I n t e r n a t i o n a l   T e l e c o m m u n i c a t i o n   U n i o n

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.808.1

Amendment 2
(09/2012)

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Digital networks – General aspects

Generic protection switching – Linear trail and subnetwork protection

Amendment 2: New Appendix VII – Solution for service protection in dynamic bandwidth networks

Recommendation ITU-T G.808.1 (2010) – Amendment 2

ITU-T

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Recommendation ITU-T G.808.1

Generic protection switching – Linear trail and subnetwork protection

Amendment 2

New Appendix VII – Solution for service protection in dynamic bandwidth networks

Summary

Amendment 2 to Recommendation ITU-T G.808.1 (2010) introduces Appendix VII.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T G.808.1	2003-12-14	15
1.1	ITU-T G.808.1 (2003) Amd. 1	2005-07-14	15
2.0	ITU-T G.808.1	2006-03-29	15
2.1	ITU-T G.808.1 (2006) Amd. 1	2009-01-13	15
3.0	ITU-T G.808.1	2010-02-22	15
3.1	ITU-T G.808.1 (2010) Amd. 1	2012-08-06	15
3.2	ITU-T G.808.1 (2010) Amd. 2	2012-09-21	15

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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.

NOTE

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

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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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.808.1

Generic protection switching – Linear trail and subnetwork protection

Amendment 2

New Appendix VII – Solution for service protection in dynamic bandwidth networks

1) Clause 4

Add the following abbreviations to clause 4:

CIR Committed Information Rate

DBN Dynamic Bandwidth Network

2) Appendix VII

Introduce Appendix VII as shown below, after Appendix VI.

Appendix VII

Solution for service protection in DBN

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

NOTE – This is a special implementation proposed for service protection switching in dynamic bandwidth networks (DBN). In this appendix, bandwidth degradation could trigger a signal degrade (SD) condition or a bandwidth degradation message.

For networks using links that offer dynamic bandwidth adjustment, additional consideration can be made for protection action during bandwidth degradation periods. Under bandwidth degradation conditions, where the available link bandwidth is less than that available under normal conditions, some of the services associated with that particular link could potentially be no longer supported. The solution presented here supports load sharing in dynamic bandwidth networks and can provide protection for high priority services while maintaining high network utilization.

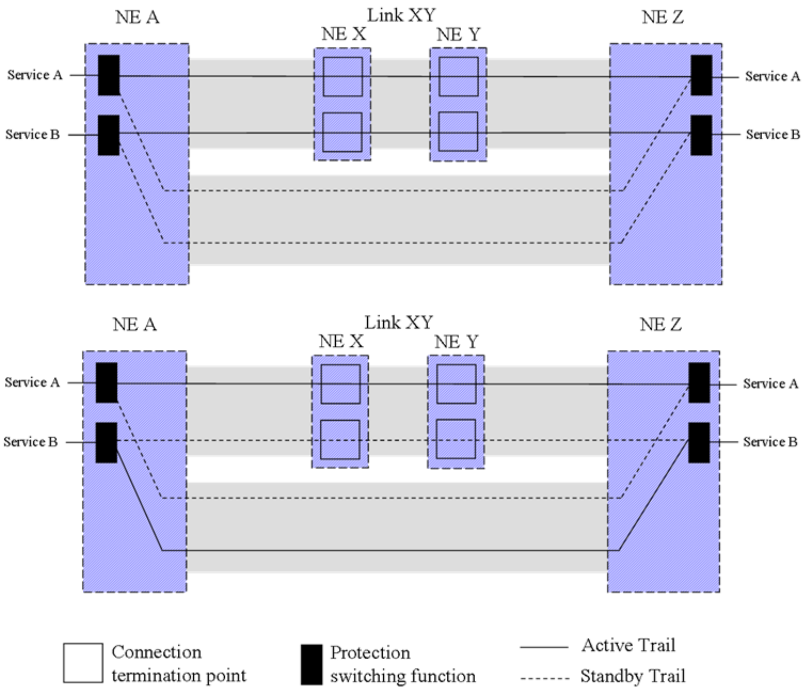

Figure VII.1 – Load sharing in a dynamic bandwidth network

Figure VII.1 shows the concept of redistributing services through protection switching. In this simple set-up a bandwidth change of link XY may trigger protection switching to redistribute the services according to the current bandwidth. This is achieved through signalling the state of the trail(s) on Link XY to the head-ends. The state could be conveyed to the head-ends either as a signal degrade (SD) condition or a bandwidth degradation message.

Below is a generic linear protection example showing how this scheme may be deployed when using a dynamic bandwidth link. In this example two trails supporting service A and service B share the physical dynamic bandwidth link XY.

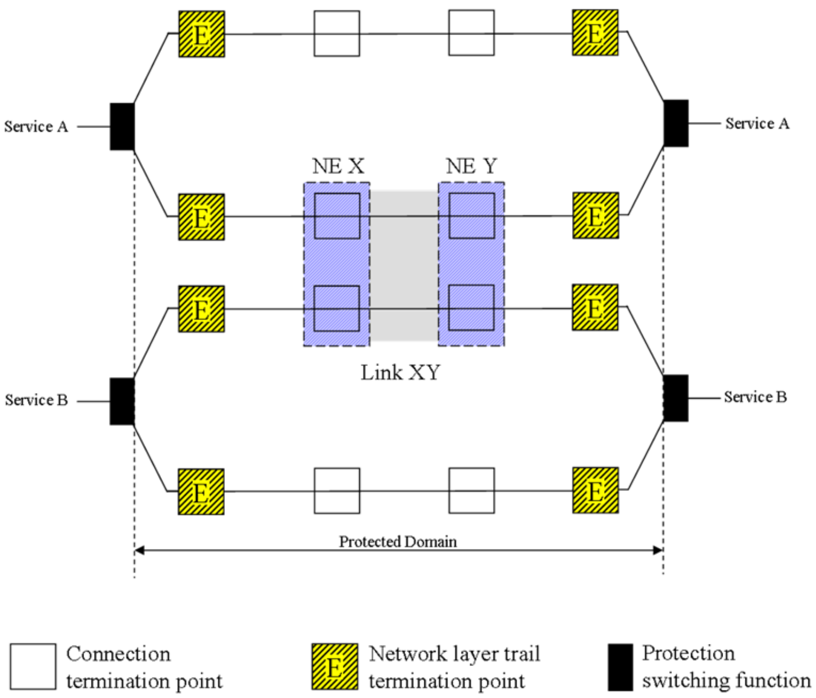

Figure VII.2 – Generic concept of trail protection over dynamic bandwidth links

In Figure VII.2, the network elements (NEs) X and Y implement a dynamic bandwidth link XY. The bandwidth of the link is dynamic in the sense that the NEs adjust the transmission rate in real time to current propagation conditions. The transmission rate is increased during favourable conditions and decreased at less favourable conditions. This adaptive functionality is implemented in the physical layer (layer 1) and changes in the rate occur. From this follows that the NEs have access to the current dynamic bandwidth for link XY, however, how this information is generated is not covered by this appendix.

The services in Figure VII.2, service A and service B, are associated with service-specific committed information rates, CIR A and CIR B.

In the case where NE X and NE Y have the knowledge of service bandwidths, CIR A and CIR B, signal degradation can be used for triggering protection switching. The generation of a signal degrade for a trail due to bandwidth degradation may then be implemented as follows:

– During normal conditions, where the aggregated CIR for the trails (CIR A+ CIR B) is less than the current link bandwidth, no trail is signalled as degraded as the trails/services requirements have been met.
– In the case where a current link bandwidth is being degraded to the extent that only the most prioritized trail/service can be sustained, the less prioritized service is signalled as degraded, as the requirement of that service cannot be met i.e., the service cannot be sustained during the degradation.
– In the case that the current bandwidth degrades to the extent that the CIR of the most prioritized service cannot be met both services may be signalled as degraded.

The NEs (X and Y) which implement the connection termination point will raise the SD condition for unsupportable/unsustainable trails. This condition is passed to the protection switching function which may take protection switching action (if the trail is the working trail and there is a protection trail available). The rationale for using SD (as opposed to SF) is that it may be interpreted as an indication that service degradation is most likely to occur if using an SD conditioned trail. The actual outcome however, depends on the total level of utilization of the bandwidth degraded link. For those cases when all trails of a protection switching function have an SD condition it is still viable to send the service over one of the trails as some bandwidth may still be available. Furthermore, it is assumed that alarm and fault handling is improved if link failure and bandwidth degradation can be separated.

In the case where NE X and NE Y have no knowledge of the service bandwidth, a bandwidth degradation message can be used for triggering protection switching. This method can be applied in the ACL-SNCG/I protection switching scheme. Protection switching can be performed as follows:

– During normal conditions, no bandwidth degradation message is sent by NEs (X and Y).
– In the case of link bandwidth degradation, bandwidth degradation messages which carry current bandwidth information are signalled to the head-ends. This bandwidth information is the current bandwidth allocated for the component link on Link XY.
– The head-end may update the distribution policy based on the received bandwidth information. In the case that multiple degradations occur along one component link, the head-end may receive multiple and different bandwidth values. The lowest value should be selected.
– The head-end will perform protection switching to redistribution services on the component links according to the updated distribution policy.

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