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SERIES E: TELEPHONE NETWORK AND ISDN

Quality of service, network management and traffic
engineering – Traffic engineering – ISDN traffic
engineering

Methods for allocating and dimensioning Intelligent Network (IN) resources

ITU-T Recommendation E.734

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION E.734

METHODS FOR ALLOCATING AND DIMENSIONING INTELLIGENT NETWORK (IN) RESOURCES

Summary

This Recommendation provides an overview of typical considerations which are useful in network planning for the initial deployment and subsequent growth of networks based on Intelligent Network architectures, including considerations of interworking with existing PSTN/ISDN infrastructures.

It addresses methods for analysing network infrastructure requirements and detailed dimensioning of Intelligent Network nodes to accommodate expected traffic loads for services offered by a given network.

Source

ITU-T Recommendation E.734 was prepared by ITU-T Study Group 2 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 8th of October 1996.

FOREWORD

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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).

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.

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Recommendation E.734**METHODS FOR ALLOCATING AND DIMENSIONING
INTELLIGENT NETWORK (IN) RESOURCES***(Geneva, 1996)***1 Scope**

This Recommendation provides an overview of typical considerations which are useful in network planning for the initial deployment and subsequent growth of networks based on Intelligent Network (IN) architectures.

Because the various relationships between Intelligent Network functional entities can be implemented using different kinds of subnetworks, an important consideration is interworking with existing PSTN/ISDN infrastructures. Moreover, this Recommendation deals primarily with implementations using SS No. 7 signalling subnetworks but does not imply that these are the only implementations.

Networks providing IN services may also provide basic PSTN/ISDN services. Network elements providing IN services may also provide non-IN functions. Dimensioning of IN-structured networks thus should consider all demands on network elements. Recognizing that appropriate procedures exist for dimensioning the basic PSTN/ISDN, this Recommendation identifies the extra calculation procedures required to address the needs for IN services.

Note also that this Recommendation is developed in the context of IN Capability Set 1.

In this Recommendation, references to various networks (including Intelligent Networks and signalling subnetworks) and any implied network boundaries are not intended to have any ownership or regulatory significance. Such issues may have operational implications, but such matters are outside the scope of this Recommendation.

2 References

The following 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.

- ITU-T Recommendation E.492 (1996), *Traffic reference period*.
- CCITT Recommendation E.508 (1992), *Forecasting new telecommunication services*.
- CCITT Recommendation E.520 (1988), *Number of circuits to be provided in automatic and/or semiautomatic operation, without overflow facilities*.
- CCITT Recommendation E.522 (1988), *Number of circuits in a high-usage group*.
- ITU-T Recommendation E.724 (1996), *GOS parameters and target GOS objectives for IN services*.
- ITU-T Recommendation E.733 (1996), *Methods for dimensioning resources in Signalling System No. 7 networks*.

- ITU-T Recommendation Q.1200 (1993), *Q-series intelligent network Recommendation structure*.
- ITU-T Recommendation Q.1205 (1993), *Intelligent network physical plane architecture*.
- ITU-T Recommendation Q.1211 (1993), *Introduction to intelligent network Capability Set 1*.
- ITU-T Recommendation Q.1215 (1995), *Physical plane for intelligent network CS-1*.

3 Definitions

Definitions of Intelligent Network terms can be found in the Recommendations listed in clause 2 – in particular, see Recommendation Q.1215 for definitions of the following terms:

- Service Switching Point (SSP);
- Service Control Point (SCP);
- Service Data Point (SDP); and
- Intelligent Peripheral (IP).

4 Abbreviations

For the purposes of this Recommendation the following abbreviations are used.

CS-1	Capability Set 1
GOS	Grade of Service
IN	Intelligent Network
IP	Intelligent Peripheral
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
MTP	Message Transfer Part
PSTN	Public Switched Telephone Network
SCCP	Signalling Connection Control Part
SCE	Service Creation Environment
SCEF	Service Creation Environment Function
SCF	Service Control Function
SCP	Service Control Point
SDF	Service Data Function
SDP	Service Data Point
SIB	Service Independent Building Block
SMAF	Service Management Access Function
SMF	Service Management Function
SP	Signalling Point
SRF	Specialized Resource Function
SS No. 7	Signalling System No. 7
SSF	Service Switching Function

SSP	Service Switching Point
STP	Signalling Transfer Point
TCAP	Transaction Capabilities Application Part
UPT	Universal Personal Telecommunication

5 Introduction

This clause describes the aims of this Recommendation, which deals with resource allocation and dimensioning methods for Intelligent Networks.

Resource allocation encompasses the methods for locating IN-specific elements and for partitioning Intelligent Network functionality (such as service logic) among these elements. Dimensioning determines the sizing of network components.

In the case of Intelligent Networks, as for the PSTN/ISDN, traffic engineering activities involve the interplay of three factors: performance objectives, traffic forecasts, and resource allocation/dimensioning. Recommendation E.724 deals with GOS parameters and performance objectives; this Recommendation deals with traffic forecasts and resource allocation/dimensioning.

Subclause 5.1 discusses the new traffic engineering considerations needed to address Intelligent Network deployment; subclause 5.2 briefly describes the approach to resource allocation/dimensioning.

Clause 6 elaborates on how to assess service loads and message flows in the network.

Clause 7 discusses the subject of resource allocation in more depth; subclause 7.1 covers the general factors to be considered while subclause 7.2 details particular issues relating to SSPs, SCPs, SDPs, and IPs.

Clause 8 discusses various aspects of dimensioning the circuit-switched subnetwork and IN-specific components as well as the supporting signalling subnetwork.

Clause 9 provides for each network some general guidelines on re-dimensioning. The intent is to facilitate the exchange of information between network operators and equipment manufacturers – and not to provide an exhaustive analysis of network planning tools for particular networks and specific IN implementations.

5.1 New traffic engineering factors in Intelligent Networks

The deployment of Intelligent Network services introduces some new aspects into traffic engineering. This encompasses PSTN/ISDN subnetwork issues and the important subject of re-dimensioning.

IN-based services are normally incremental to existing PSTN/ISDN networks, but traffic engineering and resource allocation/dimensioning for networks offering IN-based services involve several new factors to be considered in planning and managing IN networks.

In an Intelligent Network environment, the following factors have an impact on traffic models and traffic forecasts:

- *Distribution of the Busy Hour Call Attempt rate (BHCA)*

The dimensioning process for IN should take into account that the BHCA for IN services may have characteristics which differ from those adopted for PSTN. Some IN services, like Private Virtual Networks, have peaks during normal working hours, while services like

Televoting are generally concentrated in the evening. Therefore, it is necessary to analyse the distribution of the BHCA in order to derive traffic loads for the dimensioning process.

– *Traffic characteristics*

The characteristics of the distribution of the call arrival process for some IN services may deserve special attention. The Poissonian assumptions adopted for the PSTN may not apply for all IN services. Also, IN services which may lead to mass calling situations must be carefully considered.

– *Traffic loads*

In the PSTN, the dimensioning of network elements is made based on call attempt rates and average holding times. These values are approximately known and used as input values. In an IN environment, however, the services may have differing degrees of complexity. A simple IN service such as number translation, with high call attempt rate, may have the same impact on the network as a complex service with a relatively low call attempt rate.

– *Call processing logic*

With IN-based services, call processing logic is no longer provided only by switching nodes acting sequentially on a given call. Instead, call processing logic may be distributed over other nodes such as SCPs and IPs. In general, while the call processing logic may be described independently of the network architecture, planning for the implementation of a given service requires the specification of service logic functions and the assignment, or allocation, of these functions to particular network nodes. Thus, IN-based services generate a new requirement within service design and implementation: namely, allocation of call processing logic to appropriate network nodes.

– *Call processing data*

In the same way that IN-based service logic may be distributed over various network nodes, the specific data used by the call processing logic may also be distributed, and will not necessarily duplicate the distribution of service logic. Thus, IN-based services generate a second allocation requirement: namely, allocation of the storage locations for data required for call processing.

– *Communication paths*

The distributed nature of the call processing logic and data generates additional signalling traffic (typically on an SS No. 7 subnetwork) and additional circuit-switched traffic (for example, to establish communication paths to IPs). These new parcels of traffic need to be characterized, and new dimensioning procedures may be required when IN-based services are added to existing PSTN/ISDN.

– *New network elements and functions*

The new network architecture for IN-based services includes several new network elements (such as IPs and SCPs) and new functions for existing nodes (such as local and transit exchanges). These new nodes and functions require appropriate dimensioning guidelines for use in planning, implementing and providing new IN-based services.

The Intelligent Peripheral is a new element associated with the delivery of IN-services requiring interaction with the user as part of the call set-up process, and the Service Control Points (SCPs) provide the distributed service logic to support IN-based services. Other components, such as Signalling Transfer Points (STPs) and their interconnecting links may already be present in some pre-IN networks or may be dedicated to message processing only for IN-based services.