Some applications or host providers might find it handy to know about CloudFlare's IPs. This page is intended to be the definitive source of CloudFlare's current IP ranges. IPv4

IPv4

- 103.21.244.0/22
- 103.22.200.0/22
- 103.31.4.0/22
- 104.16.0.12
- 108.162.192.0/18
- 131.0.72.0/22
- 141.101.64.0/18
- 162.158.0.0/15
- 172.64.0.0/13
- 173.245.48.0/20
- 188.114.96.0/20
- 190.93.240.0/20
- 197.234.240.0/22
- 198.41.128.0/17
- 199.27.128.0/21

Also available as a IPv4 text list.

On average, a website on CloudFlare:
- Loads twice as fast
- Uses 60% less bandwidth
- Has 65% fewer requests
The ONI collects global data on Internet filtering using technical and contextual tools. Our analysis is based on a fusion of expert (qualitative) and statistical (quantitative) methods, and represents the current state of filtering drawn from ONI’s on-going survey work. ONI testing is an ongoing and evolving process. We continue to refine our analytical toolset and document new methods and means by which information on the Internet is shaped and filtered. The categories embedded in our maps are provided as an aid to interpreting results, rather than an absolute measure of how countries filter.

Regional Summaries:
- asia
- australia / nz
- cis
europe
- latin america
- middle east / n africa
- sub-saharan africa
- us / canada

NOTE: Gaza & the West Bank do not appear in the map’s coding.

click here for Gaza/West Bank summary

Financial support for the OpenNet Initiative has come from the Ford Foundation, the Open Society Institute and the International Development Research Council. ONI is currently supported by a generous grant from the John D. and Catherine T. MacArthur Foundation.
### twitter.com

<table>
<thead>
<tr>
<th>Server</th>
<th>IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.8.8.8 (US)</td>
<td>199.59.149.198</td>
</tr>
<tr>
<td>77.88.8.8 (Russia)</td>
<td>199.16.156.102</td>
</tr>
<tr>
<td>180.76.76.6 (China)</td>
<td>159.106.121.75</td>
</tr>
<tr>
<td>Server</td>
<td>IP</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>8.8.8.8 (US)</td>
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<td>199.16.156.102</td>
</tr>
<tr>
<td>180.76.76.6 (China)</td>
<td>159.106.121.75</td>
</tr>
</tbody>
</table>
Structure

• How & Why of measurement
• Background
• Algorithmic Identification
• Measurement Collection System
• Determination of Censorship
• Results
DNS

![Diagram showing the relationship between DNS and a server.](image-url)
DNS

Resolver

l.root-servers.org
DNS

Resolver

l.root-servers.org
dns1.nic.uk
DNS

Resolver

Server

ns.bbc.co.uk
DNS

Resolver

ns.bbc.co.uk
DNS

Resolver

ns.bbc.co.uk

Block Page
DNS Resolver

Resolver

Resolver

Resolver
Scale

- Open Resolvers: 7,000,000
- Networks with >20 resolvers: ~20,000
- Countries with >20 resolvers: ~170
- Scan frequency: weekly
Wikipedia has four IP addresses that are returned everywhere
Google does not have a single set of ‘correct’ IP addresses
Overall DNS Resolutions

20% of domains do not have a small number of dominant IPs
### Divergence

<table>
<thead>
<tr>
<th></th>
<th>imgur.com</th>
<th>scribd.com</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AS 2856</strong></td>
<td>185.31.19.193: 130</td>
<td>185.31.19.175: 183</td>
</tr>
<tr>
<td><strong>British Telecom</strong></td>
<td>185.31.18.193: 49</td>
<td>185.31.18.175: 173</td>
</tr>
<tr>
<td><strong>AS 12880</strong></td>
<td>199.27.73.193: 123</td>
<td>10.10.34.36: 214</td>
</tr>
<tr>
<td><strong>ITC</strong></td>
<td>23.235.47.193: 50</td>
<td>185.31.17.175: 31</td>
</tr>
<tr>
<td></td>
<td>199.27.79.193: 48</td>
<td></td>
</tr>
</tbody>
</table>

Censorship causes divergence from expected CDN responses.
Structure

• How & Why of measurement

• Background

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• Measurement Collection System

• Determination of Censorship

• Results
Domain Similarity

a.com

b.com

AS25

5.5.5.5
Domain Similarity

a.com

AS25

5.5.5.5

b.com

AS73

5.5.6.6
Domain Similarity

a.com

AS25
5.5.5.5

b.com

AS73
5.5.6.6

AS12880
192.168.1.1
Domain Similarity

- DomainSimilarity(A, B)
  \[ \langle \text{Resolutions of A, Resolutions of B} \rangle \]

- IPTrust(A, IP)
  \[ \sum_D \text{DomainSimilarity}(D, A) \times \text{Resolutions to IP} \]
  \[ \text{Resolutions to IP} \]

Clusters appear through iterative computation to a fixed point.
A few iterations produce well-defined clusters
## CDNs

<table>
<thead>
<tr>
<th>Fastly Domain</th>
<th>Alexa Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>imgur.com</td>
<td>47</td>
</tr>
<tr>
<td>cnn.com</td>
<td>84</td>
</tr>
<tr>
<td>bbc.com</td>
<td>131</td>
</tr>
<tr>
<td>wikihow.com</td>
<td>238</td>
</tr>
<tr>
<td>scribd.com</td>
<td>449</td>
</tr>
<tr>
<td>kickstarter.com</td>
<td>529</td>
</tr>
<tr>
<td><a href="http://www.gov.uk">www.gov.uk</a></td>
<td>684</td>
</tr>
</tbody>
</table>
Implementation

- Weekly scan of top 10,000 domains
- 1 Machine. Modified zmap client
- Scan time of 3 days at 100,000 pps
- 300GB weekly collection
- 2 years of measurements, code
Censorship

1. **Too Few Responses?** → Interference
   - **No**
   - **Domain Single Homed?**
     - **Yes** → **Correct Answer Present?** → Interference
     - **No** → **Domain resolves to single AS**
       - **Yes** → **Correct AS Present?** → Interference
       - **No** → **Responses not in identified CDN?** → Interference
Structure

• How & Why of measurement
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• Determination of Censorship

• Results
Correctness

>90% identification. 95% of misidentifications are conservative.
# CDNs

<table>
<thead>
<tr>
<th>CDN</th>
<th>Size</th>
<th>Representative Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>CloudFlare</td>
<td>726</td>
<td>reddit.com</td>
</tr>
<tr>
<td>AWS</td>
<td>647</td>
<td>amazon.com</td>
</tr>
<tr>
<td>Akamai</td>
<td>410</td>
<td>ebay.com</td>
</tr>
<tr>
<td>Google</td>
<td>141</td>
<td>google.com</td>
</tr>
<tr>
<td>Dyn</td>
<td>112</td>
<td>webmd.com</td>
</tr>
<tr>
<td>Rackspace</td>
<td>77</td>
<td>wikihow.com</td>
</tr>
<tr>
<td>Fastly</td>
<td>72</td>
<td>imgur.com</td>
</tr>
<tr>
<td>Edgecast</td>
<td>68</td>
<td>soundcloud.com</td>
</tr>
<tr>
<td>Incapsula</td>
<td>55</td>
<td>wix.com</td>
</tr>
</tbody>
</table>
Censorship
Satellite

Will Scott <wrs@cs.washington.edu>
satellite.cs.washington.edu

- CDN mapping and censorship detection are related
- Satellite estimates both from observed behavior
- Public dataset of weekly global measurements of Alexa top 10,000 domains from a single machine