

# Leaky Forms: A Study of Email and Password Exfiltration Before Form Submission

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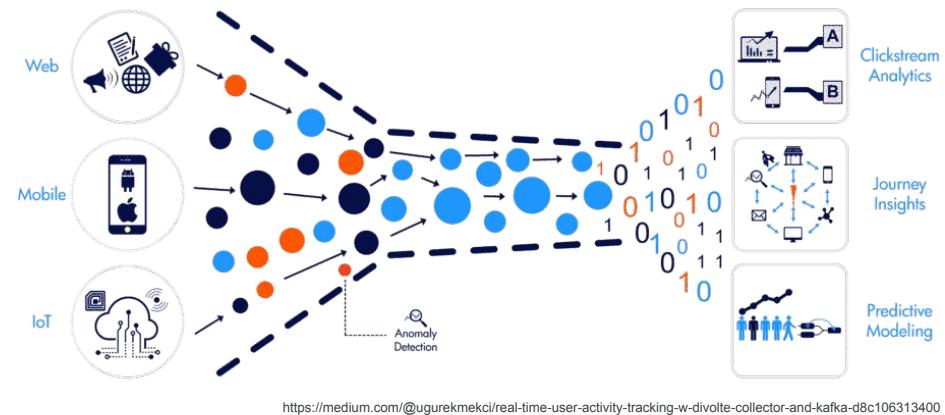
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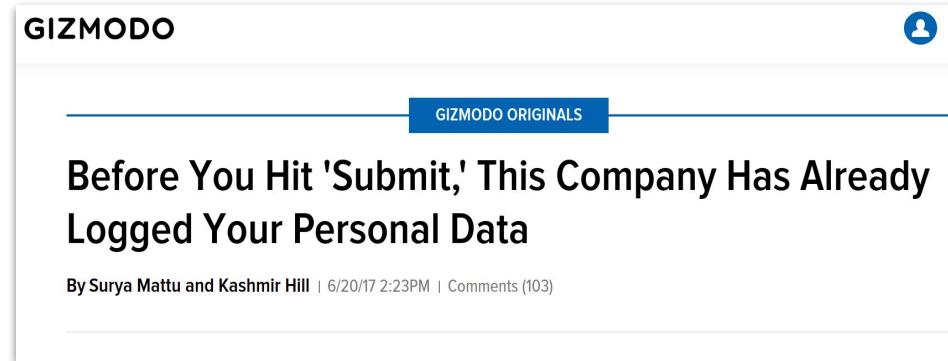
# Background

- Websites use advertising and marketing for monetization
  - built-in anti-tracking countermeasures
  - potential third-party cookie phase-out
- Tracking by email addresses
  - persistent, cross-site, cross-platform



# Motivation

- PII collection before form submission on a mortgage calculator website (Gizmodo, 2017)
- A 2018 survey (n=502):
  - 81% abandoned forms at least once
  - 59% abandoned a form in the last month



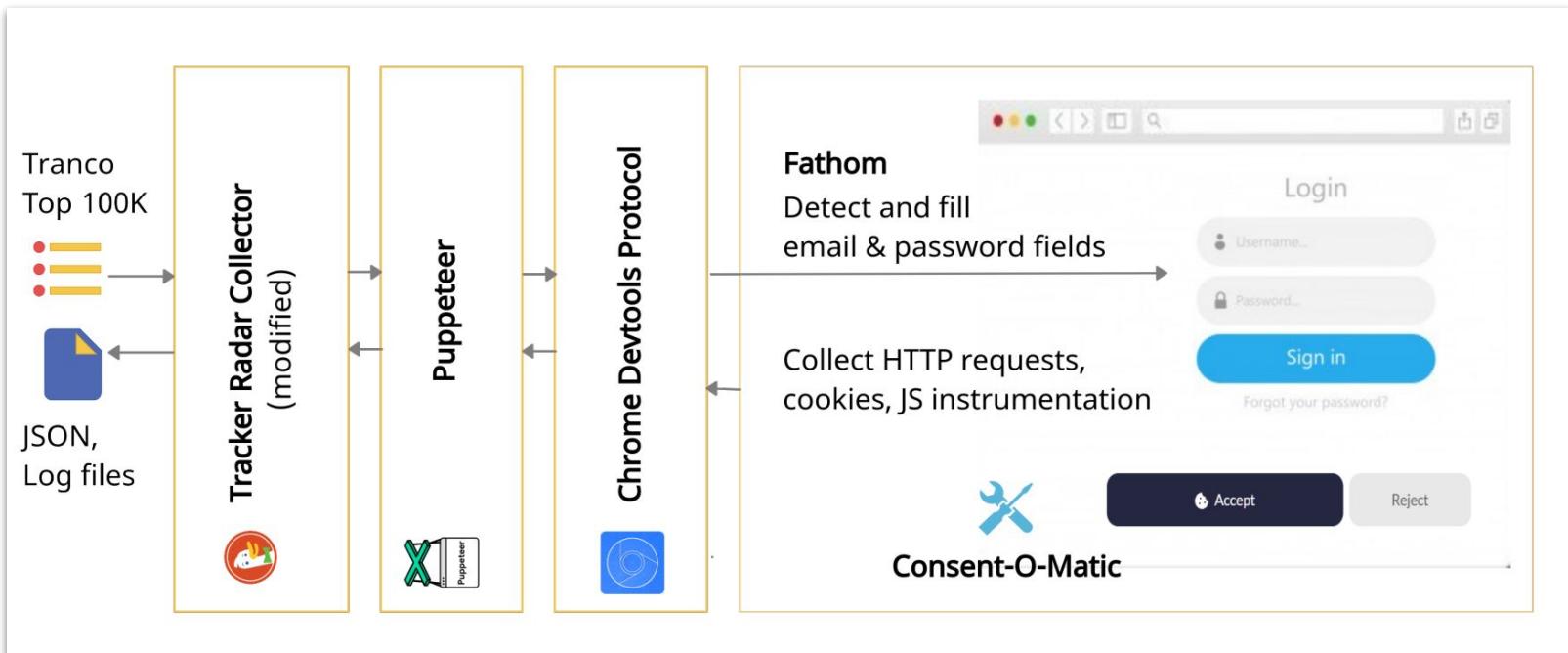
# Study Objectives

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- Measure email and password collection prior to form submission
  - effect of location: EU vs. US
  - effect of consent
  - mobile vs. desktop

# Method – Web Crawler

- Built on Tracker Radar Collector (developed by DuckDuckGo)



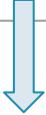
# Crawls (May, June 2021)

Crawl Option	EU				US			
	no-action	accept-all	reject-all	mobile	no-action	accept-all	reject-all	mobile
Crawled URLs	100K	7,720	7,720	100K	100K	7,720	7,720	100K
Visited websites	99,380	7,716	7,716	99,363	99,437	7,714	7,716	99,409
Crawled pages	625,143	44,752	40,385	597,791	690,394	51,735	49,260	668,848

> 2.8 million pages

# Results

	Email		Password	
	EU	US	EU	US
Websites where we filled	52,055	53,038	31,002	31,324
Leaks to 1st party	4,395	5,518	89	92
Leaks to 3rd party	2,633	3,790	87	87
Leaks to trackers	1,844	2,950	48	49



## How did we label them?

By using blocklists such as Easylist, EasyPrivacy

+ Manual labeling: Discovered **41** unlisted tracker domains

# Prominent Tracker Domains

EU			US		
Name	Domain	Num Sites	Name	Domain	Num Sites
Taboola	taboola.com	327	LiveRamp	rlcdn.com	524
FullStory	fullstory.com	182	Taboola	taboola.com	383
Adobe	bizable.com	160	Adobe	bizable.com	191
Yandex	yandex.com	121	BounceX	bouncex.net	189
Awin	awin1.com	113	Awin	awin1.com	119
	zenaps.com	112		zenaps.com	118

**Taboola Ads****Getting Started****Create & Manage Great Campaigns** ▾[Create A New Campaign](#)[Edit Campaigns](#)**Campaign Targeting Options** ▾[Send your 1st Party Audiences  
via DMP or MMP](#)

# Lookalike Targeting

Look-alike models are used to increase scale by finding new people likely to be interested in your business because they resemble existing customers.

Use your CRM data to create lookalike audiences on Taboola! You can upload either a customer list of hashed email addresses, mobile device IDs, or 5 digit US zip codes and Taboola's predictive engine will find similar users that are more likely to convert based on the assumption that these users will be "like" your current customers in your database.

Visit our Advertiser Data Use Policy [here](#).

## Search

## Getting Started

[Glossary of All Terms](#)[Doc Site Tips](#)

## LaunchPad

## Authenticated Traffic Solution

## Registration Manager

## Privacy Manager

## PreferenceLink

## Release Notes and System Information

4

If you selected a method that includes On-page detection, use the Start Detecting Identifier on dropdown to choose the listener event type for when ATS needs to actually detect the identifier on the website:

- **Click event:** [Click event](#) will fire off whenever a specified element is clicked (enter these elements in the Trigger Elements field).
- **Submit Event:** [Submit event](#) will fire off whenever a specified form is submitted (enter these elements in the Trigger Elements field).

**Note**

Trigger Elements are CSS selectors to define elements on which the event will be triggered. For examples: #button-id-click or #form-id. As shown in the examples, the given value should start with a hash #. In order to configure Trigger Elements it is recommended to add a CSS ID of html elements to your forms.

- **Blur Event:** [Blur event](#) will fire off whenever a specified input field loses focus for example when a user clicks outside of the input field.

**Warning**

The 'Blur Event' method doesn't require human interaction for identifiers to be obtained, while other methods require users to click on a button such as "Submit" or "Ok". To your users, this may give the perception that malicious activities are happening in the background, which is not the case because ATS.js will only start detection with proper consent in place.

Blur Event detection also leaves room for incorrect identifiers because it will not wait for actions from the user like clicking on a login button. For these reasons, we recommend using On Click or On Submit method instead.

# Top ten websites

EU			US		
Rank	Website	3rd-party	Rank	Website	3rd-party
154	usatoday.com*	taboola.com	95	issue.com	taboola.com
242	trello.com*	bizable.com	128	businessinsider.com	taboola.com
243	independent.co.uk*	taboola.com	154	usatoday.com	taboola.com
300	shopify.com	bizable.com	191	time.com	bouncex.net
328	marriott.com	glassboxdigital.io	196	udemy.com udemy.com	awin1.com
567	newsweek.com*	rlcdn.com			zenaps.com
705	prezi.com	taboola.com	217	healthline.com	rlcdn.com
754	branch.io*	bizable.com	34	foxnews.com	rlcdn.com
1,153	prothomalo.com	facebook.com	242	trello.com*	bizable.com
1,311	codecademy.com	fullstory.com	278	theverge.com	rlcdn.com
1,543	azcentral.com*	taboola.com	288	webmd.com	rlcdn.com

\*: Not reproducible anymore as of February 2022.

# Website Categories

EU/US		EU		US	
Categories	Sites	Filled sites	Leaky sites	Filled sites	Leaky sites
Fashion/Beauty	1,669	1,176	131 (11.1%)	1,179	224 (19.0%)
Online Shopping	5,395	3,658	345 (9. %)	3,744	567 (15.1%)
General News	7,390	3,579	235 (6.6%)	3,848	392 (10.2%)
Software/Hardware	4,933	2,834	138 (4.9%)	2,855	162 (5.7%)
Business	13,462	7,805	377 (4.8%)	7,924	484 (6.1%)
.....	.....	.....	.....	.....	.....
Gov't/Military	3,754	939	3 (0.5%)	974	7 (0.7%)
Pornography	<b>1,388</b>	<b>528</b>	<b>0 (0.0%)</b>	<b>645</b>	<b>0 (0.0%)</b>

# EU vs US

Num distinct websites	EU	US
Visited websites	99,380	99,437
Websites where we filled	52,055	53,038
Emails sent to 1st party	4,395	5,518
Emails sent to 3rd party	<b>2,633</b>	<b>3,790</b>
Emails sent to trackers	<b>1,844</b>	<b>2,950</b>

60% difference

addthis.com, yahoo.com,  
doubleclick.net and criteo.com



Only appear in the US crawl

# EU vs US

The screenshot shows a web browser window for Vail Mountain Resort. The top navigation bar includes links for Explore the Resort, The Mountain, Tickets & Passes, Lessons & Rentals, Lodging, Need Help?, and Sign In. A weather icon shows 10°F. The main content area has two sections: 'SIGN IN TO YOUR EPIC ACCOUNT' and 'CREATE AN EPIC ACCOUNT'. The sign-in section includes fields for Email Address or Username and Password, with links for 'Forgot Username?' and 'Forgot Password?'. The account creation section includes a brief description of Epic Pass benefits and a 'CREATE ACCOUNT' button. Below the main content is a developer tools console showing multiple errors: 'Failed to load resource: the server responded with a status of 451 ()' repeated numerous times.

rlcdn.com sends HTTP  
451 error: Unavailable For  
Legal Reasons

# EU vs US

Same script (from securedvisit.com) served with different content

```
1 /* sv_ea082ada0bf69f160b0bc84078d230c0.js
2 THIS APPLICATION CONTAINS INFORMATION PROPRIETARY TO SECUREDVISIT.COM
3 TO USE THIS SOFTWARE, YOU MUST BE AN AUTHORIZED EMPLOYEE OR AGENT
4 OF SECUREDVISIT.COM.
5 ALL RIGHTS NOT GRANTED TO YOU HEREIN ARE EXPRESSLY AND UNCONDITIONALLY
6 RESERVED. YOU MAY NOT REMOVE ANY PROPRIETARY NOTICE FROM ANY COPY OF THE SOFTWARE.
7 YOU MAY NOT PUBLISH, DISPLAY, DISCLOSE, RENT, LEASE, LICENSE,
8 SUBLICENSE, MODIFY, RENAME, LOAN, DISTRIBUTE, OR CREATE DERIVATIVE WORKS
9 BASED ON ANY PART OF THE SOFTWARE. YOU MAY NOT REVERSE ENGINEER,
10 DECOMPILE, TRANSLATE, ADAPT, OR DISASSEMBLE ANY PART OF THE SOFTWARE,
11 NOR SHALL YOU ATTEMPT TO CREATE THE SOURCE CODE FROM THE OBJECT CODE FOR
12 ANY PART OF THE SOFTWARE.
13 JQuery Sizzle:
14 This software consists of voluntary contributions made by many
15 individuals. For exact contribution history, see the revision history
16 available at https://github.com/jquery/sizzle
17 MD5 (Message-Digest Algorithm):
18 available at http://www.webtoolkit.info/
19 window.sv_DNT=true;
```

```
20 !function(e){var t,n=!e.sv_DNT,r=e.sv_px,o="https://track.securedvisit.com/citecapture",i=r&&"string"==typeof
f,r.url&&"https":=r.url.substring(0,6)?r.url:"https://track.securedvisit.com",u=i+"/identity",a={key:"sv_px_
domain_data",value:r&&r.domain_data?r.domain_data:void 0},c={key:"sv_pubid",value:e.sv_pubid},s={key:"sv_ci_
d",value:e.sv_cid},l=!e.sv_idq_wait&&[],f=function(e){function t(e,t,n,r){var o,i,u,a,c,l,d,v=t&&t.ownerDocu_
ment,p=t?t.nodeType:9;if(n==[]||[],"string"!=typeof e||!e||!==p&&9!=p&&11!=p)return n;if(!r&&(t?t.ownerDocu
```

in the EU

```
1 /* sv_ea082ada0bf69f160b0bc84078d230c0.js
2 THIS APPLICATION CONTAINS INFORMATION PROPRIETARY TO SECUREDVISIT.COM
3 TO USE THIS SOFTWARE, YOU MUST BE AN AUTHORIZED EMPLOYEE OR AGENT
4 OF SECUREDVISIT.COM.
5 ALL RIGHTS NOT GRANTED TO YOU HEREIN ARE EXPRESSLY AND UNCONDITIONALLY
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9 BASED ON ANY PART OF THE SOFTWARE. YOU MAY NOT REVERSE ENGINEER,
10 DECOMPILE, TRANSLATE, ADAPT, OR DISASSEMBLE ANY PART OF THE SOFTWARE,
11 NOR SHALL YOU ATTEMPT TO CREATE THE SOURCE CODE FROM THE OBJECT CODE FOR
12 ANY PART OF THE SOFTWARE.
13 JQuery Sizzle:
14 This software consists of voluntary contributions made by many
15 individuals. For exact contribution history, see the revision history
16 available at https://github.com/jquery/sizzle
17 MD5 (Message-Digest Algorithm):
18 available at http://www.webtoolkit.info/
19 window.sv_px={"url":"https://track.securedvisit.com","domain_data":{"sid_found":false,"ver":"1.0.0","sid_va_
l":""}}
```

```
20 window.c=function(){var i="1.0.1";var e="onready";var g="fire";function f(j){if(Array.isArray){return Array.
isArray(j)}else{return Object.prototype.toString.call(j)==="[object Array]"}}function b(j,l){var k=l;j;if
(typeof k=="object"){|k|JSON.stringify(k)}if(l){k+=";"+"k"}console.log(k)}function h(j){this.name=j;this.ca_
llbacks=[]};h.prototype.registerCallback=function(j){this.callbacks.push(j)};function d({this.type:"",this.dat_
a:{},this.timeStamp:Date.now()}{this.dataLayer:[]};this.events={};this.isReady=false);a.prototype.registerEvent=f(j)(this.eve_
nts[j]=new h(j));a.prototype.on=a.prototype.addEventListener=function(j,k)
{if(!this.events.hasOwnProperty(j)){this.registerEvent(j).log("listening for",j,k);this.events[j].registerC_
allback(k)};a.prototype.fire=a.prototype.dispatchEvent=function(k,j){if(this.events.hasOwnProperty(k)){for
(var l=0;l<this.events[k].callbacks.length;l++){var n=this.events[k].callbacks[l];if(n){var m=new Date();m.type=
k;m.detail=j;this.log("firing",k,j);n.call(this,m)}}else{this.log("dispatching an event with no registered listeners",k,j)}}};a.prototype.ready=function(){this.i_
sReady=true;this.dispatchEvent(e,this)};a.prototype.push=function(o){var k=this,j=arguments.length;if(!f(o)){re_
turn}for(var m=0;m<j;){try{[k.arguments[m][0]].apply(k,arguments[m].slice(1))}catch(n){}}};a.prototype.log_
=function(m,l,j){var k;if(this.debug){k=m+" "+svData.Event+" "+l+" "+b(k,j)}};function c(){var k=window._svData,
j=null;if(k){if(f(k)){j=new a();if(k.hasOwnProperty("debug")){j.debug=k.debug}};j.push.apply(j,k);j.ready()}el_
se{j=new a();j.ready()}};return j?j:k}return c()}()}
```

```
21 !function(e){var t,n=!e.sv_DNT,r=e.sv_px,o="https://track.securedvisit.com/citecapture",i=r&&"string"==typeof
f,r.url&&"https":=r.url.substring(0,6)?r.url:"https://track.securedvisit.com",u=i+"/identity",a={key:"sv_px_
domain_data",value:r&&r.domain_data?r.domain_data:void 0},c={key:"sv_pubid",value:e.sv_pubid},s={key:"sv_ci_
d",value:e.sv_cid},l=!e.sv_idq_wait&&[],f=function(e){function t(e,t,n,r){var o,i,u,a,c,l,d,v=t&&t.ownerDocu_
ment,p=t?t.nodeType:9;if(n==[]||[],"string"!=typeof e||!e||!==p&&9!=p&&11!=p)return n;if(!r&&(t?t.ownerDocu
```

in the US

# Mobile vs Desktop

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	Leaky/ Filled Sites EU	Leaky/ Filled Sites US
<b>Desktop</b>	1,844 / 60,008 (3.0%)	2,950 / 60,999 (4.8%)
<b>Mobile</b>	1,745 / 55,738 (3.1%)	2,744 / 57,715 (4.8%)

# Received Emails

- 290 emails from 88 distinct sites
  - Offer a discount, or
  - Invite us back to their site

A friendly reminder Inbox ×

 Diabetes UK <[donate@diabetes.org.uk](mailto:donate@diabetes.org.uk)>  
to cosicadam0+diabetes.org.uk ▾

**DiABETES UK**  
KNOW DIABETES. FIGHT DIABETES.

We noticed that you were on our online donation form but didn't complete it. If you still feel able to donate, then please take a moment to [complete our form](#).

Is there anything we can help with? If you have any questions please email us at [helpline@diabetes.org.uk](mailto:helpline@diabetes.org.uk) or call us on [0345 123 2399\\*](tel:0345 123 2399) we are happy to help you.

Thank you,

Diabetes UK

\*Monday to Friday, 9am to 5pm

View our [Privacy](#) and [Cookies](#) policies.

Email from: diabetes.org.uk  
Tracker domain: freshaddress.biz

# Received Emails

Searching for products that actually work? [Inbox x](#)



**MyPillow** <mike.lindell@mail.mypillow.com> [Unsubscribe](#)  
to cosicadam0+mypillow.com ▾



## Thanks For Stopping By

When I started MyPillow, my passion was to help people get the best sleep of their life! What a blessing it has been to see that dream become a reality!

To help you best care for your MyPillow, please read our product care recommendations. If you have any questions, please don't hesitate to contact us!

Email from: [mypadress.com](http://mypadress.com)

Tracker domain: [listrakbi.com](http://listrakbi.com)

¡Se despedire Hot Days! 18 MSI + BONIFICACIÓN [Inbox x](#)



**Walmart** <mgnoreply@walmart.com.mx>  
to cosicadam0+walmart.com.mx ▾

Spanish ▾ > English ▾ [Translate message](#)

Decide tu compra con BBVA | Tecnología | Línea blanca

**Walmart.com.mx**



OUTLET | TV Y VIDEO | BEBÉS | VIDEOJUEGOS | MUEBLES | CELULARES



BBVA

Hasta  
**18** Meses Sin  
Intereses + 3 meses de  
bonificación en Edo. Cta.

Exclusivo en línea. Válido del 21 al 31 de mayo de 2021. Compra mínima para MSI es de \$1,500 acumulables sin incluir costo de envío. Compra mínima para bonificación en Estado de Cuenta es de \$3,000 a 18 MSI sin incluir costo de envío. Consulta términos y condiciones en: [www.walmart.com.mx/beneficios](http://www.walmart.com.mx/beneficios)



Email from: [walmart.com.mx](http://walmart.com.mx)

Tracker domain: [veinteractive.com](http://veinteractive.com)

# Password Leaks

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- Incidental collection on 52 sites by
  - Yandex Metrica: due to React framework (50 websites)
  - Mixpanel: due to outdated SDK usage (1 website)
  - LogRocket: No response (1 website)
- Fixed thanks to our disclosures

Официальный сайт Toyota: [toyota.ru/#/publish/my\\_toyota\\_login](#)

toyota.ru/#/publish/my\_toyota\_login

Settings

Elements Console Sources Network Performance Memory

Preserve log Disable cache No throttling

1 webvisor Hide data URLs All XHR JS CSS Img Media Font Doc WS Manifest Other

Has blocked cookies Blocked Requests

Name Status Type Initiator Size T... Waterfall

44886451?wmode=0&wv-part=2&wv... 200 xhr ruxitagentis IC... 145 B 7...  
mc.yandex.ru/webvisor Script 43 B 7...

44886451?wmode=0&wv-part=2&wv... 200 xhr ruxitagentis IC... 73 B 6...  
mc.yandex.ru/webvisor Script 43 B 6...

44886451?wmode=0&wv-part=3&wv... 200 xhr ruxitagentis IC... 145 B 5...  
mc.yandex.ru/webvisor Script 43 B 5...

44886451?wmode=0&wv-part=3&wv... 200 xhr ruxitagentis IC... 73 B 5...  
mc.yandex.ru/webvisor Script 43 B 5...

Оценить сайт

МОЯ TOYOTA

Войти в личный кабинет

Электронная почта/Имя пользователя

Пароль

Вход

У меня нет учетной записи >

Восстановить пароль

50000 р

100000 р

4 requests | 436 B transferred | 172 B resources

# Outreach Efforts

First parties: 30/58 replied



- Were not aware & removed
  - [fivethirtyeight.com](http://fivethirtyeight.com) (via Walt Disney's DPO)
  - [trello.com](http://trello.com) (Atlassian)
- Marriott: Glassbox is used for **customer care, technical support, and fraud prevention**

Third parties: 15/28 replied



- Adobe and Yandex: Referred to corresponding first parties
- Taboola: ad & content personalization, CMP misconfiguration

0/33 first parties replied  
(Websites in the US crawl)



- No response from these 33 websites.

# Leaks to Facebook & TikTok

- Closer look to Facebook
- Due to Automatic Advanced Matching feature of Facebook/Tiktok Pixel (scrapes personal information from forms)

The screenshot shows the Meta Business Help Centre homepage. At the top, there's a navigation bar with the Meta for Business logo and links for "Meta Business Help Centre", "Create and manage accounts", "Publish and distribute content", "Advertise", "Sell on Facebook and Instagram", and "Monetise content". Below the navigation is a dark banner with the text "Business Help Centre". A search bar contains the query "Hi Ali, how can we help?". The main content area features a large heading "About advanced matching for w..." followed by a paragraph of text. A red rectangular box highlights a specific sentence in the paragraph: "Advanced matching can help you optimise your Meta ads to drive better results. With advanced matching, you can send us hashed customer information along with your pixel events, which can help you attribute more conversions and reach more people. We hash the customer information on the...".

Meta for Business | Meta Business Help Centre

Create and manage accounts   Publish and distribute content   Advertise   Sell on Facebook and Instagram   Monetise content

Business Help Centre

Hi Ali, how can we help?

About advanced matching for w...

15,463 views

Advanced matching can help you optimise your Meta ads to drive better results. With advanced matching, you can send us hashed customer information along with your pixel events, which can help you attribute more conversions and reach more people. We hash the customer information on the...



# How it Works

With automatic advanced matching, we can capture the hashed customer data (ex: email addresses) you collect from your website during processes like checkout, account sign-in, or registration. Hashing is the process we use to transform data for security reasons. We can then use hashed identifiers to better match people visiting your website with people on Facebook, which can lead to more attributed conversions for your Facebook campaigns and a larger size of your custom audiences.

1

A visitor fills out a form on your website, such as during checkout, account sign-in, or registration.

2

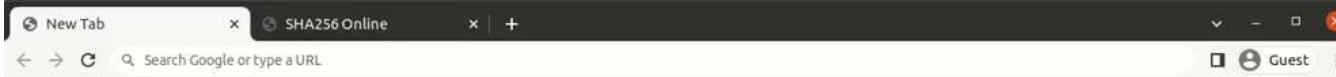
After the visitor hits **Submit**, the Pixel's JavaScript code automatically detects and passes the relevant form fields to Facebook. Sensitive data, such as passwords or financial data, is **never** shared with Facebook.

3

The form field data is hashed in the visitor's browser before it is sent to Facebook.

4

Facebook takes the form data and the action that was taken (for example, a purchase), and matches it to a Facebook user.



## You're browsing as a Guest

Pages you view in this window won't appear in the browser history and they won't leave other traces, like cookies, on the computer after you close all open Guest windows. Any files you download will be preserved, however.

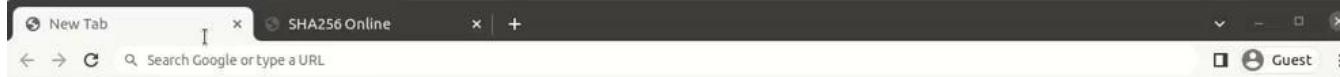
[Learn more](#)

A screenshot of the Network tab in the developer tools. The tab bar includes "Elements", "Console", "Sources", "Network", "Performance", "Memory", "Application", "Security", "Lighthouse", and "Recorder". The "Network" tab is selected. The main pane shows a list of network requests for the domain "facebook". The requests are categorized into "All", "Fetch/XHR", "JS", "CSS", "Img", "Media", "Font", "Doc", "WS", "Wasm", "Manifest", and "Other". There are checkboxes for "Preserve log", "Disable cache", and "No throttling". Other options include "Invert", "Hide data URLs", and checkboxes for "Group by frame" and "Capture screenshots". A "Show overview" button is also present.

Recording network activity...

Perform a request or hit **Ctrl+R** to record the reload.

[Learn more](#)



## You're browsing as a Guest

Pages you view in this window won't appear in the browser history and they won't leave other traces, like cookies, on the computer after you close all open Guest windows. Any files you download will be preserved, however.

[Learn more](#)

A screenshot of the Network tab in the developer tools. The tab bar includes "Elements", "Console", "Sources", "Network", "Performance", "Memory", "Application", "Security", "Lighthouse", and "Recorder". The "Network" tab is selected. The main content area shows a list of network requests for the domain "tiktok". There are several checkboxes at the top of the list: "Preserve log" (checked), "Disable cache", "No throttling", "Invert", "Hide data URLs", and "All". Below these are filters for "Fetch/XHR", "JS", "CSS", "Img", "Media", "Font", "Doc", "WS", "Wasm", "Manifest", "Other", and checkboxes for "Has blocked cookies", "Blocked Requests", and "3rd-party requests". At the bottom of the list are checkboxes for "Use large request rows" (checked), "Show overview", "Group by frame", and "Capture screenshots".

Recording network activity...

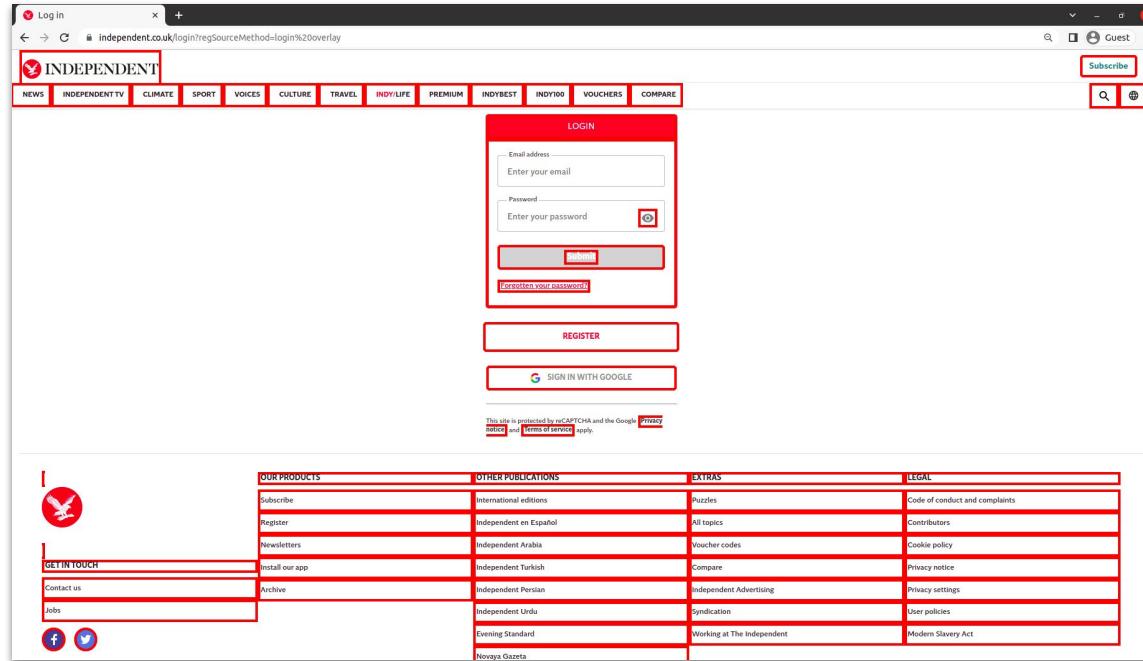
Perform a request or hit **Ctrl+R** to record the reload.

[Learn more](#)

# Leaks to Facebook & TikTok

- Triggered when the user clicks any **link or button** on the page

	EU	US
Facebook	7,379	8,438
TikTok	147	154



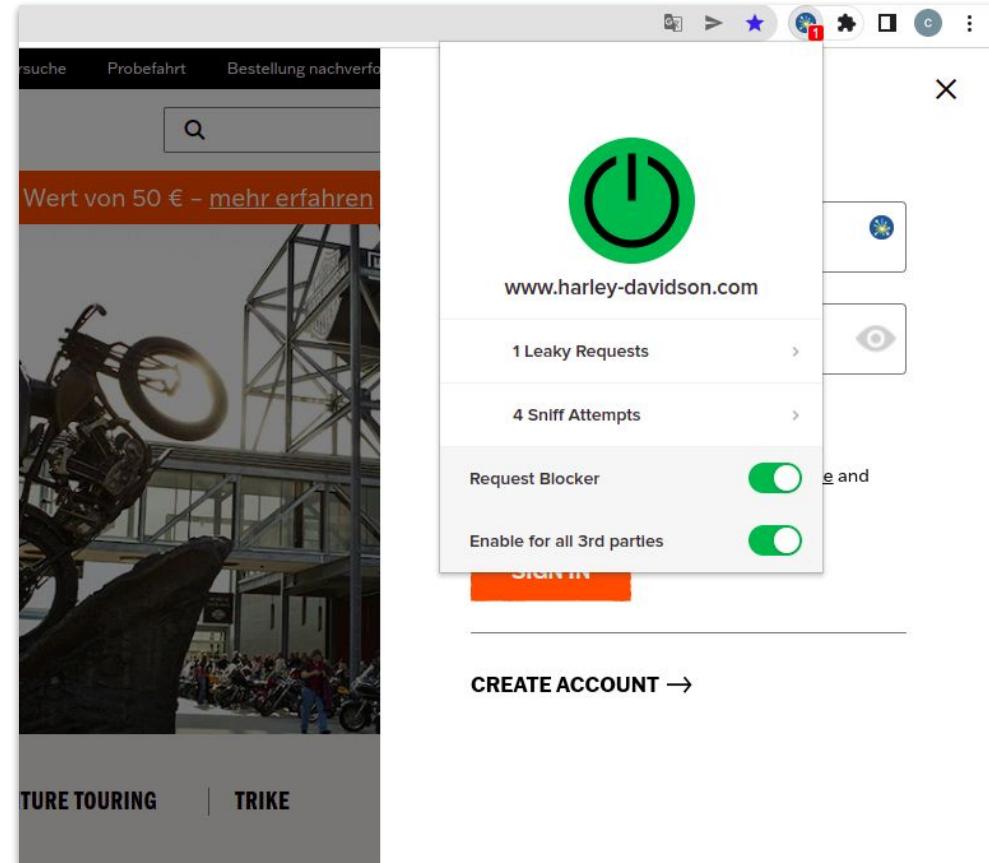
# Countermeasures

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- Adblockers that block requests to tracker domains
- Private email relay services that hide users' emails
  - Apple, Mozilla, DuckDuckGo
  - e.g. testuser@duck.com-> testuser@gmail.com
- NO tool for detection and prevention of sniff & exfiltration on online forms

# LEAKINSPECTOR

- Proof-of-concept browser add-on
- (<https://github.com/leaky-forms/leak-inspector>)
- Detects sniff attempts
- Blocks leaky requests



# Press Release Distribution

## Empowering the Earned Media Advantage

#1 in Customer Satisfaction 2021

Best in Class - Science, Process and Technology

Simple, Targeted, Cost-Effective

Distribute the **Right Message** to the **Right Audience** at the **Right Time**

Let's Get Started - Press Release Distribution



# Summary

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- Email leaks on 1,844 (EU), 2,950 (US) websites
- Password leaks on 52 websites due to session replay scripts
- Uncovered 41 unlisted tracking domains
- Developed a transparency browser add-on that detects and blocks personal data exfiltration from online forms

# Any Questions?

[Leaky Forms](#)   [Highlights](#)   [Findings](#)   [Leaks to Meta & TikTok](#)   [Outreach](#)   [Follow-up Crawls](#)   [LeakInspector](#)   [Data and Code](#)   [Q&A](#)   [Acknowledgments](#)   [Corrigendum](#)   [Contact](#)

## Leaky Forms: A Study of Email and Password Exfiltration Before Form Submission

To appear at [USENIX Security'22](#)

Email addresses—or identifiers derived from them—are known to be used by data brokers and advertisers for cross-site, cross-platform, and persistent identification of potentially unsuspecting individuals. In order to find out whether access to online forms are misused by online trackers, we present a measurement of *email and password collection that occur before form submission* on the top 100K websites.

[Paper »](#)   [Source code »](#)   [Browser add-on »](#)

- Source code: <https://github.com/leaky-forms/leaky-forms>
- Project website: <https://homes.esat.kuleuven.be/~asenol/leaky-forms>
- Press coverage: [Wired](#), [Fortune](#), [Le Monde](#), [Die Zeit](#)