
Generic Requirements for Operations Interfaces Using OSI Tools: SONET Transport Information Model Overview

Contents

Preface	Preface-1
1. Introduction.....	1-1
1.1 Purpose and Scope	1-1
1.2 Relationship with Other GRs and Standards.....	1-2
1.3 Structure and Use of This Document.....	1-3
1.4 Summary of Changes	1-4
1.5 Requirements Terminology.....	1-7
1.6 Requirement Labeling Conventions.....	1-8
1.6.1 Numbering of Requirement and Related Objects	1-8
1.6.2 Requirement, Conditional Requirement, and Objective Object Identification	1-8
2. Background of Operations Interfaces Environment.....	2-1
2.1 Conceptual View of System Management.....	2-1
2.2 OSI-Based OS/NE Communications Environment	2-2
2.3 SONET Operations Communications Overview	2-4
3. Overview of the SONET Transport Information Model.....	3-1
3.1 Mapping Between SDH Terminology and SONET Terminology	3-1
3.2 Summary of Object Classes for Management of SONET NEs.....	3-2
3.3 Inheritance Relationships	3-11
3.4 Name Bindings.....	3-11
4. SONET NE Object Classes and Requirements.....	4-1
4.1 Network Element Fragment	4-1
4.2 Hardware Fragment.....	4-1
4.3 Software Fragment	4-2
4.4 Generic Support Fragment	4-4
4.5 Configuration Management Support Fragment	4-5
4.6 Alarm Surveillance Support Fragment.....	4-6
4.7 Basic Cross-Connection Fragment.....	4-9
4.8 Termination Point Fragment	4-11
4.8.1 Connection Termination Points	4-14
4.8.2 Supervised Connection Termination Points.....	4-18
4.8.3 Trail Termination Points	4-20
4.8.4 Indirect Adaptors.....	4-24
4.8.5 Monitor Points.....	4-25
4.9 Performance Monitoring Fragment.....	4-26

4.10	Linear APS Fragment.....	4-31
4.11	UPSR Fragment	4-33
4.12	BLSR Fragment	4-36
4.13	Operations Communications Management Fragment.....	4-41
4.13.1	General/Upper Layers	4-41
4.13.2	DCC	4-42
4.13.3	LAN	4-44
4.13.4	X.25.....	4-45
4.13.5	CLNP Network Layer	4-47
4.13.6	Transport Layer.....	4-49
5.	SONET Information Model Usage: Example Scenarios	5-1
5.1	Basic SONET Transmission, Cross-Connect and Linear APS Examples	5-2
5.2	SONET UPSR Examples	5-15
5.3	SONET BLSR Examples	5-31
5.3.1	Two-Fiber BLSR Protection Switching.....	5-31
5.3.2	Four-Fiber BLSR Protection Switching.....	5-41
5.3.3	BLSR Ring Interconnection Using the Service Selector	5-50
5.3.3.1	Drop and Continue Ring Interworking	5-50
5.3.3.2	Dual Transmit Ring Interworking	5-56
5.3.4	Ring Interworking on Protection (RIP).....	5-61
5.3.5	East/West Tables and Ring Maps	5-65
5.3.6	STS Squelching.....	5-68
5.3.7	VT Squelching	5-71
5.3.7.1	BLSR Configuration Example for VT Squelching.....	5-71
5.3.7.2	Information Model for the VT Squelching Example.....	5-72
5.3.7.3	BLSR Protection Switching and Squelching.....	5-76
5.3.7.4	Virtual Tributary Squelching.....	5-81
5.3.8	Enhanced Non-preemptible Unprotected Traffic (E-NUT)	5-83
5.4	Operations Communications Model Examples.....	5-85
5.4.1	SONET End System.....	5-86
5.4.2	SONET Intermediate System.....	5-87
5.4.3	SONET Gateway NE	5-88
6.	SONET Information Model Usage Guidelines.....	6-1
6.1	Name Bindings Reference Guide.....	6-1
6.2	Managed Object Creation/Deletion Guide.....	6-10
6.3	Applicable Conditional Packages Guide.....	6-17
Appendix A: Major Issues for Future Releases of GR-1042-CORE and		
	GR-1042-IMD.....	A-1
A.1	Synchronization.....	A-1
A.2	Equipment Protection.....	A-1
A.3	User security.....	A-1
A.4	Protocol stack.....	A-1
A.5	BLSR.....	A-2

References	References-1
Acronyms.....	Acronyms-1
Requirement-Object Index	ROI-1

List of Figures

Figure 2-1.	A Conceptual Model for System Management Functions.....	2-2
Figure 2-2.	Management Communications Using CMISE	2-3
Figure 3-1.	Inheritance Hierarchy (Sheet 1 of 6)	3-12
Figure 3-2.	Name Bindings (Sheet 1 of 7)	3-18
Figure 5-1.	SONET OC-n Section Terminating Regenerator Example.....	5-6
Figure 5-2.	SONET OC-3 “Hardwired” Terminal Multiplexer Example	5-7
Figure 5-3.	SONET Add-Drop Multiplex (ADM) Example.....	5-8
Figure 5-4.	SONET 1:1 Linear APS Example (No extra traffic; Normal working condition).....	5-9
Figure 5-5.	SONET 1:1 Linear APS Example (No extra traffic; Failure of protected line).....	5-10
Figure 5-6.	SONET 1:1 Linear APS Example (Extra traffic supported; Normal working condition)	5-11
Figure 5-7.	SONET 1:1 Linear APS Example (Extra traffic supported; Failure of protected line).....	5-12
Figure 5-8.	SONET 1+1 Unidirectional Linear APS Example (Initial Configuration)	5-13
Figure 5-9.	SONET 1+1 Unidirectional Linear APS Example (Failure of protected line).....	5-14
Figure 5-10.	STS-1 Based UPSR Node, Bidirectional Traffic, Pass-Through	5-18
Figure 5-11.	STS-1 Based UPSR Node, Bidirectional Traffic, Unprotected Add/Drop, Dropped-Nonterminated.....	5-19
Figure 5-12.	STS-1 Based UPSR Node, Bidirectional Traffic, Unprotected Add/Drop, Dropped-Terminated	5-20
Figure 5-13.	STS-1 Based UPSR Node, Bidirectional Traffic, Protected Add/Drop, Dropped-Nonterminated.....	5-21
Figure 5-14.	STS-1 Based UPSR Node, Bidirectional Traffic, Protected Add/Drop, Dropped-Nonterminated (Showing Only Traffic Flows).....	5-22
Figure 5-15.	STS-1 Based UPSR Node, Bidirectional Traffic, Protected Add/Drop, Dropped-Nonterminated - Failure	5-23
Figure 5-16.	STS-1 Based UPSR Node, Bidirectional Traffic, Protected Add/Drop, Dropped-Nonterminated - Failure (Showing Only Traffic Flows)	5-24
Figure 5-17.	STS-1 Based UPSR Node, Bidirectional Traffic, Protected Add/Drop, Dropped-Terminated	5-25
Figure 5-18.	STS-1 Based UPSR Node, Bidirectional Traffic, Drop-and-Continue, Dropped-Nonterminated	5-26
Figure 5-19.	STS-1 Based UPSR Node, Bidirectional Traffic, Drop-and-Continue, Dropped-Nonterminated (Showing Only Traffic Flows)	5-27
Figure 5-20.	STS-1 Based UPSR Node, Bidirectional Traffic, Drop-and-Continue, Dropped-Nonterminated - Failure	5-28

Figure 5-21.	STS-1 Based UPSR Node, Bidirectional Traffic, Drop-and-Continue, Dropped-Nonterminated - Failure (Showing Only Traffic Flows)	5-29
Figure 5-22.	STS-1 Based UPSR Node, Bidirectional Traffic, Drop-and-Continue, Dropped-Terminated	5-30
Figure 5-23.	Two-Fiber Bidirectional SONET OC-3 ADM Node Model (No Protection)	5-34
Figure 5-24.	Two-Fiber OC-48 BLSR ADM Node, No Extra Traffic, Normal Operation (ringPU Pointers, Cross Connections NOT SHOWN)	5-35
Figure 5-25.	Two-Fiber OC-48 BLSR ADM Node, No Extra Traffic, Normal Operation, With ringPU Pointers (Cross Connections NOT SHOWN)	5-36
Figure 5-26.	Two-Fiber OC-48 BLSR ADM Node, Normal Operation With Extra Traffic (ringPU Pointers, Cross Connections NOT SHOWN)	5-37
Figure 5-27.	Two-Fiber OC-48 BLSR ADM Node in Pass Through Mode (ringPU Pointers, Cross Connections NOT SHOWN)	5-38
Figure 5-28.	Two-Fiber OC-48 BLSR ADM Node, No Extra Traffic, Ring Switch (ringPU Pointers, Cross Connections NOT SHOWN)	5-39
Figure 5-29.	Two-Fiber OC-48 BLSR ADM Node, No Extra Traffic, Ring Switch (Showing Only Traffic Flows)	5-40
Figure 5-30.	Four-Fiber Bidirectional SONET OC-3 ADM Node Model (No Protection, Add/Drop NOT SHOWN)	5-43
Figure 5-31.	Four-Fiber OC-48 BLSR ADM Node, No Extra Traffic, Normal Operation (ringPU and spanPU Pointers, Cross Connections NOT SHOWN)	5-44
Figure 5-32.	Four-Fiber OC-48 BLSR ADM Node, No Extra Traffic, Normal Operation, With ringPU and spanPU Pointers (Cross Connections NOT SHOWN)	5-45
Figure 5-33.	Four-Fiber OC-48 BLSR ADM Node, Normal Operation With Extra Traffic (ringPU and spanPU Pointers, Cross Connections NOT SHOWN)	5-46
Figure 5-34.	Four-Fiber OC-48 BLSR ADM Node in Pass Through Mode (ringPU and spanPU Pointers, Cross Connections NOT SHOWN)	5-47
Figure 5-35.	Four-Fiber OC-48 BLSR ADM Node, No Extra Traffic, Ring Switch (ringPU and spanPU Pointers, Cross Connections NOT SHOWN)	5-48
Figure 5-36.	Four-Fiber OC-48 BLSR ADM Node, No Extra Traffic, Span Switch (ringPU and spanPU Pointers, Cross Connections NOT SHOWN)	5-49
Figure 5-37.	Methods of Ring Interworking: Drop and Continue and Dual Transmit	5-50
Figure 5-38.	Two-Fiber OC-48 BLSR Drop and Continue Interconnection Primary ADM Node Service Selector, Normal Operation	5-52
Figure 5-39.	Two-Fiber OC-48 BLSR Drop and Continue Interconnection Primary ADM Node Service Selector, Normal Operation (showing ONLY Traffic Flow)	5-53

Figure 5-40.	Two-Fiber OC-48 BLSR Drop and Continue Interconnection Primary ADM Node Service Selector, Protection Switch.....	5-54
Figure 5-41.	Two-Fiber OC-48 BLSR Drop and Continue Interconnection Primary ADM Node Service Selector, Protection Switch (showing ONLY Traffic Flow).....	5-55
Figure 5-42.	Two-Fiber OC-48 BLSR Dual Transmit Interconnection Terminating ADM Node Service Selector, Normal Operation.....	5-57
Figure 5-43.	Two-Fiber OC-48 BLSR Dual Transmit Interconnection Terminating ADM Node Service Selector, Normal Operation (showing ONLY Traffic Flow)	5-58
Figure 5-44.	Two-Fiber OC-48 BLSR Dual Transmit Interconnection Terminating ADM Node Service Selector, Protection Switch.....	5-59
Figure 5-45.	Two-Fiber OC-48 BLSR Dual Transmit Interconnection Terminating ADM Node Service Selector, Protection Switch (showing ONLY Traffic Flow).....	5-60
Figure 5-46.	Primary Node Failure Restoral for Ring Interworking on Protection (RIP).....	5-61
Figure 5-47.	Ring Interworking on Protection (RIP) Example	5-62
Figure 5-48.	RIP Table Example.....	5-63
Figure 5-49.	Two-Fiber Drop and Continue RIP Primary Node Service Selector, Normal Operation	5-64
Figure 5-50.	East/West Table Population.....	5-66
Figure 5-51.	Ring Map Illustration.....	5-67
Figure 5-52.	Sample Fabric Configuration of a BLSR NE	5-69
Figure 5-53.	Squelch Table Illustration for Figure 5-43	5-70
Figure 5-54.	Use of the Quality of Service Alarm With Ring Segmentation	5-71
Figure 5-55.	BLSR With Support for VT Switching	5-72
Figure 5-56.	Node 2 of the Two-Fiber OC-48 BLSR in Figure 5-55	5-74
Figure 5-57.	Detailed View of the Fabric in Node 2 in Figure 5-55	5-75
Figure 5-58.	VT Recovery from Node Failure.....	5-77
Figure 5-59.	Illustration of VT Source Identification	5-81
Figure 5-60.	Enhanced Name Binding Diagram for VT Squelching Objects.....	5-83
Figure 5-61.	4-Fiber BLSR NUT Tables Example	5-85
Figure 5-62.	SONET End System Example.....	5-86
Figure 5-63.	SONET Intermediate System Example	5-87
Figure 5-64.	SONET Gateway NE Example.....	5-89

List of Tables

Table 3-1.	Mappings Between SDH and SONET Terminologies	3-1
Table 3-2.	Object Classes for Management of SONET NEs	3-4
Table 5-1.	Acronyms Used in the Examples.....	5-1
Table 5-2.	The ringMapBCRr2 for Node 2.....	5-79
Table 5-3.	The stsSquelchEntryBCR for Node 2.....	5-80
Table 5-4.	VT Squelch Entries for the Example Shown in Figure 5-58.....	5-82
Table 6-1.	Name Binding Table.....	6-2
Table 6-2.	Managed Object Creation/Deletion Responsibilities	6-11
Table 6-3.	SONET-Specific Conditional Package Matrix.....	6-17