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Analysis of Energy Consumption in the Computer Section of the Group Libra

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Abstract

With technological advances under way, the issue of pollutant emissions and reduced operating costs are important topics to be highlighted in any organization, highlighting the need to accept a different attitude that we use the resources we have available today. From a holistic view, This fact occurs due to financial, business, government, strategic reasons or simply for environmental awareness. With the increase in mass of this problem, computers are part of a select group of pollutants, rated one of the major consumers of electricity, both in its production, and in your life, use and disposal on their behalf directly or indirectly, the increased emission of greenhouse gases that impact the environmental condition. This article is part of an abstraction on energy applied to Green IT, which is the sum of the energy management of the economy, with regard to resources. The main objective of this project is to present a proposal to implement a policy of standardization of equipment(laptop / desktop) added to a conscious use, in order to reduce energy consumption, which sees a reduction in electricity cost(TEPHEN, 2009).

Keywords: *Green IT, Efficiency Environmental, Assessment IT, Energy Consumption Estimation.*

1. Introduction

The IT Green IT or Green as it is known is a set of practices to become more sustainable and less damaging use of computing can be defined as a continuous series of acts in order to ensure that the activity of a company triggers the lowest environmental impact.

A unique factor is that its definition is part of many forums for discussions in the media, always aiming at the junction of IT concepts with economic sustainability and ecology. Thus, analyzing the business district, more specifically entering the administrative structure, the sector of Information Technology (IT) grows equally or more than other sectors, and aims to provide necessary assistance to the development in various sectors, such which HR Management, Finance, New Business and others, where you can find one or "n" computers.

Thus, examining issues arising from the technology and bringing up environmental issues, we can conclude that only the operation of computers as the departments mentioned above, would be enough for finding a high rate of CO2 emissions in the atmosphere, as well equipment dedicated to keeping all this infrastructure, the examples desktops, notebooks, servers, routers, nobreaks, etc.. It is noteworthy that the above-mentioned equipment are mounted in locations called data centers, due to the large heat generation, cooling systems are needed that are also major energy consumers. Therefore, the use of modern IT resources from Focus on the problems associated with energy efficiency, specifically in the computational structure.

With extreme clarity, we can estimate that high consumption of energy powers these devices resulting is associated with other problems of great importance to organizations that make use of these structures. As stated by (ALVES,2010), companies have spent a very high relative to the extreme amount of energy that is being used, and not only the energy consumed is itself expensive, but also all cooling systems and communication systems used. The accounts associated with this excessive consumption then begin to represent a large percentage of the costs of the entities and organizations that make use of these systems.

Thus, the massive costs involved in low energy efficiency and environmental degradation caused by high performance mean that governments and members involved in this field as researchers and consumers are focusing attention on developing new technologies and strategies to achieve a more computationally Green (ALVES,2010).

2. Sustainability and Green IT

Sustainable practices are those that ensure that resources are used at the same rate it is possible to recover them, naturally or through specific actions. In the context of computing the area of sustainability is possible by green computing, which is defined as a set of practices that aims to make the manufacture, use and disposal of IT equipment more sustainable and less damaging to the environment.

Among the factors discussed in this issue, we emphasize the importance of management and sustainable use of IT which is defined as the way a company manages its assets in the area of Information Technology. This purchase includes desktops, notebooks, servers and other equipment in terms of energy efficient as well as manage the power consumption of its products and equipment.

Today with advances in technology and tax reduction in global aspect, the area of information technology has become extremely affordable, but on the other point, through the benefits obtained by society, urban development increasingly harms the environment, either through deforestation , e-waste, energy consumption or the emission of gases in the planet's atmosphere, which increases the greenhouse effect.

Seeing the environmental side, computers can be considered one of the major consumers of electricity, each phase of the life of a computer (production, time use, disposable), represents a direct or indirect increase in emissions of carbon dioxide (CO2) that impacts on the environment (PINTO, LOUZA, TEIXEIRA, 2010). A computer in use generates around one tonne of CO2 each year. Its components contain toxic materials and disposal of these is currently one of the major environmental problems, polluting rivers and landfills. Since the technological point, the discourse on green IT is correlated to energy consumption, itself being always among the first topics to be discussed, as is the factor that generates expenditure within the topics covered by it. Therefore the concern is to find mutually techniques to do the same things using less energy, for example, Server virtualization, or even changing the technology park. The contribution of this research for the group is evident in Libra can demonstrate that the replacement of obsolete equipment is not only linked to productivity and employee satisfaction, but also with the reduction in energy costs and environmental preservation.

3. Electric Energy Consumption

Energy consumption and conservation issues are much discussed points of the twenty-first century, energy consumption grows at faster pace than the sources of power generation, unable to meet the needs of society (T. JOSEPH LUI, 2010), events by increasing consumption, together with lack of investments in electric generation sector, which has been mitigated by every day gap between demand and supply, making the supply increasingly critical in the short term.

Since the technological point of view, according to (MURUGESAN, 2009), the use of computers and IT equipment presents a major concern due to the large increase in consumption of electric, thermology less power means having to pay bills lower. Usually, the biggest expenses are related to a data center power consumption. Each equipment has reduced its consumption, investment could be used in other areas related to business.

In search of solutions to this mystery, covers among other alternatives, research shows companies that work to reduce the environmental impact, tend to have better financial performance than companies not adept at this vision.

To reduce costs, there are strategies such as planning the type of equipment that can be purchased. Choose the hardware more energy efficient and within standards that keep popping up is the best alternative. Plan what technologies can be employed, such as virtualization and thin clients, and even the layout of your data center are other options that may contribute to the green image of the company.

4. Engineering Management

Given the recognition of the importance of environmental issues, there is an intense mobilization of the sector of information technology to establish ways to identify, organize, organize, manage and measure the actions taken by companies that produce impacts on the environment and has not faced the sustainable development.

The primary core of sustainability is to make engineering and economically act as propulsive movements, changing the concept of generating results in the short term to generate results continuously.

It should be noted that many are the reasons for companies Invest in a consistent policy for Green IT. For (MILAGRE, 2011) the industrial sector of information technology, records that these pressures tend to be in financial need, taxes and even laws. According to the author, Environmental Law focuses his tutelage on Information Technology in order to tame it as regards its rapid development, of course, with regard to sustainability.

As for (BARROS, 2011) the author shares this view and considers that the market for user equipment solutions for information technology will require that there is, throughout the supply chain policies, preservation of the environment, and for being one of the largest consumers of energy, the sector of Information Technology fits this context as one of the main areas to be changed. Find a way to make the technology advances, reducing its cost and at the same time, without harm to the environment, it is a matter of order to the market, ie, a factor which is trivial reason, the concept of Green IT, generated Featured in the communication strategies of companies.

Analyzing the market, you have basically two key points, the first refers to companies that are questioned by their customers about costs, risks and opportunities for growth in infrastructure in a more sustainable. Already in the second core concern for evaluating the energy consumption of data centers. Accordingly, the virtualization also help, by the possibility to migrate critical applications which use more processing to places with higher cooling, eliminating the need to maintain the same

temperature in all machines, implement the concept of Service Oriented Architecture (SOA) is another way to promote reduction of energy costs. Thus, you can avoid some critical applications used require dedicated servers, and thus arises a third hypothesis: Research has shown to be illusory perception of customers that green technologies are more expensive, since this analysis should be placed under the optical an investment perspective and not an immediate vision of how we are led to have. For him the actions that lead you to the environmental preservation shall be construed as an investment whose goals have to be perceived in the medium and long term, for example a five-year planning. It is obvious that in the beginning, there will be a greater economic burden on the acquisition of green products, but later, from the perspective of the life cycle of the product, that expenditure tends to be diluted because the product is much more economical in terms such energy consumption, or simply because it becomes cheaper when it seeks its recycling process in possible damage to the environment.

5. Analysis and Evaluation of Energy Consumption in Equipment

With respect to the direction of which this work takes place through the Director of Information Technology, Mr. José Antonio Furtado were selected three models of notebook and three desktop models among all equipment in the Libra Group.

These devices are the property of the Company and the technical characteristics will be used as a reference for the performance comparison of techniques applied. Workload is defined, which corresponds to a period of 8 hours, 22 days and 12 months and three years, as demonstrate in the tables below and based on the cost of R$ 0.29651 as providing service provider company AES Eletropaulo, in São Paulo.

Table 1: Estimated consumption of equipment for each valued in 8 hours of work.

Basis ofcomparisonfor1equipment			**X 100**	**X 250**	**X 1000**
	Watts Day	**value**	**value**	**value**	**value**
Latitude E4310	240	R$ 0,07	R$ 7,12	R$ 17,79	R$ 71,16
Latitude E6400	280	R$ 0,08	R$ 8,30	R$ 20,76	R$ 83,02
Latitude E6320	240	R$ 0,07	R$ 7,12	R$ 17,79	R$ 71,16
Latitude E4310 c/ Monitor LED	408	R$ 0,12	R$ 12,10	R$ 30,24	R$ 120,98
Latitude E6400 c/ Monitor LED	448	R$ 0,13	R$ 13,28	R$ 33,21	R$ 132,84
Latitude E6320 c/ Monitor LED	408	R$ 0,12	R$ 12,10	R$ 30,24	R$ 120,98
OptiPlex 320 c/ monitor LED	2088	R$ 0,62	R$ 61,91	R$ 154,78	R$ 619,11
OptiPlex 755 c/ monitor LED	2472	R$ 0,73	R$ 73,30	R$ 183,24	R$ 732,97
OptiPlex 780 c/ monitor LED	2728	R$ 0,81	R$ 80,89	R$ 202,22	R$ 808,88
OptiPlex 320 c/ monitor LCD	2200	R$ 0,65	R$ 65,23	R$ 163,08	R$ 652,32
OptiPlex 755 c/ monitor LCD	2584	R$ 0,77	R$ 76,62	R$ 191,55	R$ 766,18
OptiPlex 780 c/ monitor LCD	2840	R$ 0,84	R$ 84,21	R$ 210,52	R$ 842,09

OptiPlex 320 c/ monitor CRT	2520	R$ 0,75	R$ 74,72	R$ 186,80	R$ 747,21
OptiPlex 755 c/ monitor CRT	2904	R$ 0,86	R$ 86,11	R$ 215,27	R$ 861,07
OptiPlex 780 c/ monitor CRT	3160	R$ 0,94	R$ 93,70	R$ 234,24	R$ 936,97

Source: In Table I are detailed power consumption per device, 8 hours, and its estimated value based on actual R$ 0.29651.

Table 2: Estimate of consumption for each equipment valued in 22 days of work.

Basis ofcomparisonfor1equipment			**X 100**	**X 250**	**X 1000**
	Watts Day	**value**	**value**	**value**	**value**
Latitude E4310	5280	R$ 1,57	R$ 156,56	R$ 391,39	R$ 1.565,57
Latitude E6400	6160	R$ 1,83	R$ 182,65	R$ 456,63	R$ 1.826,50
Latitude E6320	5280	R$ 1,57	R$ 156,56	R$ 391,39	R$ 1.565,57
Latitude E4310 c/ Monitor LED	8976	R$ 2,66	R$ 266,15	R$ 665,37	R$ 2.661,47
Latitude E6400 c/ Monitor LED	9856	R$ 2,92	R$ 292,24	R$ 730,60	R$ 2.922,40
Latitude E6320 c/ Monitor LED	8976	R$ 2,66	R$ 266,15	R$ 665,37	R$ 2.661,47
OptiPlex 320 c/ monitor LED	45936	R$ 13,62	R$ 1.362,05	R$ 3.405,12	R$ 13.620,48
OptiPlex 755 c/ monitor LED	54384	R$ 16,13	R$ 1.612,54	R$ 4.031,35	R$ 16.125,40
OptiPlex 780 c/ monitor LED	60016	R$ 17,80	R$ 1.779,53	R$ 4.448,84	R$ 17.795,34
OptiPlex 320 c/ monitor LCD	48400	R$ 14,35	R$ 1.435,11	R$ 3.587,77	R$ 14.351,08
OptiPlex 755 c/ monitor LCD	56848	R$ 16,86	R$ 1.685,60	R$ 4.214,00	R$ 16.856,00
OptiPlex 780 c/ monitor LCD	62480	R$ 18,53	R$ 1.852,59	R$ 4.631,49	R$ 18.525,94
OptiPlex 320 c/ monitor CRT	55440	R$ 16,44	R$ 1.643,85	R$ 4.109,63	R$ 16.438,51
OptiPlex 755 c/ monitor CRT	63888	R$ 18,94	R$ 1.894,34	R$ 4.735,86	R$ 18.943,43
OptiPlex 780 c/ monitor CRT	69520	R$ 20,61	R$ 2.061,34	R$ 5.153,34	R$ 20.613,38

Source: In Table II are detailed energy consumption by equipment in 22 working days, and its estimated value based on actual R$ 0.29651.

Table 3: Estimate of consumption for each equipment valued at 12 months of work.

Basis ofcomparisonfor1equipment	**X 100**	**X 250**	**X 1000**

	Watts Day	value	value	value	value
Latitude E4310	63360	R$ 18,79	R$ 1.878,69	R$ 4.696,72	R$ 18.786,87
Latitude E6400	73920	R$ 21,92	R$ 2.191,80	R$ 5.479,50	R$ 21.918,02
Latitude E6320	63360	R$ 18,79	R$ 1.878,69	R$ 4.696,72	R$ 18.786,87
Latitude E4310 c/ Monitor LED	107712	R$ 31,94	R$ 3.193,77	R$ 7.984,42	R$ 31.937,69
Latitude E6400 c/ Monitor LED	118272	R$ 35,07	R$ 3.506,88	R$ 8.767,21	R$ 35.068,83
Latitude E6320 c/ Monitor LED	107712	R$ 31,94	R$ 3.193,77	R$ 7.984,42	R$ 31.937,69
OptiPlex 320 c/ monitor LED	551232	R$ 163,45	R$ 16.344,58	R$ 40.861,45	R$ 163.445,80
OptiPlex 755 c/ monitor LED	652608	R$ 193,50	R$ 19.350,48	R$ 48.376,20	R$ 193.504,80
OptiPlex 780 c/ monitor LED	720192	R$ 213,54	R$ 21.354,41	R$ 53.386,03	R$ 213.544,13
OptiPlex 320 c/ monitor LCD	580800	R$ 172,21	R$ 17.221,30	R$ 43.053,25	R$ 172.213,01
OptiPlex 755 c/ monitor LCD	682176	R$ 202,27	R$ 20.227,20	R$ 50.568,00	R$ 202.272,01
OptiPlex 780 c/ monitor LCD	749760	R$ 222,31	R$ 22.231,13	R$ 55.577,83	R$ 222.311,34
OptiPlex 320 c/ monitor CRT	665280	R$ 197,26	R$ 19.726,22	R$ 49.315,54	R$ 197.262,17
OptiPlex 755 c/ monitor CRT	766656	R$ 227,32	R$ 22.732,12	R$ 56.830,29	R$ 227.321,17
OptiPlex 780 c/ monitor CRT	834240	R$ 247,36	R$ 24.736,05	R$ 61.840,13	R$ 247.360,50

Source: In Table III are detailed energy consumption by equipment within 12 months of work, and its estimated value based on actual R$ 0.29651.

Table 4: Estimate of consumption for each equipment valued at 36 months of work.

Basis ofcomparisonfor1equipment			X 100	X 250	X 1000
	Watts Day	value	value	value	value
Latitude E4310	190080	R$ 56,36	R$ 5.636,06	R$ 14.090,16	R$ 56.360,62
Latitude E6400	221760	R$ 65,75	R$ 6.575,41	R$ 16.438,51	R$ 65.754,06
Latitude E6320	190080	R$ 56,36	R$ 5.636,06	R$ 14.090,16	R$ 56.360,62
Latitude E4310 c/ Monitor LED	323136	R$ 95,81	R$ 9.581,31	R$ 23.953,26	R$ 95.813,06
Latitude E6400 c/ Monitor LED	354816	R$ 105,21	R$ 10.520,65	R$ 26.301,62	R$ 105.206,49
Latitude E6320 c/ Monitor LED	323136	R$ 95,81	R$ 9.581,31	R$ 23.953,26	R$ 95.813,06
OptiPlex 320 c/ monitor LED	1653696	R$ 490,34	R$ 49.033,74	R$ 122.584,35	R$ 490.337,40
OptiPlex 755 c/ monitor LED	1957824	R$ 580,51	R$ 58.051,44	R$ 145.128,60	R$ 580.514,39

OptiPlex 780 c/ monitor LED	2160576	R$ 640,63	R$ 64.063,24	R$ 160.158,10	R$ 640.632,39
OptiPlex 320 c/ monitor LCD	1742400	R$ 516,64	R$ 51.663,90	R$ 129.159,76	R$ 516.639,02
OptiPlex 755 c/ monitor LCD	2046528	R$ 606,82	R$ 60.681,60	R$ 151.704,00	R$ 606.816,02
OptiPlex 780 c/ monitor LCD	2249280	R$ 666,93	R$ 66.693,40	R$ 166.733,50	R$ 666.934,01
OptiPlex 320 c/ monitor CRT	1995840	R$ 591,79	R$ 59.178,65	R$ 147.946,63	R$ 591.786,52
OptiPlex 755 c/ monitor CRT	2299968	R$ 681,96	R$ 68.196,35	R$ 170.490,88	R$ 681.963,51
OptiPlex 780 c/ monitor CRT	2502720	R$ 742,08	R$ 74.208,15	R$ 185.520,38	R$ 742.081,51

Source: In Table IV are detailed energy consumption by equipment in 32 months of work, and its estimated value based on actual R$ 0.29651.

6. Results

The results from the analysis equipment are shown in Tables 1, 2, 3 and 4. We analyzed three laptop models: Latitude E6320, Latitude E6400 and Latitude E4310, and three desktop models, with the OptiPlex 320, OptiPlex 755 and OptiPlex 780, with changes in CRT, LCD and LED.

We can observe with respect to the monitors, the CRT model showed a higher energy consumption compared to LCD and LED models.

From the scale watts per day, it is possible to evaluate the consumption higher than the pad desktop with a variance of about 10 times the value of the model Latitude E6400.

Within the models discussed in this paper, notebooks specifications Latitude E6320 and Latitude E4310 were more economical and sustainable benefits from a consumption of 240 watts / day, ie, with the cost value of $ 1.57/month. These models are being considered to be referred to arcade machines for the employees of the Libra Group. It is worth mentioning that the model is less than the Latitude E4310 Latitude E6320 model.

7. Conclusion

As shown, technological changes have a constant presence in our lives, favored by the speed of emergence of new solutions or infrastructure items to support the management or business oportunizar (LAUREANO, 2011).

The progress will be needed to support the needs of today's society, but this should be implemented in the best sustainable practices. The principles and practices for green IT, this project has focused on the analysis of the energy consumed by the equipment, studying ways to optimize the consumption, in addition to prizes for awareness and change habits through awareness thus improving performance and reducing energy consumption of equipment.

From the results obtained in this study we can say that the value of such equipment is not only linked performance and satisfaction, but the reduction in energy costs. But what is meant is that the same way that people give importance to computing today, should also take care of green computing, of course will have their new practices and methods and therefore the adoption of the best ways are necessary. The pace and spread will be linked to the degree of confidence in the model and technologies between the parties involved (TAURION, 2011), making it trivial to follow a reference at

the time of drawing the business goal, as in a vision for the future universal accessibility become obsolete installed applications have their paradigms broken leaving what we know behind.

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