IPv6 Support for Multiple Routers, Multiple Interfaces, and Multiple Prefixes

Fernando Gont
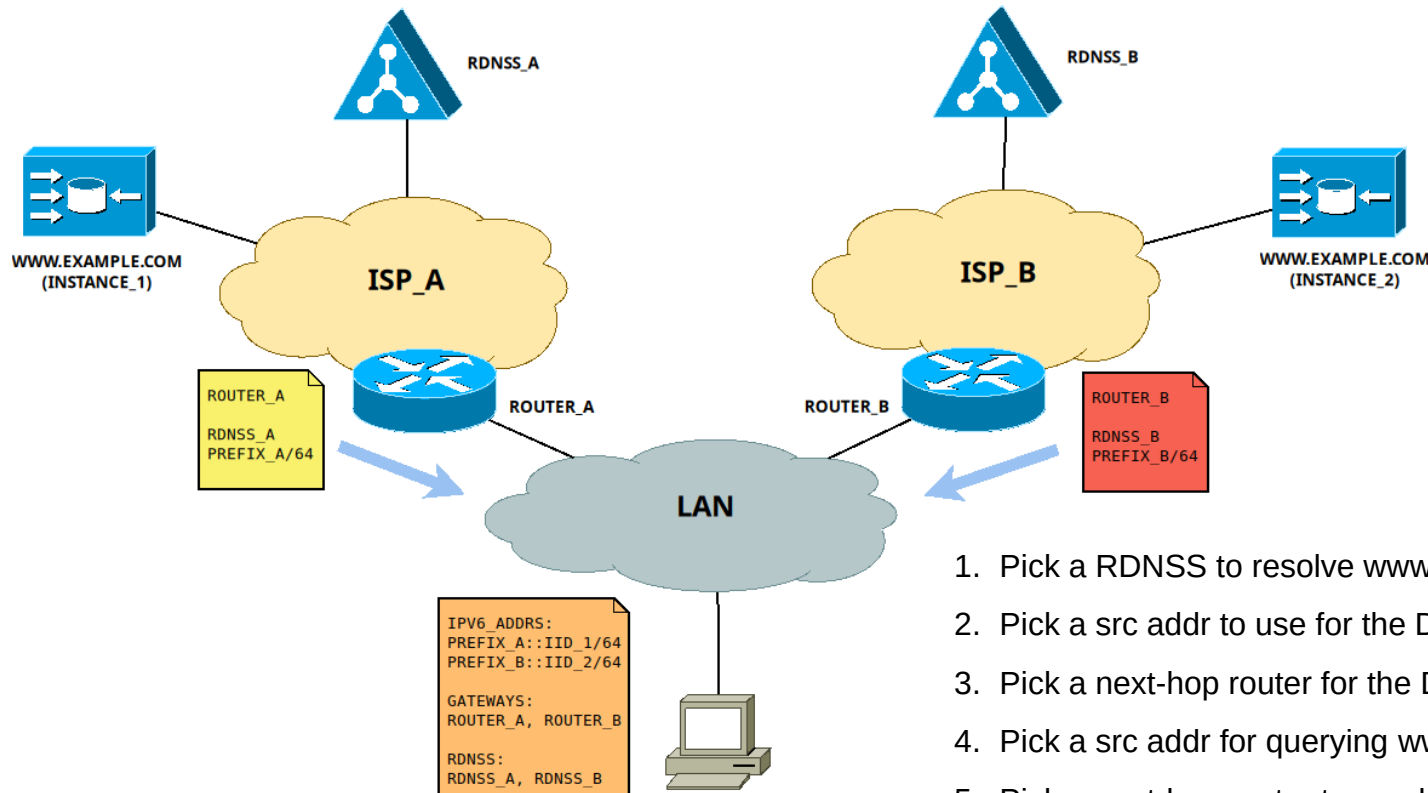**SI6 Networks**

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Introduction

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Multi-(Router, Interface, Prefix)

- Scenarios with multiple routers, multiple interfaces, and/or multiple prefixes are quite common. They include:

    - A laptop connects to the Internet via Ethernet & WiFi interfaces

    - SOHO connects to the Internet via two ISPs (and associated CPE routers)

- Support for these scenarios has been poor (if at all present):

    - Breakage is sometimes avoided by employing only one interface at a time, or,

    - Otherwise things just break badly

- This warrants improved support in host implementations

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Common Multi-IPv6 Scenario

RDNSS_A

RDNSS_B

WWW.EXAMPLE.COM
(INSTANCE_1)

WWW.EXAMPLE.COM
(INSTANCE_2)

ISP_A

ISP_B

ROUTER_A

ROUTER_B

ROUTER_A

RDNSS_A
PREFIX_A/64

ROUTER_B

RDNSS_B
PREFIX_B/64

LAN

IPV6_ADDRS:
PREFIX_A::IID_1/64
PREFIX_B::IID_2/64
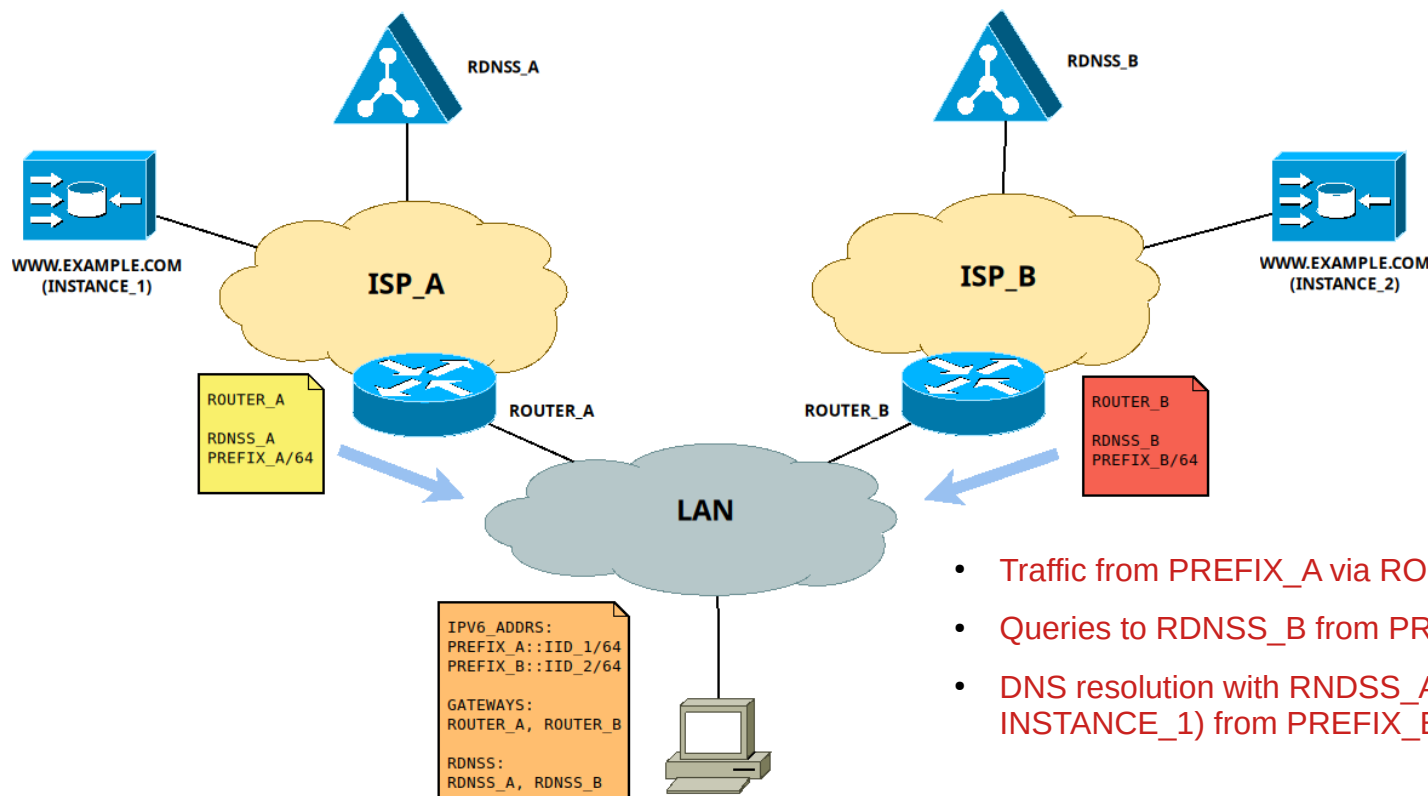
GATEWAYS:
ROUTER_A, ROUTER_B

RDNSS:
RDNSS_A, RDNSS_B

1. Pick a RDNSS to resolve www.example.com

2. Pick a src addr to use for the DNS query

3. Pick a next-hop router for the DNS query packets

4. Pick a src addr for querying www.example.com

5. Pick a next-hop router to reach www.example.com

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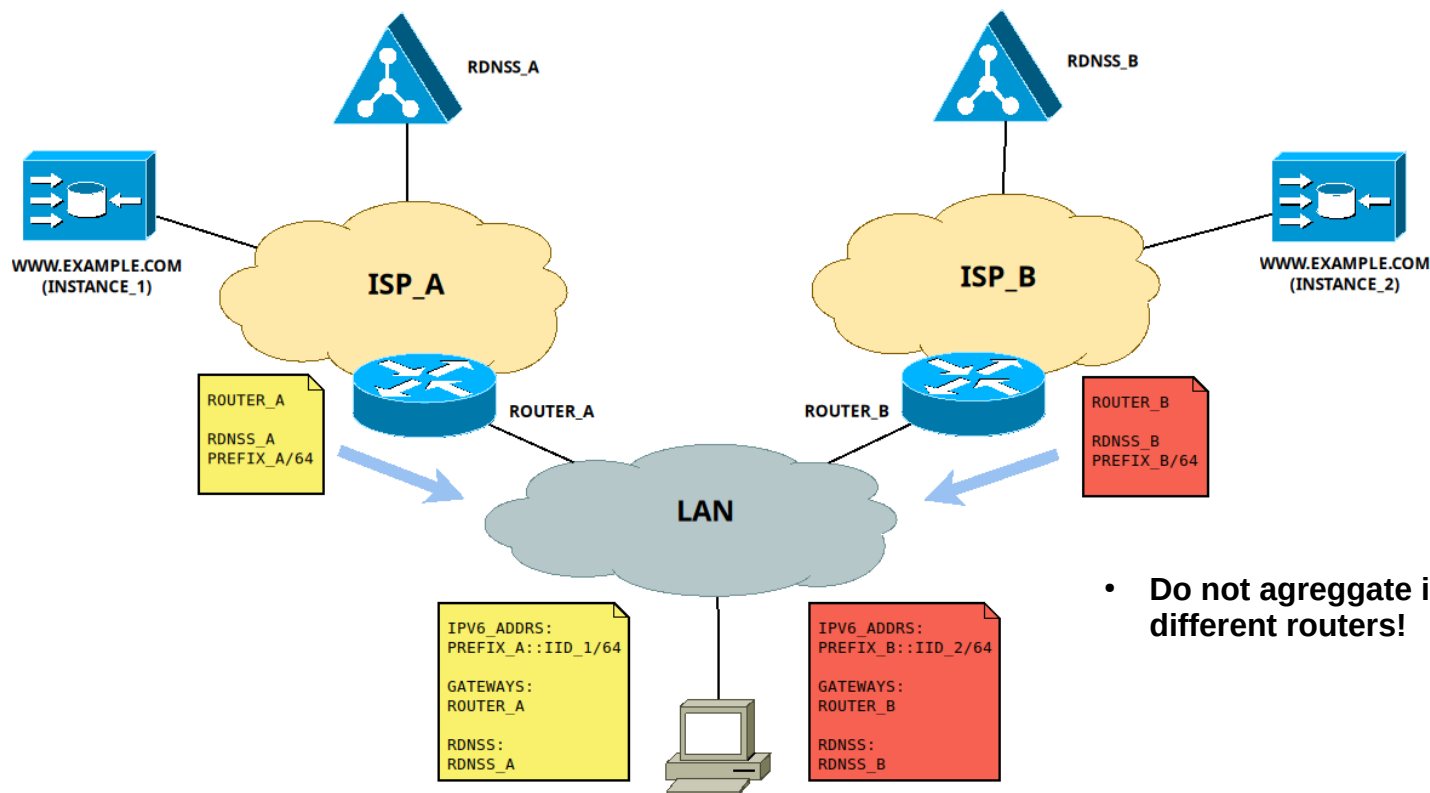NETWORKS

So.... what is the problem?

- SLAAC operates on the premise that:

    - Each router advertises configuration information

    - All information is globally valid

    - Hosts aggregate all received information

    - Hosts employ this information as they see fits

- But except in specific scenarios, this doesn't play out well

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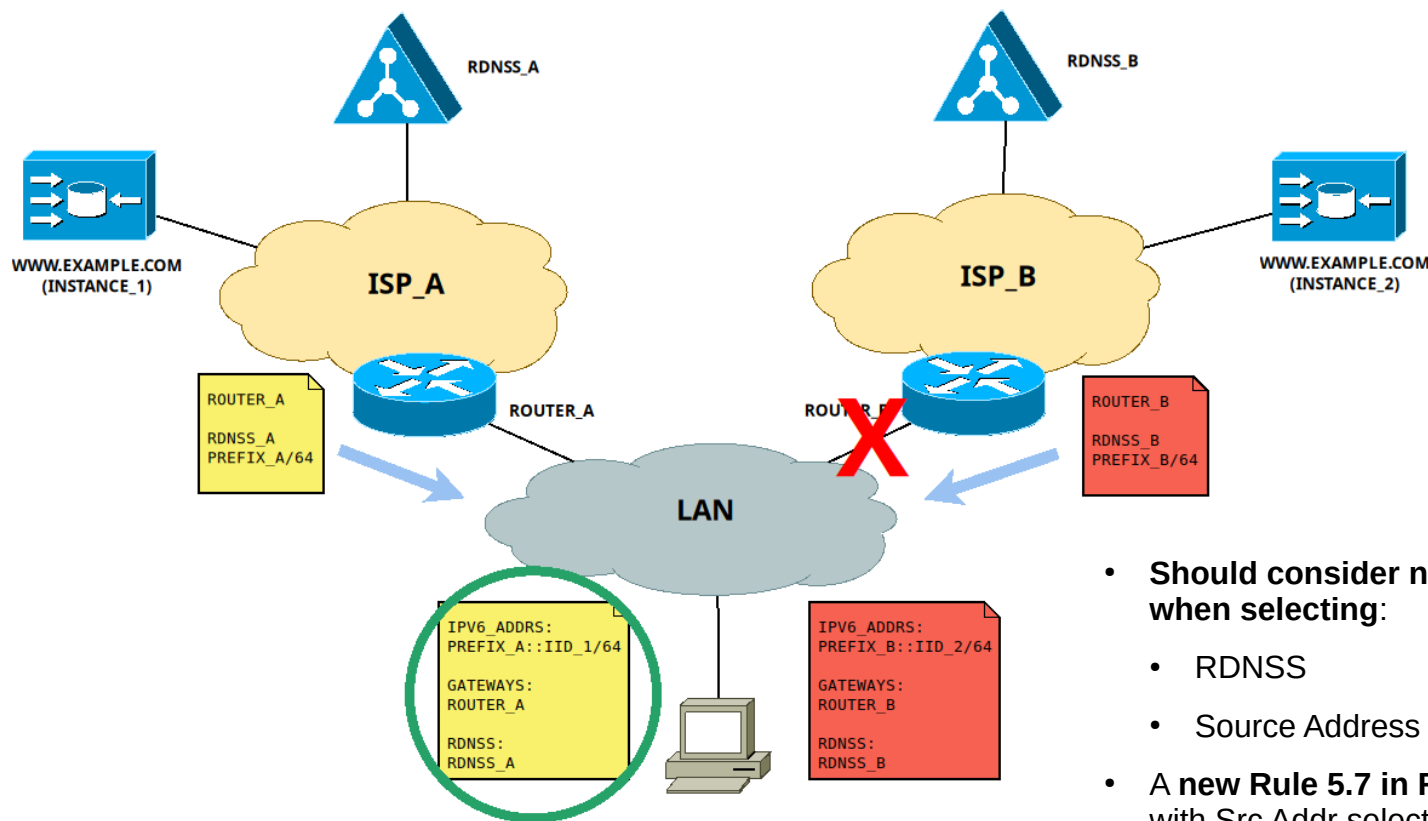Lisbon, Portugal. May 12nd-16th, 2025

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Multi-IPv6 Scenarios

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Scenario #1: Multi-Router, Multi-Prefix

- Traffic from PREFIX_A via ROUTER_B
- Queries to RDNSS_B from PREFIX_A
- DNS resolution with RNDSS_A, HTTP requests (to INSTANCE_1) from PREFIX_B

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Scenario #1: Multi-Router, Multi-Prefix (improved)

- **Do not agreggate information from different routers!**

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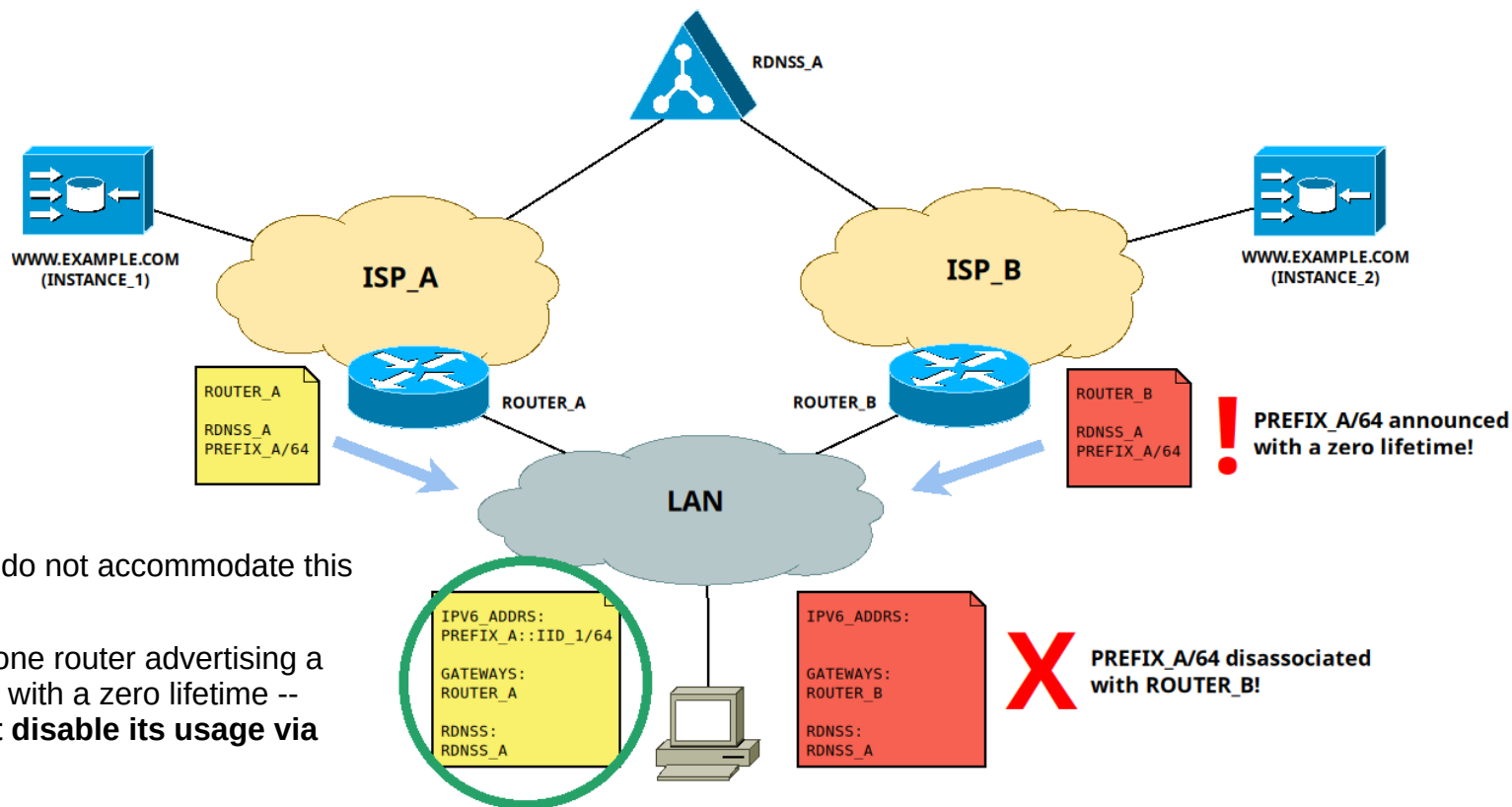
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Scenario #2: Multi-Router, Multi-Prefix Failover

- **Should consider network reachability when selecting**:
  - RDNSS
  - Source Address
- A **new Rule 5.7 in RFC 6724** could help with Src Addr selection

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Scenario #5: Conflicting information

- Current specs do not accommodate this scenario

- Consider e.g. one router advertising a public resolver with a zero lifetime -- **this shouldn't disable its usage via other routers**

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Ongoing Work

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What are we doing about it?

- We are pursuing work in this area at the IETF

- draft-gont-v6ops-multi-ipv6:

  - Problem statement
  - Defines specific scenarios that any solution in this space should address

- draft-gont-6man-multi-ipv6-spec:

  - Host-only updates
  - No new or modified wire protocols

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Conclusions

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Conclusions

- Multi-IPv6 scenarios are currently broken

- Past attempts at improving support for Multi-IPv6 have focused on new/updated wire protocols

- We believe most common scenarios can (and should!) be addressed with host-only improvements

- **We know what the other possible alternative is...**

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Comments / Questions?

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Thanks!

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IPv6 Hackers mailing-list

http://www.si6networks.com/community/

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