Opengate data systems

Harmonic Distortion on Network Communication

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Summary

Deployment of high density IT equipment into data center infrastructure is now a common occurrence. Many data center managers are concerned about the Electro-magnetic Interference (EMI) on the communication network. EMI is the interference emitted from an electrical device that has an adverse effect on the function of a surrounding or connected device.

In the data center there is a significant quantity of electronic devices requiring power as well as communication. The adverse effects of EMI on data communication can be mitigated in the data center by following industry accepted standards and by using best practice for grounding, cable routing and separation.

EMI Types

There are four types of EMI that produce magnetic, electro-magnetic or electrostatic disturbances.

Radiated EMI is derived electro-magnetic fields, the result of electrostatic and magnetic fields in close proximity.

Capacitive coupling is derived from electrostatic fields. Electrostatic fields are the direct result of the differential potential between the source and the receptor.

Inductive coupling is derived from a magnetic field about a conductor created by the current flowing through a conductor.

Conducted coupling is derived from a device (source) having a direct cable connection to a device (receptor) effected by the disturbance.

EMI can disrupt data communication in the data center if standards and best practice cable routing and grounding are not adhered to.

Electro-magnetic Compatibility (EMC)

The Federal Communications Commission (FCC) defines acceptable limits for radiated and conducted emissions. To ensure EMC between devices, only FCC Class-A compliant devices should be deployed in the data center.

Grounding and Cable Routing Practices

Good grounding and cable routing practices are essential to ensure EMI does not effect data communication.

To ensure proper grounding of devices deployed into the data center ANSI/TIA/EIA 607 section 9 states cables must be installed in a grounded metallic raceway.

NEC article 800-52 states data and power cables be separated by a barrier when sharing a raceway.

The Telecommunication Distribution Design Manual (TDMM) published by BICSI, a trusted telecom association, recommends that data cables be routed a minimum of 12 inches from power conductors.

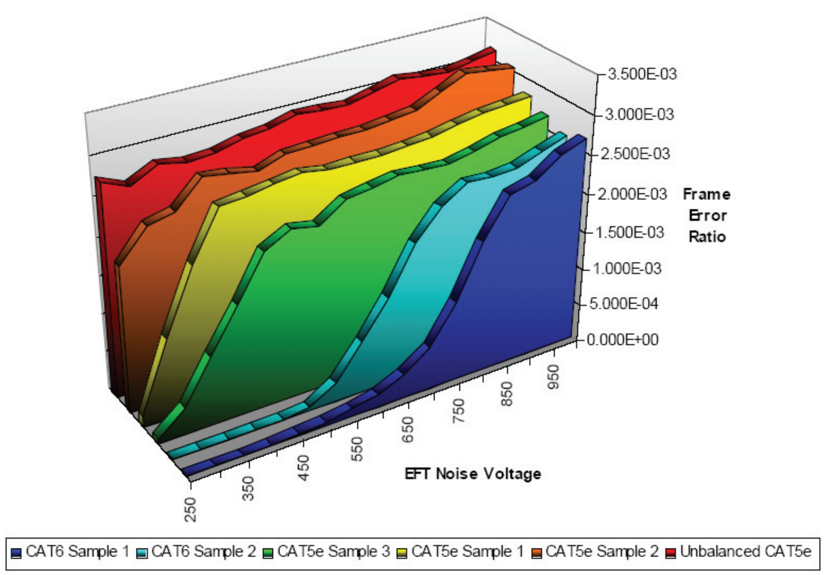
Data Communication Failure Rates

A test performed by an independent data communications competency lab shows that Gigabit Ethernet signals transmitted over cabling with no separation between the data cables and power cables produced data packet loss.

Power cables were exposed to varied power spikes and frame error rates were recorded.

Category 5e cables consistently showed data packet loss starting at 250V. Category 6 cables are more resistant to data loss due to voltage.

Error Rates of Cables under EFT



Conclusion

Corruption of data communications can be mitigated by deploying devices with FCC Class-A compliance, with proper grounding of devices and proper separation between power and data cables as defined by the identified industry standards.

Company standards that are developed and reference the applicable industry standards along with photographs of best practice methods will be a valuable asset to any organization.

About the Author

Mark Germagian is currently serving as President for Opengate Data Systems with responsibility to lead the firm into new technology areas relating to effective and efficient data center operation. Mark has directed technology development and was a design engineer for 22 years with experience designing products for telecom and technical work environments as well as cooling distribution systems for computer data centers. Mark holds multiple U.S. and international patents and is a contributing author for ASHRAE TC9.9 datacom series publications.

References

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BICSI TDDM

NEC 1999 Handbook

FCC Title 47, Part 15

Nexans Competence Center, Comparison of Cat5e to Cat 6 Using EFT Pulse EMI