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QUALITY OF SERVICE, NETWORK MANAGEMENT AND TRAFFIC ENGINEERING

OBSERVATIONS ON INTERNATIONAL OUTGOING TELEPHONE CALLS FOR QUALITY OF SERVICE

ITU-T Recommendation E.422

(Previously “CCITT Recommendation”)

FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (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 (Helsinki, March 1-12, 1993).

ITU-T Recommendation E.422 was revised by ITU-T Study Group 2 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 19th of February 1996.

NOTE

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

CONTENTS

SUMMARY

This Recommendation describes service observation in the international service in order to assess the quality of service obtained by the calling subscriber. It is essential to have factual or objective recording of observations (i.e. successful and unsuccessful calls), and to present them in the form of tables. The purpose of the revisions to this Recommendation are to include common channel Signalling System No. 7 features, to augment the QOS observations for Signalling Systems No. 5, No. 6 and R2 already present.

Recommendation E.422

OBSERVATIONS ON INTERNATIONAL OUTGOING TELEPHONE CALLS FOR QUALITY OF SERVICE

(revised in 1996)

1 Objectives concerning Tables 1 to 4/E.422

1.1 The purpose of service observation in the international service is to assess the quality of service obtained by the calling subscriber. Consequently, it is essential to have factual or objective recording of observations (i.e. successful and unsuccessful calls), and to present them in the form of a table (see Table 1 for manual or semi-automatic observations, and Tables 2, 3 and 4 for automatic observations).

1.2 The modern trend is to carry out automatic measurements for the following reasons:

- operating costs are minimized (staff reduction);
- continuous observation is possible;
- it is possible to take a larger sample;
- human error is eliminated;
- automatic processing of data is facilitated;
- conversational privacy is ensured;
- the time at which observations are made can be recorded.

The increasing deployment of out-of-band signalling system as Signalling System No. 7 TUP and ISUP greatly enhance the value of these observations permitting a comprehensive analysis of traffic quality of service.

However, manual observations may prove useful in monitoring transmission impairments such as noise, echo, clipping and distortion.

1.3 Due to the different capabilities and limitations of each signalling protocol used in the international network, it is recommended that, for automatic observation:

- Table 2 be used for CCITT Signalling Systems other than Signalling System No. 7.
- Table 3 be used for CCITT Signalling System No. 7 – TUP (Telephone User Part).
- Table 4 be used for CCITT Signalling System No. 7 – ISUP (ISDN User Part).

2 Manual or semi-automatic observations (Table 1/E.422)

2.1 Table 1 should be capable of being completed through the use of a wide range of observation facilities, i.e. from the simple to the sophisticated.

2.2 Specialized training of observers should be kept to a minimum.

2.3 The table should be self-explanatory so that reference to detailed how-to-complete instructions is unnecessary.

2.4 The major categories should be selected such that:

- they identify the major factors adversely affecting the quality of service;
- they are suitable for the centralized processing of observation results.

2.5 To permit the orderly collection of data for human factors studies to identify sources of difficulty in customer use of the international (automatic) telephone service, Recommendation E.427 contains an additional table to Table 1/E.422.

TABLE 1/E.422

Observations of international outgoing telephone calls for quality of service

Country of origin ..... Point of access: .....
Outgoing international exchange ..... National side .....
Group of circuits ..... Link circuits .....
Service { automatic[a] / semi-automatic[a] } Outgoing side .....
Period: from ..... to ..... Time of observations .....

Category	Number		Percentage	
	Subtotal	Total	Subtotal	Total
A1 Calls successfully put through (see Note 1)		...		...
A2 Ring tone received but no answer		...		...
A3 Unsuccessful calls: *Positive* indication of congestion, including subscriber busy, from beyond the outgoing international exchange. Visual signal, tone or recorded announcement		...		...
3.1 Subscriber busy/congestion indicated by visual signal	...		...	
3.2 Subscriber busy/congestion indicated by busy/congestion tone	...		...	
3.3 Congestion indicated by a recorded announcement	...		...	
A4 Unsuccessful calls: Other visual signals, tones or recorded announcements, not positively identified as Category 3 or 8		...		...
4.1 Visual signal received	...		...	
4.2 Tone received	...		...	
4.3 Recorded announcement received	...		...	
A5 Unsuccessful calls for other technical reasons		...		...
5.1 Wrong number obtained	...		...	
5.2 Abandoned due to very poor speech transmission	...		...	
5.3 No tone, no answer after waiting ... seconds	...		...	
5.4 Reception of answer signal when the called party does not reply	...		...	
5.5 Other failures of a technical kind	...		...	
A6 Unsuccessful calls due to incorrect handling by the calling party		...		...
6.1 Wrong number dialled	...		...	
6.2 Incomplete number	...		...	
6.3 Call prematurely abandoned before receipt of signal, tone or announcement (within less than ... seconds)	...		...	
6.4 Call prematurely abandoned after receipt of ring tone (within less than 30 seconds)	...		...	
6.5 Other failures due to incorrect handling	...		...	

TABLE 1/E.422 *(Concluded)*

Observations of international outgoing telephone calls for quality of service

Category	Number		Percentage	
	Subtotal	Total	Subtotal	Total
A7 ***Total calls monitored*** **(Category 1-6)**		...		100
A8 Unsuccessful calls: *Positive* indication of failure from outgoing international exchange		...		
8.1 Congestion on outgoing international circuits	...			
8.2 All other indications	...			
A9 Successful calls with defects. These calls are included in Category 1		...		
9.1 Non-reception of answer signal on chargeable calls	...			
9.2 Call with impaired intelligibility but not abandoned	...			
9.3 Other calls with defects but not abandoned	...			

a) Delete whatever is inapplicable.

NOTES

1 A successful call is one that reaches the wanted number and allows conversation to proceed. All successful calls are entered in Category 1. However, a successful call may or may not have noticeable defects. Successful calls with noticeable defects should also be entered in Category 9.

2 With the exception noted above for Categories 1 and 9, the results of one call observation should be entered under one category only, namely the most appropriate one from 1 to 6.

3 Administrations should periodically exchange necessary information to interpret the observation data recorded under Categories 4.1, 4.2 and 4.3.

3 Comments concerning the use of Table 1/E.422

3.1 Table 1 summarizes observations made on outgoing automatic and/or semi-automatic traffic, on a country of origin to a country of destination basis. A separate form should be used for each country of destination, and if required, for each group of circuits to which traffic to a country of destination has access at the outgoing international exchange (or exchanges). It is not necessary to make observations on both automatic and semi-automatic services. An Administration may select the service to be observed, provided that the service is the majority of the traffic to the country of destination.

3.2 For an explanation of the point of access, see 4.1/E.421.

3.3 The result of each call observed should be entered only under the most appropriate category. In the case of several faults on one call, the most significant cause of failure should be entered.

3.4 In completing Table 1 reference should be made to the following explanations.

4 How to fill in Table 1/E.422

Category A1 – To ensure objective recording and to avoid producing a biased sample resulting from the exclusion of calls which require subjective assessment, the successful call is defined as a call that reaches the wanted number and allows conversation to proceed. All non-abandoned calls are entered into Category 1 and of these calls those which are subjectively adjudged to be defective are also entered into Category 9. Thus it is required of the observer to make *two* entries for successful calls with noticeable defects.

Enter in Category 1 then, calls successfully put through. This includes answered calls for which a clearback signal is received after some words have been spoken, without knowing for what reason the call is abandoned. If it is observed that the caller has dialled a wrong number, the call will be entered under 6.1. Category 1 will also include calls put through correctly to operator positions, information services, or to machines replying in place of the subscriber or to their equivalents.

Category A2 – Enter in this category calls on which ring tone was heard but the subscriber did not answer before the attempt was abandoned, the caller having waited at least 30 seconds after commencement of ring tone before clearing forward. (See Category 6.4 if the call was abandoned *less* than 30 seconds after ring tone commenced.)

Category A3 – Enter in this category all unsuccessful calls in which a *positive* indication of subscriber busy or congestion beyond the outgoing international exchange had been encountered, either by visual signal, tone or recorded announcement. Congestion encountered on common control equipment should be entered in this category as well (e.g. no "proceed-to-send" signal). Where a positive indication of these conditions has *not* been received, enter in Category 4.

Categories 3.1, 3.2 and 3.3 are entered for the specific indication received.

When more than one indication is received, e.g. visual signal and audible tone, only one entry should be made. In this case, the preferred order of entry should be tone, announcement, visual signal.

Category A4 – Enter in this category all other indications on unsuccessful calls whether by visual signal, tone or recorded announcement that cannot be positively identified and entered in Category 3 or 8.

Categories 4.1, 4.2 and 4.3 are entered for the specific indication received.

When more than one indication is received, e.g. visual signal and audible tone, only one entry should be made. In this case, the preferred order of entry should be tone, announcement, visual signal.

Category A5 – Enter in this category those calls which fail for technical reasons not included in Categories 3, 4 and 8. Category 5 subdivides as follows:

- *Category 5.1* – Calls on which the wrong number was obtained, although the caller dialled correctly.
- *Category 5.2* – Calls abandoned by the caller because of very poor speech transmission, although the answer signal was received. (See Category 9.2 if speech transmission is poor but the call is not abandoned.) In some countries observers may be required to cease listening immediately after conversation is established, thus reducing the number of calls that would be reported in this category.
- *Category 5.3* – Calls on which the dialling information was correctly and completely sent, but the caller received no signal, tone or announcement before abandoning the call, having waited for at least the specified period before clearing forward.

  The value of this time period left open under this category should be filled in by the Administrations of the originating country according to its experience in this matter. The prescribed value may differ depending on the international destination. It is, however, recommended to limit the number of such different quoted periods to a maximum of three values (e.g. 10, 20 or 30 seconds or any other value considered pertinent by the Administrations concerned).
- *Category 5.4* – Calls on which an answer signal was received, although the called subscriber did not answer.
- *Category 5.5* – Call failures due to technical reasons which are unable to be entered in Categories 5.1 to 5.4. These should be very few, if any, and this category is provided in case they do arise. All possible information about these failures should be supplied as an attachment to the summary of the table. This category includes calls abandoned due to reception of a clear-back signal while connecting with the extension number (PBX).

Category A6 – Enter in this category all unsuccessful calls which have failed due to incorrect handling by the caller (subscriber or operator). Category 6 subdivides as follows:

- *Category 6.1* – Calls on which it was determined that the number which should have been dialled was different from the number actually dialled.
- *Category 6.2* – Calls on which it was determined that the number dialled had insufficient digits to be successful.

– *Category 6.3* – Calls on which the digital information was correctly and completely sent, but the caller abandoned the call without receiving any signal, tone or announcement, and without waiting for at least the specified period.

The value of the time period left open under this category should be filled in by the Administrations of the originating country according to its experience in this matter. The prescribed value may differ depending on the international destination. It is, however, recommended to limit the number of such different quoted periods to a maximum of three values (e.g. 10, 20 or 30 seconds or any other value considered pertinent by the Administration concerned).

The value quoted under Category 6 must be the same as that quoted under Category 5.

– *Category 6.4* – Calls prematurely abandoned after receipt of the ringing tone on which the caller disconnected less than 30 seconds after the ringing tone commenced. (See Category 2 if the call was abandoned after *more* than 30 seconds had elapsed from the time of commencement of ringing tone.)

– *Category 6.5* – Calls which failed due to incorrect handling by the caller which cannot be classified under Categories 6.1 to 6.4. All possible information about these failures should be supplied as an attachment to the summary of the table. As in Category 5.5, these should be very few, if any.

Category A7 – Enter in Category 7 the number of calls monitored (Categories 1-6).

Category A8 – Category 8 will be useful for those Administrations which observe on the national side of the outgoing international exchange. (See 4.1/E.421.) Positive indications of failure, congestion or other, are to be entered here. They are not to be included with Categories 1-6, which give the data for calls monitored for Category 7.

Thus, when Category 8 is viewed with Categories 3 and 4 a more complete picture is provided of quality of service received by the caller.

Category A9 – Entries in Category 9 are for successful calls (entered in Category 1) which encountered defects, but which were not abandoned. They are thus automatically included in the total of Category 7.

– *Category 9.1* – Enter here chargeable calls for which no answer signal was received. If abandonment should be detected on such calls, enter in Category 5.5.

– *Category 9.2* – Enter here calls on which poor speech transmission was observed, but the call was not abandoned. (See Category 5.2 if the call was abandoned.) All possible information about these calls should be supplied as an attachment to the summary of the table. Note that in some countries observers may be required to ease listening immediately after conversation was established, thus reducing the number of calls that would be reported under this category.

– *Category 9.3* – Enter here calls encountering switching, signalling or transmission defects, but which were not abandoned and which cannot be classified under Categories 9.1 or 9.2.

5 Automatic observations for CCITT Signalling Systems other than Signalling System No. 7 (Table 2/E.422)

Considering the limitation of abilities of automatic observation equipment (for example, automatic observation equipment cannot understand tones or announcements) and the variety of signals used in signalling systems, the table recommended for CCITT Signalling Systems other than Signalling System No. 7 is given below.

6 Comments concerning the use of Table 2/E.422

6.1 Table 2 summarizes observations made on outgoing automatic and semi-automatic traffic, on a country of origin to a country of destination basis. A separate form should be used for each country of destination, and if required, for each group of circuits to which traffic to the country of destination has access at the outgoing international exchange (or exchanges).

6.2 For an explanation of the point of access, see 4.1/E.421.

6.3 The result of each call observed should be entered only under the most appropriate category. In the case of several faults on one call, the most significant cause of failure should be entered.

TABLE 2/E.422

Automatic observations of international outgoing telephone calls for quality of service

Country of origin ..... Point of access: .....
Outgoing international exchange ..... National side .....
Group of circuits ..... Link circuits .....
Service {automatic[a] / semi-automatic[a]} Outgoing side .....
Period: from..... to ..... Time of observations .....

Category	Number		Percentage	
	Subtotal	Total	Subtotal	Total
B1 Calls successfully put through		...		...
B2 Ring tone received but no answer		...		...
B3 Unsuccessful calls: *Positive* indication of congestion, including subscriber busy, from beyond the outgoing international exchange. Visual signal or tone		...		...
3.1 Subscriber busy/congestion indicated by visual signal	...		...	
3.2 Subscriber busy/congestion indicated by busy/congestion tone	...		...	
B4 Unsuccessful calls: Other tones or recorded announcements, not positively identified as Cagegory 3 or 8		...		...
4.1 Tone received	...		...	
4.2 Recorded announcement received	...		...	
B5 Unsuccessful calls for other technical reasons		...		...
5.1 No tone, no answer signals after waiting ... seconds	...		...	
5.2 Reception of answer signal when the called party does not reply	...		...	
5.3 Other failures of a technical kind	...		...	
B6 Unsuccessful calls due to incorrect handling by the calling party		...		...
6.1 Call prematurely abandoned before receipt of signal, tone or announcement (within less than ... seconds)	...		...	
6.2 Call prematurely abandoned after receipt of ring tone (within less than 30 seconds)	...		...	
6.3 Other failures due to incorrect handling	...		...	
B7 *Total calls monitored* (Categories 1-6)		...		100
B8 Unsuccessful calls: *Positive* indication of failure from outgoing international exchange		...		
8.1 Congestion on outgoing international circuits	...			
8.2 All other indications	...			
B9 Unsuccessful calls with defects. These calls are all included in Category 1		...		
9.1 Non-reception of answer signal on chargeable calls	...			
9.2 Other calls with defects	...			

[a] Delete whatever is inapplicable.

6.4 In completing Table 2 reference should be made to the following explanations.

7 How to fill in Table 2/E.422

Category B1 – The successful call is defined as a call that allows conversation to begin between subscribers, or allows to begin sending facsimile or data. This includes calls put through to operator positions, information services, or to machines replying in place of the subscriber or to their equivalents. In other words, the successful call is such that the automatic observation equipment detected voice on both sending and receiving lines, or that it detected sending tone of facsimiles or data, or that it detected voice on the receiving line after receipt of answer signal.

Category B2 – This category includes those calls for which the automatic observation equipment detected ringing tone, but there was no answer signal and the clear-forward signal was sent 30 seconds after the detection or ringing tone.

Category B3 – Enter in Category 3 all unsuccessful calls for which a positive indication of subscriber busy or congestion beyond the outgoing international exchange has been encountered, either by visual signal (busy-flash signal) or by tone (also includes no "proceed-to-send" signal).

Category B4 – Enter in Category 4 unsuccessful calls for which the automatic observation equipment detected a tone, but could not classify it, or the equipment detected announcement (that is, it detected voice on receiving line without answer signal).

Category B5 – Enter in Category 5 those calls which failed for technical reasons not included in Categories 3, 4 and 8. Category 5 subdivides as follows:

- *Category 5.1* – Calls on which the dialling information was completely sent, but the automatic observation equipment received no signal, tone or announcement and it received a clear-forward signal after a specified period. The value of this time period left open under this category should be filled in by the Administrations of the origination country according to its experience in this matter. The prescribed value may differ depending on the international destination. It is, however, recommended to limit the number of such different quoted periods to a maximum of three values (e.g. 10, 20 or 30 seconds or any other value considered pertinent by the Administrations concerned).

- *Category 5.2* – Calls on which an answer signal was received, although the called subscriber did not answer. In other words, calls for which the automatic observation equipment received an answer signal, although it detected no voice on receiving line.

- *Category 5.3* – Failed calls due to technical reasons which are unable to be entered in Categories 5.1 and 5.2. For example, a call for which there was a busy-flash signal after receiving ringing tone.

Category B6 – Enter in Category 6 all unsuccessful calls which have failed due to incorrect handling by the caller (subscriber or operator). Category 6 subdivides as follows:

- *Category 6.1* – Calls on which the dialling information was completely sent, but the automatic observation equipment received no signal, tone or announcement and it received a clear-forward signal within a specified period. (For this period, see Category 5.1 above.)

- *Category 6.2* – Calls prematurely abandoned after receipt of the ringing tone on which a clear-forward signal was received less than 30 seconds after the ringing tone was detected.

- *Category 6.3* – Calls which failed due to incorrect handling by the caller which cannot be classified under Categories 6.1 and 6.2. For example, a call for which the automatic observation equipment received an answer signal after receiving ringing tone, and then the ringing tone stopped, but the equipment could not detect any voice either on the sending line or the receiving line.

Category B7 – Enter in Category 7 the number of calls monitored (Categories 1-6).

Category B8 – Category 8 will be useful for those Administrations which observe on the national side of the outgoing international exchange. Positive indications of failure, congestion or other, are to be entered here.

Category B9 – Entries in Category 9 are for successful calls (entered in Category 1) which encountered defects. Category 9 subdivides as follows:

- *Category 9.1* – Calls on which no answer signal was received, but the conversation was begun.
- *Category 9.2* – Calls which encountered switching or signalling defects, but on which the conversation was begun.

8 Automatic observation for Signalling System No. 7 – TUP (Table 3/E.422)

When Signalling System No. 7 TUP is used on the international link, it is possible to analyse the cause of unsuccessful calls in detail because twelve independent messages (UBM – Unsuccessful Backward Messages) are defined to identify failure cause. The explanation on the meaning of each UBM can be found in Recommendation Q.722.

9 Comments concerning the use of Table 3/E.422

9.1 Table 3 summarizes observations made on outgoing automatic and semi-automatic traffic, on a country of origin to a country of destination basis. A separate form should be used for each country of destination, and if required, for each group of circuits to which traffic to the country of destination has access at the outgoing international exchange (or exchanges).

9.2 For an explanation of the point of access, see 4.1/E.421. However, the information carried in the international signalling links is also necessary for filling Table 3. This information can be retrieved, for example, through an external monitoring device or using Call Data Records (CDR) generated in the switching systems.

9.3 It is suggested to evaluate network connectivity by combining Category 1, call successfully put through, and Category 2.1, unsuccessful calls due to the customer.

9.4 In completing Table 3 reference should be made to the following explanations.

10 How to fill in Table 3/E.422

Category C.1 – The success call is defined as a call responded by answer signal.

Category C.2.1 – This category relates to unsuccessful calls due to the customer. The distinction between “Ringing tone but no answer” and “Busy tone received” can be estimated based on the holding time. The value of this time period left open under this category should be filled in by the Administrations of the originating country according to its experience in this matter. The prescribed value may differ depending on the international destination. It is however recommended to limit the number of such different quoted periods to a maximum of 3 values (e.g. 15, 20 or 25 seconds or any other value considered pertinent by the Administration concerned).

Category C.2.2 – This category relates to call failure due to network. Enter in one of Category 2.2 according to the received signal from destination country.

Category C.2.3 – This category relates to call failure due to customer and/or network. Enter in one of Category 2.3 according to the received signal from destination country.

Category C.3 – Enter in Category 3 the number of calls monitored (Categories 1-2).

Category C.4 – Enter in this Category the total number of ACM (Address Complete Messages) received.

Category C.5 – Enter in this category unsuccessful calls for which no specific UBM message was received because the failure took place internally on the outgoing switch or on the selection of the outgoing circuit.

Category C.6 – Entries in Category 6 are for successful calls (entered in Category 1) which encountered defects.

TABLE 3/E.422

Observations of international outgoing telephone calls for quality of service
(Signalling System No. 7 – Telephone User Part)

Country of origin .....

Point of access:

Outgoing international exchange .....

National side .....

Group of circuits .....

Link circuits .....

Service automatic/semi-automatic .....

Outgoing side .....

Period: From ..... To .....

Time of observations .....

Category		Number			Percentage	
		UBM	Subtotal	Total	Subtotal	Total
C.1 Calls successfully put through				...		...
C.2 Unsuccessful calls						
C.2.1 Due to the customer				...		...
2.1.1	Call abandoned after ... seconds (Ring tone received but no answer)		...		...	
2.1.2	Call abandoned within ... seconds (Busy tone received)		...		...	
2.1.3	Subscriber busy	SSB	...		...	
2.1.4	Access Barred	ACB				
C.2.2 Due to the Network				...		...
2.2.1	Circuit Group Congestion	CGC	...		...	
2.2.2	Switching Equipment Congestion	SEC	...		...	
2.2.3	National Network Congestion	NNC	...		...	
2.2.4	Digital Path Not Provided	DPN	...		...	
C.2.3 Due to the Customer and/or Network				...		...
2.3.1	Unallocated Number	UNN	...		...	
2.3.2	Line Out of Service	LOS	...		...	
2.3.3	Address Incomplete	ADI	...		...	
2.3.4	Call Failure	CFL	...		...	
2.3.5	Send special Information Tone	SST				
C.3 Total calls monitored (Categories 1-2)				...		100
C.4 Total number of ACM messages				...		
C.5 Unsuccessful calls: Positive indication of failure from outgoing international exchange				...		
5.1	Congestion on outgoing international circuits		...			
5.2	Network Management Restrictions		...			
5.3	Dual Seizure					
	at first call attempt					
	at last call attempt					
5.4	Continuity Check Failure					
	at first call attempt					
	at last call attempt					
5.5	All other indications					

TABLE 3/E.422 *(Concluded)*

Observations of international outgoing telephone calls for quality of service (Signalling System No. 7 – Telephone User Part)

Category	Number			Percentage	
	UBM	Subtotal	Total	Subtotal	Total
C.6 Successful calls with defects. These calls are all included in Category 1			...		
6.1 Non-reception of ANC on chargeable calls		...			
6.2 Other calls with defects		...			
C.7 Unsuccessful calls due to the signalling system failure. These calls are not included in the previous categories			...		
7.1 Protocol failure		...			
7.2 Signalling network failure		...			

Category C.7 – Entries in Category 7 are for unsuccessful calls due to the signalling system failure. These calls are not included in previous categories.

11 Automatic observations for CCITT Signalling System No. 7 – ISUP (Table 4/E.422)

When Signalling System No. 7 ISUP is used on international link, it is possible to analyse the cause of unsuccessful calls in great detail because a large number of Cause Values (CV) have been defined for release (REL) messages. The explanation on the meaning of each CV can be found in Recommendation Q.850.

12 Comments concerning the use of Table 4/E.422

12.1 Table 4 summarizes observations made on outgoing automatic and semi-automatic traffic, on a country of origin to a country of destination basis. A separate form should be used for each country of destination, and if required, for each group of circuits to which traffic to the country of destination has access at the outgoing international exchange (exchanges).

12.2 For an explanation of the point of access, see 4.1/E.421. However, the information carried in the international signalling links is also necessary for filling Table 4. This information can be retrieved, for example, through an external monitoring device or using Call Data Records (CDR) generated in the switching systems.

12.3 It is suggested to evaluate network connectivity by combining Category 1, call successfully put through, and Category 2.1, unsuccessful calls due to the customer.

12.4 In completing Table 4 reference should be made to the following explanations.

13 How to fill in Table 4/E.422

Category D.1 – The success call is defined as a call responded by answer signal.

Category D.2.1 – This category relates to unsuccessful calls due to the customer. The distinction between “Ringing tone but no answer” and “Busy tone received” can be estimated based on the holding time. The value of this time period left open under this category should be filled in by the Administrations of the originating country according to its experience in this matter. The prescribed value may differ depending on the international destination. It is however recommended to limit the number of such different quoted periods to a maximum of 3 values (e.g. 15, 20 or 25 seconds or any other value considered pertinent by the Administration concerned).

Category D.2.2 – This category relates to call failure due to customer and/or network. Enter in one of Category 2.2. according to the cause value conveyed by REL message from destination country. Cause values that are not specifically assigned in the table but belong to the range defined, shall be included in “Other Causes”.

Category D.3 – This category relates to call failure due to resource unavailability. Enter in Category 3 according to the cause value conveyed by REL message from destination country. Cause values that are not specifically assigned in the table but belong to the range defined, shall be included in “Other Causes”.

Category D.4 – This category relates to call failure due to service or option unavailability. Enter in Category 4 according to the cause value conveyed by REL message from destination country.

Category D.5 – This category relates to call failure due to service or option implemented. Enter in Category 5 according to the cause value conveyed by REL message from destination country.

Category D.6 – This category relates to call failure due to invalid message class. Enter in Category 6 according to the cause value conveyed by REL message from destination country.

Category D.7 – This category relates to call failure due to protocol error. Enter in Category 7 according to the cause value conveyed by REL message from destination country.

Category D.8 – This category relates to call failure due to interworking. Enter in Category 8 if cause value conveyed by REL message from destination country is 127.

Category D.9 – Enter in Category 9 the number of calls monitored (Categories 1-8)

Category D.10 – Enter in this category the total number of ACM (Address Complete Messages) received.

Category D.11 – Enter in this category unsuccessful calls for which no specific REL-Cause Value message was received because that failure took place internally on the outgoing switch or on the selection of the outgoing circuit.

Category D.12 – Entries in Category 12 are for successful calls (entered in Category 1) which encountered defects.

Category D.13 – Entries in Category 13 are for unsuccessful calls due to the signalling system failure. These calls are not included in the previous categories.

TABLE 4/E.422

Observations of international outgoing telephone calls for quality of service (Signalling System No. 7 – ISDN User Part)

Country of origin ..... Point of access:

Outgoing international exchange ..... National side .....

Group of circuits ..... Link circuits .....

Service automatic/semi-automatic ..... Outgoing side .....

Period: From ..... To ..... Time of observations .....

Category		Number			Percentage	
		CV	Subtotal	Total	Subtotal	Total
D.1 Calls successfully put through				...		...
D.2 Unsuccessful calls: normal class (CV 1 to 15, 17 to 31)						
D.2.1 Due to the Customer				...		...
2.1.1	Calls abandoned after ... seconds (Ring tone received but no answer)	...	...		...	
2.1.2	Calls abandoned within ... seconds (Busy tone received)	...	...		...	
2.1.3	User busy	17	...		...	
2.1.4	No user responding	18	...		...	
2.1.5	No answer from user	19	...		...	
D.2.2 Due to the Customer and/or Network				...		...
2.2.1	Unallocated number	1	...		...	
2.2.2	No route to destination	3	...		...	
2.2.3	Send special information tone	4	...		...	
2.2.4	Call rejected	21	...		...	
2.2.5	Number changed	22	...		...	
2.2.6	Destination out of order	27	...		...	
2.2.7	Address incomplete	28	...		...	
2.2.8	Facility rejected	29	...		...	
2.2.9	Normal, unspecified	31	...		...	
2.2.10	Other causes		...		...	
D.3 Unsuccessful calls: Resource unavailable class (CV 34 to 47)				...		...
3.1	No circuit available	34	...		...	
3.2	Network out of service	38	...		...	
3.3	Switching equipment congestion	42	...		...	
3.4	Other causes		...		...	

TABLE 4/E.422 *(Concluded)*

Observations of international outgoing telephone calls for quality of service (Signalling System No. 7 – ISDN User Part)

Category	Number			Percentage	
	CV	Subtotal	Total	Subtotal	Total
D.4 Unsuccessful calls: Service or option not available class (CV 50 to 63)			...		...
D.5 Unsuccessful calls: Service or option not implemented class (CV 65 to 79)			...		...
D.6 Unsuccessful calls: Invalid message class (CV 87 to 95)		...			...
D.7 Unsuccessful calls: Protocol error class (CV 102 to 111)			...		...
D.8 Unsuccessful calls: Interworking class	127		...		...
D.9 Total calls monitored (Categories 1-8)			...		100
D.10 Total number of ACM messages			...		
D.11 Unsuccessful calls: Positive indication of failure from outgoing international exchange			...		
11.1 Congestion on outgoing international circuits		...			
11.2 Network Management Restrictions					
11.3 Dual Seizure					
at first call attempt at last call attempt					
11.4 Continuity Check Failure					
at first call attempt at last call attempt					
11.5 All other indications		...			
D.12 Successful calls with defects. These calls are all included in Category 1			...		
12.1 Non reception of ANM on chargeable calls		...			
12.2 Other calls with defects		...			
D.13 Unsuccessful calls due to the signalling system failure. These calls are not included in the previous categories			...		
13.1 Protocol failure		...			
13.2 Signalling network failure		...			

NOTES

1 Some cause values in the range specified in each class may not yet be defined.

2 Some cause values in the range specified in each class may not be applicable to the International Interface.