PROGNOSIS®

for › Web Applications

Case Study

Seven Scenarios for Success

By Integrated Research

If your web-based applications are critical to your business, then these case studies will be invaluable to your success.

The "Seven scenarios for success" are based on actual web applications that provide real-world business solutions. This paper discusses web applications that transact, validate, distribute information and everything in between.

Each scenario illustrates how PROGNOSIS for Web Applications meets specific requirements and provides solutions that you can apply to your own circumstances.

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ir PROGNOSIS®

Precise performance monitoring for business-critical systems

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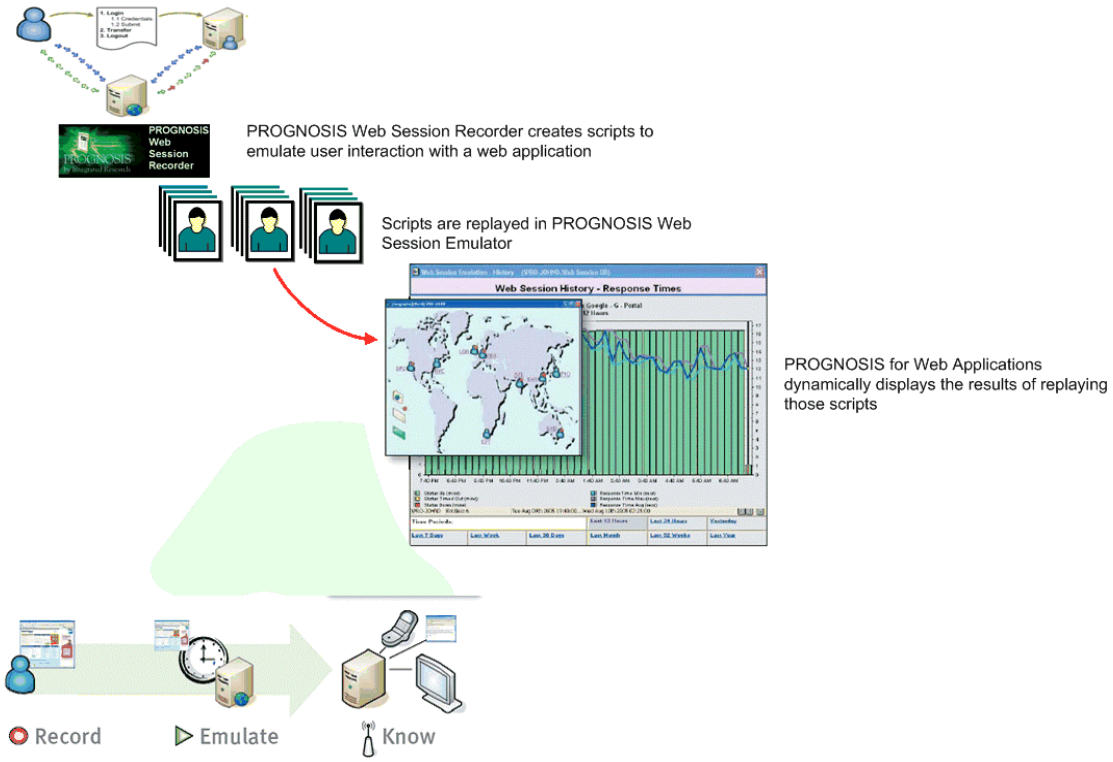
Introduction

PROGNOSIS for Web Applications is specifically designed to address the uncompromising management and monitoring requirements of business-critical web applications. It captures, emulates and monitors a user's interaction with web applications providing deep and specific visibility of the availability and performance of the application from the user's perspective.

Scripts emulate user interaction with the web application and are designed to reflect atomic, logical groupings of browser activities that are robust, secure and repeatable. During script playback, data is captured from the activities the browser is performing to provide service-level reporting. The session recorder component[1] allows a script author to easily capture and refine activities into a repeatable, automated script incorporating technologies such as JavaScript[2] and Regular Expressions[3] to retrieve, test and manipulate properties within the script.

The use of sophisticated, highly customized scripts provides visibility into the availability, validity, performance and behavior of web applications. Everyday activities such as online banking, broking and insurance or customized industry-specific applications can be measured from the user perspective.

A variety of examples must be investigated to fully understand the nuances of individual scenarios and how PROGNOSIS for Web Applications can be leveraged to individual needs. The following scenarios go some way to explaining how PROGNOSIS for Web Applications provides an effective web application monitoring solution.



[1] *PROGNOSIS Web Session Recorder enables user interaction with a web application to be recorded and refined into a repeatable script. A recorded script is then deployed to PROGNOSIS Web Session Emulator. From there it is replayed on a periodic basis, providing availability, performance, verification and behaviour monitoring – all from a user-perspective.*

[2] *JavaScript is a simple programming language integrated with and embedded in HTML.*

[3] *A Regular Expression is a way to express how a program should look for a specified pattern in text.*

Scenario 1: Online leisure and travel portal

Application management

A provider of cutting-edge technology, solutions and services to the travel industry requires an effective and robust tool to emulate and monitor their customers' activity on hosted leisure and vacation portals. This company designs and hosts worldwide travel portals focusing on travel agent tools, travel product distribution and dynamic travel packaging.

Visitors to these (Microsoft .NET framework) web sites access vivid destination and hotel videos, virtual tours, dynamic maps, city guides and weather information. The application has a best-price search engine and can book multi-stop and multi-airline packages. A dynamic packaging engine bundles all the components selected by the traveler to create a single reservation requiring only one payment from the customer.

In addition to the web interface, back office management incorporates transaction processing, supplier inventory management, accounting and reporting, with 100 per cent of the business revenue derived from this application.

Business challenges

This business must provide a seamless web experience by transacting package bookings through a secure and encrypted shopping cart interface incorporating real-time online credit card verification and authorization. It must also provide rich multimedia content that is consistently current, robust and of high quality. Service levels must be maintained and be comparable between application revisions that occur every three months.

The role of PROGNOSIS for Web Applications

In order to monitor the performance and availability of the application it is important to analyze its components and identify the information required by each part of the organization. PROGNOSIS Web Session Recorder can create atomic scripts to provide deep and granular visibility for each component.

PROGNOSIS Web Session Recorder provides the ability to break each user action into as many components as required so performance data can be monitored, collected and analyzed for each part of the user's experience. For example, to simulate user logins automatically, credentials can be retrieved from a secure ODBC data source such as a SQL Server, Oracle database, Excel spreadsheet or a comma separated text file.

PROGNOSIS Web Session Recorder scripts will iterate and provide all the values in the data source to the login process.

Emulating the user experience

Atomic scripts

Web application administrators can create sophisticated, discrete web sessions combining administrative processes with user actions. By emulating user actions; availability and performance of the web application can be monitored, any failed validations or actions can be notified and session data can be captured and matched to service level agreements.

Web forms

The majority of user interaction with a travel portal occurs through the use of web forms. Identifying, populating and submitting web forms are key features of PROGNOSIS Web Session Recorder. Scripts can be designed to emulate a tour, airline or hotel operator executing a secure login and testing access to rental car, hotel, flight and reservation links. The validity of these links is tested using dynamically rendered browser content. Any failures resulting from these tests will trigger an alert in the PROGNOSIS monitoring console. In the event of a failure, continuation behavior can be defined in the script to re-test the link, trigger another process through the use of JavaScript, or capture a screenshot for evaluation of the problem.

Back office integration

A key benefit for users of this vacation portal is the dynamic booking engine that combines reservation management, an email guestbook, destination content and integration with back office processes. PROGNOSIS Web Session Recorder scripts allow the testing of all combinations of user activities ensuring that the technology used by the web application is fully integrated into the business processes.

Keyword placement

In such a competitive, low-margin environment it is vital to ensure that specific keywords are always present to ensure high placement with search engines. An airline may require the presence of certain keywords to facilitate complete air-inclusive vacations for their customers. Additionally hoteliers may want to add air tickets and other features to their room sales, so ensuring appropriate keywords are present to match a user's search is essential to vacation packaging. PROGNOSIS Web Session Recorder can consistently test source HTML, rendered browser content and message boxes for the presence of specified keywords, or pattern match using a Regular Expression.

In the example shown below in *Figure A,* a site offering vacation packages is tested for the presence of required keywords.

Figure A: Script validating presence of keywords

Precise performance monitoring

Once scripts emulating user activity have been designed and deployed, PROGNOSIS for Web Applications monitors the performance of those scripts providing historical data as well as alerting to any failures. As this customer requires visibility of service levels between revisions, a database collection can be replayed providing statistical information incorporating response times, successful and failed logins and user and back office transactions. *Figure B* shows an example of the details that can be viewed when a script is executing.

PSR Summary (\TOKYO.Web Session DB)

	Web Session Script	Response	kB	Status	Last Run	Freq	Clock	View	Sho
1	H - Portal	7.454	16.80	DOWN	03:58:13	900	8.984	Children	History
2	H - Login	7.583	16.82	UP	03:58:25	300	8.421	Children	History
3	N - Summary Quote	13.870	129.78	UP	03:58:35	300	15.062	Children	History
4	G - Home Page	1.276	2.84	UP	04:01:18	60	2.329	Children	History
5	G - I Feel Lucky	8.206	39.47	UP	03:58:56	300	8.891	Children	Histor
6	H - Home Page	3.642	9.50	UP	04:01:37	60	4.781	Children	History
7	G - Search	2.223	20.43	UP	03:59:16	300	2.609	Children	History
8	N - Info Quote	13.771	118.23	UP	03:59:21	300	14.765	Children	History
9	H - Send Mail	7.813	22.17	DOWN	03:59:38	300	9.609	Children	History
10	G - Portal	9.609	156.36	UP	03:59:50	900	12.562	Children	History
11	N - Home Page	7.547	78.40	UP	04:01:23	60	11.046	Children	History

Figure B: Database replay showing script details and status

Scenario 2: Online banking, investing, insurance

Complete management

The highly integrated, functional and diverse web site of a major bank uses several web applications to provide customers with online banking, investing and insurance services. The design of the web site offers easy-to-use integrated financial services including online digital imaging via a secure login with bi-lingual support.

The bank offers online tutorials in Flash or HTML in order to educate customers in the use of its products. During the tutorials users can perform such actions as opening an account online, e-mailing the bank, printing an application form or requesting an information kit. Customers can also complete online surveys. These actions are all achieved through the use of web forms. Additionally there is an extensive forms library to use online or download as Adobe PDFs.

Online investors can access an asset mix calculator to help them determine their investment goals and any visitor navigating to the Solutions Centre can take advantage of mortgage, life and travel insurance calculators.

Business challenges

The business must maintain an extensive number of links utilizing protocols such as HTTP, HTTPS and JavaScript. Core web site functionality must be available for activities such as access to current interest rates, amortization periods, special offers and email.

Other challenges include keeping all information current, all links functional, maintaining secure logins for online banking and investing, provision of online digital imaging, and ensuring all online tutorials and components using Perl, CGI scripting and POST form data function correctly.

The role of PROGNOSIS for Web Applications

A single solution for monitoring all web applications, and a consolidated view of performance and availability is required. The bank needs to know if user logins fail or components of the application are not working, or working correctly but performing below required levels.

Emulating the user experience

Handling multiple windows

The application opens multiple windows, launches pop-up windows and message boxes enabling users to move easily between banking and investment accounts and other components of the application. For this reason it is vital that PROGNOSIS Web Session Recorder can target secure instrumented user activity to any window whether it has current focus or not. The Window control will close any windows that have been launched and are no longer required.

Testing CGI, Perl and JavaScript functionality

PROGNOSIS Web Session Recorder can instrument user activity using mouse clicks and key presses to test the functionality of scripts for items such as mortgage, life insurance and net worth calculators.

PROGNOSIS Web Session Recorder supports the POST method of submitting data, and can supply variables to web forms, manipulating the parameters to supply different interest rates, amortization periods and any other required values. An example of this can be seen below in *Figure C.*

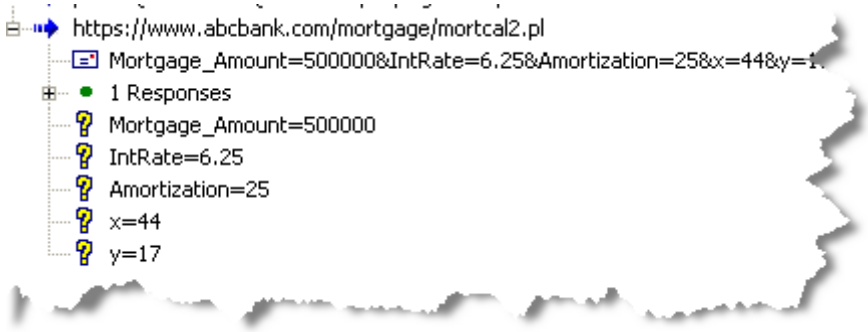


Figure C: Script details of mortgage calculation using Perl script

Validating web pages

PROGNOSIS Web Session Recorder can ensure the current date is located on pages providing daily cash or current mortgage rates or that hyperlinks using keywords such as *privacy*, *security* and *legal terms* appear on every page that is displayed in the browser.

PROGNOSIS Web Session Recorder provides the flexibility to retrieve values to test from the source HTML, dynamically rendered browser content, or from a pattern match using a Regular Expression.

Precise performance monitoring

PROGNOSIS for Web Applications provides monitoring and alerting for all user activities including logon validation, link navigation, and successful use of web based scripts. It can check that web pages contain specific text, provide alerts if violations occur and ensure that forms can be successfully populated and submitted.

Session data is available as a rolled up total for the entire script or for individual steps, including response times, data transferred, and the status of each user activity.

Drilldown for further information is available for individual components within those steps such as JavaScript Requests or parameter submission within forms or HTTP Requests.

Scenario 3: Online trading, banking, investing

A distributed enterprise

A globally distributed stock broking firm uses a business critical web application to provide sophisticated services for investing and banking clients. The web site is highly functional and includes an online active trading platform, account opening, instant credit card application processing, subscription services, and live online investor workshops.

It provides rich multi-media content such as web casts, interactive applications, check imaging and double byte character support for Asian languages. The business partners with affiliates as required providing a wide range of executive services to clients.

Business challenges

Some of the challenges facing this business include ensuring the information it provides is up to date and is delivered in a secure, reliable, and timely manner. With eight major offices, users must be able to successfully navigate the myriad of links at each location.

Secure interactive services such as online trading, banking, investing, and credit card applications, must be available and perform according to required service levels. Demonstrations, web casts and application 'test drives' must perform properly, forms libraries and file downloads must be up to date and function correctly.

Streaming quotes and news must execute correctly, as well as interactive charting, stock screeners, and customizable alerts. Basic support for video, audio, and email is vital.

The role of PROGNOSIS for Web Applications

PROGNOSIS will monitor application availability and performance from all eight geographic locations and most importantly provide real time performance metrics in the time sensitive share market. It will immediately identify if there are failures in any of the user activities vital to the provision of the services offered from the firm's portal.

Emulating the user experience

Using web forms with JavaScript

A script created using PROGNOSIS Web Session Recorder can emulate a user's interaction with any services provided by the portal. Atomic scripts can be created to emulate just one part of a user action such as completing a credit card application or downloading a form. PROGNOSIS Web Session Recorder automates completion and submission of web forms, and other functions can be invoked on form submission through the use of JavaScript.

Other scripts might emulate a user accessing their online trading or checking account from a secure data source and performing a transaction. Each page that is displayed in response to a user request can be tested to ensure that it is the correct one.

Handling multiple windows and message boxes

PROGNOSIS Web Session Recorder ensures that pop-up windows and message boxes generated as the user navigates the site are handled correctly and that the instrumented user behavior occurs in the correct window. Message boxes can be acknowledged or automatically dismissed if it is known that a specific user action will cause a particular message box to display.

Using Timers

When replaying a script with multiple steps testing different components of the application, it may be necessary for the script to pause until it has received a response from a previous step. Timers can be inserted into the script to achieve this, either in a specific part of the script, for example, to wait until a page has finished loading, or to cascade throughout the script so that a configurable delay occurs between user interactions.

Monitoring multiple locations

A distributed enterprise needs to easily test user interaction with its web applications at any of its locations. PROGNOSIS Web Session Recorder makes it easy to automate the substitution of one hostname for another to test a user's experience at each location. Cascading timer items can be used to streamline instrumented user activity, ensuring a smooth transition between web sites. Similarly, application components sharing common values across multiple sites can be linked and tested by a single script.

Precise performance monitoring

PROGNOSIS for Web Applications can monitor the ability of the PROGNOSIS Web Session Recorder script to access each location. It will report on successful or failed attempts to execute the HTTP, HTTPS or JavaScript Requests at each location. It can test that the home page of each location is rendered in the Browser by checking for the presence of a web site identifier such as the country location for the Google web sites as shown below in *Figure D.*

Figure D: PROGNOSIS checks for text in the HTML source to identify a web page

Scenario 4: Validating secure access to a web site

The business of providing complex and highly secure logins

This company obtains and provides highly confidential information about potential employees to be used by clients in the interview screening process. The information they maintain online ranges from personal information and social security numbers to the results of drug testing, credit, criminal history and reference checks. Clients can log onto the secure web site and view the results online as screening reports become available, so it is vital that none of this information becomes available to unauthorized users. Similarly the protection of electronically stored faxed release and consent forms is critical.

Business challenges

The web application must go to extraordinary lengths to prevent hacking. A common login security technique is to use two forms on a page. One form is used to enter credentials, the other is submitted to the server. JavaScript transfers information from one form to the other so a blank form is not submitted. Typically the JavaScript is called by a user event – such as a key press or mouse click.

The implementation of this web application introduces the complexities of handling pop-up windows, retrieving a Session ID and managing cookies.

The role of PROGNOSIS for Web Applications

Emulating the user experience

After accessing the web site, the basic operational steps are to execute a secure logon to the application, access the required information, return to the main menu and log out.

Viewing page structure to target forms

Investigation of the HTML source is required to determine the steps involved to emulate the separation of user input and form submission. Due to the anti-hacking measures employed, it is not sufficient to merely populate the fields in the login form and submit it automatically. PROGNOSIS Web Session Recorder provides an easy to use Document Object Model (DOM) window that allows visibility into the frame and form structure of the page. Forms can be referenced by the order they appear on a page or by their name. To correctly emulate the secure user login it is necessary to identify and specify the name of the form prefixed by the frame that contains it.

Using JavaScript to automate form submission

After establishing that the form displayed to the user only existed for the purpose of receiving their login credentials, PROGNOSIS Web Session Recorder emulated that user interaction, moved the focus, and programmatically invoked the necessary JavaScript to automate submission of the hidden form. Alternatively values could be set in the hidden form directly.

Other products cannot emulate these events so the copy of user credentials, from one form to the other, does not occur and the login fails.

Removing cookies

A further requirement due to the enhanced security techniques employed to validate the user login is the necessity to remove any residual session information created by the web application. This enables consecutive playbacks to be completely independent of each other. PROGNOSIS Web Session Recorder provides the ability to remove cookies from previous sessions that may interfere with the ability to repeatedly run the script.

Retrieving the unique Session ID

PROGNOSIS Web Session Recorder is able to ensure a unique session identifier is also required to automate repeated secure logins. This is achieved through the use of a Regular Expression pattern match and the supply of a unique session ID for each logon.

Precise performance monitoring

PROGNOSIS for Web Applications allows the monitoring of each step of the login, browse and logging out processes. It is possible to monitor what will happen in the event a user fails to enter correct credentials and then retries and is successful on the second attempt. *Figure E* below illustrates logins occurring over a 12 hour period.

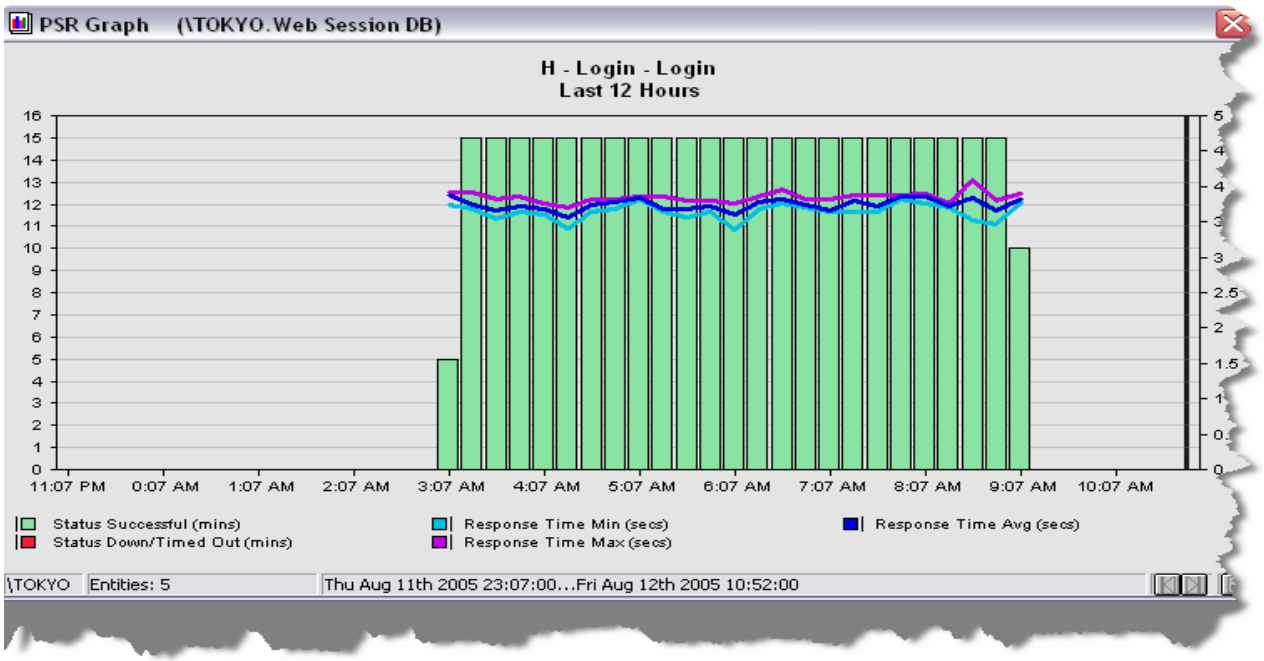


Figure E: Response times for user logins

Scenario 5: The challenge of security validation

The following scenarios describe the flexibility of PROGNOSIS Web Session Recorder in emulating and automating user logon processes when they are controlled by technologies such as Java applets, ActiveX controls and COM objects. The ability to successfully navigate login processes using alternative technologies to HTML provides powerful and valuable functionality

Using Java applets to provide secure logons

Providing secure logins can be achieved in a number of ways. It can be implemented through the use of hidden forms, or by implementing security with an independently written Java applet.

A third party security applet can look just like an HTML form. PROGNOSIS Web Session Recorder can enter login credentials into a Java applet and access the remainder of an application which is built in HTML.

Request parameters can be modified as required

PROGNOSIS Web Session Recorder can modify the Request parameter to directly invoke the applet to be run. The destination and purpose of the parameter determines what values are sent to the applet. Other products can only control HTML and cannot get past the login screen because of their inability to control Java applets.

Using ActiveX and private keys to provide secure logins

Banks implement logon validations in various ways. One bank even issues customers with a private key to access online banking. When customers want to log in to the bank's site, an ActiveX control is downloaded and displays a pop-up window. The user enters the path to the private key, along with their user ID and password.

Mouse clicks and key presses

PROGNOSIS Web Session Recorder has the ability to control the pop-up window with mouse clicks and keystrokes to enter the relevant information for successful log in. This is achieved because PROGNOSIS Web Session Recorder can control windows outside the browser, capturing the position of the mouse within the context of the browser or the overall application window. Mouse clicks can be configured to take into account changes in window size so that, prior to executing a mouse click, the window is resized to its original dimensions.

A distinguishing feature of PROGNOSIS Web Session Recorder is its ability to control windows outside the browser ensuring that user activity can be emulated if such actions are required.

Using a COM object to validate a user login

An intranet web application has been designed to use a collection of locally installed components known as a Dynamic Link Library (DLL). The advantage of a DLL is that it is not loaded into memory until it is required to perform a particular function. In this scenario the DLL is called by the web application to validate a user login. The DLL accesses a remote database and supplies login credentials to the web application for the locally logged in user.

To properly emulate the login process, a small Visual Basic COM object was created to call the locally installed DLL. This Visual Basic object, written as a component, allows it to be reused in future revisions of the web application, as well as being available to other applications.

Using JavaScript

A JavaScript action was created and incorporated into the PROGNOSIS Web Session Recorder login script to call the Visual Basic object, which in turn called the DLL and retrieved the login credentials. This level of flexibility and sophistication from a PROGNOSIS Web Session Recorder script demonstrates power beyond the web.

Precise performance monitoring

PROGNOSIS for Web Applications allows the monitoring of each step of the login process, irrespective of the technology used to validate the user login. It will alert to any failed login attempt, as well as provide performance metrics on successful logins. It will display the total number of scripts being run that have exceeded pre-set time-out values, the number of scripts that have run with all transactions being successful or failed, and the maximum and average response times of all scripts displayed in seconds.

Scenario 6: Legacy/hybrid systems performance

Information provision and distribution

An organization has created a web application as a skin over its legacy mainframe console application. The application collects price sensitive data from multiple sources and distributes it to its subscribers. The web server creates a console session when a user logs into the web application. The screens that are returned by the mainframe are dynamically converted into HTML pages. Effectively each page appears to the user as the same page, although each one is actually different and contains randomly generated identifiers on each access.

Retrieve and use random values

When a user goes to a page and requests information such as a first and last name, three identifiers are involved – the form they are using and the two requested fields. In a typical web application the identifiers are constant – the form name eg *form1*, first name eg *fname* and second name eg *sname*. In this application, the identifiers are randomly generated in the generic form of *abcd*, *efgh* and *ijkl*, and change on every page refresh. PROGNOSIS Web Session Recorder is able to dynamically retrieve the identifiers of the form and the fields it contains to instrument user interaction with the application. Many other products will not be able to deal with this level of complexity when attempting to instrument user activity with this web application.

Business challenges

Users complained the web application was slower than the console application, which is actually a Java applet in the web page.

The role of PROGNOSIS for Web Applications

PROGNOSIS was used to perform the same user transaction through the new HTML web application and the Java console applet, and compare transaction times. The web response time was ascertained by creating steps that emulated user activity in the HTML web application and rolling up the response times for each step to provide the cumulative transaction time. Similarly, response times collected when performing user activity in the Java applet console could be compared against the Java clock time. Java does not give responses, so PROGNOSIS Web Session Recorder measured the time taken to complete the transaction and showed the console to be faster. PROGNOSIS Web Session Recorder's ability to emulate user interaction with the web goes way beyond the ability to control just HTML, providing the ability to control Java applets as well as ActiveX controls and COM objects.

Scenario 7: Bulletin board and file transfer

This organization provides an online bulletin board providing users with the ability to log in, upload a file, have it processed and make it available for download.

The business challenges

The challenge for this business is to ensure availability and performance meet or exceed customer expectations.

The role of PROGNOSIS for Web Applications

PROGNOSIS Web Session Recorder can be used to emulate a user logging in, uploading a file, waiting until file processing is completed, downloading and archiving it.

Automated and timed file transfers

PROGNOSIS Web Session Recorder is able to offer some unique benefits, such as automating file upload and download, and testing the status of that action before continuing. Additionally the ability to maintain focus on a page and refresh it until it has completed updating ensures the process is emulated in a controlled manner.

Support for advanced web technologies

Scripts used to emulate user interaction with this site take advantage of PROGNOSIS Web Session Recorder's support for JavaScript, Regular Expressions and the ability to navigate by the HTML name of a link, as well as by using HTTP, HTTPS or JavaScript Requests.

Additionally the ability to use timers, perform validation checks and anticipate named browser windows to issue mouse clicks provide a highly sophisticated, robust and repeatable way to emulate a user's actions.

Precise performance monitoring

PROGNOSIS for Web Applications can monitor from a single location all the servers that are running web session scripts. They can be viewed by customized priority and application groups. In the event of a failure of a script or a component within a script, a notification can be emailed to people specified in groups such as night or day shift operators.

Summary

The scenarios in this document have identified a number of different types of web applications and how PROGNOSIS for Web Applications can instrument user interaction with those applications and provide performance and availability data.

Whether it is capturing web application interaction for a user booking a vacation package, executing an online trade, or downloading files from a secure bulletin board, PROGNOSIS for Web Applications will provide deep and specific visibility into the availability, performance, and behaviour of web applications.

To instrument user behaviour PROGNOSIS for Web Applications uses sophisticated techniques to incorporate user names and passwords from secure databases, and leverages advanced web functionality through its support of JavaScript and Regular Expressions.