Special Loop Address
draft-turaga-lmap-special-loop-address

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Background-I

- Applications get affected badly when there is a link issue between any two points in a network.

- The troubleshooting gets more difficult when the issue is not detected by the router counters.

- In many cases, network operators depend on ping from different points in the network to troubleshoot these issues and attempt to isolate it to a link or a certain path.
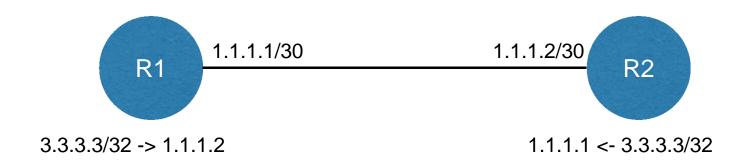
Background-II

- Consider an IP point-to-point link between 2 routers over an emulated L2 circuit that is experiencing some drops on the link. Available options to detect these drops are as follows:

  - Using CFM or BFD – can be done pro-actively.

  - Large sized probes - can be done pro-actively.

  - Layer2 loops at various points – has to be done reactively

  - Rapid pings – has to be done reactively

- Each of the above has limitations

Proposal

- One possible way to detect these kinds of link 'brown outs' is to have an **easy to use** mechanism of sending **multiple probes between the routers on a link without** increasing the **load on the route processors** and **without** taking the **link out of service** is described in this draft.
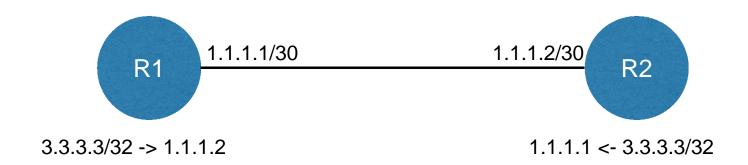
Overview - I

In a simple topology shown above. Say, we had a static route 3.3.3.3/32 on both routers pointing back to the neighbor router's IP address on the connected link between them. And say we do the following:
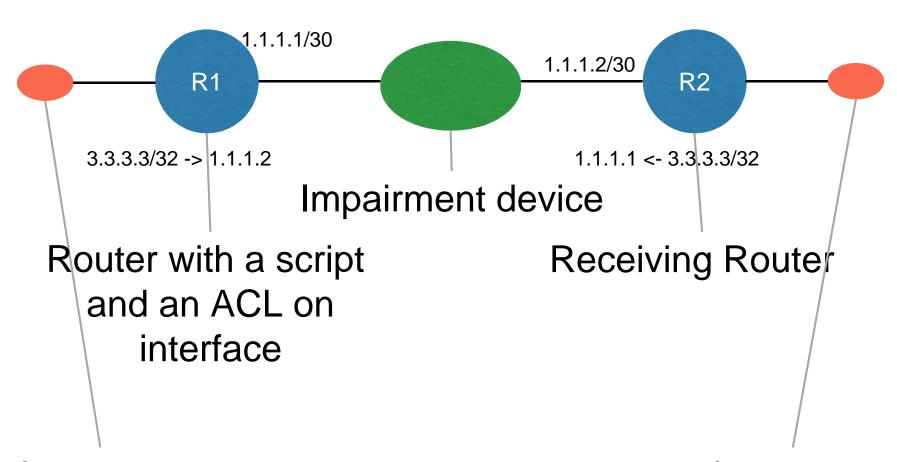
- Send packet sourced from R1 SrcIP: 1.1.1.1, DstIP: 3.3.3.3 and say TTL = 10.

- Probe packet goes to R2. TTL is decremented by 1 and becomes 9.

Overview - II

R1 ——1.1.1.1/30 —————————— 1.1.1.2/30—— R2

3.3.3.3/32 -> 1.1.1.2   1.1.1.1 <- 3.3.3.3/32

- Since, there is static route for destination and a corresponding FIB entry pointing back to R1, the packet is forwarded back to R1.

- This keeps happening till the TTL expires on R1.

- A TTL expired message will be sent back to the source address (1.1.1.1) of the packet.

- So, if a TTL message is received then the test is successful. If not, the test failed.

Prototype Example

1.1.1.1/30

R1

1.1.1.2/30

R2

3.3.3.3/32 -> 1.1.1.2

1.1.1.1 <- 3.3.3.3/32

Impairment device

Router with a script
and an ACL on
interface

Receiving Router

packet generator
sending transit traffic

packet generator
receiving transit traffic

Special Loop Address

- Instead of a static address the draft proposes a special address that functions very similar to the static route in the link local scope.

- So, the special address a.b.c.d/32 now points to the neighbor address for each interface on each router.

- Such special address should be allocated as IPv4 and IPv6

Discussion points

- Use a special address, such that any packet to this address points back to the neighbor's link address on that link.

- Assure that packets with special address do not transit the router (or the link).

- Have an offline or inline mechanism that can manipulate the TTL, qos bits, size etc of the original TTL packet.

- Some mechanism that can maintain count of the original packets sent and how many TTL time expired messages have come back.

Takeaways

- **Ease of use** - This mechanism can generate a lot of 'probe' packets by way of amplification using IP TTL.

- **End to End state** – This methodology gives end to end state of the link. Giving flexibility to the operator to quickly identify issues

- **Light Weight** - The load on the route processor is minimal. The load is there only for generating the original packet and processing the TTL expired messages. The rest of the packet processing is intrinsically handled by the forwarding layer.

- **Extensible** - It can be potentially easily extended to see the impact of various qos values and various IP protocols.

- **Large-scale deployment** - If we use a special address we can scope them to the link and easily scale out a solution for all the interfaces in any network.

LMAP charter and our proposal

- Draft proposes a special purpose IPv4 and IPv6 address to assist with Large Scale Measurements of Broadband Performance.

- The special purpose IP address registration falls into OPS area.

- It proposes a new TTL based probes to be used as a link performance or health indicator.

- It focuses on customer facing or core links performance measurements.

- It can be enabled in a very large scale simultaneously as well as the test results can and likely will be available from large number of testing endpoints .

TTL=0