APPENDIX D

Quality of Service Statistics Output

Overview

This chapter describes the Cisco BAMS ability to generate output files that include voice-gateway, Quality-of-Service (QoS) statistics produced by Cisco voice gateways, collected by the Cisco PGW 2200, and sent to the Cisco BAMS.

✎ **Note** Not all calls produce the DSP and gateway statistics. If the required CDE tags are present in the CDB and the corresponding gateway statistics are present in the CDE tag, then the corresponding field will be populated in the QoS output.

Software Requirements

This section identifies the software releases required to support the production of Quality of Service (QoS) Statistics.

IOS for Cisco Voice Gateways

To support the generation of QoS statistics output files, a Cisco voice gateway must be running Cisco IOS Release 12.4(4)T or later.

Cisco PGW 2200

To support the generation of QoS statistics output files, a Cisco PGW 2200 must be running PGW 9.6(1) with the patch that includes the featurette: IOS DSP Stats in PGW - K factor and Other...

Cisco BAMS

The functionality to generate QoS statistics output files is included in a patch of Cisco BAMS named CSCOBAMS320QOS.pkg. This patch is added by issuing the following command:

```
pkgadd -d CSCOBAMS320QOS.pkg
```

✎ **Note** Installing the QoS package adds an entry for file maintenance in the MSC_PARMS table for the QoS files.

By default, the patch enables QoS output on all nodes. You can determine whether QoS output is enabled on a BAMS node by issuing the following Unix command:

```
$ show_bams_qos
```

This command typically returns a response as shown in the following example:

```
Node 1: enabled
Node 2: enabled
Node 3: enabled
Node 4: enabled
Node 5: enabled
Node 6: enabled
Node 7: enabled
Node 8: enabled
```

The following Unix-level commands enable and disable the QoS output on an individual node:

```
$ enable_bams_qos
```

The following command would enable BAMS on a node numbered 2 (the **enable_bams_qos** command can be used to enable the feature on 1 to 8 BAMS nodes):

```
$ enable_bams_qos -s2
```

The following command would disable BAMS on a node numbered 2.

```
$ disable_bams_qos -s2
```

The QoS feed produces its own logs.which are located in respective node directories, such as /opt/CiscoBAMS/files/s0x.

QoS logs are not viewable in CLI as other logs are. QoS logs rollover and are named:

```
QOS.log
QOS.log.1
QOS.log.2
QOS.log.3
QOS.log.4
```

The default log level of LOG_NOTICE should be sufficient; however, the log levels can be set in the qos.cfg file, which is also located in the individual directory of each BAMS node, for example, /opt/CiscoBAMS/files/s0x.

The available log levels for QoS feeds are:

- LOG_NOTICE—For this log level, BAMS writes out only the filename that is being processed and archived, and nothing more. This is the log level for normal processing.

- LOG_DEBUG—This log level is for debug purposes only and should be set only when debugging.

Billing Interface

New gateway statistics output are generated from BAMS for the gateway statistics. Each record in the output corresponds to a finished call processed by BAMS.

Output File Location

The new output files are stored in the /opt/CiscoBAMS/data/s0X/QOS_STAT directory.

Output File Naming

A new gateway statistics output file is generated for each PGW CDR file. The generated file name is in the format QOS_STAT_YYYYMMDDhhmmss_XXXXXX.csv. In this format:

- YYYYMMDDhhmmss is date-time in UTC format contained in CDE tag 6001 of the corresponding CDR file header.
  - YYYY—year
  - MM—month
  - DD—day of the month
  - hh—hour
  - mm—minute
  - ss—second

  For example, 04/16/2005 13:45:27 UTC would generate 20050416134527.

- XXXXXX is the file sequence number, which is the same as the PGW file sequence number. For example, 000123.

File Content

Each file contains 0(zero) or more records. The records are separated by the new-line character (0xA). Cisco BAMS generates a record for each 1030 or 1040 CDB in the corresponding Cisco PGW CDR file. Each record contains fields separated by commas.

Table 0-1 describes the contents of the fields included in records generated for a QoS output file.

Table 0-1   QoS Output File—Record Fields

Field	Tag	Description	Format	PGW CDR CDE Tag
1	5000	Global Call Id	Text	5000
2	4002	Call Reference ID	Hex	4002
3	4106	First REL Timepoint ms	Seconds, milliseconds	4106
4	4107	Second REL Timepoint ms	Seconds, milliseconds	4107
5	4108	RLC Timepoint rcvd ms	Seconds, milliseconds	4108
6	4109	RLC Timepoint sent ms	Seconds, milliseconds	4109
7	P:PS	Ingress Packets sent	Integer	4046
8	P:PR	Ingress Packets received	Integer	4046
9	P:PL	Ingress Packets Lost	Integer	4046
10	P:OS	Ingress Octet Sent	Integer	4046
11	P:OR	Ingress Octet Received	Integer	4046
12	P:JI	Ingress Jitter	Integer	4046

Table 0-1   QoS Output File—Record Fields (continued)

Field	Tag	Description	Format	PGW CDR CDE Tag
13	P:LA	Ingress Latency	Integer	4046
14		Ingress Reservd1		4046
15		Ingress Reserved2		4046
16	P:PS	Egress Packets sent	Integer	4047
17	P:PR	Egress Packets received	Integer	4047
18	P:PL	Egress Packets Lost	Integer	4047
19	P:OS	Egress Octet Sent	Integer	4047
20	P:OR	Egress Octet Received	Integer	4047
21	P:JI	Egress Jitter	Integer	4047
22	P:LA	Egress Latency	Integer	4047
23		Egress Reservd1		4047
24		Egress Reserved2		4047
25	DSP/TX:PK	Ingress tx packets	Integer	4098
26	DSP/TX: SG	Ingress signalling packets	Integer	4098
27	DSP/TX: NS	Ingress noise packets	Integer	4098
28	DSP/TX: DU	Ingress tx duration	Integer	4098
29	DSP/TX: VO	Ingress voice tx duration	Integer	4098
30	DSP/RX: PK	Ingress voice packets	Integer	4098
31	DSP/RX: SG	Ingress signalling packets	Integer	4098
32	DSP/RX: RX	Ingress comfort noise packets		4098
33	DSP/RX: VO	Ingress rx duration		4098
34	DSP/RX: BS	Ingress voice rx duration		4098
35	DSP/RX: BP	Ingress bad sequence		4098
36	DSP/RX: LP	Ingress bad protocol		4098
37	DSP/RX: EP	Ingress late packets		4098
38	DSP/PD: CU	Ingress early packets		4098
39	DSP/PD: MI	Ingress playout delay current		4098
40	DSP/PD: MA	Ingress playout delay min		4098
41	DSP/PD: CO	Ingress playout delay max		4098
42	DSP/PD: IJ	Ingress playout delay clock_offset		4098
43	DSP/PE: PC	Ingress playout delay interarrival jitter		4098
44	DSP/PE: IC	Ingress playout error predictive concealment		4098

Table 0-1   QoS Output File—Record Fields (continued)

Field	Tag	Description	Format	PGW CDR CDE Tag
45	DSP/PE: SC	Ingress playout error interpolative concealment		4098
46	DSP/PE: RM	Ingress playout error silence concealment		4098
47	DSP/PE: BO	Ingress playout error retroactive mem update		4098
48	DSP/PE: EE	Ingress playout error buffer overflow		4098
49	DSP/LE: TP	Ingress playout error talkspurt end point error		4098
50	DSP/LE: TX	Ingress Level tx power in 0.1 dBm		4098
51	DSP/LE: RP	Ingress Level tx mean in 0.1 dBm		4098
52	DSP/LE: RM	Ingress Level rx power in 0.1 dBm		4098
53	DSP/LE: BN	Ingress Level rx mean in 0.1 dBm		4098
54	DSP/LE: ER	Ingress Level background noise		4098
55	DSP/LE: AC	Ingress Level erl level		4098
56	DSP/LE: TA	Ingress Level acom level		4098
57	DSP/LE: RA	Ingress Level curr tx act		4098
58	DSP/ER: RD	Ingress Level curr rx act		4098
59	DSP/ER: TD	Ingress error_stats rx dropped		4098
60	DSP/ER: RC	Ingress error_stats tx dropped		4098
61	DSP/ER: TC	Ingress error_stats rx control		4098
62	DSP/IC: IC	Ingress error_stats tx control		4098
63	DSP/EC:CI	Ingress ICPIF value for measuring voice quality		4098
64	DSP/EC:FM	Ingress Codec ID	Text	4098
65	DSP/EC:FP	Ingress Frame size in ms	Integer	4098
66	DSP/EC:VS	Ingress Frames per packet	Integer	4098
67	DSP/EC:GT	Ingress VAD enabled flag	Integer	4098
68	DSP/EC:GR	Ingress TX Gain (linear)	Integer	4098
69	DSP/EC:JD	Ingress RX Gain (linear)	Integer	4098
70	DSP/EC:JN	Ingress Jitter Buffer Mode	Integer	4098

Table 0-1   QoS Output File—Record Fields (continued)

Field	Tag	Description	Format	PGW CDR CDE Tag
71	DSP/EC:JM	Ingress Jitter buffer nominal playout delay	Integer	4098
72	DSP/EC:JX	Ingress Jitter buffer minimum playout delay	Integer	4098
73	DSP/KF:KF	Ingress Jitter buffer max playout delay	Integer	4098
74	DSP/KF:AV	Ingress K-factor MOS-k (inst)	Integer	4098
75	DSP/KF:MI	Ingress Average MOS-k	Integer	4098
76	DSP/KF:MI	Ingress Minimum MOS-k	Integer	4098
77	DSP/KF:BS	Ingress Baseline MOS-k (Max)	Integer	4098
78	DSP/KF:NB	Ingress Number of bursts	Integer	4098
79	DSP/KF:FL	Ingress Average frame loss rate	Integer	4098
80	DSP/KF:NW	Ingress Number of windows in average MOS	Integer	4098
81	DSP/KF:VR	Ingress MOS K-factor Version ID	Integer	4098
82	DSP/CS:CR	Ingress Conceal Ratio (instantaneous)	Integer	4098
83	DSP/CS:AV	Ingress Average CR	Integer	4098
84	DSP/CS:MX	Ingress Maximum CR	Integer	4098
85	DSP/CS:CT	Ingress Concealment Time	Integer	4098
86	DSP/CS:TT	Ingress Total time (duration)	Integer	4098
87	DSP/CS:OK	Ingress OK seconds	Integer	4098
88	DSP/CS:CS	Ingress Concealed seconds	Integer	4098
89	DSP/CS:SC	Ingress Severely concealed seconds	Integer	4098
90	DSP/CS:TS	Ingress Conceal threshold	Integer	4098
91	DSP/CS:DC	Ingress Dead connection indication	Integer	4098
92	DSP/RF:ML	Ingress R-factor MOS-LQE	Integer	4098
93	DSP/RF:MC	Ingress R-factor MOS-CQE	Integer	4098
94	DSP/RF:R1	Ingress R-factor LQ profile 1	Integer	4098
95	DSP/RF:R2	Ingress R-factor LQ profile 2	Integer	4098
96	DSP/RF:IF	Ingress Ie_eff	Integer	4098
97	DSP/RF:ID	Ingress Idd	Integer	4098

Table 0-1   QoS Output File—Record Fields (continued)

Field	Tag	Description	Format	PGW CDR CDE Tag
98	DSP/RF:IE	Ingress Codec baseline IE score	Integer	4098
99	DSP/RF:BL	Ingress Codec baseline BPL	Integer	4098
100	DSP/RF:R0	Ingress R0 default	Integer	4098
101	DSP/RF:VR	Ingress R-factor Version ID	Integer	4098
102	DSP/UC:U1	Ingress User conceal seconds 1 count (UCS1)	Integer	4098
103	DSP/UC:U2	Ingress User conceal seconds 2 count (UCS2)	Integer	4098
104	DSP/UC:T1	Ingress UCS1 threshold in ms	Integer	4098
105	DSP/UC:T2	Ingress UCS2 threshold in ms	Integer	4098
106	DSP/DL:RT	Ingress Round trip delay	Integer	4098
107	DSP/DL:ED	Ingress End system delay	Integer	4098
108	DSP/TX:PK	Egress tx packets	Integer	4099
109	DSP/TX: SG	Egress signalling packets	Integer	4099
110	DSP/TX: NS	Egress noise packets	Integer	4099
111	DSP/TX: DU	Egress tx duration	Integer	4099
112	DSP/TX: VO	Egress voice tx duration	Integer	4099
113	DSP/RX: PK	Egress voice packets	Integer	4099
114	DSP/RX: SG	Egress signalling packets	Integer	4099
115	DSP/RX: CF	Egress comfort noise packets	Integer	4099
116	DSP/RX: RX	Egress rx duration	Integer	4099
117	DSP/RX: VO	Egress voice rx duration	Integer	4099
118	DSP/RX: BS	Egress bad sequence	Integer	4099
119	DSP/RX: BP	Egress bad protocol	Integer	4099
120	DSP/RX: LP	Egress late packets	Integer	4099
121	DSP/RX: EP	Egress early packets	Integer	4099
122	DSP/PD: CU	Egress playout delay current	Integer	4099
123	DSP/PD: MI	Egress playout delay min	Integer	4099
124	DSP/PD: MA	Egress playout delay max	Integer	4099
125	DSP/PD: CO	Egress playout delay clock_offset	Integer	4099
126	DSP/PD: IJ	Egress playout delay interarrival jitter	Integer	4099
127	DSP/PE: PC	Egress playout error predictive concealment	Integer	4099

Table 0-1   QoS Output File—Record Fields (continued)

Field	Tag	Description	Format	PGW CDR CDE Tag
128	DSP/PE: IC	Egress playout error interpolative concealment	Integer	4099
129	DSP/PE: SC	Egress playout error silence concealment	Integer	4099
130	DSP/PE: RM	Egress playout error retroactive mem update	Integer	4099
131	DSP/PE: BO	Egress playout error buffer overflow	Integer	4099
132	DSP/PE: EE	Egress playout error talkspurt end point error	Integer	4099
133	DSP/LE: TP	Egress Level tx power in units of 0.1 dBm	Integer	4099
134	DSP/LE: TX	Egress Level tx mean in units of 0.1 dBm	Integer	4099
135	DSP/LE: RP	Egress Level rx power in units of 0.1 dBm	Integer	4099
136	DSP/LE: RM	Egress Level rx mean in units of 0.1 dBm	Integer	4099
137	DSP/LE: BN	Egress Level background noise	Integer	4099
138	DSP/LE: ER	Egress Level erl level	Integer	4099
139	DSP/LE: AC	Egress Level acom level	Integer	4099
140	DSP/LE: TA	Egress Level curr tx act	Integer	4099
141	DSP/LE: RA	Egress Level curr rx act	Integer	4099
142	DSP/ER: RD	Egress error_stats rx dropped	Integer	4099
143	DSP/ER: TD	Egress error_stats tx dropped	Integer	4099
144	DSP/ER: RC	Egress error_stats rx control	Integer	4099
145	DSP/ER: TC	Egress error_stats tx control	Integer	4099
146	DSP/IC: IC	Egress ICPIF value for measuring voice quality	Integer	4099
147	DSP/EC:CI	Egress Codec ID	Integer	4099
148	DSP/EC:FM	Egress Frame size in ms	Integer	4099
149	DSP/EC:FP	Egress Frames per packet	Integer	4099
150	DSP/EC:VS	Egress VAD enabled flag	Integer	4099
151	DSP/EC:GT	Egress TX Gain (linear)	Integer	4099
152	DSP/EC:GR	Egress RX Gain (linear)	Integer	4099
153	DSP/EC:JD	Egress Jitter Buffer Mode	Integer	4099

Table 0-1   QoS Output File—Record Fields (continued)

Field	Tag	Description	Format	PGW CDR CDE Tag
154	DSP/EC:JN	Egress Jitter buffer nominal playout delay	Integer	4099
155	DSP/EC:JM	Egress Jitter buffer minimum playout delay	Integer	4099
156	DSP/EC:JX	Egress Jitter buffer max playout delay	Integer	4099
157	DSP/KF:KF	Egress K-factor MOS-k (inst)	Integer	4099
158	DSP/KF:AV	Egress Average MOS-k	Integer	4099
159	DSP/KF:MI	Egress Minimum MOS-k	Integer	4099
160	DSP/KF:BS	Egress Baseline MOS-k (Max)	Integer	4099
161	DSP/KF:NB	Egress Number of bursts	Integer	4099
162	DSP/KF:FL	Egress Average frame loss rate	Integer	4099
163	DSP/KF:NW	Egress Number of windows in average MOS	Integer	4099
164	DSP/KF:VR	Egress MOS K-factor Version ID	Integer	4099
165	DSP/CS:CR	Egress Conceal Ratio (instantaneous)	Integer	4099
166	DSP/CS:AV	Egress Average CR	Integer	4099
167	DSP/CS:MX	Egress Maximum CR	Integer	4099
168	DSP/CS:CT	Egress Concealment Time	Integer	4099
169	DSP/CS:TT	Egress Total time (duration)	Integer	4099
170	DSP/CS:OK	Egress OK seconds	Integer	4099
171	DSP/CS:CS	Egress Concealed seconds	Integer	4099
172	DSP/CS:SC	Egress Severely concealed seconds	Integer	4099
173	DSP/CS:TS	Egress Conceal threshold	Integer	4099
174	DSP/CS:DC	Egress Dead connection indication	Integer	4099
175	DSP/RF:ML	Egress R-factor MOS-LQE	Integer	4099
176	DSP/RF:MC	Egress R-factor MOS-CQE	Integer	4099
177	DSP/RF:R1	Egress R-factor LQ profile 1	Integer	4099
178	DSP/RF:R2	Egress R-factor LQ profile 2	Integer	4099
179	DSP/RF:IF	Egress Ie_eff	Integer	4099
180	DSP/RF:ID	Egress Idd	Integer	4099

Table 0-1   QoS Output File—Record Fields (continued)

Field	Tag	Description	Format	PGW CDR CDE Tag
181	DSP/RF:IE	Egress Codec baseline IE score	Integer	4099
182	DSP/RF:BL	Egress Codec baseline BPL	Integer	4099
183	DSP/RF:R0	Egress R0 default	Integer	4099
184	DSP/RF:VR	Egress R-factor Version ID	Integer	4099
185	DSP/UC:U1	Egress User conceal seconds 1 count (UCS1)	Integer	4099
186	DSP/UC:U2	Egress User conceal seconds 2 count (UCS2)	Integer	4099
187	DSP/UC:T1	Egress UCS1 threshold in ms	Integer	4099
188	DSP/UC:T2	Egress UCS2 threshold in ms	Integer	4099
189	DSP/DL:RT	Egress Round trip delay	Integer	4099
190	DSP/DL:ED	Egress End system delay	Integer	4099
191	4087	Egress MGCP DLCX Return Code	Hex	4087
192	4088	Egress MGCP DLCX Return Code	Hex	4088
193	4205	Egress Media Device Address	String	4205
194	4206	Egress Media Device Address	String	4206
195	4207	Initial Codec	String	4207
196	4208	Final Codec	String	4208
197	4209	Egress Media Device Port	String	4209
198	4210	Egress Media Device Port	String	4210
199	4227	Route Optimization/Path Replacement Action	Hex	4227
200	4228	Route Optimization/Path Replacement Call Reference	Hex	4228
201	4229	Route Optimization/Path Replacement Trunk Group Info	Hex	4229
202	4230	Route Optimization/Path Replacement Channel Info	Hex	4230
203	4231	Route Optimization Switchover Timestamp	Hex	4231