

Alcatel-Lucent IP Multimedia Subsystem (IMS)

Eco-efficiency Makes Economic Sense

Alcatel-Lucent has an IMS based solution available now that can reduce the environmental and economic impact by over 90% compared to a TDM based solution. This solution positions the operator to respond to the increased demands of today's consumers, and to new revenue opportunities. Conservation, economics and the proliferation of new and innovative end user applications and devices all point to IMS as the smart choice. Alcatel-Lucent has a field proven IMS based Solution supported by a history of innovation. With Alcatel-Lucent IMS, sound environmental choices also make economic sense.

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1. Introduction

Conservation of energy, water, and other resources, is a prime focus around the globe. In developed countries, consumers and businesses are more aware of the environmental and financial impact of their actions and consumption-driven economies. In emerging markets, conservation is more pragmatic — resources such as water and electricity are not as accessible, and may be more costly on a relative basis, so efficient use must be made of available resources.

At the same time, the global economic recession has both businesses and consumers carefully watching their spending, and constantly looking for ways to minimize expenses, while optimizing value. Although the recession has dampened demand for electricity, in some growing economies such as China,[1] this is a short term phenomenon and demand is expected to return by 2010.

In the telecommunications industry, there is a third force at play — end user demand for new and innovative services and unprecedented anytime access. Consumers are no longer content with a simple telephone; they want broadband and accessibility, wherever they are, on any device they choose. They want access to information, plus instant and reliable communications.

While a eco-efficient lifestyle may not drive the demand for new communications services, it changes the way we live and work, and in many cases, reduces our environmental impact. Instant access to information, more personal and context aware communications can all reduce our environmental impact.

Telecommunications, as a part of the Information and Computing Technology (ICT) industry can increase our own eco-efficiency, and can reduce the environmental impact of other industries as well, by changing the way people live and work.

While these three forces are seemingly at odds, the Alcatel-Lucent industry leading IMS End-to-End Solution addresses them all. This solution is globally deployed and field proven and we are committed to further optimization of our solution for economic and environmental efficiencies.

2. Market drivers and business challenges

To fully understand how IMS can address these challenges, it is helpful to understand today's situation with respect to conservation, reducing Operating Expenses (OPEX) and adapting to new end user behavior.

2.1 Conservation – reducing demand for electricity

Traditional fixed line time-division multiplexing (TDM) switches carry the majority of today's voice traffic. In the US, there are an estimated 12,347 fixed line TDM switches.[2] Using a conservative estimate that each of these switches (excluding line units) consumes 400 Amps[3] of electricity, calculations show that these switches consume over 2 Billion kWh of electricity annually just to operate. If we assume an additional 50% of electricity usage for cooling,[4] the number rises to 3.1 Billion kWh per year. This is approximately the same amount of power consumed by nearly 16% of the 2.3 million[5] households in the greater New York City area.[6] The Telecommunications Industry Association (TIA) estimates that data centers and telecom systems account for 3% of the US total electricity demand, and the proportion is growing rapidly.[7] The message is clear — we use large amounts of electricity to browse the Internet and talk on the phone!

There is an environmental price to pay for this huge use of electricity. The power required for these 12,347 fixed line TDM switches in the US results in 1.7 Billion kg of CO₂ added to our atmosphere each year — the equivalent of approximately 361,000 passenger cars, driven for a year.[8]

Many of the existing switches in the TDM network are reaching their end of life in the foreseeable future, and will require either negotiations for ongoing support or replacement. Replacing existing TDM switches with an IMS solution reduces the risk of equipment becoming obsolete or unsupported, and also reduces operators' energy consumption, OPEX and environmental impact immediately.

TDM Switching in the US has the same environmental impact as 361,000 passenger vehicles

2.2 Reducing operating costs

Power consumption comes at an economic price. The electricity consumed by the 12,347 fixed line switches referenced previously costs telecom operators \$343 Million USD annually (240 Million Euro).[9]

Ovum, in their 2009 report, *Increased focus on network power consumption to lower opex, go green*, estimates that power usage accounts for 2-3% of operating expenses for telecommunication companies worldwide, and this trend is increasing upwards.[10] Pike Research agrees; in their report, *Green Telecom Networks*, they note that “Energy consumption is one of the leading drivers of operating expenses for both fixed and mobile network operators.”[11] While the energy consumed by TDM switches is a fraction of this total number, IMS implementation positions operators well for the future, while immediately offsetting capital expense with OPEX savings.

The OPEX impacts of TDM switching are not limited to high electricity usage. While TDM switches use considerably less space than the electromechanical switches of the past, they still occupy a significant amount of what is often prime real estate. A representative 10,000 subscriber TDM switch (including aisle space, but excluding line units) occupies approximately 9 telco frames or 103 ft² (9.6 m²). Using the US based reference of 12,347 switches, and the average switch size,[12] this translates to 1,276,000 ft² (118,900 m²) of space, and costs carriers approximately \$53.6 Million USD per year (37.5 M Euro).[13]

While this example is compelling, it is not all encompassing. 20% of Americans live in rural areas, and a large percentage (in excess of 50%) of these TDM switches are much smaller than 10,000 subscribers. These switches that support smaller numbers of subscribers still occupy a similar amount of space, so the actual subscriber space density is much lower. These low density switches also offer an additional opportunity for greater savings — multiple TDM switches can be replaced by a single IMS solution, in a single location. Closing remote end offices offers savings as well as a reduction in on-site maintenance costs.

2.3 Adapting to new end user behavior

Despite pressure to spend less and reduce our energy consumption, consumers embrace new and innovative ways to communicate. Today, in many areas, a telephone and voicemail are considered barely adequate. Consumers want communication experiences that are richer and more integrated. They want to download songs and videos, send text messages, conference with colleagues and friends, exchange pictures and videos, access social networks and generate content on many different devices. The line is becoming blurred between home and work, and geographic location matters less and less.

The telecommunications industry can make a positive impact on total energy consumption, not only by reducing its consumption through more efficient network infrastructure, but also by enabling other industries to reduce their impact. Technologies that can be enhanced with IMS (video conferencing, presence aware messaging, and anytime access) reduce or eliminate the need to travel to meetings or commute daily. New and innovative ways of communicating change the way we live and work. The Global e-Sustainability Initiative (GeSI) notes that “... *Through enabling other sectors to reduce their emissions, the ICT industry could reduce global emissions by as much as 15 per cent by 2020 — a volume of CO₂ five times its own footprint in 2020.*”[14]

3. The Alcatel-Lucent End-to-End IMS Solution

The Alcatel-Lucent comprehensive eco-sustainability program uses innovation to build smarter, eco-sustainable end-to-end networks. Our products are thoroughly evaluated for energy efficiency to ensure they support our customers’ efforts to reduce the carbon emissions of existing and new networks.

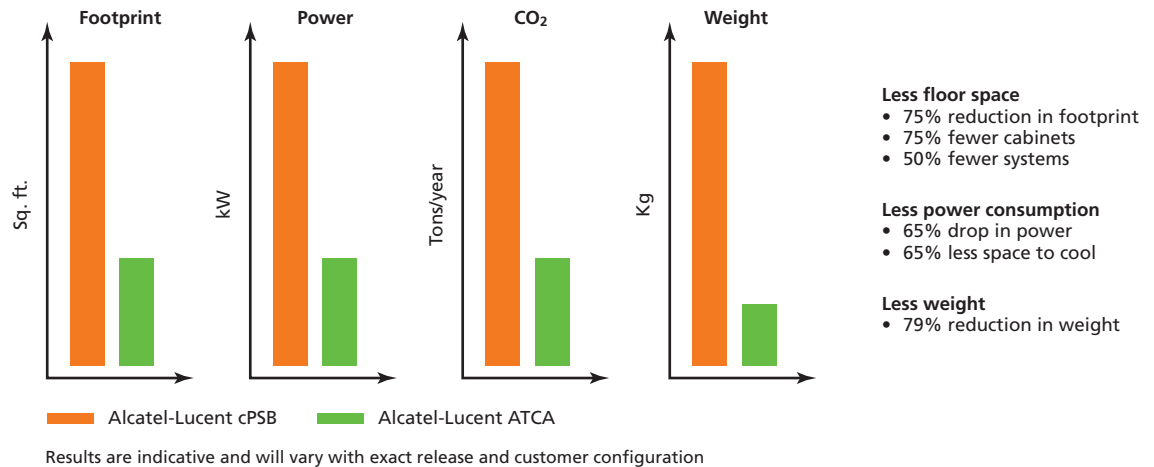
Our scientists and engineers are creating innovative solutions and services that enable significant environmental benefits in different business sectors using techniques such as smart metering, smart buildings, smart transport and teleworking.

An IMS solution from Alcatel Lucent consumes less electricity and occupies less space than TDM based solutions. What makes business sense also makes sense for the environment.

Alcatel-Lucent has a proven track record of IMS deployments for fixed voice (VoIP, POTS, ISDN), while continuing to innovate and improve upon it. Alcatel-Lucent first introduced IMS in 2002. Our IMS solution evolved to an energy-efficient blade-base architecture based on PICMG 2.16 standards (also known as cPSB) and then to its current incarnation on the Advanced Telecommunications Computing Architecture (ATCA) platform.

Alcatel-Lucent introduced the ATCA platform throughout the IMS core in 2008. While power and space savings vary from product to product and depend on the exact customer configuration and traffic patterns, footprints were reduced by 75% and power use by 65% on average compared to cPSB based products throughout our distributed solution (see Figure 1). Standardizing on ATCA as the common platform across the Alcatel-Lucent IMS Solution reduces the total cost of ownership through simplified operation and provides energy and space savings.

Figure 1. Alcatel-Lucent ATCA compared to the previous cPSB (cPCI) solution



Smaller footprint, lower power consumption, lighter weight

Throughout the evolution of our IMS Solution, it is clear we are committed to continued improvement to best meet the needs of our customers — including their environmental and economic concerns.

The Alcatel-Lucent IMS Solution leverages an award-winning hardware design,[15] which uses innovative methods and design tools to produce industry-leading products.

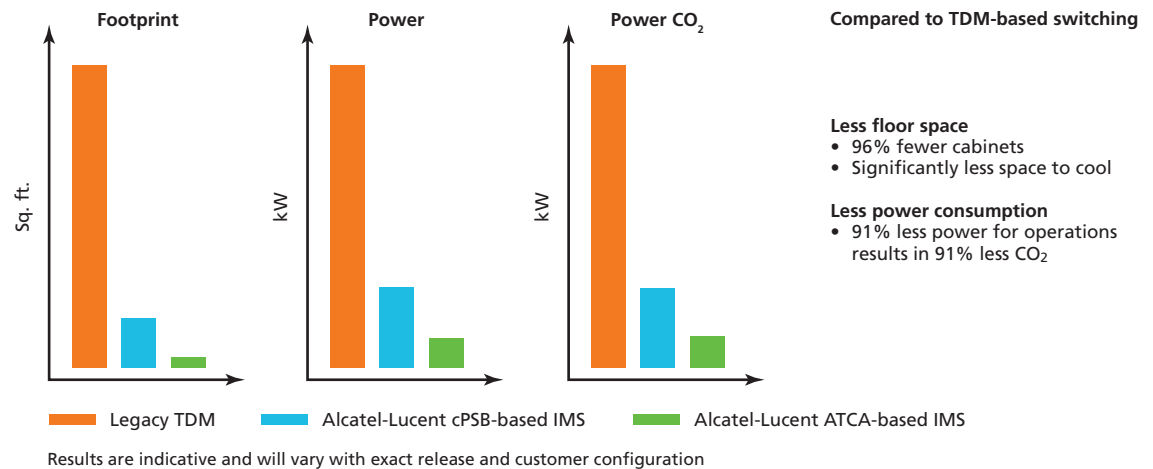
The Alcatel-Lucent 5060 IP Call Server (ICS) is an Alcatel-Lucent innovation that can offer significant savings for customers looking for an introduction to IMS. This second generation of an Alcatel-Lucent innovation is sometimes referred to as *IMS in a Box*. Like the Alcatel-Lucent IMS Solution, the 5060 ICS is based on the ATCA platform. It allows operators to efficiently offer an integrated IMS solution for small deployments and up to 3 million subscribers, either for voice (VoIP, POTS, ISDN) or as an alternative to a Next Generation Network (NGN). This integrated solution can also be used for more elaborate services offered by IMS such as Presence or Multimedia Instant Messaging. Operators can add additional IMS services, or migrate to a distributed model, as their needs evolve.

To put the potential impact of the Alcatel-Lucent IMS Solution in perspective, consider the example of four 5ESS TDM switches, each serving 100,000 subscribers, for a total of 400,000 subscribers. If we exclude the line units, the four switches would typically use 674,000 kWh of electricity annually, and occupy 77 m² (827 ft²) of central office space. An integrated IMS solution from Alcatel-Lucent, utilizing the 5060 IP Call Server (ICS) occupies a mere 3.2 m² (34.4 ft²), and consumes only 61,390 kWh of electricity. This provides a savings of 91% for electricity and 96% for space.

If these switches were located near Paris, this would result in gross OPEX savings of 62,624 Euro. This assumes electricity costs 40 Euro per MWh, and space costs 350 Euro/m². Another benefit beyond operating costs is the reduction of civil engineering costs, due to the avoidance of building additions and the reduction of backup power sources. Alternatively, the freed space and power are readily used to deliver new services such as IPTV. In addition, the distributed nature of the IMS solution allows the placement of some elements in more remote (and thus, less expensive) locations, which further increases the net space savings.

As illustrated in Figure 2, when compared to TDM based solutions of a decade ago,[16] the improvements are staggering. Today's Alcatel-Lucent IMS Solution uses 91% less power, and 96% less floor space — and provides the environmental and economic benefits to match!

Figure 2. Alcatel-Lucent IMS – Continuous eco-improvement



Today's Alcatel-Lucent IMS is more than 90% more eco-friendly than existing TDM solutions

4. The Alcatel-Lucent IMS platform vision

Alcatel-Lucent is committed to further reducing the environmental impact of our IMS Solution. Work is ongoing to further increase the capacity of the products on the ATCA platform. These changes not only increase subscriber density, but also decrease the power required per subscriber, resulting in a net overall power decrease. Capacity increases are not limited to products on the ATCA platform; the Alcatel-Lucent 7510 Media Gateway (MGW) has significant capacity increases planned in 2010.

Our efforts to reduce the number of unique platforms in our solution have other economic and environmental benefits as well. Our industry leading experience with product co-residency,[17] coupled with a common platform sets the stage for multiple network elements to reside in a single chassis, optimizing space and power requirements for small and mid sized deployments. The 5060 ICS currently includes 5450 IP Session Control (ISC), 5450 IP Resource Control (IRC), 5420 Converged Telephony Server (CTS), an internal billing function, and an on-board subscriber database. Planned for the future, the 5060 Media Gateway Controller-8 (MGC-8) will also reside on a blade in this single chassis, further reducing footprint.

**ALCATEL-LUCENT
IMS INNOVATION**

- IMS in a box
- Optimized ATCA implementation
- Increased density
- Product Co-Residency

Alcatel-Lucent initiatives for other economic and environmental improvements include investigating opportunities for further platform consolidation and capacity increases, dynamic powering to turn off unused areas of a switch and more efficient thermal management designs. Through the use of a common platform, Alcatel-Lucent offers unprecedented flexibility for equipment re-use and re-configuration as a service provider's network evolves to add capacity or new features. This flexibility is supported by the comprehensive end-of-life solutions offered by Alcatel-Lucent. With our equipment re-manufacturing to reduce and recycle, Alcatel-Lucent is a partner in minimizing environmental impact.

5. New revenue and market opportunities

It is easy to see where the cost savings come from, but there are also new opportunities for revenue generation that are inherent benefits of IMS.

The Alcatel-Lucent End-to-End IMS Solution enables operators to offer multimedia communication services to end users including voice, video, web, messaging, and other conversational services using the most appropriate communications tools, whether it is their PC, TV, mobile phone, or home phones. The solution provides user-experience continuity, instant access anywhere, and self service personalization. The Alcatel-Lucent End-to-End IMS Solution is the bridge that allows service providers to connect their subscriber base to many different revenue-generating services and applications.

The Alcatel-Lucent End-to-End IMS Solution opens up new market opportunities for both service providers and enterprises, while leveraging these same assets for near term OPEX savings. The Alcatel-Lucent End-to-End IMS solution is a carrier grade, field-proven, flexible, integrated solution that enables carriers to introduce IP Multimedia Communications in a way that is right for them. Our flexible deployment options allow carriers to implement as much or as little of IMS as they require. For more information about Alcatel-Lucent End-to-End IMS Solution, and its advantages over other alternative solutions, refer to our strategic whitepaper, *IMS: The Logical Choice for Future-ready Networks*.

In addition to the economic and environmental operational savings, Alcatel-Lucent IMS helps enable a more eco-efficient lifestyle. IMS offers new ways of working and communicating — unimaginable a few short years ago — that can have a significant impact on the environment. Tools such as virtual meetings, teleconferencing and telecommunicating all reduce the amount of time and money we spend traveling and commuting and are provided with a lower environmental impact with IMS. Some savings estimates are as high as \$20-40 Billion USD and 70-130 MMT (Million Metric Tonnes) of CO₂ (70,000-130,000 kg) per year.[18]

6. Conclusion

It is clear that the amount of energy consumed by today's communication needs has a very real impact on both the environment, and the bottom line for telecom operators. The global economic crisis and increasing demands from consumers for more and better services are seemingly opposing forces that cause operators to look for alternatives to the TDM switches in operation today. *"Improved energy efficiency is the first step in creating greener telecom networks"*,[19] says Clint Wheelock, managing director, Pike Research. *"Reduced power requirements will facilitate the integration of renewable energy sources such as solar photovoltaics, wind energy, and fuel cells, while also opening the door for more efficient network architectures and topologies"*.

Alcatel-Lucent has an IMS solution available today that reduces the environmental and economic impact by over 90%, compared to a TDM based solution. At the same time, this solution allows the service provider to respond to the increased demands of today's consumers, and new revenue opportunities.

With the introduction of the ATCA platform in 2008, Alcatel-Lucent has reduced the environmental impact of its solution over 65% since 2007, and is committed to further innovations to reduce the economic and environmental impact of our solution.

With Alcatel-Lucent IMS, sound environmental choices also make economic sense.

7. References

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- [5] http://en.wikipedia.org/wiki/Demographics_of_New_York_City
- [6] Parisians consume, on average 25006 kWh per year, while New Yorkers tend to consume 2.5 time that, at 6400⁶ kWh annually.
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