

**SLOVENSKI STANDARD**  
**SIST-TS TS 101 329-3 V2.1.2:2004**  
**01-april-2004**

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**Harmonizacija telekomunikacij in internetnega protokola prek omrežij (TIPHON), 3. izdaja - Kakovost storitve od konca do konca v sistemih TIPHON - 3. del: Signalizacija in krmiljenje kakovosti storitve (QoS) od konca do konca**

Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 3; End-to-end Quality of Service in TIPHON systems; Part 3: Signalling and control of end-to-end Quality of Service (QoS)

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**Ta slovenski standard je istoveten z: ETSI TS 101 329-3 V2.1.2 (2002-01)**

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**ICS:**

33.040.30	Komutacijski in signalizacijski sistem	Switching and signalling systems
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**SIST-TS TS 101 329-3 V2.1.2:2004**      **en**

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# ETSI TS 101 329-3 V2.1.2 (2002-01)

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*Technical Specification*

## **Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 3; End-to-end Quality of Service in TIPHON systems; Part 3: Signalling and control of end-to-end Quality of Service (QoS)**

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**Reference**

RTS/TIPHON-05003 [2]a

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**Keywords**internet, network, interoperability, protocol, QoS,  
telephony, IP, quality, service, signalling**ETSI**650 Route des Lucioles  
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## Foreword

This Technical Specification (TS) has been produced by ETSI Project Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON).

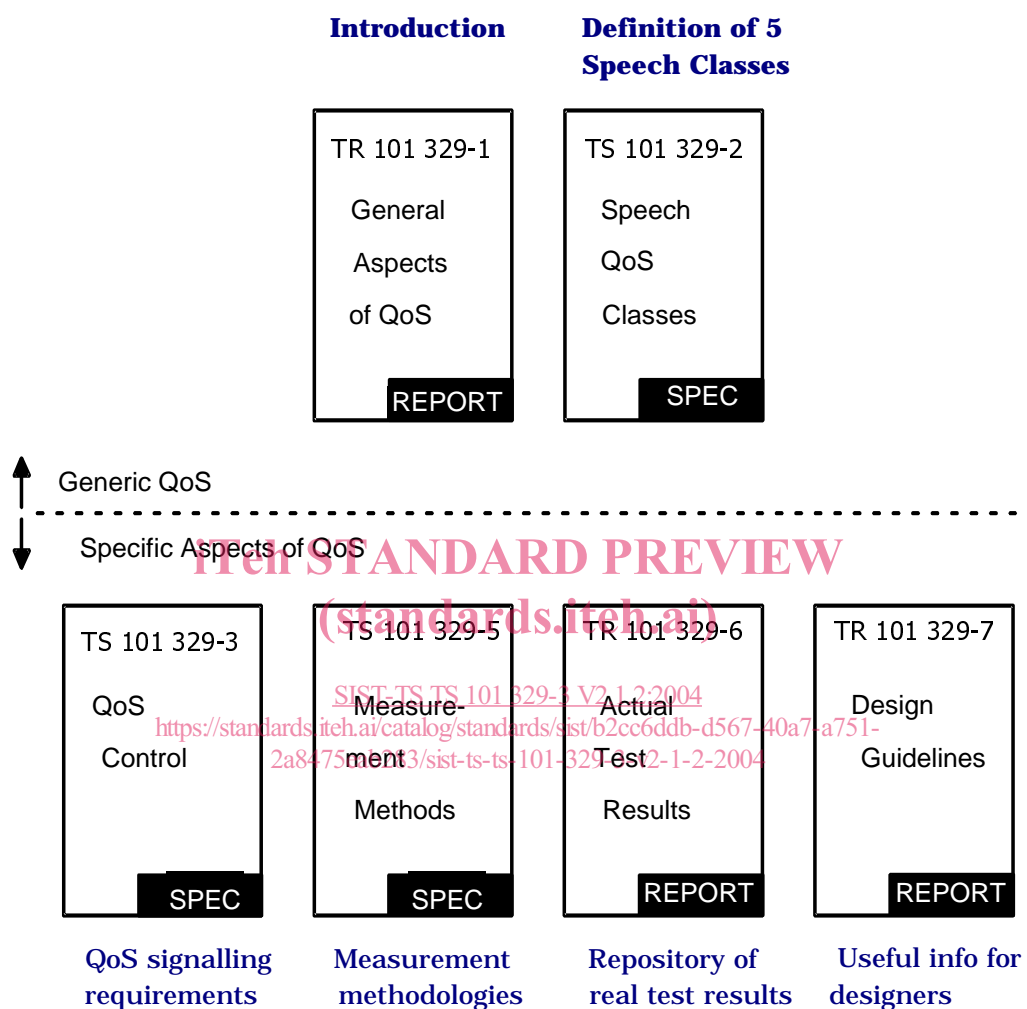
The present document is part 3 of a multi-part deliverable covering End-to-end Quality of Service in TIPHON systems, as identified below:

- TR 101 329-1: "General aspects of Quality of Service (QoS)";
- TS 101 329-2: "Definition of speech Quality of Service (QoS) classes";
- TS 101 329-3: "Signalling and control of end-to-end Quality of Service (QoS)";**
- TS 101 329-5: "Quality of Service (QoS) measurement methodologies";
- TR 101 329-6: "Actual measurements of network and terminal characteristics and performance parameters in TIPHON networks and their influence on voice quality";
- TR 101 329-7: "Design guide for elements of a TIPHON connection from an end-to-end speech transmission performance point of view".

Quality of Service aspects of TIPHON Release 4 and 5 Systems will be covered in TS 102 024 and TS 102 025 respectively, and more comprehensive versions of the Release 3 documents listed above will be published as part of Release 4 and 5 as work progresses.

# Introduction

The present document forms one of a series of technical specifications and technical reports produced by TIPHON Working Group 5 addressing Quality of Service (QoS) in TIPHON Systems. The structure of this work is illustrated in figure 1.



**Figure 1: Structure of TIPHON QoS Documentation for Release 3**

The present document, describes a framework for the signalling and control of end-to-end Quality of Service in TIPHON Systems.



# 1 Scope

The present document describes a framework for enabling the end-to-end QoS levels defined in TS 101 329-2 [1] to be signalled and controlled in TIPHON systems. The mechanisms involved operate between TIPHON terminals, IP telephony Service Providers (ITSPs), and network transport systems, and provide a flexible means for the dynamic allocation of QoS parameters across these entities in order to meet the QoS Service Classes defined in TS 101 329-2 [1]. The functional entities involved in the QoS signalling and control are defined, as are the requirements of the reference points between these functional entities. The QoS parameters and information flows used to establish the required Service QoS levels are also specified.

The Application Plane mechanisms described in the present document are intended to be independent of the transport QoS mechanisms used within the underlying IP networks.

The emphasis of the present document is on media QoS (primarily voice, but the mechanisms are also applicable to other media types). Issues related to performance of the signalling channels are outside the scope of the present document.

TS 101 314 [2] describes how this QoS framework fits into the overall TIPHON architecture and details of the signalling involved are described in TS 101 471 [3].

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

- [1] ETSI TS 101 329-2: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 3; End-to-end Quality of Service (QoS) in TIPHON systems; Part 2: Definition of speech Quality of Service (QoS) classes".
- [2] ETSI TS 101 314: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Network architecture and reference configurations; TIPHON Release 2".
- [3] ETSI TS 101 471: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Signalling for calls between an H.323 terminals and terminals in a Switched-Circuit Network (SCN); Phase III: Scenario 1, 2, 3, and 4".

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

**IP Telephony Service Provider (ITSP):** service provider providing IP telephony services

NOTE: The same business entity may act as both a Transport Network Operator and an IP Telephony Service Provider.

**InterConnect Function (ICF):** functional entity that interconnects Transport Domains

**NOTE:** It provides a policy and/or administrative boundary and may police authorized media flows between two Transport Domains to ensure they are consistent with the QoS policy specified by the relevant Transport Resource Manager

**Quality of Service Manager (QoSM):** functional entity that mediates requests for end-to-end QoS in accordance with policy determined by the QoSPE

**NOTE:** It communicates with, other QoSMs and with TRMs to determine, establish and control the offered QoS.

**Quality of Service Policy Element (QoSPE):** functional entity that manages IP Telephony QoS policies and provides authorization of permitted and default QoS levels

**NOTE:** It receives requests from and issues responses to QoSMs to establish the authorized end-to-end QoS levels.

**service domain:** collection of physical or functional entities offering IP telephony services under the control of an IP telephony service provider which share a consistent set of policies and common technologies

**Transport Domain (TD):** collection of transport resources sharing a common set of policies, QoS mechanisms and transport technologies under the control of a transport network operator

**transport network:** collection of transport resources which provide transport functionality

**transport network operator:** business entity operating a Transport Network

**Transport Policy Entity (TPE):** functional entity that maintains the policies of a Transport Domain

**Transport Resource Manager (TRM):** functional entity that applies a set of policies and mechanisms to a set of transport resources to ensure that those resources are allocated such that they are sufficient to enable QoS guarantees across the domain of control of the TRM

**Transport Function (TF):** functional entity representing the collection of transport resources within a Transport Domain which are capable of control by a Transport Resource Manager (TRM)

**User Equipment (UE):** equipment under the control of an End-User

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ATM	Asynchronous Transfer Mode
BC	Bearer Control
CBR	Constant Bit Rate
DiffServ	Differentiated Services
ICF	InterConnect Function
IntServ	Integrated Services
IP	Internet Protocol
ITSP	IP Telephony Service Provider
MPLS	Multi Protocol Label Switching
QoS	Quality of Service
QoSM	Quality of Service Manager
QoSPE	Quality of Service Policy Element
RMS	Root Mean Square
RSVP	Resource Reservation Set-up Protocol
RTP	Real-time Transport Protocol
SCN	Switched Communications Network
SLA	Service Level Agreement
TD	Transport Domain
TF	Transport Function
TPE	Transport Policy Element
TRM	Transport Resource Manager
UDP	User Datagram Protocol
UE	User Equipment
VBR	Variable Bit Rate

VPN

Virtual Private Network

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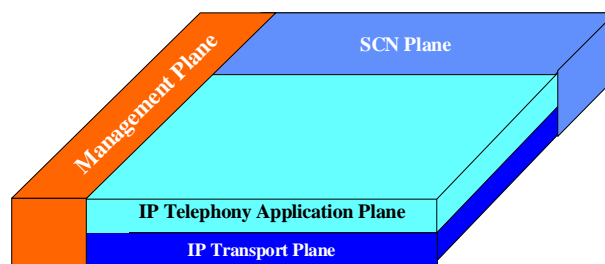
## 4 Void

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## 5 QoS architecture

### 5.1 TIPHON architectural planes

The Generalized TIPHON Architecture is shown in figure 2 (see TS 101 314 [2]).



**Figure 2: Generalized TIPHON Architecture**

End-to-end QoS signalling and control will in general involve QoS information flows in each of the architectural planes.

The Required end-to-end QoS levels are established within the IP Telephony Application Plane between End-Users and Service Provider(s). Decisions determining QoS, specific to the application, will take place in the IP Telephony Application Plane (e.g. codec type, packetization, etc).

The IP Transport Plane (IP Network Operators) provides a QoS service to the Application Plane (Service Providers). QoS control within the IP Transport Plane is the responsibility of the IP Network Operators.

#### 5.1.1 IP telephony application plane

Within this plane, QoS parameters specific to the application are requested, authorized, signalled, controlled and accounted.

#### 5.1.2 IP transport plane

Within this plane, general non-application specific parameters effecting QoS must be controlled and accounted to achieve the QoS requirements requested by the application.

#### 5.1.3 Management plane

Within this plane QoS management entities applicable to both application and transport planes will reside and information flows applicable to QoS management will terminate.

## 5.2 Service and transport domains

A TIPHON-compliant deployment will in the general case be made up of a number of separate Service and End-User Domains, each representing the domain of control of an ITSP or End-User. These domains will generally be restricted to IP Telephony Application plane functionality, e.g. gatekeepers, softswitches, call agents, etc.

Similarly, a TIPHON-compliant system will, in general, also be made up of a number of separate Transport Domains. Transport Domains consist solely of transport related functionality; this includes IP routers and switches, firewalls, etc. Each Transport Domain may have its own QoS policies and/or differ from other domains in terms of administrative control (e.g. Network Operator), QoS mechanisms (RSVP/IntServ, DiffServ, MPLS), access, metering, addressing schemes (global, local) and transport protocol (IPv4, IPv6), etc.

Since these policies are local, functional entities are needed to interface to other domains. These entities are called InterConnect Functions.

The general TIPHON deployment is illustrated in figure 3.

### 5.2.1 Void

### 5.2.2 Void

### 5.2.3 End-to-end QoS control

End-to-end QoS control across multiple domains may be achieved in one of two ways:

- by having an IP Telephony Application Service Domain control each Transport Domain. The Service Domain would request the transport resources with QoS from each of the Transport Domains and establish the interconnect in a controlled fashion;
- by means of end-to-end signalling within and between Transport Domains which share common policies.

These two mechanisms are explained hereafter.

#### 5.2.3.1 IP application plane control

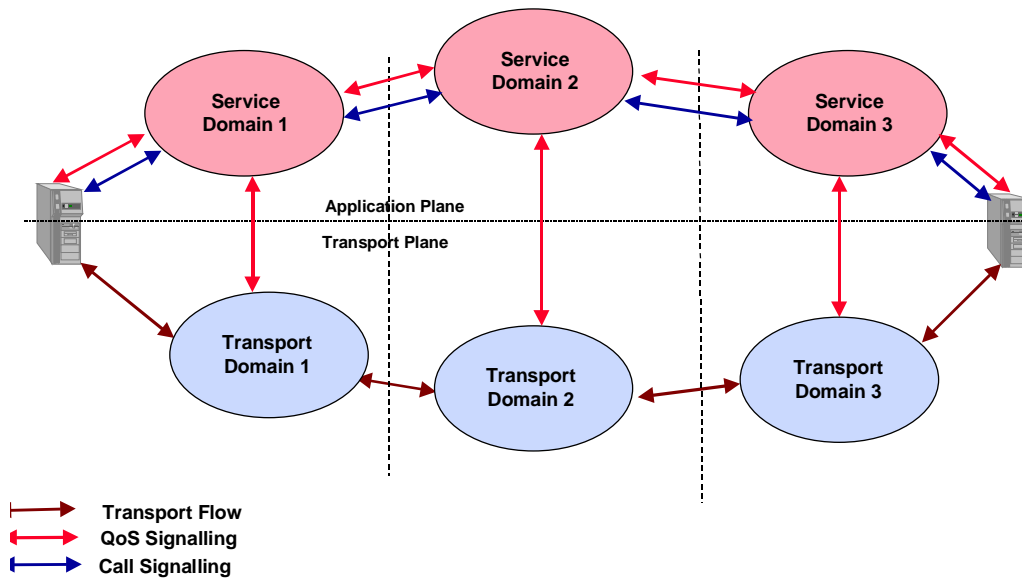
In this first case, the routing of the call between Transport Domains is under the control of the ITSPs. In this general case, where the Transport Plane is made up of a number of heterogeneous Transport Domains, each domain may have its own QoS mechanisms and policies.

Figure 3 illustrates the general case where a number of separate ITSPs and Transport Domains are involved in a call.

Call-Control signalling takes place in the IP Telephony Application Plane between ITSPs, and between End-Users and ITSPs.

Transport flows are between End-Users and transport domains, and between transport domains.

QoS signalling and SLAs are between End-Users and ITSPs, and between ITSPs and follow Call Routing. Between each ITSP involved in the call and its associated Transport Domain(s) QoS SLAs then ensure that the required QoS parameters are met by each Transport Domain involved in the call.



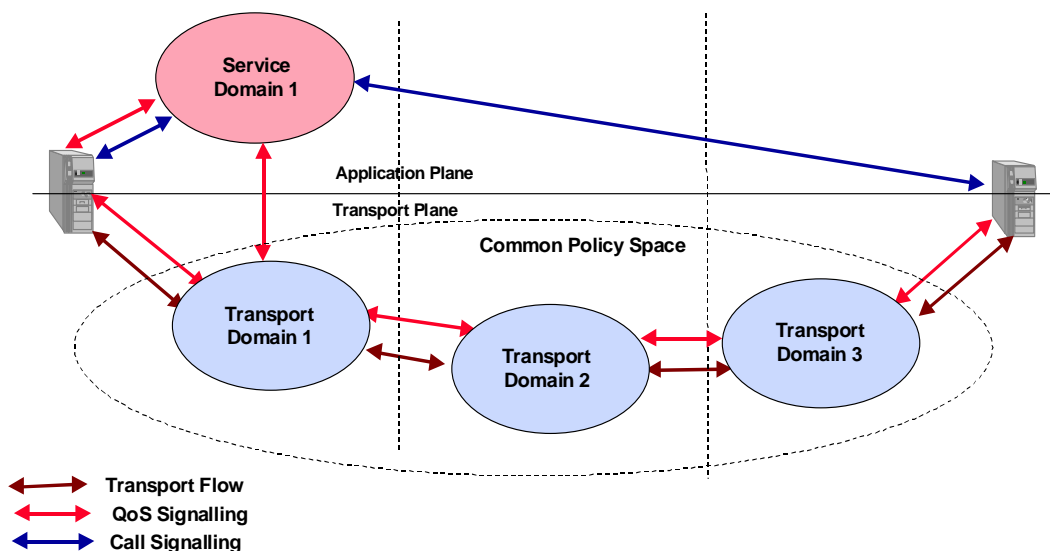
**Figure 3: Generalized TIPHON Architecture with Service Domain End-to-end QoS Control**

### 5.2.3.2 Transport plane control

In this case, the QoS control of the call between Transport Domains is performed by the local Transport Domain and by agreement between Transport Network Operators. QoS SLAs are required between End-Users and ITSPs and between Transport Network Operators. The End-Users may first register with their ITSP and receive authorization to make a call before establishing a media connection with the local Transport Network Operator.

This approach is a viable option where the Transport Plane comprises a single homogeneous policy space. Addressing, Access and QoS mechanisms and policies all have to be uniform for this case to work.

Figure 4 illustrates the case where end-to-end control of QoS is performed by signalling in the transport plane with QoS authorization by the access Service Provider.



**Figure 4: Generalized TIPHON architecture with transport plane End-to-end QoS control**

Hybrid situations are possible where a Service Domain may control several Transport Domains or one Transport Domain may control others. Some of these configurations are shown in annex A.