Deployment Models for PCN-Based Admission Control and Flow Termination Using Packet-Specific Dual Marking (PSDM)
draft-menth-pcn-psdm-deployment-00

Michael Menth, presented by Philip Eardley

www3.informatik.uni-wuerzburg.de
What is PSDM?

- An encoding (Experimental extension of Baseline encoding)
  - draft-menth-pcn-psdm-encoding-00
- A deployment model
  - draft-menth-pcn-psdm-deployment-00
**PSDM Encoding**

<table>
<thead>
<tr>
<th>DSCP</th>
<th>00</th>
<th>10</th>
<th>01</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSCP1</td>
<td>Not-PCN</td>
<td>NM</td>
<td>EXP</td>
<td>PM</td>
</tr>
<tr>
<td>DSCP1</td>
<td>Not-PCN</td>
<td>NM (not-ExM)</td>
<td>NM (not-ThM)</td>
<td>PM</td>
</tr>
</tbody>
</table>

- **Baseline**
- **PSDM**

---

- Same Pros as baseline (single DSCP, compatible with tunnelling)
- But can distinguish threshold & excess traffic marking

---

*Deployment Models for Packet-Specific Dual Marking (PSDM)*
PSDM Usage

- PCN ingress nodes mark
  - Data packets encoded with “NM (not-ExM)“
  - Probe packets encoded with „NM (not-ThM)“

- PCN interior nodes
  - Threshold meter: meters all PCN traffic
  - Excess traffic meter: meters only “NM (not ExM)” pkts

- PCN egress nodes interpret
  - PM on data packet = excess-traffic-marked pkt
  - PM on probe pkt = threshold-marked pkt
Example: Probe-Based Admission Control for IEAs

RSVP PATH msg is implicit ‘probe’
Probe-Based Admission Control for Individual Flows

- **Assumption**
  - Admission requests triggered by external protocol, e.g. RSVP

- **RSVP sends**
  - PATH message from ingress to egress (downstream)
  - RESV message from egress to ingress (upstream)

- **Implicit probing**
  - Ingress marks PATH message with VOICE-ADMIT and not-ThM
  - Egress receives PATH message
    - If PATH message is marked, it sends PATH-TEAR
    - If PATH message not marked, it forwards PATH msg downstream
  - Egress forwards returning RESV to ingress
  - Ingress accepts admission request when its first RESV arrives

- **“Good probing”**
  - No extra probe traffic
  - No extra admission delay
Example: Observation-Based AC with Probing

Send regular ‘probes’ on IEA
Basic principle
- Ingress node keeps admission state \( K \) per IEA
  - \( K=\text{accept} \): accept new flows for this IEA
  - \( K=\text{block} \): block new flows for this IEA
- Ingress node sends probe packets to egress node
- Egress node
  - Observes probe packets
  - Controls \( K \) at ingress by sending admission-stop and admission-continue msgs

“Good probing”
- No per-flow probe packets
- No admission delay

Alternatives for egress nodes to influence new \( K \)
- CLE-based AC with probes
  - Calculate percentage CLE of marked probe packets based on measurement intervals
  - If \( \text{CLE}<T_{\text{ACont}} \), send admission-continue
  - If \( \text{CLE} \geq T_{\text{AStop}} \), send admission-stop
- Observation-based AC with probes
  - If marked probe packet observed
    - If \( K=\text{accept} \), set a timer and send admission-stop
    - If \( K=\text{block} \), reset timer
  - If timer expires, send admission-continue
Benefits of PSDM

- PSDM requires only a single DSCP (VOICE-ADMIT)
- Admission control
  - Probing guarantees correct AC decisions even for empty IEAs
  - Risk of over-admission minimized especially for small IEAs
  - Implicit per-flow probing supports multipath routing
- Flow termination
  - Excess marking based on supportable rate (SR) provides information about the strength of the SR-overload.
  - Use either measured rate termination (MRT) or marked flow termination (MFT)
  - MFT supports multipath routing

Deployment Models for Packet-Specific Dual Marking (PSDM)
Conclusion

PSDM encoding
- Requires only a single DSCP (VOICE-ADMIT)
- Supports two different marking schemes

PSDM deployment requires
- Existing flow termination mechanisms
- New probe-based admission control mechanisms
  - “Good probing“ – no additional delay
  - IEA-based AC possible
  - Implicit per-flow probing possible re-using RSVP signalling

Benefits
- New AC works with small IEAs
- New AC works with multipath routing
Spare slides
Pre-Congestion Notification (PCN) – Concept

Pre-congestion information is coded into packet headers and carried to PCN egress nodes.
Problem Statement

- ECN field of VOICE-ADMIT DSCP reused for PCN encoding
  - Only CE codepoint appropriate for marking due to tunneling constraints

- Potential solutions
  - Redefine tunneling (draft-briscoe-tsvwg-ecn-tunnel) and use 3-in-1 encoding (draft-briscoe-pcn-3-in-1-encoding)
    - Long-term process and potential problems with legacy equipment
  - Use only single marking scheme for AC and FT (draft-charny-pcn-single-marking)
    - AC and FT do not work well for ingress-egress aggregates (IEAs) with only little traffic
    - [Link](http://www3.informatik.uni-wuerzburg.de/~menth/Publications/papers/Menth08-Sub-8.pdf)
    - [Link](http://www3.informatik.uni-wuerzburg.de/~menth/Publications/papers/Menth08-Sub-9.pdf)
  - Use VOICE-ADMIT and another DSCP to get two different CE codepoints to support two different marking schemes (draft-moncaster-pcn-3-state-encoding)
    - Requires two DSCPs for marking, not likely to be accepted
  - Use PSDM encoding (draft-menth-pcn-psdm-encoding)
    - Only one DSCP, perfect AC and FT behavior, but requires new edge-behavior (this proposal)
    - [Link](http://www3.informatik.uni-wuerzburg.de/~menth/Publications/papers/Menth08-Sub-14.pdf)
A Short Note on Probing

- Probe traffic
  - Definition: all PCN traffic that is not data traffic and which is possibly used for AC decisions

- ”Bad probing“
  - Extra probe packets per flow
  - Introduces additional delay for admission decision when PCN ingress node waits for response from PCN egress node

- ”Good probing“
  - No explicit probe packets per flow
  - No additional admission delay

- PSDM deployment uses ”good probing“ for AC
Review: PSDM Codepoints

- Prerequisite for PCN traffic: DSCP=VOICE-ADMIT
- Redefinition of ECN field
  - 00: no PCN traffic (not-PCN)
  - 10: not-excess-marked PCN traffic (not-EcM)
    - Subject to excess marking
    - Excess marking meters and possibly re-marks only not-EcM-marked traffic
  - 01: not-threshold-marked PCN traffic (not-ThM)
    - Subject to threshold marking
    - Threshold marking meters all PCN traffic and possibly re-marks only not-ThM-marked traffic
  - 11: marked PCN traffic (M)
PSDM Usage

- PCN ingress nodes mark
  - Data packets with not-EcM
  - Probe packets with not-ThM

- PCN egress nodes interpret
  - Data packets
    - Not-EcM = not marked
    - M = marked;
      - Supportable rate (SR) exceeded
      - Terminate traffic!
      - Rate of marked data traffic is estimate for SR-overload
    - Support flow termination; use any method
  - Probe packets
    - Not-ThM = not marked
    - M = marked
      - Admissible rate (AR) exceeded
      - Stop admission!
    - Support admission control; use probe-based AC methods (=contribution of this draft)