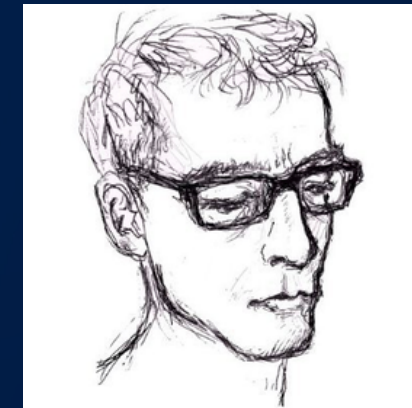


# Beyond the Firewall

A Journey into Internet Censorship and  
Measurement

Armin Huremagic

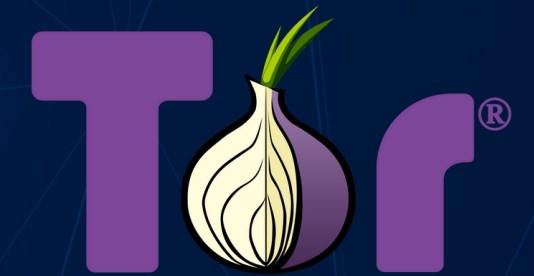
The background of the slide features a stylized representation of the Earth. The globe is shown from a perspective that highlights the Americas. Overlaid on the globe are numerous glowing, curved lines in shades of blue and cyan. These lines represent data paths or network connections, creating a complex web of arcs that crisscross the planet's surface. The lines vary in brightness and thickness, with some appearing as sharp, bright streaks and others as softer, more diffuse glows. The overall effect is one of global connectivity and digital infrastructure.



Philipp Winter



Roya Ensafi



TorProject.org



Censored Planet



UNIVERSITY OF MICHIGAN



# accessnow



# Iran blocks social media, app stores and encrypted DNS amid Mahsa Amini protests

Simone Basso (OONI), Maria Xynou (OONI), Arturo Filastò (OONI), Amanda Meng (IODA - Georgia Tech), 2022-09-25

Protests [erupted](#) in Iran over the last week following the death of Mahsa Amini, a 22-year-old Kurdish woman who was reportedly beaten to death by Iran's morality police for allegedly violating strict hijab rules. Amid the [ongoing protests](#), which have [reportedly](#) resulted in at least 31 civilian deaths, Iranian authorities [cracked down on the internet](#) in an attempt to curb dissent.

Over the past week, Iran experienced [severe mobile network outages](#), in addition to increased levels of internet censorship. In this report, we share [OONI network measurement findings from Iran](#) on the blocking of WhatsApp, Instagram, LinkedIn, Skype, Google Play Store, Apple App Store, and encrypted DNS (DNS over HTTPS). We also share [IODA](#) and [Cloudflare Radar](#) data on mobile network outages over the last few days.

# How Pakistan blocked news outlets, social media sites, and IM apps amidst protests

Maria Xynou (OONI), Arturo Filastò (OONI), Shahzad Ahmad (Bytes for All Pakistan), Abdul Salam (Bytes for All Pakistan), 2017-11-29

Last weekend, a number of social media sites and news outlets were [blocked](#) in Pakistan during [Islamist protests](#). Protesters gathered in Islamabad alleged that Mr. Zahid Hamid, the Federal Law Minister, should be removed from his position because he omitted a reference to the Prophet Muhammad in a parliamentary bill. On Saturday, 25th November 2017, law enforcement agencies initiated an operation to disperse the sit-in at the Faizabad Interchange linking Islamabad and Rawalpindi.

NEWS

# The day the news died Here are all Russia's independent media outlets banned, blocked, or shuttered in just the past few days

6:49 am, March 5, 2022 · Source: Meduza

## Russia blocks access to Facebook and Twitter

Move to block Facebook and Twitter comes as the government passed a bill the criminalizes 'fake' reports against the war

MATT BURGESS SECURITY JUL 25, 2022 7:00 AM

## Russia Is Quietly Ramping Up Its Internet Censorship Machine

Since Vladimir Putin blocked Facebook, Instagram, and Twitter in March, Russia has been pushing away from the global internet at a rapid pace.

## Russia is blocking more and more VPNs

News

By Anthony Spadafora published March 21, 2022

Russian government forced Google to delist 36k URLs linked to VPNs

CHRIS STOKEL-WALKER SECURITY DEC 10, 2021 7:00 AM

## Russia's Internet Censorship Machine Is Going After Tor

The attempt to block the site, which helps users mask their online activity, is the latest step in the country's efforts to control the internet.

REPORT

# Throttling of Twitter in Russia

**AUTHORS:** Diwen Xue, Reethika Ramesh, ValdikSS, Leonid Evdokimov, Andrey Viktorov, Arham Jain, Eric Wustrow, Simone Basso, Roya Ensafi (ensafi@umich.edu)

**AFFILIATIONS:** Censored Planet at the University of Michigan

**DATE:** April 6, 2021

REPORT

# TSPU: Russia's Decentralized Censorship System

**AUTHORS:** Diwen Xue, Benjamin Mixon-Baca, ValdikSS, Anna Ablove, Beau Kujath, Jedidiah R. Crandall, Roya Ensafi

**AFFILIATIONS:** Censored Planet at the University of Michigan, Arizona State University

**DATE:** November 2, 2022

# Italy blocks Gutenberg book publishing website

D. Brunello (Independent researcher), Arturo Filastò (OOONI), Maria Xynou (OOONI), Simone Basso (OOONI), 2021-09-10



This site can't be reached

**www.gutenberg.org** took too long to respond.

Try:

- Checking the connection
- [Checking the proxy and the firewall](#)

ERR\_CONNECTION\_TIMED\_OUT

Details

# Evidence of Internet Censorship during Catalonia's Independence Referendum

Tord Lundström (Virtual Road), Maria Xynou (OOONI), 2017-10-03

## Translation(s):

- [Catalan: Evidència de Censura a Internet durant el Referèndum d'Independència de Catalunya](#)
- [French: Preuve de la censure sur Internet pendant le référendum de l'indépendance de la Catalogne](#)
- [Spanish: Evidencia de censura en Internet durante el referéndum de independencia de Cataluña](#)

*Este dominio ha sido intervenido y se encuentra a disposición de la Autoridad Judicial*



*This domain name has been seized pursuant to a seizure warrant under the Judicial Authority and is under its administration*

### Website gesperrt

Aufgrund eines Sperrbegehrens nach § 81 Abs 1 UrhG wurde diese Seite gesperrt.

kinox.to - A1

 Magenta

Privat | Business

Handys & Tarife

Internettarife

Magenta TV

Internet + TV

Service & Kontakt

## Netzsperr

Liebe Kundin, lieber Kunde,

aufgrund einer Abmahnung nach § 81 Abs. 1a UrhG/einstweiligen Verfügung/gerichtlichen Entscheidung musste der Zugang zu dieser Webseite gesperrt werden.

Weitere Informationen: [Entscheidung des Obersten Gerichtshofs \(OGH\)](#) oder im [Magenta Blog](#)

de.rt.com - Magenta





# Forms of Internet Censorship

**Internet Shutdowns**

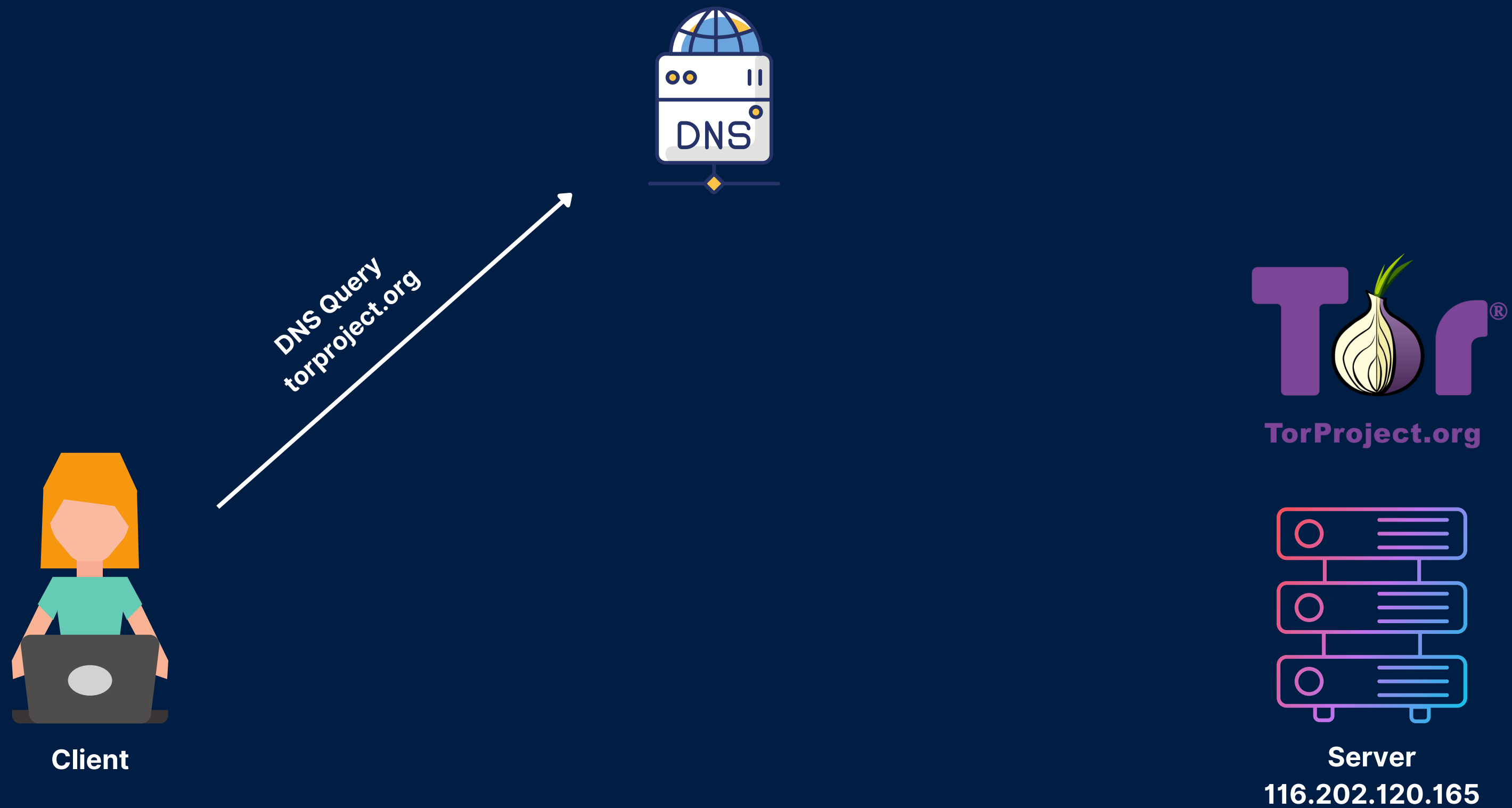
**Throttling**

**Content Takedowns**

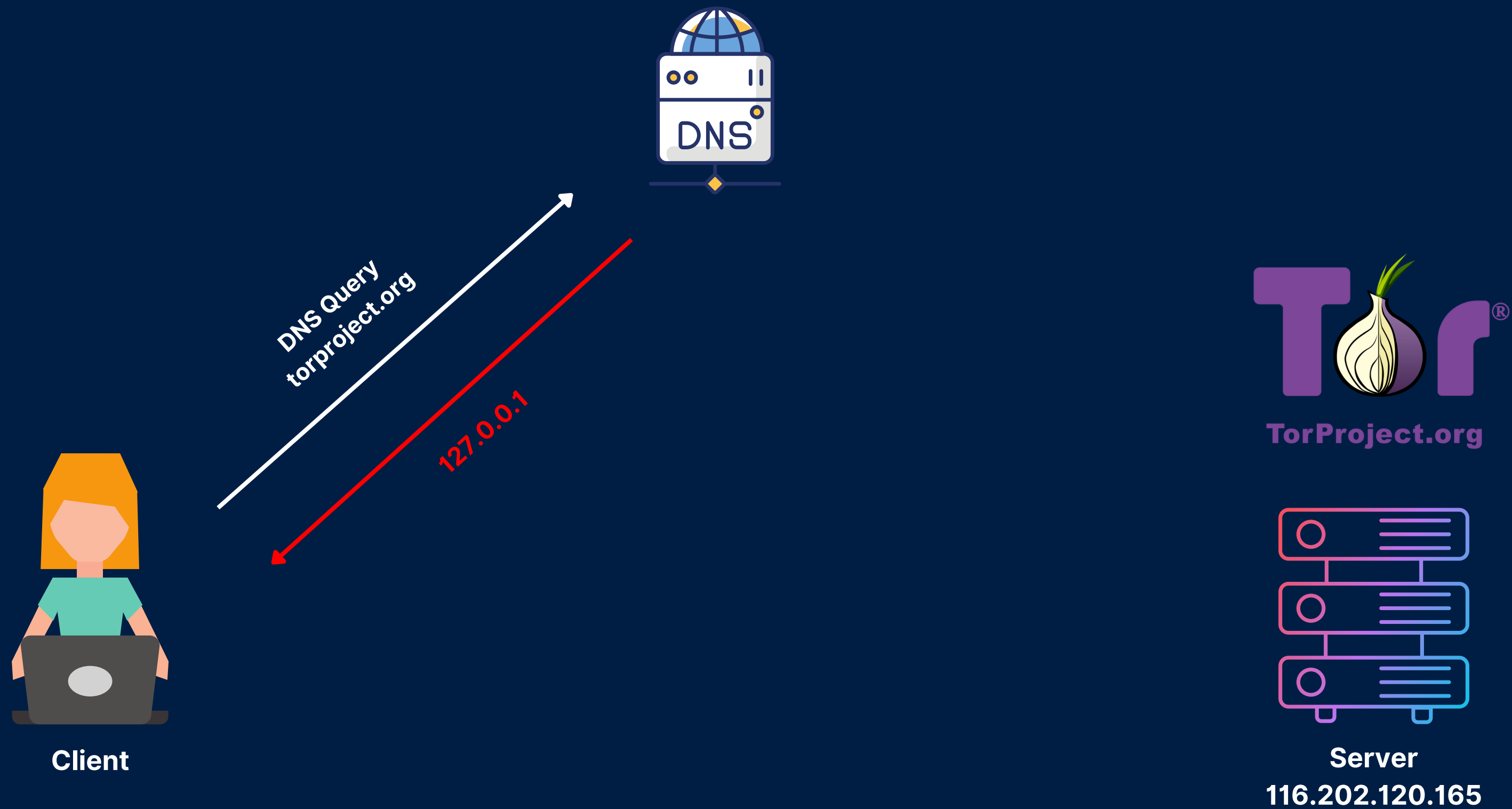
**Website Blocking**

- a. IP Blocking
- b. DNS Manipulation
- c. HTTP(S) Blocking

# DNS Manipulation



# DNS Manipulation

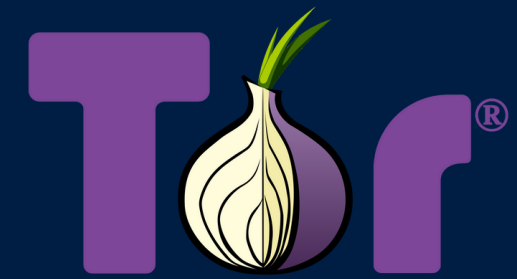


# IP Blocking

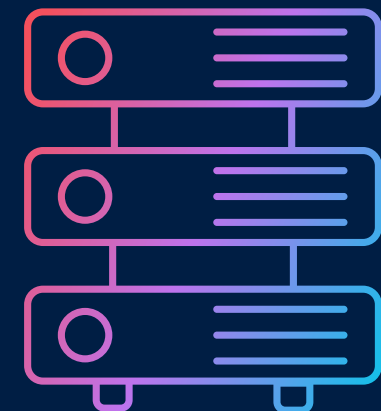


Client

TCP Handshake



TorProject.org



Server

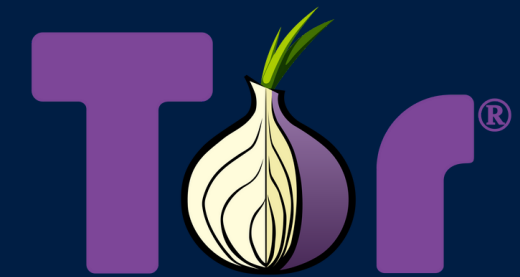
116.202.120.165

# HTTP(S) Blocking

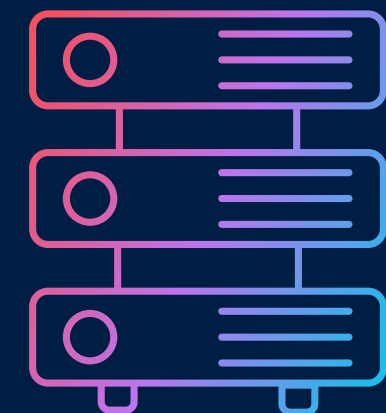


Client

TCP Handshake



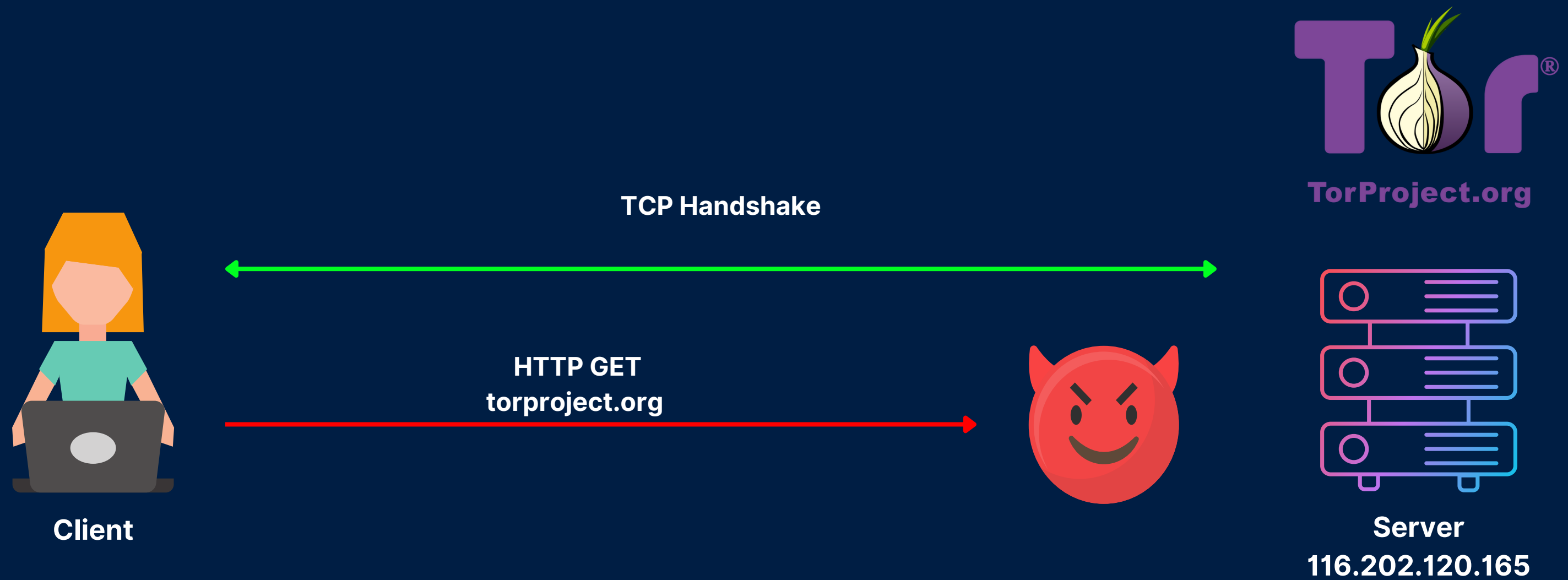
TorProject.org



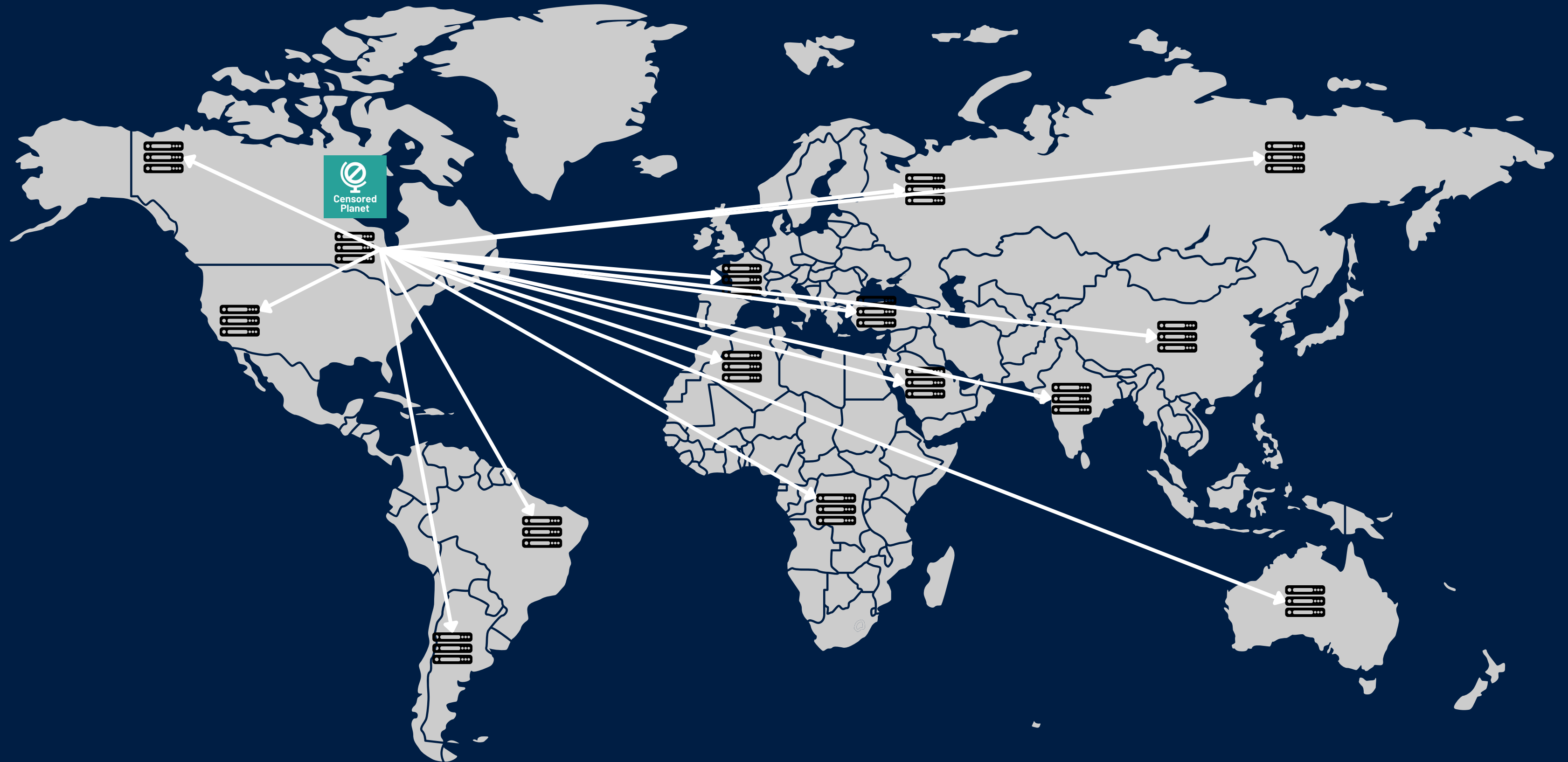
Server

116.202.120.165

# HTTP(S) Blocking



# Remote Measurements

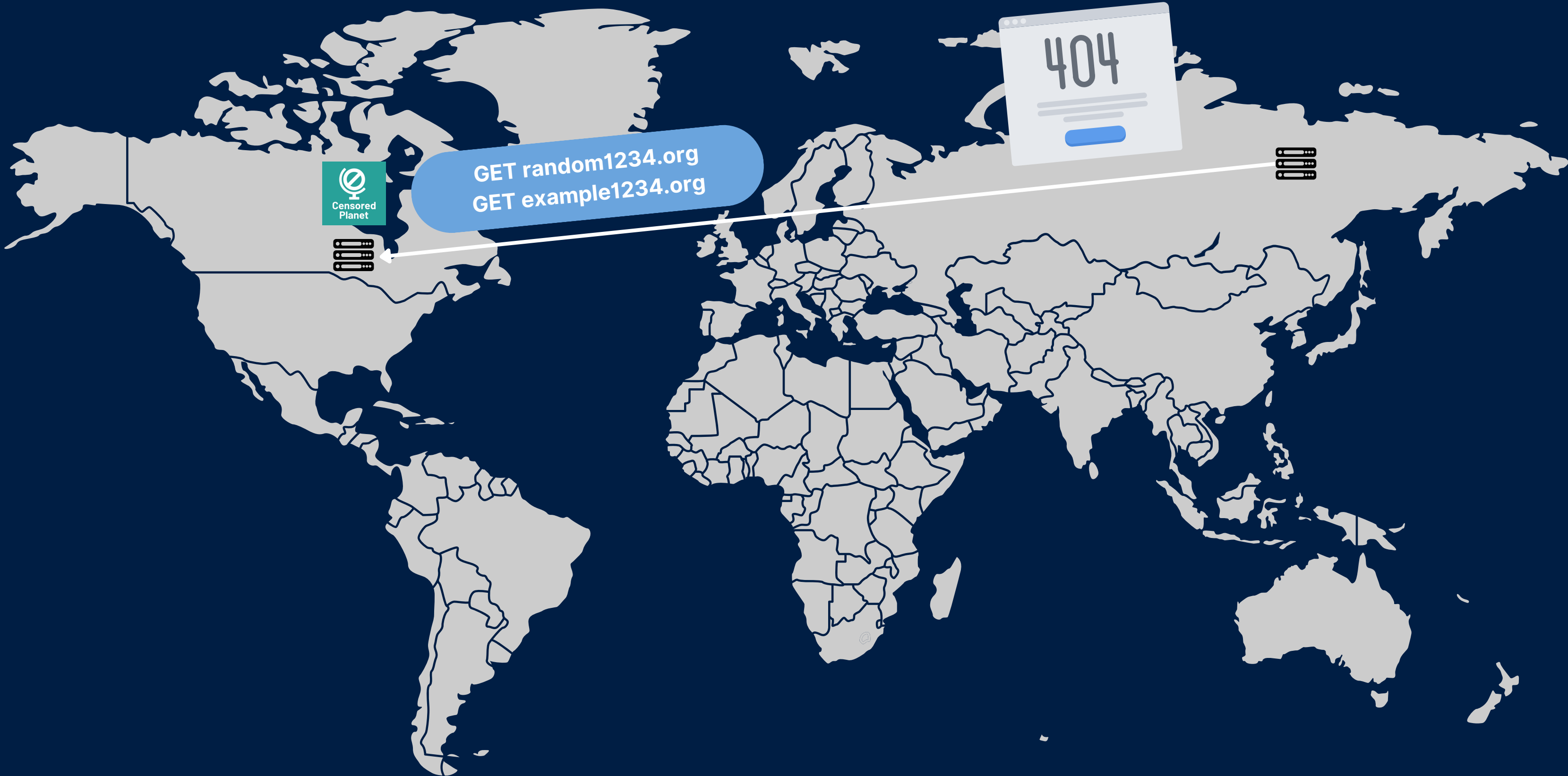


# Remote Measurements





# Remote Measurements



# Remote Measurements



# Remote Measurements



GET torproject.org



Уважаемые пользователи!  
Мы приносим свои извинения, но доступ к запрашиваемому ресурсу ограничен.

Важнейшие причины ограничения доступа:

1. Доступ ограничен: по решению суда или по иному распоряжению уполномоченных ведомостей Российской Федерации.
2. Сетевой адрес, принадлежащий оператору интернет-сервисов, включен в Единый реестр доменных имен, указателей страниц сайтов в сети Интернет и адресов почтовых ящиков, принадлежащих операторам почтовой связи, содержащих информацию, распространяющуюся в нарушение законодательства.
3. Сетевой адрес, принадлежащий оператору интернет-сервисов, включен в Единый реестр доменных имен, указателей страниц сайтов в сети Интернет и адресов почтовых ящиков, принадлежащих операторам почтовой связи, содержащих информацию, распространяющуюся с нарушением законодательства.
4. Сетевой адрес, принадлежащий оператору интернет-сервисов, включен в Единый реестр доменных имен, указателей страниц сайтов в сети Интернет и адресов почтовых ящиков, принадлежащих операторам почтовой связи, содержащих информацию, распространяющуюся с нарушением законодательства, указан в Едином реестре доменных имен, указателей страниц сайтов в сети Интернет и адресов почтовых ящиков, принадлежащих операторам почтовой связи, содержащих информацию, распространяющуюся с нарушением законодательства, указан в Едином реестре доменных имен, указателей страниц сайтов в сети Интернет и адресов почтовых ящиков, принадлежащих операторам почтовой связи, содержащих информацию, распространяющуюся с нарушением законодательства.

Привести точное сетевое адрес в Реестре имен в разделе «Протокол реестра» на сайте [www.fsa.gov.ru](http://www.fsa.gov.ru).



# Censored Planet Dashboard

[DNS Analysis](#)
[HTTPS Analysis](#)
[HTTP Analysis](#)
[How to use this dashboard](#)



## Censored Planet

This dashboard is an exploration of the [Censored Planet](#) data, based on a [data analysis pipeline](#). Please refer to the [Censored Planet data page](#) or reach out at [censoredplanet@umich.edu](mailto:censoredplanet@umich.edu) for access to underlying data.

29.09.2023 - 12.10.2023

Country: Russia (1) | Network | Subnetwork | Site Category | Domain: twitter.com, ww... (22)

### Unexpected outcome by domain and network

Top 10 – Network / Top 5 – Subnetwork / Probe Count / Unexpected Rate

+ Top 50 – Domain	PJSC Rostelecom				"Domain names registrar REG.RU", Ltd							
	AS12389 - Rostelecom ...		AS12389 - Dynamic dist...		AS12389 - Rostelecom ...		AS12389 - PJSC Rostel...		AS197695 - Reg.Ru		AS197695	
	Probe C...	Unexpe...	Probe C...	Unexpe...	Probe C...	Unexpe...	Probe C...	Unexpe...	Probe C...	Unexpe...	Probe C...	Unexpe...
www.facebook.com	63	100 %	7	0 %	7	0 %	7	0 %	28	0 %	7	0 %
www.betfair.com	63	100 %	7	0 %	7	0 %	7	0 %	28	0 %	7	0 %
psiphon.ca	63	100 %	7	0 %	7	0 %	7	0 %	28	0 %	7	0 %
www.occrp.org	63	100 %	7	0 %	7	0 %	7	0 %	28	0 %	7	0 %
twitter.com	63	100 %	7	0 %	7	0 %	7	0 %	28	0 %	7	0 %
www.hrw.org	63	100 %	7	0 %	7	0 %	7	0 %	28	0 %	7	0 %
www.linkedin.com	63	100 %	7	0 %	7	0 %	7	0 %	28	0 %	7	0 %
bbc.com	63	100 %	7	0 %	7	0 %	7	0 %	28	0 %	7	0 %
www.torproject.org	63	100 %	7	0 %	7	0 %	7	0 %	28	0 %	7	0 %



**OONI**

**Open Observatory of Network Interference**

Global community measuring Internet censorship since 2012

# OONI Explorer

## OONI Measurement Aggregation Toolkit (MAT)

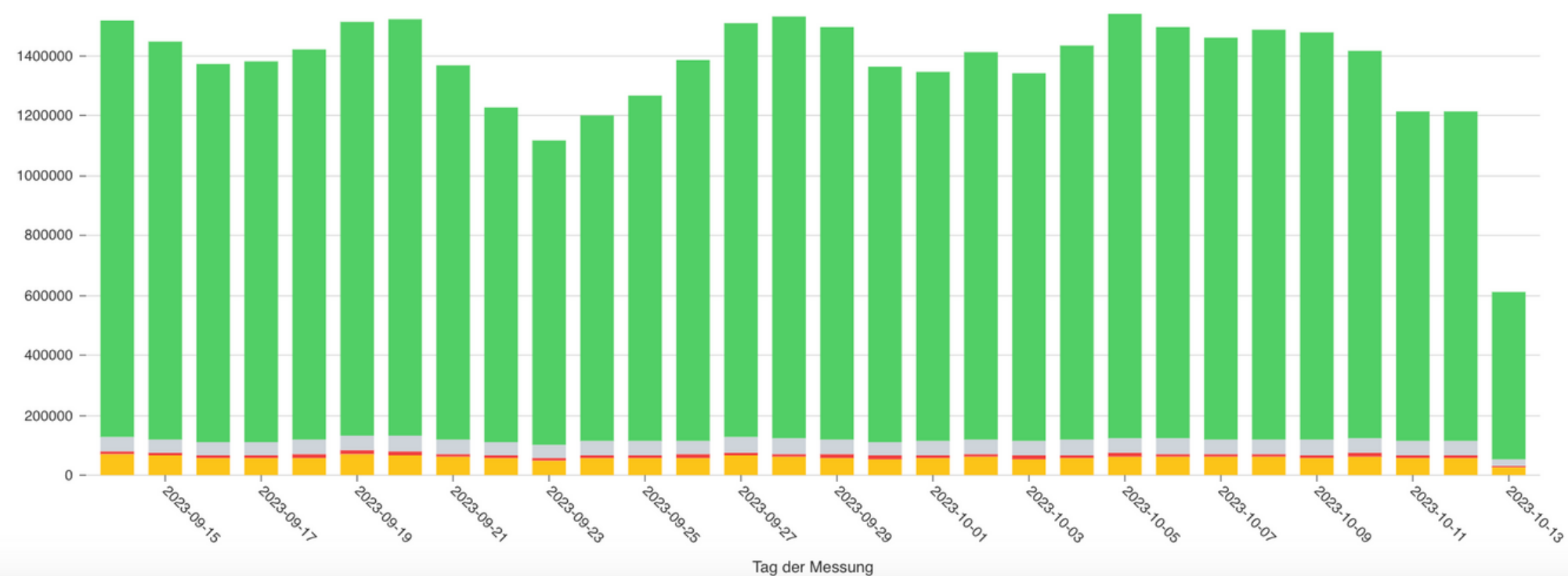
Erstelle Diagramme auf der Grundlage aggregierter Ansichten von OONI-Echtzeitdaten aus aller Welt

Land	ASN	Von	Bis	Zeitliche Auflösung	Spalten	Zeilen
Alle Länder	AS1234	2023-09-14	2023-10-14	Tag	Tag der Messung	
Testname	Domain	Eingabe	Website-Kategorien			
Web Connectivity Test	twitter.com	https://fbcdn.net/robots.txt	Alle			

Diagramm Anzeigen

### Web Connectivity Test

OK Bestätigt Anomalie Fehler



# OONI Probe

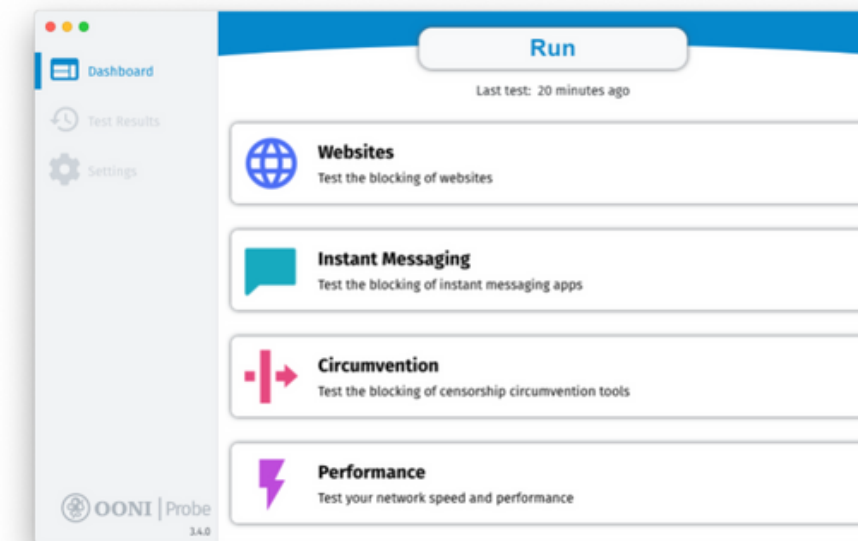
## OONI | Probe Measure internet censorship



### Mobile

Get the OONI Probe mobile app to measure many different networks.

[Install OONI Probe Mobile >>](#)



### Desktop

Get the OONI Probe desktop app to perform more extensive testing from your computer.

[Install OONI Probe Desktop >>](#)

# M-Lab

MLAB

Measurement Lab is led by teams based at Code for Science & Society; Google, Inc; and supported by partners around the world.

Learn more about M-Lab. Get Involved.

Home

About

Visualizations

Data

Tests

Publications

Blog

Learn

Contribute

FAQ

## Measurement Lab

Measure the Internet, save the data, and make it universally accessible and useful.

### Wehe data is now available in BigQuery

Posted by Dave Choffnes, Phillipa Gill, Zeinab Shmeis, Katherine Townsend, Lai Yi Ohlsen on 2023-09-28

Wehe, data, BigQuery

M-Lab and the Wehe team are pleased to announce that Wehe data is available for open access in BigQuery.

▶ [Read More](#)

### Join us at the IMC 2023 Hackathon on Network Interference using Open Data

Posted by Lai Yi Ohlsen, Katherine Townsend on 2023-08-28

data, event, research

Are you attending the Internet Measurement Conference (IMC) 2023?

▶ [Read More](#)



### Run an NDT Test

M-Lab provides the largest collection of open Internet performance data on the planet. As a consortium of research, industry, and public-interest partners, M-Lab is dedicated to providing an ecosystem for the open, verifiable measurement of global network performance. Real science requires verifiable processes, and M-Lab welcomes scientific collaboration and scrutiny. This is why all of the data collected by M-Lab's global measurement platform are made *openly available*, and all of the measurement tools hosted by M-Lab are *open source*. Anyone with time and skill can review and improve the underlying methodologies and assumptions on which M-Lab's platform, tools, and data rely. Transparency and review are key to good

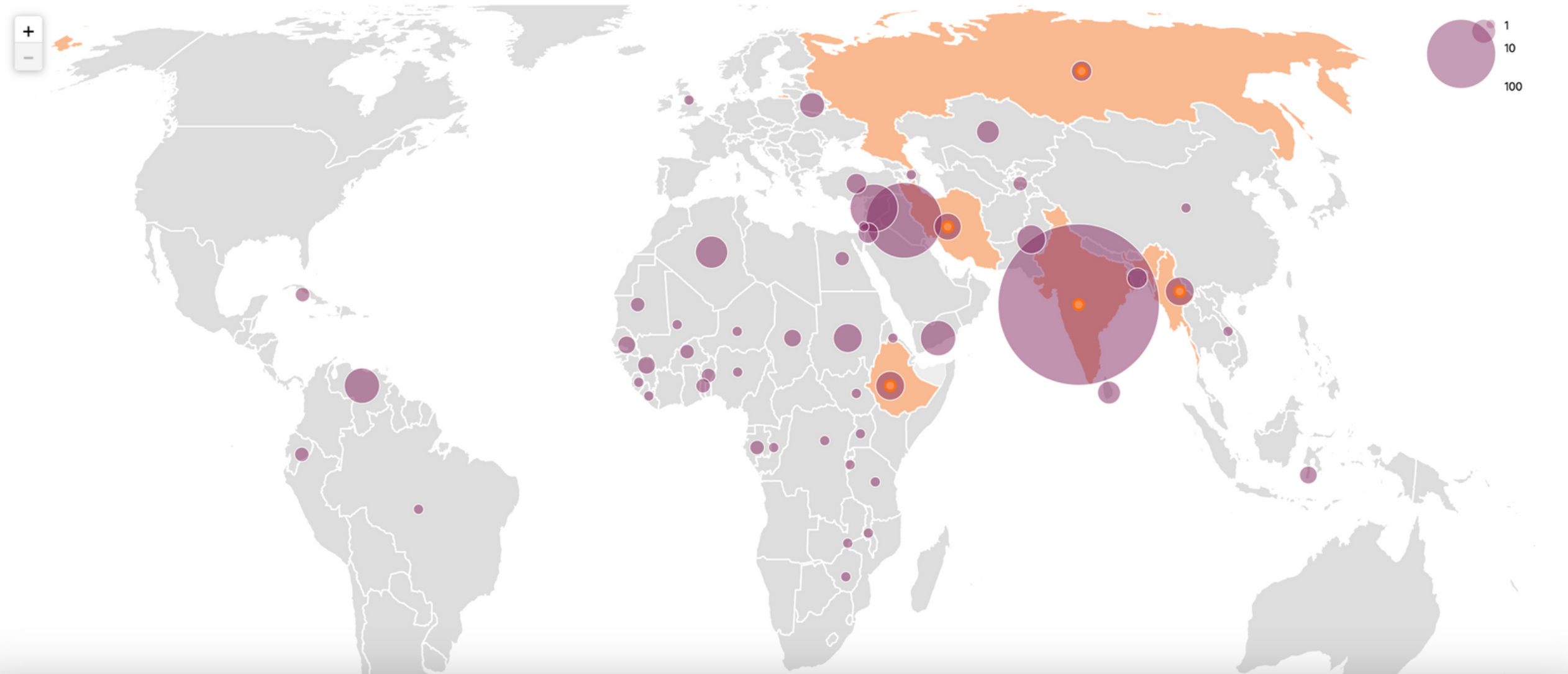


# ISOC Pulse

## Global Internet Shutdowns

● Ongoing ● Past

[Country](#) [Sub-Region](#) [Region](#)



# Net4People



net4people / bbs

Q Type to search



<> Code

Issues 263

Pull requests

Actions

Wiki

Security

Insights

## Reading list

wkrp edited this page 3 weeks ago · 51 revisions

Documents to read and perhaps summarize.

- [Do circumvention tools promote democratic values? Exploring the correlates of anticensorship technology adoption in China](#), Journal of Information Technology & Politics 2018
  - There is a page for what appears to be a [longer preprint](#) at SSRN, but the PDF links do not work
- [Distributed Detection of Tor Directory Authorities Censorship in Mexico](#), TICS 2019
- [Tithonus: A Bitcoin Based Censorship Resilient System](#), PETS 2019
- [Turbo Tunnel, a good way to design censorship circumvention protocols](#), FOCI 2020
- [Come as You Are: Helping Unmodified Clients Bypass Censorship with Server-side Evasion](#), SIGCOMM 2020
- [Assessing the Privacy Benefits of Domain Name Encryption](#), Asia CCS 2020
- [Iran: Tightening the Net 2020, Article 19](#)
- [A Survey of Worldwide Censorship Techniques](#), Internet-Draft
- [How China Detects and Blocks Shadowsocks](#), IMC 2020
- [Censored Planet: An Internet-wide, Longitudinal Censorship Observatory](#), CCS 2020
- [Measuring DoT/DoH Blocking Using OONI Probe: a Preliminary Study](#), DNS Privacy Workshop 2021
- [Clairvoyance: Inferring Blocklist Use on the Internet](#), PAM 2021
- [Throttling Twitter: an emerging censorship technique in Russia](#)
- [Defeating DNN-Based Traffic Analysis Systems in Real-Time With Blind Adversarial Perturbations](#), USENIX Security 2021

Pages 2

Find a page...

Home

Reading list

Clone this wiki locally

<https://github.com/net4people/b>



# Research Power Tools





# Resources

## Censored Planet

Website: <https://censoredplanet.org/>

Raw data: <https://censoredplanet.org/data/raw>

Dashboard: <https://dashboard.censoredplanet.org/>

Twitter Throttling Russia: <https://censoredplanet.org/throttling>

TSPU Russia: <https://censoredplanet.org/tspu>

## OONI

Website: <https://ooni.org/>

OONI Explorer: <https://explorer.ooni.org/>

OONI Probe: <https://ooni.org/install/>

OONI Blogs: <https://ooni.org/blog/>

## M-Lab

Website: <https://www.measurementlab.net/>



# Resources

## Internet Society

Website: <https://www.internetsociety.org/>

ISOC Pulse: <https://pulse.internetsociety.org/>

## Access Now

Website: <https://www.accessnow.org/>

KeepItOn Campaign: <https://www.accessnow.org/campaign/keepiton/>

## Net4People

Website: <https://github.com/net4people/bbs/issues>

Reading List: <https://github.com/net4people/bbs/wiki/Reading-list>

## Book

Website: <https://research-power-tools.com/>

**Thank You**

The background is a vibrant blue digital landscape. It features a central perspective view of a tunnel or corridor formed by glowing blue lines and grids that recede into the distance. A bright, white-yellow light source is positioned at the end of this tunnel, creating a strong lens flare and illuminating the surrounding blue lines. The overall aesthetic is high-tech and futuristic.