Aurora Forte ATM Congestion Control on ATM networks

The cell transmission protocol used by ATM has several advantages that are attractive to the network operator. Two of these are the ability to mix different traffic types on the same network, and to offer a variety of service level agreements (SLAs) to customers depending on their traffic type.

Application Note ANFORTE 07

Testing the World's Digital Networks

TrendCommunications

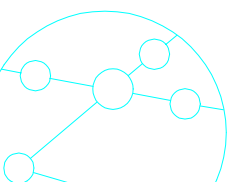
INTRODUCTION

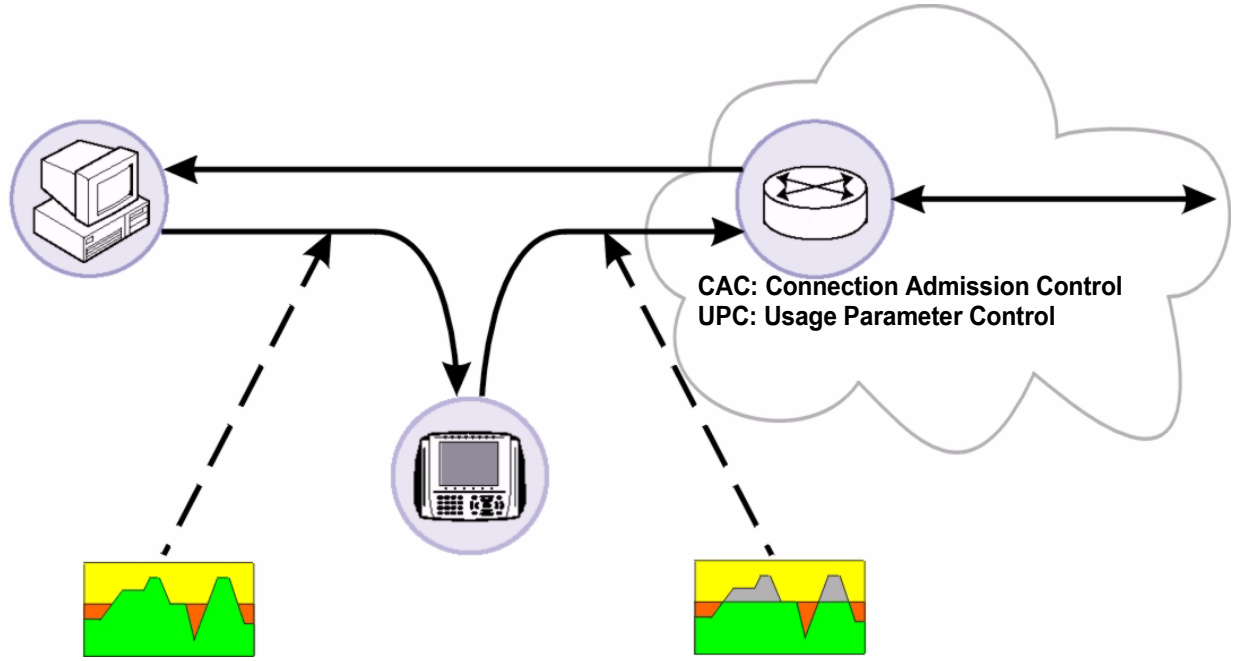
The cell transmission protocol used by ATM has several advantages that are attractive to the network operator. Two of these are the ability to mix different traffic types on the same network, and to offer a variety of service level agreements (SLAs) to customers depending on their traffic type. Disputes may arise between the operator and customer about the implementation or operation of the SLA. In addition the cell multiplexing used by the ATM network can result in data discard during congestion. The congestion may happen because of excess traffic from particular customers or because of the network configuration.

The Aurora Forte application of Traffic Policing can be used to monitor VCC usage and inform of excess data rate, and even to control the data rate between the customer and network. This can help in dispute resolution with the customer, or for the investigation of network congestion.

What needs to be tested?

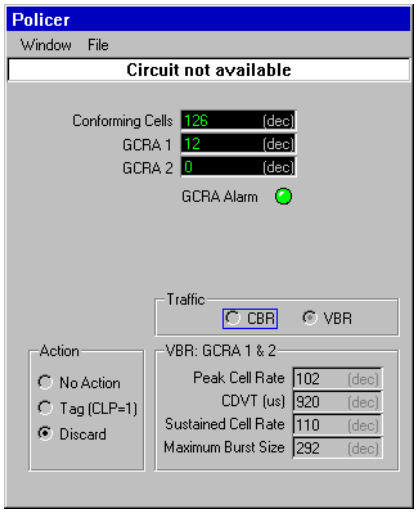
It will be necessary to check that the data rate being sent from the customer equipment is complying with the data rate contract. If the data rate is too high the access switch may be set to discard the excess data, this is the purpose of the Usage Parameter Control (UPC) function. The result will be a loss of data from the customers connection and a reduction in the expected service quality. There may also be data retransmission that will actually cause an increase in the data rate seen by the ATM switch. This problem may be caused by either the customer equipment (Traffic Shaping) or ATM switch (UPC) being programmed incorrectly, however the customer will not be receiving the expected service and will blame the operator. A quick resolution to this problem will satisfy both parties.





How is the testing done?

Aurora Forte is connected between the customer and network switch in order to monitor the data flowing into the network. There are two methods of connection that can be used. Either Passive Monitor, or Through Mode in which case it will be possible to enforce the traffic contract onto the customers data.



The ATM Receive application on AuroraForte will list the active VCCs showing the VP/VC value and cell rate statistics. A VCC can then be selected for monitoring using the Traffic Policing application. The tester should be programmed with the expected data Generic Cell Rate Algorithm (GCRA) contract using the MBS, PCR, CDVT & SCR parameters. A comparison between the actual data rate from the customer equipment and the expected contract will be made by the tester, and a count of excess cells provided. This information can be used to demonstrate to the customer if the contract is being complied with correctly or not.

In addition, when the tester re-transmits the data to the network a choice of Action can be made to enforce the contract by either tagging the cells for discard by the network, or to discard the excess cells inside the tester. This will be useful for showing the effect on the customers application or internal network, or for removing the source of congestion on the ATM switch.

Aurora Forte can also monitor an ATM link in both directions using two installed interfaces, provided they are of the same type, e.g. two OC3/STM1 single mode interface modules. In this application enforcing the Traffic Policing in the customer to network direction can change the data rate being returned from the far end back to the customer. It may be useful to monitor this effect at the same time as the customer equipment is re-configured.

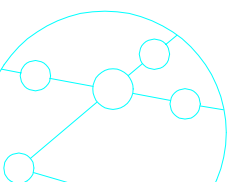
Typical Faults

Customer complaint of too low a data rate

- Customer equipment Traffic Shaping is set too low.
- ATM switch UPC is set too low, causing data loss.
- Customer application requires a faster Traffic Contract than agreed.

Customer complaint of data loss or data errors

- Customer equipment Traffic Shaping is not active, or set too high.
- ATM switch UPC is discarding data.
- Congestion is happening in the ATM switch or elsewhere in the network.

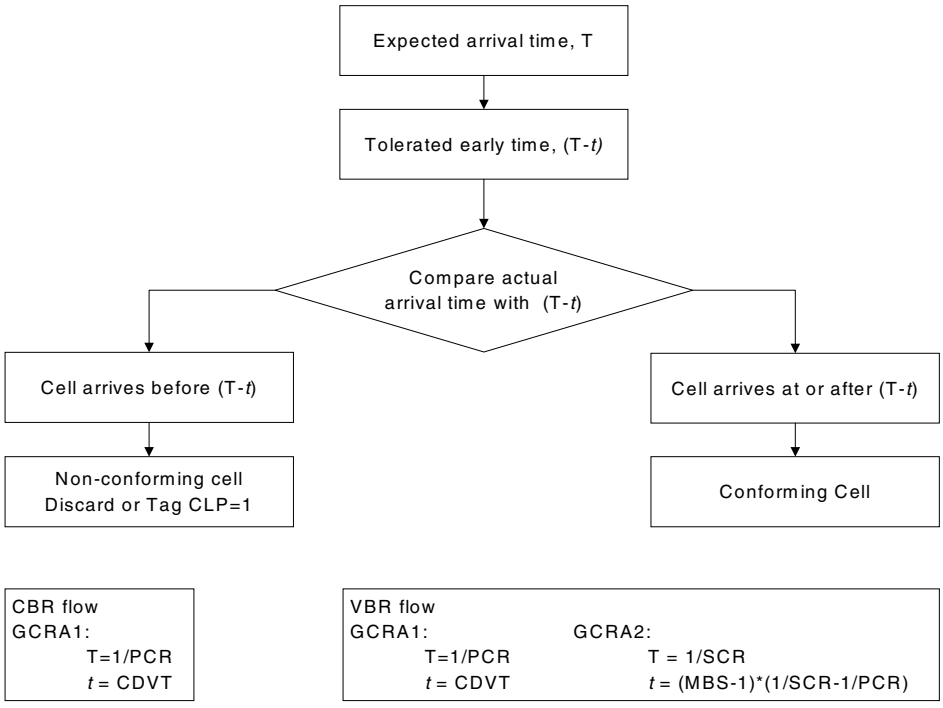


Network congestion

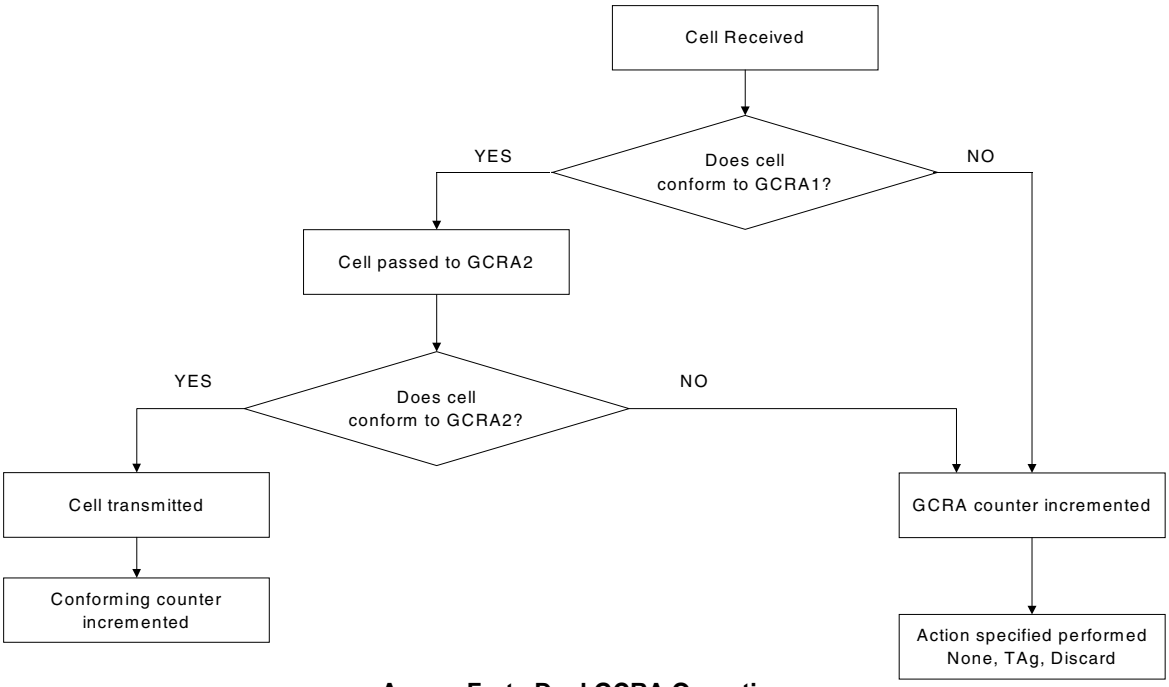
- Customer equipment is transmitting a high data rate.
- ATM switch UPC is not active, or set too high.
- Too much data being aggregated through an ATM node.

What is the GCRA

The Generic Cell Rate Algorithm is the process of scheduling cells for transmission through the ATM network. A Constant Bit Rate (CBR) profile will use a single GCRA (PCR & CDVT parameters), and a Variable Bit Rate profile will use a dual GCRA (PCR, CDVT, SCR, MBS parameters). The algorithm works by comparing the actual arrival time of each cell with the theoretical arrival time calculated from the parameters.

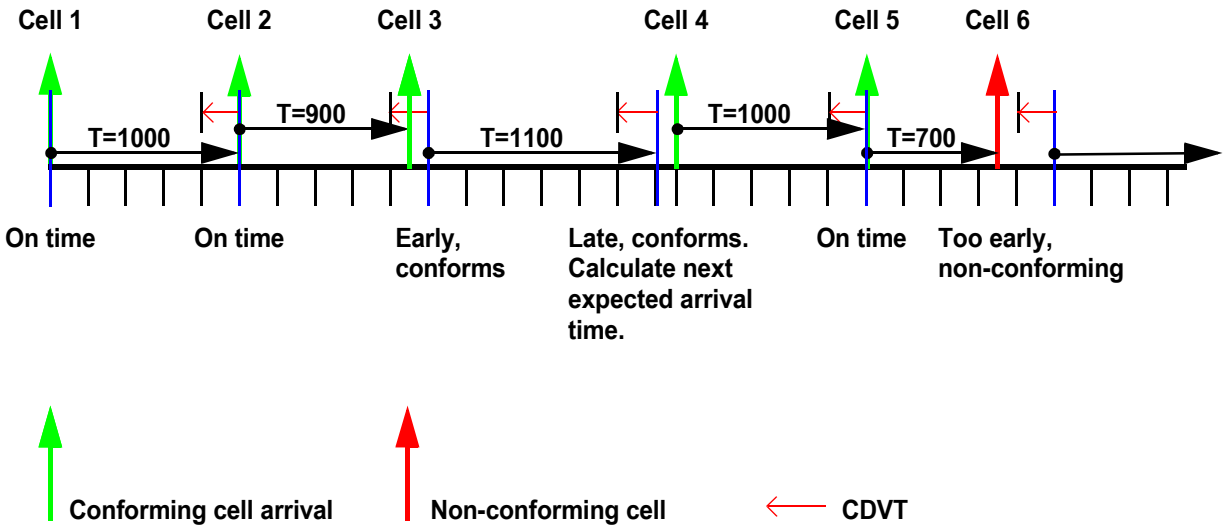


Generic Cell Rate Algorithm Theory

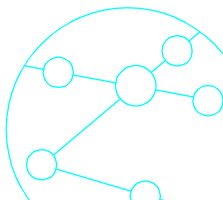


Aurora Forte Dual GCRA Operation

Here is a time diagram showing examples of conformance and non-conformance for a CBR flow. In this example the cell inter-arrival time T=1000, and the cell delay variation tolerance CDVT=200.



It can be seen that the CDVT parameter allows a cell to be late and still conform because the cell rate requirement is not being exceeded. Following a late cell the next arrival time is re-calculated to ensure that the PCR is not exceeded between consecutive cells. However cells that are earlier than the CDVT allows will be discarded. Cells following early arriving cells are timed from the original expected arrival time, so even if cells arrive within the allowed CDVT the PCR has to be met, otherwise cell discard will eventually take place.



Aurora Forte

Aurora Forte is an ATM handheld tester with the key features of being multi-interface with a graphical user interface and providing physical, ATM and IP layer test routines. File Management System allows test results and configurations to be copied to/from a PC using the testers Ethernet port.

- *Portable, battery powered, handheld unit, rugged design*
- *Large high resolution colour display*
- *Graphical ICON based window applications for easy operation of tests*
- *Interfaces - combined E1 + E3, combined DS1 + DS3, ATM25,*
- *OC3/STM1 (Single mode, Multi mode, G703, CAT5)*
- *Bi-directional monitoring*
- *Pass / Fail parameters for fast analysis of test results*
- *Physical Frame and Alarm monitoring & Injection*
- *Physical BERT for E1, E3, DS1, DS3*
- *ATM VCC real time Traffic Scanning - up to 1024 VCC*
- *ATM cellstream transmission - up to 256 VCC*
- *ATM BERT*
- *Quality of Service (O.191) measurement*
- *Traffic Policing - to monitor and enforce a committed service level agreement*
- *F4 and F5 OAM testing of ATM fault management layer (AIS, RDI, CC, Loopback), real time and trace history OAM cell capture with English language decode*
- *IP ping over ATM - transmit and respond tests*
- *SVC UNI 3.0, 3.1, 4.0 support with comprehensive Information Element editing*
- *Management of results and configuration files via PC on Ethernet interface for simple operation*
- *Software upgrades available from Trend Communications website, with download to tester via Ethernet port*

Aurora Forte is subject to an ongoing development program with continuous addition of new features - call for more information.

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