Membership test for Mapping Information optimization
draft-flinck-lisp-membertest-00
The problem we are addressing

If an Ingress Tunnel Router acting as a gateway between two namespaces doesn’t have a mapping for the destination EID, it needs to resolve the EID-to-RLOC mapping from a mapping system possibly using a map resolver.

EIDs are allocated in blocks; ALT assumes aggregatable EID-prefixes. EIDs are stated to be Provider Independent (= portable across provider boundaries)

However (as has happened with IPv4 allocations) prefix based allocations change over the time: new enterprises born, old ones merge and some disappear obsoleting the earlier allocations.
The problem we are addressing (cont.)

More over:
1) Some sites maybe too small to be worth of a prefix allocation and related administration,
2) Some sites will be composition of devices (with PI EIDs) from earlier different EID-prefix allocations,
3) Server, terminal and network migration (and mobility) will break the EID-prefix based allocation

Individual EID-to-RLOC mappings needs to be supported. Prefix based EID mappings do not cover all cases
Map resolution is costly

• The first packet without a EID-to-RLOC mapping is:
  – Dropped
  – Buffered or
  – Relayed over the mapping system

• All of the above approaches contribute to delay and jitter. Therefore mappings are reused (= cached) when possible.

• To improve cache hit rate more information than the requested mapping should be returned.

• Possibly all entries that a queried ETR is servicing
Membership test

The authoritative ETR provides to ITR a *membership test* that represents all or a subset of the EID it can route to.

Membership test is an efficient compressed data structure to represent the members that belong to the same set (= ETR).

An ETR can express with it:

- e.g. the most frequently requested mappings,
- any other subset or all of the mappings.

Membership test doesn't require that the EIDs aggregate into prefixes. *This makes it ideal for cases where an ETR is serving EIDs from different EID blocks.*

- *Small enterprises of size 100 and 1000 of hosts, larger ones are likely to have well managed EID-prefixes*
Message handling with Membership test

Packet arrives from a host to an ITR

1. EID-to-RLOC mapping cache look up
2. If the look up doesn't result into a RLOC then a membership test cache is checked
3. If any of the membership tests results into a match then the corresponding RLOC is used
4. Map-Request message is "piggybacked" with the user packet to the RLOC
5. If no matching membership tests, use the map resolution

Map-Request Message arrives to the authoritative ETR

1. Generate a Map-Reply message with the mapping information complemented with one or more optional membership test information elements
2. If EID unknown send Negative Map-Reply

Note: The ETR SHOULD calculate the membership tests beforehand and just add the membership test option to the Map-Reply message.
Message Format

- extends the LISP Map-Reply Message Format by defining a new Mapping Protocol Data option

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---------------------------------------------------------------+
| Type=M | T | Reserved | Length of the Membership test |
+---------------------------------------------------------------+
| Membership test vector(0)                                    |
+---------------------------------------------------------------+
| Membership test vector (1 ... N)                             |
+---------------------------------------------------------------+
| Membership TTL                                              |
+---------------------------------------------------------------+
```
Calculation of the membership test

• Standard Bloom filter are defined by the follow three parameters $<P_{err}, k, m>$:
  – $P_{err}$ = error probability
  – $k$ = number of hashes
  – $m$ = test vector size

• We fix the membership test for two types of small sites/enterprises: a) those with 100+ hosts and those b) with 1000+ hosts

• The length of the vector tells the ITR which set of the parameters to use
  – $P_{err} = 10^{exp-6}$
  – $k = 20$
  – $m = 4096$ or $32768$ bits

• Hash functions are MD5 functions

• EID-prefixes should not be added to membership test as this adds to the processing complexity
Error handling and security

• The false positive error case degenerates into stale mapping information case of baseline LISP

• ITR can trust an EID-to-RLOC mapping from an ETR, it can trust the Membership test as well, no new security issues
Thank you

Future doesn't need to be a repetition of the past