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Common Label and Label Request Specification for Automatic Switched Transport Network

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1. Status of this Memo

2. Abstract

This draft completes the [GMPLS-REORG] draft and details technology specific issues. It proposes different approach and enhancement to [GMPLS-SIG] and [GMPLS-SIGEN]. Changes are:

-- New set of Signal Type structures of ETSI-PDH, ANSI-PDH, SONET, SDH and OTN for Generalized Label Request [GMPLS-SIG].
-- G-PIDs associated each signal type for G-Label Request.
-- Label Channel ID [GMPLS-REORG] field structure.

3. G-Label Request Specification

```
 0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| LSP Enc. Type |                Signal Type                    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Service Type |  Dir   | Rserved |           G-PID            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

LSP Encoding Type and Signal Type together identify the unique signal type of the LSP.

3.1 LSP Encoding

LSP Encoding Type: 8 bit

Indicates the encoding technology of the LSP being requested.

Value	Type
3	ANSI PDH
4	ETSI PDH
5	SDH
6	SONET
7	OTN
8	Analog

3.2 Signaling Type and Associated G-PID

Signaling Type: 24 bits

Indicates the specific signal type of the LSP being requested. This field is interpreted according to the technology specified by LSP Encoding Type. The Signal Type provides transit switches with the information required to determine which link connection can support the LSP.

G-PID: 16 bits

Indicates the payload carried by an LSP, i.e. an identifier of the client layer of the LSP. It's the same as Payload Types in G.709, Signal Label in G.707 and L3PID in RSVP-TE. Each of signal type may only allow certain types of client signals. The G-PID is mainly used by the adaptation layer function at the LSP terminating points. G-PID is associated with each signal type.

3.2.1 ANSI PDH Signaling Type

Permitted values and their meaning for LSP Encoding Type ANSI-PDH:

Value	Type
1	DS1 SF
2	DS1 ESF
3	DS2
4	DS3 M23
5	DS3 C-bit Parity
6	DS4

When the technology encoding type is ANSI-PDH, GPID can take the following values:

Value	Client Type
0	Unknown

3.2.2 ETSI PDH Signaling Type

Permitted values and their meaning for LSP Encoding Type ETSI-PDH:

Value	Type
1	E1 P12x
2	E1 P12s
3	E2 P22x
4	E2 P22e
5	E3 P31x
6	E3 P31e
7	E3 P31s
8	E4 P4x
9	E4 P4e
10	E4 P4s

3.2.3 SDH Signaling Type

For SONET/SDH, the 24-bit Signal Type SHALL be encoded in the following format:

```
 0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| LSP Enc. Type |      Type       |              X                |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```


Type: 8 bits

Indicates specific signal type of a LSP encoding type

X : 16 bits

Indicates concatenation value.

Permitted type values and their meaning for LSP Encoding Type SDH are:

Value	Type
1	VC-11
2	VC-12
3	VC-2
4	VC-2-Xc (1<=x<=7)
5	VC-3
6	VC-4
7	VC-4-Xc (X=4,16,64,256)
8	MS-X (STM-X MS) (X=1,4,16,64,256)
9	STM-X (X=1,4,16,64,256)
10	VC-11-Xv (1<=X<=64)
11	VC-12-Xv (1<=X<=64)
12	VC-2-Xv (1<=X<=64)
13	VC-3-Xv (1<=X<=256)
14	VC-4-Xv (1<=X<=256)
15	VC-11-Xv LCAS
16	VC-12-Xv LCAS
17	VC-2-Xv LCAS
18	VC-3-Xv LCAS
19	VC-4-Xv LCAS
20	VC-11-X **

21	VC-12-X
22	VC-2-X
23	VC-3-X
24	VC-4-X
128	TUG-2
129	TUG-3
130	AUG-X (X=1,4,16,64,256)
131	VC-4-Xa (1<=X<=256)
132	STM-Xst
133-143	Reserved for vendor specific SDH signal type

** This is used at intermediate nodes to support the LCAS when a subset of the link connections are co-routed.

The "MS-X" and "STM-X" Signal types represent transparent STM Multiplex Section and Regenerator Section LSPs respectively. Note that the "STM-X" signal type represents the complete STM-N signal, including all its SOH.

The "VC-n-Xc" Signal Type represents a contiguous standard concatenated VC-n signal (ITU-T Rec. G.707), which is transported via the AU and TU timeslots according to the (E,D,C,B,A) and (K,L,M) structures.

The "VC-n-Xv" Signal type represents a virtual concatenated VC-n signal.

The "VC-n-Xv LCAS" Signal type represents a VC-n-Xv signal with Link Capacity Adjustment Scheme (LCAS) capability. The "VC-n-X" Signal type represents a group of VC-n signals that are to be co-routed.

Besides the set of signal types derived from the SDH standards, a number of additional signal types are defined. These additional signal types are vendor specific extensions of the SDH standards.

The "AUG-X" Signal type represents an AUG-X bandwidth, of which the specific AU structure is not predefined. This AUG-X link will autonomously adapt to the incoming AU structure. Idem for TUG-2 and TUG-3.

The "VC-4-Xa" Signal type represents a contiguous arbitrary concatenated VC-4 signal.

The "STM-Xst" Signal type represents a "semi transparent" STM-X signal. The AUG-X and some of the SOH (vendor specific selection) is transported through the link connection. Interworking between equipment of different vendors is not to be expected.

To support other vendor specific SDH signal types a set of 13 code points (133-143) is reserved. Within its subnetwork a vendor may assign these code points to its specific signals.

The G-PIDs associated with each Signal Type are (based on G.707):

```
VC-11:     (1) async 1.544 Mbps, (2) bit sync 1.544 Mbps, (3) byte sync
               1.544 Mbps, (4) byte sync 384 kbps, (5) ATM, (6) HDLC
               framed, (7) GFP framed
VC-12:     (1) async 2.048 Mbps - transparent, (2) async 2.048 Mbps -
               terminated, (3) byte sync 2.048 Mbps - transparent, (4)
               byte sync 2.048 Mbps - terminated, (3) 31x64 kbps, (4)
               ATM, (5) HDLC framed, (7) GFP framed
VC-2:      (1) async 6.312 Mbps, (2) bit sync 6.312 Mbps, (3) ATM, (4)
               HDLC framed, (5) GFP framed
VC-2-Xc:   (1) ATM, (2) HDLC framed w/ scrambling
VC-3:      (1) 44.736 Mbps - transparent, (2) 44.736 Mbps - terminated,
               (3) 34.368 Mbps - transparent, (4) 34.368 Mbps -
               terminated G.751 frame, (5) 34.368 Mbps - terminated
               G.832 frame, (3) TUG (4) ATM, (5) HDLC framed w/
               scrambling, (6) GFP framed
```



```
TUG-2:     (1) one TU-2, (2) three TU-12, (3) four TU-11
TUG-3:     (1) one TU-3, (2) seven TUG-2
VC-4:      (1) 139.264 Mbps - transparent, (2) 139.264 Mbps - terminated
               G.751 frame, (3) 139.264 Mbps - terminated G.832 frame,
               (4) TUG, (5) ATM, (6) HDLC framed w/ scrambling, (7)
               DQDB, (8) async FDDI, (9) GFP framed
VC-4-4c:   (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
VC-4-16c:  (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
VC-4-64c:  (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
VC-4-256c: (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
AUG-1:     (1) one AU-4,   (2) three AU-3
AUG-4:     (1) four AUG-1, (2) one AU-4-4c
AUG-16:    (1) four AUG-4, (2) one AU-4-16c
AUG-64:    (1) four AUG-16, (2) one AU-4-64c
AUG-256:   (1) four AUG-64, (2) one AU-4-256c
MS-X:      (1) AUG-X
STM-X:
VC-11-Xv:  (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
VC-12-Xv:  (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
VC-2-Xv:   (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
VC-3-Xv:   (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
VC-4-Xv:   (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
VC-11-Xv LCAS: (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
VC-12-Xv LCAS: (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
```

VC-2-Xv LCAS: (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
VC-3-Xv LCAS: (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
VC-4-Xv LCAS: (1) ATM, (2) HDLC framed w/ scrambling, (3) GFP framed
VC-11-X group that is co-routed: (0) unknown
VC-12-X group that is co-routed: (0) unknown
VC-2-X group that is co-routed: (0) unknown
VC-3-X group that is co-routed: (0) unknown
VC-4-X group that is co-routed: (0) unknown

3.2.4 SONET Signaling Type

Permitted type values and their meaning for LSP Encoding Type SONET are:

Value	Type	
1	VT1.5	
2	VT2	
3	VT3	
4	VT6	
5	STS-1 SPE	
6	STS-Xc SPE	(X=3,12,48,192,768)
7	STS-X SPE	(X=1,3,12,48,192,768)
8	STS-X Line	(X=1,3,12,48,192,768)
9	STS-X	(X=1,3,12,48,192,768)
10	VT1.5-Xv	(1<=X<=64)
11	VT2-Xv	(1<=X<=64)
12	VT3-Xv	(1<=X<=64)
13	VT6-Xv	(1<=X<=64)
14	STS-1-Xv	(1<=X<=256)
15	STS-3c-Xv	(1<=X<=256)
16	VT1.5-Xv LCAS	
17	VT2-Xv LCAS	
18	VT3-Xv LCAS	
19	VT6-Xv LCAS	
20	STS-1-Xv LCAS	
21	STS-3c-Xv LCAS	
22	VT1.5-X **	
23	VT2-X	
24	VT3-X	
25	VT6-X	
26	STS-1-X	
27	STS-3c-X	

```
128          VTG
129          STS Group-X (X=3,12,48,192,768)
130          STS-3c-Xa (1&lt;=X&lt;=256)
131          STS-Xst
132-143      Reserved for vendor specific SONET signal type
```

** This is used at intermediate nodes to support the LCAS when a subset of the link connections are co-routed.

The "STS-X Line" and "STS-X" Signal types represent transparent STS Line and STS Section LSPs respectively. Note that the "STS-X" signal type represents the complete STS-N signal, including all its TOH.

The "STS-Xc" Signal Type represents a contiguous standard concatenated STS signal (ANSI T1.105), which is transported via the STS timeslots according to the (E,D,C,B,A) structures.

The "VTn-Xv" and "STS-n-Xv" Signal types represent virtual concatenated VT and STS signals. The "VTn-Xv LCAS" and "STS-n-Xv LCAS" Signal type represent VTn-Xv and STS-n-Xv signal with Link Capacity Adjustment Scheme (LCAS) capability. The "VTn-X" and "STS-n-X" Signal types represent a group of VTn and STS-n signals that are to be co-routed.

Besides the set of signal types derived from the SONET standards, a number of additional signal types are defined. These additional signal types are vendor specific extensions of the SONET standards.

The "STS Group-X" Signal type represents an STS Group bandwidth, of which the specific STS structure is not predefined. This STS Group-X link will autonomously adapt to the incoming STS structure. Idem VTG.

The "STS-3c-Xa" Signal type represents a contiguous arbitrary concatenated STS-3c signal.

The "STS-Xst" Signal type represents a "semi transparent" STS-X signal. The STS-X SPE and some of the TOH (vendor specific selection) is transported through the link connection. Inter-working between equipment of different vendors is not to be expected.

To support other vendor specific SONET signal types a set of 13 code points (132-143) is reserved. Within its subnetwork a vendor may assign these code points to its specific signals.

The G-PIDs associated with each Signal Type are (based on T1.105):

```
   VT1.5:       (1) async DS1 (1.544 Mbps), (2) bit sync DS1, byte sync
```

```
                 DS1, (3) GFP framed
VT2:         (1) async 2.048 Mbps, (2) bit sync 2.048 Mbps, (3) byte
                 sync 2.048 Mbps, (4) GFP framed
VT3:         (1) async DS1C (3.152 Mbps)
VT6:         (1) async DS2 (6.312 Mbps), (2) GFP framed
STS Group-X: (1) STS-X SPE
STS-1 SPE:   (1) async DS3 (44.736 Mbps), (2) VTG, (3) GFP framed
STS-3c SPE:  (1) ATM, (2) HDLC framed, (3) GFP framed, (4) SDL w/
                 scrambler
STS-12c SPE: (1) ATM, (2) HDLC framed, (3) GFP framed, SDL w/ scrambler
STS-48c SPE: (1) ATM, (2) HDLC framed, (3) GFP framed, SDL w/ scrambler
STS-192c SPE:(1) ATM, (2) HDLC framed, (3) GFP framed, SDL w/ scrambler,
                 10 Gbps Ethernet
STS-768c SPE:(1)ATM,  (2) HDLC framed, (3) GFP framed, SDL w/ scrambler
STS-1 Line:
STS-3 Line:
STS-12 Line:
STS-48 Line:
STS-192 Line:
STS-768 Line:
STS-1:
STS-3:
STS-12:
STS-48:
STS-192:
STS-768:
VT1.5-Xv:    (1) ATM, (2) HDLC framed, (3) GFP framed, SDL w/ scrambler
VT2-Xv:      (1) ATM, (2) HDLC framed, (3) GFP framed, SDL w/ scrambler
VT3-Xv:      (1) ATM, (2) HDLC framed, (3) GFP framed, SDL w/ scrambler
VT6-Xv:      (1) ATM, (2) HDLC framed, (3) GFP framed, SDL w/ scrambler
STS-1-Xv:    (1) ATM, (2) HDLC framed, (3) GFP framed, SDL w/ scrambler
STS-3c-Xv:   (1) ATM, (2) HDLC framed, (3) GFP framed, SDL w/ scrambler
VT1.5-Xv LCAS:
VT2-Xv LCAS:
VT3-Xv LCAS:
```



```
VT6-Xv LCAS:
STS-1-Xv LCAS:
STS-3c-Xv LCAS:
```

3.2.5 OTN Signaling Type

For OTN, the permitted signal types are

Value	Type
1	ODU1
2	ODU2
3	ODU3
10	OCh - further typing will be added to OCh

G-PIDs for ODU1 include:

Value	Type
1	CBR2G5a (asynchronous constant bit rate of 2.5 Gbps such as STM-16 or OC-48)
2	CBR2G5b (bit synchronous constant bit rate of 2.5 Gbps such as STM-16 or OC-48)
3	ATM2G5
4	GFP2G5 (used for transporting data, e.g., IP @ 2.5 Gbps)
5	BSOT2G5 (mapping of non-specific client bit stream w/ octet timing)
6	BSNT2G5 (mapping of non-specific client bit stream w/o octet timing)

G-PIDs for ODU2 include:

Value	Type
1	CBR10Ga
2	CBR10Gb
3	ATM10G
4	GFP10G
5	BSOT10G
6	BSNT10G

G-PIDs for ODU3 include:

Value	Type
1	CBR40Ga

Value	Type
2	CBR40Gb
3	ATM40G
4	GFP40G
5	BSOT40G

```
       6            BSNT40G
```

G-PIDs for OCh include:

Value	Type
1	OTU1
2	OTU1V
3	OTU2
4	OTU2V
5	OTU3
6	OTU3V
7	STM-16/OC-48
8	STM-64/OC-192
9	STM-256/OC-256
10	1 GbE

3.3 Directionality and Service Type are defined in [GMPLS-REORG].

4. G-label Channel ID Specification

4.1 G-Label Specification

[GMPLS-REORG] introduces two type of Label format for automatically switched transport network.

Basic Format:

```
 0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  G-Label     (Port ID)                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| D |              G-Label     (Channel ID)                     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Hierarchical Format:

```
 0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
//                 G-Label     (Connection ID)                 //
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| D |              G-Label     (Channel ID)                     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

4.2 G-Label Channel ID for SONET/SDH

For SDH/SONET, the label identifies both a timeslot in the SDH/SONET frame as well as a Connection Termination Point (CTP) in the equipment.

The Channel ID of the G-label represents for SDH/SONET either the AU/STS timeslots or the TU/VT timeslots.

SDH/SONET are technologies encompassing multiple independent layer networks. Trails and connections in layer networks are set up and torn down independent of trails and connections in their server layer networks. Trails and connections in layer networks are modified independent of trails and connections in their server and client layer networks.

Typically, server layer trails must have been set up before client layer connections and trails can be set up. Server layer trails provide the client layer link connections (label switched hops). As such, STM-N/OC-N (i.e. multiplex section/line) trails must have been established before HOVC connections and trails can be set up. Similarly, VC-4/STS-1 trails must have been established before LOVC/VT connections and trails can be set up.

There is a multiplicity of ports (physical and logical) in SDH/SONET equipment; STM-N/OC-N physical ports, HOVC/STS logical ports, LOVC/VT logical ports. In future hybrid OTN/SDH/SONET equipment STM-N/OC-N ports might also be logical ports.

HOVC/STS signals can be transported over STM-N/OC-N signals. LOVC/VT signals can be transported over either VC-4/VC-3/STS-1 signals, or sub-STM-0/sub-STS-1 signals (e.g. sSTM-1k [k=1,2,4,8,16], sSTM-2n [n=1,2,4]), or 34 376 and 139 264 kbit/s signals with G.832 framing.

STM-N/OC-N signals aggregate HOVC/STS signals. The associated multiplex structure may be adapted during the lifetime of the STM-N/OC-N trail to accommodate the requested mix of HOVC/STS signal types. VC-4/VC-3/STS-1 signals aggregate LOVC/VT signals. The associated multiplex structure may be adapted during the lifetime of the VC-4/VC-3/STS-1 trail to accommodate the requested mix of LOVC/VT signal types. At any moment in time, the complete aggregation bandwidth's multiplex structure must be defined to prevent alarms to be raised.

SDH/SONET equipment may have either no switch fabric, or a HOVC/STS switch fabric, or a LOVC/VT switch fabric, or a HOVC/STS and a LOVC/VT switch fabric. SDH/SONET interfaces on none-SDH/SONET equipment typically have no switch fabric. Hybrid equipment may have SDH/SONET type switch fabrics in addition to client layer (e.g. ATM VP, ATM, VC, IP, Ethernet) switch fabrics and/or server layer (e.g. OTN OCh, OTN ODUk) switch fabrics.

Installing fibers between equipment will establish physical layer trails, but most likely no HOVC/STS or LOVC/VT trails, despite that there might be some SDH/SONET interfaces without switch fabrics connected at the edge of the (sub)network.

Therefore, HOVC/STS labels are independent of LOVC/VT labels. Each one will have a dedicated Channel ID.

4.2.1. HOVC/STS specific Channel ID in STM-N/OC-N

The latest version of G.707 (10/00) has defined a naming structure for the AU's, similar to that for the TU's. AUs are now named according the (E,D,C,B,A) structure (TUs are named according the (K,L,M) structure). This (E,D,C,B,A) structure identifies the AU type, the location in the STM-N/OC-N frame and at the same time implies a restriction on the AU-4-Xc/STS-Xc types and the timeslots these signals can be transported over. Vendor specific extensions exist that have fewer restrictions. To accommodate both cases in a single channel ID structure, HOVC/STS channel IDs are represented by means of the "SU" structure. A conversion between (E,D,C,B,A) and SU is included.

```
 0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       S                       |   U   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

1. S is the index of a particular AUG-X/STS-X, AU/STS, STM-Xst signal. S=1->N indicates the first timeslot of a specific AUG-X/STS-X,

   AU/STS, STM-Xst inside an STM-N/STS-N multiplex. For example, S=1 indicates the first AUG-1/STS-3, and S=N indicates the last AUG-1/STS-3 of this multiplex. S=0 is invalid.

2. U indicates if the AUG-1/STS-3 is subdivided. U=1 indicates that the AUG-1/STS-3 is not further subdivided and contains an AU-4/STS-3c. U=2->4 indicates a specific AU-3/STS-1 inside the given AUG-1/STS-3. For the other signals, U is not-applicable and is fixed to 0.

4.2.2. TU/VT specific Channel ID portion in VC-4 and STS-1

```
 0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
```

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                       |   K   |   L   |   M   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

For SDH VC-4 and VC-3, this is an extension of the numbering scheme defined

in G.707 section 7.3, i.e. the (K, L, M) and (L,M) numbering. For SONET and SDH VC-3 the K field is not significant and must be set to zero.

Each letter indicates a possible branch number starting at the parent node in the multiplex structure. Branches are considered as numbered in increasing order, starting from the top of the multiplexing structure. The numbering starts at 1, zero is used to indicate a non-significant field.

When a field is not significant in a particular context it MUST be set to zero when transmitted, and MUST be ignored when received.

1. K is only significant for SDH VC-4 and must be ignored for SONET and SDH VC-3. It indicates a specific branch of a VC-4. K=1 indicates that the VC-4 is not further sub-divided and contains a C-4. K=2->4 indicates a specific TUG-3 inside the VC-4.

2. L indicates a specific branch of a TUG-3, VC-3 or STS-1 SPE. It is not significant for an unstructured VC-4, and must be 0 in this case. L=1 indicates that the TUG-3/VC-3/STS-1 SPE is not further sub-divided and contains a TU-3 in SDH; It is not applicable for SONET. L=2->8 indicates a specific TUG-2/VT Group inside the corresponding higher order signal.
   L=9 indicates that the TUG3 structure is not predefined; instead it is determined by the incoming signal and autonomously adapts to the TU structure of the incoming signal. This signal is referred to as a TUG-3.

3. M indicates a specific branch of a TUG-2/VT Group. It is not significant for an unstructured VC-4, TUG-3, VC-3 or STS-1 SPE and must be 0 in this case. M=1 indicates that the TUG-2/VT Group is not further sub-divided and contains a TU-2/VT-6. M=2->3 indicates a specific VT-3 inside the corresponding VT Group, these values MUST NOT be used for SDH since there is no equivalent of VT-3 with SDH. M=4->6 indicates a specific TU-12/VT-2 inside the corresponding TUG-2/VT Group. M=7->10 indicates a specific TU-11/VT-1.5 inside the corresponding TUG-2/VT Group.
   M=11 indicates that the TUG2/VTG structure is not predefined; instead it is determined by the incoming signal and autonomously adapts to the TU/VT structure of the incoming signal. This signal

is referred to as a TUG-2/VTG.

4.2.3 TU/VT specific channel portion in sSTM-1k and sSTM-2n

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                               |   L   |   M   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```


For SDH sSTM-2n, this is an extension of the numbering scheme defined in G.708, i.e. the (L,M) numbering.

1. L=1->n indicates a specific TUG-2/VT Group inside the sSTM-2n (n=1,2,4). L=5 indicates that the TUG2 structure is not predefined; instead it is determined by the incoming signal and autonomously adapts to the TU structure of the incoming signal. This signal is referred to as a TUG-2.

2. M indicates a specific branch of a TUG-2/VT Group. M=1 indicates that the TUG-2/VT Group is not further sub-divided and contains a TU-2/VT-6. M=2->4 indicates a specific TU-12/VT-2 inside the corresponding TUG-2/VT Group. M=5->8 indicates a specific TU-11/VT-1.5 inside the corresponding TUG-2/VT Group.
M=9 indicates that the TUG2/VTG structure is not predefined; instead it is determined by the incoming signal and autonomously adapts to the TU/VT structure of the incoming signal. This signal is referred to as a TUG-2/VTG.

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                       |   M   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

For SDH sSTM-1k, this is an extension of the numbering scheme defined in G.708, i.e. the (M) numbering.

1. M=1->k indicates a specific TU-12 inside the sSTM-1k (k=1,2,4,8,16).

4.2.4 TU/VT specific channel portion in P31s and P4s

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
```

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                       |   K   |   L   |   M   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

For the 139 264 kbit/s G.832 framed signal (P4s) option II, this is an extension of the numbering scheme defined in ETSI EN 300 417-5-1, i.e. the (K, L, M) numbering.

Each letter indicates a possible branch number starting at the parent node in the multiplex structure. Branches are considered as numbered in increasing order, starting from the top of the multiplexing structure. The numbering starts at 1, zero is used to indicate a non-significant field.

When a field is not significant in a particular context it MUST be set to zero when transmitted, and MUST be ignored when received.

1. K indicates a specific branch of a P4s. K=1->3 indicates a specific TUG-3 (A, B, C) inside the P4s.

2. L indicates a specific branch of a TUG-3. L=1 indicates that the TUG-3 is not further sub-divided and contains a TU-3. L=2->8 (for K=3, L is limited to 2->6) indicates a specific TUG-2.

3. M indicates a specific branch of a TUG-2. It is not significant for an unstructured TUG-3 and must be 0 in this case. M=1 indicates that the TUG-2 is not further sub-divided and contains a TU-2. M=2->4 indicates a specific TU-12 inside the corresponding TUG-2.

```
 0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                               |   L   |   M   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

For the 139 264 kbit/s G.832 framed signal (P4s) option I, this is an extension of the numbering scheme defined in ETSI EN 300 417-5-1, i.e. the (L, M) numbering.

Each letter indicates a possible branch number starting at the parent node in the multiplex structure. Branches are considered as numbered in increasing order, starting from the top of the multiplexing structure. The numbering starts at 1, zero is used to indicate a non-significant field.

When a field is not significant in a particular context it MUST be set to zero when transmitted, and MUST be ignored when received.

1. L indicates a specific branch of a P4s. L=1->20 indicates a specific TUG-2.

2. M indicates a specific branch of a TUG-2. M=1 indicates that the TUG-2 is not further sub-divided and contains a TU-2. M=2->4 indicates a specific TU-12 inside the corresponding TUG-2.

```
 0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                        |   M   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

For the 34 368 kbit/s G.832 framed signal (P4s) option I, this is an extension of the numbering scheme defined in ETSI EN 300 417-5-1, i.e. the (L, M) numbering. For sSTM-1k, this is an extension of the numbering scheme

defined in G.708, i.e. the (M) numbering.

1. M=1->k indicates a specific TU-12 inside the sSTM-1k (k=1,2,4,8,16).

4.3 OTN Label

TBD

5. Security Considerations

This document raises no new security concerns.

6. References

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