An Efficient and Usable Client-Side Cross Platform Compatible Phishing Prevention Application

FIRST REVIEW

Guide
Dr. Angelin Gladston
Associate Professor
Department of CSE

Submitted by
N. Dhanush 2016103021
G. Santhosh 2016103057
S. Ben Stewart 2016103513

OUTLINE

1. INTRODUCTION
2. OVERALL OBJECTIVE
3. LITERATURE SURVEY
4. PROPOSED SYSTEM
5. HIGH LEVEL BLOCK DIAGRAM
6. MODULE LIST
7. IMPLEMENTATION
8. EVALUATION METRICS
9. REFERENCES

INTRODUCTION

- Phishing
- Lists of such sites
- Time constraints
- Computational resources
- Vulnerabilities
- Cross platform

OVERALL OBJECTIVE

- Create a phishing list
- Cross Platform application
- Web browser add-on
- Provide temporal resilience
- Remove false positives from list

LITERATURE SURVEY

- Previous work by Samuel Marchal, Giovanni Armano, Tommi Grondahl, Kalle Saari, Nidhi Singh, and N. Asokan
- IEEE Trans. Comput., vol. 66, no. 10, pp. 1717-1733, Oct. 2017
- Implemented a client-side phishing prevention application.
- Had background tasks communicate with a browser add-on.
- Not platform independent.

AUTOMATIC PHISHING CLASSIFICATION

- Colin Whittaker, Brian Ryner and Marria Nazif for Google
- Proc. Netw. Distrib. Syst. Security Symp., 2010
- Features used
    1. The URL of the page
    2. The HTML page contents
    3. The host server details
- Needs blacklist updating.

CANTINA

- Guang Xiang, Jason Hong, Carolyn P. Rose and Lorrie Cranor
- ACM Trans. Inf. Syst. Secur., 2011
- Page similarity
- SHA 1 algorithm
- Easy to break
- Performance gains

AUTO UPDATED WHITELIST

- Ankit Kumar Jain and B. B. Gupta
- EURASIP J. Inf. Secur., vol. 2016, no. 1, Dec. 2016
- Whitelist
  a. the domain name
  b. the IP address
- Reverts to old system if not in whitelist

FUZZY ROUGH SET FEATURE SELECTION TO ENHANCE PHISHING ATTACK DETECTION

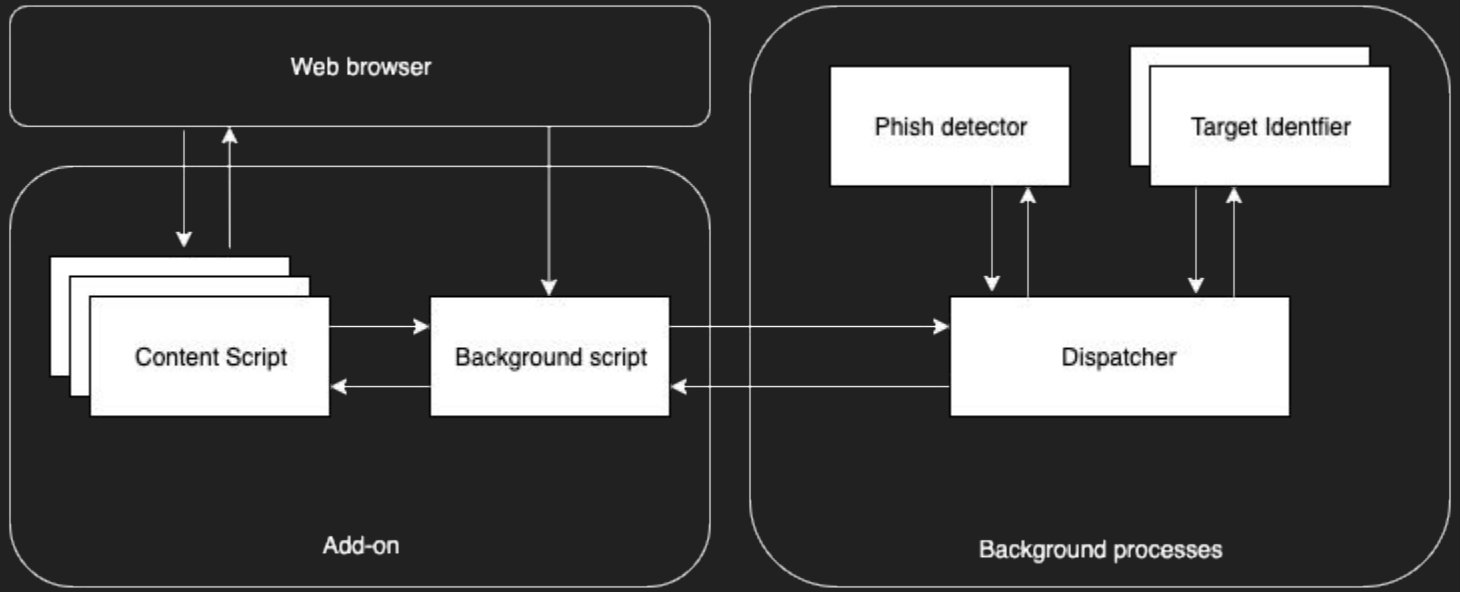
- Mahdieh Zabihimayvan and Derek Doran
- IEEE International Conference on Fuzzy Systems, June 2019
- Fuzzy Rough Set (FRS) theory
- Feature selection algorithm
- Random Forest classification
- No third party features

Paper	Journal/Conf. , Year	Contributions	Limitations
Large-Scale Automatic Classification of Phishing Pages	Proc. Netw. Distrib. Syst. Security Symp., 2010	Machine learning model can be used with reliable accuracy.	Needs blacklist for updating.
CANTINA: A feature-rich machine learning framework for detecting phishing Web sites	ACM Trans. Inf. Syst. Secur., 2011	SHA1 based similarity check for similar looking sites.	SHA1 could be manipulated.
A novel approach to protect against phishing attacks at client side using auto-updated white-list	EURASIP J. Inf. Secur., vol. 2016, no. 1, Dec. 2016	Auto-updated whitelist for faster detection of sites on average.	Not temporally resilient.
Fuzzy Rough Set Feature Selection to Enhance Phishing Attack Detection	IEEE International Conference on Fuzzy Systems, June 2019	Feature selection.	Not a user oriented application.

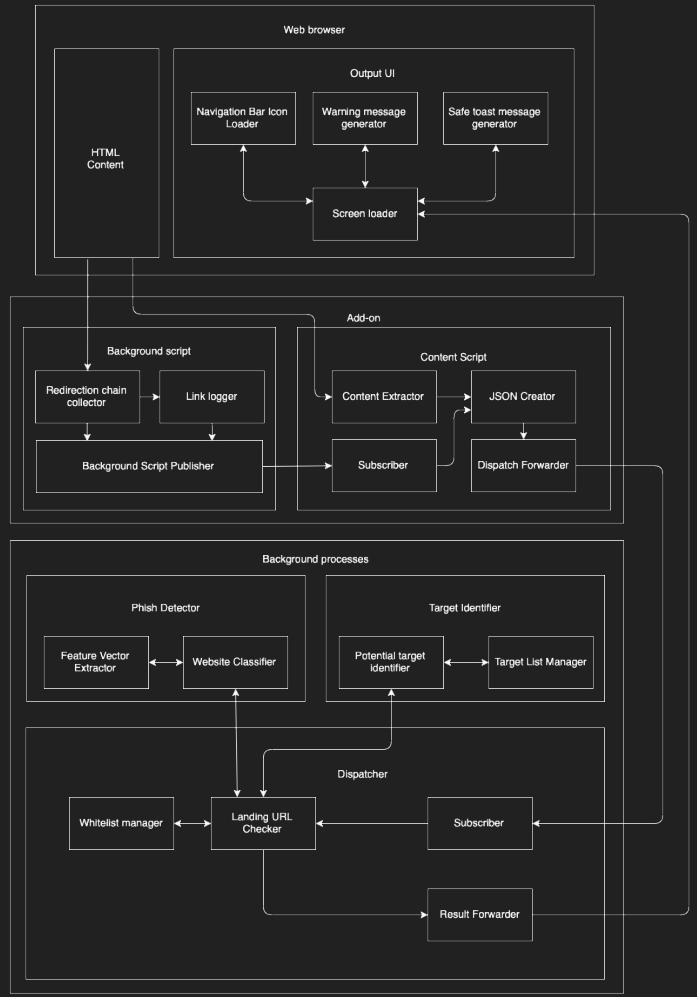
PROPOSED SYSTEM

- Platform independent
- Browser add-on
- Reduce false warnings
- Context independent detection
- Static observations

SYSTEM ARCHITECTURE



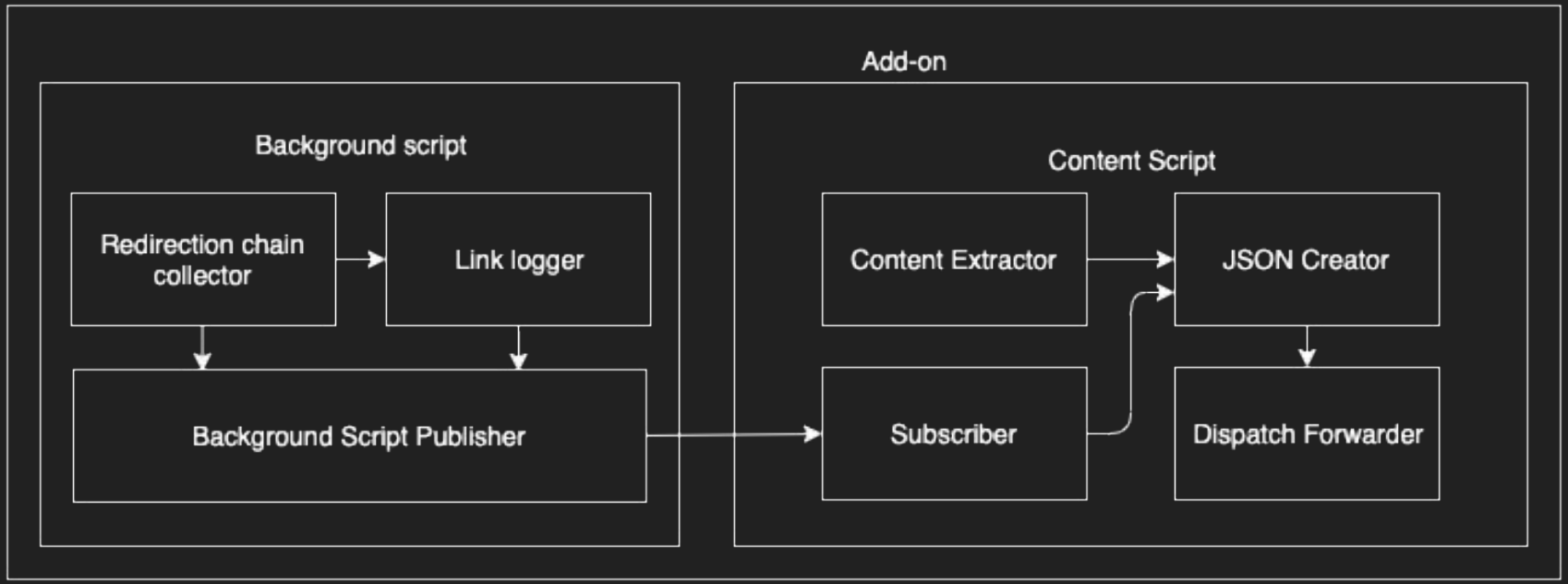
HIGH LEVEL BLOCK DIAGRAM



MODULE LIST

- Add on
  a. Background script
  b. Content script
- Background process
  a. Dispatcher
  b. Phish Detector
  c. Target Identifier
- Web Browser
  a. HTML content
  b. Output UI

ADD-ON


Add-on
Background script
Redirection chain collector
Link logger
Background Script Publisher
Content Script
Content Extractor
JSON Creator
Subscriber
Dispatch Forwarder

BACKGROUND SCRIPT

Begin

For each page load redirect

Add listener to that event

Get the list of redirects from listener

If page is fully loaded

Send the list of redirects to content script

Done

End

CONTENT SCRIPT

Begin

For each page load redirect

If page is fully loaded

Get the URL from the tab

Get the HTML content from innerHTML tag

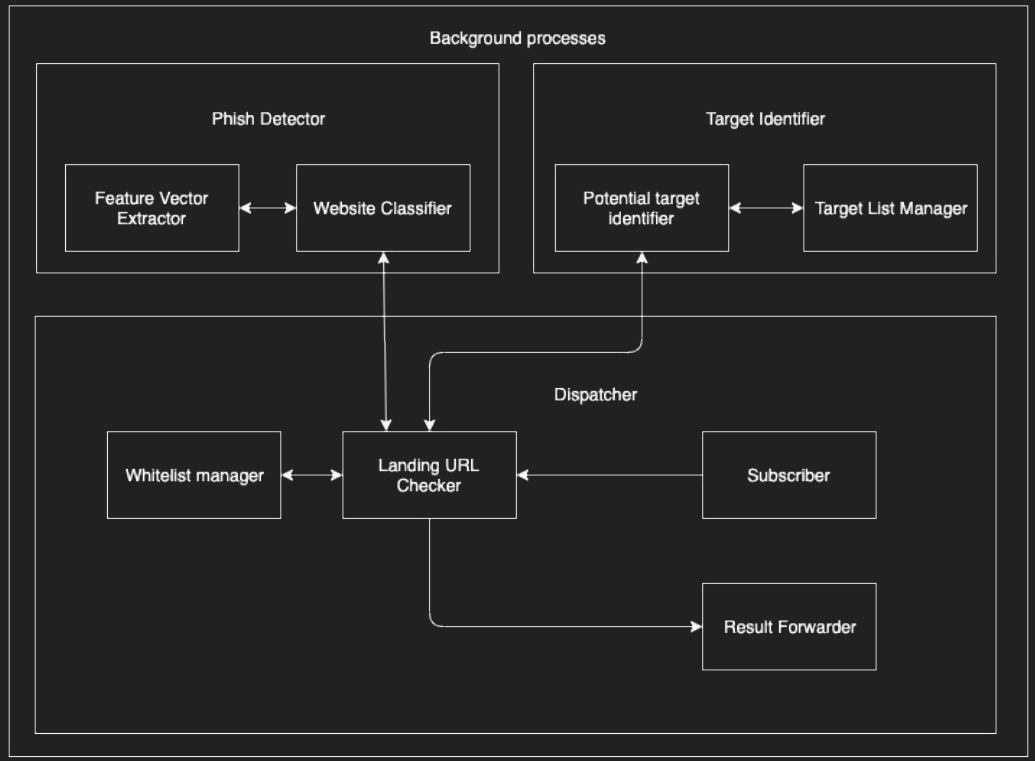
Get redirection list from background script

Send them to the background process

Done

End

BACKGROUND PROCESS



DISPATCHER

Begin
If page address is in whitelist
Send the GREEN signal
Else
Send content to phish detector
Get results from phish detector
If phish is FALSE
Send the GREEN signal
Else
Send the RED signal
Send content to target identifier
If target is found
Publish target
Else
No target matched
End

PHISH DETECTOR

Begin

For each page URL

Get the feature values for the URL

Load the saved model

Publish the result

Done

End

TARGET IDENTIFIER

Begin

Get the hash value for page content

Compare with values in hash list

If match

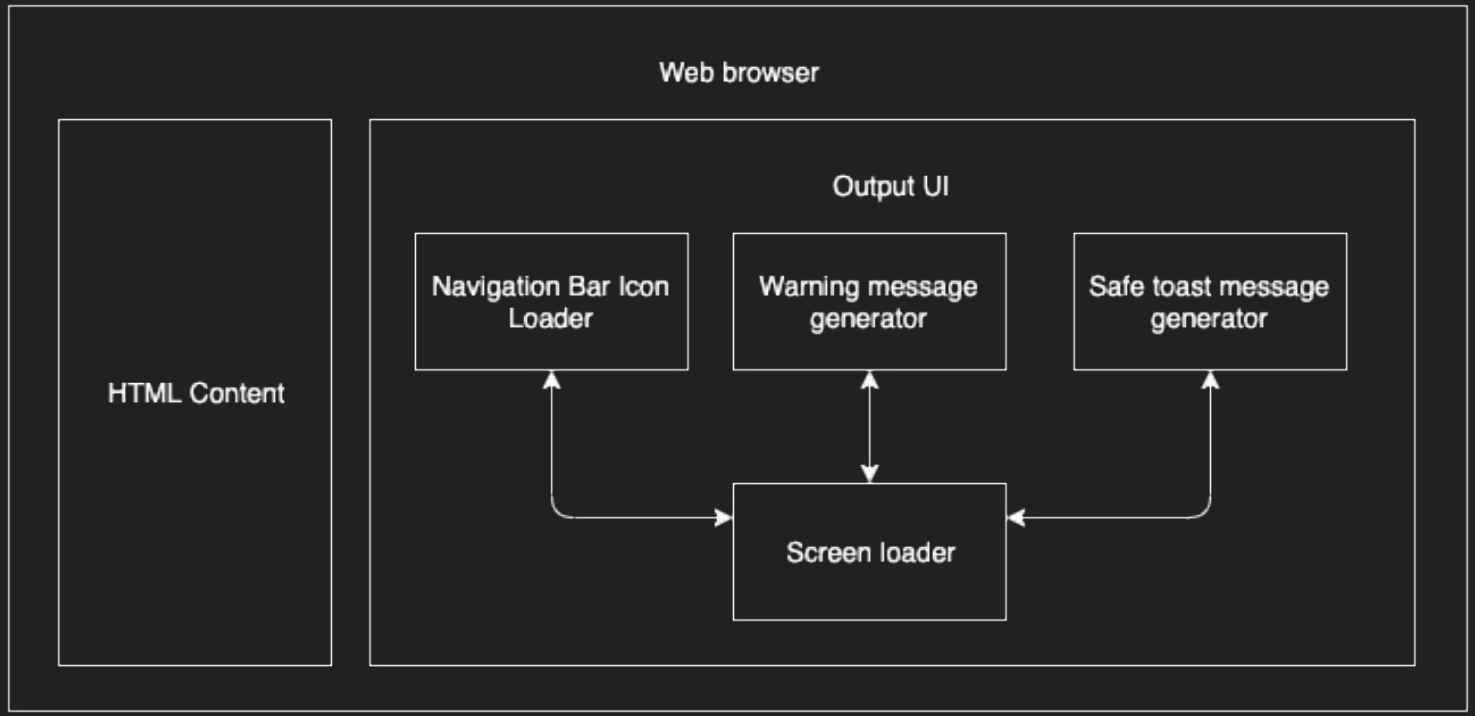
Display target

Else

No target found

End

WEB BROWSER


Web browser
HTML Content
Output UI
Navigation Bar Icon Loader
Warning message generator
Safe toast message generator
Screen loader

OUTPUT UI

Begin

If site is phish

Change icon to red

Display warning message

If site has target

Display target link

Else

Display no target

Else

Change icon to green

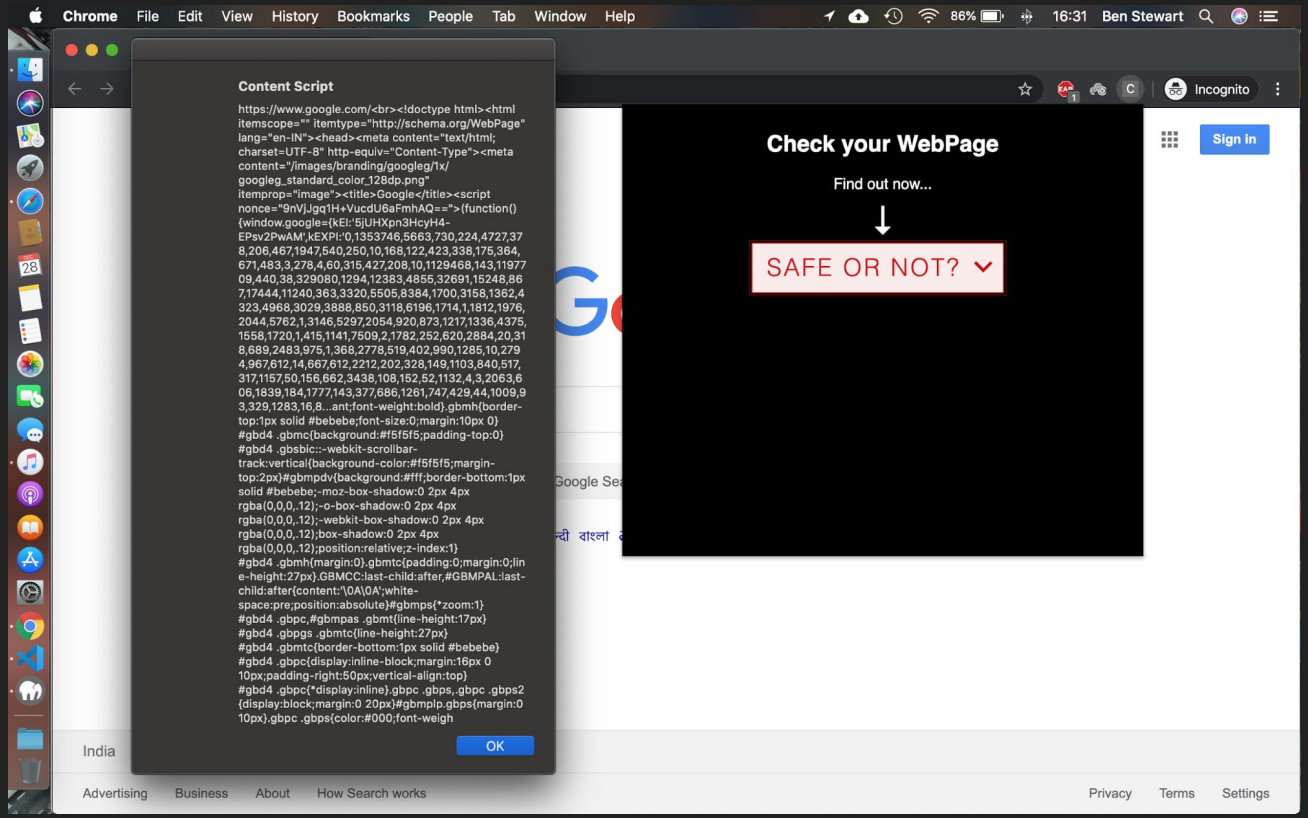
Display safe to proceed message

End

IMPLEMENTATION

- CONTENT SCRIPT
- BACKGROUND SCRIPT

CONTENT SCRIPT

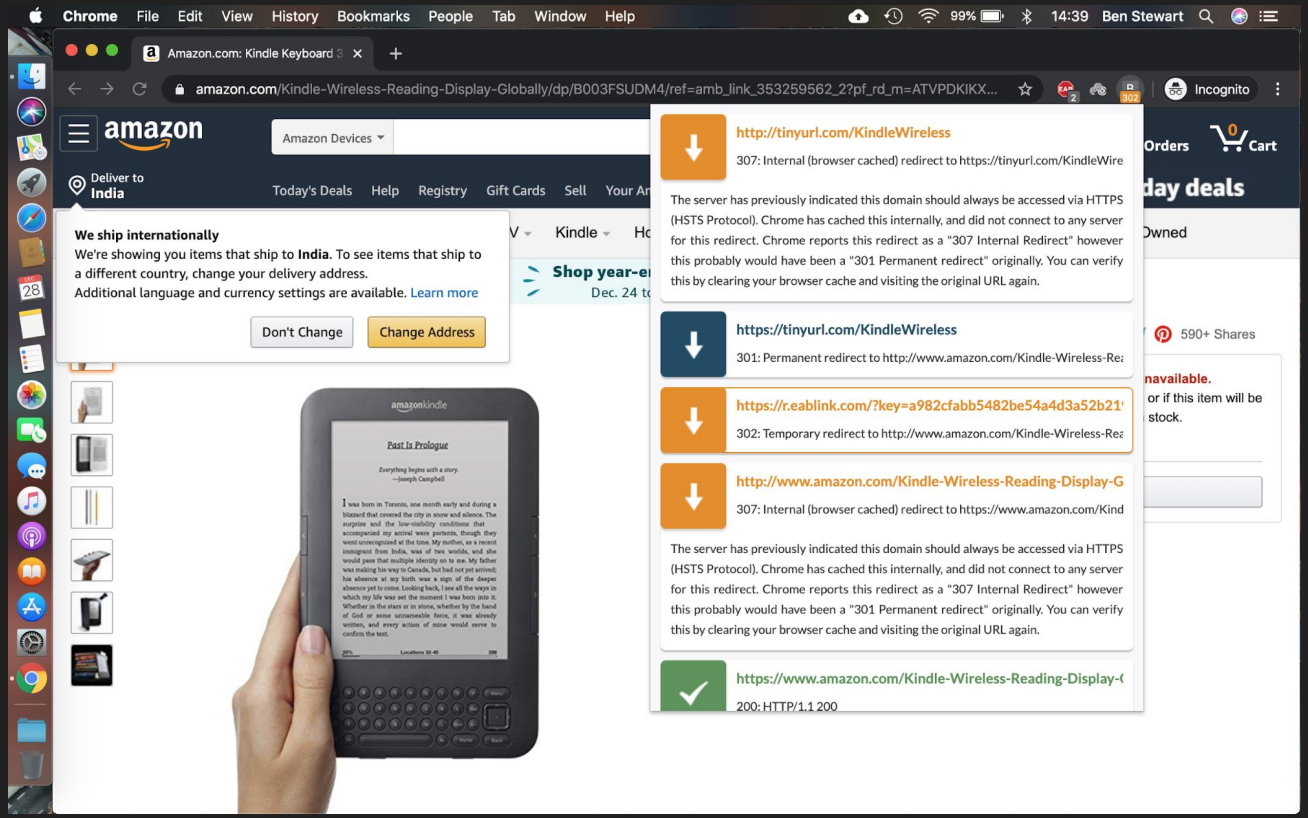


CONTENT SCRIPT

```
//Retrieve URL JS
tablink = tab.url;

//Retrieve Page content PHP
$site=$_POST['url'];
$html = file_get_contents($site);
```

BACKGROUND SCRIPT



BACKGROUND SCRIPT

```
//URL path item
url: pathItem.url,
status: pathItem.status_line,
redirect_type: pathItem.redirect_type,
redirect_url: pathItem.redirect_url,
meta_timer: pathItem.meta_timer
```

EVALUATION METRICS

1. Phish detection accuracy
2. Target detection ratio
3. Memory usage profiling
4. Addon rendering time
5. Temporal resilience accuracy

REFERENCES

1. Mahdieh Zabihimayvan and Derek Doran, "Fuzzy Rough Set Feature Selection to Enhance Phishing Attack Detection", IEEE International Conference on Fuzzy Systems, June 2019.
2. S. Marchal, G. Armano, T. Gröndahl, K. Saari, N. Singh, N. Asokan, "Off-the-hook: An efficient and usable client-side phishing prevention application", IEEE Trans. Comput., vol. 66, no. 10, pp. 1717-1733, Oct. 2017.
3. A. K. Jain, B. B. Gupta, "A novel approach to protect against phishing attacks at client side using auto-updated white-list", EURASIP J. Inf. Secur., vol. 2016, no. 1, Dec. 2016.
4. G. Xiang, J. Hong, C. P. Rosé, L. Cranor, "CANTINA: A feature-rich machine learning framework for detecting phishing Web sites", ACM Trans. Inf. Syst. Secur., vol. 14, no. 2, 2011.
5. Implementation for the Usage of Google Safe Browsing APIs (v4), 2019, [online] Available: https://github.com/google/safebrowsing.
6. C. Whittaker, B. Ryner, and M. Nazif, “Large-scale automatic classification of phishing pages,” in Proc. Netw. Distrib. Syst. Security Symp., 2010, pp. 1–14.