Compact Alternate Marking

Tal Mizrahi       Marvell
Carmi Arad       Marvell
Giuseppe Fioccola Telecom Italia
Mauro Cociglio    Telecom Italia
Mach Chen         Huawei
Lianshu Zheng     Huawei
Greg Mirsky       ZTE

draft-mizrahi-ippm-compact-alternate-marking-00
IETF 100, Singapore, November 2017
Alternate Marking - Background

Monitor data traffic from MP 1 to MP 2

- Loss
- Delay

MP = Measurement Point
Every data packet includes a color bit.

Traffic Flow: AAAAA BBBBB AAAAA BBBBB
Marking Bit: 00000 11111 00000 11111

Time
Scope of the Current Draft

• New alternate marking methods with low overhead.
  – Single bit per packet.
  – Zero bits per packet.

• Summary of alternate marking methods.
Existing Alternate Marking Methods
(draft-ietf-ippm-alt-mark)
Double Marking

Traffic Flow

Color Bit: C =

Timestamp Bit: T =

Time

• Color indication.
• Timestamp indication.
New Methods for Single-bit Marking
Method 3: Multiplexed Marking

- **A single bit** is used for C / T
- Same measurement resolution as double marking

Traffic Flow: AAAAA BBBBB AAAAA BBBBB
Color Bit: C = 00000 11111 00000 11111
Timestamp Bit: T = 00100 00100 00100 00100

Using only one bit: T XOR C

Packets that should be timestamped
Method 4: Pulse Marking

<table>
<thead>
<tr>
<th>Traffic Flow</th>
<th>Marking Bit:</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAAAAA</td>
<td>00100</td>
<td></td>
</tr>
<tr>
<td>BBBB</td>
<td>00100</td>
<td></td>
</tr>
<tr>
<td>AAAAAA</td>
<td>00100</td>
<td></td>
</tr>
<tr>
<td>BBBB</td>
<td>00100</td>
<td></td>
</tr>
</tbody>
</table>

Both measurement points capture the value of the:
- Counter.
- Timestamp.
Methods for Zero-bit Marking
Hash-based Selection

- Hash is computed over packet header.
- If Hash = SelectedValue
  Packet is selected for measurement

- It is possible to use a mixed approach:
  - Color bit
  - Hash-based sampling for delay measurement
    • Dynamic hash can be used to pace the number of samples per period
## Summary and Tradeoff of Marking Methods

<table>
<thead>
<tr>
<th>Method</th>
<th># of bits</th>
<th># of counters</th>
<th>DM Resilience to Reordering</th>
<th>Resilience to Reordering</th>
<th>LM Resilience to Reordering</th>
<th>DM Resilience to Reordering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double marking</td>
<td>2</td>
<td>2</td>
<td>Step</td>
<td>Pulse</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Single marking</td>
<td>1</td>
<td>2</td>
<td>Step</td>
<td>Step</td>
<td>+</td>
<td>--</td>
</tr>
<tr>
<td>- 1st packet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single marking</td>
<td>1</td>
<td>2</td>
<td>Step</td>
<td>Mean</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>- mean delay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiplexed marking</td>
<td>1</td>
<td>2</td>
<td>Step</td>
<td>Pulse</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Pulse marking</td>
<td>1</td>
<td>1</td>
<td>Pulse</td>
<td>Pulse</td>
<td>--</td>
<td>+</td>
</tr>
<tr>
<td>Hashed pulse marking</td>
<td>0</td>
<td>1</td>
<td>Hashed</td>
<td>Hashed</td>
<td>--</td>
<td>+</td>
</tr>
<tr>
<td>Mixed hashed marking</td>
<td>1</td>
<td>2</td>
<td>Step</td>
<td>Hashed</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

+ Accurate measurement.
- No measurement in case of disturbance (detectable).
-- False measurement in case of disturbance (not detectable).
* Hashed step works only when the hash is monotonically increasing.
IETF 99 Bits-n-Bites Alternate Marking Demo

- Alternate marking using one bit.
- Multiplexed marking approach.
- TimeFlips* are used for the color toggling.

---

Draft History and Status

- October 2016 – first submission of draft-mizrahi-ippm-multiplexed-alternate-marking-00.
- Discussed at IETF 97, IETF 98.
- Draft 02 – major revision.
- October 2017 – renamed: draft-mizrahi-ippm-compact-alternate-marking-00

- Next step:
  - Ask for working group adoption.
Thanks!
Method 1: Single Marking – 1st Packet

Traffic Flow: AAAAA BBBBB AAAAA BBBBB
Color Bit: C=

First packet of each block is timestamped.

Delay measurement
Method 2: Single Marking – Mean Delay

Traffic Flow: AAAAA BBBBB AAAAA BBBBB
Color Bit: C=

All packets are timestamped, compute average of each block.

Delay measurement
Multiplexed Marking using Two Values

Instead of a single marking bit ➔ A marking field with two values: U, W.

E.g., two MPLS labels
[draft-bryant-mpls-rfc6374-sfl]

Traffic Flow

Packets that should be timestamped

Using a field with two values:

The value of the field in timestamped packets is toggled.
Related Work

• This presentation summarizes [1].
• The alternate marking method was first presented in [2], and later evolved into [3], [4]. Alternate marking using a conventional timestamp field is discussed in [5].
• The most updated version of the alternate marking working document is [3].
• Security considerations are discussed in [3] and in [1]. Security considerations of time protocols are discussed in [6].
References


