Scenario 2 (and 4) Solutions and Comparisons

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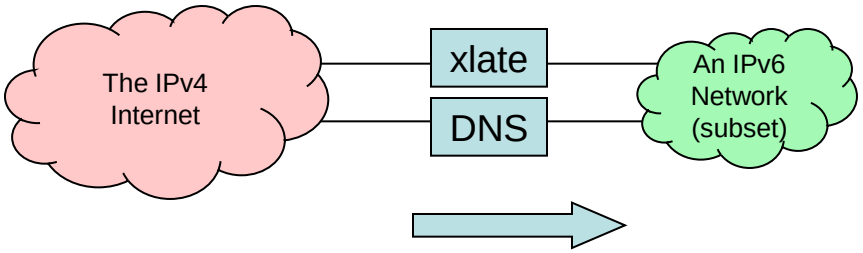
Outline

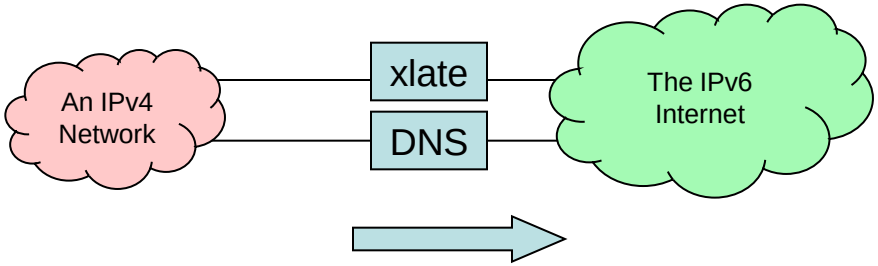
- Scenario
- 1:1-IVI
- 1:1-IVI+DHCPv6
- 1:N-IVI
- Bi-Directional-NAT-PT
- SIPNAT
- Comparisons

Scenarios 2 and 4

- (1:1 IVI), (1:N IVI), and SIPNAT have been proposed to enable communications to be initiated from today's IPv4-based Internet and successfully terminated at IPv6-only devices.
- This is important so that IPv6-only devices will be fully functional and reachable in today's Internet.



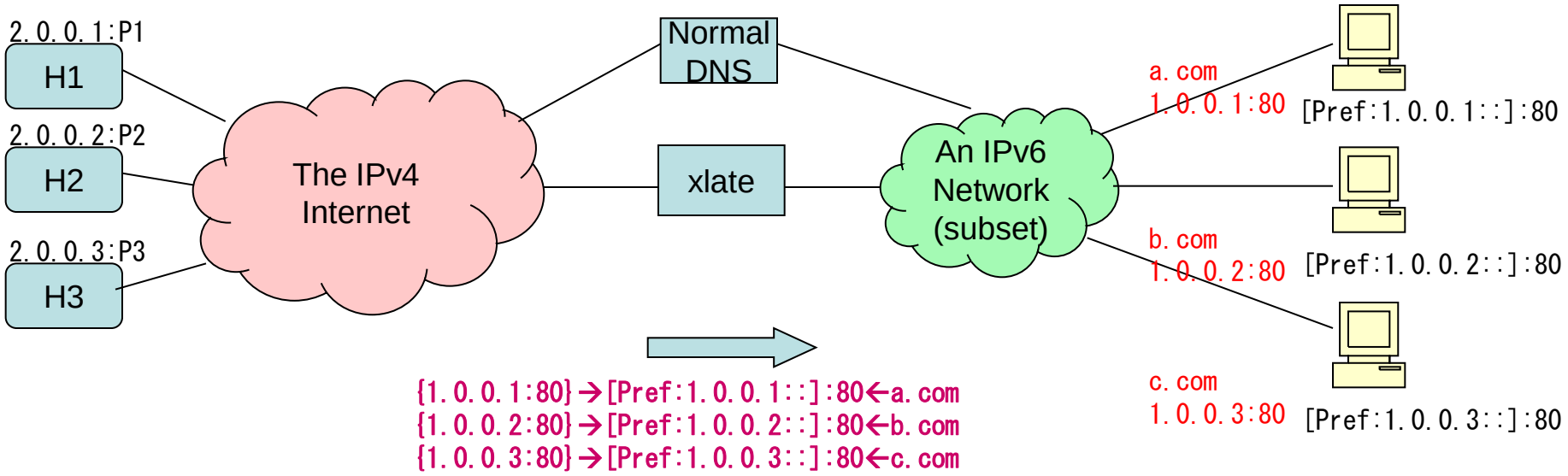
Scenario 2: the IPv4 Internet to an IPv6 network



Scenario 4: an IPv4 network to the IPv6 Internet

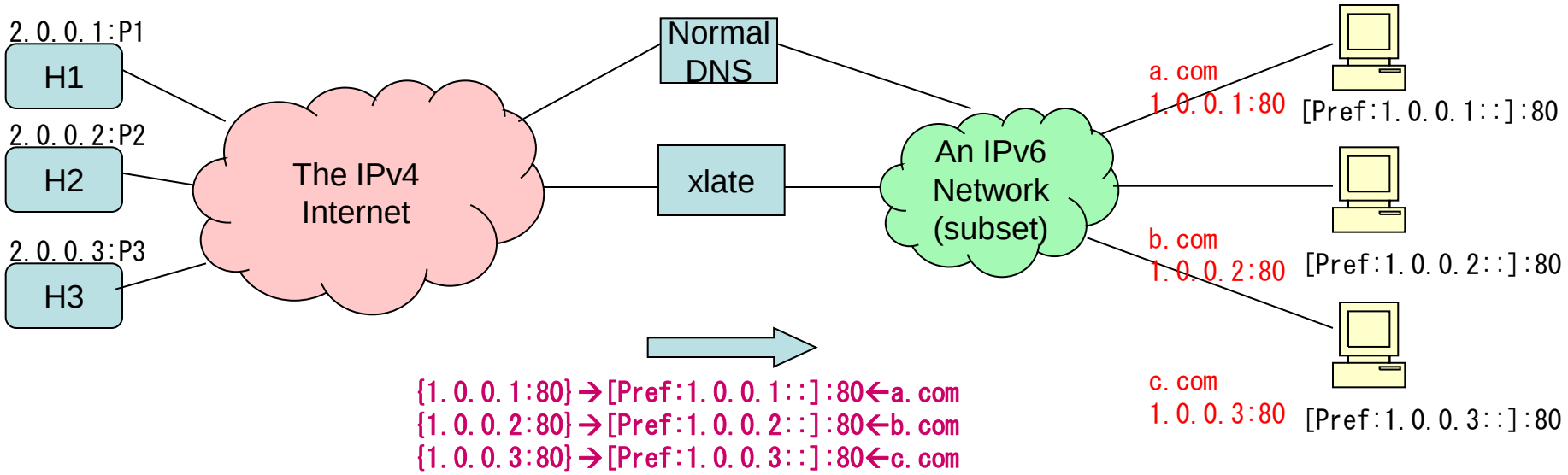
1:1-IVI (1)

- 1:1 IVI statically reserves an IPv4 address for each IPv6 destination (IPv4-translatable address) which is to be made reachable to the global IPv4 Internet.
- Each IPv4 address can only be used by a single IPv6 destination.



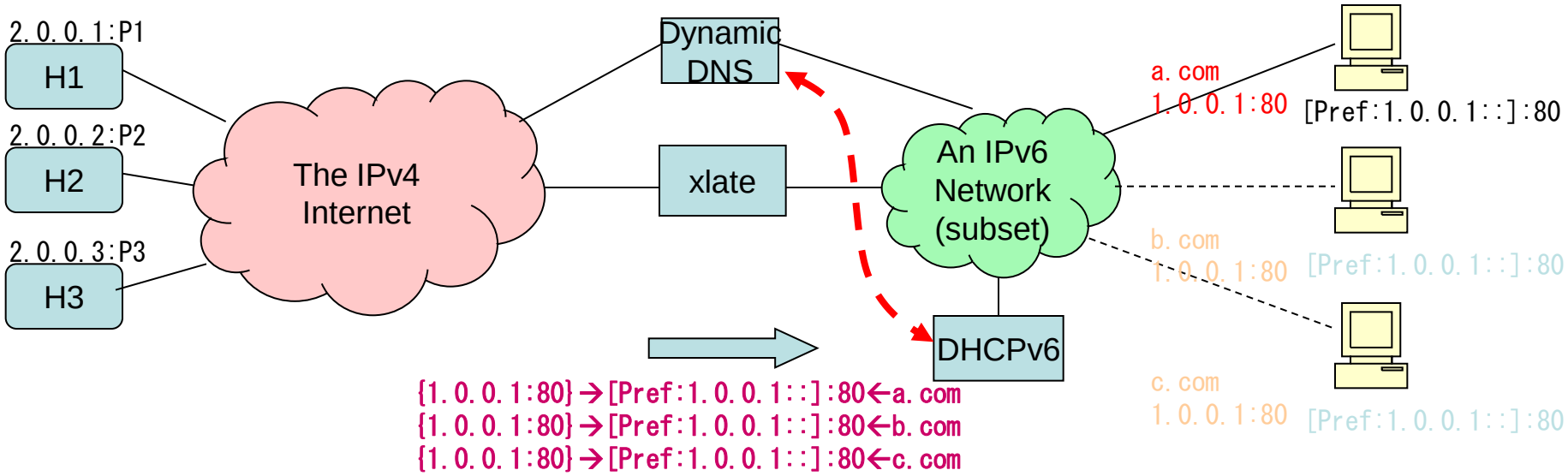
1:1-IVI (2)

- For scenario 2 (also for scenario 1)
- Stateless translation
- Does not require DNS-ALG
- Static address assignment
- 1-to-1 IPv4/IPv6 address mapping
- Unmodified service port



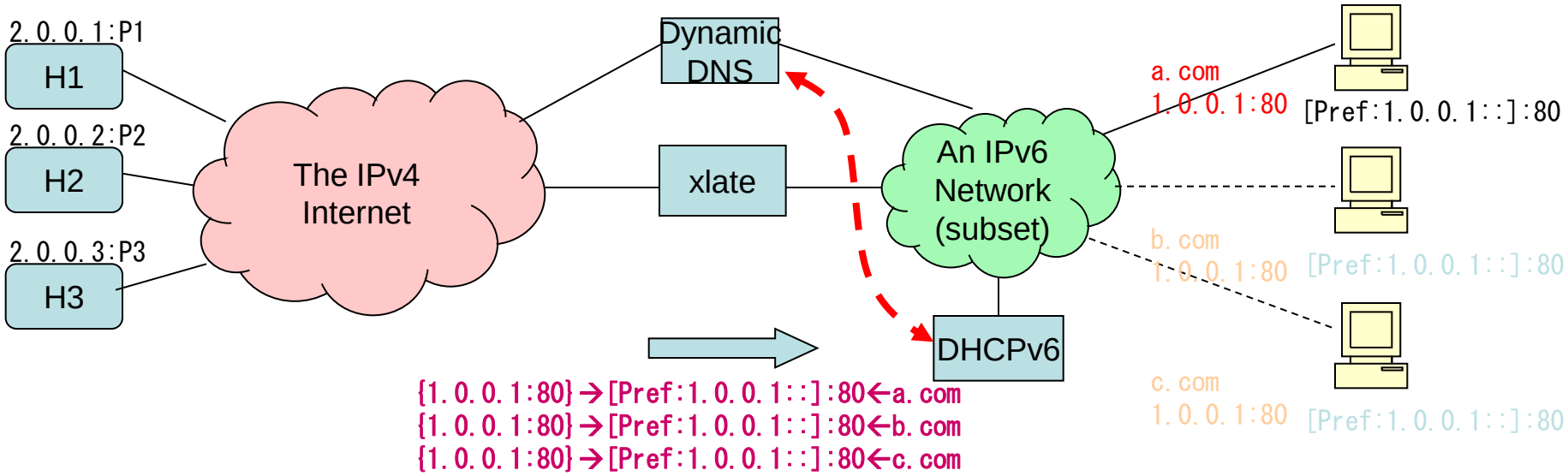
1:1-IVI+DHCPv6 (1)

- (1:1 IVI + DHCPv6) uses DHCPv6 to dynamically reserve a translatable IPv4 address for the IPv6 host. The reservation process updates the DNS with the allocated address so that the IPv6 destination becomes reachable.
- At any one time, each IPv4 address can only be used by a single IPv6 destination, but over time the IPv4 address can be reused for other IPv6 destinations, depending on DHCP lifetime allocation policies.



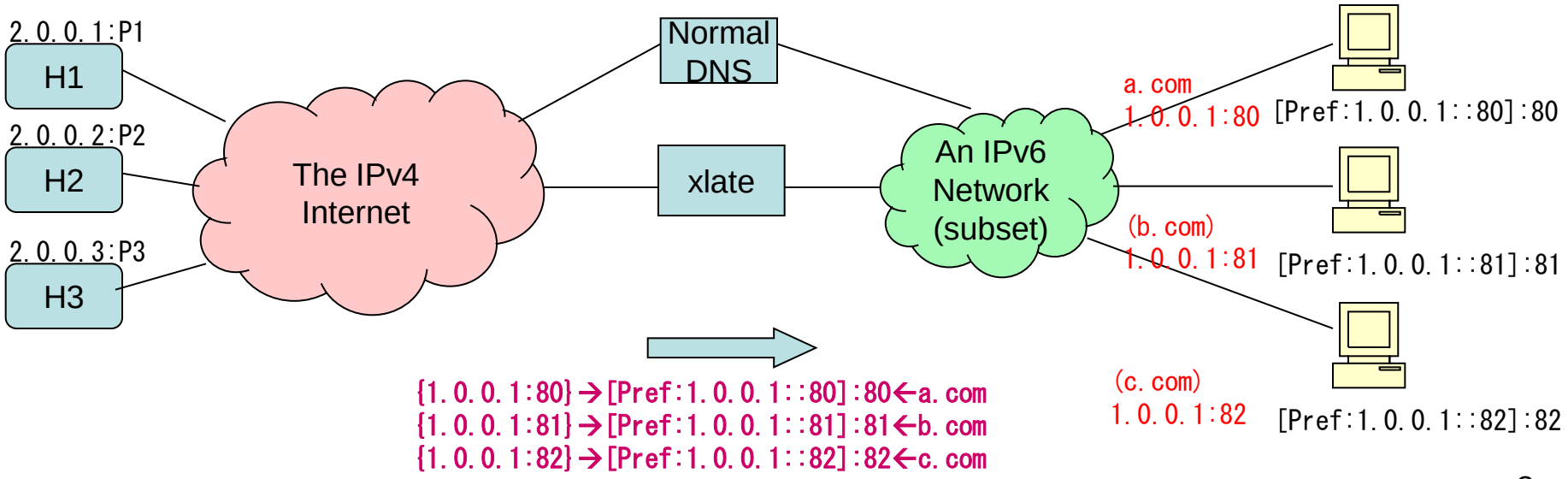
1:1-IVI+DHCPv6 (2)

- For scenario 2 (also for scenario 1)
- Stateless translation
- Does not require DNS-ALG
- Dynamic address assignment (may link to DNS)
- 1-to-1 IPv4/IPv6 address mapping
- Unmodified service port



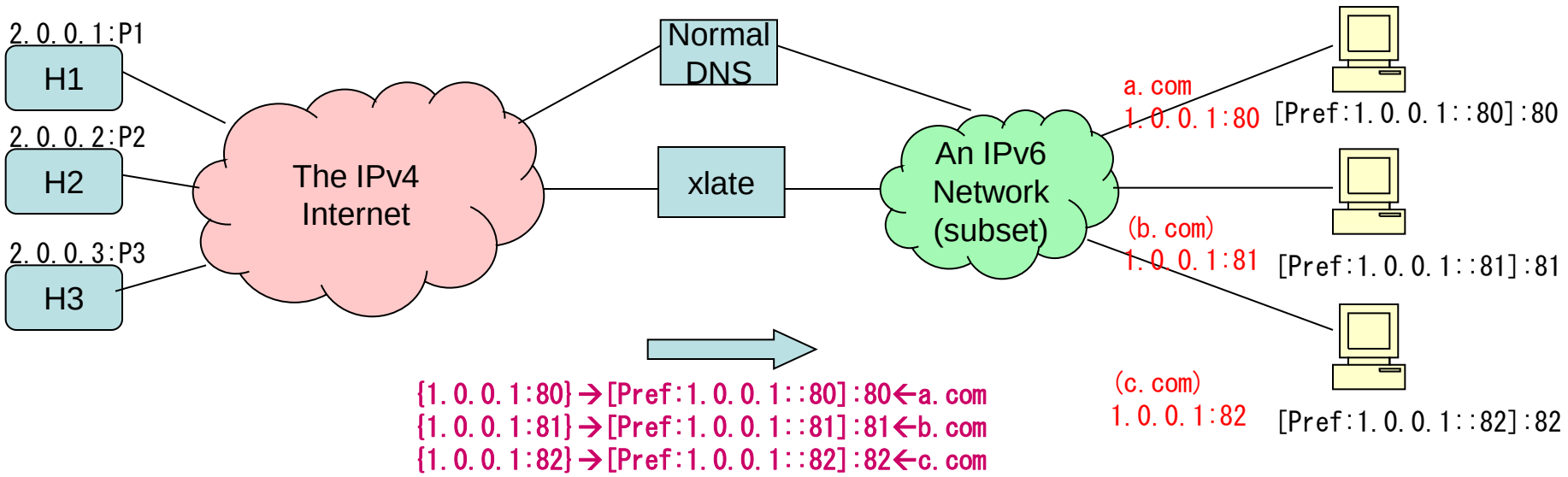
1:N-IVI (1)

- 1:N IVI statically reserves an IPv4 address and a port range (extended IPv4-convertible address) for each IPv6 destination which is to be made reachable to the global IPv4 Internet.
- The IPv4 address and port range can only be used by the single IPv6 destination.



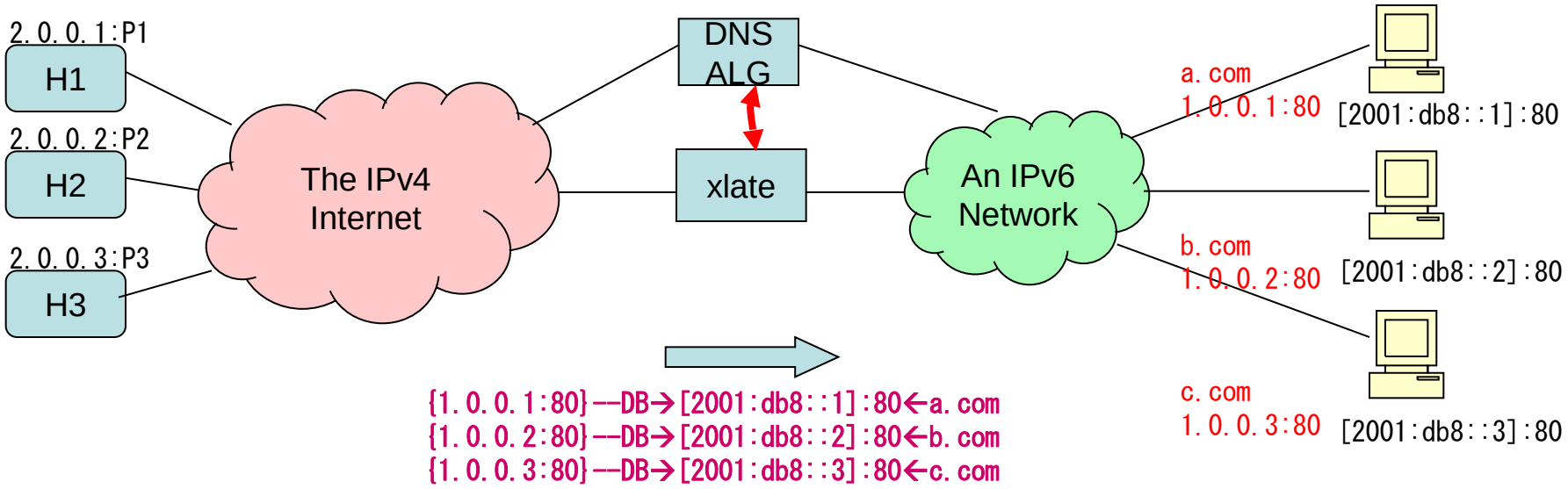
1:N-IVI (2)

- For scenario 2 (also for scenario 1)
- Stateless translation
- Does not require DNS-ALG
- Static address assignment
- 1-to-N IPv4/IPv6 address mapping
- Modified service port (application transparency lost)



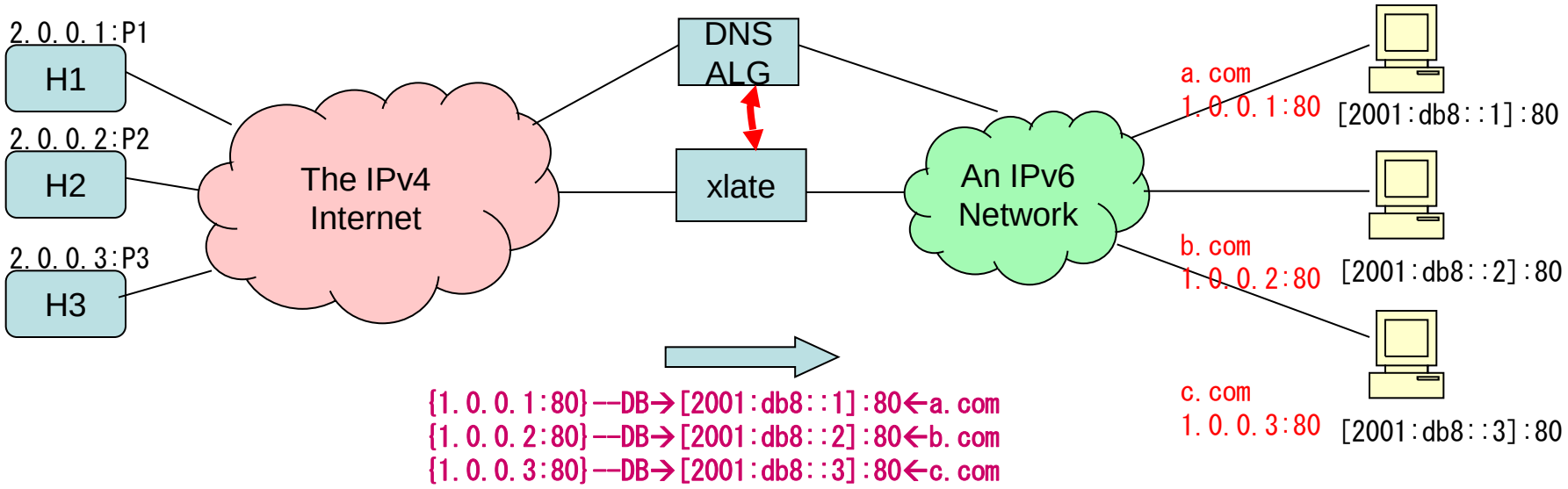
Bi-Directional-NAT-PT (1)

- NAT-PT combined with a DNS-ALG provides bi-directional connectivity between the IPv6 stub domain and the IPv4 world allowing sessions to be initialized by IPv4 nodes outside the IPv6 stub domain. This makes NAT-PT useful for IPv6 only stub networks that need to deploy servers visible to the IPv4 world.



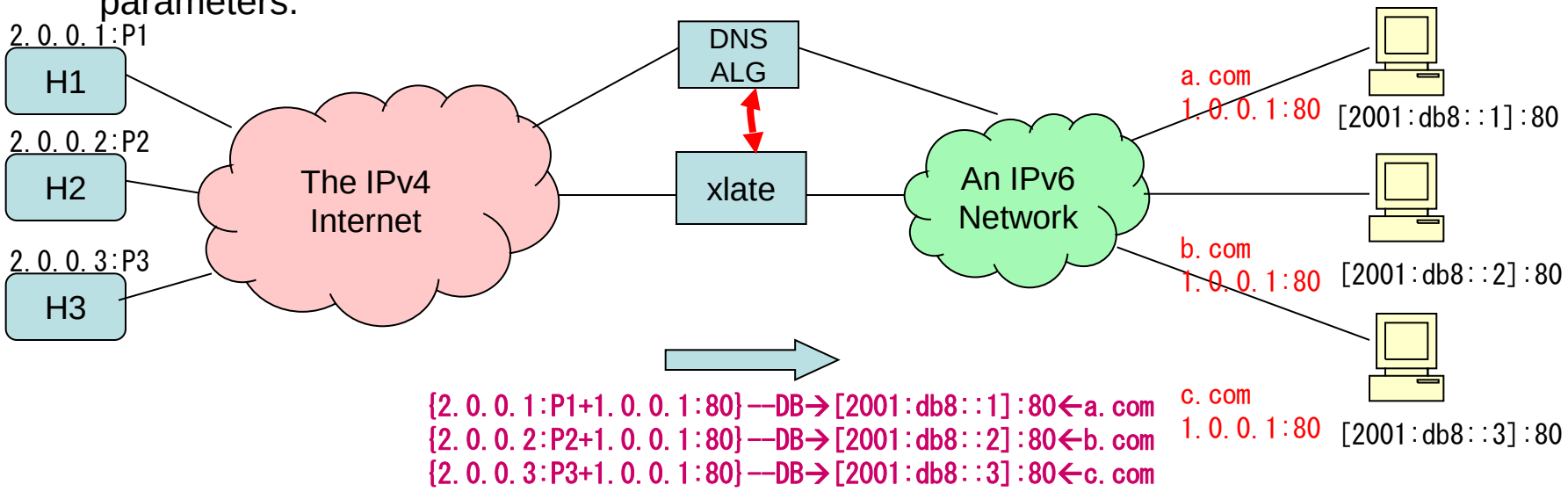
Bi-Directional-NAT-PT (2)

- For scenario 2 (also for scenario 1)
- Stateful translation
- Requires DNS-ALG
- Dynamic address binding via database
- 1-to-1 IPv4/IPv6 address mapping
- Unmodified service port



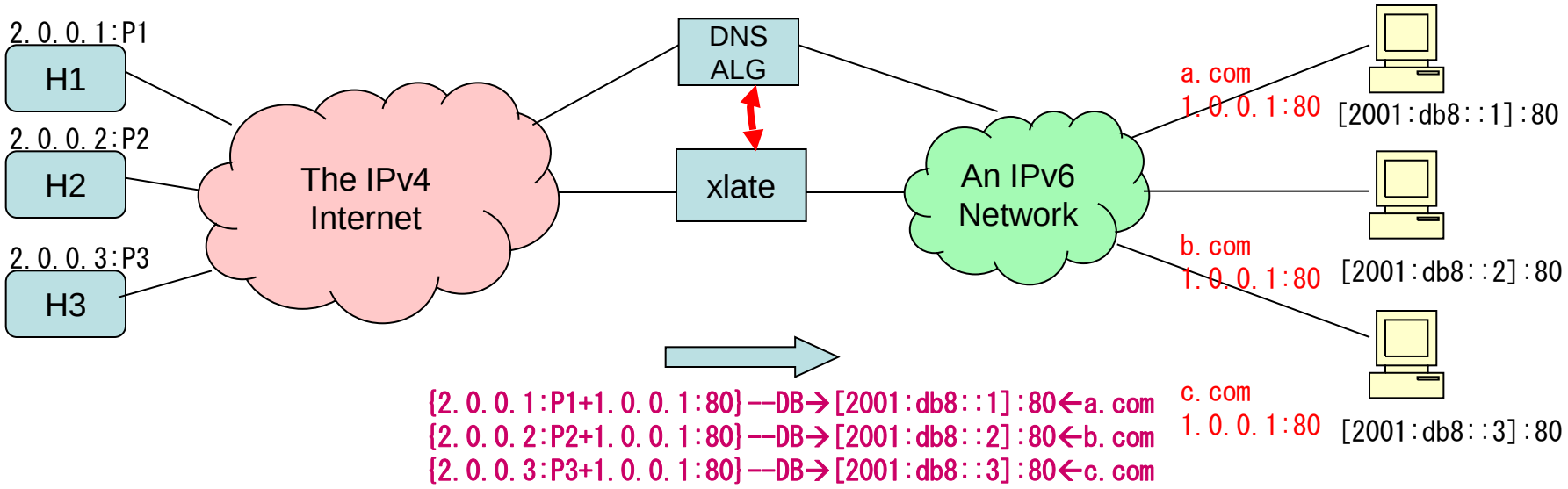
SIPNAT (1)

- SIPNAT ("Source-IP NAT") dynamically associates an IPv4 address on the NAT, on demand, when a communication is initiated from the global IPv4 Internet. The FQDN of the destination IPv6 does not typically have a persistent resolution for any particular IPv4 address. A single IPv4 address of the NAT can be simultaneously used for flows to many different IPv6 destinations. The source IPv4 address of incoming packets is used to identify the desired IPv6 destination. For any such source IPv4 address, only one destination is reachable at the NAT IPv4 interface address which as been associated with the IPv6 destination. Ports are not required for the translation, but should be considered as part of of the set of flow translation parameters.



SIPNAT (2)

- For scenario 2 (also for scenario 1, can extend for scenario 4)
- Stateful translation
- Requires DNS-ALG
- Dynamic address binding via database
- 1-to-N IPv4/IPv6 address mapping
- Unmodified service port
- Depends upon source address



Comparisons (1)

- (1:1 IVI) is a good solution for destinations that serve many flows, and are each typically active serving one or more flows from the IPv4 Internet. In this case, there is little or no advantage to be gained by dynamic assignment.
- (1:1 IVI+DHCP) is a good solution for destinations that may be inactive for extended periods of time, but are also likely to serve many flows during other extended periods of time.
- Bi-Directional-NAT-PT shares some scalability properties with (1:1 IVI+DHCP)
- (1:N IVI) is a solution which may be workable for situations where destinations host applications that are resilient and aware of port restrictions.
- SIPNAT is a good solution for situations where there are a large number of IPv6 destinations, each of which serves a relatively low volume of flows (e.g, fewer than 100 distinct flows per hour).

Comparison criteria

- Translator complexity
  - Stateless
  - DNS decoupled
- Conserves IPv4 addresses
- Application Port Transparency
- Continuous service (vs. dynamic assignment)

Comparisons (2)

	Stateless	Decoupled from DNS	Conserves IPv4 addresses	Application Port Transparency	Port-based Translation	Continuous service
1:1-IVI	yes	yes	no	yes	no	yes
1:1-IVI + DHCPv6	yes	yes	yes	yes	no	no
1:N-IVI	yes	yes	yes	no	yes	yes
Bidirectional NAT-PT	no	no	no	yes	yes	yes
SIPNAT	no	no	yes	yes	no	yes

Conclusions

- Supporting IPv4-initiated communication is crucial.
- This draft compares (1:1 IVI), (1:1 IVI+DHCP), (1:N IVI), (Bi-Directional-NAT-PT) and (SIPNAT) solutions which can support IPv4-initiated communication.
- These approaches can be integrated to provide comprehensive support.
- See draft-nat46compare-perkins-01.txt