Solution approaches for address-selection problems

draft-arifumi-6man-addr-select-sol-00.txt

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About our series of drafts

- **At v6ops**
  - **PS(Problem statement draft) is at AD review**
    - **lists up address selection related problems.**
  - **REQ(Requirements draft) is at AD review**
    - **lists up requirements for solutions.**
  - **SOL(Solution analysis draft) was at v6ops**
    - **outlines and evaluates 4 kinds of possible approaches**
- **SOL moves from v6ops to 6man**
 - **Mainly because this entails protocol work.**
  - **And 6man is there now.**

Motivation for address selection

- **Detailed in PS, but very shortly …**
- **Detailed control over unmanaged hosts' address selection behavior :**
  - **Put less/higher priority on 6to4, Teredo and ULA,...**
    - 6to4 comes before IPv4 by default.
  - **Smooth IPv4 to IPv6 transition**
    - v4-only -> v4 then v6 -> v6 then v4 -> v6-only
  - **Smooth address renumbering**
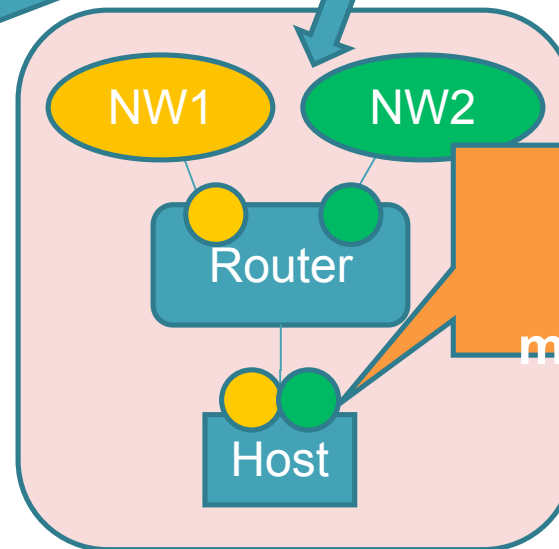   - More quick and definitive renum. process

Motivation for address selection Cont.

- **To replace a NAT box :**
  - **NAT lies everywhere in IPv4 network**
  - **How do we deploy IPv6 in these sites ?**
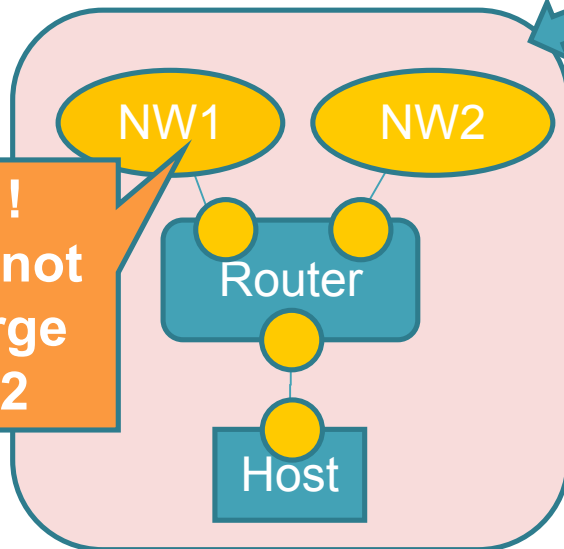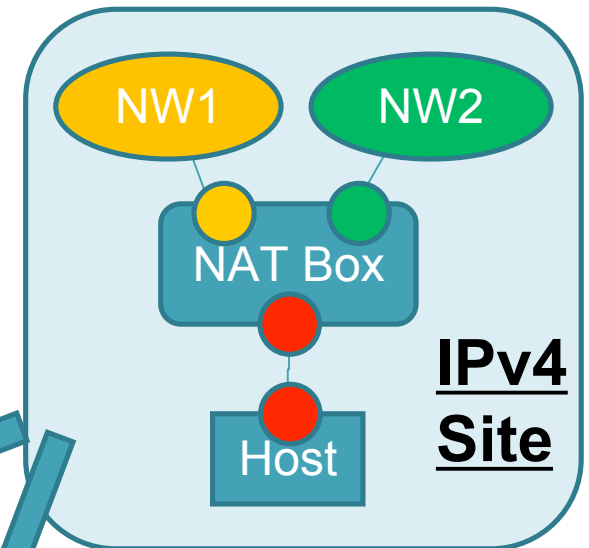
Beautiful !
But, we cannot always merge NW1 and 2

We need address selection method here.

IPv4 Site

We decided not to NAT, so we need an alternative way

Possible Approaches for Address Selection Problems

static

- **Proactive Approach**
  - **Deliver Everything At Once Approach**
    - **E.g. A host acquires RFC 3484 Policy Table**
    - **E.g. K. Fujikawa's address selection proposal**
  - **A Question and An Answer Approach**
    - **A host asks an Agent Server(router) about addresses.**

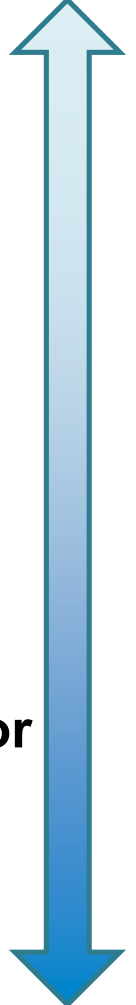- **Reactive Approach**
  - **Try-and-Error Approach**
    - **Host stores addr-select cache based on ICMP error**
  - **All by Oneself Approach**
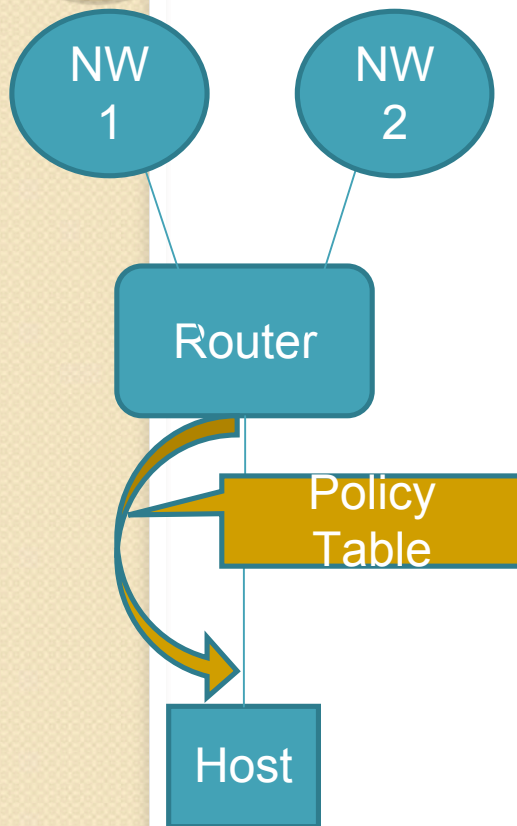   - **Shim6: A host performs failure detection, address cycling**

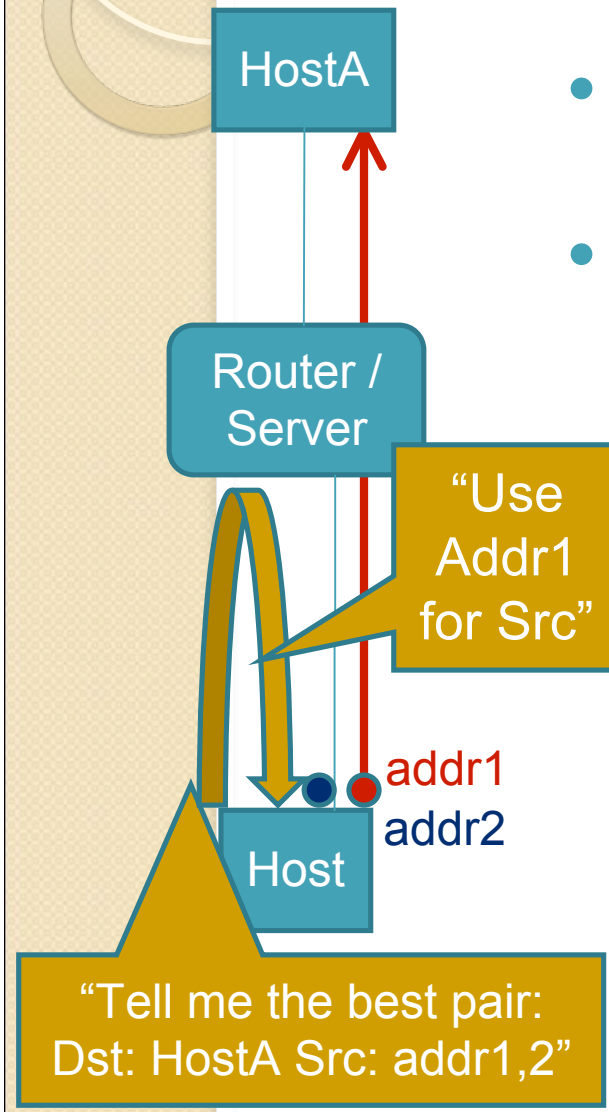dynamic

The Most Proactive Approach
"Deliver Everything At Once Approach"

NW 1

NW 2

Router

Policy Table

Host

- **E.g. "RFC 3484 Policy Table Delivery by DHCPv6"**
  - ◦ draft-fujisaki-dhc-addr-select-opt-04.txt
- **Requirement correspondence analysis**
  - ◦ **Dynamicness depends on the transport mechanism.**
  - ◦ **Policy collision can happen when belongs to multiple admin domain simultaneously.**
- **Other Issue**
  - ◦ **OS with Policy Table needs no**

Proactive Approach
"A Question and An Answer Approach"

HostA

Router / Server

"Use Addr1 for Src"

addr1
addr2

Host

"Tell me the best pair:
Dst: HostA Src: addr1,2"

- **E.g. "Routing system assistance for address selection"**
- **Requirement correspondence analysis**
  - **Dynamically changing network status is easily reflected.**
  - **Policy can collide in multiple admin domain and with multiple servers.**

Other Issues

- **Host implementation needs a big change.**
- **Application also has to be modified.**

Reactive Approach
"Try-and-Error Approach"

HostA

Router

ICMP
Error

addr1   addr2
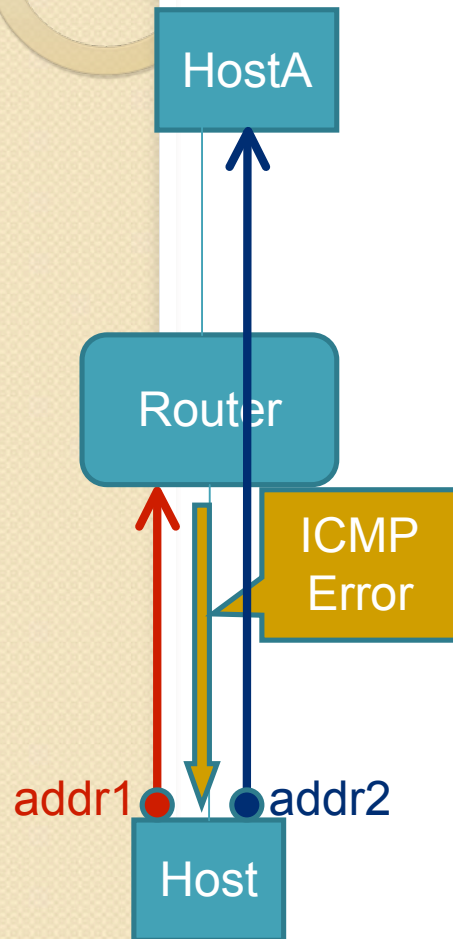
Host

- **E.g. RFC3484-update by M. Bagnulo**
    - **An ICMP Error notifies address mal-selection.**
    - **Hosts store cache of address-pair reachability**

- **Requirement correspondence analysis**
    - **Dynamically changing network status is easily reflected.**
    - **The usability can degrade badly dependent on application behavior.**

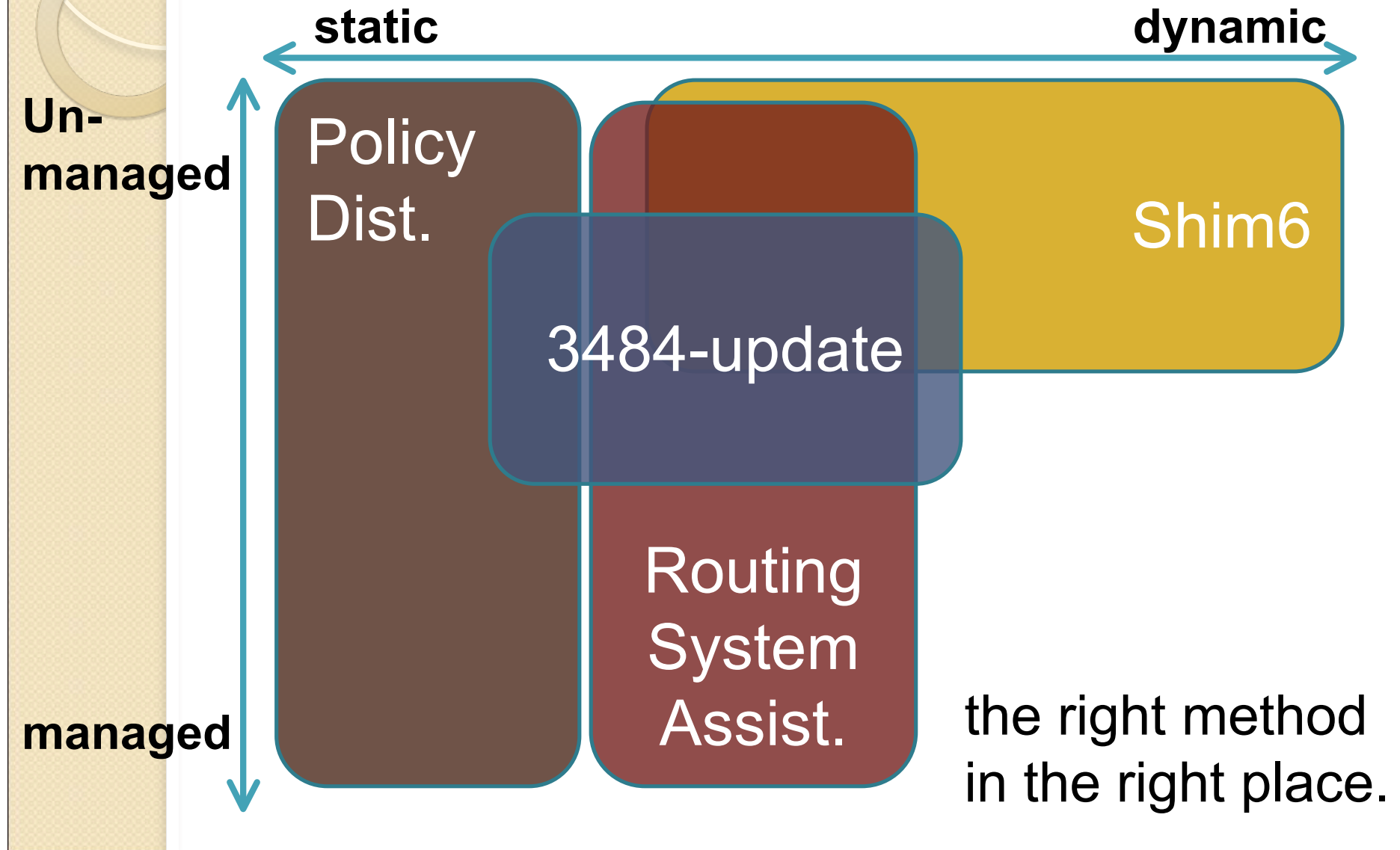- **Other Issues**
    - **Per destination host cache can be so big.**

The Most Reactive Approach
"All by Oneself Approach"

HostA

Router / Server
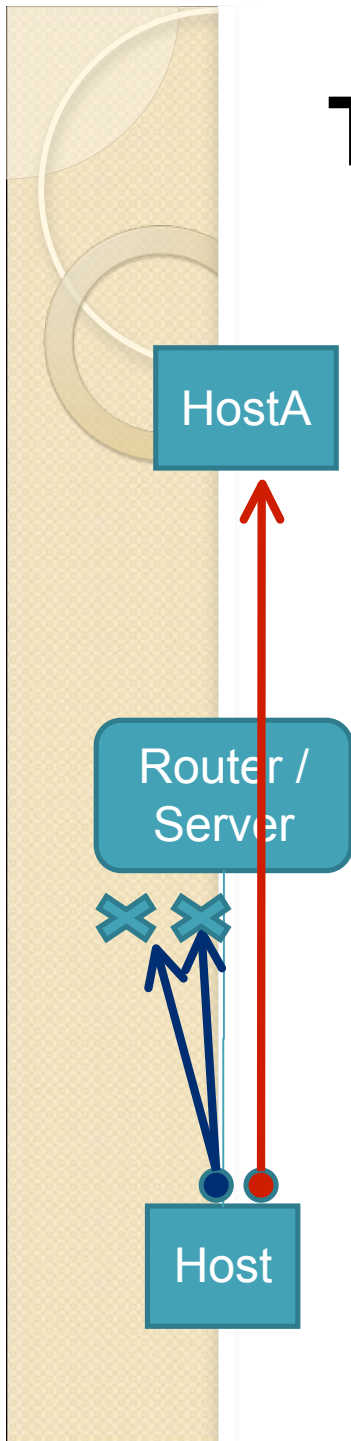
Host

- **E.g. Shim6**
  - **A host can perform failure detection and address cycling without a help from outside.**
- **Requirement correspondence analysis**
  - **A User may have to wait before finding working address pair.**
  - **Central control can only be implemented by packet filtering**
- **Other Issues**
  - **No router modification needed.**
  - **The host implementation has to be changed**

Applicability Domain

static   dynamic

Un-
managed

Policy
Dist.

Shim6

3484-update

managed

Routing
System
Assist.

the right method
in the right place.

Requirement correspondence analysis summary

Requirement	Policy Dist	Router Assist	3484-update	Shim6
Effectiveness	Good	Good	Fair	Fair
Timing	Good	Good	Fair	Fair
Dynamic Update	Good	Good	Good	Good
Node-Specific	Good	Good	Fair	Fair
Appl-Specific	Fair	Fair	Fair	Fair
Multi-Interface	Fair	Fair	Good	Good
Central Control	Good	Good	Fair	Fair
Route Selection	Fair	Good	Fair	Fair
Other Issue	Freq. updates cause traffic	Big Impact on a host's stack	Big Impact on a host's stack	Big impact on a host's stack

Discussion@Chicago and ML

- **About multi-prefix way,**
  - **It isn't simple and should be avoided.**
  - **It's necessary in today's complex network.**
    - **>> The discussion ends up undecided.**
- **About requirement,**
  - **"compatibility with RFC3493" is important**
    - **>> Then, was included in the req. list in -04.**
- **About "policy table distribution method",**
  - **Manybody likes it.**
    - **"looks like the only implementable approach"**
  - **Zone-index should not be distributed**
    - **>> Then, zone-index was made optional in -04.**

Next step

- **Is this work useful ?**
  - **as 6man wg item.**

- **Have we decided one direction ?**
  - **Policy Table Distribution**
  - **Q and A approach**
  - **Try and Error approach**
  - **All by oneself approach**