Noise Mitigation Techniques

Introduction

Electromagnetic Interference (EMI) also referred to as noise, is the result of electrical components creating EM fields nearby other elements, primarily those focused on the transmission of data.

Noise can be detrimental to this transmission, impacting performance and quality of signal transmission and in severe cases, causing a complete system shutdown. To ensure system function, the impact of noise should be mitigated wherever possible.

Cause

As electricity passes through a conductor, an electromagnetic field is generated around the conductor. The same effect happens in reverse. If a magnetic field is moved over a wire, a current is produced.
The impact of these events scales with the strength of the magnetic field and the current being passed.
The larger the current, the stronger the electromagnetic field that is created.
The larger the magnetic field, the stronger the current that is created.

As with all magnetic fields, their strength decreases at an inverse of the distance from the source. The farther away, the weaker it is.

Mitigation Techniques

Various building/construction codes exist to help mitigate the impact of EMI however from time to time, some work may need to be done to further improve a situation especially if required communications are affected.

The following techniques help mitigate the impact of noise on communications.

Introduce an air gap between cabling and noise emitters

EMI is stronger the closer the data line is to the source of the electromagnetic field. Introducing an air gap or any sort of physical spacing. While moving cables in conduits, roof trays or direct burial may not be possible, moving network elements around in their respective closets can help reduce the impact of noise. Remember that other data lines can be sources of interference.

If power and data lines run in parallel, move them such that they intersect instead.

In various locations, power lines and data lines must be physically close to each other. In these environments, re-routing data lines such that they don’t run in parallel with power lines will help reduced induced voltage.

Ground any existing cable shields

Shielded cable is designed to provide an ideal path for voltage to make its way to earth ground before it impacts the data lines. Ensuring that this shielding is connected to ground guarantees that the shielding does its job. An ungrounded shield may cause negative impact compared to an unshielded cable.

Ensure as much of the cabling is twisted especially in areas where multiple ports are in close proximity to each other (bundles, cross-connects, etc)

In various cross-connects and cable termination blocks, stranded cabling may be introduced to save costs and time. This cabling is particularly poor at mitigating noise and is generally introduced in environments where there is a collection of data lines and other electrical equipment. Ensuring that twisting of the cables is maintained through these cross-connects and leading right up to the connections is crucial to reducing crosstalk.

Ensure pairs are terminated to the same length

Pair twisting relies on matched length conductors to function. Mismatched lengths of wire on a twisted pair will prevent the cables natural twist and noise mitigation from functioning as effectively as possible. When trimming service loops and terminating lines, ensure that both conductors of the twisted pair are cut at the same position.

Use ferrite filters

Ferrite filters can reduce or eliminate high frequency noise. Note that they will not stop direct voltage induction. Their uses are limited but if high frequency voltage is being inducted onto a line, a ferrite can drastically reduce this impact. Ferrite filters come in various shapes and sizes. NVT Phybridge recommends toroid (donut) shaped devices be installed with the cabling looping through several times (3-5 turns is ideal).

Telephone:

1 (905) 901-3633

Fax:

1 (866) 252-9148

Email:

support@nvtphybridge.com