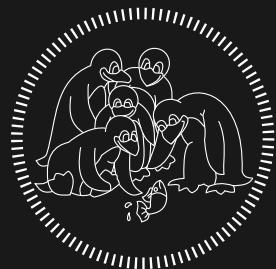




LD**M**I 2023

When one browser tries to rule them all

How web monopolies impose their rules on your computer



POLITECNICO OPEN
unix LABS

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POLITECNICO OPEN unix LABS

Who are we?

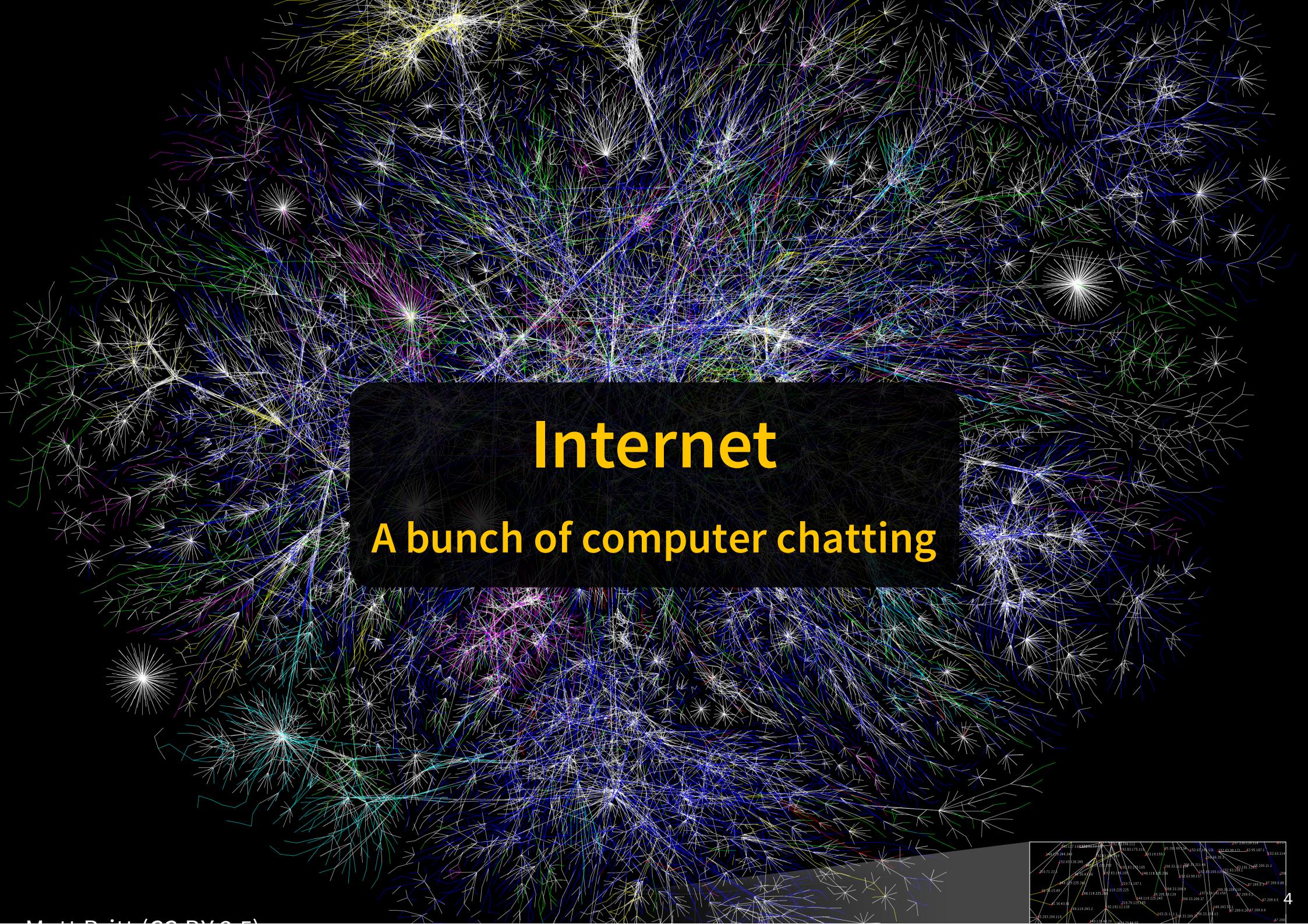
We are a non-profit *association* and *hacking community* formed by students from  **Politecnico di Milano**, the largest technical university in Italy.

POLITECNICO OPEN unix LABS

What do we do?

We promote the use of  **Free and Open Source Software** through courses, talks and workshops

You can find our work on  slides.poul.org



Internet
A bunch of computer chatting



Speaker notes

Everybody can connect to the Internet and provide a service to other computers.



Internet
A bunch of computer chatting
What language do they speak?



They all speak Internet Standards

In general, an Internet Standard is a specification that is stable and well-understood, is technically competent, has multiple, independent, and interoperable implementations with substantial operational experience, enjoys significant public support, and is recognizably useful in some or all parts of the Internet.

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Keep this in mind!

But I am not a computer, how can I interact with the Internet?

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Browsers to the rescue!



They *fetch and display* web pages on your computer

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and...

- Keep an history of visited pages
- Manage passwords
- Upload and download files
- Encode and decode (encrypted) audio/video
- Record audio/video
- Modify the pages before displaying them
- Access the device position and sensors
- Directly control the hardware
- Intercept HID actions (mouse and keyboard inputs)

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- Intercept HID actions (mouse and keyboard inputs)
- **Run arbitrary code**

But can all browsers do all of that?

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Yes! Because all of the features are *standardized*

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So every website is compatible with every browser, right?

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What if...

One browser could become *so popular*
that it can afford to

What if...

**One browser could become so popular
that it can afford to**

*not implement some standards and
force the websites not to use them?*

or

What if...

**One browser could become so popular
that it can afford to**

*not implement some standards and
force the websites not to use them?*

or

*unilaterally create new standards and
force the other browsers to adopt them?*



Enter the magic world of

Monopolies

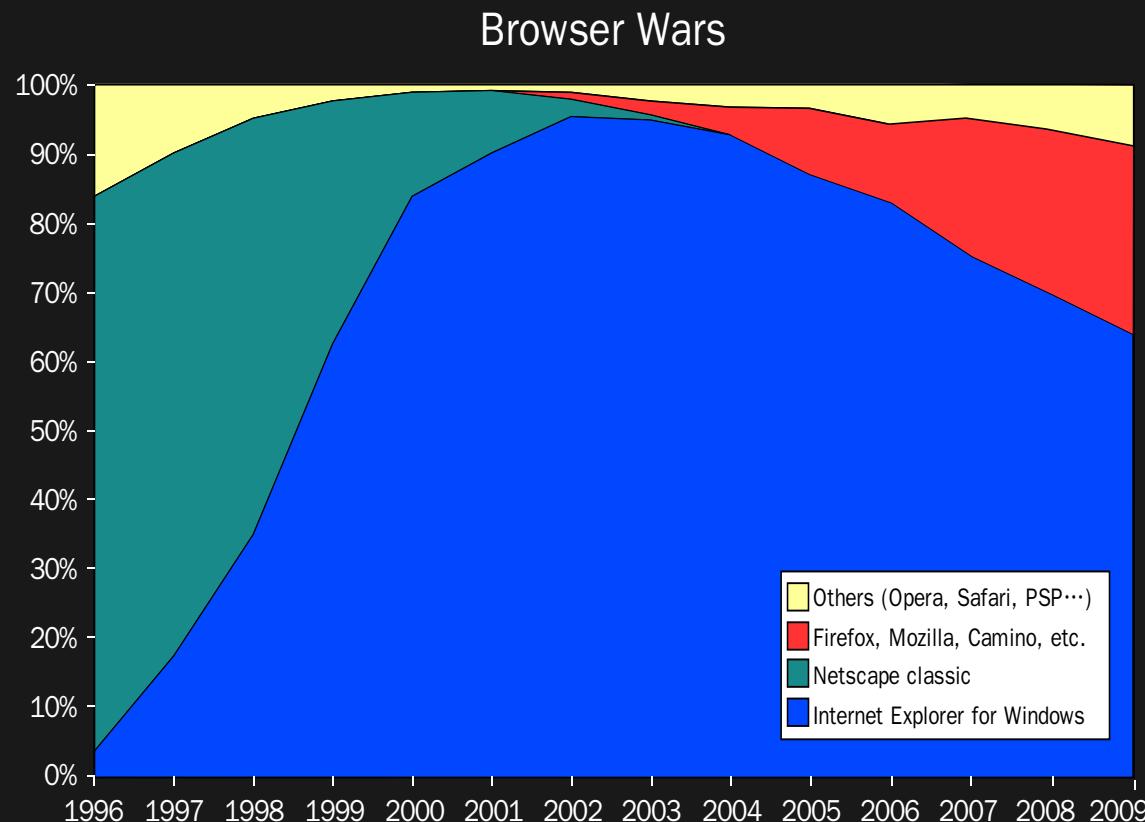
Where they can do whatever they want!

but you can't

*But the user is **free** to choose whichever browser they want!*

Story time!

First browser war (1995-2001)



Source [Wikimedia Commons](#)

How did we *attempt* to solve this?

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Microsoft Corp. v. EU Commission (2007)

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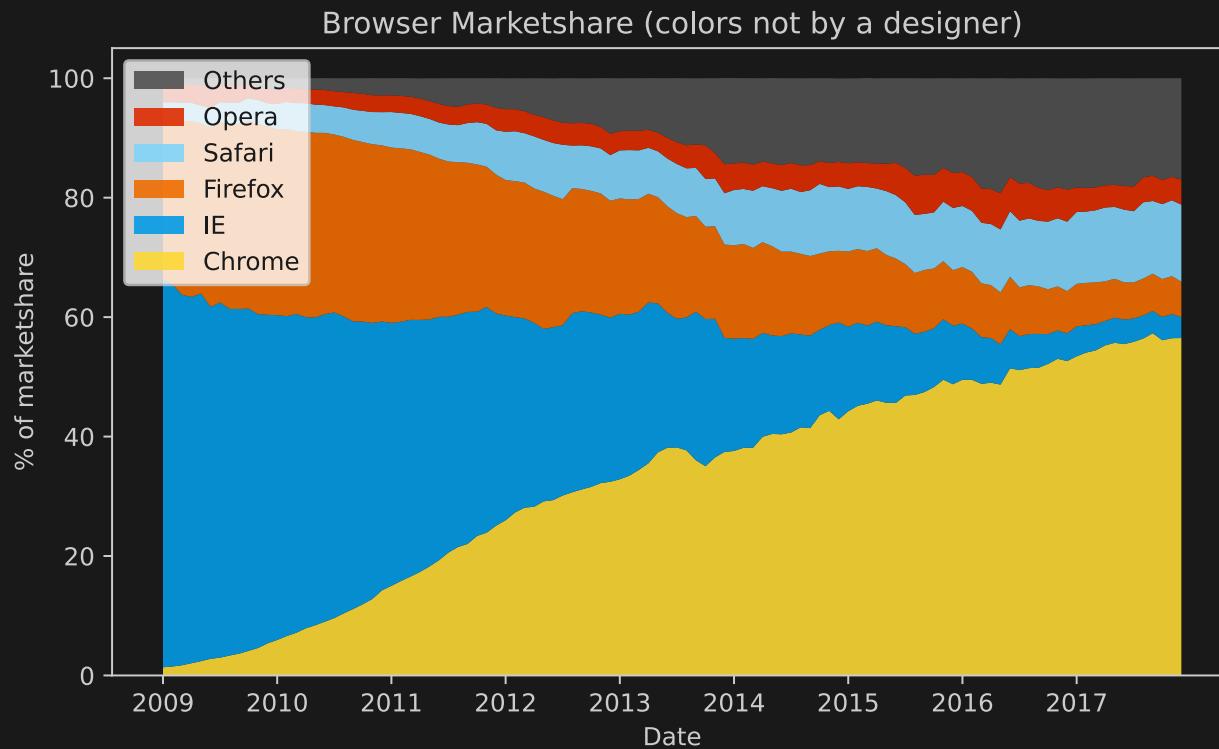
Select your web browser(s)

 Maxthon Browser	 chrome	 Internet Explorer	 Opera™ browser	 Mozilla Firefox
Unsurpassed speed and easy-to-use with features you will only find in Maxthon 3. Take you from view to do! 600 million downloads.	A fast new browser from Google. Try it now!	Fast, clean and trusted. The world's most popular browser on Windows. Free from Microsoft.	Upgrade to a better browser. Opera is fast, smooth and easy to use.	Firefox is fast, flexible and secure. Proudly non-profit, we're always innovating for you. Try the free download!
Install	Install	Install	Install	Install
Tell me more	Tell me more	Tell me more	Tell me more	Tell me more

[Further Information](#), [Terms of use](#) and [Privacy statement](#).

Story time!

Second browser war (2004-2017)



Source [StatCounter Global Stats](#)

Mozilla CTO admits that
Google Chrome **won** the Second Browser War

How did we *attempt* to solve this?

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Alphabet (Google) v. EU Commission (2019)

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- On mobile, Google cannot subordinate the installation of Play Store to the preinstallation of the Chrome browser.
- €4.1 billion fine

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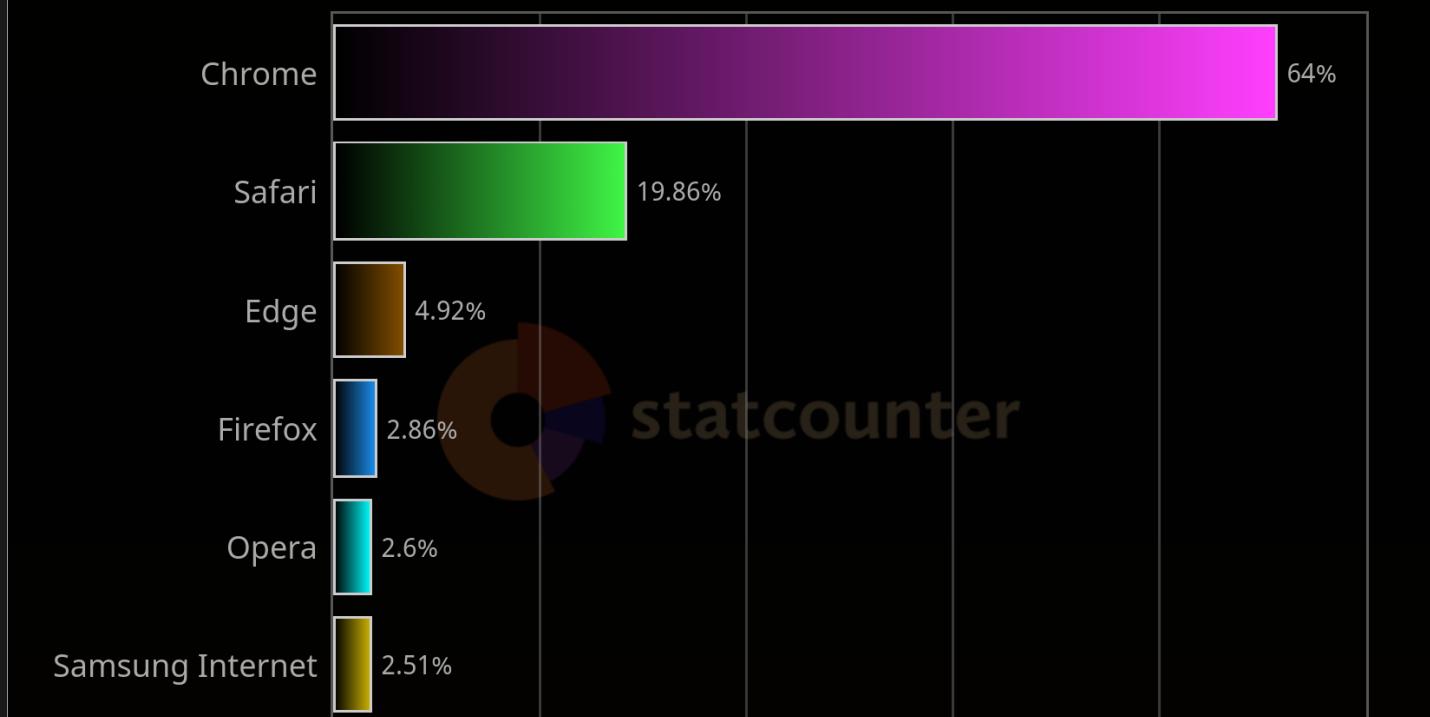


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Did it work?

Today

Browser Market Share Worldwide 2023



Source [StatCounter Global Stats](#)

Why did we end up here?

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changing browsers requires effort
- User **loyalty**
users loyal to a corporation will not give up their browser

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*if the user does not care about their browser,
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- Better integrations
*Chrome with Google ecosystem,
Safari with Apple ecosystem,
Edge with Microsoft ecosystem*
- Website requirements
*some websites (did) require certain browsers
(for more or less valid reasons)*

But why should we care?

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What is Chromium?

Chromium is a free and open-source web browser project, mainly developed and maintained by Google. This codebase provides the vast majority of code for the Google Chrome browser [...] Microsoft Edge, Samsung Internet, Opera, and many other browsers are based on the Chromium code. Moreover, significant portions of the code are used by several app frameworks.

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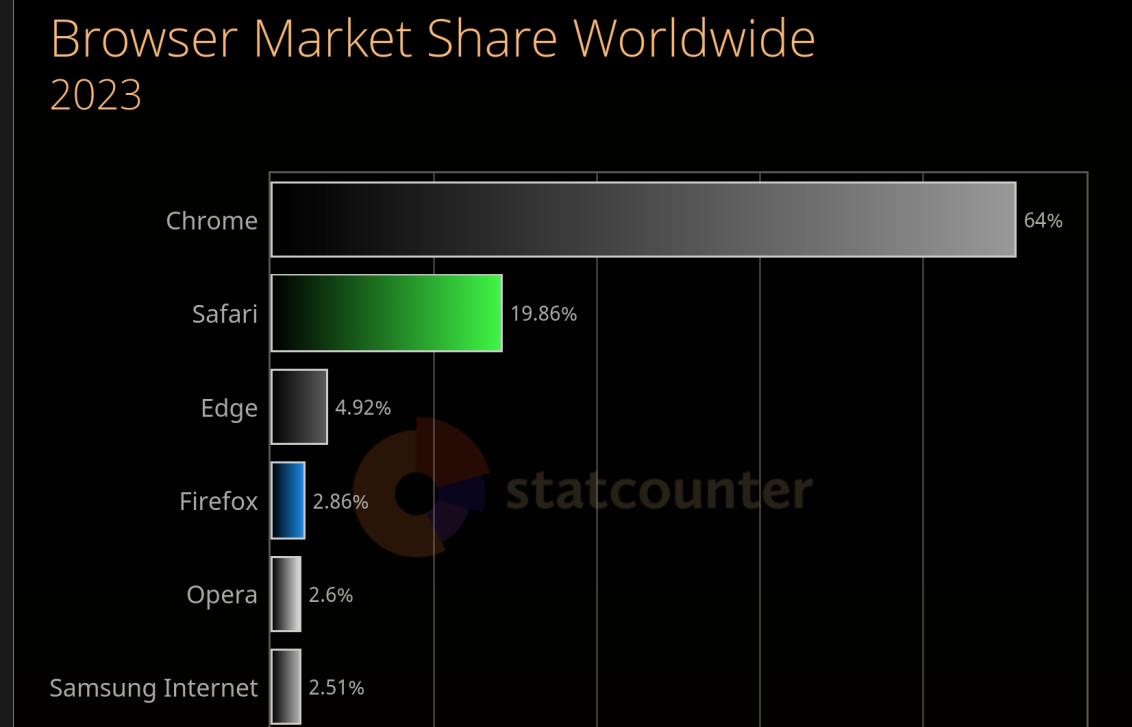
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Source  From Wikipedia, The Free Encyclopedia

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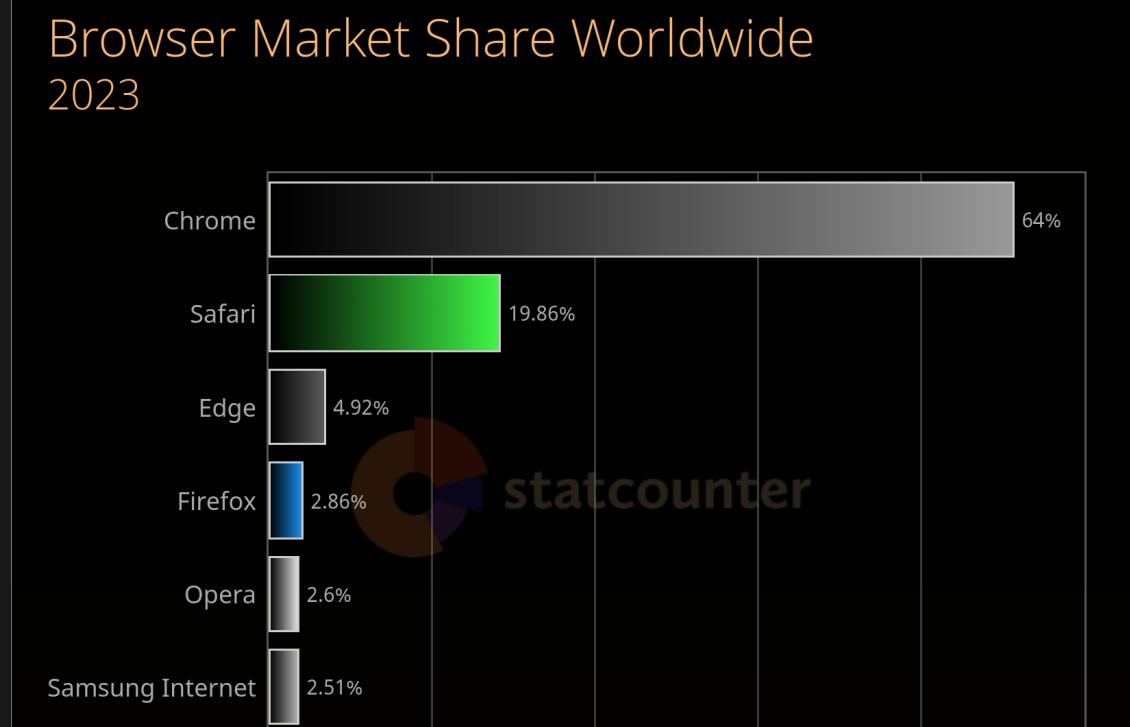
Chromium is everywhere



Source  Statcounter Global Stats

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Source [Statcounter Global Stats](#)

Only less than 25% of browsers are somewhat independent

But why should we care?

The vast sea of independent browsers

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- **Firefox**: developed **openly** by the **Mozilla Foundation**

So basically **only Firefox** is truly **independent**

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 - They can **decide what we do** with our browsers (e.g. *ManifestV3* and *WEI* cases)
- Single **huge point of failure** in terms of security
 - If a critical **security vulnerability** is found in **Chromium**, more than **70%** of the internet population is **vulnerable**

But why should we care?

Mozilla Foundation

Who develops Firefox

It is a **non-profit organization** that governs the **development** of the **Firefox** browser and other Mozilla project

According to  **their manifesto** they are committed to an open and accessible internet

But why should we care?

How the Mozilla Foundation survives

Alphabet Inc.  accounted for 83% of Mozilla's revenue in 2021

But why should we care?

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But why though?

But why should we care?

Why Alphabet keeps Mozilla alive

Alphabet pays **royalties** to Mozilla so that
Google is the **default search engine** in Firefox

But why should we care?

Why Alphabet keeps Mozilla alive

This creates a **difficult relationship**:

But why should we care?

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Source  bloomberg.com

**Recent cases: JPEG-XL, ManifestV3, and
use of un-standardized features**

Recent cases

JPEG XL

JPEG XL is a royalty-free raster-graphics file format that supports both lossy and lossless compression. It is designed to outperform existing raster formats and thus become their universal replacement.

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Non exhaustive list of impressive features

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Non exhaustive list of impressive features

- **60% improvement** in compression efficiency over JPEG
- Better compression **performance** than HEIC, AVIF, WebP and JPEG 2000
- Support for **both lossy and lossless** compression
- **Progressive decoding**
- And many more...

Recent cases

JPEG XL's support from the industry

Well known industry names voiced support
for the format as their preferred choice like:

Recent cases

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Firefox added support but at the time of writing it is still experimental and hidden

Recent cases

What Chromium did

Support was **included in an experimental state on April 1st 2021**, and then **removed on December 9th 2022** citing "**lack of interest** and a wish to improve existing formats"

Recent cases

What Chromium did

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Obviously  the community was not happy

Recent cases

Why it is important

Once we have support in at least a big chunk of the browsers, the companies like Facebook will probably start deploying quite quickly and others will follow



Jon Sneyders told New Scientist before Google removed support

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Jon Sneyders told New Scientist before Google removed support

Unfortunately, his hopes didn't come true

Google, **with its decision, stunted JPEG-XL's adoption**, allowing rival formats (AV1F) to take hold

Recent cases

Manifest V3

An extension manifest gives the browser information about the extension, such as the most important files and the capabilities the extension might use.

 Google Developer Docs

Recent cases

Manifest V3

Manifest V3 brought **many changes** in the name of
privacy, usability and performance...

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Manifest V3

Manifest V3 brought **many changes** in the name of
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While **some** changes may be **improvements**,
like disabling remote code, **some** were **controversial**

Recent cases

Manifest V3

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Manifest V3

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It **broke many extensions** that worked fine with Manifest V2, like **for example ad-blockers**

A [good read](#) on the matter from the **EFF**

Recent cases

How Manifest V3 limits extensions: declarativeNetRequest

With **Manifest V2**, extensions could use the
webRequest API to:

Recent cases

How Manifest V3 limits extensions: declarativeNetRequest

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Recent cases

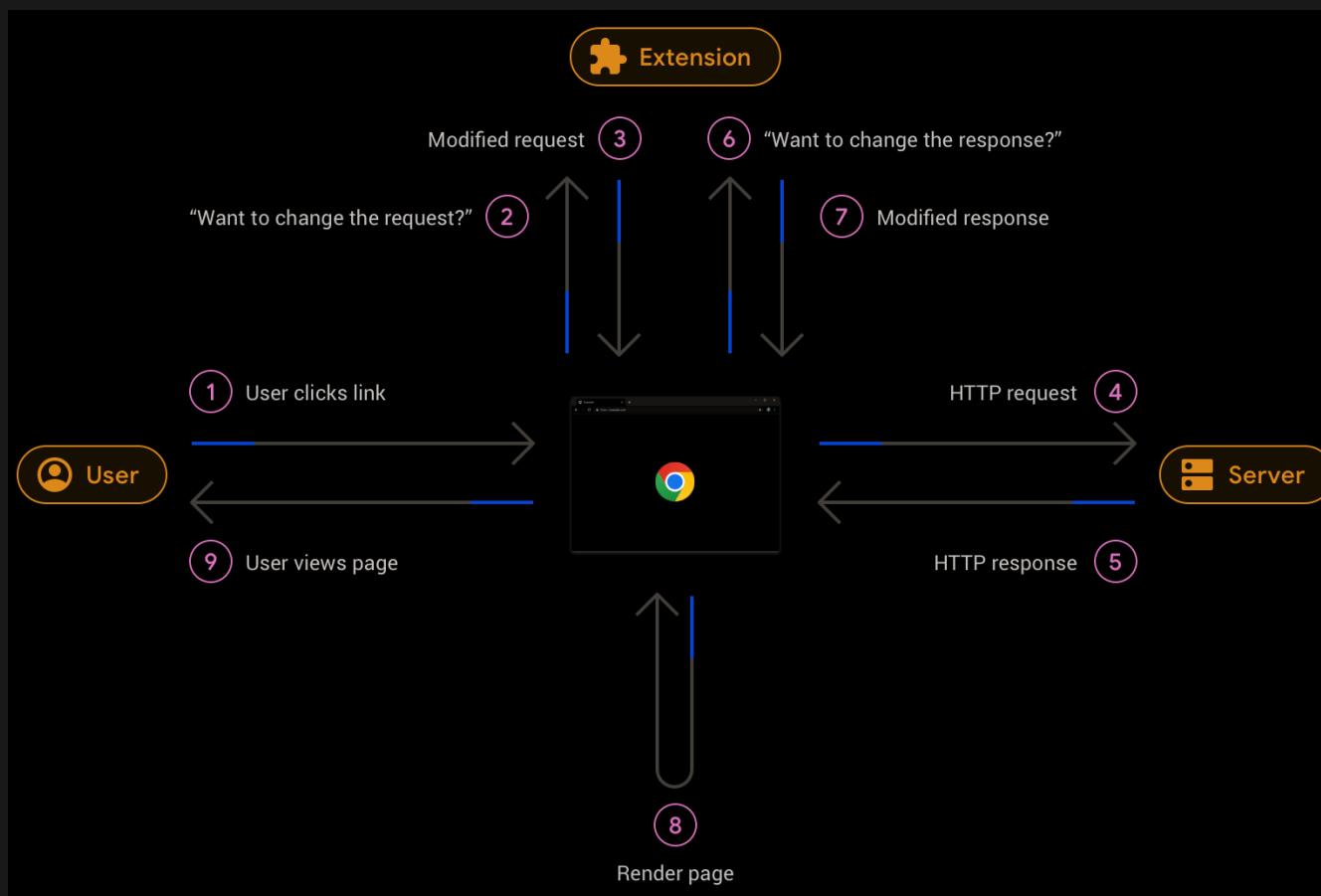
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Recent cases

How Manifest V3 limits extensions: declarativeNetRequest



For those with a visual memory

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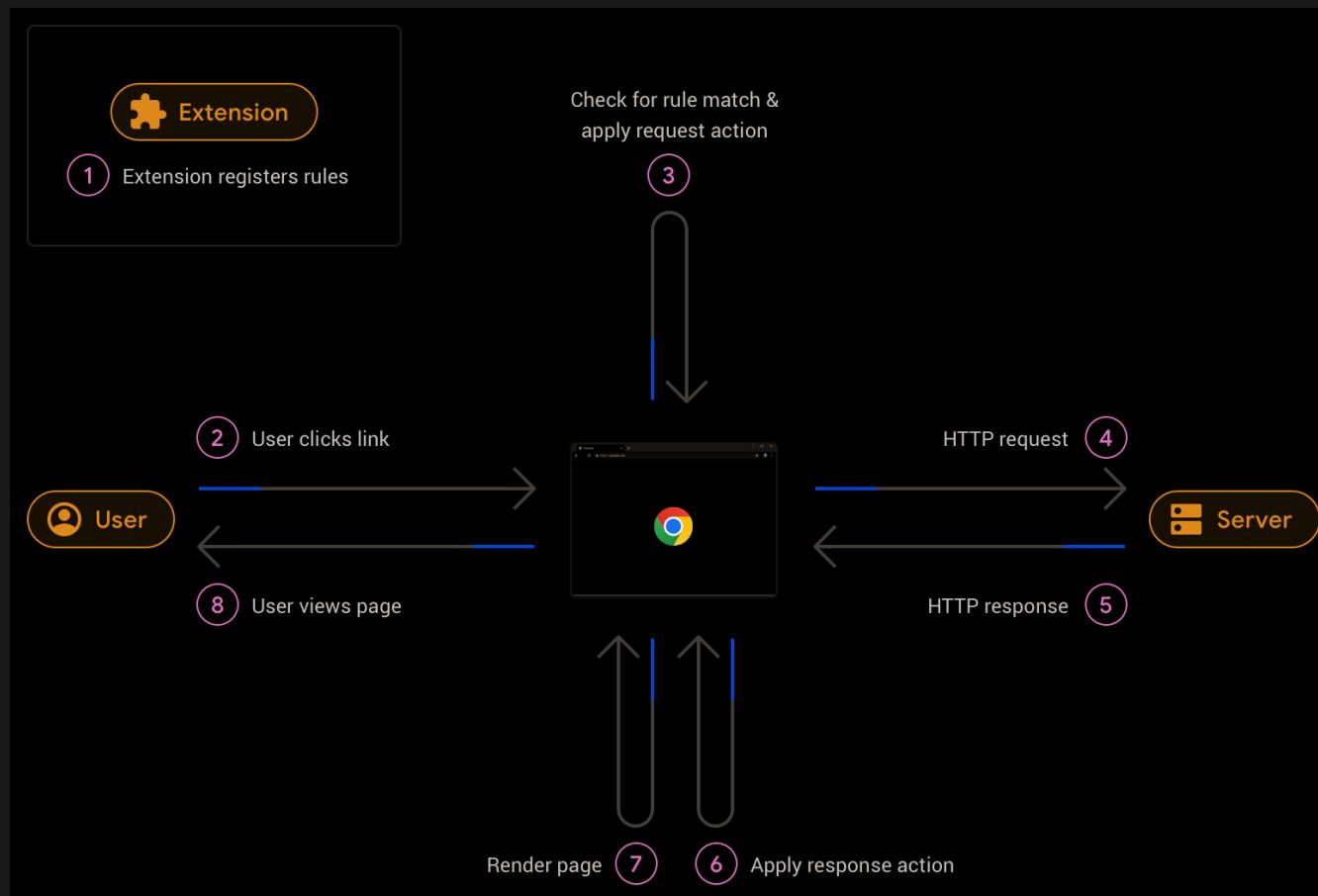
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Recent cases

How Manifest V3 limits extensions: declarativeNetRequest



For those with a visual memory

Recent cases

Manifest V3 affected not just Chrome users...

Other browsers, like Firefox, had to find a way to implement a compatible system so that:

- They would not miss out on Chrome's extension ecosystem
- They could give extension developers the same freedom as Manifest V2

Recent cases

Sites designed to work only for Chromium browser

Chromium would often **implement un-standardized features** ahead of everyone, leading to  some sites requiring a Chromium-based browser to function

Recent cases

Sites designed to work only for Chromium browser

This often **forced** the hand of **standardizers** and **other browsers** that needed to implement experimental features only to not break user experience

Recent cases

These are not the only ones

-  WebBundle

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 -  Web Environment Integrity

Thank you for your attention!



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Source code available [here](#)

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