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QUALITY OF SERVICE, NETWORK MANAGEMENT AND TRAFFIC ENGINEERING

FIGURE OF MERIT FOR FACSIMILE TRANSMISSION PERFORMANCE

ITU-T Recommendation E.458

(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.458 was prepared by ITU-T Study Group 2 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the19th 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.

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SUMMARY

This Recommendation introduces metrics for Figure of Merit (FOM) for end-to-end facsimile transmission performance. The Recommendation is intended to facilitate the exchange of network performance data by Recognized Operating Agencies with the aim of improving service quality. The FOM is defined through seven different transaction types that can result from a facsimile transaction. The transaction types are based on call cut-offs, transmission speed reduction and image quality. They range from Type I (considered to be "perfect") to Type VII (not completed). The FOM measurements are based on intrusive measurements (i.e. test calls).

FOM metrics for non-intrusive measurements and transactions using ECM are for further study. FOM metrics for transactions not using wired access are also for further study.

Recommendation E.458

FIGURE OF MERIT FOR FACSIMILE TRANSMISSION PERFORMANCE

(Geneva, 1996)

1 Introduction

The purpose of this Recommendation is to introduce metrics for Figure of Merit (FOM) for end-to-end facsimile transmission performance. The Recommendation is intended for use by Recognized Operating Agencies (ROAs) to exchange network performance data for service improvement purposes. In previous Recommendations E.451, E.452, E.453 and E.456, facsimile metrics such as facsimile call cut-offs, modem speed reduction and image quality based on scan line errors and test transactions, respectively, were defined. It would be very useful to produce simple metrics for facsimile FOM that combine all three parameters so that performance of networks can be compared easily and corrective action taken to improve performance. End-to-end facsimile performance includes performance impacts both due to the network and the facsimile terminals. However, when a fixed set of test terminals with nominal terminal performances are used, it is possible to treat the terminal performance as a constant factor and compare network performances. The impact of terminal performance on facsimile call cut-offs, modem speed reduction and image quality are more fully discussed in Recommendations E.451, E.452 and E.453.

The FOMs considered so far do not address factors such as network blocking, etc. However, the FOMs can be multiplied by the Phase A Completion Ratio, PACR (see Recommendation E.451) to obtain a combined view of call completion and facsimile transmission performance.

The facsimile Figures of Merit are defined through seven different transaction types. Type I transaction is one that is complete, the speed is maximum possible and the image quality is error-free for all pages. Type I transaction can be considered to be “PERFECT” from a transmission point of view. Type II transactions are complete, the speed is maximum possible but the transactions contained errored but not severely errored pages. In a similar fashion, another five transaction types have been defined depending on whether the transaction is complete, the speed is the maximum possible and the image quality is error-free, errored or severely errored. ROAs, depending upon their need, may exchange information on some transaction type or combinations of transaction types for service improvement purposes.

For the present, this Recommendation does not address the customer preference weights that could be assigned to different performance parameters such as cut-off, speed and image quality. The main reasons are that customer weights may show considerable variation depending upon the customer base, the type of application, national expectations, etc. A large, complex study would be required to obtain a comprehensive view of customer perception. This subject is left for future study.

Facsimile FOM for ECM transmission and non-intrusive measurements are for further study. FOM for services not using wired access, (e.g. mobile) are also for further study.

2 Definitions

As in Recommendation E.451, we begin by considering transactions where the intended receiving facsimile terminal has responded by going off-hook and CED has been received at the originating terminal. Table 1 defines seven transaction types that can be used to define facsimile Figures of Merit. The maximum speed of a facsimile transaction is defined as the speed used for the initial TCF message as discussed in Recommendation E.452.

TABLE 1/E.458

Transactions type for facsimile Figures of Merit

Transaction type	Complete	Maximum speed	Image quality
I	Yes	Yes	ERROR-FREE
II	Yes	Yes	ERRORED
III	Yes	Yes	SEVERELY ERRORED
IV	Yes	No	ERROR-FREE
V	Yes	No	ERRORED
VI	Yes	No	SEVERELY ERRORED
VII	No	Not applicable	Not applicable

NOTES

1 ERROR-FREE, ERRORED and SEVERELY ERRORED transactions are as defined in Recommendation E.453.

2 If the transaction is incomplete, it is categorized as Type VII irrespective of the speed and image quality of the completed pages.

3 Remarks

a) ROAs, depending upon their need, may exchange information on some transaction types or combinations of transaction types. Some useful transaction types and combinations are suggested in the following:

- Type I transaction are those that complete, have the highest possible speed and are error-free, i.e. these can be considered “PERFECT” from a transmission point of view.
- A combination of Type I and Type II transactions are those that complete, have the highest possible speed and do not have any severely errored pages. For most facsimile applications, the transmissions maintain their utility to the customer, i.e. they can be considered “EFFECTIVE”.
- A combination of Types IV, V and VI represents transactions that have speed fallbacks and result in longer connection times.
- A combination of Type III, VI and VII represent transactions that are “BADLY” damaged in some form. ROAs may wish to exchange this information with a view to take prompt corrective actions.

b) FOM for a particular network may be strongly impacted by the facsimile modem speed, i.e. the speed set by the first TCF, used by the test terminals. For example, the FOM for test terminals employing V.17 modem modulation may be different from that for test terminals employing V.29 modulation. It is recommended that FOM be evaluated separately depending on the speed of the initial TCF of the test terminals.

c) The FOM metrics defined in this Recommendation apply, in general, to any type of transmission media. However, the targets for the FOM metrics that the ROAs set may depend on the media type, the operational (e.g. maintenance) cost for meeting the targets, expectations of their customers regarding facsimile quality, etc.

d) For network improvement purposes, it may be necessary to further breakdown transactions that were not of Type I to understand the root causes for the imperfections. Service improvement actions can be taken based on the root causes and priorities assigned to different types of failure. ROAs can set these priorities based on customer-related factors such as customer complaint rate for various types of failures, the quality of the underlying network, the economics for improving a particular performance metric, etc.