Sound infrastructure?

Imagine the company is going to invest in constructing of a new building or extending onto your existing building, as the investment is going to be substantial you want to make sure that it is functional and impressive – in fact a bit of a show piece!!

You spend time choosing the style of windows, types of doors, flooring and decoration, all of which you want your clients to see and associate with you to be a quality building, after all isn't it a quality service you provide?

As part of the new building you would have to invest in good ground works to provide a solid foundation on to which you build on, skimping on this could mean your whole building being compromised in the near future – not good!

Get the foundations wrong and trouble is only a short time away, get them right and you can be confident your investment is stable and sound for years to come. Logical really isn't it??

So why then are many companies prepared to over look the foundation of their IT infrastructure, surely the same rule applies here? Apparently this is not always the case...

The investment in I.T. is never taken lightly, making the right choice in new hardware or software is critical to the effective running of your company, ensuring that it is the best for your company in terms of cost effectiveness, ease of use and all the other decision making points normally considered, are part of the usual investment steps taken by any company.

- However during this time has anybody thought about the infrastructure?
- Is the cabling system capable of handling the demands required in the modern working environment?
- What evidence do you have to prove that your data cabling is performing to its expected level?
- Ever considered the cost of a badly installed infrastructure?

The cabling system is usually a part of your I.T. system that gets over looked for very simple reasons, it is not on show and therefore out of mind, and as it is 'just a piece of cable' it either works or doesn't and as all the attached devices can see each other it therefore must be working!

Sorry this is fundamentally flawed.

Whilst we except that 'seeing' devices across the network must mean there is connectivity what it doesn't tell you is how well they are doing it. In general people usually click the network connection icon on their PC's to see the network speed, depending on the network card it will invariably say 100.0 Mbps or 1000.0 Mbps, a presumption is made that this means the connection is at the speed indicated.

This figure is a guide and does not give a complete representation of the entire connectivity link.

To get an accurate measure of your network connectivity you should look at two main areas the cable infrastructure and the network equipment controlling the cabling.

Cabling: These days the cabling can usually be broken down into one of two solutions **Cat 5+** and **Cat 6**, although these cables look similar they differ in two areas speed and bandwidth.

Cat 5+ can operate at speeds up to 1000.0 Mbps (1Gbps) and have a bandwidth of up to 150 MHz we normally liken this to a speed dial on a car which invariably is optimistic on the top speed available for the car – 1.1 engine with 160Mph on the dial – as the car salesman would say "it goes up to 160Mph" we would say very optimistic!

or

Cat 6 cabling is designed to operate at a minimum speed of 1000 Mbps (1Gbps) with an associated bandwidth of around 350 MHz – some premium cabling systems claim to outperform the current Cat 6 standards by some considerable margin.

Regardless of the cable type each single run of cable should be end to end tested to check that it conforms to the relevant standard, this test will verify that the cable has been installed in such a manner that it will perform to the speeds it was designed for. Ideally the test should include patch and fly leads, after all they do form part of the cable infrastructure and are usually the more abused due to re-patching etc.

Let's test it then!!

Hopefully having understood the need to test the cable infrastructure (either existing or new) the next step is to complete a test. By testing we don't mean a simple continuity test either, a continuity test only completes a test to show connectivity, the test we are referring to takes several minutes per cable and tests for performance values.

These values are defined by the following:

Attenuation To Cross Talk Radio(ACR)

ACR (attenuation to crosstalk ratio) is the difference between NEXT in dB and attenuation in dB. The ACR value indicates how the amplitude of signals received from a far-end transmitter compare to the amplitude of NEXT produced by near-end transmissions. A high ACR value means that the received signals are much larger than the crosstalk. In terms of NEXT and attenuation values, a high ACR value corresponds to low NEXT and low attenuation.

Near End Cross Talk (NEXT)

Crosstalk is undesirable signal transmission from one signal pair to another in close proximity. Crosstalk can cause communication problems in networks. The most significant characteristic of LAN cabling performance is crosstalk. High levels of crosstalk will prevent a LAN from performing properly.

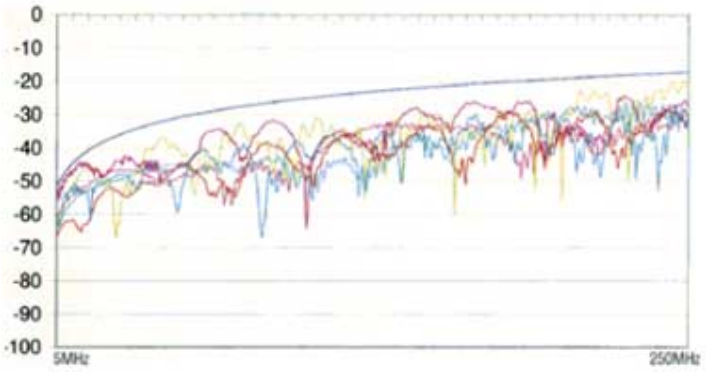
The NEXT test measures crosstalk by applying a test signal to one signal pair and measuring the amplitude of the crosstalk signals received by the other signal pairs. The crosstalk value is computed as the difference in amplitude between the test signal and the crosstalk signal as measured on the pair under test, from the same end of the cable. This difference is called Near End Crosstalk (NEXT) and is expressed in decibels (dB). Lower NEXT values correspond to better system performance.

All signals transmitted through a cable are affected by attenuation, therefore crosstalk occurring at the far end of a cable contributes less to NEXT than crosstalk occurring at the near end of a cable.

Power Sum ACR(PRACR)

PowerSum ACR is to ACR as PSNEXT is to NEXT. Instead of the ACR values being measured for all six pair combinations they are calculated for the four pairs in the cable. Modern protocols utilise more than one pair to achieve their high bit rates. In situations such as these more than one signal in each direction could be transmitted at any one time. PowerSum is a method of testing that ensures that a cabling system is capable of transmitting a multi-pair protocol.

Equal Level Far End Cross Talk(ELFEXT)



Far End CrossTalk (FEXT) is another new type of test that has been introduced to ensure modern cabling systems are capable of transmitting modern protocols. New protocols utilise multiple pairs and the signals can travel in opposite directions at the same time. It is no longer sufficient to simply test for Cross Talk at the Near End but a Far End Cross Talk test must also be completed.

The test signal is transmitted from one end of the cabling sample and measured at the other on a different pair. By repeating the tests on all combinations of pairs in both directions a full evaluation of FEXT can be derived.

Since the signal has been attenuated along the length of the cable, that attenuation is added back to the final measurement to give equal level FEXT. This adding back of the attenuation provides a relative measurement of FEXT and allows a true comparison of the level of received signals at the Far End.

PowerSum Equal Level Far End Cross Talk (PSELFEXT)

As with all crosstalk measurements (including ACR) there is also a PowerSum ELFEXT (PSELFEXT). These are calculated values expected for multi-pair simultaneous full duplex transmissions

Attenuation

Attenuation is the decrease in the strength of a signal over the length of the cabling link and channel. This is caused by the loss of electrical energy due to the resistance of the conductors, and by leakage of energy from the link and channel. This loss of energy is expressed in decibels (dB). Lower attenuation values correspond to better link and channel performance. For example, when comparing the performance of two cables at a particular frequency, a link and channel with an attenuation of 10 dB performs better than a link and channel with an attenuation of 20 dB.

Link and channel attenuation is determined by the cable and cross connect construction, length and the frequencies of the signals transmitted through the link and channel. At higher frequencies, skin effect, inductance and capacitance cause attenuation to increase.

Characteristic Impedance

Characteristic impedance is the impedance that a link and channel exhibits if the link and channel were infinitely long. Impedance is a type of resistance that opposes the flow of alternating current (AC). A link and channel's characteristic impedance is a complex property resulting from the combined effects of the link and channel's inductive, capacitive, and resistive values. These values are determined by physical parameters such as the size of the conductors, distance between conductors, and the properties of the cable's insulation material.

Proper network operation depends on constant characteristic impedance throughout the system's cables and connectors. Abrupt changes in characteristic impedance, called impedance discontinuities or impedance anomalies, causes signal reflections, which can distort signals transmitted through LAN cables and cause network problems.

Looks pretty in depth doesn't it? It has to be; only this way can truly test your cable infrastructure to see if it is capable of performing to its defined standard. In other words if we need to know if a Cat 6 cable is running at 1Gbt plus with bandwidth capabilities of around 250MHz, in other words working to its standards, this is the **only** way of charting the performance.

Contact us for more information.