Design Guidelines
for IPv6 Networks
draft-matthews-v6ops-design-guidelines

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What?

- Advice to designers of IPv6 networks.
- Discusses questions that often arise in IPv6 or dual-stack network design.
  - Ex: "Use LLAs or GUAs for eBGP sessions?"
- For each question:
  - List all the options
  - Discuss pros and cons
  - Describe current practice or make recommendation

- Lower-level than existing docs on "Deploying IPv6 in <foo>-type networks".
- -00 version very preliminary

Scope

- No Addressing Plan section
  - See RFC 5375   (Time to revise?)
- Unicast only, for now
- No DNS etc, for now
  - Separate doc?
- MPLS currently in

Next-hop address in static route?

In a static route:

    (a) Use far-end's LLA addresses as next-hop, OR

    (b) Use far-end's GUA/ULA?

RFC 4861 ("ND for IPv6") section 8 specifies (a):

    "A router MUST be able to determine the link-local address for each of its neighboring routers in order to ensure that the target address in a Redirect message identifies the neighbor router by its link-local address. For static routing, this requirement implies that the next-hop router's address should be specified using the link-local address of the router."

This implies (b) will prevent a router from sending redirects. Typically only a problem when 2+ routers and 1+ hosts are connected to same LAN, and where one router might redirect to the other (e.g., not running VRRP).

When redirects are not a concern, either (a) or (b) can be used.

Q for WG: Any other pros/cons?

        My sense is that most operators do (b).

        Suggest 6MAN update 4861?

Mix or separate v4 and v6?

On a **point-to-point router link**:

    (a) Mix v4 and v6, OR

                     $\Rightarrow$ *One L3 interface at each end*

    (b) Separate v4 and v6 onto separate (logical) links?

                     $\Rightarrow$ *Two L3 interfaces at each end*

Pros for Option (a):

- Better scaling. Also lower cost if physical, rather than logical, links are used for option (b).

Pros for Option (b):

- Easier to measure traffic levels of each individual protocol. This is difficult today with option (a).

Most operators do (a) today, but (b) is also used.

Q for WG: Any other pros/cons? Recommend (a)?

LLA or GUA/ULA addressing ?

On a **point-to-point router link**:
    (a) Use LLA addresses <u>only</u> ("unnumbered"), OR
    (b) Also use GUA/ULA addresses?

Pros for unnumbered links:
- Ease of configuration (less so if using manual LLA assignment).
- Security: interfaces cannot be attacked off-link

Cons for unnumbered links:
- Cannot ping interfaces from an off-link device.
- Traceroute returns loopback/system address rather than interface address.
- On some routers, LLA will change after line card swap unless hard-coded.
- Cannot identify interface or link by just LLA (in database, email, etc.)

Because of the cons, operators do (b) today.

Q for WG: Any other pros/cons? Recommend (b)?

eBGP with LLA or GUA endpoints?

For an eBGP session:

    (a) Use LLA addresses as endpoints, OR

    (b) Use GUA addresses as endpoints ?

Note: This is about the eBGP endpoints, and not whether the link has GUAs.

Pros for option (a):

- Security against off-link attacks

Cons for option (a):

- Need "next-hop-self" at both endpoints (some routers do this automatically)
- Cannot refer to BGP session using just addresses, something operators are used to doing
- Inconsistency between v4 and v6 when doing dual-stack
- On some routers, eBGP with LLAs is more complex to configure.
- Strict interpretation of RFC 2545 ("MP-BGP for IPv6") can be seen as forbidding eBGP sessions with LLA endpoints, as it requires the next-hop field to contain a GUA.

Most operators today use (b).

Q for WG: Any other pros/cons? Recommend (b)?