IPv6 on hosts

Computer Network Technologies and Services (CNTS)
Tecnologie e Servizi di Rete (TSR)

1 IPv6 network configuration

The IPv6 protocol is available in the latest Windows versions. A router is connected to the laboratory LAN and IPv6 Router Advertisement is enabled on it.

The objective of this experience is to understand IPv6 host configuration mechanism and capture and analyze IPv6 traffic.

1.1 Useful Notes

- **Wireshark.** In order to capture the network traffic, you have to run the Wireshark network analyzer. Documentation is available at [http://www.wireshark.org/docs/](http://www.wireshark.org/docs/).

  **ATTENTION!** Once installed and opened wireshark, you have to select the physical interface; any other interface does not work for the purpose of this exercise.

- **Command Prompt.** You need to run commands proposed in this exercise using the Windows CLI, called Command Prompt (also known as **cmd**). On the latest Windows version, in order to open it you need to type “cmd” into the “Start” menu, then click on the Command Prompt icon.

  Commands to use in the CLI are **netsh** and **ipconfig**.

  References:
  netsh:

  ipconfig:
2 Answer the Following Questions

Reminder. You will not get any evaluation for your responses. The aim of proposed questions is to help you to check by yourself your understanding of the given topics.

1. Identify and list the interfaces available on your PC. Identify which of these interfaces are related to native IPv6 operation and briefly describe what each one of them is.

Some interfaces, clearly indicated as “tunnel” are related to tunneling mechanisms that are used to enable IPv6 hosts to operate on and across IPv4 networks (this enables a smooth and incremental transition from IPv4 to IPv6). If we have not yet discussed such interfaces in the lectures when you do the lab experience, ignore them for the time being, but please come back to them later once the IPv4 to IPv6 transition has been addressed in the lectures and observe the differences among tunneling technologies.

Run the the following commands from the CLI in order to retrieve information about the network interfaces:

- `ipconfig /all`
- `netsh interface ipv6 show interface`
2. Identify all the IPv6 addresses (link local, public addresses, . . . ) of the LAN interface.

<table>
<thead>
<tr>
<th>Link local</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto-configuration IPv6 address</td>
<td></td>
</tr>
<tr>
<td>IPv6 address due to privacy extension</td>
<td></td>
</tr>
</tbody>
</table>

3. Briefly describe the differences among the usage of the addresses identified in the previous answer.

4. Identify the validity of addresses (Tip: Use the command `netsh interface ipv6 show address <interface identifier>`).

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5. Capture traffic generated by the execution of ping and traceroute commands with IPv6 hosts as targets; analyze the messages exchanged and write the most significant fields in those messages.

- Ping other addresses in the lab LAN (using both link-local and global addresses)
  - ping <ipv6 remote address>
- Ping the IPv6 localhost address (::1) (*due to driver limitations, capture works only in Unix OS*)

6. Identify the local router address. Run the command `netsh interface ipv6 show neighbors`. Can you find the same information inside the packets you can capture in the network?
7. Run the `netsh interface ipv6 show neighbors` command. Describe the difference among *Permanent*, *Stale* and *Reachable* addresses.

8. Capture the auto-configuration of a host (you need to force the execution of the configuration procedure; TIP: you can, for example, unplug and plug again the network cable or de-activate and activate again an interface). Analyze the capture and briefly describe the operating principles of the auto-configuration procedure of IPv6 address (Router Advertisement/Router Solicitation). Which IPv6 address is used when communicating?
9. Capture the Neighbor Discovery of a host (TIP: force your host to execute Neighbor Discovery by having it send packets to a host it has never communicated with earlier). Analyze the capture and briefly describe the operating principles of the Neighbor Discovery Protocol (specially Neighbor Solicitation/Neighbor Advertisement messages). Which IPv6 address is used when communicating?