

Introducing IPv6-only in the Internet:

Balkanisation... or Translation?

Alain.Durand@sun.com

When will IPv6-only deployment happen?

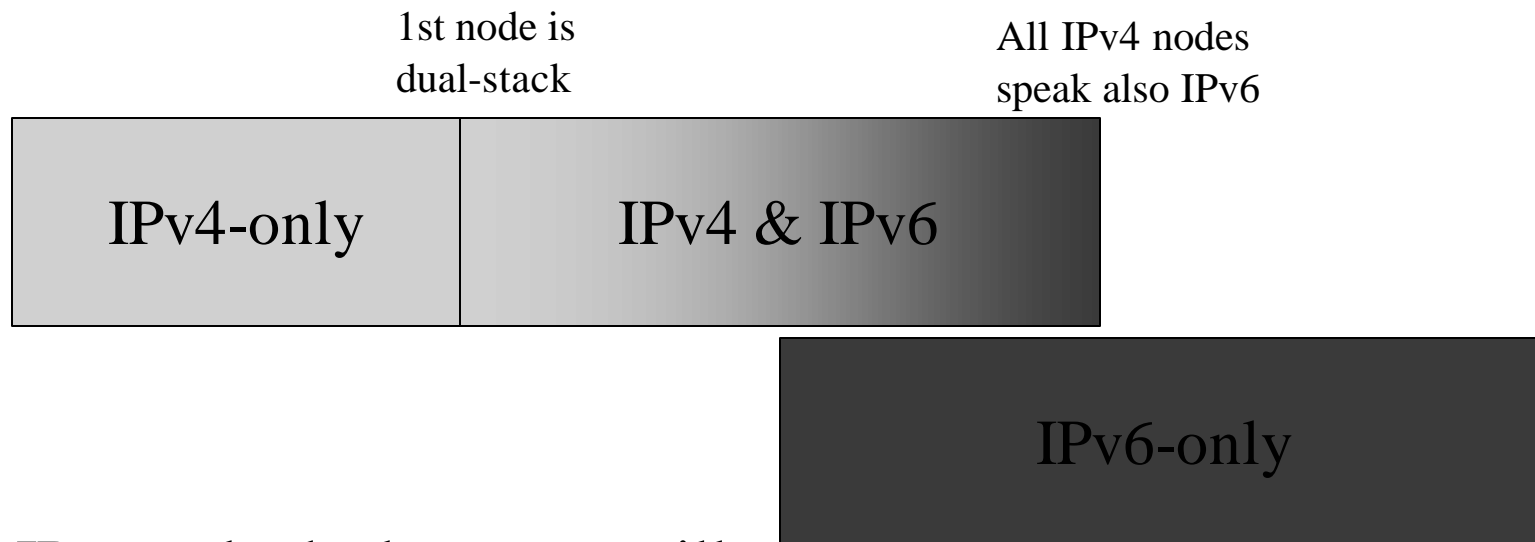
Hypothesis 1



IPv6-only deployments will happen after all IPv4 nodes are converted to speak also IPv6.

When will IPv6-only deployment happen?

Hypothesis 2



IPv6-only deployments will happen before all IPv4 nodes are converted to speak also IPv6.

Balkanization ?

- Early IPv6-only deployment (hypothesis 2) is very likely to happen.
- What will happen when an IPvX node will try to communicate with an IPvY node?

Even simple things are complex

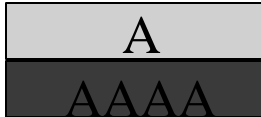
- Hypothesis: IPv6 only nodes use IPv6 applications and only ‘need’ to talk to IPv6 nodes.
- Sounds nice, but:
 - When node A (IPv6) wants to “communicate” with node B (IPv6), some initial setup involving 3rd parties may be necessary:
 - DNS, LDAP request
 - MAIL relays
 - SIP gateways
 - Some of those 3rd parties may be IPv4 only and things get sour.

Example of problems

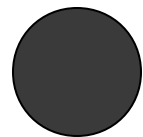
Example 1

Dual stack
web server

www.sun.com

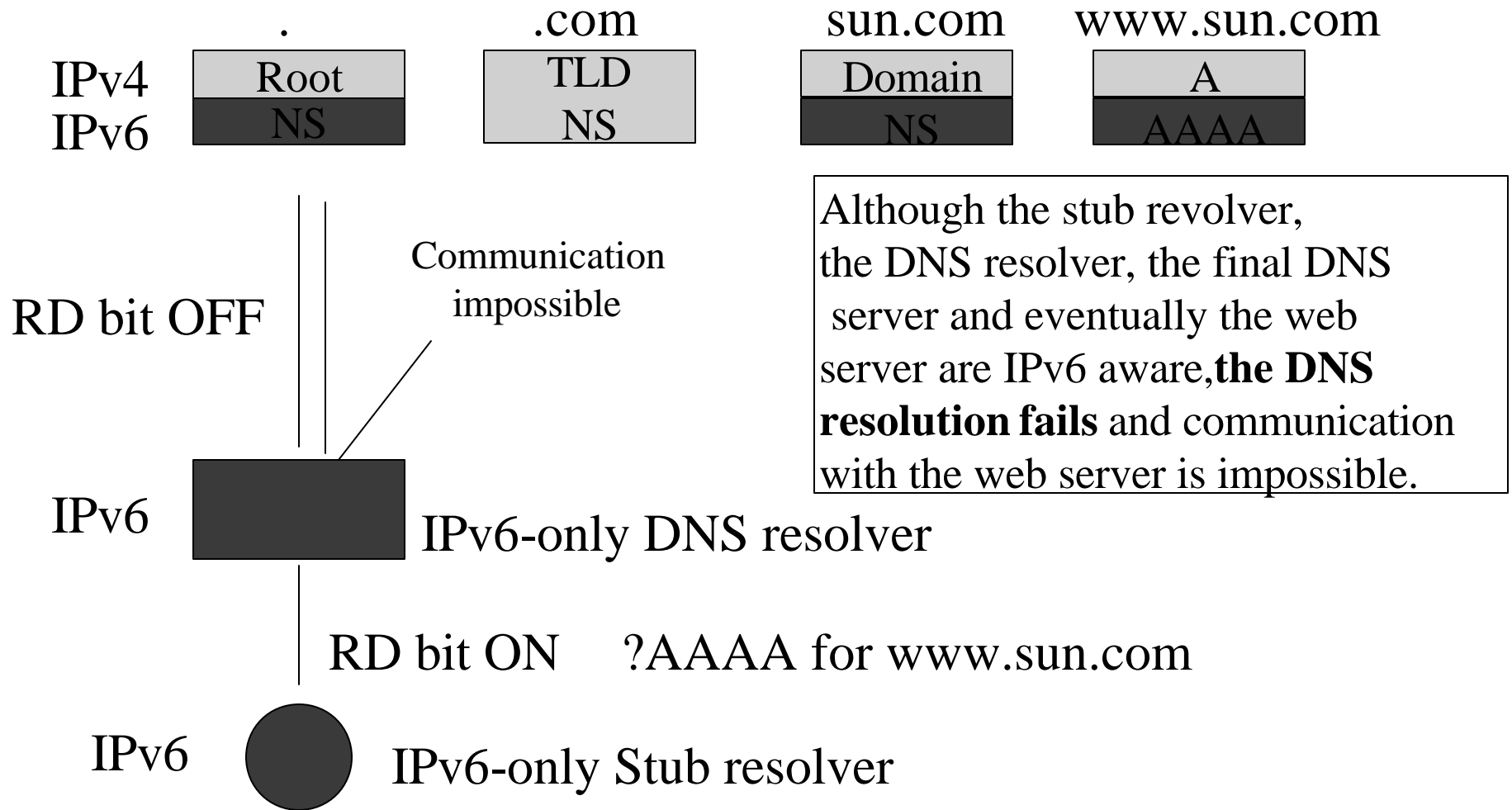


The IPv6 only node wants to
browse the dual stack web server.

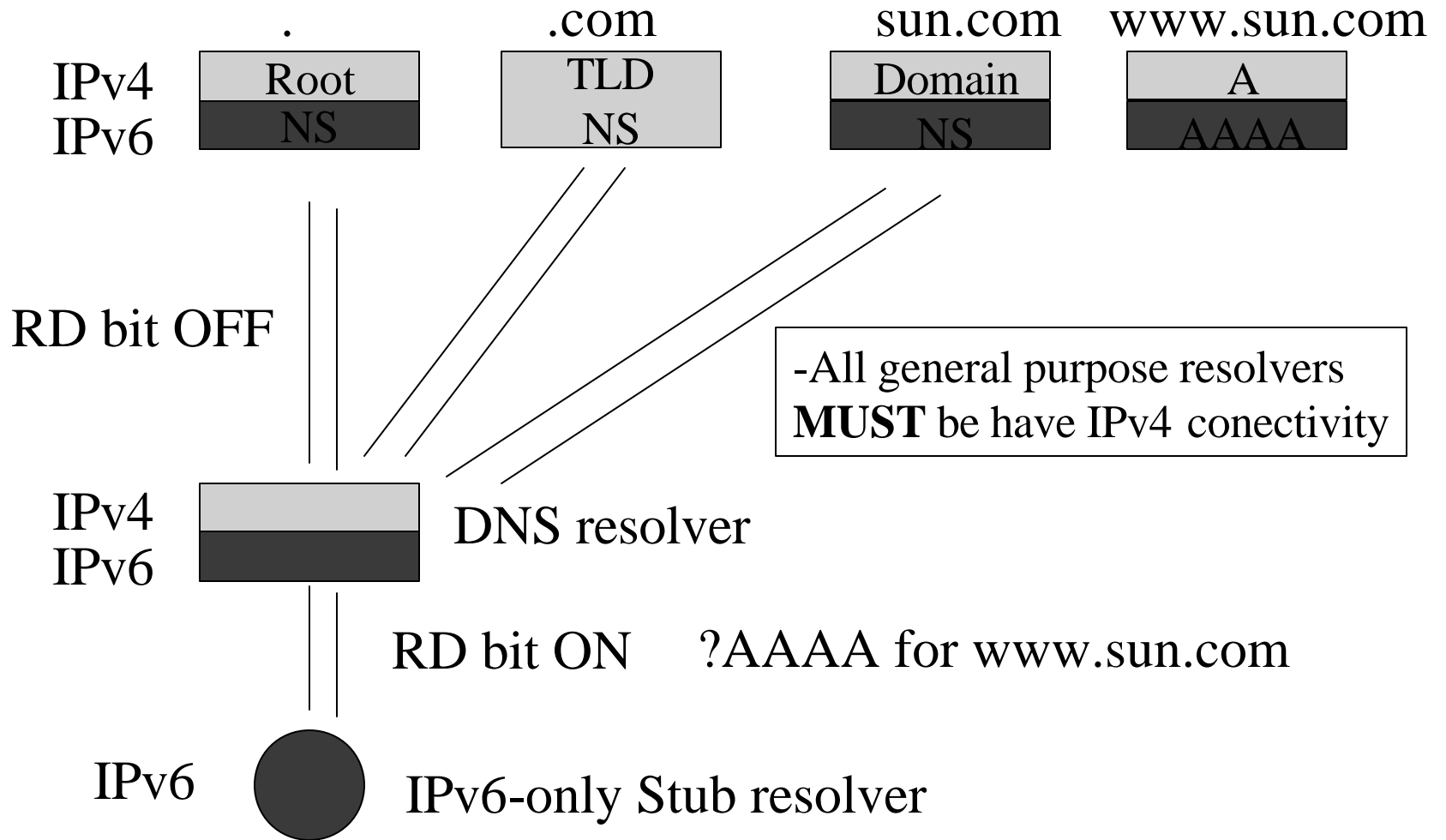


IPv6-only node

Example 1



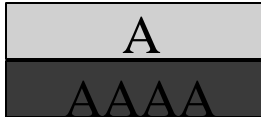
Administrative Solution 1



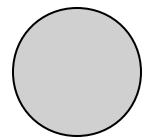
Example 1bis

Dual stack
web server

www.sun.new



The IPv4 only node wants to
browse the dual stack web server.

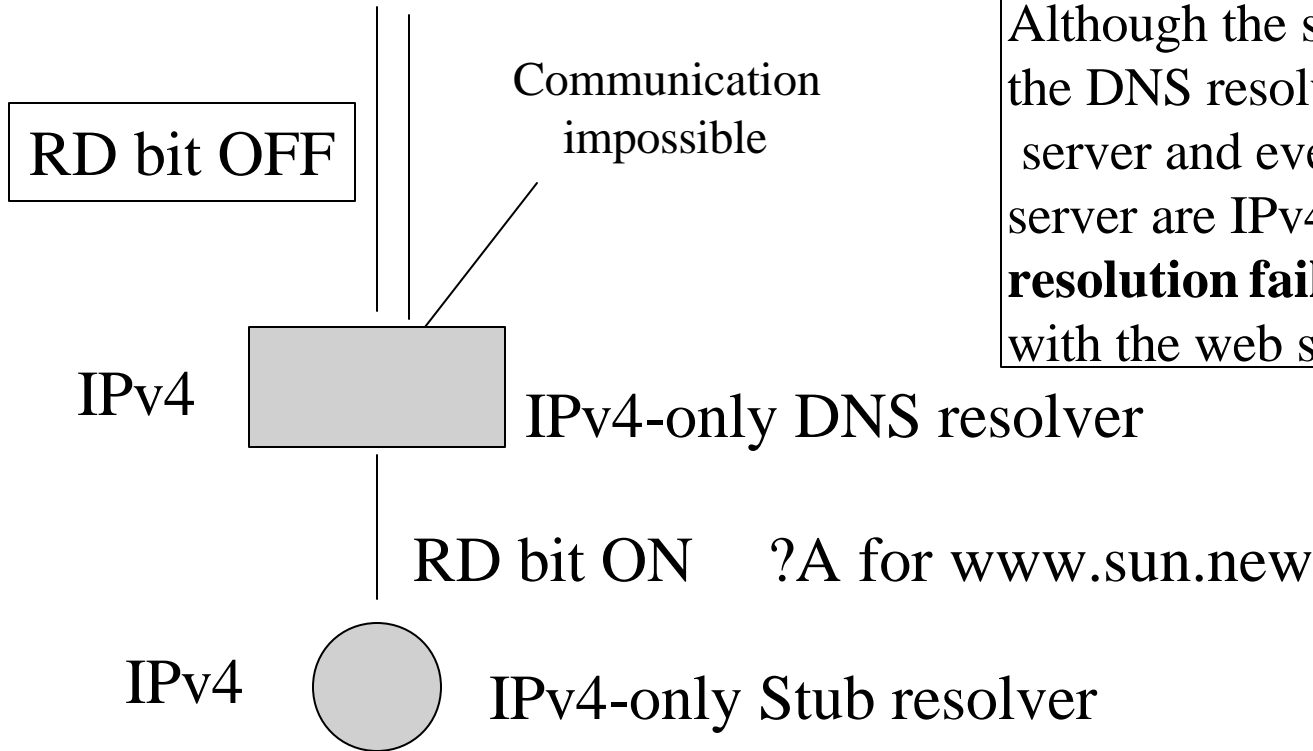


IPv4-only node

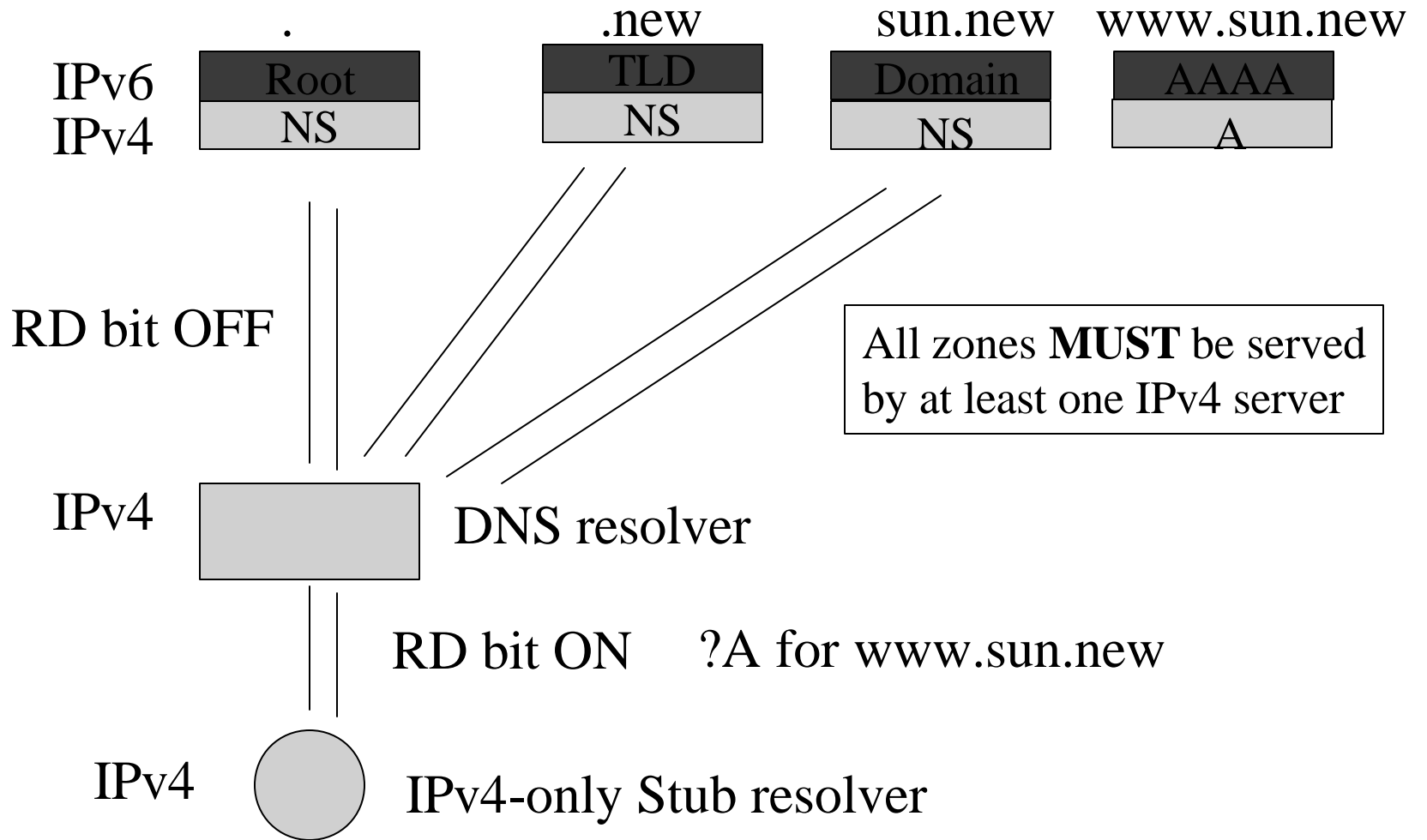
Example 1bis



Although the stub resolver, the DNS resolver, the final DNS server and eventually the web server are IPv4 aware, **the DNS resolution fails** and communication with the web server is impossible.

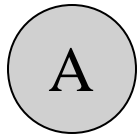


Administrative Solution 1bis

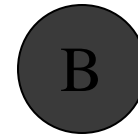


Example 2

User on A wants to send mail to user on B



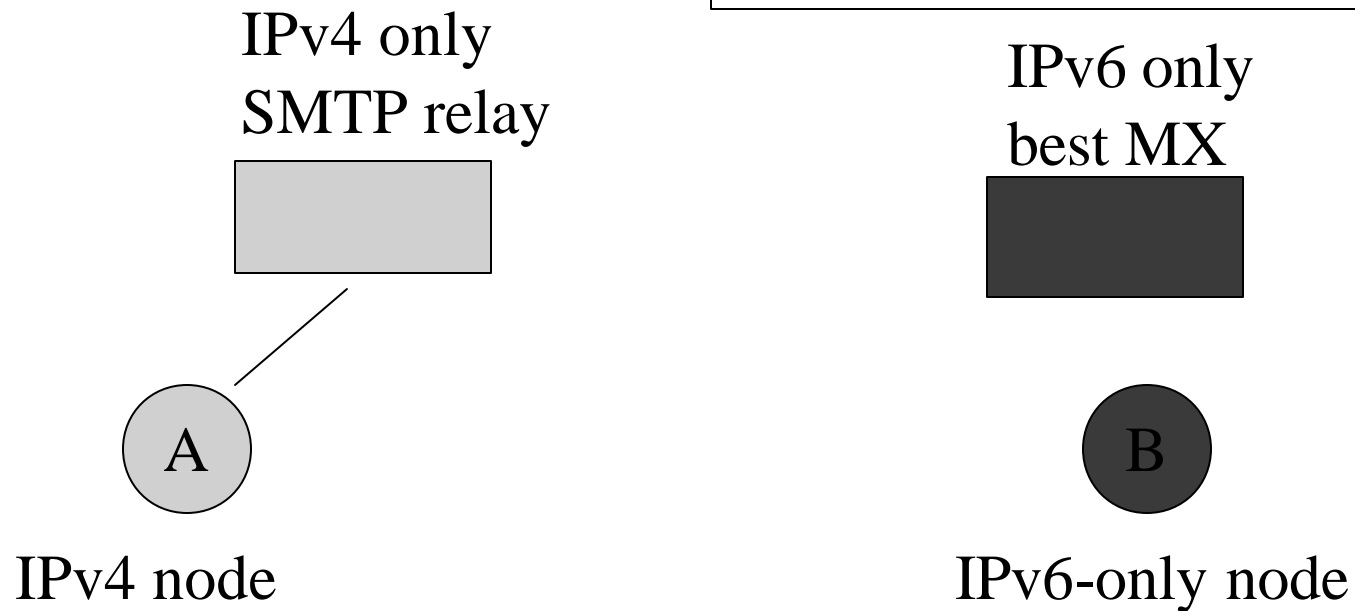
IPv4 node



IPv6-only node

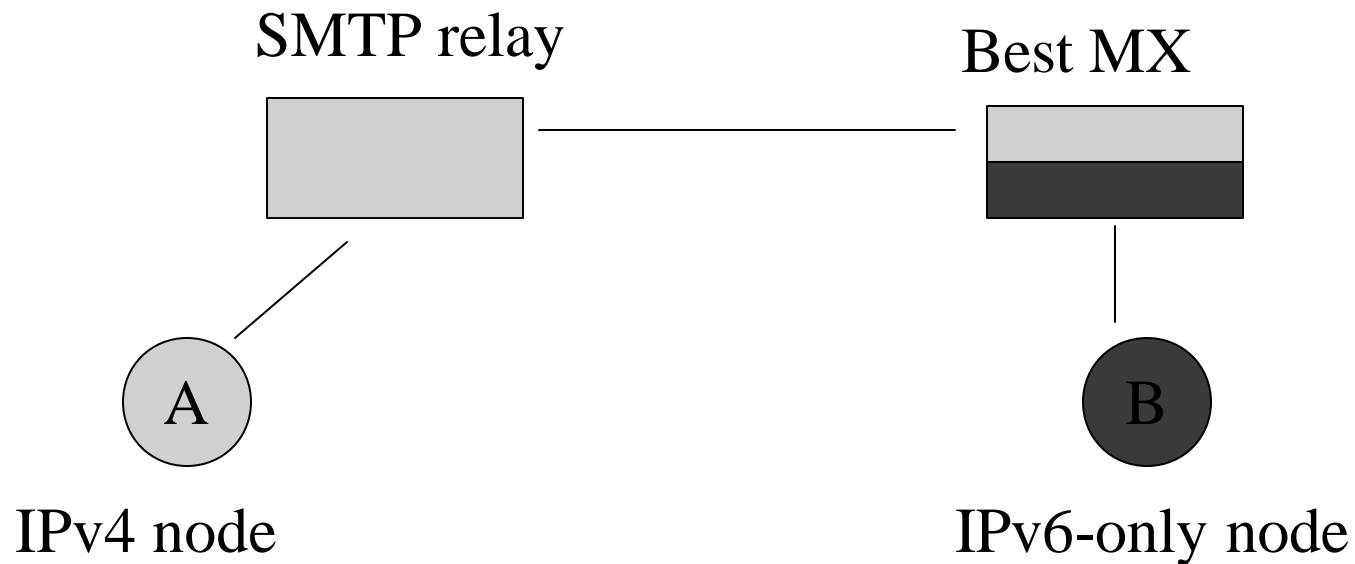
Example 2

The IPv4 only SMTP relay can not talk to the IPv6 only best MX for B.



Administrative Solution 2

All best MX must have IPv4 connectivity

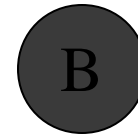


Example 2bis

User on B wants to send mail to user on A



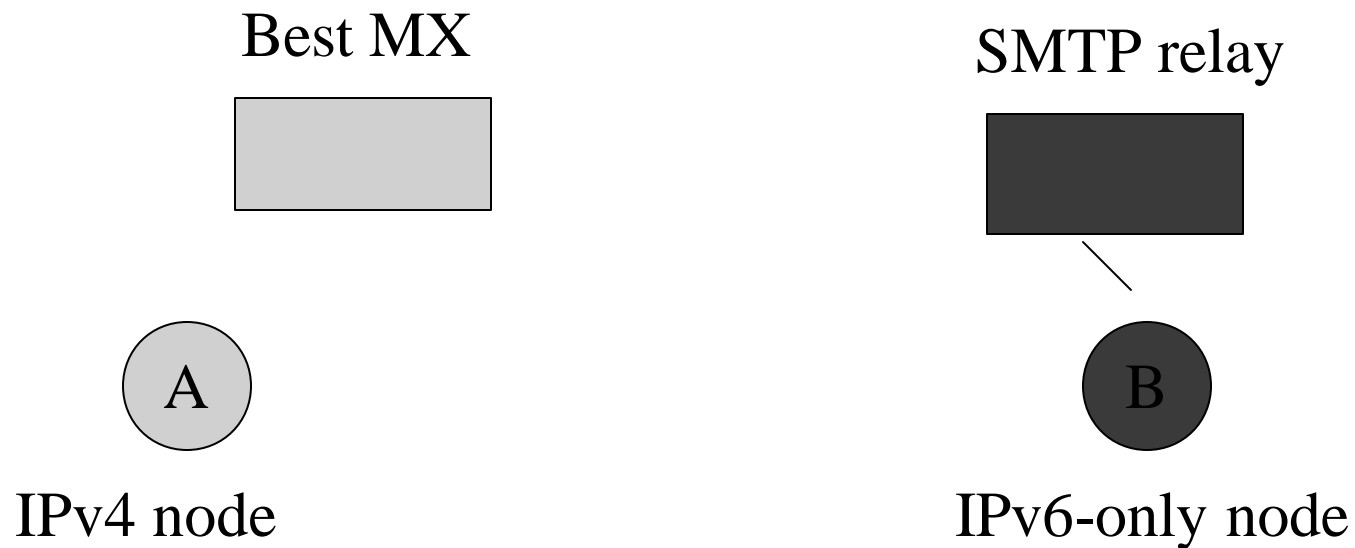
IPv4 node



IPv6-only node

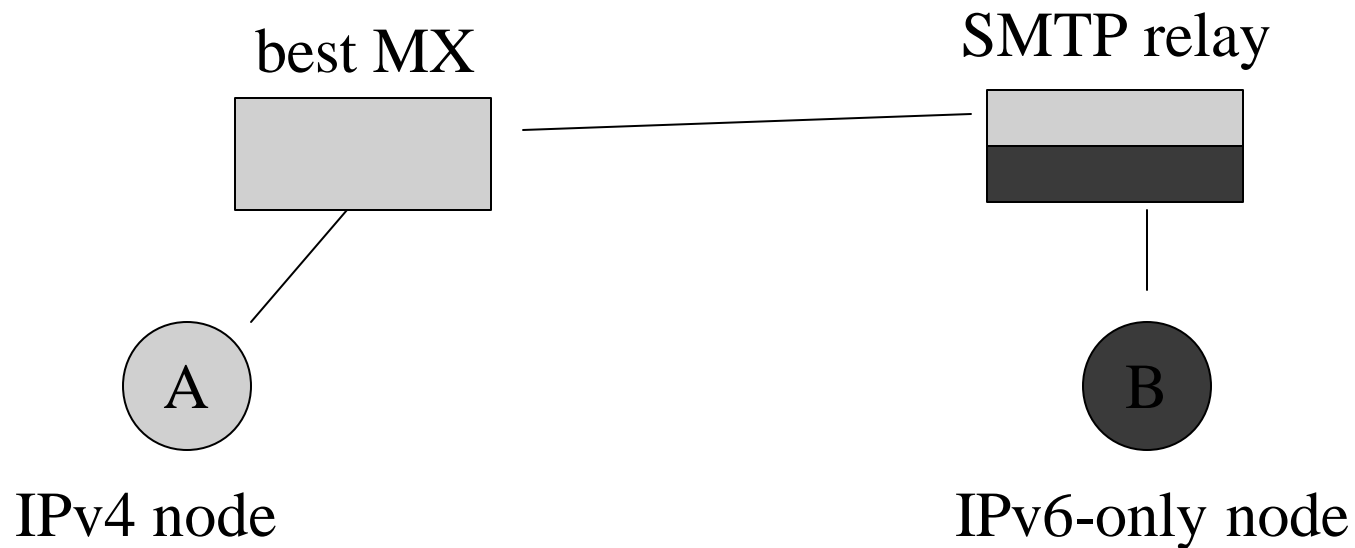
Example 2bis

The IPv6 only SMTP relay can not talk to the IPv4 only best MX for A.



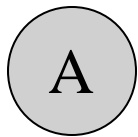
Administrative Solution 2bis

All SMTP relays must have IPv4 connectivity

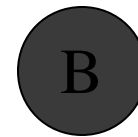


Example 3

User on A wants a SIP-controlled session with user on B



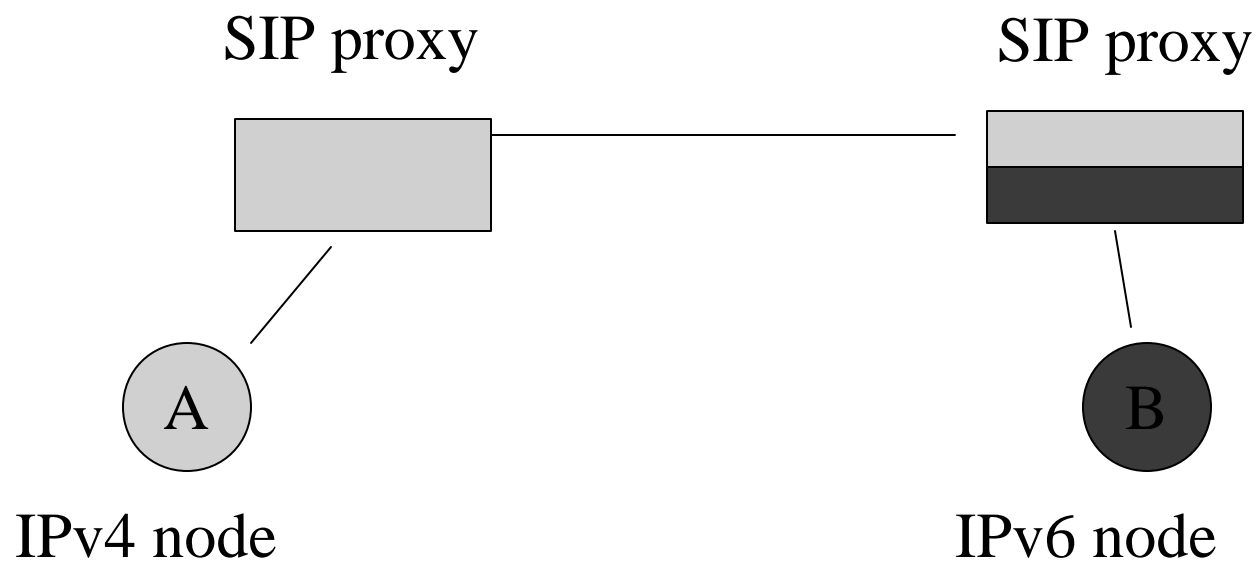
IPv4 node



IPv6 node

Example 3

Even if B's SIP proxy is dual-stack, signaling will work, but direct communication will fail



Observations/1

- There are similarities in the problems faced by DNS, SMTP, (LDAP), SIP....
- Administrative solutions are possible to implement in the early phases of deployment for some applications.
- However those solutions have scaling issues
- Administrative solutions do not work for SIP-like applications.

Observations/2

- It is probably interesting to explore a L3 solution instead of a per application ad-hoc solution.
- IPv4 installed based is virtually impossible to change, so NAT4->6 is much more complex than NAT6->4
- ALG will be needed to assist NAT6->4 and NAT4->6

Exploring technical solutions

- Problem statements:
 - Scalable solution to enable IPv6 client to communicate with any unmodified IPv4-only server on any unmodified IPv4-only node on the public Internet with minimum configuration in the network and without introducing any new security problems.
 - Scalable solution to enable unmodified IPv4 client running on an unmodified IPv4 node to communicate with any IPv6 server in the public Internet with minimum configuration in the network and without introducing any new security problems.

IPv6 -> IPv4

- NAT-PT has serious issues
 - draft-durand-natpt-dns-alg-issues-00.txt
- Solution 1: patching NAT-PT DNS ALG
 - draft-hallin-natpt-dns-alg-solutions-00.txt
- Solution 2: removing DNS ALG
 - NAT64
 - draft-durand-ngtrans-nat64-nat46-00.txt

IPv4 -> IPv6

- Much more difficult problem
- DNS ALG “near” the IPv4 node
 - NAT46
 - draft-durand-ngtrans-nat64-nat46-00.txt
- Other approaches ???