

Physical and Virtual Desktop Energy Use Comparison



Summary

Zero Client Systems reduce user and administrative power loads by shifting local computing to server-based computing. The system is the combination of a terminal and a server. Our study, in partnership with the Walton College of Business, demonstrates an 88% reduction in electrical consumption, including front-end consumption and back-end server needs through the implementation of virtual desktops. The benefits of the Zero Client System beyond energy savings include the centralization of IT administration, reduced noise in classrooms, lowered air conditioning needs, reduced capital costs, reduced maintenance, reduced service interruption in the classroom due to PC failure, increased IT security, and standardization of administrative practices across IT platforms.

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Overview

The Walton College of Business and the Office for Sustainability tracked electrical consumption of 32 Dell OptiPlex personal tower computers (PCs) between 6/20/2013 and 7/1/2013 and 32 Zero Clients between 7/25/2013 and 8/8/2013. The measurements were made from JB Hunt 220 during a summer session course. WCOB and the OFS used Kill-watt-readers to record the electrical consumption. Use levels were approximately the same between the physical and virtual desktops.

The reduction in electrical consumption demonstrates a savings of approximately 88%. The cost associated with the Dell OptiPlex machines was \$0.12 per machine per day. The machines consumed 1.73 kWhs per day and the cumulative electrical cost was \$41.95 during the 11-day observation period. This was assumed to represent a baseline figure for future analyses; it represented low-to-moderate use during the observation period.

The 32 PCs were replaced with a Zero Client System after the 11-day observation period. The associated electrical cost was approximately \$0.01 per day per machine. The machines consumed approximately 0.20 kWhs per day and cost approximately \$3.82 in electricity for

32 machines, demonstrating an 88% drop in electricity costs (Table 1). This cost estimate includes server electrical demands using Dell’s server power specifications.

Table 1. Summary of PC and Zero Client System

	Zero Client System	PC Towers
Cost ^{-day}	\$0.01	\$0.12
Total kWh ^{-day}	0.20	1.73
Total Cost during trial	\$3.82	\$41.95
Estimated reduction in electricity (%)	88%	

Energy Savings Extrapolation

The Zero Client System’s estimated annual savings for 32 machines, operating 365 days of the year on the Zero Client System saves approximately \$1,231.41 in avoided electrical costs (Table 2). Increasing the number of machines that use the Zero Client can easily demonstrate substantial electricity savings and associated greenhouse gas emissions reductions (Table 3).

Table 2. Estimated Annual Operating Costs Per 32 Machines

	Zero Client System	PC Towers
Annual Cost ^{-32 Machines}	\$160.50	\$1,391.91
Estimated annual savings in electricity	\$1,231.41	

Table 3. Estimated Savings for 400 & 800 Machines

	Zero Client System	PC Towers	Savings
Estimated Cost ^{-400 machines - year}	\$2,006.24	\$17,398.83	\$15,392.58
Estimated Cost ^{-800 machines - year}	\$4,012.49	\$34,797.66	\$30,785.17

Conclusion

The power consumption trial clearly demonstrates a significant reduction in electrical use of 88% in a classroom setting. The expansion of the system could increase by thousands or tens of thousands of dollars annually. The Zero Client system enables access to Walton College Lab computers for their students from any device, at any time, over any Internet connection. Zero Client consoles reduce maintenance and labor and have a lifespan double that of traditional PC towers. While the system is not designed to meet every computer users’ needs, it is ideal for general access computing and is proven to reduce electrical loads.