

The logo for ZebraTester is a stylized triangle composed of several overlapping, colorful segments in shades of green, yellow, and red.

ZebraTester

Release Notes

Version 5.5



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1 V5.5

1.1 New Functions and Features

1.1.1 Major Release V5.5-X

ZebraTester V5.5-X release contains the following new features:

- **New Var Assign Pattern:** - ZT introduces a new variable assign pattern where variables can be assigned automatically and manually in the requests using the pattern **{*\$variable name*}**
- **AMF3 / Flex Support:** - ZT support the AMF3 Binary format, means ZT can encode and decode AMF 3 data. Decoding is mainly from AMF 3 binary format to a xml format.
- **Support of Entry conditions for Inner Loops:** - ZT now support entry conditions (optional) in order to decide whether to execute the inner loop or not during the load test / monitoring.
- **Support for Modular Scripting:** - ZT support modular scripting with the help of inner loops and a built-in plugin called **SupportModularScripts**
- **Browser Cache full version:** - Now ZT support the complete options for the browser cache like **Cache HTML & Simulate New User per Loop**. Also have the browser cache metrics available in the ZT result file (. **prxres**), which states the cache hits and misses.
- **Variable Rules support:** - In ZT now user have the possibility to create rules for variable extraction and assign (global settings) and can be applied to the recorded session (. **prxdat**) at any time. This will also support the new var assign pattern.
- **Save option for the recorded session:** - ZT now have the provision to save the recorded session (. **prxdat**) faster by just clicking a button instead of always going into the **save** as mode. This is a new save icon and the old save button is renamed to save as.

In addition, ZebraTester V5.5-X release contains the following bug fixes / improvements:

- **Changed the filtering of CSS and JavaScript on the recorded session in a way that it won't filter out the JSON requests.**
- **Now in ZT user can extract variables by using multiline left and right boundaries.**
- **Trimmed the rows from the replay result which was not executed due to the failure and also automatically scroll down to the item where failure happens.**
- **Solved a bug related to the break condition for the URL loops in case of parallel URLs.**
- **Fixed a bug related to web socket when pay load length is more than 65535.**
- **Also done an improvement in processing the recorded response content, so that the content with above 1 MB, ZT won't automatically display the form parameters and hyperlinks in the item details page for extraction, user has to use the other ways of extraction like boundary / regex.**

1.1.2 Major Release V5.5-S

ZebraTester V5.5-S release contains the following new features:

- **Changes in Kerberos with SPNEGO:** - Instead of getting the ticket granting ticket every time from the Key distribution Centre by authenticating using the username and password, now ZT will look if there is a ticket available in the local OS cache. If it is available, then ZT will use that ticket in order to do the challenge with the webserver.
- **CyberArk Integration with NTLM:** - ZT now have a provision of configuring the password vault API or command to retrieve the password when doing the NTLM challenge with the webserver. This way user doesn't need to configure the static password along with the script.
- **User Defined data points:** - ZT enables the user to create data points, that can be used to create a custom performance metric and that later becomes part of the performance test results. The measured user defined data points are shown in a Diagram in the results.
- **Input files support in LR to ZT conversion:** - Now the LR to ZT conversion will take the external parameter files (.dat files) from load runner and then convert that to the input files / variables relation in ZT.
- **Edit option for Var Extractor patterns:** - In ZT now user have a provision to modify the extractors, so that they don't need to delete the variables and created again in case of the extractor pattern changes.

- **Support Occurrence all, Save Length and Save Offset for Var extractors: - Occurrence = ALL** option in the extractors will extract all the occurrence out of which user can create multiple variables and also the count of the occurrence. **SaveLen** [When used SaveLen = 5 and the captured value is Elephant, the final var value will become Eleph (only 5 char)]. **SaveOffset** [When used SaveOffset = 2, the final value of Elephant will become ephant (2 char ignored)].
- **Text Compare Utility for the Record and Replay Analyse Screen:** - ZT now have a feature, which will highlight the differences between the recorded and replayed data (both requests and responses data)
- Support ZT AWS images for Job Controller and Exec Agents on Stockholm and Paris.
- In cooperated 2 new recorder plugins for auto correlate variables based on left and right boundary pattern; one general edition and other is wild card edition.

1.1.3 Major Release V5.5-F Java8 version

ZebraTester V5.5-F Java8 release contains the following new features:

- **Replay of the recording session:** - This feature eases the scripting effort as user can replay the session by simply clicking a button. The replay will end with a summary similar to the load test summary.
- **Analyze the Recorded and Replayed data:** - By this feature user can do the comparison of the recorded request/response data with the replayed request/response data, both during real time and after the replay.
- **Support for pacing on outer loops:** - This feature is similar to the pacing feature we had for inner loops and URL loops, but this pacing applies to the max loops load test parameter (outer loops).
- **Browser Emulation Options (user agents and browser cache) – Initial version:** - Browser emulation options enable user to select the user agents and the browser cache options like conditional GET during both replay and load test.
- **Pages summary table on the result:** - This is a new section in the result, which will give a table summary of pages like now we have the transaction summary table.

- **Response codes summary on the result:** - This is also a new section in the result, which will give the summary of all the response codes received during the execution.
- **Support for Brotli Data format specification:** - This feature enables support for Brotli data format in ZT.
- **GUI update for better representations of Var extractors/assigners:** - This feature basically highlights the variables indicating from where in the response they are extracted, and to which request they are assigned.

In addition, ZebraTester V5.5-F Java8 release contains the following bug fixes / improvements:

- **ECC enabled by default (no need to pass `-ecc` option)**
- **Windows Kit is digitally signed by Apica's certificate**
- **Improved version of Load Runner to ZT conversion**
- **Resolved UTF-8 Character encoding issues**
- **Resolved GIT integration issue with Bitbucket**
- **Included Open SSL as a part of the kit**
- **Regex extractor plugin for WebSocket frames**

1.1.4 Minor Release V5.5-F (Installation Kit dated August 24, 2017)

ZebraTester V5.5-F contains the following new features:

- **Loops around URLs within a Page**
In addition to "Inner Loops" which are loops around pages there is now also possible to define "URL Loops" which are loops around URLs within a page. The number of iterations can be constant or depending on a variable, and it's also possible to define conditions to continue and break an URL Loop. In this context, there is also a new scope available for extracting lines from input files: New line per URL loop – which means that a new line is extracted from the input file each time when an iteration of an URL loop starts. Note that URL loops can be defined only for URLs which are executed in serial order. There is also a possibility to define a condition for entering the URL loop; Entry Loop Condition
- **Support for latest Dynatrace Versions**
ZebraTester has updated to support the latest Dynatrace versions i.e. 6.X. Further information is available in the revised "Dynatrace Integration Handbook" which is delivered as a part of the ZebraTester installation kit.
- **WebSocket Plug-Ins**
Recorded sessions which contain WebSocket frames can now be enhanced by WebSocket Plug-Ins in order to support a dynamic behavior of the

simulated WebSocket clients. Similar to Load Test Plug-Ins, WebSocket Plug-Ins can be developed in Java and are executed at runtime during the load test execution. Further information is available in the document 'WebSocketPluginDeveloperHandbook'.

- **MQTT for WebSockets**

MQTT messages which are exchanged by using WebSockets are now fully supported by ZebraTester when recording sessions as well as when executing load tests. The recorded MQTT messages are also shown in the GUI and can be post processed by extracting values into variables and by assigning values from variables. Further information is available in the document 'WebSocketRecordingGuide'. For further details about the protocol itself please refer to **OASIS Standard** document at <http://docs.oasis-open.org/mqtt/mqtt/v3.1.1/os/mqtt-v3.1.1-os.html>

- **WebSocket and MQTT Event Listener**

As most of the IoT devices are passive in nature, and only act upon events, ZebraTester now supports wait loops/event listener. By using this feature we make a load test program to wait for certain event, and then we continue normal execution.

- **Defining "On the Fly" Diagrams in Inline-Scripts**

Inline scripts can now define at run time new diagrams and add self-measured values to them. The diagrams and their values are shown in the load test result as "External Measured Data".

- **Error Handling in Inline-Scripts**

Error handling is now supported in Inline-Scripts by using the new implemented "On Error Goto" statement.

- **Load Test Execution Plans**

Alter (increase and decrease) the number of simulated users during the load test job execution can now be pre-defined in "Execution Plans". Such "Execution Plans" are text files, which contain instructions written in a simple scripting language. When defining a new load test job, optionally an "Execution Plan" can be selected which controls during the load test execution the number of simulated users. The scripting language supports also simple loops, but currently no variables. For example, when an Execution Plan contains a loop executed 10 times, and within each loop-iteration the number of users are first increased by 100 and second a delay of 5 minutes is applied before the next loop-iteration is executed, then the total load test duration will be approximately $10 * (\text{ramp-up-delay for 100 users} + 5 \text{ minutes}) \approx 60 \text{ minutes}$.

Note that load test jobs which are controlled by Execution Plans are always starting with zero simulated users and that they have technically seen no execution time limit (= infinite job duration). Therefore, a valid "Execution Plan" file must contain at least the two following instructions:

- Set the Title of the Execution Plan shown in the GUI. Example: `set ("ExecutionPlanTitle, "My Execution Plan")`

- Set the Maximal Test Duration of the Load Test Job. Example: `set ("MaxTestDuration, 60:0)`

Execution Plan Files (*.exepf) which do not contain these two minimal required instructions are invalid and cannot be selected in the GUI when defining a load test job. In addition, Execution Plan Files which contain invalid syntax instructions also cannot be selected in the GUI.

The load test is immediately stopped after the last line of the Execution Plan is interpreted, or when the maximal test duration is reached.

Using Execution Plans requires that the Java code of the load test program is generated by ZebraTester version V5.5-D or later.

- **Abort Increase and Abort Decrease of Users**
An ongoing increase and/or decrease of simulated users during the load test can now be aborted which means that the load test continues with the currently actual numbers of users.
- **Decrease of Users with Delay**
The decrease of users can now be delayed with an extra time applied for the decrease.
- **Getting the Current Increase and Decrease Status**
Real time information about the number of users to be increased and the number of users to be decreased is now available.
- **Enhancement for Manual Entered URL Calls**
Instead of recording a session URLs can also be entered manually and added in such a way to the session. This functionality has moved from the Web Tools menu to the Main Menu and enhanced in such a way that also Form, JSON, XML and Multipart data can be entered as an Argument of a HTTP POST. Furthermore, the HTTP request header fields can now be edited before sending the request and a custom value can be set for the browser type.
- **Dynamic Outbound Proxy Configuration for Load Test Programs.**
Load test programs which are generated by ZebraTester V5.5-D or later support to configure if an outbound proxy is used or not, and which data are used to communicate with the proxy. The configuration data are placed in a text file named ZBAProxySettings.properties which must be zipped together with the load test program. The Proxy Configuration of the "Personal Settings" menu can now be exported into that file and is placed in the current Project Navigator directory.
- **Welcome Screen for First Time Users**
A welcome screen containing hints and help text is shown by default in the main menu. The welcome screen can be disabled and can be manually called from the main menu.
- **Single Click for Save/Compile/Run Load Test**
After a load test has been saved, compiled and run the first time then an automation icon is shown in the main menu which processes these 3 steps by one mouse click.
- **Testing Web Sites Published with No-Latin Characters**
Web Sites of almost any languages can now be recorded and load tested, for example Web Sites written in an Indian Language or Japanese Web Sites. "Page Break" names and "Verify Content by Text" of URLs can now have text in any language.
- **TLS Session Tickets**
TLS session tickets as described in RFC 5077 are now supported by ZebraTester, but disabled by default. Enabling TLS session tickets for recording can be configured in the Personal Settings menu. Enabling TLS session tickets for load test execution can be switched on by the new additional load test option -tlssessiontickets.

In addition, ZebraTester V5.5-F contains the following bug fixes / improvements:

- **Improved functionality for the import of LoadRunner scripts (support of URL Loops).**
- **The “My Tests” root directory used by Project Navigator can now modified via the Personal Settings Menu.**
- **Instead of creating simple sub-directories in Project navigator, symbolic links can now be created. However, some Windows systems do not support to create symbolic links in case when the Windows-User has administrator rights.**
- **The main menu shows now a warning if the root certificate file of ZebraTester was deleted.**
- **If a load test job crashes by itself then the test result data (*. prxres file) are now written in the most of the cases, as long as the JVM is healthy.**
- **Extracting values from JSON data has optimized to use less CPU and a bug regarding to blank characters has been fixed.**
- **Support of “JSON Path” based var extractors has added.**
- **The real-time monitoring values shown in the GUI when executing JUnit-Loadtests have now been optimized.**
- **Enable/Disable Retry SSL Handshake option available in the Personal Settings (Useful for monitoring solutions like B-Net).**
- **The session is automatically saved each time when the load test program is generated.**
- **Substitution of Blank Text with User given values when Extracting Variables.**
- **Measuring the Proxy Recorder Webserver Certificate Generation Time.**
- **Removed the Strong binding to Log4J.**
- **Fixed the Bug in calculating the Startup Delay for Cluster Jobs.**
- **Fixed the Bug for Calculating transactions with Inner Loops and URL Loops.**
- **Fixed the Bug for JSON Path in Inline Scripts.**
- **Fixed the Bugs in Installation Kit: Rarely crash on MAC OS Sierra, White Spaces in Windows Folder, Support of Java 8 for Ubuntu.**
- **Provided the SNI settings in Page Scanner.**

1.1.5 Minor Release V5.5-F (Installation Kit dated March 20, 2018)

- **Suppress the collection of samples of pages with no urls.**

- **Fixed the problem of user count strangeness during the ramp up of users for long start up delay.**
- **Fixed the problem when user count reaches 0, the job completes for cluster jobs in case of ramp up and down.**
- **Web socket implementation revised.**
- **Add URL implementation revised.**
- **Kerberos authentication enabled.**

1.1.6 Minor Release V5.5-F (Installation Kit dated March 21, 2019)

PAC (Proxy Auto Config) support for both recording and load testing

1.1.7 Minor Release V5.5-F (Installation Kit dated April 16, 2019)

Applied the validation for setting up the Java compiler path so that user can input the java compiler path, not other executables

1.1.8 Major Release V5.5-A (Installation Kit dated November 23, 2016)

ZebraTester V5.5-A contains the following new features:

- **Enhanced Session Cutter**
The "Session Cutter" menu that allows you to compile fragments of different recorded sessions into a new session has enhanced in such a way that now existing definitions of Variables, Variable Extractors and Variable Assigners are copied into the new compiled session. In addition, the name of the Page Breaks can now be modified in this menu and a preview of all Variables, Variable Extractors and Variable Assigners is shown per loaded session.
- **Support of WebSockets**
The recording and executing of Web Sessions containing WebSockets messages as described in RFC 6455 is now supported. In order to avoid endless recording of WebSocket streams the recoding time can configured in the "Personal Settings" menu. The recorded WebSocket frames are shown in the "URL Detail" menu where you can also define Var Extractors and Var Assigners for the WebSocket frame data. The WebSocket frames transmitted during the load test can verified either by counting the number of frames of by searching for text patterns that should occur inside the frame data.
- **Import of LoadRunner Scripts**
LoadRunner Scripts (written in C language) can now converted automatically into ZebraTester sessions. The load LoadRunner Scripts can be placed into any "Project Navigator" directory from which they can converted by a single mouse click. The conversion includes also correlations and transactions and can applied for LoadRunner Scripts created with LoadRunner version 11.x and 12.x. The import can also be automated by calling the command line tool LRToProxyDataDump (see revised "ZebraTester Application Reference Manual").

- **3 new Types of Variable Extractors**

The following 3 new types of Variable Extractors have been implemented: Left and Right Boundary based Var Extractors, RegEx based Var Extractors, XPath based Var Extractors. These 3 types of Extractors also support Random Extraction.

- **Support of HTTPS for the WebAdmin GUI**

By using the WebAdmin startup argument `-https <full DNS name or IP address>` an additionally Web Admin HTTPS server is started that runs usually at TCP/IP port 7991 and supports encrypted connections. The "full DNS name or IP address" is used to generate the HTTPS server certificate on the fly – in the same way as the server certificates for the Proxy Recorder are generated.

- **Support of Multiple JobControllers**

In order to speed up the data replication of load test jobs in geographically far locations ZebraTester supports now multiple JobControllers. Additional JobControllers can added and managed in the "Exec Agent Network Configuration" menu. This menu supports also to "ping" a JobController, to get the log-output of a JobController, and to reassign a cluster of load generators from one JobController to another one. Each JobController can serve multiple clusters. The communication protocol for a JobController can be either "plain TCP/IP" or "TLS over TCP/IP". Further information is available in the revised "ZebraTester Application Reference Manual", chapter 2.1 "Support of Multiple Cluster Job Controllers".

- **Full Encryption for Load Test Jobs**

JobControllers and ExecAgents that are operated in untrusted environments (as for example in cloud data centers) can now started in "Encrypted Mode" which effects that all load test job files and all load test job data are stored as encrypted files only. Furthermore, this option effects that also the data communication from the WebAdmin GUI to the JobControllers and ExecAgents is always encrypted, even when the "plain TPC/IP" communication protocol is used (File + Transport Encryption = Full Encryption). All cryptographic keys needed for encryption and decryption are dynamically generated and kept in memory only. Further information is available in the following documents:

- "Running ZebraTester Load Generators in Encrypted Mode" (New Document: ZebraTesterEncryptedLoadGenerators.pdf)
- In the revised "ZebraTester Application Reference Manual", chapter 2.2 "Running Full Encrypted Jobs in Untrusted Environments".
- In the revised "Load Test Plug-In Developer Handbook", chapter 3.4.3.10 "Support of Load Generators which are Running in Encrypted Mode"

Starting from this product version, all of the ZebraTester Amazon EC2 Load Generators and EC2 Cluster Job Controllers (EC2 AMIs) are starting up in "Full Encrypted Mode" – but do not confuse this with the EC2 AMI encryption option provided by Amazon. ZebraTester encrypts the load test job files at application level, independently of the environment in which the ZebraTester product is operated. Therefore, you can use this new feature on any machine, also on such machines that are physically owned and operated by your company.

- **Copy Jobs on JobControllers and ExecAgents**

Old Load Test Jobs can now be copied directly on JobControllers and on ExecAgents into new Load Test Jobs, regardless of the current state of the old load test job ("configured", "running" or "completed"). Such new jobs are always in the state "configured" and can started in a normal way. The copy of the job data is performed remotely inside the Exec Agent (for Exec Agent jobs) or remotely inside the Job Controller (for cluster jobs).

- **New PrxJob Commands**

The following commands have been added to the PrxJob utility:

- copyJob
- copyClusterJob,
- getControllerList,
- pingController and
- getControllerClusterList.

Detailed information about these new PrxJob commands is available in the revised "ZebraTester Application Reference Manual".

- **Support of Pure IP V6 Connections**

Load Test Jobs can now be executed in such a way that IP V6 is used only, without using IP V4 as a fallback. This allows you to examine the stability of IP V6 servers without any side effects. Further information is available in the online Help of the "Execute Load Test" → "Additional Options" menu. Option: `-enableIPv6 [<network-interface-name>]` .

- **Configurable TCP/IP Connect Timeout**

The TCP/IP connect timeout can now be configured separately, in addition to the overall URL timeout. Further information is available in the online Help of the "Execute Load Test" → "Additional Options" menu. Option: `-tconnect <seconds>` .

- **Amazon EC2: Support of Data Centers "Ohio" and "Mumbai"**

Predefined public AMLs for ExecAgents and JobControllers are now available in all EC2 data centers, inclusive of the two new EC2 data centers "Ohio" and "Mumbai".

- **Running Job Controllers on Amazon EC2**

The revised EC2 GUI allows you to launch either new Exec Agents only, or to launch new Job Controllers only, or to launch a new Job Controller together with new associated Exec Agents.

Along with this provision, we also have introduced the extended GUI for launching a Job Controller and multiple ExecAgents on Amazon EC2 in just one step – by automatically combining all of them to a new load releasing cluster.

- **New XPath and Regex Functions for Inline Script**

Two new functions have been added for Inline Scripts, for extracting values from JSON and XML data. These methods use XPath as an argument. There is also a new function available to extract Regex groups. Further information is available in the revised "PRX Basic Language Reference Manual".

- **Support of Variables in Occurrence for 3 New Var Extractors**

The occurrence position of the 3 new var extractors (Left and Right Boundary, Regex and XPath) can be configured by selecting an already extracted/created variable.

In addition, ZebraTester V5.5-A contains the following bug fixes / improvements:

- **Fixed SSL/TLS Handshake Problem with some of the Web servers (mostly IIS).**
- **Increased maximum number of in parallel-executed URLs per Web page from 300 to 600 (for generated load test programs).**
- **Proxy Recorder bug fix for “No Next Proxy” in combination with the ZebraTester DNS stack.**
- **Improved performance for writing files in Inline Scripts.**
- **Improved External Resources Menu.**
- **Support of IP V6 DNS queries in Web Tools Menu.**
- **A new Load Test Plug-In named “Massive Peak Load” is available, delivered by the installation kit.**

1.1.9 Documentation for executing Slowloris DoS Tests is available on request.

Upgrade Instructions

Before upgrading ZebraTester please uninstall first your old version by calling "Uninstall ZebraTester" which is located in the ZebraTester installation directory. All of your data in the /MyTests folder and your certificates are not deleted and survive the uninstall procedure.

Then install the latest ZebraTester version at the same location where the old version was installed before.

Note that a manual update of a system containing an older ZebraTester installation kit, performed by replacing only the *.jar files, normally result in a damaged installation!

We strongly recommend that you use always the uninstall and install procedure of the installation kit for upgrading ZebraTester.

1.1.10 Upgrade Manually Installed Systems to V5.5-F Java8 version

When you have to manually upgrade to this version, First make sure that you have Adopt Open JDK 8 (<https://adoptopenjdk.net/>) installed and then the following steps are mandatory

Add **-encoding UTF-8** to javacOptions property in **javaSetup.dat** and Add **-Dfile.encoding=UTF8** to javaOptions property in **javaSetup.dat**.

You also need to add **-Dfile.encoding=UTF8** as JVM parameter when start ZT processes using a script (bat or sh).

1.1.11 Upgrade Manually Installed Systems from V5.5-A to V5.5-F

ZebraTester V5.5-F contains a new fifth component named “Plan Controller” which must start at the same machine(s) where the Web Admin GUI is running. Therefore, the product contains now the following components:

- **ProxySniffer**
- **WebAdmin**
- **ExecAgent**
- **JobController**

- **PlanController**

The “Plan Controller” can either started as a thread inside ProxySniffer by passing the -PlanController argument. Example:

```
java -Xmx4096m ProxySniffer -WebAdmin -ExecAgent -JobController -PlanController -tz PST
```

Or, alternatively the PlanController can started an independent process. Example:

```
java -Xmx256m PlanController -tz PST
```

Note that the product will not work if no plan controller is started.

1.2 Version 5.5 Compatibility

Previous Version Data Files / Version 4.6-Z – Version 5.4-R	Compatibility with Version 5.5	
Recorded Web Surfing Sessions (*.prxdat files)	Compatible	¹ Load Generators (ExecAgents) which are operated in Encrypted Mode require load test programs that are generated by version 5.5. Workaround: You can load any old web surfing session (*.prxdat file) into V5.5 by using the Project Navigator. After that you have to generate and compile the load test program again before you can run it on V5.5.
Generated Load Test Programs (*.java and *.class files)	Compatible / NOT Compatible ¹	
Load Test Results (*.prxres files)	Compatible	

Previous Version Data Files / Version 4.0 – Version 4.6-Y	Compatibility with Version 5.5	
Recorded Web Surfing Sessions (*.prxdat files)	Compatible	¹ Workaround: You can load any old web surfing session (*.prxdat file) into V5.5 by using the Project Navigator. After that you have to generate and compile the load test program again before you can run it on V5.5.
Generated Load Test Programs (*.java and *.class files)	NOT Compatible ¹	
Load Test Results (*.prxres files)	Compatible	

2 V5.4

The brand of the product has been renamed from ProxySniffer to ZebraTester.

2.1 New Functions and Features

2.1.1 Major Release V5.4-A (Installation Kit dated July 22, 2015)

ZebraTester V5.4-A contains the following new features:

- **Revised Content Test Menu**

The "Content Test Menu" is now an overlay instead of a pop-up window and has been revised and improved. It's now also supported to verify text fragments of a received HTTP response header.

- **Other Revised Menus**

The following menus are now overlays instead of pop-up windows:

- Cumulated Response Time per Media Type
- Recorded URL Performance Data
- Delete URLs
- Delete Pages

The filter for the hosts in the main menu is now also implemented as an overlay which contains checkboxes per host name, rather than a simple text input field as before. This new overly can activated only if the recorded session contains more than one host name.

- **Enhanced Var Extractor Wizard**

A new variable extractor type has been implemented to extract values from unstructured HTTP responses. This new variable extractor type is no longer text-line based and uses as algorithm a search text and a relative token number, counted from the search text (in comparison to the already existing variable extractor whose token number always starts at the beginning of a line). Both type of variable extractors are now supported by the Var Extractor Wizard.

- **Reduced Size of Log Output for Load Test Jobs**

Load test jobs are writing now only a small set of overall values about the measured data to the log, but no longer detailed error data in case when an URL call fails. This reduces the size of the job *.out file normally by more than 95%. All detailed error data are still available in the "Error Snapshots" as before. To re-enable the old functionality for the log output you can select the new debug option "debug failed loops" when starting a load test. Furthermore, it is now also possible to suppress completely to write any data to the job *.out file by using the new "Additional Option" -nostdoutlog.

- **Real-Time Control of Load Test Jobs**

The "Abort Job" button shown during load test execution has been replaced by an overlay which allows you:

- To abort the load test job (as before).
- To suspend and to resume the load test job (new).
- To increase or decrease the planned test duration (new).
- To increase and to decrease the number of simulated users (new).
- To modify the values of "User Input Fields" in real-time (new).

This is supported for normal jobs as well as for cluster jobs. Any manual actions made in this overlay are journaled in the test result (*.prxres file) and can be retraced in the "Load Test Result Detail Menu" → "Test Scenario".

Notes: a) If a load test job is suspended it will nevertheless be terminated when the planned test duration is exceeded.

b) If you decrease the number of users to zero then the load test job will stop as soon as zero users are reached.

c) Only already running users can be decreased – decreasing of users which are started in future is not supported.

d) If you trigger an increase or a decrease during an already increasing/decreasing process then a second increasing/decreasing process will run in parallel.

e) User Input Fields can only be modified in real-time if they have been created/declared by enabling the (new) checkbox "Enable Value Changes in Real-Time - During Test Execution".

- **Reduced Overhead Between Executed Loops**

The overhead of a couple of 10 Milliseconds between the executed loops of a simulated user has been reduced to almost zero.

- **Reduced File Size / Memory Size for Cluster Job Results**

When acquiring the result of a cluster job you can now select if all of the "raw" Exec Agent member data should be part of the test result (as before). If you de-select this (new) option then the size of the result file – respectively the size of the required Java memory to display the result – will be up to 90% smaller – depending on the number of cluster members. You will not lose any data – but the cluster job result cannot be expanded later into single Exec Agent job results.

- **Optimized Resources for “One Loop Only per User” Load Tests**

The Java memory and the references to terminated threads has been substantially reduced for “One Loop Only per User” load tests

- **Measuring of the SSL Handshake Time**

The time elapsed to perform SSL Handshakes is now measured and displayed in real-time during the test execution as well as in the load test results.

- **Removed Load Test Options**

The load test options "-log", "-nolog" and "-sslreset" have been removed. Passing such options take now no effect. The SSL session cache is now cleared at the start of each executed loop (as by setting "-sslreset" before).

- **New PrxJob Commands**

The following PrxJob Commands have been added:

- changeJobNumSimulatedUser <exec agent name> <job id> <delta number> [<startup delay ms>]
- setJobSuspend <exec agent name> <job id> <"false"|"true"> [<startup delay ms>]
- isJobSuspend <exec agent name> <job id>
- changeJobTestDuration <exec agent name> <job id> <delta seconds>
- getJobRealTimeUserInputFields <exec agent name> <job id>
- getClusterJobRealTimeData <cluster name> <cluster job id> [-detailed]
- changeClusterJobNumSimulatedUser <cluster name> <cluster job id> <delta number> [<startup delay ms>]
- setClusterJobSuspend <cluster name> <cluster job id> <"false"|"true"> [<startup delay ms>]
- isClusterJobSuspend <cluster name> <cluster job id>
- changeClusterJobTestDuration <cluster name> <cluster job id> <delta seconds>
- getClusterJobRealTimeUserInputFields <cluster name> <cluster job id>

- **Revised PrxJob checkUrl Command**

The PrxJob checkUrl Command supports now SNI (Server Name Indication). Furthermore, the following new options have been added:

- [-ssl <version>] (Optional. Set the SSL or TLS version. Possible values are "all", "v3", "tls", "tls11" or "tls12")
- [-dnsstatistic] (Optional. Measure also the DNS resolve time.)
- [-dnssrv <IP-name-server-1>[,<IP-name-server-N>]] (Optional. Set an alternative list of DNS servers.)

- **Two New Internal Processing States for Measured URL Calls**

The internal processing states "DNS Resolve" and "SSL/TLS Handshake" have been implemented for measured URL calls. In case if an URL call fails (for example when a timeout occurs), you will see now if such an error did potentially happen during query of a DNS server or during a SSL/TLS handshake.

Complete list of all internal processing states:

Internal Processing State of URL Call	Value	Meaning
No Step / Not Initialized	-1	The URL call had not yet started.
DNS Resolve (new)	10	The URL call failed during resolving the DNS name of the web server.
Open Network Connection to Proxy	0	The URL call failed during the opening of a network connection to an outbound proxy server. This processing state is executed only if the load test is performed via a proxy server (unusual, not recommended test scenario).
Open Network Connection	1	The URL call failed during the opening of a TCP network connection to the web server.
SSL/TLS Handshake (new)	11	The URL call failed during executing the SSL/TLS handshake with the web server.
Transmit HTTP Request	2	The URL call failed during the transmission of the HTTP request data.

Wait for Server Response	3	The URL call failed while waiting for the first byte of the HTTP response data from the web server.
Receive HTTP Header	4	The URL call failed while receiving the HTTP response header from the web server.
Receive Content	5	The URL call failed while receiving the HTTP response content from the web server (HTML data, images, ...).
Close Network Connection	6	The URL call failed while closing the network connection to the web server.
All Done	7	The URL call itself completed successfully (all data transmitted and received), but the received HTTP status code was incorrect, or the received MIME type (text/html, image/gif, ...) was incorrect, or an error was detected inside the received content data.

- **DNS Resolve Time and SSL Handshake Time Shown in URL Performance Data**

The DNS Resolve Time and the SSL Handshake Time are now shown in all URL performance data.

- **Support to Terminate a Simulated User due to a Failed URL Call**

The “Failure Action” in the “HTTP Response Verification” menu contains a new option which allows to terminate a simulated user when a “red error” occurred for the (particular) configured URL. All simulated users for which this error occurs are removed from further load test execution. The users are also terminated if a variable extraction for that URL fails or when a load test plug-in which is bound to that URL releases a self-generated error. The corresponding captured error snapshots are marked with a yellow colored warning sign in order that you can retrace why a user has been terminated.

- **Accessible X509 Server Certificate Chain**

The X509 certificate chain received from the web server during the SSL/TLS handshake is now accessible from load test plug-ins. This allows also to extract the public key of a Web server certificate during the load test execution.

- **New Functions added to the Proxy Recorder REST API**

The following functions have been added to the Proxy Recorder REST API:

- getRecorderURLBlacklist
- setRecorderURLBlacklist
- getRecorderURLWhitelist
- setRecorderURLWhitelist
- getRecorderOutboundProxyTimeout (Apica BNet only)
- setRecorderOutboundProxyTimeout (Apica BNet only)
- getRecorderRecordFailedTransmitRequests (Apica BNet only)
- setRecorderRecordFailedTransmitRequests (Apica BNet only)
- getRecorderSSLVersion

- setRecorderSSLVersion

The updated Application Reference Manual contains further information about these new REST API functions.

- **Additional Java Methods for Recorded Sessions and Recorder Plug-Ins**

- Class dfischer.proxysniffer.ProxyDataRecord
 - New method getRecorderSequenceID()
 - New method getExecutionStep()
 - New method getFailureExceptionText()

- **Additional Java Methods for Recorder Plug-Ins**

- Class dfischer.proxysniffer.ProxyRecorderContext
 - getRecorderSequenceID()
- Class dfischer.proxysniffer.ProxyRecorderPluginURLContext
 - getRecorderSequenceID()
 - getExecutionStep()
 - getFailureException()

- **Revised Installation Kits**

The installation kits for Windows, Mac OS X and Linux have been revised. The Mac OS X installation kit contains now an integrated Java compiler and interpreter.

2.1.2 Minor Release V5.4-D (Installation Kit dated October 8, 2015)

ZebraTester V5.4-D contains the following new features:

- **Support for Log4j**

As an option, all components of ZebraTester (but not the executed load test programs) can be configured in such a way that log4j is used for logging. The startup option -log4j has been added to ProxySniffer, WebAdmin, ExecAgent and JobController. For further information see the revised Application Reference Manual.

- **New Functions added to the Proxy Recorder REST API**

The following functions have been added to the Proxy Recorder REST API:

- getRecorderURLRegexBlacklist
- setRecorderURLRegexBlacklist
- getRecorderURLRegexWhitelist
- setRecorderURLRegexWhitelist

The revised Application Reference Manual contains further information about these new REST API functions.

- **New Function added to the PrxJob Utility**

The following function has been added to the PrxJob Utility:

- getClusterJobStartStatistics

The revised Application Reference Manual contains further information about this new PrxJob function.

- **Enhanced Support of the Apica Load Test Portal (LTP)**

The functions to upload and download of files to/from the Apica Load Test Portal (LTP) have been enhanced and support now all new features of the LTP.

- **Signed Firefox Recording Extension**

The Firefox Recording Extension has been revised and signed and supports now the latest Firefox versions.

- **Upgrade to Java 7**

ZebraTester requires now Java 7 (instead of Java 6). The Windows and the Mac OS X installation kits contain now an integrated Java 7 compiler and interpreter.

- **Improved Mac OS X Installation Kit**

The installation of ZebraTester on Mac OS X has been simplified and the Mac installation kit supports now the latest Mac OS X versions "Yosemite" and "El Capitan".

2.1.3 Minor Release V5.4-I (Installation Kit dated March 8, 2016)

ZebraTester V5.4-I contains the following new features:

- **GitHub Integration of the MyTests Directory Tree**

By using the GitHub integration you can manage all of your recorded sessions and all of your load test result with a remote revision control system. This allows you to have multiple branches of the MyTests directory tree, and to track changes/modifications of any file. Furthermore the content of old, overwritten files can also be restored. The GitHub integration is accessible from the Project Navigator menu. For further information see the new **GitHub Integration Manual**.

- **New Feature: "User-Defined" Transactions**

By defining "User-Defined" Transactions in the GUI you can mark sections in the recorded session which can start at any URL and can end at any succeeding URL or page. Later, when executing the load test, performance data of such sections are separately measured, which means that the "transaction time" and the "number of transactions" are captured. For example: If you define a transaction around a login procedure, you can measure how many logins per second have been performed during the load test. The measured data of transactions are shown in real time while executing the load test, and are shown in the load test result details. In addition, the measured data of transactions are also shown as "load curve diagrams".

- **New Feature: Inline Scripts**

Inline Scripts allow you to enhance the load test program with additional features. Like for example: Modify the HTTP request data before transmitting an URL call, or extracting data fragments from HTTP responses into variables. Similar as you can do with Load Test Plug-Ins - but in an (much) easier way. Inline Scripts can also abort the current executed loop of a user and trigger a "red" URL error snapshot.

Inline Scripts are written in **Prx BASIC** programming language. The runtime behavior of Inline Scripts can be tested in advance, whereby the script environment is simulated based on the data of the recorded session. For full documentation see **Prx BASIC Language Reference Manual**.

- **Support of EC2 Data Center "Seoul"**

AMIs for load generators and "Pure Cloud" instances are now also available in the EC2 Data Center "Seoul".

- **Proxy Recorder Certificates now with SHA-2 signed**

The Web server certificates created by the Proxy Recorder are now signed using the SHA-2 algorithm (instead of using SHA-1 as before). The updated **CreateOwnCARootCertificate** tool delivered by the new installation kits supports also to create an own Root Certificate signed by the SHA-2 algorithm.

Note in case if you are upgrading ZebraTester from an older version: Because some Web browsers inclusive Firefox (on all OS) and also Mac OS X and iOS 9 don't longer accept certificates signed by the SHA-1 algorithm we recommend that you delete/remove the old ZebraTester CA root certificate from your Web browser and from your OS. After that create a new one by using the updated **CreateOwnCARootCertificate** tool provided by the installation kit (see ZebraTester Installation Guide) and then install your new CA root certificate into the Web browser and import it into the OS.

By clicking on the certificate icon in the ZebraTester main menu you can verify that the new root certificate is now signed by the

"sha256WithRSAEncryption" algorithm (don't confuse it with the certificate fingerprint which is still generated in standard form using SHA-1). Finally you should delete all old Web server certificates by using the Web Admin GUI in order that they are newly created with the SHA-2 algorithm. After that restart the ZebraTester Console.

- **New Diagram: SSL Handshake Time**

The captured SSL Handshake Times are now shown as a time/value diagram in the "Load Test Result Detail" menu.

- **New Diagram: Load Generator Performance**

The CPU Usage of the load generator(s) and the "Java Garbage Collector Rate" of the load test jobs is now measured during the load test execution and added to the load test result. Both data collections are shown as time/value diagram in the "Load Test Result Detail" menu.

- **Job ID and Job Max. Java Memory added to Test Scenario/Objectives**

The Job ID and the Job Max. Java Memory (max. available Java memory of load test job) has added to the "Load Test Result Detail → Test Scenario/Objectives" menu.

- **Optimized PrxCombineTestResults Tool**

The PrxCombineTestResults command line tool has been optimized and does no longer append by default the discrete results of the cluster members to the combined data. You can re-enable the old behavior by passing the new argument -addDiscreteResults . This tool is now documented in the revised Application Reference Manual.

- **Enhanced PageScannerSessionToJava Tool**

The PageScannerSessionToJava command line tool – which allows you to convert a recorded session into a Java load test program – supports now the optional arguments -noStripReferer and -noStripAccept. Further information is available in the revised Application Reference Manual.

Discontinued Functions

- The support for "SSL V2" has been removed

Version 5.4 Compatibility

Previous Version Data Files / Version 4.6-Z – 5.2-*	Compatibility with Version 5.4
Recorded Web Surfing Sessions (*.prxdatt files)	Compatible
Created Load Test Programs (*.java and *.class files)	Compatible
Load Test Results (*.prxres files)	Compatible

Previous Version Data Files / Version 4.0 – Version 4.6-Y	Compatibility with Version 5.4	
Recorded Web Surfing Sessions (*.prxdatt files)	Compatible	¹ Workaround: you can load any old web surfing session (*.prxdatt file) into V5.4 by using the Project Navigator. After that you have to generate and compile the load test program again before you can run it on V5.4.
Created Load Test Programs (*.java and *.class files)	NOT Compatible ¹	
Load Test Results (*.prxres files)	Compatible	