802.1ad Provider & Provider Edge Bridges

Provider Bridge

S-VLAN

PNP n n PNP

PNP n n PNP

PNP n n PNP

Provider Edge Bridge

Customer Systems

S-VLAN

PNP n

PNP n

PNP n

1 CNP PEP 1|n C-VLAN n CEP *C-tagged srvc i/f*
1 CNP PEP 1|n

1 CNP PEP 1|n C-VLAN n CEP *C-tagged srvc i/f*
1 CNP PEP 1|n

n CNP *S-tagged srvc i/f*

1 CNP *port based srvc i/f*

1|n bundling/multiplexing n client entities into 1 server entity

1 single instance/entities port   **n** n instance/entities port

802.1ad Provider & Provider Edge Bridges
S-VLAN MEP & MIP function locations

Provider Bridge

S-VLAN

PNP — **n** **n** — PNP

PNP — **n** **n** — PNP

PNP — **n** **n** — PNP

Provider Edge Bridge

Customer Systems

S-VLAN Comp.

PNP — **n**

CNP — **1** — **1|n** C-VLAN — PEP — **1|n** — **n** CEP — *C-tagged srvc i/f*

CNP — **1** — PEP — **1|n**

PNP — **n**

CNP — **1** — **1|n** C-VLAN — PEP — **1|n** — **n** CEP — *C-tagged srvc i/f*

CNP — **1** — PEP — **1|n**

1 CNP — *port based srvc i/f*

PNP — **n**

n CNP — *S-tagged srvc i/f*
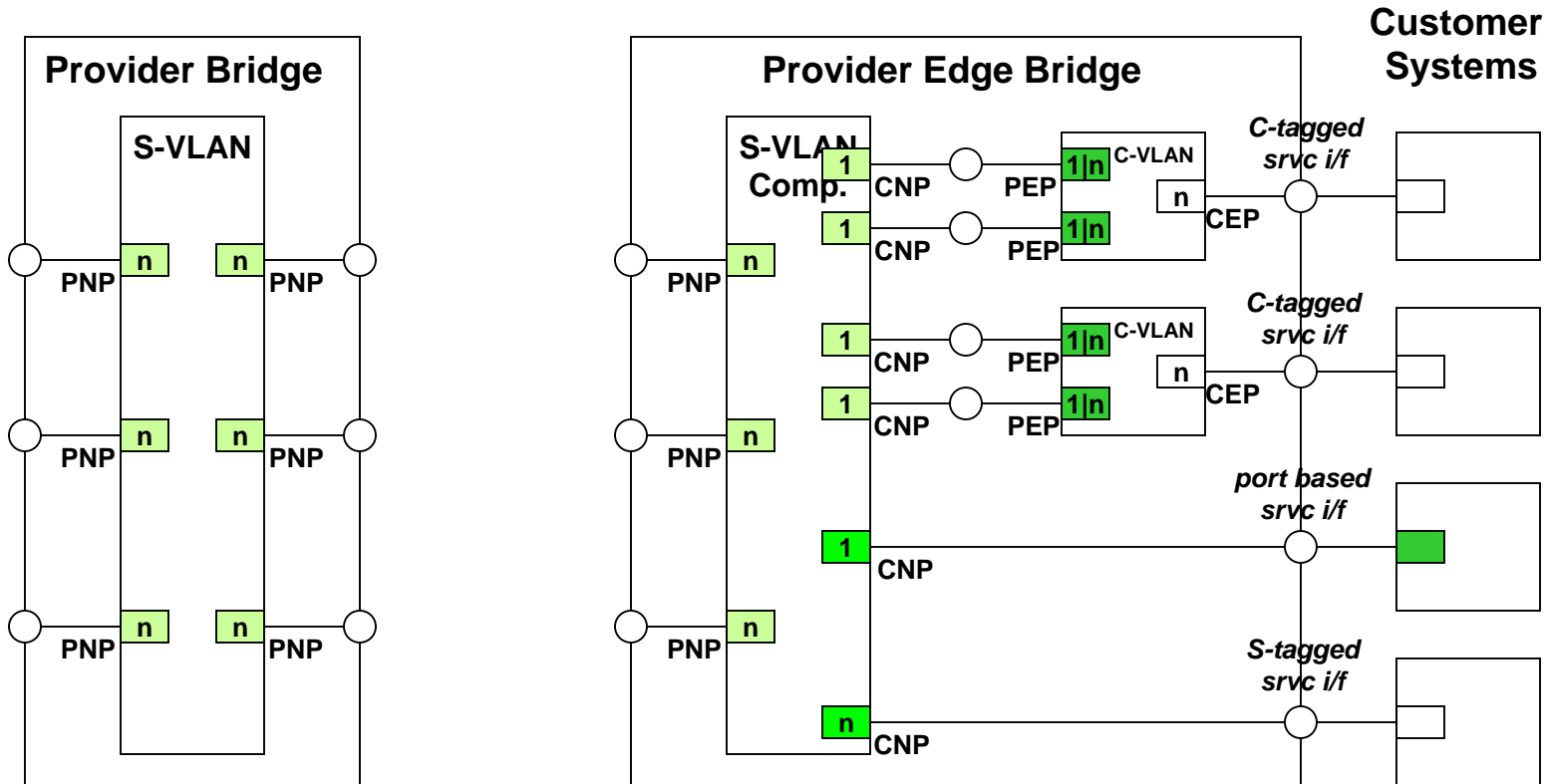
■ S-VLAN instance end point with S-VLAN MEP function

■ S-VLAN instance interm. point with S-VLAN MIP function

■ S-VLAN instance interm. point with S-VLAN-MIP & S-VLAN-MEP functions

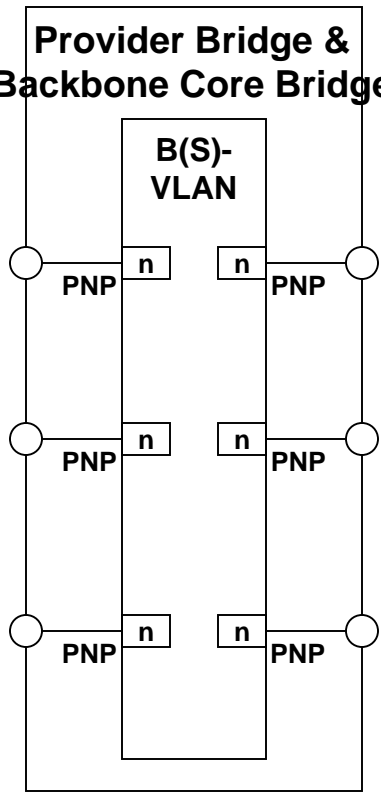**1|n** bundling/multiplexing n client entities into 1 server entity

1 single instance/entities port   **n** n instance/entities port

PB & PBB models / 2006-10-10

802.1ah Backbone Edge & Core Bridges

Backbone-MAC Service Boundary

Backbone-MAC Provider | Backbone-MAC Client

Customer Systems

Backbone Edge Bridge

Provider Bridge & Backbone Core Bridge

B(S)-VLAN
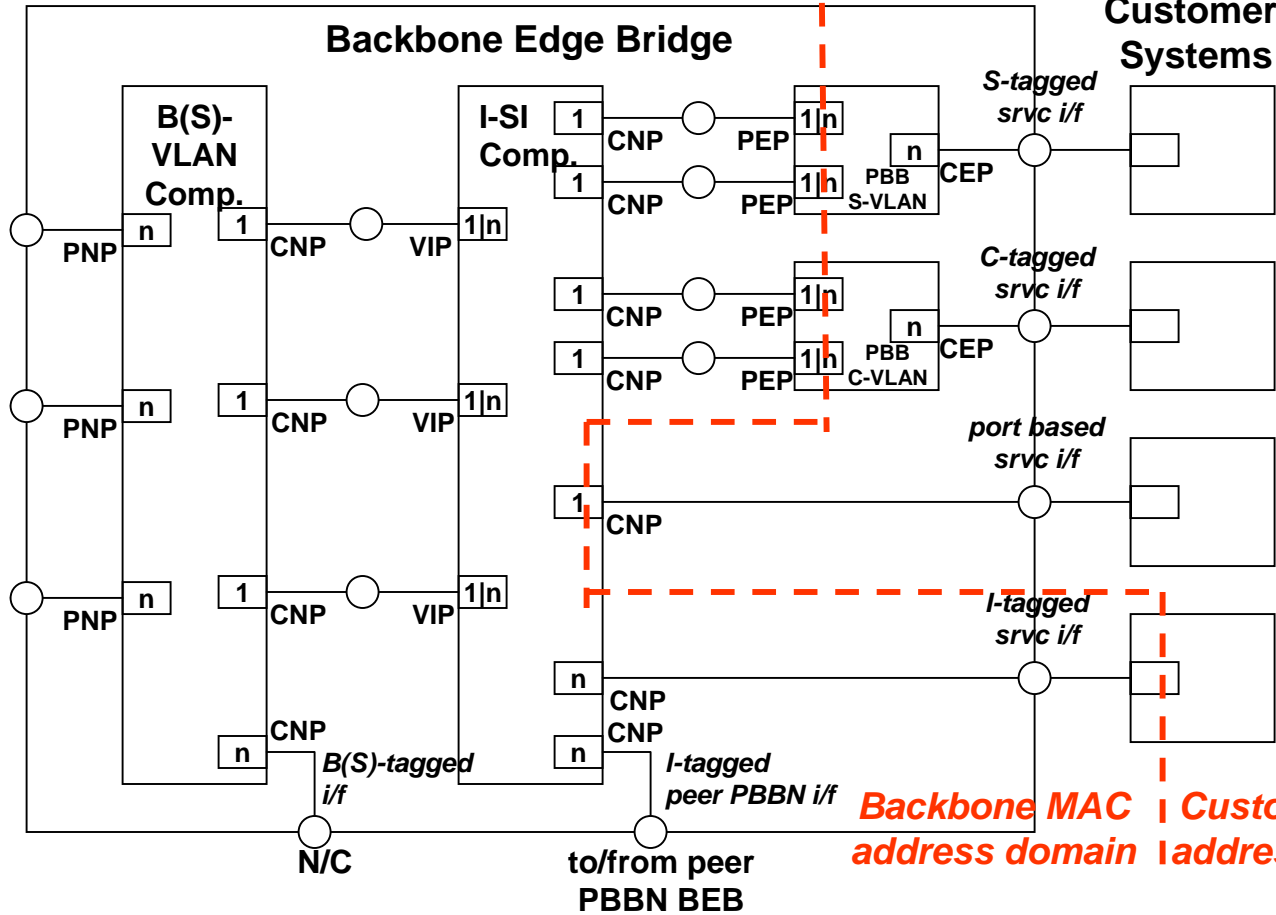
B(S)-VLAN Comp.

I-SI Comp.

PNP

PNP

PNP

PNP

PNP

PNP

PNP

PNP

PNP

n

CNP

VIP

1|n

CNP

PEP

1|n

n

PBB S-VLAN

CEP

S-tagged srvc i/f

CNP

PEP

1|n

CNP

VIP

1|n

CNP

PEP

1|n

n

PBB C-VLAN

CEP

C-tagged srvc i/f

CNP

PEP

1|n

CNP

VIP

1|n

CNP

port based srvc i/f

CNP

CNP

I-tagged srvc i/f

CNP *B(S)-tagged i/f*

CNP *I-tagged peer PBBN i/f*

N/C

to/from peer PBBN BEB

Backbone MAC address domain | *Customer MAC address domain*

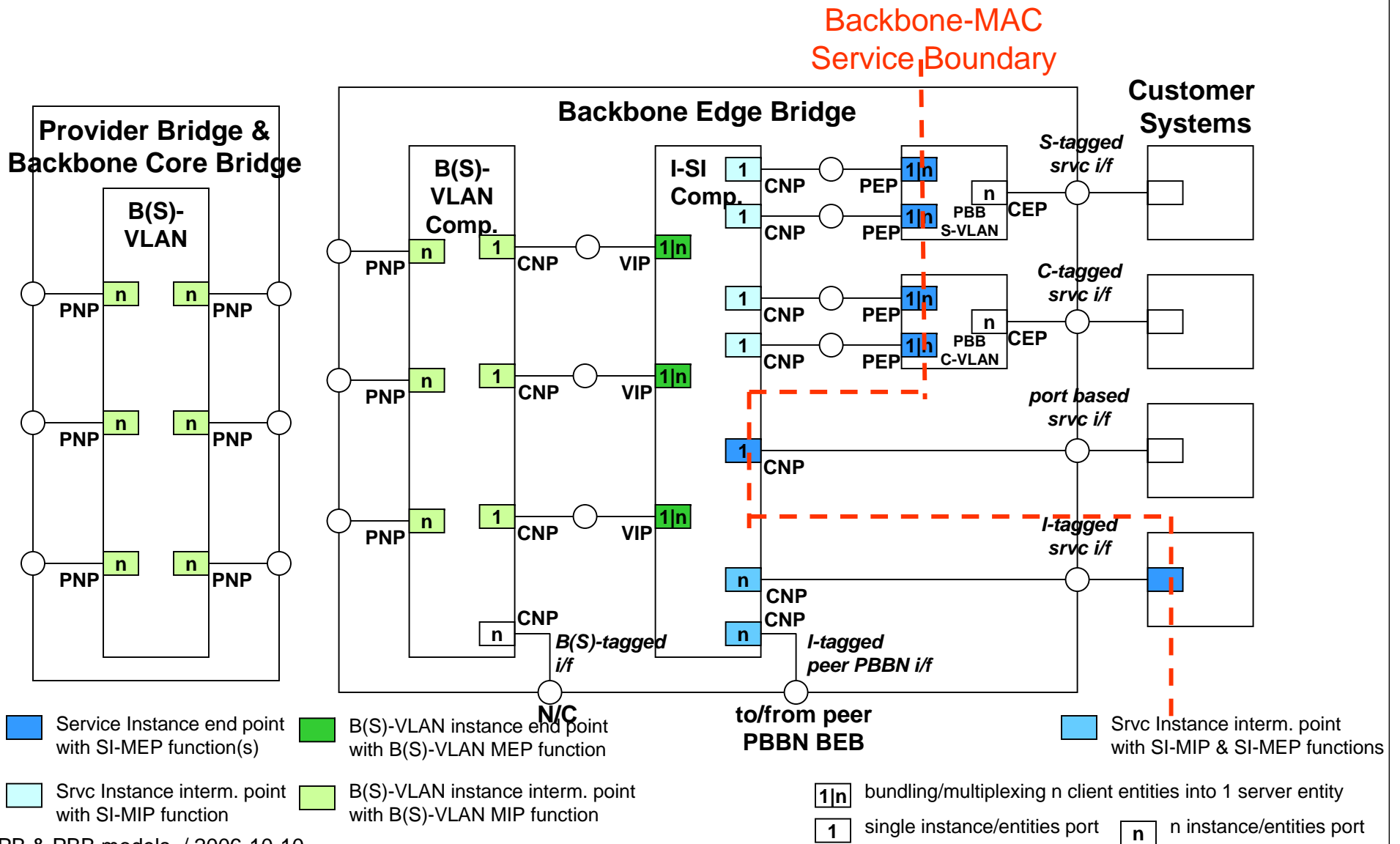| 1\|n | bundling/multiplexing n client entities into 1 server entity |
| 1 | single instance/entities port |
| n | n instance/entities port |

PB & PBB models / 2006-10-10

802.1ah Backbone Edge & Core Bridges I-SI and B(S)-VLAN MEP & MIP function locations
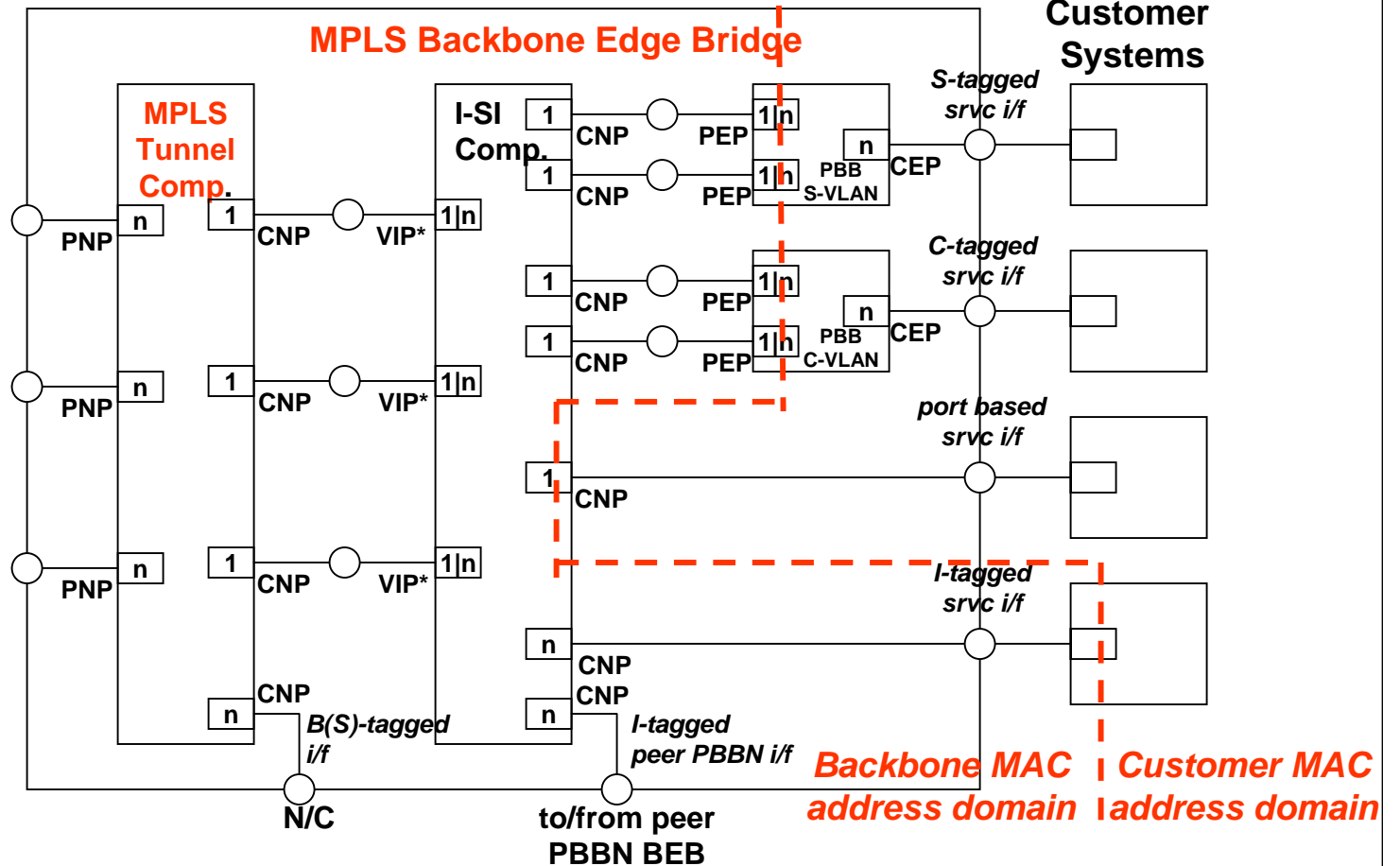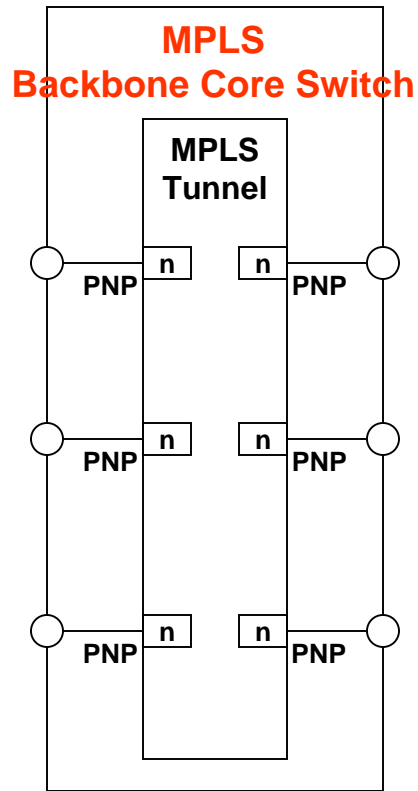

PB & PBB models / 2006-10-10

Hybrid 802.1ah/MPLS Backbone Edge Bridge & MPLS Backbone Core Switch

- (H)VPLS combines MPLS PW (i.e. service instance) and Tunnel layers with an Ethernet Service Instance layer

- To scale HVPLS the Ethernet Service Instance layer should be the PBB Service Instance layer

- PBB and MPLS Backbone Edge Bridges have same architecture
  - main difference are
    - B-VLAN component is replaced by MPLS Tunnel component
    - I-SID and PCP/DE are replaced by MPLS PW label and EXP ➔ I.e. I-SI component translates in its VIP* port its Relay VID into PW label (instead into I-SID)
    - B-VID and PCP/DE are replaced by MPLS Tunnel label and EXP

Hybrid 802.1ah/MPLS Backbone Edge Bridge & MPLS Backbone Core Switch

Backbone-MAC Service Boundary

Backbone-MAC Provider | Backbone-MAC Client

Customer Systems

MPLS Backbone Core Switch

MPLS Backbone Edge Bridge

MPLS Tunnel

MPLS Tunnel Comp.

I-SI Comp.

PNP   n   PNP

PNP   n   PNP

PNP   n   PNP

PNP   n   1   CNP   VIP*   1|n

PNP   n   1   CNP   VIP*   1|n

PNP   n   1   CNP   VIP*   1|n

n   CNP

B(S)-tagged i/f

N/C

1   CNP   PEP   1|n   *S-tagged srvc i/f*
1   CNP   PEP   1|n   n   CEP   PBB S-VLAN

1   CNP   PEP   1|n   *C-tagged srvc i/f*
1   CNP   PEP   1|n   n   CEP   PBB C-VLAN

1   CNP   *port based srvc i/f*

n   CNP   CNP
n   CNP   *I-tagged srvc i/f*

I-tagged peer PBBN i/f

to/from peer PBBN BEB

Backbone MAC address domain | *Customer MAC address domain*

1	n	bundling/multiplexing n client entities into 1 server entity
1	single instance/entities port
n	n instance/entities port

PB & PBB models / 2006-10-10

Hybrid 802.1ah/MPLS Backbone Edge Bridge & MPLS Backbone Core Switch

Backbone-MAC
Service Boundary

Customer Systems

MPLS Backbone Edge Bridge

MPLS Backbone Core Switch

MPLS Tunnel

MPLS Tunnel Comp.

I-SI Comp.

S-tagged srvc i/f

PNP | n | n | PNP

PNP | n | 1 | CNP | VIP | 1|n

1 | CNP | 1|n | PEP

1 | CNP | 1|n | PEP | PBB S-VLAN | n | CEP

C-tagged srvc i/f

1 | CNP | 1|n | PEP

1 | CNP | 1|n | PEP | PBB C-VLAN | n | CEP

PNP | n | 1 | CNP | VIP | 1|n

PNP | n | n | PNP

port based srvc i/f

1 | CNP

PNP | n | 1 | CNP | VIP | 1|n

I-tagged srvc i/f

n | CNP

n | CNP

n | CNP | B(S)-tagged i/f

I-tagged peer PBBN i/f

N/C

to/from peer PBBN BEB

Legend

| | Service Instance end point with SI-MEP function(s) | | **Tunnel** instance end point with Tunnel MEP function | | Srvc Instance interm. point with SI-MIP & SI-MEP functions |

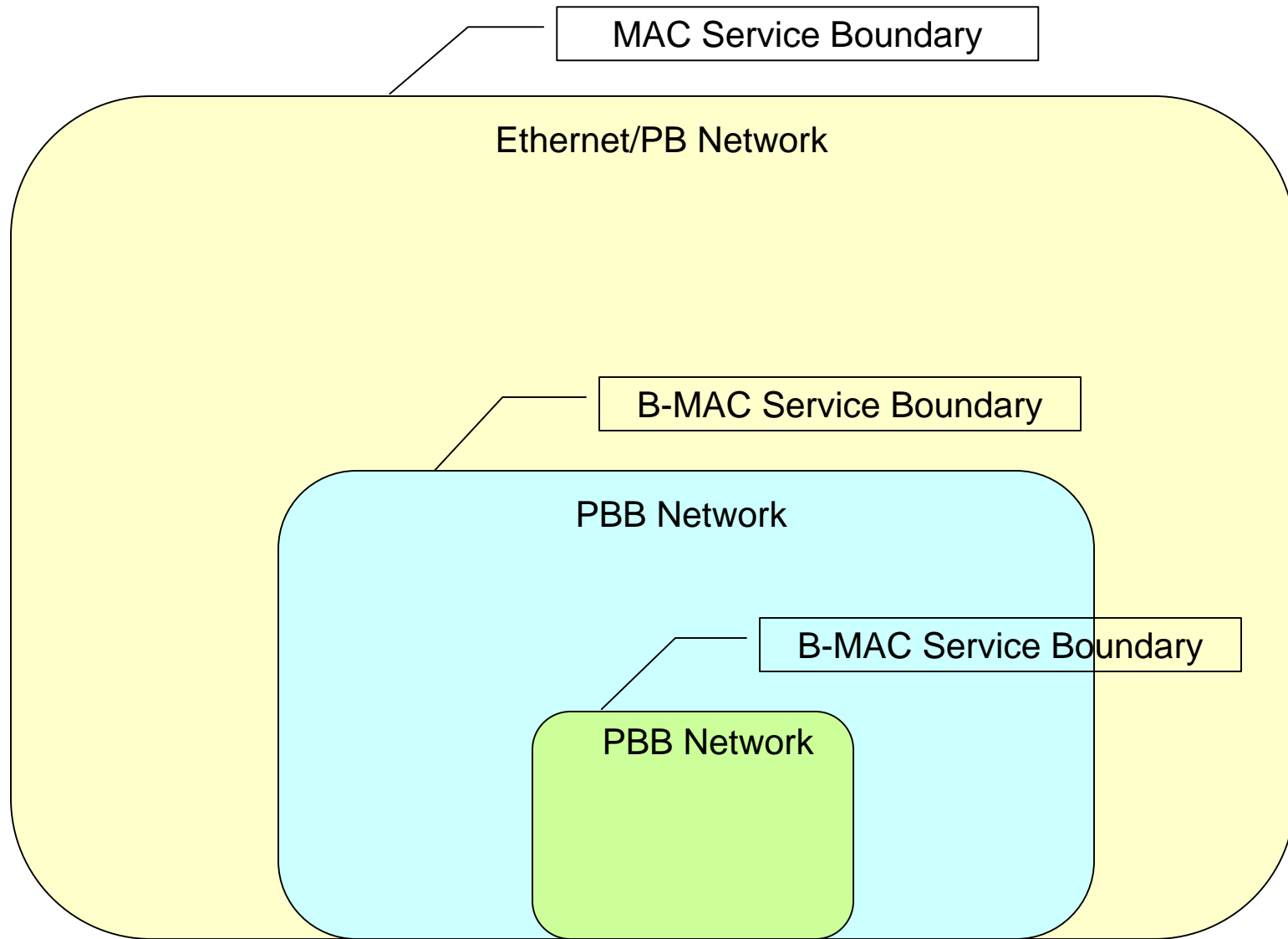| | Srvc Instance interm. point with SI-MIP function | | **Tunnel** instance interm. point with Tunnel MIP function |

1	n	bundling/multiplexing n client entities into 1 server entity
1	single instance/entities port
n	n instance/entities port

PB & PBB models / 2006-10-10

PBB provides B-MAC Services

MAC Service Boundary

Ethernet/PB Network

B-MAC Service Boundary

PBB Network

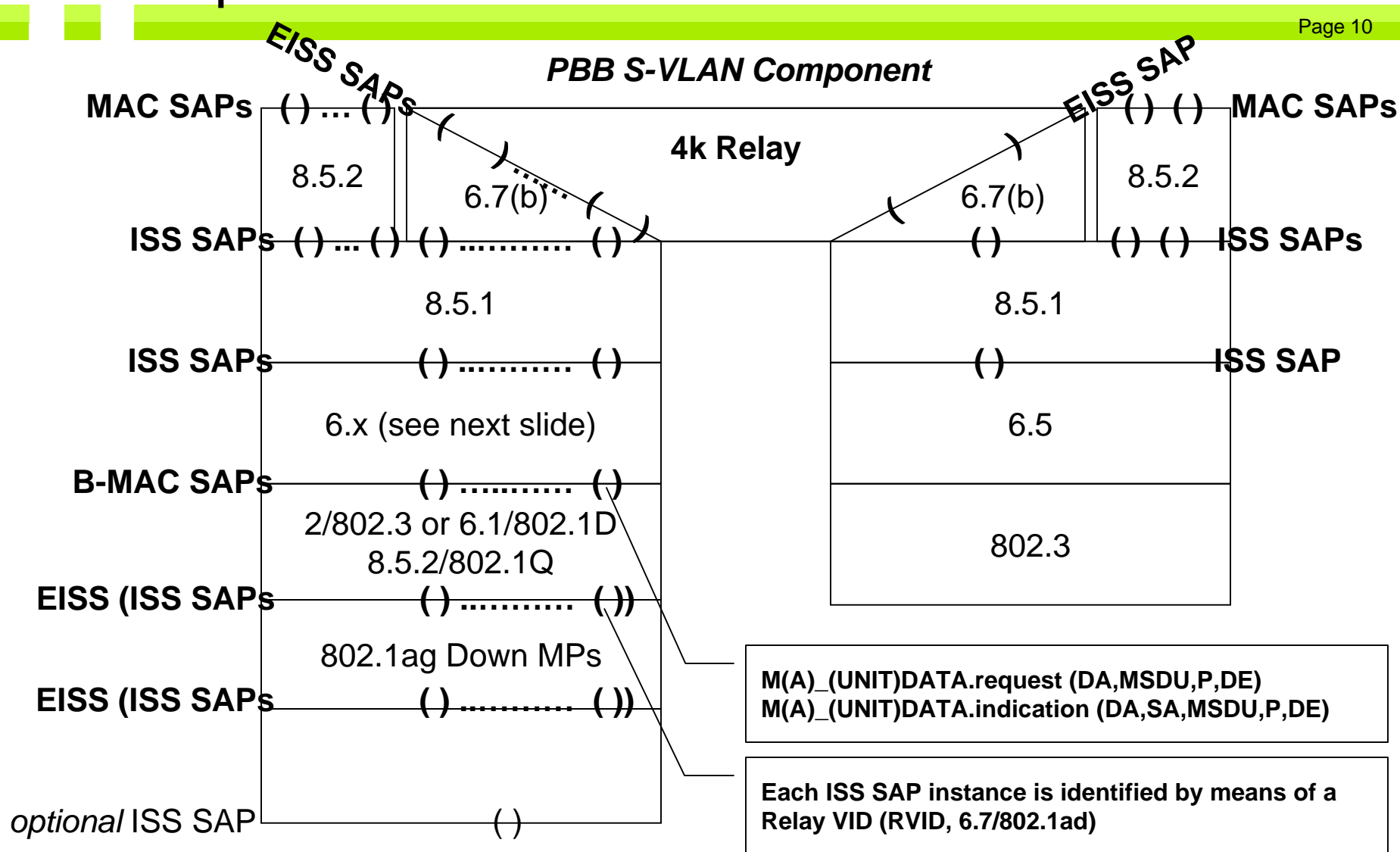B-MAC Service Boundary

PBB Network

PB & PBB models / 2006-10-10

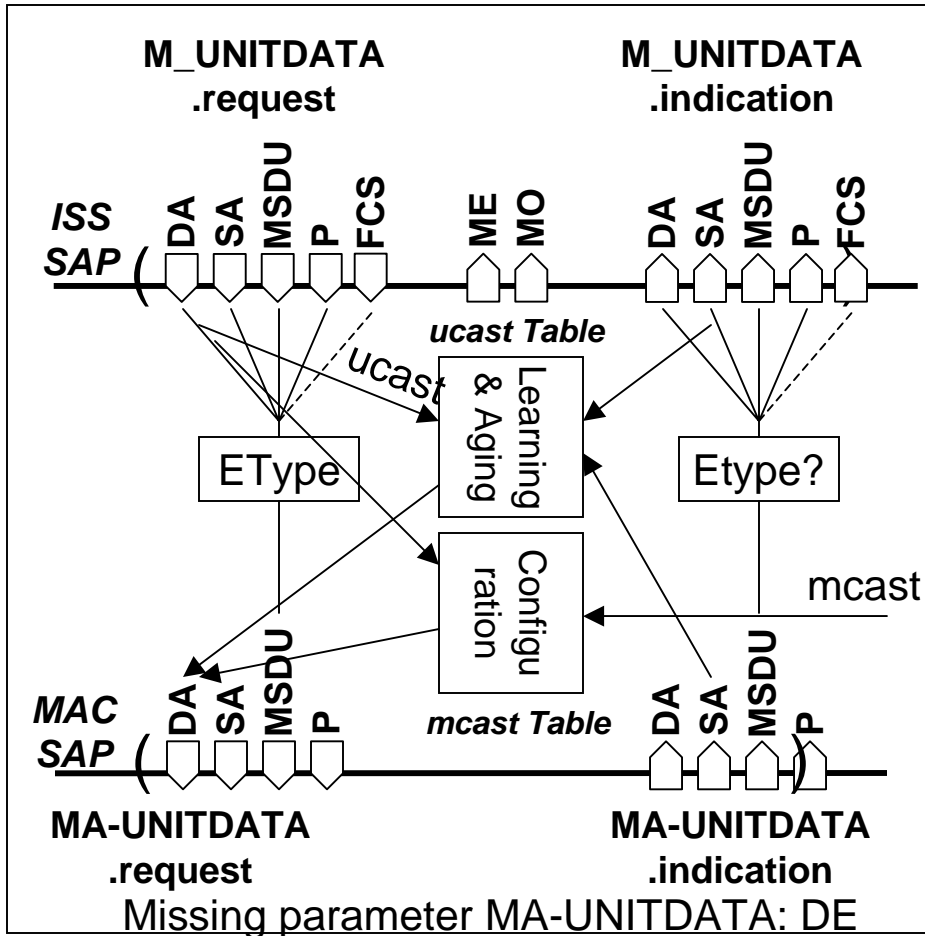# Customer Instance ⇔ Service Instance (PBB S-VLAN) Component

- **Proposed new "PBB S-VLAN Component" maps "Customer Instances" onto "Service Instances"**
- **PBB Service Instances provide B-MAC Service to customer**
- **PBB S-VLAN Component's PEPs include B-MAC SAPs and "ISS SAP into B-MAC SAP mapping"**
  - ISS SAP ⇔ B-MAC SAP mapping process to be defined in new clause 6.x (refer to slide 11)

- **802.1ad's Relay VID (RVID) should be used as generic ISS SAP identifier**
  - associated with both B-VLAN (trunk) instances and I-Service instances
  - VID translation function converts bridge-internal RVID into externally observable C-VID, S-VID, B-VID, I-SID, or other technology label format
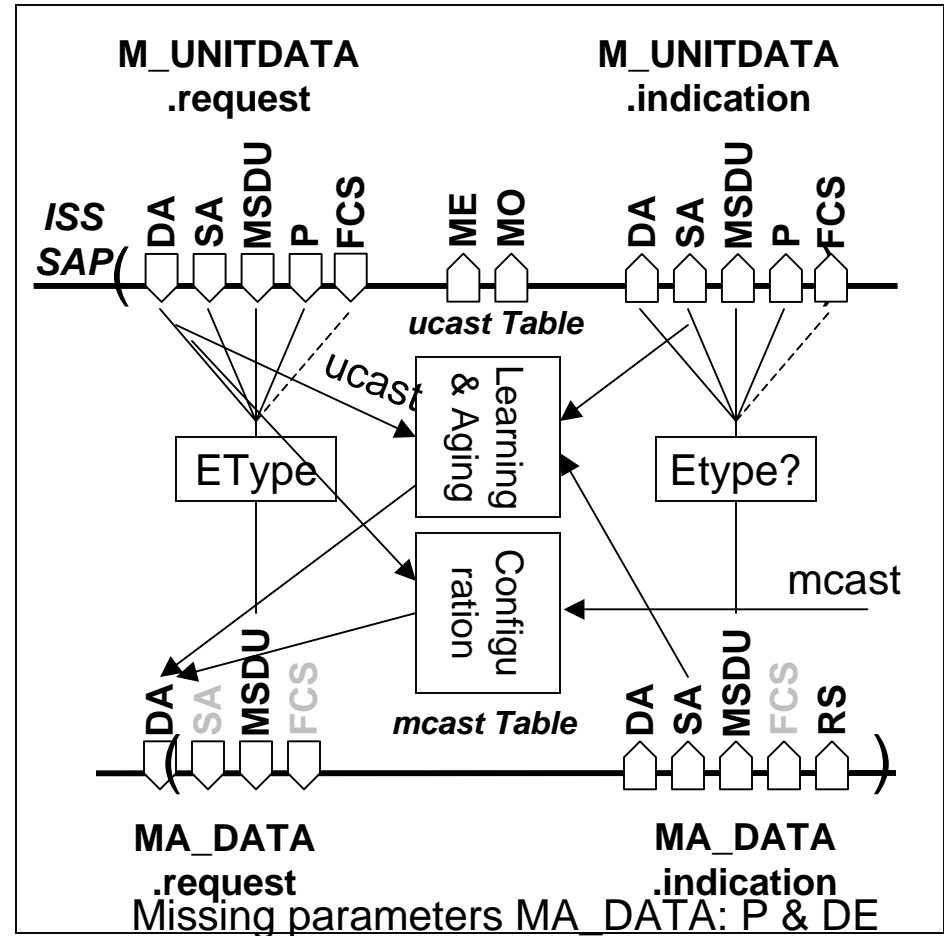
Customer Instance ⇔ Service Instance Component

EISS SAPs

PBB S-VLAN Component

EISS SAP

MAC SAPs ( ) ... ( )   ( ) ( ) **MAC SAPs**

4k Relay

8.5.2   8.5.2

6.7(b)   6.7(b)

ISS SAPs ( ) ... ( ) ( ) .... ( )   ( )   ( ) ( ) **ISS SAPs**

8.5.1   8.5.1

ISS SAPs ——————— ( ) .... ( )   ( ) ——————— **ISS SAP**

6.x (see next slide)   6.5

B-MAC SAPs ——————— ( ) .... ( )

2/802.3 or 6.1/802.1D   802.3
8.5.2/802.1Q

EISS (ISS SAPs ——————— ( ) .... ( ))

802.1ag Down MPs

M(A)_(UNIT)DATA.request (DA,MSDU,P,DE)
M(A)_(UNIT)DATA.indication (DA,SA,MSDU,P,DE)

EISS (ISS SAPs ——————— ( ) .... ( ))

optional ISS SAP ——————— ( )

Each ISS SAP instance is identified by means of a Relay VID (RVID, 6.7/802.1ad)

New clause 6.x/ 802.1ah

Alternative A: 6.1/802.1D

Alternative B: 2.3/802.3

Missing parameter MA-UNITDATA: DE

Missing parameters MA_DATA: P & DE

PB & PBB models / 2006-10-10

Resources

Following slides present considerations on resources in the bridge

- fabric unit
- interface port unit

and illustrate on which resources

- customer instances
- service instances
- trunk instances and
- physical link instances

start/end

Resources

Functional model of PEB, PB, BEB, BCB must be mapped onto Resource model, consisting of

- Fabric Units
- Interface Port Units

Fabric unit supports

- Bridge Relay Entity
  - Typical Relay Port bandwidths: 1G, 2.5G, 10G, 40G (and in the future: 100G)
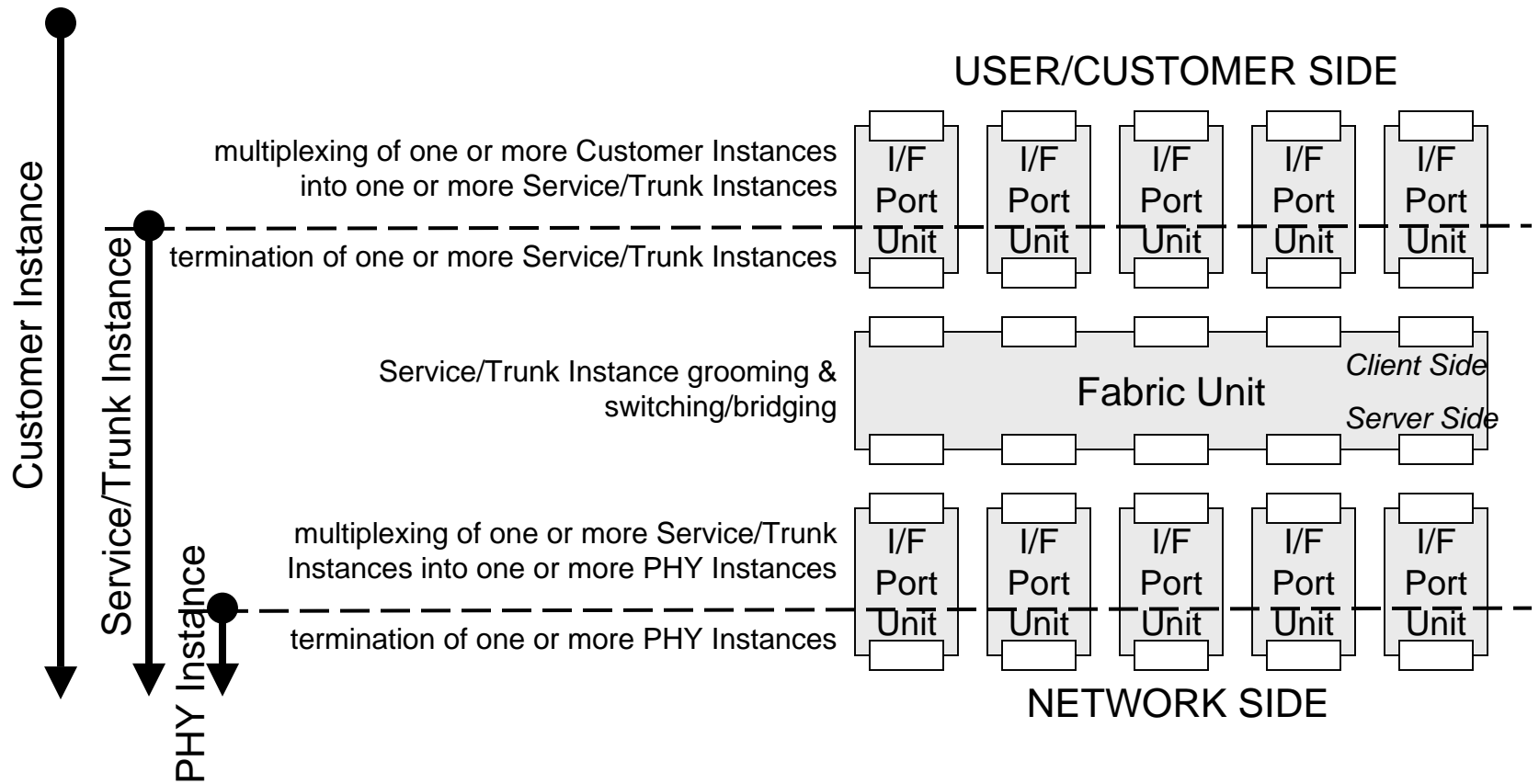
Interface Port unit may support

- Physical Media (PHY)
- Multiplexing/Demultiplexing ((DE)MUX)
- MEP and MIP functions (OAM)
- Mapping/Demapping ((DE)MAP) including bundling

Two types of equipment (ignoring service definition relays)

- Single Relay: PEB, PB, BCB, I-BEB, B-BEB
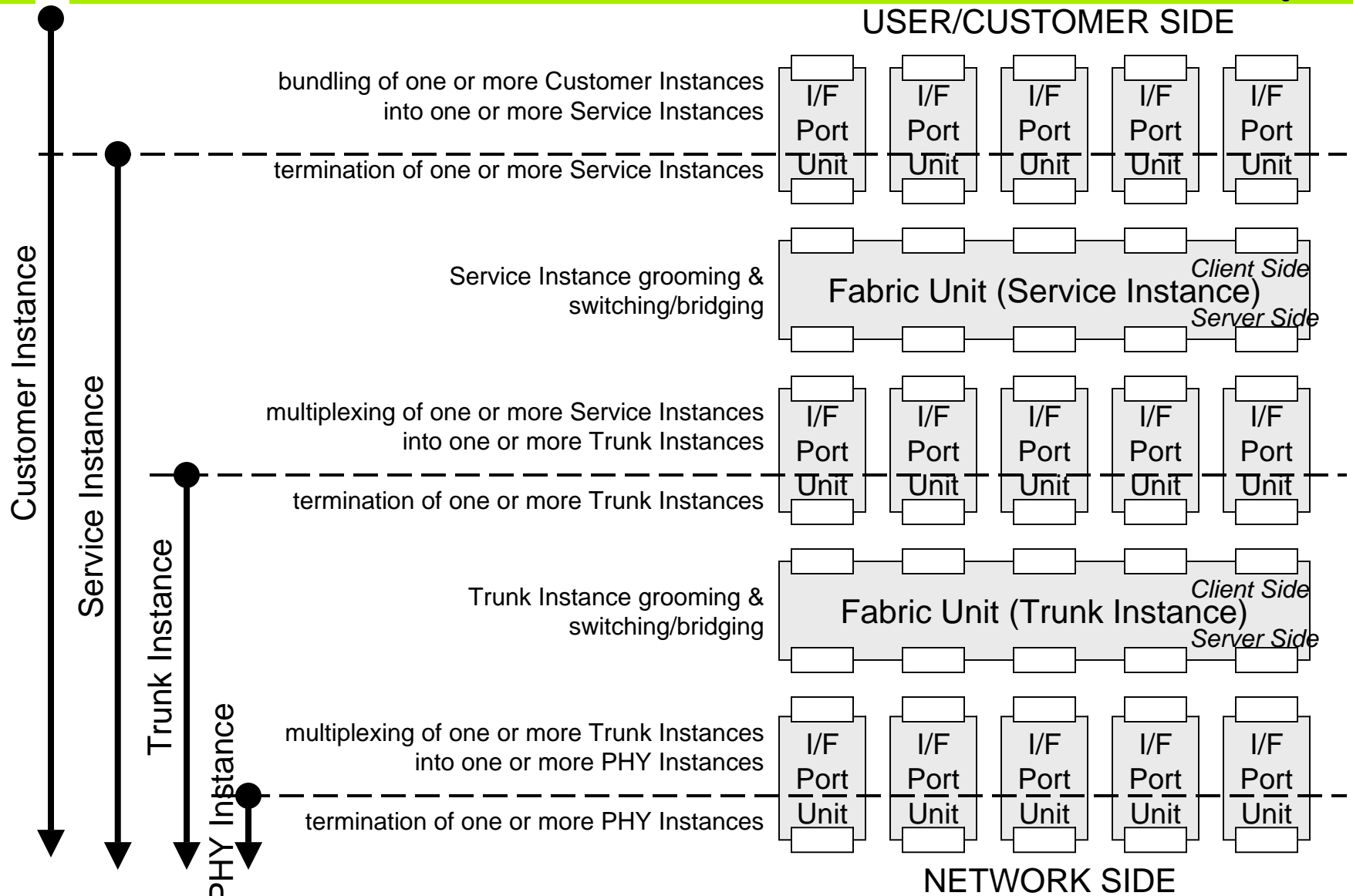- Dual Relay: IB-BEB

Resources
Single Relay equipment

USER/CUSTOMER SIDE

Customer Instance

Service/Trunk Instance

PHY Instance

multiplexing of one or more Customer Instances into one or more Service/Trunk Instances

| I/F Port Unit | I/F Port Unit | I/F Port Unit | I/F Port Unit | I/F Port Unit |

termination of one or more Service/Trunk Instances

Service/Trunk Instance grooming & switching/bridging

Fabric Unit

Client Side

Server Side

multiplexing of one or more Service/Trunk Instances into one or more PHY Instances

| I/F Port Unit | I/F Port Unit | I/F Port Unit | I/F Port Unit | I/F Port Unit |

termination of one or more PHY Instances

NETWORK SIDE

PB & PBB models / 2006-10-10

Resources
Dual Relay equipment

USER/CUSTOMER SIDE

bundling of one or more Customer Instances into one or more Service Instances

I/F Port Unit   I/F Port Unit   I/F Port Unit   I/F Port Unit   I/F Port Unit

termination of one or more Service Instances

Service Instance grooming & switching/bridging

Fabric Unit (Service Instance)

Client Side

Server Side

multiplexing of one or more Service Instances into one or more Trunk Instances

I/F Port Unit   I/F Port Unit   I/F Port Unit   I/F Port Unit   I/F Port Unit

termination of one or more Trunk Instances

Trunk Instance grooming & switching/bridging

Fabric Unit (Trunk Instance)

Client Side

Server Side

multiplexing of one or more Trunk Instances into one or more PHY Instances

I/F Port Unit   I/F Port Unit   I/F Port Unit   I/F Port Unit   I/F Port Unit

termination of one or more PHY Instances

NETWORK SIDE

Customer Instance

Service Instance

Trunk Instance

PHY Instance

PB & PBB models / 2006-10-10

Relay Resources

Two Relay types in 802.1
- 4k relay ($\leq$ 4094 instances)
- 16M relay ($\leq$ 16,777,214 instances)
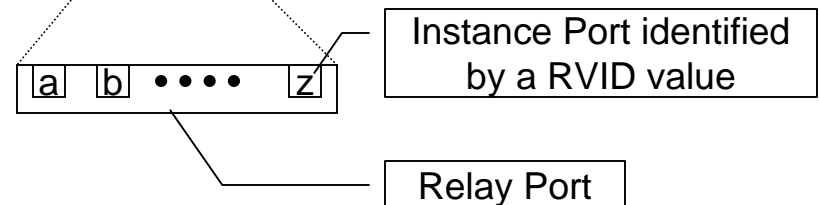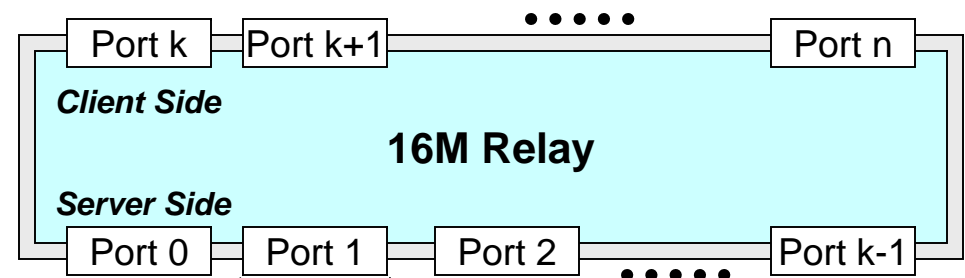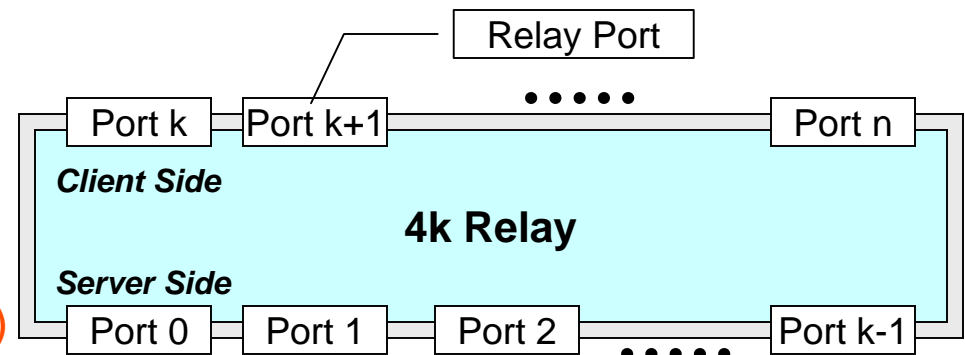
4k Relay (802.1Q, .1ad, .1ah)
- 12-bit Relay VID (R_{12}VID)
- $0 \leq R_{12}VID \leq 4094$

16M Relay (802.1ah)
- 24-bit Relay VID (R_{24}VID)
- $0 \leq R_{24}VID \leq 16,777,215$

Relay Ports
- Contain one or more Instance Ports
- Instance Port identified by RVID

Relay Port

Port k	Port k+1	• • • • •	Port n

Client Side

4k Relay

Server Side

Port 0	Port 1	Port 2	• • • • •	Port k-1

Port k	Port k+1	• • • • •	Port n

Client Side

16M Relay

Server Side

Port 0	Port 1	Port 2	• • • • •	Port k-1

a	b	• • • •	z

Instance Port identified by a RVID value

Relay Port

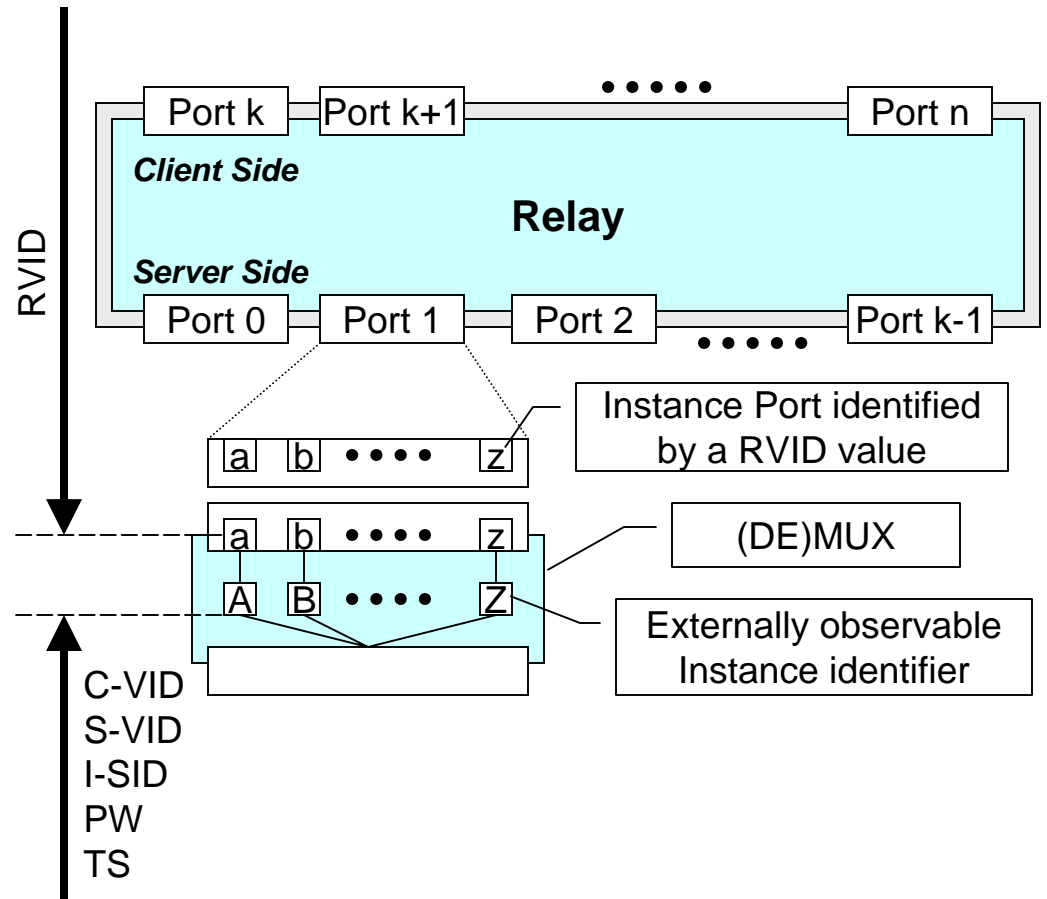# Interface Port Resources

to be added

Relay VID Translation

[a] Relay VID (RVID)

- bridge internal instance identifier

[A] External presentation as

- C-VID
- S-VID/B-VID
- I-SID
- PW label (PW)
- Time slot (TS)
- ...

[a] ⇕ [A] RVID translation function

- C-VID=RVID, RVID=C-VID
- S-VID =f[RVID], RVID = f^{-1}[S-VID]
- I-SID = f[RVID], RVID = f^{-1}[I-SID]
- PW = f[RVID], RVID = f^{-1}[PW]
- TS = f[RVID], RVID = f^{-1}[TS]

RVID

| Port k | Port k+1 | • • • • • | Port n |

Client Side

Relay

Server Side

| Port 0 | Port 1 | Port 2 | • • • • • | Port k-1 |

| a | b | • • • • | z |

Instance Port identified by a RVID value

| a | b | • • • • | z |

(DE)MUX

| A | B | • • • • | Z |

Externally observable Instance identifier

C-VID
S-VID
I-SID
PW
TS

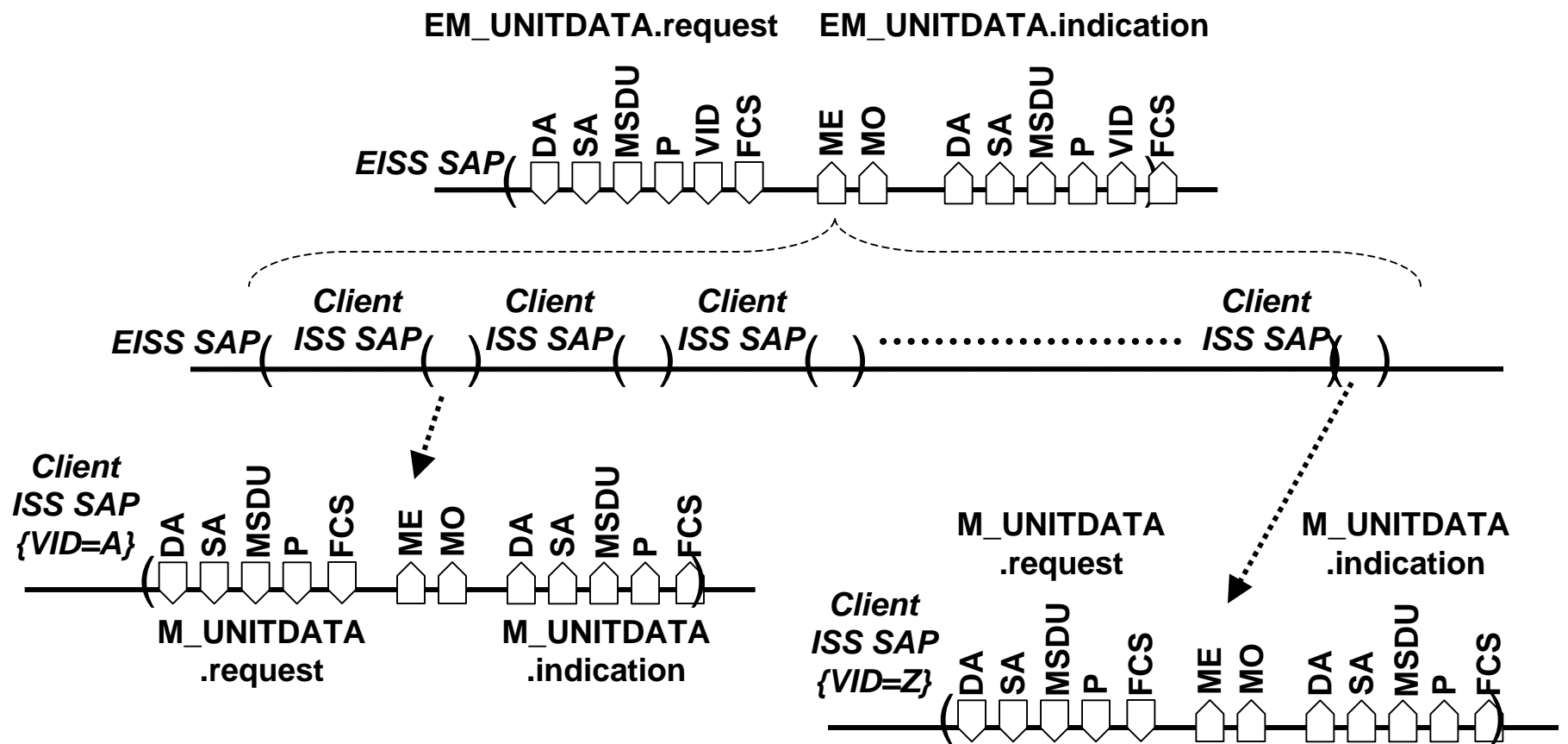# EISS SAP

EISS SAP represents a set of "client-ISS SAPs"

■ each client-ISS SAP is identified by its VID (to be replaced by RVID)

It seems that when deploying RVID in 802.1ah, current EISS SAP definitions can be maintained without extensions

IEEE 802.1Q-2005
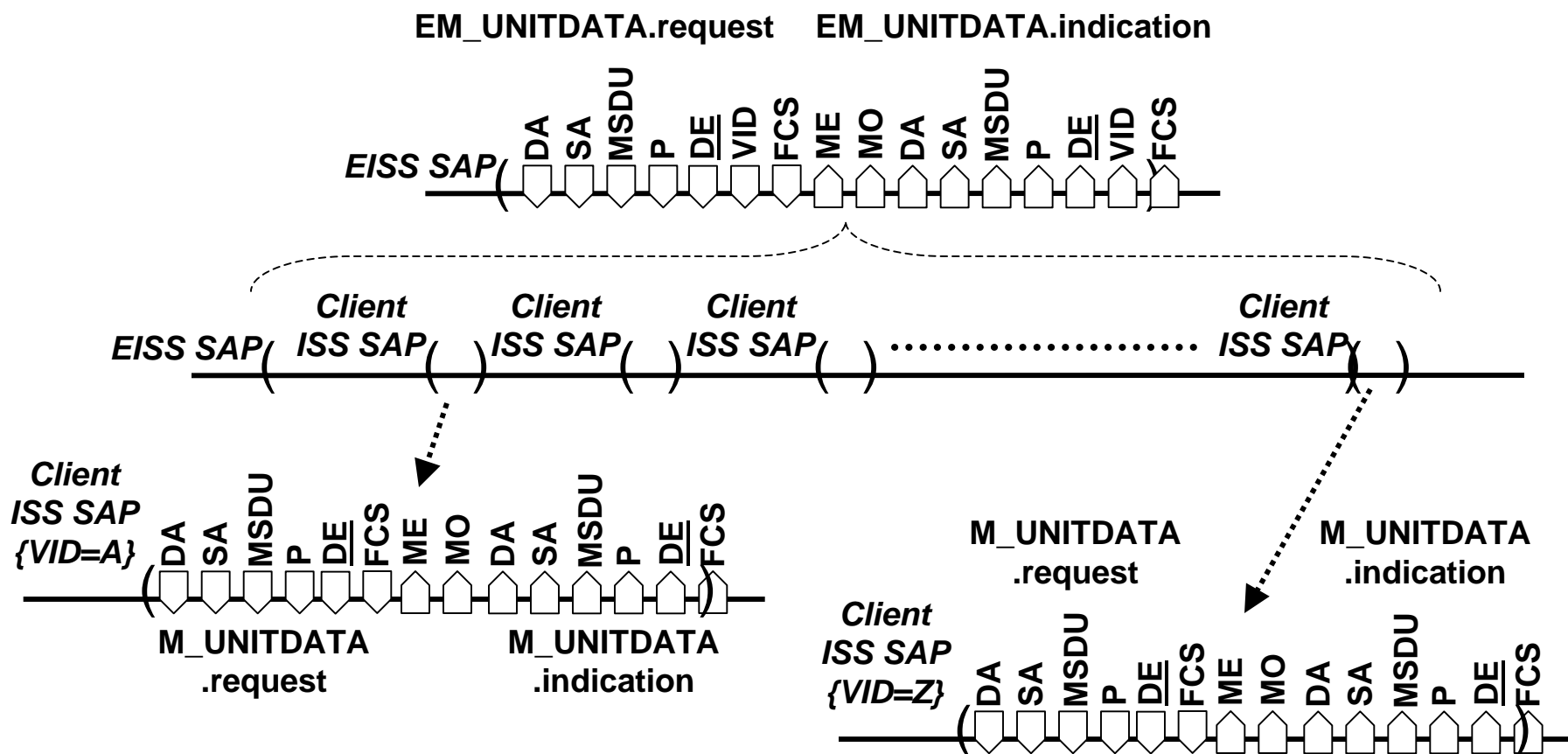# EISS SAP represents set of client ISS SAPs

■ EISS SAP may support between 1 and 4094 Client-ISS SAPs

IEEE 802.1ad-2005
EISS SAP represents set of client ISS SAPs

- EISS SAP may support between 1 and 4094 Client-ISS SAPs

Note: ISS SAP (6.4/802.1Q) should get drop_eligibility

p802.1ah
EISS SAP represents set of client ISS SAPs

■ Trunk Instances: EISS SAP may support between 1 and 4094 Client-ISS SAPs

■ Service Instances: EISS SAP may support between 1 and 16777214 Client-ISS SAPs

Note: ISS SAP (6.4/802.1Q) should get drop_eligibility