

# IPv6 only Recursive Resolver

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# Background

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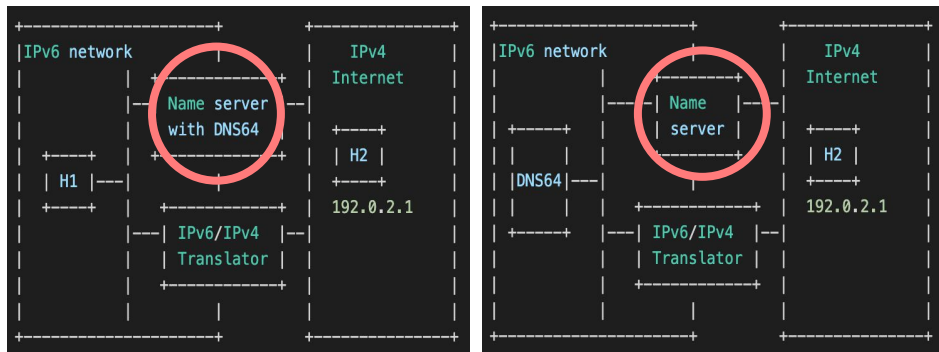
## We want an IPv6 only iterative resolver

1. Operation of **IPv6 only network** is increasing.  
ex) draft-xie-v6ops-framework-md-ipv6only-underlay
2. We (IPv6 enthusiasts) want to operative every application with **IPv6**.  
NO IPv4 !!
3. We want our **own recursive name server**.

# Objectives

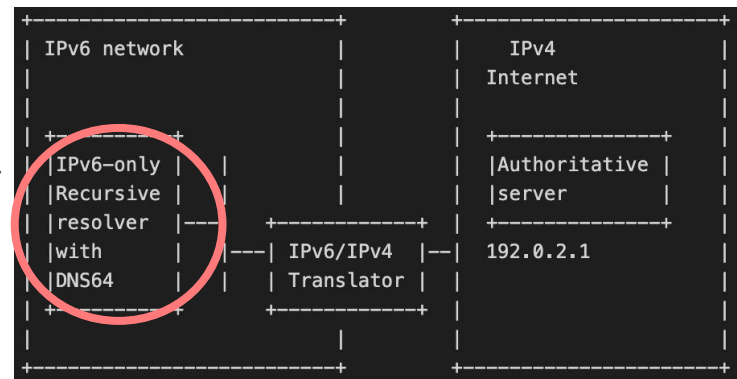
In order to run an IPv6-only network,  
We aim to concentrate IPv4 operations on NAT64.

## Dual Stack Name server



The network design outlined in RFC6147 for DNS64.  
According to this definition, the name server sits in the center of both IPv4 and IPv6 networks.

## IPv6 only Name server

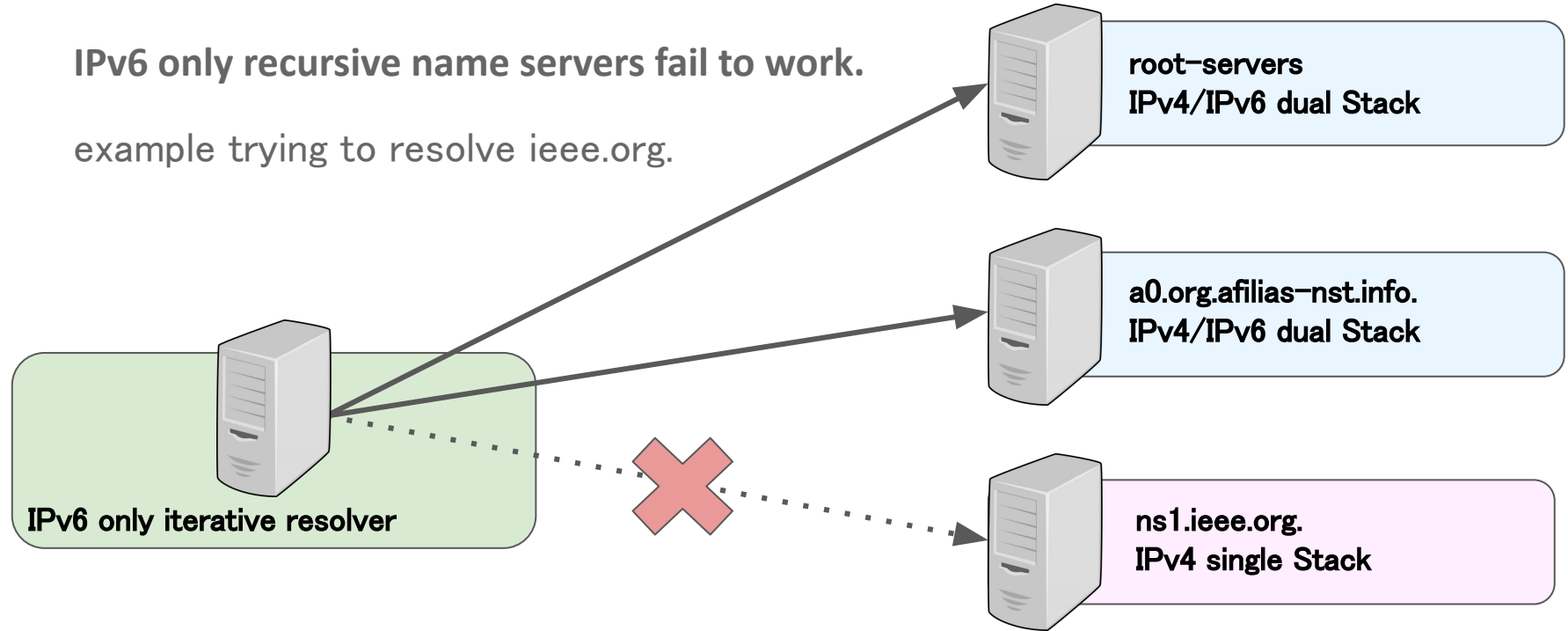


The network topology we want to achieve.  
The Resolver is inside the IPv6 only network.

# Issues of an IPv6 iterative resolver failing

IPv6 only recursive name servers fail to work.

example trying to resolve `ieee.org`.



# Issues of an IPv6 iterative resolver failing

These domain names couldn't be resolved from a "normal" IPv6 only recursive resolvers

wikipedia.org

samsung.com

Because they use IPv4 only Authoritative name servers

yahoo.co.jp

nginx.org

fastly.net

alipay.com

line.me

ns.nginx.org.

harvard.edu

intel.com

ns1.naver.jp.

pixiv.net

dell.com

try for yourself with

ieee.org

webex.com

# dig fastly.net @2001:200:0:1cd1::20

<- an iterative server that only sends IPv6 packets

	A records answered (%)	AAAA records answered (%)
Resolvign with IPv4	93.2	27.6
Resolving with IPv6	78.0	25.4

IPv6 only resolvers failing

status: SERVFAIL

# Reference RFC3901 BCP91

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## 4. DNS IPv6 Transport recommended Guidelines

In order to preserve name space continuity, the following administrative policies are recommended:

- **every recursive name server SHOULD be either IPv4-only or dual stack,**

This rules out IPv6-only recursive servers. However, one might design configurations where a chain of IPv6-only name server forward queries to a set of dual stack recursive name server actually performing those recursive queries.

- **every DNS zone SHOULD be served by at least one IPv4-reachable authoritative name server.**

This rules out DNS zones served only by IPv6-only authoritative name servers.

# Proposal

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## How can we achieve IPv6 only recursive name servers?

There are two ways to achieve this.

1. Change **all authoritative name servers** so...

Every DNS zone be served by at least one IPv6-reachable authoritative name server

2. Change the **IPv6 only recursive name servers implementation** so...

An IPv6 only recursive name server utilizes the NAT64 in the network when sending queries to IPv4 only authoritative name servers.

# Proposal

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## How can we achieve IPv6 only recursive name servers?

There are two ways to achieve this.

1. Change all authoritative name servers so...

Every DNS zone be served by at least one IPv6-reachable authoritative name server

**Giving IPv6-reachability to all authoritative name servers is hard.**

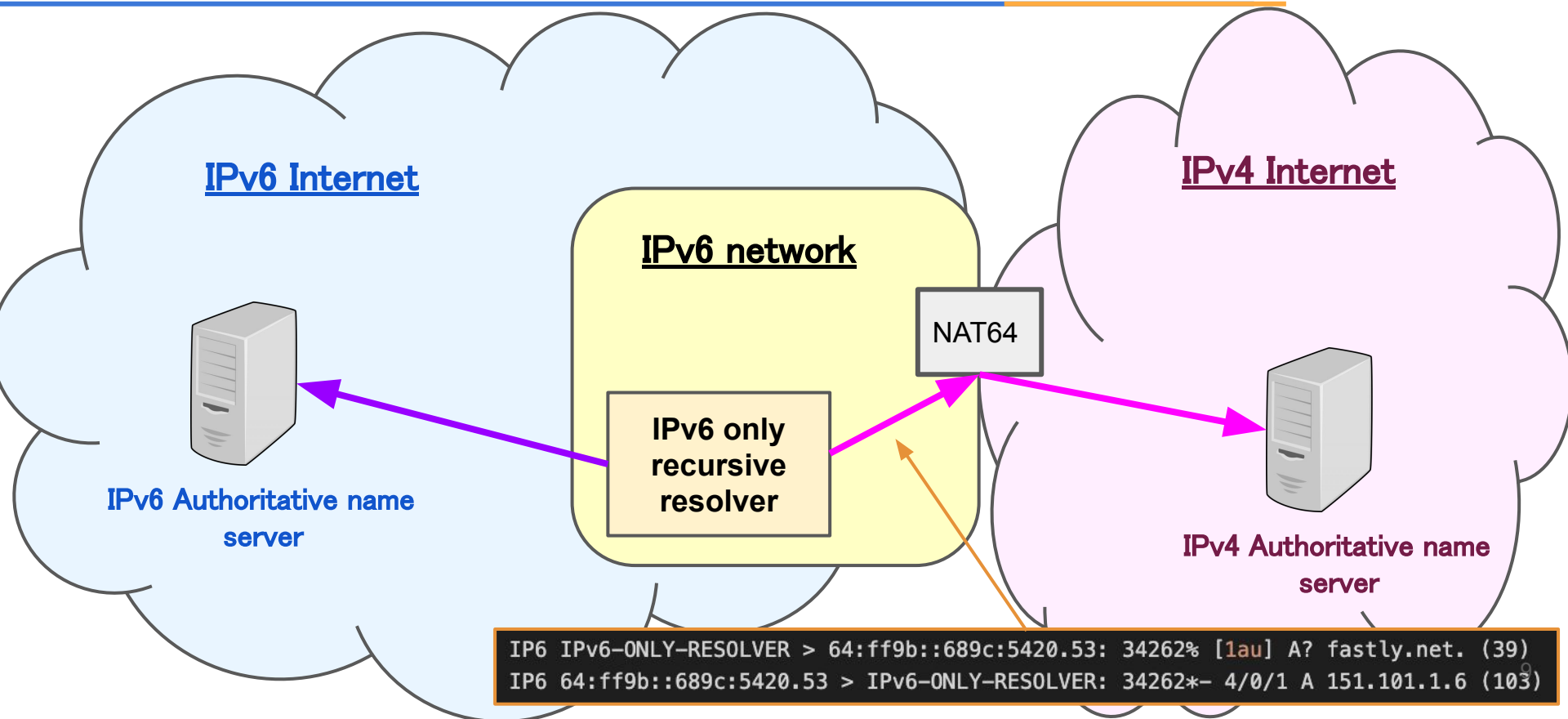
2. Change the IPv6 only recursive name servers implementation so...

An IPv6 only recursive name server utilizes the NAT64 in the network when sending queries to IPv4 only authoritative name servers.

**We can deploy this IPv6 only recursive name server to an IPv6 only network**



# Approach (the resolver doing CLAT function)



# Background and Proposal

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## Background:

1. Operation of **IPv6 only network** is increasing. ex) draft-xie-v6ops-framework-md-ipv6only-underlay
2. We (an IPv6 enthusiast) want to operative every application with **IPv6**. NO IPv4 !!
3. We want our **own recursive name server**.
4. However “every recursive name server SHOULD be either IPv4-only or dual stack”  
RFC3901 BCP91

## Proposal:

1. The networking community should normalize IPv6 only iterative resolvers.
2. As a stepping stone we propose **IPv6 only resolver under NAT64**

# Implementations

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Not yet merged changes.

## BIND

[https://gitlab.isc.org/isc-projects/bind9/-/merge\\_requests/6334/commits](https://gitlab.isc.org/isc-projects/bind9/-/merge_requests/6334/commits)

## Unbound

<https://github.com/NLnetLabs/unbound/issues/721>

# Roadmap

## Current State

IPv6 single stack recursive name server can't work properly, because of IPv4 only Authoritative servers.  
( ; ω ; ` )

## Current Goals I have

Propose  
[draft-momoka-dnsop-ipv6-only-resolver](#)

Obtain a standard understanding (RFC) of a **recursive name server that only supports IPv6 and uses NAT64**. platform @v6ops IETF ?

## Further Future Goals out of scope for today

not for now :)

Every Recursive resolver can work with IPv6 only.

# Limitation & discussion

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1. Are there any security considerations?
  - a. Are there any security issues using a NAT64 for DNS
  - b. There is the problem of “DNSSEC Validators and DNS64” but that is when the answer of a query is changed and is out of the scope of our proposal.
  - c. Does DNSSEC work with this resolver.
    - i. I think so but still WIP for PoC

# Propose draft-momoka-v6ops-ipv6-only-resolver

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## Abstract:

By performing IPv4 to IPv6 translation, IPv6-only iterative resolvers can operate in an IPv6-only environment. When a specific DNS zone is only served by an IPv4-only authoritative server, the iterative resolver will translate the IPv4 address to IPv6 to access the authoritative server's IPv4 address via NAT64. This mechanism allows IPv6-only iterative resolvers to initiate communications to IPv4-only authoritative servers.

Feedback is highly appreciated!



in progress at

<https://datatracker.ietf.org/doc/draft-momoka-v6ops-ipv6-only-resolver/>