Summary of IPv4/IPv6 dual stack support

• Austin release supports only IPv4
• IPv4 address exhaustion
  – especially in Asia Pacific region
  – NGN (Next Generation Network) in Japan supports both IPv4 and IPv6.
  – all public servers of US Government must be upgraded to IPv6 by FY 2012
• NTT PF Lab. proposes dual stack
  – Future goal of IPv4/IPv6 dual stack support:
    • Each VIF can use both IPv4 and IPv6 address, or only IPv4 address, or only IPv6 address.
    • nova-api can support both IPv4 and IPv6 access

• Bexar release:
  – Configuration flag to select IPv4 mode or IPv4/IPv6 dual stack mode
  – In IPv4/IPv6 dual stack mode:
    • IPv6 support coexist with current VlanManager
    • Each VIF of VM is assigned both IPv6 global unicast address and IPv4 private address
      – Not support assignment of only IPv4 address or only IPv6 address to VM.
    • Pass-through IPv6 packets on network node
    • Firewall rule management for IPv6 traffic
    • nova-api supports both IPv4 and IPv6 access
  – In IPv4 mode, same to current implementation
Each VIF are assigned private address which can be used for communication in VLAN.

All the traffic from public network and to public network are translated by NAT.

VM is accessible by associated public IP address (by using EC2 Associate Address API).

It is possible to change assignment of public IP address from one VM to another (by using EC2 Associate Address API).

- IPv4 private address (fixed address)

- IPv4 private address (fixed address)

- IPv4 private address (fixed address)

IPv4 Elastic IP (floating IP) address

Public Internet

Access from IPv4 public network

VM#2

VM#3

VM#1

Compute node

Network Node

Access to IPv4 public network

It is possible to change the assignment of Elastic IP from VM#2 to VM#3

VLAN

IPv4: NAT by iptables

IPv4 Elastic IP

- IPv4 private address

- IPv4 private address

- IPv4 private address
Design of IPv4/IPv6 dual stack support

2 different concepts

Design1:
IPv6 implementation similar to current IPv4 VLANManager and Elastic IP
- for compatibility with current network architecture and API

Design2:
IPv6 direct access model
Design 1: IPv6 implementation similar to current IPv4 VlanManager and Elastic IP

- Consideration Point:
  - How to implement IPv6 Elastic IP by using a mechanism similar to IPv4 NAT?
    - ip6tables doesn’t have NAT function
    - We’re testing LVS/ipvs for as an alternative to NAT

Any suggestions?

IPv4 Elastic IP Address (floating IP)
- IPv6 global unicast address (floating IP)

Access to IPv4 public network

Access from IPv4 public network

IPv6 access

How to implement the NAT feature for IPv6?
**Design2: IPv6 direct access model (Bexar release)**

- IPv6 direct access model
  - VIF of VM is assigned both IPv4 private address and IPv6 global unicast address.
  - IPv6 global unicast address assigned to VIF is used to communicate with public network.
  - When IPv6 protocol is used, inbound and outbound access are done without using NAT.
  - For about IPv6 address management, network API will not be compatible to current (IPv4) API
    - Ex. For IPv6, EC2 associate address will not be implemented.
  - We’re designing additional network control APIs for managing IPv6 addresses.

- **IPv4:**
  - NAT by `iptables`

- **IPv6:**
  - Global unicast address (fixed address)
  - Pass-through inbound / outbound IPv6 packets
  - Apply firewall rules.

**VM**
- VIF
  - IPv4 private address (fixed ip)
  - IPv6 global unicast address (fixed address)

**Network node**
- VLAN
- IPv6 global address

**Access to / from IPv4 network**

**Access to / from IPv6 network**

**Public Internet**

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NTT PF Lab. would like to implement IPv6 direct access model.

Roadmap:

• Bexar release:
  Limited implementation of IPv6 direct access model
  – Configuration flag to select IPv4 mode or IPv4/IPv6 dual stack mode
  – In IPv4/IPv6 dual stack mode:
    • IPv6 support coexist with current VlanManager or FlatManager
    • Each VM is assigned both IPv6 global unicast address and IPv4 private address
      – Not support assignment of only IPv4 or only IPv6 address to VM.
    • Pass-through IPv6 packets
    • Firewall rule management for IPv6 traffic
    • nova-api support both IPv4 and IPv6 access
  – In IPv4 mode, same to current implementation

• 3rd release or later:
  Further implementation of IPv6 direct access model
  – Under consideration