

Updates to DNS64 Functionality Advertisement for DNS RA Option

draft-ma-6man-ra-dns64-flag-01

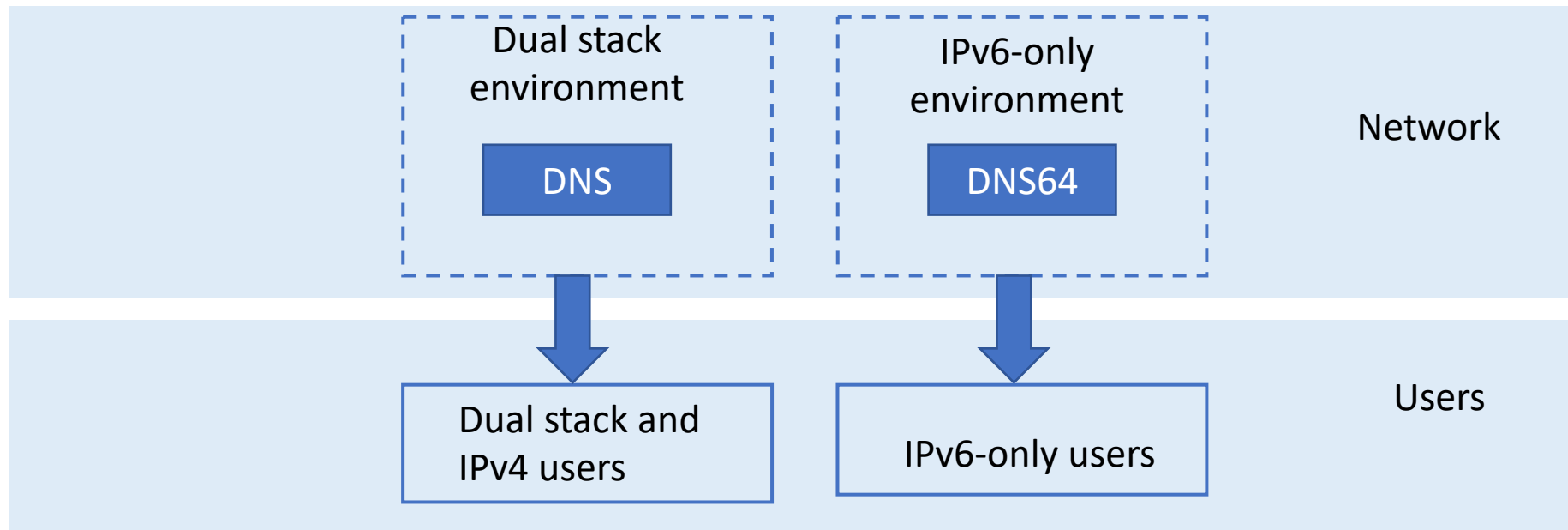
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What is New in the Version -01

- On Clarity of the Problem Statement. In this revision, we have:
 - Added detailed use cases to illustrate some deployment scenarios.
 - Clarified the relationship with existing technologies (Pref64, RDNSS, PDP context) to avoid being misunderstood as a "replacement".
- We hope these additions make the intent and applicability of the proposal clearer.

Use Case 1: Coexistence of IPv6-Only and Dual-Stack Users on the Same Network

- Operators may wish to gradually migrate users from dual-stack to IPv6-only without relying on APN isolation or separate network slices. In such scenarios:
 - IPv6-only users require DNS64 to access IPv4-only content.
 - Dual-stack users should continue using standard DNS resolvers to avoid unnecessary translation and performance impact on NAT64 gateways.
- If both user groups share the same network, the operator needs a mechanism to selectively provide DNS64 server addresses only to IPv6-only hosts.



Use Case 2: Phased Rollout of DNS64 Services

- Operators often roll out new services gradually to manage risk and validate performance. For example:
 - Initially, only 10% of IPv6-only users are directed to DNS64 resolvers.
 - Over time, this percentage is increased until full deployment is achieved.
- With RDNSS alone, all users receive the same DNS server addresses, making phased rollout difficult without complex per-user configuration or multiple network slices.
- The proposed option allows operators to control which hosts receive DNS64 resolver information based on network policies
 - e.g., by selectively sending Router Advertisements with or without the new option

Use Case 3: Multiple DNS Server Tiers with Different Capabilities

- In some deployments, operators operate multiple DNS server tiers:
 - Tier 1: Standard DNS resolvers (non-DNS64) for dual-stack and IPv4-only users.
 - Tier 2: DNS64-capable resolvers for IPv6-only users.
- With RDNSS alone, all users receive the same DNS
- Both tiers may serve the same network prefix. Without explicit signaling, IPv6-only hosts cannot distinguish which resolvers support DNS64.

Use Case 4: Avoiding Dependency on Host-Side Synthesis

- While host-side synthesis (e.g., using Pref64 options as defined in RFC 8781) is a valid approach, it requires host support and may not be available on all devices. In many real-world deployments:
 - Legacy or constrained devices may not support host-side synthesis.
 - Operators may prefer centralized translation for policy control, logging, or security reasons.
- For such environments, DNS64 remains a necessary component. The proposed option enhances DNS64 deployments by giving operators better control over which hosts use DNS64, without requiring host-side modifications beyond initial implementation of the option.

Relationship with Pref64 Option (RFC 8781)

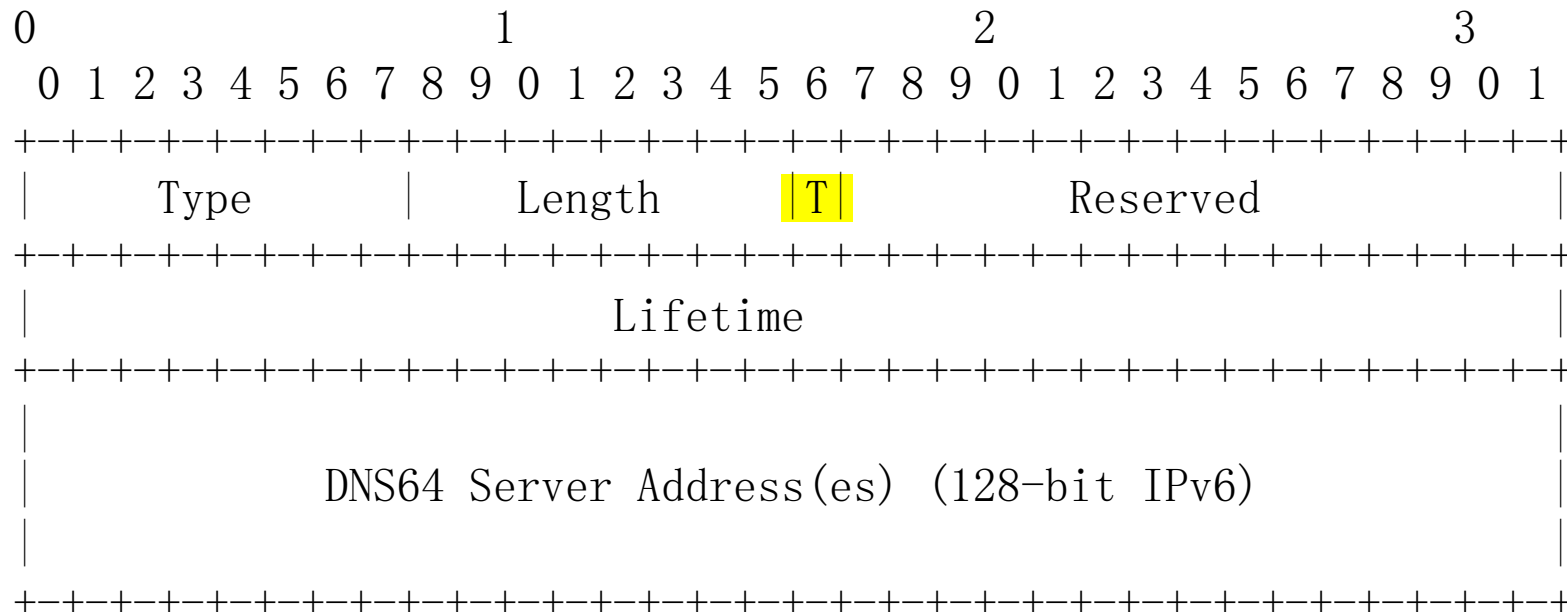
- The Pref64 option (RFC 8781) is used to advertise the IPv6 prefix used for DNS64-based address synthesis, enabling host-side synthesis. This approach allows IPv6-only hosts to synthesize IPv4-embedded addresses locally without involving a DNS64 server.
- The proposed DNS64 option addresses a different problem: it signals which DNS servers are DNS64-capable, enabling hosts to select the appropriate resolver. The two options are complementary:
 - Pref64 option enables host-side synthesis.
 - DNS64 option enables network-side DNS64 selection.
- Operators may choose to deploy:
 - Pref64 only (for hosts that support local synthesis),
 - DNS64 option only (for networks relying on centralized DNS64 translation), or
 - Both (for networks supporting a mix of host types and deployment strategies).
- Neither option replaces the other; they serve different operational needs.

Relationship with RDNSS (RFC 8106)

- RDNSS (Recursive DNS Server) is the standard mechanism for distributing DNS server addresses via Router Advertisements. However, RDNSS alone cannot indicate whether a DNS server supports DNS64 functionality. This limitation leads to the operational challenges described in the use cases:
 - IPv6-only hosts cannot distinguish DNS64-capable resolvers from standard ones.
 - Dual-stack hosts may unintentionally use DNS64 resolvers, increasing load on NAT64 gateways.
- The proposed option extends RDNSS by adding capability signaling. It does not replace RDNSS

DNS64 Flag

- Introduces a 'T' flag bit allocated in the leftmost bit of the Reserved field to signal the presence of DNS64 server addresses in the option payload.
- Flag T: 1-bit integer. set to indicate DNS64 server addresses are in the option payload.



What is the next?

- We would like to thank all those who have provided comments and feedback on this document!
 - Lorenzo Colitti, Nick Buraglio, Jordi Palet, Jen Linkova, Philipp S. Tiesel, Ted Lemon
- To move this work forward, we propose:
 - Seek broader input and contributions from the working group — we welcome reviews, suggestions, and potential collaboration to further refine the solution.
 - Request adoption as a working group draft — we believe this document addresses a real operational need and would benefit from WG consensus and further development.

Thank You