Framework for IPv4/IPv6 Translation

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Outcome from the Montreal Interim

- Basically, merging NAT64 and IVI to produce a common translation technology
  - Not to exclude other documents, but these form the basis
- Described in at least four documents:
  - Framework
    - draft-baker-behave-v4v6-framework
  - SIIT Update –basic translation behavior
    - draft-baker-behave-v4v6-translation
  - Extensions for stateful translation
    - draft-bagnulo-behave-nat64
  - DNS Translation gateway
    - draft-bagnulo-behave-dns64
  - Possible future documents
    - FTP ALG etc

Need update to reflect Minneapolis conclusion

Document structure

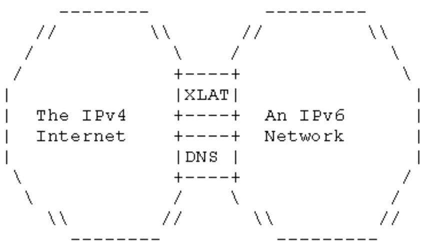
- Introduction
  - Why translation
  - Terminology
  - Translation objectives
  - Transition Plan
  - Scenarios of the IPv4/IPv6 translation (updated)
  - Expected uses of translation
- Framework
  - Operation mode
  - Embedded address format (updated)
  - Translation components
  - Translation in operation

Scenarios of the IPv4/IPv6 translation (updated)

- Connecting between the IPv4 Internet and the IPv6 Internet
  - A general solution for this case does not exist.
- Connecting an IPv6 network to the IPv4 Internet
  - Stateless IVI (Both IPv6 and IPv4 initiated communications)
  - Stateful NAT64 (IPv6 initiated communications)
- Connecting an IPv4 network to the IPv6 Internet
  - Stateful NAT64 type 2 (IPv6 initiated communications)
  - Dual stack solution should be encouraged
- Connecting between an IPv4 network and an IPv6 network
  - Easy, can be either stateless or stateful, support both IPv6 and IPv4 initiated communications.

- Reason: In order to perform the required function, the translator needs to represent the IPv4 addresses in the IPv6 Internet and the IPv6 addresses in the IPv4 Internet.

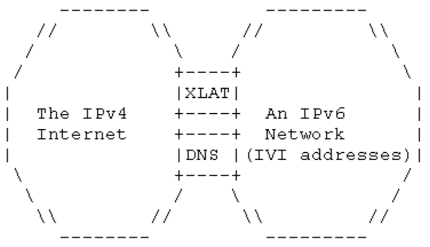
The scenarios and the solutions



XLAT: Stateful
V4/V6 Translator
DNS: DNS-ALG Serve

<====
Support IPv6 initiated communication

NAT64 stateful,
Connect to IPv4 Internet
Support IPv6 initiated



XLAT: Stateless
V4/V6 Translator
DNS: DNS-ALG and
normal DNS Server

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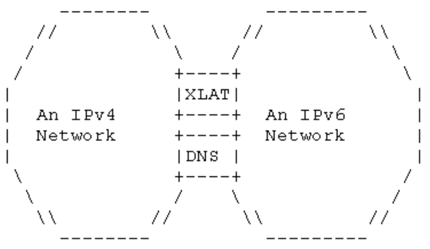
Support both IPv6 and IPv4 initiated communication

IVI stateless
Connect to IPv4 Internet
Support both directions



XLAT: Stateless/Stateful
V4/V6 Translator
DNS: Normal DNS Server

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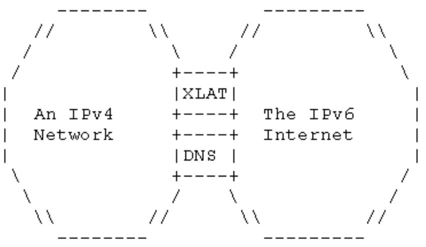
Support both IPv6 and IPv4 initiated communication

NAT64 type 2
Connect to IPv6 Internet
Support IPv6 initiated



XLAT: Stateful
V4/V6 Translator
DNS: Normal DNS Server

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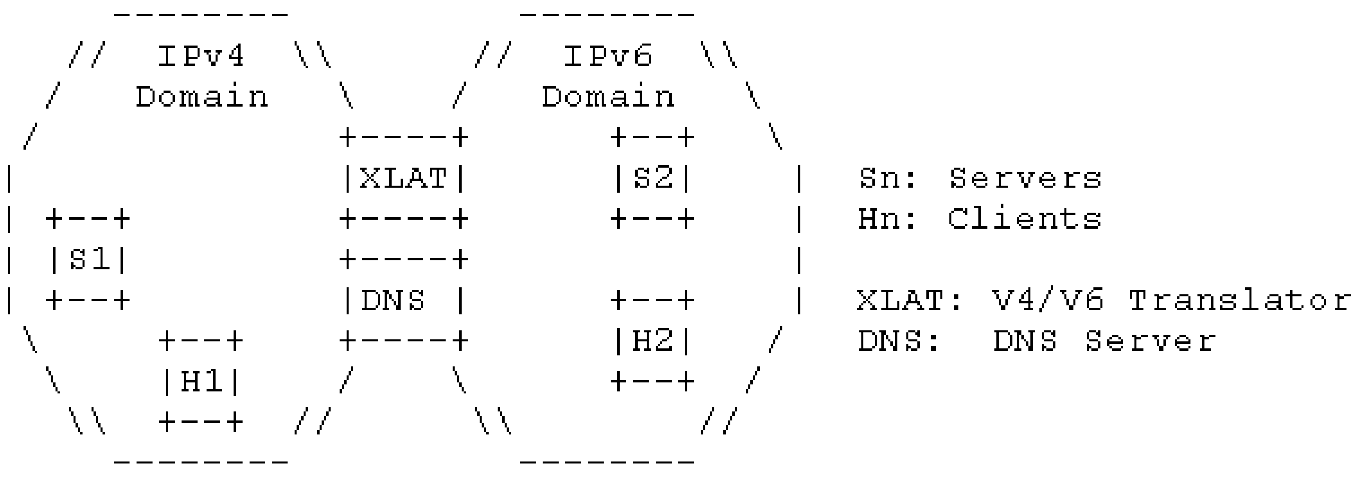
Support IPv6 initiated communication

Figure 3: NAT64 type 2

Within same organization
Either stateless or stateful
Support both directions

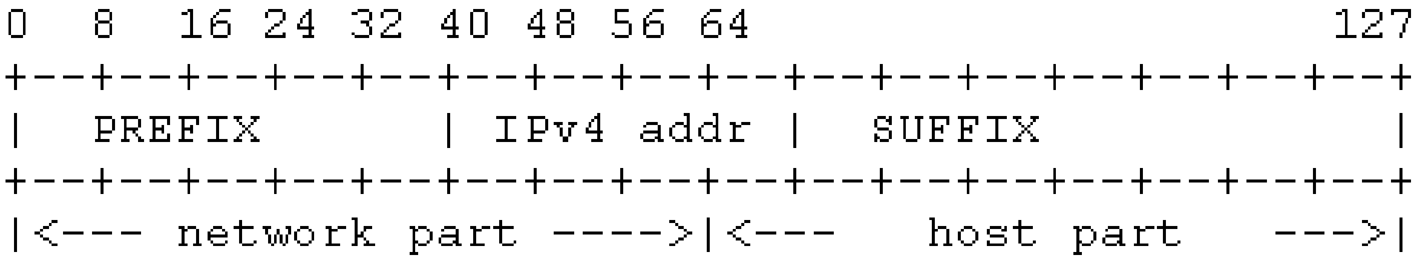
Translation Model



```
     --------          --------
   //  IPv4  \\      //  IPv6  \\
  /   Domain   \    /   Domain   \
 /             +----+      +--+   \
|              |XLAT|      |S2|    |  Sn: Servers
| +--+         +----+      +--+    |  Hn: Clients
| |S1|         +----+              |
| +--+         |DNS |      +--+    |  XLAT: V4/V6 Translator
 \     +--+    +----+      |H2|   /   DNS:  DNS Server
  \    |H1|    /    \      +--+  /
   \\  +--+  //      \\        //
     --------          --------
```

Figure 8: Translation Model

Embedded Address Format



```
0  8  16 24 32 40 48 56 64                    127
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|  PREFIX      | IPv4 addr |  SUFFIX            |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|<--- network part ---->|<---   host part   --->|
```

Figure 9: Embedded Address Format

- Prefix:
  - /32../63 or /96 – specified by network administration
- Embedded IPv4 Address:
  - 32 bit IPv4 address
- Suffix:
  - Remaining bits following IPv4 address of any

Discussions

- **Prefix**
  - **LIR prefix versus Well-Known prefix**
    - **Stateless**
    - **Stateful**
- **Prefix length**
- **Suffix**

1. **IPv6 Routing system scalability**
2. **Referral support**
3. **Native connectivity preference in communications involving dual stack nodes**
4. **DNS ALG configuration**
5. **Support for multiple translators**

Recommendations

- For the PREFIX selection
  - We recommend to use LIR prefix.
  - For the stateful translator, a Well-Known prefix can be used, but adds no obvious value.
- For the prefix length selection
  - There are some obvious values that might be popular, including /40, /44, and /96.
  - But there is no requirement than any of them be used; this is left to the operator's discretion.
- For the SUFFIX selection
  - It is entirely zero at this time.
  - However, it could be used for the future extension of the translation functions.

Translation components

- DNS Translator
- Stateless Translation - (IVI)
- Stateful translation - (NAT64)
- Translation gateway technologies