Recovering user-browser interactions from HTTP logs of Rich Internet Applications

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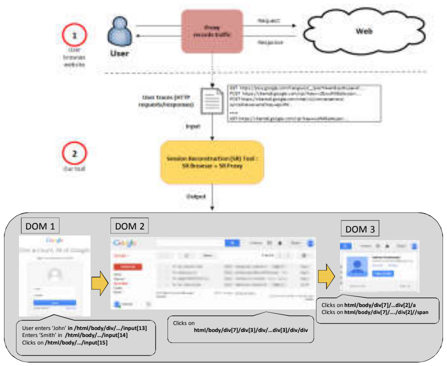
Introduction

In a Web Application, each user-session generates a series of HTTP requests and responses regardless of technology/device used.

It is beneficial to reconstruct user's session from HTTP traces for several reasons, including:

- **Forensics Analysis**: Analysis of usage logs of a security incident to find out how the attack happened.
- **Debugging**: Reconstruction of what user has done to reproduce the fault automatically after a user reports a bug.
- **Automatic Login**: Automatic learning of login action for crawlers.



User enters 'John' in **/html/body/div/.../input[13]**
Enters 'Smith' in **/html/body/.../input[14]**
Clicks on **/html/body/.../input[15]**

Clicks on **html/body/div[7]/div[3]/div/...div[3]/div/div**

Clicks on **html/body/div[7]/...div[2]/a**
Clicks on **html/body/div[7]/..../div[2]//span**

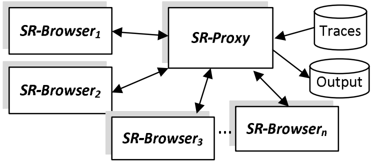
Methodology

We have developed **D-ForenRIA**, a session reconstruction (SR) tool which reconstructs user's session based on a set of previously recorded HTTP requests/responses.

D-ForenRIA has two components:

1- SR-Proxy: Responds to HTTP requests from SR-Browsers based on the traffic captured earlier. The SR-Proxy replaces the actual application server**.**

2- SR-Browsers: A set of browsers where each browser loads a page, selects and executes events on the DOM, and communicates with the SR-Proxy to rebuild the user session.



D-ForenRIA

Implementation:

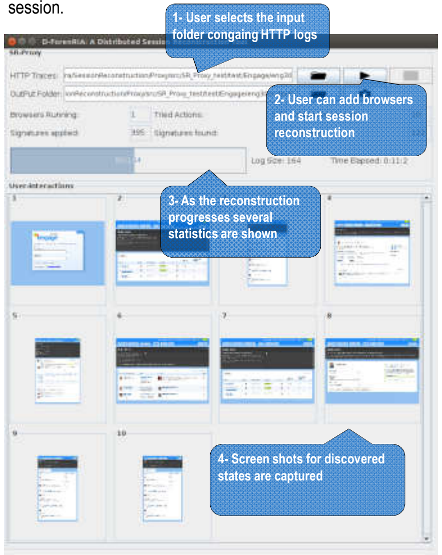
Based on our methodology, we have used the following technologies to implement D-ForenRIA:

SR-Browser relies on **Selenium** to execute JavaScript events and to get access to the current DOM of the application.

SR-Proxy was developed using **Java.**

Input and Output:

- **Input** is HTTP traces of user's previous session (Captured using Fiddler).
- **Output** is a series of DOMs and the XPath of the elements with which the user has interacted and provided inputs during the session.



1- User selects the input folder congaing HTTP logs

2- User can add browsers and start session reconstruction

3- As the reconstruction progresses several statistics are shown

4- Screen shots for discovered states are captured

Challenges and Solutions

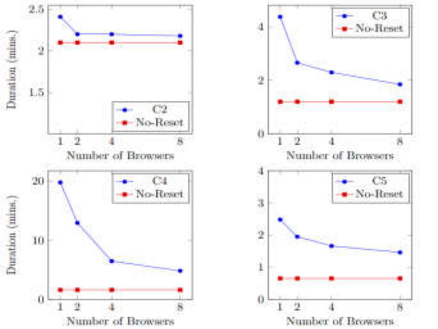
- **Finding the Next promising actions**: Considering a large number of possible events on each DOM, so a blind search is not practical. D-ForenRIA prioritizes "Actionable Elements " and it learns the "Signature" of Actions .
- **Random Parameters:** The SR-Proxy asks the SR-Browser to repeat the execution of actions generating random parameters in requests**.**
- **Timers :** The SR-Browser detects the existence of timers, timer handlers are being executed at the appropriate time.
- **JSON based User-inputs**: user-input interactions that encode data using JSON are detected by performing actions using sample data.
- **SSL Encrypted Websites:** A "man-in-the-middle" proxy has been added to decrypt requests and encrypt responses.
- **AJAX calls**: SR-Browser keeps track of sent requests and received responses. No event is selected/executed while we have pending requests.

Experiments

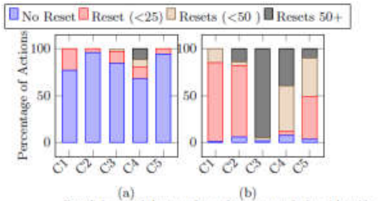
We have tested our tool on several Websites. Experimental results have shown that D-ForenRIA was able to handle different RIAs successfully.

Subject applications and characteristics of the recorded user-sessions

ID	Name	#Requests	#Actions	URL
C1	Elfinder	175	150	https://github.com/Studio-42/elFinder
C2	AltoroMutual	204	50	http://www.altoromutual.com/
C3	PeriodicTable	94	45	http://ssrg.site.uottawa.ca/apr5/success1/
C4	Engage	164	25	http://engage.calibreapps.com/
C5	TestRIA	74	31	http://ssrg.eecs.uottawa.ca/testbeds.html



Scalability of *D-ForenRIA* in different RIAs compared to the no-reset time.



Breakdown of the number of resets needed to identify a user-browser interaction in *D-ForenRIA* (a) and in the basic solution (b).

A demonstration of several experiments including sample inputs/outputs of the tool can be found on :

http://ssrg.site.uottawa.ca/sr/demo.html

Conclusion and Future Work

- We have presented a tool to reconstruct user-sessions from HTTP traces. It includes the ability to fill forms and works with SSL encrypted sites.
- In the future, we plan to improve the performance of D-ForenRIA and connect it to crawlers and testing tools.

Acknowledgments

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