

The State of Internet Censorship Observation

Leveraging OONI Tools and Analyzing Data from ASNs in Taiwan

TWNOG #5 2024/04/26 13:30-15:00 | Session C

Toomore Chiang / Open Culture Foundation



What's OONI?

What's OONI?

Open Observatory of Network Interference

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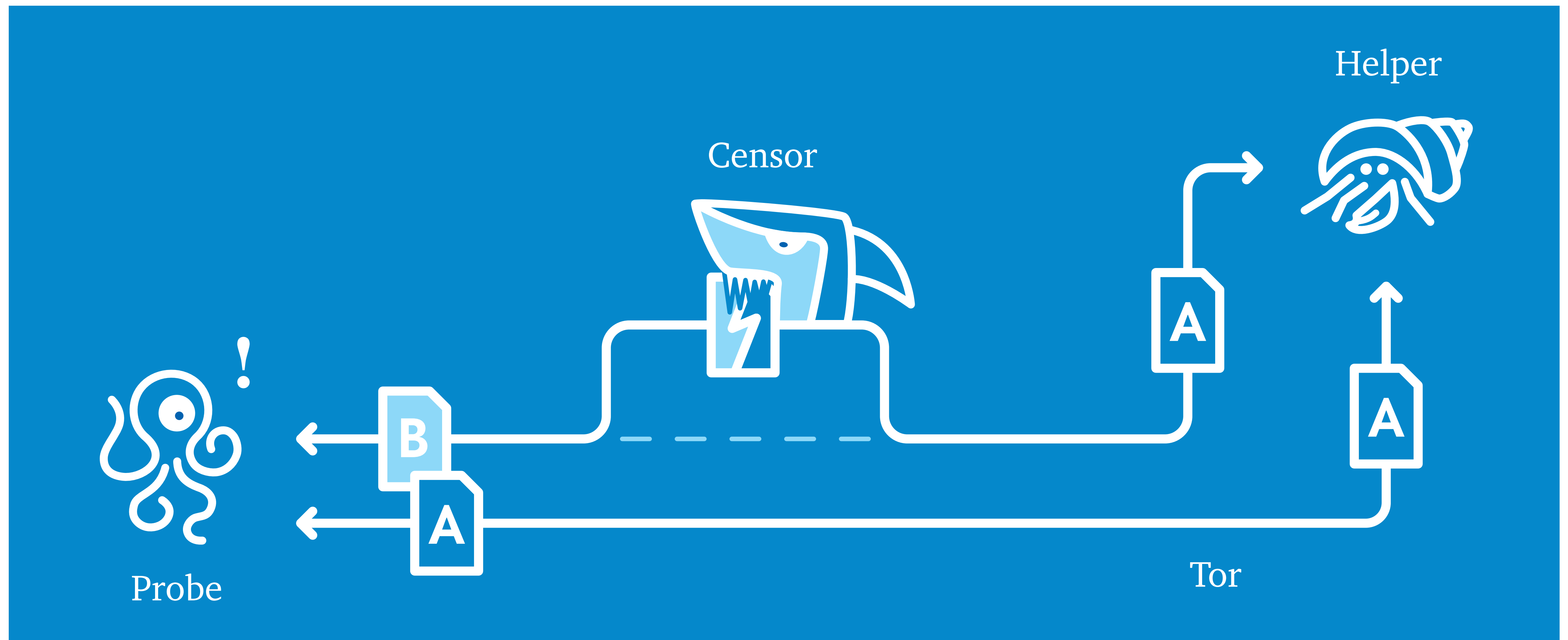
Open Observatory of Network Interference

Test the blocking of websites and apps.
Measure the speed and performance of your network.
Since 2012



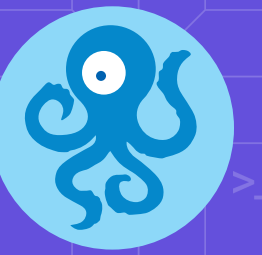
How OONI Works

How OONI Works



How OONI Works

OONI Probe tests



WEB CONNECTIVITY

This test checks whether access to websites is blocked by means of DNS tampering, TCP/IP blocking or by a transparent HTTP proxy.

FACEBOOK MESSENGER

This test is designed to examine the reachability of Facebook Messenger within a tested network.

PSIPHON

This test provides an automated way of examining whether Psiphon works in a tested network.

DASH STREAMING TEST

Measures video streaming performance

TOR

This test provides an automated way of examining whether Tor works in a tested network.

SIGNAL

This test measures the reachability of the Signal messaging app within a tested network.

RISEUPVPN

This test provides an automated way of examining whether RiseupVPN works in a tested network.

NDT SPEED TEST

NDT (Network Diagnostic Test) provides a sophisticated speed and diagnostic test for understanding the performance of your network

TOR SNOWFLAKE

This test provides an automated way of measuring whether the Tor Snowflake pluggable transport works on a tested network.

TELEGRAM

This test is designed to examine the reachability of Telegram's app and web version within a tested network.

HTTP HEADER FIELD MANIPULATION

This test tries to detect the presence of network components ("middle box") which could be responsible for censorship and/or traffic manipulation.

VANILLA TOR

This test measures the reachability of the Tor network.

WHATSAPP

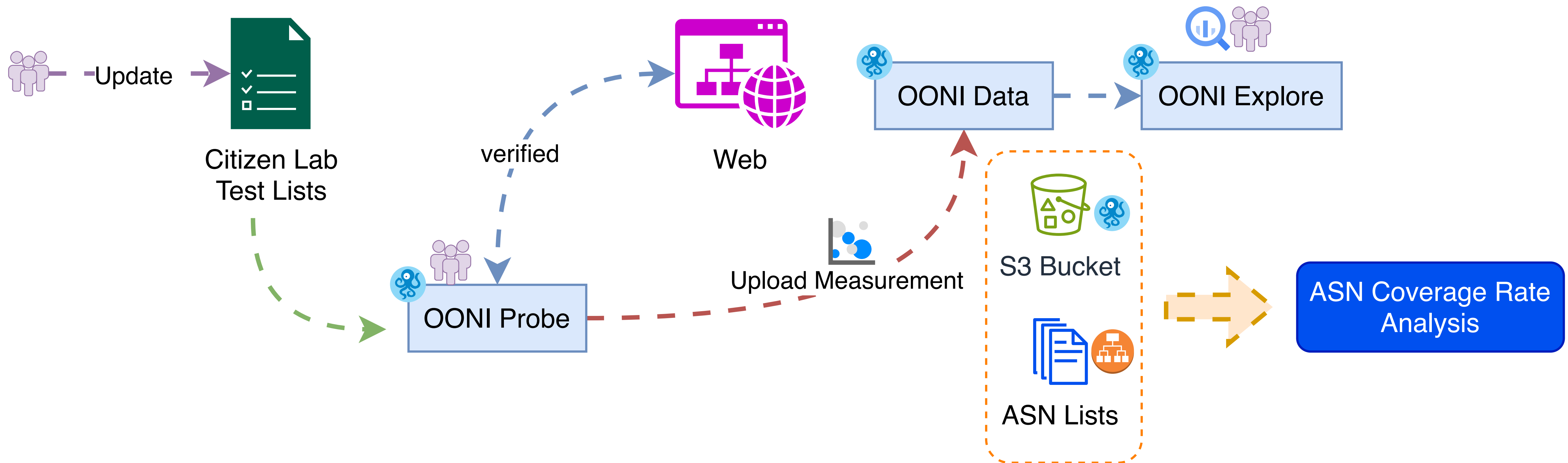
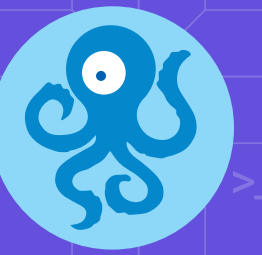
This test is designed to examine the reachability of both WhatsApp's app and the WhatsApp web version within a tested network.

HTTP INVALID REQUEST LINE

This test tries to detect the presence of network components ("middle box") which could be responsible for censorship and/or traffic manipulation.

How OONI Works

Data pipeline



How OONI Works

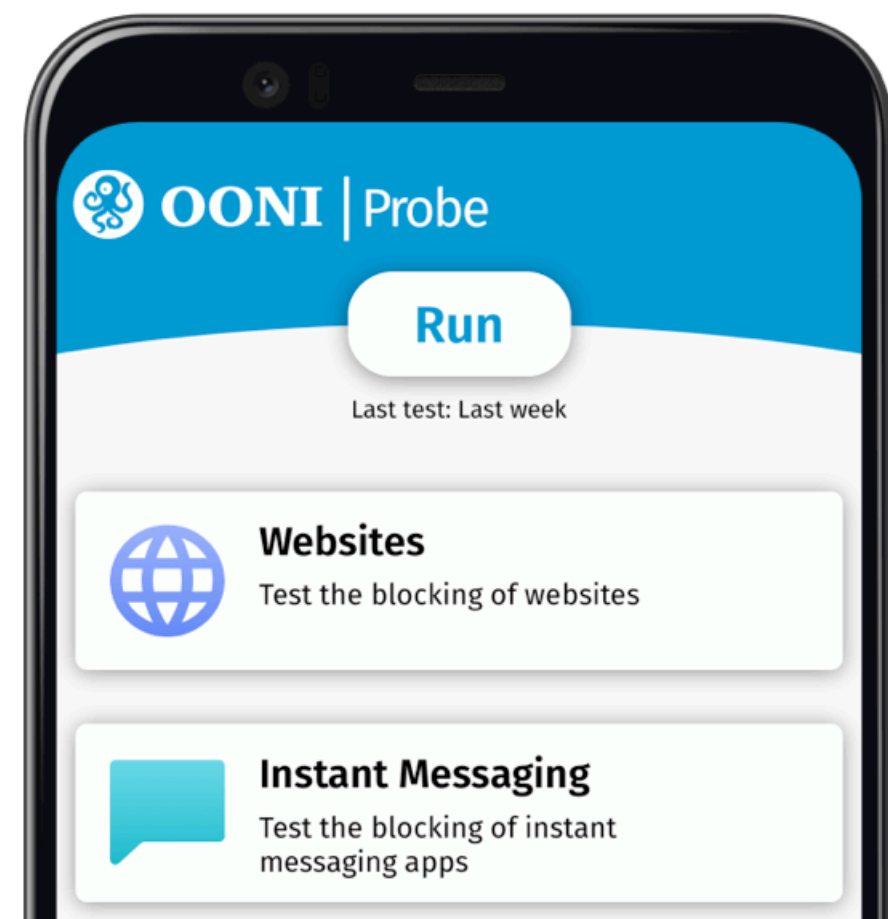
Install Probe

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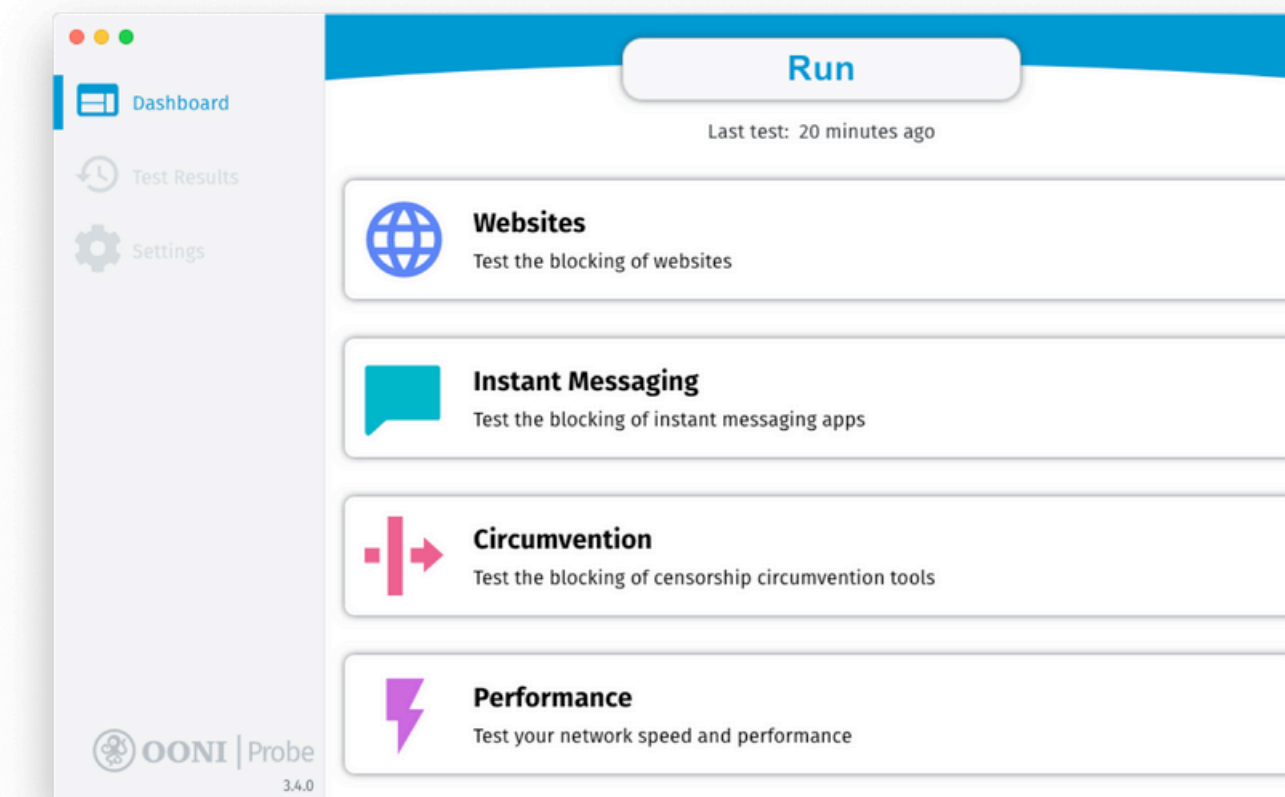
Measure internet censorship



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 >>](#)



How OONI Works

Install CLI



```
~ % ooniprobe run websites
0.01% starting the test
0.01% Processing input: https://login.live.com/
[engine] web_connectivity: starting dns_query for login.live.com
[engine] web_connectivity: starting tcp_connect
[engine] web_connectivity: success to connect to 40.90.22.183:443
[engine] web_connectivity: success to connect to 40.90.22.190:443
[engine] web_connectivity: success to connect to 40.90.22.184:443
[engine] web_connectivity: starting http_request to https://login.live.com/
[engine] web_connectivity: doing control request
[engine] Using backend https://wcth.ooni.io
```

Command Line Interface

Are you a power user? Check out the OONI Probe Command Line Interface (CLI) tool!

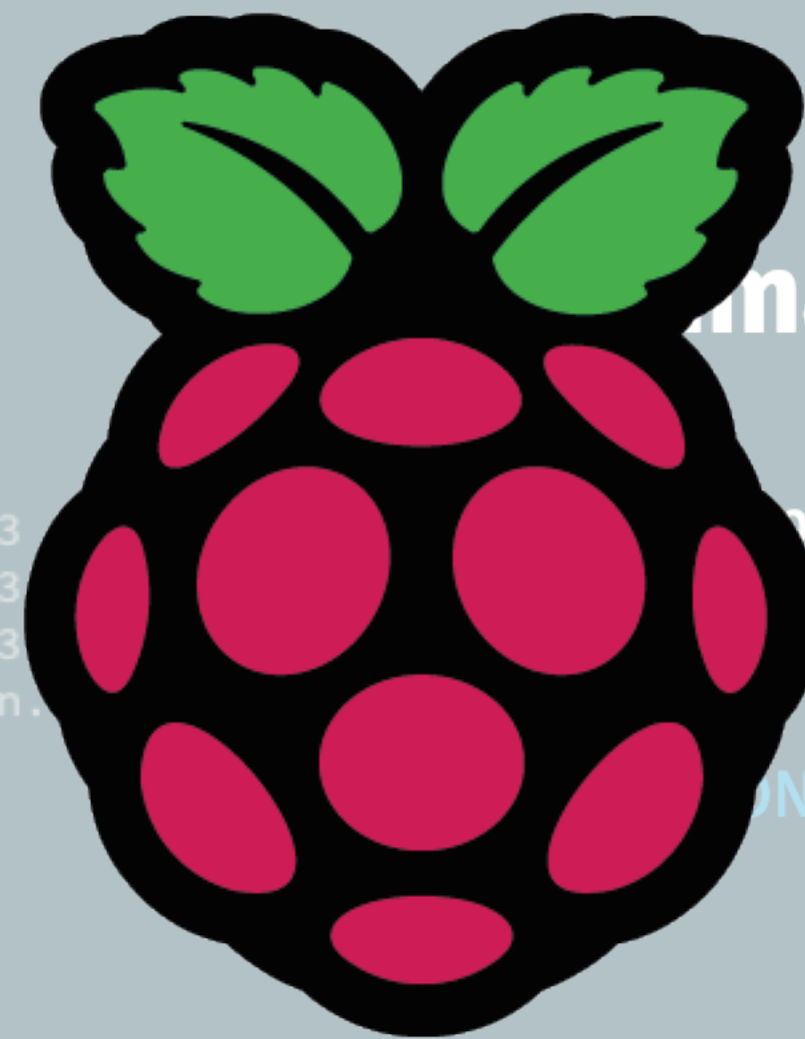
[Install OONI Probe CLI >>](#)



How OONI Works

Install OONI Probe on Raspberry Pi

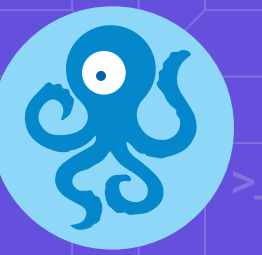
```
~ % ooniprobe run websites
0.01% starting the test
0.01% Processing input: https://login.live.com/
[engine] web_connectivity: starting dns_query for login.live.com
[engine] web_connectivity: starting tcp_connect
[engine] web_connectivity: success to connect to 40.90.22.183:443
[engine] web_connectivity: success to connect to 40.90.22.190:443
[engine] web_connectivity: success to connect to 40.90.22.184:443
[engine] web_connectivity: starting http_request to https://login.
[engine] web_connectivity: doing control request
[engine] Using backend https://wcth.ooni.io
```



Command Line Interface

power user? Check out the OONI Probe Command Line Interface

ONI Probe CLI >>



How OONI Works

Install OONI Probe on Raspberry Pi

```
~ % ooniprobe run websites
0.01% starting the test
0.01% Processing input: https://login.live.com/
[engine] web_connectivity: starting dns_query for log
[engine] web_connectivity: starting tcp_connect
[engine] web_connectivity: success to connect to 40.90
[engine] web_connectivity: success to connect to 40.90
[engine] web_connectivity: success to connect to 40.90
[engine] web_connectivity: starting http_request to h
[engine] web_connectivity: doing control request
[engine] Using backend https://wcth.ooni.io
```



Command Line Interface

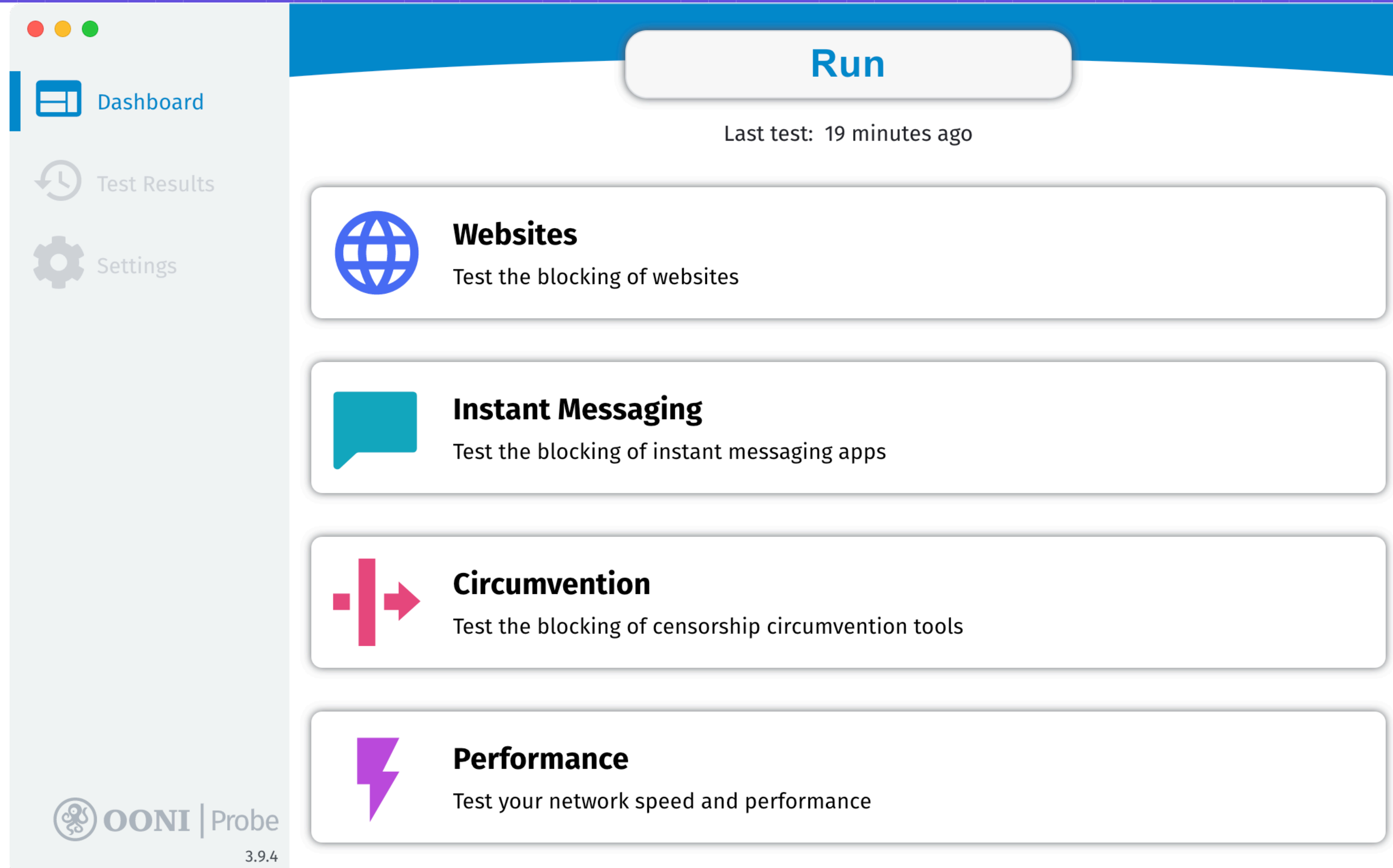
Check out the OONI Probe Command Line Interface

>>

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Websites

Running:

Web Connectivity Test

Estimated time left: a minute
processing input: <https://www.instagram.com/>

Close Log ▾

DNS analysis result: consistent
TCP/TLS endpoints: 16/20 reachable
GET <https://www.youtube.com/>...
GET <https://www.youtube.com/>... ok
BodyLengthMatch: nil
BodyProportion: 0
StatusCodeMatch: true
HeadersMatch: true
TitleMatch: nil
Blocking: nil
Accessible: true
0.2318022691555555% - processing input: <https://www.instagram.com/>
dnslookup:<https://www.instagram.com/>...
dnslookup:<https://www.instagram.com/>... ok
using control: [{Address:<https://2.th.ooni.org> Type:https Front:} {Address:<https://3.th.ooni.org> Type:https Front:} {Address:<https://4.th.ooni.org> Type:https Front:}]
control for <https://www.instagram.com/>...
control for <https://www.instagram.com/>... ok
DNS analysis result: consistent
TCP/TLS endpoints: 1/2 reachable
GET <https://www.instagram.com/>...

↓

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Dashboard

Test Results

Settings

< Apr 11, 2024 12:44 PM

Tested
15
Websites

Blocked
2
Websites

Accessible
13
Websites

↑↓ Data Usage

⌚ Total Runtime

🇵🇸 Country

🌐 Network

↑ 1.05_{MB} ↓ 1.37_{MB}

96.48s

SG

M247 Europe SRL (9009)

🗨️

https://www.viber.com/

!

>

👤

https://kiwifarms.net/

!

>

👤

https://twitter.com/

✓

>

👤

https://www.facebook.com/

✓

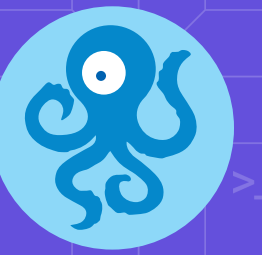
>

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3.9.4

How OONI Works

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Dashboard

Test Results

Settings

<

Web Connectivity Test

!

<https://kiwifarms.net/>

Likely blocked

Apr 11, 2024 12:45 PM
Date & Time

M247 Europe SRL (AS9009)
Network

Runtime: 2s

Methodology

<https://kiwifarms.net/> is likely blocked by means of **DNS tampering**.

Note: False positives can occur. Learn more [here](#).

Data

Show In OONI Explorer

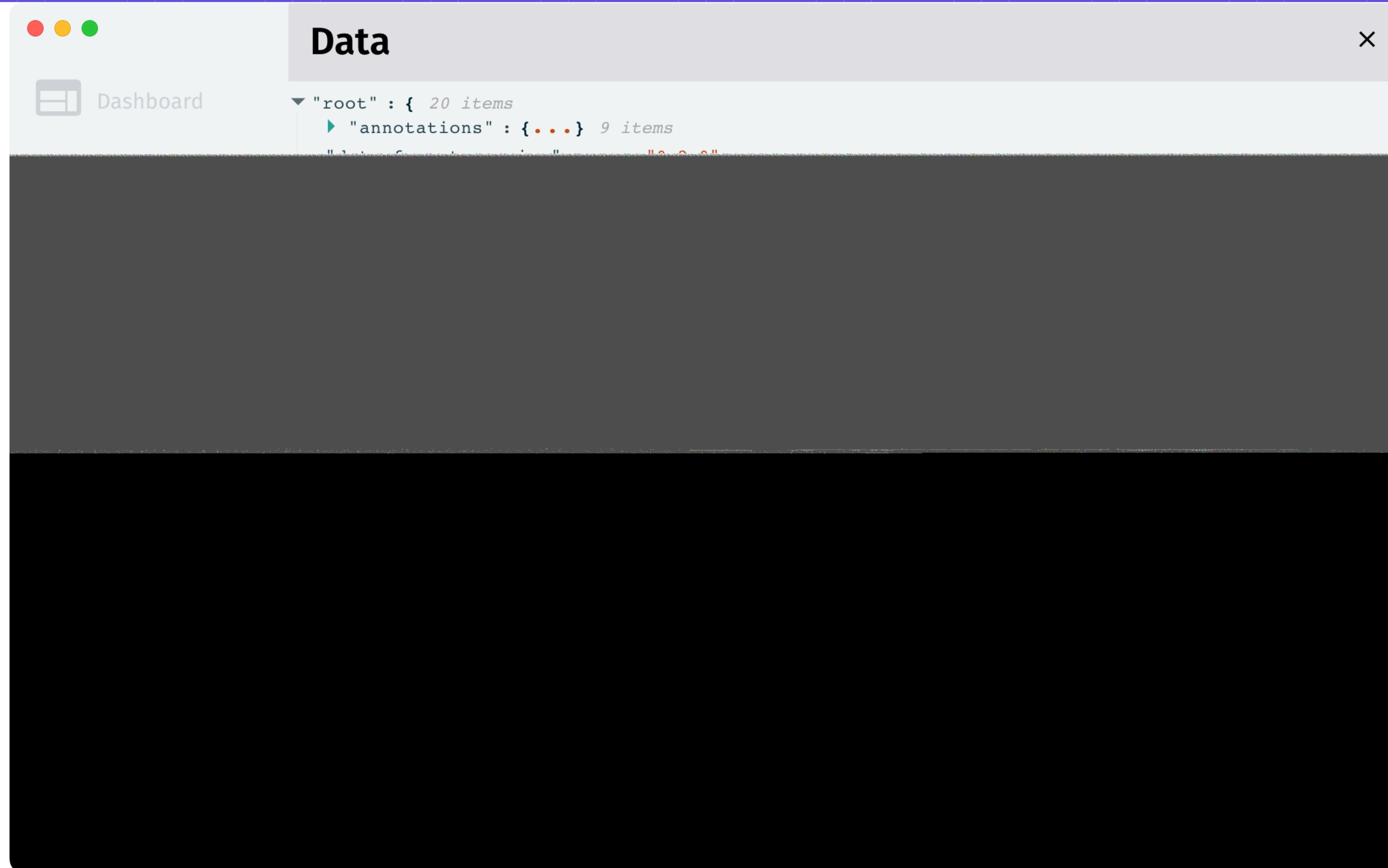
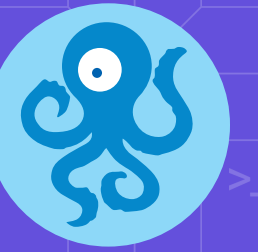
CC BY-NC-SA

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3.9.4

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 OONI | Explorer

Search

MAT Charts

Circumvention Charts

Countries

Networks

Domains

Findings

English

April 11, 2024 at 5:45:31 AM UTC


VERIFY

! Anomaly

<https://kiwifarms.net/>

DNS tampering

 Singapore

[AS9009 M247 Europe SRL](#)

WEBSITES  Web Connectivity Test 

Runtime: 1.6s

 Share on or

On April 11, 2024 at 5:45:31 AM UTC, <https://kiwifarms.net/> presented signs of DNS tampering on AS9009 in Singapore. This might mean that <https://kiwifarms.net/> was blocked, but **false positives** can occur. Please explore the network measurement data below.

Failures



HTTP Experiment

✓ null

DNS Experiment

✗ dns_nxdomain_error

Control

✓ null





What's OONI Explorer

What's OONI Explorer

Observation data dashboard

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[MAT Charts](#)

[Circumvention Charts](#)

[Countries](#)

[Networks](#)

[Domains](#)

[Findings](#)

[English](#)

OONI Measurement Aggregation Toolkit (MAT)

Create charts based on aggregate views of real-time OONI data from around the world

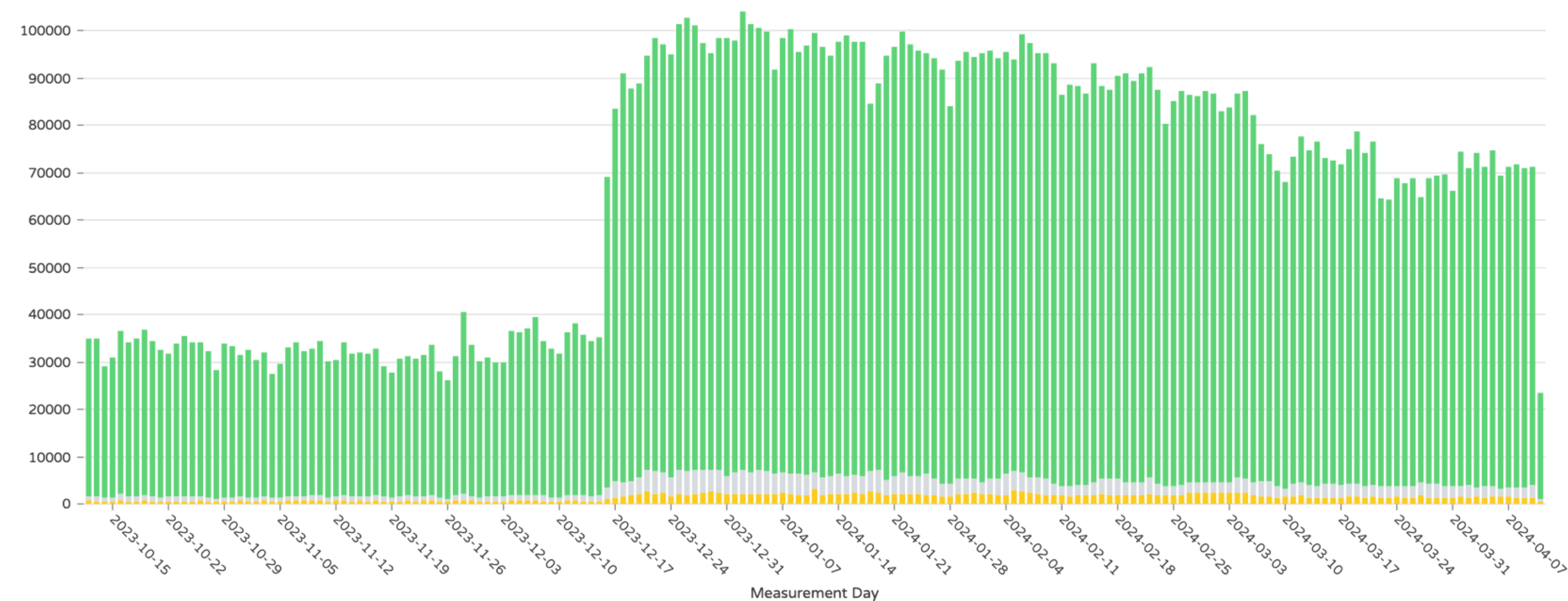
Country	ASN	From	Until	Time Granularity	Columns	Rows
Taiwan	AS1234	2023-10-12	2024-04-12	Day	Measurement Day	
Test Name	Domain	Input	Website Categories			
Web Connectivity Test	twitter.com	https://fbcdn.net/robots.txt	All			

Show Chart

Web Connectivity Test

Taiwan

OK Confirmed Anomaly Failure



What's OONI Explorer

Observation data dashboard

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Search

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English

Reachability of Censorship Circumvention Tools

The charts below display aggregate views of OONI data based on the testing of the following circumvention tools:

- [Psiphon](#)
- [Tor](#)
- [Tor Snowflake](#)

Please note that the presence of [anomalous measurements](#) is not always indicative of blocking, as [false positives](#) can occur. Moreover, circumvention tools often have built-in circumvention techniques for evading censorship.

We therefore recommend referring to [Tor Metrics](#) and to the [Psiphon Data Engine](#) to view usage stats and gain a more comprehensive understanding of whether these tools work in each country.

Country

China X Russia X Taiwan X X

From

2024-03-12

Until

2024-04-12

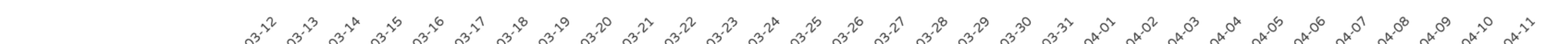
Tor Test

OK Confirmed Anomaly Failure



Tor Snowflake Test

OK Confirmed Anomaly Failure

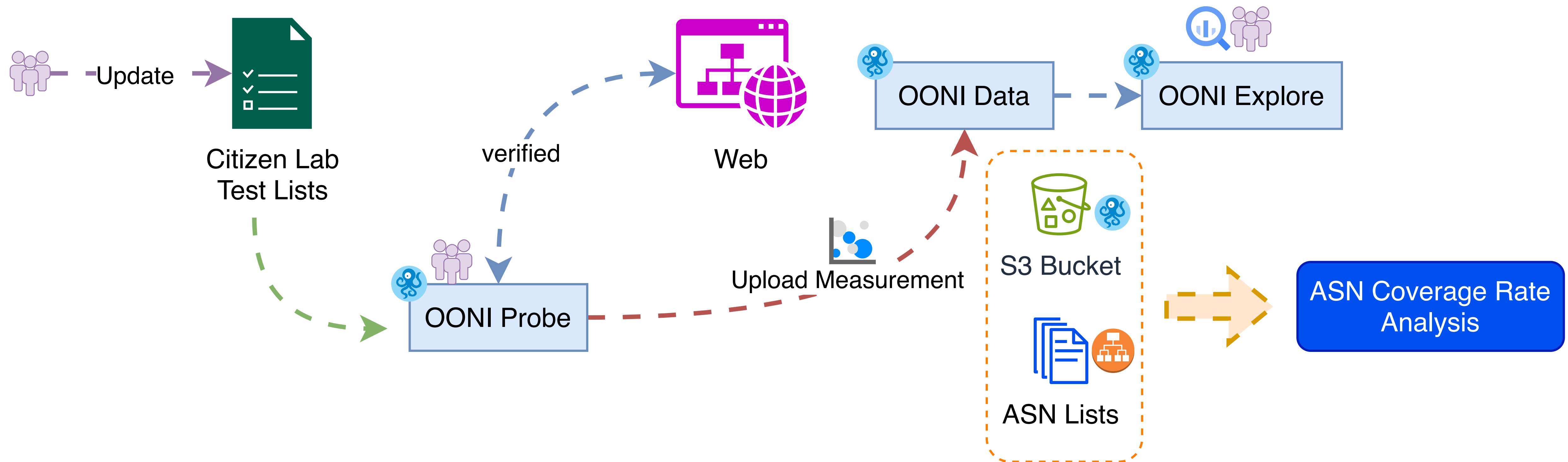
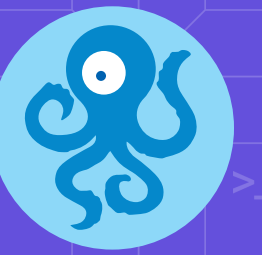




What's OONI Data

What's OONI Data

Data pipeline



What's OONI Data

Open Data on AWS

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Registry of Open Data on AWS



Open Observatory of Network Interference (OONI)

internet

Description

A free software, global observation network for detecting censorship, surveillance and traffic manipulation on the internet.

Update Frequency

Hourly

License

Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International <https://github.com/ooni/license/blob/master/data/LICENSE.md>

Documentation

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

Managed By

Open Observatory of Network Interference

See all datasets managed by [Open Observatory of Network Interference](#).

Contact

<https://ooni.org/get-involved/>

How to Cite

Open Observatory of Network Interference (OONI) was accessed on **DATE** from <https://registry.opendata.aws/ooni>.

Resources on AWS

Description

New S3 bucket with JSONL files

Resource type

S3 Bucket

Amazon Resource Name (ARN)

`arn:aws:s3:::ooni-data-eu-fra`

AWS Region

`eu-central-1`

AWS CLI Access (No AWS account required)

```
aws s3 ls --no-sign-request s3://ooni-data-eu-fra/
```

Description

Old S3 bucket with cans for older measurements

Resource type

S3 Bucket

Amazon Resource Name (ARN)

`arn:aws:s3:::ooni-data`

AWS Region

`us-east-1`

AWS CLI Access (No AWS account required)

```
aws s3 ls --no-sign-request s3://ooni-data/
```



Open Data on AWS

```
▼ "root" : { 20 items
  ► "annotations" : { . . . } 9 items
  "1" : "C"
  "2" : "C"
  "3" : "C"
  "4" : "C"
  "5" : "C"
  "6" : "C"
  "7" : "C"
  "8" : "C"
  "9" : "C"
  "10" : "C"
  "11" : "C"
  "12" : "C"
  "13" : "C"
  "14" : "C"
  "15" : "C"
  "16" : "C"
  "17" : "C"
  "18" : "C"
  "19" : "C"
  "20" : "C"
}
```

What's OONI Data

Open Data on AWS



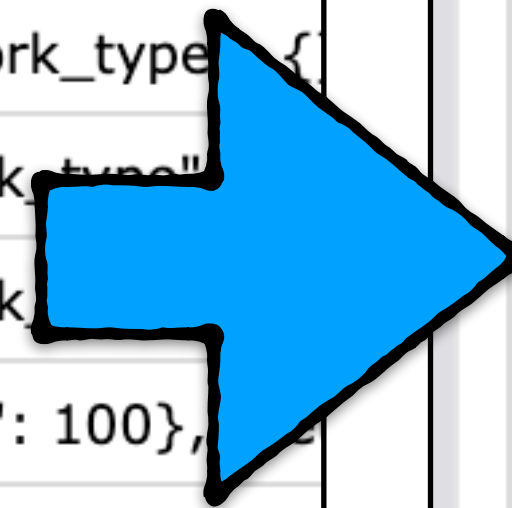
```
19  ✓ class OONIS3:
20      ''' OONI S3 bucket '''
21
22  ✓ def __init__(self) -> None:
23      self.s3client = boto3.client('s3', config=Config(
24          region_name='eu-central-1',
25          user_agent='OCF.tw OONI-Research github.com/ocftw/ooni-research',
26          signature_version=UNSIGNED,
27          connect_timeout=120,
28          read_timeout=120,
29      ))
30
31  ✓ def list_webconnectivity(self, date='20231110', hour='09', location='TW'):
32      ''' List objects '''
33      return self.s3client.list_objects_v2(
34          Bucket='ooni-data-eu-fra',
35          Prefix=f'raw/{date}/{hour}/{location.upper()}/webconnectivity/',
36          Delimiter='/',
37      )
```


What's OONI Data

Open Data on AWS



loc	date	hour	statistics
TW	2023/09/01	00	{"counts": {"AS3462": 870, "AS9916": 800, "AS131668": 553, "AS18419": 100}, "ne
TW	2023/09/01	01	{"counts": {"AS131668": 555, "AS9916": 703, "AS18419": 155, "AS3462": 221}, "ne
TW	2023/09/01	02	{"counts": {"AS9916": 277, "AS131668": 437, "AS18419": 100, "AS3462": 150}, "ne
TW	2023/09/01	03	{"counts": {"AS3462": 590, "AS18419": 100, "AS24158": 6}, "network_type": {"wifi"
TW	2023/09/01	04	{"counts": {"AS3462": 1124, "AS18419": 100, "AS131668": 325}, "network_type": {"
TW	2023/09/01	05	{"counts": {"AS3462": 987, "AS131668": 582, "AS18419": 100}, "network_type": {"
TW	2023/09/01	06	{"counts": {"AS3462": 575, "AS131668": 600, "AS18419": 100}, "network"
TW	2023/09/01	07	{"counts": {"AS131668": 465, "AS3462": 200, "AS17421": 15, "AS18419": 100}, "e
TW	2023/09/01	08	{"counts": {"AS3462": 271, "AS131668": 54, "AS18419": 100, "AS18041": 77}, "netv
TW	2023/09/01	09	{"counts": {"AS3462": 229, "AS18041": 23, "AS18419": 100, "AS24158": 5, "AS1316
TW	2023/09/01	10	{"counts": {"AS131668": 819, "AS18419": 100, "AS24157": 100, "AS3462": 200}, "n
TW	2023/09/01	11	{"counts": {"AS131668": 665, "AS18419": 100, "AS3462": 100}, "network_type": {"}}
TW	2023/09/01	12	{"counts": {"AS131668": 440, "AS3462": 100, "AS18419": 100}, "network_type": {"}}
TW	2023/09/01	13	{"counts": {"AS131668": 190, "AS3462": 300, "AS18419": 100}, "network_type": {"}}



loc	date	hour	asn	count
TW	2023/09/01	00	AS3462	870
TW	2023/09/01	00	AS9916	800
TW	2023/09/01	00	AS131668	553
TW	2023/09/01	00	AS18419	100
TW	2023/09/01	01	AS131668	555
TW	2023/09/01	01	AS9916	703
TW	2023/09/01	01	AS18419	155
TW	2023/09/01	01	AS3462	221
TW	2023/09/01	02	AS9916	277
TW	2023/09/01	02	AS131668	437
TW	2023/09/01	02	AS18419	100

ASNs Data

Fetch ASNs data from RIPE NCC



```
class RIIPEData(Session):
    ''' Fetch RIPE Data '''

    def __init__(self) -> None:
        super().__init__()
        self.url = 'https://ftp.ripe.net'

    def fetch_asn(self) -> Response:
        ''' Fetch ASN name '''
        return super().get(self.url+'/ripe/asnames/asn.txt')

    def get_asn_name(self):
        ''' Get and Process ASN Data '''
        asn_data = self.fetch_asn()
        pattens = (
            re.compile(
                r"(?P<no>\d+) (?P<reserved>-Reserved AS-), (?P<location>
            re.compile(
                r"(?P<no>\d+) (?P<org_id>[\w-]+)? ?(?P<registrar>[\w-
            re.compile(r"(?P<no>23456) (?P<name>.+)"),
            re.compile(r"(?P<no>\d+) , "),
        )
```

	A	B	C	D	E	F
1	no	location	org_id	registrar	reserved	name
947	945	TW	8964			
1661	1659	TW	ERX-TANET-AS	Taiwan Academic Network TANet Information Cent		
1770	1768	TW	NCIC-BACKBON	NCIC No.334, Sec. 1, Sichuan Rd., Banqiao Dist.		
1771	1769	TW	NCIC-LAB	NCIC No.334, Sec. 1, Sichuan Rd., Banqiao Dist.		
3350	3462	TW	HINET	Data Communication Business Group		
4523	4636	TW	TFN-TW-GCN-1	Taiwan Fixed Network Co., LTD.		
4549	4662	TW	QTCN-ASN1	GCNet Reach & Range Inc.		
4612	4747	TW	TFN-TW-TTN	TTN ASN merged by TFN		
4645	4780	TW	SEEDNET	Digital United Inc.		
4646	4781	TW	PAGICNET-AS1	PAGIC.netINC.		
4647	4782	TW	GSNET	Data Communication Business Group		
4648	4783	TW	SYSNET-AS1	SYSTEX CORPORATION		
4710	4845	TW	SINGTEL-TW	Chung Hsiao East Road		
7220	7478	TW	MACKAY-AS-AP	Mackay Telecommunication Inc.		
7222	7480	TW	STEVEYI-NETW	Tsung-Yi Yu		
7223	7481	TW	TWIX	Data Communication Business Group		



OONI Research Report



2023/Q1 - 2024/Q2

Data Range

(2023/10/01 - 2024/03/31)



11,826,278

Observed datas in TW



50

Unique ASN in the observed data in TW

(2024/04/15)



But ...

How many ASNs are registered in TW

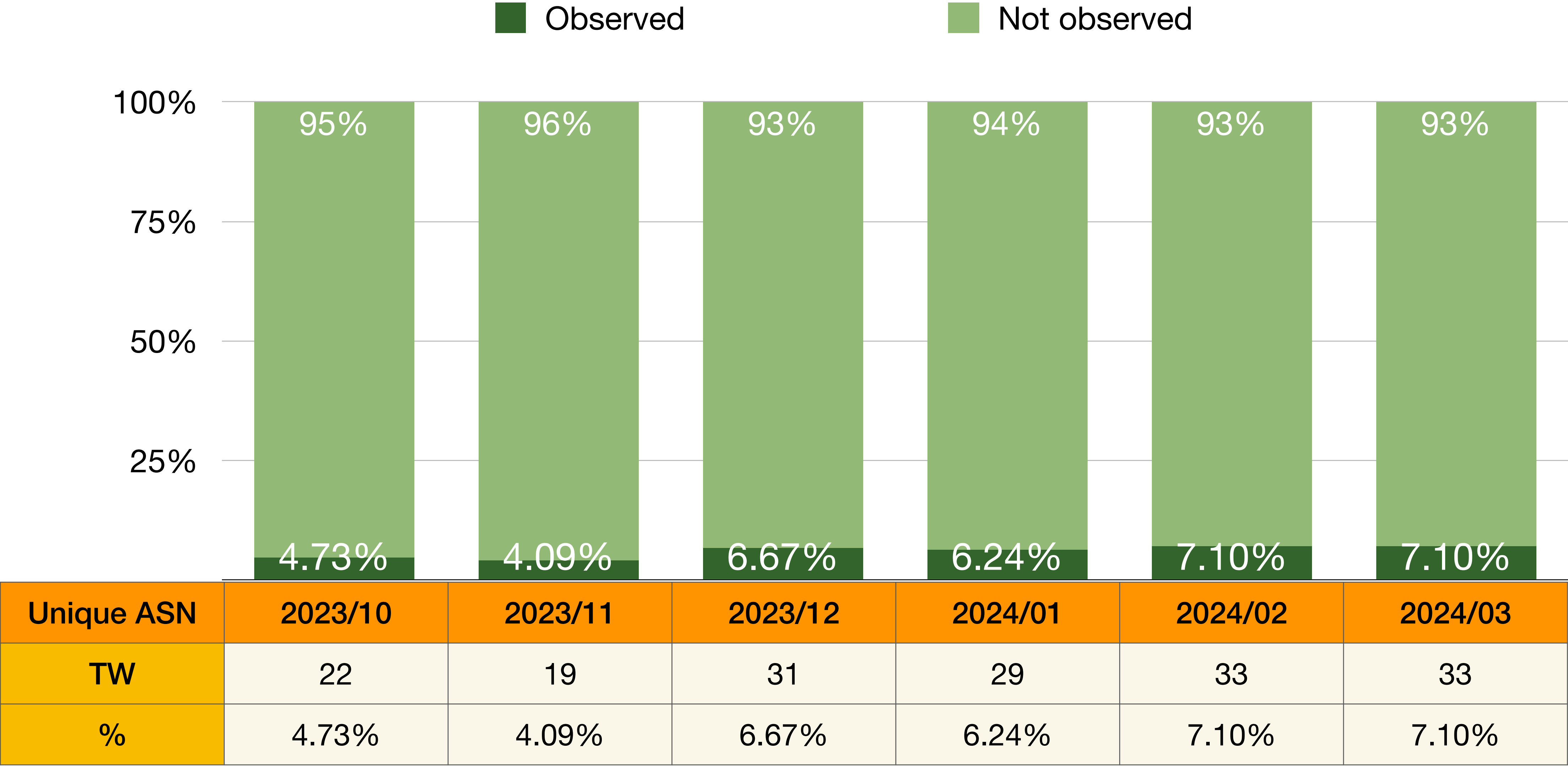
(2024/04/15)

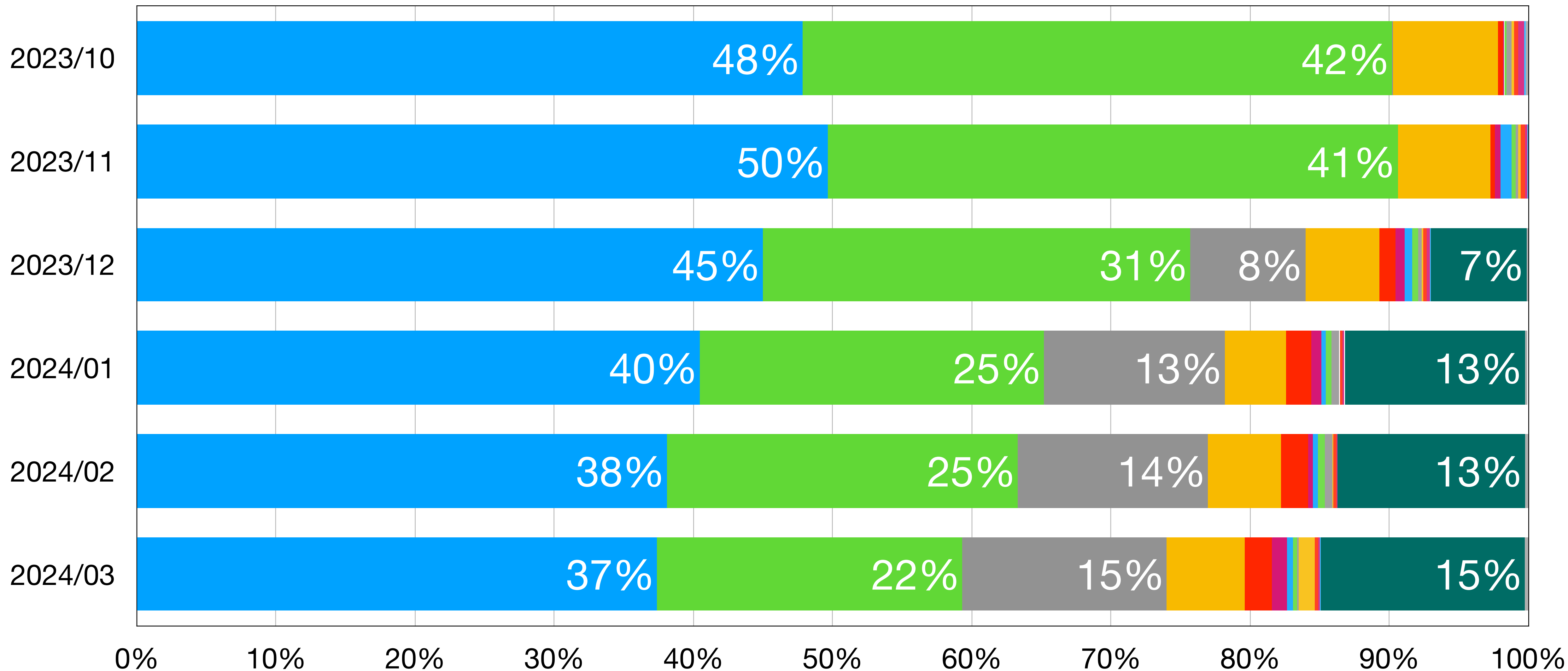
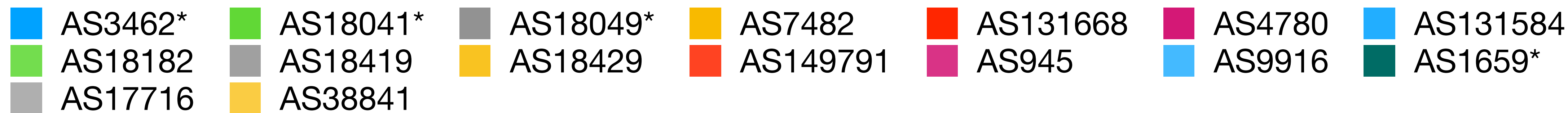


465

ASNs are registered in TW

(2024/04/15)







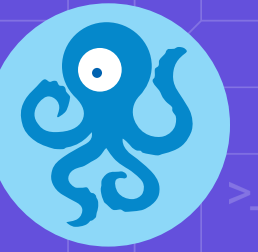
AS3462*	AS131668	AS18419	AS9916
AS18041*	AS4780	AS18429	AS1659*
AS18049*	AS131584	AS149791	AS17716
AS7482	AS18182	AS945	AS38841

Display ASNs at least 5 times from October 2023 to March 2024.

Top 3 ASNs



- AS3462 HINET, Data Communication Business Group
 - 中華電信數據通信分公司
- AS18041 TWDS-TRANSIT-AS-TW, Taiwan Digital Streaming Co.
 - 台灣數位串流有限公司
- AS18049 TINP-TW, Taiwan Infrastructure Network Technologie
 - 台灣基礎開發科技股份有限公司
- AS1659 ERX-TANET-ASN1, Taiwan Academic Network TANet Information Center
 - 臺灣學術網路



What we found



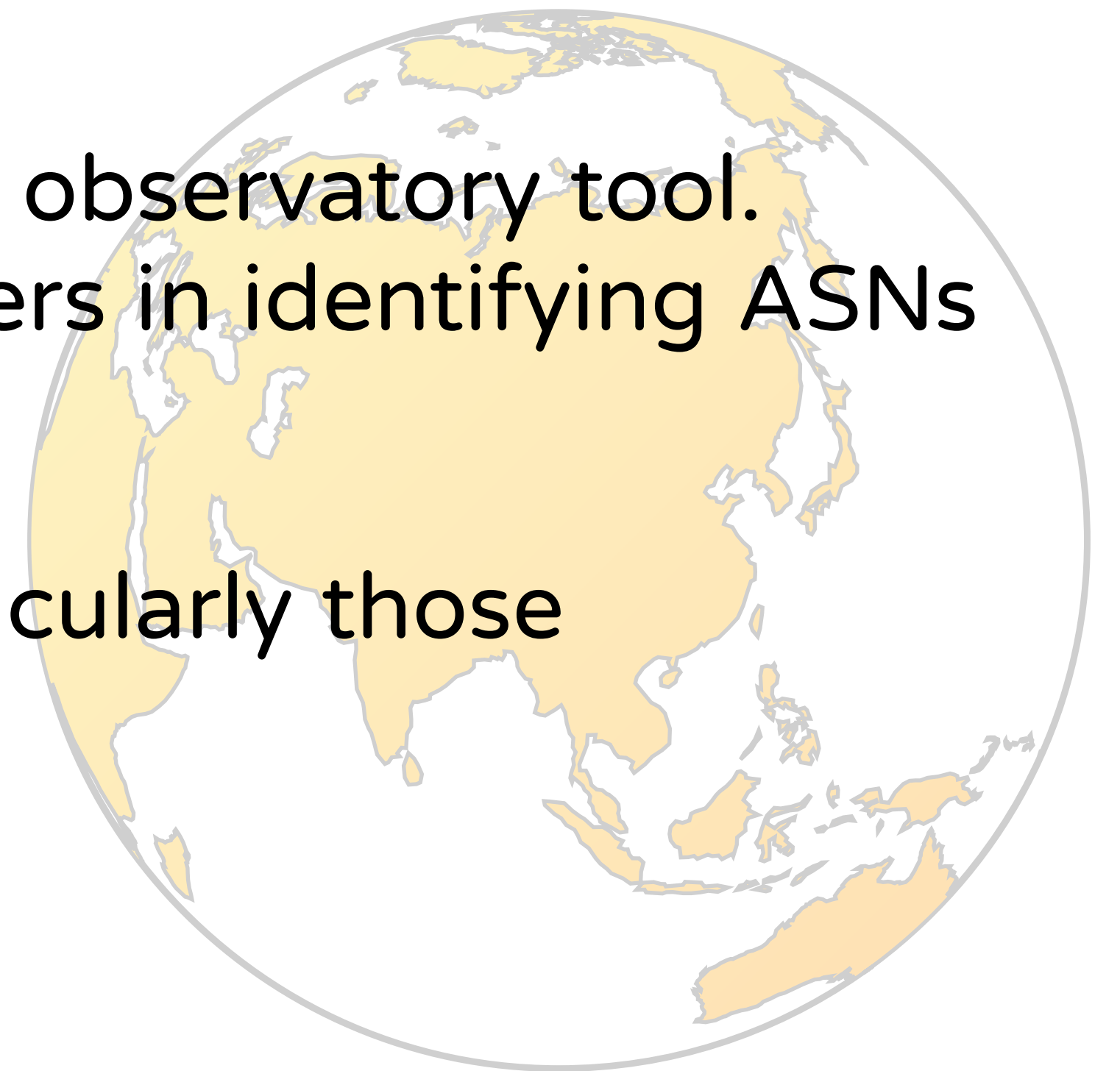
- Observed datas are more concentrated in few ASNs.
- In the current registration of ASNs in Taiwan, there are a total of 465, and the observation data (TW) with unique ASNs for only 4-7%, which is a relatively low proportion.
- AS3462, AS18041, AS18049, AS1659

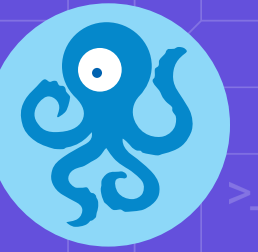


- Telecommunications in Taiwan
 - Major telecom operators : Chunghwa Telecom (中華電信) , Far EasTone (遠傳) , Taiwan Mobile (台灣大哥大)
 - Cable / MOD: cable TV, fixed network services.
 - Second-class telecom services (virtual mobile network services).



- This report provides an initial overview of the OONI observation data. It serves as a valuable resource for community partners to make informed decisions regarding promotion.
- Currently, we are encouraging volunteers to use the observatory tool. However, this approach will evolve to guide volunteers in identifying ASNs that are not currently under observation.
- Seek additional insights from different regions, particularly those neighboring Asia.





Special Thanks

What's happened

Rise suddenly in the observation data

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[Domains](#)

[Findings](#)

[English](#)

OONI Measurement Aggregation Toolkit (MAT)

Create charts based on aggregate views of real-time OONI data from around the world

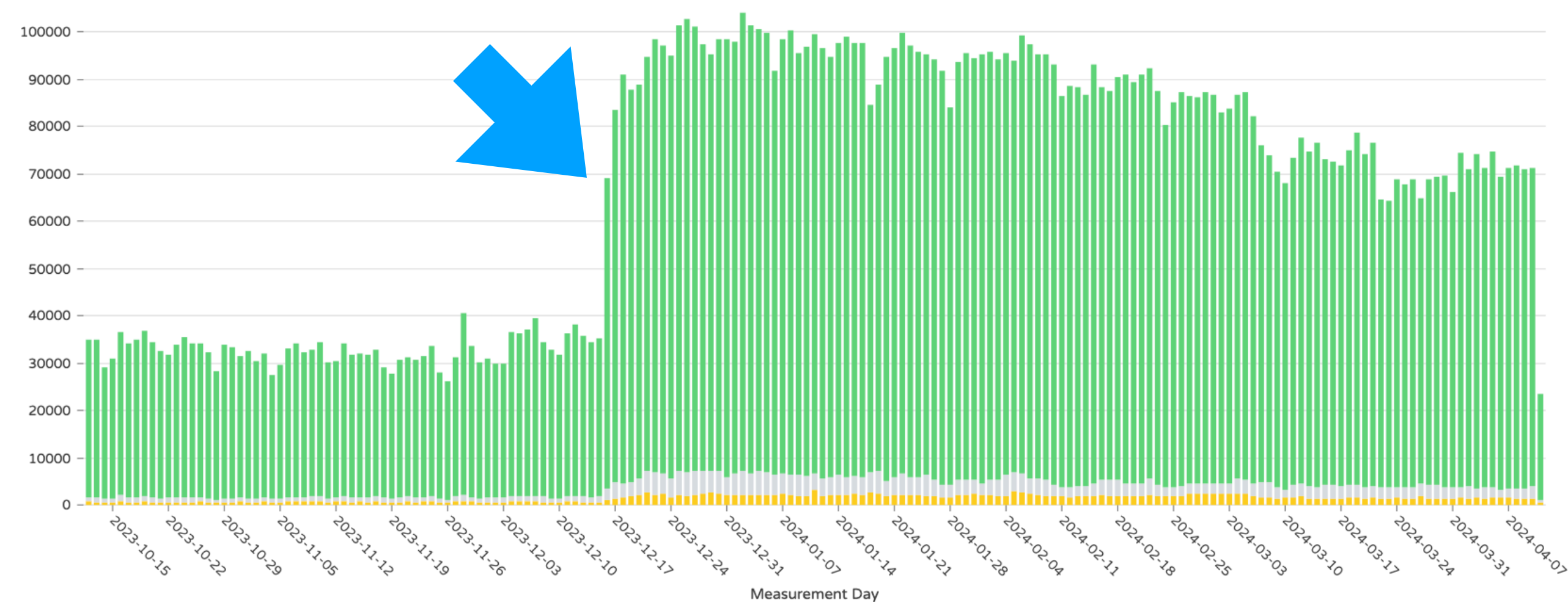
Country	ASN	From	Until	Time Granularity	Columns	Rows
Taiwan	AS1234	2023-10-12	2024-04-12	Day	Measurement Day	
Test Name	Domain	Input	Website Categories			
Web Connectivity Test	twitter.com	https://fbcdn.net/robots.txt	All			

Show Chart

Web Connectivity Test

Taiwan

OK Confirmed Anomaly Failure



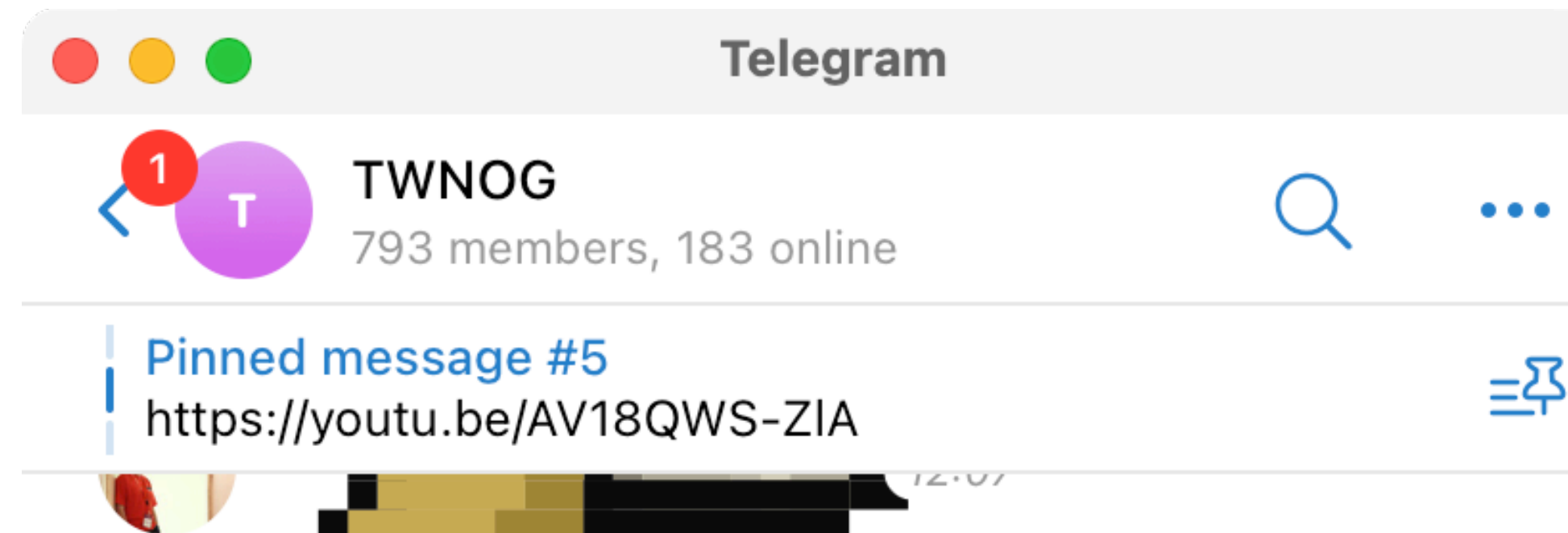
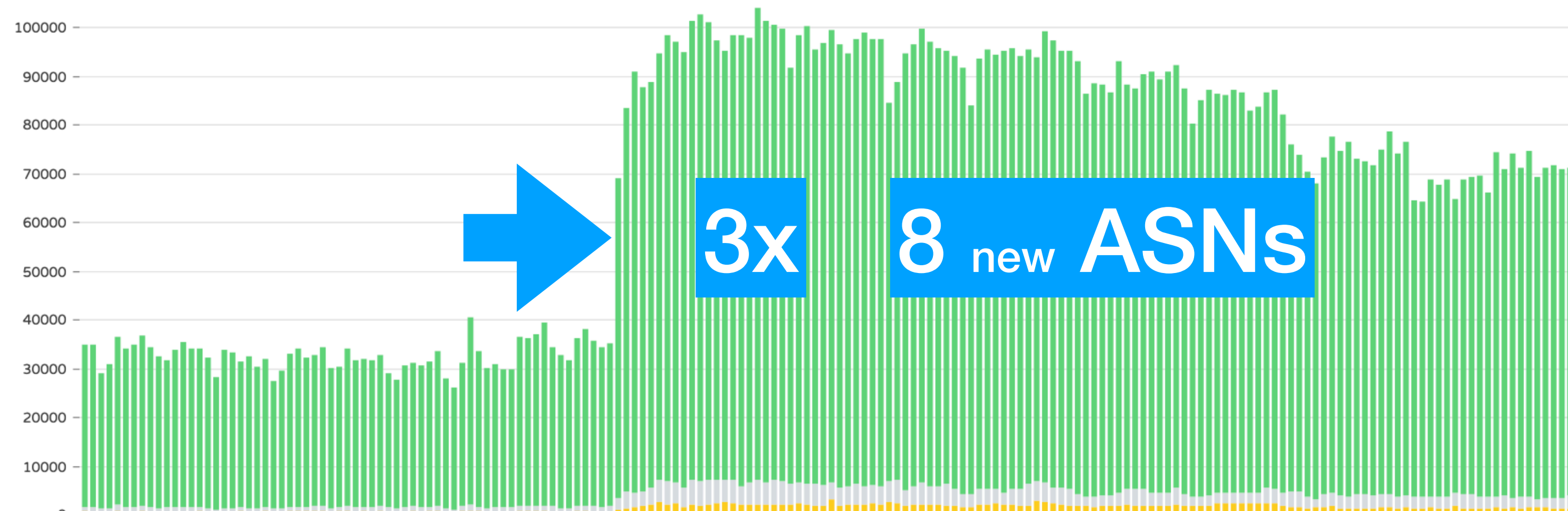


- After the report announced, the more volunteers even the ASN owners actively join us.

Web Connectivity Test

Taiwan

OK Confirmed Anomaly Failure



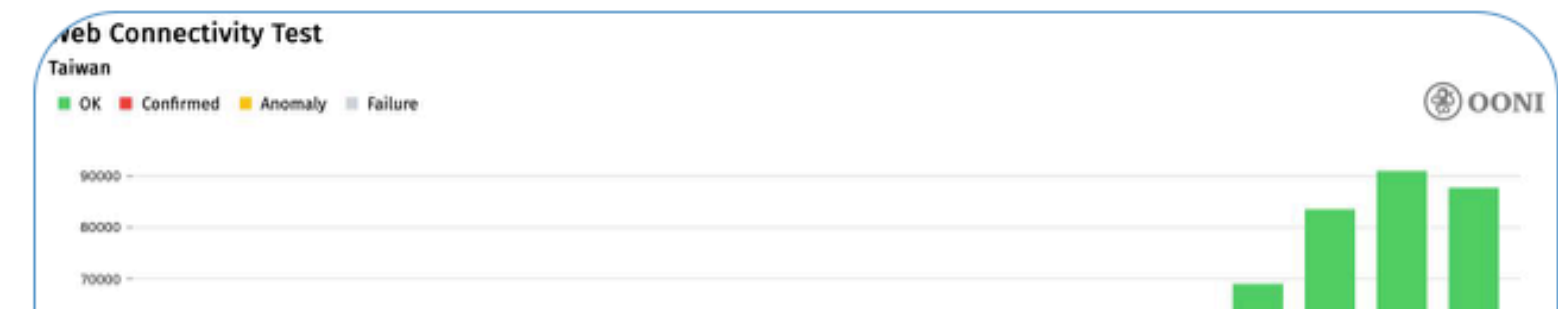
感謝大家前幾天的協助，從 12/16 開始有明顯觀察到一些新的 ASNs 紀錄 (AS131584、AS134823、AS18049、AS18182、AS18429、AS31972、AS4780、AS7482) [explorer.ooni]，有興趣提供觀察資料可以參考說明與報告，再次感謝。🌟🙏

explorer.ooni.org

OONI Explorer

OONI Explorer is an open data resource on Internet censorship around the world consisting of more than a billion measurements on network interference.

13:26 ✓✓



Toomore Chiang

Technical Project Lead



- Joined OCF in 2023/05.
- OCF: From the community, For the community.
- My mission is to make the open source communities and civic society organizations work together.
- I am also a volunteer at COSCUP since 2008.
- Backend Engineer. (Python)
- Before joining, I worked in e-commerce (Pinkoi) and advertising (Appier).



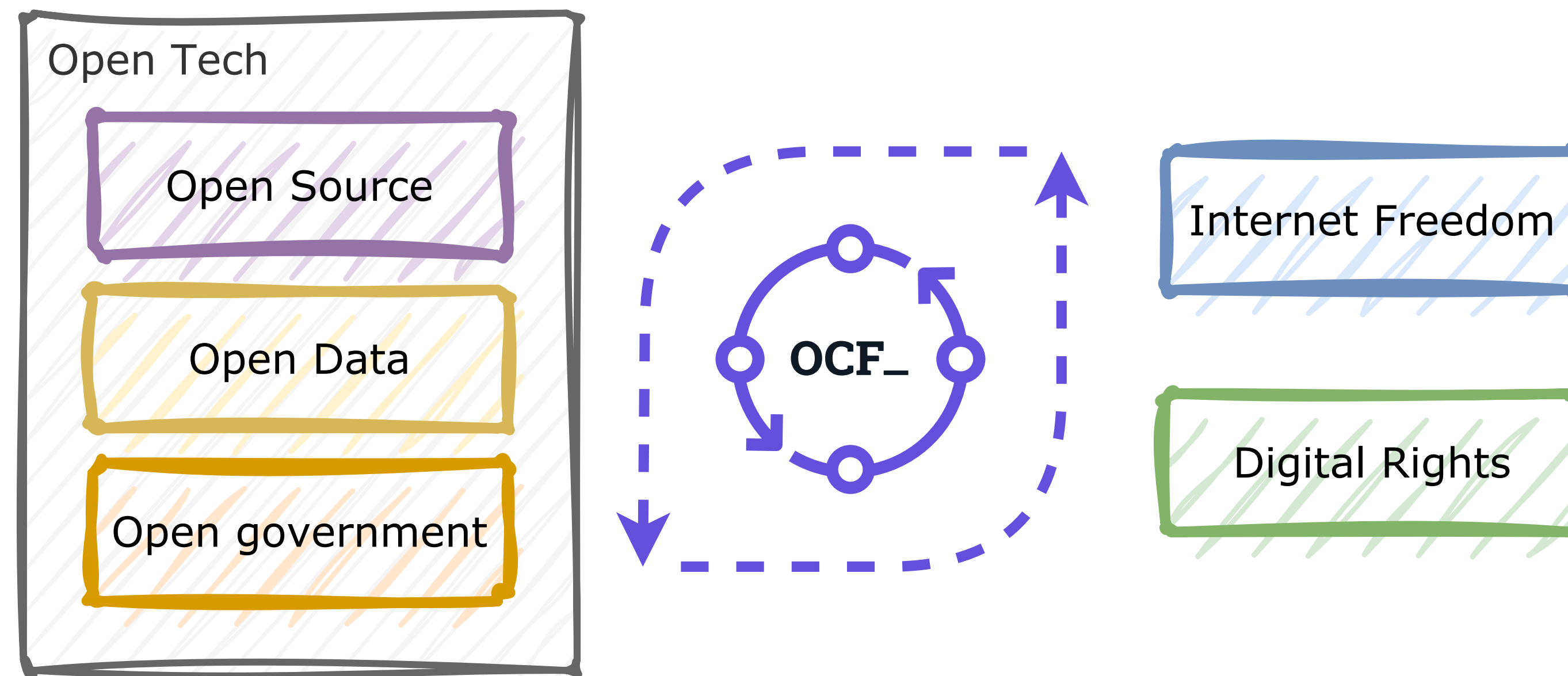
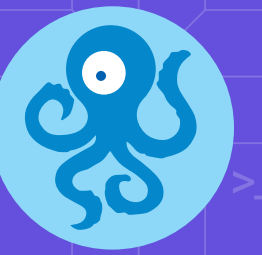
toomore@ocf.tw

PGP 0xEE4E7A36CB58C83A

Open Culture Foundation

開放文化基金會

OpenCulture
Foundation_



- Open Culture Foundation has been a NPO in Taiwan since 2014.
- We are dedicated to promoting the open source culture, open data, open tech in Taiwan.

Open Culture Foundation

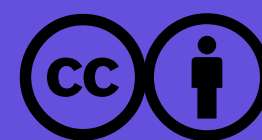
開放文化基金會

OpenCulture
Foundation_



- OCF aims to serve as a hub for Taiwan's open source community.
- The focus on creating an administrative center to facilitate the operation of Taiwan's open source community.

Thank you.



OpenCulture
Foundation