Stateless Source Address Mapping Algorithm for ICMPv6 Packets

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Outline

- Problem Statement
- Analysis of the Possible Approaches
- Stateless Source Address Mapping Algorithms for ICMPv6 Packets
- Recommendations

“A future work” in xlate

- **IP/ICMP Translation Algorithm draft-ietf-behave-v6v4-xlate-11**
  - 4.3. Translating ICMPv6 Error Messages into ICMPv4
    - ……
    - Note that the IPv6 addresses in the IPv6 header may not be IPv4-translatable addresses and there will be no corresponding IPv4 addresses. In this case, the translator can do stateful translation. A mechanism by which the translator can instead do stateless translation is left for future work.

Problem statement

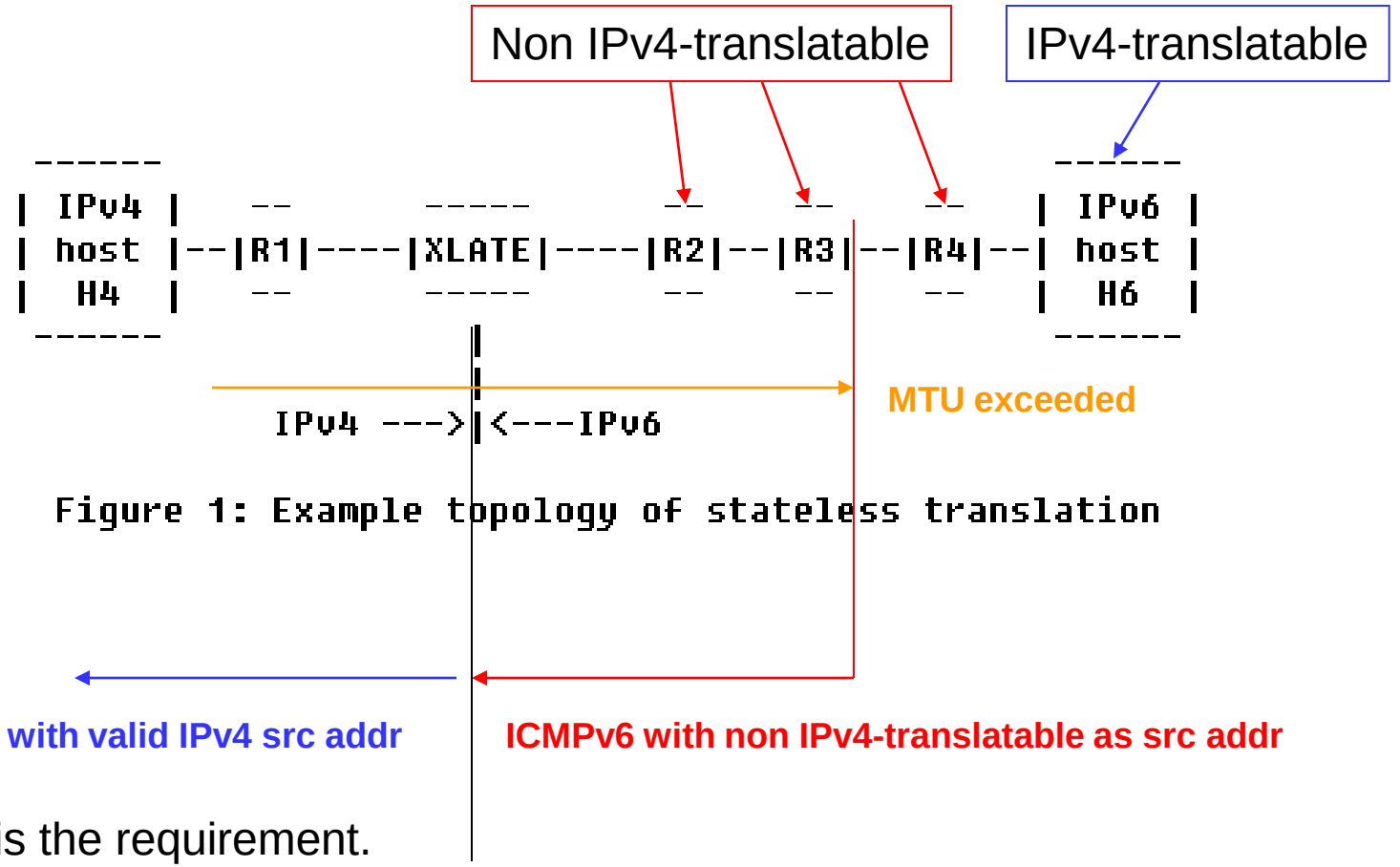


Figure 1: Example topology of stateless translation

This is the requirement.

Analysis of the Current Approaches

- Configure IPv6 Routers Using IPv4-translatable Addresses
  - Use Public IPv4 Addresses
  - Use RFC1918 Addresses
- Perform Stateful Source Address Mapping for ICMPv6 Packets
  - Use Public IPv4 Addresses
  - Use RFC1918 Addresses
- Use Translator's Interface Address to Represent Source Address for ICMPv6 Packets

Comparisons

- Configuring IPv6 routers using IPv4-translatable addresses
  - Renumbering of all the IPv6 interface addresses in all routers.
  - If public IPv4 address is used, it is a waste of the resource
  - If the IPv6 routers forward packets from multiple translators with different prefixes, there is no way to achieve this.
- Performing stateful source address mapping for ICMPv6 Packets
  - For stateless-only translator, not worth the cost.
- Using translator's interface address to represent source address for ICMPv6 Packets
  - Different non IPv4-translatable addresses will be mapped to same IPv4 address. (routing loop?)

Stateless Source Address Mapping Algorithms for ICMPv6 Packets

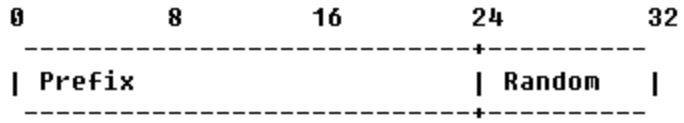
- Not to be dropped by IPv4 routers due to failure of security checks such as uRPF checks.
- Content in the ICMP message is more important than who generating the content.
- Public IPv4 addresses SHOULD NOT be wasted.
- Identify this special translation for everybody.
- Different non IPv4-translatable IPv6 addresses have different IPv4 address representations for a specific application (traceroute).

Choosing an IPv4 /24 Address Block

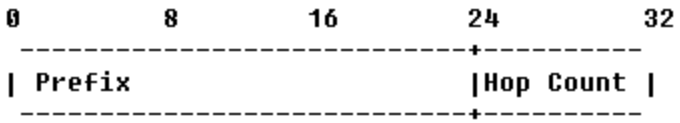
- Use Public IPv4 Addresses
  - Waste public IPv4
  - Can only be identified by admin
- Use RFC1918 Addresses
  - May cause confusion
  - Can only be identified by admin
- Ask IANA for allocating an IPv4 Well-Known Prefix
  - /24

Design an Algorithm to Generate the Last Octet of IPv4 /24

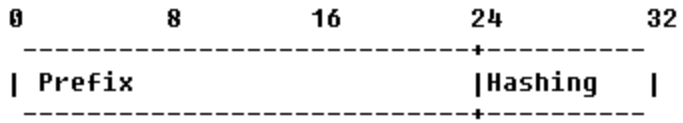
- Randomly Generate the Last Octet



- Copy Hop Count into Last Octet



- Hashing of the IPv6 address to generate Last Octet



Discussions

- Randomly Generate the Last Octet
  - Easy, may have collision, or need to have some states
- Copy Hop Count into Last Octet
  - Almost unique, stateless, identify the hop count.
- Hashing of the IPv6 address to generate Last Octet
  - Almost unique based on the efficiency of the hashing algorithm, fast, stateless.

Recommendations

- Asking IANA for an IPv4 /24 as a "Well-Known Prefix"
- Last /24 is configurable
  - Random
  - Hop Count
  - Hashing