INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

E.450

(03/98)

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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Facsimile quality of service on public networks – General aspects

ITU-T Recommendation E.450

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION E.450

FACSIMILE QUALITY OF SERVICE ON PUBLIC NETWORKS – GENERAL ASPECTS

Summary

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. A roadmap of the E.450-series Recommendations is shown in Figure 1.

Source

ITU-T Recommendation E.450 was revised by ITU-T Study Group 2 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 9th of March 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.450

FACSIMILE QUALITY OF SERVICE ON PUBLIC NETWORKS – GENERAL ASPECTS

(Helsinki, 1993; revised in 1998)

1 Scope

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. A roadmap of the E.450-Series Recommendations is shown in Figure 1.

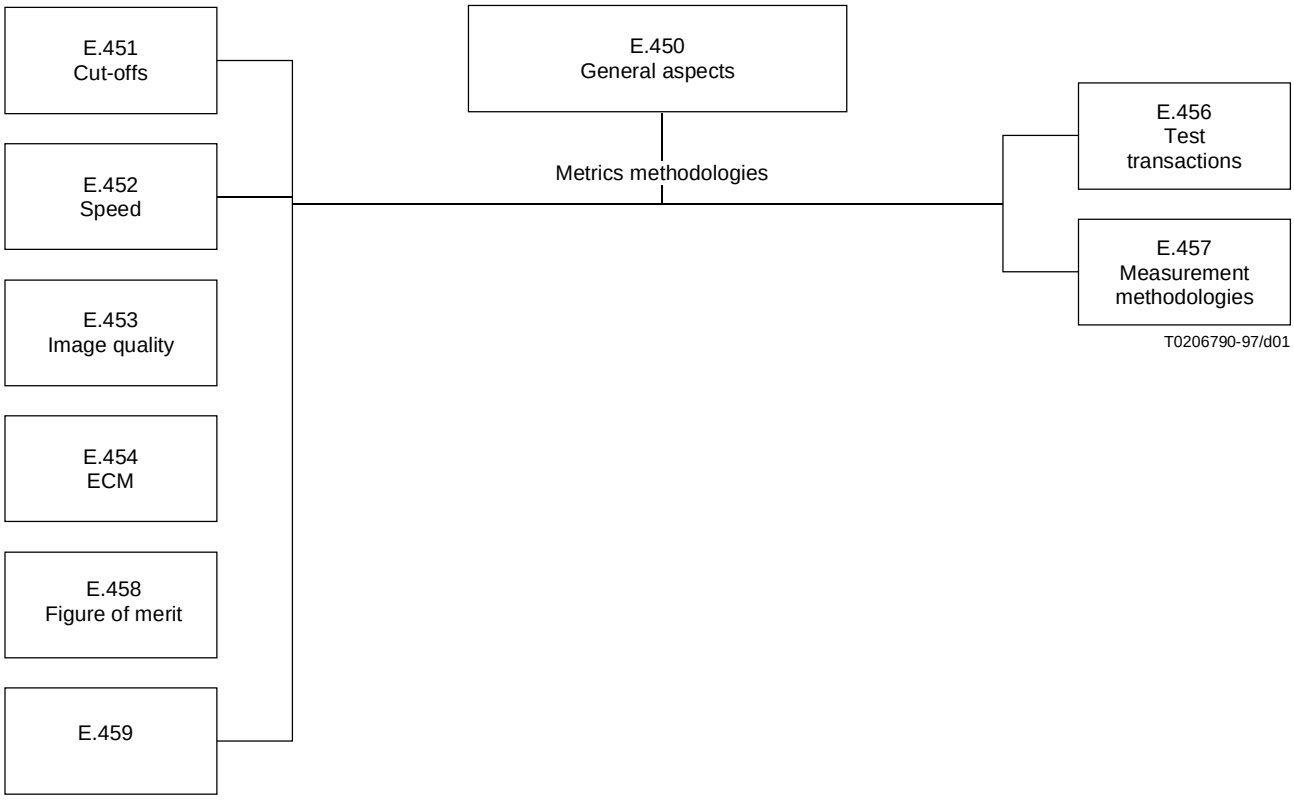

Figure 1/E.450 – Roadmap for E.450-Series Recommendations – Facsimile quality of service

2 Introduction

The following aspects of facsimile performance issues are considered:

1) connection establishment and disconnection;

2) message transmission;

3) methods and procedures for facsimile performance characterization.

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 described as phase A in clauses 2/T.30 and 3/T.30. Usually in the PSTN (see Notes 1 and 2) no distinction is made between the connection establishment and the disconnection performance for voice and facsimile calls.

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

NOTE 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 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 Recommendation E.431 for these parameters.

3.2 Facsimile phase A completion rate

Usually the facsimile phase A completion rate is the same as the 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 failures because of interaction between the network and facsimile protocol.

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 in clause 3), 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, as described in clauses 2/T.30 and 3/T.30);

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 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.

Facsimile modem speed metrics and transaction times are studied under 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.

Recommendation E.453 defines metrics for facsimile image quality based on the impact of transmission impairment induced scan line errors. Page and transaction metrics are defined based on the number and distribution of errored scan lines.

Recommendation E.458 defines a figure of merit. In that Recommendation, facsimile transaction types have been classified in seven categories depending on whether the transaction was completed without cut-offs, whether or not the speed dropped down and whether or not there was degradation in image quality.

Recommendation E.454 defines several transmission metrics for error correction mode facsimile. Performance parameters defined in Recommendations E.451, E.452 and E.453 have been modified to accommodate the error correction and partial page characteristics of ECM facsimile.

Recommendation E.456 defines test transactions for characterizing facsimile transmission performance.

Recommendation E.457 provides an overview of various measurement methodologies for G3 facsimile transmission performance. That Recommendation evaluates the advantages and disadvantages of test-call based, non-intrusive, mixed-mode and terminal based measurements. Test planning aspects including planning approach, measurement topology, test location points, and some statistical aspects are described.

Recommendation E.459 defines measurements and metrics for characterizing facsimile transmission performance using non-intrusive techniques. Non-intrusive measurements are typically made from within a network and derive data from the signals exchanged by the communicating fax terminals. Large amounts of data can be collected providing a broad view of network performance. Non-intrusive data may be impacted by customer behaviour and network/terminal interactions.

Annex A

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

CED Called Station Identification

CFR Confirmation to Receive

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-Retransmission

FCF Facsimile Control Field

FCS Frame Check Sequence

FIF Facsimile Information Field

FTT Failure to Train

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

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