Analysis of Solution Candidates to Reveal the Origin IP Address in Shared Address Deployments

draft-boucadair-intarea-nat-reveal-analysis-01

(INTAREA WG, BEHAVE WG)

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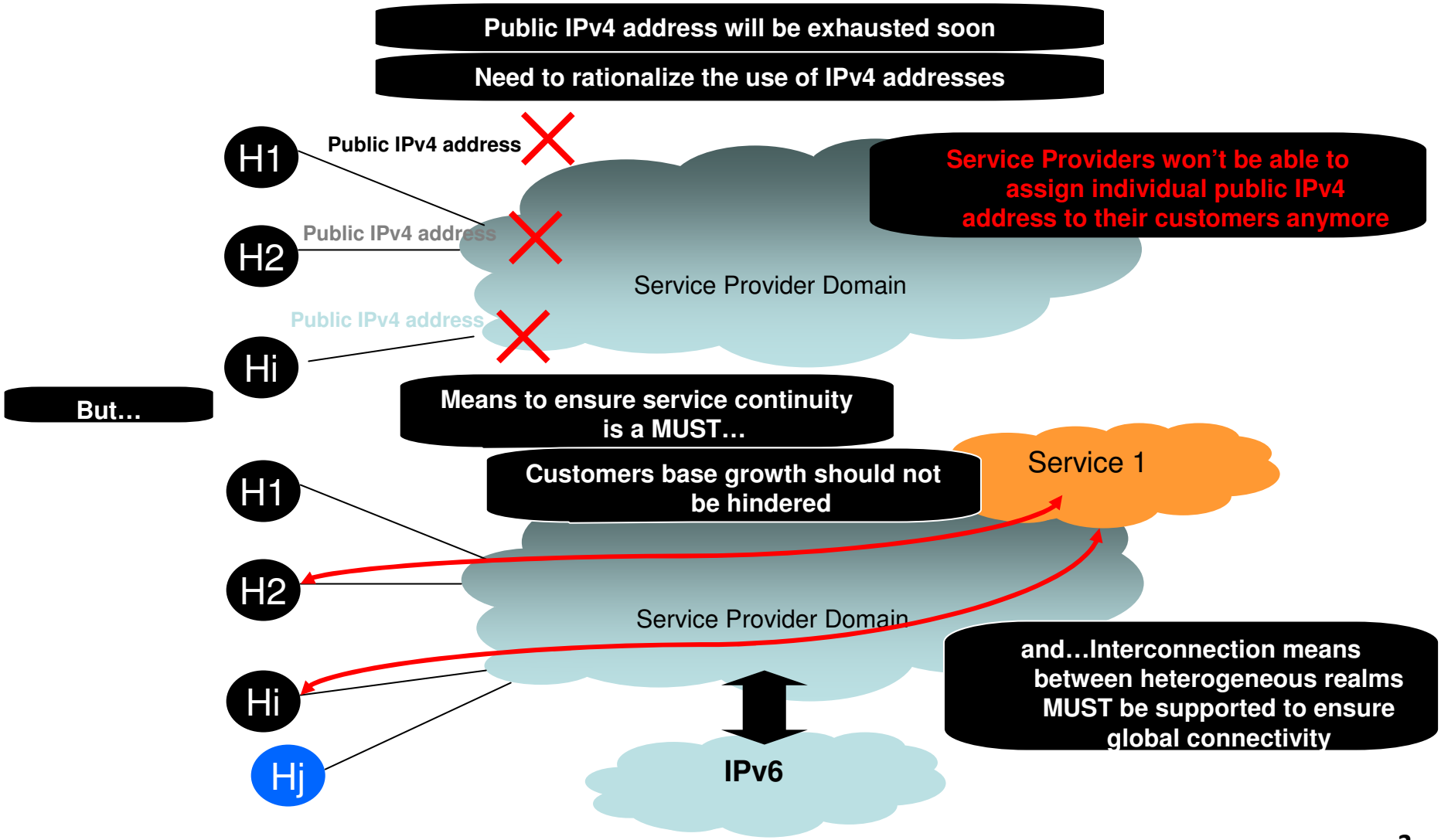
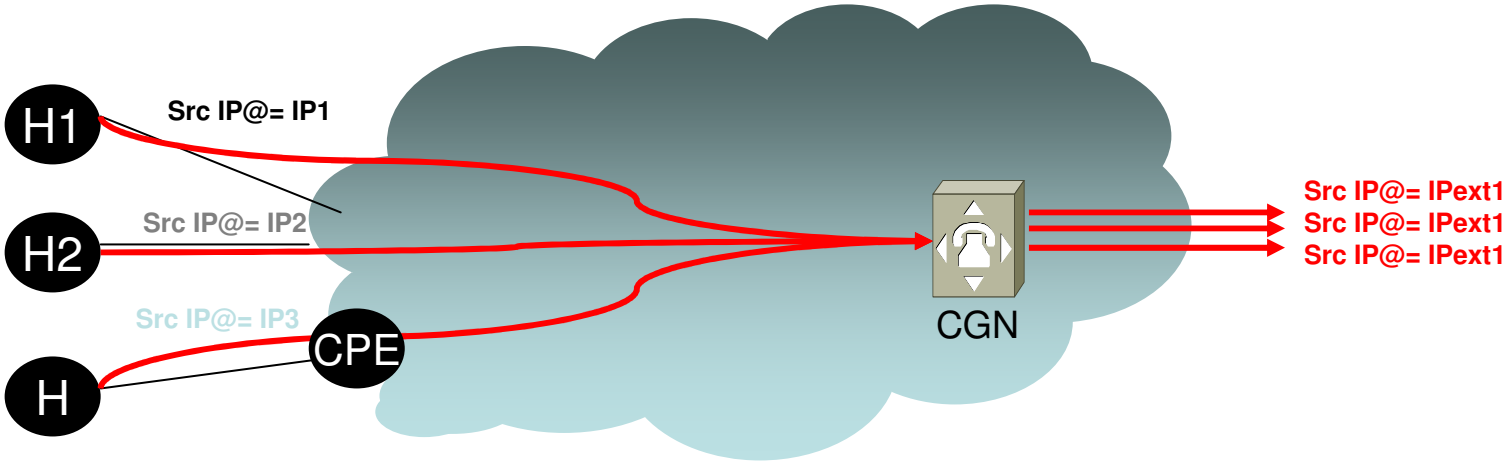
Agenda

- Reminder about some address sharing issues
- Why Host_ID is needed?
- How to insert a HOST_ID?
- Solution analysis
- Next steps

IPv4 Service Continuity

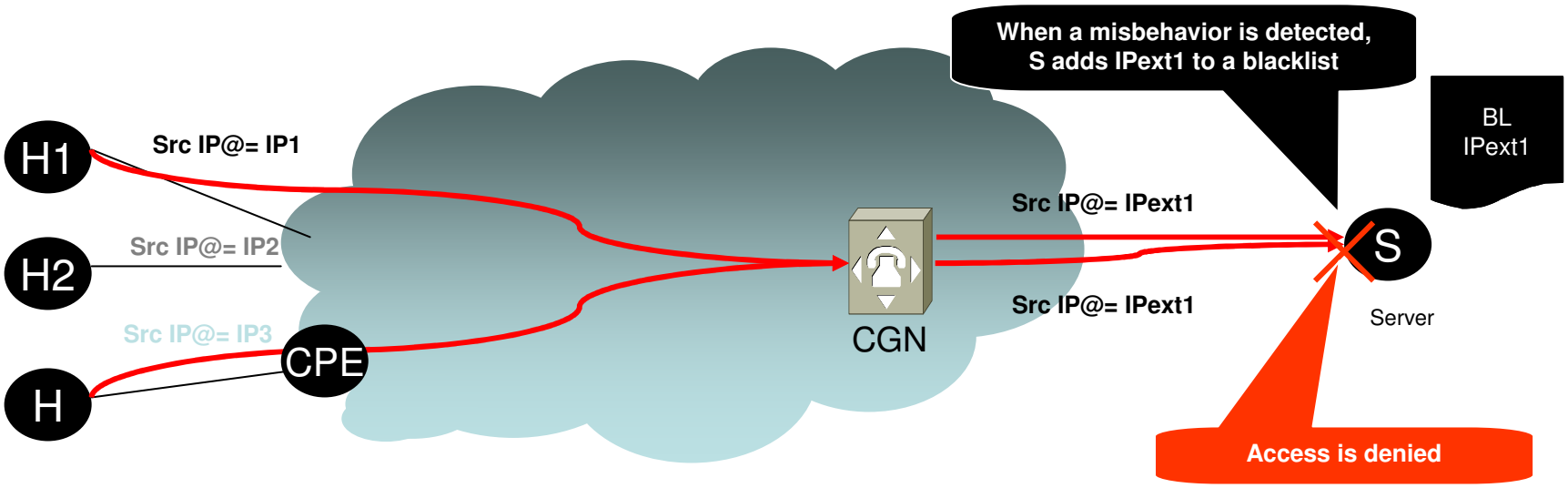


NAT-based Address Sharing



The internal and the external IP addresses may be of distinct address families (e.g., IPv4, IPv6): NAT44 or NAT64

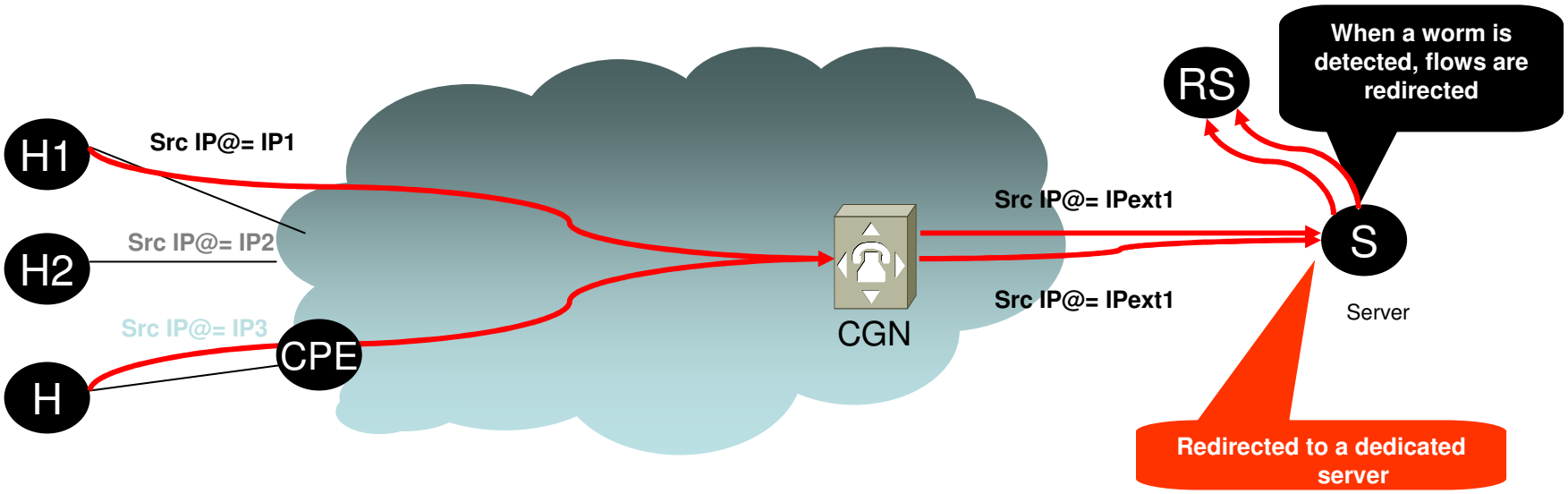
NAT-based Address Sharing



Blacklisting a misbehaving user:
The server relies on the source IP address

All subscribers using the same address will be impacted:
Loss of users for the content providers, calls to the hotline for the IP Network Provider ($$/mn, OPEX loss for the ISP) and unsatisfied customers

NAT-based Address Sharing



Infected machine
traffic redirection is based on the source IP address

All subscribers using the same address will be impacted:
Difficult to troubleshoot, calls to the hotline for the IP Network Provider ($$/mn, OPEX loss for the ISP) and unsatisfied customers

A more exhaustive list of issues are identified in I-D.ietf-intarea-shared-addressing-issues

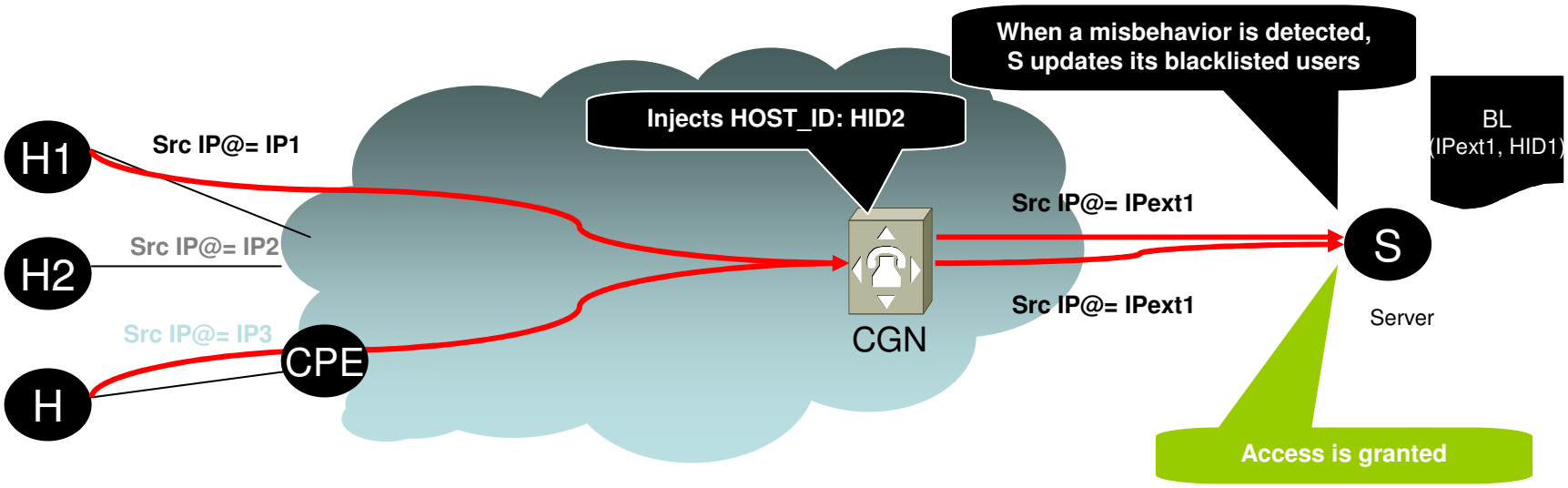
Generalizing the issue

- Observation
  - Today, servers use the source IPv4 address as an identifier to treat some incoming connections differently
  - **Tomorrow**, because this address is shared, the **server does not know which host is the sending host**
- Objective
  - The server should be able to sort out the packets by sending host (not only based on the source IP @)
- Requirement
  - The server must have extra information than the source IP address to differentiate the sending host: We call **HOST_ID** this information

HOST_ID: Rationale

- **What is the HOST_ID?**
  - It must be unique to each user under the same address
  - Adding a HOST_ID does not “break” the privacy of the user, it reveals the same information as the source IP address when there is not CGN in the path
  - E.g., first bits of an IPv6 address, private IPv4 address, etc.
- **Who puts the HOST_ID?**
  - The address sharing function injects the HOST_ID when it translates IP packets
  - The CPE can put the identification in the packet and the CGN checks it instead of doing the actual writing. The performance impact would be distributed/shared between CPE and CGN
- **Where is the HOST_ID?**
  - If the HOST_ID is put at the IP level, all packets will have to bear the identifier
  - If it is put at a higher connection-oriented level, the identifier is only needed once in the session establishment phase
    - for instance TCP three-way-handshake

NAT-based Address Sharing (revisited)



Blacklisting a misbehaving user:
The server relies on the source IP address **& HOST_ID**

The server needs to be updated to:
(1) be able to extract the HOST_ID, (2) Enforce policies based on the HOST_ID, (3) log the HOST_ID

Solutions to reveal the HOST_ID

	UDP	TCP	HTTP	Encrypted traffic	Success Ratio	Possible performance impact	Modify OS TCP/IP stack is needed (*)	Deployable	Notes
IP Option	Yes	Yes	Yes	Yes	30%	High	Yes	Yes	
TCP Option	No	Yes	Yes	Yes	99%	Med to High	Yes	Yes	
IP-ID	Yes	Yes	Yes	Yes	100%	Low to Med	Yes	Yes	1
HTTP Header (XFF)	No	No	Yes	No	100%	Med to High	No	Yes	2
Proxy Protocol	No	Yes	Yes	Yes	Low	High	No	No	
Port Set	Yes	Yes	Yes	Yes	100%	NA	No	Yes	1,3
HIP					Low	NA	--	No	4,5

(1) Requires mechanism to advertise NAT is participating in this scheme (e.g., DNS PTR record)
(2) This solution is widely deployed
(3) When the port set is not advertised, the solution is less efficient.
(4) Requires the client and the server to be HIP-compliant and HIP infrastructure to be deployed
(5) If the client and the server are HIP-enabled, the address sharing function does not need to insert a user-hint. If the client is not HIP-enabled, designing the device that performs address sharing to act as a UDP/TCP-HIP relay is not viable.

(*) Server side

IP option, IP ID and Proxy Protocol are **broken**

HIP is not “widely” **deployed**

Port Set requires **coordination**

XFF is **largely deployed** in operational networks but still the address sharing function **needs to parse all applications messages**

TCP Option is superior to XFF since it is not specific to HTTP but what about **UDP**? Update the Servers OS **TCP/IP is required**

What to do with this analysis?

- Recommend a solution?
  - Of course, individual solutions needs to discuss potential impact on performance, mis-usage of the solution to reveal other "sensitive" information, etc.
- Add a conclusion to say: "IETF has documented the issues and has analyzed solution candidates but IETF believes CGN should stay "evil""?
  - Risk of emergence of proprietary solutions
- Add a statement to say: "IPv6 will solve this?"
  - Yes, this is a strong signal but this does not mitigate the service brokenness to be encountered by subscribers when address sharing will be deployed at large
  - The issues are also valid for NAT64

Next steps?

- Please advise