



CHAPTER 12

Obtaining Measurements

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Introduction

The Statistics module on the Cisco Billing and Measurements Server (BAMS) computes, augments, generates, and maintains performance indicators. Performance indicators amount to a history of traffic statistics on a telephone or data network. Counters are calculated for various events (for example, number of call attempts, call duration) for a particular time period. Each counter is associated with a time stamp and a key formed by the concatenation of several fields copied out of the Call Detail Record (CDR) being processed.

Counters that correspond to the same key within the same time period are added together, producing an accumulated count. For this reason, performance indicators are also known as accumulators. That is, “accumulators” and “counters” are used interchangeably to refer to performance indicators.

BAMS maintains counters for three different interval categories (real time, hourly, and daily intervals).

BAMS also maintains a flat file for each collection interval. In order for information to be timely, as soon as an interval boundary is reached, the buckets for that interval are written to disk. As the measurements are written, each measurement is checked against a user-defined threshold value and test condition.

New Measurements in BAMS Release 3.30

Cisco BAMS 3.30 introduces 11 new measurements. Some of these new measurements are recorded when a call is received, several are recorded at a specified interval, and two are recorded daily only.

Per Received-Call Measurements

Table 12-1 lists the new measurements for BAMS 3.30 that are recorded each time a call is received.

Table 12-1 Per Received-Call Measurements

Index	Name	Time Point	Mnemonic	Formula for Derivation and Mapping	Support in nailed mode?	Threshold Crossing Support?
57	Answered Calls Incoming	1010 received, tag 4104 and 4105 both populated	BAM: IGR CALL ANS	Pegged when a 1010 CDB is recorded with 4008, 4104 and 4105 populated	Yes	Yes
58	Answered Calls Outgoing	1010 received, tag 4104 and 4105 both populated	BAM:EGR CALL ANS	Pegged when a 1010 CDB is recorded with 4015, 4104 and 4105 populated	No	Yes
59	Answered Calls Total	1010 received, tag 4104 and 4105 both populated	BAM: TTL CALL ANS	This equals the sum of "IGR CALL ANS" (Index # 57) and "EGR CALL ANS" (#58) for the trunk group	No	Yes
60	Call Attempts Total	1010 or 1030 received, tag 4100 and 4101 populated	BAM: TTL CALL ATT	This equals the sum of "IGR CALL ATT" (#1) and "EGR CALL ATT (#2) for the trunk group	No	Yes

Per Interval Measurements

[Table 12-2](#) lists the new measurements for BAMS 3.30 that are recorded at the end of each reporting interval.

Table 12-2 Per Interval Measurements

Index	Name	Time Point	Mnemonic	Formula for Derivation and Mapping	Support in nailed mode?	Threshold Crossing Support?
61	Answer Seizure Ratio Incoming	Calculated only at the end of measurement interval	BAMS:IGR ASR	This is calculated as percentage of “IGR CALL ANS” (#57) divided by “IGR CALL ATT” (#1), precision to 1 digit after the decimal point. For example, 92/96 = 95.8%. If the “IGR CALL ATT” is 0, then the value should be 100%.	No	Yes

Table 12-2 Per Interval Measurements (continued)

Index	Name	Time Point	Mnemonic	Formula for Derivation and Mapping	Support in nailed mode?	Threshold Crossing Support?
62	Answer Seizure Ratio Outgoing	Calculated only at the end of measurement interval	BAMS:EGR ASR	This is calculated as percentage of “EGR CALL ANS” (#58) divided by “EGR CALL ATT” (#2), precision to 1 digit after the decimal point. For example, $92/96 = 95.8\%$. If the “EGR CALL ATT” is 0, then the value should be 100%.	No	Yes, only whole number percentages are supported (for example 75%).
63	Answer Seizure Ratio Total	Calculated only at the end of measurement interval	BAMS:TTL ASR	This is calculated as percentage of “TTL CALL ANS” (#59) divided by “TTL CALL ATT” (#60), precision to 1 digit after the decimal point. For example, $92/96 = 95.8\%$. If the “TTL CALL ATT” is 0, then the value should be 100%.	No	Yes, only whole number percentages are supported (for example, 75%).

Daily Measurements

Two of the new measurements introduced in BAMS 3.30 are reported daily only: Busy Hour and Busy Period. Because there is no database, the values recorded for each hour or period during a day are retained only for one additional hour or one additional period in case any pegs arrive late. However, after the value for an hour or a period is updated and reported, if these values are not greater than the values previously recorded, they are released.

As a consequence of the brief retention of recorded measurements, BAMS cannot examine the measurement values recorded for each hour and each period during a day to determine which hour or period was busiest.

Instead, BAMS 3.30 saves the values recorded for the busiest hour and busiest period, as of the current time, as the day proceeds. As the measurement value for each hour and period is recorded, it is compared with the values currently retained. If they are not greater, they are released. By this process, at the end of the day, BAMS will have identified the busiest hour and busiest period during the day and the value of each.

[Table 12-3](#) lists the new measurements for BAMS 3.30 that are recorded only at the end of each day.

Table 12-3 Daily Measurements

Index	Name	Time Point	Mnemonic	Formula for Derivation and Mapping	Support in nailed mode?	Threshold Crossing Support?
64	Busy Hour	Calculated only at the end of the day.	BAMS:TTL BH	The hour during the day in which the hourly “TTL ERLANG” (#13) is greatest. This is displayed in the format of HHMM (in UTC). For example, 1400. This is based on the BAMS hourly measurements from the acc_h files.	Yes	No
65	Busy Period	Calculated only at the end of the day.	BAMS:TTL BP	The measurement interval during the day in which “TTL ERLANG” (#13) is greatest among all acc_r files. This is displayed in the format of HHMM UTC, for the starting time of the interval. For example, with 15 minute intervals, 1415.	Yes	No

Measurements Based on Current and New Stored Values

Most of the new measurements for BAMS 3.30 are based on values that are also captured for preexisting measurements. Only two of the new measurements require data that must be stored separately.

Therefore, BAMS 3.30 does not allocate additional memory to store data that will be used to calculate both new measurements as well as existing measurements. The calculation for the new measurement values is performed when it is time to output the measurement value rather than when the CDR is initially analyzed.

Although most of the new measurements do not require additional storage, the new output must be threshold checked. Additional threshold-crossing flags are allocated to the new measurements. The threshold trunk groups are expanded to store the threshold-crossing value and condition for each measurement that requires threshold checking.

The measurements Busy Hour and Busy Period do not require this additional threshold-checking mechanism.

Measurements That Capture New Data

Two of the new measurements, Answered Calls Incoming, and Answered Calls Outgoing, require capturing and storing real-time hourly and daily counts. BAMS 3.30 records the hour and period of the day during which the highest number of Answered Calls Incoming and Answered Calls Outgoing occurs. BAMS records the Busy Hour and Busy Period and the count for both measurements. These values are stored in the base of the trunk group along with the circuit counts and flags.

Non-Integer Measurements

For all releases of Cisco BAMS prior to BAMS 3.30, all measurements were recorded as integer values. BAMS 3.30 extends to an additional decimal place the value it records for the measurements Answer Seizure Ratio Incoming and Answer Seizure Ratio Outgoing.

Because system thresholds are set to integer values, measurements that pertain to such thresholds are rounded and recorded to the nearest whole integer value. Therefore, a threshold-crossing condition is evaluated by comparing the specified integer value for the threshold and the recorded integer value of the corresponding measurement. Non-integer threshold values are not supported.

Measurement Matrix

[Table 12-4](#) presents the measurement matrix for all BAMS 3.30 measurements.

Table 12-4 BAMS Measurement Matrix

#	Measurement Name	Predefined No 1071	Predefined w/1071	Dynamic	MGCP	Support in Nailed	Threshold Crossing
1	Call Attempts Incoming						
2	Call Attempts Outgoing				No Peg		
3	<u>Incoming Peg Count</u> ¹						
4	<u>Outgoing Peg Count</u> ²						
5	Outgoing attempts blocked				No Peg		
6	<u>Failed Calls</u> ³						
7	Failed Calls - Congestion						
8	Successful Calls Incoming						
9	Successful Calls Outgoing				No Peg		
10	Percent Trunk Group Usage Incoming	Suppress		Suppress			

Table 12-4 BAMS Measurement Matrix (continued)

#	Measurement Name	Predefined No 1071	Predefined w/1071	Dynamic	MGCP	Support in Nailed	Threshold Crossing
11	Percent Trunk Group Usage Outgoing	Suppress		Suppress	No Peg		
12	Maintenance Duration per Trunk Group	Suppress		Suppress			
13	Total Traffic in Erlangs						
14	Total Calls Terminated Normally						
15	Calls Terminated Abnormally						
16	Calls Terminated, failed MGW or NAS						
17	Calls Rejected						
18	Calls Rejected, unknown Dialed Number						
19	Calls Rejected, other reasons						
20	Overflow, outgoing attempts blocked				No Peg		
21	Total sum of usage pegs per trunk group						
22	Tandem routing attempts, outgoing			Suppress	No Peg		
23	Tandem completions, outgoing			Suppress	No Peg		
24	Tandem attempts, incoming			Suppress			
25	Tandem completions, incoming			Suppress			
26	Tandem duration, outgoing			Suppress			
27	Tandem duration, incoming			Suppress			
28	IC destined calls						
29	Ic destined calls, no circuit						
30	IC usage						
31	Conversation Duration Ingress						
32	Conversation Duration Egress				No Peg		
33	Setup Duration Ingress						
34	Setup Duration Egress				No Peg		
35	Teardown Duration Ingress						
36	Teardown Duration Egress				No Peg		
37	Call Routing I Peg						
38	Call Routing II Peg						
39	Call Routing III Peg						
40	Carrier Select No Indication			Suppress			

Table 12-4 BAMS Measurement Matrix (continued)

#	Measurement Name	Predefined No 1071	Predefined w/1071	Dynamic	MGCP	Support in Nailed	Threshold Crossing
41	Carrier Select PreSubscribed Not Input			Suppress			
42	Carrier Select PreSubscribed and Input			Suppress			
43	Carrier Select PreSubscribed with No Indication			Suppress			
44	Carrier ID Code Not PreSubscribed but Input by Customer			Suppress			
45	Successful H.323 terminating pegs						
46	Successful H.323 originating pegs						
47	Unsuccessful H.323 terminating pegs						
48	Unsuccessful H.323 originating pegs						
49	Successful ISUP terminating pegs						
50	Successful ISUP originating pegs						
51	Unsuccessful ISUP terminating pegs						
52	Unsuccessful ISUP originating pegs						
53	ISDN Terminating Setup Message Delay pegs						
54	ISDN Originating Setup Message Delay pegs						
55	Number of defined CICs during the measurement period	Suppress		Suppress			
56	Average number of available CICs during the measurement period	Suppress		Suppress			
57	Answered Calls incoming						
58	Answered Calls outgoing				No Peg	Suppress	
59	Answered Calls total					Suppress	
60	Call Attempts total					Suppress	
61	Answer Seizure Ratio incoming						
62	Answer Seizure Ratio outgoing				No Peg	Suppress	

■ Noncarrier and Carrier-Based Measurements

Table 12-4 BAMS Measurement Matrix (continued)

#	Measurement Name	Predefined No 1071	Predefined w/1071	Dynamic	MGCP	Support in Nailed	Threshold Crossing
63	Answer Seizure Ratio total					Suppress	
64	Busy Hour						No
65	Busy Period						No

1. No longer supported (these are duplicates of other measurements)
2. No longer supported (these are duplicates of other measurements)
3. No longer supported (these are duplicates of other measurements)

Noncarrier and Carrier-Based Measurements

Each measurement value represents an accumulation of activity that took place during the measurement interval. At any point in time, three intervals are being collected in parallel, in real-time, hourly, and daily. Measurement values are organized into measurement groups. There are two types of measurement groups: noncarrier and carrier-based. For each noncarrier group, 45 different measurements are accumulated. For each carrier-based group, eight different measurements are accumulated.

Types of Measurement Intervals

The Accumulation (ACC) task generates measurements for one variable, real-time interval, or period and two fixed-time intervals. At any moment in time, two collection windows are open for updating, the current window called “N,” and the most recent window called “N-1.” Each N and N-1 collection window consists of real-time, hourly, and daily counters. The two open windows are necessary because the Cisco Media Gateway Controller (MGC) does not produce a CDR at the first Initial Address Message (IAM) or seizure. Instead, it produces the CDR at the time of answer or abandonment of the call.

Because of the particular time points that are recorded by the Cisco MGC, an event might not be reported until after the collection interval has been closed, even though the event should have been credited to that interval. The one exception to the two-window rule is at startup, where only the current window is open. That remains the case until after the first interval boundary is crossed.

Real-Time Intervals

You can configure the real-time interval to any of the following durations: 5 minutes, 10 minutes, 15 minutes, 20 minutes, or 30 minutes. The default real-time interval is 15 minutes. All real-time measurements are stored in files whose names have the prefix acc_r.

Hourly Intervals

The hourly interval contains the sum of all of the real-time intervals that took place during the hour. For this reason, 60 minutes must be evenly divisible by the real-time interval length. All hourly measurements are stored in files whose names have the prefix acc_h.

Daily Intervals

The daily interval contains the sum of all of the hourly intervals that took place during the day. All daily measurements are stored in files whose names have the prefix acc_d.

Noncarrier Measurements

Noncarrier measurements are organized by trunk group. [Table 12-5](#) lists these measurements and their mnemonics. It also describes each measurement's trigger time point and tag, derivation, and mapping.



Note For a list of which measurements are suppressed or not pegged based on the PGW_DYNAMIC_UPDATE value, see “[Setting the PGW Dynamic Update Mode](#)” section on [page 2-20](#).

Table 12-5 Noncarrier Measurements

Measurement	Trigger Time Point and Tag	Mnemonic	Derivation and Mapping
Call Attempts Incoming	1010 or 1030 received, Tag 4100 or 4101	BAM:IGR CALL ATT	Pegged when a 1010 CDB is recorded w/4008 or when 1030 recorded w/4008
Call Attempts Outgoing	1010 or 1030 received, Tag 4100 or 4101	BAM:EGR CALL ATT	Pegged when a 1010 CDB is recorded w/4015 or when 1030 recorded w/4015. Suppressed in MGCP Dial or MGCP Scripting calls.
Outgoing Attempts Blocked	1030 or 1040 received, Tag 4100 or 4101	BAM:EGR CALL BLKD	4015 populated, 1030 or 1040 with (Cause Code) Tag {2008,3008} == {21, 25, 27, 29, 34, 38, 41, 42, 44, 46, 47, 53, 63}. Suppressed in MGCP Dial or MGCP Scripting calls.
Failed Calls-Congestion	1030 or 1040 received, Tag 4100 or 4101	BAM:TTL FAILED CONGEST	Peg for all 1030 or 1040 where {2008 or 3008} == {42, 44, 47}
Successful Calls Incoming	1040 or 1030 received, later of Tag 4106 or 4107	BAM:IGR TERM NORM	Peg for all 1040 CDB or 1030 CDB where 4008 is populated and {2008 or 3008} == {16,17,18,19, 31}
Successful Calls Outgoing	1040 or 1030 received, later of Tag 4106 or 4107	BAM:EGR TERM NORM	Pegged when 1040 or 1030 CDB recorded w/4015 populated and {2008 or 3008} == {16,17,18,19, 31}. Suppressed in MGCP Dial or MGCP Scripting calls.

■ Noncarrier and Carrier-Based Measurements

Table 12-5 Noncarrier Measurements (continued)

Measurement	Trigger Time Point and Tag	Mnemonic	Derivation and Mapping
Percent Trunk Group Usage Incoming	Starts when 1010 received (Tag 4100 or 4101). Closes when interval is closed or 1040 received.	BAM:IGR PCT TRK USE	Measured as a percentage of time that circuits are occupied based on the total number of circuits belonging to a trunk group over the provisioned interval of measurement. Any circuit on Tag 4008 triggers this measurement from CDB Tag 1010. The starting time point is the earlier of 4100 or 4101, the end timepoint is in the 1040 CDB, the later of tag 4108 or 4109. Suppressed before 1071 CDB is received on trunk group when the PGW_DYNAMIC_UPDATE flag is set to true. Also suppressed for dynamically added trunk groups.
Percent Trunk Group Usage Outgoing	Starts when 1010 received (Tag 4100 or 4101). Closes when interval is closed or 1040 received.	BAM:EGR PCT TRK USE	Measured as a percentage of time that circuits are occupied based on the total number of circuits belonging to a trunk group over the provisioned interval of measurement. Any circuit on Tag 4015 triggers this measurement from CDB Tag 1010. The starting time point is the earlier of 4100 or 4101, the end timepoint is in the 1040 CDB, the later of tag 4108 or 4109. Suppressed before 1071 CDB is received on trunk group when the PGW_DYNAMIC_UPDATE flag is set to true. Also suppressed in MGCP Dial or MGCP Scripting mode. Always suppressed for dynamically added trunk groups.

When the measurement Percent Trunk Group Usage (PCT TRK USE) is specified, it is possible for the measurement to be recorded in the real-time acc_r file but not recorded in the hourly acc_h or daily acc_d files. For example, trunk group usage that is as low as 1% for a real-time duration set for 10, 15, or 30 minutes, will be recorded in the acc_r file. However, such low usage will fall below 1% for the greater hourly and daily time periods and, therefore, will not be recorded in the acc_h or acc_d files. Similarly, a measurement can meet the minimum usage percentage to be recorded in the real-time and hourly files but not the daily file.

Table 12-5 Noncarrier Measurements (continued)

Measurement	Trigger Time Point and Tag	Mnemonic	Derivation and Mapping
Maintenance Duration per Trunk Group	Starts when 1071 received (Tag 4100 or 4101). Closes when interval is closed or another 1071 received.	BAM:TTL MAINT USE	Only available with PGW release 9.4(1) or later and if the PGW_DYNAMIC_UPDATE flag is set to true. Measured as a percentage of time that circuits are occupied based on the total number of circuits belonging to a trunk group over the provisioned interval of measurement. When the 1071 CDB contains the number of circuits unavailable for a trunk group, BAMS is able to track the number of circuits out of service. Only available if the PGW_DYNAMIC_UPDATE flag is set to true and trunk group is configured in the Trunk Group table, suppressed before 1071 is received. Always suppressed for dynamically added trunk groups.
Total Traffic in Erlangs	Starts when 1010 received (Tag 4100 or 4101). Closes when interval is closed or 1040 received	BAM:TTL ERLANGS	Measured as Erlangs for both Ingress and Egress for a trunk group. Use total seconds duration, from 1010 CDB, use timepoint in earlier of 4100 or 4101. For the end of the duration, use the later of 4108 or 4109. Erlangs = (total seconds) / (seconds in measured interval) Example: For a one-hour measurement, with 99,000 secs measured, the formula would be $(99,000)/(3600\text{secs}) = 27.5$ Erlangs. If the same measurement occurred over a 15-minute interval, the formula would be $(99,000)/(900\text{secs}) = 110$ Erlangs.
Total Calls Terminated Normally	1040 received (Tag 4106 or 4107)	BAM:TTL TERM NORM	Pegged when 1040 CDB recorded and release code in the set {16,17,18,19, 31}
Calls Terminated Abnormally	1030 or 1040 received (Tag 4106 or 4107)	BAM:TTL TERM ABNORM	Pegged for any 1040 where {2008 or 3008} != {16,17,18,19, 31} or for 1030 CDB with any release code.

Noncarrier and Carrier-Based Measurements

Table 12-5 Noncarrier Measurements (continued)

Measurement	Trigger Time Point and Tag	Mnemonic	Derivation and Mapping
Calls Terminated, Failed MGW or NAS	1030 or 1040 received (Tag 4106 or 4107)	BAM:TTL TERM FAILED MGW	Pegged for any 1030 or 1040 CDB where {2008 or 3008} == {29}
Calls Rejected	1030 CDB received (Tag 4100 or 4101)	BAM:TTL CALLS REJECTED	Pegged for any 1030 CDB where {2008 or 3008} == {21}
Calls Rejected, Unknown Dialed Number	1030 CDB received (Tag 4100 or 4101)	BAM:TTL REJECTED DIALNUM	Pegged for any 1030 CDB where {2008 or 3008} == {1, 5, 22, 28}
Calls Rejected, Other Reasons	1030 CDB received (Tag 4100 or 4101)	BAM:TTL REJECTED OTHER	Pegged for any 1030 CDB where {2008 or 3008} != {1,5,16,17,18,19,21,22,28,29}
Overflow, Outgoing Attempts Blocked	1030 CDB received (Tag 4100 or 4101)	BAM:EGR OFL BLKD	Pegged for 1030 CDB where 4015 is populated and {2008 or 3008} == {27, 34, 41, 42, 44, 47, 53, 63}. Suppressed in MGCP Dial or MGCP Scripting calls.
Total Sum of Usage Pegs per Trunk Group	1010 or 1030 CDB received (Tag 4100 or 4101)	BAM:TTL TRAFFIC USAGE PEGS	Pegged for any 1010 or 1030 CDB.
Tandem Routing Attempts, Outgoing	1010 or 1030 CDB received (Tag 4100 or 4101)	BAM:EGR TANDEM ATT	Pegged when Tag 4015 (trunk group) is marked T (tandem connection) for 1010 or 1030 CDB. Always suppressed for dynamically added trunk groups. Also suppressed in MGCP Dial or MGCP Scripting calls.
Tandem Completions, Outgoing	1010 CDB received (Tag 4100 or 4101)	BAM:EGR TANDEM COMPLT	Pegged when Tag 4015 (trunk group) is marked T (tandem connection) for 1010 CDB. Always suppressed for dynamically added trunk groups. Also suppressed in MGCP Dial or MGCP Scripting calls.
Tandem Attempts, Incoming	1010 or 1030 CDB received (Tag 4100 or 4101)	BAM:IGR TANDEM ATT	Pegged when Tag 4008 (trunk group) is marked T (tandem connection) for 1010 or 1030 CDB. Always suppressed for dynamically added trunk groups.
Tandem Completions, Incoming	1010 CDB received (Tag 4100 or 4101)	BAM:IGR TANDEM COMPLT	Pegged when Tag 4008 (trunk group) is marked T (tandem connection) for 1010 CDB. Always suppressed for dynamically added trunk groups.

Table 12-5 Noncarrier Measurements (continued)

Measurement	Trigger Time Point and Tag	Mnemonic	Derivation and Mapping
Tandem Duration, Outgoing	1010 CDB received (Tag 4100 or 4101)	BAM:EGR TANDEM DUR	Duration measured when Tag 4015 (trunk group) is marked T (tandem connection) for 1010 CDB. Always suppressed for dynamically added trunk groups.
Tandem Duration, Incoming	Starts when 1010 received (Tag 4100 or 4101). Closes when interval is closed or 1040 received (tag 4108 or 4109).	BAM:IGR TANDEM DUR	Duration measured when Tag 4008 (trunk group) is marked T (tandem connection) for 1010 CDB. Start with earlier of timepoint in 4100 or 4101 of 1010 CDB, end with later of 4108 or 4109 in 1040 CDB. Always suppressed for dynamically added trunk groups.
Conversation Duration Ingress	Starts when 1010 received (Tag 4100 or 4101). Closes when interval is closed or 1040 received (tag 4108 or 4109).	BAM:IGR CONV DURATION	Duration measured from the later of tag 4104 or 4105 in the 1010 CDB, till the earlier of tag 4106 or 4107, when tag 4008 is populated with valid trunk group number.
Conversation Duration Egress	Starts when 1010 received (Tag 4100 or 4101). Closes when interval is closed or 1040 received (tag 4108 or 4109).	BAM:EGR CONV DURATION	Duration measured from the later of tag 4104 or 4105 in the 1010 CDB, till the earlier of tag 4106 or 4107, when tag 4015 is populated with valid trunk group number. Suppressed in MGCP Dial or MGCP Scripting calls.
Setup Duration Ingress	1010 or 1030 CDB received (Tag 4100 or 4101)	BAM:IGR SETUP DURATION	Duration measured from timepoint in earlier of tag 4100 or 4101 of 1010 CDB, end with later of 4102 or 4103 in 1010 CDB. For 1030 CDB, start with earlier of 4100 or 4101, end with earlier of 4106 or 4107, when tag 4008 is populated with valid trunk group number.

Noncarrier and Carrier-Based Measurements

Table 12-5 Noncarrier Measurements (continued)

Measurement	Trigger Time Point and Tag	Mnemonic	Derivation and Mapping
Setup Duration Egress	1010 or 1030 CDB received (Tag 4100 or 4101)	BAM:EGR SETUP DURATION	Duration measured from timepoint in earlier of tag 4100 or 4101 of 1010 CDB, end with later of 4102 or 4103 in 1010 CDB. For 1030 CDB, start with earlier of 4100 or 4101, end with earlier of 4106 or 4107, when tag 4015 is populated with valid trunk group number. Suppressed in MGCP Dial or MGCP Scripting calls.
Teardown Duration Ingress	1030 or 1040 CDB received (Tag 4106 or 4107)	BAM:IGR TEARDOWN DURATION	Duration measured from timepoint in earlier of 4106 or 4107, end with later of 4108 or 4109, when tag 4008 is populated with valid trunk group number.
Teardown Duration Egress	1030 or 1040 CDB received (Tag 4106 or 4107)	BAM:EGR TEARDOWN DURATION	Duration measured from timepoint in earlier of 4106 or 4107, end with later of 4108 or 4109, when tag 4015 is populated with valid trunk group number. Suppressed in MGCP Dial or MGCP Scripting calls.
Call Routing I Peg	1030 or 1010 CDB received (Tag 4100 or 4101)	BAM:TTL CALL ROUTING I	Pegged when ingress and egress traffic terminations are maintained by the same gateway. When tag 4038 and tag 4039 are equal and neither tag 4069 nor 4073 equal 6 (EISUP).
Call Routing II Peg	1030 or 1010 CDB received (Tag 4100 or 4101)	BAM:TTL CALL ROUTING II	Pegged when ingress and egress traffic terminations are maintained by the different gateways, but under control of the same MGC. When tag 4038 and tag 4039 are not equal and neither tag 4069 nor 4073 equal 6.
Call Routing III Peg	1030 or 1010 CDB received (Tag 4100 or 4101)	BAM:TTL CALL ROUTING III	Pegged when one side of a call originates or terminates under the control of a gateway connected to the MGC, but the other side of the call terminates in another network not under the control of the MGC. When either tag 4069 or 4073 equal 6.

Table 12-5 Noncarrier Measurements (continued)

Measurement	Trigger Time Point and Tag	Mnemonic	Derivation and Mapping
Successful H.323 Terminating Pegs	1010 CDB received (Tag 4100 or 4101)	BAM:EGR SUCCESSFUL H.323	Pegged when a 1010 CDB is received with a tag 4073 with a value of 7. Note The H.323 measurements are output only when the enable-H323 parameter is set to 1 in the Node Parameters table.
Successful H.323 Originating Pegs	1010 CDB received (Tag 4100 or 4101)	BAM:IGR SUCCESSFUL H.323	Pegged when a 1010 CDB is received with a tag 4069 with a value of 7. Note The H.323 measurements are output only when the enable-H323 parameter is set to 1 in the Node Parameters table.
Unsuccessful H.323 Terminating Pegs	1030 CDB received (Tag 4100 or 4101)	BAM:EGR UNSUCCESSFUL H.323	Pegged when a 1030 CDB is received with a tag 4073 with a value of 7. Note The H.323 measurements are output only when the enable-H323 parameter is set to 1 in the Node Parameters table.
Unsuccessful H.323 Originating Pegs	1030 CDB received (Tag 4100 or 4101)	BAM:IGR UNSUCCESSFUL H.323	Pegged when a 1030 CDB is received with a tag 4069 of value 7. Note The H.323 measurements are output only when the enable-H323 parameter is set to 1 in the Node Parameters table.
Successful ISUP Terminating Pegs	1010 CDB received (Tag 4100 or 4101)	BAM:EGR SUCCESSFUL ISUP	Pegged when a 1010 CDB is received with a tag 4073 of value 0.
Successful ISUP Originating Pegs	1010 CDB received (Tag 4100 or 4101)	BAM:IGR SUCCESSFUL ISUP	Pegged when a 1010 CDB is received with a tag 4069 of value 0.
Unsuccessful ISUP Terminating Pegs	1030 CDB received (Tag 4100 or 4101)	BAM:EGR UNSUCCESSFUL ISUP	Pegged when a 1030 CDB is received with a tag 4073 of value 0.
Unsuccessful ISUP Originating Pegs	1030 CDB received (Tag 4100 or 4101)	BAM:IGR UNSUCCESSFUL ISUP	Pegged when a 1030 CDB is received with a tag 4069 of value 0.

■ Noncarrier and Carrier-Based Measurements

Table 12-5 Noncarrier Measurements (continued)

Measurement	Trigger Time Point and Tag	Mnemonic	Derivation and Mapping
ISDN Terminating Setup Message Delay Pegs	1010 or 1030 CDB received (Tag 4100 or 4101)	BAM:EGR ISDN SETUP MSG DELAY	Pegged when a 1010 or 1030 CDB is received with a tag 4073 with a value of 0, when the setup duration > 3000 ms. The setup duration is measured from timepoint in earlier of tag 4100 or 4101 of 1010 CDB, end with later of 4102 or 4103.
ISDN Originating Setup Message Delay Pegs	1010 or 1030 CDB received (Tag 4100 or 4101)	BAM:IGR ISDN SETUP MSG DELAY	Pegged when a 1010 or 1030 CDB is received with a tag 4069 having a value of 0, when the setup duration > 3000 ms. The setup duration is measured from timepoint in earlier of tag 4100 or 4101 of 1010 CDB, end with later of 4102 or 4103.

Table 12-5 Noncarrier Measurements (continued)

Measurement	Trigger Time Point and Tag	Mnemonic	Derivation and Mapping
Number of Defined CICs during the Measurement Period	Start of measurement interval	BAM:TTL CIC DEFINED	<p>Number of circuits provisioned in the Trunk Group table when the PGW_DYNAMIC_UPDATE flag is set to false. Or the value for the number of circuits in the trunk group received from the latest 1071 CDB when the PGW_DYNAMIC_UPDATE flag is set to true.</p> <p>Suppressed before 1071 CDB is received on trunk group when the PGW_DYNAMIC_UPDATE flag is set to true. Always suppressed for dynamically added trunk groups.</p> <p>Note No corresponding threshold crossing alert exists for this measurement.</p>
Average Number of Available CICs during the Measurement Period	1071 received	BAM:TTL AVLBL CIC	<p>Total – maintDuration / intervalLength</p> <p>Where, total = Total number of circuits; maintDuration = total maintenance duration (see “TTL MAINT USE” in Table 12-5 for details); intervalLength = total number of seconds for the measurement period.</p> <p>Only available if the PGW_DYNAMIC_UPDATE flag is set to true and trunk group is configured in the Trunk Group table. Suppressed before 1071 CDB is received on trunk group. Always suppressed for dynamically added trunk groups.</p>

Carrier-Based Measurements

Carrier-based measurements are grouped by Trunk Group/Interexchange Carrier (IC). [Table 12-6](#) lists these measurements with their mnemonics. It also describes each measurement's trigger time point and tag, derivation, and mapping.

Table 12-6 Carrier Measurements

Measurement	Trigger Time Point and Tag	Mnemonic	Derivation and Mapping
IC Destined Calls	1010 CDB received (Tag 4100 or 4101)	BAM:IC:XXXX IC EGR CALLS	Pegged per IC for CDB 1010 where Tag 2014 is populated with a valid carrier id.
IC Destined Calls, No Circuit	1030 CDB received (Tag 4100 or 4101)	BAM: IC:XXXX IC EGR NO CKT	Pegged per IC for 1030 CDB where Tag 2008 = {42, 44, 47}
IC Usage	1010 CDB received (Tag 4100 or 4101)	BAM:IC:XXXX TTL DURATION	Duration measured per IC when CDB 1010 tag 2014 is populated with a valid carrier id. Start with earlier of timepoint in 4100 or 4101 of 1010 CDB, end with later of 4108 or 4109 in 1040 CDB.
Carrier Select No Indication	1030 or 1010 CDB received (Tag 4100 or 4101)	BAM:TTL CARRIERSELECT NO INDICATION	Pegged when Tag 2015 != {1,2,3,4} and marked "T" for tandem connected in the Trunk Group table. Output by trunk group and carrier. Always suppressed for dynamically added trunk groups.
Carrier Select PreSubscribed Not Input	1030 or 1010 CDB received (Tag 4100 or 4101)	BAM:TTL CARRIERSELECT PRESUBSCRIBED NIPT	Pegged when Tag 2015 = {1} and marked "T" for tandem connected in the Trunk Group table. Output by trunkgroup and carrier. Always suppressed for dynamically added trunk groups.
CarrierSelect PreSubscribed and Input	1030 or 1010 CDB received (Tag 4100 or 4101)	BAM:TTL CARRIERSELECT PRESUBSCRIBED INPT	Pegged when Tag 2015 = {2} and marked "T" for tandem connected in the Trunk Group table. Output by trunkgroup and carrier. Always suppressed for dynamically added trunk groups.

Table 12-6 Carrier Measurements (continued)

Measurement	Trigger Time Point and Tag	Mnemonic	Derivation and Mapping
CarrierSelect PreSubscribed with No Indication	1030 or 1010 CDB received (Tag 4100 or 4101)	BAM:TTL CARRIERSELECT PRESUBSCRIBED WNI	Pegged when Tag 2015 = { 3 } and marked "T" for tandem connected in the Trunk Group table. Output by trunkgroup and carrier. Always suppressed for dynamically added trunk groups.
Carrier Id Code Not PreSubscribed but Input by Customer	1030 or 1010 CDB received (Tag 4100 or 4101)	BAM:TTL CARRIERSELECT NOTPRESUBSCRIBED	Pegged when Tag 2015 = { 4 } and marked "T" for tandem connected in the Trunk Group table. Output by trunkgroup and carrier. Always suppressed for dynamically added trunk groups.

Storage of Measurements

Both carrier-based and noncarrier measurements are stored internally in groups. Each group consists of all the measurements that belong to a particular key. These measurements are then put in subgroups according to interval. Each measurement group contains real-time, hourly, and daily measurements. There are two types of keys or measurement groups. These are noncarrier measurements and carrier-based measurements. Regardless of group type, measurements are held in memory for performance reasons. Up to two time periods for each key can reside in memory simultaneously. These are the current time period and the one preceding the current time period. Because memory is somewhat volatile, the counters must be written to disk to prevent loss of data. At the end of each real-time time period, the contents of memory are written to disk. This disk file is then available to be read at the next startup.

Noncarrier Measurement Production

Noncarrier measurements consist of 45 measurements or accumulators for each of the three intervals kept in memory. This results in 135 measurements for the current time period, plus a possible additional 135 measurements for the preceding time period.

Carrier-Based Measurement Production

Carrier measurements consist of eight measurements or accumulators for each of the three intervals kept in memory. This results in 24 measurements for the current time period, plus a possible additional 24 measurements for the preceding time period.

Memory Allocation

Depending on the operating mode, the system either preallocates counters for all of the configured measurement groups or it allocates counters as activity is detected in each measurement group.

Threshold Crossing Alarms

TCA Table

The Threshold Crossing Alarms (TCA) table contains values and conditions for each measurement that you wish to link to an alarm. These values and conditions are organized by trunk group or Trunk Group/IC (measurement group). Enter the measurement groups that are of concern. You need not populate every value and condition for a specified measurement group. A global measurement group can be specified to be used for all measurement groups that are not specifically entered.

Threshold String Values

[Table 12-7](#) lists the condition value strings and the threshold value strings that you use to identify the condition and threshold values you set in an MML provisioning session with the TCA-TBL tag ID. For more information, see the “[Updating the Threshold Crossing Alarms Table](#)” section on page 5-24.

Table 12-7 Threshold String Values

Threshold	Condition Value String	Threshold Value String	Entered By
Call Attempts Incoming	igr-call-att-cond	igr-call-att	TAG/TRK
Call Attempts Outgoing	egr-call-att-cond	egr-call-att	TAG/TRK
Outgoing Attempts Blocked	egr-call-blkd-cond	egr-call-blkd	TAG/TRK
Failed Calls Congestion	ttl-failed-cong-cond	ttl-failed-cong	TAG/TRK
Successful Calls Incoming	igr-term-norm-cond	igr-term-norm	TAG/TRK
Successful Calls Outgoing	egr-term-norm-cond	egr-term-norm	TAG/TRK
Percent Trunk Group Usage Incoming	igr-pct-trk-use-cond	igr-pct-trk-use	TAG/TRK
Percent Trunk Group Usage Outgoing	egr-pct-trk-use-cond	egr-pct-trk-use	TAG/TRK
Maintenance Duration per Trunk Group	ttl-maint-use-cond	ttl-maint-use	TAG/TRK
Total Traffic Erlangs	ttl-erlangs-cond	ttl-erlangs	TAG/TRK
Total Calls Terminated Normally	ttl-term-norm-cond	ttl-term-norm	TAG/TRK

Table 12-7 Threshold String Values (continued)

Threshold	Condition Value String	Threshold Value String	Entered By
Calls Terminated Abnormally	ttl-term-abnorm-cond	ttl-term-abnorm	TAG/TRK
Calls Terminated, Failed MGW or NAS	ttl-term-failed-mgw-cond	ttl-term-failed-mgw	TAG/TRK
Calls Rejected	ttl-calls-rejected-cond	ttl-calls-rejected	TAG/TRK
Calls Rejected, Unknown Dialed Number	ttl-rejected-dialnum-cond	ttl-rejected-dialnum	TAG/TRK
Calls Rejected, Other Reasons	ttl-rejected-other-cond	ttl-rejected-other	TAG/TRK
Overflow, Outgoing Attempts Blocked	egr-ofl-blkd-cond	egr-ofl-blkd	TAG/TRK
Total Sum of Usage Pegs per Trunk Group (not including maintenance pegs for Release 2.xx)	ttl-traffic-usage-pegs-cond	ttl-traffic-usage-pegs	TAG/TRK
Tandem Routing Attempts, Outgoing	egr-tndm-att-cond	egr-tndm-att	TAG/TRK
Tandem Completions, Outgoing	egr-tndm-cmplt-cond	egr-tndm-cmplt	TAG/TRK
Tandem Routing Attempts, Incoming	igr-tndm-att-cond	igr-tndm-att	TAG/TRK
Tandem Completions, Incoming	igr-tndm-cmplt-cond	igr-tndm-cmplt	TAG/TRK
Tandem Duration, Outgoing	egr-tndm-dur-cond	egr-tndm-dur	TAG/TRK
Tandem Duration, Incoming	igr-tndm-dur-cond	igr-tndm-dur	TAG/TRK
IC Destined Calls, Outgoing	egr-ic-calls-cond	egr-ic-calls	TAG/TRK/IC
IC Destined Calls, No Circuit	egr-ic-nockt-cond	egr-ic-nockt	TAG/TRK/IC
IC Usage	ttl-ic-usage-cond	ttl-ic-usage	TAG/TRK/IC
Conversation Duration, Incoming	igr-conv-dur-cond	igr-conv-dur	TAG/TRK

Table 12-7 Threshold String Values (continued)

Threshold	Condition Value String	Threshold Value String	Entered By
Conversation Duration, Outgoing	egr-conv-dur-cond	egr-conv-dur	TAG/TRK
Setup Duration, Incoming	igr-setup-dur-cond	igr-setup-dur	TAG/TRK
Setup Duration, Outgoing	egr-setup-dur-cond	egr-setup-dur	TAG/TRK
Tear Down Duration, Incoming	igr-teardown-dur-cond	igr-teardown-dur	TAG/TRK
Tear Down Duration, Outgoing	egr-teardown-dur-cond	igr-teardown-dur	TAG/TRK
Call Routing I Peg Total	ttl-route-1-cond	ttl-route-1	TAG/TRK
Call Routing II Peg Total	ttl-route-2-cond	ttl-route-2	TAG/TRK
Call Routing III Peg Total	ttl-route-3-cond	ttl-route-3	TAG/TRK
Total Carrier Select No Indication	ttl-ic-sel-noind-cond	ttl-ic-sel-noind	TAG/TRK/IC
Total Carrier Select Presubscribed Not Input	ttl-ic-sel-pr-nipt-cond	ttl-ic-sel-pr-nipt	TAG/TRK/IC
Total Carrier Select Presubscribed and Input	ttl-ic-sel-pr-inpt-cond	ttl-ic-sel-pr-inpt	TAG/TRK/IC
Total Carrier Select Presubscribed with No Indication	ttl-ic-sel-pr-wni-cond	ttl-ic-sel-pr-wni	TAG/TRK/IC
Total Carrier Id Code Not Presubscribed but Input by Customer	ttl-ic-sel-no-pr-cond	ttl-ic-sel-no-pr	TAG/TRK/IC

Table 12-7 Threshold String Values (continued)

Threshold	Condition Value String	Threshold Value String	Entered By
Successful H.323 Terminating Peg	egr-scfl-h323-cond	egr-scfl-h323	TAG/TRK Note The H.323 measurements are checked only when the enable-H323 parameter is set to 1 in the Node Parameters table.
Successful H.323 Originating Peg	igr-scfl-h323-cond	igr-scfl-h323	TAG/TRK Note The H.323 measurements are checked only when the enable-H323 parameter is set to 1 in the Node Parameters table.
Unsuccessful H.323 Terminating Peg	egr-unscfl-h323-cond	egr-unscfl-h323	TAG/TRK Note The H.323 measurements are checked only when the enable-H323 parameter is set to 1 in the Node Parameters table.
Unsuccessful H.323 Originating Peg	igr-unscfl-h323-cond	igr-unscfl-h323	TAG/TRK Note The H.323 measurements are checked only when the enable-H323 parameter is set to 1 in the Node Parameters table.
Total Successful Terminating ISUP Requests	egr-scfl-isup-cond	egr-scfl-isup	TAG/TRK
Unsuccessful Terminating ISUP Requests	egr-unscfl-isup-cond	egr-unscfl-isup	TAG/TRK
Successful ISUP Originating Requests	igr-scfl-isup-cond	igr-scfl-isup	TAG/TRK

Table 12-7 Threshold String Values (continued)

Threshold	Condition Value String	Threshold Value String	Entered By
Unsuccessful ISUP Originating Requests	igr-unscfl-isup-cond	igr-unscfl-isup	TAG/TRK
Terminating ISUP Setup Message Response Delay	egr-isdn-su-msg-delay-cond	egr-isdn-su-msg-delay	TAG/TRK
Originating ISUP Setup Message Response Delay	igr-isdn-su-msg-delay-cond	igr-isdn-su-msg-delay	TAG/TRK
Total Number of Available CICs	ttl-avlbl-cic-cond	ttl-avlbl-cic	TAG/TRK
Answered Calls Incoming	igr-ans-calls-cond	igr-ans-calls	TAG/TRK
Answered Calls Outgoing	egr-ans-calls-cond	egr-ans-calls	TAG/TRK
Answered Calls Total	ttl-ans-calls-cond	ttl-ans-calls	TAG/TRK
Call Attempts Total	ttl-call-att-cond	ttl-call-att	TAG/TRK
Answer Seizure Ratio Incoming	igr-ans-seize-ratio-cond	igr-ans-seize-ratio	TAG/TRK
Answer Seizure Ratio Incoming	egr-ans-seize-ratio-cond	egr-ans-seize-ratio	TAG/TRK
Answer Seizure Ratio Incoming	ttl-ans-seize-ratio-cond	ttl-ans-seize-ratio	TAG/TRK

Threshold Crossing Conditions

Each threshold crossing condition is a code that checks the difference (if any) between the user-specified value and the current real-time measurement value. The condition is specified as a number between 0 and 4. Any other value is invalid. [Table 12-8](#) defines the meaning of each condition value.

Condition Value Relationship

[Table 12-8](#) lists condition values used for measurements.

Table 12-8 Condition Values

Value	Condition Description
0	Ignore
1	Less Than (<)
2	Equal To (=)

Table 12-8 Condition Values (continued)

Value	Condition Description
3	Greater Than (>)
4	Not Equal To (!=)

Threshold Values

With the TCA-TBL tag ID, you specify the threshold value and the condition value to so that they generate an alarm if a specific measurement condition is reached. For example, for a given measurement, if the condition is set to 4 and the threshold value is set to 10, an alarm is generated if the measurement value is greater than 10. Threshold values are specified as positive integers.

Trunk Group Identification (Threshold Key)

Each threshold specification (threshold value and condition value) must be associated with a measurement group. If the Entered By tag specifies TAG/TRK, the measurement is organized by the trunk group number. If the Entered By tag specifies TAG/TRK/IC, the measurement is organized by trunk group number and an interexchange-carrier number. A special measurement group can be specified to apply to all TAG/TRK measurement groups that are not otherwise specified. This measurement group is identified by the name “global/0,” where the TAG is “global” and the trunk group is “0.”

Processing Logic

The same logic is used for processing all accumulation periods: computation is based on the time stamps from call detail records generated by the switch. The distinguishing factor among the different accumulation periods is the time period in which two events are considered to occur for the same counter. Counts for any given event are added to the accumulators for the time period that matches the time stamp of the event. More specifically, [Table 12-6](#) identifies the time point for each event that is used to match the accumulator time period.

Three different levels at which statistics can be generated are as follows:

- Using the CDR details
- Using the aggregate CDRs
- Using the correlated CDRs

There are advantages and disadvantages to each of the above approaches. Statistics computed from CDR details result in more frequent updates, and thus a finer granularity of reporting. However, more records must also be processed. Thus, the volume of connections and the length of the switch-reporting interval can dramatically drive up the amount of processing required to make the statistics available. Conversely, computing statistics from aggregated or correlated CDRs provides a more efficient computation, but less timely statistics.

The following section applies to all accumulation types, periods, and levels.

Statistics Subsystem Functions

The Statistics subsystem provides the following functionality:

- Obtains the chain of aggregated CDR details.

■ Noncarrier and Carrier-Based Measurements

- Receives the CDR details in time order from the Augmentation (AUG) task. The CDRs arrive in two types of files: aug_acei and aug_acbc. The aug_acei files contain complete CDRs taken from fmt files. For each fmt file, at least one aug_acei file exists. An aug_acbc file exists for each threshold crossing. The aug_acbc files contain all partial CDRs (CDRs that did not complete during the interval).
- Assigns the usage in real-time, hourly, and daily intervals. For cumulative count fields, a call that began before the start of the interval and has not ended adds the full length of the real-time interval to the count. Any CDR that begins in the interval (but has not ended) adds the time from the start of CDR to the end of the interval. Any CDR that ends in the interval (but did not start in the interval) adds the time from the start of the interval to the end time of the CDR. Any CDR that both begins and ends in the same interval adds the delta between the start and end time of the CDR.
- Calculates hourly counters.
- Monitors check points at the end of every file interval (complete reading of all aug_acei files and the aug_acbc file for the given interval).
- Summarizes the hourly counters and produces daily counters. These tables should be stored in table sets.
- Manages the daily counters so that counters older than a specified retention period are purged regularly.

At any moment in time, two collection intervals are open for updating, the current interval, called “N,” and the most recent interval, called “N-1.” The two open intervals are necessary because the Cisco MGC does not produce a CDR at the first IAM or seizure; rather, it creates the first indication of a call at answer or abandonment. Because of the particular time points that are recorded by the Cisco MGC, there are some cases where an event is not reported until after the collection interval has been closed, yet the event should be credited to that interval. A bucket or interval shall never be credited for more than the total duration that is available during that interval, regardless of when the indication of the call was received.

A flat file is maintained for each collection interval. In order to provide timely information, buckets for an interval (the current interval, or N) are written as soon as an interval boundary is reached. At the same time, the previous interval (N-1), which may have been updated because of late reports for call abandonment, is rewritten to disk and is not updated again. Very late reports are written to the oldest collection period that is still open, which is always the N-1 interval. The one exception to this rule is at startup, when only the current period is open, until after the first interval boundary is crossed.

Keys and Counters

Keys and counters are stored in memory and written to a checkpoint file on a regular basis.

The key is a unique sequence number used to identify the specific collection of counters. The key fields are the trunk group number and the IC. [Table 12-9](#) lists the key field names and their descriptions.

Table 12-9 Key Field Name Descriptions

Field	Description
Trunk Group	Taken from the sigpath to trunkgroup configuration. <ul style="list-style-type: none"> • For Ingress, use the Terminating Trunk Group. • For Egress, use the Originating Trunk Group. The values are 1–9999 for BAF, 4096 for ITU, and 1684 for ANSI. The default is 0 if no information is available.
IC	Carrier ID: 2014.

Counter Sets

Each counter set is made up of three groups of counters, one group for real time, one for hourly, and one for daily. The counters in each group represent running tallies of the specified statistics. Each group of counters represents only the current interval of the counter type (current real time interval, the current hour, the current day). Each counter statistic is credited to the time period in which it occurred. Note that there are different time periods. Hourly counters keep track of the statistics on hourly boundaries. If an event spans multiple hours, one counter for each hour spanned is created. For example, if a call is established at 11:50 and is disconnected at 12:15, one counter for the 11:00 hour is created with 10 minutes of conversation time credited to it, and a second one is created for the 12:00 hour with 15 minutes of conversation time.

Similarly, daily counters credit statistics on daily boundaries.

Frequency of Statistics

In addition to the rollup hourly and 24-hour statistics, which are tabulated with any of the previous options, the system also supports 5-, 10-, 15-, 20-, and 30-minute (real-time), hourly, and daily statistics.


Note

You can configure the measurements interval by editing the interval-minutes field in the Node Parameters table. For more information, see the “[Updating the Node Parameters Table](#)” section on [page 5-11](#).

Statistics Output

After statistics have been collected, they are output to a flat file. For each real-time interval, an acc_rYYYYMMDDHHMM00 file is created. For each hourly interval, an acc_hYYYYMMDDHH0000 file is created. For each daily interval, an acc_dYYYYMMDD000000 file is created. These files are stored in the opt/CiscoBAMS/data/s0x/Measurements directory.


Note

All times are in Universal Coordinated Time, which is taken from the CDR record.

The output files are generated as soon as the ACC task has finished processing the aug_acbc file (last file) for the given interval. This means that the ACC task generates a flat file for the real-time interval at the end of each set of files for the real-time interval (5, 10, 15, 20, or 30 minutes). The hourly output file is generated when the last interval file is processed for that hour. The daily output file is generated as soon as the last interval file for the day is processed. Each file is created on a real-time, 1-hour, and 24-hour basis. Each file contains all of the statistics gathered in the previous period.

■ Noncarrier and Carrier-Based Measurements

In the following section, the term “trunk groups” is used to represent both TAG/Trunk Group and TAG/Trunk Group/IC.

Statistics are generated from CDBs produced by the Cisco MGC. Since the output is reported by TAG/Trunk Group or by TAG/Trunk Group/IC, measurements are produced only for trunk groups that have call activity starts (unless the system is running in configured mode and trunk groups are specified). Therefore, when the system is started, the statistics output files are empty until call activity begins. Regardless of call activity, the appropriate acc_x files are generated. These files can, however, be empty.



Note If CDB files produced by the Cisco MGC software on a Cisco PGW are not available for processing, the acc_x files will not be written for that interval.

Over the course of the day, the system continues to add to the trunk groups that are reported on, as call activity is received. Once added, a trunk group is reported on in every interval that follows, until the end of the day. At midnight, the system generates the acc_d (daily) file. This file contains all of the activity for the day for any trunk group that had call activity during the 24-hour period. Once the daily counts have been reported, the system attempts to clear out as many trunk groups from memory as possible. This step eliminates the need to report on trunk groups that are no longer active. The system purges any trunk group that does not currently have a threshold alarm asserted. These trunks groups must be retained so that the system does not assert additional alarms before the current alarm clears. If the system is running in configured mode, trunks specified in the Trunk Group table are not purged either.

Acc_x files produced after midnight contain only trunk groups that have had call activity after midnight and trunk groups that have threshold crossing alarms asserted. If the system is running in configured mode, trunks specified in the Trunk Group table are also reported.

Since the data is stored in flat files, you can configure MSC to purge outdated statistics.

Example from a MGC acc_h file:

```
0,972477302,3600,203,"occurrences","BAM:EGR CALL ATT","TG8004"
```

Statistics Output Format

The format for the statistics output mirrors the SS7-type statistics format created on the Cisco MGC. The format is comma-delimited, and appears in the order shown in [Table 12-10](#).

Table 12-10 Output Format Order

Column	Description	Comments
Field 1	Record release level (version, 0 (zero) initially).	Constant: Set to 0
Field 2	Time when the measurement interval started. The time is based on UNIX time format (seconds elapsed since January 1, 1970).	
Field 3	Elapsed time of collection interval, in seconds.	
Field 4	The value of the measurement at the end of the interval.	
Field 5	Measurement unit.	

Table 12-10 Output Format Order (continued)

Column	Description	Comments																		
Field 6	<p>The measurement category. The direction is identified by EGR for egress, IGR for ingress, or TTL for total. The measurements are either carrier-based or noncarrier-based. The measurement name is one of the following:</p> <p>Carrier-based Measurements</p> <table> <thead> <tr> <th>Field Name</th><th>Full Name</th></tr> </thead> <tbody> <tr> <td>IC EGR CALLS</td><td>IC Destined Calls</td></tr> <tr> <td>IC EGR NO CKT</td><td>IC Destined Calls, No Circuit</td></tr> <tr> <td>TTL DURATION</td><td>IC Duration</td></tr> <tr> <td>TTL CARRIERSELECT NO INDICATION</td><td>Total Carrier Select, No Indication</td></tr> <tr> <td>TTL CARRIERSELECT PRESUBSCRIBED NO NIPT</td><td>Total Carrier Select Presubscribed, Not Input</td></tr> <tr> <td>TTL CARRIERSELECT PRESUBSCRIBED INPT</td><td>Total Carrier Select, Presubscribed and Input</td></tr> <tr> <td>TTL CARRIERSELECT PRESUBSCRIBED WNI</td><td>Total Carrier Select, Presubscribed with No Indication</td></tr> <tr> <td>TTL CARRIERSELECT NOTPRESUBSCRIBED</td><td>Total Carrier ID Code, Not PreSubscribed but Input by Customer</td></tr> </tbody> </table>	Field Name	Full Name	IC EGR CALLS	IC Destined Calls	IC EGR NO CKT	IC Destined Calls, No Circuit	TTL DURATION	IC Duration	TTL CARRIERSELECT NO INDICATION	Total Carrier Select, No Indication	TTL CARRIERSELECT PRESUBSCRIBED NO NIPT	Total Carrier Select Presubscribed, Not Input	TTL CARRIERSELECT PRESUBSCRIBED INPT	Total Carrier Select, Presubscribed and Input	TTL CARRIERSELECT PRESUBSCRIBED WNI	Total Carrier Select, Presubscribed with No Indication	TTL CARRIERSELECT NOTPRESUBSCRIBED	Total Carrier ID Code, Not PreSubscribed but Input by Customer	
Field Name	Full Name																			
IC EGR CALLS	IC Destined Calls																			
IC EGR NO CKT	IC Destined Calls, No Circuit																			
TTL DURATION	IC Duration																			
TTL CARRIERSELECT NO INDICATION	Total Carrier Select, No Indication																			
TTL CARRIERSELECT PRESUBSCRIBED NO NIPT	Total Carrier Select Presubscribed, Not Input																			
TTL CARRIERSELECT PRESUBSCRIBED INPT	Total Carrier Select, Presubscribed and Input																			
TTL CARRIERSELECT PRESUBSCRIBED WNI	Total Carrier Select, Presubscribed with No Indication																			
TTL CARRIERSELECT NOTPRESUBSCRIBED	Total Carrier ID Code, Not PreSubscribed but Input by Customer																			

Table 12-10 Output Format Order (continued)

Column	Description	Comments
Field 6 <i>(continued)</i>	Noncarrier-based Measurements	
	Field Name	Full Name
	IGR CALL ATT	Call Attempts Incoming
	EGR CALL ATT	Call Attempts Outgoing
	EGR CALL BLKD	Outgoing Attempts Blocked
	TTL FAILED CONGEST	Failed Calls Congestion
	IGR TERM NORM	Successful Calls Incoming
	EGR TERM NORM	Successful Calls Outgoing
	IGR PCT TRK USE	Percent Trunk Group Usage Incoming
	EGR PCT TRK USE	Percent Trunk Group Usage Outgoing
	TTL MAINT USE	Percent Trunk Group Maintenance Usage
	TTL ERLANGS	Total Traffic in Erlangs
	TTL TERM NORM	Total Calls Terminated Normally
	TTL TERM ABNORM	Total Calls Terminated Abnormally
	TTL TERM FAILED MGW	Total Calls Terminated, Failed MGW or NAS
	TTL CALLS REJECTED	Total Calls Rejected
	TTL REJECTED DIALNUM	Total Calls Rejected, Unknown Dialed Number
	TTL REJECTED OTHER	Total Calls Rejected, Other Reasons
	EGR OFL BLKD	Overflow, Outgoing Attempts Blocked
	TTL TRAFFIC USAGE PEGS	Total Sum of Usage Pegs per Trunk Group
	EGR TANDEM ATT	Tandem Routing Attempts, Outgoing
	EGR TANDEM COMPLT	Tandem Completions, Outgoing
	IGR TANDEM ATT	Tandem Attempts, Incoming
	IGR TANDEM COMPLT	Tandem Completions, Incoming
	EGR TANDEM DUR	Tandem Duration, Outgoing
	IGR TANDEM DUR	Tandem Duration, Incoming
	IGR CONV DURATION	Conversation Duration, Ingress
	EGR CONV DURATION	Conversation Duration, Egress
	IGR SETUP DURATION	Setup Duration, Ingress
	EGR SETUP DURATION	Setup Duration, Egress
	IGR TEARDOWN DURATION	Teardown Duration, Ingress
	EGR TEARDOWN DURATION	Teardown Duration Egress
	TTL CALL ROUTING I	Call Routing I Peg Total
	TTL CALL ROUTING II	Call Routing II Peg Total
	TTL CALL ROUTING III	Call Routing III Peg Total
	EGR SUCCESSFUL H.323	Successful H.323 Terminating Peg
	IGR SUCCESSFUL H.323	Successful H.323 Originating Peg
	EGR UNSUCCESSFUL H.323	Unsuccessful H.323 Terminating Peg
	IGR UNSUCCESSFUL H.323	Unsuccessful H.323 Originating Peg

Table 12-10 Output Format Order (continued)

Column	Description	Comments
Field 6 <i>(continued)</i>	EGR SUCCESSFUL ISUP	Successful Terminating ISDN User Part (ISUP) Requests
	EGR UNSUCCESSFUL ISUP	Unsuccessful Terminating ISUP Requests
	IGR SUCCESSFUL ISUP	Successful ISUP Originating Requests
	IGR UNSUCCESSFUL ISUP	Unsuccessful ISUP Originating Requests
	EGR ISDN SETUP MSG DELAY	Terminating ISUP Setup Message Response Delay
	IGR ISDN SETUP MSG DELAY	Originating ISUP Setup Message Response Delay
	TTL CIC DEFINED	Total Number of Defined CICs
	TTL AVLBL CIC	Total Number of Available CICs
Note For IC calls, the string “IC:xxxx” where xxxx is the carrier number, precedes the EGR, IGR, or TTL.		
Field 7	Trunk Group “TG,” followed by the zero-padded trunk group number.	
Field 8	TCA flag “*” if a threshold crossing alarm is asserted for this measurement, otherwise blank.	

Threshold Crossing Alarms

Each measurement instance can be monitored with a threshold crossing alarm. Threshold values that are permitted are Ignore, Less Than, Equal To, and Greater Than. The system identifies threshold value sets by the TAG and the trunk group number. Each threshold value set consists of a value and a check or test for each measurement category. Threshold value sets can be partially populated to check only one or any number of categories for a trunk group. Any unpopulated category is treated as an Ignore condition.

If no threshold value set has been specified for a given TAG/trunk group, the measurements are checked against a global threshold value set. Like trunk group-specific threshold value sets, the global threshold value set can be partially populated. There is no requirement to specify a global threshold value set. If none is specified, and no specific threshold value set has been entered, then no threshold checks are performed. If a threshold value set has been specified for a given TAG/trunk group, no global test is performed on any categories in that TAG/trunk group.

As measurements are tested against the threshold value set, each time a measurement crosses the threshold value, a minor alarm is generated (ACC227). The text of the alarm contains the strings defined in [Appendix A, “Troubleshooting Cisco BAMS,”](#) the measured value, the test condition, and the threshold value.

When the threshold is crossed in the opposite direction, a clear alarm is generated containing the same text as the ACC227 alarm. For example, if the test is greater than 5 and the measurement is 8, the minor alarm is generated. If on the next check, the measurement is 10, no new minor alarm is generated. If the measurement drops to 3, the clear alarm is generated. When the system is started, the memory of all alarms is cleared. For example, suppose the measurement is 8 and the system is stopped. When the system first tests the measurement (after restarting), if the value is 8, a minor alarm is generated.

The following special conditions apply to threshold crossing alarms:

- No error is detected if a carrier is applied to a noncarrier-based measurement.

Zero Counts

- No error is detected if no carrier is applied to a carrier-based measurement.
- A global threshold exists for TAG/trunk group measurements. The global threshold is specified by “global/0” (as the TAG/trunk group).
- Only those specific thresholds that are entered are checked; all other thresholds are set to ignore.
- If a trunk group-specific threshold is specified, the global thresholds are not checked for that TAG/trunk group.
- A carrier ID of 0 indicates that the carrier should be ignored. Entering abc/8003/0 is the same as entering abc/8003, thus making it a TAG/trunk group specification.
- All thresholds must be entered as integers.
- Conditions must be entered as a value from 0 through 4 (0 = Ignore, 1 = Less Than, 2 = Equal, 3 = Greater Than, 4 = Not Equal)

**Note**

If there is no global/0 defined, any measurement that does not have a specific threshold set for it simply is not checked. The measurement is still reported in the acc_x file, but no alarm is generated, regardless of the value. If global/0 is defined, it is used when no specific thresholds have been specified for a trunk group. If the user sets thresholds for a specific trunk group, only those values specified are checked. Any unspecified measurements within the TAG/TRK are treated as an ignore condition. A trunk group can have a maximum of 64 measurements. A global TCA can be set up with a maximum of 64 measurements, which are listed in [Table 12-7](#). Any trunk group that does not have a specific threshold crossing alarm (TCA) is checked against the global TCA. For some measurements, users can specify TAG/TRK/IC, where TAG is a user identifier, TRK is the trunk, and IC is the interexchange carrier. The user needs to know the carrier codes, such as 0288 for AT&T. Three-digit codes must be entered as four digits with a leading 0.

Zero Counts

The ACC task can operate in several different configurations with respect to zero counts. One configuration parameter outputs or suppresses all measurements that are equal to zero. The other configuration parameter selects all dynamic measurement group output or configured measurement group output regardless of activity.

Zero Count Suppression

Within each trunk group or trunk group/IC (measurement group), some measurements might not accumulate. For instance, if a trunk group is configured as an outgoing trunk, the ingress measurements are never pegged and the ingress durations are never anything other than zero. The ACC task provides a command-line switch to suppress these values. By default, if a measurement group has one measurement that is greater than zero, all measurements for the group are included in the output file. A command-line switch can override this feature and only non-zero values within each measurement group are output. If rounding or truncation causes an output measurement value to be zero, the ACC task treats the measurement as a zero and suppresses it if that feature is active.

Configured vs. Dynamic Trunk Group Output

Dynamic measurement groups are output only if they contain at least one non-zero measurement since midnight or have an alarm asserted. This is known as dynamic output. In BAMS, an MML option is available to output all configured measurement groups only, regardless of measurement values (configured mode), to output dynamic measurement groups only (dynamic mode), or to output both configured and dynamic measurement groups. (For more information, see the dynamicaccumes field in the “[Updating the Node Parameters Table](#)” section on page 5-11.) This is a dynamic parameter that is reread at the start of each measurement interval. The trunk groups are also dynamic and are reloaded at the start of each measurement interval. If BAMS is not set for configured mode (dynamic mode or both) any activity detected on a nonconfigured trunk causes the trunk group to be added dynamically (as if in dynamic mode) and measurements are output.

If a trunk group is removed from the configuration, it no longer generates output if it has no counts accumulated for the day. The trunk group continues to be output if any counts for the day have accumulated. Likewise, if a trunk group is not configured and counts accumulate for that unconfigured trunk group (dynamic addition), the measurements for that trunk group are output for the remainder of the day.

The only distinction between a configured trunk with counts removed and a dynamic trunk with counts is that at the end of the day, the dynamic trunk has its pending alarms cleared if there are any. If a dynamically added trunk has an alarm pending at the end of the day, it continues to be reported into the next day and the alarm clears only when the threshold is crossed in the reverse direction.

Changing the overall mode to dynamic from configured causes any trunk groups with no counts accumulated for the day and no alarms to be removed from the output list. All other trunks are changed to dynamic. At midnight, all trunks are then treated as dynamic in the manner described above.

If the system is changed from dynamic to configured, all of the configured trunks are marked as configured, and any other trunks being reported prior to the mode change remain dynamic. All carrier-based measurements are dynamic. These cannot be preconfigured.

Rounding of Measurements

All measurements that are output as a percentage are rounded up or down to the nearest percent. This causes any percentage measurement that is less than 0.5 to round down to zero. The displayed value is zero, internally, but the ACC task maintains the decimal portion of the percentage. Under this condition, the ACC task considers the group to have at least one non-zero measurement. If the system is configured to suppress zero counts (with the NODEPARMS tag ID), the measurement is not displayed.

Truncation of Measurements

All measurements that are output as a duration are truncated to seconds. The ACC task performs all calculations to the millisecond. The truncation is applied only to the output measurement value. Any real-time duration that contains milliseconds is added to the hourly and daily totals with the milliseconds intact.

Last Interval Update

Introduction

Due to the manner in which the VSC produces data, BAMS must sometimes update the measurement data that was output in the previous interval. The VSC does not generate an event when a line is seized. The first event produced is an answer or an abort. Because of this, it is possible for a seizure to take place in one interval, and the answer or abort to take place in the next interval. When this happens, the ACC task determines what pegs or setup durations should be credited to an interval that has already been processed. Then the ACC task applies the measurements to the previously closed interval.

Preliminary vs. Final Measurements

The measurements for each interval are written twice. The first time the measurement file is written, the values are as accurate as possible, given the data provided by the VSC to that point. This write takes place as quickly as the system can process the data following the detection of data that belongs to the next interval. Because some events might not have been signaled by the VSC (seizure), the counts might not be 100 percent accurate.

When the system detects data from the following interval, the system again processes the measurements. At this time, if events are present for calls that began in an interval prior to the current one, the prior interval measurement data is updated. This is the last time that the ACC task writes to the previous interval. Since during any interval, the ACC task will make the final write to the previous interval before making the preliminary write to the current interval, the data in any output file is final when a measurement file exists for a later interval.

Interval-Update Rules

BAMS follows these rules when performing last-interval updates:

- Only the interval prior to the current interval can be updated.
- If pegs are detected that apply to an interval older than the previous interval, those pegs are applied to the previous interval. This ensures that the pegs are included in the hourly and daily totals. This also ensures that the sum of the intervals equals the daily and hourly totals.
- If durations are detected that apply to an interval older than the previous interval, those durations are dropped. This prevents any interval from possibly exceeding 100 percent utilization. The duration is not applied to the hourly or daily totals in order to ensure that the sum of the intervals equals the hourly and daily totals.
- On startup, there is no previous interval; therefore, the current interval is treated as the previous interval.
- The previous interval is updated before the preliminary measurements are written for the current interval.
- When a previous interval ends an hour, the hourly measurement file is also updated.
- When a previous interval ends a day, the daily measurement file is also updated.

Nonprovisioned Trunk Group Measurements

Measurements data is written for calls in which the trunk group is not provisioned in the Trunk Group table on BAMS. However, the following special rules apply to nonprovisioned trunk group measurements.

- When BAMS encounters the nonprovisioned trunk group, pegs are written for that trunk group, including 0 counts until midnight when the memory is cleared.
- Any peg that requires the number of circuits to calculate will be suppressed. The number of circuits are only maintained for trunks defined in the Trunk Group table; therefore, BAMS has no knowledge of the number of circuits when the trunk group is not provisioned.
- Cisco recommends checking the /opt/CiscoBAMS/files/s0x/FMT_cdr.log in which nonprovisioned trunk groups are reported. When you detect a nonprovisioned trunk group, configure the trunk group as soon as possible.

MGCP Dial and MGCP Scripting Handoff Measurements

In MGCP Dial and MGCP Script Handoff calls, the Egress trunk group (4015), Egress SigPath (4070) and Egress BearChan (4072) fields are not populated. Thus, special treatment is required for these calls. A MGCP Dial or MGCP Scripting call is defined as a call where Egress Protocol (CDE Tag 4073 from 1010 or 1030 CDE) equals 9 or 10.

When processing MGCP Dial and MGCP Script calls, BAMS does not peg the following Egress measurements:

- BAM:EGR CALL ATT
- BAM:EGR CALL BLKD
- BAM:EGR TERM NORM
- BAM:EGR PCT TRK USE
- BAM:EGR OFL BLKD
- BAM:EGR TANDEM ATT
- BAM:EGR TANDEM COMPLT
- BAM:EGR CONV DURATION
- BAM:EGR SETUP DURATION
- BAM:EGR TEARDOWN DURATION

■ MGCP Dial and MGCP Scripting Handoff Measurements