

Weakening Aggregated Traffic of DHCP Discover Messages

draft-yang-sunset4-weaken-dhcp-00

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Problem Description-1

- All networks are changing from IPv4-Only to Dual-Stack, and even IPv6-Only in the near future. We may turn off some IPv4 services gradually, such as DHCPv4.
- If a Dual-Stack host initials DHCPv4 Discover messages through the link to a DHCPv6-Only server, it cannot get any response. Then the host will re-broadcast the messages endlessly, that may cause the aggregated traffic.
- We found this problem in the ‘Dual-Stack host/network + DHCPv6-only server’ scenario in IPv6 experiments. It is similar to that described in the draft “Turning off IPv4 Using DHCPv6 ”

Problem Description-2

- It is not specified in RFCs what the hosts should do when there is no DHCP OFFER messages
- In our test, different OSs work in their own way

Test Result: Different OS behavior

Win7 (SP1)	<ul style="list-style-type: none">•It initiates 8 times DHCPDISCOVER requests in about 300s interval;•Obtain 169.254.198.228 immediately after the first failure of Discover, but the test broadcasts endlessly•If DHCP service is reset, it can get a new IPv4 address
WinXP (SP3)	<ul style="list-style-type: none">•firstly it launches 9 times DISCOVER messages, then initiates 4 times requests in around 330s intervals, and never stop.•Obtain 169.254.96.2 after 1min after failures•If DHCP service is reset, it can get a new IPv4 address
IOS 5.01	<ul style="list-style-type: none">•it seems like WindowsXP. There are 10 times attempts in one cycle, and the interval is about 68s.•Obtain 169.254.161.128 after 15s;•Obtain new IP address after DHCP service reset.
Symbian S60 5th	<ul style="list-style-type: none">•using the simplest backoff method, it launches DISCOVER in every 2 or 4 seconds; Cut off the WAN connection after 1min•Obtain 169.254.8.21 after 6s• CANNOT obtain new IP address after DHCP service reset.
Android (2.3.7)	<ul style="list-style-type: none">•DHCP Discover will be sent 5 times in 30s, and a group of Discover is sent in 20s interval. If failing to connect 9 or 10 times, it will mark the connection into “blocked” and never try again.•It doesn't use link local addressCANNOT obtain new IP address after DHCP service reset.•Notice: After first “blocked”, all the requests for other SSID connections will be only 1 time.

Test Result: Logs of Different OS

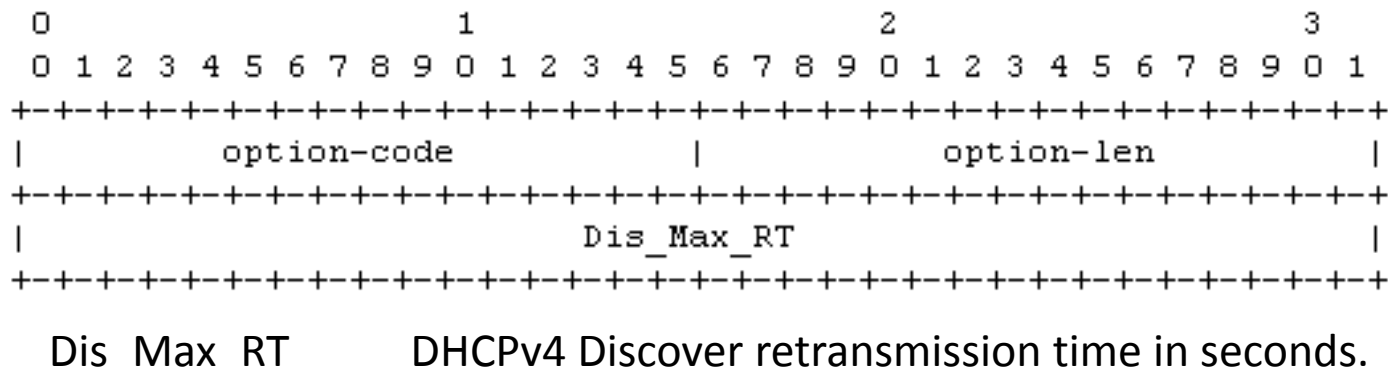
DHCP Discover Packages Time Table										
No.	Windows7		Windows XP		IOS_5.0.1		Android_2.3.7		Symbian_S60 5th	
	Time	Time difference	Time	Time difference	Time	Time difference	Time	Time difference	Time	Time difference
1	0		0		0.1		7.8		0	
2	3.9	3.9	0.1	0.1	1.4	1.3	10.3	2.5	2	2
3	13.3	9.4	4.1	4	3.8	2.4	17.9	7.6	6	4
4	30.5	17.2	12.1	8	7.9	4.1	33.9	16	8	2
5	62.8	32.3	29.1	17	16.3	8.4	36.5	2.6	12	4
6	65.9	3.1	64.9	35.8	24.9	8.6	disconnect&reconnect		14	2
7	74.9	9	68.9	4	33.4	8.5	56.6	20.1	18	4
8	92.1	17.2	77.9	9	42.2	8.8	60.2	3.6	20	2
9	395.2	303.1	93.9	16	50.8	8.6	68.4	8.2	24	4
10	399.1	3.9	433.9	340	59.1	8.3	84.8	16.4	26	2
11	407.1	8	438.9	5	127.3	68.2	86.7	1.9	30.1	4.1
12	423.4	16.3	447.9	9	128.9	1.6	disconnect&reconnect		32.1	2
13	455.4	32	464.9	17	131.1	2.2	106.7	20	36.1	4
14	460.4	5	794.9	330	135.1	4	111.4	4.7	38.1	2
15	467.4	7	799.9	5	143.4	8.3	120.6	9.2	42.1	4
16	483.4	16	808.9	9	151.7	8.3	134.9	14.3	44.1	2
17	842.9	359.5	824.9	16	160.4	8.7	136.8	1.9	48.2	4.1
18	846.9	4	1141.9	317	168.8	8.4	disconnect&reconnect		50.2	2

Problem summary

- Obviously, DHCP server needs to weaken the DISCOVER traffic caused by the clients, , which is like DDoS attack when many DHCPv4 clients send DISCOVER messages simultaneously.
- Some of mobile phone operating systems could stop or decrease sending DISCOVER , such as Android and Symbian. That may be because of the considering of the power capacity.
- But there still are some potential problems:
 - ① The 'stop' or 'decrease' behavior is passive. Before that , it has tried hundreds of times to get response
 - ② For Symbian, it cannot 'wake up' when roaming to other IPv4 WLANs unless rebooted (system or WLAN module)

Proposal-1: DHCPv6 solution

- A new option named OPTION_Dis_Max_RT in DHCPv6 is defined to affect the retransmission of DHCPv4 DISCOVER message of the host.
- Format of new option



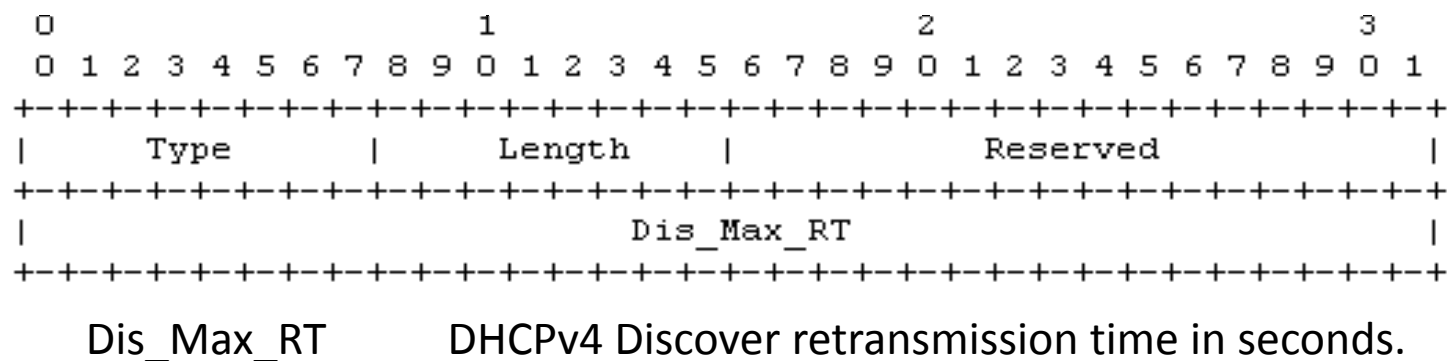
- ① A DHCPv6 client MUST include the OPTION_Dis_Max_RT code in Option Request Option [RFC3115, section 22.7].
- ② The DHCPv6 server MAY include the OPTION_Dis_Max_RT in any response it sends to a client.

Semantics of Dis_Max_RT

- ① If Dis_Max_RT=0, server will respond Offer or other DHCP messages in normal;
 - This situation is similar to Level 0 in the description in draft 'Turning off IPv4 Using DHCPv6 ': IPv4 fully enabled
- ② If Dis_Max_RT=FFFF, client should not send Discover message any more.
 - This situation is included in Level 1/2: No IPv4 upstream
- ③ If $FFFF > \text{Dis_Max_RT} > 0$, server won't respond to Discover immediately, client should wait for resending Discover message later;

Proposal-2: RA solution

- NDP is a basic protocol of IPv6 and a mandatory requirement of any IPv6-supporting device. It is used more widely than DHCPv6.
- Whether DHCPV6 flow initiated or not depends on the value of M in RA.
 - ✓ Only M=1 , DHCPv6 will be initiated
 - ✓ If M=0, only RA can sent the parameters to clients
- A new option named Option_Dis_Max_RT is defined in RA to affect the retransmission of DHCPv4 DISCOVER message.
- The mechanism is similar to the option in DHCPv6. and much easier



- ① Server send RA with this option to cliet to tell it the intervals to resend Discover messages.

History

- IETF83: draft-yang-dhc-ipv4-dis-00
 - We had found the problem of DHCP Discover since that draft, and proposed a solution by introducing a new option in DHCP.
 - We were doing the experiments simultaneously, but didn't finish
- IETF84: draft-yang-dhc-ipv4-dis-01
 - Shared the test results of various OS
- IETF85: draft-yang-sunset4-weaken-dhcp-00
 - Proposed the solutions using DHCPv6 and RA

Relationship with the draft of “NoIPv4”

- ① Basically, the two drafts are focusing on “turning off” or “weakening” IPv4
- ② This draft has focused on weakening DHCP when it had been submitted in IETF 83. Draft of “NoIPv4” has a larger scope to turn off all the IPv4 stream, and it starts to pay attention to turn off DHCP in Version-01.
- ③ This draft proposed a flexible method to “slow down” or “weaken” DHCP stream than just turn it off. This situation is between Level 0 and Level 1 described in “NoIPv4”
- ④ It may introduce a new option in RA to solve this problem
 - RA is mandatory
 - The process is easier

For the similar target and solutions, can we merge them into one draft?