

Contents

1. Introduction	1-1
1.1 Background	1-1
1.2 Purpose and Scope	1-1
1.3 Target Audience	1-2
1.4 Relationship to Other Next Generation Network (NGN) Voice over Packet (VOP) GRs	1-3
1.5 Structure and Use of This Document	1-3
1.6 Requirements Terminology	1-5
1.7 Requirement Labeling Conventions	1-6
1.7.1 Numbering of Requirement and Related Objects	1-6
1.7.2 Requirement, Conditional Requirement, and Objective Object Identification	1-7
1.8 Reason for Re-Issue	1-7
2. VOP Architecture	2-1
2.1 Overview	2-1
2.2 Functional Elements	2-1
2.3 Interfaces and Protocols	2-4
2.4 Assumptions	2-10
2.4.1 Connectivity	2-10
2.4.2 Signaling	2-10
2.4.3 Routing	2-10
2.4.4 Core Network	2-11
2.4.5 Call Types	2-12
2.4.6 Resource Management	2-13
2.4.7 Connection Control	2-14
2.4.8 CN Bearer Connections	2-14
2.4.9 Miscellaneous	2-15
2.5 High-Level Call Flows	2-16
2.5.1 Successful Call Setup	2-16
2.5.1.1 TGW to TGW	2-16
2.5.1.2 AGW to AGW	2-18
2.5.1.3 AGW to TGW	2-20
2.5.1.4 TGW to AGW	2-22
2.5.2 Successful Call Release Initiated by the Calling Party	2-24
3. CCA Functional Architecture and High-Level Requirements	3-1
3.1 CCA Functional Architecture	3-1
3.2 Modularity, Scalability and Extensibility	3-2
3.3 Resource Management and Connection Control	3-3
3.4 Routing Analysis and Name/Address Resolution	3-4
4. Interface Requirements	4-1
4.1 Lower Layer Requirements	4-1
4.1.1 Core Network Access	4-1

4.1.2	Common Requirements for Signaling and Control Protocol Transport	4-2
4.1.2.1	Signaling Control Transmission Protocol (SCTP) - Old	4-2
4.1.2.2	Stream Control Transmission Protocol (New)	4-8
4.1.3	Specific for CCA-to-BGW/VFS Gateway Control Interface	4-14
4.1.4	Specific for CCA-to-BGW ISDN Signaling Interface	4-15
4.1.5	Specific for CCA-to-CCA Interface	4-19
4.1.6	Specific for CCA-to-SGW/PSTN Interface	4-20
4.1.6.1	M3UA Signaling Message Handling Functions	4-21
4.1.6.2	M3UA Routing Data	4-21
4.1.6.3	SCTP Stream Mapping	4-24
4.1.6.4	M3UA Network Management Functions	4-25
4.2	Services, Support & Operations Interfaces	4-27
4.2.1	CCA to Service Agent Interface	4-27
4.2.2	CCA to Billing Server	4-27
4.2.3	CCA to RTS	4-27
4.2.4	CCA to DNS	4-27
4.2.5	Management and Operations Interface	4-28
4.3	CCA to BGW or VFS Gateway Control	4-28
4.3.1	Foundation Interface Compliance	4-29
4.3.2	Terminations, Contexts and Edge-to-Edge Connections	4-34
4.3.3	Control Protocol Semantics and Syntax	4-36
4.3.3.1	Message Structure and Content	4-36
4.3.3.2	Commands and Command Contents	4-37
4.3.3.3	Syntax and Encoding	4-38
4.3.3.4	Overview of Command Triggers and Send/Receive Requirements	4-39
4.3.4	Properties, Events, Signals, Digit Map Specifications and Packages	4-47
4.3.5	Call Statistics	4-52
4.3.6	Device Associations and Capabilities	4-53
4.4	CCA-to-CCA Interface	4-54
5.	Call Processing and Connection Control Procedures	5-1
5.1	Overview	5-1
5.2	BGW/VFS Gateway Control Procedures	5-1
5.2.1	Non-Call Related Procedures	5-1
5.2.1.1	Association Management, Startup/Registration and Failover	5-2
5.2.1.2	Application of Specific Commands	5-6
5.2.2	Call-Related Procedures	5-9
5.2.2.1	General Connection Control Requirements	5-9
5.2.2.2	AddRequest	5-21
5.2.2.3	AddAccept	5-21
5.2.2.4	ModifyRequest	5-21
5.2.2.5	ModifyAccept	5-22

	5.2.2.6	SubtractRequest	5-22
	5.2.2.7	SubtractAccept	5-23
	5.2.2.8	MoveRequest and MoveAccept	5-23
	5.2.2.9	AuditCapabilities and AuditValue	5-23
	5.2.2.10	NotifyRequest	5-23
	5.2.2.11	NotifyAccept	5-24
	5.2.3	Command Rejects and Error Handling	5-24
	5.2.3.1	General Error Handling Requirements	5-24
	5.2.3.2	Command Reject Requirements	5-26
5.3		TGW Procedures	5-27
	5.3.1	Call Set Up	5-27
	5.3.1.1	Call Origination - Part 1 (Receiving an Initial Address Message (ISUP_IAM))	5-27
	5.3.1.2	Call Origination - Part 2	5-31
	5.3.1.3	Call Termination - Part 1 (Sending an ISUP_IAM)	5-34
	5.3.1.4	Call Termination - Part 2	5-37
	5.3.2	Call Completion	5-38
	5.3.2.1	Receiving an ISUP_ACM	5-38
	5.3.2.2	Sending an ISUP_ACM	5-38
	5.3.3	Call Answered	5-39
	5.3.3.1	Receiving an ISUP_ANM	5-39
	5.3.3.2	Sending an ISUP_ANM	5-40
	5.3.4	Call Release	5-40
	5.3.4.1	Initiating the Release of a Call (Receiving an ISUP_REL)	5-40
	5.3.4.2	Finishing the Release of a Call (Sending an ISUP_REL)	5-42
	5.3.5	CCA Procedures for M3UA Notifications	5-44
	5.3.5.1	Data Transfer Procedure	5-45
	5.3.5.2	Destination Unavailable Procedure	5-45
	5.3.5.3	Destination Available Procedure	5-46
	5.3.5.4	SS7 Network Congestion State Procedure	5-46
	5.3.5.5	Destination User Part Unavailable Procedure	5-47
	5.3.5.6	AS State Mapping Procedures	5-47
5.4		AGW procedures	5-48
	5.4.1	Plain Old Telephone Service (POTS) Access	5-48
	5.4.1.1	Call Origination	5-48
	5.4.1.2	Call Terminating to an Analog User	5-56
	5.4.1.3	Call Clearing	5-58
	5.4.2	ISDN PRI Access	5-61
	5.4.2.1	Call Origination	5-62
	5.4.2.2	Call Termination	5-68
	5.4.2.3	Call Clearing	5-70
	5.4.2.4	Error Treatment	5-72
	5.4.2.5	D-Channel Back-Up	5-72
	5.4.2.6	B-Channel Availability	5-73
	5.4.3	ISDN BRI Access	5-73

	5.4.3.1	Call Origination	5-74
	5.4.3.2	Call Termination	5-80
	5.4.3.3	Call Clearing	5-82
	5.4.3.4	Exception Procedures	5-84
5.4.4		Non-ISDN PBX Trunk Access	5-84
	5.4.4.1	Call Origination	5-85
	5.4.4.2	Call Termination	5-85
	5.4.4.3	Call Clearing	5-86
	5.4.4.4	Exception Procedures	5-86
	5.4.4.5	D-Channel Back-up Procedures	5-86
	5.4.4.6	B-Channel Availability Procedures	5-87
5.5		CCA to CCA Procedures	5-87
	5.5.1	Introduction	5-87
	5.5.2	Successful Call Set Up	5-92
	5.5.2.1	Forward Address Signaling	5-92
	5.5.2.2	Address Complete Message	5-100
	5.5.2.3	Answer Message	5-101
	5.5.3	Normal Call Release	5-101
	5.5.4	Suspend and Resume Messages	5-102
5.6		Call Routing	5-102
5.7		User and Service Profiles	5-104
	5.7.1	User Service Profile for a Non-ISDN User	5-104
	5.7.2	User Service Profile for a Non-ISDN PBX	5-105
	5.7.3	User Service Profile for an ISDN BRI	5-105
	5.7.4	User Service Profile for an ISDN PRI	5-106
6.		Management and Operations	6-1
	6.1	Overview of NGN VOP Network Management Framework	6-1
	6.1.1	TMN Overview	6-2
	6.1.2	Functional Management Strategy Overview	6-4
	6.1.3	Management Interfaces	6-5
	6.1.4	The Dual Role of a CCA	6-6
	6.1.5	Overview and Scope of CCA Management	6-8
	6.2	Configuration Management	6-8
	6.2.1	Capacity Installation	6-10
	6.2.1.1	Software Generic Requirements	6-10
	6.2.1.2	CCA Configuration Data Requirements	6-11
	6.2.2	Service Activation	6-18
	6.2.2.1	Service Feature Logic	6-18
	6.2.2.2	Service Data Change Notification and Query	6-19
	6.2.2.3	Configuration Database Management	6-22
	6.2.3	Status and Control	6-23
	6.2.3.1	State Information Requirements	6-25
	6.3	Fault Management	6-30
	6.3.1	Alarm Surveillance	6-30
	6.3.1.1	Alarm/Event Notification Contents (Common)	6-33
	6.3.1.2	Notification Retention	6-34

6.3.1.3	CCA-SGW Interface (M3UA and SCTP)	6-34
6.3.1.4	CCA-AGW Interface (IUA and SCTP)	6-41
6.3.1.5	CCA-CCA Interface (M3UA and SCTP)	6-47
6.3.1.6	Core Network Interfaces	6-53
6.3.2	Fault Localization	6-53
6.3.3	Testing	6-54
6.3.3.1	Core Network Interfaces	6-55
6.4	Performance Management	6-56
6.4.1	Common Monitoring Requirements	6-56
6.4.1.1	Counters and Monitoring Intervals	6-56
6.4.1.2	Generation of Threshold Crossing Alerts (TCAs)	6-58
6.4.2	Performance Monitoring	6-58
6.4.2.1	Core Network Performance Monitoring	6-59
6.4.2.2	CCA-SGW Performance Monitoring	6-65
6.4.2.3	CCA - Bearer Gateway Performance Monitoring	6-67
6.4.2.4	CCA - CCA Performance Monitoring	6-73
6.4.2.5	Call Related Performance Monitoring	6-76
6.4.2.6	Measurements for Other CCA Components or Modules	6-78
Appendix A: Detailed Message Flows for the Reference Call Cases		A-1
A.1	Successful Call Set Up	A-1
A.1.1	TGW to TGW	A-1
A.1.1.1	Two CCAs and Two TGWs	A-1
A.1.1.2	One CCA and Two TGWs	A-21
A.1.1.3	One CCA and One TGW	A-23
A.1.2	AGW to AGW	A-25
A.1.2.1	Two CCAs and Two AGWs	A-25
A.1.2.2	One CCA and Two AGWs	A-44
A.1.2.3	One CCA and One AGW	A-46
A.1.3	AGW to TGW	A-48
A.1.4	TGW to AGW	A-67
A.2	Successful Call Release Initiated by the Calling Party	A-86
Appendix B: Informative Summary of H.248 Changes from Issue 1		B-1
Appendix C: Customer Gateway		C-1
C.1	Customer Gateway to CCA Interface Signaling	C-1
C.2	Customer Gateway to Network Mediation Gateway Bearer Association	C-2
C.3	Non-Call-Associated Procedures	C-2
C.4	Customer Gateway Call Control Procedures	C-3
C.4.1	Call Origination	C-4
C.4.2	Call Termination	C-5
C.4.3	Call Clearing	C-6
C.5	Customer Gateway Specific Subscription/Administration Parameters	C-6
Appendix D: Network Mediation Gateway		D-1

D.1	NMGW Signaling interface	D-1
D.2	NMGW Generic Procedures	D-1
D.2.1	Registration	D-1
D.2.2	Support of Packet Contexts	D-1
D.3	Network Mediation Gateway to Customer Gateway Bearer Association	D-2
D.4	NMGW Call Control Procedures	D-2
D.4.1	Call Origination (from CG)	D-2
D.4.2	Call Termination (to CGW)	D-6
D.4.3	Call Clearing	D-8
D.4.4	Setting Up Bearer Connections via the Core Network	D-9
Appendix E:	Handling SIP and H.323 Terminals in an NGN/VOP Network	E-1
E.1	Support for H.323 Terminals	E-1
E.2	Support for SIP Terminals	E-3
Requirement-Object Index		ROI-1
Acronyms		Acronyms-1
References		References-1

List of Figures

Figure 2-1.	High-Level VOP Network Architecture	2-1
Figure 2-2.	Overview of VOP Physical Interfaces	2-5
Figure 2-3.	Overview of Logical Interfaces and Protocols for the VOP Architecture	2-6
Figure 2-4.	Bearer and Signaling Transport Stack	2-12
Figure 2-5.	A Successful Call Setup Between Two TGWs Using Two CCAs	2-16
Figure 2-6.	A Successful Call Setup Between Two AGWs Each Serving an Analog Line Using Two CCAs	2-18
Figure 2-7.	A Successful Call Setup from an AGW to a TGW	2-20
Figure 2-8.	A Successful Call Setup from a TGW to an AGW	2-22
Figure 2-9.	A Successful Call Release Initiated by the Calling Party	2-24
Figure 3-1.	CCA Functional Architecture	3-1
Figure 6-1.	TMN Logical Layers	6-2
Figure 6-2.	TMN Functional Architecture	6-4
Figure 6-3.	Functional Management Architecture Example	6-4
Figure 6-4.	Relationship of VOP CCA With Other VOP FEs	6-7
Figure 6-5.	Relationship of VOP EMS With Other VOP FEs	6-7
Figure A-1.	A Successful Call Set Up Between Two TGWs Using Two CCAs	A-2
Figure A-2.	A Successful Call Set Up Between Two TGWs Using One CCA	A-21
Figure A-3.	A Successful Call Set Up Using One TGW and One CCA	A-23
Figure A-4.	A Successful Call Set Up Between Two AGWs Each Serving an Analog Line Using Two CCAs	A-26
Figure A-5.	Successful Call Set Up Between Two AGWs Using One CCA	A-44
Figure A-6.	A Successful Call Set Up Using One AGW and CCA	A-46
Figure A-7.	A Successful Call Set Up from an AGW to a TGW	A-48
Figure A-8.	A Successful Call Set Up from a TGW to an AGW	A-67
Figure A-9.	A Successful Call Release Initiated by the Calling Party	A-86

List of Tables

Table 1-1.	Applicability of Sections to Call Scenarios	1-4
Table 2-1.	VOP Interface and Protocol Summary	2-6
Table 4-1.	Support Status for Elements of H.248	4-29
Table 4-2.	Supplements to H.248	4-33
Table 4-3.	Summary of Command Triggers and Follow-On Actions . . .	4-40
Table 5-1.	Voiceband Data Tones	5-15
Table 5-2.	Decision Rules for Initial Call Settings	5-16
Table 5-3.	Decision Rules for Call Settings Upon and After Call Establishment	5-19
Table 6-1.	Sample Comparison of VOP EMS and CCA Functionality . . .	6-7
Table B-1.	Summary of Major Changes in H.248 from Version 13 to Approved Version and Associated Changes for GR-3051-CORE, Issue 2 . .	B-1