Details of APRICOT-IVI trial SSID

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2012-02-29

APRICOT-IVI

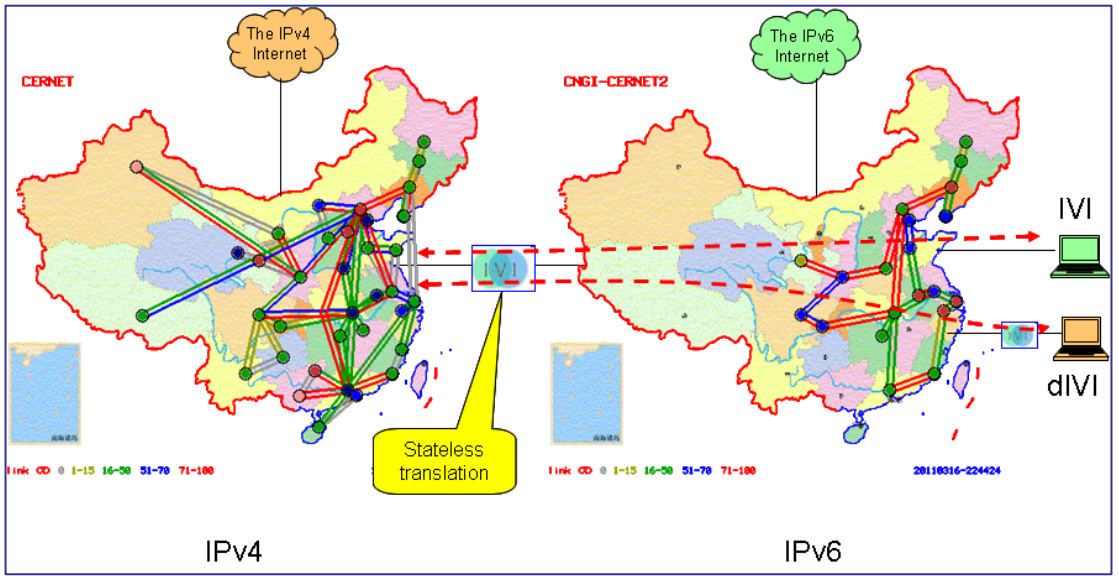
For Windows 7
(DHCPv6 stateful)

- Introduction
- Documents
- Network topology
- Features
- Extension

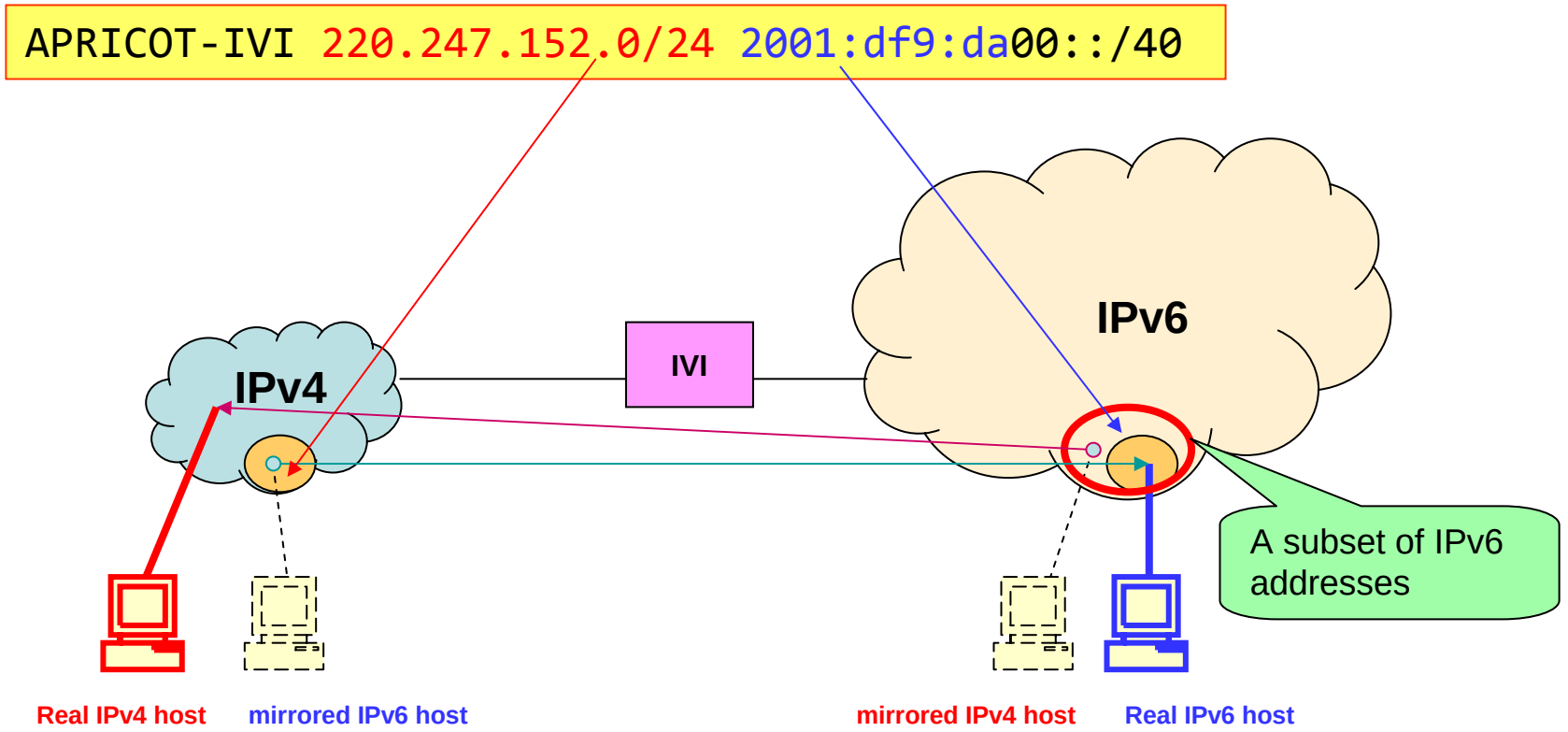
APRICOT-IVI 220.247.152.0/24 2001:df9:da00::/40

Introduction

- The IPv6-only users communicate with the IPv4 Internet in a stateless fashion

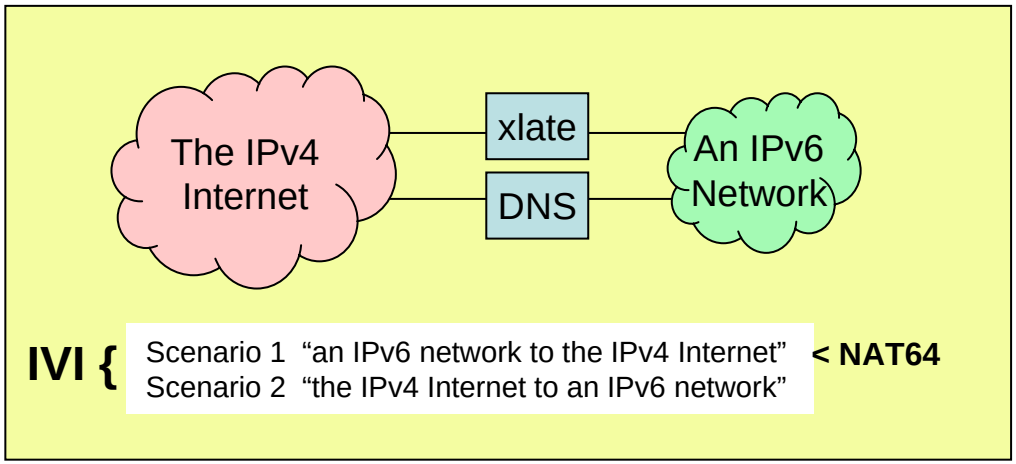


IVI

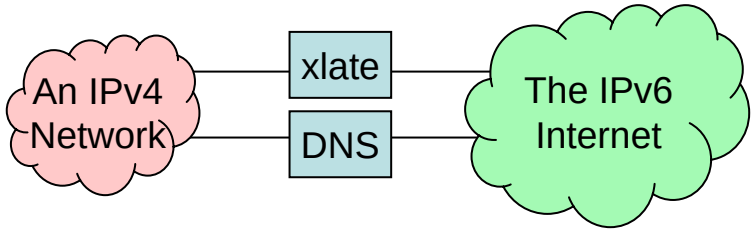


A subset of IPv6 addresses

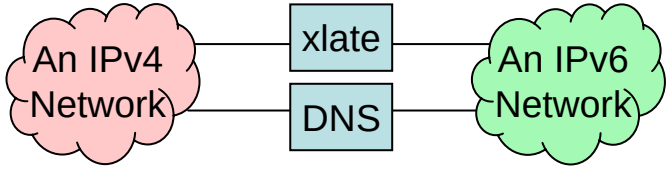
RFC6144



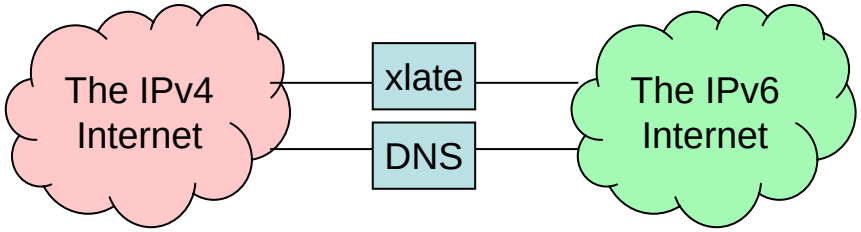
IVI { Scenario 1 "an IPv6 network to the IPv4 Internet" **< NAT64**
Scenario 2 "the IPv4 Internet to an IPv6 network"



Scenario 3" the IPv6 Internet to an IPv4 network **< NAT64**
Scenario 4 "an IPv4 network to the IPv6 Internet"



IVI { Scenario 5 "an IPv6 network to an IPv4network" **< NAT64**
Scenario 6 "an IPv4 network to an IPv6 network"

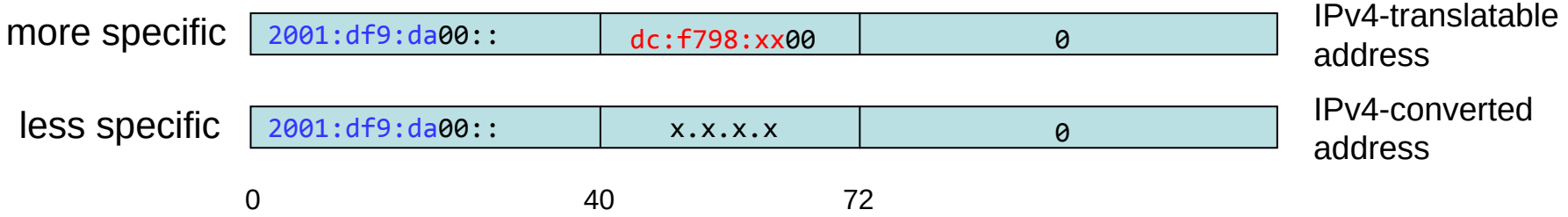


Scenario 7 "the IPv6 Internet to the IPv4 Internet"
Scenario 8 "the IPv4 Internet to the IPv6Internet"

RFC6052

APRICOT-IVI 220.247.152.0/24 2001:df9:da00::/40

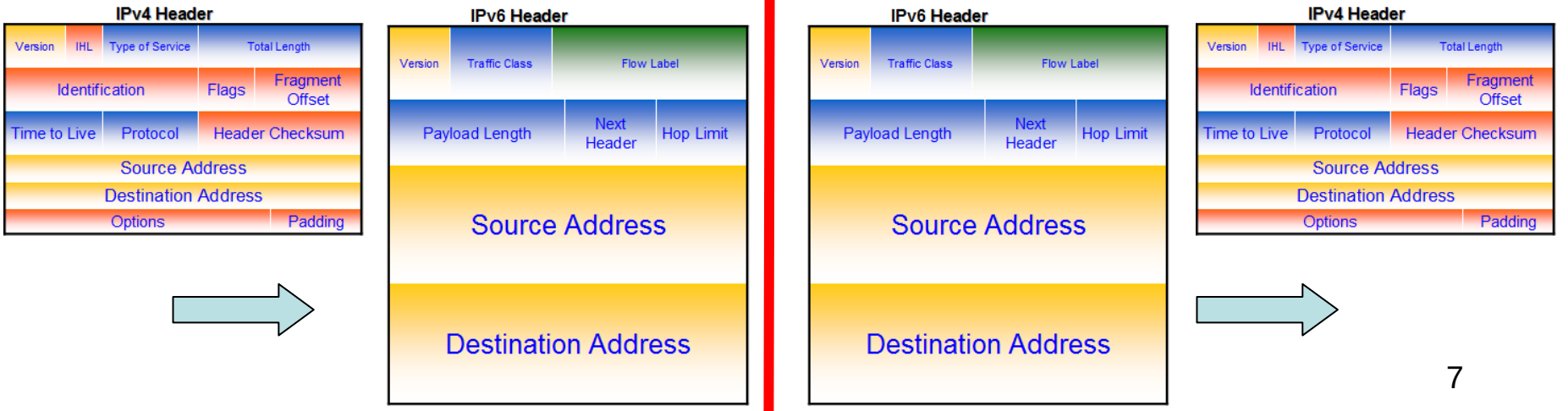
PL	0–32	40	48	56	64	72	80	88	96	104
32	prefix	v4(32)			u	suffix				
40	prefix	v4(24)			u	(8)	suffix			
48	prefix	v4(16)			u	(16)	suffix			
56	prefix	(8)			u	v4(24)	suffix			
64	prefix				u	v4(32)	suffix			
96	prefix						v4(32)			



RFC6145

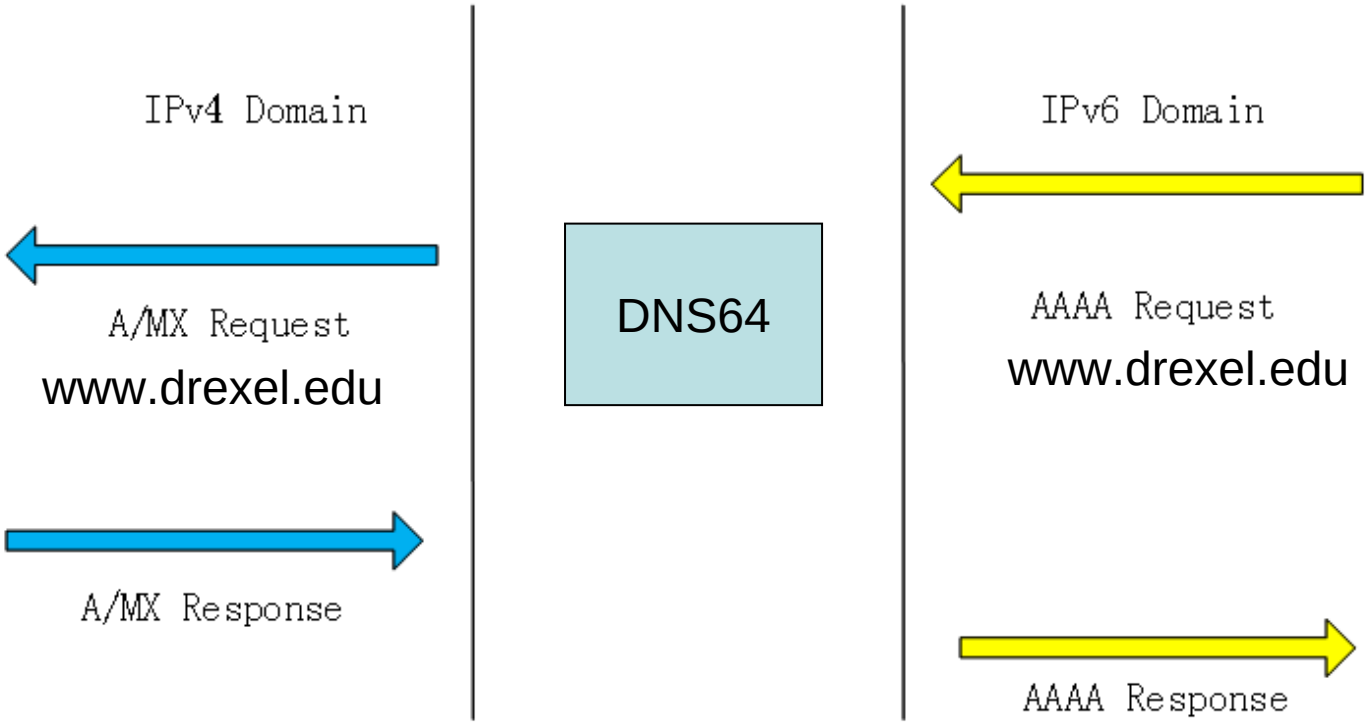
IPv4 Field	Translated to IPv6
Version (0x4)	Version (0x6)
IHL	(discarded)
Type of Service	Traffic Class
Total Length	Payload Length = Total Length -IHL * 4
Identification	(discarded, cf. Subsection V-C)
Flags	(same as above)
Offset	(same as above)
Time to Live	Hop Limit
Protocol	Next Header
Header Checksum	(discarded)
Source Address	Apply IVI stateless address mapping
Destination Addr.	(same as above)
Options	(discarded)

IPv6 Field	Translated to IPv4 Header
Version (6)	Version (4)
Traffic Class	Type of Service
Flow Label	(discarded)
Payload Length	Total Length = Payload Length + 20
Next Header	Protocol
Hop Limit	TTL
Source Address	Apply IVI inverse address mapping
Destination Addr.	(same as above)
—	IHL = 5
—	Header Checksum recalculated



RFC6146

APRICOT-IVI 220.247.152.0/24 2001:df9:da00::/40

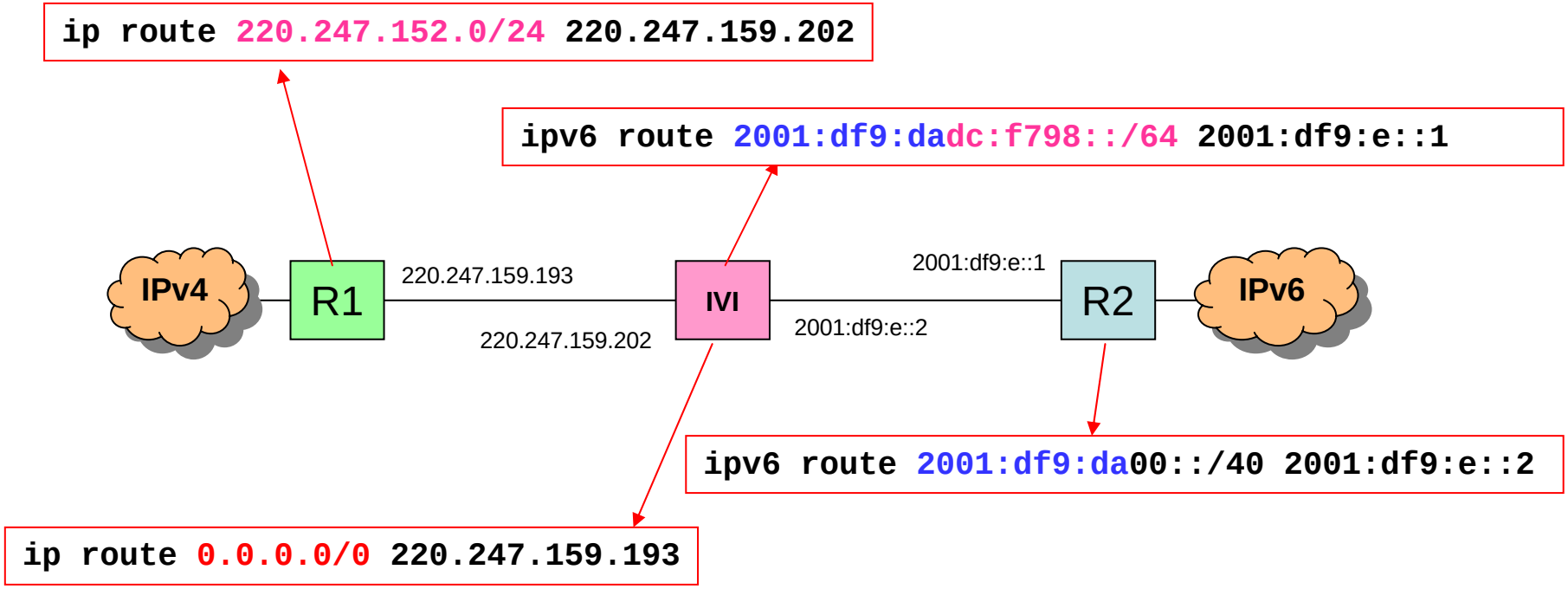


A= 144.118.31.11

AAAA= 2001:df9:da90:761f:0b00::

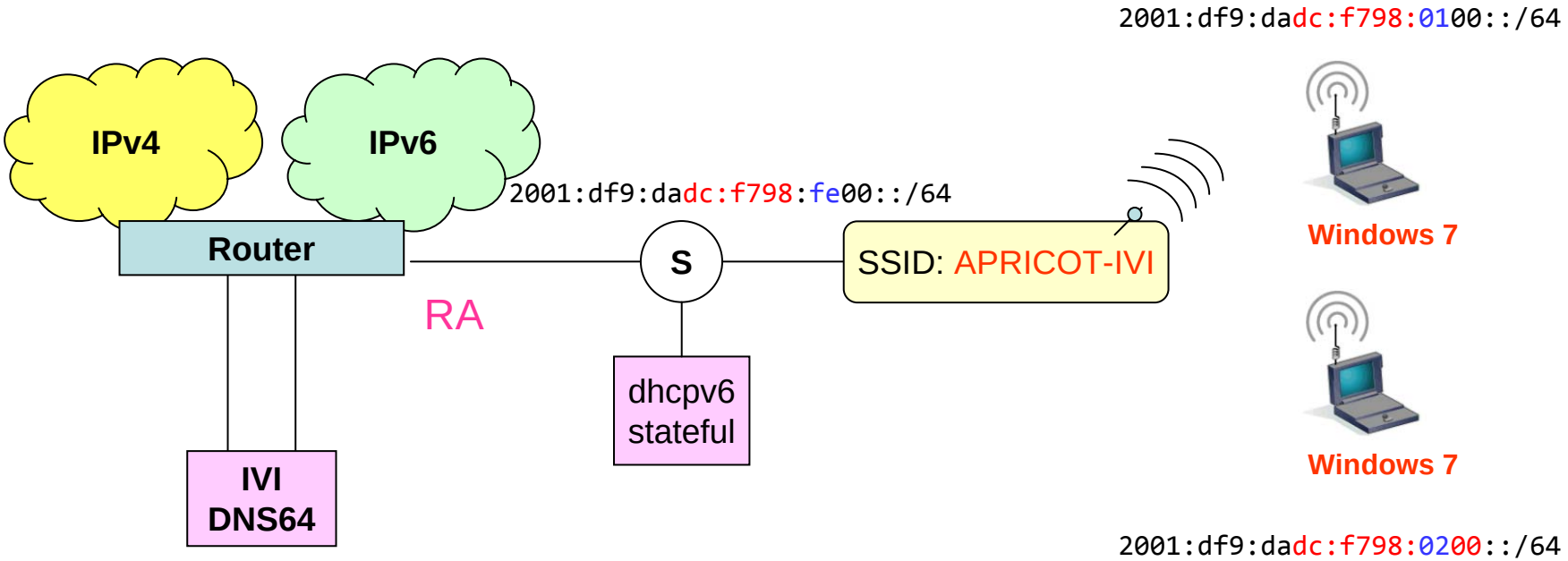
RFC6219

APRICOT-IVI 220.247.152.0/24 2001:df9:da00::/40



Topology

APRICOT-IVI 220.247.152.0/24 2001:df9:da00::/40



XLAT conf


```
ip addr add 220.247.159.202/26 dev eth0
ip -6 addr add 2001:df9:e::2/64 dev eth1

ip route add  220.247.152.0/24 via 10.0.0.2 dev ivi0
ivimap -4 -p 2001:df9:da00:: -l 40 -P 2001:df9:da00:: -L 40 -c 10.0.0.2
ip -6 route add 2001:df9:dadc:f798::/64 via 2001:df9:e::1 dev eth1

ip -6 route add 2001:df9:da00::/40 via fec0::2 dev ivi1
ivimap -6 -l 40 -L 40 fec0::2
ip route add default via 220.247.159.193 dev eth0


ividns -p 2001:df9:da00::/40 220.247.159.194 &
```

OS related issues

- Windows 7
  - Plug and play
  - IPv4-translatable address is obtained via DHCPv6 stateful, as well as the address of DNS resolver
  - The default gateway is obtained via RA
- Windows XP
  - No build in DHCPv6 client (install dibbler DHCPv6 client)
  - Cannot resolve DNS via IPv6 (use DHCP to assign a RFC1918 for DNS resolving only)

Host configuration

- Don’t use Auto-configuration
  - MUST avoid SLAAC
  - Cannot use DHCPv6 stateless
- MUST use DHCPv6 stateful
  - IVI6 address/prefix length: DHCPv6
  - default gateway: RA
  - nameserver: DHCPv6

RA configuration

Cisco 7304 example

- `interface Vlan30`

```
no ip address
ipv6 address 2001:df9:dadc:f798:100::/64
ipv6 enable
ipv6 nd prefix default 2592000 604800 no-autoconfig
ipv6 nd managed-config-flag
ipv6 nd other-config-flag
ipv6 nd ra suppress
ipv6 dhcp relay destination 2402:f000:x:x:x:x:x:x
```

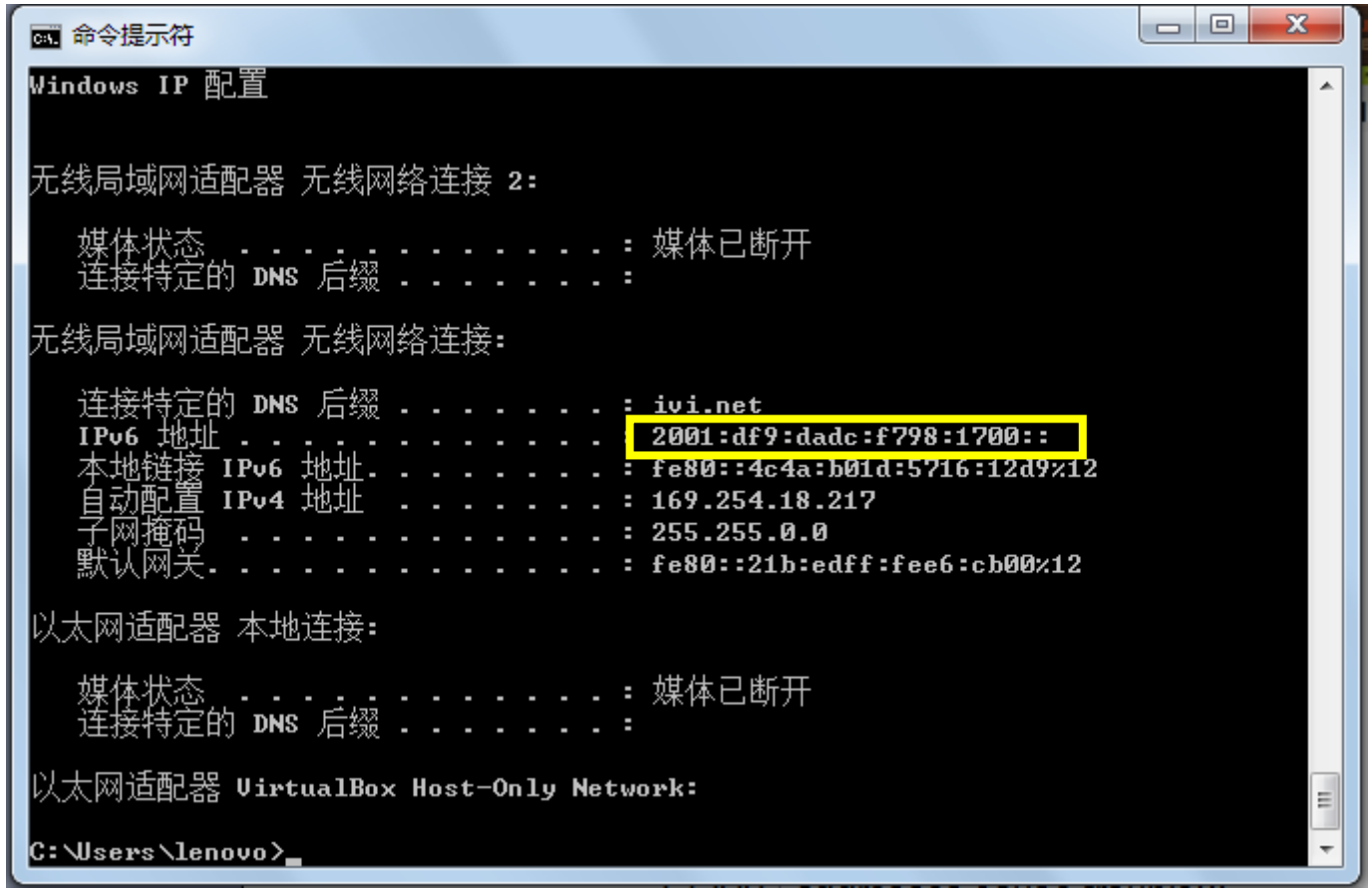
no-autoconfig	A=0
managed-config-flag	M=1
other-config-flag	O=1

DHCPv6 config

- ISC DHCP4.1.1-P1 example:

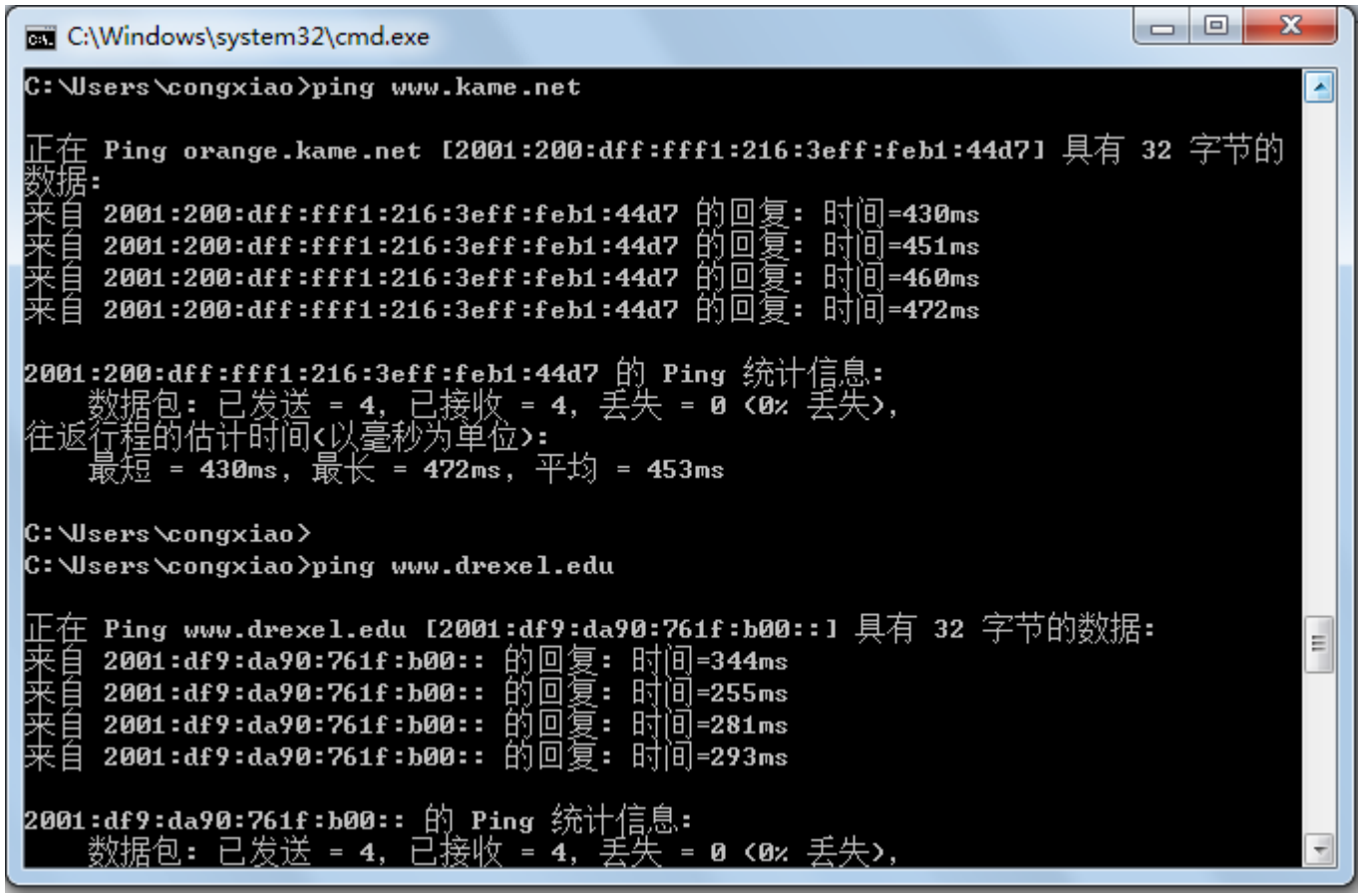
```
subnet6 2001:df9:dadc:f798::/64 {
range6 2001:df9:dadc:f798:0200:: 2001:df9:dadc:f798:0200::;
range6 2001:df9:dadc:f798:0300:: 2001:df9:dadc:f798:0300::;
range6 2001:df9:dadc:f798:0400:: 2001:df9:dadc:f798:0400::;
range6 2001:df9:dadc:f798:0500:: 2001:df9:dadc:f798:0500::;
range6 2001:df9:dadc:f798:0600:: 2001:df9:dadc:f798:0600::;
range6 2001:df9:dadc:f798:0700:: 2001:df9:dadc:f798:0700::;
            ... ...
range6 2001:df9:dadc:f798:fa00:: 2001:df9:dadc:f798:fa00::;
range6 2001:df9:dadc:f798:fb00:: 2001:df9:dadc:f798:fb00::;
range6 2001:df9:dadc:f798:fc00:: 2001:df9:dadc:f798:fc00::;
range6 2001:df9:dadc:f798:fd00:: 2001:df9:dadc:f798:fd00::;
option dhcp6.name-servers 2001:df9:e::2;
option dhcp6.domain-search "ivi.net";
}
```

Examples



SLAAC addresses cause trouble!!!

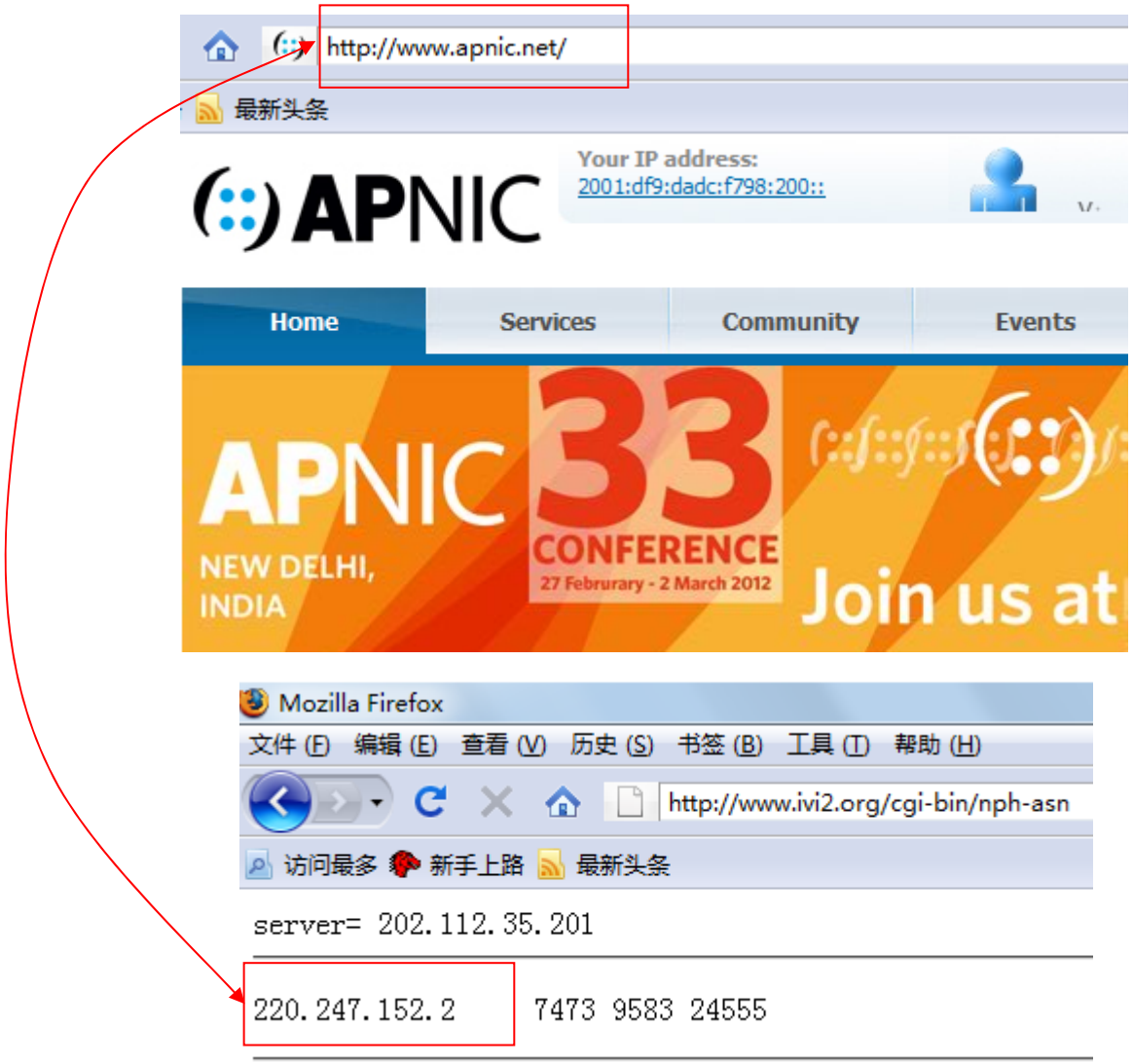
ping



144.118.31.11

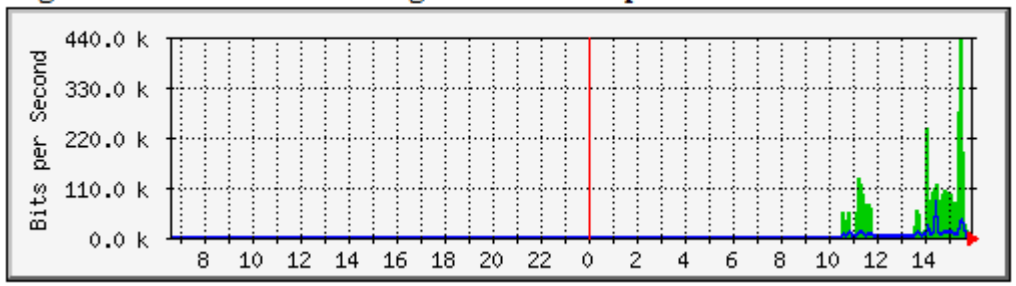
2001:df9:da90:761f:0b00::

Access IPv6/IPv4

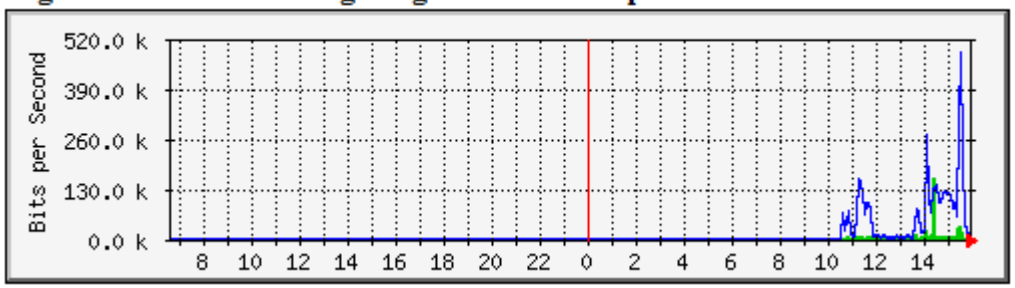


IVI Traffics

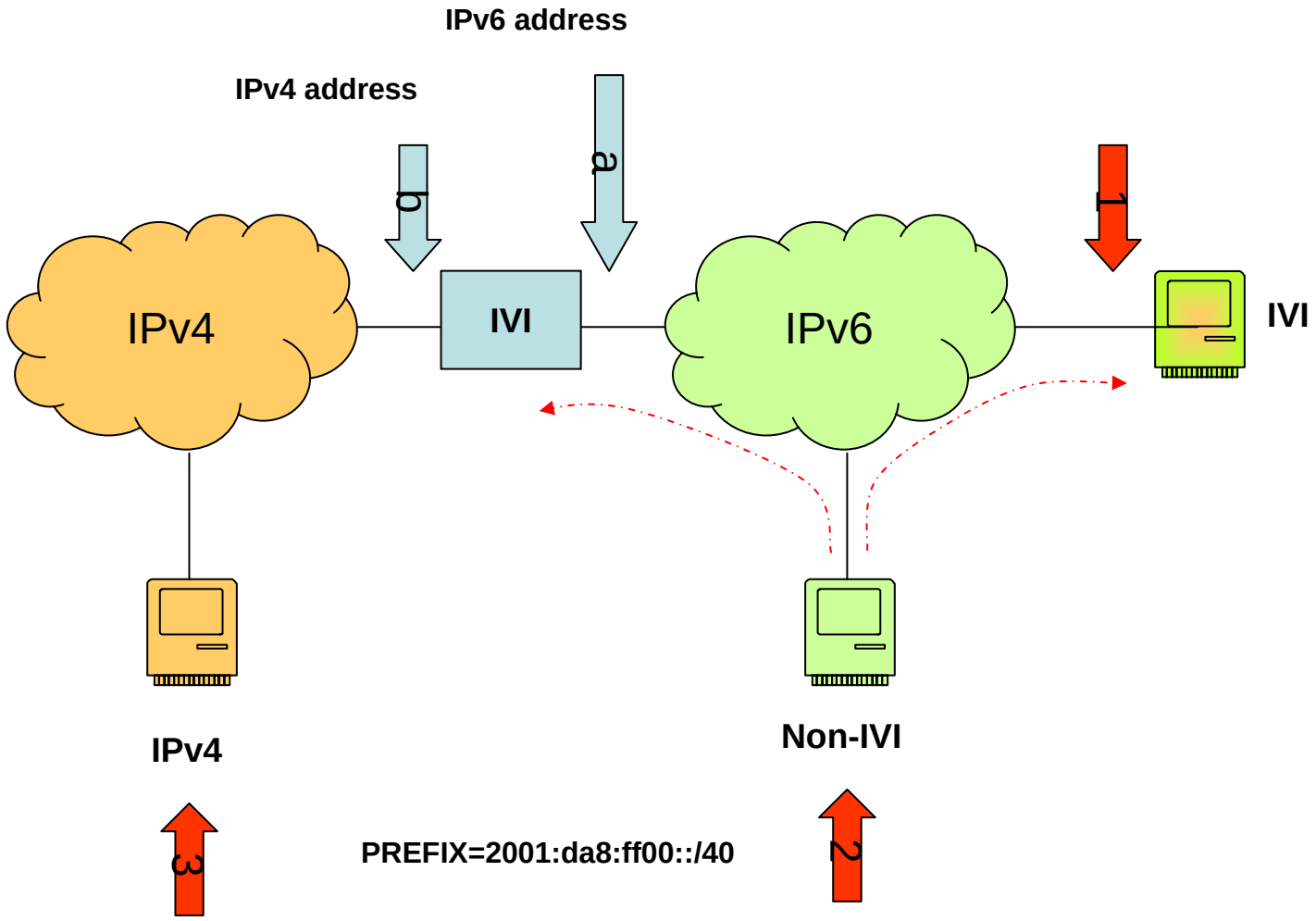
GigabitEthernet1/12 IVI-v6 -- gw-conference.apricot2012.net



GigabitEthernet1/16 IVI-gw -- gw-conference.apricot2012.net



Trouble shooting



Features

- Stateless translation supports bi-directional initiated communications
  - IPv6 ←→ IPv4
- IPv6 version of the application is required
  - Not work for skype, etc
- IPv4/IPv6 ALG is required
  - Not work for ftp, etc

Extensions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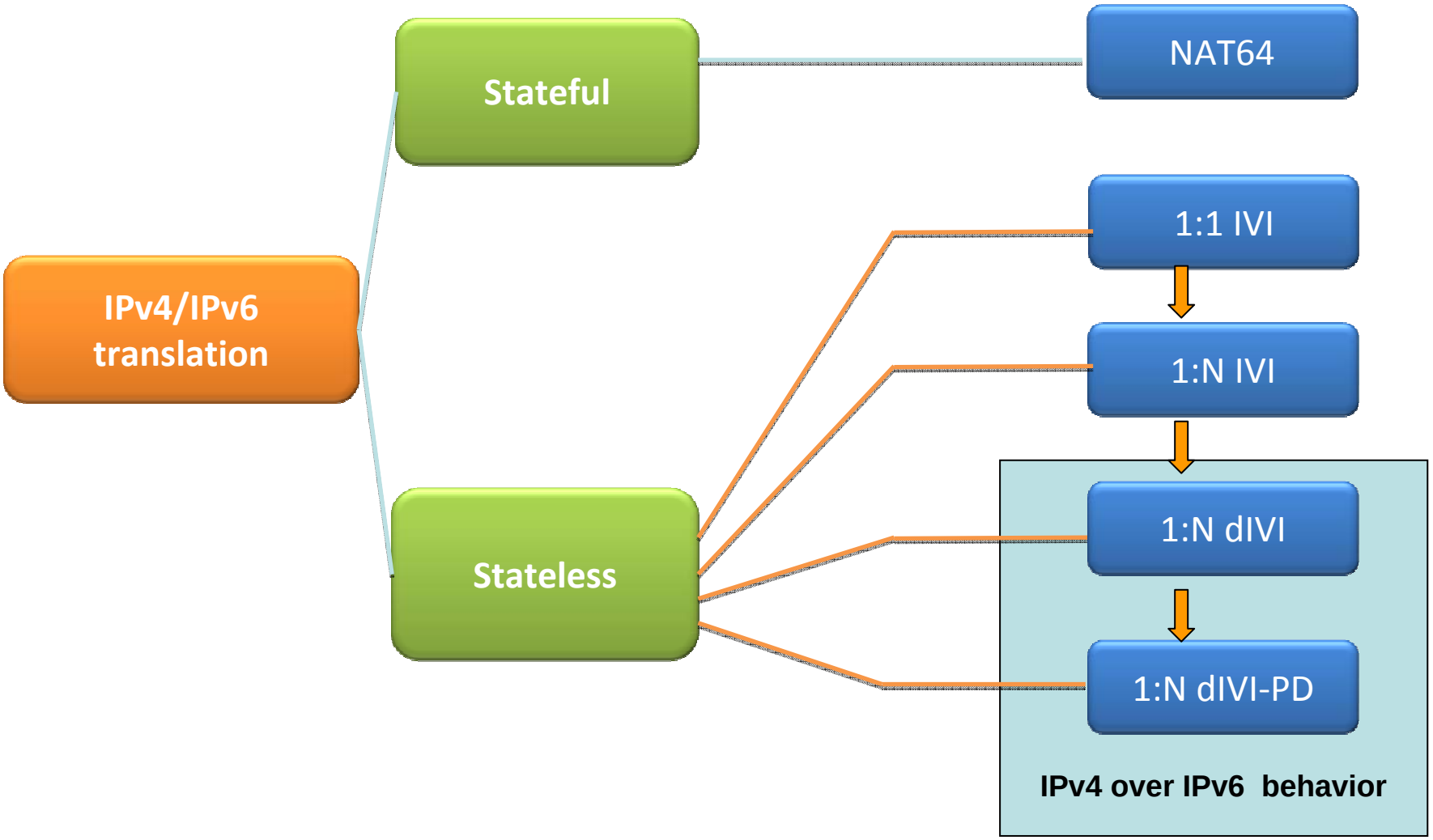
IPv6 Transition & Integration


IPv4/IPv6 translation
Stateful
Stateless
NAT64
1:1 IVI
1:N IVI
1:N dIVI
1:N dIVI-PD
IPv4 over IPv6 behavior

1:N IVI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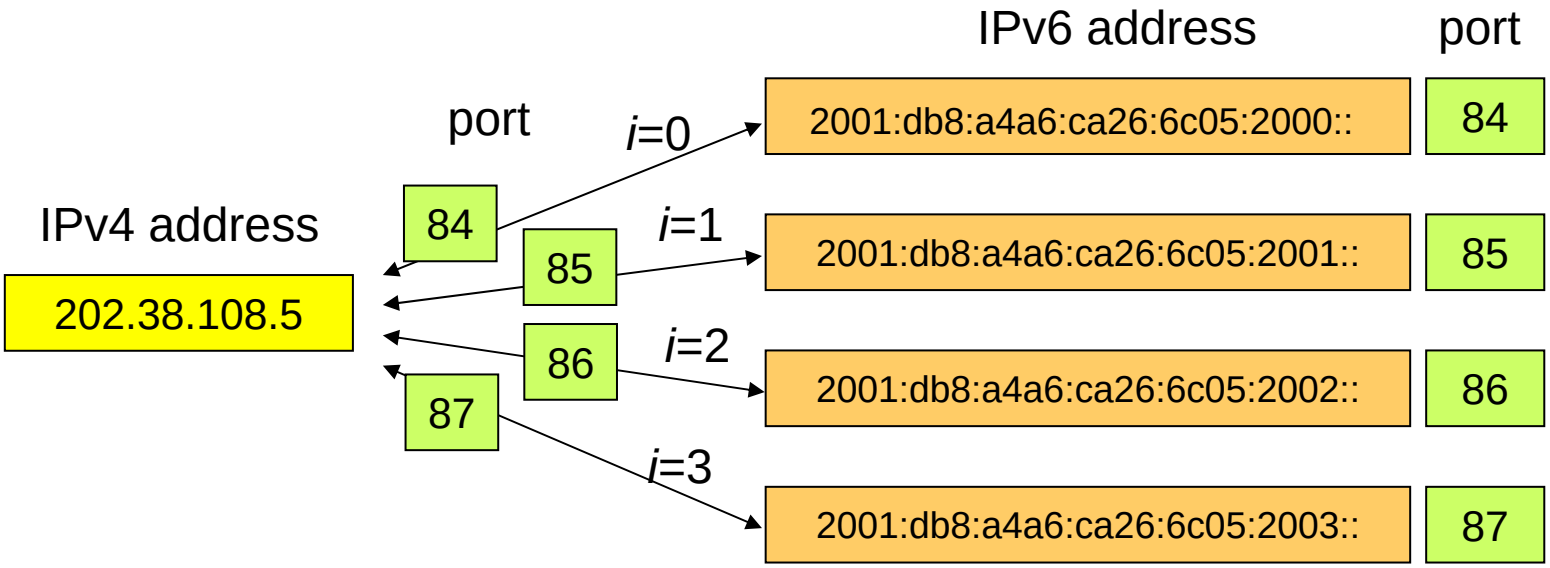
IPv6 address
port
port
i=0
IPv4 address
84
2001:db8:a4a6:ca26:6c05:2000::
84
i=1
85
2001:db8:a4a6:ca26:6c05:2001::
85
202.38.108.5
i=2
86
2001:db8:a4a6:ca26:6c05:2002::
86
87
i=3
2001:db8:a4a6:ca26:6c05:2003::
87

Port-set algorithm

The algorithm used to derive available port-set for a specific CPE, or by XLAT1 to construct, per domain, the CPE index based on an IPv4 address and TCP/UDP port.

For a domain's multiplexing ratio N, the port-set numbers of a CPE with port-set-id K is composed of P=j*N + K + 1024, for all the values of j=0, 1, ..., (65536-N)/N.

For a destination port number (P), the port-set-id of a given CPE with port-set-id K is determined by the modulo operation: K=((P-1024)%N) (% is the Modulus Operator).

1:N dIVI


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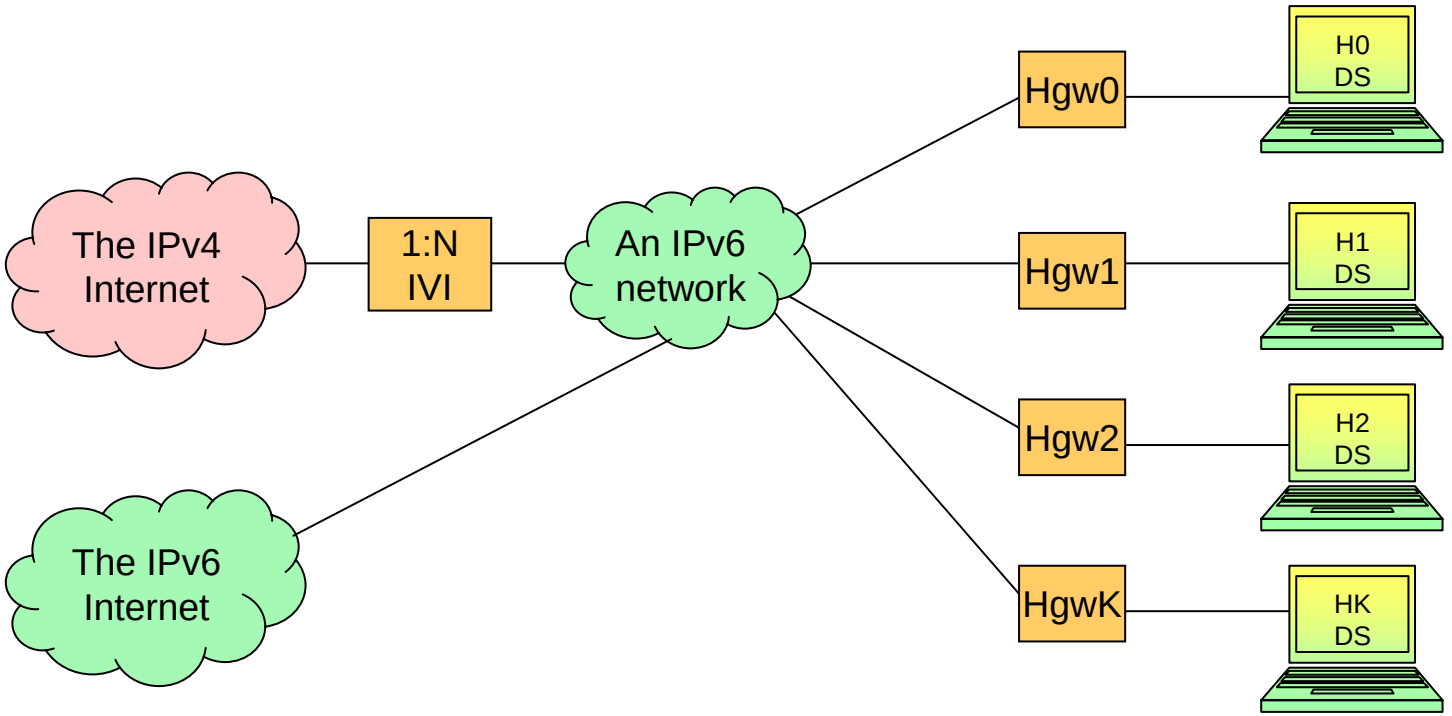
The IPv4 Internet
1:N IVI
An IPv6 network
The IPv6 Internet
Hgw0
Hgw1
Hgw2
HgwK
H0 DS
H1 DS
H2 DS
HK DS

dIVI-PD


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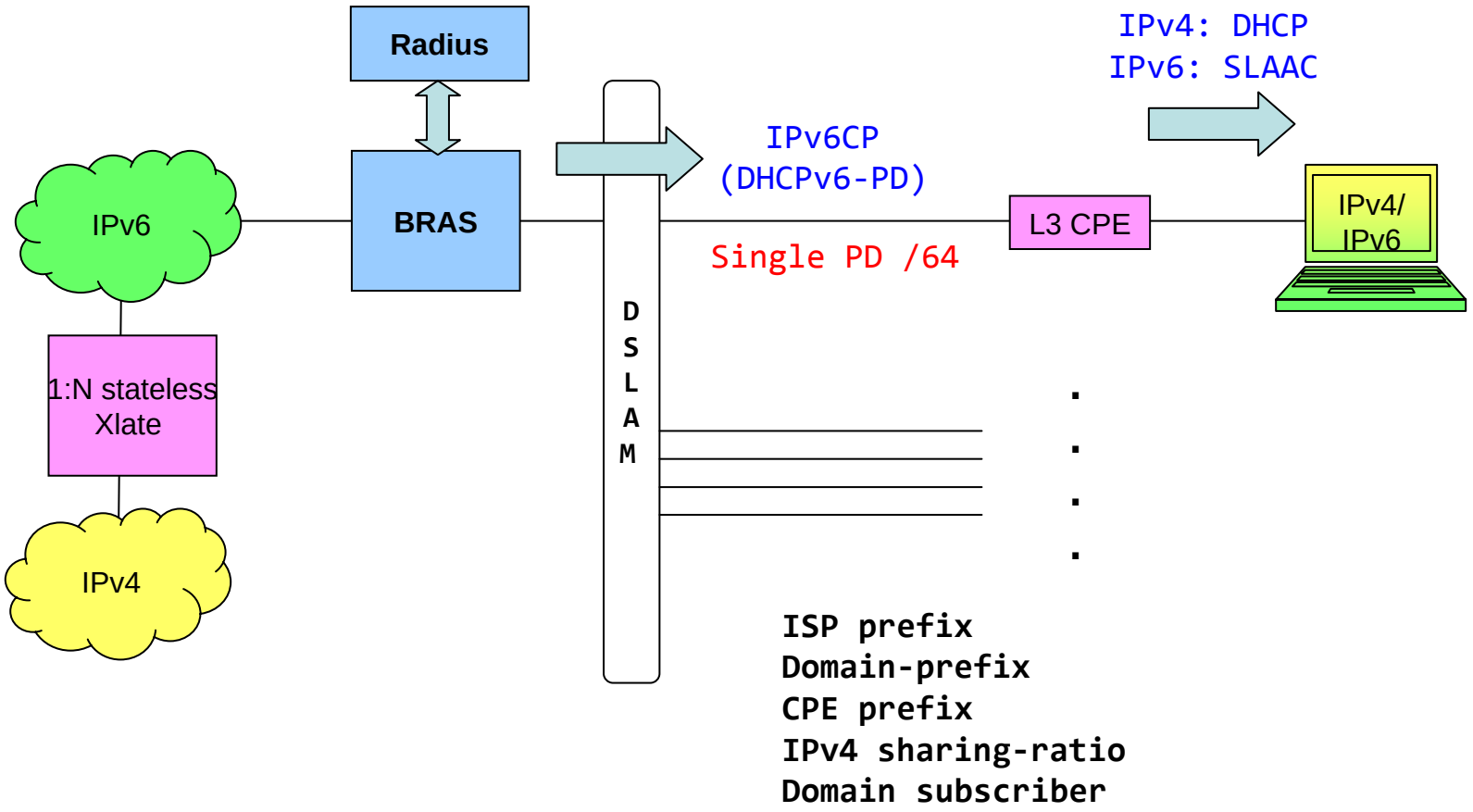
Radius
BRAS
IPv6
1:N stateless Xlate
IPv4
DSLAM
IPv6CP (DHCPv6-PD)
Single PD /64
IPv4: DHCP
IPv6: SLAAC
L3 CPE
IPv4/ IPv6
ISP prefix
Domain-prefix
CPE prefix
IPv4 sharing-ratio
Domain subscriber

RFCs and drafts

- Softwire
  - RFC4925: Softwire Problem Statement
  - Draft: Mapping of Address and Port (MAP)
  - Draft: MAP Translation (MAP-T) - specification
  - Draft: DHCPv6 Options for Mapping of Address and Port
- Behave
  - RFC6052: IPv6 Addressing of IPv4/IPv6 Translators
  - RFC6144: Framework for IPv4/IPv6 Translation
  - RFC6145: IP/ICMP Translation Algorithm
  - RFC6146: Stateful NAT64: Network Address and Protocol Translation from IPv6 Clients to IPv4 Servers
  - RFC6147: DNS64: DNS extensions for Network Address Translation from IPv6 Clients to IPv4 Servers
  - RFC6219: The China Education and Research Network (CERNET) IVI Translation Design and Deployment for the IPv4/IPv6 Coexistence and Transition
  - Draft: dIVI: Dual-Stateless IPv4/IPv6 Translation
- v6ops
  - Draft: Stateless Source Address Mapping for ICMPv6 Packets

IVI equipment

Home gateway

Core translator

Thanks to

- Gaurab Raj Upadhaya
- Philip Smith
- Mark Tinka
- Congxiao Bao
- Weicai Wang

http://en.wikipedia.org/wiki/Stateless_NAT64_(Stateless_NAT46,_IVI)

dIVI Translation - Wikipedia, the free encyclopedia - Mozilla Firefox

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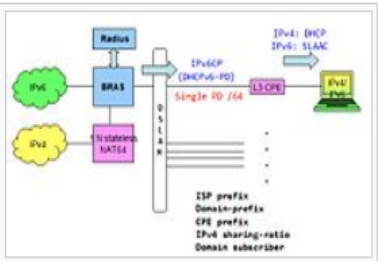
dIVI Translation

From Wikipedia, the free encyclopedia

dIVI Translation refers to a dual stateless IPv4/IPv6 translation technique. dIVI is an extension of 1:1 stateless IPv4/IPv6 translation (IVI Translation) with features of IPv4 address sharing and dual translation. dIVI-PD is a further extension of dIVI to be well used in DSL, Cable and 3G access environment, where the prefix delegation (/64 or shorter) is preferred.

dIVI Translation is intended to benefit the network operators (ISPs) to effectively share the public IPv4 addresses among a set of customers (since IANA has run out of public IPv4 addresses). In parallel, it leverages IPv6 in the network in a manner that makes IPv4-customer originated traffic looks like native IPv6 traffic in the network, resulting in simplified operations. More importantly, (unlike CGN44, DS-Lite, CGN64 etc.) dIVI/dIVI-PD does not require any Stateful NAT, DNS64 and ALG in the network, thereby benefiting the network operator to not deal with any NAT logging etc. dIVI maintains end-to-end address transparency and bidirectional-initiated communications.



dIVI-PD

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