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SERIES E: OVERALL NETWORK OPERATION,
TELEPHONE SERVICE, SERVICE OPERATION AND
HUMAN FACTORS

Quality of service, network management and traffic
engineering – Traffic engineering – Determination of the
number of circuits in automatic and semi-automatic
operation

Overflow approximations for non-random inputs

ITU-T Recommendation E.524

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION E.524

OVERFLOW APPROXIMATIONS FOR NON-RANDOM INPUTS

Summary

To ensure accurate network design and planning in the presence of multiple streams (arising, e.g. from different services on the same network), it is imperative to determine the individual means and variances of the overflows of the different traffic streams offered to a common trunk group arrangement. The exact calculation of these parameters for the individual overflow streams is a very hard problem. Thus, this Recommendation introduces different approximate methods for the calculation of the individual overflows. These methods are evaluated in terms of accuracy, processing time, memory requirements and programming effort. This Recommendation also provides sample numerical results based on exact calculations to which the results based on these methods may be compared.

Source

ITU-T Recommendation E.524 was revised by ITU-T Study Group 2 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 10th of May 1999.

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 term *recognized operating agency (ROA)* includes any individual, company, corporation or governmental organization that operates a public correspondence service. The terms *Administration*, *ROA* and *public correspondence* are defined in the *Constitution of the ITU (Geneva, 1992)*.

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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.524**OVERFLOW APPROXIMATIONS FOR NON-RANDOM INPUTS***(revised in 1999)***1 Scope**

This Recommendation introduces approximate methods for the calculation of means and variances of overflows for individual (non-random) traffic streams offered to a circuit group arrangement.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- CCITT Recommendation E.521 (1988), *Calculation of the number of circuits in a group carrying overflow traffic.*
- ITU-T Recommendation E.600 (1993), *Terms and definitions of traffic engineering.*

3 Terms and definitions

General terms and definitions are given in Recommendation E.600; notations used in the description of the proposed methods appear with the methods themselves in clause 6.

4 Abbreviations

This Recommendation uses the following abbreviations:

AWW	approximate Wilkinson Wallström
EC	equivalent capacity
EPS	equivalent Poisson stream
ERT	equivalent random traffic
IPP	interrupted Poisson process

5 Introduction

This Recommendation provides approximate methods for the calculation of means and variances of overflows for individual (non-random) traffic streams in a circuit group arrangement.

The considered methods are necessary complements to those included in the existing Recommendation E.521 where it is required to take into account concepts such as cluster engineering with service equalization, service protection and end-to-end grade of service. Recommendation E.521 is then insufficient as it is concerned with the grade of service for only one non-random traffic stream in a circuit group.