

ASSIGNMENT-8

Question 2: (2 + 0.5 + 1 + 0.5 = 4 points) Neighbor Discovery in IPv6

We will now consider the Neighbor Discovery in IPv6. Use Wireshark to open the trace u08-ipv6nd.pcap1 and answer the following questions.

(a) Explain the purpose of each packet in the trace (except the packets that belong to TCP connections) with one or two short sentences. Give a short summary about the purpose of the TCP connections.

Solution :

- 1) ICMPv6 -Neighbor Solicitation(NS) – Host try's to find out neighbor by sending NS packet at the destination IP which is a Multicast IP
- 2) ICMPv6 -Neighbor Advertisement(NA)- Host responds to the NS packet by sending NA packet which includes mainly IP and MAC address
- 3) There are few TCP packets which are lost
- 4) The purpose of the TCP connection is to make a request for “hny.jpg”

```
GET /hny.jpg HTTP/1.1
Host: hedwig.inet.tu-berlin.de:8080
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:20.0) Gecko/20100101 Firefox/20.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Connection: keep-alive
```

(b) How many Neighbor Discoveries are in the trace and where do they occur?

Solution:

1. There are two Neighbor Discovery in the trace and also they occur in LAN

| IPv6 | | | | | | |
|------|-----------------|-------------------------------------|----------|-------------------------------------|----------|------------------------------------------------------------------|
| | Time | Source | Sequence | Destination | Protocol | Length Info |
| 1 | 17:10:45,821958 | 2001:470:96b9:1:20b2:e332:830f:c769 | | ff02::1:fff3:978c | ICMPv6 | 86 Neighbor Solicitation for 2001:470:96b9:1:20b2:e332:830f:c769 |
| 2 | 17:10:45,822070 | 2001:470:96b9:1:816a:71c4:f4f3:978c | | 2001:470:96b9:1:20b2:e332:830f:c769 | ICMPv6 | 86 Neighbor Advertisement 2001:470:96b9:1:816a:71c4:f4f3:978c |
| 163 | 17:10:51,058074 | 2001:470:96b9:1:816a:71c4:f4f3:978c | | 2001:470:96b9:1:20b2:e332:830f:c769 | ICMPv6 | 86 Neighbor Solicitation for 2001:470:96b9:1:20b2:e332:830f:c769 |
| 164 | 17:10:51,058297 | 2001:470:96b9:1:20b2:e332:830f:c769 | | 2001:470:96b9:1:816a:71c4:f4f3:978c | ICMPv6 | 78 Neighbor Advertisement 2001:470:96b9:1:816a:71c4:f4f3:978c |

(c) Why are packets in the trace sufficient to populate the IPv6 neighbor cache of the hosts involved? Assume that the IPv6 neighbor cache was empty at the beginning of the trace.

Solution:

The data for the fields highlighted below is needed to populate neighbor cache table. Since both the hosts in the trace have sent NS packet and received NA packet they have all details to fill their own **neighbor cache** table. Hence, packets in the trace are **sufficient to populate the IPv6 neighbor cache**

| Internet Address | Physical Address | Type |
|------------------|------------------|------|
|------------------|------------------|------|

(d) Comparing Neighbor Discovery in IPv6 and ARP in IPv4, at which layer of the network stack do they operate?

Solution:

NDP and ARP operates at link layer.

Comparing Neighbor Discovery in IPv6 and ARP in IPv4 [1]:

1. Router discovery is the part of IPV6 whereas IPv4 uses ARP , ICMP for router discovery
2. IPv6 router advertisements consists local link address so no need to send any additional packet as in IPv4
3. IPv6 router advertisements consists MTU for hosts to use on link whereas IPV4 hosts might use different MTU
4. IPv6 router advertisements consists prefixes of the link and no separate mechanism is needed to configure netmask as in IPv4
5. NDP detects the reachability of the hosts and avoids sending packets if the host is unavailable whereas this is not possible in ARP

References:

1. <https://docs.oracle.com/cd/E19082-01/819-3000/chapter1-41/index.html>