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Livingston Introduction - FTTH

On activation of the network is important to thoroughly test it. It is at this point that quality of service must be tested and monitored in order to meet service-level agreements (SLAs) with subscribers.

It is possible for three optical signals to simultaneously travel along a Passive Optical Network (PON) link at different wavelengths. A simple means of detecting these signals, measuring them, and verifying that they are within acceptable power ranges, is needed by the operators and each needs to be determined according to the type of network and equipment used. Much of this work is performed using a PON Power Meter. This instrument will provide the user with a power level reading for each individual wavelength and, dependent on the optical levels measured, the technician can identify which service is affected. Further, by measuring these optical levels in different locations, the faulty section can be identified.

When a fault is found, such as no or little signal, the source of the disruption or fault needs to be determined. This kind of fault finding requires the use of a PON power meter combined with an OTDR optimised for live testing, which does not interfere with the normal operation and expected performance of the information channels.

Whilst turning up services in the network, a thorough performance assessment including detailed frame analysis and bit error rate testing, provides the baseline for service-level agreements (SLAs).

Test methodologies to verify Ethernet performance at Layer 2 and Layer 3 in EPON have been developed and the RFC 2544 from the Internet Engineering Task Force (IETF) specifies the procedures for testing the following characteristics:

- ✓ Throughput: Data throughput is simply the maximum amount of data, that can be transported from source to destination. However the definition and measuring of throughput is complicated by the need to define an acceptable level of quality. For example, if 10% errored or lost frames were deemed to be acceptable then the throughput would be measured at 10% error rate.
- ✓ Latency: Is the total time taken for a frame to travel from source to destination. This total time is the sum of both the processing delays in the network elements and the propagation delay along the transmission medium. In order to measure latency a test frame containing a time stamp is transmitted through the network. The time stamp is then checked when the frame is received. In order for this to happen the test frame needs to return to the original test set by means of a loopback (round-trip delay).
- ✓ Frame Loss: is simply the number of frames that were transmitted successfully from the source but were never received at the destination. It is usually referred to as frame loss rate and is expressed as a percentage of the total frames transmitted.
- ✓ Back-to-back: This involves sending a burst of frames with minimum inter-frame gaps to the Device Under Test (DUT) and count the number of frames forwarded by the DUT. If the count of transmitted frames is equal to the number forwarded then the length of the burst is increased and the test rerun. If the number of forwarded frames is less than the number transmitted, then the length of the burst is reduced and the test is rerun. The back-to-back value is the number of frames in the longest burst that the DUT will handle without the loss of any frames.

These tests most often carried out at the end of the installation phase, and can be performed with Ethernet testers and other similar instruments.