Telecommunications Industry Association Business Performance Community (TIA-BPC)

TL 9000
Quality Management System

Measurements Handbook

SO Examples

6.1 SO Examples

6.1.1 – Host End-Office System-Outage Reporting

As of June, 2006, consider a population of host end-office systems, product category 1.1h, consisting of 4 systems – sites A, B, C, and D. Table 6.1.1-1 summarizes the termination distribution across the sites.

Table 6.1.1-1 Site Information Summary for Host End-Office Systems

Site	Termination Count (S)
A	6,000
B	2,000
C	10,000
D	15,000
Population (**SOs**)	33,000

For this example the following outages occurred in June, 2006:

1) Site A experienced a 10-minute, Product Attributable, affecting all terminations
2) Site D experienced a 30-minute, Product Attributable, affecting all terminations
3) Site A experienced a 5-minute, Product Attributable, CCS outage (default weight 50%)
4) Site C experienced a 15-minute, Product Attributable, CCS outage (default weight 50%)
5) Site B experiences a 20-minute, Product Attributable, outages affecting 500 terminations

Table 6.1.1-2 summarizes the outage data for the current reporting month.

Table 6.1.1-2 Outage Measurement Summary for Host End-Office Systems

Outage Number	Terminations Affected (A)	Outage Duration in minutes (P)	Weighted Time (A * P)
1	6,000	10	60,000
2	15,000	30	450,000
3	3,000	5	15,000
4	5,000	15	75,000
5	500	20	10,000
Totals	29,500		610,000

Service Impact Calculations

The "All Cause" downtime calculation for the host systems is

$$SO2 = 12 \times \frac{\sum_{i=1}^{k} A_i P_i}{\sum_{n=1}^{N} S_n}$$

$$SO2 = 12 \times \frac{610,000}{33,000}$$

$$SO2 = 221.82 \text{ minutes/termination/year}$$

The "All Causes" outage frequency calculation for the host systems is

$$SO1 = 12 \times \frac{\sum_{i=1}^{k} A_i}{\sum_{n=1}^{N} S_n}$$

$$SO1 = 12 \times \frac{29,500}{33,000}$$

$$SO1 = 10.73 \text{ events/termination/year}$$

These measurements translate directly to real performance delivered to the end user. A typical termination on a typical host system will experience 10.73 outages totaling 221.82 minutes in a year based on performance in the current month.

The host system population consists of 33,000 terminations, which is reported as SOs in the SO measurement. Since all the outages were product attributable, the all causes and product Attributable measurements are identical. The organization reports SOda and SOds as 610,000 and SOea and SOes as 29,500 in the measurement submission.

The data reported to the MRS for the service impact measurements are shown in Table 6.1-7.

Table 6.1-7   SO Data Table Report for June, 2006

Identifier	Value
MeasurementID	SO
SOa	12
SOs	33,000
SOea	29,500
SOda	610,000
SOes	29,500
SOds	610,000

6.1.2 SOs Normalization Units Calculation

6.1.2.1 SDH/SONET

For 3.2.2.1.2.1(SDH/SONET), the NU (Normalization Unit) is OC-1. The total system capacity depends on the number of optical interface boards which are installed in the working side of the actual network, and the capacity of each installed board.

For example, with an 8 nodes standard 2.5G ADM ring if there are sixteen 2.5G boards used. Then the aggregate capacity is:

8 nodes * 2 sides/NE * 48 OC-1s/2.5G = 768 OC-1s.

Protection equipment installed within each node does not add capacity to the network and are therefore not included when determining the number of normalization units.

6.1.2.2 WDM/DWDM

For 3.2.2.1.2.2(WDM), the NU (Normalization Unit) is Optical Channel. The total system capacity depends on the number of OTU (Optical Transponder Unit) boards which are installed in the working side of the actual network, and the capacity of each installed board.

For example, with a 2 OTM nodes 40 Optical Channel WDM system if there are only two OTU boards (1 Optical Channel for each OTU board) used in each OTM node. Then the aggregate capacity is:

2 nodes * 2 optical channels/NE = 4 Optical Channels.

Protection equipment installed within each node does not add capacity to the network and are therefore not included when determining the number of normalization units.

6.1.3 – Normalization Unit of NE - Base Station Controller

Consider a population of Base Station Controllers, product category 3.3.1, consisting of 4 Base Station Controllers A, B, C, and D. Table 6.1.3-1 summarizes the BSC distribution.

Table 6.1.3-1 Site Information Summary for BSC Systems

BSC	Network Element Count (S)
A	1
B	1
C	1
D	1
Population (**SOs**)	4

For this example the following outages occurred in the reporting month:

1) BSC A experienced a 10-minute, Customer Attributable, affecting entire BSC
2) BSC D experienced a 30-minute, Product Attributable, affecting entire BSC
3) BSC A experienced a 5-minute, Product Attributable, (weight 50%)
4) BSC C experienced a 15-minute, Product Attributable, (weight 50%)
5) BSC B experiences a 20-minute, Product Attributable, (weight 25%)

For the SO measurements, when the NU is a NE, both frequency and duration are weighted by the percentage of the NE affected in the outage.

Table 6.1.3-2 summarizes the "All Causes" outage data for the current reporting month.

Table 6.1.3-2 Outage Measurement Summary for BSC Systems (all causes)

Outage Number	Impact	Events	Duration (Minutes)	Weighted Frequency SOea	Weighted Time (Minutes) SOda
1	100%	1	10	1	10
2	100%	1	30	1	30
3	50%	1	5	0.5	2.5
4	50%	1	15	0.5	7.5
5	25%	1	20	0.25	5
Totals		5		3.25	55

Service Impact Calculations (from Table 6.1.3-2)

The "All Causes" downtime calculation is:

$$SO2 = 12 \times \frac{\sum_{i=1}^{k} A_i P_i}{\sum_{n=1}^{N} S_n}$$

SO2 = Afactor x $\dfrac{SOda}{SOs}$

SO2 = 12 x $\dfrac{55}{4}$

SO2 = 165 min./NE/year

The "All Causes" outage frequency calculation is:

$$SO1 = 12 \times \frac{\sum_{i=1}^{k} A_i}{\sum_{n=1}^{N} S_n}$$

SO1 = Afactor $\dfrac{SOea}{SOs}$

SO1 = 12 x $\dfrac{3.25}{4}$

SO1 = 9.75 events/NE/year

Table 6.1.3-3 summarizes the Product Attributable outage data for the current reporting month.

Table 6.1.3-3 Outage Measurement Summary for BSC Systems (product-attributable causes)

Outage Number	Impact	Events	Duration (Minutes)	Weighted Frequency (Minutes) SOep	Weighted Time (Minutes) SOdp
1	0	0	0	0	Customer attributable not counted
2	100%	1	30	1	30
3	50%	1	5	0.5	2.5
4	50%	1	15	0.5	7.5
5	25%	1	20	0.25	5
Totals		4		2.25	45

Service Impact Calculations (from Table 6.1.3-3)

The "Product Attributable" downtime calculation is:

The "Product Attributable" outage frequency calculation is:

$$SO4 - 12 \times \frac{\sum_{i=1}^{k} A_i P_i}{\sum_{n=1}^{N} S_n}$$

$$SO3 - 12 \times \frac{\sum_{i=1}^{k} A_i}{\sum_{n=1}^{N} S_n}$$

$$SO4 = Afactor \times \frac{SOdp}{SOs}$$

$$SO3 = Afactor \frac{SOep}{SOs}$$

$$\textbf{SO4} = 12 \times \frac{45}{4}$$

$$\textbf{SO3} = 12 \times \frac{2.25}{4}$$

SO4 = 135 min./NE/year

SO3 = 6.75 events/NE/year

6.1.4 Effect of Product or Service in Retirement Phase (MHB R5.6)

With Measurement Handbook R5.6, when a product or service is in Retirement Phase (or beyond), data will be excluded for this product or service from the monthly data submission. This exclusion also applies when a software product or a particular release of a software product is no longer deploying new features.

For outage reporting, any outage associated with a product or service that is in Retirement Phase at the time of the outage is excluded from the outage calculation. When calculating the monthly Network Units (NUs) for the measurement, any NUs associated with products or services in Retirement Phase are excluded from the calculation.