

OAM for Deterministic Networks with IP Data Plane

draft-mirsky-detnet-ip-oam

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Update

- David Black joined as co-author
- On-demand OAM using ICMP in DetNet over IP
- Active OAM using DetNet-in-UDP encapsulation
- Mapping active OAM and IP DetNet flows
- Active OAM using GRE-in-UDP encapsulation

Active OAM

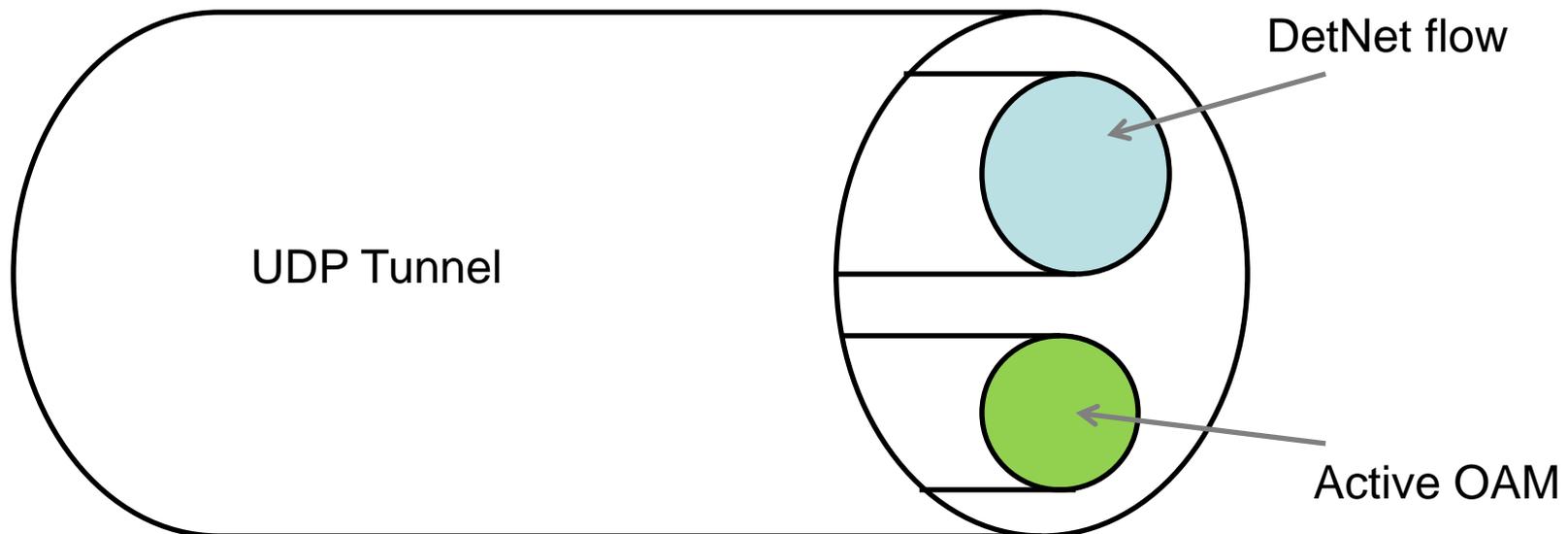
- What OAM tools we need?
 - On-demand continuity check and defect localization, e.g., ICMP or L2 Linktrace
 - Proactive path continuity check, e.g., BFD or L2 CCM
 - Proactive connectivity verification, e.g., L2 CCM (L3 does not use a concept of Misconnection error)
 - Performance monitoring, e.g., STAMP or ETH-LM/ETH-DM

Internet Control Message Protocol in IP DetNet

- Previously stated:
 - All active IP OAM protocols run over UDP and are identified by their respective well-known destination port numbers
- That statement missed the case of ICMP, which is an IP protocol as, for example, UDP.
- Most of on-demand failure detection and localization in IP networks is being done by using ICMP Echo Request, Echo Reply and the set of defined error messages, e.g., Destination Unreachable, with the more detailed information provided through code points.
- A DetNet node **MUST** be able to associate an ICMP packet generated by the specified IP DetNet node and addressed to the another IP DetNet node with an IP DetNet flow between this pair of endpoints.

Active OAM using DetNet-in-UDP encapsulation

- An IP DetNet flow is encapsulated in UDP
 - Ed.note: If deemed to be a viable solution, where to define the DetNet-in-UDP encapsulation?
- A DetNet-in-UDP tunnel between IP DetNet nodes ensures that active OAM test packets are fate-sharing with the packets of the monitored DetNet flow.



Mapping active OAM and IP DetNet flows

- Some active OAM protocols use well-known destination UDP port numbers assigned by IANA
- Co-routedness, i.e. traversing the same nodes and links, even in the multi-path environment (ECMP or LAG) can be achieved by selecting (using “black magic”) the value of the UDP source port number.
- Alternatively, “spraying”, i.e., iteratively transmit a test probe, incrementing the UDP source port each time across a large enough range to exercise all the paths, may be used.
- To maximize the accuracy of OAM results in detecting failures and monitoring performance of IP DetNet, test packets should receive the same treatment by the nodes as experienced by the IP DetNet packet.
 - A DSCP value used for a test packet **MUST** be mapped to DetNet.

Active OAM using GRE-in-UDP encapsulation

- RFC 8086 has defined the method of encapsulating Generic Routing Encapsulation headers in UDP.
- GRE-in-UDP encapsulation can be used for active IP DetNet OAM.
- A GRE-in-UDP tunnel can be matched to an IP DetNet flow identified by N-tuple.
- The Protocol Type field in GRE header MUST be set to 0x8902 assigned by IANA.
- As a result, OAM tools defined in ITU-T Recommendation Y.1731/G.8013 can be used as a comprehensive toolset of IP DetNet OAM:
 - Continuity check – CCM
 - Loss measurement ETH-LM
 - Delay measurement ETH-DM
- Simplified OAM interworking with TSN domain by way of using the same OAM toolset

Next steps

- Your comments, suggestions, questions always welcome and greatly appreciated
- WG adoption

Thank you!