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TELEPHONE SERVICE, SERVICE OPERATION AND
HUMAN FACTORS

International routing plan

QoS routing support for interworking of QoS service classes across routing technologies

ITU-T Recommendation E.361

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ITU-T Recommendation E.361

QoS routing support for interworking of QoS service classes across routing technologies

Summary

ITU-T Rec. E.360.1, "Framework for QoS routing and related traffic engineering methods for IP-, ATM-, and TDM-based multiservice networks", provides a framework for QoS Service Classes (QSCs), called virtual networks (VNETs) in the E.360.x series. QSCs are defined as aggregations of individual service classes. Instead of having per-class parameters being configured and propagated on each network interface, classes are aggregated into QSCs having common per-QSC parameters (e.g., maximum bandwidth) to satisfy required performance levels. QSCs are known as VNETs in TDM networks, class types in IP/MPLS/DiffServ networks, and QoS classes in ATM networks.

In this Recommendation we identify QoS routing functions and associated parameters, which include:

- a) bandwidth allocation/protection, with traffic and QoS parameters;
- b) routing priority;
- c) queuing priority; and
- d) class-of-service identification, with service identity and QSC/VNET parameters.

We propose means of signalling these QoS routing parameters across networks employing different routing technologies, including IP-, ATM-, and TDM-based routing technologies. We propose extensions to signalling protocols such as SIP and RSVP-TE to support signalling of QSCs within and across networks.

Source

ITU-T Recommendation E.361 was prepared by ITU-T Study Group 2 (2001-2004) and approved under the WTSA Resolution 1 procedure on 2 May 2003.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. 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 Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 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 expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, 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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ITU-T Recommendation E.361

QoS routing support for interworking of QoS service classes across routing technologies

1 Introduction

Current and future networks are rapidly evolving to carry a multitude of voice/ISDN services and packet data services on Internet Protocol (IP), asynchronous transfer mode (ATM), and time division multiplexing (TDM) networks. QoS routing is an indispensable network function which controls a network's response to traffic demands and other stimuli, such as network failures. QoS routing encompasses traffic management through control of routing functions, which include number/name translation to routing address, connection routing, routing table management, and QoS resource management.

To support the ability to carry all types of telecommunications traffic (voice, data, video, etc.) over a single network, networks are evolving beyond best effort capabilities to provide a variety of performance and reliability options. Transport backbones are incorporating new optical technologies enabling flexible and cost-effective solutions for carrying various grades of telecommunications traffic. It is important for service providers to satisfy customer expectations for end-to-end reliability and QoS, for all types of transactions and services. QoS requirements include performance parameters such as delay, jitter, packet loss, etc, and are related to the type of transaction (e.g., voice, data, video). Reliability on the other hand represents expectations on adequate service availability over a specified period for the desired transaction types, and these expectations are typically negotiated in Service Level Agreements (SLA).

Further, services may have different reliability expectations depending on the type of service. For example, a voice over IP (VoIP) packet stream for emergency services calls would require high priority reliability treatment. Other VoIP services may have lower reliability expectations and hence their network reliability treatment may be less stringent. To satisfy reliability and QoS considerations for all transaction and service types, a service provider needs to ensure that all network protocol layers are equipped to recognize and satisfy the QoS and reliability requirements for the service classes.

ITU-T Rec. E.360.1, "Framework for QoS routing and related traffic engineering methods for IP-, ATM-, and TDM-based multiservice networks," provides a framework for QoS Service Classes (QSCs), called virtual networks (VNETs) in the E.360.x series. QSCs are defined as aggregations of individual service classes. Instead of having per-class parameters being configured and propagated on each network interface, classes are aggregated into QSCs having common per-QSC parameters (e.g., maximum bandwidth) to satisfy required performance levels. There is no maximum or minimum bandwidth requirement to be enforced at the level of individual class in the QSC. QSCs are known as VNETs in TDM networks, class types in IP/MPLS/DiffServ networks, and QoS classes in ATM networks.

In this Recommendation we identify QoS routing functions and associated parameters, which include:

- a) bandwidth allocation/protection, with traffic and QoS parameters;
- b) routing priority;
- c) queuing priority; and
- d) class-of-service identification, with service identity and QSC/VNET parameters.

We propose means of signalling these QoS routing parameters across networks employing different routing technologies, including IP-, ATM-, and TDM-based routing technologies. We propose extensions to signalling protocols such as SIP and RSVP-TE to support signalling of QoS routing parameters within and across networks.

Clause 6 summarizes the QoS routing functions and associated parameters. Clause 7 describes proposed means for signalling QoS routing information within protocols such as SIP and RSVP-TE. We discuss necessary signalling and information exchange requirements to enable the QoS routing functions, and to ensure compatibility and inter-working across different types of networks. Clause 8 gives an example of internetwork QoS routing and signalling.

2 Scope

This Recommendation identifies QoS routing functions and associated parameters associated with QSCs, and proposes means of signalling these parameters across networks employing different routing technologies, including IP-, ATM-, and TDM-based routing technologies, as well as the inter-working between these network technologies. Multi-layer QoS routing control functions are identified including:

- a) application or 'call' control;
- b) vertical control; and
- c) bearer control.

We also propose extensions to signalling protocols such as SIP and RSVP-TE to support signalling of QSCs within and across networks. The guidance of this Recommendation applies to QoS routing for individual microflows or for aggregated flows. For QSCs or aggregated flows, this Recommendation applies within networks where an operator can aggregate individual service classes or flows however they wish. However, inter-network aggregation is for further study

3 Definitions

This Recommendation defines the following terms:

3.1 alternate path routing: a routing technique where multiple paths, rather than just the shortest path, between a source node and a destination node are utilized to route traffic, which is used to distribute load among multiple paths in the network.

3.2 blocking: refers to the denial or non-admission of a call or connection-request, based for example on the lack of available resources on a particular link (e.g., link bandwidth or queuing resources).

3.3 call: generic term to describe the establishment, utilization, and release of a connection (bearer path) or data flow.

3.4 call routing: number (or name) translation to routing address(es), perhaps involving use of network servers or intelligent network (IN) databases for service processing.

3.5 circuit switching: denotes the transfer of an individual set of bits within a TDM time-slot over a connection between an input port and an output port within a given circuit-switching node through the circuit-switching fabric (see "switching").

3.6 class of service: characteristics of a service such as described by service identity, virtual network, link capability requirements, QoS and traffic threshold parameters.

3.7 class type: the set of Traffic Trunks crossing a link that is governed by a specific set of bandwidth constraints. Class type is used for the purposes of link bandwidth allocation, constraint based routing, and admission control. A given Traffic Trunk belongs to the same class type on all links.