

Discussion on Host-based IPv6 Translation

denghui@chinamobile.com

Outline

- Conventional IPv4 application support
- Network scenarios
- Why we need host based translation
- Vs DS Lite, NAT64, Double NAT
- Signaling procedure of PNAT44COM
- What to do next?

Plenty of IPv4 legacy on the host side (By Teemu)

I. Applications

- IPv6 has not generally been a real requirement for applications
- Many applications are IPv4-only, percentage unknown
- Many legacy applications will never see update to IPv6

II. Runtime environments

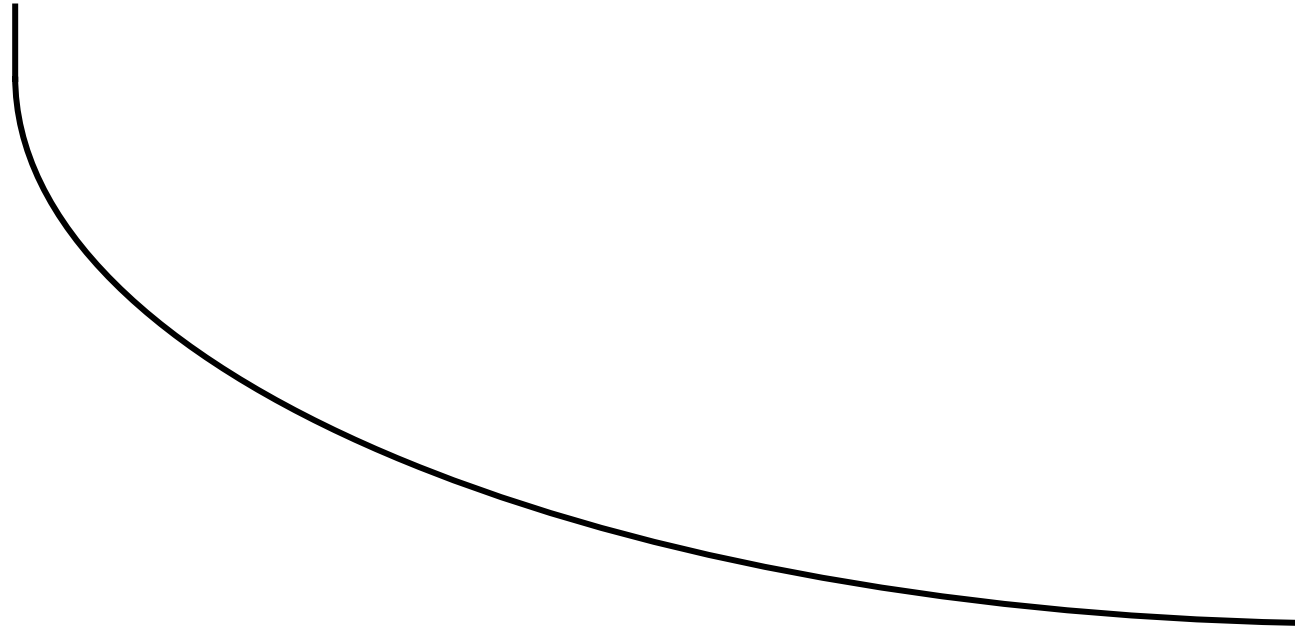
- All runtime environments do not support IPv4, while most should
- A common runtime environment in mobile environment is Java Platform, Micro Edition (Java ME). It has Mobile Information Device Profile, of which newest version 2.0 (MIDP 2.0) **that is IPv4-only**. IPv6 support is coming with MIDP 3, but it is not yet standardized

III. External devices

- A host may implement internet connection sharing for **other hosts**
- These hosts are not necessarily IPv6 capable at all, or may run IPv4-only applications, or IPv4-only runtimes..

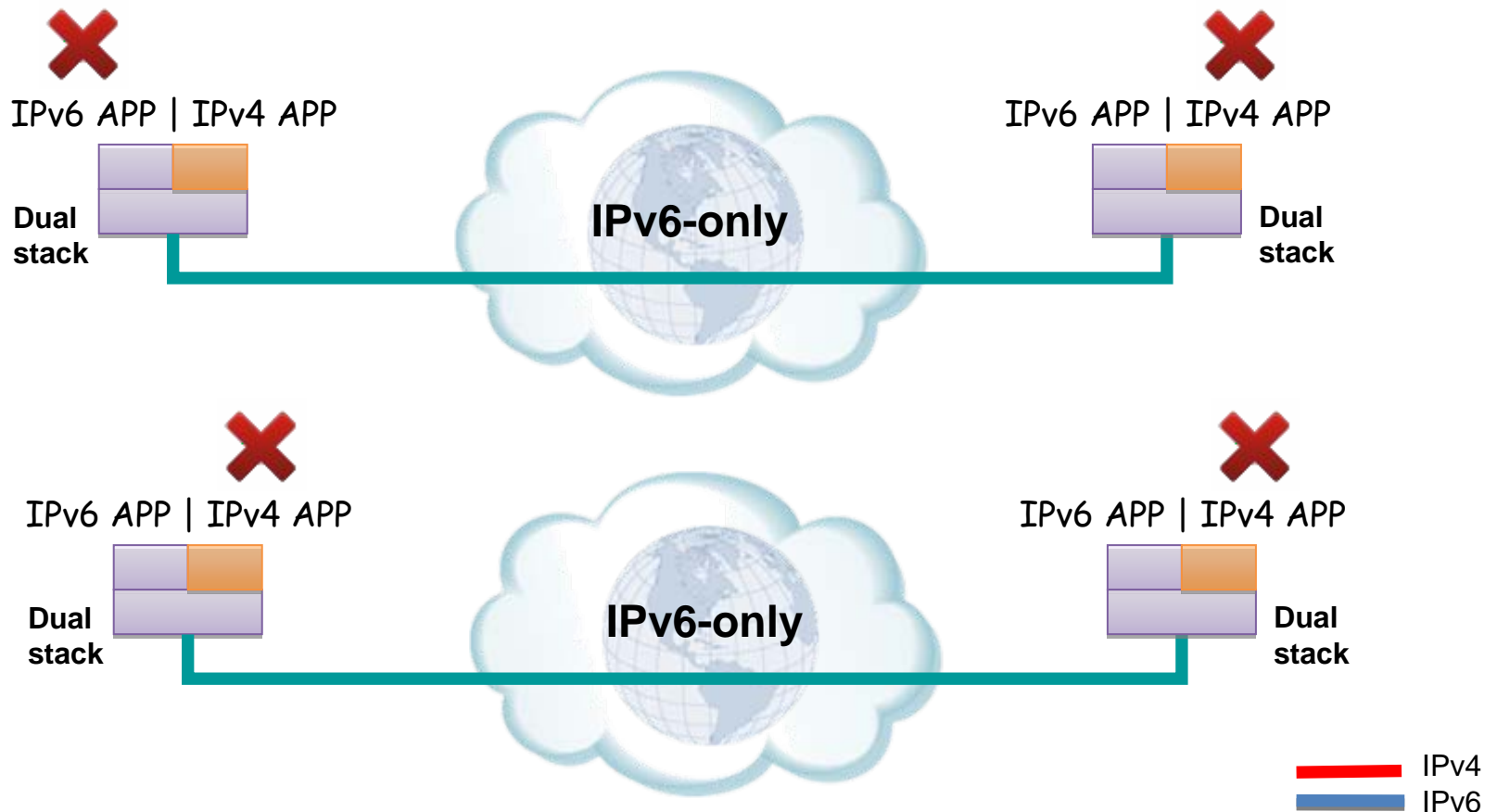
The host side... (by Teemu)

- will feel strong incentive to support IPv6 only after networks start actually providing IPv6 connectivity
- Should not be forced to upgrade everything due IPv6 deployment
- will have a *long* IPv4 tail



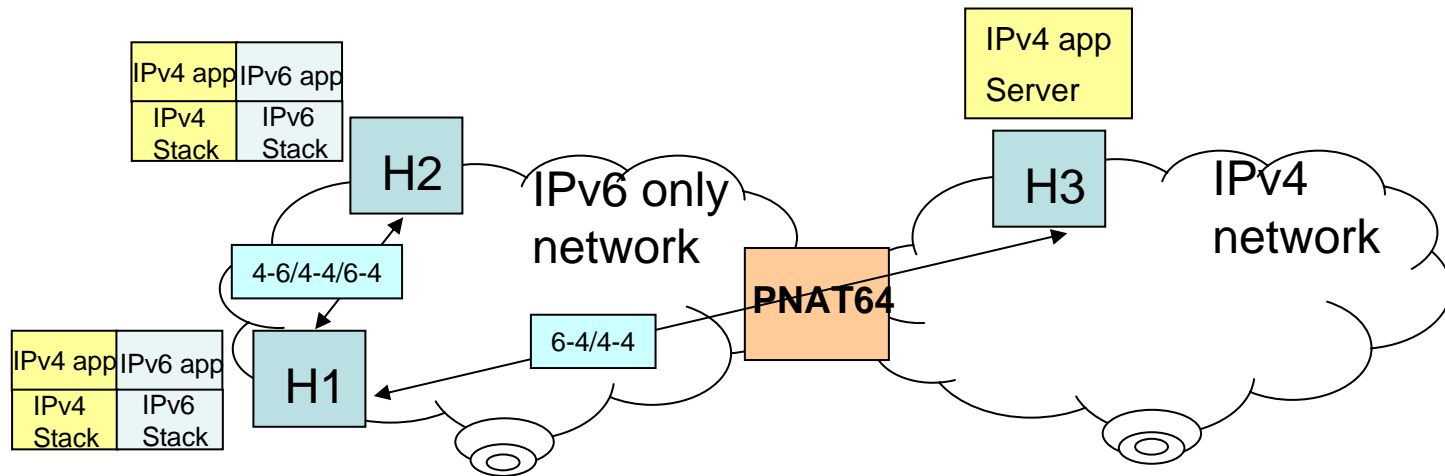
... (by Sheng Jiang)

- A virtual Scenario has not been answered yet:
How to support conventional IPv4 applications in IPv6 only network without encapsulation



Scenarios (H1 talk with H2)

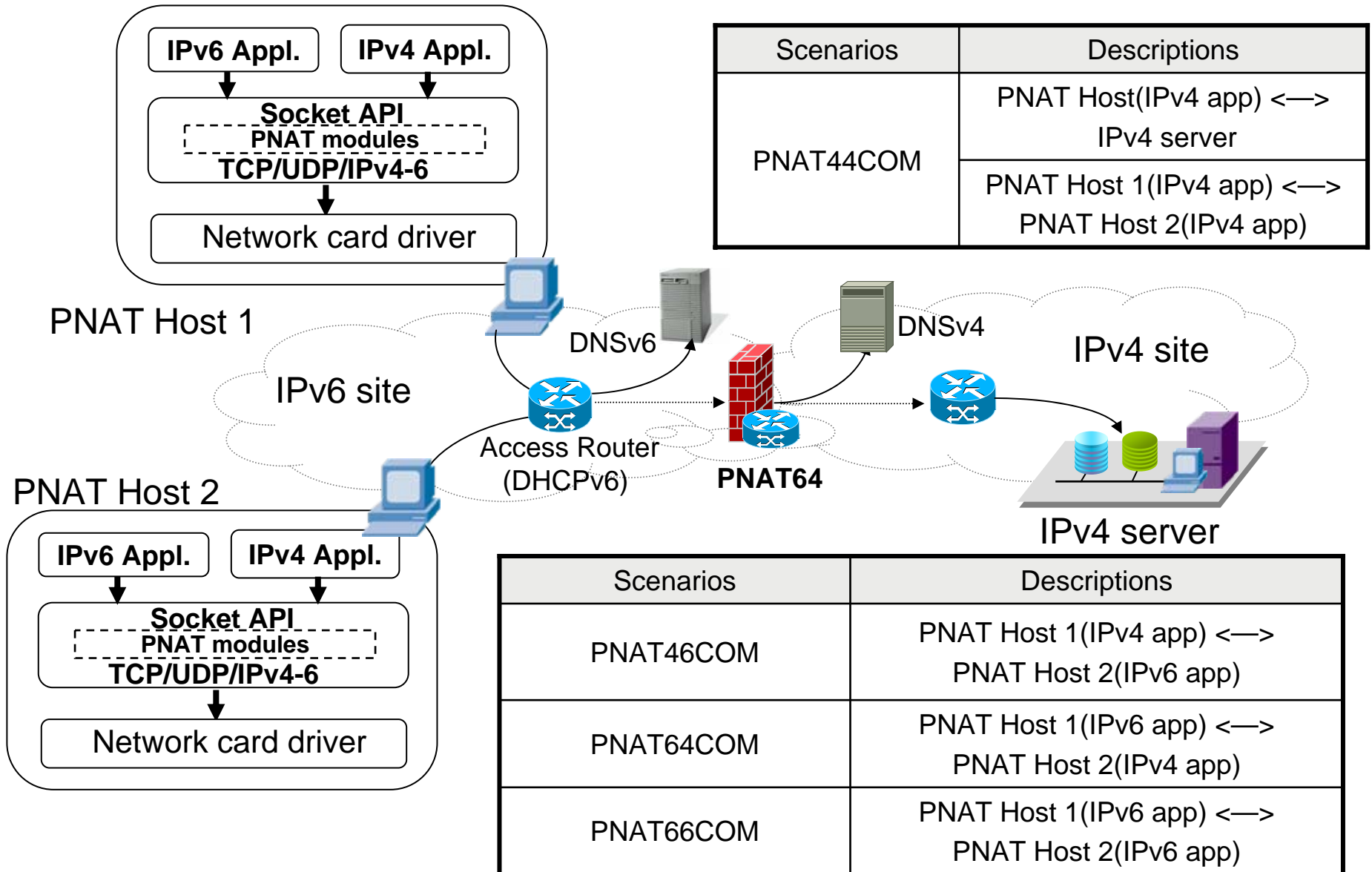
- H1 could know H2's address either by DNS or referral, but H1's application has no idea how to setup the tunnel between H1 and H2.
- Communication between H1 and H2 could be 4-4, 4-6, and 6-4
- Direct IPv6 routing will benefit for such communication



Scenarios we consider are multiple possibilities:

- PNAT44COM: IPv4-IPv4 application communicate within/through IPv6 network;
- PNAT46COM: IPv4-IPv6 application communicate within/through IPv6 network
- PNAT64COM: IPv6-IPv4 application communicate within/through IPv6 network

Network Scenarios



Why we need host based translation

- How to support conventional IPv4 applications in IPv6 only network, iPhone store already has more than 60,000 applications.
- The implementation of operator's service has been long-time running, quite stable, and hard to upgrade.
- Modify the host is very difficulty, but modify the host's network stack is not that difficulty.
- Operator customize the host more than before.

Translation in the host vs in the network

- The first hop of the network is IPv6 only
- The major difference:
 - Supporting the conventional IPv4 application is mandatory requirement for the operators.

Translation vs Tunneling

- This is not comparison between them, but for special host scenarios.
- The difference:
 - Communication need to be directly route each other to avoid tunnel mesh, other than passing through the tunneling aggregation point. (CGN)
 - Different IP families need to talk each other.

PNAT vs Dual-stack Lite

- The major difference:
 - Within IPv6 network communication, it need not go through any CGN.
 - 3GPP QoS will be based out IP header other than inside IP header
 - For MTU, translation is a little better than tunneling.
 - DNS synthesis problems - DNSSEC relations?

Compatible with NAT64, not DNS64

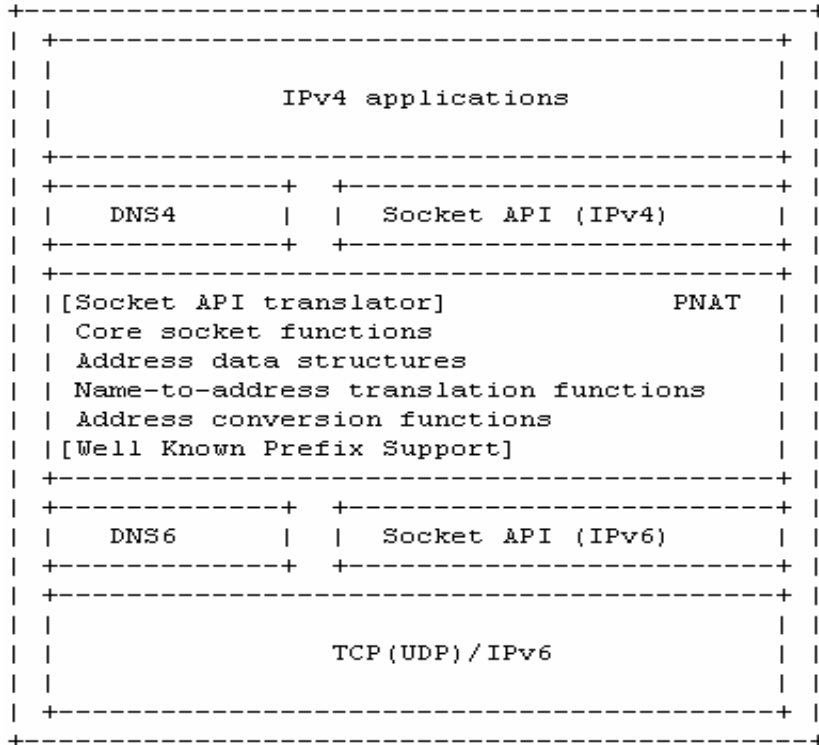
- The current framework document assumes that DNS queries go to a DNS64 if sent over an IPv6-only network. Is there a reason to change this assumption?
 - PNAT is compatible with NAT64, but it doesn't compatible with DNS64, the reason is PNAT host need to identify the peer side IP type.

Avoid double NAT issue

- <http://tools.ietf.org/html/draft-durand-v6ops-natv4v6v4-01>.
 - Since PNAT could identify the peer side IP type based on DNS resolve result, so it could know whether it need do ALG^{m²} inside the host or not, the issue has been avoided.

PNAT module in the host

PNAT Socket Translation Host modules



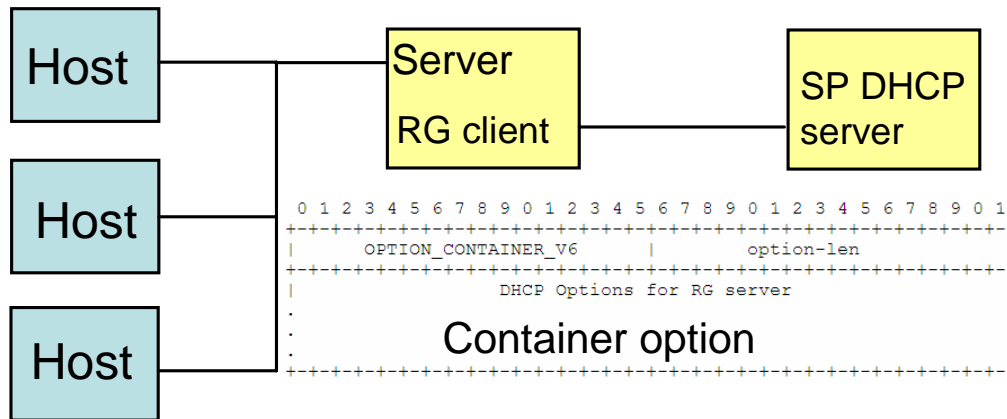
- PNAT inside the host will translate IPv4 socket API into IPv6 socket API
- DNS IPv4 socket call can be translated into IPv6 socket call

LIR prefix will be used for PNAT source address translation

Well-know prefix will be used for PNAT destination address translation

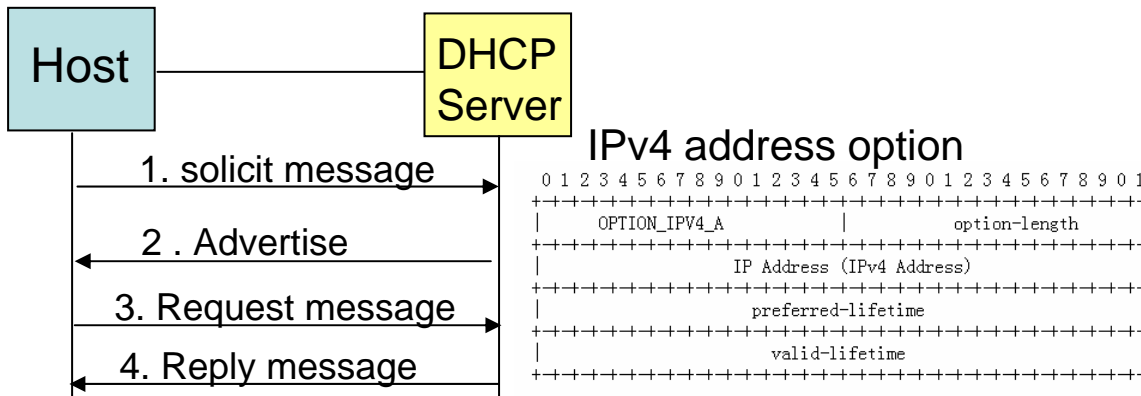
Two possible ways to perform DHCPv6 process

- PNAT host request IPv4 address , IPv6 prefix , both DNS4 and DNS6 server address from DHCPv6 server.
There are two methods to achieve the goals



Method 1: container option for server configuration

Thanks the discussion from James woodyatt

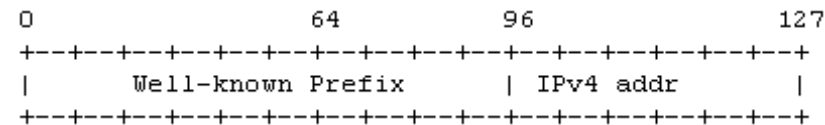


Method 2: extension of DHCPv6 option to support assigning IPv4 address; For IPv6 prefix, RFC 3633 could be used

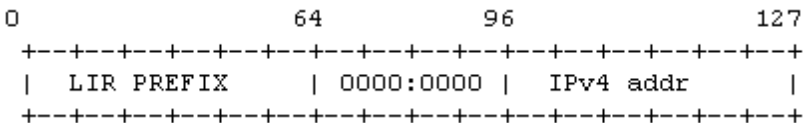
PNAT Address translation and PNAT64 operations

PNAT address translation

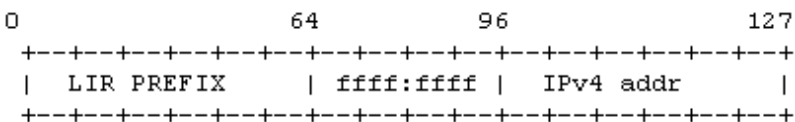
- For the destination address



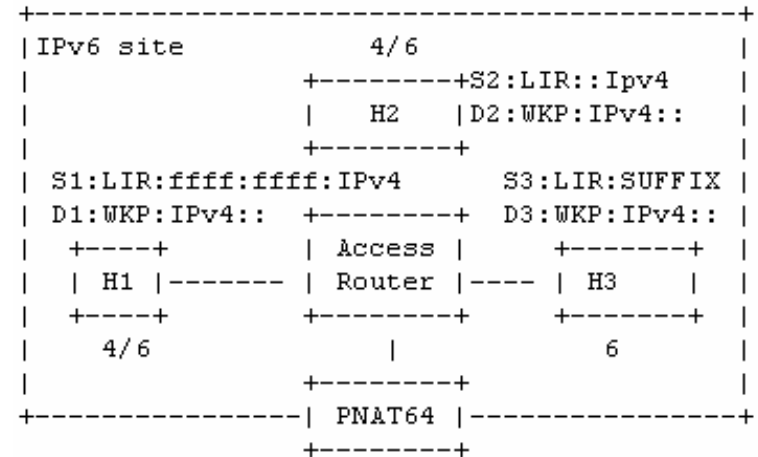
- For the source address, all zero in 65-96 bits is to identify the case of private IPv4 address embedded



- For the source address, all one in 65-96 bits is to identify the case of public IPv4 address embedded

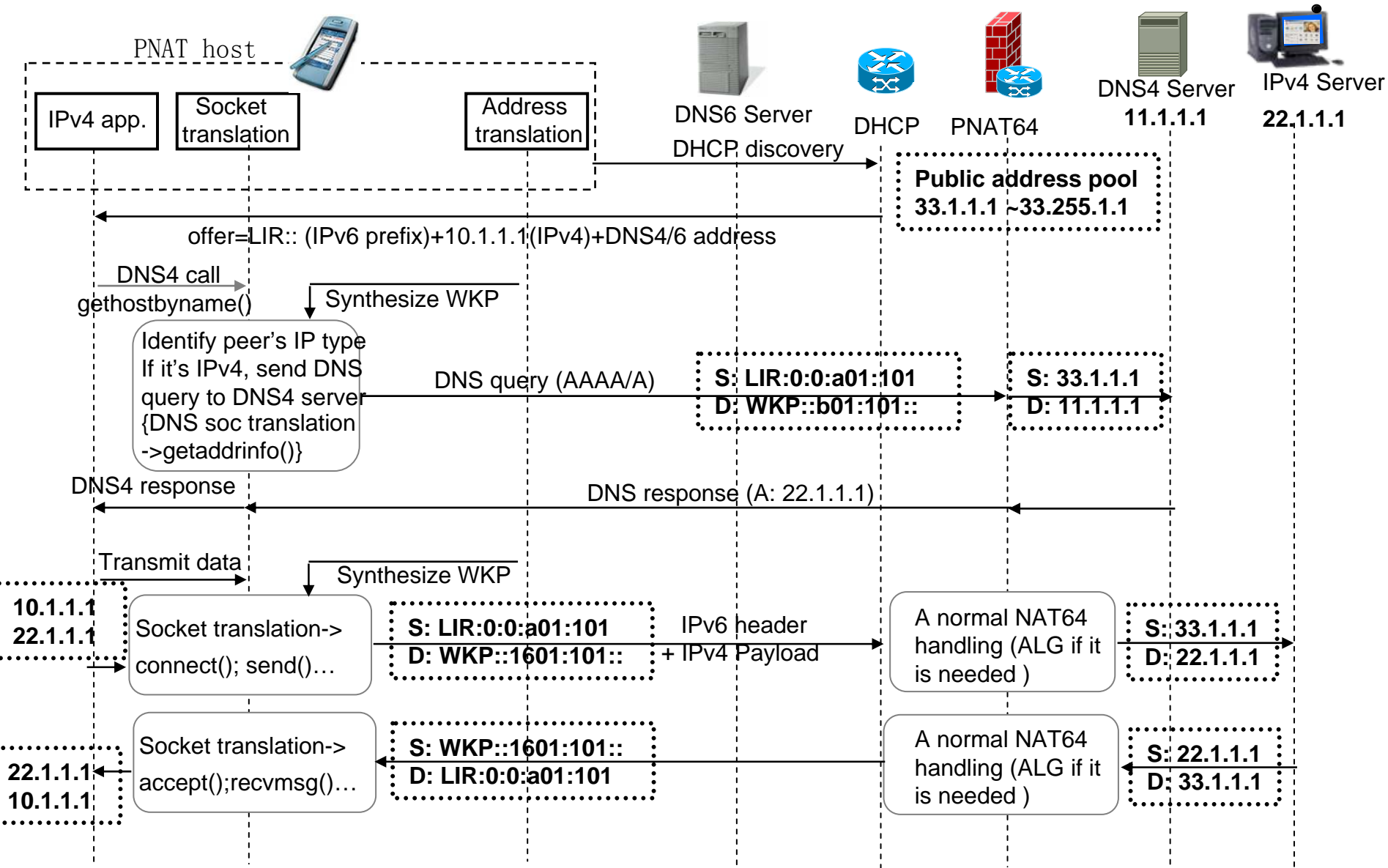


PNAT64 operations

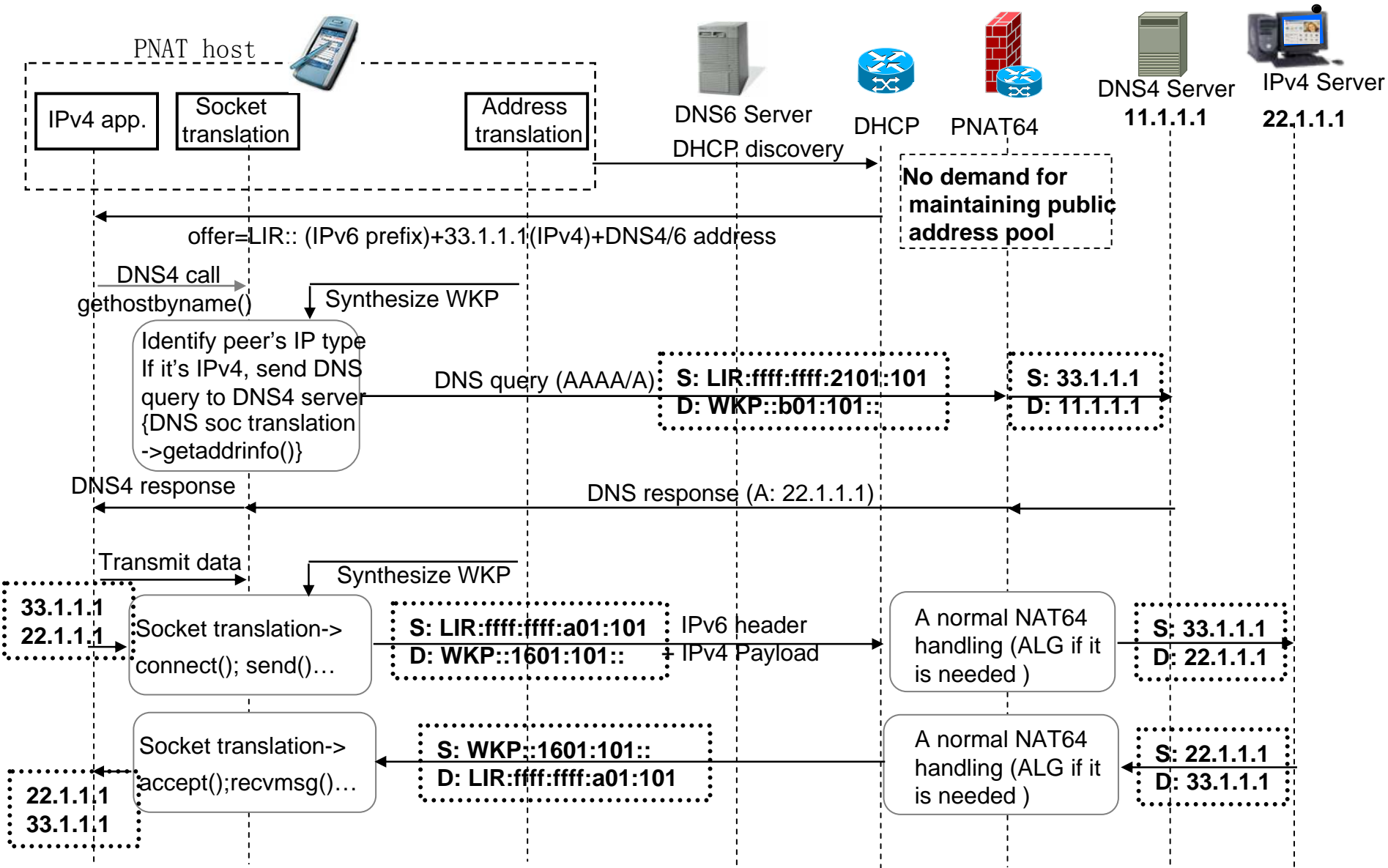


Destination addr	Actions
WKP::	perform a translation operation
Source addr	Actions
Padding all one in 65-96 bits	Get rid of prefix, record the relationship between IPv4 address and IPv6 prefix
Padding all zero in 65-96 bits	A normal NAT64 procedure
Normal IPv6 address	A normal NAT64 procedure

PNAT44COM signaling (private IPv4 address embedded in source address)



PNAT44COM signaling (public IPv4 address embedded in source address)



Next?

- We are doing the implementation, more than 5 vendors are involved in, hope we can finish by the early of Nov. this technology will be deployed in our network hopefully within this year, for IPv6 based HDTV service.
- Will Behave WG consider to have host based translation solution work item?
- How to proceed this work? (To chairs)

Appendix

PNAT vs (BIA or BIS)

- The difference:
 - There are no demands to retain mapping table in PNAT44COM, but BIA/BIS still needs
 - PNAT described in detail how it work together with PNAT64, but BIA/BIS doesn't.
 - PNAT host and PNAT64 will process differently for public and private IPv4 source address, but BIA/BIS couldn't.
 - PNAT can identify peer application type (4 or 6) by responded A or AAAA records, so knows whether the host need to do ALG or not which could avoid NAT464 issue.