

Matt Hobbs

Twitter: @TheRealNooshu

Mastodon: @TheRealNooshu@hachyderm.io

Hello! 🖐️



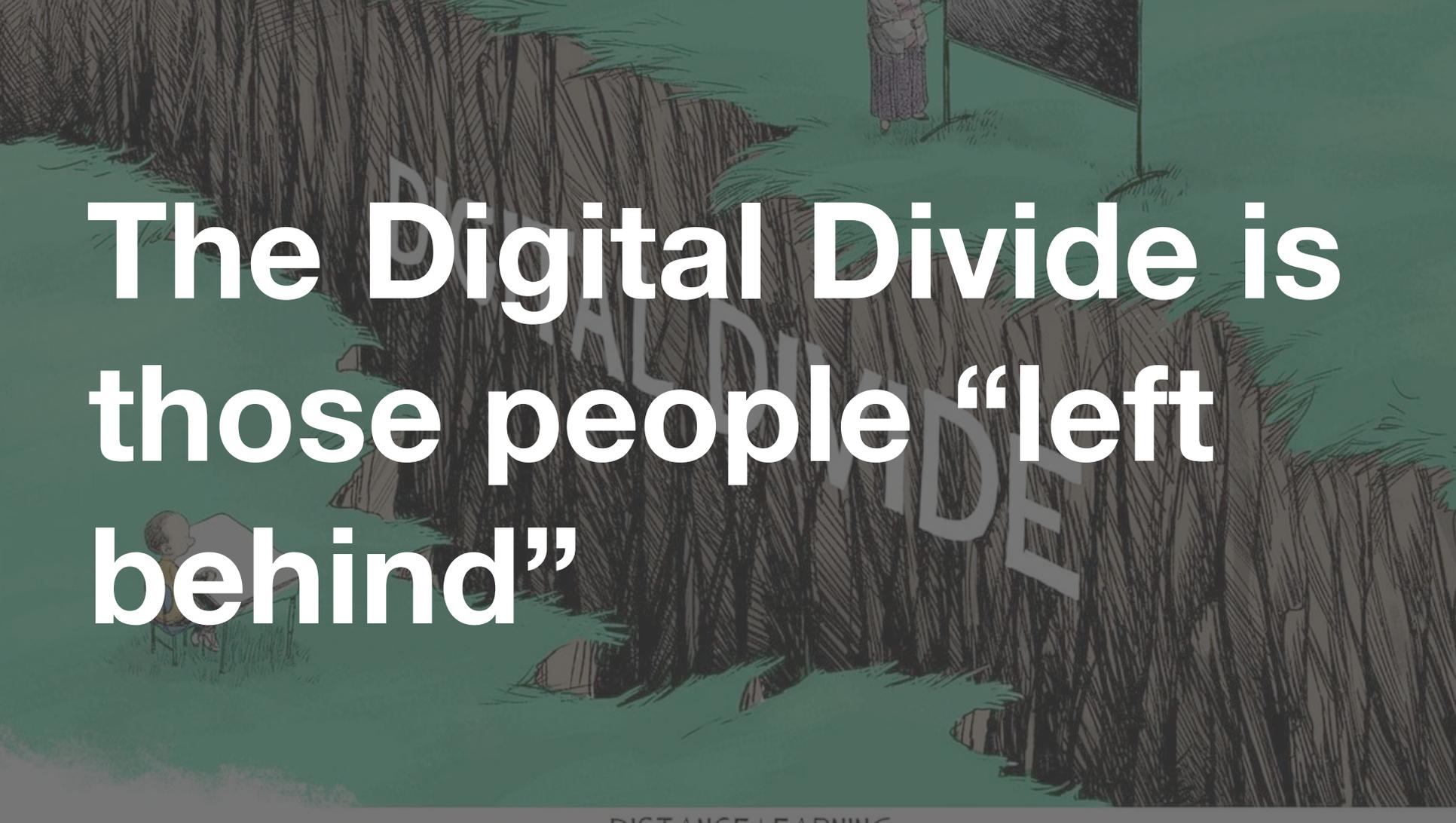


Bridging the Digital Divide using Web Performance

I. Understanding the Digital Divide.

What is the Digital divide?

- **Population Growth**
 - **The population of the UK has been steadily increasing for years**
- **Ageing Population**
 - **People are living longer, better healthcare, healthier lives, better living conditions**
- **Life Expectancy increasing**
 - **In the UK: 81 years for men, 84 years for women**
- **Demographic Shift**
 - **Ageing population puts pressure on social and healthcare systems.**



**The Digital Divide is
those people “left
behind”**

- **Socioeconomic status**
 - Come from a family with less disposable income to spend on luxuries like mobile phones, iPads etc
- **Geographic location**
 - Some areas of the country have poor connectivity
 - Underfunded education system
- **Lack of opportunity**
 - Simply not had anyone in their life to teach them
 - Always get person “x” to do it for them.
- **Don’t see the benefit**
 - Lack of motivation because they don’t understand the benefit of what the technology can bring.
- **Scared of change or Technology**
 - “I’ve always done it this way, why change?”, “Technology is going to take my job”

II. Why is it important to bridge the Digital divide?

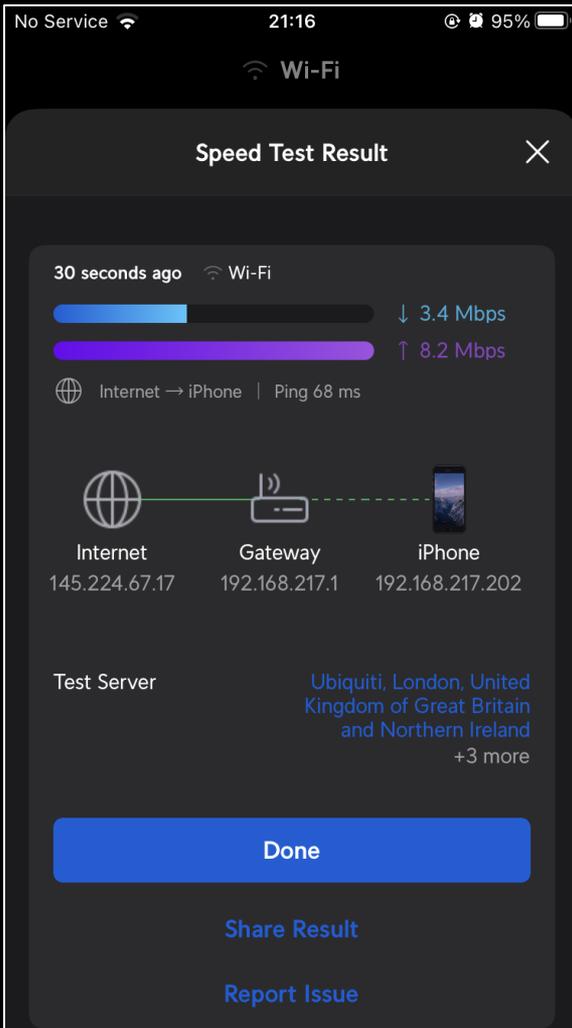
- **Social Inclusion and Empowerment**
 - Existing social inequalities can be exacerbated, leading to further social and civic exclusion.
- **Access to Information and Knowledge**
 - Ensure that everyone has equal opportunities to access information and knowledge.
- **Economic Opportunities**
 - Many job opportunities and economic activities rely on digital technologies.
- **Education and Skill Development**
 - Digital technologies play a crucial role in modern education.
- **Health and Wellbeing**
 - Access to digital technologies can improve healthcare outcomes and a person's overall well-being.
- **Bridge the Global Knowledge Gap**
 - Knowledge fosters a more inclusive and interconnected global community.

III. How can Web Performance help?

1. Optimised and Efficient Web Design

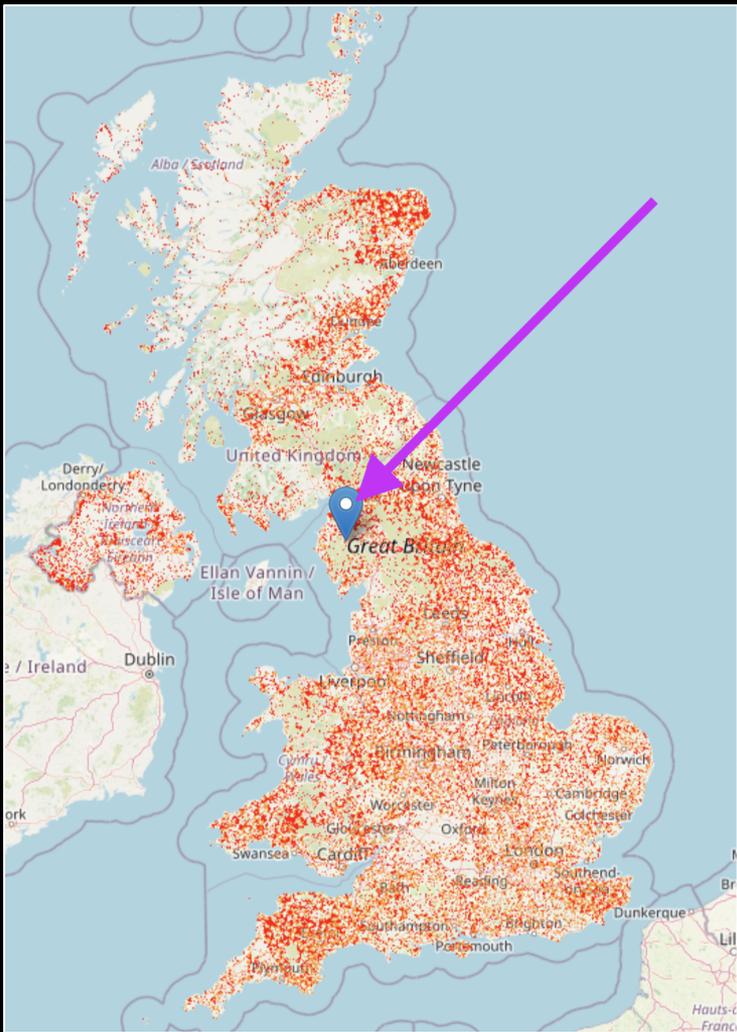
Rural connectivity





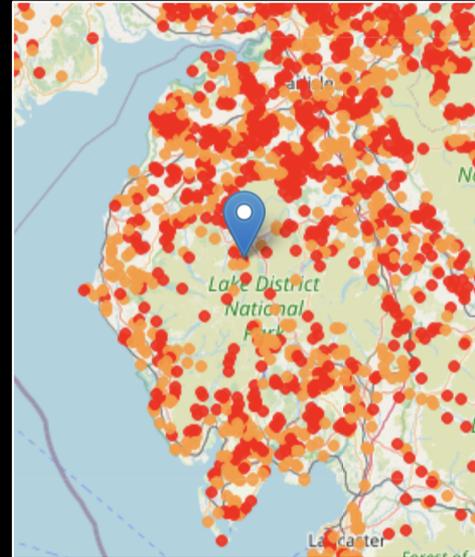
Derwentwater Independent Hostel

- No mobile service available
- 150+ guests
- Limited Wi-Fi only available in 2 rooms downstairs
- Limited bandwidth: 3.4 Mbps down, 8.2 Mbps up
- “Free Wi-Fi, although speed and bandwidth, is limited by our rural location.”



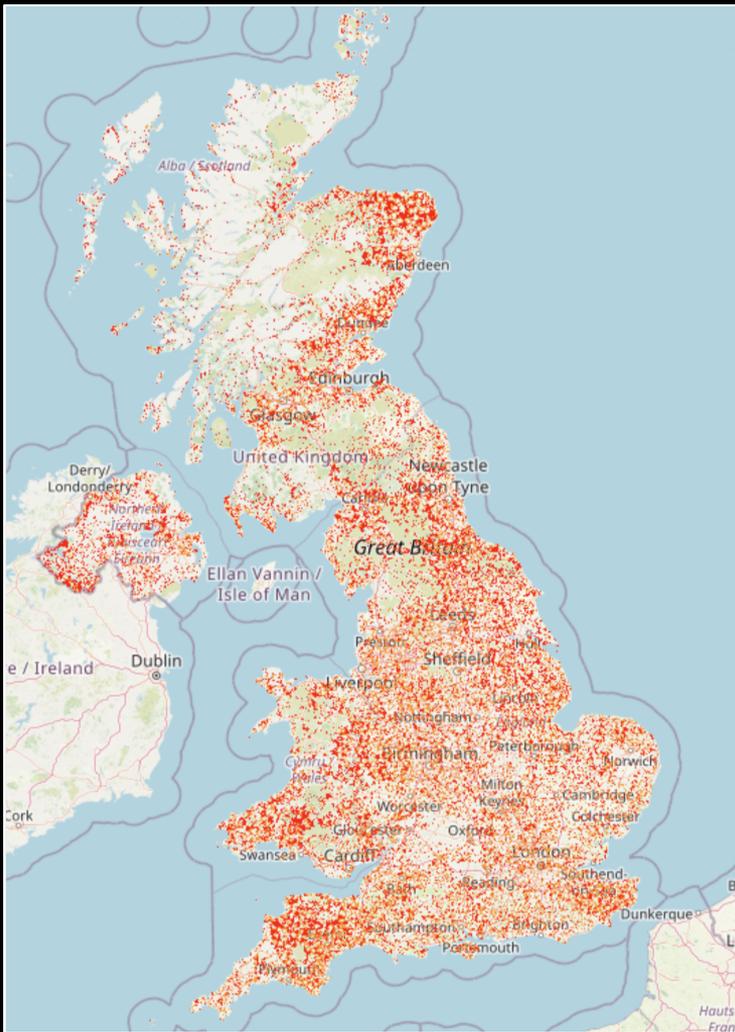
UK Connectivity Map

- Updated 15th July '23 by thinkbroadband.com
- Orange = under 10 Mbps
- Red = under 2 Mbps
- Clear = very little to zero connectivity



Ofcom Connected Nations update— Spring 2023

Geographic area not covered by any operator (not-spots)	May 2022	September 2022	January 2023
UK	8%	8%	8%
England	2%	2%	2%
Northern Ireland	3%	3%	3%
Scotland	17%	17%	17%
Wales	10%	10%	9%



UK Connectivity Map

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The Communications and Digital Committee report—29th June 2023

Committees

[UK Parliament](#) > [Business](#) > [Committees](#) > [Communications and Digital Committee](#) > News Article

The Government has “no credible strategy” to tackle digital exclusion

29 June 2023

Source: UK Parliament – The Government has “no credible strategy” to tackle digital exclusion – 29 June ‘23

“The Government’s ambition to make the UK a technology superpower and boost economic growth is being undermined by high levels of digital exclusion. The Committee says the scale of the problem is a ‘direct consequence of political lethargy’”.

- 4 million people are still unable to complete a single basic digital task to get online.
- 5 million workers will be acutely under skilled in basic digital skills by 2030.
- 7 million households have no broadband or mobile internet access.
- Approximately £63 Billion is lost each year to the UK economy due to overall digital skills shortages.
- 1 million people have cut back or cancelled their internet packages in the last year due to affordability issues.

Recommendations

- Urgent action to help with the cost of living crisis
- Investment in basic skills.
- Boosting digital inclusion hubs
- Future-proofing public services

“Digital exclusion is a moving target. As technology develops, people currently confident using IT at work and home will need to keep refreshing their skills to avoid being left behind. We can’t assume younger people are digital natives who won’t need to develop new skills. We need to ensure everyone and all age groups have the digital skills they need to operate and the opportunities to keep developing those skills as technologies change.”

- *Baroness Stowell of Beeston (Chair of the Committee)*

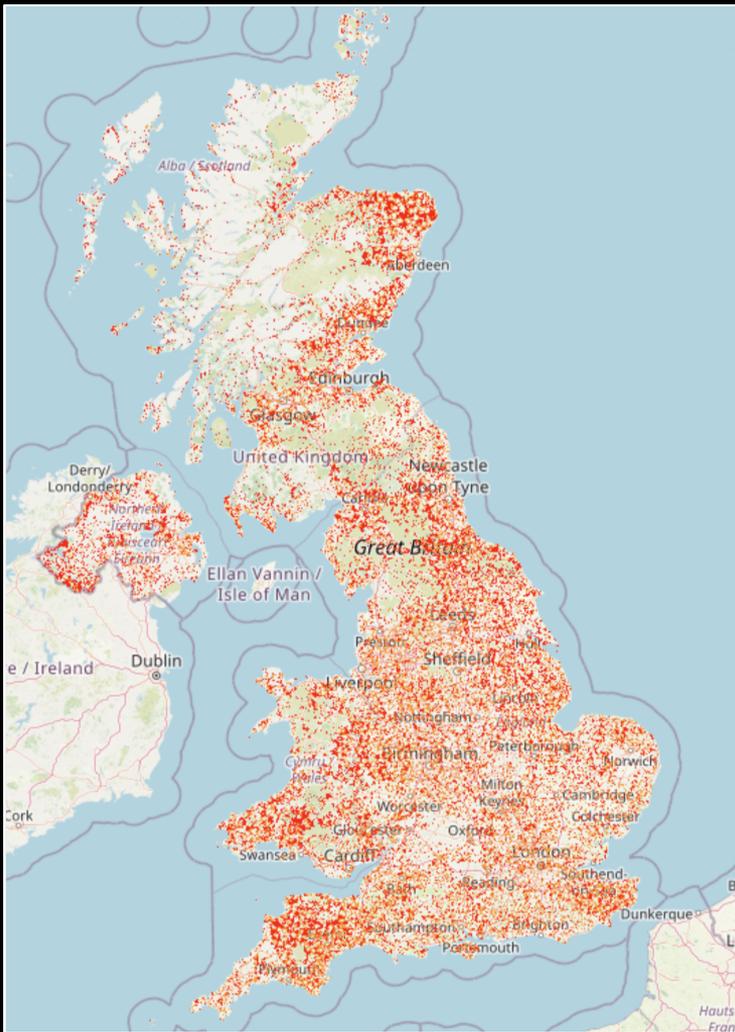
Responsibility?



1. At all levels of government, sensible policy needs to be enacted to ensure equal access to digital resources.
2. Private sector Tech companies can take the initiative to make their products more accessible and affordable.
3. Non-profit organizations already work directly to combat the digital divide by providing equipment, training.
4. Schools and universities should incorporate digital literacy into their curriculums and provide resources for learning these new skills.
5. On a smaller scale, individuals can help reduce the digital divide by donating old equipment, volunteering their time to teach digital literacy skills.
6. Groups like the United Nations or World Bank often provide funding and support for projects aimed at reducing the digital divide, especially in developing countries.

SO TELL ME...

WHAT'S IN IT FOR ME?



UK Connectivity Map

- Updated 15th July '23 by thinkbroadband.com
- Orange = under 10 Mbps
- Red = under 2 Mbps
- Clear = very little to zero connectivity

“Earlier this year (2022), ITU reported that 2.7 billion people – roughly one-third of the global population – remain unconnected to the Internet.”

Source: Internet more affordable and widespread, but world’s poorest still shut off from online opportunities—
International Telecommunications Union (ITU)

“...for the average consumer in most low-income economies, the cost of fixed or mobile broadband services remains too high.”

Source: Internet more affordable and widespread, but world's poorest still shut off from online opportunities—
International Telecommunications Union (ITU)

“A basic mobile data plan in these countries was found to cost on average 9 percent of average income”

Source: Internet more affordable and widespread, but world's poorest still shut off from online opportunities—
International Telecommunications Union (ITU)

SO TELL ME...

WHAT'S IN IT FOR ME?

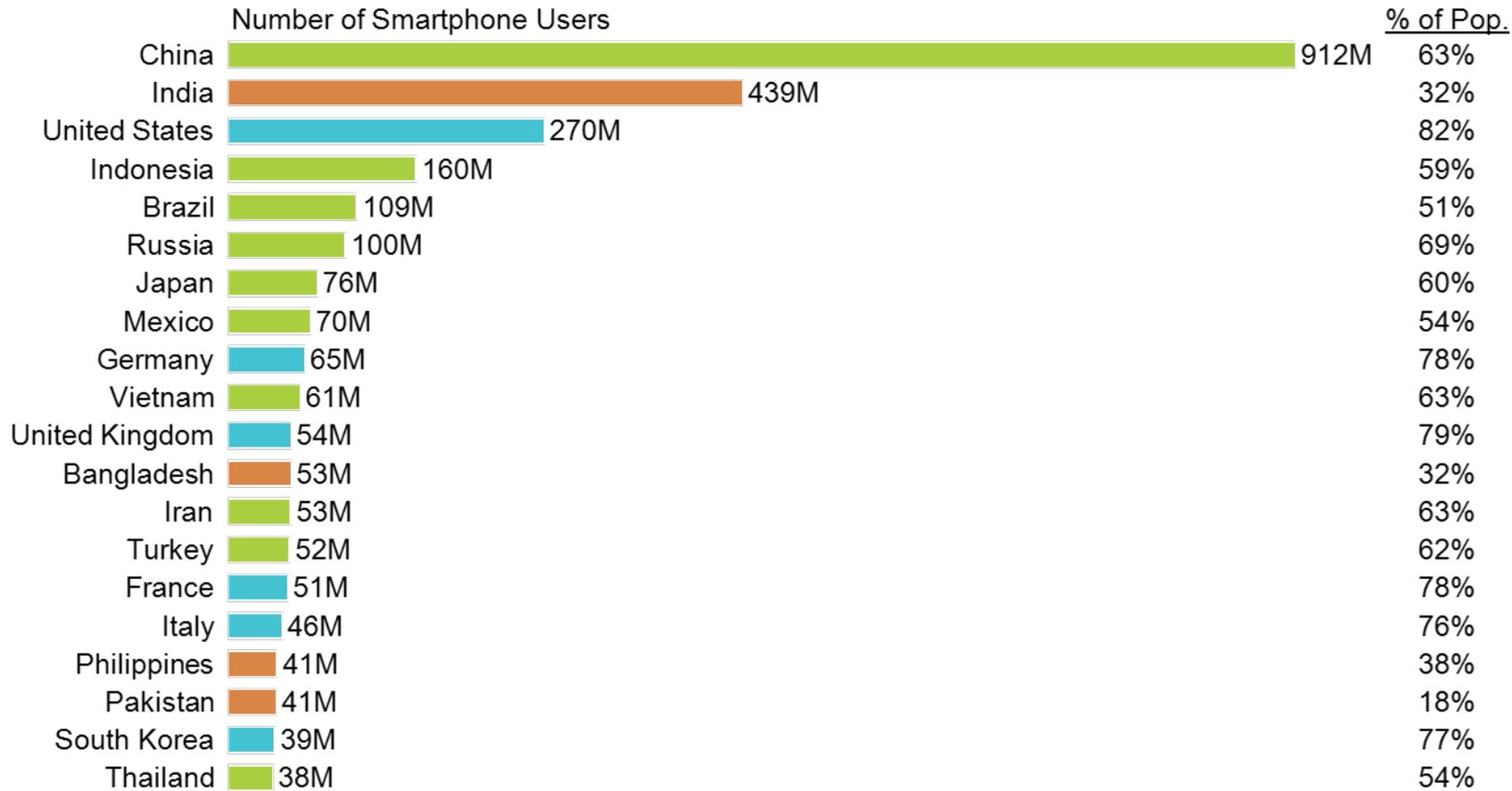
- There are 7 million households in the UK alone that could be your next customers, potentially worth billions to the economy.
- 2.7 billion people – roughly one-third of the global population aren't on the internet yet!
- If you want massive growth in whatever sector you work in, target these people by bridging the digital divide.
- Web performance is a key requirement for being successful in these low-income economies.

“A rising tide lifts all boats”

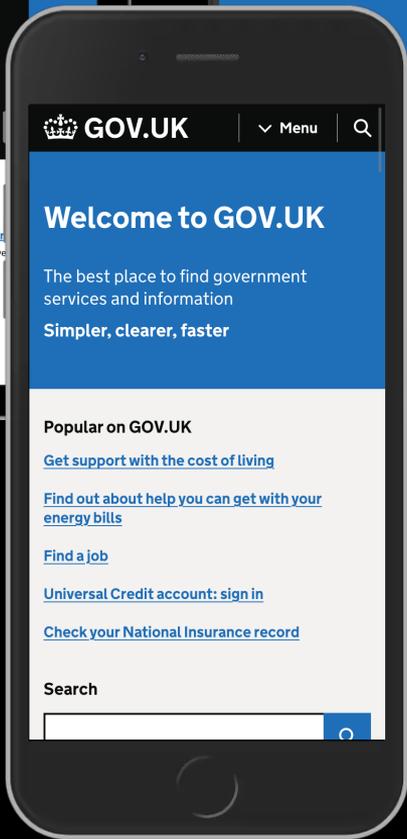
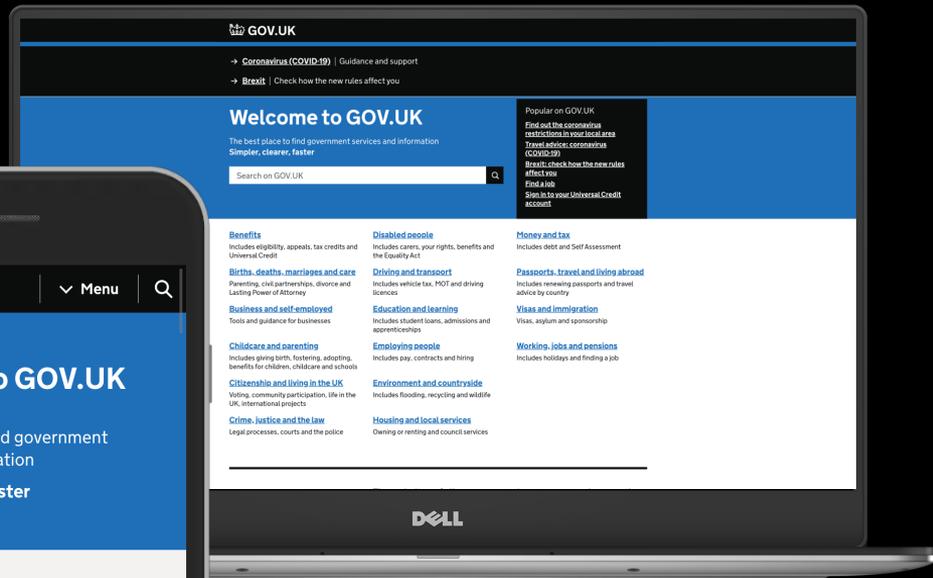
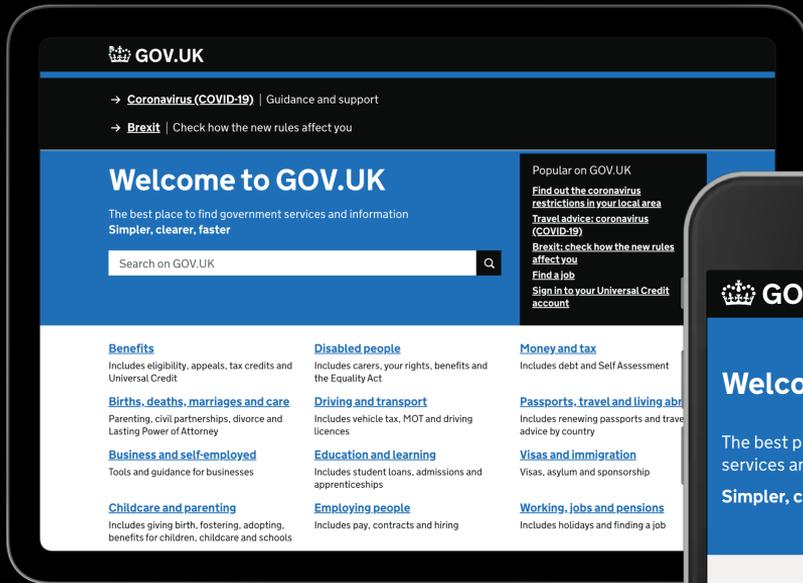
- John F. Kennedy



2. Mobile-First Design



■ Over 75% of population use smartphones
 ■ 50-75%
 ■ Under 50%



Welcome to GOV.UK

The best place to find government services and information

Simpler, clearer, faster

Popular on GOV.UK

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[Find out about help you can get with your energy bills](#)

[Find a job](#)

[Universal Credit account: sign in](#)

[Check your National Insurance record](#)

Search

Issue №
306



Responsive Web Design

by **Ethan Marcotte** · May 25, 2010

Published in [CSS](#), [Interaction Design](#), [Layout & Grids](#), [Mobile/Multidevice](#), [Responsive Design](#)

Why 2013 Is the Year of Responsive Web Design

By [Pete Cashmore](#) on December 11, 2012



From 17 October,
GOV.UK will replace Directgov
as the best place to find government
services and information



GOV.UK

Get Started >

New workplace pensions



Starting from October, millions of workers will be enrolled into a workplace pension

▶ New workplace pensions - how it affects you

Most popular

- ▶ Job search
- ▶ Student finance
- ▶ SORN
- ▶ Car tax
- ▶ Driving theory test

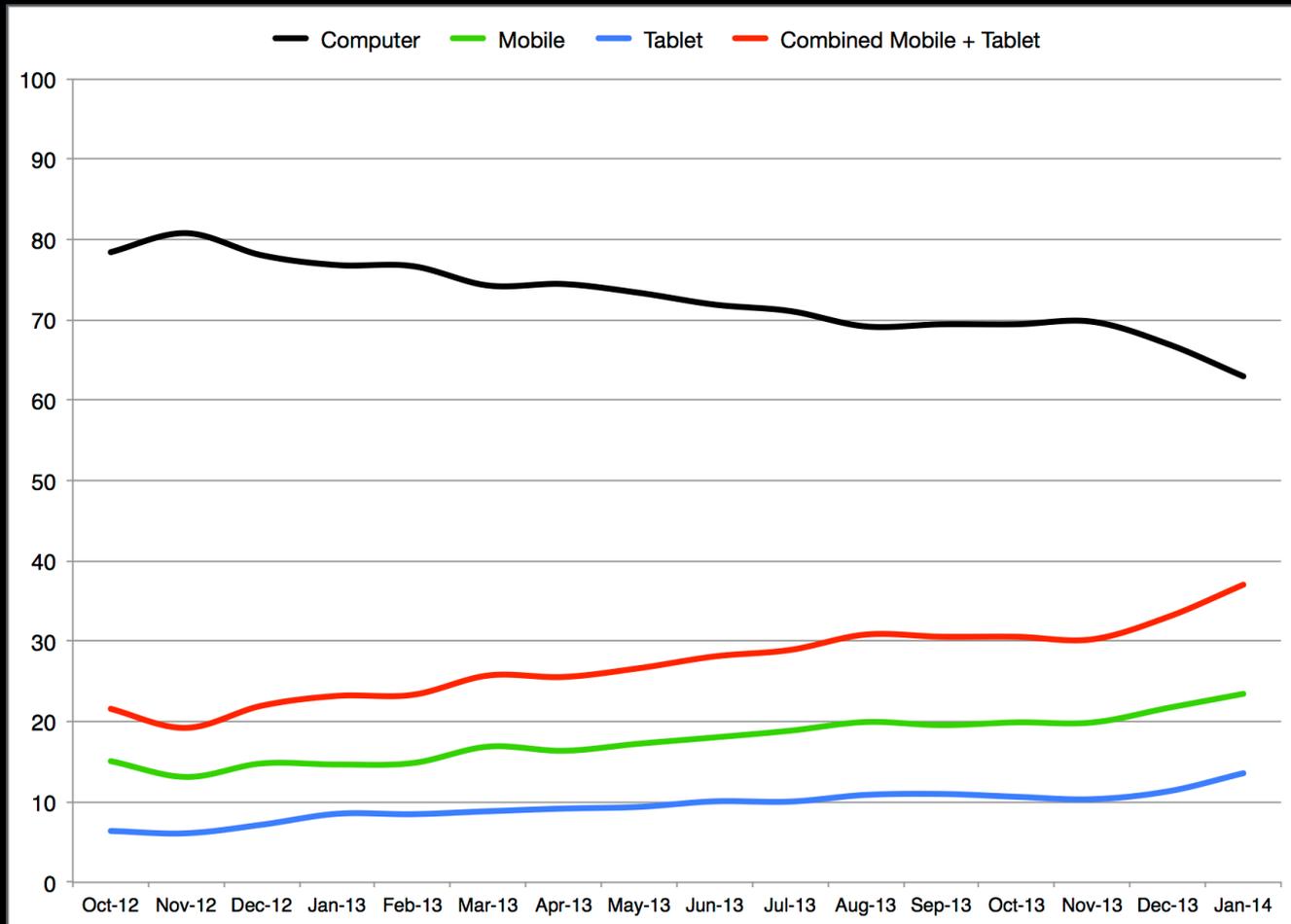
Straight to...

- ▶ **Motoring**
Car tax, Learners, Driving licence...
- ▶ **Education and learning**
Student finance, University, 14-19s...
- ▶ **Money, tax and benefits**
Benefits, Taxes, Benefits adviser...
- ▶ **Parents**
Preschool, Schools, Childcare...
- ▶ **Employment**
Jobs, Redundancy, Holidays, Pay...
- ▶ **Young people**
Money, Work and careers, Leisure...

“Where is the government web site for grown-ups? The whole of “gov.uk” is obviously designed for primary school children and those with special educational needs.”

- Howard Andrews, posted on 27 October 2012

Source: GOV.UK – The start of a new way of delivering public services—Francis Maude, 16 October 2012



Source: GDS Blog – When will more people visit GOV.UK using a mobile or tablet than a PC? - 8 January '14

Education ▶ Schools Teachers Universities Students

Politics live with Andrew Sparrow
Coronavirus

● This article is more than 2 years old

UK Covid: Boris Johnson tells people to stay at home as England enters third national lockdown – as it happened

Updated 4 Jan 2021

Latest updates: Boris Johnson says all schools in England must close; UK sees new record high of 58,784 cases and 407 deaths

- [England to enter toughest Covid lockdown since March](#)
- [England lockdown: what are the new Covid restrictions?](#)
- [Scotland to go into full lockdown at midnight, Sturgeon announces](#)
- [What Scotland's new Covid-19 lockdown restrictions mean](#)
- [Matt Hancock's morning interviews - Summary and analysis](#)
- [Global coronavirus updates - live](#)

4 Jan 2021
Summary

4 Jan 2021
Exams 'will not be able to go forward as normal'

4 Jan 2021
England to enter third national lockdown

4 Jan 2021
Scottish MP Margaret Ferrier arrested over alleged Covid rule breach

4 Jan 2021
Welsh schools and colleges to move to remote teaching until 18 January

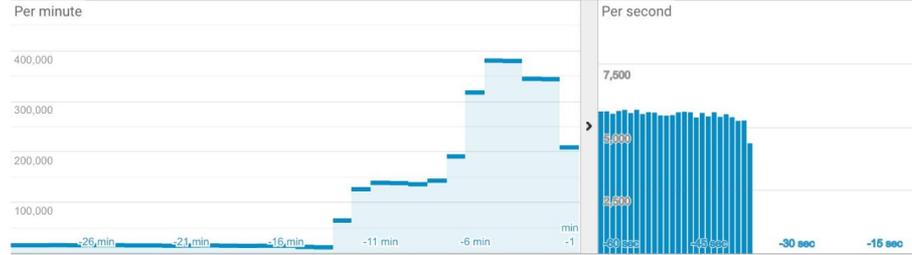
4 Jan 2021
CMOs: UK alert should move to

Right now
769187

active users on site



Page Views

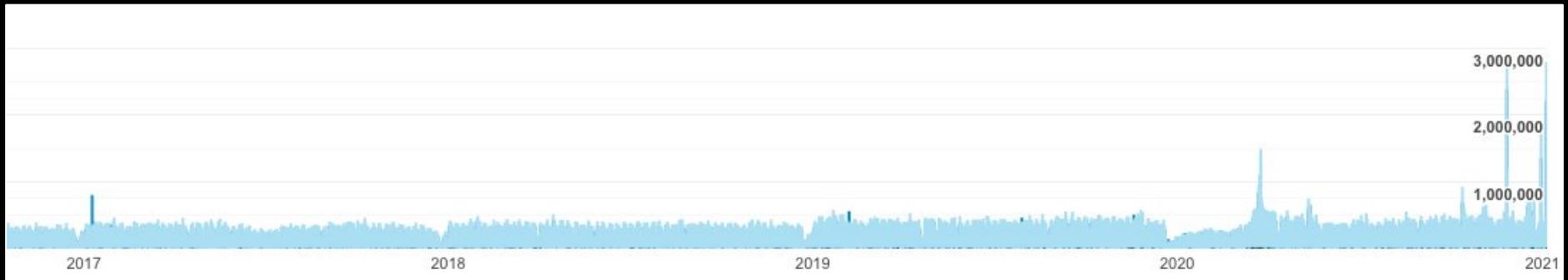


Top Referrals:

Source	Active Users
1. nhs.uk	1,883
2. tax.service.gov.uk	481
3. assets.publishing.service.gov.uk	288
4. bbc.co.uk	282
5. universal-credit.service.gov.uk	175

Top Active Pages:

Active Page	Active Users
1. /coronavirus	247,211 (32.17%)
2. /guidance/national-lockdown-stay-at-home	187,291 (24.37%)
3. /guidance/local-restricti...ers-what-you-need-to-know	39,201 (5.10%)
4. /	32,968 (4.29%)
5. /find-coronavirus-local-restrictions	31,362 (4.08%)
6. /guidance/making-a-summary-is-with-another	24,400 (3.18%)



Right now

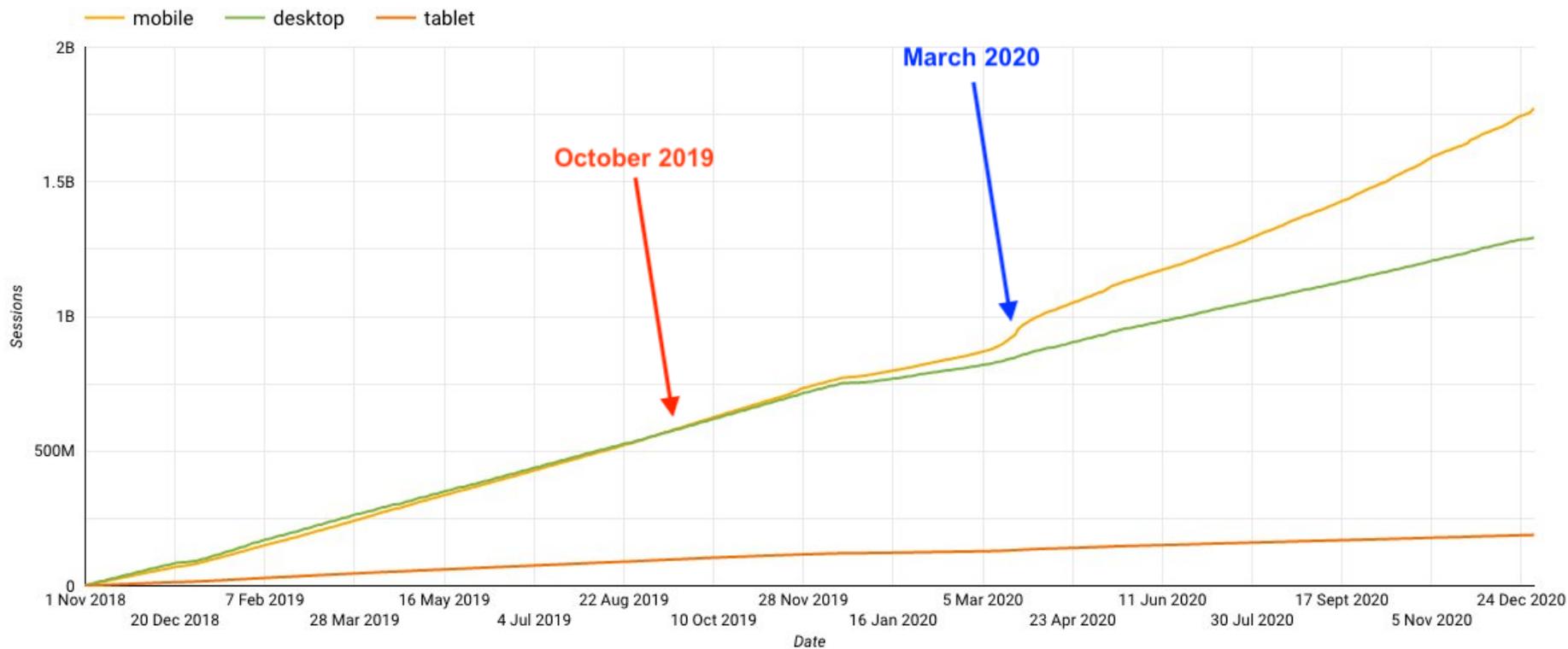
769187

active users on site

■ MOBILE ■ DESKTOP ■ TABLET



Device type usage over time (cumulative)





All Device Resolutions visiting GOV.UK Treemap (no limits)



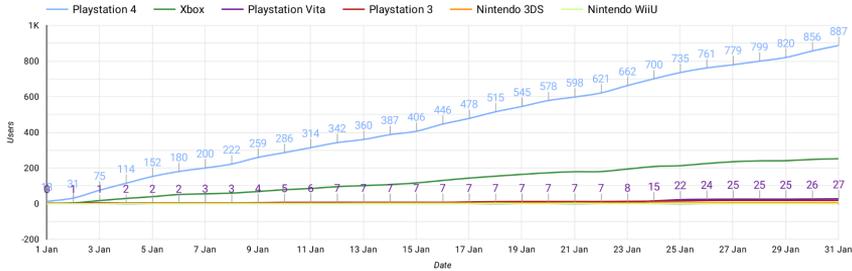
802,512	0.73%	395,757	1.01%
1,014,108	0.92%	366,881	0.93%
689,707	0.63%	357,175	0.91%
1 - 20 / 51989 < >			

51,989 screen resolutions!

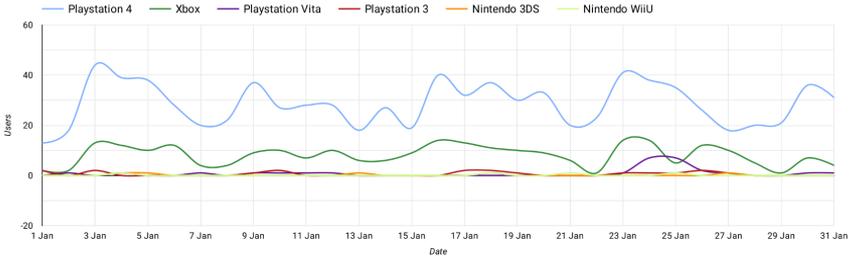




Console type usage over time (cumulative)



Console type usage over time (time series)



Popular pages and web performance metrics for Game Consoles visiting GOV.UK

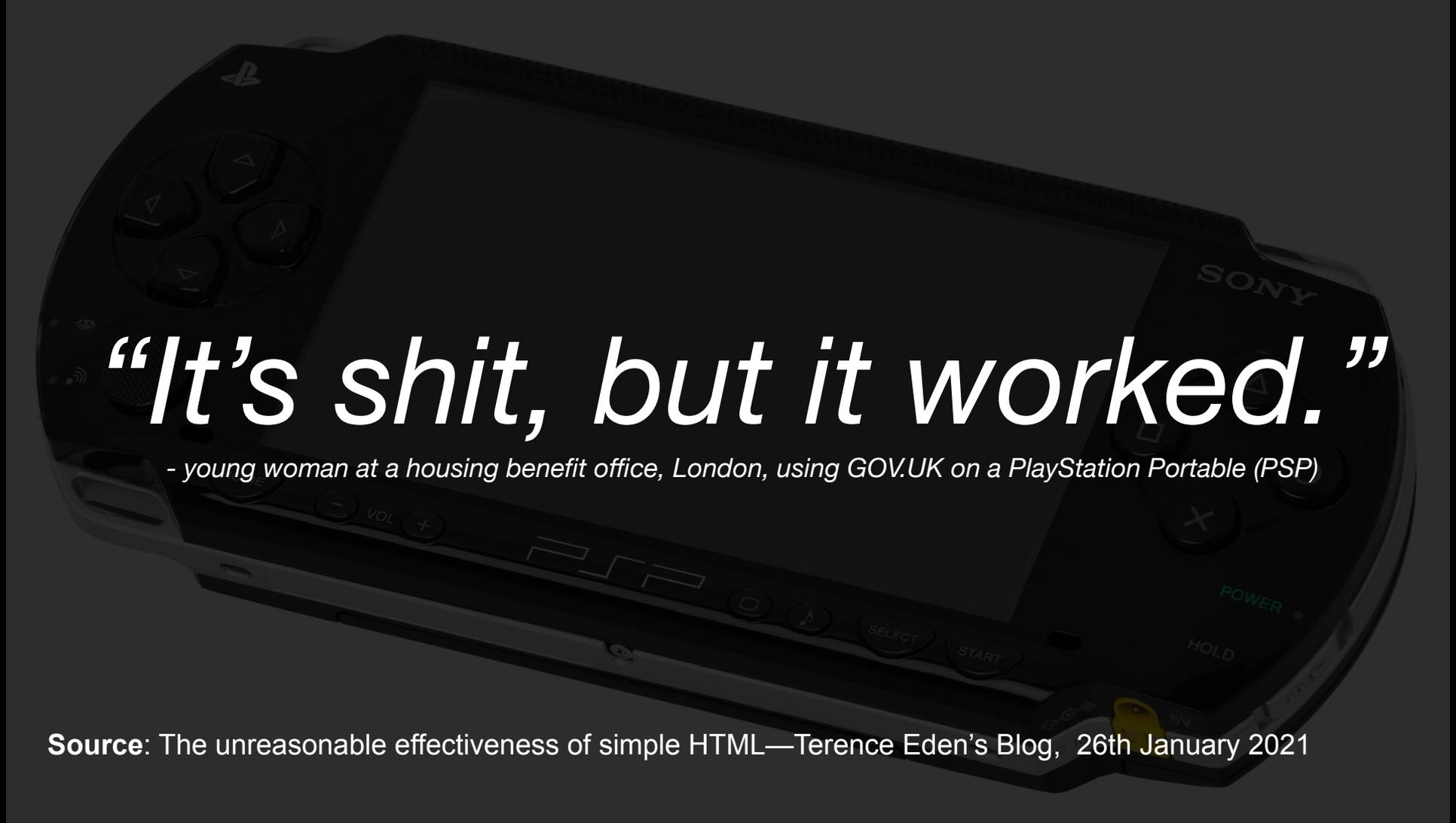
Page	Page Views	Sessions	Users	Avg. Page Load Time...	Avg. Document Cont...	Avg. Server Connecti...	Avg. Server Respons...	Page Load...
1. /sign-in-universal-cre...	686	487	291	null	null	null	null	0
2. /	216	146	101	6.04	5.21	0.07	0.02	1
3. /universal-credit	83	53	52	null	null	null	null	0
4. /guidance/cost-of-liv...	107	51	68	null	null	null	null	0
5. /cold-weather-payme...	63	40	23	null	null	null	null	0
6. /government/news/...	79	34	43	null	null	null	null	0
7. /pip/how-to-claim	40	21	14	null	null	null	null	0
8. /find-a-job	52	17	13	null	null	null	null	0
9. /check-mot-history	31	17	20	1.2	0.98	0.07	0.02	1

GOV.UK Game console usage (Jan '23):

- PlayStation 4 – 571
- Xbox – 171
- PlayStation Vita – 19
- PlayStation 3 – 16
- Nintendo 3DS – 4
- Nintendo Wii U – 4

Popular pages and web performance metrics for Game Co

Page	Page Views	Sessions
1. /sign-in-universal-cre...	686	487
2. /	216	146
3. /universal-credit	83	53
4. /guidance/cost-of-liv...	107	51
5. /cold-weather-payme...	63	40
6. /government/news/...	79	34
7. /pip/how-to-claim	40	21
8. /find-a-job	52	17
9. /check-mot-history	31	17



“It’s shit, but it worked.”

- young woman at a housing benefit office, London, using GOV.UK on a PlayStation Portable (PSP)

Source: The unreasonable effectiveness of simple HTML—Terence Eden’s Blog, 26th January 2021



3. Accessibility Considerations and Digital exclusion



Performance



Accessibility



Best Practices



SEO



Progressive
Web App



0-49



50-89



90-100

Audit	Weight
[accesskey] values are unique	7
[aria-*] attributes match their roles	10
Values assigned to <code>role=""</code> are valid ARIA roles	1
<code>button</code> , <code>link</code> , and <code>menuitem</code> elements have accessible names	7
Elements with <code>role="dialog"</code> or <code>role="alertdialog"</code> have accessible names	7



“We're all just temporarily abled”

- Abraham Lincoln



One arm



Arm injury



New parent



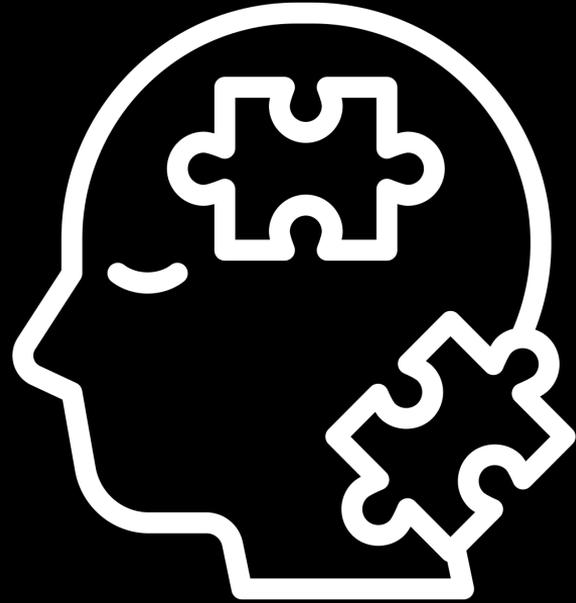
Deaf



Ear infection

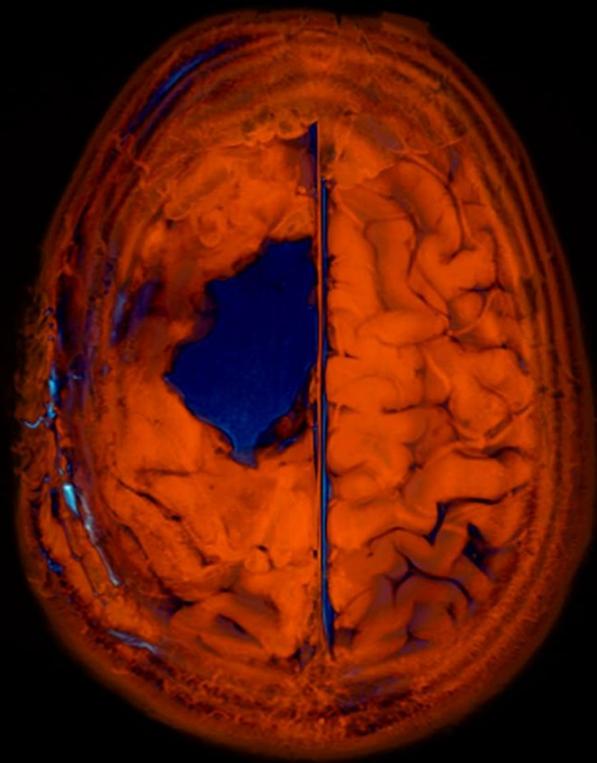
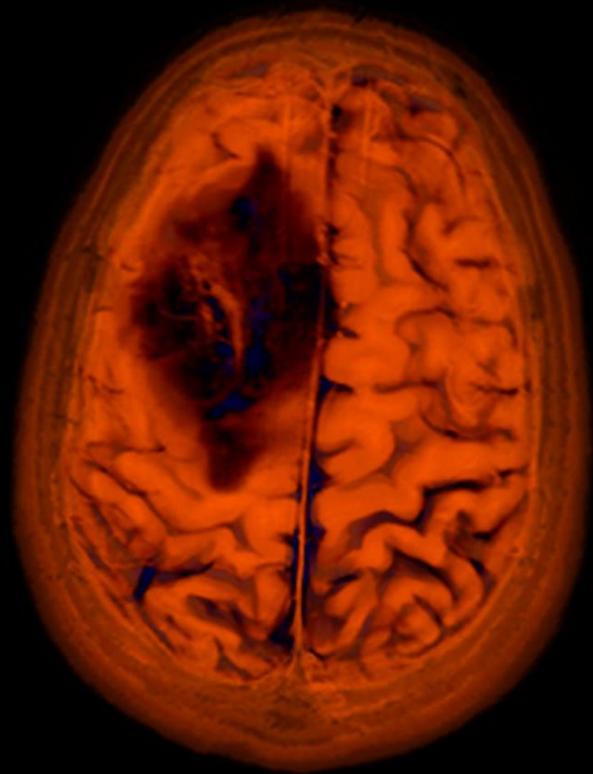


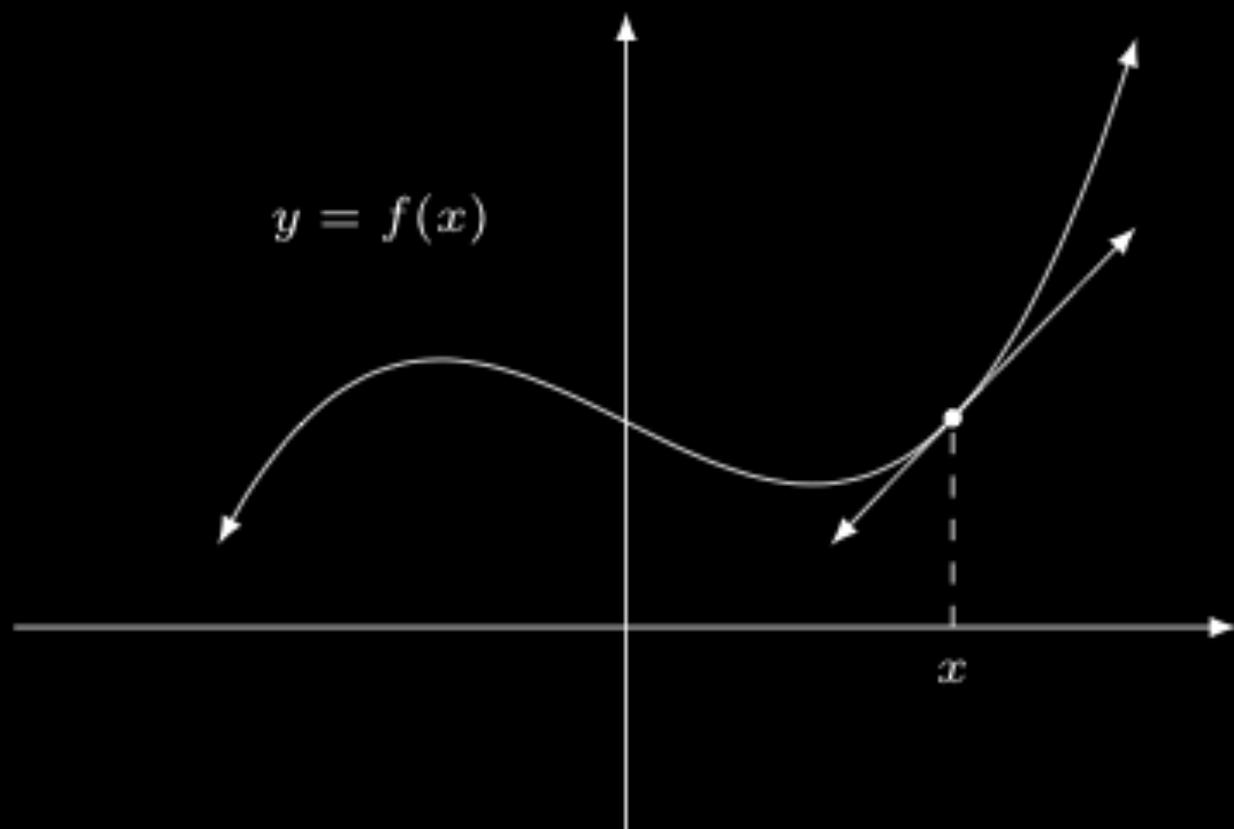
Bartender



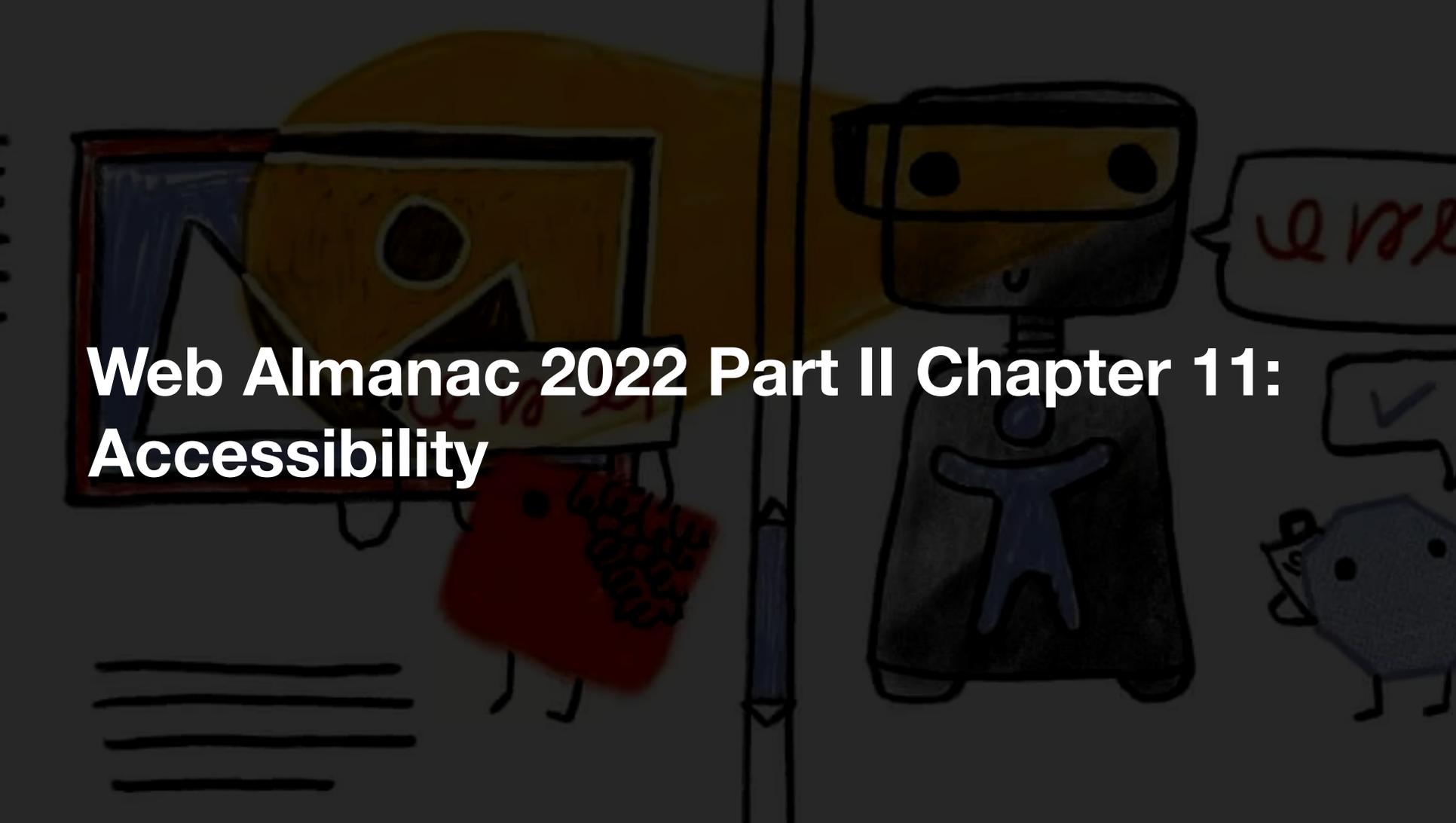
Hello! 🙋







Web Almanac 2022 Part II Chapter 11: Accessibility



“Though there have been some improvements—for example, adoption of *‘:focus-visible’* has increased by almost 9% this year. Our analysis shows that there are still a lot of straightforward fixes, such as colour contrast and image *‘alt’* attributes, that could cause high impacts if addressed.”



“no MVP without accessibility”
- Anna E. Cook

European Accessibility Act

A key step to a Union of Equality

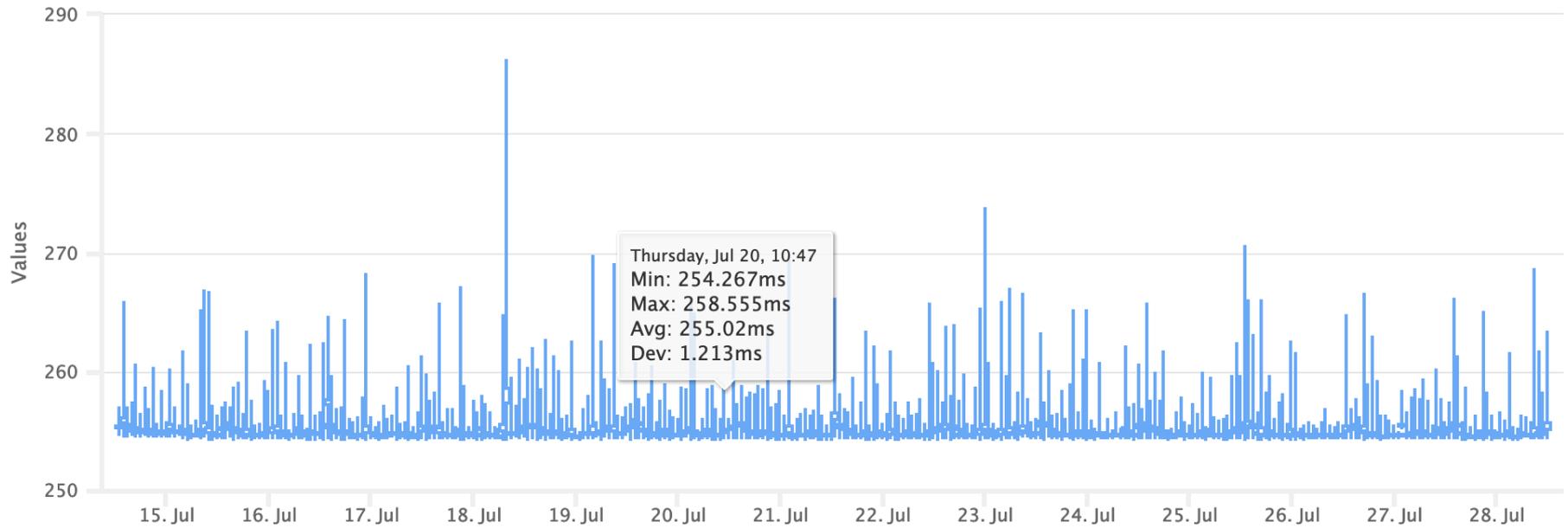


#EUDisabilityRights
#UnionOfEquality



European
Commission

4. Content Delivery Networks (CDNs)



Source: wondernetwork.com – Global Ping Statistics

North America [15]

South America [8]

Africa [1]

Middle-East [2]

Europe [13]

Oceania [3]

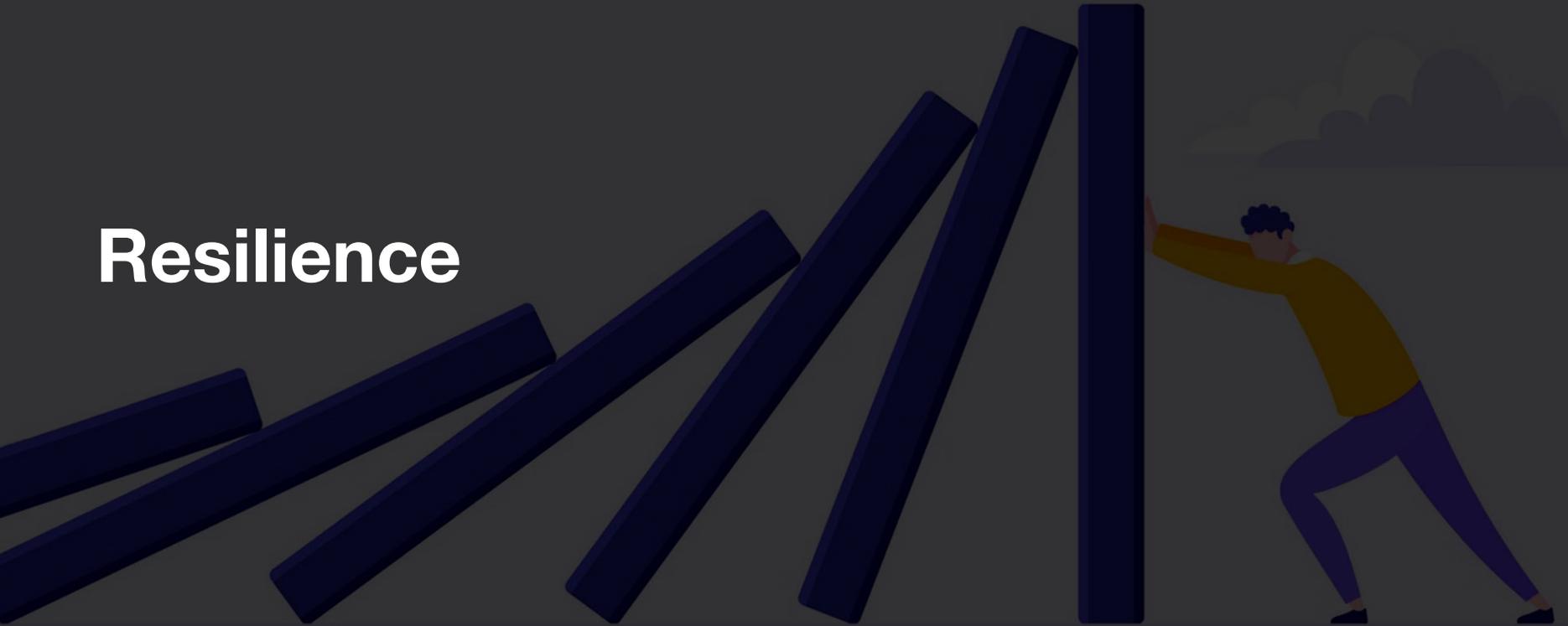
Asia [12]

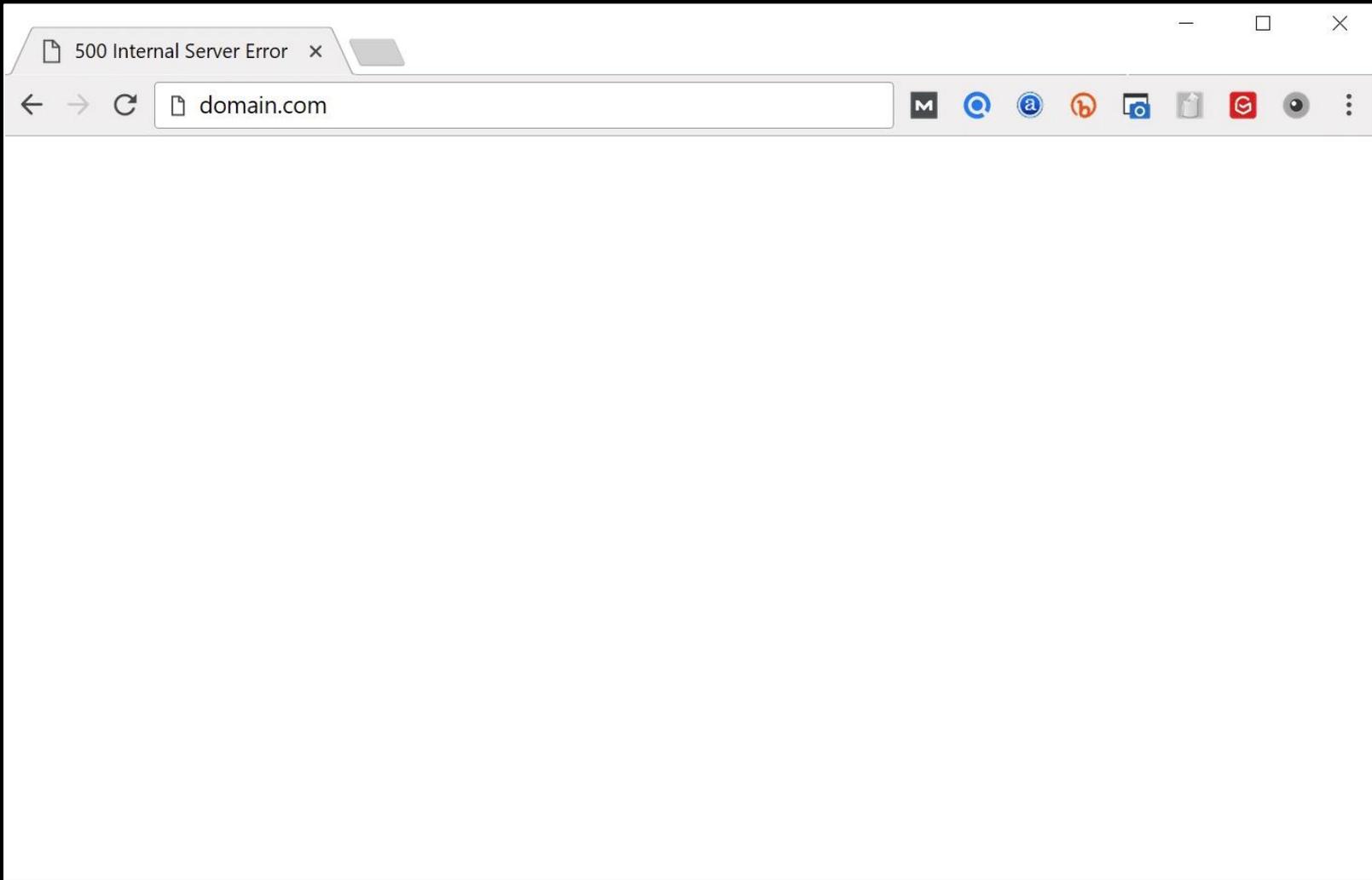




“While a good TTFB doesn’t necessarily mean you will have a fast website, a bad TTFB almost certainly guarantees a slow one.”
- Harry Roberts

Resilience







Internal Server Error

The server encountered an internal error or misconfiguration and was unable to complete your request.

Please contact the server administrator at root@localhost to inform them of the time this error occurred, and the actions you performed just before this error.

More information about this error may be available in the server error log.

Right now
769187

active users on site



Page Views

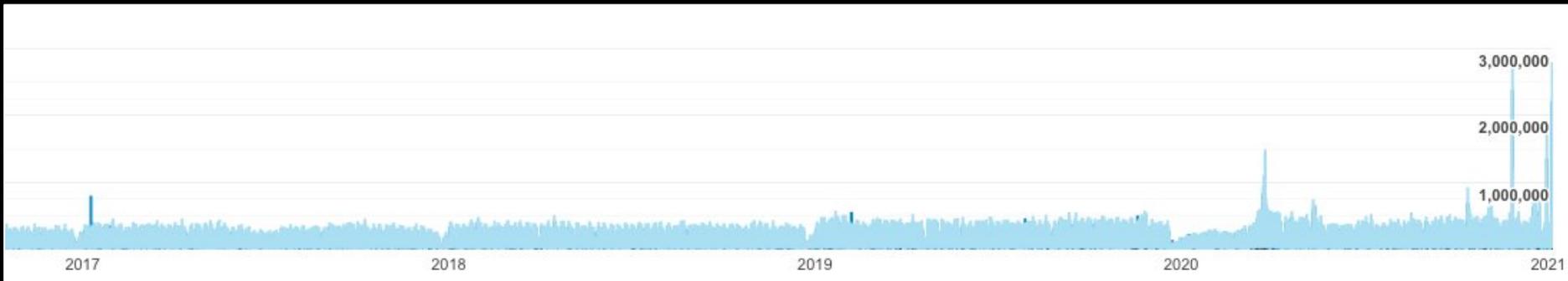


Top Referrals:

Source	Active Users
1. nhs.uk	1,883
2. tax.service.gov.uk	481
3. assets.publishing.service.gov.uk	288
4. bbc.co.uk	282
5. universal-credit.service.gov.uk	175

Top Active Pages:

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1. /coronavirus	247,211 (32.17%)
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5. /find-coronavirus-local-restrictions	31,362 (4.08%)
6. /guidance/making-a-summary-is-with-another	24,400 (3.18%)



→ [Coronavirus \(COVID-19\)](#) | National lockdown: stay at home

→ [Brexit](#) | Check how the new rules affect you

Welcome to GOV.UK

The best place to find government services and information
Simpler, clearer, faster



Popular on GOV.UK

[National lockdown: what you can and cannot do](#)

[Travel advice: coronavirus \(COVID-19\)](#)

[Brexit: check how the new rules affect you](#)

[Find a job](#)

[Sign in to your Universal Credit account](#)

[Benefits](#)

Includes eligibility, appeals, tax credits and Universal Credit

[Births, deaths, marriages and care](#)

Parenting, civil partnerships, divorce and Lasting Power of Attorney

[Disabled people](#)

Includes carers, your rights, benefits and the Equality Act

[Driving and transport](#)

Includes vehicle tax, MOT and driving licences

[Money and tax](#)

Includes debt and Self Assessment

[Passports, travel and living abroad](#)

Includes renewing passports and travel advice by country

It's like being a duck. Calm and unruffled on the surface, but paddling like hell underneath.

Barbara Stanny

GOV.UK 4th January 2021 stats

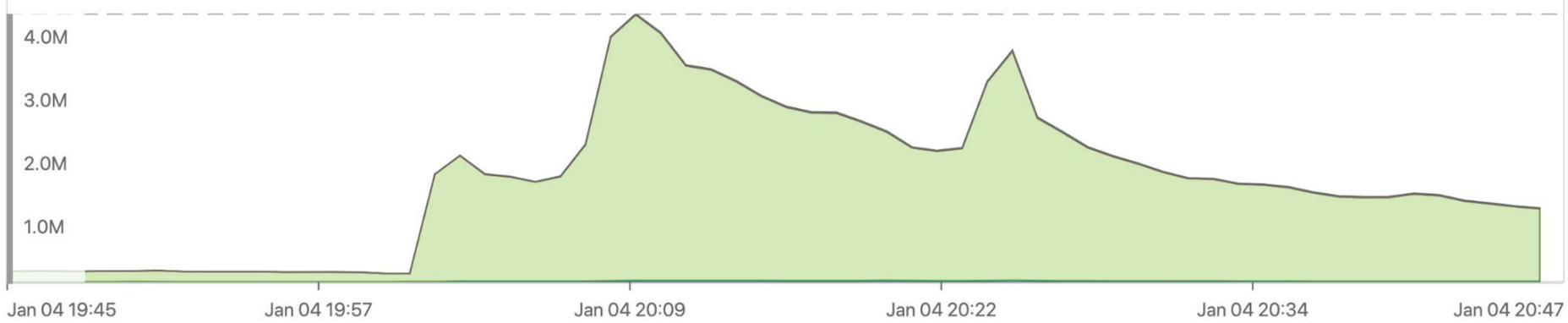
- 3,400,000 concurrent sessions
- 3,200,000 concurrent “users”
- Around 88,000 requests per second
- 5.1 Gbps bandwidth out at the peak
- 99% cache hit rate at the CDN
- Out of the 17M page requests made between 8–9pm, GOV.UK served only 21 5xx errors!

MISSES [hide](#)

HITS [hide](#)

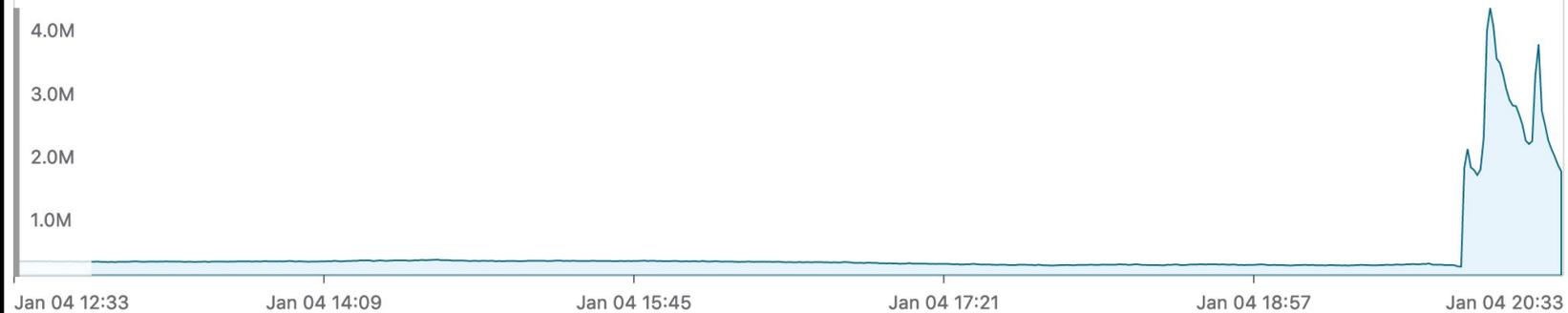
SYNTHETIC [hide](#)

PASSES [hide](#)



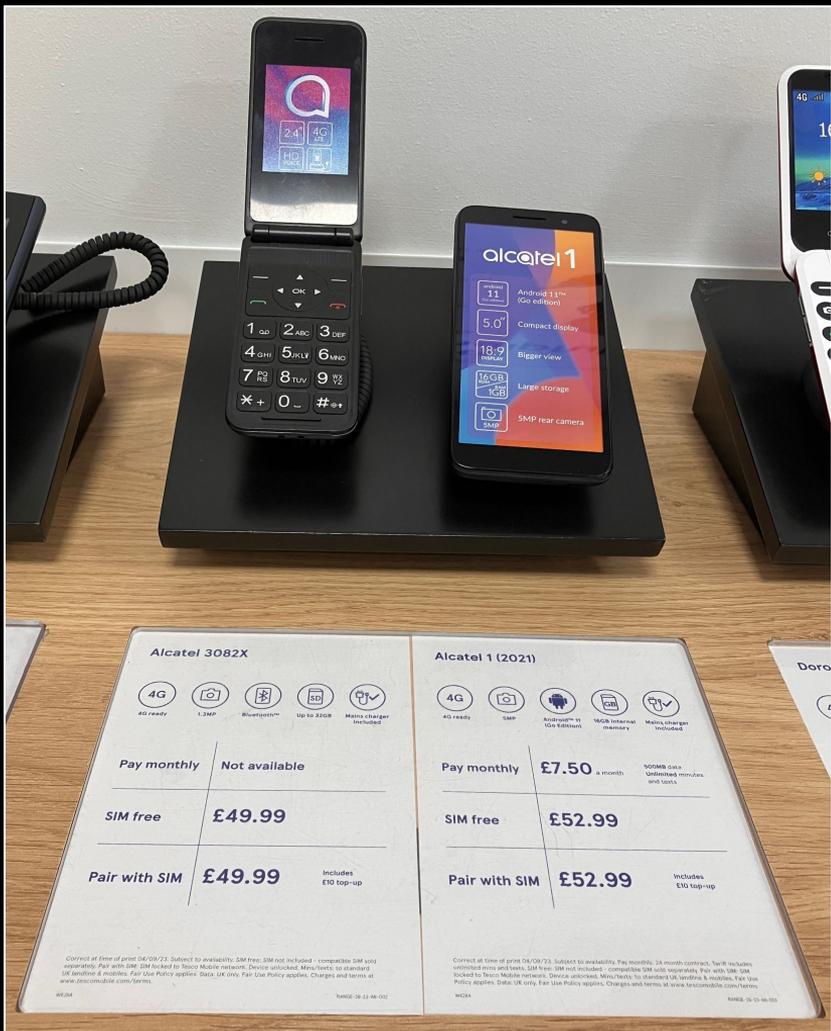
REQUESTS [?](#)

4.2M Maximum ▾





Accessibility



Alcatel 1 (2021)



4G ready



5MP



Android™ 11
(Go Edition)



16GB internal
memory



Mains charger
included

Pay monthly

£7.50 a month

500MB data
Unlimited minutes and
texts

SIM free

£52.99

Pair with SIM

£52.99

Includes
£10 top-up

Alcatel 3082X



Pay monthly Not available

SIM free **£49.99**

Pair with SIM **£49.99** Includes
£10 top-up

Correct as time of print 04/09/23. Subject to availability. SIM free: SIM not included - compatible SIM sold separately. Pair with SIM: SIM locked to Tesco Mobile network. Device unlocked. Mins/texts: to standard UK landline & mobiles. Fair Use Policy applies. Data: UK only. Fair Use Policy applies. Charges and terms at www.tescomobile.com/terms.

WKG

RANGE: 18-23-A6-002

Alcatel 1 (2021)



Pay monthly **£7.50** a month

SIM free **£52.99**

Pair with SIM **£52.99** Includes
£10 top-up

Correct as time of print 04/09/23. Subject to availability. Pay monthly: 24 month contract. Tariff includes unlimited mins and texts. SIM free: SIM not included - compatible SIM sold separately. Pair with SIM: SIM locked to Tesco Mobile network. Device unlocked. Mins/texts: to standard UK landline & mobiles. Fair Use Policy applies. Data: UK only. Fair Use Policy applies. Charges and terms at www.tescomobile.com/terms.

WKG

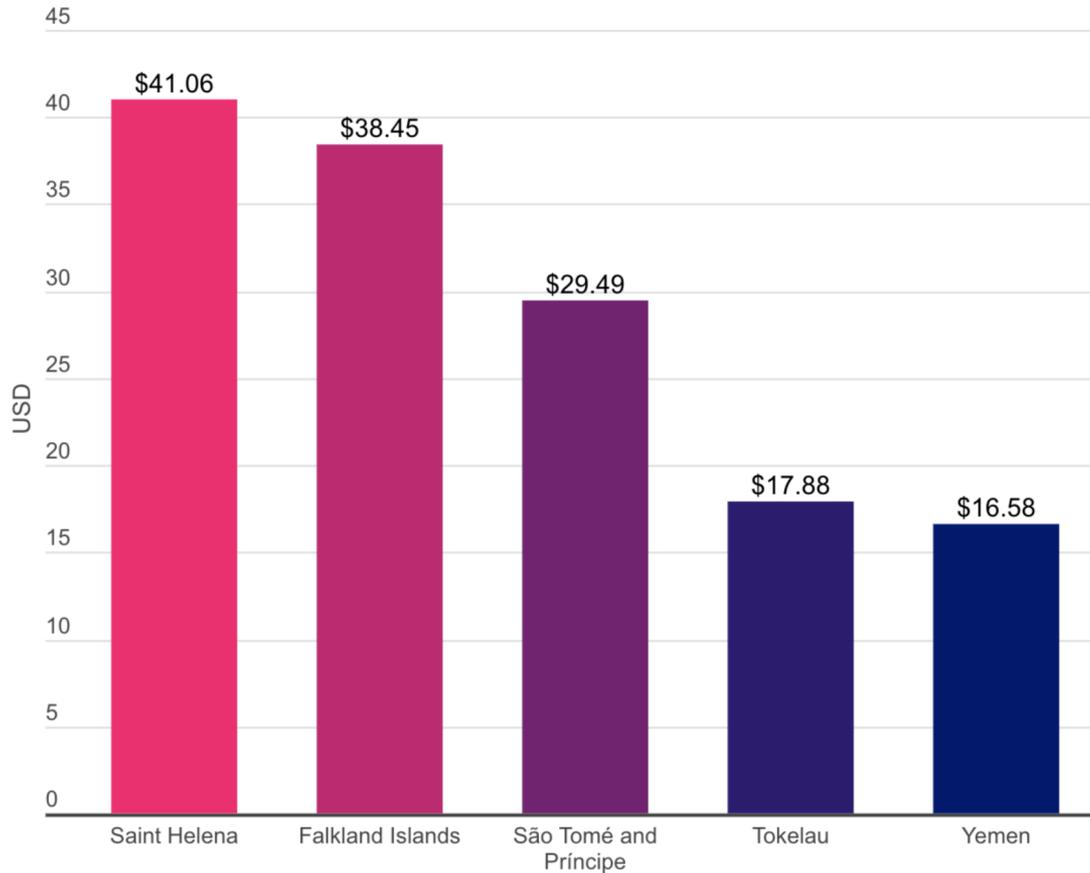
RANGE: 18-23-A6-001

Correct as time of print 04/09/23. Subject to availability. Pay monthly: 24 month contract. Tariff includes unlimited mins and texts. SIM free: SIM not included - compatible SIM sold separately. Pair with SIM: SIM locked to Tesco Mobile network. Device unlocked. Mins/texts: to standard UK landline & mobiles. Fair Use Policy applies. Data: UK only. Fair Use Policy applies. Charges and terms at www.tescomobile.com/terms.

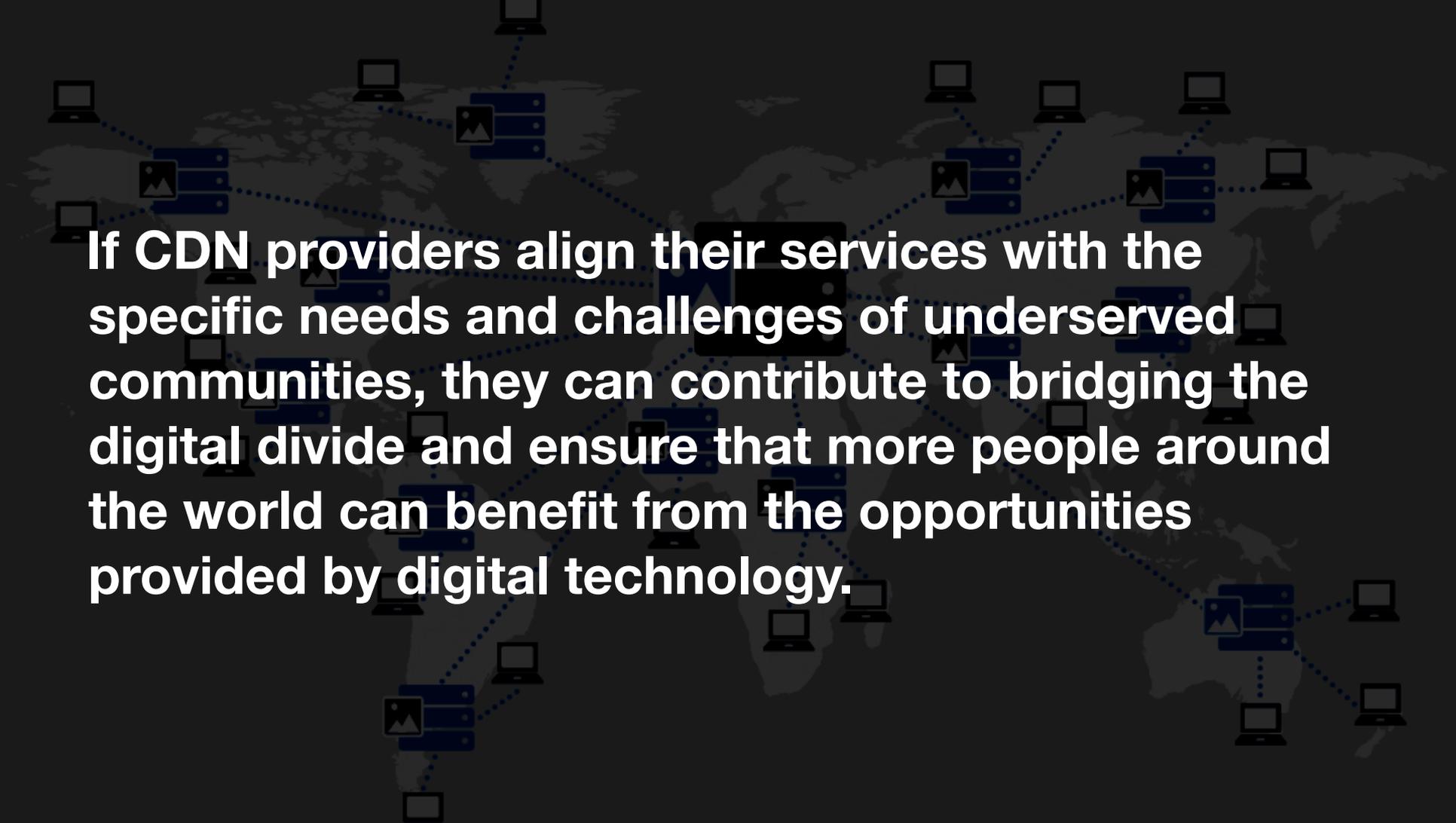
WKG2A

RANGE: 28-23-A6-001

Cost of 1GB of mobile data



Source: Worldwide mobile data pricing 2022 – The cost of 1 GB of mobile data in 233 countries – www.cable.co.uk



If CDN providers align their services with the specific needs and challenges of underserved communities, they can contribute to bridging the digital divide and ensure that more people around the world can benefit from the opportunities provided by digital technology.

5. Data Compression

Cost of 1GB of mobile data

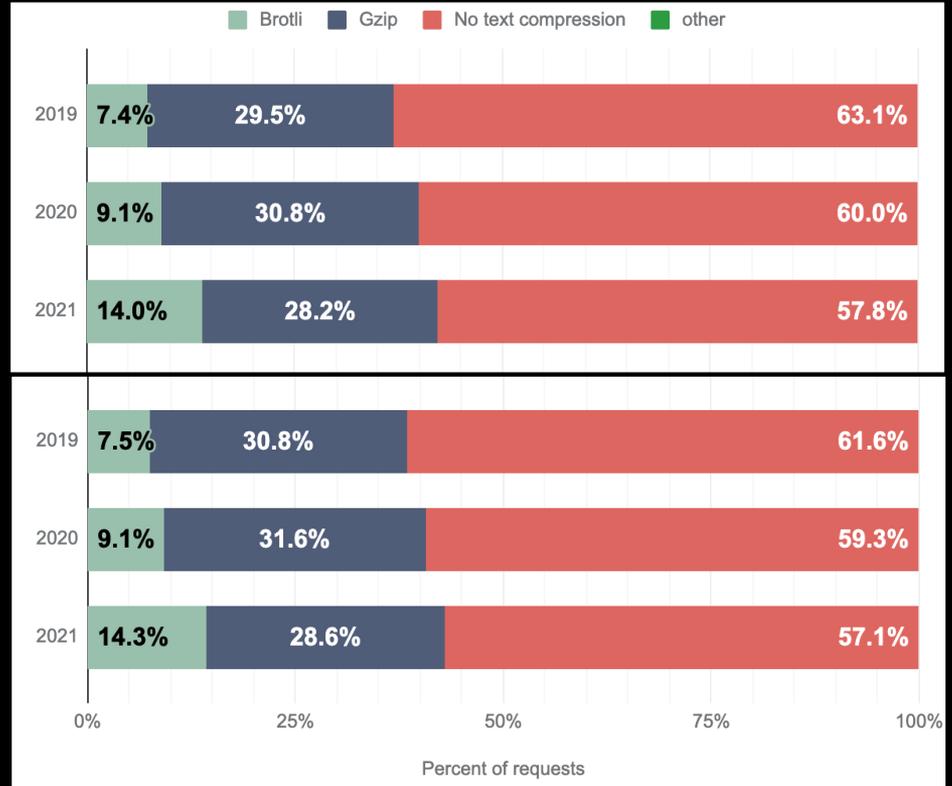


Source: Worldwide mobile data pricing 2022 – The cost of 1 GB of mobile data in 233 countries – www.cable.co.uk

Uncompressed Assets

Desktop: 5.3% reduction

Mobile: 4.5% reduction



Source: Web Almanac 2021

CDN	CDN → client	CDN ← origin	File types	Brotli
AdvancedHosting ⓘ	Resend from origin	○	○	○
Akamai ⓘ	Resend, or compress on edge	●	?	●
BelugaCDN	Compress on edge	◐	○	○
bunny.net ⓘ	Compress on edge	?	○	●
CacheFly	Resend, or compress on edge	●	●	●
CDN77 ⓘ	Compress on edge	◐	◐	●
CDNetworks	Resend, or compress on edge	●	●	?
CDNvideo	Resend from origin	●	○	○
ChinaCache	Resend, or compress on edge	●	●	○
Cloudflare ⓘ	Resend, or compress on edge	●	◐	●
CloudFront ⓘ	Resend, or compress on edge	●	○	●
EdgeNext ⓘ	Resend, or compress on edge	●	●	?
Edgio ⓘ	Resend, or compress on edge	●	●	○
Fastly ⓘ	Resend, or compress on edge	●	●	●
Gcore ⓘ	Resend, or compress on edge	●	●	●
Imperva ⓘ	Resend, or compress on edge	●	●	○
Kingsoft Cloud ⓘ	Resend, or compress on edge	●	●	○
Leaseweb	Resend, or compress on edge	●	○	○
Lumen	Resend from origin	?	○	○
StackPath ⓘ	Resend, or compress on edge	●	?	◐
Tata Communications ⓘ	Resend from origin	●	●	○
Tencent Cloud ⓘ	Resend, or compress on edge	●	●	●

Major CDN compression offerings

Brotli compression at the edge:

- **Fastly**
- **Cloudflare**
- **Akamai**
- **CloudFront**

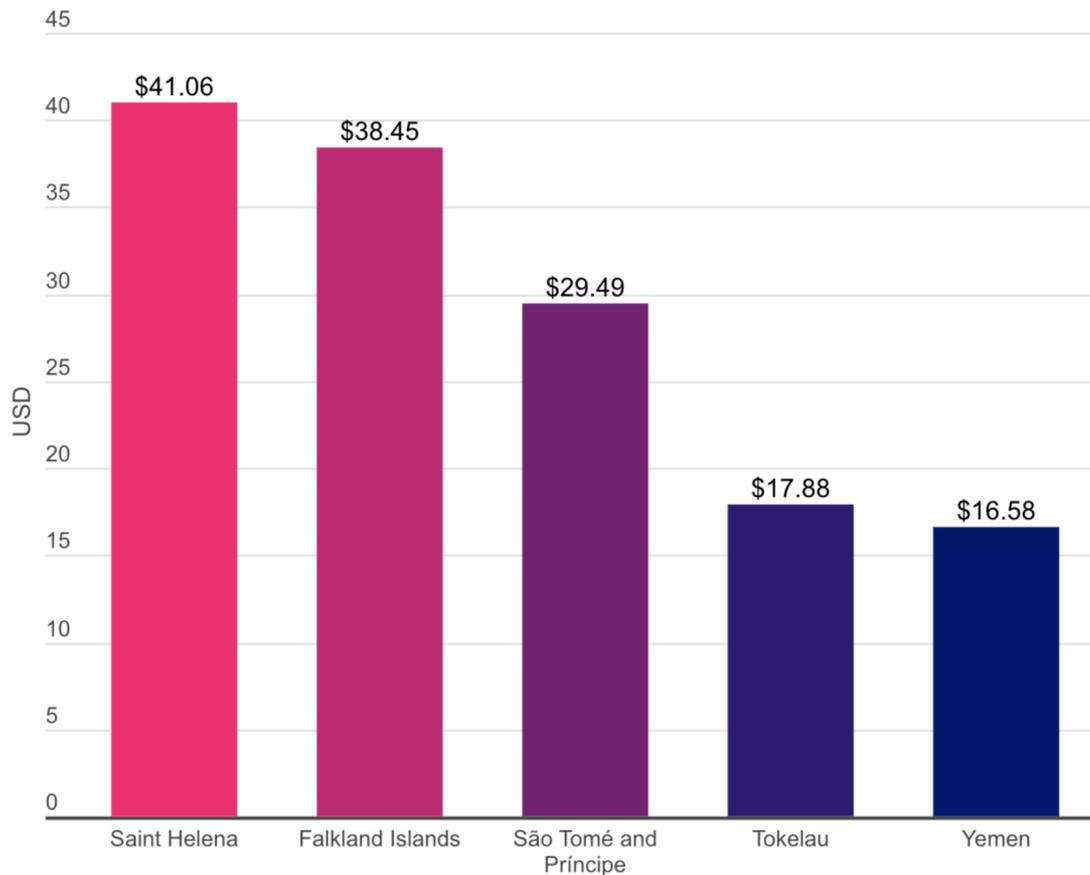
Source: CDN Planet

Test	Size (bytes)	% Reduction of original file (Higher % better)
Uncompressed response (no compression used)	2,747	-
Cloudflare default Gzip compression (level 8)	1,121	59.21%
Cloudflare default Brotli compression (level 4)	1,110	59.58%
Compressed with max Gzip level (level 9)	1,121	59.21%
Compressed with max Brotli level (level 11)	909	66.94%

Source: All the way up to 11 – Cloudflare blog – June‘23

“...by utilizing Brotli compression, particularly at its highest levels, which can lead to improved website performance, faster page load times...”

Cost of 1GB of mobile data



Source: Worldwide mobile data pricing 2022 – The cost of 1 GB of mobile data in 233 countries – www.cable.co.uk

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Coronavirus: Village life 'abysmal' without broadband

© 22 April 2020



Lockdown with poor internet

"People in Pandy, Wrexham, in the Ceiriog Valley, say they typically get broadband speeds of 1 MB or less, have limited mobile phone signal and no 4G."

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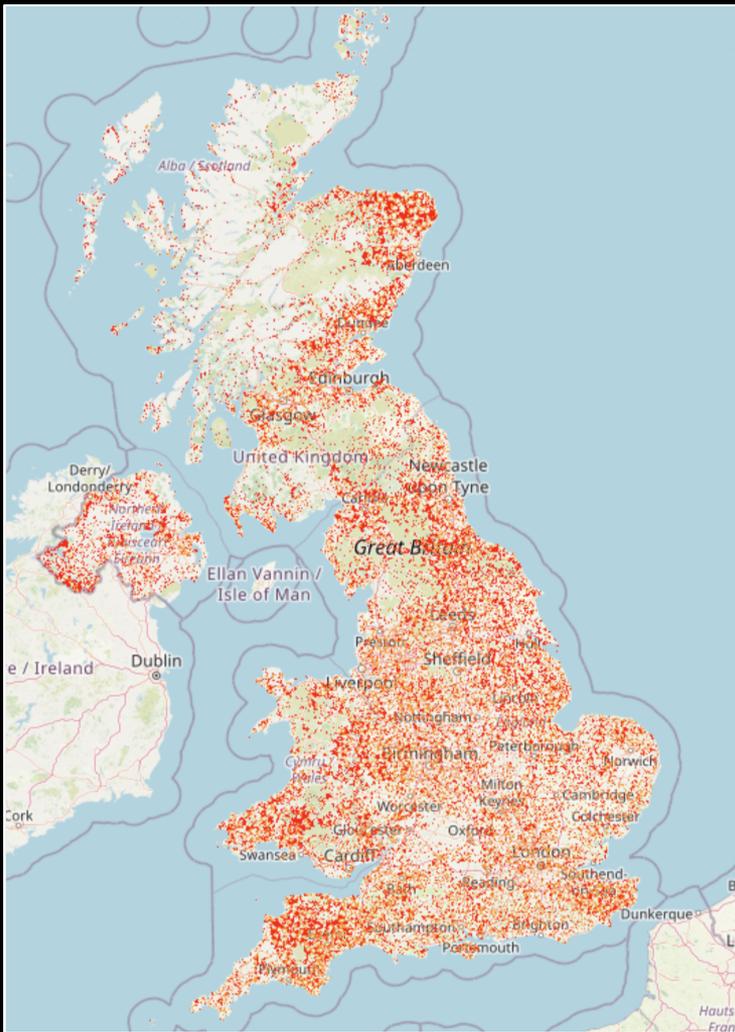
Coronavirus: Calls for better broadband for working from home

© 5 June 2020



FFION STORER-JONES
Ffion Storer-Jones has mapped out local 4G hotspots she can go to

Broadband and phone signal is so bad in her home in mid-Wales, she often has to go up a hill to get 4G.



UK Connectivity Map

- Updated 15th July '23 by thinkbroadband.com
- Orange = under 10 Mbps
- Red = under 2 Mbps
- Clear = very little to zero connectivity

Data compression can help reduce the size of data sent over the network, improving load times and reducing data usage, which can be critical for users with limited data plans.

6. Offline Capabilities & PWA's

is
SERVICEMORKER ready?

Yes.

[Status](#) * [Spec](#) * [Intro](#) * [Resources](#) * [GitHub](#)



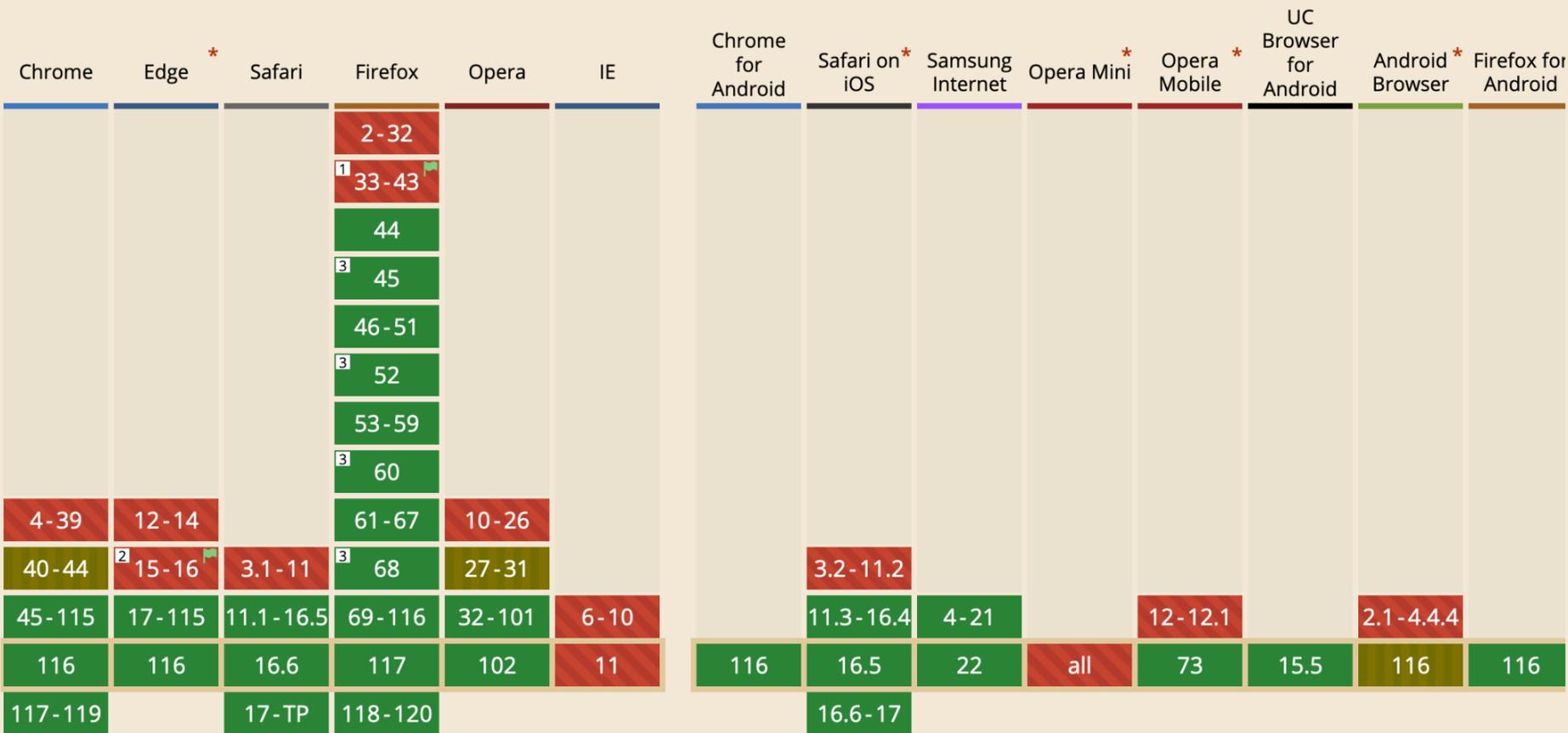
Current aligned

Usage relative

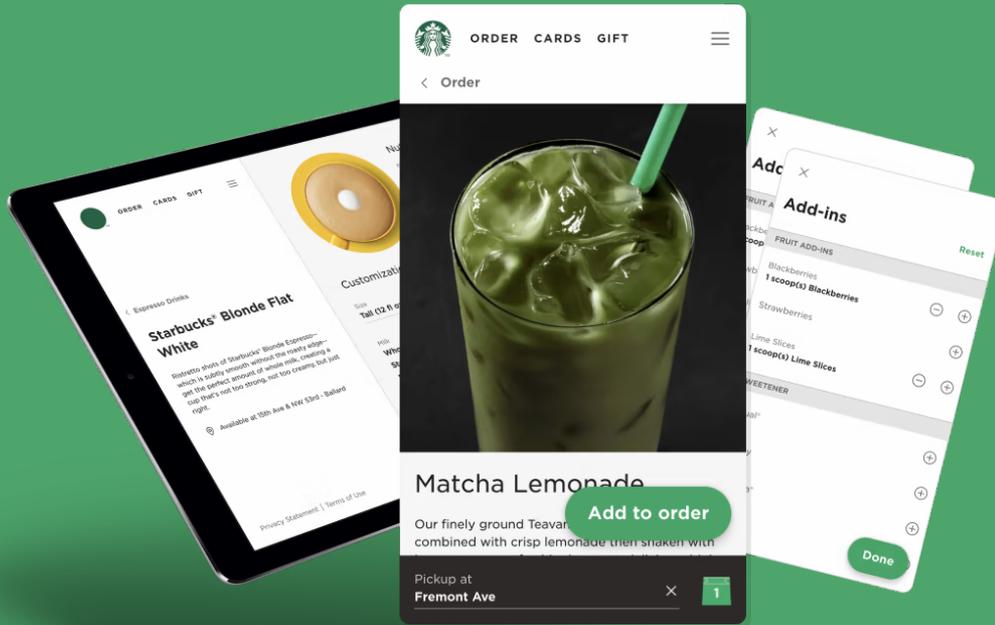
Date relative

Filtered

All



Source: Can I Use? Service Workers – September 2023

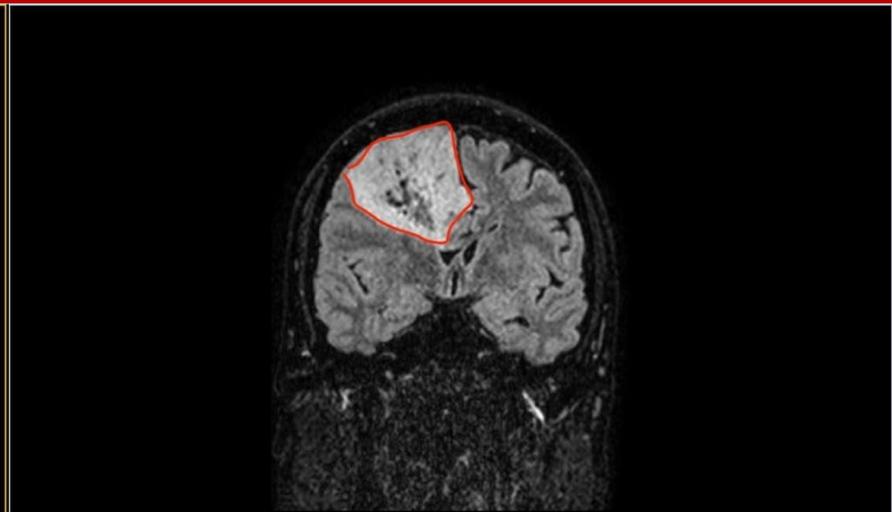
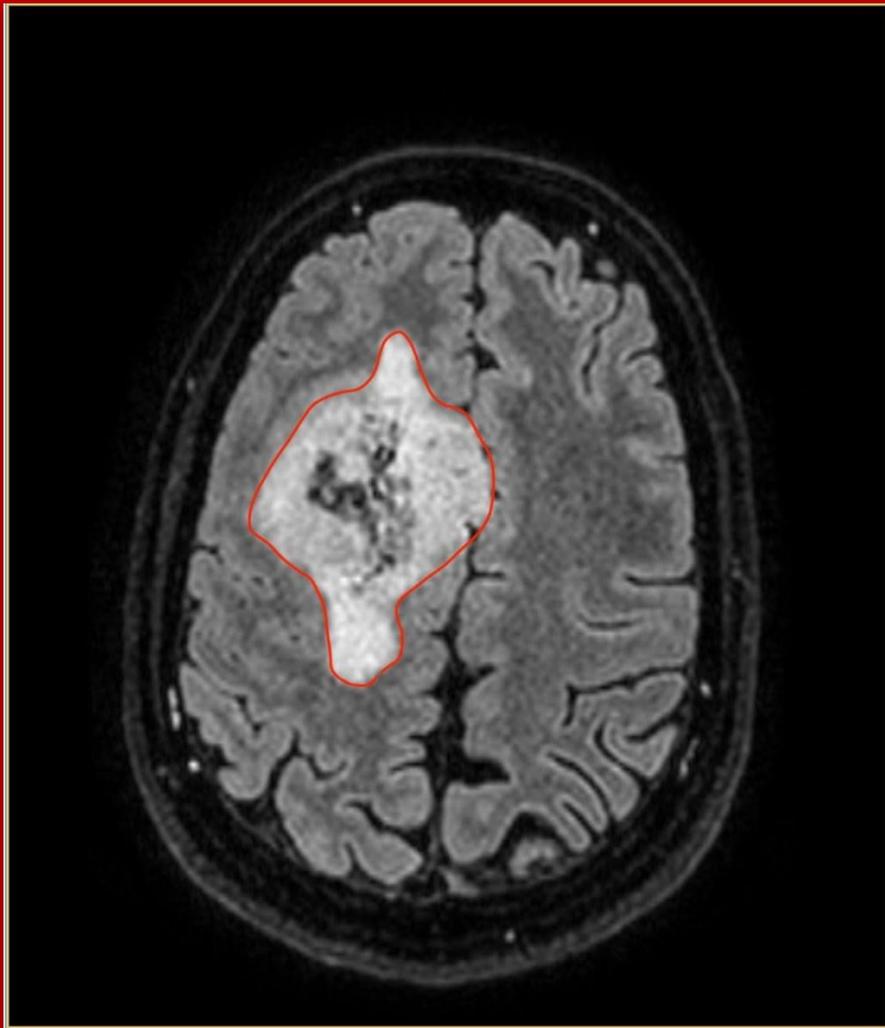


The PWA ended up being 233 KB, 99.84% smaller than the 148 MB size of the original iOS mobile app





The #webperf community is wonderful!





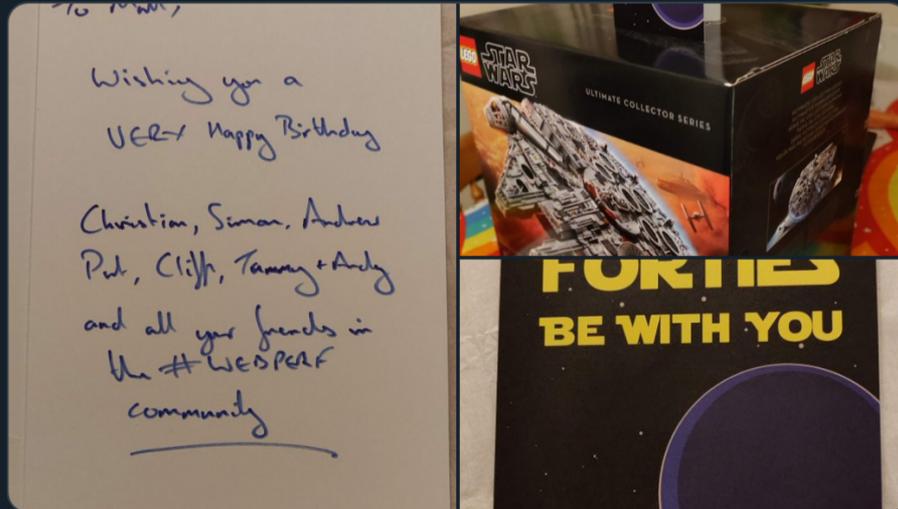
Matt Hobbs (@TheRealNooshu@hachyderm.io)

@TheRealNooshu



Feeling extremely lucky today, a very kind and thoughtful group of [#webperf](#) folks chipped in and purchased the huge 75192 Lego Millennium Falcon for my 40th / pre-cancer operation.

Very surprised and grateful when I opened it yesterday. And both my sons went crazy too!



10:27 AM · Dec 13, 2021



To Matt,

Wishing you a
VERY Happy Birthday

Christian, Simon, Andrew
Paul, Cliff, Tammy + Andy
and all your friends in
the #WESPERF
community



Alex Russell

@slightlylate



Can't say often enough how kind, supportive, and collegial the web performance community is.

Truly the best of us, staring endlessly at the worst of the web community's excesses and staying positive.

7:51 AM · Jan 14, 2022

Fin!

Thanks for listening!



Matt Hobbs

Twitter: @TheRealNooshu

Mastodon: @TheRealNooshu@hachyderm.io

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- [We've spotted something on your scan... – Matt Hobbs](#)
- <https://twitter.com/TheRealNooshu/status/1470339680247894016>
- <https://twitter.com/slightlylate/status/1481896676621123585>