

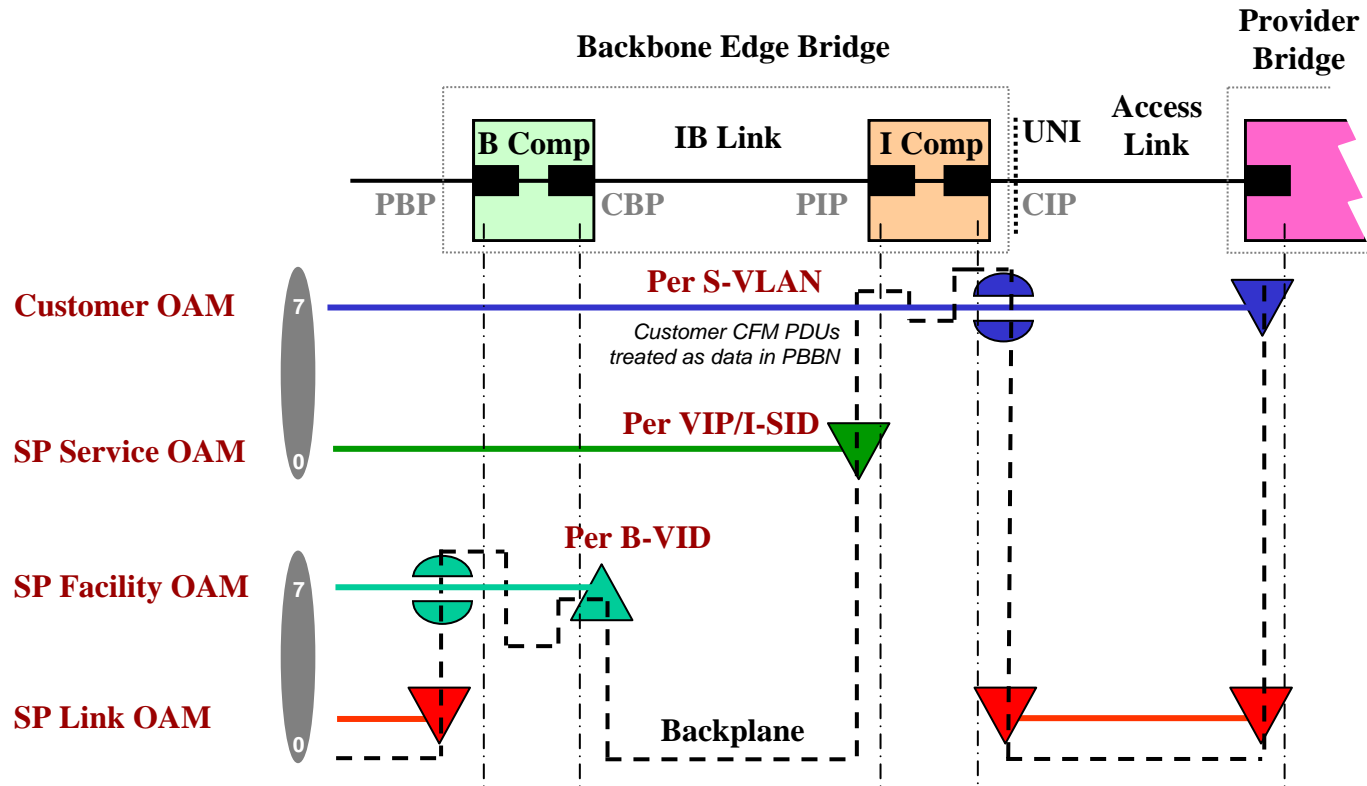
802.1ah: CFM in Provider Backbone Bridges

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802.1 Plenary, Orlando

CFM as supported in 802.1ah-d3.0

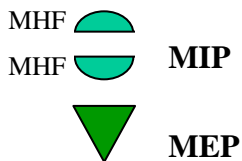
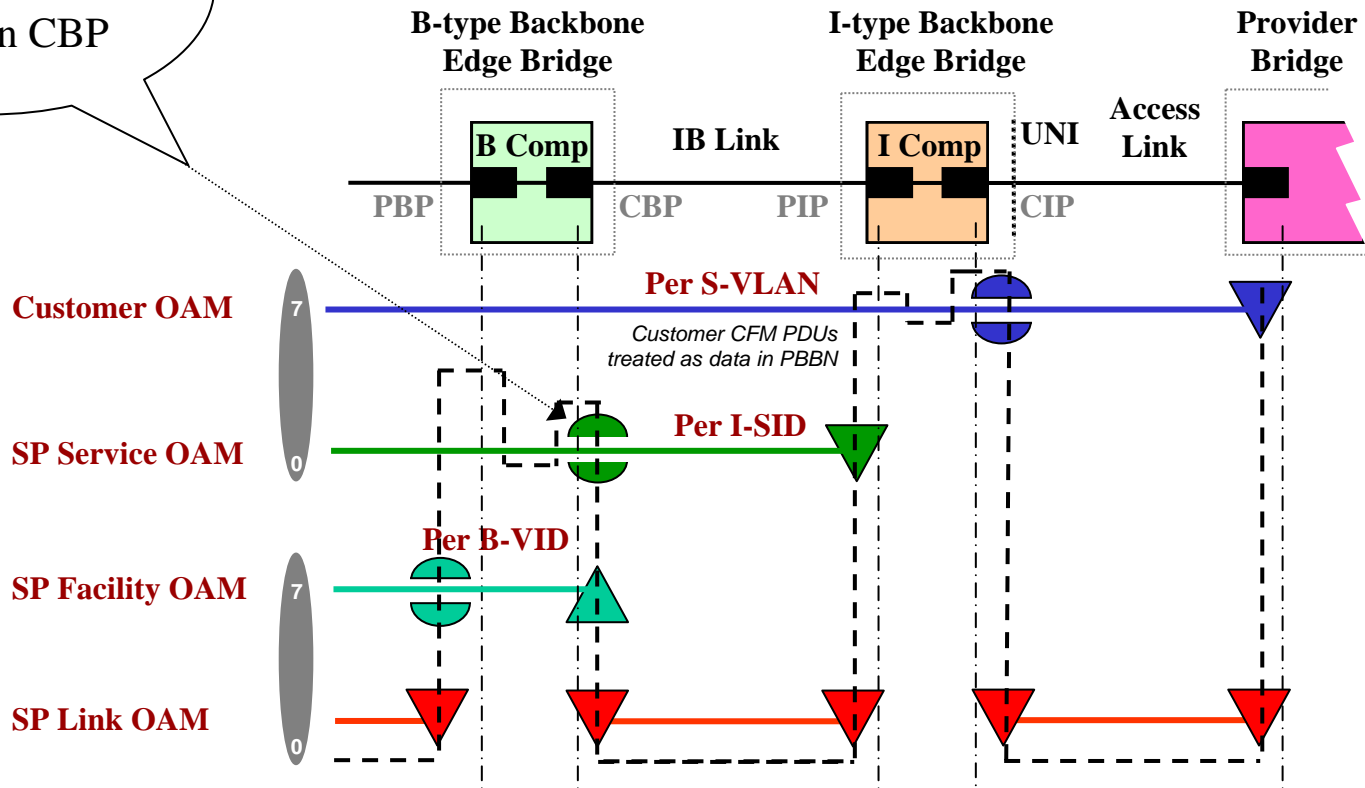


1:1 S-Tagged Service Interface

[From ah-martin-CFM-MPs-frames-1106]

CFM as desired in 802.1ah

Want ability to create per I-SID MIPs on CBP



1:1 S-Tagged Service Interface

[Modified from ah-martin-CFM-MPs-frames-1106]

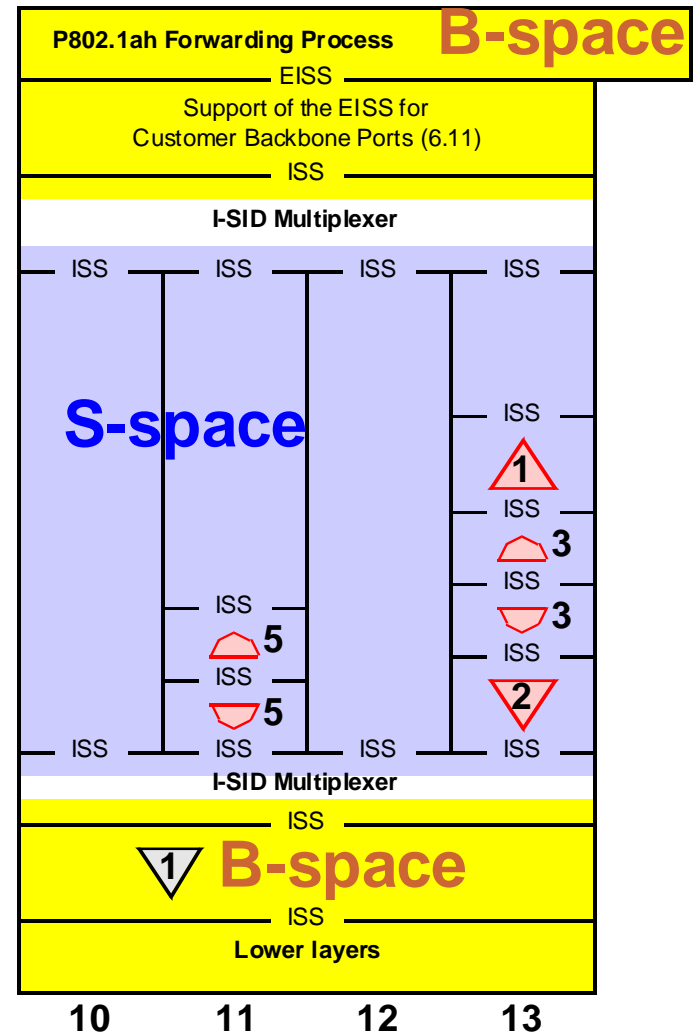
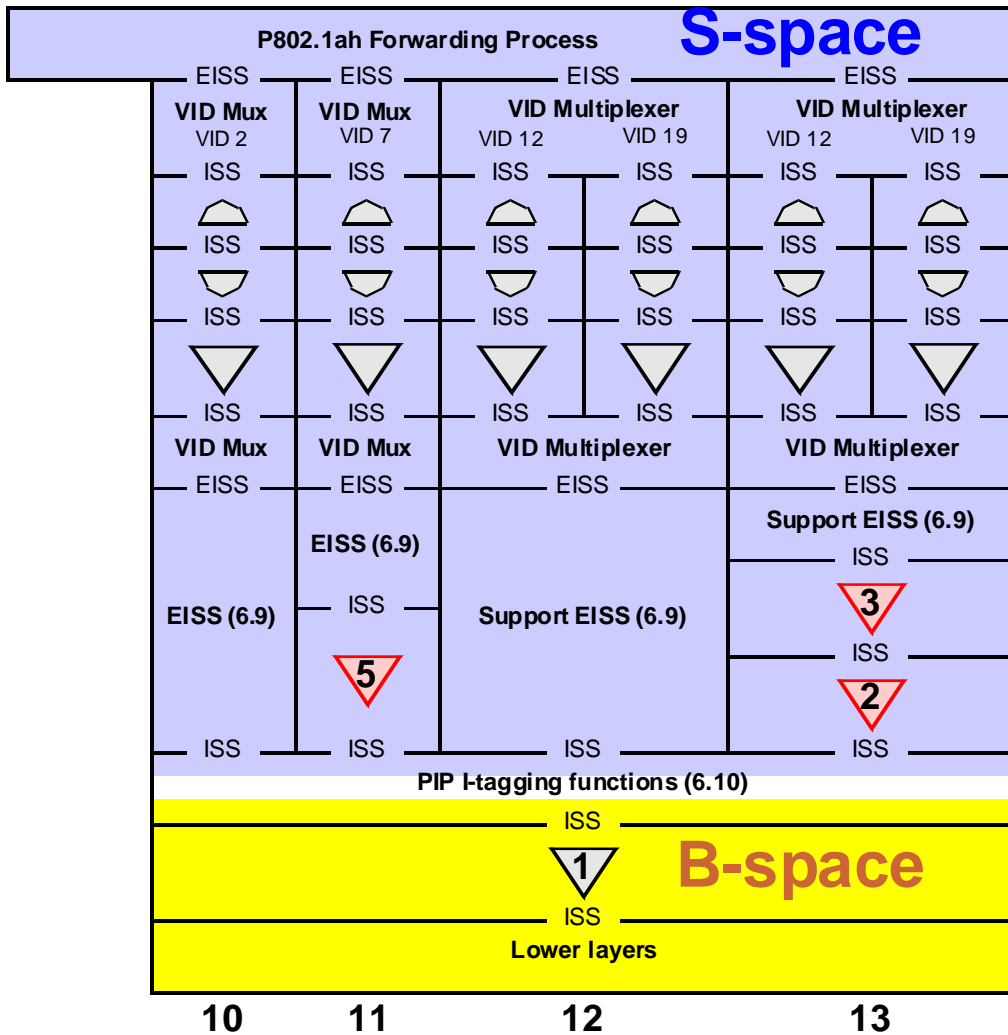
Required CBP structure

- In draft 3.2 the Customer Backbone Port (CBP) functions in subclause 6.9 support an EISS at the relay using an ISS from the MAC. There are no interfaces in the structure that are per service instance (per I-SID).
- 802.1ag added a new subclause that describes an EISS Multiplex Entity that examines the VLAN tag and separates the EISS into a set of per-VLAN ISS interfaces.
- We need an analogous structure that examines the I-TAG and separates an ISS into a set of per-ISID ISS interfaces.
- We can then configure CFM shims on the per-ISID ISS interfaces.
- Do the `destination_address` and `source_address` parameter values passed to the CFM shims come from the B-DA/B-SA fields (B-Space model) or the C-DA/C-SA fields (S-Space model)?

Norm's S-Space Model

Provider Instance Port

Customer Backbone Port



S-Space model for PIP

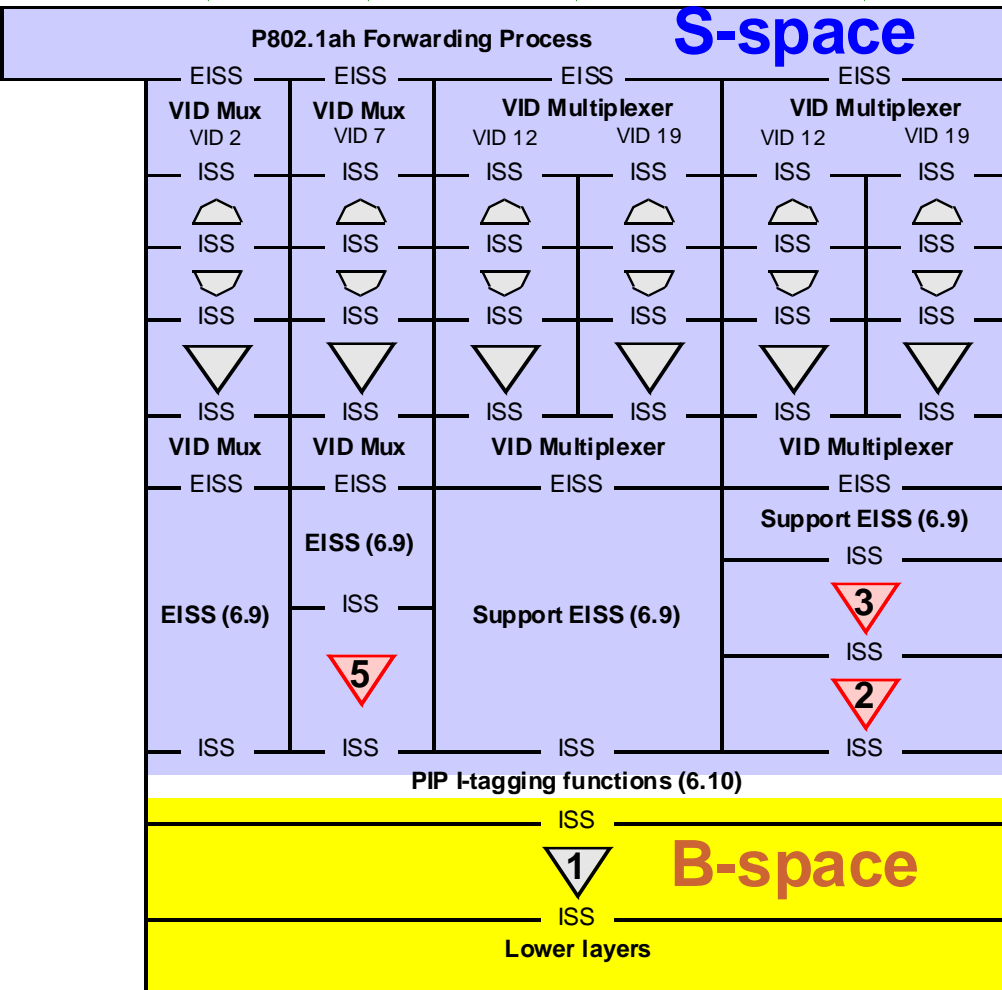
Virtual Instance Ports

Instantiating per S-VLAN
MPs at EISS of VIPs
(nothing new here)

S-tagging functions:

- Use 6.9 instead of embedding duplicate functions in 6.10
- Result is to expose ISS where can instantiate per-ISID MEPs
- 6.9 must pass connection_identifier EISS ↔ ISS

I-tagging functions in 6.10
(with S-tagging functions removed)

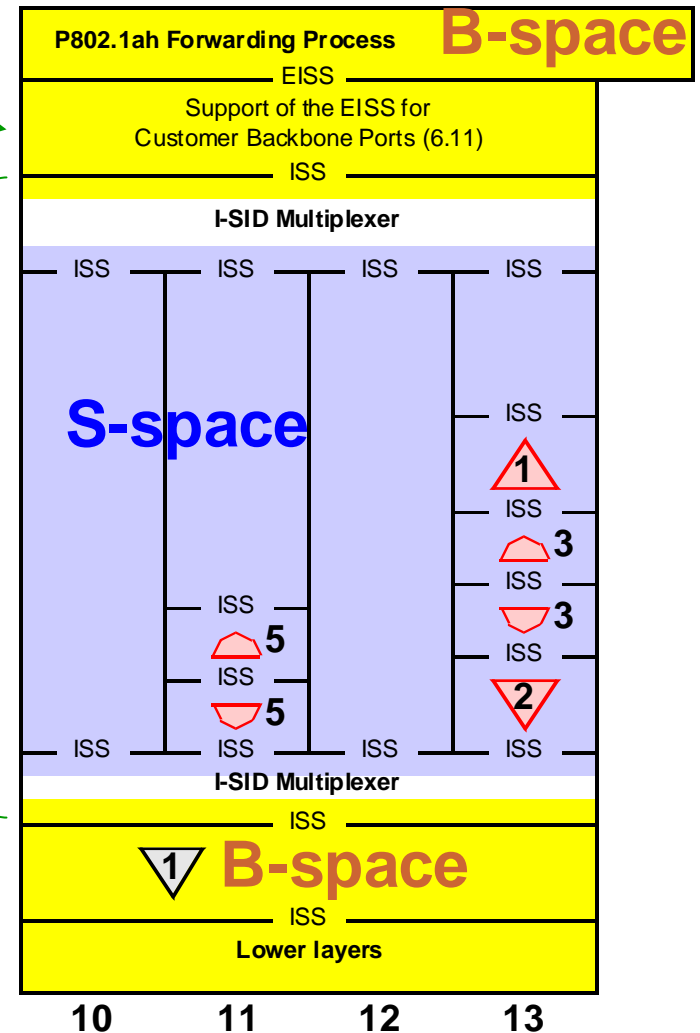


S-Space model for CBP

Current CBP support functions (6.11)

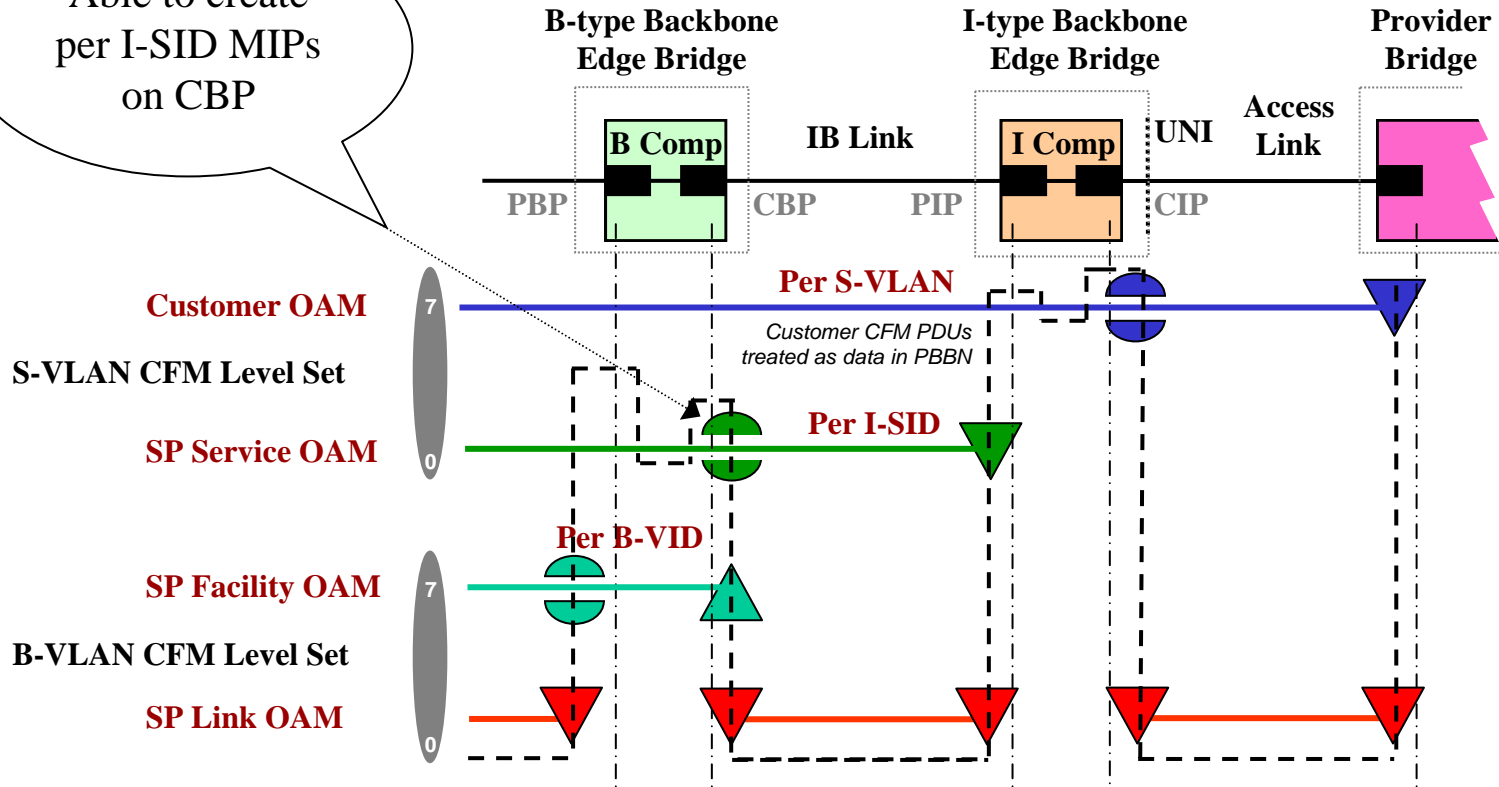
Back to back ISID Multiplex Entities:

- Removes/Inserts (long) I-tag
- Demux/Mux based on ISID
 - Expose a set of per-ISID ISS interfaces where can instantiate MEPs and MIPs
- Parameters at per-ISID ISS (and therefore at CFM shim):
 - Connection_identifier \Leftrightarrow B-DA:B-SA
 - Destination_address \Leftrightarrow C-DA
 - Source_address \Leftrightarrow C-SA



CFM as delivered by S-Space Model

Able to create per I-SID MIPs on CBP

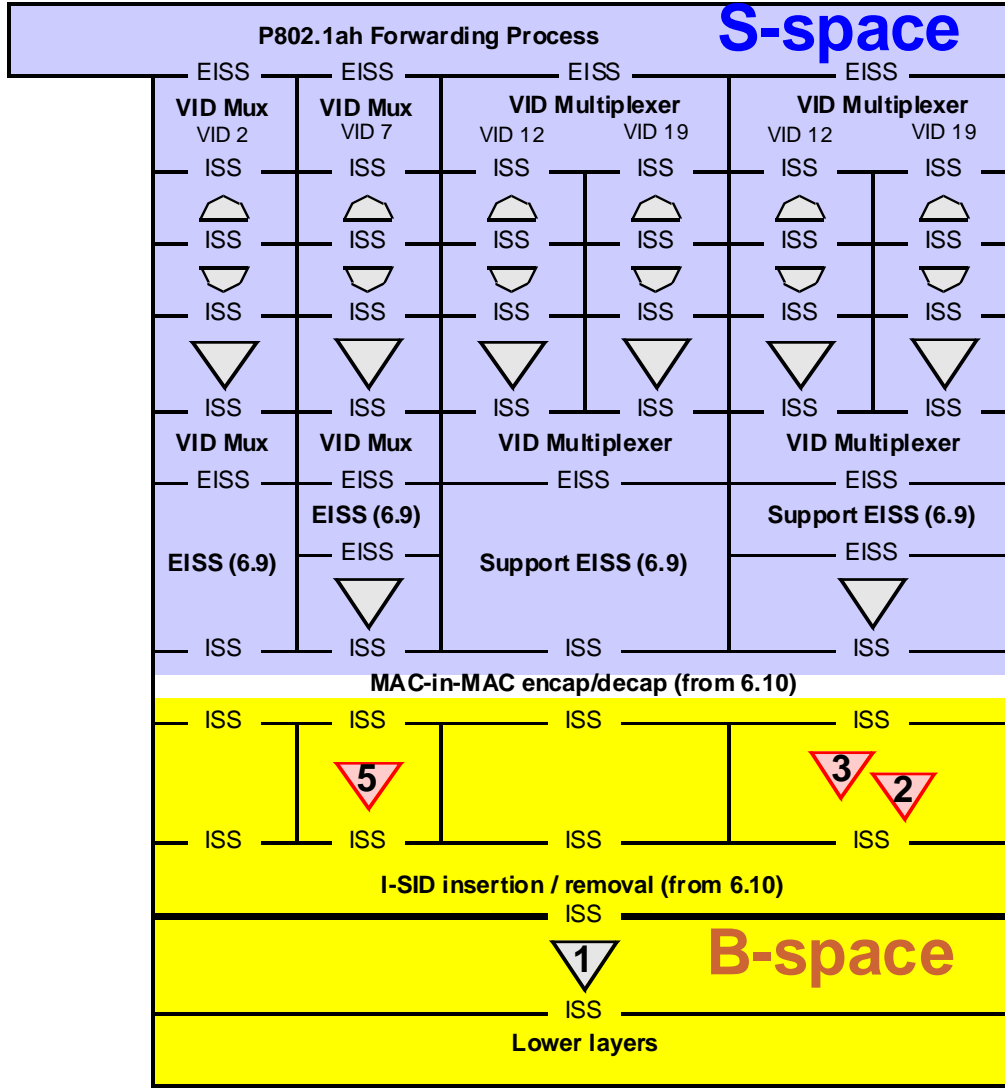


This is just what we asked for !

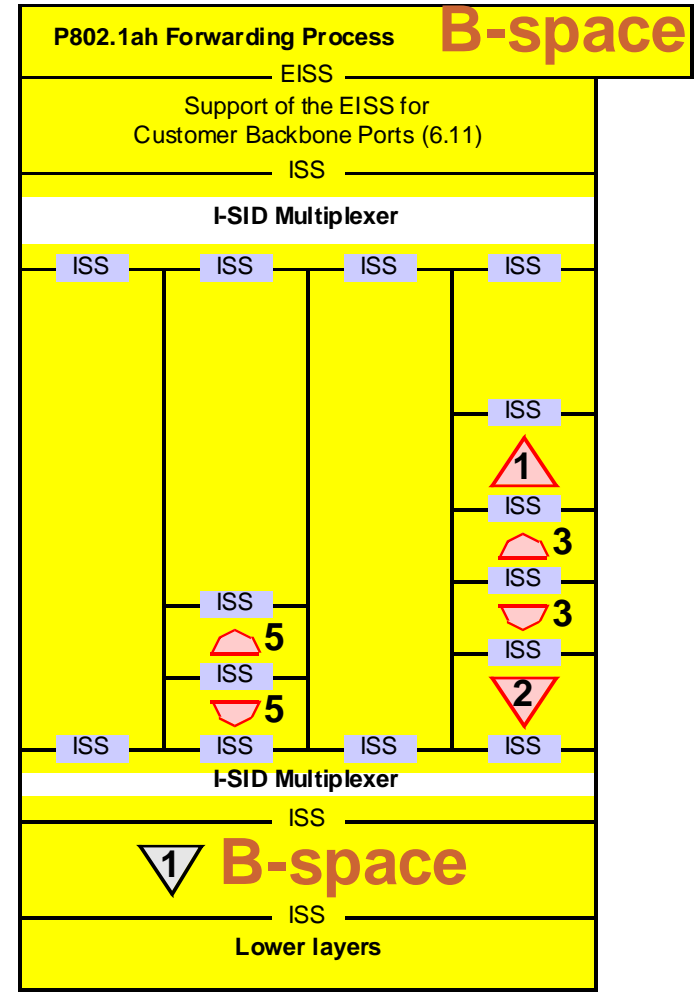
[Modified from ah-martin-CFM-MPs-frames-1106]

Norm's B-Space Model

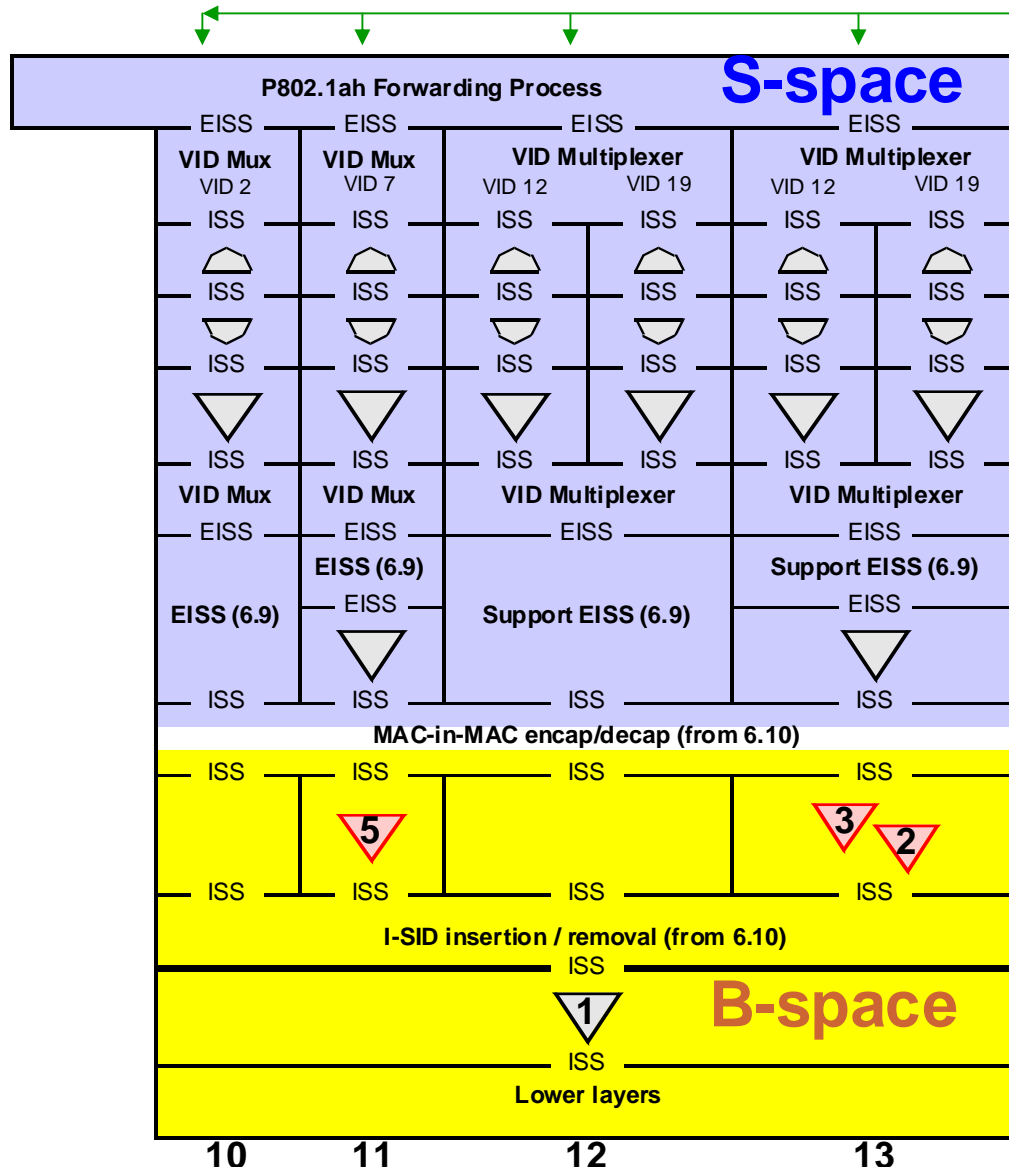
Provider Instance Port



Customer Backbone Port



B-Space model for PIP



Virtual Instance Ports

Instantiating per S-VLAN
MPs at EISS of VIPs
(nothing new here)

S-tagging functions:

- Could separate out of 6.10, but CFM frames from these MEPs will not be visible at CBP.

Separate functions in 6.10

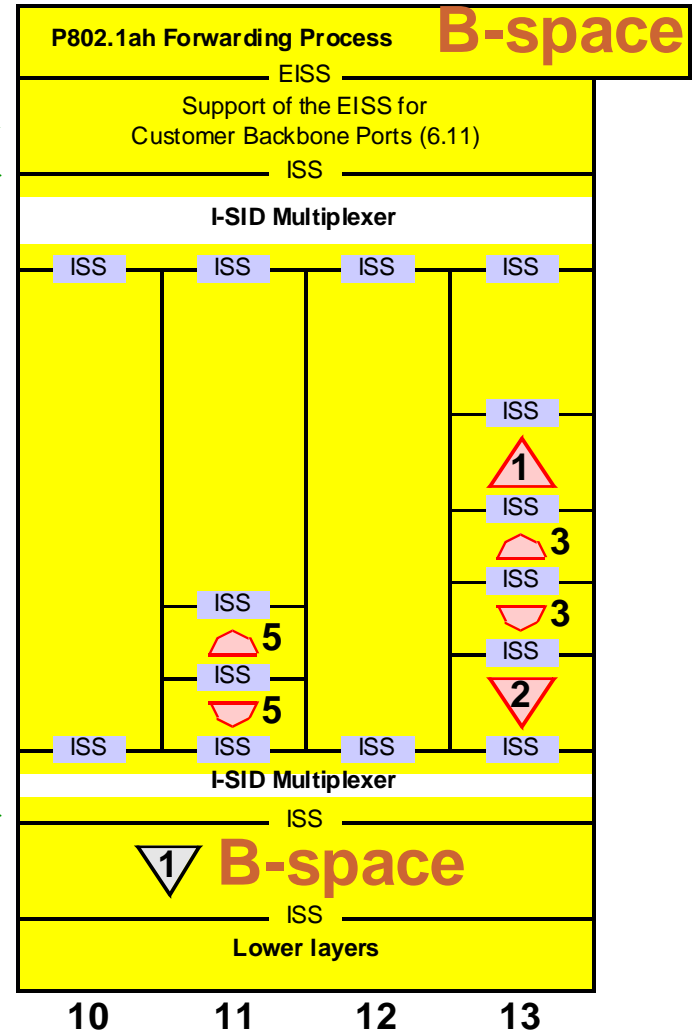
- Create per-ISID ISS between the M-in-M encap functions and ISID insertion functions.
- Various options on how it affects I-tag and frame format.
- CFM frames from these MEPS will be visible at CBP

B-Space model for CBP

Current CBP support functions (6.11)

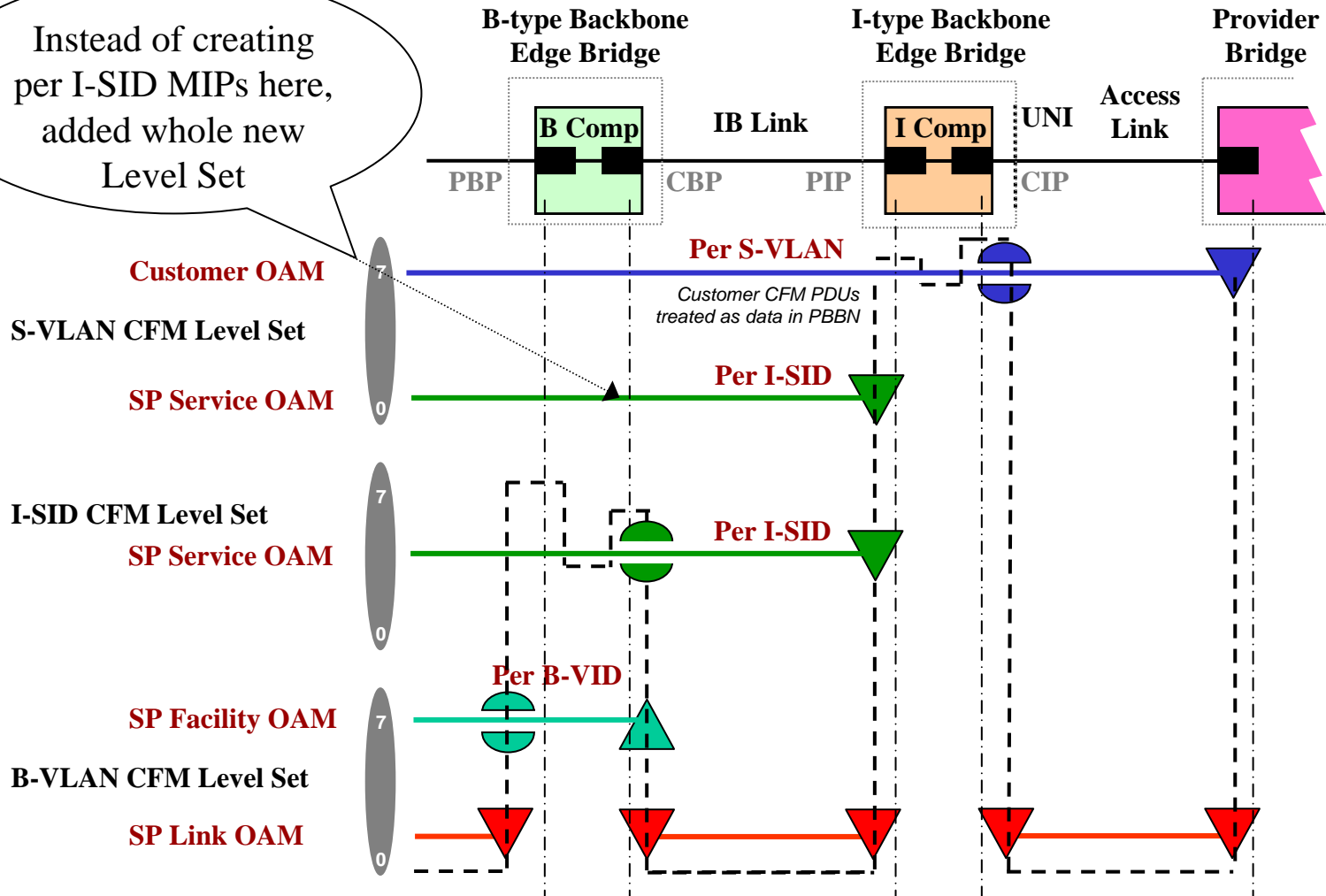
Back to back ISID Multiplex Entities:

- Removes/Inserts I-SID
 - Does not decap M-in-M
- Demux/Mux based on ISID
 - Expose a set of per-ISID ISS interfaces where can instantiate MEPs and MIPs
- Parameters at per-ISID ISS (and therefore at CFM shim):
 - Connection_identifier ⇔ not used
 - Destination_address ⇔ B-DA
 - Source_address ⇔ B-SA



CFM as delivered by B-Space model

Instead of creating per I-SID MIPs here, added whole new Level Set

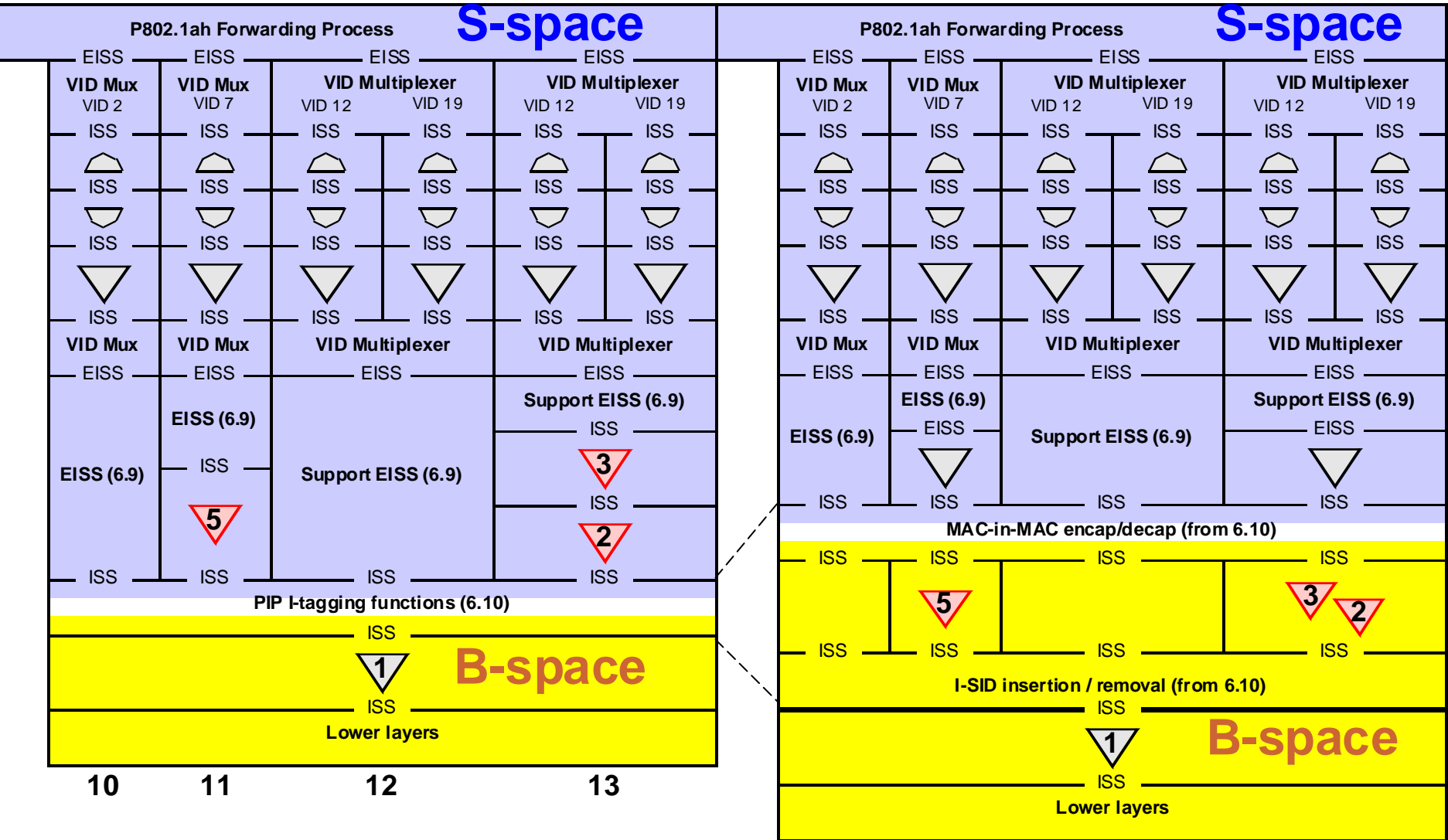


This is a bit more than we asked for !

PIP options side-by-side

S-Space Model

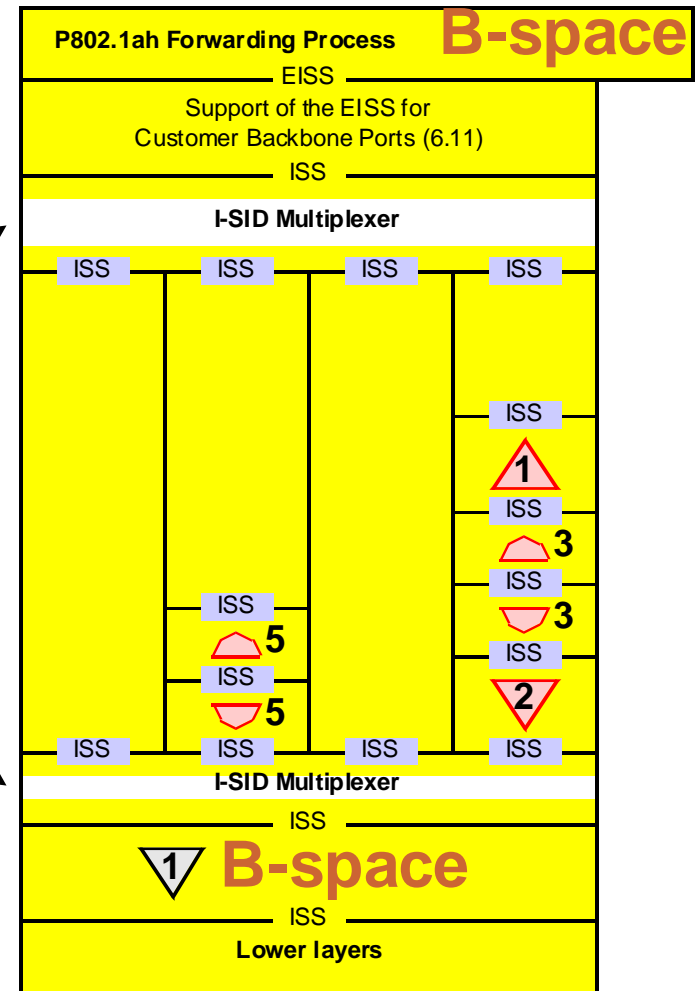
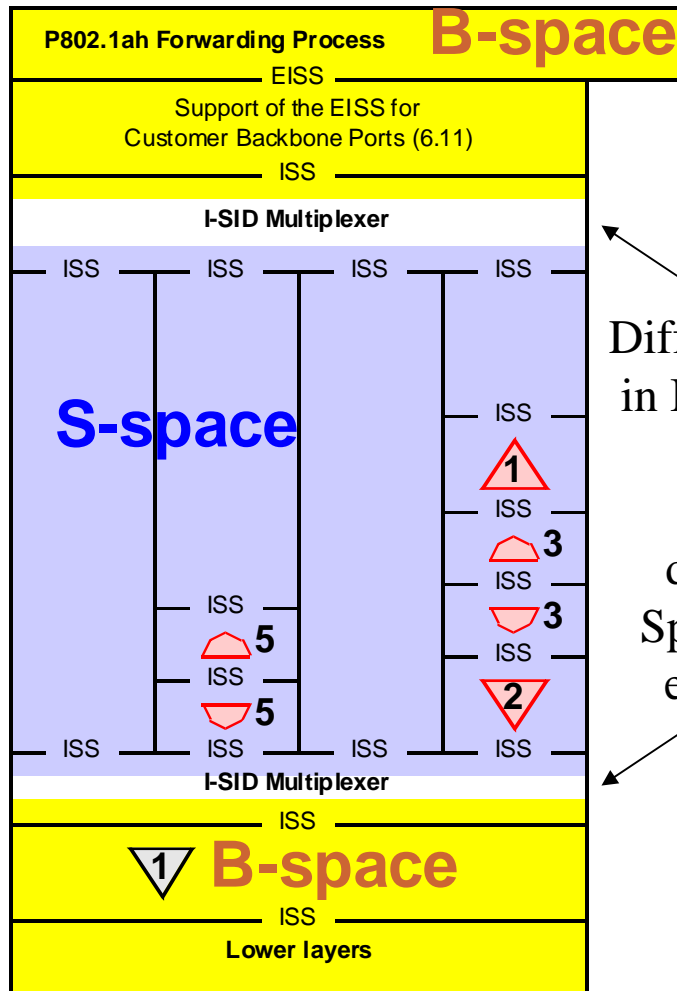
B-Space Model



CBP options side-by-side

S-Space Model

B-Space Model



Differences embedded in I-SID Multiplexer.

Details vary depending on B-Space model frame encoding option.

10 11 12 13

10 11 12 13

Issues for evaluating models

1. CFM Frame Addressing
2. CFM Address spaces and MD Level sets
3. Tag Structure & Frame Encoding
 - And what goes on “beneath the covers” in the interface stack diagram

CFM Frame Addressing

What goes in B-DA/B-SA fields of a frame generated by one of these per-ISID CFM shims?

- **B-Space Model:**

The `destination_address` and `source_address` parameters from the CFM shim go in the **B-DA** and **B-SA** fields.

- **S-Space Model:**

The `destination_address` and `source_address` parameters from the CFM shim go in the **C-DA** and **C-SA** fields.

The backbone addresses come from the `connection_identifier` parameter.

There are three options for how to use the `connection_identifier` to create the **B-DA** and **B-SA** fields:

CFM Frame Addressing (S-Space options)

Option 1: Connection_identifier parameter is NULL.

- In draft 3.3 this resulted in B-DA \leq Broadcast, so CFM frame broadcast throughout a B-VLAN. (Norm hated this !)
- In draft 3.4 this results in B-DA \leq Multicast address formed from ISID, so allows pruning multicast tree to distribute CFM frames only to ISID endpoints. (This is better !)

Not optimum for unicast CFM frames !

Option 2: Connection_identifier parameter contains the same value as the destination_address parameter.

- B-DA gets CFM destination address, just as in B-Space model.
- If CFM address is multicast, it will be broadcast throughout B-VLAN.

Not optimum for multicast CFM frames (e.g. CCM) !

Option 3: Connection_identifier parameter contains the same value as the destination_address parameter if unicast; otherwise is NULL.

Optimum for both unicast and multicast CFM frames !

Address Spaces & MD Level Sets

S-Space: In this model the per-ISID CFM shims at PIPs and CBPs will “see” any customer CFM frames that are not S-tagged.

- CFM shim uses MD Level to determine whether to act upon the frame. Means the MD Level used by these shims comes from the S-VLAN CFM Level Set.
- The port address used by these shims cannot overlap any customer addresses (?). Effectively means they must be global addresses.

B-Space: In this model the per-ISID CFM shims at PIPs and CBPs will never “see” any customer CFM frames.

- The fundamental constraint on the interface stack architecture, tag structure, and frame format is to guarantee this.
- Means the MD Level used by these shims is independent of the S-VLAN CFM Level Set (uses new I-SID CFM Level Set).
- The port addresses used by these shims could overlap customer addresses, but cannot overlap addresses of other backbone providers interconnected by peer NNIs. Effectively means they must be global addresses.

Tag Structure & Frame Encoding

S-Space model:

B addr	(Long) I-type	I-SID	Cust Addr	Customer Type & PDU
				CFM Type & PDU

- No change to current encoding of customer frames

B-Space model (“natural encoding”):

B addr	(Short) I-type	I-SID	EE Type	Cust Addr	Customer Type & PDU
			CFM Type & PDU		

- When split 6.10 into two sub-layers (M-in-M encap/decap and I-tag insert/remove), use a different tag with a different type for each sub-layer.
- Changes encoding of customer frames.

B-Space frame encoding variations

Two I-tag types:

B addr	(Long) I-type	I-SID	Cust Addr	Customer Type & PDU
	(Short) I-type	I-SID	CFM Type & PDU	

Single I-tag type with two sub-types:

B addr	I-type	0 I-SID	Cust Addr	Customer Type & PDU
		1 I-SID	CFM Type & PDU	

- No change to current encoding of customer frames.
- To correctly parse frame after removing I-type and I-SID, require either:
 - Adding a type-of-SDU parameter to ISS and making shims (e.g. CFM) aware of it so they parse frames (as in Norm's presentation); or
 - Creating a bypass so frames with customer address fields go around shims (as in current draft 6.15, or as in Paul's comment #331); or
 - Translating the "variation" to the "natural" encoding in the I-tag insert/remove functions of 6.10 and the ISID Multiplex Entity 6.15.

More B-Space frame encoding variations

Variations with Pad:

- Add 12 bytes of zeros to make all I-tag variations the same length.
- In the third format below, the pad itself differentiates the I-tag types.

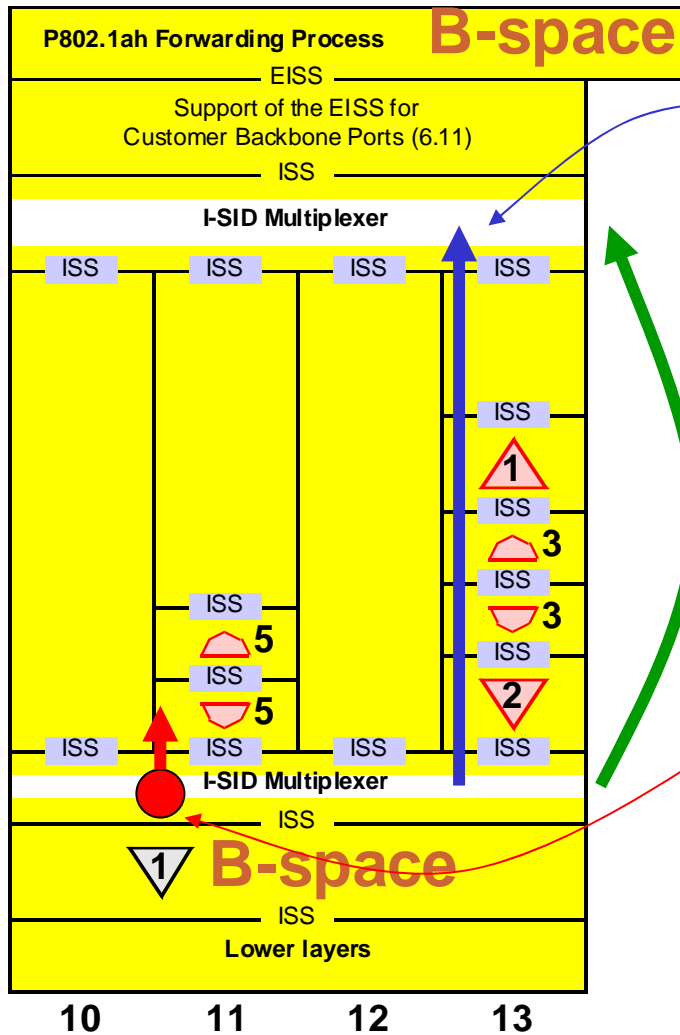
B addr	(Long) I-type	I-SID	Cust Addr	Customer Type & PDU
	(Short) I-type	I-SID	Pad	CFM Type & PDU

B addr	I-type	0 I-SID	Cust Addr	Customer Type & PDU
		1 I-SID	Pad	CFM Type & PDU

B addr	I-type	I-SID	Cust Addr	Customer Type & PDU
			Pad	CFM Type & PDU

- Same characteristics as variations on previous slide.

Parsing B-Space encoding variations



Option 1: Add a type-of-SDU parameter to ISS so shims can parse the SDU.

Option 2: Add a bypass around shims so they don't see SDUs containing customer addresses.

Option 3: Translate between "variation" and "natural" encoding so shims see all SDUs beginning with a Ethertype field.

Summary

S-VLAN Space model

B-VLAN Space model

Allows per-ISID MIPs at CBP	Allows per-ISID MIPs at CBP
Per-ISID MP Level comes from S-VLAN Level Set	Per-ISID MP Level comes from new I-SID Level Set
PIP/CBP addresses used for CFM cannot overlap customer or peer backbone addresses. Effectively must be global.	PIP/CBP addresses used for CFM cannot overlap peer backbone addresses. Effectively must be global.
CFM frame backbone addresses may be optimized for unicast, multicast, or both	CFM frame backbone addresses optimized for unicast, bad for multicast
Has a “natural” frame encoding that does not change the format of customer data frames on the PBBN	Has a “natural” frame encoding that changes the format of customer data frames. Has variations that do not change the format of customer data frames, but require kludges in the interface stack.

Recommendation

Use the S-Space Model