International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.8032/Y.1344

Amendment 2
(02/2011)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Packet over Transport aspects – Ethernet over Transport aspects

SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT-GENERATION NETWORKS

Internet protocol aspects – Transport

Ethernet ring protection switching

Amendment 2: Appendix XI – End-to-end service resilience

Recommendation ITU-T G.8032/Y.1344 (2010) – Amendment 2

ITU-T

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TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

INTERNATIONAL TELEPHONE CONNECTIONS AND CIRCUITS	G.100–G.199
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For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T G.8032/Y.1344

Ethernet ring protection switching

Amendment 2

Appendix XI – End-to-end service resilience

Summary

Amendment 2 to Recommendation ITU-T G.8032/Y.1344 provides a revised Appendix XI, which addresses situations in which an Ethernet service that traverses an Ethernet ring protection (ERP) protected ring may start and end outside that ring. In order to provide full service protection, three options are described in this appendix. One is an interaction between ITU-T G.8032/Y.1344 and ITU-T G.8031/Y.1342, a second is the usage of a modified sub-ring, and a third is the insertion of a non-ERP node in the ERP protected ring.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T G.8032/Y.1344	2008-06-22	15
1.1	ITU-T G.8032/Y.1344 (2008) Amd. 1	2009-04-22	15
2.0	ITU-T G.8032/Y.1344	2010-03-09	15
2.1	ITU-T G.8032/Y.1344 (2010) Amd. 1	2010-06-11	15
2.2	ITU-T G.8032/Y.1344 (2010) Cor. 1	2010-10-07	15
2.3	ITU-T G.8032/Y.1344 (2010) Amd. 2	2011-02-25	15

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

Recommendation ITU-T G.8032/Y.1344

Ethernet ring protection switching

Amendment 2

Appendix XI – End-to-end service resilience

(This appendix does not form an integral part of this Recommendation.)

1) Modified Appendix XI

Replace Appendix XI with the following text:

XI.1 Generic end-to-end service resilience

End-to-end service resilience may require protection based on the protection provided as described in this Recommendation. However, additional protection may be required for the access links. This can be achieved by duplicating the access links as shown in Figure XI.1.

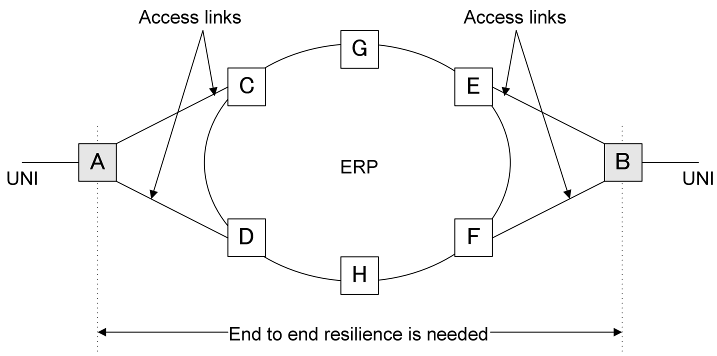

Figure XI.1 – A network model example for end-to-end service resilience

The protection mechanism used on the access links to provide end-to-end resilience could use the protection mechanisms described in [b-ITU-T G.8031], [b-IEEE 802.1D] or some other similar protection mechanism.

XI.2 Layering ITU-T G.8031 protection over ITU-T G.8032

For the purposes of this clause we pre-suppose that the protection mechanism employed for the end-to-end service is [b-ITU-T G.8031].

Referring to the service shown in Figure XI.1 above, we can imagine that the end-to-end protection would configure a working path that traverses the nodes [A-C-E-B] and a protection path that traverses the nodes [A-D-F-B].

XI.2.1 Basic guidelines for the layering of ITU-T G.8031 over ITU-T G.8032

When the protection of the end-to-end service, for example when the service runs between nodes A and B in Figure XI.1, is based on ITU-T G.8031 Ethernet linear protection and part of the working and/or the protection path crosses a logical ring that is protected by ITU-T G.8032 ERP, then the following guidelines are recommended:

- The working/protection path that crosses the ERP protected ring should only include two Ethernet ring nodes, at the points where the ring is entered and exited.
- The "link" between these two nodes can be considered a logical link, in the sense that the exact path that connects these two nodes is determined by the ERP mechanism, i.e., the ERP protection mechanism may determine that the connection may traverse the ring on either the shorter path or in the opposite direction along the longer path.
- The hold-off timer of the Ethernet linear protection mechanism should be configured with a value large enough to allow the ERP mechanism to complete its procedures prior to triggering linear protection as a result of a failure condition of this logical link.
- The working and protection paths (whichever cross the ring) should use different VIDs that are protected by ERP instances of the ring. Both of these VIDs may be protected by the same ERP instance or by separate ERP instances, at the operator's discretion.

  NOTE – When there are multiple services that are protected by [ITU-T G.8031], it may be possible to reuse these same VIDs for the additional services, based on the method of service identification.

This scenario may also be applied to the layering of RSTP [b-IEEE 802.1D] over ITU-T G.8032 by connecting two Ethernet private line (EPL) services (as defined in [b-ITU-T G.8011.1], where EPLs are separated by VIDs) between nodes A and B (in Figure XI.1).

XI.2.2 End-to-end service that traverses interconnected rings

If the end-to-end service crosses a network of interconnected rings, as shown in Figure XI.2, below, then the entire network of interconnected rings may be considered the underlying layer in the sense of the previous subclause. Similar guidelines as stated above would apply, with the following generalization:

- The working/protection path that crosses the network of ERP-protected rings should only include two Ethernet ring nodes, at the points where the chain of Ethernet rings is entered and exited (for example, nodes C and E for the working path and nodes D and F for the protection path in Figure XI.2, i.e., nodes G, H, J, K, L, M would be transparent to the ITU-T G.8031 protection mechanism).

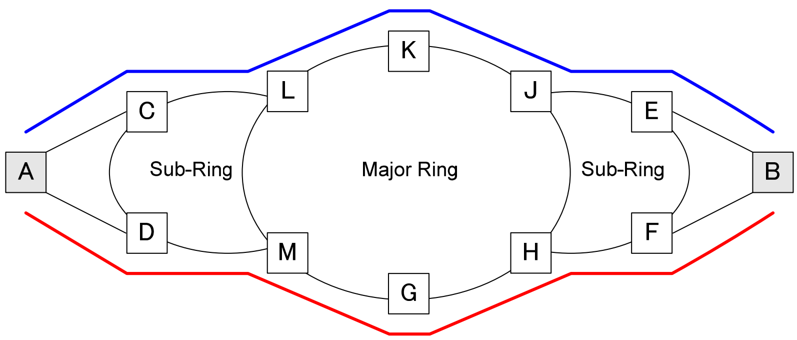

Figure XI.2 – End-to-end service resilience over interconnected rings

XI.3 Access sub-ring connected to major ring

Referring to the service shown in Figure XI.2 above, we can also imagine that the end-to-end protection is realized by using sub-ring C-A-D connected to Major Ring C-D-H-F-E-G. However, in this sub-ring, node A does not support ERP functionality and, as a result, is excluded from R-APS communication. Therefore, this sub-ring is a modified version of the sub-ring as presented in the main body of this Recommendation and is referred to as an access sub-ring.

XI.3.1 Basic configuration

Figure XI.3 shows the access network with access sub-ring B-A-C connected to major ring B-C-D-E-F-B. Their ERP instances are shown in Figure XI.4.

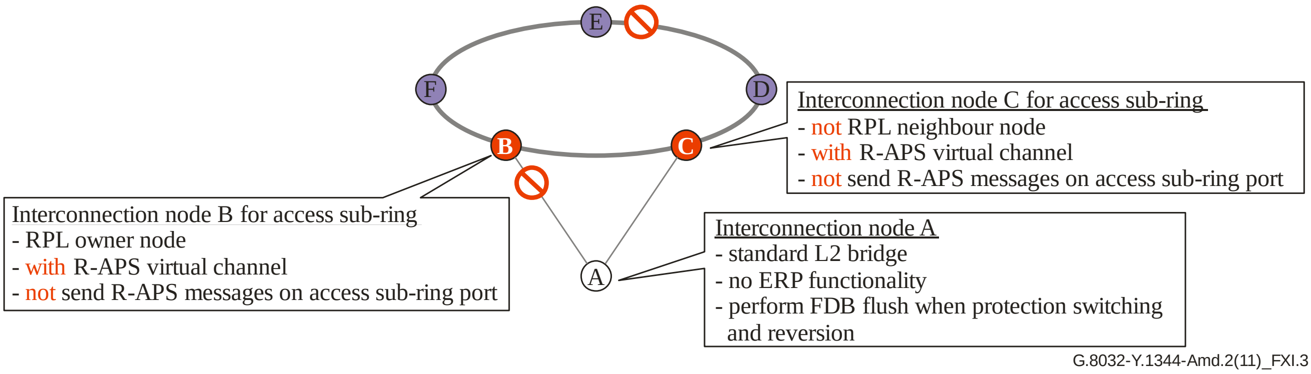

Figure XI.3 – Access sub-ring connected to major ring

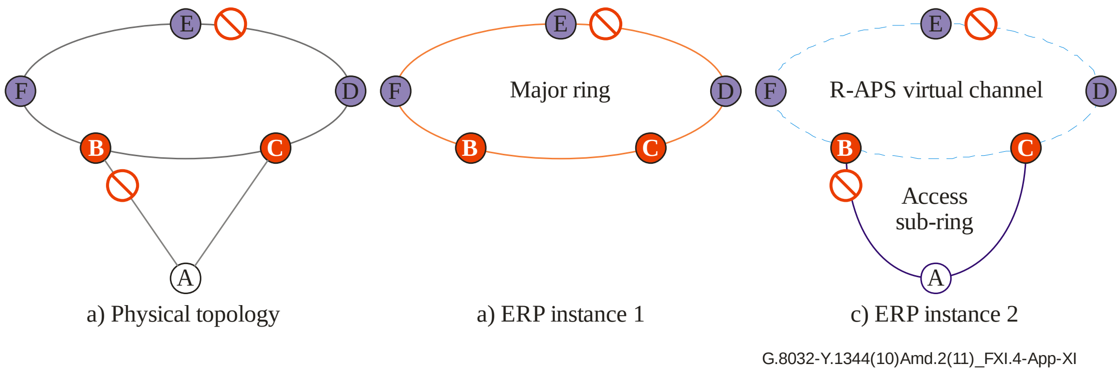

Figure XI.4 – ERP instances

In this network, Ethernet ring nodes B and C are the interconnection nodes connecting the major ring and access sub-ring; node A is a user node that does not support an ERP control process. RPLs of major ring and access sub-ring are located on E-D link and B-A link, respectively. The RPL owner node of access sub-ring is node B.

The characteristics of the access sub-ring are as follows:

I. Node A is excluded from R-APS communication, i.e., does not generate nor transfer R-APS messages.

II. Interconnection nodes B and C do not send any R-APS messages on their access sub-ring port.

III. Interconnection nodes B and C must be able to notify node A when protection switching and reversion is invoked on the access sub-ring.

(The notification is needed to trigger the FDB flush when a failure occurs or when it is recovered. This generic flush request should comply with the standard requests that are supported by node A.)

IV. Node A should be able to perform an FDB flush when protection switching and reversion are invoked.

V. Access sub-ring must configure an R-APS virtual channel on the major ring.

(This is because node A cannot receive and transfer any R-APS messages, so R-APS message cannot be received from the access sub-ring ports of interconnection nodes B and C.)

VI. Access sub-ring should not configure an RPL neighbour node.

(If interconnection node C is configured as RPL neighbour node, both access links are blocked.)

XI.4 Non-ERP node connected in major ring

Ensuring end-to-end resilience when connecting into a different technology domain can be made simpler by allowing for a non-ERP node to be located within a major ring. This clause provides guidelines on how to support such a configuration.

XI.4.1 Basic configuration

Figure XI.5 shows a network with Ethernet ring A-B-C-D-E-F-G where node D does not support ERP functionality, but is a VLAN bridge:

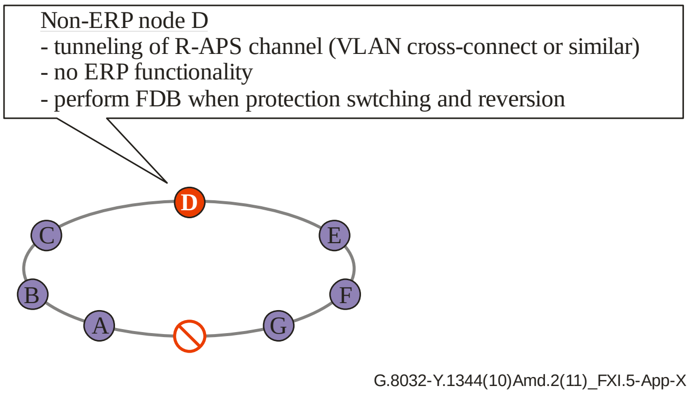

Figure XI.5 – Non-ERP node as part of major ring

The characteristics of a non-ERP node in an Ethernet ring are as follows:

I. Non-ERP node D tunnels R-APS communication between Ethernet ring nodes C and E.

II. Ethernet ring nodes C and E must be able to notify node D when protection switching and reversion is invoked on the Ethernet ring. (The notification is needed to trigger the FDB flush when a failure occurs or when it is recovered. This generic flush request should comply with the standard requests that are supported by node D.)

III. Non-ERP node D performs FDB flush when protection switching and reversion is invoked.

XI.4.2 Principles of operation

The principles of clause 10 are used. It should be noted that when a failure occurs on a ring link between an ERP and non-ERP node, all three burst messages triggered by the state machine on a "Tx R-APS()" action are required to ensure successful operation of block/unblock and flush operations. One example of this is the requirement of the RPL owner node to unblock the RPL upon receipt of R-APS(SF) – there is no guarantee that the RPL port would be unblocked for R-APS frames fast enough that the second and third R-APS(SF) frames would pass through.

In this case, implementations may optionally include a management configuration option ETH_C_MI_RAPS_Pass_Thru that is applied to the R-APS block logic and R-APS request processing of Figure 10-1. Note that this implies the presence of the R-APS block logic in the ERP control process of ring nodes on the Ethernet ring. The additions to Figure 10-1 to support this functionality are shown with the thick dashed line in Figure XI.6 below:

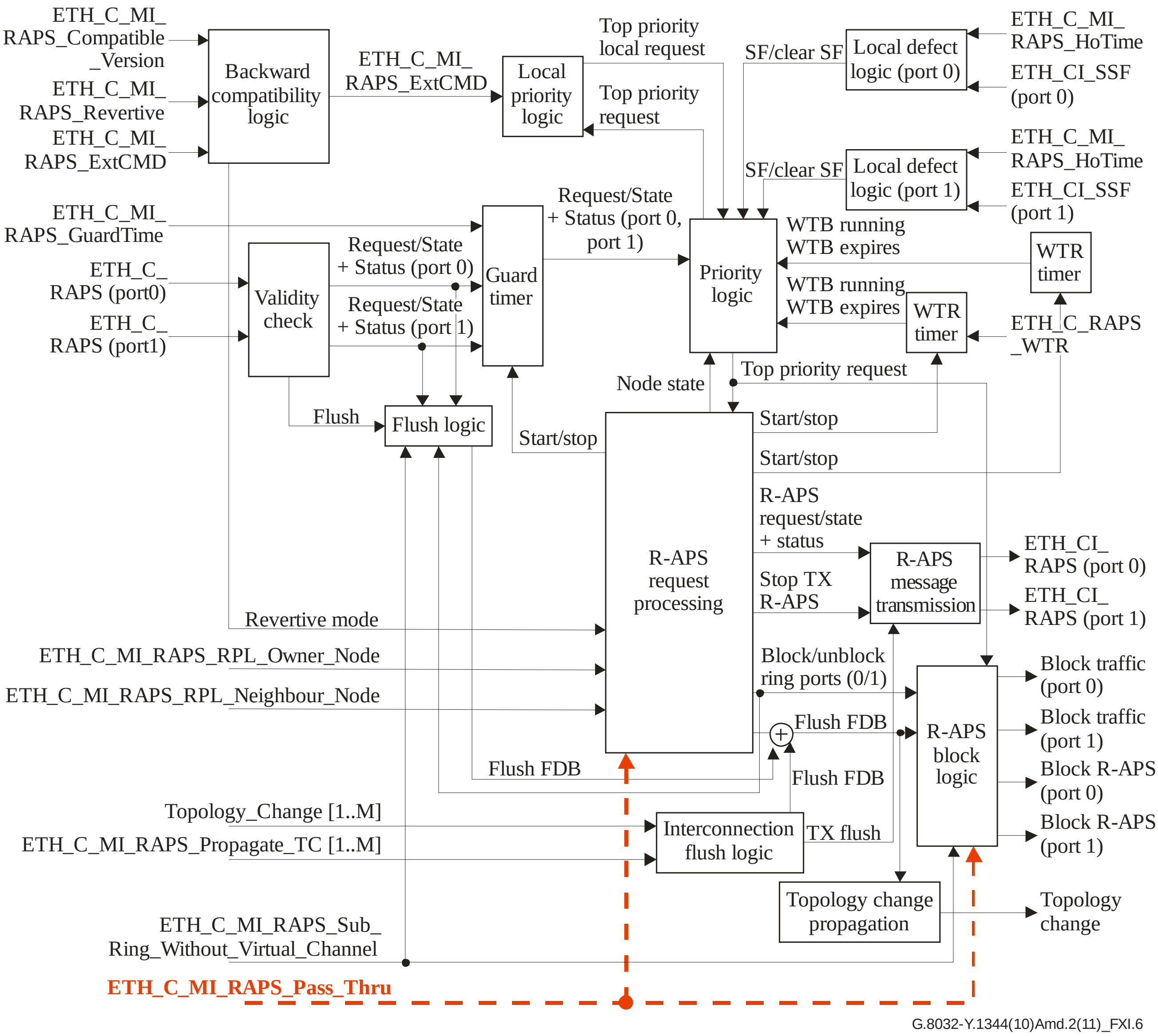

Figure XI.6 – Decomposition of ERP control process

The management information supplied in ETH_C_MI_RAPS_Pass_Thru may affect the blocking of the R-APS channel at the RPL. This MI may be either disabled or enabled. When disabled, the RPL is blocked and R-APS messages are not transmitted. This is the default value and behaviour. When the MI is enabled, the RPL owner node and the RPL neighbour node block the RPL traffic channel and will terminate any R-APS messages intended for the RPL, however the R-APS channel will not be blocked. If the action indicated in the state machine, Table 10-2, indicates that the RPL owner node or the RPL neighbour node should unblock the RPL link then, if the MI is enabled, they will additionally transmit a copy of the last received R-APS message over the RPL immediately.

2) Bibliography

Add the following reference to the bibliography:

[b-IEEE 802.1D] IEEE STD 802.1D-2004, *IEEE Standard for Local and metropolitan area networks – Media Access Control (MAC) Bridges.*

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