International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Y.1542

Amendment 1

(03/2009)

SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT-GENERATION NETWORKS

Internet protocol aspects – Quality of service and network performance

---

Framework for achieving end-to-end IP performance objectives

Amendment 1: New Appendix V – Additional considerations for achieving end-to-end performance objectives in an NGN environment

Recommendation ITU-T Y.1542 (2006) – Amendment 1

ITU-T Y-SERIES RECOMMENDATIONS

GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT-GENERATION NETWORKS

GLOBAL INFORMATION INFRASTRUCTURE	
General	Y.100–Y.199
Services, applications and middleware	Y.200–Y.299
Network aspects	Y.300–Y.399
Interfaces and protocols	Y.400–Y.499
Numbering, addressing and naming	Y.500–Y.599
Operation, administration and maintenance	Y.600–Y.699
Security	Y.700–Y.799
Performances	Y.800–Y.899
INTERNET PROTOCOL ASPECTS	
General	Y.1000–Y.1099
Services and applications	Y.1100–Y.1199
Architecture, access, network capabilities and resource management	Y.1200–Y.1299
Transport	Y.1300–Y.1399
Interworking	Y.1400–Y.1499
Quality of service and network performance	**Y.1500–Y.1599**
Signalling	Y.1600–Y.1699
Operation, administration and maintenance	Y.1700–Y.1799
Charging	Y.1800–Y.1899
NEXT GENERATION NETWORKS	
Frameworks and functional architecture models	Y.2000–Y.2099
Quality of Service and performance	Y.2100–Y.2199
Service aspects: Service capabilities and service architecture	Y.2200–Y.2249
Service aspects: Interoperability of services and networks in NGN	Y.2250–Y.2299
Numbering, naming and addressing	Y.2300–Y.2399
Network management	Y.2400–Y.2499
Network control architectures and protocols	Y.2500–Y.2599
Security	Y.2700–Y.2799
Generalized mobility	Y.2800–Y.2899

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T Y.1542

Framework for achieving end-to-end IP performance objectives

Amendment 1

New Appendix V – Additional considerations for achieving end-to-end performance objectives in an NGN environment

Summary

Amendment 1 to Recommendation ITU-T Y.1542 introduces Appendix V, which provides some considerations needed when the NGN environment is used. Even though NGN is based on the same IP technology as that of non-NGN IP networks, there are some technological differences compared with generic IP networks. In particular, with respect to QoS aspects of the NGN, each segment is appropriately managed, and the capability of providing QoS services is supplied as one of the key features of NGN. With regard to services, session-based services such as IP telephony are particularly important in the NGN because they are often considered to be fundamental services to be provided in a public network.

Source

Amendment 1 to Recommendation ITU-T Y.1542 (2006) was agreed on 19 March 2009 by ITU-T Study Group 12 (2009-2012).

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). 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.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

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, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

CONTENTS

Recommendation ITU-T Y.1542

Framework for achieving end-to-end IP performance objectives

Amendment 1

New Appendix V – Additional considerations for achieving end-to-end performance objectives in an NGN environment

(This appendix does not form an integral part of this Recommendation)

V.1 Introduction

This appendix provides some considerations that need to be addressed when the NGN environment is used. Even though NGN is based on the same IP technology as that of non-NGN IP networks, there are some technological differences compared with generic IP networks. In particular, with respect to QoS aspects of the NGN, each segment is appropriately managed, and the capability of providing QoS services is supplied as one of the key features of NGN. With regard to services, session-based services such as IP telephony are particularly important in the NGN because they are often considered to be fundamental services to be provided in a public network. Thus, some countries or regions have special interest in specifying the QoS performance of the NGN [b-NICC ND 1704], [b-JDTEL A35] so that speech services with PSTN-like quality can be supported. As there are end-to-end QoS requirements to the NGN [b-ITU-T Y.2001], the QoS assignment for each NGN segment of interconnected NGNs needs to be considered (Figure V.1). This appendix describes an overview of the relationship between Recommendation ITU-T Y.1542 and other QoS-related Recommendations, and provides some information about the applicability of Recommendation ITU-T Y.1542 with respect to end-to-end QoS achievement in the interconnected NGN environment.

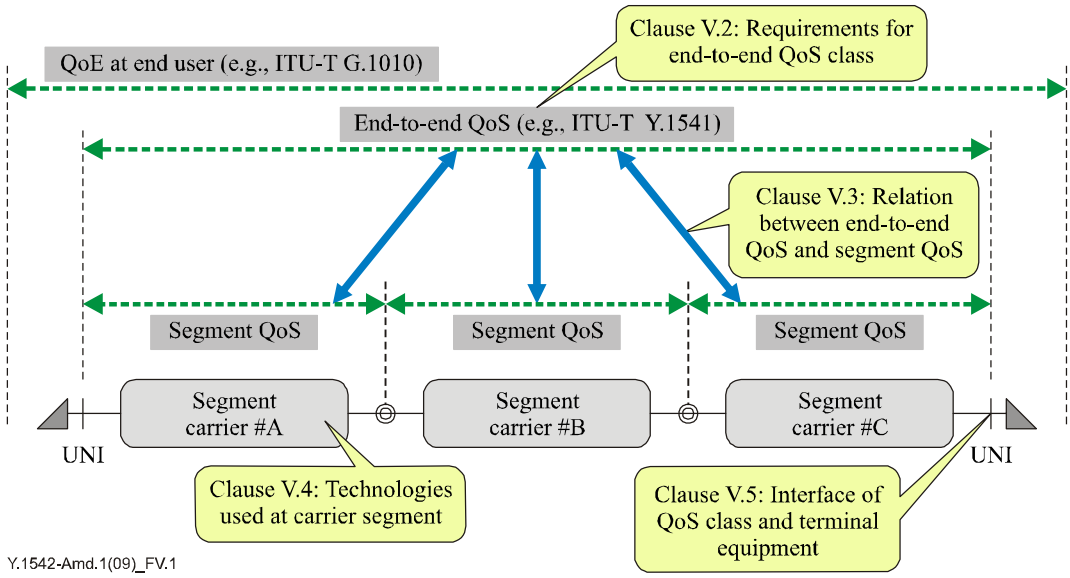

Figure V.1 – End-to-end QoS and NGN segments

V.2 Requirements for end-to-end QoS class

End-to-end QoS classes are defined in [ITU-T Y.1541]. A QoS class consists of a set of network performance parameters and each QoS class is characterized by the objectives of those network performance parameters to fulfil various performance requirements. There are many performance requirements depending on various applications, terminal equipment and users, but negotiation and determination of all parameters and their values respectively are too complicated and not so efficient. Showing too much detail about QoS class in a protocol to end users would be useless since most end users do not know the exact meaning of these parameters. Thus, aggregating parameters into a few service classes is a good way of managing QoS services and the concept of QoS class has been introduced.

One thing worth mentioning here is that the scope of Y.1541 QoS classes is end-to-end, not a segment of end-to-end. Therefore, specifying a segment QoS class by referring to the same objectives of the QoS classes in [ITU-T Y.1541] is meaningless, confusing, and should be avoided.

The concept of QoS class can be applied to a part of the end-to-end network in terms of efficiency of QoS-related information handling. It is obvious that end-to-end characteristics have some relation with those of the segments. A segment QoS class should be mapped from an end-to-end QoS class. The mapping should vary depending on relationships among segment carriers that provide each segment. The QoS class specification of each segment should be determined with consideration of other segments along the end-to-end path.

V.3 End-to-end QoS performance objectives and multi-domain network

In a multi-domain network, such as interconnected NGNs, the method of guaranteeing an end-to-end QoS is not clear. The relationship between QoS class and performance requirements between segment carrier and end-to-end path varies depending on issues such as the selection of a neighbouring carrier and the location of the source and the destination. Several models related to these issues are described in Recommendation ITU-T Y.1542. There are two major approaches: one is a top-down approach (such as "static divisor" approach), which allocates a performance budget that is given in advance, and the other is a bottom-up approach (such as the "impairment accumulation" approach), which first considers actual network performance and then compares that performance to performance objectives (Figure V.2).

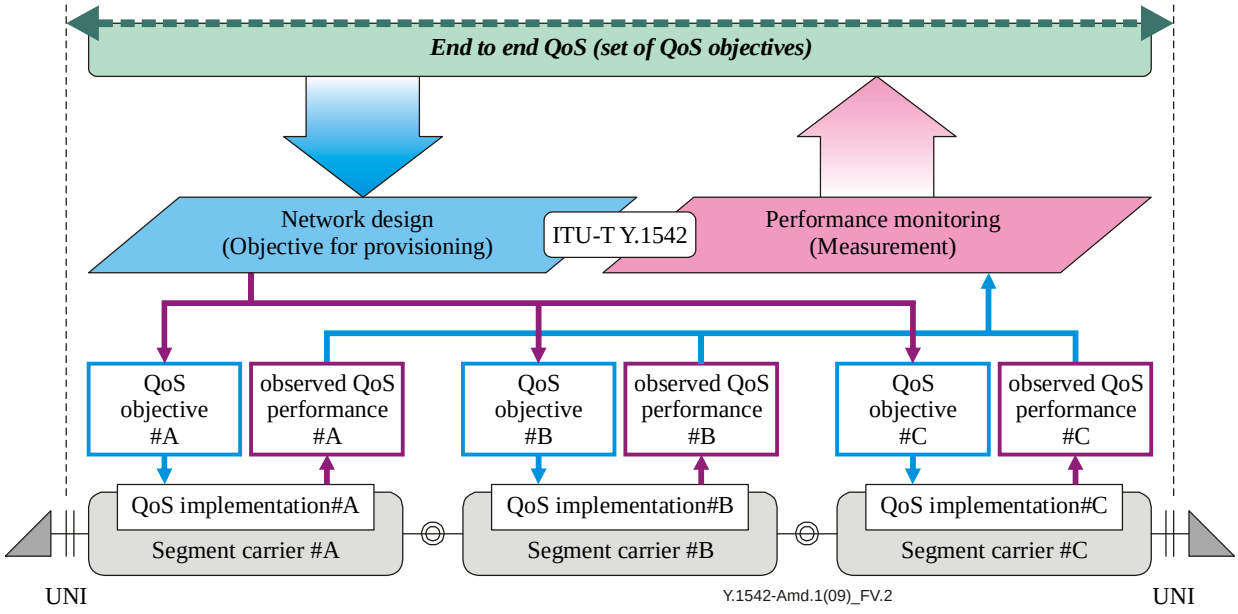

Figure V.2 – End-to-end QoS performance objectives and multi-domain network

Each approach is developed from different background requirements. In situations like NGN interconnections under well-organized regional arrangement within a small or medium size area, the top-down approach with all carriers conforming to the required performance would be suitable. On the other hand, a top-down approach might not work well in a dynamically routed network, in which it is hard to predict the number of networks involved and their impairments. In the case of worldwide interconnections, a static allocation would not be applicable because the performance varies too much. These are cases for which the bottom-up approach is well suited. If QoS assignment is based only on on-the-fly measurements with predetermined performance objectives, naturally, the bottom-up approach would be selected.

There is often the common misunderstanding that these approaches are mutually exclusive, which is not correct. One can also use these approaches in combination. Here is one example scenario: At the beginning, the end-to-end performance of multiple network domains is designed (top-down) to meet a fixed set of regional objectives. However, the pre-configured pattern-based apportionment design may not cover all the situations. For those situations, the bottom-up type of approach may also be used alternatively to achieve end-to-end QoS.

V.4 Technologies used at carrier segment

End-to-end QoS in a multi-domain environment can only be achieved when all segment carriers along the path are well managed to satisfy a given quality requirement. Since Y.1541 QoS classes are only a set of end-to-end performance values, the performance requirement for each segment would also be a set of figures. There seems to be some attempts to seek the unique technology solution for all network segments. The implementation used to achieve the required QoS performance, however, does not matter as long as the required performance is being fulfilled. There are a number of technologies to ensure QoS: DiffServ and MPLS, for example. Each technology has its pros and cons regarding the type of service, terminal and network structure, network scale, and regional regulation, for example. More time is needed for the convergence to a single universal solution out of multiple candidate technologies. As a practical solution, each segment carrier should be free to choose any technologies as far as it meets the required performance.

Carriers need to negotiate minimum QoS-related parameters, which are neutral with respect to any specific technology. [b-ITU-T Y.1223] describes an adequate set of these parameters. Thus, it could be used as a specification for this set of exchange parameters.

V.5 Interface of QoS class and terminal equipment

As discussed regarding inter-carrier negotiation, there should also be a negotiation mechanism to share the common view on the QoS class at the user network interface (UNI) between an end-user terminal and the network. There are currently few methods that are standardized and well deployed. One way that has been used in some cases is to use session initiation protocol and session description protocol (SIP/SDP) to deduce the required QoS class, which are specified in [b-3GPP TS 29.213]. When using SIP to establish a session, SDP gives a simple description of the flow. Parameters specified in SDP such as "m" meaning media, "b" meaning bandwidth, and "a" meaning attribute are used to decide an appropriate QoS class. Currently, this method offers the only practical solution.

V.6 Interface of QoS class and enterprise networks

In addition to considering the interaction between the network QoS class and the terminal, it will be necessary to consider the interaction between the network QoS class and the QoS scheme of interconnected enterprise networks. Such enterprise networks may be regional, or even global, in reach and may have a QoS scheme that is as complex as that of the public carrier networks. This may be based on the top-down or bottom-up approaches described above and it may be necessary to treat the enterprise network as another network cloud. Detailed discussion of this interaction remains for further study.

It should be borne in mind that enterprise networks may add significant amounts of delay, IPDV etc. above that recommended by [ITU-T Y.1541].

Bibliography

[b-ITU-T Y.1223] Recommendation ITU-T Y.1223 (2008), *Interworking guidelines for transporting assured IP flows*.

[b-ITU-T Y.2001] Recommendation ITU-T Y.2001 (2004), *General overview of NGN*.

[b-3GPP TS 29.213] 3GPP TS 29.213 V8.0.0 (2008-05), *Policy and Charging Control signaling flows and QoS parameter mapping*.

[b-JDTEL A35] Japanese Directive: Directive for Commercial Telecommunication Network Equipments (rules that Japanese telecom carriers need to obey) Article 35 (2008.4)
http://law.e-gov.go.jp/htmldata/S60/S60F04001000030.html (Japanese only)

[b-NICC ND 1704] NICC ND 1704, *End-to-End Network Performance Rules & Objectives for the Interconnection of NGNs*.
http://www.nicc.org.uk/nicc-public/Public/interconnectstandards/info/nd1704_2008_03.pdf

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	Telecommunication management, including TMN and network maintenance
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Terminals and subjective and objective assessment methods
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks, open system communications and security
Series Y	**Global information infrastructure, Internet protocol aspects and next-generation networks**
Series Z	Languages and general software aspects for telecommunication systems

Printed in Switzerland
Geneva, 2010