

# IPv6 Multihoming Overview

---

MENOG 8 - Al-Khobar, May 2011

Adil Baghir (a.baghir@mobily.com.sa)

# Agenda

---

1. Overview
2. Multihoming Technical Motivations
3. IPv6 Multihoming Approaches
  - Routing
  - Middle-box
  - Host-Centric
4. Summary

# Overview

---

- Multihoming refers to the practice of having a network connected to more than one ISP.
- A wide range of solutions have been proposed for Multihoming in IPv6
  - 1. Routing**
    - Multihoming with BGP - PI address space
    - Multihoming with BGP - PA address space
    - Multihoming Support at Site Exit Router
  - 2. Middle-box**
    - LISP (Locator Identifier Separation Protocol)
    - IPv6 Multihoming with NAT (NAT66)
  - 3. Host-Centric**
    - SHIM6 (Site Multihoming by IPv6 Intermediation)
- We will briefly review and discuss the routing approaches

# Multihoming Technical Motivations

---

➤ **Redundancy:**

In order to protect the network against failures. These failures could be either in the multihomed network itself, or in the upstream network.

➤ **Load Balancing:**

To distribute inbound/outbound traffic .

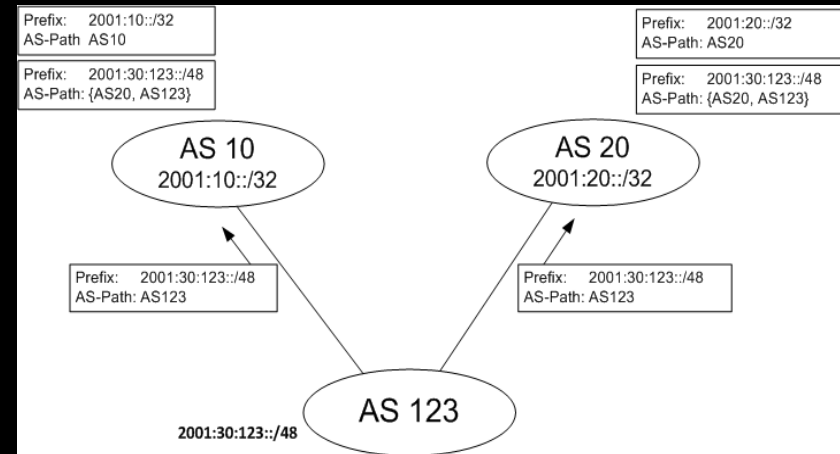
➤ **Performance:**

To avoid traffic congestion at the upstream provider network/link.

# IPv6 Multihoming Routing Approach

# IPv6 Multihoming with PI Address Space

- Most effective Multihoming technique for ISPs and large enterprise
- Obtain a PI allocation, According to RIPE the minimum PI allocation is a /48
- Network operators currently filtering on /48 from PI space.
  - Nothing is official but it's becoming best practices
- Provide the greatest flexibility and reliability.
- The most expensive solution (might require high-end router, address space/AS number from RIR)
- **Do the exact same thing in IPv6 that you are doing in IPv4**



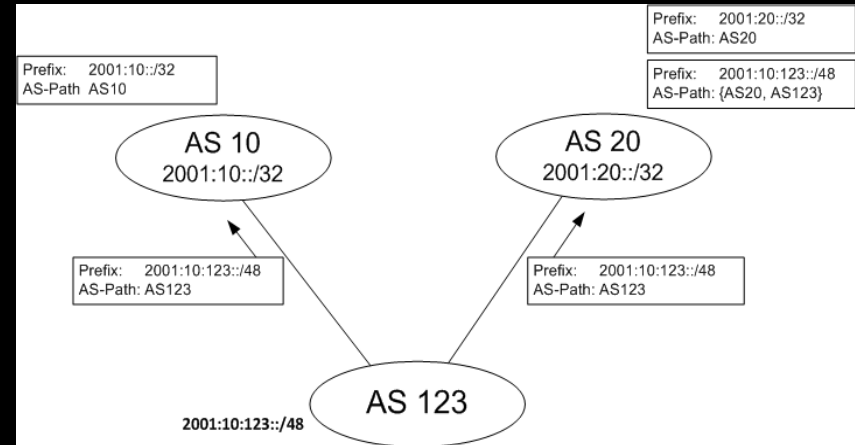
# IPv6 Multihoming with PI Address Space (2)

---

- **Problems with Provider-Independent**
  - Current protocols can only control routing table growth if routes are aggregated.
  - The address space is so large that routing table growth could easily exceed the capability of the hardware and protocols.
  - This might not be the long term solutions for highly scalable (millions of customers) multihoming.

# IPv6 Multihoming with PA Address Space

- The standard practice in IPv4 is to get addresses from one ISP, and advertise that PA space to all of our providers – *effectively making it a PI address.*



- Use more specific from ISPs PA with a different ISP
  - ❑ Ingress filtering might be an issue with IPv6
- Announce the PA prefix to both ISPs.
- In the v6 world, most providers probably won't advertise a foreign prefix to their peers, but might carry it within their own network.
- This might not work due to inbound filter at the ISPs



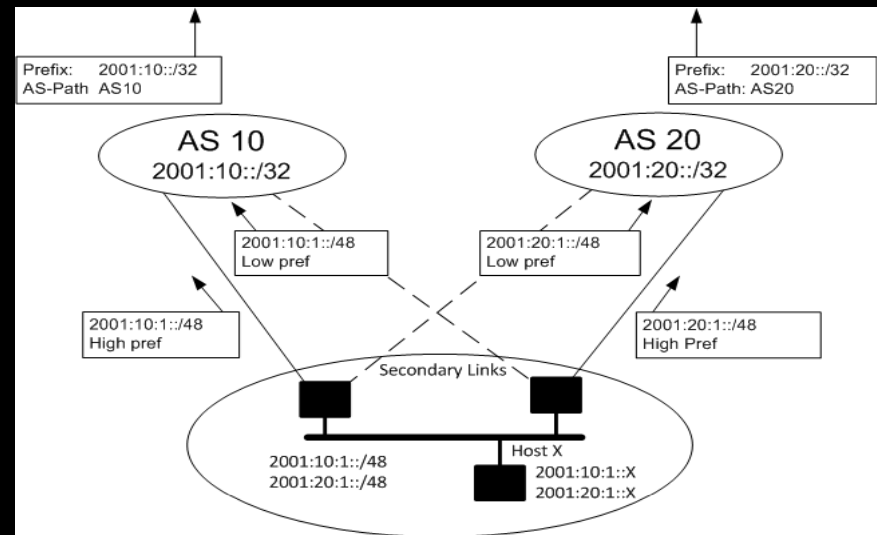
## IPv6 Multihoming with PA Address Space(2)

---

- There are some issues with PA and might be good to consider switching to PI space
- Some operators still filtering on /32 for PA space so no guarantee PA multihoming will work
- This might not be the long term solutions for highly scalable (millions of customers) multihoming
- Still dependency of address providing ISP

# IPv6 Multihoming Support at Site Exit Router

- Multihomed site is assigned multiple prefixes, one per Provider.
- The two prefixes are advertised by the site exit routers to every host inside the network.



- These prefixes are used to derive one IPv6 address per provider for each host interface.
- Redundancy is provided by using secondary links
- Secondary links are advertised by the routing protocol with a low preference.
- How hosts select the source address of their packets is not defined in this solution?!

# IPv6 Multihoming Support at Site Exit Router

---

- **Problems with Site Exit Router**
  - If the host or app chooses from several global addresses, that choice overrides policy, may conflict with routing intentions and can break connectivity
  - Address selection rules are complex.
  - In case of failure, application will lose connectivity and has to re-establish the connection
  - Still dependency of address providing ISP

# Summary

---

## ➤ **Routing Approach**

- Might be convenient for ISPs and large enterprise networks
- Uncontrolled growth of the routing table
- Expensive Equipment

## ➤ **Middle-box and Host-Centric Approach (e.g. LISP, SHIM6)**

- Convenient for Small-Medium enterprise networks
- No need for BGP
- Minimal deployment impact
- Cheap solution

# References

---

- <http://ietf.org/rfc/rfc3178.txt>
- <http://tools.ietf.org/html/rfc3582>
- <http://www.space.net/~gert/RIPE/ipv6-filters.html>
- <http://www.consulintel.euro6ix.org/ietf/draft-palet-multi6-scenarios-00.txt>
- <http://www.ripe.net/ripe/docs/ripe-512>
- [www.lisp4.net](http://www.lisp4.net)
- [www.shim6.org](http://www.shim6.org)

Q & A