Flow ID Options

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Three Different Approaches to Flow IDs

- My perceptions on the different assumptions:
  - Destination Differentiated
    - As in au-bestler-endstationrps-0708-05.pdf
    - Destination/Priority determine set.
    - Other L2-L4 headers hash within set for multi-pathing.
  - Non-Destination-Differentiated
    - Similar to above, but limited differentiation by Destination.
  - Opaque
    - Minimize standardized restrictions on End Station use of Flows so that the Flow ID can be used to facilitate identifying the true source of congestion in the upper layers.

- Use of a salt to randomize the resulting Flow ID should work with all of these approaches.
• Flow Queue Set is functionally derived from:
  • FID of VLAN ID
  • Destination Address
  • Priority
• Each Queue Set has \( N \) Flow Queues within it to allow for network multi-pathing.
  • A default algorithm for selecting path from the Flow ID would be suggested, but not mandated. For link aggregation it may be elevated to a SHOULD.
• Other L2-L4 headers determine hash within the Flow Queue Set
  • Any given L4 flow should go to a single Flow ID.
  • Language from Link Aggregation can be referenced.
• L4 Flow to Flow ID mapping is locked when Rate Limited.
• Optimized for CPs near the destination.
One weakness of the Destination Differentiation is the impact on CPs on Core Bridges.

If there are many active destinations then a Core Bridge would be forced to send numerous CNMs before truly slowing traffic.

Limiting the total number of Flow IDs that an End Station could use, regardless of Destination, would prevent this.

This does result in undesirable Fate Sharing, but not having it could result in Priority-based Flow Control being invoked

• which is worse Fate Sharing.

The Global strategy might also lock Flow ID mapping totally.

This is clearly the best algorithm for traffic patterns where most CNMs are generated by Core Bridges.
When congestion is being caused by relatively few flows then the method of choosing Flow ID is largely irrelevant to QCN performance.

- Statistically, the “Elephants” will be the one selected for CNM reduction, and they will be quickly reduced.
- Therefore it would be enough to state that End Stations and/or applications should not artificially increase the number of Flow IDs by varying header parameters for what is a single application flow.

If unrestricted, End Stations would be better able to use the Flow ID to collaborate with upper layers (such as the network stack) on identifying the source of congestion.

- Working with the network stack can be more effective at eliminating congestion than L2 working alone.
Opaque Hybrid?

- A Flow ID could encode both a Rate Limiter ID (as in the first two options) and an Opaque l4-source-flow identification.
- But such a Flow ID probably would need to be larger than 16 bits.
- There may be implementation benefits to keeping the Cn-Tag structurally identical to a Q-Tag.
- Do the benefits of having both outweigh the cost of the larger size and extra format?
How many different flows contribute to congestion?

- When the network is congested, what % of the flows cause what % of the traffic.
- The absence of scenarios where a large number of flows cause congestion would suggest not standardizing what a Flow ID was.

What is core/edge distribution of congestion?

- If edge congestion is more common then Destination differentiation will minimize penalizing innocent flows.
- If core congestion is more common then Destination differentiation will result in Priority-based Flow Control, which penalizes even more innocent flows.