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QUALITY OF SERVICE, NETWORK MANAGEMENT AND TRAFFIC ENGINEERING

FACSIMILE CALL CUT-OFF PERFORMANCE

ITU-T Recommendation E.451

(Previously “CCITT Recommendation”)

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. 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, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation E.451 was revised by the ITU-T Study Group II (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

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

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CONTENTS

Page

1	Introduction	1
2	Scope	1
3	Definitions	1
4	Remarks	2

FACSIMILE CALL CUT-OFF PERFORMANCE

(Helsinki, 1993)

1 Introduction

Call cut-off is one of the most important factors that affect the quality of service for facsimile applications on PSTN. Facsimile cut-offs can occur in various phases of a facsimile call and the failure modes can be quite complex. The cut-off ratio may be defined in general, as the percentage of established facsimile calls that are terminated prior to the transmittal of all the pages in the facsimile transaction. Since the failure modes are complex, it is important to define cut-offs precisely so that valid comparisons can be made between cut-off ratio measurements from a variety of sources. The focus of the definitions is on test calls that follow certain rules and the definitions are developed from the perspective of the transmitting terminal. Uniformly, the terminology in Recommendation T.30 has been employed. For the time being, only definitions and qualifying remarks are presented; the values for the parameters are to be obtained from measurements on the international networks, and will be provided as they become available.

2 Scope

The definitions in 3 apply to test calls

a) that use automatic-to-automatic scenario (method No. 4 in Table 1/T.30) and may be adapted for other methods in the same table;

b) that use standard test transactions of N (N to be defined later) test pages (test pages to be defined later);

c) where the intended receiving facsimile terminal has responded by going off-hook and CED has been received at the originating terminal [see Remark e)];

d) that are sent to a receiving facsimile terminal that is connected to a dedicated line and not shared with voice terminals.

3 Definitions

For the purposes of this Recommendation, the following definitions apply.

a) A **pre-message phase B failure** is considered to have occurred if prior to the transmittal of the first page, either the originating or the terminating facsimile terminal goes on-hook prior to the reception of a CFR message by the originating terminal.

   A **post-message phase B failure** is considered to have occurred if a phase B failure occurs after the transmission of any page.

b) A **phase C/phase D failure at any page** is considered to have occurred if a valid post message response (MCF, RTP, RTN, PIN, PIP) is not received in response to either the MPS or the EOP message. If this occurs at *m*th page, then $m - 1$ pages are considered to be successfully transmitted but one can consider that there was a failure at the *m*th page.

c) When transmitting N-page transactions, the **facsimile call cut-off ratio (expressed as a percentage) for N pages** is

$$\%C_N = (F_N / T) * 100$$

   where F_N is the number of transactions where there was either a phase B, C, or D failure, and T is the total number of transactions satisfying the conditions in 2.

d) Based on the definition in item c) above, **facsimile call cut-off ratios for *m* pages** ($1 \leq m < N$) is

$$\%C_m = (F_m / T) * 100$$

where F_m is the number of transactions that had a phase B, C or D failure at the *m*th page.

e) The **cut-off ratio for transactions for which a pre-message phase B failure occurs** is

$$\%C_{1B} = (F_{1B} / T) * 100$$

where F_{1B} is the number of transactions with a pre-picture phase B failure.

f) Given that conditions a) to d) in 2 have been satisfied, it is possible to define conditional facsimile success (CFS) ratios which are the complements of cutoff ratios:

$$\%CFS_N = 100 - \%C_N$$

$$\%CFS_m = 100 - \%C_m$$

$$\%CFS_{1B} = 100 - \%C_{1B}$$

g) End-to-end facsimile success (FS) ratios can be defined as follows:

$$\%FS_N = PACR * \%CFS_N$$

$$\%FS_m = PACR * \%CFS_m$$

$$\%FS_{1B} = PACR * \%CFS_{1B}$$

The FS's represent the true facsimile success performance observed by the customers. The ratio PACR is the phase A completion ratio and is dependent on several factors. These factors include network blocking, terminal availability, proper operation of the terminating facsimile terminal and correct reception of the CED signal by the originating terminal.

4 Remarks

a) During test calls, retransmissions of pages may occur. The retransmitted pages are not counted for computing call cut-off ratios. For example, if retransmissions occur prior to the *m*th page of the original document followed by a failure at the *m*th page, it is still counted as a cut-off at the *m*th page.

b) N, the number of pages in the test transactions, should be chosen such that

- it is larger than the "average" number of pages in customer transactions world-wide;
- it is not so large that the holding times of test transactions are too long.

N between four to six pages may be a reasonable compromise. This issue needs further discussion.

c) The test page(s) for test transactions should be chosen such that

- the holding time of the test page(s) is not too long. Ideally it should be in the range of 60 seconds;
- the image content is geared to the evaluation of transmission induced scan line errors.

This issue needs to be studied further.

d) When cut-off ratios are measured from real traffic using facsimile terminal reports or network based measurement systems, the image content and therefore the transmission time can not be controlled. In such cases, the cut-off ratio C_{1B} is still accurate. However, the *m*-page ($1 \leq m \leq N$) cut-off ratios, C_m, may be affected by the transmission time for each page. Also note that when C_m is computed, only those

transactions for which at least *m* pages were attempted should be included. Assuming that the sample of facsimile transaction is large enough and that the pages have a random distribution of transmission times which are reasonable (e.g. an average of 30 seconds), approximate comparisons of C_m are permitted.

e) When measurements are made using network based monitoring equipment, it is important to ensure that the call is between two fax terminals. This can be done by observing an appropriate protocol message from the originating terminal. Detection of messages such as DCS, DTC, NSS or NSC can serve this purpose. It should be noted that the initial message (e.g. DIS, etc.) from the terminating terminal may not be received properly, in which case there will be no response from the originating terminal. This type of facsimile call cut-off may not be detected by the monitoring equipment.

f) For manual to automatic test calls (method No. 2 in Table 1/T.30) there are no changes in definitions contained in 3 provided that there are no operator errors.

g) From a measurement point of view, the precise evaluation of cut-off ratios C_N requires that the T.30 HDLC protocol messages be monitored and recorded during test transactions. This should not be a problem for specially constructed/configured test vehicles or network based monitoring systems.

h) When facsimile cut-off ratios are collected from facsimile terminal reports, the detailed protocol information will not often be available from the terminal. Facsimile protocol analyzers available in the market can be bridged on to the terminals to collect protocol data in addition to that provided by the terminals. In the absence of detailed protocol data, the cut-off ratios computed from terminal reports may not be completely accurate. Also, there are machines that do not generate error reports (or even report the call attempt) in the case of a pre-message phase B failure. At a minimum, the facsimile terminals used for cut-off data collection should produce a report for all failures, particularly pre-message phase B. If these conditions are satisfied, it is permitted to compute cut-off ratios from the terminal.

i) If measurements are made between terminals from the same manufacturer that will result in the use of non-standard features, the possible impact of these features on cut-off ratios should be identified and understood.

j) Machines from some manufacturers disconnect on the receipt of an RTN while others do not. In the presence of network impairments, machines that disconnect on the receipt of an RTN may result in a higher facsimile call cut-off ratio compared to those machines that do not disconnect on the receipt of an RTN. Therefore, it is important to explicitly state the characteristics of machines such as the response to RTNs when comparing the results from different machines.