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# IPv6-only and IPv6-Mostly Terminology Definitions
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## Abstract

This document defines the terminology regarding the usage of expressions such as "IPv6-only" and "IPv6-Mostly", in order to avoid confusions when using them in IETF and other documents. The goal is that the reference to "IPv6-only" describes the actual native functionality being used, not the actual protocol support.

## 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 8 November 2026.

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## 1. Introduction

Due to the nature of the Internet and the different types of users, parts of a network, providers, flows, etc., there is not a single and easy way to categorically say something such as "IPv6-only".

The goal of this document is to depict this situation and agree in a common language to be used for IETF and other documents, in order to facilitate ourselves and future readers, the correct understanding of what we are talking about.

The term IPv6-only is being used by many IETF documents, with a clear definition of the scope or terminology, for example [RFC6877], [RFC8585] and [RFC8683].

Note that all the references in this document are regarding the actual usage of IPv4/IPv6, not the support of those protocols by nodes. For example, a device or access network may support both IPv4 and IPv6, however actually is only "natively" forwarding IPv6,

because the link used for that communication is only natively configured for IPv6. IPv4 may be used as well, but it is being encapsulated or translated by means of IPv6. So, from this perspective, this device is attached to an IPv6-only link.

As such, a network service is considered IPv6-only if it forwards IPv6, not IPv4, even if IPv4 is still supported and enabled but not configured neither used in the nodes participating in the service.

## 2. Scope is a must

The transition from IPv4 to IPv6 is not something that can be done, in the large majority of the cases, overnight and in a single step in a complete network. Consequently, in general, we are unable to talk about a whole network having a "single and uniform" status regarding the IPv6 support, at least not in the early deployment stages of an operator network.

Even if possible, it is not frequent to deploy new IPv6 networks which have no IPv4 connectivity at all, because at the current phase of the universal goal of the IPv6 deployment, almost every network still need to provide some kind of "access" to IPv4(-only) sites and services. It is not feasible for most of the operators to tell their customers "I can provide you IPv6 service, but you will not be able to access all Internet contents and apps, because some of them still don’t support IPv6, so you will miss every content that it is IPv4-only". Of course, this will change over the time, and there will be less and less dependency on IPv4-only end-sites/services.

Some networks may have IPv6-only support for specific purposes or services. For example, a DOCSIS provider may have decided that is worth the effort to get rid of IPv4 for the management network of the cable-modems. Or a network that provides connectivity only to IoT devices, may be IPv6-only.

However, the "end-networks", in general, need to continue supporting IPv4, as there are many devices or apps, in both corporate and end-user networks (smartTV, IP cameras, etc.), which are IPv4-only and it is not always feasible to update or replace them. Also if customer devices in a LAN are IPv4-only, they will not be able to access IPv6-only services, so this means that IPv6-only services can’t be deployed unless it is done in such way that some transition mechanism solves that problem as well (example an IPv6-only Data Center, requires SIIT-DC).

In IPv6-only access networks, IPv4 support may be provided by mechanisms that allow "IPv4-as-a-service" (IPv4aaS, for example by means of encapsulation and/or translation on top of IPv6).

Consequently, considering the context described above, if we want to be precise and avoid confusing others (making the text shorter clearly creates confusion), we can’t use the terminology such as "IPv6-only" in a generic way, and we need to explicitly indicate what part of the network we are referring to, or to say in another way, what is the specific "scope".

Note that the usage of "Native" in this document must be interpreted only in the context of the usage of IPv4 or IPv6 support.

## 3. IPv4/IPv6 Native

"IPv4 Native" or "IPv6 Native" means that IP packets run directly over a layer 2 (logical link layer) interface, for example, IEEE 802 link layer, without anything at layer 3 being encapsulated within an IP packet of another IP protocol.

## 4. IPv4-Only

"IPv4-Only" in a given scope, means that only IPv4 is native in that scope. IPv6 is neither configured or managed in that scope, even if it may be transported (or encapsulated) on top of IPv4.

## 5. IPv6-Only

"IPv6-Only" in a given scope, means that only IPv6 is native in that scope. IPv4 is neither configured or managed in that scope, even if it may be transported (or encapsulated) on top of IPv6.

## 6. Dual-Stack

"Dual-Stack" in a given scope, means that both, IPv4 and IPv6 are native in that scope.

## 7. IPv4 as a Service (IPv4aaS)

In the case of IPv6-Only scopes, it is common that, to ensure that communications with legacy IPv4-Only scopes is possible, IPv4 may be transported on top of IPv6, typically by means of encapsulation or translation. This can be made explicit by adding "IPv4aaS" (IPv4 as a Service). For example, IPv6-Only with IPv4aaS access network.

## 8. IPv6-Mostly

"IPv6-Mostly" is similar to dual-stack, with two additional key elements: a NAT64 ([RFC6146]) and DHCPv4 infrastructure operating Option 108 ([RFC8925]). Optionally there may be also a DNS64 ([RFC6147]). This way, in a dual-stack network scope, it can support a mix of IPv4-only, dual-stack or IPv6-only clients, depending on the client capabilities or configuration. It can be seen as a way to provide IPv4 support on demand.

## 9. IPv6-Only-Strict

"IPv6-Only-Strict" in a given scope, means that only IPv6 is native in that scope and IPv4 is neither configured or managed, but also not transported (neither encapsulated nor translated) on top of IPv6. In other words, it means that communication with other endpoints is only possible using IPv6.

## 10. Additional Scope Qualification

In some cases, the scope can be further qualified indicating if refering to the data-plane, control-plane or both.

## 11. API Scope

For the foreseeable future, it is not expected that APIs are IPv6-Only, and typically will be IPv4-Only (worst case) if they haven’t been updated, or dual-stack.

It is expected and recommended that, in normally configured and up-to-date hosts, the API is dual-stack regardless of any usage of IPv6-Only in other scopes. As a result of this good practics, applications will operate correctly in any situation.

## 12. Example Diagrams

The next example diagrams show only a few of the possibilities of different scope combinations. They have been choosen and ordered to follow the most natural approach, that in general, a "full" transition from IPv4 to IPv6 will follow. This doesn’t mean that all these transition stages are actually needed in all the transition cases.

### 12.1. IPv4-Only Network

The following diagram shows the most simple case, when all the scopes are IPv4-Only and IPv6 is not present.

In general, an IPv4-Only network will have, even if embedded in the CE Router, a DHCPv4 function, as well as a DNS or DNS-proxy. They are represented as different boxes in the diagrams, so it applies not just to residential and SOHO networks but also to enterprise networks.

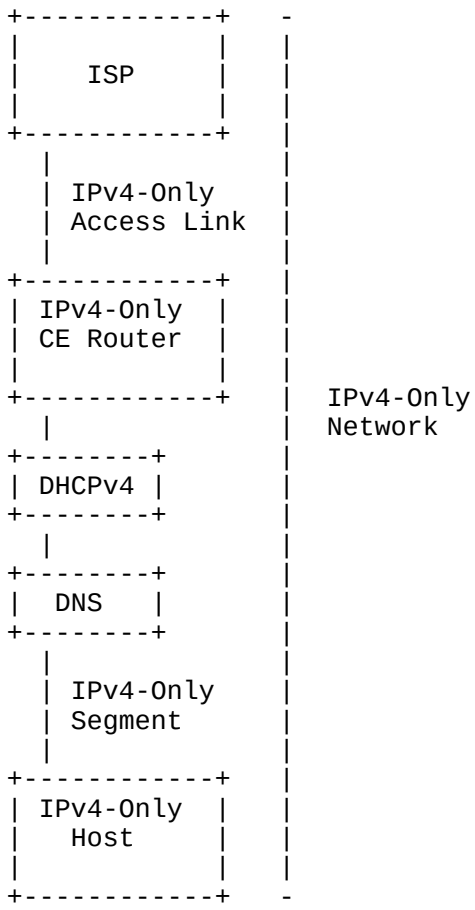


Figure 1: IPv4-Only diagram

## 12.2. Dual-Stack Network

The following diagram shows the most simple case, when all the scopes are Dual-Stack.

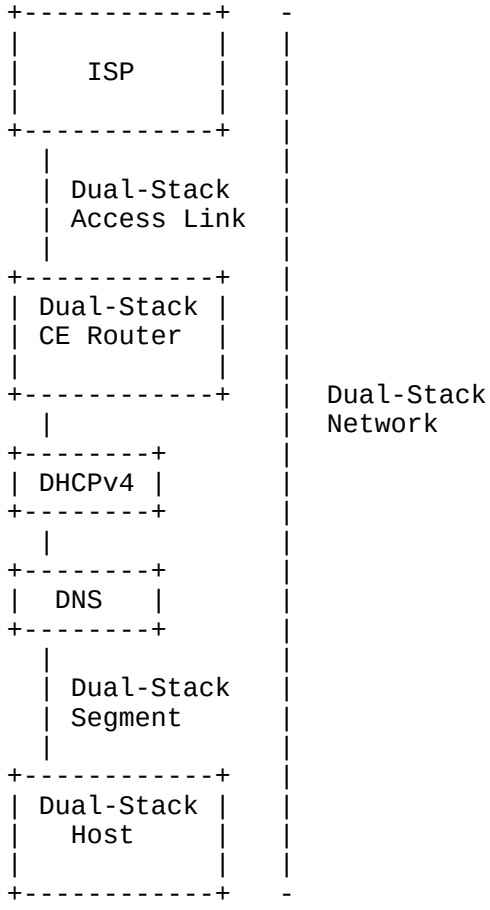


Figure 2: Dual-Stack diagram

## 12.3. IPv6-Only with IPv4aaS Network

The following diagram shows a very common case, when the service provider deploys IPv6-Only in the access link scope (instead of Dual-Stack), however the subscriber segments are still Dual-Stack. This is also a very frequent in mobile networks (UEs or tethered devices remain Dual-Stack). Either the CE Router or the devices will have a CLAT function. The Internet Service Provider provides the stateless NAT64 (PLAT) function.

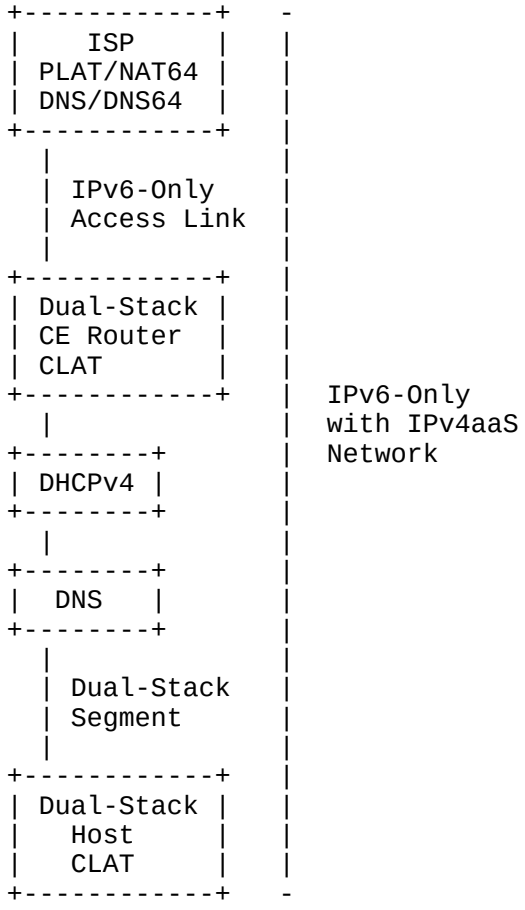


Figure 3: IPv6-Only with IPv4aaS diagram

## 12.4. IPv6-Mostly Segment with Dual-Stack Access Link

The following diagram shows the case of IPv6-Mostly, which may be implemented in different ways. For example when used in residential and SOHO networks, tipically the PLAT is located in the service provider network, as well as the DNS64 (which may be optional). However in enterprises, it may be implemented in the enterprise network itself, in order to gain a bigger control of the configurarion. It is important to note than, in this case, the DHCPv4 function needs to support the option 108. Because that, a Dual-Stack segment will be able to support both, hosts using IPv6-Only (even if they are Dual-Stack and have the CLAT function) as well as IPv4-Only hosts or Dual-Stack hosts without the support of CLAT/option 108. Both, residential, SOHO an enterprise networks

could choose an IPv6-Only Access Link, so the case becomes a mix of IPv6-Mostly and IPv4aaS.

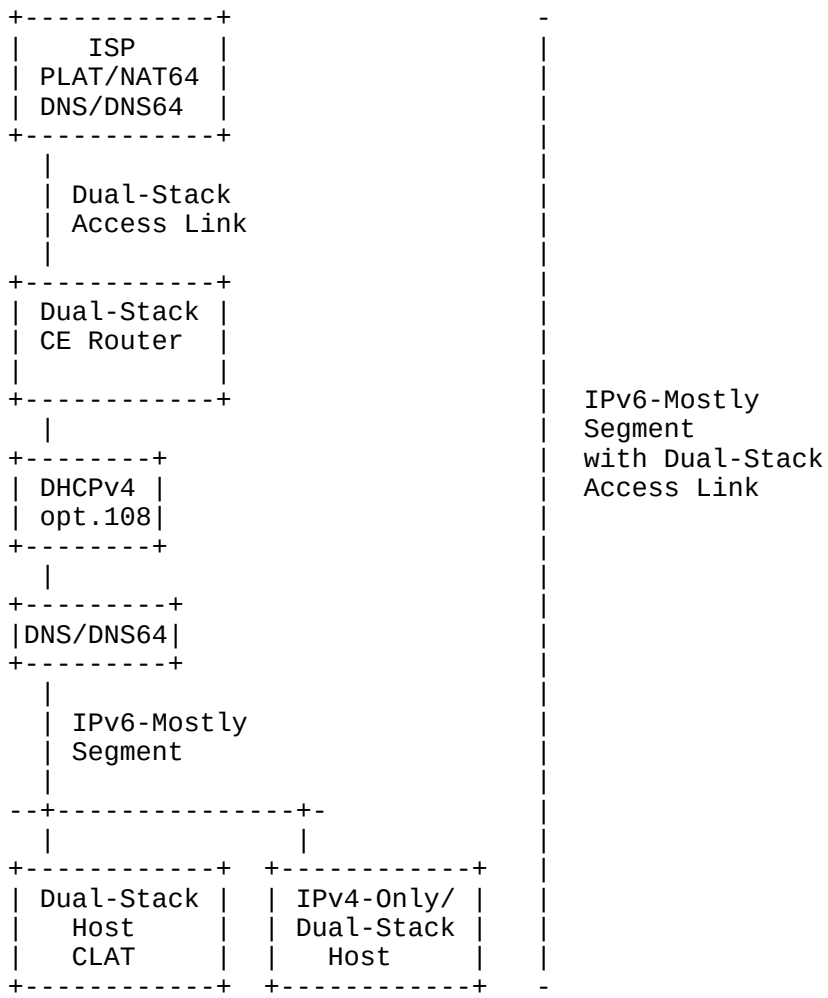


Figure 4: IPv6-Mostly diagram

## 12.5. IPv6-Only Segment with Dual-Stack Access Link

The following diagram shows the case, more common in enterprise networks, when hosts in a segment are able to use IPv6-Only but they still need Dual-Stack access link because they still need to reach IPv4-Only in Internet or other networks segments may need IPv4, for example if the enterprise network needs to expose some Dual-Stack services to Internet. In this case, DHCPv4 is not needed.

Residential and SOHO networks in general will keep using an IPv6-Only Access Link.

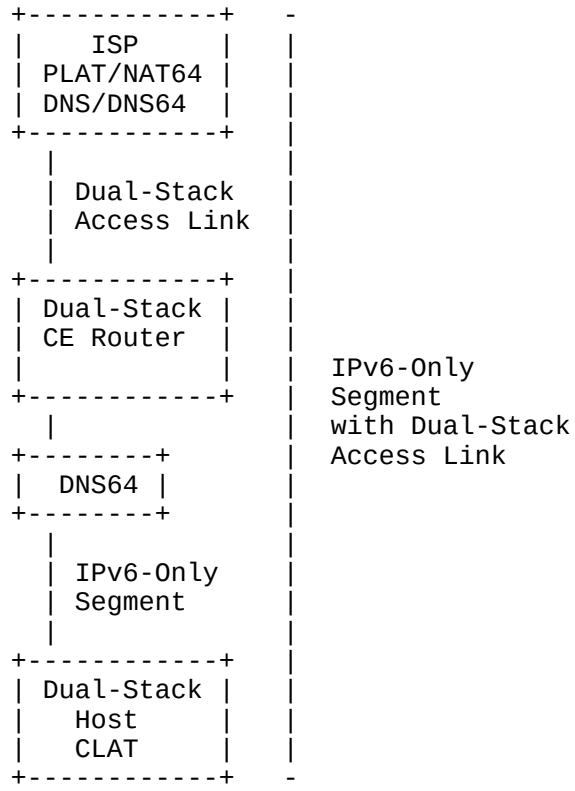


Figure 5: IPv6-Only diagram

## 12.6. IPv6-Only-Strict

The following diagram shows the case, when all the scopes of a network are using only IPv6 and IPv4 communication is not possible. This would be the ideal "full transition" stage, which however, is not feasible in most of the cases, as may be certain destinations in Internet, that a network still need to reach, that remain IPv4-Only for a long period of time.

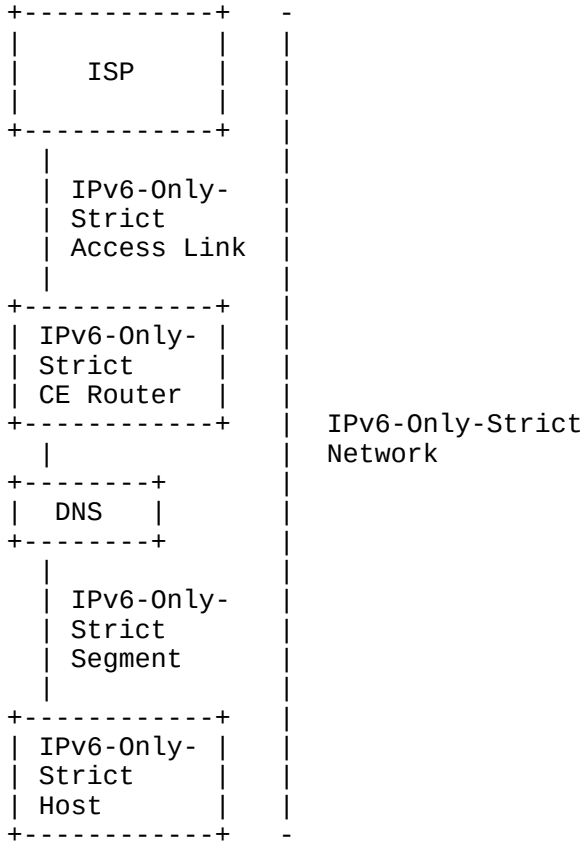


Figure 6: IPv6-Only-Strict diagram

## 13. Usage examples and practical applicability

A typical example will be a service provider network, which has different types of IPv4/IPv6 support in different parts of the network. Typically it will be a "dual-stack core", "dual-stack upstream", "dual-stack BGP", "dual-stack router", but offers "IPv6-only access". It is not common, but may be cases where it is "IPv6-only access data-plane" and "Dual-Stack access control-plane" or "IPv4-only access out-of-band management".

As of this writing, most end-user networks and hosts need to support IPv4, due to many global resources being only available over IPv4. Transition technologies may allow islands to be connected to the broader Internet over a IPv6-only access networks acting as an underlay for legacy IPv4 traffic. An organization aiming to switch to an IPv6-only end-user network will need to ensure that all host/

routers are capable of IPv6-only operation and need to ensure that all off-network resources are available over IPv6 (either as IPv6-only or dual-stacked).

In the case of data-denters, "IPv6-Only compute nodes" may be provided with IPv4 external IPv4 communication, using SIIT-DC. In this case, we have and "IPv6-Only data-center" whe we speak about the internal LANs (anything behind the Border Relay), but "Dual-Stack data-center upstreams".

In the case of a mobile network, we have UEs (User Equipment, e.g., mobile phones) with "IPv6-Only PDP Context", those UEs may offer "Dual-Stack Tethering" and "Dual-Stack to the UE applications"(by means of CLAT), and this is possible thanks to the support of NAT64 in the service provider network; the NAT64 is a "Dual-Stack service", which has an "IPv6-only transport to the UEs".

In the case of an enterprise network, we can find a mix of VLANs or network segments offering Dual-Stack, IPv6-Only and IPv6-Mostly. So in this case, we will be talking about "Dual-Stack VLAN x", "IPv6-Only VLAN y" and "IPv6-Mostly VLAN z".

IPv6-only server, data-center and cloud environments are entirely possible as of this writing, as long as:

* All host/routers are capable of IPv6-only operation.

* All accessed resources (DNS resolvers, NTP servers, software update servers, network management services, and other external resources) are available over IPv6 (either IPv6-only or dual-stacked).

* All inbound communications are capable of IPv6, either due to all external endpoints supporting IPv6 or due to all legacy IPv4 traffic being relayed through a gateway (such as reverse proxy, SIIT-DC gateway, CDN, etc).

Data-centers and cloud enviroments may also support IPv6-only WAN and at the same time internal dual-stack but using only private IPv4 addresses ([RFC1918]).

## 14. Security Considerations

This document does not have any specific security considerations.

## 15. IANA Considerations

This document does not have any IANA considerations.

## 16. Acknowledgements

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