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QUALITY OF SERVICE, NETWORK MANAGEMENT AND TRAFFIC ENGINEERING

FACSIMILE QUALITY OF SERVICE ON PSTN – GENERAL ASPECTS

ITU-T Recommendation E.450

(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.450 was prepared 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 Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.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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Recommendation E.450

FACSIMILE QUALITY OF SERVICE ON PSTN – GENERAL ASPECTS

(Helsinki, 1993)

1 Purpose

Facsimile is the most important non-voice application on international PSTN and the most widely used standard is group 3 facsimile. This Recommendation is aimed at forming a framework for Recommendations on facsimile quality of service on PSTN.

2 Introduction

The following aspects of facsimile performance issues are considered:

1) connection establishment and disconnection;

2) message transmission;

3) methods, procedures and instrumentation for facsimile performance caracterization;

4) facsimile troubles.

Facsimile terminal performance issues not related to the network are not considered in this Recommendation. Uniformly, the terminology of Recommendations T.30 and T.4 have been employed.

In the following clauses, each of these major issues are considered in detail.

3 Connection establishment and disconnection

Facsimile connection establishment is defined in phase A of Recommendation T.30. Usually in PSTN (see Notes 1 and 2) no distinction is made between the connection establishment and the disconnection performance for voice and facsimile calls.

NOTES

1 Certain Administrations give special treatment to facsimile by special numbering/access/methods. Such special treatments could produce performance and performance issues that are different from those of normal PSTN facsimile calls. These special treatments are not considered here.

2 It is assumed that in manual operation at the receive terminal there are no operator errors or equipment malfunction after off-hook and that the CED is transmitted as specified in Recommendation T.30. In automatic operation, it is assumed that the machine is working and goes off-hook and transmits the CED signal. It is further assumed that the terminals operate in accordance with all other aspects of Recommendation T.30.

The following parameters can be studied under connection establishment:

1) start dial signal delay and post dialling delay (using the terminology in proposed Recommendation E.431 for calls on PSTN);

2) facsimile phase A completion rate.

3.1 Start dial signal delay and post dialling delay

Start dial signal delay (SDSD) and post dialling delay (PDD) issues for voice and facsimile are similar for PSTN calls (see Note 1 in clause 3). At present, we shall follow proposed Recommendation E.431 for these parameters, and fascimile specific issues for these parameters, if any, will be considered in the future.

3.2 Facsimile phase A completion rate

Usually facsimile phase A completion rate is the same as call completion rate for voice calls [see Notes 1 and 2 in clause 3) and see the Note below].

NOTE – There could be facsimile phase A completion failure because of interaction between the network and facsimile protocol. Such failures will be considered in the future Handbook of facsimile performance.

The phase A completion rate depends on such factors as end-to-end blocking, dialling of the correct number by the customer (see Notes 1 and 2), the ability of the network to deliver the call to the correct B-party number without wrong numbers, etc. Voice call completion rates are extensively studied in other E-Series Recommendations and will therefore not be studied separately except in those cases where there is a facsimile specific issue.

4 Message transmission

The key performance parameters considered under message transmission are:

1) facsimile call cut-offs (phases B through D);

2) facsimile modem speed and transaction times;

3) facsimile image quality as impacted by transmission impairments.

Facsimile call cut-offs (phases B through D) are discussed in detail in proposed Recommendation E.451. In that Recommendation a set of rules for facsimile test calls are formulated. Based on these test calls, certain types of call failure modes are discussed and cut-off ratios defined. While the focus is on cut-off measurements from test calls, comments are also made on cut-off data obtained from other sources such as facsimile terminal reports.

Facsimile modem speed distributions and transaction times are studied under proposed Recommendation E.452. Facsimile modem speed reductions and increased transaction time are important parameters when measuring the performance of networks carrying group 3 facsimile. The purpose of Recommendation E.452 is to develop modem speed and transaction time metrics that can be used to describe the performance of transmission networks with respect to group 3 facsimile.

Further work is planned to study the impact of transmission impairment induced scan line errors on facsimile image quality. Facsimile image quality issues dependent purely on the terminal characteristics, are not planned to be studied in this Recommendation. Error correction mode based image quality metrics, are for further study.

5 Methods, procedures and instrumentation for facsimile performance characterization

Facsimile performance may be characterized by

1) measurements made using test facsimile machines using test procedures specified in Recommendations E.451, E.452 and other future Recommendations;

2) in-service performance measurements using network based performance analysis systems;

3) facsimile terminal reports.

Each of these methods has its own advantages and disadvantages. The general methodology for each of these methods of characterization, preferred modes of operation, range of validity of results, etc., are for further study.

6 Facsimile troubles

Facsimile has a complex protocol that can interact with a variety of network elements and impairments to produce unsatisfactory quality. Frequently, the troubles are severe enough that specific actions to identify and resolve troubles have to be taken. In early 1990's, many of the severe troubles have been associated with facsimile call cut-offs; however, severe troubles related to poor image quality and excessive transaction times are also known. This matter is planned to be discussed in the future Handbook of facsimile performance.

Annex A

Glossary of terms and abbreviations for E.450-Series Recommendations

(This annex forms an integral part of this Recommendation)

CED Called station identification

CFR Confirmation to receive

CFS Conditional facsimile success ratios

CIG Calling subscriber identification

CNG Calling tone

CPE Customer premises equipment

CRP Command repeat

CSI Called subscriber identification

CTC Continue to correct

CTR Response to continue to correct

DCN Disconnect

DCS Digital command signal

DIS Digital identification signal

DTC Digital transmit command

ECM Error correction mode

EOM End-of-message

EOP End-of-procedure

EOR End-of-retransmission

ERR Response for end-of-transmission

FCF Facsimile control field

FCS Frame check sequence

FIF Facsimile information field

FTT Failure to train

GC Group command

GI Group identification

HDLC High level data link control

LCS Line conditioning signals

MCF Message confirmation

MPS Multipage signal

NSC Non-standard facilities command

NSF Non-standard facilities

NSS Non-standard facilities set-up

PACR Phase A completion rate

PDD Post dialling delay

PIN Procedure interrupt negative

PIP Procedure interrupt positive

PIS Procedure interrupt signal

PPR Partial page request

PPS Partial page signal

PRI Procedure interrupt

PSTN Public switched telephone network

RNR Receiver not ready

RTN Retrain negative

RTP Retrain positive