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 1

(07/2005)

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

Digital networks – General aspects

Generic protection switching – Linear trail and subnetwork protection

Amendment 1

ITU-T Recommendation G.808.1 (2003) – Amendment 1

ITU-T

International Telecommunication Union

ITU-T G-SERIES RECOMMENDATIONS

TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

For further details, please refer to the list of ITU-T Recommendations.

ITU-T Recommendation G.808.1

Generic protection switching – Linear trail and subnetwork protection

Amendment 1

Summary

This amendment contains a modification to clause 12, originally dedicated to the survivability mechanism offered by LCAS. The amended clause 12 generalizes the survivability mechanism for generic inverse multiplexed link connections. The application of survivability offered by LCAS, which represents a subset of the inverse multiplexed link, is described in a new Appendix V.

Source

Amendment 1 to ITU-T Recommendation G.808.1 (2003) was approved on 14 July 2005 by ITU-T Study Group 15 (2005-2008) under the ITU-T Recommendation A.8 procedure.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. 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.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

ITU-T Recommendation G.808.1

Generic protection switching – Linear trail and subnetwork protection

Amendment 1

1) Clause 4 Abbreviations

Add the following new abbreviations alphabetically:

IMG Inverse Multiplexed Group

SIM Survivability of Inverse Multiplexed link connections

2) New clause 12 Survivability of Inverse Multiplexed link connections (SIM)

Replace the existing text and Figures of clause 12 as follows, and renumber subsequent Figures accordingly:

12 Survivability of Inverse Multiplexed link connections (SIM)

Transport methodologies are available that support inverse multiplexing. Inverse multiplexing can be used to transport a client signal by distributing the payload and transferring the fragments over a number of individual trails through the network. The individual fragment trails can be considered as members of an Inverse Multiplexed Group (IMG).

Inverse multiplexing schemes that provide accommodation to network faults (e.g., Virtual Concatenation with LCAS) can be used to offer survivability to a P-X signal trail across an entire operator's network, or across multiple operator networks. It is an end-to-end survivability architecture that can be used in different network topologies, e.g., meshed networks, ring networks, etc. As it is a dedicated survivability mechanism, there is no fundamental limitation on the number of NEs within the trails.

SIM will operate in all combinations of protection architectures, switching and operation.

SIM generically protects against faults in the server layer, and connectivity faults and performance degradations in the client layer.

SIM protects the Adapted Information (AI) (i.e., the total payload of the network layer's individual Characteristic Information (CI)). See Figure 32.

The accommodation consists of removing the fractional payload transported by any member of the IMG that experiences a transport entity fault condition. The result is a reduced AI payload size.

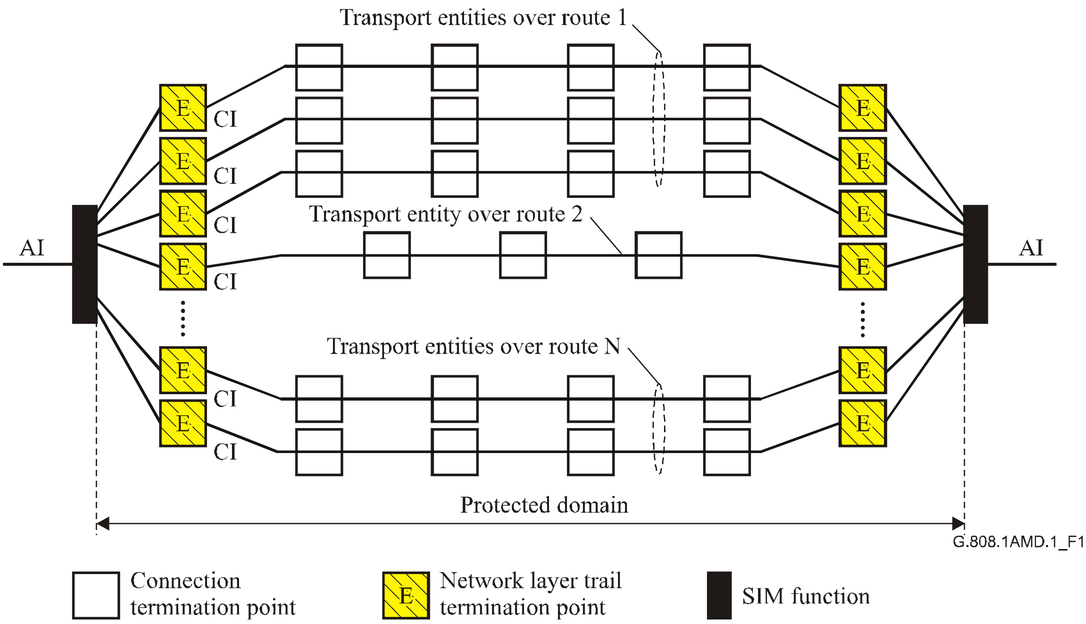

Figure 32/G.808.1 – Generic concept of survivability of Inverse Multiplexed Trail

The AI is transported using an IMG with X members, distributed over N routes, where

- N = number of routes ($1 \leq N \leq X$) each containing one or more network connections within the IMG;
- X = number of members in the IMG required to transport the client's bandwidth AI + extra/protection capacity Z ($X \geq 1$, $Z \geq 0$);
- B = total bandwidth of the X+Z members in the group. $B = \sum_{i}^{X+Z} B_i$
- B_{ACT} = actual transported payload ($0 \leq B_{ACT} \leq B$); due to failure of one or more of the member trails the bandwidth of one or more members in the IMG will not be used to transport the AI.

SIM is independent of protection at the server layers.

12.1 SIM functional model

Figure 33 illustrates the case of SIM for transport between NEs A and Z. Multiple independent trails (in layer network Y) are used as transport entities for the normal (payload) traffic signal Z_CI. The X trail termination functions Y_TT generate/insert and monitor/extract the end-to-end overhead information to determine the status of the individual transport entities. The Inverse Multiplexing adaptation functions Y-Xv/Y-X_A generate/insert and monitor/extract the end-to-end Inverse Multiplexing overhead information to determine and align the status of the X members in the IMG.

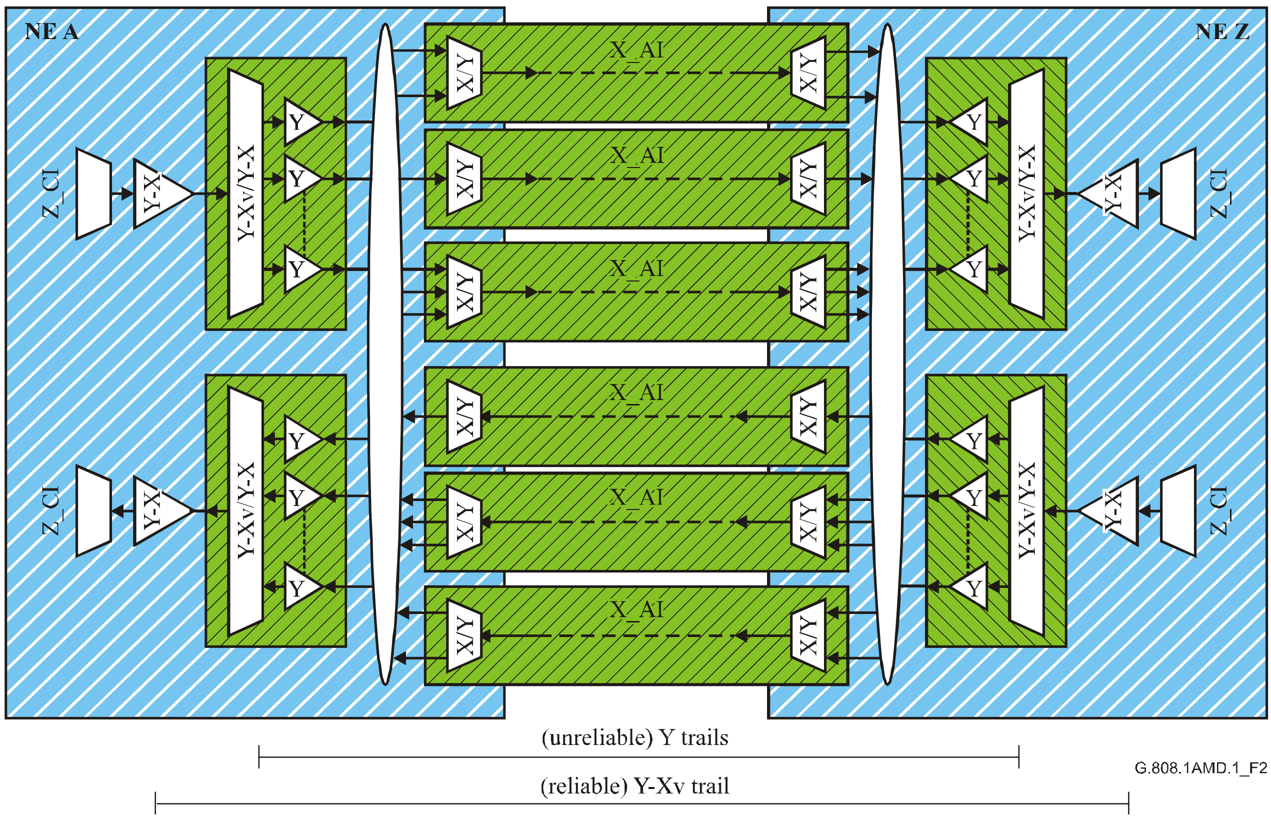

Figure 33/G.808.1 – SIM functional model

The Inverse Multiplexing adaptation functions Y-Xv/Y-X_A distribute/collect the transported payload using the X_{ACT} available layer network Y trails out of the X provisioned layer network Y trails.

3) New Appendix V

Add new Appendix V as follows:

Appendix V

Examples of survivability of inverse multiplexed trails

V.1 Survivability offered by LCAS

Using the Inverse Multiplexing capability of VCAT+LCAS where Y = Y-Xv and Z = Y-Xc and the IMG is equivalent to a VCG, the following example is provided.

The AI is transported using a Virtual Concatenation Group (VCG) with X members (VC_n_Xv, ODUk_Xv), distributed over N routes, where:

- All members belonging to the VCG have the same bandwidth;
- The Bandwidth of the VCG is proportional to the number of active members;
- N = number of routes ($1 \leq N \leq X$) each containing one or more network connections within the VCG;

- X = number of members in the VCG required to transport the client's bandwidth AI + extra/protection capacity Z ($X \geq 1$, $Z \geq 0$);
- X_{ACT} = actual transported payload ($0 \leq X_{ACT} \leq X$); due to failure of one or more of the trails the bandwidth of one or more members in the VCG will not be used to transport the AI.

For the transport of a 10 Mbit/s signal, a VC-12-5v is required. Five (5) individual VC-12 trails are set-up in this VCG, two are routed via route 1 and three VC-12 are routed via route 2 (Figure V.1). In this particular case, the survivable bandwidth is 2 × VC-12 or 40% and the non-survivable bandwidth is 3 × VC-12 or 60%. When one extra VC-12 would have been provisioned (E = 1) routed via route 1, the survivable bandwidth would have been 3 × VC-12 or 60% and the unprotected bandwidth 2 × VC-12 or 40%.

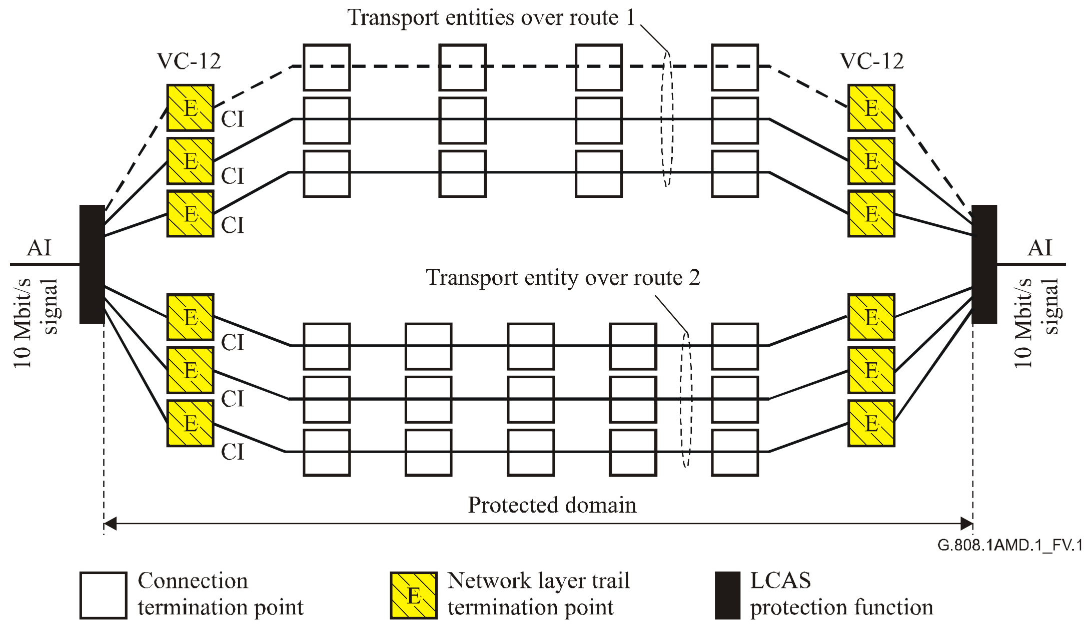

Figure V.1/G.808.1 – Example LCAS survivability for 10 Mbit/s signal over VC-12-(X+E)v (X = 5, E = 0,1)

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	**Transmission systems and media, digital systems and networks**
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	Telecommunication management, including TMN and network maintenance
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks, open system communications and security
Series Y	Global information infrastructure, Internet protocol aspects and next-generation networks
Series Z	Languages and general software aspects for telecommunication systems

Printed in Switzerland
Geneva, 2005