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SERIES E: OVERALL NETWORK OPERATION, TELEPHONE SERVICE, SERVICE OPERATION AND HUMAN FACTORS

Quality of service, network management and traffic engineering – Network management – Checking the quality of the international telephone service

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Internal automatic observations

ITU-T Recommendation E.425

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION E.425

INTERNAL AUTOMATIC OBSERVATIONS

Summary

This Recommendation describes internal monitoring of network performance using specific performance parameters such as Answer Seizure Ratio (ASR) and Answer Bid Ratio (ABR). The advantages of internal monitoring is that a large volume of records can be collected which allows day-to-day evaluation of network performance.

Source

ITU-T Recommendation E.425 was revised by ITU-T Study Group 2 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 9th of November 1998.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Recommendation E.425

INTERNAL AUTOMATIC OBSERVATIONS[1]

(revised in 1998)

1 Definitions

1.1 Essential information (of internal automatic observations)

The Answer Seizure Ratio (ASR) (see 1.3) or Answer Bid Ratio (ABR) (see 1.4), whichever is appropriate in terms of attempts, completed attempts and percentage completed.

The Network Effectiveness Ratio (NER) (see 1.5) provides a good indication of the ability of a network to deliver calls.

1.2 Supplementary information (of internal automatic observations)

Information on signalling faults, subscriber behaviour and the network.

1.3 Answer Seizure Ratio (ASR)

ASR gives the relationship between the number of seizures that result in an answer signal and the total number of seizures. This is a direct measure of the effectiveness of the service being offered and is usually expressed as a percentage as follows:

$$\text{ASR} = \frac{\text{Seizures resulting in answer signal}}{\text{Total seizures}} \times 100$$

Measurement of ASR may be made on a route or on a destination code basis.

1.4 Answer Bid Ratio (ABR)

Gives the relationship between the number of bids that result in an answer signal and the total number of bids.

$$\text{ABR} = \frac{\text{Bids resulting in answer signal}}{\text{Total bids}} \times 100$$

ABR is expressed as a percentage and is a direct measure of the effectiveness of traffic from the point of measurement. It is similar to ASR except that it includes bids that do not result in a seizure.

1.5 Network Effectiveness Ratio (NER)

NER is designed to express the ability of networks to deliver calls to the far-end terminal. NER expresses the relationship between the number of seizures and the sum of the number of seizures resulting in either an answer signal, or a user busy, or a ring no answer, or in the case of ISDN a terminal rejection/unavailability. Unlike ASR, NER excludes the effects of customer behaviour and terminal behaviour.

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[1] This Recommendation also applies in case external monitoring equipment is used when a route is monitored constantly for all or a large (statistical significance) number of calls. Refer to 2.4/E.421.

NER = {Seizures Resulting in Answer Signal

+ User Busy (CV = 17)

+ RingNoAnswer (CV = 16, 18, 19)

+ Terminal Rejects/unavailability (CV = 21, 27)

}× 100/Seizures.

Remarks

1) Accurate measurement of NER is more complex than that of ASR.

2) Accurate measurement of NER requires more complete signalling than does ASR.

3) Cause values provided by ITU-T Signalling System No. 7 TUP and ISUP can be used as a basis for the measurement of NER. This type of data is usually available from systems that capture signalling information. It may also be available on Call Detail Records.

   The following cause value definitions apply: 16 – normal call clearing, 17 – user busy, 18 – no user responding, 19 – No answer from user, user alerted, 21 – call reject, 27 – destination out of order.

4) Even if ITU-T Signalling System No. 7 is used on the international link, the use of other signalling systems in the domestic network, and their interworking with the Signalling System No. 7 may impact the accuracy of the measure.

5) If multiple exchanges are involved in the connection, accurate translation of the Cause values across exchanges is necessary.

6) NER should be regarded as a lower bound of the ability of a network to deliver calls. This is because it is not always possible to determine why calls were not delivered to the terminal. For example, a network vacant code could be caused by either customer dialling errors or network routing errors. Customer dialing errors that are not detected by network screening mechansims will reduce the NER for that network.

7) Call attempts that do not complete due to network screening should not contribute to NER. For example, a call attempt to a network vacant code caused by customer dialing error that is detected by screening shall not result in a seizure being counted for NER, and will not produce an answer, user busy, ring no answer or terminal reject disposition. Improved network screening can serve to increase the NER of a network.

8) NER is calculated as a percentage of seizures, specifically, seizures of international circuits. A seizure will be said to have taken place, if the originating international switch has reserved a trunk for a specific call and has begun the signalling procedure to establish a call over that trunk.

2 Merits of internal automatic observations

The advantage of internal monitoring is that a large volume of records can be collected. The large volume of data obtained from an internal observation system allows day-to-day evaluation of network performance. Daily analysis of this information has proven invaluable in trouble detection, and, coupled with a good maintenance response, is instrumental in providing the best possible

Quality of Service[2]. The disadvantage is that this method does not have the capability of detecting tones or speech and therefore cannot present a complete representation of all call dispositions.

To overcome this disadvantage, Administrations are advised to use Recommendation E.422 as well to supplement the data obtained from internal automatic observations.

3 Time of observations

The results of the ASR, ABR daily profile should be recorded. This data can be hourly, in groups of hours, or a total day.

4 Exchange of the results of observations

4.1 The essential information[3] should be exchanged monthly (preferably by facsimile or telex) to all network analyses points of those Administrations who are interested (the analyses points can then make comparisons between different streams going to the same destination). If information on ASR or ABR can be supplied separately for direct routes and indirect routes via transit countries, this should also be exchanged as being essential information, including the name of the transit country involved.

4.2 With respect to supplementary data such as: signalling faults, failures due to calling subscriber, failures due to called subscriber and failures due to the network, a quarterly exchange of information is appropriate. Because different formats will be required, mail seems the most likely means to be used for exchanging supplementary data.

4.3 Besides the monthly and quarterly exchange of information, a direct contact on all aspects should be made (by telephone) as soon as action is required to prevent a persistent drop in the Quality of Service.

5 Classes of calls

The distinction between classes of calls (such as operator-operator, subscriber-subscriber and operator-subscriber) is considered useful in identifying problems relating to the Quality of Service. This can only be done if the language digit[4] and some of the subsequent digits are analysed.

6 Destination analysis from service observation data

Consideration should be given to include the dialled digits, as observed by the monitoring equipment, in the exchange of information, especially for the sake of destination analyses (see Annex A/E.420).

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[2] Using these techniques, one can improve the quality of service even when no distinction can be made between ring no answer, subscriber busy (or congestion indicated by congestion tone) and recorded announcement.

[3] The Administration supplying the data must indicate whether the ASR or ABR is used.

[4] The language or discrimination digit is inserted automatically, or by the operator, between the country code (see Recommendation E.161) and the national (significant) number.

7 Details about supplementary information for Signalling System No. 5

7.1 Signalling faults

– faulty signals;

– time-outs, the main item in this category being no proceed-to-send signal;

– busy flash (since busy flash is applied in many situations, including failures due to calling and called subscriber and the network, it is considered useful to distinguish between busy flash received within 0-15 seconds, 15-30 seconds and after 30 seconds when making destination analysis).

7.2 Ineffective calls associated with the calling subscriber

Premature release, to distinguish between release before or after having received ringing tone; equipment which can detect audible signals is required.

7.3 Ineffective calls associated with the called subscriber

Ringing tone no answer cannot be detected without equipment which can detect audible signals.

7.4 Network

Here only the busy flash can be detected without equipment which can detect audible signals.

8 Equipment impact

8.1 Administrations are recommended to consider inclusion of appropriate facilities in existing and new exchanges to record all or some of the following phases:

a) Calls switched to speech position, then:
   1) answered;
   2) unanswered, but released by calling party;
   3) timed out awaiting answer;
   4) a call failure signal (busy flash or equivalent) received;
   5) timed out after clearback signal;
   6) faulty signal received after answer.

b) Calls failing to switch to speech position:
   1) clear forward signal received;
   2) insufficient digits received;
   3) congestion on international circuits;
   4) faulty signals received into exchange;
   5) signalling fault into next exchange;
   6) time out while signalling to next exchange;
   7) congestion signal received from next exchange;
   8) vacant number received;
   9) busy subscriber signal received;
   10) line out of order signal received;
   11) transferred subscriber signal received.

As a minimum requirement, one should be capable of determining the Answer Seizure Ratio (ASR) or the Answer Bid Ratio (ABR). This recording can be done by off-line processing of call records if they contain some more information than the information already required for international accounting.

8.2 Another way to assemble date on the Quality of Service (QoS) on outgoing circuit groups is through event counters. Five event counters already give a reasonable amount of information, three of them being common to Signalling Systems No. 5, No. 6 and R2: seizure, answer and busy signals[5]:

Signalling System No. 5

The number of:

– seizing signals sent;
– end-of-pulsing (ST) signals sent;
– proceed-to-send signals received;
– busy flash signals received;
– answer signals received.

Signalling System No. 6

The number of:

– Initial Address Messages (IAMs) sent;
– congestion (switching-equipment; circuit groups; national network) signals, call-failure signals and confusion signals received;
– address-complete (subscriber-free, charge; subscriber-free, no charge; subscriber-free, coinbox; charge; no charge; coinbox) signals received;
– subscriber busy signals received;
– answer (charge; no charge) signals received.

Signalling System R2

The number of:

– seizing signals sent;
– congestion [national network (A4 or B4); international exchange (A15)] signals received;
– address complete (charge; subscriber's line free, charge; subscriber's line free, no charge) signals received;
– subscriber line busy signals received;
– answer signals received.

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[5] In case the event counting is used to analyse the quality of service to a particular destination, the counting should be done separately for each signalling system.

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