International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Y.1221
Amendment 3
(10/2007)

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

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

---

Traffic control and congestion control in IP-based networks

Amendment 3: New Appendix IV – Example methods for determining token-bucket parameters

ITU-T Recommendation Y.1221 (2002) – Amendment 3

ITU-T

International Telecommunication Union

ITU-T Y-SERIES RECOMMENDATIONS

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

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

ITU-T Recommendation Y.1221

Traffic control and congestion control in IP-based networks

Amendment 3

New Appendix IV – Example methods for determining token-bucket parameters

Source

Amendment 3 to ITU-T Recommendation Y.1221 (2002) was agreed on 11 October 2007 by ITU-T Study Group 12 (2005-2008).

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 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/.

ITU-T Recommendation Y.1221

Traffic control and congestion control in IP-based networks

Amendment 3

New Appendix IV – Example methods for determining token-bucket parameters

The appropriate function and its parameters for determining the token bucket size parameter may depend on several factors, such as the application, media type, and transmission protocol. The network operators/carriers should select the most appropriate method depending on the information available.

This appendix provides a few examples of methods for determining token bucket parameters when the only available information is the bit rate of the IP flow.

To monitor the conformance of an IP packet flow with the token bucket algorithm, two parameters are required:

- bucket rate (R);
- bucket size (B).

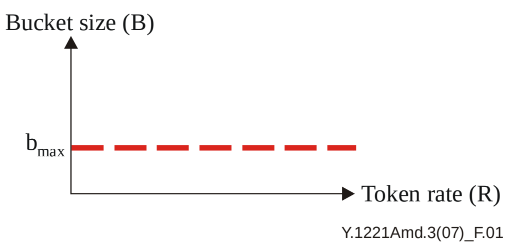
When some application that has an IP-flow requests a QoS guarantee, these two parameters must be specified before a session is established. If these parameters are omitted, the network cannot decide the conformance of each packet, and transmission assurance is not feasible.

However, these parameters are quite often unavailable. For example, when the sessions are established using SIP/SDP, only bucket-rate information is available. The bucket rate is directly related to the bit-rate information of the IP flow, so using SIP/SDP bandwidth information (b=) is a straightforward method. On the other hand, there is no information related to the burstiness of the IP flow, so determining the bucket size parameter is difficult. In general, bit-rate information is easy to know because many application/protocol designers are aware of the bit-rate. However, burstiness is not as easy to know, because application/protocol designers often do not care about the burstiness.

Therefore, some method to determine the bucket-size parameter (B) under such conditions is needed.

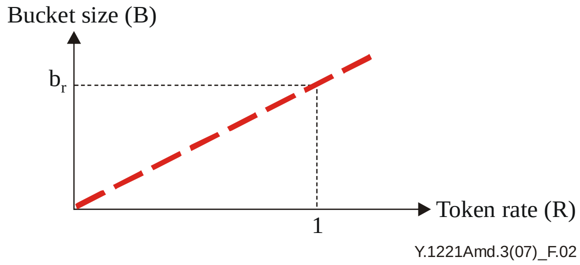
The bucket size, parameter B, corresponds to the burstiness of the IP flow. The value of parameter B may depend on the type of application, end-terminal performance, and interface condition between the user and the network, for example. A few example methods for determining the value of B are given below.

Example 1: B = b_{max} (constant)



When the possible range of the burstiness of all IP flows is known, the maximum bucket size $B = b_{max}$ can be applied to all the flows. In this case, the network does not necessarily need to know the burstiness of each IP flow. However, a huge buffer resource is required for preventing the loss of conforming packets even for very low-bit-rate flows.

Example 2: $B = b_r*x$ (proportional to bucket rate)



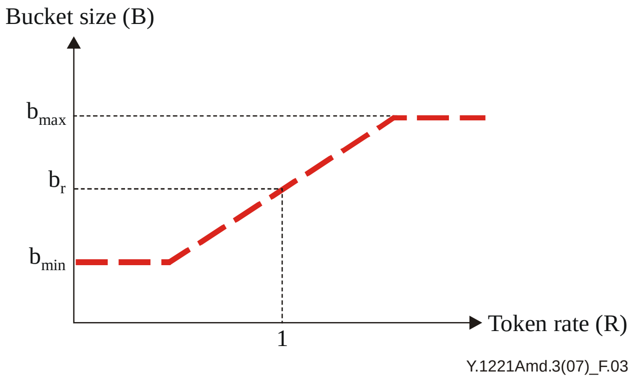
This example is based on the following assumption.

Assumption:

When the bit rate of the IP flow is greater, the burst from the flow becomes greater.

Based on the above assumption, the bucket size of the IP flow is expressed by the non-decreasing function of the bucket rate, b_r. Using a linear function is one of the simplest examples of determining the bucket size.

Example 3: $B = \min(b_{max}, \max(b_r *x, b_{min}))$ (with upper and lower limit)



In the second example, two problems might occur. The bucket size may become too small or too large. For very low-bit-rate flows, the bucket size might become smaller than the size of a single packet. In such a situation, there is a possibility that all packets are discarded as non-conforming packets. On the other hand, for very high-bit-rate flows, the bucket size might become very large; the burst traffic from those flows may cause the traffic congestion in the network. To avoid this problem, upper and lower limits can be introduced mainly from the viewpoint of the implementation.

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	Telephone transmission quality, telephone installations, local line networks
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, 2008