



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

M.2301

(07/2002)

SERIES M: TMN AND NETWORK MAINTENANCE:
INTERNATIONAL TRANSMISSION SYSTEMS,
TELEPHONE CIRCUITS, TELEGRAPHY, FACSIMILE
AND LEASED CIRCUITS

International transport network

**Performance objectives and procedures for
provisioning and maintenance of IP-based
networks**

ITU-T Recommendation M.2301

ITU-T M-SERIES RECOMMENDATIONS

TMN AND NETWORK MAINTENANCE: INTERNATIONAL TRANSMISSION SYSTEMS, TELEPHONE CIRCUITS, TELEGRAPHY, FACSIMILE AND LEASED CIRCUITS

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ITU-T Recommendation M.2301

Performance objectives and procedures for provisioning and maintenance of IP-based networks

Summary

This Recommendation provides performance objectives and procedures for provisioning and maintenance of IP-based networks. It focuses attention on parameters that significantly affect the quality of service perceived by the customer, and the methods of measuring those parameters. These include those parameters that affect delay performance at the application layer. Performance limits for temporary dial-up access links, end-customer owned portions and MPLS networks are not covered by this Recommendation and are for further study. However, the performance of fixed access links, whose routing does not change, is covered.

Source

ITU-T Recommendation M.2301 was prepared by ITU-T Study Group 4 (2001-2004) and approved under the WTSA Resolution 1 procedure on 14 July 2002.

Keywords

Autonomous system, Border gateway protocol, Border gateway router, Bringing-into-service procedure, Intrusive measurements, IP operator domain, Maintenance procedure, Management information base, MIB monitoring, Non-intrusive measurements, Operator border gateway router, Performance objectives, Provisioning, Quality of service, Reference network.

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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Introduction

This Recommendation provides performance objectives and procedures for provisioning and maintenance of IP-based networks owned by different operators. This is regardless of the transport technology supporting the IP network and the higher layers to be implemented over IP. These objectives include error performance, delay performance and availability. This Recommendation defines the parameters and their associated objectives based on the principles in ITU-T Rec. Y.1540. This Recommendation uses a reference model based on the concept of IP Operator Domains (IPODs) and their interconnecting links. An IPOD consists of one or more Autonomous Systems (ASs) and their interconnecting links. The interconnecting links between IPODs involve a change in jurisdictional responsibility.

This Recommendation also provides, in an appendix, guidance on the performance objectives and limits for IP network resources (e.g. routers, subnetworks etc.), which are owned and managed by a single operator. However, the allocation of performance inside an IP network operator's domain or network portion, is the responsibility of each operator to ensure the end-to-end performance over their domain or network portion meets the limits given in this Recommendation.

ITU-T Rec. Y.1540 provides a general framework for applying these limits. Guidance on the methods and procedures for applying these limits in provisioning and maintenance are given in this Recommendation.

This Recommendation uses certain principles that are the basis of the maintenance of a digital network:

- it is desirable to do in-service, continuous measurements. In some cases, out-of-service measurements may be necessary;
- performance limits of IP flows are independent of the supporting transport, but the allocation to network sections may be dependent on the transport medium used.

ITU-T Recommendation M.2301

Performance objectives and procedures for provisioning and maintenance of IP-based networks

1 Scope

This Recommendation provides performance objectives and procedures for provisioning and maintenance of IP-based networks owned by different operators. This is regardless of the transport technology supporting the IP network and the higher layers to be implemented over IP. These objectives include error performance, delay performance and availability. This Recommendation also provides guidance, in an appendix, on the performance objectives and limits for IP network resources (e.g. routers, subnetworks etc.), which are owned and managed by a single operator. Performance limits for temporary dial-up access links, end-customer owned portions and MPLS networks are not covered by this Recommendation and are for further study. However, the performance of fixed access links, whose routing does not change, is covered.

This Recommendation provides the network QoS classes needed to support user-oriented QoS categories. Accordingly, this Recommendation is consistent with the general framework for defining quality of communication services in ITU-T Rec. G.1000 [1], and with the end-user multimedia QoS categories needed to support user applications given in ITU-T Rec. G.1010 [2].

NOTE – This Recommendation uses parameters defined in ITU-T Rec. Y.1540 [4] that can be used to characterise IP network performance provided using IPv4. Applicability or extension to other protocols (e.g. IPv6) is for further study.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [1] ITU-T Recommendation G.1000 (2001), *Communications Quality of Service: A Framework and Definitions*.
- [2] ITU-T Recommendation G.1010 (2001), *End-user multimedia QoS categories*.
- [3] ITU-T Recommendation M.60 (1993), *Maintenance terminology and definitions*.
- [4] ITU-T Recommendation Y.1540 (1999), *Internet protocol data communication service – IP packet transfer and availability performance parameters*.
- [5] ITU-T Recommendation Y.1541 (2002), *Network performance objectives of IP-based services*.
- [6] IETF RFC 1213 (1991), *Management Information Base for Network Management of TCP/IP-based internets: MIB-II*.
- [7] IETF RFC 1267 (1991), *A Border Gateway Protocol 3 (BGP-3)*.
- [8] IETF RFC 2011 (1996), *SNMPv2 Management Information Base for the Internet Protocol using SMIPv2*.
- [9] IETF RFC 2012 (1996), *SNMPv2 Management Information Base for the Transmission Control Protocol using SMIPv2*.

- [10] IETF RFC 2013 (1996), *SNMPv2 Management Information Base for the User Datagram Protocol using SMIv2*.

3 Terms and definitions

General terms and definitions related to maintenance are provided in ITU-T Rec. M.60 [3] and for IP performance are given in ITU-T Rec. Y.1540 [4]. This Recommendation defines the following terms:

3.1 Access Gateway (AG): The IP network equipment that provides access to the AS and terminates the access protocol from the user.

3.2 Autonomous System (AS): An IP network controlled and managed by a single authority and identified by a specific AS number in the whole Internet. An IP network operator may own and manage one or more ASs.

3.3 Border Gateway Protocol (BGP): The Inter-Autonomous System routing protocol defined in RFC 1267 [7] that allows an AS to exchange routing information with other ASs.

3.4 Border Gateway Router (BGR): A router, belonging to an AS, that exchanges network reachability information with the neighbored ASs.

3.5 connectivity: The ability of an AS to provide a number of routes to its customers' traffic. An AS achieves whole Internet connectivity from its interconnection with other ASs.

3.6 Customer Premises Equipment (CPE): Any network equipment sited on the customer's premises used to connect with an AS. This may include simple modems e.g. DSL, multiplexers, routers, switches or complete customer local area networks.

3.7 IP Operator Domain (IPOD): Any connected subset of ASs together with all the links that interconnect them, which are under a single jurisdiction. The term IPOD can be used to refer to a single AS or any number of ASs and their interconnecting links. It can also be used to represent an entire single operator IP network and is defined between two OBGRs.

3.8 Management Information Base (MIB): The database in a network element that contains configuration, event and performance data that is accessible by a management system.

3.9 Measurement Point (MP): The physical or logical point at which measurements can be made and to which the data obtained is related. In the context of this Recommendation, this is typically at an OBGR.

3.10 Network Interface (NI): The interface between the access network and the customer installation.

3.11 Operator Border Gateway Router (OBGR): A router, belonging to an IPOD, that exchanges network reachability information with the neighbored IPOD. It is situated at the edge of an IPOD.

3.12 provisioning: The installation, assignment and commissioning (including bringing-into-service testing) of network resources.

4 Abbreviations

This Recommendation uses the following abbreviations:

AG	Access Gateway
AL	Access Line
AS	Autonomous System
BGP	Border Gateway Protocol