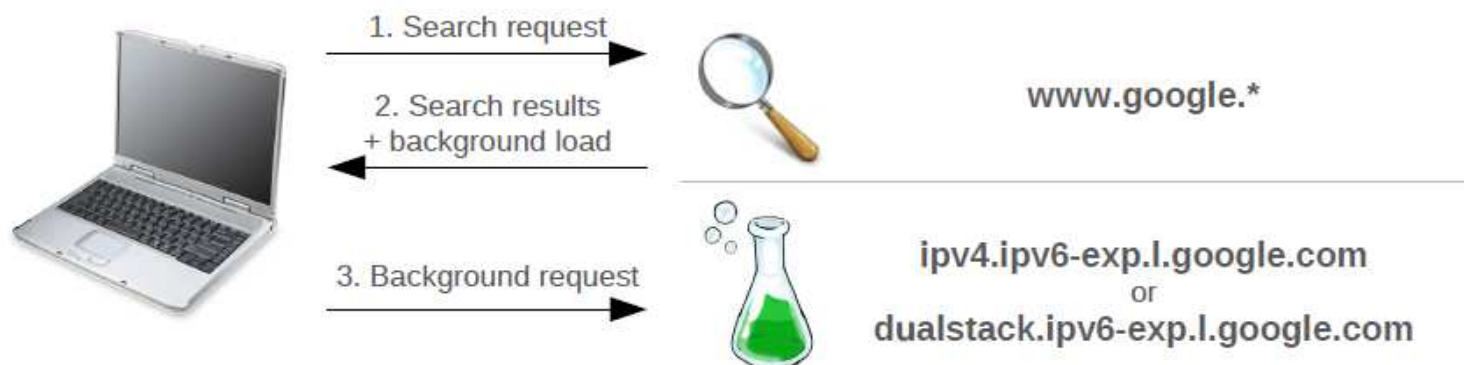


Global IPv6 statistics - Measuring the current state of IPv6 for ordinary users

Methodology



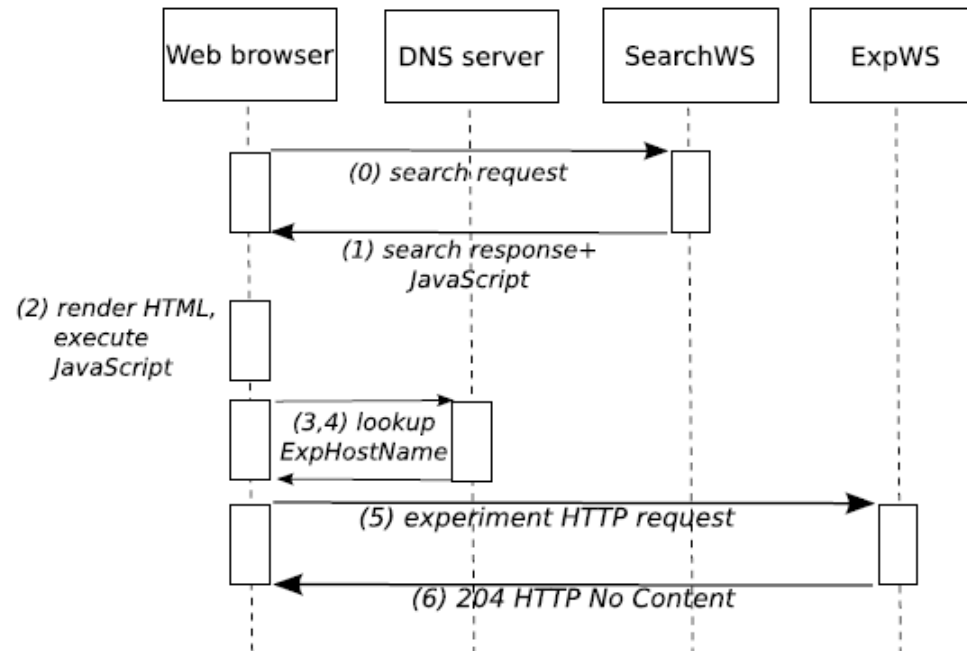
- Enroll a small fraction of ordinary Google users into an “IPv6 experiment”, where their browser is asked to perform a background request
 - Involves users from all datacenters equally, but background request goes to one of two datacenters (one in the US, one in Europe)
 - Cryptographically signed to avoid easy injection of false data



- Recorded information:
 - IPv4 and IPv6 addresses, as applicable
 - Image request latency
 - Browser/OS details (User-Agent string)

Evaluating IPv6 Adoption in the Internet

<http://research.google.com/pubs/archive/36240.pdf>



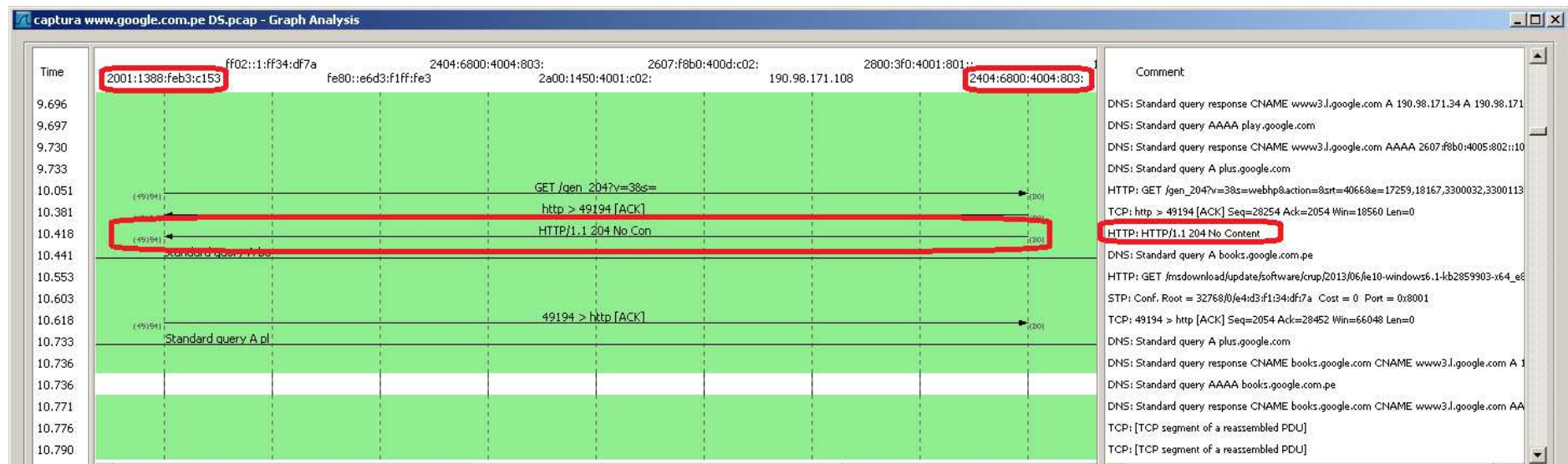
1. SearchWS adds to the search results a JavaScript fragment which instructs the browser to fetch a URL (the *ExpURL*) containing an ExpHostName.
2. If the browser executes the Javascript code, it will:
 - (a) Execute a DNS lookup for the ExpHostName (either A or AAAA+A)
 - (b) Receive an IPv4 and/or an IPv6 ExpVIP (depending on which ExpHostName and which DNS records were requested)
 - (c) Send an HTTP request (the *ExpRequest*) to the ExpVIP
3. If ExpWS receives the ExpRequest, it logs it and returns to the browser a HTTP 204 No Content response.

Conexiones IPv6 al acceder a www.google.com.pe

IPv6 Conversations: captura www.google.com.pe D5.pcap

IPv6 Conversations: 12

Address A	Address B	Packets	Bytes	Packets A→B	Bytes A→B	Packets B→A	Bytes B→A	Rel Start	Duration	bps A→B	bps B→A
fe80::392f:4e5e:b287:5603	ff02::1:3	14	1 212	14	1 212	0	0	5.071523000	13.2192	733.48	N/A
2001:1388:feb3:c153:4029:330f:5179:1b6a	ff02::1:ff34:df7a	1	86	1	86	0	0	7.629495000	0.0000	N/A	N/A
2001:1388:feb3:c153:4029:330f:5179:1b6a	fe80::e6d3:f1ff:fe34:df7a	7	602	3	258	4	344	7.642594000	95.9968	21.50	28.67
2001:1388:feb3:c153:4029:330f:5179:1b6a	2404:6800:4004:803::1014	17	2 572	10	1 528	7	1 044	7.642894000	91.2346	133.98	91.54
2001:1388:feb3:c153:4029:330f:5179:1b6a	2a00:1450:4001:c02::8b	29	6 077	15	1 983	14	4 094	7.705088000	91.1500	174.04	359.32
2001:1388:feb3:c153:4029:330f:5179:1b6a	2607:f8b0:400d:c02::5f	22	5 554	11	1 696	11	3 858	7.711233000	90.8788	149.30	339.62
2001:1388:feb3:c153:4029:330f:5179:1b6a	2800:3f0:4001:801::100f	140	93 940	56	4 998	84	88 942	8.307196000	98.8475	404.50	7198.32
2001:1388:feb3:c153:4029:330f:5179:1b6a	2404:6800:4004:803::1017	88	37 210	46	5 543	42	31 667	8.308672000	92.6864	478.43	2733.26
2001:1388:feb3:c153:4029:330f:5179:1b6a	2001:44b8:2::2	6	574	3	287	3	287	11.733428000	3.8107	602.51	602.51
2001:1388:feb3:c153:4029:330f:5179:1b6a	2001:44b8:1::1	2	190	1	95	1	95	12.214070000	0.4274	N/A	N/A
fe80::392f:4e5e:b287:5603	fe80::e6d3:f1ff:fe34:df7a	8	672	4	344	4	328	66.281647000	44.0854	62.42	59.52
fe80::e6d3:f1ff:fe34:df7a	ff02::1	1	118	1	118	0	0	112.238912000	0.0000	N/A	N/A



Direcciones IPv6 en LAN – Acceso IPv6 ADSL

```

DIRCEU#
DIRCEU#
DIRCEU#sh ip arp
Protocol Address Age (min) Hardware Addr Type Interface
Internet 10.10.10.1 - e4d3.f134.df7a ARPA Vlan1
Internet 10.10.10.3 0 0023.14cc.3900 ARPA Vlan1
Internet 10.10.10.4 18 5c0a.5beb.8a34 ARPA Vlan1
Internet 10.10.10.5 0 e892.a47b.738b ARPA Vlan1
Internet 10.10.10.6 0 e0cb.4eeb.05ae ARPA Vlan1
Internet 10.10.10.7 6 8060.0741.2c1a ARPA Vlan1
DIRCEU#
DIRCEU#
DIRCEU#
DIRCEU#sh ipv6 neig vlan 1
IPv6 Address Age Link-layer Addr State Interface
FE80::EA92:A4FF:FE7B:738B 1 e892.a47b.738b STALE V11
FE80::F8BD:6465:1EB5:5DB 0 0023.14cc.3900 REACH V11
2001:1388:FEB3:C153:4029:330F:5179:1B6A 0 e0cb.4eeb.05ae REACH V11
2001:1388:FEB3:C153:8078:BF47:C24F:F873 0 0023.14cc.3900 REACH V11
FE80::392F:4E5E:B287:5603 0 e0cb.4eeb.05ae REACH V11
2001:1388:FEB3:C153:F8:7CBA:F3BC:B37 37 0023.14cc.3900 STALE V11
2001:1388:FEB3:C153:D0D0:8AAD:1F75:93A4 136 e0cb.4eeb.05ae STALE V11
2001:1388:FEB3:C153:EA92:A4FF:FE7B:738B 0 e892.a47b.738b REACH V11
DIRCEU#
DIRCEU#

```

Home User	IPv4 Privada	Global IPv6 (Temporal)	MAC-Address
Laptop 1	10.10.10.3	2001:1388:FEB3:C153:8078:BF47:C24F:F873	0023.14cc.3900
PC 1	10.10.10.6	2001:1388:FEB3:C153:4029:330F:5179:1B6A	e0cb.4eeb.05ae
Cell Android 1	10.10.10.5	2001:1388:FEB3:C153:EA92:A4FF:FE7B:738B	e892.a47b.738b

Direccion IPv6 detectada Laptop 1 - <http://ipv6-test.com/>

Your internet connection is **IPv6** capable

2001:1388:feb3:c153:8078:bf47:c24f:f873 

Telefonica del Peru S.A.A.



Address type is
Global Unicast / Native IPv6

Your internet connection is **IPv4** capable

181.67.28.20 

Telefonica del Peru S.A.A.



Informacion Direccion IPv6 Laptop 1 – Windows 7

```
Adaptador de LAN inalámbrica Conexión de red inalámbrica:
    Sufijo DNS específico para la conexión. . . : 
    Descripción . . . . . : Intel(R) Centrino(R) Advanced-N 6
2000 AGN
    Dirección física. . . . . : 00-23-14-CC-39-00
    DHCP habilitado . . . . . : sí
    Configuración automática habilitada . . . : sí
    Dirección IPv6 . . . . . : 2001:1388:feb3:c153:f8bd:6465:1eb5:5db(P
    eferido)
    Dirección IPv6 temporal. . . . . : 2001:1388:feb3:c153:8078:bf47:c24f:f873<
    Preferido>
    Dirección IPv6 local. . . . . : fe80::e6d3:f1ff:fe34:df7a%10
    Dirección IPv4. . . . . : 10.10.10.3(Preferido)
    Máscara de subred . . . . . : 255.255.255.240
    Concesión obtenida. . . . . : viernes, 14 de junio de 2013 10:2
9:41 p.m.
    La concesión expira . . . . . : sábado, 15 de junio de 2013 12:29
:41 a.m.
    Puerta de enlace predeterminada . . . . . : fe80::e6d3:f1ff:fe34:df7a%10
    10.10.10.1
    Servidor DHCP . . . . . : 10.10.10.1
    IAID DHCPv6 . . . . . : 234890004
    DUID de cliente DHCPv6. . . . . : 00-01-00-01-19-15-C5-76-00-23-14-
CC-39-00
    Servidores DNS. . . . . : 2001:44b8:1::1
    2001:44b8:2::2
    200.48.225.130
    200.48.225.148
    NetBIOS sobre TCP/IP. . . . . : habilitado
```

<http://ccieblog.co.uk/ipv6/windows-7-temporary-address-ipv6>

Direccion IPv6 detectada PC 1 - <http://ipv6-test.com/>

Your internet connection is **IPv6** capable

2001:1388:feb3:c153:4029:330f:5179:1b6a ⓘ

Telefonica del Peru S.A.A.



Address type is

Global Unicast / Native IPv6

Your internet connection is **IPv4** capable

181.67.28.20 ⓘ

Telefonica del Peru S.A.A.



Informacion Direccion IPv6 PC1 – Windows 7

```
C:\Users\mdaroytthy>ipconfig /all

Configuración IP de Windows

Nombre de host. . . . . : mdaroytthy-PC
Sufijo DNS principal . . . . . :
Tipo de nodo. . . . . : híbrido
Enrutamiento IP habilitado. . . : no
Proxy WINS habilitado . . . . . : no

Adaptador de Ethernet Conexión de área local:

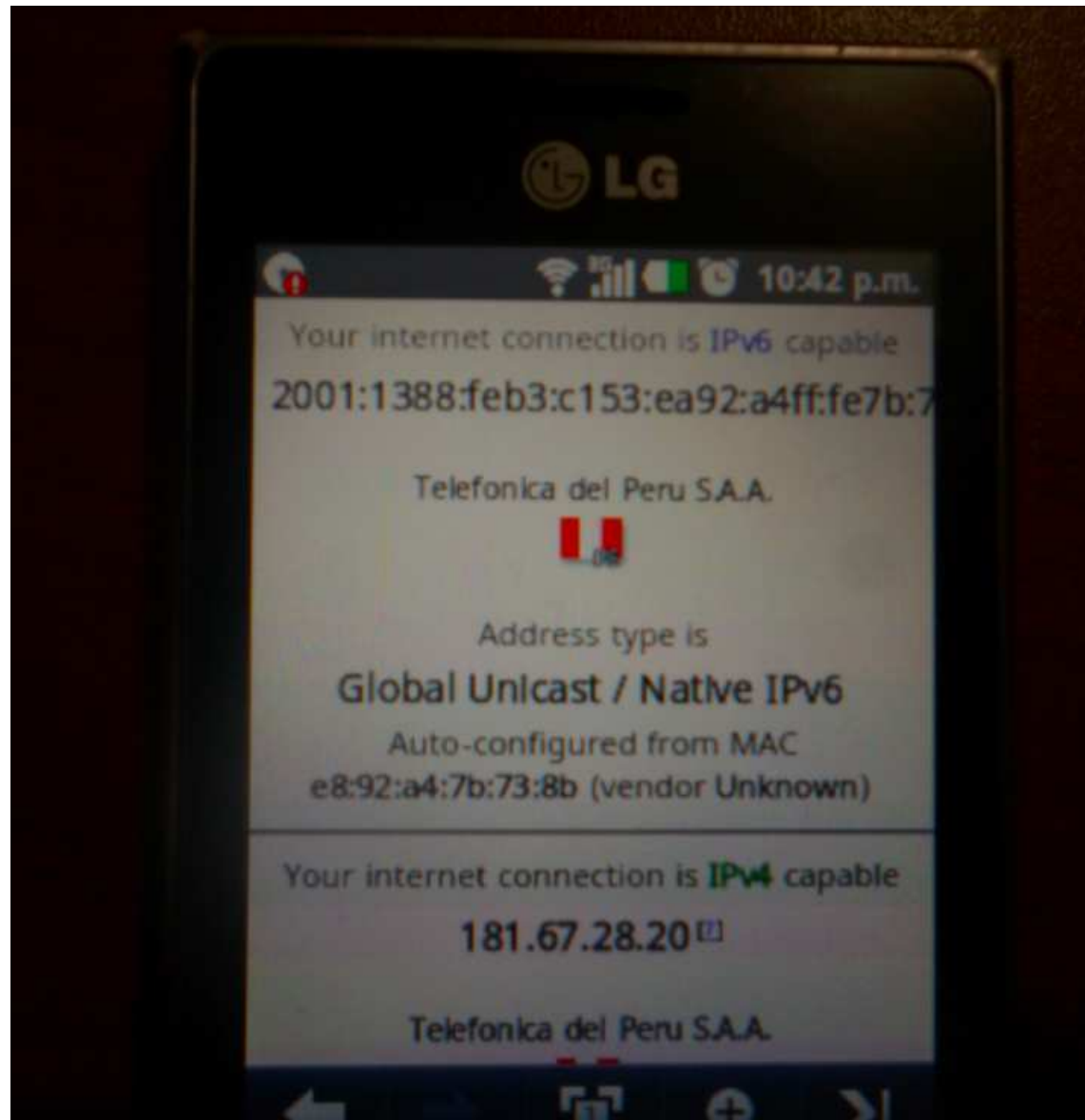
Sufijo DNS específico para la conexión. . :
Descripción . . . . . : Realtek PCIe GBE Family Controller

Dirección física. . . . . : E0-CB-4E-EB-05-AE
DHCP habilitado . . . . . : sí
Configuración automática habilitada . . . : sí
Dirección IPv6 . . . . . : 2001:1388:feb3:c153:392f:4e5e:b287:5603<
Preferido>
Dirección IPv6 temporal. . . . . : 2001:1388:feb3:c153:4029:330f:5179:1b6a<
Preferido>
Vínculo. Dirección IPv6 local. . . . . : fe80::392f:4e5e:b287:5603%10<Preferido>

Dirección IPv4. . . . . : 10.10.10.6<Preferido>
Máscara de subred . . . . . : 255.255.255.248
Concesión obtenida. . . . . : viernes, 14 de junio de 2013 08:38:21 p.m.
La concesión expira . . . . . : viernes, 14 de junio de 2013 11:38:20 p.m.
Puerta de enlace predeterminada . . . . : fe80::e6d3:f1ff:fe34:df7a%10
10.10.10.1
Servidor DHCP . . . . . : 10.10.10.1
IAD DHCPv6 . . . . . : 249613134
DUID de cliente DHCPv6. . . . . : 00-01-00-01-16-06-FF-0B-E0-CB-4E-EB-05-AE
Servidores DNS. . . . . : 2001:44b8:1::1
2001:44b8:2::2
200.48.225.130
200.48.225.148
NetBIOS sobre TCP/IP. . . . . : habilitado
```

<http://ccieblog.co.uk/ipv6/windows-7-temporary-address-ipv6>

Direccion IPv6 detectada Cell Android 1 - <http://ipv6-test.com/>



Traceroute IPv6 Address LAN (Laptop 1)

Traceroute IPv6 - Traceroute6

www.traceroute6.net

Home | Site map

+13 Recommend this on Google

Like Send 41 people like this.

Trace6 2001:1388:feb3:c153:8078:b47:c24f Do

Your IP: 2001:1388:feb3:c153:8078:b47:c24ff873

Status: IPv6 Enabled
Last: 2013-06-15
URL: www.traceroute6.net

```
traceroute to 2001:1388:feb3:c153:8078:b47:c24f:f873 (2001:1388:feb3:c153:8078:b47:c24f:f873), 30 hops max, 80 byte packets
 1 2001:2e8:665:0:2:2:0:1 (2001:2e8:665:0:2:2:0:1) 0.056 ms 0.019 ms 0.017 ms
 2 2001:2e8:22:204::2 (2001:2e8:22:204::2) 1.215 ms 1.183 ms 1.421 ms
 3 2001:2e8:20::22:11 (2001:2e8:20::22:11) 1.382 ms 1.360 ms 1.331 ms
 4 2001:3e0:5001:12::1 (2001:3e0:5001:12::1) 2.364 ms 2.331 ms 2.304 ms
 5 gigabitethernet2-8.core1.tyo1.he.net (2001:7fa:7:1::6939:1) 2.247 ms 2.218 ms 2.194 ms
 6 10gigabitethernet15-2.core1.lax2.he.net (2001:470:0:294::1) 105.484 ms 102.130 ms 102.084 ms
 7 10gigabitethernet2-1.core1.lax1.he.net (2001:470:0:72::1) 106.641 ms 10gigabitethernet9-5.core1.sjc2.he.net (2001:470:0:16a::1) 118.011 ms 10gigabitethernet2-1.core1.lax1.he.net (2001:470:0:72::1) 115.829 ms
 8 10gigabitethernet4-2.core3.fmt2.he.net (2001:470:0:18d::1) 107.206 ms 107.176 ms 10gigabitethernet5-2.core1.pao1.he.net (2001:470:0:32::2) 115.901 ms
 9 10gigabitethernet5-4.core1.pao1.he.net (2001:470:0:263::2) 115.871 ms 115.864 ms 115.829 ms
10 2001:470:0:13e::2 (2001:470:0:13e::2) 110.020 ms lo0-grtmiabr4-ip6.red.telefonica-wholesale.net (2001:1498:1::32:250) 337.526 ms 369.501 ms
11 * lo0-grtmiabr4-ip6.red.telefonica-wholesale.net (2001:1498:1::32:250) 242.077 ms 242.276 ms
12 OTF4-0-0-204-grtlurem4-ip6.red.telefonica-wholesale.net (2001:1498:1:24d:2) 363.301 ms 363.269 ms 345.027 ms
13 * * *
14 2001:1388:feb3:c153:8078:b47:c24f:f873 (2001:1388:feb3:c153:8078:b47:c24f:f873) 459.983 ms 442.261 ms 449.100 ms
```