



CONTENTS

About This Book **xv**

CHAPTER 1

Overview **1-1**

What's New **1-1**

CSG2 Features **1-2**

Comparison of CSG1 and CSG2 Hardware Architectures **1-4**

MIB Support **1-5**

CSG2 Billing Criteria **1-5**

CSG2 Interactions with External Entities **1-6**

CDR Support **1-7**

Fixed CDR Support for HTTP, IMAP, RTSP, and WAP **1-7**

Single CDR Support for HTTP and WAP Connectionless **1-7**

Service-Level CDR Summarization **1-7**

Prepaid and Postpaid Envelope Information Support for SMTP **1-7**

Fixed Attribute CDRs for WAP **1-8**

CDR Suppression for Unestablished TCP Connections **1-8**

Byte Counting **1-8**

HTTP Byte Counting **1-9**

WAP Byte and Packet Counting **1-10**

IMAP Byte Counting **1-10**

FTP and RTSP Byte Counting **1-11**

SIP Byte Counting **1-11**

POP3 and SMTP Byte Counting **1-12**

Byte and Packet Counting After a Failover **1-12**

Flexible Accounting for Retransmitted TCP Segments **1-12**

CSG2 User Table **1-12**

CSG2 Interface Awareness **1-12**

Billing Plan Features **1-13**

BMA Features **1-13**

Quota Server Features **1-14**

Service Features **1-14**

IPC Features **1-15**

PSD Features **1-15**

iSCSI Features **1-16**

RADIUS Features **1-16**

Gx Features	1-17
HTTP Features	1-17
HTTP Pipelining and Chunked Transfer Encoding	1-18
Support for Multipart HTTP	1-18
HTTP 1.0 Content Billing	1-18
HTTP 1.1 Content Billing	1-18
HTTP Records Reporting Flexibility	1-18
HTTP Error Code Reporting	1-19
Policy Matching for HTTP Downgrade	1-19
Support for Out-of-Order Forwarding of HTTP Packets	1-19
Support for Relative URIs	1-20
Learning Client IP Addresses Using Inspection of HTTP X-Forwarded-For Headers	1-20
Restrictions for HTTP	1-21
SIP Features	1-21
WAP Features	1-21
WAP Traffic	1-21
WAP 2.0	1-22
Support for WAP Segmentation and Reassembly (SAR)	1-23
RTSP Features	1-23
RTSP Billing	1-24
Per-Click Authorization	1-24
URL Maps for Interleaved RTSP	1-25
Correlation	1-25
POP3 Support	1-28
SMTP and POP3 Billing	1-29
SMTP CDR Header Removal	1-30
FTP Billing	1-30
Attribute, Header, Method, and URL Mapping	1-30
Service Duration Billing	1-30
Charging for Service Duration Billing	1-30
Calculating Usage for Service Duration Billing	1-31
Reporting Quadrans to the Quota Server and to the BMA	1-34
Handling Out-of-Quota Conditions	1-34
Connection Duration Billing	1-34
Postpaid Service Tagging	1-35
Stateful Redundancy and Failover	1-36
“Default” Policy	1-37
Tariff Switch	1-37
Prepaid Error Reimbursement	1-38
Postpaid Billing	1-39

Prepaid Content Billing and Accounting	1-39
Dual Quota Support	1-41
Session-Based Quality of Service (QoS) Support	1-41
NBAR Protocol Support	1-41
License-Exceeded Notifications	1-44
Obtaining User IDs	1-44
Filtering Accounting	1-44
Intermediate Billing Records	1-44
Packet Forwarding	1-45
Per-User Uplink Next-Hop Support	1-45
URL-Redirect	1-45
Supplemental Usage Reports	1-46
Enhanced Interoperability with Cisco Service-Aware GGSN	1-46
Miscellaneous Features	1-46
IP Fragment Support for All Protocols	1-46
Support for Out-of-Order Packets for All Protocols	1-46
Enhanced Adaptability for Network-Generated Out-of-Order TCP Packets for Layer 4 Flows	1-47
Billing Chain Failure Notification	1-47
Asynchronous Service Stop	1-47
Support for Port Number Ranges	1-47
Packet Counts	1-47
Negative Quadrans	1-47
Enhanced “ show interface ” Command	1-48
Enhanced “ show ip csg radius detail ” Command	1-48
Enhancements for Layer 2	1-48
CSG2 Prerequisites	1-48
CSG2 Restrictions	1-48

CHAPTER 2

Configuring the CSG2 2-1

Preparing to Install the CSG2 Software	2-1
Installing the CSG2 Software	2-3
Upgrading the CSG2 Software	2-7
Saving and Restoring CSG2 Configurations	2-7
Configuring the CSG2 Features	2-8
Configuring the User Database	2-9
Configuring the CSG2 User Table	2-9
Configuring the Fragment Database	2-11
Configuring the Session Table	2-11
Configuring URL-Redirect	2-11

Configuring Policies and Traffic Types	2-13
Configuring a Content Billing Service	2-14
Configuring a Billing Plan	2-14
Disabling Offline Billing	2-15
Assigning a Default Billing Plan	2-15
Configuring Content	2-16
Configuring Single-TP Mode	2-18
Configuring Fixed, Variable, or Combined Format CDR Support	2-18
Fixed CDR Support for HTTP and WAP	2-19
Fixed CDR Support for IMAP	2-19
Fixed CDR Support for RTSP	2-19
Single CDR Support for HTTP and WAP	2-19
Specifying the CDR Format	2-20
Configuring a Refund Policy on the CSG2	2-20
Configuring Session-Based Quality of Service (QoS)	2-20
Configuring NBAR Protocol Support	2-23
Configuring 8-Byte TLVs	2-25
Configuring HTTP Header Reporting	2-26
Configuring SMTP CDR Header Removal	2-26
Configuring Supplemental Usage Reporting	2-27
Configuring Actual PDU Reporting for WAP	2-27
Configuring CDR Suppression for Unestablished TCP Connections	2-28
Configuring Content Name Reporting	2-28
Configuring Policy Name Reporting	2-28
Configuring Flexible TCP Packet Counting	2-28
Configuring Maps for Pattern-Matching	2-29
Configuring Connection Redundancy	2-30
Configuring High Availability	2-31
Components That Provide HA	2-31
Enabling HA	2-32
Configuring a Secondary IP Address for HA	2-32
Synchronizing Clocks for HA	2-33
Modifying an HA Configuration	2-33
Distributed Crash Data Collection	2-34
Configuring HA for CSG2s in Different Chassis	2-35
Configuring the CSG2 for HA Peer Connectivity	2-35
Classifying Data Traffic	2-35
Configuring a CSG2 Subscriber Interface	2-36
Configuring Case Sensitivity	2-36
Configuring WAP and WSP Support	2-36

Counting Bytes and Packets	2-36
Incomplete WAP Transactions	2-36
Multimedia Messaging Service	2-37
Blocking Ports	2-37
Configuring SNMP Timers	2-38
Configuring the Interval for CSG2 Rate Calculations	2-38
Configuring the SAMI Bit Rate Limit	2-38
Configuring the SNMP Notification Types	2-39
Configuring the Subscriber Threshold for License-Exceeded Notifications	2-39
Configuring Packet Logging	2-40
Trouble-Shooting a Problem Using Packet Logging	2-41
Configuring a Packet Filter	2-41
Defining the Size of the Packet Buffer	2-42
Enabling and Disabling Packet Logging	2-42
Displaying the Contents of the Packet Buffer	2-42
Setting Up Packet Logging for NBAR	2-43
Configuring Layer 2–Adjacent Devices	2-44
Changing the Order of Next-Hop IP Address Selection	2-44
CSG2 Configuration Examples	2-45
Sample Configuration for Subscriber-to-Subscriber Traffic	2-45
Configuring Next-Hop for a Subscriber-to-Subscriber Content	2-46
Configuring Reverse Next-Hop for a Subscriber-to-Subscriber Content	2-46
Configuring Prepaid Subscriber-to-Subscriber Contents for a Service	2-47
Description of Subscriber-to-Subscriber Traffic Flow	2-47
Sample Configuration for HTTP X-Forwarded-For	2-47
Sample Configuration for High Availability	2-48
HA Configuration on the Active CSG2	2-48
HA Configuration on the Standby CSG2	2-49
Sample Configuration for HA Peer Connectivity	2-50
Sample Configuration for Supervisor Engine Side 1	2-50
Sample Configuration for CSG2 Side 1	2-51
Sample Configuration for Supervisor Engine Side 2	2-51
Sample Configuration for CSG2 Side 2	2-52
Displaying Port-Channel Information for One Side	2-52
Configuring CSG2 Network/Subscriber Traffic	2-54

CHAPTER 3

Configuring BMA Support 3-1

Configuring the BMA Local Port	3-1
Configuring a BMA	3-2

Configuring the BMA Keepalive Time	3-2
Configuring the BMA GTP' Message Buffer	3-3
Configuring the BMA Retransmit Time	3-3
Configuring the BMA Retry Number	3-3
Configuring the BMA Window Size	3-4
Configuring BMA Load Sharing	3-4
Reporting the Billing Plan ID to the BMA	3-5

CHAPTER 4

Configuring Quota Server Support 4-1

Configuring the Quota Server Local Port	4-2
Configuring a Quota Server	4-2
Configuring the Quota Server Keepalive Time	4-2
Configuring the Quota Server GTP' Message Buffer	4-3
Configuring the Quota Server Retransmit Time	4-3
Configuring the Quota Server Retry Number	4-4
Configuring the Quota Server Window Size	4-4
Configuring Quota Server Load Sharing	4-4
Reassigning Subscribers to a New Quota Server	4-5
Sending User Profile Requests to Quota Servers	4-5
Quota Push	4-6
Replacing Quota Balance	4-6
Delaying Quota Reauthorization	4-6
Asynchronous Quota Return	4-7
Reporting the Billing Plan ID to the Quota Server	4-7
Pricing by Quota Server Configuration Example	4-7
Differentiating Prices Configuration Example	4-8
Reducing the Number of Services Configuration Example	4-9

CHAPTER 5

Configuring Service Support 5-1

Configuring a Basic Content Billing Service	5-2
Configuring the Billing Basis for a Service	5-2
Specifying a Service Owner	5-3
Specifying a Service Class	5-3
Configuring a Service Idle Time	5-3
Configuring Advice of Charge	5-4
Enabling AoC URL-Rewriting	5-5

Configuring an AoC Token	5-6
Configuring AoC URL-Appending	5-6
Redirect Flexibility	5-7
Configuring Service Verification	5-7
Enabling Service Verification URL-Rewriting	5-8
Configuring a Service Verification Token	5-8
Enabling Service-Level CDR Summarization	5-9
Configuring Passthrough Mode and the Default Quota	5-10
Flagging of Messages	5-11
User Profile Requests	5-11
Quota Server Recovery	5-11
Configuring Metering	5-11
Configuring an Initial Quota for Metering	5-12
Configuring a Minimum Quota for Metering	5-12
Configuring a Debit Increment for Metering	5-12
Excluding RTSP PAUSE from Metering	5-13
Including IMAP Bytes in Metering	5-14
Excluding MMS from Metering	5-16
Excluding the Final Service Idle from Metering	5-16
Configuring the Quota Reauthorization Threshold	5-17
Configuring the Quota Reauthorization Timeout	5-17
Enabling a Refund Policy for a Service	5-18

CHAPTER 6
Configuring IPC Support 6-1

Configuring the IPC Keepalive Time	6-1
Configuring the IPC Retransmit Time	6-1
Configuring the IPC Retry Number	6-2
Changing the IPC Crash Dump Setting	6-2

CHAPTER 7
Configuring PSD Support 7-1

Configuring the PSD Local Port	7-2
Configuring the PSD	7-2
Configuring the PSD Packet Drain Settings	7-2
Configuring the PSD Keepalive Time	7-3
Configuring the PSD GTP' Message Buffer	7-3
Configuring the PSD Retransmit Time	7-4
Configuring the PSD Retry Number	7-4

Configuring the PSD Window Size 7-4

CHAPTER 8

Configuring iSCSI Support 8-1

iSCSI Overview 8-1

Configuring an iSCSI Target Interface Profile on the CSG2 8-2

Associating an iSCSI Target Interface Profile with the CSG2 8-3

Configuring the iSCSI Packet Drain Settings 8-4

Verifying the iSCSI Session 8-4

CHAPTER 9

Configuring RADIUS Support 9-1

Configuring RADIUS Proxy 9-2

Configuring RADIUS Endpoint 9-3

Configuring RADIUS Handoff 9-4

Configuring RADIUS Packet of Disconnect 9-4

Configuring RADIUS Change of Authorization 9-5

Configuring RADIUS Monitor 9-6

RADIUS Attributes and VSA Subattributes 9-6

RADIUS Attributes Required for CSG2 User Table 9-6

Deleting Entries from the CSG2 User Table 9-7

Reporting RADIUS Attributes and VSA Subattributes 9-7

Enabling RADIUS Roaming Service Control 9-9

Enabling RADIUS Geo-Redundancy 9-9

Retrieving the Billing Plan ID from RADIUS 9-10

RADIUS Subscriber Cleanup 9-11

RADIUS Error Acknowledgment 9-11

RADIUS Correlation Processing 9-12

Processing Multiple RADIUS Accounting Stops 9-13

CHAPTER 10

Configuring Gx Support 10-1

Enabling Gx on the CSG2 10-3

Configuring a User Profile 10-3

Preloading Policies 10-4

Support for Gx TCP Signature Reporting 10-5

Dynamic Provisioning of 3GPP Per-User DGRs 10-5

Dynamic Provisioning of Cisco Per-User DGRs 10-6

Roaming Support 10-6

Volume and Duration Triggers	10-7
Service Flow Detection Triggers	10-7
Billing Plan Assignment and Modification	10-8
PDP Context QoS Signaling	10-8
Secondary PDP Context Activation	10-8
PCRF-Specified Service-Level QoS	10-8
PCRF Failure Handling	10-8
Restrictions for Gx	10-9

CHAPTER 11

Configuring Prepaid Support	11-1
Configuring a Prepaid Billing Plan	11-1
Configuring Virtual Prepaid Mode	11-2
Prepaid WAP Support	11-2
Configuring a Postpaid Service for a Prepaid Billing Plan	11-3

APPENDIX A

CSG2 Command Reference	A-1
-------------------------------	------------

APPENDIX B

CSG2 Command History—CSG1 R7 to CSG2 R1	B-1
Unchanged Commands	B-1
New Commands	B-2
Deleted Commands	B-3
Changed Commands	B-5
Changes to Module CSG Configuration Mode	B-10
Changes to Module CSG VLAN Configuration Mode	B-10
Changes to Accounting Configuration Mode	B-11
Changes to Billing Configuration Mode	B-12
Changes to Block Configuration Mode	B-12
Changes to Content Configuration Mode	B-12
Changes to Map Configuration Mode	B-13
Changes to Policy Configuration Mode	B-13
Changes to Refund Configuration Mode	B-14
Changes to Ruleset Configuration Mode	B-14
Changes to Service Configuration Mode	B-14
Changes to SNMP Timer Configuration Mode	B-15
Changes to Transport-Type Configuration Mode	B-15
Changes to User Group Configuration Mode	B-16

Changes to Weight Configuration Mode **B-17**

APPENDIX C

CSG2 Command History—CSG2 R1 to CSG2 R2 C-1

New Commands **C-1**
 Deleted Commands **C-2**
 Changed Commands **C-2**

APPENDIX D

CSG2 Command History—CSG2 R2 to CSG2 R3 D-1

New Commands **D-1**
 Deleted Commands **D-1**
 Changed Commands **D-2**

APPENDIX E

CSG2 Command History—CSG2 R3 to CSG2 R3.5 E-1

New Commands **E-1**
 Deleted Commands **E-2**
 Changed Commands **E-2**

APPENDIX F

Protocol Compliance Statements for the CSG2 F-1

Layer 4 Inspection (parse protocol=other) **F-1**
 Layer 7 Inspection (parse protocol=specific protocol) **F-1**

APPENDIX G

CSG2 System Messages G-1

CSG2 System Messages **G-1**
 Message: Configuration download error: %s **G-1**
 Message: %s **G-2**
 Message: Startup configuration completed. **G-2**
 Message: Configuration Sync error: %s **G-2**
 Message: %s **G-2**
 Message: %s packet drop: queue size %d reached, record storage %s is currently %s **G-3**
 Message: GTP error: %s **G-3**
 Message: GTP received reject cause code %d from %i:%u **G-3**
 Message: GTP state change: %s **G-4**
 Message: IPC is link failed to processor %u, state = %u, software reloading card now. **G-4**
 Message: %s **G-4**
 Message: iSCSI device %i:%u is full **G-5**
 Message: iSCSI state change: %s **G-5**
 Message: %s transaction discarded due to high load. **G-5**

Message: Failed to set %s local port. Either there are no IP addresses configured or port %u is in use. **G-6**

Message: Lock depth %u has crossed threshold. **G-6**

Message: CSG NTP synchronization is complete **G-6**

Message: Error: %s **G-7**

Message: PSD device %i:%u is full **G-7**

Message: CSG replicate condition: %s **G-7**

Message: Error: %s **G-8**

Message: Unexpected condition: %s **G-8**

SAMI System Messages **G-8**

Message: Nvram CRC Failure: %d\n **G-8**

Message: Nvram Erase Failure: handle 0x%x, offset 0x%x, error %s **G-9**

Message: Nvram Init Failure of flash device at %d:%s **G-9**

Message: Nvram Init Failure: %s **G-9**

Message: Nvram Magic Corrupt: Present %d Expected %d\n **G-9**

Message: Nvram Write Failure: handle 0x%x, offset 0x%x, numbytes 0x%x error %s **G-10**

Message: Nvram Write Config Failure: \n **G-10**

Message: Unexpected condition: %s **G-10**

Message: Unexpected condition: %s **G-10**

iSCSI System Messages **G-11**

Message: Error: %s **G-11**

Message: Error: %s **G-11**

Message: Warning: %s **G-11**

APPENDIX H

Monitoring Notifications **H-1**

SNMP Overview **H-1**

MIB Description **H-2**

SNMP Notifications **H-2**

SNMP Versions **H-3**

SNMPv1 and SNMPv2c **H-3**

SNMPv3 **H-4**

SNMP Security Models and Levels **H-4**

Requests for Comments **H-4**

Object Identifiers **H-5**

Related Information and Useful Links **H-5**

TAC Information and FAQs **H-5**

SNMP Configuration Information **H-5**

Configuring MIB Support **H-6**

Determining MIBs Included for Cisco IOS Releases **H-6**

Downloading and Compiling MIBs	H-6
Considerations for Working with MIBs	H-7
Downloading MIBs	H-8
Compiling MIBs	H-8
Enabling SNMP Support	H-8
Enabling and Disabling SNMP Notifications	H-9
Enabling and Disabling CSG2 Notifications via the CLI	H-9
Enabling and Disabling CSG2 SNMP Notifications via SNMP	H-10