

Fearless, 1000 days and still running : the ‘most resilient’ exit nodes of the Tor network and their ISP’s – a quantitative approach.

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Abstract

We make use of metrics to identify what we call ‘the most resilient exit nodes of the Tor network’, and so gain an insight into their characteristics. This first quantitative answer, we hope, will be of help, both to the users and makers of this network.

1 Introduction

Some questions are like some flowers, so perennials : ‘*present at all seasons of the year*’.

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“*Can I install extensions for the Tor Browser?*”, “*What ISP should I use if I want to run a relay or exit node?*”, etc.

But to answer these, words should never be left long without numbers, and common language, with its inherent incertitudes, avoided as much as possible – hence we chose to opt for a different approach than has been generally so far, to answer one of them.

The quantitative approach adopted here will be a complement to the more qualitative methodologies preferred so far¹.

2 Methodology

Resilience here is understood as a combination of age and present status (i.e. the node must be running).

Our criteria in this study were :

- The relay is an exit node;
- The exit node has existed for at least 1000 days;²
- The exit node is running.

We make use of the Tor Metrics database³, where this translates into the following search query :

```
flag:exit running:true first_seen_days:1000-10000
```

With about 180 servers as a result, at the time of writing⁴.

To describe them going forward we use consistently the nomenclature ‘*most resilient*’.

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This approach, of course, merits comment, but it is the best ‘proxy’ (in the sense that this term has within statistics) that this problematic has for answer; an approximation in other words.

It does not account for instance for the fact that some of the most resilient Tor exits may have happened to be down, or offline, at the time of this writing, or that some of those recorded here may have been inactive for considerable periods of time. We do not account for this (though the aforementioned database provides this information for the latter).

¹<https://trac.torproject.org/projects/tor/wiki/doc/GoodBadISPs>

²An arbitrary value, as one must be chosen, resulting in a number of servers small enough to be handled by one researcher.

³<https://metrics.torproject.org/>

⁴The number fluctuated between 177 at the beginning, 180 in the middle, and 178 again by the end of our research (single day). We can only conclude this was attributable to the smaller nodes, hence we added a criteria of our own : bandwidth should be 1 MiB/s or more. The servers that were left did not change, we went through the list multiple times.

Because computer science is a social science – as computer scientists eventually always find out – it must deal with the same problems that these same sciences have been dealing with for centuries.

Except, they may find themselves not well equipped enough, lacking the right tools to solve these problems, having either rejected or ignored them.

This research gives an overview of the most resilient exits of the Tor network, and their ISP’s (Internet Service Providers).

3 Results

We truncate the values for total bandwidth.

ISP	Number of exit nodes amongst ‘most resilient’	Total bandwidth
OVH	10	155 MiB/s
Leaseweb	3	118 MiB/s
NForce	3	89 MiB/s
Online	6	53 MiB/s
Bahnhof	1	38 MiB/s
Flokinet	6	22 MiB/s

Table 1: Most resilient exit nodes of the Tor network and commercial ISP’s.

ISP / org.	Number of exit nodes amongst ‘most resilient’	Total bandwidth
Zwiebelfreunde E.V.	12	490 MiB/s
Calyx Institute	13	163 MiB/s
Tetaneutral.net	2	107 MiB/s
DFRI	5	105 MiB/s

Table 2: Most resilient Tor exit nodes and non-commercial ISP’s, organizations.

Tetaneutral.net, an ISP built as an association, provides services for the non-profit organization *Nos oignons*.

Finally, it is our understanding that *Zwiebelfreunde*, an association, is behind the exit nodes with nomenclature **nifty**.

4 Recommendations

From a prescriptive point of view, this does not mean users wishing to start a Tor relay or node – exit or otherwise – should necessarily choose

one of the companies which, in this research, come up often (e.g. OVH, Leaseweb or Online).

As the association *Nos oignons* – two of the largest ‘most resilient’ exit nodes – point out the Tor network suffers from what they call a problem of “diversity”, understood in the following specific sense :

(...) a big majority of Tor relays are hosted at OVH, Online and Hetzner, three leaders in cheap, mainstream hosting.

With the algorithm currently used by Tor to determine routes or circuits between relays, it would unfortunately be enough to compromise these three companies to gain a considerable overview of the network, and make it easy to launch attacks on users with the goal of de-anonymization.

By choosing other ISP’s, we contribute to improve the Tor network’s quality : the more relays are hosted with other providers, the harder it gets to conduct a global surveillance of the network, the better its security.⁵

Less obvious commercial ISP’s unveiled in this study include *NForce*, which provides more bandwidth to ‘most resilient’ exit nodes than *Online*, *Flokinet*, which services no less than 6 such relays, and *Bahnhof*, whose advertised bandwidth amongst these is considerable – to name a few.

⁵Our translation.

Acknowledgements

To the owners of the most resilient Tor exit nodes – who, with their pages they have given us much to laugh, and with their courage much to think, dream.

To the universities and their staff : the *University of Waterloo*, *Boston University*, the *University of North Carolina at Chapel Hill*, and *Carnegie Mellon University*.

To the organizations encountered :

<https://www.zwiebelfreunde.de/>
<https://www.calyxinstitute.org/>
<https://nos-oignons.net/>
<https://www.dfri.se/>
<https://www.hartvoorinternetvrijheid.nl/>
<https://www.gitoyen.net>
<https://digitalcourage.de/>
<https://effi.org/>

... – we apologize to those we could not identify and hence forgot.

We will not mention those who *in fact* are not among them, as they have identified themselves, but the reader is left to draw their own conclusions as to the merit of the ones that aren't here : be they their own universities, non-profit's or ISP's ... Contact them, and bring about change!

--- ca. 70 MiB/s

PrivacyRepublic0001	OVH SAS
ExitNinja	Leaseweb Deutschland GmbH
marylou2	Tetaneutral.net
niftymouse	Joshua Peter McQuistan
niftyquokka	Joshua Peter McQuistan
niftysugarglider	Joshua Peter McQuistan
niftychipmunk	Joshua Peter McQuistan

--- ca. 50 MiB/s

marylou1	Tetaneutral.net
apx1	NForce Entertainment B.V.
CalyxInstitute15	The Calyx Institute
niftypika	Joshua Peter McQuistan
niftyjerboa	Joshua Peter McQuistan
CalyxInstitute10	The Calyx Institute
niftypedetes	Joshua Peter McQuistan
gurgle	University of Waterloo
che	Bahnhof AB
tollana	BENESTRA, s.r.o.
dreamatorium	Unithost Internet B.V.
kree	BENESTRA, s.r.o.
ori	BENESTRA, s.r.o.
hviv104	SURFnet bv
niftyvolcanorabbit	Joshua Peter McQuistan
niftygerbil	Joshua Peter McQuistan
niftyhedgehog	Joshua Peter McQuistan
apx3	NForce Entertainment B.V.

--- ca. 30 MiB/s

Unnamed	Leaseweb USA, Inc.
ogopogo	Hextet Systems
niftycottontail	Joshua Peter McQuistan
DFRI5	Foreningen for digitala fri- och rattigheter
DFRI0	Foreningen for digitala fri- och rattigheter
Libero	Specialized Bulletin Board Systems
DFRI3	Foreningen for digitala fri- och rattigheter
prawksi	Hextet Systems
niftyguineapig	Joshua Peter McQuistan
manipogo	Hextet Systems
Dhalgren	Leaseweb Deutschland GmbH
dexter	Magyar Telekom plc.
QuintexAirVPN1	Quintex Alliance Consulting

--- ca. 20 MiB/s

jumpnet	TOCICI LLC
DigiGesTorle1	SOFTplus Entwicklungen GmbH
rehm	IP-Only Networks AB
DigiGesTorle2	SOFTplus Entwicklungen GmbH
Unnamed	Online S.a.s.
Unnamed	Online S.a.s.
DFRI1	Foreningen for digitala fri- och rattigheter
DFRI4	Foreningen for digitala fri- och rattigheter
birnenpfeffimitzimt	D-hosting die Rackspace & Connectivity GmbH
eddy	NForce Entertainment B.V.
xmission1	XMission, L.C.
AlGrothendieck	Association Gitoyen
argenla	Online S.a.s.

chaucer
snowfall
cowcat
PrivacyRepublic0002
TorThdNinja
multisec2
tor03k
lewverDuarUesSlaav
kramse2
Apollo
kramse
multisec5
multisec4
Wix

Hextet Systems
Hextet Systems
Hextet Systems
OVH SAS
OVH SAS
Broadnet AS
OVH SAS
ServerAstra Kft.
Zencurity ApS
Denetron LLC
Zencurity ApS
Broadnet AS
Broadnet AS
OVH SAS

--- ca. 10 MiB/s

PrivacyRepublic0003
batrelay
multisec3
PrivacyRepublic0004
Cloud
FelixIO
CalyxInstitute06
CalyxInstitute12
CalyxInstitute11
CalyxInstitute08
CalyxInstitute13
CalyxInstitute05
marcuse2
marcuse1
CalyxInstitute09
AquaRayTerminus
CalyxInstitute14
Minotaur
CalyxInstitute03
hedden
CalyxInstitute01
TorExitVIF
CalyxInstitute04
ua321
micole
torNodeCom2
BostonUCompSci
windeck
saveyourprivacyex1
glittershy
corewars
torNodeCom
Mercury
nacor
ibibUNC0
Unnamed
Unnamed
yuicat2

OVH SAS
Andreas Fink trading as Fink Telecom Services
Broadnet AS
OVH SAS
OVH SAS
Keyweb AG
The Calyx Institute

Ielo-liazo Services SAS
Ielo-liazo Services SAS

Aqua Ray SAS

GoDaddy.com, LLC

Quasi Networks LTD.

Concorde inc.

UA VPS LLC
PT Cloud Hosting Indonesia
Login, Inc.
Boston University
23media GmbH
Flokinet Ltd
MCI Communications Services, Inc. d/b/a Verizon Business
MULTACOM CORPORATION
Login, Inc.
Denetron LLC
CityNet Telekom Ltd.
University of North Carolina at Chapel Hill
Hurricane Electric LLC
I.C.S. Trabia-Network S.R.L.
CYBERDYNE

--- ca. 5 MiB/s

timcinel
Unnamed
ByteIndian
ByteIndian1
alkalal
balthaasar

OVH SAS
I.C.S. Trabia-Network S.R.L.
Online S.a.s.
Online S.a.s.
SC Fastweb SRL
Online S.a.s.

Unnamed	I.C.S. Trabia-Network S.R.L.
Digitalcourage3ip1	Martin Prager trading as NbIServ
cragg	RADIOGRAFICA COSTARRICENSE
TorExitRomania	Flokinet Ltd
PESEC	JSC ER-Telecom Holding
drogo	Makonix SIA
Unnamed	Inter Connects Inc
Unnamed	Flokinet Ltd
TorExitFinland	Flokinet Ltd
LebLibraries	Comcast Cable Communications, LLC
BoingBoing	Priority Colo Inc
PulseboxExit	OVH SAS
ekumen	GANDI SAS
cmutornode	Carnegie Mellon University
initramfs	Data Communication Business Group
tauro	DataCorpore Servi\u00E7os e Representa\u00E7\u00F5es
nibbana	Flokinet Ltd
HelpCensoredOnes	Visual Online S.A.
ThorExit	OVH SAS
Unnamed	Data Communication Business Group
LetoAms	Xs4all Internet BV
vcexit1	Flokinet Ltd
servicenode01	Get AS
Gertrude	Linode, LLC
zoombaroomba	Hostkey B.v.
anduinExit01	Broadnet AS
notamateurhour	AxcelX Technologies LLC
barwin	Data Miners S.A. (Racknation.cr)
toreffiorg	European Backbone Networks Inc.
RunningOnFumes1	Hydra Communications Ltd
CrashMe	EWE-Tel GmbH
Thoreau	CenturyLink Communications, LLC
HorstHanfblatt	Contabo GmbH

--- ca. 1 MiB/s