Scope of Unique Local IPv6 Unicast Addresses

(draft-gont-6man-ipv6-ula-scope)

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Introduction

- “scope” has conflicting usage in different IETF standards:
  - RFC 4007: IPv6 Scoped Address Architecture
  - RFC 4291: IP Version 6 Addressing Architecture
  - RFC 4193: Unique Local IPv6 Unicast Addresses
- Implications:
  - Understanding the architecture is difficult (if at all possible)
  - IPv6 deployments **do not** break (terminology rarely does!)
  - Where IPv6 address semantics matters, it **is** problematic

Definition of “scope”

- RFC 4007 defines the scope of an address as:

  "[the] topological span within which the address may be used as a unique identifier for an interface or set of interfaces"

- And defines "global scope" to be used for:

  "uniquely identifying interfaces anywhere in the Internet"

- But then, RFC 4291 and RFC 4193 consider ULAs to be “global scope”

More on “scope” (RFC 4193)

- Section “3.3. Scope Definition” of RFC 4193 notes:

> By default, the scope of these addresses is global. That is, they are not limited by ambiguity like the site-local addresses defined in [ADDARCH]. Rather, **these prefixes are globally unique**, and as such, their applicability is greater than site-local addresses. **Their limitation is in the routability of the prefixes, which is limited to a site and any explicit routing agreements with other sites to propagate them (also see Section 4.1)**. Also, unlike site-locals, a site may have more than one of these prefixes and use them at the same time.

More on “scope” (RFC 4193) (II)

- Section “3.2.3. Analysis of the Uniqueness of Global IDs” of RFC 4193 computes probability of collisions

Connections	Probability of Collision
2	1.81*10^-12
10	4.54*10^-11
100	4.54*10^-09
1000	4.54*10^-07
10000	4.54*10^-05

Compute the birthday paradox when connecting **all ULA-based networks**, and you get P~1 → i.e., this doesn’t comply with RFC4007’s “global scope”

Some practical implications

- Python's `ipaddress` library has objects with attributes:
  - `is_private`: '`True`' if address allocated for private networks
  - `is_global`: '`True`' if address allocated for public networks
- ULAs have:
  - `is_private: True`
  - `is_global: False`
- **No, we can't blame them**

What this document proposes

- Update RFC 4291 marking the ULA prefix as “local scope”
  - or pick your favorite term (“private”, “domain-local”, etc.)
- Update RFC 4193, explaining that:

```
The scope of these addresses is 'local', defined to be 'larger than
link-local, but smaller than global'. Their limitation is in the
routability of the prefixes, generally limited by any explicit
routing agreements with other autonomous systems (ASes) to propagate
them, and normally limited by the Default-Free Zone (DFZ) (also see
Section 4.1).
```

- Have "IANA IPv6 Special-Purpose Address Registry" point to this document

Moving forward

- Adopt this document as a wg item?
- Do rfc4007bis?
  - But fixing this inconsistency will require some “interesting” definitions.
- Do nothing?
  - Doesn’t seem attractive if IPv6 is here to stay for a long time