Passive Monitoring using a Multiplexed Marking Field

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draft-mizrahi-ippm-multiplexed-alternate-marking-00

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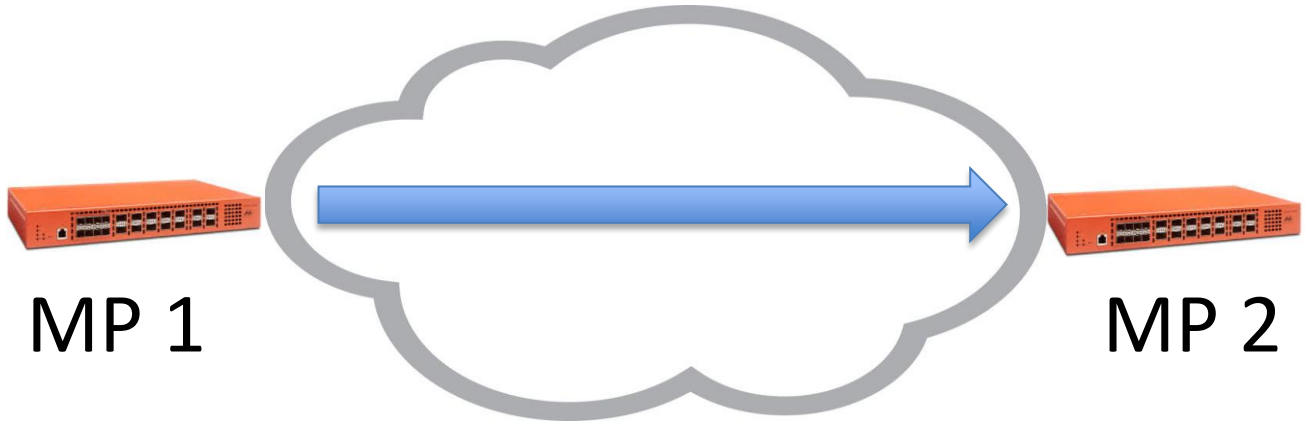
Background

Alternate Marking - Background

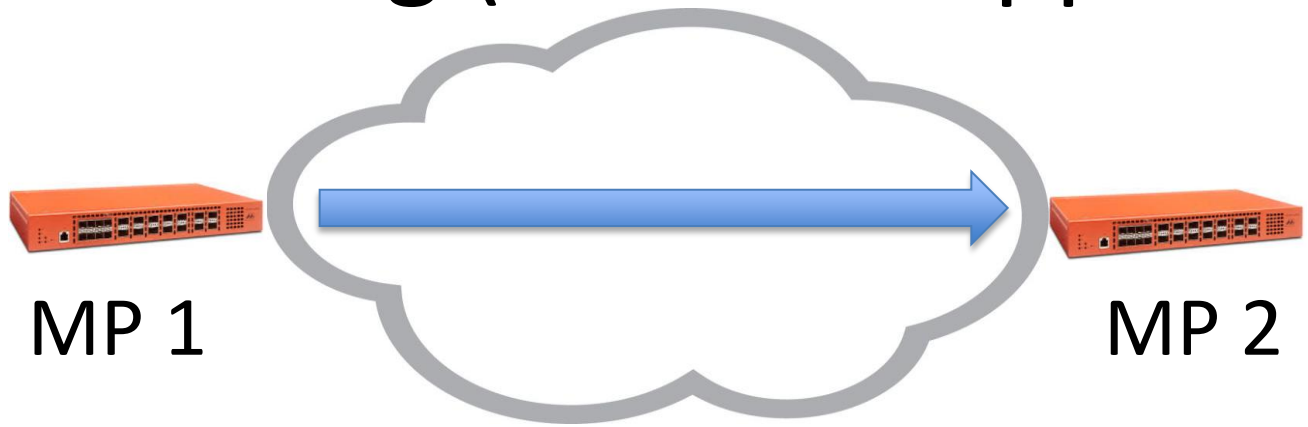
We want to monitor data traffic from MP 1 to MP 2

- Loss
- Delay

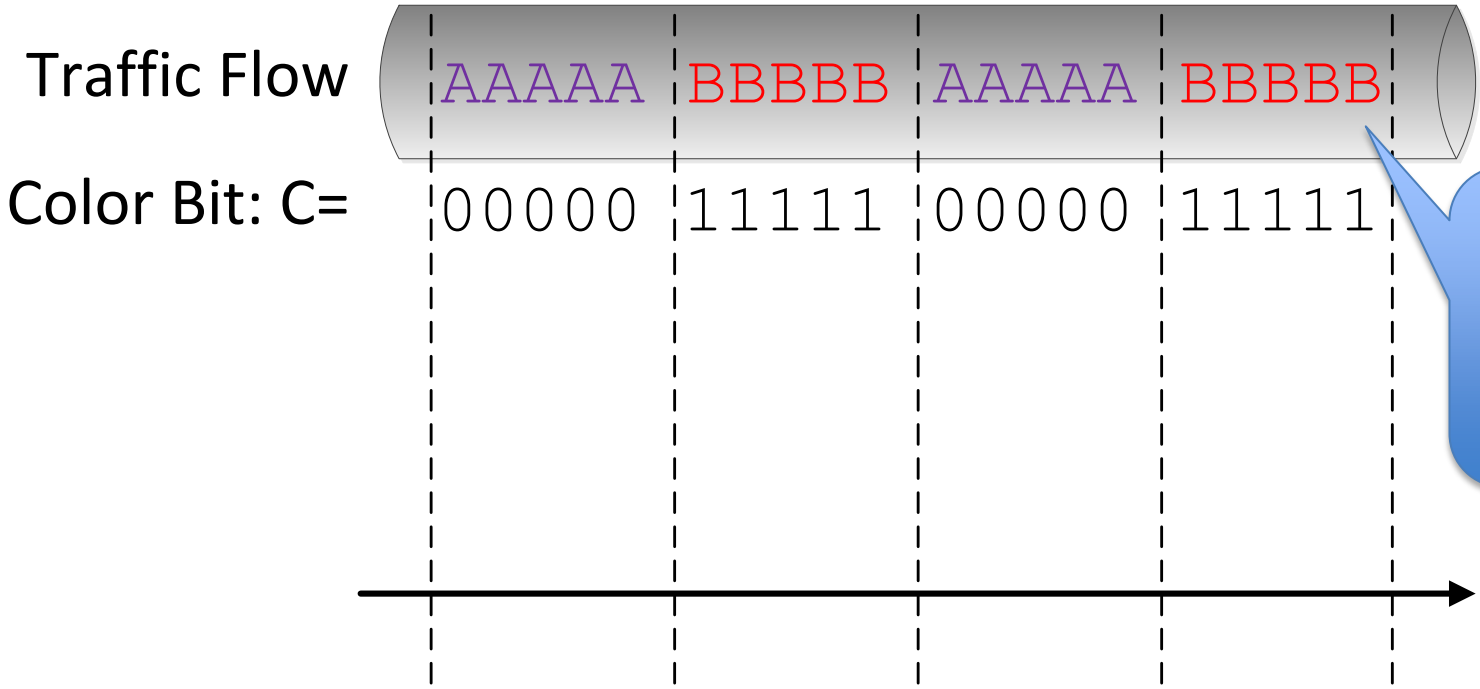


MP = Measurement Point

Alternate Marking (draft-ietf-ippm-alt-mark)



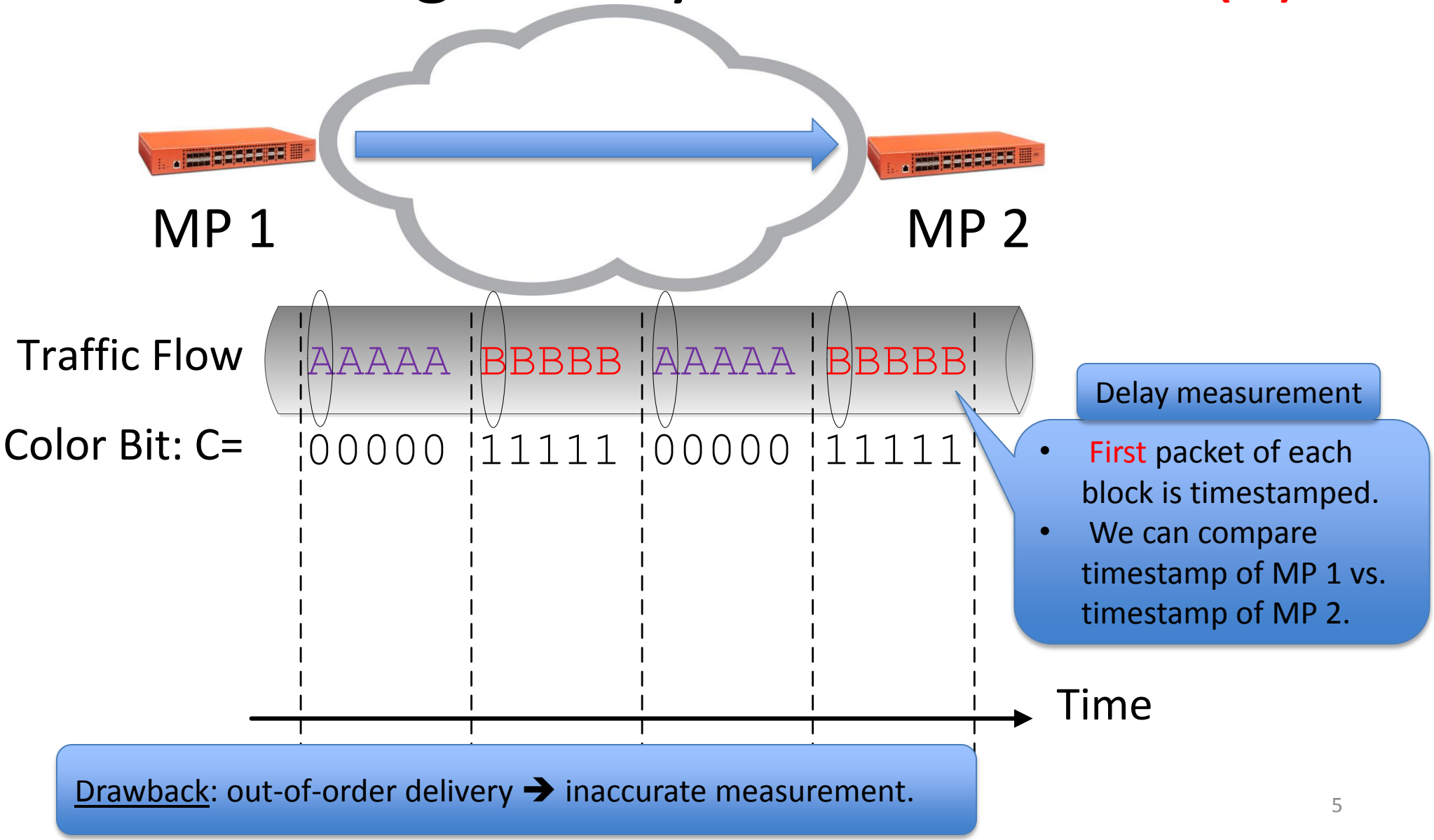
Every data packet includes a color bit.



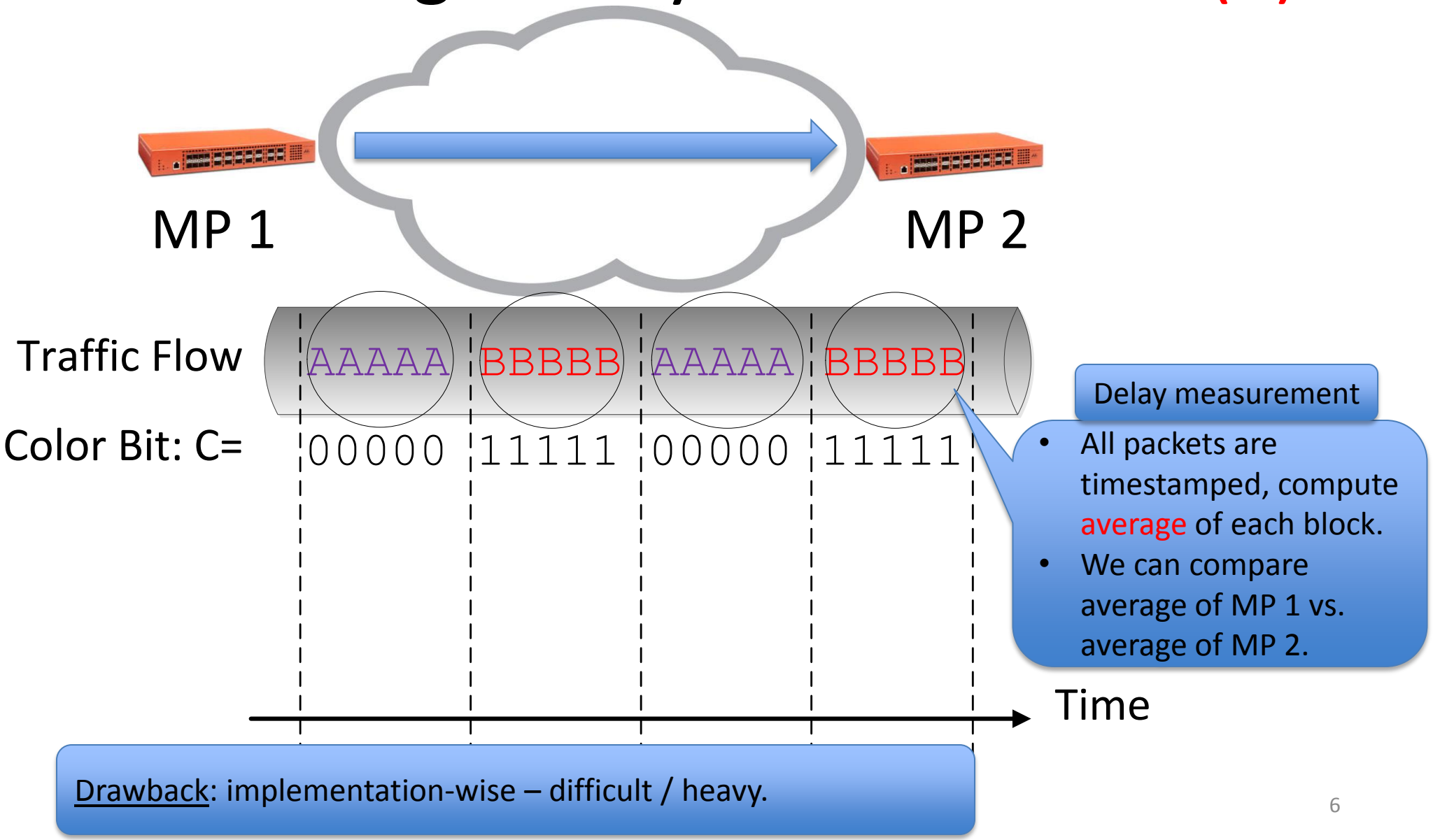
Loss measurement

- Each color is counted separately.
- We can compare counter of MP 1 vs. counter of MP 2.

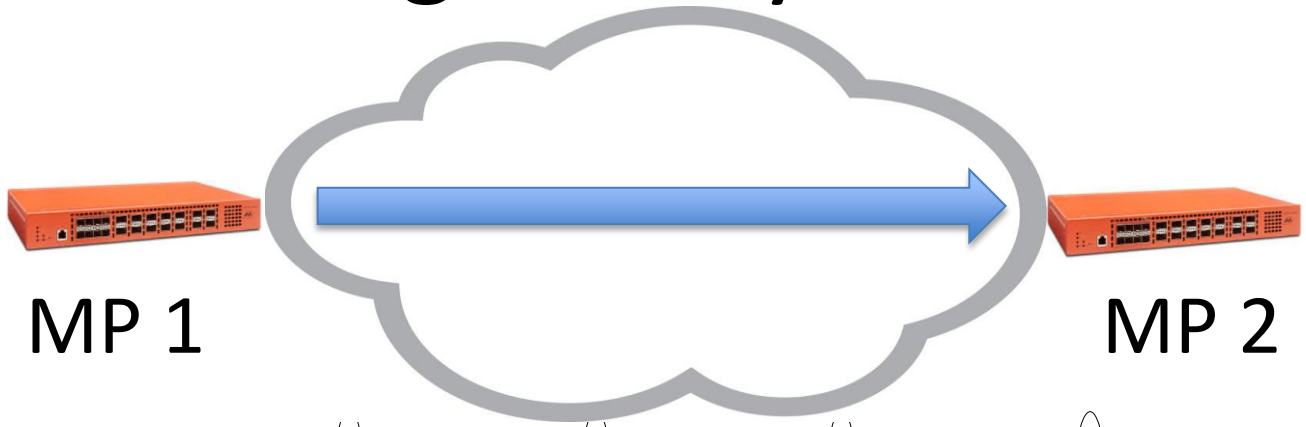
Alternate Marking - Delay Measurement (1)



Alternate Marking - Delay Measurement (2)



Alternate Marking - Delay Measurement (3)



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

Time

Delay measurement

- Timestamp bit indicates which packet is timestamped.
- We can compare timestamp of MP 1 vs. timestamp of MP 2.

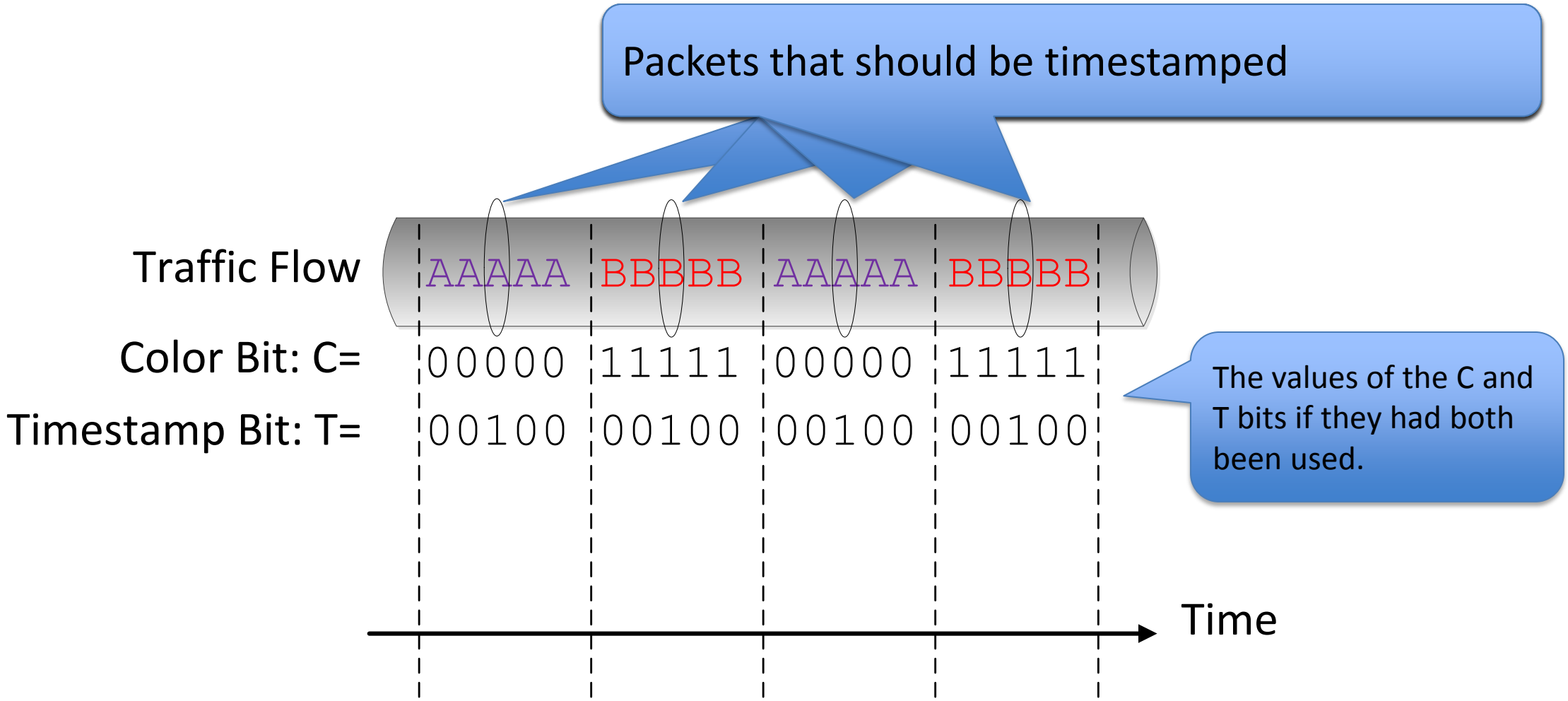
Drawback: two bits in the header instead of one bit.

Multiplexed Marking Field

Overview

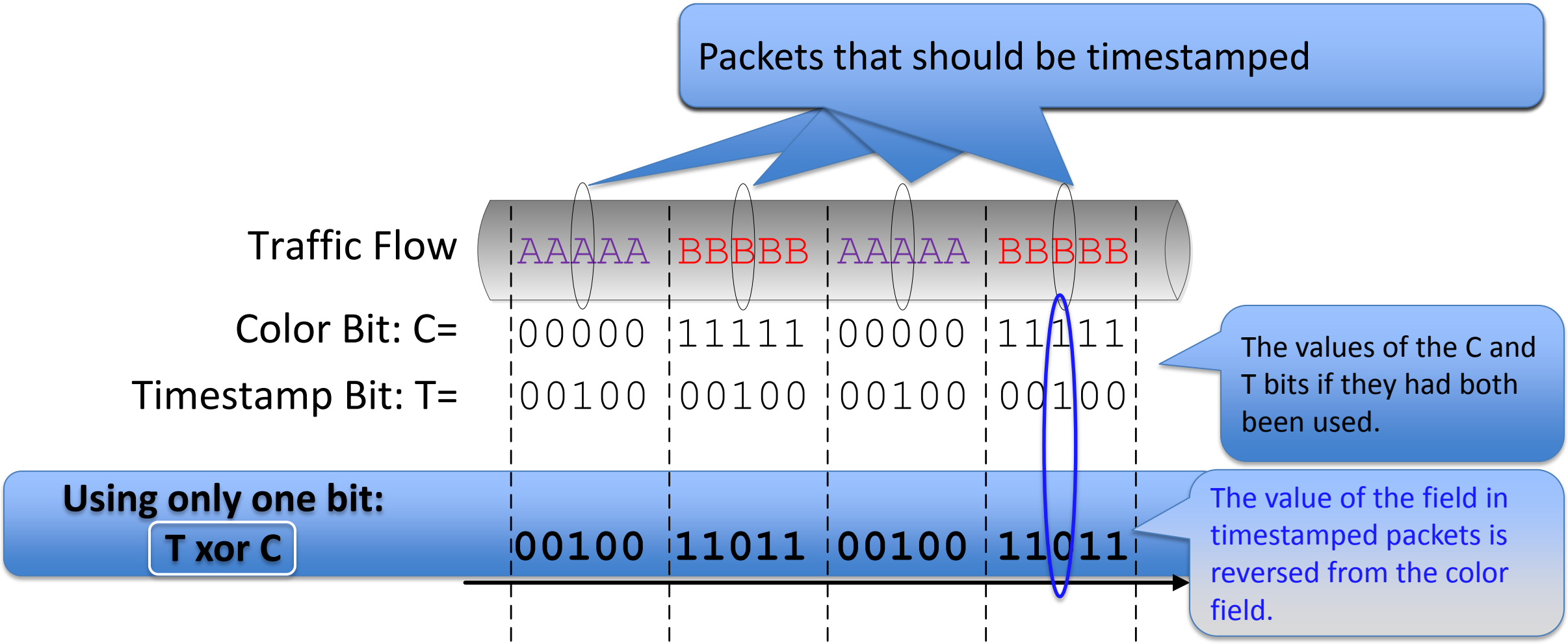
- **Concept: use a single bit for both:**
  - **Color indication.**
  - **Timestamping indication.**
- **Time multiplexing is used by MP 2 to determine the purpose of the field.**
  - **Its purpose is changed intermittently.**
- **Multiplexed marking field:**
  - **Allows accurate loss and delay measurement.**
  - **Is resilient to packet reordering.**
  - **Allows efficient implementation, since it does not require timestamping of every packet.**

Multiplexed Marking

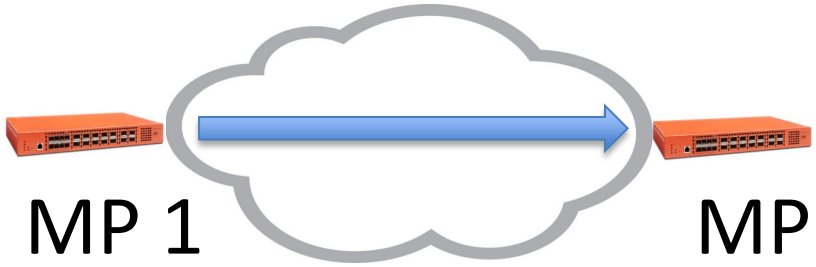


Multiplexed Marking

A single field is used for C / T:

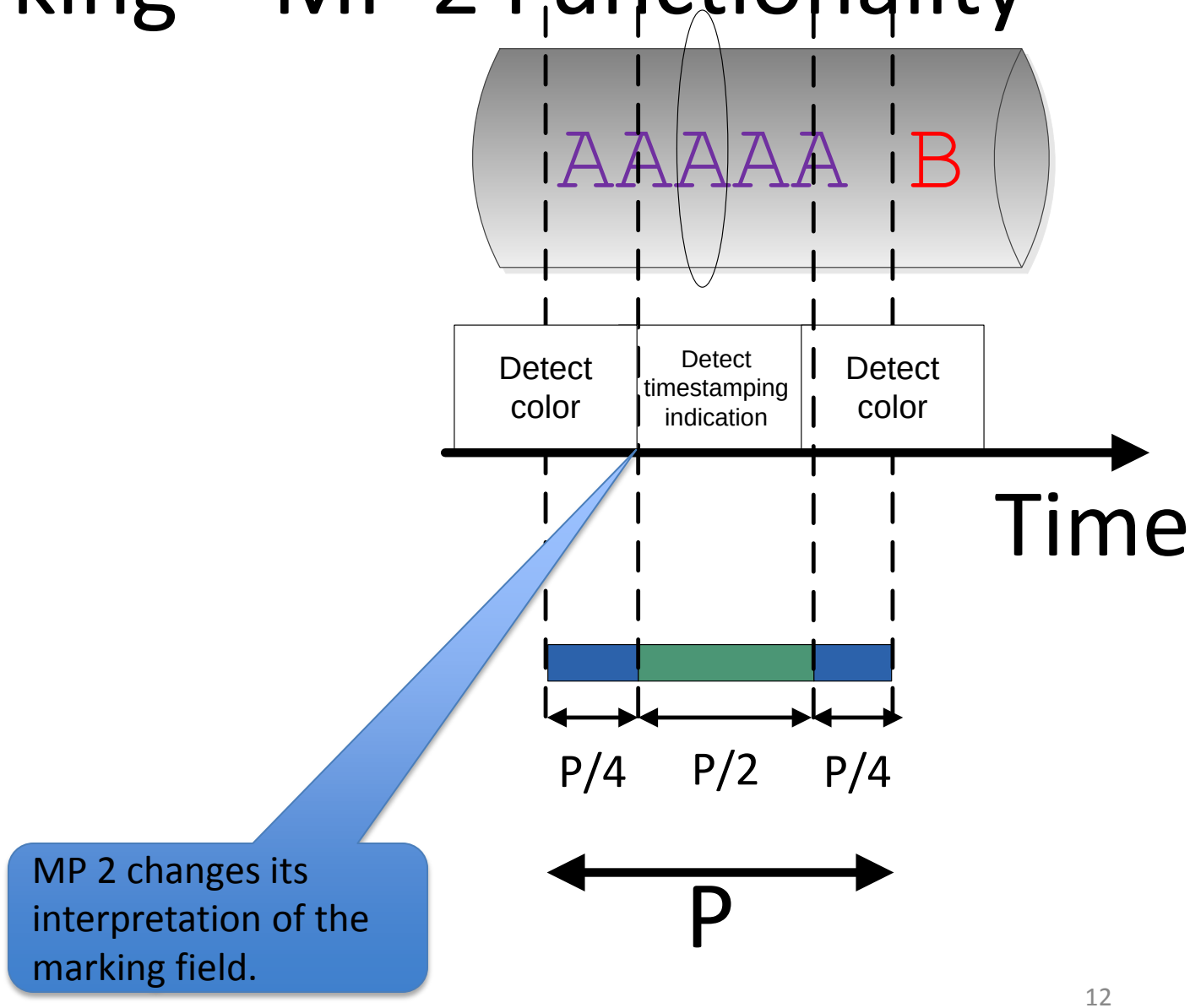


Multiplexed Marking – MP 2 Functionality

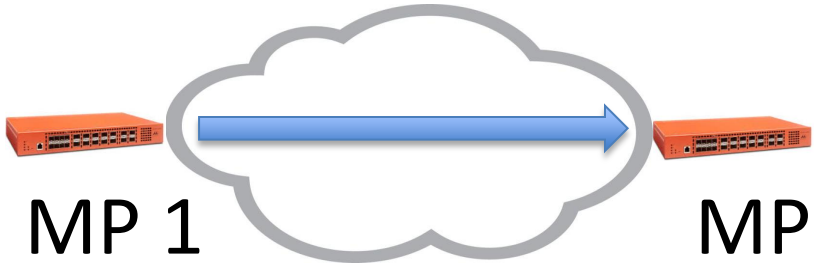


MP 2 functionality:

- Blue period:
  - Marking bit is processed as C.
- Green period:
  - Marking bit is processed as T xor C.

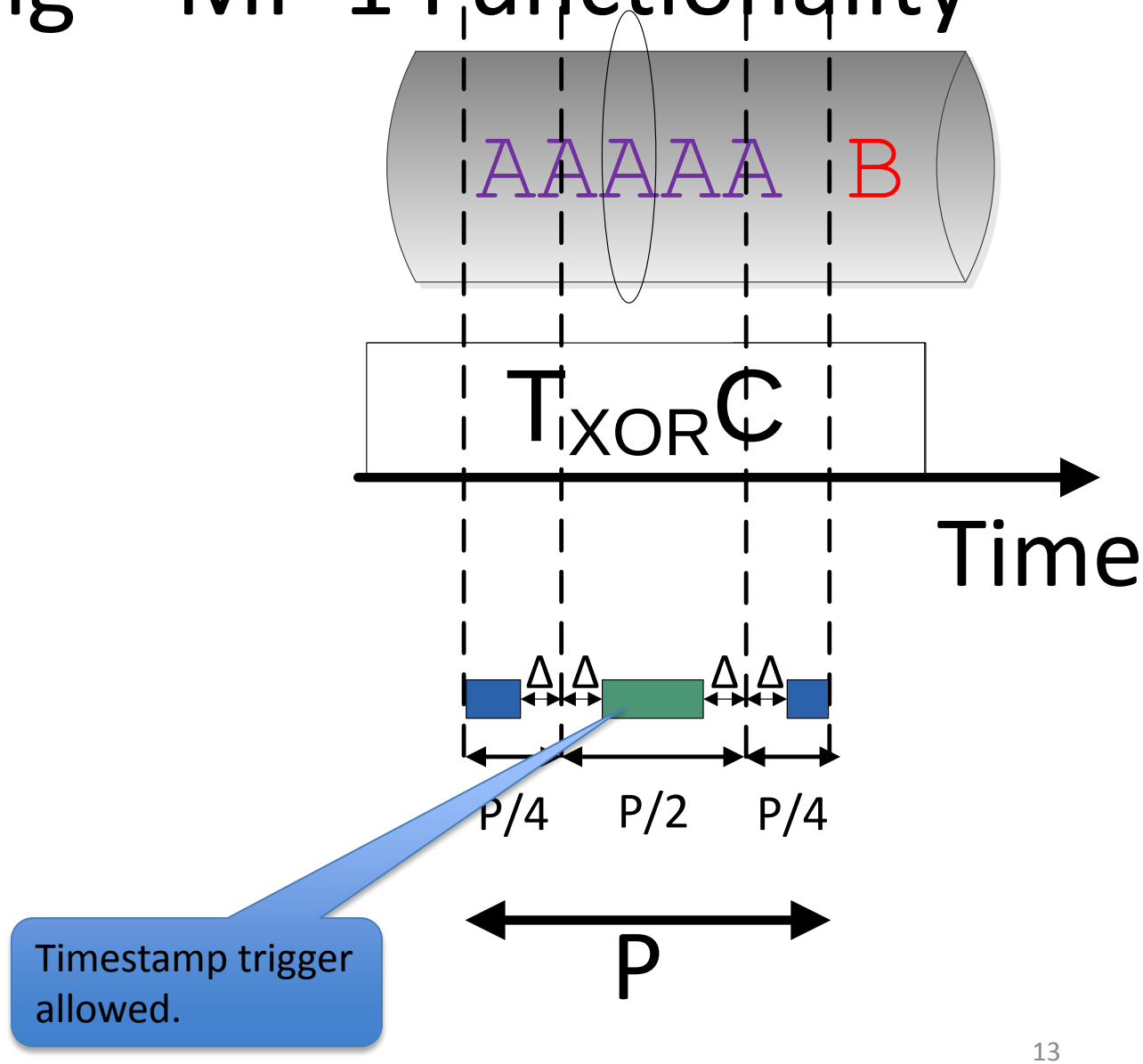


Multiplexed Marking – MP 1 Functionality



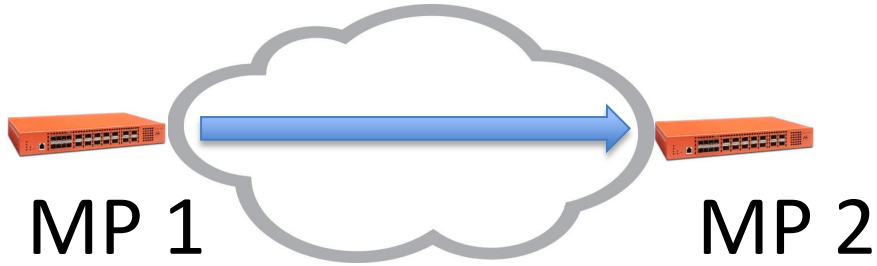
MP 1 functionality:

- Toggles color periodically (constant time period).
- Blue period:
  - Color is toggled at some time during the blue period.
- Green period:
  - Packets may be marked for delay.
- Guard band: ±Δ around role change.
  - Color value must not change during guard band interval.
  - No timestamped packet during guard band.



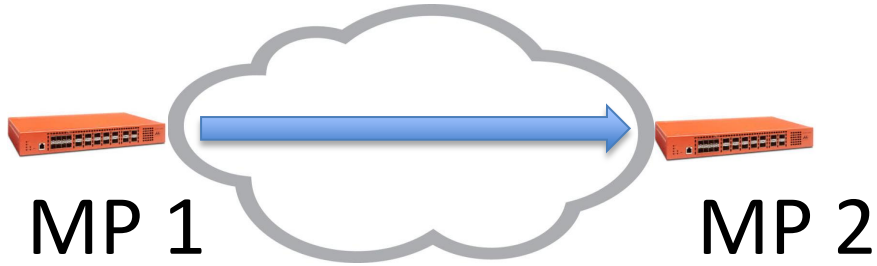
Multiplexed Marking Field - Summary

- A single field is used in the packet header for loss, delay measurement.
- Requires synchronization of ±P/8.
  - draft-ietf-ippm-alt-mark: more relaxed sync requirement, ±P/2



Draft Status and Next Steps

- October 2016 – draft 00 submitted.
- Next steps:
  - Working group feedback.
  - Consider WG adoption.



Thanks!

Marking-based Monitoring – Summary

Delay Measurement Method	Fields in the header	Problems
1. First packet	Color field	Problem 1: does not work if packets are reordered between the source and destination.
2. Average	Color field	Problem 2: Inefficient implementation: - The time of every packet must be measured. - Average computation: heavy computational load.
3. Additional field	(i) Color field (ii) Delay indication field	Problem 3: Two fields – increases packet length

Challenge: use a single field for loss and delay measurement, without incurring Problems 1, 2.

Detailed Description – MP 1 Functionality

Sender and receiver are time synchronized.

δ = the maximal time difference between sender and receiver.
D = maximal delay from sender to receiver
d = minimal delay from sender to receiver

$\Delta = \delta + (D-d)$

P = block period

Requirement: $P/4 > \Delta$

MP 1 functionality:

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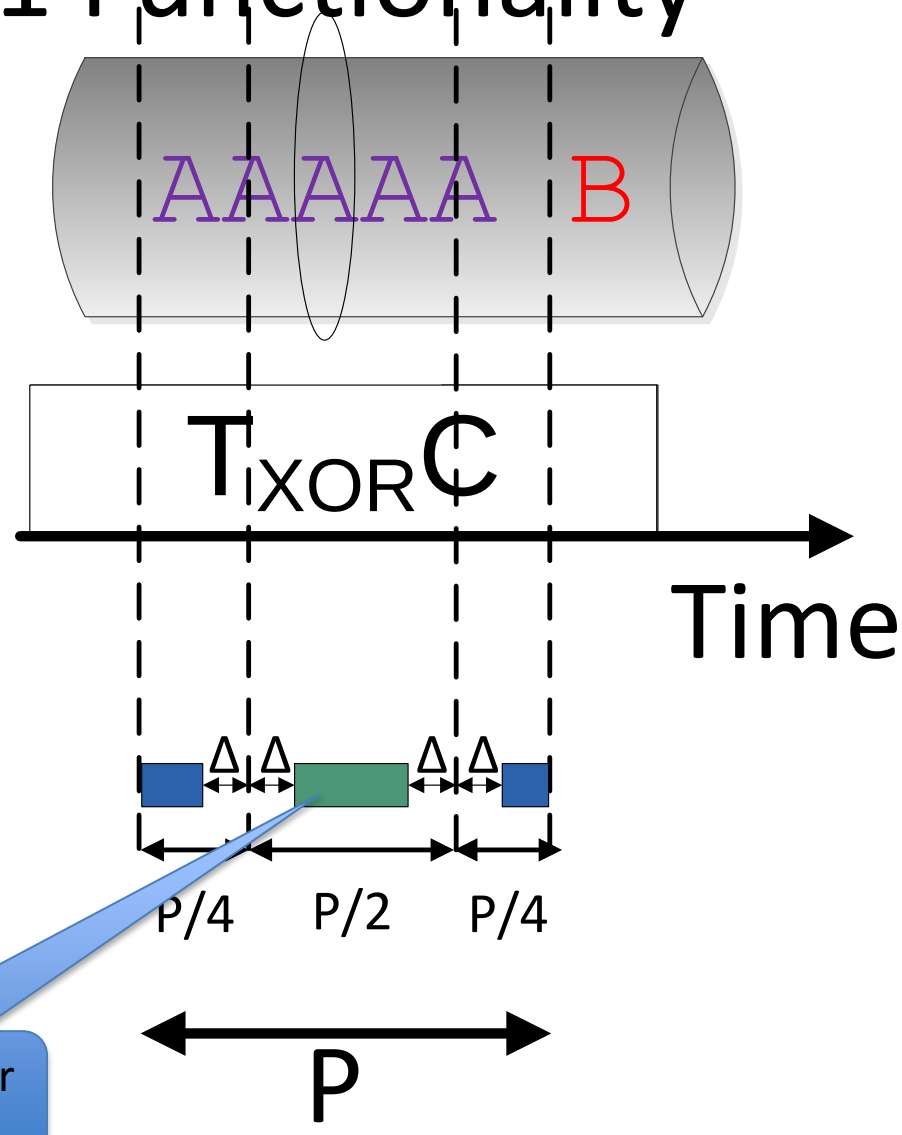

Related Work

- 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

[1] T. Mizrahi, G. Fioccola, M. Chen, L. Zheng, G. Mirsky, “Passive Performance Monitoring using a Multiplexed Marking Field”, draft-mizrahi-ippm-multiplexed-alternate-marking-00, work in progress, 2016.

[2] M. Cociglio, A. Capello, A. Tempia Bonda, L. Castaldelli, “A packet-based method for passive performance monitoring”, draft-tempia-opsawg-p3m-00, expired, 2011.

[3] G. Fioccola, A. Capello, M. Cociglio, L. Castaldelli, M. Chen, L. Zheng, G. Mirsky, T. Mizrahi, “Alternate Marking method for passive performance monitoring”, draft-ietf-ippm-alt-mark-02, work in progress, 2016.

[4] M. Chen, L. Zheng, G. Mirsky, G. Fioccola, T. Mizrahi, “IP Flow Performance Measurement Framework,” draft-chen-ippm-coloring-based-ipfpm-framework, expired, 2016.

[5] T. Mizrahi, Y. Moses, "The Case for Data Plane Timestamping in SDN", IEEE INFOCOM Workshop on Software-Driven Flexible and Agile Networking (SWFAN), 2016.

[6] T. Mizrahi, "Security Requirements of Time Protocols in Packet Switched Networks", RFC 7384, 2014.