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An Approach for Increasing Root And TLD DNS Servers
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Abstract

Currently, it is thought that the maximum number of DNS servers for a zone is 13. In fact, current root and some TLD zones have 13 DNS servers. But this is not enough for DNS stability and robustness especially root and/or TLD server, therefore, IP anycast [Hardie, 2002] is introduced on some root servers.

This draft proposes an another approach for increasing of DNS server hosts without changing DNS protocol by using 'multiple-addresses per host' method.

And this draft also considers what is the most suitable number of the IP addresses for one DNS server name.

1. Introduction

Currently, it is thought that the maximum number of DNS server hosts for a zone is 13. In fact, current root and some TLD zones have 13 DNS

;; MSG SIZE rcvd: 508

In this case, 13 NS records of .net servers are in authority section, and 1 glue A record is in additional section, and the DNS message size

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;; AUTHORITY SECTION:

net.	172800	IN	NS	0.GTLD-SERVERS.net.
net.	172800	IN	NS	P.GTLD-SERVERS.net.
net.	172800	IN	NS	N.GTLD-SERVERS.net.

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;; ADDITIONAL SECTION:
N.GTLD-SERVERS.net.      172800 IN      A      192.33.14.30
N.GTLD-SERVERS.net.      172800 IN      A      192.35.51.30
N.GTLD-SERVERS.net.      172800 IN      A      192.5.6.30
N.GTLD-SERVERS.net.      172800 IN      A      192.12.94.30
N.GTLD-SERVERS.net.      172800 IN      A      192.26.92.30
N.GTLD-SERVERS.net.      172800 IN      A      192.31.80.30
O.GTLD-SERVERS.net.      172800 IN      A      192.52.178.30
O.GTLD-SERVERS.net.      172800 IN      A      192.54.112.30
O.GTLD-SERVERS.net.      172800 IN      A      192.42.93.30
O.GTLD-SERVERS.net.      172800 IN      A      192.43.172.30
O.GTLD-SERVERS.net.      172800 IN      A      192.48.79.30

;; Query time: 0 msec
;; SERVER: 10.0.0.15#53(10.0.0.15)
;; WHEN: Fri Jul 16 10:02:33 2004
;; MSG SIZE rcvd: 508
```

In this case, 3 NS records of .net servers are in authority section, and **11 glue A records are in additional section, and the DNS message size is 508 (it is the same of previous case). It means that in this case, DNS cache server can get more glue A records than previous case.**

This technique is trivial, but the big possibility in DNS server operation is hidden. Especially, this makes it possible to add IPv6 (AAAA) glue, making minimum influence on existing IPv4 (A) glue. And it is also useful for signing zone for DNSSEC.

We tested some various cases of combinations 'the number of DNS servers' and 'IPv4 and IPv6 addresses per name'. The result is attached to APPENDIX A.

2. Consideration Points

There are some consideration points in this case.

2.1. 'Number of Addresses per Server' Issue

If DNS operators try to apply this to their own zone, they should consider how many is the number of IP addresses given to per name the most suitable.

DNS treats the resource records (RRs) on 'RRSet' basis, so if NS has only one name (and it has many IP addresses), when the name resolution to the RR is partially canceled by some reasons, cancellation of the whole RRSet will be carried out.

Especially this makes direct influence on additional section in a DNS packet. Because, it is occurred at NS query, all needed glue A records may be cancelled. This is harmful for name resolution and this must be

avoided.

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2.2. Server Selection Issue

Some DNS implementations may search DNS server list at 'name basis', not an 'IP address basis'. So, if some troubles are occurred at one of the host of 'DNS server set', it may be harmful for whole of server set. So, if so many IP addresses have been gathered to one name, it may be harmful for DNS server operation, for example, one bad server may block access to other good servers.

2.3. Registration Issue

Some registries and/or registrars, this 'multiple IP addresses registration' for DNS server host may not be allowed. In this case, users can not register this. This is not good limitation and should be fixed.

3. IANA considerations

IANA announces the beginning of registering IPv6 address information for root zone glue, so we consider IANA should support it its own registry system. It is useful for IPv6 deployment.

4. Acknowledgements

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APPENDIX A: Test Results

This is the result of surveying the case of various number of NS, IPv4 addresses, and IPv6 addresses.

"NS" is the number of NS records, "v4adr" and "v6adr" are the number of IPv4 and IPv6 address per NS, "psize" is the size of DNS response packet, "glue4" and "glue6" are the number of "returned" IP address of glue.

NS	Test Pattern			Maximum Name Query			Minimum Name Query		
	v4adr	v6adr	psize	glue4	glue6	psize	glue4	glue6	
1	1	7	504	1	7	254	1	7	
1	3	6	508	3	6	258	3	6	
1	5	5	512	5	5	262	5	5	
1	6	4	500	6	4	250	6	4	
1	8	3	504	8	3	254	8	3	
1	10	2	508	10	2	258	10	2	
1	12	1	512	12	1	262	12	1	
2	2	6	508	2	6	458	4	12	
2	4	5	512	4	5	466	8	10	
2	5	4	500	5	4	442	10	8	
2	7	3	504	7	3	450	14	6	
2	9	2	508	9	2	458	18	4	
2	11	1	512	11	1	466	22	2	
3	2	4	500	4	4	506	6	12	
3	3	3	504	6	3	470	9	9	
3	5	2	460	5	2	482	15	6	
3	7	1	492	7	2	494	21	3	
4	1	3	488	4	3	490	4	12	

	4	3	2		500	3	4		506	12	8
	4	4	1		488	4	3		458	16	4
	+-----+-----+-----										
+	5	1	2		500	2	4		466	5	10
	5	3	1		508	6	2		486	15	5
	6	2	1		492	4	2		482	12	6
	7	1	1		504	2	3		446	7	7
	8	1	1		508	3	2		506	8	8
	+-----+-----+-----										
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