IPv6 Flow Label for Server Load Balancing - update

draft-carpenter-v6ops-label-balance-02

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Updated Scenario Diagram

Use Flow Label to Reduce Work on L3/L4 Load Balancers

- According to RFC 6437, the flow label SHOULD be set to a suitable (uniformly distributed) value at the source

- Behaviors on a STATEFUL L3/L4 load balancer:

  - if flow label is not present, fall back to current methods (eg: L7 or srcIP)

  - if flow label is present and known, use it to select the proper server. It means, for subsequent packets of flows, the load balancing can depend on 2 tuple {source address, flow label} – more efficient for ASICs than 5 tuple today

  - if flow label is present, but new for records, apply the usual load balancing algorithm to select the server and remember the flow label <-> server mapping

- A stateless load balancer can also benefit by using 2 tuple as input of hash algorithm than 5 tuple

Possible Further Improvement: Supporting Session Persistence

- LBs need to maintain session persistence (i.e. always pick the same server) when a transaction includes several transport flows (even different source addresses)

- If applications used the same flow label for all parts of a transaction, LBs could maintain persistence without DPI or session cookies.

  - One flow label per transaction, which may involve multiple transport connections, some of them may from different source addresses.

  - [RFC6437] a flow is not necessarily 1:1 mapped to a transport connection

- It reduces the work on L7 Load Balancers

Possible Benefits

- Assuming that 80-90% of users will reach the net without a proxy, large sites will be able to off-load most of their load balancing into ASIC-based LBs or even switches.

    - Ingress router sets flow label if zero

- The remaining 10-20% of sessions will have persistence issues (multiple ports or source addresses) and will follow the normal route via the L7 LBs.

    - Unless we deploy the extended role (same flow label for all parts of a transaction), newly proposed in this document

Questions?

Thanks

Clarification: Who Sets The Label?

- According to RFC 6437, the flow label SHOULD be set to a suitable (uniformly distributed) value at the source

- Until that becomes general practice, a site using it for server load balancing has two choices when the incoming label is zero:

  - Set the label, per RFC 6437, in an ingress router, thus reducing L3/L4 balancer load except for the first packet.

  - Use the full 5-tuple (as today).

New Security Considerations

- Using a flow label as a transaction handle would require some precautions.

- An unguessable flow label will help in avoiding DDOS attacks on a single server, by making it hard to fool the LB algorithm.

- The LB will store the association between a given flow label value and a given server. This will improve session recovery after a server failure, and also makes it harder for an attacker to target a single server, because this association is not known externally.