Russia vs. Telegram
technical notes on the battle

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35c3, Leipzig, 29 Dec 2018
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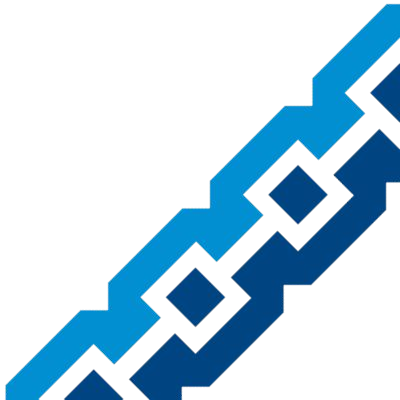
$ whoami

Internet measurement fanatic

NOT a Telegram team member

One of the millions of Telegram users

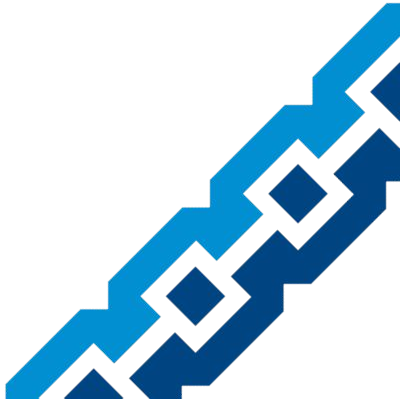
Brief history



Pre-blocklist era

2007 May 23: court order for 4 (four) ISP to block access to “extremist” websites

2007 Jul 14: the 1st issue of the “Federal List of Extremist Materials” by Ministry of Justice

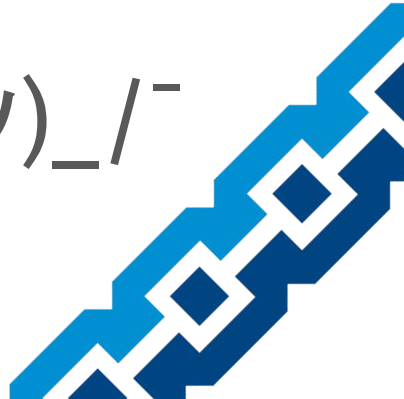


Librarian’s resistance

2011 Feb: www.zhurnal.lib.ru is banned

Maksim Moshkow “transfers” domain to the Ministry of Justice (via DNS “A” RR)

Some ISPs block minjust.ru ¯_(ツ)_/¯

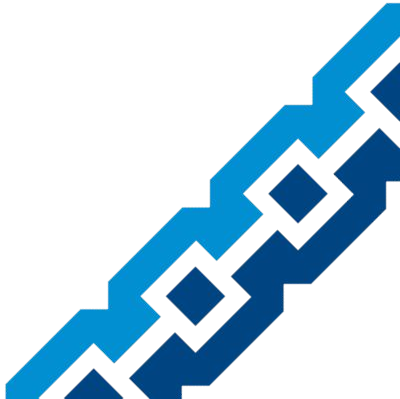


Blocklist awakens

2012 Jul 10: Wikipedia strikes, Yandex & VK protest

2012 Jul 11: the internet restriction bill accepted by Duma (Parliament)

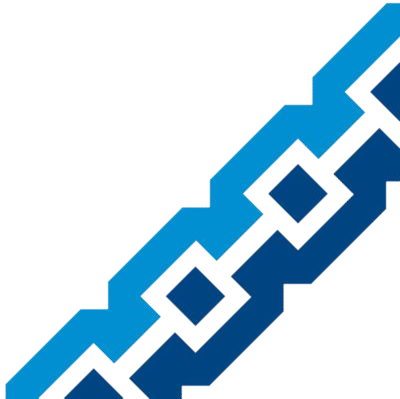
2012 Jul 28: the bill signed



What's the blocklist like today?

XML file, signed by CN=Roskomnadzor with GOST, fetched by ISPs via SOAP, updated at least hourly.

ISPs ***control*** filtering equipment. Roskomnadzor ***monitors*** it.



Blocklist 2012 awards

8 Nov: Absurdopedia (Uncyclopedia)

11 Nov: Lurkmore memepedia, lib.rus.ec

17 Nov: Github repo with blocklist leak

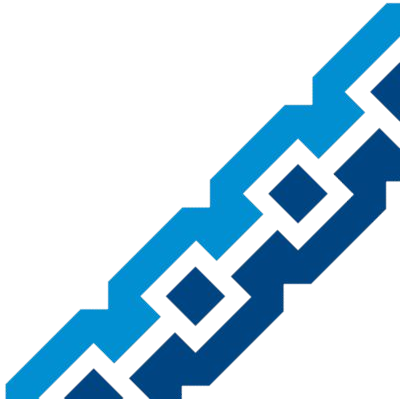
18 Nov: Google's https://....gstatic.com

Blacklisted resources in pre-Telegram era

Web Archive, GitHub, Google, LinkedIn, Pornhub, Reddit, VK, Wikipedia…

Comodo CA CRL & OCSP responders

127.0.0.1 (sic!)



“Revisor” — Roskomnadzor’s monitoring system

The law does not matter. The fine does.

2016 Jan: OpenWRT-based TP-Link MR3020, that was talking with C&C via https API without `ca-certificates` and via ssh without `known_hosts`

Внимание!

Эта страница НЕ ИМЕЕТ ОТНОШЕНИЯ к провайдеру, через которого осуществляется проверка факта открытия веб-сайтов Ревизором.

Подробную информацию читайте по ссылке: https://habrahabr.ru/post/282087/

ValdikSS

“Revisor” — complying with blackbox

No codified monitoring rules, just FAQ

Some ISPs reverse-engineer it

Some ISPs comply at best-effort

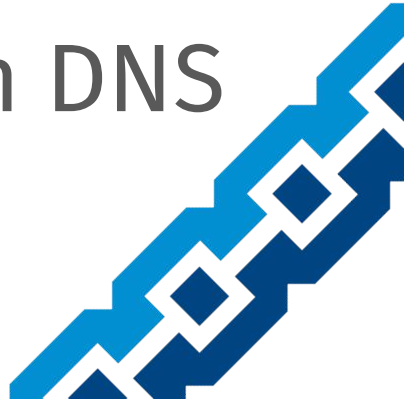
Some ISPs place it into a “sandbox”

Logo of Revisor-devoted Telegram chat @i_love_auditor

“Revisor” & DNS

ISPs are forced to comply with the black-box monitoring system

Stale IPs in `dump.xml`, “Revisor” using DNS… ⇒ ISPs feed A & AAAA from DNS ***directly*** to filters



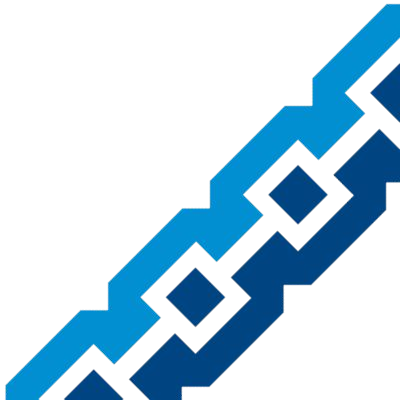
“Revisor”-provoked so called “DNS-attacks”

2017 May 15: block IP from DNS? Bo-om!

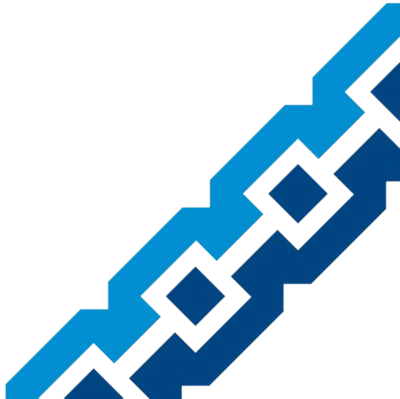
Adding /32 from DNS to routing table?

2017 Jun 7: drop IX peers!

2018 Mar 14: routers go on strike!



Telegram:
Policeman Enters The Game



Telegram? Why?

2017 Apr 7: St.Petersburg bombing

2017 Jun 26, FSB: “terrorists used TG”
RKN promises to block, counts days.

2017 Jun 28: Telegram added to the “Information Distributors Registry”

Telegram non-compliance

2017 Dec: Roskomsvoboda starts legal campaign Telegram vs. FSB

2018 Mar 20: court orders Telegram to pass encryption keys to FSB

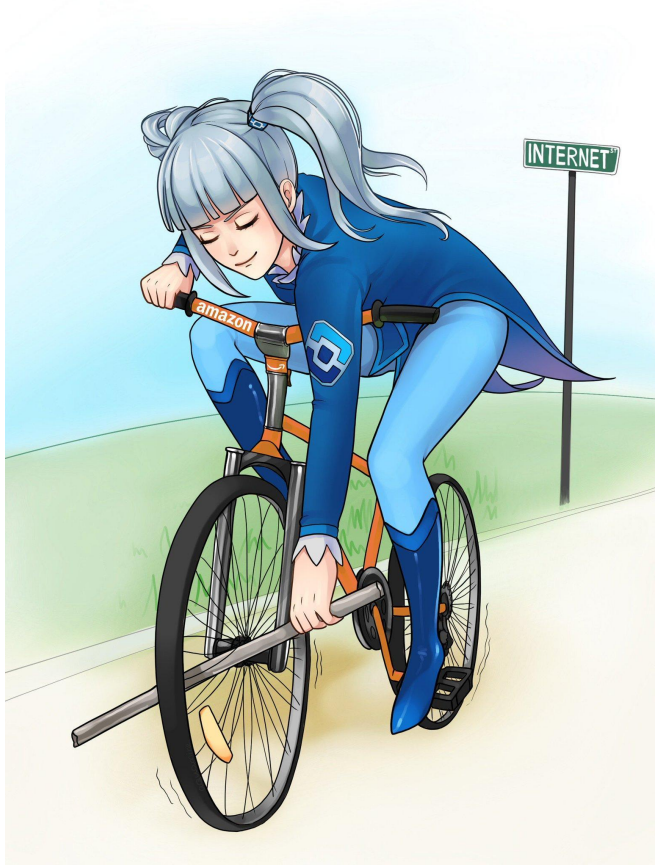
2018 Apr 16: RKN attempts to block

Civil cyber-war: leak of BGP-Blackholing letter

Mar 23: Mikhael Klimarev publishes leak

RKN plans ban of 15M IPs: 36 subnets of Amazon, SoftLayer, ... to block Zello.

Keywords: Null0, BGP, redistribute.



RKN-tan tries to block 14 million IP addresses of Amazon hosting half of Internet

– @aquam1ne

Civil cyber-war: April, 16th, TZ=MSK

11:39 RKN bans TG's ~/19, no effect

17:58 bans Amazon's ~/13, TG works

18:33 adds missing TG's /24 ¯_(ツ)_/¯

20:21 Google's /12, Amazon's /15...

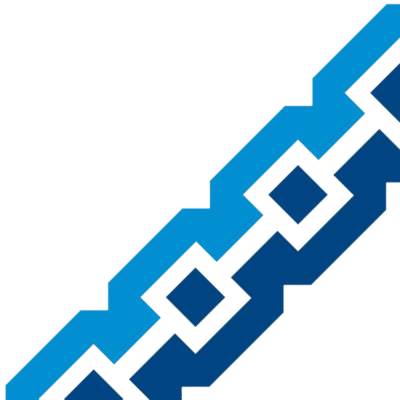
1.8 M IPs banned, Telegram is ~fine

Civil cyber-war: that escalated quickly

Apr 16: ~ 1.8 M banned IPs

Apr 17: ~ 16 M

Apr 22: ~ 19 M, *local* peak



Civil cyber-war: IP space sanity checks? Ha!

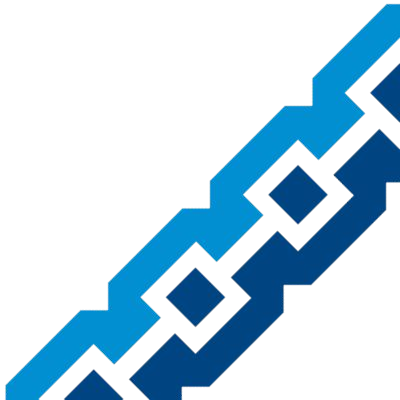
Overlapping subnets in blocklist:

52.0/11 ∩ 52.28/15

34.192/10 ∩ 34.240/13

52.192/11 ∩ 52.208/13

...



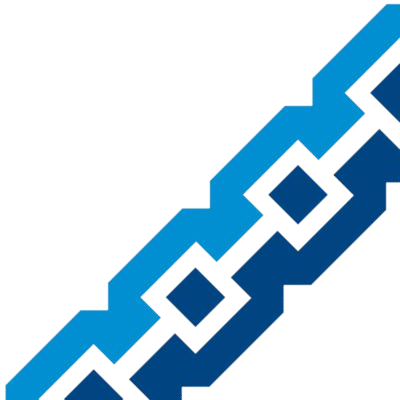
Civil cyber-war: URL sanity checks? Ha!

Malformed URL in blocklist:

<![CDATA[http:// 46.101.189.65]]>

^ whitespace

Guess, what filter do?



Civil cyber-war: major services by mistake? Ha!

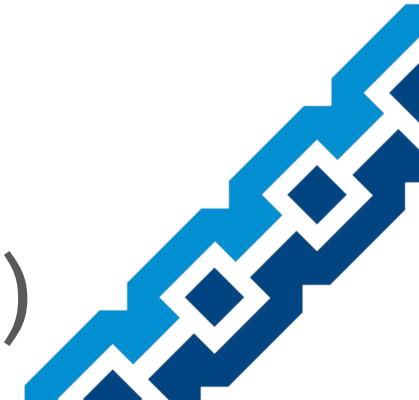
RKN: significant ones are not affected

Affected: ~34 k .ru, .рф, .su services

Affected: vk.com (87.240.129.133)

Affected: Yandex.Metrica (213.180.193.119)

Affected: Yandex ads (77.88.21.90)



Civil cyber-war: fakenews? Sure!

RKN: “Google Play, Google Drive and google.ru IPs were not banned”

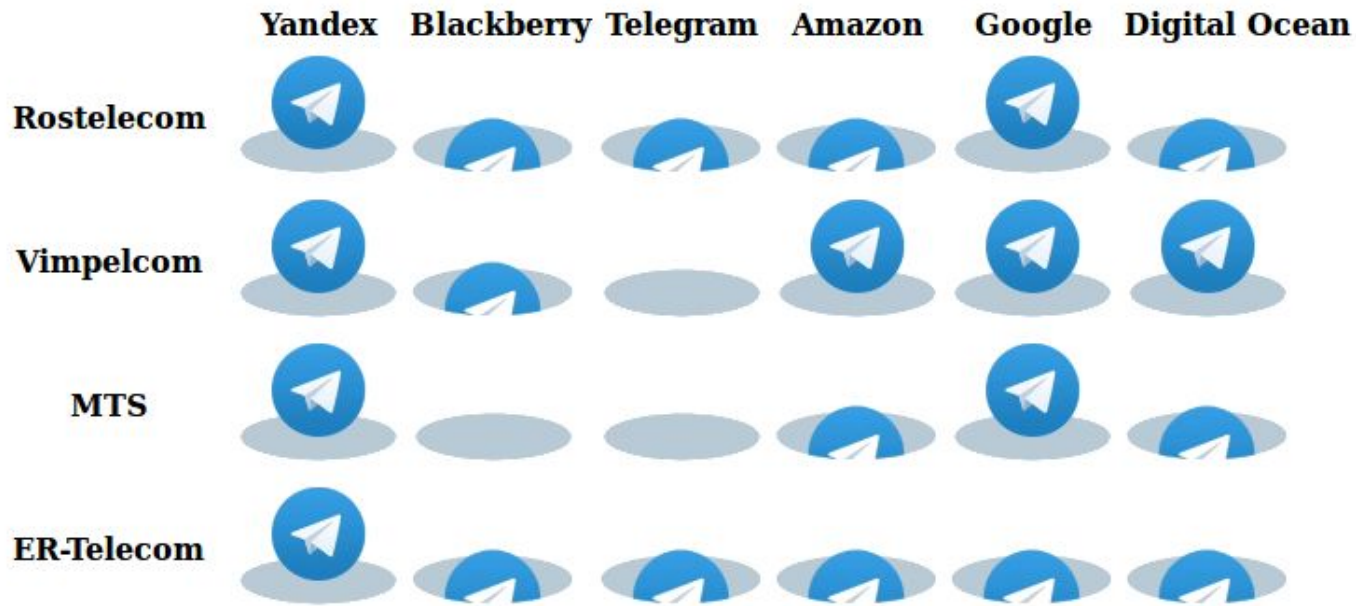
Data: dozens IPs of load balancers discovered via EDNS Client Subnet are actually blocklisted

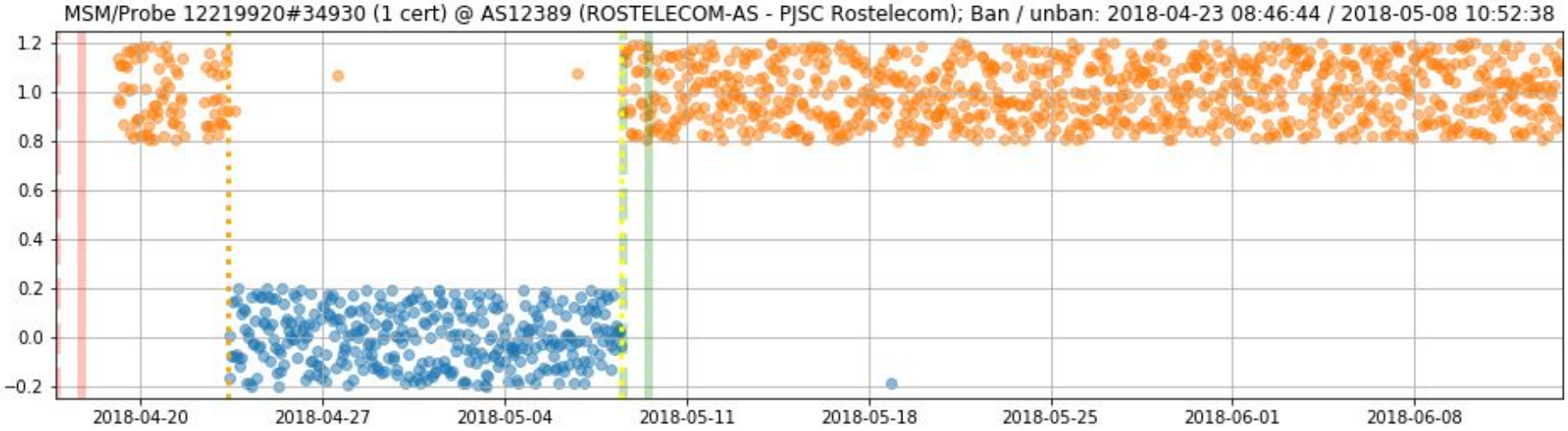
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	IPv4
www.google.com, №0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	418
google.com, №1	0	100	96	61	86	76	82	89	76	95	0	0	0	0	0	0	0	0	0	509
play.google.com, №2	0	94	100	60	84	75	81	87	75	94	0	0	0	0	0	0	0	0	0	520
www.youtube.com, №3	0	47	48	100	45	41	48	45	49	47	0	0	0	0	0	0	0	0	0	659
docs.google.com, №4	0	85	85	57	100	82	73	79	73	85	0	0	0	0	0	0	0	0	0	514
drive.google.com, №5	0	82	83	58	90	100	74	80	76	82	0	0	0	0	0	0	0	0	0	468
connectivitycheck.android.com, №6	0	94	95	71	85	78	100	90	79	94	0	0	0	0	0	0	0	0	0	444
clients3.google.com, №7	0	95	96	62	86	79	84	100	80	96	0	0	0	0	0	0	0	0	0	474
s.ytimg.com, №8	0	84	85	70	82	78	77	83	100	85	0	0	0	0	0	0	0	0	0	458
www.google-analytics.com, №9	0	95	96	61	86	75	82	89	76	100	0	0	0	0	0	0	0	0	0	510
stats.g.doubleclick.net, №10	0	0	0	0	0	0	0	0	0	0	100	40	0	0	0	0	0	0	0	308
googleads.g.doubleclick.net, №11	0	0	0	0	0	0	0	0	0	0	33	100	0	0	0	0	0	0	0	375
www.googletagmanager.com, №12	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	250
fonts.googleapis.com, №13	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	235
fonts.gstatic.com, №14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	86	92	0	0	275
www.google.ru, №15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	91	100	92	0	0	261
google.ru, №16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88	84	100	0	0	287
mail.google.com, №17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	91	362
gmail.com, №18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	100	351

G.DNS

Civil cyber-war: ISP non-compliance

А примерно так ISP (не) блокируют облака:





Delayed compliance example, RIPE Atlas data

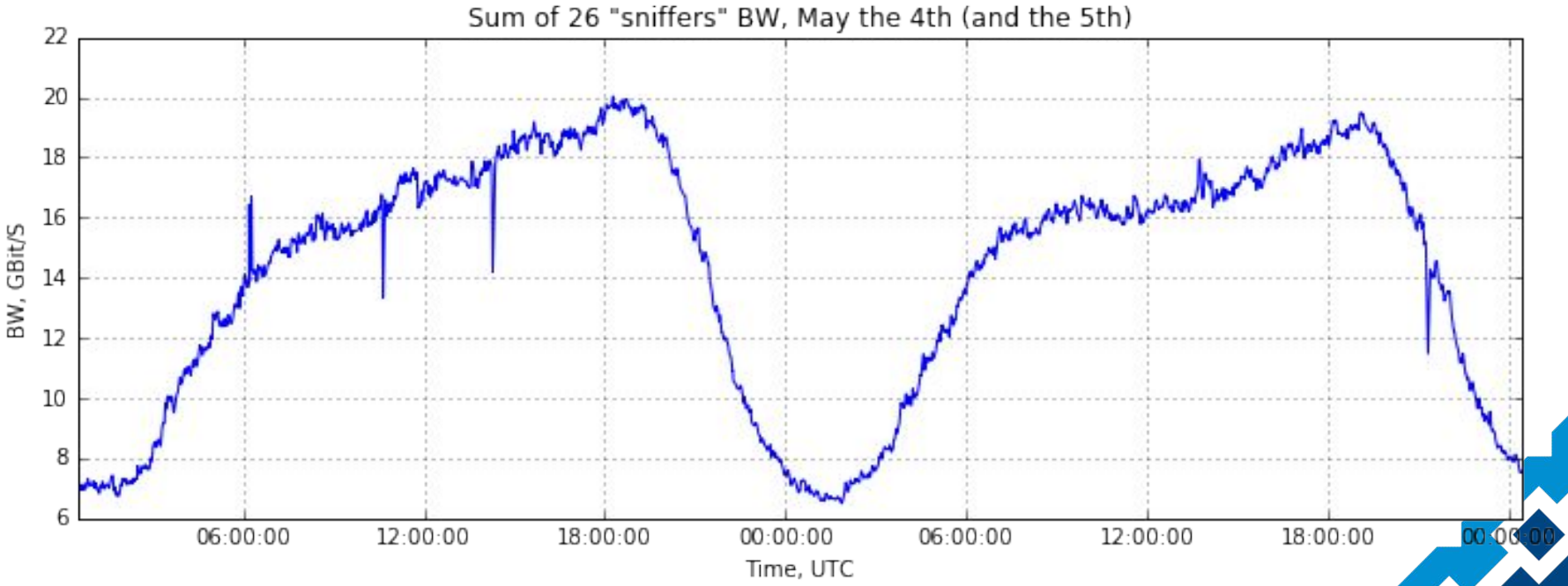
Civil cyber-war: lawful interception?

Sniffers used to hunt proxies?

28 Apr: public “tip”, 30 Apr: private tip

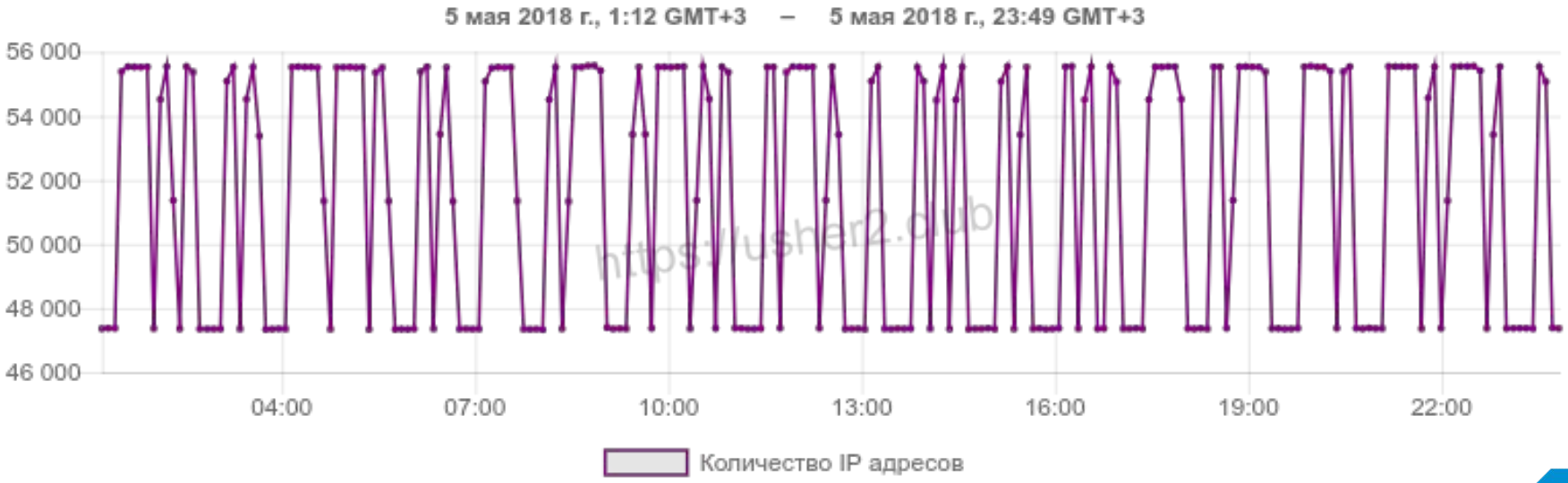
Unsecured SORMs, pumping 20 Gbit/s, leaking rpm repo, clickstream and PII?!

SORM: this incident was reported



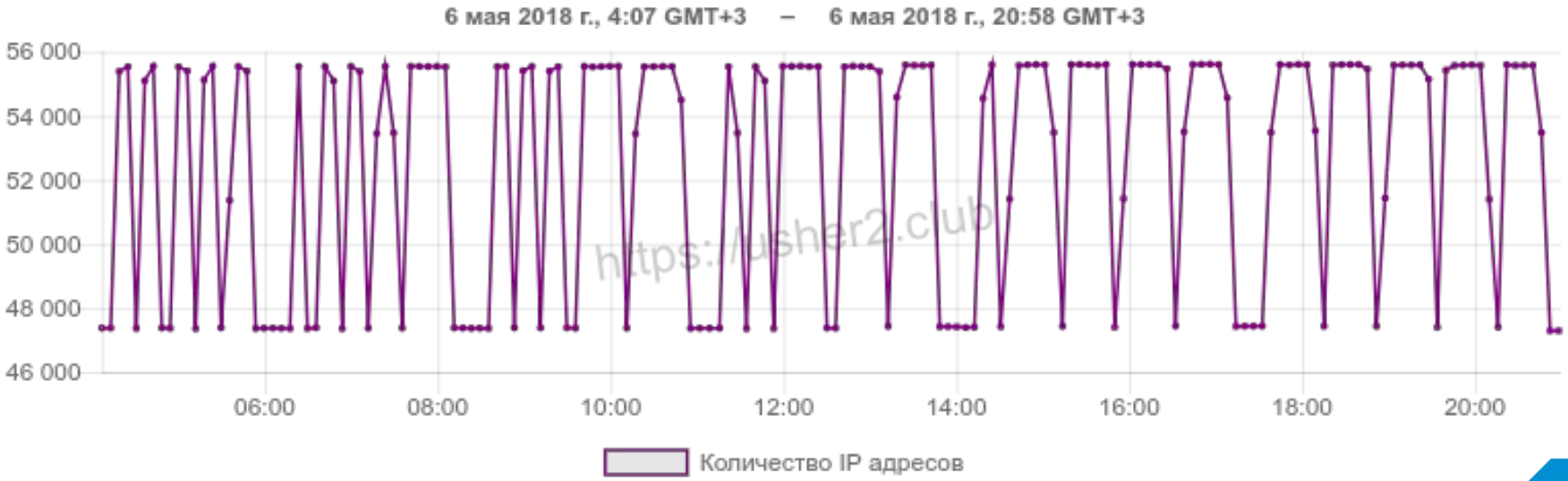
Protest meetings because of app ban!

Civil cyber-war: Morse prank



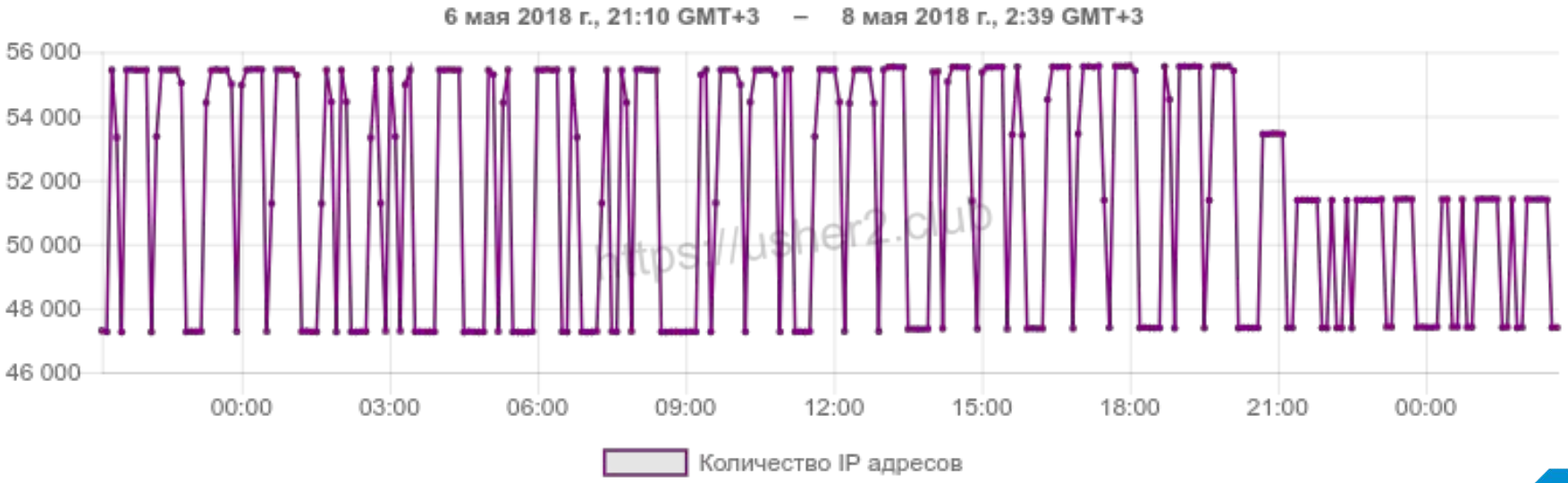
D I G I T A L R E S I S T A N C E

Civil cyber-war: Morse prank



Countdown (cheap drama)

Civil cyber-war: Morse prank



“Truly, Popov!” – Radio Day greeting

Civil cyber-war: prank-effects

Nice amplitude fade-out (thanks, RKN!)

“&.” TLD flash-blocking

15 M → 11 M banned IPs

Expired domains blocklist cleanup

Civil cyber-war: partial rollback

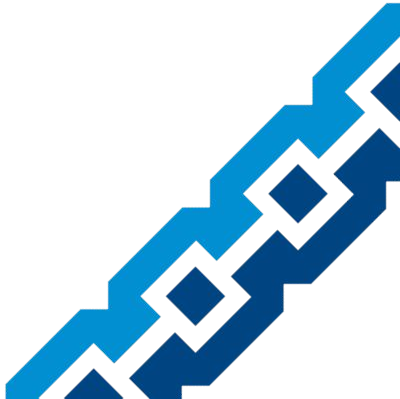
28 Apr: 19 M → 15 M (protest)

8 May: 15 M → 11 M (prank?)

8 Jun: 11 M → 3.7 M (?)

7 Jul: Open Letter on collateral damage had no effect, still ~3.7 M

PCAP or it didn’t happen



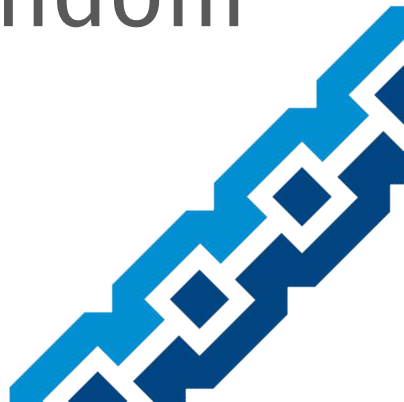
Selective protocol throttling

TG speaks Socks5, MTProto, MTproto-dd

~7500 kbps: Socks5, HTTP xor RC4

~22 kbps: MTProto, obfs4, `nc urandom`

Camouflage matters!



Proxy-hunting: MTProto

`pkt.len`-based hunting was noticed

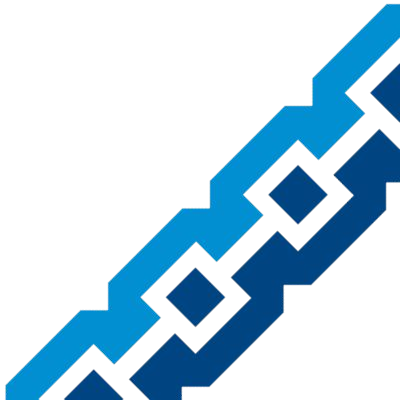
Rostelecom was part of the experiment

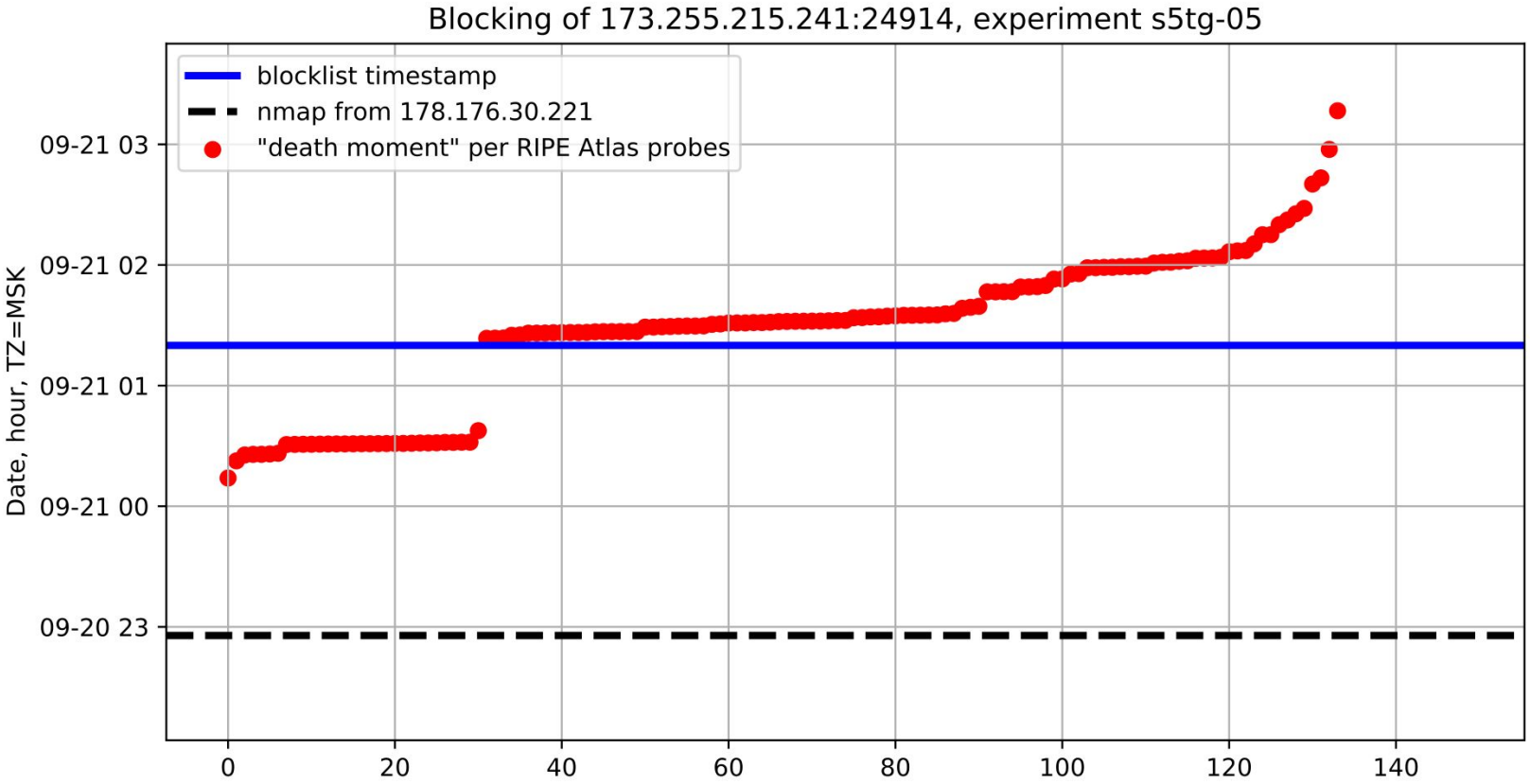
Any IP:Port may be killed by “knocking”

Reuters: “alike experiment happened”

Proxy-hunting: Socks5 in Moscow subway

1. One uses Socks5 in subway
2. Nmap scans IP:Port
3. Socks5-scanner tries connect(TG)
4. IP unreachable via ***some*** ISPs
5. IP officially blocklisted




Blocking of 173.255.215.241:24914, experiment s5tg-05
blocklist timestamp
nmap from 178.176.30.221
"death moment" per RIPE Atlas probes
Date, hour, TZ=MSK
09-21 03
09-21 02
09-21 01
09-21 00
09-20 23
0
20
40
60
80
100
120
140

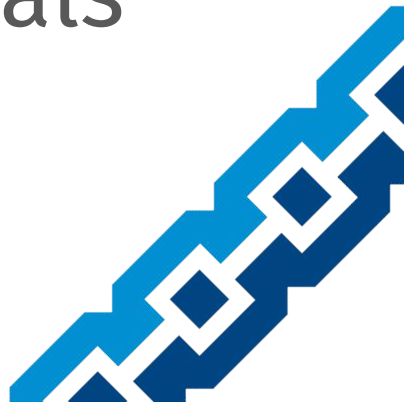
Secret blocklist private to some ISPs?

*> 4. IP unreachable via **some** ISPs*

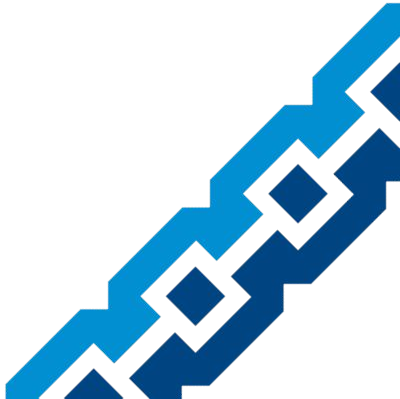
Some other blacklists exist... regional?...

...***at least*** List of Extremist Materials

Block-race is still observed



And then things got worse



Roskomnadzor: The Phantom Menace

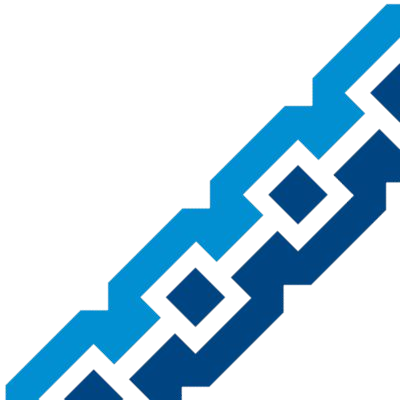
RKN deploys “anti-threat” equipment

That also acts as filter

RKN ***directly*** controls IP routing & DNS

Registry of “good” Internet Exchanges

so it goes



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Thanks RKN & Durov for fun!

Questions?

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