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Sharing /64 3GPP Mobile Interface Subnet to a LAN
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Abstract

This document describes a known and implemented method of sharing a /64 IPv6 prefix from a User Equipment 3GPP radio interface to a tethered LAN.

Table of Contents

1. Introduction

3GPP mobile cellular networks such as GSM, UMTS, and LTE have architectural support for IPv6 [RFC6459], but only 3GPP Release-10 and onwards of the 3GPP specification supports DHCPv6 [RFC3633] for delegating IPv6 addresses to a tethered LAN. To facilitate the use of IPv6 in a tethered LAN prior to deployment of DHCPv6 in a 3GPP network and in User Equipment (UE), this document describes how the 3GPP UE interface assigned /64 subnet may be shared from the 3GPP interface to a tethered LAN. This is achieved by specifying the UE 3GPP interface as an IPv6 /128 subnet taken from the 3GPP interface's network assigned /64 subnet. Then, assign the same address to the tethered LAN interface with the full /64 subnet. The /64 tethered LAN subnet will then be advertised to the tethered LAN via Router Advertisements (RA) [RFC4861].

The end result is that all UE interfaces have link-local IPv6 addresses, the UE's 3GPP interface has a /128 address from the 3GPP network assigned /64, and the same address that is assigned to the 3GPP interface is assigned to the tethered LAN interface with a /64 subnet and advertised to the LAN via RA. This approach only impacts the UE configuration and does not require any changes to the 3GPP network.

2. The Challenge of Providing IPv6 Addresses to a 3GPP Tethered LAN

As described in [RFC6459], 3GPP networks assign a /64 subnet to each UE with RA. IPv6 prefix delegation is an optional part of 3GPP Release-10 and is not covered by any earlier releases. Neighbor Discovery Proxy (ND Proxy) [RFC4389] functionality has been suggested as an option for sharing the assigned /64 from the 3GPP interface to the LAN, but ND Proxy is an experimental protocol and has some limitations with loop-avoidance.

DHCPv6 is the best way to delegate a prefix to a tethered LAN. The method described in this document should only be applied when deploying DHCPv6 is not achievable in the 3GPP network and the UE.

3. Method for Sharing the 3GPP Interface /64 to the Tethered LAN

As [RFC6459] describes, the 3GPP network assigned /64 is completely dedicated to the UE and the gateway does not consume any of the /64 addresses. The gateway routes the entire /64 to the UE and does not perform ND or Network Unreachability Detection (NUD) [RFC4861]. Communication between the UE and the gateway is only done using link-local addresses and the link is point-to-point. This allows for the UE to use the 3GPP network assigned /64 to assign itself a /128

address to the 3GPP radio interface for consistent network connection formation and the same address with a /64 to the tethered LAN interface. The tethered LAN interface may then advertise the /64 to the LAN with RA. The LAN interface RA configuration must be tightly coupled with the 3GPP interface state. If the 3GPP interface goes down or changes address, that state should be reflected in the LAN IPv6 configuration. Just as in a standard IPv6 router, the packet TTL will be decremented when passing packets between interfaces.

The procedure may also be described in terms of the following usage example:

1. The user activates tethering on the wireless LAN of the UE.

2. The UE checks to make sure the 3GPP interfaces is active and has an IPv6 address. If the interface does not have an IPv6 address, an attempt will be made to acquire one, or else the procedure will terminate.

3. In this example, the UE finds the 3GPP interface has the IPv6 address 2001:db8:ac10:f002:1234:4567:0:9/128 assigned and active.

4. The UE copies the address 2001:db8:ac10:f002:1234:4567:0:9 with a 64 bit mask from the 3GPP interfaces to the wireless LAN interfaces and begins announcing the prefix 2001:db8:ac10:f002::/64 via RA to the wireless LAN.

5. The gateway in the 3GPP network routes all packets for 2001:db8:ac10:f002::/64 to the UE using the link-local address as the next hop. The gateway does not perform Neighbor Discover or Network Unreachability Detection on 3GPP wireless link segment towards the UE.

6. The UE directly processes all packets destine to itself at 2001:db8:ac10:f002:1234:4567:0:9.

7. The UE, acting as a router running NDP on the LAN, will route packet to and from the LAN. IPv6 packets passing between interfaces will have the TTL decremented.

8. If the 3GPP interface state changes, the LAN will immediately update to reflect the change and ensure that the LAN IPv6 prefix remains a valid extension of the 3GPP network.

9. Since the address 2001:db8:ac10:f002:1234:4567:0:9/128 is the only instance of the assigned /64 on the 3GPP interface, there is no chance of an address conflict on that interface. On the LAN interface, there is no chance of address conflict since the

address is defended using Duplicate Address Detection (DAD).

The UE should be compliant with the relevant requirements in [I-D.draft-binet-v6ops-cellular-host-requirement].

4. Security Considerations

Security considerations identified in [I-D.draft-binet-v6ops-cellular-host-requirement] are to be taken into account.

5. IANA Considerations

This document does not require any action from IANA.

6. Acknowledgments

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