

Quality of Internet in Iran;

Analytical Report on Disruptions, Restrictions, and Internet Speed in Iran

Third Report - Spring 2024



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Introduction

Foreign Sanctions and Domestic Policymakers Against Free Access to the Internet in Iran

The quality of access to free internet in Iran has not seen significant changes compared to the previous report from Winter 2023; the result of ongoing restrictive domestic policies and unilateral foreign sanctions continues to be described with three prominent terms: highly disrupted¹, limited², and slow³. Indeed, Iran ranks among the lowest globally in overall internet quality indicators. This situation, according to many internet specialists and policy researchers, is a consequence of restrictive domestic policymaking and unilateral international sanctions.

Generally, **technological sanctions**, alongside **extensive domestic filtering**, negatively impact user experience in accessing the internet.

Similar to how major global companies sanction Iranian users in violation of international regulations without providing channels for complaints, domestic policymakers replicate similar behavior. In other words, they also reproduce restrictive domestic regulations without providing reasons or avenues for protest within the country's borders.

The internet is the backbone of the digital economy, and as representatives of a segment of the country's digital economy activists, we see no alternative but to demand and repeatedly voice the needs of the innovation and technology ecosystem of the country. Therefore, we have prepared the third edition of the national internet report with an emphasis on advocating to the future government of Iran. Statistics on human capital migration, the loss of startups, and capital flight indicate that the digital economy of the country is not in a favorable condition⁴ or at least is still far from the expected goals. This issue should be considered alongside Iran's position in the rankings of internet quality indicators. Iran and China share similar standings in the rankings of the world's most restricted countries (lowest ranks among 100 countries). However, in indicators related to speed and disruptions, China (ranked 61 out of 100 in the Cloudflare report and 87 out of 100 in the CrUX report) generally fares better than Iran (ranked 97 and 90 out of 100). This comparison should be viewed in light of China's significantly larger economy (over 46 times that of Iran) and its billion-plus population (over 16 times that of Iran), making China's economic self-sufficiency incomparable to Iran's. The situation becomes particularly troubling when we evaluate Iran's internet quality ranking on an international level alongside other countries. In these rankings, Iran is positioned among underdeveloped countries, while in terms of economic development indicators, Iran has a favorable GDP status, close to economically emerging countries.

1. Disruption: This refers to the loss of part of the information in an internet connection, typically accompanied by deliberate and direct interference. Disruption is the primary reason why ordinary users experience a poor internet experience without understanding the underlying causes.

2. Censorship: This refers to the filtering of domains and IP addresses and is one of the main reasons for internet inefficiency in a geographic area. In Iran, the implementation of these restrictions, in addition to domestic censorship, is also a result of certain inhumane international policies that use sanctions to limit internet access for Iranians.

3. Speed: This refers to high bandwidth and low latency in loading a website or internet content. This indicator is one of the drivers for the emergence and widespread adoption of new technologies in the digital economy.

4. Farzin Ferdows in an interview with Eco Iran (Donya-e-Eqtasad)

The quality of the internet in Iran is the result of "ineffective actions to lift sanctions" and "insistence on continuing technical measures against VPNs."

The issues related to the country's internet can be divided into various and extensive sections. This report aims to address the most important ones in detail. However, the two main factors contributing to the critical state of the internet in Iran are external sanctions and widespread internal filtering. Additionally, our investigations reveal that **role of filtering has gone far beyond merely creating restrictions. Today, it has become the primary cause of continuous slowdowns, instability, and a significant barrier to increasing speed and developing the internet.**

For years, technology experts have explained that technically, blocking VPNs is impossible. The main issue is that the more restrictions are imposed to counteract VPNs, the more advanced the algorithms they use become. Today, VPNs mimic user behavior, the HTTP protocol, and even browser fingerprints, and they leave no trace by generating asymmetric traffic. Meanwhile, Iranian users are using VPNs more than ever to access the internet. This claim is based on the latest ISPA report, which shows that **83.6 % of internet users use VPNs.**⁵

A similar report by "Dataak" indicates that after a temporary decrease in Instagram usage in September 2022, **over 90% of users returned to this social network by March 2024.**

In fact, the continuous efforts of the authorities, by imposing significant costs⁶ on the people and operators, preventing the expansion⁷ of a multi-thousand-billion network, and blocking protocols essential for businesses, have not changed people's behavior regarding the use of VPNs. These actions have only increased demand and caused widespread disruptions and irreparable damage to the public and the digital economy. Therefore, it can be said that on a larger scale, the results of these policies should be observed in the ongoing disillusionment of the workforce⁸ and, ultimately,⁹ the withering of the economic tree and the exodus of the country's digital experts.

In summary, two significant damages to the country's internet can be highlighted:

- **Extensive, costly, and severe technology sanctions**

against the Iranian people, with "sanction-breaking" systems proving ineffective in practice.

- **Blocking VPNs**

is not technically feasible and does not change people's behavior; instead, it causes widespread slowdowns and imposes heavy and irreparable costs on the country. The solution lies in policy reform, reducing demand, and bringing VPN usage statistics closer to the global average.¹⁰

5. Internet Report from the People's Perspective - Sharif Governance Think Tank and Masir - Spring 2024

6. According to Parliamentary Representatives' Speeches, the Summer 2023 report by Yektanet estimates at least 64% of people use VPNs, based on the report by the Industries and Mines Commission of the Parliament dated August 21, 2023, and...

7. Report of the Industries and Mines Commission of the Islamic Consultative Assembly - Summer 2023

8. Digiato Report - 2022

9. Iran Migration Observatory Report (Sharif University) - 2022

10. According to ISPA Survey, after WhatsApp and Instagram were blocked, the rate of VPN use in the country tripled.

#	GDP-Rank	Country	CrUX		OONI			CrUX	OONI	Total (Avg)
			Total Domain	AVG	Total Domain	Disturbed-%	Censored-%	Rank	Censored-Rank	
100	93	Turkmenistan	100	30%				100		100
99	88	Cogo, Dem.Rep.	100	41%	5	0%	0%	99		99
98	89	Sudan	100	41%	12	0%	0%	98		98
97	26	Cuba	100	50%	5	20%	0%	96		96
96	42	Iran	100	60%	100	5%	59%	90	100	95
95	69	Angola	100	51%	4	0%	0%	95		95
94	62	Ethiopia	100	53%	8	0%	0%	94		94
93	96	Cameroon	100	42%	100	1%	5%	97	90	94
92	2	China	100	69%	100	4%	59%	87	99	93
91	83	Cote d'Ivoire	100	57%	22	0%	0%	92		92
90	94	Uganda	100	65%	85	1%	11%	88	95	92
...										
68	19	Turkiye	100	96%	100	0%	2%	31	81	56
...										
33	38	Malayasia	100	95%	100	1%	0%	40	1	21
...										
10	23	Sweden	100	98%	100	0%	0%	10	1	6
9	49	Finland	100	98%	100	1%	0%	9	1	5
8	51	Portugal	100	98%	100	0%	0%	8	1	5
7	48	Czechia	100	98%	100	0%	0%	7	1	4
6	63	Slovak Republic	100	98%	99	0%	0%	6	1	4
5	25	Belgium	100	98%	100	1%	0%	5	1	3
4	86	Slovenia	100	98%	93	3%	0%	4	1	3
3	24	Norway	100	99%	100	1%	0%	3	1	2
2	59	Hungary	100	99%	100	0%	0%	2	1	2
1	41	Denmark	100	99%	100	2%	0%	1	1	1

Iran remains among the worst countries in terms of free access to the internet.¹¹

In this report, we examined, compared, and analyzed three indicators of internet disruption, restriction, and speed of free access to the internet using data¹² from OONI and Google CrUX. For the latest information, we compared the reliability of these databases with others, including Cloudflare Radar. Contrary to the previous report, we increased the number of countries examined from 5 to 100, focusing on those with the highest Gross Domestic Product (GDP). By analyzing and comparing countries in the Google CrUX database, we obtained more reliable data regarding latency, potential issues, and speed. However, due to insufficient statistical data, we removed 25 countries from the restriction index and extrapolated their scores from the speed and disruption sections. Ultimately, Iran ranks 95th out of 100 countries in terms of free access to the internet. If we exclude countries lacking sufficient data on restrictions, Iran's internet status falls below that of China and Cameroon, placing it at the top of the list of countries with the most restricted access to the internet.

11. The evaluation period for ranking the countries was set to the first of June 2024. However, for the separate sections of each part (disruption, restriction, and speed), we considered the last six months (following the publication of the second internet report).

12. Open Observatory of Network Interference (OONI)

The most significant positive and negative events related to the quality of the internet in Iran over the past six months

Disruptions caused by the increase in DDoS attacks

Blocking of 6in4 Bridges

Several days of IPv6 outage

Increased internal geographic restrictions (Iran Access)

Transparent reporting of internet metrics

Expansion of the fiber optic network

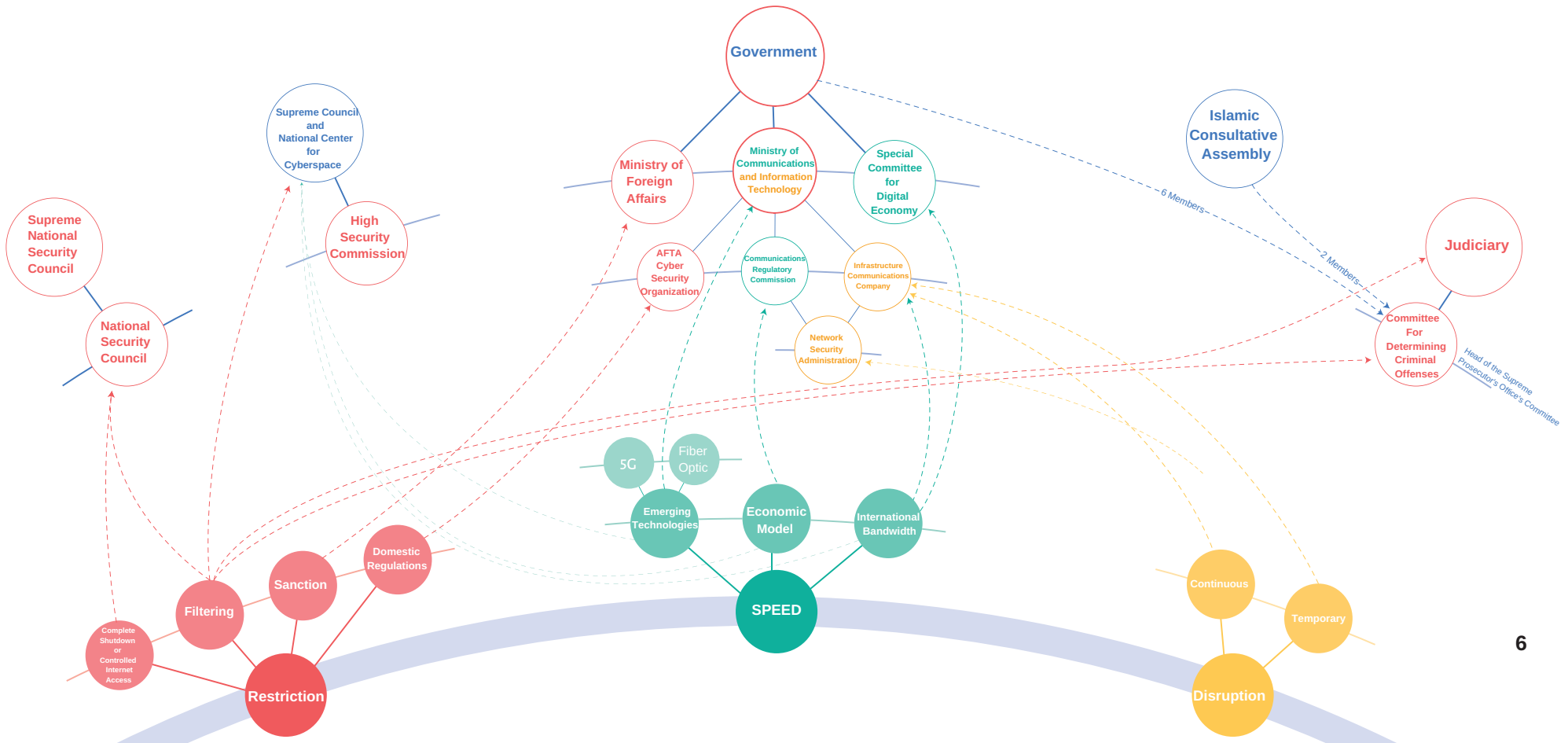
Minimal improvement in some disruptions and slowdowns

Median speed growth according to Ookla Speedtest report (access network improvement)

Who should be accountable for the quality of the internet?

Numerous questions have been raised about the state of the country's internet: from the black box of filtering to the monopoly of international gateways and the interventions of parallel agencies; it seems that the low quality of Iran's internet is always attributed to some unknown, unaccountable entity. As mentioned in the second internet quality report, we strive to outline the responsibilities of various stakeholders according to the country's approved laws in each section. In each edition, we aim to refine these graphs and complete them based on feedback, so that the media, public opinion, and most importantly, the President and the Islamic Consultative Assembly, as direct representatives of the people, can be more accountable to public opinion.

Based on this and due to the commencement of the **twelfth Islamic Consultative Assembly** and the beginning of the **fourteenth presidential election** in Iran, the E-commerce Association presents its requests to the Speaker of the Assembly and the future President of Iran. It calls on the presidential candidates to share their clear and transparent responses to these questions with the people of Iran.



Active efforts and transparent reporting to the public in the face of sanctions, filtering, and monopoly

On the eve of the presidential election, we see this as an opportune moment to voice the rightful demands of activists, users, and businesses in the digital economy.

Acknowledging that the government alone does not have a 100% impact on all aspects related to the internet, we divide the demands into two categories: direct government influence and active influence and advocacy with other institutions to uphold the rights of Iranian users and citizens.

Three Requests from the Candidates and the Future President of the Country

1. Active effort to reform filtering structures and reduce internet restrictions **Active effort**

- Efforts and transparent reporting to the public on lifting the ban on useful websites and popular social networks.
- Transparency in the votes of the six government representatives in the Commission for Determining Instances of Criminal Content.
- Efforts to reform filtering laws, including: stopping smart filtering, prohibiting blocking based on IP or a service provider on a national level, banning the filtering of licensed Iranian sites, standardizing hosting laws domestically and internationally, etc.
- Immediate resolution of disruptions caused by filtering systems under the supervision of private sector representatives.

2. Eliminating the monopoly of the Telecommunications Infrastructure Company and rapid development of high-speed internet **Direct action**

- Increase speed and international bandwidth.
- Continue and expedite the fiber optic plan in densely populated cities and develop 5G. Provide transparent and online reports on internet performance indicators by operator, province, domestic/foreign content, etc.

3. Strengthening international diplomacy and efforts to lift international technology sanctions **Direct action**

Three requests from the Presidency of the Islamic Consultative Assembly

1. Transparency in the selection of two parliamentary representatives and their votes in the Commission for Determining Criminal Content.

2. Active efforts to reform the filtering structure by passing facilitating laws and reviewing previous restrictive policies, including:

- Immediate review by the Supreme Council of Cyberspace on the restrictions imposed on foreign platforms, with a focus on re-voting regarding their continuation, centralization and monopoly of decision-making, halting intelligent filtering, prohibition of blocking based on IP or a service provider nationwide, prohibition of filtering licensed Iranian websites, standardization of hosting laws domestically and abroad, centralization of decision-making, transparency and accountability of responsible institutions regarding filtering policies and their implementation, amending restrictive laws, and more.

3. Supervision of the performance of agencies related to internet quality

- Request performance reports from councils, working groups, and institutions related to internet quality in the presence of private sector representatives, and publish semi-annual reports on the actions taken to improve internet quality and existing weaknesses.

Methodology and Comparative Analysis of Internet Quality in Iran

Google categorizes the connection speed and website loading by users into four quality levels:

Title	Minimum RTT	Maximum downlink	
Slow-2g	2000ms	50 Kbps	Internet suitable for receiving low-volume content, such as text-only content
2g	1400ms	70 Kbps	Internet suitable for receiving small images.
3g	270ms	700 Kbps	Internet suitable for receiving large content, including high-quality images, audio, and SD-quality videos
4g	0ms	∞	Internet suitable for receiving HD videos and video streaming

As is evident, the 4G standard is not only not stringent but it is expected that with today's technologies, in times when there is no disruption or slowdown in the network, all requests will be loaded with an RTT of less than 270ms and at a speed of more than 700kbps. Various international reports also indicate that in the top five countries, more than 94 percent of communications are categorized in the same manner and classified under 4G Density. Therefore, considering the prevalence of technology, 3G communications can be considered as potential slowdowns or disruptions, and communications that are 2G or slow-2G can be regarded as severe slowdowns or disruptions.

CrUX attempts to provide a realistic picture of the internet user experience worldwide by collecting information from Google's database¹³ through Google Chrome browsers¹⁴ globally. One of the major advantages of this database is its accurate identification of Iranian users due to its connection with the browser. It can correctly identify the user's country even when they use various circumvention tools and VPNs, allowing for a thorough analysis of popular websites and the final user experience in each country.

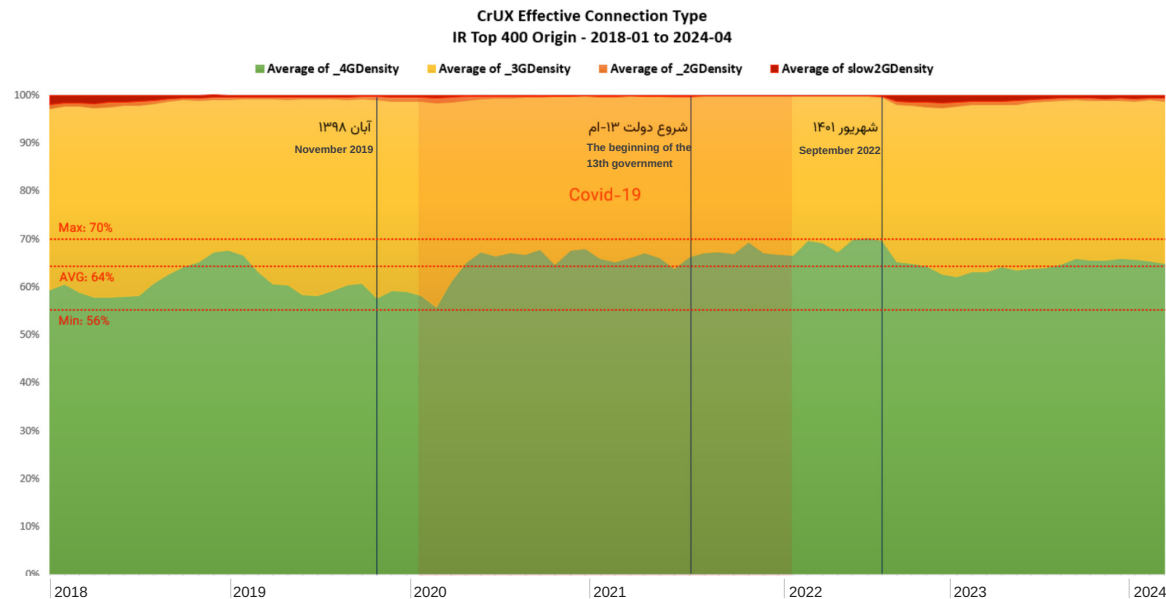
In this report, we extracted the 5,000 most visited Iranian websites as of April 2024 (Farvardin and Ordibehesht 1403). First, we examined how many of these websites were also used by Iranian users over the past 77 months. With this data, we could compare the user experience and show fluctuations in internet quality over the past years. Ultimately, we were able to compare the experience of Iranian users in loading 400 high-traffic websites consistently used throughout different months and years.

13. **Methodological Considerations of CrUX:** Google CrUX is a data set that gathers user feedback from various sources, including Google's own services like Search, Maps, and Google Play, as well as third-party applications and websites. The data is collected anonymously to provide insights into user experiences, challenging aspects of user experience, and user preferences across different countries.

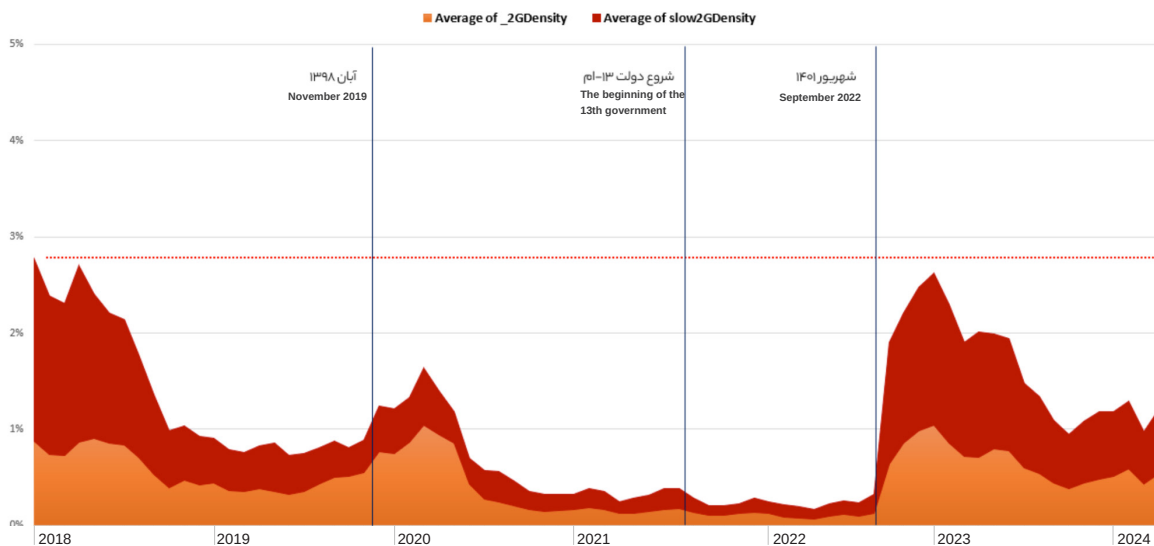
The advantages of using Google CrUX include comprehensive coverage, large-scale data, and the ability to compare different countries and regions. Additionally, since Google uses more than just IP addresses to determine the location of users, it yields more accurate results in countries like Iran, where VPN usage is high. However, there are methodological drawbacks and limitations in using Google CrUX for analyzing user experience, the most significant of which is the "positive bias." Since the data used in this method is typically biased towards more active online users, the analysis results based on the CrUX database tend to be overestimated and consistently present the situation as slightly better than it actually is.

14. According to Cloudflare Radar data, 8% of browsers used in Iran are Chrome:

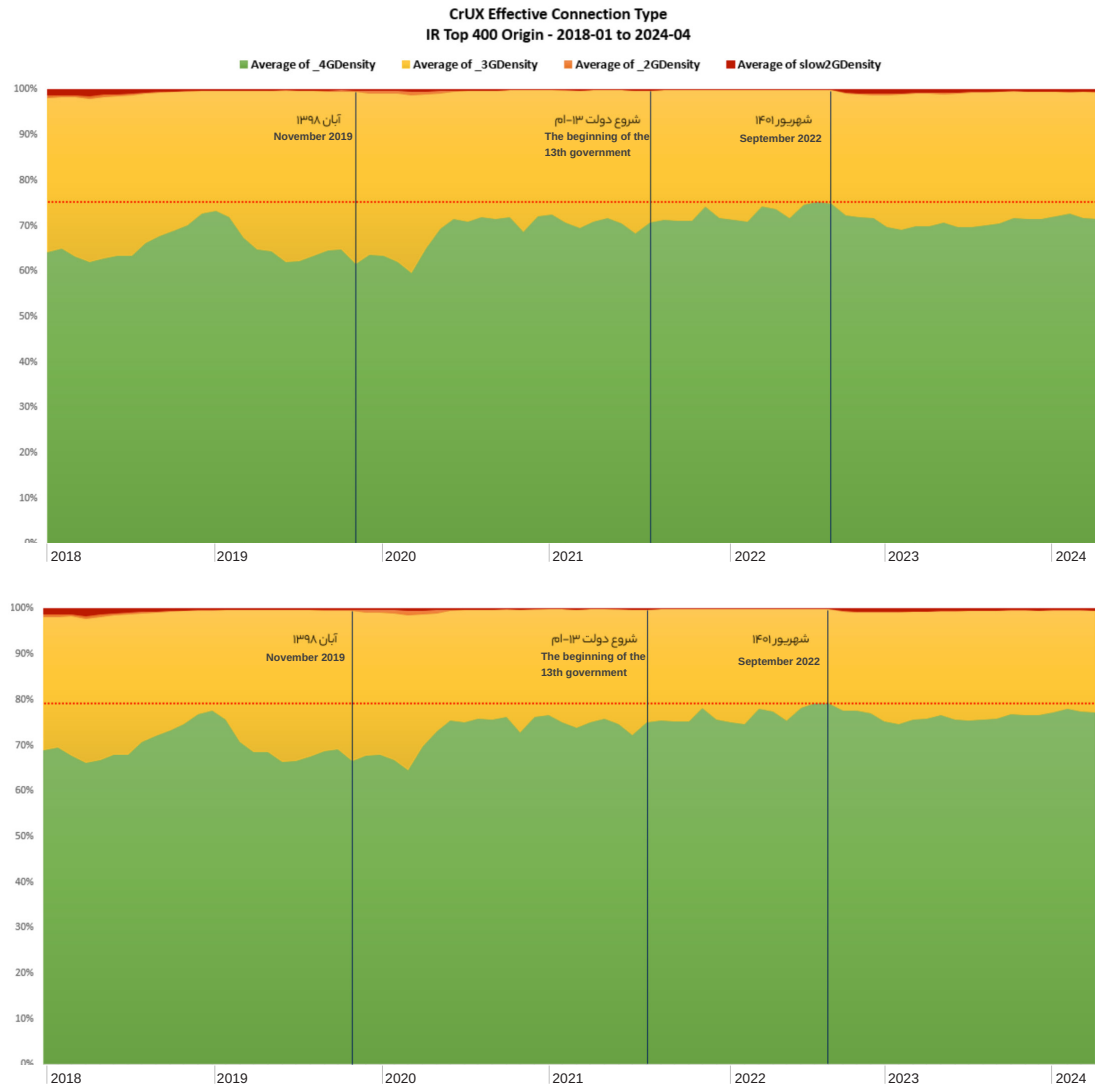
<https://radar.cloudflare.com/ir?dateRange=52w>



As shown in the image, over the past six years, approximately 80% of the internet connections used by Iranian users have been related to viewing high-quality, highly visited websites (4G Density). In a notable event in September 2022, this situation experienced a decline and gradually saw relative growth, but it has not yet reached its peak as it did in September 2022.



Another important point evident in this chart is the significant increase in connections with slow2GDensity status after September 2022.

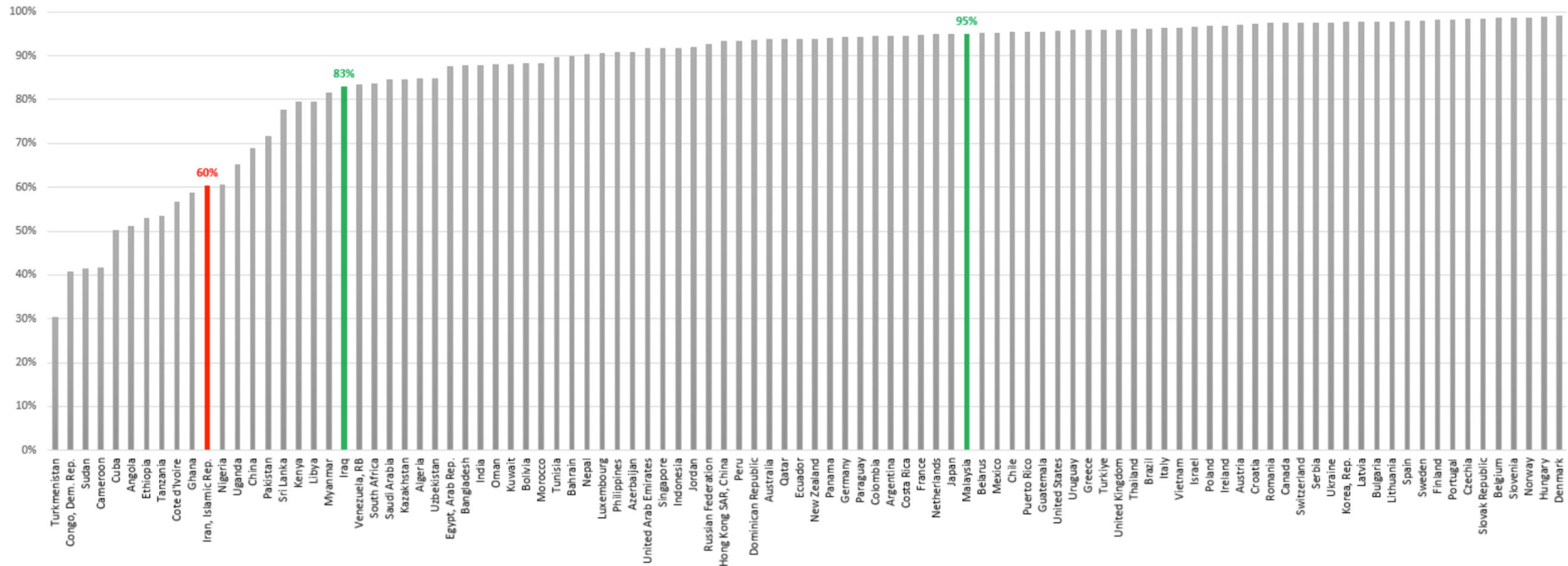


If we exclude the filtered websites from this list, the average loading speed improves, but changes in user experience since September 2022 are still evident:

This time, if we limit the selected 400 domains to those hosted in Iran, the situation slightly improves. However, as evident in the chart, more than 20% of user connections still lack adequate quality.

To better understand these charts, they should be examined in comparison with other countries. For this comparison, we analyzed 5,000 of the most visited websites, comparing Iran with 100 countries that have the highest Gross Domestic Product (GDP). Among the top 100 domains (based on Tranco ranking) that were common across these countries, we established a basis for comparison. In this comparison, although filtered and sanctioned sites are part of the Iranian user experience, we attempted to exclude these websites to compare the state of free internet access speed more fairly.



Analytical Report on Disruptions, Restrictions, and Internet Speed in Iran



As shown in the image, in the top 67 countries, the average connections with over 90% quality are established using 4G Density. For instance, in Malaysia, this figure is 95%.

To provide a clearer understanding with an example, the average loading quality for Apple Music and YouTube in Turkey is 94% and 97%, respectively. In contrast, in Iran, these figures drop significantly to 55% and 5%. Even if we attempt to make a comparison by substituting Apple Music with its Iranian equivalent, "Beeptunes," and YouTube with its counterpart, "Aparat," we observe a noticeable disparity. In this scenario, 71% of users could access Beeptunes, and 77% could access Aparat with 4G Density quality.

This comparison further illustrates the challenges faced by Iranian users in terms of internet quality and speed, highlighting a significant gap even when comparing local services with their international counterparts.

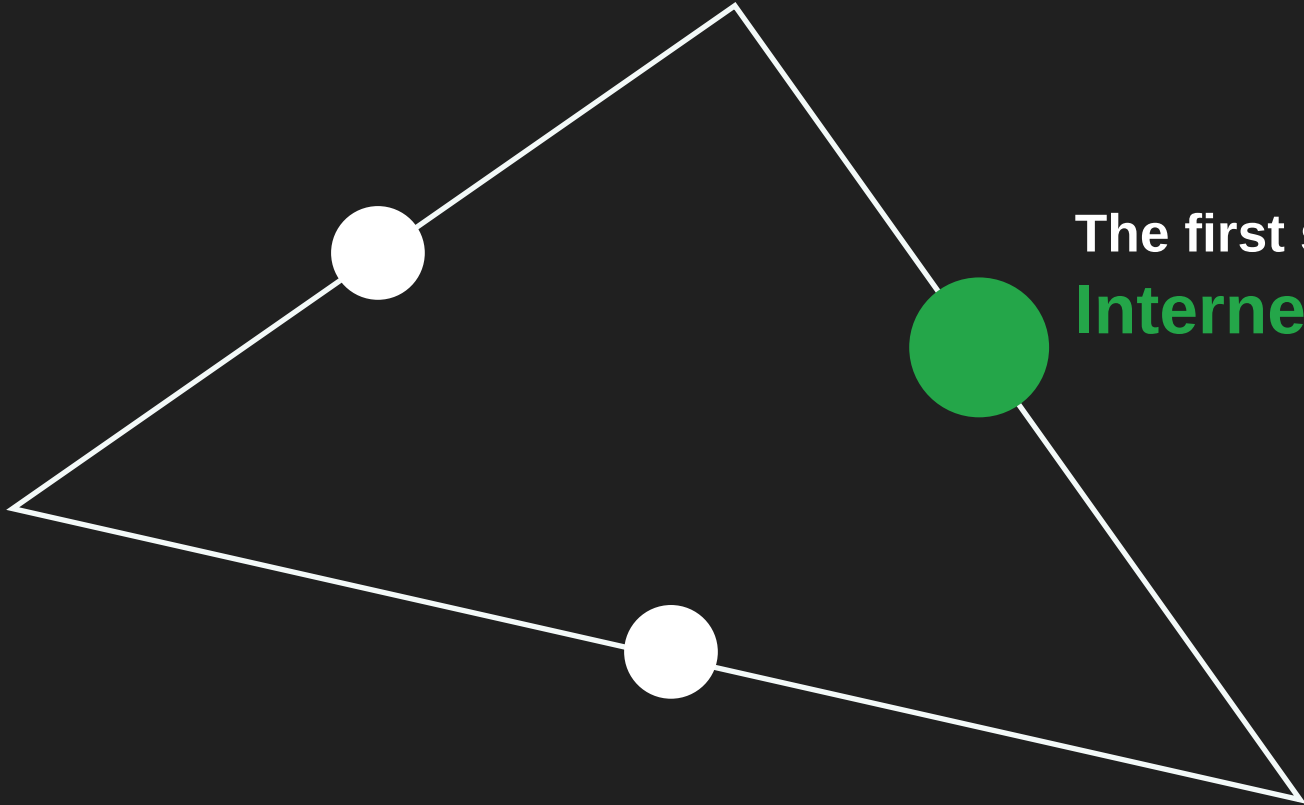
Youtube	Aparat
97%	77%
	

#	GDP-Rank	Country	CrUX		OONI			CrUX	OONI	Total (Avg)
			Total Domain	AVG	Total Domain	Disturbed-%	Censored-%	Rank	Censored-Rank	
100	93	Turkmenistan	100	30%				100		100
99	88	Cogo, Dem.Rep.	100	41%	5	0%	0%	99		99
98	89	Sudan	100	41%	12	0%	0%	98		98
97	26	Cuba	100	50%	5	20%	0%	96		96
96	42	Iran	100	60%	100	5%	59%	90	100	95
95	69	Angola	100	51%	4	0%	0%	95		95
94	62	Ethiopia	100	53%	8	0%	0%	94		94
93	96	Cameroon	100	42%	100	1%	5%	97	90	94
92	2	China	100	69%	100	4%	59%	87	99	93
91	83	Cote d'Ivoire	100	57%	22	0%	0%	92		92
90	94	Uganda	100	65%	85	1%	11%	88	95	92
...										
68	19	Turkiye	100	96%	100	0%	2%	31	81	56
...										
33	38	Malayasia	100	95%	100	1%	0%	40	1	21
...										
10	23	Sweden	100	98%	100	0%	0%	10	1	6
9	49	Finland	100	98%	100	1%	0%	9	1	5
8	51	Portugal	100	98%	100	0%	0%	8	1	5
7	48	Czechia	100	98%	100	0%	0%	7	1	4
6	63	Slovak Republic	100	98%	99	0%	0%	6	1	4
5	25	Belgium	100	98%	100	1%	0%	5	1	3
4	86	Slovenia	100	98%	93	3%	0%	4	1	3
3	24	Norway	100	99%	100	1%	0%	3	1	2
2	59	Hungary	100	99%	100	0%	0%	2	1	2
1	41	Denmark	100	99%	100	2%	0%	1	1	1

Addition of Restriction Category in the Ranking

After analyzing the CrUX data, we also incorporated information from OONI to our comparison. This allowed us to consider not only speed and disruptions but also the variable of restrictions in the final ranking. As mentioned in the initial section, Iran and China, with the highest number of filtered domains, topped this table. Out of the 100 countries examined, 4 had no statistical samples, 21 had minimal statistical samples, and the remaining countries had significant statistical samples. Among these, 5 countries had no filtered websites from this 100-domain statistical sample.

Finally, by combining this table with the findings obtained from the CrUX data, we arrived at the final ranking (third page of the report).



The first side
Internet Disruption

First Section: Intermittent Disruptions



From Natural Disasters to Technical Failures Beyond Control

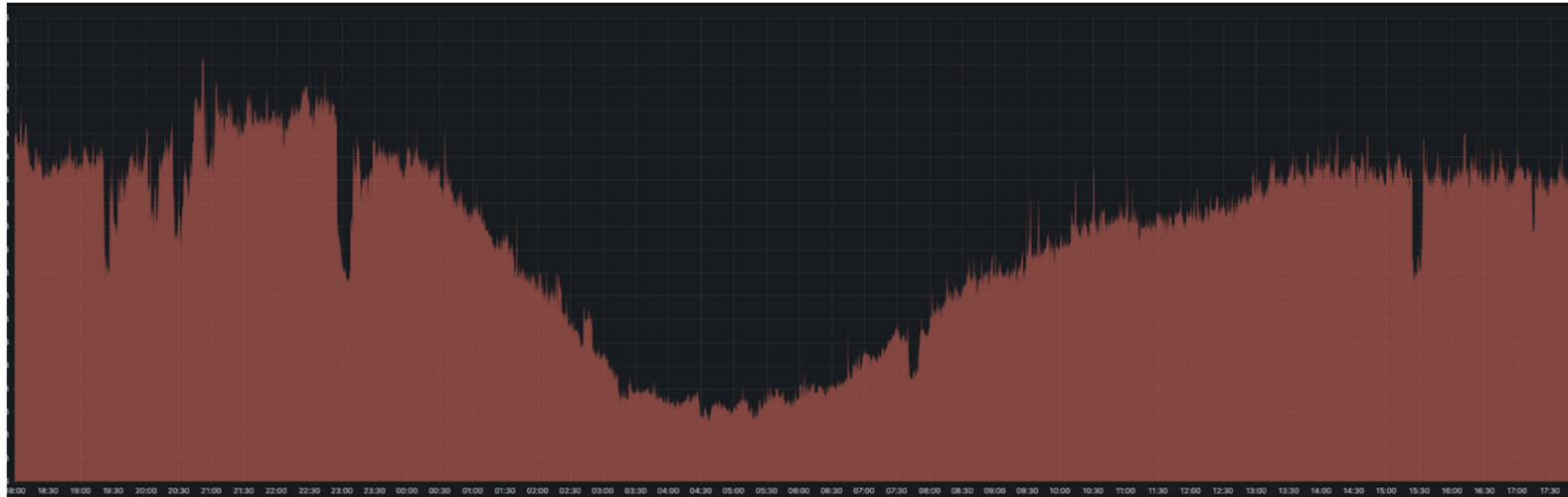
Disruptions that occur due to natural or technical reasons and on a case-by-case basis fall into this category. The causes of these disruptions range from the disconnection of communication links in the internet network due to natural disasters to incidents such as cyber attacks, power outages, configuration errors, and similar issues.

Widespread DDoS Attacks and Link Disruptions in April and May

The most significant intermittent disruptions in the past six months have been related to widespread DDoS attacks on the country's operators and data centers, resulting in the disconnection of links, communication saturation, and disruption of Iran-Access¹⁵. Consequently, access to some domestic websites has been interrupted for users outside the country.

Reports indicate that during short intervals of 5 to 10 minutes, communication links in some operators were severed, causing disruptions in users' internet connectivity.

¹⁵. Enforcement of Regulations by Iranian Policymakers to Restrict Access for Each User Outside of Iran



Example Graph Indicating Short and Intermittent Internet Disruptions - Hamrah e Aval (MCI) Data Center May 12, 2024

Unofficial reports show that DDoS attacks in April and May 2024 were tens of times more frequent than similar attacks in previous years. According to reports from the Telecommunication Infrastructure Company over a three-year period, the capacity to counter DDoS attacks increased from 200Gb/s (which was exclusively purchased from Tata Communications) to 1800Gb/s, including 800Gb/s of scrubbing services from upstream foreign operators and 1000Gb/s from domestic systems. The number of DDoS attacks has sharply increased since September 2022, as shown in the graph below, and certainly, managing and actively countering this vast volume of attacks requires extensive financial resources and centralized, reliable guidance and support. The Ministry of Communications' measures to combat these attacks and increase the DDoS mitigation capacity from 200Gb/s to 1800Gb/s, a nine-fold increase in this service's capacity, have minimized the effects of these attacks on the quality of end-user experience.

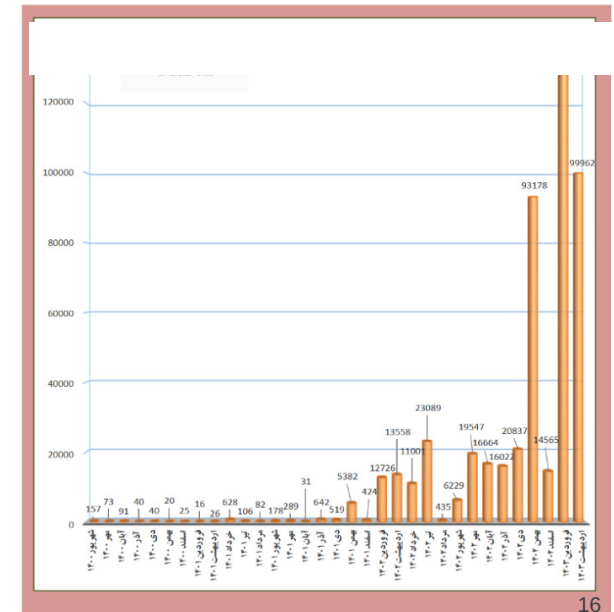
But what corrections and improvements can make the country more resilient to the recurrence of these events?

Monopoly at the Upstream Operator Level

Independent networks (AS) should be able to connect to multiple other networks and eliminate all Single Points of Failure (SPoF) in a competitive environment to achieve the highest possible resilience. However, in Iran, due to the monopoly of the upstream network by the Telecommunication Infrastructure Company, all operators' networks are required to have exclusive connections and receive internet from this company. Consequently, any disruption in this network leads to disruptions across the entire country's network, saturating the DDoS mitigation link capacity or relying on a single mitigation system that may have its inherent limitations.

Technical Inability in Most Intermediate Operators

Most intermediate operators in Iran lack sufficient infrastructure to detect and mitigate DDoS attacks and instantly switch services to alternative links during service interruptions. Part of these limitations is related to technical capability and investment, part to the restriction in choosing upstream operators, and part to the limitations of international tunnels.



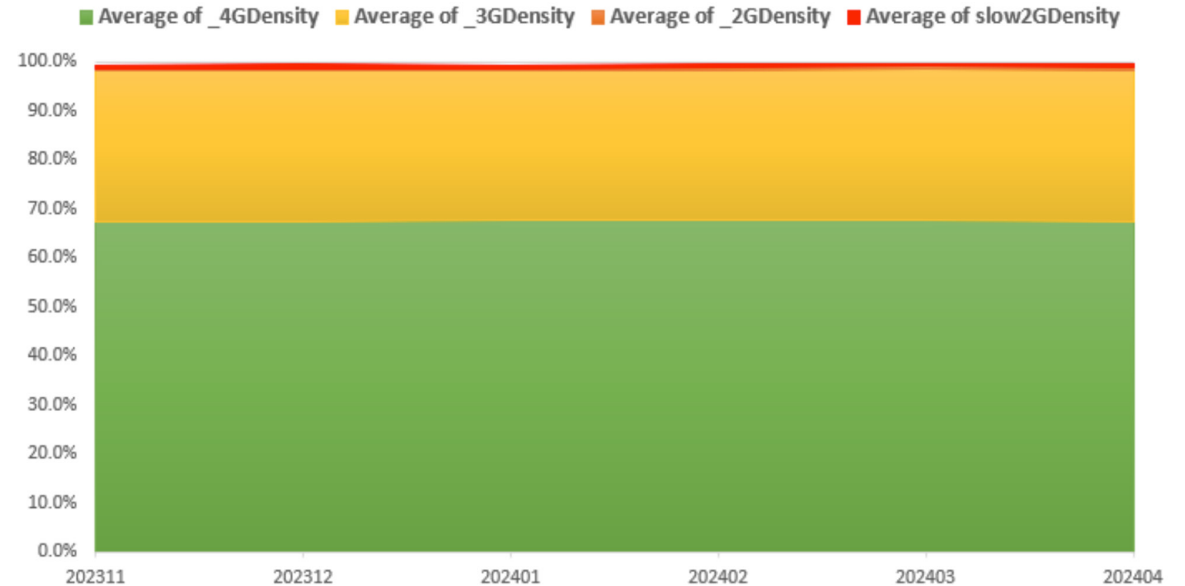
Restrictions on GRE and IPIP Tunnels for Private Sector Use

Private companies and businesses, especially infrastructure companies, can directly use international scrubbing services or create high-capacity pools outside the country to filter their traffic and bring clean traffic into the country. Unfortunately, the prohibition on the use of standard GRE and IPIP tunnels and widespread disruptions on other tunnels prevent businesses from benefiting from these services, resulting in internet disruptions.

16. This chart, provided by the Telecommunication Infrastructure Company to the E-Commerce Association, indicates an increase in the number of attacks. For a more comparative and precise analysis of the attack volume, it is necessary to plot the charts based on the utilized capacity or the number of requests.

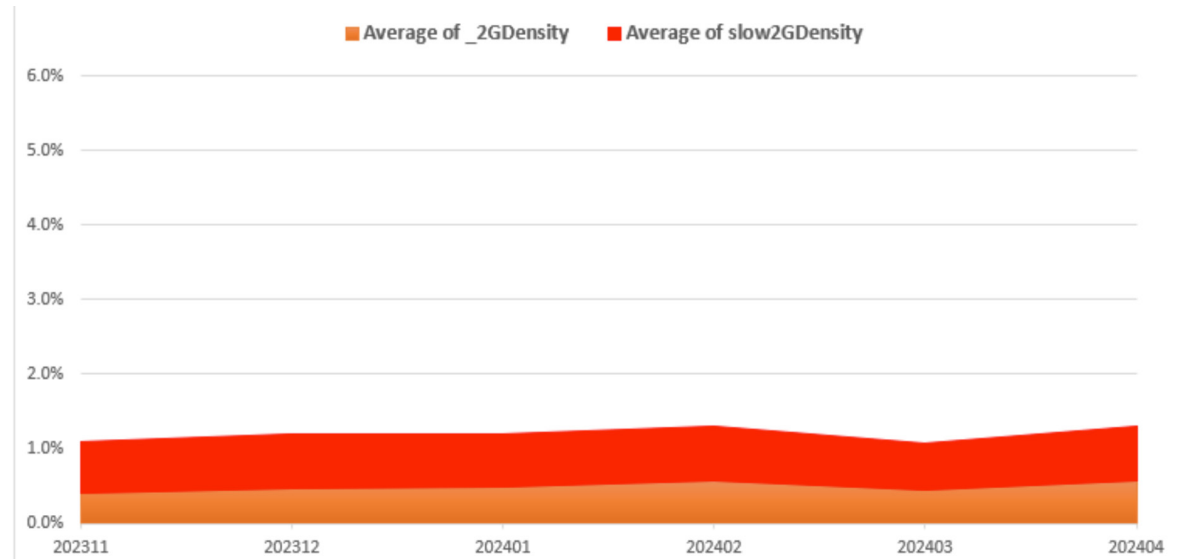
Second Section Trends in Disruptions and Slowdowns

The second group of disruptions is the almost constant network slowdowns. As explained at the beginning of the report, there has been no significant change in the disruptions over the past six months, and nearly one percent of connections to the 5,000 most-visited websites in the country experience complete slowdowns, with more than three percent facing partial slowdowns or relative disruptions. OONI data also confirms this and shows no significant changes in the charts.

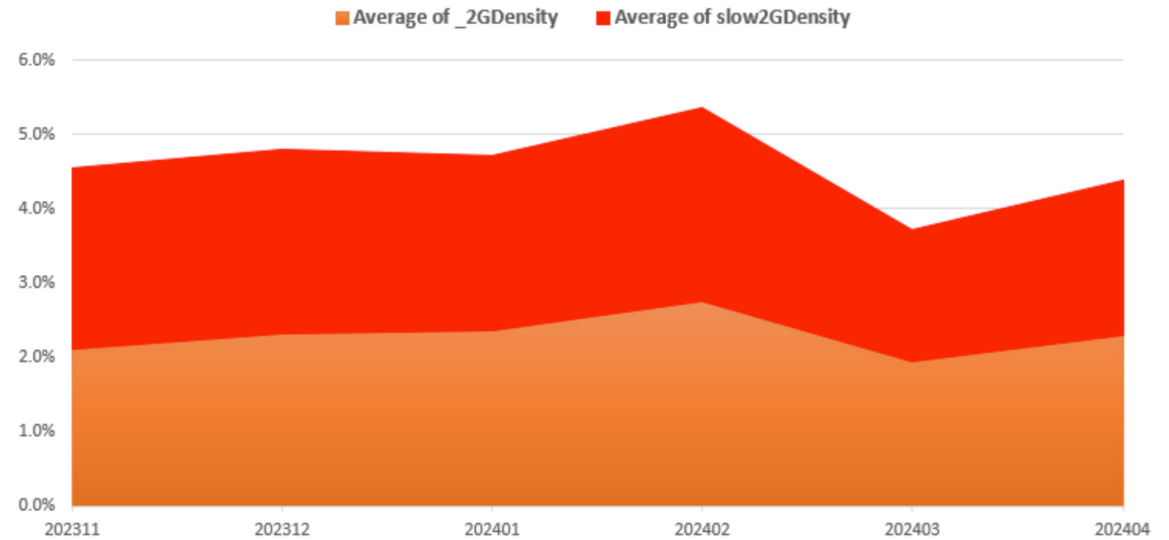


The status of loading the 5,000 most-visited websites by Iranian users in the six months ending April 2024.

We plotted this chart again based on the websites that are filtered. It shows that the rate of slowdowns and disruptions increases significantly, up to five times. Ultimately, it must be emphasized once again that filtering high-traffic websites has negatively impacted the end-user experience of internet users in Iran.



Disruptions in the Past 6 Months
5,000 Most Visited Websites in Iran



Disruption on Fastly: Type : Timeout

Many disruptions in Iran's internet do not follow a consistent logic or pattern for users. Restrictions on different destinations and varying policies among domestic operators produce different results. As a result, it is not possible to definitively determine whether a disruption is due to governmental policies or equipment malfunctions.

For example, domains using Fastly's CDN services exhibit different types of disruptions. Disruptions on Fastly may manifest as domains not loading. Many websites are hosted on Fastly's infrastructure; our examinations show disruptions on Github (which uses parts of Fastly's services). Another example is the disruption on well-known Linux repositories, including Debian. To clarify this issue, we assessed these disruptions on Fastly's domain itself, and the results showed that both HTTP3 and HTTP2 protocols experienced disruptions. While HTTP3 is completely blocked, the HTTP2 protocol also shows some level of disruption.

The intermittent nature of these disruptions is such that even changing client variables results in different network behaviors. For example, altering the User-Agent and Client Hello on Github's domain leads to different observed behaviors.

```
> curl -m 30 -o /dev/null -L https://github.com/stunel/static-curl/releases/download/8.8.0/curl-linux-x86_64-8.8.0.tar.xz
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           %             Dload  Upload  Total   Spent    Left   Speed
0         0         0     0         0     0         0     0  --:--:--  --:--:--  --:--:--    0
100 3256k  100 3256k    0     0  1863k    0  0:00:01  0:00:01  --:--:-- 2995k
dnslookup | connect | appconnect | starttransfer | total | size
0.181120 | 0.376954 | 0.580564 | 1.042135 | 1.747377 | 3334676
```

```
> time wget --read-timeout 30 https://github.com/stunel/static-curl/releases/download/8.8.0/curl-linux-x86_64-8.8.0.tar.xz
--2024-06-10 23:00:43-- https://github.com/stunel/static-curl/releases/download/8.8.0/curl-linux-x86_64-8.8.0.tar.xz
Resolving github.com (github.com)... 140.82.121.3
Connecting to github.com (github.com)|140.82.121.3|:443.. connected.
HTTP request sent, awaiting response... 302 Found
Location: https://objects.githubusercontent.com/github-production-release-asset-2e65be/535010912/3e799647-b9ce-4b59-9b1e-c6106d50ba05?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=releaseassetproduction%2F20240610%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20240610T225908Z&X-Amz-Expires=300&X-Amz-Signature=06ccdc685921621d76905e411b5a4eb53dbb822064d9e610edbba1356845297&X-Amz-SignedHeaders=host&actor_id=0&key_id=0&repo_id=535010912&response-content-disposition=attachment%3B%20filename%3Dcurl-linux-x86_64-8.8.0.tar.xz&response-content-type=application%2Foctet-stream [following]
--2024-06-10 23:00:43-- https://objects.githubusercontent.com/github-production-release-asset-2e65be/535010912/3e799647-b9ce-4b59-9b1e-c6106d50ba05?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=releaseassetproduction%2F20240610%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20240610T225908Z&X-Amz-Expires=300&X-Amz-Signature=06ccdc685921621d76905e411b5a4eb53dbb822064d9e610edbba1356845297&X-Amz-SignedHeaders=host&actor_id=0&key_id=0&repo_id=535010912&response-content-disposition=attachment%3B%20filename%3Dcurl-linux-x86_64-8.8.0.tar.xz&response-content-type=application%2Foctet-stream
Resolving objects.githubusercontent.com (objects.githubusercontent.com)... 185.199.108.133, 185.199.109.133, 185.199.110.133, ...
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.108.133|:443.. connected.
Unable to establish SSL connection.

real    0m30.597s
```

Disruption on Akamai: Type: Connection Disruption

Disruptions on Akamai, like other disruptions, occur intermittently. At certain times, these disruptions are clearly observable, while at other times, they may not be noticeable. For example, sending two requests to the domain salesforce.com shows that the first request encountered a disruption, and the second request sent a few seconds later was successfully responded to:

```
# curl -m 15 -4 -v -I https://salesforce.com
```

Our investigations indicate that the likely reason for this issue is the hijacking of some Akamai IPs within Iran. For example, in the PCAP file below, captured from the MCI network to troubleshoot this issue, it is evident that the request sent to the domain salesforce.com was responded to in less than 2ms. This is also apparent through packet tracing (Traceroute). A 2ms response time to such a request indicates that the processing and response occurred within the country.

```
* Trying 185.200.232.67:443...
* Connected to www.salesforce.com (185.200.232.67) port 443 (#0)
* ALPN, offering h2
* ALPN, offering http/1.1
* successfully set certificate verify locations:
* CAfile: /etc/ssl/certs/ca-certificates.crt
* CApath: /etc/ssl/certs
* TLSv1.3 (OUT), TLS handshake, Client hello (1):
* OpenSSL SSL_connect: SSL_ERROR_SYSCALL in connection to www.salesforce.com:443
* Closing connection 0
curl: (35) OpenSSL SSL_connect: SSL_ERROR_SYSCALL in connection to www.salesforce.com:443
dnslookup | connect | appconnect | starttransfer | total | size
0.264934 | 0.266036 | 0.000000 | 0.000000 | 0.480127 | 0
```

```
* Trying 185.200.232.67:443...
* Connected to www.salesforce.com (185.200.232.67) port 443 (#0)
* ALPN, offering h2
* ALPN, offering http/1.1
* successfully set certificate verify locations:
* CAfile: /etc/ssl/certs/ca-certificates.crt
* CApath: /etc/ssl/certs
* TLSv1.3 (OUT), TLS handshake, Client hello (1):
* TLSv1.3 (IN), TLS handshake, Server hello (2):
* TLSv1.3 (IN), TLS handshake, Encrypted Extensions (8):
* TLSv1.3 (IN), TLS handshake, Certificate (11):
* TLSv1.3 (IN), TLS handshake, CERT verify (15):
* TLSv1.3 (IN), TLS handshake, Finished (20):
* TLSv1.3 (OUT), TLS change cipher, Change cipher spec (1):
* TLSv1.3 (OUT), TLS handshake, Finished (20):
* SSL connection using TLSv1.3 / TLS_AES_256_GCM_SHA384
* ALPN, server accepted to use h2
* Server certificate:
* subject: c=US; ST=California; L=San Francisco; O=Salesforce, Inc.; CN=www.salesforce.com
```

The screenshot shows a Wireshark capture of an HTTP/2 connection. The packet list pane displays the following key packets:

No.	Time	Source	Destination	Protocol	Seq	Identification	Info
18	0.618431	89.45.48.68	185.200.232.67	TCP	550189911	0xb08f (56207) 15966 → 443 [SYN]	
19	0.619437	185.200.232.67	89.45.48.68	TCP	3589895556	0xb000 (0) 443 → 15966 [SYN]	
20	6.619400	89.45.48.68	185.200.232.67	TCP	550189912	0xbd90 (56208) 15966 → 443 [ACK]	
21	6.629208	89.45.48.68	185.200.232.67	TLSv1.3	550189912	0xbd91 (56209) Client Hello	
22	6.630949	185.200.232.67	89.45.48.68	TCP	3589895557	0xb470 (33904) 443 → 15966 [ACK]	
23	6.834086	185.200.232.67	89.45.48.68	TLSv1.3	3589895557	0xb471 (33905) Server Hello, Cha	
24	6.834915	89.45.48.68	185.200.232.67	TCP	550190429	0xbd92 (56210) 15966 → 443 [ACK]	
25	6.834964	185.200.232.67	89.45.48.68	TLSv1.3	3589898453	0xb473 (33907) Application Data,	
26	6.834990	89.45.48.68	185.200.232.67	TCP	550190429	0xbd93 (56211) 15966 → 443 [ACK]	
27	6.836273	89.45.48.68	185.200.232.67	TLSv1.3	550190429	0xbd94 (56212) Change Cipher Spec	
28	6.836590	89.45.48.68	185.200.232.67	TLSv1.3	550190500	0xb095 (56213) Application Data	
29	6.836614	89.45.48.68	185.200.232.67	TLSv1.3	550190555	0xb096 (56214) Application Data	
30	6.836642	89.45.48.68	185.200.232.67	TLSv1.3	550190604	0xbd97 (56215) Application Data	
31	6.836698	89.45.48.68	185.200.232.67	TLSv1.3	550190639	0xbd98 (56216) Application Data	
32	6.837159	185.200.232.67	89.45.48.68	TCP	3589899114	0xb474 (33908) 443 → 15966 [ACK]	

The packet details pane for packet 22 (Server Hello) shows the following structure:

- Length: 23
- Server Name Indication extension
 - Server Name list length: 21
 - Server Name Type: host_name (0)
 - Server Name length: 18
 - Server Name: www.salesforce.com
- Extension: ec_point_formats (len=4)
- Extension: supported_groups (len=12)
- Extension: next_protocol_negotiation (len=0)
- Extension: application_layer_protocol_negotiation (len=14)

Disruption on Cloudflare: Type: Upload Restriction

Another reported disruption is the issue and slowdown in uploading on the Cloudflare network. Our investigations show that smaller uploads experience fewer disruptions. For example, the disruption observed while uploading a 20MB file on Cloudflare is much greater than that seen when uploading a smaller 4MB file. It appears that intelligent filtering equipment becomes suspicious of connections that last longer and subsequently blocks them.

To reassess this disruption, we repeatedly uploaded a file of a specific size on a website that uses Cloudflare's CDN. The results showed that some connections remained stable while others encountered disruptions.

Disruption on HTTP3: Up to 6 Times Slower than HTTP2

As mentioned in the initial internet quality report, HTTP3 is a modern and practical protocol designed to increase speed and improve user experience. Thanks to the efforts of the E-Commerce Association, this protocol was fortunately unblocked, and according to radar.cloudflare.com, about 3 percent of Iranian user traffic has migrated to this protocol. However, our investigations unfortunately show that, likely due to governmental policies, this protocol performs much slower in Iran than its older versions.

To examine this issue more closely, we uploaded a sample file from a server in Frankfurt to a website using Cloudflare's CDN services. In both HTTP2 and HTTP3 scenarios, uploading this file took about 1 second. We conducted a similar test on the Irancell network and, to our complete surprise, the file upload took about 1.8 seconds with HTTP2 and approximately 13.9 seconds with HTTP3.

```
* upload completely sent off: 20971733 bytes
< HTTP/2 200
< date: Mon, 10 Jun 2024 17:55:12 GMT
< content-type: text/plain;charset=UTF-8
< content-length: 120
< report-to: [{"endpoints":[{"url":"https://a.nel.cloudflare.com/report/v4?ps=hztstptDSM8Q6%
2FicHrAolE23KfrFw1G6u1jJan%2B%909RxcjJedak1TBLmF7x2bYat3THHrS2KYtd6X0Mfnc6Gx5t8YA74eSpw9
bZuHtaCr1p408XByActvYjN887VxFOzntdA3Dk3D"}],"group":"cf-nel","max_age":604800}]
< nel: {"success_fraction":0,"report_to":"cf-nel","max_age":604800}
< server: cloudflare
< cf-ray: 891b3b1bee731c73-FRA
< alt-svc: h3=":443"; ma=86400
<
* Connection #0 to host upload. left intact
{"name":"test.file","type":"application/octet-stream","size":20971520,"hash":"9674344c90c2f66
46f0b78026e127c9b86e3ad77"}
DNS: 0.274254, Connection: 0.357709s, PreTransfer: 0.461923s, Response: 1.868777s
```

```
* upload completely sent off:
< HTTP/3 200
< date: Mon, 10 Jun 2024 17:56:08 GMT
< content-type: text/plain;charset=UTF-8
< content-length: 120
< report-to: [{"endpoints":[{"url":"https://a.nel.cloudflare.com/report/v4?ps=1lwP6ETEKO1IA
SEsqkplvc2B0y0i12oRaEFAte1Voh4j9nd07mmmyculTtAe4Zk6F11amBjYAS52B9K4whh5FPDjyBwK2p%2B1T5
0hZw8g8TmKY0h2icAVAK28auocdfD3jyEAWTQ5SDk3D"}],"group":"cf-nel","max_age":604800}]
< nel: {"success_fraction":0,"report_to":"cf-nel","max_age":604800}
< server: cloudflare
< cf-ray: 891b3c2ba9309969-FRA
< alt-svc: h3=":443"; ma=86400
<
* Connection #0 to host upload.mehndadep.com left intact
{"name":"test.file","type":"application/octet-stream","size":20971520,"hash":"9674344c90c2f66
46f0b78026e127c9b86e3ad77"}
DNS: 0.155422, Connection: 0.231719s, PreTransfer: 0.245363s, Response: 13.971457s
```

Disruption on UDP Protocol in Global Providers

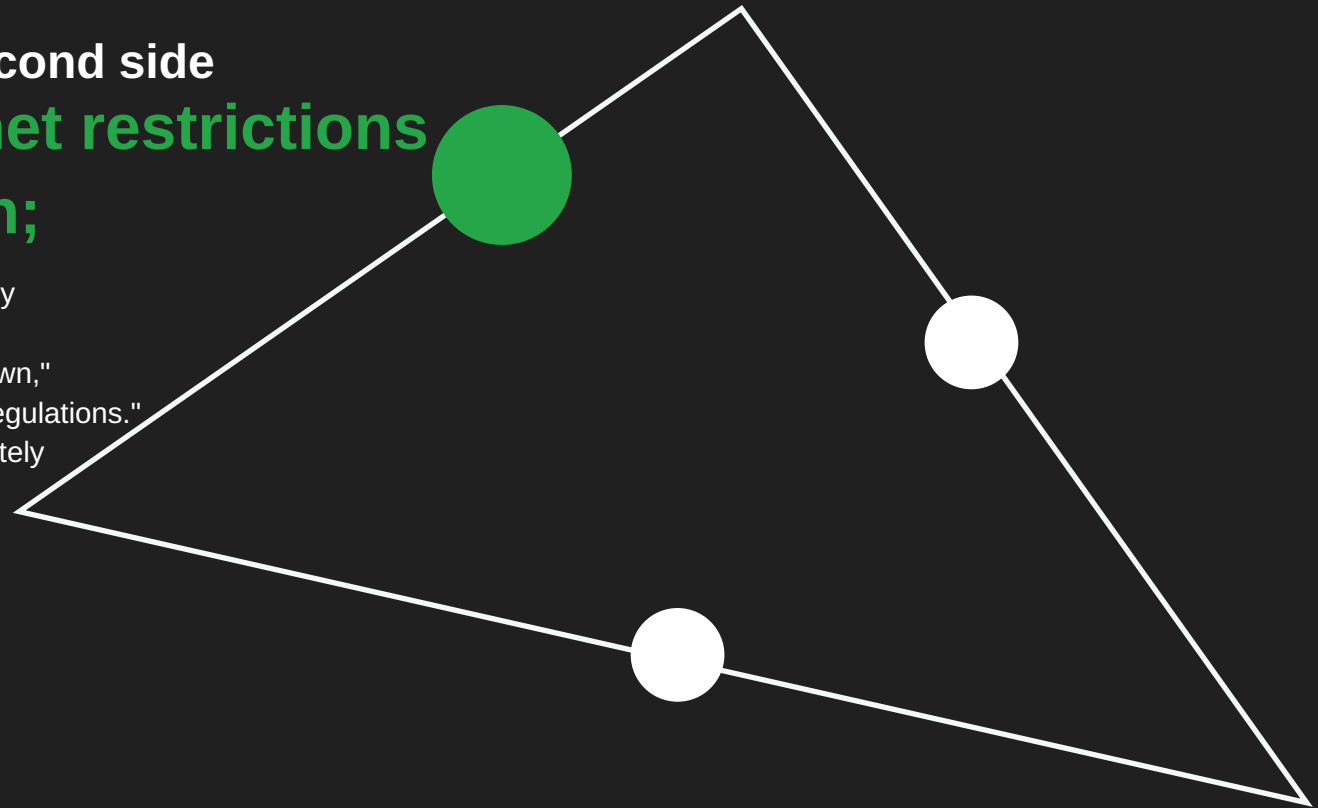
In addition to the potential limitations on the QUIC and HTTP3 protocols on Cloudflare, our recent investigations have revealed that this protocol is blocked to many data centers and foreign service providers. This limitation is likely due to the implementation of filtering policies in the country. However, immediate action is needed to resolve the disruption and reopen this protocol.

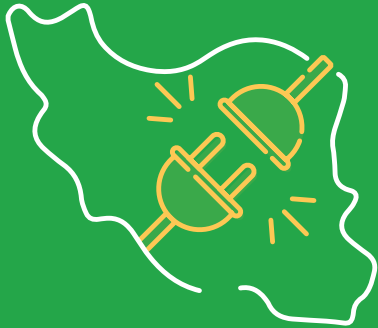
```
# curl -m 15 -4 -v -I https://www.fastly.com --http3-only
```

```
* Host www.fastly.com:443 was resolved.
* IPv6: (none)
* IPv4: 151.101.1.57, 151.101.65.57, 151.101.129.57, 151.101.193.57
*   Trying 151.101.1.57:443...
*   CAfile: /etc/ssl/certs/ca-certificates.crt
*   CPath: /etc/ssl/certs
* ipv4 connect timeout after 7478ms, move on!
*   Trying 151.101.65.57:443...
*   CAfile: /etc/ssl/certs/ca-certificates.crt
*   CPath: /etc/ssl/certs
* ipv4 connect timeout after 3738ms, move on!
*   Trying 151.101.129.57:443...
*   CAfile: /etc/ssl/certs/ca-certificates.crt
*   CPath: /etc/ssl/certs
* ipv4 connect timeout after 1868ms, move on!
*   Trying 151.101.193.57:443...
*   CAfile: /etc/ssl/certs/ca-certificates.crt
*   CPath: /etc/ssl/certs
* Connection timed out after 15002 milliseconds
* Closing connection
curl: (28) Connection timed out after 15002 milliseconds
dnslookup | connect | appconnect | starttransfer | total | size
0.044053 | 0.000000 | 0.000000 | 0.000000 | 15.002274 | 0
```

The second side Internet restrictions in Iran;

Internet restrictions in Iran can generally be categorized into four levels: "complete or controlled internet shutdown," "filtering," "sanctions," and "domestic regulations." Each of these will be discussed separately in the following sections.



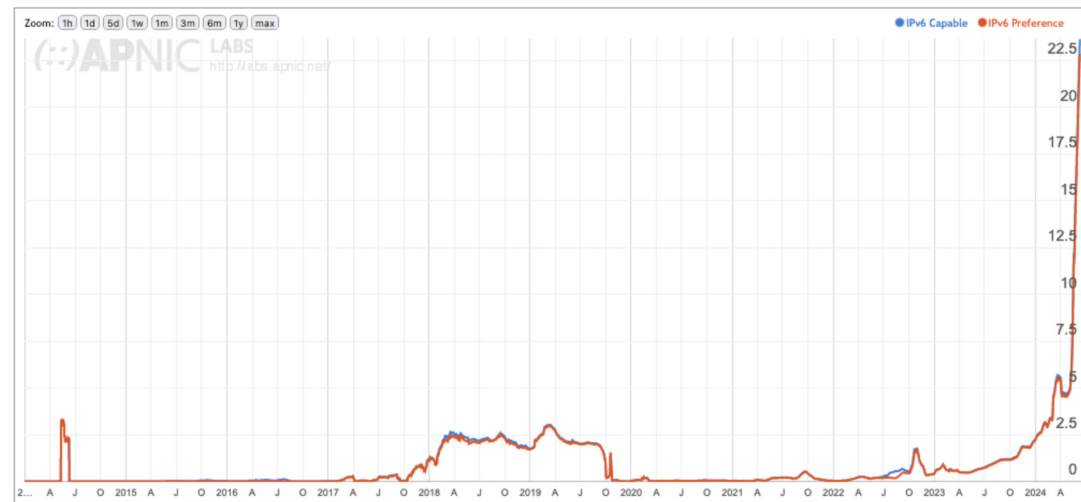


Section One: Complete, Regional, or Controlled Internet Shutdowns

Complete or controlled internet shutdowns refer to incidents where the country's internet is entirely or partially disconnected by authoritative orders. Events such as the 2009 election-related incidents, the November 2019 protests, the regional shutdown in Khuzestan in 2020, and the regional shutdown in September 2022 fall into this category. It appears that these measures have been carried out by order of the Supreme National Security Council (SNSC). However, evidence shows that in the past six months, there has been no total internet blackout in the country.

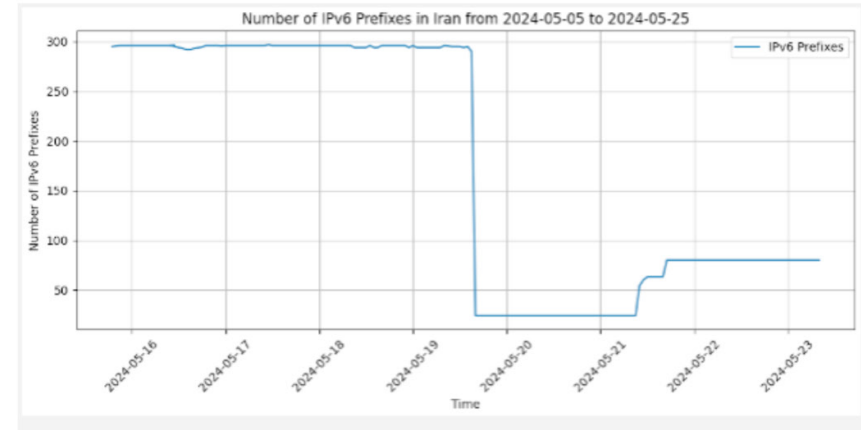
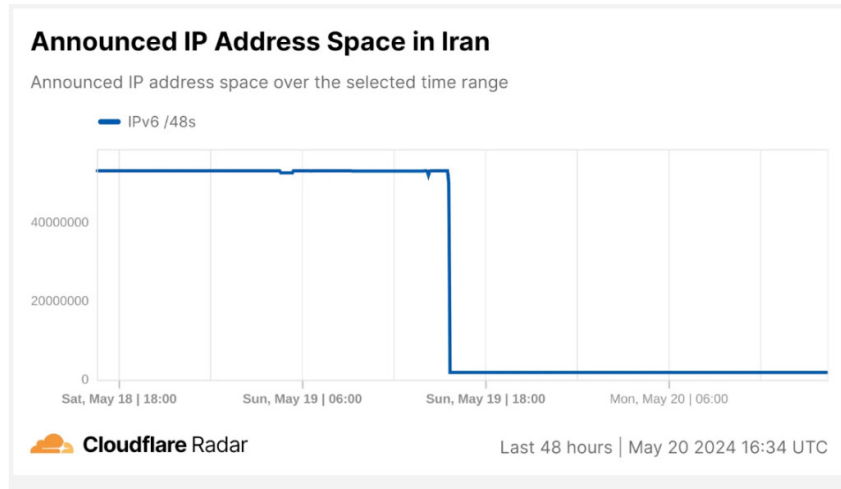
Complete IPv6 Shutdown for One Week

The sixth version of the Internet Protocol, or IPv6, was designed to address the issues and limitations of IPv4. Its main advantages, such as a larger address space, better routing efficiency, improved support for security protocols, and automatic configuration, are reasons why internet service providers have begun migrating to this version. Consequently, in recent years, the process of preparing infrastructure, and training employees and customers has been initiated as key actions in this direction. The master plan and network architecture document of the National Information Network, approved by the Supreme Council of Cyberspace, emphasizes the use of IPv6, and the Information Technology Organization has been continuously pursuing the development and migration to IPv6.



نمودار رشد استفاده از IPv6 در ایران

Just as leading cloud companies were developing infrastructure and advancing services on IPv6, this protocol was suddenly shut down in the country without any notification or explanation regarding the cause and significance of the matter! According to investigations, on Sunday, May 19 of this year, the Telecommunication Infrastructure Company (AS49666) ceased advertising a large number of routes related to Iran on the IPv6 platform to the internet.



The resolution of this issue began two days after the incident, with the return of routes related to MCI (AS197207), bringing the number of IPv6 routes in Iran to 78. However, other service providers remained inaccessible. Eventually, everything returned to normal after six days.

Given the timing of this event coinciding with the passing of the president and his delegation, it seems this disruption was a form of controlled restriction on free internet access over IPv6. Despite several weeks passing since this incident and media and individual inquiries, no official response has been provided on the matter.

According to the latest published information, out of the 1.3 million domains registered under Iran's name, only 3,000 are active on IPv6. Sustainable migration in this field requires a reliable and secure infrastructure. As long as modern technologies like IPv6 and protocols like HTTP3 are regarded as insignificant, easily disruptable, and generally secondary by decision-makers, there will be no progress in the migration and modernization of the country's infrastructure, further widening the gap between Iran and developed countries.

Section Two Filtering



To more accurately assess the status of filtering from December 2023 to early June 2024, we examined 300 internet domains selected based on SimilarWeb from the ooni.com¹⁸ database. According to this review, it was found that in December 2023, an average of 137 domains were filtered (experiencing more than 5 percent disruption). There was no significant change compared to the same period last year in the country.

Additionally, in examining the 5,000 most-visited websites by Iranian users in CrUX, it was found that at least 730 websites were directly filtered, with their main domains resolving to filtering IPs. Many websites blocked through IP filtering, subdomains, CDNs, etc., should also be added to this list.

The findings regarding restricted websites indicate that some of these domains comply with the general laws of criminal content (such as phishing, porn, etc.). However, a significant portion of highly-visited, functional websites (such as news and information, social networks, entertainment websites, and even skill-based domains) are also filtered. Collectively, these websites comprise a substantial part of the daily needs of Iranians. Overall, this situation symbolizes the inefficiency of the so-called "intelligent" filtering structure and operation in the country, depriving citizens of access to practical information. As a result of these arbitrary policies, Iran is ranked among the lowest countries in terms of free internet access.

18. Open Observatory of Network Interference

Social Networks Still Under Complete Restriction!

Social networks such as Twitter, Instagram, Telegram, WhatsApp, Facebook, YouTube, Twitch, and Pinterest are filtered in Iran.

As a result, Iran, along with China and Turkmenistan, ranks among the top countries with the most severe restrictions on social networks.

In the analytical statistics published by Surfshark in the first half of this year, 29 countries worldwide experiencing various types of internet censorship were examined. According to this report, Iran is among the countries with the worst situation regarding free access to social networks. To further assess this issue, we evaluated Iranians' access to Twitch and Pinterest and used the OONI database, which monitors disruption and censorship in various countries, as a benchmark for these indices. Overall, it was determined that Iranian citizens' access to social information platforms is significantly more restricted than in most other countries, similar to the situation in China.

	Country	f	🐦	📺	📷	📩	🗨️	🗣️	📌
1	Iran	*	*	*	*	*	*	*	*
	China	*	*	*	*	*	*	*	*
2	Turkmenistan	*	*	*	*	*	*	-	-
3	Uzbekistan	*	-	*	*	*	-	-	-
4	Guinea	*	-	-	-	*	*	-	-
5	Ethiopia	*	-	*	-	*	-	-	-
6	Myanmar	*	*	-	*	-	*	-	-
7	Russia	*	*	-	*	-	-	-	-
8	Yemen	-	-	*	-	-	-	-	-

However, in this report, the extent and manner of free user access to the internet is considered the main indicator for determining the quality of user experience. What differentiates the comparison between Iran and some developed countries like China is China's population (16+ times that of Iran), its economic development (46+ times that of Iran), the significant gap in technical development and global standing, and finally, the gradual success of high-quality Chinese products that have gained international popularity in attracting users and organically reducing the demand for foreign platforms. This issue has become a significant challenge in Iran. Despite the implementation of the strictest restrictions, more than half of the users continue to use blocked platforms, specifically Instagram, WhatsApp, and Telegram. The imposition of network restrictions, price increases, and the numerous inconveniences to reduce the user base of these platforms have only succeeded in reducing their traffic or preventing further increases in their traffic consumption. This should not be mistaken as a reduction in their popularity among users.

Triple Increase in VPN Usage



According to the Sharif University Governance Think Tank and ISPA surveys, 83.6 percent of Iranian users utilize VPNs. VPN usage has tripled since the filtering of "Instagram" and "WhatsApp" in the fall of 2022, with the average Iranian user spending 4 hours per day using VPNs, according to an ISPA survey in March 2024. Based on the Data and Governance Lab report, at least 3 percent of internet users in the country spend up to 150,000 tomans per month for purchasing or renewing VPN subscriptions. Considering the number of internet users in the country, the annual market turnover for VPN tools is estimated to exceed 5 trillion tomans, nearly equal to the total annual revenue of Rightel. This expenditure, which could have been used to develop the country's communication infrastructure with proper planning and policymaking, now represents an added cost to the household budget. Moreover, it contributes to widespread social dissatisfaction and further deteriorates the internet user experience in Iran.

19. The estimated financial turnover of VPNs is provided using the following assumptions: VPN users in the country: 80% of all users / Paid VPN users: 35% of all VPN users / Average monthly payment: 55,000 Toman / Total unique users: 40 million. Explanation: Certainly, if this calculation is repeated with changes in assumptions such as the average payment of users and the total number of unique internet users in the country, and rounding up, the final result will increase significantly.

66.88 %

Based on the March survey, 66.9% of people who use VPNs utilize free VPNs and proxies, 25.4% use paid VPNs, and 6.3% use paid VPN accounts of friends and acquaintances for free.

In response to the question, "Did you use VPNs and proxies to access Telegram, YouTube, and other blocked sites before WhatsApp and Instagram were filtered?" 34% answered "Yes" and 64% answered "No." This indicates that two-thirds of users did not use VPNs before the filtering. (March 2024)

VPN Usage:

According to the September survey, 60.32% of people (75.4% of internet users) used VPNs. This number increased to 66.88% of people (83.6% of internet users) in the March survey.

Filtering of Social Networks; A Polarizing Policy for Society

In summary, it can be concluded that, to date, policymakers have not only been largely unsuccessful in fostering trust and public cooperation among at least a quarter of users²⁰ in using domestic messaging apps among at least half of Iranian citizens but also, by insisting on continuing the implementation of this policy in non-transparent levels and failing to seriously reconsider it over the past year, have led to a deepening social divide, increased polarization in society, and a weakening of social cohesion.²¹ This approach can be largely attributed to a dominance of purely technical and hardware perspectives in efforts to combat VPNs and, more significantly, to the lack of serious, tangible, and constructive action by the Supreme Council of Cyberspace in its primary mission of "revising internet blocking policies in light of new cyberspace conditions and emphasizing values."

Moreover, another clear indication of the failure of this policy and the prevailing double standards of the government regarding it is that many high-ranking officials of the country have consistently engaged in political activities on filtered social networks over the past years and have even sometimes announced their most important statements through these platforms, a phenomenon that becomes particularly evident with the intensification of the campaign for the fourteenth presidential election.

20. Based on a survey conducted by ISPA in January 2024 (door-to-door, nationwide, with a sample of 5,000 people), this figure has been reported as 40 percent (approximately half of the users).

21. Echo chamber

The Impact of Twitch Filtering on the Gaming Community and Content Creators

The Twitch streaming service was filtered on July 3, 2022, by the Committee for Determining Instances of Criminal Content with a minimum vote of 4 members. In contrast, lifting the filter on a popular service requires at least 7 votes, indicating a bias in the laws towards blocking. A week after this event,²² a petition was formed against the decision, gathering 44,000 signatures, but like most civil protests against filtering policies, it was ineffective.

In the previous report, we examined the negative impact of filtering Google Play on Iranian users. In this report, we delved deeper into the Twitch service. We interviewed 15 streamers who have been producing game content on the Twitch and YouTube platforms for an average of 5 years. We asked them about the impact of Twitch being filtered on their content, interaction with viewers, and their income.²³

According to this survey, 90% of respondents cited Twitch filtering as the cause of a drop in views and interaction with their audience. 100% of respondents indicated that Twitch filtering has led to a decrease in their income. Additionally, these individuals reported that during each live broadcast, they lose their live connection more than three times on average due to instability, and the process of starting a stream has become much more complicated due to the restrictions.



22. <https://www.karzar.net/49357>

23. Attachment No. 6

Section 3: Sanctions

1. International Bandwidth and Internet

One of the impacts of the sanctions is on international bandwidth and the import or increased cost of equipment needed for the country's internet gateways. For instance, in 2017, Pakistan Telecommunication Company Limited (PTCL), the largest fixed-line operator in Pakistan and one of the country's oldest ISPs, created cables to establish fixed-line connections between Pakistan and Iran. However, due to sanctions against Iran, these cables were never utilized, as the equipment provider firmly refused to allow the use of its equipment for trade with Iran, including internet transit.²⁴

2. Iranian Users' Access to Internet Services

Ordinary Iranian users, without the use of VPNs or anti-sanction tools, cannot access many international services and often encounter the well-known 403 error. Even by changing their IP addresses, due to banking sanctions, they are deprived of services that require subscriptions. The most significant, and increasingly critical, aspect of this issue in the future will be artificial intelligence services. The revenue model for such services typically involves monthly subscriptions.

They Are Not What They Seem!

Alongside domestic restrictive policies, sanctions related to and impacting the quality of free internet access in Iran are also a very significant issue. Although this matter has perhaps received less attention in recent years, it is essential to both shed light on the impactful dimensions of this issue and pursue professional-national advocacy regarding it.

Undoubtedly, analyzing the damage caused by sanctions to the digital economy and the country's internet requires extensive and independent research. However, below we briefly examine some of the most critical impacts of banking and technology sanctions. These sanctions can be evaluated in four layers based on their negative impact on the quality of the internet, internet user access, and the country's active businesses.

The Gemini logo features the word "Gemini" in a blue, sans-serif font. A small, four-pointed star is positioned above the letter "i".The ChatGPT logo consists of a black square icon on the left containing a white, interlocking knot-like symbol. To the right of the icon, the text "ChatGPT" is written in a bold, black, sans-serif font.

24. This finding is based on Nowmay Opalinski research. Nowmay Opalinski is a Ph.D. Candidate at the French Institute of Geopolitics (Paris 8 University), his research is part of the "Exploring Pakistan's Internet Connectivity" (EPIC) bilateral research project with the Lahore University of Management Sciences (LUMS) Computer Science Department. The outcome of his research will be published on the website of geode.science (Geopolitics of the Datasphere – research project). SANCTIONS and the INTERNET)

3. The Ominous Shadow of Sanctions on Businesses

Iranian businesses, even if they manage to use foreign services illegally, face complexities and additional costs in officially recording these expenses within the country. Moreover, there is always the concern that their nationality might be revealed (lol), leading to their accounts being blocked and their stored data being permanently lost. It is rare to find an active business in the digital economy sector that has not had several bitter experiences of significant losses related to these issues over the past years.

4. Lack of Access to Regional and Global Markets

Due to banking sanctions, Iranian businesses effectively cannot expand internationally or face serious limitations in this regard. The inability to expand and access larger markets results in reduced investments, leading to the gradual deterioration of systems and services, similar to what has happened in the country's automotive industry.

In recent years, many Iranian businesses have faced numerous complexities in attempting to enter global markets. These include operating in global markets under a false identity, dealing with international sanctions, and being forced to use intermediaries and companies outside the country. These factors impose significant risks and losses on the companies.



However, since the E-Commerce Association considers its primary duty to be domestic and international advocacy, we invite you, if you or your colleagues are working in one of the companies sanctioning Iranian users, to join us in negotiating and striving to lift or reduce these sanctions.

The E-Commerce Association is ready to hold meetings with the legal teams of these companies through its legal representatives.

We look forward to your cooperation:
internet@etchamber.ir

OFAC General License (D-2) for Reducing Part of Technology Sanctions

The E-Commerce Association, as a representative of a segment of the country's digital economy, has repeatedly made independent efforts for international advocacy. Last summer, emails were sent to dozens of companies sanctioning Iranian users, highlighting the impact of sanctions on the Iranian people and businesses. Despite referencing the approval of General License D-2, which acknowledges communications in support of internet freedom for Iranian users, we ultimately received no positive response from any of these companies.

This General License, recently added to the Federal Regulations of the United States²⁵, allows for the exchange of certain communications as per its text. However, it still does not permit the use of financial services between Iranian users and foreign services.²⁶ As a result, this license does not provide any incentive for foreign companies to open their doors to Iranian commercial entities.²⁷ Due to the complexity and cost of verifying Iranian users, granting access to Iranian users will not be a priority for these companies.

25. <https://public-inspection.federalregister.gov/2024-10721.pdf>

26. 560.540(b)(3) Excludes from authorization the exportation of reexportation of web-hosting services for websites of commercial entities located in Iran.

27. 560.540 (c), Transfers of funds from Iran or for or on behalf of a person in Iran in furtherance of an underlying transaction authorized by paragraph (a) of this section may be processed by U.S. depository institutions and U.S. Registered brokers or dealers in securities provided they are consistent with 560.516.

Campaign Against Sanctions

In recent weeks, the E-Commerce Association has launched a campaign to lift the sanctions. We kindly ask you, the audience of this report, to join other people of Iran in opposing technology sanctions by signing this petition.

The technology sanctions are in clear violation of human rights and the free access of individuals to information. These extensive technology sanctions have created numerous problems for the people of Iran. The signatories of this campaign condemn the technology sanctions, particularly the following issues:

- Restrictions on Iranian Users and IPs: Limitations on the use of public services from international service providers, especially cloud services.
- Limitations on Internet Purchases and Connections: Restrictions on Iranian companies' access to international IXP networks.
- Sanctions on Infrastructure Companies: Bans on Iranian infrastructure companies.
- Exclusion of Iran as a Nationality: Removal of Iran as a nationality option in registration forms and the impossibility of registering with Iranian phone numbers (+98).

We expect companies such as Google, Microsoft, Amazon, IBM, HP, OpenAI, Oracle, AMD, Intel, Nvidia, Cisco, Adobe, Figma, Sygic, Udemy, and others, which have blocked part or all of their services to Iranians due to the sanctions, to lift these restrictions and limitations in light of the new directive from the US government in May 2024 that converts the general license D-2 into law.

Tehran E-Commerce Association

Please Sign.

[https://www.karzar.net/
iran-tech-sanctions](https://www.karzar.net/iran-tech-sanctions)

What Did We Do to Lift Iran Access Restrictions?²⁸

Last summer, we sent official letters to all internal companies and organizations that restricted access to foreign IPs, highlighting the consequences of such restrictive measures as tools contributing to internet insecurity and degrading internet quality.

In a meeting with the Secretary of the Supreme Council of Cyberspace, it was agreed that we would provide a list of recommended websites for lifting these restrictions. This list, included in the third appendix of this report, was submitted to the Supreme Council of Cyberspace. By the time of this report's publication, seven domains have been removed from the restriction list. Unfortunately, due to regional incidents and cyber threats in recent months, more than three websites have been added to this list.

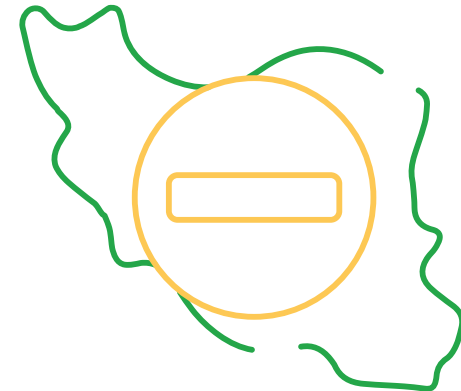
The E-Commerce Association has repeatedly explained from a technical standpoint that this measure not only fails to enhance the security of internal websites but also poses a serious threat to internet security and user safety in the country.

Significant Increase in Internal Self-Filtering (IRAN Access) in Recent Months

More surprising than filtering foreign websites is the filtering of domestic websites for users outside the country. Many Iranian government and banking websites are not accessible to international users. Important national websites, including those of the Parliament, ministries, major organizations, and Shaparak, are not accessible to users outside Iran! It is important to note that since the publication of the second report, approximately five more domains have been added to this list.

28. An image of the letter sent is included in the Actions section of the E-Commerce Association's report.

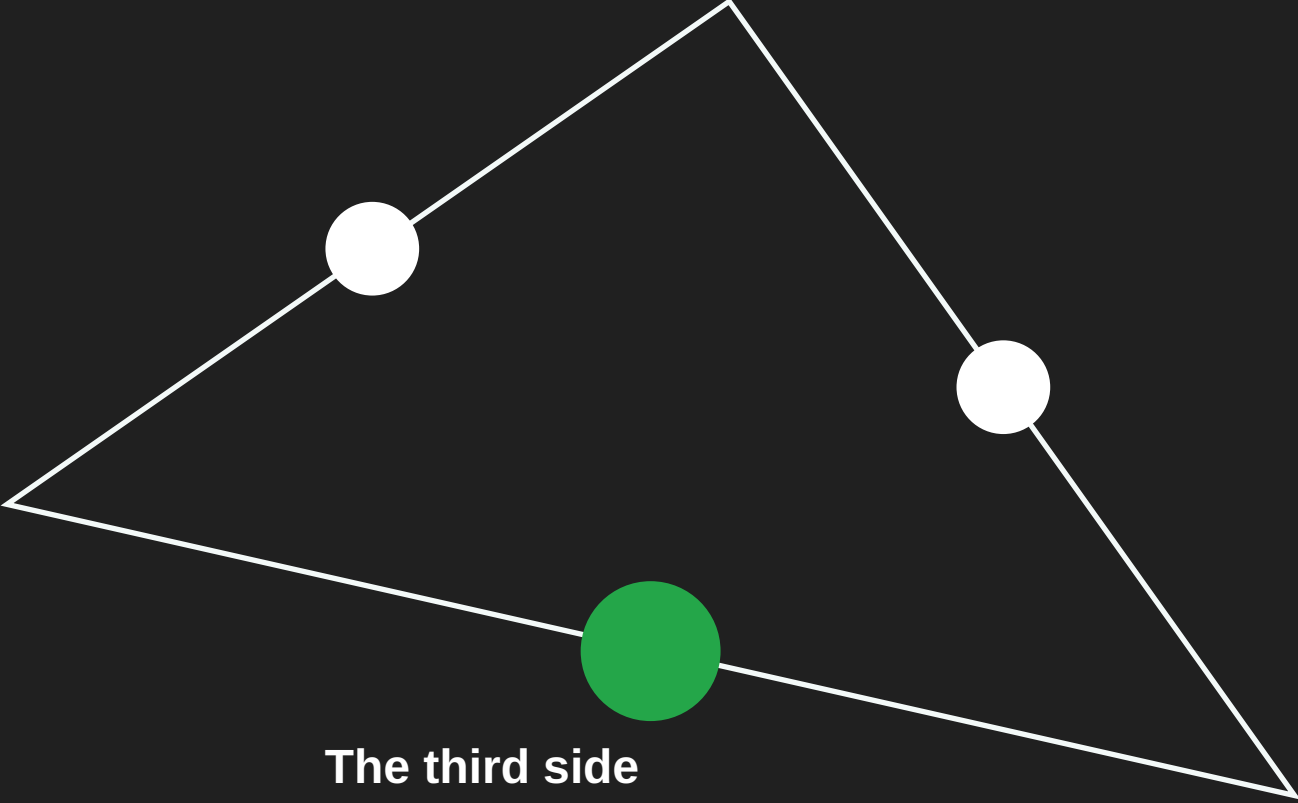
Section Four: Domestic Regulations



Important Iranian websites have been subjected to Iran Access filtering

Green: Unblocked | Red: Recently added to the blocked list
| White: Continued blockage since the previous report

mcth.ir	edu.iau.ac.ir	nioc.ir	tic.ir	ime.org.ir	ibto.ir
ict.gov.ir	iranemp.ir	nigc.ir	edu.iau.ac.ir	nlho.ir	post.ir
caa.gov.ir	anaj.ir	foia.farhang.gov.ir	bargheman.com	gsi.ir	ict.gov.ir
nlai.ir	marooffestival.ir	audit.org.ir	iranemp.ir	intamedia.ir	iranfoia.ir
inif.ir	sohabfa.ir	seo.ir	anaj.ir	cra.ir	msrt.ir
mcls.gov.ir	mojavezcinema.ir	intamedia.ir	marooffestival.ir	nioc.ir	medu.ir
iranair.ir	spsco.ir	bim.ir	sohabfa.ir	nigc.ir	postbank.ir
mcth.ir	imarooof.ir	airport.ir	mojavezcinema.ir	foia.farhang.gov.ir	gilan.ir
ict.gov.ir	honarazmoon.ir	rai.ir	spmco.co	audit.org.ir	sampad.gov.ir
caa.gov.ir	refah.swf.ir	mrud.ir	spsco.ir	seo.ir	medu.gov.ir
gsi.ir	tobank.ir	pmo.ir	imarooof.ir	intamedia.ir	maj.ir
intamedia.ir	sasanhospital.com	rmto.ir	honarazmoon.ir	bim.ir	tedan.ir
cra.ir	cc.saipayadak.org	moj.gov.ir	refah.swf.ir	airport.ir	imo.org.ir
post.ir	farhang.gov.ir	rcs.ir	tobank.ir	rai.ir	tic.ir
iranfoia.ir	parliran.ir	moi.ir	sasanhospital.com	mrud.ir	esalecar.ir
msrt.ir	bipc.ir	imo.org.ir	mail.ict.gov.ir	pmo.ir	
nlho.ir	esalecar.ir	tehran.ir	cc.saipayadak.org	rmto.ir	
ibto.ir	tehran.ir	bipc.ir	farhang.gov.ir	moj.gov.ir	
ime.org.ir	medu.ir	moi.ir	parliran.ir	rcs.ir	



The third side
Internet speed in Iran

The biggest concern of the people is the slow internet

The slow internet and restricted access to free internet in Iran is one of the few concerning issues that both the public and officials agree on. According to the "Internet in Iran" report and a survey conducted by ISPA in March 2024, more than 46% of Iranians consider slow internet as one of their major concerns in the internet domain. This issue was highlighted in the last presidential debate, where official statistics released by the national broadcaster indicated that it was among the top 10 priorities for the people (with approximately 7% frequency), following welfare-livelihood and foreign policy concerns.

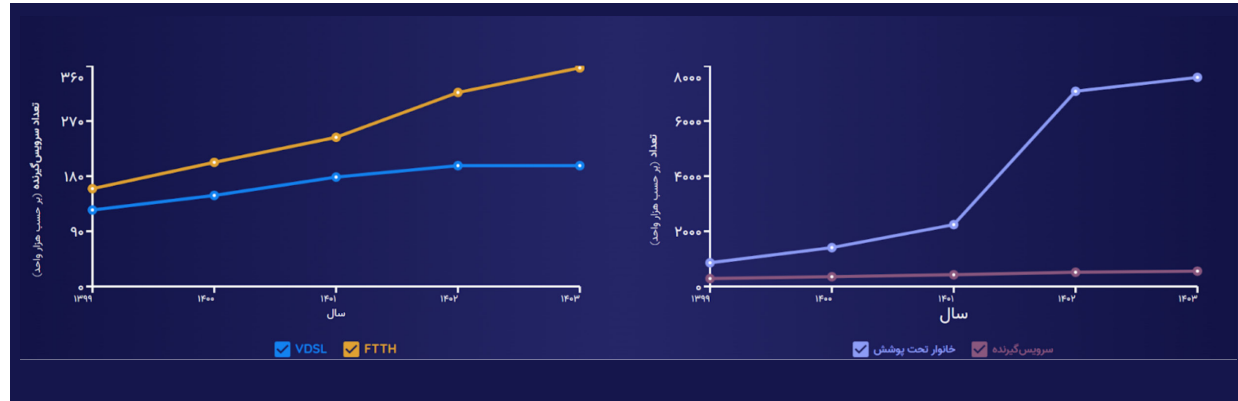
Percentage - March 2024	
Slow Internet Speed:	43%
Restrictions or Filtering:	18.3%
High Costs:	30.7%
All Three Issues:	3.3%

The development and consequent limitations on increasing internet speed in the country can be divided into four different sections to better assess the situation of each and design the expected actions. The following explains these four sections:

Section One: Access Layer

From Rapid Fiber Optic Development to the Country's Long-term Lag

If we were to choose the best and most effective action taken by the Ministry of Communications over the past three years, it would undoubtedly be the development of fiber optics in the country. This is a massive, costly, and long-term project that remains a development priority even as the thirteenth government ends its term.



Official government reports on the Iran FTTH platform show that household coverage has exceeded 7.5 million, demonstrating significant growth. However, the number of subscribers is still less than 550,000, meaning the benefits of fiber optic expansion on internet quality are not yet evident.

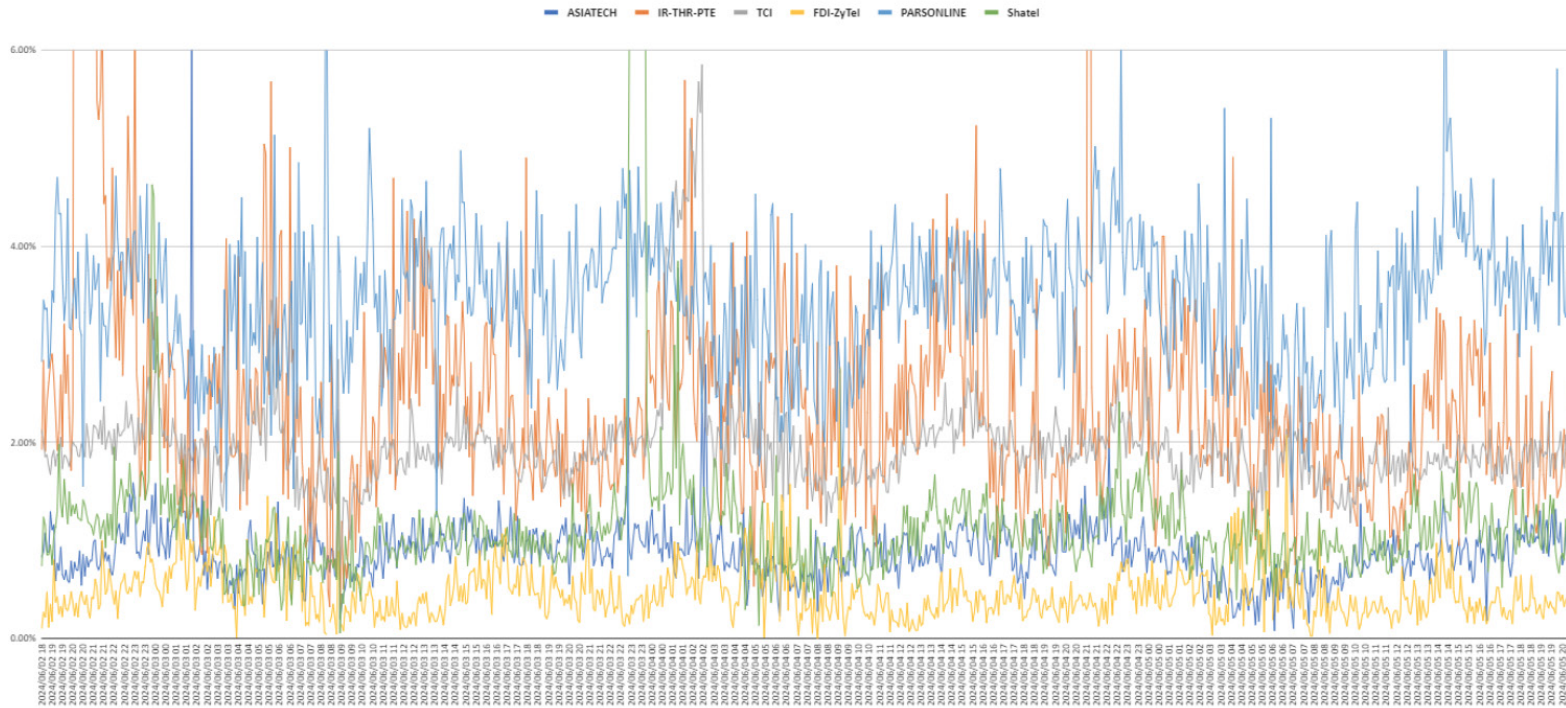
Critics argue that the fiber optic development, given the weaknesses in other sectors of the country, merely increases network speed rather than internet speed. However, it must be acknowledged that developing the Access network may not alone enhance internet speed, but it is a vital and necessary infrastructure for the country's internet development, a process that is time-consuming and very costly. The E-Commerce Association has consistently welcomed investment in this sector.

Referring again to the CrUX report, it is evident that even in domestic communications and the loading of domestically hosted websites, there is a significant gap compared to regional and international competitors. While the poor quality of website loading cannot be entirely attributed to weaknesses in the Access network, it is certainly the most important factor in this area. The E-Commerce Association's reports and studies indicate that the current state of the Access network is very inadequate. In a four-day statistical sample from June 3 to 6, 2024, we examined and analyzed the fixed operators' connections in Tehran, Mashhad, Shiraz, Isfahan, and Tabriz.

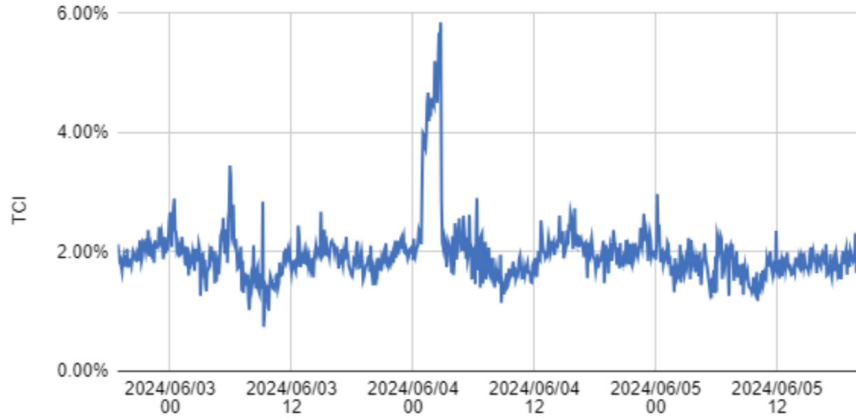
Analytical Report on Disruptions, Restrictions, and Internet Speed in Iran

POP	AS number	AS owner	RTT p75	jitter p75	retrans p75
Tehran	16322	Pars Online	124	56	3.5%
Tehran	49100	Pishgaman Tose'eh	107	47	2.5%
Tehran	58224	TCI	84	40	1.9%
Tehran	31549	Respina	96	44	1.2%
Tehran	43754	Asiatech	139	54	0.9%
Tehran	206065	Zitel	74	34	0.4%

The Retransmission variable, which indicates the loss of information and the retransmission of a packet in the TCP network, exceeds the standard (above 0.5%) for most operators, rising to more than 5% during peak hours.



TCI vs. Row Labels



For example, in the Telecommunications Company, this rate increases to more than 2.5% during peak hours and decreases to around 1.5% during other times.

نام اپراتور	تعداد شهر	تعهد پوشش	پوش داده شده	پیش رفت %	از مجموع تعهد %
مخابرات ایران	282	13,526,868	2,582,366	19.1%	25.8%
گروه فناوری ارتباطات و اطلاعات شاتل	30	5,549,403	1,097,147	19.8%	10.6%
خدمات ارتباطی ایرانسل	15	4,518,114	861,396	19.1%	8.6%
انتقال داده های آسیا تک	37	4,520,807	762,921	16.9%	8.6%
توسعه فناوری ارتباطات پاسارگاد آریان (فناپ تلکام)	17	1,787,563	672,688	37.6%	3.4%
انتقال داده های ندا گستر صبا (صبا نت)	26	6,299,161	435,811	6.9%	12.0%
داده گستر عصر نوین (های وب)	39	369,641	357,340	96.7%	0.7%
پیشگامان توسعه ارتباطات	16	3,948,209	313,513	7.9%	7.5%
شرکت ارتباطات مبین نت	81	11,558,404	268,143	2.3%	22.1%
گسترش ارتباطات مینا	4	57,428	45,901	79.9%	0.1%
خدمات ارتباطی رایتل	3	240,315	43,612	18.1%	0.5%
مجموع	550	52,375,913	7,440,838	14.2%	100.0%

As a result, it is necessary to once again emphasize the urgent need for the rapid development of fiber optics in the country. If we survey and analyze the data available on the Iran FTTX map, the development status of each operator in the country will be as follows:

As evident, Telecommunications Company, Mobinnet, and Sabanet have made the most commitments in this sector. However, Telecommunications Company, Shatel, and Irancell have achieved the most coverage, while Hiweb and Mabna have shown the highest level of program fulfillment.

Section Two: Transmission Network and Inter-Operator Communications



The second section that can contribute to either the reduction or increase of internet speed in the country includes intra-provincial, inter-provincial communications, IXP network, and ultimately inter-operator communications. The E-Commerce Association's investigations in this section have not revealed any serious signs of weakness or major issues.

The indicators from the Ministry of Communications show that the expansion of the network in this sector has been progressing at a good pace. The transmission network capacity has increased from 31.9 Tbps to 64 Tbps, and the IXP network capacity has increased from 6 Tbps to 28 Tbps. In-depth discussions with senior experts and country operators have also not identified any significant limitations or problems in this area. Additionally, the online dashboard of the Telecommunication Infrastructure Company²⁹ indicates an acceptable level of delay in the inter-provincial network.

While acknowledging the Ministry of Communications and the Telecommunication Infrastructure Company for the rapid development of the internal network, the E-Commerce Association's criticism and objection remain regarding the non-opening of the Tehran-IX system for online or delayed display of IXP network traffic at traffic exchange points.

29. <https://stats.tic.ir/>

Section Three

Regulatory Equipment

In in-depth discussions with senior technical experts from operators, we once again encountered the limitations and damages imposed by filtering and regulatory equipment. In this section, three main propositions are presented, which are considered the main obstacles to network development. Since the operators' views in this section differ from those of the Telecommunication Infrastructure Company, we will reflect both perspectives separately.

Operators believe:

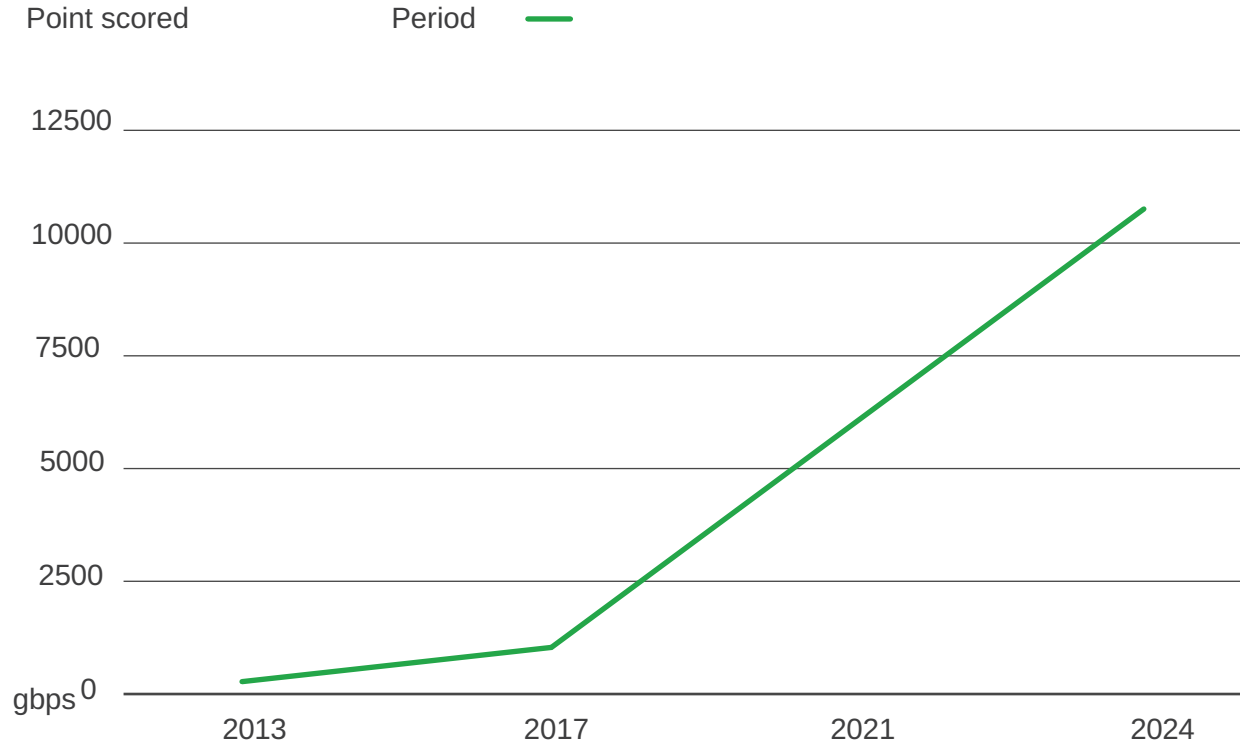
1. With changes in the country's policies and the need to install regulatory equipment in the internal network, the requirement for regulatory equipment has doubled.
2. High costs and long delivery times for regulatory equipment are major obstacles to development.
3. The various restrictions have led to customer demand for internet services exceeding the operators' capacity to supply it. This limitation has especially increased in the provinces (traffic exchange points in Tabriz, Mashhad, Shiraz, and Isfahan), and due to the lack of regulatory equipment in these provinces, operators are forced to route traffic to Tehran. This results in reduced quality, increased latency, higher costs, and ultimately contradicts the principle of traffic distribution in the country.

In discussions between the E-Commerce Association experts and the managers of the Telecommunication Infrastructure Company, the operators' claims were refuted and clarified:

1. Over the past three years, no policy change in this area has occurred, and the filtering of Meta platforms (Instagram and WhatsApp) has increased the burden on the regulatory equipment in the network.
2. There is no limitation on the supply of regulatory equipment in the country.
3. The reason for routing internet traffic from the provinces to Tehran is solely due to the economic model of the operators, their limitations in equipment distribution, and ultimately their economic benefit.

Ultimately, it appears that regulatory equipment, whether due to policy changes or extensive filtering and public demand to access filtered sites, is one of the serious obstacles to network expansion and traffic distribution in the country.

The E-Commerce Association continues to emphasize its previous proposals to reduce filtering, stop so-called "smart" filtering, and remove regulatory equipment from the internal network, considering these two strategies effective in increasing speed, improving the network, and ensuring free access to the internet.



Section Four: Gateways and International Bandwidth

In the first and second versions of this report, one of the requests from the E-Commerce Association was the transparent announcement of key indicators, especially the growth of international bandwidth. The Minister of Communications and his deputies have announced in recent months that the capacity has reached 10.7 Gb/s, indicating nearly a 100% increase in the country's international bandwidth capacity since the beginning of the thirteenth government. The Telecommunications Infrastructure Company believes that the increase in the number of international routes and this increased capacity has significantly met the country's needs in this sector.

The E-Commerce Association welcomes the transparent publication of these indicators and the developments achieved. While emphasizing the need for faster growth of international gateways, it will pursue the elimination of the Telecommunications Infrastructure Company's monopoly in this sector as a serious demand from the future government. This issue has also been highlighted as one of the main needs for the development of the country's internet in in-depth interviews with operators.



Appendices

Appendices 1

List of Countries Compared Based on Highest Gross Domestic Product

GDP RANK	Country	GDP RANK	Country	GDP RANK	Country	GDP RANK	Country
1	United States	26	Cuba	51	Portugal	76	Tanzania
2	China	27	Ireland	52	New Zealand	77	Sri Lanka
3	Japan	28	Israel	53	Peru	78	Ghana
4	Germany	29	United Arab Emirates	54	Qatar	79	Belarus
5	India	30	Thailand	55	Kazakhstan	80	Uruguay
6	United Kingdom	31	Venezuela, RB	56	Greece	81	Croatia
7	France	32	Nigeria	57	Algeria	82	Lithuania
8	Russian Federation	33	Egypt, Arab Rep.	58	Kuwait	83	Cote d'Ivoire
9	Canada	34	Austria	59	Hungary	84	Costa Rica
10	Italy	35	Singapore	60	Ukraine	85	Serbia
11	Brazil	36	Bangladesh	61	Morocco	86	Slovenia
12	Australia	37	Vietnam	62	Ethiopia	87	Myanmar
13	Korea, Rep.	38	Malaysia	63	Slovak Republic	88	Congo, Dem. Rep.
14	Mexico	39	South Africa	64	Ecuador	89	Sudan
15	Spain	40	Philippines	65	Oman	90	Jordan
16	Indonesia	41	Denmark	66	Dominican Republic	91	Tunisia
17	Saudi Arabia	42	Iran, Islamic Rep.	67	Puerto Rico	92	Libya
18	Netherlands	43	Pakistan	68	Kenya	93	Turkmenistan
19	Turkiye	44	Hong Kong SAR, China	69	Angola	94	Uganda
20	Switzerland	45	Colombia	70	Guatemala	95	Bahrain
21	Poland	46	Romania	71	Bulgaria	96	Cameroon
22	Argentina	47	Chile	72	Luxembourg	97	Bolivia
23	Sweden	48	Czechia	73	Uzbekistan	98	Paraguay
24	Norway	49	Finland	74	Azerbaijan	99	Latvia
25	Belgium	50	Iraq	75	Panama	100	Nepal

Appendices 2

List of Some Important Websites That Have Restricted Access for Iranian Users

GDP RANK	Country	Country	GDP RANK	Country	Country
1	Android Developers	https://developer.android.com	26	Docker	https://www.docker.com
2	Visual Studio Installer	https://visualstudio.microsoft.com	27	BugSnag	https://www.bugsnag.com
3	Chat GPT	https://www.chat.openai.com	28	Nvidia experience	https://www.nvidia.com
4	Coursera	https://www.coursera.org	29	Microsoft Download	https://www.microsoft.com/en-us/download
5	Google cloud	https://cloud.google.com	30	MathWorks	https://www.mathworks.com
6	Google Developers	https://developers.google.com	31	Google Research	https://www.research.google.com
7	Firebase	https://firebase.google.com	32	Adobe	https://adobe.com
8	Spotify DE	https://www.spotify.com	33	Android Studio	https://developer.android.com/studio
9	CentOS Repositories	https://mirror.centos.org	34	ItPro	https://www.itpro.tv
10	Bootstrap	https://www.bootstrapcdn.com	35	HuggingFace	https://huggingface.co
11	CodeCanyon	https://codecanyon.net	36	MaxCDN	https://cp.maxcdn.com
12	Elsevier	https://www.elsevier.com	37	Unity	https://unity.com
13	Google Lens	https://lens.google	38	StudyTogether	https://www.studytogether.com
14	Envato	https://www.envato.com	39	Freepik	https://www.freepik.com
15	CloudEra	https://www.cloudera.com	40	MySQL	https://www.mysql.com
16	GtMetrix	https://gtmetrix.com	41	MyFonts	https://www.myfonts.com
17	Openai	https://www.openai.com	42	Qualcomm	https://www.qualcomm.com
18	Google Analytics	https://analytics.google.com	43	Zoom	https://zoom.us
19	JetBrains	https://www.jetbrains.com	44	Artstation	https://www.artstation.com
20	Googleplay console	https://play.google.com/console/developer	45	Udemy	https://www.udemy.com
21	Figma	https://www.figma.com	46	Google services	https://code.earthengine.google.com
22	Clamav	https://www.clamav.net	47	Kaggle	https://www.kaggle.com
23	Google Earth	https://earth.google.com	48	Pearson	https://www.pearson.com
24	Bytes	https://bytes.com	49	Google Remotedesktop	https://www.remotedesktop.google.com
25	Cadence	https://www.cadence.com	50	Ubuntu	https://ubuntu.com

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GDP RANK	Country	Country	GDP RANK	Country	Country
51	Gitlab	https://about.gitlab.com	76	Virtual Box	https://www.virtualbox.org
52	InfoWorld	https://www.infoworld.com	77	Remini	https://www.remini.ai
53	Apple developer	https://developer.apple.com	78	PhpStorm	https://www.jetbrains.com/phpstorm
54	Unreal Engine	https://www.unrealengine.com	79	Tensorflow	https://www.tensorflow.org
55	Google Code	https://code.google.com	80	Maven	https://maven.apache.org
56	GoDoc	https://godoc.org	81	inshot	https://inshot.cc
57	unsplash	https://unsplash.com	82	TeamViewer	https://www.teamviewer.com
58	Elastic	https://www.elastic.co	83	PhotoDune	https://photodune.net
59	Expo	https://expo.dev	84	MatLabExpo	https://www.matlabexpo.com
60	Ebay	https://www.ebay.com	85	GrAvatar	https://gravatar.com
61	JitPack	https://jitpack.io	86	DemandBase	https://www.demandbase.com
62	KhanAcademy	https://www.khanacademy.org	87	Java	https://www.java.com
63	Krisp.ai	https://krisp.ai	88	NXP	https://www.nxp.com
64	Codeium	https://www.codeium.com	89	Tenable	https://www.tenable.com
65	GraphicRiver	https://graphicriver.net	90	Flaticon	https://www.flaticon.com
66	GoAnimate	https://goanimate.com	91	Oracle	https://www.oracle.com
67	Google tag manager	https://tagmanager.google.com	92	HP	https://www.hp.com/us-en/home.html
68	Simple Note	https://simplenote.com	93	NetBeans	https://netbeans.apache.org
69	Realm	https://realm.io	94	GrabCad	https://grabcad.com
70	Grafana	https://grafana.com	95	Asus	https://www.asus.com/us
71	Melpa	https://melpa.org	96	GSK	https://www.gsk.com
72	Gradle	https://gradle.org	97	PerKins	https://www.perkins.com
73	SpiceWorks	https://www.spiceworks.com	98	Intel	https://www.intel.com
74	MouseFlow	https://mouseflow.com	99	Vmware	https://www.vmware.com
75	Api Codeium	https://www.api.codeium.com	100	SolarWinds	https://www.solarwinds.com

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GDP RANK	Country	Country	GDP RANK	Country	Country
101	Cisco	https://www.cisco.com	126	Dribbble	https://www.dribbble.com
102	Rstudio	https://www.rstudio.com	127	VideoHive	https://videohive.net
103	SketchFab	https://sketchfab.com	128	NuGet	https://www.nuget.org
104	Mongodb	https://www.mongodb.com	129	Slack	https://api.slack.com
105	TeamTreeHouse	https://teamtreehouse.com	130	invisionapp	https://www.invisionapp.com
106	HashiCorp	https://www.hashicorp.com	131	Ti	https://ti.com
107	Asus Rog	https://www.asus.com	132	NewRelic	https://newrelic.com
108	MixPanel	https://mixpanel.com	133	Turbo squid	https://www.turbosquid.com
109	Paessler	https://www.paessler.com/	134	Webex	https://www.webex.com
110	Renesas	https://www.renesas.com	135	Mcafee	https://www.mcafee.com
111	MSC Software	https://mscsoftware.com	136	simplilearn	https://www.simplilearn.com
112	SourceForge	https://www.sourceforge.net	137	IIS app platform	https://www.microsoft.com/web/downloads/platform.aspx
113	tinyjpg	https://tinyjpg.com	138	Instructure	https://www.instructure.com
114	3d Ocean	https://3docean.net	139	Sygic	https://www.sygic.com
115	Amd Radeon	https://www.amd.com	140	Spring	https://spring.io
116	RedHat	https://www.redhat.com/en	141	Analog	https://analog.com
117	Trello	https://www.trello.com	142	GFI	https://www.gfi.com
118	Flurry	https://flurry.com	143	Ansible	https://www.ansible.com
119	Themeforest	https://www.themeforest.net	144	Sketch	https://sketch.com
120	MailGun	https://www.mailgun.com	145	IDT DNA	https://www.idtdna.com
121	ResellerClub	https://www.resellerclub.com	146	SendGrid	https://sendgrid.com
122	Lenovo	https://www.lenovo.com	147	seleniumhq	https://www.selenium.dev
123	Amazon Prime	https://www.amazon.com	148	salesforce	https://www.salesforce.com
124	Twilio	https://www.twilio.com	149	Sartorius	https://www.sartorius.com
125	Training Sap	https://training.sap.com/	150	Jquery Code	https://www.jquery.com

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GDP RANK	Country	Country	GDP RANK	Country	Country
151	Weebly	https://www.weebly.com	176	Veritas	https://www.veritas.com
152	IBM	https://www.ibm.com	177	ThermoFisher	https://www.thermofisher.com
153	SigmaAldrich	https://www.sigmaaldrich.com	178	Vagrantup	https://www.vagrantup.com
154	Pixel Squid	https://www.pixelsquid.com	179	Bintray	https://bintray.com
155	PackAgist	https://packagist.org	180	Merck millipore	https://www.merckmillipore.com
156	Mbed	https://os.mbed.com	181	Rjx hobby	https://www.rjxhobby.com
157	Data Camp	https://www.datacamp.com	182	Epidemic Sound	https://www.epidemicsound.com
158	OverLeaf	https://www.overleaf.com	183	SyncFusion	https://www.syncfusion.com
159	ATI Radeon	https://ati.com	184	MAAS	https://maas.io
160	AcousticJava	https://acousticjava.com	185	BMC	https://bmc.com
161	Voicemod	https://www.voicemod.net	186	BackTory	https://backtory.com
162	Arcgis Online	https://www.arcgis.com/home	187	Warkiani Lab	https://www.warkianilab.com
163	Stripe	https://stripe.com	188	artgrid	https://artgrid.io
164	Toggl	https://toggl.com	189	artlist	https://artlist.io
165	Sophos	https://sophos.com	190	analytics.moz	https://analytics.moz.com
166	Apache	https://apache.org	191	miro	https://miro.com
167	Videvo	https://www.videvo.net	192	openhub	https://www.openhub.net
168	Atlassian	https://www.atlassian.com	193	Pagespeed	https://pagespeed.web.dev
169	Parsec	https://parsec.app	194	redis	https://redis.io
170	Vuforia	https://developer.vuforia.com	195	wandb	https://wandb.ai
171	Audio Jungle	https://audiojungle.net	196	Click House	https://clickhouse.com
172	GCD API	https://cloud.google.com/api/datastorage	197	opensea	https://www.opensea.io
173	Schema	https://www.schema.org	198	tutsplus	https://tutsplus.com
174	burst shopify	https://burst.shopify.com	199	teachable	https://www.teachable.com/
175	foodiesfeed	https://www.foodiesfeed.com	200	plotly	https://plotly.com

Appendices 3

Websites (Among the Top 300 Iranian Websites) That Face Access Restrictions from Outside (Iran Access):

Plan and Budget Organization of the Country	mporg.ir	Shaparak	shaparak.ir
Islamic Consultative Assembly News Agency	icana.ir	Iran Khodro	ikco.ir
Secretariat of the High Supervisory Board	iranianasnaf.ir	Bank Melli Iran	bmi.ir
Traffic Police	rahvar190.ir	Social Security Organization	tamin.ir
National Iranian Oil Products Distribution Company	niopdc.ir	Electronic Tax Services Portal	tax.gov.ir
Regulatory Authority	cra.ir	Enamad	enamad.ir
Customs of the Islamic Republic of Iran	irica.gov.ir	Iran Telecommunication Portal	tci.ir
Post Bank of Iran	postbank.ir	Ministry of Education	medu.ir
Official Portal of the Iranian National Tax Administration	intamedia.ir	Registration Organization for Deeds and Properties	ssaa.ir
Medical Education Assessment Center	sanjeshp.ir	Police Electronic Services Police+10	epolice.ir
Armed Forces Social Security Organization	esata.ir	Comprehensive Trade System of Iran	ntsw.ir
General Inspection Organization of Iran	bazresi.ir	Government Electronic Procurement System	setadiran.ir
National Database for the Information of Laws and Regulations	dotic.ir	Samandehi	site.samandehi.ir
Iran Grid Management Company	tavanir.org.ir	Central Bank of Iran	cbi.ir
Administrative Justice Court	divan-edalat.ir	Codal Information Dissemination System	codal.ir
Iran Khodro News	ikcpress.ir	Ministry of Roads and Urban Development	mrud.ir
Organization for Non-Governmental Schools and Development of Public Participation	mosharekatha.ir	National Organization of Educational Testing	sanjesh.org
Tehran City Education Department	tehranedu.ir	Vice Presidency for Science, Technology and Knowledge-Based Economy	isti.ir
Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)	imidro.gov.ir	Iran Health Insurance Organization	ihio.gov.ir
Tehran Province Water and Wastewater Company	tpww.ir	Main Page - Bank Maskan Website	bank-maskan.ir
Karaj Municipality	karaj.ir	Ministry of Culture and Islamic Guidance	farhang.gov.ir
Ministry of Education	medu.gov.ir	Ministry of Health	behdasht.gov.ir
Ministry of Agriculture Jihad	maj.ir	Islamic Consultative Assembly (Parliament)	majlis.ir
Gilan Governorate	gilan.ir	Islamic Republic of Iran Customs Administration	irica.ir
National Organization for Development of Exceptional Talents (Sampad)	sampad.gov.ir	National Judiciary Portal	eadl.ir

Analytical Report on Disruptions, Restrictions, and Internet Speed in Iran

National Post Company	post.ir
National System for Publishing and Access to Information	iranfoia.ir
Ministry of Science, Research, and Technology	msrt.ir
Ministry of Education	medu.ir
Comprehensive System of the Iranian Mining Engineering Organization (Sanam)	ime.org.ir
National Land and Housing Organization	nlho.ir
Geological Survey & Mineral Explorations of Iran	gsi.ir
National Tax Administration	intamedia.ir
Regulatory and Radio Communications Organization	cra.ir
National Iranian Oil Company	nioc.ir
National Iranian Gas Company	nigc.ir
Secretariat of the Commission on Publishing and Access to Information	foia.farhang.gov.ir
Audit Organization	audit.org.ir
Securities and Exchange Organization	seo.ir
National Tax Administration	intamedia.ir
Bank of Industry and Mine	bim.ir
Iran Airports and Air Navigation Company	airport.ir
Islamic Republic of Iran Railways	rai.ir
Ministry of Roads and Urban Development	mrud.ir
Ports and Maritime Organization	pmo.ir
Road Maintenance and Transportation Organization	rmto.ir
Ministry of Justice	moj.gov.ir
Red Crescent	rscs.ir
Ministry of Interior	moi.ir
Organization of Municipalities and Village Administrations of the Country	imo.org.ir
Telecommunications Infrastructure Company	tic.ir
Investment Institutions Association of Iran	tedan.ir

Ministry of Cultural Heritage, Tourism, and Handicrafts	mcth.ir
Ministry of Communications and Information Technology	ict.gov.ir
Civil Aviation Organization	caa.gov.ir
National Library and Archives of Iran	nlai.ir
Innovation and Prosperity Fund	inif.ir
Ministry of Cooperatives, Labour, and Social Welfare	mcls.gov.ir
Iran Air (Homa)	iranair.ir
Integrated Educational Management System of Islamic Azad University (EdiYar)	edu.iaa.ac.ir
Department of Environment	iranemp.ir
Anaj News Portal	anaj.ir
Festival Management System	marooffestival.ir
Soha System - Water and Wastewater Company	sohabfa.ir
Cinema Organization of Iran	mojavezcinema.ir
Pars Steel Sabzevar Company	spsco.ir
Headquarters for Promoting Virtue and Preventing Vice	imarooof.ir
Examination Management System of the Ministry of Culture and Islamic Guidance	honarazmoon.ir
Student Welfare Fund	refah.swf.ir
To Bank - Tourism	tobank.ir
Sasan Hospital	sasanhospital.com
Saipa Yadak After-Sales Service	cc.saipayadak.org
Ministry of Culture and Islamic Guidance	farhang.gov.ir
Islamic Consultative Assembly (Parliament)	parliran.ir
Bandar Imam Petrochemical Company	bipc.ir
Integrated Domestic Car Supply System	esalecar.ir
Tehran Municipality	tehran.ir
Iranian Blood Transfusion Organization	ibto.ir

Appendices 4

Details of Responses from Technical Representatives of Operators to Questions from E-Commerce Association Experts

محدودیت تجهیزات PE	محدودیت تجهیزات LI	محدودیت فروش پهنای باند توسط شرکت ارتباطات زیرساخت	محدودیت سرمایه‌گذاری در لایه Access	محدودیت سرمایه‌گذاری در شبکه Core اپراتور	اپراتورهای اینترنتی (ثابت و سیار)
۶۶٪	۱۰۰٪	۸۴٪	۳۴٪	۱۶٪	زیاد
۳۴٪		۱۶٪	۱۶٪	۵۰٪	متوسط
			۵۰٪	۳۴٪	کم

قیمت‌گذاری هزینه‌های انتقال و فروش پهنای باند در استان‌ها	محدودیت تجهیزات PE در شهرهای دیگر	محدودیت تجهیزات LI در شهرهای دیگر	محدودیت فروش پهنای باند توسط شرکت ارتباطات زیرساخت در شهرهای دیگر	محدودیت سرمایه‌گذاری برای گسترش شبکه	اپراتورهای اینترنتی (ثابت و سیار)
۳۴٪	۸۴٪	۸۴٪	۵۰٪	۱۶٪	زیاد
۵۰٪		۱۶٪	۱۶٪		متوسط
۱۶٪			۳۴٪	۸۴٪	کم

تجهیزات فیلترینگ	قیمت بالای فروش پهنای باند شرکت ارتباطات زیرساخت به اپراتورها	قیمت پایین فروش اینترنت به مشترکین	کیفیت پایین شبکه مرکزی اپراتورها	کیفیت پایین فناوری لایه Access (سرویس اپراتورها)	انحصار شرکت ارتباطات زیرساخت	اپراتورهای اینترنتی (ثابت و سیار)
۱۰۰٪	۸۴٪			۶۶٪	۶۶٪	زیاد
	۱۶٪	۵۰٪	۶۶٪	۱۶٪		متوسط
		۵۰٪	۳۴٪	۱۶٪	۳۴٪	کم

Is customer demand exceeding the company's capacity? **Yes, 100%**

1. What is the relative importance of different factors in the mismatch between customer demand and company capacity?
2. How much do each of the following contribute to your problems in expanding the geographic scope of company services and decentralizing from Tehran?
3. To what extent do each of the following factors influence the low quality of the internet in Iran?
4. "The installation of filtering equipment in internal communications has led to an increased need for this equipment, network upgrade limitations, and decreased quality." How accurate is this statement:
 - Correct: 84%**
 - To some extent: 16%
 - Incorrect: 0%

Appendices 5

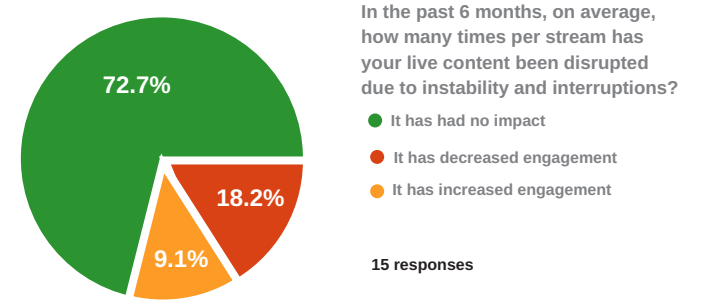
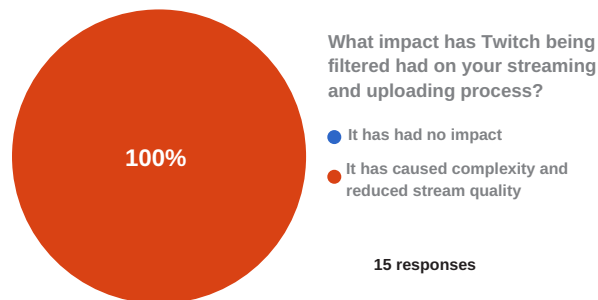
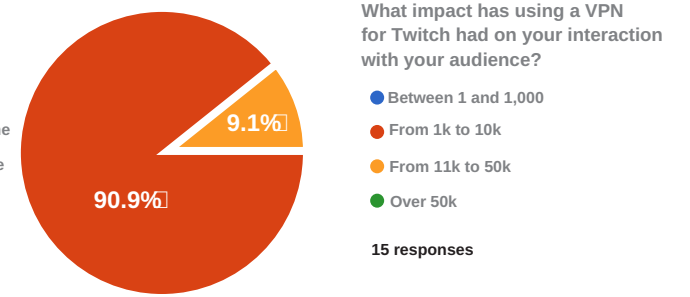
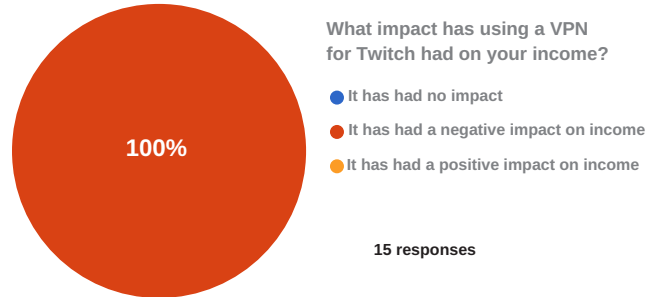
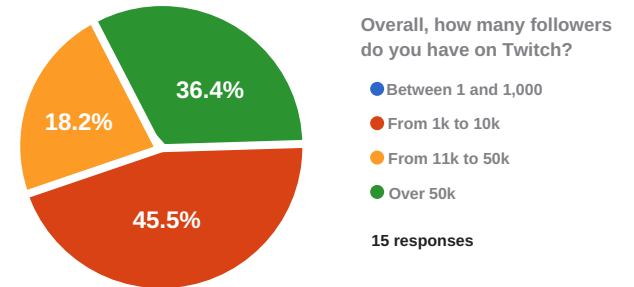
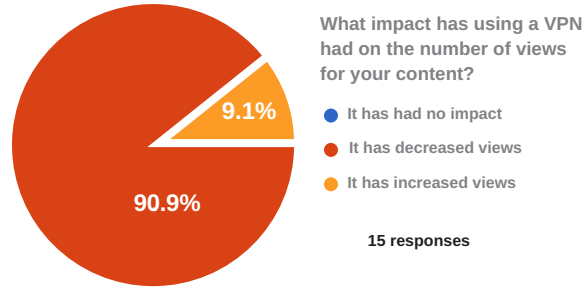
Cloudflare Speed Report Update

In the first and second reports, our primary reference for speed comparison was the Cloudflare Radar report. Since Cloudflare does not have a POP in Iran, it was not the ideal reference for comparing speed between Iran and other countries. However, it was the best reliable source for comparing between countries. In this report, by replacing it with CrUX reports, we used Cloudflare's information solely for comparison and analysis of other data.

Rank	Country	Bandwidth	DNS	Latency
1	Switzerland	39	21	20
2	Sweden	35	25	21
3	Netherlands	36	25	21
4	France	33	28	21
5	United Kingdom	28	25	23
...
34	China	5	21	141
....
48	Kazakhstan	6	69	106
49	Kenya	6	80	113
97	Iran	4	80	151
98	Ethiopia	4	135	3133
99	Cuba	3	103	141
100	Sudan	3	179	138

Appendices 6

Raw survey data from 15 gaming streamers



Quality of Internet in Iran;

Analytical Report on Disruptions Restrictions
and Internet Speed in Iran - Third Report
Spring 2024 (Local calendar: 1403)



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