

Walton College Zero Client Power Trial

Readings from JBHT220 for Standard PCs

	Date / Time of Reading		Date / Time of Reading		Date / Time of Reading		Date / Time of Reading		Date / Time of Reading		Date / Time of Reading		Date / Time of Reading	
	06/20/2013 @ 4:15 PM		06/21/2013 @ 9:50 AM		06/21/2013 @ 4:20 PM		06/24/2013 @ 9:30 AM		6/24/2013 @ 4:50 PM		6/25/2013 @ 9:56 AM		6/25/2013 @ 4:20 PM	
	Reader		Reader		Reader		Reader		Reader		Reader		Reader	
	Anthony Mader		Shervon Thomas		Anthony Mader		Shervon Thomas		Anthony Mader		Shervon Thomas		Anthony Mader	
Unit #	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time
1	0.16	3 hrs 1 min	0.16	20 hrs 47 min			0.33	3d 20hr 22m	2.99	4d 3hr 41m	8.95	4d 20h 27m	11.15	5d 3h 10m
2	3.11	7 hrs 1 min	11.02	1 day 34 min	14.04	1d 7hr 8 min	46.5	4d 17 min	49.71	4d 7h 40m	57.07	5d 42m	60.08	5d 7h 7m
3	2.44	6 hrs 58 min	8.69	1 day 38 min	10.84	1d 7hr 6 min	33.62	4d 20 min	36.1	4d 7h 39m	41.85	5d 46m	43.89	5d 7h 7m
4	2.96	7 hrs 1 min	10.47	1 day 38 min	13.32	1d 7hr 8 min	42.63	4d 19 min	45.77	4d 7h 40m	52.99	5d 44m	55.85	5d 7h 7m
6	3.37	7 hrs 3 min	11.55	1 day 44 min	14.47	1d 7hr 11min	43.21	4d 25 min	46.07	4d 7h 43m	53.09	5d 50m	55.73	5d 7h 10m
8	3.18	7 hrs 3 min	11.4	1 day 44 min	14.02	1 d 7 hr 11min	44.27	4 d 27 min	47.46	4d 7h 43m	54.94	5d 51m	57.78	5d 7h 10m

	Date / Time of Reading		Date / Time of Reading		Date / Time of Reading		Date / Time of Reading		Date / Time of Reading		Date / Time of Reading	
	6/26/2013 @ 4:20 PM		6/27/2013 @ 12:15 PM		6/27/2013 @ 4:25 PM		6/28/2013 @ 9:30 AM		6/28/2013 @ 4:20 PM		7/1/2013 @ 9:30 AM	
	Reader		Reader		Reader		Reader		Reader		Reader	
	Anthony Mader		Shervon Thomas		Anthony Mader		Shervon Thomas		Anthony Mader		Shervon Thomas	
Unit #	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time
1	19.01	6d 3h 3m	25.8	6d 23h 3m	27.43	7d 3h 17m	33.65	7d 20h 15m	36.25	8d 3h 11m	58.84	11
2	71.09	6d 7h 2m	80.07	7d 2h 58m	82.05	7d 7h 11m	89.79	8d 10m	93.09	8d 7h 8m	125	11
3	51.11	6d 7h 1m	57.33	7d 3h 2m	58.91	7d 7h 11m	64.28	8d 14m	66.49	8d 7h 8m	87.1	11
4	65.92	6d 7h 2m	74.23	7d 3h 1m	75.95	7d 7h 11m	82.78	8d 13m	85.59	8d 7h 8m	110	11
6	65.53	6d 7h 5m	73.78	7d 3h 5m	75.55	7d 7h 14m	82.62	8d 17m	85.39	8d 7h 11m	111	11
8	67.53	6d 7h 5m	75.96	7d 3h 6m	77.81	7d 7h 14m	84.34	8d 18m	87.36	8d 7h 11m	116	11

Analysis

Standard PC Cost ^{-machine-day}	\$0.12
Total kWh ^{-machine-day}	1.73
Mean kWh	101.323
Standard Deviation of kWh	24.298
Coefficient of Variation	0.240
Total Cost during trial	\$41.95

Assumptions

# of devices observed	32
# of days observed	11

Percent of total that deviates from actual expenses

Walton College Zero Client Power Trial

Readings from JBHT220 for Zero Clients

	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	Date / Time of Reading	
	7/25/2013 @ 4:10 PM	7/26/2013 @ 2:30 PM	7/30/2013 @ 4:15 PM	8/2/2013	8/5/2013 @ 2:25 PM	8/6/2013	8/7/2013 @ 3:35 PM	8/8/2013 @ 2:26 PM								
	Reader	Reader	Reader	Reader	Reader	Reader	Reader	Reader								
	Anthony Mader	Shervon Thomas	Anthony Mader	Anthony Mader	Anthony Mader	Anthony Mader	Anthony Mader	Shervon Thomas								
Unit #	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time	Cumulative Power	Elapsed Time
1	0.53	1d 1h 6m	0.99	1d 23h 42m	2.72	6d 1h 22m	4.69	9d 1h 52m	6.05	12	6.54	13d 0h 43m	7.01	14d 0h 45m	7.46	14d 23h 37m
2	0.87	1d 1h 11m	1.71	1d 23h 36m	4.46	6d 1h 18m	7.42	9d 1h 48m	9.5	12	10.19	13d 0h 39m	10.81	14d 0h 41m	11.38	14d 23h 31m
3	0.54	1d 1h 12m	1.04	1d 23h 39m	3.06	6d 1h 18m	5.56	9d 1h 49m	2.1	12	7.67	13d 0h 39m	8.21	14d 0h 42m	8.72	14d 23h 34m
4	0.8	1d 1h 10m	1.51	1d 23h 36m	3.91	6d 1h 16m	7.18	9d 1h 46m	9.01	12	9.68	13d 0h 37m	10.32	14d 0h 40m	10.93	14d 23h 32m
6	0.73	1d 1h 33m	1.46	2d 0h 1m	2.77	6d 1h 39m	3.53	9d 2h 9m	4.25	12	4.51	13d 1h 0m	4.76	14d 1h 2m	5	14d 23h 55m
8	0.81	1d 1h 12m	1.55	1d 23h 42m	4.55	6d 1h 18m	7.59	9d 1h 49m	9.57	12	10.47	13d 0h 39m	11.25	14d 0h 42m	11.91	14d 23h 36m

Analysis

Zero Client Cost ^{-machine-day}	\$0.01
Total kWh ^{-machine-day}	0.14
Mean kWh	6.7467
Standard Deviation of kWh	3.1300
Coefficient of Variation	0.4639
Total Cost during trial	\$3.82

Assumptions

# of devices observed*	32
# of days observed	12
Cummulative kWh	55.4

Percent of total that deviates from actual expenses

Server Cost

Cost* -Day -Machine	\$0.003787
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Notes

*Estimated cost of maximum VDI's hosted by Server	
kWh based on 8 month power monitoring for Dell's server spec sheet (229 Days)	5027.3
kWh annual consumption based on Dell's server spec sheet	63%
Estimated 12 month power consumption	8012.47
Estimated daily kWh consumption ^{-400 VDI}	0.05487991
Estimated cost ^{-Day -400 VDI}	\$0.003787
Server Peak Consumption (kWh)	151.1
Number of VDI's hosted by server	

System Cost

Cost	-machine -day	\$0.0137
kWh	-machine -day	0.1992

Notes

Zero Client Cost	-Machine -D	\$0.01
Zero Client kWh	-Day - Machine	0.14
Server Cost	-Machine -Day	#####
Server kWh	-Machine -Day	0.05487991

Electrical Costs

	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%	

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

	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