Cabling Infrastructure and Green Building Initiatives

In a recent study, Gartner analysts revealed that IT activity accounts for 2% of global CO_2 emissions, equivalent to the amount produced by the aviation industry. We typically think of emissions as coming from forms of transportation, heavy industry and power generation, but with recent work to address global issues we see that in fact, IT and IT related products can have an impact in several areas.

Siemon, a network infrastructure specialist, addresses a number of cabling-related areas in which a greener approach to IT is possible.

GLOBALLY GREEN - AN OVERVIEW

The drive to reduce emissions and other environmental harm from more "hidden" activities such as IT has spawned a number of international efforts. The most wide reaching initiatives in the IT marketplace are focused on "Green Buildings" — efforts aimed at reducing the environmental impact of commercial and residential spaces.

The WGBC (World Green Building Council) currently consists of members from the USA, Canada, Mexico, UK, United Arab Emirates, India, Taiwan, Japan, Australia and New Zealand. As of the date of this writing, the following countries have announced plans to participate in green initiatives: Argentina, Brazil, Chile, Egypt, Germany, Greece, Guatemala, Hong Kong, Israel, Korea, Nigeria, Panama, Philippines, Switzerland, Turkey and Vietnam, with more to likely follow.

While the initial focus is on renewable energy sources, power and energy savings and environmental protection of sites for new and existing buildings; further examination indicates that network cabling and infrastructure will impact the overall effort.

In the United States, the USGBC (United States Green Building Council) has issued LEED (Leadership in Energy and Environmental Design) guidelines that provide a road map for measuring and documenting success for every building type and phase of a building life cycle. Although they vary slightly region to region, most global WGBG participants have guidelines that are very similar to LEED. An overview of the USGBC LEED program is provided in the appendix of this document

While a portion of these documents' scope falls outside of the cabling realm, Siemon wishes to illustrate some ways in which we can assist our end users in their Green efforts globally. In doing so, we primarily address LEED guidelines as put forth by the USGBC, as they are largely representative of related global guidelines such as: Indian, Canadian and Mexican proposed revisions; the BREEAM (BRE Environmental Assessment Methodology) certification; Green Star Program from Australia and New Zealand's adaptation of the same; Japan's Comprehensive Assessment System for Building Environmental Efficiency (CASBEE); and EEWH as set forth in Taiwan.

SOME CABLING-SPECIFIC STRATEGIES

Based on the general guidelines put forth by LEED, there are a number of cabling strategies that may be explored as green options and potential contributors to overall facility certification.

DATA CENTERS AND ENERGY CONSUMPTION

Energy conservation efforts are being introduced into the data center space at an ever–increasing rate with good reason. Current studies show that power alone represents from 30-50% of overall data center budgets. While a portion of the energy is consumed by the actual servers, switches, routers and other active gear, an additional power load is needed to cool this equipment. There is a cycle of cooling to power and power requiring cooling.

In order to have the most efficient cooling, cabling must be properly designed, remediated and routed to allow the air to flow in an unobstructed manner. TIA-942 and other complimentary data center standards around the globe suggest that horizontal and vertical cabling be run accommodating growth so that these areas do not need to be revisited. There are several reasons for this recommendation, including: eliminating the adverse affects of removing floor tiles and decreasing static pressure under raised floors during MAC work; assuring that pathways are run in a manner that will allow the flow of cold air in cold aisles to be unobstructed by cabling; and a potential benefit to cooling as the cabling can be installed to provide a baffle of sorts, channeling cool air into cold aisles.

A significant number of older data centers and even telecommunications areas have suffered from ill-managed MACs (moves, adds and changes) over the years, leaving abandoned cabling channels behind. These unused channels often create air dams which obstruct air flow, which could result in higher energy consumption as your cooling equipment will work less efficiently. While that problem alone should be enough to commission the removal of abandoned cabling, there may also be issues with the older cabling jackets not meeting current RoHS (Reduction of Hazardous Substances) requirements. In many cases, these older cables carry significant fuel load which can pose additional fire threats, and can release toxins such as halogens if ignited. Beyond the life and safety issues at risk, the proper removal and disposal/recycle of abandoned cable can remove a significant environmental risk.

Although removing abandoned cable will have a positive green impact, reducing the volume of potentially abandoned channels through proper management is an even better option. Intelligent infrastructure management systems (such as MapIT®), can provide a lights out advantage by allowing detailed monitoring of any MACs made. By providing a consistent and up to date diagram of the physical layer connections, channels can be managed and fully utilized before they become a management headache or a source of unchecked MAC work.

While the ability to keep the cabling channels in check will almost certainly reduce power consumption on the cooling side, intelligent infrastructure management can also reduce power needs of the active network equipment. When designed with a central patching field, an intelligent infrastructure management system can help ensure that all switch ports are utilized — decreasing the power needs for electronics by keeping unused ports to a minimum. The ability to patch into unused ports rather than adding additional switches can provide an energy savings which in turn translates into further cooling savings.

BENEFITS OF INSTALLING SYSTEMS WITH GREATER BANDWIDTH THAN CURRENTLY REQUIRED

When installing data cabling, it is in the end-user's best interest to install systems that will provide the maximum longevity. Currently, category 7/class F cabling is the highest performing cabling system on the market, with a category 7A/class FA standard due to publish soon. The latter is characterized to 1000MHz, or 1GHz per channel, which provides a significant amount of bandwidth above and beyond the latest 10Gb/s network speeds for copper. These higher bandwidth cabling systems are completely backwards compatible with older technology.

A recent whitepaper released by Siemon explores the ROI/TCO (return on investment and total cost of ownership) for cabling plants. It concludes that lower-performing cabling will cost significantly more over the entire life cycle of the cabling plant. When examining the green building initiatives, the reduction of materials that will need to be replaced over time is an even greater incentive to install higher-performing cabling.

For instance, installation of a category 5e system would mean replacement in a few years as 10GBASE-T is implemented to the desktop. Category 6 systems will require remediation (another visit from the installer) and certain replacement of longer channels. Each of these scenarios would have a negative impact on "green" ratings due to the waste of materials and additional site visits by contractors. The significant reduction in cables being removed and reinstalled, likewise results in the conservation of copper, aluminum and other natural resources.

PHY designers are always on the look-out for improvements that can support performance enhancements for their next-generation products. Moving to higher performing class F/FA, fully-shielded cabling systems such as TERA® will significantly reduce noise on the cabling channel which can result in a significant power savings in the active electronics by eliminating Digital Signal Processing (DSP) complexity used to suppress noise levels. A study presented jointly by Siemon and KeyEye Communications indicated that the use of fully-shielded cabling could offer a reduction of approximately 20% in the overall power budget related to 10GBASE-T chip architectures. The bulk of these savings would result from a reduction in the levels of DSP complexity associated with NEXT and FEXT cancellers.

Furthermore, low alien crosstalk levels exhibited in these channels will lead to greater signal to noise ratios which help a system achieve higher levels of robustness and reliability. Class F/FA cabling helps dramatically improve issues with noise budgets that factor into transceiver DSP complexity and power for worst case cabling lengths up to 100m. Processing and level requirements can be reduced with no loses in performance and the additional bandwidth provided by class F/FA cabling offers an end user an upgrade path to even higher signaling rates when needed in the future. While network equipment that is specifically designed to take advantage of the internal noise and SNR benefits provided by class F/FA cabling is not commercially available at this time, research clearly demonstrates the advantage in power utilization and latency that these cabling systems potentially offer to next-generation product designers.

POTENTIAL SOURCES FOR GREEN LEED CREDITS

Potential Contributions to LEED Credits

Product/Svc.	LEED Credit	Explanation
MapIT	MR 2.1 - Construction Waste Mgmt. - 50% MR 2.2 - Construction Waste Mgmt. - 75%	• Reduction of unnecessary channels due to undocumented/poorly managed MAC work
	MR 3.1 - Resource Reuse - 5% MR 3.2 - Resource Reuse - 10%	• Identification and utilization of unused cabling channels to limit installation of new channels
	EA 1 - Optimize Energy Performance	• Maximization of active port usage to limit the installation of unnecessary active equipment • Identification and utilization/elimination of abandoned channels to maximize pathway space/increase airflow for energy-efficient cooling
TERA	MR 2.1 - Construction Waste Mgmt. - 50% MR 2.2 - Construction Waste Mgmt. - 75%	• Cable sharing as a means to reduce number of installed cabling channels • Future-proof performance extends the lifecycle of the cabling, decreasing the frequency of cable removal/disposal and installation of additional cabling
	EA 1 - Optimize Energy Performance	• Shielded construction may limit noise sufficiently to reduce active equipment power consumption through elimination of DSP.
Z-MAX 6A Shielded	MR 2.1 - Construction Waste Mgmt. - 50% MR 2.2 - Construction Waste Mgmt. - 75%	• Future-proof performance extends the lifecycle of the cabling, decreasing the frequency of cable removal/disposal and installation of additional cabling • Reduced cabling diameter reduces pathway infrastructure (cable tray, conduit, j-hooks) • Reduced cabling diameter reduces the use of cable jacket materials
	EA 1 - Optimize Energy Performance	• Smaller cable diameter maximizes pathway space/increase airflow for energy efficient cooling
Z-MAX 6A UTP	MR 2.1 - Construction Waste Mgmt. - 50% MR 2.2 - Construction Waste Mgmt. - 75%	• Future-proof performance extends the lifecycle of the cabling, decreasing the frequency of cable removal/disposal and installation of additional cabling
XGLO Fiber	MR 2.1 - Construction Waste Mgmt. - 50% MR 2.2 - Construction Waste Mgmt. - 75%	• Reduced cabling diameter reduces pathway infrastructure (cable tray, conduit, j-hooks) • Reduced cabling diameter reduces the use of cable jacket materials • Future-proof performance extends the lifecycle of the cabling, decreasing the frequency of cable removal/disposal and installation of additional cabling
	EA 1 - Optimize Energy Performance	• Smaller cable diameter maximizes pathway space/increase airflow for energy-efficient cooling
Trunking Cable	MR 2.1 - Construction Waste Mgmt. - 50%	• Factory termination eliminates onsite waste created by field terminations
	MR 2.2 - Construction Waste Mgmt. - 75%	• Faster and more efficient installation of trunk cables requires fewer contractor visits and smaller crews
	MR 3.1 - Resource Reuse - 5% MR 3.2 - Resource Reuse - 10%	• Modular design of trunks allows for on-site re-use
	EA 1 - Optimize Energy Performance	• Well-organized channels eliminate airdams in pathways caused by poorly managed individual channels to maximize airflow for energy-efficient cooling
GPS/Project Asst.	MR 5.1 - Regional Materials - 10% MR 5.2 - Regional Materials - 20%	• GPS/Project Assistance providing logistical efficiencies through use of local stock and labor

MANY PATHS TO GREEN BUILDINGS

While this paper covers a number of ways in which cabling infrastructure decisions may affect a Green Building effort, it is hardly comprehensive. As Siemon continues to align its drive to innovation with its longstanding commitment to the environment, more opportunities for global improvements in sustainable IT practices will arise.

APPENDIX:

INTRODUCTION TO LEED

A "green" building is a building that is constructed in a responsible manner that minimizes or eliminates the negative environmental impact of the building on the environment, its community and on the health of its occupants, and reduces natural resource consumption. Historically, how to define and standardize the green building is a long term challenge until the advent of green building rating systems. (LEED) is the most widely accepted national green building rating system. Through its use as a design guideline and third-party certification tool, LEED aims to improve occupant well-being, environmental performance and economic returns of buildings using established and innovative practices, standards and technologies. In fact, LEED has been the green building standard of choice for Federal agencies and state and local governments nationwide.

LEED promotes integrated, entire building design and construction practices and encourages awareness various green building benefits. LEED-based green design not only makes a positive impact on public health and the environment, it also reduces operating costs, enhances building and organizational marketability, potentially increases occupant productivity, and helps create a sustainable community. LEED typically recognizes performance in six key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, indoor environmental quality, and innovation & design process.

Since 1998, Members of the U.S. Green Building Council representing all segments of the building industry developed LEED and continue to contribute to its evolution. LEED provides a roadmap for measuring and documenting success for every building types and phase of a building lifecycles.

While understanding LEED is helpful for any enterprise wishing to reduce their environmental impact, it is absolutely critical to gaining green building certification. Fortunately, LEED is a very user-friendly system. In fact, a major contributor to the success of LEED is the simplicity of its credit/point-based the rating system.

For each credit, the LEED standard identifies the detailed intent, requirements, and technologies or strategies to achieve the credit. One or more points are available within each credit, and points are achieved by meeting specified requirements.

The amount of points achieved will determine which level of LEED certification the project is awarded. There are (69) possible points and (4) levels of LEED certification available:

- Certified (26 to 32 points)
- Silver (33 to 38 points)
- Gold (39 to 51 points)
- Platinum (52 to 69 points)

It is important to note that individual products and services do not earn projects points.

DETAILED SUMMARY OF THE LEED AREAS OFFERING POTENTIAL CABLING-RELATED CREDIT OPPORTUNITIES

ENERGY & ATMOSPHERE (EA)	
EA Prerequisites	
1. Fundamental of the Building Energy System 2. Minimum Energy Performance 3. Fundamental Refrigerant Management	
EA Credits	**Eligible Points**
1. Optimize Energy Performance	1-10
2. On-Site Renewable Energy	1-3
3. Enhanced Commissioning	1
4. Enhanced Refrigerant Management	1
5. Measurement & Verification	1
6. Green Power	1
Total Possible Points	17

MATERIALS & RESOURCES (MR)		
MR Prerequisites		
1. Storage & Collection of Recyclables		
MR Credits		**Eligible Points**
1. Building Reuse	1.1: Maintain 75% of Existing Wall, Floors and Roof	1
	1.2: Maintain 95% of Existing Walls, Floors and Roof	1
	1.3: Maintain 50% of Interior Non-Structural Elements	1
2. Construction Waste Management	2.1: Divert 50% From Disposal	1
	2.2: Divert 75% From Disposal	1
3. Materials Reuse	3.1: 5%	1
	3.2: 10%	1
4. Recycle Content	4.1: 10% (post-consumer + 1/2 pre-consumer	1
	4.2: 20% (post-consumer + 1/2 pre-consumer	1
5. Regional Materials	5.1: 10% Extracted, Processed and Manufactured Regionally	1
	5.2: 20% Extracted, Processed and Manufactured Regionally	1
6. Rapidly Renewable Materials		1
7. Certified Wood		1
	Total Possible Points	13

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