Action Logger Overview

Action Logger is a standalone component of the Apromore project, which aims at capturing and recording all the user interactions with IT systems in the form of UI logs. Currently the tool covers Excel and Chrome web browser applications. It consists of two plugins, each listening to the corresponding application and the actual logging component that receives the information about preformed actions in the form of JSON objects, converts it into format suitable for process mining tools and saves it in the UI log in CSV format. In addition, there is also a clipboard listener component that is running on the backend and records all the copying events. The architecture of a tool is presented in Fig. 1:

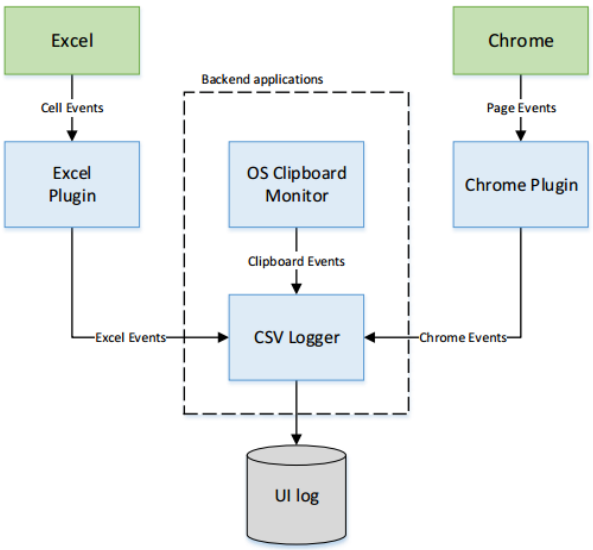

Fig. 1. Architecture of a tool

The tool is publicly available at https://github.com/apromore/RPA_UILogger and can be downloaded from https://github.com/apromore/RPA_UILogger/releases.

Installation (also available at https://youtu.be/YQlD44Z2v6A)

1) Install Node.js (https://nodejs.org/en/)
2) Download the newest version of Action Logger (https://github.com/apromore/RPA_UILogger/releases)
3) Unzip the downloaded file

To install Chrome plugin:

1) Open the browser and navigate to chrome://extensions
2) Turn on Developer Mode at the right top corner of the page
3) Select "*Load unpacked*" option and pick folder RPA_UILogger-*version*/PassiveListener
4) The Chrome plugin should appear on the right top corner of a browser
5) Check in the box in the plugin in order to set it in the recording mode

To install Excel plugin:

1) Navigate to *RPA_UILogger_version* folder
2) Right click *Excel_Addin* folder, select *Properties -> Sharing -> Share -> Share*
3) Copy the URL of the shared folder
4) Open Excel, go to *File -> Options -> Trust Center -> Trust Center Settings -> Trusted Add-in Catalogs*
5) Insert the copied URL into "Catalog URL" field and click "*Add catalog*"
6) Tick the "*Show in Menu*" box, then click "*OK*"
7) Select *Insert -> My Add-Ins -> Shared Folder -> Excel Passive Listener*

To run the logger:

1) Navigate to *RPA_UILogger_version* folder
2) Run *start_windows.bat* script (or start_linux.sh on Unix Operating systems)
3) In the opened console, specify the user ID and press ENTER
4) All the required dependencies will be installed
5) There will be two consoles opened – one for Excel listener and another for Chrome
6) The Excel plugin starts recording when you see "*Compiled successfully*" message
7) The Chrome plugin and the logging component starts recording when you see "*Action logger now recording*" message in another console window
8) The Chrome listener runs on http://localhost:8080
9) The Excel listener runs on http://localhost:3000
10) In Excel go to *Home -> Show Taskpane*, if the Excel listener is running, you should be able to see the content of a page http://localhost:3000 on the right hand side of Excel
11) Make sure both plugins are set in recording mode by ticking the corresponding checkboxes
12) The generated UI log is available at *RPA_UILogger_version/append_http* folder and is named *logs.csv*
13) The Action Logger appends all the new events to logs.csv file, so in case you want to generate a new log, rename the *logs.csv* file or take it out from the directory

Use Case

We will demonstrate the Action Logger in practice by recording the task of transferring the data from Excel spreadsheet to a form of a web-based information system.

We created an Excel spreadsheet and populated it with the users' contact data (full name, date of birth, phone number and email).

	A	B	C	D
1	**Full Name**	**Date of birth**	**Phone number**	**Email**
2	John Doe	11/03/1986	+61 039 689 9324	jdoe@gmail.com
3	Albert Rauf	11/04/1986	+61 043 512 4834	arauf@gmail.com
4	Steven Richards	18/06/1986	+61 035 376 0669	srichards@gmail.com
5	Gerard Dubois	08/04/1987	+61 043 532 6105	gdubois@gmail.com
6	Audrey Backer	20/06/1987	+61 519 790 1066	abacker@gmail.com
7	Carl Gustafsson	01/08/1987	+61 043 587 1823	cgustafsson@gmail.com
8	Sarah Johnson	25/03/1989	+61 035 341 2938	sjohnson@gmail.com
9	Andrea Bolzano	22/07/1989	+61 031 023 0066	abolzano@gmail.com
10	Hannah Dietmeier	12/07/1990	+61 072 237 8681	hdietmeier@gmail.com
11	Igor Honchar	28/03/1992	+61 096 826 1262	ihonchar@gmail.com
12	Oliver Dunkan	04/08/1994	+61 079 149 3015	odunkan@gmail.com
13	Terry Klint	23/08/1994	+61 035 390 4126	tklint@gmail.com
14	Volodymyr Leno	17/10/1994	+61 096 652 4777	vleno@gmail.com
15	William Macdonald	19/06/1995	+61 814 239 7588	wmacdonald@gmail.com
16	Jorge Canales	07/09/1997	+61 778 961 4150	jcanales@gmail.com
17	Thomas Taylor	31/01/1998	+61 036 270 0025	ttaylor@gmail.com
18	Jack Brown	09/03/1998	+61 074 503 4635	jbrown@gmail.com
19	Cristina Esposito	21/05/1996	+61 031 450 9254	cesposito@gmail.com
20	Amelia Wilson	25/06/1993	+61 035 349 4724	awilson@gmail.com

Fig. 2. Extract from an Excel spreadsheet containing users' contact data

We used Zoho Online Form Builder to generate the following form:

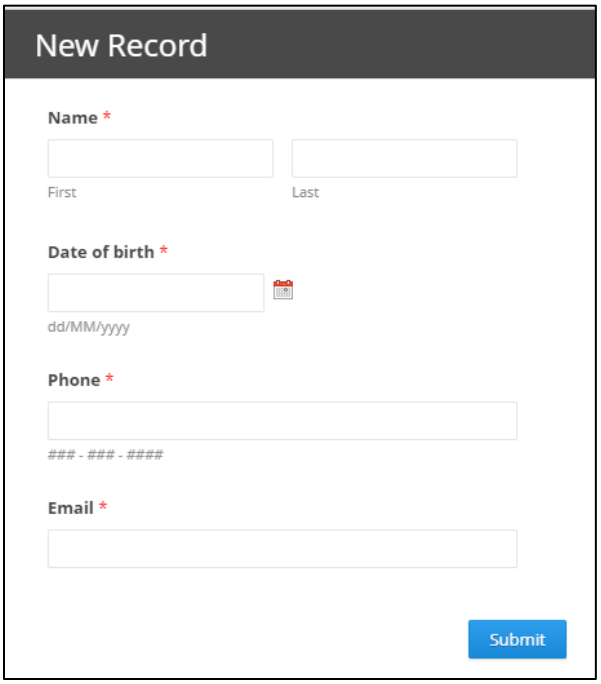

Fig. 3. Web form

Let us run the Action Logger and record the copying of the first entry in Excel spreadsheet. The following UI log will be generated:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	timeStamp	userID	targetApp	eventType	url	content	target.workbookName	target.sheetName	target.id	target.class	target.tagName	target.type	target.name	target.value	target.innerText
2	2019-06-11T05:17:23.108Z	vleno	Excel	getCell			StudentRecords.xlsx	Sheet1	A2					John Doe	
3	2019-06-11T05:17:24.058Z		OS-Clipboard	copy		John Doe									
4	2019-06-11T05:17:26.424Z	vleno	Chrome	clickTextField							INPUT	text	Name_First		
5	2019-06-11T05:17:26.839Z	vleno	Chrome	paste		John Doe					INPUT	text	Name_First		
6	2019-06-11T05:17:28.384Z	vleno	Chrome	editField							INPUT	text	Name_First	John	
7	2019-06-11T05:17:28.463Z	vleno	Chrome	clickTextField							INPUT	text	Name_Last		
8	2019-06-11T05:17:28.783Z	vleno	Chrome	paste		John Doe					INPUT	text	Name_Last		
9	2019-06-11T05:17:31.072Z	vleno	Chrome	editField							INPUT	text	Name_Last	Doe	
10	2019-06-11T05:17:35.817Z		OS-Clipboard	copy		11/03/1986									
11	2019-06-11T05:17:38.458Z	vleno	Chrome	clickTextField					Date-date		INPUT	text	date		
12	2019-06-11T05:17:38.911Z	vleno	Chrome	paste		11/03/1986			Date-date		INPUT	text	date		
13	2019-06-11T05:17:39.661Z	vleno	Chrome	editField					Date-date		INPUT	text	date	11/03/1986	
14	2019-06-11T05:17:35.715Z	vleno	Excel	getCell			StudentRecords.xlsx	Sheet1	B2					11/03/1986	
15	2019-06-11T05:17:43.194Z	vleno	Excel	getCell			StudentRecords.xlsx	Sheet1	C2					+61 039 689 9324	
16	2019-06-11T05:17:43.322Z		OS-Clipboard	copy		+61 039 689 9324									
17	2019-06-11T05:17:44.822Z	vleno	Chrome	clickTextField					PhoneNumber		INPUT	text	countrycode		
18	2019-06-11T05:17:45.223Z	vleno	Chrome	paste		+61 039 689 9324			PhoneNumber		INPUT	text	countrycode		
19	2019-06-11T05:17:50.473Z	vleno	Chrome	editField					PhoneNumber		INPUT	text	countrycode	039-689-9324	
20	2019-06-11T05:17:53.904Z		OS-Clipboard	copy		jdoe@gmail.com									
21	2019-06-11T05:17:55.670Z	vleno	Chrome	clickTextField							INPUT	text	Email		
22	2019-06-11T05:17:56.215Z	vleno	Chrome	paste		jdoe@gmail.com					INPUT	text	Email		
23	2019-06-11T05:17:57.488Z	vleno	Chrome	editField							INPUT	text	Email	jdoe@gmail.com	
24	2019-06-11T05:18:05.368Z	vleno	Chrome	clickButton							BUTTON	submit		submit	Submit
25	2019-06-11T05:18:06.533Z	vleno	Chrome	link	https://forms.										
26	2019-06-11T05:17:53.827Z	vleno	Excel	getCell			StudentRecords.xlsx	Sheet1	D2					jdoe@gmail.com	

Fig. 4. Generated UI log

The generated log is unordered and contains operational system events related to clipboard. This log can be optimized by applying semantic filterer, the auxiliary tool that we developed for the action logger. This tool is available at https://github.com/apromore/RPA_SemFilter. To get filtered log perform the following set of commands:

1) Put the target UI log in the same folder with RPA_SemFilter.exe file
2) Select the log and drop it onto RPA_SemFilter.exe
3) The tool will automatically remove all redundant events and generate the file *targetLog_filtered.csv*

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	timeStamp	userID	targetApp	eventType	url	content	target.workbookName	target.sheetName	target.id	target.class	target.tagName	target.type	target.name	target.value	target.innerText
2	2019-06-11T05:17:24.058Z	vleno	Excel	copyCell		John Doe	StudentRecords.xlsx	Sheet1	A2					John Doe	
3	2019-06-11T05:17:26.839Z	vleno	Chrome	paste		John Doe					INPUT	text	Name_First		
4	2019-06-11T05:17:28.384Z	vleno	Chrome	editField							INPUT	text	Name_First	John	
5	2019-06-11T05:17:28.783Z	vleno	Chrome	paste		John Doe					INPUT	text	Name_Last		
6	2019-06-11T05:17:31.072Z	vleno	Chrome	editField							INPUT	text	Name_Last	Doe	
7	2019-06-11T05:17:35.817Z	vleno	Excel	copyCell		11/03/1986	StudentRecords.xlsx	Sheet1	B2					11/03/1986	
8	2019-06-11T05:17:38.911Z	vleno	Chrome	paste		11/03/1986			Date-date		INPUT	text	date		
9	2019-06-11T05:17:39.661Z	vleno	Chrome	editField					Date-date		INPUT	text	date	11/03/1986	
10	2019-06-11T05:17:43.322Z	vleno	Excel	copyCell		+61 039 689 9324	StudentRecords.xlsx	Sheet1	C2					+61 039 689 9324	
11	2019-06-11T05:17:45.223Z	vleno	Chrome	paste		+61 039 689 9324			PhoneNumber		INPUT	text	countrycode		
12	2019-06-11T05:17:50.473Z	vleno	Chrome	editField					PhoneNumber		INPUT	text	countrycode	039-689-9324	
13	2019-06-11T05:17:53.904Z	vleno	Excel	copyCell		jdoe@gmail.com	StudentRecords.xlsx	Sheet1	D2					jdoe@gmail.com	
14	2019-06-11T05:17:56.215Z	vleno	Chrome	paste		jdoe@gmail.com					INPUT	text	Email		
15	2019-06-11T05:17:57.488Z	vleno	Chrome	editField							INPUT	text	Email	jdoe@gmail.com	
16	2019-06-11T05:18:05.368Z	vleno	Chrome	clickButton							BUTTON	submit		submit	Submit
17	2019-06-11T05:18:06.533Z	vleno	Chrome	link	https://forms.										

Fig. 5. Simplified UI log

Finally, we can build a model that describes a process recorded in the log. We will use the Apromore tool to do this.

1) Go to the cloud-based version of Apromore available at http://apromore.cis.unimelb.edu.au/
2) Select *Discover -> CSV Importer -> Import File*
3) Select a corresponding UI log
4) Assign the following roles to the attributes:
   - timeStamp – End timestamp (use the following parsing format: “yyyy-MM-dd'T'HH:mm:ss.SSS”)

- eventType – Activity
- userID – Case ID (at this moment the Action Logger does not assign events to specific case)

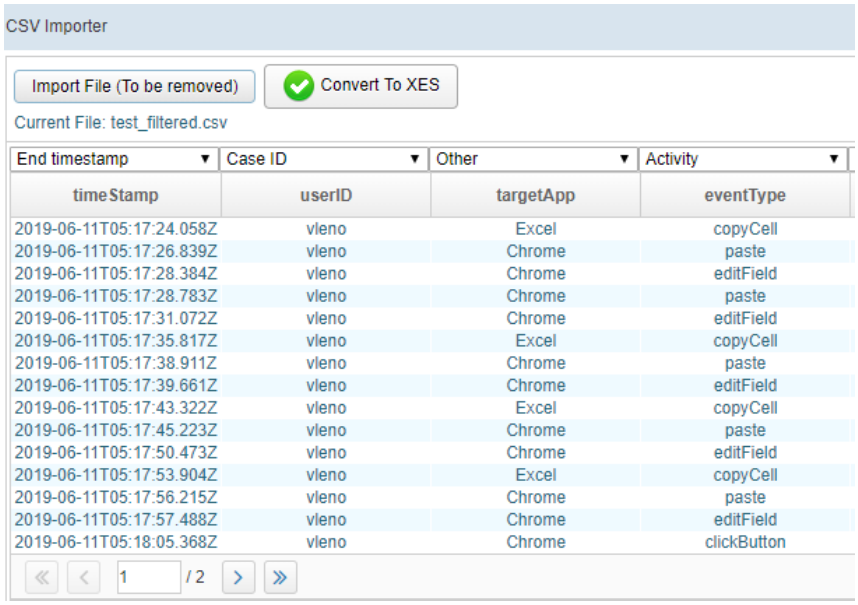

Fig. 6. Importing the generated UI log

5) Select *Convert to XES*
6) The corresponding file of XES format will be created and can be found in the currently active folder
7) Double click on the generated XES file to see the preview of a discovered model

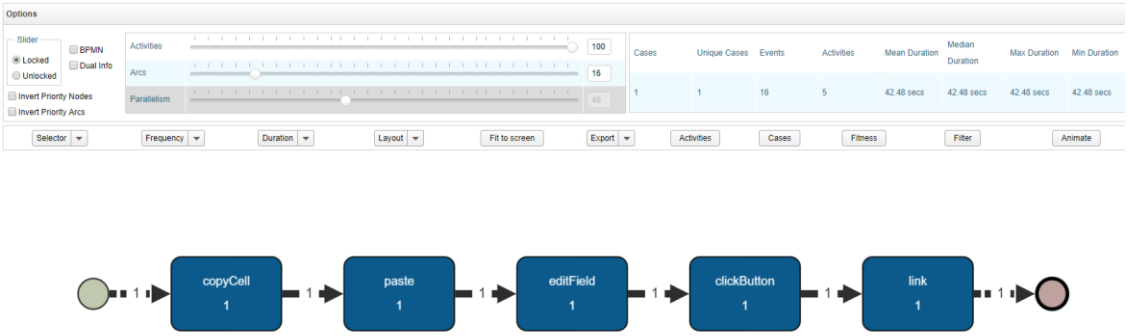

Fig. 7. The model discovered from the generated UI log

8) Currently the case frequency is displayed. You can switch to cumulative frequency by selecting *Frequency -> Cumulative*

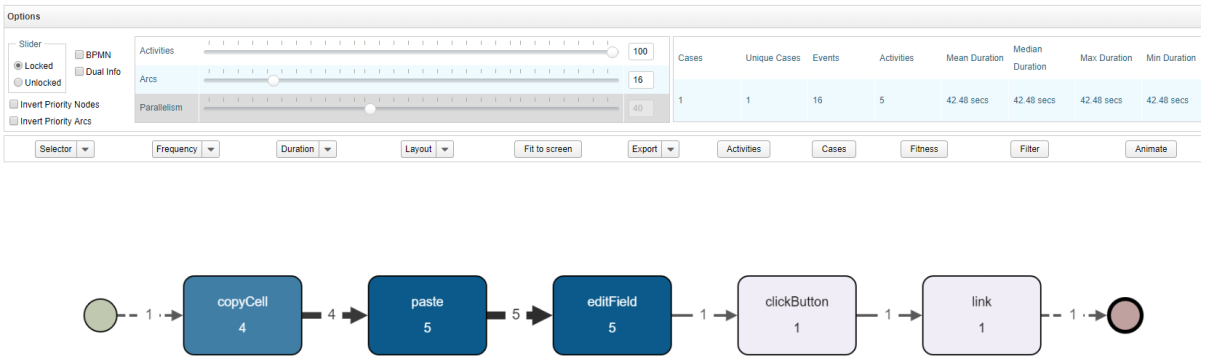

Fig. 8. The discovered model showing cumulative frequency

9) You can look at the full model by moving the Arcs slider to maximum

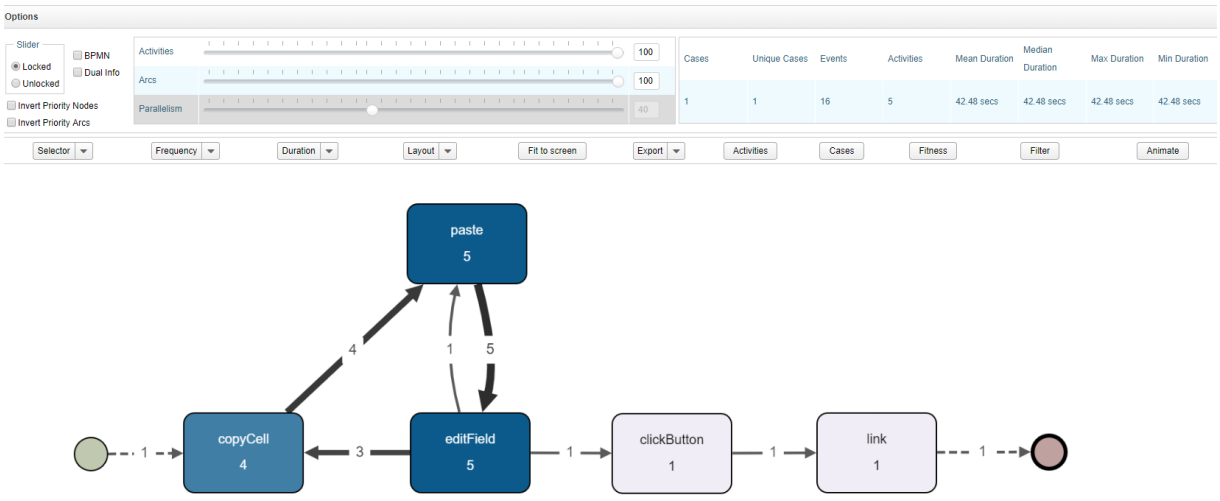

Fig. 9. The discovered model showing all the arcs in a process