802.1Qbp OAM

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June 23, 2011
Bi-Weekly Conference Call

Baggy Pants Model for OAM operation at BEB

MAC Relay (Clause 8)

EISS
Flow ID Multiplex Entity (new clause)

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ISS ISS ISS
Flow ID Multiplex Entity (new clause)
EISS
n-tuple Hash Function (new sub-clause)
ISS
Customer Backbone Port Functions (6.11)
ISS
Service Instance Multiplex Entity (6.18)

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Service Instance Multiplex Entity (6.18)
ISS
C.8.5
ISS
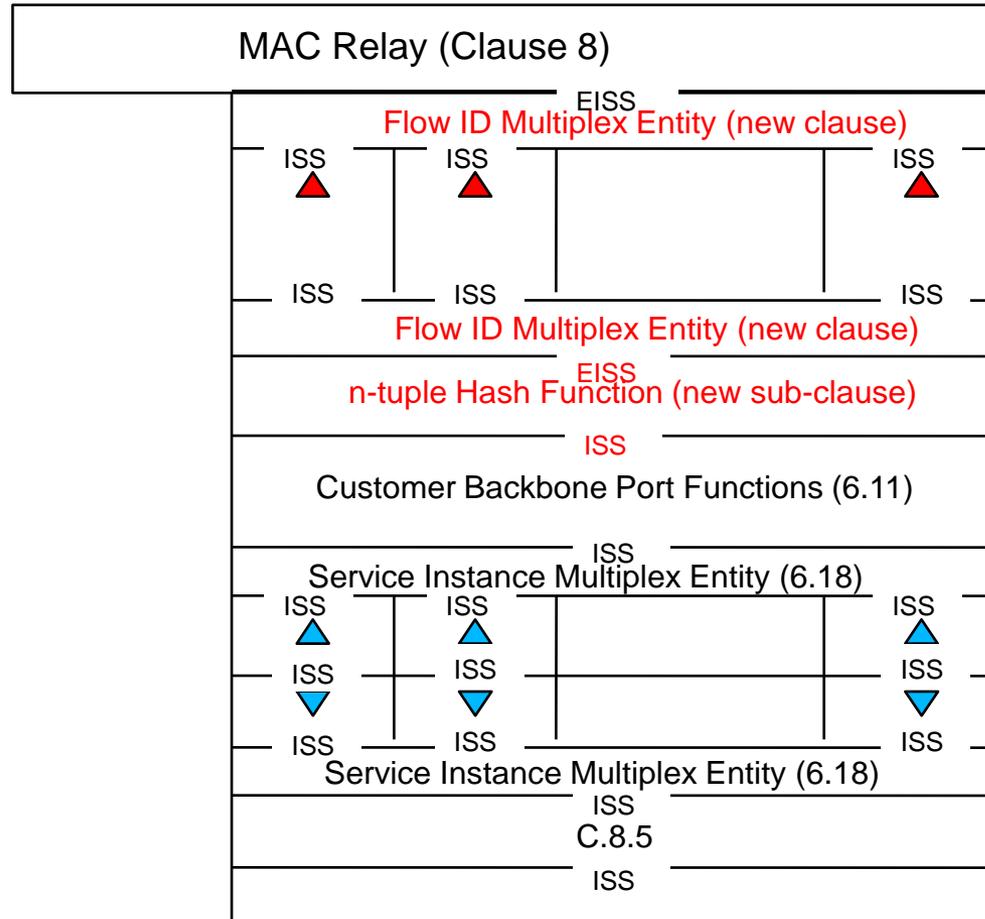
NOTE: Clause 6.11 needs to be modified to indicate that all ECMP I-SIDs are mapped to a single default B-VID

Baggy Pants Diagram for OAM operation at BCB

MAC Relay (Clause 8)

Flow ID Multiplex Entity (sub-clause)

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Flow ID Multiplex Entity (sub-clause)

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TTL & Flow ID Processing (sub-clause)

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Clause 6.7
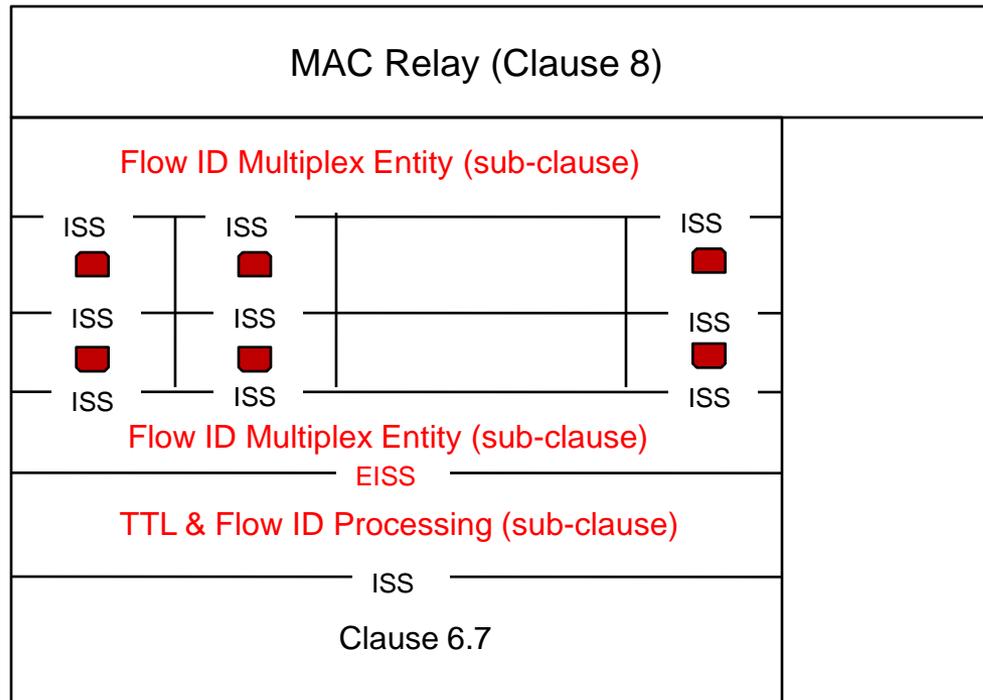
OAM Granularity: Flow, Service & Network

- **Flow OAM**: OAM functions performed on the user Flows.

- **Service OAM**: OAM functions performed on the user VLAN itself. Test Flows are chosen to exercise all the ECMPs.

- **Network OAM**: OAM functions performed on a Test VLAN. Test Flows are chosen to exercise all ECMPs for the Test VLAN.

Flow OAM (reactive)

- User supplies flow information, including one or more of:
    - MAC SA and/or DA
    - IP Src and/or Dst
    - Src and/or Dst Port (TCP or UDP)

- Flow parameters are converted to a flow ID (e.g., NMS can query platform using flow parameters and get back flow ID)

- MEP monitors the flow by sending periodic CCMs for that flow.
    - Monitoring of unicast flows uses unicast CCMs
    - Monitoring of multicast flows uses multicast CCMs

CFM Flow
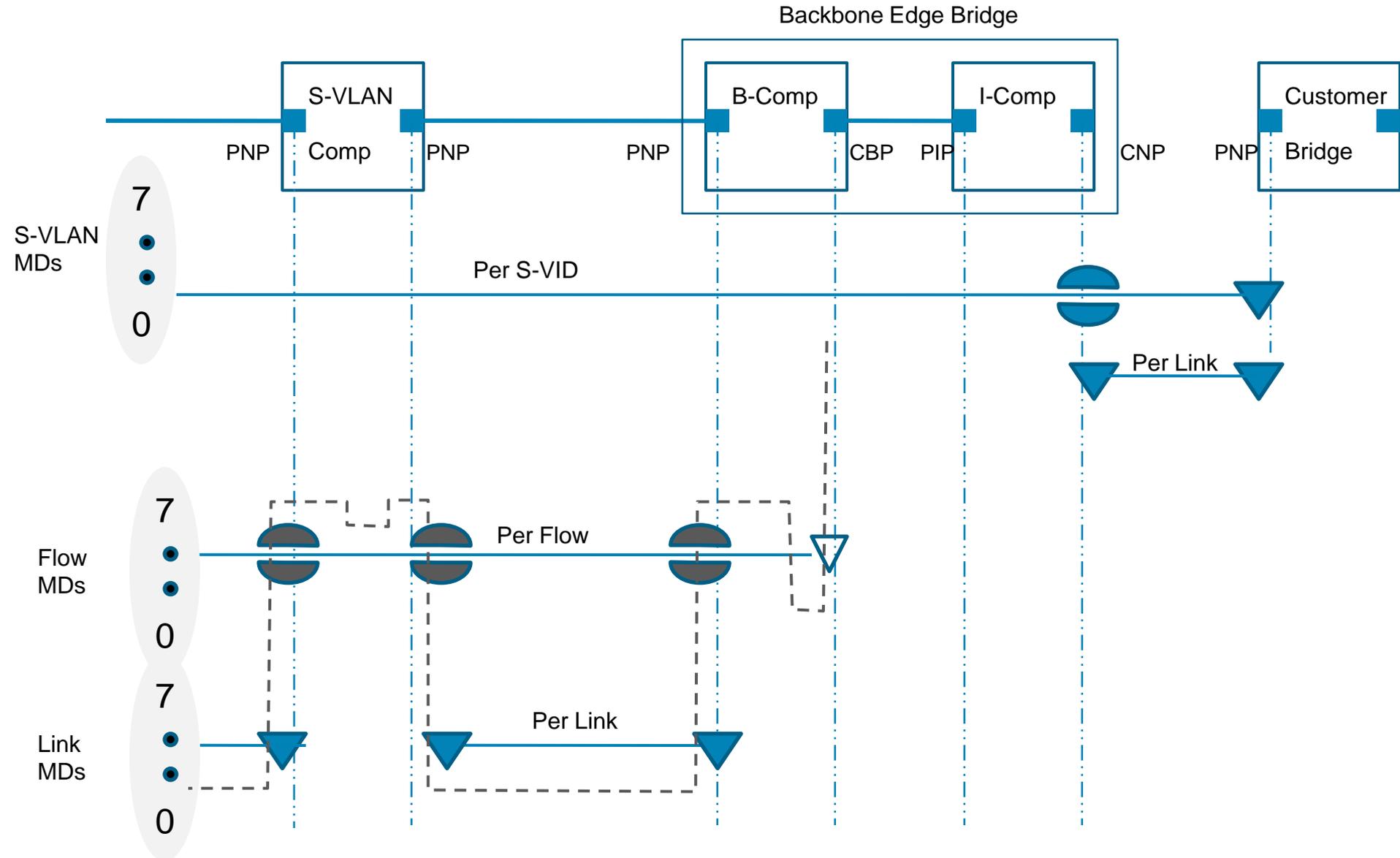
Flow OAM: Fault Detection

- Per flow CCM is used to detect a fault

- Flow parameters is used to generate flow ID

- MEPs are configured at the end points but MIPs don't need to be explicitly configured

- Fault detection is always wrt reverse traffic wrt CCM generator because of non-congruent nature of forward/reverse traffic – e.g., not receiving a CCM from remote bridge doesn't mean there is a problem with the reception of your CCM

- When a loss of CCM is detected, RDI flag is set to notify the remote bridge that its CCM was not received and there is a problem on the path from remote bridge to self

- Remote bridge can initiate fault isolation procedure if needed

NOTE: Fault Isolation procedure needs to start from the remote bridge because of the non-congruent nature of forward/reverse traffic

Flow OAM: Fault Isolation

- "Flow Trace" is used for fault isolation

- It works similar to "Link Trace"

  - A singel FTM is generated from MEP and traverses the network hop by hop. Each hop generates a response to the originating MEP

  - FTM is generated with the proper flow-id and TTL=1

  - Because of TTL=1, the message is stopped in the next hop and a respond is generated (FTR) with similar info as current LTR

  - Next hop sets the TTL=1 and forwards the message to its next hop with the same B-MAC DA.

   ➢ should B-MAC SA be same as originating MEP ?

Service OAM (proactive)

- A MEP, knowing the topology and how to exercise the ECMPs, first calculates the necessary Test Flows for full coverage of all paths in a given service instance.

    - At this point brute force method is used to generate test flows until someone comes with better scheme

- On a per service instance basis, MEPs perform monitoring of all unicast and multicast paths using the Test Flows.

- MEPs follow a 'round-robin of Test Flows' scheme to verify connectivity over all ECMP paths (unicast) and shared trees (multicast).

    –Round-robin scheduling reduces processing burden on nodes, and modulates the volume of OAM messaging over the network.

    – Comes at the expense of relatively longer fault detection time

    – For critical flows, it is possible to schedule their connectivity check continuously.

    – MEP CCDB will track every flow independently (timer per flow per remote MEP rather than per remote MEP in CFM)

Service OAM (proactive)

- In order to do proper fault suppression during topology change, once a network topology change is detected, a flag is set on the CCM message to notify the far end not to generate faults as the result of missing CCMs till the network settles down

- Once the network settles down and new test flows are generated, then the flag is cleared

CFM Flow
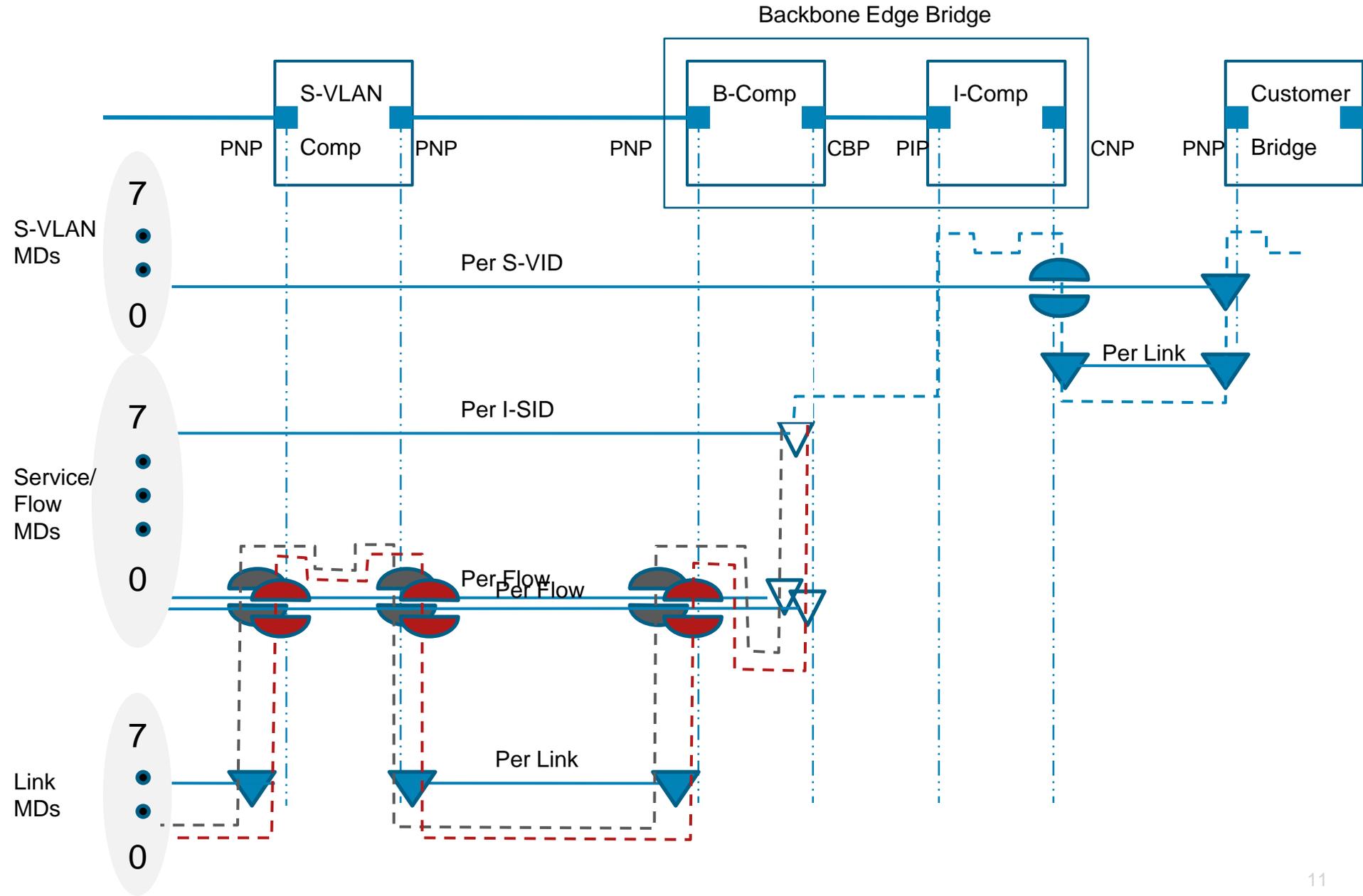
Network OAM (Proactive)

- Network OAM is a degenerate case of service OAM where a single default E-SID can be configured on all BEBs and the CFM is performed for that default E-SID just as described above for service-level OAM

  - This default E-SID is per B-VID – e.g., per ECMP algorithm. If there are multiple ECMP algorithms in the network and the E-SIDs are divided among these algorithms, then one default E-SID is needed per E-SID group (e.g., per B-VID).

  - Typically there is only a single ECMP algorithm