



DSL Testing



Application Note ANPINTRODSL-13

xDSL



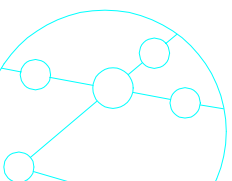
A PRACTICAL INTRODUCTION TO DSL SERVICE TESTING USING AURORA PRESTO

Introduction

Service installation and commissioning is not without it's problems. Up until recently in the USA it was taken as a general 'rule of thumb' that an ADSL installation would average 3 truck rolls before the service was operating satisfactorily. With the growth of 'self install' where the customer obtains the DSL modem and a splitter box from a high street retailer, as a move to cut costs, the problem can only grow. A recent survey around 42% of DSL self-installers in the USA had to contact the helpdesk during installation and the average time spent identifying and solving the genuine problems was nine hours.

The key to cutting the time spent deploying the service lies with effective problem resolution. Effective problem resolution in turn depends on accurate fault location. Many methods of achieving this have been tried. Providing fault diagnosis software on a PC as an installation test is one method tried with limited success. This will work if the service is partially functional and a complete IP layer connection between an Internet Service Provider (ISP) and the customer PC is available, but is of no benefit if no connection can be made. A copper test head at the main distribution frame linked to the network management system provides only a limited viewpoint. Even the DSLAM management system with it's complex list of statistics and routing tables will only provide a subset of the information needed to isolate type and location of any possible network problem.

Centralised fully automated network testing is technically impractical and commercially prohibitive for residential DSL services in particular where the geographical population density is low. With the move to de-skilling or 'multi-skilling', there is a definite need for the first-line maintenance technician to carry tools capable of investigating the problem and then providing the necessary information to enable the support technicians to correct the fault with a minimal number of further visits to the field.



Maintenance

The installation service process should provide the necessary detail to the maintenance technicians to diagnose and correct faults at any point between the customer PC and the WEB site or internet service that the customer wishes to access. To achieve this and make the low cost high penetration DSL business model work, a sound service test strategy must be in place that clearly segments the service to allow clear fault location and diagnosis.

To achieve this aim, the service and network topology must be clearly understood and is shown below in figure 1.

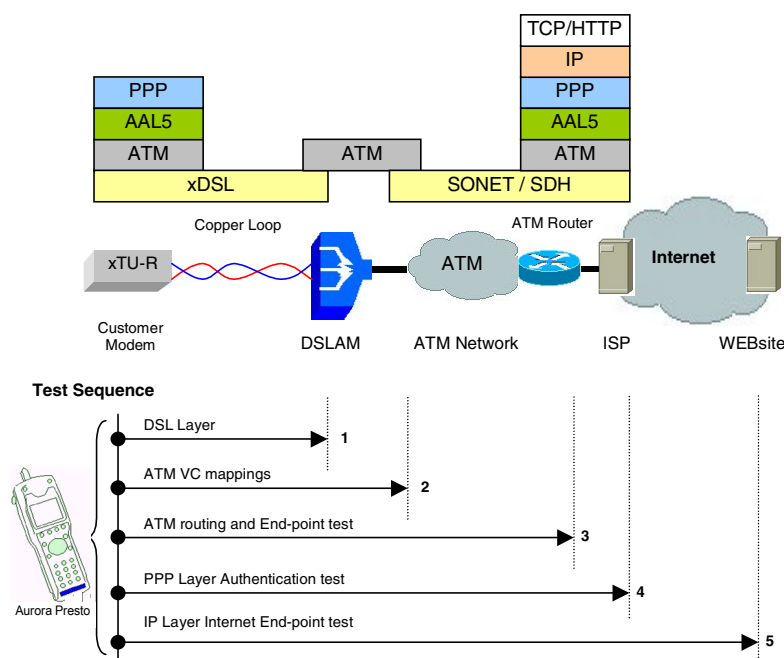


Figure 1

DSL service, protocol layer map and test segments

As shown in the DSL service diagram and protocol model in figure 1, a typical ADSL service from customer modem to ISP consists of several different layered technologies. In order to correctly locate and identify a fault condition, the test equipment deployed must be capable of conducting tests at the DSL, ATM, AAL5, PPP and IP layers. Table 1 details the minimum test requirements for each layer.

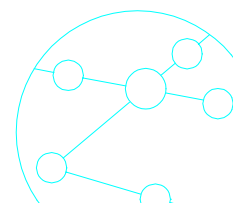


Table 1 Multi-Layered test requirements..

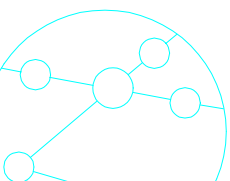
Layer	Minimum quality test	Location test
DSL	Channel bit rate evaluation, Capacity, Attenuation, Noise Margin and bits per channel mapping.	Tests between the Customer Modem and the DSLAM line card at point 1 (e.g. ATU-C).
ATM	Virtual Circuit Mappings, Node and end point determination using F5 OAM PING.	Tests ATU-R, DSLAM (point 2) and ATM network mappings and routing between the Customer Modem and the ATM switch serving the ISP (point 3).
AAL5	AAL5 statistics	Identifies packet loss and the quality of the virtual circuit between the DSLAM and the Customer Modem.
PPP	PPPoE / PPPoA with PAP CHAP support for authentication	Tests from the Customer interface to the ISP gateway (point 4).
IP	IP PING	Tests from the Customer interface to a known WEB site (point 5).

The segments for each layer test are shown in figure 3. This five-stage test strategy should take under 60 seconds to perform and will provide fault location and diagnosis for the technician, reducing fault correction time and cutting the travelling costs.

All layers are very important to consider but many operators have neglected to test the ATM layer and this has cost them significant time and money. Whilst ATM technology appears complex to the subscriber loop technicians, the test methodology is very simple. Common ATM layer problems that occur include:-

- Wrong or crossed virtual circuits at the DSLAM manifesting themselves as one way traffic or no access to the ISP or application server.
- Disparities between the virtual circuit mappings, hard configured in the customer ADSL modem and the mapping tables in the DSLAM.
- Incorrect routing of the virtual circuit through the ATM network providing an incorrect end point.

A combination of the use of a simple cell-stream analyser and the transmission of F5 OAM loop-back cells acting like a PING can identify and locate all of these problems simply and effectively. It is important to remember that if the ATM layer is mis-configured then the service will not work.



Summary

The definite need to test the copper infrastructure prior to installation of the DSL service is open to argument. Indeed some operators opt for no pre-qualification and reap the short-term gains while others pre-qualify individual pairs or qualify pairs in bulk and guarantee minimal problems for the future. The second option will certainly ensure that a larger percentage of the bundle can be used for broadband services. Probably the most important copper test capability lies in the second line network maintenance role to allow problems of interference, pair interaction and in-service copper faults to be isolated. In the current environment a comprehensive DSL service tool is of most benefit to the network installation and maintenance technicians.

The most important feature of any DSL service test solution for field use is the combination of a simple one-button, fully automated test sequence for the first line technician allied with a multi-layer analysis and capture facility. Thus providing the second or third line support technicians with the information they require without the need for repeat visits.

Accurate fault location is of course becoming more critical for any DSL test solution as competition for the local loop becomes greater and the field test solution becomes an independent arbitrator.

The multi-layer five point test strategy detailed above will provide the network operator with a complete picture of the service. It provides a segmented approach to fault location that has been missing from conventional test strategies. This strategy also fills the ATM system test gap that has been overlooked by network operators and test vendors to date. This omission has left a large blind spot for the network technicians to deal with and has caused many time-consuming problems in the installation and commissioning process.

