

Zero Client System– A Computer Power Management Opportunity



UNIVERSITY OF
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Office for Sustainability

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Project Statement

Zero Client Systems reduce user and administrative power loads by shifting local computing to server-based computing. The system is the combination of a dumb terminal and a server. The system uses 88% less energy than typical computers such as a Dell OptiPlex. The adoption of 32 computers shows an annual savings of approximately \$1,231.41 in energy use. The expansion of the system could increase by thousands or tens of thousands of dollars annually. The benefits of the Zero Client System are multiple (i.e. the centralization of IT administration, reduced noise in classrooms, lowered air conditioning needs, deferred maintenance and others), however, this paper demonstrates energy savings associated with the Zero Client System.

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Overview

The Walton College of Business and the Office for Sustainability tracked electrical consumption of 32 Dell OptiPlex's between 6/20/2013 and 7/1/2013 and 32 Zero Clients between 7/25/2013 and 8/8/2013. The readings were taken from JB Hunt 220 during a summer session course. WCOB and the OFS used Kill-watt-readers to record the electrical consumption. The reduction in electrical consumption demonstrates a clear savings of approximately least 88%.

The costs associated with the OptiPlex machines were \$0.12 per machine per day. The machines consumed 1.73 kWh's per day and the cumulative electrical cost was \$41.95 during the 11-day observation period. This may represent a baseline figure for future analysis due to the low-to-moderate use of the classroom during the observation period.

The 32 OptiPlex's were replaced with a Zero Client System after the 11-day observation period and demonstrated a sharp decrease in electrical use thereafter. The associated electrical cost was \$0.01 per day per machine. The machines consumed approximately .20 kWh's 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 demands¹.

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 energy savings can be easily extrapolated to determine deferred electrical costs. For instance, 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). While increasing the number of machines that use the Zero Client can easily demonstrate savings (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

¹ Power consumption was estimated using Dell's server specifications sheet.

Conclusion

The power consumption trial clearly demonstrates a significant reduction in electrical use of 88% in a classroom setting. Additional savings are achieved as the system absorbs additional machines within a general access computing lab network. The adoption of 32 computers shows an annual savings of approximately \$1,231.41 in energy use. 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 from any device, at any time, over any Internet connection for Walton College of Business students. It has several benefits, including reduced maintenance and labor as well as 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.