



A Privacy Measure Turned Upside Down?

Investigating the Use of HTTP Client Hints
on the Web

Stephan Wiefling*, Marian Hönscheid, Luigi Lo Iacono

H-BRS University of Applied Sciences, Germany

swiefling.de & H-BRS University of Applied Sciences, Germany (*)



Vienna | Austria
July 30 - August 02, 2024

[Conference](#) ▾ [Venue and Location](#) [Authors Area](#) [Co-located Conferences](#) ▾ [Archive](#)

[Registration & Visa](#)

The International Conference on Availability, Reliability and Security

focuses since 2006 on rigorous and novel research in the field of dependability, computer and information security. In cooperation with the conference several workshops are held covering a huge variety of security topics.

Co-located Conferences [DOD 2024](#) and [ICS-CSR 2024](#).

[Submit Now!](#)



WORKSHOP SUBMISSION - This link will guide you to the ARES Easychair Submission.

24



← 1 | 4 →

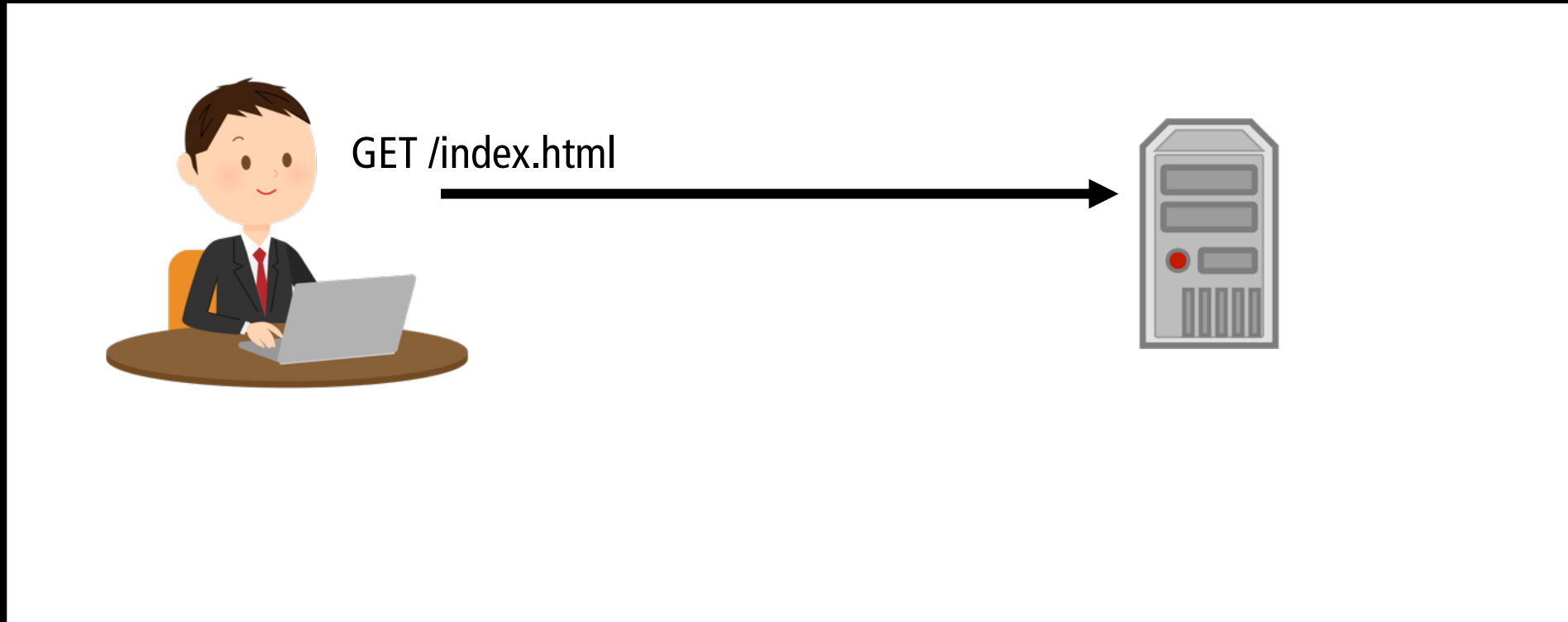
MORE ↓

User Agent String



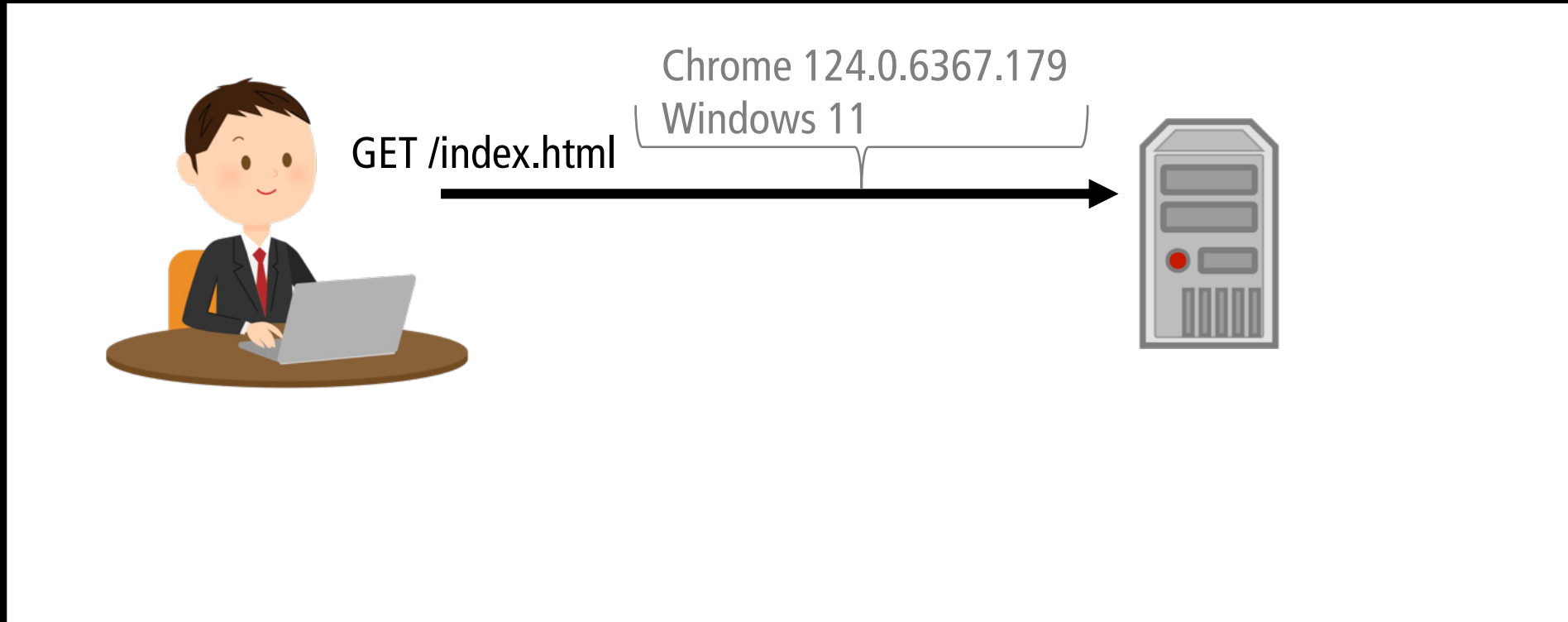
Nielsen et al. 1996. Hypertext Transfer Protocol – HTTP/1.0

User Agent String



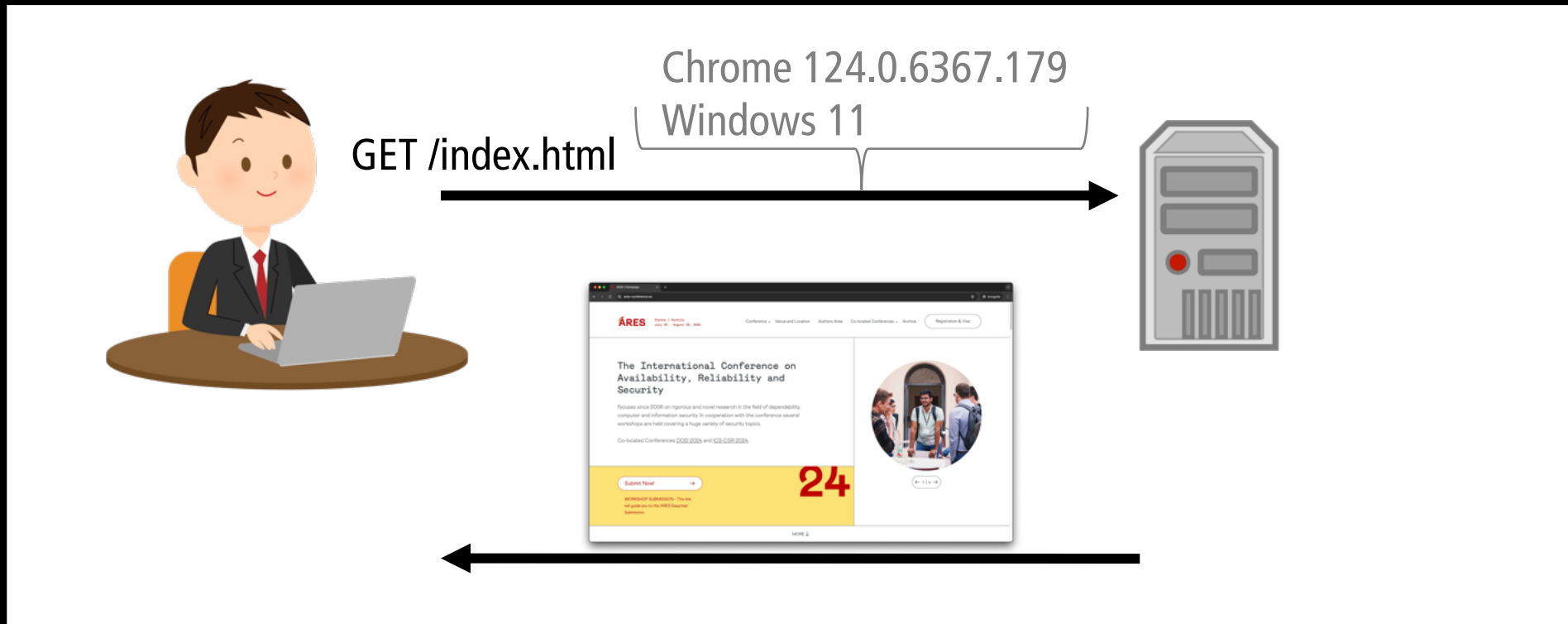
Nielsen et al. 1996. Hypertext Transfer Protocol – HTTP/1.0

User Agent String



Nielsen et al. 1996. Hypertext Transfer Protocol – HTTP/1.0

User Agent String



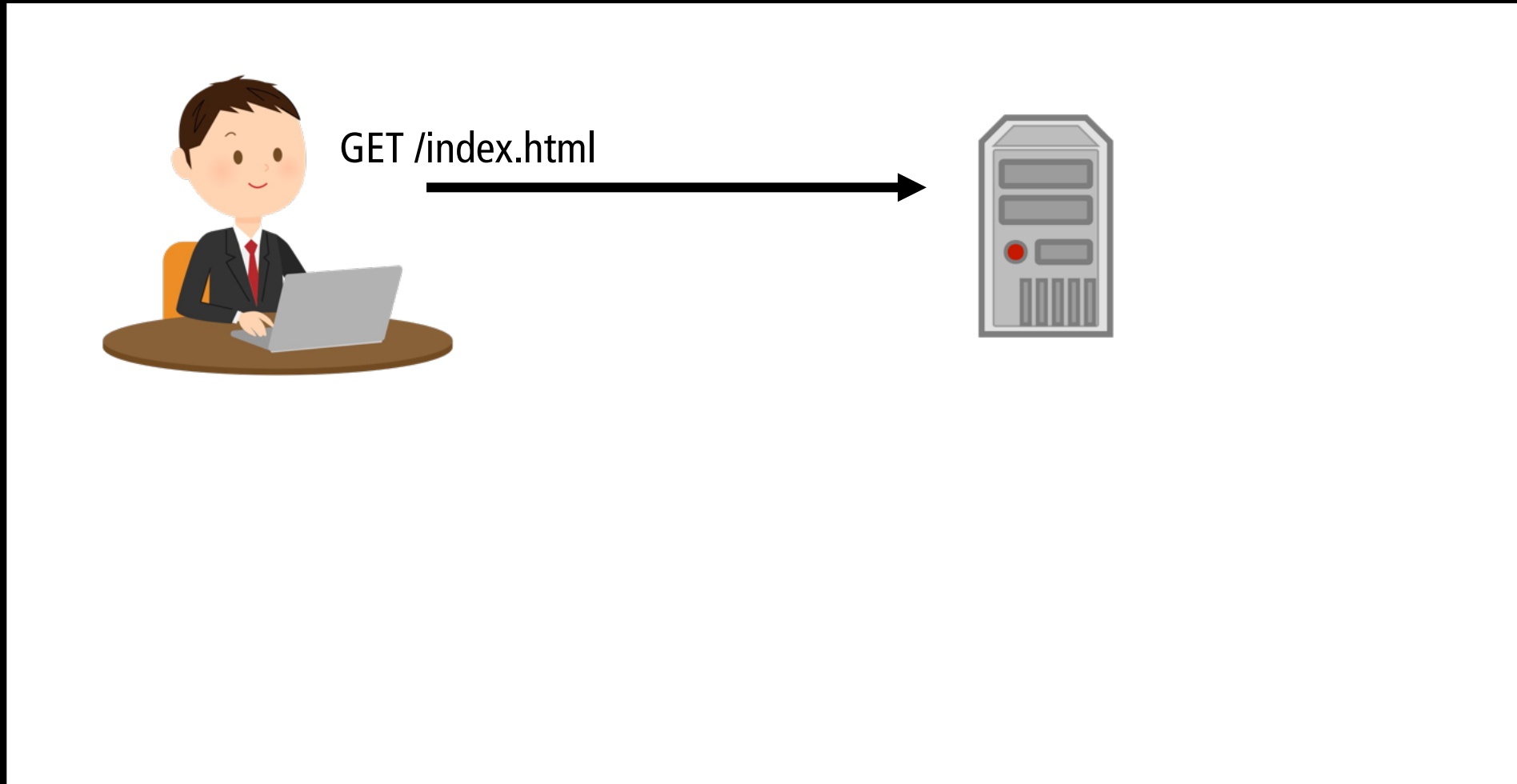
Nielsen et al. 1996. Hypertext Transfer Protocol – HTTP/1.0



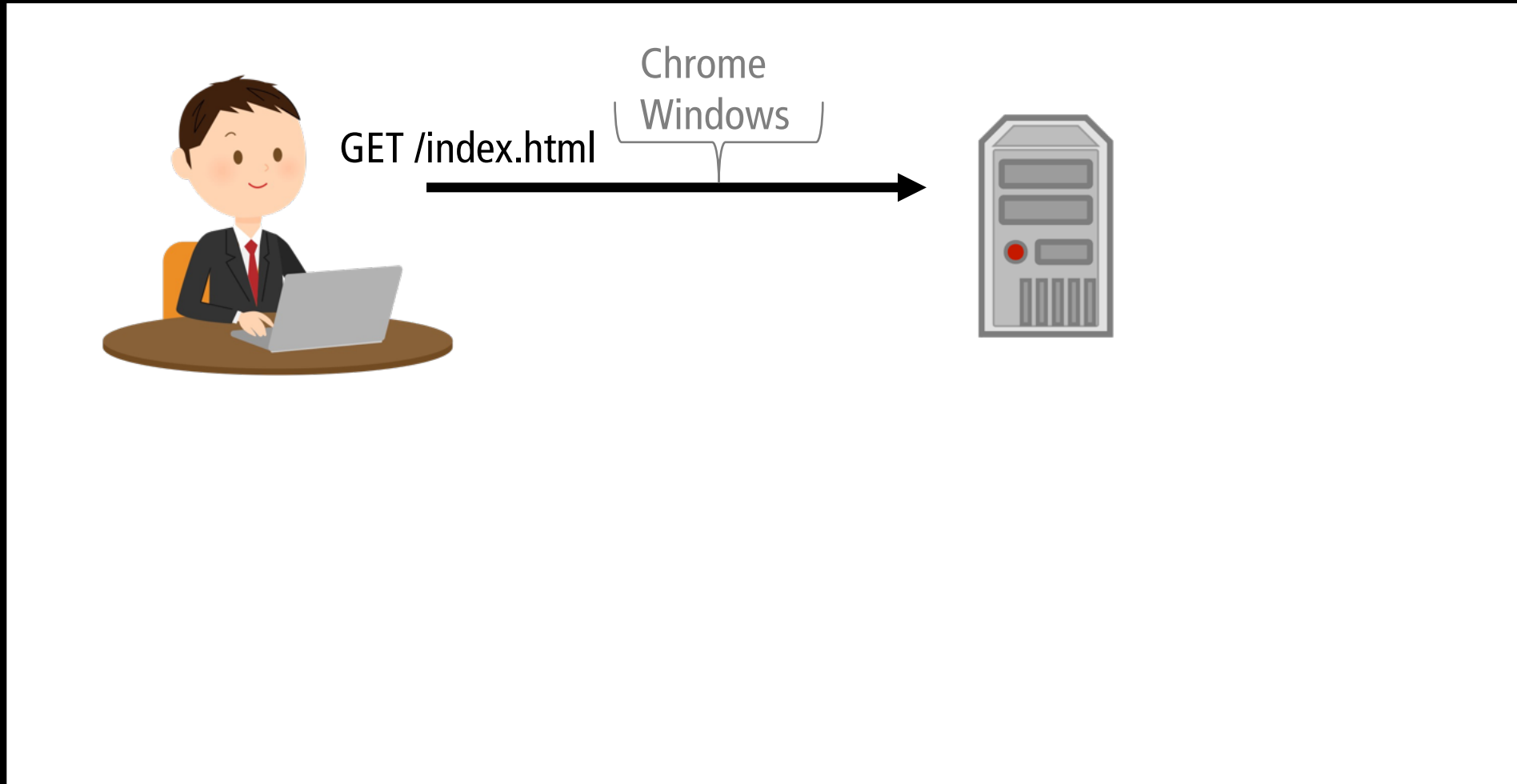
HTTP Client Hints (HTTP CHs)



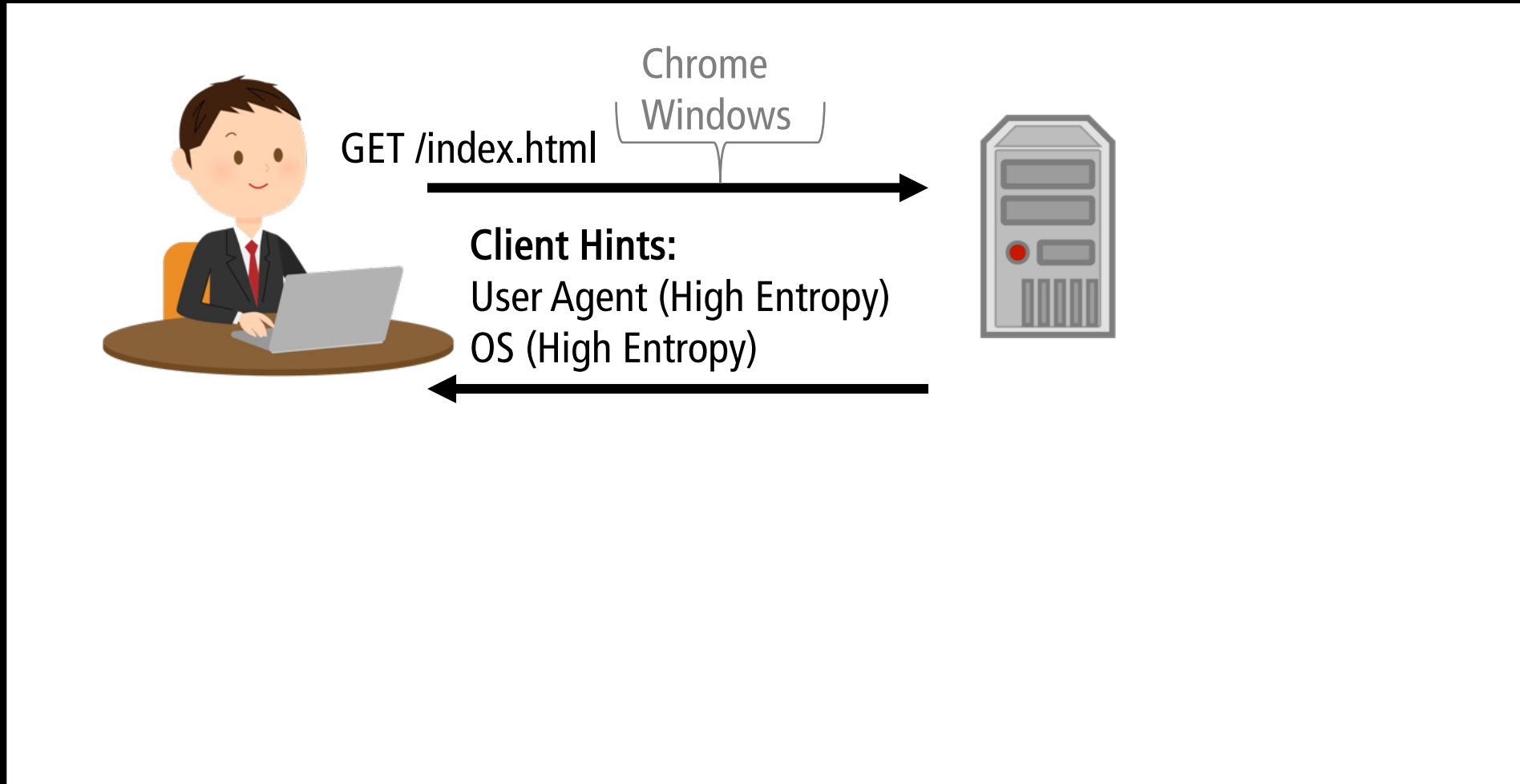
HTTP Client Hints (HTTP CHs)



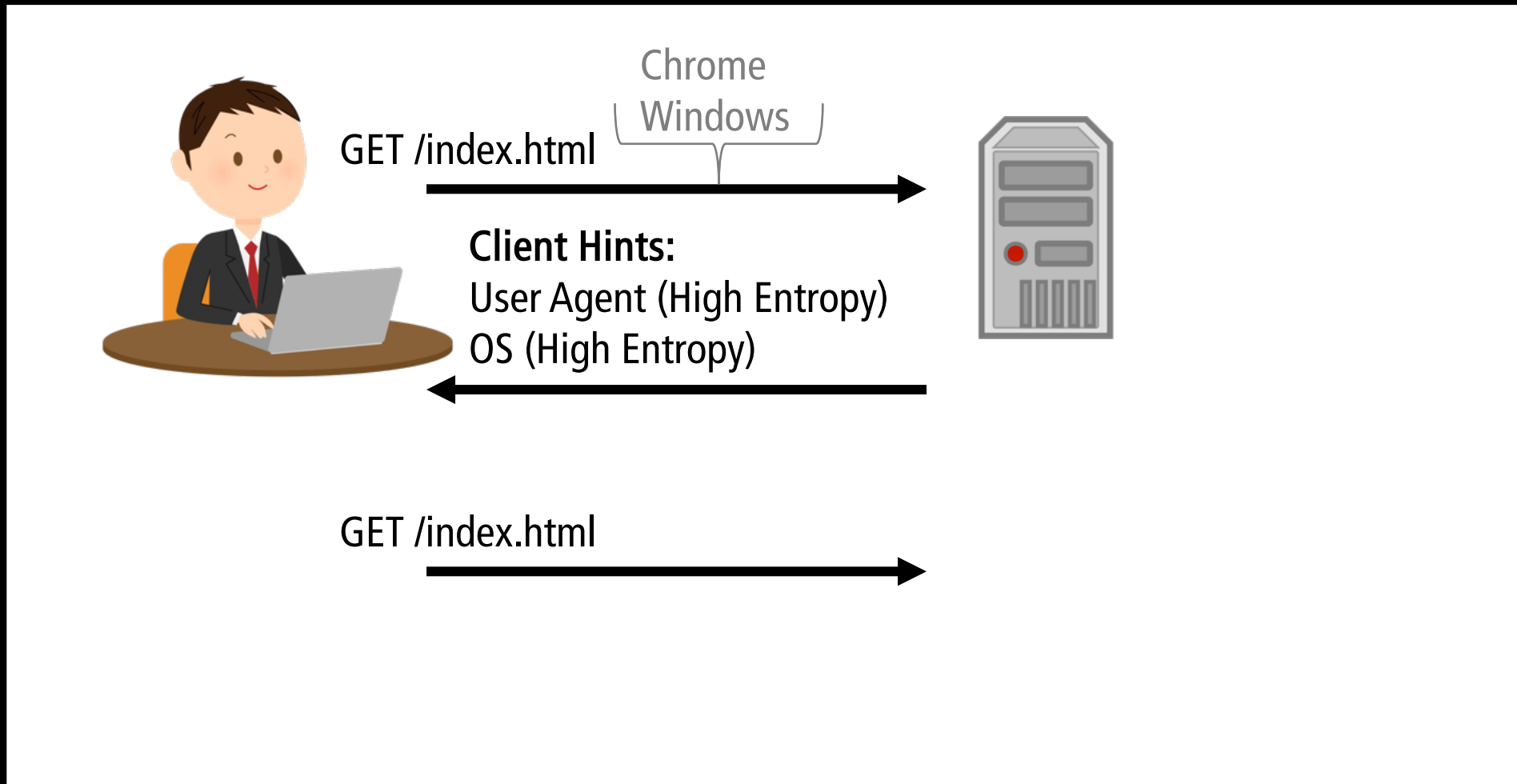
HTTP Client Hints (HTTP CHs)



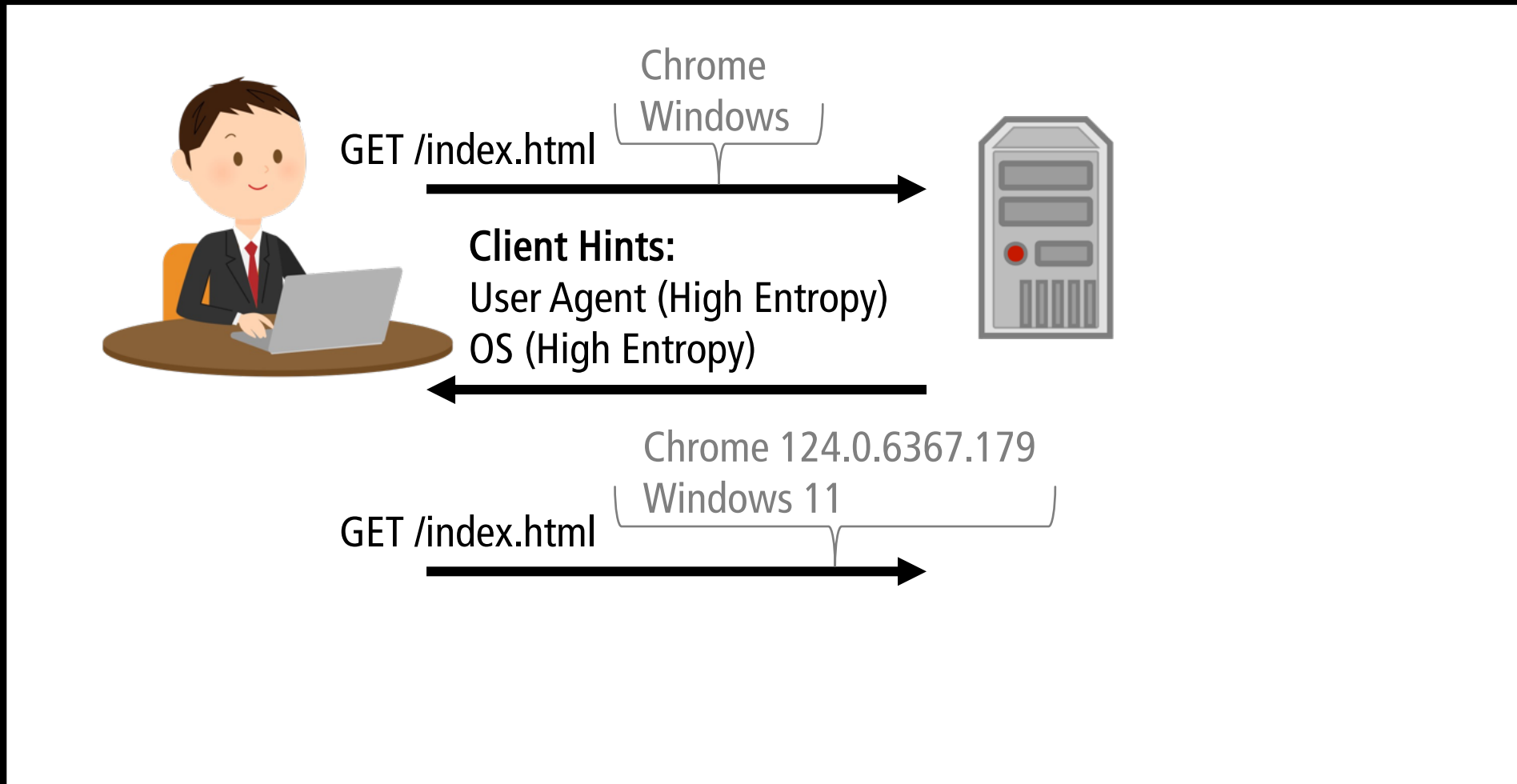
HTTP Client Hints (HTTP CHs)



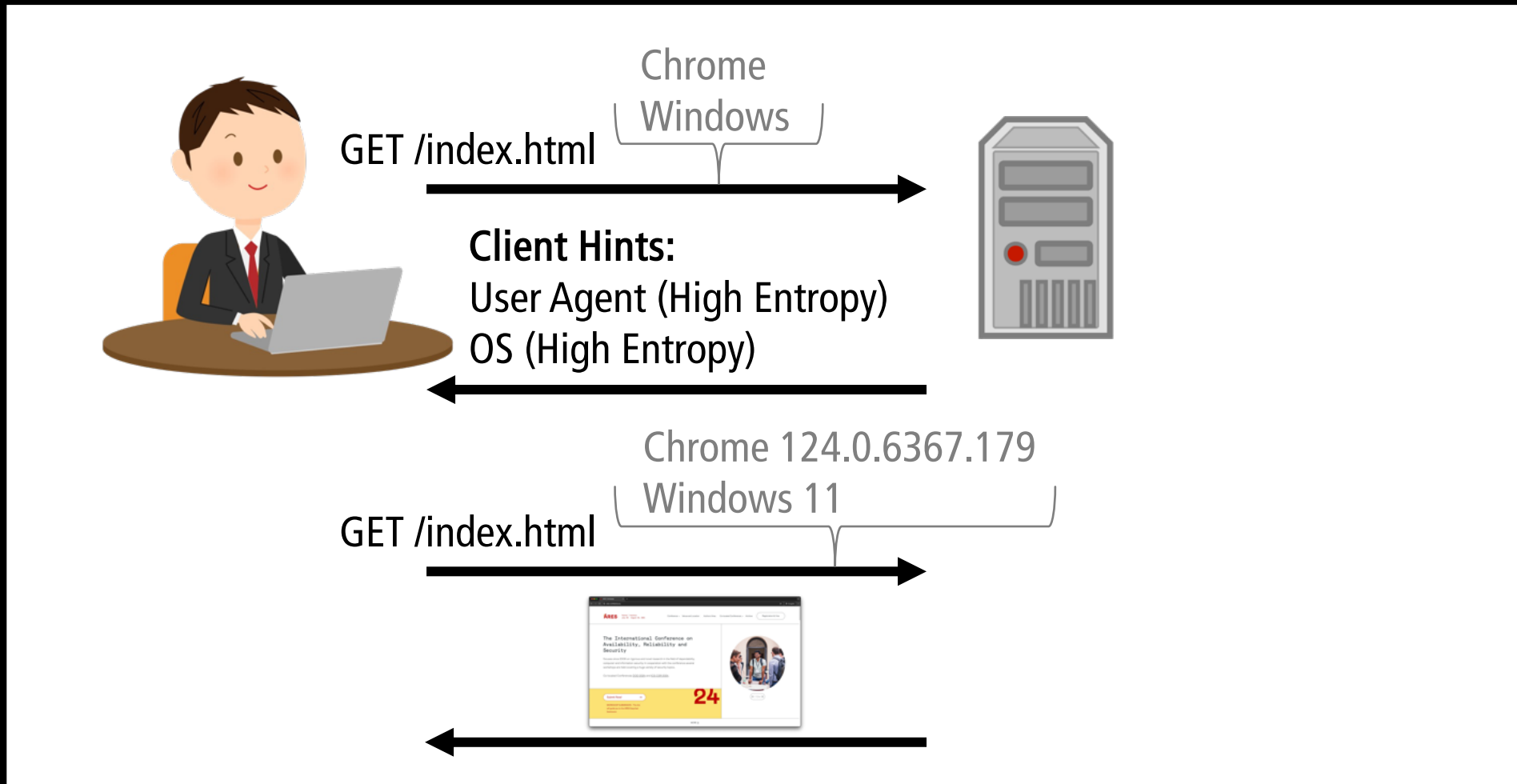
HTTP Client Hints (HTTP CHs)



HTTP Client Hints (HTTP CHs)



HTTP Client Hints (HTTP CHs)





User Agent

User Agent (High Entropy)

User Agent Brand List

OS (High Entropy)

Device Model

OS (Low Entropy)

User Agent (Low Entropy)

CPU Bitness

Device Form Factor

Is Windows64

Platform Architecture

Prefers Mobile UX

Level of Detail

High

Medium

Low



User Agent

User Agent (High Entropy)

User Agent Brand List

OS (High Entropy)

Device Model

OS (Low Entropy)

User Agent (Low Entropy)

CPU Bitness

Device Form Factor

Is Windows64

Platform Architecture

Prefers Mobile UX

Level of Detail

High

Medium

Low



User Preference Media

Contrast Preference

Forced Colors

Light/Dark Mode

Prefers Reduced Motion

Reduced Transparency

Level of Detail

Low



Device Information

Viewport Width
Width

Client Device Pixel Ratio
Client's RAM

Image Device Pixel Ratio

Level of Detail

High

Low



Network

Bandwidth

Network Profile

Round-Trip Time

Prefers Reduced Data

Level of Detail

High

Low

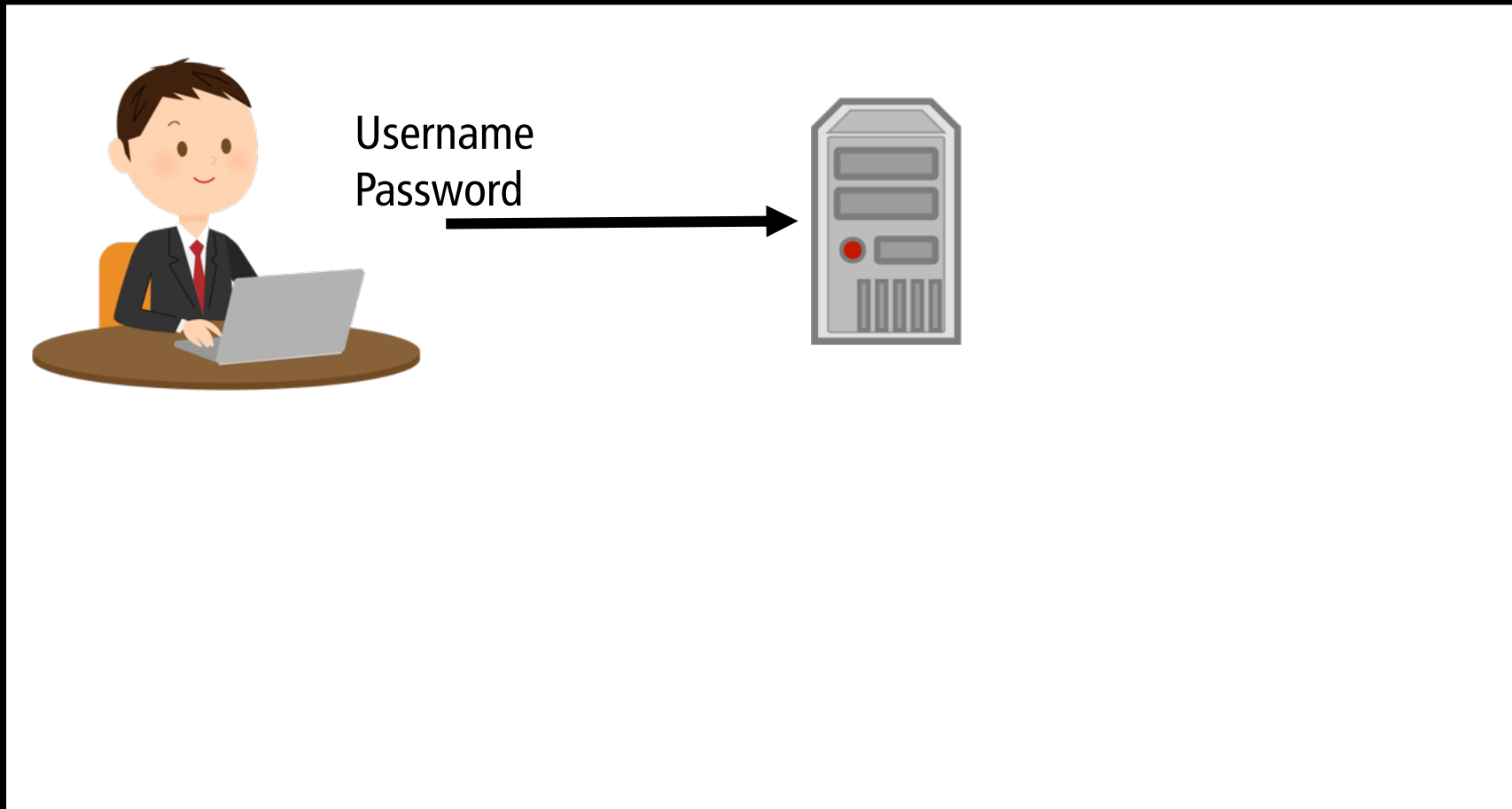
Affects 78% desktop
and 69% mobile users*



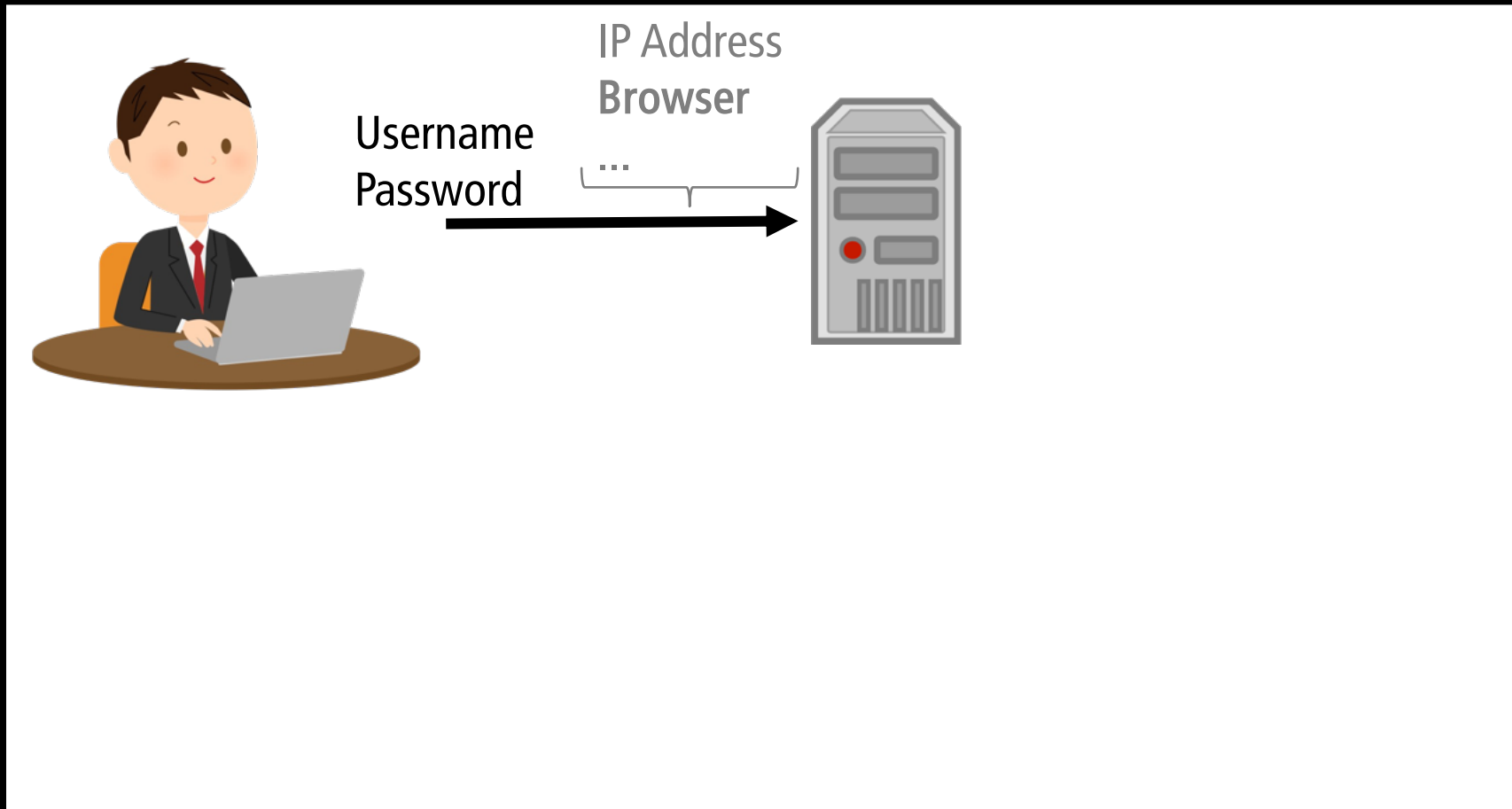
* Statscounter. 2024. Browser Market Share Worldwide.

Some Websites Depend on Browser Information

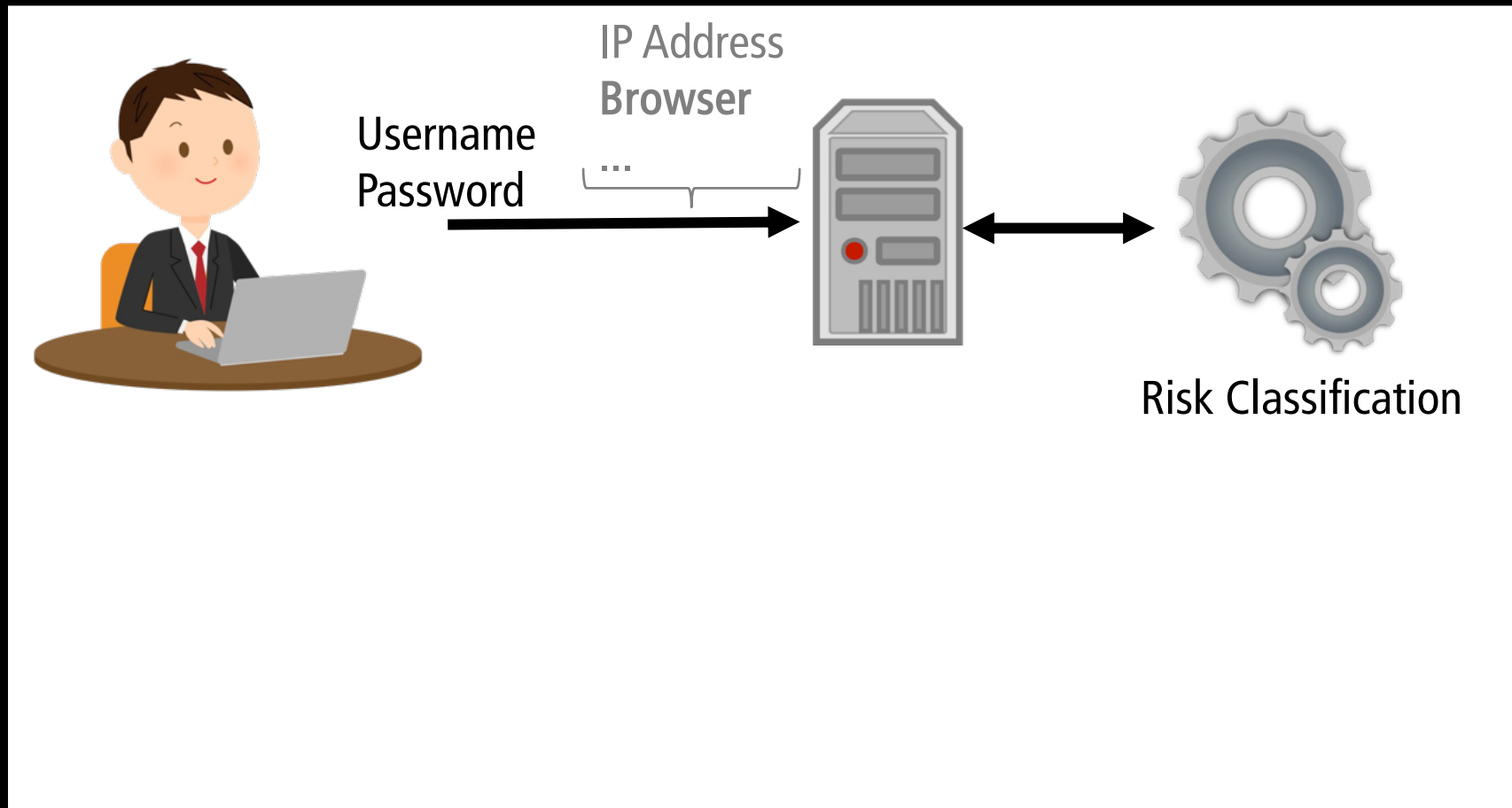
Risk-Based Authentication (RBA)



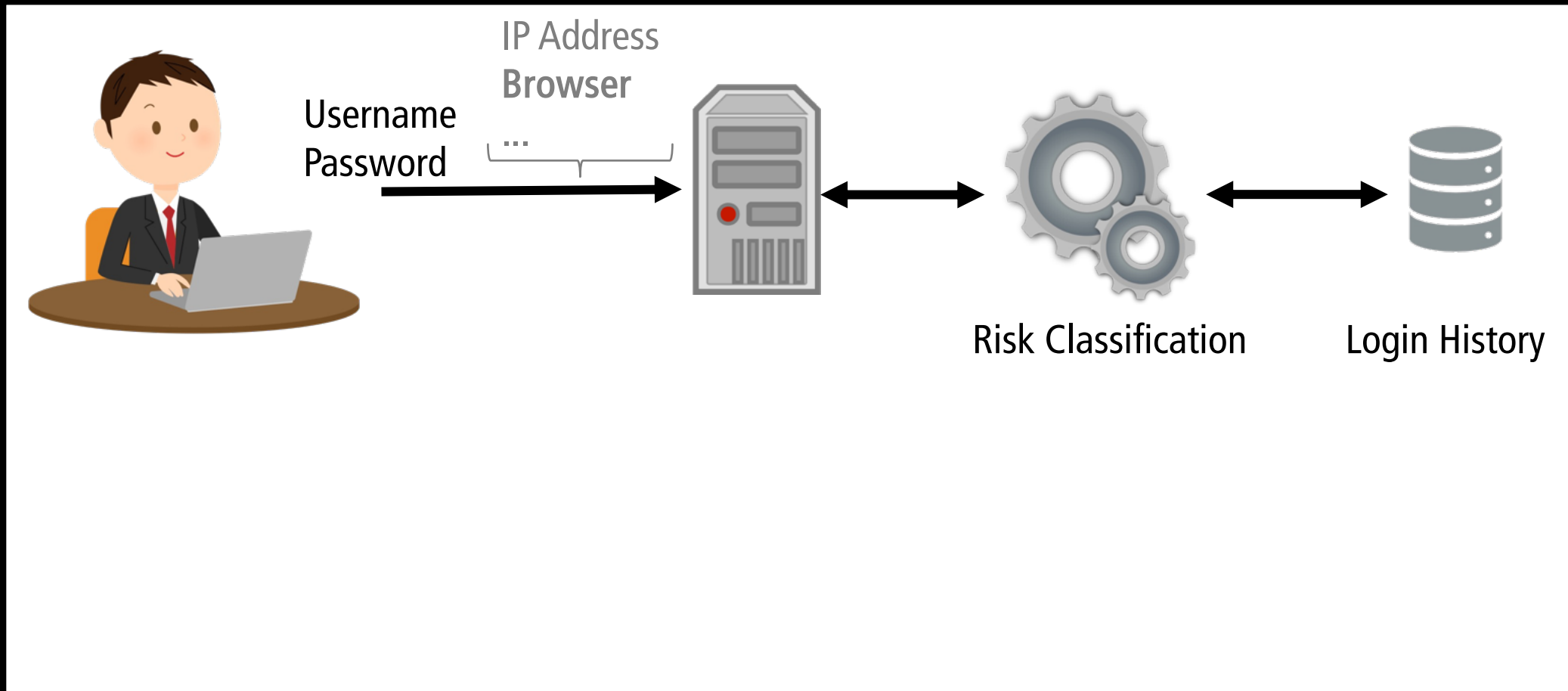
Risk-Based Authentication (RBA)



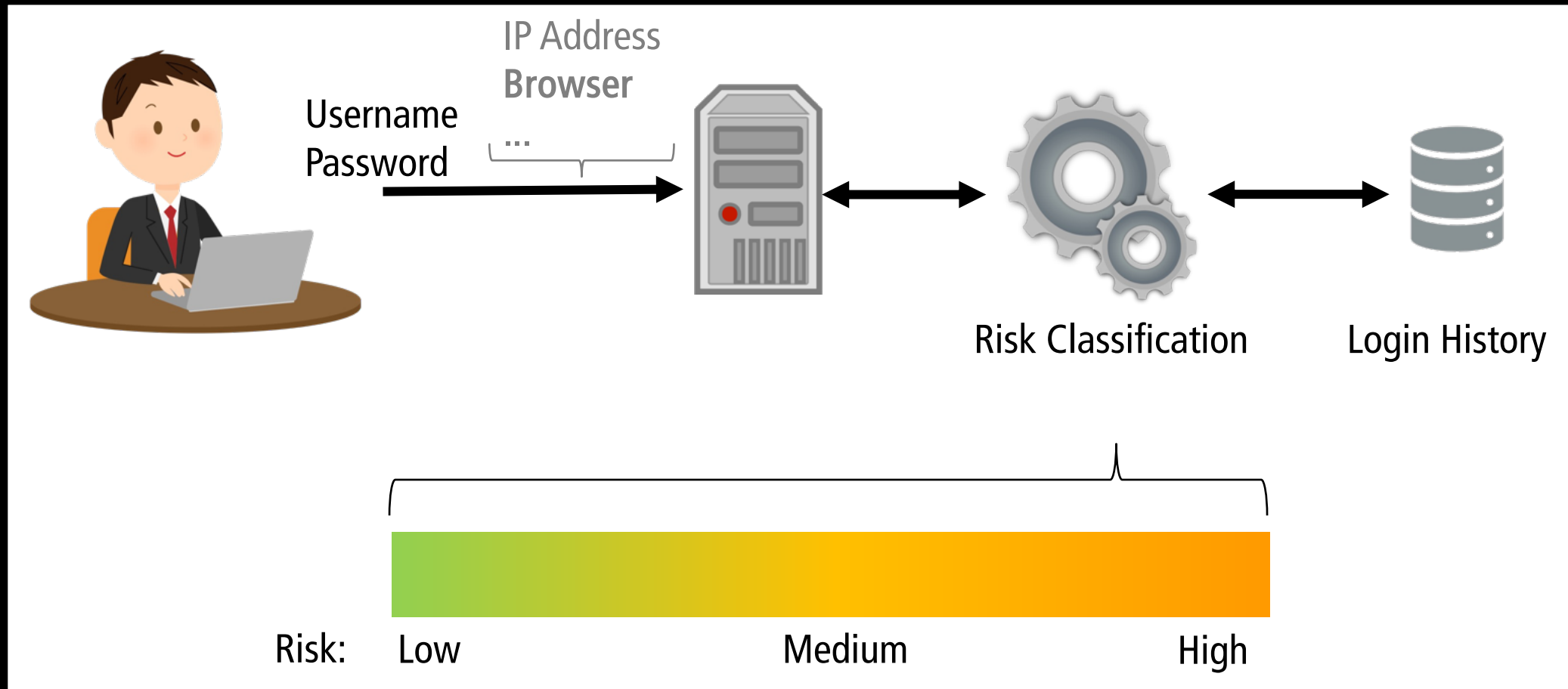
Risk-Based Authentication (RBA)



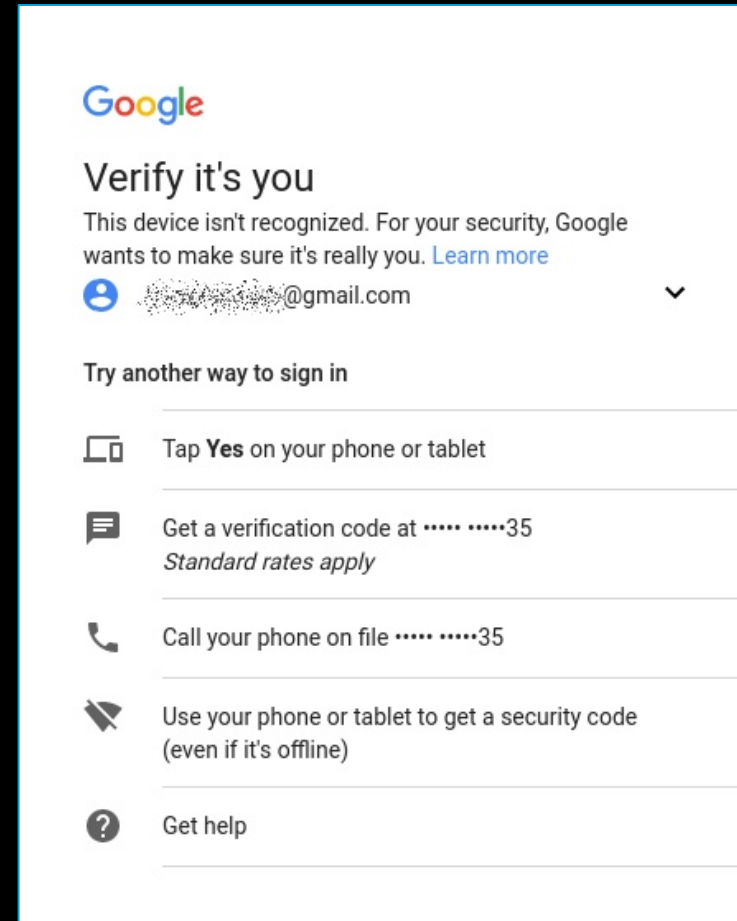
Risk-Based Authentication (RBA)



Risk-Based Authentication (RBA)



Risk-Based Authentication



User Tracking



How do Websites use HTTP CHs in Practice?



Overview



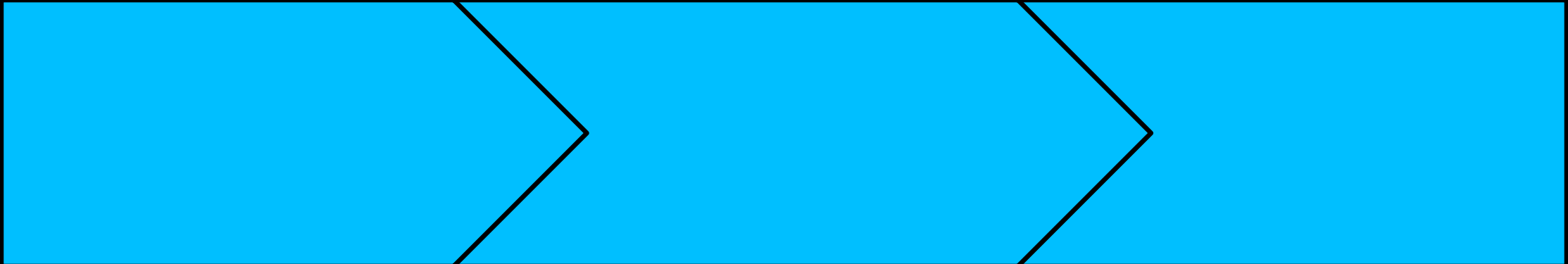
Study



Results



Conclusion





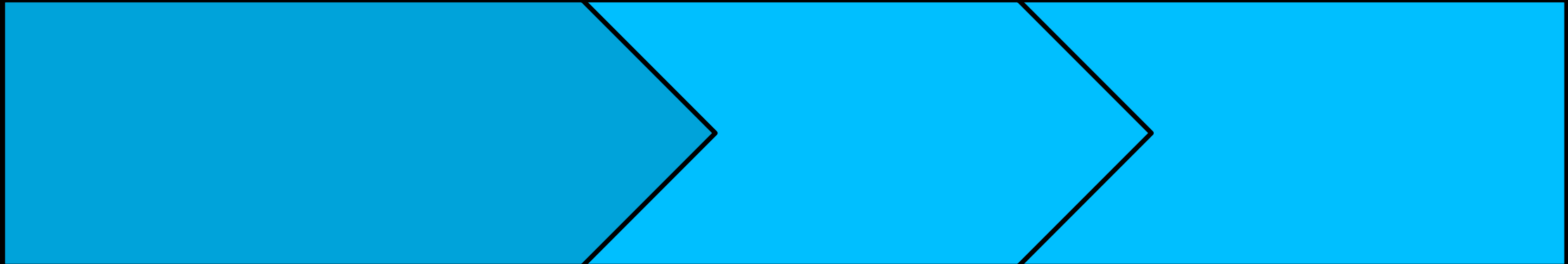
Overview



Results



Conclusion





Two Data Sources



Two Data Sources

- Website Start Pages (~12M Websites*)

*12M websites from on Chrome UX Report



Two Data Sources

- Website Start Pages (~12M Websites*)
 - Taken from The HTTP Archive
 - November 2010 - December 2023

*12M websites from on Chrome UX Report



Two Data Sources

- Website Start Pages (~12M Websites*)
 - Taken from The HTTP Archive
 - November 2010 - December 2023
- Login Pages from Tranco 8M[#]

*12M websites from on Chrome UX Report

[#] 8M most popular websites based on the Tranco List

Le Pochat et al.: Tranco: A Research-Oriented Top Sites Ranking Hardened Against Manipulation. In: NDSS (2019). Internet Society



Two Data Sources

- Website Start Pages (~12M Websites*)
 - Taken from The HTTP Archive
 - November 2010 - December 2023
- Login Pages from Tranco 8M#
 - Own Crawling Data
 - August 2022 – December 2023

*12M websites from on Chrome UX Report

8M most popular websites based on the Tranco List

Le Pochat et al.: Tranco: A Research-Oriented Top Sites Ranking Hardened Against Manipulation. In: NDSS (2019). Internet Society



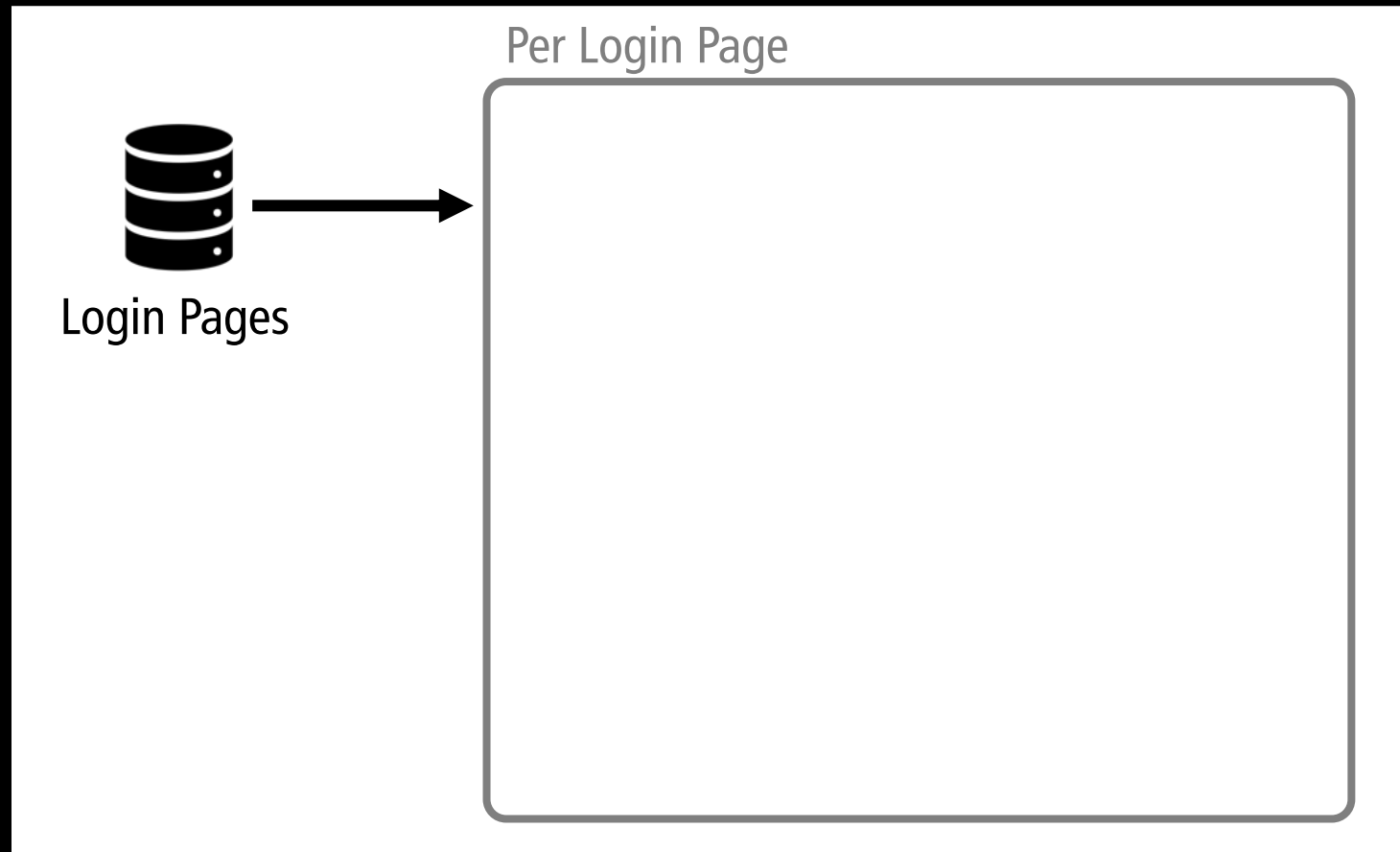
Login Pages Crawling



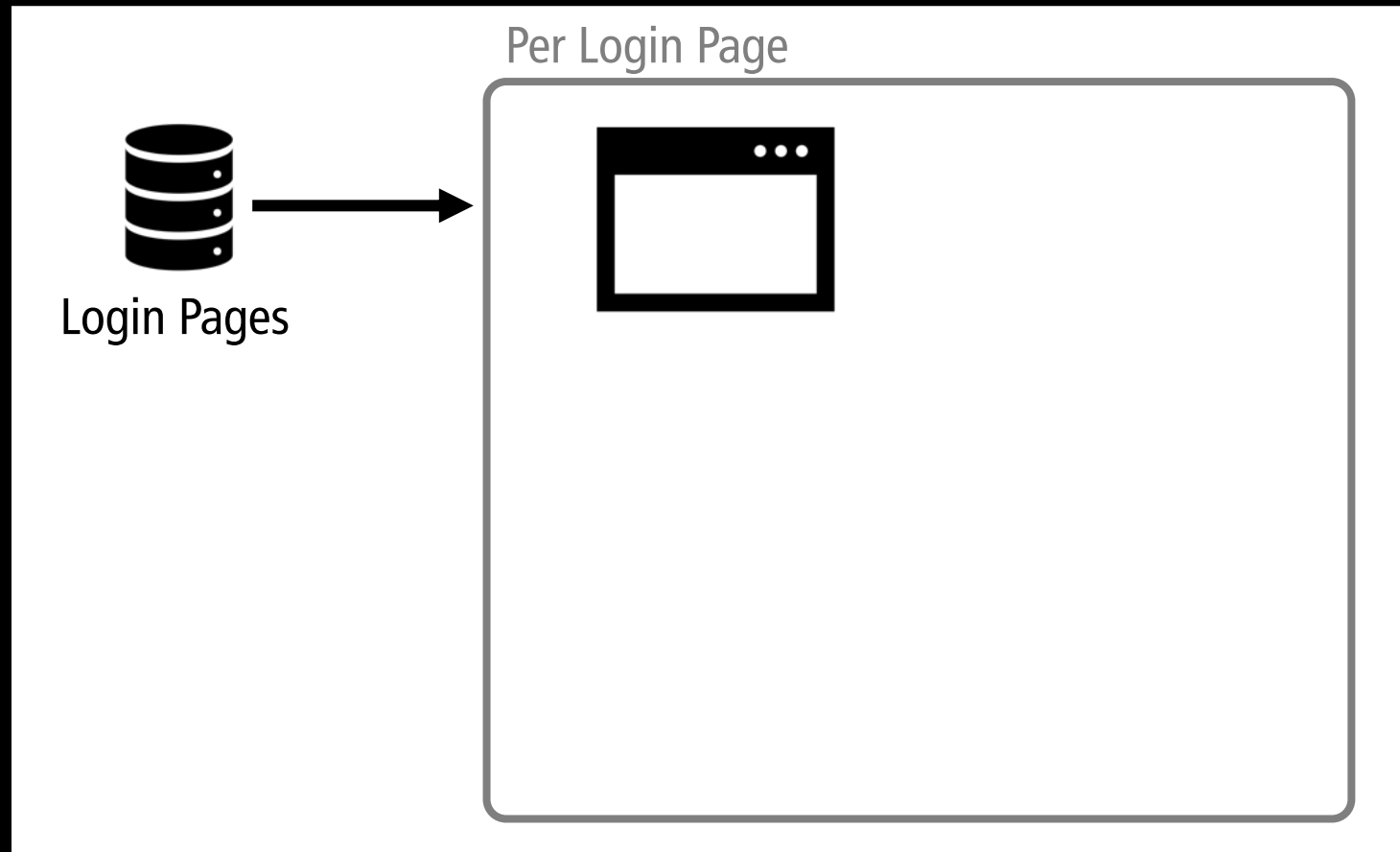
Login Pages



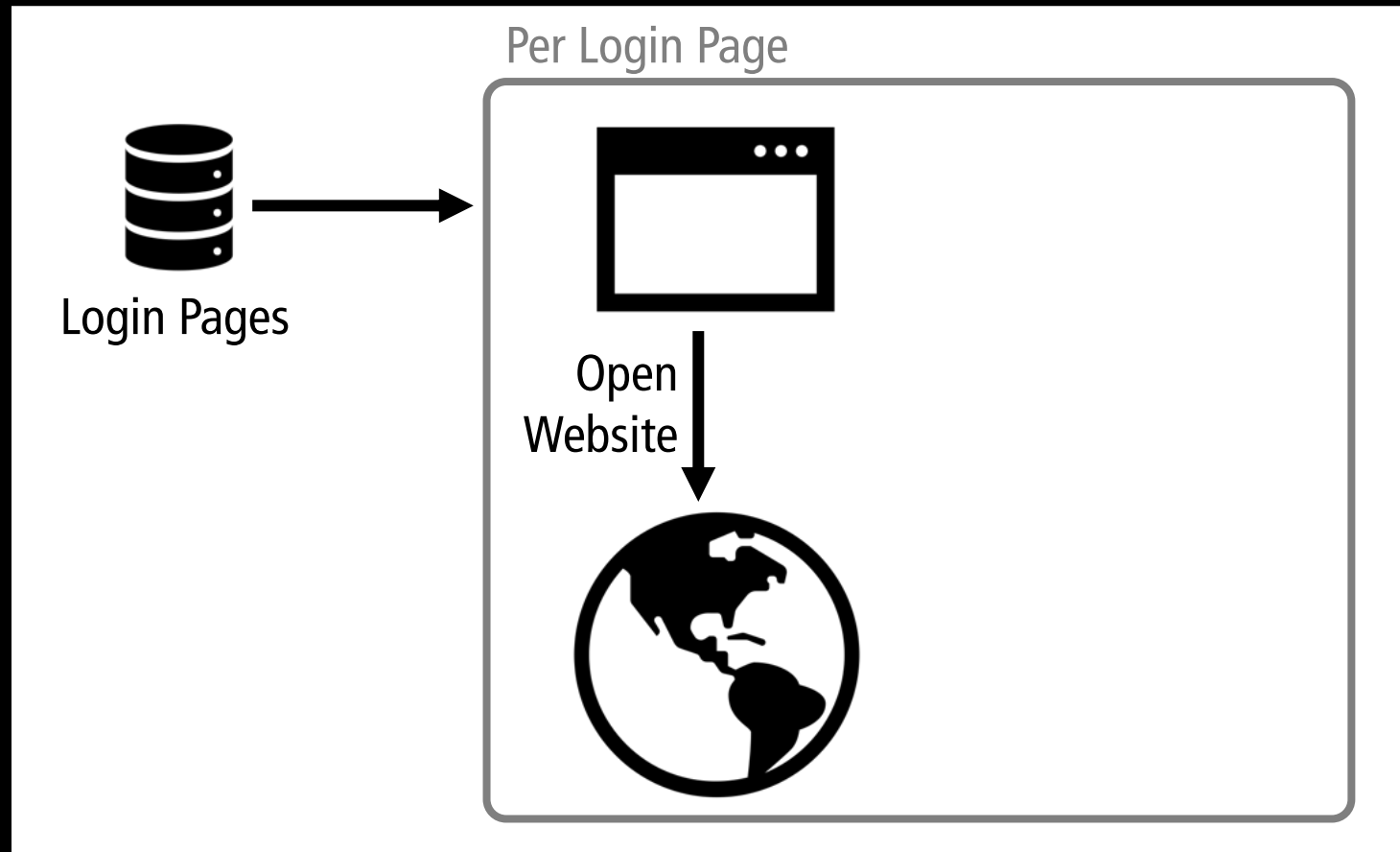
Login Pages Crawling



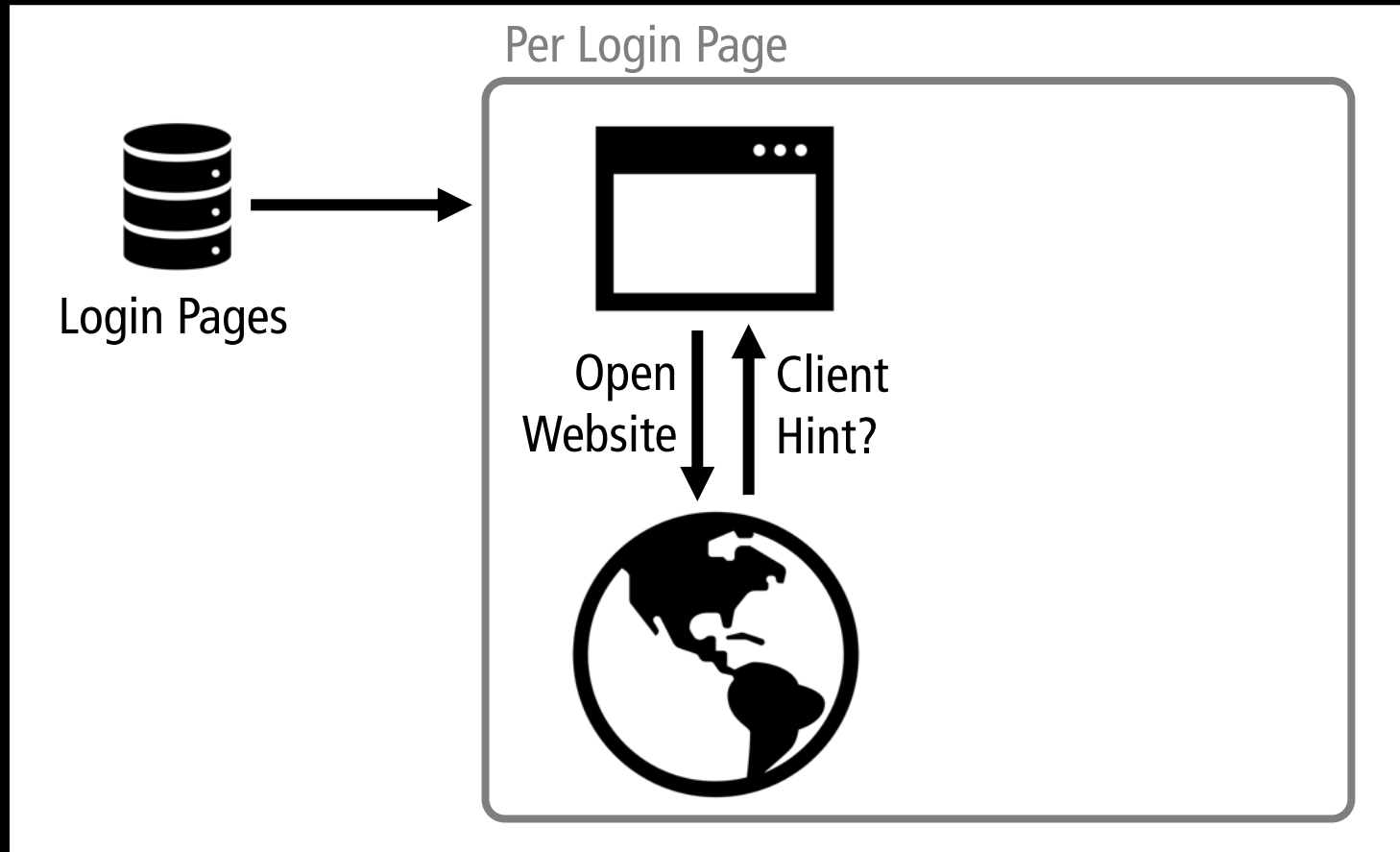
Login Pages Crawling



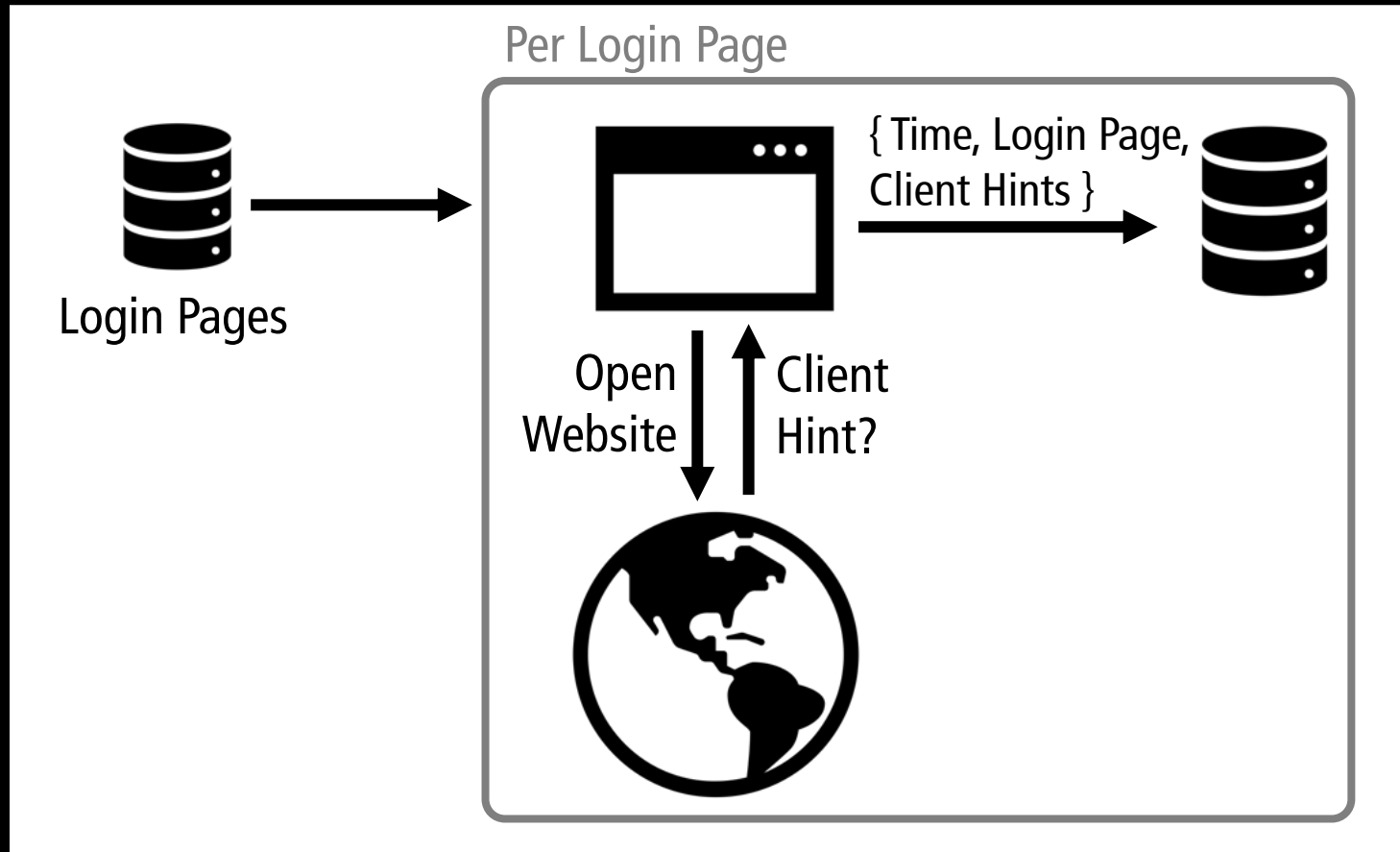
Login Pages Crawling



Login Pages Crawling



Login Pages Crawling





Overview



Study



Results

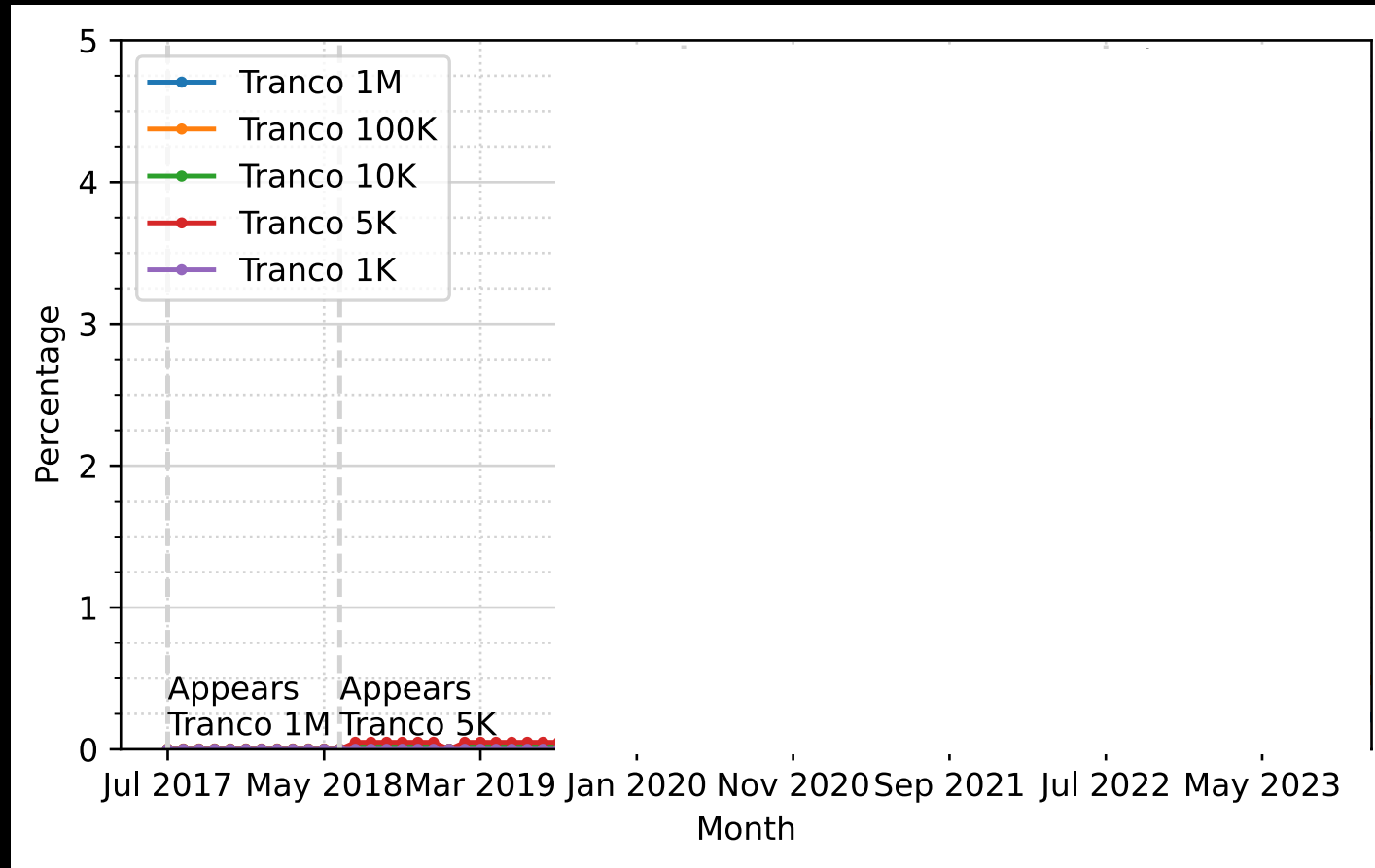


Conclusion

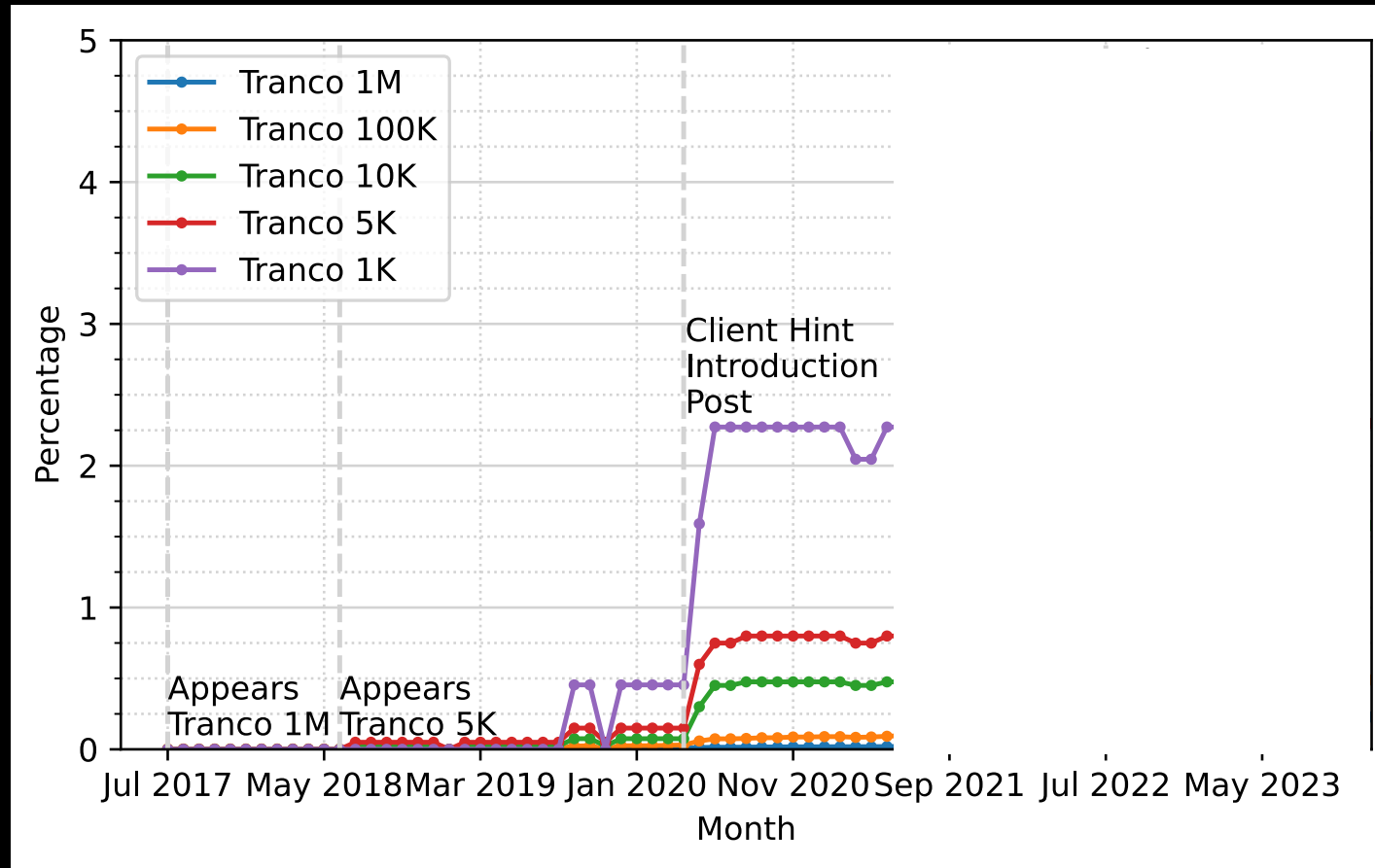




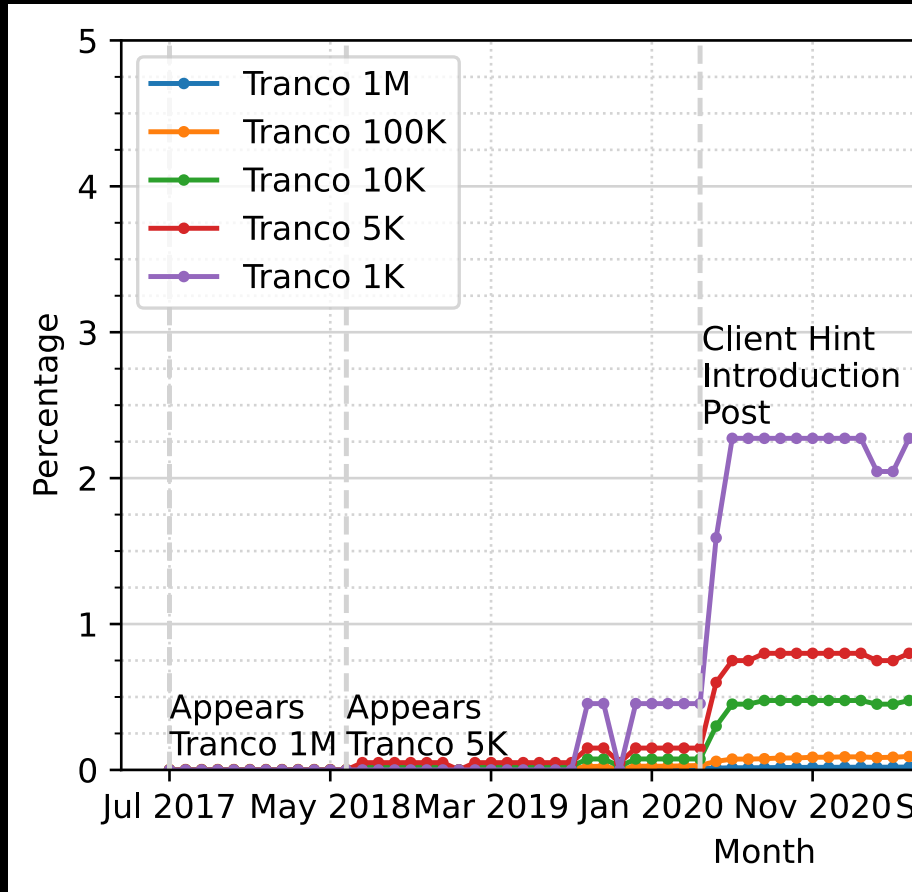
HTTP CHs Get More Popular



HTTP CHs Get More Popular



HTTP CHs Get More Popular



Chrome for Developers | Get inspired | Blog | Docs | New in Chrome | Search

Privacy & Security

Improving user privacy and developer experience with User-Agent Client Hints

User-Agent Client Hints are a new expansion to the Client Hints API, that enables developers to access information about a user's browser in a privacy-preserving and ergonomic way.

Rowan Merewood | Yoav Weiss

Just the data you need
web.dev LIVE

Just the data you need

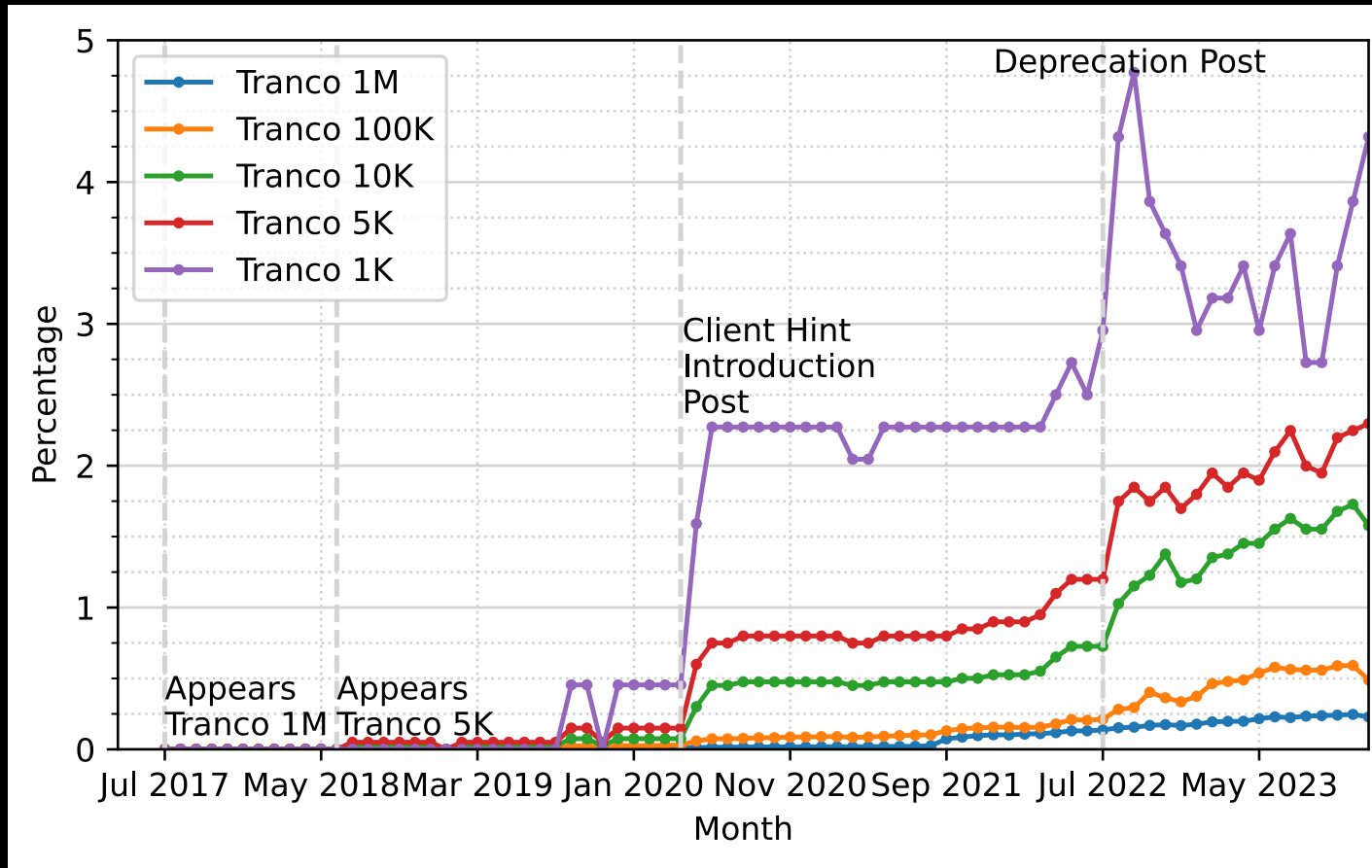
Ansehen auf YouTube

Client Hints enable developers to actively request information about the user's device or conditions, rather than needing to parse it out of the User-Agent (UA) string. Providing this alternative route is the first step to eventually reducing User-Agent string granularity.

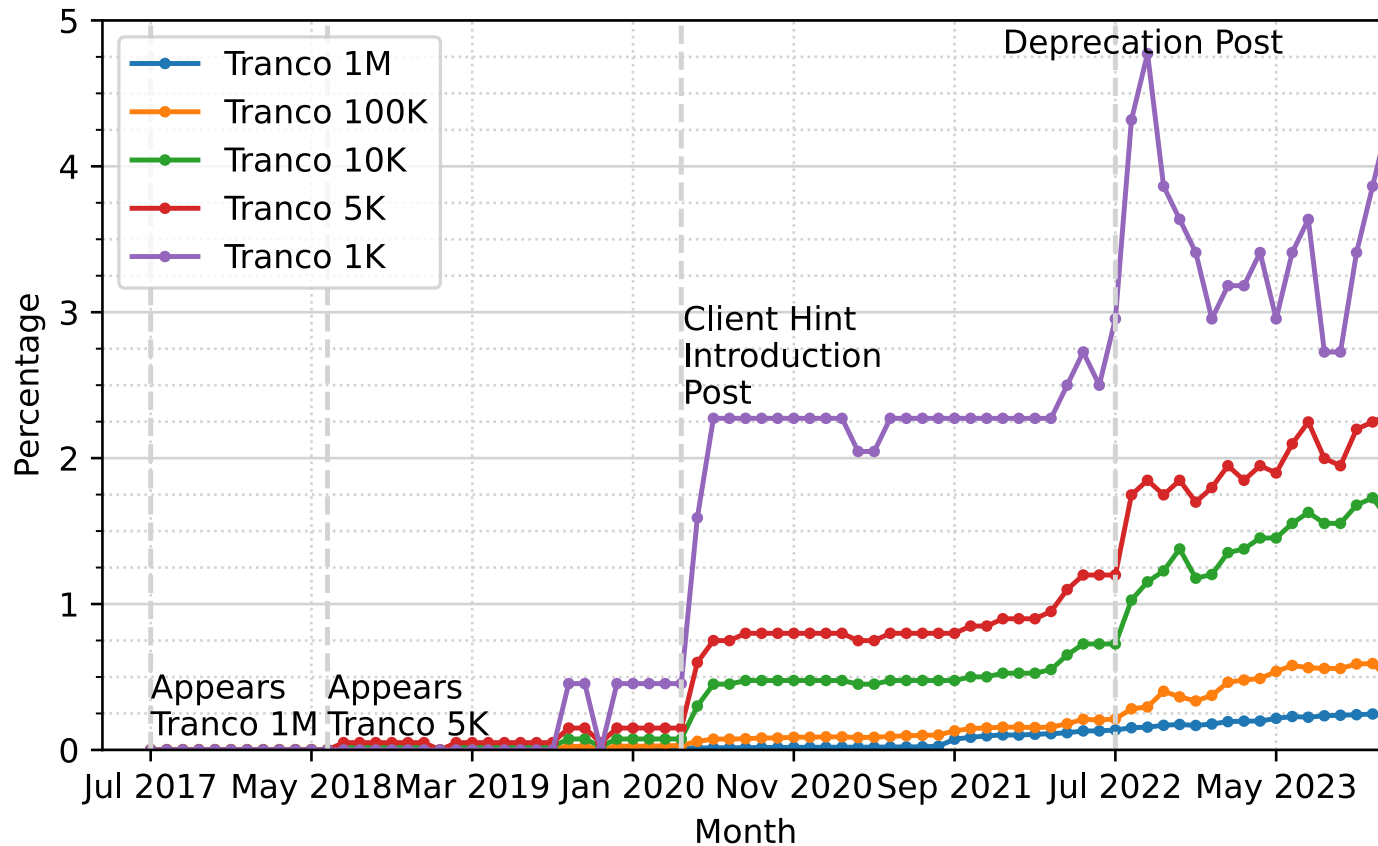
Learn how to update your existing functionality that relies on parsing the User-Agent string to make use of User-Agent Client Hints instead.

<https://developer.chrome.com/docs/privacy-security/user-agent-client-hints>

HTTP CHs Get More Popular



HTTP CHs Get More Popular



M89 Mar 2021 Rolled out User Agent Client Hints API
 M95 Oct 2021 Enable testing reduced UA at scale
 six months for testing
 M100 Mar '22 Minor Version
 M101 Apr '22
 M107 Oct '22 Desktop
 M110 Feb '23 Android
 M113 May '23
 UA String Reduction
 Apr '22 - Feb '23
 Mar '22 - May '23 Enable opt-in to legacy UA

2021 2022 2023

Prepare for User-Agent Reduction changes in October

What's happening with the User-Agent string, why Chrome is making this change, and what you can do to prepare.

Published on Thursday, August 25, 2022
 Translated to: [日本語](#)

Jeremy Ney
 Strategic Partner Development Manager, Google Chrome

Table of contents ▾

In October, Chrome will take the next step in reducing the information available in the browser's User-Agent (UA) string, to improve privacy for users. With this change, websites and services that rely on the User-Agent string for certain information may need to take action.

Here's some background on what's happening, why Chrome is making this change, and what you can do to prepare.

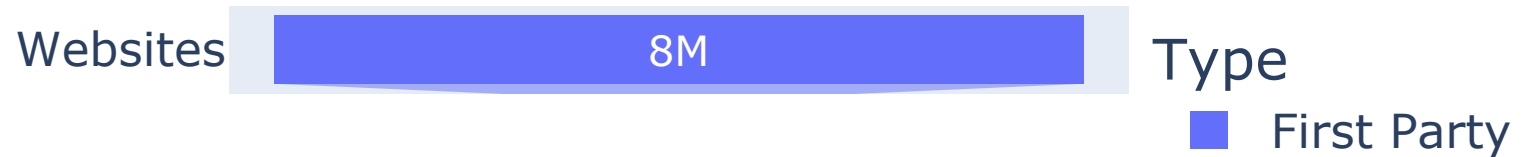
Why is the User-Agent string changing

https://developer.chrome.com/blog/user-agent-reduction-oct-2022-updates/

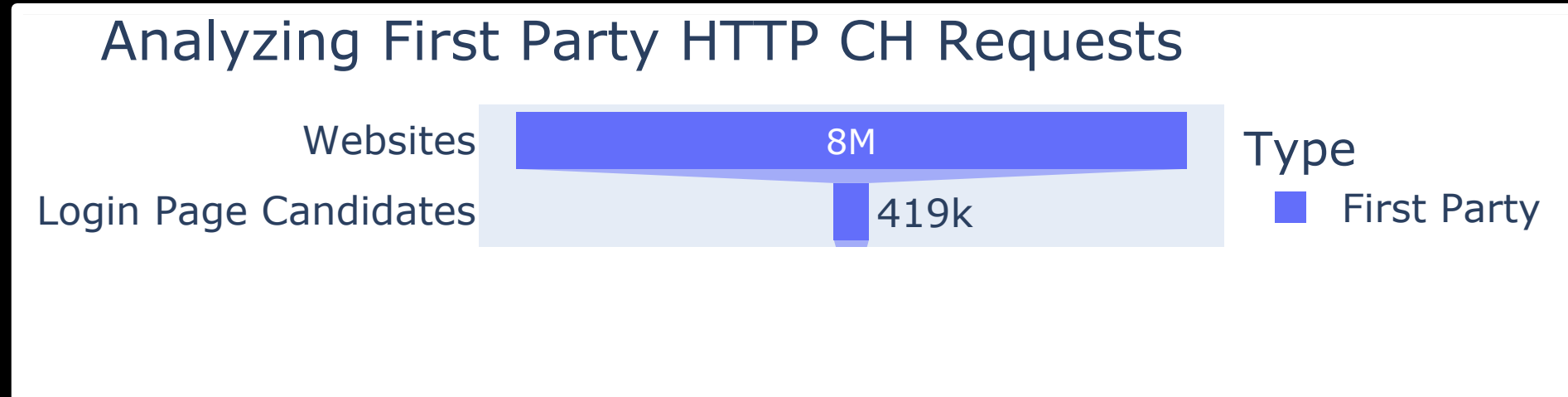


But Only Few Websites Use Them

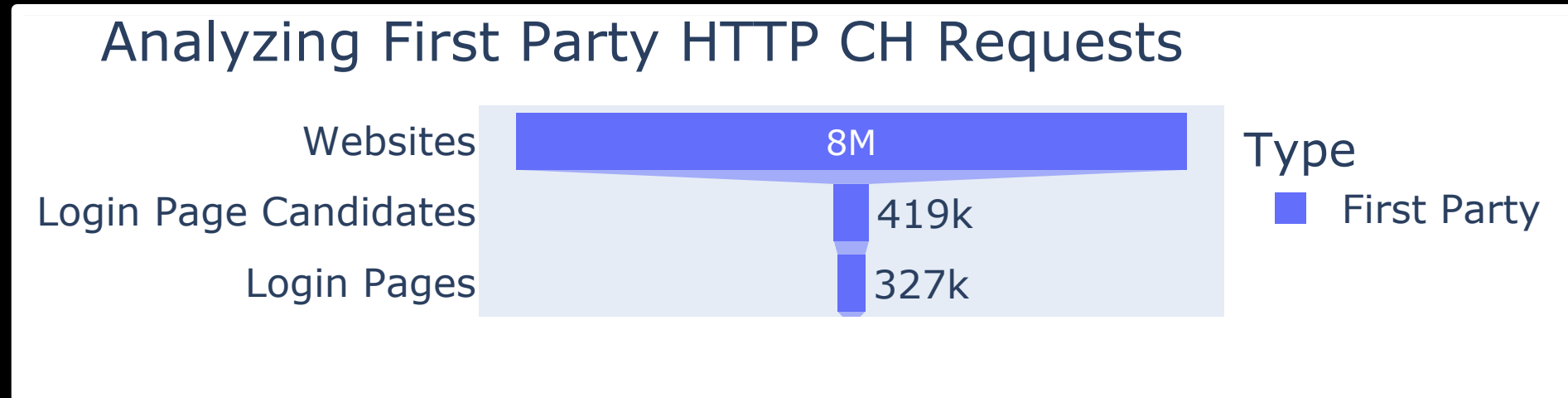
Analyzing First Party HTTP CH Requests



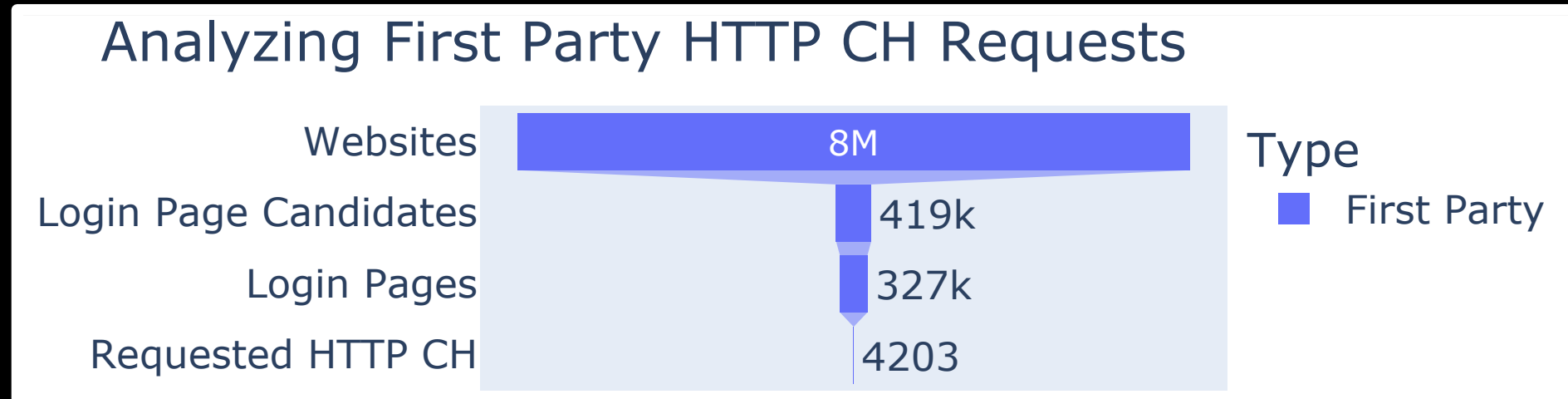
But Only Few Websites Use Them



But Only Few Websites Use Them



But Only Few Websites Use Them



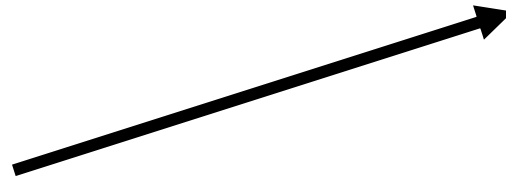


Except for Embedded Third Parties



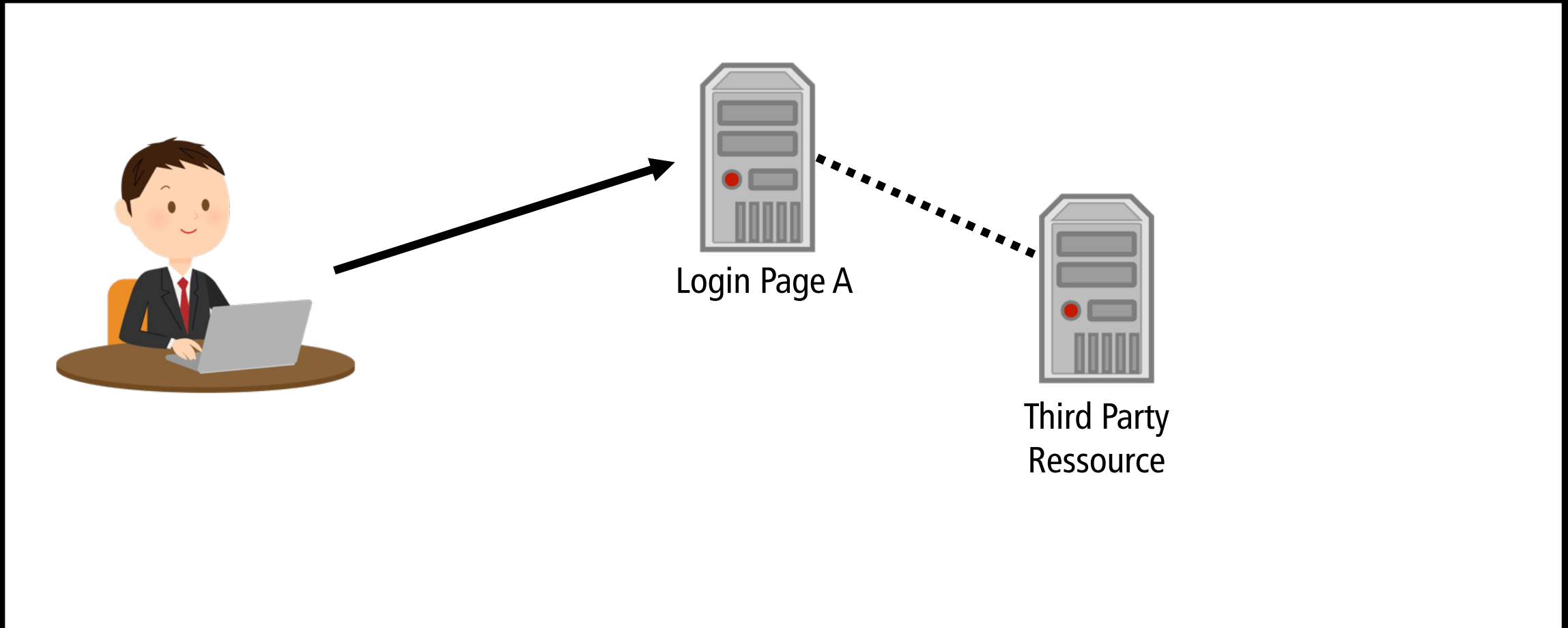


Except for Embedded Third Parties

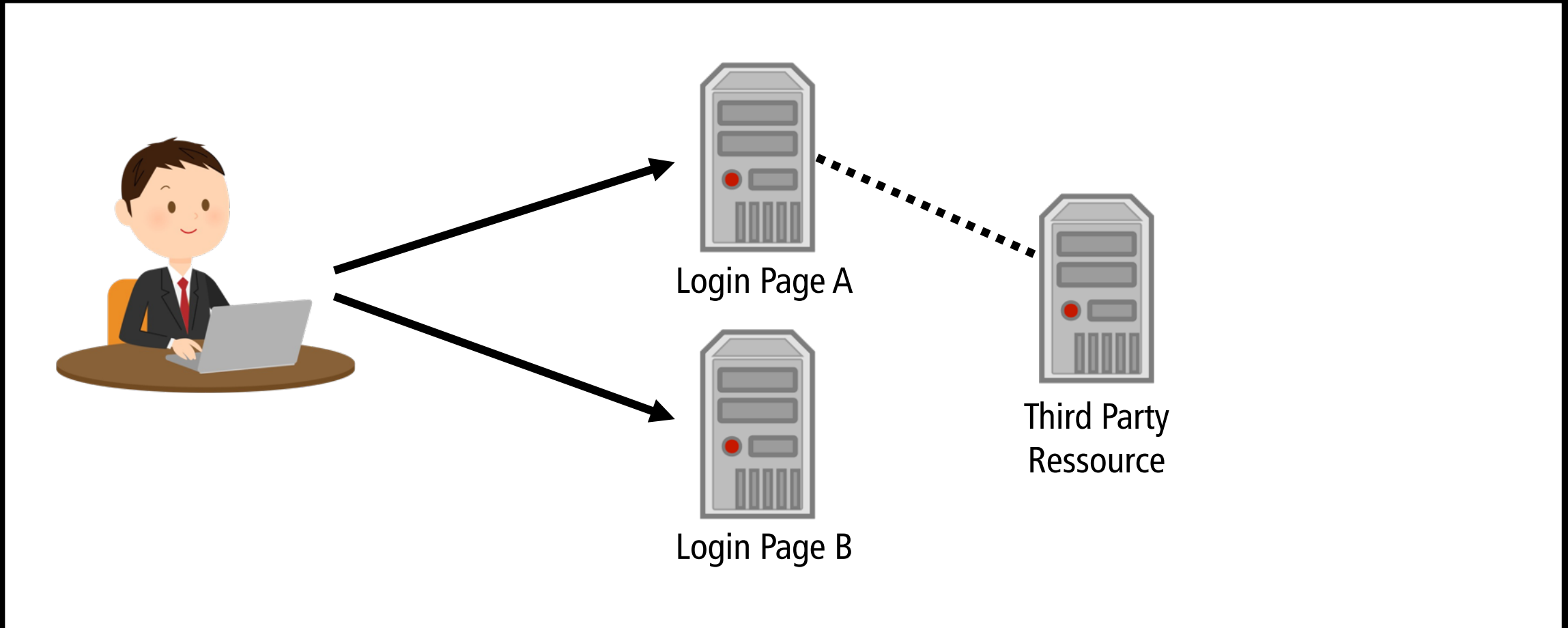


Login Page A

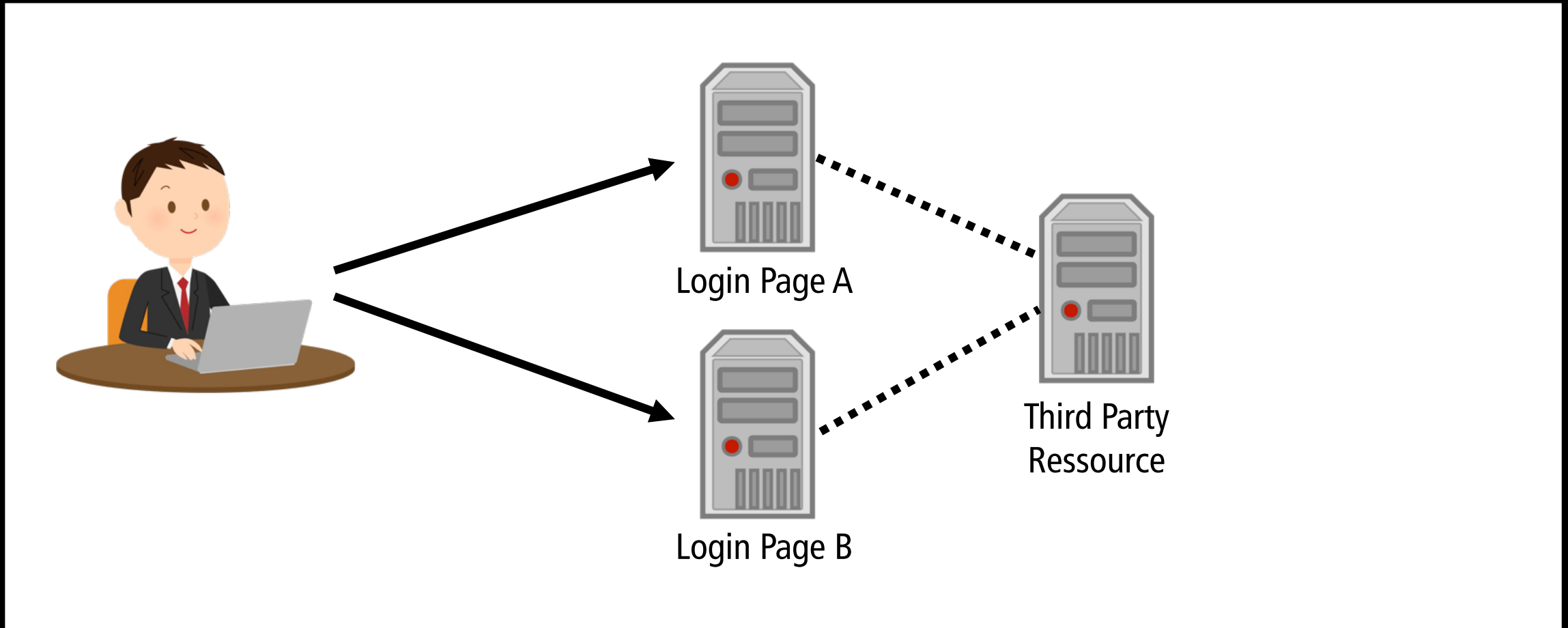
Except for Embedded Third Parties



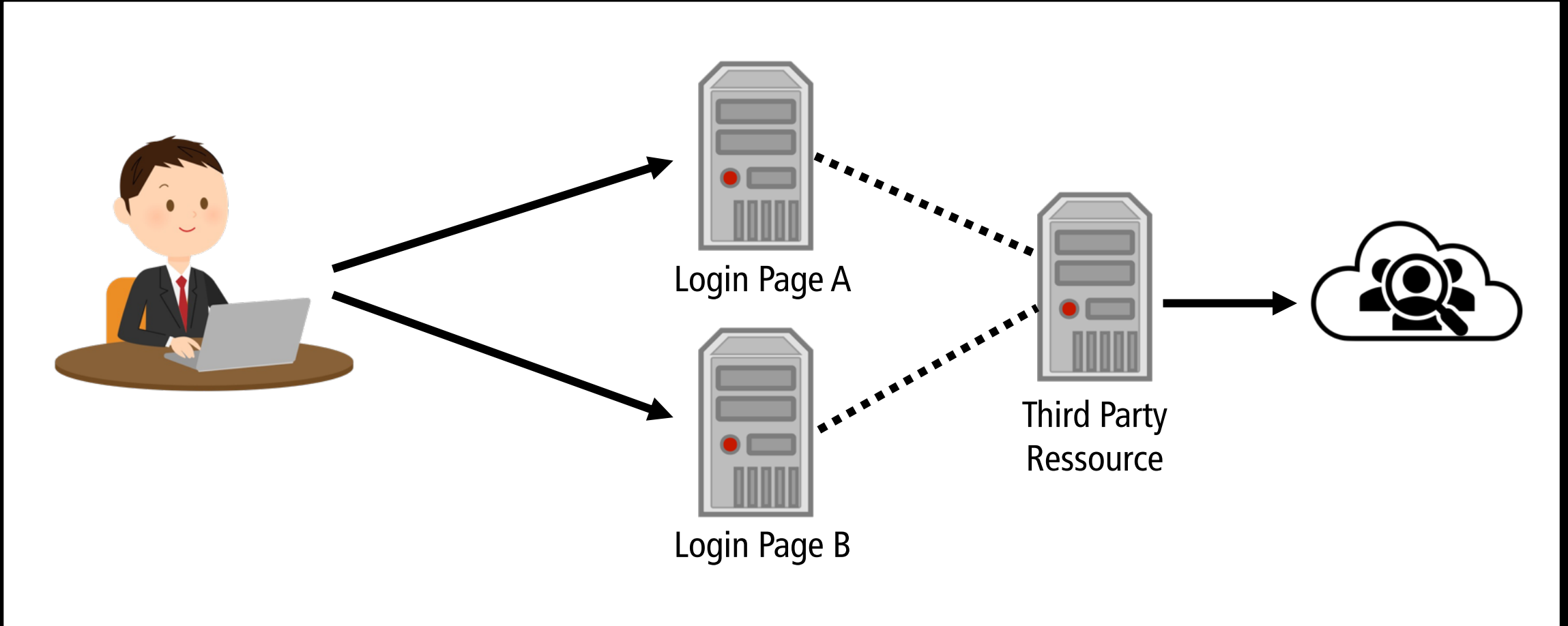
Except for Embedded Third Parties



Except for Embedded Third Parties

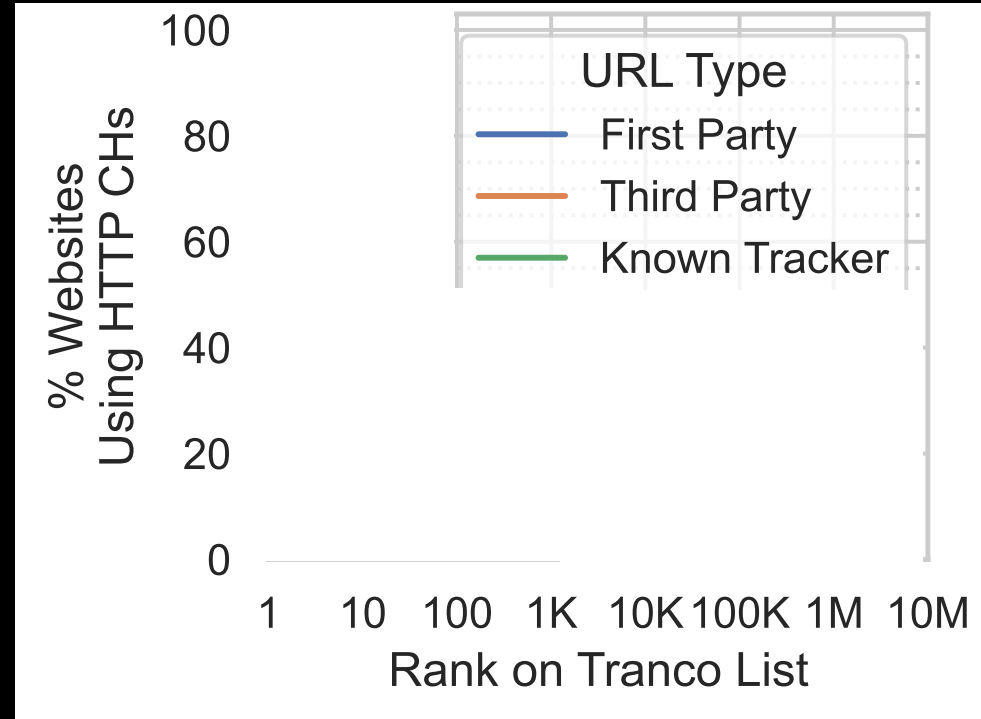


Except for Embedded Third Parties

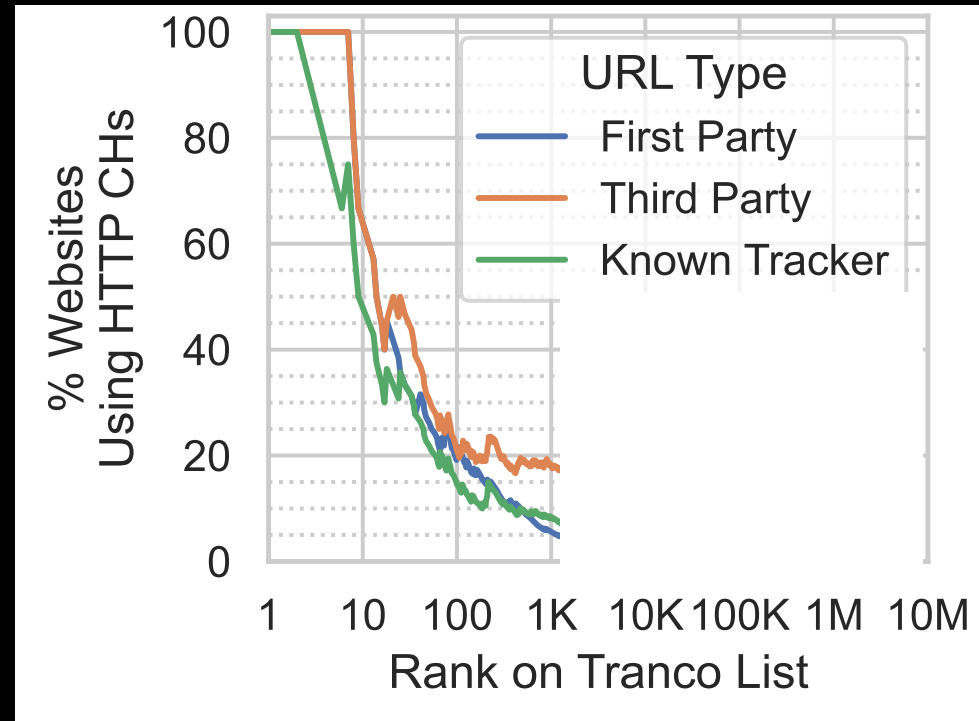




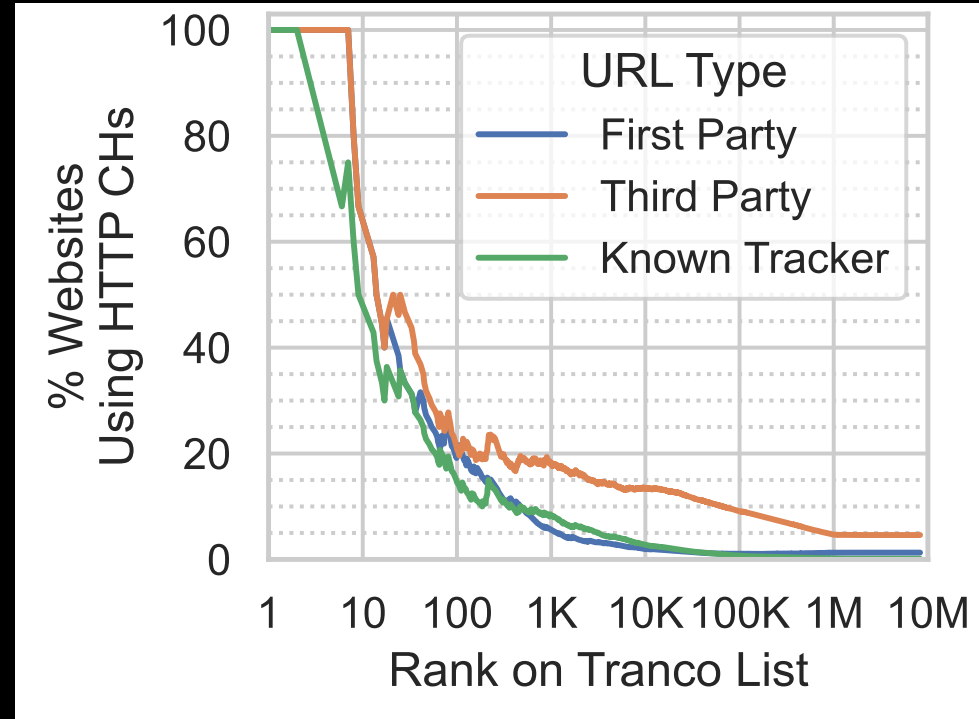
Except for Embedded Third Parties



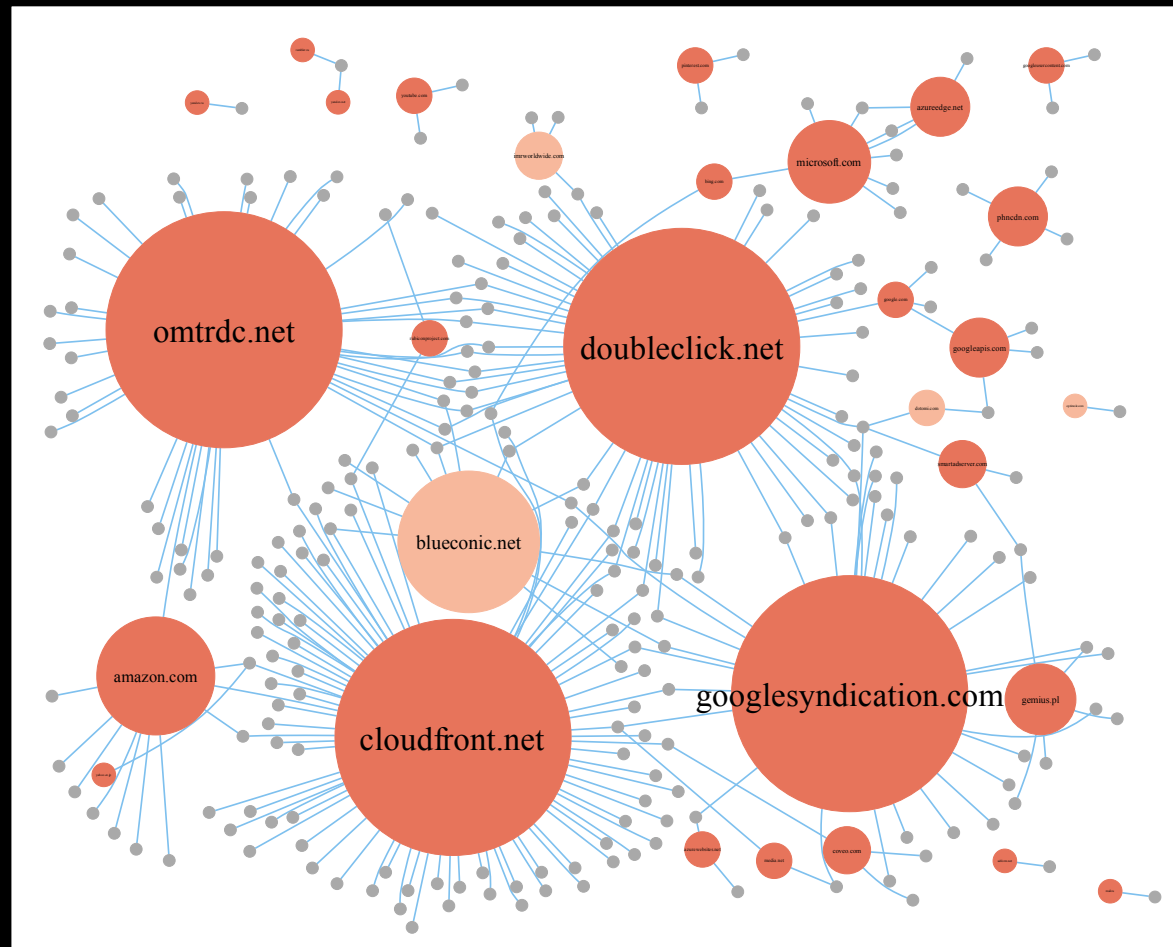
Except for Embedded Third Parties



Except for Embedded Third Parties

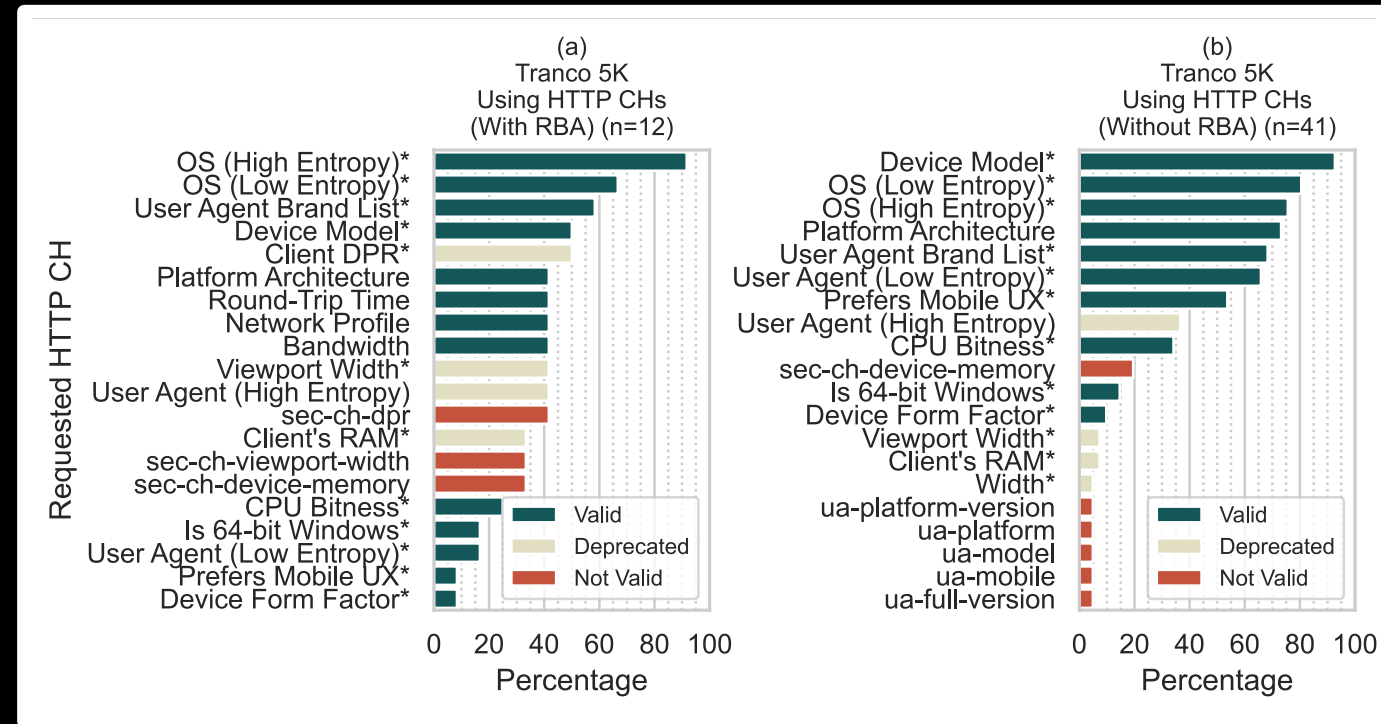


Except for Embedded Third Parties



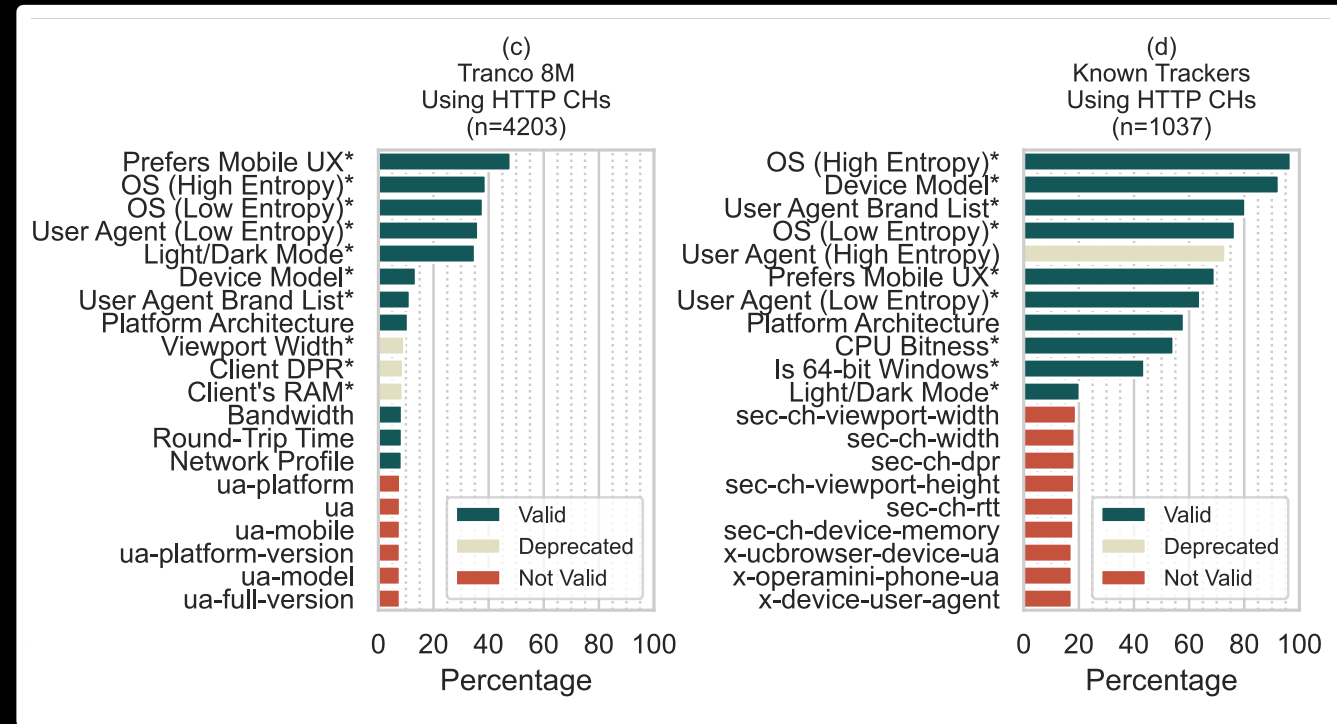
Collected Data Differs on Use Case

- Websites with risk-based authentication (RBA) request higher entropy data than those without

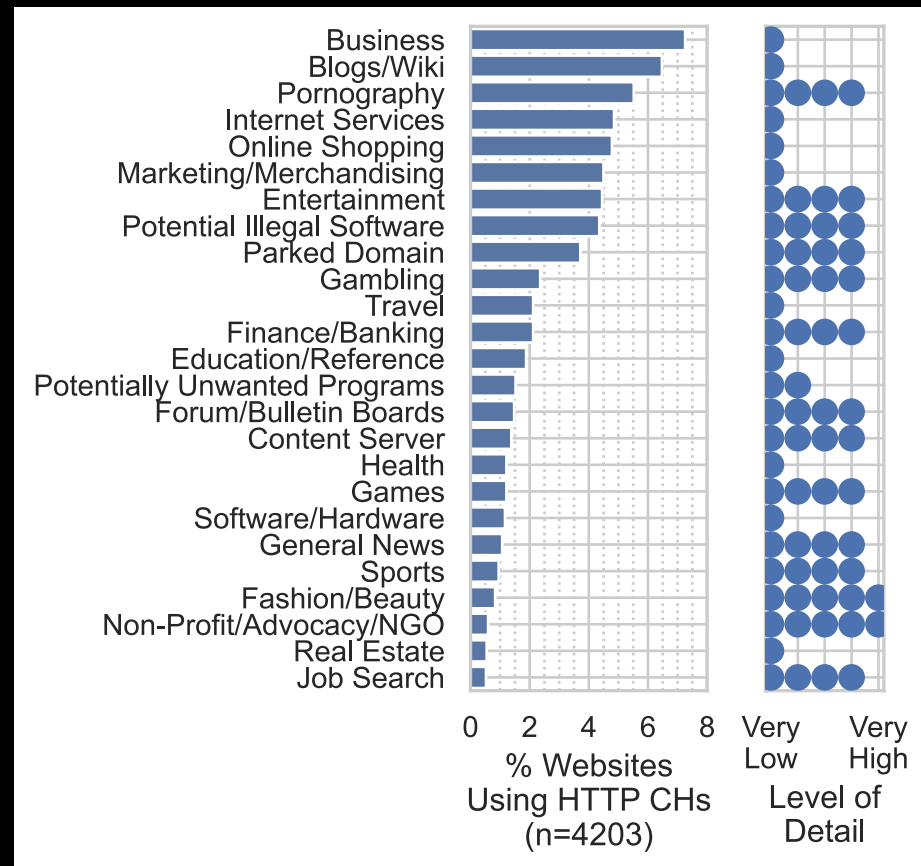


Collected Data Differs on Use Case

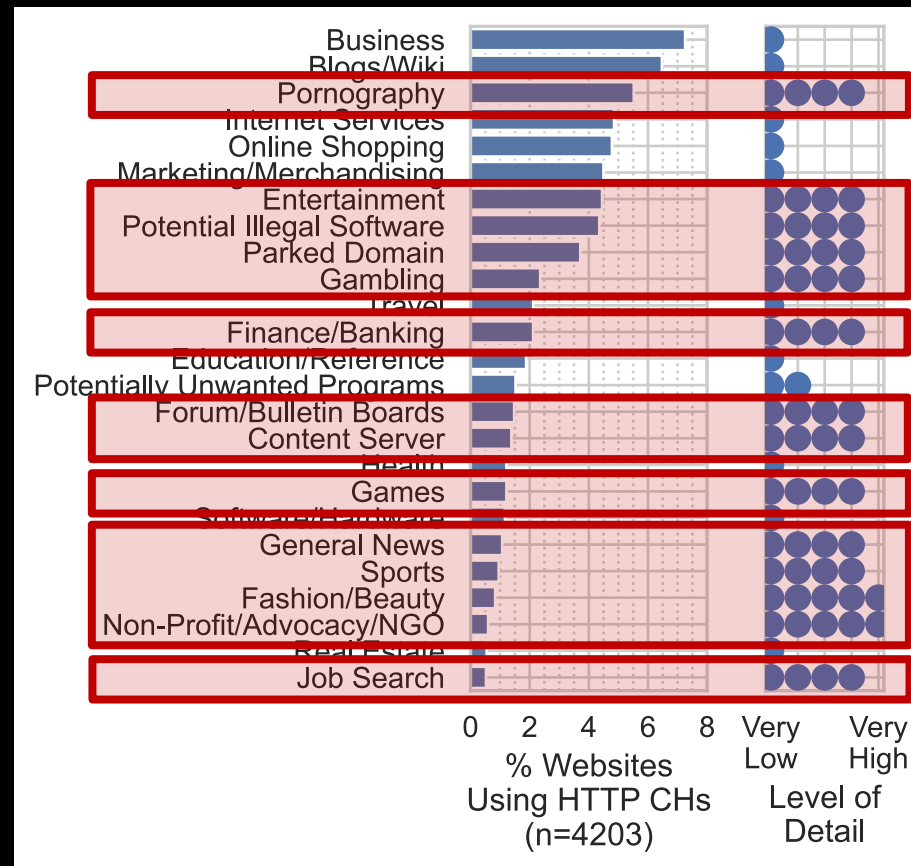
- Known trackers collect more high entropy data than general websites



Website Type Matters, Too



Website Type Matters, Too



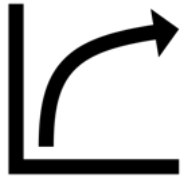


Summary

*rbainfo.org/clienthints



Summary

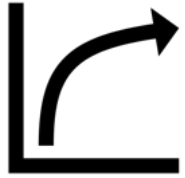


- HTTP CHs are not widespread on 8M top websites

*rbainfo.org/clienthints



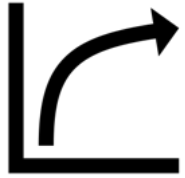
Summary



- HTTP CHs are not widespread on 8M top websites
- But: Highly adopted by third-party trackers

*rbainfo.org/clienthints

Summary

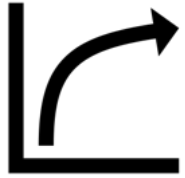


- HTTP CHs are not widespread on 8M top websites
- But: Highly adopted by third-party trackers



- Privacy issue: HTTP CHs collect more data than the classical user agent string

Summary

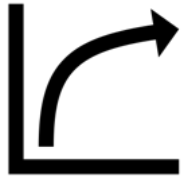


- HTTP CHs are not widespread on 8M top websites
- But: Highly adopted by third-party trackers



- Privacy issue: HTTP CHs collect more data than the classical user agent string
- Browsers should implement countermeasures

Summary



- HTTP CHs are not widespread on 8M top websites
- But: Highly adopted by third-party trackers



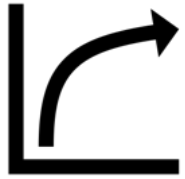
- Privacy issue: HTTP CHs collect more data than the classical user agent string
- Browsers should implement countermeasures



- Crawling data provided as open data*

*rbainfo.org/clienthints

Summary



- HTTP CHs are not widespread on 8M top websites
- But: Highly adopted by third-party trackers



- Privacy issue: HTTP CHs collect more data than the classical user agent string
- Browsers should implement countermeasures



- Crawling data provided as open data*
- Login URLs provided to ethical researchers on request

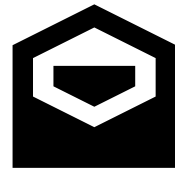
*rbainfo.org/clienthints



Thank you



rbainfo.org/clienthints
das.h-brs.de



clienthints@swiefling.de
luigi.lo_iacono@h-brs.de



[@swiefling@hci.social](https://twitter.com/swiefling)