Multipoint Alternate Marking method for passive and hybrid performance monitoring

draft-fioccola-ippm-multipoint-alt-mark-01

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Document changes: -00 to -01

New Section “Correlation with RFC5644” (input from Al Morton)

RFC 5644 is limited to active measurements.

RFC 5644 introduces metric names that can be extended to be applied to passive/hybrid performance measurements (and to alternate marking):

- the multiparty metrics are not only one-to-group metrics but can be also group-to-group metrics;
- the spatial metrics, used for measuring the performance of segments of a source to destination path, are applied also to group-to-group segments (called Clusters).

Delay measurements: RC5474 and RFC5475 coupled with alternate marking

This enables a detailed delay measurement also for multipoint paths

Behind Multipoint Alternate Marking

“The Alternate Marking method, as presented in draft-ietf-ippm-alt-mark, seems to be applicable only to point-to-point flows, but this is not true!”

- A monitored flow is identified by all the packets having a set of common characteristics: packet selection rules, that operate on the **«Identification Fields» (IFs)** of the packet header.
- Some applications of the alternate marking method can involve a lot of monitored flows and nodes

Multipoint Alternate Marking introduces more flexibility because enables the performance monitoring of multipoint flows selected by identification fields without any constraint

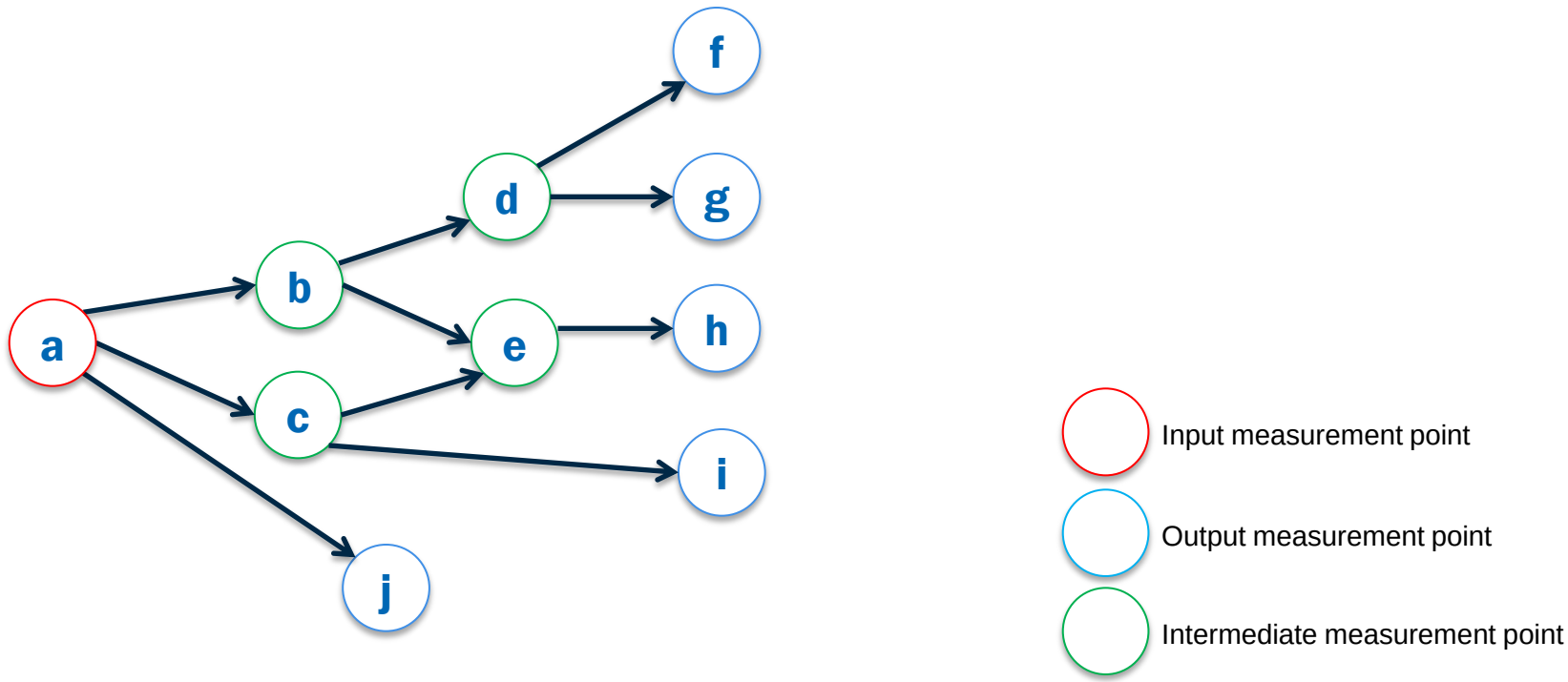
- multiple marking points and multiple exit points can be considered for the same monitored flow.
- even the entire network production traffic can be considered as a single monitored flow.

Multipoint Alternate Marking: Cluster Packet Loss (1/2)

«In a packet network, the number of lost packets is the number of input packets minus the number of output packets»

How we can localize the losses?

the monitoring network can be considered as a whole or can be split in the smallest subnetworks, maintaining the packet loss property for each subnetwork.

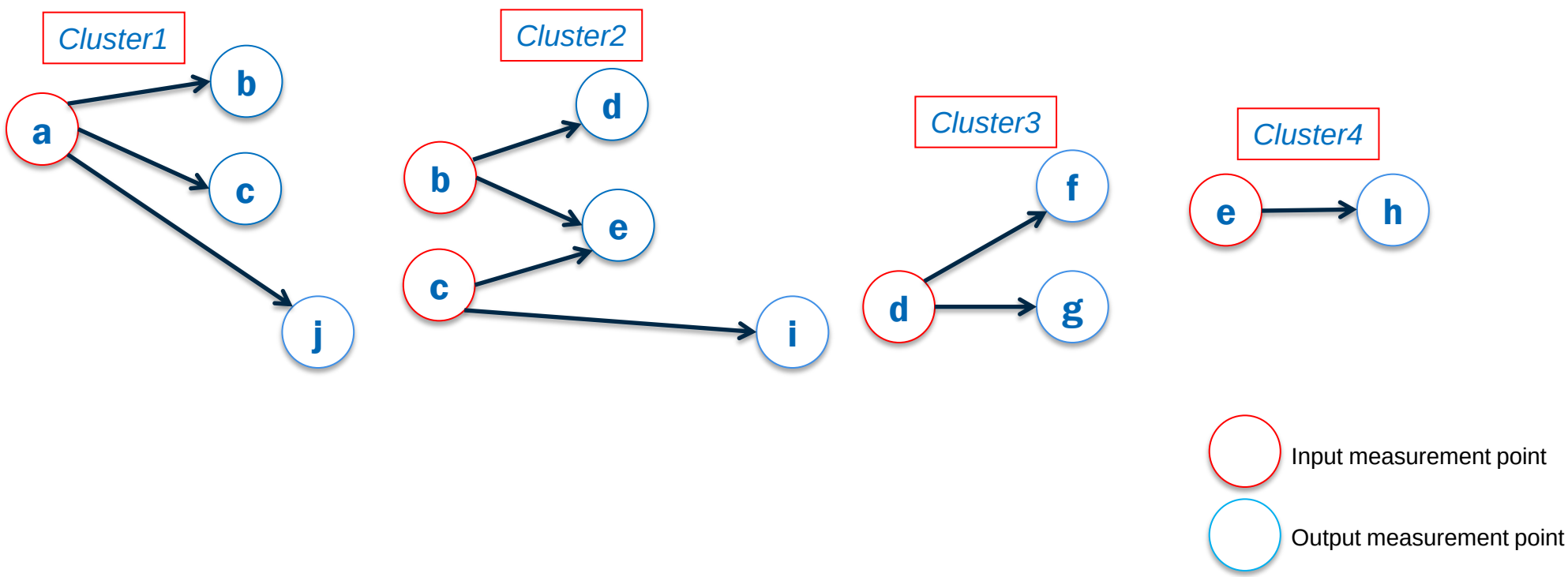


Multipoint Alternate Marking: Cluster Packet Loss (2/2)

«Clusters are the smallest subnetworks, maintaining the packet loss property for each subnetwork»

Clusters are, in general, group-to-group segments. They can also be combined in new connected subnetworks (Super Clusters)

In our monitoring network example we have 4 clusters:



Delay measurements for multipoint flows

Mean delay and delay variation measurements can also be generalized to the case of multipoint flows.

It is possible to compute the mean one-way delay of packets in a cluster or in the entire monitored network.

How about delay/delay variation on single packets?

- In point to point flows we can use Double Marking, but this does not work for multipoint flows
- In multipoint flows we need a way to select the same packets in every monitoring point of a network: Hash Selection can implement a «virtual double marking»:
  - Using an «a priori» hashing value, calculated on invariable packet fields, to select the right packets
  - This technique is described in RFC5474, RFC5475, RFC5476 and RFC5477

RFC 5475 «weaknesses» and Alternate Marking as a solution

- 1st problem: Difficult implementation in a «continuous» packet flow

Alternate Marking splits the continuous flow in batches of packets and anchor the samples so this simplifies the correlation of the hashing packets along the path.

- 2nd problem: Using Basic Hash, the number of samples depends on packet rate

In a marking period it is possible to select a number of samples «almost» constant, by using Dynamic Hash

> This can be realized by choosing the maximum number of samples (NMAX) in a marking period.
>
> The algorithm starts with only few hash bits, that permit to select a greater percentage of packets (all with 0 bit, half with 1 bit,…). When the number of selected packets reaches NMAX, a hashing bit is added. This step can be repeated iteratively.
>
> The dynamic process statistically converges at the end of a marking period and the final number of selected samples is between NMAX/2 and NMAX.

Dynamic Hash enables a detailed(also per flow) delay measurement for multipoint paths

Inputs and Reviews

- Inputs from IETF Last Call on draft-ietf-ippm-alt-mark

  OPSDIR review (Eric Vyncke)

  - How it works with multiple sources: this document can be the answer
  - How collect counters and How marking is provisioned: Data Model?

  INTDIR review (Brian Haberman):

  - How select flows to monitor and associate counters and How NMS works: companion documents?

- Reviews from Al Morton

  - Do delay/delay variation measurements make sense in multipoint path? Yes, if we can do that on single packets with the hashing technique

  - Sentence to modify: <<The alternate marking method, as presented until now, is applicable to a point-to-point path... so the extension proposed in this document explains the most general case of multipoint-to-multipoint path>>

  - draft-amf-ippm-route can help with the building of the monitoring network

The suggestions will be addressed in the next revision of the document

Summary and Next Steps

This document adds a new point of view to the alternate marking method:

- A Controller can calibrate Performance Measurements. It can start with the entire Network;
- In case of necessity, the filtering criteria could be specified more in order to perform a Cluster or a point-to-point flow detailed analysis
- Hashing technique helps to perform a better (also per flow) delay and delay variation analysis.

See also draft-mizrahi-ippm-compact-alternate-marking for marking methods strengths and weaknesses

Inputs and Comments always welcome