LISP Version-Hashing

Anaheim IETF - LISP WG

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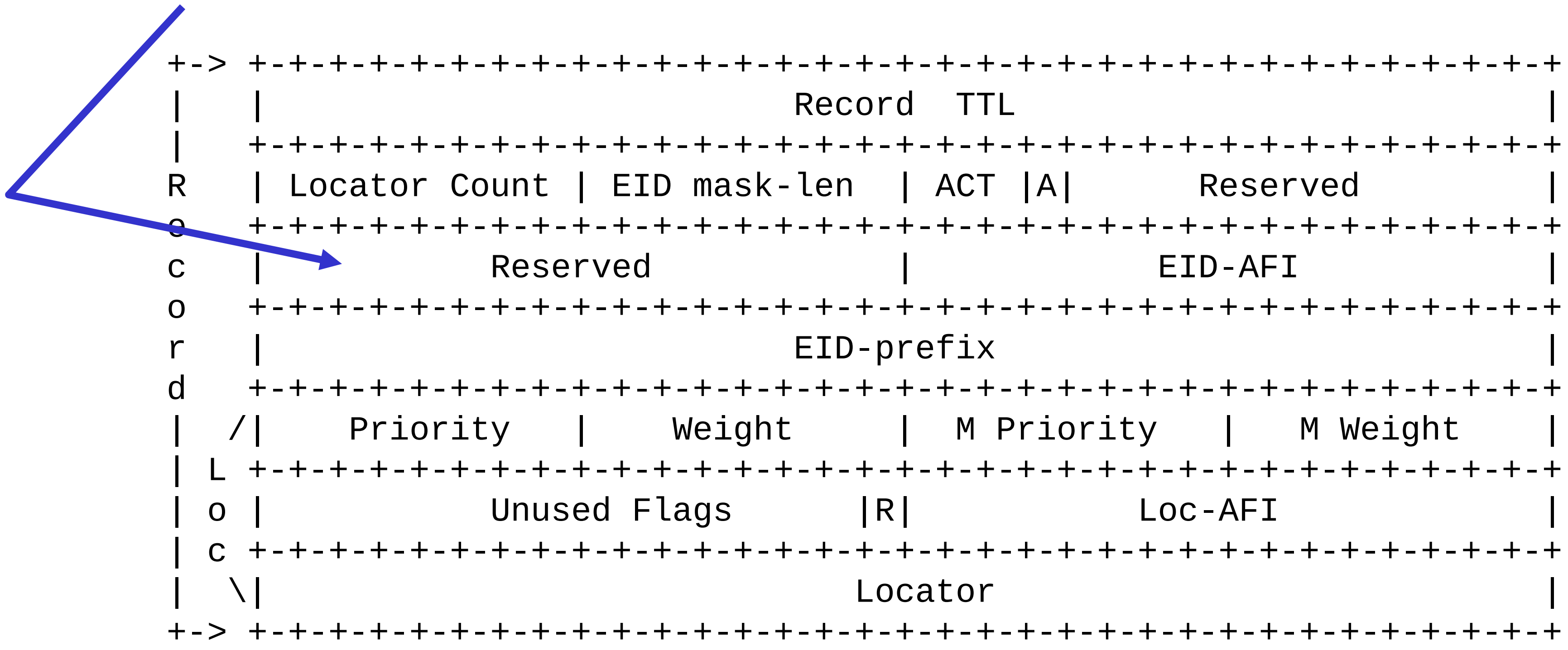
Why Version Hashing?

- PITRs need to know when ETRs have changed their Database Mappings
- Define a Database Mapping change:
  - A locator address has been added or removed from a locator-set
  - A locator priority or weight has changed
- Problem unique to PITRs due to unidirectional data flow
  - But can be used in ITRs and LISP Mobile Nodes

What is a Version-Hash?

- 16-bit hash of EID record in a Map-Reply
  - Modulo the R-bit
- Change Reserved field to become version-hash



```
+-> +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   |                          Record  TTL                          |
|   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
R   | Locator Count | EID mask-len  | ACT |A|      Reserved         |
e   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
c   |           Reserved            |            EID-AFI            |
o   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
r   |                          EID-prefix                           |
d   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  /|    Priority   |    Weight     |  M Priority   |   M Weight    |
| L +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| o |           Unused Flags      |R|           Loc-AFI             |
| c +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  \|                            Locator                            |
+-> +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

What is a Version-Hash?

- All ETRs at a site run independently
  - On the same database-mapping entries
  - On the same database-mapping policy entries
- So each computes the <u>same</u> version-hash

Who uses Version Hashes?

- PITRs (and ITRs as well) will send the version hash in encapsulated packets
- Header format now:

```
         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
     L   |N|L|E|  rflags |                 Nonce                         |
     I \ +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
     S / |                     Locator Status Bits                       |
     P   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

- Changed header format:

```
         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
     L   |N|L|E|V|I|flags|   Reserved     |          Version Hash        |
     I \ +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
     S / |                     Locator Status Bits                       |
     P   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

- When V-bit is set, low-order 16-bits of nonce field contains the version-hash

Version-Hash Checking

- During ETR packet decapsulation:
  - When version-hash in LISP header does not match what ETR has cached, ETR sends a Solicit Map-Request (SMR)
- PITR (or ITR) responds to SMR with a Map-Request to any ETR at the site
- Map-Reply is returned with updated database mapping

Overloading Fields

- When V-bit is set
  - N-bit and E-bit must be 0 (using nonce field for version-hashing)
- When N-bit is set
  - V-bit must be 0 (using nonce field to hold 24-bit nonce)
- If V-bit and N-bit are both erroneously set
  - ETR interprets field as 24-bit nonce
- Echo-Noncing and Version-Hashing can run concurrently
  - Version-hashes need not be in every packet
  - Version hashing used when not in echo-nonce-request or echo-nonce state

Use Fletcher Checksum

- Sum up each byte while summing up each running sum

```
ip lisp database-mapping 240.22.0.0/16 1.11.22.22 priority 1 weight 100
ip lisp database-mapping 240.22.0.0/16 1.22.23.22 priority 2 weight 100
```

```
0x0000 05A0      0x0000 05A0
0x0210 1000      0x0210 1000
0x0000 0001      0x0000 0001
0xF016 0000      0xF016 0000
0x0164 FF00      0x0264 FF00
0x0000 0001      0x0000 0001
0x010B 1616      0x010B 1616
0x0264 FF00      0x0164 FF00
0x0000 0001      0x0000 0001
0x0116 1716      0x0116 1716
-----------      -----------
   0x1A8E           0x1CB4
```

This is good!
Finds positional changes

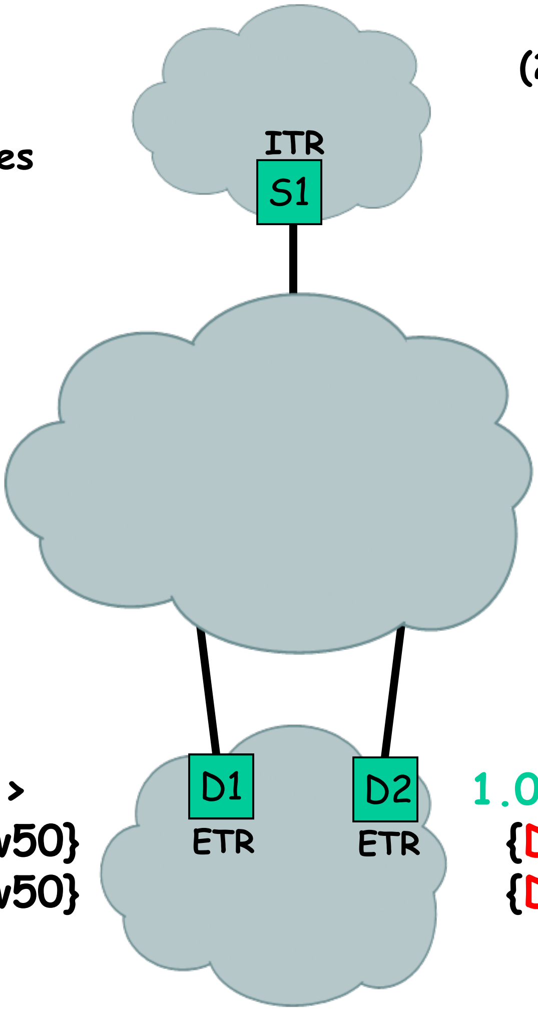
Semantic of a Version Value

- Should the version be a hash or a monotonically increasing value?
- Do we need to know what's different or which is relatively more current?
- The point is if the ETRs do not have the same mapping, neither version value type helps the problem
- We do not want the complexity of ETR synchronization
  - The site needs to resolve the conflict
  - Just need to spec what an ITR should do in this situation
  - Currency is in the eye of the ETR beholder

Out of Sync ETRs

(1) If ITR gets Map-Reply from D1, it can never know of a new version, it just uses active/active

(2) If ITR gets Map-Reply from D2, it can never know if D1 and D2 are out of sync, it just uses active/backup



(3) When ITR RLOC-probes, it gets inconsistent results, must pick one, a mono-version will tell you which is newer, a version hash can't

Conclusion; mono-versions can make ITRs use the newer mapping but may require configuration and non-volatile storing of a version number which the user may have to deal with. Hashes are auto-generating

active/active

1.0.0.0/8 ->
{D1, p1, w50}
{D2, p1, w50}

older

1.0.0.0/8 ->
{D1, p1, w100}
{D2, p2, w100}

active/backup

newer

Version-Hash vs Mono-Version

- Hash can tell you when the mappings are the same
- Mono-Version can only do this when ETRs are sync'ed
- Hashing has no sync requirement
- Better for the end-user, less to worry about

Proposed Plan

- If no objections, put into `draft-ietf-lisp-07`
- Make data-header changes in one revision
  - And reflect I-bit as well