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Amendment 1
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SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT GENERATION NETWORKS

Internet protocol aspects – Architecture, access, network capabilities and resource management

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Traffic control and congestion control in IP-based networks

Amendment 1: Extensions to transfer capabilities

ITU-T Recommendation Y.1221 (2002) – Amendment 1

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ITU-T Recommendation Y.1221

Traffic control and congestion control in IP-based networks

Amendment 1

Extensions to transfer capabilities

Source

Amendment 1 to ITU-T Recommendation Y.1221 (2002) was approved on 29 March 2004 by ITU-T Study Group 13 (2001-2004) under the ITU-T Recommendation A.8 procedure. It also includes the new Appendix III agreed by Study Group 13 on 12 February 2004.

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.

CONTENTS

ITU-T Recommendation Y.1221

Traffic control and congestion control in IP-based networks

Amendment 1

Extensions to transfer capabilities

1) New clause 6.4

Add the following text as a new clause 6.4:

6.4 Delay-sensitive Statistical Bandwidth (DSBW) transfer capability

6.4.1 Description

The Delay-sensitive Statistical Bandwidth (DSBW) transfer capability is intended to support applications that do not have requirements on delay variation. It aims to support the guaranteed and timely delivery of IP packets across the end-to-end path of the network.

The DSBW transfer capability strives for compatibility with the controlled-load network element service [RFC 2211] and the end-to-end services based on the assured forwarding per-hop behaviour [RFC 2597].

6.4.2 Service model

The DSBW transfer capability provides a specified sustainable rate (*Rs*) for non-real time applications with limited burst duration with the expectation that traffic in excess of GBRA(*Rs*,*Bs*) will be delivered within the limits of available resources.

The following two examples describe the commitment the DSBW user will receive:

– If the user sends conforming packets at a constant rate that is less than or equal to the *Rs*, then the commitment is that packets are delivered in a timely way across the network, with performance corresponding to the associated QoS class (see Table VI.1/Y.1541).

– If the user has not sent packets for a long time, and the user sends conforming packets in a burst with a duration that does not exceed the bound set by GBRA(*Rs*,*Bs*), then the commitment is that packets are delivered in a timely way across the network, with performance corresponding to the associated QoS class.

The DSBW capability also allows the user to send conforming packets in excess of the GBRA(*Rs*,*Bs*), but traffic that exceeds this bound will only be delivered within the limits of available resources.

The DSBW capability may be associated with a specified packet loss commitment and packet transfer delay commitment to assure timely packet delivery.

The network does not fragment packets. In addition, the network commits to attempt, as long as possible (e.g., until there is a need to reroute the flow), to maintain packet sequence integrity.

6.4.3 Traffic descriptor

The traffic descriptor consists of:

– The peak rate *Rp* and the peak bucket size *Bp* as specified in 5.3.2.2;

– The sustainable rate *Rs* and the sustainable token bucket size *Bs* as specified in 5.3.2.2;

– The maximum allowed packet size *M* as specified in 5.3.2.1.

6.4.4 Conformance definition

An IP packet is conforming if the arrival conforms to the following three parts:

– The arrival is conforming to the peak GBRA(*Rp*,*Bp*);

– The arrival is conforming to the sustainable GBRA(*Rs*,*Bs*);

– The actual packet length does not exceed the maximum packet size *M*.

The GBRAs are updated in coordinated mode (see Annex B) for conforming packets only.

6.4.5 QoS commitments

The SBW capability may be associated with specified loss commitments.

If all packets are conforming, the QoS commitments apply to all packets. Otherwise, the QoS commitments apply to a number of bytes in conforming packets. Non-conforming traffic may be delivered within the limits of available resources, or they may be discarded, at the discretion of the network provider.

The table below summarizes the mapping between the QoS classes of ITU-T Rec. Y.1541 and the transfer capabilities of ITU-T Rec. Y.1221 if this proposal is followed.

Table 1/Y.1221 – Summary mapping table from Y.1541 QoS classes to Y.1221 transfer capabilities

	QoS classes from Y.1541					
	Class 0	Class 1	Class 2	Class 3	Class 4	Class 5
Transfer capabilities from Y.1221	DBW		DSBW			BE

2) New Appendix III

Add the following new Appendix III:

Appendix III

Guidelines for support of services using IP transfer capabilities in differentiated services environment

One or more of the transfer capabilities defined in this Recommendation may need to be supported at network boundaries. The transfer capabilities strive to comply with end-to-end services based on differentiated services per-hop behaviours, so a possible way to meet these transfer capabilities is to use the differentiated services architecture as indicated in RFC 2475 [6]. It should be noted that there may be alternative ways besides following the differentiated services architecture to provide these transfer capabilities.

If the differentiated services architecture is chosen to implement these transfer capabilities, then the following guidelines apply:

III.1 Guidelines applicable to all Y.1221 transfer capabilities

1) Packet scheduling would be supported at network boundaries. Guidelines for the packet scheduling function based on each service definition are provided below.

2) User-to-network boundaries would support IP packet classification based on information in the following IP header fields: source + destination address (RFC 791 [4]), DS field (RFC 2474 [11], RFC 3260 [12]), and L4 source + destination port as specified in RFC 768 [3] and RFC 793 [5].

3) All network boundaries would support IP packet classification based on information in the IP DS field as specified in RFC 2474 [11].

4) ITU-T Rec. Y.1221 provides a conformance definition for each of the transfer capabilities it defines. The test for conformance to the traffic descriptors for each transfer capability would be performed at the ingress of network boundaries using a packet control function. Guidelines for the packet control function based on each service definition are provided below.

5) All network boundaries would be capable of both packet marking and packet discard based on compliance to the conformance definition at ingress.

III.2 DBW guidelines

When the DiffServ architecture is used to implement the DBW transfer capability, the EF PHB, as described in RFC 3246 [7] could be used at network boundaries.

This clause defines the traffic control guidelines for network boundaries suitable to meet the service definitions of the DBW transfer capability. It assumes the use of the EF PHB at network boundaries.

1) Conformance to the DBW traffic descriptor for network boundaries could be determined by a parameter control function that tests that the arrival conforms to GBRA(Rp,Bp) and that the packet length is less than M. After the test, some (possibly all) of the non-conforming packets may be dropped. Conforming packets will always be transmitted.

2) Network boundaries would support a packet scheduler capable of meeting the requirements of RFC 3246 [7].

III.3 SBW guidelines

When the DiffServ architecture is used to implement the SBW transfer capability, the AF PHB, as described in RFC 2597 [10] could be used at network boundaries.

This clause defines the traffic control requirements at network boundaries suitable to meet the service definitions of the SBW transfer capability. It assumes the use of the AF PHB at network boundaries.

1) Conformance to the SBW traffic descriptor for all network boundaries could be determined by a parameter control function that tests that the arrival conforms to GBRA(Rp,Bp) and GBRA(Rs,Bs), and that the packet length is less than M. If packets are found non-conforming, then some (possibly all) of those packets may be remarked or dropped. Conforming packets will always be transmitted.

2) Network boundaries would support a packet scheduler capable of meeting the requirements of RFC 2597 [10].

3) Network boundaries would support packet discard control capable of meeting the active queue management requirements[1] of RFC 2597 [10].

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[1] Active queue management requirements for the AF PHB are described in section 4 of RFC 2597.

III.4 BE guidelines

When the DiffServ architecture is used to implement the BE transfer capability, the default PHB, as described in RFC 2474 [11], would be used at network boundaries.

This clause defines the traffic control guidelines for network boundaries suitable to meet the service definitions of the BE transfer capability. It assumes the use of the default PHB at network boundaries.

1) Conformance to the BE traffic descriptor at network boundaries could be determined by a parameter control function that tests that the packet length is less than M. If packets are found non-conforming, then some (possibly all) of those packets may be remarked or dropped.
2) Network boundaries would support a packet scheduler capable of meeting the requirements of the default PHB described in RFC 2474 [11].

III.5 Appendix III references

[1] ITU-T Recommendation Y.1221 (2002), *Traffic control and congestion control in IP-based networks*.

[2] ITU-T Recommendation Y.1541 (2002), *Network performance objectives for IP-based services*.

[3] IETF RFC 768 (1980), *User Datagram Protocol*.

[4] IETF RFC 791 (1981), *Internet Protocol – DARPA Internet Program – Protocol Specification*.

[5] IETF RFC 793 (1981), *Transmission Control Protocol – DARPA Internet Program – Protocol Specification*.

[6] IETF RFC 2475 (1998), *An Architecture for Differentiated Services*.

[7] IETF RFC 3246 (2002), *An Expedited Forwarding PHB (Per-Hop Behaviour)*.

[8] IETF RFC 2697 (1999), *A Single Rate Three Color Marker*.

[9] IETF RFC 2698 (1999), *A Two Rate Three Color Marker*.

[10] IETF RFC 2597 (1999), *Assured Forwarding PHB Group*.

[11] IETF RFC 2474 (1998), *Definition of the Differentiated Services Field (DS Field) in the Ipv4 and Ipv6 Headers*.

[12] IETF RFC 3260 (2002), *New Terminology and Clarifications for Diffserv*.

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