Descripción gráfica de SONET

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Introducción

Este documento proporciona una descripción de Synchronous Optical Network (SONET), representada en imágenes.

Nota: *Tablas y diagramas cortesía de JDS UniPhase Corporation*

Prerequisites

Requirements

No hay requisitos específicos para este documento.

Componentes Utilizados

Este documento no tiene restricciones específicas en cuanto a versiones de software y de hardware.

Convenciones

Consulte Convenciones de Consejos TécnicosCisco para obtener más información sobre las convenciones del documento.

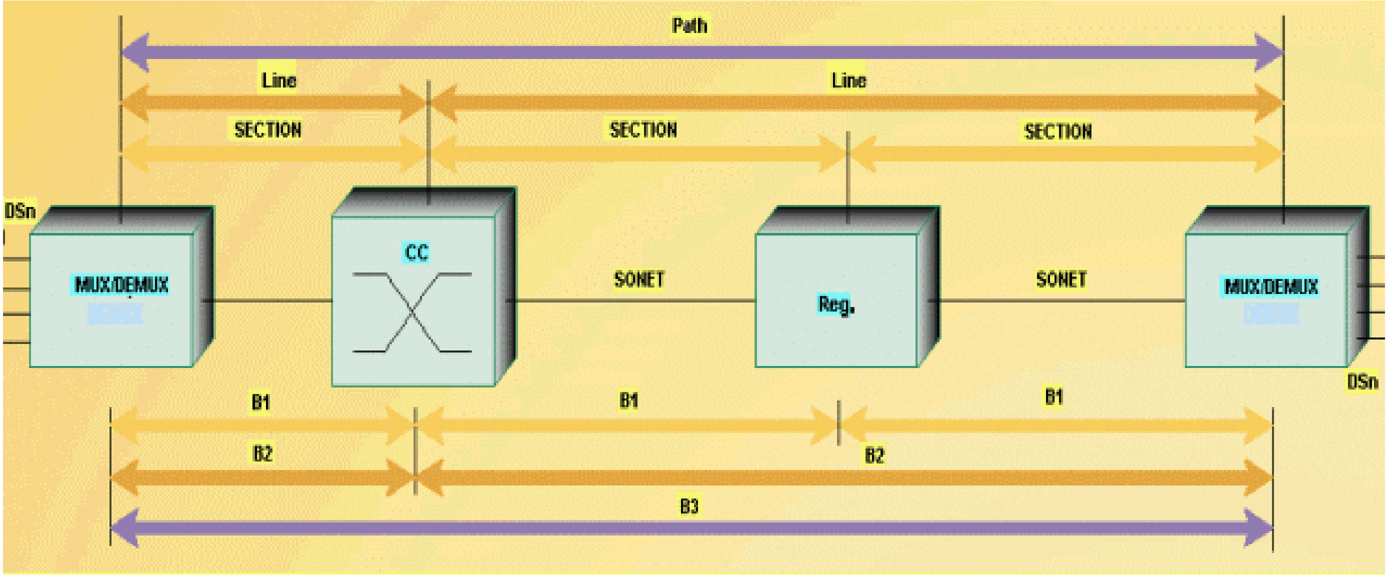
Información general de SONET

Esta sección proporciona una descripción general de SONET en formato gráfico.

El link SONET

La figura 1 muestra cómo se ve un enlace SONET.

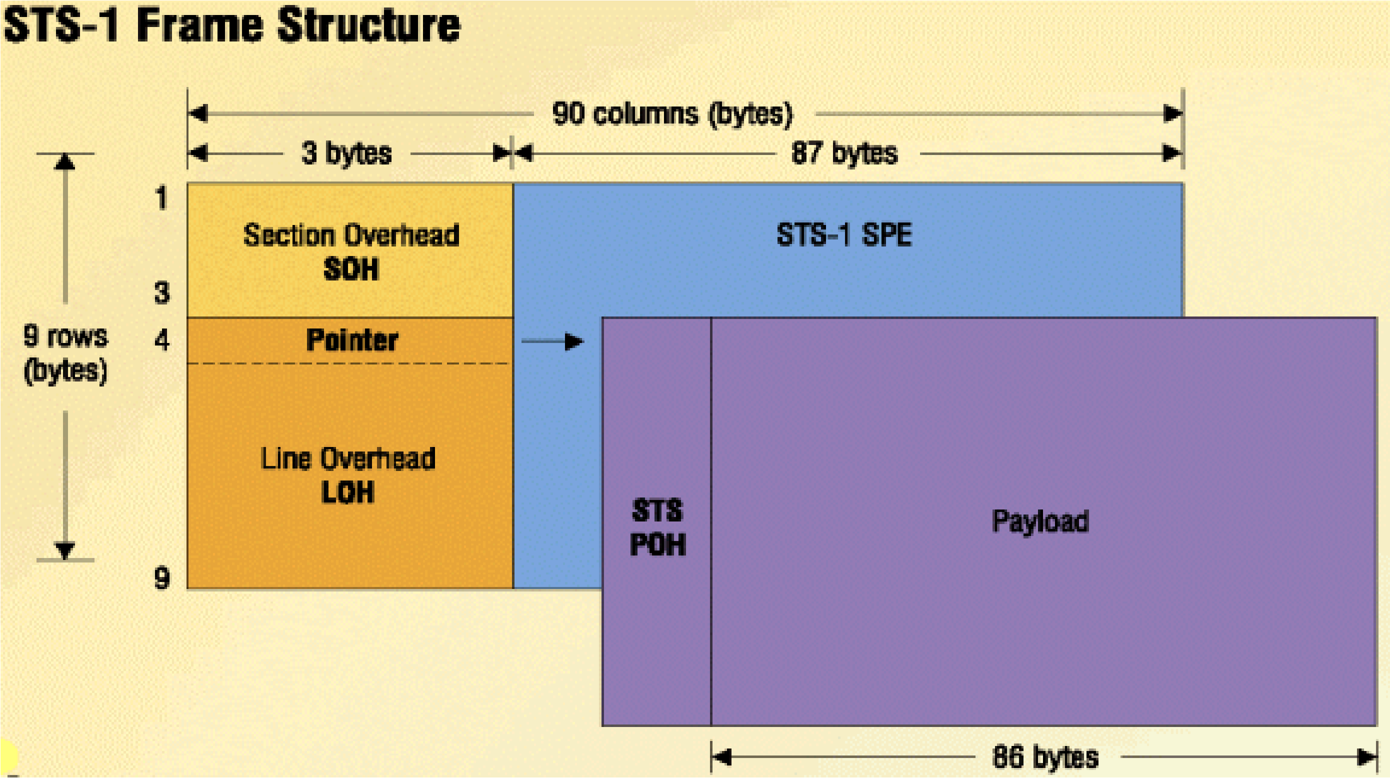
Figura 1: Un enlace SONET


Path
Line
Line
SECTION
SECTION
SECTION
DSn
MUX/DEMUX
CC
SONET
Reg.
SONET
MUX/DEMUX
DSn
B1
B1
B1
B2
B2
B3

STS-1 Tramas

La figura 2 muestra la estructura de tramas del nivel 1 de señal de transporte síncrona (STS-1).

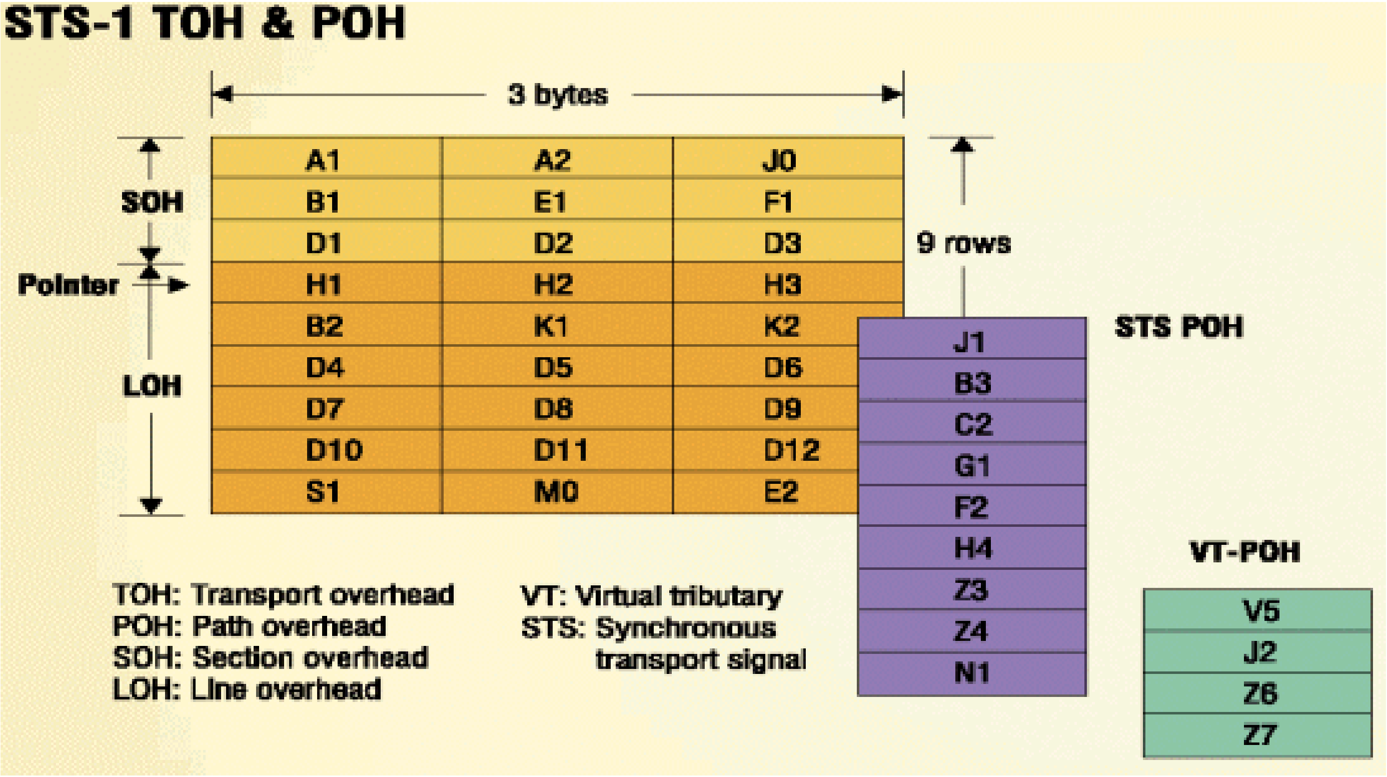
Figura 2: Estructura de la trama STS-1


STS-1 Frame Structure
90 columns (bytes)
3 bytes
87 bytes
1
3
4
9
9 rows (bytes)
Section Overhead
SOH
Pointer
Line Overhead
LOH
STS-1 SPE
STS
POH
Payload
86 bytes

STS-1 SONET Overhead

La figura 3 muestra la sobrecarga de ruta y transporte STS-1 (SONET Overhead).

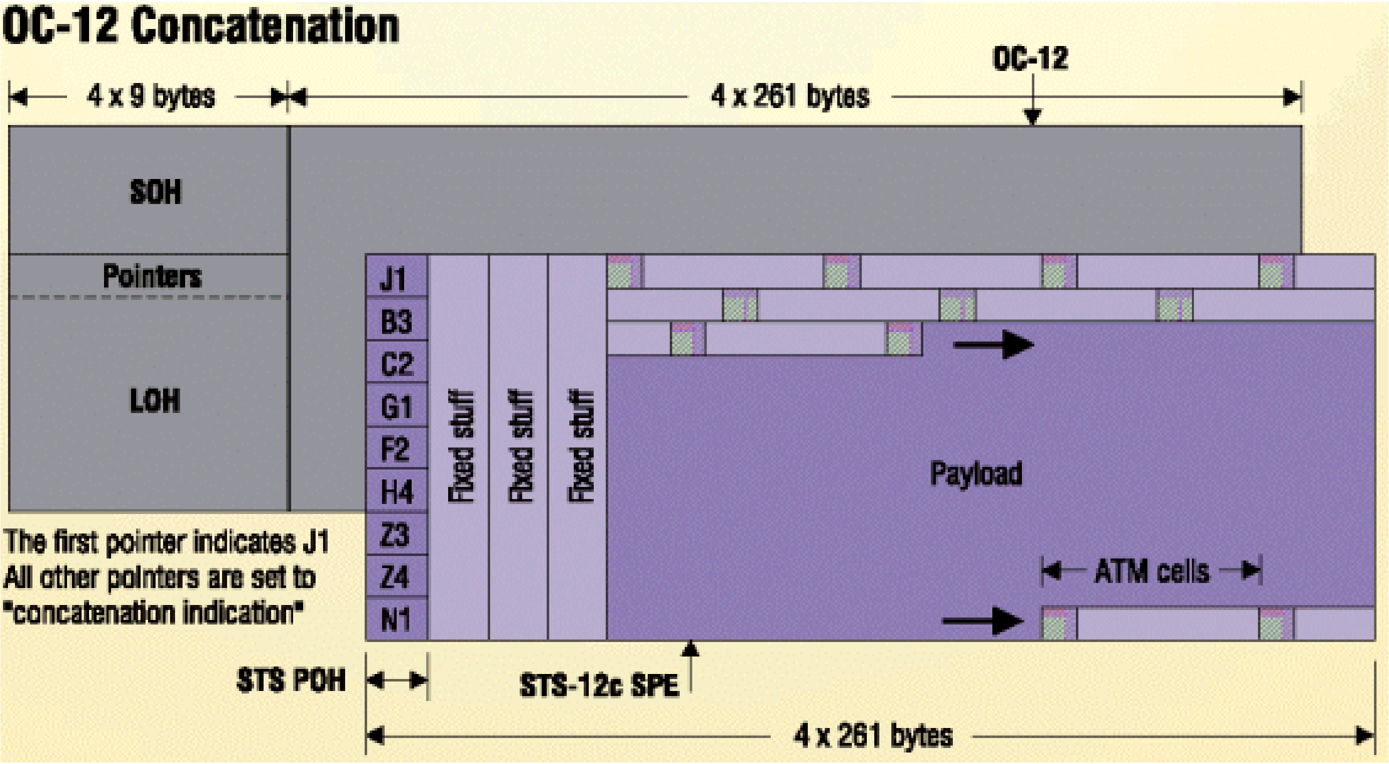
Figura 3 - Gastos generales de transporte y trayecto STS-1


STS-1 TOH & POH
3 bytes
SOH
Pointer
LOH
A1 A2 J0
B1 E1 F1
D1 D2 D3
H1 H2 H3
B2 K1 K2
D4 D5 D6
D7 D8 D9
D10 D11 D12
S1 M0 E2
9 rows
STS POH
J1 B3 C2 G1 F2 H4 Z3 Z4 N1
VT-POH
V5 J2 Z6 Z7
TOH: Transport overhead
POH: Path overhead
SOH: Section overhead
LOH: Line overhead
VT: Virtual tributary
STS: Synchronous transport signal

Concatenación OC-12

La figura 4 observa la concatenación OC-12.

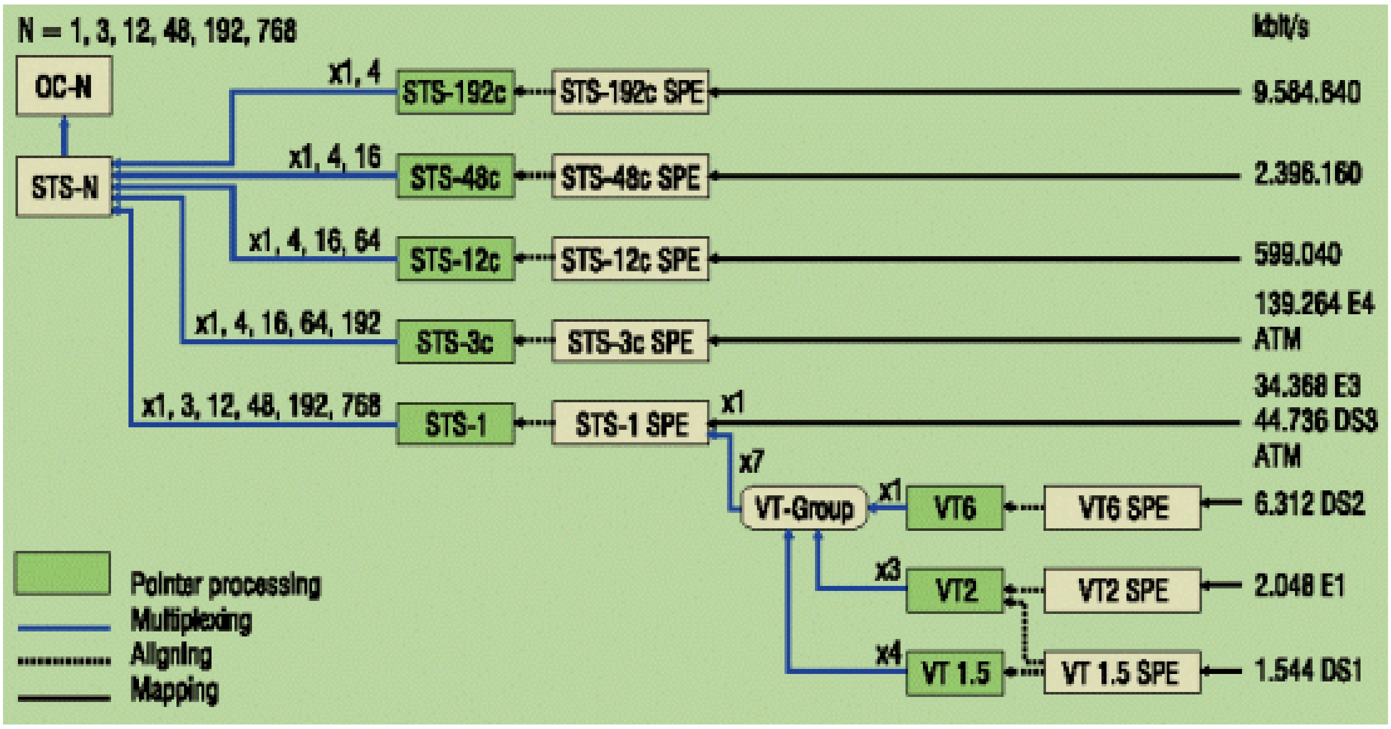
Figura 4: Concatenación de OC-12


OC-12 Concatenation
4 x 9 bytes
4 x 261 bytes
OC-12
SOH
Pointers
LOH
J1 B3 C2 G1 F2 H4 Z3 Z4 N1
Fixed stuff
Fixed stuff
Fixed stuff
Payload
ATM cells
The first pointer indicates J1
All other pointers are set to "concatenation indication"
STS POH
STS-12c SPE
4 x 261 bytes

Jerarquía SONET

La figura 5 muestra la jerarquía SONET.

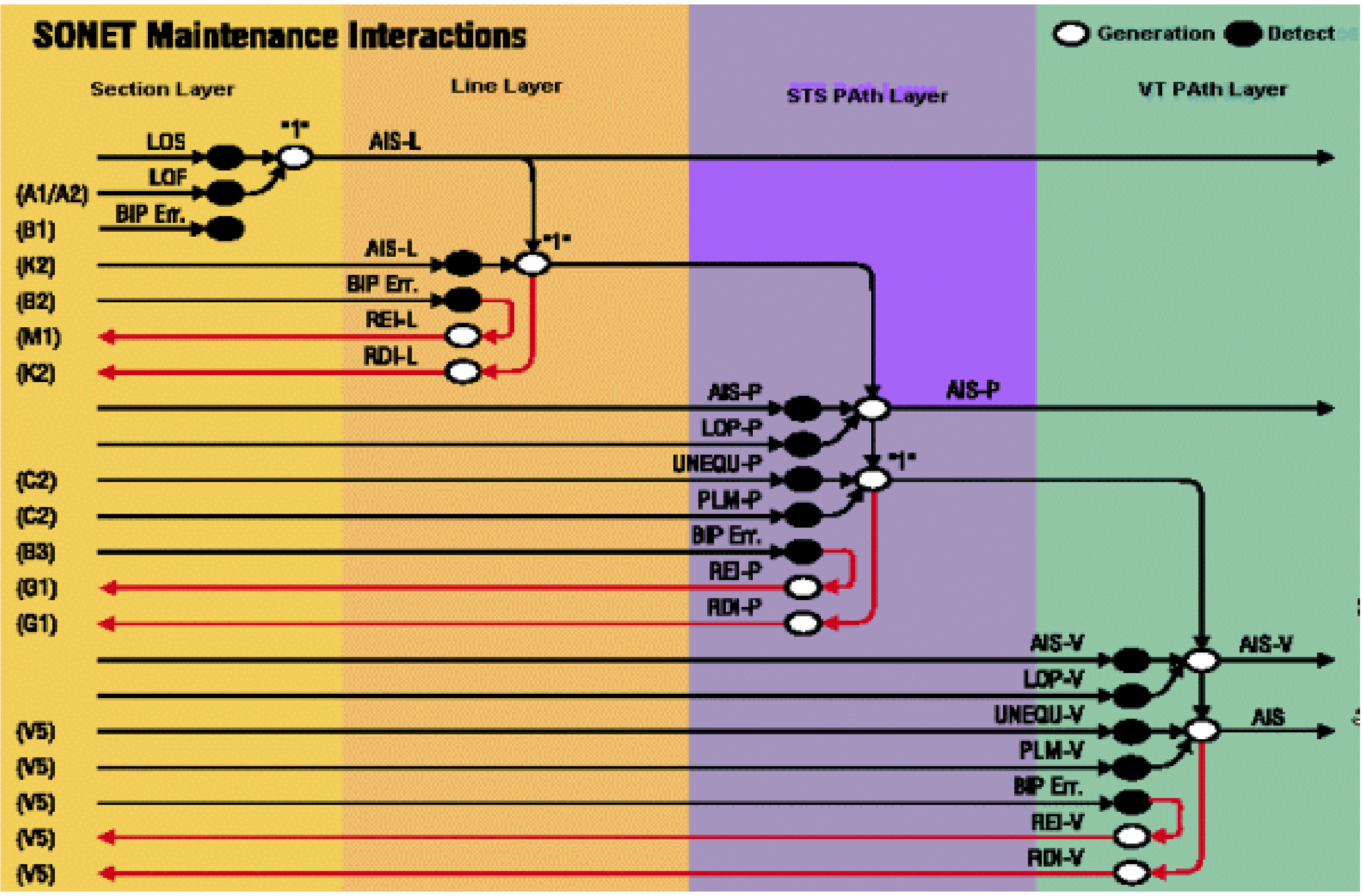
Figura 5: Jerarquía SONET


N = 1, 3, 12, 48, 192, 768
kbit/s
OC-N
STS-N
x1, 4
STS-192c
STS-192c SPE
9.584.640
x1, 4, 16
STS-48c
STS-48c SPE
2.396.160
x1, 4, 16, 64
STS-12c
STS-12c SPE
599.040
x1, 4, 16, 64, 192
STS-3c
STS-3c SPE
139.264 E4
ATM
x1, 3, 12, 48, 192, 768
STS-1
STS-1 SPE
x1
34.368 E3
44.736 DS3
ATM
x7
VT-Group
x1
VT6
VT6 SPE
6.312 DS2
x3
VT2
VT2 SPE
2.048 E1
x4
VT 1.5
VT 1.5 SPE
1.544 DS1
Pointer processing
Multiplexing
Aligning
Mapping

Interacciones de mantenimiento de SONET

La figura 6 muestra cómo aparecen las interacciones de mantenimiento de SONET.

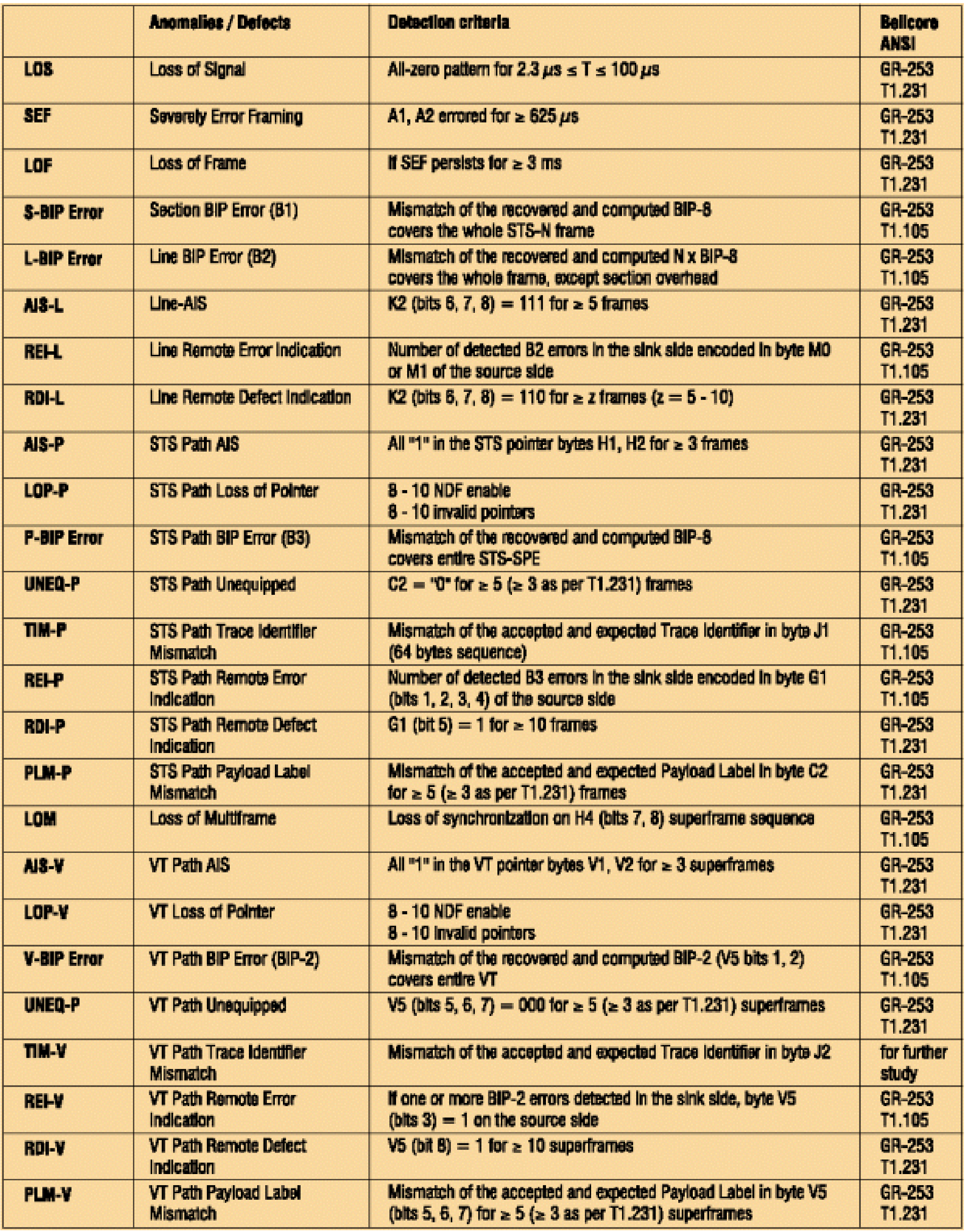
Figura 6: Interacciones de mantenimiento de SONET


SONET Maintenance Interactions
Generation
Detect
Section Layer
Line Layer
STS PAth Layer
VT PAth Layer
LOS
LOF
BIP Err.
"1"
AIS-L
(A1/A2)
(B1)
(K2)
(B2)
(M1)
(K2)
AIS-L
BIP Err.
REI-L
RDI-L
"1"
AIS-P
LOP-P
UNEQU-P
PLM-P
BIP Err.
REI-P
RDI-P
AIS-P
"1"
(C2)
(C2)
(B3)
(G1)
(G1)
AIS-V
LOP-V
UNEQU-V
PLM-V
BIP Err.
REI-V
RDI-V
AIS-V
AIS
(V5)
(V5)
(V5)
(V5)
(V5)

Criterios de alarmas y detección

La tabla 1 enumera el significado de las alarmas y sus criterios de detección.

Tabla 1: Significado de las alarmas y sus criterios de detección

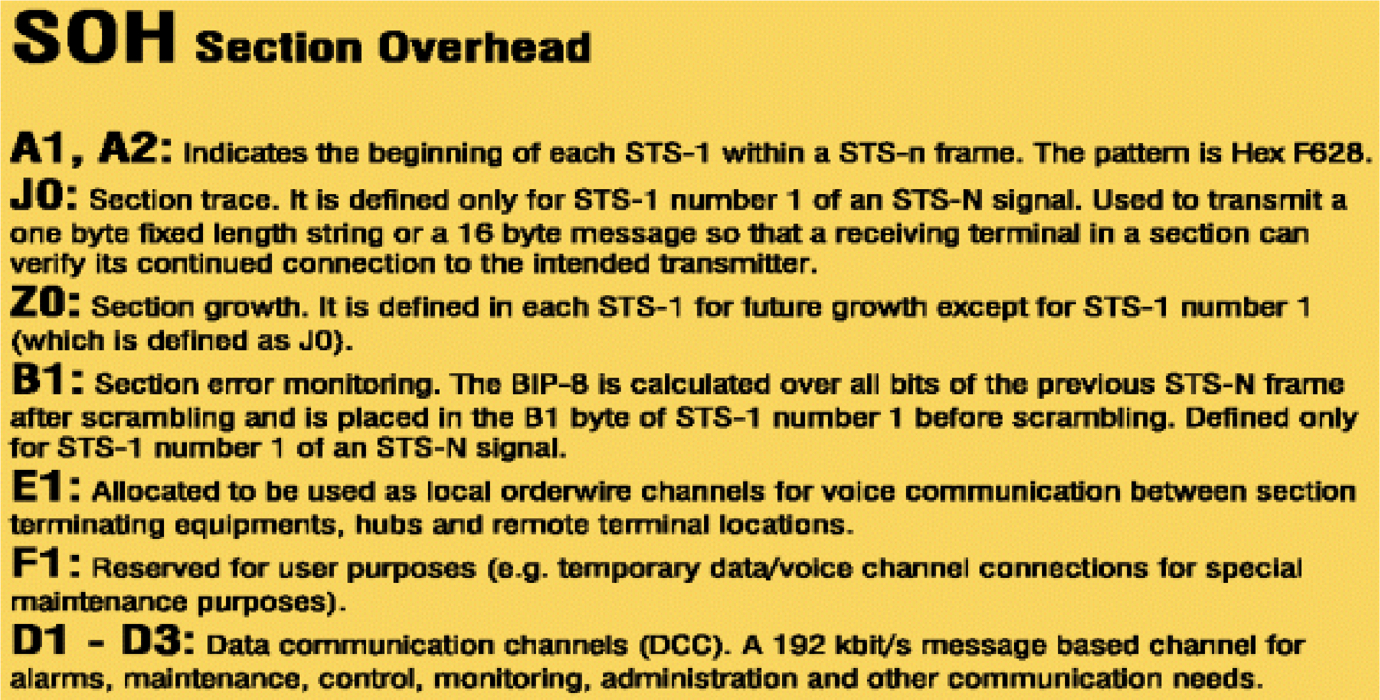


	Anomalies / Defects	Detection criteria	Bellcore ANSI
LOS	Loss of Signal	All-zero pattern for $2.3\,\mu s \leq T \leq 100\,\mu s$	GR-253 T1.231
SEF	Severely Error Framing	A1, A2 errored for ≥ 625 μs	GR-253 T1.231
LOF	Loss of Frame	If SEF persists for ≥ 3 ms	GR-253 T1.231
S-BIP Error	Section BIP Error (B1)	Mismatch of the recovered and computed BIP-8 covers the whole STS-N frame	GR-253 T1.105
L-BIP Error	Line BIP Error (B2)	Mismatch of the recovered and computed N x BIP-8 covers the whole frame, except section overhead	GR-253 T1.105
AIS-L	Line-AIS	K2 (bits 6, 7, 8) = 111 for ≥ 5 frames	GR-253 T1.231
REI-L	Line Remote Error Indication	Number of detected B2 errors in the sink side encoded in byte M0 or M1 of the source side	GR-253 T1.105
RDI-L	Line Remote Defect Indication	K2 (bits 6, 7, 8) = 110 for ≥ z frames (z = 5 - 10)	GR-253 T1.231
AIS-P	STS Path AIS	All "1" in the STS pointer bytes H1, H2 for ≥ 3 frames	GR-253 T1.231
LOP-P	STS Path Loss of Pointer	8 - 10 NDF enable 8 - 10 invalid pointers	GR-253 T1.231
P-BIP Error	STS Path BIP Error (B3)	Mismatch of the recovered and computed BIP-8 covers entire STS-SPE	GR-253 T1.105
UNEQ-P	STS Path Unequipped	C2 = "0" for ≥ 5 (≥ 3 as per T1.231) frames	GR-253 T1.231
TIM-P	STS Path Trace Identifier Mismatch	Mismatch of the accepted and expected Trace Identifier in byte J1 (64 bytes sequence)	GR-253 T1.105
REI-P	STS Path Remote Error Indication	Number of detected B3 errors in the sink side encoded in byte G1 (bits 1, 2, 3, 4) of the source side	GR-253 T1.105
RDI-P	STS Path Remote Defect Indication	G1 (bit 5) = 1 for ≥ 10 frames	GR-253 T1.231
PLM-P	STS Path Payload Label Mismatch	Mismatch of the accepted and expected Payload Label in byte C2 for ≥ 5 (≥ 3 as per T1.231) frames	GR-253 T1.231
LOM	Loss of Multiframe	Loss of synchronization on H4 (bits 7, 8) superframe sequence	GR-253 T1.105
AIS-V	VT Path AIS	All "1" in the VT pointer bytes V1, V2 for ≥ 3 superframes	GR-253 T1.231
LOP-V	VT Loss of Pointer	8 - 10 NDF enable 8 - 10 invalid pointers	GR-253 T1.231
V-BIP Error	VT Path BIP Error (BIP-2)	Mismatch of the recovered and computed BIP-2 (V5 bits 1, 2) covers entire VT	GR-253 T1.105
UNEQ-P	VT Path Unequipped	V5 (bits 5, 6, 7) = 000 for ≥ 5 (≥ 3 as per T1.231) superframes	GR-253 T1.231
TIM-V	VT Path Trace Identifier Mismatch	Mismatch of the accepted and expected Trace Identifier in byte J2	for further study
REI-V	VT Path Remote Error Indication	If one or more BIP-2 errors detected in the sink side, byte V5 (bits 3) = 1 on the source side	GR-253 T1.105
RDI-V	VT Path Remote Defect Indication	V5 (bit 8) = 1 for ≥ 10 superframes	GR-253 T1.231
PLM-V	VT Path Payload Label Mismatch	Mismatch of the accepted and expected Payload Label in byte V5 (bits 5, 6, 7) for ≥ 5 (≥ 3 as per T1.231) superframes	GR-253 T1.231

Bytes STS-1 SOH, LOH, POH y VT POH

La figura 7 y la figura 8 proporcionan una descripción de todos los bytes de STS-1 SOH, Line OverHead (LOH), Path OverHead (POH) y Virtual Tributary Path OverHead (VT POH).

Figura 7: Gastos generales de la sección SOH



SOH **Section Overhead**

A1, A2: Indicates the beginning of each STS-1 within a STS-n frame. The pattern is Hex F628.

J0: Section trace. It is defined only for STS-1 number 1 of an STS-N signal. Used to transmit a one byte fixed length string or a 16 byte message so that a receiving terminal in a section can verify its continued connection to the intended transmitter.

Z0: Section growth. It is defined in each STS-1 for future growth except for STS-1 number 1 (which is defined as J0).

B1: Section error monitoring. The BIP-8 is calculated over all bits of the previous STS-N frame after scrambling and is placed in the B1 byte of STS-1 number 1 before scrambling. Defined only for STS-1 number 1 of an STS-N signal.

E1: Allocated to be used as local orderwire channels for voice communication between section terminating equipments, hubs and remote terminal locations.

F1: Reserved for user purposes (e.g. temporary data/voice channel connections for special maintenance purposes).

D1 - D3: Data communication channels (DCC). A 192 kbit/s message based channel for alarms, maintenance, control, monitoring, administration and other communication needs.

Figura 8: Sobrecarga de línea LOH