Contents

1. Introduction 1–1
1.1 Purpose and Scope 1–1
1.2 Background 1–1
1.3 Target Audience 1–3
1.4 Relationship to other Next Generation Network (NGN) Voice over Packet (VoP) GRs 1–4
1.5 Structure and Use of This Document 1–4
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 1–6

2. VoP Performance Models 2–1
2.1 Measurement Points 2–1
2.1.1 Measurement Point (MP) 2–1
2.2 Performance Significant Reference Events 2–1
2.2.1 Exit Event 2–2
2.2.2 Entry Event 2–2
2.3 Signaling Reference Models 2–2
2.3.1 Signaling Reference Configurations 2–2
2.3.2 Performance Significant Reference Events 2–6
2.3.2.1 Scenario 1 - Example Call Flow 2–6
2.3.2.2 Scenario 2 - Example Call Flow 2–8
2.3.2.3 Scenario 3 - Example Call Flow 2–10
2.3.2.4 Scenario 4 - Example Call Flow 2–12
2.3.3 Hypothetical Reference Connection (HRX) 2–14
2.4 Transport Reference Models 2–15
2.4.1 Transport Reference Configurations 2–15

3. Signaling Performance 3–1
3.1 Delay Concepts 3–1
3.1.1 Delay at a Single Boundary 3–1
3.1.2 Delay Between Two Boundaries 3–2
3.2 Classification of Call Attempts and Call Releases 3–3
3.2.1 Successful Call Set-up Message Flow 3–3
3.2.2 Failure Outside the Portion Under Test and User Blocking . 3–4
3.2.3 Call Set Up Failure 3–4
3.2.4 Call Set Up Error 3–4
3.3 Access Function Performance Parameter Definitions 3–4
3.3.1 Call Set Up Delay 3–5
3.3.2 Call Answer Signal Delay (CASD) 3–6
3.3.3 Call Set Up Failure Probability 3–7
3.3.4 Call Set Up Error Probability 3–9
3.4 Access Function Objectives 3–10

3.4.1 Nature of Performance Objectives . . . 3–10
3.4.2 Considerations for Specification of Objectives . . . 3–10
3.4.3 Call Set-Up Delay Objectives . . . 3–11
3.4.4 Call Answer Signal Delay Objectives . . . 3–12
3.4.5 Call Set-Up Failure Probability Objectives . . . 3–12
3.4.6 Call Set Up Error Probability Objectives . . . 3–13
3.5 Access Function Allocation Rules . . . 3–13
3.5.1 Distance Based Allocation of Delay . . . 3–14
3.5.2 Call Set Up Delay Allocation . . . 3–15
3.5.3 Call Answer Signal Delay Allocation . . . 3–15
3.5.4 Call Set Up Failure Probability Allocation . . . 3–15
3.5.5 Call Set Up Error Probability Allocation . . . 3–16
3.6 Disengagement Function Performance Parameter Definitions . . . 3–16
3.6.1 Successful Call Release . . . 3–16
3.6.2 Call Release Delay . . . 3–18
3.6.3 Call Release Failure Events . . . 3–19
3.6.4 Call Release Failure Probability . . . 3–22
3.6.5 Premature Disconnect Event . . . 3–22
3.6.6 Premature Disconnect Probability . . . 3–22
3.7 Disengagement Function Objectives . . . 3–22
3.7.1 Call Release Delay Objectives . . . 3–22
3.7.2 Call Release Failure Probability Objective . . . 3–23
3.7.3 Premature Disconnect Probability Objectives . . . 3–23
3.8 Disengagement Function Allocation Rules . . . 3–23
3.8.1 Call Release Delay Allocation . . . 3–23
3.8.2 Call Release Failure Probability Allocation . . . 3–24
3.8.3 Premature Disconnect Probability Allocation . . . 3–24

4. Transport Performance Requirements . . . 4–1
4.1 Performance Parameters . . . 4–1
4.2 Reference Events for Transport Parameters . . . 4–2
4.2.1 IP Core Network Reference Events . . . 4–2
4.2.2 ATM Core Network Reference Events . . . 4–2
4.3 Objectives and Allocation Rules . . . 4–3
4.3.1 End-to-End Objectives . . . 4–3
4.3.1.1 IP End-to-End Objectives . . . 4–3
4.3.1.2 ATM End-to-End Objectives . . . 4–4
4.3.2 Route Length Calculation . . . 4–4
4.3.3 IP Packet Transfer Performance Parameter Allocations . . . 4–5
4.3.3.1 Allocation of the IPTD Objective . . . 4–5
4.3.3.2 Allocation of the IPLR Objective . . . 4–5
4.3.3.3 Allocation of the IPDV Objective . . . 4–5
4.3.4 ATM Cell Transfer Performance Parameter Allocations . . . 4–6
4.3.4.1 Allocation of the CTD Objective . . . 4–6
4.3.4.2 Allocation of the CLR Objective . . . 4–6
4.3.4.3 Allocation of the ATM CDV Objective . . . 4–6
4.4 QoS Mappings of ATM to IP (for IP over ATM) . . . 4–7

4.4.1 Mapping of ATM CLR to IP IPLR 4–7
4.4.2 Mapping of ATM CTD to IP IPTD 4–7
4.4.3 Mapping of ATM CDV to IP IPDV 4–8

5. Network Element Performance 5–1
5.1 Information Transfer Performance of Network Elements 5–1
5.2 Call Connection Agent 5–2
5.3 Access Gateway 5–2
5.4 Trunk Gateway 5–2
5.5 Signaling Gateway 5–3
5.6 Core Router 5–3
5.7 Signaling Performance of Network Elements 5–3

6. Network Service Availability 6–1
6.1 Availability Parameters 6–1
6.1.1 Definition of Service Availability 6–1
6.1.2 Definition of Mean Time Between Service Outage 6–1
6.1.3 Related Parameters 6–1
6.2 Service Availability Definition 6–2
6.2.1 VoP Availability Function 6–2

Appendix A: Definition of IP and ATM Transport Performance Parameters . . A–1
A.1 IP Transport Performance Parameters from I.380 . . . . . A–1
A.2 ATM Transport Performance Parameters from I.356 . . . . . A–1

Appendix B: Specialization of Performance Parameters to CCA B–1

References References–1

Acronyms and Abbreviations Acronyms–1

List of Figures

Figure 1-1. High Level VoP Network Architecture 1–2
Figure 2-1. Scenario 1 Reference Configuration - PSTN to PSTN Call . . . 2–3
Figure 2-2. Scenario 2 Reference Configuration - PSTN to VOP Subscriber (with POTS line) Call Scenario 2–4
Figure 2-3. Scenario 3 Reference Configuration - VOP Subscriber to VOP Subscriber (both with POTS lines) 2–4
Figure 2-4. Scenario 4 Reference Configuration - VOP Subscriber (with POTS line) to PSTN Subscriber 2–5
Figure 2-5. Scenario 1 Call Flow 2–7
Figure 2-6. Scenario 1 - Call Flow (Continued) 2–8
Figure 2-7. Scenario 2 - Example Call Flow 2–8
Figure 2-8. Scenario 2 - Example Call Flow (Continued) 2–9
Figure 2-9. Scenario 3 - Example Call Flow 2–11
Figure 2-10. Scenario 3 - Example Call Flow (Continued) 2–12
Figure 2-11. Scenario 4 - Example Call Flow 2–13
Figure 2-12. Scenario 4 - Example Call Flow (Continued) 2–14
Figure 2-13. Scenario 1 Reference Configuration - PSTN to PSTN Call . . 2–16
Figure 2-14. Scenario 2 Reference Configuration - PSTN to VOP Subscriber (with POTS line) Call Scenario 2–16
Figure 2-15. Scenario 3 Reference Configuration - VOP Subscriber to VOP Subscriber (both with POTS lines) 2–17
Figure 3-1. Delay at a Single Boundary 3–2
Figure 3-2. Delay Between two Boundaries 3–2
Figure 3-3. Successful Call Set-up 3–3

List of Tables

Table 3-1. Consistent Boundary Names 3–5
Table 3-2. Call Setup Delay: Starting and Ending Reference Events for Delay at a Single Boundary - Scenario 1 3–5
Table 3-3. Call Setup Delay: Starting and Ending Reference Events for Delay at a Single Boundary - Scenario 2 3–5
Table 3-4. Call Setup Delay: Starting and Ending Reference Events for Delay at a Single Boundary - Scenario 3 3–6
Table 3-5. Call Setup Delay: Starting and Ending Reference Events For Delay at a Single Boundary - Scenario 4 3–6
Table 3-6. Call Answer Signal Delay: Starting and Ending Reference Events for Delay - Scenario 1 3–7
Table 3-7. Call Answer Signal Delay: Starting and Ending Reference Events for Delay - Scenario 2 3–7
Table 3-8. Call Answer Signal Delay: Starting and Ending Reference Events for Delay - Scenario 3 3–7
Table 3-9. Call Answer Signal Delay: Starting and Ending Reference Events For Delay - Scenario 4 3–7
Table 3-10. REs at Initial (Bi) and Final (Bj) Boundaries Occurring During Successful Call Setup - Scenario 1 3–8
Table 3-11. REs at Initial (Bi) and Final (Bj) Boundaries Occurring During Successful Call Setup - Scenario 2 3–8
Table 3-12. REs at Initial (Bi) and Final (Bj) Boundaries Occurring During Successful Call Setup - Scenario 3 3–9
Table 3-13. REs at Initial (Bi) and Final (Bj) Boundaries Occurring During Successful Call Setup - Scenario 4 3–9
Table 3-14. Call Set-Up Delay Objectives 3–11
Table 3-15. Call Answer Signal Delay Objectives 3–12
Table 3-16. Call Set Up Failure Probability Objectives 3–13
Table 3-17. Call Set Up Error Probability Objectives 3–13
Table 3-18. Call Set-Up Delay Allocation 3–15
Table 3-19. Call Answer Signal Delay Allocation 3–15
Table 3-20. Call Set-Up Failure Probability Allocation 3–15
Table 3-22. Events Defining Successful Call Release - Scenario 1 3–16
Table 3-21. Call Set-Up Failure Probability Allocation 3–16
Table 3-23. Events Defining Successful Call Release - Scenario 2 3–17
Table 3-24. Events Defining Successful Call Release - Scenario 3 3–17
Table 3-25. Events Defining Successful Call Release - Scenario 4 3–17
Table 3-26. Call Release Delay Defining Reference Events for Scenario 1 3–18
Table 3-27. Call Release Delay Defining Reference Events for Scenario 2 3–18
Table 3-28. Call Release Delay Defining Reference Events for Scenario 3 3–18
Table 3-29. Call Release Delay Defining Reference Events for Scenario 4 3–19
Table 3-31. Call Release Failure Reference Events for Scenario 2 3–20
Table 3-30. Call Release Failure Reference Events for Scenario 1 3–20
Table 3-32. Call Release Failure Reference Events for Scenario 3 3–21

Table 3-33. Call Release Failure Reference Events for Scenario 4 3–21
Table 3-34. Call Release Delay Objectives 3–22
Table 3-35. Call Release Delay Allocation 3–23
Table 3-36. Premature Disconnect Probability Allocation 3–24
Table 4-1. IP Reference Events Occurring During Successful IP Packet Transfer 4–2
Table 4-2. ATM Reference Events Occurring During Successful ATM Cell Transfer 4–2
Table 4-3. End-to-End IP Objectives 4–3
Table 4-4. End-to-End ATM Objectives 4–4
Table 4-5. IPLR Values in a Hybrid IP/ATM Network 4–7
Table 5-3. Trunk Gateway Performance Allocations 5–2
Table 5-1. CCA Performance Allocations 5–2
Table 5-2. AG call Processing Performance Requirements 5–2
Table 5-4. Signaling Gateway Performance Allocations 5–3
Table 6-1. VoP Availability Function 6–2
Table B-1. CCA Contribution to CSD: Associated REs for Scenario 1 . . . B–1
Table B-2. CCA Contribution to CASD: Associated REs for Scenario 1 . . B–1
Table B-3. CCA Contribution to CSD: Associated REs for Scenario 2 . . . B–1
Table B-4. CCA Contribution to CASD: Associated REs for Scenario 2 . . B–2
Table B-5. CCA Contribution to CSD: Associated REs for Scenario 3 . . . B–2
Table B-6. CCA Contribution to CSD: Associated REs for Scenario 4 . . . B–2