Deep Dive into IPv6 Extension Header Testing: CDN
IETF 116

draft-elkins-v6ops-eh-deepdive-cdn

N. Elkins, M. Ackermann, D. Dhody
What Topologies Being Tested?

• Client – Internet – Server

• Client – Internet – CDN Cache Server – CDN network – Origin Server
  • (Internal to CDN may have multiple more complex topologies)

• Client – Internet – Edge of Cloud Provider – Origin server hosted by cloud provider
Simplest: Client – Internet -- Server
Goal of testing

• EHs serve a useful and needed function

• Why look at CDNs?
  • Many high usage websites on the internet use CDNs
  • They have a disproportionate impact on IPv6 and EH use

• Need to figure out
  • Where EH can be sent with 90%+ probability (and why)
  • Where EH CANNOT be sent with 90%+ probability (and why)
  • What is unknown
• a test server enabled to send EH with every packet
• an IPv6 enabled web server (Apache / NGINX / Tomcat, et al)
• a packet trace capture tool such as TCPDump, WireShark, etc.
Move Server Behind CDN

- Our server has a domain name: MyEHServer
- Our server also has an IPv6 address (also IPv4 probably)
- Let’s say: 2001::1 and 201.1.1.1 (MyEHServer resolves to these)
- To move behind a CDN, you have to give the CDN authority to resolve MyEHServer
- Let’s give the CDN IPv6 addresses starting with 2CD0::/64 (2CD0::1, 2CD0::2, etc)
- After CDN move, MyEHServer will resolve to some CDN cache server address (2CD0::1 for example)

We will now refer to our server as the “Origin Server”
So, the way many CDNs work is that they can either serve as “DNS only” or “DNS and Proxy”
Test #1: Going to Dual Stacked Web server and DNS

https://MyEHServer.com

Client
IPv6

CDN is preferring IPv4 if available!

IPv6
IPv6
IPv4
IPv6 / IPv4
IPv4
IPv4

Origin Server
IPv4
IPv6 forwarding to IPv4 on the other side of the proxy. The HTTP forward header was used.
Let’s take out the IPv4 definitions in DNS

<table>
<thead>
<tr>
<th>Original</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>;; A Records exthdrtest.com. 1 IN A 45.76.3.11</td>
<td>;; A Records ww4.exthdrtest.com. 1 IN A 45.76.3.11</td>
</tr>
<tr>
<td>;; A Records ww4.exthdrtest.com. 1 IN A 45.76.3.11</td>
<td></td>
</tr>
</tbody>
</table>
Test #2: IPv6-only Web Server and DNS AAAA only

https://MyEHServer.com

Uses IPv6 but CDN is not sending EH to Origin Server
Test #3: Doing DNS only at CDN

https://MyEHServer.com

Client
IPv6
EH-Yes

Internet
IPv6
EH-Yes

Origin Server
IPv6
EH-Yes

This works. We have managed to send EH to Origin Server by bypassing CDN Proxy. Now we are back to simple client / server scenario.
Interesting observation regarding CDN #1

<table>
<thead>
<tr>
<th></th>
<th>Total number of sites responding to PDM</th>
<th>Total number of sites with CDN #1</th>
<th>Percentage of sites responding</th>
</tr>
</thead>
<tbody>
<tr>
<td>November capture</td>
<td>5</td>
<td>16</td>
<td>31.25%</td>
</tr>
<tr>
<td>February capture</td>
<td>9</td>
<td>9</td>
<td>100.00%</td>
</tr>
</tbody>
</table>
## Interesting observation regarding CDN #2

<table>
<thead>
<tr>
<th></th>
<th>Total number of sites responding to PDM</th>
<th>Total number of sites with CDN #2</th>
<th>Percentage of sites responding</th>
</tr>
</thead>
<tbody>
<tr>
<td>November capture</td>
<td>16</td>
<td>100</td>
<td>16.00%</td>
</tr>
<tr>
<td>February capture</td>
<td>103</td>
<td>104</td>
<td>99.04%</td>
</tr>
</tbody>
</table>
Preliminary Conclusions

• Where EH can be sent with 90%+ probability (and why)
  • Standalone webservers (certain size / type EH)

• Where EH CANNOT be sent (to Origin Server) with 90%+ probability (and why)
  • CDN mediated web sites (unless in DNS-only mode)
  • “Proxy” may be the reason
  • More complications being researched

• What is unknown
  • Is it possible to collocate with CDN proxy to return EH?
Questions for WG

• Should CDNs be encouraged to prioritize IPv6 over IPv4 in DNS?

• Should CDNs be encouraged to do IPv6 to Origin Server?

• Should CDNs be encouraged to send EH to Origin Server?

• Should there be a BCP?