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Graceful IPv4 Sunset with Traffic Migration
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Abstract

In order to make a graceful IPv4 sunset, this memo described a method helping traffic migration to IPv6. With the growth of IPv6 traffic, operators could safely turn off IPv4 and evolve to IPv6-only network. In order to achieve the goal, new traffic-migration options have been proposed in DHCPv6 and PCP. IPv6 traffic steering could be performed using those configurations.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on April 18, 2013.

Table of Contents

1. Introduction

The working group of Sunset4 was targeted to standardize technologies that facilitate the graceful sunsetting of the IPv4 Internet in the context of the exhaustion of IPv4 address space while IPv6 is deployed. This memo has described the way to incrementally turn off the IPv4 by steering traffic to IPv6 networks.

As imminent demands to IP address, the community has to seek a way to accelerate IPv6. However, the tremendous success of the Internet has adhered to IPv4 technologies. ISPs don't want to significantly changed its IPv4 network. Dual stack[RFC4213] was designed to provide complete support for both Internet protocols. It's the simplest deployment model to enable IPv4 hosts to access the IPv4 Internet and IPv6 hosts to access the IPv6 Internet. With the thoughtful considerations, e.g. happy eyeballs[RFC6555], white-listing[RFC6589], dual-stack approach could ensure user experiences as original as possible.

[RFC6180]recommended the native dual-stack connectivity model. Some ISPs have already successfully deployed dual-stack networks, in which the dual-stack capable devices integrate both IPv6 and IPv4 forwarding. In those cases, IPv4 and IPv6 data flows are ships-in-the-night. [RFC6264]commentated such transition mechanism may be lack of drive to motive IPv6 growth, since most end users are not sufficiently expert to configure or maintain host-based IPv6 transition. If there are no IPv4 sunset technologies, IPv4 connectivity and traffic would still continue to represent the majority of traffic in most ISP networks.

The IPv4 sunset should be graceful. The arbitrary IPv4 turning off may don't help the IPv6 acceleration, but exacerbate the situation of instable IPv6 connections and IPv4 incompability. [RFC6586] has stated the concerns in a IPv6-only environment. It should be avoided during the period of IPv4 sunset, especially in a commercial network. Under those considerations, traffic migration could achieve the graceful process with no impacts to services. This memo enumerates several migration technologies in Section 3. The corresponding configurations have been described afterwards.

2. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

3. Traffic Migration Technologies

With the stress of IP address shortage, switching the whole ISP network into IPv6-only would be considered a ultimate strategy. A number of IPv6 transition technologies were proposed. Some of them may likely be less optimal than equivalent technologies for native IP connections, i.e. IPv6-only and dual-stack networks. Whereas, it could help migrate IPv4 traffic to IPv6 network that is transparent to user's experiences. The Figure show the architecture those technologies apply to .

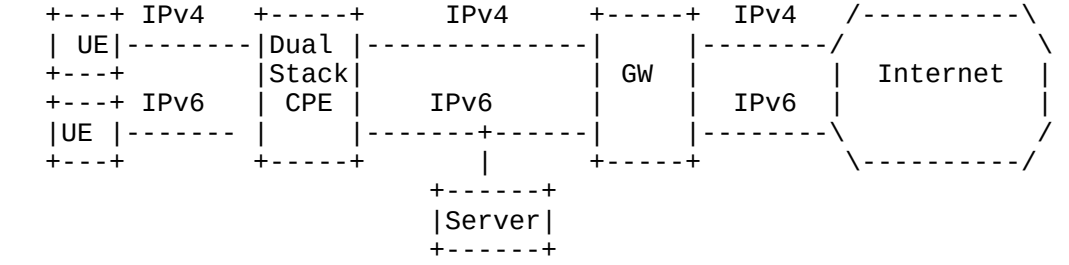


Figure 1: Traffic Migration architecture

Traffic migration technologies could shift IPv4 traffic to IPv6 links. Meanwhile, the issues of IPv4 compability have been thoroughly considered and addressed in those technologies. The migration enforcement could be located on a end-host or dual-stack CPE. Translations or tunnel could be performed at an enforcement point. Following enumerates relevant technologies.

- Dual-stack Lite: it employs IPv4 over IPv6 tunnel on CPE. The packages would be encapsulated in IPv6 and transmitted. GW would decapsulate the IPv6 packages and perform IPv4/IPv4 NAT[RFC6333]. It should be noted that several technologies have been discussed in Softwires working group recently. Those technologies could also successfully switch traffic to IPv6 network.

- 464xlat: it employs double translation framework[I-D.ietf-v6ops-464xlat]. CPE could receive IPv4 packages and make stateless translation[RFC6145] to IPv6. GW adopts stateful NAT64 [RFC6146]processing.

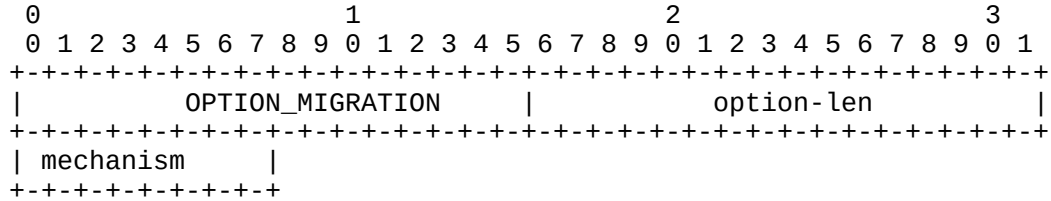
- BIH: It employs host based translation[RFC6535]. Embedded BIH module could translate IPv4 packages into IPv6 on a host. Such process is transparent to IPv4 applications.

At a sunset stage, a devices(e.g. a host or CPE) would observe the appearance of enabling messages to discover the availability of

migration technology. Thus, when an ISP decides to switch their traffic to IPv6, the devices would detect and switch automatically to traffic-migration mode.

4. Configurations with DHCPv6 Options

Enabling traffic migration could be achieved via DHCPv6. The migration DHCPv6 option is proposed as below to inform the device performing the traffic steering process. The format of the migration option is shown in Figure 2.



option-code OPTION_MIGRATION(TBD)

option-len 1

mechanism This data is to indicate the particular mechanism to be performed

Figure2: Migration Option for DHCPv6

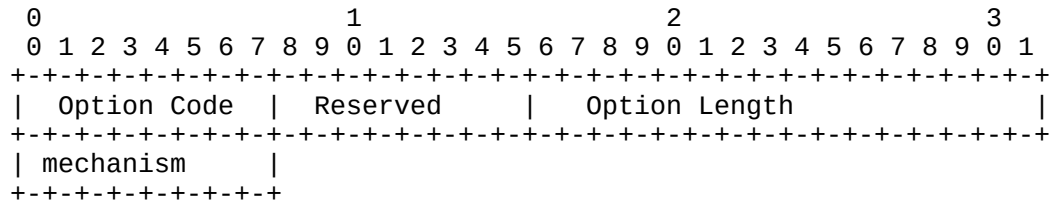
The DHCPv6 client MUST include the OPTION_Migration option code in the Option Request Option[RFC3315].

[Editor note: the mechanism filed informs the device that the specific technology should be taken. This is very depending on the ISP strategy and implementations. Weighting different options is surely going beyond the scope of this document. Therefore, it should be decided whether the particular semantics should be defined in the draft.]

5. Configurations with PCP Options

It’s also feasible to deliver such message in a NAT environment, where there is coexistence of NAT44 and NAT64 on a network side. If PCP clients are embedded in CPE or UE, new PCP options could help to indicate migration preferring.

The format of migration PCP Option is depicted in Figure 3.



option-code To be assigned by IANA

option-len 1

mechanism This data is to indicate the particular mechanism to be performed

Figure3: Migration Option for PCP

A PCP Client MAY include a migration PCP Option in a MAP request to learn network capability used by an upstream PCP-controlled device. A PCP server controlling a NAT SHOULD be configured to return the value to indicate if the migration technology should be enable. When allowed, migration PCP Option conveys the value for the selection of specific mechanism.

[Editor note: Same concern applies to the mechanism filed. it should be decided whether the particular semantics should be defined in the draft.]

6. Security Considerations

TBD

7. IANA Considerations

This document makes no request of IANA.

8. References

8.1. Normative References

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8.2. Informative References

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