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TELEPHONE NETWORK AND ISDN

QUALITY OF SERVICE, NETWORK MANAGEMENT AND TRAFFIC ENGINEERING

UPT GRADE OF SERVICE CONCEPT

ITU-T Recommendation E.775

(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.775 was prepared by ITU-T Study Group 2 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 19th of February 1996.

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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 outlines the general considerations for selecting UPT (Universal Personal Telecommunication) traffic GOS parameters based on the service provisioning and operational environment for UPT and the associated network considerations.

UPT GRADE OF SERVICE CONCEPT

(Geneva, 1996)

1 Scope

This Recommendation outlines the general considerations for selecting UPT traffic GOS parameters based on the service provisioning and operational environment for UPT, and the associated network considerations. The reference connection provided in Recommendation E.755 reflects some of these operational/network factors.

Although it is realized that supplementary services, e.g. Call Forwarding, could have an impact on the GOS as perceived by the user, the scope of this Recommendation is initially limited to basic services.

2 Related Recommendations

The following Recommendations are the ones applicable at the time of publication of this Recommendation and contain material that is either relevant to or provides background for this Recommendation.

– ITU-T Recommendation E.168 (1993), *Application of E.164 numbering plan for UPT*.

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

– CCITT Recommendation E.720 (1988), *ISDN grade of service concept*.

– CCITT Recommendation E.721 (1991), *Network grade of service parameters and target values for circuit-switched services in the evolving ISDN*.

– ITU-T Recommendation E.755 (1996), *Reference connections for UPT traffic performance and GOS*.

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

– ITU-T Recommendation E.771 (1993), *Network grade of service parameters and target values for circuit-switched land mobile services*.

– ITU-T Recommendation F.850 (1993), *Principles of Universal Personal Telecommunication (UPT)*.

– ITU-T Recommendation F.851 (1995), *Universal Personal Telecommunication (UPT) – Service description (service set 1)*.

– ITU-T Recommendation I.373 (1993), *Network capabilities to support Universal Personal Telecommunication (UPT)*.

– ITU-T Recommendation I.114 (1993), *Vocabulary of terms for universal personal telecommunication*.

– CCITT Recommendation Q.1201 (1992), *Principles of intelligent network architecture*.

3 Definitions

For the purposes of this Recommendation, definitions provided in Recommendations E.600, E.721, I.114 and F.851 will be applicable.

4 Abbreviations

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

GOS   Grade of Service

IN   Intelligent Network

ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
PLMN	Public Land Mobile Networks
PSTN	Public Switched Telephone Network
SS No. 7	Signalling System No. 7
TCAP	Transaction Capabilities Application Part
UPT	Universal Personal Telecommunication

5 Introduction

UPT represents an emerging telecommunications service concept which will provide personal mobility and associated service portability features across both fixed and wireless access types using the advances in network intelligence and signalling. The Intelligent Network (IN) will support the necessary database requirements and provide personal mobility and call, connection and service management functions for UPT. The Signalling System No. 7 (SS No. 7) network, with suitable application protocols for UPT, will provide the messaging backbone for UPT service.

The scope of UPT includes provision of UPT service across multiple networks and different terminal types (fixed, mobile, portable). Thus, a UPT user can originate and receive calls, and access subscribed services in a network different from his home network, from a terminal designated by the user.

The primary service and network aspects that will influence UPT traffic performance and need to be considered in developing GOS parameters for UPT include:

- the IN and database architectures deployed for mobility management;

- the access security arrangements for authentication/verification of UPT users; and

- expected high penetration of wireless access in the network.

6 GOS issues for UPT

6.1 IN and database architecture considerations

The initial implementations of UPT can use simple database and signalling arrangements to provide personal mobility management functions within the current PSTN/ISDN capabilities. However, it is generally recognized that the evolving IN architecture is well suited for supporting these functions for UPT. The key impact of IN architecture, in terms of database location and information sharing strategies, will be on the overall messaging traffic in the signalling network (SS No. 7 network) which in turn will be reflected in traffic performance parameters like post-selection delay and answer signal delay perceived by the user.

UPT represents only one application (but an important one) within the common IN platform which will support a whole class of database-dependent services. Thus, UPT-related messages will constitute only a part of the messaging load on the signalling network. However, the traffic performance for UPT (e.g. post-selection delay for a UPT call) will be impacted by the total messaging load, as the UPT call related messages compete with other messages on the signalling network for common resources.

To a large extent, the overall signalling network performance studies and their impact on UPT traffic performance standards will evolve within the framework of general IN architecture and performance studies. Recommendation E.723 contains the SS No. 7 reference connections and performance targets for basic ISDN circuit-switched services (ISUP). However, with the increasing penetration of IN services that require database look-up for number translation and/or other call screening purposes, new reference connection models that include the database query-response aspects are needed.

As mentioned earlier, the messaging load on the signalling network generated by the mobility management requirements for UPT will depend on the database location and information sharing strategy deployed in the network. The database architecture could range from a single UPT database per network which is completely autonomous and does not share any of its information with other databases, to multiple UPT databases per network which share information with databases within a parent network as well as across other networks. The initial implementations (e.g. UPT Service Set 1) are expected to deploy centralized databases.

6.2   Access security requirements

Security of access to UPT service through some form of UPT-user authentication and verification procedure is required in order to protect the user's resources or information from unauthorized persons (fraudulent use), or from unauthorized listening or recording of information (eavesdropping). The access security procedures thus minimize the probability of incorrect charging, malicious call redirection and ensure integrity of user's information and privacy.

The access security procedures affect the UPT user's perception of service and suitable performance measures are needed to design such procedures. The primary performance parameters/measures in this category are:

- increased signalling network traffic load and resulting delay in call set-up;

- false rejection rate;

- imposter acceptance rate; and

- user authentication/verification delay.

The authentication/verification delay is defined as the time interval from the instant the UPT user starts the authentication process until the network communicates its final decision (acceptance or rejection) to the user. The authentication delay will add to the pre-selection or post-selection delay perceived by the UPT user depending on whether the authentication precedes or follows a request for an outgoing call by the UPT user.

In general there will be a trade-off between the false rejection (level of user annoyance) and imposter acceptance (breach of security) rates and also between the level of security (low imposter acceptance rate) and authentication delay.

6.3   Impact of wireless access arrangements

UPT traffic GOS Recommendations address end-to-end delay and blocking performance. It is then necessary to include in the relevant considerations the contribution of delay/blocking in the access network. As UPT service evolves, an increasing number of UPT calls will originate from and/or terminate on wireless terminals. It is therefore essential to include the additional delay/blocking contribution introduced by increasing penetration of mobile terminals and associated wireless access arrangements.

Wireless access combined with the use of pocket-sized terminals is viewed as a major driver for personal communications and for providing an impetus for rapid growth in wireless access and terminals in the network. Increased penetration of wireless access could impact end-to-end traffic performance perceived by UPT users due to potentially different bandwidth and signalling capabilities associated with wireless access, as well as increased signalling traffic for terminal location and call handover requirements.

The emerging wireless access systems will be deploying, among others, smaller cell sizes than the current mobile systems. The smaller cell sizes will result in increased signalling network traffic due to more frequent location updates and call handovers. This potential increase in signalling load results from the terminal mobility management requirements of wireless access and needs to be factored in when setting the delay targets for personal mobility management messages for UPT.

For the foreseeable future, many of the wireless applications (like cellular mobile) will have their own database arrangements to support terminal authentication and mobility functions (Authentication Centres, Home and Visitor Location Registers) which are independent of user authentication and personal mobility management for UPT. Separate user and terminal authentication will add to the overall delay perceived by the user.

The traffic performance aspects of wireless access that will also contribute towards the overall UPT traffic performance include:

- increased signalling network traffic load and resulting delays in call set-up;

- additional delay in UPT user authentication introduced by the need for separate registration/authentication for wireless terminals;

- call blocking due to radio channel unavailability;

- call blocking/cut-off due to failure of call handover between cells.

7 GOS parameter selection and allocation principles

The GOS parameters selection for networks supporting UPT should take account of the fact that UPT service will be provisioned on such existing networks as PSTN, ISDN and PLMN. It should therefore draw on the GOS concepts for these networks (e.g. Recommendations E.720 and E.770) as well as the influencing factors for networks supporting UPT outlined in the preceding clause.

Recommendations E.721 and E.771 address the GOS parameters and target values for ISDN and Land Mobile networks, respectively. For a UPT reference connection which includes both ISDN and Land Mobile networks, it is essential that the proposed GOS for UPT is consistent with GOS specified in Recommendations E.721 and E.771. Further, within the signalling network, it may be desirable to partition the call set-up delays between the delay for call/connection set-up (SS No. 7 ISUP component) and the delay for database access and interrogation (SS No. 7 TCAP component).

8 History

Recommendation first published in 1996.