MINIMIZING POWER USAGE IN GREEN COMPUTING

A project presented by Group2

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ABSTRACT:

Green computing or green IT, refers to environmental sustainable computing or IT. It is "the study and practice of designing, manufacturing, using and disposing of computers, servers and associated subsystems- such as monitors, storage devices and networking and communications systems effectively and efficiently with minimal or no impact on environment.

Benefits of Green Computing:

- Reduce Hazardous material usage
- Maximize energy efficiency
- Promote recyclability
- Device efficient disposal methods
- Reduce carbon footprint
- Reduce GHG emmisions
- Save money due to reduced utility cost

Power Management

The Avanced Configuration and Power Interface (ACPI), an open industry standard, allows an operating system to directly control the power saving aspects of its uderlying hardware. This allows system to automatically turn off components such as monitors and hard drives after set periods of inactivity.

Power Supply:

Desktop computer power supplies (PSUs) are generally 70-75% effecient, dissipating the remaining energy as heat.

An industry initiative called 80 plus certifies PDUs that are at least 80% effecient; typically these models are drop-in replacements for order, less efficient PSUs of the same form factor.

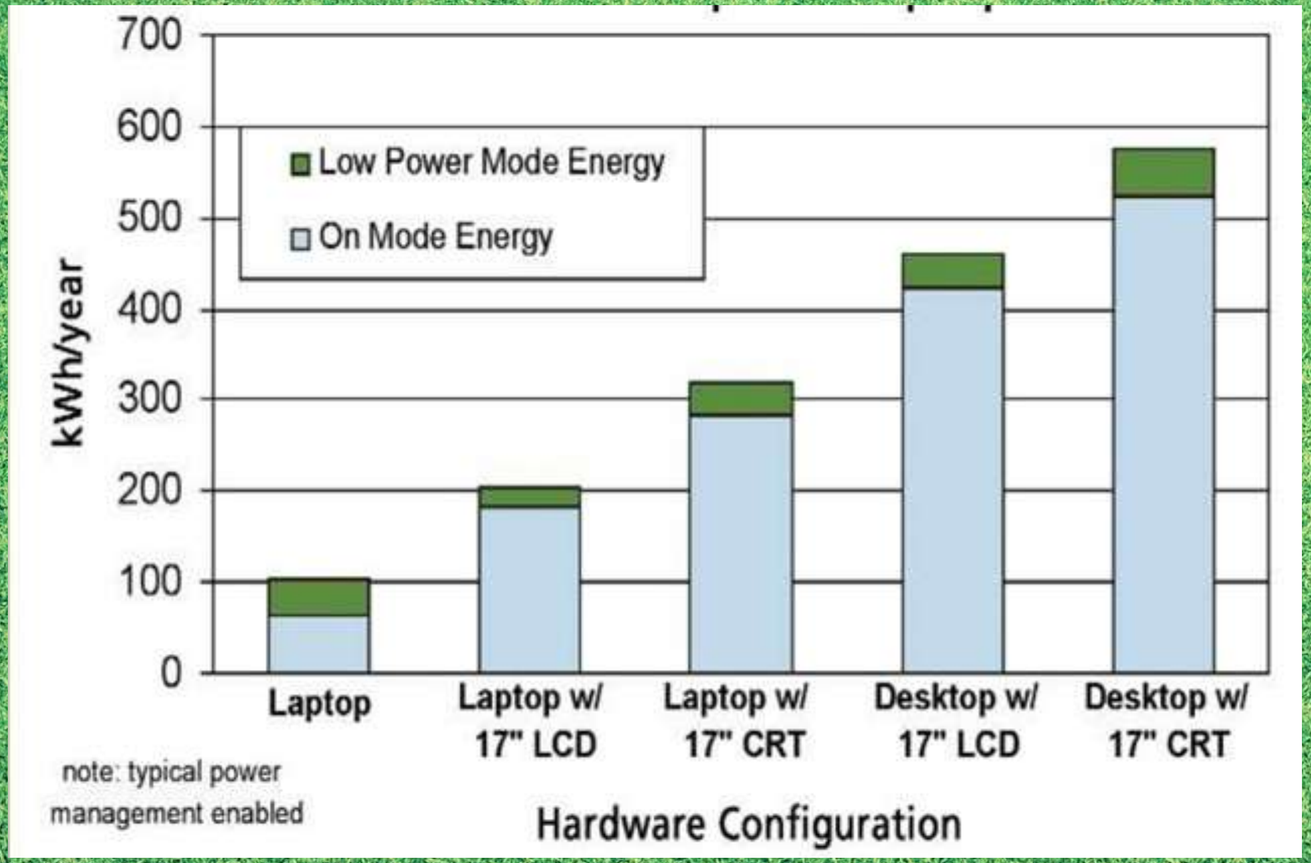
As of July 20 2007, all new Energy Star 4.0certified desktop PSUs must be atleast 80% efficient.

Power Savings Opportunities:

Following areas where the authors felt that there is the scope of optimising the usage of power:

- I/O devices
- Storage Units
- Processors
- Operating systems

Energy Consumption for Desktop and Laptop:



Display:

Brightness	White CRT	Grey CRT	Black CRT
100	85	74	63
50	84	67.5	60.5
0	77.7	65	60.0

Power Consumption Parameter	CRT Monitor	LCD Monitor
Avg. consumption	76 W	20 W
Screen color sensitivity	Extremely sensitive. Consumes lot more power (43% more) when displaying white on screen.	Completely insensitive. Consumes same power for all colors on screen.
Brightness setting sensitivity	Moderately sensitive. Consumes more power at higher brightness.	Sensitive. Consumes higher power for higher brightness
Contrast setting sensitivity	Less sensitive. (Almost insensitive when brightness setting is low.)	Completely insensitive. Consumes same power for all contrast
Consumption when turned off from computer power settings	2W	0 W

Processor Power Consumption:

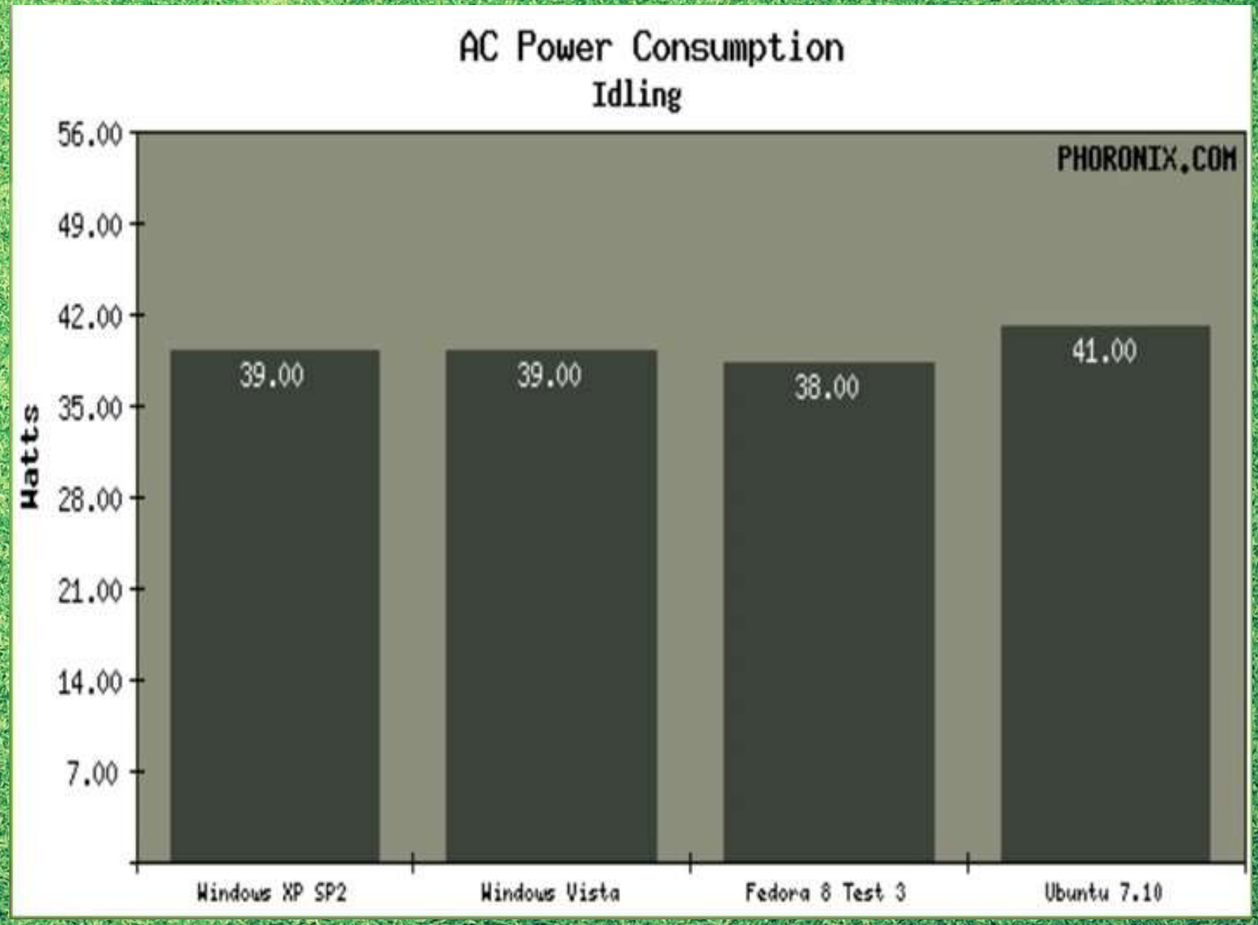
Testing power consumption of CPUs is a trickier task than graphic cards. The difference in power consumption between a CPU at idle and a CPU at full load wasn't as large as with graphic cards.

The system all had the following components:

COMPONENT	MODEL
Power supply	PC power and cooling Turbocool 850 SSI
Motherboard, Intel Testing	Intel D975XBX
Motherboard, AMD testing	ASUS A8N32-SLI
Memory, AMD testing	1GB Corsair XMS 3200XL, CAS 2-2-2-5
Memory, Intel testing	Corsair XMS5300 Pro at 4-4-4-8
Graphics card	Nvidia GeForce 7800 GTX (256MB)
Hard drive 1	Seagate 7200.8 160GB SATA
Hard drive 2	Western Digital 400GB SATA
Optical drive	Sony multiformat DVD burner

Operating System Issues:

In our "desktop usage" power tests, both Feodra 8 Test 3 and Ubuntu 7.10 had consumed more power than both versions of Microsoft Windows Tested. Feodra and Ubuntu were consuming 65 Watts while Windows Xp cnsumed 58 Watts. Granted, this test isn't very controlled and was just intented to give a rough overview.



Top 10steps to Minimize PowerUsage:

- Energy star labelled accessories.
- Sleep mode for unwanted usage.
- Better turn up switch off to save.
- Better be recycling the Electronics.
- Indicators for saving electricity.
- Screen savers use powers so do not use them.
- Don't discard your computing devices rather donate or recycle them.
- Use hibernate features when not using computers for a short time.
- Enable the power management feature.
- Use optimal brightness level to consume power.

Advantages and Disadvantages:

Advantages

- Sustainable computing means reduced energy consumption that leads to reduced GHG emissions and fossil fuel usage.
- Green computing is cost-effective due to less energy usage and cooling requirements.
- Sustainable IT helps in the preservation and effective utilization of natural resources.
- Green IT uses non-toxic components which do not pose any health hazard to the end-users
- Sustainable computing inspires people to reduce, reuse and recycle.

Disadvantages

- The initial implementation is costly.
- Frequent change in technology.
- Green IT cause more burden to an individual.
- The disparity in the level of understanding across various companies, professionals and end-users.
- Fewer courses and publications related to green computing.

Conclusion:

It has been observed that the power management can be achieved by controlling the use of the processor through the optimized usage of processor and the display devices through the OS. A little optimization in the discussed area will produce the better power control for domestic and commercial computing devices. The power management has a large scope in the portable devices also as it is the technology of the future.