PCN with Single Marking

draft-charny-pcn-single-marking-03

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Single-Marking

- **Initial Motivation**
  - Saves one code-point
    - Essential if must be limited to 2 codepoints
    - Important for MPLS
  - Requires only one metering/marking mechanism in the core instead of two
    - Important for data path performance
  - Incremental deployment step towards CL

- **Focus of this Presentation: What do we lose?**
Single-Marking: What do we lose?

- **Functionality:**
  - Network-wide parameter configuration coordination: U
  - ECMP for termination
    - No, partial support with additional complexity at edge
  - ECMP for admission
    - Yes, with probes, but need many probes

- **Performance-wise**

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<th>IE Aggregation</th>
<th>Multi Bottleneck</th>
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### Summary of all the Parameters

- **Configuration Parameters**
  - Insensitive for both admission and termination
  - Insensitive to RTT difference (absolute or relative)

- **RTT Difference**
  - No effect with absolute difference for both admission and termination
  - Visible over-termination with relative difference, not significant

- **SM performs comparable to CL**
  - “comparable” means error difference within 2-3%

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### Cause?
- Uneven marking distribution among IE-Aggregate (Synchronization Effect)

### How Bad?
- Significant only when IE-aggregation level is very low, < 10 flow/IE
- Effect disappears with enough randomization of CBR
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**Cause?**
- Again, uneven marking distribution among IE-Aggregates,
- False termination, when traffic is close below the (implicit) termination threshold

**How Bad?**
- Degree of IE aggregation needed for < 10% over-termination is ~50 to ~150 Flow/IE

**Smoothing can fix**
- Trade-off reaction time vs. accuracy
The multi-bottleneck “beat-down effect” is amplified, since Single-Marking is metering against admission-threshold. Mostly within 20% error (vs. within 10% for CL-PHB). Result for 1.2<U<2.0 (we consider it the case of practical importance). Result are compared to a “rate-proportionally fair” reference algorithm.
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- **Bottleneck Utilization**
  - Works well in both SM and CL

- **Fairness**
  - Unfair to long-haul aggregates in both CL and SM
  - Degree of unfairness (current results, more to come)
    - No significant difference between SM and CL
    - Very sensitive to statistical variation of the flow arrival
    - For it to be significant, needs large demand overload for long duration
Single-Marking Performance Summary

Applicability Area

- At sufficient level ingress-egress aggregation performance of Single-Marking is comparable to CL-PHB
  - Admission: ~10 flow or more
  - Termination ~50-150 flow or more

What is lost?

- At low ingress-egress aggregation, Single-Marking is less accurate (over-admission & over-termination)
- In the presence of multiple bottleneck, Single-Marking termination performs worse than CL-PHB
Thank you!
What’s “Marking Synchronization”

- Cause: for periodic traffic and certain parameter combinations marking is not well distributed among flows sharing the bottleneck
  - some flows are always marked and some are never marked
  - most relevant for CBR, but visible for near-CBR portions of other traffic types

- Relevant only to excess-rate token bucket marking/metering when ingress-egress aggregation is low
  - Detrimental to excess-rate admission: overadmission
  - Beneficial to termination: less over-termination than theoretical worst case
Evaluation Details
IE-Aggregation Admission

- With enough randomization, SM performs comparable to CL
  - Graph above for CBR, other traffic types show similar
Evaluation Details
Fluid vs. Packet

- The error between Fluid and Packet Simulation is relatively contained.
Evaluation Details
Multi-bottleneck Admission

- 250 packet-level SM simulations, with exact same parameter setting and traffic load (PLT2, 5x overload)
  - CL shows similar trend

It shows statistical variations of flow arrival have a strong effect on the degree of unfairness.