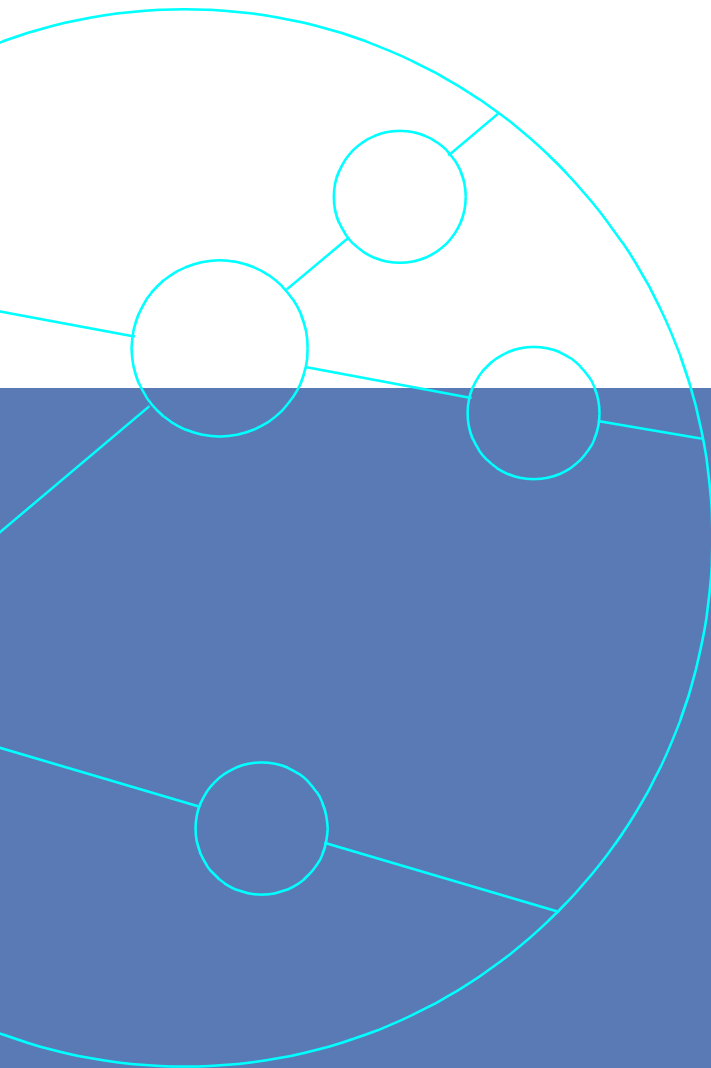


Aurora Forte IP over ATM Route Testing

This application note will show you how to use Aurora Forte to test routing of IP (Internet Protocol) packets over ATM circuits. Testing the parameters described here will prove that an ATM route exists between the test points, that the packet protocol is recognised and that the IP addressing is correct.

Application Note ANFORTE 06

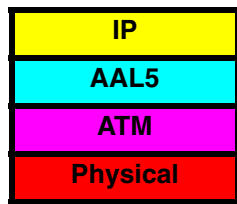


Testing the World's Digital Networks

TrendCommunications

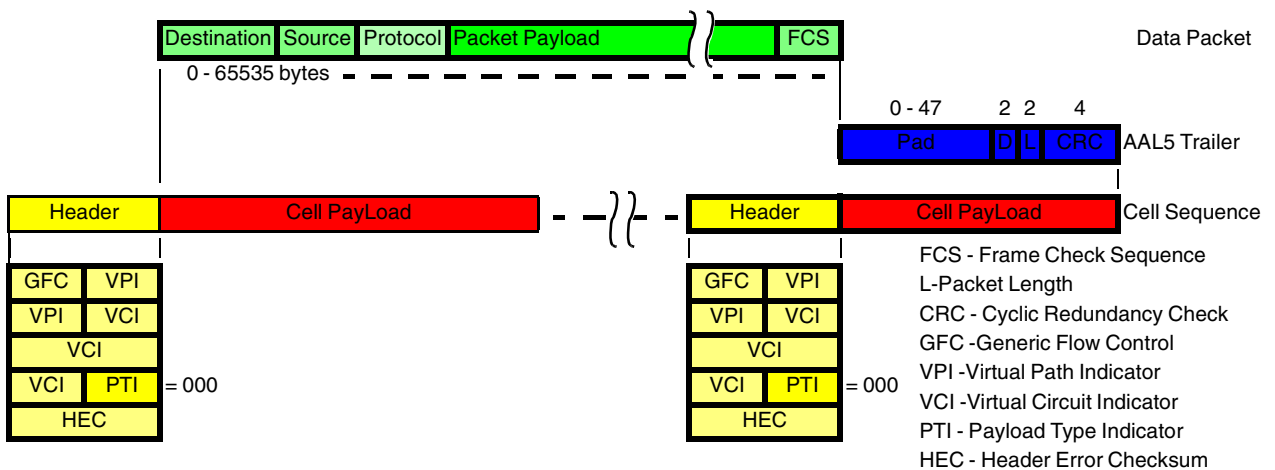
PACKET ROUTING OVER ATM NETWORKS

The ATM protocol defines the basic transport capability of the network, so to carry useful data there must be a mechanism for mapping the user data onto cells. This is known as the ATM Adaptation Layer (AAL) and there are different types depending on the type of data that is being carried. Data that is formatted in packets, such as IP, is most efficiently encapsulated in AAL type 5.

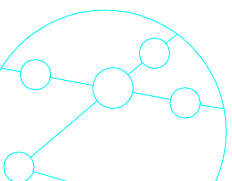


Protocol Layer Model

The diagram below summarises the process of packet Segmentation and Re-assembly: Each packet is expected to be of a variable length, and so the AAL5 process provides for the packet to be divided into the required number of consecutive cells. A trailer is added to the end of the last cell in each packet sequence that pads the data to fit exactly into the ATM cell payload, this includes a length count and CRC. The last cell of the packet sequence is identified by the PTI field of the cell header being equal to 001.



Packet Encapsulation in AAL5



The following is a list of some of the AAL5 process limitations:

- The cells from each packet must be sent consecutively on the same VCC into the network. Other packets that are to be sent must wait in turn before they can be sent on the VCC.
- The equipment at each end of the VCC must know that AAL5 is being used, and understand the packet protocol that is being transported.
- The packet length is only known when the last cell is received, all cells must be buffered before Re-assembly can take place and the packet passed to the user application for processing.
- Packet errors that occur due to data corruption or cell loss will be reported to the higher application for processing. The ATM layers do not provide error correction or re-transmission; this task is left to the higher protocol to decide what action to take.

What needs to be tested?

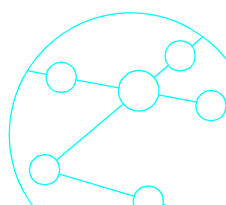
The basic principle of testing is to prove that the protocol type is transported correctly across the network between the user end-stations. The application described here will use an IP PING message as a test method.

The advantages of the IP PING are:

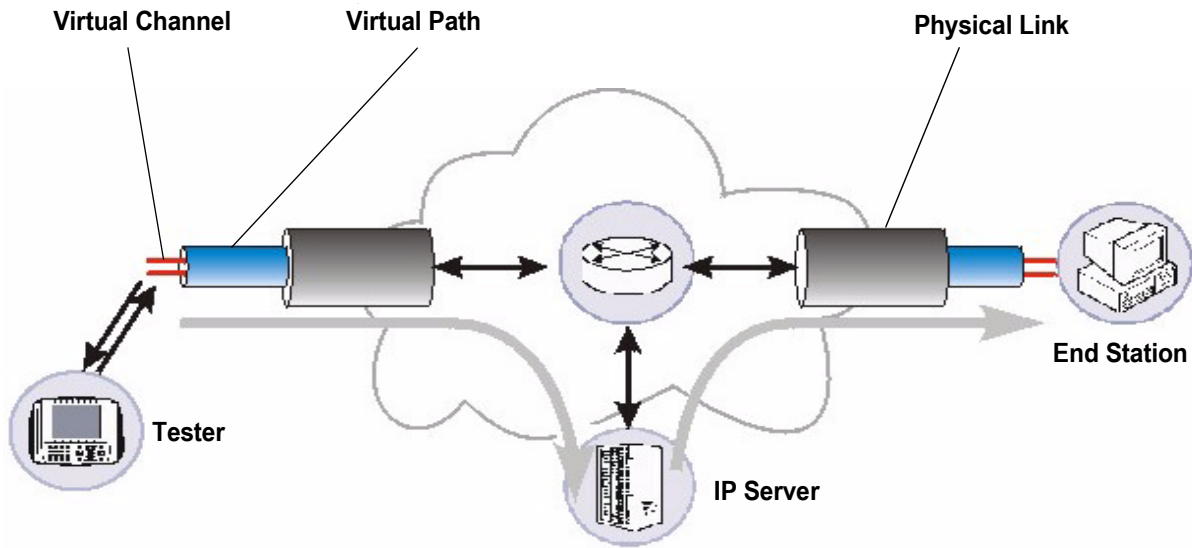
- Same packet format as user data.
- The end-station will automatically respond to receiving the message
- May be set with varying packet length and repeat rate.
- Can be used to measure Round Trip Delay at the IP layer.

For the packet communication to be successful the network settings that are required to be correct are:

- Packet protocol type, e.g. VC-mux or MPOA.
- Destination and Source IP addresses.
- ATM VCC route.



How's the Testing Done?



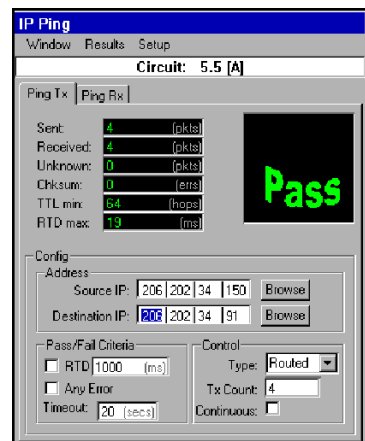
There are several alternatives to the test scenario:

- Tester at each end of the ATM PVC route.
- Testers at the termination of VCCs with an IP server determining packet routing.
- Tester at the termination of a VCC with an IP end-station at the far end.

The last of these is the most interesting as it shows a new termination being added to an existing network and relies on the VCC routing between each termination and the switch being correct, and also between the ATM switch and IP server. Plus, the IP addressing at the servers and end-stations must be set as expected. In this instance, the tester is setup by first selecting the VCC at the end-termination that is routed through the ATM switch to the IP server.

Ping TX

The IP Ping application is configured with the Source IP address that is assigned to the end-point being tested and with a Destination IP address that matches either the IP server, or the far end-station. When the IP Ping application is started the packets will be sent over the VCC to the server, if the Destination IP address matches the server address then a reply will be immediately returned. If the IP address matches the address of another



destination then the packet will be forwarded to that address and a reply will be returned via the server to the tester. In both cases the tester should receive a response to each Ping packet sent proving that the VCC route and IP addresses are correct. When the Ping response is received the tester will also indicate packet checksum errors, the Time To Live (TTL) value and Round Trip Delay (RTD). If packets are received that are not Ping responses these will be indicated as an Unknown count.

The Ping Tx setup includes a choice of Routed or Bridged type Ping. The Bridged type is used where the far end is on an Ethernet segment, common on ADSL networks. When the test is started an Address Resolution message is sent in order to discover the MAC address of the far device, if no reply is received an error message will be displayed.

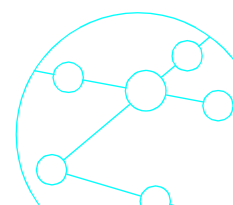
Ping RX

An alternative scenario using the same equipment is to use the tester to respond to Ping packets. In this case any station on the network can send a Ping to the IP address assigned to the tester and it will automatically return a reply. The tester will indicate the Source address originating the Ping and whether the Destination address matches that set on the tester. The response message returned by Aurora Forte will contain the same payload information as was received, for this reason it may be important to set the Peak Cell Rate (PCR) of the return data so that multi-cell messages do not suffer cell discard by the network.

The ATM Rx summary window can be used at the same time in order to monitor the ATM cells carrying the IP packet. As each packet arrives at the tester the ATM layer will record a burst of cells arriving on the assigned VCC.

ADSL NETWORK TESTING WITH AURORA PRESTO AND AURORA FORTE

ADSL network testing may also be done using the IP Ping application. Out of service testing of the DSLAM is possible using Aurora Presto to terminate the ADSL side of the DSLAM and Aurora Forte on the network side. The two products are then able to send and receive IP Pings between each other, thus proving the ATM routing and IP routing through the DSLAM.



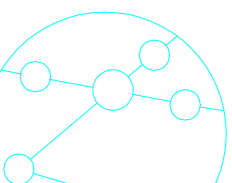
Typical Faults

Ping TX

- No reply received at tester.
Has the correct VCC been selected for the test? Try using the Ping RX test to check that data can be received on the VCC.
- MAC error message displayed.
Is this an Ethernet link? NO - Try using the Routed type Ping.
YES - Consider previous fault description.
- Unknown packet count is incrementing.
An unknown count when sending Pings may be error messages from the server indicating that the Destination IP address is incorrect.
Packets may not be the Ping message but from another source.
The selected VCC may be incorrect, so that a different packet flow is being received.

Ping RX

- No packets received at tester.
View the RX summary window to check that cells are being received on the correct VCC.
Has the correct VCC been selected for the test? The packet may be on a different VCC to that expected.
Is the Ping being sent to the incorrect IP address (i.e. is the address set for this location)?
- Response not received at far end.
Is the PCR set to high? The ATM network may discard cells that exceed the allowed data rate. Try using a smaller packet length at the sending end.



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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