Performance evaluation of m-way trie for longest common prefix matching in Data Plane

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Introduction
- Router determines the next hop for an internet packet.
- Router stores network prefix values in routing tables.
- 129 possible prefixes for IPv6, [0 – 128].
- Router matches the longest common prefix against stored network prefixes to find the next hop.

Motivation
- Software based routers.
- Enhance the lookup speed even with larger table size.

Background
- Cisco’s VPP - A software router/switch.
- Previous work- Cuckoo filter, Bloom filter and Binary trie.
- Trie traversal lookup the leaf node to determine the longest common prefix.

Insertion in trie
- Binary network prefix:
  01111010010000000000000000000000
  11-bits 117 zeros

Lookup pseudocode
1. Input: IPv6 for lookup, root node and m value of m-way trie. Convert IPv6 to binary.
2. Starting from prefix=128, consider m bits of binary IP. Decrement prefix by 1 each time a bit of IP is considered.
3. Move current to current->child[Decimal].
4. current is not null keep doing step 3 to 5 until prefix becomes 0. Once prefix is 0 start backtracking.
5. If current is null, start backtracking.
6. While backtracking, find the first leaf node or broken prefix.

Results
- DT dataset has 17 prefixes.
- RV dataset has 34 prefixes.
- Bottom Up quicker than Top Down.
- 2-way trie is the fastest.

Conclusions
- Size of the m-way trie is very large.
- The m-way trie works fastest for k=2 (2-way trie).
- Slower than VPP’s lookup algorithm.

References