

INTERNET-DRAFT Call/Cell Benchmarking Terminology

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Abstract

This memo discusses and defines terms associated with performance benchmarking tests and the results of these tests in the context of cell-based and call-based switching devices. The terms defined in this memo will be used in addition to terms defined in RFCs 1242, 1944 and 2285. This memo is a product of the Benchmarking Methodology Working Group (BMWG) of the Internet Engineering Task Force (IETF).

I. Background

1. Introduction

This document provides terminology for benchmarking cell-based and call-based switching devices. It extends terminology already defined for benchmarking network interconnect devices in RFCs 1242, 1944 and 2285. Although some of the definitions in this

memo may be applicable to a broader group of network interconnect devices, the primary focus of the terminology in this memo is on cell-based and call-based switches. Specifically, this includes Asynchronous Transfer Mode (ATM) cell relay and signaling and Frame Relay (FR) signaling.

This memo contains two major sections: Background and Definitions. Within the definitions section are a formal definitions sub-section, provided as a courtesy to the reader, and a measurement definitions sub-section which contains performance metrics with inherent units.

2. Existing Definitions

[RFC 1242](#) "Benchmarking Terminology for Network Interconnect Devices" should be consulted before attempting to make use of this document. [RFC 1944](#) "Benchmarking Methodology for Network Interconnect Devices" contains discussions of a number of terms relevant to the benchmarking of switching devices and should also be consulted. [RFC 2285](#) "Benchmarking Terminology for LAN Switching Devices" contains a number of terms pertaining to traffic distributions and datagram interarrival.

For the sake of clarity and continuity this RFC adopts the template for definitions set out in [Section 2 of RFC 1242](#). Definitions are indexed and grouped together in sections for ease of reference.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#).

II. Definitions

The definitions presented in this section have been divided into two groups. The first group is formal definitions, which are required in the definitions of the performance metrics but are not themselves strictly metrics. These definitions are subsumed from other work done in other working groups both inside and outside the IETF. They are provided as a courtesy to the reader.

1. Formal Definitions

1.1. Definition Format (from [RFC1242](#))

Term to be defined.

Definition: The specific definition for the term.

Discussion: A brief discussion of the term, its application and any restrictions on measurement procedures.

Specification: The working group and document in which the term is specified. Listed in the references.

1.2 Definitions

1.2.1 Available Bit Rate (ABR):

Definition: ABR is an ATM layer service category for which the limiting ATM layer transfer characteristics provided by the network may change subsequent to connection establishment. A flow control mechanism is specified which supports several types of feedback to control the source rate in response to changing ATM layer transfer characteristics.

Discussion: It is expected that an end-system that adapts its traffic in accordance with the feedback will experience a low cell loss ratio and obtain a fair share of the available bandwidth according to a network specific allocation policy. Cell delay variation is not controlled in this service, although admitted cells are not delayed unnecessarily.

Specification: AF-TM4.0

1.2.2 Call-based

Definition: An association between two or more users or between a user and a network entity that is established by the use of network capabilities. This association may have zero or more connections.

Discussion: none

Specification: AF-UNI3.1

[1.2.3](#) Cell

Definition: A unit of transmission in ATM. A fixed size frame consisting of a 5 octet header and a 48 octet payload.

Discussion: none

Specification: AF-UNI3.1

[2.](#) Performance Metrics

[2.1.](#) Definition Format (from [RFC1242](#))

Metric to be defined.

Definition: The specific definition for the metric.

Discussion: A brief discussion of the metric, its application and any restrictions on measurement procedures.

Measurement units: Intrinsic units used to quantify this metric. This includes subsidiary units, e.g. microseconds are acceptable if the intrinsic unit is seconds.

[2.2](#) Definitions

[2.2.1](#) Cell Transfer Delay (CTD)

Definition: The elapsed time between a cell exit event at the measurement point 1 (e.g., at the source UNI) and the corresponding cell entry event at a measurement point 2 (e.g., the destination UNI) for a particular connection.

Discussion: The cell transfer delay between two measurement points is the sum of the total inter-ATM node transmission delay and the total ATM node processing delay.

Measurement units: seconds

[2.2.2](#) Cell Delay Variation (CDV)

Definition: The variation in cell transfer delay associated with a given traffic load, orientation and distribution, as well as an integration period. $CDV = \max(CTD) - \min(CTD)$ where max and min indicate the maximum and minimum over the integration period, respectively.

Discussion: CDV is a component of cell transfer delay, induced by buffering and cell scheduling. Peak-to-peak CDV is a QoS delay parameter associated with CBR and VBR services. The peak-to-peak CDV is the $((1-a)$ quantile of the CTD) minus the fixed CTD that could be experienced by any delivered cell on a connection during the entire connection holding time. The parameter "a" is the probability of a cell arriving late.

Measurement Units: seconds.

[2.2.3](#) Cell Error Ratio (CER)

Definition: The ratio of errored cells in a transmission in relation to the total cells sent in a transmission associated with a given traffic load, orientation and distribution, as well as an integration period. $CER = \text{Errored Cells} / \text{Total Cells Transmitted}$.

Discussion: The measurement is taken over a time interval and is desirable to be measured on an in-service circuit.

Measurement Units: dimensionless.

[2.2.4](#) Cell Loss Ratio (CLR)

Definition: The ratio of lost cells in a transmission in relation to the total cells sent in a transmission associated with a given traffic load, orientation and distribution, as well as an integration period. $CLR = \text{Lost Cells} / \text{Total Cells Transmitted}$.

Discussion: CLR is a negotiated QoS parameter and acceptable values are network specific. The objective is to minimize CLR provided the end-system adapts the traffic to the changing ATM layer transfer characteristics. The CLR parameter is the value of CLR that the network agrees to offer as an objective over the lifetime of the connection. It is expressed as an order of

magnitude, having a range of 10⁻¹ to 10⁻¹⁵ and unspecified.

Measurement Units: dimensionless.

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[2.2.5](#) Cell Misinsertion Rate (CMR)

Definition: The ratio of cells received at an endpoint that were not originally transmitted by the source end in relation to the total number of cells properly transmitted associated with a given traffic load, orientation and distribution, as well as an integration period. $CMR = \text{Mis-inserted Cells} / \text{Total Cells Transmitted}$.

Discussion: none

Measurement Units: dimensionless.

[3.](#) Security Considerations

Security issues are not addressed in this memo.

[4.](#) References

[AF-TM4.0] ATM Forum, Traffic Management Specification Version 4.0, af-tm-0056.00, April 1996.

[AF-UNI3.1] ATM Forum, User Network Interface Specification Version 3.1, September 1994.

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