International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.709/Y.1331

Amendment 2

(11/2007)

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Amendment 2

ITU-T Recommendation G.709/Y.1331 (2003) – Amendment 2

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ITU-T Recommendation G.709/Y.1331

Interfaces for the Optical Transport Network (OTN)

Amendment 2

Summary

Amendment 2 to ITU-T Recommendation G.709/Y.1331 (03/2003) as modified per Corrigendum 1 (12/2006):

– clarifies the coding of the MSI fields in the OPU3 for the case of ODU1 and/or ODU2 mapping into tributary slots of the OPU3;

– extends the listed set of client signals of the ODUk with the T-MPLS client;

– corrects a number of editorial mistakes in clauses 19.2.x and Appendix I.

Source

Amendment 2 to ITU-T Recommendation G.709/Y.1331 (2003) was approved on 22 November 2007 by ITU-T Study Group 15 (2005-2008) under the ITU-T Recommendation A.8 procedure.

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.

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Interfaces for the Optical Transport Network (OTN)

Amendment 2

1) Clause 6.1, Basic signal structure

Replace Figure 6-1 with the following figure in which T-MPLS is included as client:

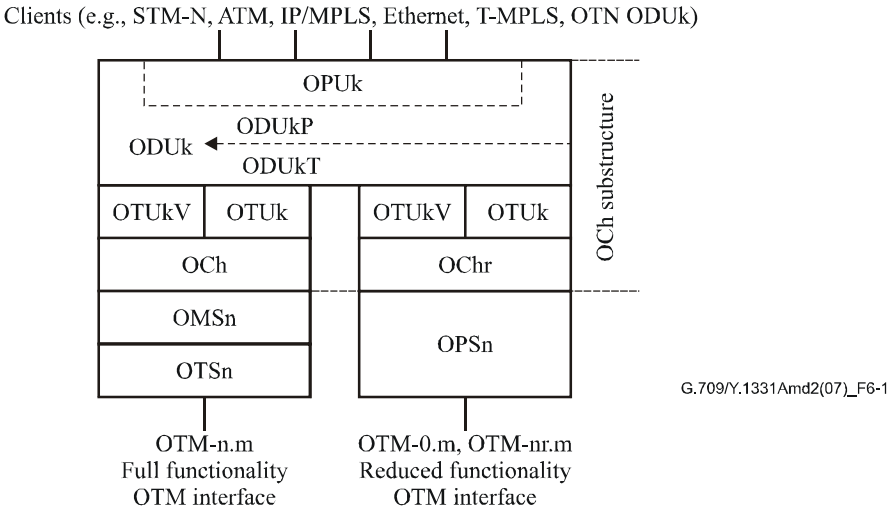

Figure 6-1 – Structure of the OTN interfaces

2) Clause 19.2.1, ODTU12

Modify the following paragraph as follows:

The Optical channel Data Tributary Unit 12 (ODTU12) is a structure with 952 columns by 16 (4 × 4) rows plus 1 column of Justification Overhead (JOH). It carries a justified ODU1 signal. The ODTU12 structure is illustrated in Figure 19-11. The location of the JOH column depends on the OPU2 tributary slot used when multiplexing the ODTU12 in the OPU2 (see 19.1.1).

3) Clause 19.2.2, ODTU13

Modify the following paragraph as follows:

The Optical channel Data Tributary Unit 13 (ODTU13) is a structure with 238 columns by 64 (16 × 4) rows plus 1 column of Justification Overhead (JOH). It carries a justified ODU1 signal. The ODTU13 structure is illustrated in Figure 19-12. The location of the JOH column depends on the OPU3 tributary slot used when multiplexing the ODTU13 in the OPU3 (see 19.1.2).

4) Clause 19.2.3, ODTU23

Modify the following paragraph as follows:

The Optical channel Data Tributary Unit 23 (ODTU23) is a structure with 952 columns by 64 (16 × 4) rows plus 4 times 1 column of Justification Overhead (JOH). It carries a justified ODU2 signal. The ODTU23 structure is illustrated in Figure 19-13. The location of the JOH column depends on the OPU3 tributary slot used when multiplexing the ODTU23 in the OPU3 (see 19.1.2). They might not be equally distributed.

5) Clause 19.4, OPUk Multiplex Overhead

Replace Figure 19-6 with the following figure in which the MSI field is defined with an OPUk specific length:

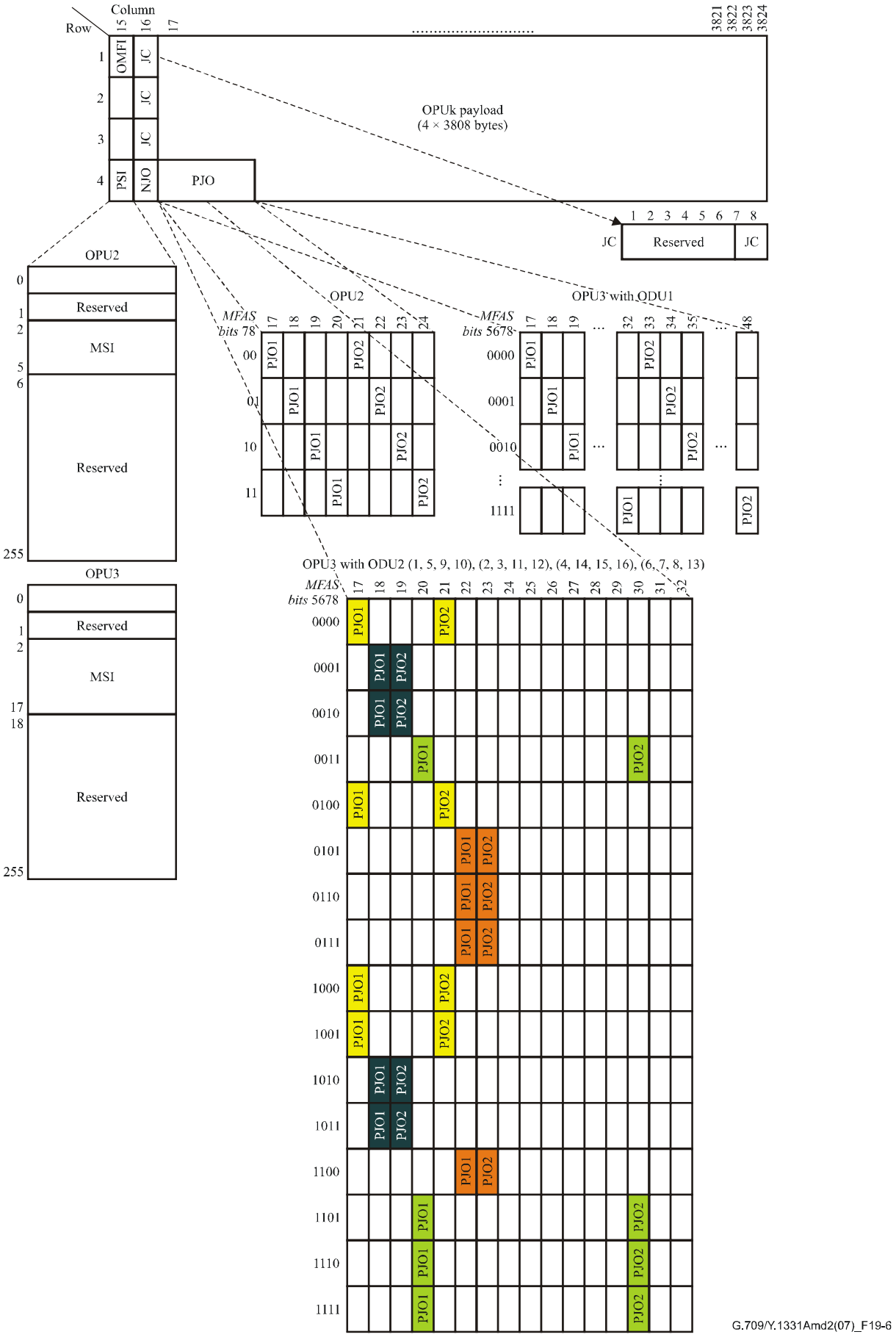

Figure 19-6 – OPUk multiplex overhead

6) Clause 19.4.1, OPUk Multiplex Structure Identifier (MSI)

Modify the following paragraphs as follows:

The multiplex structure identifier (MSI) overhead, which encodes the ODU multiplex structure in the OPU, is located in the mapping specific area of the PSI signal (OPU2: PSI[2] .. PSI[5], OPU3: PSI[2] .. PSI[17]). The MSI has an OPU specific length (OPU2: 4 bytes, OPU3: 16 bytes) and indicates the content of each tributary slot (TS) of an OPU. The generic coding for each TS is shown in Figure 19-7. One byte is used for each TS.

– Bits 1 and 2 indicate the ODU type transported in the TS.

– Bits 3 to 8 indicate the tributary port of the ODU transported. This is of interest in case of flexible assignment of ODUs to tributary slots (e.g., ODU2 into OPU3). In case of fixed assignment the tributary port number corresponds to the tributary slot number.

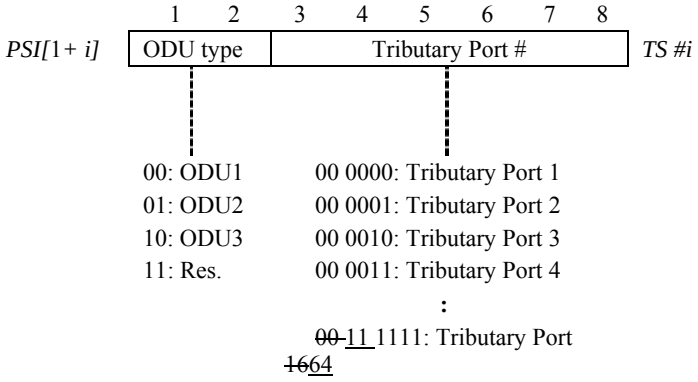

Figure 19-7 – Generic MSI coding

7) Clause 19.4.1.1, OPU2 Multiplex Structure Identifier (MSI)

Modify the following paragraphs as follows:

For the 4 OPU2 tributary slots 4 bytes of the PSI are used (PSI[2] .. PSI[5]) as shown in Figures 19-6 and 19-8.

– The ODU type is fixed ODU1.

– The tributary port # indicates the port number of the ODU1 that is being transported in this TS; the assignment of ports to tributary slots is fixed, the port number equals the tributary slot number.

~~The remaining 12 bytes of the MSI field (PSI[6] to PSI[17]) are unused. They are set to 0 and ignored by the receiver.~~

8) Clause 19.4.1.2, OPU3 Multiplex Structure Identifier (MSI)

Modify the following paragraphs as follows:

For the 16 OPU3 tributary slots 16 bytes of the PSI are used (PSI[2] .. PSI[17]) as shown in Figures 19-6 and 19-9.

– The ODU type indicates if the OPU3 TS is carrying ODU1 or ODU2. The default ODU type is ODU1; it is present when either a tributary slot carries an ODU1, or is not allocated to carry an ODU. Refer to Appendix VI for some examples.

9) Clause 19.4.2, OPUk Payload Structure Identifier Reserved overhead (RES)

Modify the following paragraph as follows:

251 (OPU2) and 239 (OPU3) bytes are reserved in the OPUk PSI for future international standardization. These bytes are located in PSI[1] and PSI[6] (OPU2), PSI[18] (OPU3) to ~~[~~PSI[255] of the OPUk overhead. These bytes are set to all ZEROs.

10) Appendix I

Modify the 4th paragraph as follows:

Let α represent justification ratio ($-1 \le \alpha \le 1$ for CBR client into ODUk mapping; ~~-1~~2 $\le \alpha \le$ ~~2~~ 1 for ODUj into ODUk mapping ($k > j$)), and use the further convention that positive α will correspond to negative justification and negative α to positive justification (the reason for this convention is explained below).

11) Appendix I, ODU1 into ODU2 multiplexing

Modify the last paragraph as follows:

In addition, stuff ratios of ~~–1~~ 2 and +1~~2~~ are obtained for frequency offsets of ~~–47.998~~ 113.65 ppm and ~~148.96~~ 83.30 ppm, respectively. The range of frequency offset that can be accommodated is approximately 197 ppm. This is 50% larger than the range that can be accommodated by a +1/0/–1 justification scheme (see above), and is due to the additional positive stuff byte.

12) Appendix I, ODU2 into ODU3 multiplexing

Modify the last paragraph as follows:

In addition, stuff ratios of ~~–1~~ 2 and +~~2~~ 1 are obtained for frequency offsets of ~~–30.195~~ 95.85 ppm and ~~166.77~~ 101.11 ppm, respectively. As above, the range of frequency offset that can be accommodated is approximately 197 ppm, which is 50% larger than the range that can be accommodated by a +1/0/–1 justification scheme (see above) due to the additional positive stuff byte.

13) Appendix I, ODU1 into ODU3 multiplexing

Modify the last paragraph as follows:

In addition, stuff ratios of ~~–1~~ 2 and +~~2~~ 1 are obtained for frequency offsets of ~~–30.472~~ 96.40 ppm and ~~167.32~~ 101.39 ppm, respectively. As above, the range of frequency offset that can be accommodated is approximately 197 ppm, which is 50% larger than the range that can be accommodated by a +1/0/–1 justification scheme (see above) due to the additional positive stuff byte.

14) Appendix VI

Add a new Appendix VI with the following text:

Appendix VI

ODUk Multiplex Structure Identifier (MSI) examples

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

The following figures present four examples of ODU1 and ODU2 carryage within an OPU3 and the associated MSI encoding.

	1 2	3 4 5 6 7 8	
PSI[2]	00	000000	*TS1*
PSI[3]	00	000001	*TS2*
PSI[4]	00	000010	*TS3*
PSI[5]	00	000011	*TS4*
PSI[6]	00	000100	*TS5*
PSI[7]	00	000101	*TS6*
PSI[8]	00	000110	*TS7*
PSI[9]	00	000111	*TS8*
PSI[10]	00	001000	*TS9*
PSI[11]	00	001001	*TS10*
PSI[12]	00	001010	*TS11*
PSI[13]	00	001011	*TS12*
PSI[14]	00	001100	*TS13*
PSI[15]	00	001101	*TS14*
PSI[16]	00	001110	*TS15*
PSI[17]	00	001111	*TS16*

Figure VI.1 – OPU3-MSI coding for case of 16-tuple ODU1 into OPU3

	1 2	3 4 5 6 7 8	
PSI[2]	01	000000	*TS1*
PSI[3]	01	000001	*TS2*
PSI[4]	01	000010	*TS3*
PSI[5]	01	000011	*TS4*
PSI[6]	01	000000	*TS5*
PSI[7]	01	000001	*TS6*
PSI[8]	01	000010	*TS7*
PSI[9]	01	000011	*TS8*
PSI[10]	01	000000	*TS9*
PSI[11]	01	000001	*TS10*
PSI[12]	01	000010	*TS11*
PSI[13]	01	000011	*TS12*
PSI[14]	01	000000	*TS13*
PSI[15]	01	000001	*TS14*
PSI[16]	01	000010	*TS15*
PSI[17]	01	000011	*TS16*

Figure VI.2 – OPU3-MSI coding for case of 4-tuple ODU2 into OPU3 TS# (1, 5, 9, 13), (2, 6, 10, 14), (3, 7, 11, 15) and (4, 8, 12, 16)

	1 2	3 4 5 6 7 8	
PSI[2]	01	000000	*TS*1
PSI[3]	01	000001	*TS*2
PSI[4]	01	000001	*TS*3
PSI[5]	01	000010	*TS*4
PSI[6]	01	000000	*TS*5
PSI[7]	01	000011	*TS*6
PSI[8]	01	000011	*TS*7
PSI[9]	01	000011	*TS*8
PSI[10]	01	000000	*TS*9
PSI[11]	01	000000	*TS*10
PSI[12]	01	000001	*TS*11
PSI[13]	01	000001	*TS*12
PSI[14]	01	000011	*TS*13
PSI[15]	01	000010	*TS*14
PSI[16]	01	000010	*TS*15
PSI[17]	01	000010	*TS*16

Figure VI.3 – OPU3-MSI coding for case of 4-tuple ODU2 into OPU3 TS# (1, 5, 9, 10), (2, 3, 11, 12), (4, 14, 15, 16) and (6, 7, 8, 13)

	1 2	3 4 5 6 7 8	
PSI[2]	01	000000	*TS*1
PSI[3]	00	000001	*TS*2
PSI[4]	00	000010	*TS*3
PSI[5]	00	000001	*TS*4
PSI[6]	01	000000	*TS*5
PSI[7]	00	000101	*TS*6
PSI[8]	00	000110	*TS*7
PSI[9]	00	000001	*TS*8
PSI[10]	01	000000	*TS*9
PSI[11]	01	000001	*TS*10
PSI[12]	00	001010	*TS*11
PSI[13]	00	001011	*TS*12
PSI[14]	01	000000	*TS*13
PSI[15]	00	001101	*TS*14
PSI[16]	00	001110	*TS*15
PSI[17]	01	000001	*TS*16

Figure VI.4 – OPU3-MSI coding for case of 5-tuple ODU1 and 2-tuple ODU2 into OPU3 TS# (2), (6), (11), (12), (14), (1, 5, 9, 13) and (4, 8, 10, 16) and OPU3 TS# 3, 7, 15 unallocated (default to ODU1)

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