IEEE802.1Qay

Project Status

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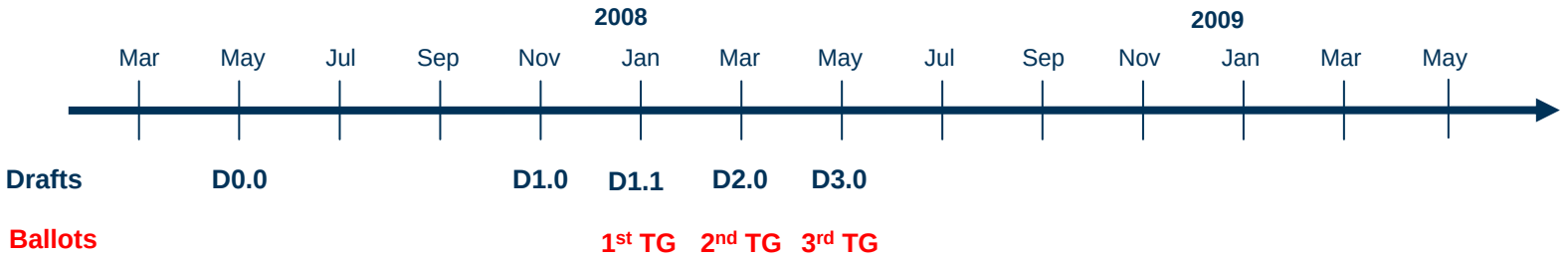
PBB-TE Current Status

- Draft P802.1Qay/D3.0 has been released on April 18th
- The is the third draft to enter a Task Group Ballot. The ballot closed on May 5th.
- Aim is to enter a Sponsor Ballot in the 2nd quarter of 2009
  - 5 more meetings till March 2009
  - One new draft version per meeting



P802.1Qay/D3.0 major new items

- MIB support is provided. Kevin Nolish has finished the first version of the PBBTE MIB (clause 17);
- The PICS (Protocol Implementation Conformance Statement) clause is provided (Annex A);
- Modification on the TE service instance multiplex;
- Updates to provide proper Loopback support for point-to-multipoint TE service instances;
- Updates on Protection Switching;
- Protection Switching with load sharing informative appendix (Annex M);
- Updates on PBB-TE terminology; and
- A number of editorial changes.

MIB Support

have a negative effect on network operations. These tables and objects and their sensitivity/vulnerability are described below.

The following tables and objects in the PBB-MIB could be manipulated to interfere with the operation of Provider Backbone Bridges. This could, for example, be used to force a reinitialization of state machines to cause network instability, or changing the forwarding and filtering policies. The following are all the writable objects from the IEEE8021-PBB-MIB:

17.5 MIB Modules

Insert a new subclause at the end of the clause as follows

17.5.10 Definitions for the IEEE8021-PBBTE MIB module

```
IEEE8021-PBBTE-MIB DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, Unsigned32
      FROM SNMPv2-SMI
    RowStatus, TEXTUAL-CONVENTION, TruthValue
        FROM SNMPv2-TC
    ieee802dot1mibs,
    IEEE8021PbbServiceIdentifierTC
        FROM IEEE8021-TC-MIB
    ieee8021BridgeBaseComponentId
        FROM IEEE8021-BRIDGE-MIB
    PortList
        FROM Q-BRIDGE-MIB
    ieee8021QBridgeVlanCurrentComponentId,
    ieee8021QBridgeVlanIndex
        FROM IEEE8021-Q-BRIDGE-MIB
    MODULE-COMPLIANCE, OBJECT-GROUP
        FROM SNMPv2-CONF;

ieee8021PbbTeMib MODULE-IDENTITY
    LAST-UPDATED "200804120000Z" -- April 12 2008
    ORGANIZATION "IEEE 802.1 Working Grouop"
    CONTACT-INFO
       "  WG-URL: http://grouper.ieee.org/groups/802/1/index.html
        WG-EMAIL: stds-802-1@ieee.org

        Contact: Kevin Nolish
         Postal: 5000 Ericsson Drive
                 Warrendale, PA
                 <Zip>
                 USA
            Tel: +1 724 742 6989
         E-Mail: kevin.nolish@ericsson.com"
    DESCRIPTION
       "Copyright (C) IEEE.  All Rights Reserved
        This version of this MIB module is part of IEEE 802.1Q;
        See the standard itself for full legal notices.
```

Annex A (PICS)

Annex A (normative)

PICS proforma

A.5 Major capabilities

Change items in A.5 as follows

Item	Feature	Status	References	Support
MGT	Is management of the Bridge supported?	O PBBTE: M	A.14 {D}14	Yes [ ] No [ ]
RMGT	Is a remote management protocol supported?	MGT: O PBBTE: M	A.15 {D}5.2	Yes [ ] No [ ]
CFM	Is Connectivity Fault Management implemented?	O PBBTE: M	5.4.1.3, 19, 20, 21, 22	Yes [ ] No [ ]

Insert the following items at the end of A.5

Item	Feature	Status	References	Support
PBBTE	Can the Bridge be configured by an external agent to provide TE service instances?	O	8.4, 8.9, 25.10	Yes [ ] No [ ]
EXAG	Is the active topology, learning and forwarding of the TE service instances under the control of an external agent?	PBBTE: O.1	8.4, 8.9	Yes [ ] No [ ]
TESI	Is the VID used by the external agent to identify the TE service instances?	EXAG: M	8.4, 8.9, 25.10	Yes [ ] N/A [ ]
PTESI	Can the Bridge support point to point TE service instances??	TESI: M	25.10	Yes [ ] N/A [ ]
MTESI	Can the Bridge support point to multipoint TE service instances?	TESI: O	25.10	Yes [ ] No [ ]
BCBTE	Can the Bridge be configured to operate as a Backbone Core Bridge that supports TE service instances?	PB AND PBBTE: O.4	5.10, 5.6.2	Yes [ ] N/A [ ]
BEBTE	Can the Bridge be configured to operate as a Backbone Edge Bridge that supports TE service instances?	BEB AND PBBTE: O.4	5.8.2, 5.11.1	Yes [ ] N/A [ ]
PS	Is protection switching supported?	BEBTE: M	5.8.2, 26.10	Yes [ ] N/A [ ]

Annex M

Insert the following Annex after Annex L

Annex M (informative)

1:1 Protection with Load Sharing Use Cases

This material is intended to assist the reader in understanding the use of 1:1 protection with load sharing and in evaluating the benefits of load sharing in particular PBB-TE network configurations. The set of use cases described is not intended to be exhaustive.

To more easily understand the use cases a brief description of load sharing and the associated protection model is helpful. In conventional 1:1 protection schemes traffic is carried between two protection points over a single "working" path. A second "protection" path is reserved to carry the traffic in the event that the working path fails. In the case of PBB-TE protection with load sharing a protection group comprising two or more TE service instances (TESIs) is provisioned to carry traffic between the two protection points, and backbone service instances (BSIs) are distributed (the load is shared) across some or all of these TESIs. In the event that one of the TESIs fails the traffic assigned to the failed TESI is reassigned to the other TESIs until the failed TESI is restored. This reassignment may also be distributed (load shared) across the remaining TESIs. The reassignment is pre-planned to enable rapid protection switching.

Protection with load sharing provides several benefits which are illustrated by the use cases below. Among these are:

a) The network operator may provision a protection group of TESIs on a set of acceptable paths between protection points, normally between edges of a PBB-TE network domain, and manage the distribution of BSIs to these TESIs to meet changing traffic demands according to traffic engineering policies. The traffic distribution within the protection group can be altered to adjust link loads and optimize network resource use without requiring (or with less frequent) provisioning of new TESIs.
b) The bandwidth reserved to protect traffic in the event of failure may be substantially reduced, providing more efficient resource usage.
c) If some BSIs are to be protected and some are not, a load sharing protection group can be provisioned to support both protected and unprotected BSIs rather than requiring a protection group for protected BSIs and a separate TESI for unprotected BSIs.
d) For cases in which conventional 1:1 protection behavior is desired, it can be accommodated within the load sharing protection model as a subcase in which there are two TESIs in the protection group and all BSIs are distributed to one of the TESIs under normal conditions and redistributed to the other TESI in case of a fault on the first TESI.

The following use cases provide some illustration of these benefits.

Ballot statistics

- 74 members have answered (the current total number of voting members is 98)
- 11 members have sent approve ballots
- 20 member have sent disapprove ballots

	1st TG Ballot		2nd TG Ballot		3rd TG Ballot	
Approve	0	0.00%	0	0.00%	11	14.86%
Disapprove	29	34.94%	29	40.85%	20	27.03%
Abstain	54	65.06%	42	59.15%	43	58.11%
Total	83		71		74	

Ballot statistics

- A total of 235 comments have been sent

	1st TG Ballot		2nd TG Ballot		3rd TG Ballot	
TR	221	50.80%	191	45.05%	101	42.98%
T	36	8.28%	15	3.54%	32	13.62%
ER	121	27.82%	166	39.15%	68	28.94%
E	54	12.41%	48	11.32%	33	14.04%
O	3	0.69%	4	0.94%	1	0.43%
	435		424		235	

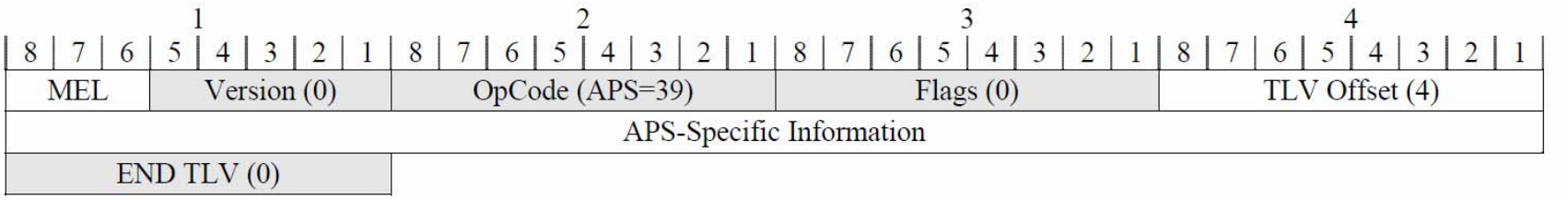
Major remaining issues

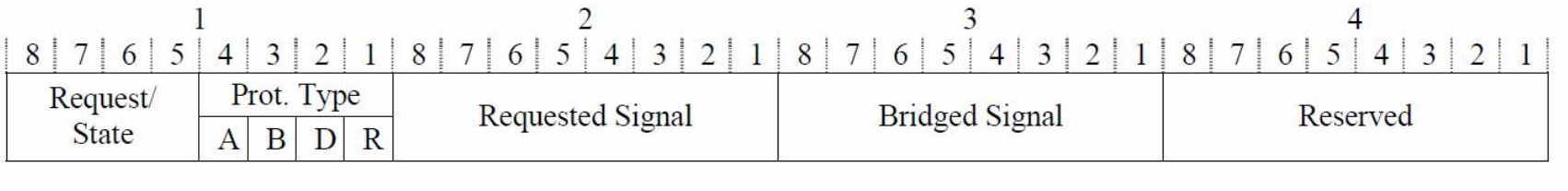
- Protection switching mechanism
  - Relationship to G.8031
  - State Machine comments
- Load sharing
  - Number of TESIs allowed

Other comments

- CFM issues
  - MAID in CCM
  - LTM in PBB-TE
- MIB issues
- A number of purely editorial comments

APS frame


1 2 3 4
8 7 6 5 4 3 2 1 8 7 6 5 4 3 2 1 8 7 6 5 4 3 2 1 8 7 6 5 4 3 2 1
MEL
Version (0)
OpCode (APS=39)
Flags (0)
TLV Offset (4)
APS-Specific Information
END TLV (0)


1 2 3 4
8 7 6 5 4 3 2 1 8 7 6 5 4 3 2 1 8 7 6 5 4 3 2 1 8 7 6 5 4 3 2 1
Request/ State
Prot. Type
A B D R
Requested Signal
Bridged Signal
Reserved

APS signaling parameters

Protection Type	A	0	No APS Channel
		1	APS Channel
	B	0	1+1 (Permanent Bridge)
		1	1:1 (no Permanent Bridge)
	D	0	Unidirectional switching
		1	Bidirectional switching
	R	0	Non-revertive operation
		1	Revertive operation

Fixed parameters do not need signal

Request/State

Request/State			
	1111	Lockout of Protection (LO)	Priority
	1110	Signal Fail for Protection (SF-P)	highest
	1101	Forced Switch (FS)	
	1011	Signal Fail for Working (SF)	
	1001	Signal Degrade (SD) (Note 1)	
	0111	Manual Switch (MS)	
	0101	Wait to Restore (WTR)	
	0100	Exercise (EXER)	
	0010	Reverse Request (RR) (Note 2)	
	0001	Do Not Revert (DNR)	
	0000	No Request (NR)	lowest

Management command

RDI field in CCMs on W

Management command

RDI field in CCMs on P

N/A

Management command

Local hidden timer

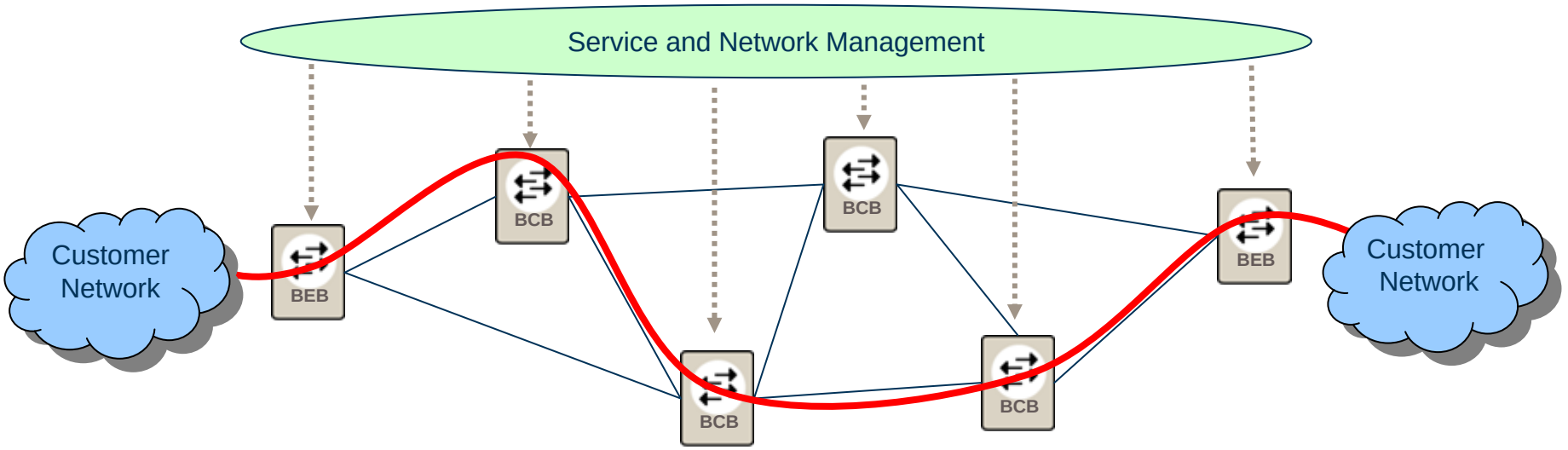
Management command

N/A only bi-directional

Infinite WTR

No RDI set in CCMs

What is PBB-TE?



- Provider Backbone Bridges – Traffic Engineering is a method for providing full traffic engineering of paths in a bridged network.
- PBB-TE replaces the MSTP control plane for a subset of VLANs with either a management plane or an external control plane and then populates the tables of the related bridges by creating static filtering table entries

Requested/Bridged Signal

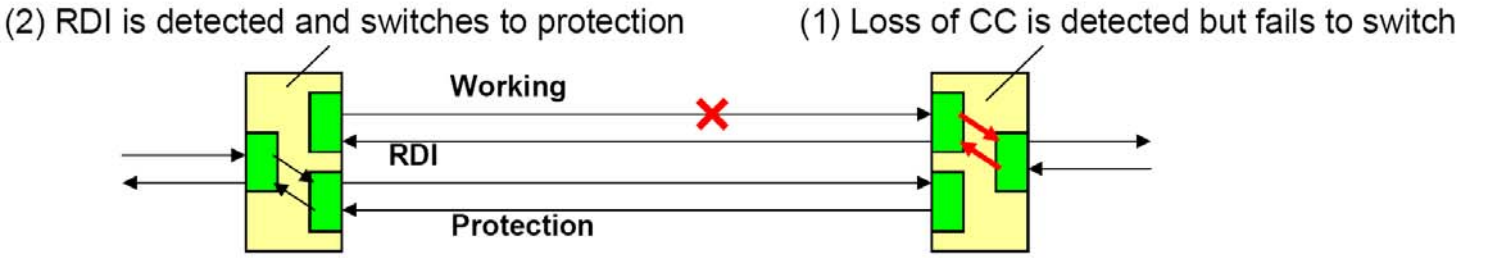
Requested Signal	0	Null Signal
	1	Normal Traffic Signal
	2-255	(Reserved for future use)
Bridged Signal	0	Null Signal
	1	Normal Traffic Signal
	2-255	(Reserved for future use)

Single W channel inherently indicated by B-VID

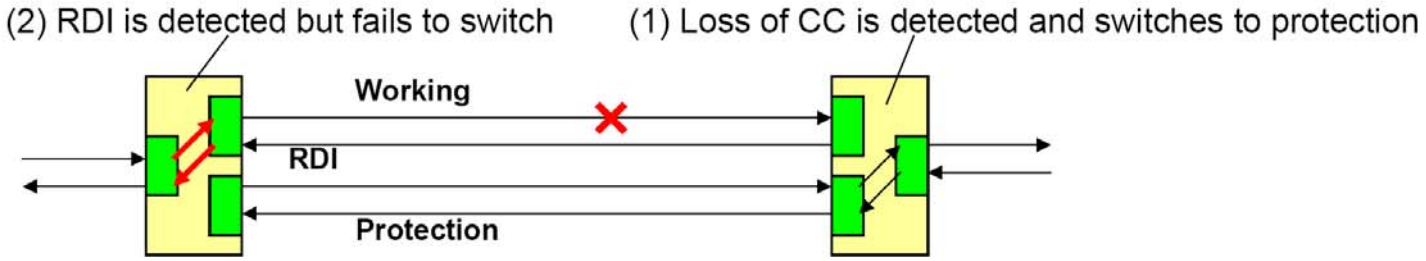
Single W channel indicated by B-VID

Mismatch of bridge/selector positions of near end and far end (1)

- Mismatch can happen when:
  - The near end fails to switch over but it sends RDI to the far end due to a hardware malfunction
  - The near end detects a defect and switch but the far end fails to switch even it receives RDI



Case A: Switching failure at the near end



Case B: Switching failure at the far end

CCM Frame Format

	Octet
MD Level	1 (high-order 3 bits)
Version	1 (low-order 5 bits)
OpCode	2
Flags	3
First TLV Offset	4
Varies with value of OpCode	5
End TLV (0)	First TLV Offset + 5

CFM Common Header

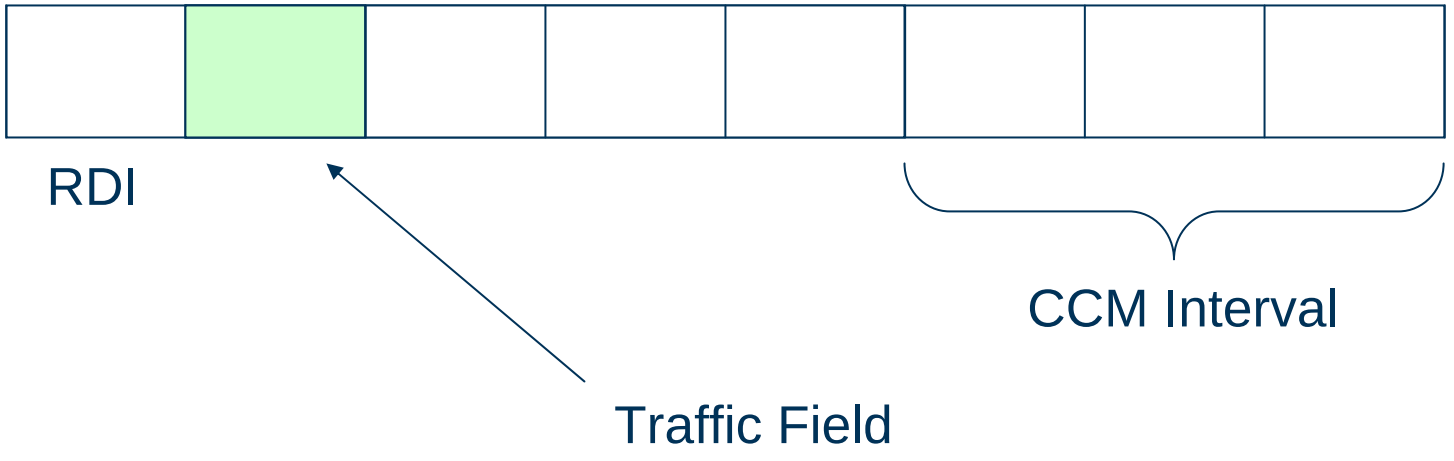
	Octet
Common CFM Header	1 - 4
Sequence Number	5 - 8
Maintenance association End Point Identifier	9 - 10
Maintenance Association Identifier (MAID)	11 - 58
Defined by ITU-T Y.1731	59 - 74
Reserved for definition in future versions of the protocol*	
Optional CCM TLVs	First TLV Offset + 5†
End TLV (0)	First TLV Offset + 5, if no Optional CCM TLVs are present

* This field has 0 length in this version 0 of CFM. It is shown in order to stress that additional information can be present in future versions of CFM, and that a version 0 receiver ignores its contents, if present.

† Octet 75 for transmitted CCMs.

CCM Frame Format

CCM Flags Field



Backbone Service Instance Table			
I-SID	**B-VID**	**Default B-DA**	**Local-SID**
I-SID1	B-VID1	B-DA1	
…	…	…	
$I\text{-}SID_n$	ESP-VID1	ESP-MAC DA1	
…	…	…	

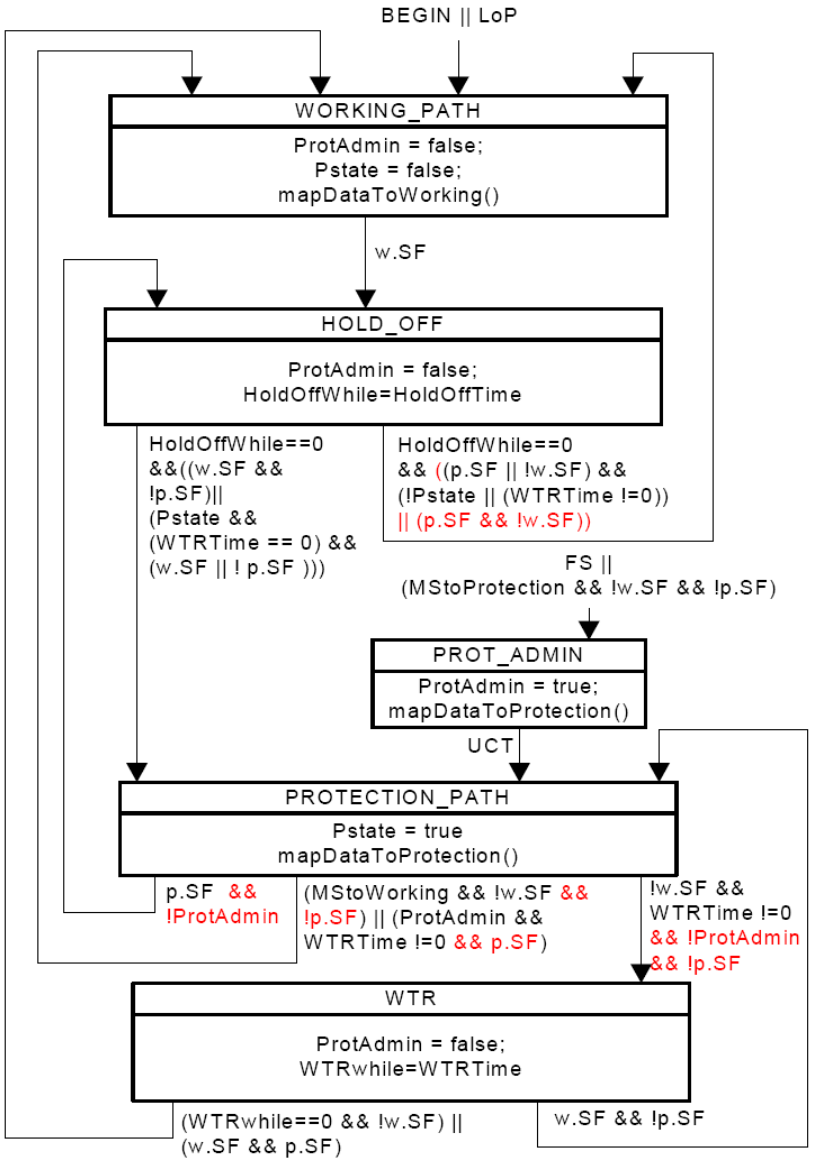


Figure 26-12—Protection Switching State Machine

Table 26-8—Protection Requests Hierarchy

Priority	Request
highest	LoP
	FS
	p.SF
	w.SF
	MStoP, W
lowest	WTR

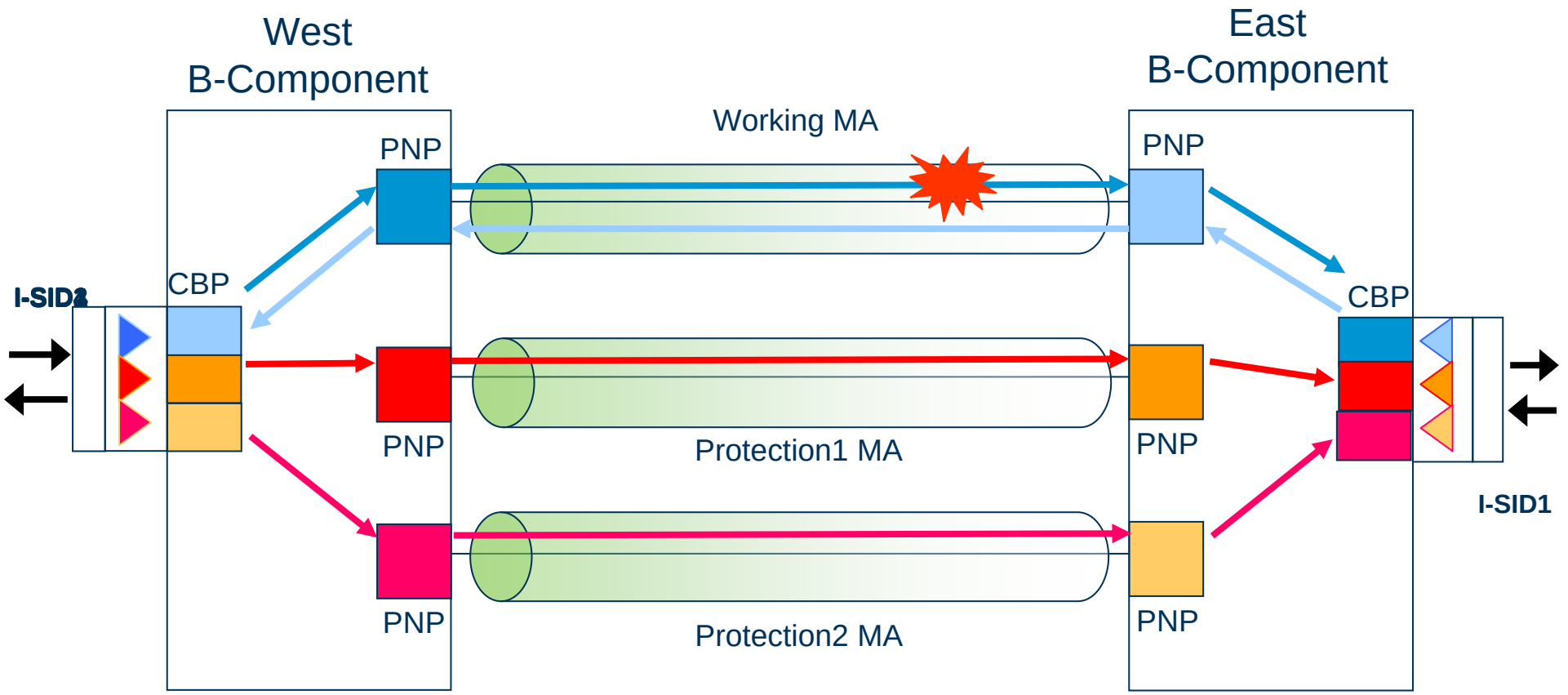
PS with load sharing

- Protection Group is configured with
  - A reference to one PBB-TE MA -> working entity
  - A reference to one (but can be extended to a list of PBB-TE MAs) -> protection entity(-ies)
- A list of services protected by a Protection Group defined by their I-SID values
- For each I-SID in the protection group the following is provided
  - Preferred PBB-TE MA: by default the PBB-TE MA associated with the working entity, can be configured to be any of the PBB-TE MAs in the Protection Group
  - Alternate PBB-TE MA: by default the PBB-TE MA associated with the first priority protection entity, can be configured to be any of the PBB-TE MAs in the Protection Group

BSI Table for PS with load sharing

Protected Group BSI2	“Working” PBB-TE MA	Protection1 PBB-TE MA	Protection2 PBB-TE MA
I-SID1	Preferred	Alternate	
I-SID2	Preferred		Alternate
I-SID3	Alternate	Preferred	
I-SID4	Alternate		Preferred

PBB-TE 1:1 Protection Switching Example



Path state machine for PG TESIs

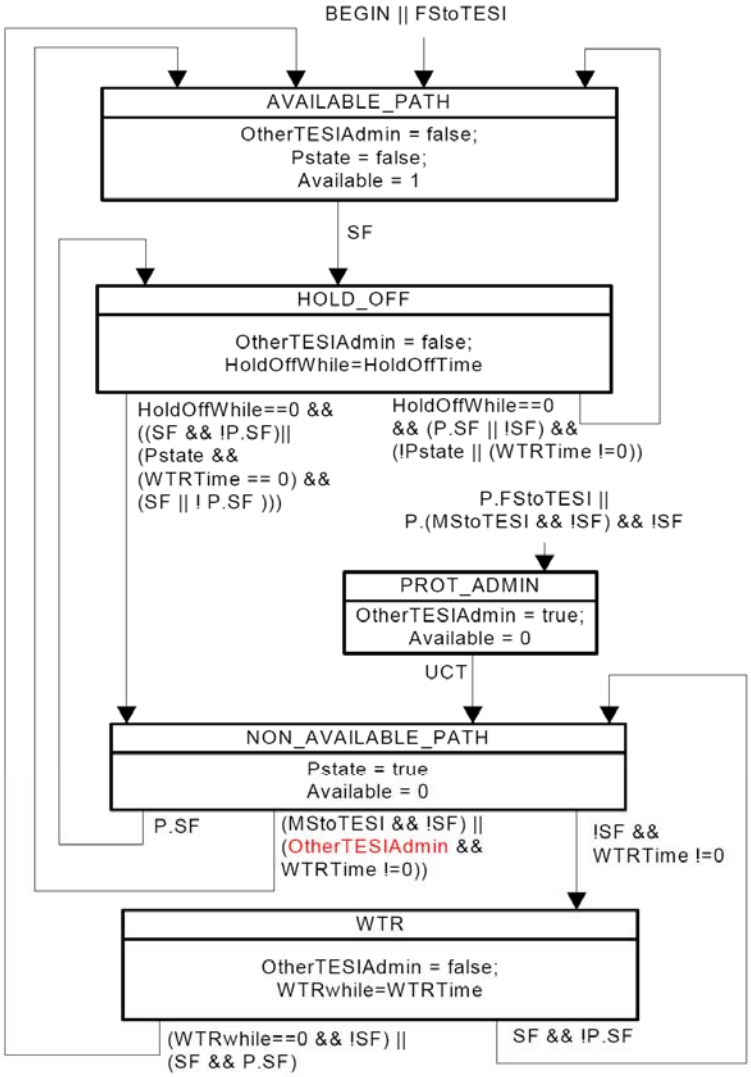


Figure 26-13—Path state machine for the TE service instances

Backbone service instance

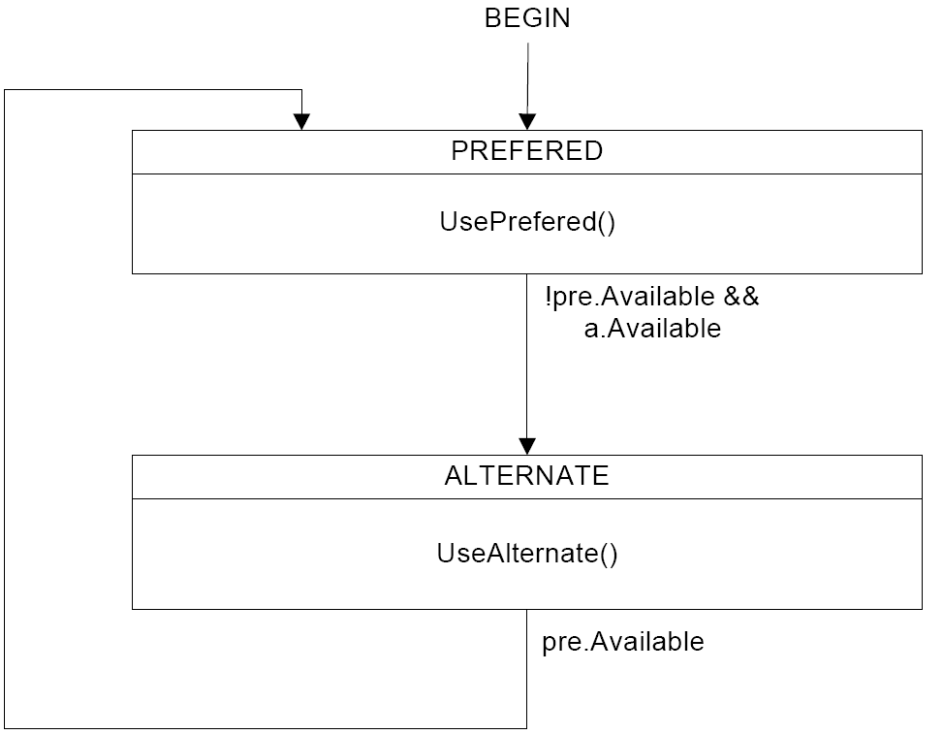


Figure 26-14— Protected backbone service instance state machine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