SPB Agreement Digest construction

The Agreement Digest is a key input into the IEEE 802.1aq Agreement Protocol, which guarantees that loops cannot form during topology changes when the IS-IS-SPB Link State databases may not be synchronised.

Agreement Digest Objectives :

- → **To summarise the key elements of the IS-IS-SPB Link State Database in a manner which has an infinitesimal probability that two nodes with differing Databases generate the same Digest :**
  - → even when many elements of the Database are likely to be highly correlated (e.g. OUI values in MAC addresses, Link Metrics)
- → **To have a very low incremental computation overhead**
  - → in general, link failure and repair are isolated events
- → **To accommodate extensions if needed**

The Agreement Digest is carried in ISIS-SPB IIH (Hello) PDUs

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SPB Agreement Digest Elements

The Topology Digest Format Identifier (4 bits)

→ this version of the Agreement Digest is v0

The Topology Digest Format Capabilities (4 bits)

→ Digest versions which this bridge can process; now “0”.

The Topology Digest Convention Identifier (4 bits)

→ The forwarding rule being executed by this bridge; see next slide

The Topology Digest Convention Capabilities (4 bits)

→ The forwarding rules which this bridge could execute;

→ the value “0” covers the 4 conventions defined on the next slide

The Topology Digest Edge Count (2 Bytes)

→ discussed later

The Computed Topology Digest (20 Bytes)

→ discussed later

SPB Agreement Digest Elements
- the Topology Digest Convention Identifier

The following Topology Digest Conventions are defined :

0. indicates that the transmitter will not forward until a digest match occurs (as provided for by the Agreement Protocol defined in this standard).

1. means the transmitter will continue loop-free forwarding of both multicast and unicast traffic up to the limits of change specified by the rules in this version of the standard.

2. means the transmitter will continue loop-free forwarding of multicast traffic up to the limits of change specified by the rules in this version of the standard, and will continue forwarding of unicast traffic unconditionally.

3. means the transmitter will continue forwarding of both multicast and unicast traffic unconditionally.

Note The use of rule 3 in accordance with this standard is only permitted if an alternative mechanism (as yet undefined) for loop control is in operation.

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SPB Agreement Digest Elements
- The Topology Digest Edge Count

The Topology Digest Edge Count is included because it is a very powerful signature of a topology, orthogonal to the Computed Digest, and has negligible computation overhead.

It is defined as :

→ **Edge Count = Σ#-Edges-in-SPB-Region Modulo 2^{16}**

- → where each physical link is counted as **two** Edges
  - corresponding to its advertisement by ISIS-SPB in one LSP flooded from each end of the link
- → If more that one IS-IS-SPM topology is configured, the Edge Count accumulates **all** edges in **all** configured topologies. If Edges are absent in a particular topology, they have the value 0 for this summation
- → In the case of shared media, the number of edges is provisionally (*TBC*) defined by the point-to-point links joining each connected SPB bridge to the IS-IS-SPB Pseudo-Node used to represent the shared medium within the routing system

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SPB Agreement Digest Elements
- The Computed Topology Digest

The Computed Topology Digest is formed from the arithmetic sum of the individual MD5 hashes of each Edge in the SPB Region :

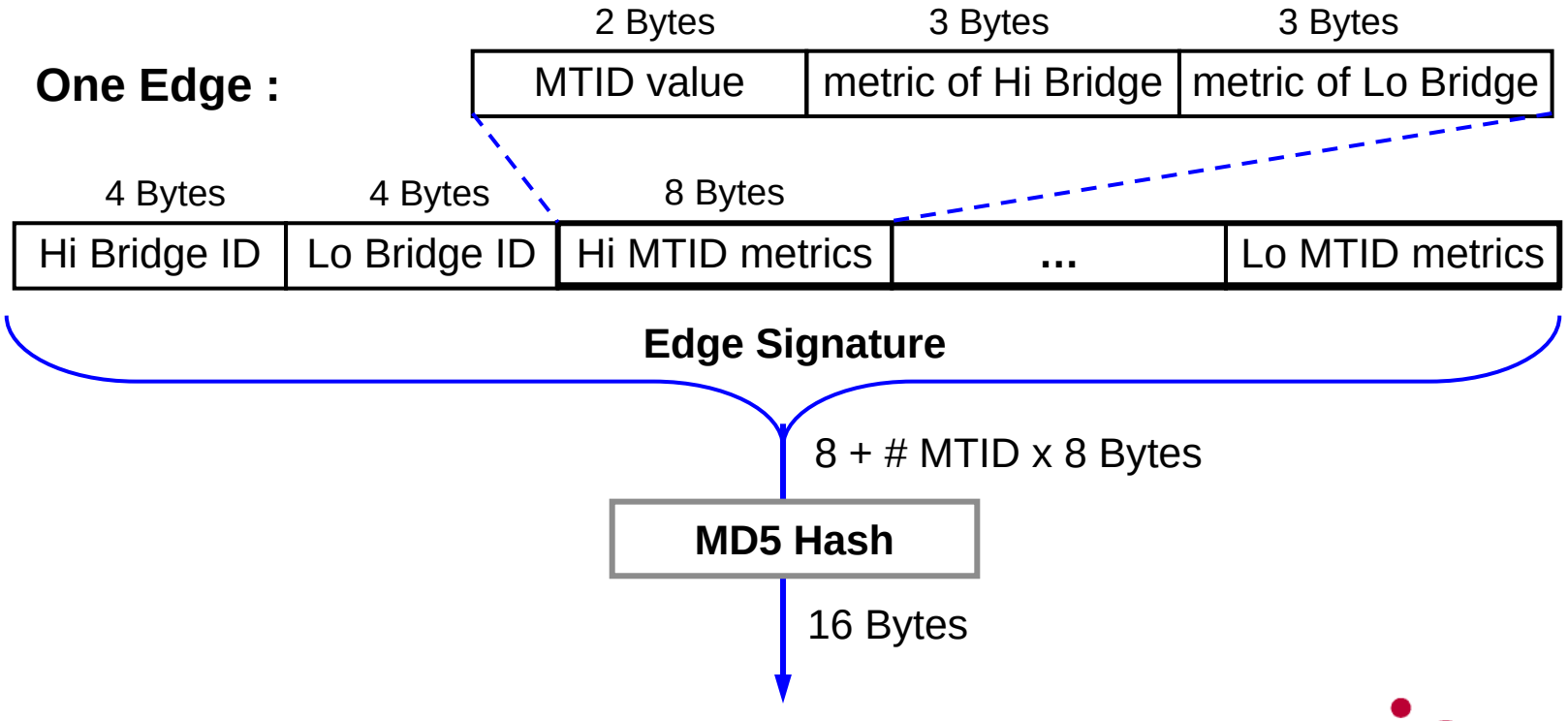
- → this ensures that the MD5 hash of each Edge has to be computed precisely once (when it is first advertised), and its contribution to the overall Computed Topology Digest may thereafter be computed incrementally
- → MD5 is widely reported to be cryptographically compromised. This is not relevant in this application, because there is no motivation for an attack :
  - all that is required are excellent “avalanche” properties

The composition of the input message into MD5 from each Edge is detailed in the next chart

SPB Agreement Digest Elements
- The Edge input to the Computed Digest

In the figure below :

- → Bridge ID = Bridge Priority || ISIS-SPB SysID
- → "Hi" = numerically higher value of parameter as unsigned integer
  - by extension "Lo"



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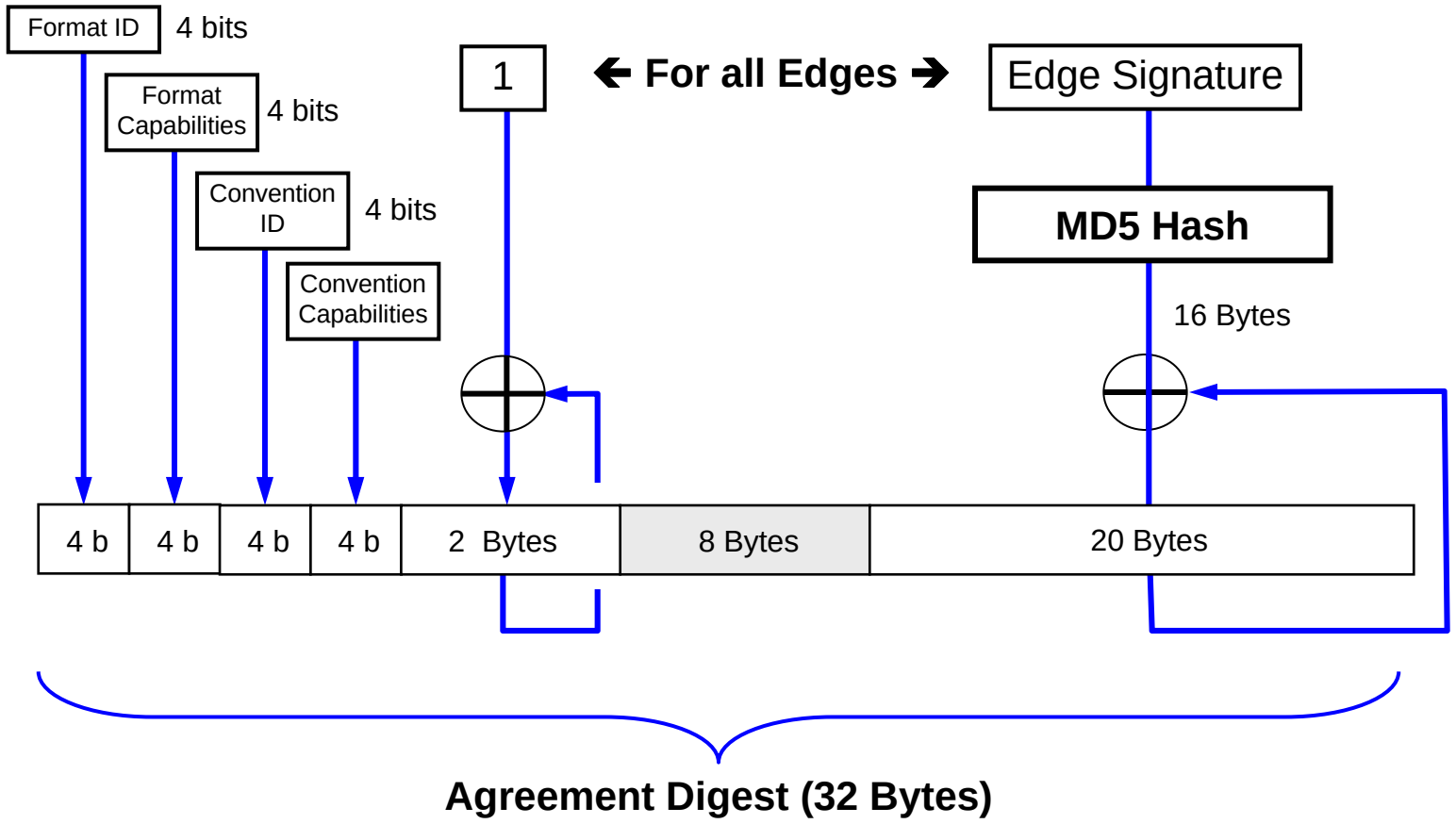
SPB Agreement Digest Elements
- Putting it all together

Each link ➔ 2 Edges, but both Edge Signatures are identical



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