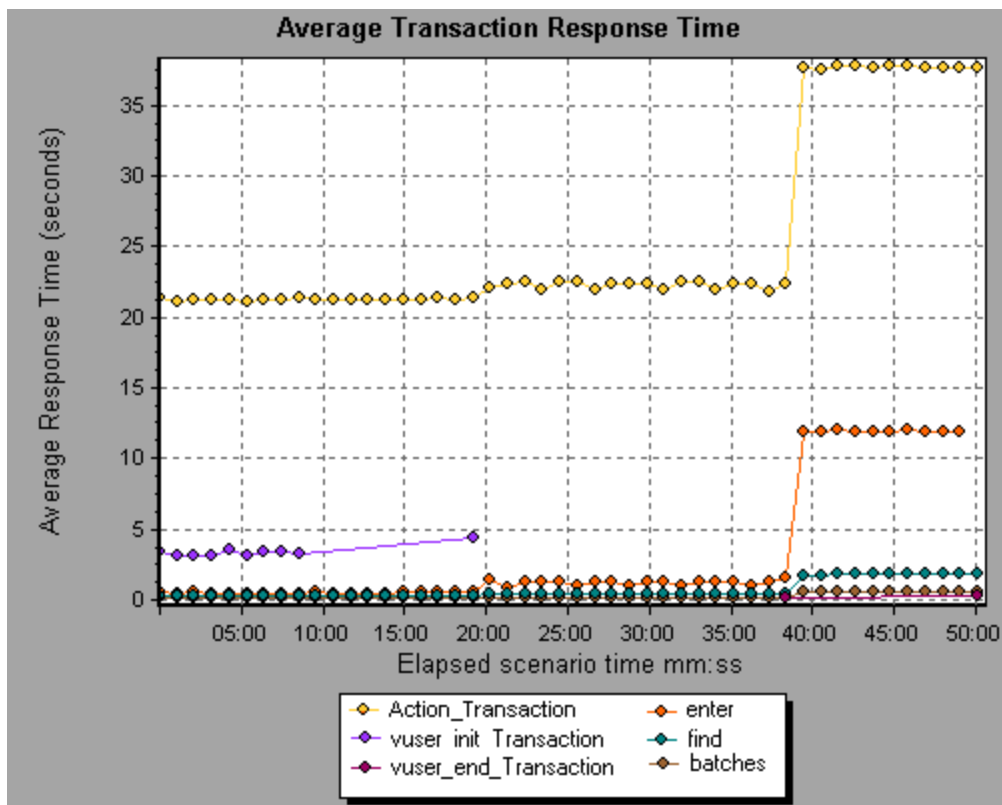
### Oracle 11i Diagnostics Graphs Overview

Oracle 11i Diagnostics graphs provide you with performance information for SQLs generated by transactions on the Oracle NCA system. You can view the SQLs for each transaction, identify the problematic SQL queries of each script, and identify at what point problems occurred.

To analyze where problems are occurring, you correlate the data in the Oracle 11i Diagnostics graphs with data in the Transaction Response Time graphs.

You begin analyzing these graphs with the transaction graphs that display the average transaction response time during each second of the load test scenario run. For example, the following Average Transaction Response Time graph demonstrates that the average transaction response time for the **enter** transaction was high.





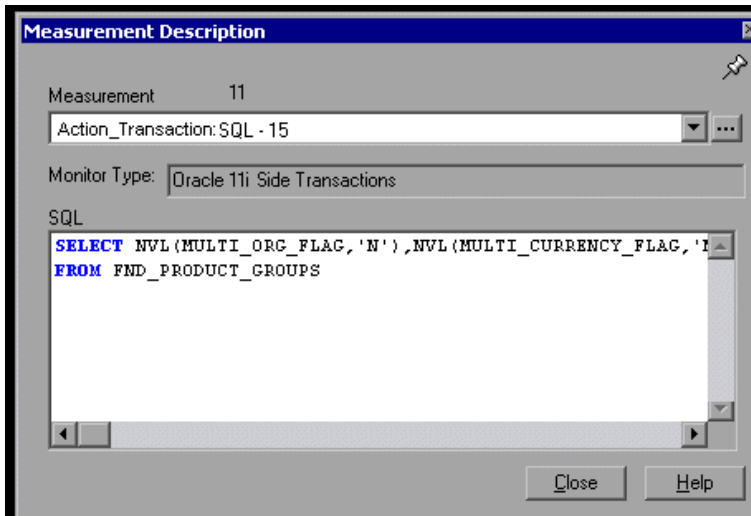
Using the Oracle 11i Diagnostics graphs, you can pinpoint the cause of the delay in response time for this transaction.


**Note:**

- A measurement that is broken down in the Average Transaction Response Time graph will be different from the same measurement broken down in the Oracle 11i(DB) Side Transactions graph. This is because the Average Transaction Response Time graph displays the average transaction time, whereas the Oracle 11iDB Side Transactions graph displays the average time per transaction event (sum of SQL component response times).
- **vuser\_init** and **vuser\_end** actions in Oracle cannot be broken down.



## Measurement Description Dialog Box

This dialog box enables you to view the full SQL statement for a selected SQL element.



<b>To access</b>	Legend window > 
<b>See also</b>	<ul style="list-style-type: none"> <li>• <a href="#">"Oracle 11i Diagnostics Graphs Overview" on page 416</a></li> <li>• <a href="#">"Oracle Breakdown Levels" below</a></li> </ul>

User interface elements are described below:

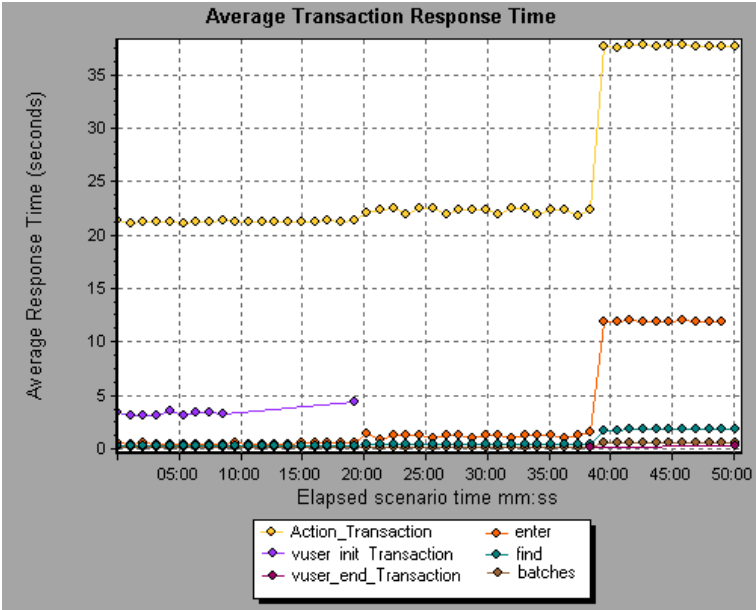
UI Element	Description
	To keep the focus on the Measurement Description dialog box, click the Stay on Top button. This enables you to view the full SQL statement of any measurement by selecting it in the Legend window. Click the button again to remove the focus.
	Click the Breaking Measurement button to display the Transaction Name and SQL Alias Name of the selected measurement.

## Oracle Breakdown Levels

After you have enabled Oracle 11i Diagnostics on the Controller machine and run the load test scenario, you can view the diagnostics data.

<b>To access</b>	Use one of the following to access breakdown options: <ul style="list-style-type: none"><li>• &lt;Oracle Diagnostics Graphs&gt; &gt; View &gt; Oracle Diagnostics</li><li>• &lt;Oracle Diagnostics Graphs&gt; &gt; select transaction &gt; short-cut menu &gt; Oracle Diagnostics</li><li>• See toolbar options for each breakdown level</li></ul>
<b>Important Information</b>	The breakdown menu options and buttons are not displayed until a transaction is selected.
<b>See also</b>	<a href="#">"Oracle 11i Diagnostics Graphs Overview" on page 416</a>

Oracle Breakdown Levels are described below:

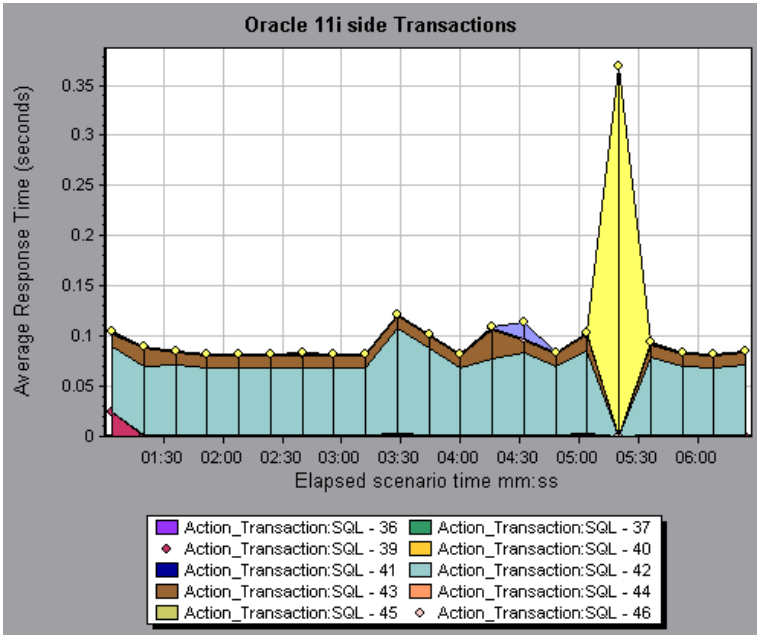
<b>Transaction Level</b>	<p>The following figure illustrates the top level Average Transaction Response Time graph. The graph displays several transactions.</p>  <p>The graph, titled "Average Transaction Response Time", plots "Average Response Time (seconds)" on the y-axis (0 to 35) against "Elapsed scenario time mm:ss" on the x-axis (05:00 to 50:00). It shows several data series: Action_Transaction (yellow diamonds), vuser_init Transaction (purple diamonds), vuser_end_Transaction (pink diamonds), enter (orange diamonds), find (teal diamonds), and batches (brown diamonds). Action_Transaction starts at ~21s, rises to ~23s at 20:00, and spikes to ~37s at 40:00. vuser_init Transaction starts at ~3s and rises to ~5s at 20:00. enter starts at ~1s and spikes to ~12s at 40:00. find, vuser_end_Transaction, and batches remain near 0s throughout.</p>
--------------------------	--

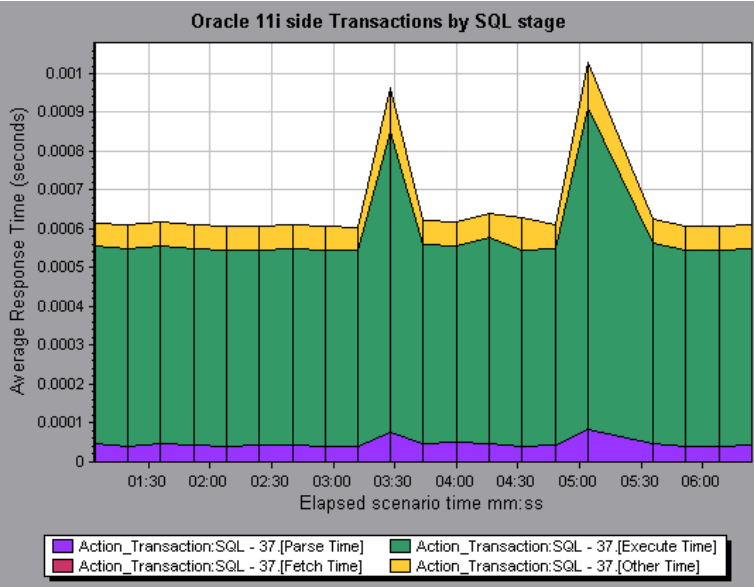


SQL  
Statements  
Level



**Oracle SQL Statement Breakdown** button shows the breakdown of the selected transaction.

In the following figure, the Oracle 11iDB Side Transactions graph displays the Action\_Transaction transaction broken down to its SQL statements.

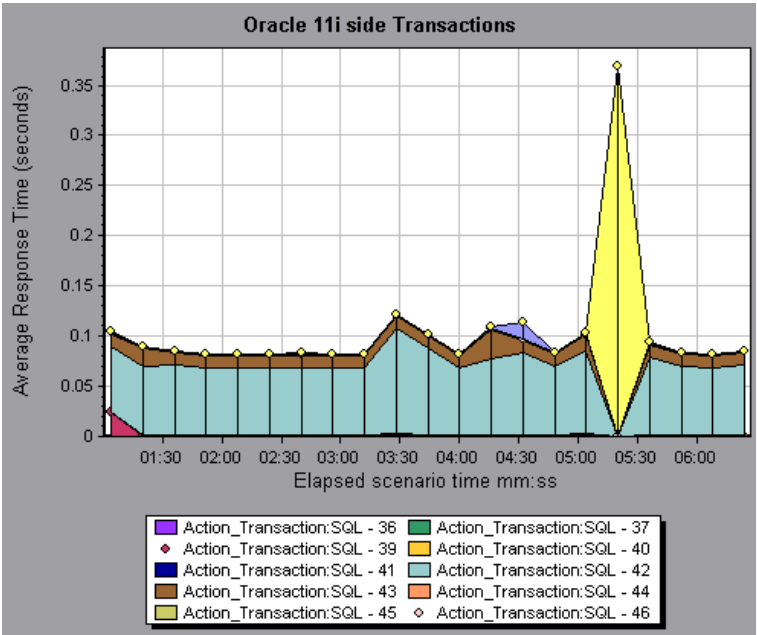


<p><b>SQL Stages Level</b></p>	<p>In the following figure, the Oracle 11iDB Side Transactions by SQL Stage graph displays Action_Transaction:SQL-37 broken down to its SQL stages: Parse Time, Execute Time, Fetch Time, and Other Time. Other Time includes other database time such as bind time.</p> <div data-bbox="456 457 1205 1039"></div>
	<p>You can break the data down to a lower level.</p>
	<p>Enables you to return to a previous level.</p>

Oracle 11iDB Side Transactions Graph

This graph displays the average transaction execution time in the Oracle database.

<p><b>X-axis</b></p>	<p>Elapsed time of the scenario run.</p>
<p><b>Y-axis</b></p>	<p>Response time (in seconds) of each transaction.</p>

<b>Breakdown options</b>	<p>You can break down a transaction in the Oracle 11iDB Side Transactions graph to view its SQL statements. In the following figure, the Action_Transaction transaction is broken down to its SQL statements.</p>  <p>To break the displayed elements down further, see <a href="#">"Oracle Breakdown Levels"</a> on page 418.</p>
<b>See also</b>	<a href="#">"Oracle 11i Diagnostics Graphs Overview"</a> on page 416

## Oracle 11iDB Side Transactions by SQL Stage Graph

This graph displays the time taken by each SQL, divided by the SQL stages: Parse Time, Execute Time, Fetch Time, and Other Time. Other Time includes other database time such as bind time.

<b>X-axis</b>	Elapsed time since the scenario run.
<b>Y-axis</b>	Average response time (in seconds) of each SQL stage.
<b>Breakdown options</b>	<a href="#">"Oracle Breakdown Levels"</a> on page 418
<b>See also</b>	<a href="#">"Oracle 11i Diagnostics Graphs Overview"</a> on page 416

## Oracle 11i SQL Average Execution Time Graph

This graph displays the average execution time of each SQL performed in the Oracle database.

<b>Purpose</b>	The graph enables you to identify problematic SQLs regardless of the transaction that produced them.
<b>X-axis</b>	Elapsed time since the scenario run.
<b>Y-axis</b>	Average response time (in seconds) of each SQL.
<b>Breakdown options</b>	<a href="#">"Oracle Breakdown Levels" on page 418</a>
<b>Tips</b>	You can select <b>Show measurement description</b> from the Legend window to view the full SQL statement.
<b>Note</b>	The SQL statements are shortened to a numeric indicator.
<b>See also</b>	<a href="#">"Oracle 11i Diagnostics Graphs Overview" on page 416</a>

## SAP Diagnostics Graphs

### SAP Diagnostics Graphs Overview

SAP Diagnostics enables you to pinpoint the root cause of a certain problem (for example, DBA, Network, WAS, Application, OS/HW) quickly and easily, and engage with the relevant expert only, without having to present the problem to a whole team of people.

Using SAP Diagnostics, you can create graphs and reports, which you can present to the relevant expert when discussing the problems that occurred.

SAP Diagnostics also allow an SAP performance expert (in one of the areas of expertise) to perform the required root-cause analysis more quickly and easily.

### How to Configure SAP Alerts

SAP Diagnostics comes with a set of alert rules with pre-defined threshold values.

When you open a LoadRunner results file (.lrr) in Analysis, these alert rules are applied to the load test scenario results, and if a threshold value is exceeded, Analysis generates an alert that there is a problem.

Before opening a LoadRunner results file, you can define new threshold values for the alert rules using the Alerts Configuration dialog box. Then, when you open the results file, the customized alert rules are applied.

**Note:** When an Analysis session is open, the Alerts Configuration dialog box is not editable. To edit thresholds in the Alerts Configuration dialog box, close all open sessions.

This task describes how to define threshold values for alert rules when analyzing load test scenario results.

1. Close all open Analysis sessions.
2. From the **Tools** menu, select **SAP Diagnostics Alerts Configuration**.
3. The **Generate alert if** column lists the rules. Set the threshold for each rule in the **Threshold** column.
4. By default, all pre-defined alert rules are enabled. To disable an alert rule, clear the check box next to that rule.
5. Click **OK** to apply your changes and close the Alerts Configuration dialog box.

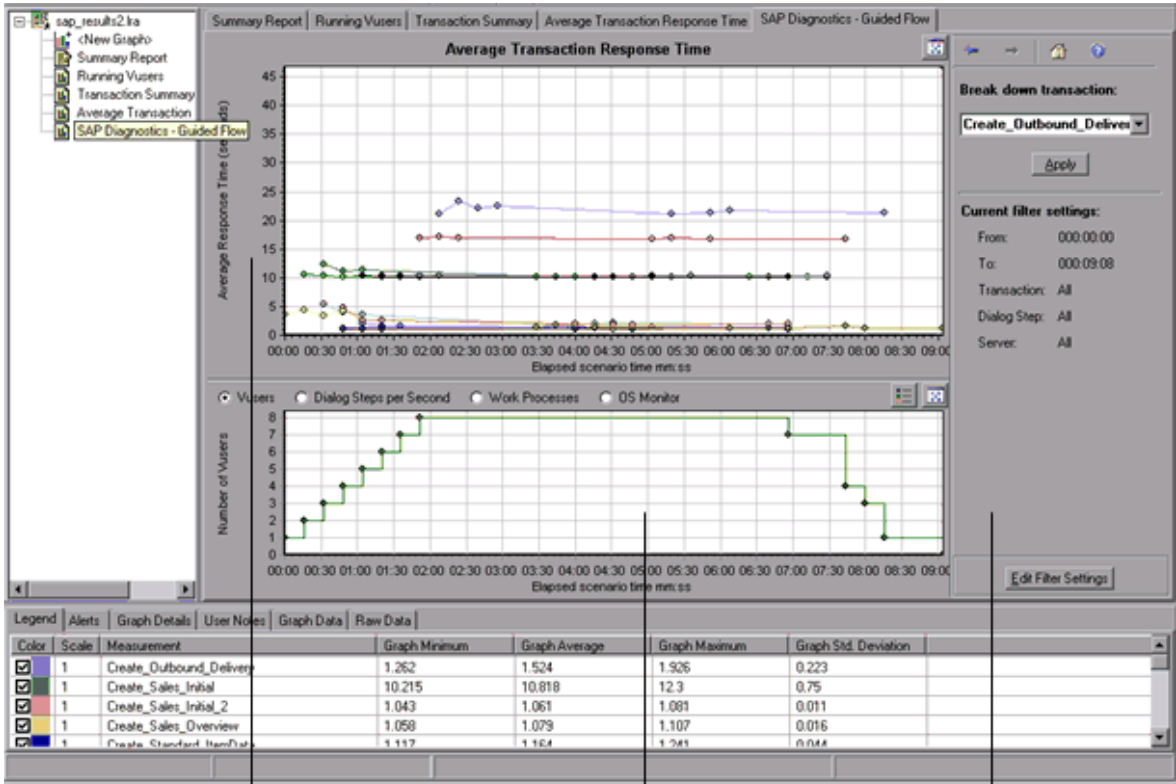
**Note:** Modifying the alert rules does not affect the results of a saved Analysis session. You need to re-analyze the results in order for new settings to take effect.

## SAP Diagnostics - Guided Flow Tab

You open the SAP Diagnostics graphs from the Analysis Summary Report or from **Session Explorer > Graphs > SAP Diagnostics - Guided Flow**.

This tab remains open throughout the Analysis application flow, and its content varies according to the breakdown flow.





Primary Graph Pane                      Secondary Graph Pane                      Task Pane

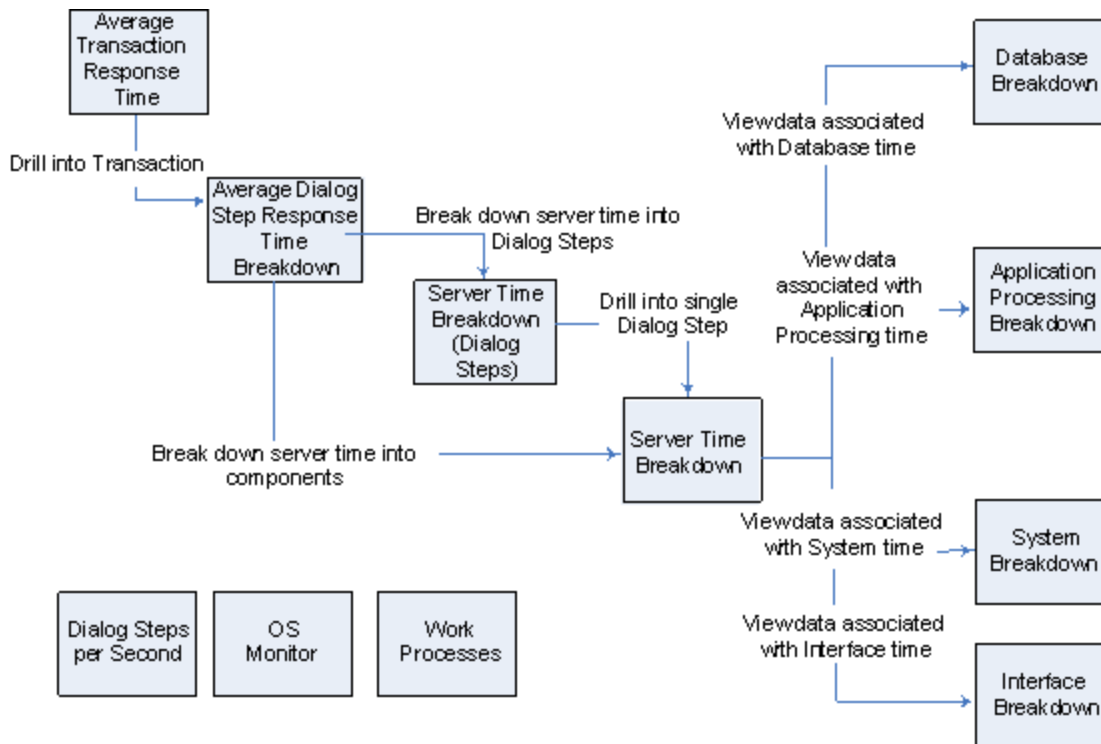
User interface elements are described below:

UI Element	Description
Primary Graph Pane	<p>The upper pane of the SAP Diagnostics - Guided Flow tab is referred to as the <i>primary graph pane</i>. This pane displays graphs of the transactions and their broken down dialog steps or components, and other associated resources.</p> <p>You break down the graphs displayed in this pane using the breakdown options provided in the right pane of the guided flow (see <a href="#">"SAP Breakdown Task Pane" on page 434</a>).</p> <p>You can open the displayed graph in full view by clicking the <b>Enlarge Graph</b> button in the top right corner of this pane. An enlarged version of the graph opens in a new tab.</p>

UI Element	Description
<b>Secondary Graph Pane</b>	<p>The lower pane of the SAP Diagnostics - Guided Flow tab is referred to as the <i>secondary graph pane</i> and displays graphs showing secondary information supporting the graph displayed in the primary graph pane.</p> <p>To see the legend for the graph displayed in this pane, click the <b>Graph Legend</b> button in the top right corner. To see all the data in the Legend, scroll along the horizontal scroll bar.</p> <p>You can open the displayed graph in full view by clicking the <b>Enlarge Graph</b> button in the top right corner of this pane. An enlarged version of the graph opens in a new tab.</p>
<b>Task Pane</b>	<p>The pane on the right side of the SAP Diagnostics - Guided Flow tab is referred to as the <i>task pane</i>. You use the task pane to choose the level of breakdown you want to view, to filter and group transaction and server information, and to navigate backwards and forwards through the broken down graphs.</p> <p>For more information, see <a href="#">"SAP Breakdown Task Pane" on page 434</a>.</p>

## SAP Diagnostics Application Flow

The following diagram depicts the general flow of SAP Diagnostics:



The main view of SAP Diagnostics displays all of the transactions in a scenario run for which there is SAP diagnostics data. Each transaction can be broken down into server-time components, or first into the dialog steps that comprise a transaction, and then into server-time components. The server components can further be broken down into sub-components or other related data.

There are three independent/parallel views: **Dialog Steps per Second**, **OS Monitor**, and **Work Processes**. These do not generally participate in the breakdown flow, and you may choose to display or hide them.

## Dialog Steps per Second Graph

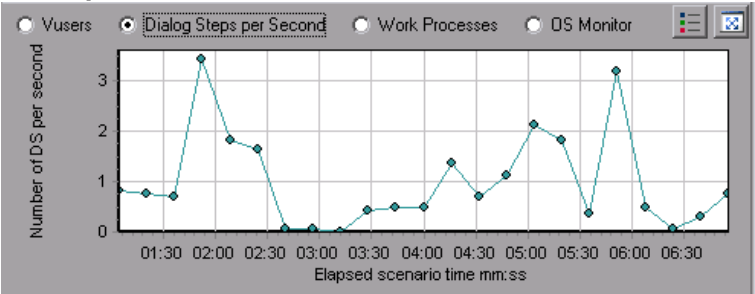
This graph represents the number of dialog steps that ran on all the servers during each second of the load test scenario run.

<b>X-axis</b>	Elapsed scenario time (in hh:mm:ss).
<b>Y-axis</b>	Number of dialog steps per second.

, continued

<b>See also</b>	<a href="#">"SAP Breakdown Task Pane" on page 434</a> <a href="#">"Vuser Graphs" on page 159</a> <a href="#">"Work Processes Graph" on page 444</a> <a href="#">"OS Monitor Graph" below</a>
-----------------	---

Example

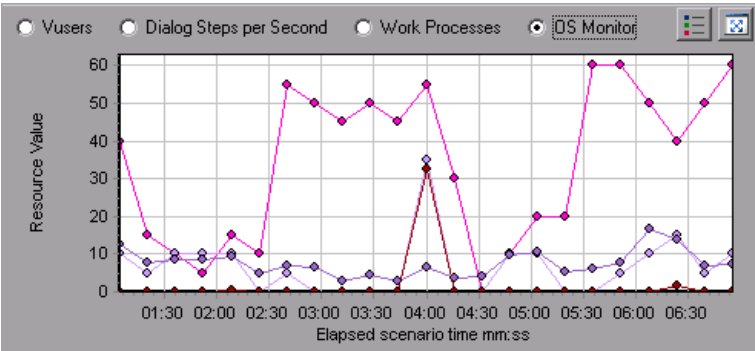


OS Monitor Graph

This graph represents the operating system resources that were measured throughout the load test scenario run.

<b>X-axis</b>	Elapsed scenario time (in hh:mm:ss).
<b>Y-axis</b>	Resource value.
<b>Note</b>	This graph is available only when a single server filter is applied.
<b>See also</b>	<a href="#">"SAP Breakdown Task Pane" on page 434</a> <a href="#">"Dialog Steps per Second Graph" on the previous page</a> <a href="#">"Work Processes Graph" on page 444</a>

Example



## SAP Alerts Configuration Dialog box

This dialog box enables you to define threshold values for alert rules used when opening the results file (.lrr) in Analysis.

### SAP Diagnostics summary

Transaction Name	SAP Diagnostics Layers	Total time (sec)
Delivery create Overview 2		2.135
Create Standard Overview		1.463
Processing Units 2		1.349
Create Standard Schedule Line Data		1.062
Create Outbound Delivery		0.515
vf01		0.382
Create Sales Initial		0.312
Processing Units		0.24
R 1140		0.197
SAP Easy Access		0.134

■ Database Time      ■ System Time  
■ Interface Time      ■ Application Processing Time

<b>Important information</b>	Modifying the alert rules does not affect the results of a saved Analysis session. You need to re-analyze the results in order for new settings to take effect.
<b>See also</b>	<a href="#">"SAP Diagnostics Graphs Overview" on page 423</a>

User interface elements are described below:



UI Element	Description
<b>Enabled</b>	By default, all pre-defined alert rules are enabled. To disable an alert rule, clear the check box next to that rule.
<b>Generate alert if</b>	The <b>Generate alert if</b> column lists the rules.
<b>Threshold</b>	Set the threshold for each rule in the <b>Threshold</b> column.

## SAP Alerts Window

This Window displays a list of alerts related to the data displayed in the current graph(s) shown in the Analysis window.

<b>To access</b>	<b>Windows &gt; SAP Alerts</b>
<b>See also</b>	<a href="#">"SAP Alerts Configuration Dialog box" on the previous page</a> <a href="#">"How to Configure SAP Alerts" on page 423</a>

User interface elements are described below:

UI Element	Description
<b>Type</b>	<p>Displays one of the following icons indicating the type of alert:</p> <p> <b>Standard Alert.</b> This alert is generated in the context of a transaction and/or server if the conditions of a pre-defined alert rule are met.</p> <p> <b>Major Alert.</b> There are two types of alerts:</p> <ul style="list-style-type: none"> <li>• <b>General Application Problem Alert.</b> If a standard alert was generated in the context of a transaction, and the same alert was generated in the context of all other transactions running in the same time frame, then a major alert of this type is generated, indicating that there is a general application problem.</li> </ul> <p><b>Note:</b> If a Dialog Step filter is applied (for a single dialog step), then this alert is not generated.</p> <ul style="list-style-type: none"> <li>• <b>Server-Specific Problem Alert.</b> This alert is generated for a specific server if a certain measurement on that server exceeds its threshold, while the overall server performance for that measurement is satisfactory. This type of alert indicates that there is a server related problem.</li> </ul> <p><b>Note:</b> Server-Specific Problem alerts are generated only when the current server context is "All Servers".</p>
<b>Time interval</b>	The time interval during which the problem occurred.
<b>Transaction/Server</b>	The name of the transaction and server where problem occurred.
<b>Description</b>	A description of the alert.
<b>Recommended Step</b>	Recommends what to do in order to understand the problem on a deeper level.

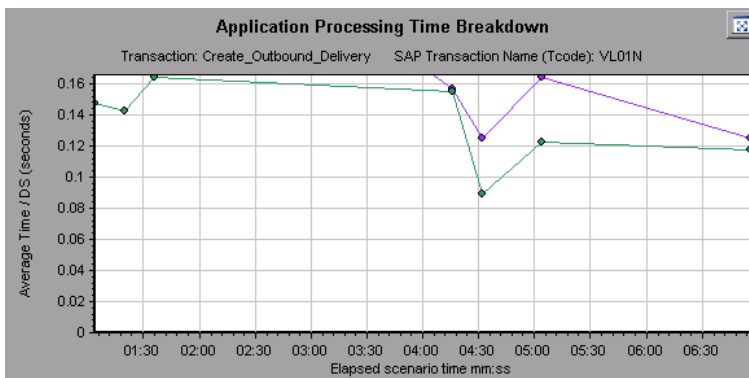
UI Element	Description
<b>Action</b>	A link to a graph representing the data described in the alert, allowing for a more graphic display of the alert. Double-click the link to open the graph.

## SAP Application Processing Time Breakdown Graph

This graph displays the behavior of resources associated with application processing time, namely ABAP time and CPU time.


<b>X-axis</b>	Elapsed load test scenario time (in hh:mm:ss).
<b>Y-axis</b>	Average time per dialog step (in seconds).
<b>See also</b>	<a href="#">"SAP Breakdown Task Pane" on page 434</a> <a href="#">"SAP Secondary Graphs" on page 443</a>

### Example



## SAP Primary Graphs

You view the SAP Diagnostics graphs in the primary graph pane.

You can open the graph in full view by clicking  in the top right corner of the primary graph pane. An enlarged version of the graph opens in a new tab.

To filter or group data displayed in these graphs, see ["SAP Breakdown Task Pane" on page 434](#).

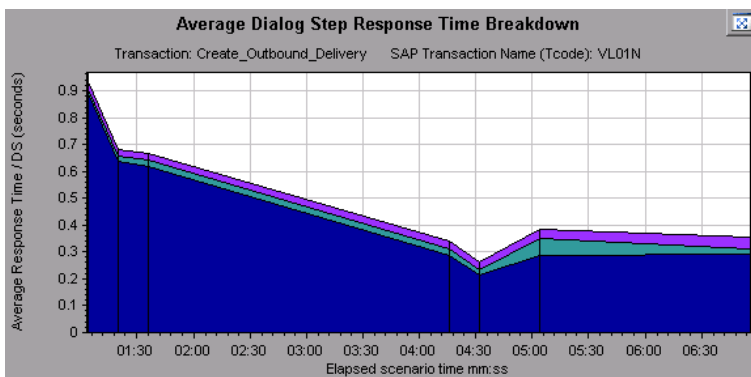


## SAP Average Dialog Step Response Time Breakdown Graph

This graph represents a breakdown of the average dialog step response time of a specific transaction. The graph displays the Network Time, Server Response Time, (including the GUI time), and Other Time (the time taken for the client to process the dialog step) of a single transaction.

<b>X-axis</b>	Elapsed time since the start of the run (in hh:mm:ss).
<b>Y-axis</b>	The average response time divided by the number of dialog steps (in seconds).
<b>Breakdown options</b>	<p><b>Components</b></p> <p>This option opens the "SAP Server Time Breakdown Graph" on page 439</p> <p><b>Dialog Steps</b></p> <p>This option opens the "SAP Server Time Breakdown (Dialog Steps) Graphs" on page 438</p>
<b>See also</b>	<p>"SAP Breakdown Task Pane" on the next page</p> <p>"SAP Secondary Graphs" on page 443</p> <p>"SAP Breakdown Task Pane" on the next page</p>

### Example



## SAP Average Transaction Response Time Graph

This graph displays all the SAP-related transactions in the load test scenario.

<b>X-axis</b>	Elapsed time since the start of the run.
<b>Y-axis</b>	Average response time (in seconds) of each transaction
<b>Breakdown graph</b>	<a href="#">"SAP Average Dialog Step Response Time Breakdown Graph" on the previous page</a>
<b>Tips</b>	<p>Select a transaction in one of the following ways:</p> <ul style="list-style-type: none"><li>• Select the transaction from the Breakdown transaction: list in the task pane.</li><li>• Highlight the transaction by selecting the line representing it in the graph.</li><li>• Select the transaction from the graph legend. This highlights the line in the graph.</li></ul>
<b>See also</b>	<p><a href="#">"SAP Breakdown Task Pane" below</a></p> <p><a href="#">"SAP Secondary Graphs" on page 443</a></p> <p><a href="#">"SAP Breakdown Task Pane" below</a></p>





## SAP Breakdown Task Pane

The task pane enables you to choose the level of breakdown you want to view, to filter and group transaction and server information, and to navigate backwards and forwards through the broken down graphs.

<b>To access</b>	<b>Session Explorer &gt; Graphs &gt; SAP Diagnostics &gt; SAP Diagnostics - Guided Flow</b>
<b>See also</b>	<a href="#">"SAP Diagnostics Graphs Overview" on page 423</a>

## SAP Breakdown Toolbar

User interface elements are described below:

UI Element	Description
	<b>Back.</b> Click to view previous breakdown graph, or to ungroup grouped data.
	<b>Next.</b> Click to view next breakdown graph.
	<b>Home.</b> Click to return to the initial SAP Average Transaction Response Time graph.
	<b>Help.</b> Click to get help on the breakdown options.

## Breakdown Options

To break down SAP diagnostics data, choose the breakdown and filter options from the task pane.

User interface elements are described below:

UI Element	Description
<b>Break down transaction</b>	Select a transaction from this list to display the average dialog step response time breakdown.
<b>Break down server time into</b>	<p>Displays the breakdown options for the Average Dialog Step Response Time Breakdown graph.</p> <ul style="list-style-type: none"><li>• Select <b>Components</b> to view a breakdown of the transaction's server components, namely database time, interface time, application processing time, and system time.</li><li>• Select <b>Dialog Steps</b> to view a breakdown of the transaction's dialog steps.</li></ul>

UI Element	Description
<b>Break down dialog step &lt;dialog step&gt;</b>	Break down a dialog step into its server-time components, namely database time, interface time, application processing time, and system time.
<b>View data associated with &lt;component&gt;</b>	Break down a server-time component (database time; interface time; application processing time; system time) to view data associated with it.
<b>No available breakdown</b>	There are no further breakdown options.
<b>Apply</b>	Click to apply the selected breakdown option.

## Current filter settings

This section displays the filter/grouping settings of the graph currently displayed in the primary graph pane.

User interface elements are described below:

UI Element	Description
<b>From/To</b>	Enter values (in hh:mm:ss) to filter the graph over a specified time interval.
<b>Transaction</b>	Displays the name of the transaction represented in the graph.
<b>Dialog Step</b>	Displays the name of the dialog step represented in the graph.
<b>Server</b>	Displays the name of the server represented in the graph.

## Edit filter settings

Click this button to modify filter or grouping settings. When you click **Edit Filter Settings** the filter/grouping options become editable.

User interface elements are described below:

UI Element	Description
<b>Filter</b>	<p>Use this option to filter the current graph by time interval, transaction, dialog step, and/or server.</p> <ul style="list-style-type: none"> <li>• <b>From/To.</b> Enter values (in hh:mm:ss) to filter the graph over a specified time interval.</li> <li>• <b>By Transaction.</b> Filter the graph to display information about a specific transaction by selecting the transaction from the list.</li> <li>• <b>By Dialog Step.</b> Filter the graph to display information about a specific dialog step by selecting the dialog step from the list.</li> <li>• <b>By Server.</b> Filter the graph to display information about a server by selecting the server name from the list.</li> </ul> <p><b>Note:</b> Only servers associated with the data displayed in the current graph are listed in the By Server list</p>
<b>Group</b>	<p>Use this option to group the data represented in the graph by transaction or by server. Select a transaction, component or subcomponent from the list.</p> <ul style="list-style-type: none"> <li>• <b>By Transaction.</b> Select this check box to group by transaction.</li> <li>• <b>By Server.</b> Select this check box to group by server.</li> </ul> <p><b>Note:</b> After applying grouping to a graph, you need to ungroup the data in order to apply further breakdown options. To ungroup grouped data, click the <b>Back</b> button on the toolbar.</p> <p><b>Important:</b> When you open a saved session, the <b>Back</b> is disabled. If you have grouped data, you need to click the Home button, or open a new SAP Diagnostics - Guided Flow tab to restart SAP breakdown.</p>

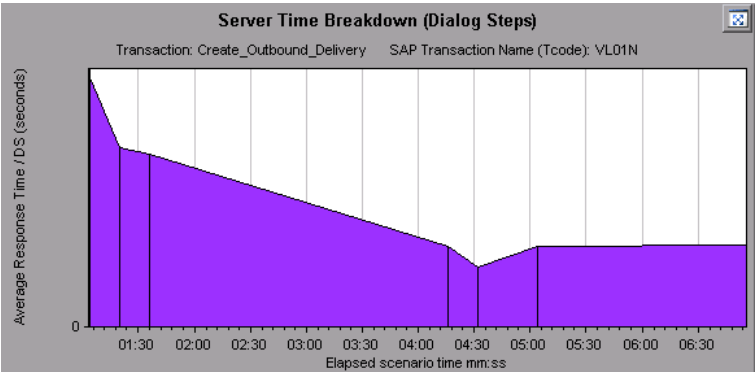
UI Element	Description
OK	<p>Click <b>OK</b> to apply the chosen filter/grouping settings. The <b>Current filter settings</b> area displays the chosen settings in non-editable mode.</p> <p><b>Notes:</b></p> <ul style="list-style-type: none"><li>• Global filtering is enabled when viewing SAP Diagnostics graphs (special SAP view) but cannot be applied on these graphs.</li><li>• Local filtering is disabled in the SAP Diagnostics - Guided Flow tab. To apply local filters to a SAP Diagnostics graph displayed in the Guided Flow tab, open the graph in a new tab by clicking the Enlarge Graph button.</li></ul>

## SAP Server Time Breakdown (Dialog Steps) Graphs

This graph displays the dialog steps of a particular transaction.

<b>X-axis</b>	Elapsed time since the start of the run (in hh:mm:ss).
<b>Y-axis</b>	The average response time per dialog step (in seconds).
<b>Breakdown graph</b>	<a href="#">"SAP Server Time Breakdown Graph" on the next page</a>
<b>See also</b>	<a href="#">"SAP Breakdown Task Pane" on page 434</a> <a href="#">"SAP Secondary Graphs" on page 443</a> <a href="#">"SAP Breakdown Task Pane" on page 434</a>

### Example

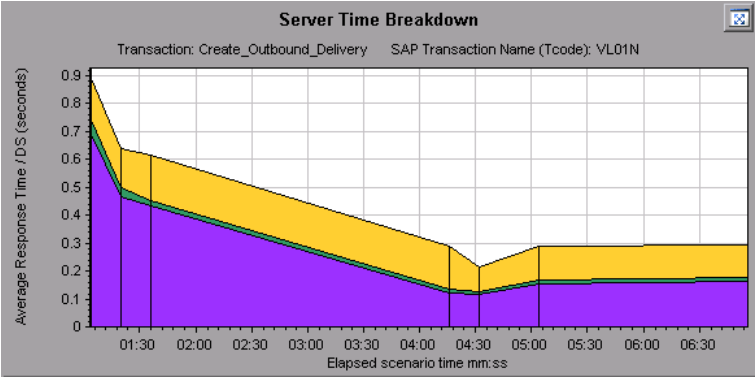


## SAP Server Time Breakdown Graph

This graph represents the server-time components of a single transaction, namely database time, application processing time, interface time, and system time.


<b>X-axis</b>	Elapsed time since the start of the run (in hh:mm:ss).
<b>Y-axis</b>	Represents the average response time per dialog step (in seconds).
<b>Breakdown graphs</b>	<ul style="list-style-type: none"><li>• <a href="#">"SAP Database Time Breakdown Graph" on the next page</a></li><li>• <a href="#">"SAP Application Processing Time Breakdown Graph" on page 432</a></li><li>• <a href="#">"SAP System Time Breakdown Graph" on page 443</a></li><li>• <a href="#">"SAP Interface Time Breakdown Graph" on page 442</a></li></ul>
<b>Tips</b>	In the task pane, select a component from the <b>View data associated with</b> box.
<b>See also</b>	<a href="#">"SAP Breakdown Task Pane" on page 434</a> <a href="#">"SAP Secondary Graphs" on page 443</a> <a href="#">"SAP Breakdown Task Pane" on page 434</a>

### Example

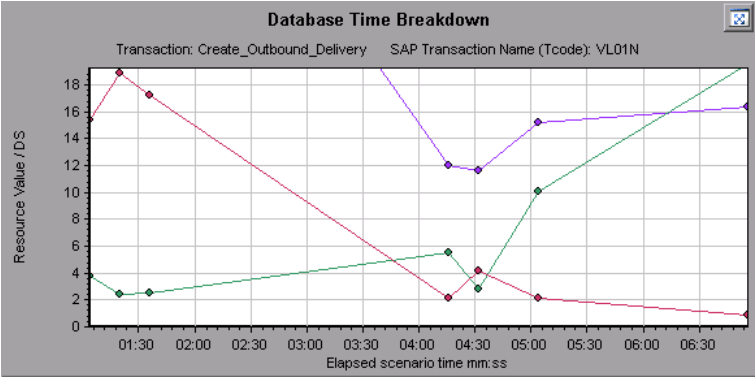


## SAP Database Time Breakdown Graph

This graph displays the behavior of resources associated with database time, namely time taken to access a record, database time, and the number of records accessed per dialog step.

<b>X-axis</b>	Elapsed time since the start of the run (in hh:mm:ss).
<b>Y-axis</b>	Represents the resource value per dialog step (in msec).
<b>Tips</b>	You can open the graph in full view by clicking  in the top right corner of the primary graph pane. An enlarged version of the graph opens in a new tab.
<b>See also</b>	<a href="#">"SAP Breakdown Task Pane" on page 434</a> <a href="#">"SAP Secondary Graphs" on page 443</a>

### Example

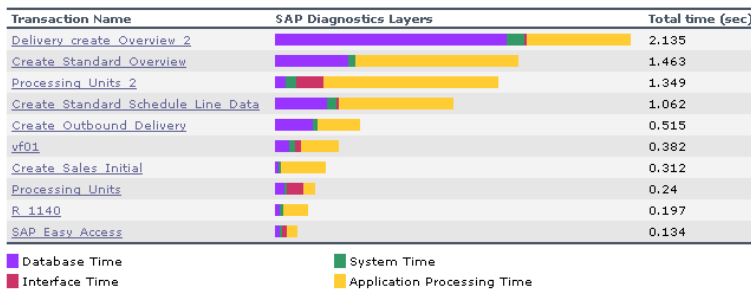




## SAP Diagnostics Summary Report

This report displays a list of major alerts generated when opening the Analysis session, and a summary of the SAP diagnostics data.

### SAP Diagnostics summary



<b>To access</b>	Use one of the following: <ul style="list-style-type: none"> <li><b>Session Explorer &gt; Reports &gt; Summary Report &gt; Major Alerts</b></li> <li><b>Session Explorer &gt; Reports &gt; Summary Report &gt; SAP Diagnostics Summary</b></li> </ul>
<b>Note</b>	If you do not see diagnostics data on the Summary Report, check if you are using a user-defined template. To view relevant data, choose a different template from the list of templates, or create and apply a new template. For more information about using templates, see <a href="#">"Apply/Edit Template Dialog Box" on page 107</a> .
<b>See also</b>	<a href="#">"SAP Diagnostics Graphs Overview" on page 423</a>

## SAP Diagnostics Summary

User interface elements are described below:

UI Element	Description
<b>Transaction</b>	Individual transactions. You can click a transaction name to display the server time breakdown for that transaction.

UI Element	Description
<b>SAP Diagnostics Layers</b>	Relative server-time breakdown in layers. Click a layer to display data associated with the component.
<b>Total time</b>	Total usage time for each transaction.

## Major Alerts

User interface elements are described below:

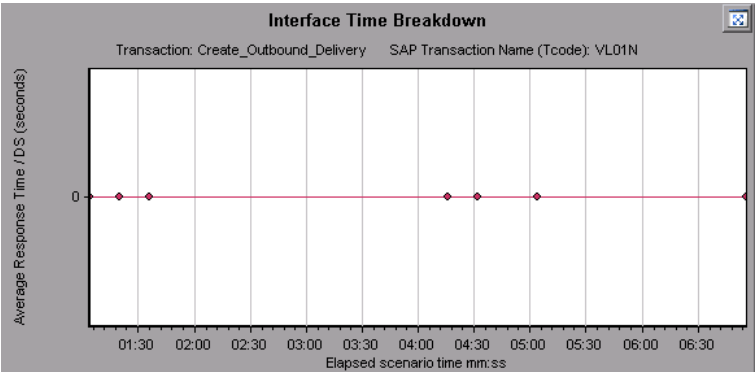
UI Element	Description
<b>Time Interval</b>	The time during which the problem occurred.
<b>Transaction/Server</b>	Which transaction and server were involved.
<b>Description</b>	A description of the alert.
<b>Action</b>	This column provides a link to a graphic depiction of the problem.

## SAP Interface Time Breakdown Graph

This graph displays the behavior of resources associated with interface time, namely GUI time, RFC time, and roll-wait time.

<b>X-axis</b>	Elapsed load test scenario time (in hh:mm:ss)
<b>Y-axis</b>	Average response time per dialog step (in seconds).
<b>See also</b>	<a href="#">"SAP Breakdown Task Pane" on page 434</a> <a href="#">"SAP Secondary Graphs" on the next page</a>

### Example

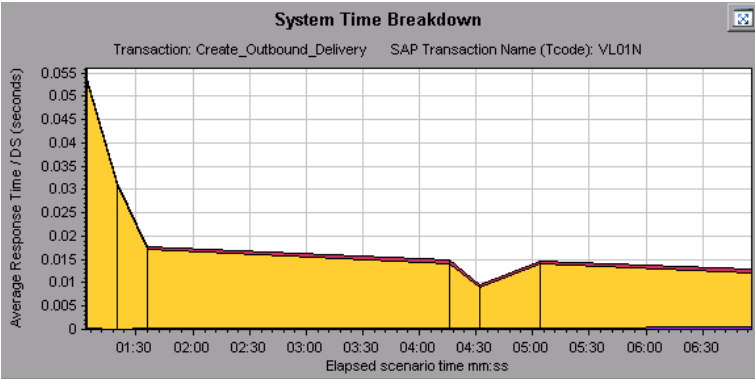


## SAP System Time Breakdown Graph

This graph displays the behavior of the sub-components of the system time component, namely the dispatcher wait time, the load and generation time, and the roll-in and roll-out times.

<b>X-axis</b>	Elapsed load test scenario time (in hh:mm:ss)
<b>Y-axis</b>	Average response time per dialog step (in seconds)
<b>See also</b>	<a href="#">"SAP Breakdown Task Pane" on page 434</a> <a href="#">"Secondary Graph Pane" on page 426</a>


### Example




## SAP Secondary Graphs

The secondary graph pane of the SAP Diagnostics - Guided Flow tab displays graphs that support the graph displayed in the primary graph pane. You can

correlate over time only one graph displayed in the secondary graph pane.

To see the legend for the graph displayed in this pane, click the **Graph Legend** button  in the top right corner. To see all the data in the Legend, scroll along the horizontal scroll bar.

You can open the displayed graph in full view by clicking the **Enlarge Graph** button  in the top right corner of this pane. An enlarged version of the graph opens in a new tab.

You view the following graphs in the secondary graph pane:

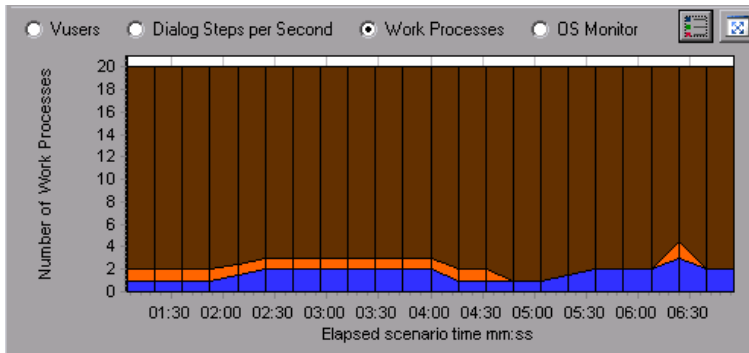
- ["Vuser Graphs" on page 159](#)
- ["Dialog Steps per Second Graph" on page 427](#)
- ["Work Processes Graph" below](#)
- ["OS Monitor Graph" on page 428](#)

## Work Processes Graph

This graph represents the number and distribution of work processes that ran throughout the load test scenario.

<b>X-axis</b>	Elapsed scenario time (in hh:mm:ss).
<b>Y-axis</b>	Number of work processes.
<b>Note</b>	This graph is available only when a single server filter is applied.
<b>See also</b>	<a href="#">"SAP Breakdown Task Pane" on page 434</a> <a href="#">"Vuser Graphs" on page 159</a> <a href="#">"Dialog Steps per Second Graph" on page 427</a> <a href="#">"OS Monitor Graph" on page 428</a>

### Example



## Analysis Reports

### Understanding Analysis Reports

#### Analysis Reports Overview



After running a load test scenario, you can view reports that summarize your system's performance. Analysis provides the following reporting tools:

- ["Summary Report" on page 460](#)
- ["SLA Reports" on page 467](#)
- ["Transaction Analysis Report" on page 468](#)
- ["HTML Report" on page 466](#)

The Summary report provides general information about the scenario run. You can access the Summary report at any time from the Session Explorer.

The SLA report provides an overview of the defined SLAs (Service Level Agreements) with succeeded or failed status.

The Transaction Analysis report provides a detailed analysis of a specific transaction over a specific time period.

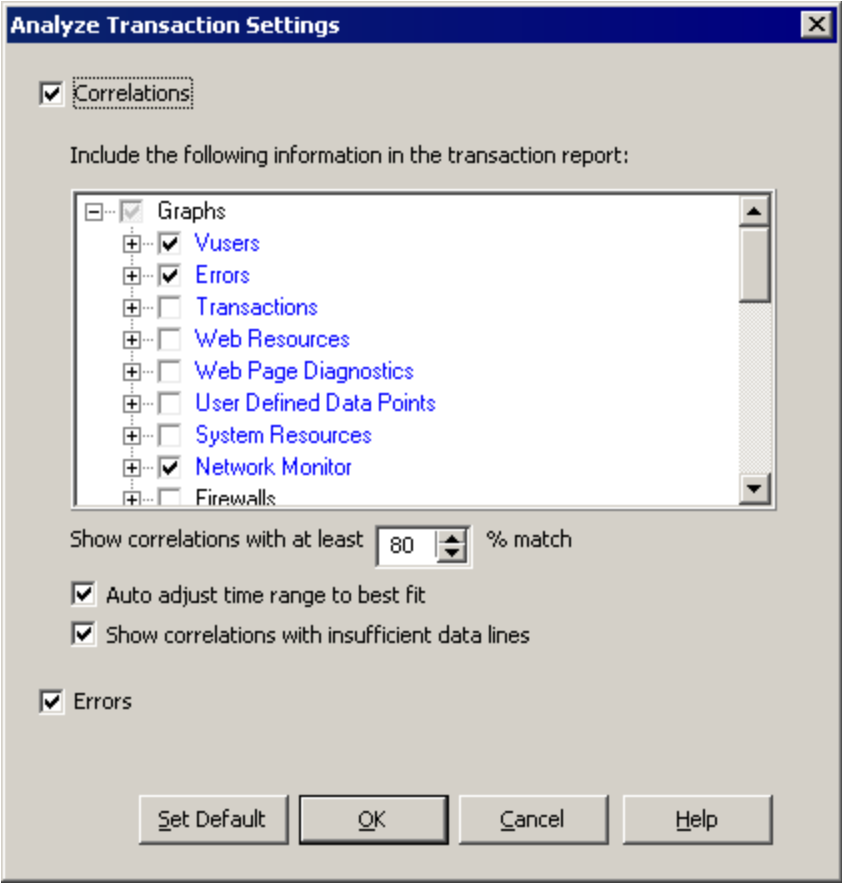
You can instruct Analysis to create an HTML report. The HTML report contains a page for each open graph, the Summary report, the SLA report, and the Transaction Analysis report.

Transaction reports provide performance information about the transactions defined within the Vuser scripts. These reports give you a statistical breakdown of your results and allow you to print and export the data.

**Note:** SLA reports and Transaction Analysis reports are not available when generating Cross Result graphs. For more information on Cross Result graphs, see "[Cross Result and Merged Graphs](#)" on page 153.

## Analyze Transaction Settings Dialog Box

This dialog box enables you to configure the Transaction Analysis Report to show correlations between the graph of the analyzed transaction and other graphs that you select.



<b>To access</b>	Use one of the following: <ul style="list-style-type: none"> <li>• <b>Reports &gt; Analyze Transaction &gt; Settings</b></li> <li>• <b>Tools &gt; Options &gt; Analyze Transaction Settings tab</b></li> </ul>
<b>See also</b>	<a href="#">"Analyze Transactions Dialog Box" on the next page</a>

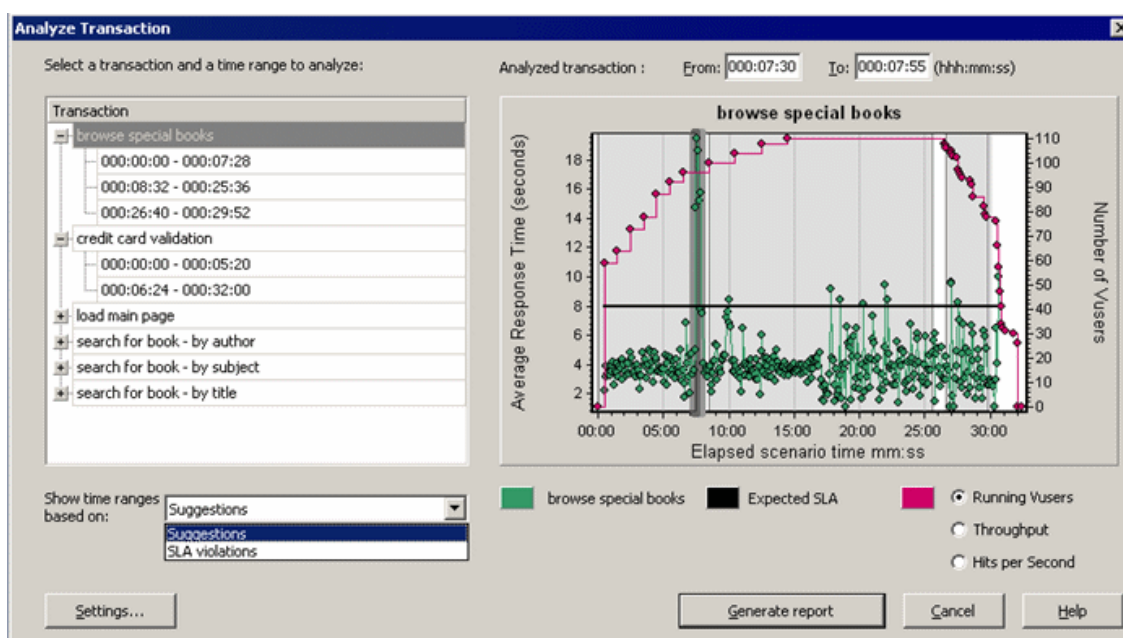
User interface elements are described below:

UI Element	Description
<b>Correlations</b>	Defines which graphs you want Analysis to match to the graph of the transaction you selected. Graphs where data is available appear in blue.


UI Element	Description
<b>Show correlations with at least x% match</b>	The positive or negative percentage correlation between the graph of the analyzed transaction and the graphs selected above. You can change the percentage by entering a value in the box. The default is 20%.
<b>Auto adjust time range to best fit</b>	Analysis adjusts the selected time range to focus on the SLA violations within and around that time period. This option only applies when the Transaction Analysis report is generated directly from the Summary report (from the <b>X Worst transactions</b> or <b>Scenario behavior over time</b> sections).
<b>Show correlations with insufficient data lines</b>	Displays correlations where one of the measurements contains less than 15 units of granularity.
<b>Errors</b>	Displays errors in the Transaction Analysis Report if selected.

## Analyze Transactions Dialog Box

You use the Analyze Transaction dialog box to define the criteria that will be used to analyze the selected transaction in the Transaction Analysis Report. You can analyze a transaction even if you have not defined an SLA.





<b>To access</b>	<b>Reports &gt; Analyze Transaction</b>  <b>Summary Report &gt; right-click menu &gt; Add New Item &gt; Analyze Transaction</b>  <b>Toolbar &gt; </b>  <b>Summary Report with no SLA &gt; Statistics Summary section &gt; Analyze Transaction tool link</b>
<b>Note</b>	Analysis data (for example, transactions) that has been excluded by the Summary Filter will not be available for analysis in the Transaction Analysis report.
<b>See also</b>	<a href="#">"Filtering and Sorting Graph Data" on page 129</a>

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Element	Description
<b>Show time ranges based on box</b>	Select one of the display options: <ul style="list-style-type: none"> <li>• <b>Suggestions.</b> Lists all transactions and time ranges from the scenario run.</li> <li>• <b>SLA Violations.</b> Lists only those transactions and time ranges where the transaction exceeded the SLA. This option does not appear if there were no transactions that exceeded the SLA.</li> </ul>
<b>Transaction</b>	Select the transaction to analyze from the Transaction tree.
<b>&lt;Time Range&gt;</b>	Select the time range to analyze in one of the following ways: <ul style="list-style-type: none"> <li>• Select the time range from the Transaction tree.</li> <li>• Enter the time range in the <b>From</b> and <b>To</b> boxes above the graph.</li> <li>• Select the time range by dragging the bars on the graph.</li> </ul>

UI Element	Description
<Display options>	<p>Select one of the following:</p> <ul style="list-style-type: none"><li>• <b>Running Vusers</b></li><li>• <b>Throughput</b></li><li>• <b>Hits per Second</b></li></ul> <p>The option you select is displayed on the graph and will appear on the snapshot of the graph that appears on the Transaction Analysis Report. Note that your choice only affects the display of the graph and not the calculation for correlations.</p>
<b>Settings</b>	<p>Click <b>Settings</b> to define the Analyze Transaction settings in the <b>Analyze Transaction Settings</b> dialog box. For more information, see <a href="#">"Analyze Transaction Settings Dialog Box" on page 446</a>.</p> <p><b>Note:</b> You can also define the Analyze Transaction settings in the <b>Analyze Transaction Settings</b> tab of the <b>Options</b> dialog box (<b>Tools &gt; Options</b>).</p>
<b>Generate report</b>	<p>The Transaction Analysis Report opens. Once the report has been created, you can access it at any time from the Session Explorer.</p>

## New Report Dialog Box

This dialog box enables you to create a report based on the report template selected. You can adjust the report template settings to generate a report that corresponds to the required report layout.

New Report

Based on template Customer facing (for cross session)

General

Format

Content

Title

Customer facing (for cross session)

Author

First Name:

Surname:

Job Title:

Organization:

Description

By using this template you can easily generate a cross session customer facing report that includes a wide range of performance statistics. This template will automatically include any open graph you have in your analysis session as well as the following information:

- General details
- Executive summary
- Business processes
- Workload characteristics
- Performance overview for high level aggregated metrics and transactions
- Worst performing URLs based on Web Page Diagnostics data

Global Settings

Report Time Range:

Whole Scenario

(hhh:mm:ss)

Granularity:

1

(sec)

Precision:

1

(Number of digits to appear after the decimal point in none graph content items)

☐ Include Think Time

☐ Use Raw Result Time Zone

Save As Template

Generate

Cancel

Help

To access	Reports > New Report
See also	<a href="#">"Report Templates Dialog Box" on the next page</a> <b>Note:</b> This dialog box and the Report Templates dialog box utilize the same components.

User interface elements are described below:

UI Element	Description
Based on Template	The template upon which to build the report. After you select a template, the corresponding settings of the report template appear.
General tab	For user interface details, see <a href="#">"Report Templates - General Tab" on page 454</a> .
Format tab	For user interface details, see <a href="#">"Report Templates - Format Tab" on page 456</a> .

UI Element	Description
Content tab	For user interface details, see <a href="#">"Report Templates - Content Tab" on page 457</a> .
Save As Template	Prompts you for a template name that will be added to the report template list.
Generate	Generates the report according to your settings.

# Analysis Report Templates

## Report Templates Overview

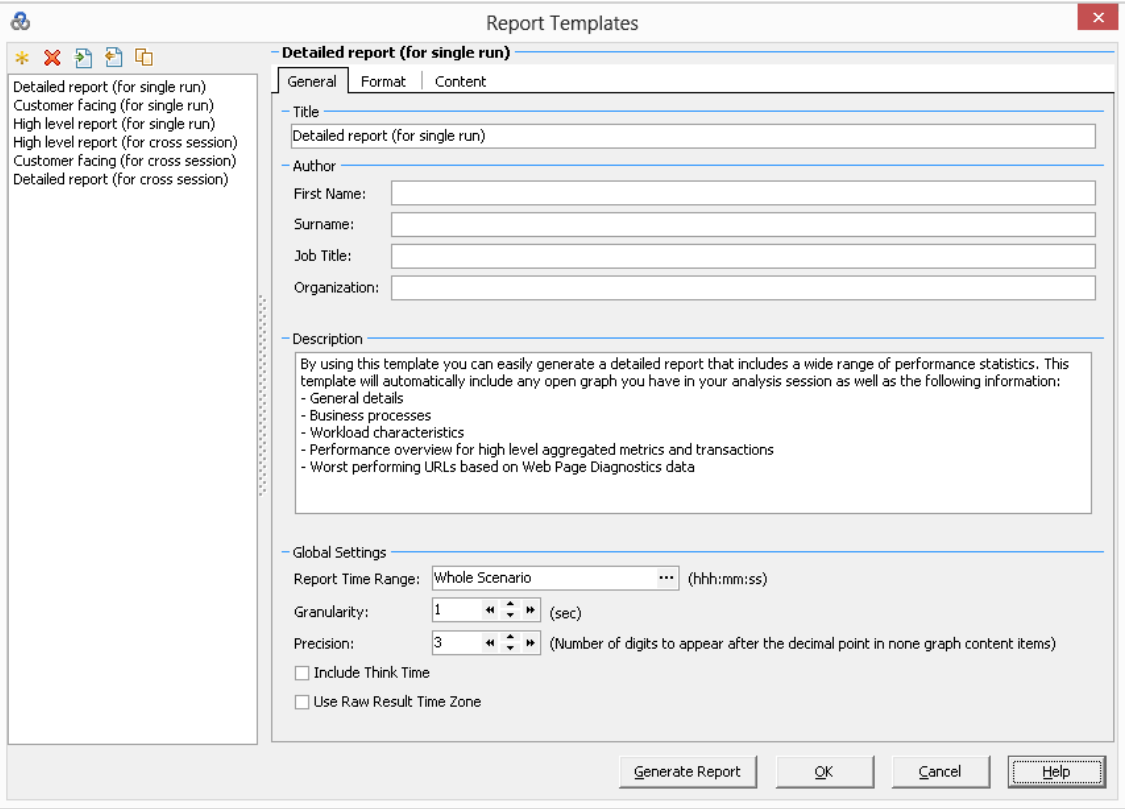
You can use Report Templates to create and customize templates which are used when generating reports. Report templates can be used across similar scenario runs and saves time and effort on recreating reports each time.

Using the Report Templates dialog box, you can record document details, define the format of the report, and select the content items to include in the report and configure each content item accordingly.

A list of report templates is displayed in the **Templates** dialog box, under **Rich Reports**. Select this option if you want to generate the report in the load run session in word, excel, HTML or PDF format. For more information on templates, see ["Apply/Edit Template Dialog Box" on page 107](#).




## Report Templates Dialog Box



This dialog box enables you to add, modify, import, export, or duplicate a report template.

The image shows a 'Report Templates' dialog box with a title bar and a close button. On the left is a list of templates: 'Detailed report (for single run)', 'Customer facing (for single run)', 'High level report (for single run)', 'High level report (for cross session)', 'Customer facing (for cross session)', and 'Detailed report (for cross session)'. The main area is titled 'Detailed report (for single run)' and has three tabs: 'General', 'Format', and 'Content'. The 'General' tab is active, showing fields for 'Title' (pre-filled with 'Detailed report (for single run)'), 'Author' (with sub-fields for First Name, Surname, Job Title, and Organization), 'Description' (with a text area containing a description of the template's capabilities), and 'Global Settings' (with fields for Report Time Range, Granularity, and Precision, and checkboxes for 'Include Think Time' and 'Use Raw Result Time Zone'). At the bottom are buttons for 'Generate Report', 'OK', 'Cancel', and 'Help'.

To access	Reports > Report Templates
See also	<ul style="list-style-type: none"><li>"Report Templates Overview" on the previous page</li><li>"New Report Dialog Box" on page 450</li></ul> <p><b>Note:</b> This dialog box and the New Report dialog box utilize the same components.</p>

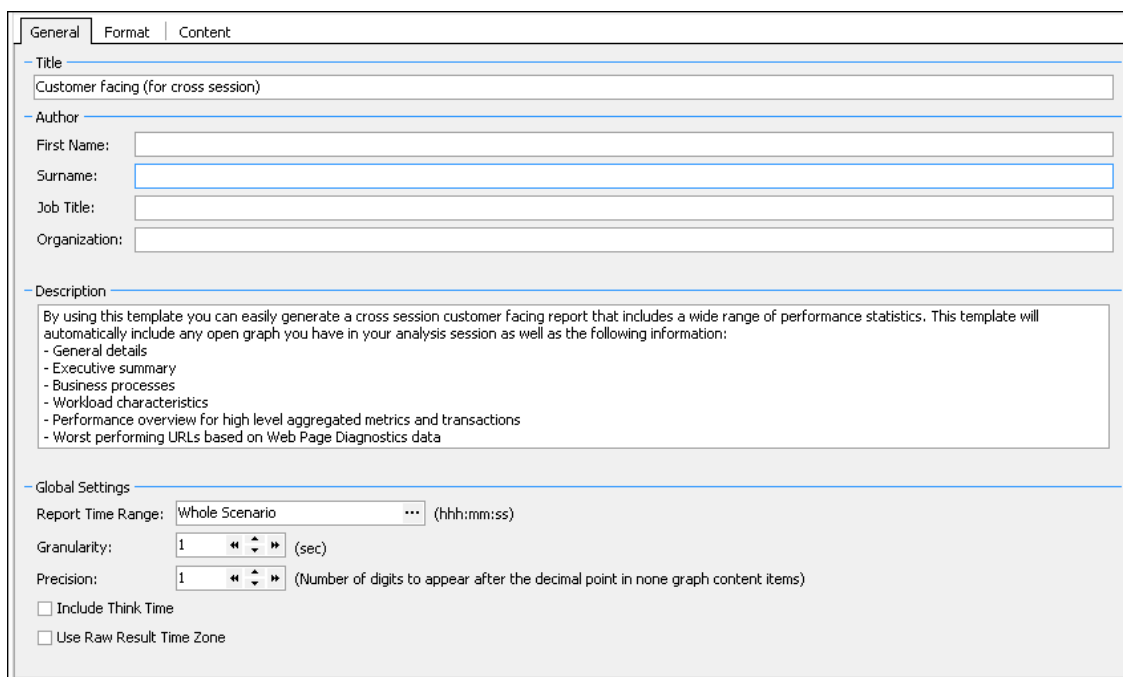
User interface elements are described below:

UI Element	Description
	<b>New.</b> Adds a new report template.
	<b>Delete.</b> Removes the selected template.
	<b>Import.</b> Imports a report template from an XML file.

UI Element	Description
	<b>Export.</b> Saves the selected template as an XML file.
	<b>Duplicate.</b> Creates a copy of the selected template.
<b>General tab</b>	For user interface details, see <a href="#">"Report Templates - General Tab" below</a> .
<b>Format tab</b>	For user interface details, see <a href="#">"Report Templates - Format Tab" on page 456</a> .
<b>Content tab</b>	For user interface details, see <a href="#">"Report Templates - Content Tab" on page 457</a> .
<b>Generate Report button</b>	Generates the report according to your settings.

## Report Templates - General Tab

This tab enables you to record document details, such as title, author name and title and set global settings, such as Report Time Range and granularity.




The screenshot shows the 'General' tab of the 'Report Templates' configuration window. It features three tabs: 'General', 'Format', and 'Content'. The 'General' tab is active and contains the following sections:

- Title:** A text field containing 'Customer facing (for cross session)'.
- Author:** Four text fields for 'First Name:', 'Surname:', 'Job Title:', and 'Organization:'.
- Description:** A text area containing a description of the template and a bulleted list of included information:
  - General details
  - Executive summary
  - Business processes
  - Workload characteristics
  - Performance overview for high level aggregated metrics and transactions
  - Worst performing URLs based on Web Page Diagnostics data
- Global Settings:**
  - Report Time Range:** A dropdown menu set to 'Whole Scenario' with a '(hhh:mm:ss)' label.
  - Granularity:** A numeric input field set to '1' with a '(sec)' label and up/down arrows.
  - Precision:** A numeric input field set to '1' with a '(Number of digits to appear after the decimal point in none graph content items)' label and up/down arrows.
  - Include Think Time:** An unchecked checkbox.
  - Use Raw Result Time Zone:** An unchecked checkbox.

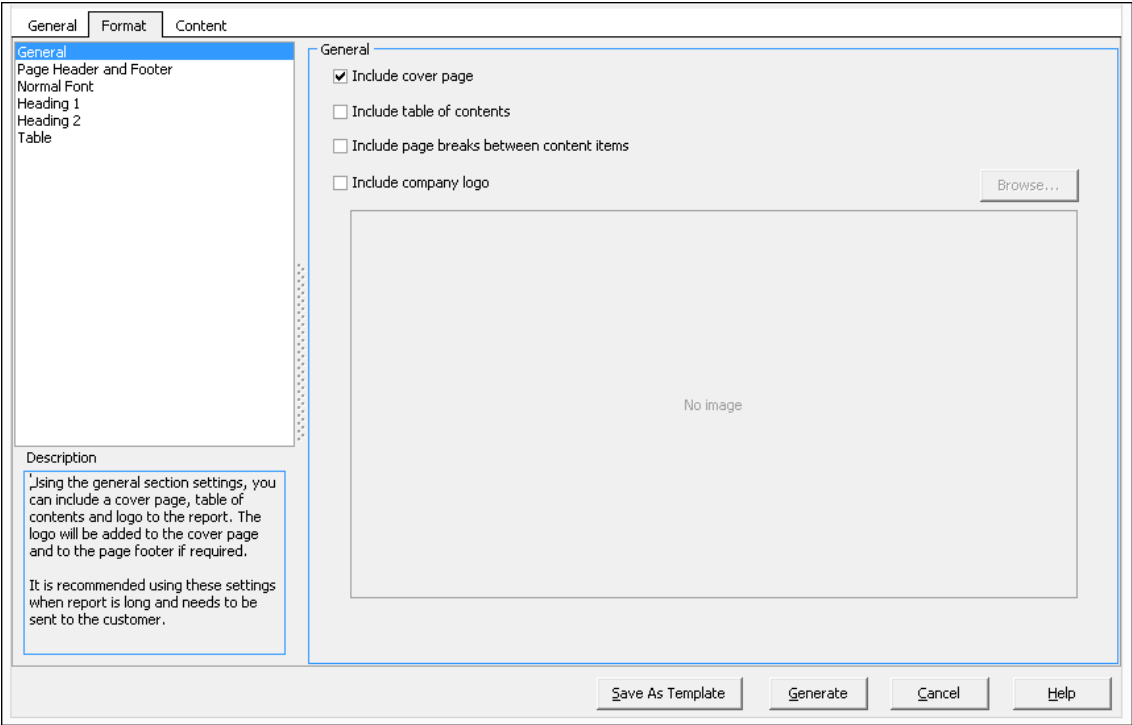
<b>To Access</b>	<b>Reports &gt; New Report... &gt; General tab</b>  or  <b>Reports &gt; Report Templates... &gt; General tab</b>
<b>See also</b>	<ul style="list-style-type: none"> <li>• <a href="#">"Report Templates Overview" on page 452</a></li> <li>• <a href="#">"New Report Dialog Box" on page 450</a></li> <li>• <a href="#">"Report Templates Dialog Box" on page 452</a></li> </ul>

User interface elements are described below:

UI Element	Description
<b>Title</b>	A description of the template.
<b>First Name</b>	The first name of the person to display on the report.
<b>Surname</b>	The last name of the person to display on the report.
<b>Job title</b>	The job title of the person to display on the report.
<b>Organization</b>	The name of the organization to display on the report.
<b>Description</b>	You can enter a description and include details of the report template.
<b>Report Time Range</b>	The default setting is Whole Scenario. Click  to set the start and end time range of the scenario run time to display on the report.
<b>Granularity</b>	Define granularity settings (in seconds).
<b>Precision</b>	The number of digits to appear after the decimal point in none graph content items.
<b>Include Think Time</b>	Include think time when processing the Analysis data. This data is then used when generating reports.
<b>Use Raw Result Time Zone</b>	When creating the report, use the time zone that was generated in the raw data results.

# Report Templates - Format Tab

This tab enables you to define the format of report template.



<b>To access</b>	<b>Reports &gt; New Report... &gt; Format tab</b>  or <b>Reports &gt; Report Templates... &gt; Format tab</b>
<b>See also</b>	<ul style="list-style-type: none"><li>• <a href="#">"Report Templates Overview" on page 452</a></li><li>• <a href="#">"New Report Dialog Box" on page 450</a></li><li>• <a href="#">"Report Templates Dialog Box" on page 452</a></li></ul>

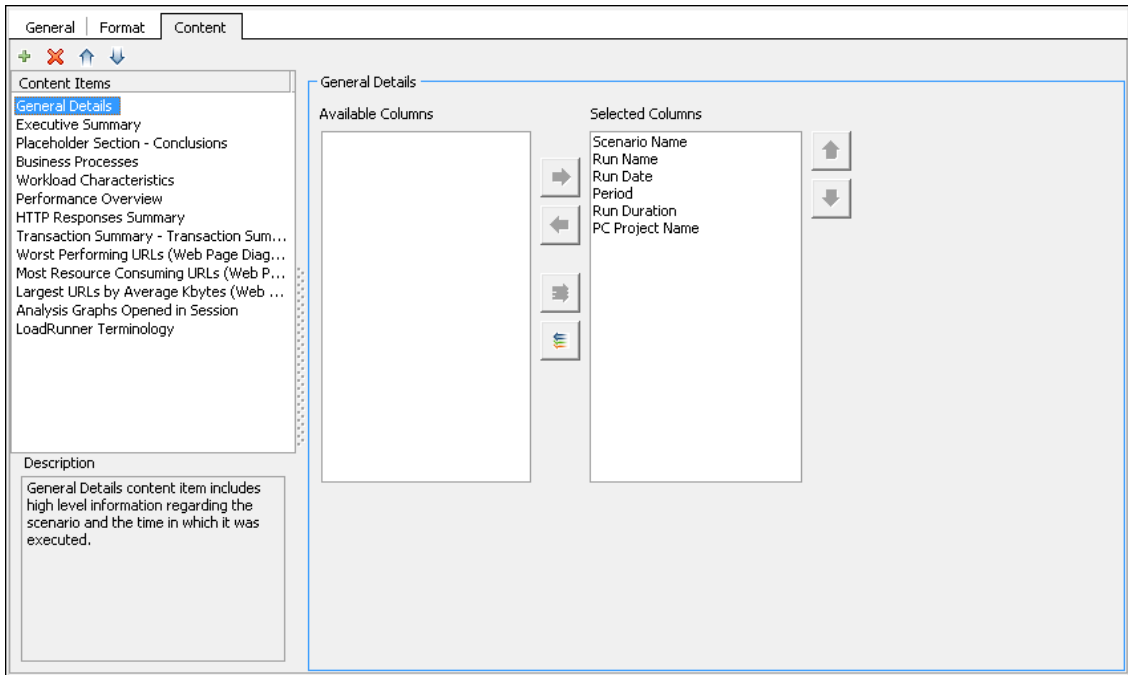
User interface elements are described below:



UI Element	Description
<b>General</b>	General options such as: <ul style="list-style-type: none"><li>• include a cover page</li><li>• include table of contents</li><li>• include company logo</li></ul>
<b>Page Header and Footer</b>	Header and footer options: <ul style="list-style-type: none"><li>• Font type, size and color</li><li>• Bold, italicize, or underline</li><li>• Right, center or left align</li><li>• You can add tags, such as date, name or organization.</li><li>• You can include required details such as page count, date, name, and so forth on the left, center or right column.</li></ul>
<b>Normal Font</b>	The type of font to use in the report template.
<b>Heading 1/2</b>	The style for your headings.
<b>Table</b>	Table format options: <ul style="list-style-type: none"><li>• Font type, size and color</li><li>• Background color</li><li>• Bold, italicize, or underline</li><li>• Right, center or left align</li></ul>

## Report Templates - Content Tab

This tab enables you to select the content items to include in the report and configure each item accordingly.



<b>To access</b>	<b>Reports &gt; New Report... &gt; Content tab</b> or <b>Reports &gt; Report Templates... &gt; Content tab</b>
<b>See also</b>	<ul style="list-style-type: none"> <li>• <a href="#">"Report Templates Overview" on page 452</a></li> <li>• <a href="#">"New Report Dialog Box" on page 450</a></li> <li>• <a href="#">"Report Templates Dialog Box" on page 452</a></li> </ul>

User interface elements are described below:

UI Element	Description
	<b>Add Content.</b> Opens the <b>Add Content Items</b> pane. Select one or more items from the grid and click <b>OK</b> .
	<b>Delete Content.</b> Removes the selected items from the Content Items pane.
	<b>Reorder.</b> Reorders the content items, determining how they will be shown in the report.

UI Element	Description
<b>Contents Item pane</b>	<p>A list of the content items to be included in the report.</p> <ul style="list-style-type: none"><li>• To add more items, click the Add Content button.</li><li>• To learn about a content item, select it and view the information in the Description pane beneath it.</li></ul>
<b>&lt;Configuration pane&gt;</b>	<p>Settings for the selected content item. The components and tabs in this pane vary, based on the selected content item.</p> <ul style="list-style-type: none"><li>• <b>Parameters tab.</b> Settings such as integer values for percentiles or number of elements.</li><li>• <b>Columns tab.</b> Allows you to select the columns to include in the report. To include a column, make sure it appears in the <b>Selected Columns</b> pane.</li><li>• <b>Filter tab.</b> Allows you to enter criteria for including a specific range of a measurement.</li><li>• <b>Text area.</b> A rich text box for enter free text, such as in a Placeholder Section or an Executive Summary.</li></ul>
<b>Generate Report</b>	<p>Generates the report according to your settings.</p>

## Analysis Report Types

### Summary Report Overview

The Summary report provides general information about load test scenario execution. This report is always available from the Session Explorer or as a tab in the Analysis window.

The Summary report lists statistics about the scenario run and provides links to the following graphs: Running Vusers, Throughput, Hits Per Second, HTTP Responses per Second, Transaction Summary, and Average Transaction Response Time.

The appearance of the Summary report and the information displayed, will vary depending on whether an SLA (Service Level Agreement) was defined.


An SLA defines goals for the scenario. LoadRunner measures these goals during the scenario run, and analyzes them in the Summary report. For more information on defining an SLA, see ["SLA Reports" on page 467](#)

A Summary report is also provided for Cross Result graphs. For more information about Cross Result graphs, see ["Cross Result Graphs Overview" on page 153](#).

**Note:** You can save the Summary reports to an Excel file by selecting **View > Export Summary to Excel** or by clicking the **Export Summary to Excel** button on the toolbar.


## Summary Report

The Summary report provides general information about load test scenario execution. It lists statistics about the scenario run and provides links to the following graphs: Running Vusers, Throughput, Hits Per Second, HTTP Responses per Second, Transaction Summary, and Average Transaction Response Time.

<b>To access</b>	<b>Session Explorer &gt; Reports &gt; Summary Report</b>
<b>Important information</b>	The Summary report for SAP Diagnostics, J2EE /.NET Diagnostics, and Siebel Diagnostics provides a usage chart that links to and displays each individual transaction's Web, application, and database layers, and provides the total usage time for each transaction.
<b>Relevant tasks</b>	You can save the Summary reports to an Excel file by selecting <b>View &gt; Export Summary to Excel</b> or by clicking  on the toolbar.
<b>See also</b>	<p>The Summary reports for the various diagnostics environments are discussed in detail in the following sections:</p> <p><a href="#">"SAP Diagnostics Summary Report" on page 441</a></p> <p><a href="#">J2EE &amp; .NET Diagnostics Graphs Summary Report</a></p> <p><a href="#">"Siebel Diagnostics Graphs Summary Report" on page 403</a></p>

## Summary Report with No SLA

User interface elements are described below:

UI Element	Description
<b>Scenario Details</b>	Shows the basic details of the load test scenario being analyzed.
<b>Statistics Summary</b>	<p>This section shows a breakdown of the transaction statistics and also provides links to the following:</p> <ul style="list-style-type: none"> <li>• The SLA configuration wizard. For more information on defining an SLA, see <a href="#">"SLA Reports" on page 467</a></li> <li>• The Analyze Transaction tool. For more information on analyzing transactions, see <a href="#">"Analyze Transactions Dialog Box" on page 448</a></li> </ul>
<b>Transaction Summary</b>	<p>This section displays a table containing the load test scenario's diagnostics data. Included in this data is a percentile column (x Percent). This column indicates the maximum response time for that percentage of transactions performed during the run.</p> <p><b>Note:</b> You can change the value in the percentile column in one of the following ways:</p> <ul style="list-style-type: none"> <li>• Open the Options dialog box (<b>Tools &gt; Options</b>). Click the <b>General</b> tab and in the Summary Report section enter the desired percentile in the Transaction Percentile box.</li> <li>• Select <b>View &gt; Summary Filter</b> or click  on the toolbar. The Analysis Summary Filter dialog box opens. In the Additional Settings area enter desired percentile.</li> </ul>
<b>HTTP Responses Summary</b>	<p>This section shows the number of HTTP status codes returned from the Web server during the load test scenario, grouped by status code.</p> <p><b>Note:</b> There are additional Diagnostics sections that may appear at the end of the Summary report, depending on the configuration of your system.</p>

## Summary Report with SLA

User interface elements are described below:

UI Element	Description
<b>Scenario details</b>	This section shows the basic details of the load test scenario being analyzed.
<b>Statistics Summary</b>	This section shows a breakdown of the transaction statistics.

UI Element	Description
<b>X Worst Transactions</b>	<p>The X Worst Transactions table shows the worst transactions in terms of how often the transactions exceeded the SLA boundary during the run, and by how much. Click <a href="#">here</a> to see an example of the 5 Worst transactions section of the summary report.</p> <p><b>Note:</b> You choose how many transactions are displayed in this table in the Summary Report section on the General tab of the options dialog box. Open the dialog box (<b>Tools &gt; Options</b>) and enter the number of transactions to display. The default is <b>5</b>.</p> <p>You expand a transaction to get more information. When expanded, the following information appears for each transaction:</p> <p><b>Failure Ratio</b></p> <ul style="list-style-type: none"> <li>■ The percentage of time intervals where the transaction exceeded the SLA. You can see this graphically in the Scenario Behavior Over Time section below.</li> </ul> <p><b>Failure Value</b></p> <ul style="list-style-type: none"> <li>■ The average percentage by which the transaction exceeded the SLA over the whole run.</li> </ul> <p><b>Avg exceeding ratio</b></p> <ul style="list-style-type: none"> <li>■ The average percentage by which the transaction exceeded the SLA over a specific time interval. For example, in the first time interval in the screenshot above, the figure is 4.25%. This means that during that time interval, the transaction may have exceeded the SLA boundary several times, each time by a different percentage margin, the average percentage being 4.25%.</li> </ul> <p><b>Max exceeding ratio</b></p> <ul style="list-style-type: none"> <li>■ The highest percentage by which the transaction exceeded the SLA over a specific time interval. For example, using the</li> </ul>

UI Element	Description
	<p>same time interval as above, the transaction may have exceeded the SLA several times, each time by a different percentage margin. The highest percentage being 7.39%</p> <p>Analysis allows you to analyze a specific transaction in more detail. You open the Analyze Transaction tool from this section by clicking the <b>Analyze Transaction</b> button. For more information on Transaction Analysis Reports, see <a href="#">"Analyze Transactions Dialog Box" on page 448</a>.</p>
<b>Scenario Behavior Over Time</b>	<p>This section shows how each transaction performed in terms of the SLA over time intervals. The green squares show time intervals where the transaction performed within the SLA boundary. Red squares show time intervals where the transaction failed and gray squares show where no relevant SLA was defined.</p> <p><b>Note:</b> The time intervals displayed in the <b>Scenario Behavior Over Time</b> section may vary for each interval. The time interval set in the tracking period of the SLA is only the minimum time interval that will be displayed.</p> <p>It is only the display that varies. The SLA is still determined over the time interval you choose in the <b>Advanced Settings</b> section.</p> <p>Analysis allows you to analyze a specific transaction in more detail. You open the Analyze Transaction tool from the <b>Scenario Behavior Over Time</b> section in one of the following ways:</p> <ul style="list-style-type: none"> <li>• Select the transaction to analyze from the list and enter the time interval in the <b>From</b> and <b>To</b> boxes. Then click <b>Analyze Transaction</b>.</li> <li>• Drag the mouse over the desired transaction and time range to analyze. Then click <b>Analyze Transaction</b>.</li> </ul> <p>For more information on Transaction Analysis Reports, see <a href="#">"Analyze Transactions Dialog Box" on page 448</a>.</p>



UI Element	Description
<b>Transaction Summary</b>	<p>This section displays a table containing the load test scenario's diagnostics data. Included in this data is a percentile column (x Percent). This column indicates the maximum response time for that percentage of transactions performed during the run. For example, in the table below, the value in the 88 Percent column for <b>browse special books</b> is 8.072. This means that the response time for 88% of the <b>browse special books</b> transactions was less than 8.072 seconds. Click <a href="#">here</a> to see an example of a Transaction Summary.</p> <p><b>Note:</b> You can change the value in the percentile column in the Summary Report section of the General tab of the Options dialog box. Open the dialog box (<b>Tools &gt; Options</b>) and enter the desired percentage.</p> <p>Alternatively, you can also change the value in the Summary Filter (<b>View &gt; Summary Filter</b>) .</p>
<b>HTTP Responses Summary</b>	<p>This section shows the number of HTTP status codes returned from the Web server during the load test scenario, grouped by status code.</p> <p><b>Note:</b> There are additional Diagnostics sections that may appear at the end of the Summary report, depending on the configuration of your system.</p>

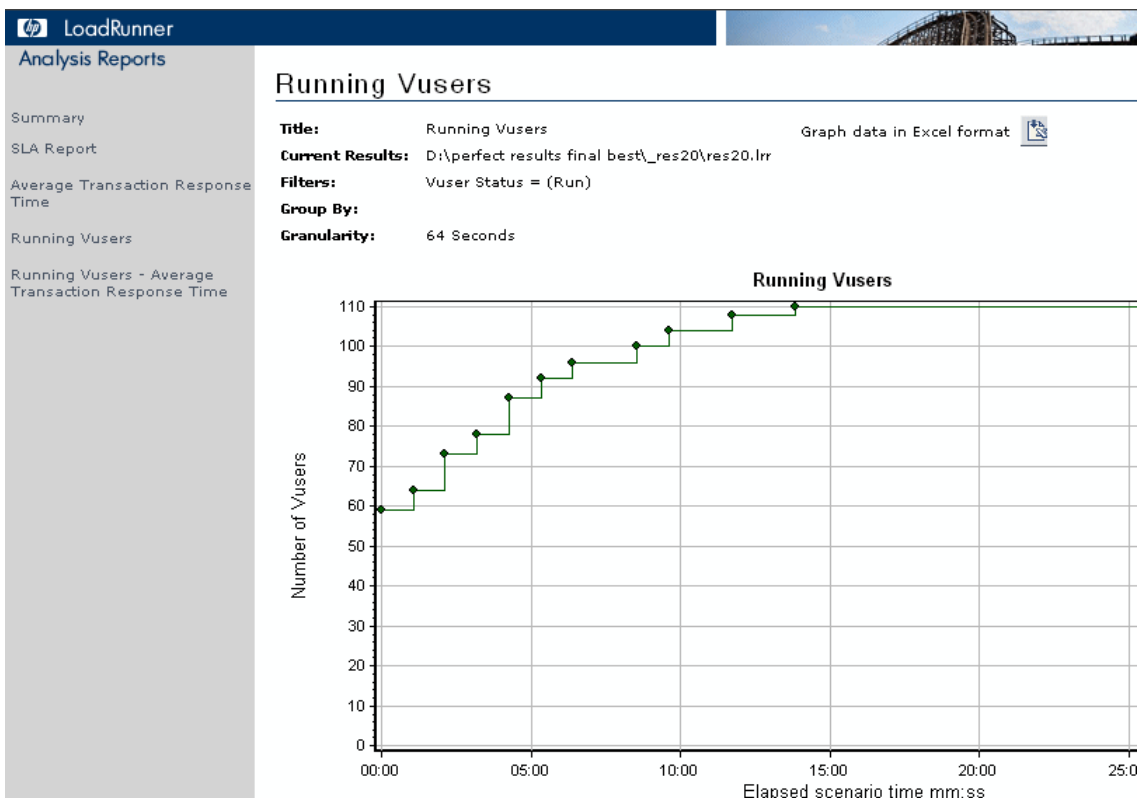
## Summary reports for Cross Result Graphs


User interface elements are described below:

UI Element	Description
<graphs>	<p>Displays summary information for the scenarios that you are comparing. The information is displayed in a way that enables you to compare data from the different scenarios. Includes the same type of information as the regular Summary report except for the following:</p> <ul style="list-style-type: none"> <li>• SLA information</li> <li>• Diagnostics information</li> <li>• Scenario behavior over time</li> </ul>


## HTML Report

Analysis enables you to create HTML reports for your load test scenario run. It creates a separate page for each one of the open graphs and reports.



<b>To access</b>	<p>Use one of the following:</p> <ul style="list-style-type: none"> <li>• <b>Reports &gt; HTML Report</b></li> <li>• <b>Toolbar</b> &gt; </li> </ul>
<b>Relevant tasks</b>	<ul style="list-style-type: none"> <li>• Open all graphs that you want to include in the report.</li> <li>• Specify a path and file name for the HTML report and click <b>Save</b>. Analysis saves a Summary report which has the same name as the file in the selected folder. The rest of the graphs are saved in a folder with the same name as the Summary report's file name. When you create an HTML report, Analysis opens your default browser and displays the Summary report.</li> <li>• To copy the HTML reports to another location, be sure to copy the filename and the folder with the same name. For example, if you named your HTML report test1, copy test1.html and the folder test1 to the desired location</li> </ul>


User interface elements are described below:

UI Element	Description
<b>&lt;Graphs&gt; menu left frame</b>	Click the graph link to view an HTML report for that graph.
	You can view an Excel file containing the graph data, by clicking the <b>Graph data in Excel format</b> button on the relevant graph page.

## SLA Reports

An SLA (Service Level Agreement) defines goals for the load test scenario. LoadRunner measures these goals during the scenario run and analyzes them in the Summary report. The SLA Report shows the succeeded or failed status of all SLAs that were defined for the scenario run.

**Note:** Analysis data (for example, transactions) that has been excluded by the Summary Filter will not be available for analysis in the SLA report.

<b>To access</b>	<p>You create the SLA Report in one of the following ways:</p> <p><b>Reports &gt; Analyze SLA</b></p> <p><b>Right-click the Summary pane &gt; Add New Item &gt; Analyze SLA</b></p> <p><b>Summary Report &gt; </b></p>
<b>Relevant tasks</b>	<a href="#">"Defining Service Level Agreements " on page 63</a>

User interface elements are described below:



UI Element	Description
<b>Display of SLA statuses</b>	<p><a href="#">SLA Status per goal definition</a></p> <ul style="list-style-type: none"><li>■ Where the SLA was defined over the whole run, the report displays a single SLA status for each goal definition.</li></ul> <p><a href="#">SLA status for each transaction per time interval</a></p> <ul style="list-style-type: none"><li>■ Where the SLA was defined per time interval within the run, the report displays the status of the SLA for each transaction per time interval. The green squares show time intervals where the transaction performed within the SLA boundary. Red squares where the transaction failed and gray squares show where no relevant SLA was defined.</li></ul> <p><a href="#">SLA goal definitions</a></p> <ul style="list-style-type: none"><li>■ Where the SLA was defined per time interval within the run, a further section appears detailing the goal definitions for the SLA.</li></ul>

## Transaction Analysis Report

This report enables you to individually examine each of the transactions from the load test scenario run.

<b>To access</b>	<b>Reports &gt; Analyze Transaction &gt; Generate Report button</b>
------------------	---

User interface elements are described below:

UI Element	Description
<b>Observations</b>	<p>This section shows both positive and negative correlations between the graph of the transaction being analyzed, and other graphs based on the settings you chose in the Analyze Transaction Dialog Box. When two graphs are correlated, it means that their behavior matches each other by a certain percentage.</p> <p> To view the correlating graph, select one of the results and then click the View Graph icon at the bottom of the section. The graph comparison opens.</p> <p> You can return to the Transaction Analysis Report from the graph comparison at anytime by clicking the Back to &lt;transaction name&gt; icon on the toolbar.</p> <p><b>Note:</b> The correlations are automatically calculated according to a default ratio of 20%. You can adjust this ratio by clicking the arrows next to the percentage. Then click <b>Recalculate</b>.</p>
<b>Errors</b>	<p>This section is divided into two sub-sections.</p> <ul style="list-style-type: none"> <li>• <b>Application Under Test errors.</b> Shows errors that occurred during the transaction that were direct results of Vuser activity.</li> <li>• <b>All errors.</b> Shows Application Under Test errors as well as errors that were not related to Vuser activity, and which affected your system and not the application under test.</li> </ul>
<b>Observation Settings</b>	<p>This section displays a summary of the settings that were selected in the Advanced Settings section of the Analyze Transaction dialog box.</p>
<b>Graph</b>	<p>The Graph section displays a snapshot of selected transaction and time range for analysis merged with the display option you selected (Running Vusers, Throughput, or Hits per Second). Note that it is only a snapshot and can not be manipulated like normal graphs.</p>

# Importing External Data

## Import Data Tool Overview

The LoadRunner Analysis Import Data tool enables you to import and integrate non-HP data into a LoadRunner Analysis session. After the import procedure, you can view the data files as graphs within the session, using all the capabilities of the Analysis tool.

Suppose an NT Performance Monitor runs on a server and measures its behavior. Following a LoadRunner scenario on the server, you can retrieve the results of the Performance Monitor, and integrate the data into LoadRunner's results. This enables you to correlate trends and relationships between the two sets of data: LoadRunner's and the Performance Monitor's.

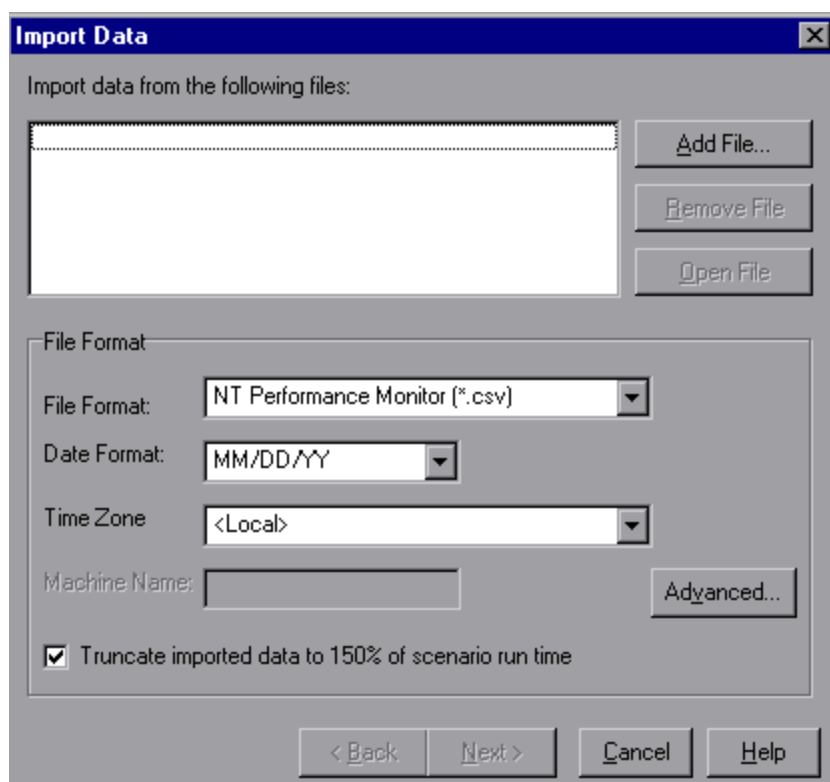
In this case, the results of the NT Performance Monitor are saved as a .csv file. You launch the Import Data tool, direct it to the .csv file, and specify its format. LoadRunner reads the file and integrates the results into its own Analysis session.

For a list of data formats that are supported, see ["Supported File Types" on page 472](#). To define your own custom data files, see ["How to Define Custom File Formats" on page 472](#).

## How to Use the Import Data Tool

This task describes how to import data files to integrate into your analysis session.

1. Choose **Tools > External Monitors > Import Data**. The Import Data dialog box opens.



2. Select the format of the external data file from the **File format** list box.
3. Click **Add File**. In the **Select File to Import** dialog box that opens, the **Files of type** list box shows the type chosen in step 2.
4. Set other file format options, as described in ["Import Data Dialog Box" on page 478](#). You must enter a machine name.
5. To specify character separators and symbols, click **Advanced**. For more information, see ["Advanced Settings Dialog Box \(Import Data Dialog Box\)" on page 475](#).
6. Click **Next**. The **Import Data** dialog box opens.
7. Select the type of monitor that generated the external data file. If your monitor type does not exist, you can add it, as described in [How to Customize Monitor Types for Import](#).

When opening a new graph, you will see your monitor added to the list of available graphs under this particular category. (See ["Open a New Graph Dialog Box" on page 31](#).)

8. Click **Finish**. LoadRunner Analysis imports the data file or files, and refreshes all graphs currently displayed in the session.

**Note:** When importing data into a scenario with two or more cross results, the imported data will be integrated into the last set of results listed in the **File > Cross with Result** dialog box. For more information, see ["How to Generate Merged Graphs" on page 157](#).

## How to Define Custom File Formats

This task describes how to define a custom format, if the file format of your import file is not supported.

If the file format of your import file is not supported, you can define a custom format.

1. Choose **Tools > External Monitors > Import Data**. The Import Data dialog box opens.
2. From the **File Format** list, select **<Custom File Format>**. The Enter New Format Name dialog box opens.
3. Enter a name for the new format (in this case, `my_monitor_format`).
4. Click **OK**. The Define External Format dialog box opens.
5. Specify the mandatory and optional data, as described in ["Define External Format Dialog Box" on page 476](#).
6. Click **Save**.

## Supported File Types

The following file types are supported:

### NT Performance Monitor (.csv)

Default file type of NT Performance monitor, in comma separated value (CSV) format.



For example:

```
Reported on \\WINTER
Date: 10/23/01
Time: 10:08:39 AM
Data: Current Activity
Interval: 1.000 seconds

,,% Privileged Time,% Processor Time,% User Time,
,,0,0,0,
,,,,,
,,Processor,Processor,Processor,
Date,Time,\\WINTER,\\WINTER,\\WINTER,
10/23/01,10:07:00 AM , 0.998, 1.174, 0.000,
10/23/01,10:07:01 AM , 0.000, 0.275, 0.000,
```

## Windows 2000 Performance Monitor (.csv)

Default file type of Windows 2000 Performance monitor, but incompatible with NT Performance monitor. In comma separated value (CSV) format.

For example:

```
"(PDH-CSV 4.0)","\\MACRON\Processor(_Total)\% Processor Time","\\MACRON\Processor(_Total)\% User Time",
"\\MACRON\Processor(_Total)\Interrupts/sec","\\MACRON\System\File Control Bytes/sec"
"10/29/2001
13:09:33.746", "99.999148401465547", "0.0021716772078191897", "997.21487008127474", "488.53479318892"
"10/29/2001
13:09:48.747", "18.157543391188248", "8.4112149532710276", "1116.5859176246415", "9843.2933303122791"
"10/29/2001
13:10:03.749", "5.941255006675572", "1.5353805073431241", "1100.9651204860379", "623.18277489319848"
```

## Standard Comma Separated File (.csv)

This file type has the following format:

Date,Time,Measurement\_1,Measurement\_2, ...

where fields are comma separated and first row contains column titles.

The following example from a standard CSV file shows 3 measurements: an interrupt rate, a file IO rate and a CPU usage. The first row shows an interrupt rate of 1122.19 and an IO rate of 4.18:

```
date, time, interrupt rate, File IO rate, CPU bust percent
25/05/01,10:09:01,1122.19,4.18,1.59
25/05/01,10:10:01,1123.7,6.43,1.42
```

## Master-Detail Comma Separated File (.csv)

This file type is identical to Standard Comma Separated Files except for an additional **Master** column which specifies that row's particular breakdown of a

more general measurement. For example, a Standard CSV file may contain data points of a machine's total CPU usage at a given moment:

Date,Time,CPU\_Usage

However, if the total CPU usage can be further broken up into CPU time per-process, then a Master-Detail CSV file can be created with an extra column **ProcessName**, containing the name of a process.

Each row contains the measurement of a specific process's CPU usage only. The format will be the following:

Date,Time,ProcessName,CPU\_Usage

as in the following example:

```
date, time, process name, CPU used, elapsed time used
25/05/01, 10:06:01, edaSend, 0.1, 47981.36
25/05/01, 10:06:01, PDS, 0, 47981.17
```

## Microsoft Excel File (.xls)

Created by the Microsoft Excel application. The first row contains column titles.

	A	B	C	D	E
1	date	time	interrupt rate	File IO rate	CPU bust percent
2	25/05/01	10:09:01	1122.19	4.18	1.59
3	25/05/01	10:10:01	1123.7	6.43	1.42
4	25/05/01	10:11:01	1103.62	5.33	1.17
5	25/05/01	10:12:01	1118.89	12.18	2.37
6	25/05/01	10:13:01	1116.89	19.85	3.87
7	25/05/01	10:14:01	1128.12	19.9	4.15
8	25/05/01	10:15:01	1151.98	20.82	4.25
9	25/05/01	10:16:01	1110.1	4.83	1.34

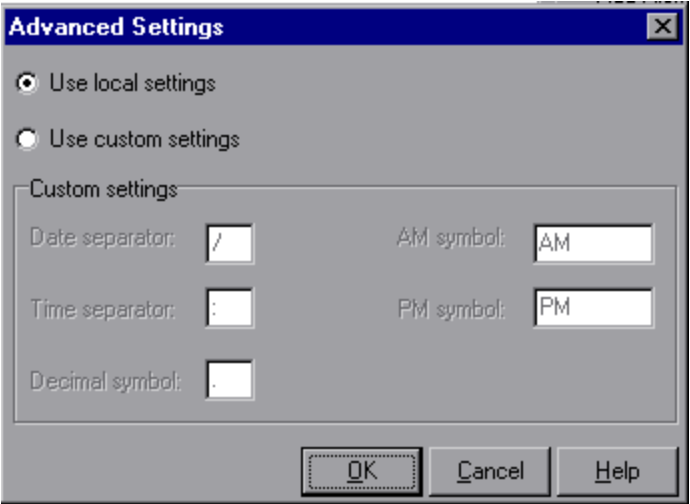
## Master-Detail Microsoft Excel file (.xls)

Created by Microsoft's Excel application. The first row contains column titles. It contains an extra **Master** column.

	A	B	C	D	E
1	date	time	process name	CPU used	elapsed time used
2	25/05/01	10:06:01	edaSend	0.1	47981.36
3	25/05/01	10:06:01	PDS	0	47981.17
4					

# Advanced Settings Dialog Box (Import Data Dialog Box)

This dialog box enables you to define the data format of the imported file to settings other than of the regional configuration.



To access	Tools > External Monitors > Import Data > Advanced
-----------	--

User interface elements are described below:

UI Element	Description
Use local settings	Keep default settings of the regional configuration. Disables the Custom Settings area of the dialog box.

UI Element	Description
<b>Use custom settings</b>	<p>Define your own settings. Enables the <b>Custom Settings</b> area of the dialog box.</p> <ul style="list-style-type: none"><li>• <b>Date Separator.</b> Enter a custom symbol, for example, the slash ( '/') character in 11/10/02</li><li>• <b>Time Separator.</b> Enter a custom symbol, for example, the colon ':' character in 9:54:19</li><li>• <b>Decimal symbol.</b> Enter a custom symbol, for example, the '.' character in the number 2.5</li><li>• <b>AM symbol.</b> Enter a custom symbol for the hours between midnight and noon.</li><li>• <b>PM symbol.</b> Enter a custom symbol for the hours between noon and midnight.</li></ul>

## Define External Format Dialog Box

This dialog box enables you to define a new file format for external data files not supported by Analysis.

The Define External Format dialog box is divided into mandatory and optional information.

<b>To access</b>	<b>Tools &gt; External Monitors &gt; Import data &gt; File Format &gt; &lt;Custom File Format&gt;</b>
<b>Relevant tasks</b>	<a href="#">"How to Define Custom File Formats" on page 472</a>

### Mandatory tab

User interface elements are described below:

UI Element	Description
<b>Date Column Number</b>	Enter the column that contains the date. If there is a master column (see <a href="#">"Supported File Types" on page 472</a> ), specify its number.
<b>Time Column Number</b>	Enter the column that contains the time.
<b>Use Master Column</b>	Select this if the data file contains a master column. A master column specifies the row's particular breakdown of a more general measurement.
<b>File Extension</b>	Enter the file suffix.
<b>Field Separator</b>	Enter the character that separates a field in a row from its neighbor. To select a field separator character, click <b>Browse</b> and select a character from the define Field Separator dialog box.

## Optional tab

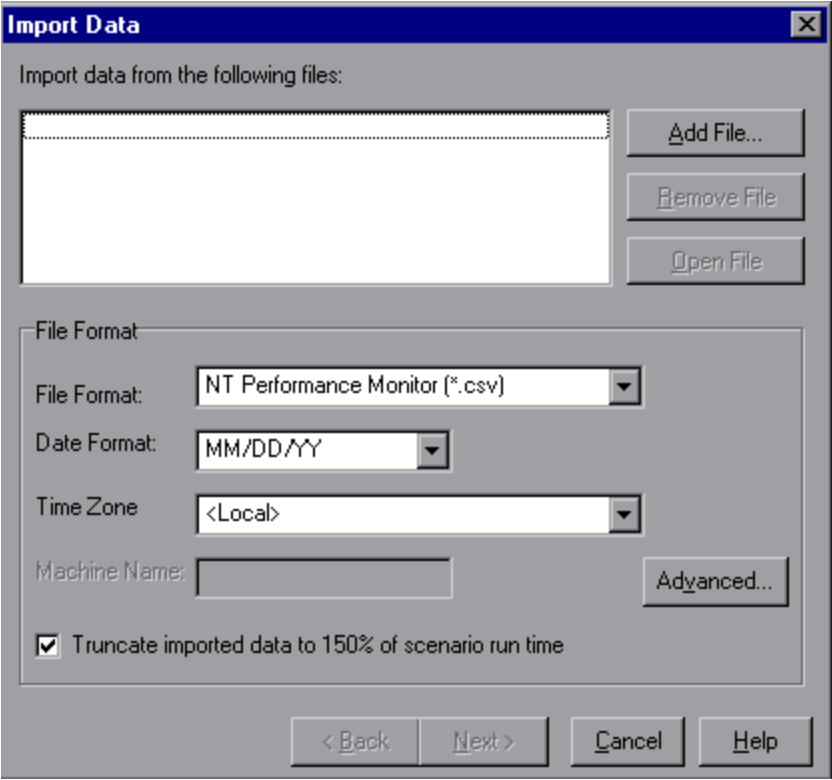
User interface elements are described below:

UI Element	Description
<b>Date Format</b>	Specify the format of the date in the imported data file. For example, for European dates with a 4 digit year, choose <b>DD/MM/YYYY</b> .
<b>Time Zone</b>	Select the time zone where the external data file was recorded. LoadRunner Analysis aligns the times in the file with local time zone settings to match LoadRunner results. (LoadRunner does not alter the file itself).
<b>Machine Name</b>	Specify the machine name the monitor runs on. This associates the machine name with the measurement.

UI Element	Description
<b>Exclude Columns</b>	Indicate which columns are to be excluded from the data import, such as columns containing descriptive comments. When there is more than one column to be excluded, specify the columns in a comma-separated list. For example, 1,3,8.
<b>Convert file from UNIX to DOS format</b>	Monitors often run on UNIX machines. Check this option to convert data files to Windows format. A carriage return (Ascii character 13) is appended to all line feed characters (Ascii character 10) in the UNIX file.
<b>Skip the first <input type="text"/> lines</b>	Specify the number of lines at the start of the file to ignore before reading in data. Typically, the first few lines in a file contain headings and sub-headings.

## Import Data Dialog Box

This dialog box enables you to import and integrate non-HP data files into Analysis session.



To access	Tools > External Monitors > Import Data
-----------	---

User interface elements are described below (unlabeled elements are shown in angle brackets>):

UI Element	Description
Import data from the following files	Displays the files that you selected for import.
Add file	Select an external data file to import. A dialog box opens to enable you to select files.
Remove file	Delete an external data file from the list.
Open File	Open an external data file using the associated application.

UI Element	Description
<b>File Format</b>	<p>Set the file format options.</p> <ul style="list-style-type: none"> <li>• <b>File Format.</b> Choose the format of the external data file. For an explanation of available formats, see <a href="#">"Supported File Types" on page 472</a>.</li> <li>• <b>Date Format.</b> Specify the format of the date in the imported data file. For example, for European dates with a 4 digit year, choose <b>DD/MM/YYYY</b>.</li> </ul>
<b>Time Zone</b>	<p>Select the time zone where the external data file was recorded. LoadRunner Analysis compensates for the various international time zones and aligns the times in the file with local time zone settings in order to match LoadRunner results. If the times in the imported file are erroneous by a constant offset, you can synchronize the time.</p>
<b>&lt;Synchronize with scenario start time&gt;</b>	<p>Time Zone also contains the option <b>&lt;Synchronize with scenario start time&gt;</b>. Choose this to align the earliest measurement found in the data file to the start time of the LoadRunner scenario.</p>
<b>Machine Name</b>	<p>Specify the machine name the monitor runs on. This associates the machine name with the measurement. For example, a file IO rate on the machine fender will be named File IO Rate:fender. This enables you to apply Graph settings by the machine name. For more information, see <a href="#">"Filtering and Sorting Graph Data" on page 129</a>.</p>
<b>Advanced</b>	<p>For more information, see <a href="#">"Advanced Settings Dialog Box (Import Data Dialog Box)" on page 475</a>.</p>
<b>Truncate imported data to 150% of scenario run time</b>	<p>In certain cases, the external monitor may have collected data over a time period that was larger than the actual load test. This option deletes data that was collected while the load test was not running, limiting the data collection period to 150% of the load testing period.</p>



# Troubleshooting and Limitations - Analysis

This section contains troubleshooting and limitations for Analysis.

## General

- Analysis API works only on x86 platforms. If you are using Visual Studio, define the platform as x86 in the Project options.
- When analyzing results from a load test in which the Web Vusers accesses the AUT through a proxy server, the **Time to First Buffer Breakdown** graph shows only zero values for Network Time and Server Time. This is because the "time to first buffer" metric is turned off when working behind a proxy, and the time values can only be calculated to the proxy server.
- Load results that contain transactions with the '@' or ',' characters may conflict with existing transactions. This is because Analysis attempts to replace those characters with the '\_', and if this results in a transaction name conflict, an error will occur.  
**Workaround:** Avoid using the '@' and ',' characters in transaction names.
- The following Analysis default settings have been modified: **Include Think Time** is disabled and **Display summary while generating complete data** is enabled.
- When exporting Analysis reports to MS Word, the content load may affect the table format within the document. The recommended format is RTF.

## Graphs

- When the Analysis results consists of a large number of similar measurements, you may experience spikes in graphs, or an *Out of memory* message.  
**Workaround:** For 64-bit Windows, make sure that you have 4 GB or more memory. For 32-bit Windows, Select **Start > Run**, and type msconfig. In the

**Boot** tab, click **Advanced Options**. Select **Maximum memory** and set it to the maximum value.

- After running a Language User Interface Pack, the Analysis data generated from the sample session (in the <LR Installation>\tutorial folder) is displayed in English and filtering cannot be applied.

**Workaround:** Regenerate the graphs.

- The Transaction Response Time (Percentile) graph may show inaccurate results.

**Workaround:** Follow these steps:

- a. Close the Analysis application.
- b. Open the C:\Program Files (x86)\HP\LoadRunner\bin\dat\percentile.def file
- c. In the [Graph Definition] section, set BasicTableName to an empty string:  
[Graph Definitions]  
BasicTableName=
- d. Open Analysis again and view the graph.

## Microsoft SQL Server

- If you are using your own policy in an MS SQL server, you may need to add your own account to the Analysis database template (in the <LR Installation>\bin\dat folder).

- Analysis may fail to load results created through an MS SQL database, if the decimal separator on the Analysis machine is different from the decimal separator on the MS SQL Server machine (common on non-English operating systems).

**Workaround:** Change the decimal separator on Analysis machine to be the same as the MS SQL Server machine.

- Filtering of transactions for MS Access and SQL queries is limited to 100 transactions.
- If you are using Microsoft SQL Server 2000, you need to either migrate Analysis data, or upgrade to Microsoft SQL Server 2005. The following tasks describe how to migrate and upgrade.

**To migrate legacy Analysis data to a SQL 2005 server:**

1. From the SQL Server Management Studio, using Object Explorer, connect to an instance of SQL Server Database Engine.
2. Expand Databases, right-click Analysis database, select Tasks\Copy Database.
3. Follow the instructions in the wizard.

**To upgrade SQL 2000 to SQL 2005:**

1. Uninstall SQL 2000.
2. Install SQL 2005.
3. Restore Analysis data from backup. ([http://msdn.microsoft.com/en-us/library/ms177429\(SQL.90\).aspx](http://msdn.microsoft.com/en-us/library/ms177429(SQL.90).aspx))

# HP LoadRunner Tutorial

The HP LoadRunner Tutorial is a self-paced online and printable guide, designed to lead you through the process of load testing, and familiarize you with the LoadRunner testing environment.

- To access a PDF version of the tutorial, click **Start > All Programs > HP Software > HP LoadRunner > Documentation > Tutorial > Tutorial - Print Version**. In icon-based desktops, such as Windows 8, search for **Tutorial** and select **Tutorial - Print Version** from the results.

# HP LoadRunner Analysis API Reference

The HP Analysis API set can be used for unattended creating of an Analysis session or for custom extraction of data from the results of a test run under the Controller.

To view this guide, go to **Start > All Programs > HP Software > HP LoadRunner > Documentation > Analysis API Reference**. In icon-based desktops, such as Windows 8, search for **API** and select **Analysis API Reference** from the results.

**Note:** The Analysis API is only supported for 32-bit environments. If you use Visual Studio to develop your script, make sure to define x86 as the platform in the project options.

