In the Telecommunications Industry, What Does it Mean to "Go Green"?

Today, the challenges facing the world economy are greater than ever. In an environment where capital conservation and frugal consumption are the mantra, telecommunications service providers face new difficulties in maintaining their revenue levels and profitability. Even before the recent economic downturn, service providers, like other business leaders, were confronted with the need to go green. Since the adoption of the original Kyoto Protocol agreement in 1997, there has been increasing pressure from society, from government and even business customers, to adopt more environmentally friendly business practices.

The telecommunications industry accounts for 2-3% of the world's CO_2 emissions. According to Gartner Group, data centers alone are outpacing the airline industry when it comes to polluting the Earth.

But in the telecommunications industry, what does it really mean to **"Go Green"**? Is it about reducing your carbon footprint to save the planet? Is it about corporate responsibility? Does it enhance an organization's image among its shareholders and within its community? Or does being **"Green"** simply represent the **"Color of Money"** for solutions providers seeking to become as profitable as possible?

TelcoBridges believes the answer can be "all of the above"; that it is in fact possible for service providers to reconcile the need to go green with the need to limit capital spending and reduce operating expenses as they expand their service capacity. This **"TCO Green Paper"** shows how a smart, higher density, field upgradeable Media Gateway architecture can help service providers address their needs to expand intelligently and cost-effectively while also meeting the goal of greening their operations.

Communications Trends – More Calls and the Rise of Co-Location Services

More Calls Require More Capacity

Today's mobile devices and VoIP calling plans make it easier and more affordable than ever to call family, friends, and colleagues anywhere, at any time. The functionality available on today's mobile devices makes us more productive, but it also makes us dependent upon these devices for work, entertainment, and many aspects of our social lives. So it should come as no surprise that call volumes will continue to rise.

According to data published by the telecom research firm iLocus in late 2008, worldwide VoIP calling now accounts for 1.7 trillion minutes annually. However, this growth pales in comparison to the continuous global growth of wireless call minutes, which are rapidly displacing those of fixed line calls as consumers pursue a strategy of trading in their home phone for a mobile phone. Annual global growth for wireless calls was growing between 10 to 15% per year before the recession and now accounts for more than 30 trillion minutes annually.

This increasing call volume means additional expenses for telecom service providers, in the form of equipment purchased to provide the capacity and surging energy costs to power and cool it. While purchasing and operating equipment are relatively straightforward, the incremental expense required to accommodate, power up and cool that equipment in the data centre is becoming a real issue.

As more and more hardware is placed into data centres, equipment racks are bursting at the seams while incoming power requirements for operating and cooling that equipment are bumping up against physical limits. As a result, incremental growth in telecommunications capacity no longer means just buying new hardware, but provisioning the data centre capacity to support it. While some service providers are turning to co-location with third parties to meet their data centre needs, others are looking to make the most of what they have by expanding internally. In either case, overall market trends are putting pressure on service providers' bottom lines, not to mention their ability to be green.

Internal Hosting & Co-location Trends

The following hosting/co-location trends are also putting pressure to telecom service providers' bottom lines:

Demand for Global, Multi-tenant Data Centers is Outpacing Supply
Tier1 Research recently reported a 14% spike in demand, with capacity increases of only 6% - further exacerbating a lopsided supply/demand curve. ***The Wall Street Journal*** recently highlighted how the current credit crunch makes it difficult to even fund the development of new facilities, putting a further cramp on capacity.

Unfulfilled Demand is Driving Up Co-location Costs - Such As Space, Power & Cooling
Co-location costs in the US are approximately $100-$150 per single rack unit (1U), and prices vary significantly, based upon location. In London - where data center prices have doubled within the last year - new data centers are constricted to the availability of space and power. Typically, hosting facilities limit the power available per 1Rack Unit, forcing customers to rent more space than they need, in order to ensure sufficient power.

Space, & Continually Rising Energy Costs Impact TCO More than Ever Before
Most telecommunications equipment was designed when power was cheap, conservation was less important, and the notion of co-location services had yet to take shape. As a result, they take up more room than they should and cost more to operate, a difficult proposition to defend in today's economic reality.

Understanding Total Cost of Ownership (TCO), & Why Energy Costs Matter in the Data Center…

In the data center, space is money. With estimates of $100-$150 per single rack unit (1U), organizations need to utilize their space in a way that efficiently addresses their needs today, and provides headroom to scale up as their operations grow. Yet, despite these facts, (and despite the rise of virtualization and soft-switching technology), excessive hardware still bloats datacenters around the world.

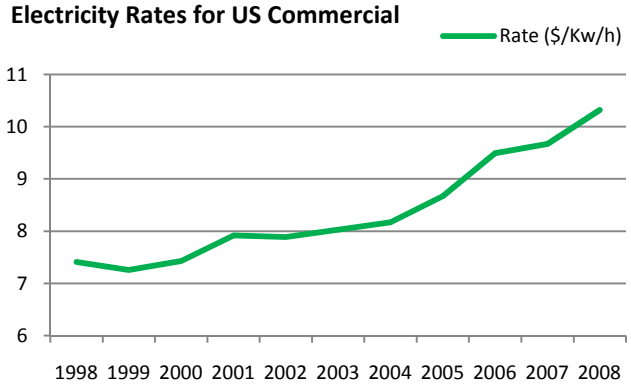
Market research firm IDC reports that there are currently more than 25 million pieces of telecom hardware in use throughout the United States alone. They estimate that for every $1 spent on hardware, an additional $7 is spent to maintain this equipment. They also recently reported that the average power and cooling bill for every 100 servers is about $40,000 annually. In fact, power costs have become the second-largest expense in the data center - second only to IT payroll.

And electricity rates continue to grow, at an increasing rate. According to the Energy Information Administration of the US Government, **electricity rates have increased by 39% over the last 10 years** in the US. Energy prices vary from country to country, with Asia being the most expensive. But one thing is clear - energy rates are expected to continue increasing, and they will play an even more significant role in TCO for carriers, and for the service providers who support them through co-located services.

"Most of the carriers we're talking to are interested in a co-location model, especially when it comes to opening new markets, and establishing a point of presence outside of their home country. The first benefit is the simplicity of the co-location model, in that a carrier doesn't need an extensive capital investment. Beyond this, carriers like the simplicity of outsourcing the hassles, and the maintenance of the equipment. And what we're seeing more and more of lately, is that many of our customers are concerned about the total costs associated with the space, power, and electricity required to maintain their operations."

— Mark Bradley
VP of Business Development for **VSC**

Electricity Rates for US Commercial



Source: http://www.eia.doe.gov/cneaf/electricity/epm/table5_3.html

Average Commercial Electricity Prices (USD/Kwh)

REGION		USD
Europe	Highest	$0.15
	Lowest	$0.06
	Average	$0.10
North American	USA	$0.10
	Canada	$0.06
Asia Pacific	Highest	$0.28
	Lowest	$0.04
	Average	$0.12
Russia		$0.05
South America	Chile	$0.13
	Argentina	$0.05
	Average	$0.09

How Does the *T*media™ Unique and Modular Architecture Help Companies Save on Space and Energy Costs?

From a telecommunications perspective, the classic TDM-based switches were built during a time where power was relatively cheap and profits were high. Telecom service providers thought nothing of paying tens of thousands of dollars per year on facility service contracts or filling the CO with rack upon rack of power hungry switching gear.

With the rise of VoIP and IP communications in general, and the drive to reduce costs following industry deregulation and the arrival of new market entrants, some of this "heavy iron" transitioned to softswitch-based systems, and to dedicated stand-alone components such as application hosts, signalling systems, media servers as well as media gateways – which consume less power than TDM-based solutions. However, in today's economy, when every watt of electricity counts, the choice of each hardware component makes a difference: financially and ethically, as stakeholders expect businesses, including service providers, to conserve energy, and minimize the carbon footprint of their systems.

While many of the media gateways on the market today yield significant power savings over TDM-based equipment, these systems are not nearly as energy efficient as the *T*media product family. This is because, unlike the *T*media family of media gateways, many were designed **prior to Y2K,** and not in 2007 like *T*media. To better appreciate just how advanced and energy efficient the *T*media family of media gateways is, let us take a quick look at what some competitors are offering.

Competitor #1 (a company facing much product overlap and unclear product roadmap due to its growth strategy): Competitor #1's flagship offering that can ramp up to 2048 ports was designed in the mid 1990s, more than a decade ago. As well as being 9 times larger than the *T*media' TMG3200 (i.e., 9U vs. 1U form factor), this competitor`s hardware requires almost 5-times more power and cooling to support a 2048 port configuration.

Unfortunately for our competition, having a solution designed in this millennium does not guarantee that it will be efficient and / or scalable. **(A manufacturer of legacy VoIP products for Enterprise and Service Providers) Competitor #2**'s comparable solution in terms of capacity, was designed five years ago and is still twice as big (2U vs 1U) than the TMG3200 for 2048 ports and it consumes almost 80% more energy.

Competitor #3 (a one-stop shop of IP communications gear): This company's media gateways solutions require a separate server for SS7 signalling functionality (1U, requiring up to 300 watts of power), as well as a separate 1U Ethernet server (note that both are included in *T*media). Once the system scales past 10 T1/E1 links, a 2U media gateway is needed, and at 18 T1/E1s, an additional 2 x 2U media gateway device is needed; this means that 4Usare required just for media gateway. These units do NOT provide non-blocking support, so instead of offering a full 18 T1/E1 system, solution providers are forced to work with two parallel 9 T1/E1 systems. Depending on the configuration, **TelcoB**ridges' *T*media will often need 25% of the power and cooling and 10-20% of the total number of units required by an equivalent solution from this competitor.

NOTE: The data used for the previously mentioned comparisons comes from publicly available information.

TelcoBridges High-Density, Non-Blocking Architecture:

Designed in 2007, the *T*media "**Green IT Architecture**" is unique for its ability to optimize service provider's resources while providing paramount telecom performance. This is why we can claim:

> The **lowest power consumption** per universal voice channel (0.06 watts) on the market

> The **highest non-blocking density** from 1U to 16U (From 1 to 1024 T1/E1)

> Optimized power and cooling for significantly **reduced energy requirements**:
> > Power savings of more than 30% over the next closest competitor
> > As much as an 80% power savings over other competitive solutions

Why can we make these claims?

Modular Architecture

*T*media's modular architecture provides a scalable platform that is easy to evolve. It facilitates scalability from 1 to 1024 T1/E1 (1 to 48 DS3 or 1 to 16 OC3/STM1) in a non-blocking system – enabling organizations to expand their media gateway capabilities and still consider it a single system (by being able to transfer calls to and from any *T*media in the System).

Every **TelcoB**ridges component is chosen for its ability to reduce overall TCO via space and power:

> Modular hardware design **reduces heat dissipation**

> Flexible architecture supports all gateway combinations, with or without IP

> Real-time monitoring for voltage, temperature and dynamic power allocation turns off resources that are not being utilized.

> All units are **Hot Scalable and Field Upgradeable** (including the power supply, host CPU, DSP, and all VoIP and telecom interfaces)

One of the things we like the most about TelcoBridges is that we can start relatively small, and we can add components to grow into an extremely large system. Our customers don't always have the up-front budget for a huge/full scale system. With TelcoBridges, we can start with 16-32 E1s – and we can scale up without needing more space. So when one of our customers adds a new route, we can easily add 8-10 new E1s without altering the system, or even needing more rack space. This is critical for VSC, because we're providing co-location services for dozens of customers, and our goals are to help them all grow. TelcoBridges' hardware plays a central role in our ability to service these customers.

- Mark Bradley
VP of Business Development for **VSC**

OSE Real-Time Operating System

TelcoBridges is the only hardware vendor to utilize OSE, which is a much more efficient embedded operating system for telecommunications requirements than either VXworks or Linux. This helps **TelcoB**ridges reduce CPU size (and power requirements) without affecting performance.

The Tmedia is so efficient that we have tested it successfully in extreme military standards environments with temperatures from -40°C to over 100°C

Field-Programmable Gate Arrays (FPGA)

FPGA's are configurable semiconductor devices used to implement logical functions that an application-specific integrated circuit (ASIC) could perform. This unique processing ability, called "reconfigurable computing", enables many tasks typically done on other components (such as CPU's, DSP's or other chips), to be addressed by a single *T*media unit, directly on FPGA.

*There are approximately 40 million transistors per FPGA and each is **individually programmable**!*

TelcoBridges' engineering expertise is unique with respect to FPGA. Other hardware providers that have not mastered FPGA programming must rely on off-the-shelf components (and their limited capacity and features) to provide features such as:

> SS7 signalling and HDLC control: Removing part of these functions from the CPU results in a smaller CPU

> Timeslot Interchanges (TSI) available on the market have limited capacity. But through FPGA programming, **TelcoB**ridges provides its own TSI, which exceeds competitive capacity limits and provides our non-blocking architecture

> Dynamic trunk configuration; reduces start-up power requirements, and eliminates the need to shut-down and reboot, in order to change trunk configurations

> A built-in Ulaw/Alaw converter, allows *T*media to have lower DSP requirements

> Without FPGA for VoIP and packetization, *T*media would require more CPUs and/or dedicated chipsets.

> FPGA *a*lso allows *T*media to **circumvent existing chips errata** (bugs), and **optimize the usage** of the different media gateway components.

Media Gateway TCO basics

Telecom service providers must consider 5 cost drivers when designing a new "efficient/green architecture."

These cost drivers are:

1. **Hot Scalability and Field Upgradeability**: the ability to add capacity and new capabilities into the same unit.

2. **A Non-Blocking Architecture:** which enables newly added units or modules to act as part of a single system (and not as different systems working in parallel). This enables "Exportability" to extend applications and reuse them on larger systems. It also facilitates Dynamic configuration; preventing the need to stop/reboot systems to change a configuration.

3. **Power requirements to run all units**: as measured in watts/DS0 or per 1U for architecture benchmarking. There are two important factors to consider:

> **Price per Kwh**: Prices vary greatly per country, and continue to increase.

> **Power supplies in the Hosting facility**: building an infrastructure (with redundant power and back-ups) is extremely expensive, and power is typically rationed per 1U or rack in hosting centers.

4. **Cooling**: For every watt of power, another watt is required for cooling systems. Facilitating this cooling capacity is expensive, and it factors heavily in the design requirements for hosting centers.

5. **Co-locations**: Rates for hosting services vary from $100 to $150+ /mo. per 1 Rack Unit depending on the location and the services required. The current market conditions with higher demand than offer will make these rates go up. The yearly costs associated with deploying excessive (and unnecessary) hardware scales exponentially for larger systems.

While items #1 and #2 are important for all systems, and items #3, #4, and #5 significantly impact larger scale systems from 12T1s/E1s and up.

Putting the Green to your TCO

Carbon emission

We have seen that the telecommunications industry accounts for 2-3% of the world's CO_2 emissions. For every 100 watts of power savings made in your media gateway configuration you save another 100 watts of power required for cooling which translates for a year into 17,520 Kwh and over 10 years to 13,5 tons of CO_2 emission.

Every KW used to power and cool servers and networking equipment yields 1.5 lbs of CO_2 emissions.

100 watts is not much, but when we consider that for a simple 2 T1/E1 capacity system you can save 71,000 Kwh and 55 tons of CO_2 emissions over 10 years, the economies that can be made clearly present themselves. For a larger scale media gateway, such as one featuring 48 DS3 interfaces, these savings reach over 1,500,000 Kwh and 1,191 tons of CO_2 emission over 10 years.

A single Tmedia can save as much CO_2 over its lifetime as 250 cars or 1,191 trees…

Understanding your own TCO Green

Do carriers, and the solutions providers who service them, truly understand the total cost of their telecommunications solutions? Today, the **TCO Green** equation includes the co-locations costs of space, and electricity, more so than ever before, and these costs add up exponentially as systems grow.

TelcoBridges has created a new web-based ***T*media Configuration Tool** and a **TCO Green Calculator**, that helps telecom service providers understand how each of the variables discussed in this whitepaper contributes to the total cost of their solutions. These interactive Web tools enable solutions providers to see precisely how much money they can save by adopting **TelcoB**ridges green-architecture based products.

Visit us at www.telcobridges.com/TCOGreen and see first-hand how much money your organization can save this year with **TelcoB**ridges.

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