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SERIES E: TELEPHONE NETWORK AND ISDN

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

Network grade of service parameters and target values for maritime and aeronautical mobile services

ITU-T Recommendation E.774

ITU-T E-SERIES RECOMMENDATIONS

TELEPHONE NETWORK AND ISDN

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ITU-T RECOMMENDATION E.774

NETWORK GRADE OF SERVICE PARAMETERS AND TARGET VALUES FOR MARITIME AND AERONAUTICAL MOBILE SERVICES

Summary

This Recommendation identifies the Grade of Service (GOS) parameters and associated target values for circuit-switched services in both satellite- and terrestrial-based maritime and aeronautical systems. The GOS parameters and target values are confined to the mobile network segment of end-to-end connections.

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 (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.774

NETWORK GRADE OF SERVICE PARAMETERS AND TARGET VALUES FOR MARITIME AND AERONAUTICAL MOBILE SERVICES

(Geneva, 1996)

1   Scope

This Recommendation outlines the general consideration for identifying Grade of Service (GOS) parameters for the maritime and aeronautical circuit-switched services and defines the target values under normal and heavy traffic load conditions.

These parameters are defined – and their target values specified – assuming that the network and the network components are operating in their normal mode (i.e. are fully operational). Further, the parameters and their target values assume normal (as opposed to distress or emergency) traffic.

Mobile services in terrestrial- and satellite-based maritime and aeronautical systems can be circuit- or packet-switched. This Recommendation is initially concerned with circuit-switched user plane traffic and normal (as opposed to distress and safety) traffic. Packet-switched traffic is for further study. This Recommendation is applicable to the terrestrial/satellite subsystem.

2   Related Recommendations

The following Recommendations contain material that is either relevant to or provides background for this Recommendation:

–   CCITT Recommendation E.500 (1992), *Traffic intensity measurement principles*.

–   ITU-T Recommendation E.600 (1993), *Terms and definitions of traffic engineering*.

–   ITU-T Recommendation E.751 (1996), *Reference connections for traffic engineering of land mobile networks*.

–   ITU-T Recommendation E.752 (1996), *Reference connections for traffic engineering of maritime and aeronautical systems*.

–   ITU-T Recommendation E.770 (1993), *Land mobile and fixed network interconnection traffic grade of service concept*.

–   ITU-T Recommendation E.771 (1996), *Network grade of service parameters and target values for circuit-switched public land mobile services*.

–   ITU-T Recommendation E.773 (1996*), Maritime and aeronautical mobile grade of service concept*.

–   ITU-T Recommendation F.110 (1996), *Operational provision for the maritime mobile service*.

3   Definitions

Definitions relevant to this Recommendation are contained in Recommendation E.752. The following definitions complement those in Recommendation E.752.

3.1   normal traffic load[1]: Average of all week days busy hour traffic for the three busiest months of the year excluding December – (Average Busy Season Busy Hour, ABSBH).

3.2   high traffic load[1]: Mean of the three highest busy hour traffic in the same period as the normal load subject to the condition that the three values fall on different days – (Highest Busy Season Busy Hour, HBSBH).

4   Abbreviations

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

ABSBH   Average Busy Season Busy Hour

AES   Aircraft Earth Station

GES   Ground Earth Station

GOS   Grade of Service

GS   Ground Station

HBSBH   Highest Busy Season Busy Hour

LES   Land Earth Station

SES   Ship Earth Station

TSS   Terrestrial/Satellite Subsystem

5   Introduction

This Recommendation proposes network Grade of Service (GOS) parameters and target values for both satellite- and terrestrial-based maritime/aeronautical mobile networks. Although these systems provide circuit- and packet-switched services, this Recommendation defines the parameters and the target values only for the circuit-switched traffic. The parameters and target values for the signalling traffic are covered under separate Recommendations.

Note that in aeronautical mobile-satellite systems the high traffic load (HBSBH) is typically 30% greater than the normal traffic load (ABSBH). Hence the GOS criteria for the ABSBH typically would not meet that of HBSBH and therefore the aeronautical mobile-satellite systems must be dimensioned for the HBSBH.

This Recommendation covers GOS parameters and target values for both terrestrial- and satellite-based mobile networks.

6   GOS parameters and target values

6.1   GOS parameters

The GOS parameters for circuit-switched traffic specified on an end-to-end basis depend on a number of factors. These include user behaviour, routing arrangements such as priority offered in the

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[1] This definition is derived from Recommendation E.500, modified to reflect the peculiar diurnal and
     seasonal profile of mobile satellite telecommunications using SCPC (Single Channel Per Carrier) demand
     assigned channel allocation.

different stages of connection, and the time difference between busy hours associated with different segments of the connection.

A successful call attempt is one for which the system has successfully assigned a channel and routed a call attempt to the designated terminal address. A non-pre-empted call attempt to a busy end-user should be treated as successful from the viewpoint of the GOS performance.

In this Recommendation, the following traffic GOS parameters are specified for mobile circuit-switched services.

–   probability of link blocking for the terrestrial/satellite subsystem;

–   probability of blocking at LES/GES;

–   probability of unsuccessful handover for terrestrial-based systems;

–   authentication delay.

6.1.1   Probability of link blocking for the terrestrial/satellite subsystem

Probability that an offered call will be blocked (loss probability) during the busy hour due to shortage of satellite/terrestrial circuits in the terrestrial/satellite subsystem segment. Different GOS target values for link blocking probability are applicable to carry Average Busy Season Busy Hour (ABSBH) traffic and Highest Busy Season Busy Hour (HBSBH) traffic.

6.1.2   Probability of blocking at LES/GES

Probability that an offered call will fail due to shortage of channel units and terrestrial link to fixed network at LES/GES in the ground subsystem. As in the case of the probability of link blocking for the terrestrial/satellite subsystem, the target values are defined for ABSBH and HBSBH traffic load conditions.

6.1.3   Probability of unsuccessful handover for terrestrial based systems

This parameter is the probability that a handover attempt fails because of lack of radio resources in the target cell, or because of a lack of free resources for establishing the new network connection. The failure condition is based either on a specified time interval since the handover request was first issued or on a threshold on signal strength. (Satellite-based systems can be designed without the possibility of handover between spot beams, e.g. the original Inmarsat system.)

6.1.4   Authentication delay

Authentication of an automatic credit/charge/calling card call, originating from a mobile station involves a preliminary (format) verification at the SES/AES before the information is passed to the LES/GES for further processing.

Authentication delay is defined as the time elapsed since the initial verification is performed at the LES/GES to the time the caller receives the authentication message. The final responsibility for meeting the target value for the authentication delay rests with the mobile service provider, although the total authentication procedure may be accomplished by using a combination of mobile and fixed network facilities. These latter are credit card agency database systems chosen by the mobile service provider and typically contribute a substantial portion to the overall authentication delay.

The GOS parameters recommended for maritime and aeronautical circuit switched-services are summarized in Table 1.

TABLE 1/E.774

GOS parameters for maritime and aeronautical mobile services

GOS parameters	Terrestrial mobile network			Satellite mobile network		
	M-F	F-M	M-M	M-F	F-M	M-M
Probability of link blocking for terrestrial/satellite subsystem	A	A	A	A	A	A
Probability of blocking at LES/GES	A	A	A	A	A	A
Probability of unsuccessful handover	FS	FS	FS	NA	NA	NA
Authentication delay for mobile originated credit card calls	FS	FS	FS	A	NA	A
M-F Mobile-to-Fixed network						
F-M Fixed network-to-Mobile						
M-M Mobile-to-Mobile						
A Applicable						
NA Not Applicable						
FS Further Study						

6.2   Target values for GOS parameters

GOS target values for circuit-switched services are given in Table 2.

TABLE 2/E.774

Target values for GOS parameters - circuit-switched services

GOS parameters	Terrestrial mobile network		Satellite mobile network	
	Maritime	Aeronautical	Maritime	Aeronautical
Probability of Link blocking for terrestrial/satellite Subsystem	FS	FS		
Normal Load			2%	2%
High Load			10%	10%
Probability of blocking at LES/GES	FS	FS		
Normal Load			1%	1%
High Load			2%	2%
Probability of unsuccessful handover	FS	FS	NA	NA
Authentication delay (only for mobile originated calls, normal and high load)	FS	FS	95% of calls to be authenticated within ≤15.0 secs	95% of calls to be authenticated within ≤12.0 secs
NA Not Applicable				
FS Further Study				
NOTE – Authentication delay refers to the overall delay as defined in 6.1.4.				

7   History

This is the first issue of Recommendation E.774.

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