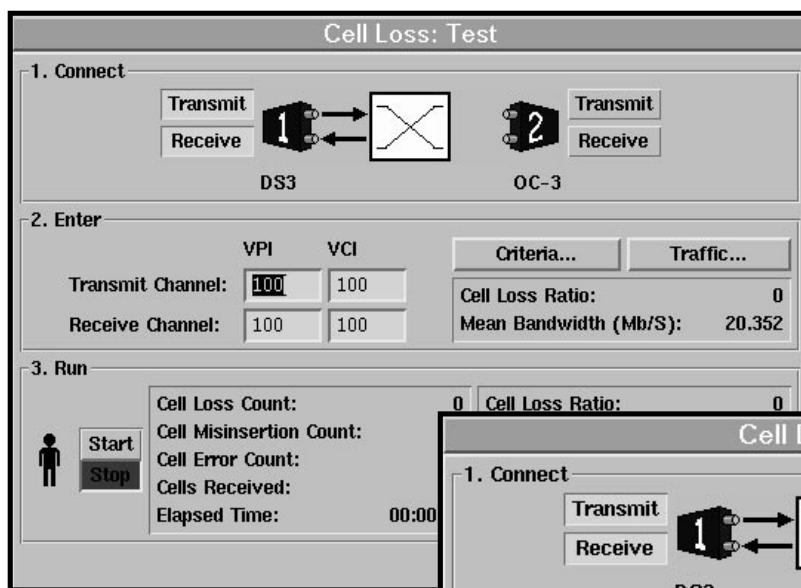


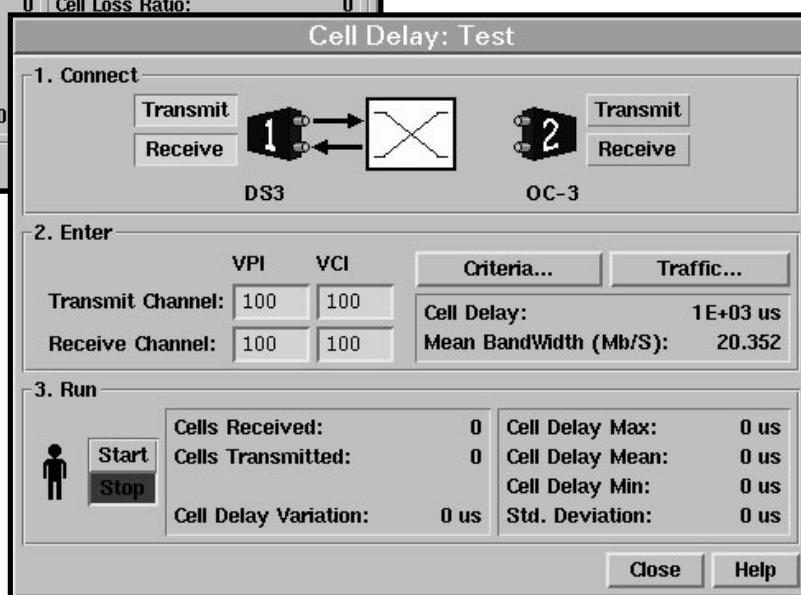
# QoS and Traffic Performance Analysis

HP E5200A Broadband Service Analyzer



## Key features:

- New cell loss and cell delay SMARTtests
- Support for I.356 QoS measurements (cell loss, cell misinsertion, cell error, cell transfer delay, and cell delay variation)
- Traffic Policing (GCRA) test
- Cell interarrival test
- Remote cell loss test
- Network stress test



## Quality of Service

Quality of Service (QoS) is the term used to describe the end-to-end network performance of an ATM connection. At the ATM layer, a set of QoS parameters and traffic types are defined that allow QoS to be managed on a network.

These parameters and classes form the basis of the connection agreements between a service user and the network operator. In a connection agreement, the network guarantees to meet or exceed the

QoS requirements of user connections that conform to agreed traffic characteristics.

The QoS parameters defined by ATM Forum TM4.0 and ITU-T I.356 include

- cell error ratio (CER)
- cell loss ratio (CLR)
- cell misinsertion rate (CMR)
- cell transfer delay (CTD)
- cell delay variation (CDV)
- severely-errored cell block ratio (SECBR)



HP E5200A Broadband Service Analyzer

The HP E5200A Broadband Service Analyzer offers a range of SMARTtests and several predefined macro tests that allow you to quickly and easily determine whether your network is meeting the agreed QoS parameters and network performance.

### SMARTtests

SMARTtests are predefined tests that facilitate rapid network installation and problem identification. You can start a SMARTtest quickly and easily without the need to develop complex test routines. The HP E5200A Broadband Service Analyzer offers two SMARTtests for QoS analysis: cell loss and cell delay.

### Cell Delay SMARTtest

The cell delay SMARTtest is an “out-of-service test” that provides detailed cell delay measurements for ATM cells passing through an ATM network. Cell delay is caused by transmission delays inherent in

- propagation media
- switch fabric
- switch buffers

Cell delay variation (or jitter) is the variable delay caused by the variable queuing times in the switch buffers. The cell delay test can be configured for dual-port or single-port operation and transmits then receives timestamped cells. The test inserts departure timestamps into the payload of the transmitted cells, and tags the received cells with an arrival timestamp.

When measuring cell delay, a parameter known as “alpha” (as specified in ATM Forum TM3.0, 4.0 and ITU-T I.371) excludes the severely delayed cells and provides an accurate maximum cell delay measurement. Due to the nature of networks, a connection agreement can never guarantee that 100% of cells will not exceed the value

### Cell Delay

VPI/VCI	User selectable
Measurements	<ul style="list-style-type: none"> <li>- Cell delay = arrival timestamp - departure timestamp</li> <li>- Mean = sum of all cells divided by number of cells received</li> <li>- Minimum = smallest cell delay measurement</li> <li>- Maximum = largest cell delay measurement</li> <li>- Standard deviation</li> <li>- Cell delay variation</li> <li>- Number of cells transmitted</li> <li>- Number of cells received</li> </ul>
Pass Criteria	Any combination of <ul style="list-style-type: none"> <li>- Maximum cell delay (User selectable, 0 - 42 seconds)</li> <li>- Maximum cell delay variation (User selectable, 0 - 42 seconds)</li> </ul>
Conditions	<ul style="list-style-type: none"> <li>- Alpha (User selectable, 0.0 - 0.1)</li> <li>- Number of cells to receive (User selectable, 2 - 114688 cells)</li> </ul>
Pass Criteria Resolution	ns, us, ms, sec
Traffic Distributions	Constant, Poisson, Sawtooth, Burst

### Cell Loss

VPI/VCI	User selectable
Measurements	<ul style="list-style-type: none"> <li>- Cell loss count</li> <li>- Cell loss ratio (number of cells lost divided by number of cells that should have been received)</li> <li>- Cell misinsertion count</li> <li>- Cell misinsertion ratio (cells/sec)</li> <li>- Cell error count</li> <li>- Cell error ratio</li> <li>- Number of cells transmitted</li> <li>- Number of cells received</li> </ul>
Pass Criteria	Any combination of <ul style="list-style-type: none"> <li>- Maximum cell loss count (User selectable, 0 - 16777214 cells)</li> <li>- Maximum cell loss ratio (User selectable, 0 - 1)</li> <li>- Maximum cell misinsertion count (User selectable)</li> <li>- Maximum cell error count (User selectable)</li> <li>- Maximum cell error ratio (User selectable, 0 - 1)</li> </ul>
Test Duration	User selectable, 5 sec - 72 hours
Traffic Distributions	Constant, Poisson, Sawtooth, Burst

specified for maximum cell delay. The value of alpha is used to allow for the possibility of severely delayed cells caused by network problems.

## Cell Loss SMARTtest

The cell loss SMARTtest is an "out-of-service" test that identifies whether the system under test is losing ATM traffic. Cell loss is one of the factors used to determine the quality of service for a particular ATM channel (VPI/VCI). Cell loss can occur for a number of reasons, including

- network congestion
- data corruption
- policing mechanisms

The cell loss SMARTtest sets up a VPI/VCI channel (user selectable) and transmits ATM test cells containing a sequence number (SN) and CRC-32 into the system under test.

## QoS and Traffic Performance Macro Tests

The service analyzer provides a suite of macro tests that allow you to perform extensive QoS and traffic performance tests on your network. Each macro test contains a set of specific instructions that are used by the analyzer to perform the test. The macro tests ensure that the same tests are carried out independent of the user or the service analyzer that is being used.

The following QoS/Traffic Performance macro tests are available on the service analyzer

- Traffic Policing: Generic Cell Rate Algorithm (GCRA)
- Cell interarrival measurements
- Remote cell loss test
- Network stress test

These macro tests are accessed via the main menu and are located in a dedicated macro test directory.

## Traffic Policing (GCRA)

Policing is the term used to describe the Usage Parameter Control (UPC) process at the UNI. UPC uses a Generic Cell Rate Algorithm (GCRA), also known as a "leaky bucket" algorithm, to monitor the conformance of the user's ATM cell stream to agreed cell rate parameters. Cells that do not conform with agreed parameters can either be tagged or discarded, depending on the policy of the service provider and the traffic type.

The GCRA is specified in ATM Forum TM3.0, 4.0 and ITU-T I.371. The GCRA is used to define the relationship between the peak cell rate (PCR) and the cell delay variation tolerance (CDVT), and the relationship between the sustainable cell rate (SCR) and the burst tolerance (BT).

This two-stage GCRA macro test measures how many cells (count or ratio) in the cell stream are non-conforming. The macro test also checks the arrival timestamp of all cells in the capture memory. It applies the GCRA algorithm to each timestamp it extracts, using the user defined values initially specified.

The GCRA macro test provides you with the number of

- non-conforming cells
- conforming cells
- tagged cells

The user can also select the traffic type (CBR, VBR.1, VBR.2, VBR.3, UBR) that determines the algorithm to be used (single-bucket GCRA, dual-bucket GCRA, with/without tagging).

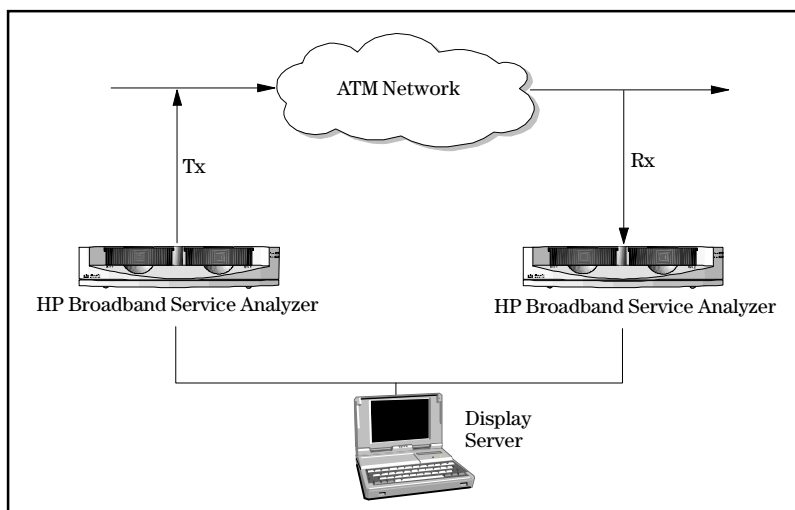
## Cell Interarrival Testing

Cell interarrival time is measured by comparing the arrival timestamps of successive cells in a stream. The time is measured between the start of one cell, and the start of the next consecutive cell.

The cell interarrival time macro test provides you with measurements to help characterize the spread or clumping of the cell stream.

The macro test provides you with the following results

- interarrival time (minimum, maximum, mean, standard deviation)
- peak-peak variation (range)
- total number of cells captured



Remote cell loss testing

## Remote Cell Loss Testing

The remote cell loss macro test emulates the cell loss SMARTtest across two remote points of a network, using two separate service analyzers. The user initiates the macro test on one of the two service analyzers. This service analyzer then controls and monitors the second analyzer across the LAN or WAN segment.

This is an end-to-end remote cell loss test as opposed to a round trip cell loss test that can only be performed on a local segment. The remote cell loss macro test is geographically transparent in that the test can be performed across even the largest of ATM networks.

The remote cell loss test calculates the following QoS parameters

- cell loss
- cell misinsertion
- cell error

The remote cell loss test can also be used in conjunction with the HP E5180A Broadband Launch Pad.

## Network Stress Testing

The network stress macro test repeatedly runs the cell loss and cell delay SMARTtests, gradually increasing the bandwidth each time they run. This macro test allows a network administrator to find the bandwidth level at which the QoS parameters start to degrade.

The network stress macro test calculates the following QoS parameters at each bandwidth level:

- cell loss ratio
- cell misinsertion rate
- cell error ratio
- cell transfer delay  
(minimum, maximum, mean, standard variation)
- peak-to-peak cell delay variation

## HP E5200A Broadband Service Analyzer

The HP E5200A Broadband Service Analyzer gives you complete network analysis control—much more than ordinary test technology. The service analyzer allows you to manage the end-to-end quality of your service. It shows the important interactions between the elements of the service, instantly notifying you of abnormal network conditions. It leads the way in a new class of portable test instruments specifically designed for dispatched, remote, and distributed applications.

## HP E5180A Broadband Launch Pad

The HP Broadband Launch Pad is a flexible console application that makes remote testing easy. It allows you to centrally manage and control broadband test instruments that are installed in your network. The HP E5180A Broadband Launch Pad has been specifically designed to work with the HP E5200A Broadband Service Analyzer to provide remote testing and analysis of ATM-based services.

## System Requirements

These QoS and traffic performance analysis features are available as **standard** on the HP E5200A Broadband Service Analyzer. Simply make sure you have the following system configuration:

- HP E5200A Broadband Service Analyzer
- HP E5200A opt 002 (Release 1.3 or later)
- X-server display or Unix workstation

### HP Sales and Support Offices

For more information, call your local HP sales office listed in your telephone directory or an HP regional office listed below for the location of your nearest sales office.

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